Wireless infrastructure

Solutions for remote radios and cell sites

Edition 2014/03

HUBER+SUHNER

Excellence in Connectivity Solutions

Count on proven wireless technology

Your partner for connectivity solutions

The HUBER+SUHNER group is a leading global supplier of components and systems for electrical and optical connectivity. Our customers in communication, industry and transportation appreciate that we are specialists with detailed knowledge of practical applications. We offer expertise in radio frequency, fiber optics and low frequency all under one roof, thus providing a unique basis for continual innovation which is focused on the needs of our customers all over the world.

Our motto: "EXCELLENCE in CONNECTIVITY SOLUTIONS". 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 future-proof and reliable.

HUBER+SUHNER
Excellence in Connectivity Solutions

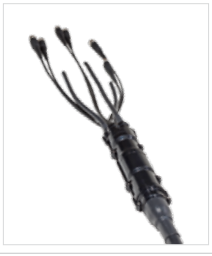
Centered around your excellence: Our global presence and experience

HUBER+SUHNER's continuous involvement with mobile network rollouts across the globe has helped us to become a leader in the wireless infrastucture market. Our partners and customers have been able to take advantage of our global manufacturing, assembly and distribution network covering the Americas, Asia Pacific, Europe, Middle East and Africa enabling successful completion of their infrastructure builds.

- **Worldwide manufacturing:** Being close to our customers is a must. HUBER+SUHNER operates manufacturing plants in Poland, Tunisia, China, India, Malaysia, Mexico, Brazil and Switzerland so that we can respond immediately to our customers' needs and provide best-in-class support throughout all regions of the world.
- **Worldwide assembly:** HUBER+SUHNER is globally co-operating with numerous third-party fiber optic assembly shops to extend the capa city and coverage of the HUBER+SUHNER brand. All of our assembly shops follow the same stringent processes and quality controls as our own group companies.
- **Worldwide distribution:** Customers can rely on HUBER+SUHNER's wordwide sales and support network. Market proximity is the advantage of our global presence with 14 subsidiaries and representatives in over 60 countries. Our customers benefit from our strength to deliver local solutions and services tailored to their requirements.

SaskTel

Saskatchewan Telecommunications Holding Corporation is the leading full service communications provider in Saskatchewan, Canada with over 1.4 million customer connections. For their 3G Network Upgrade and subsequent LTE overlays HUBER + SUHNER delivered MASTERLINE Extreme and MASTERLINE Extreme Power, a plug-and-play RRH cabling system which supports up to 12 RRHs per fibre riser without the need for any mast mount distribution boxes.



Sprint/T-Mobile USA

Collectively Sprint and T-Mobile provide over 90 million subscribers mobile network services in the highly competitive US market. For their respective 4G network roll-outs HUBER+SUHNER's MASTERLINE hybrid solutions are deployed in there nationwide networks to connect the RRHs with the base station. No other hybrid cabling system can be installed faster and more efficiently.

Ericsson Brazil

Ericsson is globally the leading equipment manufacturer and service provider for mobile communications with more than 100 000 employees world wide. HUBER+SUHNER is a core supplier to Ericsson for FTTA (fiber-to-the-antenna) solutions in all geographical regions, for example in Brazil where we support with local production, logistics and engineering to specific local telecomunication standards.

US Operators

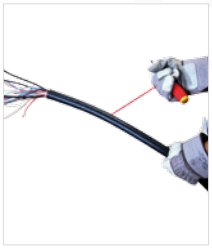
HUBER+SUHNER is a key supplier of Hybrid cabling systems to 3 out of 4 of the tier1 operators in the US. Operators utilise MASTERLINE Extreme and MASTERLINE Classic Hybrid solutions for critical UMTS, AWS and LTE deployments because of their flexibility and speed of deployment, to date HUBER+SUHNER hybrid solutions have been deployed in over 55 000 sites across the nation.

Telefonica (O2) UK

The project to upgrade the O2 UK network infrastructure, delivering 4G to many of the major towns and cities of the UK utilises Masterline Extreme Hybrid (MLEH) from HUBER+SUHNER. This labour and space saving hybrid solution combines FO and DC into one high performance cable system delivering power and data feeds to the remote radio heads mounted on masts and towers.

SFR France

Part of the French group Vivendi, SFR's nationwide network consists of around 18 000 cell sites. SFR's network enhancement program is making use of HUBER+SUHNER's MASTERLINE Classic product portfolio and a hybrid box to provide both FTTA (fiber-to-the-antenna) and PTTA (power-to-the-antenna) connectivity.



Australian Operators

The Australian market requires special ruggedised solutions to protect the cable infrastructure from bird attack and animal bites. The HUBER+SUHNER hybrid cabling solutions have become the preferred market choice providing superior «installability» compared to competing solutions whilst ensuring the required protection of the cables.

- HUBER+SUHNER Group companies
- Local assembly shops

Solutions for cell sites

Content

HUBER+SUHNER
Excellence in Connectivity Solutions

Remote radio installation solutions

Work with the leader for remote radio installation solutions

Remote radio technology

Remote radio systems have evolved as the dominating technology in the wireless communication industry. Remote radios significantly reduce the network's energy consumption while at the same time improving the network performance. The explosion of mobile data demand has triggered global investments to upgrade existing 3G networks and to build 4G infrastructure. Mobile operators, installers and system integrators face new challenges to commonly install up to 18 RRHs per site, to integrate new dualmode radios and antenna integrated radios (AIR), to rollout ever increasing network complexity and to simply boost the network capacity. HUBER+SUHNER guarantees to build reliable cable infrastructures which are easy and most cost effective to install and which fulfills today's and tomorrow's network requirements.

HUBER+SUHNER provides complete installation solutions

HUBER+SUHNER is the global leader for remote radio installation solutions. We have a comprehensive offering of FTTA (fiber-to the-antenna) and PTTA (power-to-the-antenna) products which are tailored to the customer's needs. We advise operators about which installation methods are available and what are their advantages. 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.

Globally leading hybrid portfolio

Hybrid cables combining optical fiber and DC power for remote radios has evolved as the dominating solution in North America and shows strong acceptance in other Global markets. HUBER+SUHNER's hybrid cabling systems (MASTERLINE Extreme Hybrid, MASTERLINE Ultimate Hybrid) are the most efficient and easiest-to-install products available on the market. Mobile operators on four continents verified that MASTERLINE Extreme 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.

Benefit from HUBER+SUHNER's expertise

www.wireless-infrastructure.com

The microsite is a powerful guide to design your optimum RRH installation solution and provides comprehensive information about the available installation options. It also contains detailed product data sheets, success stories, market news and is an excellent information platform for mobile operators, installation companies and system integrators.

Power design tool for remote radios

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 500 W remote radio with 6 mm^2 power cable.

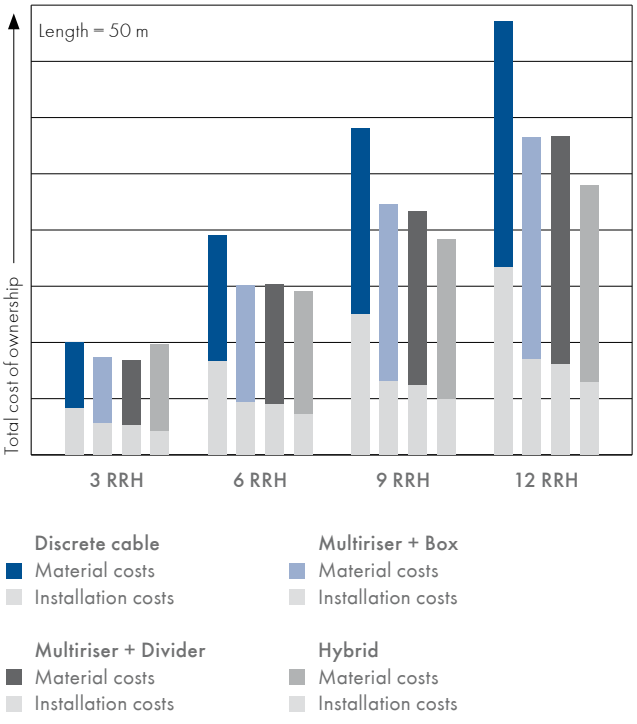
Make your own power dimensioning under «www.hubersuhner.com/powerdesigntool»

Best practices guide 2013: How to install remote radio systems

The installation of remote radio systems poses new challenges for mobile operators, installers and system integrators. What installation methods are available and what are their advantages? How can a network operator install a future-proof passive infrastructure? How can savings be made on installation costs and follow-up costs? What are the advantages and disadvantages of hybrid cabling systems? HUBER+SUHNER offers expert answers to these questions and discusses optimum installation solutions.

Download the new version 2013 of the white paper:
www.hubersuhner.com/RRHinstallation

Total cost of ownership analysis



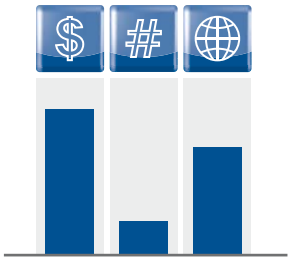
HUBER+SUHNER offers total cost of ownership (TCO) analysis for network upgrades and expansions. In close cooperation with mobile operators we have developed a sound understanding of real costs and roll out issues associated with remote radio systems. The optimum installation solution depends very much 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.

Please contact our market expert and ask for our track record.

