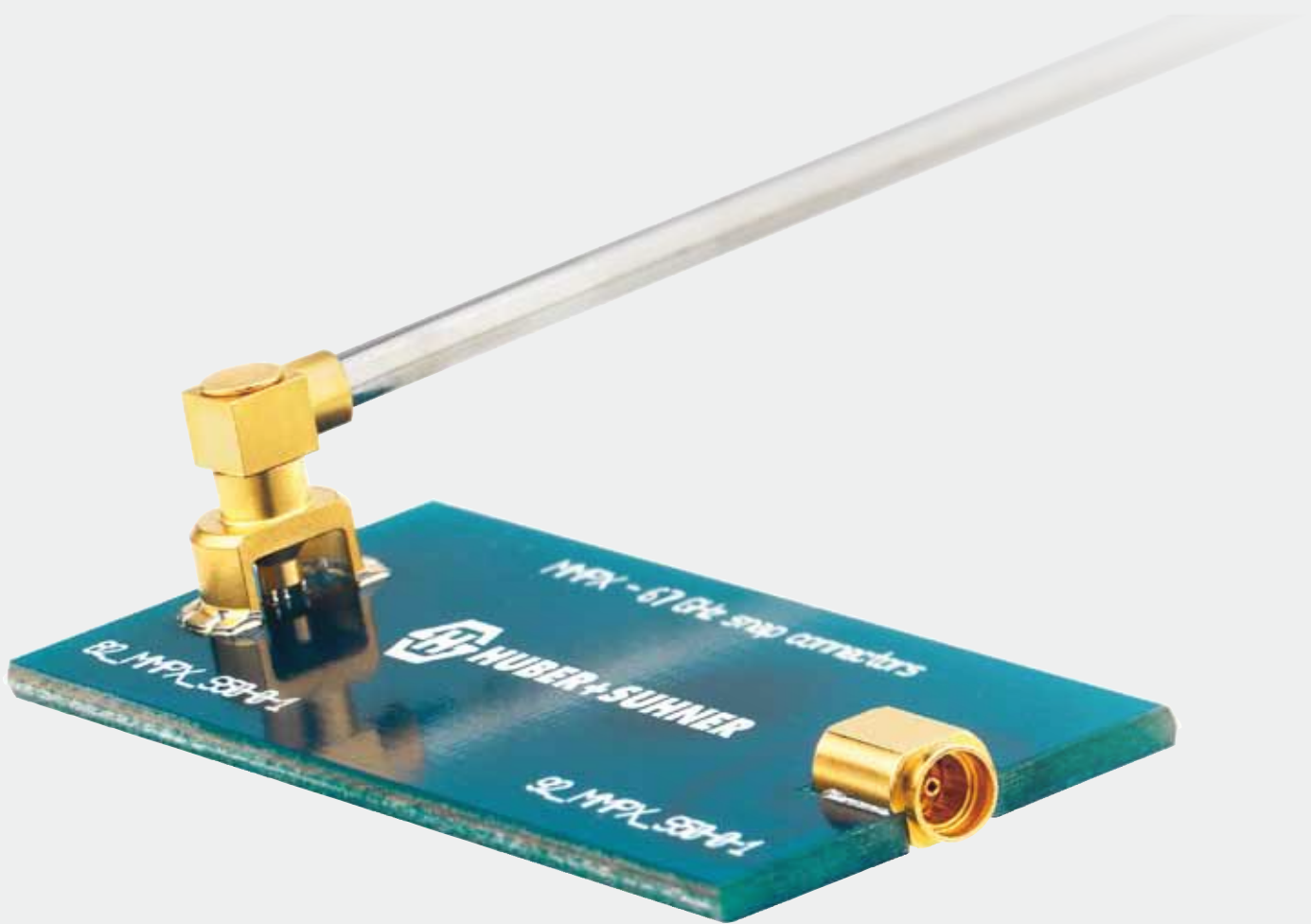


# MMPX

67 GHz / 80 Gbps Snap-on Connectors Patented US 7,294,023

Edition 2011



# Leading Edge RF Technology





### **Your partner for system solutions**

The HUBER+SUHNER Group is a leading global supplier of components and systems for electrical and optical connectivity. We offer technical knowledge in radio frequency technology, fiber optics and low frequency under one roof, thus providing a unique basis for continual innovation focused on the needs of our customers all over the world.

### **Leading edge radio frequency technology**

HUBER+SUHNER's extensive range of high quality components are matched to the various needs with excellent electrical performance in numerous markets. All these products are distinguished by their high performance and stable characteristics - the result of years of experience in the development and production of radio frequency components.

## Snap into the Future

The snap-on connector family MMPX is the most ideal coaxial-to-PCB system solution for operating frequencies up to 67 GHz and data rates up to 80 Gbps. The comprehensive product range consists of cable connectors and assemblies, PCB connectors and adapters to open standards. MMPX connectors feature excellent electrical performance at smallest mechanical dimensions. The broadband characteristics, the small size and the outstanding performance permit new solutions for applications in numerous markets such as high speed digital testing and radio frequency testing (60 GHz WPAN), industrial, mobile communication, space and defence.



