Wireless infrastructure

Solutions for remote radios and cell sites

Edition 09/2026



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HUBER+SUHNER


Connecting – today and beyond



HUBER+SUHNER is a global company with headquarters in Switzerland which develops and manufactures components and system solutions for electrical and optical connectivity. With cables, connectors and systems – developed from the three core technologies of radio frequency, fiber optics and low frequency – the company serves customers in the communication, transportation and industrial sectors.

The products deliver high performance, quality, reliability and long service life – even under the toughest of conditions. The company's global production network, combined with group companies and agencies, ensures that HUBER+SUHNER maintains a close relationship with its customers in over 80 countries.

At the heart of our offering is a broad range of products that can be relied on to meet high quality standards, backed up by flexible, dependable services with fast response times and excellence in delivery performance. In the wireless market, we concentrate on solutions that allow mobile operators to reduce their total cost of ownership and to make their mobile network futureproof and reliable.



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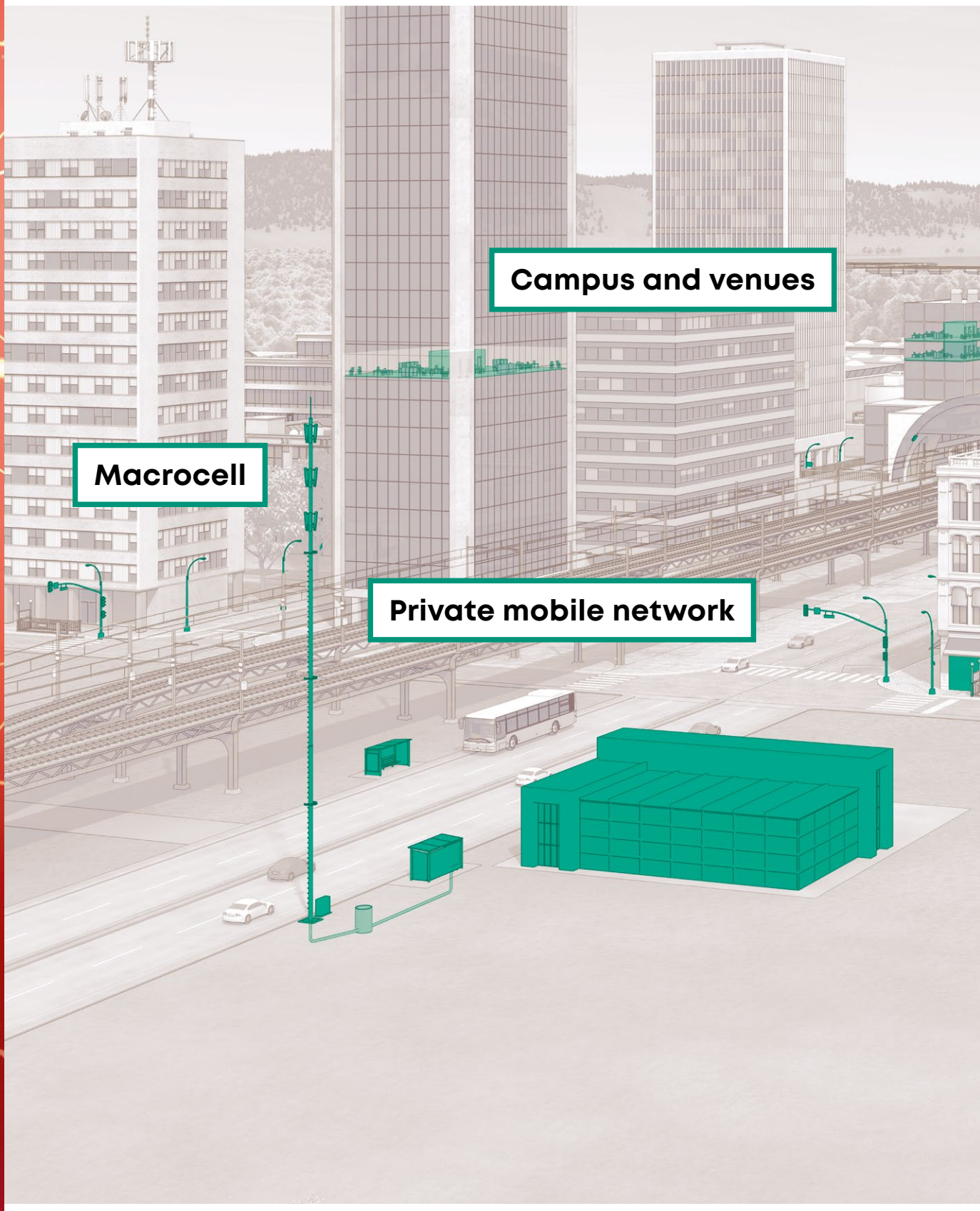
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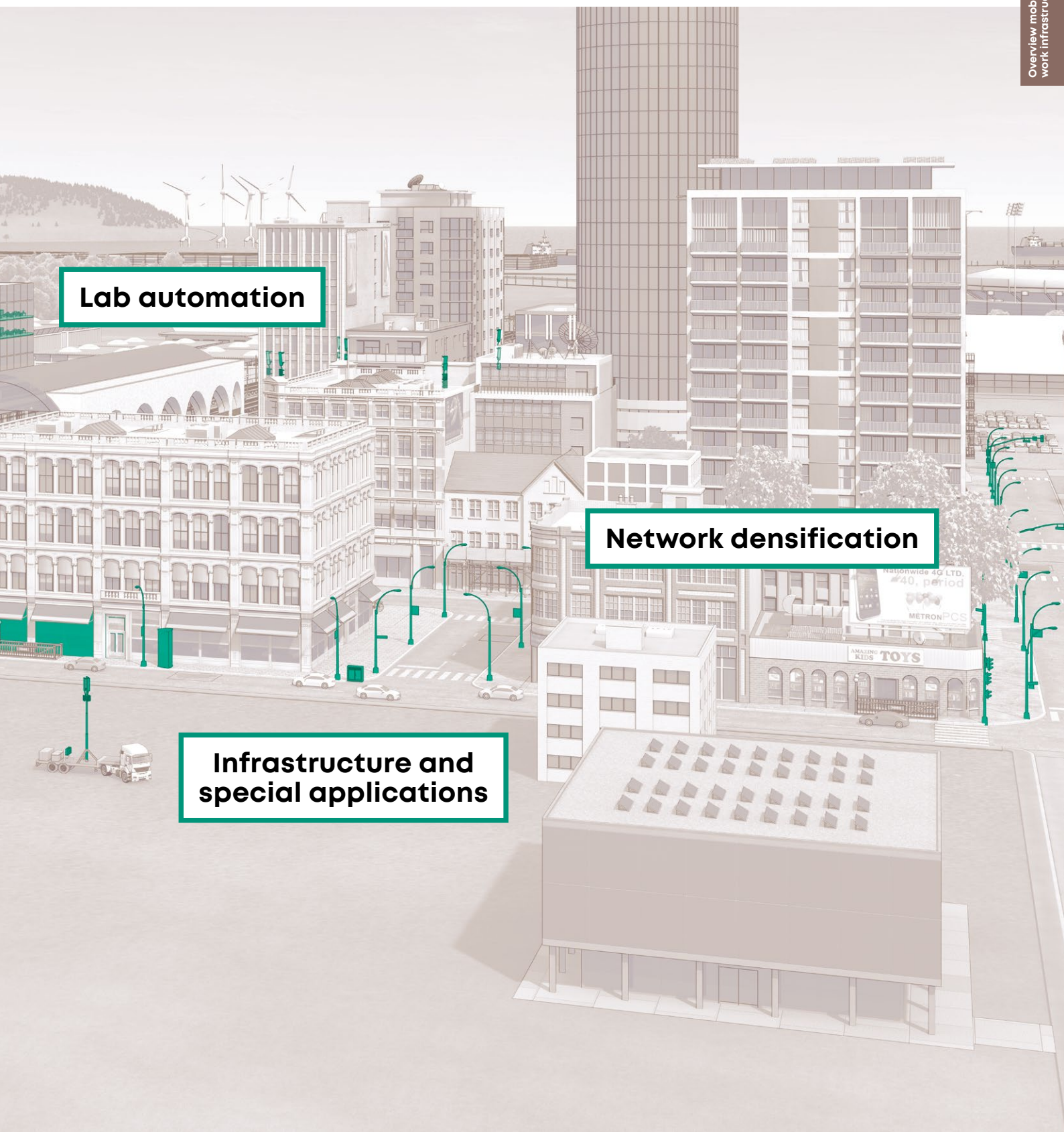
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Improve the business case of your **mobile network** infrastructure




Lab automation
Network densification
Infrastructure and special applications
Nationwide 4G LTD.
40. period
METRO PCS
AMAZING KIDS TOYS

Remote radio installation solutions



Work with the leader for remote radio installation solutions

HUBER+SUHNER provides complete installation solution

HUBER+SUHNER is the global leader for remote radio installation solutions. We have a comprehensive offering of Fiber-To-The-Antenna (FTTA), Power-To-The-Antenna (PTTA) and Hybrid-To-The-Antenna (HTTA) products, which are tailored to the customer's needs. We advise operators about which installation methods are available and what their advantages are. We are experts on how to make savings on installation costs and how expensive follow-up costs can be saved. HUBER+SUHNER implements future-proof passive cable network infrastructures, which are compatible with all system vendor products and endure the future generations of active equipment.

MASTERLINE fiber optic cabling systems of HUBER+SUHNER

HUBER+SUHNER offers 3 different FTTA cabling systems, MASTERLINE Classic (MLC), MASTERLINE Extreme (MLE) and MASTERLINE Ultimate (MLU). MASTERLINE cabling systems of HUBER+SUHNER are the most efficient and easiest-to-install fiber optic products available on the market. All MASTERLINE fiber optic cabling systems of HUBER+SUHNER use glass-armoured multifiber loose tube cables (6 to 48 fibers). With a short fiber optic jumper the cabling systems are quickly and easily connected to the vendor specific RRH interfaces.

MASTERLINE Ultimate has a compact, pre-connectorised and factory-sealed connector head with 12 Q-ODC-2 sockets. The robust connector head with an integrated pulling eye allows easy cable lifting. The encapsulated connector head can be directly attached to the mast with a single „click" at a pre-mounted adapter plate. Short easy-to-install Q-ODC fiber optic jumpers connect the RRH interface.

MASTERLINE Extreme has a robust and very compact divider, which divides the fibers in 6 or 12 single cables terminated with Q-ODC-2 extension connectors. The very compact divider requires only a small space on the mast, minimises the wind-load and can be fed through small holes. Short easy-to-install Q-ODC fiber optic jumpers connect the RRH interface.

MASTERLINE Classic has a divider, which divides the fibers in 6, 12, 18 or 24 single cables terminated with LC duplex connectors. The divider is fixed at a distribution box and the LC duplex connectors connected to adapters. Short LC duplex jumper connect the RRH interfaces.



MASTERLINE Ultimate



MASTERLINE Extreme



MASTERLINE Classic

Work with the leader for remote radio installation solutions

MASTERLINE hybrid cabling systems of HUBER+SUHNER

Hybrid cables, combining optical fiber and DC power for remote radios, have evolved as the dominating solution in North America, Australia and Europe. MASTERLINE hybrid cabling systems of HUBER+SUHNER are the most efficient and easiest-to-install products available on the market. Mobile operators on four continents verified that MASTERLINE Hybrid can be installed in approximately half of the time of competitive hybrid solutions based on corrugated coax cable designs. The factory-terminated „plug & play“ system in combination with a highly flexible and easy-to-route cable makes the HUBER+SUHNER solution the hybrid cable of choice for operators, system vendors and installers alike.

HUBER+SUHNER offers 3 different hybrid cabling systems, MASTERLINE Classic Hybrid (MLCH), MASTERLINE Extreme Hybrid (MLEH) and MASTERLINE Ultimate Hybrid (MLUH). All HUBER+SUHNER's MASTERLINE Hybrid cabling systems use highly flexible hybrid cables with a multifiber loose tube cables (6 to 36 fibers) and up to 18 copper conductors. With a short fiber optic jumper the cabling systems are quickly and easily connected to the vendor specific RRH interfaces.

MASTERLINE Ultimate Hybrid has a compact, pre-connectorised and factory-sealed connector head with up to 6 Q-ODC-2 sockets and up to 6 power sockets. The robust connector head with an integrated pulling eye allows easy cable lifting. The encapsulated connector head can be directly attached to the mast with a single „click“ at a pre-mounted adapter plate. Short easy-to-install Q-ODC fiber optic and power jumpers connect the RRH interface.

The most innovative hybrid cabling system of HUBER+SUHNER for remote radio installation became even more innovative by offering capability to deliver 230 VAC up the mast, allowing much longer cabling with significant cost savings on cables and more efficient power transfer. The pre-connectorised factory-sealed hybrid systems supports up to 12 RRHs and connects the remote radios with easy-to-install Q-ODC fiber optic and power jumpers. The encapsulated connector head can be directly attached to the mast with a single „click“ at a pre-mounted adaptor plate. These unique features make MASTERLINE Ultimate Hybrid High Voltage the only in-class product offering all the advantages of the MASTERLINE Ultimate family together with high voltage conformity confirmed by the worldwide recognised CE marking. For extra safety the whole head is protected by removable cover.

MASTERLINE Extreme Hybrid has a robust and very compact divider, which divides the fibers in up to 18 single cables terminated with Q-ODC-2 extension connectors and up to 9 power cables. The very compact divider requires only a small space on the mast, minimises the wind-load and can be fed through small holes (80/100 mm diameter). Short easy-to-install Q-ODC fiber optic and power jumpers connect the RRH interface.

MASTERLINE Classic Hybrid has a divider, which divides the fibers in 6, 12, 18 or 24 single cables terminated with LC duplex connectors. The hybrid cable is fed into a distribution box. The LC duplex connectors are connected to adapters and the conductors terminated to screw terminals. Short LC duplex and power jumper connect the RRH interfaces.

Work with the leader for remote radio installation solutions

MASTERLINE cabling systems of HUBER+SUHNER: reduced installation cost, flexibility and scalability

Reduced installation costs
MASTERLINE cabling systems are more cost-effective, because only 1 cable is laid instead of 6 or more. As the number of RRHs rises, cost efficiency rises accordingly. The length of time required for installation is a major cost factor. Cabling systems of HUBER+SUHNER are pre-connectorised „plug & play" solutions and can be connected directly with the active equipment. In addition, the multi-riser cables are more rigid than individual cables due to their increased diameter, meaning that the securing clips can be installed at intervals of between 1.5 and 2 meters. Empirical data indicates that cable installation times can be reduced by between a third and a half (compared to discrete cables). With our latest hybrid cabling system MASTERLINE Ultimate Hybrid High Voltage the installation cost can be reduced further. The capability to deliver 230 VAC up the mast, allows significant cost savings on cables due to more efficient power transfer.

Flexibility
Only the short jumper cables may need to be renewed when upgrading or replacing the RRH. Most of the installed passive infrastructure remains unaffected. This means that the installation is independent of the system and manufacturer and offers maximum flexibility in terms of evolution within the network.

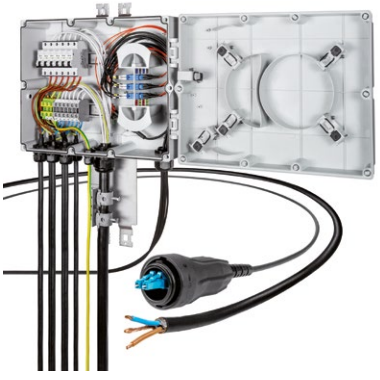
Scalability
Additional RRHs must be installed when setting up new systems or frequency bands. During initial installation, 12 or 24 integrated fiber optic cores can be laid instead of 6, so that the necessary fibers are already in place if new services are being set up at a later date. No expensive new cable installations are required – all that is needed is a number of additional jumpers.



MASTERLINE Extreme Hybrid



MASTERLINE Ultimate Hybrid

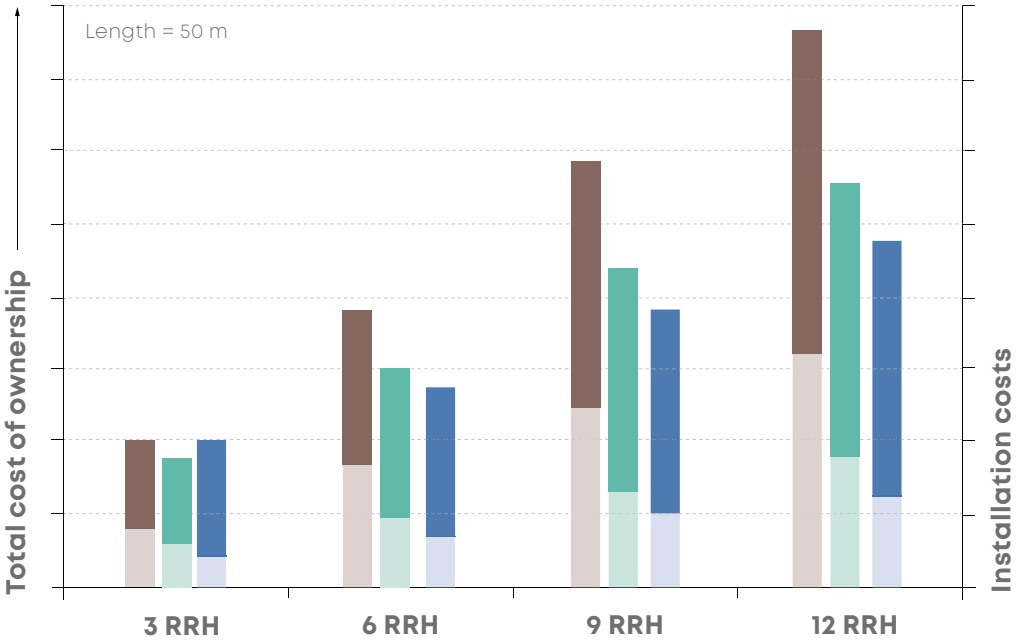


MASTERLINE Classic Hybrid

Work with the leader for remote radio installation solutions

Total cost of ownership analysis

HUBER+SUHNER offers total cost of ownership (TCO) analysis for network upgrades and expansions. In close cooperation with mobile operators we have developed a sound understanding of real costs and roll out issues associated with remote radio systems. The optimum installation solution depends very much on the legacy infrastructure, on the installation phase, on the material supply chain and on future expansion plans. HUBER+SUHNER has consulted with network deployment managers across the globe on how to save millions on installation and material costs by deploying reliable cable infrastructures which are easy and cost effective to install and which fulfill today's and tomorrow's network deployment requirements.



Example: 50 m remote radio head installation in UK

TCO calculation model of HUBER+SUHNER provides a country/operator specific TCO comparison between the different installation solutions.

Please contact your sales representative for an individualised TCO calculation.

Descrete cable
- Material costs
- Installation costs

Hybrid
- Material costs
- Installation costs

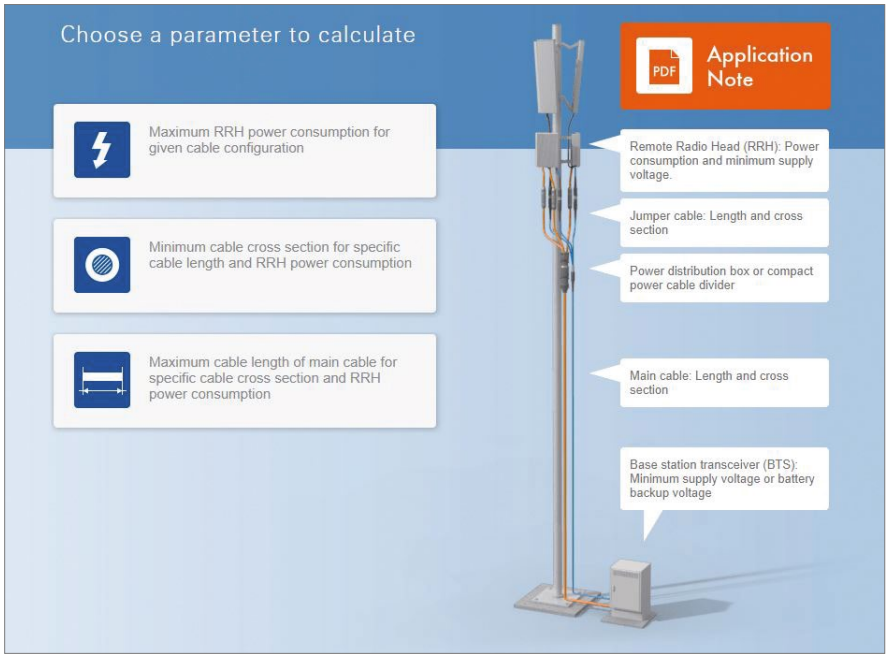
Multiriser
- Material costs
- Installation costs

Work with the leader for remote radio installation solutions

Power design tool for remote radios – Powering 5G networks

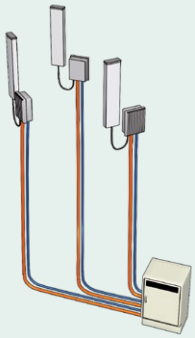
Mobile networks are drawing a lot of power. 5G networks will require even more power to bring the benefits it promises. This results in an near duplication of the power requirement per active equipment. The power design tool supports system engineers to correctly dimension DC power cables or to verify the limits of an existing power supply system. It is a powerful and easy-to-use tool to answer the following questions:

What is the maximum allowable RRH power consumption at given cable configuration?
What is the minimum required cable cross section to supply a specific RRH at a given tower height?
What is the maximum allowed cable length of a pre-specified cable cross section and RRH? E. g., a 1000 W remote radio with 10 mm^2 power cable.



Make your own power dimensioning under
https://pdt.hubersuhner.com/

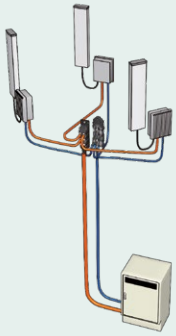
Quick guide on installation solutions



Discrete fiber feeders for single RRH

- One fiber optic feeder per RRH needed
- Default solution of system vendors
- Not scalable and not future-proof
- Vendor specific cables and connectors

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MASTERLINE Ultimate (MLU)

- Multi-riser cable with compact connector head up to 12 RRHs
- Pre-connectorised fiber optic cabling system with up to 12 outdoor socket connectors (Q-ODC)
- Installation friendly plug & play system with outdoor connectors
- Low wind-load and space efficient
- Supports multi-vendor installs

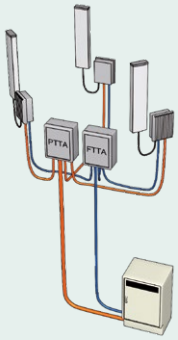
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MASTERLINE Extreme (MLE)

- Multi-riser cable with compact divider for up to 12 RRHs
- Pre-assembled fiber optic cabling system with up to 12 outdoor connectors (Q-ODC)
- Installation friendly plug & play system with outdoor connectors
- Low wind-load and space efficient
- Supports multi-vendor installs

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MASTERLINE Classic (MLC)

- Multi-riser cable with distribution box for up to 24 RRHs
- Pre-assembled fiber optic cabling system with up to 12 indoor connectors (LC duplex)
- Requires handling of indoor fiber optic connectors
- Supports multi-vendor installs

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Discrete power feeders for single RRH

- One power feeder cable per RRH needed

MASTERLINE Ultimate Power (MLUP)

- Multi-wire power cable with compact power connector head for up to 6 RRHs
- Pre-connectorised power cabling system with up to 6 power socket connectors (IP68)

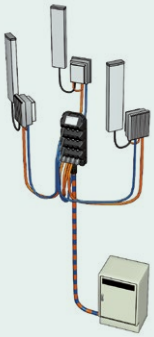
MASTERLINE Extreme Power (MLEP)

- Multi-wire power cable with compact divider for up to 6 RRHs
- Pre-assembled power cabling system with up to 6 power socket connectors (IP68) or open-end wires

Multicore Power supply cable with distribution box

- 2, 6 or 12 wire shielded power supply cable with distribution box for up to 6 RRHs
- Power distribution box with optional surge protection device and/or circuit breaker

Quick guide on installation solutions



MASTERLINE Ultimate Hybrid High Voltage (MLUH HV)

- Hybrid riser cable with compact connector head high voltage (230 VAC) CE conformity
- Suitable for 230 VAC power supply
- Allowing much longer cabling length
- Significant cost savings on cables
- More efficient power transfer
- Pre-connectorised factory-sealed hybrid cable system for 12 RRH
- Mounting bracket for easy mast-, pole-, and wall-installation
- Integral earth point
- Equipped with protection cover for cable exits

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MASTERLINE Ultimate Hybrid (MLUH)

- Hybrid riser cable with compact connector head for up to 6 RRHs
- Pre-connectorised hybrid cabling system with up to 6 fiber optic outdoor socket connectors (Q-ODC) and up to 6 power socket connectors (IP68)
- Optional with Q-ODC-12 connector for up to 18 fiber optic interfaces
- Ultimate „plug & play" solution
- Fast and safe installation
- Low wind-load and space efficient
- Supports multi-vendor installs
- Hybrid cable combines glass fiber cables and copper conductors within a single cable

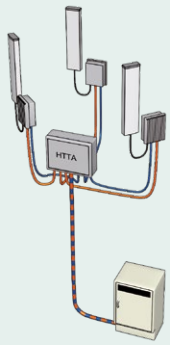
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MASTERLINE Extreme Hybrid (MLEH)

- Hybrid riser cable with compact divider for up to 9 RRHs
- Pre-assembled hybrid cabling system with up to 18 fiber optic outdoor connectors (Q-ODC) and up to 9 power socket connectors (IP68)
- Most commonly installed hybrid product globally
- Fast and safe installation
- Low wind-load and space efficient
- Supports multi-vendor installs
- Hybrid cable combines glass fiber cables and copper conductors within a single cable

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MASTERLINE Classic Hybrid (MLCH)

- Hybrid riser cable with distribution box for up to 6 RRHs
- Pre-assembled hybrid cabling system with up to 12 fiber optic indoor connectors (LC duplex) and up to 6 pairs of copper wires
- Hybrid distribution box with optional surge protection device and/or circuit breaker
- High wind-load compared with MLUH and MLEH
- Elaborate box installation at mast required
- Supports multi-vendor installs
- Hybrid cable combines glass fiber cables and copper conductors within a single cable

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Discrete fiber optic feeders for single RRH



The solution with discrete fiber and power cables supports every type of cell site installation, whether the remote radios are co-located (mast-top installation) or distributed on rooftops of buildings.

HUBER+SUHNER has a leading role in the design and manufacturing of harsh environment connectors (e.g. ODC, FullAXS, Q-ODC or Q-XCO) and cable assemblies for remote radio systems. The installation method with discrete cables is the default solution of mobile system vendors.

HUBER+SUHNER is an approved and qualified cable assembly supplier for the majority of the tier 1 and tier 2 system vendors.

Discrete fiber optic feeders for single RRH

RF **LISCA RF jumper**
page 202



PTTA **Power distribution box with surge protection (optional)**
page 84



FTTA **Discrete fiber optic feeder for single RRH**
page 16



PTTA **Discrete power feeder for single RRH**
page 23

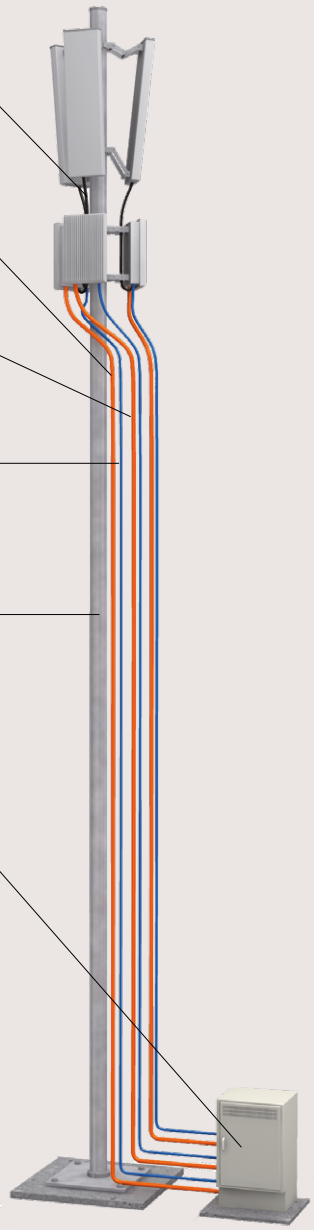


XTTA **Cable clamps**
page 140



FTTA **Overlength box**
page 135





XTTA FTTA, PTTA and HTTA

RF Radio Frequency

FTTA Fiber-To-The-Antenna

PTTA Power-To-The-Antenna

HTTA Hybrid-To-The-Antenna

Discrete fiber feeders for single RRH



Features

- FTTA feeders for all common RRH models and systems
- Ruggedised design and installation proof
- Standard assemblies and customised lengths, available with short lead-time
- Cable diameter 4.8 mm, 5.5 mm
- All cables rodent resistant, CPR compliant and UL (OFNR) approved
- All cable assemblies factory-terminated and tested
- Anatel approved cables, available on request

Specifications

Outer cable diameter	4.8 mm	5.5 mm
Jacket material	LSFH™	
Cable tensile strength (service/during installation)	500/1000 N	
Cable crush resistance (long-term/short-term)	6000/20 000 N/dm	
Temperature range	–40 to +75 °C	
Flame resistance	IEC 60332-1, IEC 60332-3-24, UL1666	
UV resistant	yes	

HUBER+SUHNER cables are deployed on a global scale

Year by year, HUBER+SUHNER produces tens of thousands of FTTA feeder cables and is a leading global supplier to major system vendors and operators. Our customers valueour quality products which are manufactured on all continents close to the local markets.

HUBER+SUHNER is also an innovation leader for remote radio interfaces and is the owner of globally successful products like ODC, Q-ODC and Q-XCO.



Discrete fiber feeders for single RRH

Ordering information

FullAXS feeder with 4.8 mm cable



Length	Item no. single-mode E9/125 A2 (G.657.A2)
	CPR D_{ca} and UL listed OFNR
15 m	85101684
20 m	85101685
30 m	85101686
40 m	85101687
50 m	85101688
60 m	85101689
70 m	85101690
80 m	85101691
90 m	85101692
100 m	85101693
125 m	85101694
150 m	85101695

LC feeder with moulded divider and ruggedised break-out 98 mm long, Ø 4.8 mm cable



Length	Item no. single-mode E9/125 A2 (G.657.A2)
	CPR D_{ca} and UL listed OFNR
10 m	85031795
20 m	85031796
30 m	85031797
40 m	85031798
50 m	85031799
60 m	85031800
70 m	85031801
80 m	85031802
90 m	85031803
100 m	85031804
125 m	85031805
150 m	85031806

Discrete fiber feeders for single RRH

LC feeder with metal divider and ruggedised break-out 90 mm long Ø 4.8 mm cable



Length	Item no. single-mode E9/125 A2 (G.657.A2)
	CPR D_{ca} and UL listed OFNR
10 m	85101708
20 m	85101709
30 m	85101710
40 m	85101711
90 m	85101716
100 m	85101717
125 m	85101718
150 m	85101719

Discrete fiber feeders for single RRH

LC feeder with ruggedised break-out 90 mm long, Ø 4.8 mm cable (Ø 7.0 mm at the RRH pre-chamber entry position)



Length	**Item no. single-mode E9/125 A2 (G.657.A2)**
	CPR D_{ca} and UL listed OFNR
10 m	85101742
15 m	85101743
20 m	85101744
30 m	85101745
40 m	85101746
50 m	85101747
60 m	85101748
70 m	85101749
80 m	85101750
90 m	85101751
100 m	85101752
125 m	85101753
150 m	85101754

Please contact HUBER+SUHNER for other OEM interfaces which are not listed.

Discrete fiber feeders for single RRH

Region specific cable assemblies

Ask for approved regional item numbers fulfilling local market requirements.

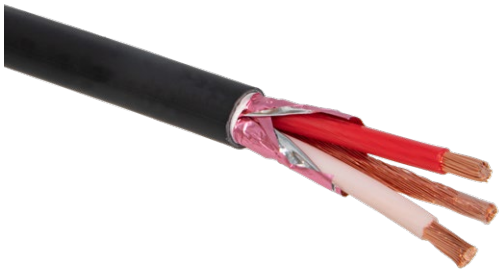
US/North America	UL approved cables	
Europe	CPR approved cables	
Brazil	Anatel approved cables	
India	Monkey-bite proof cables	

Accessories

Description	Item no.	Page	
For outdoor and indoor installation, stores up to 20 m cable excess length (depending on cable diameter)	84103325	135	
Combined clamps for fiber optic and power cable	depends on cable diameter	148	
SFP/SFP+ transceivers for different protocols, data rates and power budgets	See transceiver selection guide on page 262	262	

Discrete power feeders for single RRH

2 core power cable with aluminium foil shielding, red and white insulation and CPR class $B2_{ca}$



Features

- Highly flexible power cable with low bending radius and excellent cable routing properties
- Red and white XLPE insulation compliant to IEC60445:2021
- Aluminum foil shielding with tinned copper drain conductor
- CPR compliant class $B2_{ca}$
- Voltage rating 600 V

Specifications

Jacket material	LSFH
Insulation material	XLPE
Insulation color IEC 60445:2021	red, white
Screen	Aluminum/PET foil with tinned copper drain conductor
Drain wire type IEC 60228	Annealed tinned copper class 5
UV-resistant	According to IEC 60068-2-5
CPR classification	B2ca-s1,d1,a1
Standard	IEC 60502 / IEC 60092
Rated voltage	0.6/1.0 kV
Temperature range	-40 to 85 °C
Conductor type IEC 60228	Annealed copper class 5

Conductor cross section	**6 mm²**	**10 mm²**	**16 mm²**	**25 mm²**
Conductor resistance	3.30 Ω/km	1.91 Ω/km	1.21 Ω/km	0.78 Ω/km
Maximum current rating*	45 A	61 A	82 A	105 A
Drain wire cross section	4 mm²	6 mm²	6 mm²	6 mm²
Cable diameter	11.6 mm	13.7 mm	15.8 mm	19.7 mm
Weight	0.22 kg/m	0.34 kg/m	0.46 kg/m	0.77 kg/m

* Current-carrying capacity according IEC 60364-5-52, copper conductor with max conductor temperature 90°C, ambient temperature 60°C, installation methode E

Ordering information

Item no.	**Cross section**	**Length per reel**	**Reel flange size**
85173020	6 mm²	1000 m	100 cm
85173021	10 mm²	1000 m	110 cm
85173926	16 mm²	1000 m	120 cm
85173058	25 mm²	1000 m	140 cm

Discrete power feeders for single RRH

2 core power cable with aluminium foil shielding with dual copper drain wire, red and white insulation and CPR class $B2_{ca}$



Features

- Highly flexible power cable with low bending radius and excellent cable routing properties
- Stranded cable construction
- LSFH thermoplastic jacket
- Red and white XLPE insulation
- Aluminum foil shielding with dual copper drain conductor
- CPR compliant class B2ca
- Voltage rating 600 V

Specifications

Jacket material	LSFH thermoplastic
Insulation material	FR Polyolefin
Insulation color	Red, white (according IEC 60445:2021 for DC installations)
Shielding	Aluminum foil with dual tinned copper drain wire class 5
Conductor type	Annealed copper class 5 (IEC 60228)
UV-resistant	According to IEC 60068-2-5
CPR classification	$B2_{ca}$-s1,d2,a1
Rated voltage	0.6/1.0 kV
Temperature range	-40 to 85 °C

Conductor cross section	**2x 6 mm²**	**2x 10 mm²**	**2x 16 mm²**	**2x 25 mm²**	**2x 35 mm²**
Conductor resistance	3.30 Ω/km	1.91 Ω/km	1.21 Ω/km	0.78 Ω/km	0.55 Ω/km
Maximum current rating*	45 A	61 A	82 A	105 A	131 A
Drain wire cross section	2 x 3 mm²	2 x 5 mm²	2 x 8 mm²	2 x 8 mm²	2 x 8 mm²
Drain wire resistance	3.30 Ω/km	1.91 Ω/km	1.21 Ω/km	1.21 Ω/km	1.21 Ω/km
Cable diameter	10.2 mm	12.0 mm	14.6 mm	17.1 mm	20.8 mm
Weight	0.244 kg/m	0.375 kg/m	0.587 kg/m	0.793 kg/m	1.137 kg/m

* Current-carrying capacity according IEC 60364-5-52, copper conductor with max conductor temperature 90 °C, ambient temperature 60 °C, installation methode E

Ordering information

Item no.	**Cross section**	**Length per reel**	**Reel flange size**
85254562	2x 6 mm²	1000 m	1000 mm
85254563	2x 10 mm²	1000 m	1000 mm
85254564	2x 16 mm²	1000 m	1200 mm
85254565	2x 25 mm²	1000 m	1400 mm
85254566	2x 35 mm²	1000 m	1400 mm

Discrete power feeders for single RRH

2 core power cable with aluminium foil shielding with dual aluminium drain wire, red and white insulation and CPR class $B2_{ca}$



Features

- Highly flexible power cable with low bending radius and excellent cable routing properties
- Stranded cable construction
- LSFH thermoplastic jacket
- Red and white XLPE insulation
- Aluminum foil shielding with dual aluminum drain conductor
- CPR compliant class B2ca
- Voltage rating 600 V

Specifications

Jacket material	LSFH thermoplastic
Insulation material	FR Polyolefin
Insulation color	Red, white (according IEC 60445:2021 for DC installations)
Shielding	Aluminum foil with dual aluminum drain wire class 5
Conductor type	Annealed copper class 5 (IEC 60228)
UV-resistant	According to IEC 60068-2-5
CPR classification	$B2_{ca}$-s1, d2, a1
Rated voltage	0.6/1.0 kV
Temperature range	-40 to 85 °C

Conductor cross section	**2x 6 mm²**	**2x 10 mm²**	**2x 16 mm²**	**2x 25 mm²**
Conductor resistance	3.30 Ω/km	1.91 Ω/km	1.21 Ω/km	0.78 Ω/km
Maximum current rating*	45 A	61 A	82 A	105 A
Drain wire cross section	2 x 3 mm²	2 x 3 mm²	2 x 3 mm²	2 x 3 mm²
Drain wire resistance	4.95 Ω/km	4.95 Ω/km	4.95 Ω/km	4.95 Ω/km
Cable diameter	10.2 mm	12.0 mm	14.6 mm	17.1 mm
Weight	0.188 kg/m	0.271 kg/m	0.408 kg/m	0.593 kg/m

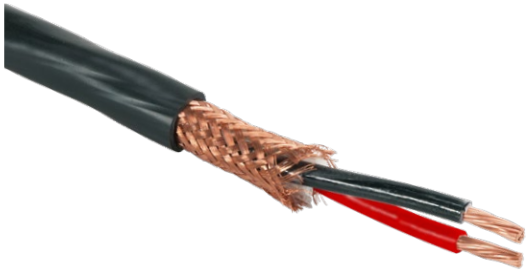
* Current-carrying capacity according IEC 60364-5-52, copper conductor with max conductor temperature 90°C, ambient temperature 60°C, installation methode E

Ordering information

Item no.	**Cross section**	**Length per reel**	**Reel flange size**
85256810	2x 6 mm²	1000 m	1000 mm
85268349	2x 10 mm²	1000 m	1000 mm
85268351	2x 16 mm²	1000 m	1200 mm
85268350	2x 25 mm²	1000 m	1400 mm

Discrete power feeders for single RRH

2 core power supply cable PVC jacket material, red and black insulation, UL listed



Features

- 2 core copper cable for RRH power supply
- UL listed tray cable TC-ER
- PVC jacket material
- Red and black XLPE insulation
- Braided copper shield
- AWG 10 to AWG 4 conductors

Specifications

Jacket material	PVC
Insulation material	XLPE
Insulation color	Red and black
Screen	Braided screen of copper wires
Installation temperature range	-10 °C to +50 °C
Operating temperature range	-40 °C to +75 °C

Cross section	AWG 8
Resistance	0.63 Ω/kft
Maximum current rating at 50°C ambient temperature	45 A
Cable diameter	0.532" (13.5 mm)
Weight	-10 °C to +50 °C

Ordering information

Cross section	AWG 8
Item number	85219851

Cross sections from AWG 10 to AWG 4 on request

Discrete power feeders for single RRH

2 core power supply cable PVC jacket material, UL listed (TC-ER)



Features

- 2 core copper cable for RRH power supply
- UL listed tray cable TC-ER
- PVC jacket material
- Braided copper shield
- AWG 10 to AWG 2 conductors

Specifications

Jacket material	PVC
Conductor type	copper stranded, class C, type THHN/THWN-2
Insulation material	PVC
Insulation colour	black, white
Screen	braid copper shield, coverage 65 to 85 %
Rated voltage	0.6/1.0 kV
Temperature range	–40 to 90 °C
Minuimum bending radius	10 × outer diameter
	8 × outer diameter

Cross section	**AWG 12**	**AWG 10**	**AWG 8**	**AWG 6**	**AWG 4**
Resistance	1.65 Ω/kft	1.04 Ω/kft	0.64 Ω/kft	0.39 Ω/kft	0.25 Ω/kft
Maximum current rating at 50 °C ambient temperature	25 A	33 A	45 A	62 A	88 A
Cable diameter	0.41" (10.3 mm)	0.47" (11.8 mm)	0.59" (15.9 mm)	0.69" (17.6 mm)	0.87" (22.0 mm)
Cross section braid	AWG 12	AWG 10	AWG 10	AWG 8	AWG 8
Weight	88 lbs/kft	124 lbs/kft	205 lbs/kft	353 lbs/kft	551 lbs/kft

Ordering information

Cross section	**AWG 12**	**AWG 10**	**AWG 8**	**AWG 6**	**AWG 4**
Item number	85020805	85020806	85020807	85086434	85086435

MASTERLINE Ultimate (MLU)



Multi-riser cable with compact connector head

MASTERLINE Ultimate is the most innovative fiber optic cabling system of HUBER+SUHNER for remote radio installations. The pre-connectorised factory-sealed fiber optic systems support up to 12 RRHs and connect the remote radios with easy-to-install Q-ODC fiber optic jumpers.

The robust connector head with an integrated pulling eye allows easy cable lifting without the need for hoisting grips. The encapsulated connector head can be directly attached to the mast with a single „click“ at a pre-mounted adaptor plate.

MASTERLINE Ultimate is available with Q-ODC-12/24 (MLUQ), a 12 or 24 fiber outdoor connector, instead of a hardwired multi-riser cable. MLUQ allows the use of RRH/antenna pole mount frames to further reduce on-site installation time.

These unique features make MASTERLINE Ultimate the best-in-class product in terms of ease of mast-top installation, installation robustness and efficiency.

MASTERLINE Ultimate (MLU)

RF **LISCA RF jumper**
page 202



FTTA **Q-ODC RRH jumpers**
page 23



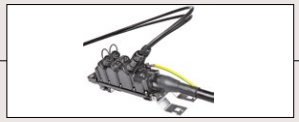
PTTA **Power jumpers**
page 48



FTTA **MASTERLINE Ultimate with Q-ODC-2**
MASTERLINE Ultimate with Q-ODC-24
page 28



PTTA **MASTERLINE Ultimate Power**
page 42



XTTA **Cable clamps**
page 140



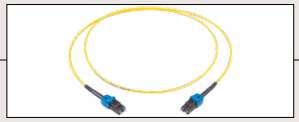
FTTA **Overlength box**
page 135

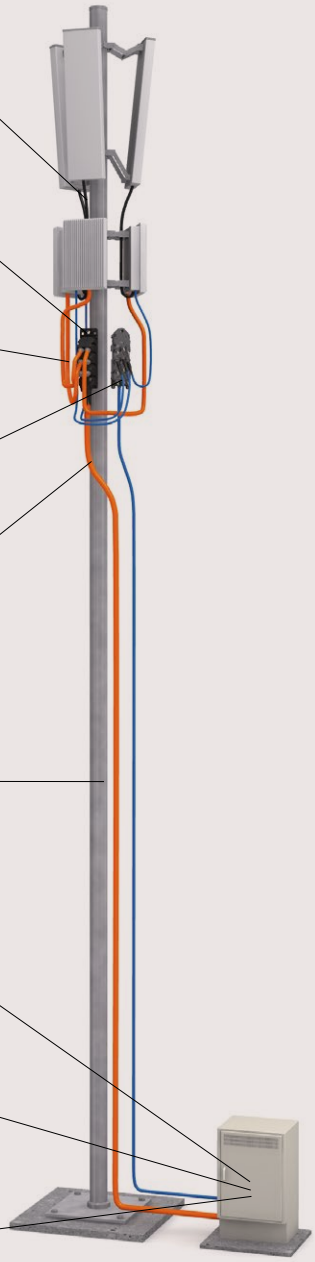


FTTA **CTB 19“ patching box**
page 136



FTTA **LC patchcord**
page 139





XTTA FTTA, PTTA and HTTA

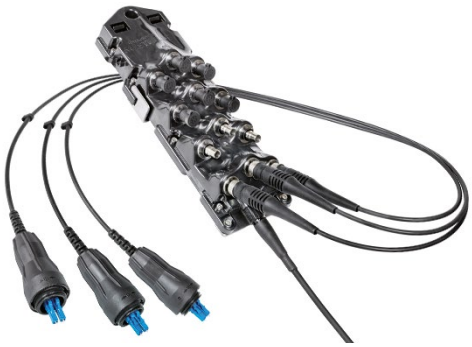
RF Radio Frequency

FTTA Fiber-To-The-Antenna

PTTA Power-To-The-Antenna

HTTA Hybrid-To-The-Antenna

MASTERLINE Ultimate (MLU)



Features

- Pre-connectorised factory-sealed „plug & play“ fiber optic cabling system for up to 12 RRHs
- Robust connector head with 6 or 12 Q-ODC sockets
- Connects the RRH with easy-to-install Q-ODC fiber optic jumpers
- Integrated pulling eye for easy cable lifting
- Loose tube cables with up to 24 fibers, rodent protected and UV resistant and CPR compliant
- Connectors numbered for easy channel identification
- Easy and time-saving installation

Specifications

Number of Q-ODC connector socket		6 or 12 (sepcifications see page 145)
Dimensions L × W × H	enclosure without cover	293 × 110 × 46 mm
	enclosure with cover	460 × 160 × 110 mm
Temperature range	during installation	–10 up to +50 °C
	in service	–40 up to +75 °C
Ingress protection		IP67
Impact resistance		IK 07
UV resistant for outdoor use		ISO 4892-3
Cable type		glass-armoured multifiber loose tube cable
Jacket material		LSFH™, black
Cable diameter		7.0 mm
Minimum bending radius	during installation	110 mm
	in service	70 mm
Cable flame resistance	IEC 60332-1 IEC 60332-3-24	passed
CPR compliant		class D_{ca} s1a, d0, a1
Protection tube BTS side	outer diameter	36 mm



MASTERLINE Classic with LC uniboot at BTS side



Protective cover for connector is optional available

MASTERLINE Ultimate (MLU)

Ordering information

MASTERLINE Ultimate with Q-ODC sockets and LC uniboot connectors



Length	Item no. Fiber type: single-mode E9/125 A2 (G.657.A2)				Item no. Fiber type: multimode G50/125 OM3	
	Cable type: LSFH™, CPR D_{ca}		Cable type: LSFH™, UL listed		Cable type: LSFH™, CPR D_{ca}	
	12 fibers – 6 RRH	24 fiber – 12 RRH	12 fibers – 6RRH	24 fibers – 12 RRH	12 fibers – 6 RRH	24 fibers – 12 RRH
20 m	85019356	85019892	85183908	85019905	85087480	85087490
30 m	85019357	85019893	85183909	85019906	85087481	85087491
40 m	85019358	85019894	85183910		85087482	85087492
50 m	85019359	85019895	85183911		85087483	85087493
60 m	85019360	85019896	85183912	85019911	85087484	85087494
70 m	85019361	85019897	85183913		85087485	85087495
80 m	85019362	85019898	85183914		85087486	85087496
90 m	85019363	85019899	85183915		85087487	85087497
100 m	85019364	85019900	85183916	85019916	85087488	85087498
125 m	85019365	85019901	85183917	85184419		
150 m	85019366	85019902	85183919	85184420		
200 m	85019367	85019903	85183920	85184421		

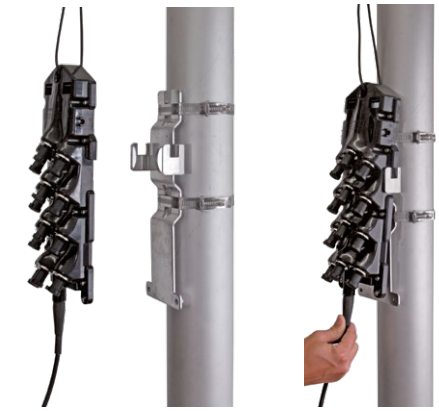
Up to 80 m supplied as air ring and for longer cable systems on a double-flange reel.

Option:
Customizable in length

MLU installation

Easiest-to-install fiber optic product available on the market.

Installation features



Pulling
The robust connector head with integrated pulling eye allows for easy cable lifting without the need for hoisting grips. The small form factor allows pulling of the connector head even inside of a mono pole.

Mounting bracket
The MLU connector head can be locked easily to the mounting bracket.
The bracket has provision for fixation either to a mast or directly onto a wall.



Q-ODC push-pull connector
The Q-ODC push-pull connector allows for a quick and reliable connection of the remote radio head with jumper cables. The Q-ODC connector is used by an ever-growing number of operators and OEMs world-wide.



Protection tube on BTS side
Supplied with robust protection tube to protect the fibers breakouts on BTS side from damage during installation. Can be easily removed by pulling the rip cord.

NEW: MASTERLINE Ultimate with ODC-2

MASTERLINE Ultimate fiber optic cabling system is also available with ODC-2 connector sockets.
The ODC-2 connector has a screwed locking mechanism, instead a push-pull coupling mechanism like Q-ODC-2 connector.

Specifications see page 151.



MASTERLINE Ultimate (MLU)

Q-ODC connectors



Q-ODC plug
on the jumper

Features

- Robust push-pull coupling mechanism – two clearly defined mating states
- Highest outdoor installation safety
- Available for all types of RRH
- Waterproof, dust proof and corrosion resistant; does not require secondary wrapping



Q-ODC socket on MLU head

Specifications see page 152.

Mating/un-mating sequences



Push plug connector slightly into socket connector, rotate to find keying position, push connector to mate.



Mated – connector snaps in and is fully strain relieved.



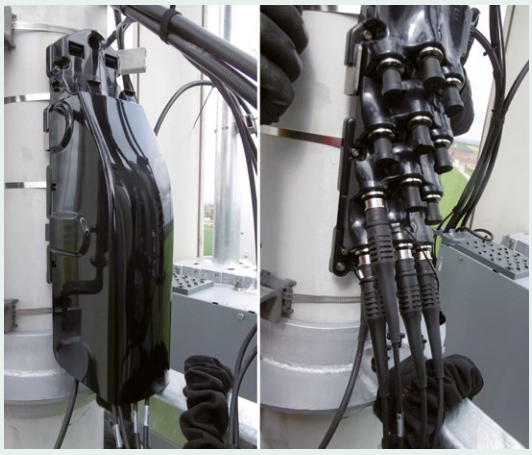
Pull coupling ring to un-mate.

Easiest-to-install fiber cabling system

The robust connector head with an integrated pulling eye allows easy cable lifting. The encapsulated connector head can be directly attached to the mast with a single «click» at a pre-mounted adaptor plate.

MLU offers highest variability and security in connecting remote radio units to the fiber optic network. With the unique shape of the top end and the additional protection cover this new connection system is providing a stream-line shaped appearance that provides less wind load.

These unique features make MASTERLINE Ultimate the best-in-class product in terms of ease of mast-top installation, installation robustness and efficiency.



MASTERLINE Ultimate (MLU)

Q-ODC RRH jumpers



Features

- Compatible with MLE, MLEH, MLU and MLUH terminated with Q-ODC
- Ruggedised and robust RRH jumper cable – easy and reliable to install
- Available for all types of RRH
- Cable diameter 4.8 mm, 5.5 mm or 7 mm
- Standard lengths of 2, 5 and 10 m, customised lengths available
- Ingress protection IP68 (Q-ODC)

Ordering information

Q-ODC plug to LC duplex jumper with moulded divider and ruggedised break-out 98 mm long, Ø 4.8 mm cable



Length	Item no. single-mode E9/125 A2 (G.657.A2)
	CPR D_{ca} and UL listed OFNR
2 m	85032280
5 m	85032282
10 m	85032283

Q-ODC plug to FullAXS, cable Ø 4.8 mm



Length	Item no. single-mode E9/125 A2 (G.657.A2)
	CPR D_{ca} and UL listed OFNR
2 m	85006042
5 m	85006043
10 m	85006044

MASTERLINE Ultimate (MLU)

Ordering information

Q-ODC plug to LC duplex jumper with ruggedised break-out 85 mm long, cable Ø 5.5 mm



Length	Item no. multimode G50/125 OM3
	CPR D_{ca}
2 m	85002965
5 m	85002966

Q-ODC plug to LC duplex jumper with ruggedised break-out 90 mm long, Ø 7.0 mm cable



Length	Item no. single-mode E9/125 A1 (G.657.A1)
	CPR D_{ca}
2 m	84204528
5 m	84204530
10 m	84204532

Q-ODC plug to PDLC, cable Ø 7.0 mm



Length	Item no. single-mode E9/125 A1 (G.657.A1)
	CPR D_{ca}
2 m	84204521
5 m	84204523

Q-ODC plug RRH jumpers to other OEM interfaces

Please contact HUBER+SUHNER for Q-ODC plug RRH jumpers for other OEM interfaces which are not listed above.

MASTERLINE Ultimate with Q-ODC-12/24 (MLUQ)



Features

- Pre-connectorised factory-sealed “plug & play” fiber optic cabling system for up to 12 RRHs
- Modular RRH installation solution – connector head and multifiber cable can be installed separated
- Q-ODC-12 or Q-ODC-24 connectivity between the connector head and multifiber cable
- Connectorised multifiber cable can be installed through a hole with a minimum diameter of only 22 mm
- Robust connector head with 6 or 12 Q-ODC-2 sockets to connect the RRH with Q-ODC-2 fiber optic jumpers
- Easy and time-saving installation

Specifications

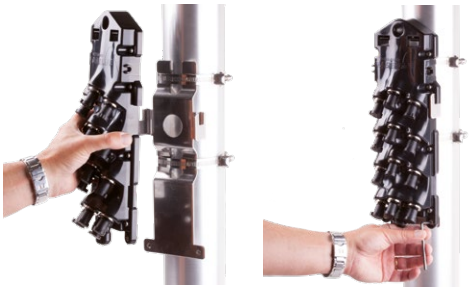
Connector head		
Number of Q-ODC-2 connector socket		6 or 12
Number of Q-ODC-12/24 connector socket (reverse plug)		1
Dimensions L × W × H	enclosure without cover	293 × 110 × 46 mm
	enclosure with cover	460 × 160 × 110 mm
Temperature range	during installation	–10 up to +50 °C
	in service	–40 up to +75 °C
Ingress protection		IP67
Impact resistance		IK 07
UV resistant for outdoor use		ISO 4892-3
Mounting bracket material		stainless steel

Multifiber cable		
Cable type		glass-armoured multifiber loose tube cable
Jacket material		LSFH™, black
Cable diameter		7.0 mm
Minimum bending radius	during installation	110 mm
	in service	70 mm
Fire propagation		IEC 60332-1 and IEC 60332-3-25
CPR compliant		class D_{ca} s1a, d0, a1

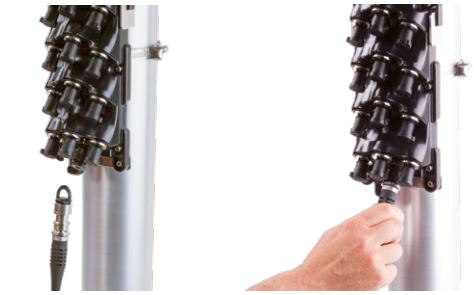


Protective cover for connector is optional available

MASTERLINE Ultimate installation



Hook in MLU head to mounting bracket
The MLU connector head can be easily hooked in to the pre-mounted bracket and firmly fixed with two captive screws at the bottom of the connector head.



Lift the connectorised multifiber cable
Use the integrated pulling eye at the Q-ODC12/24 connector cap to lift the multifiber cable, connectorised with Q-ODC-12/24 extension, up to the mast.

Connect the Q-ODC-12/24 extension to the Q-ODC-12/24 socket (reverse plug) at the bottom of the MLUQ.

Modularity for reduced on-site installation

MASTERLINE Ultimate with Q-ODC-12/24 (MLUQ) is a modular cabling system which allows the use of RRH/antenna pole mount frames. A multifiber cable connectorised with Q-ODC-12/24 extension on the top side is installed at the mast or pole separately from the RRH installation.

The operator builds it's frames with the RRHs, antennas and MLUQ connector head at their logistics centers. Usually 3 or 4 Radios are installed on a pole mount frame (a frame per sector or frequency). At the site the whole radio/antenna frame is lifted up and fixed to the mast and with one click the MLUQ connector head (for up to 12 RRHs) gets connected via the Q-ODC-12/24 connector and multifiber cable fed down to the BBU.



MASTERLINE Ultimate (MLUQ)

Q-ODC-12/Q-ODC-24 connector



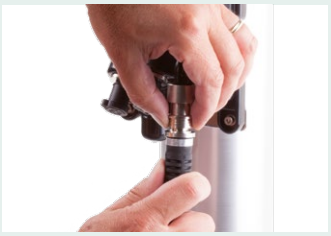
Features

- Up to 24 fibers, single-mode or multimode
- Compact design with MT ferrules
- Robust push-pull coupling mechanism – two clearly defined mating states
- Highest outdoor installation safety
- Waterproof, dust proof and corrosion resistant
- Waterproof protection caps available

Q-ODC-12/24 extension terminated to the multifiber cable and
Q-ODC-12/24 socket (reverse plug) on the MLUQ enclosure

Specifications on page 147.

Mating/unmating sequences



Un-mate protection cap with pulling eye
Pull back metal coupling ring at the Q-ODC-12/24 protection cap and remove protective cap



Mating sequence
Push extension connector slightly into socket (reverse plug) connector, rotate to find keying position, push connector to mate.
Use arrows on the boot for pre-alignment.
Mated – connector snaps in and is fully strain relieved.



Un-mating sequence
Push black rubber coupling ring at the MLUQ socket (reverse plug) to unmate.
Replace dust protection caps.

Q-ODC-2 connector



Specifications and mating/
unmating sequences on page 151.

Features

- 2 fibers, single-mode or multimode
- Compact design with 2 × 1.25 mm ferrules
- Robust push-pull coupling mechanism – two clearly defined mating states
- Highest outdoor installation safety
- Waterproof, dust proof and corrosion resistant
- Waterproof protection caps available
- Fulfills performance standard IEC 61753-1 Cat. E

MASTERLINE Ultimate with Q-ODC-12/24 (MLUQ)

Ordering information

MASTERLINE Ultimate with Q-ODC-12/24 (MLUQ) and multifiber cable connectorised with Q-ODC-12/24 extension and 6/12 × LC duplex connector



MLUQ connector head

Item no. MLUQ connector head with 12 fiber, 6 × Q-ODC-2 socket and 1 × Q-ODC-12 socket (reverse plug) including mounting bracket Fiber type: single-mode E9/125 A2 (G.657.A2)	Item no. MLUQ connector head with 24 fiber, 12 × Q-ODC-2 socket and 1 × Q-ODC-24 socket (reverse plug) including mounting bracket Fiber type: single-mode E9/125 A2 (G.657.A2)
85089691	85089688

Connectorised multifiber cable

Length	Item no. Multifiber cable connectorised with Q-ODC-12 extension and 6 × LC duplex connector, 12 fiber Fiber type: single-mode E9/125 A2 (G.657.A2)	Item no. Multifiber cable connectorised with Q-ODC-24 extension and 12 × LC duplex connector, 24 fiber Fiber type: single-mode E9/125 A2 (G.657.A2)
20 m	85032143	85096335
30 m	85032144	85096336
40 m	85032145	85096337
50 m	85032146	85096338
60 m	85032147	85096339
70 m	85032148	85096340
80 m	85032149	85096341
90 m	85032150	85096342
100 m	85032151	85096343



Q-ODC-12/24 extension with pulling eye cap



MASTERLINE Classic with LC duplex connector at BTS side

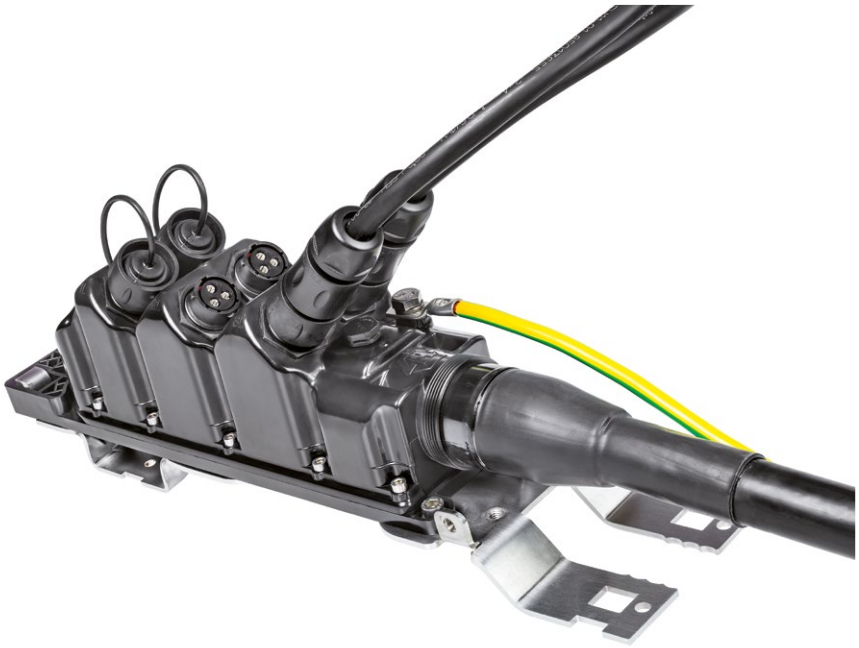
MASTERLINE Ultimate (MLU)

Accessories

Description		Item no.	Page	Picture
Protective cover for connector head		85108554	--	
Overlength box for outdoor and indoor installation, stores up to 20 m cable excess length (depending on cable diameter)		84103325	135	
Combined clamps for fiber optic and power cable		depends on cable diameter	134	
19" CTB patching box	6, 12, 18 or 24 LC duplex adapter blue	depends on quantity of LC adapter	136	
LC patchcords	0.5 m, 0.7 m or 1 m length, single-mode	depends on length	139	
Quick hose clamps. Stainless steel. One set includes 2 pieces hose clamps.	clamping Ø 30 to 155 mm	84076411	146	
	clamping Ø 60 to 500 mm	84076412		
SFP/SFP+ transceivers for different protocols, data rates and power budgets.		See transceiver selection guide on page 262	262	



MASTERLINE Ultimate Power (MLUP)



Multi-wire power cable with compact connector head

MASTERLINE Ultimate Power enables a power supply installation with only one power cable, instead of 6 individual power cables. The compact pre-connectorised head supplies –48 Vdc for up to 6 RRHs.

Power jumpers, available in different lengths, connect the RRHs with –48 Vdc. A pre-laced hoisting grip below the robust connector head allows for easy cable lifting. The encapsulated connector head can be directly attached to the mast at a pre-mounted adaptor plate.

MASTERLINE Ultimate Power (MLUP)

RF **LISCA RF jumper**
page 202



FTTA **Q-ODC RRH jumpers**
page 23



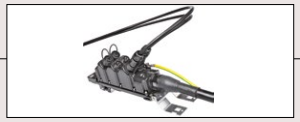
PTTA **Power jumpers**
page 48



FTTA **MASTERLINE Ultimate**
page 28



PTTA **MASTERLINE Ultimate Power**
page 42



XTTA **Cable clamps**
page 140



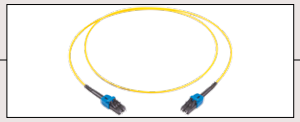
FTTA **Overlength box**
page 135

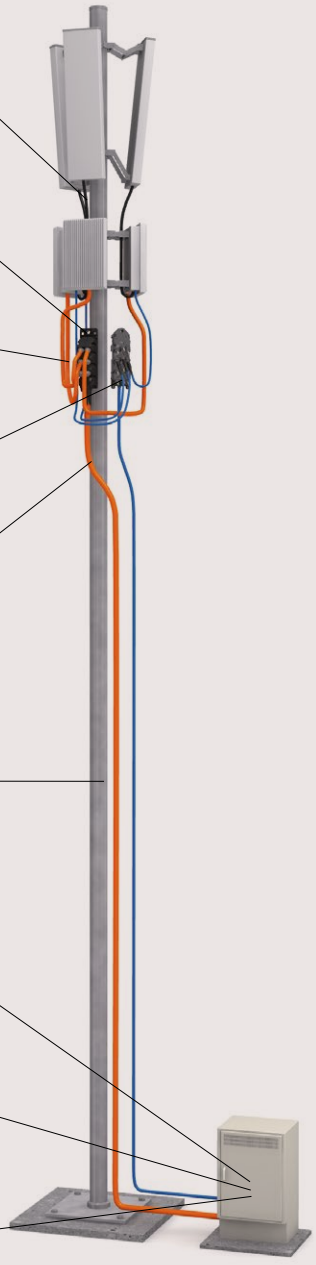


FTTA **CTB 19" patching box**
page 136



FTTA **LC patchcord**
page 139





XTTA FTTA, PTTA and HTTA

RF Radio Frequency

FTTA Fiber-To-The-Antenna

PTTA Power-To-The-Antenna

HTTA Hybrid-To-The-Antenna

MASTERLINE Ultimate Power (MLUP)



Features

- Pre-connectorised factory-sealed power cabling system for up to 6 RRHs
- Modular "plug & play" system with 6 power connectors
- Highly flexible 12-core power cable 6 mm² to 16 mm² and AWG 10 to AWG 6
- Conductor insulation color red and white acc. IEC 60445:2021
- Hoisting grip for cable lifting
- Mounting bracket for easy mast-, pole-, and wall-installation
- Space-efficient, low wind-load
- Integral earth point which can be connected to an earth lead with M8 ring terminal

Connector head specifications

Number of power connector (rugged circular plastic socket)	6
Maximum current rating	up to 40 A (IEC) / 44 A (UL)
Maximum voltage rating	74 Vdc
Dimensions L × W × H	310 × 90 × 97 mm
Ambient temperature range	–10 up to +50 °C (during installation)
	–40 up to +75 °C (in service)
Ingress protection (IEC 60529)	IP67
Impact resistance (IEC 62262)	IK 10
Material housing	high-performance polycarbonate
UV resistance, ISO 4892-3 (methode A/cylce 1)	1000 h
Material flammability rating	UL94-V0

Power cable specifications

	LSFH power cable, global market			**UL listed power cable, US market**		
Jacket material	thermoplastic, LSFH™, CPR class $B2_{ca}$, s1a, d1, a1			PVC		
Conductor cross section	**6 mm²**	**10 mm²**	**16 mm²**	**AWG 10**	**AWG 8**	**AWG 6**
Resistance	3.30 Ω/km	1.91 Ω/km	1.21 Ω/km	3.41 Ω/km	2.13 Ω/km	1.30 Ω/km
Outer diameter	21.7 mm	25.9 mm	30.3 mm	23.5 mm (0.93")	29.5 mm (1.16")	33.5 mm (1.32")
Weight	0.89 kg/m	1.39 kg/m	2.02 kg/m	1.14 kg/m	1.64 kg/m	2.33 kg/m
Shielding	Aluminium foil with earth conductor copper tinned 6mm²			Copper foil with earth conductor 6 AWG		



12-core
power cable

MASTERLINE Ultimate Power (MLUP)

Power connectors



Power connector plug at the jumper

Features

- Rugged circular plastic plug connector for remote radio installations
- Machined crimp contacts Ø 3.6 mm for high current
- Bayonet coupling system for easy and quick mating
- 2 wire shielded copper cable with cross section of 6 mm^2 – 10 mm^2
- 3-pol connector for 2-wire shielded copper cable



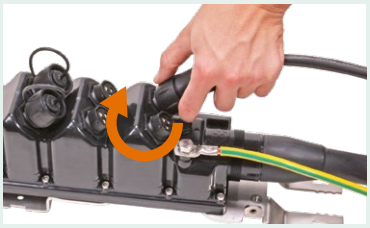
Power connector flange socket at the MLUH connector head

The bayonet coupling system enables a simple and fast mating. With only a 1/3 twist of the coupling ring, connectors are mated with an audible and tactile "click". The machined 3.6 mm crimp contacts ensure a vibration safe termination and a high current rating.

Mating/unmating sequences



Twist the coupling ring of the plug connector to remove protecting cap as shown.



Push plug connector slightly into flange connector, rotate to find keying position, twist coupling ring of the plug connector as shown.



Twist coupling ring as shown to unmate the plug connector.