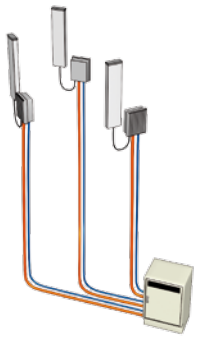
Quick guide on installation solutions

Discrete feeders for single RRH (FTTA/PTTA)

Single RRH fiber and power feeder



- Default solution of system vendors
- Vendor specific cables and connectors
- Not scalable
- Not future proof



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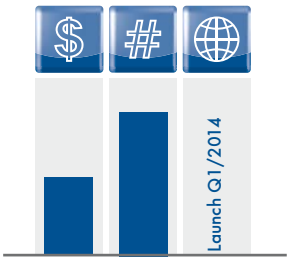
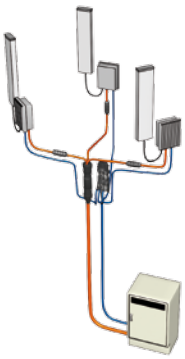
MASTERLINE Ultimate (MLU)

Multi-riser cable with compact connector head



- Pre-connectorised factory-sealed «plug & play» fiber optic cabling system for up to 12 RRHs
- Robust connectors 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



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MASTERLINE Extreme (MLE)

Multi-riser cable with compact divider

- Installation friendly «plug & play» system
- Preferred non-hybrid solution
- Low wind-load and space efficient (no mast mount box)
- Supports multi-vendor installs

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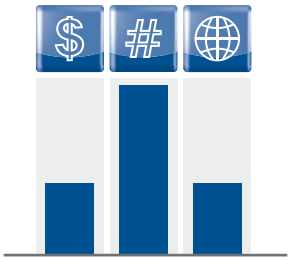
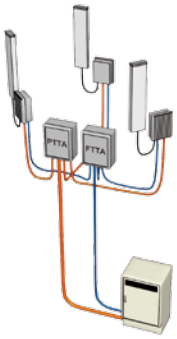
MASTERLINE Classic (MLC)

Multi-riser cable with distribution boxes



- Offers greatest configuration flexibility
- Box required/ higher wind load/ higher tower leasing costs
- Requires handling of indoor fiber-optic connectors



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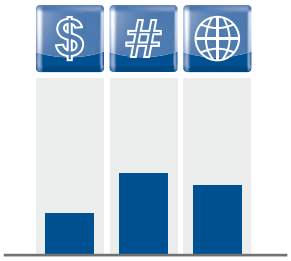
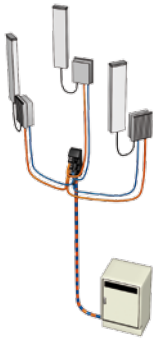
Total-cost of ownership (TCO)
The higher the bar, the higher the total costs of the solution. Cost-effective solutions are shown by small bars.

MASTERLINE Ultimate Hybrid (MLUH)

Hybrid riser cable with compact connector head



- Ultimate «plug & play» solution
- Connectorised head / jumpers for fast and safe installation
- Most efficient hybrid solution for up to 6 RRHs
- Low wind-load and space efficient



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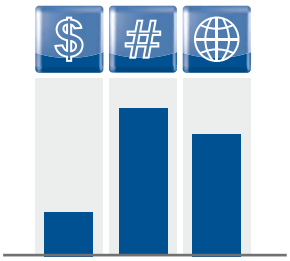
MASTERLINE Extreme Hybrid (MLEH)

Hybrid-riser cable with compact divider



- Most commonly installed hybrid product globally
- Preferred solution in US market
- Efficient solution for up to 9 RRHs
- Low wind-load and space efficient (no mast mount box)

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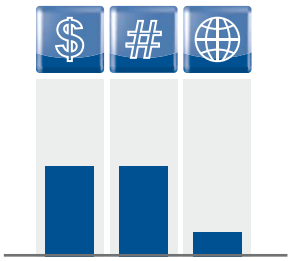
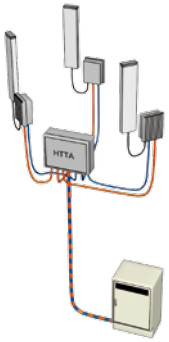
MASTERLINE Classic Hybrid (MLCH)

Hybrid-riser cable with hybrid (HTTA) box



- Large hybrid boxes required
- Elaborate box installation at mast required
- Configurations with surge protection and circuit breakers possible



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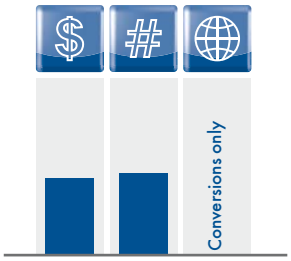
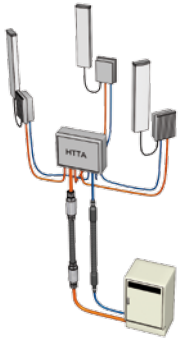
Re-use of corrugated coax cables

Smart DC kit with MASTERLINE Classic



- Conversion from coax to RRHs
- Re-use of corrugated coax cables for power supply
- Significant cost savings



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Number of remote radios (3 to 15)
The maximum number of RRHs per site for which this solution is technically or commercially possible and/or advisable.

Global use/market acceptance
A high bar indicates a high level of global coverage whereas regional niche solutions are indicated by a small bar.

Discrete 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 feeders for single RRH

Only for low RRH count	**Cost efficient for short distances**	Not scalable / no flexibility when RRHs are swapped

RF LISCA RF jumper
page 132

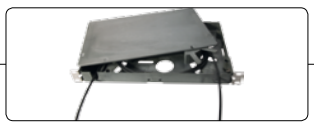
PTTA Overvoltage protection box (optional)
page 51

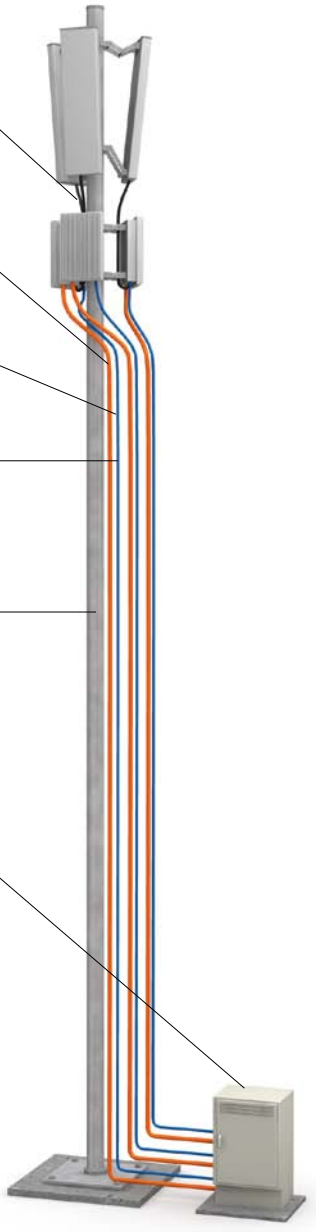
FTTA FTTA / fiber feeder
page 16

PTTA Power / PTTA cable
page 23

XTTA Mounting clamps
page 125

FTTA Overlength box
page 123





XTTA FTTA, PTTA and HTTA
RF Radio Frequency
FTTA Fiber-To-The-Antenna
PTTA Power-To-The-Antenna
HTTA Hybrid-To-The-Antenna

Discrete feeders for single RRH

FTTA Fiber-To-The-Antenna feeder

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 or 7 mm
- All cables rodent resistant
- All cable assemblies factory-terminated and tested
- UL (OFNR) and Anatel approved cables available on request

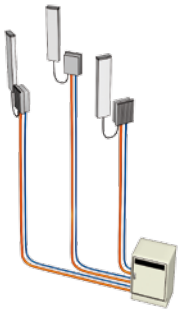
Cable specifications

Outer cable diameter	4.8 mm	5.5 mm	7 mm
Jacket material	LSFH™	LSFH™	LSFH™
Maximum tensile strength (during installation/service)	300/500 N	500/1000 N	650/1000 N
Cable crush resistance (short-term/long-term)	2000/600 N/cm	2000/600 N/cm	2000/600 N/cm
Temperature range	-40 to +90 °C	-40 to +80 °C	-40 to +80 °C
Flame resistance	IEC 60332-1, IEC 60332-3-24, UL1666		
UV resistant	yes	yes	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 value our 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 feeders for single RRH

FTTA Fiber-To-The-Antenna feeder

Ordering information

FullAXS feeder with 4.8 mm cable, singlemode bend insensitive fiber

Length	Item no.	Length	Item no.
1 m	84137909	50 m	84137917
2 m	84137910	60 m	84137918
5 m	84137911	70 m	84137919
10 m	84137912	80 m	84137920
15 m	84137913	90 m	84137921
20 m	84137914	100 m	84137922
30 m	84137915	125 m	84137923
40 m	84137916	150 m	84137924

ODC feeder with Ø 5.5 mm cable

Length	Item no. singlemode bend insensitive fiber	Item no. multimode
1 m	84122151	84124943
2 m	84122152	84124942
5m	84078725	84078739
10 m	84078726	84078740
15 m	84078727	84078741
20 m	84078728	84078742
30 m	84078729	84078743
40 m	84078730	84078744
50 m	84078731	84078745
60 m	84078732	84078746
70 m	84078733	84078747
80 m	84078734	84078748
90 m	84078735	84078749
100 m	84078736	84078750
125 m	84078737	84078751
150 m	84078738	84078752

ODC feeder also available with 7 mm cable diameter or as 1-fiber version.