## Smallest Dimensions – highest Performance

### Key features

- True 67 GHz/80 Gbps coaxial-to-PCB transition
- Broadband characteristics from DC to 67 GHz
- Excellent return loss
- Excellent shielding – low cross-talk
- Via-in-pad capable
- 5.08 mm pitch (0.2")
- Mechanically robust design
- Extensive technical support
- 3D-files, modelling data and customised footprints

### Benefits

- Future proof design  
Thanks to the broadband characteristics, the excellent return loss and the true 67 GHz coaxial-to-PCB transition MMPX helps in developing future proof RF systems.
- Quick and reliable mating  
The MMPX snap-on mechanism is completely decoupled from the electrical path and therefore specifically optimised for quick and reliable mating.
- Space saving  
The minimal pitch on boards of 5.08 mm (0.2 inch) saves expensive board material.
- One connector for several applications  
The unique electrical and mechanical performance as well as the compact form makes MMPX ideal for a variety of applications.
- Overall cost saving  
The attractive pricing, the extensive technical support including footprint service and the HUBER+SUHNER one-stop shop approach minimises the overall costs for design-ins and trade procedures.

### Comprehensive product range

- Various PCB connector and cable connector types
- Broad range of standard HUBER+SUHNER MULTIFLEX 86 assemblies (MMPX to SMA, 3.5 mm, 2.92 mm and 1.85 mm / phase match: +/- 1 ps absolute)
- Customised assemblies with semi-rigid, HUBER+SUHNER SUCOFORM and MULTIFLEX cables
- Adapters to 2.92 mm and 1.85 mm

# Technical Data

Electrical data				
Impedance	50 Ω			
Frequency range	DC ... 67 GHz			
Return loss (see diagrams on page 7)	typical values for coaxial-to-PCB transition (measured) <sup>1)</sup>			
	configuration	DC ... 26.5 GHz	26.5 ... 50 GHz	50 ... 67 GHz
	straight PCB jack mated with a straight cable plug	25 dB	20 dB	10 dB
	straight PCB jack mated with a right angle cable plug	25 dB	20 dB	10 dB
	edge mount PCB jack mated with a straight cable plug	25 dB	20 dB	16 dB
RF-leakage (interface only)	- 60 dB (DC ... 67 GHz)			
Dielectric withstanding voltage (at sea level)	500 V rms, 50 Hz			
Working voltage (at sea level)	≤ 170 V rms, 50 Hz			
Insulation resistance	≥ 1 GΩ			
Contact resistance				
- centre contact	≤ 5 mΩ			
- outer contact	≤ 2 mΩ			

<sup>1)</sup> Valid for recommended PCB material/stacking only!

Mechanical data	
Engagement force	max. 30 N / 6.7 lb <sub>f</sub> (typical 20 N / 4.4 lb <sub>f</sub> )
Disengagement force	max. 30 N / 6.7 lb <sub>f</sub> (typical 15 N / 3.3 lb <sub>f</sub> )
Durability (matings)	100 (adapters: 500)

Environmental data	Testing conditions
Temperature range	- 65 °C ... + 155 °C / - 85 °F ... + 311 °F
Thermal shock	MIL-STD-202, Method 107 G, Condition A/F
High temperature endurance	IEC-61-169-1
Corrosion	MIL-STD-202, Method 101, Condition B
Vibration	MIL-STD-202, Method 204 D, Condition D
Mechanical shock	MIL-STD-202, Method 213 D, Condition I
Solderability	MIL-STD-883D

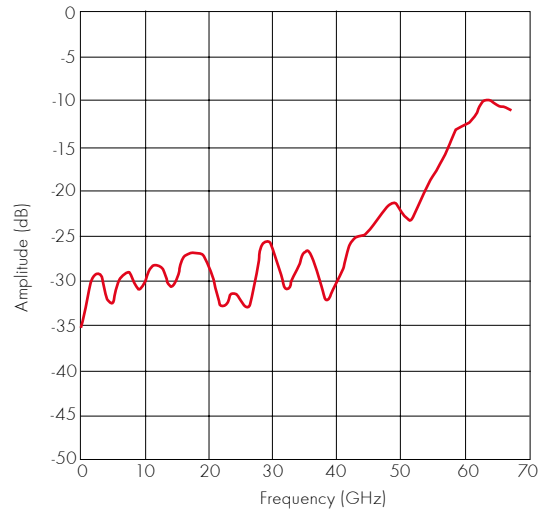
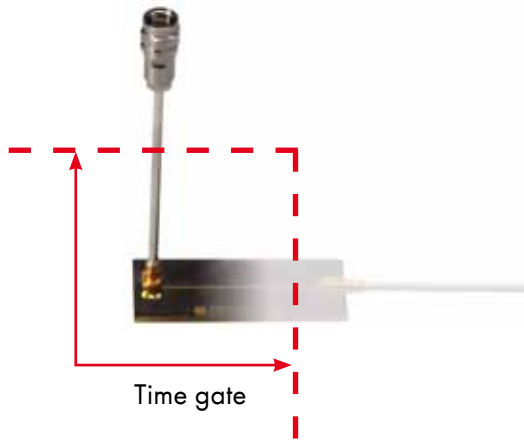
Processing data		
Typical values adherent to the PCB	straight PCB jack full SMT	edge mount PCB full SMT
- shearing	90 N / 20.2 lb <sub>f</sub>	70 N / 15.7 lb <sub>f</sub>
- pulling (vertical to the PCB)	50 N / 11.2 lb <sub>f</sub>	no standard value available

