PROBES FOR ICT AND FCT
INTERFACE PROBES
POSITION TEST
ACCESSORIES FOR TEST FIXTURES

CONTACT PROBES

FOR PCB TESTING



FEINMETALL
Contact Technologies

Version 1

CONTENTS

Contact Probes for In-Circuit Test and Functional Test (ICT, FCT)

For many years FEINMETALL is a worldwide leading provider of contact probes for ICT and FCT applications. Based on long-term experience and a strong customer focus we have consistently set high standards in developing innovative and practical contacting solutions for contacting PCBs, even with smaller and smaller centers.

These solutions are included in this catalog.

Contact probes for other applications are shown in the corresponding further catalogs.

Competence

FEINMETALL is your partner for the reliable contacting of electronic components. The wide range of applications for spring contact probes includes board tests with fine centers up to wire harness and connector tests with individual and intelligent solutions.

Broad Competence In-house
The development and manufacturing of spring contact probes, special contact solutions and wafer probe cards in one company are a wide basis for our competence in precision technology and micro-mechanics. This combination is unique at the market and represents "German Technology" at its best.

Innovative Capacity
For many years FEINMETALL represents a high level of innovation. Many patent-registered solutions have been milestones in the world of test engineering.

International Customer Service
We are acting in the international high-tech industry and our processes are aligned accordingly. With seven subsidiaries worldwide and a strong network of well trained partners we are always connected to the markets and to our customers, wherever they are. Local stocks and special customs certificates provide a high delivery performance.

Quality

Quality controls all process steps at FEINMETALL. From product development and construction up to manufacturing and delivery all operation steps are perfectly aligned.

FEINMETALL is certified according to DIN ISO 9001. Additionally a wide range of measures like e.g. risk analysis by FMEA during the whole product development process ensure a maximum of technical as well as delivery reliability.

Environment and Health Protection
FEINMETALL is committed to the goals of the up-to-date legislation regarding environment as well as health protection and to conformance to all necessary measures. The current statements regarding the various European environment and health regulations are available on our homepage.

Traceability of Contact Probes
FEINMETALL contact probes with a sufficient diameter are marked by laser. This enables the traceability of each single contact probe and the correlation to the exact production lot. Additionally the laser marking guarantees the use of "the original".

Customer Focus
Our engineers and technicians work closely together with our customers and have a deep knowledge of the practical applications. Our know-how is your advantage!

Note
This catalogue contains contact probes for contacting PCBs.
The whole contact probe portfolio as well as corresponding step-files for the integration in your CAD-system can be downloaded from our homepage at **www.feinmetall.com.**

Overview of Tip Styles for Board Test

01	02	03	04	05	06
Conical 90°	Conical 90° stepped	Conical 60°	Conical 60° stepped	Concave stepped	Serrated stepped

07	09	10	11	12	14
Hexagonal 90° stepped	6-point crown 120° stepped	Flexible Needle	Spherical	Spherical stepped	4-point crown stepped (self cleaning)

15	16	17	18	21	28
Triangular 45° stepped	Flat	Flat stepped	Conical 30°	4-point crown (self cleaning)	4-point crown stepped

29	30	32	33	35	36
4-point crown	Triangular 45°	Rigid needle 10°	Square lance 38°	3-point crown stepped (self cleaning)	6-point crown with middle pin stepped

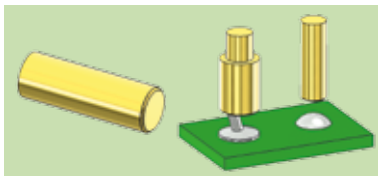
37	38	41	43	53	55
4-point crown stepped	Square lance 140°	6-point crown stepped (self cleaning)	Square lance 90°	Square lance 55°	Concave (self cleaning)

62	63	66
Triangular 30°	8-point crown stepped (self cleaning)	Serrated stepped (self cleaning)

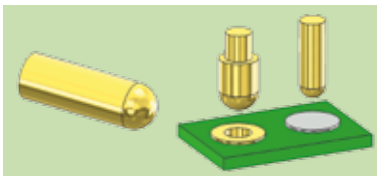
Special Versions

(06) IK	(17) K
IK = Insulating cap	K = Synthetic head

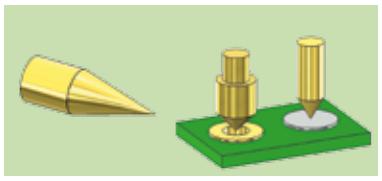
Typical Tip Styles and Applications



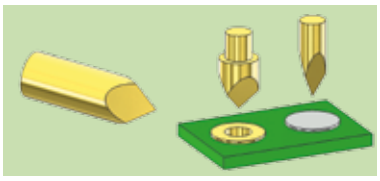
Flat
(16,17)
Suitable for solder pads and contact pins.



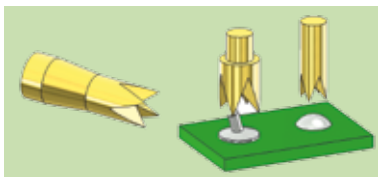
Spherical
(11,12)
For testing clean contact surfaces, does not leave marks or scratches.



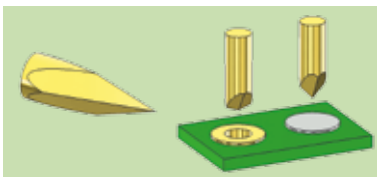
Conical
(01,02,03,10,18,32,34,35)
Universal tip style with different angles of 10°, 15°, 30°, 60°, 90° or 120° for contacting solder pads and vias.



Triangular stepped
(15,30,62)
For via holes and solder pads. The sharp edges penetrate flux residues and oxide layers.

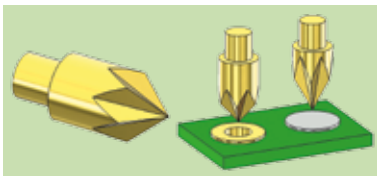


4-point crown
(14,20,21,28,29,37)
For pad surfaces and soldered pins. The sharp edges penetrate flux residues and oxide layers.



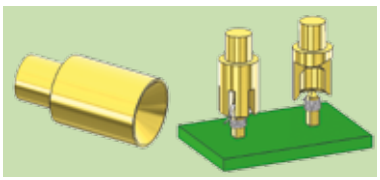
Square lance
(33,38,43,53)
For via holes and solder pads. The sharp edges penetrate flux residues and oxide layers.

Crown
(09,35,40,41,42,60,63)
For wire wrap posts, even if the contacts are bent or twisted.

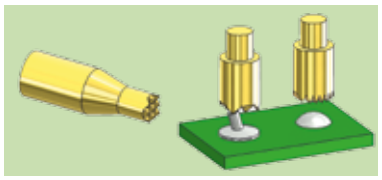


Hexagonal
(07,08)
For testing plated vias and pads. The sharp edges penetrate contamination and oxide layers.

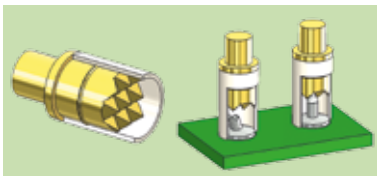
Crown with inner pin
(36,68)
Used for reliable contacting of plated or filled vias.



Concave
(05,50,55)
For a smooth contact of pins and wire wrap posts. The risk of contamination can be minimized by using a self cleaning version.



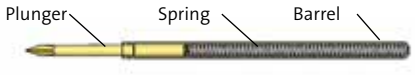
Serrated, W-profile
(06,46,64,66)
Universal tip style for contacting wires, pins and wire wrap posts, even suitable for bent contacts.



Insulation cap (IK)
(05,06,17,41)
For detecting the correct length and straightness of pins.

Design of Spring Contact Probes

Spring contact probes are typically composed of a plunger, a barrel and a spring.



Plunger

FEINMETALL manufactures plungers with many different tip styles, suitable for a large variety of applications. Plungers are generally made from beryllium copper (BeCu) or steel. Optimized turning and plating processes are resulting in an outstanding straightness and exactness of the plunger surface, the base for a long lifetime. Aggressive tip styles are made by a special grinding process for ultra sharp edges.

Barrel

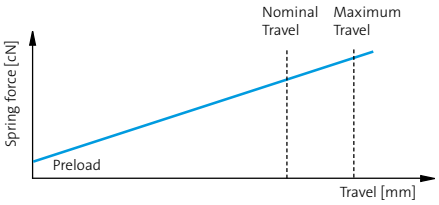
FEINMETALL barrels are usually made of nickel silver, bronze or brass. Nickel silver barrels are deep-drawn whereas barrels made of bronze are turned or deep-drawn and barrels of brass are turned. All barrels are usually silver or gold plated. A small hole in the bottom permits the barrels to be thoroughly cleaned during manufacturing and ensures continuous wetting in the plating process.

Spring

During the early years FEINMETALL developed long-life springs for the clock industry and subsequently made use of this knowledge in the manufacturing of spring contact probes. Compression springs are normally made of silver plated music wire or stainless steel, for some special applications also of non-magnetic beryllium copper. Springs made of music wire have a working temperature up to a Maximum of 80°C (176°F) while made of stainless steel or BeCu can be operated up to 200°C (392°F).

Spring Force

The selection of the spring force mainly depends on the application. On the one hand side the spring force needs to ensure the quality of the electrical contact and the penetration of contaminations or oxide layers. On the other hand side it should not lead to any damages on the contacting surface or on the board. It also needs to be taken into consideration that the penetration of the contacted surface highly depends on the chosen tip style. In test fixtures (especially vacuum fixtures) the sum of all spring forces has to be observed in order to close the fixture and the contacts without problems. Due to manufacturing processes and material variances all spring forces have a tolerance of ±20%.



Spring Travel

The spring force increases proportional to the spring travel. This linear function is shown in the force-travel-diagram. During the assembly of the probe the spring is already compressed by a certain travel. The resulting spring force is called preload. The preload makes sure that there is a certain force right from the beginning of the contacting process. Also it makes sure that the plunger is completely pushed back after the contacting. The nominal spring force is the spring force at the recommended working travel. The recommended working travel should not be exceeded significantly, because otherwise the life time of the probe could be considerably reduced.

Electrical Specifications

In a contact probe the primary current flow is typically leading through the plunger, the barrel and the receptacle. A secondary current flow is leading through the plunger, the spring and the barrel. The transition points cause certain transfer resistances that are influenced by the following factors:

- → Conductivity of the base material
- → Conductivity of the plating material
- → Condition of the surface of the probe
- → Size of the contact surface
- → Contact forces at the transition points

FEINMETALL is taking measures to guarantee a constant low contact resistance during the whole lifetime of the probes. The maximum continuous currents and the typical resistances of each specific probe are shown in the data sheets.

Important note for all products with electrically insulated functions
like e.g. switch probes, switch receptacles, combi receptacles, coaxial probes, insulation caps etc.: For safety reasons according to DIN VDE 0100, part 410, over electrically insulated parts only low-voltages of maximum 25 V (AC) or 60 V (DC) are allowed. These values are effective values including voltage pulses due to over-voltages etc.

	Basic Materials	Plating
Barrel	Nickel Silver (deep-drawn) Bronze (turned or deep-drawn) Brass (drilled) Nickel	Silver Gold
Plunger	Beryllium-Copper - BeCu (B) Steel (S) Synthetic Material (K) Palladium Alloy (P) Brass (M)	Chemical Nickel Gold FM-Longtime Gold Rhodium Progressive Coating Multiplex
Spring	Music Wire (max. 80°C) Stainless Steel (max. 200°C) BeCu (non-magnetic, max. 200°C)	Silver Gold
Receptacle	Nickel Silver Bronze Brass	Gold

Different Types of Spring Contact Probes

Spring Contact Probes are available for various applications. Below you find a brief overview of the most important types.

ICT/FCT Probes for Test Fixtures
Test fixtures for in-circuit test (ICT) and functional test (FCT) are mainly equipped with standard probes for the centers 50 mil, 75 mil and 100 mil.

Fine Pitch Probes
Contact probes for centers smaller than 1,27 mm / 50 mil are fine pitch probes. In these centers a direct soldering or the use of receptacles is not possible. Therefore most fine pitch probes are designed as double plunger probes to be mounted into sandwich blocks.

Battery Contacts
Battery contacts are compact probes, often with a limited travel. They are well suitable as charging contact, but they can also be integrated in end user products whenever low-wear electrical contacts are required.

Interface Probes
Interface probes are used for transmitting the signals from the test fixture into the test system. Contact probes for this application are specifically standardized for each test system.

Threaded Probes
Contact probes with thread are mainly used in modules for testing connectors and wire harnesses. The advantage is that even under difficult conditions the probes do not move out of the receptacle and a secure seat is guaranteed.

High Current Probes
For high current applications spring contact probes need to be designed with a very small probe resistance. High current probes are available in different versions and designs.

Switch Probes
Special probes with integrated switch element are mainly used for presence tests. Switch probes close or open an electric circuit after a defined travel of the plunger (switch travel). For non-conductive contacting, switch probes are available with various insulated tips.

Switch Probes with Ball Head
For side contacts with laterally moved test items, FEINMETALL has developed a special switch probe series with a rolling ball as contact element. These probes are less sensitive to lateral forces and have a remarkably higher durability compared to standard probes with only round tip styles.

Pneumatic Switch Probes
For selective contacting of test points or for positions that are difficult to access, it can be helpful to use pneumatic contact probes, operated by compressed air.

Push Back Probes
During the push back test of connectors the tight seat of the connector elements is verified. For this application contact probes with very high spring forces are used.

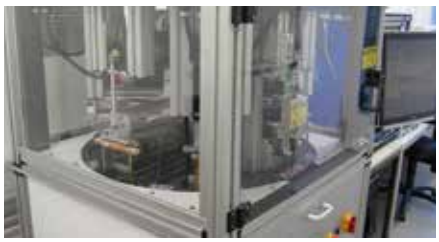
Kelvin Probes
Very low resistances of components are measured by the 4-wire measurement (Kelvin-method). For this application contacts for the current source and the voltmeter need to be implemented very close to the component. These connections can be realized by special coaxial probes (Kelvin probes), using the outer conductor for the constant current and the inner conductor for measuring the voltage. Therefore measuring errors caused by the connection wires are eliminated.

Radio Frequency Probes
In many applications, like e.g. testing antenna connectors, radio frequency signals need to be transmitted. To carry these signals, special coaxial contact probes are used. RF probes have an inner conductor for the transmission of the signal and an outer conductor for the electromagnetic shielding.

Life Cycle Test of Contact Probes

The life cycle of spring contact probes is depending on the design of the probes as well as on the operating conditions in the field.

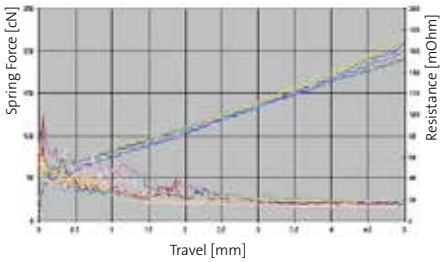
High lateral forces, high current load and contamination may lead to a significantly reduced lifetime of the probes. For us as manufacturer of these probes, it is vital to permanently control and review the quality parameters and to analyze the lifetime performance of our products. In our own laboratory we have various test and measurement setups for quality control and for the determination of technical parameters during research and development. One important subject is the life cycle test, conducted with seven autonomous stress stages. The test conditions provide an internal standard reference that allows competent statements regarding the life cycles of our probes.

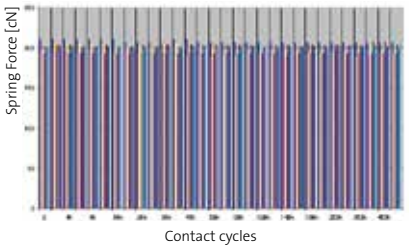


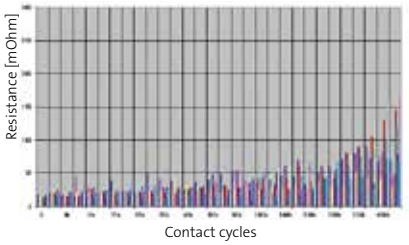
Life cycle tests are performed under the following conditions:

→ Ambient temperature: +20°C to +30°C
→ Relative humidity: 40 to 60%
→ Dust free environment

For the life cycle test up to 10 sample probes are mounted in a stress stage and then pressed with a stroke frequency of 5 to 6 strokes per second. In predetermined steps (e.g. after 2000 strokes) the probes are analyzed in a separate test station and the spring force and the contact resistance of each probe are measured as a function of the spring travel (see picture right on the top). Later the test results are combined in a diagram, showing the whole life cycle of the probe (up to more than a million strokes). The diagrams show typical life cycle test results of spring force and resistance.





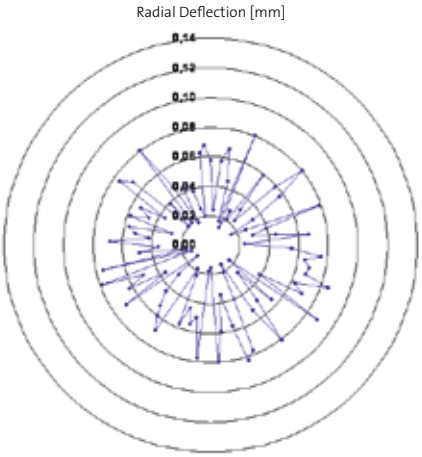


Pointing Accuracy and Radial Tolerance

The pointing accuracy of a spring contact probe is determined by many factors, for example by manufacturing tolerances, by the length of the plungers and by the type of plunger guiding. Further factors that are independent of the contact probe have to be considered, for example the receptacles and the mounting of the test fixture or module.

To optimize the pointing accuracy especially in applications with small centers additional guiding plates in the fixture can be used. There is always a radial tolerance between plunger and barrel of a spring contact probe. This leads to a certain deflection of the plunger tip. The guide clearance is necessary and if ideally designed, it guarantees a low abrasion and a reduction of lateral forces. The know-how to produce a good functioning and still long living spring contact probe lies in the definition of the optimum tolerances of plunger and barrel.

The most important factor for the pointing accuracy is the radial deflection of the tip compared to the central axis of the probe at the moment of contacting. The specific pointing accuracy in the technical specifications of the probes is approximately corresponding with the maximum radial deflection. The radial deflection can be shown in a diagram.



Materials

The optimum performance of a spring contact probe is significantly depending on the selection and combination of materials and platings. Developing, testing and qualifying materials for the various applications is an important aspect of our research and development efforts.

Basic Materials

For choosing the optimum basic material for barrel, plunger, spring and receptacle of spring contact probes different aspects need to be considered. Besides the technical applicability also machining and economical facts are relevant for this decision.

Beryllium-Copper
combines outstanding mechanical properties with a high electrical conductivity. It is used for plungers or contact elements in a great variety of products, especially in the field of standard- and high current probes. Also springs can be made of BeCu.

Steel
is significantly harder than BeCu and is used for plungers with aggressive tip styles or the requirement of extremely long durability.

Palladium Alloy
is used as basic material for plungers. Because of the high hardness it is very robust, an additional plating is not necessary.

Nickel Silver
is very resistant to corrosion and is well suitable for machining. Barrels and receptacles made of nickel silver can also be deep drawn economically.

Bronze
is characterized by a combination of good wear resistance, cold formability and high electrical conductivity. It is used for barrels and receptacles.

Brass
is an extremely high quality material with a high electrical conductivity, a good wear resistance and the suitability for different ways of machining. It is used for barrels, receptacles and for special shapes.

Nickel
Barrels in very small diameters can be manufactured by electroforming. In this case nickel is separated and combined with precious metal. This results in pipes with very thin pipe wall of nickel, that can already be gold plated on the inner surface. These barrels are highly precise, however, the thickness of the pipe wall cannot be varied within one part.

Plating Materials

Typically the surfaces of all elements of contact probes are galvanically plated in order to protect the basic material against corrosion. At the assembled contact probe the plating also reduces friction and thereby leads to low abrasion and low contact resistances.

FEINMETALL plating materials are basically galvanic nickel, chemical nickel, gold, hard gold, longtime gold, rhodium, silver or progressive coating. To achieve the maximum performance the ideal selection and combination of coating materials, coating thicknesses, coating alloys as well as various boundary processes have to be made.

Galvanic Nickel
has a good chemical durability and a hardness of 300 to 500 HV. It has a good ductility and adheres well to the base material. Nickel also prevents the base material from migrating into the precious metal surface and contaminating it and leads to a high temperature stability and life time.

Chemical Nickel
has a very good chemical durability and is not brittle. It has a hardness of 400 to 600 HV. Chemical nickel is most appropriate for aggressive tip styles, because it has a good contouring capability and wear resistance.

Rhodium
is extremely resistant to wear and abrasion. Due to its hardness of 800 to 900 HV it is plated on plungers which are used in very rough applications.

Silver
is used as a bearing surface and as corrosion protection for barrels and springs. The hardness of the silver layer is 80 to 100 HV only, but it adheres very well to the base material even at small diameters. Silver improves the electrical conductivity.

Gold
guarantees the best chemical durability with a hardness of 150 to 200 HV. Gold considerably improves the electrical conductivity. Standard gold is mainly used for plungers made of beryllium-copper or brass.

Hard Gold
is the hardest galvanic gold layer with up to 400 HV. Hard gold differs from the other gold types by its slightly lighter color.

FM Longtime Gold
is a special gold plating layer system for steel plungers developed by FEINMETALL. The combination of steel and FM-Longtime gold results in a high performance and a long lifetime, even at heavy load applications.

Progressive Coating
is a special coating for contacting lead-free soldering pads and other contaminated or oxidized surfaces. This coating is characterized by a high hardness of 550 to 600 HV and a very low contamination of the tips, which leads to a long lifetime of the probes.

Multiplex
is a multi-layer coating system with a very high corrosion resistance. It has been developed for gold plating of steel plungers, that are used in conditions with high humidity.

Receptacles for Spring Contact Probes

For simple replacement spring contact probes are typically mounted into receptacles. The probes are either plugged-in or screwed into the receptacle, depending on the type of contact probe. Receptacles are available with different types of electrical connection.

Mounting

Receptacles with collar on top have a fixed projection height and guarantee the tightest seat with very low tolerances. Receptacles with press ring can be used in two ways. Either the press ring is used as dead stop or it is inserted into the mounting plate, which results in a variable projection height. For receptacle insertion into the mounting plate, a special insertion tool is necessary.

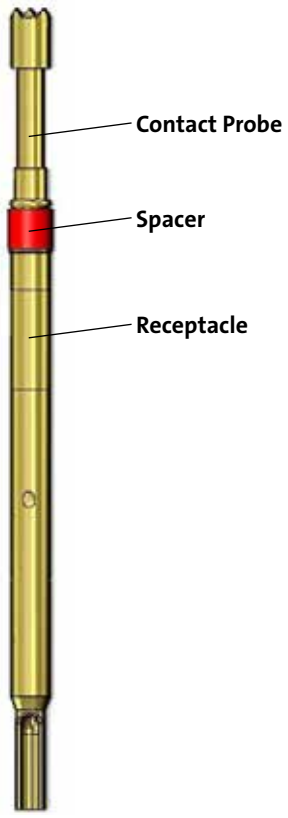
Connection of Receptacles

Almost all receptacles are available with solder or crimp connection. Wire wrap connections are frequently used for test fixture manufacturing, because they can be wired automatically. Some receptacles (especially those with very small diameters) are available with pre-assembled wires. Additionally, for example to connect coaxial probes, special connecting elements can be used

Types of Receptacles

At ICT/FCT test fixtures mainly plug-in probes are used. However, in some applications, particularly at modules for wire harness and connector tests, threaded probes are used, which are screwed into the receptacles.

Threaded probes guarantee a secure seat because they do not move out of the receptacle even under difficult conditions. Knurled receptacles ensure a firm seat of the receptacle in the drill hole. For switch probes and coaxial probes, FEINMETALL has developed special receptacles called „combi-receptacles“, which enable a solder free exchange of these probes. Further receptacles with integrated switch function are available, that are frequently used in combination with twist proof probes.



Spacers

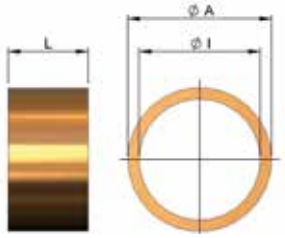
For height adjustment and balancing of tolerances.

Spacers H772DS/xx for 100mil Probes

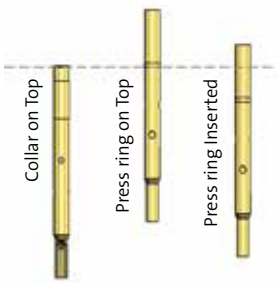
Order Code	Outer-Ø	Inner-Ø	Length
H772DS/10	2,20	1,70	1,00
H772DS/20	2,20	1,70	2,00
H772DS/30	2,20	1,70	3,00
H772DS/50	2,20	1,70	5,00

Spacers H773DS/xx for 138 mil Probes

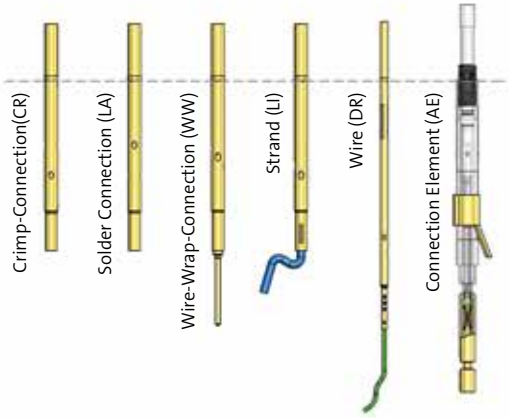
Order Code	Outer-Ø	Inner-Ø	Length
H773DS/01	3,20	2,70	0,10
H773DS/05	3,20	2,70	0,50
H773DS/10	3,20	2,70	1,00
H773DS/20	3,20	2,70	2,00
H773DS/30	3,20	2,70	3,00
H773DS/50	3,20	2,70	5,00



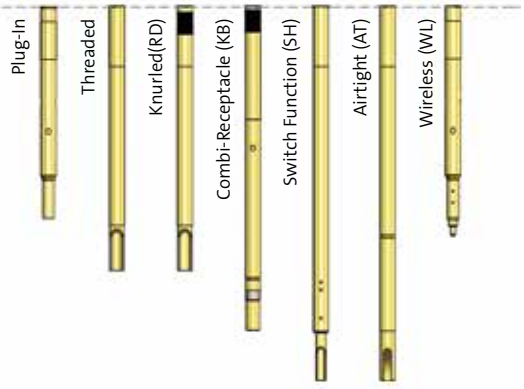
Mounting



Types of Connections



Types of Receptacles



Drilling Recommendations

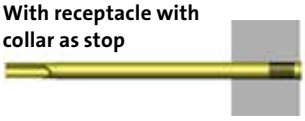
Mounting the receptacle into the mounting plate demands special precision. Various parameters like rotating speed, feed, helical groove length, material and plate thickness are influencing the drilling results. The drilling recommendations in the technical specifications of the probes are guideline values only as a basis for your own drilling trials. **Therefore it is very important to make drilling tests in order to ensure that the receptacles have a proper seat in the mounting plate.**

Material-characteristics	FR4	CEM1
Density (g/cm³)	1,70 - 1,90	1,54
Humidity-absorption (%)	0,15	0,15
Thermal conductivity (W/m K)	0,30	0,20
Operation temperature permanent (°C)	155	130

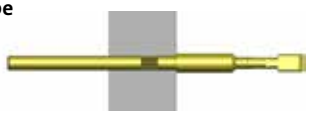
Press ring as stop

With inserted Press ring

With receptacle with collar as stop

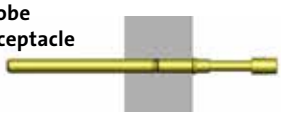


Contact probe with knurl



Interface pin

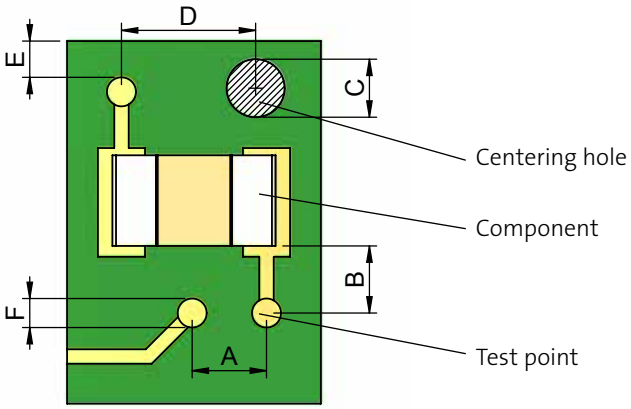
Contact probe without receptacle



Outer-Ø Receptacle [mm]	Drill-Ø [mm] EP 105	Drill-Ø [mm] HGW 2372.1	FEINMETALL Receptacles
Receptacle with press ring as stop (without knurl)			
0,66	0,66-0,68	0,66-0,68	H109
0,85	0,83-0,84	0,83-0,84	H111
0,94	0,94-0,96	0,94-0,96	H605
0,95	0,96-0,97	0,97-0,98	H050
1,00	0,99-1,00	0,99-1,00	H768, H787, H730
1,14	1,12-1,14	1,12-1,14	H709
1,20	1,19-1,20	1,19-1,20	H310
1,30	1,29-1,30	1,29-1,30	H703, H075
1,32	1,31-1,32	1,31-1,32	H701
1,50	1,49-1,50	1,49-1,50	-
1,56	1,54-1,55	1,54-1,55	H708
1,68	1,67-1,68	1,68-1,69	H502, H585, H100
1,75	1,73-1,74	1,74-1,75	H320
1,80	1,78-1,79	1,78-1,79	H610
2,00	1,99-2,00	1,99-2,00	H722, H732, H712, H752, H756, H757, H772, H875, HVF100
2,10	2,08-2,09	2,08-2,09	H810
2,30	2,28-2,29	2,28-2,29	H702
2,35	2,33-2,34	2,33-2,34	H330
2,36	2,34-2,35	2,34-2,35	H563
2,40	2,38-2,39	2,39-2,40	H891
2,50	2,48-2,49	2,48-2,49	HVF3
2,69	2,67-2,68	2,67-2,68	H564
2,70	2,68-2,69	2,68-2,69	H340
3,00	2,97-2,99	2,97-2,99	HVF4
3,00	2,98-2,99	2,98-2,99	H723, H733, H760, H761, H773, H774, H880, H884, H885, H893
3,40	3,38-3,39	3,39-3,40	H895
3,50	3,48-3,49	3,48-3,49	HVF4
3,56	3,54-3,55	3,54-3,55	H566
4,00	3,98-3,99	3,98-3,99	H775, H735
4,50	4,48-4,49	4,48-4,49	-
4,70	4,68-4,69	4,68-4,69	H820, H831
5,00	4,98-4,99	4,98-4,99	-
5,50	5,48-5,49	5,48-5,49	-
5,60	5,58-5,59	5,58-5,59	-
6,50	6,46-6,49	6,46-6,49	H888S1
8,00	7,98-7,99	7,98-7,99	-
9,00	8,96-8,99	8,96-8,99	H888S2
Receptacle with inserted press ring (without knurl)			
1,05	0,98-1,00	0,99-1,01	H050
1,10	1,05-1,08	1,05-1,08	H787
1,47	1,36-1,40	1,36-1,40	H703, H075
1,80	1,70-1,75	1,70-1,75	-
1,81	1,70-1,75	1,70-1,75	H502, H585, H100
2,08	2,03-2,05	2,03-2,05	H772, HVF100
2,49	2,39-2,44	2,39-2,44	-
2,50	2,40-2,45	2,40-2,45	H563
2,80	2,72-2,77	2,72-2,77	-
2,82	2,75-2,78	2,75-2,78	H564
3,66	3,58-3,63	3,58-3,63	H566
Receptacle with collar as stop (with knurl)			
(1,32) 1,35 R	1,32-1,34	1,32-1,34	H175
(1,67) 1,70 R	1,67-1,68	1,67-1,68	H731
(2,00) 2,05 R	2,00-2,02	2,00-2,02	H732, H875
(2,75) 2,95 R	2,92-2,94	2,92-2,94	-
(3,00) 3,05 R	3,00-3,02	3,00-3,02	H733, H737, H881, H885
(3,45) 3,55 R	3,47-3,52	3,47-3,52	H755
(3,50) 3,56 R	3,50-3,52	3,50-3,52	H887
(4,70) 4,74 R	4,70-4,72	4,70-4,72	H831
(6,50) 6,80 R	6,55-6,75	6,55-6,75	H888RD
(8,70) 8,90 R	8,75-8,85	8,75-8,85	H888RDS1
Contact probe (with knurl)			
(1,65) 1,72 R	1,66	1,66	F752
(2,50) 2,55 R	2,50-2,52	2,50-2,52	V03
(2,565) 2,70 R	2,66	2,66	F754
Interface pins			
1,43-1,53	1,44-1,49	1,44-1,49	I-Z1
1,45-1,50	1,45-1,48	1,45-1,48	I-G
(1,33) 1,50 R	1,40-1,47	1,40-1,47	I-G1
(1,98) 2,03 R	1,98-2,00	1,98-2,00	I-D, I-C
(2,45) 2,60 R	2,55-2,57		I-P1
Contact probe directly inserted in drill hole (without knurl)			
...	drill-Ø = outer-Ø of the barrel		all plug-in contact probes

Minimum Distances and Test Point Sizes

Each test fixture implies various tolerances resulting in a deviation from optimum positions. For this reason, there are practical limits regarding the minimum test point sizes and minimum distances between test points and components of the tested board. Here is an overview of some typical values:

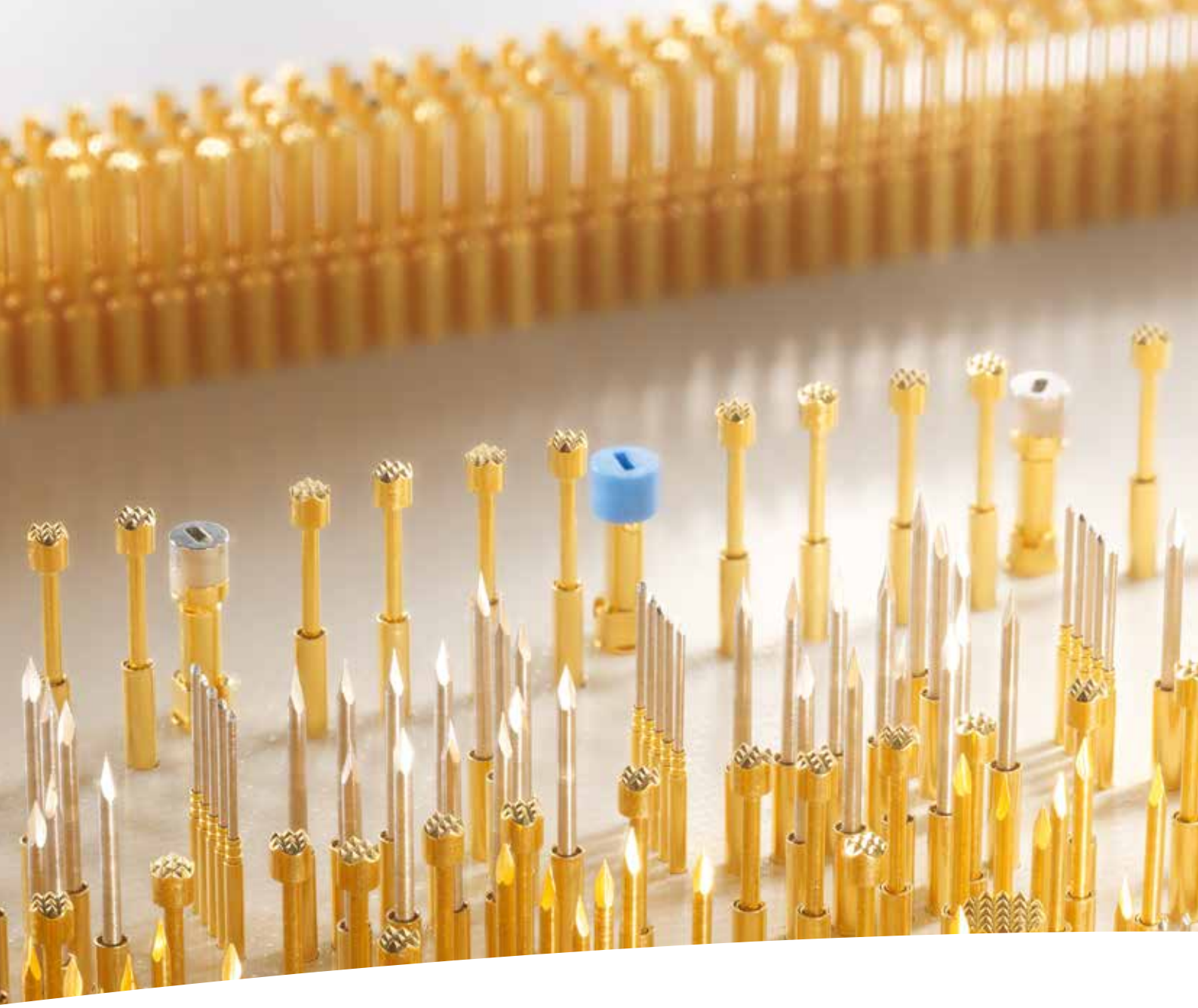


Minimum distance test point – test point by center	Dimension	mm	mil
100 mil	A	2,05	81
75 mil		1,70	67
50 mil		1,27	50

Minimum distance test point – component	Dimension	Component height < 3 mm		Component height > 3 mm	
		mm	mil	mm	mil
100 mil	B	0,85	33	1,24	49
75 mil		0,72	28	1,05	41
50 mil		0,65	26	0,93	36

Further minimum distances and minimum sizes	Dimension	mm	mil	Note
Centering hole diameter tolerance	C	+0,1 / -0,05	+4 / -2	TP ≥ 0,8
		±0,05	±2	TP < 0,8
Test point – centering hole	D	1,0	40	
Test point – board edge	E	0,3	12	
		3	119	with mold
Test point size	F	> 0,8	32	without guiding plate
		> 0,7	28	with guiding plate
		> 0,4	16	rigid probe
Tolerance of board contour		±0,25	±10	positioning by pilot pin
		±0,1	±4	positioning by board contour

The stated minimum test point size can only be realized at optimum conditions. Tolerances e.g. of the centering holes on the board may cause further limitations. Additional restrictions may depend on the choice of tip style and tip size of the spring contact probes.



Probes for In-Circuit- and Functional Test

For the in-circuit and functional test of PCBs standard probes in the centers 50 mil, 75 mil and 100 mil are most commonly used. In these applications long lifetime, reliable contacts and great variety of tip styles and spring forces are essential.

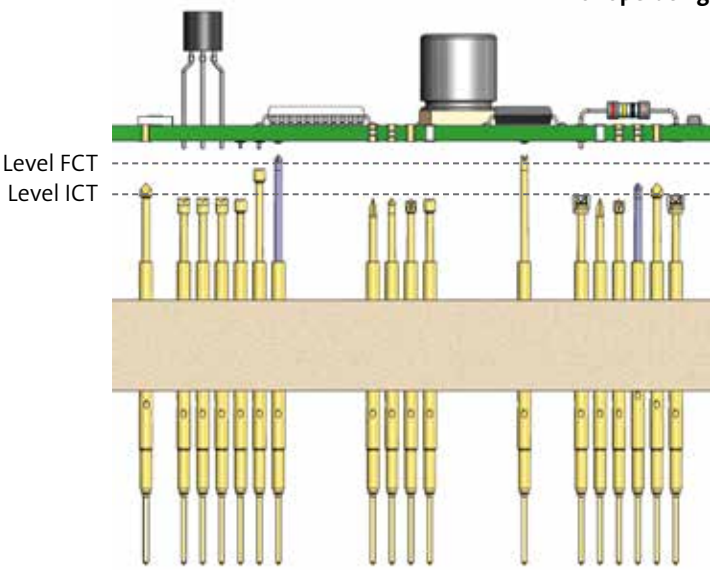
Additionally, for many applications special solutions are required like e.g. for contacting lead-free soldered pads as well as contaminated, oxidized or OSP-coated boards.

Probes for In-Circuit Test (ICT) and Functional Test (FCT)

Height Proportions in Dual-Stage Fixtures
In-circuit tests and functional tests are very often performed by two levels in one test fixture.

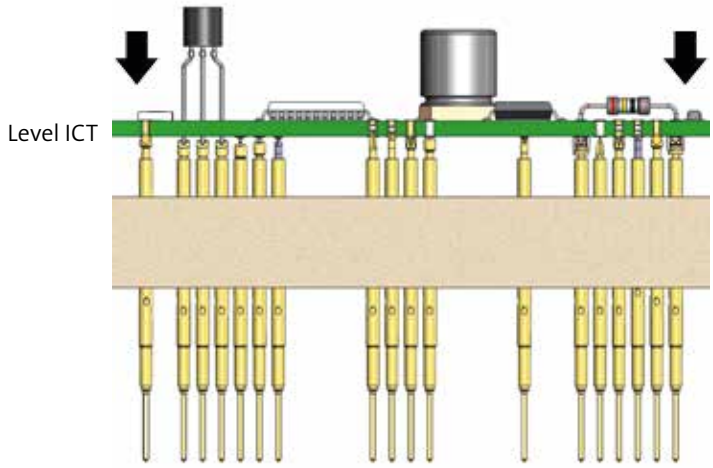
The small difference in height between wired components and PCB pads can be compensated by contacting with probes of different lengths (standard length or L-version).

nonoperating



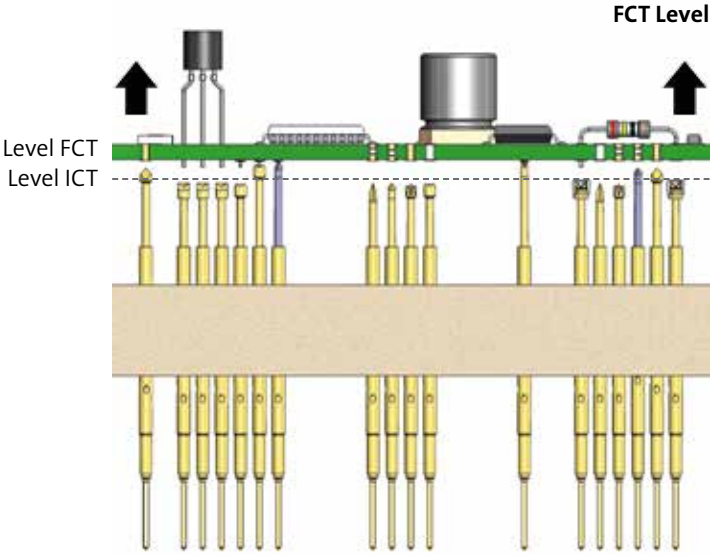
The first step is the in-circuit test.
The ICT level is reached either by manual closing of the fixture or by a vacuum exhaust. At this level all installed probes are contacting the board.

ICT Level



For the following functional test the travel of the fixture is reduced. Only the long travel probes are contacting the DUT.

FCT Level



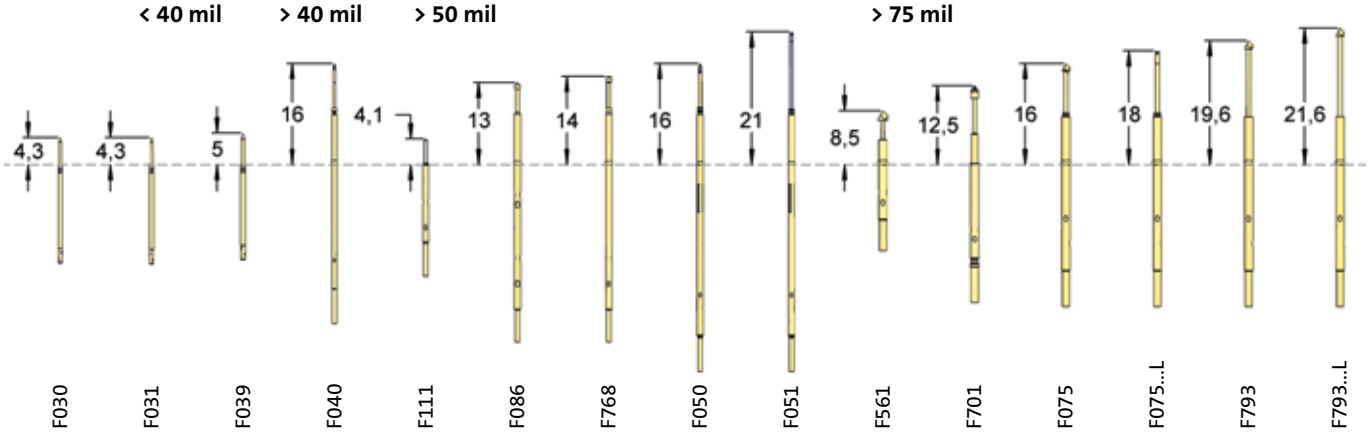
The Most Important Probes at a Glance

< 1,00 mm
< 40 mil

> 1,00 mm
> 40 mil

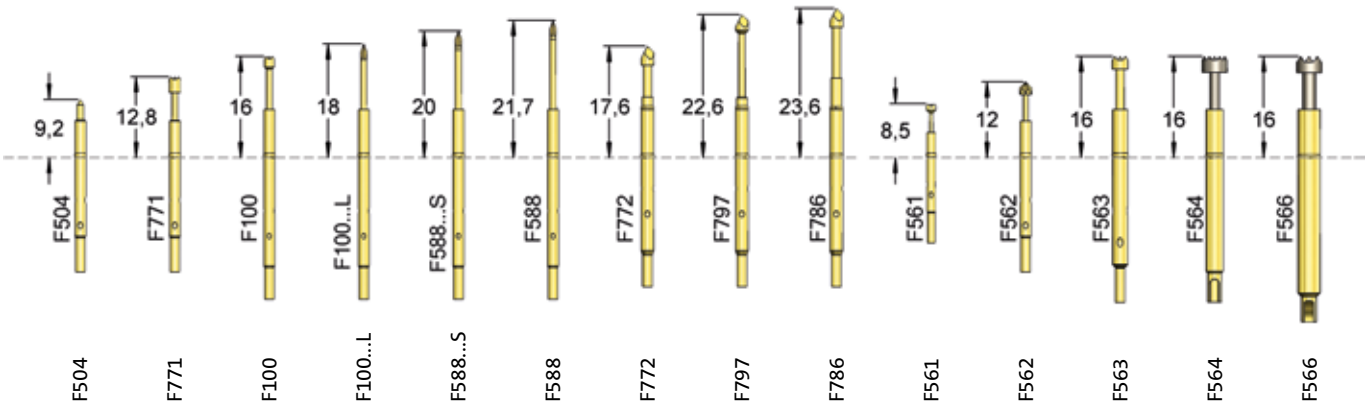
> 1,27 mm
> 50 mil

> 1,90 mm
> 75 mil



2,54 mm
100 mil

> 2,54 mm
> 100 mil



Combination of Probes for Dual-Stage Fixtures:

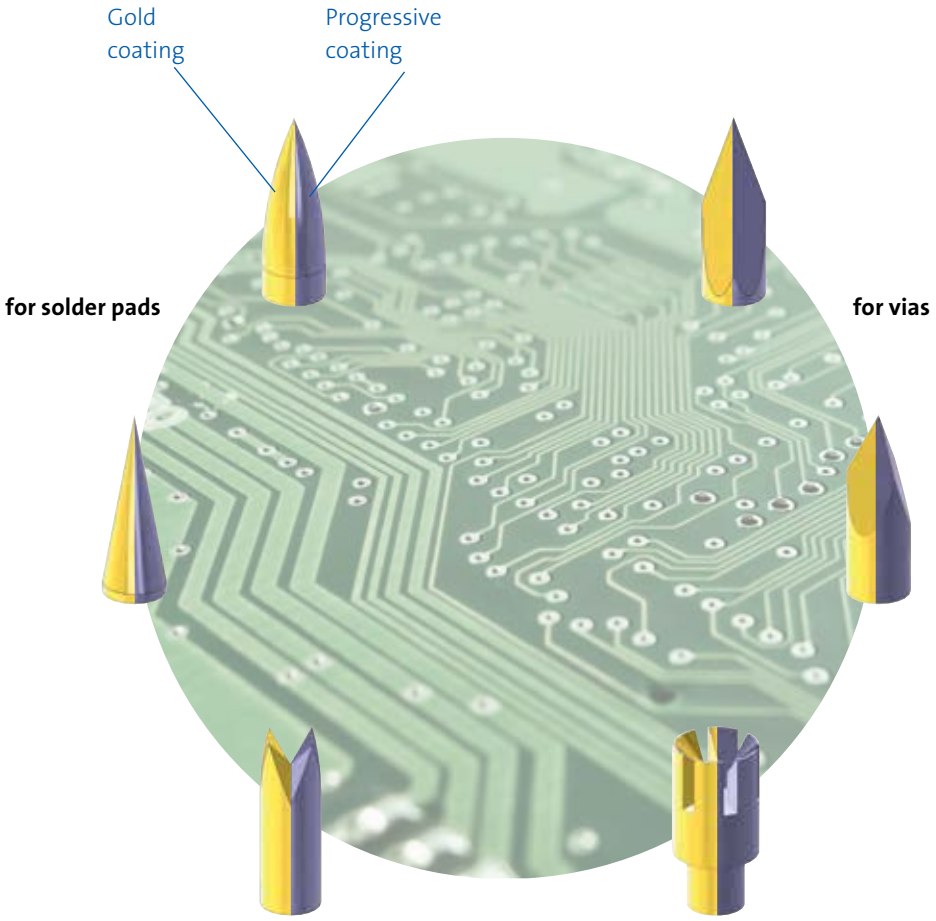
Centers [mm/mil]	Barrel-Ø Probe [mm]	Limited Space (Standard)	Limited Space (Long Version)	ICT-Level (Standard)	ICT-Level (Long Version)	FCT-Level (Standard)	FCT-Level (Long Version)
0,75 / 30	0,62	F030 / F031	-	-	-	-	-
1,00 / 40	0,62	F039	-	F040	-	-	-
1,27 / 50	0,79	F111, F112	F511, F768, F767	F050	F050...L	-	F051
1,90 / 75	1,00	F561	F701	F075 / F703	F075...L / F703...L	F793	F793...L
2,54 / 100	1,37	F502, F504, F562	F771	F100 / F585	F100...L / F585...L	F588...S	F588
2,54 / 100	1,66	-	-	F772	-	F786	F797
3,00 / 118	2,03	F563	F140	-	-	-	-
3,18 / 125	2,36	F564	-	-	-	-	-
3,50 / 138	2,65	-	-	F773	-	F785, F796	F785...L
4,50 / 177	3,18	F566	-	-	-	-	-

Applications with Special Challenges

Lead free soldering and contaminated surfaces

The changeover from leaded to lead free soldering has caused some unexpected problems. The most important disadvantages are the 10 to 30 K increased melting temperature and a higher aggressiveness against metallic materials. The necessary soldering parameters for lead free soldering often lead to a decomposition of tools or test equipment that is directly contacting the soldering metal. Additionally, lead free solders and surfaces have less universal applications and cause technical problems like embrittlement or whisker formation. These conditions also cause strong challenges regarding the contacting, similar to the problems caused by contaminations or oxidation.