Discrete feeders for single RRH

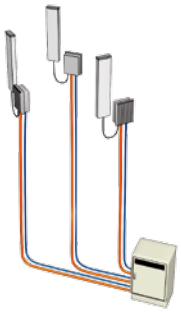
FTTA Fiber-To-The-Antenna feeder

LC feeder with metal divider and ruggedized break-out, Ø 4.8 mm cable, singlemode bend insensitive fiber

Length	Item no.
1 m	84142316
2 m	84142320
5 m	84142321
10 m	84142322
20 m	84142323
30 m	84142324
40 m	84142325
50 m	84142326
60 m	84142327
70 m	84142328
80 m	84142329
90 m	84142330
100 m	84142331
125 m	84142332
150 m	84142333

LC feeder with Ø 5.5 mm cable

Length	Item no. singlemode bend insensitive fiber	Item no. multimode
2.5 m	84122419	84122420
5 m	84122418	84104136
15 m	84104111	84104137
30 m	84104112	84104138
50 m	84104113	84104139
70 m	84104114	84104140
85 m	84104115	84104142
100 m	84104116	84104143
150 m	84104117	84104144
200 m	84104118	84104145
250 m	84104120	84104146
300 m	84104121	84104147



Discrete feeders for single RRH

FTTA Fiber-To-The-Antenna feeder

LC feeder with Ø 4.8 mm cable

Length	Item no. singlemode bend insensitive fiber	Item no. multimode
2 m	85015008	-
3 m	85015009	-
5 m	85015010	-
10 m	85015011	-
15 m	85015012	-
20 m	85015013	84234373
25 m	85012619	84241178
30 m	85012614	84234375
35 m	85012620	84241180
40 m	85012621	84241182
45 m	85012622	84241184
50 m	85012615	84234377
60 m	85012623	84241186
70 m	85012616	84234379
80 m	85012624	84241188
90 m	85012625	84241190
100 m	85012617	84234381
110 m	85012959	85013002
120 m	85012960	85013003
125 m	85012626	84241192
130 m	85012961	85013004
140 m	85012962	85013005
150 m	85012618	84234383
160 m	85012963	85013006
170 m	85012964	85013007
180 m	85012965	85013008
190 m	85012966	85013009
200 m	85012967	85013010

Discrete feeders for single RRH

FTTA Fiber-To-The-Antenna feeder

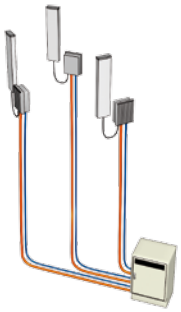
LC feeder with 90° boot, Ø 5 mm cable, OFNR, multimode fiber

Only available for vendor approved companies.

Length	Item no.
2 m	84082925
5 m	84122156
10 m	84083054
20 m	84083071
30 m	84083074
40 m	84083079
50 m	84083081
75 m	84083084
100 m	84083086
200 m	84083087

PDLC feeder with Ø 7 mm, singlemode bend insensitive fiber

Length [m]	Fiber type
1 m	84150633
2 m	84150634
5 m	84150635
10 m	84208599
15 m	84208601
20 m	84208603
30 m	84208605
40 m	84208607
50 m	84208609
60 m	84208611
70 m	84208613
80 m	84208615
90 m	84208617
100 m	84208619
125 m	84208621
150 m	84208623



Discrete feeders for single RRH

FTTA Fiber-To-The-Antenna feeder

ODC-4 feeder with Ø 5.5 mm cable

Length [m]	Fiber type	Description
L	singlemode bend insensitive fiber	09H04FGG-LB-J2/88-3-**L** NN
L	multimode	09H04FG0-50-J2/88-3-**L** MM

Q-XCO feeder with Ø 5.5 mm cable

Length [m]	Fiber type	Description
L	singlemode bend insensitive fiber	09H02FGG-LB-XA/88-2-**L** NN
L	multimode	09H02FG0-50-XA/88-2-**L** MM

Discrete feeders for single RRH

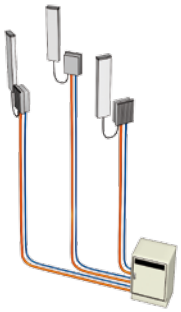
Region specific cable assemblies

Ask for approved regional item numbers fulfilling local market requirements .

US / North America	UL 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	123	
Combined clamps for fiber optic and power cable	Depends on cable diameter	125	



Discrete feeders for single RRH

PTTA Power-To-The-Antenna cables

Features

- Copper cable for RRH power supply
- 2 wire shielded power supply cable
- 4 mm^2, 6 mm^2, 10 mm^2 and 16 mm^2 conductors available
- Suitable for all remote radio systems
- For indoor and outdoor application

Specifications

Jacket material	LSFH™
Conductor	copper stranded 4 mm^2, 6 mm^2, 10 mm^2 IEC 60228 class 2 16 mm^2 IEC 60228 class 5
Screen	braided screen of copper wires
Operating voltage	48 V dc
Rated voltage	0.6 / 1.0 kV
Temperature range	-40 °C to +90 °C
Braid coverage	75 % - 85 %

Cross section	2 x 4 mm^2	2 x 6 mm^2	2 x 10 mm^2	2 x 16 mm^2
Resistance (Ω / km)	4.61	3.08	1.83	1.21
Current per conductor (A)	34	44	61	80
Cable diameter (mm)	10.7	12.1	13.3	16.2
Cross section braid (mm^2)	4	5	6	7
Weight (kg/km)	186	248	332	469

Ordering information

Cross section	Item no.
2 x 4 mm^2	85013655
2 x 6 mm^2	85013656
2 x 10 mm^2	85013657
2 x 16 mm^2	85013658

MASTERLINE Ultimate (MLU)

Multi-riser cable with compact connector head

HUBER+SUHNER launched the most innovative cabling system for remote radio installation: MASTERLINE Ultimate. The pre-connectorised factory-sealed fiber optic systems supports up to 12 RRHs and connects the remote radios with easy-to-install Q-ODC fiber optic jumpers.

The robust connector head with an integrated pulling eye allow for 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.

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

Available Q1/2014

MASTERLINE Ultimate (MLU)

Multi-riser cable with compact connector head

Unique «plug & play system» up to 12 RRH

Best-in-class and easiest mast top installability

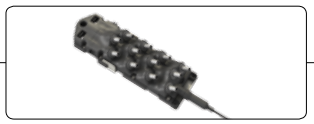
Global production in Europe and Asia

RF LISCA RF jumper
page 132

FTTA Q-ODC RRH jumpers
page 34

PTTA Power jumpers (optional)
page 67

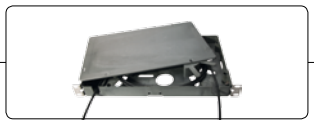
FTTA MASTERLINE Ultimate
page 24



PTTA MASTERLINE Extreme Power
page 38

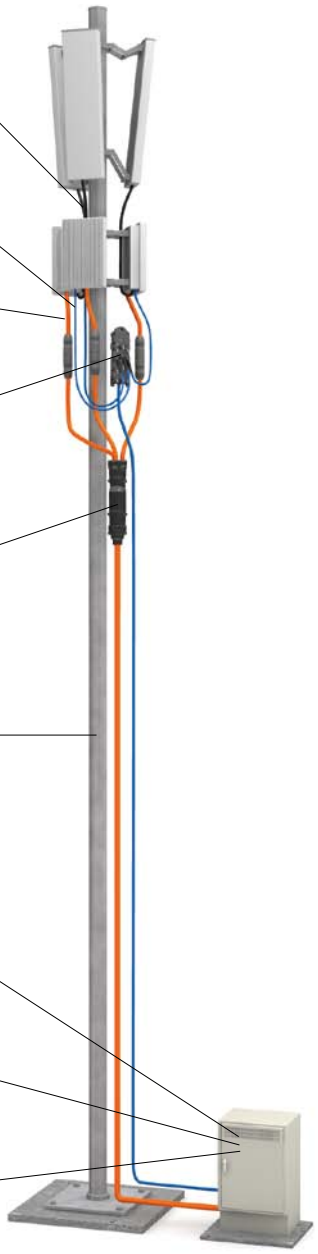
XTTA Mounting clamps
page 125

FTTA Overlength box
page 123



FTTA CTB 19" patching box
page 124

FTTA LC patchcord
page 123



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

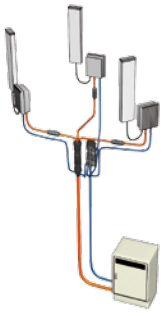
- Pre-connectorised factory-sealed «plug & play» fiber optic cabling system for up to 12 RRHs
- Robust connector head with 6 or 12 Q-ODC sockets
- Connects the RRH with easy-to-install Q-ODC fiber optic jumpers
- Integrated pulling eye for easy cable lifting
- Loose tube cables with up to 24 fibers,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

Specifications

Number of Q-ODC connector socket		6 or 12
Dimensions L x W x H	enclosure without cover enclosure with cover	293 x 110 x 46 mm 460 x 160 x 110 mm
Material		Plastic PPE black
Pulling eye force		800 N (short-term during installation)
Cable retention force at enclosure		800 N
Temperature range	during installation in service in storage	-10 °C up to +50 °C -40 °C up to +75 °C -20 °C up to +70 °C
Ingress protection		IP67
Impact resistance		IK 7
Halogen free		IEC 60754-2
UV resistant for outdoor use		ISO 4892-3
Material flammability rating		UL94-V0
Cable type		Glass-armoured loose-tube cable
Jacket material		LSFH™
Cable diameter		7.0 mm
Tensile strength	during installation in service	2000 N 1200 N
Crush resistance	short-term long-term	500 N/cm 200 N/cm
Flame resistance	IEC 60332-1, IEC 60332-3-24	passed

MASTERLINE Classic with LC uniboot at BTS side

Protecting tube



MASTERLINE Ultimate (MLU)

Standard portfolio

- MLU with 12 and 24 fibers
- Connector head with Q-ODC sockets
- BTS side terminated with LC uniboot connectors
- Adaption to any RRH interface with Q-ODC plug jumpers

Ordering information

MLU connector head with Q-ODC socket / MASTERLINE Classic with LC uniboot connector