Power connector specifications

Maximum current rating	40 A (IEC), 44 A (UL), 30 A (CSA)
Rated voltage	230 V (IEC), 600 V (UL), 600 V (CSA)
Operating temperature	–40 to 105 °C (40/10/21 per NFF 61-030)
Flammability rating	UL 94 V0
Salt spray	> 500 hours
UV resistant for outdoor use	ISO 4892
Ingress protection mated	IP67 (EN 60529)
Dimensions	Ø 35.1 mm, length 70 mm
Cable diameter range	5 to 14 mm
Material body connector and backshell	thermoplastic, halogen-free
Crimp contacts	machined Ø 3.6 mm
Material crimp contacts	copper alloy, plating 2 µ Ni + 2 µ Ag
Mating cycles	100
RoHS compliant	yes
Compliance	UL1977: certificate ECBT2 file number E169916 CSA C22.2 n°182.3: certificate ECBT8 file number E169916

Available configuration with metric cross section according IEC

MLUP config. size	Power cable construction	Power connector	Maximum current rating [1]	RRH max. power consumption [2]	MLUP Order Code
MLEP6					
	6 pairs 6 mm²	6 x power connector UTS 40 A	25.5 A	1122 W	MLUP60-06M-X-2000-0000-xxx
	6 pairs 10 mm²		34.8 A	1531 W	MLUP60-10M-X-2000-0000-xxx
	6 pairs 16mm²		40.0 A	1760 W	MLUP60-16M-X-0000-0000-xxx

[1] Maximum current rating @ 60 °C ambient temperature according IEC 60364-5-52, copper conductor with XLPE insulation (installation methode E)
[2] RRH maximum power consumption @ RRH voltage 44 Vdc

Available configuration with American Wire Gauge cross section according NEC

MLUP config. size	Power cable construction	Power connector	Maximum current rating [1]	RRH max. power consumption [2]	MLUP Order Code
MLEP6 small housing					
	6 pairs 10 AWG	6 x power connector UTS 40 A	16.4 A	722 W	MLUP60-10A-X-2000-0000-xxx
	6 pairs 8 AWG		22.6 A	994 W	MLUP60-08A-X-2000-0000-xxx
	6 pairs 6 AWG		30.8 A	1355 W	MLUP60-06A-X-0000-0000-xxx

[1] Current rating @ 50 °C ambient temperature according NEC table 310.15
[2] RRH maximum power consumption @ RRH voltage 44 Vdc

MLUP order code:

MLUP	x	0	xxx	X	20	00	0000	xxx
	Number of power connectors 3, 4 or 6		Cross section power conductor		Power connector type 20 = UTS 40A / 44A			Length in meter 5 or 10m steps

Options:

- Multi-core power cable TPE jacket material with UL -40 °C listing for installation temperature down to -30 °C

MASTERLINE Ultimate Power (MLUP)

Ordering information

Accessories

Description	Item no.	Page	Picture
Clamps for hybrid cable	depends on cable diameter	138	
Grounding kits	85015070	250	
Grounding cable, 0.5 m, 16 mm² and 25 mm², black and yellow/green	depens on cross section and colour	251	
Auxiliary tool to open and close power connector	85013939	--	
Protection cover for MLUH 3 Stainless steel Dimension (L × H × W) 365 × 200 × 90 mm	85032157	--	

MASTERLINE Ultimate Power (MLUP)

Power jumpers



Features

- Compatible with MLUP, MLEP, and MLUH
- Terminated with a rugged circular plastic plug connector and blunt cut on the RRH side
- 2 wire shielded copper cable with a cross section of 6 mm² to 10 mm² and AWG 10 to AWG 8
- Standard length 2, 5, 10 and 15 m

Specifications

	Global market		**UL listed US market**		
Jacket material	LSFH™		PVC, flame retardant		
Conductor type	6 mm²/10 mm² IEC 60228 class 5		THHN/THWN-2, class C		
Insulation colour	red, white		black, white		
Cable shielding	Aluminium foil with earth conductor		Braided screen of copper wires		
Rated voltage	0.6/1.0 kV				
Number of conductor	2				
Conductor cross section	**6 mm²**	**10 mm²**	**AWG 12**	**AWG 10**	**AWG 8**
Resistance	3.30 Ω/km	1.91 Ω/km	1.65 Ω/kft	1.04 Ω/kft	0.64 Ω/kft
Maximum power current	40 A *	40 A *	30 A	40 A	44 A*
Cable diameter	11.6 mm	13.3 mm	0.41" (10.3 mm)	0.47" (11.8 mm)	0.529" (13.3 mm)
Cross section shielding	4 mm²	6 mm²	AWG 12	AWG 10	AWG 10

* limitation through power connector maximum current rating 40 A (IEC)/44 A (UL)

Ordering information



Market	**Length**	**Item no.**		
Global			**6 mm²**	**10 mm²**
	2 m		85228304	85228306
	5 m		85228303	85228307
	10 m		85228305	85228308
US UL listed		**AWG 12**	**AWG 10**	**AWG 8**
	5 m	85086575	85183646	85142464
	10 m	85080185	85183649	85165762
	15 m	85086584	85207879	85165763

MASTERLINE Ultimate Power (MLUP)

Y- and λ- Power Jumper

HUBER+SUHNER Y- and λ- Power Jumpers provide flexible installation options for efficiently delivering DC power to Remote Radio Heads (RRHs). The Y-Power Jumper allows for the connection of a single RRH with dual power feed or two RRHs with a single power feed, enhancing versatility. Meanwhile, the λ-Power Jumper facilitates easy upgrades of existing power installations to support high-power radios, ensuring seamless integration.



Features

- Compatible with MLUP, MLEP and MLUH
- One Y-/λ-Piece design
- Terminated with a rugged circular plastic plug connector and blunt cut on the RRH side
- Blunt cut to blunt cut assembly options available
- 2 wire shielded copper section of 6 mm² to 16 mm² and AWG 10 to AWG 6
- Standard length 2, 5 and 10 m

Specifications

	EMEA market			**APAC market**		**UL listed US market**		
Jacket material	LSFH™			LSFH™		PVC, flame retardant		
Conductor type	6 mm²/16 mm² IEC 60228 class 5			6 mm²/10 mm² IEC 60228 class 5		THHN/THWN-2, class C		
Insulation colour	red, white			red, blue		red, black		
Cable shielding	Aluminium foil with earth conductor			Braided screen of copper wires				
Rated voltage	0.6/1.0 kV							
Number of conductor	2							
Conductor cross section	**6 mm²**	**10 mm²**	**16 mm²**	**6 mm²**	**10 mm²**	**AWG 10**	**AWG 8**	**AWG 6**
Resistance	3.30 Ω/km	1.91 Ω/km	1.21 Ω/km	3.30 Ω/km	1.91 Ω/km	1.04 Ω/kf	0.628 Ω/kf	0.402 Ω/kf
Maximum power current	40 A*	40 A*	40 A*	40 A*	40 A*	40 A	44 A*	44 A*
Cable diameter	11.6 mm	13.3 mm	15.8 mm	12.1 mm	13.3 mm	0.47" (11.8 mm)	0.532" (13.5mm)	0.654" (16.6mm)
Cross section shielding	4 mm²	6 mm²	6 mm²	4.5 mm²	6 mm²	AWG 10	AWG 8	AWG 8

* limitation through power connector maximum current rating 40 A (IEC)/44 A (UL)

Ordering information



Y-Power Jumper



Y-Power Jumper (bird proof)

Assembly length options:

Other standard lengths available: 2m and 10 m

Product Availability	Assembly type	Cross section Side BTS	Cross section Side Radio	Length	Item Number
EMEA	Y-Assembly, blunt cut side B	6 mm^2	6 mm^2	5 m	85235228
EMEA	Y-Assembly, blunt cut side B	10 mm^2	6 mm^2	5 m	85228310
EMEA	Y-Assembly, blunt cut side B	10 mm^2	10 mm^2	5 m	85239863
EMEA	Y-Assembly, blunt cut both sides	16 mm^2	10 mm^2	5 m	85239908
EMEA	Y-Assembly, blunt cut both sides	16 mm^2	16 mm^2	5 m	85239877
APAC	Y-Assembly, blunt cut side B, Bird Proof	6 mm^2	6 mm^2	5 m	85241341
APAC	Y-Assembly, blunt cut side B, Bird Proof	10 mm^2	6 mm^2	5 m	85241348
APAC	Y-Assembly, blunt cut side B, Bird Proof	10 mm^2	10 mm^2	5 m	85241358
NAM	Y-Assembly, blunt cut side B	10 AWG	10 AWG	5 m	85243206
NAM	Y-Assembly, blunt cut side B	8 AWG	10 AWG	5 m	85243211
NAM	Y-Assembly, blunt cut side B	8 AWG	8 AWG	5 m	85243797
NAM	Y-Assembly, blunt cut all sides	6 AWG	8 AWG	5 m	85243905
NAM	Y-Assembly, blunt cut all sides	6 AWG	6 AWG	5 m	85243217

Product Availability	Assembly type	Cross section Side BTS	Cross section Side Radio	Length	Item Number
EMEA	λ-Assembly, blunt cut side B	6 mm^2	6 mm^2	5 m	85240301
EMEA	λ-Assembly, blunt cut side B	6 mm^2	10 mm^2	5 m	85228313
EMEA	λ-Assembly, blunt cut side B	10 mm^2	10 mm^2	5 m	85240309
EMEA	λ-Assembly, blunt cut side B	10 mm^2	16 mm^2	5 m	85235255
EMEA	λ-Assembly, blunt cut all sides	16 mm^2	16 mm^2	5 m	85240314
APAC	λ-Assembly, blunt cut side B, Bird Proof	6 mm^2	6 mm^2	5 m	85243169
APAC	λ-Assembly, blunt cut side B, Bird Proof	6 mm^2	10 mm^2	5 m	85243173
APAC	λ-Assembly, blunt cut side B, Bird Proof	10 mm^2	10 mm^2	5 m	85243178
NAM	λ-Assembly, blunt cut side B	10 AWG	10 AWG	5 m	85243240
NAM	λ-Assembly, blunt cut side B	8 AWG	10 AWG	5 m	85243245
NAM	λ-Assembly, blunt cut side B	8 AWG	8 AWG	5 m	85243916
NAM	λ-Assembly, blunt cut side B	6 AWG	8 AWG	5 m	85243925
NAM	λ-Assembly, blunt cut all sides	6 AWG	6 AWG	5 m	85243253



MASTERLINE Extreme (MLE)



Multi-riser cable with compact divider

MASTERLINE Extreme with Q-ODC-2 connectors is an efficient solution in terms of ease of installation, cost and required space on the mast. The compact divider minimises the wind-load and can be fed through small holes (80 mm diameter). The ruggedised push-pull connector Q-ODC allows the installer to connect the RRH jumper cables with a single „click", making it a genuine „plug & play" cabling system. MLE with Q-ODC is available to support up to 12 remote radios.

MASTERLINE Extreme with one Q-ODC-12 connector allows the installer to connect 6 RRH jumper cables with a single „click" and can even be installed through holes with a diameter of 20 mm. The Q-ODC-12 connector has the highest fiber density, based on the proven QN push-pull mating system and can connect 12 fibers in one mating step.

MASTERLINE Extreme is the preferred choice of network installers who require trouble free, reliable and efficient field deployments. MASTERLINE Extreme product family of HUBER+SUHNER is unique in the market and provides the best value for money.

MASTERLINE Extreme (MLE)

RF **LISCA RF jumper**
page 202



FTTA **Q-ODC RRH jumper**
Q-ODC-12 RRH jumper
page 23, 33



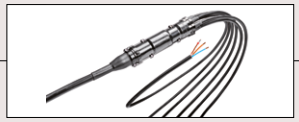
PTTA **Power jumpers (optional)**
page 48



FTTA **MASTERLINE Extreme with Q-ODC**
MASTERLINE Extreme with Q-ODC-12
page 54, 57



PTTA **MASTERLINE Extreme Power**
page 62



XTTA **Cable clamps**
page 140



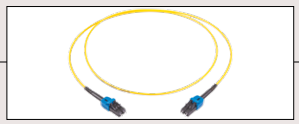
FTTA **Overlength box**
page 135

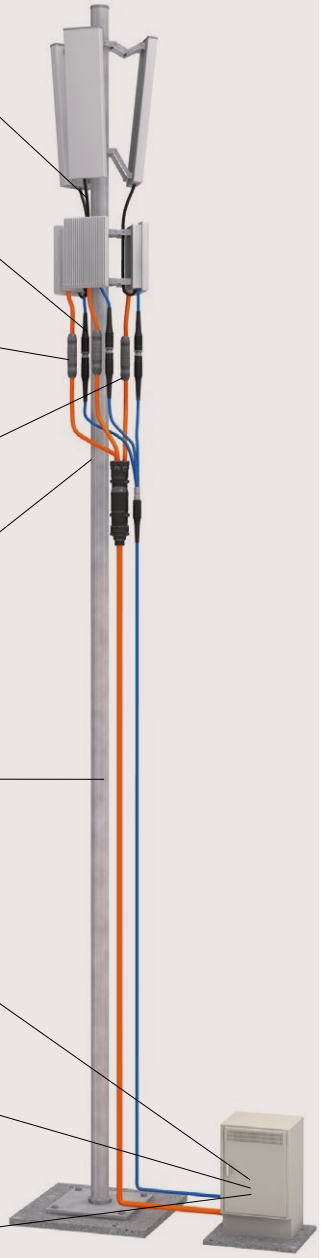


FTTA **CTB 19" patching box**
page 136



FTTA **LC patchcord**
page 139





XTTA FTTA, PTTA and HTTA

RF Radio Frequency

FTTA Fiber-To-The-Antenna

PTTA Power-To-The-Antenna

HTTA Hybrid-To-The-Antenna

MASTERLINE Extreme (MLE) with Q-ODC



Features

- Pre-assembled „plug & play“ cabling system
- Terminated with Q-ODC extension connectors on RRH side
- Adaptation to any RRH interface with Q-ODC plug jumpers
- BTS side terminated with LC uniboot connectors
- Ruggedised design with robust break-out cables
- Robust pulling tube for cable lifting
- Loose tube cables with 12 or 24 fibers, rodent protected and UV resistant and CPR compliant
- Connectors numbered for easy channel identification
- Easy and time-saving installation

Specifications

Number of fibers		12	24
Build-in hole dimension divider BTS side		15.6 to 16.4 mm	
Outer diameter divider	RRH side	22.0 mm	28.0 mm
Tensile load on individual break-out cables		600 N	
Ingress protection with Q-ODC connector		IP67	
Break-out lengths		0.55/0.64 m	0.55/0.64/0.73/0.82 m
Break-out cable diameter		5 mm	
Cable type		glass-armoured multifiber loose tube cable	
Jacket material		LSFH™, black	
Cable diameter		7.0 mm	
Temperature range	installation	–10 to +50 °C	
	in service	–40 to +75 °C	
Fire propagation		IEC 60332-1 and IEC 60332-3-25	
CPR compliant		class D_{ca} s1a, d0, a1	
Flame resistance	IEC 60332-1	passed	
	IEC 60332-3-24		
Pulling tube with pulling eye	outer diameter	60 mm	
Protection tube BTS side	outer diameter	36 mm	



LC uniboot at BTS side



Protecting tube at BTS side



Pulling tube with pulling eye

MASTERLINE Extreme (MLE) with Q-ODC

Q-ODC connectors



Q-ODC plug on the jumper

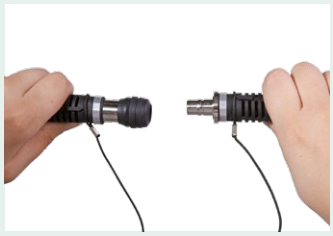
Features

- Robust push-pull coupling mechanism – two clearly defined mating states
- Highest outdoor installation safety
- Waterproof, dust proof and corrosion resistant; does not require secondary wrapping



Q-ODC extension on the MLE

Mating/unmating sequences



Push plug connector slightly into extension connector, rotate to find keying position, push connector to mate.



Mated – connector snaps in and is fully strain relieved.



Pull coupling ring to unmate.

Q-ODC RRH jumpers



For ordering information, please see page 23.

Features

- Compatible with MLE, MLEH, MLU and MLUH terminated with Q-ODC
- Ruggedised and robust RRH jumper cable – easy and reliable to install
- Available for all types of RRH
- Cable diameter 4.8 mm, 5.5 mm or 7 mm
- Standard lengths of 2, 5 and 10 m, customised lengths available

MASTERLINE Extreme (MLE) with Q-ODC

Ordering information

MASTERLINE Extreme with Q-ODC extensions and LC uniboot connectors.



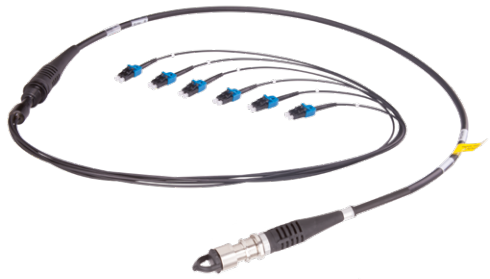
Length	Item no. Fiber type: single-mode E9/125 A2 (G.657.A2)				Item no. Fiber type: multimode G50/125 OM3	
	Cable type: LSFH™, CPR D_{ca}		Cable type: LSFH™, UL listed		Cable type: LSFH™, CPR D_{ca}	
	12 fibers – 6 RRH	24 fiber – 12 RRH	12 fibers – 6 RRH	24 fibers – 12 RRH	12 fibers – 6 RRH	24 fibers – 12 RRH
20 m	85005467	85005609	85004452	85004479	85009293	85014283
30 m	85005468	85005610	85004453	85004481	85009294	85014284
40 m	85005469	85005611	85004454	85004482	85009295	85014285
50 m	85005470	85005612	85004455	85004483	85009064	85014286
60 m	85005471	85005613	85004456	85004484	85009296	85014287
70 m	85005472	85005614	85004457	85004485	85009297	85014288
80 m	85005473	85005615	85004458	85004486	85009299	85014289
90 m	85005474	85170077	85004459	85004487	85009300	85014300
100 m	85005475	85005617	85004460	85004488	85009301	85014301
125 m	85005478	85005620	85004461	85004489	85014280	85014302
150 m	85005479	85005621	85004462	85004490	85014281	85014303
200 m	85005480	85005622	85004463	85004491	85014282	85014304

Options:
Other length



Supplied on a double-flange reel

MASTERLINE Extreme (MLE) with Q-ODC-12

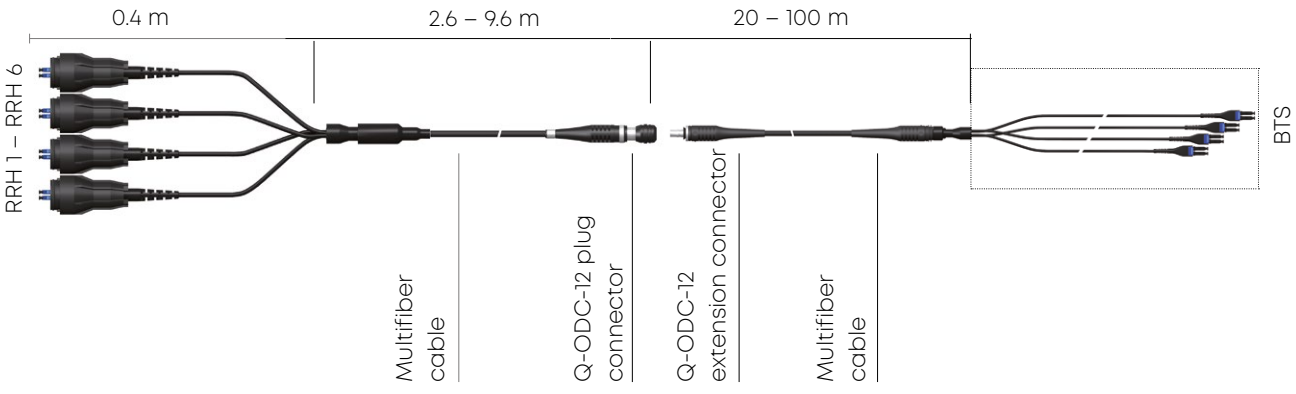


Features

- Pre-assembled „plug & play“ cabling system
- Terminated with Q-ODC-12 extension connectors on RRH side
- Adaptation to any RRH interface with Q-ODC-12 plug connector
- BTS side terminated with LC uniboot connectors
- Ruggedised design with robust break-out cables
- Robust connector cap with pulling eye
- Loose tube cables with 8/12 fibers, rodent protected and UV resistant and CPR compliant
- Connectors numbered for easy channel identification
- Easy and time-saving installation

Specifications

Number of fibers		8/12
Build-in hole diameter BTS side		15.6 to 16.4 mm
Outer diameter divider BTS side		22.0 mm
Break-out cable diameter		5.0 mm
Ingress protection with Q-ODC 12 (mated)		IP68
Cable type		yelly-free glass-armoured multifiber loose tube cable
Jacket material		LSFH™, black
Cable diameter		7.0 mm
Temperature range	installation	–10 to +50 °C
	in service	–40 to +75 °C
Fire propagation		IEC 60332-1 and IEC 60332-3-25
CPR compliant		class D_{ca} s1a, d0, a1
Flame resistance	IEC 60332-1	passed
	IEC 60332-3-24	
Pulling tube with pulling eye	outer diameter	20 mm
Protection tube BTS side	outer diameter	36 mm





LC uniboot at BTS side



Protecting tube at BTS side

MASTERLINE Extreme (MLE) with Q-ODC-12

Q-ODC-12 connector



Q-ODC-12 plug on the multi-branch RRH jumper

Features

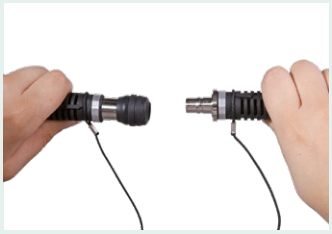
- Connects 12 fibers in one mating step
- Compact design with MT ferrules
- Robust push-pull coupling mechanism – two clearly defined mating states
- Highest outdoor installation safety
- Waterproof, dust proof and corrosion resistant



Q-ODC-12 extension with robust connector cap pulling eye

Specifications on page 147.

Mating/unmating sequences



Push plug connector slightly into extension connector, rotate to find keying position, push connector to mate.



Mated – connector snaps in and is fully strain relieved.



Pull coupling ring to unmate.

MASTERLINE Extreme (MLE) with Q-ODC-12

Ordering information

Glass-armoured 8/12 fiber loose tube cable with Q-ODC-12 extension and LC uniboot connectors



Length	Item no. : 8 fiber, single-mode E9/125 A2	Item no. 12 fiber, single-mode E9/125 A2	
	Cable type: LSFH™, CPR D_{ca}	Cable type: LSFH™, CPR D_{ca}	Cable type: LSFH™, UL listed
20 m	85085658	85032143	85032158
30 m	85085663	85032144	85032159
40 m	85085667	85032145	85032160
50 m	85085677	85032146	85032161
60 m	85085680	85032147	85032162
70 m	85085690	85032148	85032163
80 m	85085693	85032149	85032164
90 m	85085698	85032150	85032165
100 m	85085737	85032151	85032166
125 m	85085739	85032152	85032167
150 m	85085740	85032154	85032169
200 m	85085741	85032155	85032170

Option:
Multimode OM3



Supplied on a double-flange reel

MASTERLINE Extreme (MLE) with Q-ODC-12

Q-ODC-12 multi-branch RRH jumper

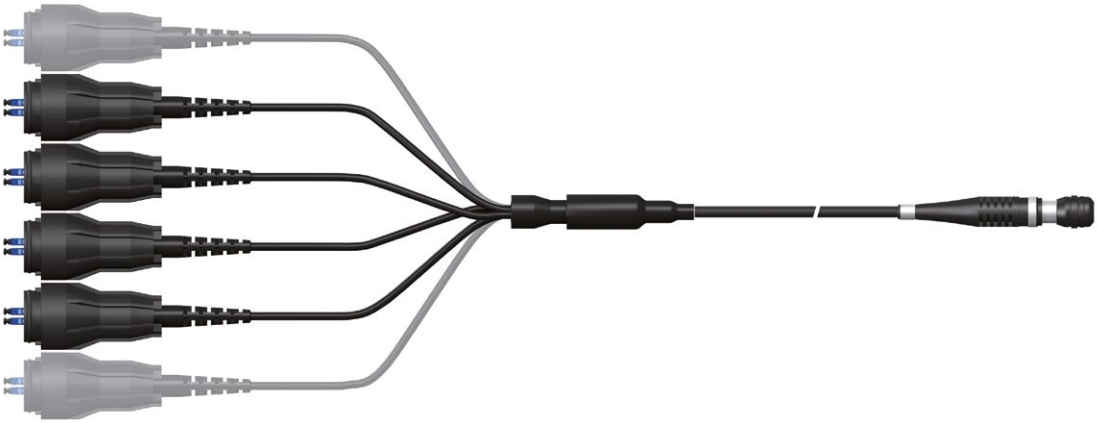


Features

- Terminated with Q-ODC-12 plug and with 2 to 6 RRH-specific interfaces
- Connects up to 6 RRH jumper cables with a single "click"
- Ruggedised design with robust break-out cables
- RRH-specific interface numbered for easy channel identification
- Ingress protection IP68 (Q-ODC-12, mated)

Ordering information

Q-ODC-12 multi-branch RRH jumper with 4/6 FullAXS connector and cable Ø 5.0 mm, single-mode fiber



No. of connectors	Total length	Branch break-out length	Item no.
6	3 m	2 m	85031204
4	3 m	0.4 m	85127434

Q-ODC-12 multi-branch RRH jumper with 4/6 LC duplex, moulded divider and ruggedised break-out 90 mm long and cable Ø 5.0 mm, single-mode fiber



No. of connectors	Total length	Branch break-out length	Item no.
6	3 m	2 m	85032210
4	3 m	0.4 m	85127435

MASTERLINE Extreme (MLE)

Accessories

Description		Item no.	Page	Picture
Overlength box for outdoor and indoor installation, stores up to 20 m cable excess length (depending on cable diameter)		84103325	135	
Combined clamps for fiber optic and power cable		depends on cable diameter	140	
19" CTB patching box	6, 12, 18 or 24 LC duplex adapter blue	depends on quantity of LC adapter	136	
LC patchcords	0.5 m, 0.7 m or 1 m length, single-mode	depends on length	139	
3 fold cable clamp suitable for ODC boot to fix the Q-ODC extension connectors		85012939	142	
6 fold cable clamp suitable for ODC boot to fix 6 Q-ODC extention connectors		85066072	140	
Clamp for MLE 12 fiber divider (22 mm)		85015525	140	
Clamp for MLE 24 fiber divider (28 mm)		85013128	140	
SFP/SFP+ transceivers for different protocols, data rates and power budgets.		See transceiver selection guide on page 262	261	

MASTERLINE Extreme Power (MLEP)



Power-riser cable system

Designed for new 5G Advanced and 6G capabilities

The HUBER+SUHNER **MASTERLINE Extreme Power (MLEP) cable system is a highly modular and scalable power cabling system** built for the demands of 5G Advanced and emerging 6G networks. A wide range of copper cross-sections enables the power supply of RRH/AAU from 300 W up to 3300 W. Besides cable systems for -48Vdc, MLEP is also available for power supplies with 120Vac / 230 VAC.
The new design features more customized configuration options and new features.

MASTERLINE Extreme Power (MLEP)

RF **LISCA RF jumper**
page 202



FTTA **Q-ODC RRH jumper**
Q-ODC-12 RRH jumper
page 23, 33



PTTA **Power jumpers (optional)**
page 48



FTTA **MASTERLINE Extreme with Q-ODC**
MASTERLINE Extreme with Q-ODC-12
page 54, 57



PTTA **MASTERLINE Extreme Power**
page 62



XTTA **Cable clamps**
page 140



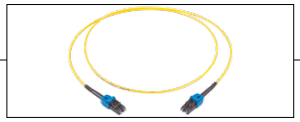
FTTA **Overlength box**
page 135

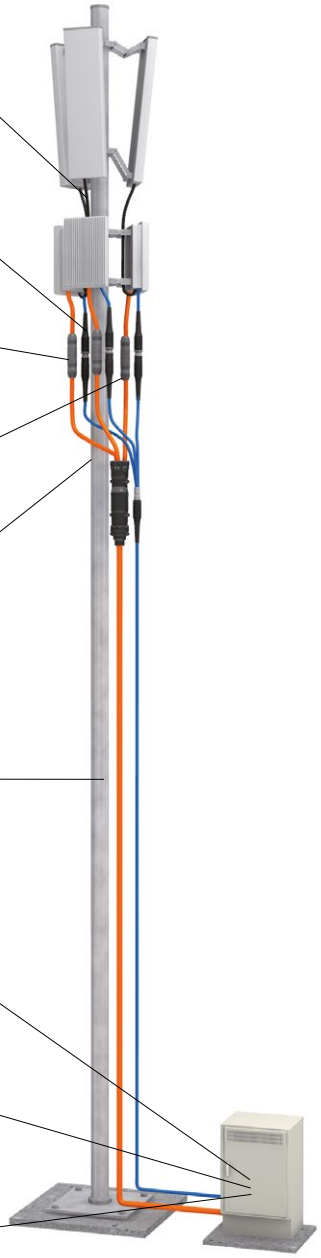


FTTA **CTB 19" patching box**
page 136



FTTA **LC patchcord**
page 139





XTTA FTTA, PTTA and HTTA

RF Radio Frequency

FTTA Fiber-To-The-Antenna

PTTA Power-To-The-Antenna

HTTA Hybrid-To-The-Antenna

MASTERLINE Extreme Power (MLEP)

Key advantages



More flexibility

The modular housing design enables rapid, customer-specific configurations delivered within just a few weeks. Its compact, space-saving form factor makes MLEP the ideal solution for virtually any site requirement. The 2-core power breakout cables are available in lengths from 4 to 8 m / 13 to 26 ft, or as 0.5 m / 1.6 ft versions with a factory-installed power connector. Connectorized MLEP solutions provide maximum installation flexibility, eliminating the need to define the exact breakout length in advance.



More power

With large copper cross-sections, MLEP delivers power up to 3'300 W and supports both -48 Vdc and 120 / 230 Vac power supplies - ensuring maximum performance for next-generation network deployments.



More sustainability

The innovative power splitter architecture minimizes current derating as defined by NEC/NFPA regulations (USA), enabling copper savings of up to 37%. The modular design also supports efficient AC configurations using compact 10 AWG / 4 mm^2 conductors for a lighter, greener installation.



Space-saving installation

The extremely robust, powder coated aluminum divider housing is available in two sizes and allows for a compact, space efficient installation on any site.

Unique options for unique situations

Customer specific numbers of power breakout cables

The MLEP housing supports 2–9 power breakout cables.

Example for an installation of 3 RRH (3 power interfaces)



Example for an installation of 9 RRH (9 power interfaces)



Wide range of conductor cross-sections for low- and high-power radios

A wide range of conductor cross sections is available to support both low and high power radios. Power main cables with copper cross sections of up to 3 AWG / 25 mm² and power breakout cables with up to 6 AWG / 16 mm² per RRH enable reliable power delivery for radios with high energy demands of up to 3300 W per RRH. For low power radios with power consumption around 400 W per RRH, a 10 AWG / 6 mm² conductor cross section is generally sufficient for both the power main cable and the power breakout cable.

The following conductor cross-sections are available for -48V dc power supply

Power supply voltage	Power main cable	Power breakout cable
Up to -74 Vdc	10 to 3 AWG / 6 to 25 mm²	10 to 6 AWG / 6 to 16 mm²

Power supply voltage 120 / 230 Vac

In the telecom industry, –48 Vdc is the most widely used supply voltage due to its reliability, safety, and compatibility with battery-backed power systems. However, in special installations with long distances between the power supply and the RRH, using 230 Vac can be advantageous, as it reduces transmission losses and allows for more efficient power distribution over extended cable runs. The new MLEP design is now also available for 120 / 230 Vac power supply and accompanied by a CE Declaration of Conformity.

The following conductor cross-sections are available for 120 / 230 Vac power supply

Power supply voltage	Power main cable	Power breakout cable
120 / 230 Vac	14 to 12 AWG / 1.5 to 4 mm²	14 to 12 AWG / 1.5 to 4mm²

Power breakouts with or without power connectors

The required length of the power breakouts varies in many cases and is often difficult to determine in advance. The standard length is 4 m / 13 ft and can be increased to 8 m / 26 ft upon customer request. Power breakouts with a length of 0.5 m / 1.6 ft, terminated with a power connector, together with power jumpers in various lengths from 2 m / 6.5 ft to 10 m / 33 ft, allow for flexible installation without needing to know the exact breakout length beforehand. Upon request, HUBER+SUHNER offers power jumpers with factory installed and tested RRH Power Interface connectors. Factory terminated connectors are tested and not prone to water leakage as field mounted plugs. The installation time can be reduced significantly.

Without power connector (blunt cut)

Power breakouts are available with up to 8 m / 26 ft long shielded 2-core power cables



With power connector

UTS (40 A, 6 or 10mm2 / 10 or 8 AWG) or QL (50 A, 6 to 16mm² / 10 to 6 AWG)



With RRH power interface connector

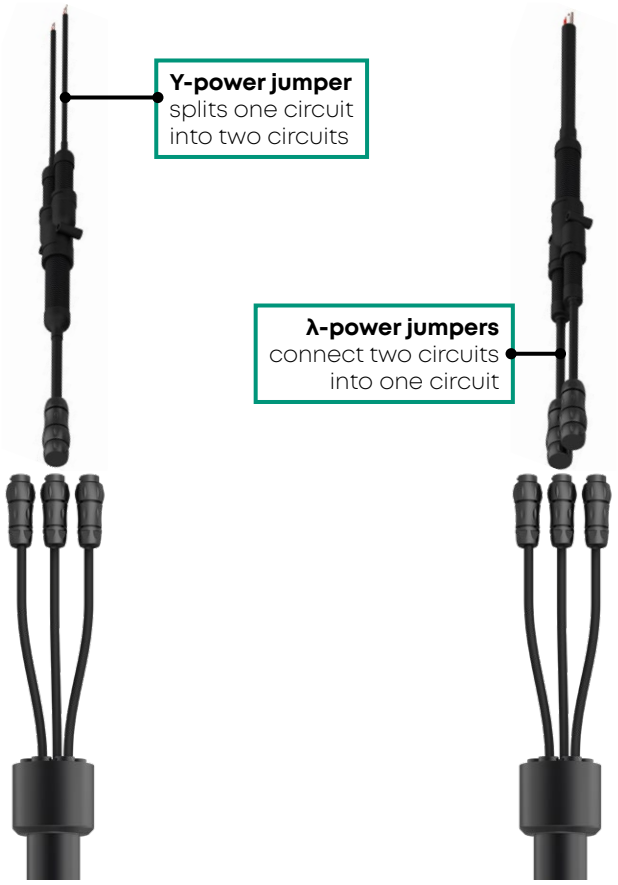
Power jumper with factory terminated RRH power connector



Y-power jumpers for dual power feed and λ-power jumpers for swaps to high power radios.

In addition to standard straight power jumpers, HUBER+SUHNER offers Y-power jumpers that simplify installation for RRHs equipped with two power connectors.

For high power upgrades, λ-power jumpers provide an ideal solution: two circuits are combined into a single, higher current circuit, enabling an easy swap to next generation high power radios. λ-power jumpers can also reduce power loss when not all power connections are used, further improving efficiency. For specification and ordering information see page 73.

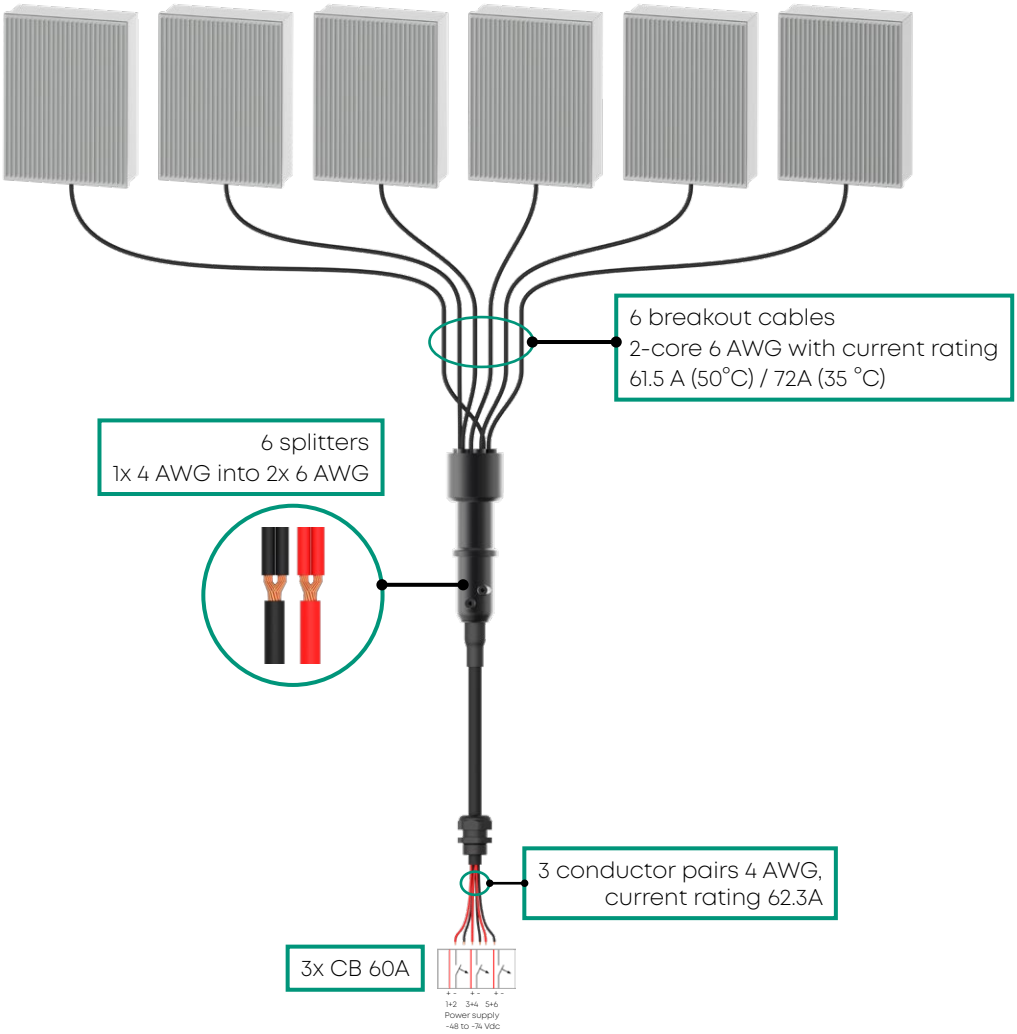


Integrated power splitter – more sustainability, less copper

The innovative power splitter architecture minimizes current derating as defined by NEC/NFPA regulations (USA), enabling substantial copper savings and thereby reducing CO_2 emissions.

Inside the MLEH housing, the integrated splitter divides one power circuit into two breakout cables, allowing for higher current ratings. Because the US NEC/NFPA standard assigns a significantly lower derating factor to cables with fewer conductors — for example, 0.70 for 6 conductors instead of 0.57 for 12 conductors — the design enables a reduction in copper cross section of up to 37%. This not only saves material but also significantly lowers overall cabling system costs.

Example: 6 RRH with MLEP 3 (3 conductor pairs)



Power splitter	Circuit breaker power supply	Hybrid cable AWG size and current rating	Total copper cross section		Current rating total		RRH current rating / power consumption
no	6x 30 A	6 pair 6 AWG 6 x 30.8A	159.6 mm²		cable: 6×30.8 A = 184.8 A CB: 6×30 A = 180 A		6 RRH each 30 A maximum power consumption 1320W @ -44 V U_{RRH}
6	3x 60 A	3 pairs 4 AWG 3 x 62.3A	126.6 mm²	-21%	cable: 3×62.3 A = 186.9 A CB: 3×60 A = 180 A	+1%	
no	6x 35 A	6 pairs 4 AWG 6 x 39.0A	254.4 mm²		cable: 6×39.0 A= 234 A CB: 6×35 A = 210 A		6 RRH each 35 A maximum power consumption 1540W @ -44V U_{RRH}
6	3x 70 A	3 pairs 3 AWG 3 x 75.4A	160.2 mm²	-37%	cable: 3×75.4 A =226.2 A CB: 3×70A = 210A	-3%	

Divider housing and general specifications

	Small housing	Large housing
Number of power breakout cables	Up to 6	Up to 9
Housing material	Powder coated aluminum	
Housing dimensions	Ø 95mm / 3.74" length 318 mm / 12.5"	Ø 121mm / 4.76" length 318 mm / 12.5"
Maximum voltage rating	-74 Vdc, optional 230 Vac	
Maximum current rating	Up to 74 A, depending on configuration	
Temperature range (IEC 60529)	in service –40 to +75 °C	
	during installation –10 to +50 °C, optional –30 to +50 °C (with TPE power cables)	
Ingress protection (IEC 60529)	IP67 for housing and connectors on breakout cables	
	IP65 or protection tube BBU side	
Impact resistance housing (IEC 62262)	IK10	
UV resistance, ISO 4892-3 (methode A/cylce 1)	1000 h	

Power cable

Power cables of HUBER+SUHNER are highly flexible and easy-to-route. The shielding, a copper-foil beneath the jacket and the drain wire, ensures continuous electrical contact along the entire cable length. This design supports effective potential equalization and ensures safe installation, even in environments exposed to lightning strikes.



HUBER+SUHNER power cables are designed with region-specific specifications. For the North American market (NAM), all power cables are UL listed and equipped with a PVC outer jacket. These power cables support installation temperatures from -10 °C to +50 °C. For applications requiring installation at lower temperatures, a TPE jacket is available as an alternative. It remains flexible even in cold environments, enabling installations down to –30 °C.

For Europe and APAC region, LSFH thermoplastic is used. Power cables for the European market comply with CPR Class B2. Upon request, an additional PA6 layer can be added to protect the cable against cockatoo damage. Cable construction follows UL 1277 for NAM, and IEC 60502 1 for APAC and Europe. All power cables have a voltage rating of 600 V. The power cables are installation-friendly because they use highly flexible copper conductors. For NAM, class C conductors are used up to 6 AWG and class D conductors for 4 and 3 AWG, while in Europe and APAC the copper conductors correspond to class 5.
Conductor insulation colors follow regional standards: red and black for NAM, red and blue for APAC, and red and white for Europe. Other color combinations can be provided upon customer request.

	Europe	NAM	APAC
Jacket material	LSFH thermoplastic CPR class B2ca s1a,d1,a1	UL listed, PVC, optional TPE for installation temperature -30 °C to 50 °C	LSFH thermoplastic, optional outer layer PA6 (bird proof)
Standard	IEC 60502-1:2004-04 IEC 60092-353:2016	UL 1277, TC-OF-ER	IEC 60502-1:2004-04
Rated voltage	0.6kV / 1 kV (1.2 kV)		
Flame retardant	IEC 60332-1-2:2004	UL 1685 (UL 1581), FT4 vertical tray flame test	IEC 60332-1-2:2004
Min. bending radius during installation	9x cable-Ø	12x cable-Ø	10x cable-Ø
Min. bending radius in service	6x cable-Ø	10x cable-Ø	8x cable-Ø
Cable shielding	copper foil 100 % coverage (contacted with drain wire)		
Conductor type	IEC 60228 class 5	class C or D THHN/THWN-2	IEC 60228 class 5
Conductor color	red and white numbed (according IEC 60445:2021-07)	Red and black numbered	Red and blue numbered

Power cable specification for 3 RRHs with 3 copper conductor pairs (MLEH 3)

	Europe and APAC			
Conductor cross section	6 mm²	10 mm²	16 mm²	25 mm²
Resistance	3.30 Ω/km	1.91 Ω/km	1.21 Ω/km	0.78 Ω/km
Outer diameter	16.7 mm	19.7 mm	22.7 mm	28.1 mm
Weight	0.52 kg/m	0.79 kg/m	1.13 kg/m	1.71 kg/m
Drain wire cross section	6 mm²			

APAC: OD with outer layer PA6 is +3.0mm
Power cable 2.5 mm² and 4 mm² for 230Vac on request

	NAM				
Conductor cross section	10 AWG	8 AWG	6 AWG	4 AWG	3 AWG
Resistance	3.41 Ω/km	2.13 Ω/km	1.32 Ω/km	0.82 Ω/km	0.65 Ω/km
Outer diameter	0.770" (19.6 mm)	0.92" (23.4 mm)	0.945" (23.9 mm)	1.24" (31.5mm)	1.31" (33.4mm)
Weight	0.69 kg/m	1.05 kg/m	1.40 kg/m	1.80 kg/m	2.33 kg/m
Drain wire cross section	6 mm²				

Power cable 12 AWG and 10 AWG for 120Vac / 230Vac on request

Power cable specification for 6 RRHs with 6 copper conductor pairs (MLEP 6)

	Europe and APAC			
Conductor cross section	6 mm²	10 mm²	16 mm²	25 mm²
Resistance	3.30 Ω/km	1.91 Ω/km	1.21 Ω/km	0.78 Ω/km
Outer diameter	21.7 mm	25.9 mm	30.3 mm	42.0mm
Weight	0.89 kg/m	1.39 kg/m	2.02 kg/m	3.9 kg/m
Drain wire cross section	6 mm²			

APAC: OD with outer layer PA6 is +3.0mm
Power cable 2.5 mm² and 4 mm² for 230Vac on request

	NAM				
Conductor cross section	10 AWG	8 AWG	6 AWG	4 AWG	3 AWG
Resistance	3.41 Ω/km	2.13 Ω/km	1.30 Ω/km	0.82 Ω/km	0.65 Ω/km
Outer diameter	1.00" (25.4 mm)	1.12" (28.5 mm)	1.29" (32.8 mm)	1.57" (40.0 mm)	1.77" (44.9mm
Weight	1.25 kg/m	1.60 kg/m	2.28 kg/m	3.27 kg/m	4.44 kg/m
Drain wire cross section	6 AWG				

Power cable 12 AWG and 10 AWG for 120Vac / 230Vac on request

Power cable specification for 9 RRHs with 9 copper conductor pairs (MLEP 9)

	Europe and APAC		
Conductor cross section	6 mm²	10 mm²	16 mm²
Resistance	3.30 Ω/km	1.91 Ω/km	1.21 Ω/km
Outer diameter	27.8 mm	31.8 mm	42.0mm
Weight	1.17 kg/m	1.72 kg/m	3.8 kg/m
Drain wire cross section	6 mm²		

APAC: OD with outer layer PA6 is +3.0mm
Power cable 2.5mm² and 4mm² for 230Vac on request

	NAM			
Conductor cross section	10 AWG	8 AWG	6 AWG	4 AWG
Resistance	3.41 Ω/km	2.13 Ω/km	1.30 Ω/km	0.82 Ω/km
Outer diameter	1.14" (29.0 mm)	1.640" (36.0 mm)	1.575" (40.0 mm)	1.925" (48.9mm)
Weight	1.65 kg/m	2.30 kg/m	3.41kg/m	5.20 kg/m
Drain wire cross section	6 AWG			

Power cable 12 AWG and 10 AWG for 120Vac / 230Vac on request

Breakout power cable

The small housing supports the routing of up to six 2-core power cables, while the large housing accommodates up to nine 2-core power cables. The breakout power cables are shielded and available with copper cross-sections ranging from 10 AWG to 6 AWG / 6 mm² to 16 mm².It is recommended to use the same cross-section as the main power cable.

	Europe and APAC			**NAM**		
Conductor cross section	6mm²	10 mm²	16 mm²	10 AWG	8 AWG	6 AWG
Conductor resistance	3.30 Ω/km	1.91 Ω/km	1.21 Ω/km	3.41 Ω/km	2.06 Ω/km	1.30 Ω/km
Cable diameter	11.6 mm	13.7 mm	15.8 mm	11.8 mm	13.5 mm	16.5 mm
Cable jacket material	LSFH thermoplastic, CPR B2 for Europe			PVC		
Shielding	AL-foil with CU earth conductor 4 mm²	Aluminum foil with copper earth conductor 6 mm²		Braided copper 10 AWG	Braided copper 10 AWG	Braided copper 8 AWG
Power cable 2.5 mm² and 4 mm² / 12 AWG and 10 AWG for 120Vac / 230Vac on request						

Power connector

UTS or QL power connectors, which are designed to meet the high-performance requirements of modern 5G remote radio heads installed at macro cell sites, are available for the connectorized power breakouts. For installations with RRHs up to approximately 1800 W and a conductor cross-section of up to 10 mm2 / 8 AWG, the UTS power connector with 40 A / 44 A current rating is the preferred choice. The QL power connector with 50 A current rating is suitable for RRHs with more than 1800 W and for 16 mm² / 6 AWG conductor cross-sections.



Power connector plug at the jumper



Power connector extension at the MLEP (0.5 m long breakout)

Power Connector UTS up to 40A / 44A

The UTS power connector has a bayonet coupling system which enables a simple and fast mating. With only a 1/3 twist of the coupling ring, connectors are mated with an audible and sensitive "click".

Specification

Maximum current rating	40 A (IEC), 44 A (UL), 30 A (CSA)
Voltage rating	300 V (IEC), 600 V (UL, CSA)
Maximum conductor cross section	10mm² / 8 AWG
Ingress protection (IEC 60529)	IPX7

Mating/unmating sequences



Twist the coupling ring of the power jumper plug connector to remove protecting cap as shown.



Twist the coupling ring of the MLEH receptacle connector to remove protecting cap as shown.



Push plug connector slightly into receptacle connector, rotate to find keying position.



Twist coupling ring of the power jumper plug connector to mate the connectors as shown.



Power connector plug at the jumper



Power connector extension at the MLEH (0.5m long breakout)

Power connector QL upto 50A

The QL power connector withstand very harsh environmental conditions and ensures simple, secure and fast mating and un-mating due to a quick lock coupling mechanism. With a current rating of 50A and the ability to connect up to 16mm² /6 AWG conductor, the QL power connector is suitable for high power radios.

Specification

Maximum current rating	50 A (IEC, UL)
Voltage rating	500 V
Maximum conductor cross section	16mm² / 6 AWG
Ingress protection (IEC 60529)	IPX7

Mating/unmating sequences



Pull the protective cap straight off the plug connector of the power jumper.



Push the release lever on the receptacle (female) connectors of the MLEH/ MLEP breakout cables and pull the protective cap straight away.



Align the two connectors, ensuring the locking mechanism is in line. Push the plug connector into receptacle connector until you hear a “click” and the locking lever snaps into place.

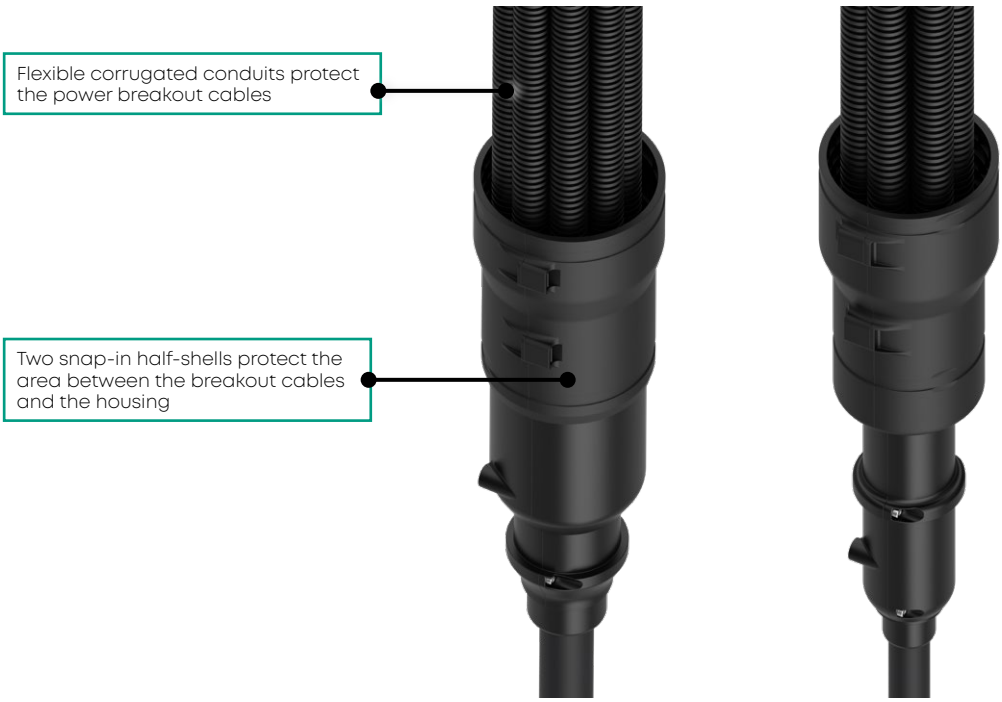


Un-mating:
Push the locking lever on the receptacle connector and pull the plug straight out.

Mount the protection cap to avoid ingress of water or dirt.

Cable protection against birds and rodents

In certain regions, it may be necessary to additionally protect power cables against rodents or birds, e.g. cockatoos in Australia. The power breakout cables can be safeguarded with flexible corrugated conduits. To protect the area between the housing and the conduits, two snap-in half-shells are available. The main power cable can be additional protect by a second cable sheath layer made of very hard polyamide.

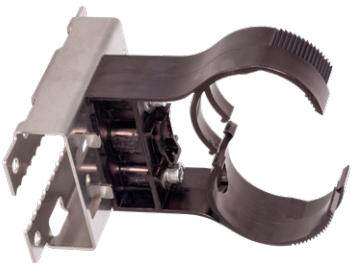


Housing mounting bracket

The housing mounting bracket enables quick and easy installation of the housing on masts, poles, or walls. It features a snap-fit mechanism with clips that can be closed by hand without the need for tools. The clips can be reopened at any time using a medium-sized screwdriver. The clips are made of black UV-resistant Polyamide 12, while the brackets are manufactured from stainless. Both are included in the delivery. For mounting on a pole or mast, 2 hose clamps are required. For wall mounting, four M8 or M10 screws are needed



Mounting bracket for small MLEP housing



Mounting bracket for large MLEP housing

Ordering information

The following ordering information represents only a small selection of the many available configuration options. Your HUBER+SUHNER contact person will be happy to assist you in selecting the optimal MLEP configuration for your specific cell site requirements.

Examples of configurations for APAC and Europe with metric cross section according to IEC

MLEP config. size	Power cable construction	Power breakouts (number of pairs and cross section)	Maximum current rating [1] RRH max. power consumption [2]	MLEP Order Code
3 pairs small housing	 Example: 3 pairs power breakout blunt cut			
	3 pairs 6 mm²	3 × 6 mm² blunt cut	31.3 A / 1377 W	MLEP30-06M-X-0000-0000-xxx__00
		3 × 6 mm² with power connector UTS 40 A	31.3 A / 1377 W	MLEP30-06M-X-1000-0000-xxx__00
	3 pairs 10 mm²	3 × 10 mm² blunt cut	42.7 A / 1879 W	MLEP30-10M-X-0000-0000-xxx__00
		3 × 10 mm² with power connector UTS 40 A	40.0 A / 1760 W	MLEP30-10M-X-1000-0000-xxx__00
	3 pairs 16 mm²	3 × 16 mm² blunt cut	57.2 A / 2517 W	MLEP30-16M-X-0000-0000-xxx__00
		3 × 16 mm² with power connector QL 50 A	50.0 A / 2200 W	MLEP30-16M-X-1100-0000-xxx__00
	3 pairs 25 mm²	3 × 16 mm² blunt cut	74.1 A / 3260 W	MLEP30-25M-X-0000-0000-xxx__00
		3 × 16 mm² with power connector QL 50 A	50.0 A / 2200 W	MLEP30-25M-X-1100-0000-xxx__00

MLEP config. size	Power cable construction	Power breakouts (number of pairs and cross section)	Maximum current rating [1] RRH max. power consumption [2]	MLEP Order Code
6 pairs small housing	 Example: 6 pairs power breakout with power connector			
	6 pairs 6 mm²	6 × 6 mm² blunt cut	25.5 A / 1122 W	MLEP60-06M-X-0000-0000-xxx__00
		6 × 6 mm² with power connector UTS 40 A	25.5 A / 1122 W	MLEP60-06M-X-1000-0000-xxx__00
	6 pairs 10 mm²	6 × 10 mm² blunt cut	34.8 A / 1531 W	MLEP60-10M-X-0000-0000-xxx__00
		6 × 10 mm² with power connector UTS 40 A	34.8 A / 1531 W	MLEP60-10M-X-1000-0000-xxx__00
	6 pairs 16 mm²	6 × 16 mm² blunt cut	46.5 A / 2046 W	MLEP60-16M-X-0000-0000-xxx__00
		6 × 16 mm² with power connector QL 50 A	46.5 A / 2046 W	MLEP60-16M-X-1100-0000-xxx__00
	6 pairs 25 mm²	6 × 16 mm² blunt cut	60.3 A / 2653 W	MLEP60-25M-X-0000-0000-xxx__00
		6 × 16 mm² with power connector QL 50 A	50.0 A / 2200 W	MLEP60-25M-X-1100-0000-xxx__00

MLEP config. size	Power cable construction	Power breakouts (number of pairs and cross section)	Maximum current rating [1] RRH max. power consumption [2]	MLEP Order Code
9 pairs small housing	 Example: 9 pairs power breakout blunt cut			
	9 pairs 6 mm²	9 × 6 mm² blunt cut	22.4 A / 986 W	MLEH90-06M-X-0000-0000-xxx__00
		9 × 6 mm² with power connector UTS 40 A	22.4 A / 986 W	MLEH90-06M-X-1000-0000-xxx__00
	9 pairs 10 mm²	9 × 10 mm² blunt cut	30.5 A / 1342 W	MLEH90-10M-X-0000-0000-xxx__00
		9 × 10 mm² with power connector UTS 40 A	30.5 A / 1342 W	MLEH90-10M-X-1000-0000-xxx__00
	9 pairs 16 mm²	9 × 16 mm² blunt cut	40.8 A / 1795 W	MLEH90-16M-X-0000-0000-xxx__00
		9 × 16 mm² with power connector QL 50 A	40.8 A / 1795 W	MLEH90-16M-X-1100-0000-xxx__00

[1] Maximum current rating @ 60°C ambient temperature according IEC 60364-5-52, copper conductor with XLPE insulation (installation methode E)
[2] RRH maximum power consumption @ RRH voltage 44 Vdc

Examples of configurations for NAM with American Wire Gauge cross section according NEC

MLEP config. size	Power cable construction	Power breakouts (number of pairs and cross section)	Maximum current rating [1] RRH max. power consumption [2]	MLEP Order Code
3 pairs small housing	 Example: 6 pairs power breakout with power connector			
	3 pairs 10 AWG	3 × 10 AWG blunt cut	26.2 A / 1153 W	MLEP30-10A-X-0000-0000-xxx__00
		3 × 10 AWG with power connector UTS 44 A	26.2 A / 1153 W	MLEP30-10A-X-1000-0000-xxx__00
	3 pairs 8 AWG	3 × 8 AWG blunt cut	36.1 A / 1588 W	MLEP30-08A-X-0000-0000-xxx__00
		3 × 8 AWG with power connector UTS 44 A	36.1 A / 1588 W	MLEP30-08A-X-1000-0000-xxx__00
	3 pairs 6 AWG	3 × 6 AWG blunt cut	45.1 A / 1984 W	MLEP30-06A-X-0000-0000-xxx__00
		3 × 6 AWG with power connector QL 50 A	45.1 A / 1984 W	MLEP30-06A-X-1100-0000-xxx__00
	3 pairs 4 AWG	3 × 6 AWG blunt cut	61.5 A / 2706 W	MLEP30-04A-X-0000-0000-xxx__00
		3 × 6 AWG with power connector QL 50 A	50.0 A / 2200 W	MLEP30-04A-X-1100-0000-xxx__00
	3 pairs 3 AWG	3 × 6 AWG blunt cut	61.5 A / 2706 W	MLEP30-03A-X-0000-0000-xxx__00
		3 × 6 AWG with power connector QL 50 A	50.0 A / 2200 W	MLEP30-03A-X-1100-0000-xxx__00

MLEP config. size	Power cable construction	Power breakouts (number of pairs and cross section)	Maximum current rating [1] RRH max. power consumption [2]	MLEP Order Code
6 pairs small housing	 Example: 3 pairs power breakout blunt cut			
	6 pairs 10 AWG 3 to 12 pairs OF	6 × 10 AWG blunt cut	16.4 A / 722 W	MLEP60-10A-X-0000-0000-xxx__00
		6 × 10 AWG with power connector UTS 44 A	16.4 A / 722 W	MLEP60-10A-X-1000-0000-xxx__00
	6 pairs 8 AWG 3 to 12 pairs OF	6 × 8 AWG blunt cut	22.6 A / 994 W	MLEP60-08A-X-0000-0000-xxx__00
		6 × 8 AWG with power connector UTS 44 A	22.6 A / 994 W	MLEP60-08A-X-1000-0000-xxx__00
	6 pairs 6 AWG 3 to 12 pairs OF	6 × 6 AWG blunt cut	30.8 A / 1355 W	MLEP60-06A-X-0000-0000-xxx__00
		6 × 6 AWG with power connector QL 50 A	30.8 A / 1355 W	MLEP60-06A-X-1100-0000-xxx__00
	6 pairs 4 AWG 3 to 12 pairs OF	6 × 6 AWG blunt cut	39.0 A / 1716 W	MLEP60-04A-X-0000-0000-xxx__00
		6 × 6 AWG with power connector QL 50 A	39.0 A / 1716 W	MLEP60-04A-X-1100-0000-xxx__00
	6 pairs 3 AWG 3 to 12 pairs OF	6 × 6 AWG blunt cut	47.2 A / 2077 W	MLEP60-03A-X-0000-0000-xxx__00
		6 × 6 AWG with power connector QL 50 A	47.2 A / 2077 W	MLEP60-03A-X-1100-0000-xxx__00

MLEP config. size	Power cable construction	Power breakouts (number of pairs and cross section)	Maximum current rating [1] RRH max. power consumption [2]	MLEP Order Code
9 pairs small housing	 Example: 3 pairs power breakout blunt cut			
	9 pairs 10 AWG	9 × 10 AWG blunt cut	16.4 A / 722 W	MLEP90-10A-X-0000-0000-xxx__00
		9 × 10 AWG with power connector UTS 44 A	16.4 A / 722 W	MLEP90-10A-X-1000-0000-xxx__00
	9 pairs 8 AWG	9 × 8 AWG blunt cut	22.6 A / 994 W	MLEP90-08A-X-0000-0000-xxx__00
		9 × 8 AWG with power connector UTS 44 A	22.6 A / 994 W	MLEP90-08A-X-1000-0000-xxx__00
	9 pairs 6 AWG	9 × 6 AWG blunt cut	30.8 A / 1355 W	MLEP90-06A-X-0000-0000-xxx__00
		9 × 6 AWG with power connector QL 50 A	30.8 A / 1355 W	MLEP90-06A-X-1100-0000-xxx__00
	9 pairs 4 AWG	9 × 6 AWG blunt cut	39.0 A / 1716 W	MLEP90-04A-X-0000-0000-xxx__00
		9 × 6 AWG with power connector QL 50 A	39.0 A / 1716 W	MLEP90-04A-X-1100-0000-xxx__00

[1] Current rating @ 50 °C ambient temperature according NEC table 310.15
[2] RRH maximum power consumption @ RRH voltage 44 Vdc

MLEP order code

MLEP	x	0	xxx	X	xx	00-0000	xxx (ft)_00
	Number of power conductor pairs 3 to 9		Cross section power conductor 2.5 mm^2 to 25mm^2 12 AWG to 3 AWG Example: 10M = 10mm^2 06A = 6 AWG		Power connector type 00 = blunt cut 10 = UTS 40 / 44A 11 = QL 50A		Length in steps of 5 or 10 m steps or in steps of 20 or 30 ft Example: 050 =50 m 210ft = 210 feet

Example:

- MLEP30-10M-X-1000-0000-050__00
- MLEP60-06A-X-0000-0000-210ft00

Power jumpers with UTS connector upto 40 A / 44 A



Features

- Maximum current rating 40A (IEC) / 44 A (UL)
- Compatible with MLEP, MLEH and MLUH
- 2-core shielded copper cable with a cross section of 6 or 10 mm^2 / 12 to 8 AWG
- Standard length 2, 5 and 10 m

Ordering information

Market	Length	Item no.		
Europe and APAC			**6 mm^2**	**10 mm^2**
	2 m		85228304	85228306
	5 m		85228303	85228307
	10 m		85228305	85228308
NAM		**AWG 12**	**AWG 10**	**AWG 8**
	5 m	85086575	85183646	85142464
	10 m	85080185	85183649	85165762
	15 m	85086584	85207879	85165763

Power jumper with QL connector up to 50 A



Features

- Maximum current rating 50 A (IEC / UL)
- Compatible with MLEP, MLEH
- 2 wire shielded copper cable with a cross section of up to 16 mm^2 / 6 AWG
- Standard length 2, 5 and 10 m

Ordering information

Market	Length	Item no.		
Europe and APAC		6mm^2	10mm^2	16mm^2
	2 m	85239686	85239692	85239698
NAM		10 AWG	8 AWG	6 AWG
	2 m	85239685	85239690	85239694

Accessories

Description		Item no.	Page	Picture
Clamps for power cable		depends on cable diameter	142	
Grounding kits		85015070	250	
Grounding cable, 0.5 m, 16 mm^2 and 25 mm^2, black and yellow/green		depends on cross section and colour	145	
Quick hose clamps Stainless steel One set includes 2 pieces hose clamps	clamping Ø 30 to 155 mm	84076411	146	
	clamping Ø 60 to 500 mm	84076412		

MASTERLINE Classic (MLC)



Multi-riser cable with distribution box

MASTERLINE Classic uses separate multifiber and multi-conductor copper riser cables that are connected to mast mounted FTTA/PTTA distribution boxes which are then linked to the RRHs with short jumper cables. Traditionally multi-riser cables with distribution boxes have been the preferred solution for multi-RRH installations, however with the increasing number of remote radios per site mast space limitations and wind loading have become critical issues to operators.

Moreover some operators can incur extra leasing costs for every box placed on the mast, thus distribution box based systems are gradually being superseded by box-less solutions like MASTERLINE Extreme (see page 44). In general, the installation method with boxes is cost effective and offers installation flexibility but it does require handling and connecting of indoor LC connectors at the mast-top distribution box. Many operators want to avoid the risk of opening and maintaining mast-top boxes by non-trained or non-authorised persons.

MASTERLINE Classic (MLC)

RF **LISCA RF jumper**
page 202



FTTA **LC duplex RRH jumpers**
page 80



PTTA **2-core power cable**
page 83



FTTA **FTTA distribution box**
page 77



PTTA **PTTA distribution box**
page 84



FTTA **MASTERLINE Classic**
page 76



PTTA **Multicore power cable**
page 82



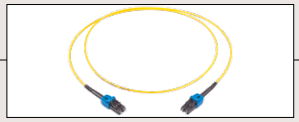
XTTA **Cable clamps**
page 140

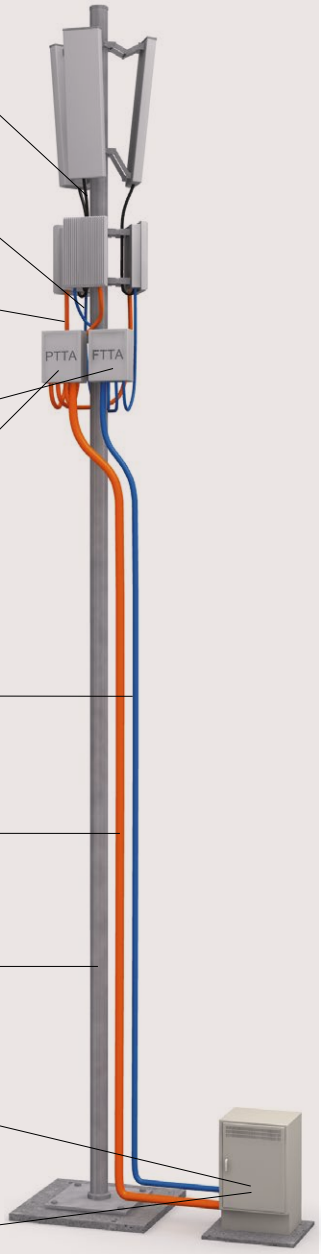


FTTA **CTB 19" patching box (optional)**
page 136



FTTA **LC patchcord**
page 139





XTTA FTTA, PTTA and HTTA

RF Radio Frequency

FTTA Fiber-To-The-Antenna

PTTA Power-To-The-Antenna

HTTA Hybrid-To-The-Antenna

MASTERLINE Classic (MLC)



Features

- Ruggedised outdoor fiber distribution box
- Supports up to 24 remote radio heads
- Fitted with bend radius limiting mandrels
- Suitable for mounting on poles, walls and tower legs with round-, L-, V- and ☐-shape.
- Easy to mount and install with pre-mounted brackets
- Compatible with MASTERLINE Classic
- Fully electrically isolated
- Protective vent equalises pressure and prevents water condensation

Specifications

Number of RRH		up to 6 RRH (12 fibers)	up to 12 RRH (24 fibers) up to 18 RRH (36 fibers)	up to 24 RRH (48 fibers)
Dimensions		255 × 180 × 65 mm	240 × 240 × 132 mm	250 × 320 × 138 mm
Cable entry		1 × MLC 12 fibers (Ø 16 mm)	2 × MLC 12 fibers (Ø 16 mm) 1 × MLC 24 fibers (Ø 26 mm)	2 × MLC 12 fibers (Ø 16 mm) 1 × MLC 48 fibers (Ø 26 mm)
Cable exit (pre-installed cable gland)		up to 6 jumper cable 1 x M32 cable gland with 6-fold seal for jumper cables with Ø 4.7 to 5.6 mm	up to 18 jumper cable 3 × M32 cable gland with 6-fold seal for jumper cable with Ø 4.7 to 5.6 mm	up to 24 jumper cable 4 × M32 cable gland with 6-fold seal for jumper cable with Ø 4.7 to 5.6 mm
Material		glass-filled polycarbonate, halogen-free, UV resistant		
Colour		grey RAL 7035		
Flammability rating		UL 94 V0		
Operating temperature	during inst.	–10 to +50 °C		
	in service	–40 to +75 °C		
Protective vent		typical airflow 2500 ml/min		
Ingress protection		IP66/67		
Impact resistance		IK 07 (EN 62262)		

MASTERLINE Classic (MLC)

FTTA distribution box – ordering information

Description	Item no. single-mode	Item no. multimode OM3	Picture
FTTA box small Compatible with MASTERLINE Classic 12 fibers Cable glands for up to 6 jumper 6 LC duplex adapter (blue/aqua)	85169840	85174583	
FTTA box medium Compatible with MASTERLINE Classic 12/24 fibers Cable glands for up to 12 jumper 12 LC duplex adapter (blue/aqua)	85028080	85174629	
FTTA box medium Compatible with MASTERLINE Classic 12/24/36 fibers Cable glands for up to 18 jumper 18 LC duplex adapter (blue/aqua)	85029818	85174630	
FTTA box large Compatible with MASTERLINE Classic 12/24/36/48 fibers Cable glands for up to 24 jumper 24 LC duplex adapter (blue/aqua)	85028863	85174631	

All boxes are pre-assembled with fiber management components, cable glands and quick-hose clamps.