FEINMETALL offers a great variety of specially developed spring contact probes for exactly these challenges.
These solutions are already proofed and established in many customers' applications.



Applications with Special Challenges

DUT – Device Under Test

is the tested item in test and measurement technology. This can be an isolated area on a wafer, a single component, an assembly or even a complete device. The tested characteristics or features of the DUT depend on the required test parameters or measuring values as well as on the available test equipment.

Solder pads

They are used for positioning and soldering of electric components (SMD, surface mounted devices).

Component pins by THT assembly

Leaded components are commonly used and established. They are also called THT (through hole technology) components. It can be differentiated between axially, radially and other designs.

Vias (through connections)

Vias are vertical electrical connections between PCB conductor paths on different levels. The connection is usually made by an inner metal-coated drill hole in the PCB material.

Challenges

OSP

OSP (organic surface protection) is an organic dilution based on substituted imidazoles. It is a transparent, nearly invisible layer on the copper and has a thickness of 0,2 to 0,6 µm. OSP is significantly harder than tin or other common surface refinements. For contacting OSP coated boards the tip styles 32, 33, 38 and 43 have proved to be suitable. These variants penetrate the hard surface reliably due to their aggressiveness, especially in combination with a higher preload. So they provide a good contact and long life times.

Bent pins

The assembly based on through hole technology is characterized by components with pins. These pins are plugged through holes in the PCB and afterwards soldered onto conductor paths. During this process pins can be damaged, bent or contaminated. For contacting slightly bent pins, self-centering tip styles can be used (e.g. tip style 05 or 55).
For contacting contaminated pins e.g. tip styles 06, 14, 55 or 63 are used.

Empty or filled vias

Vias are usually contacted with pointed tips or sharp lances (e.g. tip styles 15, 33 and 62), because these are centering well in the hole and create a good contact. However, at partially or fully filled vias these tip styles often come to rest on not conductive materials. In this case multi-sided lances with larger angles can be useful (e.g. tip styles 38, 43 and 53). These tips contact the via at the upper edge without being stopped by the filled material.

Contaminations and Oxides

Contaminations are usually caused by not sufficiently wetted vanishes or just by general dust or deposits. They can occur either during the manufacturing process, e.g. because of residues of soldering paste or glues, or during later conditions and storage, e.g. because of inappropriate handling, grease spots, oils, dust etc. Additionally, if the PCBs are stored for a longer period, the conductor paths can oxidize strongly. For reliable contacting in these difficult conditions the ***Progressive Series*** is an excellent and well established solution.

Progressive Series

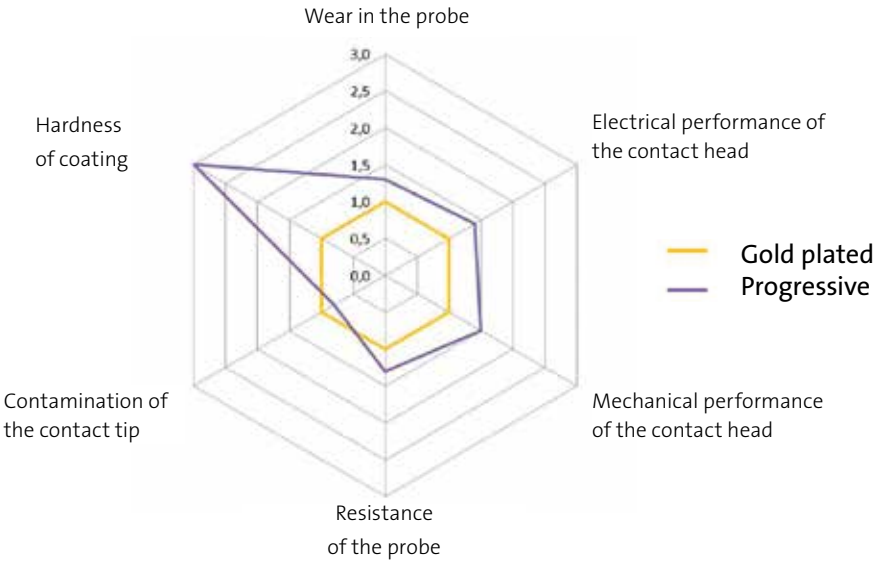
Coating, Tip Style and Spring Force – the Perfect Combination!

Contacting lead free soldered pads or strongly contaminated or oxidized boards often causes problems, because contaminations or flux residues are difficult to penetrate and contact tips are contaminated very quickly. This leads to a reduced electrical contact to the DUT, in extreme cases there might not even be an electrical contact at all. The analysis of these problems was the basis for developing the FEINMETALL Progressive Series.

Three Essential Factors of the Progressive Series

1. Functional "progressive" coating – reduced contamination of the contact probe tips

With the "progressive coating" FEINMETALL offers a very special finish of the probe tips. Compared to standard gold platings this coating has a reduced vulnerability to contaminations and a 3-fold higher hardness. This leads to a significantly longer life time of the probes even in applications with strong contaminations.

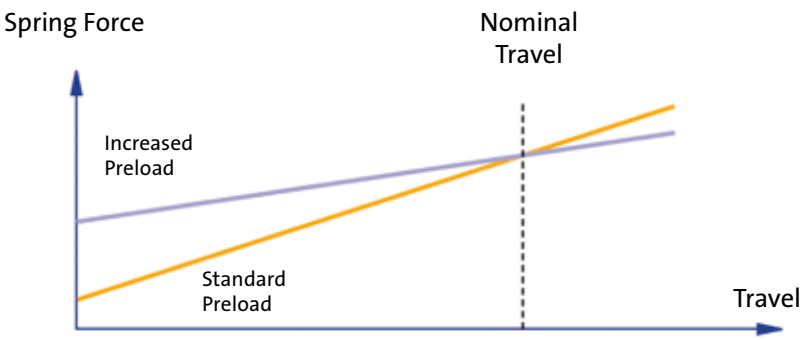


2. Aggressiveness of the probe tips – penetration of contaminations and oxide layers

For a reliable penetration of contaminations and flux residues a contact probe needs to have a very sharp and aggressive tip. The optimum choice of the tip style is essential. FEINMETALL offers a wide range of aggressive tip styles.

3. Higher preload – optimized contact force during the contacting process

By a higher preload of the spring the travel-force diagram is optimized. Already at the beginning of the contacting there's a strong force on the DUT for better penetration of contaminations. The nominal force at the nominal travel is not changed by this measure, so the nominal force on the DUT is not larger.

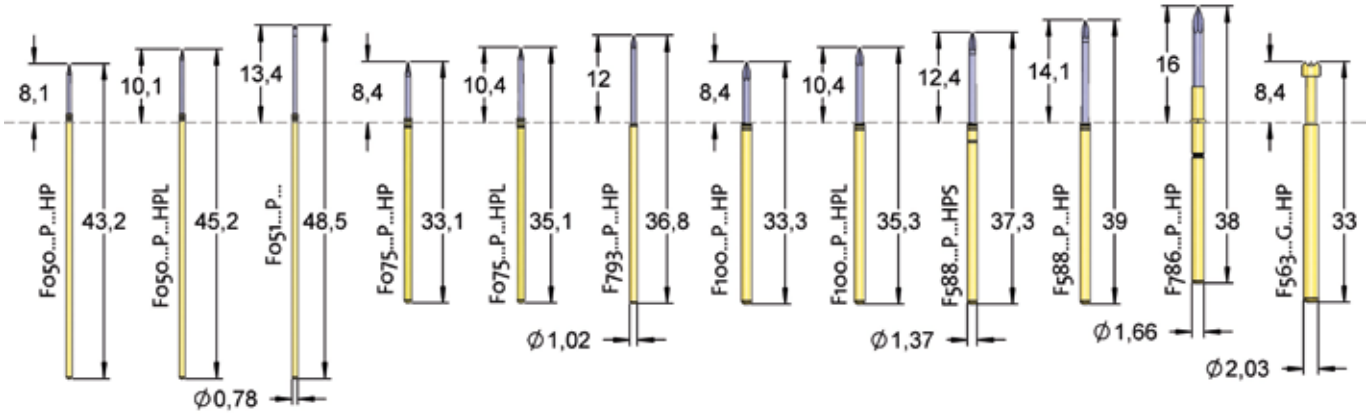


Progressive Series

The Most Important Probes at a Glance

Series	Order code	Description
F050	F05021S050P200HP	for ICT, Standard
	F05033S050P200HP	for ICT, Standard
	F05033S050P200HPL	for ICT, Standard
	F05043S050P130HP	for ICT, Standard
	F05043S050P200HP	for ICT, Standard
	F05062S050P200HP	for ICT, Standard
F051	F05143S050P150	for FCT, Standard (only progressive coating)
F075	F07521S064P200HP	for ICT, Standard
	F07521S064P200HPL	for ICT, Long version
	F07521S064P250HP	for ICT, Standard
	F07521S064P250HPL	for ICT, Long version
	F07532S064P250HP	for ICT, Standard
	F07532S064P250HPL	for ICT, Long version
	F07533S064L200HPL	for ICT, Long version (only high preload)
	F07533S064P200HP	for ICT, Standard
	F07533S064P200HPL	for ICT, Long version
	F07533S064P250HP	for ICT, Standard
	F07533S064P250HPL	for ICT, Long version
	F07543S064P200HP	for ICT, Standard
	F07543S064P200HPL	for ICT, Long version
	F07543S064P250HP	for ICT, Standard
	F07543S064P250HPL	for ICT, Long version
	F07562S064P200HP	for ICT, Standard
	F07562S064P200HPL	for ICT, Long version
	F07562S064P250HP	for ICT, Standard
	F07562S064P250HPL	for ICT, Long version
F793	F79333S064P250HP	for ICT, Standard
F100	F10006B200P100HP	for ICT, Standard
	F10010S060P150HPRP	for ICT, Wobbling plunger
	F10012S105P300HPRPL	for ICT, Long version, wobbling
	F10014S150L200HPL	for ICT, Long version (only high preload)
	F10014S150L300HP	for ICT, Standard

Series	Order code	Description
F100	F10014S150P130HP	for ICT, Standard
	F10014S150P300HP	for ICT, Standard
	F10021S090P200HP	for ICT, Standard
	F10021S090P200HPL	for ICT, Long version
	F10021S090P300HP	for ICT, Standard
	F10021S090P300HPL	for ICT, Long version
	F10032S090P300HP	for ICT, Standard
	F10032S090P300HPL	for ICT, Long version
	F10033S090L200HP	for ICT, Standard
	F10033S090P130HPL	for ICT, Long version
	F10033S090P150HP	for ICT, Standard
	F10033S090P200HP	for ICT, Standard
	F10033S090P200HPL	for ICT, Long version
	F10033S090P300HP	for ICT, Standard
	F10033S090P300HPL	for ICT, Long version
	F10037S050P300HP	for ICT, Standard
	F10043S090P130HP	for ICT, Standard
	F10043S090P200HP	for ICT, Standard
	F10043S090P200HPL	for ICT, Long version
	F10043S090P300HP	for ICT, Standard
	F10043S090P300HPL	for ICT, Long version
	F10062S090P150HP	for ICT, Standard
	F10062S090P200HP	for ICT, Standard
	F10062S090P200HPL	for ICT, Long version
	F10062S090P300HP	for ICT, Standard
	F10062S090P300HPL	for ICT, Long version
F588	F58833S090P300HP	for FCT, Long version
	F58833S090P300HPS	for FCT, Long version
F772	F77233S130P300HP	for ICT, Standard
F786	F78610S063P300HP	for FCT, Standard
	F78633S130P300HP	for FCT, Standard
	F78633S130P500HP	for FCT, Standard
F563	F56306B250G180HP	for ICT, Standard (only high preload)



F030

NEW

Probe 30 mil Standard

Centers (mm/mil)	0,76 / 30
Current	1,5 A
R typ	150 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	35	80

Travel (mm)

Version	Nominal	Maximum
Standard	2,0	3,5
Pointing Accuracy		±0,05 mm

Materials and Plating

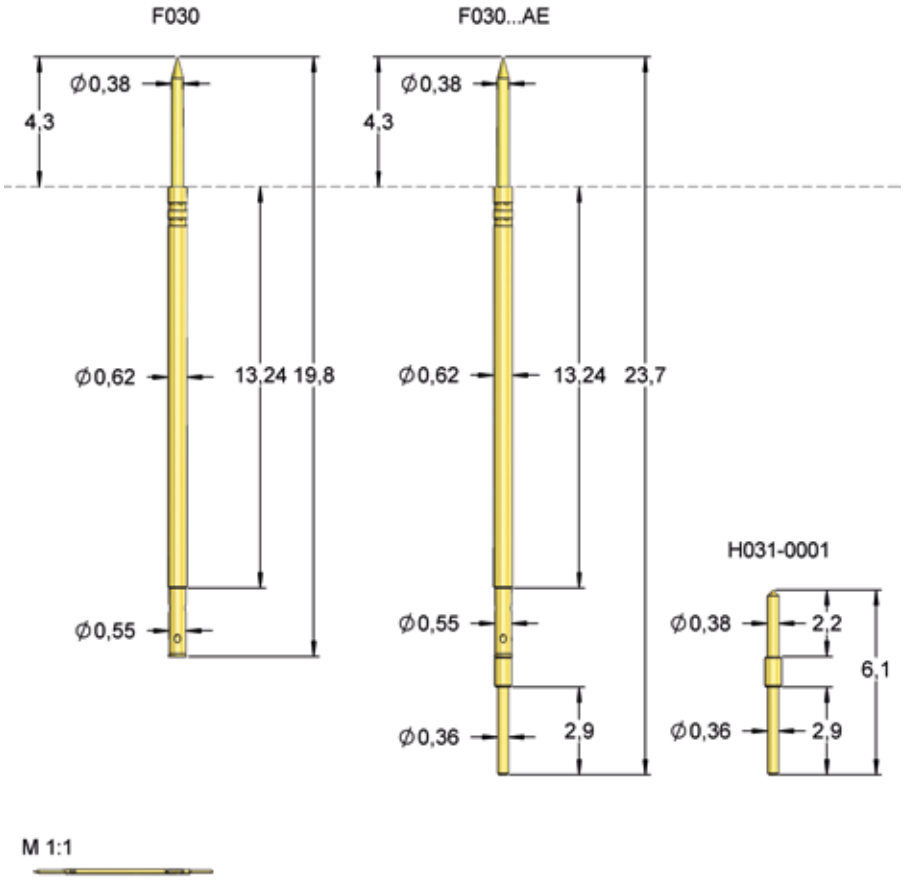
Plunger	see tip style
Barrel	Bronze, gold plated
Spring	Music wire, silver plated

Accessories

Connecting element	H031-0001

Drill size (mm)

Barrel-Ø	0,61 - 0,63



The AE variant is the combination of F030 and H031-0001.

Series			Tip-Ø		Spring Force (cN)	
F030	18	E	038	M	080	AE
	Tip Style	Material	Plating		Version	

Material: E = Stainless steel
Tip-Ø: 038 = 0,38 mm (e.g.)
Plating: M = Multiplex coating
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	18	E	M	0,38	-
	18	E	M	0,38	AE

F031

NEW

Probe 31 mil
Standard

Centers (mm/mil)	0,80 / 31
Current	1,5 A
R typ	150 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	35	80

Travel (mm)

Version	Nominal	Maximum
Standard	2,0	3,5
Pointing Accuracy		±0,05 mm

Materials and Plating

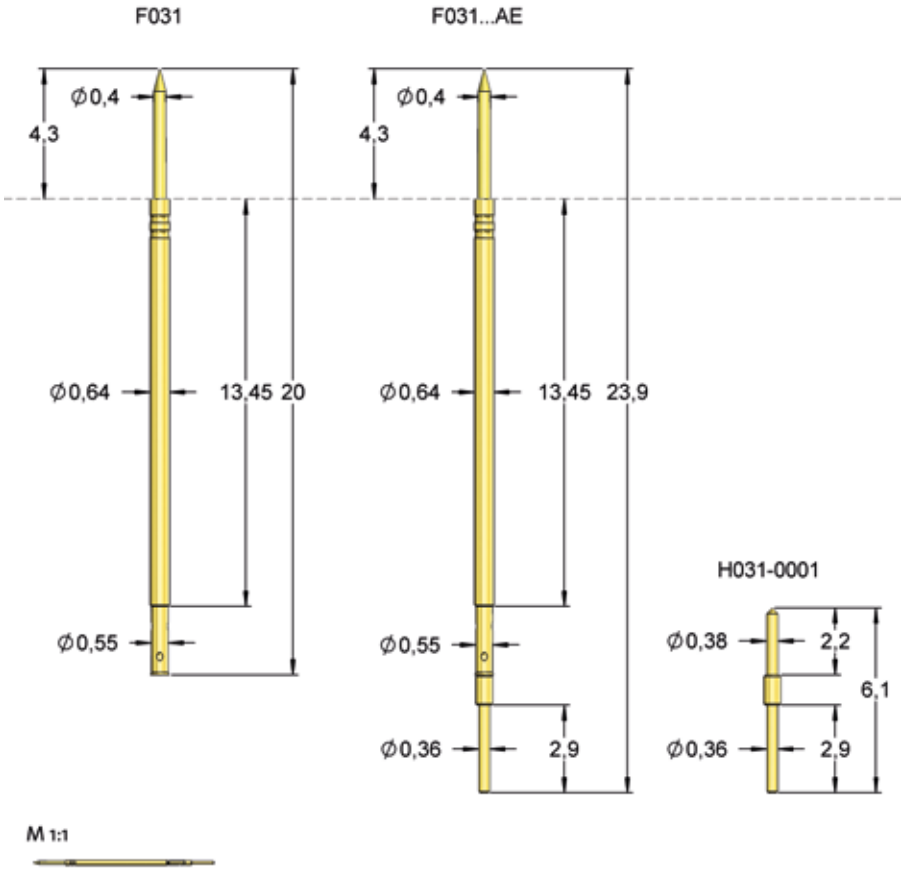
Plunger	see tip style
Barrel	Bronze, gold plated
Spring	Music wire, silver plated
Connecting element	BeCu, gold plated

Accessories

Connecting element	H031AE

Drill size (mm)

Barrel-Ø	0,63 - 0,65



The AE variant is the combination of F031 and H031-0001.

Series			Tip-Ø		Spring Force (cN)	
F031	18	S	040	M	080	AE
	Tip Style	Material	Plating		Version	

Material: S = Steel; E = Stainless steel
Tip-Ø: 040= 0,40 mm (e.g.)
Plating: M = Multiplex coatig
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	18	E	M	0,40	-
	18	E	M	0,40	AE

F039

NEW

Probe 39 mil
Standard

Centers (mm/mil)	1,00 / 39
Current	2,0 A
R typ	150 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	10	30
Standard	60	130

Travel (mm)

Version	Nominal	Maximum
Standard	2,0	3,7
Pointing Accuracy		±0,05 mm

Materials and Plating

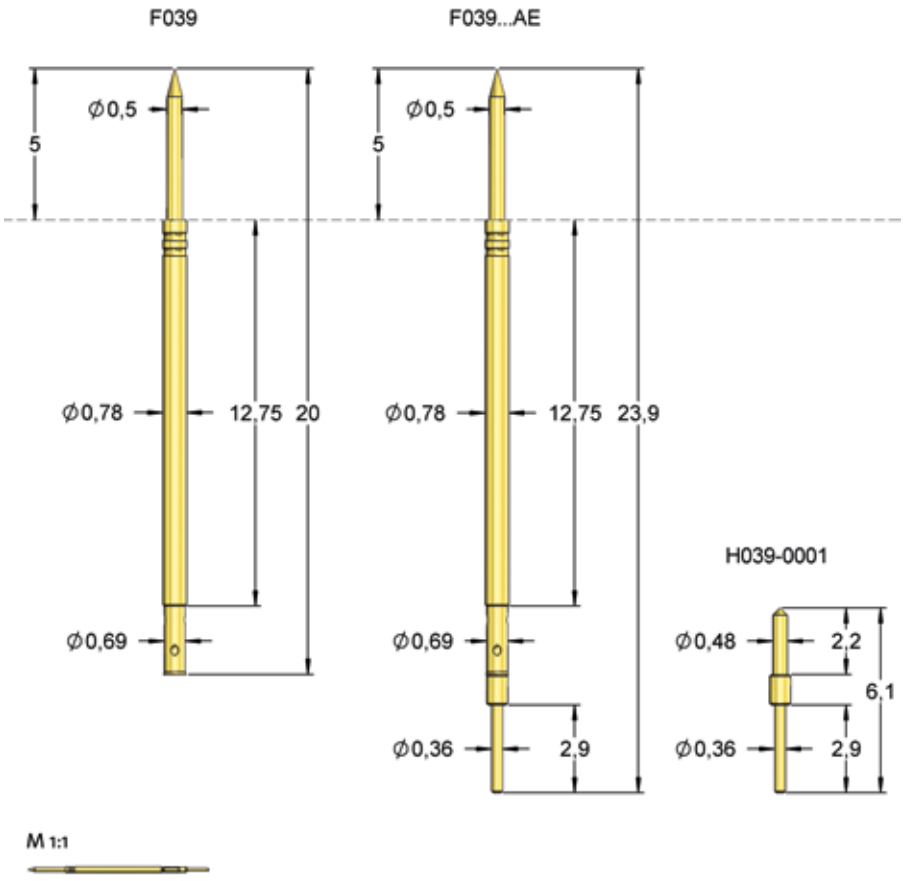
Plunger	see tip style
Barrel	Bronze, gold plated
Spring	Music wire, silver plated Stainless steel, gold plated

Accessories

Connecting element	H039-0001
Insertion tool probe	FDWZ-039

Drill size (mm)

Barrel-Ø	0,77 - 0,79



The AE variant is the combined variant of F039 and H039-0001.

Series			Tip-Ø		Spring Force (cN)	
F039	18	S	050	M	130	AE
	Tip Style	Material		Plating		Version

Material: S = Steel; E = Stainless steel
Tip-Ø: 050= 0,50 mm (e.g.)
Plating: G = Gold plated; M = Multiplex coating
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	18	S	G	0,50	-
	18	E	M	0,50	-
	18	E	M	0,50	AE

F040

Probe 40 mil
Standard

Centers (mm/mil)	1,00 / 40
Current	2,0 A
R typ	20 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	40	80

Travel (mm)

Version	Nominal	Maximum
Standard	4,3	6,4
Pointing Accuracy		±0,05 mm

Materials and Plating

Plunger	see tip style
Barrel	Bronze, gold plated
Spring	Music wire, gold plated
Receptacle	Nickel silver, gold plated

Accessories

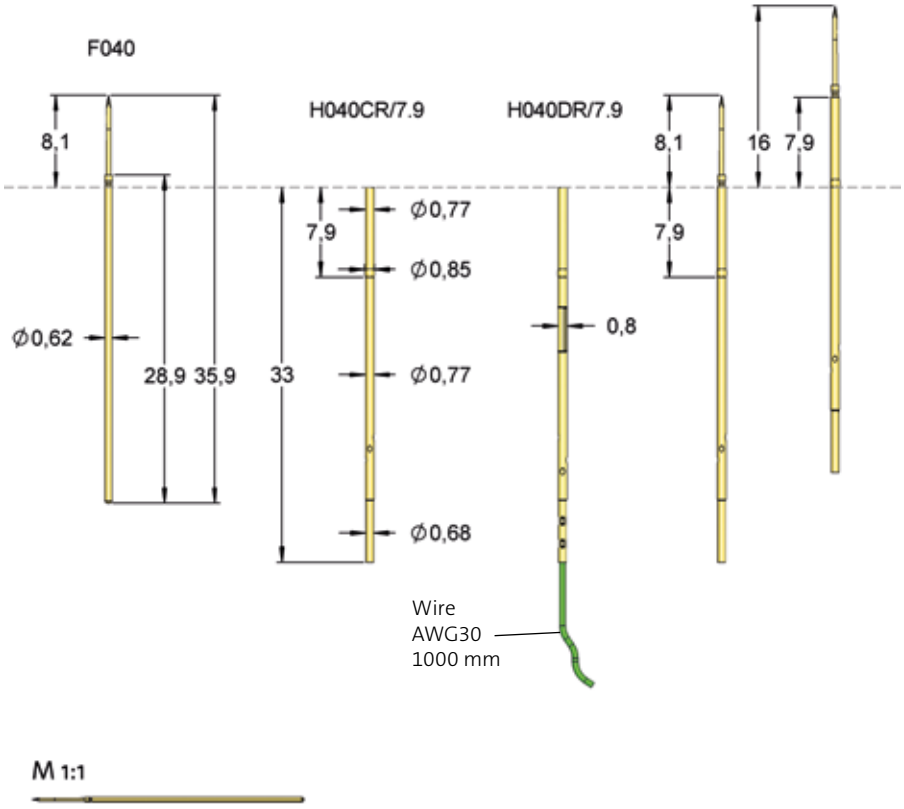
Insertion tool receptacle	FEWZ-040E0
Insertion tool probe	FDWZ-050

Drill size (mm)

Press ring as stop	0,80 - 0,81
Press ring inserted	0,82 - 0,83

Projection Height (mm)

H040... with F040	8,1 - 16,0



Series		Tip-Ø	Spring Force (cN)
F040	18 S 038 L 080		
	Tip Style / Material / Plating / Version		

Material: S = Steel
Tip-Ø: 038 = 0,38 mm (e.g.)
Plating: L = Longtime Gold plated
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	18	S	L	0,38	-
	29	S	L	0,38	-
	33	S	L	0,38	-
	43	S	L	0,38	-

F111

Probe 50 mil
Short Version

Centers (mm/mil)	1,27 / 50
Current	3,0 A
R typ	65 mOhm
Temperature	-20°C...+80°C, -40°C...+200°C (H)

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	20	40
Standard	20	85
H	40	95
E05	33	70

Travel (mm)

Version	Nominal	Maximum
Standard	2,0	2,8
H	2,0	2,8
E05	2,0	2,8
Pointing Accuracy		±0,09 mm

Materials and Plating

Plunger	see tip style
Barrel	Bronze, gold plated
Spring	Stainless steel, unplated (H) Music wire, silver plated
Receptacle	Bronze, gold plated

Accessories

Insertion tool receptacle	FEWZ-511E0
Insertion tool probe	FDWZ-050

Drill size (mm)

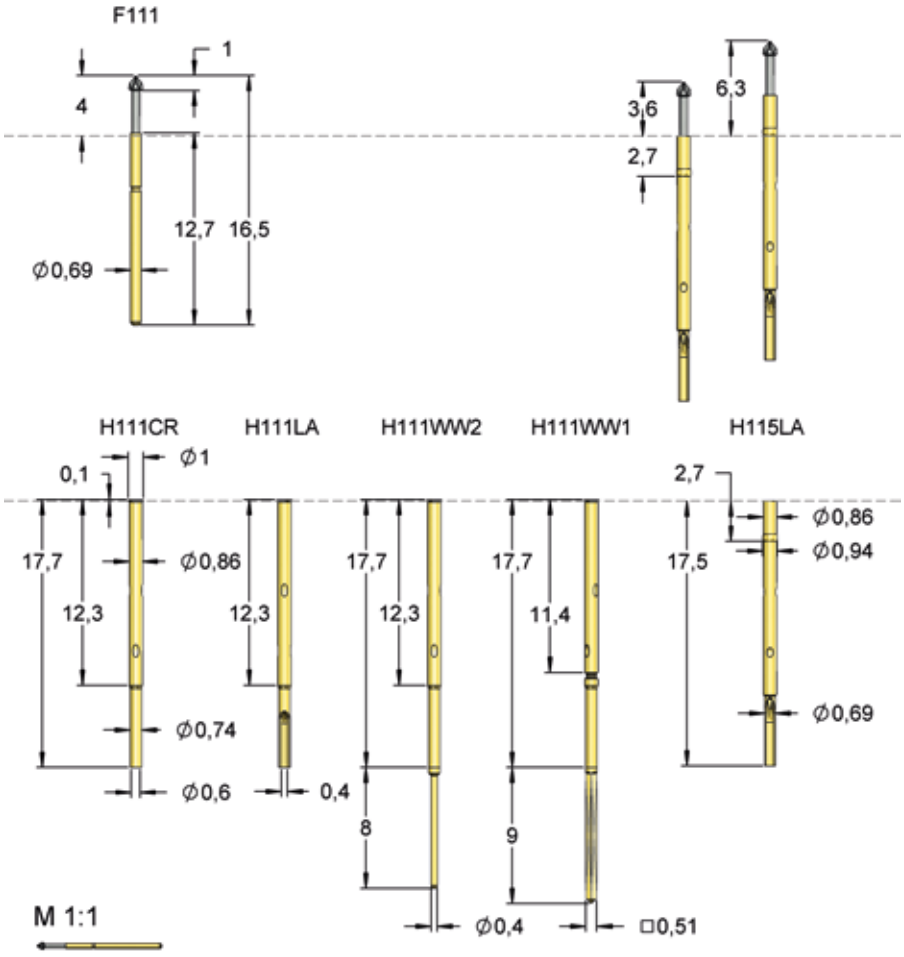
Receptacle H111 with collar	0,83 - 0,84
Receptacle H115 with Press ring	0,88 - 0,92

Projection Height (mm)

H111CR / H111LA	4,0
H111WW2 / H111LI	4,0
H111WW1	5,0
H111LA2	6,0
H111LA1	8,0
H115LA	3,6 - 6,3

Series			Tip-Ø		Spring Force (cN)	
F111	**18**	**S**	**053**	**L**	**095**	**H**
	Tip Style	Material		Plating		Version

Material: B = BeCu, S = Steel
Tip-Ø: 053 = 0,53 mm (e.g.)
Plating: G = Gold plated, L = Longtime Gold plated, N = Nickel plated , R = Rhodium plated
Version: H = High temperature, E05 = Projection Height 5,0 mm
Receptacle: Order Code according drawing



Also available: receptacle H111LI with 550 mm pre-assembled flexible wire AWG30.

Tip Style	Number	Material	Plating	Ø in mm	Version
	01	S	N	0,53	-
	03	S	N	0,53	-
	05	S	L	0,90	-
	05	S	L	1,50	-
	06	B	G	0,90	-
	07	S	N	0,90	-
	09	S	N	0,90	- / H
	12	S	L	0,90	- / H
	12	S	R	0,90	H
	14	S	N	0,90	- / H
	15	B	G	0,90	E05
	18	S	N	0,53	- / H
	18	S	R	0,53	- / H
	21	S	N	0,53	- / H

F112

Probe 50 mil
Short Version, Non-Magnetic

Centers (mm/mil)	1,27 / 50
Current	3,0 A
R typ	35 mOhm
Temperature	-20°C...+200°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	6	40

Travel (mm)

Version	Nominal	Maximum
Standard	2,0	2,8
Pointing Accuracy		±0,09 mm

Materials and Plating

Plunger	see tip style
Barrel	Bronze, gold plated
Spring	BeCu, gold plated
Receptacle	Bronze, gold plated

Accessories

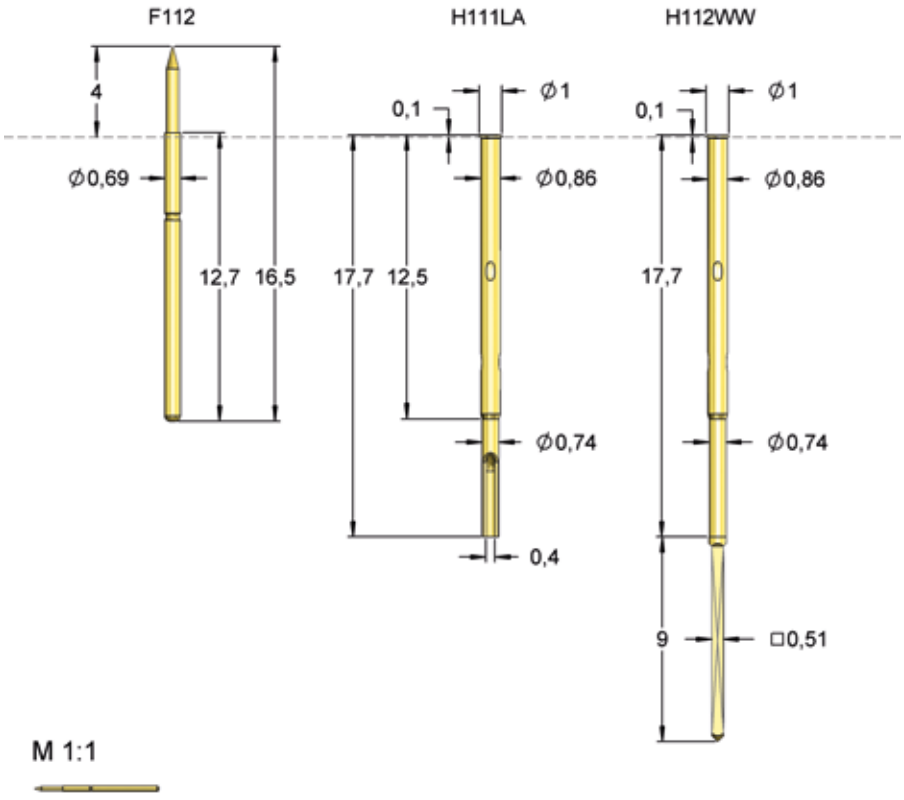
Insertion tool receptacle	FEWZ-511E0
Insertion tool probe	FDWZ-050

Drill size (mm)

Receptacle with collar	0,83 - 0,84

Projection Height (mm)

H111LA / H112WW	4,0



The materials and platings of series F112 do not contain magnetic components.
This leads to a minimized influence of electromagnetic fields on the transmitted signal.

Series		Tip-Ø	Spring Force (cN)
F112	18 B 053 G 040		
	Tip Style	Material	Plating	Version

Material: B = BeCu
Tip-Ø: 053 = 0,53 mm (e.g.)
Plating: G = Gold plated
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	05	B	G	0,90	-
	12	B	G	0,90	-
	18	B	G	0,53	-

F768

Probe 50 mil
Standard

Centers (mm/mil)	1,27 / 50
Current	3,0 A
R typ	20 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	50	130

Travel (mm)

Version	Nominal	Maximum
Standard	3,2	4,0
Pointing Accuracy		±0,07 mm

Materials and Plating

Plunger	see tip style
Barrel	Bronze, gold plated
Spring	Music wire, silver plated
Receptacle	Nickel silver, gold plated

Accessories

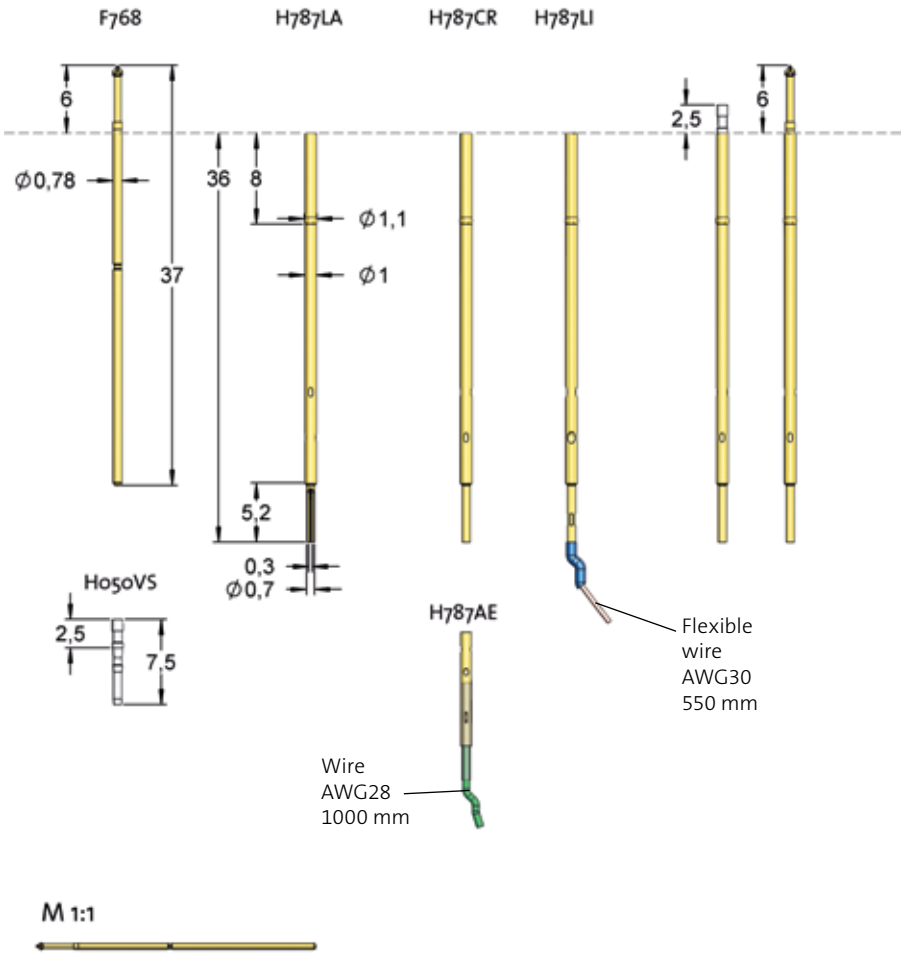
Insertion tool receptacle	FEWZ-050EV
Insertion tool receptacle	FEWZ-050E0
Insertion tool probe	FDWZ-050
Plug lock	H050VS

Drill size (mm)

Receptacle Press ring as stop	0,99 - 1,00
Receptacle Press ring inserted	1,05 - 1,07

Projection Height (mm)

H787... with F768	6,0 - 14,0



The series F768 is well suitable for the use in text fixtures with low heights.

Series			Tip-Ø		Spring Force (cN)
F768	06	B	090	G	130
	Tip Style	Material		Plating	Version

Material: B = BeCu, S = Steel
Tip-Ø: 090 = 0,90 mm (e.g.)
Plating: G = Gold plated, L = Longtime Gold plated
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	06	B	G	0,90	-
	07	S	L	0,90	-
	11	B	G	0,60	-
	18	B	G	0,60	-
	21	S	L	0,60	-
	28	B	G	0,90	-
	33	S	L	0,60	-

F788

Probe 50 mil
Long Travel Version

Centers (mm/mil)	1,27 / 50
Current	3,0 A
R typ	20 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	30	165
L	30	165

Travel (mm)

Version	Nominal	Maximum
Standard	6,4	7,0
L	6,4	7,0
Pointing Accuracy		±0,10 mm

Materials and Plating

Plunger	see tip style
Barrel	Bronze, gold plated
Spring	Music wire, silver plated
Receptacle	Nickel silver, gold plated

Accessories

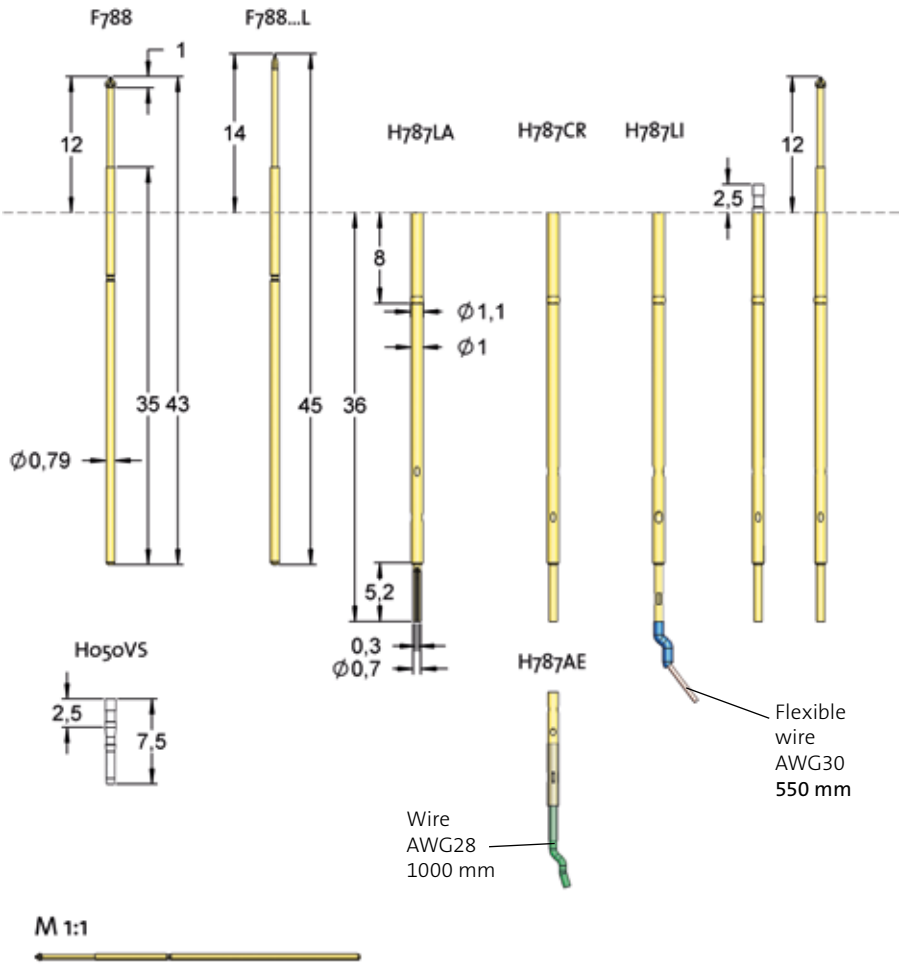
Insertion tool receptacle	FEWZ-050EV
Insertion tool receptacle	FEWZ-050E0
Insertion tool probe	FDWZ-050
Plug lock	H050VS

Drill size (mm)

Receptacle Press ring as stop	0,99 - 1,00
Receptacle Press ring inserted	1,05 - 1,07

Projection Height (mm)

H787... with F788	12,0 - 20,0
H787... with F788...L	14,0 - 22,0



The F788 is the long travel version of the F768. These probes can be combined well in dual stage fixtures. Also available: receptacle H050WL11/7.6 with spring loaded end for contacting conductor paths.