		Item no.	
Length	Fiber type / cable type	12 fibers – 6 RRH	24 fibers – 12 RRH
20 m	singlemode LSFH™ non-UL listed	85019356	85019892
30 m		85019357	85019893
40 m		85019358	85019894
50 m		85019359	85019895
60 m		85019360	85019896
70 m		85019361	85019897
80 m		85019362	85019898
90 m		85019363	85019899
100 m		85019364	85019900
125 m		85019365	85019901
150 m		85019366	85019902
200 m		85019367	85019903
20 m	singlemode LSFH™	85019878	85019905
30 m		85019879	85019906
40 m		85019880	85019908
50 m		85019881	85019909
60 m		85019882	85019911
70 m		85019883	85019912
80 m		85019884	85019913
90 m		85019885	85019915
100 m		85019886	85019916
125 m		85019887	85019917
150 m		85019889	85019919
200 m		85019890	85019920

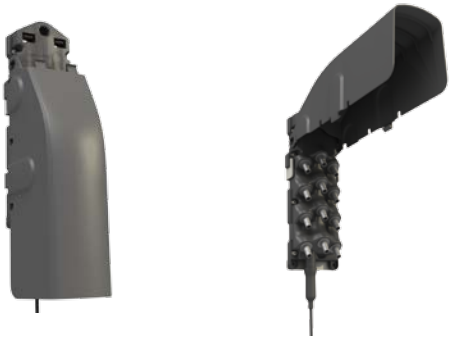
MASTERLINE Ultimate (MLU)

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 IP67 (Q-ODC)
- Tensile load 450 N

Jumpers for all types of remote radio systems available. Ordering information see page 35 (MLE).

Protective cover



Protective cover for connector is optional available.

Accessories

Description		Item no.	Page	Picture
Protective cover for connector head		85019191	26	
Overlength box for outdoor and indoor installation, stores up to 20 m cable excess length (depending on cable diameter)		84103325	123	
Combined clamps for fiber optic and power cable		depends on cable diameter	125	
19" CTB patching box	12 fiber singlemode	84138010	124	
	24 fiber singlemode	84125915	124	
LC patchcords	1 m length singlemode	84125519	123	

MASTERLINE Extreme (MLE)

Multi-riser cable with compact divider

MASTERLINE Extreme is the most efficient fiber (FTTA) and power (PTTA) solution in terms of ease of installation, cost and required space on the mast. The compact divider minimises the wind-load and makes a bulky mast-top box redundant. The ruggedised push-pull connector Q-ODC allows the installer to connect the RRH jumper cables with a single «click» making it a genuin «plug & play» cabling system. MASTERLINE Extreme is the preferred choice of network installers who require trouble free, reliable and efficient field deployments. For that reason, this product is a HUBER+SUHNER best-seller which is always available on stock – with best lead times guaranteed.

HUBER+SUHNER's MASTERLINE Extreme product family is unique in the market and provides the best value for money. The product is available to support up to 12 remote radios.

MASTERLINE Extreme (MLE)

Multi-riser cable with compact divider

Preferred FTTA solution up to 12 RRH

Cost efficient installation

Short lead time Stock items

RF LISCA RF jumper
page 132

FTTA Q-ODC RRH jumpers
page 34

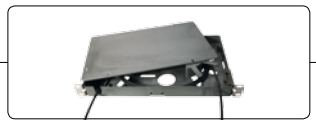
PTTA Power jumpers (optional)
page 67

FTTA MASTERLINE Extreme
page 32

PTTA MASTERLINE Extreme Power
page 38

XTTA Mounting clamps
page 125

FTTA Overlength box
page 123



FTTA CTB 19" patching box
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FTTA LC patchcord
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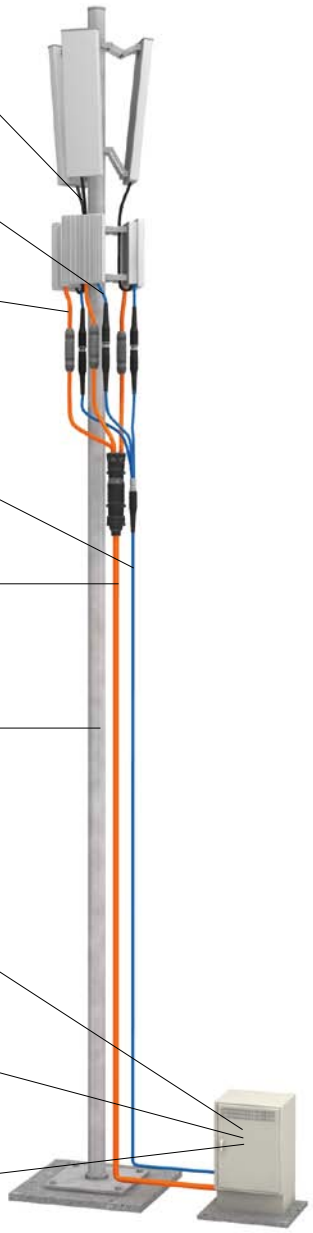


XTTA FTTA, PTTA and HTTA
RF Radio Frequency
FTTA Fiber-To-The-Antenna
PTTA Power-To-The-Antenna
HTTA Hybrid-To-The-Antenna

MASTERLINE Extreme (MLE)

Features

- Pre-assembled «plug & play» cabling system
- Terminated with Q-ODC extension or with RRH-specific interface
- Ruggedised design with robust breakout cables
- Robust pulling tube for cable lifting
- Loose tube cables with up to 24 fibers, rodent protected and UV resistant
- Fibers and connectors numbered for easy channel identification
- Easy and time-saving installation

Specifications

Number of fibers		up to 12	18 to 24
Numer of RRHs		up to 6	9 to 12
Build-in hole dimension		16.0 mm	26.0 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 loose-tube cable	
Jacket material		LSFH™	
Cable diameter		7.0 mm	
Tensile strength	during installation in service	2000 N 1200 N	
Crush resistance	short-term long-term	500 N/cm 200 N/cm	
Temperature range	installation in service	-10 °C to +50 °C -40 °C to +75 °C	
Flame resistance	IEC 60332-1, IEC 60332-3-24	passed	

MASTERLINE Classic with LC uniboot at BTS side

Protecting tube

MASTERLINE Extreme (MLE)

Standard portfolio

- MLE with 12 and 24 fibers
- RRH side terminated with Q-ODC extension connectors
- BTS side terminated with LC uniboot connectors
- Adaptation to any RRH interface with Q-ODC plug jumpers

Ordering information

MLE with Q-ODC extension / MASTERLINE Classic with LC uniboot connector.

High runner items available ex stock at guaranteed short lead times (only valid for non-UL portfolio).

	Item no. Fiber type: singlemode			
	Cable type: LSFH™, not UL listed		Cable type: LSFH™, UL listed	
Length	12 fibers – 6 RRH	24 – 12 RRH	12 fibers – 6RRH	24 fibers – 12 RRH
20 m	85005467	85005609	85004452	85004479
30 m	85005468	85005610	85004453	85004481
40 m	85005469	85005611	85004454	85004482
50 m	85005470	85005612	85004455	85004483
60 m	85005471	85005613	85004456	85004484
70 m	85005472	85005614	85004457	85004485
80 m	85005473	85005615	85004458	85004486
90 m	85005474	85005616	85004459	85004487
100 m	85005475	85005617	85004460	85004488
125 m	85005478	85005620	85004461	85004489
150 m	85005479	85005621	85004462	85004490
200 m	85005480	85005622	85004463	85004491

Supplied on a double-flange reel

Pulling tube with pulling eye

Q-ODC extension with plastic push-on cap (IP67)

MASTERLINE Extreme (MLE)

Q-ODC connectors

Q-ODC plug on the jumper

Q-ODC extension on the MLE

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

All breakouts are terminated with a Q-ODC extension connector.

Mating / un-mating 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 un-mate.

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 IP67 (Q-ODC)
- Tensile load 450 N

MASTERLINE Extreme (MLE)

Q-ODC RRH jumpers

Ordering information

Q-ODC plug to LC duplex with metal divider and ruggedized break, Ø 4.8 mm cable, singlemode bend insensitive fiber

Length	Item no.
2 m	85002956
5 m	85002957
10 m	85002958

Q-ODC plug to FullAXS, cable Ø 4.8 mm, singlemode bend insensitive fiber

Length	Item no.
2 m	85006042
5 m	85006043
10 m	85006044

Q-ODC plug to LC duplex with breakout length 105 mm, cable Ø 5.5 mm, singlemode bend insensitive fiber

Length	Item no.
2 m	85002962
5 m	85002963
10 m	85002964

Q-ODC plug to LC duplex with breakout length 85 mm, Ø 7.0 mm cable, singlemode bend insensitive fiber

Length	Item no.
2 m	84204528
5 m	84204530
10 m	84204532

MASTERLINE Extreme (MLE)

Q-ODC RRH jumpers

Ordering information

Q-ODC plug to LC duplex with angled boot, cable Ø 4.8 mm, singlemode bend insensitive fiber

Length	Item no.
2 m	85002981
5 m	85002982
10 m	85002983

Q-ODC plug to LC duplex with straight boot, cable Ø 4.8 mm, singlemode bend insensitive fiber

Length	Item no.
2 m	85003008
5 m	85003009
10 m	85003010

Q-ODC plug to PDLC, cable Ø 4.8 mm, singlemode bend insensitive fiber

Length	Item no.
2 m	84204521
5 m	84204523
10 m	84204525

Jumpers for all types for remote radio systems available (e.g. Q-XCO, XCO, R2CT, LC push-pull connector, industrial LC connector). Angled and straight boot jumpers only available for approved companies. Multimode fiber on request.