Accessories – ordering information

Description		Item no.	Page	Picture
For outdoor and indoor installation, stores up to 20 m cable excess, length (depending on cable diameter)		84103325	135	
Combined clamps for fiber optic and power cable		depends on cable diameter	140	
19" CTB patching box	6, 12, 18 or 24 LC duplex adapter	depends on quantity of LC adapter	136	
LC patchcords	0.5 m, 0.7 m or 1 m length, single-mode	depends on length	139	
Quick hose clamps Stainless steel One set includes 2 pieces hose clamps	clamping Ø 30 to 155 mm	84076411	146	
	clamping Ø 60 to 500 mm	84076412		
SFP/SFP+ transceivers for different protocols, data rates and power budgets.		see transceiver selection guide on page 262	261	

MASTERLINE Classic (MLC)



Features

- Pre-assembled „plug & play“ cabling system
- Ruggedised design with robust pulling tube
- Outdoor and indoor with high flame resistance
- Temperature range –40 up to +75 °C
- Ingress protection IP67 when installed
- Loose tube cables with up to 48 fibers, rodent protected and UV resistant and CPR compliant
- Both sides terminated with LC uniboot connectors
- Breakouts numbered for easy channel identification
- Easy and time-saving installation
- Each system factory tested

Specifications

		MLC 12 fiber	MLC 24 fiber	MLC 36 fiber	MLC 48 fiber
Number of fibers		12	24	36	48
Number of LC-HQ duplex uniboot connectors each side		6	12	18	24
Build-in hole dimension	FTTA box side	15.6 to 16.4 mm	25.5 to 26.5 mm	25.5 to 26.5 mm	25.5 to 26.5 mm
	BTS side	15.6 to 16.4 mm	15.6 to 16.4 mm	25.5 to 26.5 mm	25.5 to 26.5 mm
Cable type		Glass-armoured multifiber loose tube cable			
Jacket material		LSFH™, black			
Cable diameter		7.0 mm		9.6 mm	
Minimum bending radius	during installation	110 mm		140 mm	
	in service	70 mm		100 mm	
Temperature range	during installation	–10 to +50 °C			
	in service	–40 to 75 °C			
Ingress protection		IP67, when installed with FTTA box			
Halogen-free		IEC 60754-1			
Fire propagation		IEC 60332-1 and IEC 60332-3-25			
CPR compliant		class D_{ca} s1a, d0, a1			
Pulling tube with pulling eye	outer diameter	36 mm			50 mm
Protection tube BTS side	outer diameter	36 mm			50 mm



Protecting tube at BTS side



Pulling tube with pulling eye at RRH side

MASTERLINE Classic (MLC)

Ordering information



Length	Item no. :					
	12 fibers/6 RRH		24 fibers/12 RRH		36 fibers/18 RRH	48 fibers/24 RRH
	single-mode E9/125 A2	multimode G50/125 OM3	single-mode E9/125 A2	multimode G50/125 OM3	single-mode E9/125 A2	single-mode E9/125 A2
20 m	85012382	85164945	85012383	85142756	85066843	85074331
30 m	85012502	85164946	85012589	85142757	85066962	85074332
40 m	85012503	85164947	85012590	85142758	85066964	85074333
50 m	85012504	85164948	85012592	85142759	85066966	85074334
60 m	85012505	85164949	85012593	85142768	85066979	85074335
70 m	85012506	85164950	85012594	85142769	85066986	85074336
80 m	85012543	85164951	85012595	85142780	85066987	85074337
90 m	85012544	85164952	85012596	85087968	85066988	85074338
100 m	85012545	85164953	85012597	85142781	85066989	85074339
125 m	85012546	85004887	85012598	85142782	85068299	85074340

Option:

- Other length
- Multimode OM4
- UL listed (OFNR)





Up to 80 m supplied as air ring and for longer cable systems on a double-flange reel

MASTERLINE Classic (MLC)



Features

- Jumper available for all types of remote radios
- Cable diameter 4.8 mm, 5.5 mm or 7 mm
- Standard lengths of 2 m and 5 m, any customised length available

Ordering information

LC duplex to ODC plug, jumper cable Ø 5.5 mm



Length	Item no. single-mode E9/125 A1 (G.657.A1)
2 m	84122152
5 m	84078725

LC duplex to LC duplex with moulded divider and ruggedised break-out 98 mm long, cable Ø 4.8 mm cable



Length	Item no. single-mode E9/125 A2 (G.657.A2)
2 m	85031793
5 m	85031794

LC duplex to LC duplex jumper, with metal divider and ruggedised break-out 90 mm long, cable Ø 4.8 mm



Length	Item no. single-mode E9/125 A2 (G.657.A2)
2 m	84142320
5 m	84142321

MASTERLINE Classic (MLC)

LC duplex to FullAXS jumper, cable Ø 4.8 mm



Length	Item no. single-mode E9/125 A2 (G.657.A2)
2 m	84137910
5 m	84137911

LC duplex to LC duplex jumper with ruggedised break-out 90 mm long, cable Ø 4.8 mm (Ø 7.0 mm at the RRH pre-chamber entry position), single-mode bend insensitive fiber



Length	Item no. single-mode E9/125 A2 (G.657.A2)
2 m	85015008
3 m	85015009

LC duplex to PDLC, jumper cable Ø 7 mm



Length	Item no. single-mode E9/125 A2 (G.657.A2)
2 m	84150634
5 m	84150635

LC duplex RRH jumper for other OEM interfaces

Please contact HUBER+SUHNER for LC duplex RRH jumper for other OEM interfaces which are not listed above.

Options:

- Other length
- Multimode OM4

Multicore power supply cable

6, 12 and 24 core power supply cable



Features

- Highly flexible power cable with low bending radius
- White and red insulation according IEC 60445:2021
- 6, 12 and 24 core power supply cables with cross section up to 25 mm^2
- Aluminum foil shielding and earth conductor for grounding
- CPR compliant class $B2_{ca}$
- LSFH jacket material

Specifications

Jacket material	Thermoplastic LSFH (low smoke free of halogen)
Insulation material	XLPE
Insulation color	Red and white, IEC 60445:2021
Screen	Aluminum foil with earth conductor copper tinned 6 mm^2
UV-resistant	passed according to EN ISO 4892-2
CPR classification	class $B2_{ca}$-s1a,d1,a1
Standard	IEC 60502-1
Rated voltage	0.6 / 1.0 kV
Operating temperature range	-40 °C to +90 °C
Installation temperature range	-10 °C to +50 °C
Conductor type IEC 60228	annealed copper class 5

	6 core cable				12 core cable			24 core cable		
Cross section	6 mm^2	10 mm^2	16 mm^2	25 mm^2	6 mm^2	10 mm^2	16 mm^2	6 mm^2	10 mm^2	16 mm^2
Resistance	3.30 Ω/km	1.91 Ω/km	1.21 Ω/km	0.78 Ω/km	3.30 Ω/km	1.91 Ω/km	1.21 Ω/km	3.30 Ω/km	1.91 Ω/km	1.21 Ω/km
Current rating*	31.3 A	42.7 A	57.2 A	74.1 A	26.0 A	35.0 A	46.5 A	20.1 A	27.5 A	36.7 A
Cable diameter	16.7 mm	19.7 mm	22.7 mm	28.1 mm	21.7 mm	25.9 mm	30.3 mm	29.9 mm	36.3 mm	42.7 mm
Weight	0.52 kg/m	0.79 kg/m	1.13 kg/m	1.71 kg/m	0.89 kg/m	1.39 kg/m	2.02 kg/m	1.66 kg/m	2.62 kg/m	3.92 kg/m

Ordering information

Item no.	Cross section	Length per reel	Item no.	Cross section	Length per reel	Item no.	Cross section	Length per reel
85202643	6 x 6 mm^2	1000 m	85202638	12 x 6 mm^2	1000 m	85202582	24 x 6 mm^2	500 m
85202642	6 x 10 mm^2	1000 m	85202627	12 x 10 mm^2	1000 m	85202581	24 x 10 mm^2	250 m
85202646	6 x 16 mm^2	1000 m	85202622	12 x 16 mm^2	750 m	85202645	24 x 16 mm^2	250 m
85202644	6 x 25 mm^2	500 m						

Multicore power cables are delivered on wooden reel with flange diameter 140 cm or 160 cm

2 core power jumper cable

2 core power cable with aluminium foil shielding, red and white insulation and CPR class $B2_{ca}$



Features

- Suitable for HUBER+SUHNER's PTTA boxes
- Highly flexible power cable with low bending radius and excellent cable routing properties
- Red and white XLPE insulation compliant to IEC60445:2021
- Aluminum foil shielding with tinned copper drain conductor
- CPR compliant class $B2_{ca}$
- Voltage rating 600 V

Specifications

Jacket material	LSFH
Insulation material	XLPE
Insulation color IEC 60445:2021	red, white
Screen	Aluminum/PET foil with tinned copper drain conductor
Drain wire type IEC 60228	Annealed tinned copper class 5
UV-resistant	According to IEC 60068-2-5
CPR classification	B2ca-s1,d1,a1
Standard	IEC 60502 / IEC 60092
Rated voltage	0.6/1.0 kV
Temperature range	-40 to 85 °C
Conductor type IEC 60228	Annealed copper class 5

Conductor cross section	**6 mm²**	**10 mm²**	**16 mm²**	**25 mm²**
Conductor resistance	3.30 Ω/km	1.91 Ω/km	1.21 Ω/km	0.78 Ω/km
Maximum current rating at 60 °C ambient temperature	45 A	61 A	82 A	105 A
Drain wire cross section	4 mm²	6 mm²	6 mm²	6 mm²
Cable diameter	11.6 mm	13.7 mm	15.8 mm	19.7 mm
Weight	0.22 kg/m	0.34 kg/m	0.46 kg/m	0.77 kg/m

Ordering information

Item no.	Cross section	Length per reel	Reel flange size
85173020	6 mm²	1000 m	100 cm
85173021	10 mm²	1000 m	110 cm
85173926	16 mm²	1000 m	120 cm
85173058	25 mm²	1000 m	140 cm

PTTA distribution box

PTTA distribution box 6 RRH



Features

- Ruggedised outdoor power distribution box
- Supports up to 6 remote radio heads
- Maximum current rating 40 A
- Push-in terminals with front connection to enable wiring in a confined space
- Suitable for mounting on poles, walls and tower legs with round, L, V and □-shape

The Power-to-the-Antenna distribution box 6 RRH is fitted with the latest connection technology – push in terminals - for conductors up to 16 mm² cross section. The push in terminals have front access to allow easy and fast connection. By using cable glands with 6-fold seals, the PTTA box has very small dimensions. The 6-fold seal is tailored to HUBER+SUHNER 2-core power jumper with 6 mm², 10 mm² and 16 mm² conductors. With a maximum current of 40 A, the PTTA Box can be used for RRHs with high power consumption.

The opened lid is secured with a wire against falling down. The box is optional available with a hinged cover.

Specifications

Number of RRH	up to 6
Dimension	278 x 188 x 130 mm
Power entry	Cable gland M50 with wrench size 60 mm, 2 seals for Ø 21.0 – 25.5 / Ø 25.5 – 36.0 mm 1 cable 12 core shielded up to 16 mm²
Power exit	Cable gland M63 with wrench size 73 mm, 3 seals for Ø 11.8 / 13.7 / 15.5 mm
Grounding cable	Ø 6.0 – 12 mm
Maximum voltage rating	- 74 Vdc
Maximum current rating per RRH	40 A (with 16 mm² 12 core power cable)
Terminals	Push-in type up to 16 mm²
Temperature range during installation	-10 to +40 °C
Temperature range during service	-40 to +75 °C
Box material	Polycarbonat, light grey (RAL 7035), halogen free
UV resistance	according UL 508
Ingress protection	IP 65 EN 60529
Impact resistance	IK 08 EN 62262

Ordering information

Description	Item no.
PTTA distribution box 6 RRH for an installation with a 12 core power cable up to 16 mm² and 6 power jumper cable 6 to 16 mm², push-in terminals, quick hose clamps for pole diameter 30 to 155 mm are included	85145915

PTTA distribution box

PTTA distribution box 12 RRH



Features

- Ruggedised outdoor power distribution box
- Supports up to 12 remote radio heads
- Maximum current rating 36 A
- Push-in terminals with front connection to enable wiring in a confined space
- Suitable for mounting on poles, walls and tower legs with round, L, V and □-shape

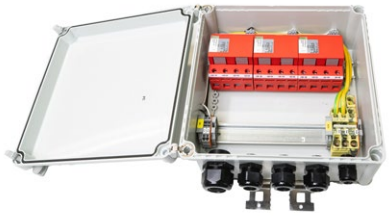
Specifications

Number of RRH	up to 12
Dimension	378 × 188 × 130 mm
Power entry	Cable gland M63 with wrench size 73 mm, 3 seals for Ø 28.0 – 35.0 / 35.0 – 41.0 / 41.0 – 47.0 mm 1 cable 24 core shielded up to 16 mm²
Power exit	2 cable glands M63 with wrench size 73 mm, 3 seals for Ø 11.8 / 13.7 / 15.5 mm up to 12 cables 2-core shielded up to 10 mm²
Grounding cable	Ø 6.0 – 12 mm
Maximum voltage rating	- 74 Vdc
Maximum current rating per RRH	36 A (with 16 mm² 24 core power cable)
Terminals	Push-in type up to 16 mm²
Temperature range during installation	-10 to +40 °C
Temperature range during service	-40 to +75 °C
Box material	Polycarbonat, light grey (RAL 7035), halogen free
UV resistance	according UL 508
Ingress protection	IP 65 EN 60529
Impact resistance	IK 08 EN 62262

Ordering information

Description	Item no.
PTTA distribution box 12 RRH for an installation with a 24 core power cable up to 16 mm² and 6 power jumper cable 6 to 16 mm², push-in terminals, quick hose clamps for pole diameter 30 to 155 mm are included	85145922

PTTA distribution box 3 RRH with Surge Protection Devices



Features

- Ruggedized outdoor power distribution box
- Supports up to 3 remote radio heads
- Incorporates surge protection devices Type 1 / Class I (coordinated spark-gap-based lightning current arrester)
- Suitable for 6-core power cable and 2-core power cable with cross section up to 16 mm²
- Maximum current rating 50 A
- Suitable for mounting on poles, walls and tower legs

The Power-to-the-Antenna distribution box delivers compact, high-performance power distribution for 3 remote radio heads all protected with advanced surge protection technology (Type 1 / Class I) for maximum reliable over-voltage protection. The unit supports 6-core power cables with integrated alarm wiring and 2-core power cable up to 16 mm². With a maximum current of 50 A, the PTTA Box can be used for RRHs with high power consumption.
Note: Additional PTTA distribution box configurations are available on request.

Specifications

Number of RRH	up to 3
Dimension	278 x 278 x 130mm
Power entry	Cable gland M32 Ø 13.0 to 25.0 mm 1 cable 6 core shielded up to 16 mm²
Power exit	3 cable glands M25 Ø 9.0 to 16.0 mm 3 cables 2-core shielded up to 16 mm²
Grounding cable	Ø 6.0 – 12 mm
Maximum voltage rating	-60 Vdc
Maximum current rating per RRH	50 A (with 16 mm² 6 core power cable)
Terminals	Grounding terminal: Push-in type up to 16 mm²
Temperature range during installation	-10 to +40 °C
Temperature range during service	-40 to +75 °C
Box material	Polycarbonat, light grey (RAL 7035), halogen free
UV resistance	according UL 508
Ingress protection	IP 65 EN 60529
Impact resistance	IK 08 EN 62262
Surge Protection Device Type	SPD type 1 / Class I (DEHNsecure modular device)
Amount of SPD	3
Lightning impulse current (10/350 µs) DC+/DC- -> DC-/DC+) / (DC-/DC+ -> gnd) (I_{imp})	25 / 50 kA
Short-circuit withstand capability for max. mains-side overcurrent protection d.c. (I_{SCCR})	25 kA

Ordering information

Description	Item no.
PTTA distribution box 3 RRH with integrated SPDs Type 1 / Class I for installation with a 6-core power cable up to 16 mm² and 3 power jumpers up to 16 mm², quick hose clamps for pole diameter 30 to 155 mm are included	85254568

Options:

- Flexible RRH support: Available with different numbers of RRH power outputs (up to 12 RRH)
- Customizable surge protection: Choice of SPD manufacturers, types/classes, and electrical performance levels
- Adaptable cable options: Multiple cable entry and exit gland configurations to support various cable sizes
- Integrated circuit protection: Optional circuit breakers with selectable current ratings

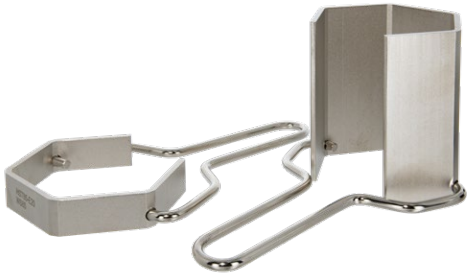
Customized PTTA (Power-To-The-Antenna) boxes

In addition to pure power distribution from multi-core copper cables to 2-core power jumper cables, HUBER+SUHNER offers customised configurations with circuit breakers and surge protection devices. The DC circuit breakers with hydraulic-magnetic technology have a rating capability that is independent of the ambient temperature, which is a great advantage when used on outdoor installations. The circuit breakers are available with 20A, 25A, 32A or 40A current rating. Surge protection device type 1/2 (class I/II) for grounded return installation are used for lightning protection or optional a lightning current arrester, in accordance with type 1 (class I) with impulse discharge current (10/350) µs 25 kA / 100 kA.



PTTA distribution box

Cable gland tools



Features

- Hexagonal steel tube with a handle
- Suitable for large cable glands with wrench size 60 to 85mm

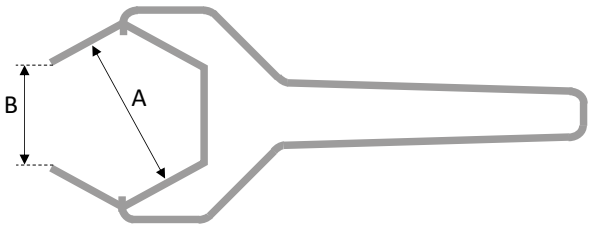
To tighten the cable glands use the hexagonal tube with a handle. You will then torque to completion using the torque spanner to finish up the job for the best results. For the correct torque value please refer to the installation manual.



Specifications

Material wrench	Cr12 alloy tool steel
Material hand shank	Stainless steel





Ordering information

Item number	Wrench size	Dimensions A / B / E	
85162588	60 mm	60.5 / 37.4 / 100 mm	
85162589	68 mm	68.5 / 41.8 / 100 mm	
85162590	73 mm	73.5 / 44.0 / 100 mm	
85162591	80 mm	80.5 / 49.0 / 100 mm	
85162725	60 mm	60.5 / 37.4 / 20 mm	
85162669	75 mm	75.5 / 46.0 / 20 mm	
85162669	85 mm	85.5 / 51.0 / 20 mm	



MASTERLINE Ultimate Hybrid (MLUH)



Hybrid-riser cable with compact connector head

The most innovative hybrid cabling system from HUBER+SUHNER for remote radio installation: MASTERLINE Ultimate Hybrid. The pre-connectorised factory-sealed hybrid systems supports up to 6 RRHs and connects the remote radios with easy-to-install Q-ODC fiber optic and power jumpers. A pre-laced hosting grip below the robust connector head allow for easy cable lifting. The encapsulated connector head can be directly attached to the mast at a pre-mounted bracket. These unique features make MASTERLINE Ultimate Hybrid the best-in-class product in terms of ease of mast-top installation, installation robustness and efficiency.

MASTERLINE Ultimate Hybrid (MLUH)

RF **LISCA RF jumper**
page 202



FTTA **Q-ODC RRH jumper**
page 23



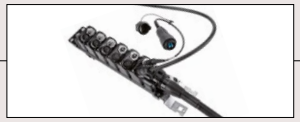
FTTA **Q-ODC-12 multi-branch RRH jumper**
page 33



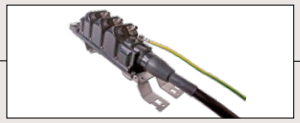
FTTA **Power jumpers**
page 48



HTTA **MLUH with Q-ODC-2**
page 96



HTTA **MLUH with Q-ODC-12**
page 97



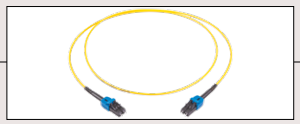
XTTA **Cable clamps**
page 140

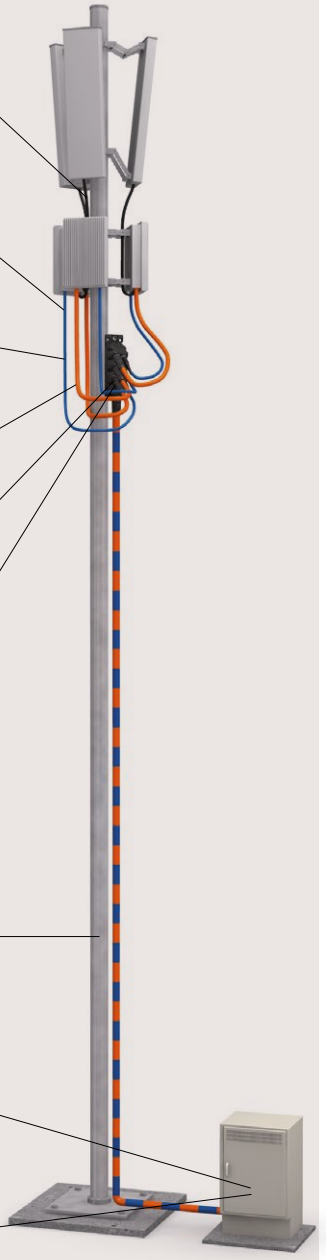


FTTA **CTB 19" patching box (optional)**
page 136



FTTA **LC patchcord (optional)**
page 139





XTTA FTTA, PTTA and HTTA

RF Radio Frequency

FTTA Fiber-To-The-Antenna

PTTA Power-To-The-Antenna

HTTA Hybrid-To-The-Antenna

MASTERLINE Ultimate Hybrid (MLUH)



Features

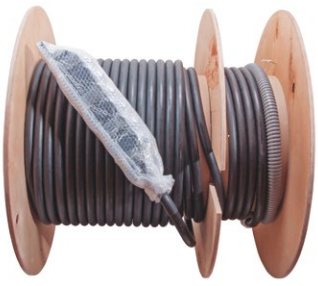
- Pre-connectorised factory-sealed hybrid cable system for 3 and 6 RRHs
- Modular "plug & play" system compatible with Q-ODC / Q-ODC-12 and power jumpers
- Highly flexible 6- / 12-core hybrid cable up to 16 mm² / AWG 6
- Conductor insulation color red and white acc. IEC EC 60445:2021
- Encapsulated IP67 sealed connector head housing
- Hoisting grip for cable lifting
- Space-efficient, low wind-load
- Mounting bracket for easy mast-, pole-, and wall-installation
- Integral earth point which can be connected to an earth lead with M8 ring terminal
- Optional protection cover for cable exits available

Specifications

		Small	Large
Number of rugged circular power sockets		3	6
Number of Q-ODC-2 sockets		3 (2 fibers per socket)	6 (2 fibers per socket)
Maximum voltage rating		74 Vdc	
Maximum current rating		up to 4 A (IEC) / 44 A (UL)	
Dimensions L × W × H		310 × 90 × 97 mm	477 × 90 × 97 mm
Housing material		high-performance polycarbonate	
UV resistance, ISO 4892-3 (methode A/cylce 1)		1000 h	
Ambient temperature range	in service	–40 to +75 °C	
	installation	–10 to +50 °C	
Ingress protection (IEC 60529)		IP67	
Impact resistance (IEC 62262)		IK 10	
Material flammability rating		UL94-V0	



MASTERLINE Classic at BTS side



Supplied on a double-flange reel



Integral earth connection

MASTERLINE Ultimate Hybrid (MLUH)

Hybrid cable with 6 pairs power wire and 6 pairs of fiber optic



Hybrid cables of HUBER+SUHNER combine optical fiber and DC power, are highly flexible and easy-to-route. Two rip cords between the shielding and the jacket allows a quick stripping of the jacket. The shielding, a copper foil under the jacket and the drain wire maintain contact throughout the cable run and allow potential equali-sation and a safe installation with regard to lightning strikes.

Hybrid cable general specifications

	LSFH jacket, European market	PVC jacket UL listed, US market	PA6 jacket, Australian market
Jacket material	LSFH thermoplastic CPR class	PVC	Inner layer LSFH thermoplastic Outer layer PA6 bird proof
Standard	IEC 60502-1:2004-04 IEC 60092-353:2016	UL 1277, TC-OF-ER	IEC 60502-1:2004-04
Rated voltage	0.6kV / 1 kV (1.2 kV)		
Flame retardant	IEC 60332-1-2:2004	UL 1685 (UL 1581) vertical tray flame test	IEC 60332-1-2:2004
Min. bending radius during installation	10x cable-Ø	12x cable-Ø	10x cable-Ø
Min. bending radius in service	8x cable-Ø	10x cable-Ø	8x cable-Ø
Cable shielding	copper foil 100% coverage (contacted with drain wire)		
Conductor type	IEC 60228 class 5	class C or D THHN/THWN-2	IEC 60228 class 5
Conductor color	red and white numbed (according IEC 60445:2021-07)	Red and black numbered	Red and blue numbered

Hybrid cable specification MLUH 3/3 and MLUH 3/6 for 3 RRHs with 1 or 2 fiber optic interfaces

	LSFH jacket, European market			PVC jacket UL listed, US market			PA6 jacket, Australian market	
onductor cross section	6 mm²	10 mm²	16 mm²	10 AWG	8 AWG	6 AWG	6 mm²	10 mm²
Resistance	3.30 Ω/km	1.91 Ω/km	1.21 Ω/km	3.41 Ω/km	2.13 Ω/km	1.30 Ω/km	3.30 Ω/km	1.91 Ω/km
Outer diameter	17.4 mm	19.7 mm	22.7 mm	0.770" (19.6 mm)	0.92" (23.4 mm)	0.945" (23.9 mm)	21.0 mm	23.3 mm
Weight	0.56 kg/m	0.85 kg/m	1.17 kg/m	0.69 kg/m	1.05 kg/m	1.40 kg/m	0.63 kg/m	0.94 kg/m
Drain wire cross section	6 mm²	10 mm²	10 mm²	6 AWG	6 AWG	6 AWG	6 mm²	10 mm²
Fiber optic	5 mm loose tube cable with 6 or 12 fibers single-mode E9/125 A2 or multimode OM3/OM4							

Hybrid cable specification MLUH 6/6 for 6 RRHs with 1 fiber optic interface

	LSFH jacket, European market			PVC jacket UL listed, US market			PA6 jacket, Australian market	
Conductor cross section	6 mm²	10 mm²	16 mm²	10 AWG	8 AWG	6 AWG	6 mm²	10 mm²
Resistance	3.30 Ω/km	1.91 Ω/km	1.21 Ω/km	3.41 Ω/km	2.13 Ω/km	1.30 Ω/km	3.30 Ω/km	1.91 Ω/km
Outer diameter	23.4 mm	27.4 mm	32.2 mm	1.00" (25.4 mm)	1.18" (30.0 mm)	1.28" (33.0 mm)	27.5 mm	33.5 mm
Weight	0.97 kg/m	1.72 kg/m	2.24 kg/m	1.25 kg/m	1.64 kg/m	2.28 kg/m	1.19 kg/m	1.87 kg/m
Drain wire cross section	6 mm²	10 mm²	10 mm²	6 AWG	6 AWG	6 AWG	6 mm²	10 mm²
Fiber optic	5 mm loose tube cable with 12 fibers single-mode E9/125 A2 or multimode OM3/OM4							

MASTERLINE Ultimate Hybrid (MLUH)

Power connectors



Power connector plug at the jumper



Power connector flange socket at the MLUH connector head

Features

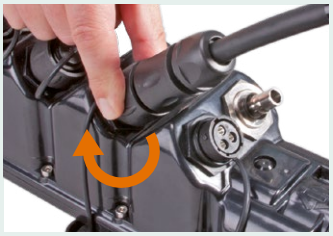
- Rugged circular plastic plug connector for remote radio installations
- Machined crimp contacts Ø 3.6 mm for high current
- Bayonet coupling system for easy and quick mating
- 2 wire shielded copper cable with cross section of 6 mm² - 10 mm²

The bayonet coupling system enables a simple and fast mating. With only a 1/3 twist of the coupling ring, connectors are mated with an audible and tactile "click". The machined 3.6 mm crimp contacts ensure a vibration safe termination and a high current rating. Specifications see page 41 (MLUP).

Mating/un-mating sequences



Twist the coupling ring of the plug connector to remove protecting cap as shown.



Push plug connector slightly into flange connector, rotate to find keying position, twist coupling ring of the plug connector as shown.



Twist coupling ring as shown to un-mate the plug connector.

Q-ODC connectors



Q-ODC plug on the jumper



Q-ODC socket on MLUH head

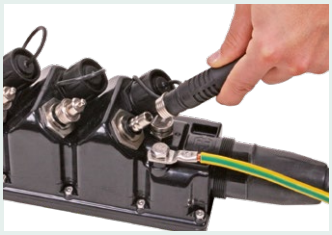
Features

Robust push-pull coupling mechanism – two clearly defined mating states

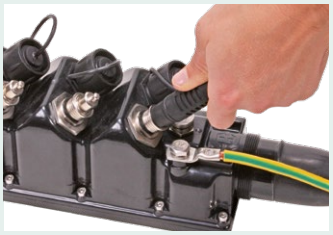
Highest outdoor installation safety

Waterproof, dust proof and corrosion resistant; does not require secondary wrapping

Mating/un-mating sequences



Push plug connector slightly into socket connector, rotate to find keying position, push connector to mate.



Mated - connector snaps in and is fully strain relieved.

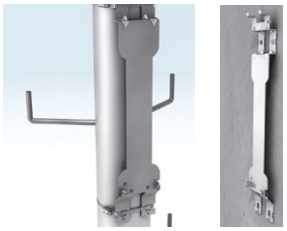
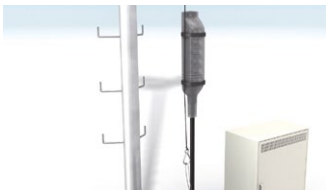
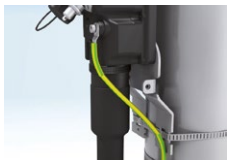
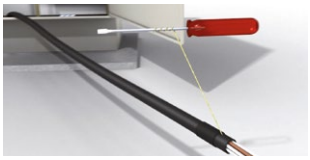


Pull coupling ring to un-mate.

MLUH installation

Easiest-to-install hybrid product available on the market.

Installation features

	**Installation video and manual** With a smartphone the QR code attached to the spool can be scanned and it takes you directly to the relevant internet site where the installation manual or installation video can be chosen.
	**MLUH mounting bracket** The MLUH mounting bracket is fixed to the mast or wall before the MLUH is lifted.
	**Unspooling** The MLUH is supplied on a double-flange reel which allows for easy and straightforward unspooling while lifting the cable up the mast..
	**Pulling** With a pre-laced hosting grip below the MLUH connector head, the cable system is lifted up to the mast.
	**Hook-in MLUH head at mounting bracket** After the protection air bubble bag is removed, the MLUH connector head can be hooked-in to the mounting bracket.
	**RRH connection** The remote radios are connected with fiber optic jumpers, which are terminated with Q-ODC/ Q-ODC-12 plug connectors and RRH compatible interfaces. The power jumpers are terminated with a rugged circular plastic plug connector and are blunt cut on the RRH side.
	**Earthing** The MLUH head has an integral earth point which can be connected to an earth lead with M8 ring terminal. Optional, the shielding of the hybrid cable can be grounded with standard grounding kits.
	**Base station connection** The pre-terminated LC fiber optic connectors are protected with a IP65 protection tube. Once the protection tube is screwed-off, the installer has access to the fiber optic breakout cables and the individual copper/ground wires.
	**Overlength management** The hybrid cable has 2 rip cords below the jacket to allow easy stripping of the jacket over a distance of several meters. This allows the installer to cut the excess length of the copper wire while the overlength of the pre-terminated fiber cable is stored inside the base station or in a overlength box.

Ordering information

Available configuration with metric cross section according IEC

MLUH config. size	Hybrid cable construction	Power connector	Maximum current rating [1]	RRH max. power consumption [2]	Fiber optic connectors	MLUH Order Code
3/3 small housing						
	3 pairs 6 mm² 3 pairs OF	3 x power connector UTS 40 A	31.3 A	1377 W	3 LC duplex 3 Q-ODC-2	MLUH33-06M-x-20QI-008U-xxx
	3 pairs 10 mm² 3 pairs OF		40.0 A	1760 W		MLUH33-10M-x-20QI-008U-xxx
	3 pairs 16mm² 3 pairs OF		40.0 A	1760 W		MLUH33-16M-x-20QI-008U-xxx
6/6 large housing						
	6 pairs 6 mm² 6 pairs OF	6 x power connector UTS 40 A	25.5 A	1122 W	6 LC duplex 6 Q-ODC-2	MLUH66-06M-x-20QI-008U-xxx
	6 pairs 10mm² 3 pairs OF		34.8 A	1531 W		MLUH66-06M-x-20QI-008U-xxx
	6 pairs 16mm² 6 pairs OF		40.0 A	1760 W		MLUH66-16M-x-20QI-008U-xxx
3/6 small housing						
	3 pairs 6 mm² 6 pairs OF	3 x power connector UTS 40 A	31.3 A	1377 W	6 LC duplex 6 Q-ODC-2	MLUH36-06M-x-20QI-008U-xxx
	3 pairs 10 mm² 6 pairs OF		40.0 A	1760 W		MLUH36-10M-x-20QI-008U-xxx
	3 pairs 16mm² 6 pairs OF		40.0 A	1760 W		MLUH36-16M-x-20QI-008U-xxx

[1] Maximum current rating @ 60°C ambient temperature according IEC 60364-5-52, copper conductor with XLPE insulation (installation methode E)
[2] RRH maximum power consumption @ RRH voltage 44 Vdc

Available configuration with metric cross section according NEC

MLUH config. size	Hybrid cable construction	Power connector	Maximum current rating [1]	RRH max. power consumption [2]	Fiber optic connectors	MLUH Order Code
3/3 small housing						
	3 pairs 10 AWG 3 pairs OF	3x power connector UTS 44 A	26.2 A	1153 W	3 LC duplex 3 Q-ODC-2	MLUH33-10A-x-20QI-008U-xxx
	3 pairs 8 AWG 3 pairs OF		36.1 A	1588 W		MLUH33-08A-x-20QI-008U-xxx
	3 pairs 6 AWG 3 pairs OF		44.0 A	1936 W		MLUH33-06A-x-20QI-008U-xxx
3/6 large housing						
	3 pairs 10 AWG 6 pairs OF	3x power connector UTS 44 A	26.2 A	1153 W	3 LC duplex 3 Q-ODC-2	MLUH36-10A-x-20QI-008U-xxx
	3 pairs 8 AWG 6 pairs OF		36.1 A	1588 W		MLUH36-08A-x-20QI-008U-xxx
	3 pairs 6 AWG 6 pairs OF		44.0 A	1936 W		MLUH36-06A-x-20QI-008U-xxx
6/6 small housing						
	6 pairs 10 mm² 6 pairs OF	6x power connector UTS 40 A	16.4 A	722 W	6 LC duplex 6 Q-ODC-2	MLUH66-10A-x-20QI-008U-xxx
	6 pairs 8 mm² 6 pairs OF		22.6 A	994 W		MLUH66-08A-x-20QI-008U-xxx
	6 pairs 6mm² 6 pairs OF		30.8 A	1355 W		MLUH66-06A-x-20QI-008U-xxx

[1] Current rating @ 50°C ambient temperature according NEC table 310.15
[2] RRH maximum power consumption @ RRH voltage 44 Vdc

MLUH order code

MLUH	X	x	-	xxx	-	X	-	20	xx	-	008U	-	xxx
	Number of power connector pairs	Number of fiber optic pairs		Cross section power conductor		Fiber type 0 = G.657 A2 3 = OM3 4 = OM4		Power connector UTS 40A / 44A	Fiber optic connecter type QI= Q-ODC-2 QW= Q-ODC-12 B3= ODC-2 K2= ODC-4		CD fiber optic connector		Length in meter 5 or 10m steps

Options:
- ODC-2, ODC-4 or Q-ODC-12 socket connector
- OM3 or OM4 fiber

MASTERLINE Ultimate Hybrid (MLUH) with Q-ODC-2

Q-ODC RRH jumpers



Features

- Compatible with MLE, MLEH, MLU and MLUH terminated with Q-ODC
- Ruggedised and robust RRH jumper cable – easy and reliable to install
- Available for all types of RRH
- Cable diameter 4.8 mm, 5.5 mm or 7 mm
- Standard lengths of 2, 5 and 10 m, customised lengths available

Jumpers for all types of remote radio systems available.
Ordering information see page 30 (MLU).

Power jumpers UTS connector upto 40 A / 44 A



Features

- Maximum current rating 40A (IEC) / 44 A (UL)
- Compatible with MLEP, MLEH and MLUH
- Cut on the RRH side
- 2 wire shielded copper cable with a cross section of 6 or 10 mm² / 10 or 8 AWG
- Standard length 2, 5 and 10 m

Ordering information see page 43 (MLUP).

Y- and λ- Power Jumper

HUBER+SUHNER Y- and λ- Power Jumpers provide flexible installation options for efficiently delivering DC power to Remote Radio Heads (RRHs). The Y-Power Jumper allows for the connection of a single RRH with dual power feed or two RRHs with a single power feed, enhancing versatility. Meanwhile, the λ-Power Jumper facilitates easy upgrades of existing power installations to support high-power radios, ensuring seamless integration.



Features

- Compatible with MLUP, MLEP and MLUH
- One Y-/λ-Piece design
- Terminated with a rugged circular plastic plug connector and blunt cut on the RRH side
- Blunt cut to blunt cut assembly options available
- 2 wire shielded copper section of 6 mm² to 16 mm² and AWG 10 to AWG 6
- Standard length 2, 5 and 10 m

MASTERLINE Ultimate Hybrid (MLUH) is the most innovative hybrid cabling system of HUBER+SUHNER for remote radio installation.

The pre-connectorised factory-sealed hybrid systems supports up to 6 RRHs and connects the remote radios with easy-to-install Q-ODC fiber optic and power jumpers. A pre-laced hoisting grip below the robust connector head allow for easy cable lifting. The encapsulated connector head can be directly hooked in to a pre-mounted bracket.

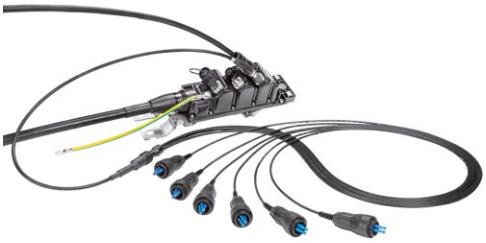
The MLUH head has an integral earth point which can be connected to an earth lead with M8 ring terminal. Optional, the shielding of the hybrid cable can be grounded with standard grounding kits.

The hybrid cable is designed in a way that the outer jacket and shielding can be easily stripped off over a distance of several meters. This allows the installer to cut the excess length of the copper wire while the overlength of the pre-terminated fiber cable is stored inside the base station or in an overlength box.

These unique features make MASTERLINE Ultimate Hybrid the best-in-class product in terms of ease of mast-top installation, installation robustness and efficiency.



MASTERLINE Ultimate Hybrid (MLUH) with Q-ODC-12



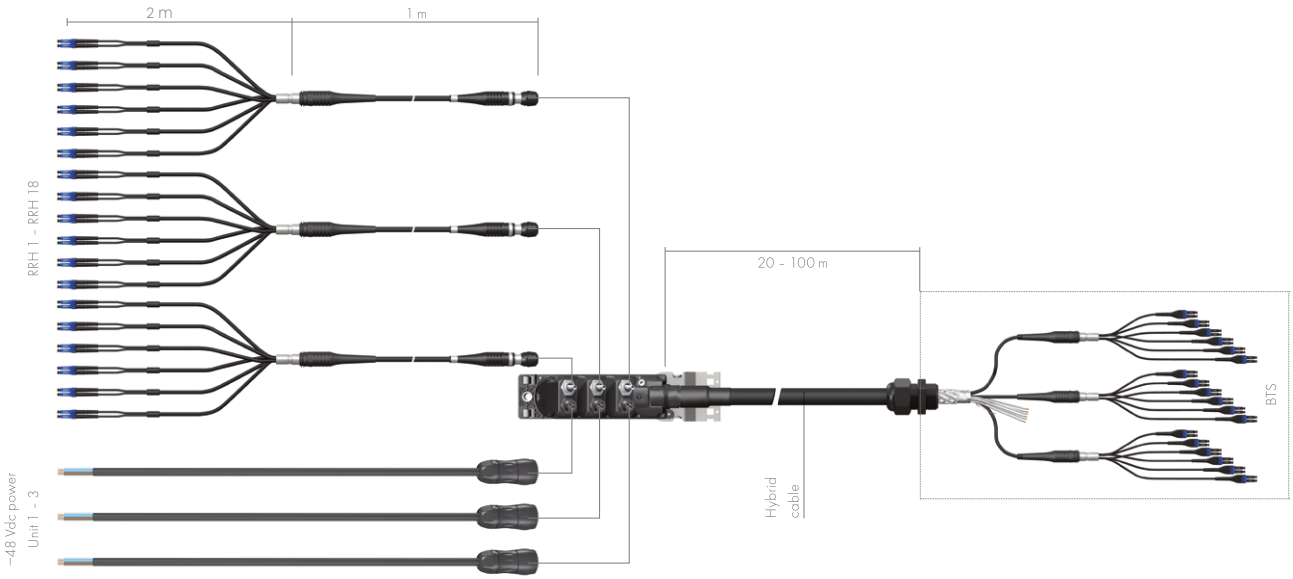
Features

- Pre-connectorised factory-sealed hybrid cable system with 3 power connectors and 3 Q-ODC-12 connectors
- Modular "plug & play" system compatible with Q-ODC-12 jumpers
- Encapsulated IP67 sealed connector head housing
- Hoisting grip for cable lifting
- Space-efficient, low wind-load
- Mounting bracket for easy mast-, pole- and wall-installation
- Integral earth point which can be connected to an earth lead with M8 ring terminal
- Optional protection cover for cable exits available

Specifications

Number of rugged circular power sockets		3
Number of Q-ODC-12 sockets		3 (12 fibers per socket)
Dimensions L × W × H		310 × 90 × 97 mm
Maximum voltage rating		74 Vdc
Maximum current rating		up to 40 A (IEC) / 44 A (UL)
Ambient temperature range	in service	–40 to +75 °C
	installation	–10 to +50 °C
Ingress protection (IEC 60529)		IP67
Impact resistance (IEC 62262) IK 10		IK 10
Material housing		high-performance polycarbonate
UV resistant for outdoor use		EN ISO 4892-3:2016
Material flammability rating		UL94-V0

MASTERLINE Ultimate Hybrid with Q-ODC-12 allows the connection to 18 remote radio interfaces and 3 power supply units.
The MLUH connector head is equipped with 3 power connectors and 3 Q-ODC-12 sockets.



MASTERLINE Ultimate Hybrid (MLUH) with Q-ODC-12

Q-ODC-12 connector



Q-ODC-12 plug on the multi-branch RRH jumper



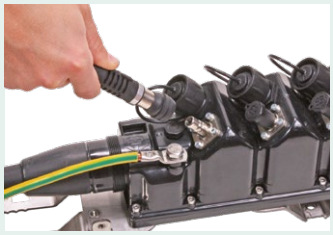
Q-ODC-12 socket on MLUH head

Specifications on page 153

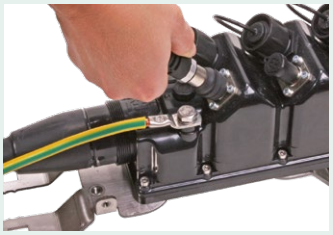
Features

- Connects 12 fibers in one mating step
- Compact design with MT ferrules
- Robust push-pull coupling mechanism – two clearly definded mating states
- Highest outdoor installation safety
- Waterproof, dust proof and corrosion resistant

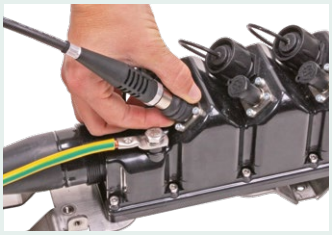
Mating/unmating sequences



Push plug connector slightly into extension connector, rotate to find keying position, push connector to mate.



Mated – connector snaps in and is fully strain relieved.



Pull coupling ring to unmate.

Q-ODC-12 multi-branch RRH jumper



Features

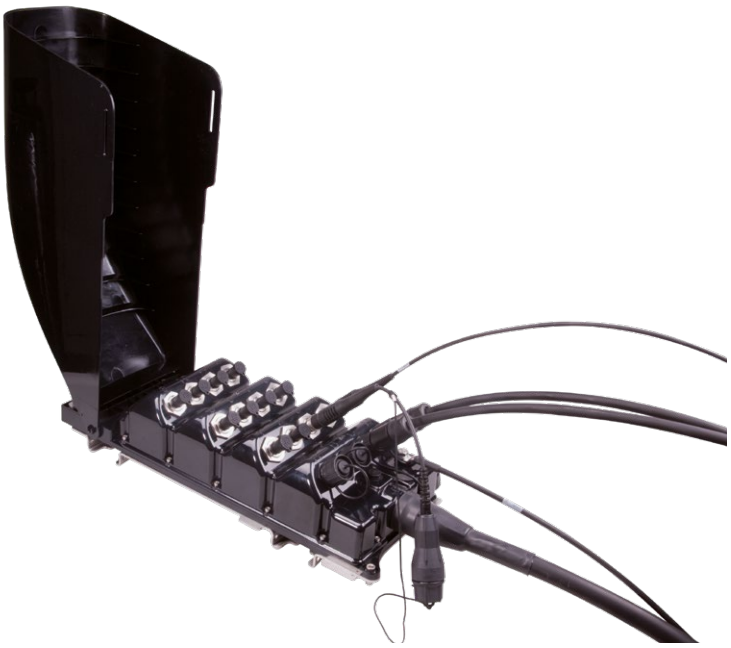
- Terminated with Q-ODC-12 plug and with 2 to 6 RRH-specific interfaces
- Connects up to 6 RRH jumper cables with a single "click"
- Ruggedised design with robust break-out cables
- RRH-specific interface numbered for easy channel identification
- Ingress protection IP68 (Q-ODC-12, mated)

MASTERLINE Ultimate Hybrid (MLUH)

Accessories

Description		Item no.	Page	Picture
Overlength box for outdoor and indoor installation, stores up to 20 m cable excess length (depending on cable diameter)		84103325	135	
Clamps for hybrid cable		depends on cable diameter	140	
Grounding kits		85015070	250	
Grounding cable, 0.5 m, 16 mm² and 25 mm², black and yellow/green		depends on cross section and colour	139	
19" CTB patching box	6, 12, 18 or 24 LC duplex adapter blue	depends on quantity of LC adapter	136	
LC patchcords	0.5 m, 0.7 m or 1 m length, single-mode	depends on length	139	
Protection cover for MLUH 3 Stainless steel Dimension (L × H × W) 365 × 200 × 90 mm		85032157	--	
Protection cover for MLUH 6 Stainless steel Dimension (L × H × W) 550 × 250 × 90 mm		85032156	--	
Auxiliary tool to open and close power connector		85013939	--	
Quick hose clamps Stainless steel One set includes 2 pieces hose clamps	clamping Ø 30 to 155 mm	84076411	146	
	clamping Ø 60 to 500 mm	84076412		
SFP/SFP+ transceivers for different protocols, data rates and power budgets.		see transceiver selection guide on page 262	261	

MASTERLINE Ultimate Hybrid High Voltage (MLUH HV)



Hybrid-riser cable with compact connector head high voltage CE conformity

The most innovative hybrid cabling system of HUBER+SUHNER for remote radio installation became even more innovative by offering capability to deliver 230 VAC up the mast, allowing much longer cabling with significant cost savings on cables and more efficient power transfer. The pre-connectorised factory-sealed hybrid systems supports up to 12 RRHs and connects the remote radios with easy-to-install Q-ODC fiber optic and power jumpers. The encapsulated connector head can be directly attached to the mast with a single „click“ at a pre-mounted adaptor plate. These unique features make MASTERLINE Ultimate Hybrid High Voltage the only in-class product offering all the advantages of the MASTERLINE Ultimate family together with high voltage conformity confirmed by the worldwide recognised CE marking. For extra safety the whole head is protected by removable cover.

MASTERLINE Ultimate Hybrid High Voltage (MLUH HV)

RF **LISCA RF jumper**
page 202



FTTA **Q-ODC RRH jumper**
page 23

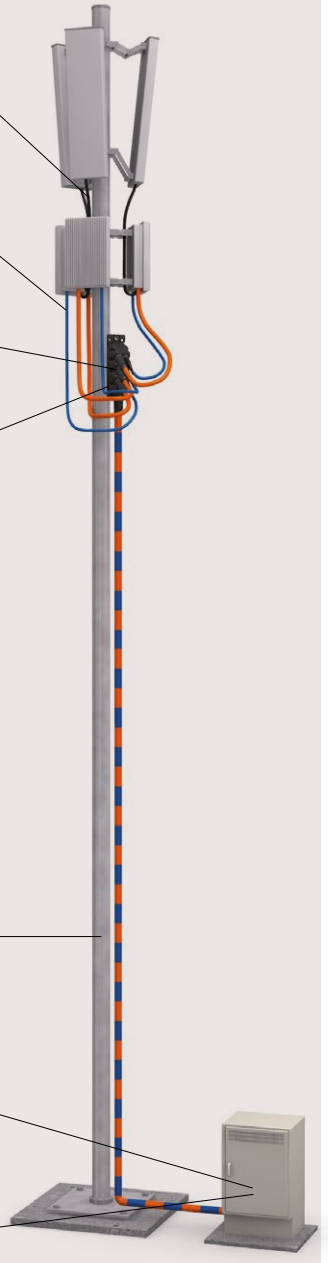


PTTA **Alternative power jumper**
page 104



HTTA **MLUH HV with Q-ODC-2**
page 102





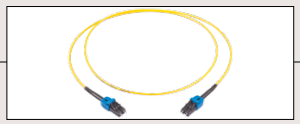
XTTA **Cable clamps**
page 140



FTTA **CTB 19" patching box (optional)**
page 136



FTTA **LC patchcord (optional)**
page 139



XTTA FTTA, PTTA and HTTA

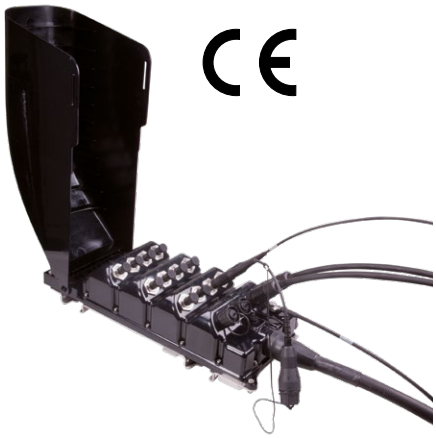
RF Radio Frequency

FTTA Fiber-To-The-Antenna

PTTA Power-To-The-Antenna

HTTA Hybrid-To-The-Antenna

MASTERLINE Ultimate Hybrid High Voltage (MLUH HV)



Features

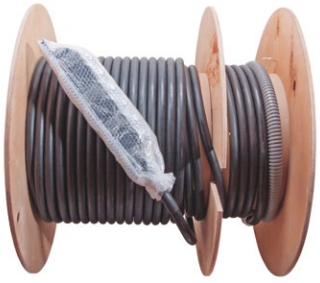
- Pre-connectorised factory-sealed hybrid cable system for 12 RRHs
- Modular „plug & play“ system compatible with Q-ODC/Q-ODC-12 and power jumpers
- Encapsulated IP67 sealed connector head housing
- Hoisting grip for cable lifting
- Space-efficient, low wind-load
- Mounting bracket for easy mast-, pole-, and wall-installation
- Integral earth point which can be connected to an earth lead with M8 ring terminal
- Equipped with protection cover for cable exits as a standard
- CE conformity for 230 VAC (higher voltages on request)

Specifications

Number of rugged circular power sockets		4
Number of Q-ODC-2 sockets		12 (2 fibers per socket)
Dimensions L × W × H		515 × 195 × 234 mm
Dimensions without cover L x W x H		515 × 195 × 110 mm
Rated current (IEC 60364-5-52, method E)		40 A (4 x 10A)
Rated voltage		230 VAC
Ambient temperature range	in service	–40 to +75 °C
	installation	–10 to +50 °C
Ingress protection (IEC 60300)		IP65/IP67
Impact resistance (IEC 60300)		IK 10
Halogen-free IEC (60754-2)		yes
UV resistant for outdoor use		ISO 4892-3 (1000h)
Material flammability rating		UL94-V0
Housing material		high-performance polycarbonate



MASTERLINE Classic at BTS side

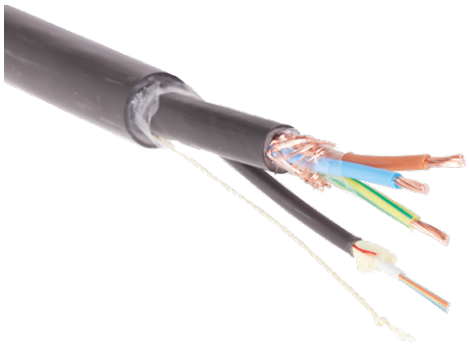


Supplied on a double-flange reel



Integral earth connection

MASTERLINE Ultimate Hybrid High Voltage (MLUH HV)



Hybrid cable consisting of a shielded power cable with 3 conductors (L, N, PE) and a fiber optic cable with 24 fibers

Hybrid cables of HUBER+SUHNER combine optical fiber and AC power, are highly flexible, easy-to-route and offer substantial costs savings due to lower number of copper conductors. The rip cord between the shielding and the jacket allows a quick stripping of the jacket. The power cable consist of three conductors extra shielded by the braided copper shield.

Specifications

Jacket material		thermoplastic, low smoke, free of halogen
Standard		IEC 60502-1:2004-04
Temperature range	in service	–40 to +75 °C
	installation	–10 to +50 °C
Operating voltage		230 VAC
Rated voltage		0.6 kV/1 kV (1.2 kV)
Min. bending radius	during installation	10 × cable-Ø
	in service	8 × cable-Ø
Conductors		4 mm^2
Fiber optic		non-armoured multifiber loose tube jelly-filled
Halogen-free		yes
Flame retardant		IEC 60332-1-2:2004.
UV resistant		IEC 60068-2-5
CE conform		yes
CPR compliant		yes, class D_{ca}

Ask your local sales contact for further information or find more information at http://literature.hubersuhner.com/Technologies/Fiberoptics/LowInductanceWhitepaper/.

MASTERLINE Ultimate Hybrid High Voltage (MLUH HV)

Power connectors



Power connector plug at the jumper



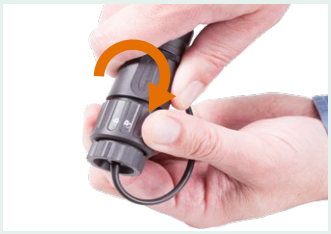
Power connector flange socket at the MLUH connector head

Features

- Rugged circular plastic plug connector for remote radio installations
- Machined crimp contacts Ø 3.6 mm for high current
- Bayonet coupling system for easy and quick mating
- 3 wire shielded copper cable with 1.5 mm² cross section

The bayonet coupling system enables a simple and fast mating. With only a 1/3 twist of the coupling ring, connectors are mated with an audible and tactile "click". The machined 3.6 mm crimp contacts ensure a vibration safe termination and a high current rating. Specifications see page 42(MLUP).

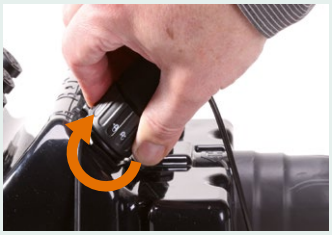
Mating/unmating sequences



Twist the coupling ring of the plug connector to remove protecting cap as shown.



Align white strip on the plug with the white strip on the socket to find keying position easier. Make sure the plug connector is in-line with the socket connector before coupling ring is twisted.



Twist coupling ring as shown to mate or unmate the plug connector.

Q-ODC connectors



Q-ODC plug on the jumper



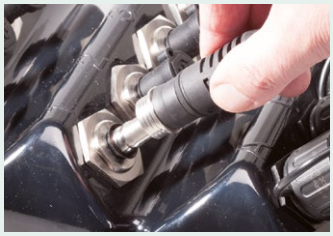
Q-ODC socket on MLUH HV

Features

- Robust push-pull coupling mechanism – two clearly defined mating states
- Highest outdoor installation safety
- Waterproof, dust proof and corrosion resistant; does not require secondary wrapping

Specification see page 96 (Fiber optic interfaces).

Mating/unmating sequences



Push plug connector slightly into socket connector, rotate to find keying position, push connector to mate.



Mated - connector snaps in and is fully strain relieved.

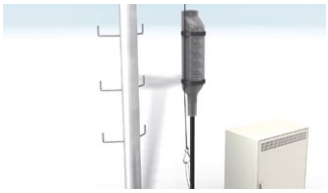
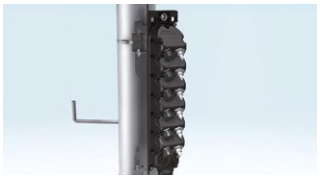


Pull coupling ring to unmate.

MLUH HV installation

Easiest-to-install hybrid product available on the market.

Installation features

	**Installation video and manual** With a smartphone the QR code attached to the spool can be scanned and it takes you directly to the relevant internet site where the installation manual or installation video can be chosen.
	**MLUH HV mounting bracket** The MLUH HV mounting bracket is fixed to the mast or wall before the MLUH HV is lifted.
	**Unspooling** The MLUH HV is supplied on a double-flange reel which allows for easy and straight-forward unspooling while lifting the cable up the mast..
	**Pulling** With a pre-laced hosting grip below the MLUH connector head, the cable system is lifted up to the mast.
	**Hook-in MLUH HV head at mounting bracket** After the protection air bubble bag is removed, the MLUH HV connector head can be hooked-in to the mounting bracket.
	**RRH connection** The remote radios are connected with fiber optic jumpers, which are terminated with Q-ODC/ Q-ODC-12 plug connectors and RRH compatible interfaces. The power jumpers are terminated with a rugged circular plastic plug connector and are blunt cut on the RRH side.
	**Earthing** The MLUH HV head has an integral earth point which can be connected to an earth lead with M8 ring terminal. Optional, the shielding of the hybrid cable can be grounded with standard grounding kits.
	**Base station connection** The pre-terminated LC fiber optic connectors are protected with a IP65 protection tube. Once the protection tube is screwed-off, the installer has access to the fiber optic breakout cables and the individual copper/ground wires.
	**Overlength management** The hybrid cable has 1 rip cord below the jacket to allow easy stripping of the jacket over a distance of several meters. This allows the installer to cut the excess length of the copper wire while the overlength of the pre-terminated fiber cable is stored inside the base station or in a overlength box.

MASTERLINE Ultimate Hybrid High Voltage (MLUH HV) with Q-ODC

Ordering information

MASTERLINE Ultimate Hybrid for 12 RRHs - MLUH HV 4/12



	Radio end side	BTS side
Fiber optic	12 Q-ODC sockets	12 uniboot
Power	3 conductors (phase, zero, grounding) blunt cut	3 conductors (phase, zero, grounding) blunt cut wire cross section 4 mm^2

Hybrid cable	Fiber optic	Market	Jacket material	Wire cross section Cable diameter Cable weight	Length	Item no.
3 pairs conductors	12 pairs single-mode	global CPR compliant	LSFH™	4 mm^2 22 mm (5/8") 0.57 kg/m	10 m	85105314
					20 m	85098600
					30 m	85105315
					40 m	85105316
					50 m	85105318
					60 m	85105319
					70 m	85105320
					80 m	85105321
					90 m	85105322
					100 m	85105323

Option
Multimode fiber
Other length

MASTERLINE Ultimate Hybrid High Voltage (MLUH HV) with Q-ODC

Q-ODC RRH jumpers



Features

- Compatible with MLE, MLEH, MLU and MLUH terminated with Q-ODC
- Ruggedised and robust RRH jumper cable – easy and reliable to install
- Available for all types of RRH
- Cable diameter 4.8 mm, 5.5 mm or 7 mm
- Standard lengths of 2, 5 and 10 m, customised lengths available

Jumpers for all types of remote radio systems available. Ordering information see page 30 (MLU).

Power jumpers



Features

- Compatible with MLUH HV
- Terminated with a rugged circular plastic plug connector and blunt cut on the RRH side
- 3 copper conductor 1.5 mm² with braided copper shielding for 230 VAC power supply
- Standard length 2, 5 and 10 m

Ordering information see below.

Specifications

Jacket material	LSFH™
Conductor type	copper stranded, IEC 60228 class 2
Insulation colour	blue, brown, yellow/green (grounding)
Cable shielding	braided screen of copper wires, coverage 65 to 85 %
Rated voltage	0.6/1.0 kV
Conductor cross section	3 × 1.5 mm²
Resistance	12.1 Ω/km
Current per conductor	10 A
Cable diameter	11 mm
Cross section braid	3.1 mm²



Ordering information

Market	Length	Item no.
Global Not UL listed	2 m	85099139
	5 m	85099140
	10 m	85099141

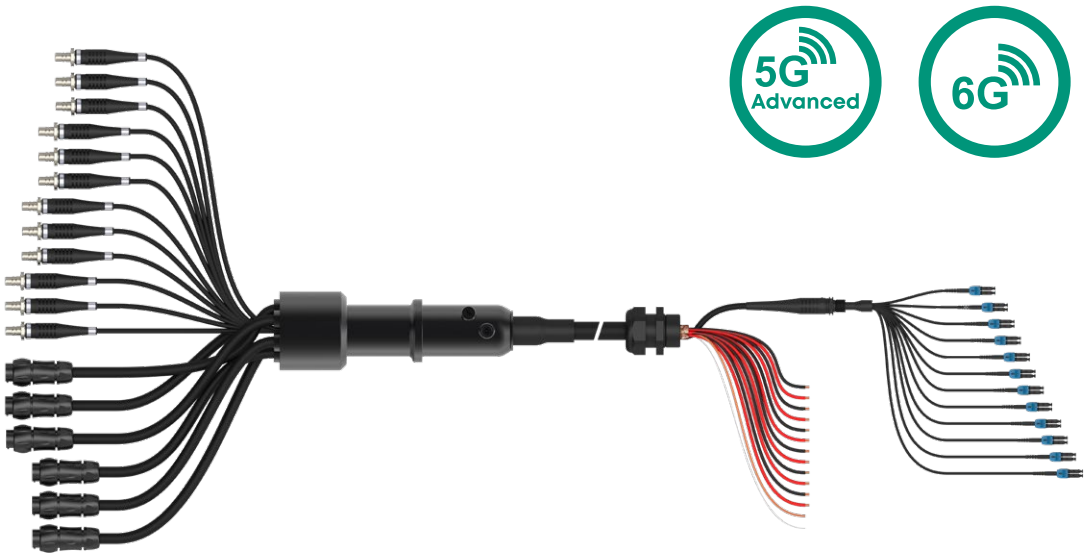
MASTERLINE Ultimate Hybrid High Voltage (MLUH HV)

Accessories

Description		Item no.	Page	Picture
Overlength box for outdoor and indoor installation, stores up to 20 m cable excess length (depending on cable diameter)		84103325	135	
Clamps for hybrid cable		depends on cable diameter	140	
Grounding cable, 0.5 m, 16 mm² and 25 mm², black and yellow/green		depends on cross section and colour	139	
19" CTB patching box	6, 12, 18 or 24 LC duplex adapter blue	depends on quantity of LC adapter	136	
LC patchcords	0.5 m, 0.7 m or 1 m length, single-mode	depends on length	139	
Quick hose clamps Stainless steel One set includes 2 pieces hose clamps	clamping Ø 30 to 155 mm	84076411	146	
	clamping Ø 60 to 500 mm	84076412		
SFP/SFP+ transceivers for different protocols, data rates and power budgets.		see transceiver selection guide on page 262	261	



MASTERLINE Extreme Hybrid (MLEH)



Hybrid-riser cable system

Designed for new 5G Advanced and 6G capabilities

The HUBER+SUHNER **MASTERLINE Extreme Hybrid (MLEH) cable system** is a **highly modular, scalable and future-proof hybrid cabling system** built for the demands of **5G Advanced and emerging 6G networks.**
Evolved since 2012 for maximum performance with minimal installation effort, MLEH ensures seamless, spliceless fiber routing all the way from the base band unit to HUBER+SUHNER harsh environment outdoor connector ODC, which connects the RRH/AAU via a fiber optic jumper —guaranteeing reliable, hassle-free connectivity.

The new design features more customized configuration options and new features.

MASTERLINE Extreme Hybrid (MLEH)

RF **LISCA RF jumper**
page 202



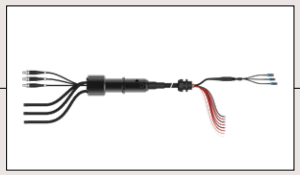
FTTA **Q-ODC RRH jumpers**
page 23



PTTA **Power jumpers (optional)**
page 48



HTTA **MASTERLINE Extreme Hybrid**
page 110



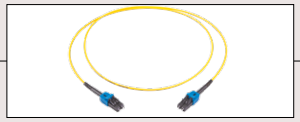
XTTA **Cable clamps**
page 140



FTTA **CTB 19" patching box (optional)**
page 136



FTTA **LC patchcord (optional)**
page 139





XTTA FTTA, PTTA and HTTA

RF Radio Frequency

FTTA Fiber-To-The-Antenna

PTTA Power-To-The-Antenna

HTTA Hybrid-To-The-Antenna

MASTERLINE Extreme Hybrid (MLEH)

Key advantages

More flexibility
Modular housing enables fast, customer specific configurations delivered within weeks, while the space saving design and full OEM agnostic compatibility make MLEH the perfect fit for any site requirement. Also featuring protection against birds or rodents. With operations in Mexico, Poland, and China, we maintain a global footprint to stay close to our customers.

More fiber
Up to 24 fiber optic cable breakouts enabled by a patented spliceless divider for quicker, error-free installations.

More power
With large copper cross-sections, MLEH delivers power up to 3'300 W and supports both -48 Vdc and 120 / 230 Vac power supplies - ensuring maximum performance for next-generation network deployments.

More sustainability
The innovative power splitter architecture minimizes current derating as defined by NEC/NFPA regulations (USA), enabling copper savings of up to 37%. The modular design also supports efficient AC configurations using compact 10 AWG / 4 mm^2 conductors for a lighter, greener installation.

Space-saving installation
The extremely robust, powder coated aluminum divider housing is available in two sizes and allows for a compact, space efficient installation on any site.
The patented, compact hybrid divider cleanly separates the optical fiber and DC power feeds into individual ruggedized outdoor cables, which connect to the RRHs either directly or via extension jumpers — eliminating the need for bulky mast mount distribution boxes and ensuring a streamlined, installation friendly setup.

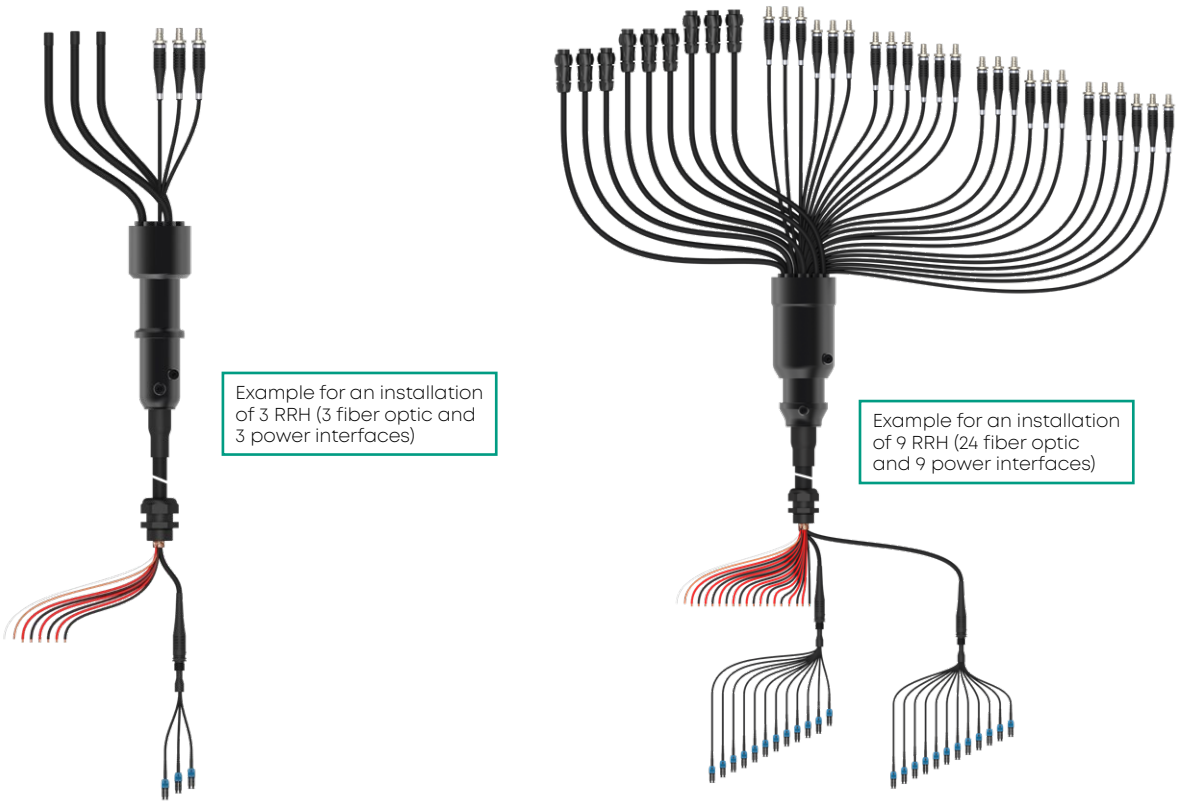
Independent from system hardware
The RRH jumpers enable seamless adaptation to a wide range of fiber optic interfaces used by OEMs such as Ericsson, Samsung, Huawei and ZTE, making the solution fully independent of the system vendor's hardware. This ensures maximum flexibility and easy integration across diverse network environments.

Unique options for unique situations

The new enhanced MLEH cable system enables even more customer-specific configurations making it ideally suited for 5G and future 6G mobile network installations.

Customer specific numbers of fiber optic and power breakout cables

The patented hybrid divider supports 2–9 power breakout cables and 2–24 fiber optic breakout cables (up to 48 fibers), connecting to as many as 24 fiber optic RRH interfaces.



Wide range of conductor cross-sections for low- and high-power radios

A wide range of conductor cross sections is available to support both low and high power radios. Hybrid cables with copper cross sections of up to 3 AWG / 25 mm² and power breakout cables with up to 6 AWG / 16 mm² per RRH enable reliable power delivery for radios with high energy demands of up to 3300 W per RRH. For low power radios with power consumption around 400 W per RRH, a 10 AWG / 6 mm² conductor cross section is generally sufficient for both the hybrid cable and the power breakout cable.

The following conductor cross-sections are available for -48 Vdc power supply

Power supply voltage	Hybrid cable	Power breakout cable
Up to -74 Vdc	10 to 3 AWG / 6 to 25 mm²	10 to 6 AWG / 6 to 16 mm²

Power supply voltage 120 / 230 Vac

In the telecom industry, –48 Vdc is the most widely used supply voltage due to its reliability, safety, and compatibility with battery-backed power systems. However, in special installations with long distances between the power supply and the RRH, using 230 Vac can be advantageous, as it reduces transmission losses and allows for more efficient power distribution over extended cable runs. The new MLEH design is now also available for 120 / 230 Vac power supply and accompanied by a CE Declaration of Conformity.

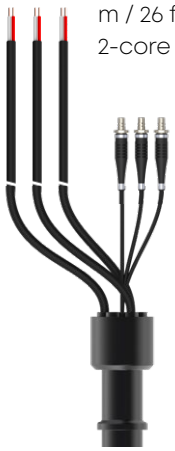
The following conductor cross-sections are available for 120 / 230 Vac power supply

Power supply voltage	Hybrid cable	Power breakout cable
120 / 230 Vac	14 to 12 AWG / 1.5 to 4mm²	14 to 12 AWG / 1.5 to 4mm²

Power breakouts with or without power connectors

The required length of the power breakouts varies in many cases and is often difficult to determine in advance. The standard length is 4 m / 13 ft and can be increased to 8 m / 26 ft upon customer request. Power breakouts with a length of 0.5 m / 1.6 ft, terminated with a power connector, together with power jumpers in various lengths from 2 m / 6.5 ft to 10 m / 33 ft, allow for flexible installation without needing to know the exact breakout length beforehand. Upon request, HUBER+SUHNER offers power jumpers with factory installed and tested RRH Power Interface connectors. Factory terminated connectors are tested and not prone to water leakage as field mounted plugs. The installation time can be reduced significantly. For specification and ordering information, see page 62 (MLEP).

