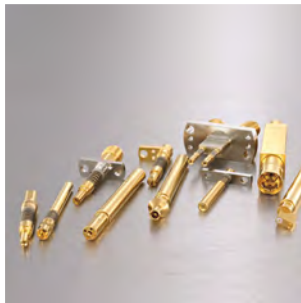












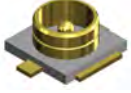




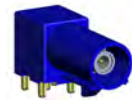


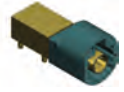








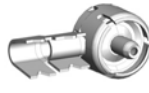
















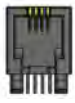

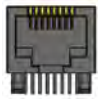








PRODUCT PORTFOLIO CONTACT PROBES FOR RADIO FREQUENCY MEASUREMENTS



OVERVIEW OF CONNECTORS

GSC-Male 	HSC-Male 	JSC-Male 	KSC-Switch 	LSC-Male 
MHF-Male 	MHF5-Male 	SWD-Switch 	SWF-Switch 	SWG-Switch 
SWH-Switch 	SWJ-Switch 	U.FL-Male 		
BMA-Male 	BNC-Female 	DIN 1,0/2,3-Female 	FME-Male 	FAKRA-Male 
FAKRA-Female 	GT16 Male 	HSD-Male 	HSD-Female 	HFM-Male 
MATE-AX-Male 	MMBX-Female 	MMCX-Female 	mSMP-Male 	N-Type-Female 
QMA-Female 	RF-Male 	R-TNC-Female 	R-SMA-Female 	SMA-Female 
SMB-Female 	SMB-Male 	SMC-Male 		
PCB GSG 	PCB-coax-closed 	PCB-coax-open 	PCB-coax-kidney 	PCB GSG 
PCB GGSGG 		F-Type 	HDMI 1.4 	HDMI 2.0 
RCA 	RJ-9 	RJ-11 	RJ-45 	RJ-50 
Mikro-USB 	Mini-USB 	USB 2.0 A 	USB 3.0 A 	USB 3.1 C 

Design of RF-Probes

Spring contact probes for RF-applications are coaxial probes. The inner and outer conductors are designed and dimensioned according the RF specific requirements. That means the signals within a wide frequency band are transmitted with a minimum loss. For evaluation of RF-probes various definitions and parameters are relevant.

Two-Port Network

The common two-port network describes the characteristics of possible transmission paths. These can be wires, radio transmissions or RF-contact probes.



S-Parameters

In radio frequency technology the transmission characteristics of two-port networks are described by S-parameters (scattering parameters). The S-parameters are typically specified as attenuation given in decibel [dB].
S11: Reflection loss input side
S21: Insertion loss forward
S12: Insertion loss backward
S22: Reflection loss output side

Matching

The matching always refers to the impedance of the DUT and its RF related environment. The more constant the impedance on the transmission path, the better is the reflection and transmission behavior. For RF testing always the complete transmission path of DUT, RF-probe and connecting element has to be considered. A major part of the signal loss is caused by mismatching between RF probe and DUT. The frequency response charts in the specification sheets of the probes HF60 include the probe as well as an RF-connector (representing the DUT) and a connecting element with connected cable. The type and length of the cable is also influencing the transmission of the signal

and may lead to a reduced bandwidth. For reference, the values S21 and S11 for the HF60 without DUT and connecting element are shown as well.

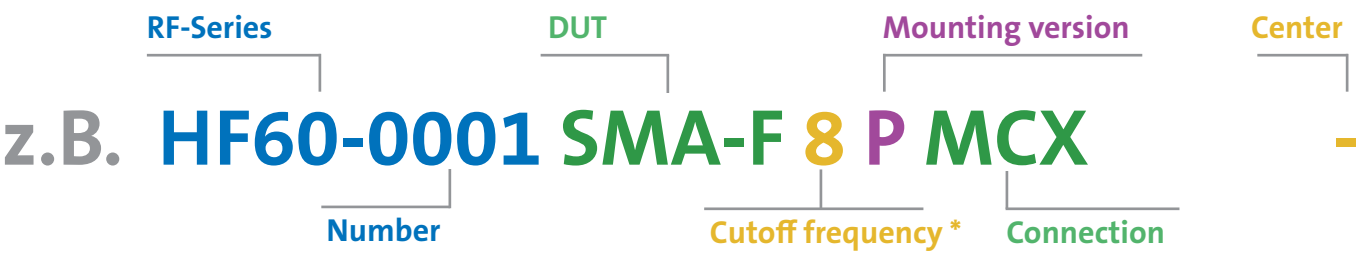
Insertion Loss

The insertion loss describes the transmission behavior of a two-port network and is represented by the value S21. Very often the 3dB cutoff frequency is used as characteristic value. This is the frequency with an attenuation of -3dB. At this frequency the power has reduced by 50% and the voltage by 30%.

Frequency

The values for frequency specified in the catalogue correspond to the maximum operating frequency recommended by FEINMETALL. Depending on the application and the permissible transmission quality, the high-frequency probes can also be used above this. On request, diagrams with the frequency characteristics are available.

New generation for RF-Probes



Type number:

Is composed of RF-Series and number

DUT (e.g.):

SMA-F (Female)
SMB-M (Male)
GSG (Ground-Signal-Ground)

Mounting options:

F (flange)
P (plug-in)
S (threaded)

Center:

Center specifies only distance ground to signal, otherwise the field is left blank

* the specified value is the recommended maximum operating frequency.

