Test+Measurement

Edition 2008/2009

HUBER+SUHNER

Excellence in Connectivity Solutions

Be precise

Your partner for system solutions

The HUBER+SUHNER Group is a leading global supplier of components and systems for electrical and optical connectivity.
Our customers in Communications, Industrial and Transportation markets appreciate that we are specialists with detailed knowledge of practical applications. We offer technical expertise 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.

Solutions and services for Test+Measurement

The best measurement set-up is as good as its weakest link. To obtain reliable and reproducable measurement results, particular care must be taken in selecting the components required for the measurement set-up.
HUBER+SUHNER's extensive range of high-quality components are matched to the various needs in the field of test and measurement. 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.

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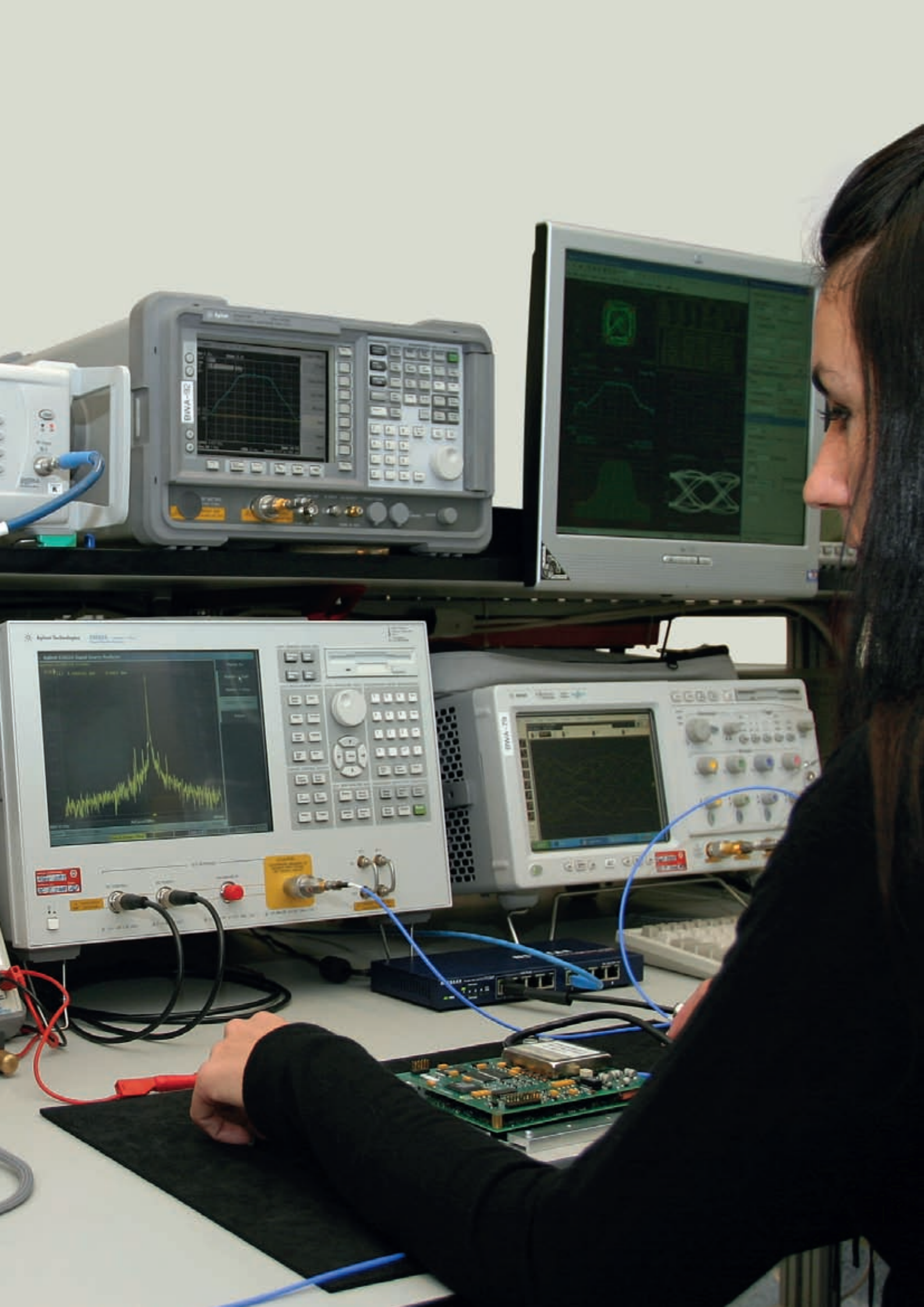


Performance Measurement

Test leads up to 6 GHz

HUBER+SUHNER is a leading supplier of high quality and high performance products used in Test+Measurement applications. In particular, we offer a comprehensive range of pre-made and tested cable assemblies.

Features

- Flexible to ultra flexible assemblies
- Single screened, double screened
- All assemblies ROHS compliant

Benefits

- Cost effective solution: no scrap, no stocking, no tooling
- Precisely matched cables/connectors from one manufacturer
- Products ready for use with guaranteed performance

Test leads, 50 Ω

Frequency (GHz)**	Connectors (male)	Cable	Cable length (mm / inch)	Loss (dB)*	H+S Type	Item no
1	BNC - BNC	RG_58_C/U	1000 / 39	0.70	RG58/BNCm/BNCm/1000	23005031
1	N - BNC	RG_58_C/U	1000 / 39	0.70	RG58/Nm/BNCm/1000	23005032
1	N - N	RG_58_C/U	1000 / 39	0.70	RG58/Nm/Nm/1000	23005033
4	BNC – BNC	G_03232_D-01	1000 / 39	1.52	G032D/BNCm/BNCm/1000	23005037
4	N - BNC	G_03232_D-01	1000 / 39	1.52	G032D/Nm/BNCm/1000	23005039
6	N - SMA	G_03232_D-01	1000 / 39	1.97	G032D/Nm/SMAm/1000	23005041
6	N - N	G_03232_D-01	1000 / 39	1.97	G032D/Nm/Nm/1000	23005038
6	N - N Quick-Lock ***	G_03232_D-01	1000 / 39	1.97	G032D/Nm/Nm-QL/1000	23005040
3.5	N - N	RG_214_HiFlex	2000 / 79	1.37	RG214HF/Nm/Nm/2000	23005043
3.5	N - 7/16	RG_214_HiFlex	2000 / 79	1.37	RG214HF/Nm/716m/2000	23005045

* Attenuation values specified at +25°C ambient temperature and maximum operating frequency.
** Reduced frequency range due to specification of connector interface.
*** Quick Lock is a specific coupling nut for which a three-quarter turn is necessary to connect.