Material data		
Male connector parts	Material	Plating
Centre contact	CuBe / brass	SUCOPRO®
Outer contact	brass	SUCOPRO®
Body	brass	SUCOPRO®
Insulators	PTFE	
Female connector parts		
Centre contact	CuBe	SUCOPRO®
Outer contact	CuBe	SUCOPRO®
Body	brass	SUCOPRO®
Insulators	PTFE	

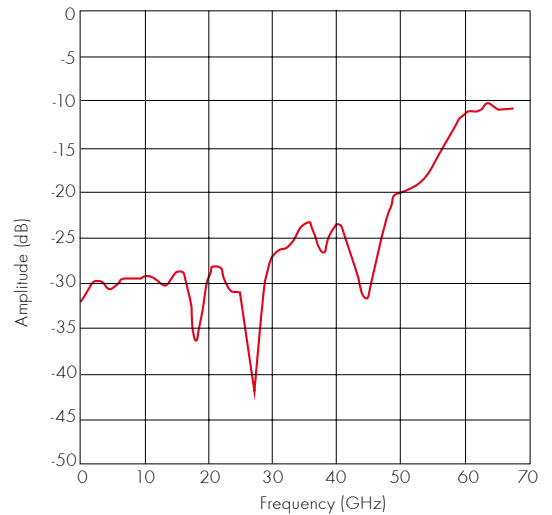
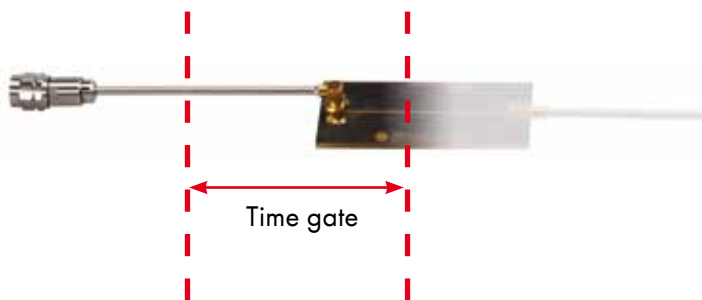
Some connectors may have a specification that differs from the mentioned data.

# Typical Return Loss (measured)

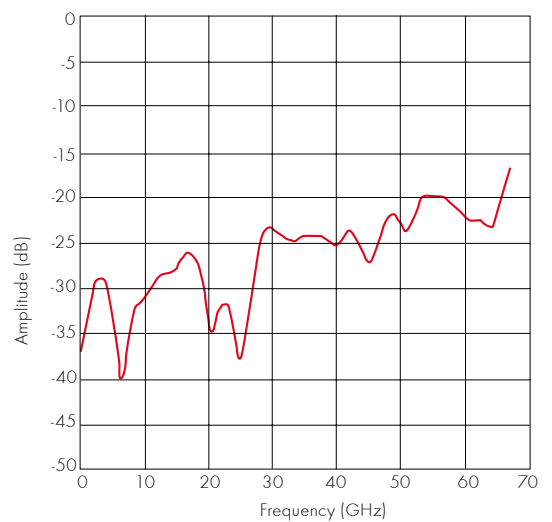
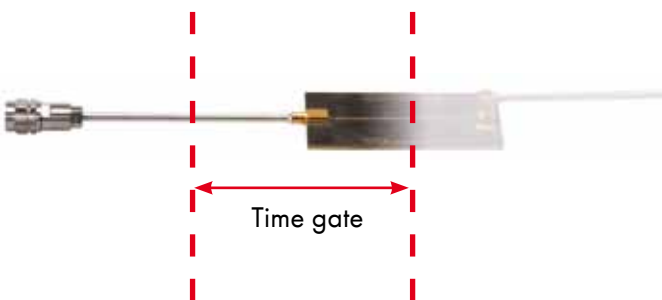
Straight cable plug mated with a straight PCB jack



Right angle cable plug mated with a straight PCB jack



Straight cable plug mated with an edge mount PCB jack



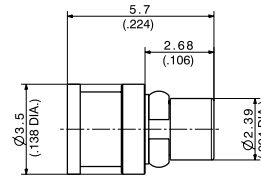
Note:

The measured assemblies are equipped with semi-rigid cable SR\_86\_TP\_LA (see page 20)

# Straight Cable Plugs (Male)

## For semi-rigid cables

- Outer contact soldered
- Center contact soldered
- Decoupling tool 74\_Z-0-0-491 or 74\_Z-0-0-555 recommended



HUBER+SUHNER type	Item no.	Cable size	Packaging	Notes
11_MMPX-50-2-1/111_NE	84022225	0.086"	single	Air dielectric - no support bead. For optimal electrical performance. For semi-rigid cables only!