COAXIAL PROBES FOR RADIO FREQUENCY MEASUREMENTS



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.

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

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.

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).

RF type

DUT

Mounting version

Pitch

e.g. HF60-0001 SMA-F 8 P MCX -

Number

Cutoff frequency

Connection type

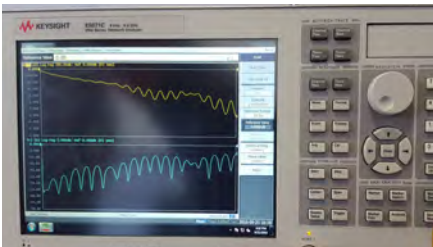
RF test set-up



Contacting RF connector



RF monitoring



MOUNTING OF THE NEW RF PROBES

Mounting Options

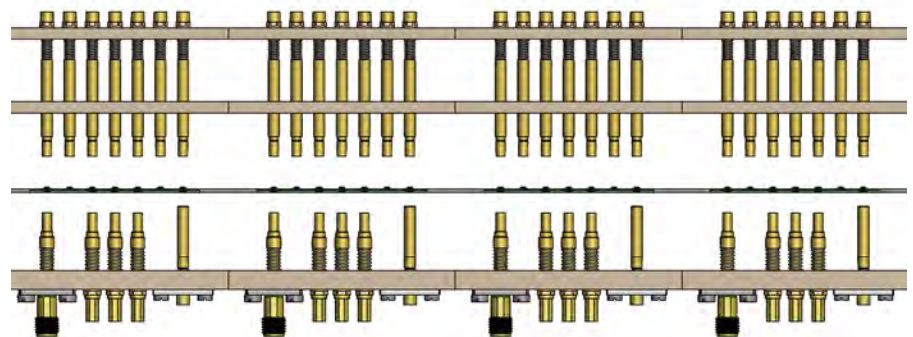
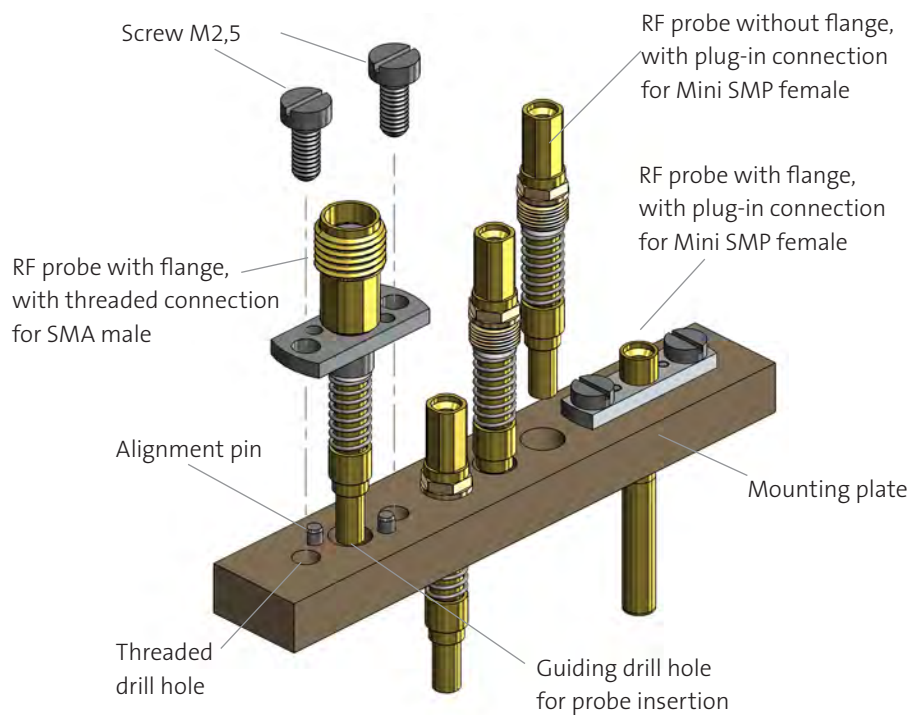
For the new RF probe series HF66 and HF05 different mounting options are possible.

Some probes can be threaded directly into the mounting plate.

Some versions have a flange that is screwed to the mounting plate, this version allows a simple adjusting and contacting of the DUT. The drill hole for mounting needs to have a sufficient diameter to allow a movement of the probe.

For mounting RF probes with flange drill holes for the centering pins, threaded holes for the fixing screws as well as guiding holes for the probe are needed. These need to correspond with the pattern of the flange.

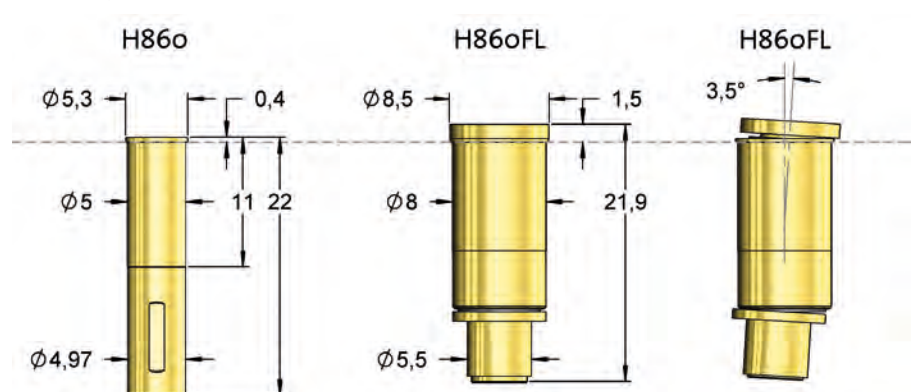
Mounting example HF66



Mounting Options

The new receptacle H860FL allows a flexible (floating) mounting of the high frequency probe HF60. It permits a wobbling by 360 degrees in case of a small offset to the DUT. Such a possible offset is compensated without damaging the DUT. In released mode the HF probe is returned to its zero point position.