Test leads, 75 Ω

Frequency (GHz)**	Connectors (male)	Cable	Cable length (mm / inch)	Loss (dB) *	H+S Type	Item no
1	BNC - BNC	G_04233_D-01	1000 / 39	0.55	G042D/BNCm/BNCm/1000	23011398
1	N - BNC	G_04233_D-01	1000 / 39	0.55	G042D/Nm/BNCm/1000	23011399
1	N - N	G_04233_D-01	1000 / 39	0.55	G042D/Nm/Nm/1000	23005036

* Attenuation values specified refer to typical values at +25°C ambient temperature and maximum operating frequency.
** Reduced frequency range due to specification of connector interface.

Test leads up to 18 GHz

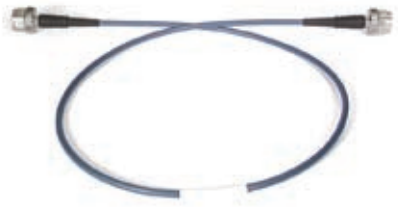
SUCOTEST™ cable assembly features excellent electrical performance characteristics (low insertion loss combined with unique loss stability and excellent return loss) up to 18 GHz. SUCOTEST™18 is ideal for daily use in components and assembly shops, test labs, and automatic test equipment applications.

Features

- Unique loss stability
- No cable spring back
- Low insertion loss
- Excellent VSWR

Benefits

- Precise and constant measurement results
- Unique handling due to newly designed N nut
  Cable can be positioned without spring back
- Low overall measurement costs



Test leads up to 6 GHz

Connectors	Cable	Cable length (mm / inch)	VSWR	Loss (dB)	H+S Type	Item no
QMA male SMA male	SUCOTEST 18	900 / 36	≤ 1.12	< 1.51	ST18/QMAm/SMAm/36	84057230
QMA male N male	SUCOTEST 18	900 / 36	≤ 1.12	< 1.51	ST18/QMAm/Nm/36	84057228
2x QMA male	SUCOTEST 18	900 / 36	≤ 1.12	< 1.51	ST18/QMAm/QMAm/36	84057231
QMA male SMA male	SUCOTEST 18	1800 / 72	≤ 1.12	< 1.58	ST18/QMAm/SMAm/72	84048042
QMA male N male	SUCOTEST 18	1800 / 72	≤ 1.12	< 1.58	ST18/QMAm/Nm/72	84057209
2x QMA male	SUCOTEST 18	1800 / 72	≤ 1.12	< 1.58	ST18/QMAm/QMAm/72	84057208

Test leads up to 18 GHz

Connectors	Cable	Cable length (mm / inch)	VSWR	Loss (dB)	H+S Type	Item no
2x SMA male	SUCOTEST 18	900 / 36	≤ 1.25	< 1.51	ST18/SMAm/SMAm/36	84002061
2x N male	SUCOTEST 18	900 / 36	≤ 1.25	< 1.51	ST18/Nm/Nm/36	84002060
SMA N male	SUCOTEST 18	900 / 36	≤ 1.25	< 1.51	ST18/SMAm/Nm/36	84004594
2x SMA male	SUCOTEST 18	1200 / 48	≤ 1.25	< 1.95	ST18/SMAm/SMAm/48	84003373
2x N male	SUCOTEST 18	1200 / 48	≤ 1.25	< 1.95	ST18/Nm/Nm/48	84003372
SMA / N male	SUCOTEST 18	1200 / 48	≤ 1.25	< 1.95	ST18/SMAm/Nm/48	84004006
2x SMA male	SUCOTEST 18	1800 / 72	≤ 1.25	< 2.85	ST18/SMAm/SMAm/72	84004007
2x N male	SUCOTEST 18	1800 / 72	≤ 1.25	< 2.85	ST18/Nm/Nm/72	84004070
SMA / N male	SUCOTEST 18	1800 / 72	≤ 1.25	< 2.85	ST18/SMAm/Nm/72	84004595

Test Leads up to 18 GHz for harsh environment

SUCOTEST™18A armoured test assemblies offer excellent electrical performance (low insertion loss combined with unique stability and excellent return loss) for heavy-duty, outdoor and harsh environment measurements. The ideal applications of SUCOTEST™18A are outdoor and on site tests of wireless communication infrastructures, top precision field measurements of Defence, Space, and Industrial Systems, and applications where heavy duty and high stability armoured test assemblies are required.

Features

- Phase and loss stability with flexure
- Crush, torque, and kink-resistant
- Waterproofed IP68
- Outstanding durability

Benefits

- Longer calibration intervals
- accurate measurements
- Longer service life even in harsh environment
- Increasing routing options

Test leads up to 7.5 GHz

Connectors	Cable	Cable length (mm / inch)	VSWR	Loss (dB)	H+S Type	Item no
N male 7/16 male	SUCOTEST 18A	1500 / 59	< 1.28	2.74	ST18A/11N468/ 11716403/1500mm	84013033
N male 7/16 female	SUCOTEST 18A	1500 / 59	< 1.28	2.74	ST18A/11N468/ 21716403/1500mm	84013034
N male 7/16 male	SUCOTEST 18A	3000 / 118	< 1.28	5.30	ST18A/11N468/ 11716403/3000mm	84013035
N male 7/16 female	SUCOTEST 18A	3000 / 118	< 1.28	5.30	ST18A/11N468/ 21716403/3000mm	84013036

Assemblies delivered with ruggedisiation type A, blue colour.
SUCOTEST™ cable assemblies also available with TNC connectors.

Test leads up to 18 GHz

Connectors	Cable	Cable length (mm / inch)	VSWR	Loss (dB)	H+S Type	Item no
2x N male	SUCOTEST 18A	1500 / 59	< 1.25	2.74	ST18A/11N468/ 11N468/1500mm	84013029
N male N female	SUCOTEST 18A	1500 / 59	< 1.25	2.74	ST18A/11N468/ 21N409/1500mm	84013030
2x N male	SUCOTEST 18A	3000 / 118	< 1.25	5.30	ST18A/11N468/ 11N468/3000mm	84013031
N male N female	SUCOTEST 18A	3000 / 118	< 1.25	5.30	ST18A/11N468/ 21N409/3000mm	84013032

Assemblies delivered with ruggedisiation type A, blue colour.
SUCOTEST™ cable assemblies also available with TNC connectors.

Test leads up to 50 GHz

The SUCOFLEX® 100 high-end cable assemblies are designed to provide optimal performance up to 50 GHz where stringent electrical requirements - in particular stability and low loss, are important. Their mechanical and climate resistance properties surpass those of standard flexible cables.