Without power connector (blunt cut)
Power breakouts are available with up to 8 m / 26 ft long shielded 2-core power cables



With power connector
UTS (40 A, 6 or 10 mm² / 10 or 8 AWG) or QL (50 A, 6 to 16 mm² / 10 to 6 AWG)



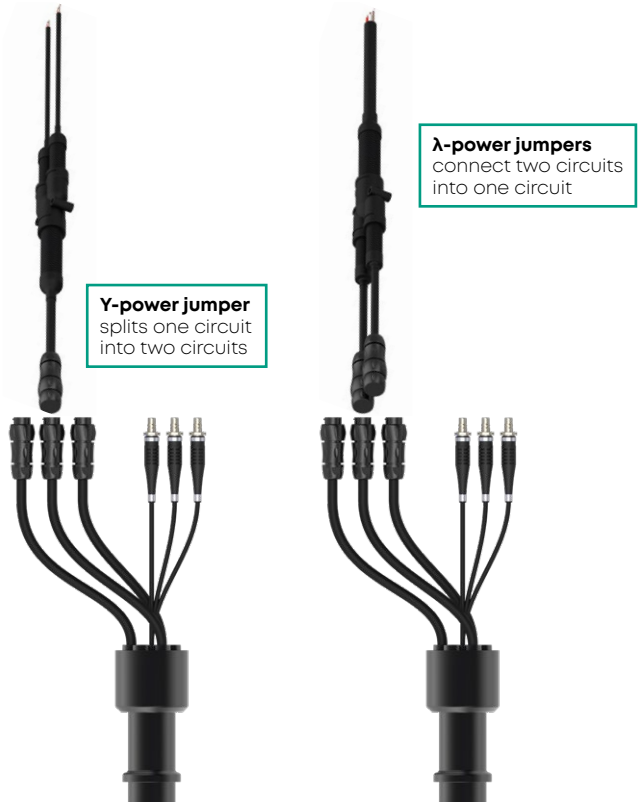
With RRH power interface connector
Power jumper with factory-terminated RRH power connector



Y-power jumpers for dual power feed and λ-power jumpers for swaps to high power radios.

In addition to standard straight power jumpers, HUBER+SUHNER offers Y power jumpers that simplify installation for RRHs equipped with two power connectors.

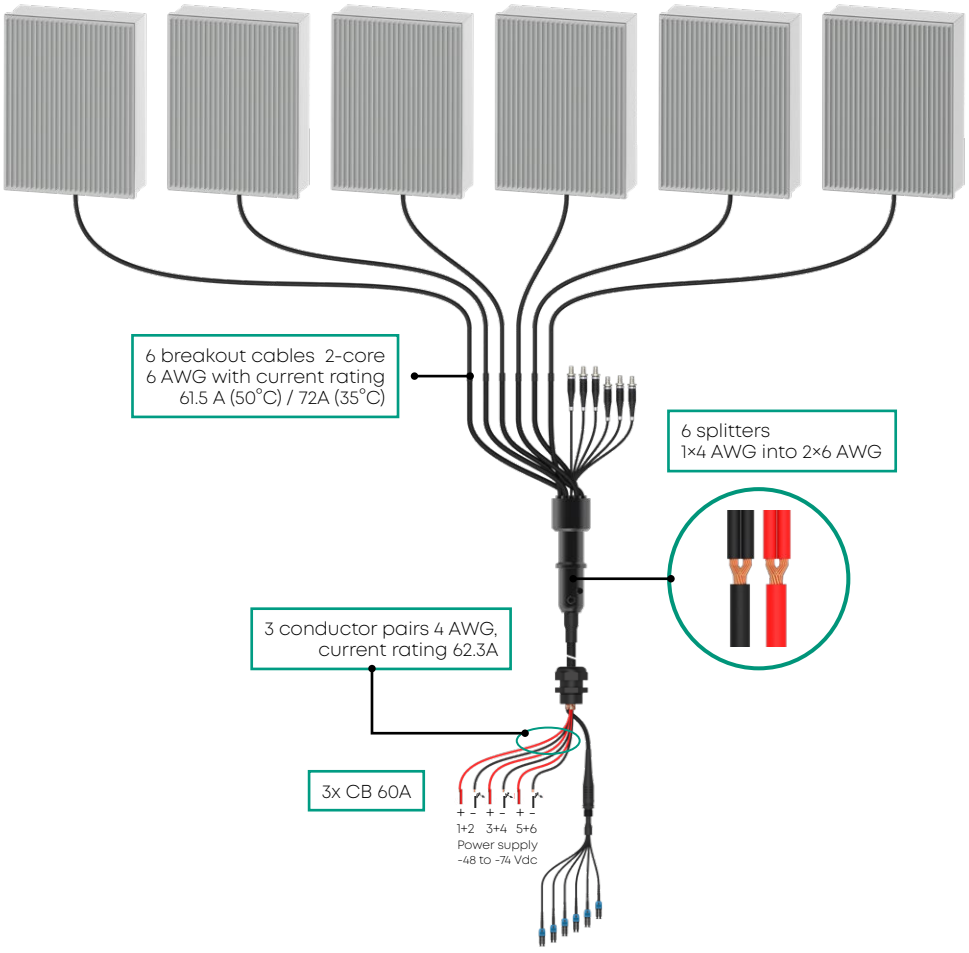
For high power upgrades, λ power jumpers provide an ideal solution: two circuits are combined into a single, higher current circuit, enabling an easy swap to next generation high power radios. λ power jumpers can also reduce power loss when not all power connections are used, further improving efficiency. For specification and ordering information see page **xxx**.



Integrated power splitter – more sustainability, less copper

The innovative power splitter architecture minimizes current derating as defined by NEC/NFPA regulations (USA), enabling substantial copper savings and thereby reducing CO_2 emissions.
Inside the MLEH housing, the integrated splitter divides one power circuit into two breakout cables, allowing for higher current ratings. Because the US NEC/NFPA standard assigns a significantly lower derating factor to cables with fewer conductors — for example, 0.70 for 6 conductors instead of 0.57 for 12 conductors — the design enables a reduction in copper cross section of up to 37%. This not only saves material but also significantly lowers overall cabling system costs.

Example: 6 RRH with MLEH 3/6 (3 conductor pairs and 6 fiber optic pairs)



Power splitter	Circuit breaker power supply	Hybrid cable AWG size and current rating	Total copper cross section		Current rating total		RRH current rating / power consumption
no	6x 30 A	6 pair 6 AWG 6 × 30.8A	159.6 mm²		cable: 6 × 30.8 A = 184.8 A CB: 6× 30 A = 180 A		6 RRH each 30 A maximum power consumption 1320W @ -44 V U_{RRH}
6	3x 60 A	3 pairs 4 AWG 3 × 62.3A	126.6 mm²	-21%	cable: 3 × 62.3 A = 186.9 A CB: 3 × 60 A = 180 A	+1%	
no	6x 35 A	6 pairs 4 AWG 6 × 39.0A	254.4 mm²		cable: 6 × 39.0 A= 234 A CB: 6 × 35 A = 210 A		6 RRH each 35 A maximum power consumption 1540W @ -44V U_{RRH}
6	3x 70 A	3 pairs 3 AWG 3 × 75.4A	160.2 mm²	-37%	cable: 3×75.4 A =226.2 A CB: 3 × 70A = 210A	-3%	

Fiber optic breakouts with HUBER+SUHNER ODC connector

With RRH specific jumpers in different length the fibers are connected to the RRHs and allow an adaptation to different RRH interfaces and therefore make the solution independent from the system vendor's hardware. For specification and order information see page **xxx** (MLUP).
The small housing supports the routing of 3 to12 fiber-optic breakout cables, each carring 2 fibers, while the large housing accomodates up to 24 fiber-optic cables. All fiber-optic breakouts are terminated with the extremely robust HUBER+SUHNER ODC connector. The Q-ODC-2 serves as the standard connector, enabling fast and reliable mating of fiber optic jumpers. It features a rugged push-pull coupling mechanism with two clearly defined mating states to ensure maximum safety during outdoor installation. The standard fiber optic cable includes aramid reinforcement and a TPU jacket with a diameter of 5.3 mm which are terminated with the Q-ODC-2 or the ODC-2 extension connector. The breakout lengths are staggered in bundles of 3 cables, ranging from 0.5 m / 1.6 ft to 1 m / 3.3 ft. Optionally, steel-armored cables with a PE jacket are available. Another available option is a 4-fiber cable, terminated with the HUBER+SUHNER ODC-4 connector. For the ODC connectors specifications see page **xxx** (fiber optic interfaces).



RRH fiber optic jumper Q-ODC-2 to RRH interface



Overview ODC fiber optic connector

Q-ODC-2 connectors
2 fibers, push-pull coupling mechanism



ODC-2 connectors
2 fibers, screwed looking mechanism



ODC-4 connectors
4 fibers, screwed locking mechanism



Overview ODC fiber optic connector

2-fiber, aramid reinforcement
TPU jacket material
Outer diameter 5.3mm



4-fiber, aramid reinforcement
TPU jacket material
Outer diameter 5.8mm



2-fiber, steel armored
PE jacket material
Outer diameter 5.5mm

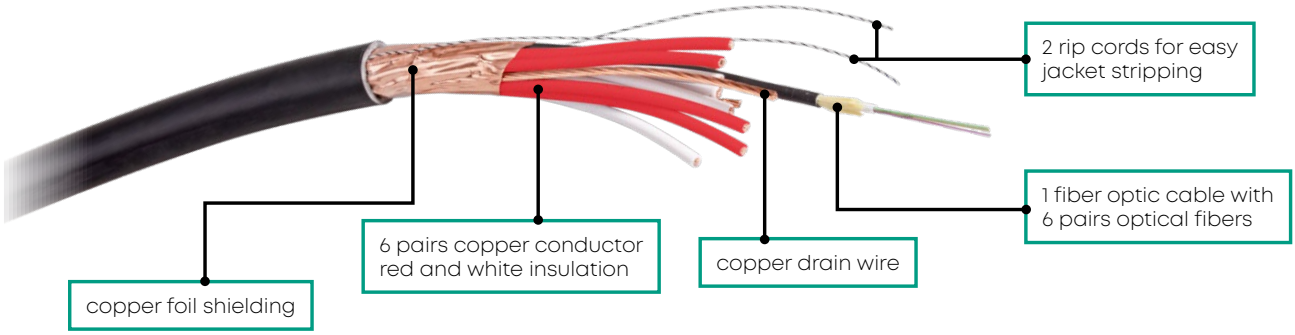


Divider housing and general specifications

	Small housing	**Large housing**
Number of power breakout cables	up to 6	up to 9
Number of fiber optic breakout cables	up to 12	up to 24
Housing material	Powder coated aluminum	
Housing dimensions	Ø 95mm / 3.74" length 318 mm / 12.5"	Ø 121mm / 4.76" length 318 mm / 12.5"
Maximum voltage rating	-74 Vdc, optional 230 Vac	
Maximum current rating	Up to 74 A, depending on configuration	
Temperature range (IEC 60529)	in service –40 to +75 °C	
	during installation –10 to +50 °C, optional –30 to +50 °C (with TPE hybrid cables)	
Ingress protection (IEC 60529)	IP67 for housing and connectors on breakout cables	
	IP65 or protection tube BBU side	
Impact resistance housing (IEC 62262)	IK10	
UV resistance, ISO 4892-3 (methode A/cylce 1)	1000 h	

Hybrid cable

Hybrid cables of HUBER+SUHNER combine optical fibre and DC power, are highly flexible and easy-to-route. Two rip cords between the shielding and the jacket allows a quick stripping of the jacket. The shielding, a copper-foil beneath the jacket and the drain wire, ensures continuous electrical contact along the entire cable length. This design supports effective potential equalization and ensures safe installation, even in environments exposed to lightning strikes.



HUBER+SUHNER hybrid cables are designed with region-specific specifications. For the North American market (NAM), all hybrid and power cables are UL listed and equipped with a PVC outer jacket. These hybrid cables support installation temperatures from -10°C to +50°C For applications requiring installation at lower temperatures, a TPE jacket is available as an alternative. It remains flexible even in cold environments, enabling installations down to –30°C.
For Europe and APAC region, LSFH thermoplastic is used. Hybrid and power cables for the European market comply with CPR Class B2. Upon request, an additional PA6 layer can be added to protect the cable against cockatoo damage. Cable construction follows UL 1277 for NAM, and IEC 60502 1 for APAC and Europe. All hybrid cables have a voltage rating of 600 V. The hybrid cables are installation-friendly because they use highly flexible copper conductors. For NAM, class C conductors are used up to 6 AWG and class D conductors for 4 and 3 AWG, while in Europe and APAC the copper conductors correspond to class 5. Conductor insulation colors follow regional standards: red and black for NAM, red and blue for APAC, and red and white for Europe. Other color combinations can be provided upon customer request.

Hybrid cable general specifications

	Europe	**NAM**	**APAC**
Jacket material	LSFH thermoplastic CPR class B2ca-s1a,d1,a1	UL listed, PVC, optional TPE for installation temperature -30°C to 50°C	LSFH thermoplastic, optional outer layer PA6 (bird proof)
Standard	IEC 60502-1:2004-04 IEC 60092-353:2016	UL 1277, TC-OF-ER	IEC 60502-1:2004-04
Rated voltage	0.6kV / 1 kV (1.2 kV)		
Flame retardant	IEC 60332-1-2:2004	UL 1685 (UL 1581) FT4 vertical tray flame test	IEC 60332-1-2:2004
Min. bending radius during installation	10x cable-Ø	12x cable-Ø	10x cable-Ø
Min. bending radius in service	8x cable-Ø	10x cable-Ø	8x cable-Ø
Cable shielding	copper foil 100 % coverage (contacted with drain wire)		
Conductor type	IEC 60228 class 5	class C or D THHN/THWN-2	IEC 60228 class 5
Conductor color	red and white numbered (according IEC 60445:2021-07)	Red and black numbered	Red and blue numbered

Hybrid cable specification for 3 RRHs with 3 copper conductor pairs and 3 to 12 fiber pairs (MLEH 3/3, 3/6, 3/9, 3/12)

	Europe and APAC			
Conductor cross section	6 mm^2	10 mm^2	16 mm^2	25 mm^2
Resistance	3.30 Ω/km	1.91 Ω/km	1.21 Ω/km	0.78 Ω/km
Outer diameter	17.4 mm	19.7 mm	22.7 mm	28.1 mm
Weight	0.56 kg/m	0.85 kg/m	1.17 kg/m	1.71 kg/m
Drain wire cross section	6 mm^2	10 mm^2		
Fiber optic	5 mm loose tube cable with 6 to 24 fibers single-mode E9/125 A2 or multimode OM3/OM4			
APAC: OD with outer layer PA6 is +3.0mm Hybrid cable 2.5mm^2 and 4mm^2 for 230Vac on request				

	NAM				
Conductor cross section	10 AWG	8 AWG	6 AWG	4 AWG	3 AWG
Resistance	3.41 Ω/km	2.13 Ω/km	1.32 Ω/km	0.82 Ω/km	0.65 Ω/km
Outer diameter	0.770" (19.6 mm)	0.92" (23.4 mm)	0.945" (23.9 mm)	1.24'' (31.5mm)	1.31'' (33.4mm)
Weight	0.69 kg/m	1.05 kg/m	1.40 kg/m	1.96 kg/m	2.33 kg/m
Drain wire cross section	6 AWG				
Fiber optic	5 mm loose tube cable with 6 to 24 fibers single-mode E9/125 A2 or multimode OM3/OM4				
Hybrid cable 12 AWG and 10 AWG for 120Vac / 230Vac on request					

Hybrid cable specification for 6 RRHs with 6 copper conductor pairs and 6 to 24 fiber pairs (MLEH 6/6, 6/12, 6/18, 6/24)

	Europe and APAC			
Conductor cross section	6 mm^2	10 mm^2	16 mm^2	25 mm^2
Resistance	3.30 Ω/km	1.91 Ω/km	1.21 Ω/km	0.78 Ω/km
Outer diameter	23.4 mm	27.4 mm	32.2 mm	42.0mm
Weight	0.97 kg/m	1.72 kg/m	2.24 kg/m	3.9 kg/m
Drain wire cross section	6 mm^2	10 mm^2		
Fiber optic	5 mm loose tube cable with 12 to 24 fibers single-mode E9/125 A2 or multimode OM3/OM4 Optional 2nd 5 mm loose tube cable with 12 to 24 fibers			
APAC: OD with outer layer PA6 is +3.0mm Hybrid cable 2.5mm^2 and 4mm^2 for 230Vac on request				

	NAM				
Conductor cross section	10 AWG	8 AWG	6 AWG	4 AWG	3 AWG
Resistance	3.41 Ω/km	2.13 Ω/km	1.30 Ω/km	0.82 Ω/km	0.65 Ω/km
Outer diameter	1.00" (25.4 mm)	1.18" (30.0 mm)	1.28" (33.0 mm)	1.57'' (40.0 mm)	1.77'' (44.9mm
Weight	1.25 kg/m	1.64 kg/m	2.28 kg/m	3.27 kg/m	4.44 kg/m
Drain wire cross section	6 AWG				
Fiber optic	5 mm loose tube cable with 12 to 24 fibers single-mode E9/125 A2 or multimode OM3/OM4 Optional 2nd 5 mm loose tube cable with 12 to 24 fibers				
Hybrid cable 12 AWG and 10 AWG for 120Vac / 230Vac on request					

Hybrid cable specification for 9 RRHs with 9 copper conductor pairs and 9 to 24 fiber pairs (MLEH 9/9, 9/18, 9/24)

	Europe and APAC		
Conductor cross section	6 mm^2	10 mm^2	16 mm^2
Resistance	3.30 Ω/km	1.91 Ω/km	1.21 Ω/km
Outer diameter	27.8 mm	31.8 mm	42.0mm
Weight	1.35 kg/m	1.91 kg/m	3.8 kg/m
Drain wire cross section	6 mm^2	10 mm^2	
Fiber optic	5 mm loose tube cable with 18 to 24 fibers single-mode E9/125 A2 or multimode OM3/OM4 Optional 2nd 5 mm loose tube cable with 12 to 24 fibers		
APAC: OD with outer layer PA6 is +3.0mm Hybrid cable 2.5mm^2 and 4mm^2 for 230Vac on request			

	NAM			
Conductor cross section	10 AWG	8 AWG	6 AWG	4 AWG
Resistance	3.41 Ω/km	2.13 Ω/km	1.30 Ω/km	0.82 Ω/km
Outer diameter	1.14" (29.0 mm)	1.640" (36.0 mm)	1.575" (40.0 mm)	1.925" (48.9mm)
Weight	1.65 kg/m	2.30 kg/m	3.41kg/m	5.20 kg/m
Drain wire cross section	6 AWG			
Fiber optic	5 mm loose tube cable with 18 to 24 fibers single-mode E9/125 A2 or multimode OM3/OM4 Optional 2nd 5 mm loose tube cable with 12 to 24 fibers			
Hybrid cable 12 AWG and 10 AWG for 120Vac / 230Vac on request				

Breakout power cable



The small housing supports the routing of up to six 2-core power cables, while the large housing accommodates up to nine 2-core power cables. The breakout power cables are shielded and available with copper cross-sections ranging from 10 AWG to 6 AWG / 6 mm² to 16 mm². It is recommended to use the same cross-section as the hybrid cable.

Power cable general specifications

	Europe and APAC			**NAM**		
Conductor cross section	6mm²	10 mm²	16 mm²	10 AWG	8 AWG	6 AWG
Conductor resistance	3.30 Ω/km	1.91 Ω/km	1.21 Ω/km	3.41 Ω/km	2.06 Ω/km	1.30 Ω/km
Cable diameter	11.6 mm	13.7 mm	15.8 mm	11.8 mm	13.5 mm	16.5mm
Cable jacket material	LSFH thermoplastic, CPR B2 for Europe			PVC		
Shielding	AL-foil with CU earth conductor 4mm²	Aluminum foil with copper earth conductor 6mm²		Braided copper 10 AWG	Braided copper 10 AWG	Braided copper 8 AWG
Power cable 2.5mm2 and 4mm2 / 12 AWG and 10 AWG for 120Vac / 230Vac on request						

Power connector

UTS or QL power connectors, which are designed to meet the high-performance requirements of modern 5G remote radio heads installed at macro cell sites, are available for the connectorized power breakouts. For installations with RRHs up to approximately 1800 W and a conductor cross-section of up to 10 mm² / 8 AWG, the UTS power connector with 40 A / 44 A current rating is the preferred choice. The QL power connector with 50 A current rating is suitable for RRHs with more than 1800 W and for 16 mm² / 6 AWG conductor cross-sections.



Power connector plug at the jumper



Power connector extension at the MLEH (0.5 m long breakout)

Power Connector UTS up to 40A / 44A

The UTS power connector has a current rating of 40A / 44 A (UL) and has a bayonet coupling system which enables a simple and fast mating. With only a 1/3 twist of the coupling ring, connectors are mated with an audible and sensitive "click".

Power connector specifications

Maximum current rating	40 A (IEC), 44 A (UL), 30 A (CSA)
Voltage rating	300 V (IEC), 600 V (UL, CSA)
Maximum conductor cross section	10mm² / 8 AWG
Ingress protection (IEC 60529)	IPX7

Mating/unmating sequences



Twist the coupling ring of the power jumper plug connector to remove protecting cap as shown.



Twist the coupling ring of the MLEH receptacle connector to remove protecting cap as shown.



Push plug connector slightly into receptacle connector, rotate to find keying position.



Twist coupling ring of the power jumper plug connector to mate the connectors as shown.

Power Connector QL up to 50 A



Power connector plug
at the jumper



Power connector extension
at the MLEH (0.5m long breakout)

The QL power connector withstand very harsh environmental conditions and ensures simple, secure and fast mating and un-mating due to a quick lock coupling mechanism. With a current rating of 50A and the ability to connect up to 16mm² / 6 AWG conductor, the QL power connector is suitable for high power radios.

QL power connector specifications

Maximum current rating	50 A (IEC, UL)
Voltage rating	500 V
Maximum conductor cross section	16mm² / 6 AWG
Ingress protection (IEC 60529)	IPX7

Mating/unmating sequences



Pull the protective cap straight off the plug connector of the power jumper.



Push the release lever on the receptacle (female) connectors of the MLEH/ MLEP breakout cables and pull the protective cap straight away.



Align the two connectors, ensuring the locking mechanism is in line. Push the plug connector into receptacle connector until you hear a “click” and the locking lever snaps into place.

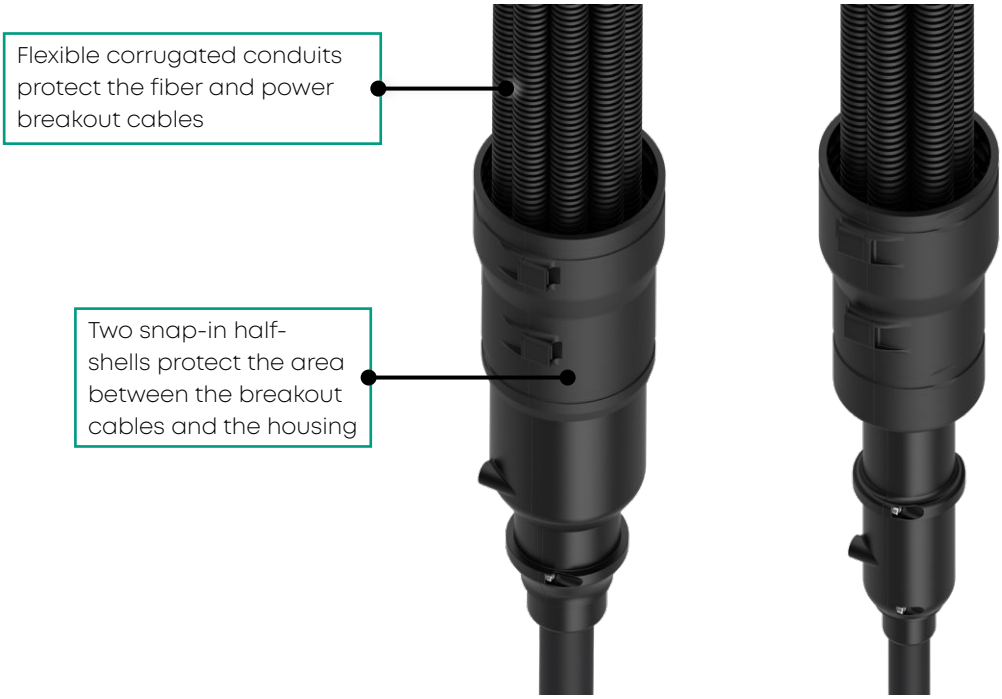


Un-mating:
Push the locking lever on the receptacle connector and pull the plug straight out.

Mount the protection cap to avoid ingress of water or dirt.

Cable protection against birds and rodents

In certain regions, it may be necessary to additionally protect hybrid, power and fiber optic cables against rodents or birds, e.g. cockatoos in Australia. To protecting fiber-optic breakout cables, steel-armored cables are available. Alternatively, both fiber-optic and power breakout cables can be safeguarded with flexible corrugated conduits. To protect the area between the housing and the conduits, two snap-in half-shells are available. The hybrid cable can be additional protect by a second cable sheath layer made of very hard polyamide.

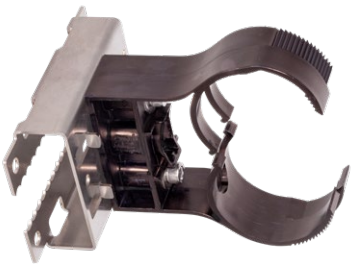


Housing mounting bracket

The MLEH mounting bracket enables quick and easy installation of the housing on masts, poles, or walls. It features a snap-fit mechanism with clips that can be closed by hand without the need for tools. The clips can be reopened at any time using a medium-sized screwdriver. The clips are made of black UV-resistant Polyamide 12, while the brackets are manufactured from stainless. Both are included in the delivery. For mounting on a pole or mast, 2 hose clamps are required. For wall mounting, four M8 or M10 screws are needed.



Mounting bracket for small MLEP housing



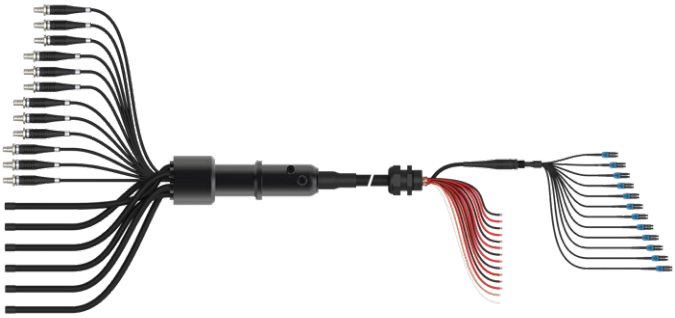
Mounting bracket for large MLEP housing

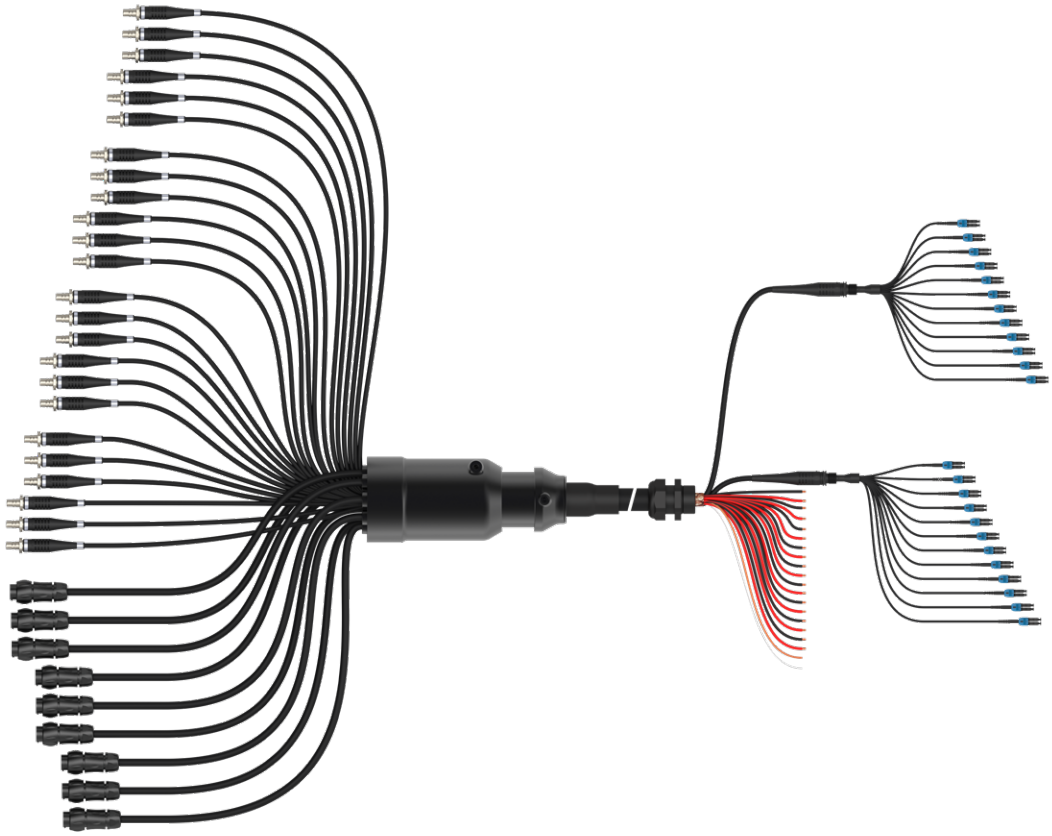
MASTERLINE Extreme Hybrid (MLEH)

Ordering information

The following ordering information represents only a small selection of the many available configuration options. Your HUBER+SUHNER contact person will be happy to assist you in selecting the optimal MLEH configuration for your specific cell site requirements.

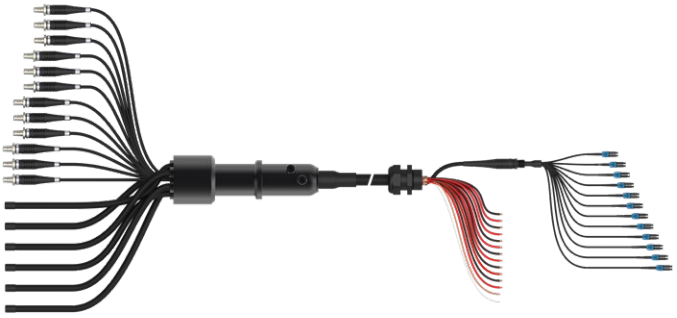
Examples of configurations for APAC and Europe with metric cross section according to IEC

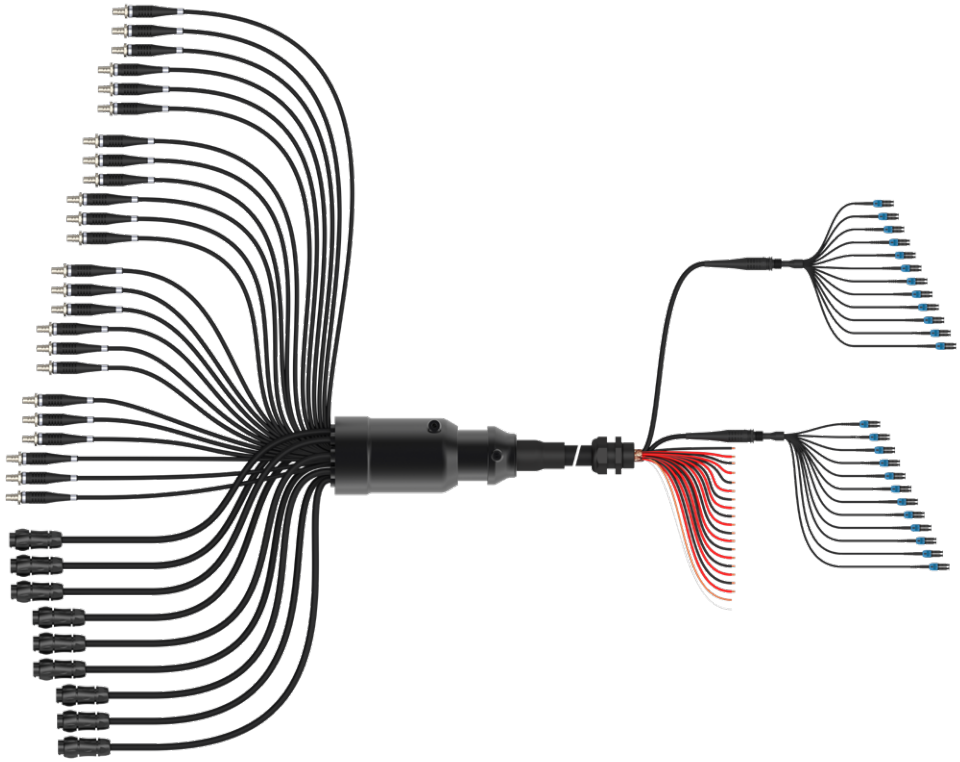
MLEH config. size	Hybrid cable construction	Power connector	Maximum current rating [1] RRH max. power consumption [2]	Fiber optic connectors	MLEH Order Code
3/x X = 3 to 12 pairs OF small housing	 Example: 3 pairs power breakout with power connector and 6 pairs fiber optic with Q-ODC-2 connector				
	3 pairs 6 mm² 3 to 12 pairs OF	3 × 6 mm² blunt cut	31.3 A / 1377 W	X = 3 to 12 LC duplex / Q-ODC-2 connectors	MLEH3x-06M-0-00QG-008U-xxx__SS
		3 × 6 mm² with power connector UTS 40 A	31.3 A / 1377 W		MLEH3x-06M-0-10QG-008U-xxx__SS
	3 pairs 10 mm² 3 to 12 pairs OF	3 × 10 mm² blunt cut	42.7 A / 1879 W		MLEH3x-10M-0-00QG-008U-xxx__SS
		3 × 10 mm² with power connector UTS 40 A	40.0 A / 1760 W		MLEH3x-10M-0-10QG-008U-xxx__SS
	3 pairs 16mm² 3 to 12 pairs OF	3 × 16 mm² blunt cut	57.2 A / 2517 W		MLEH3x-16M-0-00QG-008U-xxx__SS
		3 × 16 mm² with power connector QL 50 A	50.0 A / 2200 W		MLEH3x-16M-0-11QG-008U-xxx__SS
	3 pairs 25mm² 3 to 12 pairs OF	3 × 16 mm² blunt cut	74.1 A / 3260 W		MLEH3x-25M-0-00QG-008U-xxx__SS
		3 × 16 mm² with power connector QL 50 A	50.0 A / 2200 W		MLEH3x-25M-0-11QG-008U-xxx__SS
MLEH config. size	**Hybrid cable construction**	**Power connector**	**Maximum current rating [1]**	**Fiber optic connectors**	**MLEH Order Code**
6/x X = 3 to 12 pairs OF small housing	 Example: 6 pairs power breakout blunt cut and 12 pairs fiber optic with Q-ODC-2 connector				
	6 pairs 6 mm² 3 to 12 pairs OF	6 x 6 mm² blunt cut	25.5 A / 1122 W	X = 3 to 12 LC duplex / Q-ODC-2 connectors	MLEH6x-06M-0-00QG-008U-xxx__SS
		6 x 6 mm² with power connector UTS 40 A	25.5 A / 1122 W		MLEH6x-06M-0-10QG-008U-xxx__SS
	6 pairs 10 mm² 3 to 12 pairs OF	6 x 10 mm² blunt cut	34.8 A / 1531 W		MLEH6x-10M-0-00QG-008U-xxx__SS
		6x 10 mm² with power connector UTS 40 A	34.8 A / 1531 W		MLEH6x-10M-0-10QG-008U-xxx__SS
	6 pairs 16 mm² 3 to 12 pairs OF	6 x 16 mm² blunt cut	46.5 A / 2046 W		MLEH6x-16M-0-00QG-008U-xxx__SS
		6x 16 mm² with power connector QL 50 A	46.5 A / 2046 W		MLEH6x-16M-0-11QG-008U-xxx__SS
	6 pairs 25 mm² 6 or 12 pairs OF	6 x 16 mm² blunt cut	60.3 A / 2653 W		MLEH6x-25M-0-00QG-008U-xxx__SS
		6x 16 mm² with power connector QL 50 A	50.0 A / 2200 W		MLEH6x-25M-0-11QG-008U-xxx__SS

MLEH config. size	Hybrid cable construction	Power connector	Maximum current rating [1] RRH max. power consumption [2]	Fiber optic connec-tors	MLEH Order Code
9/x X = 3 to 24 pairs OF large housing	 Example: 9 pairs power breakout with power connector and 24 pairs fiber optic with Q-ODC-2 connector				
	9 pairs 6 mm² 3 to 24 pairs FO	9 x 6 mm² blunt cut	22.4 A / 986 W	9 or 18 x LC duplex / Q-ODC-2	MLEH9x-06M-0-00QG-008U-xxx__SS
		9 x 6 mm² with power connector UTS 40 A	22.4 A / 986 W		MLEH9x-06M-0-10QG-008U-xxx__SS
	9 pairs 10 mm² 3 to 24 pairs FO	9 x 10 mm² blunt cut	30.5 A / 1342 W		MLEH9x-10M-0-00QG-008U-xxx__SS
		9 x 10 mm² with power connector UTS 40 A	30.5 A / 1342 W		MLEH9x-10M-0-10QG-008U-xxx__SS
	9 pairs 16 mm² 3 to 24 pairs FO	9 x 16 mm² blunt cut	40.8 A / 1795 W		MLEH9x-16M-0-00QG-008U-xxx__SS
		9 x 16 mm² with power connector QL 50 A	40.8 A / 1795 W		MLEH9x-16M-0-11QG-008U-xxx__SS

[1] Maximum current rating @ 60°C ambient temperature according IEC 60364-5-52, copper conductor with XLPE insulation (installation methode E)
[2] RRH maximum power consumption @ RRH voltage 44 Vdc

Examples of configurations for NAM with American Wire Gauge cross section according to NEC

MLEH config. size	Hybrid cable construction	Power breakouts (number of pairs and cross section)	Maximum current rating [1] RRH max. power consumption [2]	Fiber optic connec-tors	MLEH Order Code
3/x X = 3 to 12 pairs OF small housing	 Example: 3 pairs power breakout with power connector and 6 pairs fiber optic with Q-ODC-2 connector				
	3 pairs 10 AWG 3 to 12 pairs OF	3 x 10 AWG blunt cut	26.2 A / 1153 W	X = 3 to 12 LC duplex / Q-ODC-2 connectors	MLEH3x-10A-0-00QG-008U-xxx__SS
		3 x 10 AWG with power connector UTS 44 A	26.2 A / 1153 W		MLEH3x-10A-0-10QG-008U-xxx__SS
	3 pairs 8 AWG 3 to 12 pairs OF	3 x 8 AWG blunt cut	36.1 A / 1588 W		MLEH3x-08A-0-00QG-008U-xxx__SS
		3 x 8 AWG with power connector UTS 44 A	36.1 A / 1588 W		MLEH3x-08A-0-10QG-008U-xxx__SS
	3 pairs 6 AWG 3 to 12 pairs OF	3 x 6 AWG blunt cut	45.1 A / 1984 W		MLEH3x-06A-0-00QG-008U-xxx__SS
		3 x 6 AWG with power connector QL 50 A	45.1 A / 1984 W		MLEH3x-06A-0-11QG-008U-xxx__SS
	3 pairs 4 AWG 3 to 12 pairs OF	3 x 6 AWG blunt cut	61.5 A / 2706 W		MLEH3x-04A-0-00QG-008U-xxx__SS
		3 x 6 AWG with power connector QL 50 A	50.0 A / 2200 W		MLEH3x-04A-0-11QG-008U-xxx__SS
	3 pairs 3 AWG 3 to 12 pairs OF	3 x 6 AWG blunt cut	61.5 A / 2706 W		MLEH3x-03A-0-00QG-008U-xxx__SS
		3 x 6 AWG with power connector QL 50 A	50.0 A / 2200 W		MLEH3x-03A-0-11QG-008U-xxx__SS
6/x X = 3 to 12 pairs OF small housing	 Example: 6 pairs power breakout blunt cut and 12 pairs fiber optic with Q-ODC-2 connector				
	6 pairs 10 AWG 3 to 12 pairs OF	6 x 10 AWG blunt cut	16.4 A / 722 W	X = 3 to 12 LC duplex / Q-ODC-2 connectors	MLEH6x-10A-0-00QG-008U-xxx__SS
		6 x 10 AWG with power connector UTS 44 A	16.4 A / 722 W		MLEH6x-10A-0-10QG-008U-xxx__SS
	6 pairs 8 AWG 3 to 12 pairs OF	6 x 8 AWG blunt cut	22.6 A / 994 W		MLEH6x-08A-0-00QG-008U-xxx__SS
		6 x 8 AWG with power connector UTS 44 A	22.6 A / 994 W		MLEH6x-08A-0-10QG-008U-xxx__SS
	6 pairs 6 AWG 3 to 12 pairs OF	6 x 6 AWG blunt cut	30.8 A / 1355 W		MLEH6x-06A-0-00QG-008U-xxx__SS
		6 x 6 AWG with power connector QL 50 A	30.8 A / 1355 W		MLEH6x-06A-0-11QG-008U-xxx__SS
	6 pairs 4 AWG 3 to 12 pairs OF	6 x 6 AWG blunt cut	39.0 A / 1716 W		MLEH6x-04A-0-00QG-008U-xxx__SS
		6 x 6 AWG with power connector QL 50 A	39.0 A / 1716 W		MLEH6x-04A-0-11QG-008U-xxx__SS
	6 pairs 3 AWG 3 to 12 pairs OF	6 x 6 AWG blunt cut	47.2 A / 2077 W		MLEH6x-03A-0-00QG-008U-xxx__SS
		6 x 6 AWG with power connector QL 50 A	47.2 A / 2077 W		MLEH6x-03A-0-11QG-008U-xxx__SS

MLEH config. size	Hybrid cable construction	Power breakouts (number of pairs and cross section)	Maximum current rating [1] RRH max. power consumption [2]	Fiber optic connec-tors	MLEH Order Code
9/x X = 3 to 24 pairs OF large housing	 Example: 9 pairs power breakout with power connector and 24 pairs fiber optic with Q-ODC-2 connector				
	9 pairs 10 AWG 3 to 12 pairs OF	9 x 10 AWG blunt cut	16.4 A / 722 W	9 or 18 x LC duplex / Q-ODC-2	MLEH9x-10A-0-00QG-008U-xxx__SS
		9 x 10 AWG with power connector UTS 44 A	16.4 A / 722 W		MLEH9x-10A-0-10QG-008U-xxx__SS
	9 pairs 8 AWG 3 to 12 pairs OF	9 x 8 AWG blunt cut	22.6 A / 994 W		MLEH9x-08A-0-00QG-008U-xxx__SS
		9 x 8 AWG with power connector UTS 44 A	22.6 A / 994 W		MLEH9x-08A-0-10QG-008U-xxx__SS
	9 pairs 6 AWG 3 to 12 pairs OF	9 x 6 AWG blunt cut	30.8 A / 1355 W		MLEH9x-06A-0-00QG-008U-xxx__SS
		9 x 6 AWG with power connector QL 50 A	30.8 A / 1355 W		MLEH9x-06A-0-11QG-008U-xxx__SS
	9 pairs 4 AWG 3 to 12 pairs OF	9 x 4 AWG blunt cut	39.0 A / 1716 W		MLEH9x-04A-0-00QG-008U-xxx__SS
		9 x 4 AWG with power connector QL 50 A	39.0 A / 1716 W		MLEH9x-04A-0-11QG-008U-xxx__SS

MLEH order code:

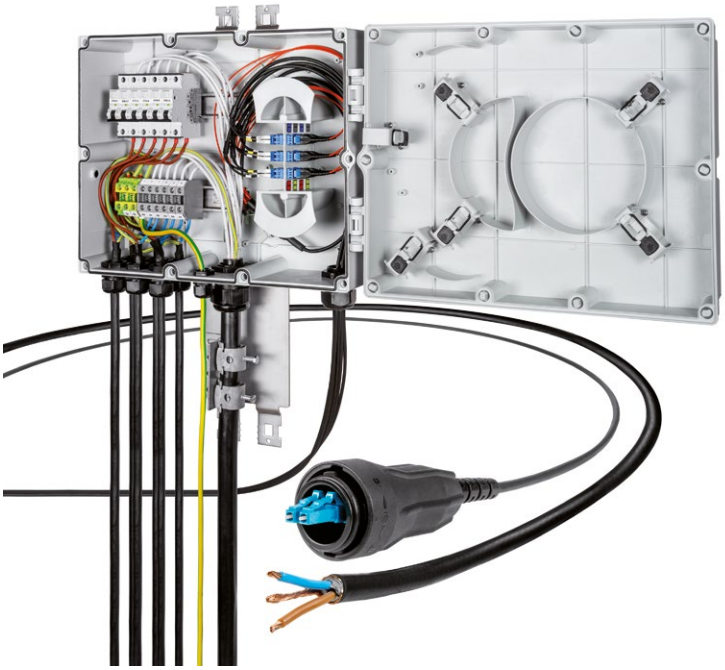
MLEH	x	x	-	xxx	-	x	-	xx	xx	-	00xx	-	xxx(ft)__SS
	Number of power conductor pairs 3 to 9	Number of fiber optic pairs 3 to 24 Note: A = 10 C = 12 I = 18 O = 24		Cross section power conductor 2.5 mm² to 25 mm² 12 AWG to 3 AWG Example: 10M = 10 mm² 06A = 6 AWG		Fiber type 0 = G.657 A2 3 = OM3 4 = OM4		Power connector type 00 = blunt cut 10 = UTS 40 / 44A 11 = QL 50A	Fiber optic connector type on break-out cables QG = Q-ODC-2 extension E1 = ODC-2 ex-tension E4 = ODC-4 extension A4 = ODC-2 plug		Fiber optic connec-tor type on BBU side 8U = LCD uniboot 52 = MTP		Length in steps of 5 or 10m or in steps of 20 or 30 ft Example: 050 =50m 210ft = 210 feet

Example:
- MLEH6C-10M-0-10QG-008U-050__SS
- MLEP9O-04A-0-11QG-008U-210ftSS

Accessories

Description		Item no.	Page	Picture
Overlength box for outdoor and indoor installation, stores up to 20 m cable excess length (depending on cable diameter)		84103325	135	
Clamps for hybrid cable		depends on cable diameter	140	
Grounding kits		85015070	250	
Grounding cable, 0.5 m, 16 mm² and 25 mm², black and yellow/green		depends on cross section and colour	139	
19" CTB patching box	6, 12, 18 or 24 LC duplex adapter blue	depends on quantity of LC adapter	136	
LC patchcords	0.5 m, 0.7 m or 1 m length, single-mode	depends on length	139	
3 fold cable clamp suitable for ODC boot to fix the Q-ODC extension connectors		85012939	142	
6 fold cable clamp suitable for 3 ODC boot and 3 power connectors		85028293	140	
Quick hose clamps Stainless steel One set includes 2 pieces hose clamps	clamping Ø 30 to 155 mm	84076411	146	
	clamping Ø 60 to 500 mm	84076412		
SFP/SFP+ transceivers for different protocols, data rates and power budgets		see transceiver selection guide on page 262	261	

MASTERLINE Classic Hybrid (MLCH)



Hybrid-riser cable with distribution box

This solution, a factory-terminated hybrid-riser cable assembly, minimises the amount of cables running up the mast. At the hybrid distribution box the multifiber/wire cable are split into individual cables which are linked to the RRHs with short jumper cables. The jumpers allow an adaptation to different RRH interfaces and therefore make the solution independent from the system vendor's hardware. A box solution enables the use of circuit breaker and/or surge protection devices.

However, this installation method requires large and bulky boxes on the top of the mast. With increasing number of remote ratios per site, space limitations and wind load become critical issues. Many operators also want to avoid the risk of opening and maintaining mast-top boxes by non-trained or non-authorised persons.

MASTERLINE Classic Hybrid (MLCH)

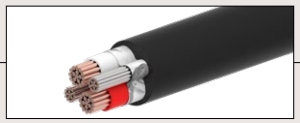
RF **LISCA RF jumper**
page 202



FTTA **LC duplex RRH jumpers**
page 80



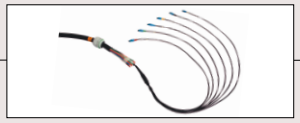
PTTA **Power cable**
page 68



HTTA **HTTA distribution box**
page 126



HTTA **MASTERLINE Classic Hybrid**
page 124



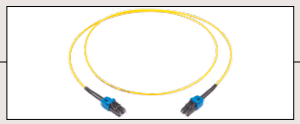
XTTA **Cable clamps**
page 140

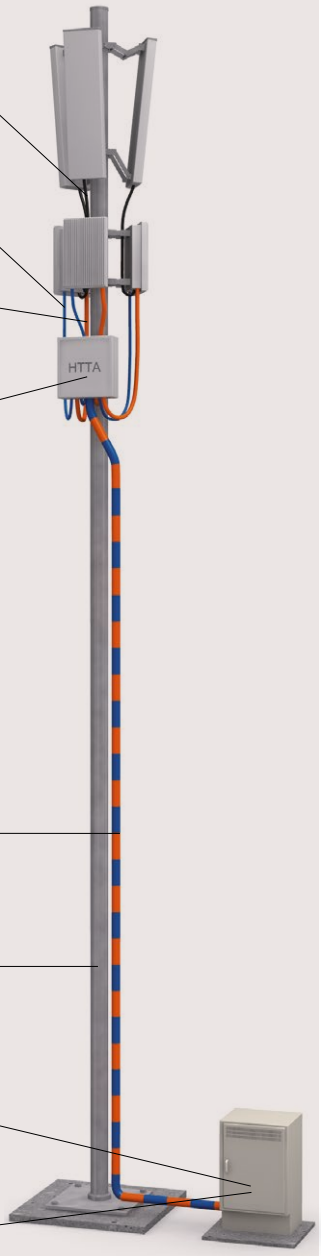


FTTA **CTB 19" patching box (optional)**
page 136



FTTA **LC patchcord (optional)**
page 139





XTTA FTTA, PTTA and HTTA

RF Radio Frequency

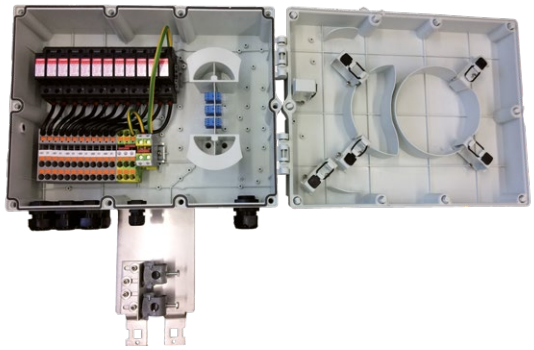
FTTA Fiber-To-The-Antenna

PTTA Power-To-The-Antenna

HTTA Hybrid-To-The-Antenna

MASTERLINE Classic Hybrid (MLCH)

Distribution box



Features

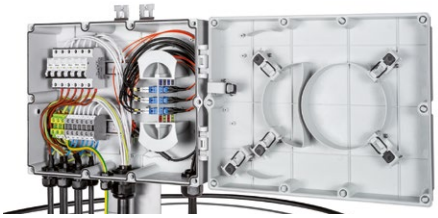
- Ruggedised outdoor distribution box for fiber optic and power supply
- Supports up to 6 remote radio heads
- Fitted with bend radius limiting mandrels
- Optional with circuit breaker or/and surge protection devices
- Cover stores up to 20 m fiber optic cables excess length
- Suitable for mounting on poles, walls and tower legs
- Easy to mount and install with pre-mounted brackets
- Hybrid cable clamp integrated on mounting brackets
- Protective vent to equalise pressure and prevent condensation

Specifications

Number of RRH		up to 6 RRH
Compatible with MASTERLINE Classic Hybrid		up to 12 fibers and up to 12 power wire
Box dimensions		429 × 390 × 159 mm
U_N rated voltage		–48 V DC
I_N rated current per RRH	without circuit breaker	15.0 A
	with circuit breaker	11.7 A
Ambient temperature range	operation	–40 to +75 °C (with CB +55 °C)
	installation	–10 to +50 °C
Box material		glass-filled polycarbonate
Ingress protection		IP67
Impact resistance		IK 07 (EN 62262)
Colour		RAL 7035 grey
Halogen-free		Yes
UV resistant for outdoor use		ISO 4892-3
Material flammability rating		UL94-V0
Screw terminals		6 mm² to 16 mm² (25 mm² without wire end sleeves)
Circuit breaker (optional)		miniature circuit breaker C 20 A
Surge protection device (optional)		SPD type 1+2/class I+II or type 2/class II

MASTERLINE Classic Hybrid (MLCH)

Distribution box – installation features



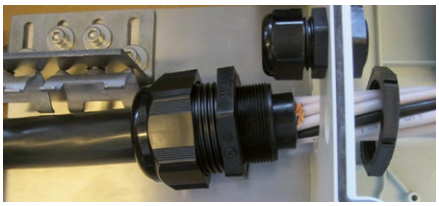
Pre-installed power distribution and fiber management components
Pre-installed screw terminals and optional circuit breaker and/or surge protection device for up to 6 RRHs. Bend radius limiting mandrels and an LC duplex adaptor plate ensure safe fiber management. Glands for power and fiber optic jumper cable are pre-mounted.



Pulling
The HTTA box has a robust mounting bracket with which the box and hybrid cable can be lifted up the mast.

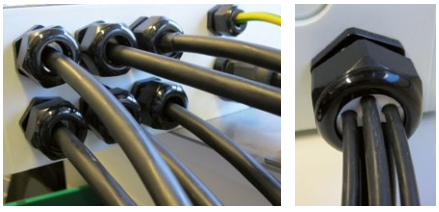


Overlength management in cover
Up to 20 m of jumper or multi-riser cable can be stored in the cover. The cable is routed and retained to allow for easy opening/closing of the cover without affecting the cable excess length.



Cable entry
A knock-out holes with Ø 40.0 mm in the middle of the bottom allows to enter the MLCH with its pre-mounted M40 cable gland.
1 × M40 cable gland for MLCH Ø 18.0 to 32.0 mm

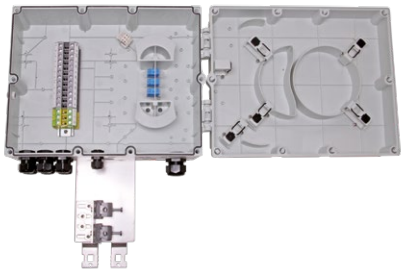
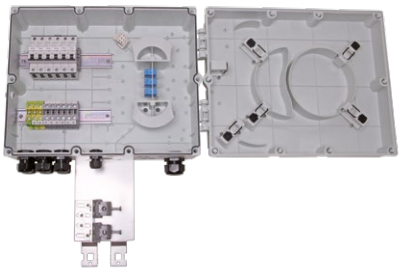
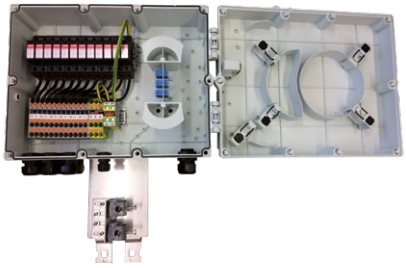
As an option , the HTTA box can be used for an installation with 1 or 2 power main cables and a separate multifiber riser cable (MLC) instead of a hybrid cable.
1 × M40 cable gland for power main cable Ø 16.0 to 28.0 mm
1 × M32 cable gland for an optional 2nd power main cable Ø 18.0 to 25.0 mm
1 × hole 16 mm for MLC 12 fibers and 1 × hole 26 mm or for MLC 24 fibers



Cable exits
The standard configuration is designed for 6 fiber optic and power jumper cables with the option to increase the number of fiber optic jumpers up to 12. The HTTA box can be electrically grounded with a 16 mm² earthing cable through a M20 cable gland.
1 × M32 cable gland with 6-fold seal for 6 jumper cable Ø 4.8 to 7.0 mm
6 × M25 cable glands for 6 power main cable Ø 9.0 to 16.0 mm
1 × M20 cable gland for earthing cable Ø 6.0 to 12.0 mm

MASTERLINE Classic Hybrid (MLCH)

Ordering information distribution box

Description	Item no.	Picture
HTTA box power distribution only • Screw terminals for 12-wire hybrid cable up to 16 mm² (25 mm²) and 6 power jumper, individual power supply circuits • 6 LC duplex adapter (single-mode, blue) • 6 cable gland for power jumper, 1 cable gland for 6 fiber optic jumper, 1 cable gland for earthing cable • Mounting breacket with 2 cable clamps for MLCH • Quick hose clamp for Ø 60 to 500 mm	84143745	
HTTA box with circuit breaker • Screw terminals for 12-wire hybrid cable up to 16 mm² (25 mm²) and 6 power jumper, individual power supply circuits • 6 circuit breaker 20A with C tripping characteristic • 6 LC duplex adapter (single-mode, blue) • 6 cable gland for power jumper, 1 cable gland for 6 fiber optic jumper, 1 cable gland for earthing cable • Mounting breacket with 2 cable clamps for MLCH • Quick hose clamp for Ø 60 to 500 mm	85002397	
HTTA box with SPD • Screw terminals for 12-wire hybrid cable up to 16 mm² (25 mm²) and 6 power jumper, common power supply circuit • 6 surge protection device type 1/2, class I/II • 6 LC duplex adapter (single-mode, blue) • 6 cable gland for power jumper, 1 cable gland for 6 fiber optic jumper, 1 cable gland for earthing cable • Mounting breacket with 2 cable clamps for MLCH • Quick hose clamp for Ø 60 to 500 mm	85098828	

Options:

12 LC duplex adapter

Multimode adapter

Customised DIN-Rail (screw terminal, circuit breaker, surge protection device)

The hybrid box is designed for flexible configurations (e.g. with surge protection devices), ease and quick deployment of up to 6 remote radio heads. Its innovative design allows for installation using MASTERLINE Classic Hybrid (MLCH), a factory-terminated hybrid cable assembly or MASTERLINE Classic (MLC) bundled fiber and bundled power riser cables.

All power distribution and fiber management components are pre-installed and the robust mounting bracket allows the hybrid cable to be pulled up with the box.

The HTTA box also has the capability to store up to 20 m of fiber cabling (riser or jumper) in it is cover and has the option to have connectorised outputs for the ultimate in flexibility..



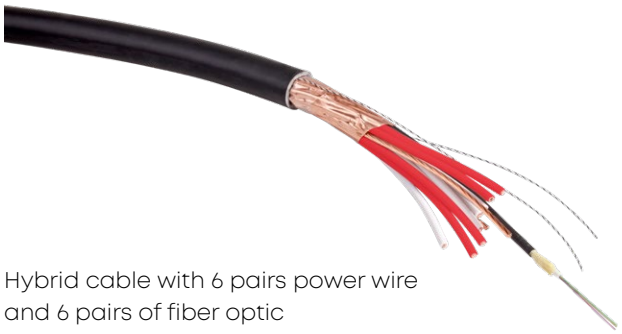
MASTERLINE Classic Hybrid (MLCH)

Hybrid cable general specifications

		LSFH™ hybrid cable, European market	UL listed hybrid cable, US market
Jacket material		LSFH thermoplastic CPR class	PVC
Standard		IEC 60502-1:2004-04 IEC 60092-353:2016	UL 1277, TC-OF-ER
Rated voltage		0.6 kV/1 kV (1.2 kV)	
Min. bending	during installation	10 × cable Ø	12 × cable Ø
	in service	8 × cable Ø	10 × cable Ø
Cable shielding		copper foil 100 % coverage (contacted with drain wire)	
Conductor type		IEC 60228 class 5	IEC 60228 class 5
Conductor color		Red and white numbered (according IEC 60445:2021-07)	Red and black numbered

12-core hybrid cable specification for MLCH 6/6

	LSFH™ hybrid cable, European market		UL listed hybrid cable, US market	
Number of conductors	12			
Conductor cross section	6 mm²	10 mm²	AWG 10	AWG 8
Resistance	3.30 Ω/km	1.91 Ω/km	3.41 Ω/km	2.13 Ω/km
Maximum current rating	22 A	35 A	16 A	23 A
Outer diameter	23.4 mm	27.4 mm	25.4 mm (1.00")	30 mm (1.18")
Weight	0.97 kg/m	1.72 kg/m	1.25 kg/m	1.64 kg/m
Drain wire cross section	6 mm²	10 mm²	AWG 6	AWG 6
Fiber optic	5 mm loose tube cable with 6 fiber pairs single-mode E9/125 A2 or multimode OM3/OM4			



Hybrid cable with 6 pairs power wire and 6 pairs of fiber optic

Hybrid cables of HUBER+SUHNER combine optical fiber and DC power, are highly flexible and easy-to-route. Two rip cords between the shielding and the jacket allows a quick stripping of the jacket. The shielding, a copper foil under the jacket and the drain wire maintain contact throughout the cable run and allow potential equalisation and a safe installation with regard to lightning strikes.

MASTERLINE Classic Hybrid (MLCH)

Ordering information

MASTERLINE Classic Hybrid for 6 RRHs – MLCH 6/6



	Radio end side	BTS side
Fiber optic	LC uniboot	LC uniboot
Power	blunt cut wire cross section 6 mm^2 or 10 mm^2	blunt cut wire cross section 6 mm^2 or 10 mm^2

Hybrid cable	Market	Length	Item no.	
6 pairs conductor 6 pairs fiber optic single-mode A9/125 A2	global not UL listed CPR compliant		**6 mm^2**	**10 mm^2**
		10 m	85282121	
		20 m	85282122	
		30 m	85282123	
		40 m	85282124	
		50 m	85282125	
		60 m		85282126
		70 m		85282127
		80 m		85282128
		90 m		85282129
		100 m		85282130

Options

- 12 pairs fiber optic single mode A9/125 A2
- Configuration MLCH 3/3: 3 pairs conductor, 3 pairs fiber optic
- Other assembly lengths
- Other cross section of copper wires (16 mm^2)

MASTERLINE Classic Hybrid (MLCH)

LC duplex RRH jumpers

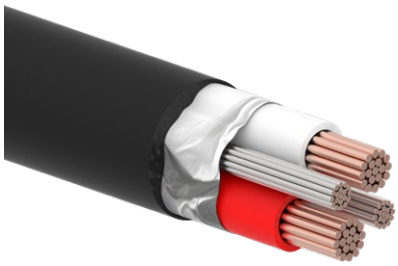


Features

- Jumper available for all types of remote radios
- Cable diameter 4.8 mm, 5.5 mm or 7 mm
- Standard lengths of 2 m and 5 m, any customised length available

The HTTA box enables the use of 6 RRH jumper cables (optional 12) through 2 cable glands with pre-split sealings.
Ordering information see page 64 (MLC).

2-core power cable



Features

- 2 core copper cable for RRH power supply
- LSFH™ jacket material
- Aluminium foil with earth conductor
- 6 and 10 mm² cross section

Ordering information see page 45 (MLUP)

Accessories

Description		Item no.	Page	Picture
Clamps for hybrid cable		depends on cable diameter	140	
Grounding kits		85015070	250	
19" CTB patching box	6, 12, 18 or 24 LC duplex adapter blue	depends on quantity of LC adapter	136	
LC patchcords	0.5 m, 0.7 m or 1 m length, single-mode	depends on length	139	
SFP/SFP+ transceivers for different protocols, data rates and power budgets		see transceiver selection guide on page 262	261	

MASTERLINE Classic Hybrid (MLCH)

Hybrid RRH jumper



Features

Pre-assembled hybrid jumper with 2 or optional 4 fibers

Jumper terminated with vendor approved RRH connectors

Power cable shielded from end-to-end, easy ground connection inside box and at RRH, no additional grounding kits required

Ruggedised cable design and cable divider

„Plug & play“ installation – no field termination/wrapping/ preparation necessary

Specifications

Temperature range	–4 0 to +75 °C	
Operating voltage	48 VDC	
Rated voltage	0.6 kV/1 kV	
Fiber (radio end)	FullAXS connector	LC duplex connector
Power (radio end)	blunt-cut	blunt-cut
Fiber (HTTA box)	LC duplex connector	
Power (HTTA box)	blunt-cut	

Portfolio/ordering

Due to the number of variables involved there is no standard portfolio

FullAXS

Compatible to RRH connector



LC duplex

10 AWG power pair

LC duplex

10 AWG power pair



LC duplex

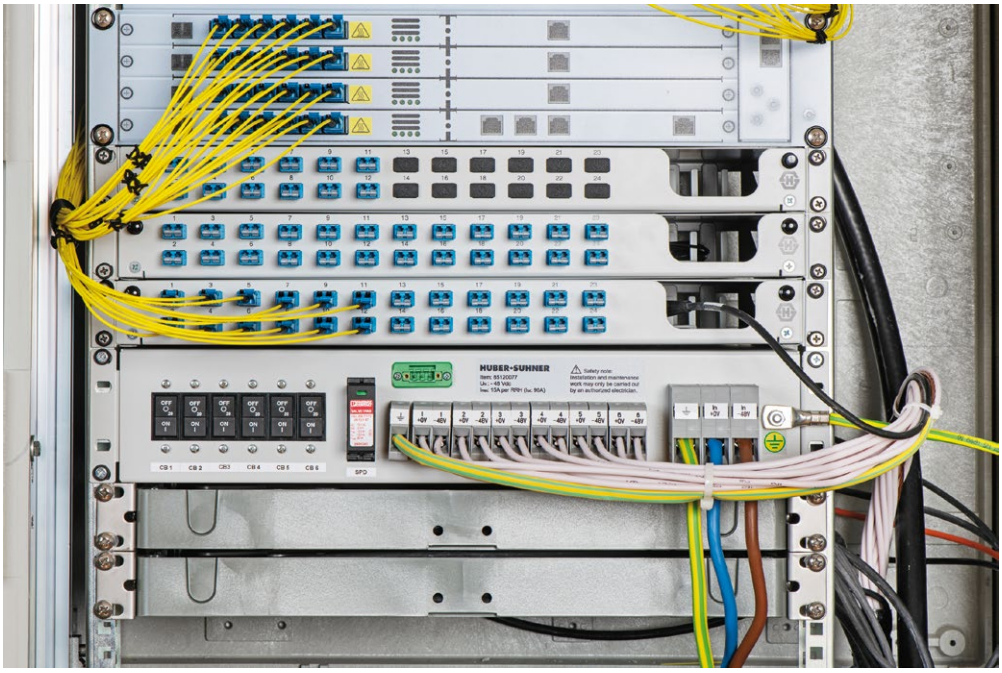
10 AWG power pair

Please contact HUBER+SUHNER to define your customised product.

- Single-mode or multimode, 2 or 4 fibers
- Cross section of copper wires (2 × 4 mm², 2 × 6 mm², or 2 × 10 mm²)
- Shielded or un-shielded
- Type of fiber optic connectors (ODC, RRH compatible connector, LC)
- Type of power termination (connectorised or open-ended)
- Assembly length (dependent on cross section)
- Breakout length at remote radio



Accessories for remote radio installation solutions



HUBER+SUHNER is an experienced partner for remote radio installation and we are close to the installers working in the field. We understand the daily installation issues and the need for field-proven tools and accessories.

Excess cable boxes help to safely store fiber optic cable at the bottom of the mast or in 19" racks. The 19" CTB patching box with a pullout tray for easy access fits to the MASTERLINE cable system.

Further, we offer a basic cable clamp portfolio, which covers most of the RRH installation solutions and cable combinations. The used clamps are field-proven, easy to install and allow for an up-grade or exchange of cables.

We offer a universal grounding kit specially designed to accommodate the range of HUBER+SUHNER power and hybrid cable sizes. Also available is a heavy-duty cable stripping tool.

Accessories

Distribution box



Features

- Outdoor and indoor installation
- Store up to 30 m cable excess length (depending on cable diameter)
- Easily mountable on poles, on walls or in 19" racks (1U)
- Supplied with fixing brackets, screws, a laser warning label and some hook and loop cable ties

Specifications

Dimensions without mounting bracket		477 × 280 × 43.8 mm (1 unit)
Mandrel radius		60 mm
Material		glass-filled polycarbonate, halogen-free, UV resistant
Flammability		UL 94 V0
Operating temperature		–40 to 75°C
Cable excess length capacity	cable Ø 4.8 mm	30 m
	cable Ø 7.0 mm	20 m

Ordering information

Description	Item no.
Overlength box	84103325

Accessories

19" CTB patching box



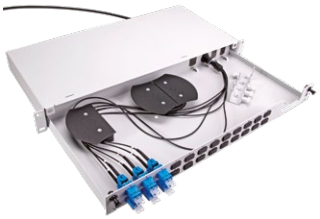
Features

- Space saving 19" rack installation
- Cable entry from the front and back for up to 3 MASTERLINE cable systems
- Pullout tray for easy access
- Fitted with 6, 12, 18 or 24 LC duplex adapter
- 3 mandrels for overlength management of the MASTERLINE cable system
- Optional patchcord guide available

Specifications

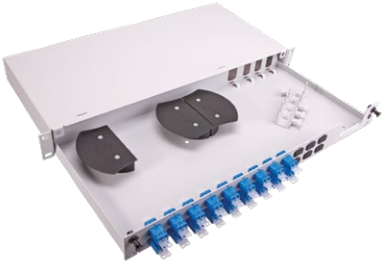
Dimensions (W × D × H)	482 × 209 × 43.5 mm (1 unit)
Connectivity	6, 12, 18 or 24 LC duplex adapter blue
Cable entry front or back	3 × MASTERLINE Classic 12 fiber or 24 fiber (small divider) 1 × MASTERLINE Classic 36 fiber (medium divider)
Material	powder coated steel
Weight	3 kg
Colour	RAL 7035 light grey

Installation features

Back or front cable entry		
Pullout tray for easy access		
Fixation of the divider, front or back entry		
Patchcord guide optional available		

Accessories

Ordering information

Description	Item no.	Picture
19" patching box 6 LC duplex adapter blue 18 blind caps extendible to 24 LC duplex adapter	85028405	
19" patching box 12 LC duplex adapter blue 12 blind caps extendible to 24 LC duplex adapter	85028406	
19" patching box 18 LC duplex adapter blue 6 blind caps extendible to 24 LC duplex adapter	85028407	
19" patching box 24 LC duplex adapter blue	85028408	
Patchcord guide Including 3 screws and nuts for mounting with the 19" CTB patching box	84125960	

Multimode available on request.

Accessories

19" CTB splicing box



Features

- Space saving 19" rack installation
- Splice cassette for 24 fibers
- Including 24 LC single-mode PC pigtails
- Fitted with 12 LC duplex adapter
- Cable entry from the front and back for MASTERLINE cable systems
- Pullout tray for easy access
- Optional patchcord guide available

Specifications

Dimensions (W × D × H)	482 × 209 × 43.5 mm (1 unit)
Connectivity	12 LC duplex adapter blue
Splice cassette	24 fiber
Pigtails	24 LC single-mode PC
Cable entry front or back	2 × MASTERLINE Classic 12 fiber or 1 × MASTERLINE Classic 24 fiber
Material	powder coated steel
Weight	3 kg
Colour	RAL 7035 light grey

Installation features

Pullout tray for easy access		
Fixation of the divider, front or back entry		
Patchcord guide optional available		

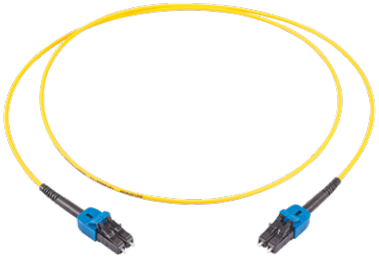
Accessories

Ordering information

Description	Item no.	Picture
19" splicing box including: • splice cassette for 24 fibers • 24 LC single-mode PC pigtails • 12 LC duplex adapter blue • 12 blind caps	85028409	
Patchcord guide Including 3 screws and nuts for mounting with the 19" CTB splicing box	84125960	

Multimode available on request.