Mounting example HF60



COAXIAL PROBES FOR RADIO FREQUENCY MEASUREMENTS

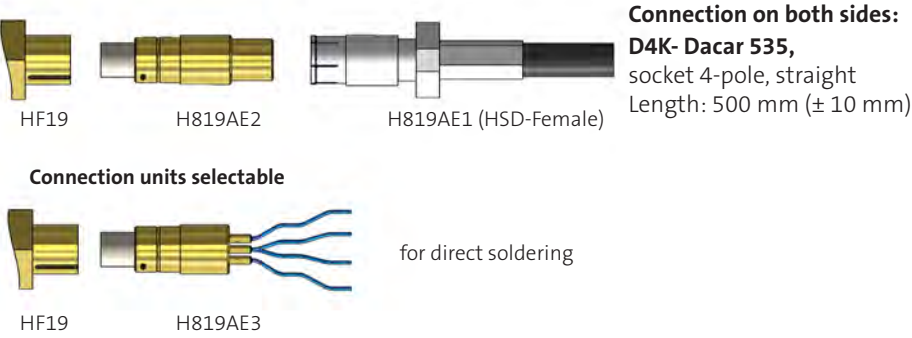


Coaxial probe HF19 up to 3 GHz

HSD (Male):			HF19-0001 HSD-M 2 P H819AE2/3 Order Code: HF81905B0001G1270
HSD (Male):			HF19-0005 HSD-M 3 P HSD Order Code: HF81955B1005G2000
HSD (Male):			HF19-0006 HSD-M 3 P HSD Order Code: HF81955B1006G2020
HSD (Male):			HF19-0004 HSD-M 2 P H819AE4 Order Code: HF81914S0004L1270
HSD (Female):			HF19-0002 HSD-F 2 P H819AE2/3 Order Code: HF81912B0002G1270 HF81912B0002G2020

Connection Cables for HF19

By combining the connection elements H819AE2 and H819AE1 a **defined and reproducible measuring** setup with fix parameters can be realized.



COAXIAL PROBES FOR RADIO FREQUENCY MEASUREMENTS



Coaxial probe HF05 up to 6 GHz

PCB-GSG:



HF05-0001 GSG 6 F M-SMP 050
Order Code: HF05-0001

PCB-GSG:



HF05-0002 GSG 6 F M-SMP 050
Order Code: HF05-0002

Coaxial probe HF77 up to 12 GHz

HFM[®] (Male):
4-fach



HF77-0001 HFM-M 12 P MSMP BG04-1
Order Code: HF77-0001BG04-1



HF77-0001 HFM-M 12 P MSMP
Order Code: HF7716B0001G530

MATE-AX[®] (Male):
4-fach

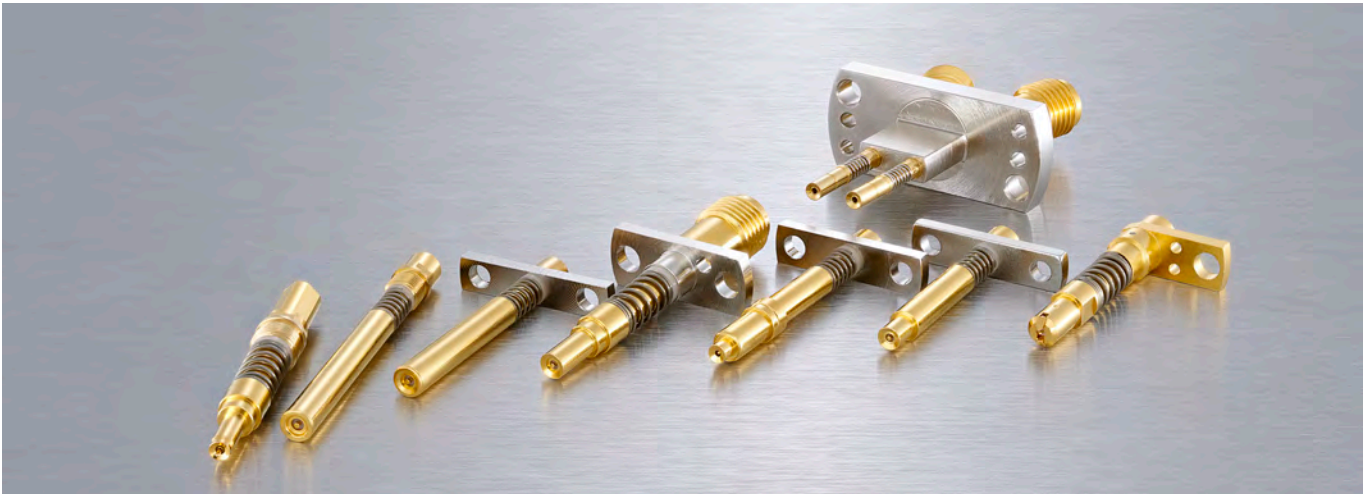


HF77-0002 MateAX-M 12 P MSMP BG04-1
Order Code: HF77-0002BG04-1



HF77-0002 MateAX-M 12 P MSMP
Order Code: HF7716B0002G530

COAXIAL PROBES FOR RADIO FREQUENCY MEASUREMENTS



Coaxial probe HF66 up to 6 GHz

HSC (Male):			HF66-0006 HSC 6 S M-SMP Order Code: HF66-0006
HSC (Male):			HF66-0008 HSC 6 F SMA Order Code: HF66-0008
JSC (Male):			HF66-0002 JSC 6 S M-SMP Order Code: HF66-0002
JSC (Male):			HF66-0010 JSC 6 S M-SMP Order Code: HF66-0010
JSC (Male):			HF66-0012 JSC 6 F SMA Order Code: HF66-0012
KSC (Switch):			HF66-0003 KSC 6 F SMA Order Code: HF66-0003

COAXIAL PROBES FOR RADIO FREQUENCY MEASUREMENTS



Coaxial probe HF66 up to 6 GHz

KSC (Switch):



HF66-0005 KSC 6 F M-SMP

Order Code: HF66-0005

KSC (Switch):



HF66-0016 MHF5/KSC 6 F M-SMP

Order Code: HF66-0016

LSC (Male):



HF66-0004 LSC 6 F M-SMP

Order Code: HF66-0004

LSC (Male):



HF66-0011 LSC 6 F SMA

Order Code: HF66-0011

MHF/U.FL (Male):



HF66-0014 MHF/U.FL 6 F M-SMP

Order Code: HF66-0014

MHF5 (Male):



HF66-0016 MHF5/KSC 6 F M-SMP

Order Code: HF66-0016

COAXIAL PROBES FOR RADIO FREQUENCY MEASUREMENTS



Coaxial probe HF66 up to 6 GHz

SWD/SWF/SWG (Switch):			HF66-0013 SW-D/F/G 6 F SMA Order Code: HF66-0013
SWF (Switch):			HF66-0015 SWF 6 F SMA Order Code: HF66-0015
SWG (Switch):			HF66-0007 SWG 6 F SMA Order Code: HF66-0007
SWH (Switch):			HF66-0009 SWH 6 S M-SMP Order Code: HF66-0009
SWJ (Switch):			HF66-0001 SWJ 6 F M-SMP Order Code: HF66-0001


















COAXIAL PROBES FOR RADIO FREQUENCY MEASUREMENTS



Connection Cables for HF60

Connection element with pre-assembled coaxial cable RG 316.
Impedance: 50 Ohm
Cutoff frequency: recommended up to **3 GHz**
Standard length: 700 mm

Connector with pre-assembled coaxial cable Multiflex 86.
Impedance: 50 Ohm
Cutoff frequency: recommended up to **10 GHz**
Standard length: 700 mm

H86oAE1		Coax cable 3GHz 700 mm	unassembled
	MCX-M straight		
H86oAE3		Coax cable 3GHz 700 mm	
	MCX-M straight		SMA-M straight
H86oAE4		Coax cable 3GHz 700 mm	
	MCX-M straight		BNC-M straight
H86oAE2		Coax cable 10GHz 700 mm	
	MCX-M straight		SMA-M straight
H86oAE5		Coax cable 10GHz 1500 mm	
	MCX-M straight		SMA-M straight
H86oAE6		Coax cable 10GHz 800 mm	
	MCX-M angled		MCX-M straight
H66AE1		Coax cable 6GHz 700 mm	
	SMA-M angled		mSMP-F straight
H66AE2		Coax cable 6GHz 700 mm	
	SMA-M straight		mSMP-F straight
H66AE3		Coax cable 6GHz 300 mm	
	SMA-M angled		SMA-M straight

Connection Cables for HF66

Connector with pre-assembled highly flexible coaxial cable.
Impedance: 50 Ohm
Cutoff frequency: recommended up to **6 GHz**

COAXIAL PROBES FOR RADIO FREQUENCY MEASUREMENTS



Coaxial probe HF60 up to 8 GHz

BMA (Male):			HF60-0011 BMA-M 5 P MCX Order Code: HF86005B0011G530
BNC (Female):			HF60-0016 BNC-F 4 P MCX Order Code: HF86002B0016G550
DIN 1,0/2,3 (Female):			HF60-0021 1,0/2,3-F 4 P MCX Order Code: HF86002B0021G530
FAKRA (Male):			HF60-0006 FAKRA-M 6 P MCX Order Code: HF86005B0006G470
FAKRA (Male):			HF60-0026 FAKRA-M 6 P MCX Order Code: HF86005B0026G550 HF86005B0026G950
FAKRA (Female):			HF60-0012 FAKRA-F 5 P MCX Order Code: HF86002B0012G930
FME (Male):			HF60-0022 FME-M 4 P MCX Order Code: HF86005B0022G790

COAXIAL PROBES FOR RADIO FREQUENCY MEASUREMENTS



Coaxial probe HF60 up to 8 GHz

R-SMA (Female):



HF60-0018 R-SMA-F 6 P MCX
Order Code: HF86005B0018G530

SMA (Female):