Series			Tip-Ø		Spring Force (cN)	
F788	33	S	050	L	165	L
	Tip Style	Material		Plating		Version

Material: B = BeCu, S = Steel
Tip-Ø: 050 = 0,50 mm (e.g.)
Plating: G = Gold plated, L = Longtime Gold plated
Version: L = Long version
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	06	B	G	0,90	-
	07	S	L	0,90	-
	11	B	G	0,60	-
	18	B	G	0,60	-
	33	S	L	0,60	-
	33	S	L	0,50	L

F050

Probe 50 mil
Standard

Centers (mm/mil)	1,27 / 50
Current	3,0 A
R typ	10 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	60	150
Standard	90	200
HP	80	130
HP	125	200
L	60	150

Travel (mm)

Version	Nominal	Maximum
Standard	4,3	6,4
HP	4,3	5,0
L	4,3	6,4
Pointing Accuracy		±0,05 mm

Materials and Plating

Plunger	see tip style
Barrel	Bronze, gold plated
Spring	BeCu, gold plated
Receptacle	Bronze, gold plated

Accessories

Insertion tool receptacle	FEWZ-050EV
Insertion tool receptacle	FEWZ-050E0
Insertion tool probe	FDWZ-050
Plug lock	H050VS

Drill size (mm)

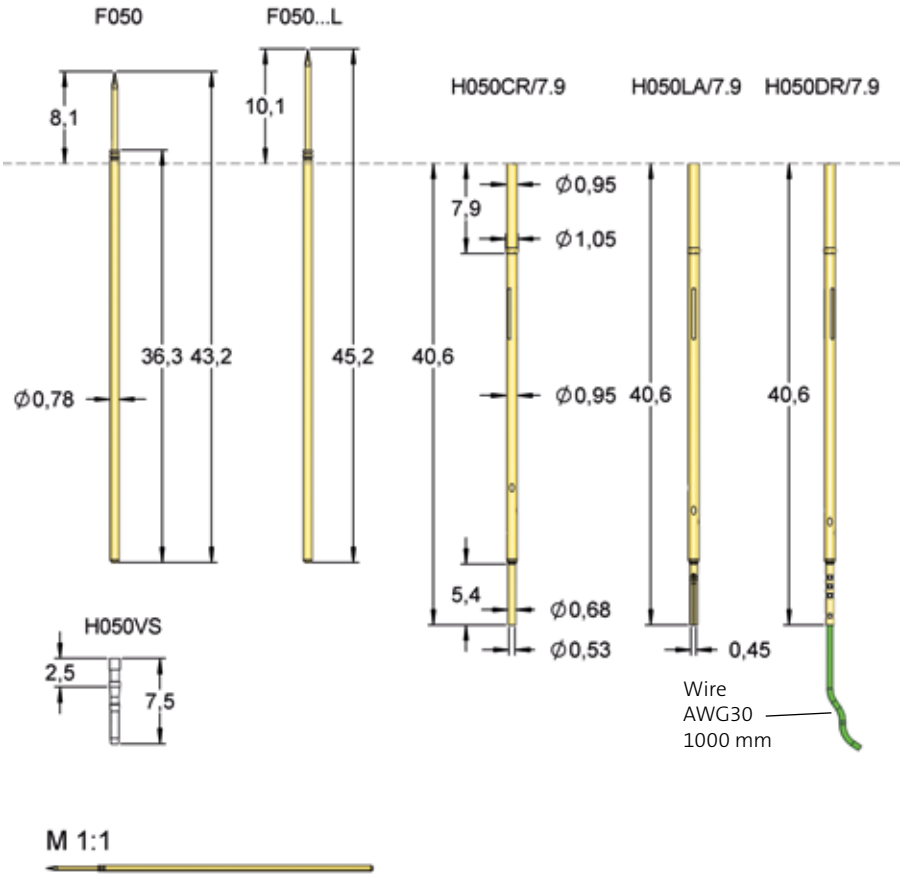
Receptacle Press ring as stop	0,95 - 0,97
Receptacle Press ring inserted	0,98 - 1,01

Projection Height (mm)

H050... with F050	8,1 - 16,0
H050... with F050...L	10,1 - 18,0
H050WL11/7.6 with F050	18,5 - 26,4
H050WL11/7.6 with F050...L	20,5 - 28,4

Series			Tip-Ø		Spring Force (cN)	
F050	**21**	**S**	**050**	**P**	**200**	**HP**
	Tip Style	Material		Plating		Version

Material: B = BeCu, S = Steel
Tip-Ø: 050 = 0,50 mm (e.g.)
Plating: G = Gold plated, L = Longtime Gold plated, P = Functional coating
Version: H = High temperature, L = Long version, HP = Progressive Series
Receptacle: Order Code according drawing



Due to the higher preload, the progressive series versions only allow a maximum travel of 5,0 mm.

Tip Style	Number	Material	Plating	Ø in mm	Version
	05	B	G	0,90	-
	06	B	G	0,90	-
	11	B	G	0,50	-
	15	B	G	0,90	-
	21	S	L	0,50	-
	21	S	P	0,50	HP
	33	S	L	0,50	-
	33	S	L	0,50	L
	33	S	P	0,50	HP
	38	S	L	0,50	-
	43	S	L	0,50	-
	43	S	P	0,50	HP
	62	S	P	0,50	HP

F051

Probe 50 mil
Long Travel Version

Centers (mm/mil)	1,27 / 50
Current	3,0 A
R typ	40 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	35	150

Travel (mm)

Version	Nominal	Maximum
Standard	8,0	10,0
Pointing Accuracy		±0,05 mm

Materials and Plating

Plunger	see tip style
Barrel	Bronze, gold plated
Spring	BeCu, gold plated
Receptacle	Bronze, gold plated

Accessories

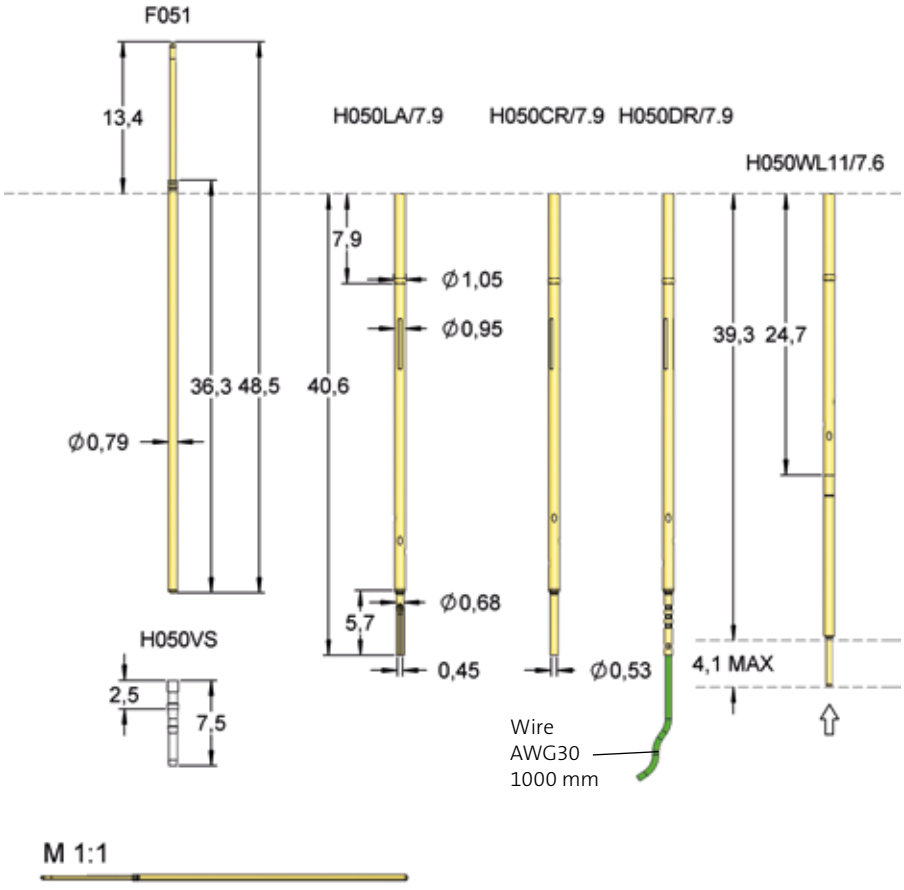
Insertion tool receptacle	FEWZ-050EV
Insertion tool receptacle	FEWZ-050E0
Insertion tool probe	FDWZ-050
Plug lock	H050VS

Drill size (mm)

Receptacle Press ring as stop	0,95 - 0,97
Receptacle Press ring inserted	0,98 - 1,01

Projection Height (mm)

H050... with F051	13,4 - 21,3
H050WL11/7.6 with F051	23,8 - 31,7



The F051 is the long travel version of the F050. These probes can be combined well in dual stage fixtures.

Series			Tip-Ø		Spring Force (cN)
F051	11	B	050	G	150
	Tip Style	Material		Plating	Version

Material: B = BeCu, S = Steel
Tip-Ø: 050 = 0,50 mm (e.g.)
Plating: G = Gold plated, L = Longtime Gold plated, P = Functional coating
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	11	B	G	0,50	-
	21	S	L	0,50	-
	43	S	L	0,50	-
	43	S	P	0,50	-

F561

Probe 75 mil
Short Version

Centers (mm/mil)	1,90 / 75
Current	4,0 A
R typ	20 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	30	80
Standard	50	100
Standard	70	150

Travel (mm)

Version	Nominal	Maximum
Standard	2,4	3,0
Pointing Accuracy		±0,05 mm

Materials and Plating

Plunger	see tip style
Barrel	Bronze, gold plated
Spring	Music wire, silver plated
Receptacle	Nickel silver, gold plated

Accessories

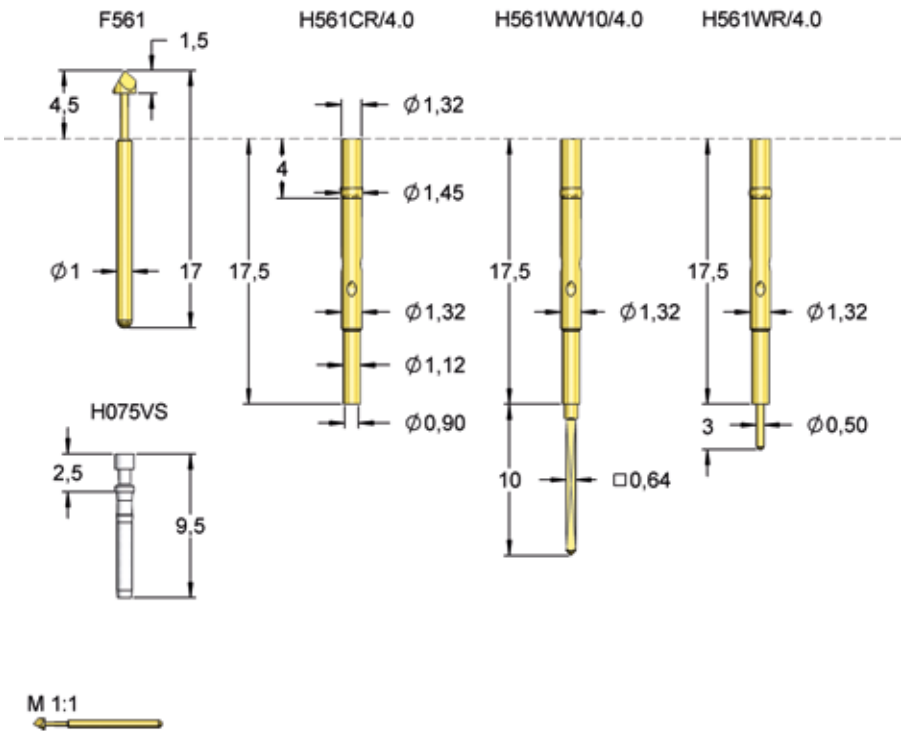
Insertion tool receptacle	FEWZ-075EV
Insertion tool receptacle	FEWZ-075E0
Insertion tool probe	FDWZ-075
Plug lock	H075VS

Drill size (mm)

Receptacle Press ring as stop	1,29 - 1,30
Receptacle Press ring inserted	1,36 - 1,40

Projection Height (mm)

H561... with F561	4,5 - 8,4



The F561 is the short version of probes for 75 mil centers.

Series			Tip-Ø		Spring Force (cN)
F561	05	B	150	G	150
	Tip Style	Material		Plating	Version

Material: B = BeCu
Tip-Ø: 150 = 1,50 mm (e.g.)
Plating: G = Gold plated
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	05	B	G	1,50	-
	06	B	G	1,50	-
	11	B	G	0,50	-
	15	B	G	1,50	-
	18	B	G	0,50	-

F701

Probe 75 mil
Short Version

Centers (mm/mil)	1,90 / 75
Current	4,0 A
R typ	20 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	15	40
Standard	40	70
Standard	30	150

Travel (mm)

Version	Nominal	Maximum
Standard	4,0	5,0
Pointing Accuracy		±0,10 mm

Materials and Plating

Plunger	see tip style
Barrel	Bronze, gold plated
Spring	Music wire, silver plated
Receptacle	Bronze, gold plated

Accessories

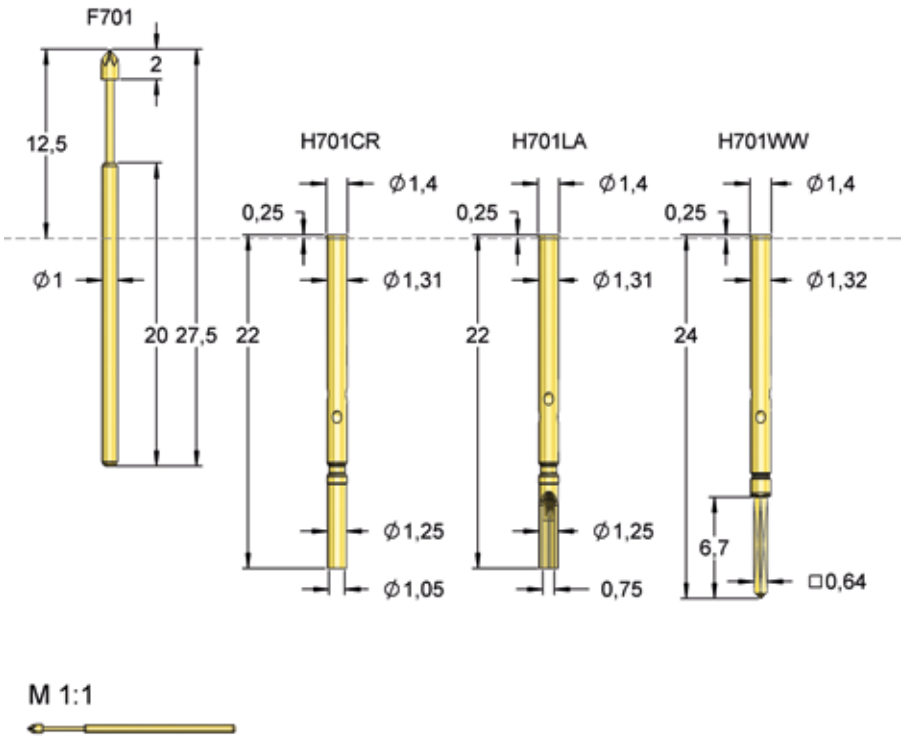
Insertion tool receptacle	FEWZ-075EV
Insertion tool receptacle	FEWZ-075E0
Insertion tool probe	FDWZ-075
Plug lock	H075VS

Drill size (mm)

Receptacle with collar	1,31 - 1,32

Projection Height (mm)

H701CR/LA with F701	12,5
H701WW with F701	12,7



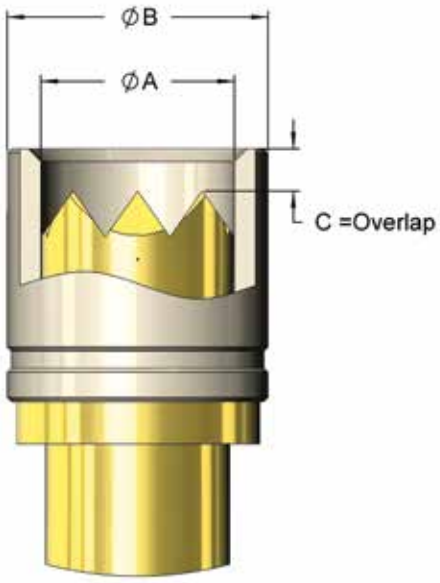
Series		Tip-Ø	Spring Force (cN)
F701	06 B 115 G 150		
	Tip Style / Material / Plating / Version		

Material: B = BeCu, S = Steel
Tip-Ø: 115 = 1,15 mm (e.g.)
Plating: G = Gold plated, L = Longtime Gold plated
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	06	B	G	1,15	-
	07	S	L	1,15	-
	11	B	G	0,50	-
	14	S	L	1,15	-
	15	B	G	1,30	-
	18	B	G	0,50	-
	21	S	L	0,50	-

Insulating Caps Overview

Exact dimensions and technical details can be found in the respective series.



F075	**Order Example**	**F07506B130G200IK04**		
	Spring Force	200 cN		
	Inner-Ø A	Ø 1,30 mm		
	Outer-Ø B	Ø 1,70 mm		
	Overlap C	0,40 mm		
F100	**Order Example**	**F10005B150G100IK04**		
	Spring Force	100 cN		
	Inner-Ø A	Ø 1,50 mm		
	Outer-Ø B	Ø 2,20 mm		
	Overlap C	0,40 mm		
F100	**Order Example**	**F10006B150GxxxIK04**		
	Spring Force	100, 200, 300 cN		
	Inner-Ø A	Ø 1,50 mm		
	Outer-Ø B	Ø 2,20 mm		
	Overlap C	0,40 mm		
F100	**Order Example**	**F10006B200GxxxIK04**	**F10006B350GxxxIK04**	**F10006B350G300IK10**
	Spring Force	200, 300 cN	200, 300 cN	300 cN
	Inner-Ø A	Ø 2,00 mm	Ø 3,50 mm	Ø 3,50 mm
	Outer-Ø B	Ø 3,20 mm	Ø 4,00 mm	Ø 4,20 mm
	Overlap C	0,40 mm	0,40 mm	1,00 mm
F100	**Order Example**	**F10006B370G300IK36**	**F10017B150G200IK04**	**F10041B150GxxxIK04**
	Spring Force	300 cN	200 cN	200, 300 cN
	Inner-Ø A	Ø 3,70 mm	Ø 1,50 mm	Ø 1,50 mm
	Outer-Ø B	Ø 4,40 mm	Ø 2,20 mm	Ø 2,20 mm
	Overlap C	3,60 mm	0,40 mm	0,40 mm
F588	**Order Example**	**F58841B150G300IK**	**F58841B150G300IK04S**	
	Spring Force	300 cN	300 cN	
	Inner-Ø A	Ø 1,50 mm	Ø 1,50 mm	
	Outer-Ø B	Ø 2,20 mm	Ø 2,20 mm	
	Overlap C	0,40 mm	0,40 mm	
F772	**Order Example**	**F77206B120G150IK05**	**F77206B180G150IK08**	**F77206B200G150IK05**
	Spring Force	150 cN	150 cN	150 cN
	Inner-Ø A	Ø 1,20 mm	Ø 1,80 mm	Ø 2,00 mm
	Outer-Ø B	Ø 2,00 mm	Ø 2,60 mm	Ø 2,80 mm
	Overlap C	0,50 mm	0,8 mm	0,50 mm
F786	**Order Example**	**F78606B400G300IK06**	**F78606B400G300IK17**	
	Spring Force	300 cN	300 cN	
	Inner-Ø A	Ø 4,00 mm	Ø 4,00 mm	
	Outer-Ø B	Ø 4,80 mm	Ø 4,80 mm	
	Overlap C	0,60 mm	1,70 mm	

F075...HP

Probe 75 mil
Progressive Series

Centers (mm/mil)	1,90 / 75
Current	4,0 A
R typ	40 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
HP	120	200
HP	130	250
HPL	120	200
HPL	130	250

Travel (mm)

Version	Nominal	Maximum
HP	4,3	6,4
HPL	4,3	6,4
Pointing Accuracy		±0,08 mm

Materials and Plating

Plunger	see tip style
Barrel	Bronze, gold plated
Spring	Music wire, gold plated
Receptacle	Nickel silver, gold plated

Accessories

Insertion tool receptacle	FEWZ-075EV
Insertion tool receptacle	FEWZ-075E0
Insertion tool probe	FDWZ-075
Plug lock	H075VS

Drill size (mm)

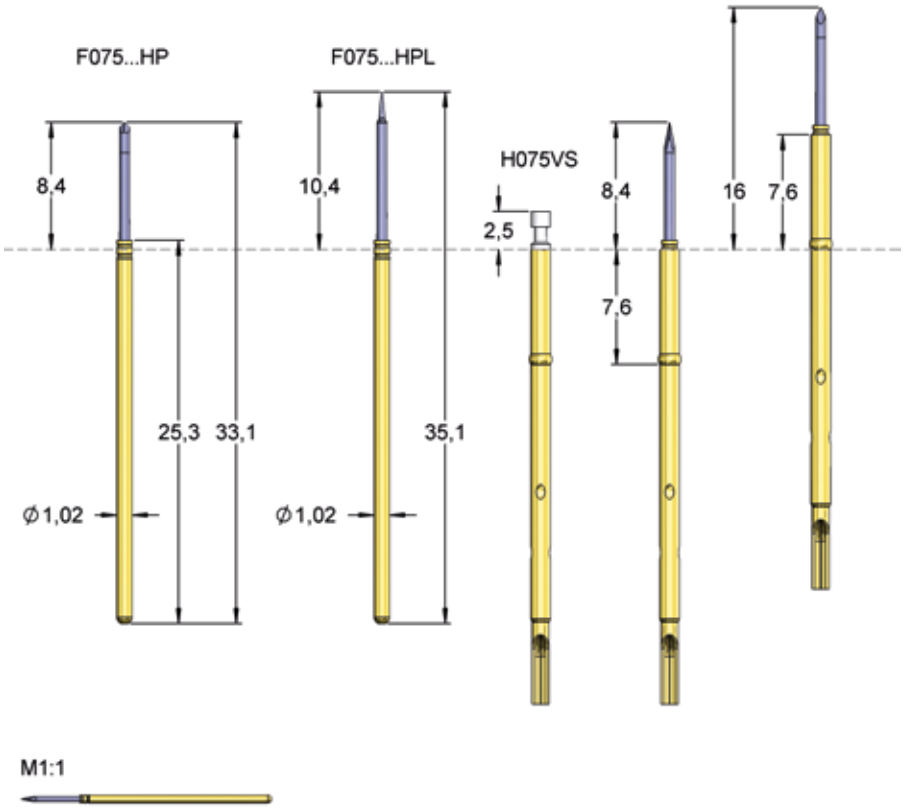
Receptacle Press ring as stop	1,29 - 1,30
Receptacle Press ring inserted	1,36 - 1,40

Projection Height (mm)

(F075) H075.../10.0	8,4 - 18,4
(F075) H075.../7.6	8,4 - 16,0
(F075) H075.../2.0	8,4 - 10,4
(F075) H075WW10/2.0S1	11,4 - 13,4
(F075) H075WW10/2.0S2	16,4 - 18,4
(F075...L) H075.../10.0	10,4 - 20,4
(F075...L) H075.../7.6	10,4 - 18,0
(F075...L) H075.../2.0	10,4 - 12,4
(F075...L) H075WW10/2.0S1	13,4 - 15,4
(F075...L) H075WW10/2.0S2	18,4 - 20,4

Series			Tip-Ø		Spring Force (cN)	
F075	21	S	064	P	200	HP
	Tip Style	Material		Plating		Version

Material: S = Steel
Tip-Ø: 064 = 0,64 mm (e.g.)
Plating: P = Functional coating
Version: HP = Progressive Series,
HPL = Progressive Series Long version
Receptacle: Order Code according drawing



This series was developed for difficult contacting conditions such as lead free soldered pads or strongly contaminated or oxidized boards. Probes of this series allow penetrating sticky layers reliably with a low vulnerability to contaminations of the tips. This leads to a high contact reliability and a long life time of these probes.

Tip Style	Number	Material	Plating	Ø in mm	Version
	21	S	P	0,64	HP
	21	S	P	0,64	HPL
	32	S	P	0,64	HP
	32	S	P	0,64	HPL
	33	S	P	0,64	HP
	33	S	P	0,64	HPL
	43	S	P	0,64	HP
	43	S	P	0,64	HPL
	62	S	P	0,64	HP
	62	S	P	0,64	HPL

F075

Probe 75 mil
Standard

Centers (mm/mil)	1,90 / 75
Current	4,0 A
R typ	50 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	30	60
Standard	50	100
Standard	70	150
Standard	80	200
Standard	100	280
L	50	100
L	70	150
L	80	200
L	100	280
IK	30	60
IK	70	150
IK	70	280

Travel (mm)

Version	Nominal	Maximum
Standard	4,3	6,4
L	4,3	6,4
IK	4,3	6,4
Pointing Accuracy		±0,08 mm

Materials and Plating

Plunger	see tip style
Barrel	Bronze, gold plated
Spring	Music wire, silver plated
Receptacle	Nickel silver, gold plated

Accessories

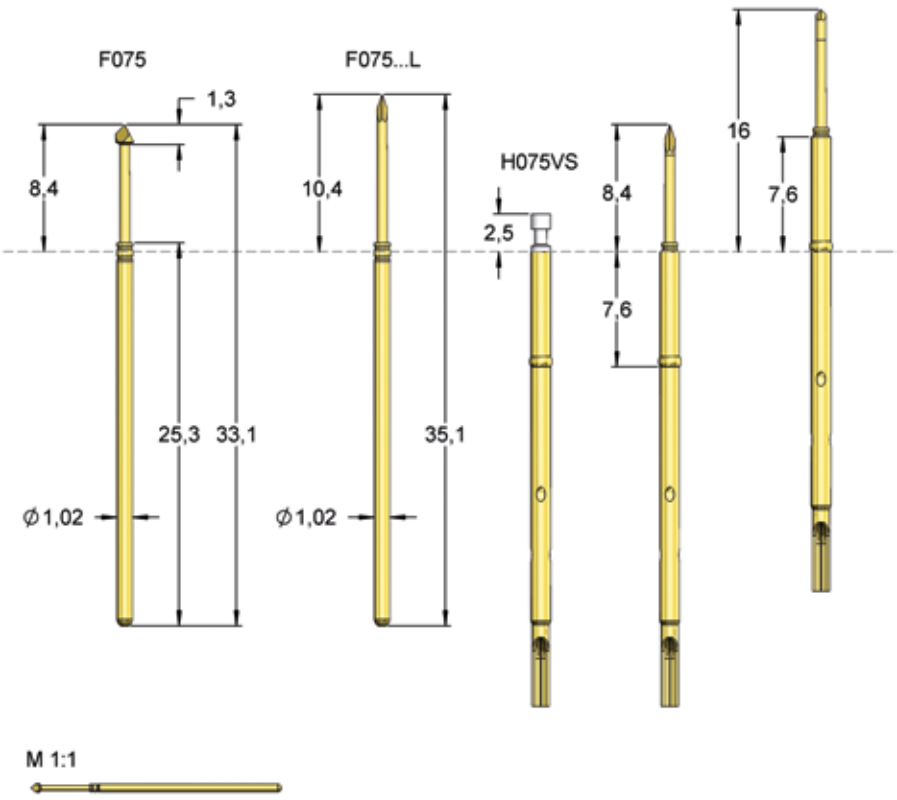
Insertion tool receptacle	FEWZ-075EV
Insertion tool receptacle	FEWZ-075E0
Insertion tool probe	FDWZ-075
Plug lock	H075VS

Drill size (mm)

Receptacle Press ring as stop	1,29 - 1,30
Receptacle Press ring inserted	1,36 - 1,40

Series			Tip-Ø		Spring Force (cN)	
F075	05	B	150	G	200	L
	Tip Style	Material		Plating		Version

Material: B = BeCu, S = Steel
Tip-Ø: 150 = 1,50 mm (e.g.)
Plating: G = Gold plated, L = Longtime Gold plated
Version: L = Long version, IK = Insulation cap
Receptacle: Order Code according drawing



Probe series F075 is the most common probe for 75 mil centers.
Further information about the receptacles see extra section for receptacle H075.

Tip Style	Number	Material	Plating	Ø in mm	Version
	05	B	G	1,20	-
	06	B	G	1,00	-
	06	B	G	1,20	-
	06	B	G	1,30	IK
	07	S	L	1,20	-
	10	S	L	0,64	-
	11	B	G	0,64	-
	14	S	L	0,78	-
	14	S	L	1,20	-
	15	B	G	0,90	-
	15	B	G	1,20	-
	15	B	G	1,20	L
	17	B	G	1,20	-
	18	B	G	0,78	-
	21	S	L	0,64	-
	21	S	L	0,64	L
	30	S	L	0,64	-
	33	S	L	0,64	-
	33	S	L	0,64	L

F075

Probe 75 mil
Standard

Projection Height (mm)	
(F075) H075.../10.0	8,4 - 18,4
(F075) H075.../7.6	8,4 - 16,0
(F075) H075.../2.0	8,4 - 10,4
(F075) H075WW10/2.0S1	11,4 - 13,4
(F075) H075WW10/2.0S2	16,4 - 18,4
(F075...L) H075.../10.0	10,4 - 20,4
(F075...L) H075.../7.6	10,4 - 18,0
(F075...L) H075.../2.0	10,4 - 12,4
(F075...L) H075WW10/2.0S1	13,4 - 15,4
(F075...L) H075WW10/2.0S2	18,4 - 20,4

Tip Style	Number	Material	Plating	Ø in mm	Version
	33	S	L	0,78	-
	36	B	G	1,20	-
	37	B	G	0,50	-
	37	B	G	0,50	L
	38	S	L	0,64	-
	38	S	L	0,64	L
	41	B	G	1,30	IK
	43	S	L	0,64	-
	53	S	L	0,64	-
	53	S	L	0,64	L
	63	S	G	1,20	-
	63	S	L	1,20	-

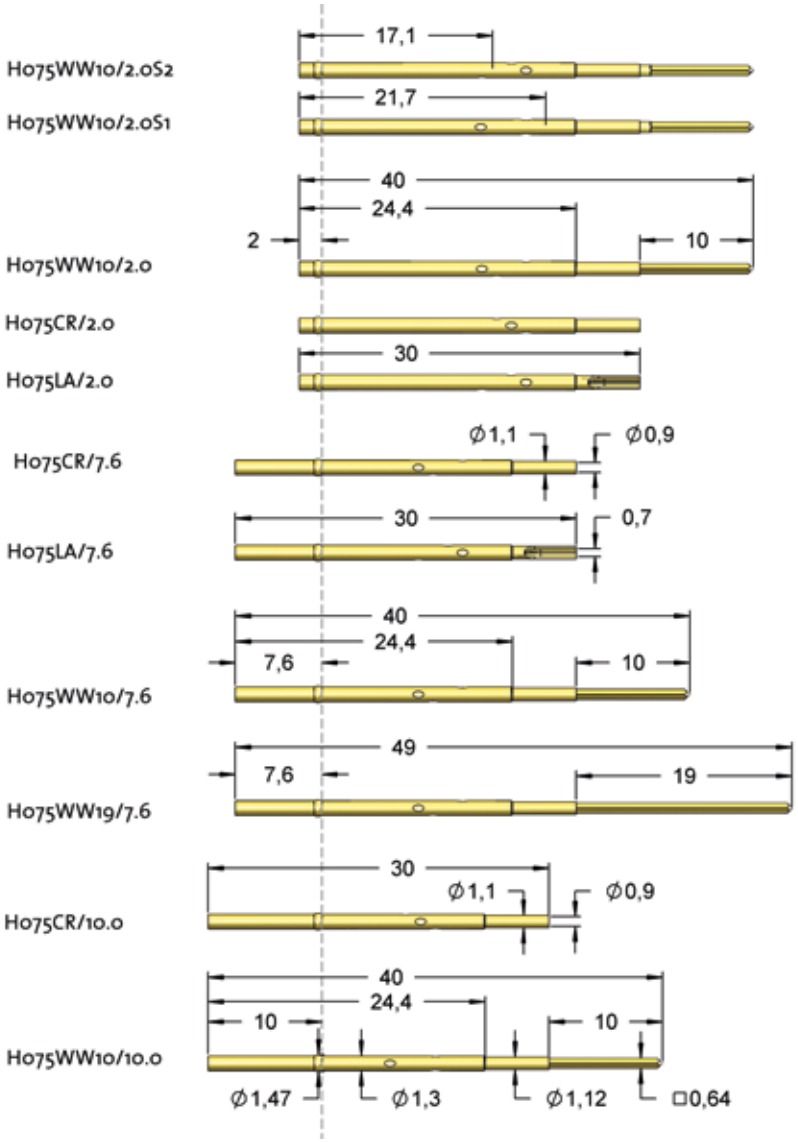
H075

Receptacle 75 mil

Materials and Plating	
Receptacle	Nickel silver, gold plated

Accessories	
Insertion tool receptacle	FEWZ-075EV
Insertion tool receptacle	FEWZ-075E0

Drill size (mm)	
Receptacle Press ring as stop	1,29 - 1,30
Receptacle Press ring inserted	1,36 - 1,40



Series	Length of Wire Wrap Pin		
H075	WW	10 /	7.6
	Connection Type		Press Ring Position

Connection Type:	CR= Crimp connection LA = Solder connection WW = Wire Wrap connection LI = Stranded wire WL = Spring loaded connection
Length of Wire Wrap Pin:	e.g. 10 = 10,0 mm
Press Ring Position:	e.g. 7.6 = 7,6 mm

F075...RP

Wobbling Plunger for Contacting Soldered Pins

Centers (mm/mil)	1,90 / 75
Current	4,0 A
R typ	50 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
RP	50	100
RP	70	150

Travel (mm)

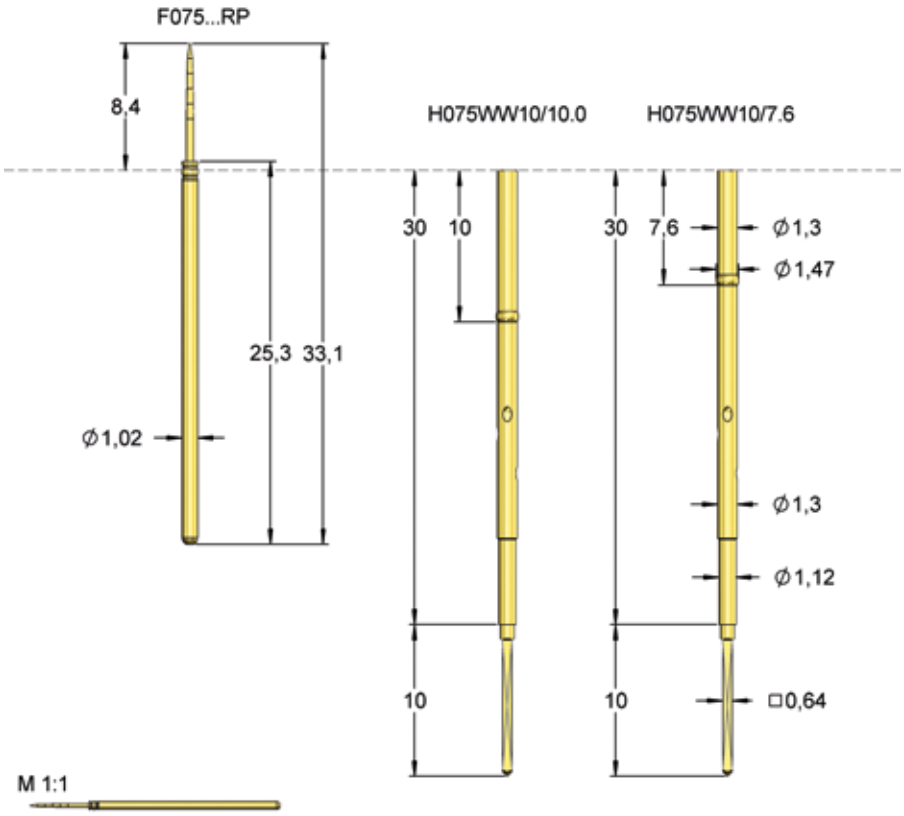
Version	Nominal	Maximum
RP	4,3	6,4
Pointing Accuracy		±0,08 mm

Materials and Plating

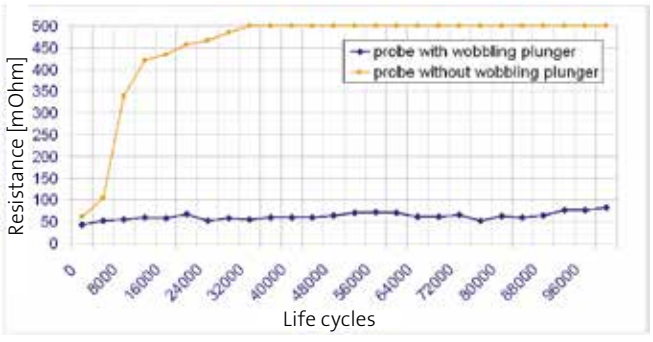
Plunger	see tip style
Barrel	Bronze, gold plated
Spring	Music wire, silver plated
Receptacle	Nickel silver, gold plated

Accessories

Insertion tool receptacle	FEWZ-075EV
Insertion tool receptacle	FEWZ-075E0
Insertion tool probe	FDWZ-075
Plug lock	H075VS



The deflection of a wobbling plunger substantially exceeds the function of the flexible needle. The special design of the plunger enables plunger deflections without notable abrasion. High level stress tests with plunger deflection up to 0.8 mm have resulted in outstanding electrical performance and life time of the probe. The diagram shows the comparison to a conventional probe without wobbling plunger.



Series			Tip-Ø		Spring Force (cN)	
F075	10	S	050	L	100	RP
	Tip Style	Material		Plating		Version

Material: S = Steel
Tip-Ø: 050 = 0,50 mm (e.g.)
Plating: L = Longtime Gold plated
Version: RP = Wobbling Plunger
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	10	S	L	0,50	RP

F793

Probe 75 mil
Long Travel Version

Centers (mm/mil)	1,90 / 75
Current	4,0 A
R typ	20 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	20	120
L	20	120
HP	70	250

Travel (mm)

Version	Nominal	Maximum
Standard	8,0	10,0
L	8,0	10,0
HP	8,0	9,0
Pointing Accuracy		±0,10 mm

Materials and Plating

Plunger	see tip style
Barrel	Nickel silver, gold plated
Spring	Music wire, gold plated
Receptacle	Nickel silver, gold plated

Accessories

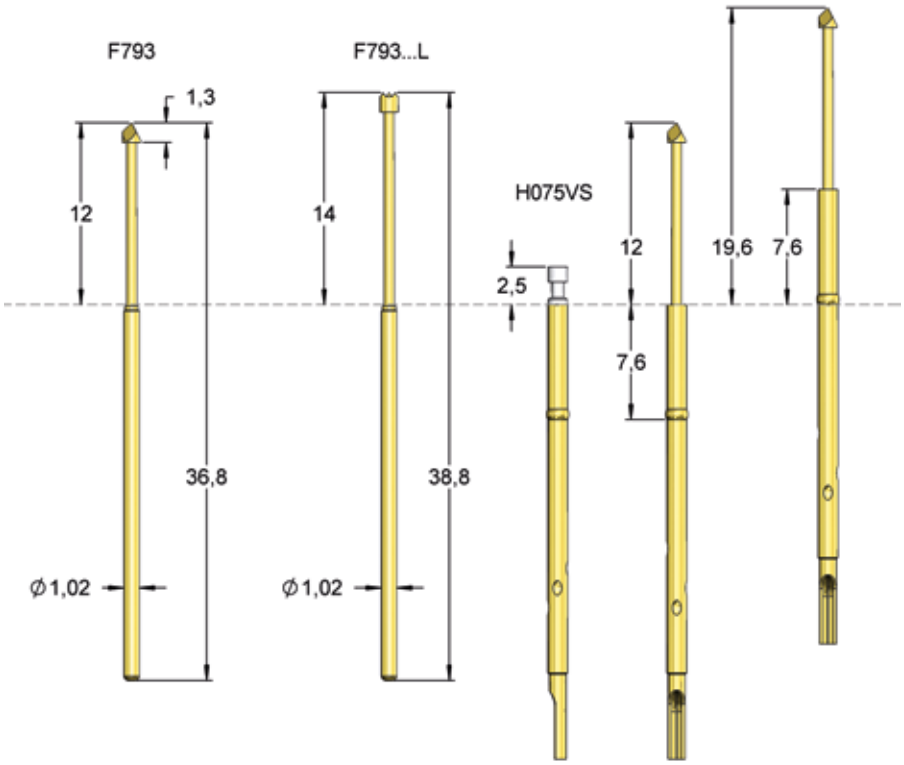
Insertion tool receptacle	FEWZ-075EV
Insertion tool receptacle	FEWZ-075E0
Insertion tool probe	FDWZ-075
Plug lock	H075VS

Projection Height (mm)

(F793) H075.../10.0	12,0 - 22,0
(F793) H075.../7.6	12,0 - 19,6
(F793) H075.../2.0	12,0 - 14,0
(F793) H075WW10/2.0S1	15,2 - 17,2
(F793) H075WW10/2.0S2	20,0 - 22,0
(F793...L) H075.../10.0	14,0 - 24,0
(F793...L) H075.../7.6	14,0 - 21,6
(F793...L) H075.../2.0	14,0 - 16,0
(F793...L) H075WW10/2.0S1	17,2 - 19,2
(F793...L) H075WW10/2.0S1	22,0 - 24,0

Series			Tip-Ø		Spring Force (cN)	
F793	**12**	**B**	**120**	**G**	**120**	**L**
	Tip Style	Material		Plating		Version

Material: B = BeCu, S = Steel
Tip-Ø: 120 = 1,20 mm (e.g.)
Plating: G = Gold plated, L = Longtime Gold plated, P = Functional coating
Version: HP = Progressive Series, L = Long version
Receptacle: Order Code according drawing



M 1:1

The F793 is the long travel version of the F075 and F703. These probes can be combined well in dual stage fixtures. Further information about the receptacles see extra section for receptacle H075.

Drill size (mm)

Receptacle Press ring as stop	1,29 - 1,30
Receptacle Press ring inserted	1,36 - 1,40

Tip Style	Number	Material	Plating	Ø in mm	Version
	06	B	G	1,20	-
	12	B	G	1,20	-
	12	B	G	1,20	L
	14	B	G	1,20	-
	14	B	G	1,20	L
	15	B	G	1,20	-
	15	B	G	1,20	L
	18	B	G	0,64	-
	21	B	G	0,64	-
	30	S	L	0,64	-
	33	S	L	0,64	-
	33	S	L	0,64	L
	33	S	P	0,64	HP
	33	S	L	1,20	L
	38	S	L	0,64	-

F562

Probe 100 mil
Short Version

Centers (mm/mil)	2,54 / 100
Current	5,0 A
R typ	20 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	60	100
Standard	60	150
Standard	60	200

Travel (mm)

Version	Nominal	Maximum
Standard	2,7	4,1
Pointing Accuracy		±0,05 mm

Materials and Plating

Plunger	see tip style
Barrel	Nickel silver, gold plated
Spring	Music wire, silver plated
Receptacle	Nickel silver, gold plated

Accessories

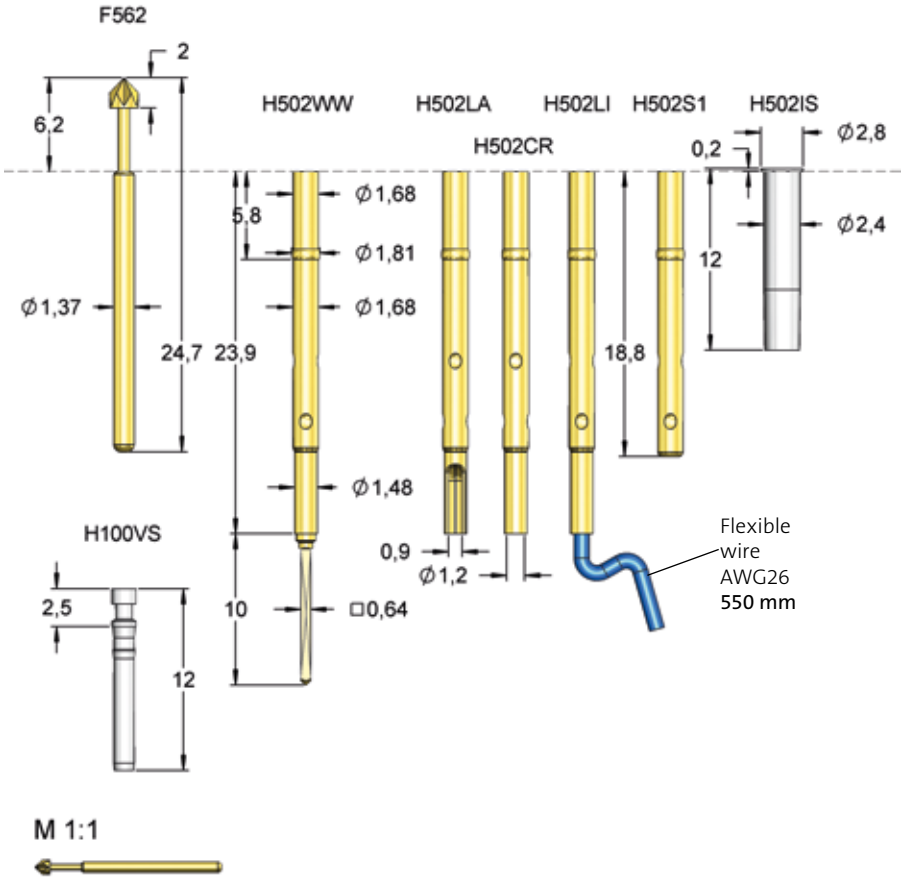
Insertion tool receptacle	FEWZ-100EV
Insertion tool receptacle	FEWZ-100E0
Insertion tool probe	FDWZ-100
Plug lock	H100VS

Drill size (mm)

Receptacle Press ring as stop	1,67 - 1,69
Receptacle Press ring inserted	1,70 - 1,75
Insulating sleeve	2,36 - 2,37

Projection Height (mm)

H502... with F562	6,2 - 12,0



Series			Tip-Ø		Spring Force (cN)
F562	04	B	190	G	100
	Tip Style	Material		Plating	Version

Material: B = BeCu, S = Steel
Tip-Ø: 190 = 1,90 mm (e.g.)
Plating: G = Gold plated, L = Longtime Gold plated
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	04	B	G	1,90	-
	05	S	L	1,90	-
	06	B	G	1,90	-
	07	S	L	1,90	-
	12	B	G	1,90	-
	14	S	L	1,90	-
	15	B	G	1,90	-
	18	B	G	0,76	-
	21	S	L	0,76	-

F771

Probe 100 mil
Short Version

Centers (mm/mil)	2,54 / 100
Current	5,0 A
R typ	20 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	50	150
Standard	100	300

Travel (mm)

Version	Nominal	Maximum
Standard	3,5	4,4
Pointing Accuracy		±0,08 mm

Materials and Plating

Plunger	see tip style
Barrel	Nickel silver, gold plated
Spring	Music wire, silver plated
Receptacle	Nickel silver, gold plated

Accessories

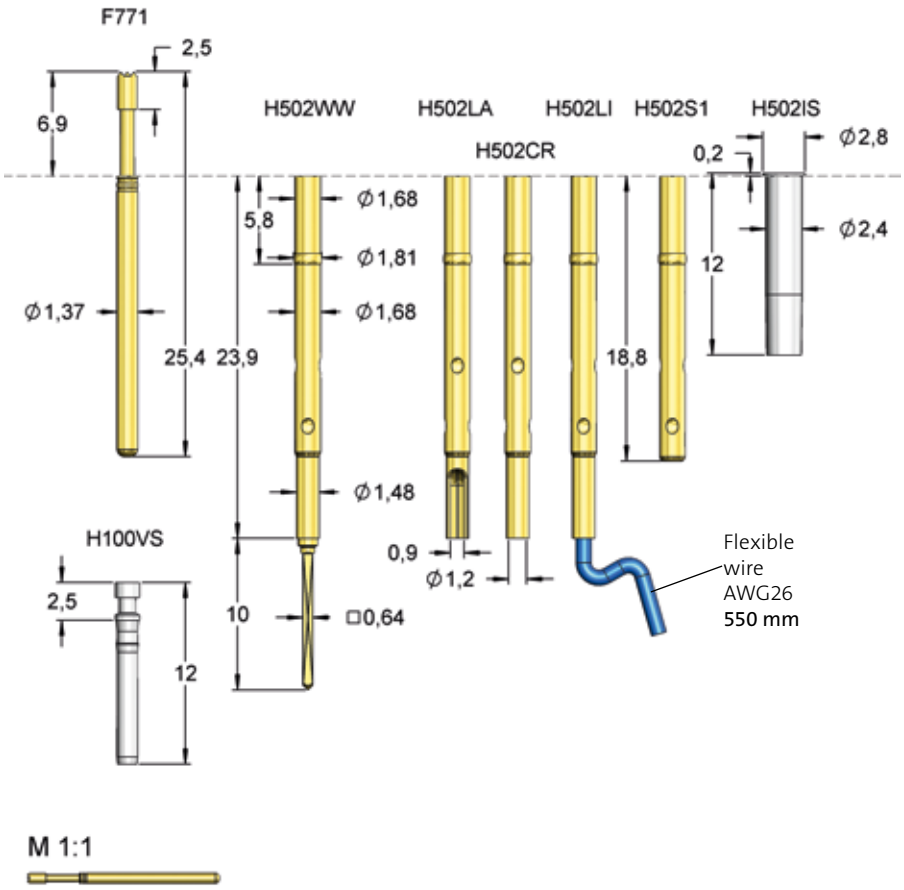
Insertion tool receptacle	FEWZ-100EV
Insertion tool receptacle	FEWZ-100E0
Insertion tool probe	FDWZ-100
Plug lock	H100VS

Drill size (mm)

Receptacle Press ring as stop	1,67 - 1,69
Receptacle Press ring inserted	1,70 - 1,75
Insulating sleeve	2,36 - 2,37

Projection Height (mm)

H502... with F771	6,9 - 12,7



Series			Tip-Ø		Spring Force (cN)
F771	05	B	180	G	150
	Tip Style	Material		Plating	Version

Material: B = BeCu
Tip-Ø: 180 = 1,80 mm (e.g.)
Plating: G = Gold plated
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	05	B	G	1,80	-
	06	B	G	1,30	-
	06	B	G	1,80	-
	11	B	G	0,65	-
	11	B	G	0,75	-
	14	B	G	1,80	-
	15	B	G	1,80	-
	17	B	G	1,80	-

F100

Probe 100 mil Standard

Centers (mm/mil)	2,54 / 100
Current	5,0 A
R typ	20 mOhm
Temperature	-20°C...+80°C -40°C...+200°C (H)

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	30	60
Standard	40	100
Standard	80	150
Standard	80	200
Standard	150	300
Standard	180	400
H	70	150
H	70	200
H	100	300
L	40	100
L	80	150
L	80	200
L	150	300
Mint-Pin	40	100
Mint-Pin	80	150
Mint-Pin	60	225

Travel (mm)

Version	Nominal	Maximum
Standard	4,3	6,4
L	4,3	6,4
Mint-Pin	4,3	6,4
Pointing Accuracy		±0,08 mm

Materials and Plating

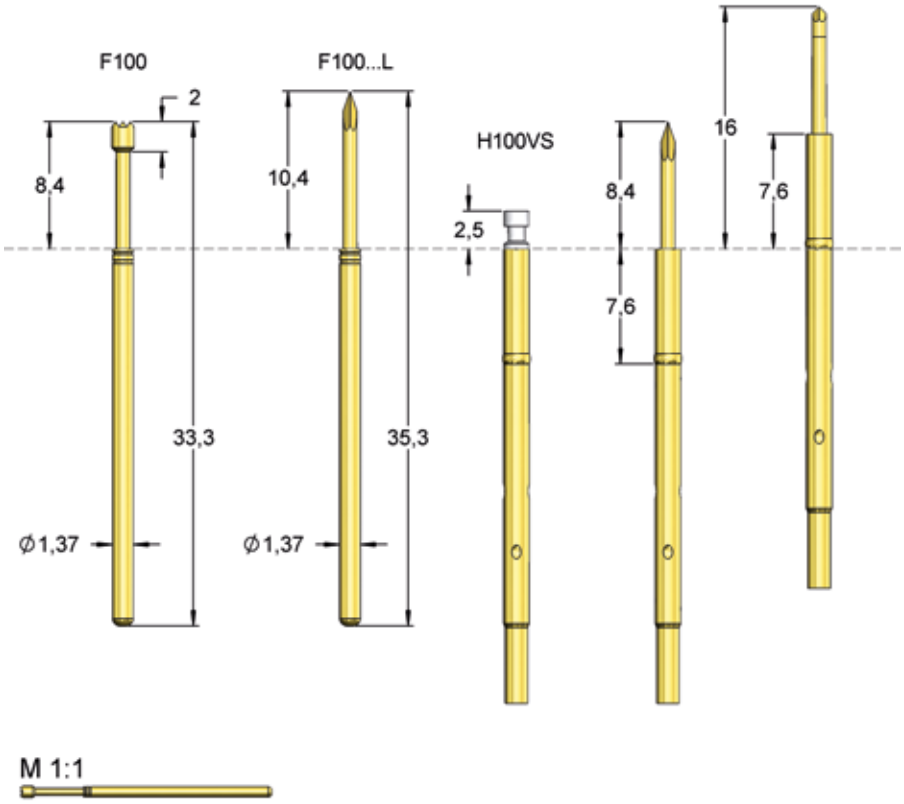
Plunger	see tip style
Barrel	Nickel silver, gold plated
Spring	Music wire, silver plated
Receptacle	Nickel silver, gold plated

Accessories

Insertion tool receptacle	FEWZ-100EV
Insertion tool receptacle	FEWZ-100E0
Insertion tool probe	FDWZ-100
Plug lock	H100VS

Series			Tip-Ø		Spring Force (cN)	
F100	06	B	150	G	100	L
	Tip Style	Material		Plating		Version

Material: B = BeCu, S = Steel
Tip-Ø: 150 = 1,50 mm (e.g.)
Plating: G = Gold plated, L = Longtime Gold plated
Version: L = Long version, IK = Insulation cap
Receptacle: Order Code according drawing



Probe series F100 is the most common probe for 100 mil centers.
Further information about the receptacles see extra section for receptacle H100.