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	123	
Combined clamps for fiber optic and power cable		depends on cable diameter	125	
19" CTB patching box	12 fiber singlemode	84138010	124	
	24 fiber singlemode	84125915	124	
LC patchcords	1 m length singlemode	84125519	123	
Metal snap-on cap with chain		84087573	109	
3 fold cable clamp suitable for ODC boot to fix the Q-ODC extension connectors		85012939	125	

MASTERLINE Extreme Power (MLEP)

Features

- Power cabling system for 3 up to 6 RRHs
- Ruggedised plastic enclosure with robust break-out cables
- Open-end or terminated with power connector
- Robust pulling tubes for cable lifting
- Supplied on double-flange reels for straight forward unspooling
- Main-cable available with 2.5 mm^2 / AWG 14, 6 mm^2 / AWG 10, 10 mm^2 / AWG 8 and 16 mm^2 / AWG 6 conductors
- Integral earth point which can be connected to an earth lead with M8 ring terminal
- Optional connectorised power jumpers for higher installation flexibility

Enclosure specifications

Dimensions		Ø 69 mm, height 315 mm
Material		plastic PPE black
Pulling tube force		2000 N (short-term during installation)
Temperature range	operation installation	-40 °C to +75 °C -25 °C to +65°C
Cable retention force at enclosure	power breakout cable power main cable	500 N 2000 N
Ingress protection	radio end	IP68
IK class		IK 10
Flammability		UL94-V0
UV resistant		ISO 4892-2
Salt mist, IEC 61300-2-26		96 h
Vibration, IEC 61300-2-1		10 - 500 Hz/ 10 g
Shock, IEC 61300-2-9		100 g

Power cable specifications

	LSFH™ power cable EMEA and Asian-Pacific market	UL Listed power cable US market
Jacket material	thermoplastic, LSFH™	PVC
Standard	IEC 60502-1:2004-04	UL 1277
Temperature range	-40 °C to + 75 °C	
Operating voltage	48 Vdc	
Rated voltage	0.6 kV/1kV (1.2kV)	
Conductors	stranded copper class 2 IEC 60228	stranded copper class C
Drain wire	stranded copper class 2 IEC 60228	stranded copper class B
Cable shielding	copper foil > 100 % coverage	
Halogen free	yes	no
Flame retardant	IEC 60332-1-2:2004	UL 1685 (UL 1581) vertical tray flame test (70 000 BTU/hr)
UV resistant	IEC 68-2-5	UL1581

MASTERLINE Extreme Power (MLEP)

Ordering information

MASTERLINE Extreme for 3 RRHs

Radio end side	BTS side
Blunt cut, 4 m length, 6 mm² / AWG 10	blunt cut, 6 mm² / AWG 10 or 10 mm² / AWG 8

Power wire	Market	Jacket material	Wire cross section Cable diameter	Length	Item no.
3 pairs	global not UL listed	LSFH™	6 mm² 16.5 mm	30 m	85006926
				40 m	85006927
				50 m	85006928
			10 mm² 19.4 mm	60 m	85006929
				70 m	85006930
				80 m	85006931
				90 m	85006932
	US	PVC	AWG 10 19.6 mm (0.77")	30 m	85006933
				40 m	85006934
				50 m	85006935
			AWG 8 23.4 mm (0.92")	60 m	85006936
				70 m	85006937
				80 m	85006938
				90 m	85006939

Other lengths and wire cross sections available on request.
Optional available with power connector, see page 67.

Integral earth connection

MLEP supplied on a double-flange reel

MASTERLINE Extreme Power (MLEP)

Ordering information

MASTERLINE Extreme for 6 RRHs

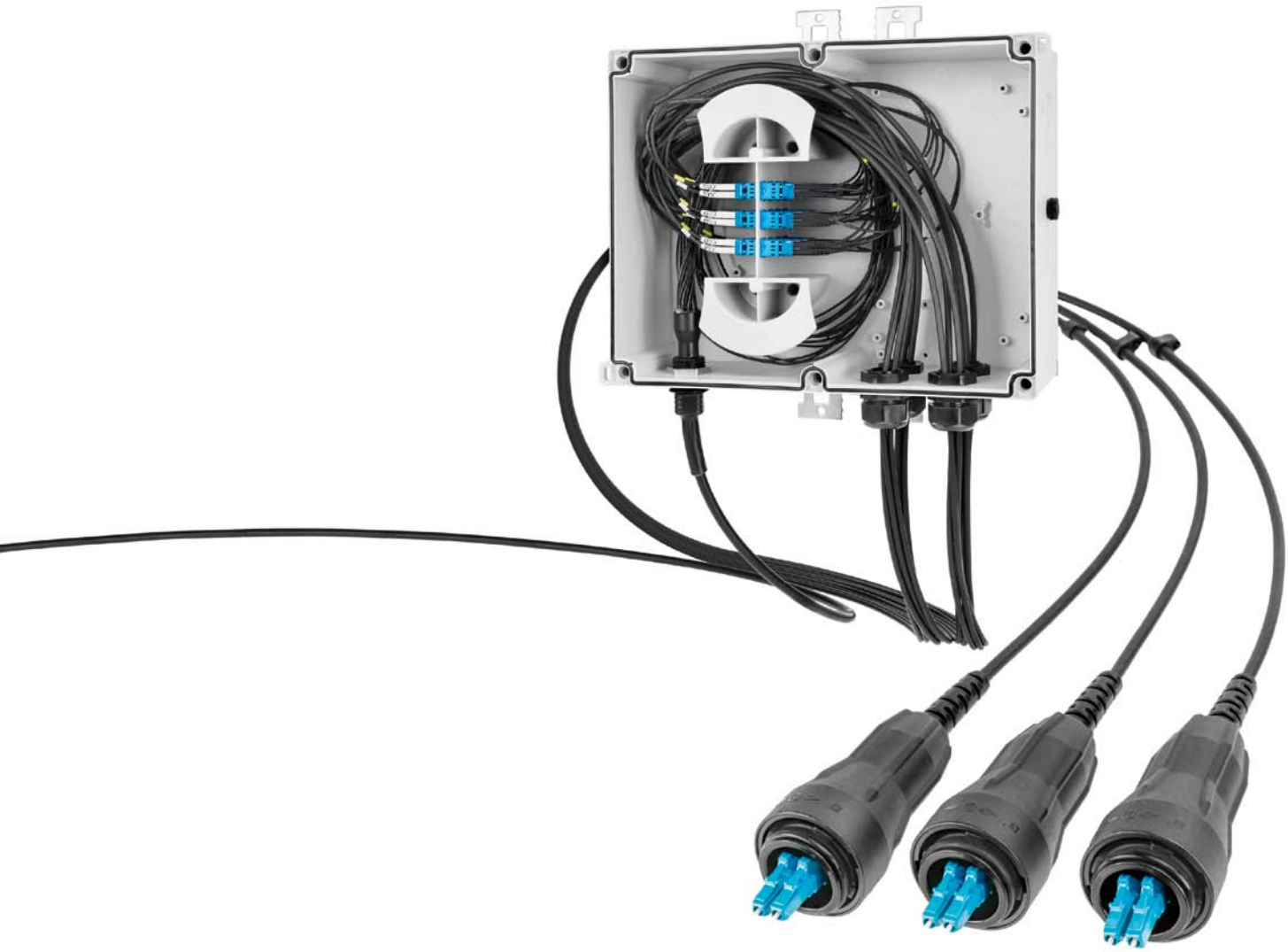
Radio end side	BTS side
Blunt cut, 4 m length, 6 mm² / AWG 10	blunt cut, 6 mm² / AWG 10 or 10 mm² / AWG 8

Power wire	Market	Jacket material	Wire cross section Cable diameter	Lenght	Item no.
6 pairs	global not UL listed	LSFH™	6 mm² 21.9 mm	30 m	85006954
				40 m	85006955
				50 m	85006956
			10 mm² 26.1 mm	60 m	85006957
				70 m	85006958
				80 m	85006959
				90 m	85006960
	US	PVC	AWG 10	30 m	85006962
				40 m	85006963
				50 m	85006964
			AWG 8	60 m	85006965
				70 m	85006966
				80 m	85006967
				90 m	85006968

Other lengths and wire cross sections available on request.
Optional available with power connector, see page 67.

Accessories

Description	Item no.	Page	
Clamps for power cable	depends on cable diameter	125	
Grounding kits	85015070	127	



MASTERLINE Classic (MLC)

Multi-riser cable with distribution box

MASTERLINE Classic uses separate multi-fiber 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 30). 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)

Multi-riser cable with distribution box

Optimum for higher RRH count (6–12)

Cost efficient for longer distances (> 50 m)