Features

- High stability and low loss
- Wide range of connectors
- VNA-specific connectors
- Various ruggedizations

Benefits

- Low overall measurement costs
- Longer calibration intervals

Test leads up to 50 GHz

Frequency (GHz)***	Connectors	Cable	Cable length (mm / inch)	VSWR	Loss (dB) *	H+S Type **	Item no
18	2x 11SMA male	SF 104	1000/39	≤ 1.25	1.39	SF104/11SMA451/ 11SMA451/1000	84016755
26.5	2x PC3.5 male	SF 104PE	1000/39	≤ 1.35	2.39	SF104PE/11PC3543/ 11PC3543/1000	84067980
26.5	PC3.5 male PC3.5 female	SF 104PE	1000/39	≤ 1.35	2.39	SF104PE/11PC3543/ 21PC3543/1000	84067981
26.5	2x PC3.5 female	SF 104PE	1000/39	≤ 1.35	2.39	SF104PE/21PC3543/ 21PC3543/1000	84067982
40	2x SK male	SF 101PEA	570/22	≤ 1.44	3.30	SF101PEA/11SK110/ 11SK110/570	84067983**
40	SK male SK female	SF 101PEA	570/22	≤ 1.44	3.30	SF101PEA/11SK110/ 21SK111/570	84067984**
40	2x SK female	SF 101PEA	570/22	≤ 1.44	3.30	SF101PEA/21SK110/ 21SK110/570	84067985**
40	SK female PC2.4 male	SF 101PEA	570/22	≤ 1.44	3.30	SF101PEA/21SK110/ 11PC24110/570	84067986**
50	DV male PC2.4 male	SF 101PEA	570/22	≤ 1.44	3.78	SF101PEA/11DV112/ 11PC24110/570	84067987**
50	2x PC2.4 male	SF 101PEA	570/22	≤ 1.44	3.78	SF101PEA/11PC24110/ 11PC24110/570	84067988**

* Attenuation values specified at +25°C ambient temperature and maximum operating frequency.
** Types with armour A/blue: additional ruggedization offers excellent protection against mechanical wear and tear and environmental influences.
*** Reduced frequency range due to specification of connector interface.

Microwave cables – Semi-Rigid

The semi-rigid cable is unique due to its easily bent-to-finished shape which maintains its set after bending. Versatile applications: low-noise amplifiers, a full range of microwave components, aerospace applications and a variety of high performance laboratory instrumentation. Semi-rigid cables provide greatly extended environmental parameters.

Features

- Very low impedance tolerance: +/- 0.5 Ω
- Low VSWR
- Smooth attenuation vs. frequency curve
- Minimum change in impedance and attenuation

Benefits

- Use in high-density areas
- MIL-C-17 qualified
- Customer specific layout
- Specific packaging

Product range

Frequency Range	Up to 40 GHz
Impedance Ω	20 / 25 / 35 / 50 / 70 / 75 / 95
Outer conductor diameter	Inch: 0.034 / 0.047 / 0.086 / 0.118 / 0.141 / 0.250
Nom. Attenuation*	Cable diameter 0.034": 5.1 dB/m Cable diameter 0.250": 1.5 dB/m
Bending Radius	Cable diameter 0.034": 1.27 mm Cable diameter 0.250": 20 mm
Connectors	MCX / MMCX / SK / SMA / SMB / N / PC3.5 / QMA / QN / SMPX / TNC / 7/16
Centre conductor	Copper / copper silver plated / steel copper clad silver plated
Dielectric	Solid extruded PTFE / low density PTFE
Outer conductor	Seamless copper tubing (copper or aluminium, blank, tin or silver plated)

* Attenuation values specified at +25 °C ambient temperature and 18 GHz.

Microwave cables – SUCOFORM®

The semi flexible, hand formable SUCOFORM® cables offer distinct mechanical advantages over semi-rigid cables. They are based on the same design as the standard PTFE insulated semi-rigid cables, but have a tin-soaked copper braid as an outer conductor, giving them outstanding hand formability. The cables are typically used in RF and Microwave test equipment, delay lines, Internal system wiring (such as antennas) and prototype systems.

Features

- High screening effectiveness: 100 dB
- High temperature range: –55 °C up to +165 °C
- Good bendable
- Comprehensive connector range

Benefits

- Suitable for delay lines and antennas
- True, hand formable alternative to semi-rigid
- Manual routing without tooling

Product range

Frequency Range	Up to 40 GHz
Impedance Ω	35 / 50 / 60 / 75 / 100
Outer conductor diameter	Inch: 0.047 / 0.086 / 0.141 / 0.250
Nom. Attenuation*	Cable diameter 0.047": 5.4 dB/m Cable diameter 0.250": 1.4 dB/m
Bending Radius	Cable diameter 0.047": 3.18 mm Cable diameter 0.250": 30 mm
Connectors	MCX / MMCX / SK / SMA / SMB / SMC / MMBX / N / PC3.5 / QMA / QN SMPX / TNC / 7/16
Centre conductor	Copper / copper silver plated / steel copper clad silver plated
Dielectric	Solid extruded PTFE
Outer conductor	Braid of tin soaked copper wire
Jacket material	PE / LSFH / FEP

* Attenuation values specified at +25 °C ambient temperature and 18 GHz.

Microwave cables – S series

The S-series is a line of cost-efficient, low loss microwave cables. It covers technically demanding requirements in a wide range of applications, preferably in fixed installations.

Features

- Low insertion loss across a wide frequency range
- Excellent screening effectiveness
- Environmentally friendly
- Low smoke Free of Halogen (LSFH) versions available

Benefits

- Cost effective solution: no scrap, no stocking, no tooling
- Precisely matched cables/connectors from one manufacturer
- Products ready for use with guaranteed performance

Product range

Frequency range	DC – 18 GHz
Impedance	50 Ω
Outer diameter max.	5.50 mm
Nom. attenuation	1.6 dB/m @ 18 GHz
Bending radius	25 mm static / 90 mm dynamic
Connectors	N, PC3.5, SMA, TNC
Centre conductor	Solid silver-plated copper wire
Dielectric	Foamed polyethylene
Outer conductor	Longitudinal aluminium foil and tin-plated copper braid
Jacket materials	PUR, PE, LSFH

Standard adaptors

HUBER+SUHNER manufactures a wide range of standard adaptors.

Features
- Wide range of different adaptor types
- Within Series
- Between Series

Benefits
- Accurate standard transitions
- One-stop-shop for most common interfaces

Product range

Within series 50 Ω	BNC, MMCX, MCX, SMA, PC3.5, SK, QLA, QMA, QN, SMB, SMC, TNC, N, 7/16
Within series 75 Ω	BNC, MCX, N
Between series 50 Ω	BMA, BNC, MCX, MMBX, MMCX, PC3.5, QLA, QMA, QN, SMA, SMB, SMC, TNC, N, 7/16
Frequency range	DC to 33 GHz

Precision adaptors

These high-performance adapters are ideal for lab and production test applications, where measurement accuracy, repeatability and optimum electrical performance are critical.