Tip Style	Number	Material	Plating	Ø in mm	Version
	05	B	G	1,50	-
	06	B	G	1,30	-
	06	B	G	1,30	H
	06	B	G	1,50	-
	06	B	G	1,50	H
	06	B	G	1,50	L
	06	B	G	2,00	-
	06	B	G	2,50	-
	06	B	G	3,00	-
	06	B	G	3,10	Mint-Pin
	06	B	G	4,00	-
	07	S	L	1,50	-
	07	S	L	1,50	H
	11	B	G	0,50	-
	11	B	G	0,64	-
	11	B	G	0,90	-
	11	B	G	0,90	H
	11	B	G	0,90	L

F100

Probe 100 mil
Standard

Drill size (mm)	
Receptacle Press ring as stop	1,67 - 1,69
Receptacle Press ring inserted	1,70 - 1,75

Projection Height (mm)	
(F100) H100.../10.0	8,4 - 18,4
(F100) H100.../7.6	8,4 - 16,0
(F100) H100.../2.0	8,4 - 10,4
(F100) H100WW10/2.0S1	11,4 - 13,4
(F100) H100WW10/2.0S2	16,4 - 18,4
(F100...L) H100.../10.0	10,4 - 20,4
(F100...L) H100.../7.6	10,4 - 18,0
(F100...L) H100.../2.0	10,4 - 12,4
(F100...L) H100WW10/2.0S1	13,4 - 15,4
(F100...L) H100WW10/2.0S2	18,4 - 20,4

Tip Style	Number	Material	Plating	Ø in mm	Version
	12	B	G	1,50	-
	14	B	G	1,30	-
	14	B	G	1,50	-
	14	S	L	1,30	-
	14	S	L	1,30	H
	14	S	L	1,50	H
	14	S	L	1,50	-
	15	B	G	1,50	-
	15	B	G	1,50	L
	15	B	G	1,50	H
	15	B	G	1,70	-
	15	B	G	2,50	H
	17	B	G	1,50	-
	17	B	G	2,00	-
	17	B	G	2,00	H
	18	B	G	0,90	-
	21	S	L	0,90	-
	21	S	L	0,90	L
	30	B	G	0,90	-
	33	S	L	0,90	-
	33	S	L	0,90	H
	33	S	L	0,90	L
	35	S	L	1,50	-
	36	S	L	1,30	-
	36	S	L	1,30	H
	37	S	L	0,50	-
	38	S	L	0,90	-
	43	S	L	0,90	-
	53	S	L	0,90	-
	53	S	L	0,90	L
	55	B	G	1,80	-
	55	B	G	1,80	H
	55	B	G	1,80	L
	62	B	G	0,90	-
	62	B	G	0,90	H
	63	B	G	1,50	-

F100...HP

Probe 100 mil
Progressive Series

Centers (mm/mil)	2,54 / 100
Current	5,0 A
R typ	20 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
HP	70	100
HP	75	130
HP	110	150
HP	130	200
HP	200	300
HPL	75	130
HPL	130	200
HPL	200	300

Travel (mm)

Version	Nominal	Maximum
HP	4,3	6,4
HPL	4,3	6,4
Pointing Accuracy		±0,08 mm

Materials and Plating

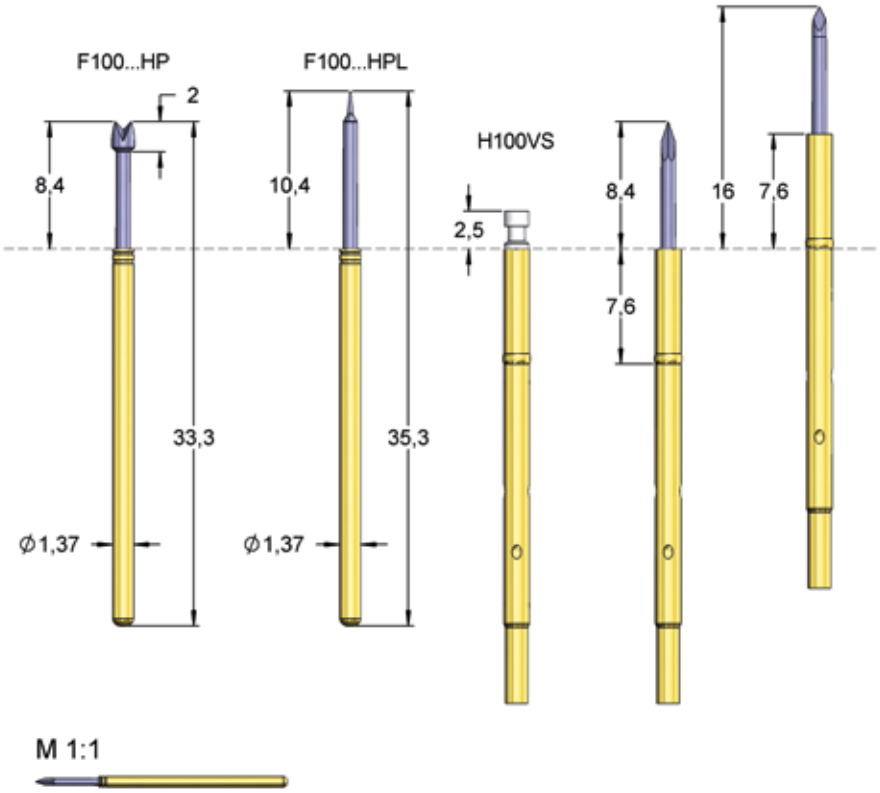
Plunger	see tip style
Barrel	Nickel silver, gold plated
Spring	Music wire, silver plated
Receptacle	Nickel silver, gold plated

Accessories

Insertion tool receptacle	FEWZ-100EV
Insertion tool receptacle	FEWZ-100E0
Insertion tool probe	FDWZ-100
Plug lock	H100VS

Drill size (mm)

Receptacle Press ring as stop	1,67 - 1,69
Receptacle Press ring inserted	1,70 - 1,75



This series was developed for difficult contacting conditions such as lead free soldered or strongly contaminated pads or oxidized boards. Probes of this series allow penetrating sticky layers reliably with a low vulnerability to contaminations of the tips. All this leads to a high contact reliability and a long life time of these probes. Further information about the receptacles see extra section for receptacle H100.

Tip Style	Number	Material	Plating	Ø in mm	Version
	06	B	P	2,00	HP
	10	S	P	0,60	HPRP
	14	S	P	1,50	HP
	21	S	P	0,90	HP
	21	S	P	0,90	HPL
	32	S	P	0,90	HP
	32	S	P	0,90	HPL
	33	S	L	0,90	HP
	33	S	P	0,90	HP
	33	S	P	0,90	HPL
	43	S	P	0,90	HP
	43	S	P	0,90	HPL
	62	S	P	0,90	HP
	62	S	P	0,90	HPL

Series			Tip-Ø		Spring Force (cN)	
F100	06	B	200	P	200	HP
	Tip Style	Material		Plating		Version

Material: B = BeCu, S = Steel
Tip-Ø: 200 = 2,00 mm (e.g.)
Plating: L = Longtime Gold plated, P = Functional coating
Version: HP = Progressive Series, HPL = Progressive Series Long version
Receptacle: Order Code according drawing

F100...RP

Wobbling Plunger for Contacting Soldered Pins

Centers (mm/mil)	2,54 / 100
Current	5,0 A
R typ	20 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
RP	70	100
RP	110	150
HPRP	110	150
HPRPL	200	300

Travel (mm)

Version	Nominal	Maximum
RP	4,3	6,4
HPRPL	4,3	6,4
Pointing Accuracy		±0,08 mm

Materials and Plating

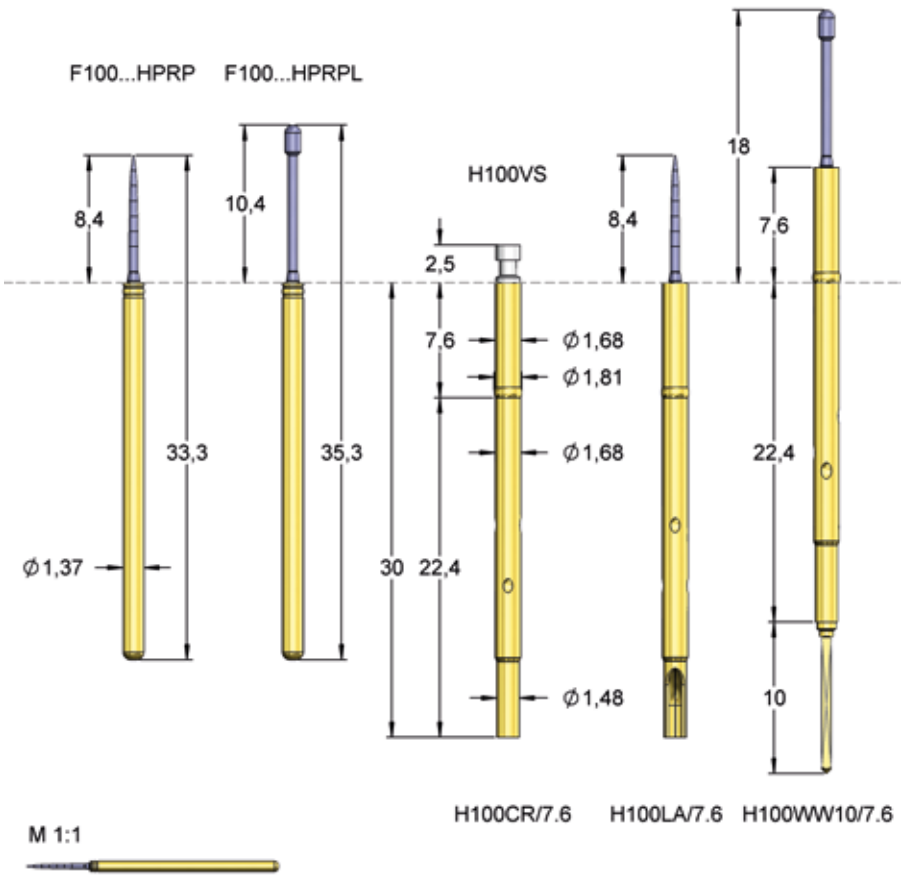
Plunger	see tip style
Barrel	Nickel silver, gold plated
Spring	Music wire, silver plated
Receptacle	Nickel silver, gold plated

Accessories

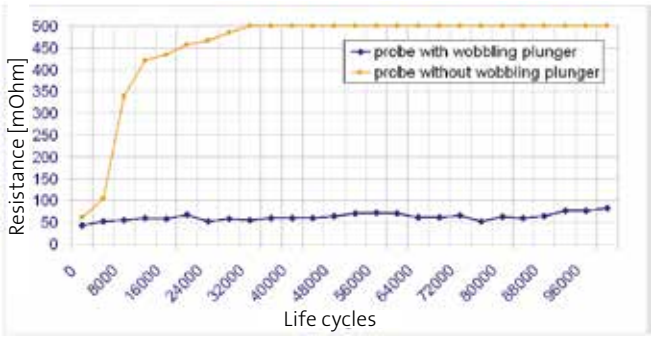
Insertion tool receptacle	FEWZ-100EV
Insertion tool receptacle	FEWZ-100E0
Insertion tool probe	FDWZ-100
Plug lock	H100VS

Drill size (mm)

Receptacle Press ring as stop	1,67 - 1,69
Receptacle Press ring inserted	1,70 - 1,75



The deflection of a wobbling plunger substantially exceeds the function of the flexible needle. The special design of the plunger enables plunger deflections without notable abrasion. High level stress tests with plunger deflection up to 0.8 mm have resulted in outstanding electrical performance and life time of the probe. The diagram shows the comparison to a conventional probe without wobbling plunger. Further information about the receptacles see extra section for receptacle H100.



Series			Tip-Ø		Spring Force (cN)	
F100	**10**	**S**	**060**	**L**	**100**	**RP**
	Tip Style	Material		Plating		Version

Material: S = Steel
Tip-Ø: 060 = 0,60 mm (e.g.)
Plating: L = Longtime Gold plated, P = Functional coating
Version: HP = Progressive Series, L = Long version, RP = Wobbling Plunger
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	10	S	L	0,60	RP
	10	S	P	0,60	HPRP
	12	S	P	105	HPRPL

H100

Receptacle 100 mil

Materials and Plating	
Receptacle	Nickel silver, gold plated

Accessories	
Insertion tool, variable for receptacle	FEWZ-100EV
Insertion tool, fix for receptacle	FEWZ-100E0
Insertion tool, variable for receptacle	FEWZ-100Exx

Drill size (mm)	
Receptacle press ring as stop	1,67 - 1,69
Receptacle press ring inserted	1,70 - 1,75

Projection Height (mm)	
(F100) H100.../10.0	8,4 - 18,4
(F100) H100.../7.6	8,4 - 16,0
(F100) H100.../2.0	8,4 - 10,4
(F100) H100WW10/2.0S1	11,4 - 13,4
(F100) H100WW10/2.0S2	16,4 - 18,4
(F100...L) H100.../10.0	10,4 - 20,4
(F100...L) H100.../7.6	10,4 - 18,0
(F100...L) H100.../2.0	10,4 - 12,4
(F100...L) H100WW10/2.0S1	13,4 - 15,4
(F100...L) H100WW10/2.0S2	18,4 - 20,4

For probes **F100, F588 and F585** different receptacles are available with different connection types (e.g. LA, CR, WW), **different press ring positions** (e.g. 2,0; 7,6; 10,0 mm) and different wire-wrap posts (10,0; 19,0 mm length).

Plug locks H100VS can be used to close empty receptacles in order to prevent false assemblies and to avoid contamination.

Die insulating sleeve **H502IS** can be also used for receptacle H100.

Series — Length of Wire Wrap Pin

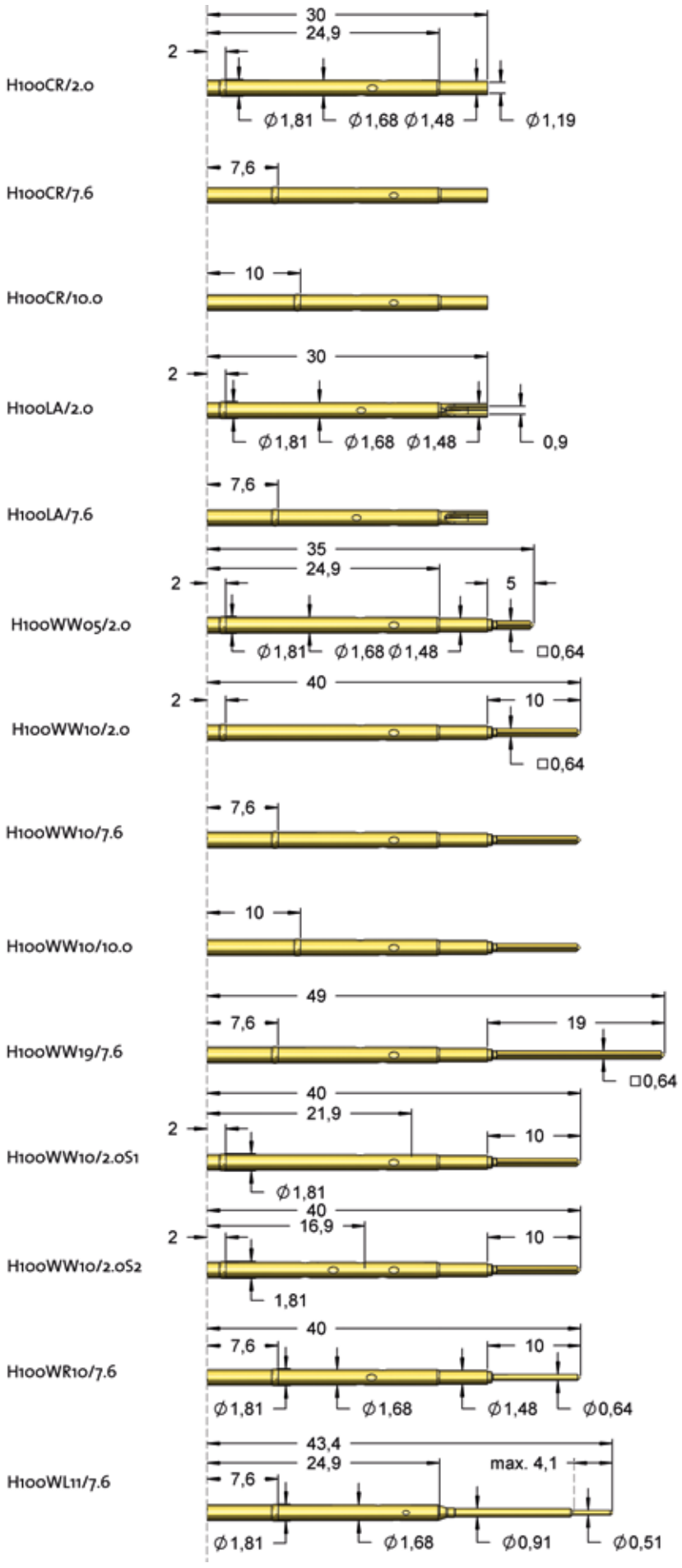
H100 WW 10 / 7.6

Connection Type — Press Ring Position

Connection Type: CR= Crimp connection
LA = Solder connection
WW = Wire Wrap connection
LI = Stranded wire
WL = Spring loaded connection

Length of Wire Wrap Pin: e.g. 10 = 10,0 mm

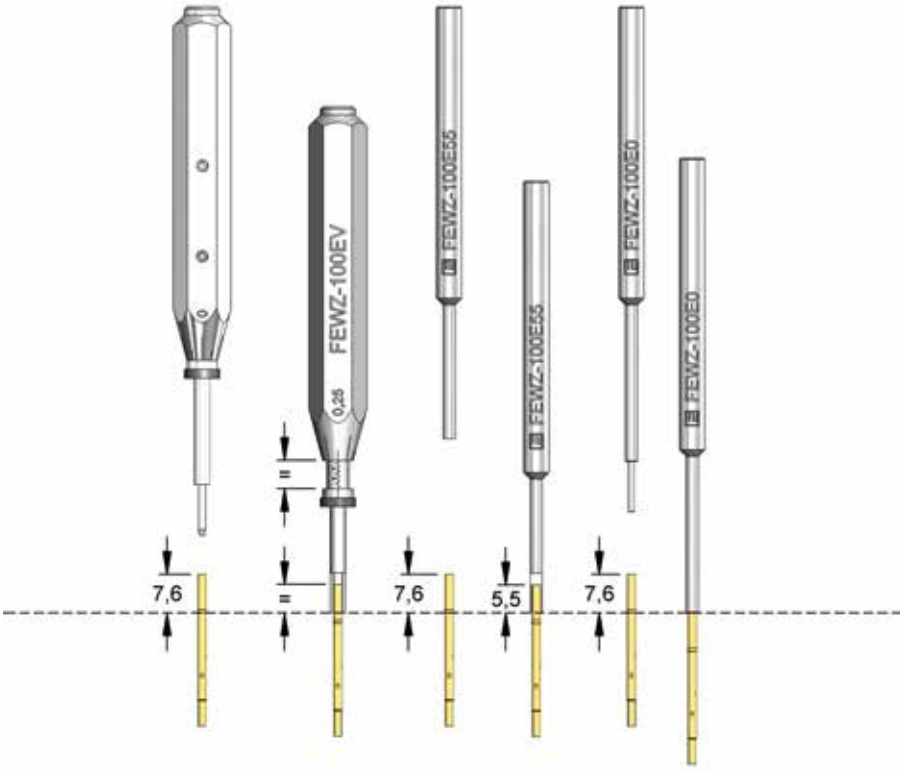
Press Ring Position: e.g. 7.6 = 7,6 mm



Mounting

Receptacle 100 mil

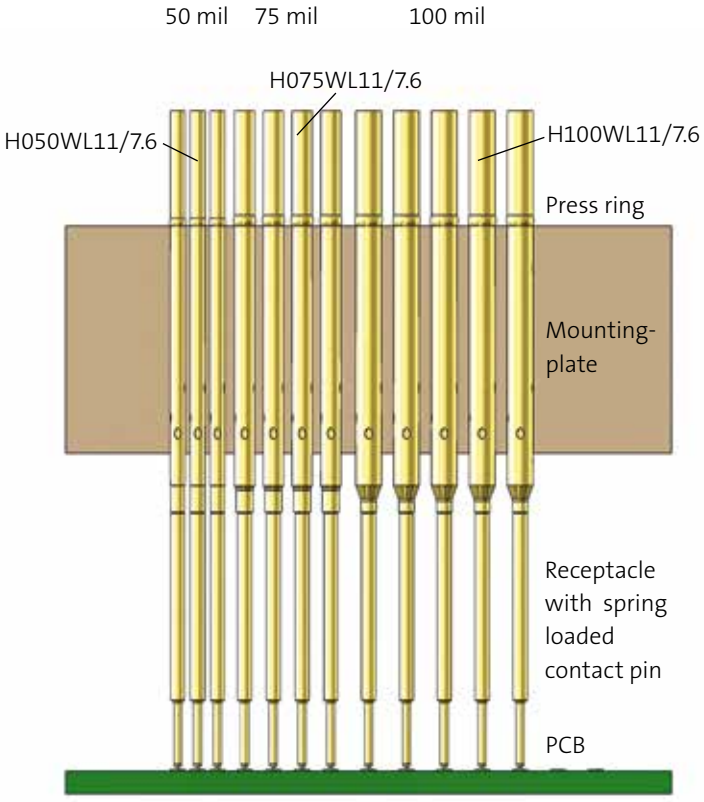
Adequate insertion tools for mounting receptacles are available. The right tool for flush insertion is FEWZ-100E0. The most economic tools for fix projection heights are FEWZ-100Exx (e.g. E55 = 5,5 mm). For variable projection heights the tool FEWZ-100EV with adjustable projection heights is appropriate.



HxxxWL11/7.6

With Spring Loaded End for Interface Systems

Receptacles with spring loaded end are often used in interface systems.
The spring loaded end of the receptacle can directly contact a PCB that is connected with the test system.
For different available space these receptacles are available in different centers (50 mil, 75 mil, 100 mil).



F588

Probe 100 mil
Long Travel Version

Centers (mm/mil)	2,54 / 100
Current	5,0 A
R typ	20 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	80	180
Standard	110	300
HP	110	180
HPS	140	300
S	100	180
S	140	300
IK	110	300

Travel (mm)

Version	Nominal	Maximum
Standard	9,3	11,7
HP	9,3	11,7
HPS	7,6	10,0
S	7,6	10,0
IK	9,3	11,7
Pointing Accuracy		±0,10 mm

Materials and Plating

Plunger	see tip style
Barrel	Nickel silver, gold plated
Spring	Music wire, silver plated
Receptacle	Nickel silver, gold plated

Accessories

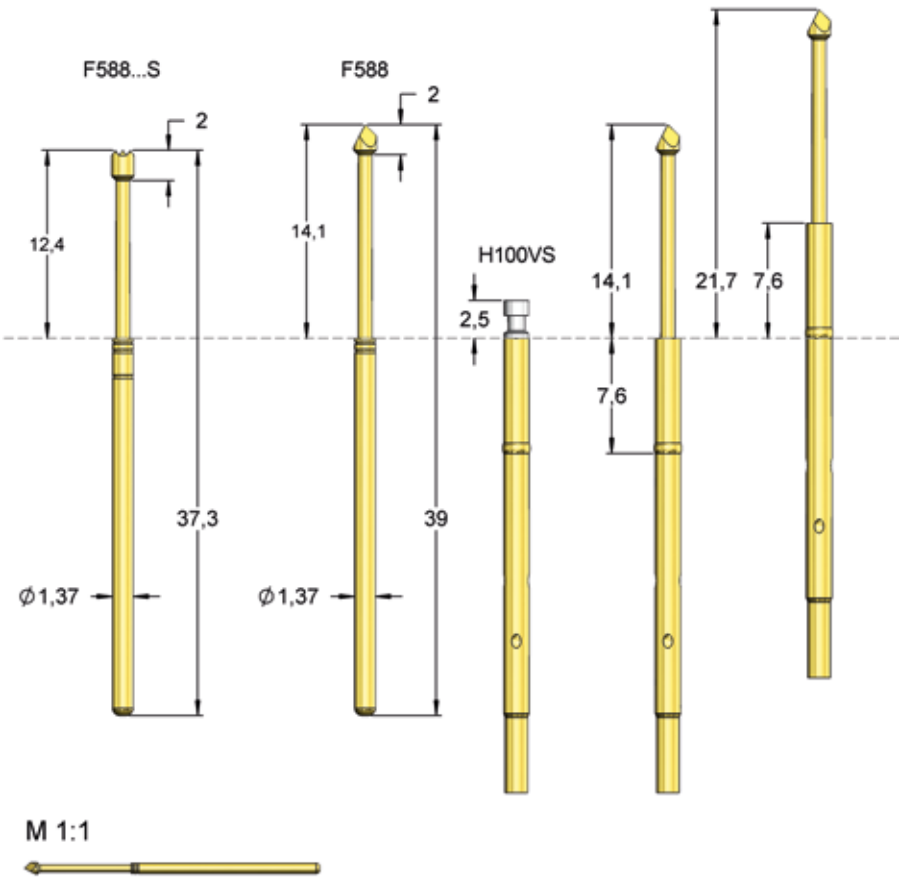
Insertion tool receptacle	FEWZ-100EV
Insertion tool receptacle	FEWZ-100E0
Insertion tool probe	FDWZ-100
Plug lock	H100VS

Drill size (mm)

Receptacle Press ring as stop	1,67 - 1,69
Receptacle Press ring inserted	1,70 - 1,75

Series			Tip-Ø		Spring Force (cN)	
F588	**05**	**B**	**150**	**G**	**180**	**S**
	Tip Style	Material		Plating		Version

Material: B = BeCu, S = Steel
Tip-Ø: 150 = 1,50 mm (e.g.)
Plating: G = Gold plated, L = Longtime Gold plated, P = Functional coating
Version: HP = Progressive Series, S = Short version
Receptacle: Order Code according drawing



The F588 is the long travel version of the F100 and F585. These probes can be combined well in dual stage fixtures. Versions with insulation caps are also available, see page insulation caps. Further information about the receptacles see extra section for receptacle H100.

Tip Style	Number	Material	Plating	Ø in mm	Version
	05	B	G	1,50	-
	05	B	G	1,50	S
	06	B	G	1,50	-
	06	B	G	1,50	S
	11	B	G	0,90	-
	12	B	G	1,50	-
	12	B	G	1,50	S
	15	B	G	1,50	-
	15	B	G	1,50	S
	18	B	G	0,76	-
	21	S	L	0,76	-
	21	S	L	0,90	-
	21	S	P	0,90	HP
	28	B	G	1,50	-
	30	B	G	0,76	-
	33	S	L	0,76	-

F588

Probe 100 mil
Long Travel Version

Centers (mm/mil)	2,54 / 100
Current	5,0 A
R typ	20 mOhm
Temperature	-20°C...+80°C

Projection Height (mm)

(F588...S) H100.../10.0	12,4 - 22,4
(F588...S) H100.../7.6	12,4 - 20,0
(F588...S) H100.../2.0	12,4 - 14,4
(F588...S) H100WW10/2.0S1	15,4 - 17,4
(F588...S) H100WW10/2.0S2	20,4 - 22,4
(F588) H100.../10.0	14,1 - 24,1
(F588) H100.../7.6	14,1 - 21,7
(F588) H100.../2.0	14,1 - 16,1
(F588) H100WW10/2.0S1	17,1 - 19,1
(F588) H100WW10/2.0S2	22,1 - 24,1

Tip Style	Number	Material	Plating	⌀ in mm	Version
	33	S	L	0,76	S
	33	S	L	0,90	-
	33	S	L	0,90	S
	33	S	P	0,90	-
	33	S	P	0,90	HP
	33	S	P	0,90	HPS
	36	S	L	1,40	-
	37	S	L	0,50	-
	37	S	P	0,50	HP
	38	S	L	0,90	-
	41	B	G	1,50	IK
	41	B	G	1,50	IKS
	43	S	P	0,90	-
	55	B	G	1,80	-
	55	B	G	1,80	H
	55	B	G	1,80	L
	62	B	P	0,90	-
	63	B	G	1,50	-
	66	B	P	2,50	HP

F772

Probe 100 mil

Centers (mm/mil)	2,54 / 100
Current	5,0 A
R typ	25 mOhm
Temperature	-20°C...+80°C -40°C...+200°C (H)

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	30	80
Standard	60	150
Standard	60	220
Standard	60	300
H	60	150
H	60	300
HP	200	300

Travel (mm)

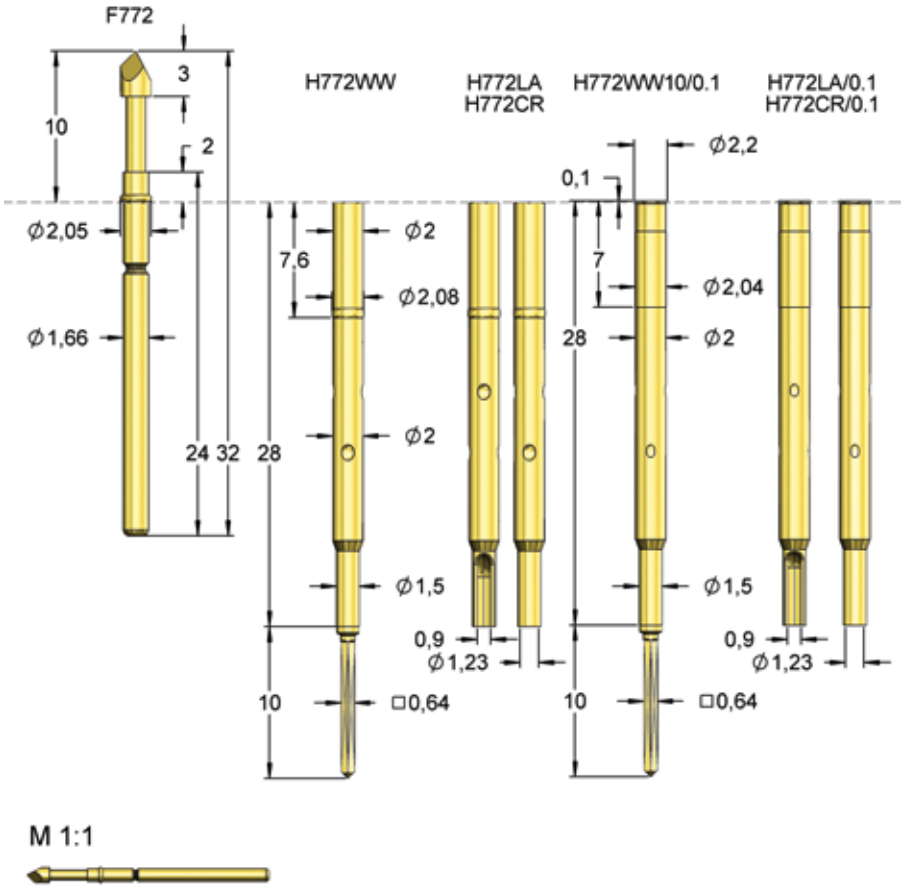
Version	Nominal	Maximum
Standard	4,0	5,0
Pointing Accuracy		±0,08 mm

Materials and Plating

Plunger	see tip style
Barrel	Nickel silver, gold plated
Spring	Music wire, silver plated, Stainless steel, unplated (H)
Receptacle	Nickel silver, gold plated

Accessories

Insertion tool receptacle	FEWZ-772EV
Insertion tool receptacle	FEWZ-772E0
Insertion tool probe	FDWZ-100
Plug lock	H772VS



Versions with different projection height available on request.

Series			Tip-Ø		Spring Force (cN)	
F772	06	B	150	G	300	H
	Tip Style	Material		Plating		Version

Material: B = BeCu, S = Steel

Tip-Ø: 150 = 1,50 mm (e.g.)

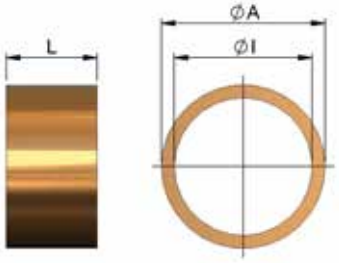
Plating: G = Gold plated, L = Longtime Gold plated, P = Functional coating, N = Nickel plated, R = Rhodium plated

Version: L = Long version, HP = Progressive Series, H = High temperature, IK = Insulation cap

Receptacle: Order Code according drawing

Spacers H772DS/xx for 100 mil probes

Order Code	Outer-Ø	Inner-Ø	Length
H772DS/10	2,20	1,70	1,00
H772DS/20	2,20	1,70	2,00
H772DS/30	2,20	1,70	3,00
H772DS/50	2,20	1,70	5,00



F772

Probe 100 mil

Centers (mm/mil)	2,54 / 100
Current	5,0 A
R typ	25 mOhm
Temperature	-20°C...+80°C -40°C...+200°C (H)

Drill size (mm)

Receptacle Press ring as stop	1,97 - 2,00
Receptacle Press ring inserted	2,03 - 2,05
Receptacle with collar	2,02 - 2,03

Projection Height (mm)

(F772) H772...	10,0 - 17,6
(F772) H772.../0.1	10,1

Tip Style	Number	Material	Plating	Ø in mm	Version
	03	B	G	1,30	-
	05	B	G	1,80	-
	05	B	G	2,00	-
	05	B	G	2,00	H
	05	B	G	2,50	-
	05	B	G	3,00 *	-
	05	B	G	4,00 *	-
	06	B	G	1,50	-
	06	B	G	1,50	H
	06	B	G	1,80	-
	06	B	G	1,80	-
	06	B	G	2,00	H
	06	B	G	2,50	-
	06	B	G	2,50	H
	07	S	L	1,75	-
	07	S	L	2,00	-
	10	S	N	0,63	-
	11	B	G	0,64	-
	11	B	G	0,70	-
	11	B	G	1,00	-
	11	B	G	1,30	-
	12	B	G	1,50	-
	12	B	G	2,00	-
	12	B	G	2,00	H
	14	S	L	2,00	-
	15	B	G	2,00	-
	15	B	G	2,00	H
	17	B	G	2,00	-
	17	B	G	3,00 *	-
	18	B	G	1,30	-
	18	S	N	0,80	-
	21	S	L	1,30	-
	21	S	L	1,30	H
	28	B	G	2,00	-
	30	B	G	1,30	-
	33	S	L	1,30	-
	33	S	L	1,30	H
	33	S	P	1,30	HP
	33	S	R	1,30	-

* Center different from standard.

F786

Probe 100 mil, Long Travel Version

Centers (mm/mil)	2,54 / 100
Current	5,0 A
R typ	25 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	60	150
Standard	60	225
Standard	60	300
IK	60	300
HP	180	300
HP	180	500

Travel (mm)

Version	Nominal	Maximum
Standard	6,4	8,0
IK	6,4	8,0
HP	6,4	8,0
Pointing Accuracy		±0,10 mm

Materials and Plating

Plunger	see tip style
Barrel	Nickel silver, gold plated
Spring	Music wire, silver plated
Receptacle	Nickel silver, gold plated

Accessories

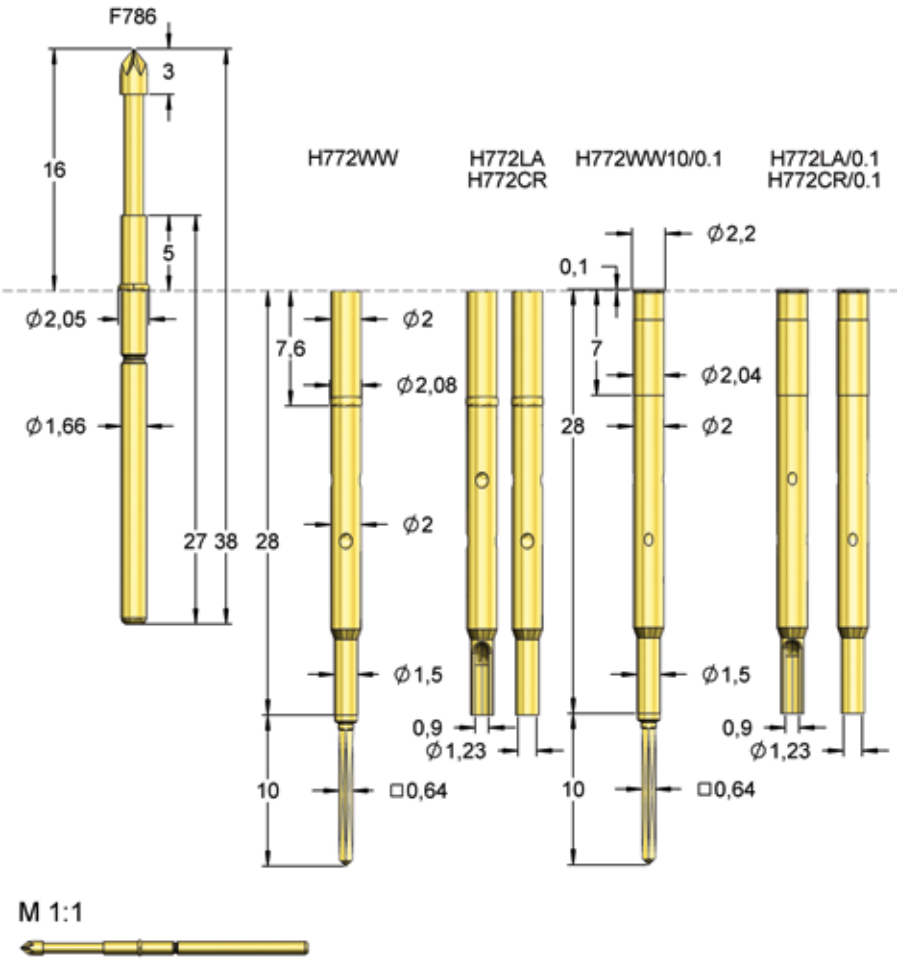
Insertion tool receptacle	FEWZ-772EV
Insertion tool receptacle	FEWZ-772E0
Insertion tool probe	FDWZ-100
Plug lock	H772VS

Drill size (mm)

Receptacle Press ring as stop	1,97 - 2,00
Receptacle Press ring inserted	2,03 - 2,05
Receptacle with collar	2,02 - 2,03

Projection Height (mm)

(F786) H772...	16,0 - 23,6
(F786) H772.../0.1	16,1



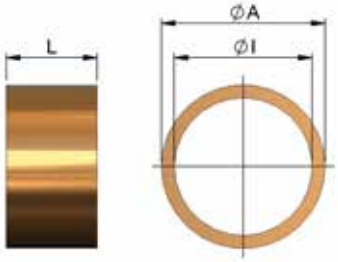
The F786 is the long travel version of the F772. These probes can be combined well in dual stage fixtures.

Series			Tip-Ø		Spring Force (cN)	
F786	**06**	**B**	**400**	**G**	**300**	**IK06**
	Tip Style	Material		Plating		Version

Material: B = BeCu, S = Steel, K = Synthetic
Tip-Ø: 400 = 4,00 mm (e.g.)
Plating: G = Gold plated, L = Longtime Gold plated, P = Functional coating, U = Unplated
Version: HP = Progressive Series, IK = Insulation cap
Receptacle: Order Code according drawing

Spacers H772DS/xx for 100 mil probes

Order Code	Outer-Ø	Inner-Ø	Length
H772DS/10	2,20	1,70	1,00
H772DS/20	2,20	1,70	2,00
H772DS/30	2,20	1,70	3,00
H772DS/50	2,20	1,70	5,00



F786

Probe 100 mil, Long Travel Version

Centers (mm/mil)	2,54 / 100
Current	5,0 A
R typ	25 mOhm
Temperature	-20°C...+80°C

Tip Style	Number	Material	Plating	⌀ in mm	Version
	04	B	G	2,00	-
	05	B	G	1,30	-
	06	B	G	2,00	-
	06	B	G	4,00 *	IK
	06	B	G	4,50 *	-
	07	S	L	1,80	-
	07	S	L	2,00	-
	10	S	P	0,63	HP
	11	B	G	1,30	-
	14	S	L	2,00	-
	15	B	G	2,00	-
	17	K	U	4,00 *	-
	18	B	G	1,30	-
	21	S	L	1,30	-
	32	S	L	0,80	-
	32	S	P	0,80	HP
	33	S	L	1,30	-
	33	S	P	1,30	HP
	34	S	L	0,80	-
	38	S	L	1,30	-
	63	S	L	2,00	-

* Center different from standard.