## For semi-rigid, semi-flexible or flexible cables

- Outer contact soldered
- Center contact plugged
- Decoupling tool 74\_Z-0-0-491 or 74\_Z-0-0-555 recommended

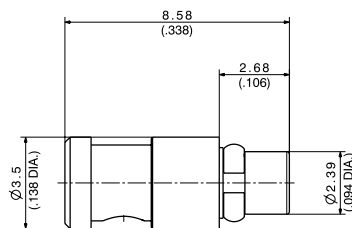


Fig. 1

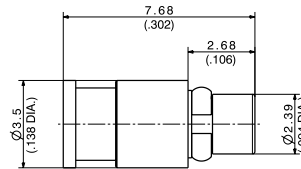


Fig. 2

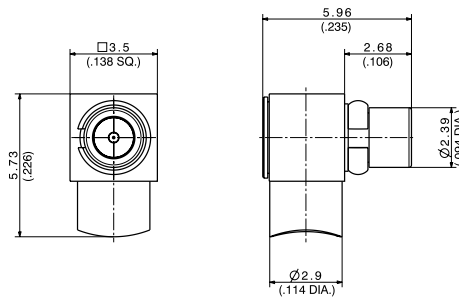
HUBER+SUHNER type	Item no.	Cable size	Packaging	Notes	Fig.
11_MMPX-50-1-4/111_NE	84122130	0.053"	single	for HUBER+SUHNER MULTIFLEX cables	1
11_MMPX-50-2-2/111_NE	84022228	0.086"	single	for semi-rigid and HUBER+SUHNER SUCOFORM cables	2
11_MMPX-50-2-3/111_NE	84089228	0.086"	single	for HUBER+SUHNER MULTIFLEX cables	2



## Right Angle Cable Plugs (Male)

For semi-rigid, semi-flexible or flexible cables

- Outer contact soldered
- Center contact plugged
- Decoupling tool 74\_Z-0-0-491 or 74\_Z-0-0-555 recommended

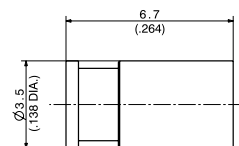


HUBER+SUHNER type	Item no.	Cable size	Packaging	Notes
16_MMPX-50-2-1/111_NE	84022227	0.086"	single	for semi-rigid and HUBER+SUHNER SUCOFORM cables
16_MMPX-50-2-2/111_NE	84067778	0.086"	single	for HUBER+SUHNER MULTIFLEX cables

## Straight Cable Jack (Female)

For semi-rigid, semi-flexible or flexible cables

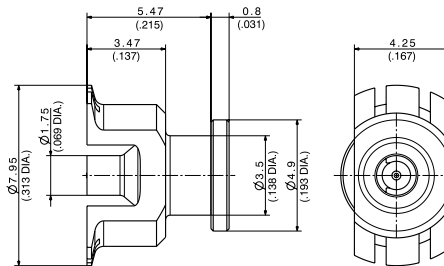
- Outer contact soldered
- Center contact soldered
- Decoupling tool 74\_Z-0-0-491 or 74\_Z-0-0-555 recommended



HUBER+SUHNER type	Item no.	Cable size	Packaging	Notes
21_MMPX-50-2-1/111_NE	84022226	0.086"	single	for semi-rigid and HUBER+SUHNER SUCOFORM cables

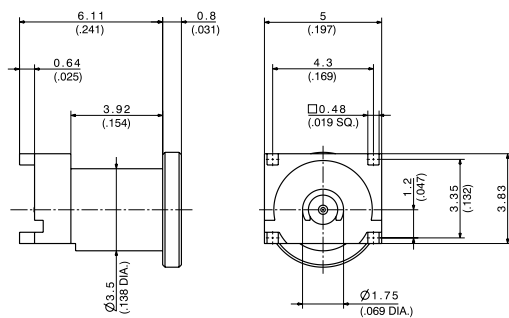
## Straight PCB Jacks (Female)

- Full SMD
- Super structure for high peel strength
- Decoupling tool 74\_Z-0-0-491 or 74\_Z-0-0-555 recommended



HUBER+SUHNER type	Item no.	PCB footprint	Packaging	Notes
82_MMPX-S50-0-2/111_NM	84096711	on request	tape	blister tape containing 10 pcs.
82_MMPX-S50-0-2/111_NM-1	84096752	on request	tape/reel	reeled blister tape containing 750 pcs.

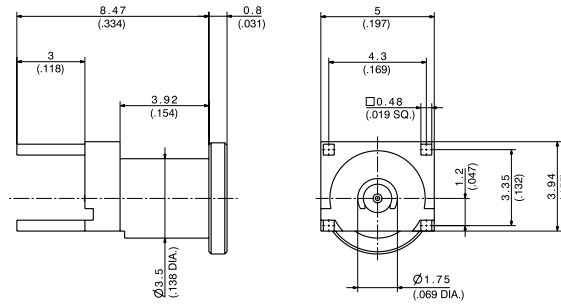
- Semi SMD
- Short leg version
- Decoupling tool 74\_Z-0-0-491 or 74\_Z-0-0-555 recommended



HUBER+SUHNER type	Item no.	PCB footprint	Packaging	Notes
96_MMPX-50-0-2/111_NM-1	84093961	on request	tape	blister tape containing 10 pcs.
96_MMPX-50-0-2/111_NM	84093966	on request	tape/reel	reeled blister tape containing 750 pcs.