HF60-0001 SMA-F 8 P MCX
Order Code: HF86002B0001G530
HF86002B0001G990

SMB (Female):



HF60-0005 SMB-F 6 P MCX
Order Code: HF86002B0005G530

SMB (Male):



HF60-0004 SMB-M 5 P MCX
Order Code: HF86005B0004G530

SMC (Male):



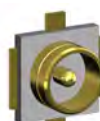
HF60-0003 SMC-M 5 P MCX
Order Code: HF86005B0003G530

R-TNC (Female):



HF60-0015 R-TNC-F 2 P MCX
Order Code: HF86005B0015G450

U.FL (Male):



HF60-0002 U.FL-M 5 P MCX
Order Code: HF86005B0002G530

COAXIAL PROBES FOR RADIO FREQUENCY MEASUREMENTS



Coaxial probe HF60 up to 8 GHz

GT16 (Male):



HF60-0023 GT16-M 4 P MCX
Order Code: HF86005B0023G530

MMBX (Female):



HF60-0024 MMBX-F 4 P MCX
Order Code: HF86002B0024G530

MMCX (Female):



HF60-0014 MMCX-F 6 P MCX
Order Code: HF86002B0014G530

mSMP (Male):



HF60-0013 MSMP-M 6 P MCX
Order Code: HF86005B0013G530

N-Connector (Female):



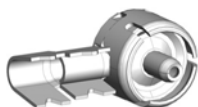
HF60-0027 N-F 6 P MCX
Order Code: HF86002B0027G430

QMA (Female):



HF60-0017 QMA-F 6 P MCX
Order Code: HF86002B0017G730

RF (Male):



HF60-0007 RF-M 5 P MCX
Order Code: HF86005B0007G530

COAXIAL PROBES FOR RADIO FREQUENCY MEASUREMENTS



Coaxial probe HF60 up to 8 GHz

PCB GSG:



HF60-0009 GSG 4 P MCX 135
Order Code: HF86002B0009G960

PCB GSGGG:



HF60-0025 GSGGG 4 P MCX 135
Order Code: HF86002B0025G960

PCB
Coax closed:



HF60-0019 PCB-coax-closed 4 P MCX
Order Code: HF86018B0019G530

PCB
Coax open:



HF60-0008 PCB-coax-open 4 P MCX
Order Code: HF86002B0008G530

PCB
Coax open:

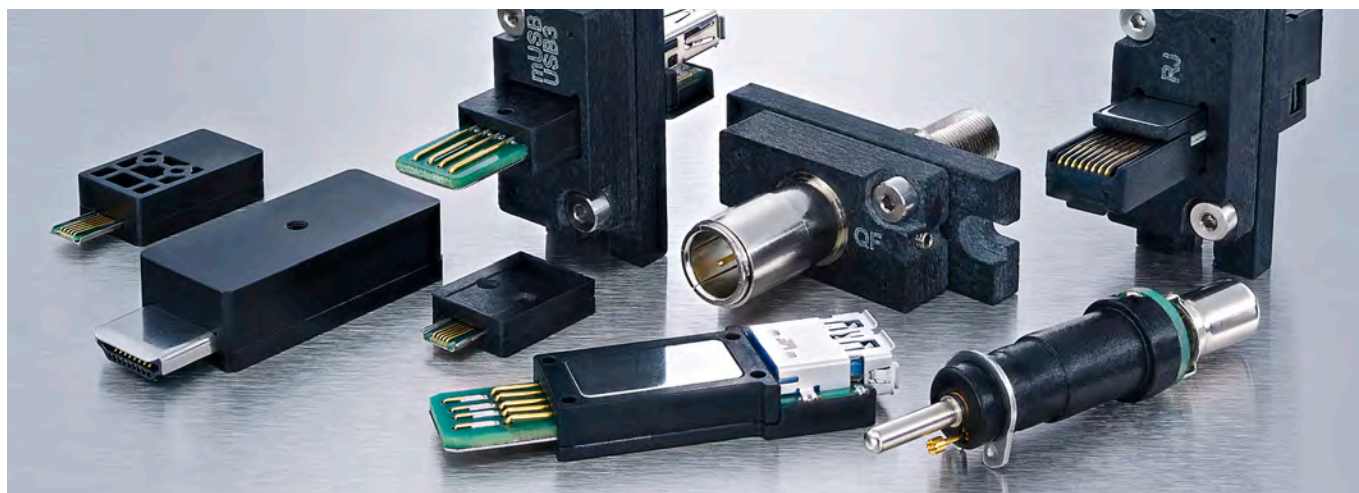


HF60-0010 PCB-coax-open 4 P MCX
Order Code: HF86018B0010G530
HF86018B0010G930

PCB
Coax kidney:



HF60-0020 PCB-coax-kidney 4 P MCX
Order Code: HF86018B0020G530



Long-life test connectors for in-circuit, functional and wire harness testing

The need for contacting common USB, RJ or HDMI connector types is not only increasing in the **in-circuit and functional test** of printed circuit boards, but is also becoming more and more important in the **wire harness test**.

Advantages when using FEINMETALL test connectors

- Very high contact cycles; up to 200,000 (depending on test specimen)
- Test connectors do not snap into the DUT compared to normal plugs
- Unnecessary loading or damage to the contact springs in the test piece is avoided
- fixture-side connection of the test connector is very simple and solder-free, using a standard connector (plug and play). In case of maintenance, it is very easy to replace the test connector.