F797

Probe 100 mil, Long Travel Version

Centers (mm/mil)	2,54 / 100
Current	5,0 A
R typ	25 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	60	150
Standard	60	300
E21	100	300

Travel (mm)

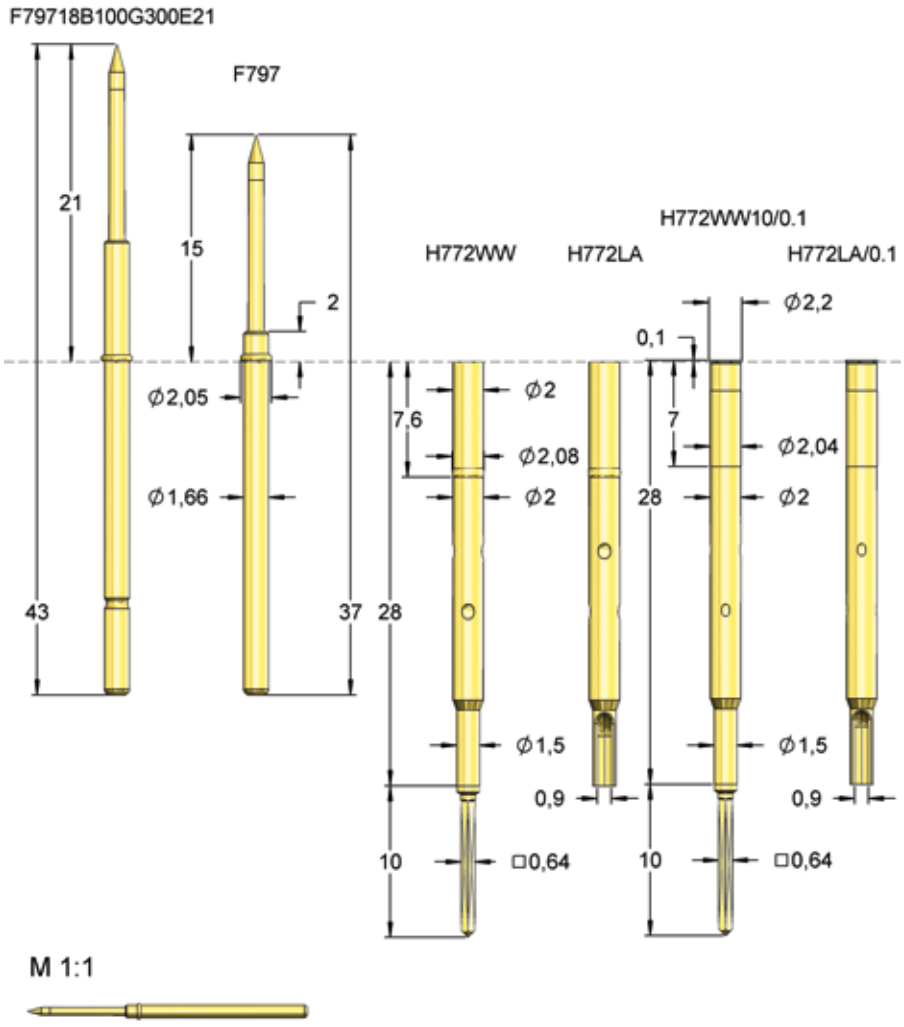
Version	Nominal	Maximum
Standard	8,0	10,0
E21	8,0	10,0
Pointing Accuracy		±0,18 mm

Materials and Plating

Plunger	see tip style
Barrel	Nickel silver, gold plated
Spring	Music wire, silver plated
Receptacle	Nickel silver, gold plated

Accessories

Insertion tool receptacle	FEWZ-772EV
Insertion tool receptacle	FEWZ-772E0
Insertion tool probe	FDWZ-100
Plug lock	H772VS



The F797 is the long travel version of the F772. These probes can be combined well in dual stage fixtures.

Drill size (mm)

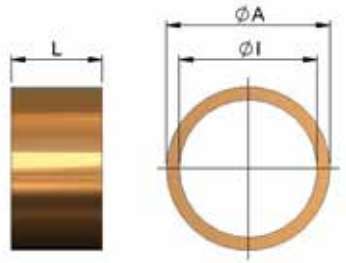
Receptacle Press ring as stop	1,97 - 2,00
Receptacle Press ring inserted	2,03 - 2,05
Receptacle with collar	2,02 - 2,03

Projection Height (mm)

(F797) H772...	15,0 - 22,6
(F797) H772.../0.1	15,1

Spacers H772DS/xx for 100 mil probes

Order Code	Outer-Ø	Inner-Ø	Length
H772DS/10	2,20	1,70	1,00
H772DS/20	2,20	1,70	2,00
H772DS/30	2,20	1,70	3,00
H772DS/50	2,20	1,70	5,00



Series			Tip-Ø		Spring Force (cN)	
F797	18	S	100	L	300	E21
	Tip Style	Material		Plating		Version

Material: B = BeCu, S = Steel, K = Synthetic
Tip-Ø: 400 = 4,00 mm (e.g.)
Plating: G = Gold plated, L = Longtime Gold plated, P = Functional coating, U = Unplated
Version: HP = Progressive Series, IK = Insulation cap
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	06	B	G	2,00	-
	14	S	L	2,00	-
	15	B	G	2,00	-
	18	B	G	1,00	-
	18	B	G	1,00	E21
	63	S	L	2,00	E21

F563

Probe 118 mil

Centers (mm/mil)	3,00 / 118
Current	6,0 A
R typ	100 mOhm
Temperature	-40°C...+200°C (H)

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	90	120
Standard	90	180
Standard	130	250
Standard	180	300
HP	140	180

Travel (mm)

Version	Nominal	Maximum
Standard	4,3	6,4
HP	4,3	6,4
Pointing Accuracy		±0,10 mm

Materials and Plating

Plunger	see tip style
Barrel	Bronze, gold plated
Spring	Stainless steel, unplated
Receptacle	Nickel silver, gold plated

Accessories

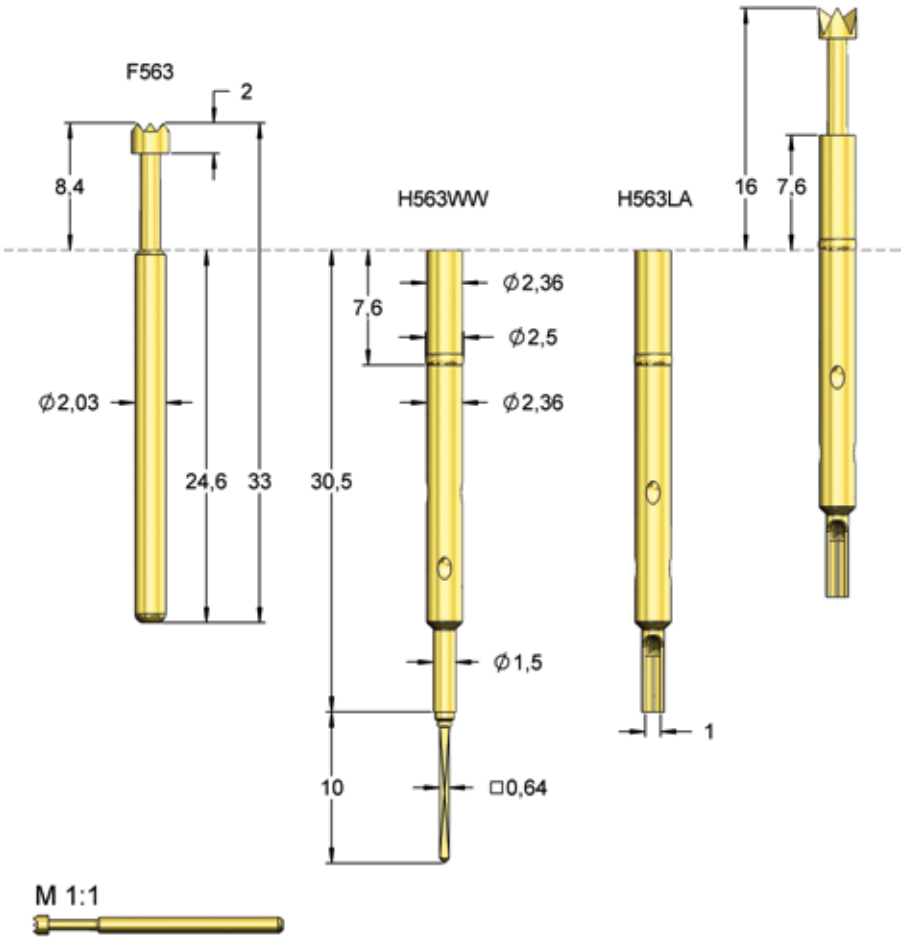
Insertion tool receptacle	FEWZ-563E0
Insertion tool probe	FDWZ-100

Drill size (mm)

Press ring as stop	2,34 - 2,35
Press ring inserted	2,40 - 2,45

Projection Height (mm)

H563... with F563	8,4 - 16,0



A long travel version is available on request (series F140).

Series			Tip-Ø		Spring Force (cN)	
F563	06	B	250	G	180	HP
	Tip Style	Material		Plating		Version

Material: B = BeCu
Tip-Ø: 250 = 2,50 mm (e.g.)
Plating: G = Gold plated, P = Functional coating
Version: HP = Progressive Series
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	05	B	G	1,70	-
	05	B	G	2,50	-
	06	B	G	2,50	-
	06	B	G	2,50	HP
	06	B	G	4,00	-
	07	S	P	3,00	-
	11	B	G	1,30	-
	12	B	G	1,70	-
	12	B	G	2,50	-
	14	B	G	2,50	-
	15	B	G	3,00	-
	16	B	G	1,30	-
	17	B	G	1,70	-
	18	B	G	0,70	-
	18	B	G	1,30	-

F773

Probe 138 mil

Centers (mm/mil)	3,50 / 138
Current	10,0 A
R typ	25 mOhm
Temperature	-20°C...+80°C -40°C...+200°C (H)

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	50	150
Standard	30	220
Standard	80	300
Standard	100	400
H	40	150
H	80	300

Travel (mm)

Version	Nominal	Maximum
Standard	4,0	5,0
H	4,0	5,0
Pointing Accuracy		±0,10 mm

Materials and Plating

Plunger	see tip style
Barrel	Bronze, gold plated
Spring	Music wire, silver plated, Stainless steel, unplated
Receptacle	Nickel silver, gold plated

Accessories

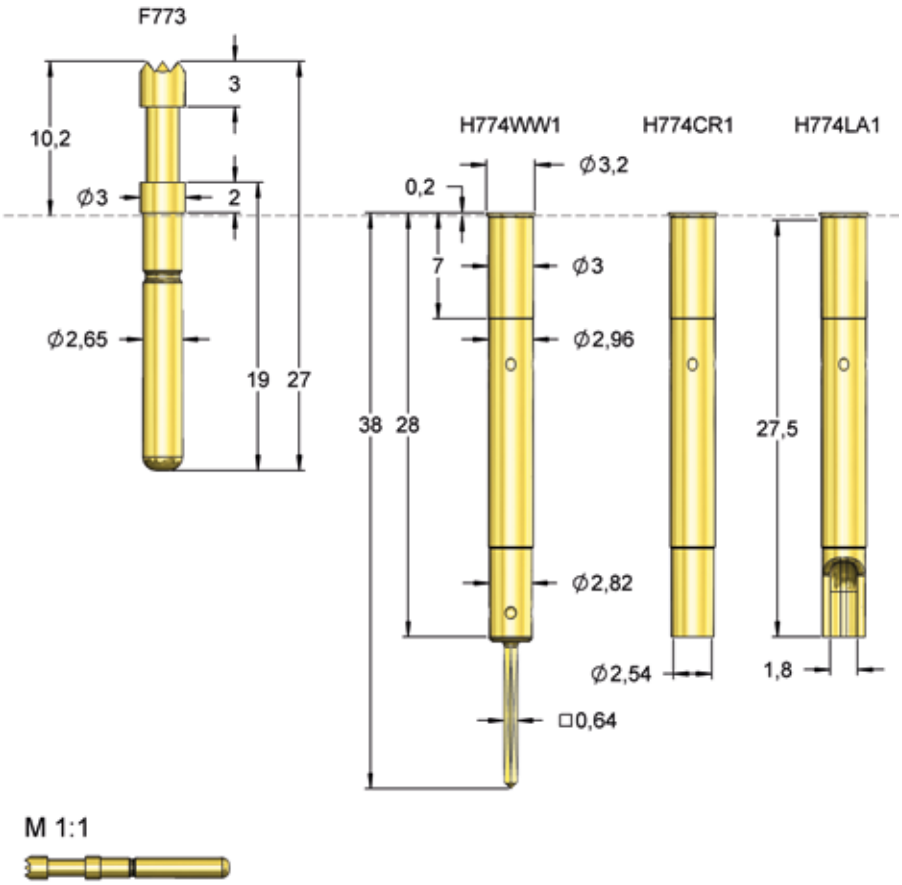
Insertion tool receptacle	FEWZ-774E0
Insertion tool probe	FDWZ-100

Drill size (mm)

H774...	2,98 - 2,99

Projection Height (mm)

H774... with F773	10,2

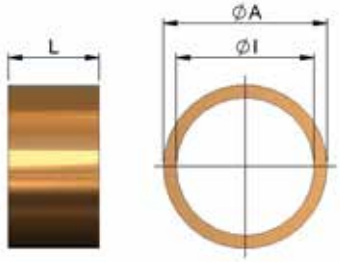


Series			Tip-Ø		Spring Force (cN)	
F773	**06**	**B**	**230**	**G**	**300**	**H**
	Tip Style	Material		Plating		Version

Material: B = BeCu, S = Steel, E = Stainless steel
Tip-Ø: 230 = 2,30 mm (e.g.)
Plating: G = Gold plated, L = Longtime Gold plated, U = Unplated
Version: H = High temperature
Receptacle: Order Code according drawing

Spacers H7732DS/xx for 138 mil probes

Order Code	Outer-Ø	Inner-Ø	Length
H773DS/01	3,20	2,70	0,10
H773DS/05	3,20	2,70	0,50
H773DS/10	3,20	2,70	1,00
H773DS/20	3,20	2,70	2,00
H773DS/30	3,20	2,70	3,00
H773DS/50	3,20	2,70	5,00



F773

Probe 138 mil

Centers (mm/mil)	3,50 / 138
Current	10,0 A
R typ	25 mOhm
Temperature	-20°C...+80°C -40°C...+200°C (H)

Tip Style	Number	Material	Plating	⌀ in mm	Version
	05	B	G	2,30	-
	06	B	G	2,30	-
	06	B	G	2,30	H
	06	B	G	3,00	-
	06	B	G	3,00	H
	06	B	G	4,00	-
	06	B	G	4,00	H
	07	S	L	2,30	-
	07	S	L	4,00	-
	09	S	L	2,30	-
	11	B	G	1,80	-
	12	B	G	2,30	-
	12	B	G	3,00	-
	12	B	G	3,00	H
	12	E	U	2,30	-
	14	S	L	2,30	-
	15	B	G	2,30	-
	15	B	G	3,00	-
	16	B	G	1,40	-
	16	B	G	1,80	-
	17	B	G	2,30	-
	17	B	G	3,00	-
	17	B	G	3,00	H
	18	B	G	1,80	-
	18	B	G	1,80	H
	21	S	L	1,80	-
	28	B	G	2,30	-
	28	B	G	2,30	H

F796

Probe 138 mil
Long Travel Version

Centers (mm/mil)	3,50 / 138
Current	10,0 A
R typ	25 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	80	300

Travel (mm)

Version	Nominal	Maximum
Standard	8,0	10,0
Pointing Accuracy		±0,13 mm

Materials and Plating

Plunger	see tip style
Barrel	Bronze, gold plated
Spring	Music wire, silver plated
Receptacle	Nickel silver, gold plated

Accessories

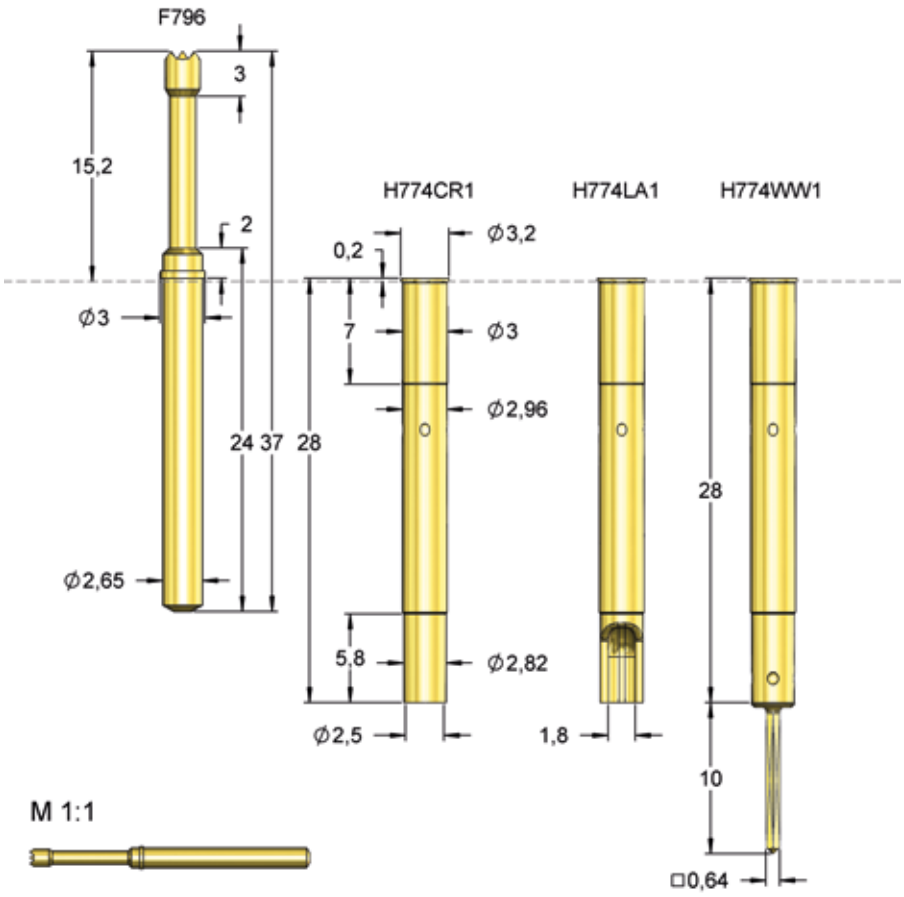
Insertion tool receptacle	FEWZ-774E0
Insertion tool probe	FDWZ-100

Drill size (mm)

H774...	2,98 - 2,99

Projection Height (mm)

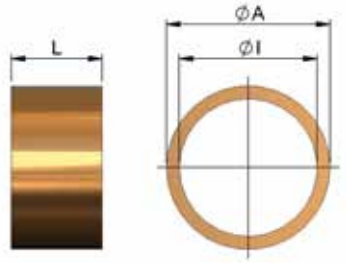
H774... with F796	15,2



The F796 is the long travel version of the F773. These probes can be combined well in dual stage fixtures.

Spacers H7732DS/xx for 138 mil probes

Order Code	Outer-Ø	Inner-Ø	Length
H773DS/01	3,20	2,70	0,10
H773DS/05	3,20	2,70	0,50
H773DS/10	3,20	2,70	1,00
H773DS/20	3,20	2,70	2,00
H773DS/30	3,20	2,70	3,00
H773DS/50	3,20	2,70	5,00



Series			Tip-Ø		Spring Force (cN)
F796	06	B	230	G	300
	Tip Style	Material		Plating	Version

Material: B = BeCu
Tip-Ø: 230 = 2,30 mm (e.g.)
Plating: G = Gold plated
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	06	B	G	2,30	-
	11	B	G	1,76	-
	12	B	G	2,30	-
	14	B	G	2,30	-

F785

Probe 138 mil
Long Travel Version

Centers (mm/mil)	3,50 / 138
Current	10,0 A
R typ	25 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	80	150
Standard	80	300
L	80	150
L	80	300

Travel (mm)

Version	Nominal	Maximum
Standard	6,4	8,0
L	6,4	8,0
Pointing Accuracy		±0,10 mm

Materials and Plating

Plunger	see tip style
Barrel	Bronze, gold plated
Spring	Music wire, silver plated
Receptacle	Nickel silver, gold plated

Accessories

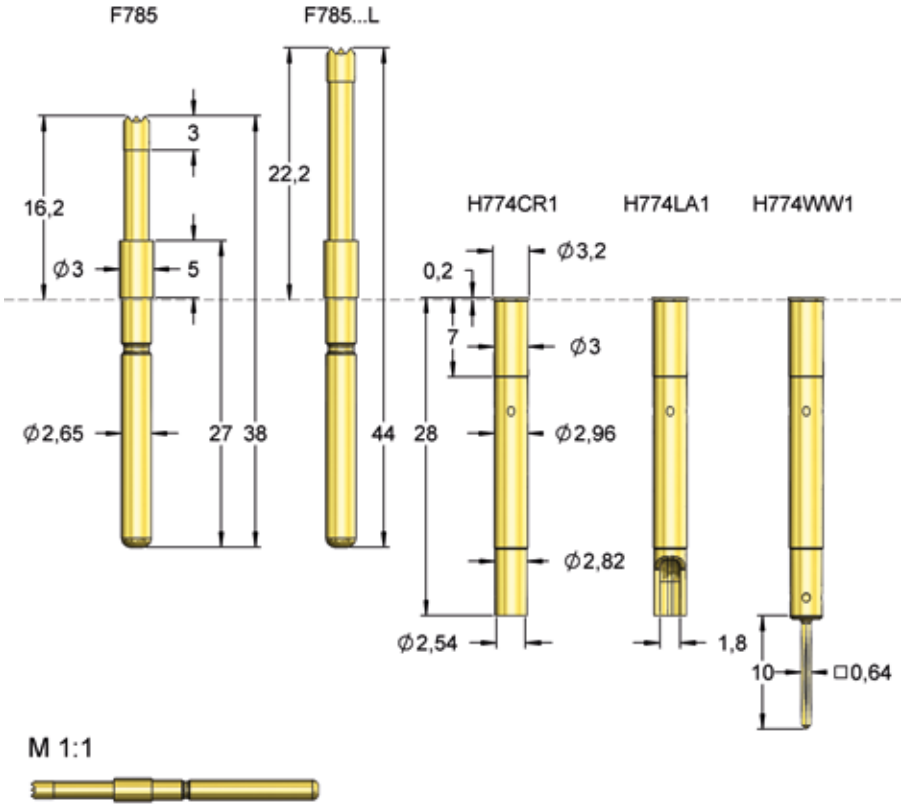
Insertion tool receptacle	FEWZ-774E0
Insertion tool probe	FDWZ-100

Drill size (mm)

H774...	2,98 - 2,99

Projection Height (mm)

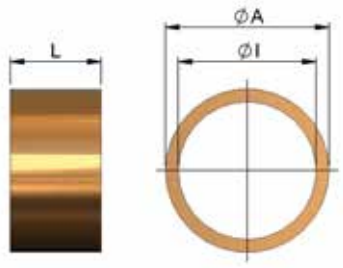
H774... with F785	16,2
H774... with F785...L	22,2



The F785 is the long travel version of the F773. These probes can be combined well in dual stage fixtures.

Spacers H7732DS/xx for 138 mil probes

Order Code	Outer-Ø	Inner-Ø	Length
H773DS/01	3,20	2,70	0,10
H773DS/05	3,20	2,70	0,50
H773DS/10	3,20	2,70	1,00
H773DS/20	3,20	2,70	2,00
H773DS/30	3,20	2,70	3,00
H773DS/50	3,20	2,70	5,00



Series			Tip-Ø		Spring Force (cN)	
F785	06	B	250	G	300	L
	Tip Style	Material		Plating		Version

Material: B = BeCu, S = Steel
Tip-Ø: 250 = 2,50 mm (e.g.)
Plating: G = Gold plated, L = Longtime Gold plated
Version: L = Long version
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	01	S	L	2,00	-
	06	B	G	1,20	L
	06	B	G	2,30	-
	06	B	G	2,50	L
	06	B	G	3,50	L
	14	S	L	2,30	-
	14	S	L	2,30	L

Interface Probes

The interface between test fixture and test system is usually realized by interface probes which are specifically standardized for each test system.

F262

For ATG Test Systems

Centers (mm/mil)	1,50 / 59
Current	2,0 A
R typ	100 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	0	40
Standard	0	140

Travel (mm)

Version	Nominal	Maximum
Standard	5,0	7,0
Pointing Accuracy		±0,08 mm

Materials and Plating

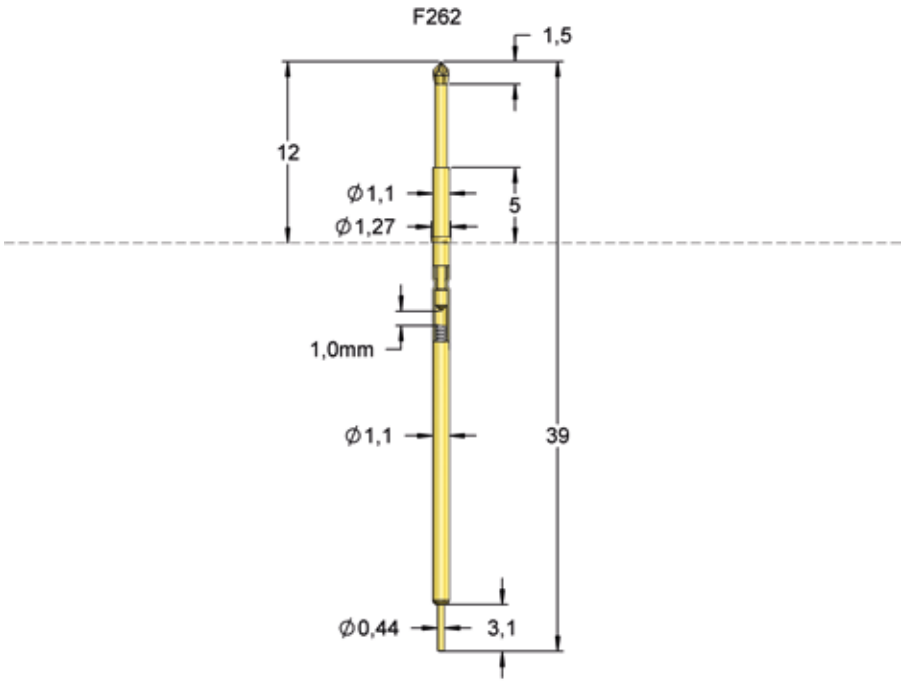
Plunger	see tip style
Barrel	Nickel silver, gold plated
Spring	Music wire, silver plated

Drill size (mm)

Press ring as stop	1,08 - 1,10
Press ring inserted	1,20 - 1,27

Projection Height (mm)

F262...	12,0



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Probe F262 is mainly used at the basic grid field of bare board testers.

Series			Tip-Ø		Spring Force (cN)
F262	07	S	100	L	140
	Tip Style	Material		Plating	Version

Material: S = Steel
Tip-Ø: 100 = 1,00 mm (e.g.)
Plating: L = Longtime Gold plated

Tip Style	Number	Material	Plating	Ø in mm	Version
	07	S	L	1,00	-

F504

For Test System Genrad 227x / 228x

Centers (mm/mil)	2,54 / 100
Current	5,0 A
R typ	35 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	60	130
L	40	100

Travel (mm)

Version	Nominal	Maximum
Standard	2,4	3,2
L	2,0	3,9
Pointing Accuracy		±0,05 mm

Materials and Plating

Plunger	see tip style
Barrel	Nickel silver, gold plated
Spring	BeCu, silver plated Music wire, silver plated (L)
Receptacle	Nickel silver, gold plated

Accessories

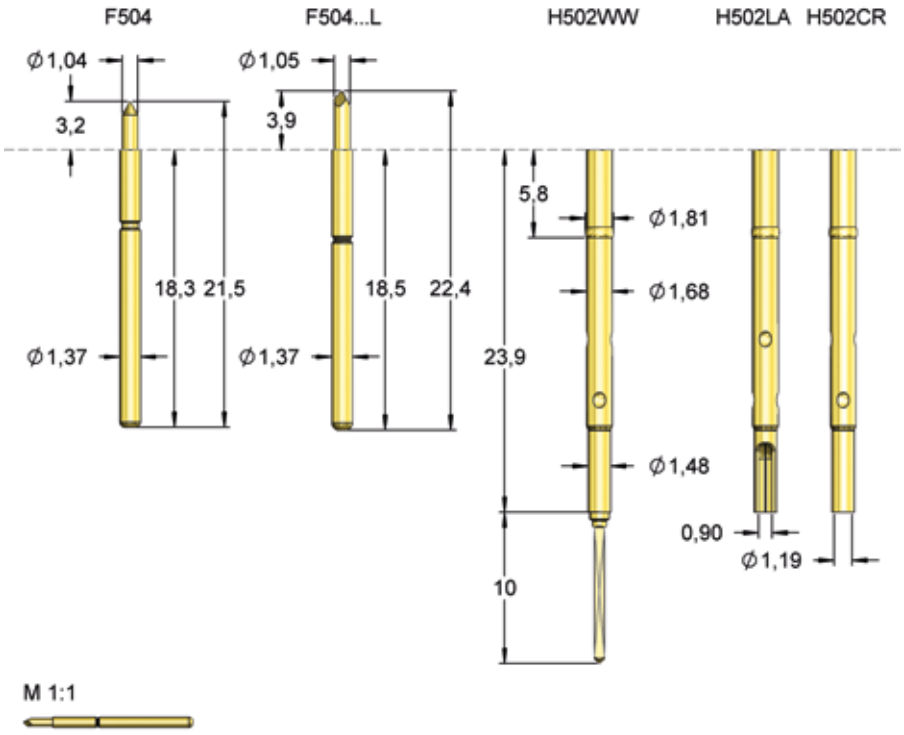
Insertion tool receptacle	FEWZ-100EV
Insertion tool receptacle	FEWZ-100E0
Insertion tool probe	FDWZ-100
Plug lock	H100VS

Drill size (mm)

Press ring as stop	1,67 - 1,69
Press ring inserted	1,70 - 1,75

Projection Height (mm)

H502... with F504	3,2 - 9,0
H502... with F502...L	3,9 - 9,7



Further receptacles H502LI, H502S1 as well as an insulating sleeve H502IS available.

Series			Tip-Ø		Spring Force (cN)	
F504	18	B	105	G	100	L
	Tip Style	Material		Plating		Version

Material: B = BeCu
Tip-Ø: 105 = 1,05 mm (e.g.)
Plating: G = Gold plated
Version: L = Long version
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	03	B	G	1,05	-
	18	B	G	1,05	L
	30	B	G	1,05	L

F502

For Testsystem Luther & Maelzer

Centers (mm/mil)	2,54 / 100
Current	5,0 A
R typ	55 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	60	130

Travel (mm)

Version	Nominal	Maximum
Standard	2,7	4,1
Pointing Accuracy		±0,05 mm

Materials and Plating

Plunger	see tip style
Barrel	Bronze, silver plated
Spring	Music wire, silver plated
Receptacle	Nickel silver, gold plated

Accessories

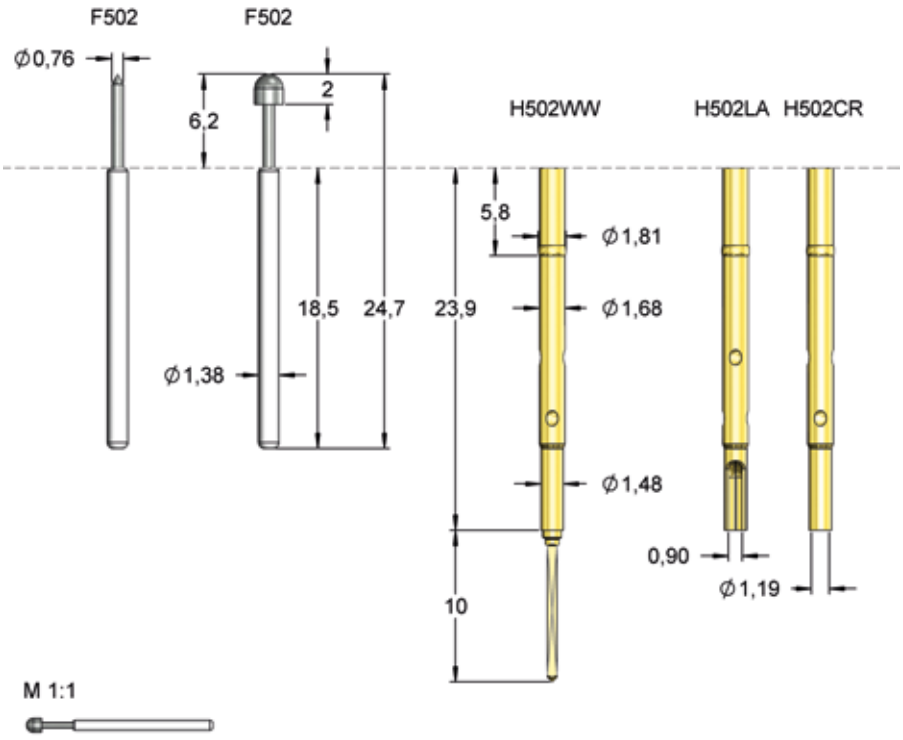
Insertion tool receptacle	FEWZ-100EV
Insertion tool receptacle	FEWZ-100E0
Insertion tool probe	FDWZ-100
Plug lock	H100VS

Drill size (mm)

Press ring as stop	1,67 - 1,69
Press ring inserted	1,70 - 1,75

Projection Height (mm)

H502... with F502	6,2 - 12,0



Further receptacles H502LI, H502S1 as well as an insulating sleeve H502IS available.

Probe F502 is used in wired fixtures (LP1800 from atg Luther & Maelzer GmbH), and as interface probes in universal test systems. Probe F50241B160N170 used in universal test systems contacts the balls of the ALS-probes with a 6-point crown.

Series			Tip-Ø		Spring Force (cN)
F502	03	S	076	N	130
	Tip Style	Material		Plating	Version

Material: S = Steel
Tip-Ø: 076 = 0,76 mm (e.g.)
Plating: N = Nickel plated
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	03	S	N	0,76	-
	12	S	N	1,90	-

F538

For Test System Digitaltest MTS 300, L&M LP1800

Centers (mm/mil)	2,54 / 100
Current	5,0 A
R typ	55 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	60	220

Travel (mm)

Version	Nominal	Maximum
Standard	2,7	4,0
Pointing Accuracy		±0,05 mm

Materials and Plating

Plunger	see tip style
Barrel	Bronze, silver plated
Spring	Music wire, silver plated
Receptacle	Nickel silver, gold plated

Accessories

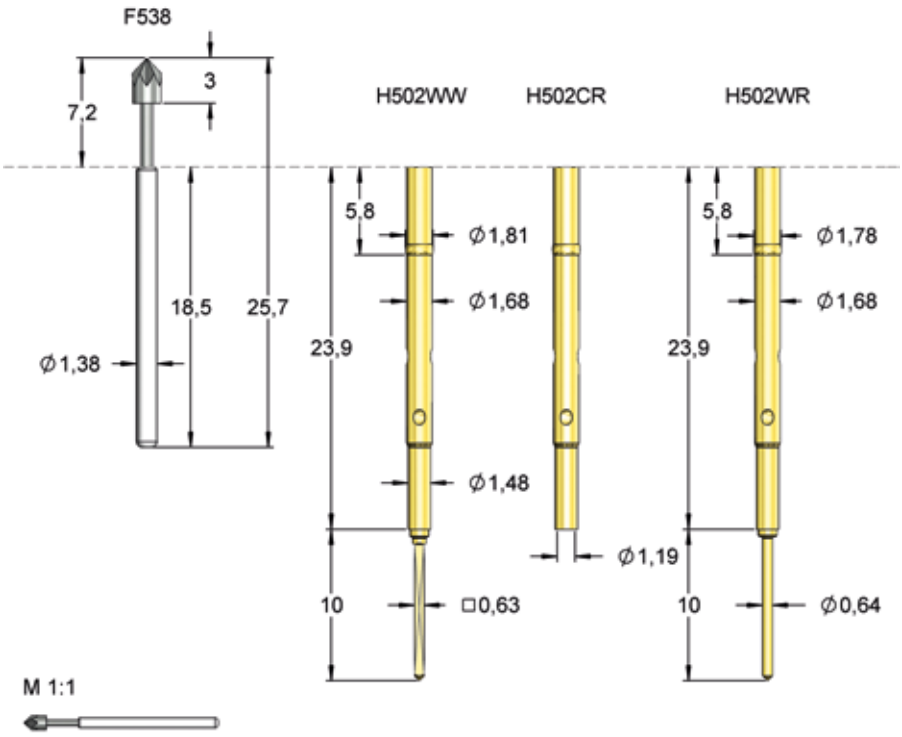
Insertion tool receptacle	FEWZ-100EV
Insertion tool receptacle	FEWZ-100E0
Insertion tool probe	FDWZ-100
Plug lock	H100VS

Drill size (mm)

Press ring as stop	1,67 - 1,69
Press ring inserted	1,70 - 1,75

Projection Height (mm)

H502... with F538	7,2 - 13,0



Further receptacles H502LI, H502S1 as well as an insulating sleeve H502IS available.

Probe F538 is used in wired fixtures (LP1800 from atg Luther & Maelzer GmbH) and as interface probes in universal test systems for testing vias and other applications in the field of bare board test.

Series			Tip-Ø		Spring Force (cN)
F538	07	S	130	N	220
	Tip Style	Material		Plating	Version

Material: S = Steel
Tip-Ø: 130 = 1,30 mm (e.g.)
Plating: N = Nickel plated
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	07	S	N	1,30	-
	07	S	N	1,90	-

F100

Probe 100 mil
for Defined Test Systems

Centers (mm/mil)	2,54 / 100
Current	5,0 A
R typ	<30 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	80	150
Standard	80	200
Mint-Pin	40	100
Mint-Pin	80	150
Mint-Pin	60	225

Travel (mm)

Version	Nominal	Maximum
Standard	4,3	6,4
Mint-Pin	4,3	6,4
Pointing Accuracy		±0,08 mm

Materials and Plating

Plunger	see tip style
Barrel	Nickel silver, gold plated
Spring	Music wire, silver plated
Receptacle	Nickel silver, gold plated

Accessories

Insertion tool receptacle	FEWZ-100EV
Insertion tool receptacle	FEWZ-100E0
Insertion tool probe	FDWZ-100
Plug lock	H100VS

Drill size (mm)

Receptacle Press ring as stop	1,67 - 1,69
Receptacle Press ring inserted	1,70 - 1,75

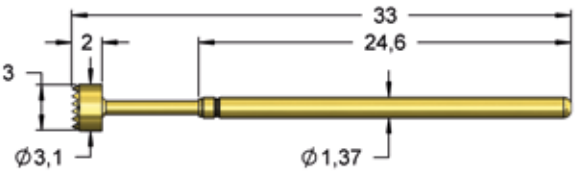
Projection Height (mm)

(F100) H100.../10.0	8,4 - 18,4
(F100) H100.../7.6	8,4 - 16,0
(F100) H100.../2.0	8,4 - 10,4
(F100) H100WW10/2.0S1	11,4 - 13,4
(F100) H100WW10/2.0S2	16,4 - 18,4
(F100...L) H100.../10.0	10,4 - 20,4
(F100...L) H100.../7.6	10,4 - 18,0
(F100...L) H100.../2.0	10,4 - 12,4
(F100...L) H100WW10/2.0S1	13,4 - 15,4
(F100...L) H100WW10/2.0S2	18,4 - 20,4

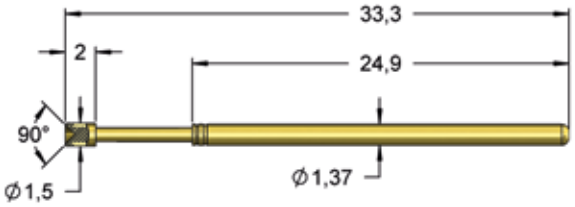
Series			Tip-Ø		Spring Force (cN)
F100	05	B	150	G	200
	Tip Style	Material		Plating	Version

Material: B = BeCu
Tip-Ø: 150 = 1,50 mm (e.g.)
Plating: G = Gold plated
Receptacle: Order Code according drawing

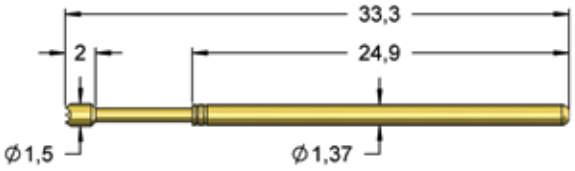
F10006B310G...
(Mint-Pin)
For Agilent Test System
(HP3070/i3070/i5000)



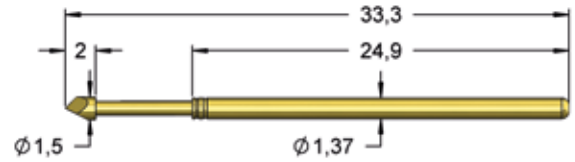
F10005B150G200
For Spea Test System
(Easytest/Unitest)



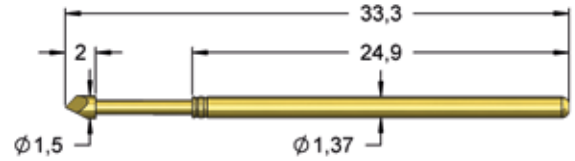
F10006B150G200
For Spea Test System
(Easytest/Unitest)



F10015B150G150
For Test System
Factron 300/700
(Schlumberger)



F10015B150G200
For Teradyne
Test System
(Spectrum 885xx)



Probe series F100 is the most common probe for 100 mil centers.
Further information about the receptacles see extra section for receptacle H100.

Tip Style	Number	Material	Plating	Ø in mm	Version
	05	B	G	1,50	-
	06	B	G	1,50	-
	06	B	G	3,10	Mint-Pin
	15	B	G	1,50	-

H100

Receptacle 100 mil

Materials and Plating

Receptacle	Nickel silver, gold plated

Accessories

Insertion tool, variable for Receptacle	FEWZ-100EV
Insertion tool, fix for Receptacle	FEWZ-100E0
Insertion tool, variable for Receptacle	FEWZ-100Exx

Drill size (mm)

Receptacle Press ring as stop	1,67 - 1,69
Receptacle Press ring inserted	1,70 - 1,75

Projection Height (mm)

(F100) H100.../10.0	8,4 - 18,4
(F100) H100.../7.6	8,4 - 16,0
(F100) H100.../2.0	8,4 - 10,4
(F100) H100WW10/2.0S1	11,4 - 13,4
(F100) H100WW10/2.0S2	16,4 - 18,4
(F100...L) H100.../10.0	10,4 - 20,4
(F100...L) H100.../7.6	10,4 - 18,0
(F100...L) H100.../2.0	10,4 - 12,4
(F100...L) H100WW10/2.0S1	13,4 - 15,4
(F100...L) H100WW10/2.0S2	18,4 - 20,4

For probes F100, F588 and F585 different receptacles are available with different connection types (e.g. LA, CR, WW), different press ring positions (e.g. 2,0; 7,6; 10,0 mm) and different wire-wrap posts (10,0; 19,0 mm length).

Plug locks H100VS can be used to close empty receptacles in order to prevent false assemblies and to avoid contamination.

Die insulating sleeve **H502IS** can be also used for receptacle H100.

Series — Length of Wire Wrap Pin

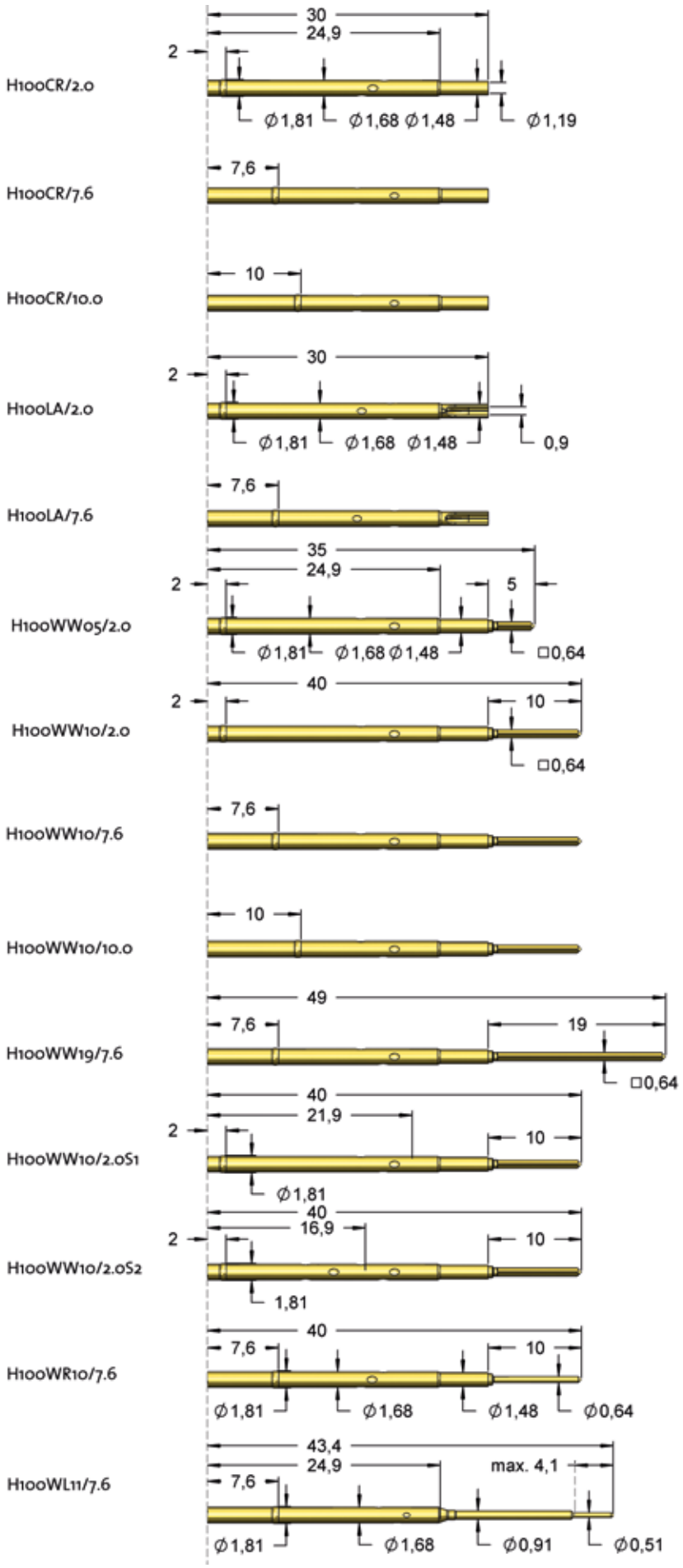
H100 WW 10 / 7.6

Connection Type — Press Ring Position

Connection Type: CR= Crimp connection
LA = Solder connection
WW = Wire Wrap connection
LI = Stranded wire
WL = Spring loaded connection

Length of Wire Wrap Pin: e.g. 10 = 10,0 mm

Press Ring Position: e.g. 7.6 = 7,6 mm



Z585

For Testing von ICs on PCBs (Test Jet)

Centers (mm/mil)	9,50 / 374
Current	3,0 A
R typ	30 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	50	100
S1	50	100

Travel (mm)

Version	Nominal	Maximum
Standard	5,0	9,6
S1	5,0	9,6

Materials and Plating

Plunger	BeCu, gold plated
Barrel	Nickel silver, gold plated
Spring	Music wire, silver plated
Receptacle	Nickel silver, gold plated

Accessories

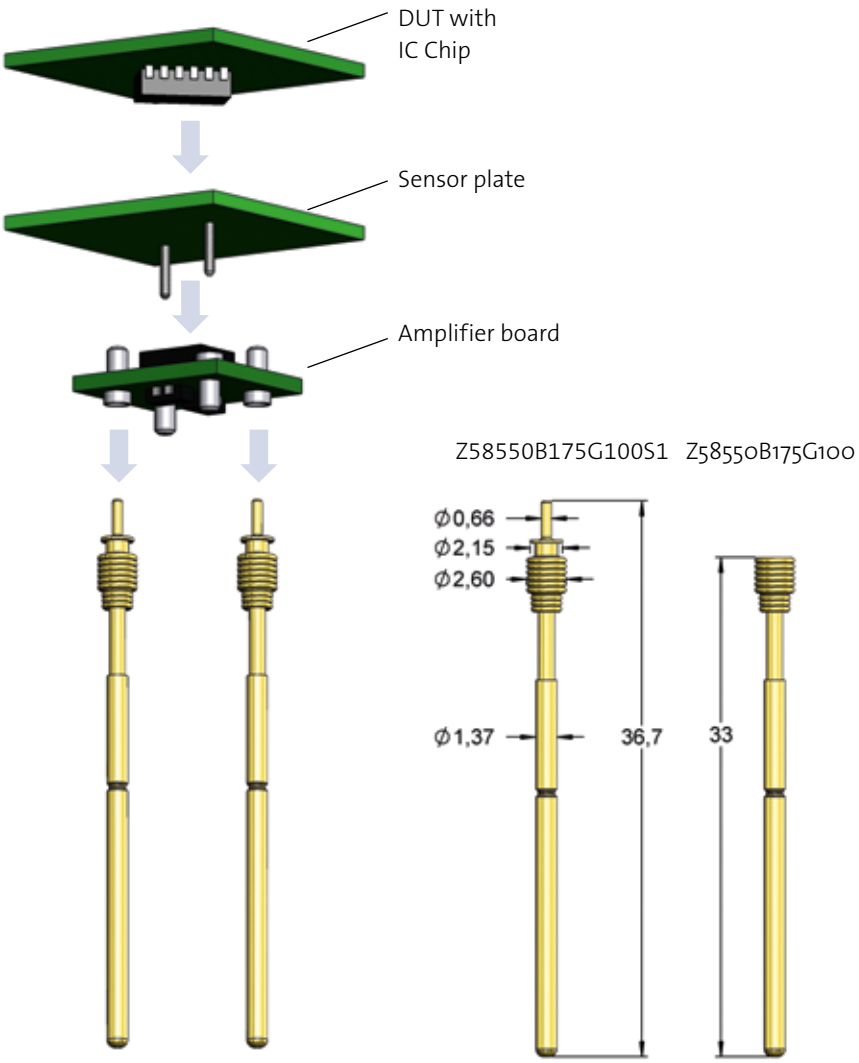
Insertion tool receptacle	FEWZ-774E0
Insertion tool probe	FDWZ-100

Drill size (mm)

H774...	2,98 - 2,99

Projection Height (mm)

H774... with F796	15,2



The Z585/Z588 is a special probe for non-contact gauging of IC-components. The contact probes are used in pairs as flexible holder for the sensor plate. This measuring principle is known as „TestJet“ in the Agilent test system and as “Frame Scan“ in the Teradyne test system. Mounting receptacles see H100.