# Straight PCB Jacks (Female)

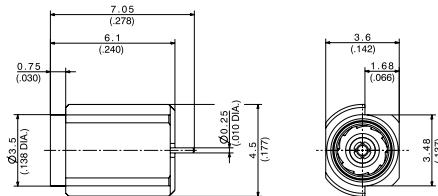
- Semi SMD
- Long leg version
- Decoupling tool 74\_Z-0-0-491 or 74\_Z-0-0-555 recommended



HUBER+SUHNER type	Item no.	PCB footprint	Packaging	Notes
96_MMPX-50-0-3/111_NM-1	84099981	on request	tape	blister tape containing 10 pcs.
96_MMPX-50-0-3/111_NM	84099988	on request	tape/reel	reeled blister tape containing 450 pcs.

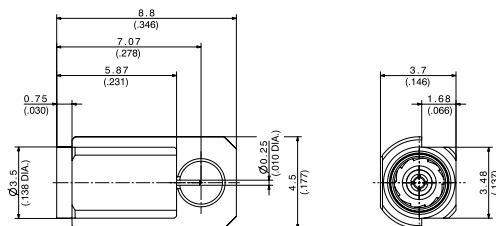
## Straight PCB Jacks (Female), edge-mount

- Full SMD
- PCB cut out necessary
- Decoupling tool 74\_Z-0-0-491 or 74\_Z-0-0-555 recommended



HUBER+SUHNER type	Item no.	PCB footprint	Packaging	Notes
92_MMPX-S50-0-1/111_NM	84009138	on request	tape	blister tape containing 10 pcs.
92_MMPX-S50-0-1/111_NM-1	84009140	on request	tape/reel	reeled blister tape containing 500 pcs.

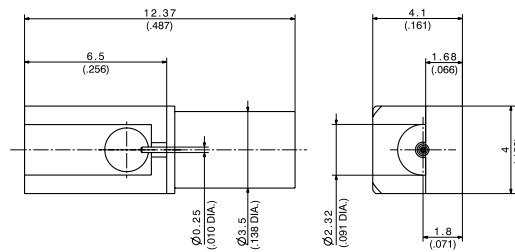
- Full SMD
- Extra shielded
- PCB cut out necessary
- Operating frequency range DC up to 26.5 GHz
- Decoupling tool 74\_Z-0-0-491 or 74\_Z-0-0-555 recommended



HUBER+SUHNER type	Item no.	PCB footprint	Packaging
92_MMPX-S50-0-2/111_NE	84116110	on request	single

## Straight PCB Jacks (Female), edge-mount

- Full SMD
- No PCB cut out necessary
- Operating frequency range DC up to 15 GHz
- Decoupling tool 74\_Z-0-0-491 or 74\_Z-0-0-555 recommended



HUBER+SUHNER type	Item no.	PCB footprint	Packaging	Notes
92_MMPX-S50-0-3/111_NM-1	84100614	on request	tape	blister tape containing 10 pcs.
92_MMPX-S50-0-3/111_NM	84096563	on request	tape/reel	reeled blister tape containing 1750 pcs.

## Adapters MMPX to PC 2.92 [SK] (2.92 mm Standard)

- Operating frequency range DC up to 40 GHz
- Fully characterised adapters for deembedding on request

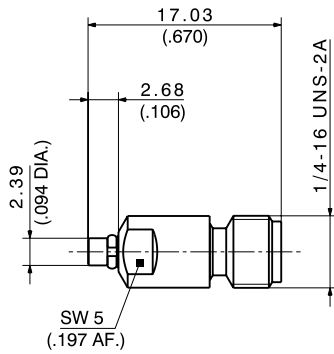


Fig. 1

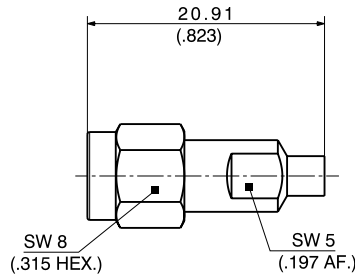


Fig. 2

HUBER+SUHNER type	Item no.	Gender	Packaging	Fig.
33_MMPX-SK-50-1/199_NE	84071648	MMPX male to SK female	single	1
33_SK-MMPX-50-1/199_NE	84071696	SK male to MMPX female	single	2

## Adapters MMPX to PC 1.85 (1.85 mm Standard)

- Operating frequency range DC up to 65 GHz
- Fully characterised adapters for deembedding on request

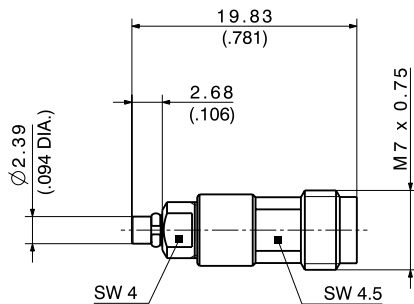


Fig. 1

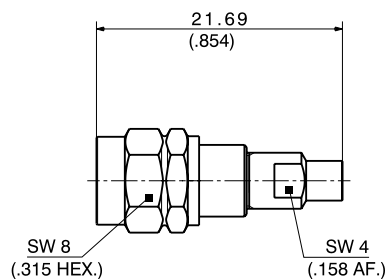


Fig. 2

HUBER+SUHNER type	Item no.	Gender	Packaging	Fig.
33_MMPX-PC185-50-1/111_NE	84004922	MMPX male to SK female	single	1
33_PC185-MMPX-50-1/111_NE	84004935	SK male to MMPX female	single	2