LC-HQ uniboot patchcord



Features

- LC-HQ uniboot patchcord to connect 19" CTB to active equipment (base station)
- Robust 2.1 mm cable
- Polarity flipping without tool

Specifications

Compliance	IEC 61754-20, TIA 604-10-A
Operating temperature	–25 to 70 °C
Mechanical resistance tensile load	70 N
Flammability	UL 94 V-0

Ordering information

Description	Cable and fiber type	Length	Item no.
LC uniboot patchcord	single-mode A2 2.1 mm yellow	0.5 m	84138001
		0.7 m	84125518
		1.0 m	84125519
		1.5 m	84138003
		2.0 m	84141892
	multimode OM 3 2.1 mm turquoise	0.5 m	84138007
		0.7 m	84125520
		1.0 m	84125521

Accessories

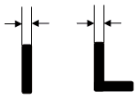
Combined cable clamps for fiber optic and power cables



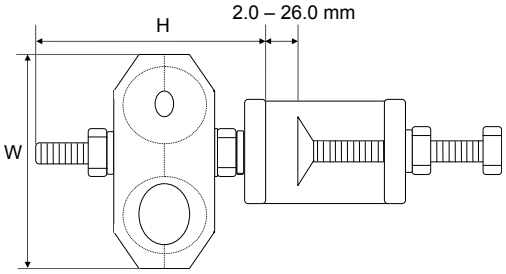
Features

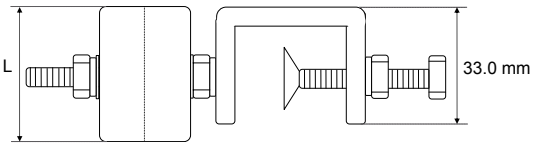
- Combined cable clamps for 1 or 3 pairs of fiber optic and power feeders
- Easy and quick installation
- Stainless steel bracket
- Double saddle with rubber cushions

Specifications

Mounting profile	 2 to 26 mm
Threated bar M8	installation with 13 mm hex wrench and torque 6 to 8 Nm
Salt mist, IEC 61300-2-26	168 h
Material bracket	stainless steel AISI 304
Material saddle	polypropylene, UV resistant
Material cushions	black rubber

Dimensions



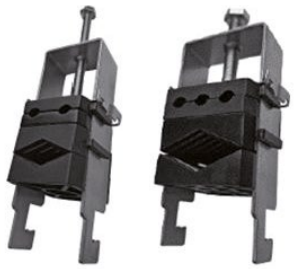


Ordering information

No. of cable pairs	Diameter range fiber optic cable	Diameter range power cable	Dimensions H × W × L	Item no.
1	4.8 to 7.0 mm	10.0 to 13.0 mm	70 × 53 × 40 mm	85011985
		13.0 to 16.0 mm		85012013
3		10.0 to 13.0 mm	130 × 53 × 40 mm	85011986
		13.0 to 16.0 mm		85012014
1	5.5 to 7.0 mm	17.5 to 20.0 mm	85 × 91 × 50 mm	85012007
		20.5 to 23.0 mm		85012005
		23.5 to 26.5 mm	90 × 65 × 50 mm	85142813
		27.0 to 28.0 mm		85142812
		30.5 to 33.5 mm		85142814
3	20.5 to 23.0 mm	20.5 to 23.0 mm	175 × 91 × 50 mm	85066072
		27.0 to 29.0 mm		85028293

Accessories

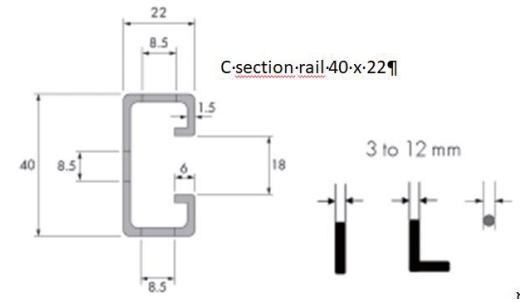
Combined cable clamps for fiber optic and power cables



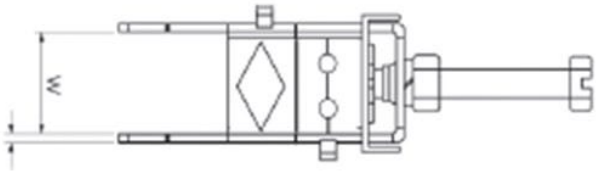
Features

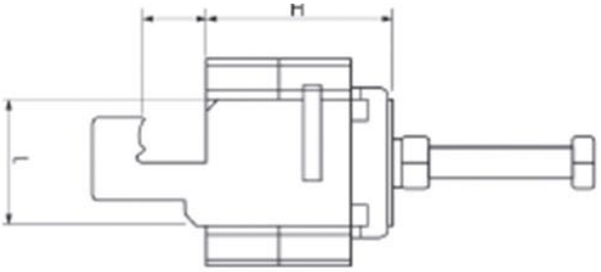
- Combined cable clamp for 2 (3) fiber optic and 1 power cable
- Suitable for C section 40 × 22, flat and round profiles (3-12 mm)
- Stainless steel bracket

Specifications

Mounting profile		
Salt mist, IEC 61300-2-26		672 h (28 d)
Material bracket		stainless steel AISI 304
Material saddle		polyamide, UV resistant
Temperature range	in service	–40°C to 75 °C
	during installation	–10°C to 50 °C

Dimensions





Specifications

Number of power cables	Power cable diameter range	Number of fiber cable	Fiber cable diameter range	Dimensions H × W × L	Packaging quantity	HUBER+SUHNER item no.	
1	15 to 34 mm	2	6 to 7 mm	88 × 35 × 46	5 pcs	85119795	
	18 to 45 mm	3		88 × 46 × 46	5 pcs	85126122	

Accessories

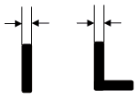
Cable clamps for power and hybrid cables



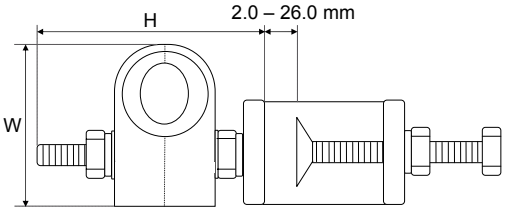
Features

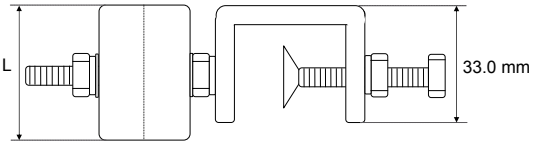
- Cable clamp for power and hybrid cables
- Easy and quick installation
- Stainless steel bracket
- Standard size without rubber cushion

Specifications

Mounting profile	 2 to 26 mm
Threated bar M8	installation with 13 mm hex wrench and torque 6 to 8 Nm
Salt mist, IEC 61300-2-26	168 h
Material bracket	stainless steel AISI 304
Material saddle	polypropylene, UV resistant
Material cushions	black rubber

Dimensions



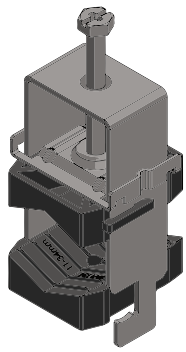


Ordering information

No. of cable	Cable diameter range	Dimensions H × W × L	Item no.
1	21.0 to 23.0 mm (5/8")	180 × 38 × 46 mm	85015525
	23.0 to 25.0 mm	100 × 51 × 55 mm	85065434
	27.0 to 29.0 mm (7/8")		85013128
	30.0 to 32.0 mm	120 × 76 × 59 mm	85014014
	32.0 to 34.5mm		85014015
	35.0 to 37.0mm		85065435
	37.0 to 40.0mm (1 1/4") 85014016		85014016
3	18.2 to 22.00 mm	175 x 55 x 51 mm	85012939

Accessories

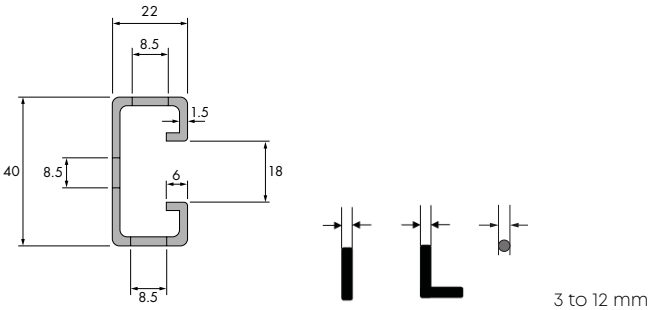
Cable clamps for power and hybrid cables



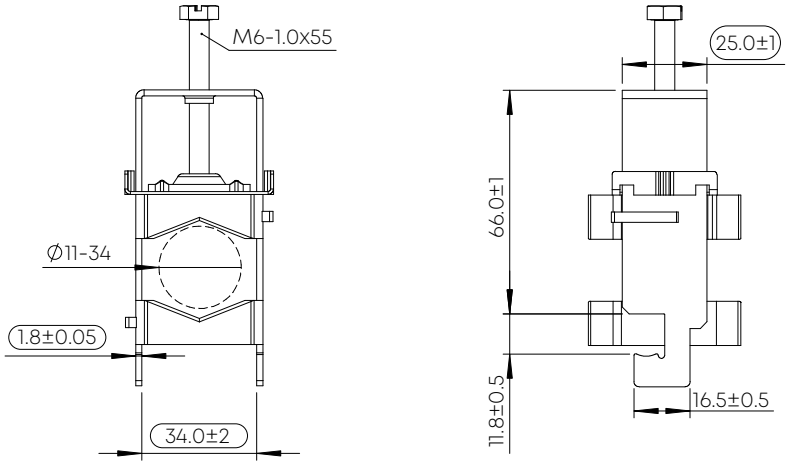
Features

- Cable clamp for power and hybrid cable
- Large cable diameter range
- Suitable for C section rail 40 × 22
- Stainless steel bracket

Specifications

Mounting profile	 C section rail 40 × 22
Salt mist, IEC 61300-2-26	720 h
Material bracket	stainless steel AISI 304
Material saddle	polyamide

Dimensions



Ordering information

Cable diameter range	Dimensions H x W x L	Item no.
7.0 to 22.0mm	50 x 22 x 25 mm	85234735
11.0 to 34.0mm	66 x 34 x 25 mm	85234736
16.0 to 46.0mm	86 x 46x 25 mm	85234740

Accessories

Grounding kit for hybrid cables



Features

- Universal grounding kit for hybrid cables
- Cable diameter range 16 mm to 40 mm
- 0.5 m long grounding wire 16 mm²
- Tin plated copper lug for M8 screwt

The universal grounding kit is specially designed to accommodate the range of HUBER+SUHNER hybrid cable sizes. The tinned copper strap and associated hardware facilitates a proper attachment to the braided screen or copper foil. The 16 mm² (AWG 6), stranded copper wire with a one-hole lug (Ø 8.5 mm) provides a low inductance transfer of lightning induced current from the hybrid cable to the system ground. Installation of grounding kits is recommended at the top and bottom of each vertical run, at 20 m (66 ft) increments and just prior to building entry.

Specifications

Typical contact transition resistance	1 mΩ
Current handling capability (10/350 µs)	25 kA
Ingress protection	IP67
Ambient temperature range	–40 to 75 °C

Installation features

List of components • Tinned copper strap assembly with 0.5 m grounding wire and one-hole lug (Ø 8.5 mm) • 50.8 mm × 6.1 m (2" × 20") roll electrical tape (PVC) • 63.5 mm × 0.4 m (2-1/2" × 15") roll butyl mastic • Coiling tool • Installation manual	
The ground strap is wrapped around the exposed screen. The end of the strap has to be pulled through the slot at the strap. With the attached coiling tool the strap has to be tightened. There is an expansion joint at the strap which provides a visual indication if the strap is tightened enough. Note: H+S reccomend to use the adjustable heavy-duty cable stripping tool with H+S item no. 85029959.	 
Butyl mastic is placed around the clamp and acts as a filler. The vinyl electrical tape is wrapped around the hole ground strap to make it waterproof.	 

Ordering information

Description	Item no.
Universal grounding kit for hybrid cables	85015070

Accessories

Grounding cable



Features

- Flexible single core grounding cable
- RADOX 125 jacket material with excellent outdoor characteristics
- Stranded tin plated copper conductor
- M8 lugs on both ends
- Available in both black or yellow/green colours

HUBER+SUHNER grounding cables with RADOX 125 (electron beam crosslinked polyolefin copolymer) jacket and M8 lugs on both ends fits onto the integral earth stud of MLEP, MLEH, MLUP and MLUH cabling systems.

Specifications

Conductor	stranded tin plated copper, class 5 acc. to EN 60228
Jacket material	electron beam crosslinked polyolefin copolymer
Ambient temperature range	–40 to 75°C
Rated Voltage U0/U	600 V/1000 Vac
Test voltage	3500 Vac
Halogen-free	acc. EN 50363
Lug type	tubular standard cable lug
Size of bolt diameter	M8
Lug material	tin-plated copper acc. to EN 13600
Vibration	acc. DIN EN 61373 class 1 B

Ordering information

Cable cross section	Cable length	Cable colour	Size of bolt diameter left side	Size of bolt diameter right side	Item no.
16 mm²	0.5 m	black	M8	M8	85086667
16 mm²	0.5 m	yellow/green	M8	M8	85083781
25 mm²	0.5 m	black	M8	M8	85086668
25 mm²	0.5 m	yellow/green	M8	M8	85083792

Options:

- Other length
- Other lugs (e.g. angled, dual hole)

Accessories

Heavy-duty cable stripping tool for power and hybrid cable

Adjustable heavy-duty cable stripping tool Wire size: 4.5 to 40 mm/0.18" to 1.57" Stripping dimensions adjustable up to 4.5 mm/0.18" insulation thickness	85029959	
Spare blade for adjustable heavy-duty cable stripping tool (85029959)	85032058	

Quick hose clamp



Features

- Stainless steel
- Diameter 40 to 160 mm or 60 to 500 m

Specifications

Material	stainless steel 304
Material thickness	0.65 mm
Dimension width	14.2 mm
Dimension range	30 to 155 mm/60 to 500 mm

Ordering information

Description		Item no.
Quick hose clamp	diameter range 30 to 155 mm	84076411
One set including 2 pieces	diameter range 60 to 500 mm	84076412



Fiber optic interfaces for remote radio heads

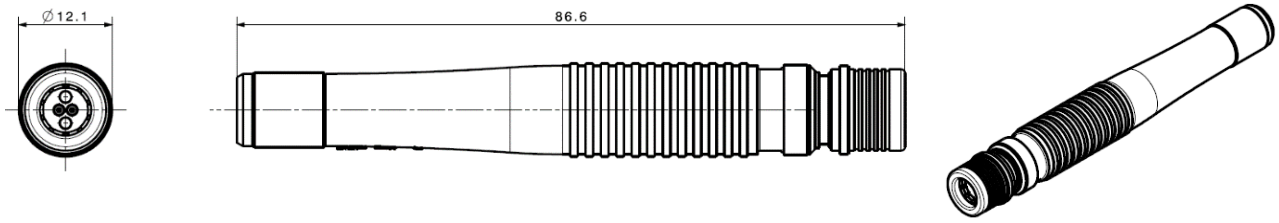


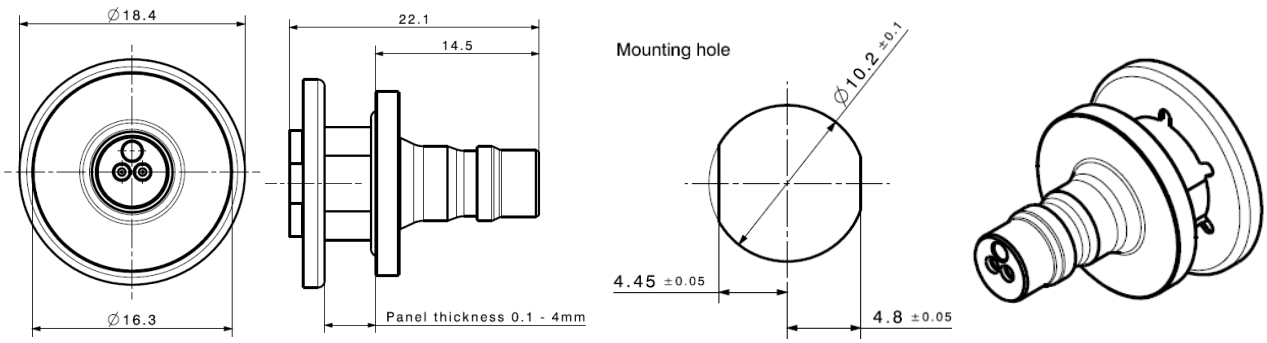
HUBER+SUHNER is the leading supplier of harsh environment fiber optic interfaces for remote radio heads. RRH are installed in many different types of environments such as coastal areas, urban buildings or rural tower sites and extreme temperatures, vibration, salt mist, corrosive gases and humidity are all typical challenges. Therefore robustness and reliability are crucial for the design of RRH interfaces. Additionally, the interface needs to be safe to install and must not cause any installation errors – this is essential to compensate for unskilled installers.
Damage to fiber optic interfaces is the number one cause of defects during RRH installation. Innovation and field-experience enables HUBER+SUHNER to design leading RRH interfaces like ODC and Q-ODC.

Q-ODC-2 Mini – smallest fiber optic connector for harsh environments

Fiber optic products manufactured by HUBER+SUHNER are suitable for complex applications with very high data rates and are constantly being further developed. HUBER+SUHNER is now expanding the connector portfolio with the Q-ODC-2 Mini. The size optimised connector with two fibers is used in especially harsh environmental conditions. Even when installation has to be fast and safe, this smallest fiber optic interface is the ideal solution for applications in communication and industrial market.







Fiber optic interfaces for remote radio heads

Harsh environment connectors Q-ODC-2 Mini



Features

- 2 fibers, singlemode or multimode
- Compact design with 2 x 1.25 mm ferrules
- Size optimised built-in socket
- Extension connector for cable chaining
- Robust push-pull coupling mechanism – two clearly defined mating states
- Highest outdoor installation safety
- Waterproof, dust proof and corrosion resistant
- Waterproof protection caps available
- EMI protected
- RoHs compliant

Specifications

Characteristics	Tested acc. to	Values
Technology		full ceramic ferrule and sleeve
Housing material		nickel-plated brass
Mating mechanism		push-pull with two clearly defined states
Mechanical performance	Q-ODC plug	≤ 150 N tensile load
Operating temperature [1]	IEC 61300-2-22	–40 up to +85 °C
Mating durability	IEC 61300-2-2	50 cycles [2]
Ingress protection (mated)	IEC 60529	IP68
Salt mist	IEC 61300-2-26	30 days passed
Vibration	IEC 61373	passed category 1A/B, 2, 3
Shock	IEC 61373	passed category 1, 2

[1] depending on cable type, [2] with repeated cleaning

Optical performance

Characteristics	Conditions	Tested acc. to	Values
Insertion loss/IEC 61300-3-34	single-mode	typ. ≤ 0.20 dB	97 % ≤ 0.45 dB
	multimode	typ. ≤ 0.20 dB	97 % ≤ 0.50 dB
Return loss		≥ 50 dB	

New type	Connector	Dust cap
QMP3	Q-ODC-2 Mini plug 	Push-on
QME1	Q-ODC-2 Mini extension 	Push-on
QME3		Push-on
QOS1	Q-ODC-2 Mini socket 	Push-on
QOS3		Push-on

Fiber optic interfaces for remote radio heads

Harsh environment connectors Q-ODC-2



Features

- 2 fibers, singlemode or multimode
- Compact design with 2 × 1.25 mm ferrules
- Extension connector for cable chaining
- Robust push-pull coupling mechanism – two clearly defined mating states
- Highest outdoor installation safety
- Waterproof, dust proof and corrosion resistant
- Waterproof protection caps available
- EMI protected
- RoHs compliant

Specifications

Characteristics	Tested acc. to	Values
Technology		full ceramic ferrule and sleeve
Housing material		nickel-plated brass
Mating mechanism		push-pull with two clearly defined states
Mechanical performance	Q-ODC-2 plug	≤ 450 N tensile load ≤ 30 N static side load
	Q-ODC-2 socket	≤ 30 N static side load
Operating temperature [1]	IEC 61300-2-22	–40 up to +85 °C
Mating durability	IEC 61300-2-2	200 cycles [2]
Ingress protection (mated)	IEC 60529	IP68 (30 days/3 m)
Salt mist	IEC 61300-2-26	30 days passed
Vibration	IEC 61300-2-1	passed 10 to 500 Hz/10 g
	IEC 61373	passed category 1A/B, 2, 3
Shock	IEC 61300-2-9	passed 100 g
	IEC 61373	passed category 1, 2

[1] depending on cable type, [2] with repeated cleaning

Optical performance

Characteristics	Conditions	Tested acc. to	Values
Insertion loss singlemode	typ. ≤ 0.20 dB	IEC 61300-3-34	97 % ≤ 0.45 dB
Insertion loss multimode	typ. ≤ 0.20 dB	IEC 61300-3-34	97 % ≤ 0.50 dB
Return loss	≥ 50 dB		

Mating/unmating sequences



Push plug connector slightly into extension connector, rotate to find keying position, push connector to mate. Use arrows on a boot for pre-alignment.



Mated – connector snaps in and is fully strain relieved.

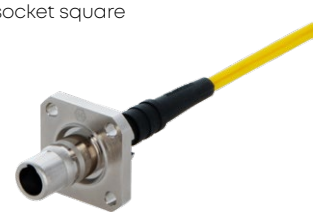


Pull coupling ring to unmate.

Fiber optic interfaces for remote radio heads

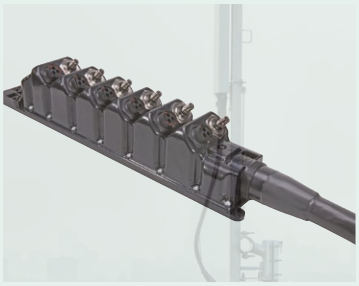
Harsh environment connectors Q-ODC-2 plug/socket

Overview of Q-ODC-2 connector types

Type new	Connector	Dust cap		
QOP5	Q-ODC-2 plug 	push-on	IP67	
QOP6		push-on	IP67	
QOE5	Q-ODC-2 extension 	push-on	IP67	
QOE6		push-on	IP67	
QOS1	Q-ODC-2 socket square 	push-on	IP67	
QOS2		push-on	IP67	
QOS3		snap-on	IP67	
QOS4		snap-on with chain	IP67	
QOR1	Q-ODC-2 socket hexagonal 	push-on	IP67	
QOR2		push-on	IP67	
QOR3		snap-on	IP67	
QOR4		snap-on with chain	IP67	

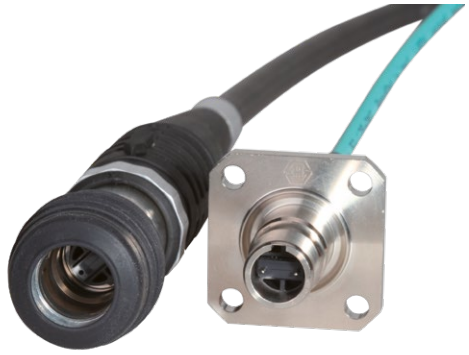
Q-ODC – push-pull connector for modular cell site installations

Q-ODC is used by a growing number of operators who build a modular and flexible cell site cable infrastructure. The push-pull connectors allows for quick and reliable cable connections, e.g. for top-mast boxes or jumpers. Additionally, the interface is designed that it is either mated or unmated – nothing in between. This makes each installation of cell site infrastructure safe.



Fiber optic interfaces for remote radio heads

Q-ODC-12 / Q-ODC-24 outdoor connector



Features

- Up to 24 fibers, singlemode or multimode
- Compact design with MTP ferrules
- Built-in socket with square flange/hexagonal flange
- Extension connector for cable chaining
- Robust push-pull coupling mechanism- two clearly defined mating states
- Highest outdoor installation safety
- Waterproof, dust proof and corrosion resistant
- Waterproof protection caps available
- RoHs compliant

Specifications

Technology		plastic ferrule (PPS)
Housing material		nickel-plated brass
Mating mechanism		push-pull with two clearly defined states
Mechanical performance	Q-ODC plug	≤ 500 N tensile load ≤ 30 N static side load
	Q-ODC socket	≤ 30 N tensile load
Operating temperature [1]	IEC 61300-2-22	–40 up to +85 °C
Mating durability	IEC 61300-2-2	100 cycles [2]
Ingress protection (mated)	IEC 60529	IP68 (3 m/30 days)
Salt mist	IEC 61300-2-26	30 days passed
Vibration	IEC 61300-2-1	passed 10 to 500 Hz/10 g
Shock	IEC 61300-2-9	passed 100 g
	IEC 61373	passed category 1, 2

[1] depending on cable type, [2] with repeated cleaning

Optical performance – MTP performance by fiber type/grade

Fiber type/grade	Typical IL (dB)	Maximum IL (dB)	RL
Low-loss single-mode (SM MT Elite)	0.15	0.35	≥ 60 dB
Low-loss multimode (MM MT Elite)	0.15	0.35	

Mating/unmating sequences



Push plug connector slightly into extension connector, rotate to find keying position, push connector to mate. Use arrows on a boot for pre-alignment.



Mated – connector snaps in and is fully strain relieved.



Pull coupling ring to unmate.

Fiber optic interfaces for remote radio heads

Q-ODC-12 / Q-ODC-24 outdoor connector

Overview of Q-ODC-2 APC connector types

Type	Type new	Connector	Dust cap		
QX	QOP1	Q-ODC-12 / Q-ODC-24 plug 	push-on	IP67	
	QOP2		push-on	IP67	
	QOP3		snap-on	IP67	
	QOP4		snap-on with chain	IP68	
QY	QOE1	Q-ODC-12 / Q-ODC-24 extension 	push-on	IP67	
	QOE2		push-on	IP67	
	QOE3		snap-on	IP68	
	QOE4		snap-on with chain	IP68	
QZ	QOS1	Q-ODC-12 / Q-ODC-24 socket square 	push-on	IP67	
	QOS2		push-on with cord	IP67	
	QOS3		snap-on	IP68	

Fiber optic interfaces for remote radio heads

ODC®-2 outdoor connector



Features

- 2 fibers, singlemode or multimode
- Compact design with 2 x 1.25 mm ferrules
- Built-in socket with square or hexagonal flange
- Extension connector for cable chaining
- Screwed locking mechanism
- Easy and safe installation
- Waterproof, dust proof and corrosion resistant
- Waterproof protection caps
- EMI protected
- RoHs compliant
- Full compatibility with previous version

Specifications

Technology		full ceramic ferrule and sleeve
Housing material		nickel-plated brass
Mating mechanism		push-pull with two clearly defined states
Mechanical performance	ODC-2 plug	≤ 800 N tensile load ≤ 30 N static side load
	ODC-2 socket	≤ 30 N tensile load
Installation torque force	min. 1 Nm	max. 2 Nm
Operating temperature [1]	IEC 61300-2-22	–40 up to +85 °C
Mating durability		1000 cycles [2]
Ingress protection (mated)	IEC 60529	IP 68 (30 days / 3m)
Salt mist	IEC 61300-2-26	30 days passed
Vibration	IEC 61300-2-1	passed 10 to 500 Hz/10 g
Shock	IEC 61300-2-9	passed 100 g

[1] depending on cable type, [2] with repeated cleaning

Optical performance

Insertion loss IEC 61300-3-34	single-mode	typ. ≤ 0.20 dB	97 % ≤ 0.45 dB
	multimode	typ. ≤ 0.20 dB	97 % ≤ 0.50 dB
Return loss	single-mode	≥ 50 dB	

Fiber optic interfaces for remote radio heads

ODC®-2 outdoor connector

Overview of ODC-2 connector types

Type	Type new	Connector	Dust cap	
A1	ODP5	ODC-2 plug 	screwed cap with pulling feature	IP68 
A4	ODP6		screwed cap with chain	IP68 
E1	ODE5	ODC-2 extension (socket type) 	screwed cap	IP68 
E3	ODE6		screwed cap with chain	IP68 
C1	ODS5	ODC-2 socket, square small 	screwed cap	IP68 
C3	ODS6		screwed cap with chain	IP68 
B3	ODR1	ODC-2 socket, hexagonal, mounted from rear 	screwed cap	IP68 
B4	ODR2		screwed cap with chain	IP68 

ODC – worldwide the most often installed remote radio interface

We believe there is no country in the world in which ODC assemblies have not been installed yet. There is no other RRH interface which is used more often and which was chosen by more system vendors.

The success comes from the fact that ODC is an extremely robust outdoor connector which withstands all installation hazards – and most importantly – does not permit handling errors. ODC makes mobile networks more reliable and guarantees 100 % performance.






Fiber optic interfaces for remote radio heads

ODC®-4 outdoor connector



Features

- 4 fibers, singlemode or multimode
- Compact design with 4 x 1.25 mm ferrules
- Extension connector for cable chaining
- Screwed locking mechanism
- Highest outdoor installation safety
- Waterproof, dust proof and corrosion resistant
- Waterproof protection caps available
- EMI protected
- RoHs compliant

Specifications

Technology		full ceramic ferrule and sleeve
Housing material		nickel-plated brass
Mechanical performance	ODC-4 plug	≤ 800 N tensile load ≤ 30 N static side load
	ODC-4 socket	≤ 30 N static side load
Installation torque force	min. 1 Nm	max. 2 Nm
Operating temperature [1]	IEC 61300-2-22	–40 up to +85 °C
Mating durability		1000 cycles [2]
Ingress protection (mated)	IEC 60529	IP68
Salt mist	IEC 61300-2-26	30 days passed
Vibration	IEC 61300-2-1	passed 10 to 500 Hz/10 g
Shock	IEC 61300-2-9	passed 100 g

[1] depending on cable type, [2] with repeated cleaning

Optical performance

Insertion loss IEC 61300-3-34	single-mode	typ. ≤ 0.20 dB	97 % ≤ 0.45 dB
	multimode	typ. ≤ 0.20 dB	97 % ≤ 0.50 dB
Return loss	single-mode	≥ 50 dB	

Fiber optic interfaces for remote radio heads

ODC®-4 outdoor connector

Overview of ODC-4 connector types

Type	Type new	Connector	Dust cap	
J2	ODP1	ODC-4 plug 	screwed cap with pulling feature	IP68 
J3	ODP2		screwed cap with chain	IP68 
E4	ODE1	ODC-4 extension (socket type) 	screwed cap	IP68 
E6	ODE2		screwed cap with chain	IP68 
K2	ODR1	ODC-4 socket, hexagonal 	screwed cap	IP68 
K3	ODR2		screwed cap with chain	IP68 
K6	ODS1	ODC-4 socket, square small 	screwed cap	IP68 
K7	ODS2		screwed cap with chain	IP68 

Fiber optic interfaces for remote radio heads

Q-XCO – quick-lock ruggedised SFP connector



Features

- Quick-lock mating connector for remote radio head and industrial applications
- Ruggedised outdoor design with 2 × LC interface
- Plugs directly into SFP module, compatible with all standard SFP modules
- Full compensation of positioning tolerances and
- SFP module tolerances
- Bayonet, blind-mating mechanism and highest installation safety
- Full protection of optical interface during installation
- Access and exchange of SFP module possible
- RoHs compliant

Mating mechanism

Mating	1-step blind mating	bayonet
	mating references	visual and latch
Compensation of positioning tolerances of SFP module	z-axis	± 2.25 mm
	x, y-axis	± 0.4 mm (± 0.6 mm depending on SFP module)
Latching of LC connector	use of LC HQ technology	automating latching and unlatching
Mating durability	IEC 61300-2-2	100 cycles
Force on SFP module		no force in mated state

Specification

Technology			LC full ceramic ferrules
Housing material		connector	high-performance plastic
		socket	die-casting with zinc plating
Material flammability rating			UL 94-V0
Mechanical performance		IEC 61300-2-4	≤ 400 N tensile load
		IEC 61300-2-42	≤ 30 N static side load
		IEC 61300-2-5	180° cable torsion, passed
Thermal performance		operation, IEC 61300-2-22	–40 to +85 °C
		installation	–40 to +55 °C
Ingress protection		IEC 60529-20	IP67 (mated or with dust cap)
Salt mist	84108683	IEC 61300-2-26, MIL-STD-202G Method 101E	192 h
	85006151	IEC 61300-2-26	720 h
Vibration		IEC 61300-2-1, MIL-STD-202G, Method 204G	passed 10 to 500 Hz/10 g
Shock		IEC 61300-3-3, MIL-STD-202G, Method 213B	passed 50 g
UV resistance		ISO 4982-2	passed 2000 h at 2000 MJ/m²

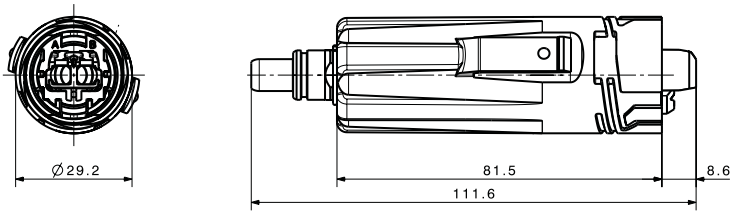
Optical performance

Insertion loss	single-mode	typ. ≤ 0.20 dB	97 % ≤ 0.45 dB
	multimode	typ. ≤ 0.20 dB	97 % ≤ 0.50 dB
Return loss	single-mode	≥ 50 dB	

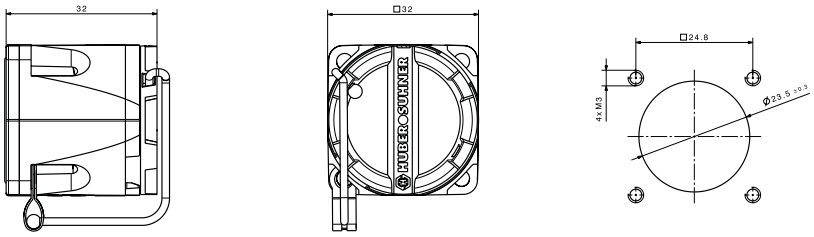
Fiber optic interfaces for remote radio heads

Q-XCO – quick-lock ruggedised SFP connector

Q-XCO plug



Q-XCO flange small



Type	Type new	Connector	Dust cap
XA	QXP2	Q-XCO connector 	IP67 
Item no. 84108683		Q-XCO flange small 	IP67 
Item no. 85006151		Q-XCO flange small e-coating 	IP67 

Fiber optic interfaces for remote radio heads

FullAXS – ruggedised sealing system



Features

- Ruggedised sealing system for fiber-to-the-antenna and industrial applications
- Open bulkhead for easy access to SFP
- Positive mechanical feedback to operator when fully mated
- Duplex LC interface
- Robust bayonet locking for easy, fast and secure mating
- Waterproof, dust proof and corrosion resistant
- Expansion to RJ45 and power possible

Specifications

Mating mechanism		bayonet style locking
Housing material		high performance plastic
Technology		LC with full ceramic ferrules
Mechanical performance	tensile load	150 N
	static side load	30 N
Operating temperature [1]		–40 up to +70 °C
Mating durability	IEC 61300-2-2	100 cycles [2]
Ingress protection (mated)	IEC 60529	IP67
Vibration	IEC 61300-2-1	passed 10 to 500 Hz/10 g
Performance standards	IEC 61753-1 cat. E	compliant
	Telcordia GR 3120	compliant

Optical performance

Insertion loss	single-mode	typ. ≤ 0.20 dB	97 % ≤ 0.45 dB
	multimode	typ. ≤ 0.20 dB	97 % ≤ 0.50 dB
Return loss	single-mode	≥ 50 dB	

Type	Type new	Connector	Dust cap
Z4	FAP2	FullAXS plug 	IP65 
Item no. 84131095		FullAXS build-in flange 	IP65 

FullAXS is a registered trademark of TE.

Fiber optic interfaces for remote radio heads

Cleaning and inspection tools harsh environment connector

Cleaning

Description	Item no.	Picture
Cleaner IBC, ODC, 1.25 mm	84108853	
Swab, pins cleaning (Q-ODC-12 socket/extension/rearmount)	84139207	
IBC cleaner for Q-ODC-12	85172238	

ODC torque wrench

Description	Item no.	Picture
74_Z-0-0-321	22651994	

Fiber optic interfaces for remote radio heads

Inspection

Description	Item no.	Picture
Adapter for ODC-2 (plug and socket) inspection (JDSU 5000i probe)	85026607	
Adapter for ODC-4 (plug and socket) inspection (JDSU 5000i probe)	85026608	
Adapter for Q-ODC-2 (plug and socket) inspection (JDSU 5000i probe)	85083464	
Adapter for Q-ODC 12/Q-ODC 24 inspection (JDSU 5000i probe)	85068197	
Plug adapter multimode (UPC) for 85068197	85068173	
Plug adapter single-mode (APC) for 85068197	85068172	
Socket adapter multimode (UPC) for 85068197	85068170	
Socket adapter single-mode (APC) for 85068197	85068171	

Antenna solutions



Maximize performance with our versatile antenna portfolio for the mobile network

Our versatile antenna portfolio ranges from small cell to macrocell applications, including 5G and indoor Distributed Antenna System (DAS) antennas. They are applicable for rooftops and towers, street furniture, storefronts, private mobile networks, subway networks, hotels and more.

Performance

Superior performance with maximum data throughput

Frequency

Covering frequencies from 600 MHz to 6 GHz

Installation

Simple and quick installation

Versatile

Versatile products for use in diverse environments

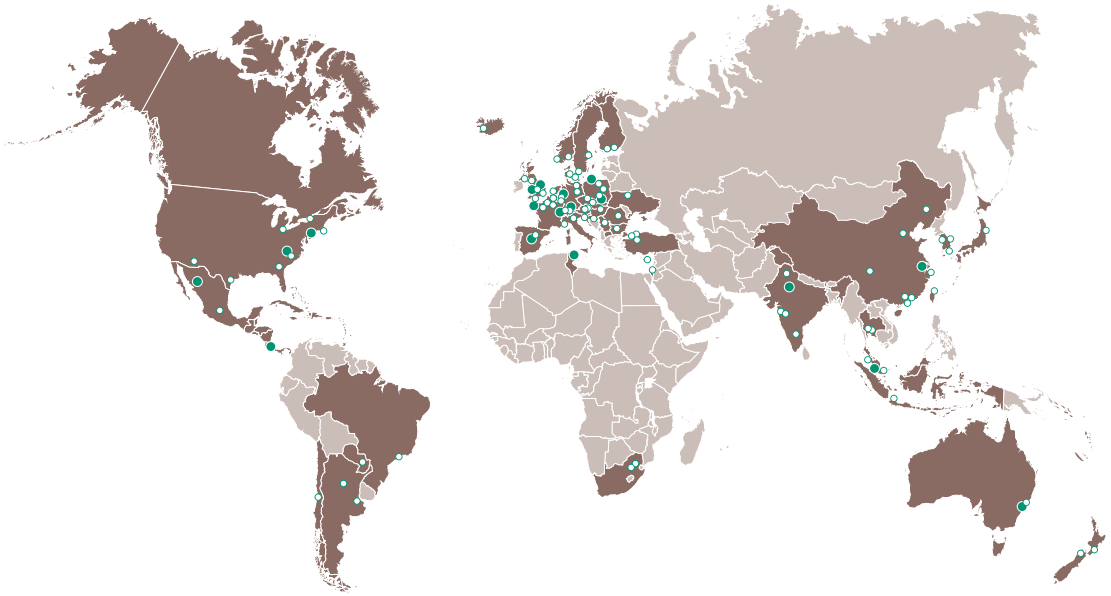
Customised

Customised solutions fitting all cell sites



Macro passive antennas

At HUBER+SUHNER, connections are at the heart of everything we do. We connect communication systems to a reliable, future-ready physical layer that ensures performance, density, and scalability for today and beyond. Our Centre of Competence in Manesar, India, is dedicated to delivering cutting-edge Macro Antennas tailored to the needs of Original Equipment Manufacturers (OEMs), Telecom operators, and System integrators. Supported by a global team of in-house experts and technology partners, equipped with advanced design software and testing equipment, our antenna solutions are essential for enhancing mobile connectivity, providing reliable and robust performance even in the most challenging conditions.



- Countries with HUBER+SUHNER representation
- Sales locations
- Production and assembly plants

HUBER+SUHNER offers both standard antennas and customized solutions tailored to your specific needs in terms of ports, frequency bands, dimensions, and packaging options. Our automated testing and advanced manufacturing techniques ensure competitive pricing without compromising quality. Adhering to the highest quality standards, our products are reliable and efficient. Comprehensive quality control is provided by accredited Advanced near/far-field Microwave Anechoic Testing Facilities and Environment Testing centers. Our production center is equipped for high-volume production, ensuring we meet your demands efficiently. Our Macro antennas are designed and rigorously tested to ensure full compliance with BASTA recommendations, guaranteeing performance and reliability for all your communication needs.

Product nomenclature

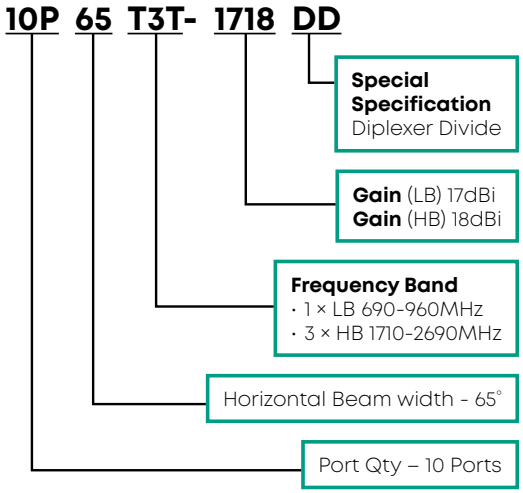
To help you navigate our catalogue with ease and confidence, we've developed a clear and consistent product nomenclature system. This structured naming approach ensures that each product is easily identifiable by its key characteristics—such as category, model, version, and specifications.

In this section, you'll find a breakdown of how our product codes and names are constructed, what each element represents, and how this information can assist you in selecting the right product for your needs.

Let's take a closer look at how our products are named—and what that means for you.

Example: 10P65T3T-1718DD

Multi Band 10 - Port Antenna
690~960/3×1710~2690MHz
65°/ 65° Horizontal Beam Width



Unique specifications definition

Mark	Contents	Mark	Contents
DC	Diplexer Combine	C	Cylinder
I	ICS	T	Tri sector
N	Null Fill	B	Bidirectional
P	Pole type	D	Dual Beam
DS	Diplexer Split (PCB)	TC	Triplexer Combine
ES	Sidelobe	R	Revision
H	High band	L	Low band
E	Eco friendly	DD	Double Diplexer Split (Cavity Diplexer)
V	Version	Tr	Tri Beam
F	Flat	PT	Pig Tail
A	Adaptive array (TDD antenna)	VD	Vertical Dual Beam
M	MET	MM	Massive MIMO
HX	Hexa Beam	MU	Module antenna
TD	Triplexer Split (Cavity Triplexer)	HG	High Efficiency (Low loss feeding)
Q	4(Quad) beam	MR	Multi CPU RET

Frequency band definition

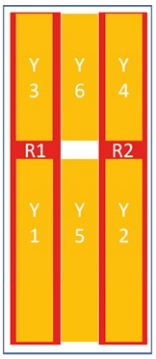
Mark	Low	High	Mark	Low	High	Mark	Low	High
A	806-960	1710-2180	J		1400-1500	S	824-894	3300-4200
B	790-960		K	698~890	3300~3800	T	698-960	1710-2690
C	824-960	1710-2400	L	Low		U	617-960	1710~6000
D		1710-1880	M	806~894	1850~1990	V	Vertical	
E	380-500	2300-2400	N	764-869	3800-4200	W	617-894	1920-2170
F	791~869	2500-2700	O		1427-2690	X	X-pol	
G	870-960	2200-2300	P		1750-1870	Y	617-806	2400-2485
H	High, Horizontal		Q			Z	617-698	5150-5850
I	400~470	2300-2700	R	698~806	4400-5000			

Passive sector macro antenna platforms

Our advanced macro antenna solutions include three mainstream platforms: Multiband, TDD+FDD, and Hybrid/ Dual Beam, each designed to optimize performance, enhance connectivity, and meet the diverse needs of modern wireless networks.

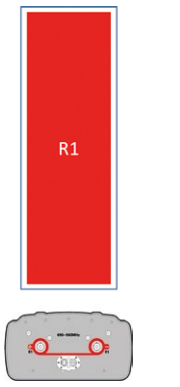
To ensure easy identification and standardization, the Antenna Interface Standards Group (AISG) has assigned specific color codes to different frequency ranges. Below is a comprehensive list of these color codes and sample layouts of 16P and 12P antennas based on these color codes.

Band edge range	Band Colour (RAL)	Band Character	
380 to 1000 MHz	Red (RAL 3020)	R	Low Band (LB)
1001 to 1700 MHz	Green (RAL 6029)	G	Low Band (LB)
1701to 2300 MHz	Blue (RAL 5015)	B	High Band (HB)
2301 to 3000 MHz	Yellow (RAL 1023)	Y	High Band (HB)
3001 to 5000 MHz	Purple (RAL 4006)	P	High Band (HB)
5001 to 6000 MHz	Orange (RAL 2009)	O	High Band (HB)





Multiband



Single Band (2P):
- LB
- HB



Dual Band (4P):
- LB × 2
- HB × 2
- LB + HB



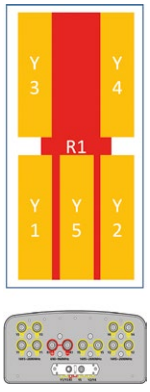
Triple Band (6P):
- LB + HB × 2
- HB × 3



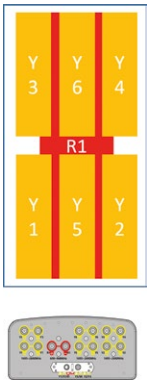
Quad Band (8P):
- LB + HB × 3
- LB × 2 + HB × 2
- HB × 4



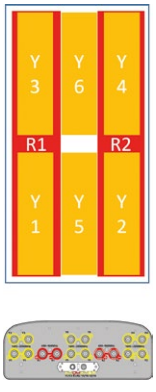
Penta Band (10P):
- LB + HB × 4
- LB × 2 + HB × 3



Hexa Band (12P):
- LB + HB × 5
- LB × 2 + HB × 4

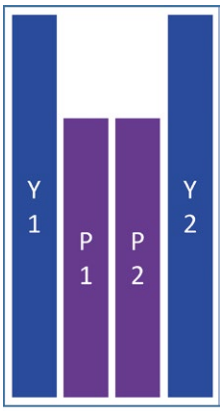


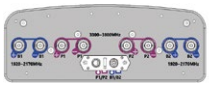
Hepta Band (14P):
- LB × 2 +HB × 5
- LB + HB × 6



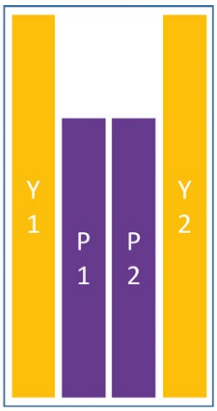
Octa Band (16P):
- LB x 2 + HB x 6

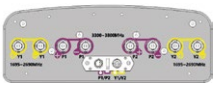
TDD + FDD





8 Port Antenna:
- 4P FDD & 4P TDD





8 Port Antenna:
- 4P FDD & 4P TDD

Hybrid / Dual



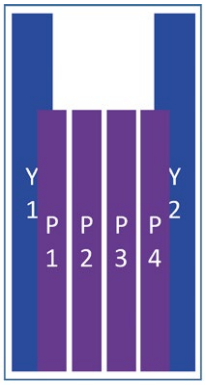


4 Port Dual Beam Antenna



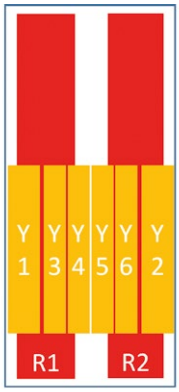


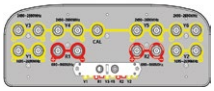
8 Port Dual Beam Antenna





12 Port Hybrid Antenna





16 Port Hybrid Antenna

SENCITY® Sector Multi Band



Product name	**SENCITY Sector Multi Band 8 Port HB**
Product ID.	**8P65HT-18V1**
Description	Multi Band 8-Port Antenna (4×1710-2690 MHz), with Integrated Remote Electrical Down tilt, continuously adjustable • Horizontal beam width of 65° • PIM <-150 dBc (2×43 dBm) • For outdoor application • Mounting brackets are included
Item no.	85138407

Technical Data	Band 1	Band 2	Band 3	Band 4	Band 5
Frequency	1710 – 1880 MHz	1850 – 1990 MHz	1920 – 2170 MHz	2300 – 2400 MHz	2500 – 2690 MHz
VSWR	1.5	1.5	1.5	1.5	1.5
Gain	17.1 ±0.5 dBi	17.4 ±0.4 dBi	17.6 ±0.5 dBi	18 ±0.4 dBi	18 ±0.5 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	8
Composite power max.	300 W
Polarization	±45°
Electrical Down tilt	0-10°

Mechanical data	
Dimensions (Height x Width x Depth)	1400 × 520 × 170 mm
Weight	16.5 kg
Mast Dia	40 – 115 mm
Mechanical Downtilt	0-20 °
Wind load	Frontal: 947.6 N @150km/h, Lateral: 309.8 N @150 km/h
Wind Speed survival	216 km/h

Material data	
Radome colour	Grey
Radome material	ASA

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® Sector Multi Band



Product name	**SENCITY Sector Multi Band 10-Port LB/HB**
Product ID.	**10P65T4T-1718**
Description	Multi Band 10-Port Antenna (1×698-960/ 4×1710-2690 MHz) with Integrated Remote Electrical downtilt, continuously adjustable • Horizontal beam width of 65° • PIM < -150 dBc (2×43 dBm) • For outdoor application • Mounting brackets included
Item no.	85138043

Technical Data	Band 1	Band 2	Band 3	Band 4	Band 5	Band 6	Band 7	Band 8
Frequency	698 MHz – 806 MHz	790 MHz – 894 MHz	880 MHz – 960 MHz	1710 MHz – 1880 MHz	1850 MHz – 1990 MHz	1920 MHz – 2170 MHz	2300 MHz – 2400 MHz	2500 MHz – 2690 MHz
VSWR	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Gain	15.9 dBi	16.2 dBi	16.8 dBi	17.1 dBi	17.3 dBi	17.5 dBi	17.7 dBi	18 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	10
Composite power max.	300 W
Polarization	±45°
Electrical Down tilt	0-10°

Mechanical data	
Dimensions (Height × Width x Depth)	2400 mm × 375 mm × 170 mm
Weight	34 kg
Mast Dia	40 mm – 115 mm
Wind load	front: 1166.9 N at 150 km/h, lateral: 529 N at 150 km/h
Wind Speed survival	Wind Speed survival: 216 km/h

Material data	
Radome colour	Grey
Radome material	FRP

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® Sector Multi Band



Product name	**SENCITY Sector Multi Band 12-Port LB/HB**
Product ID.	**12P652T4T-1718V8**
Description	Multi Band 12 - Port Antenna (2 × 698 - 960 / 4 × 1695 MHz- 2690 MHz) Integrated Remote Electrical downtilt, continuously adjustable • Horizontal beam width of 65° • PIM < -150 dBc (2 × 43 dBm) • For outdoor application • Mounting brackets included
Item no.	85246830

Technical Data	Band 1	Band 2	Band 3	Band 4	Band 5	Band 6	Band 7	Band 8
Frequency	690 MHz – 806 MHz	790 MHz – 894 MHz	880 MHz – 960 MHz	1695 MHz – 1880 MHz	1850 MHz – 1990 MHz	1920 MHz – 2170 MHz	2300 MHz – 2400 MHz	2500 MHz – 2690 MHz
VSWR	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Gain	15.7 ±0.6 dBi	16.2 ±0.5 dBi	16.4 ±0.4 dBi	16.7 ± 0.5 / 16.3 ± 0.5 dBi	17 ± 0.6 / 16.6 ± 0.6 dBi	17.2 ± 0.7 / 16.6 ± 0.6 dBi	17.9 ± 0.6 / 17.3 ± 0.6 dBi	18 ± 0.7 / 17.4 ± 0.7 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	12
Composite power max.	300 W
Polarization	±45°
Electrical Down tilt	0-10°

Mechanical data	
Dimensions (Height × Width x Depth)	2665 mm × 480 mm × 170 mm
Weight	32.3 kg
Mast Dia	40 mm – 115 mm
Wind load	front: 1079.6 N at 150 km/h, lateral: 487.9 N at 150 km/h,
Wind Speed survival	216 km/h

Material data	
Radome colour	Grey
Radome material	FRP

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® Sector Multi Band



Product name	**SENCITY Sector Multi Band 12-Port LB/HB**
Product ID.	**12P65T2D2E-1517DD**
Description	Multi Band 12-Port Antenna (698-806/ 824-960/2×1710-1880/2×2300 - 2400 MHz) Integrated Remote Electrical downtilt, continuously adjustable • Horizontal beam width of 65° • PIM < -150 dBc (2×43 dBm) • For outdoor application • Mounting brackets included
Item no.	85119872

Technical Data	Band 1	Band 2	Band 3	Band 4
Frequency	698 MHz – 806 MHz	824 MHz – 960 MHz	1710 MHz – 1880 MHz	2300 MHz – 2400 MHz
VSWR	1.5	1.5	1.5	1.5
Gain	14 ±0.5 dBi	14 ±0.5 dBi	17 ±0.5 dBi	17 ±0.5 dBi
Electrical Down tilt	2-14°	2-14°	0-10°	0-10°

Electrical data	
Impedance	50 Ω
Number of Ports	12
Polarization	±45°

Mechanical data	
Dimensions (Height × Width x Depth)	1600 mm × 375 mm × 170 mm
Weight	24 Kg
Mast Dia	40 mm – 115 mm
Wind load	front: 781 N at 150 km/h, lateral: 354.1 N at 150 km/h,
Wind Speed survival	216 km/h

Material data	
Radome colour	Grey
Radome material	FRP

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® Sector Dual Beam HB



Product name	**SENCITY Sector 8-Ports Dual Beam HB**
Product ID.	**8P30HE-19D**
Description	• High Band 8-Port Dual Beam Antenna (4×2300 - 2400 MHz) • Integrated Remote Electrical downtilt, continuously adjustable • For outdoor application • Mounting brackets included
Item no.	85141763

Technical Data	**Band 1**
Frequency	2300 MHz – 2400 MHz
VSWR	1.5
Gain	19.6 ± 0.5 / 19 ± 0.5 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	8
Composite power max.	250 W
Polarization	±45°
Electrical Down tilt	0-10°

Mechanical data	
Dimensions (Height × Width x Depth)	2200 mm × 330 mm × 155 mm
Weight	25 kg
Mast Dia	40 mm – 115 mm
Wind load	Front: 945 N at 150 km/h, lateral: 443.9 N at 150 km/h,
Wind Speed survival	216 km/h

Material data	
Radome colour	Grey
Radome material	FRP

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® Sector Dual Beam



Product name	**SENCITY Sector Dual Beam 4 Port Antenna LB**
Product ID.	**4P35LS-17D**
Description	• Low Band 4-Port Dual Beam Antenna (824~896MHz) with integrated Remote Electrical Down tilt, continuously adjustable • Horizontal beam width of 35 degree • PIM < -150 dBc (2×43 dBm) • Mounting brackets are included
Item no.	85116828

Technical Data	**Band 1**
Frequency	824 - 896 MHz
VSWR	1.5
Gain	16.5 ± 0.5 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	4
Composite power max.	500 W
Polarization	±45°
Electrical Down tilt	2 - 14°

Mechanical data	
Dimensions (Height × Width x Depth)	1450 mm × 565 mm × 170 mm
Weight	18 kg
Mast Dia	40 mm – 115 mm
Wind load	Front: 1066.4 N at 150 km/h, Lateral: 320.9 N at 150 km/h
Wind Speed survival	216 km/h

Material data	
Radome colour	Grey
Radome material	FRP

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® Sector Multi Band



Product name	**SENCITY Sector Multi Band 2-Port Antenna HB**
Product ID.	**2P30HYZ-17T0DC**
Description	Multi Band 2-Port Antenna with built in Diplexer (2400~2484 / 5150~5875MHz) • Horizontal beam width of 30 degree • Mounting brackets are included
Item no.	85150648

Technical Data	**Band 1**	**Band 2**
Frequency	2400 – 2484 MHz	5150 – 5875 MHz
VSWR	1.5	1.5
Gain	16.8 dBi	17 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	2
Composite power max.	50 W
Polarization	±45°

Mechanical data	
Dimensions (Height × Width x Depth)	450 mm × 265 mm × 99 mm
Weight	2.5 kg
Wind load	155.2 N at 150 km/h, Lateral: 58 N at 150 km/h
Wind Speed survival	216 km/h

Material data	
Radome colour	Grey
Radome material	ASA

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® Sector Multi Band



Product name	**SENCITY Sector Multi Band 2 Port Antenna LB**
Product ID.	**2P33LK-21**
Description	Multi Band 2 Port Antenna (1×698~894MHz) with integrated Remote Electrical Down tilt, continuously adjustable • Horizontal beam width of 33 degree • PIM <-150 dBc (2×43 dBm) • Mounting brackets are included
Item no.	85201961

Technical Data	**Band 1**	**Band 2**
Frequency	698 – 806 MHz	790 – 894 MHz
VSWR	1.5	1.5
Gain	19.9 ± 0.6 dBi	20.5 ± 0.6 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	2
Composite power max.	300 W
Polarization	±45°
Electrical Down Tilt	0 - 10°

Mechanical data	
Dimensions (Height × Width x Depth)	2695 mm × 565 mm × 170 mm
Weight	30 kg
Mast Diameter	40mm - 115 mm
Wind load	Frontal : 1982 N at 150 km/h, Lateral: 596.4 N at 150 km/h
Wind Speed survival	216 km/h

Material data	
Radome colour	Grey
Radome material	FRP or ASA

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® Sector Multi Band



Product name	**SENCITY Sector Multi band 2 Port Antenna LB**
Product ID.	**2P65LW-17**
Description	Multi Band 2-Port Antenna (1×690~960MHz) with integrated Remote Electrical Down tilt, continously adjustable • Horizontal beam width of 65 degree • PIM <-150 dBc (2×43 dBm) • Mounting brackets are included
Item no.	85219202

Technical Data	**Band 1**	**Band 2**	**Band 3**
Frequency	617 - 698 MHz	698 – 806 MHz	790 - 894 MHz
VSWR	1.5	1.5	1.5
Gain	15.6 ± 0.6 dBi	16.1 ± 0.6 dBi	16.5 ± 0.6 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	2
Composite power max.	300W
Polarization	±45°
Electrical Down Tilt	0 - 8°

Mechanical data	
Dimensions (Height × Width x Depth)	2575 mm × 295 mm × 145 mm
Weight	19 kg
Wind load	Frontal : 988.8 N at 150 km/h, Lateral: 486 N at 150 km/h
Mast Diameter	40mm - 115 mm
Wind Speed survival	216 km/h

Material data	
Radome colour	Grey
Radome material	ASA

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® Sector Multi Band



Product name	**SENCITY Sector Multi band 6 Port Antenna HB**
Product ID.	**6P65HT-18V4**
Description	Multi Band 6-Port Antenna (3×1710~2690MHz) with integrated Remote Electrical Down tilt, continuously adjustable • Horizontal beam width of 65 degree • PIM <-150 dBc (2×43 dBm) • Mounting brackets are included
Item no.	85195396

Technical Data	**Band 1**
Frequency	1710 – 2690 MHz
VSWR	1.5
Gain	18.5 ± 0.7 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	6
Composite power max.	300 W
Polarization	±45°
Electrical Down Tilt	0 - 10°

Mechanical data	
Dimensions (Height × Width x Depth)	1360 mm × 398 mm × 141 mm
Weight	14 kg
Mast Diameter	40mm - 115 mm
Wind load	Frontal : 704.6 N at 150 km/h, Lateral: 249.6 N at 150 km/h
Wind Speed survival	216 km/h

Material data	
Radome colour	Grey
Radome material	UVPVC

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® Sector Multi Band



Product name	**SENCITY Sector Multi band 2 Port Antenna LB**
Product ID.	**2P65LT-18V2**
Description	Multi Band 2-Port Antenna (1×690~960MHz) with integrated Remote Electrical Down tilt, continuously adjustable Horizontal beam width of 65 degree PIM <-150dBc (2×43 dBm) Mounting brackets are included
Item no.	85195393

Technical Data	**Band 1**	**Band 2**	**Band 3**
Frequency	690 - 806 MHz	790 – 894 MHz	880 – 960 MHz
VSWR	1.5	1.5	1.5
Gain	16.4 ± 0.5 dBi	17 ± 0.5 dBi	17.4 ± 0.5 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	2
Composite power max.	300W
Polarization	±45°
Electrical Down Tilt	0 - 10°

Mechanical data	
Dimensions (Height × Width x Depth)	2695 mm × 295 mm × 145 mm
Weight	20 kg
Wind load	Frontal : 1034.9 N at 150 km/h, Lateral: 508.7 N at 150 km/h
Mast Diameter	40mm - 115 mm
Wind Speed survival	216 km/h

Material data	
Radome colour	Grey
Radome material	FRP/ASA/UPVC

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® High Band



Product name	**SENCITY Sector High Band 8 Port Antenna HB**
Product ID.	**8P65HDE-17DS**
Description	High Band 8-Port Antenna (2×1710~1880 / 2×2300~2400MHz) with integrated Remote Electrical Downtilt, continuously adjustable • Horizontal beam width of 65 degree • PIM <-150 dBc (2×43 dBm) • Mounting brackets are included
Item no.	85171678

Technical Data	**Band 1**	**Band 2**
Frequency	1710 - 1880 MHz	2300 - 2400 MHz
VSWR	1.5	1.5
Gain	16.5 ± 0.5 dBi	17 ± 0.5 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	8
Composite power max.	250 W
Polarization	±45°
Electrical Down Tilt	0 - 10°

Mechanical data	
Dimensions (Height × Width x Depth)	1360 mm × 320 mm × 105 mm
Weight	14 kg
Mast Diameter	40mm - 115 mm
Wind load	Frontal : 566.5 N at 150 km/h, Lateral: 185.9 N at 150 km/h
Wind Speed survival	216 km/h

Material data	
Radome colour	Grey
Radome material	FRP

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® High Band



Product name	**SENCITY Sector High Band 4 Port Antenna HB**
Product ID.	**4P65HD-17**
Description	High Band 4-Port Antenna (2×1710~1880MHz) with integrated Remote Electrical Down tilt, continuously adjustable Horizontal beam width of 65 degree PIM <-150 dBc (2×43 dBm) Mounting brackets are included
Item no.	85127320

Technical Data	**Band 1**
Frequency	1710 – 1880 MHz
VSWR	1.5
Gain	17 ± 0.5 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	4
Composite power max.	250W
Polarization	±45°
Electrical Down Tilt	0 - 10°

Mechanical data	
Dimensions (Height × Width x Depth)	1400 mm × 320 mm × 105 mm
Weight	12 kg
Wind load	Frontal : 583.1 N at 150 km/h, Lateral: 191.3 N at 150 km/h
Mast Diameter	40mm - 115 mm
Wind Speed survival	216 km/h

Material data	
Radome colour	Grey
Radome material	FRP

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® Multi Band



Product name	**SENCITY Sector Multi Band 2 Port Antenna LB**
Product ID.	**2P65LK-16I**
Description	Multi Band 2-Port Antenna (703~894MHz) with integrated Remote Electrical Down tilt, continuously adjustable • Horizontal beam width of 65 degree • PIM <-153 dBc (2×43 dBm) • Mounting brackets are included
Item no.	84420367

Technical Data	**Band 1**	**Band 2**	**Band 3**
Frequency	703 - 803 MHz	791 - 862 MHz	824 - 894 MHz
VSWR	1.4	1.4	1.4
Gain	15.6 ± 0.5 dBi	15.9 ± 0.4 dBi	16 ± 0.4 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	2
Composite power max.	300 W
Polarization	±45°
Electrical Down Tilt	0 - 10°

Mechanical data	
Dimensions (Height × Width x Depth)	1850 mm × 295 mm × 145 mm
Weight	12 kg
Mast Diameter	40mm - 115 mm
Wind load	Frontal : 712 N at 150 km/h, Lateral: 350 N at 150 km/h
Wind Speed survival	216 km/h

Material data	
Radome colour	Grey
Radome material	ASA (UV resistant)

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® Sector Canister HB



Product name	**SENCITY Omni 4-Port Canister HB**
Product ID.	**4P360HT-12T2**
Description	• Quasi-Omni Broad Band 4-Port Antenna (1710-2690 MHz) • PIM < -150 dBc (2×43 dBm) • Fixed electrical downtilt of 2° • Mounting brackets are included
Item no.	84416118

Technical Data	**Band 1**	**Band 2**	**Band 3**	**Band 4**	**Band 5**
Frequency	1710 MHz – 1880 MHz	1850 MHz – 1990 MHz	1920 MHz – 2170 MHz	2300 MHz – 2400 MHz	2500 MHz – 2690 MHz
VSWR	1.5	1.5	1.5	1.5	1.5
Gain	11.3 dBi	11.6 dBi	11.9 dBi	12.2 dBi	12.5 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	4
Composite power max.	200 W
Polarization	±45°
Electrical Down tilt	2°, fixed

Mechanical data	
Dimensions (Height x Diameter)	1200 mm × 250 mm
Weight	16 kg
Mast Dia	40 mm – 115 mm
Wind load	227 N at 150 km/h
Wind Speed survival	216 km/h

Material data	
Radome colour	Grey
Radome material	ASA

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® Sector Canister HB



Product name	**SENCITY Tri-sector 6-Port Canister HB**
Product ID.	**6P70HT-15T2TS**
Description	• Multi Band 3-Sector 6-Port Antenna (3×1710-2690MHz) • PIM < -150 dBc (2×43 dBm) • Fixed electrical downtilt of 2° • For outdoor application • Mounting brackets are included
Item no.	85138042

Technical Data	**Band 1**	**Band 2**	**Band 3**	**Band 4**	**Band 5**
Frequency	1710 MHz – 1880 MHz	1850 MHz – 1990 MHz	1920 MHz – 2170 MHz	2300 MHz – 2400 MHz	2500 MHz – 2690 MHz
VSWR	1.5	1.5	1.5	1.5	1.5
Gain	14 dBi	14.2 dBi	14.5 dBi	14.9 dBi	15.2 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	6
Composite power max.	200 W
Polarization	±45°
Electrical Down tilt	2°, fixed

Mechanical data	
Dimensions (Height x Diameter)	700 mm × 200 mm
Weight	6.6 kg
Mast Dia	40 mm – 115 mm
Mechanical Downtilt	0 - 2°
Wind load	106.5 N at 150 km/h wind velocity
Wind Speed survival	216 km/h

Material data	
Radome colour	Grey
Radome material	ASA

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® Sector Multi Band



Product name	**SENCITY Sector Multi Band 6-Port Antenna**
Product ID.	**6P65T2T-1718V10**
Description	Multi Band 6-Port Antenna (690-960 /2x1695~2690MHz) • PIM better than -153 dBc (2x43 dBm) • Electrical Downtilt continuously adjustable • Mounting brackets are included
Item no.	85275786

Technical Data	**Band 1**	**Band 2**	**Band 3**	**Band 4**
Frequency	690-806 MHz	790-894 MHz	880-960 MHz	1695-1880 MHz
VSWR	1.5	1.5	1.5	1.5
Gain	16.3 dBi	16.9 dBi	17.2 dBi	17.3 dBi

Technical Data	**Band 5**	**Band 6**	**Band 7**	**Band 8**
Frequency	1850-1990 MHz	1920-2170 MHz	2300-2400 MHz	2500-2690 MHz
VSWR	1.5	1.5	1.5	1.5
Gain	17.6 dBi	17.8 dBi	18.1 dBi	18.3 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	6
Composite power max.	300 W
Polarization	±45°
Electrical Down tilt	0-10°

Mechanical data	
Dimensions (Height × Diameter)	2540 × 350 × 150mm
Weight	19.2 kg
Mast Dia	40 - 115 mm
Wind load	Front: 799.8 N @ 150km/h, lateral: 420.2 N at 150 km/h
Wind Speed survival	216 km/h

Material data	
Radome colour	Grey
Radome material	FRP

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® Sector Multi Band



Product name	**SENCITY Sector Multi Band 10-Port Antenna**
Product ID.	**10P65T4T-1718V10**
Description	Multi Band 10-Port Antenna (690-960 / 4×1695~2690MHz) • PIM better than -153 dBc (2×43 dBm) • Electrical Downtilt continuously adjustable • Mounting brackets are included
Item no.	85273158

Technical Data	**Band 1**	**Band 2**	**Band 3**	**Band 4**
Frequency	690-806 MHz	790-894 MHz	880-960 MHz	1695-1880 MHz
VSWR	1.5	1.5	1.5	1.5
Gain	16.3 dBi	16.9 dBi	17.2 dBi	16.9 dBi

Technical Data	**Band 5**	**Band 6**	**Band 7**	**Band 8**
Frequency	1850-1990 MHz	1920-2170 MHz	2300-2400 MHz	2500-2690 MHz
VSWR	1.5	1.5	1.5	1.5
Gain	17.1 dBi	17.3 dBi	17.9 dBi	18.1 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	10
Composite power max.	300 W
Polarization	±45°
Electrical Down tilt	0-10°

Mechanical data	
Dimensions (Height × Diameter)	2540 × 350 × 150mm
Weight	21.4 kg
Mast Dia	40 - 115 mm
Wind load	Front: 799.8N @150km/h, lateral: 420.2 N at 150 km/h
Wind Speed survival	216 km/h

Material data	
Radome colour	Grey
Radome material	FRP

Environmental data	
Operation temperature	-40°C ... 70°C

SENCITY® Sector Multi Band



Product name	**SENCITY Sector Multi Band 6-Port Antenna**
Product ID.	**2P65LT-16V1**
Description	Multi Band 2-Port Antenna(1×698~960MHz) • PIM better than -153 dBc (2×43 dBm) • Electrical Downtilt continuously adjustable • Mounting brackets are included
Item no.	85265277

Technical Data	**Band 1**	**Band 2**	**Band 3**	**Band 4**
Frequency	698-803 MHz	791-862 MHz	824-894 MHz	880-960 MHz
VSWR	1.5	1.5	1.5	1.5
Gain	15.6 dBi	15.9 dBi	16 dBi	16.2 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	2
Composite power max.	300 W
Polarization	±45°
Electrical Down tilt	0-10°

Mechanical data	
Dimensions (Height × Diameter)	1850 × 295 × 145mm
Weight	12 kg
Mast Dia	40 - 115 mm
Wind load	Front: 712 N @ 150km/h, lateral: 350 N at 150 km/h
Wind Speed survival	216 km/h

Material data	
Radome colour	Grey
Radome material	FRP

Environmental data	
Operation temperature	-40°C ... 70°C

SENCITY® Sector Multi Band



Product name	**SENCITY Sector Multi Band 2-Port Antenna**
Product ID.	**2P65HT-17**
Description	Multi Band 2-Port An tena(1×1695~2690MHz) • PIM better than -150 dBc (2×43 dBm) • Electrical Downtilt continuously adjustable • Mounting brackets are included
Item no.	85265281

Technical Data	**Band 1**	**Band 2**	**Band 3**	**Band 4**
Frequency	1695-1880 MHz	1920-2170 MHz	2300-2400 MHz	2500-2690 MHz
VSWR	1.5	1.5	1.5	1.5
Gain	15 dBi	15.8 dBi	16.5 dBi	16.6 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	2
Composite power max.	200 W
Polarization	±45°
Electrical Down tilt	0-10°

Mechanical data	
Dimensions (Height × Diameter)	1095 × 158 × 78mm
Weight	4 kg
Mast Dia	40 - 115 mm
Wind load	Front: 154.2 N @ 150km/h, lateral: 88.9 N at 150 km/h
Wind Speed survival	216 km/h

Material data	
Radome colour	Grey
Radome material	FRP

Environmental data	
Operation temperature	-40°C ... 70°C

SENCITY® Sector Multi Band Quasi Omni



Product name	**SENCITY Sector Multi Band Quasi Omni 2-Port Antenna**
Product ID.	**2P360LT-8T2**
Description	Multi Band 2-Port Antenna (1x698~960MHz) • 360° Horizontal Beam Width • PIM better than -150 dBc (2x43 dBm) • Mounting brackets are included
Item no.	85265278

Technical Data	**Band 1**	**Band 2**	**Band 3**
Frequency	698-806MHz	790-894MHz	880-960MHz
VSWR	1.5	1.5	1.5
Gain	7.6 dBi	7.9 dBi	8.2 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	2
Composite power max.	200 W
Polarization	±45°
Electrical Down tilt	2°, fixed

Mechanical data	
Dimensions (Height × Diameter)	850 × 250mm
Weight	12 kg
Mast Dia	40 - 115 mm
Wind load	Front: 161.4 N @ 150km/h
Wind Speed survival	216 km/h

Material data	
Radome colour	Grey
Radome material	FRP

Environmental data	
Operation temperature	-40°C ... 70°C

SENCITY® Sector Multi Band Quasi Omni



Product name	**SENCITY Sector Multi Band Quasi Omni 2-Port Antenna**
Product ID.	**2P360HT-12T2**
Description	Multi Band 2-Port Antenna(1×1695~2690MHz) • 360° Horizontal Beam Width • PIM better than -150 dBc (2×43 dBm) • Mounting brackets are included
Item no.	85265280

Technical Data	**Band 1**	**Band 2**	**Band 3**	**Band 4**	**Band 5**
Frequency	1710-1880 MHz	1850-1990 MHz	1920-2170 MHz	2300-2400 MHz	2500-2690MHz
VSWR	1.5	1.5	1.5	1.5	1.5
Gain	11.3 dBi	11.6 dBi	11.9 dBi	12.2 dBi	12.5 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	2
Composite power max.	200 W
Polarization	±45°
Electrical Down tilt	2°, fixed

Mechanical data	
Dimensions (Height × Diameter)	1060 × 200mm
Weight	10 kg
Mast Dia	40 - 80 mm
Wind load	Front: 157.8 N @ 150km/h
Wind Speed survival	216 km/h

Material data	
Radome colour	Grey
Radome material	FRP

Environmental data	
Operation temperature	-40°C ... 70°C

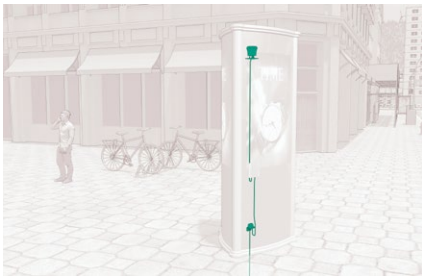
Small cell and Distributed Antenna System (DAS) antennas

In today's fast-paced world, increasing network capacity while reducing expenses is essential for the sustainability and growth of wireless communication infrastructure. By providing small cells and DAS antennas, we address key issues such as efficient use of power, optimal space utilization, and cost-effective network connections. This ensures that infrastructure providers can meet the increasing demand for high-speed, reliable wireless communication without incurring prohibitive costs. Our solutions make it feasible to deploy and maintain robust networks, ultimately benefiting both providers and end-users with improved connectivity and service quality. We provide solutions that fit various physical spaces, with simple installation processes and that enhance your overall network efficiency.