The flexible contact head with spring element ensures an optimal adjustment of the sensor plate on the IC or component.

Order Code	Description
Z58550B175G100S1	Test jet spring contact probe wit spiral spring head (Agilent)
Z58550B175G100	Test jet spring contact probe with spiral spring head (Digitaltest)

Capacitive Sensors and Accessories

Test system	Description	Order code	Unit of trading
System Agilent („Testjet“ und „VTEP“)			
Testjet	Signal Conditioner Board* (Mux Board)	2100175	1
	Signal Conditioner Board* (Mux+REF B-Revision)	2100191	1
	Testjet Amplifier incl. 2 probes 2100830 bulk	2100176	1
	Testjet Amplifier incl. 2 probes Z58550B175G130S1 bulk	2101350	1
	Testjet Amplifier without probes	2102310	1
	Sensor Plates 9,5x12 mm (0,375x0,475 inch), usable area 5,5x10,3 mm (0,217x0,405 inch) SO14	2100823	10
	Sensor Plates 10,8x14,6 mm (0,475x0,575 inch) SO20	2100824	10
	Sensor Plates 30x30 mm (1,2x1,2 inch)	2100825	1
	Sensor Plates 64x64 mm (2,5x2,5 inch)	2100826	1
	Sensor Plates 12,5x158 mm (0,5x6,1 inch)	2100827	1
	Sensor Plates* 30x30 mm (1,2x1,2 inch)	2100179	1
	Sensor Plates* 64x64 mm (2,5x2,5 inch)	2100180	1
	Sensor Plates* 12,5x158 mm (0,5x6,1 inch)	2100190	1
	Small Testjet Amplifier* incl. 2 probes 2100822 bulk	2100192	1
	Small Sensor Plates* B-C Size 4x6,4 mm also for VTEP	2100193	10
	Small Sensor Plates* D Size 5x7,6 mm also for VTEP	2100194	10
	Set: Small Testjet Amplifier* incl. 2 probes 2100822 soldered and Sensor Plate B-C-Size soldered	40400146	1
	Set: Small Testjet Amplifier* incl. 2 probes 2100822 soldered and Sensor Plate D-Size soldered	40400147	1
	Set: Small Testjet Amplifier* incl. 2 probes 2100822 soldered without Sensor Plate	40400104	1
VTEP	VTEP Signal Conditioner Board* (Mux-Board)	2101126	1
	VTEP Signal Conditioner Board* (Mux+REF)	2101127	1
	VTEP Testjet Amplifier* incl. 2 probes 2100830 bulk	2101128	1
	VTEP Testjet Amplifier* incl. 2 probes Z58550B175G130S1 bulk	2102041	1
	VTEP Testjet Amplifier* without probes	2102275	1
	VTEP Sensor Plates* 30x30 mm (1,2x1,2 inch)	2101131	1
	VTEP Sensor Plates* 64x64 mm (2,5x2,5 inch)	2101132	1
	VTEP Sensor Plates* 12,5x158 mm (0,5x6,1 inch)	2101130	1
	VTEP Small Testjet Amplifier* incl. 2 probes 2100822 bulk	2101133	1
	VTEP Small Sensor Plates, see above		
	* orig. Agilent		
System Teradyne („Framescan“ und „Capscan“)			
	Teradyne Mux-Board	4-805960	1
Framescan	Teradyne Framescan Amplifier (higher amplification factor than System Agilent Testjet Amplifier) - alternatively also System Agilent Testjet Amplifier (not for VTEP) - Sensor Plates identical to System Agilent	2101970	1
Capscan	identical to System Agilent Small Testjet parts (not for VTEP, see above)		
System Digitaltest („Opens Check“)			
	Digitaltest Opens Check Board (Amplifier)	2100199	
	Passive Sensor Connection Board incl. 2 probes Z58550B175G130	4-806448	
	Sensor Plates identical System Agilent, see above		
	Opens Check probe with FM spiral head Z58550B175G130	Z58550B175G130	10
	Plug-in part for FM spiral spring probe SO585B02G	SO585B02G	10

F150

For Test System Teradyne

Centers (mm/mil)	2,54 / 100
Current	5,0 A
R typ	20 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	50	100
S1	50	100
S2	50	100

Travel (mm)

Version	Nominal	Maximum
Standard	4,5	8,0
S1	4,5	8,0
S2	4,5	8,0
Pointing Accuracy		±0,08 mm

Materials and Plating

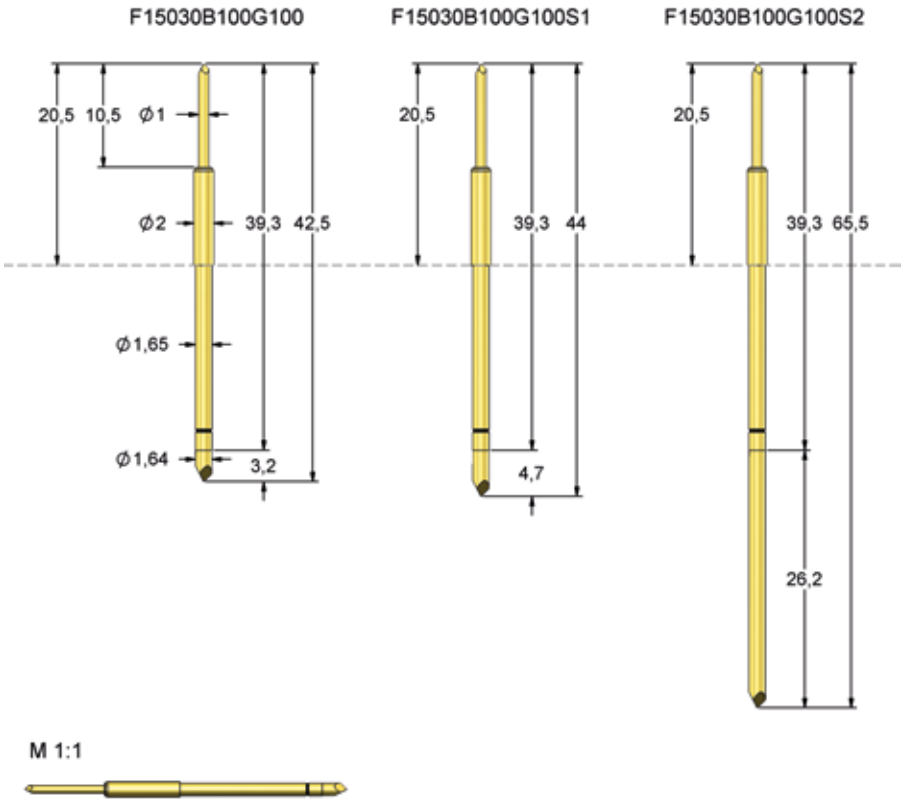
Plunger	see tip style
Barrel	Bronze, gold plated
Spring	Music wire, silver plated

Drill size (mm)

F150	1,62 - 1,65

Projection Height (mm)

F150	20,5



Series			Tip-Ø		Spring Force (cN)	
F150	30	B	100	G	100	S1
	Tip Style	Material		Plating		Version

Material: B = BeCu
Tip-Ø: 100 = 1,00 mm (e.g.)
Plating: G = Gold plated
Version: S1 /S2 = different Length of Contact end

Tip Style	Number	Material	Plating	Ø in mm	Version
	30	B	G	1,00	-
	30	B	G	1,00	S1
	30	B	G	1,00	S2

FP732

Threaded Probe 100 mil, Long Travel Flying Probe for Skorpion Tester

Centers (mm/mil)	3,00 / 118
Current	5,0 A
R typ	20 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	50	150

Travel (mm)

Version	Nominal	Maximum
Standard	6,4	8,0
Thread (M)		1,6
Wrench Size		2,0
Pointing Accuracy		±0,10 mm

Materials and Plating

Plunger	see tip style
Barrel	Brass, gold plated
Spring	Music wire, gold plated
Receptacle	Brass, gold plated

Accessories

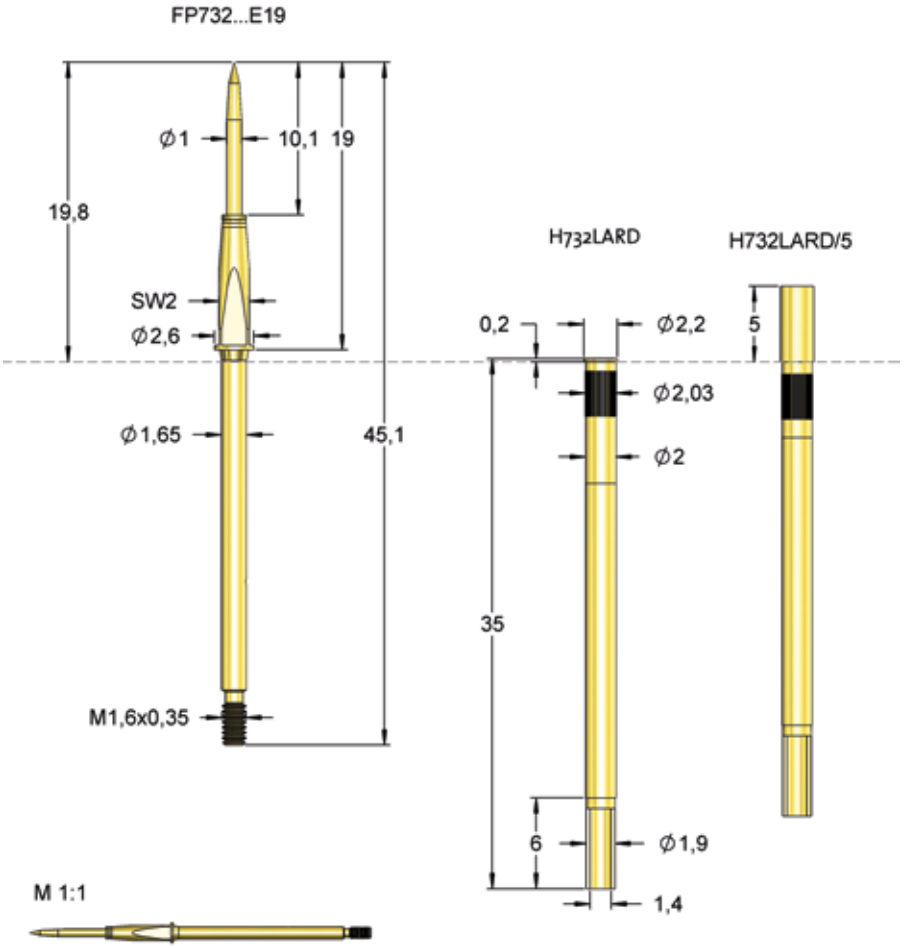
Insertion tool receptacle	FEWZ-772E0
Screw-in tool probe	FWZVF3S2 (T2)

Drill size (mm)

H732LARD	2,00 - 2,02

Projection Height (mm)

H732LARD	19,8
H732LARD/5	24,6



Series			Tip-Ø		Spring Force (cN)	
FP732	18	S	100	L	150	E19
	Tip Style	Material		Plating		Version

Material: S = Steel
Tip-Ø: 100 = 1,00 mm (e.g.)
Plating: L = Longtime Gold plated
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	18	S	L	1,00	E19

Contact Probes for Special Applications

In addition to contact probes for testing PCBs a wide range of further contact probes for other special applications are available.

These include for example:

→ Contact probes for presence and position test
→ High current probes
→ Kelvin probes for 4-wire measurements
→ Radio frequency probes

Switch Probes

As Opener and Closer

Presence Test with Switch Probes

Switch probes are contact elements, which open or close an electric circuit after a defined switch travel. This condition persists beyond the switching point.

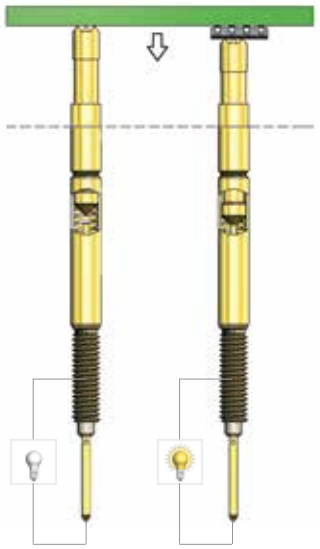
Typical applications:

- Presence test of components or connectors
- Voltage-free detection with synthetic heads
- Short-circuit-proof modules by electrically isolated switch elements (voltage-free system)
- Installation of intrinsically save circuits (only with NC-versions)

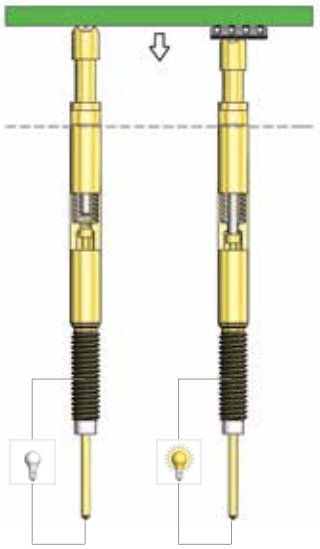
Versions of switch probes:

- Openers (NC - normally closed), closers (NO - normally open)
- Different switch travels
- Probe for a gentle lateral contacting by ball element
- Short and long versions to realize different projection heights
- Long travel versions for depth determination

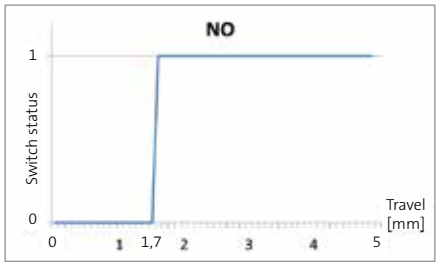
Switch Probe (NO)



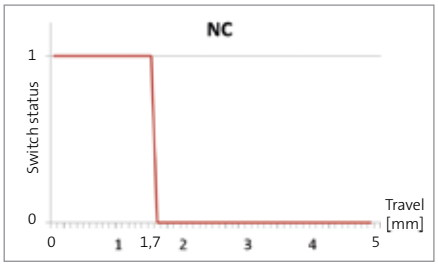
Switch Probe (NC)

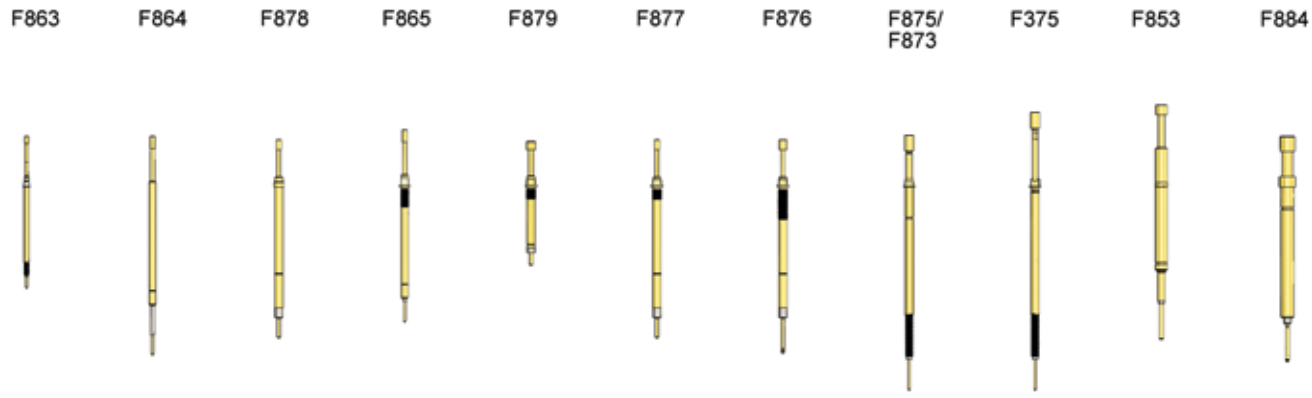


Switch Characteristic



Switch Characteristic

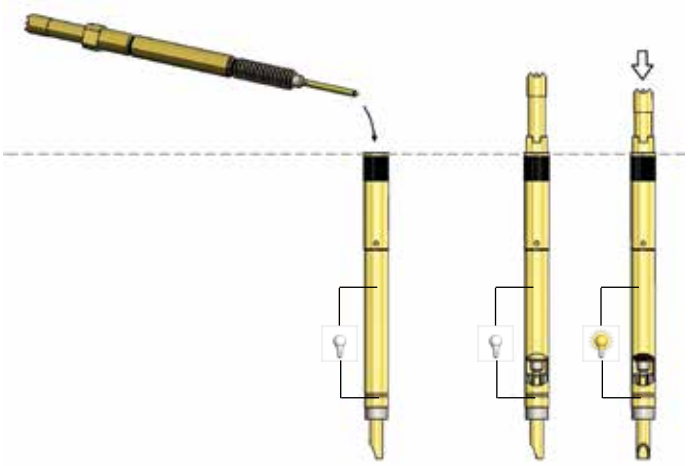




Combi Receptacles

Solderless Replacement of Switch Probes and Kelvin Probes

Combi receptacles allow a quick and solderless replacement of switch probes or Kelvin probes (plug-in and threaded versions) without disassembly of the module or fixture.
Secure connections of both signal circuits (inner and outer conductor) are realized by contact elements within the receptacle.



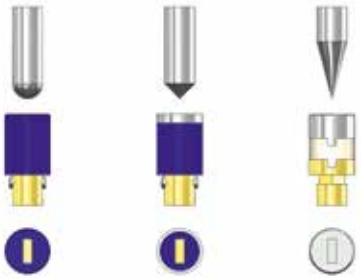
Advantages of the combi-receptacle

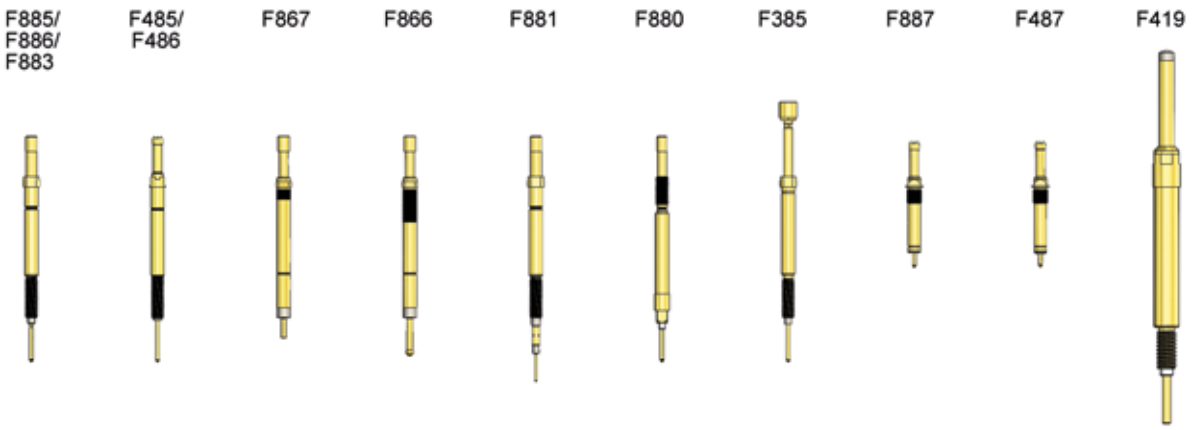
- → Solderless replacement of switch probes and Kelvin probes
- → Prevention of incorrect wirings in case of maintenance
- → Saving of time and expenses in case of maintenance
- → Height adaptability of switch probes by the probe thread and pressure marks in the receptacle
- → High frequency capabilities in combination with coaxial Kelvin probes

Insulated Tips for Switch Probes

There are three different versions of insulated switch probe tips:

- → Version K is made of synthetic material, it is the standard tip style for insulated contacting
- → Version H is reinforced additionally by a brass ring, which allows higher stress on the synthetic head.
- → Version T has a metal head, which is insulated against the plunger and therefore is suitable for applications with higher mechanical exposure. The special design avoids any electrical contact between tip and barrel, even at maximum travel. The tip of this version is silver-colored for better identification of the assembled probe.





Switch Probe with Ball Head for Lateral Contacting

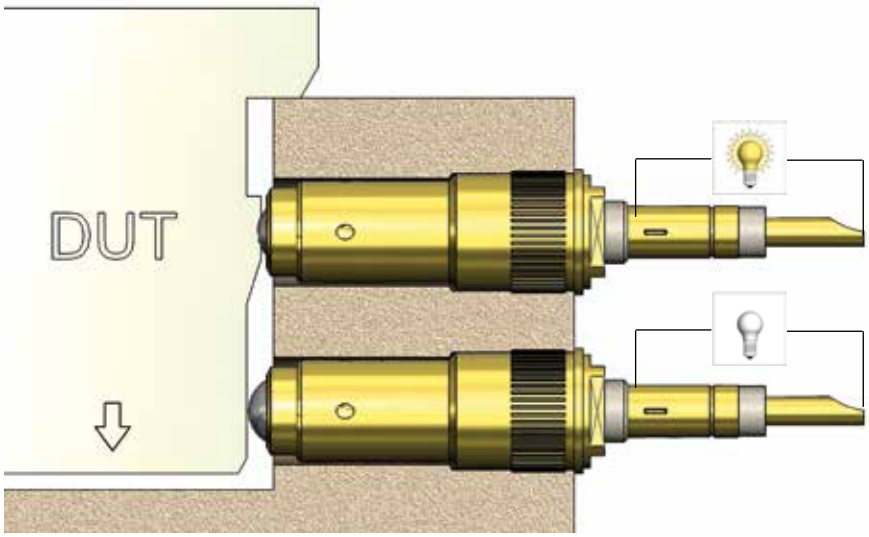
This series allows contacting applications with laterally moved DUT.

Function:

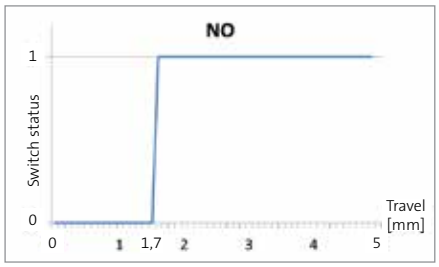
A rolling ball as contact element is insensitive against lateral forces, which leads to a remarkably higher durability compared to contact probes with fix plunger head of similar shape. This probe does not leave any scratching or damaging of the DUT.

Typical applications:

Lateral presence test of components or connectors, drill holes, screws etc.



Switch Characteristic



F88890M2104G150

With thread, without switch

F88890S1101U200S05

With thread, with switch

F88890S1103U200S05

With thread, with switch

F88890S1102U100S07

With thread, with switch

F88890S0003U100S08

Without thread, with switch

Switch Probes with Off-on-off Function

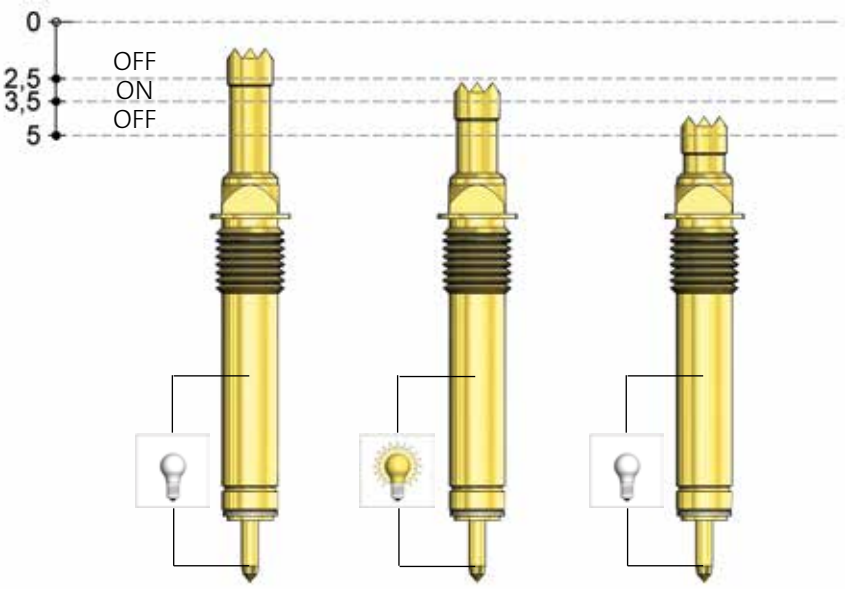
The off-on-off function allows an exact position test with only one switch probe.

Function:

Whereas standard switch probes only have one switch point, the new switch probes with off-on-off function have two switch points. After a defined travel the switch circuit is closed and after a further travel (e.g. 1,0 mm) the switch circuit is opened again. The measured position can be determined very precisely, the accuracy of the switch points is ± 0,2 mm.

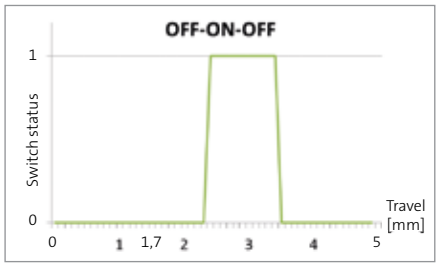
Typical applications:

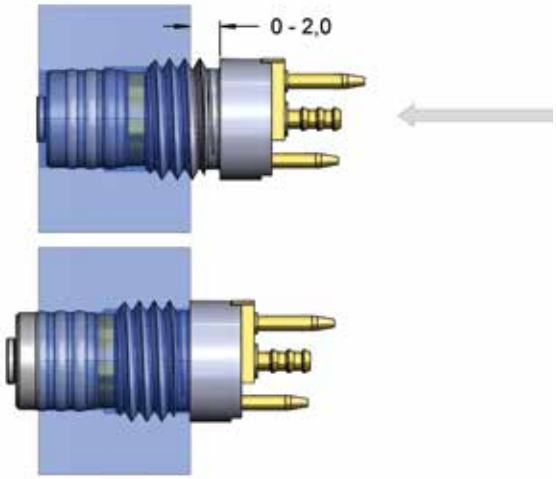
Length detection of connector pins or determination of correct hole depths.



Additionally to the pure mechanical versions also a pneumatically controlled version is available for selective or lateral contacting requirements..

Switch Characteristic





F487

With thread

F485

With thread

F486

With thread

F899P

With thread and pneumatic connection

F899

Without thread, with pneumatic connection

Position Sensor System

Contact Probe with Integrated Potentiometer

The position sensor system has been developed to enable an exact measurement of the travel of the plunger additionally to contacting the test item.

The system has a modular design and consists of a contact probe, a receptacle and a sensor element with integrated potentiometer. The potentiometer is galvanically isolated from the probe.

After applying an operating voltage, the sensor supplies a measurement voltage that is linear to the travel of the plunger (potentiometric operation). Alternatively, with restrictions regarding accuracy and life cycle, also the resulting resistance can be used as measurement value (resistive operation). FEINMETALL recommends the potentiometric operation for all position sensor systems. The measurement results can be analyzed by the available tester environment, commonly.

Variants

The position sensor system is available for different centers of 75 mil, 100 mil and 157 mil. For 100 mil centers a twist proof version is available (PS756).
The system for 157 mil is suitable for airtight modules or fixtures (i.e. leakage rate < 0,5 cm³ / min at 0,7 bar).

Measuring ranges

PS175: 0...6,4 mm (75 mil)
PS756: 0...4,4 mm (100 mil)
PS732: 0...5,0 mm (100 mil)
PS733: 0...5,0 mm (157 mil)

Modular Design of the Position Sensor System

Contact probe - Receptacle - Sensor element

Specification sensor element
Measuring principle: potentiometric
Accuracy: ≤ 2%
Reproducibility: typ. ≤ ±0,05 mm
Therm. resist. coeff. 5x10-5/K
Nominal spring force: 60 cN
Preload: 40 cN
Nominal: 4,0 mm

Connections
Red: Operating voltage U_0
Black: Measuring signal U_m or R_m
White: Mass
Blue: Test point of contact probe tip (maximum current 1 A)

Calibration

Due to test principle with a certain initial and final resistance and due to electrical and mechanical tolerances the exact plunger position in millimeter requires a calibration of the position sensor system after assembly.

Measurement of relative values

By calculating the difference between two measurement values of one probe deviations related to a required position can be determined in positive or negative travel direction.

Reference measurement

By calculating the difference between two measurement values of different probes deviations related to a reference position can be determined.

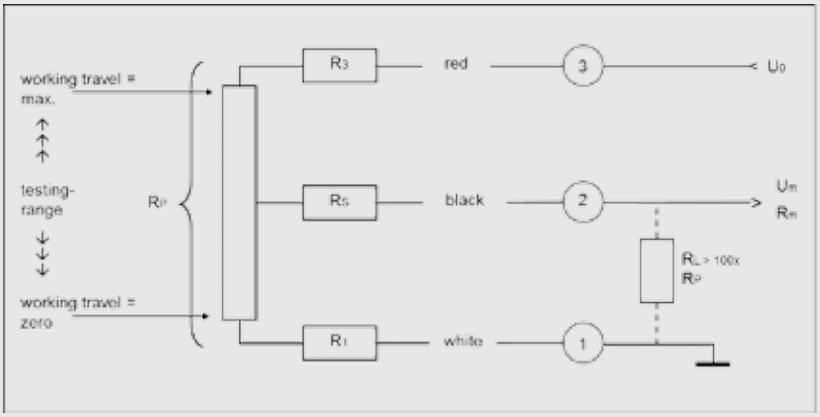
The reference can either be a certain reference point of the test item or a special “golden device”.

Zero balance

Depending on the hard- and software of the test system the measurement signal can be zeroed at user-defined positions. This method allows positive or negative deviations without calculating any differences.

FEINMETALL recommends periodic calibration and zeroing of the system.

U_0	Operating voltage (maximum 10 VDC)
U_m	Measuring voltage (potentiometric op.) ($U_1 < U_m < U_p - U_3$)
R_m	Measuring resistance (resistive op.) ($R_1 < R_m < R_p - R_3$)
R_1	Initial resistance
U_1	Initial voltage ($U_1 = I * R_1$)
R_3	Final resistance
U_3	Final voltage ($U_3 = I * R_3$)
R_p	Potentiometric resistance (4,5 kOhm ± 20%) ($R_p = R_1 + R + R_3$)
R_s	Slider resistance
R_L	Load resistor (optional to protect against over-current at the slider)

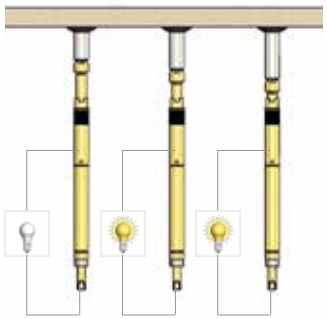


Different Solutions for Presence and Position Tests

The pictures below show the different categories of FEINMETALL solutions with increasing accuracy. Simple solutions like using standard switch probes or step probes only allow a statement of OK or NOT OK. With the off-on-off switch probe with two switch points the result is more precise. With the position sensor system the exact position of a DUT can be measured and documented. The following pages include detailed information about corresponding probes and applications.

Standard Switch Probes

Situation: too short **OK** too long

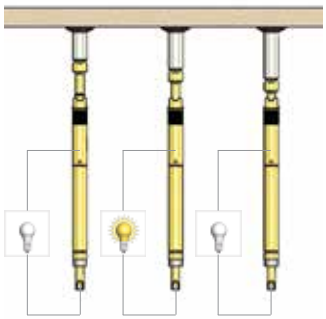


Result: NOK OK OK

Fault not detected

Off-on-off Switch Probes

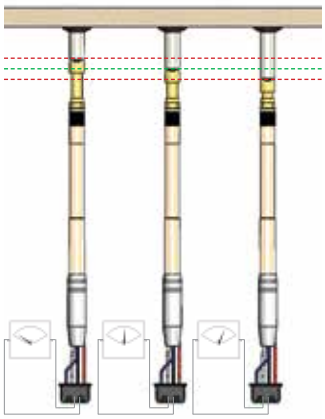
too short **OK** too long



NOK OK NOK

Position Sensor System

too short **OK** too long



3 exact measuring results

Standard Switch Probes
Switch probes open or close a switch circuit after a defined switch travel.

NO – „normally open“ = closer
NC – „normally closed“ = opener

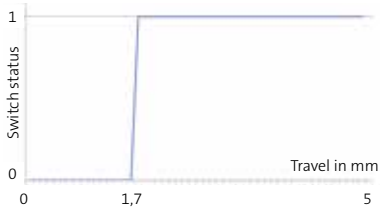
Off-on-off Switch Probes
Switch probes with off-on-off function have two switch points. After a defined travel the switch circuit is closed and after a further travel (e.g. 1,0 mm) the switch circuit is opened again.

Off-on-off - 2 switch points

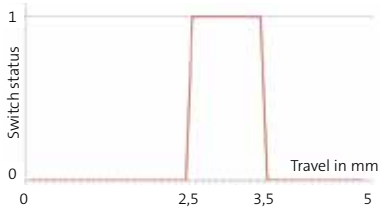
Position Sensor System
The position sensor system has a sensor element with integrated potentiometer, that allows an exact measurement of the travel.

Travel measurement

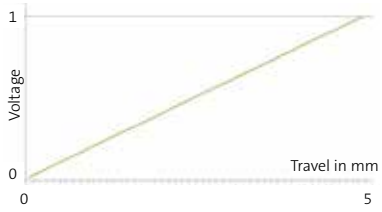
Switch Characteristic



Switch Characteristic



Measurement

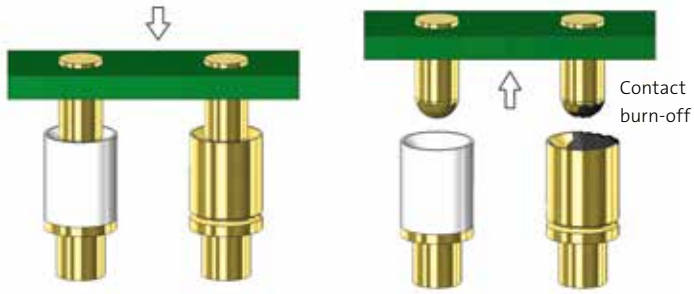


HIGH CURRENT PROBES

Basics of High Current Probes

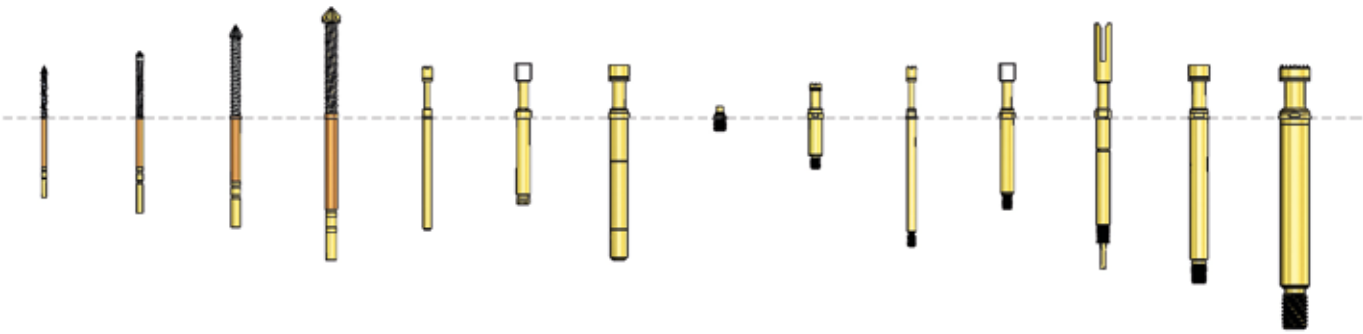
For high current applications the design of a spring contact probe has to consider a minimal electrical internal probe resistance as well as contact resistance. Otherwise, especially the spring of the probe would be overheated, what would lead to a remarkable reduction of the probe life time. A low electrical resistance of the probe significantly depends of the design and the material of the contact probe. Independently from the design of the probe a higher contact force cal also increase the maximum allowed current. The maximum continuous current is defined as I_{RMS} (root-mean-square value). It is mainly limited by the maximum tolerable warming of the probe. The maximum current values in the specifications all refer to this I_{RMS}.
The design of springs of FEINMETALL high current probes ensures that also high temperatures up to 200°C do not lead to damages or a reduction in lifetime.

Special head made of silver alloy
In high current applications ideally no voltage should apply and accordingly no current should flow during closing or releasing the contact. Otherwise, an electric spark may occur, which may damage the surface of the contact area. To avoid or at least minimise such a contact-burn-off, FEINMETALL offers tips made of a special silver alloy to minimise the contact-burn-off, reducing the transition resistance and lead to a longer life time of the probes.



High current probes with continuous plunger
have the lowest resistance and therefore allow a high current loading. If the electrical connection is assembled at the end of the continuous plunger, the cable moves synchronously with the plunger. Those contact probes always have to be connected with flexible cables.

F310 F320 F330 F340 F772C F773C F775C F360C F723C F732C F733C F762C F735C F348C

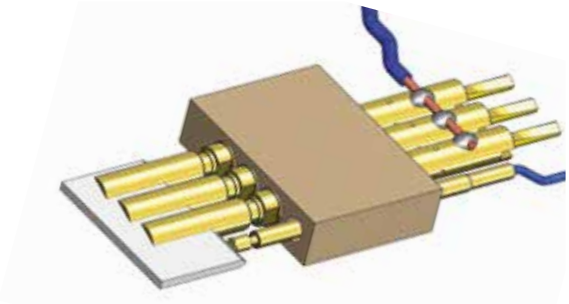


HIGH CURRENT PROBES

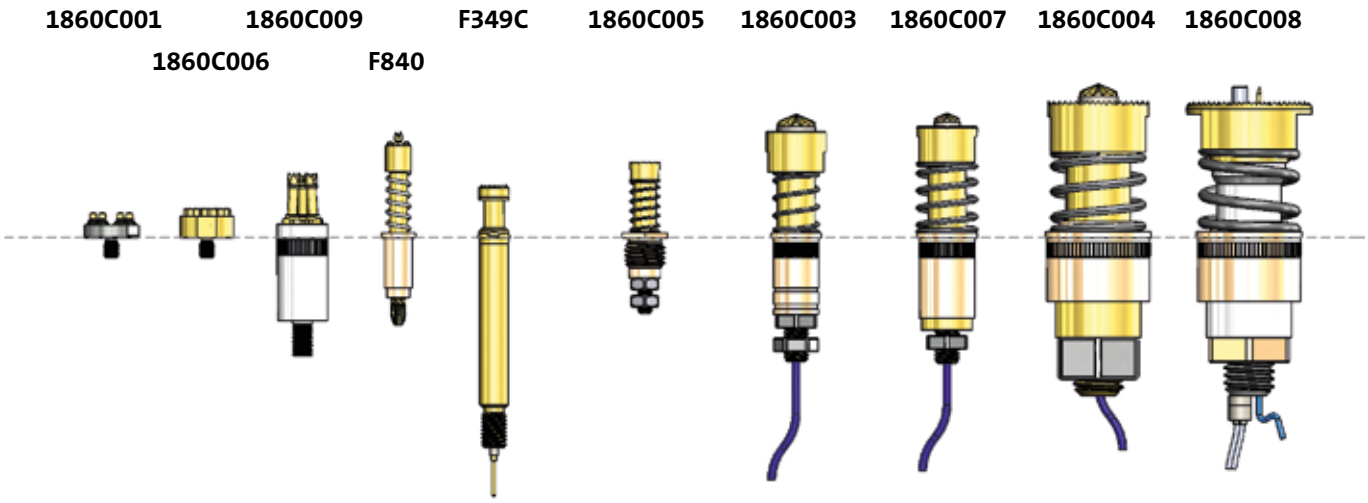
High current probes with split plungers
are designed that way, that under force effect the plunger elements optimally establish a low-resistance connection to the barrel of the contact probe. As a consequence, the current flows mainly through plunger and barrel without stressing the spring strongly.

High current blocks
Due to the integrated spring loaded plungers, this block offers a low resistance contact even if the contact surface is uneven or inclined. The block is designed to be mounted directly into conductive material to make use of the whole block surface.

High current probe for contacting flat blade connectors
Due to the twist proof design the plunger is always brought to the test item well aligned. Once the plunger is compressed by contacting the blade connector, it is twisted up to a maximum of 20°. This results in a good electrical contact without damaging or scratching the tested item.



High current probe with coaxial design
For charging and discharging of accumulator cells and simultaneously measuring the voltage special coaxial high current probes have been developed.



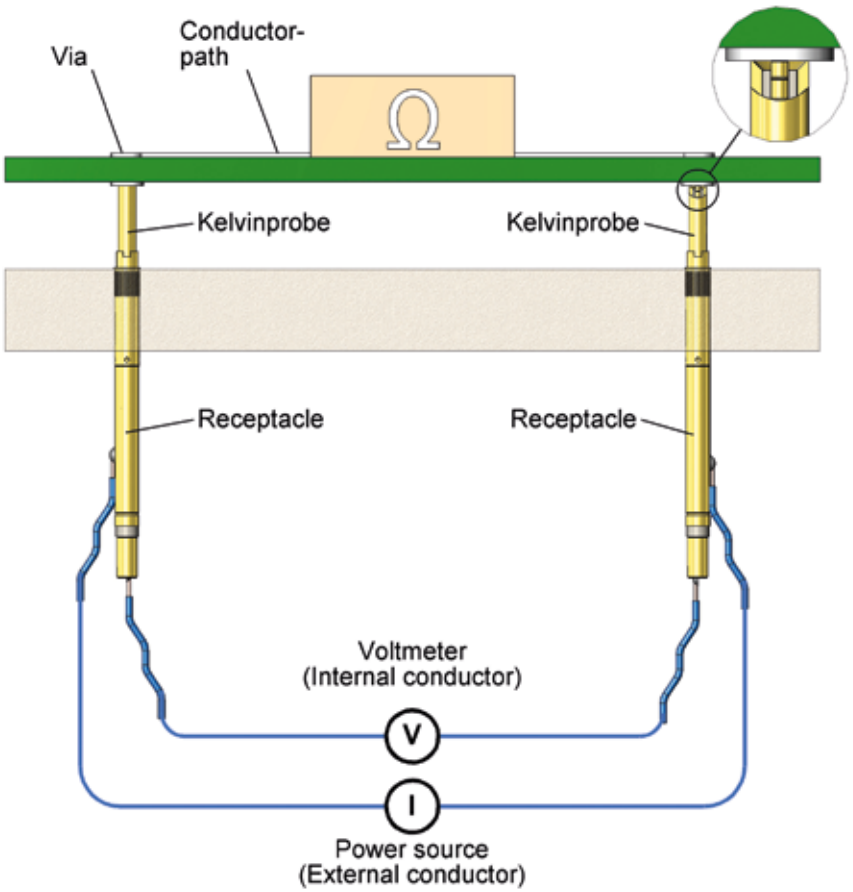
Coaxial Probes

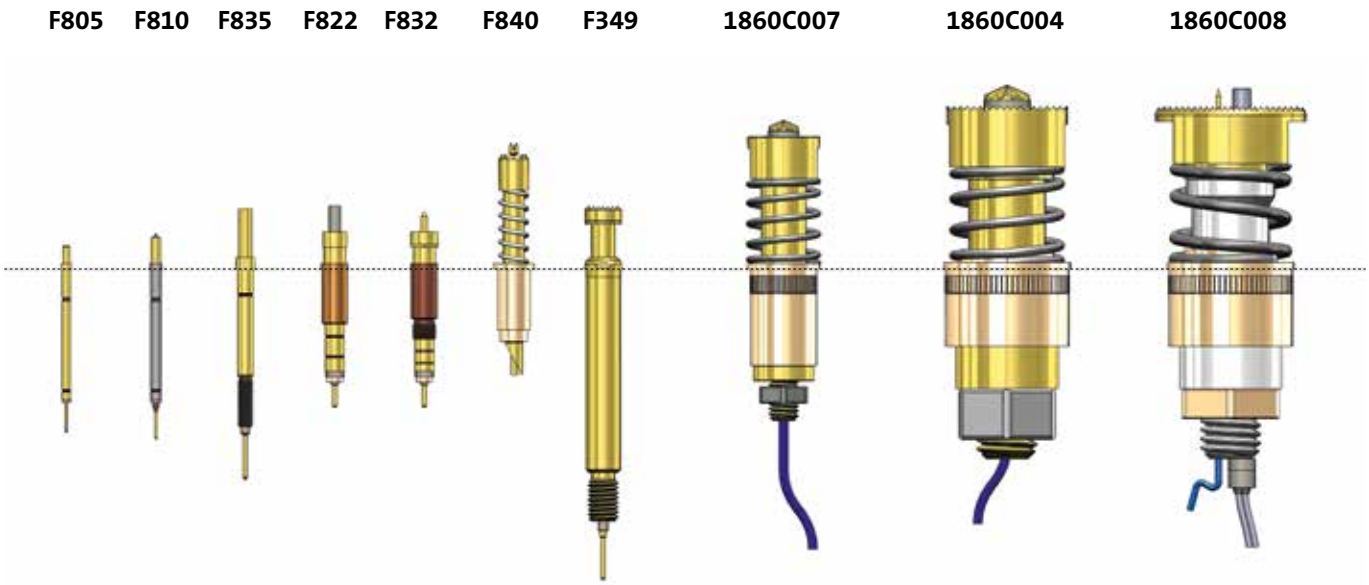
for Kelvin Measurement (4-Wire Measurement)

A Kelvin probe is a coaxial contact probe with two electrically insulated measuring circuits. The typical 4-wire measurement is based on a constant current, flowing through the test resistance and the measurement of the resulting drop in voltage, which is directly proportional to the resistance value. According "I=constant" and because of the very high internal resistance of the voltmeter, the cable and contact resistances are not influencing the measuring result.