The test connectors can be easily and effectively integrated into test fixtures and test modules. The contacting of the test specimen can be done either by the travel of the fixture or module. Alternatively, it can be integrated into a pneumatically controlled contacting unit (assembly instructions available).

With these new test connectors, FEINMETALL completes its portfolio of contact probes for test engineering and can now offer you even more comprehensive contacting solutions from a single source.

RJ 09



TC-P 201 004 RJ 09

Order code: 2112151

Max. data rate: 1 Gbit/s
Contact cycles: 200.000
Current: 1,5 A at 25°C
Number Poles: 4

RJ 11



TC-P 201 006 RJ 11

Order code: 2112152

Max. data rate: 1 Gbit/s
Contact cycles: 200.000
Current: 1,5 A at 25°C
Number Poles: 6

RJ 45



TC-P 201 008 RJ 45

Order code: 2112142

Max. data rate: 1 Gbit/s
Contact cycles: 200.000
Current: 1,5 A at 25°C
Number Poles: 8

RJ 50



TC-P 201 010 RJ 50

Order code: 2112153

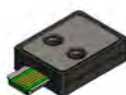
Max. data rate: 1 Gbit/s
Contact cycles: 200.000
Current: 1,5 A at 25°C
Number Poles: 10

CONTACTS FOR COMMON CONNECTOR TYPES



FEINMETALL
Contact Technologies

Micro-USB



TC-P 195 005 USB 2.0 B micro

Order code: 2112145

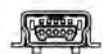
Max. data rate: 480 Mbit/s

Contact cycles: 200.000

Current: 1,5 A at 25°C

Number Poles: 5

Mini-USB



TC-P 198 005 USB 2.0 B mini

Order code: 2112757

Max. data rate: 480 Mbit/s

Contact cycles: 200.000

Current: 1,0 A at 25°C

Number Poles: 5

USB Type A



TC-P 198 004 USB 2.0 A

Order code: 2112143

Max. data rate: 480 Mbit/s

Contact cycles: 200.000

Current: 1,5 A at 25°C

Number Poles: 4

USB Type A



TC-P 198 009 USB 3.0 A

Order code: 2112159

Max. data rate: 4 Gbit/s

Contact cycles: 50.000

Current: 1,5 A at 25°C

Number Poles: 9

USB Type C



TC-P 756 024 USB 3.1 C

Order code: 211219

Max. data rate: 5 Gbit/s

Contact cycles: 50.000

Current: 5,0 A at 25°C

Number Poles: 24

HDMI 1.4



TC-P 197 019 HDMI 1.4

Order code: 2112148

Max. data rate: 8,16 Gbit/s

Contact cycles: 50.000

Current: 0,5 A at 25°C

Number Poles: 19

HDMI 2.0



TC-P 226 019 HDMI 2.0

Order code: 211218

Max. data rate: 14,4 Gbit/s

Contact cycles: 50.000

Current: 0,5 A at 25°C

Number Poles: 19

F-Type



TC-P 196 001 F QF

Order code: 2112149

Max. data rate: 300 khz - 3 Ghz

Contact cycles: 50.000

Current: 1,5 A at 25°C

Number Poles: (Coaxial)

RCA (Chinch)



TC-P 200 002 RCA

Order code: 2112150

Max. data rate: 500 khz

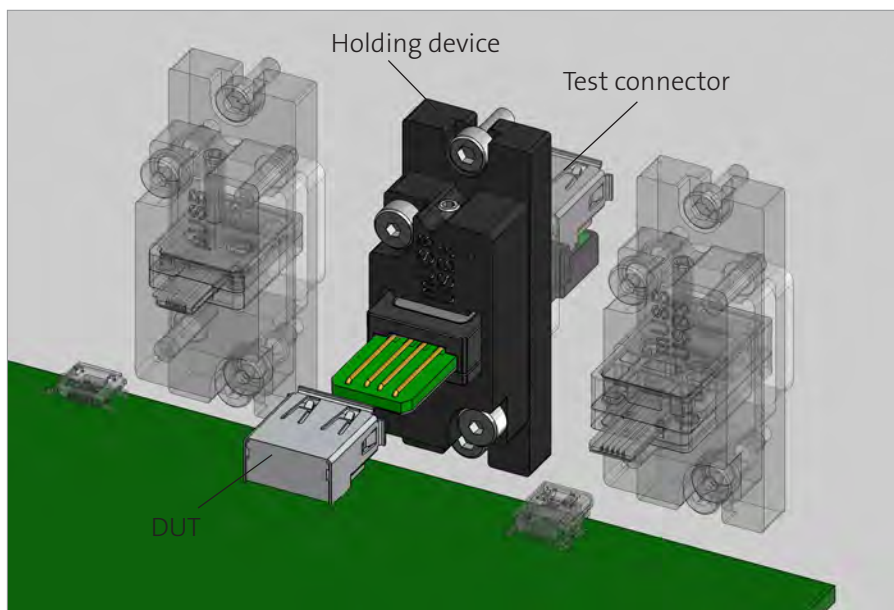
Contact cycles: 200.000

Current: 1,5 A at 25°C

Number Poles: (Coaxial)