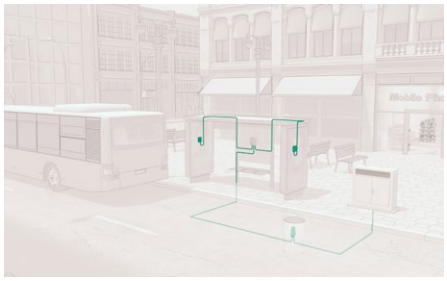


Street furniture

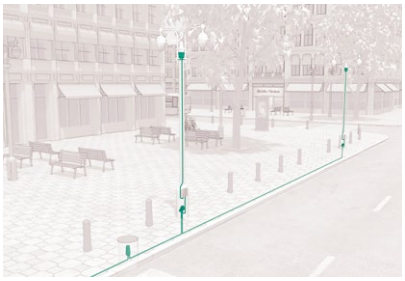
The most efficient way to deploy small cells is by utilizing preexisting assets. These assets are typically located close to people and are usually already connected to the power grid and communication network. Examples include advertising pillars, bus shelters, and street lights.



Adverstising pillar



Bus shelter

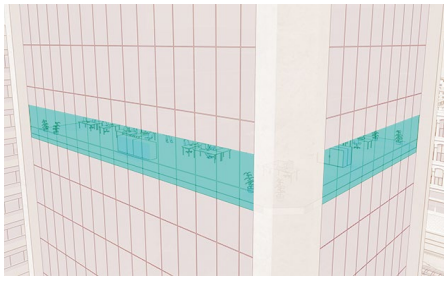


Street light

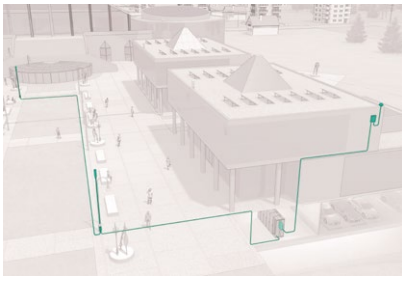
To increase indoor capacity and offload the macrocell network, in-building coverage requires appealing, easy-to-install solutions that can be seamlessly integrated into interior design.



Airport



In-building coverage



Campus

SENCITY® Occhio



Product name	**SENCITY Occhio**
Product ID.	**1399.32.0016**
Description	• Indoor omnidirectional antenna for 3G/4G and 5G mid bands • Supports MIMO 4×4 in the cellular bands from 1695 MHz till 6000 MHz • VSWR 1.5 in all bands with Vertical polarization • PIM better than -153 dBc at 2×43 dBm • Smart bracket system is included • Nex10 female connector
Item no.	85137888

Technical Data	**Band 1**	**Band 2**	**Band 3**	**Band 4**
Frequency	1695 MHz – 2690 MHz	3300 MHz – 4200 MHz	4500 MHz – 5000 MHz	5150 MHz – 6000 MHz
VSWR	1.5	1.5	1.5	1.5
Gain	4 dBi	4.5 dBi	6.5 dBi	6.5 dBi
Electrical Down tilt	2-14°	2-14°	0-10°	0-10°

Electrical data	
Impedance	50 Ω
Number of Ports	4
Composite power max.	38 W
Polarization	vertical

Mechanical data	
Dimensions (Height x Diameter)	32 mm × 200 mm
Weight	0.29 kg

Material data	
Radome colour	Grey
Radome material	ASA

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® Occhio



Product name	**SENCITY Occhio PLUS**
Product ID.	**1399.32.0020**
Description	• Indoor Omnidirectional antenna for 3G/4G/5G cellular bands • Supports MIMO 4×4 in the cellular bands from 617 MHz till 6000 MHz • Vertical polarization • PIM better than -153 dBc at 2×43 dBm • Smart bracket system is included • Nex10 female connector
Item no.	85189602

Technical Data	Band 1	Band 2	Band 3	Band 4	Band 5
Frequency	617 MHz × 960 MHz	1427 MHz × 1660 MHz	1695 MHz × 2690 MHz	3300 MHz × 4200 MHz	4500 MHz × 6000 MHz
VSWR	2	1.8	1.7	1.7	1.7
Gain	3 dBi	4 dBi	4 dBi	4 dBi	5 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	4
Composite power max.	16 W
Polarization	vertical

Mechanical data	
Dimensions (Height x Diameter)	45 mm × 275 mm
Weight	0.89 kg

Material data	
Radome colour	White
Radome material	PC (Polycarbonate)

Environmental data	
Operation temperature	-0°C – 55°C

SENCITY® Occhio



Product name	**SENCITY Occhio PLUS**
Product ID.	**1399.32.0021**
Description	• Indoor Omnidirectional antenna for 3G/4G/5G cellular bands • Supports MIMO 2×2 in the cellular bands from 617 MHz till 6000 MHz • Vertical polarization • PIM better than -153 dBc at 2×43 dBm • Smart bracket system is included • Nex10 female connector
Item no.	85200712

Technical Data	**Band 1**	**Band 2**	**Band 3**	**Band 4**	**Band 5**
Frequency	617 MHz – 960 MHz	1427 MHz – 1660 MHz	1695 MHz – 2690 MHz	3300 MHz – 4200 MHz	4500 MHz – 6000 MHz
VSWR	1.8	1.8	1.7	1.7	1.7
Gain	3 dBi	3 dBi	3 dBi	4 dBi	5 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	4
Composite power max.	16 W
Polarization	vertical

Mechanical data	
Dimensions (Height x Diameter)	45 mm × 275 mm
Weight	0.89 kg

Material data	
Radome colour	White
Radome material	PC (Polycarbonate)

Environmental data	
Operation temperature	-0°C – 55°C

SENCITY® Rondo



Product name	**SENCITY Rondo**
Product ID.	**1399.31.0007**
Description	• Indoor Omnidirectional antenna for 3G/4G/5G cellular bands • Supports MIMO 2×2 in the cellular bands from 617 MHz till 4200 MHz • Vertical polarization • PIM better than -153 dBc at 2×43 dBm • Ceiling flush mount installation • Plenum rated cable terminated with 4310 female connector
Item no.	85086028

Technical Data	Band 1	Band 2	Band 3	Band 4	Band 5	Band 6	Band 7	Band 8
Frequency	617 MHz × 698 MHz	698 MHz × 790 MHz	790 MHz × 960 MHz	1695 MHz – 2180 MHz	2180 MHz – 2400 MHz	2400 MHz – 2500 MHz	2500 MHz – 2690 MHz	3300 MHz – 4200 MHz
VSWR	1.8	1.9	2	1.6	1.6	1.5	1.5	2
Gain	2.5 dBi	3.5 dBi	4.5 dBi	5 dBi	6 dBi	6.5 dBi	6.5 dBi	5.5 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	2
Composite power max.	50 W
Polarization	vertical

Mechanical data	
Dimensions (Height x Diameter)	87 mm × 238 mm
Weight	0.82 kg

Material data	
Radome colour	White
Radome material	PC (Polycarbonate)

Environmental data	
Operation temperature	-45°C – 70°C

SENCITY® Urban



Product name	**SENCITY Urban 100**
Product ID.	**1399.17.0253**
Description	• Outodoor Omnidirectional antenna for 4G/5G mid cellular bands • Supports MIMO 2x2 in the cellular bands from 2500MHz till 4200 MHz • Vertical and horizontal polarization • PIM better than -150 dBc at 2x43 dBm • IP66 rating • Plenum rated cable terminated with N female connector
Item no.	85106726

Technical Data	**Band 1**	**Band 2**	**Band 3**
Frequency	2500 MHz ... 2690 MHz	3300 MHz ... 3800 MHz	3800 MHz ... 4200 MHz
VSWR	2	2	2
Gain	2 dBi	2.5 dBi	2.5 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	2
Composite power max.	100 W
Polarization	vertical

Mechanical data	
Dimensions (Height x Diameter)	96 mm x 117 mm
Weight	0.45 kg
Wind load	IEC 60721-3-3 with max wind speed 180Km/h

Material data	
Radome colour	RAL 7035 (light-grey)

Environmental data	
Operation temperature	-45°C – 70°C

SENCITY® Urban



Product name	**SENCITY Urban 200**
Product ID.	**1399.17.0250**
Description	• Outodoor Directional antenna for 4G/5G mid cellular bands • Supports MIMO 2 × 2 in the cellular bands from 1695 MHz till 4200 MHz • Gain of 5 dBi • Half power beamwidth of 110° (horizontal) and 65° (vertical) • Dual slant polarization • IP67 rating • PIM better than -150 dBc at 2 × 43 dBm • N female connector
Item no.	85110147

Technical Data	**Band 1**	**Band 2**	**Band 3**	**Band 4**	**Band 5**
Frequency	1695 MHz – 1920 MHz	1920 MHz – 2180 MHz	2300 MHz – 2690 MHz	3300 MHz – 3800 MHz	3800 MHz – 4200 MHz
VSWR	2	2	2	2	2
Gain	5.7 dBi	4.8 dBi	5 dBi	5.9 dBi	4.9 dBi
Composite power max.	125 W	125 W	110 W	95 W	90 W

Electrical data	
Impedance	50 Ω
Number of Ports	2
Polarization	Port 1: +45° slant Port 2: -45° slant

Mechanical data	
Dimensions (Height x Width x Depth)	184.8 mm x 164.6 mm × 84.2 mm
Weight	0.5 kg

Material data	
Radome colour	RAL 7035 (light-grey)
Radome material	PC (Polycarbonate)

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® Urban



Product name	**SENCITY Urban 200**
Product ID.	**1399.17.0248**
Description	• Outodoor Directional antenna for 4G/5G mid cellular bands • Supports MIMO 2 × 2 in the cellular bands from 1695 MHz till 4200 MHz • Gain of 7 dBi • Half power beamwidth of 70° (horizontal) and 60° (vertical) • Dual slant polarization • IP67 rating • PIM better than -150 dBc at 2 × 43 dBm • N female connector
Item no.	85110146

Technical Data	**Band 1**	**Band 2**	**Band 3**	**Band 4**	**Band 5**
Frequency	1695 MHz – 1920 MHz	1920 MHz – 2180 MHz	2300 MHz – 2690 MHz	3300 MHz – 3800 MHz	3800 MHz – 4200 MHz
VSWR	2	2	2	2	2
Gain	7.4 dBi	7.3 dBi	7.4 dBi	7.2 dBi	8.4 dBi
Composite power max.	125 W	125 W	110 W	95 W	90 W

Electrical data	
Impedance	50 Ω
Number of Ports	2
Polarization	Port 1: +45° slant Port 2: -45° slant

Mechanical data	
Dimensions (Height x Width x Depth)	184.8 mm × 164.6 mm × 84.2 mm
Weight	0.62 kg

Material data	
Radome colour	RAL 7035 (light-grey)
Radome material	PC (Polycarbonate)

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® Urban



Product name	**SENCITY Urban 200**
Product ID.	**1399.17.0272**
Description	• Outodoor Directional antenna for 5G mid cellular bands • Supports MIMO 4×4 in the cellular bands from 3300 MHz till 4200 MHz • Gain of 11 dBi • Half power beamwidth of 70° (horizontal) and 35° (vertical) • Dual slant polarization • IP67 rating • PIM better than -150 dBc at 2×43 dBm • N female connector
Item no.	85178889

Technical Data	**Band 1**	**Band 2**
Frequency	3300 MHz – 3800 MHz	3800 MHz – 4200 MHz
VSWR	1.8	1.8
Gain	11 dBi	11 dBi
Composite power max.	95 W	90 W

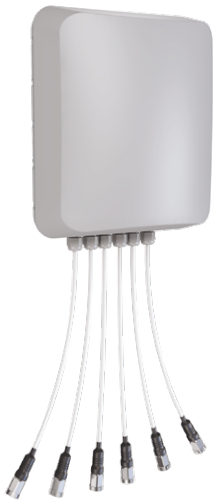
Electrical data	
Impedance	50 Ω
Number of Ports	4
Polarization	Port 1: -45° slant Port 2: +45° slant Port 3: -45° slant Port 4: +45° slant

Mechanical data	
Dimensions (Height x Width x Depth)	184.8 mm × 164.6 mm × 84.2 mm
Weight	0.59 kg

Material data	
Radome colour	RAL 7035 (light-grey)
Radome material	PC (Polycarbonate)

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® Urban



Product name	**SENCITY Urban 200**
Product ID.	**1399.31.0273**
Description	• Outodoor Directional antenna for 4G and 5G mid cellular bands • Supports MIMO 2×2 in 4G in the cellular bands from 1700 MHz till 2700 MHz • Supports MIMO 4×4 in 5G in the cellular bands from 3400 MHz till 4200 MHz • Gain of 7 dBi • Half power beamwidth of 80° (horizontal) and 85° (vertical) • Dual slant polarization • IP67 rating • PIM better than -150 dBc at 2×43 dBm • Plenum rated cable terminated with 4310 female connector
Item no.	85224309

Technical Data	Band 1	Band 2	Band 3	Band 4	Band 5
Frequency	1710 MHz – 1880 MHz	2500 MHz – 2700 MHz	2500 MHz – 2700 MHz	3400 MHz – 3600 MHz	3800 MHz – 4200 MHz
VSWR	2	1.5	1.9	1.5	1.6
Gain	7 dBi	7 dBi	6.5 dBi	6 dBi	5 dBi
Composite power max.	45 W	42 W	40 W	18 W	16 W

Electrical data	
Impedance	50 Ω
Number of Ports	6
Polarization	Port 1: +45° slant Port 2: -45° slant Port 3: +45° slant Port 4: -45° slant Port 5: +45° slant Port 6: -45° slant

Mechanical data	
Dimensions (Height x Width x Depth)	184.8 mm × 164.6 mm × 84.2 mm
Weight	0.8 kg

Material data	
Radome colour	RAL 7035 (light-grey)
Radome material	PC (Polycarbonate)

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® Urban



Product name	**SENCITY Urban 300**
Product ID.	**1399.31.0019**
Description	• Outodoor Directional antenna for 4G/ 5G cellular bands • Supports MIMO 2x2 in the cellular bands from 698 MHz till 4200 MHz • Gain of 7 dBi • Half power beamwidth of 65° (horizontal) and 65° (vertical) • Dual slant polarization • IP67 rating • PIM better than -150 dBc at 2x43 dBm • Plenum rated cable terminated with 4310 female connector
Item no.	85184287

Technical Data	**Band 1**	**Band 2**	**Band 3**
Frequency	698 MHz – 960 MHz	1695 MHz – 2700 MHz	3100 MHz – 4200 MHz
VSWR	1.8	1.7	1.6
Gain	5 dBi	7 dBi	6.5 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	2
Composite power max.	50 W
Polarization	Port 1: +45° slant Port 2: -45° slant

Mechanical data	
Dimensions (Height x Diameter)	260 mm × 200 mm × 90 mm
Weight	1.1 kg

Material data	
Radome colour	RAL 7035 (light-grey)
Radome material	PC (Polycarbonate)

Environmental data	
Operation temperature	-40°C – 70°C

SENCITY® OMNI



Product name	**SENCITY OMNI-M stick antenna**
Product ID.	**1399.17.0231**
Description	• Outodoor Omnidirectional stick antenna for 3G/4G cellular bands • Supports the cellular bands from 790 MHz till 2690 MHz • Gain of 3 dBi • PIM better than -143 dBc at 2×43 dBm • IP67 rating • N female connector
Item no.	85027954

Technical Data	**Band 1**	**Band 2**
Frequency	790 MHz – 960 MHz	1710 MHz – 2690 MHz
VSWR	2	1.9
Gain	2 dBi	3 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	1
Composite power max.	25
Polarization	vertical

Mechanical data	
Dimensions (Height x Diameter)	263 mm × 32 mm
Weight	0.4 kg

Material data	
Radome colour	RAL 9003 (signal white)
Radome material	Glass Fibre

Environmental data	
Operation temperature	-40°C – 85°C

SENCITY® OMNI



Product name	**SENCITY Omni-S Thimble**
Product ID.	**1399.17.0224**
Description	• Outodoor Omnidirectional compact broadband stick antenna for 4G/5G mid cellular bands and Wi-Fi 7 bands. • Supports the cellular bands from 1710 MHz till 7125 MHz • Gain of 3 dBi • IP69K rating • Direct mount on N type interface of wireless access points
Item no.	85012283

Technical Data	**Band 1**	**Band 2**	**Band 3**	**Band 4**	**Band 5**	**Band 6**
Frequency	1710 MHz – 2000 MHz	2000 MHz – 2700 MHz	2700 MHz – 4200 MHz	4900 MHz – 5150 MHz	5150 MHz – 5925 MHz	5925 MHz – 7125 MHz
VSWR	2	2	2	2	2	2
Gain	1.5 dBi	2 dBi	1.5 dBi	2.5 dBi	2.5 dBi	3 dBi

Electrical data	
Impedance	50 Ω
Number of Ports	1
Composite power max.	120 W
Polarization	vertical

Mechanical data	
Dimensions (Height × Diameter)	55 mm × 22 mm
Weight	0.05 kg

Material data	
Radome colour	RAL 7043 (dark grey)
Radome material	ASA (acrylic ester-styrene-acrylonitrile)

Environmental data	
Operation temperature	-40°C – 85°C



Critical Communication antennas

HUBER+SUHNER delivers robust and secure antenna solutions designed for critical communication where reliability is paramount.

Key features include coverage across TETRA, ultra-broadband, and professional LTE bands, enabling seamless integration of voice and data services.

Solutions tailored for emergency response and blue-light forces, guaranteeing dependable communication in both urban and rural areas, even where signal penetration and availability are limited.

Infrastructure that ensures secure, high-performance transmission for critical applications, providing reliable coverage when it matters most.

These systems empower organizations to maintain operational readiness and safety, combining mobility and resilience for demanding scenarios.



Omnidirectional antennas



Ordering information	**SENCITY® SC Omni-M**
	Rugged Omni antenna
Type no.	**1399.17.0338**
Frequency range	**380 – 7125 MHz**
Gain	**3 – 6.5 dBi**
Version	**N (female)**
Height	**60 mm**
Description	• For installation on outdoor cabinets • Supports TETRA with up to 2 radiators plus 2G/3G/4G/5G cellular bands • Low profile housing. Single hole mounting
Item no.	85185570

Electrical data per band	**Band 1**	**Band 2**	**Band 3**
Frequency	380 – 470 MHz	694 – 960 MHz	1710 – 2170 MHz
VSWR	2.5	2.1	2.1
Gain	3 dBi	4.5 dBi	5 dBi
Composite power max.	40 W	40 W	40 W
Port Isolation	3 dB	8 dB	15 dB
	Band 4	**Band 5**	**Band 6**
Frequency	2400 – 2690 MHz	3400 – 4200 MHz	4200 – 7125 MHz
VSWR	2.1	2.1	2.1
Gain	5 dBi	6 dBi	6.5 dBi
Composite power max.	40 W	30 W	25 W
Port Isolation	15 dB	20 dB	20 dB

Electrical data	
Impedance	50 Ohm
Ambient temperature	25 °C

Mechanical data	
Dimensions (height × diameter)	60 × 210 mm
Mounting breakthrough	Ø 30 mm
Weight	0.75 kg
Connector	2 × N (female)

Environmental data	
Environmental conditions	indoor/outdoor
RoHS 2011/65/EU	compliant

Material data	
Radome colour	grey
Radome material	PC (Polycarbonate)

Omnidirectional MIMO antenna



Ordering information	**SENCITY® SC OMNI-M antenna**
Type no.	**1399.17.0340**
Frequency range	**380 – 7125 MHz**
Gain	**2 – 6 dBi**
Version	**N (female)**
Height	**60 mm**
Description	• Rugged omni-directional antenna for installation on outdoor cabinets • Supports TETRA, LTE450, 2G/3G/4G/5G cellular, Wifi 2.4/5 GHz, Wifi 6E • 4 separate ports for 2x2 TETRA/cellular MIMO and 2x2 Wifi MIMO • Meets ETSI 300 019-1-4 class 4.1E • Low profile housing, single hole mounting, easy cabling feedthrough
Item no.	85185573

Electrical data per band	**Band 1**	**Band 2**	**Band 3**	**Band 4**
Name	TETRA/LTE450	Cellular	Cellular	Cellular
Frequency	380 – 470 MHz	694 – 960 MHz	1350 – 2700 MHz	3300 – 4200 MHz
VSWR	2.5	2	2	2
Gain	3 dBi	2 dBi	4 dBi	4 dBi
Port isolation (dB)	3 dBi	8 dBi	15 dBi	20 dBi
Composite power max.	40 W	40 W	40 W	40 W
	Band 5	**Band 6**	**Band 7**	
Name	Cellular	Wi-Fi	Wi-Fi	
Frequency	4900 – 7125 MHz	2400 – 2500 MHz	4900 – 7125 MHz	
VSWR	2	2	2	
Gain	5 dBi	6 dBi	6 dBi	
Port isolation (dB)	20 dBi	20 dBi	20 dBi	
Composite power max.	40 W	30 W	30 W	

Electrical data	
Impedance	50 Ohm
Ambient temperature	25 °C

Mechanical data	
Dimensions (height × diameter)	60 × 210 mm
Weight	1.1 kg
Connector	4 × N (female)

Environmental data	
Environmental conditions	outdoor
IP rating	IP68, IP69k
RoHS 2011/65/EU	compliant

Material data	
Radome colour	RAL 7044 (light grey)
Base material	Aluminum
Radome material	PC (Polycarbonate)

Full portfolio of types see page XX

SENCITY® SC Omni-M portfolio

The SENCITY® SC Omni-M portfolio is designed for 2×2, 3×3 or 4×4 MIMO operation in cellular and Wi-Fi applications and in addition comes with SISO or 2×2 TETRA/LTE450 options. It offers a variety of combinations of up to 9 radiators within one housing and comes with an GNSS option for L1, L2, L5 operation.

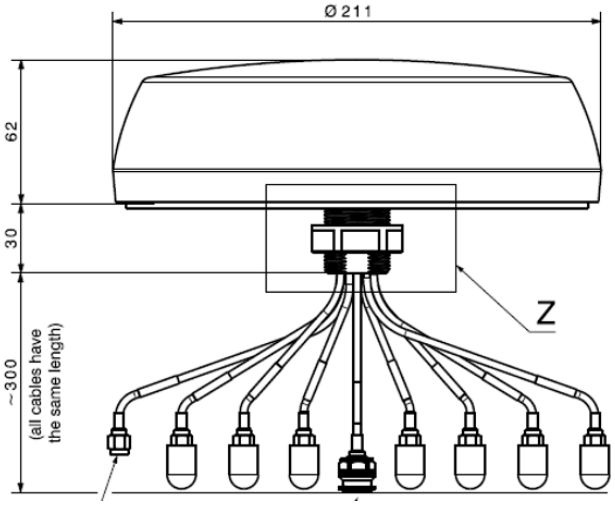
For all versions is applicable:

- Frequency Range 380 – 7125 MHz
- Cable length 500 mm
- Connector Type TNC (GNSS)
- Connector Type N (all others)
- Radome colour RAL 7044 (light grey)

The standard versions are listed below:

No of ports				Product ID	Item No
Tetra, CDMA/ LTE410/450	Cellular & Wi-Fi	GNSS (L1)	GNSS (L1+L2+L5)		
380 – 470MHz	694 – 7125 MHz	1559 – 1610 MHz	1164 – 1279 MHz & 1559 – 1610 MHz		
1		0	0	1399.17.0330	85185546
1		0	1	1399.99.0331	85185549
1		1	0	1399.99.0330	85185551
1	2	0	0	1399.17.0332	85185553
1	2	0	1	1399.99.0333	85185555
1	2	1	0	1399.99.0332	85185556
1	3	0	0	1399.17.0334	85185558
1	3	0	1	1399.99.0335	85185561
1	3	1	0	1399.99.0334	85185563
1	4	0	0	1399.17.0336	85185565
1	4	0	1	1399.99.0337	85185568
1	4	1	0	1399.99.0336	85185569
2		0	0	1399.17.0338	85185570
2		0	1	1399.99.0339	85185571
2		1	0	1399.99.0338	85185572
2	2	0	0	1399.17.0340	85185573
2	2	0	1	1399.99.0341	85185574
2	2	1	0	1399.99.0340	85185575
2	3	0	0	1399.17.0342	85192514
2	3	0	1	1399.99.0343	85192515
2	3	1	0	1399.99.0342	85192516
2	4	0	0	1399.17.0344	85192517
2	4	0	1	1399.99.0345	85192518
2	4	1	0	1399.99.0344	85192520

Outline drawing and mounting instruction are the same for every antenna.





Indoor omnidirectional antennas



Ordering information	**SENCITY® SC Indoor**
	V-Pol Indoor Omni antenna
Type no.: Version	**92210001: N (female)**
Item no.	84467570
	92210002: 4.3-10 (female)
Item no.	84467568
Frequency range	**380 – 6000 MHz multi-band**
Gain	**1 – 6 dBi**
Height	**189.8 mm**

Electrical data per band	**Band 1**	**Band 2**	**Band 3**	**Band 4**
Frequency	380 – 806 MHz	806 – 960 MHz	1395 – 1432 MHz	1710 – 2170 MHz
VSWR	2.5	2	2	2
Gain	2 dBi	4 dBi	5 dBi	5 dBi
	Band 5	**Band 6**	**Band 7**	
Frequency	2300 – 2500 MHz	3300 – 3700 MHz	4900 – 6000 MHz	
VSWR	2	1.9	1.9	
Gain	5 dBi	5 dBi	6 dBi	

Electrical data	
Impedance	50 Ohm
Composite power max.	50 W
Ambient temperature	50 °C
IMD level	–155 dBc at 2 × 20 dBm

Mechanical data	
Dimensions (height × diameter)	189.8 × 274.1 mm
Weight	0.55 kg
Connector	92210001: 1 × N (female) 92210002: 1 × 4.3-10 (female)

Environmental data	
Environmental conditions	indoor
RoHS 2011/65/EU	compliant
Flammability	UL94
WEEE 2012/19/EU	no special marking needed
REACH 2006/1907/EC	compliant

Material data	
Radome material	UV protected polycarbonate
Colour	white
Back plane	aluminum protected through chemical passivation

Omnidirectional antennas



Ordering information	**SENCITY® SC Omni**
	V-Pol Omni antenna
Type no.	**92210003**
Frequency range	**380 – 3800 MHz**
Gain	**3 – 8.5 dBi**
Version	**4.3-10 (female)**
Height	**540 mm**
Description	Small ground plane and excellent coverage
Item no.	84467565

Electrical data per band	**Band 1**	**Band 2**	**Band 3**	**Band 4**
Frequency	380 – 400 MHz	400 – 450 MHz	450 – 470 MHz	694 – 746 MHz
Gain	3 dBi	4 dBi	5 dBi	6 dBi
	Band 5	**Band 6**	**Band 7**	
Frequency	746 – 960 MHz	1200 – 2700 MHz	3300 – 3800 MHz	
Gain	7 dBi	8 dBi	8.5 dBi	

Electrical data	
VSWR	1.7
Impedance	50 Ohm
Composite power max.	50 W
Ambient temperature	50 °C
IMD level	–150 dBc at 2 × 43 dBm

Mechanical data	
Dimensions (height × diameter)	540 × 60 mm
Weight	0.5 kg
Connector	1 × 4.3-10 (female)

Environmental data	
Environmental conditions	outdoor
RoHS 2011/65/EU	compliant

Material data	
Base material	weather-proof aluminum
Radome material	UV protected plastic

Conventional cell site solutions



Work together with an expert for wireless connectivity solutions

Flexibility for your network architecture

One stop shop
Wireless infrastructure implies different technologies as radio frequency and fiber optics. HUBER+SUHNER copes with fiber optic and radio frequency and has for each application the suitable solution at hand. One stop shop reduces complexity for the purchaser and opens up additional economic potential.

Reduced operational costs

Performance
We constantly strive to optimise our products and pay special attention to the robustness of our RF components in order to guarantee a high electrical and mechanical reliability. Higher network efficiency and less maintenance leads to lower operational costs.

Expertise at your service

Local support
The successful deployment of wireless infrastructure requires strong local engineering and implementations capabilities. HUBER+SUHNER is close to the customer and provides local sales and engineering support.





LISCA – RF jumpers



LISCA cable assemblies are specially developed for applications where low VSWR and low attenuation combined with low intermodulaiton products are required. The excellent performance is achieved by utilising corrugated cables with low intermodulation connectors and a controlled assembly process with HUBER+SUHNER solder technology.

LISCA jumpers are factory-made cable assemblies and can be ordered in different lengths.
A hot-polyamide moulding between connector and cable jacket guarantees highest stability and tightness.

Benefits

RoHS compliant (2011/65/EU)

Wide variety of corrugated cable and connector types

Standard products as well as customised assemblies with special lengths and markings according to customer specifications

High volume capacity thanks to standard assembly processing at all main HUBER+SUHNER production sites worldwide

LISCA – RF jumpers

Standard LISCA assemblies

These assemblies are produced under stringent quality manu-facturing standards in order to achieve consistent high performance. All standard products are based on SUCOFEED cables with black PE jacket material. The assemblies are 100 % tested for attenuation and return loss according to the technical data. These LISCA products are factory-made cable assemblies and can only be ordered in predetermined lengths.

Features of standard LISCA



Excellent RF performance
High RF shielding efficiency
Low attenuation
Moisture protection IP68High flexibility and small bending radius
Low, stable intermodulation products

Customised LISCA assemblies

Strenghts of HUBER+SUHNER also include the production of products according to customer specifications. This product line offers additional possibilities for demanding customer wishes based on the LISCA standard requirements, like improved return loss values, even better IM performance, customised labelling or assembly lengths up to 150 m.

Additional features

Improved return loss values
  – Example: better –28 dB at 2.2 GHz with straight N, 4.3-10 or DIN 7/16 connectors
100 % factory tested products for intermodulation
  – Example: max. –155 dBc at 1.8 GHz with 2 × 20 W carriers
Factory tested products on phase length/tolerance and delay time
Specified for frequencies up to 6 GHz
Customised marking, labelling and product packaging
Special connector designs
Products with lengths up to 120 m ibility for your network architecture



LISCA – RF jumpers

Assembly performance code

Performance code		LIS...-52		LIS...-53	LIS...-71	LIS...-81	LIS...-01
Description		**LTE***		**Cluster Jumper**	**USA**[1]	**Test leads**	**Customer specific**
Impedance		50 Ω		50 Ω	50 Ω	50 Ω	50 Ω
Frequency (max. operating)		6 GHz	6 GHz	6 GHz	6 GHz	6 GHz	6 GHz
Length of assemblies		≤ 5 m	≤ 12 m	≤ 5 m	≤ 5 m	≤ 5 m	≤ 120 m
Return loss	DC to 1.0 GHz > 1.0 to 2.2 GHz > 2.2 to 2.7 GHz > 2.7 to 4.0 GHz > 4.0 to 6.0 GHz	≥ 29 dB ≥ 27 dB ≥ 25 dB ≥ 22 dB –	≥ 26 dB ≥ 24 dB ≥ 22 dB ≥ 20 dB –	≥ 28 dB ≥ 27 dB ≥ 25 dB ≥ 21 dB ≥ 18 dB	≥ 28 dB ≥ 26 dB – ≥ 22 dB –	≥ 24 dB ≥ 24 dB – – –	open
Intermodulation	IM3 (2 × 20 W)	–160 dBc –163 dBc (typical)			–160 dBc	–165 dBc QN: –155 dBc	open
RF power	see cable specification						
Attenuation	see cable specification						

LTE = Long Term Evolution
[1] special marking on cable

Assembly performance code

Connector pattern		Cable		Connector series									
				DIN 7/16	**4.1-9.5 Mini DIN**	**N**	**QN**	**4.3-10 jack (f)**	**4.3-10 plug (m)**			**MQ4/MQ5**	
	pattern code		**cable/ connector codes**	**716**	**4195**	**N**	**QN**	**4310**	**431X** [1]	**431Y** [2]	**431Z** [3]	**MQ4**[1]	**MQ5X**[1]
Straight plug (male)	**11**	1/4" HF 3/8" HF 1/2" HF 1/2	**C5** **C7** **C9** **C12**	● ● ● ●	– – ● ●	● ● ● ●	● ● ● ●	n/a	● ● ● ●	– ● ● ●	● ● ● ●	● – – –	● – – –
Right angle plug (male)	**16**	1/4" HF 3/8" HF 1/2" HF 1/2	**C5** **C7** **C9** **C12**	● ● ● ●	– – ● –	● ● ● ●	● ● ● –	n/a	● ● ● –	– – – –	● ● ● –	– – – –	– – – –
Straigh jack (female)	**21**	1/4" HF 3/8" HF 1/2" HF 1/2	**C5** **C7** **C9** **C12**	● ● ● ●	– – – –	● ● ● ●	– – – –	● ● ● ●	– – – –	– – – –	– – – –	– – – –	– – – –

[1] screw type
[2] hand screw type
[3] push-pull type

LISCA – RF jumpers

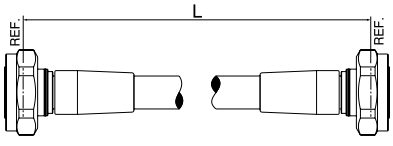
Order number for standard LISCA

			Example:	LIS	-	C9	F	-	11	431X	-	11	-	431X	-	02000	-	52
			Product family															
Sucofeed_1/4_HF		C5																
Sucofeed_3/8_HF		C7																
Sucofeed_1/2_HF		C9	Cable type															
Sucofeed_1/2		C12																
Flame retardant: F	PE: no indication																	
Straight male		11	Pattern of connector						1									
Right angle male		16																
Straight female		21	Pattern of connector									2						
7/16		716	Connector interface							1				2				
7/16	with IP-boot	716B																
4.1-9.5		4195																
MQ4 plug (m)	screw type	MQ4X																
MQ5 plug (m)	screw type	MQ5X																
N		N																
N	with IP-boot	NB																
4.3-10 jack (f)		4310																
4.3-10 plug (m)	screw type	431X																
4.3-10 plug (m)	screw type with IP-boot	43XB																
4.3-10 plug (m)	hand screw type	431Y																
NEX10® plug (m)	screw type	NXX																
NEX10® plug (m)	screw type with IP-boot	NXXB																
			Assembly length in mm															
Jumper performance code	example: 52		Technical design and performence															

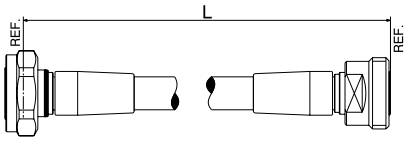
Rules for connector 1 and connector 2 description

1. For interface 1 and interface 2: numerical code before letter code (e.g. 716 befor N).
2. For connector 1 use lower pattern code (e.g. 11 or 16 if pattern of connector 2 is 21).
3. If both connectors are of right angle, additional information about alignment is required.

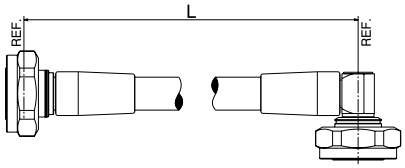
Assembly length: tolerance ± 1 %



Plug to plug



Plug to jack



Plug to right angle plug

UWP – Universal Weather Protection



The Universal Weather Protection boot from HUBER+SUHNER offers protection for RF connector systems against weather, contamination and corrosion. The most common application involves jumpers installed between antennas and remote radio heads which go through extreme outdoor weather conditions. As compared to tape or boot solutions often requiring tools, the UWP offers an easy to use, reliable and multi cable compatibility in terms of jumper suppliers and cable sizes. Additionally the protection boot is reusable, i.e., in case of network upgrades it can be removed from existing cables and installed on to the new ones.

Universal boot solution for field terminated, factory assembled (Lisca) and existing jumpers For field terminated and factory assembled jumper applications, the boot can be easily installed before terminating the connector on to the cable. The installation of boot is fast and easy.

For applications where customers have existing jumpers on site without boot protection, UWP helps to use the same jumpers by simply sliding the boot over the connectors without any tools and giving full IP68 boot protection.

UWP – Universal Weather Protection



Features

- Multi cable brand and size compatible (1/2" and 1/2“ flex)
- Fast and easy installation
- No tools or lubricants required
- Reusable
- Waterproof IP68
- UV resistant

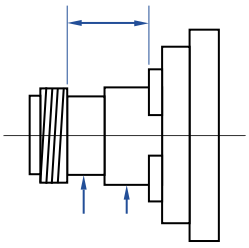
Specifications

Environmental data	
Operating temperature (°C)	–65 to +85
Installation temperature (°C)	–25 to +60
Storage temperature (°C)	–70 to +85
Waterproof degree	IP68 (1 m, 24 hrs, 20 °C)
2011/65/EU (RoHS)	compliant
UV resistance	yes
Flame resistance	UL94- HB

Material data	
Material	Silicon/black
Number of operations	20 matings of boot 2 installations over the connector through back end of boot

Order information

Part number*	**Connector type**	**Min. neck length „A“ (mm)**	**Min.-Max. diameter „B“ (mm)**	**Min.-Max. diameter „C“ (mm)**	**Weight (g)**
62_4310-U0-0-6	4.3-10	14	17 to 19	19 to 21	50.5
62_N-U0-0-20	N	14	13 to 18	N/A	51.1
62_716-U0-0-6	7/16	13	25 to 27	N/A	76.1



SUCOFEED – corrugated cables



HUBER+SUHNER SUCOFEED product range of foam corrugated coaxial cables with suitable stripping tools. The cables have excellent electrical, mechanical and environmental properties for indoor as well as outdoor installations.

The cables promise optimal shielding, low attenuation, low VSWR, remarkable intermodulation performance and flexibility for handling and installation on sites.

SUCOFEED cables are available as made from copper as well as from aluminium. For the US IBC market plenum rated „h" cable is part of our corrugated cable proposition.

Features

- Low IM distortion levels
- Low loss
- Flame retardant designs available
- High power capability
- High shielding effectiveness
- UV resistant
- Guaranteed performance up to 3 GHz

Benefits

- High efficient signal distribution
- Excellent for multi-operator DAS
- Economic high performance solution if assembled with Quick-Fit connectors

SUCOFEED – corrugated cables

1/4" high-flex



Cable design	Order/type no.	SUCOFEED_1/4_HF	SUCOFEED_1/4_HF_FR
	Dimension	1/4" high-flex	1/4" high-flex
	Jacket version	Standard	Flame retardant
Inner conductor	Ø in mm	1.90	1.90
Dielectric	Ø in mm	4.60	4.60
Outer conductor	Ø in mm	6.40	6.40
Jacket	Ø in mm	7.60	7.60

Electrical data			
Typ. operating frequency	GHz	≤ 18	≤ 18
Impedance	Ω	50 ± 1	50 ± 1
Capacitance	pF/m	79.7	79.7
Relative signal propagation	%	83.5	83.5
Signal delay	ns/m	4.00	4.00
Max. operating voltage	kVrms	0.6	0.6
Typ. attenuation at 1 GHz	dB/100 m	19.54	19.54
Typ. attenuation at 2 GHz	dB/100 m	28.45	28.45
Typ. attenuation at 2.2 GHz	dB/100 m	29.98	29.98
Typ. attenuation at 2.5 GHz	dB/100 m	32.17	32.17
Typ. attenuation at 3.0 GHz	dB/100 m	35.60	35.60
Max. power at 1 GHz (40 °C)	kW	≤ 0.290	≤ 0.290
Max. power at 2 GHz (40 °C)	kW	≤ 0.205	≤ 0.205
Max. power at 2.2 GHz (40 °C)	kW	≤ 0.196	≤ 0.196
Max. power at 2.5 GHz (40 °C)	kW	≤ 0.183	≤ 0.183
Max. power at 3.0 GHz (40 °C)	kW	≤ 0.167	≤ 0.167

General data			
Temp. range operating	°C	–55/+85	–40/+85
Temp. range installation	°C	–25/+60	–25/+60
Typ. weight	kg/100 m	7.5	8.7
Min. bending radius	mm	25	25

For detailed data sheets please go to www.hubersuhner.com and then search for type „SUCOFEED“.

SUCOFEED – corrugated cables

3/8" high-flex



Cable design	Order/type no.	SUCOFEED_3/8_HF	SUCOFEED_3/8_HF_FR
	Dimension	3/8" high-flex	3/8" high-flex
	Jacket version	Standard	Flame retardant
Inner conductor	Ø in mm	2.80	2.80
Dielectric	Ø in mm	7.00	7.00
Outer conductor	Ø in mm	9.50	9.50
Jacket	Ø in mm	10.80	10.80

Electrical data			
Typ. operating frequency	GHz	≤ 12	≤ 12
Impedance	Ω	50 ± 1	50 ± 1
Capacitance	pF/m	79.5	79.5
Relative signal propagation	%	83	83
Signal delay	ns/m	4.00	4.00
Max. operating voltage	kVrms	0.9	0.9
Typ. attenuation at 1 GHz	dB/100 m	13.33	13.33
Typ. attenuation at 2 GHz	dB/100 m	19.43	19.43
Typ. attenuation at 2.2 GHz	dB/100 m	20.48	20.48
Typ. attenuation at 2.5 GHz	dB/100 m	21.99	21.99
Typ. attenuation at 3.0 GHz	dB/100 m	24.34	24.34
Max. power at 1 GHz (40 °C)	kW	≤ 0.540	≤ 0.540
Max. power at 2 GHz (40 °C)	kW	≤ 0.382	≤ 0.382
Max. power at 2.2 GHz (40 °C)	kW	≤ 0.364	≤ 0.364
Max. power at 2.5 GHz (40 °C)	kW	≤ 0.342	≤ 0.342
Max. power at 3.0 GHz (40 °C)	kW	≤ 0.312	≤ 0.312

General data			
Temp. range operating	°C	–55/+85	–40/+85
Temp. range installation	°C	–25/+60	–25/+60
Typ. weight	kg/100 m	12.2	13.2
Min. bending radius	mm	25	25

For detailed data sheets please go to www.hubersuhner.com and then search for type „SUCOFEED“.

SUCOFEED – corrugated cables

1/2" high-flex



Cable design	Order/type no.	SUCOFEED_1/2_HF	SUCOFEED_1/2_HF_FR
	Dimension	1/2" high-flex	1/2" high-flex
	Jacket version	Standard	Flame retardant
Inner conductor	Ø in mm	3.60	3.60
Dielectric	Ø in mm	9.0	9.0
Outer conductor	Ø in mm	12.20	12.20
Jacket	Ø in mm	13.40	13.40

Electrical data			
Typ. operating frequency	GHz	≤ 10	≤ 10
Impedance	Ω	50 ± 1	50 ± 1
Capacitance	pF/m	80.3	80.3
Relative signal propagation	%	81	81
Signal delay	ns/m	4.00	4.00
Max. operating voltage	kVrms	1.27	1.27
Typ. attenuation at 1 GHz	dB/100 m	11.77	11.77
Typ. attenuation at 2 GHz	dB/100 m	17.48	17.48
Typ. attenuation at 2.2 GHz	dB/100 m	18.48	18.48
Typ. attenuation at 2.5 GHz	dB/100 m	19.92	19.92
Typ. attenuation at 3.0 GHz	dB/100 m	22.19	22.19
Max. power at 1 GHz (40 °C)	kW	≤ 0.83	≤ 0.83
Max. power at 2 GHz (40 °C)	kW	≤ 0.587	≤ 0.587
Max. power at 2.2 GHz (40 °C)	kW	≤ 0.56	≤ 0.56
Max. power at 2.5 GHz (40 °C)	kW	≤ 0.525	≤ 0.525
Max. power at 3.0 GHz (40 °C)	kW	≤ 0.479	≤ 0.479

General data			
Temp. range operating	°C	–55/+85	–40/+85
Temp. range installation	°C	–25/+60	–25/+60
Typ. weight	kg/100 m	20	20
Min. bending radius	mm	25	25

For detailed data sheets please go to www.hubersuhner.com and then search for type „SUCOFEED“.

SUCOFEED – corrugated cables

1/2" annular



Cable design	Order/type no.	SUCOFEED_1/2	SUCOFEED_1/2_FR
	Dimension	1/2"	1/2"
	Jacket version	Standard	Flame retardant
Inner conductor	Ø in mm	4.80	4.80
Dielectric	Ø in mm	12.10	12.10
Outer conductor	Ø in mm	13.80	13.80
Jacket	Ø in mm	15.90	15.90

Electrical data			
Typ. operating frequency	GHz	≤ 8	≤ 8
Impedance	Ω	50 ± 1	50 ± 1
Capacitance	pF/m	75.9	75.9
Relative signal propagation	%	88	88
Signal delay	ns/m	3.80	3.80
Max. operating voltage	kVrms	1.60	1.60
Typ. attenuation at 1 GHz	dB/100 m	7.29	7.29
Typ. attenuation at 2 GHz	dB/100 m	10.62	10.62
Typ. attenuation at 2.2 GHz	dB/100 m	11.20	11.20
Typ. attenuation at 2.5 GHz	dB/100 m	12.02	12.02
Typ. attenuation at 3.0 GHz	dB/100 m	13.31	13.31
Max. power at 1 GHz (40 °C)	kW	≤ 1.040	≤ 1.040
Max. power at 2 GHz (40 °C)	kW	≤ 0.735	≤ 0.735
Max. power at 2.2 GHz (40 °C)	kW	≤ 0.701	≤ 0.701
Max. power at 2.5 GHz (40 °C)	kW	≤ 0.658	≤ 0.658
Max. power at 3.0 GHz (40 °C)	kW	≤ 0.600	≤ 0.600

General data			
Temp. range operating	°C	–55/+85	–40/+85
Temp. range installation	°C	–25/+60	–25/+60
Typ. weight	kg/100 m	25.0	27.6
Min. bending radius	mm	70	70

For detailed data sheets please go to www.hubersuhner.com and then search for type „SUCOFEED“.

SUCOFEED – corrugated cables

7/8" high-flex and annular





Cable design	Order/type no.	SUCOFEED_7/8_HF	SUCOFEED_7/8
	Dimension	7/8" high-flex	7/8"
	Jacket version	Standard	Flame retardant
Inner conductor	Ø in mm	9.40	9.00
Dielectric	Ø in mm	22.40	22.30
Outer conductor	Ø in mm	25.00	24.80
Jacket	Ø in mm	27.50	27.60

Electrical data			
Typ. operating frequency	GHz	≤ 4.9	≤ 5
Impedance	Ω	50 ± 1	50 ± 1
Capacitance	pF/m	75.4	75.8
Relative signal propagation	%	85	88
Signal delay	ns/m	3.90	3.80
Max. operating voltage	kVrms	3.00	2.91
Typ. attenuation at 1 GHz	dB/100 m	4.25	4.11
Typ. attenuation at 2 GHz	dB/100 m	6.42	6.11
Typ. attenuation at 2.2 GHz	dB/100 m	6.81	6.46
Typ. attenuation at 2.5 GHz	dB/100 m	7.37	6.96
Typ. attenuation at 3.0 GHz	dB/100 m	8.26	7.76
Max. power at 1 GHz (40 °C)	kW	≤ 1.940	≤ 2.190
Max. power at 2 GHz (40 °C)	kW	≤ 1.372	≤ 1.549
Max. power at 2.2 GHz (40 °C)	kW	≤ 1.308	≤ 1.476
Max. power at 2.5 GHz (40 °C)	kW	≤ 1.227	≤ 1.385
Max. power at 3.0 GHz (40 °C)	kW	≤ 1.120	≤ 1.264

General data			
Temp. range operating	°C	–55/+85	–40/+85
Temp. range installation	°C	–25/+60	–25/+60
Typ. weight	kg/100 m	48.0	53
Min. bending radius	mm	90	120

For detailed data sheets please go to www.hubersuhner.com and then search for type „SUCOFEED“.

SUCOFEED – corrugated cables

7/8" annular





Cable design	Order/type no.	SUCOFEED_7/8_FR	SUCOFEED_7/8_LA	SUCOFEED_7/8_LA_FR
	Dimension	7/8"	7/8" low attenuation	7/8" low attenuation
	Jacket version	Flame retardant	Standard	Flame retardant
Inner conductor	Ø in mm	9.00	9.50	9.50
Dielectric	Ø in mm	22.30	22.70	22.70
Outer conductor	Ø in mm	24.80	25.40	25.40
Jacket	Ø in mm	27.60	27.90	27.90

Electrical data				
Typ. operating frequency	GHz	≤ 5	≤ 5.0	≤ 5.0
Impedance	Ω	50 ± 1	50 ± 1	50 ± 1
Capacitance	pF/m	75.8	73.8	73.8
Relative signal propagation	%	88	90.3	90.3
Signal delay	ns/m	3.80	3.70	3.70
Max. operating voltage	kVrms	2.91	3.00	3.00
Typ. attenuation at 1 GHz	dB/100 m	4.11	3.76	3.76
Typ. attenuation at 2 GHz	dB/100 m	6.11	5.53	5.53
Typ. attenuation at 2.2 GHz	dB/100 m	6.46	5.83	5.83
Typ. attenuation at 2.5 GHz	dB/100 m	6.96	6.28	6.28
Typ. attenuation at 3.0 GHz	dB/100 m	7.76	6.97	6.97
Max. power at 1 GHz (40 °C)	kW	≤ 2.190	≤ 2.440	≤ 2.440
Max. power at 2 GHz (40 °C)	kW	≤ 1.549	≤ 1.725	≤ 1.725
Max. power at 2.2 GHz (40 °C)	kW	≤ 1.476	≤ 1.645	≤ 1.645
Max. power at 2.5 GHz (40 °C)	kW	≤ 1.385	≤ 1.543	≤ 1.543
Max. power at 3.0 GHz (40 °C)	kW	≤ 1.264	≤ 1.409	≤ 1.409

General data				
Temp. range operating	°C	–40/+85	–55/+85	–40/+85
Temp. range installation	°C	–25/+60	–25/+60	–25/+60
Typ. weight	kg/100 m	65.0	48	52
Min. bending radius	mm	120	120	120

For detailed data sheets please go to www.hubersuhner.com and then search for type „SUCOFEED“.

SUCOFEED – corrugated cables

1 1/4" annular



Cable design	Order/type no.	SUCOFEED_1 _1/4	SUCOFEED_1 _1/4_FR
	Dimension	1 _1/4"	1 _1/4“
	Jacket version	Standard	Flame retardant
Inner conductor	Ø in mm	13.10	13.10
Dielectric	Ø in mm	32.40	32.40
Outer conductor	Ø in mm	35.80	35.80
Jacket	Ø in mm	39.50	39.50

Electrical data			
Typ. operating frequency	GHz	≤ 3	≤ 3
Impedance	Ω	50 ± 1	50 ± 1
Capacitance	pF/m	76.5	76.5
Relative signal propagation	%	88	88
Signal delay	ns/m	3.80	3.80
Max. operating voltage	kVrms	4.20	4.20
Typ. attenuation at 1 GHz	dB/100 m	2.94	2.94
Typ. attenuation at 2 GHz	dB/100 m	4.43	4.43
Typ. attenuation at 2.2 GHz	dB/100 m	4.69	4.69
Typ. attenuation at 2.5 GHz	dB/100 m	5.08	5.08
Typ. attenuation at 3.0 GHz	dB/100 m	5.68	5.68
Max. power at 1 GHz (40 °C)	kW	≤ 3.120	≤ 3.120
Max. power at 2 GHz (40 °C)	kW	≤ 2.206	≤ 2.206
Max. power at 2.2 GHz (40 °C)	kW	≤ 2.104	≤ 2.104
Max. power at 2.5 GHz (40 °C)	kW	≤ 1.973	≤ 1.973
Max. power at 3.0 GHz (40 °C)	kW	≤ 1.801	≤ 1.801

General data			
Temp. range operating	°C	–55/+85	–40/+85
Temp. range installation	°C	–25/+60	–25/+60
Typ. weight	kg/100 m	92	110.0
Min. bending radius	mm	200	200

For detailed data sheets please go to www.hubersuhner.com and then search for type „SUCOFEED“.

SUCOFEED – corrugated cables

1 5/8" annular



Cable design	Order/type no.	SUCOFEED_1_5/8_LA	SUCOFEED_1_5/8_LA_FR
	Dimension	1 5/8" low attenuation	1 5/8" low attenuation
	Jacket version	standard	flame retardant
Inner conductor	Ø in mm	17.60	17.60
Dielectric	Ø in mm	41.00	41.00
Outer conductor	Ø in mm	46.50	46.50
Jacket	Ø in mm	50.30	50.30

Electrical data			
Typ. operating frequency	GHz	≤ 2.75	≤ 2.75
Impedance	Ω	50 ± 1	50 ± 1
Capacitance	pF/m	72.50	72.50
Relative signal propagation	%	92	92
Signal delay	ns/m	3.80	3.80
Max. operating voltage	kVrms	5.50	5.50
Typ. attenuation at 1 GHz	dB/100 m	2.25	2.25
Typ. attenuation at 2 GHz	dB/100 m	3.36	3.36
Typ. attenuation at 2.2 GHz	dB/100 m	3.56	3.56
Typ. attenuation at 2.5 GHz	dB/100 m	3.84	3.84
Typ. attenuation at 3.0 GHz	dB/100 m	4.02	4.02
Max. power at 1 GHz (40 °C)	kW	≤ 4.100	≤ 4.100
Max. power at 2 GHz (40 °C)	kW	≤ 2.899	≤ 2.899
Max. power at 2.2 GHz (40 °C)	kW	≤ 2.764	≤ 2.764
Max. power at 2.5 GHz (40 °C)	kW	≤ 2.593	≤ 2.593
Max. power at 3.0 GHz (40 °C)	kW	≤ 2.495	≤ 2.495

General data			
Temp. range operating	°C	–55/+85	–40/+85
Temp. range installation	°C	–25/+60	–25/+60
Typ. weight	kg/100 m	110.0	130.0
Min. bending radius	mm	300	300

For detailed data sheets please go to www.hubersuhner.com and then search for type „SUCOFEED“.

SUCOFEED aluminium – corrugated cables



HUBER+SUHNER SUCOFEED_LW is a foam dielectric corrugated coaxial cable designed with an aluminium outer conductor and a copper clad inner conductor. This low weight SUCOFEED_ LW family is a cost efficient alternative to the copper transmission lines. The performance of the aluminium cables is equivalent to the copper transmission cables. Our FR and UL types provide enhanced flame-resistance and therefore excellent choice for indoor DAS applications.

Applications

- Cost efficient solution
- High efficient signal distribution
- Excellent for multi-operator DAS
- Economic high performing solution if assembled with Quick-Fit connectors

Features

- Light weight
- Electrical performance similar to copper cables
- HUBER+SUHNER connectors are fully compatible with aluminium and copper cables
- Cables with flame-retardant jackets on request

SUCOFEED aluminium – corrugated cables

1/2" and 7/8" light weight





Cable design	Order/type no.	SUCOFEED_1/2_LW	SUCOFEED_1/2_LW_LA
	Dimension	1/2"	7/8" low attenuation
	Jacket version	PE	PE
Inner conductor	Ø in mm	4.80	9.40
Dielectric	Ø in mm	12.20	22.80
Outer conductor	Ø in mm	13.80	25.30
Jacket	Ø in mm	15.90	27.50

Electrical data			
Typ. operating frequency	GHz	≤ 8.8	≤ 5
Impedance	Ω	50 ± 1	50 ± 1
Capacitance	pF/m	76	74
Relative signal propagation	%	88	90
Signal delay	ns/m	3.80	3.80
Max. operating voltage	kVrms	1.95	2.95
Typ. attenuation at 1 GHz	dB/100 m	7.76	4.16
Typ. attenuation at 2 GHz	dB/100 m	11.38	6.08
Typ. attenuation at 2.2 GHz	dB/100 m	12.00	6.41
Typ. attenuation at 2.5 GHz	dB/100 m	12.90	6.88
Typ. attenuation at 3.0 GHz	dB/100 m	14.31	7.62
Max. power at 1 GHz (40 °C)	kW	≤ 1.020	≤ 2.520
Max. power at 2 GHz (40 °C)	kW	≤ 0.721	≤ 1.782
Max. power at 2.2 GHz (40 °C)	kW	≤ 0.688	≤ 1.699
Max. power at 2.5 GHz (40 °C)	kW	≤ 0.645	≤ 1.594
Max. power at 3.0 GHz (40 °C)	kW	≤ 0.589	≤ 1.455

General data			
Temp. range operating	°C	–55/+85	–55/+85
Temp. range installation	°C	–40/+60	–40/+60
Typ. weight	kg/100 m	≤ 17.5	≤ 37
Min. bending radius	mm	70/125	120/250

For detailed data sheets please go to www.hubersuhner.com and then search for type „SUCOFEED“.

SUCOFEED aluminium – corrugated cables

1-1/4" and 1-5/8“ light weight





Cable design	Order/type no.	SUCOFEED_1_1/4_LW	SUCOFEED_1_5/8_LW_LA
	Dimension	1-1/4"	1-5/8" low attenuation
	Jacket version	PE	PE
Inner conductor	Ø in mm	13.10	17.60
Dielectric	Ø in mm	32.00	41.50
Outer conductor	Ø in mm	36.00	46.50
Jacket	Ø in mm	39.20	50.30

Electrical data			
Typ. operating frequency	GHz	≤ 3.60	≤ 2.75
Impedance	Ω	50 ± 1	50 ± 1
Capacitance	pF/m	75	74
Relative signal propagation	%	88	89
Signal delay	ns/m	3.8	3.8
Max. operating voltage	kVrms	4.2	5.6
Typ. attenuation at 1 GHz	dB/100 m	3.20	2.48
Typ. attenuation at 2 GHz	dB/100 m	4.70	3.69
Typ. attenuation at 2.2 GHz	dB/100 m	4.97	3.91
Typ. attenuation at 2.5 GHz	dB/100 m	5.34	4.21
Typ. attenuation at 3.0 GHz	dB/100 m	5.58	4.41
Max. power at 1 GHz (40 °C)	kW	≤ 3.350	≤ 4.100
Max. power at 2 GHz (40 °C)	kW	≤ 2.369	≤ 2.899
Max. power at 2.2 GHz (40 °C)	kW	≤ 2.259	≤ 2.764
Max. power at 2.5 GHz (40 °C)	kW	≤ 2.119	≤ 2.593
Max. power at 3.0 GHz (40 °C)	kW	≤ 2.039	≤ 2.690

General data			
Temp. range operating	°C	–55/+85	–55/+85
Temp. range installation	°C	–40/+60	–40/+60
Typ. weight	kg/100 m	≤ 65	≤ 99
Min. bending radius	mm	200/400	280/500

For detailed data sheets please go to www.hubersuhner.com and then search for type „SUCOFEED“.

Flexible RF plenum jumper



High-performance connectivity for demanding RF environments:

The HUBER+SUHNER SPJ/SM assemblies are engineered for applications where exceptional electrical performance and installation flexibility are critical. Designed with Sucoform semi-rigid cables and plenum-rated materials, these jumpers deliver optimum VSWR, low attenuation, and excellent PIM performance, even in the most space-constrained environments.

Perfectly suited for:

- Indoor and outdoor DAS (Distributed Antenna Systems)
- Small Cell deployments
- Coaxial links between antennas and feeder lines
- Connections between active and passive components in DAS trays

Whether you're routing cables through tight spaces or ensuring long-term reliability in mission-critical networks, the SPJ/SM jumper provides a robust, high-quality solution without compromise.

Thanks to their modular design, the cable can be routed through extremely tight spaces first, and the connector head mounted afterward, enabling flexible, efficient installation without compromising performance.

RF cable assembly SPJ/SM

Standard plenum jumper with Sucoform cables

Cable types	Cable attenuation	Jacket diameter	Bending radius
Sucoform 122 LA Cu CMP	0.66 dB/m @ 2.7 GHz	3.65 mm	min. 5 mm
Sucoform 141 LA Cu CMP	0.61 dB/m @ 2.7 GHz	4.10 mm	min. 8 mm
Sucoform 222 LA Cu CMP	0.41 dB/m @ 2.7 GHz	6.20 mm	min. 25 mm

Technical data			
Frequency range	DC up to 6 GHz		
Return loss	Frequency 0.38 to 1.0 GHz up to 2.2 GHz up to 2.7 GHz up to 3.8 GHz up to 6 GHz	Straight/straight ≥ 29 dB ≥ 27 dB ≥ 26 dB ≥ 23 dB ≥ 20 dB	Straight/angle ≥ 28 dB ≥ 25 dB ≥ 24 dB ≥ 20 dB ≥ 19 dB
PIM performance at 1.8GHz 2 × 43dBm	≤ 160 dBc (QMA: ≤ 140 dBc)	typical —165 dBc	

Environmental data	
Temperature range	-65°C to 165°C
Waterproof	IP67 (0.5 m/1 h/20 °C)
Cable performance	UV resistance
	UL444/CMP/FT6, ETL listed
	jacket colour: white
Further information	100 % tested for return loss, attenuation and PIM Serial product label on each jumper for tracking Stock items in lengths of 0.5 up to 5 m

SPJ cable product	Part description	Diameter (mm)	Length (mm)	Connector 1	Connector 2	Part number
SPJ_SM122L_PCC	SPJ/SM122L/PCC/PCC/00500	3,65	500	PCC	PCC	85267874
	SPJ/SM122L/PCC/PCC/01000		1000	PCC	PCC	85267875
	SPJ/SM122L/PCC/PCC/02000		2000	PCC	PCC	85267876
SPJ_SM141L_PCC	SPJ/SM141L/PCC/PCC/00500	4,1	500	PCC	PCC	85097762
	SPJ/SM141L/PCC/PCC/01000		1000	PCC	PCC	85097763
	SPJ/SM141L/PCC/PCC/02000		2000	PCC	PCC	85097765
SPJ_SM222L_PCC	SPJ/SM222L/PCC/PCC/00500	6,2	500	PCC	PCC	85140282
	SPJ/SM222L/PCC/PCC/01000		1000	PCC	PCC	85118309
	SPJ/SM222L/PCC/PCC/02000		2000	PCC	PCC	85081440

Connector types	Straight cable plug (male) part #	Straight cable jack (female) part #
N	85079663	85082504
4.3-10	85079675	85080345
SMA	85086064	
NEX10	85099127	85102243
7/16	85079671	



Copper – corrugated cables



HUBER+SUHNER plenum rated coaxial cable for in-building applications

SUCOFEED 1/2" PW is a plenum rated wideband coaxial cable designed to deliver outstanding electrical performance up to 6 GHz and support wireless in-building plenum applications. It maintains compatibility with existing connectors, tools, mounting hardware for easy and convenient installation. This plenum cable has a star-shaped profile extruded low loss dielectric and a solid copper outer conductor which provides excellent RF shielding.

Features

- Outstanding electrical performance
  – Low attenuation/high power rating
- Excellent intermodulation values
- Plenum rated
  – CMP, ETL listed to UL444, Canadian CSA 22.2/FT6
- White plenum jacket with temperature stabilised polymer material

Benefits

- Compatible with existing field mountable connectors
- Minimised system interferences

Copper – corrugated cables

1/2" PW

Cable design	Order/type no.	SUCOFEED_1/2_PW
	Dimension	**1/2“**
	Jacket version	**plenum rated white PVC**
Inner conductor	Ø in mm	4.8
Dielectric	Ø in mm	11.8
Outer conductor	Ø in mm	13.8
Jacket	Ø in mm	16

Electrical data		
Impedance	Ω	50
Max. operating frequency	GHz	6
Capacitance	pF/m	76
Velocity of signal propagation	%	88
Insulation resistance	106 MΩm	≥ 5 ×
Min. screening effectiveness	dB	> 120
Max. operating voltage	kVrms (at sea level)	4

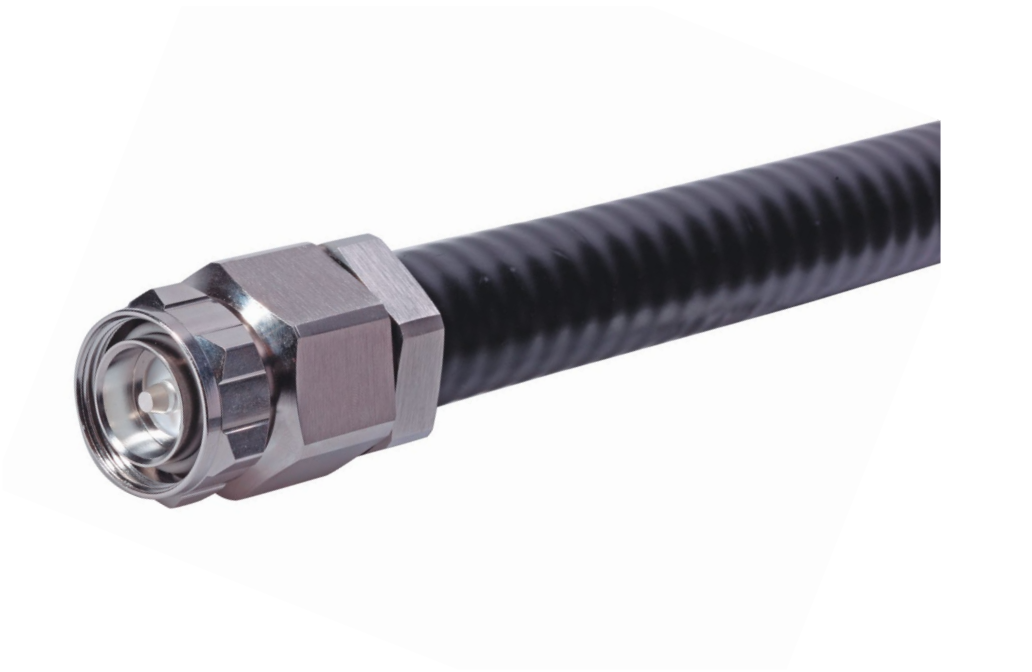
Mechanical data			
Weight		kg/100 m	26
Min. bending radius	static	mm	70
	repeated (max. 20 bendings	mm	125
	dynamic	mm	250

Environmental data	
Temperature range	–20 to + 80 °C
Installation temperature	–20 to + 80 °C
Flammability	ETL listed to UL444, CMP/FT6
Smoke density	UL444/CMP/FT6, ETL listed
2011/65/EC (RoHS)	compliant

Frequency MHz	**Nom. attenuation dB/100 m**	**Nom. attenuation dB/100 ft**	**Average power kW**
	sea level, 20 °C ambient temperature		sea level, 40 °C ambient, inner conductor 100 °C
50	1.59	0.47	4.52
100	2.19	0.67	3.20
150	2.71	0.82	2.61
200	3.15	0.96	2.26
450	4.85	1.48	1.60
600	5.68	1.73	1.30
700	6.18	1.88	1.21
800	6.65	2.03	1.13
900	7.08	2.16	1.07
1000	7.53	2.29	1.01
1500	9.46	2.88	0.83

Frequency MHz	**Nom. attenuation dB/100 m**	**Nom. attenuation dB/100 ft**	**Average power kW**
	sea level, 20 °C ambient temperature		sea level, 40 °C ambient, inner conductor 100 °C
1700	10.16	3.10	0.78
1800	10.50	3.20	0.75
2000	11.16	3.40	0.71
2200	11.80	3.60	0.68
2700	13.30	4.06	0.62
3000	14.16	4.32	0.58
3400	15.26	4.65	0.55
3800	16.31	4.97	0.52
4000	16.82	5.13	0.51
5000	19.28	5.88	0.45
6000	21.58	6.58	0.41

Quick-Fit coaxial connectors



HUBER+SUHNER Quick-Fit connectors are worldwide approved connectors for foam dielectric corrugated tube cables. They offer a greatly simplified and economic approach to cable preparation and assembly. The product line meets the requirements of multi-carrier, high-channel-count transceivers such as base stations of today's mobile communication infrastructure networks.