This leads to high accuracy of this measuring method. The contacting for current source and voltmeter is realized by two Kelvin probes, ideally located very close to the device under test.

The constant current usually is carried by the outer conductor (force signal), while the voltage drop is detected by the inner conductor (sense signal). The inner and outer conductors of FEINMETALL coaxial probes are independently spring loaded in order to balance mechanical tolerances and heights.



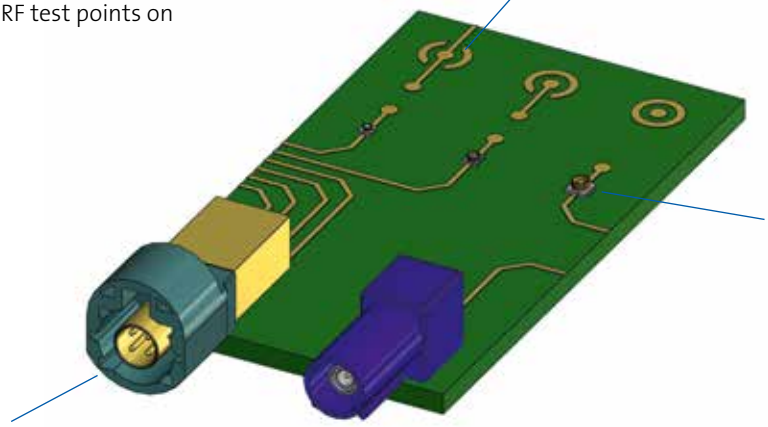


Coaxial Probes

for Radio Frequency Tests and Transmission of Radio Frequency Signals

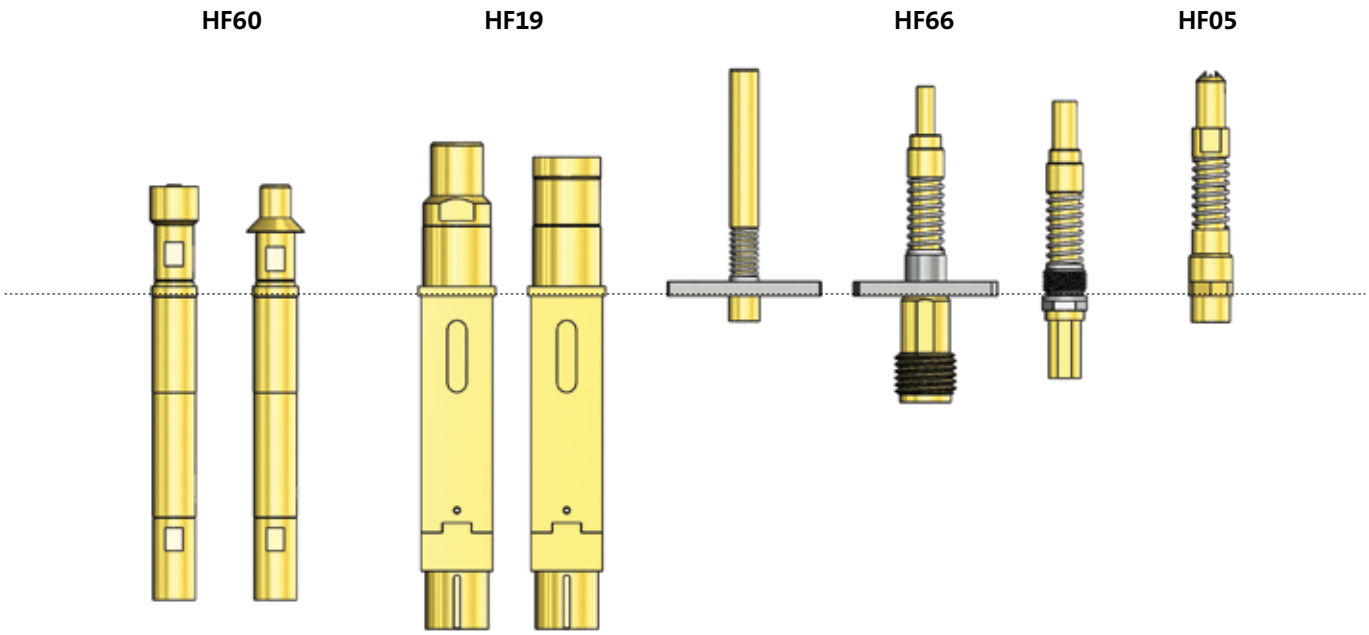
FEINMETALL offers sophisticated contact solutions for various industries and applications. Coaxial probes cover a wide range of radio frequency applications like contacting standard RF connectors, switch connectors or RF test points on the PCB.

PCB Test Points
For RF contacts directly on the PCB special RF probes are available. The probe design of these probes (e.g. HF05, HF60) is adapted to the typical requirements of the test points.



SMD mini coax and SMD switch connectors
are used on PCBs as RF interfaces. To contact these FEINMETALL provides different types of RF probes (e.g. HF66).

Connectors
In various telecommunications, consumer electronics and automotive applications different standard connectors like SMA, SMB, SMC, HSD are used. FEINMETALL offers different probe series for contacting these connectors (e.g. HF60, HF19, HF66).



F419 (NO)

NEW

Switch Probe 256 mil Long Travel, Threaded

Centers (mm/mil)	6,50 / 256
Current	10,0 A
Current (Switch)	1,0 A
R typ	20 mOhm
Temperature	-20°C...+80°C

Spring Force (cN ±20%)

Version	Preload	Nominal
Standard	200	400

Travel (mm)

Version	Nominal	Maximum
Standard	11,0	16,0
Switch travel (mm)		2,0
Thread (M)		4,0x0,5
Wrench Size		5,0
Pointing Accuracy		±0,06 mm

Materials and Plating

Plunger	see tip style
Barrel	Brass, gold plated
Spring	Music wire, silver plated
Receptacle	Brass, gold plated

Accessories

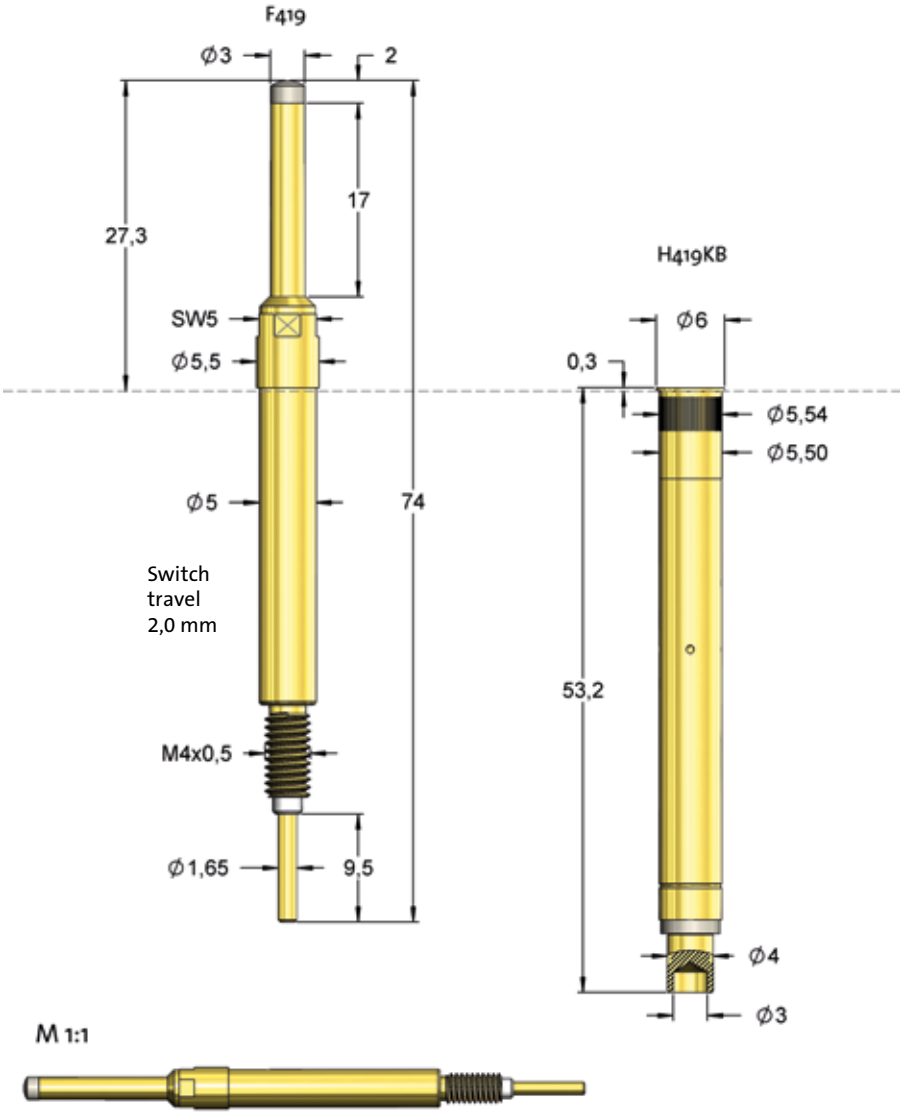
Insertion tool receptacle	FEWZ-340E0
Screw-in tool probe	FWZ888 (T)

Drill size (mm)

Receptacle with knurl	5,50 - 5,54

Projection Height (mm)

H419KB	27,3



This probe is often used in test fixtures for detecting if a DUT is inserted. The switch function of the probe is activated when the lid of the fixture closes and pushes down the DUT (switch travel of 2,0 mm). The high maximum travel of 16 mm still allows to cover the whole fixture travel of further 10 to 14 mm.

Series			Tip-Ø		Spring Force (cN)
F419	11	K	300	U	400
	Tip Style	Material		Plating	Version

Material: K = Synthetic
Tip-Ø: 300 = 3,00 mm (e.g.)
Plating: U = Unplated
Receptacle: Order Code according drawing

Tip Style	Number	Material	Plating	Ø in mm	Version
	11	K	U	3,00	-

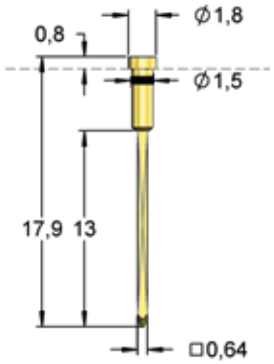
Accessories for Test Fixtures

For building up test fixtures contact probes for contacting the PCBs as well as further accessories are required, for example pre-assembled interface blocks for signal transmission between test fixture and test system or test connectors for low wear contacting of standard interfaces like USB, HDMI or RJ.

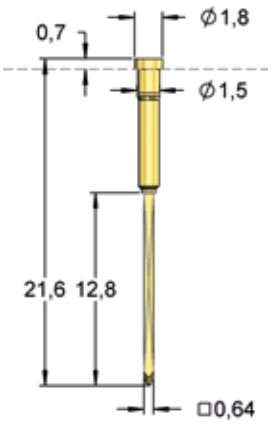
Interface Pins

Brass, gold plated (rhodanized)

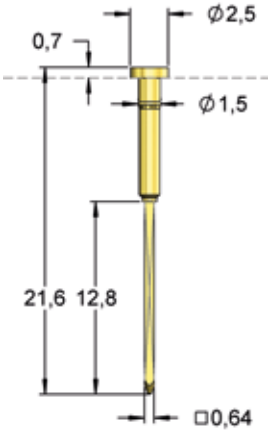
I-G1
10,0 Ampere



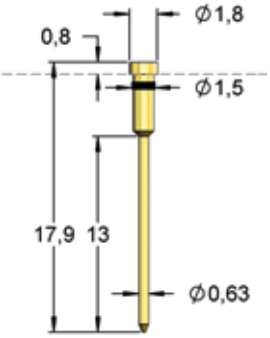
I-G1S1
10,0 Ampere



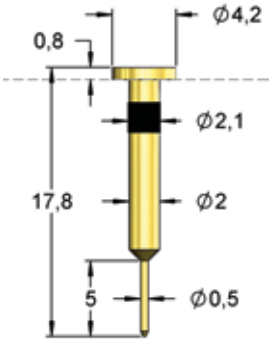
I-G1S2
10,0 Ampere



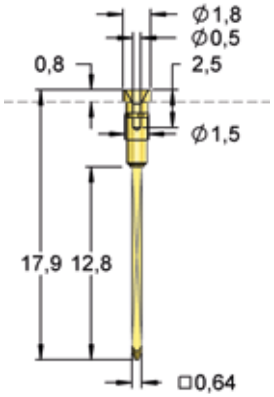
I-G1S3
10,0 Ampere



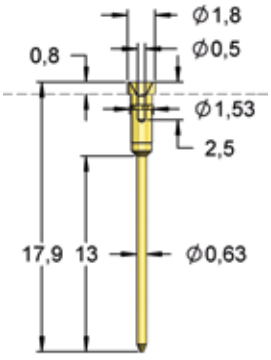
I-P18WR/0.8
10,0 Ampere



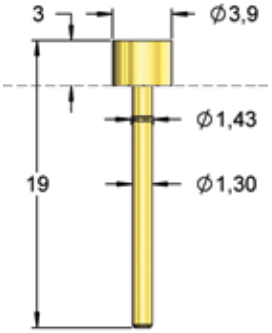
I-Z1
10,0 Ampere



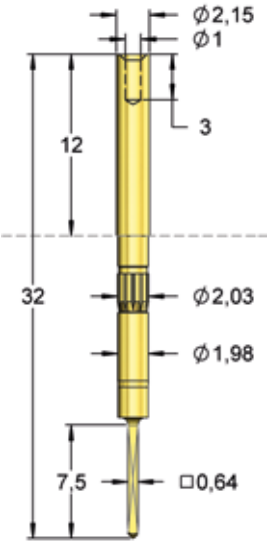
I-Z1WR/0.8
10,0 Ampere



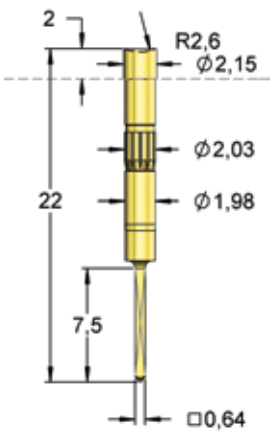
I-P1S4
10,0 Ampere



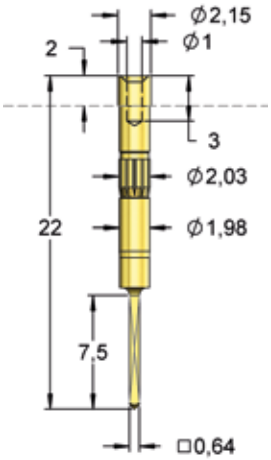
I-D32WW/12
10,0 Ampere



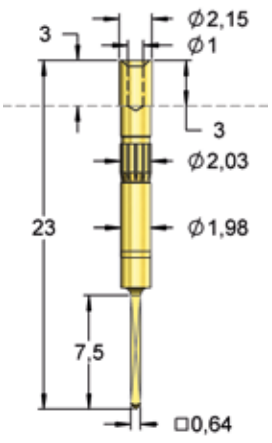
I-C22WW/2
10,0 Ampere



I-D22WW/2
10,0 Ampere



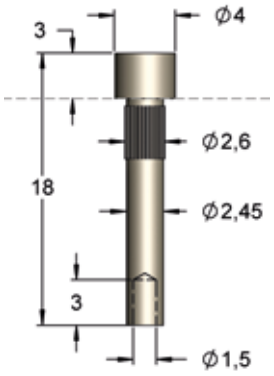
I-D23WW/3
10,0 Ampere



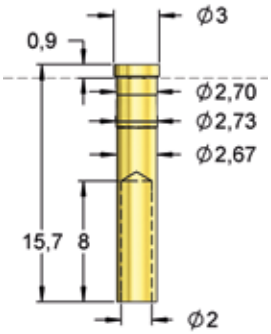
Interface Pins

Brass, gold plated (rhodanized)

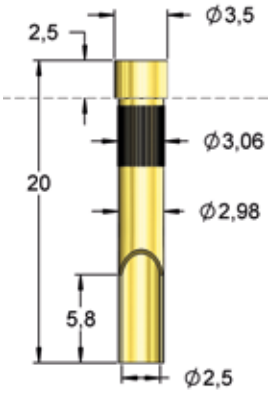
I-P1
30,0 Ampere



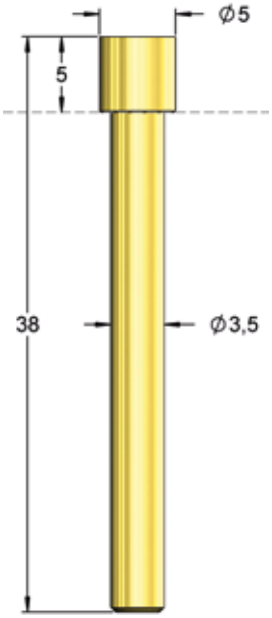
I-P16LA/0.9
30,0 Ampere



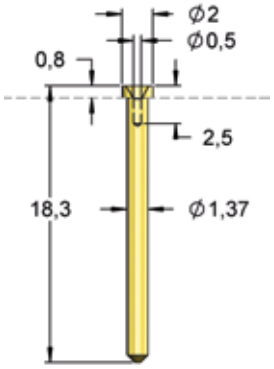
I-P20LA/2.5
30,0 Ampere



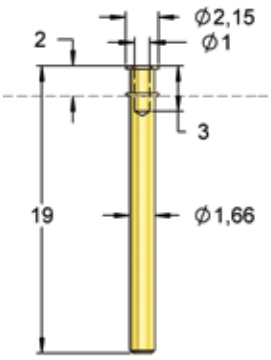
I-P1S2
40,0 Ampere



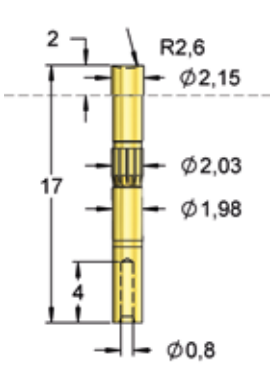
I-Z1S2
15,0 Ampere



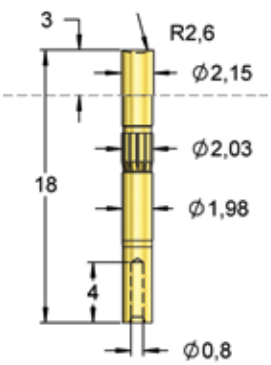
I-D19S1/2
15,0 Ampere



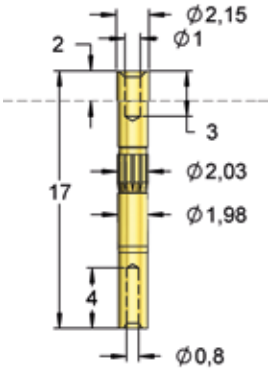
I-C17LA/2
20,0 Ampere



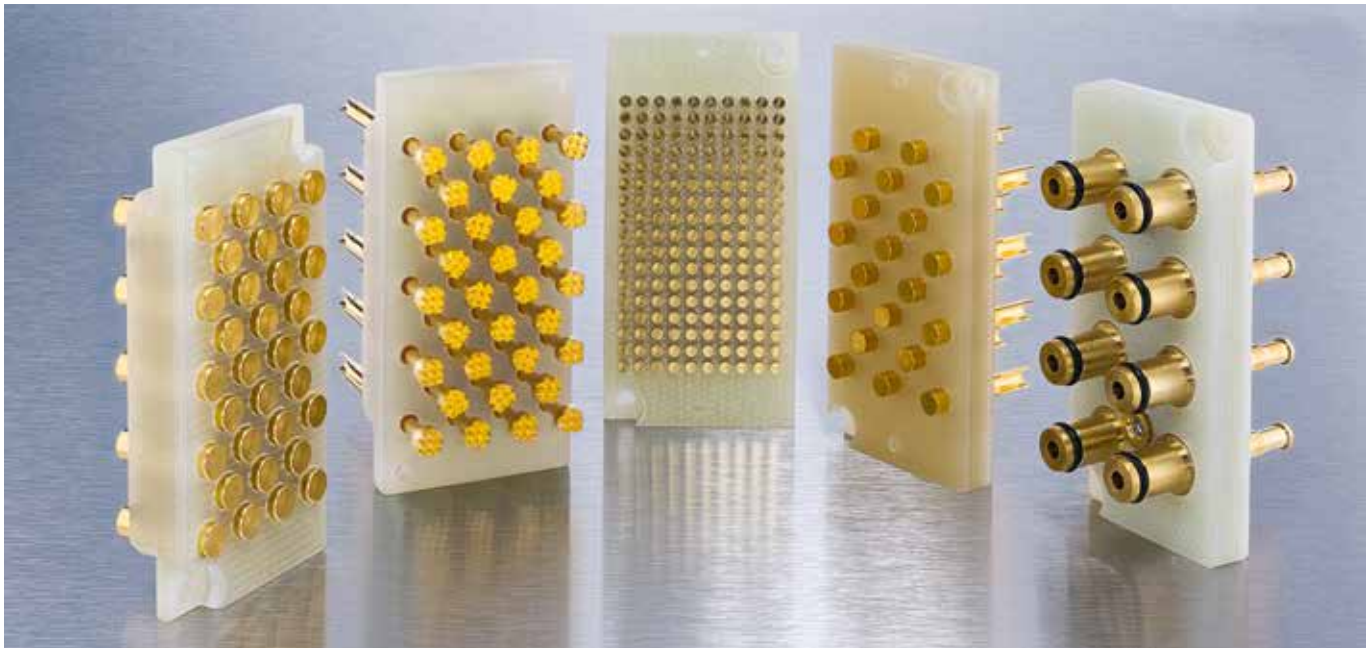
I-C18LA/3
20,0 Ampere



I-D17LA/2
20,0 Ampere



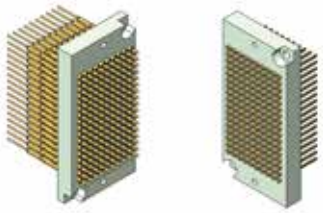
Interface Blocks



FEINMETALL interface blocks (Pylon blocks) are used as internal interface.
The integrated spring contact probes guarantee a good signal transmission with low transfer resistances. This is only a selection of available signal blocks, further variants on request.

* The sum of the currents lead to a heating of the blocks due to power loss. The maximum allowed rise of this temperature is limited to 80 Kelvin.

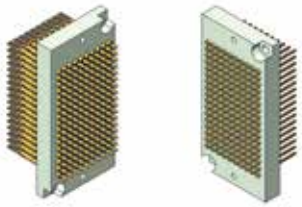
Signal Block 170 pole (max. 5A*)



Receiver side (Wire-Wrap connection)	
Order code:	43900017
Receptacle:	H502WW
Contact probe:	F50403B104G130

Fixture side	
Order code:	43900015
Receptacle:	-
Contact pin:	I-G1

Signal Block 170 pole (max. 5A*)



Receiver side (Solder connection)	
Order code:	43900018
Receptacle:	H502LA
Contact probe:	F50403B104G130

Fixture side	
Order code:	43900015
Receptacle:	-
Contact pin:	I-G1

Signal Block 170 pole (max. 5A*)

Receiver side (Wire-Wrap connection)	
Order code:	43900032
Receptacle:	H502WW
Contact probe:	F50430B104G130L

Fixture side	
Order code:	43900002
Receptacle:	-
Contact pin:	I-Z1

Signal Block 170 pole (max. 5A*)

Receiver side (Wire-Wrap connection)	
Order code:	43900032
Receptacle:	H502WW
Contact probe:	F50430B104G130L

Fixture side	
Order code:	43900032-100
Receptacle:	H502WW
Contact pin:	I-Z1S2

Interface Blocks

Signal Block 85 pole (max. 5A*)


Receiver side (Solder connection)	
Order code:	43900021
Receptacle:	H502LA
Contact probe:	F50403B104G130

Fixture side	
Order code:	43900022
Receptacle:	-
Contact pin:	I-C17LA/2

Signal Block 85 pole (max. 5A*)


Receiver side (Solder connection)	
Order code:	43900021
Receptacle:	H502LA
Contact probe:	F50403B104G130

Fixture side	
Order code:	43900022-200
Receptacle:	H502LA
Contact pin:	I-Z1S2

Signal Block 85 pole (max. 5A*)


Receiver side (Wire-Wrap connection)	
Order code:	43900067
Receptacle:	H502WW
Contact probe:	F50403B104G130

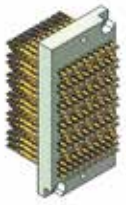
Fixture side	
Order code:	43900066
Receptacle:	-
Contact pin:	I-C22WW/2

Signal Block 85 pole (max. 5A*)


Receiver side (Wire-Wrap connection)	
Order code:	43900065
Receptacle:	H502WW
Contact probe:	F50430B104G100L

Fixture side	
Order code:	43900064
Receptacle:	-
Contact pin:	I-D22WW/2

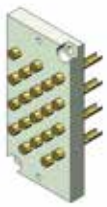
Signal Block 145 pole (max. 5A*)




Receiver side (Solder connection)	
Order code:	43900023
Receptacle:	H502LA
Contact probe:	F50430B105G130L

Fixture side	
Order code:	43900024
Receptacle:	H502LA
Contact pin:	I-Z1S2

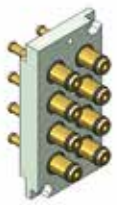
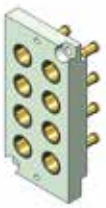
High Current Block 20 pole (max. 24 A*)

Receiver side (Solder connection)	
Order code:	43900028
Receptacle:	H735LA
Contact probe:	F73506B400G300C

Fixture side	
Order code:	43900027
Receptacle:	-
Contact pin:	I-P20LA/2.5

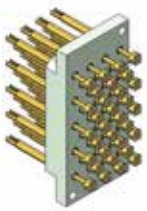
Pneumatic Block 8 pole

Receiver side	
Order code:	43900025

Fixture side	
Order code:	43900026

High Current Block 32 pole (max. 20 A*)




Receiver side (Solder connection)	
Order code:	2101178

Fixture side	
Order code:	2101179

Pre-centerings

Pre-centerings are used to simplify the insertion of the DUT. Depending on the height of the mounted components in the DUT, pre-centerings are available in different lengths. For DUTs with larger tolerances also eccentrically adjustable pre-centerings can be used.

Order code	Description
4106028	Pre-centering aluminum, blue, anodized, eccentrically adjustable, 16 mm projection
4106031	Pre-centering aluminum, blue, anodized, 30 mm projection
4106010-001	Pre-centering aluminum, blue, anodized, 15 mm projection
4106010	Pre-centering plastic, black, 15 mm projection
4106023	Pre-centering plastic, black, 30 mm projection

Board Marker

Board markers are used for optical marking of good parts after being tested.

The tip of the board marker is set onto the board. After being tested, a current pulse initiates a twist movement of the board marker for scratching a permanent mark into the board.

For the board marker replacement tips and a synthetic mounting receptacle are available.

Order code	Description
4-BMP-01	Board Marker
4-BMT-01	Board Marker replacement tip
4-BMP-01-H	Board Marker mounting receptacle PVC black

TEST CONNECTORS FOR USB, RJ AND HDMI

Durable Test Connectors for ICT and FCT Test

The need of contacting standard USB or RJ connections and interfaces is increasing in the field of in-circuit and functional test of PCBs, because the standardization of these interfaces has great advantages.

Compared to a normal USB or RJ45 plug, a specific test contact has the advantage that it does not lock into the socket. This leads to a low-wear contact with a long life time of more than 100 000 test cycles. Additionally unwanted stress or damage of the contact springs within the test item can be avoided. The connection between the test contact and the test fixture or module is realized in a very simple way without soldering just by using the standard plug of the respective interface (plug and play). For maintenance purposes the exchange of the test contact is therefore very simple.

The test contacts can be mounted into test fixtures or modules easily and effectively. The contacting of the DUT can be realized either by the vertical travel or the test fixture or by integrating the test contacts into a pneumatically controlled contacting unit.

With these new test contacts FEINMETALL extends the portfolio of contact probes for test engineering and offers even more comprehensive contacting solutions to its customers.

Mikro-USB

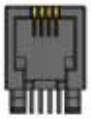
Mini-USB

USB 2.0

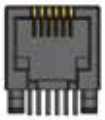
USB 3.0

HDMI 1.4

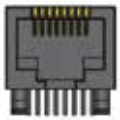
HDMI 2.0



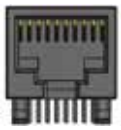
RJ-9



RJ-11



RJ-45



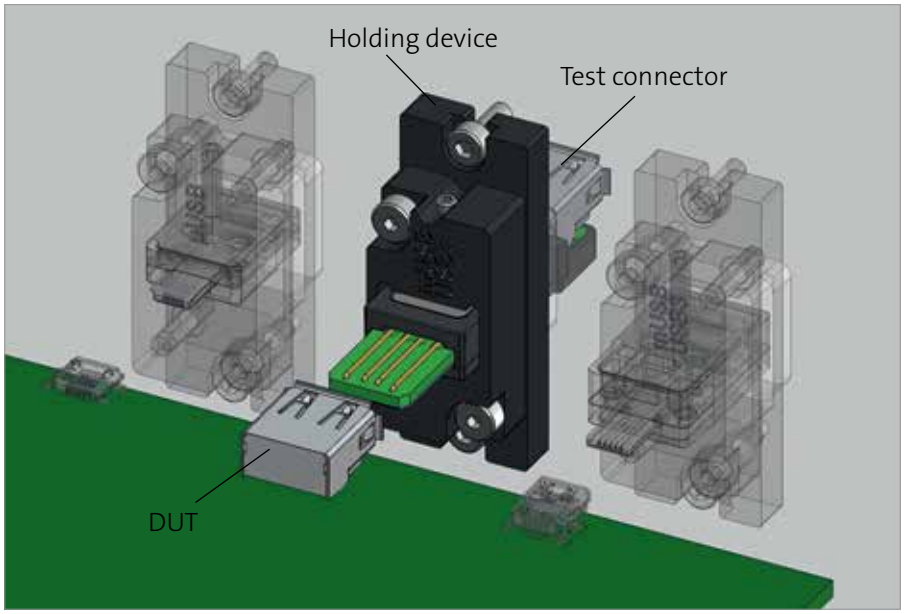
RJ-50

F-Type

RCA

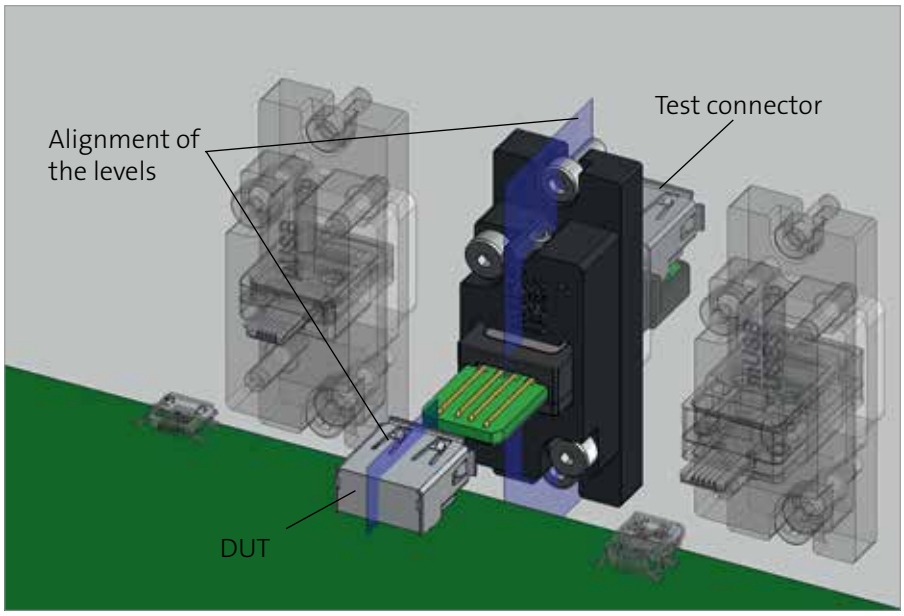
Mounting of Test Connectors

Choose the test connector and holding device according to your needs.
In this example: USB

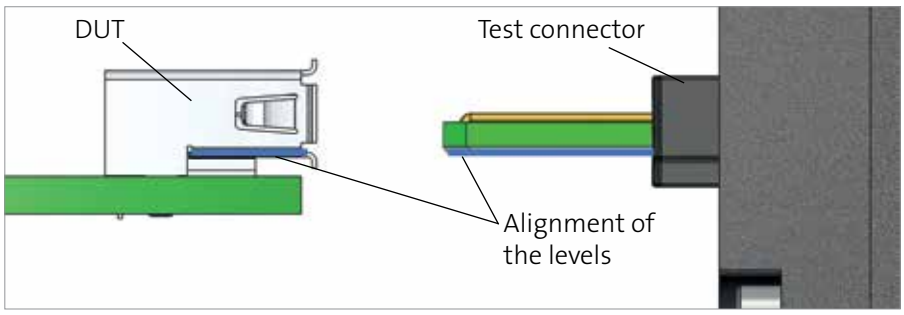


Please note the following guidelines for building up a test fixture

Align the median level of the connector to be tested (DUT) and of the test connector.

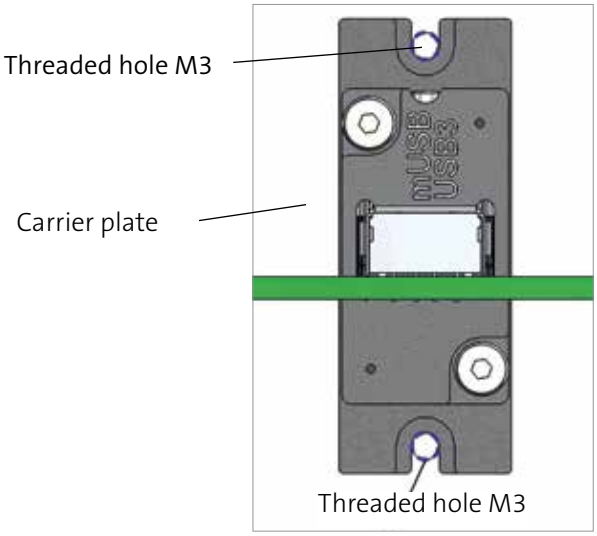


Align the lower level of the test connector on the lower internal level of the connector to test (DUT)

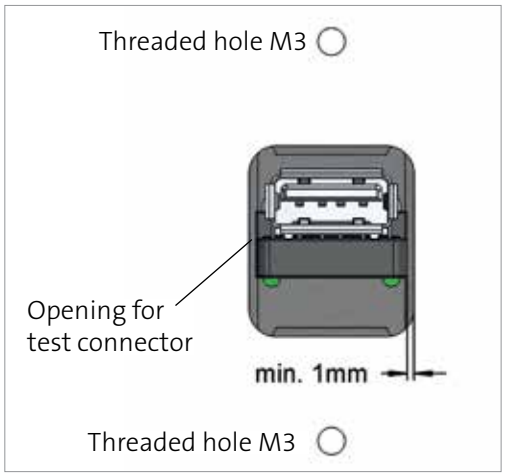


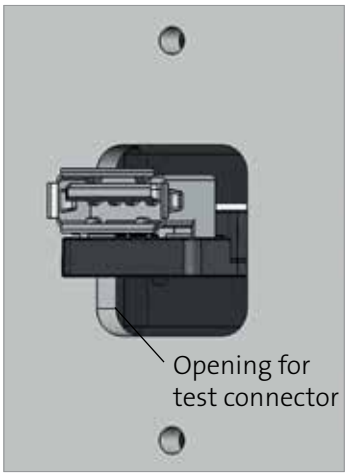
Mounting of Test Connectors

Place two opposite threaded holes M3 onto the carrier plate. For fixing of the holding device, two screws M3x8 (ISO4768) are required.



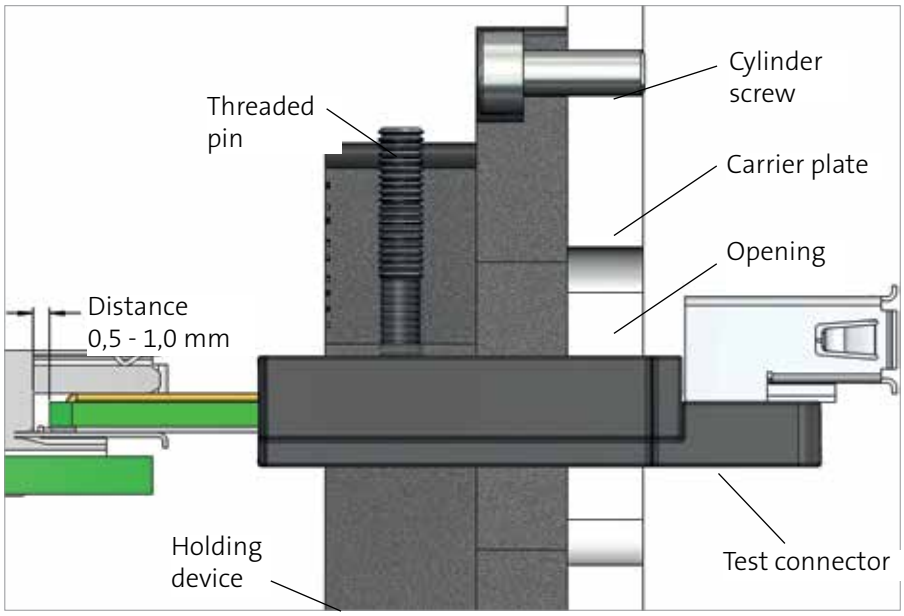
Cut a sufficient opening into the carrier plate to have enough space for later insertion of the test connector from the back. Leave at least 1 mm space between opening and test connector.





Loosen the retaining screw of the test connector. Insert the test connector into the DUT until it comes to rest. Retract the test connector for 0.5 to 1 mm in order to prevent damages of the DUT. Now the test connector can be fixed by using the threaded pin.

Both, the cylinder screws and the threaded pin require a hex wrench SW2,5 mm.



TC-P 195 005 USB 2.0 B Micro

Test Connector for Micro USB

NEW

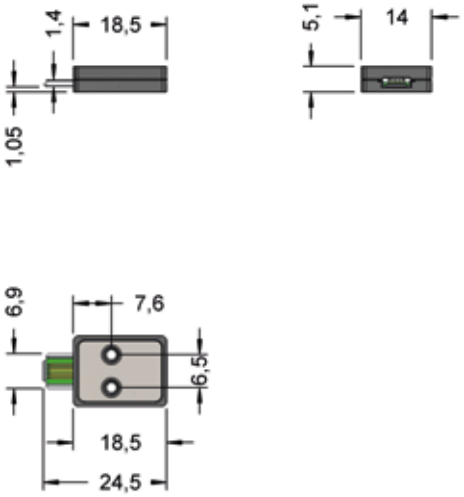
Max. Data rate	480 Mbit/s
Voltage	25 VAC / 60 VDC
Current	1,5 A at 25°C
R typ	<30 mOhm
Temperature	-20°C...+75°C

Test connector for Micro USB (5 pole) for contacting Micro USB interfaces. Application in smaller USB devices like cameras, mobile phones, radios, hard disks etc.

Features:

- → Report on Micro USB type B
- → Smooth contact to test item (front view)
- → Simple connection to the test system with standard USB cable (rear view)
- → Up to 200.000 contact cycles

	Series		Pole count		Type	
e.g.	**TC-P**	**195**	**005**	**USB 2.0**	**B**	**micro**
		Holding device		Contact side		Version



Front view

Rear view

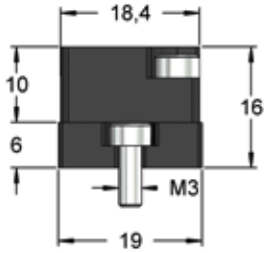
TC-H 195

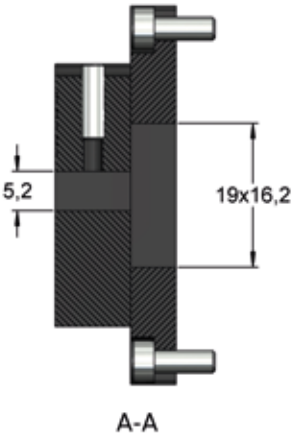
Holding Device for Test Connector Micro USB

Due to the centered seat of the test connector the holding device allows a parallel movement of the test connector and its connection.

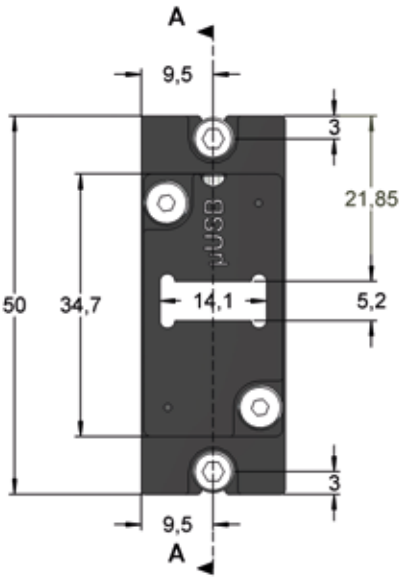
- → Floating-mounting of test connectors of ± 0,4 mm in x- and y-direction
- → A torsion angle of up to 1.8 ° ± 0.2 ° is possible
- → The holding device has a life cycle of more than 500.000 mechanical movements
- → The holding device is fixed only by two screws at the upper and lower ends
- → The test connector is attached to the holding device using only one locking screw

Both, the cylinder screws and the threaded pin require a hex wrench SW2,5 mm.





A-A



TC-P 198 005 USB 2.0 B Mini

Test connector for Mini USB

NEW

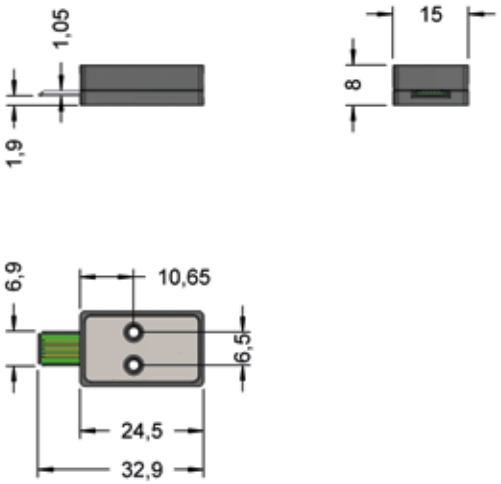
Max. Data rate	480 Mbit/s
Voltage	25 VAC / 60 VDC
Current	1,0 A at 25°C
R typ	<50 mOhm
Temperature	0°C...+50°C

Test connector for Mini USB (5 pole) for contacting Mini USB Interfaces. Application in smaller Mini-USB devices like cameras, mobile phones, radios, hard disks etc.

Features:

- Report on Mini USB type B
- Smooth contact to test item (front view)
- Easy connection to test system with standard USB cable (rear view)
- Up to 200.000 contact cycles

Series	Pole count	Type	
e.g. TC-P	198	005	USB 2.0	mini
	Holding device		Contact side	Version



Front view **Rear view**

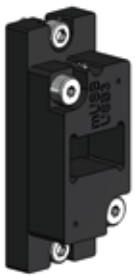
TC-H 198

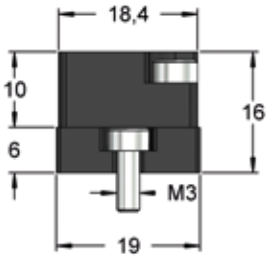
Holding Device for Test Connector mUSB / USB 2.0 / USB 3.0

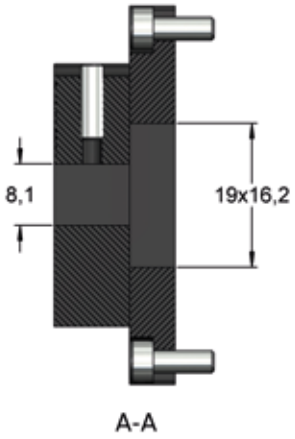
Due to the centered seat of the test connector the holding device allows a parallel movement of the test connector and its connection.

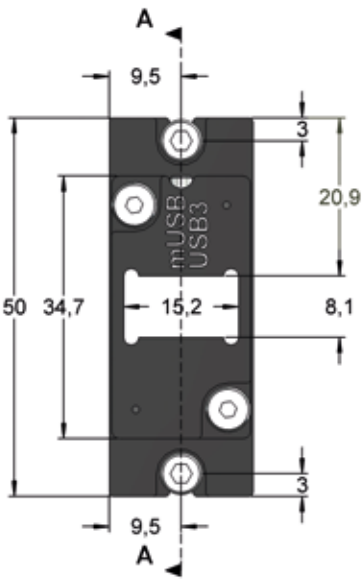
- Floating-mounting of test connectors of ± 0,4 mm in x- and y-direction
- A torsion angle of up to 1.8 ° ± 0.2 ° is possible
- The holding device has a life cycle of more than 500.000 mechanical movements
- The holding device is fixed only by two screws at the upper and lower ends
- The test connector is attached to the holding device using only one locking screw

Both, the cylinder screws and the threaded pin require a hex wrench SW2,5 mm.









TC-P 198 004 USB 2.0 A

Test Connector for USB 2.0

NEW

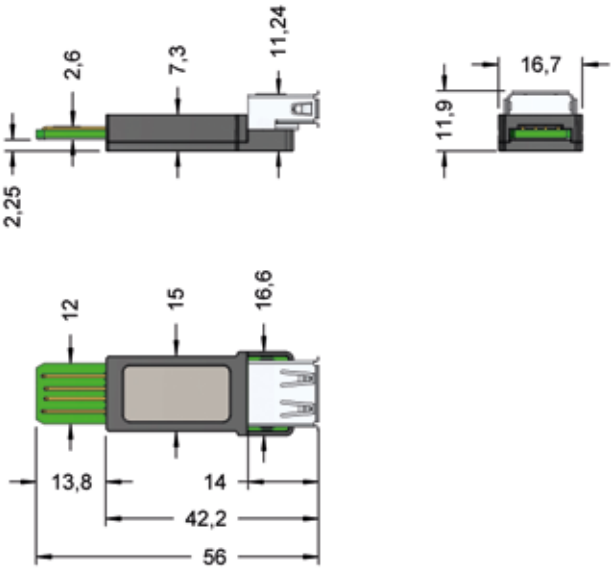
Max. Data rate	480 Mbit/s
Voltage	25 VAC / 60 VDC
Current	1,5 A at 25°C
R typ	<30 mOhm
Temperature	-20°C...+80°C

Test connector for USB 2.0 (4 pole) for contacting USB interfaces.
Application in USB devices like hard disks, data carriers, power supplies etc.

Features:

- Report on USB type A
- Smooth contact to test item (front view)
- Easy connection to test system with standard USB cable (rear view)
- Up to 200.000 contact cycles

Series	Pole count	Type
e.g. TC-P 198	004	USB 2.0 A
Holding device	Contact side	Version



Front view | Rear view

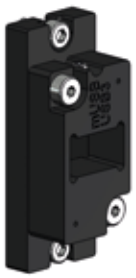
TC-H 198

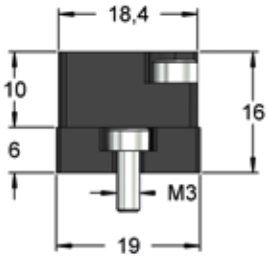
Holding Device for Test Connector USB / USB 2.0 / USB 3.0

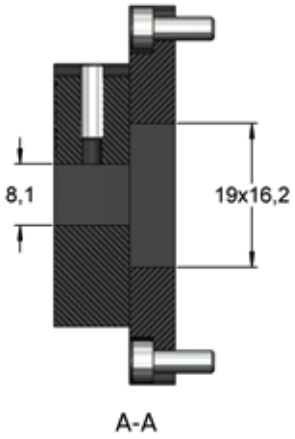
Due to the centered seat of the test connector the holding device allows a parallel movement of the test connector and its connection.