# Evaluation Kit

## Set includes:

### Adapters

- 2 x MMPX to PC 1.85

### Assemblies

- 2 x MULTIFLEX 86 cable assemblies MMPX to PC 1.85 (152 mm / 6")
- 2 x Semi-rigid 86 cable assemblies MMPX to PC 1.85 (152 mm / 6")

### PCB

- MMPX PCB connectors (pattern 82, 92 and 96, see pages 10/11 and 12)
- Material: Rogers RO3003
- Substrate thickness: 0.127 mm (5 mil)
- Dielectric constant  $\epsilon_r$ : 2.3

### USB stick

- S-parameters
- 3D-files
- Datasheets

HUBER+SUHNER type EK\_MMPX-1  
Item no. 84122121

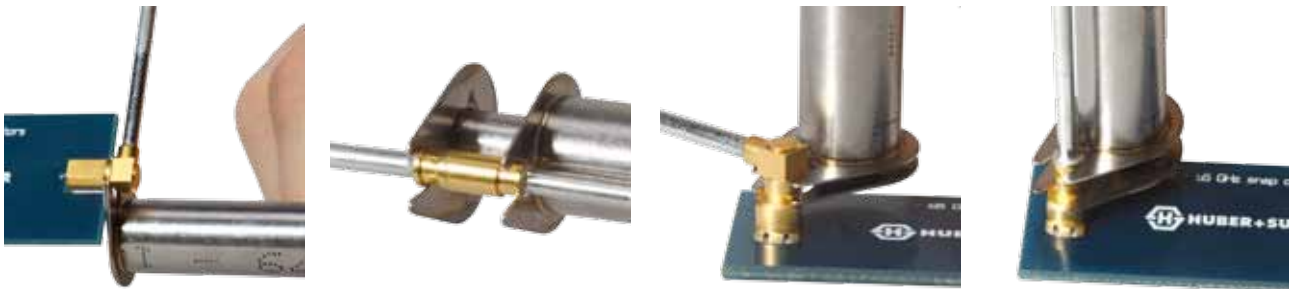


## Decoupling Tools

### «All-round» decoupling tool

This decoupling tool is suitable for all kind of MMPX combinations.

HUBER+SUHNER type 74\_Z-0-0-555  
Item no. 84020011



### «PCB» decoupling tool

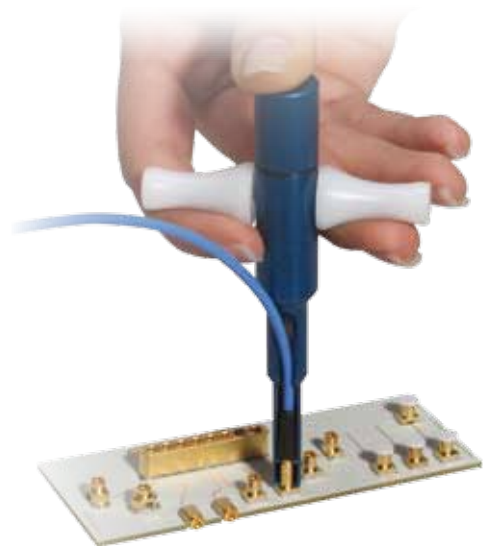
This high-end decoupling tool is especially suited for decoupling MMPX combinations when the PCB connectors are placed very close to each other. The anodized surface is non-conductive and helps to prevent short-cutting circuits on the PCB.

Note: Suitable for flexible cables only!

#### Possible combination of patterns

- 11\_MMPX / 82\_MMPX
- 11\_MMPX / 92\_MMPX
- 11\_MMPX / 96\_MMPX
- 16\_MMPX / 82\_MMPX
- 16\_MMPX / 96\_MMPX

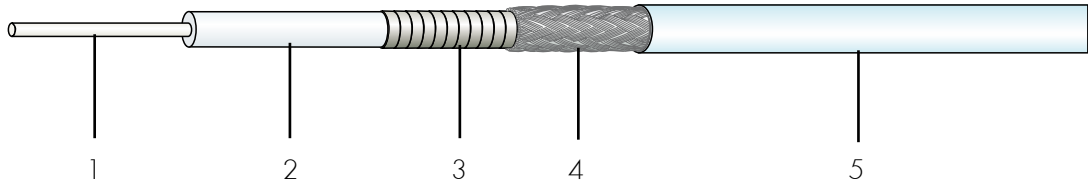
HUBER+SUHNER type 74\_Z-0-0-491  
Item no. 84114252





## Cable Data

### MULTIFLEX 53 - the high flexible microwave cable



	Description	Diameter
1. Centre conductor	solid silver-plated copper wire	0.31 mm
2. Dielectric	solid PTFE	0.99 mm
3. 1 <sup>st</sup> outer conductor	silver-plated copper tape	1.22 mm
4. 2 <sup>nd</sup> outer conductor	silver-plated copper braid	1.42 mm
5. Jacket	fluoroethylenepropylene, sky blue	1.74 mm