Features

- Excellent RF performance
- Low, stable and reproducible IM (Passive InterModulation) – typically –155 dBc
- Safe assembly process performance – in-field termination with reproducible electrical performance
- Quick and easy assembly – 2 main connector parts, 4 steps in less than 4 minutes
- High IP rating – IP68
- Multi-brand, multi-design and multi-material cable compatibility

Quick-Fit coaxial connectors

General technical data

Electrical data	4.3-10	7/16	N
Impedance (Ω)	50		
Frequency range	DC up to 12 GHz	DC up to 7.5 GHz	DC up to 11 GHz
VSWR	≤ 1.03, DC up to 4 GHz ≤ 1.05, 4 GHz up to 6 GHz	≤ 1.06, DC up to 2.5 GHz	≤ 1.06, DC up to 2.5 GHz
PIM [1]	typical –155 dBc, better than –150 dBc		

[1] Carrier to 3rd order intermodulation product ratio with 2 × 20 W (43 dBm) carrier power

Mechanical data	4.3-10	7/16	N
Recommended coupling nut torque IEC	screw type: ≥ 5 Nm (proof torque 8 Nm)	25 up to 30 Nm 18.05 up to 21.66 ft lb. IEC 61169-4	0.68 up to1.13 Nm 0.49 up to 0.82 ft lb. IEC 61169-16
Recommended coupling nut torque HUBER+SUHNER			3 Nm/2.2 ft lb. ≥ 500 with 100 matings max.
Engagement force	typical 100 N (quick lock)		
Separation force	typical 80 N (quick lock)		
Coupling nut retention force		≥ 1000 N/225.0 lbs	≥ 450 N/101.2 lbs
Centre contact	captivated	captivated	captivated
Durability (matings)	≥ 100	≥ 500	≥ 500

Environmental data	4.3-10	7/16	N
Temperature range	–40 up to +85 °C –40 up to +185 °F	–40 up to +85 °C –40 up to +185 °F	–40 up to +85 °C –40 up to +185 °F
IP rating	IP67 (acc. to IEC 60529) with taping or similar measures IP68		

Material data			
Connector part	**4.3-10**	**7/16**	**N**
Outer contacts/connector bodies	brass / SUCOPLATE®	brass / SUCOPLATE®	brass / SUCOPLATE®
Cable entries/coupling nuts	brass / SUCOPLATE®	brass / SUCOPLATE®	brass / SUCOPLATE®
Centre contacts	spring bronce/brass/silver	spring bronce/brass/silver	spring bronce/brass/silver
Insulators	PTFE or PFA	PTFE or PFA	PTFE or PFA
Gaskets	VMQ (silicon rubber)	EPDM (natural rubber)	EPDM (natural rubber)

Some connectors may have a specification that differs from the above mentioned data. The products are designed and guaranteed to pass the above mentioned test procedures. Any additional or different requirement arising from specific applications or environmental conditions which is not covered by these test procedures is subject to request.

Quick-Fit coaxial connectors

Suitable for SUCOFEED corrugated cables in the diameters below



1/2"_HF, 1/2"_HF_FR, 1/2"_HF_FR_UL

HUBER+SUHNER type	Item no.	Interface	Assembly instruction	Tools	Item no. tools
11_716-50-9-9	22660309	DIN 7/16 male	DOC-0000179418	74_Z-0-9-15	23001006
16_716-50-9-5	23007298	DIN 7/16 male right angle			
21_716-50-9-9	22660310	DIN 7/16 female			
11_N-50-9-9	22660311	N male			
16_N-50-9-6	23007299	N female right angle			
21_N-50-9-9	22660312	N female			

Cable compatibility list on request.



1/2", 1/2"_FR, 1/2"_FR_UL

HUBER+SUHNER type	Item no.	Interface	Assembly instruction	Tools	Item no. tools
11_716-50-12-50	84201175	DIN 7/16 male	DOC-0000386367	74_Z-0-12-25 74_Z-0-12-8	84147226
16_716-50-12-50	84201179	DIN 7/16 male right angle			
21_716-50-12-50	84201177	DIN 7/16 female			
11_N-50-12-50	84201169	N male			
16_N-50-12-50	84201181	N male right angle			
21_N-50-12-50	84201173	N female			
11_4310-50-12-X2	85020537	4.3-10 male screw			
11_4310-50-12-Y2	85021551	4.3-10 male hand screw			
11_4310-50-12-Z2	85021552	4.3-10 male quick lock			
21_4310-50-12-1	85029736	4.3-10 female			

Cable compatibility list on request.



7/8", 7/8"_FR, 7/8"_LA, 7/8"_LA_FR

HUBER+SUHNER type	Item no.	Interface	Assembly instruction	Tools	Item no. tools
11_716-50-23-44	84069135	DIN 7/16 male	DOC-0000295365	74_Z-0-23-100	84133923 84074476
21_716-50-23-44	84069194	DIN 7/16 female			
11_N-50-23-43	84124063	N male			
21_N-50-23-43	84124062	N female			

Cable compatibility list on request.

Quick-Fit coaxial connectors

Suitable for SUCOFEED corrugated cables in the diameters below



7/8" _HF

HUBER+SUHNER type	Item no.	Interface	Assembly instruction	Tools	Item no. tools
11_N-50-23-41	84024502	N male	DOC-0000243751	74_Z-0-23-16	23035267
21_N-50-23-41	84024596	N female			

Cable compatibility list on request.



1/2", 1/2"_FR, 1/2"_FR_UL

HUBER+SUHNER type	Item no.	Interface	Assembly instruction	Tools	Item no. tools
21_716-50-32-4	84116150	7/16 female	DOC-0000341341	74_Z-0-32-14 74_Z-0-32-15	23010533 84120843

Cable compatibility list on request.



1_5/8"_LA

HUBER+SUHNER type	Item no.	Interface	Assembly instruction	Tools	Item no. tools
21_716-50-42-4	84079305	7/16 female	DOC-0000299051	74_Z-0-42-14 74_Z-0-42-15	23010534 84085074

Cable compatibility list on request.

Cable stripping tools

for Quick-Fit and HUBER+SUHNER Eco connectors

Automating rotation stripping tools (can be used manually as well)

Automating rotation stripping tools		Cable type	Connector		Picture and remarks
Type no.	**Item no.**		**Type no.**	**Item no.**	
74_Z-0-9-15	23001006	SUCOFEED_1/2_HF SUCOFEED_1/2_HF_FR SUCOFEED_1/2_HF_FR_UL	11_716-50-9-9	22660309	
			16_716-50-9-5	23007298	
			21_716-50-9-9	22660310	
			11_N-50-9-9	22660311	
			16_N-50-9-6	23007299	
			21_N-50-9-9	22660312	
74_Z-0-12-11	84147226	SUCOFEED_1/2 SUCOFEED_1/2_FR SUCOFEED_1/2_FR_UL SUCOFEED_1/2_LW	11_716-50-12-50	84201175	
			16_716-50-12-50	84201179	
			21_716-50-12-50	84201177	
			11_N-50-12-50	84201169	
			16_N-50-12-50	84201181	
			21_N-50-12-50	84201173	
74_Z-0-12-17	84147227	SUCOFEED_1/2 SUCOFEED_1/2_FR SUCOFEED_1/2_FR_UL SUCOFEED_1/2_LW	11_716-50-12-100	84125745	
			21_716-50-12-100	84125740	
			11_N-50-12-100	84125756	
			21_N-50-12-100	84125770	
74_Z-0-23-21	85002265	SUCOFEED_7/8 SUCOFEED_7/8_FR	11_716-50-23-44	84069135	
			21_716-50-23-44	84069194	
			11_N-50-23-43	84124063	
			21_N-50-23-43	84124062	
74_Z-0-23-22	84147229	SUCOFEED_7/8_LA SUCOFEED_7/8_LA_FR SUCOFEED_7/8_LW_LA	11_716-50-23-100	84124984	
			21_716-50-23-100	84124988	
			11_N-50-23-100	84125762	
			21_N-50-23-100	84125871	
74_Z-0-23-16	23007928	SUCOFEED_7/8_HF	11_N-50-23-41	84024502	
			21_N-50-23-41	84024596	
74_Z-0-32-14	23010533	SUCOFEED_1_1/4 SUCOFEED_1_1/4_FR SUCOFEED_1-1/4_LW	21_716-50-32-4	84116150	
			11_716-50-32-100	84127325	
			21_716-50-32-100	84127329	
			11_N-50-32-100	84132614	
			21_N-50-32-100	84132616	jacket stripping only
74_Z-0-42-14	23010534	SUCOFEED_1_5/8 SUCOFEED_1_5/8_FR SUCOFEED_1_5/8_LA SUCOFEED_1_5/8_LA_FR SUCOFEED_1-5/8_LW_LA	21_716-50-42-4	84079305	
			11_716-50-42-100	84132564	
			21_716-50-42-100	84132566	
			11_N-50-42-100	84132618	
			21_N-50-42-100	84132620	jacket stripping only

Cable stripping tools

Manual stripping tool

Manual stripping tools		Cable type	Connector		Picture
Type no.	**Item no.**		**Type no.**	**Item no.**	
74_Z-0-12-100	84133923	SUCOFEED_1/2 SUCOFEED_1/2_FR SUCOFEED_1/2_FR_UL SUCOFEED_1/2_LW	11_716-50-12-100	84125745	
			21_716-50-12-100	84125740	
			11_N-50-12-100	84125756	
			21_N-50-12-100	84125770	
74_Z-0-23-100	84133924	SUCOFEED_7/8_HF SUCOFEED_7/8 SUCOFEED_7/8_FR SUCOFEED_7/8_LA SUCOFEED_7/8_LA_FR SUCOFEED_7/8_LW_LA	11_N-50-23-43	84124063	
			21_N-50-23-43	84124062	
			11_716-50-23-100	84124984	
			21_716-50-23-100	84124988	
			11_N-50-23-100	84125762	
			21_N-50-23-100	84125871	

Flaring tools

Flaring tools		Cable type	Connector		Picture
Type no.	**Item no.**		**Type no.**	**Item no.**	
74_Z-0-12-8	85006446	SUCOFEED_1/2 SUCOFEED_1/2_FR SUCOFEED_1/2_FR_UL SUCOFEED_1/2_LW	11_716-50-12-50	84201175	
			16_716-50-12-50	84201179	
			21_716-50-12-50	84201177	
			11_N-50-12-50	84201169	
			16_N-50-12-50	84201181	
			21_N-50-12-50	84201173	
74_Z-0-32-15	84120843	SUCOFEED_1_1/4 SUCOFEED_1_1/4_FR SUCOFEED_1-1/4_LW	21_716-50-32-4	84116150	
			11_716-50-32-100	84127325	
			21_716-50-32-100	84127329	
			11_N-50-32-100	84132614	
			21_N-50-32-100	84132616	
74_Z-0-42-15	84085074	SUCOFEED_1_5/8 SUCOFEED_1_5/8_FR SUCOFEED_1_5/8_LA SUCOFEED_1_5/8_LA_FR SUCOFEED_1-5/8_LW_LA	21_716-50-42-4	84079305	
			11_716-50-42-100	84132564	
			21_716-50-42-100	84132566	
			11_N-50-42-100	84132618	
			21_N-50-42-100	84132620	

Cable stripping tools

for Quick-Fit and HUBER+SUHNER Eco connectors

Spare parts for cable stripping tools

H+S type	Item no.	Part description
74_Z-0-0-359	23014976	handle (for stripping tools)
74_Z-0-0-402	22652193	abrasive paper 320
74_Z-0-0-425	23001953	spanner AF 18 mm
74_Z-0-0-428	23001956	spanner AF 22 mm
74_Z-0-0-429	23001957	spanner AF 24 mm
74_Z-0-0-415	22652206	counter sink
74_Z-0-0-418	22652209	stanley knife
74_Z-0-0-420	22652211	steel brush
74_Z-0-0-422	22652213	steel measure 200 mm
74_Z-0-0-432	23002005	screw driver
74_Z-0-0-433	23002007	screw driver
74_Z-0-0-12	22642718	small metal saw
74_Z-0-0-434	23002166	monkey wrench
74_Z-0-0-297	22650531	blade (cutting foam dielectric, centre and outer conductor), 74_Z -0-23-21, 74_Z -0-23-22
74_Z-0-0-347	23000937	blade (cutting corrugated copper tube) for 74_Z-0-12-15, 74_Z-0-12-11
74_Z-0-0-349	23001008	blade (cutting corrugated copper tube) for 74_Z-0-9-15
74_Z-0-0-355	23008264	blade (cutting jacket) for 74_Z-0-32-14, 74_Z-0-23-16, 74_Z -0-23-21, 74_Z -0-23-22
74_Z-0-0-356	23010537	blade (cutting jacket) 74_Z-0-42-14
74_Z-0-0-416	22652207	allen wrench AF 2.5 mm/0.098 in. for 74_Z-0-9-15, 74_Z-0-12-15, 74_Z-0-32-14 and 74_Z-0-42-14
74_Z-0-0-423	23000311	allen wrench AF 4 mm/0.157 in. for removing the BIT adapter



Spuma – flexible, low-loss RF cables



The Spuma product family provides highly flexible cable solutions and stands for its extremely low loss. These cables are free of halogen and offer excellent electrical performance, especially an outstanding return loss (VSWR). HUBER+SUHNER Spuma cables are designed for applications up to 6 GHz and 8 GHz and offer great opportunities in different industries, including railway, defense, communication and others. Spuma products can also be used as drop-in replacement for LMR® (LMR® is a brand of Times Microwave Inc.).

Features

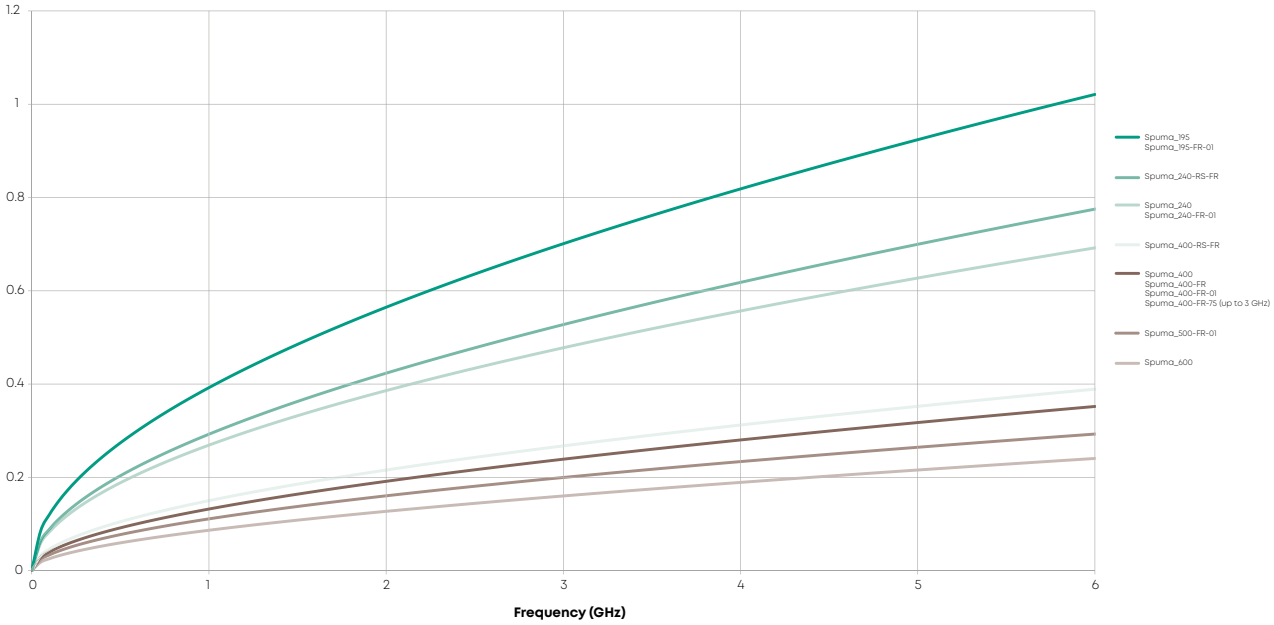
- Very low loss up to 6 or 8 GHz
- LSFH (flame retardant) types
- Excellent return loss (VSWR)
- High flexibility
- Rotary Swage to combine flexibility and low loss

Spuma – flexible, low-loss RF cables

Spuma

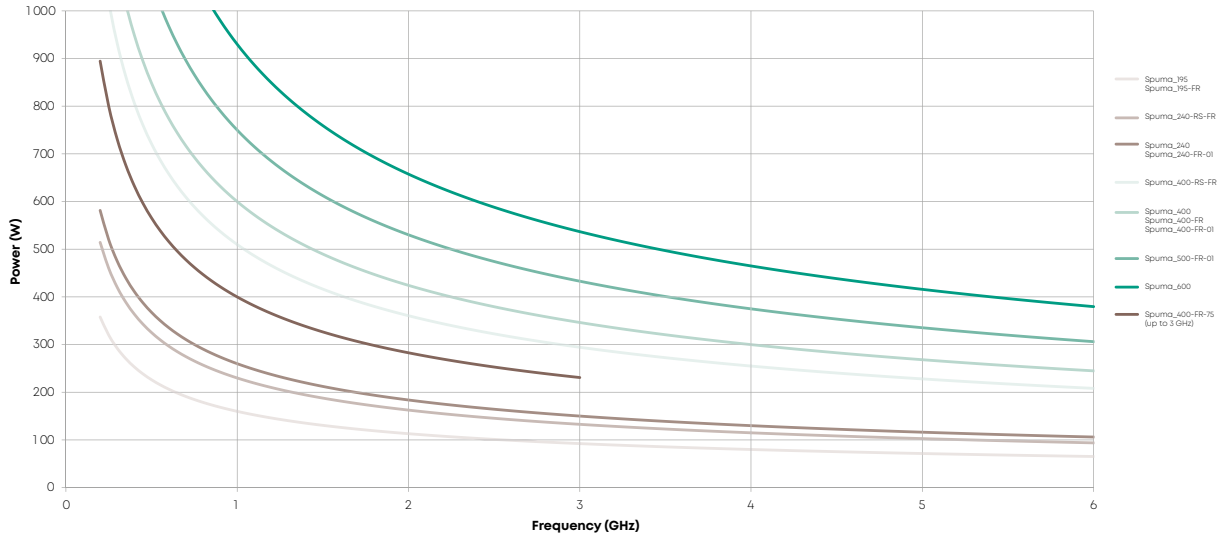
Attenuation

Typical values at 20 °C ambient temperature and sea level



CW power

Max. values at 40 °C ambient temperature and sea level



Spuma – flexible, low-loss RF cables

Portfolio overview



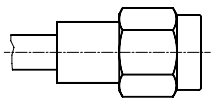
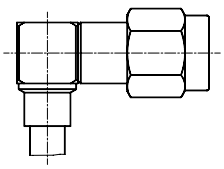
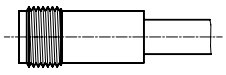
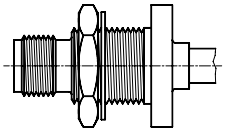
Spuma + Spuma FR

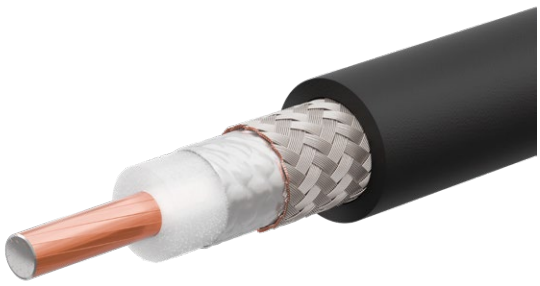
		Spuma_195 84151727	Spuma_195-FR-01 85021562	Spuma_240 84151737	Spuma_240-FR-01 85021563	Spuma_240-RS-FR 85089188	Spuma_400 84102703	Spuma_400-FR-01* 84132035	Spuma_400-RS-FR 85089191	Spuma_500-FR-01 85021564	Spuma_600 84151738	Spuma_600-RS-FR 85240547	Spuma_400-FR-75 85022187
Construction													
1 Centre conductor	Cu wire	·	·	·	·								
	Al/Cu wire						·	·		·	·		·
	Rotary Swage					·			·			·	
2 Dielectric	Foamed PE	·	·	·	·	·	·	·	·	·	·	·	·
3 Inner shield	Al-PES foil	·	·	·	·	·	·	·	·	·	·	·	·
4 Outer shield	Tin plated copper braid	·	·	·	·	·	·	·	·	·	·	·	·
5 Jacket	PE	·		·			·				·		
	LSFH		·		·			·		·			·
	TPU					·			·			·	
	Diameter (mm)	4.95	4.98	6.15	6.17	6.17	10.3	10.3	10.3	12.8	15		10.3
	Diameter (in)	0.195	0.196	0.242	0.243	0.243	0.404	0.404	0.404	0.503	0.590		0.404
Electrical													
Impedance	Ω	50 +/–2											75+/–3
Operating frequency	GHz	< 8										6	3
Screening effectiveness up to max. op. frequency	dB	> 90											
Attenuation at max. operating frequency	dB/m	1.02		0.69		0.78	0.35		0.39	0.29	0.24	0.25 dB/m	0.25
	dB/ft	0.31		0.21		0.24	0.11		0.12	0.09	0.07	0.07 dB/ft	0.12
Power at 1 GHz , 40° C ambiant temperature	W	160		240		230	600		510	750	930	870	400
Mechanical													
Bending static	mm	12.5	10	19	14	14	25	25	25	34	38	40 mm	25
	in	0.49	0.39	0.75	0.55	0.55	0.98	0.98	0.98	1.34	1.50	1.57 in	0.98
Bending repeated	mm	50	40	60	53	53	100	100	100	130	152	120 mm	100
	in	1.97	1.57	2.36	2.09	2.09	3.94	3.94	3.94	5.12	5.98	4.72 in	3.94
Environmental													
Operating temperature	°C	–40 to +85											
Installation temperature	°C	–20 to +60											
Halogen-free		·	·	·	·	·	·	·	·	·	·	·	·
RoHS	2011/65/EC	·	·	·	·	·	·	·	·	·	·	·	·
CPR					B2ca								
Railway approvals	EN 45545-2		HL3		HL3	HL3		HL3	HL3	HL3		HL2	HL3
	NFPA-130		·		·	·		·	·	·			·

* UL recognised alternative available: Spuma_400-FR (84040210)

Spuma – flexible, low-loss RF cables

Cable type / Connector	Connector pattern	Spuma_195 Spuma_195-FR-01	Spuma_240 Spuma_240-FR-01	Spuma_240-RS-FR	Spuma_400 Spuma_400-FR Spuma_400-FR-01	Spuma_400-RS-FR	Spuma_500-FR-01	Spuma_600 Spuma_600-RS-FR	Spuma_400-FR-75
Cable group		X27	X28	X34	U30	X32	X31	X29	X33
7/16	11		·		·			·	
	16				·	·			
	24				·				
BNC	11	·	·	·	·	·			
	16		·	·	·	·			
	21	·							
	24		·	·					·
N	11	·	·	·	·	·	·	·	
	16	·	·	·	·	·	·	·	
	21	·	·	·	·	·	·		
	24	·	·		·	·			
QMA	11		·	·					
	16		·	·					
	21		·						
QN	11		·	·	·	·	·		
	16		·	·	·	·			
	24		·	·	·	·			
XQN	11		·	·					
SMA	11	·	·	·	·				
	16	·	·	·	·	·			
	21	·	·						
TNC	11	·	·	·	·	·			
	16	·	·	·	·	·			
	21	·	·		·	·			
	24	·	·		·	·			

11	straight cable plug (male)	16	right angle cable plug (male)
			
21	**straight cable jack (female)**	**24**	**straight panel bulkhead cable jack (female)**
			



Detail view SPUMA_600-RS-FR showing patented Rotary Swaging technology

Lightning protectors



Four decades of experience in developing and manufacturing coaxial lightning EMP and NEMP protectors are the foundation of the current HUBER+SUHNER RF-protection portfolio. Our products are designed to meet the stringent requirements of the RF/microwave, telecommunications and wireless industry and cover civil, security and defense applications. An extensive high-voltage impulse laboratory has been established to verify our designs in accordance with the valid international lightning, surge and NEMP standards. Important inventions are covered by worldwide patents.

Features

- Broadband designs
- Excellent RF performance
- High lightning current handling capability
- Low residual energy
- PIM optimised
- High CW and PIP power rating

Benefits

- Elevates system availability
- Lowers operational risk
- Lightning protectors perform the same before and after rated lightning pulses
- Best suited for outdoor installations
- Easy installation

How to select the right protector

Application

- Quarter wave lightning EMP protectors for high power and low PIM applications without DC continuity
- Broadband gas discharge tube (GDT) protectors for single channel or low power applications with DC continuity
- Hybrid GDT protectors for multiple channel, high power and low PIM applications with DC continuity
- Optimised for outdoor installations



Important decision criteria

To find the most appropriate lightning EMP protector we guide you through the following list of criteria to evaluate the specific application requirements.

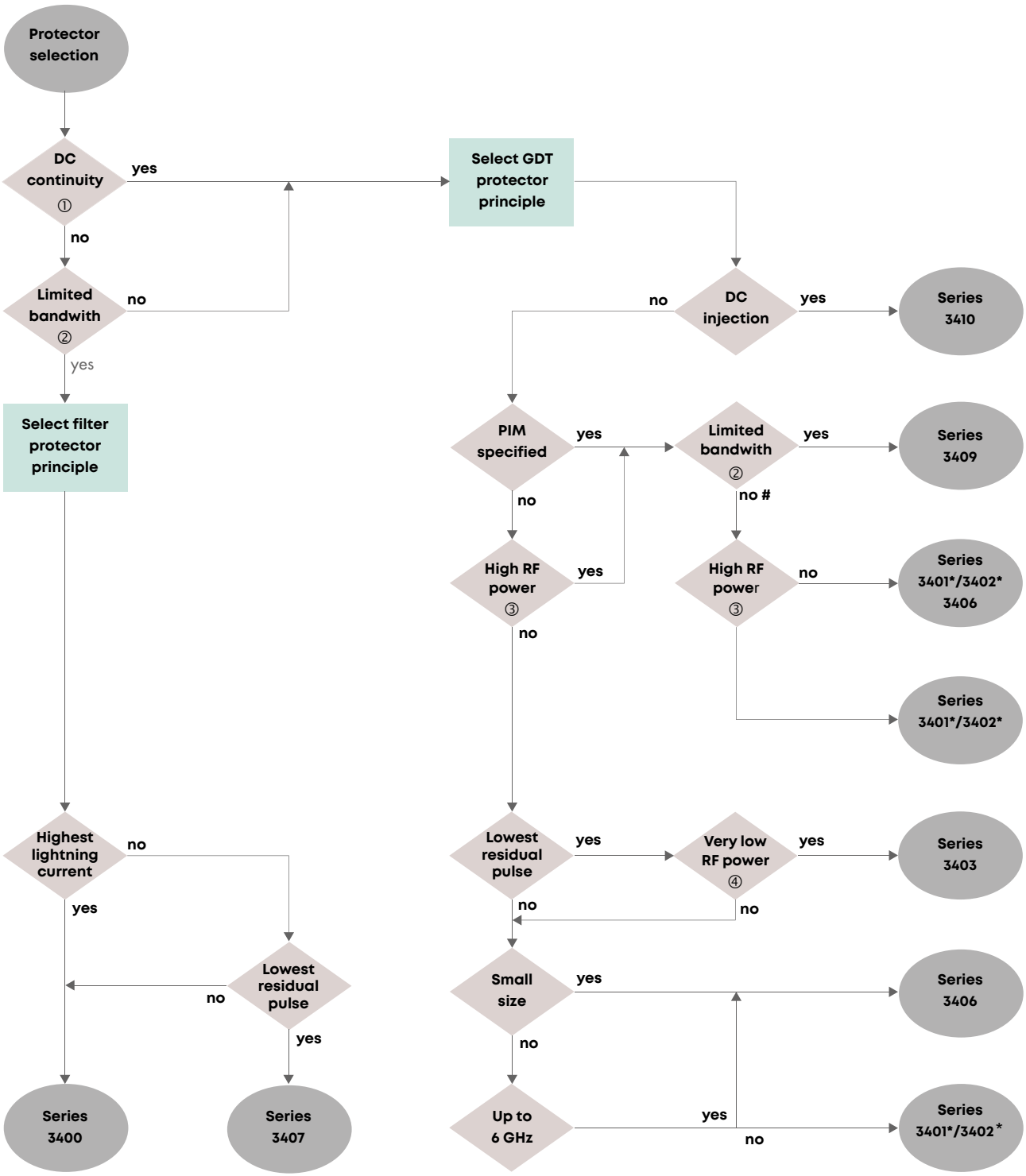
The first four evaluation criteria items are the most important.

1. DC continuity for powering of remote equipment
   DC supply voltage
2. Frequency range
   Operating band
   AISG band
   Telemetry band
3. Passive intermodulation requirements
4. RF power maximum
   Continuous wave
   Peak power
5. Protection requirements
   Surge current handling capability
   Residual pulse energy/voltage
6. RF requirements
   Return loss (RL)
   Insertion loss (IL)
7. Connector interfaces
8. Mounting/grounding requirements
   Bulkhead mount
   Screw mount
9. Environmental requirements
   IP rating
10. Material requirements
11. Selection of the gas discharge tube for GDT lightning EMP protectors according the RF power

These criteria shall be considered with the provided selection flow chart next page. Product details are listed in this catalogue and further information can be found on the related product detail specification/data sheet.

For any support contact HUBER+SUHNER, hubersuhner.com or your local representative.

Selection flow chart for HUBER+SUHNER lightning protectors



Notes

1	DC continuity	DC can be supplied on the centre conductor for remote powering
2	Limited bandwidth	no broadband operation only specific frequency bands can be transmitted
3	High RF power	application with more than 1 kW (CW) transmission power
4	Very low RF power	application with less than 50 W (CW) transmission power
#	No protector solution available featuring broadband operation and low PIM	
*	Specific GDT has to be selected according to the transmitted RF power and DC supply voltage	

Lightning protectors

Broadband lightning protectors

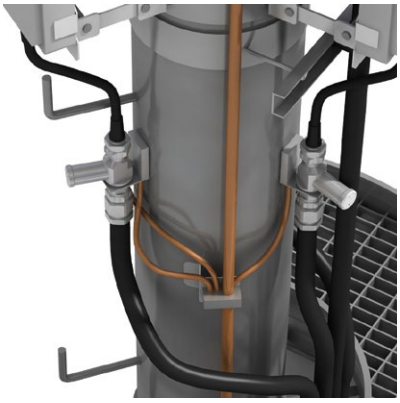


	Quarter wave shorting stub protectors				
	Series 3400				
					
Type no.	3400.17.0428	3400.17.0431	3400.31.0001	3400.31.0023	3400.41.0266
Frequency range (MHz)	2000 to 6000	690 to 2200	690 to 2700	380 to 700	690 to 2690
Return loss (dB)	≥ 20	≥ 24	≥ 24	≥ 18	≥ 28
Insertion loss (dB)	≤ 0.2	≤ 0.15	≤ 0.1	≤ 0.1	≤ 0.1
RF Interface – unprotected/protected side	N male/ female	N male/ female	4.3-10 male/ 4.3-10 female	4.3-10 male/ 4.3-10 female	7/16 male/female
PIM 3rd order (dBc)	–	≤ –150	≤ –160	≤ –150	≤ –160
RF power (CW) max. (W)	≤ 300	≤ 500	≤ 1500	≤ 2500	≤ 1500
RF power (PIP) max. (kW)	–	25	25	25	25
Max. DC voltage	no DC	no DC	no DC	no DC	no DC
Surge current (8/20 µs) – single pulse (kA) – multiple pulses (kA)	 25 50	 50 50	 100 80	 100 80	 100 80
Residual energy (typ.) (µJ) 4 kV 1.2/50 µs; 2 kA 8/20 µs	0.2	10	11	5	11
Ingress protection rating	IP68	IP67	IP67	IP67	IP67

Order information					
Item no. Type no.	84048180 3400.17.0428	84080266 3400.17.0431	85020284 3400.31.0001	85215657 3400.31.0023	84143443 3400.41.0266

Lightning protectors

Broadband lightning protectors



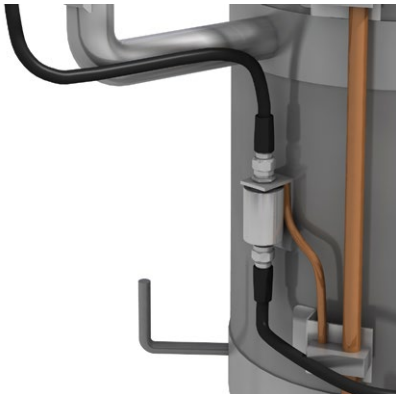
	Gas discharge tube protectors		
	Hybrid GTD series 3409		
			
Type no.	3409.31.0001	3409.41.0090 [1]	3409.41.0092
Frequency range (MHz)	690 to 2700	690 to 2690	690 to 2690
Return loss (dB)	≥ 24	≥ 28	≥ 26
Insertion loss (dB)	≤ 0.1	≤ 0.1	≤ 0.1
Supports AISG at	2.176	2.176	2.176
RF Interface – unprotected/protected side	4.3-10 male/ 4.3-10 female/	7/16 male/female	7/16 male/female
PIM 3rd order (dBc)	≤ –160	≤ –160	≤ –160
RF power (CW) max. (W)	≤ 1500	≤ 1500	≤ 1500
RF power (PIP) max. (kW)	25	25	25
GDT	replaceable	replaceable	replaceable
Max. DC voltage (V)	≤ 48	9071.99.0548 (90 V) ≤ 48	9071.99.0548 (90 V) ≤ 48
Surge current (8/20 µs) – single pulse (kA) – multiple pulses (kA)	 30 20	 30 20	 30 20
Residual energy (typ.) (µJ) 4 kV 1.2/50 µs; 2 kA 8/20 µs	350	350	350
Ingress protection rating	IP67	IP67	IP67

Order information			
Item no. Type no.	85020334 3409.31.0001	84142698 3409.41.0090 1)	84150561 3409.41.0092 1)

[1] AISG = antenna interface standards group

Lightning protectors

GPS lightning protectors



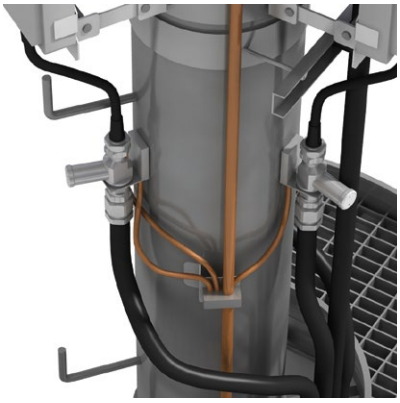
Application
Fine protector hybrid technology to protect GPS electronics

Characteristics and specialities
Very low residual pulse energy
Full lightning protection (20 kA ; 8/20 µs)
DC bypass function
Easy bulkhead installation

	Fine protectors hybrid technology	
	Series 3403	
		
Type no.	3403.17.0060	3403.17.0063
Frequency range	800 to 2500 MHz	
Return loss	≥ 26 dB	
Insertion loss	≤ 0.3 dB	
RF Interface – unprotected/protected side	N female/female	N male/female
DC bypass voltage other voltage on request	≤ 6 V	
DC bypass current	≤ 4 A	
Surge current (8/20 µs) – single pulse – multiple pulses	20 kA 10 kA	
Residual energy (typ.) 4 kV 1.2/50 µs; 2 kA 8/20 µs	6 µJ	
Ingress protection rating	IP67	
Order information		
Item no. Type no.	84030303 3403.17.0060	84038163 3403.17.0063

Lightning protectors

Broadband lightning protectors

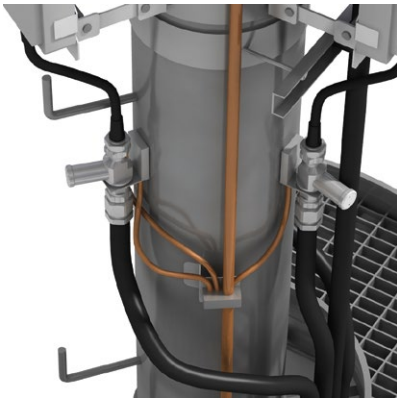


	Gas discharge tube protectors	
	Series 3402	
		
Type no.	3402.41.A	3402.17.3001
Frequency range (MHz)	DC to 2500	0 to 3000
Return loss	≥ 20 dB	≥ 20 dB
Insertion loss	≤ 0.2 dB	≤ 0.3 dB
RF Interface – unprotected/protected side	7/16 female/ female	N female/ female
RF power (CW) max.	dependant on GDT	dependant on GDT
GDT	replaceable, not included	replaceable, not included
Max. DC voltage	dependant on GDT	dependant on GDT
Surge current (8/20 µs) – single pulse – multiple pulses	 30 kA 20 kA	 30 kA 20 kA
Residual energy (typ.) 4 kV 1.2/50 µs; 2 kA 8/20 µs	350 µJ	350 µJ
Ingress protection rating	IP67	IP67

Order information		
Item no. Type no.	22642813 3402.41.A	85006748 3402.17.3001

Lightning protectors

Broadband lightning protector



	Gas discharge tube protectors							
	Series 3406							
								
Type no.	3406.17.0009			3406.17.0012			3406.17.0027	3406.17.0028
Frequency range (MHz)	0 to 6000	0 to 5600	5600 to 5800	0 to 6000	0 to 5600	5600 to 5800	DC to 4000	
Return loss (dB)	≥ 15 dB	≥ 20 dB	≥ 18.5 dB	≥ 15 dB	≥ 20 dB	≥ 18.5 dB	≥ 20	
Insertion loss (dB)	≤ 0.3	≤ 0.2	≤ 0.2	≤ 0.3	≤ 0.2	≤ 0.2	≤ 0.2	
RF Interface – unprotected/protected side	N female/ N female			N male/ N female			N female/ female	N male/ female
RF power (CW) max. (W)	≤ 50			≤ 50			≤ 21	
GDT	not replaceable, fix installed (90 V)			not replaceable, fix installed (90 V)			not replaceable, fix installed (90 V)	
Max. DC voltage (V)	60			60			60	
Surge current (8/20 µs) – single pulse (kA) – multiple pulses (kA)	 10 5			 10 5			 10 5	
Residual energy (typ.) (µJ) 4 kV 1.2/50 µs; 2 kA 8/20 µs	250			250			250	
Ingress protection rating	IP67			IP67			IP68	

Order information				
Item no. Type no.	23017636 3406.17.0009	23026117 3406.17.0012	84041874 3406.17.0027	84041875 3406.17.0028

Lightning protectors

Broadband lightning protectors



	Fine protector hybrid technology
	Series 3403
	
Type no.	3403.17.0069
Frequency range	2.5 to 400 MHz
Ethernet cabling standard	≥ 26 dB
Insertion loss	≤ 0.25 dB
RF Interface – unprotected/ protected side	N female/ female
PoE acc. IEEE 802.3 at	≤ 50 W
GDT	not replaceable, fix installed (90 V)
Max. DC voltage	≤ 60 V
Surge current (8/20 µs) – single pulse – multiple pulses	10 kA 8 kA
Residual energy (typ.) 4 kV 1.2/50 µs; 2 kA 8/20 µs	60 µs
Ingress protection rating	IP67

Order information	
Item no. Type no.	84144468 3403.17.0069

	Filter protectors	
	Series 3407	
		
Type no.	3407.17.0086	3407.17.0088
Frequency range (MHz)	690 to 2700	74 to 420
Return loss (dB)	≥ 26	≥ 23.1
Insertion loss (dB)	≤ 0.15	≤ 0.15
RF Interface – unprotected/ protected side	N female/ female	7/16 male/ female
PIM 3rd order (dBc)	≤ –150	≤ –155
RF power (CW) max. (W)	≤ 260	≤ 500
Max. DC voltage	no DC	no DC
Surge current (8/20 µs) – single pulse (kA) – multiple pulses (kA)	20 10	25 20
Residual energy (typ.) (µJ) 4 kV 1.2/50 µs; 2 kA 8/20 µs	0.001	0.1
Ingress protection rating	IP68	IP67

Order information		
Item no. Type no.	84099040 3407.17.0086	84147450 3407.17.0088

Lightning protectors

Cellular backhaul lightning protectors



Application
Protection of backhaul equipment with RJ45 interfaces

Characteristics and specialities
- Data line protector supports cat. 5 class D and alternatively Gigabit Ethernet cat. 6, class E
- Indoor and outdoor versions available
- PoE (IEEE 802.3 at)

	Data line protectors			
	Series 3414			
				
Application	for indoor	for outdoor	for indoor	for outdoor
Type no.	3414.99.0001	3414.99.0008	3414.99.0021	3414.99.0022
Frequency range	DC to 100 MHz		DC to 250 MHz	
Ethernet cabling standard	cat. 5; class D channel link		cat. 6; class E channel link	
RF Interface – unprotected/protected side	RJ 45 female/female (8 pins)		RJ 45 female/female (8 pins)	
PoE acc. IEEE 802.3 at	✓		✓	
GDT	not replaceable, fix installed		not replaceable, fix installed	
Max. DC voltage	58 V between pairs		58 V between pairs	
Total (all lines to PE) (shield PE)	10 kA 6 kA		10 kA shield (connected) to PE	
Ingress protection rating	IP20	IP68	IP20	IP68

Order information				
Item no. Type no.	23033695 3414.99.0001	84014284 3414.99.0008	84108159 3414.99.0021	84122191 3414.99.0022

Lightning protectors

DC block



Application

- Blocking of DC (galvanic isolation in centre conductor)
- Blocking or reducing of switching transients on transmission lines

Characteristics and specialities

- Braodband operation for all cellular bands
- Max. operation DC voltage ≤ 18 kV
- Isolation at 1 kHz ≥ 80 dB
- Robust and compact
- Low weight
- IP67 rated

	DC-DC block		**DC block**	
	Series 9077			
				
Type no.	9077.41.0036		9077.41.0035	
Frequency ranges	360 to 3000 MHz	650 to 2700 MHz	350 to 3000 MHz	650 to 2700 MHz
Return loss	≥ 20 dB	≥ 26 dB	≥ 20 dB	≥ 26.5 dB
Insertion loss	≤ 0.1 dB		≤ 0.1 dB	
RF Interface – unprotected/protected side	7/16 male/female		7/16 male/female	
RF power (CW) max.	750 W		370 W	
RF power (PIP) max.	25 kW		25 kW	
PIM 3rd order	≤ –160 dBc typ.		≤ –160 dBc typ.	
DC blocking voltage on centre conductor	≤ 1kV		≤ 1kV	
Isolation at 100 kHz at 10 kHz at 1 kHz	≥ 40 dB ≥ 60 dB ≥ 80 dB		≥ 40 dB ≥ 60 dB ≥ 80 dB	
Ingress protection rating	IP67		IP67	

Order information		
Item no. Type no.	84082135 9077.41.0035	85007661 9077.41.0036

Lightning protectors

Gas discharge tube (GDT)

The best fitting gas discharge tube (GDT) can be selected according to the applied continuous RF power. If a DC signal is superimposed on the RF transmission line follow the guidelines given in the lightning protection catalogue. IP67 rated.



Type no.	Item no.	U_{Zstat}	U_{Zdyn} max.	I_S 8/20 µs	I_{SG} 8/20 µs	U_{ARC}	Dim.
		(V)	(V)	(kA)	(kA)	(V)	(mm)
9071.99.0547	23011010	230 ± 15 %	675	20	30	10 to 15	6 × 8
9071.99.0548	23034582	90 ± 20 %	500	20	30	10 to 15	6 × 8
9071.99.0549	23039069	350 ± 15 %	875	20	30	10 to 15	6 × 8
9071.99.0550	23039070	470 ± 15 %	1000	20	30	10 to 15	6 × 8
9071.99.0551	23024119	600 ± 15 %	1100	20	30	10 to 15	6 × 8

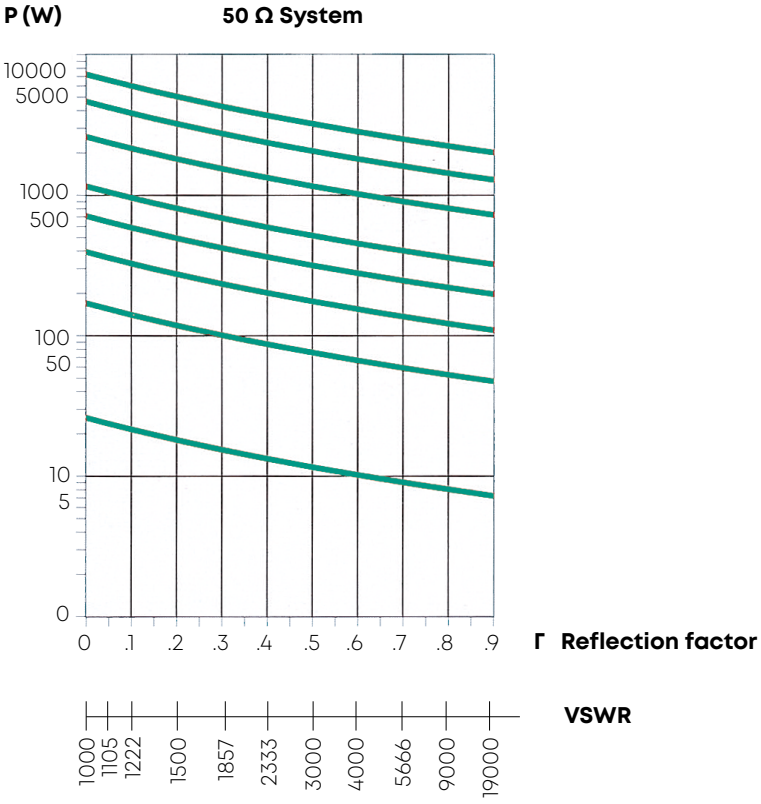


Diagramm of permissible RF power (CW or PEP) for 50 Ω systems.

Lightning protectors

Self-extinguishing gas discharge tube with automatic recovery (Semper)





Features and benefits

- Self-extinguishing gas discharge tube with automatic recovery
- Extinguishing under any coaxial line condition including:
  – Malfunction of electronic fused DC supplies
  – Malfunction of RF line monitoring
  – Absence of any such mechanism
- Can be employed for any HUBER+SUHNER GDT protector with exchangeable gas tube
- Field replacement allows cost-effective system upgrades
- Product options ensure availability for any application
- Higher safety
- Negligible system downtime

Semper GDT units for retrofit and replacement for series 3401 and 3402

HUBER+SUHNER type	U_{Zstat}	U_{Zdyn} max.	I_S 8/20 µs	I_{SG} 8/20 µs	RF power max. (single carrier) at VSWR 1.22:1 with 1.5 securtiy margin	Fig.
	V	V	kA	kA	W	
9071.99.0647 *	230 ± 15 %	675	20	30	140	1
9071.99.0648	90 ± 20 %	500			20	1
9071.99.0649	350 ± 15 %	875			325	1
9071.99.0650	470 ± 15 %	1000			590	1
9071.99.0651	600 ± 15 %	1100			960	1

* Nato stock number 5920-66-156-1512

Semper GDT units for retrofit and replacement for series 3402 platform 3000[1)]

HUBER+SUHNER type	U_{Zstat}	U_{Zdyn} max.	I_S 8/20 µs	I_{SG} 8/20 µs	RF power max. (single carrier) at VSWR 1.22:1 with 1.5 securtiy margin	Fig.
	V	V	kA	kA	W	
9071.99.0947	230 ± 15 %	675	20	30	140	2
9071.99.0948	90 ± 20 %	500			20	2
9071.99.0949	350 ± 15 %	875			325	2
9071.99.0950	470 ± 15 %	1000			590	2
9071.99.0951	600 ± 15 %	1100			960	2

[1)] Platform 3000 is a term for series 3402 protectors with a specified bandwidth of DC – 3000 MHz
Examples: 3402.17.3001, 3402.17.3002, 3402.26.3001

Lightning protectors

All dimensions in mm

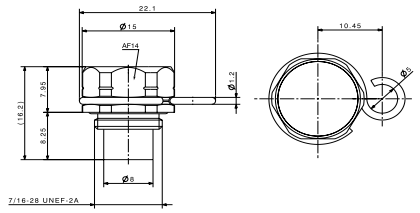


Fig. 1

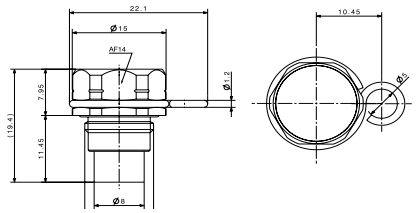


Fig. 2





Semper GDT units for retrofit and replacement for series 3409

HUBER+SUHNER type	U_{Zstat}	U_{Zdyn} max.	I_S 8/20 µs	I_{SG} 8/20 µs	RF power max. (single carrier) at VSWR 1.22:1 with 1.5 securtiy margin	Fig.
	V	V	kA	kA	W	
9071.99.0747	230 ± 15 %	675	20	30	140	3
9071.99.0748	90 ± 20 %	500			20	3

All dimensions in mm

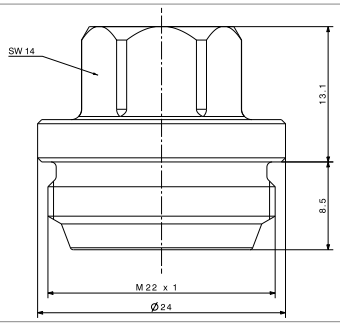
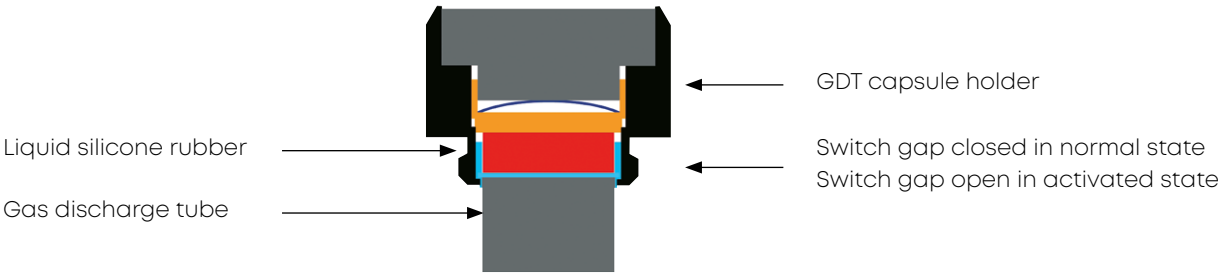


Fig. 3

Sectional view of Semper GDT module



Grounding kits and accessories



We offer a large selection of advanced products, which are rich in exclusive features and highly appreciated by the operators of leading companies in the sector because we provide total fastening safety along with practical and easy mounting.

Grounding kits and accessories

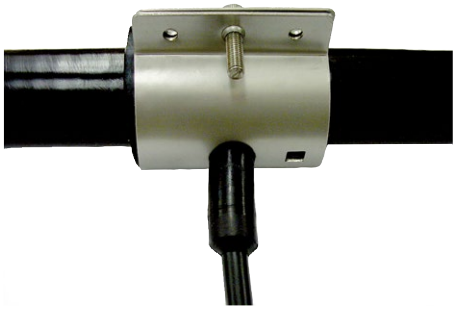
Grounding kits

Application

HUBER+SUHNER series 9076 grounding kits enable reliable grounding of today's usual corrugated copper tube and RG cables for radio transmitter antenna installations.

Features

- Quick and easy installation
- No loose piece parts
- Low contact transition resistance (1 mΩ max.)
- Grounding cable AWG6 (16 mm²)
- Current handling capability 100 kA 8/20 µs, 25 kA 10/350 µs
- Waterproof IP67
- Corrosion resistant

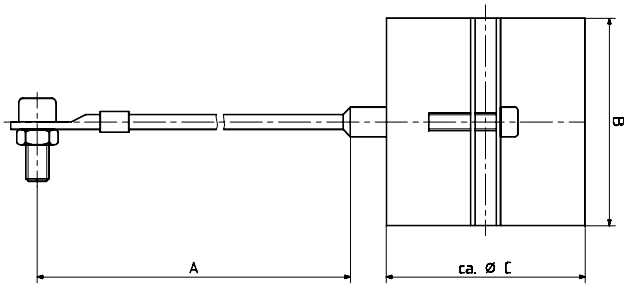


Material data

Component part	Material
Metal mounting parts	stainless steel
Contact part	copper
Gasket	EPDM

Grounding kit N-style

Straight grounding cable connection
Right angle to corrugated copper tube cable



HUBER+SUHNER type	Item no.	For cable size Sucofeed, Andrew, Nokia, Kabelmetal, RFS, Eupen, etc.	A (mm)	B (mm)	C (mm)	Stripping length	Grounding screws
9076.99.N012-50	84124423	1/2"	500	50	32	26	M8
9076.99.N013-50	84124422	1/2" highflex	500	50	32	26	M8
9076.99.N078-50	84069990	7/8"/ 7/8" highflex	500	50	44	26	M8
9076.99.N114-50	84069991	1 – 1/4"	500	50	59	26	M8
		1/2"	840	50	32	26	M8
		1/2" highflex	840	50	32	26	M8
9076.99.N014	23015053	1/4", RG_213/214 [1]	840	50	28	26	M8
9076.99.N038	23012644	3/8"	840	50	28	26	M8
	23009966	7/8"/7/8" highflex	840	50	44	26	M8
		1 – 1/4"	840	70	59	26	M8
9076.99.N158	23012647	1 – 5/8"	840	70	69	30	M8

[1] Including 3/8“ highflex

Power splitters



The RF power splitters are low loss reactive splitters for the distribution of RF signals to radio transceiver antenna systems and radiating cables. The RF power is equally distributed to all outputs with excellent amplitude and phase balance.

A broad range of power splitters with N and DIN 7/16 connectors has been designed to split even high power multi-carrier signals of all existing mobile phone systems. Multiband units simplify logistics for OEMs and multi-system operators.

Power splitters

N types with frequency range 694 to 3800 MHz



Type no.	**5502.17.0050**
Item no.	85029265
Split	2 way
Frequency	694 to 3800 MHz
Input port	N female
Output port	N female
Return loss (input)	min. 20 dB
Insertion loss	max. 0.2 dB
PIM at 2 × 43 dBm carrier power	< –161 dBc
Average power	300 W
IP rating	IP67
Operating temperature range	–35 to +85 °C/–31 to +185 °F
Weight	0.21 kg
Mounting hardware	2 clips supplied

N types with frequency range 380 to 2700 MHz





Type no.	**5501.17.0030**	**5501.17.0031**
Item no.	85029258	85029259
Split	2 way	3 way
Frequency	380 to 2700 MHz	380 to 2700 MHz
Input port	N female	N female
Output port	N female	N female
Return loss (input)	min. 19 dB	min. 19 dB
Insertion loss	typ. 0.1 dB	typ. 0.1 dB
PIM at 2 × 43 dBm carrier power	< –155 dBc	< –155 dBc
Average power	300 W	300 W
IP rating	IP67	IP67
Operating temperature range	–35 to +85 °C/–31 to +185 °F	
Weight	0.33 kg	0.37 kg
Mounting hardware	2 clips supplied	

Power splitters

DIN 7/16 types with frequency range 694 to 3800 MHz for LTE



Type no.	5501.31.0020
Item no.	85075304
Split	2 way
Frequency	380 to 2700 MHz
Input port	4310 female
Output port	4310
Return loss (input)	min. 17 dB
Insertion loss	typ. 0.1 dB
PIM at 2 × 43 dBm carrier power	-161 dBc
Average power	300 W
IP rating	IP67
Operating temperature range	-40° to +85°
Weight	0.65 Kg
Mounting hardware	2 clips supplied

DIN 7/16 types with frequency range 380 to 2700 MHz



Type no.	5501.31.0030
Item no.	85075306
Split	3 way
Frequency	380 – 2700 MHz
Input port	4310 female
Output port	4310 female
Return loss (input)	min. 17 dB
Insertion loss	typ. 0.1 dB
PIM at 2 × 43 dBm carrier power	-161 dBc
Average power	300 W
IP rating	IP67
Operating temperature range	-40° to +85°
Weight	0.85 kg
Mounting hardware	2 clips supplied

High power Low PIM Loads for stationary use

HUBER+SUHNER developed a stepped portfolio of compact Low PIM Loads starting at 30 Watt up to 150 Watt. This provides the flexibility and freedom you need for designing a DAS network. The modularity accommodates economics without compromising quality and performance.

Application
In a high power wireless infrastructure, the deployment of low PIM components is crucial in regards to the mobile network's availability and service quality.



Low PIM loads, 50 Ω

HUBER+SUHNER type	Item no.	Interface	Frequency (GHz)	Power (W)	PIM (dBc) [1]
6530.41.0001	85218440	7/16 female	0.69 to 2.7	30	≤ –160 (typ. –165)

[1] Two-tone test at 2 x 43 dBm/2 × 20 W carrier

Adaptors

These low PIM adaptors have been specially developed for IBC/DAS/small cell grade applications where passive intermodulation requirements are crucial.



Intermodulation adpators, 50 Ω

Interface 1	Interface 2	PIM (dBc) [1]	HUBER+SUHNER type	Item no.
7/16 male	NEX10 female	≤ –166 **	33_716-NEX10-50-1/133_WE	85092476
NEX10 male	7/16 female	≤ –166 **	33_NEX10-716-50-X1/133_WE	85092478
4.3-10 male	7/16 male	≤ –155 *	32_4310-716-50-X2/133_WE	85031321
4.3-10 male	7/16 female	≤ –155 *	33_4310-716-50-X2/133_WE	85031408
7/16 male	4.3-10 female	≤ –155 *	33_716-4310-50-2/133_WE	85031552
7/16 female	7/16 female	≤ –155 *	31_716-50-0-5/133_WE	85031221
7/16 male	7/16 male	≤ –155 *	32_716-50-0-5/133_WE	85031354
7/16 male	7/16 female	≤ –155 *	33_716-50-0-5/133_WE	85031578
N female	7/16 female	≤ –155 *	31_N-716-50-4/133_WE	85031263
N male	7/16 male	≤ –155 *	32_N-716-50-5/133_WE	85026230
7/16 male	N female	≤ –155 *	33_716-N-50-9/133_WE	85026231
N male	7/16 female	≤ –155 *	33_N-716-50-5/133_WE	85031611

[1] Two-tone test at 2 x 43 dBm / 2 × 20 W carrier
* typ.–160 dBc
** typ. –171 dBc

Low PIM T+M grade components





To improve or guarantee the data throughput or the system capacity in existing or new cell site networks it is vital to have access to precise test and measurement grade components which guarantee accurate and stable test results.

HUBER+SUHNER offers high performance adaptors for specific test and measurement tasks for analyzing cell site installations. The adaptors allows to accurately measure passive intermodulation (PIM) performance.

The components, such as adaptors, intermodulation standards, loads and test leads, offer a perfect range of complementary accessories to support the latest generation of portable PIM test equipment.

Low passive intermodulation adaptors

These low PIM adaptors have been specially developed for T+M grade applications in intermodulation test set-ups int the field where passive intermodulation requirements are crucial.

Features

- Outstanding intermodulation performance
- Non magnetic materials
- Excellent electrical contacts
- Reliable and repeatable intermodulation measurements



Intermodulation adpators, 50 Ω

Interface 1	Interface 2	PIM (dBC) [1]	Frequency (GHz)	HUBER+SUHNER type	Item no.
7/16 female	7/16 female	≤ –165	2.7	31_716-50-0-2/133_WE	22658136
7/16 male	7/16 male	≤ –165		32_716-50-0-2/133_WE	22658141
7/16 male	7/16 female	≤ –165		33_716-50-0-2/133_WE	22658193
7/16 female	N female	≤ –165	2.7	31_N-716-50-2/133_WE	22658137
7/16 male	N male	≤ –165		32_N-716-50-2/133_WE	22658140
7/16 male	N female	≤ –165		33_716-N-50-3/133_WE	22658823
7/16 female	N male	≤ –165		33_N-716-50-3/133_WE	22658217
7/16 female	QN female	≤ –155	2.7	31_QN-716-50-1/113_WE	23033269
7/16 male	QN male	≤ –155		32_QN-716-50-1/113_WE	23033643
7/16 male	QN female	≤ –155		33_716-QN-50-1/113_WE	23033644
7/16 female	QN male	≤ –155		33_QN-716-50-1/113_WE	23033550
7/16 female	4.1/9.5 female	≤ –165	2.7	31_4195-716-50-1/133_WE	22658138
7/16 male	4.3-10 male	≤ –166	2.7	32_4310-716-50-1/133_WE	85017233
7/16 female	4.3-10 female	≤ –166		33_4310-716-50-1/133_WE	85017237
7/16 male	4.3-10 female	≤ –166		33_716-4310-50-1/133_WE	85017213

[1] Two-tone test at 2 × 43 dBm/2 × 20 W carrier

Passive intermodulation standards

Intermodulation standards are special adaptors which generates intermodulation products of a certain preset level. They are used to verify intermodulation test benches for an instant and/or long-term level stability monitoring. If the third-order intermodulation value, displayed by the test instrument, deviates from the specified value of the intermod standard, it indicates a general measurement uncertainty which may be caused by the test set-up rooting in one or several component or interconnection PIM sources.

Features

- High repeatability
- Each item delivered with measurement protocol
- Verification traceability via serial number



7/16, 50 Ω, connector configuration male to female

Frequency band MHz	PIM (dBc) [1] 3rd order intermodulation [2]	HUBER+SUHNER type	Item no.
900	–80	69_716-50-0-1/133_WE	22658219
900	–110	69_716-50-0-3/133_WE	22658221
1800	–80	69_716-50-0-5/133_WE	23003870
1800	–110	69_716-50-0-7/133_WE	23003872

[1] Two-tone test at 2 × 43 dBm/2 × 20 W carrier

[2] IM3 ± 3 dB



TL-P – high flexible PIM test lead

HUBER+SUHNER TL-P product line is developed for indoor and outdoor applications where passive intermodulation (PIM) and return loss (RL) has to be tested. Its excellent PIM and RL performance makes this assembly perfect for the use in Test+Measurement applications. TL-P is based on a flexible cable which is optimised up to 4 GHz and protected with a steel armouring. The robust design is completed with a moulded protection between connector and cable. Field use requires flexible and ruggedised test equipment. TL-P is specially designed for this environment.

Features

- Highly flexible, tough and reliable design
- Designed for high mating cycles (> 2000)
- Produced under stringent manufacturing and quality standards
- Factory-made cable assemblies



TL-P – high flexible PIM test lead

Specifications

PIM (tested accord. IEC 62037-2)	≥ –117 dBm (–160 dBc)			
Return loss (up to L = 3.0 m)	1 GHz	2 GHz	3 GHz	4 GHz
	≤ –29 dB	≤ –26 dB	≤ –23 dB	≤ –19 dB
Shielding effectiveness	> –120 dB			
Temperature range	–15 up to 65 °C (operating) –10 up to 55 °C (installation)			
Bending radius (dynamic)	≥ 110 mm (4.3 inch)			

Choice of suitable products

Assemblies	Configuration	Length	Description	Material no.
	DIN 7/16 male – DIN 7/16 male	1.5 m 3.0 m	TL-P-11716-11716-01500-51 TL-P-11716-11716-03000-51	85027448 85027254
	DIN 7/16 male – N male	1.5 m 3.0 m	TL-P-11716-11N-01500-51 TL-P-11716-11N-03000-51	85027450 85027453
	4.3-10 male (hex.) – DIN 7/16 male	1.5 m 3.0 m	TL-P-11431X-11716-01500-51 TL-P-11431X-11716-03000-51	85029279 85029280

RF Feederline components selection guide

Quick-Fit connectors

Cable	Grounding kit		Connector		Assembling instruction	
	Type no.	Item no.	Type no.	Item no.		
SUCOFEED_1/4_HF SUCOFEED_1/4_HF_FR SUCOFEED_1/4_HF_FR_UL			Use LISCA			
SUCOFEED_3/8_HF SUCOFEED_3/8_HF_FR SUCOFEED_3/8_HF_FR_UL						
SUCOFEED_1/2_HF SUCOFEED_1/2_HF_FR SUCOFEED_1/2_HF_FR_UL	9076.99.N013-50	84124422	11_716-50-9-9	22660309	DOC-0000179418	
			16_716-50-9-5	23007298		
			21_716-50-9-9	22660310		
			11_N-50-9-9	22660311		
			16_N-50-9-6	23007299		
			21_N-50-9-9	22660312		
SUCOFEED_1/2 SUCOFEED_1/2_FR SUCOFEED_1/2_FR_UL SUCOFEED_1/2_LW	9076.99.N012-50	84124423	11_716-50-12-50	84201175	DOC-0000386367	
			16_716-50-12-50	84201179		
			21_716-50-12-50	84201177		
			11_N-50-12-50	84201169		
			16_N-50-12-50	84201181		
			21_N-50-12-50	84201173		
			11_4310-50-12-X2	85020537		
			11_4310-50-12-Y2	85021551		
			11_4310-50-12-Z2	85021552		
			21_4310-50-12-1	85029736		
SUCOFEED_7/8_HF	9076.99.N078-50	84069990	11_716-50-23-41	85010074	DOC-0000243751	
			21_716-50-23-41	85010190		
			11_N-50-23-41	84024502		
			21_N-50-23-41	84024596		
SUCOFEED_7/8 SUCOFEED_7/8_FR SUCOFEED_7/8_LA SUCOFEED_7/8_LA_FR SUCOFEED_7/8_LW_LA	9076.99.N078-50	84069990	11_716-50-23-44	84069135	DOC-0000295365	
			21_716-50-23-44	84069194		
			11_N-50-23-43	84124063		
			21_N-50-23-43	84124062		
SUCOFEED_1_1/4 SUCOFEED_1_1/4_FR SUCOFEED_1_1/4_LW	9076.99.N114-50	84069991	11_716-50-32-4	84116088	DOC-0000341341	
			21_716-50-32-4	84116150		
SUCOFEED_1-5/8 SUCOFEED_1-5/8_FR SUCOFEED_1-5/8_LA SUCOFEED_1-5/8_LA_FR SUCOFEED_1-5/8_LW_LA	9076.99. N158	23012647	11_716-50-42-4	84079343	DOC-0000299051	
			21_716-50-42-4	84079305		

	Manual stripping tools		Flaring tools		Automating rotation stripping tools	
	Type no.	**Item no.**	**Type no.**	**Item no.**	**Type no.**	**Item no.**
					74_Z-0-9-15	23001006
			74_Z-0-12-8	85006446	74_Z-0-12-11	84147226
					74_Z-0-23-16	23007928
	74_Z-0-23-100	84133924			For 7/8": 74_Z-0-23-21 For 7/8" LA: 74_Z-0-23-22	 85002265 84147229
			74_Z-0-32-15	84120843	74_Z-0-32-14 jacket stripping only	23010533
			74_Z-0-42-15	84085074	74_Z-0-42-14 jacket stripping only	2301053

RF Feederline components selection guide

HUBER+SUHNER Eco connectors

Cable	Grounding kit		Connector		Assembling instruction	
	Type no.	Item no.	Type no.	Item no.		
SUCOFEED_1/2 SUCOFEED_1/2_FR SUCOFEED_1/2_FR_UL SUCOFEED_1/2_LW	9076.99.N012-50	84124423	11_716-50-12-100	84125745	DOC-0000364681	
			21_716-50-12-100	84125740		
			11_N-50-12-100	84125756	DOC-0000364683	
			21_N-50-12-100	84125770		
SUCOFEED_7/8_HF SUCOFEED_7/8 SUCOFEED_7/8_FR SUCOFEED_7/8_LA SUCOFEED_7/8_LA_FR SUCOFEED_7/8_LW_LA	9076.99.N078-50	84069990	11_716-50-23-100	84124984	DOC-0000363432	
			21_716-50-23-100	84124988		
			11_N-50-23-100	84125762		
			21_N-50-23-100	84125871		
SUCOFEED_1_1/4 SUCOFEED_1_1/4_FR SUCOFEED_1_1/4_LW	9076.99.N114-50	84069991	11_716-50-32-100	84127325	DOC-0000364680	
			21_716-50-32-100	84127329		
			11_N-50-32-100	84132614		
			21_N-50-32-100	84132616		
SUCOFEED_1-5/8 SUCOFEED_1-5/8_FR SUCOFEED_1-5/8_LA SUCOFEED_1-5/8_LA_FR SUCOFEED_1-5/8_LW_LA	9076.99. N158	23012647	11_716-50-42-100	84132564	DOC-0000375031	
			21_716-50-42-100	84132566		
			11_N-50-42-100	84132618		
			21_N-50-42-100	84132620		

	Manual stripping tools		Flaring tools		Automating rotation stripping tools	
	Type no.	**Item no.**	**Type no.**	**Item no.**	**Type no.**	**Item no.**
					74_Z-0-12-17	84147227
	Preferred tool: 74_Z-0-23-100	84133924			For 7/8" and 7/8" HF: 74_Z-0-23-21 For 7/8" LA: 74_Z-0-23-22	 85002265 84147229
			74_Z-0-32-15	84120843	74_Z-0-32-14 jacket stripping only	23010533
			74_Z-0-42-15	84085074	74_Z-0-42-14 jacket stripping only	2301053

Cell site connectivity



Solving network densification challenges in the X-haul

Deploying 5G and 4G

Across the world the rollout of the 5G network has started with mobile operators offering enhanced mobile broadband (including fixed wireless access) services. However, in many areas the mobile fiber network infrastructure already is at its maximum capacity even without the addition of 5G. To make things even more complicated, the requirements for capacity increase solutions is extremely diverse. In a mobile fiber infrastructure network there are hardly two sites a like where the capacity increase solutions need to be placed. Available space and power, humidity and temperature resilience, available fiber strands and number of required services to name only a few.

The HUBER+SUHNER optical access solution portfolio is specifically designed to cover these diverse requirements.

Active and passive transport

Both active and passive transport solutions have their advantages. Depending on the application and location either one could be the better suited than the other. This is exactly why the HUBER+SUHNER portfolio includes both. Even more so, the passive and active solutions are designed in such a way that they can easily be combined having an active device on one side and a passive on the other side of the transport link.