Features
- Precision interface
- Electrically optimized
- Premium base material and platings applied

Benefits
- Repeatable and accurate measurements
- For precision laboratory measurements

Product range

Within series	BNC, MMCX, MCX, SMPX, SK, QMA, N, PC2.4, PC3.5, PC7, SMA, TNC, 7/16
Between series	BMA, MMCX, MCX, SMPX, SK, QN, QMA, N, PC2.4, PC3.5, PC7, SMA, TNC, 7/16
Frequency range	DC to 50 GHz
Impedance	50 Ω

Phase matched precision adaptors

For phase and propagation time measurements the electrical length of the connection between the measuring instrument and the device under test must be identical during calibration and the actual measurement process. Therefore phase matched precision adaptors are required.

Features

- Identical electrical length
- Precision interface
- Electrically optimized
- Premium base materials and platings applied

Benefits

- Fast measurement set-up change: eg. male to female
- Measure devices with QN, QMA interfaces
- Precise calibration for phase critical measurement

Product range

Within series	SK, PC3.5
Between series	PC7 to PC3.5, TNC, N SK to PC2.4 PC3.5 to QMA PC7 to QN
Phase matching	Phase tolerance ± 0.1 mm Phase tolerance ± 0.12° at 1 GHz
Frequency range	DC to 50 GHz
Impedance	50 Ω

Quick mate adaptors

Quick-mate adaptors are the ideal choice for test laboratories where the final testing of devices requires frequent mating cycles. These adaptors with slide-on coupling mechanism allow fast and dependable connection of the device under test with the measurement unit. At the same time, wear and tear on the interface of the test lead is reduced.

Features

- Adaptors with slide-on coupling mechanism
- High abrasion resistance with SUCOPRO plating

(SUCOPRO: HUBER+SUHNER specific plating)

Benefits

- Fast and reliable measurement
- Easy coupling and decoupling
- Long lifetime

Within series adaptors, 50 Ω

Interface 1	Interface 2	Frequency (GHz)	Matings Interface 1/ Interface 2	H+S type	Item no.
N male	N female*	8	500/5000	33_N-Q50-0-14/13-_NE	23003160
N male*	N female	11	1000/500	33_N-Q50-0-4/133_NE	22660297
SMA male*	SMA female	18	1000/500	33_SMA-Q50-0-4/1-9_NE	22660213

*Quick Mate interface

Between series adaptors, 50 Ω

Interface 1	Interface 2	Frequency (GHz)	Matings Interface 1/ Interface 2	H+S type	Item no.
7/16 female*	N female	6	5000/500	31_716-N-Q50-1/1-3_NE	23008294
7/16 male*	N female	6	1000/500	33_716-N-Q50-4/133_UE	23000487
BNC male*	N female	4	1000/500	33_BNC-N-Q50-4/133_NE	23003163
N male*	7/16 male	11	1000/500	32_N-PC7-Q50-4/1-_NE	23003162
PC7 female	N female*	18	500/1000	33_PC7-N-Q50-4/1-_NE	23003161
SMA male*	N female	12.4	1000/500	33_SMA-N-Q50-4/1-3_NE	22660211
TNC male*	N female	11	1000/500	33_TNC-N-Q50-4/133_NE	22660360

*Quick Mate interface

Attenuators – low, medium and high power

Attenuators are used to reduce the input power. They are used in many Test+Measurement and telecommunication applications. E.g. as fine power adjuster between different channels or as a protection for the input of the Network analyzer.

Features

- Broadband
- Wide selection of interfaces and attenuation values

Benefits

- High repeatability

Product range low power

Power	0.5 to 2 Watts
Connectors 50 Ω	BNC, N, PC2.4, QMA, PC7, QN, SK, SMA, SMPX, TNC
Connectors 75 Ω	BNC, N
Frequency range	from DC up to 50 GHz
Attenuation range	0 to 40 dB

Product range medium power

Power	3 to 60 Watts
Connectors	7/16, N, SMA
Frequency range	from DC up to 18 GHz
Attenuation range	0 to 40 dB

Product range high power

Power	100 to 300 Watts
Connectors	7/16, N, SMA
Frequency range	from DC up to 6 GHz
Attenuation range	3, 6, 10, 20, 30, 40 dB

Terminations – low, medium and high power

Terminations are used to terminate an open RF port. They are applied in a large variety of Test+Measurement, defence and telecommunication applications.

Features

- Broadband
- Low and medium power
- Low VSWR

Benefits

- High repeatability

Product range low power

Power	0.5 to 2 Watts
Connectors 50 Ω	TNC, SMPX, SMB, SMC, SMA, SK, QN, QMA, QMA IP68, QLA, PC7, PC2.4, N, MMCX, MCX, C, BNC, BMA, 7/16, 1023
Connectors 75 Ω	TNC, N, BMA, BNC, MCX
Frequency range	from DC up to 50 GHz

Product range medium power

Power	3 to 60 Watts
Connectors	SMA, N, 7/16, BNC, TNC
Frequency range	from DC up to 18 GHz
Impedance	50 Ω

Product range high power

Power	100 Watts
Connectors	N, SMA
Frequency range	from DC up to 6 GHz
Impedance	50 Ω

Feed through terminations

Match your high impedance device under test with your 50 ohm test equipment by using HUBER+SUHNER feed trough terminations.

Features

- High repeatability

Benefits

- Allows high input impedance RF measurement

Feed through terminations

Frequency (GHz)	Interface	VSWR	Power (Watt)	H+S type	Item no.
0.5	BNC	1.25	2	6701.01.A	22543741
1	BNC	1.25	0.5	6701.01.B	22543742
0.5	N	1.25	0.5	6701.17.A	22644916

DC blocks

DC Blocks act as a high-pass filter by blocking the DC current on the RF line. The main function is to protect devices which cannot withstand any additional DC current from the remainder of the RF line.

Features
- Broadband

Benefits
- High repeatability

DC blocks

Frequency (GHz)	Interface	Voltage max. (V)	Block type	H+S type	Item no.
18	SMA	50	inner	1100.19.A	22645271
5	N	250	inner	1100.17.A	22550232
4	BNC	250	inner	1100.01.A	22550233
5	TNC	250	inner	1100.26.A	23001075

Impedance matching pads

Matching pads connect two systems with different impedances values (50 and 75 Ω) with minimal reflection.