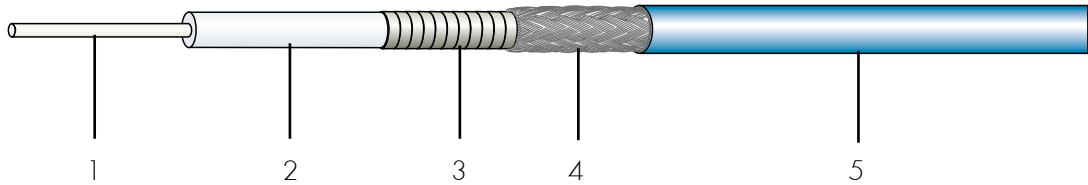
Electrical cable data			
Impedance	50 Ohm		
Operating frequency	40 GHz		
Capacitance	95.5 pF/m (29.1 pF/ft)		
Velocity of propagation	70 %		
Time delay	4.8 ns/m (1.46 ns/ft)		
Nom. attenuation*	coefficient a	1.089	coefficient b 0.032
Max. attenuation*	coefficient a	1.143	coefficient b 0.035
Max. operating voltage	750 Vrms		
Min. screening effectiveness up to 18 GHz	90 dB		

\*Attenuation calculation  $\alpha_{25} = a \cdot \sqrt{f} \text{ (GHz)} + b \cdot f \text{ (GHz)}$  (dB/m)

General cable data	
Temperature range	- 65 ... + 165 °C
Weight	0.85 kg/100 m
Min. bending radius static	10 mm

## Cable Data

### MULTIFLEX 86 HE – the flexible microwave cable



	Description	Diameter
1. Centre conductor	solid silver-plated copper wire	0.47 mm
2. Dielectric	solid PTFE	1.48 mm
3. 1 <sup>st</sup> outer conductor	silver-plated copper tape	1.71 mm
4. 2 <sup>nd</sup> outer conductor	silver-plated copper braid	2.11 mm
5. Jacket	fluoroethylenepropylene, blue	2.65 mm

Electrical cable data				
Impedance	50 Ohm			
Operating frequency	67 GHz			
Capacitance	95 pF/m (29 pF/ft)			
Velocity of propagation	71 %			
Time delay	4.7 ns/m (1.4 ns/ft)			
Nom. attenuation*	coefficient a	0.71702	coefficient b	0.02892
Max. attenuation*	coefficient a	0.75288	coefficient b	0.03037
Max. operating voltage	1.5 kVrms			
Min. screening effectiveness up to 18 GHz	90 dB			

\*Attenuation calculation  $\alpha_{25} = a \cdot \sqrt{f} \text{ [GHz]} + b \cdot f \text{ [GHz]}$  (dB/m)

General cable data	
Temperature range	- 65 ... + 165 °C
Weight	2.1 kg/100 m
Min. bending radius static	6 mm

## Cable Data

### SUCOFORM 86 – the handformable microwave cable

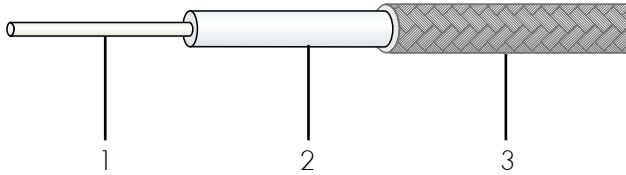


Fig. 1: SUCOFORM\_86

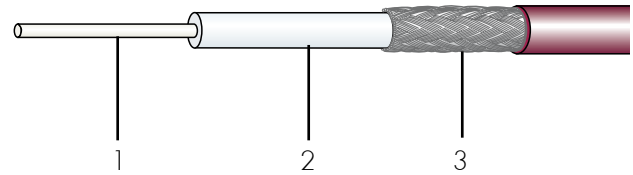


Fig. 2: SUCOFORM\_86\_PE / \_86\_FEP

	Description	Diameter
1. Centre conductor	solid silver-plated copper clad-steel wire	0.53 mm
2. Dielectric	solid PTFE	1.65 mm
3. Outer conductor	tin soaked copper braid	2.10 mm

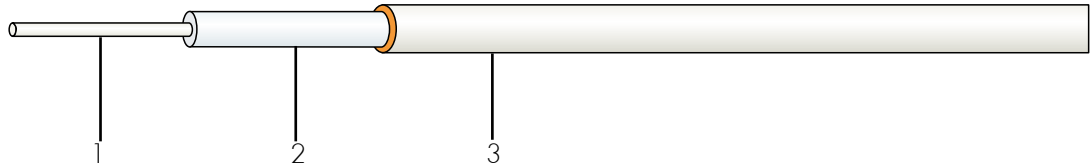
Electrical cable data			
Impedance	50 Ohm		
Operating frequency	40 GHz		
Capacitance	95 pF/m		
Velocity of propagation	71 %		
Time Delay	4.7 ns/m		
Nom. attenuation*	coefficient a	0.6283	coefficient b 0.0400
Max. attenuation*	coefficient a	0.6912	coefficient b 0.0440
Max. operating voltage	1.5 kVrms		
Min. screening effectiveness up to 18 GHz	100 dB		

\*Attenuation calculation  $\alpha_{25} = a \cdot \sqrt{f} \text{ [GHz]} + b \cdot f \text{ [GHz]}$  (dB/m)