Limited suitability for distributed antennas

RF LISCA RF jumper
page 132

FTTA LC duplex RRH jumpers
page 48

PTTA Power cable
page 48

FTTA FTTA box
page 44

PTTA PTTA box
page 51

FTTA MASTERLINE Classic
page 46

PTTA Power cable
page 50

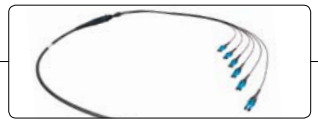
XTTA Mounting clamps
page 125

FTTA CTB 19" splicing box (optional)
page 124

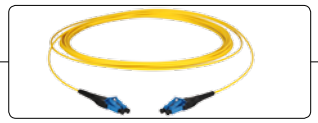
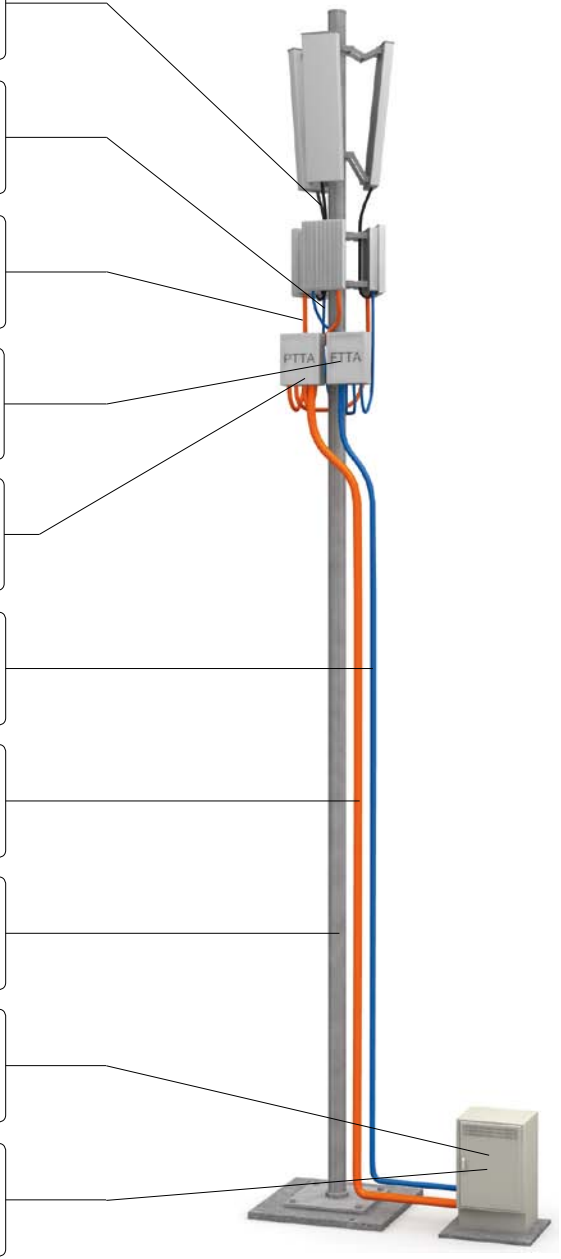
FTTA LC patchcord
page 123







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)

FTTA Fiber-To-The-Antenna box

Features

- Ruggedised outdoor fiber distribution box
- Supports up to 6/12 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 and MTP
- Fully electrically isolated
- Protective vent equalises pressure and prevents water condensation

Specifications

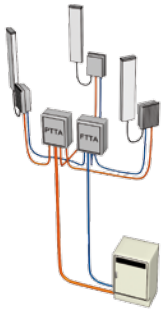
	FTTA box small	FTTA box medium
Number of RRH	3, 6 RRH	up to 12 RRH
Compatible with MASTERLINE Classic	6, 12 fibers	24 fibers or 2 x 12 fibers
Compatible with MASTERLINE MTP	12 fibers	24 fibers
Dimensions	255 x 180 x 65 mm	250 x 320 x 138 mm
Cable entry (knock-out holes)	2 x Ø 16 mm for MASTERLINE Classic up to 12 fibers or MASTERLINE MTP	1 x Ø 26 mm for MASTERLINE Classic 24 fibers or 2 x Ø 16 mm for MASTERLINE Cassic 12 fibers or MTP
Cable exit (pre-installed)	2 x M25 for 3-fold cable gland for jumper cable Ø 4.8 – 7.0 mm	4 x M25 for 3-fold cable gland for jumper cable Ø 4.8 – 7.0 mm
Material	glass filled polycarbonate, halogen free, UV resistant	
Flammability rating	UL 94 V0	
Operating temperature	-40 °C to +85 °C	
Protective vent	IP67, typical airflow 2500 ml/min	
Ingress protection	IP66 / 67	
Impact resistance	IK 07 (EN 62262)	

Customised or hybrid boxes are available upon request.

HUBER+SUHNER's MASTERLINE solution is a win for LTE

The multi-fiber cabling and box solution makes the infrastructure easier to deploy, reduces field failures, and supports multi-vendor installations. By installing additional fibers, the sites are ready for LTE roll-outs and scalable for future applications.

Global and local operators are convinced of the benefits of this cabling system. Therefore, operators such as Vodafone, T-Mobile, Telenor, Bouygues Telecom and many others trust and rely on HUBER+SUHNER's MASTERLINE solution to make their passive infrastructure future-proof, scalable and ready for LTE.



MASTERLINE Classic (MLC)

FTTA Fiber-To-The-Antenna box

Ordering information

Description		Item no.	Picture
FTTA box small Compatible with MASTERLINE Classic 12 fibers Singlemode		85002620	
FTTA box medium Compatible with MASTERLINE Classic 24 fibers Singlemode		84150431	
Quick hose clamps Stainless steel One set includes 2 pieces hose clamps	clamping Ø 30 – 155 mm	84076411	
	clamping Ø 60 – 500 mm	84076412	

All boxes are pre-assembled with fiber management components and cable glands.
Customised boxes for multimode fiber and MTP connectors available.
Quick hose clamps are not included in FTTA box.

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	123	
Combined clamps for fiber optic and power cable		depends on cable diameter	125	
19" CTB patching box	12 fiber singlemode	84138010	124	
	24 fiber singlemode	84125915	124	
LC patchcords	1 m length singlemode	84125519	123	

MASTERLINE Classic (MLC)

Features

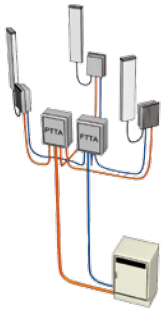
- Pre-assembled «plug & play» cabling system
- Ruggedised design with robust pulling tube
- Outdoor and indoor with high flame resistance
- Temperature range -40 °C up to +75 °C
- Ingress protection IP67 when installed
- Loose tube cables with up to 24 fibers, rodent protected and UV resistant
- LC uniboot connectors
- Breakouts numbered for easy channel identification
- Easy and time-saving installation
- Each system factory tested

Specifications

Number of fibers		up to 24
Divider		small
Build-in hole dimension		15.6 - 16.4 mm
Pulling tube with pulling eye		
Outer diameter		32 mm
Maximum tensile strength		490 N
Crush resistance		120 N/cm
Ingress protection		IP65
Glass-armoured loose-tube cable		
Jacket material		LSFH™
Cable diameter		7.0 mm
Tensile strength	during installation in service	2000 N 1200 N
Crush resistance	short-term long-term	500 N/cm 200 N/cm
Temperature range	installation service	-10 °C to +50 °C -40 °C to +75 °C
Flame resistance	IEC 60332-1-2 IEC 60332-3-25 IEC 60331-25	passed

MASTERLINE Classic at BTS side
with protecting tube

MASTERLINE Classic at RRH side
with pulling tube and pulling eye



MASTERLINE Classic (MLC)

Standard portfolio

- MASTERLINE Classic with 12 or 24 fibers
- Both sides terminated with LC uniboot connectors
- Small FTTA box compatible with 12 fibers, medium FTTA box with 24 fibers

Ordering information

	Item no. singlemode	
Length	12 fibers 6 RRH	24 fibers 12 RRH
20 m	85012382	85012383
30 m	85012502	85012589
40 m	85012503	85012590
50 m	85012504	85012592
60 m	85012505	85012583
70 m	85012506	85012594
80 m	85012543	85012595
90 m	85012544	85012596
100 m	85012545	85012597
125 m	85012546	85012598
150 m	85012547	85012599
200 m	85012548	85012600

Customised/multimode versions available upon request.

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

MASTERLINE Classic (MLC)

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

Ordering information

LC duplex to ODC plug, cable Ø 5.5 mm, singlemode bend insensitive fiber

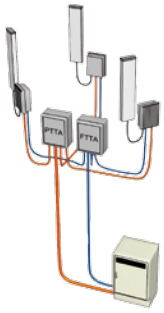
Length	Item no.
2 m	84122152
5 m	84078725

LC duplex to LC duplex with metal divider and ruggedized break-out, cable Ø 5.5 mm, singlemode bend insensitive fiber

Length	Item no.
2 m	84122154
5 m	84120589

LC duplex to FullAXS, cable Ø 4.8 mm, singlemode bend insensitive fiber

Length	Item no.
2 m	84137910
5 m	84137911



MASTERLINE Classic (MLC)

LC duplex to LC duplex with break-out length 105 mm, cable Ø 5.5 mm, singlemode bend insensitive fiber

Length	Item no.
2.5 m	84122419
5 m	84122418

LC duplex to LC duplex with break-out length 85 mm, cable Ø 7.0 mm, singlemode bend insensitive fiber

Length	Item no.
2 m	84106142
5 m	84105041

LC duplex to LC duplex with angled boot, cable Ø 7 mm, singlemode bend insensitive fiber

Length	Item no.
2 m	84132531
5 m	84132532

LC duplex to LC duplex with angled boot, cable Ø 7 mm, singlemode bend insensitive fiber

Length	Item no.
2 m	84124937
5 m	84124938

LC duplex to PDLC, cable Ø 7 mm, singlemode bend insensitive fiber

Length	Item no.
2 m	84150634
5 m	84150635

MLC – PTTA Power-To-The-Antenna cable

2, 6 and 12 wire power supply and jumper cable

Features

- Copper cable for RRH power supply
- 2, 6 or 12 wire shielded power supply cable with cross sections up to 35 mm² for connection between BTS and PTTA box
- 2 wire shielded power supply cable with cross section 4 mm² or 6 mm² for connection between PTTA box and RRH
- Suited for all remote radio systems
- Raw cable or pre-connectorised cable assemblies available
- For indoor and outdoor application

Specifications

Jacket material	LSFH™
Conductor	copper stranded 2.5 mm², 4 mm², 6 mm², 10 mm² IEC 60228 class 2 16 mm², 25 mm², 35 mm² IEC 60228 class 5
Screen	braided screen of copper wires
Operating voltage	48 V dc
Rated voltage	0.6 / 1.0 kV
Temperature range	-40 °C to +90 °C
Braid coverage	75 % - 85 %

2 wire shielded power supply – 2.5 mm² to 6 mm² for connection between PTTA box and RRH, 10 mm² to 35 mm² for connection between BTS and PTTA box