Features
- Interface according MIL standard

Benefits
- High repeatability
- Very low return loss

Impedance matching pads

Interface	Frequency (GHz)	VSWR at 50 Ω	Power max. (W)	H+S type	Item no.
BNC50(m) - 75(f)	1	1.1	1	6001.01.A	22543737
BNC50(f)-75(m)	1	1.1	1	6001.01.B	22550085
N50(f)-75(m)	1	1.1	1	6001.17.B	22642806
N50(m)-75(f)	1	1.1	1	6001.17.A	22642807
N50(m)-BNC75(f)	1	1.1	1	6001.00.0001	22649583
N50(f)-BNC75(m)	1	1.1	1	6001.00.0002	22651259

Resistive power dividers

These dividers are used to equally split an input signal into two 6 dB output channels. (Not suitable for use as a combiner!)

Features
- Broadband
- Low isolation
- Very good return loss

Benefits
- Cost effective solution to tap off a signal
- without using an expensive broadband coupler.

Resistive power divider

Interface	Frequency (GHz)	VSWR	Power max. (W)	H+S type	Item no.
BNC (fff)	2	1.15	1	4901.01.A	22550077
BNC (mff)	2	1.15	1	4901.01.B	22550078
TNC (mff)	2	1.15	1	4901.26.B	22550165
N (fff)	2	1.15	1	4901.17.A	22550252
TNC (fff)	2	1.15	1	4901.26.A	22640656
SMA (fff)	12.4	1.2	0.5	4901.19.A	22641657
N (mff)	2	1.15	1	4901.17.B	22643830

Note: BNC (mff) - all the tree port are BNC: male, female, female

Diplexer

A diplexer basically acts as a splitter but is in addition capable of separating different frequency bands between both output channels. A diplexer therefore allows for instance efficient combining of WiMax and W-LAN signals within a distributed in-building cellular network equipped with broadband 6GHz antennas.

Features
- Broadband
- Low loss
- Intermodulation -150dBc (2X43dBm

Benefits
- Good directivity and VSWR

Diplexer

Interface	Frequency (MHz)	VSWR	Feature	H+S type	Item no.
N	80 - 2700 3300 - 5850	1.3	WiMax	7501.17.0010	84045217
N	80 - 2170 2400 - 2500	1.3	WLAN	7501.17.0012	84019435

Coupler

Couplers are used in almost every field of the Test+Measurement and telecommunication markets, primarily to combine multi-band wireless antennas. They can be used to tap off one part of the input signal as either a combiner or divider.

Features

- Broadband
- Low loss

Benefits

- Good directivity and VSWR

Directional coupler

Interface	Coupling value (dB)	Frequency (GHz)	VSWR	H+S type	Item no.
N	5	2.5	1.25	7205_N-50-1	84057612
N	6	2.5	1.25	7206_N-50-1	84057613
N	7	2.5	1.25	7207_N-50-1	84057614
N	8.5	2.5	1.25	7208_N-50-1	84057615
N	10	2.5	1.25	7210_N-50-1	84057617
N	13.2	2.5	1.25	7213_N-50-1	84057618
N	15	2.5	1.25	7215_N-50-1	84057619
N	20	2.5	1.25	7220_N-50-1	84057620
N	30	2.5	1.25	7230_N-50-1	84057621
N	3	2.7	1.2	7203_N-50-2	84057610
SMA	5	2.5	1.25	7205_SMA-50-1	84064336
SMA	6	2.5	1.25	7206_SMA-50-1	84064337
SMA	7	2.5	1.25	7207_SMA-50-1	84064338
SMA	8.5	2.5	1.25	7208_SMA-50-1	84064340
SMA	10	2.5	1.25	7210_SMA-50-1	84064341
SMA	13.2	2.5	1.25	7213_SMA-50-1	84064342
SMA	15	2.5	1.25	7215_SMA-50-1	84064343
SMA	20	2.5	1.25	7220_SMA-50-1	84064344
SMA	30	2.5	1.25	7230_SMA-50-1	84064345

Hybrid coupler

Interface	Coupling value (dB)	Frequency (GHz)	VSWR	H+S type	Item no.
N	3	2.7	1.2	7203_N-50-2	84057610

Intermodulation Measurement

Intermodulation test leads

LISCA Test Lead assemblies are specially designed for use with intermodulation (IM) test equipment. The excellent performance is achieved by utilising corrugated SUCOFEED cables with low intermodulation connectors and a controlled assembly process with HUBER+SUHNER solder technology. LISCA stands for Low Loss and Low Intermodulation Soldered Corrugated Cable Assemblies.

Features

- Excellent IM performance
- 100% factory tested: RL, IL, IM
- Test report for each cable assembly
- Helical, highest flexibility cable
- Flame retardant cable jacket

Benefits

- Low and stable intermodulation products
- Customised product
- Factory-made in predetermined lengths
- RoHS compliant (2002/95/EC)

Product range

Frequency range	DC to 2.2 GHz		Order codes *
Connector range	7/16, N, QN		
Connector pattern	Straight male		11
	Straight female		21
Cable range	Corrugated cable type	Diameter jacket	
	SUCOFEED_1/4_HF	0.315 inch / 8 mm	C5
	SUCOFEED_3/8_HF	0.433 inch / 11 mm	C7
	SUCOFEED_1/2_HF	0.551 inch / 14 mm	C9
Return loss	24 dB @ 2.2 GHz		
Intermodulation Product	Series 7/16, N	≤ -165 dBc (1.8 GHz @2x43 dBm carriers)	
	Series QN	≤ -155 dBc (1.8 GHz @2x43 dBm carriers)	
Standard IM test frequencies	IM3: 1.8 GHz @2x43 dBm carriers		81
Other available IM test frequencies	IM3: 1.9 GHz @2x43 dBm carriers 0.9 GHz @2x43 dBm carriers 0.8 GHz @2x43 dBm carriers 0.4 GHz @2x43 dBm carriers IM7: 2.1 GHz @2x43 dBm carriers Other frequencies and carriers on request		01

* Order example:
Standard LISCA test lead with 2x straight DIN 7/16 male connectors, cable SUCOFEED ½"HF and assembly length of 2 meters: LIS-C9-11716-11716-02000-81.

Intermodulation adaptors

These low intermodulation adaptors have been specially developed for applications in intermodulation test set-ups. They are made of non-magnetic materials using a minimum number of piece parts to minimize intermodulation sources.