Simple upgrade path

The HUBER+SUHNER optical access portfolio at the core is based on WDM both for the active and passive solutions. WDM offers some great advantages over other optical transport and capacity increase technologies. Two of the biggest advantages are the possibility to grow as you pay and a cost effective upgrade path for future technologies.

Future proof

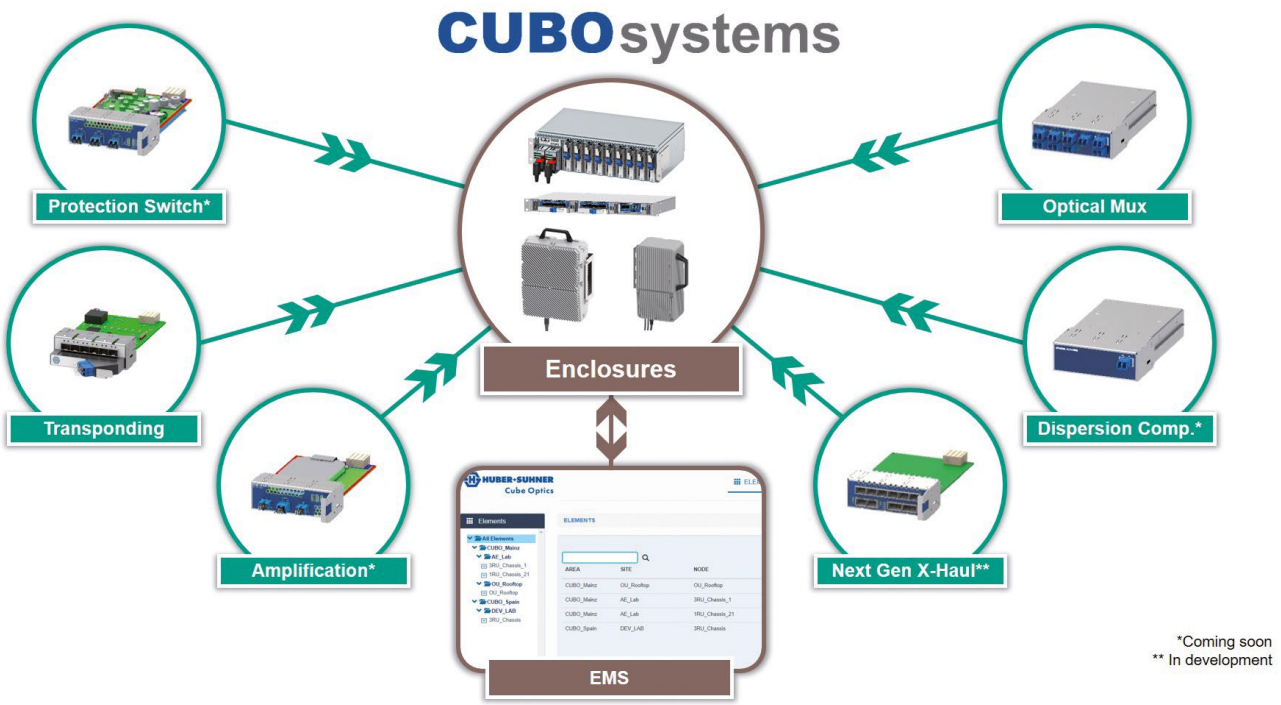
Despite the first 5G deployments having happened, there are still many uncertainties when it comes to 5G and what is to come. This is especially the case when it comes to the additional 5G services massive machine type communication (mMTC) and ultra-reliable and low-latency communication (uRLLC). For these services to make commercial sense for both operators and customers, converged 5G/4G front-, mid- and backhaul networks will become a necessity. The uncertainties hereby are the protocols that need to be supported (eCPRI, O-RAN, nFAPI, etc.) as well as timing and synchronisation requirements within the network (TSN, PTP, etc.).
As the HUBER+SUHNER optical access portfolio is based on WDM and the active solutions remain on the OSI layer 1, the above mentioned will pose no challenge.

CUBO systems

The HUBER+SUHNER CUBO systems is an active processing platform based on modular line cards that can be inserted and integrated into different indoor or outdoor form factors. In addition to the active line cards, passive modules such as optical multiplexers are also available for the CUBO systems platform. This flexible and unique platform can be used in countless different applications and really has its strong points in the demanding optical access applications such as small cell, macro cell, enterprise access and last mile backhaul.

For example the outdoor enclosures located at the radio sites combined with the 10G and/or 25G transponing multiplexer line cards are ideal for mobile fronthaul transport of current and future 4G/5G RAN.

New line cards with different functionalities are continuously being added to the CUBO systems portfolio.



The CUBO advantage

Why the HUBER+SUHNER Cube Optics active transport solution is a good choice:

- **Maximise existing fiber installation →**
  Using DWDM the capacity of a pair of fibers can be easily increased to 48 times the capacity and more.

- **Truly vendor agnostic →**
  As the active transport solution is based on a layer 1, it is completely transparent for any underlying layers and therefore is transparent for any vendor specific protocols.

- **Fast deployment →**
  The active solution is specifically designed to keep installation and configuration time to the bare minimum.

- **5G and 4G hybrid operation →**
  Due to WDM, any types of signals can be combined.

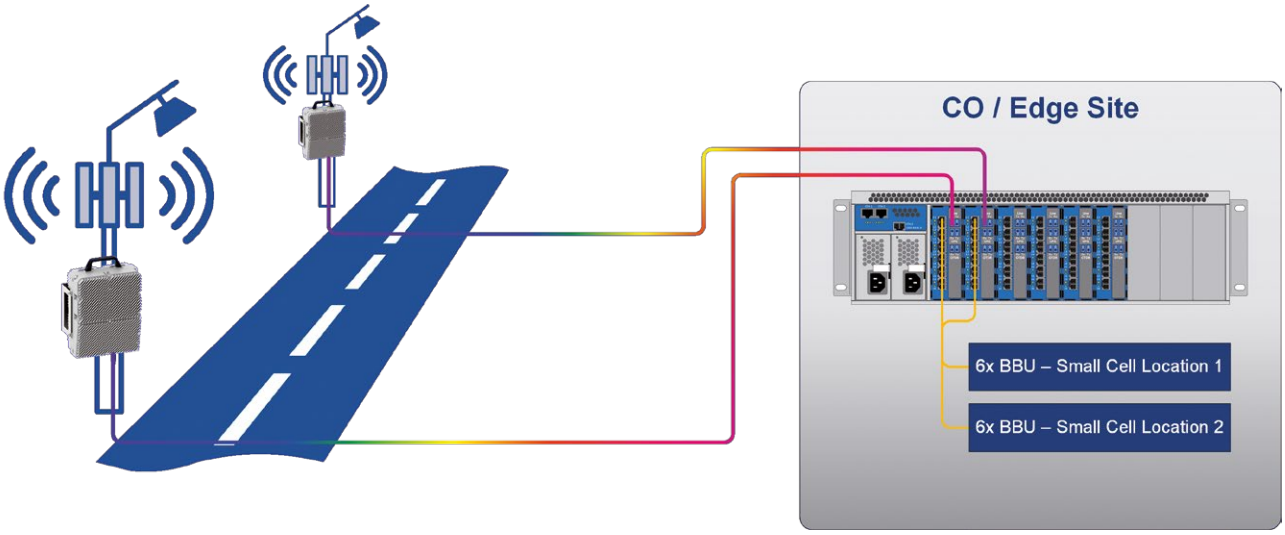
- **Future proof →**
  The modular concept combined with the flexibility of WDM allows for a simple upgrade with future modules.

- **Designed and made in Europe →**
  The active solutions are designed and manufactured in Germany and Spain.

CUBO systems

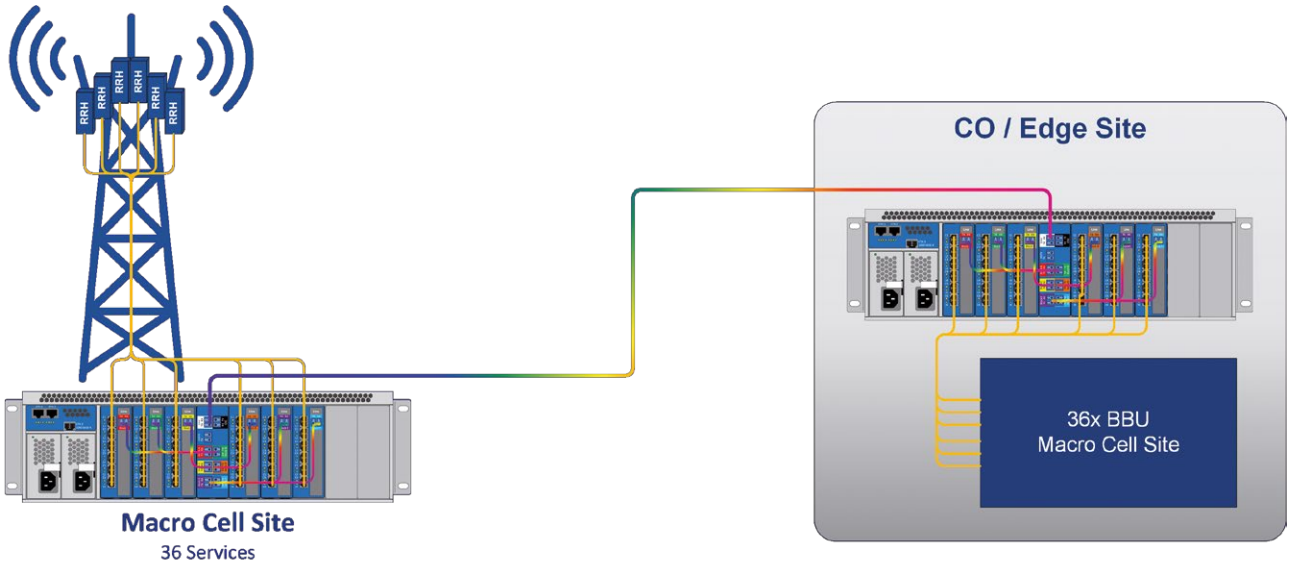
Small cell application example

The transponding multiplexer can be used in various scenarios. One of them is a hub/spoke setup for small cell applications using a combination of CUBO rack and outdoor units with transponding multiplexer modules.



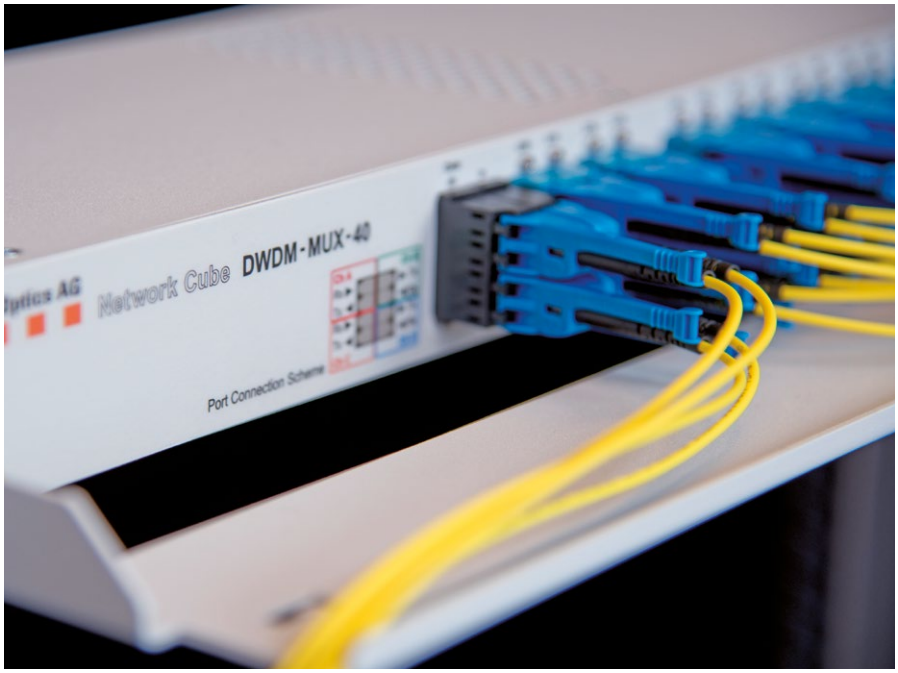
Macro cell application example

Another scenario for which the transponding multiplexer in conjunction with the terminal multiplexer are an ideal combination is a macro site to CO / edge site setup. Both are placed in the CUBO rack chassis.





HUBER+SUHNER network cubes



HUBER+SUHNER Cube Optics has specialised on optical wavelength division multiplexing. We offer all types of optical muxes, ranging from simple wideband WDM over coarse WDM to dense WDM. We are able to combine the different WDM grids and/or cascade several muxes in order to create optimal solutions suitable to each customer's needs.

We are very much aware, that each customer has a specific background and therefore a unique network architecture. In order to suite individual needs, we have products that are aimed for point to point or ring deployments (OADMs), that mix and match specific lambdas of different grids or use band splitters in order to allocate more than one wavelengths to certain locations.

Most customers will find products in the following pages covering their needs, but we encourage you to give us the chance to come up with a customised solution for your needs.

Network cube



Features

- Types of modules offered:
  – 1310/1550 wideband Mux and Demux
  – Mux and demux modules, up to 48 channels, cascadable
  – OADM modules, 1, 2 or 4 channels
  – Further modules on demand
- Suitable for CPRI/OBSAI, Ethernet
- Other functions, e.g. integrated taps, band splitter, WWDM, multimode versions etc. on demand
- Your choice of adapter: SC, LC, E2000, MU etc.
- Private labeling and customisation on demand
- For 19" or ETSI racks, adaptable to 23"
- For central office or outside plant as well as line cards for sub-rack mounts
- Also available in WDM splice enclosures or in splice trays of various brands
- Fully RoHS compliant

Ordering information

Description	Insertion loss (dB) [1]			Product family
CWDM modules (for 1 slot of the WDM modular shell)				
CWDM 4 channel mux and demux for bi-directional data transmission over two fibers. • CWDM channels: 1510, 1530, 1550, 1570 nm	Max.: Typ.:	**CWDM** < 2.4 1.6		CWDM-MUX-4 C-1643_Rev.A
CWDM 4 channel mux and demux with EXP band ports for bi-directional data transmission over two fibers. • CWDM channels: 1470, 1490, 1590, 1610 nm • EXP/express band: 1504 to 1578 nm, for later upgrades or "grey" 1550 nm transceivers	Max.: Typ.:	**CWDM** < 2.5 1.8	**Exp** < 2.5 1.5	CWDM-MUX-4+EXP C-1705_Rev.A
CWDM 8 channel mux and demux for bi-directional data transmission over two fibers. • CWDM channels: 1470, 1490, 1510, 1530, 1550,1570, 1590, 1610 nm	Max.: Typ.:	**CWDM** < 2.8 2.2		CWDM-MUX-8 C-1640_Rev.A
CWDM 8 channel mux and demux for bi-directional data transmission over two fibers. • CWDM channels: 1270, 1290, 1310, 1330, 1350, 1370, 1390, 1410 nm	Max.: Typ.:	**CWDM** < 2.8 2.2		CWDM-MUX-8 C-1939_Rev.A
CWDM 8 channel mux and demux with 1310 band ports for bi-directional data transmission over two fibers. • CWDM channels: 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610 nm • 1310/WWDM band: 1260 to 1360 nm for "grey" 1310 nm transceivers	Max.: Typ.:	**CWDM** < 3.6 1.7	**WWDM** < 1.2 0.7	CWDM-MUX-8+1310 C-1651_Rev.B
CWDM 8 channel mux and demux with UG band ports for bi-directional data transmission over two fibers. • CWDM channels: 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610 nm • UG/upgrade band: 1260 to 1438 nm, for later upgrades or "grey" 1310 nm transceivers.	Max.: Typ.:	**CWDM** < 3.6 2.5	**UG** < 1.2 1.2	CWDM-MUX-8+UG C-1678_Rev.C

[1] Insertion loss over channel bandwidth, valid over full operating temperature range and all states of polarisation with optical connectors.
The typical connector loss is 0.4 dB for a pair of connectors.

Network cube

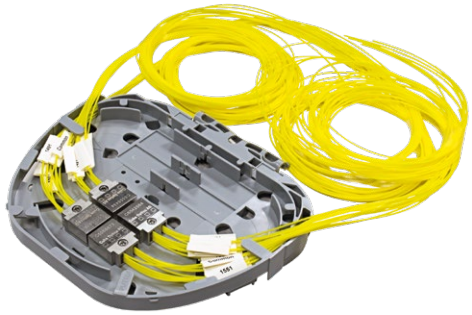
Ordering information

Description	Insertion loss (dB) [1]		Product family
DWDM modules (fixed 1HU/19" rack-mountable), all these units are also available as 200 GHz units			
DWDM 4 channel (100 GHz grid) mux and demux for bi-directional data transmission over two fibers. • DWDM channels: to be selected by customer out of the 100 GHz ITU grid	Max.: Typ.:	**DWDM** < 2.2 1.3	DWDM-MUX-4 C-1755_Rev.C
DWDM 8 channel (100 GHz grid) mux and demux for bi-directional data transmission over two fibers. • DWDM channels: to be selected by customer out of the 100 GHz ITU grid	Max.: Typ.:	**DWDM** < 3.4 2.2	DWDM-MUX-8 C-2469_Rev.A
DWDM 16 channel (100 GHz grid) mux and demux for bi-directional data transmission over one fiber. • DWDM channels: to be selected by customer out of the 100 GHz ITU grid.	Max.: Typ.:	**DWDM** < 4.0 2.4	DWDM-MUX-8FS C-2513_Rev.B
DWDM 16 channel (100 GHz grid) mux and demux for bi-directional data transmission over two fibers. • DWDM channels: to be selected by customer out of the 100 GHz ITU grid	Max.: Typ.:	**DWDM** < 4.0 2.5	DWDM-MUX-16 C-2402_Rev.A
DWDM 40 channel (100 GHz grid) mux and demux for bi-directional data transmission over two fibers, based on athermal AWG technology with wideband passbands. • DWDM channels: to be selected by customer out of the 100 GHz ITU grid	Max.:	**DWDM** < 3.0	DWDM-MUX-40 C-2819_Rev.A
DWDM 48 channel (100 GHz grid) mux and demux for bi-directional data transmission over two fibers, based on athermal AWG technology with wideband passbands. • DWDM channels: to be selected by customer out of the 100 GHz ITU grid	Max.:	**DWDM** < 3.0	DWDM-MUX-48 C-2848_Rev.A

[1] Insertion loss over channel bandwidth, valid over full operating temperature range and all states of polarisation with optical connectors.
The typical connector loss is 0.4 dB for a pair of connectors.

Network cube

Splice enclosures



A lot of above shown multiplexing configurations are available in splice enclosures. We provide either the fully assembled enclosure ready for installation on the trays with muxes to be integrated on site in your enclosure. This is available for a wide range of enclosure brands on the market.

Features

- Miniature WDM qualified for damp heat, temperature cycles, shock and vibration in accordance with Telcordia GR1221 uncontrolled environment standard and the GR1209 moisture cycling standard
- Multiplies capacity of point-to-point links within existing hand hole, pole pod or curb-side cabinet nodes
- Splice trays delivered ready for mounting and splicing
- Integrates WDM into a variety of major brands of infrastructure equipment such as 3M and others
- Fully RoHS compliant

Customised form factors





So far shown multiplexing functionality can also be integrated into other form factors to accommodate specific customer needs. Those special requirements can be e.g. outdoor enclosures, higher density or a combination of one of functionalities in one mechanical housing.

HUBER+SUHNER Cube Optics has optimised it´s production and supply chain to accommodate such requirements and being able to deliver also small series of WDM products according to special customer requests within a short period of time.

MASTERLINE Ultimate WDM (MLU WDM)



Features

- Connector head with integrated fully passive CWDM or DWDM modules for various outdoor applications
- Facilitate quick network upgrade when it comes to fiber exhaust
- CWDM wavelength ranges in accordance with ITU standard G.694.2
- DWDM wavelength ranges in accordance with ITU standard G.694.1
- Tested in accordance with Telcordia GR-1209/1221
- Available with 6 or 12 Q-ODC sockets with consecutive WDM channels

Specifications

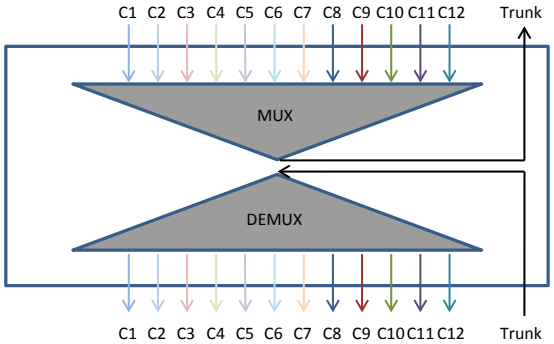
Please find general specification on page 26

Optical specifications CWDM		**MLU WDM 12**	**MLU WDM 6**
Operating wavelength range		1260 to 1620 nm	1460 to 1620 nm
Operating channels		C1 – C12	C1 – C16
Optical bandwidth		13 nm	
Insertion loss		< 3.9 dB	
Isolation	adjacent channel	> 30 dB	
	non-adjacent channel	> 40 dB	
Return loss		> 45 dB	
Directivity		> 50 dB	
Polarisation dependent loss		< 0.2 dB	
Max. optical power		< 250 mW	

Optical specifications DWD		**MLU WDM 12**	**MLU WDM 6**
Operating channels		C1 – C31	C1 – C25
Channel spacing		100 GHz	
Insertion loss		< 4.3 dB	
Isolation	adjacent channel	> 25 dB	
	non-adjacent channel	> 40 dB	
Return loss		> 45 dB	
Directivity		> 50 dB	
Polarisation dependent loss		< 0.2 dB	
Max. optical power		< 250 mW	

Due to diversity ordering information on request

LOGICAL SETUP





Integrated network cubes



Today, optical multiplexing is a widly spread procedure within fiber optic installations. It's the ideal technology to maximise the fiber capacity as it combines multiple optical signals into a fiber strand.

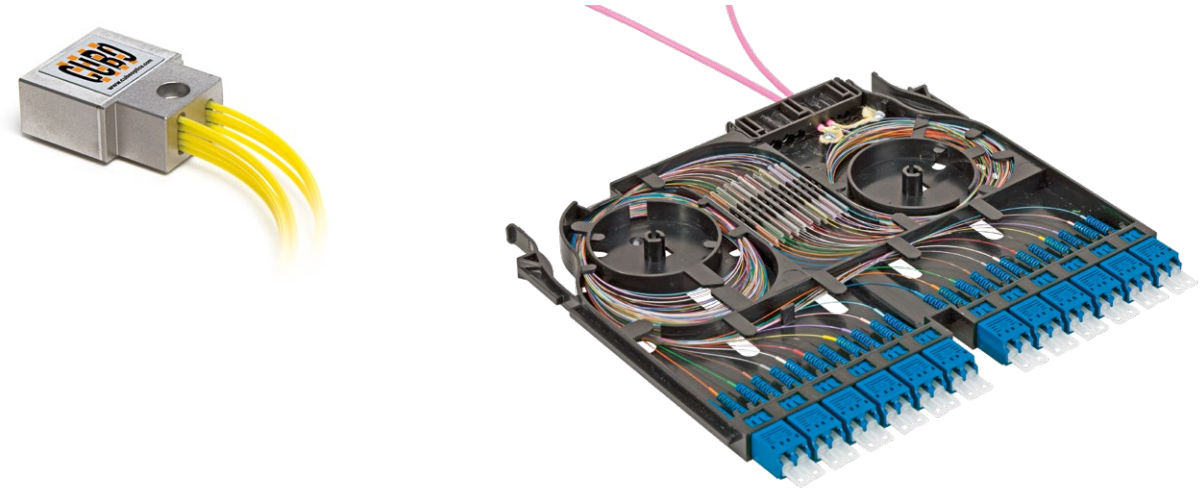
Normally the form factor of optical multiplexers are based on a 19" chassis system. This is fine for installations within data centers or other indoor locations with vast amounts of rack space available.

However, nowadays the likelyhood of having enough rack space is more than slim resulting in the necessity for compact solutions wherever possible, including the multiplexer solutions. In addition optical multiplexing is also required in other installations without 19" chassis mounting as well as for applications in outdoor environments.

The integrated network cubes are specifically designed for theses challenges and combine innovative fiber management systems, wall box systems and outdoor enclosures with state of the art WDM technology.

The enclosures used for the integrated network cubes are among others the highly acclaimed HUBER+SUHNER fiber management systems IANOS and LISA, the wall boxes Optibox and the MASTERLINE Ultimate products. The WDM technology is based on the state of the art HUBER+SUHNER Cube Optics network cubes.

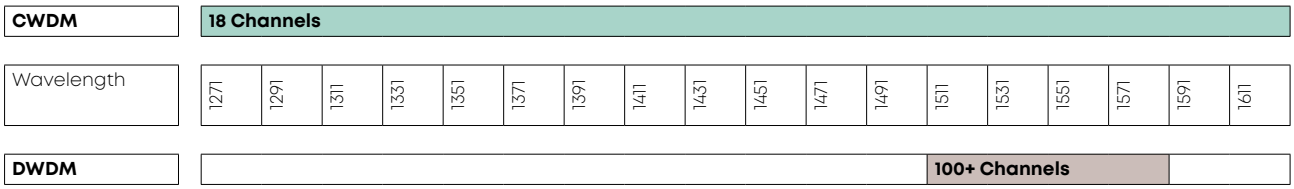
Integrated network cubes



Integrated network cubes: A combination of state of the art multiplexer and innovative enclosures

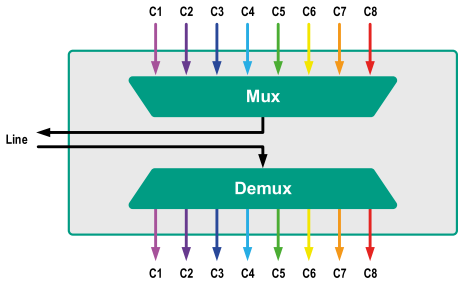
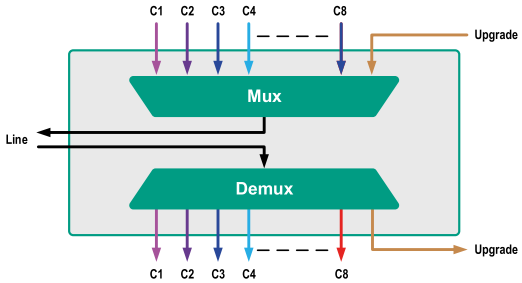
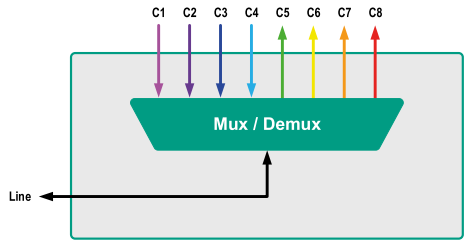
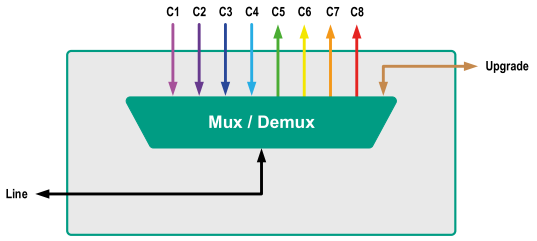
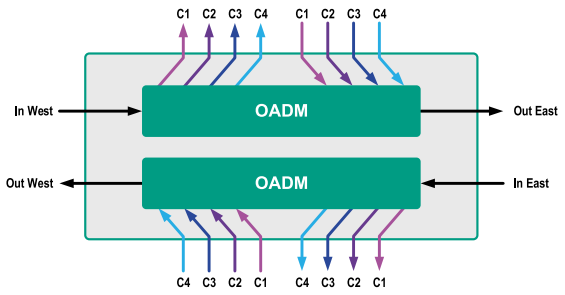
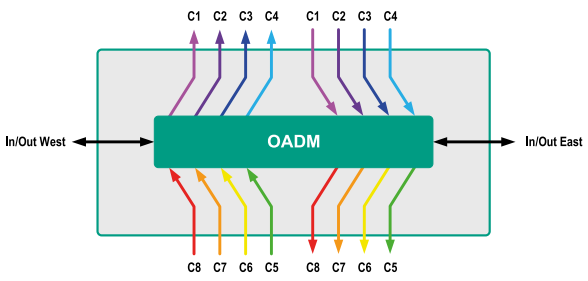
WDM grid options

Optical multiplexing has been standardised in two grids, CWDM and DWDM



CWDM	Coarse Wavelength Division Multiplex (18 channels)
DWDM	Dense Wavelength Division Multiplex (100+ channels)
Upgrade port	Most multiplexers don't cover all available channels. The upgrade port allows the addition of any of the missing channels both for CWDM and DWDM multiplexer.
1310 port	The 1310 port enables the addition of a wideband „gray" wavelength and can be combined with any DWDM multiplexers or CWDM multiplexers using the top half of the grid channels.

Integrated network cubes
WDM types

Type	Schematic	Description
Mux		**Dual Fiber Optical Multiplexer** Uses two separate fiber connections for transmission (TX) and reception (RX). The numer of wavelengths therefore is identical to the number of TX/RX channels.
Mux +UG		**Dual Fiber Optical Multiplexer + Upgrade** Uses two separate fiber connections for transmission (TX) and reception (RX). These multiplexers have a dual fiber upgrade port, which allows the addition of fiber channels that are not already covered by the multiplexer.
Mux SF		**Single Fiber Optical Multiplexer** Requires a single fiber for both transmission (TX) and reception (RX). The number of required wavelengths therefore is double the number of TX/RX channels.
Mux SF +UG		**Single Fiber Optical Multiplexer + Upgrade** Requires a single fiber for both transmission (TX) and reception (RX). These multiplexers have a single fiber upgrade port, which allows the addition of fiber channels that are not already covered by the multiplexer.
OADM		**Dual Fiber Optical Add Drop Multiplexer** East and West connection each uses a separate fiber for transmission (TX) and reception (RX). The number of add/drop channels is identical to the number of wavelengths.
OADM SF		**Single Fiber Optical Add Drop Multiplexer** East and West connection each only reqiure a single fiber for TX and RX. The number of add/drop channels therefore is double the number of wavelengths.

IANOS® – Fiber management system

The IANOS® system from HUBER+SUHNER is a state-of-theart fiber optic management system which facilitates fast, flexible and future-proof connectivity in the data center. It is made up of IANOS chassis (multiple versions and sizes available) and IANOS modules.



Data centers are constantly adapting to reflect the demands placed on them, and today's fiber management systems need to accommodate these changes with the minimum amount of cost, time and disruption.

As data centers evolve, we see a broad mixture of applications depending on the location, the business model and of course the data demand. IANOS accommodates these changes by offering the widest range of connectivity scenarios in a single generic platform.

Many of these data center applications require optical multiplexing. Instead of having separate multiplexing units, the IANOS modules with integrated HUBER+SUHNER Cube Optics network cubes are an ideal and space saving solution.

The IANOS modules come in two sizes, a single and a double width module. The single width module accomodates 6 LC duplex connectors whereas the double width module accomodates 12 LC duplex connectors. Depending on the type of network cube and number of channels either the single or double module is used.

Enclosure specification		
Type	**Single module (S)**	**Double module (D)**
Connectors	6 × LC duplex	12 × duplex
Dimensions (W×H×D)	97 × 12 × 172 mm 3.81 × 0.47 × 6.77 in	196 × 12 × 172 mm 7.71 × 0.46 × 6.77 in
Image		
Chassis	Compatible with IANOS® EDR 1U/4U and EDR zero space chassis	

IANOS® – Fiber management system

Compatibility matrix

The integrated network cube concept is extremely flexible allowing a wide range of combinations in different enclosures. However, there are limitations due to space within the enclosure and number of available fiber connections. At the same time it for example doesn't make sense to have a Network Cube with only a small number of channels in a large enclosure. The following compatibility matrix gives an overview of what WDM type and grid combination is available for the IANOS® system.

		Mux-2	Mux-2 +UG	Mux-3	Mux-3 +UG	Mux-4	Mux-4 +UG	Mux-8	Mux-8 +UG	Mux-8 +1310	Mux-16	Mux-8 2F (Dual)	Mux-1 SF	Mux-2 SF	Mux-2 SF +UG	Mux-3 SF	Mux-3 SF +UG	Mux-4 SF	Mux-4 SF + UG	Mux-6 SF	Mux-8 SF	OADM-1	OADM-2	OADM-3	OADM-4	OADM-1 SF	OADM-2 SF	OADM-3 SF	OADM-4 SF
Single	CWDM	✓	✓	✓	✓	✓	✓	×	×	×	×	×	✓	✓	✓	✓	✓	✓	✓	×	×	✓	✓	✓	✓	✓	✓	×	×
Single	DWDM	✓	✓	✓	✓	✓	✓	×	×	×	×	×	✓	✓	✓	✓	✓	✓	✓	×	×	✓	✓	✓	✓	✓	✓	×	×
Double	CWDM	×	×	×	×	×	×	✓	✓	✓	✓	✓	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	✓	✓
Double	DWDM	×	×	×	×	×	×	✓	✓	✓	✓	✓	×	×	×	×	×	×	×	✓	✓	×	×	×	×	×	×	✓	✓

IANOS® – integrated network cube versions (selection)

In addition to the WDM type, grid and enclosure combination, the integrated network cube are available with virtually any wavelength combination within the respective grid. The following table merely is a selection of available modules. If you require a version that isn't listed or more technical details regarding the optical performance, please contact HUBER+SUHNER Cube Optics.

Grid	Type	Size	Description	Item no.
CWDM		D	Mux-8: 1471, 1491, 1511, 1531, 1551, 1571, 1591, 1611 nm channel insertion loss (dB): < 3.3	85111853
CWDM		S	Mux-2+UG: 1511, 1571nm/UG: all remaining CWDM channels channel insertion loss (dB): < 1.6/upgrade insertion loss (dB): < 1.4	85111854
CWDM		S	Mux-4 SF: 1471, 1491, 1511, 1531, 1551, 1571, 1591, 1611 nm channel insertion loss (dB): < 3.3	85111855
CWDM		S	OADM-2: 1311, 1531 nm (add = drop channels) In to drop/add to out insertion loss (dB): < 1.8/in to out (dB): < 2	85111856
CWDM		D	OADM-3 SF: 1451, 1471, 1491, 1511, 1591, 1611 nm In to drop/add to out insertion loss (dB): < 2.8/in to out (dB): < 1.2	85111857
DWDM		D	Mux-8+1310: channel 18, 19, 20, 21, 22, 23, 24, 25 channel insertion loss (dB): < 3.1/1310 insertion loss (dB): < 1.4	85111858
DWDM		D	Mux-16: channel 18, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29, 30, 31, 32, 33, 34 channel insertion loss (dB): < 3.5	85111859
DWDM		D	Mux-6 SF: channel 27, 28, 29, 30, 31, 32, 33, 34, 36, 37, 38, 39 channel insertion loss (dB): < 3.9	85111860
DWDM		S	Mux-1 SF: channel 21, 24 channel insertion loss (dB): < 1.4	85111861
DWDM		D	OADM-4: channel 21, 22, 23, 24 (add = drop channels) In to drop/add to out insertion loss (dB): < 2.3/in to out (dB): < 2.9	85111862
DWDM		S	OADM-1 SF: channel 21, 24 In to drop/add to out insertion loss (dB): < 1.8/in to out (dB): < 1.2	85111863

 Dual fiber Mux	 Single fiber Mux	 Dual fiber OADM	 Single fiber OADM

LISA – fiber management system

LISA is a dedicated high-density fiber management system commonly used as a centralised cross-connect in the main distribution area (MDA) of large data centers. With a 300 mm depth and full access from the front side, LISA cabinets can be positioned against unused walls, at the end of cold aisles or back-to-back on a single floor tile.

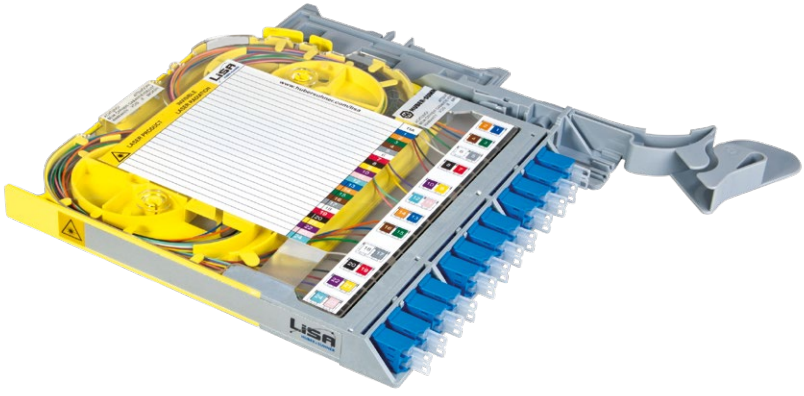


LISA racks have a density of 1500 LC ports per rack or 3000 LC ports per tile when placed back-to-back.

The main difference between LISA and conventional 19“ panels is the fact that LISA is fully accessible from the front side.

LISA fiber trays are the side-facing connectivity blocks that are inserted into tray units within high-density CDR racks. Designed for speed of installation and improved accessibility, the LISA fiber trays can be installed and removed in under 10 seconds. Fiber trays are available to cover a wide range of applications. With integrated HUBER+SUHNER Cube Optics network cubes, optical multiplexing applications are available in this very compact and easily accessible system.

The LISA modules are available with 12 or 18 LC duplex connectors. Depending on the type of Network Cube and number of channels either the 12 or 18 LC duplex connetcor version is used.

Enclosure specification	
Connectors	12 or 18x LC duplex
Dimensions (W×H×D)	288 × 18 × 262 mm (with hinge and patch cord arm) 11.38 × 0.71 × 10.32 in
Rack unit height	0.5U
Image	
Chassis	Compatible with all LISA rack solutions

LISA – fiber management system

Compatibility matrix

The integrated network cube concept is extremely flexible allowing a wide range of combinations in different enclosures. However, there are limitations due to space within the enclosure and number of available fiber connections. At the same time it for example doesn't make sense to have a network cube with only a small number of channels in a large enclosure. The following compatibility matrix gives an overview of what WDM type and grid combination is available for the LISA system.

	Mux-2	Mux-2 +UG	Mux-3	Mux-3 +UG	Mux-4	Mux-4 +UG	Mux-8	Mux-8 +UG	Mux-8 +1310	Mux-16	Mux-8 2F (Dual)	Mux-1 SF	Mux-2 SF	Mux-2 SF +UG	Mux-3 SF	Mux-3 SF +UG	Mux-4 SF	Mux-4 SF + UG	Mux-6 SF	Mux-8 SF	OADM-1	OADM-2	OADM-3	OADM-4	OADM-1 SF	OADM-2 SF	OADM-3 SF	OADM-4 SF
CWDM	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	×	×	✓	✓	✓	✓	✓	✓	✓	✓
DWDM	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×

LISA – integrated network cube versions (selection)

In addition to the WDM type, grid and enclosure combination, the integrated network cubes are available with virtually any wavelength combination within the respective grid. The following table merely is a selection of available modules. If you require a version that isn't listed or more technical details regarding the optical performance, please contact H+S Cube Optics.

Grid	Type	Description	Item no.
CWDM		Mux-3: 1511, 1531, 1551 nm channel insertion loss (dB): < 2.1	85111865
		Mux-3+UG: 1511, 1531, 1551 nm /UG: all remaining CWDM channels channel insertion loss (dB): < 2.4/upgrade insertion loss (dB): < 1.4	85111866
		Mux-8: 1471, 1491, 1511, 1531, 1551, 1571, 1591, 1611 nm channel insertion loss (dB): < 3.3	85111867
		Mux-8 2F (dual module): 1471, 1491, 1511, 1531, 1551, 1571, 1591, 1611 nm channel insertion loss (dB): < 3.3	85111869
		Mux-2 SF: 1511, 1531, 1551, 1571 nm channel insertion loss (dB): < 2.4	85111870
		Mux-2 SF+UG: 1551, 1571, 1591, 1611 nm/UG: all remaining CWDM channels channel insertion loss (dB): < 2.4/upgrad insertion loss (dB): < 1.7	85111871
		Mux-4 SF+UG: 1471, 1491, 1511, 1531, 1551, 1571, 1591, 1611 nm channel insertion loss (dB): < 3.6/upgrade insertion loss (dB): < 1.4	85111872
		OADM-1: 1451 nm (add = drop channels) In to drop/add to out insertion loss (dB): < 1.4/in to out (dB): < 1.2	85111873
		OADM-4: 1311, 1531, 1551, 1571 nm (add = drop) In to drop/add to out insertion loss (dB): < 2.4/in to out (dB): < 2.9	85111874
		OADM-1 SF: 1271, 1311 nm In to drop/add to out insertion loss (dB): < 1.8/in to out (dB): < 1.2	85111876
		OADM-3 SF: 1451, 1471, 1491, 1511, 1591, 1611 nm In to drop/add to out insertion loss (dB): < 2.8/in to out (dB): < 1.2	85111878
		OADM-4 SF: 1471, 1491, 1511, 1531, 1551, 1571, 1591, 1611 nm In to drop/add to out insertion loss (dB): < 3.3/in to out (dB): < 1.2	85111879

 Dual fiber Mux

 Single fiber Mux

 Dual fiber OADM

 Single fiber OADM

Optibox – wall enclosures

The Optibox family of products from HUBER+SUHNER are a range of wall enclosures act as the interface between the optical access network of the service provider (drop cable) and the internal „In-the-Home“ network. A passive connection enclosure at the Building Entry Point (BEP) isused for splicing, routing or connecting fibers.

The Optibox products offer a comprehensive enclosure portfolio to address a large variety of applications. From large buildings such as multi-dwelling units (MDU) to single family homes, with patching, splicing and splitting capabilities, the Optibox family satisfies the most demanding applications.

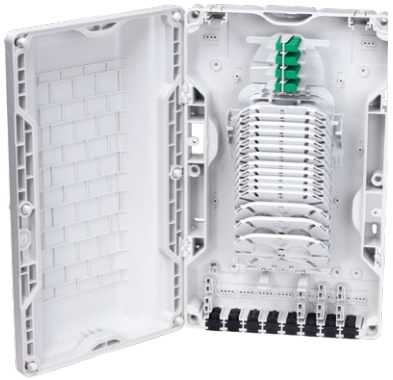
Combined with the integrated HUBER+SUHNER Cube Optics network cubes, the Optibox product range is the ideal solution for a wide range of additional applications.

Depending on the type of network cube and number of channels the best suited Optibox is used.



Enclosure specification		
Optibox 4		
Connectors	4× LC duplex	
Dimensions (W×H×D)	150 × 250 × 46 mm 5.9 × 9.84 × 1.81 in	
Ingress protection	IP54	
Optibox 4i		
Connectors	4× LC duplex	
Dimensions (W×H×D)	150 × 250 × 46 mm 5.9 × 9.84 × 1.81 in	
Ingress protection	IP67	

Optibox – wall enclosures

Enclosure specification		
Optibox 6		
Connectors	6× LC duplex	
Dimensions (WxHxD)	154 × 250 × 46 mm 6.06 × 9.84 × 1.81 in	
Ingress protection	IP54	
Optibox S8		
Connectors	8× LC duplex	
Dimensions (WxHxD)	210 × 260 × 75 mm 8.27 × 10.24 × 2.95 in	
Ingress protection	IP65	
Optibox 12		
Connectors	12× LC duplex	
Dimensions (WxHxD)	260 × 425 × 92 mm 10.23 × 16.73 × 3.62 in	
Ingress protection	IP56	
Optibox 16		
Connectors	16× LC duplex	
Dimensions (WxHxD)	347 × 437 × 109 mm 13.67 × 17.2 × 4.3 in	
Ingress protection	IP56	

Optibox – wall enclosures

Compatibility matrix

The integrated network cube concept is extremely flexible allowing a wide range of combinations in different enclosures. However, there are limitations due to space within the enclosure and number of available fiber connections. At the same time it for example doesn't make sense to have a network cube with only a small number of channels in a large enclosure.
The following compatibility matrix gives an overview of what WDM type and grid combination is available for the Optibox enclosures.

Optibox 4	Mux-2	Mux-2 +UG	Mux-3	Mux-3 +UG	Mux-4	Mux-4 +UG	Mux-8	Mux-8 +UG	Mux-8 +1310	Mux-16	Mux-8 2F (Dual)	Mux-1 SF	Mux-2 SF	Mux-2 SF +UG	Mux-3 SF	Mux-3 SF +UG	Mux-4 SF	Mux-4 SF + UG	Mux-6 SF	Mux-8 SF	OADM-1	OADM-2	OADM-3	OADM-4	OADM-1 SF	OADM-2 SF	OADM-3 SF	OADM-4 SF
CWDM	✓	✓	✓	×	✓	×	×	×	×	×	×	✓	✓	✓	✓	✓	✓	✓	×	×	✓	✓	×	×	✓	✓	×	×
DWDM	✓	✓	✓	×	✓	×	×	×	×	×	×	✓	✓	✓	✓	✓	✓	✓	×	×	✓	✓	×	×	✓	✓	×	×
Optibox 4i																												
CWDM	✓	✓	✓	×	✓	×	×	×	×	×	×	✓	✓	✓	✓	✓	✓	✓	×	×	✓	✓	×	×	✓	✓	×	×
DWDM	✓	✓	✓	×	✓	×	×	×	×	×	×	✓	✓	✓	✓	✓	✓	✓	×	×	✓	✓	×	×	✓	✓	×	×
Optibox 6																												
CWDM	×	×	×	✓	×	✓	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	✓	✓	×	×	×	×
DWDM	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	✓	×	×	×	×	×	✓	✓	×	×	×	×
Optibox S8	Mux-2	Mux-2 +UG	Mux-3	Mux-3 +UG	Mux-4	Mux-4 +UG	Mux-8	Mux-8 +UG	Mux-8 +1310	Mux-16	Mux-8 2F (Dual)	Mux-1 SF	Mux-2 SF	Mux-2 SF +UG	Mux-3 SF	Mux-3 SF +UG	Mux-4 SF	Mux-4 SF + UG	Mux-6 SF	Mux-8 SF	OADM-1	OADM-2	OADM-3	OADM-4	OADM-1 SF	OADM-2 SF	OADM-3 SF	OADM-4 SF
CWDM	×	×	×	×	×	×	×	×	×	×	×	✓	✓	✓	✓	✓	✓	✓	×	×	×	×	×	×	✓	✓	✓	✓
DWDM	×	×	×	×	×	×	×	×	×	×	×	✓	✓	✓	✓	×	×	×	×	×	×	×	×	×	×	×	×	×
Optibox 12																												
CWDM	×	×	×	×	×	×	✓	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
DWDM	×	×	×	×	×	×	✓	×	×	×	×	×	×	×	×	×	×	×	✓	✓	×	×	×	×	×	×	×	×
Optibox 16																												
CWDM	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
DWDM	×	×	×	×	×	×	×	×	×	✓	×	×	×	×	×	×	×	×	✓	✓	×	×	×	×	×	×	×	×
	Mux-2	Mux-2 +UG	Mux-3	Mux-3 +UG	Mux-4	Mux-4 +UG	Mux-8	Mux-8 +UG	Mux-8 +1310	Mux-16	Mux-8 2F (Dual)	Mux-1 SF	Mux-2 SF	Mux-2 SF +UG	Mux-3 SF	Mux-3 SF +UG	Mux-4 SF	Mux-4 SF + UG	Mux-6 SF	Mux-8 SF	OADM-1	OADM-2	OADM-3	OADM-4	OADM-1 SF	OADM-2 SF	OADM-3 SF	OADM-4 SF

Optibox – wall enclosures

Optibox – integrated network cube versions (selection)

In addition to the WDM type, grid and enclosure combination, the integrated network cubes are available with virtually any wavelength combination within the respective grid. The following table merely is a selection of available modules. If you require a version that isn't listed or more technical details regarding the optical performance, please contact HUBER+SUHNER Cube Optics.

Box	Grid	Type	Description	Item no.
Optibox 4	CWDM		Mux-3: 1511, 1531, 1551 nm channel insertion loss (dB): < 2.1	85111881
			Mux-3 SF: 1471, 1491,1511, 1531, 1551, 1571 nm channel insertion loss (dB): < 2.6	85111882
	DWDM		Mux-4: channel 21, 22, 23, 24 channel insertion loss (dB): < 2.4	85111883
			OADM-2 SF: C27, C28, C45, C46 In to drop/add to out insertion loss (dB): <1.8/in to out (dB): < 2	85111884
Optibox 4i	CWDM		Mux-3 SF+UG: 1471, 1491,1511, 1531, 1551, 1571 nm channel insertion loss (dB): < 3/upgrade insertion loss (dB): < 1.2	85111886
			OADM-1: 1451 nm (add = drop channels) In to drop/add to out insertion loss (dB): < 1.4/in to out (dB): < 1.2	85111888
	DWDM		Mux-4 SF: channel 27, 28, 29, 30, 31, 32, 33, 34 channel insertion loss (dB): < 3.3	85111890
			OADM-1 SF: channel 21, 24 In to drop/add to out insertion loss (dB): < 1.8/in to out (dB): < 1.2	85111892
Optibox 6	CWDM		Mux-3+UG: 1511, 1531, 1551 nm/UG: all remaining CWDM channels channel insertion loss (dB): < 2.4/upgrade insertion loss (dB): < 1.4	85111894
			Mux-4+UG: 1511, 1531, 1551, 1571 nm /UG: all remaining CWDM channels channel insertion loss (dB): < 2.7/upgrade insertion loss (dB): < 1.4	85111895
			OADM-4: 1311, 1531, 1551, 1571nm (add = drop channels) In to drop/add to out insertion loss (dB): < 2.4/in to out (dB): < 2.9	85111897
Optibox S8	CWDM		Mux-2 SF+UG: 1551, 1571, 1591, 1611 nm/UG: all remaining CWDM channels channel insertion loss (dB): < 2.4/upgrade insertion loss (dB): < 2.7	85111899
			Mux-3 SF+UG: 1471, 1491,1511, 1531, 1551, 1571 nm channel insertion loss (dB): < 3/upgrade insertion loss (dB): < 1.4	85111900
			OADM-2 SF: 1271, 1291, 1311, 1331 nm In to drop/add to out insertion loss (dB): < 2.4/in to out (dB): < 1.2	85111902
			OADM-4 SF: 1471, 1491, 1511, 1531, 1551, 1571, 1591, 1611nm In to drop/add to out insertion loss (dB): < 3.3/in to out (dB): < 1.2	85111903
Optibox 12	DWDM		Mux-8 SF: channel 27, 28, 29, 30, 31, 32, 33, 34, 36, 37, 38, 39, 40, 41, 42, 43 channel insertion loss (dB): < 3.3	85111905
			Mux-6 SF: channel 27, 28, 29, 30, 31, 32, 33, 34, 36, 37, 38, 39 channel insertion loss (dB): < 3.9	85111907
			Mux-8 SF: channel 27, 28, 29, 30, 31, 32, 33, 34, 36, 37, 38, 39, 40, 41, 42, 43 channel insertion loss (dB): < 4.0	85111908
Optibox 16	DWDM		Mux-16: channel 18, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29, 30, 31, 32, 33, 34 channel insertion loss (dB): < 3.5	85111910
			Mux-6 SF: channel 27, 28, 29, 30, 31, 32, 33, 34, 36, 37, 38, 39 channel insertion loss (dB): < 3.9	85111911
			Mux-8 SF: channel 27, 28, 29, 30, 31, 32, 33, 34, 36, 37, 38, 39, 40, 41, 42, 43 channel insertion loss (dB): < 4.0	85111912

 Dual fiber Mux	 Single fiber Mux	 Dual fiber OADM	 Single fiber OADM

MASTERLINE Classic – FTTA box

The MASTERLINE Classic FTTA Boxes are mainly designed for remote radio installations. These ruggedised outdoor Fiber-To-The-Antenna (FTTA) boxes are a cost effective method for an effective and flexbile installation for mobile networks. Usually, a multifiber riser cable is connected to the mast mounted FTTA distribution box which is then linked to the remote radio heads with short jumper cables.



For the integrated network cubes the MASTERLINE Classic FTTA box medium is the perfect choise. The compact size, together with the IP67 ingress protection makes this integrated network cube ideal for a wide range of indoor and outdoor applications.

Especially for centralised radio access networks using passive fronthaul to the cell sites, the integrated network cube based on the MASTERLINE Classic FTTA box medium is a good choise, as it combines all features required by this application.

Enclosure specification	
Connectors	18× LC duplex
Dimensions (W×H×D)	240 × 240 × 132 mm 9.45 × 9.45 × 5.2 in
Material	glass-filled polycarbonate, halogen-free, UV resistant
Flammability rating	UL 94 V0
Ingress protection	IP67
Impact resistance	IK 07 (EN 62262)

MASTERLINE Classic – FTTA box

Compatibility matrix

In addition to the WDM type, grid and enclosure combination, the integrated network cubes are available with virtually any wavelength combination within the respective grid. The following table merely is a selection of available modules. If you require a version that isn't listed or more technical details regarding the optical performance, please contact HUBER+SUHNER Cube Optics.

	Mux-2	Mux-2 +UG	Mux-3	Mux-3 +UG	Mux-4	Mux-4 +UG	Mux-8	Mux-8 +UG	Mux-8 +1310	Mux-16	Mux-8 2F (Dual)	Mux-1 SF	Mux-2 SF	Mux-2 SF +UG	Mux-3 SF	Mux-3 SF +UG	Mux-4 SF	Mux-4 SF + UG	Mux-6 SF	Mux-8 SF	OADM-1	OADM-2	OADM-3	OADM-4	OADM-1 SF	OADM-2 SF	OADM-3 SF	OADM-4 SF
CWDM	×	×	×	×	×	×	×	×	✓	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	✓	✓
DWDM	✓	✓	✓	✓	✓	✓	✓	×	×	×	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	×	×	×	×	✓	✓	✓

MLC FTTA – integrated network cubes versions (selection)

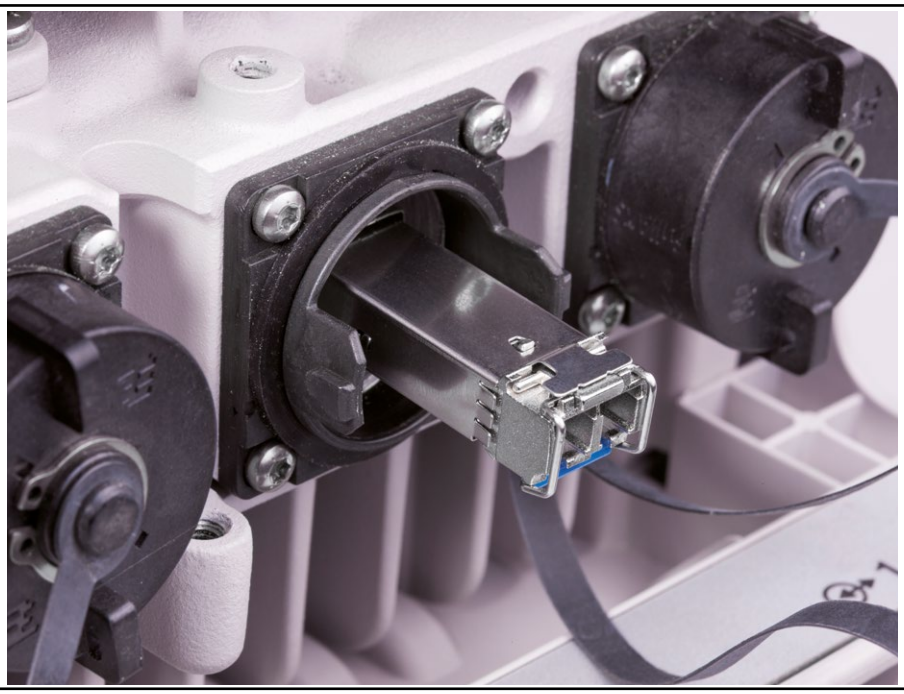
In addition to the WDM type, grid and enclosure combination, the integrated network cubes are available with virtually any wavelength combination within the respective grid. The following table merely is a selection of available modules. If you require a version that isn't listed or more technical details regarding the optical performance, please contact HUBER+SUHNER Cube Optics.

Grid	Type	Description	Item no.
DWDM		Mux-2: channel 21, 23 channel insertion loss (dB): < 1.2	85111913
		Mux-4: channel 21, 22, 23, 24 channel insertion loss (dB): < 2.4	85111914
		Mux-8: channel 18, 19, 20, 21, 22, 23, 24, 25 channel insertion loss (dB): < 3.3	85111915
		Mux-2 SF: channel 21, 22, 23, 24 channel insertion loss (dB): < 2.4	85111916
		Mux-3 SF: channel 27, 28, 29, 30, 31, 32 channel insertion loss (dB): < 2.6	85111917
		Mux-4 SF: channel 27, 28, 29, 30, 31, 32, 33, 34 channel insertion loss (dB): < 3.3	85111918
		Mux-8 SF: channel 27, 28, 29, 30, 31, 32, 33, 34, 36, 37, 38, 39, 40, 41, 42, 43 channel insertion loss (dB): < 4.0	85111919
		OADM-3: C21, C22, C23 (add = drop channels) In to drop/add to out insertion loss (dB): < 2.1 in to out (dB): < 2.3	85111920
		OADM-1: C21 (add = drop) In to drop/add to out insertion loss (dB): < 1.4/in to out (dB): < 1.2	85111921
		OADM-4 SF: C18, C19, C20, C21, C22, C23, C24, C25 In to drop/add to out insertion loss (dB): < 3.3/in to out (dB): < 1.2	85111922
		OADM-3 SF: C27, C28, C29, C45, C46, C47 In to drop/add to out insertion loss (dB): < 3/in to out (dB): < 1.2	85111923
		OADM-2 SF: C27, C28, C45, C46 In to drop/add to out insertion loss (dB): < 2.4/in to out (dB): < 1.2	85111924

Dual fiber Mux	Single fiber Mux	Dual fiber OADM	Single fiber OADM



HUBER+SUHNER pluggable transceiver



HUBER+SUHNER provides a full range of pluggable optical transceivers, approx. 2000 different types available, all compatible to MSA standard.

We are covering all major protocols and data rates (most importantly Ethernet and CPRI/OBSAI up to 100 Gbps). Our transceivers are available grey (850 nm MM/1310 nm SM/1550 nm SM) or coloured CWDM and DWDM, supporting MMF or SMF fiber at multiple power budgets to cover different distances.

The CUBO transceivers are compatible with all common active equipment, such as BBU/RRH and other small cell equipment.

Transceiver

2 core power supply cable PVC jacket material, UL listed (TC-ER)



Features

- Compliant with SFP/SFP+/QSFP(28) MSA
- Data rate up to 100 Gbps
- Transmission distance up to 160 km
- Low power consumption
- Extreme reliability
- All major codings available without surcharge
- RoHS 6/6 compliant
- Laser class 1 IEC-60825 compliant
- Case operation temperature range:
  – Commercial: 0 to 70 °C
  – Industrial: –40 to 85 °C
- Applications: Ethernet, CPRI/OBSAI, eCPRI

Typical transceiver used for wireless application

All industrial temperature (–40 to +85 °C operating), uncoded and including DMI

Form factor	Media	Protocol	Data rate	Distance
SFP	CWDM (1270 to 1610 nm)	Ethernet, CPRI 2	up to 1.25G	40 km
SFP	CWDM (1470 to 1610 nm)	Ethernet, CPRI 2	up to 1.25G	80 km
SFP	DWDM (ch17 – ch61)	Ethernet, CPRI 2 – 3	1.25G and 2.5G	80 km and 120 km
SFP	1310 nm (LX)	Ethernet, CPRI 2	up to 1.25G	2+ km … 40 km
SFP	Bidi (various wavelength)	Ethernet, CPRI 2	up to 1.25G	20 km … 160 km
SFP	850 nm (SX) MM fiber	Ethernet, CPRI 2	up to 1.25G	0.5 km
SFP+	1310 nm (LR)	Ethernet, CPRI 2 - 6	up to 6.1G	10 km
SFP+	850 nm (SR) MM fiber	Ethernet, CPRI 2 – 8	up to 10.1G	0.3 km
SFP+	1310 nm (LR)	Ethernet, CPRI 2 – 8	up to 10.1G	2+ km … 40 km
SFP+	Bidi, 1270/1330 nm	Ethernet, CPRI 2 – 8	up to 10.1G	10 km … 80 km
SFP+	CWDM (1270 to 1610 nm)	Ethernet, CPRI 2 – 8	up to 10.1G	10 km
SFP+	CWDM (1470 to 1610 nm)	Ethernet, CPRI 2 – 8	up to 10.1G	40 km and 80 km
SFP+	DWDM (ch17 – ch61)	Ethernet, CPRI 2 – 8	up to 10.1G	40 km and 80 km
SFP28	1310 nm (LR)	Ethernet, CPRI 10	up to 25G	10 km
SFP28	Bidi 1270/1310 nm	Ethernet, CPRI 10	up to 25G	10 km … 30 km
SFP28	DWDM c-Band	Ethernet, CPRI 10	up to 25G	10 km …15 km
QSFP28	1310 nm (LR4)	Ethernet	up to 112G	10 km
QSFP28	1310 nm (eLR4)	Ethernet	up to 103G	25 km

Transceiver selection guide

Selecting the right transceiver can be a challenge due to the wide range of available products. For HUBER+SUHNER to be able to propose the one transceiver to match the application and hardware, all below stated parameters A-E have to be determined and specified. Only with a complete set of parameters can we propose a suitable transceiver for a specific enquiry.

A	**Transceiver type "form factor"/MSA type**

The transceiver has to mechanically and electrically fit into a given active equipment.
Transceiver MSAs define mechanical form factors including electric interface as well as power consumption and cable connector types.

SFP/SFP+

B	**Protocol and data rate**

Different switch/router support different protocols and data rates.

CPRI: Rate 1 (0.6 G/s), Rate 2 (1.2 G/s), Rate 3 (2.5 G/s), Rate 4 (3.0 G/s), Rate 5 (4.9 G/s), Rate 6 (6.1 G/s), Rate 7 (9.8 G/s)
Ethernet: Gigabit Ethernet, 10 GE

C	**Power budget**

The transceiver power budget is the difference between laser launch power and receiver sensitivity and has to be 2 to 3 dB larger than the measured link loss. If the link loss cannot be measured it has to be calculated by adding up individual losses: transmission distance (km) + fiber type (or OTDR trace), number of ODFs, patches, splices, passive optical components (e.g. splitter and muxes) and other sources of loss have to be known. Please state all individual losses.

Power budget (dB)
common values are < 10, 14, 20, 24, 28, > 30

D	**Transport media/transceiver "colour"**

What transport media will be used: copper, single mode fiber (SMF), multimode fiber (MMF).
If SMF is used what is the optical transmission spectrum: "grey" (wide 1310/wide 1550 nm) or "coloured" (CWDM or DWDM).
If CWDM or DWDM shall be used, channels need to be specified.

850 nm MM/1310 nm grey/1550 nm grey/CWDM (1270 to 1610 nm)/DWDM (100 GHz ch 17 to 61)/
Bi-Di (please specify wave-length pair)

MM = Multimode/all others are single mode.

E	**Equipment compatibility/"coding"**

In what switch/router is the transceiver supposed to work. Is the equipment "open for 3rd party transceivers" or "vendor locked".
IOften switch/router is vendor locked, so, the transceiver has to be coded to be accepted by the equipment.
Therefore switch/router brand and model must be known (e.g. Cisco Catalyst 8500)

In case switch/router open for 3rd party transceivers, chose uncoded/none

3 Com/Alcatel/Arista/Brocade (pls. differ from Foundry)/Ciena/Cisco/Dell/Ericsson/Extreme/Force10/Juniper/HP/Huawei/
Marconi/Nortel/Transmode



Timing solutions – GPS over Fiber

As capacity increases, very low latency as well as precision timing and synchronization are needed to ensure closer coordination between cell sites. Limited power infrastructures, coupled with the complexity and time required to install multiple antennas on structural rooftops, are challenging the network expansion. Working with the leading telecommunications company in North America, HUBER+SUHNER developed a game-changing Direct GPS-over-Fiber solution for telecommunication and data center customers in search of scalable timing infrastructure solutions for outdoor remote antenna applications that provide efficient installation, flexible configurations and no need for power infrastructure at the remote end.

The Direct GPS-over-Fiber portfolio offers fast and easy-to-install solutions for timing infrastructure that are compact with integrated transmitters which reduce hardware costs by taking away the need for multiple GPS antennas, can reach longer distances over fiber optic cabling (GPS-over-Fiber) and eliminates the need for costly remote antenna power infrastructure with a copper-free GPS link that uses fiber optic cabling (Power-over-Fiber) to distribute both power and signal.



Structure
The compact space-saving design of Direct GPS-over-Fiber dramatically reduces the amount of hardware and equipment needed



Enhance
The ease-of-use benefits of Direct GPS-over-Fiber help free up time for resources to be spent elsewhere.

Drive



Direct GPS-over-Fiber optimizes ownership and lifecycle costs leaving more capital and

Portfolio overview

GPS-over-Fiber portfolio

GPS-over-Fiber Transmitter (TX) Modules (E/O Conversion)

Item-No	Product Description	# of RF Inputs	# FO outputs	Form factor
85065409	GPSoF1 - 1.5GHz (TX)	1 SMA	1 FC/APC	Din Rail mount
85072905	GPSoF1 - 1.5GHz (TX) L1+L2	1 SMA	1 FC/APC	Din Rail mount
85135572	GPSoF1 (TX) [LC/PC]	1 SMA	1 LC/UPC	Din Rail mount
85145805	GPSoF1 (TX) [LC/PC] IP66 AC	1 SMA	1 LC/UPC	Outdoor enclosure
85145804	GPSoF1 (TX) [LC/PC] IP66 DC	1 SMA	1 LC/UPC	Outdoor enclosure
85139263	GPSoF4 (TX) L1+L2	4 SMA	1 FC/APC	19" 1 RU
85154592	GPSoF IP66 Mastmount Kit			Mast mount adapter

GPS-over-Fiber Receiver (RX) Modules (O/E Conversion)

Item-No	Product Description	# of RF Outputs	# FO Inputs	# FO outputs	Form factor
85065397	GPSoF1 - 1.5GHz (RX)	1 SMA	1 FC/APC	-	Din Rail mount
85072906	GPSoF1 - 1.5GHz (RX) L1+L2	1 SMA	1 FC/APC	-	Din Rail mount
85135573	GPSoF1 (RX) [LC/PC] L1+L2	1 SMA	1 LC/UPC	-	Din Rail mount
85065809	GPSoF4 - 1.5GHz (RX)	4 SMA	1 FC/APC	-	Din Rail mount
85072907	GPSoF4 - 1.5GHz (RX) L1+L2	4 SMA	1 LC/UPC	-	Din Rail mount
85140587	GPSoF4 - 1.5GHz (RX) [LC/PC]	4 SMA	1 LC/UPC	-	Din Rail mount
85134405	GPSoF8 (RX)	8 SMA	1 LC/UPC	-	19" 1 RU
85127335	GPSoF8 - 1.5GHz (RX) L1+L2	8 SMA	1 FC/APC	-	Din Rail mount
85134363	GPSoF16 (RX)	16 SMA	1 LC/UPC	-	19" 1 RU
85145447	GPSoF16-2 (RX)	16 SMA	1 LC/UPC	2 LC/UPC	19" 1 RU
85140926	GPSoF32 (RX)	32 SMA	1 LC/UPC	-	19" 2 RU

GPS-over-Fiber antenna

Item-No	Product Description	Frequency range	Power supply
85160014	GNSS ANT L1+L2 3.3 V	L1+L2	3.3 V
85170543	GNSS ANT L1+L2 5 V		5.0 V

Direct GPS-over-Fiber portfolio

Direct GPS-over-Fiber Transmitter (TX) Module (Optical GNSS Antenna)

Item-No	Product Description	FO Interface	Form factor
85077810	Direct GPSoF (TX)	QODC12	Antenna

Direct GPS-over-Fiber Receiver (RX) Modules (O/E Conversion)

Item-No	Product Description	# of RF Inputs	# FO Inputs	# FO outputs	Form factor
85128283	Direct GPSoF - MAC8-1 (RX)	8 SMA	QODC12	1 LC/UPC	19" 1 RU

Direct GPS-over-Fiber KITS

Item-No	Product Description (SAP View)	Kit Includes
85134673	Direct GPSoF - MAC8-1 Link	85128283 + 85077810

Additional modules

Item-No	Product Description	# RF/FO Inputs	#RF/FO Outputs	Form Factor
85128403	GPSoF Amp Expansion Module 16	1 SMA	16 SMA	19" 1RU
85128404	GPSoF Amp Expansion Module 32	1 SMA	16 SMA	19" 2RU
85154296	GPSoF - OSM (1x8)	1 LC/UPC	8 LC/UPC	19" 1RU

GPS-over-Fiber Power Unit

Item-No	Product Description	Power Input	Power Output	Form Factor
85152769	Direct GPSoF DC/DC Converter	2× -48VDC	2× 12VDC	19" 1RU

Portfolio overview

Fiber optic assemblies Q-ODC-12 Riser rated

Item-No	Product Description	Length (ft)	length (m)
85115099	MA12_QOP3_QOP3_A270R_15.2_BB	50	15.25
85115100	MA12_QOP3_QOP3_A270R_30.5_BB	100	30.5
85115101	MA12_QOP3_QOP3_A270R_45.7_BB	150	45.75
85115102	MA12_QOP3_QOP3_A270R_61.0_BB	200	61
85115103	MA12_QOP3_QOP3_A270R_76.2_BB	250	76.25
85115104	MA12_QOP3_QOP3_A270R_91.4_BB	300	91.5
85115105	MA12_QOP3_QOP3_A270R_107_BB	350	106.75
85115106	MA12_QOP3_QOP3_A270R_122_BB	400	122
85115107	MA12_QOP3_QOP3_A270R_137.2_BB	450	137.25
85142046	MA12_QOP3_QOP3_A270R_152.4_BB	500	152.5
85142047	MA12_QOP3_QOP3_A270R_183_BB	600	183
85142048	MA12_QOP3_QOP3_A270R_213.4_BB	700	213.5
85142049	MA12_QOP3_QOP3_A270R_244_BB	800	244
85159918	MA12_QOP3_QOP3_A270R_274.3_BB	900	274.5
85159919	MA12_QOP3_QOP3_A270R_305_BB	1000	305

Note: Q-ODC-12 Plenum rated assemblies are available upon request

RF cable assemblies

Item-No	Product Description	Interface	Length (ft)	Length (m)
85134446	LIS-C5-11SMA-11SMA-00305-55	SMA (m)	1	0.3
85134447	LIS-C5-11SMA-11SMA-00610-55	SMA (m)	2	0.6
85134454	LIS-C5-11SMA-11SMA-00914-55	SMA (m)	3	0.9
85134452	LIS-C5-11SMA-11SMA-01829-55	SMA (m)	6	1.8
85134450	LIS-C5-11SMA-11SMA-03658-55	SMA (m)	12	3.7
85134449	LIS-C5-11SMA-11SMA-04572-55	SMA (m)	18	5.5



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HUBER+SUHNER is certified to ISO 9001, ISO 14001, ISO 45001, EN/AS 9100, IATF 16949 and ISO/TS 22163-IRIS.

Waiver
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