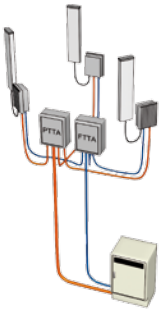
	2 wire cable						
Cross section	2 x 2.5 mm²	2 x 4 mm²	2 x 6 mm²	2 x 10 mm²	2 x 16 mm²	2 x 25 mm²	2 x 35 mm²
Resistance (Ω / km)	7.41	4.61	3.08	1.83	1.21	0.78	0.554
Current per conductor (A)	26	34	44	61	80	105	130
Cable diameter (mm)	9.6	10.7	12.1	13.3	16.2	20.4	22.8
Cross section braid (mm²)	4	4	5	6	7	9	10
Weight (kg/km)	144	186	248	332	469	717	942

Multi – wire shielded power supply cable for connection between BTS and PTTA box

	multi – wire cables								
Cross section	6 x 2.5 mm²	6 x 4 mm²	6 x 6 mm²	6 x 10 mm²	6 x 16 mm²	12 x 2.5 mm²	12 x 4 mm²	12 x 6 mm²	12 x 10 mm²
Resistance (Ω / km)	7.41	4.61	3.08	1.83	1.21	7.41	4.61	3.08	1.83
Current per conductor (A)	16	22	28	39	53	13	17	23	32
Cable diameter (mm)	12.8	14.7	16.5	19.4	23.1	16.6	19.0	21.9	26.1
Cross section braid (mm²)	4	5	6	8	10	6	7	8	10
Weight (kg/km)	284	401	542	830	1149	483	697	986	1527

Ordering information

Cross section	Item no.	Cross section	Item no.	Cross section	Item no.
2 x 2.5 mm²	85016702	2 x 35 mm²	85013660	6 x 16 mm²	85013664
2 x 4 mm²	85013655	6 x 2.5 mm²	85017324	12 x 2.5 mm²	85017325
2 x 6 mm²	85013656	6 x 4 mm²	85013661	12 x 4 mm²	85013666
2 x 10 mm²	85013657	6 x 6 mm²	85013662	12 x 6 mm²	85013667
2 x 16 mm²	85013658	6 x 10 mm²	85013663	12 x 10 mm²	85013668
2 x 25 mm²	85013659				



MLC – PTTA Power-To-The-Antenna box

Features

- Ruggedised outdoor power distribution box
- Supports 3 or 6 remote radio heads
- Different configurations, with circuit breakers or/and surge protection devices
- Suitable for mounting on poles, walls and tower legs with round, L, V and ☐-shape
- Easy to mount and install with integrated screws and pre-mounted brackets
- Protective vent to equalise pressure and prevent condensation

Specifications

	PTTA box small	PTTA box medium
Number of RRH	up to 3 RRH	up to 6 RRH
Dimension	250 x 200 x 115 mm	320 x 250 x 138 mm
U_N rated voltage	-48 V DC	
I_N rated current per RRH	≤ 16.7 A (depending on the configuration)	
Box material	polycarbonate glass-filled, halogen free, UV resistant	
Flammability rating	UL 94 V0	
Ingress protection	IP66 (EN 60529)	
Impact resistance	IK 08	
Circuit breaker	miniature circuit breaker C 20A, type 5SY6120-7	
Surge protection device	SPD type 1 + 2 / class I + II or type 2 / class II	

HUBER+SUHNER power-to-the-antenna boxes with pre-installed components and wiring, support up to 3 remote radio heads in the small version and up to 6 remote radio heads in the medium version.
Aside from customised box configurations, there are 8 standard configurations available with screw terminals only or optionally with circuit breakers (CB) and/or surge protection devices (SPD).

The boxes include a protective vent to equalise the pressure, preventing the ingress of moisture around seals and preserving the seals' integrity. The vent enables the passage of water vapour out of the box, quickly clearing away condensation.
Pre-mounted brackets allow an easy installation on poles, walls and tower legs with different shapes.

MLC – PTTA Power-To-The-Antenna box

Power entry
Huber + Suhner offers a broad range of power cables suitable to PTTA (Power-To-The-Antenna) boxes. 6 wire cables from 4 mm^2 to 16 mm^2 are available for individual power supply of 3 RRH and 12 wire cables from 4 mm^2 to 6 mm^2 for individual power supply of 6 RRH. The 2 wire cable with cross section range from 4 mm^2 to 35 mm^2 fits to PTTA boxes with surge protection devices.

Earthing
All boxes have a cable gland and screw terminals for an earthing cable with a cross section up to 16 mm^2.

Circuit breaker
PTTA boxes with 3 or 6 circuit breaker are optional available. The 20 A circuit breaker with tripping characteristic C have 6 kA switching capacity.
For more information see page 59.

Surge protection device
The PTTA boxes are optional with lightning protection equipped. The varistor-based lightning arrester is for applications with grounded return conductor (positive pole) or optional for applications with common return conductor (positive pole) and ground. The surge protection device is a combined type 1/2 arresters with lightning test current of 12.5 kA and a total discharge surge current of 25 kA (10/350 µs) and 50 kA (8/20 µs).
For more information see page 57.

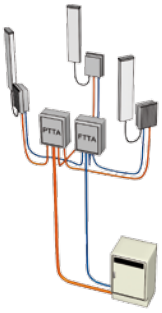
Ordering information

Description	Item no.	Description	Item no.
PTTA box for 3 RRH • Power distribution	84137118	PTTA box for 6 RRH • Power distribution	85015656
PTTA box for 3 RRH • Power distribution • 3 circuit breaker 20A	84137119	PTTA box for 6 RRH • Power distribution • Circuit breaker 20 A	85015657
PTTA box for 3 RRH • Power distribution • Surge protection type 2	84137120	PTTA box for 6 RRH • Power distribution • Surge protection type 1/2	85015658
PTTA box for 3 RRH • Power distribution • 3 circuit breaker 20A • Surge protection type 2	84137121	PTTA box for 6 RRH • Power distribution • Circuit breaker 20 A • Surge protection type 1/2	85015659

Ordering information for accessories

Description	Feature	Item no.	Picture
Quick hose clamps Stainless steel One set includes 2 pieces	clamping diameter 30 – 155 mm	84076411	
	clamping diameter 60 – 500 mm	84076412	

Quick hose clamps are not included in PTTA box.



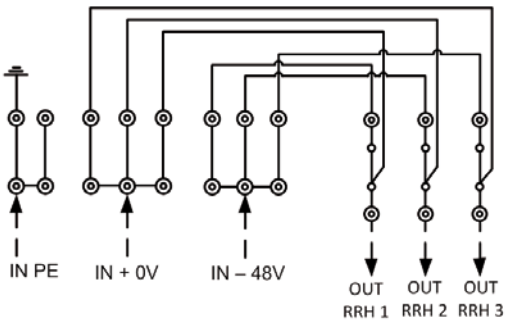
MLC – PTTA Power-To-The-Antenna box

PTTA box 3 RRH power distribution

Specifications

Dimension	250 x 200 x 115 mm
Screw terminals	up to 16 mm² with wire end sleeve, up to 25 mm² w/o wire end sleeve
Power entry	1 cable Ø 12 – 25 mm 6 x 6 mm², 6 x 10 mm², 2 x 10 mm², 2 x 16 mm², 2 x 25 mm²
Power exit	3 cables Ø 8 – 17 mm, 2 x 4 mm², 2 x 6 mm²
Earthing	1 cable Ø 5 – 13 mm, 1 x 16 mm²
I_N rated current per RRH	16.7 A
Item no.	84137118

Including removable bridges for using multiwire cable.

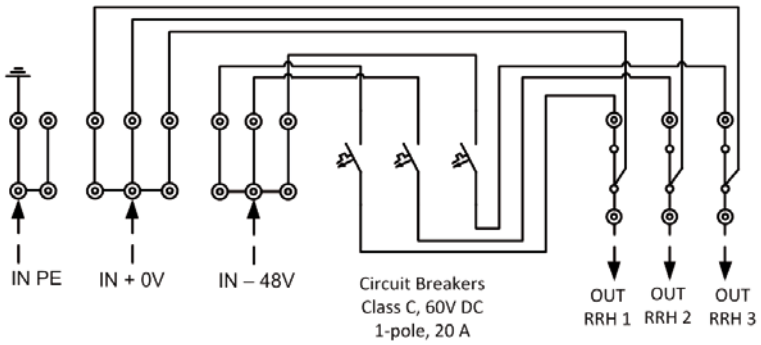


PTTA box 3 RRH power distribution with 3 circuit breaker

Specifications

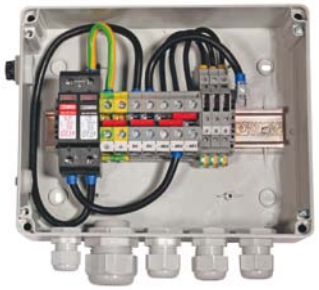
Dimension	250 x 200 x 115 mm
Screw terminals	up to 16 mm² with wire end sleeve, up to 25 mm² w/o wire end sleeve
Power entry	1 cable Ø 12 – 25 mm 6 x 6 mm², 6 x 10 mm², 2 x 10 mm², 2 x 16 mm², 2 x 25 mm²
Power exit	3 cables Ø 8 – 17 mm, 2 x 4 mm², 2 x 6 mm²
Earthing	1 cable Ø 5 – 13 mm, 1 x 16 mm²
Circuit breaker	class C 20 A
I_N rated current per RRH	13.3 A
Item no.	84137119

Including removable bridges for using multiwire cable.