Features

- Outstanding intermodulation performance
- Non magnetic materials
- Excellent electrical contacts

Benefits

- Reliable and repeatable intermodulation measurements

Intermodulation adpators, 50 Ω

Interface 1	Interface 2	IM value (dBc)	Frequency (GHz)	H+S type	Item no.
PC3.5 female	7/16 female	≤-160	2.5	31_PC35-716-50-1/133_WE	22658135
TNC female	7/16 female	≤ -165	2.5	31_TNC-716-50-1/133_WE	22658134
N female	7/16 female	≤ -165	2.5	31_N-716-50-2/133_WE	22658137
7/16 female	7/16 female	≤ -165	2.5	31_716-50-0-2/133_WE	22658136
TNC male	7/16 male	≤ -165	2.5	32_TNC-716-50-1/133_WE	22658142
N male	7/16 male	≤ -165	2.5	32_N-716-50-2/133_WE	22658140
7/16 male	7/16 male	≤ -165	2.5	32_716-50-0-2/133_WE	22658141
7/16 male	PC3.5 female	≤ -160	2.5	33_716-PC35-50-1/133_WE	22658821
7/16 male	TNC female	≤ -165	2.5	33_716-TNC-50-1/133_WE	22658824
7/16 male	N female	≤ -165	2.5	33_716-N-50-3/133_WE	22658823
N male	7/16 female	≤ -165	2.5	33_N-716-50-3/133_WE	22658217
7/16 male	7/16 female	≤ -165	2.5	33_716-50-0-2/133_WE	22658193

Intermodulation load

These loads are used in any critical Test+Measurement intermodulation environment. They close the isolated port of hybrid couplers ideally.

Features
- Other power level and customized design on request

Benefits
- High repeatability
- Outstanding intermodulation performance

Intermodulation load, 50 Ω

Interface	Frequency (GHz)	VSWR	IM value (dBc)	H+S type	Item no.
7/16	2	1.07	-160	6550.41.0001	22659656

Intermodulation standard

Intermodulation Standards are special 7/16 adaptors which deliberately produce intermodulation (+/- 3dBm). They are used to quick-check intermodulation test benches. If the value displayed by the test bench does not correspond with the specified HUBER+SUHNER intermodulation standard value, it indicates uncertain measurement performance of your equipment.

Features
- High repeatability
- Each item with serial number
- Each item delivered with measurement protocol

Benefits
- Traceability to external reference
- No interruption while production verification
- Calibration traceability via serial number

Intermodulation standard, 50 Ω

Interface	Frequency (MHz)	IM value (dBm)	With tones (dBm)	H+S type	Item no.
7/16	900	-80	2X43	69_716-50-1/133_WE	22658219
7/16	900	-100	2X43	69_716-50-0-2/133_WE	22658220
7/16	900	-110	2X43	69_716-50-0-3/133_WE	22658221
7/16	900	-125	2X43	69_716-50-0-4/133_WE	23003869
7/16	1800	-80	2X43	69_716-50-0-5/133_WE	23003870
7/16	1800	-100	2X43	69_716-50-0-6/133_WE	23003871
7/16	1800	-110	2X43	69_716-50-0-7/133_WE	23003872
7/16	2500	-80	2X35	69_716-50-0-9/133_WE	84061074
7/16	2500	-100	2X35	69_716-50-0-10/133_WE	84061082


WARNING !
DO NOT OPERATE
WITHOUT LOAD
DANGE
ROWAVE RA
RF OUT
LINEAR
POWER
AMPLIFIER
WARNING !
O NOT OPERATE

Power Measurement

Power test leads

The test lead RG 393/U is designed for low attenuation and high stability. This test lead is the ideal connection between the device under test and the measurement unit during power measurements.

Features

- To allow high continuous power, the cable has been appropriately sized, and care has also been taken to select materials offering high temperature resistance and temperature conductivity.

Benefits

- Customized configuration

Power test leads

Frequency range	DC to 15.5 GHz
Connectors	N, 7/16
Cable	RG 393/U
Power range*	up to 550 W
Loss**	1.33 dB / m
Impedance	50 Ω

* Power:
Maximum values at a max. operating frequency, 40 °C ambient temperature at sea level. Power ratings are defined for cables without ruggedisation.

** Loss: Attenuation values specified are typical values at +25 °C ambient temperature and maximum operating frequency

Terminations

Terminations are used to close an open RF port. They are applied in a large variety of test and measurement, defence and telecommunication applications.

Features
- Broadband
- Low and medium power
- Low VSWR

Benefits
- High repeatability

Product range high power

Power	100 Watts
Connectors	N, SMA
Frequency range	from DC up to 6 GHz
Impedance	50 Ω

Attenuators

RF attenuators are used to reduce the input power. They are used in many Test+Measurement and telecommunication applications (e.g. as fine power adjuster between different channels or as a protection for the input of the network analyzer).

Features
- Broadband
- Wide selection of interfaces and attenuation values

Benefits
- High repeatability

Product range high power

Power	100 to 300 Watts
Connectors	7/16, N, SMA
Frequency range	from DC up to 6 GHz
Attenuation range	3, 6, 10, 20, 30, 40 dB

EMC hall, Federal Office of Metrology (METAS) www.metas.ch

EMC Measurement

EMC test leads

The SUCOFLEX 104 PEM test lead with its special M-ruggedisation has been designed for applications in which a special emphasis must be placed on high shielding.

Features

- Thanks to an additional ferromagnetic shield (µ-metal), the cable achieves a shield attenuation better than 120dB (per meter) in the frequency range from 100 kHz to 1 GHz.

Benefits

- Customized configuration

EMC test leads, 50 Ω

Frequency (GHz)	Connectors	Cable	Cable length (mm / inch)	Loss (dB)	VSWR	H+S Type	Item no
4	2x BNC male	SF 104PEM	1500 / 59	≤ 1 GHz → 0.56 ≤ 4 GHz → 1.17	≤ 1.30	SF104PEM /BNCm/BNCm/1500	23005948
4	BNC male N male	SF 104PEM	1500 / 59	≤ 1 GHz → 0.56 ≤ 4 GHz → 1.17	≤ 1.28	SF104PEM /BNCmale/Nmale/1500	23005950
18	2x N male	SF104PEM	1500 / 59	≤ 1 GHz → 0.56 ≤ 4 GHz → 1.17 ≤ 18 GHz → 2.75	≤ 1.28	SF104PEM /Nmale/Nmale/1500	23005949

Assemblies are delivered with a black Armour, type M

Thermal Vacuum Measurement

Assemblies and adaptors for thermal vacuum application (TVAC)

Space product testing requires Test+Measurement support equipment with specific features. Devices under test (DUT) in thermal vacuum chambers have to be connected with the test-equipment outside the chamber. Also satellites under test in vast vacuum test chambers need to be connected with RF-assemblies for testing. HUBER+SUHNER provides RF assemblies and an RF adaptor specially designed for these applications.