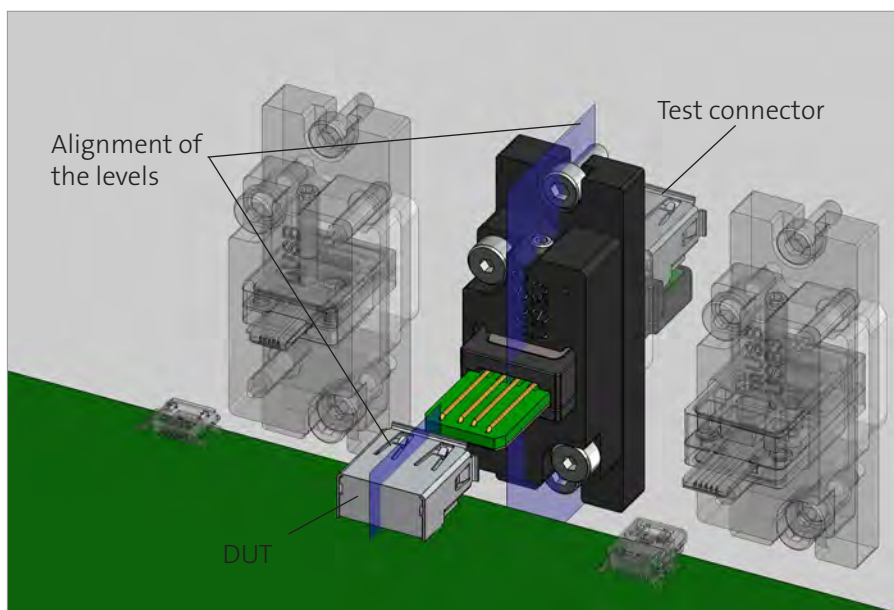
MOUNTING OF TEST CONNECTORS

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

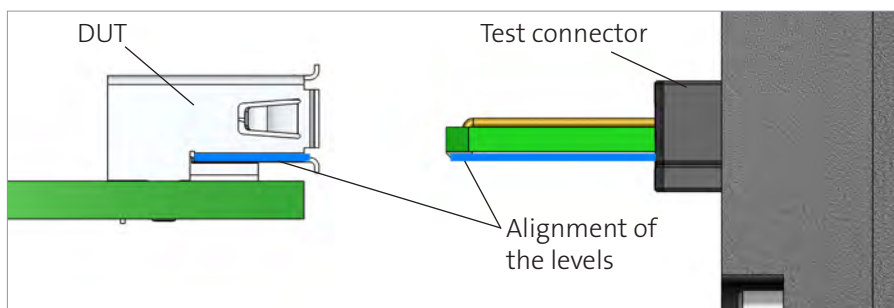


Please note the following guidelines for building up a test fixture

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

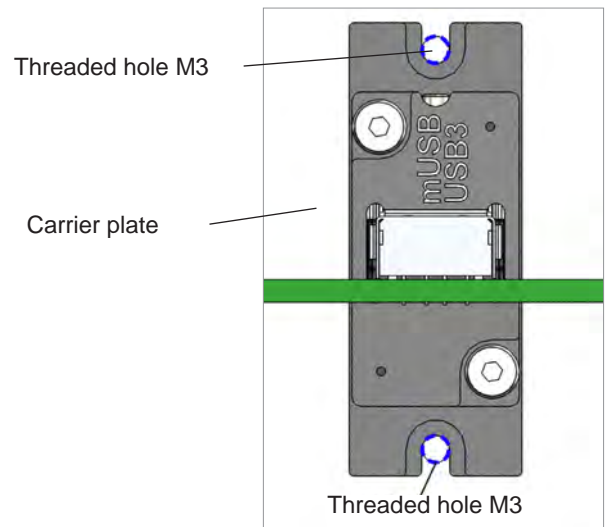


Align the lower level of the test connector on the lower internal level of the connector to test (DUT)

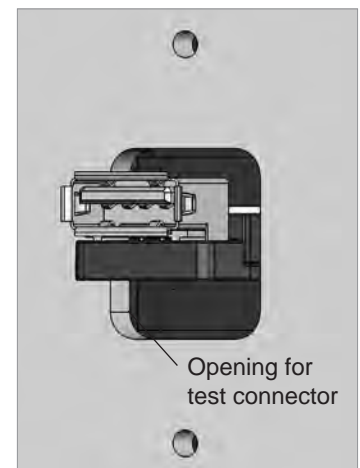
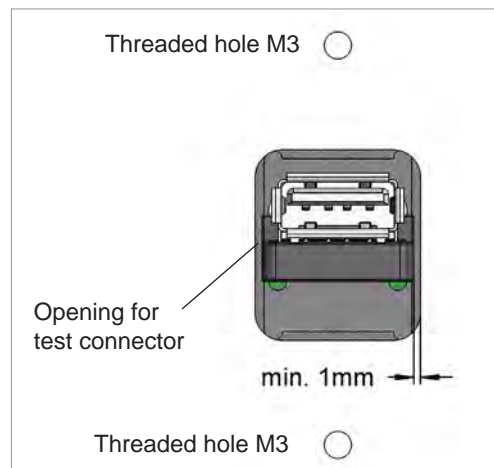


MOUNTING OF TEST CONNECTORS

Place two opposite threaded holes M3 onto the carrier plate. For fixing of the holding device, two screws M3x8 (ISO4768) are required - **not included in delivery!**