General cable data	SUCOFORM_86	SUCOFORM_86_PE	SUCOFORM_86_FEP
Additional jacket	–	PE	FEP
Colour	–	red	red
Diameter	2.10 mm	3.20 mm	2.50 mm
Weight	1.5 kg/100 m	1.7 kg/100 m	1.8 kg/100 m
Temperature range	– 65 ... + 165 °C	– 40 ... + 85 °C	– 65 ... + 165 °C
Flammability, passed	IEC 60332-1, UL 1581-§1080 (VW-1)	–	IEC 60332-1, UL 1581-§1080 (VW-1)
Min. bending radius, static	6 mm	6 mm	6 mm
Min. bending radius, repeated	20 mm	20 mm	20 mm
Drawing	see fig. 1	see fig. 2	see fig. 2

## Cable Data

Semi-Rigid SR\_86\_TP\_LA - the form-stable low loss microwave cable



	Description	Diameter
1. Centre conductor	copper, silver-plated wire	0.51 mm
2. Dielectric	LD PTFE	1.41 mm
3. Outer conductor	copper tin-plated tube, 100 %	2.18 mm

Electrical cable data	
Impedance	50 Ohm +/- 2
Operating frequency	75 GHz
Capacitance	86.92 pF/m
Velocity of propagation	78 %
Time delay	4.3 ns/m
Max. operating voltage	1.5 kVrms
Insulation resistance	$\geq 1 \times 10^8$ MΩm
Min. screening effectiveness up to 20 GHz	> 120 db
Test voltage (50 Hz / 1 min.)	5 kVrms

General cable data	
Temperature range	- 20 ... + 60 °C
Weight	2.8 kg/100 m
Min. bending radius static	6.35 mm
Insulation temperature 2002/95/EC (RoHS)	compliant

## Related Products

### PC 1.85 – the screwed 65 GHz standard

#### Straight cable connectors plug (male) and jack (female)

- Unique electrical performance
- For semi-rigid, HUBER+SUHNER SUCOFORM and MULTIFLEX cables (size 0.086")
- Outer contact soldered
- Centre contact plugged
- +/- 1 ps phase match (absolute) for assemblies possible



HUBER+SUHNER type	Item no.	Gender	Packaging	Notes
11_PC185-50-2-1/19_NE	84082808	male	single	for HUBER+SUHNER MULTIFLEX cables
11_PC185-50-2-2/19_NE	84083483	male	single	for semi-rigid and HUBER+SUHNER SUCOFORM cables
21_PC185-50-2-1/19_NE	84083483	female	single	for HUBER+SUHNER MULTIFLEX cables
21_PC185-50-2-2/19_NE	84116608	female	single	for semi-rigid and HUBER+SUHNER SUCOFORM cables

#### PC 1.85 adapters within series

- Unique electrical performance
- Phase matched



HUBER+SUHNER type	Item no.	Gender	Packaging	Notes
31_PC185-50-0-1/199_NE	84132746	female to female	single	available on request
32_PC185-50-0-1/199_NE	84132748	male to male	single	available on request
33_PC185-50-0-1/199_NE	84019546	male to female	single	available on request

## Related Products

### Recommended precision torque tool for PC 1.85

- High accuracy, 90° deflection
- Calibration certificate
- Suitable as well for SMA, SK (2.92 mm) , PC 3.5 and PC 2.4

HUBER+SUHNER type 74\_Z-0-0-492  
Item no. 84104509



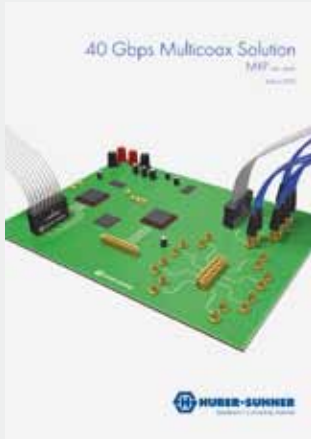
# FURTHER CATALOGUES



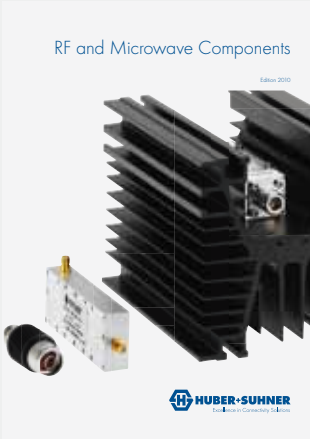
RF Coaxial Connectors  
Item no. 644802



Microwave Cables and Assemblies  
Item no. 23012500



40 Gbps Multicoax Solution MXP  
Item no. 84104394



RF and Microwave Components  
Item no. 84068668



Test+Measurement Components  
Item no. 84068138

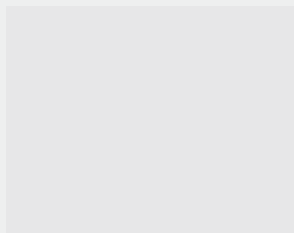


High Speed Digital Testing Solutions  
Item no. 84121228

HUBER+SUHNER is certified according to  
ISO 9001, ISO 14001, ISO/TS 16949 and IRIS.

**WAIVER**

It is exclusively in written agreements that we provide our customers with warrants and representations as to the technical specifications and/or the fitness for any particular purpose. The facts and figures contained herein are carefully compiled to the best of our knowledge, but they are intended for general informational purposes only.



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