Features

- Extended temperature range
- Low outgassing according ESA-PSS-01-702
- Superior mechanical and electrical stability
- Vented connectors for fast evacuation and venting
- Not vented connectors also available

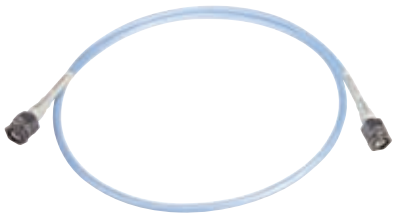
Benefits

- Longer lifetime, lower costs
- Excellent performance to price ratio
- Perfect matched cables/connectors from one manufacturer
- Assistance and support everywhere

Assembly SUCOFLEX 104P with straight SMA male connectors

Frequency range	DC – 18 GHz
Connectors vented	11_SMA-441_TVAC
Cable	SUCOFLEX 104P
VSWR / Return Loss	1.15 / 23 dB (DC – 12 GHz) 1.25 / 19 dB (12 – 18 GHz)
Insertion loss assembly	nom. 1.23 dB/m + 0.15 dB / max. 1.35 dB/m + 0.15 dB (up to 12 GHz) nom. 1.56 dB/m + 0.18 dB / max. 1.72 dB/m + 0.18 dB (up to 18 GHz)
Armour	no
Temperature range	-30 °C up to +80 °C
Outgassing	Acc. ESA-PSS-01-702: TML < 1%, CVCM < 0.1%

Assembly SUCOFLEX 104P with straight TNC male connectors

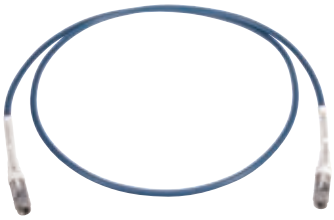


Frequency range	DC – 18 GHz
Connectors vented	11_TNC-476_TVAC
Cables	SUCOFLEX 104P
VSWR / Return Loss	1.25 / 19 dB (DC – 18 GHz)
Insertion Loss assembly	nom. 1.23 dB/m + 0.15 dB / max. 1.35 dB/m + 0.15 dB (up to 12 GHz) nom. 1.56 dB/m + 0.18 dB / max. 1.72 dB/m + 0.18 dB (up to 18 GHz)
Armour	no
Temperature range	-30 °C up to +80 °C
Outgassing	Acc. ESA-PSS-01-702: TML < 1%, CVCM < 0.1%

Assembly SUCOFLEX 106 with straight TNC male connectors

Frequency range	DC – 8 GHz
Connectors vented	11_TNC-682
Cables	SUCOFLEX 106
VSWR / Return Loss	1.33 / 17 dB (DC – 8 GHz)
Insertion Loss assembly	nom. 0.49 dB/m + 0.12 dB / max. 0.53 dB/m + 0.12 dB (up to 8 GHz)
Armour	no
Temperature range	-30 °C up to +80 °C
Outgassing	Acc. ESA-PSS-01-702: TML < 1%, CVCM < 0.1%

Assembly SUCOFLEX 103E with straight SK male connectors



Frequency range	DC – 33 GHz
Connectors vented	11_SK-302_TVAC
Cables	SUCOFLEX 103E (jacket in polyurethane)
VSWR / Return Loss	1.25 / 19 dB (DC – 33 GHz)
Insertion Loss assembly	nom. 1.87 dB/m + 0.24 dB / max. 2.05 dB/m + 0.24 dB (up to 33 GHz)
Armour	no
Temperature range	-30 °C up to +80 °C
Outgassing	Acc. ESA-PSS-01-702: TML < 1%, CVCM < 0.1%

Remark: although SK connector is used, assembly can only be used up to 33 GHz due to cut off frequency of the cable -> benefit: lower insertion loss up to 33 GHz

Assembly SUCOFLEX 103EA with straight SK male connectors

Frequency range	DC – 33 GHz
Connectors vented	11_SK-301_TVAC
Cables	SUCOFLEX 103EA (jacket and armour in polyurethane)
VSWR / Return Loss	1.25 / 19 dB (DC – 33 GHz)
Insertion Loss assembly	nom. 1.87 dB/m + 0.24 dB / max. 2.05 dB/m + 0.24 dB (up to 33 GHz)
Armour	Type A (steel spring, steel braid, polyurethane jacket)
Temperature range	-30 °C up to +80 °C
Outgassing	Acc. ESA-PSS-01-702: TML < 1%, CVCM < 0.1%

Remark: although SK connector is used, assembly can only be used up to 33 GHz due to cut off frequency of the cable -> benefit: lower insertion loss up to 33 GHz.

Adaptor 34_SK-50-0-54/199_NE

Frequency range	DC – 40 GHz
Connector interfaces	2 x SK female
VSWR / return loss	1.17 / 22 dB (DC – 26 GHz) 1.22 / 20 dB (26 – 40 GHz)
Leakage rate	Max. 10^{-7} Torr litre / sec
Temperature range	-65 ° up to +90 °C
Outgassing	Acc. ESA-PSS-01-702: TML < 1%, CVCM < 0.1%

Calibration

MCX and MMCX test kits

Cost effective solution for measurement of MCX or MMCX device under Test without using adaptor and without an expensive open, short, load calibration kit. The method is especially suitable for snap on interfaces. SSL calibration method allows same measurement feature as the OSLT but narrow banded (full 2 ports, 12 terms).

Features

- One test kit contents:
- 2 short (male, female)
- 2 Offset-short (male, female)
- 2 High end terminations, 3.5 GHz (male, female)

.Benefits

- Cost effective solution

MCX and MMCX test kits

Interface	Frequency (GHz)	H+S type	Item no.
MCX 50 Ω	3.5	73_Z-0-0-500	22651015
MCX 75 Ω	3.5	73_Z-0-0-750	23010279
MMCX 50 Ω	3.5	73_Z-0-0-355	22658212

QMA and QN adaptors

Adaptors to measure applications with QMA or QN interfaces. These adaptors support the calibration with open standard interfaces. Thanks to the same electrical length and the same return loss behaviour of all these adaptors, the swapping method can be used.