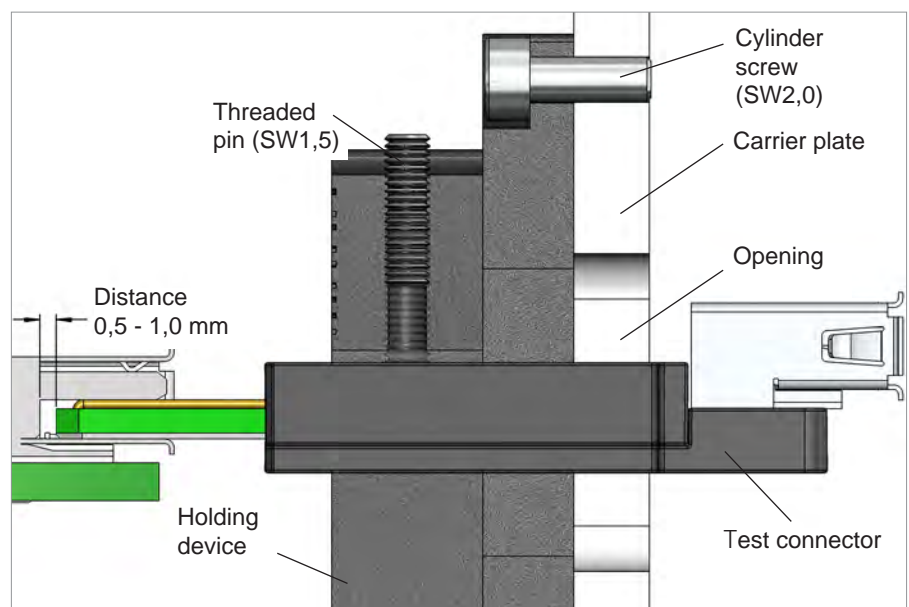


Cut a sufficient opening into the carrier plate to have enough space for later insertion of the test connector from the back. Leave at least 1 mm space between opening and test connector.

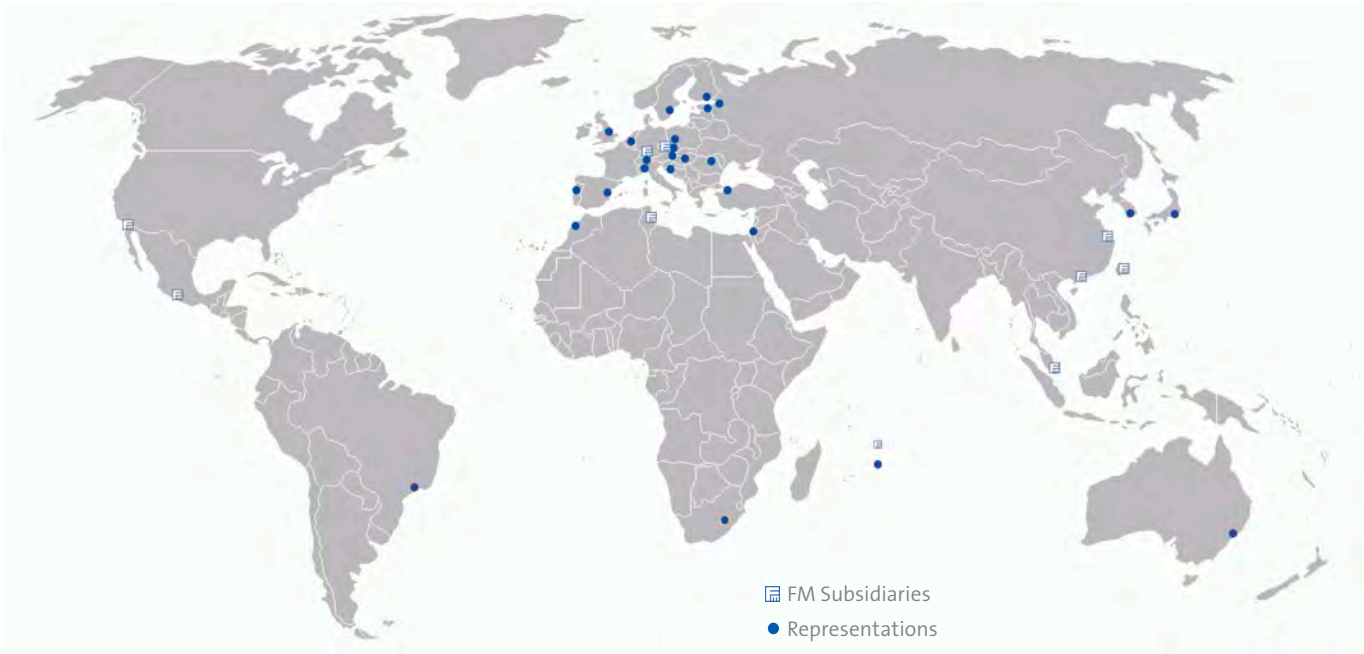


Loosen the retaining screw of the test connector. Insert the test connector into the DUT until it comes to rest. Retract the test connector for 0.5 to 1 mm in order to prevent damages of the DUT.

Now the test connector can be fixed by using the threaded pin.



INTERNATIONALLY POSITIONED FOR YOU



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You have test demands with specific requirements and you need a tailor-made solution?

In our catalogues you find contact probes for:

- **Board test**
- **Wire harness test**
- **Limited space**
- **High current and coaxial applications**



MARKETING060 / Version 2



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