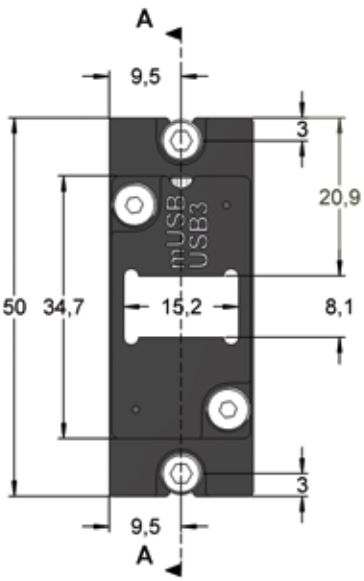
- Floating-mounting of test connectors of ± 0,4 mm in x- and y-direction
- A torsion angle of up to 1.8 ° ± 0.2 ° is possible
- The holding device has a life cycle of more than 500.000 mechanical movements
- The holding device is fixed only by two screws at the upper and lower ends
- The test connector is attached to the holding device using only one locking screw

Both, the cylinder screws and the threaded pin require a hex wrench SW2,5 mm.









TC-P 198 009 USB 3.0 A

Test Connector for USB 3.0

NEW

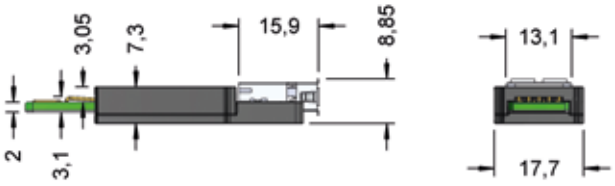
Max. Data rate	4 Gbit/s
Voltage	25 VAC / 60 VDC
Current	1,5 A at 25°C
R typ	<50 mOhm
Temperature	-20°C...+75°C

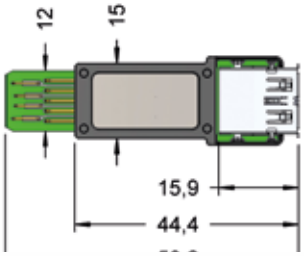
Test connector for USB 3.0 (9 pole) for contacting USB interfaces. Application in high speed USB devices like hard disks, data carriers, power supplies etc.

Features:

- Report on USB type A
- Smooth contact to test item (front view)
- Easy connection to test system with standard USB cable (rear view)
- Up to 50.000 contact cycles

Series	Pole count	Type
e.g. TC-P 198	009 USB 3.0	A
Holding device	Contact side	Version





Front view

Rear view

Test connector also possible as a piling version (holding device TC-H 208 for 2x test connector USB 3.0, note: for mounting spacer TC-D 202 necessary).

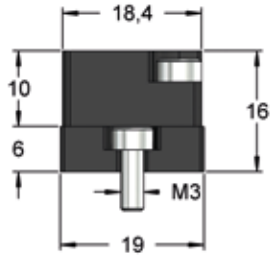
TC-H 198

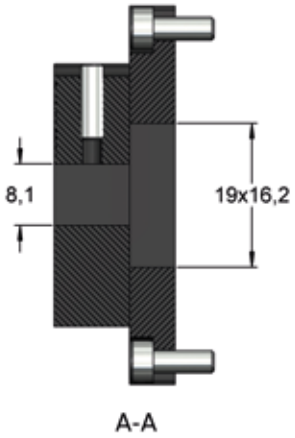
Holding Device for Test Connector mUSB / USB 2.0 / USB 3.0

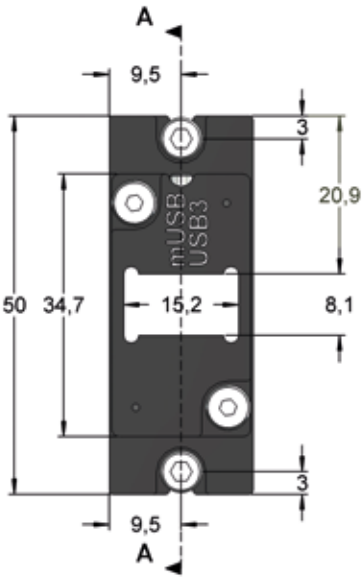
Due to the centered seat of the test connector the holding device allows a parallel movement of the test connector and its connection.

- Floating-mounting of test connectors of ± 0,4 mm in x- and y-direction
- A torsion angle of up to 1.8 ° ± 0.2 ° is possible
- The holding device has a life cycle of more than 500.000 mechanical movements
- The holding device is fixed only by two screws at the upper and lower ends
- The test connector is attached to the holding device using only one locking screw

Both, the cylinder screws and the threaded pin require a hex wrench SW2,5 mm.







TC-P 197 019 HDMI 1.4

Test Connector for HDMI 1.4

NEW

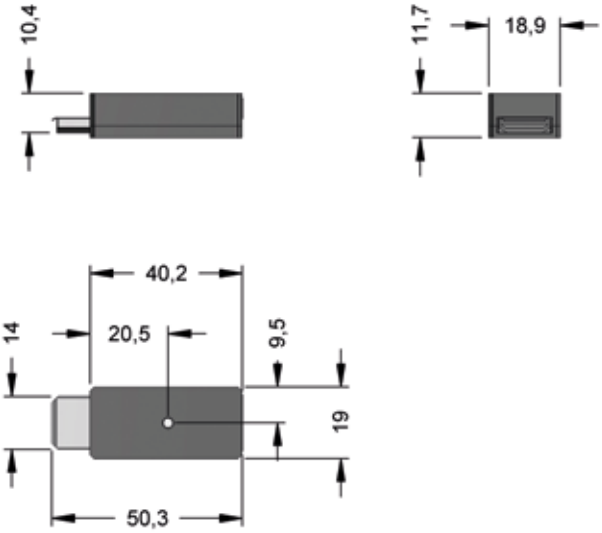
Max. Data rate	8,16 Gbit/s
Voltage	25 VAC / 60 VDC
Current	0,5 A at 25°C
R typ	<20 mOhm
Temperature	-20°C...+75°C

Test solution for HDMI connectors (19 pole).
Applications in video and audio systems.

Features:

- Smooth contact to test item (front view)
- Easy connection to HDMI cable (rear view)
- Up to 50.000 contact cycles

Series		Pole count		Type
e.g. TC-P	197	019	HDMI	1.4
	Holding device	Contact side		Version



Front view | Rear view

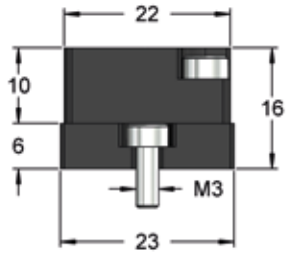
TC-H 197

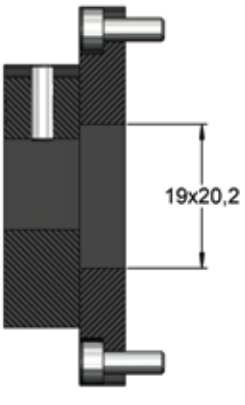
Holding Device for Test Connector HDMI

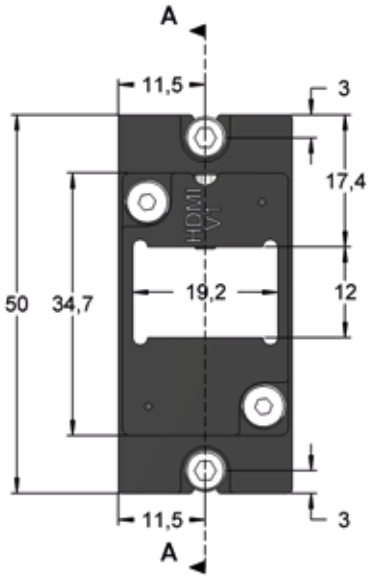
Due to the centered seat of the test connector the holding device allows a parallel movement of the test connector and its connection.

- Floating-mounting of test connectors of ± 0,4 mm in x- and y-direction
- A torsion angle of up to 1.8 ° ± 0.2 ° is possible
- The holding device has a life cycle of more than 500.000 mechanical movements
- The holding device is fixed only by two screws at the upper and lower ends
- The test connector is attached to the holding device using only one locking screw

Both, the cylinder screws and the threaded pin require a hex wrench SW2,5 mm.







TC-P 226 019 HDMI 2.0

Test Connector for HDMI 2.0

NEW

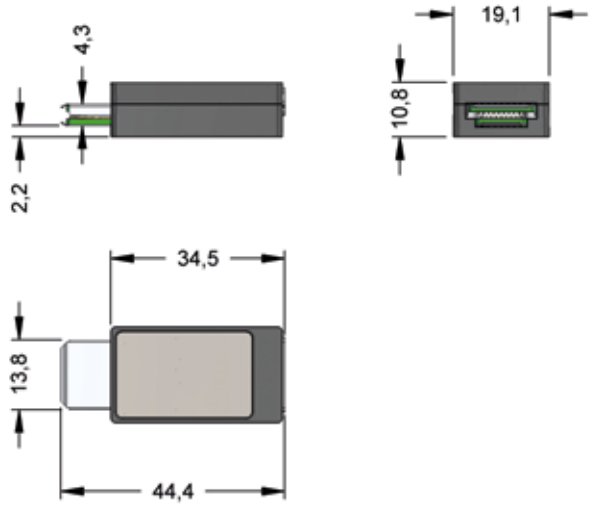
Max. Data rate	14,4 Gbit/s
Voltage	25 VAC / 60 VDC
Current	0,5 A at 25°C
R typ	<20 mOhm
Temperature	-20°C...+75°C

Test solution for HDMI connectors (19 pole).
Applications in video and audio systems.

Features:

- Smooth contact to test item (front view)
- Easy connection to HDMI cable (rear view)
- Up to 50.000 contact cycles

Series	Pole count	Type
e.g. TC-P 197	019 HDMI	2.0
Holding device	Contact side	Version



Front view | Rear view

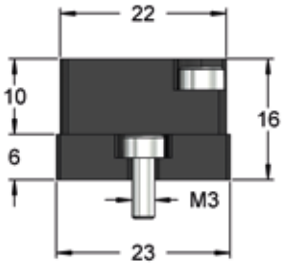
TC-H 226

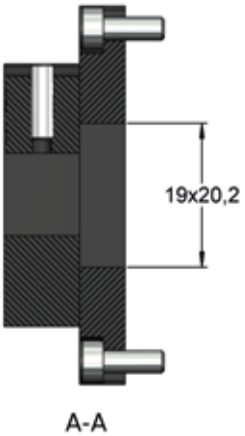
Holding Device for Test Connector HDMI

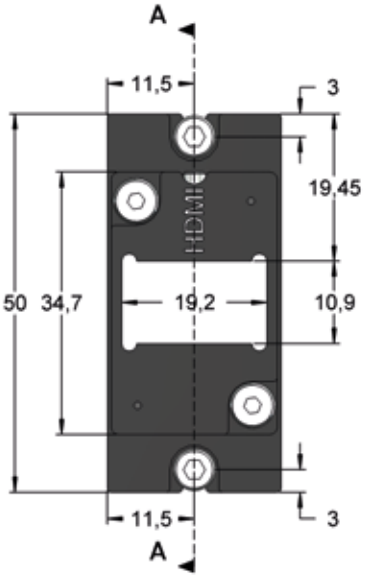
Due to the centered seat of the test connector the holding device allows a parallel movement of the test connector and its connection.

- Floating-mounting of test connectors of ± 0,4 mm in x- and y-direction
- A torsion angle of up to 1.8 ° ± 0.2 ° is possible
- The holding device has a life cycle of more than 500.000 mechanical movements
- The holding device is fixed only by two screws at the upper and lower ends
- The test connector is attached to the holding device using only one locking screw

Both, the cylinder screws and the threaded pin require a hex wrench SW2,5 mm.







TC-P 200 002 RCA

Test Connector for RCA

NEW

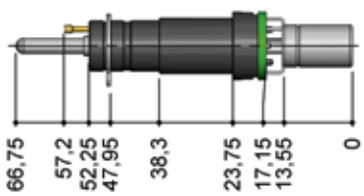
Data rate	500 khz
Voltage	25 VAC / 60 VDC
Current	1,5 A at 25°C
R typ	<50 mOhm
Temperature	-20°C...+75°C

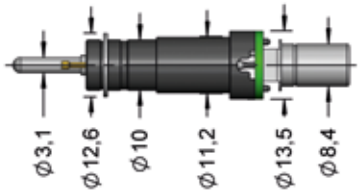
Test solution for RCA connectors. Applications with standard Chinch-connectors for audio coaxial cables

Features:

- → Smooth contact to test item (front view)
- → Easy connection to Cinch-cable (rear view)
- → Up to 200.000 contact cycles

Series	Pole count	Type
e.g. TC-P 200	002	RCA
Holding device	Contact side	Version





Front view

Rear view

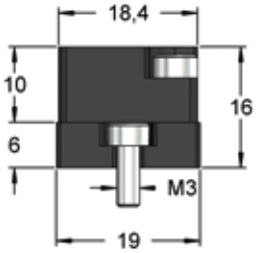
TC-H 200

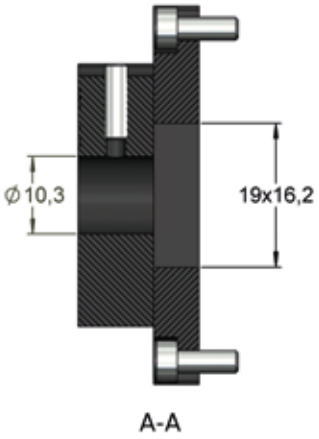
Holding Device for Test Connector RCA

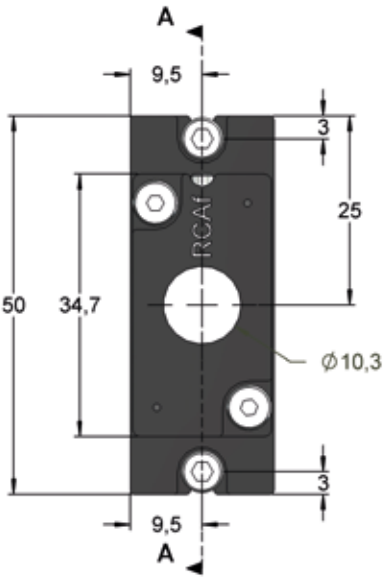
Due to the centered seat of the test connector the holding device allows a parallel movement of the test connector and its connection.

- → Floating-mounting of test connectors of ± 0,4 mm in x- and y-direction
- → A torsion angle of up to 1.8 ° ± 0.2 ° is possible
- → The holding device has a life cycle of more than 500.000 mechanical movements
- → The holding device is fixed only by two screws at the upper and lower ends
- → The test connector is attached to the holding device using only one locking screw

Both, the cylinder screws and the threaded pin require a hex wrench SW2,5 mm.







TC-P 196 001 F QF

Test Connector for F-Type

NEW

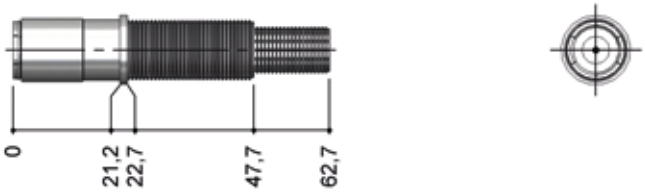
Data rate	300 khz - 3 Ghz
Voltage	25 VAC / 60 VDC
Current	1,5 A at 25°C
R typ	<50 mOhm
Temperature	-20°C...+80°C

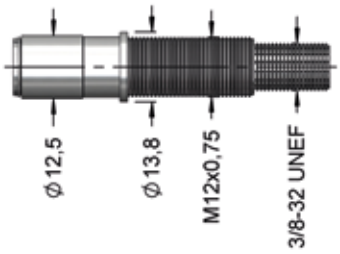
Test solution for contacting F-Series connectors. QF (Quick Fix) describes the option for direct screwing of the connector.
Application in antenna cables, routers, etc.

Features:

- Smooth contact to test item (front view)
- Easy connection to test system with F-Series antenna cable (rear view)
- Up to 50.000 contact cycles

Series	Pole count	Type
e.g. TC-P 196	001 F	QF
Holding device	Contact side	Version





Front view | Rear view

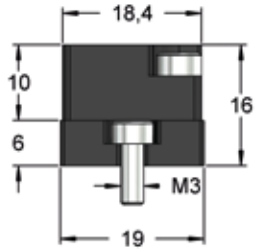
TC-H 196

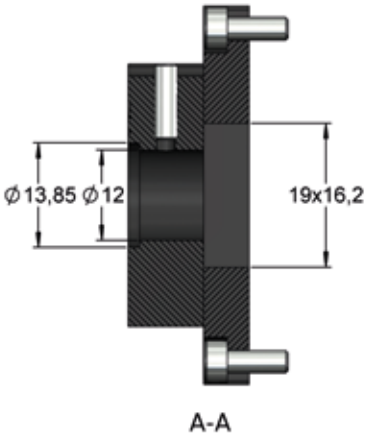
Holding Device for Test Connector F-Series

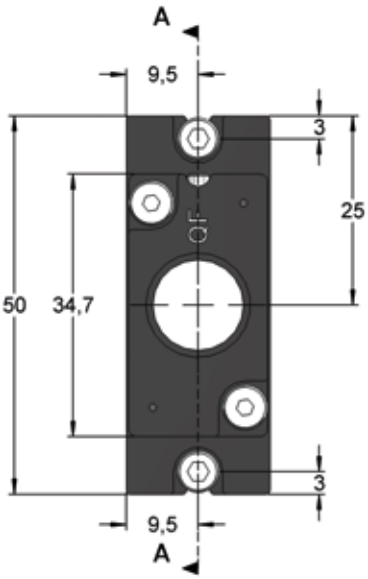
Due to the centered seat of the test connector the holding device allows a parallel movement of the test connector and its connection.

- Floating-mounting of test connectors of ± 0,4 mm in x- and y-direction
- A torsion angle of up to 1.8 ° ± 0.2 ° is possible
- The holding device has a life cycle of more than 500.000 mechanical movements
- The holding device is fixed only by two screws at the upper and lower ends
- The test connector is attached to the holding device using only one locking screw

Both, the cylinder screws and the threaded pin require a hex wrench SW2,5 mm.







TC-P 201 004 RJ 09

Test Connector for RJ-9

NEW

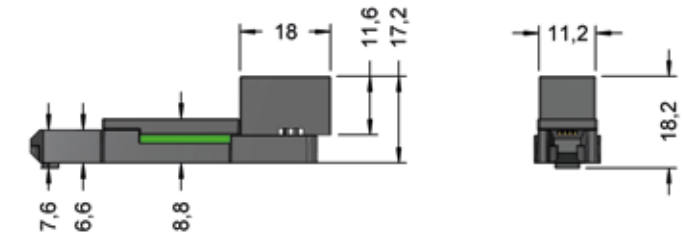
Max. Data rate	1 Gbit/s
Voltage	25 VAC / 60 VDC
Current	1,5 A at 25°C
R typ	<20 mOhm
Temperature	-20°C...+75°C

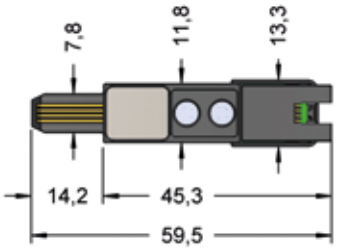
Test connector (4 pole) for contacting RJ-9 interfaces.
Applications in mini phones, headsets etc.

Features:

- Smooth contact to test item (front view)
- Easy connection to test system with RJ-9 cable (rear view)
- Up to 200.000 contact cycles

Series	Pole count		Type
e.g. TC-P 201	004	RJ	09
Holding device		Contact side	Version





Front view

Rear view

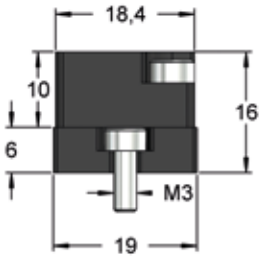
TC-H 201

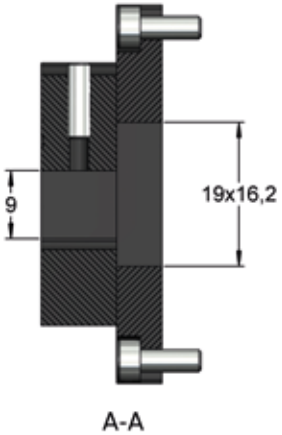
Holding Device for Test Connector RJ-xx

Due to the centered seat of the test connector the holding device allows a parallel movement of the test connector and its connection.

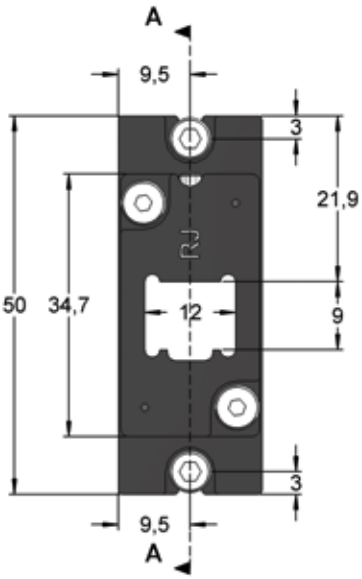
- Floating-mounting of test connectors of ± 0,4 mm in x- and y-direction
- A torsion angle of up to 1.8 ° ± 0.2 ° is possible
- The holding device has a life cycle of more than 500.000 mechanical movements
- The holding device is fixed only by two screws at the upper and lower ends
- The test connector is attached to the holding device using only one locking screw

Both, the cylinder screws and the threaded pin require a hex wrench SW2,5 mm.





A-A



TC-P 201 006 RJ 11

Test Connector for RJ-11

NEW

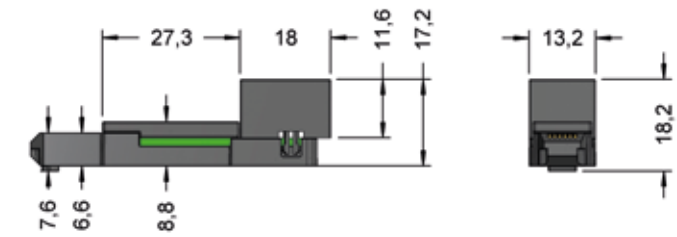
Max. Data rate	1 Gbit/s
Voltage	25 VAC / 60 VDC
Current	1,5 A at 25°C
R typ	<20 mOhm
Temperature	-20°C...+75°C

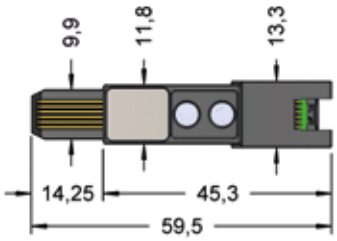
Test connector (6 pole) for contacting RJ-11 interfaces.
Applications in data networks, data transmission, power supplies, microphones etc.

Features:

- Smooth contact to test item (front view)
- Easy connection to test system with RJ-11 cable (rear view)
- Up to 200.000 contact cycles

Series	Pole count		Type
e.g. TC-P	201	006 RJ	11
	Holding device	Contact side	Version





Front view

Rear view

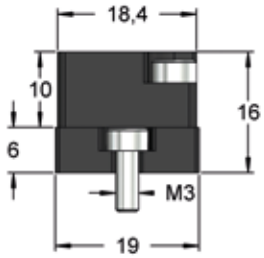
TC-H 201

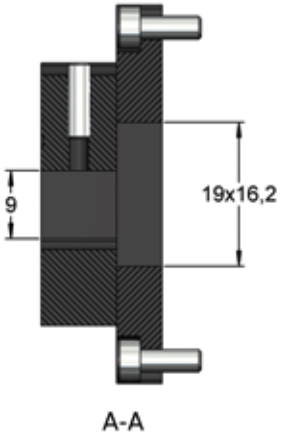
Holding Device for Test Connector RJ-xx

Due to the centered seat of the test connector the holding device allows a parallel movement of the test connector and its connection.

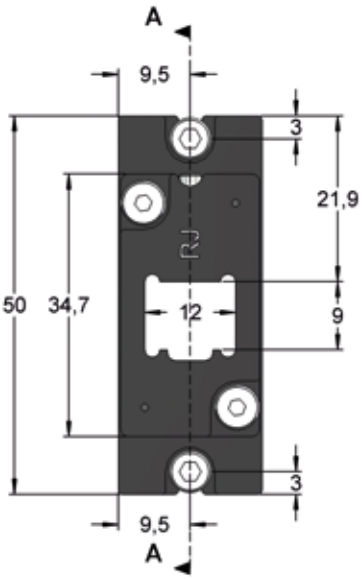
- Floating-mounting of test connectors of ± 0,4 mm in x- and y-direction
- A torsion angle of up to 1.8 ° ± 0.2 ° is possible
- The holding device has a life cycle of more than 500.000 mechanical movements
- The holding device is fixed only by two screws at the upper and lower ends
- The test connector is attached to the holding device using only one locking screw

Both, the cylinder screws and the threaded pin require a hex wrench SW2,5 mm.





A-A



TC-P 201 008 RJ 45

Test Connector for RJ-45

NEW

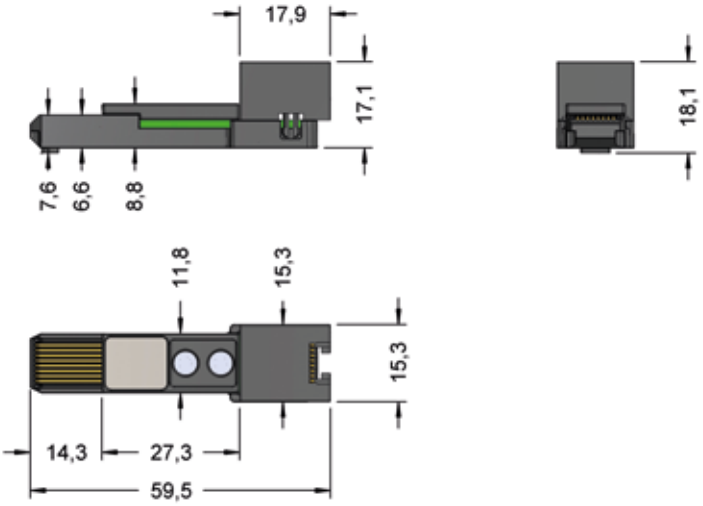
Max. Data rate	1 Gbit/s
Voltage	25 VAC / 60 VDC
Current	1,5 A at 25°C
R typ	<20 mOhm
Temperature	-20°C...+75°C

Test connector (8 pole) for contacting RJ-45 interfaces.
Applications in network cables, Ethernet interfaces etc.

Features:

- Report on RJ-45 sockets
- Smooth contact to test item (front view)
- Easy connection to test system with RJ-45 cable (rear view)
- Up to 200.000 contact cycles

Series	Pole count	Type
e.g. TC-P 201	008 RJ	45
Holding device	Contact side	Version



Front view | Rear view

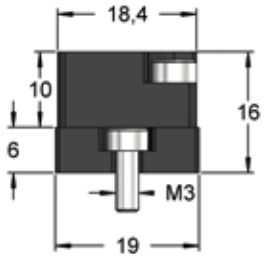
TC-H 201

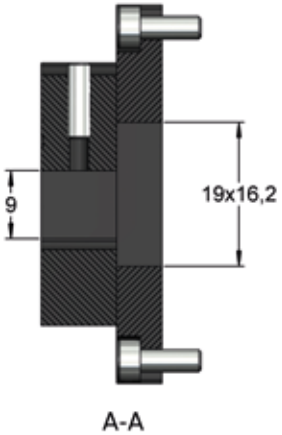
Holding Device for Test Connector RJ-xx

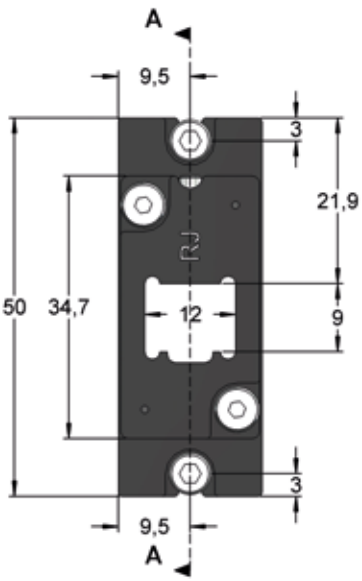
Due to the centered seat of the test connector the holding device allows a parallel movement of the test connector and its connection.

- Floating-mounting of test connectors of ± 0,4 mm in x- and y-direction
- A torsion angle of up to 1.8 ° ± 0.2 ° is possible
- The holding device has a life cycle of more than 500.000 mechanical movements
- The holding device is fixed only by two screws at the upper and lower ends
- The test connector is attached to the holding device using only one locking screw

Both, the cylinder screws and the threaded pin require a hex wrench SW2,5 mm.







TC-P 201 008 RJ 45 f

Test Connector for RJ-45, Flexible

NEW

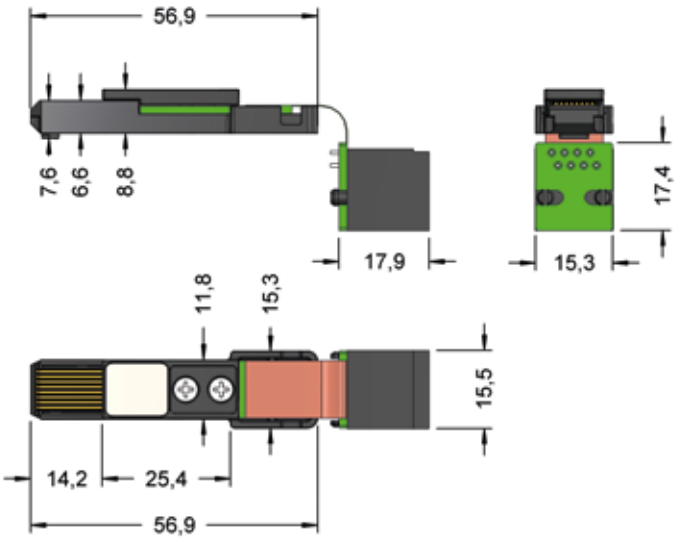
Max. Data rate	1 Gbit/s
Voltage	25 VAC / 60 VDC
Current	1,5 A at 25°C
R typ	<20 mOhm
Temperature	-20°C...+75°C

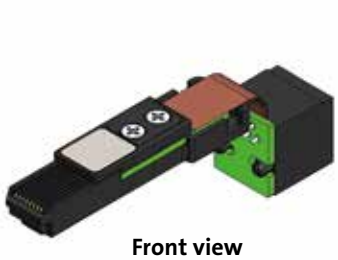
Test connector (8 pole) for contacting RJ-45 Interfaces.
Applications in network cables, Ethernet interfaces etc.

Features:

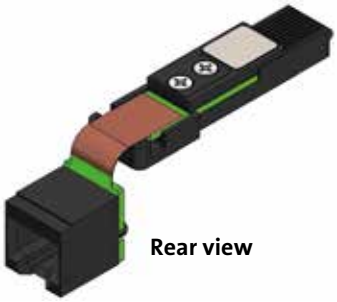
- Report on RJ-45 sockets
- Smooth contact to test item (front view)
- Easy connection to test system with RJ-45 cable (rear view)
- Up to 200.000 contact cycles

	Series		Pole count		Type	
e.g.	TC-P	201	008	RJ	45	f
		Holding device		Contact side		Version





Front view



Rear view

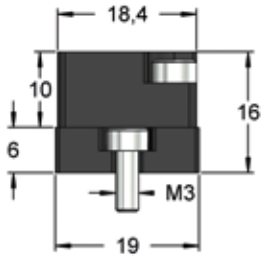
TC-H 201

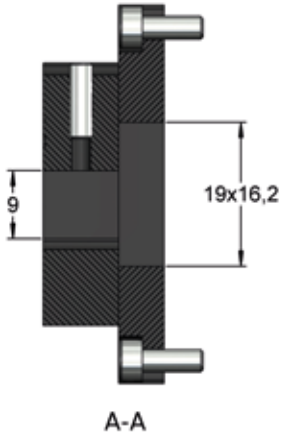
Holding Device for Test Connector RJ-xx

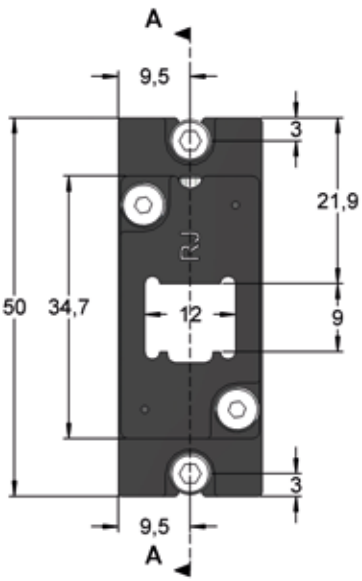
Due to the centered seat of the test connector the holding device allows a parallel movement of the test connector and its connection.

- Floating-mounting of test connectors of ± 0,4 mm in x- and y-direction
- A torsion angle of up to 1.8 ° ± 0.2 ° is possible
- The holding device has a life cycle of more than 500.000 mechanical movements
- The holding device is fixed only by two screws at the upper and lower ends
- The test connector is attached to the holding device using only one locking screw

Both, the cylinder screws and the threaded pin require a hex wrench SW2,5 mm.







TC-P 201 010 RJ 50

Test Connector for RJ-50

NEW

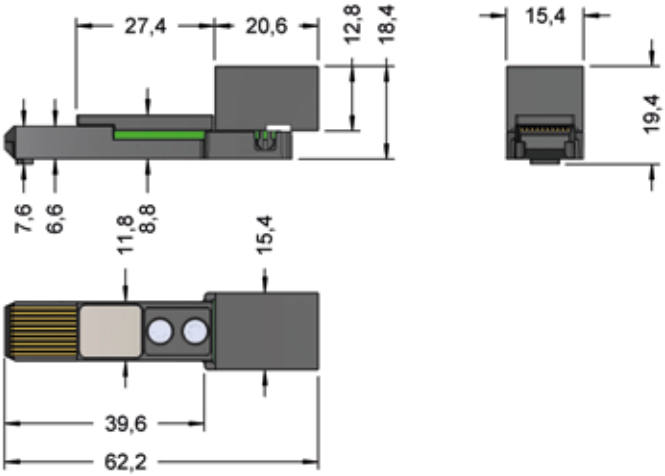
Max. Data rate	1 Gbit/s
Voltage	25 VAC / 60 VDC
Current	1,5 A at 25°C
R typ	<20 mOhm
Temperature	-20°C...+75°C

Test solution for RJ-50 connectors (10 pole).
Applications in data networks, data transmission, power supplies, microphones etc.

Features:

- Smooth contact to test item (front view)
- Easy connection to test system with RJ-50 cable (rear view)
- Up to 200.000 contact cycles

Series		Pole count		Type	
e.g. TC-P	201	010	RJ	50	
	Holding device		Contact side		Version



Front view

Rear view

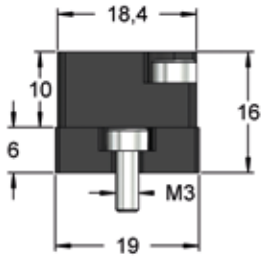
TC-H 201

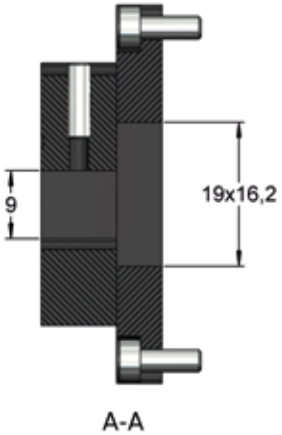
Holding Device for Test Connector RJ-xx

Due to the centered seat of the test connector the holding device allows a parallel movement of the test connector and its connection.

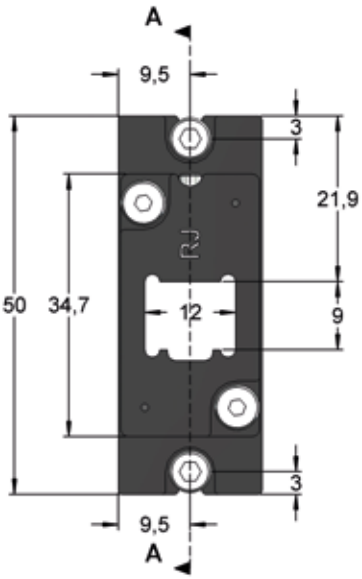
- Floating-mounting of test connectors of ± 0,4 mm in x- and y-direction
- A torsion angle of up to 1.8 ° ± 0.2 ° is possible
- The holding device has a life cycle of more than 500.000 mechanical movements
- The holding device is fixed only by two screws at the upper and lower ends
- The test connector is attached to the holding device using only one locking screw

Both, the cylinder screws and the threaded pin require a hex wrench SW2,5 mm.





A-A



Tools and Accessories

For installation and maintenance of contact probes and receptacles FEINMETALL offers a great variety of tools. For the mounting of standard probes practical insertion- and screw-in tools are useful. For a simple and effective mounting of switch probes tools with integrated functions are ideal, for example to adjust the correct position of the switch point. A spring force gauge additionally enables the measurement of spring forces, for example to identify inserted contact probes in existing modules or fixtures.

FK50

Toolbox with Spring Force Gauge

Contents:
1x Spring force gauge with receptacle for measuring sleeves
1x Measuring sleeve Ø5,0 mm
Calibration certificate

FM-TOOLBOX

Toolbox for Mounting Tools (empty)

Contents:
Empty case with corresponding inlay for bits, handles and other accessories
3x Empty boxes
1x Empty bit box

FM-TOOLBOX-SET-001

Toolbox with Predefined Mounting Tools (filled)

Contents:
22x Bits
3x Handles (standard)
3x Handles (with ratchet)
2x Alignment tools, 1x handle
2x Screw driver

FM-TOOLBOX-SET-002

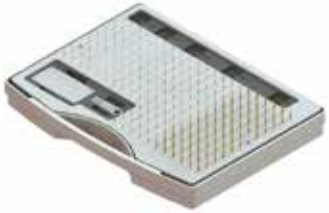
Cordless Screwdriver Set

Contents:
1x Cordless screwdriver
(shape changeable from pistol to straight shape)
1x Power connector for 230V
3x Magnetic holder with different ratchets
2x Empty boxes for probes and accessories
1x Bit box with 15 empty slots for bits

FM-SAMPLEBOX-SP

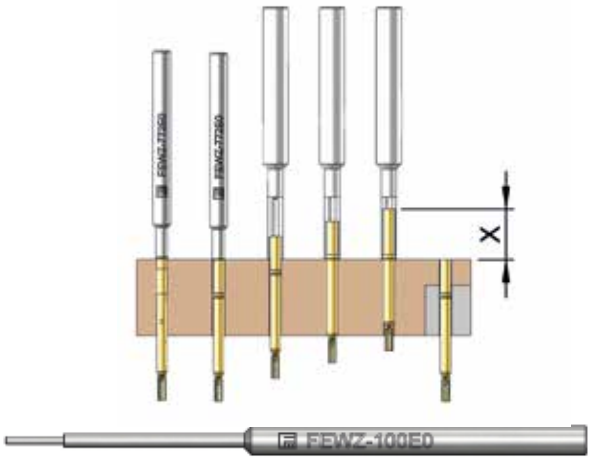
Step Probe Box

Sample box with a large variety of step probes



Insertion tool for receptacles with fixed stop (collar or press ring on top)

Receptacle	Insertion height (mm)	PIN-AØ (mm)	Insertion tool
H040	0,0	0,63	FEWZ-040E0
H050, H787	0,0	0,80	FEWZ-050E0
H075, H703, H701	0,0	0,90	FEWZ-075E0
H100, H585, H502, H708	0,0	1,30	FEWZ-100E0
H109	0,0	0,50	FEWZ-109E0
H111, H511	0,0	0,60	FEWZ-511E0
H563	0,0	2,00	FEWZ-563E0
H564	0,0	2,40	FEWZ-564E0
H735, H775	0,0	3,50	FEWZ-735E0
H772	0,0	1,60	FEWZ-772E0
H774, H566	0,0	2,6	FEWZ-774E0



All receptacles with dead stop (collar) can be inserted with tool FEWZ-...E0. Press ring at receptacles can be used also as dead stop.
The guiding pin
of the tool helps to stabilize and properly mount the receptacle.

Insertion tool for receptacles with press ring (inserted)

Receptacles	Insertion height XX required (mm)	I-Ø (mm)	Insertion tool
H050, H787	xx	1,10	FEWZ-050Exx
H075	xx	1,50	FEWZ-075Exx
H100	xx	1,83	FEWZ-100Exx

All receptacles with press ring can be inserted with tool FEWZ-...Ex. In this case the x is the fix height level (see picture).
This value is required for ordering the correct tool. For often changing projection heights the variable tool below is recommended.

Variable insertion tool for receptacles

Receptacles	Insertion height X (mm)	Insertion tool
H050, H787	0 - 10	FEWZ-050EV
H075	0 - 12	FEWZ-075EV
H100	0 - 12	FEWZ-100EV
H772	0 - 10	FEWZ-772EV

For different height levels of the receptacles with inserted press ring, the tool FEWZ-...EV is recommended.
The required height level can be adjusted at the tool..

Insertion tools FDWZ for plug-in contact probes

Insertion tool	Shank-ø (mm)	Length (mm)
FDWZ-039	A-Ø=1,00; I-Ø=0,55	67,50
FDWZ-050	1,50	100,0
FDWZ-075	2,50	100,0
FDWZ-100	3,50	100,0
FDWZ-650	A-Ø=6,00; I-Ø=4,10	100,0

For inserting the probe into the receptacle tool FDWZ is helpful. After the probe is pushed into the receptacle and stopped by the pressure marks, the probe is driven into the receptacle with the FDWZ tool. The tool is made of a synthetic material to avoid any damaging of the plunger tips.

FK50

Spring Force Gauge

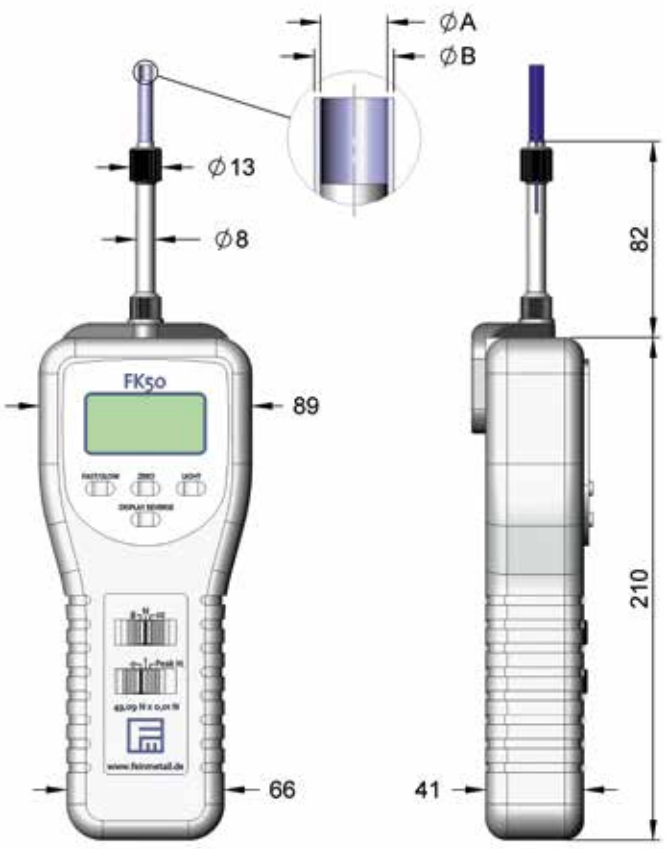
The Spring Force Gauge allows force measurement at all types of spring contact probes up to 50 N. This instrument allows in a very simple way to verify, if a probe is still intact and to determine the spring force of the probe. The measuring results are displayed at the instrument and the display can be electrically turned by 180° if needed, e.g. for overhead applications. For the measurement just put the measuring sleeve over the probe and push it to the mounting plate. The sleeves depth can be adjusted according to the projection height of the probe. Adjustable measuring sleeves are available with three different diameters.

Technical Specifications

Minimum force:	3g / 0,10oz / 0,03N
Resolution:	1g / 0,03oz / 0,01N
Measuring accuracy:	+/- 0,5% at 25°C
Data output:	via RS 232 (order code 2111810)
Power supply:	6 x 1,5V AA (UM-3 batteries)
	(Batteries non included in delivery)

Included in Delivery:

- → Spring Force Gauge with receptacle for measuring sleeve
- → Measuring sleeve Ø 5,0mm
- → Calibration certificate
- → Carrying case



Operating manual available on the homepage.

Dimensions of adjustable measuring sleeves			
Measuring sleeve	Inner-Ø A [mm]	Outer-Ø B [mm]	Height adjustable from/to [mm]
MS30	3,00	4,00	0 - 40,50
MS40	4,00	5,00	0 - 40,50
MS50	5,00	6,00	0 - 40,50

Example for height adjustment at measuring sleeve		
	Projection height of probe, e.g. F732: Nominal: Projection height - nominal: Value of height to fix:	= 10,50 mm = 4,00 mm = 10,50 - 4,00 mm = 6,50 mm

Description	Order code
Spring force gauge FK50	FK50
Measuring sleeve Ø 3,0 mm	MS30
Measuring sleeve Ø 4,0 mm	MS40
Measuring sleeve Ø 5,0 mm	MS50
Data cable RS232	2111810

Rigid measuring sleeves with fixed stop

Rigid measuring sleeves for repeating measurements at probes with fixed projection height are available with different diameters.

Measuring sleeve	Order code	for series	Inner-Ø A [mm]	Outer-Ø B [mm]	Projection Height [mm]	Nominal travel [mm]
Measuring sleeve F732	MS230E065	F732	2,30	2,70	10,50	4,00
Measuring sleeve F733	MS360E065	F733	3,60	4,00	10,50	4,00
Measuring sleeve VF3	MS270E355	VF3	2,70	3,20	40,50	5,00
Measuring sleeve VF4	MS370E355	VF4	3,70	4,20	40,50	5,00
Measuring sleeve VF5	MS460E315	VF5	4,60	5,00	36,50	4,80

Application Specific Catalogs

In order to find the right contact probe for your application quickly and at a glance, we have now created four application specific catalogs with appropriate contact probes, including many technical details and application notes.

All catalogs and brochures are available on our homepage
http://www.feinmetall.com/downloads/catalogues-and-flyers/

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Our sales offices are perfectly connected to the markets and work in close cooperation with our customers. Most important for us is a high quality - regarding our products as well as regarding our customer support.

Our strengths

- Native-speaking contacts in many countries enable ideal communication
- Application engineers take care of customer projects
- Active key account management provides customer specific know-how
- Teamwork of product managers and local sales engineers facilitate innovative and customized solutions
- Periodic technical trainings make sure that sales teams have a high level of competence
- Technical key customer trainings enhances know-how transfer to end users

These strengths have already resulted in many successful and innovative projects. FEINMETALL is already rated as preferred supplier for many notable companies. Our strong customer support is your advantage.

Version 1

FEINMETALL
Contact Technologies

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