Features

- Identical electrical length

Benefits

- Fast measurement set-up change: e.g. male to female
- Measure devices with QN, QMA interfaces
- Precise calibration for phase critical measurements

50 Ω adaptors for QMA calibration

Interface 1	Interface 2	Freq. (GHz)	Electrical length at 1 GHz	H+Stype	Item no.
PC3.5 male	PC3.5 female	18	25.40 ± 0.1 mm 30.5° ± 0.12°	33_PC35-50-0-2/199_NE	23020453
PC3.5 female	PC3.5 female	18	25.40 ± 0.1 mm 30.5° ± 0.12°	31_PC35-50-0-2/199_NE	23020456
PC3.5 male	PC3.5 male	18	25.40 ± 0.1 mm 30.5° ± 0.12°	32_PC35-50-0-2/199_NE	23020457
PC3.5 female	QMA female	18	25.40 ± 0.1 mm 30.5° ± 0.12°	31_PC35-QMA-50-1/199_NE	23017468
PC3.5 male	QMA male	18	25.40 ± 0.1 mm 30.5° ± 0.12°	32_PC35-QMA-50-1/1-_NE	23017489
PC3.5 male	QMA female	18	25.40 ± 0.1 mm 30.5° ± 0.12°	33_PC35-QMA-50-1/199_NE	23017467
QMA male	PC3.5 female	18	25.40 ± 0.1 mm 30.5° ± 0.12°	33_QMA-PC35-50-1/1-_NE	23017488

QMA calibration with adaptor swapping method

For return loss/VSWR measurement of QMA connectors, HUBER+SUHNER recommends the following calibration method:

1.) Calibration with PC3.5 to PC3.5 calibration adaptors (SMA calibration)

31_PC35-50-0-2/199_NE (Item no. 23020456) or
32_PC35-50-0-2/199_NE (Item no. 23020457) or
33_PC35-50-0-2/199_NE (Item no. 23020453)

2.) Exchanging of the calibration adaptors with the required QMA adaptors

31_PC35-QMA-50-1/199_NE (Item no. 23017468) or
32_PC35-QMA-50-1/1-_NE (Item no. 23017489) or
33_PC35-QMA-50-1/199_NE (Item no. 23017467) or
33_QMA-PC35-50-1/1-_NE (Item no. 23017488)

50 Ω adaptors for QN calibration

Interface 1	Interface 2	Freq. (GHz)	Electrical length at 1 GHz	H+Stype	Item no.
PC7	PC7	11	41.85 ± 0.1 mm 50.25° ± 0.12°	32_PC7-U50-0-1/1-_NE	23032719
PC7	PC7	11	41.85 ± 0.1 mm 50.25° ± 0.12°	33_PC7-U50-0-1/1-_NE	23032721
N male	PC7	11	41.85 ± 0.1 mm 50.25° ± 0.12°	32_N-PC7-50-6/1-_NE	23032917
PC7	N female	11	41.85 ± 0.1 mm 50.25° ± 0.12°	33_PC7-N-50-6/1-_NE	23032916
PC7	QN male	11	41.85 ± 0.1 mm 50.25° ± 0.12°	32_PC7-QN-50-1/1-_NE	23032720
PC7	QN female	11	41.85 ± 0.1 mm 50.25° ± 0.12°	33_PC7-QN-50-1/1-_NE	23032722

QN calibration with adaptor swapping method

For return loss/VSWR measurement of QN connectors, HUBER+SUHNER recommends the following calibration method:

1.) Calibration with PC7 to PC7 calibration adaptors (PC7 calibration)

32_PC7-U50-0-1/1-_NE (Item no. 23032719) and
33_PC7-U50-0-1/1-_NE (Item no. 23032721)

Alternative calibration with N to PC7 calibration adaptors (N calibration)

32_N-PC7-50-6/1-_NE (Item no. 23032917) or
33_PC7-N-50-6/1-_NE (Item no. 23032916)

2.) Exchanging of the calibration adaptors with the required QN adaptors

32_PC7-QN-50-1/1-_NE (Item no. 23032720) or
33_PC7-QN-50-1/1-_NE (Item no. 23032722)

Measurement Accessories

Torque wrenches

For tightening coupling nut and fastening nut.

Features
- Standard style and box spanner versions
- Ergonomic design

Benefits
- Easy handling
- Long life

Torque wrenches

For series	Torque (Nm)	Variant	H+S type	Item no.
BMA hermetic	2.00	Box spanner style	74_Z-0-0-214	22645579
N (18 mm/.709 in. hex nut)	1.00	Standard style	74_Z-0-0-330	22658130
N (19 mm/.748 in. hex nut)	1.00	Standard style	74_Z-0-0-321	22651994
N (20 mm/.787 in. hex nut)	1.00	Standard style	74_Z-0-0-193	22645085
SK	1.30	Standard style	74_Z-0-0-174	22643898
SK hermetic	2.00	Standard style	74_Z-0-0-189	22644368
SMA	1.00	Box spanner style	74_Z-0-0-77	22544820
SMA / PC3.5	1.00	Standard style	74_Z-0-0-21	22543130
SMA economic	0.45	Standard style	74_Z-0-0-79	22642374
SMA economic	0.45	Box spanner style	74_Z-0-0-78	22641379
SMA hermetic	1.95	Standard style	74_Z-0-0-80	22544821
SMC	0.35	Standard style	74_Z-0-0-45	22544232
SMC	0.35	Box spanner style	74_Z-0-0-147	22644235
TNC (14 mm/.55 in hex nut)	1.00	Standard style	74_Z-0-0-373	23021864
TNC (15 mm/0.591 in. hex nut)	1.00	Standard style	74_Z-0-0-192	22645084

standard style

box spanner style

Tool set for semi-rigid cable assemblies

Includes all tools required for economic and reliable assembling of connector to semi-rigid cables. The tool set includes a solid wooden storage case.

Tool set

Series	H+S type	Item no.
SMA	74_Z-0-0-70	22544725
N	74_Z-0-0-71	22641350

Solutions and services for Test+Measurement

Customized solutions

This HUBER+SUHNER short form catalogue presents you an extract of the wide range of components. If you have a specific need and do not see it in this catalogue, please contact your HUBER+SUHNER representative for assistance.

Online Configurator

The RF Assembly Configurator is a smart online cable assembly configuration tool enabling you to design, build and test your own RF cable assembly. Based on your input, you can create, save and print the HUBER+SUHNER data sheet. Request your confidential quotation for price and delivery information. If you can not find your desired product, please contact your HUBER+SUHNER representative. **www.hubersuhner.com/tm**

Repair service

For SUCOFLEX® and SUCOTEST™ 18A cable assemblies we are offering a repair service where the cable itself and any good connectors will be retained and damaged cable entries and connectors will be replaced. This service can also be used to simply change the connector type on an existing cable.

Test+Measurement webpage

You will find our services and the full standard product range with detailed specifications on our Test+Measurement webpage. **www.hubersuhner.com/tm**.

Product Index

Further catalogues

RF cables

Item no. 644817

RF coaxial connectors

Item no. 644802

Microwave cables and assemblies

Item no. 23012500

HUBER+SUHNER is certified according to ISO 9001 and ISO 14001.

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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