MLC – PTTA Power-To-The-Antenna box

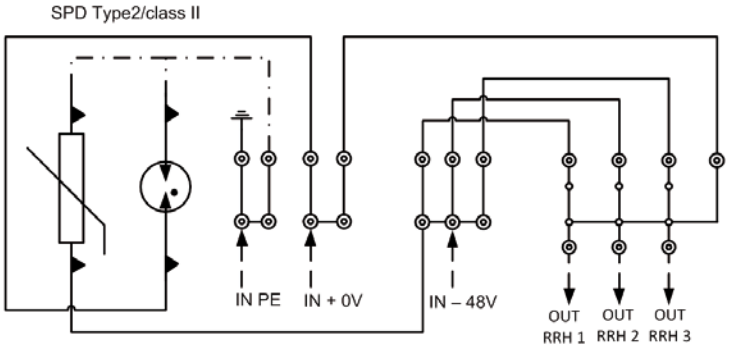
PTTA box 3 RRH power distribution with surge protection type 2



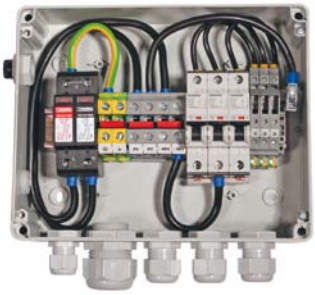
Specifications

Dimension	250 x 200 x 115 mm
Screw terminals	up to 16 mm² with wire end sleeve, up to 25 mm² w/o wire end sleeve
Power entry	1 cable Ø 12 – 25 mm, 2 x 10 mm², 2 x 16 mm², 2 x 25 mm²
Power exit	3 cables Ø 8 – 17 mm, 2 x 4 mm², 2 x 6 mm²
Earthing	1 cable Ø 5 – 13 mm, 1 x 16 mm²
Surge protection device	type 2 / class II
I_N rated current per RRH	16.7 A
Item no.	84137120

Optional available with SPD type1 + 2 / class I + II.



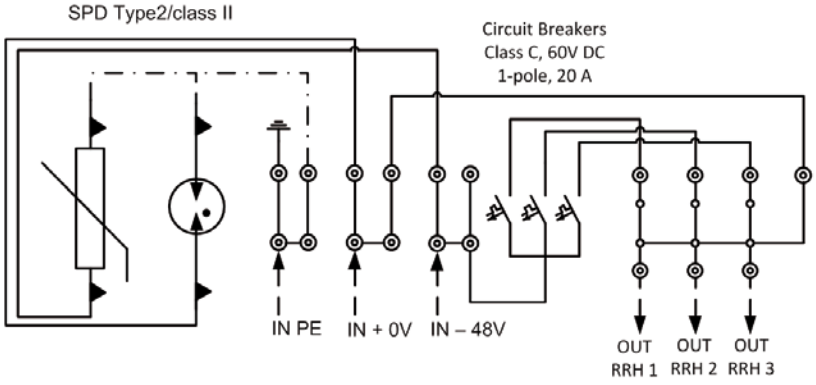
PTTA box 3 RRH power distribution with circuit breaker and surge protection type 2

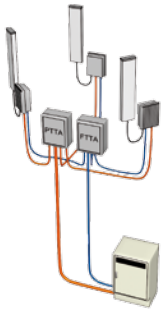


Specifications

Dimension	250 x 200 x 115 mm
Screw terminals	up to 16 mm² with wire end sleeve, up to 25 mm² w/o wire end sleeve
Power entry	1 cable Ø 12 – 25 mm, 2 x 10 mm², 2 x 16 mm², 2 x 25 mm²
Power exit	3 cables Ø 8 – 17 mm, 2 x 4 mm², 2 x 6 mm²
Earthing	1 cable Ø 5 – 13 mm, 1 x 16 mm²
Circuit breaker	class C 20 A
Surge protection device	type 2 / class II
I_N rated current per RRH	13.3 A
Item no.	84137121

Optional available with SPD type1 + 2 / class I + II.



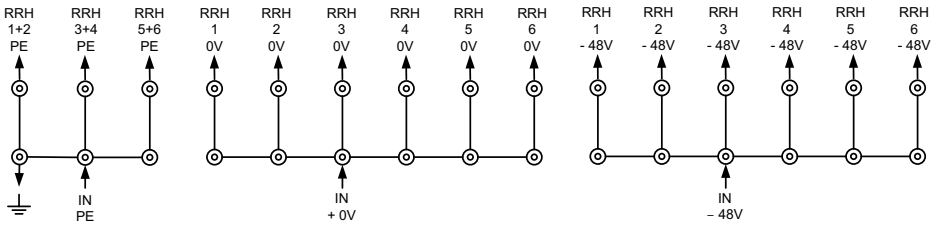


MLC – PTTA Power-To-The-Antenna box

PTTA box 6 RRH power distribution

Specifications

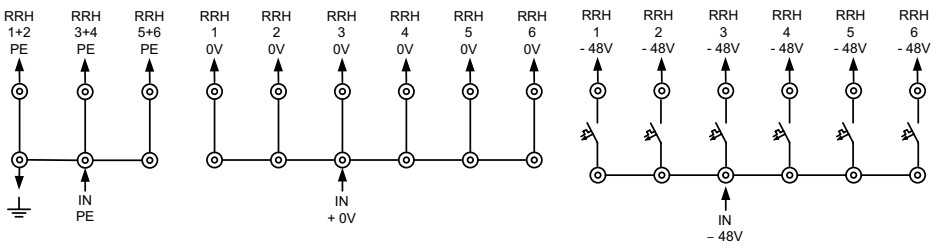
Dimension	320 x 250 x 138 mm
Screw terminals	up to 16 mm² with wire end sleeve, up to 25 mm² w/o wire end sleeve
Power entry	1 cable Ø 12 – 25 mm, 12 x 4 mm² , 12 x 6 mm², 2 x 10 mm², 2 x 16 mm², 2 x 25 mm²
Power exit	6 cables Ø 8 – 17 mm, 2 x 4 mm², 2 x 6 mm²
Earthing	1 cable Ø 5 – 13 mm, 1 x 16 mm²
I_N rated current per RRH	15 A
Item no.	85015656



PTTA box 6 RRH power distribution with 6 circuit breaker

Specifications

Dimension	320 x 250 x 138 mm
Screw terminals	up to 16 mm² with wire end sleeve, up to 25 mm² w/o wire end sleeve
Power entry	1 cable Ø 12 – 25 mm, 12 x 4 mm² , 12 x 6 mm², 2 x 10 mm², 2 x 16 mm², 2 x 25 mm²
Power exit	6 cables Ø 8 – 17 mm, 2 x 4 mm², 2 x 6 mm²
Earthing	1 cable Ø 5 – 13 mm, 1 x 16 mm²
Circuit breaker	class C 20 A
I_N rated current per RRH	11.7 A
Item no.	85015657



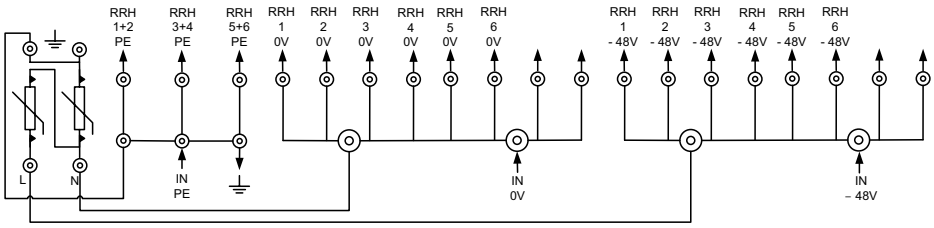
MLC – PTTA Power-To-The-Antenna box

PTTA box 6 RRH power distribution with surge protection type 1/2 for applications with grounded return conductor

Specifications

Dimension	320 x 250 x 138 mm
Power entry	1 cable Ø 12 – 25 mm, 2 x 10 mm², 2 x 16 mm², 2 x 25 mm², 2 x 35 mm² Screw terminals up to 35 mm²
Power exit	6 cables Ø 5 – 13 mm, 2 x 4 mm², 2 x 6 mm² Push in terminals up to 10 mm²
Earthing	1 cable Ø 5 – 13 mm, 1 x 16 mm²
Surge protection device	type 1/2 / class I/II
I_N rated current per RRH	15 A
Item no.	85015658

Optional available with SPD type1 1/2, class I/II for common return and ground

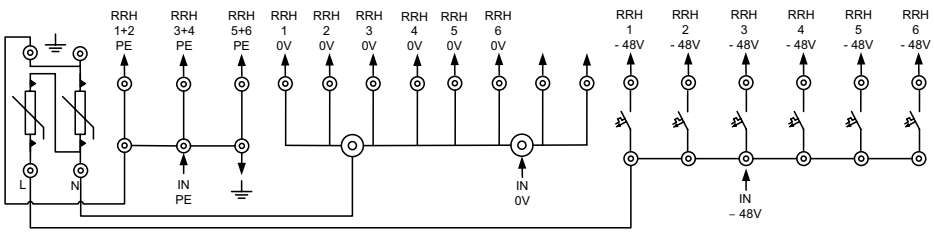


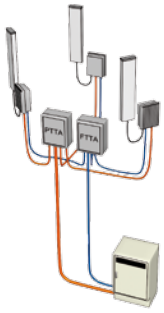
PTTA box 6 RRH power distribution with circuit breaker and surge protection type 1/2 for applications with grounded return conductor

Specifications

Dimension	320 x 250 x 138 mm
Power entry	1 cable Ø 12 – 25 mm, 2 x 10 mm², 2 x 16 mm², 2 x 25 mm², 2 x 35 mm² Screw terminals up to 35 mm²
Power exit	6 cables Ø 5 – 13 mm, 2 x 4 mm², 2 x 6 mm² Push in terminals up to 10 mm²
Earthing	1 cable Ø 5 – 13 mm, 1 x 16 mm²
Circuit breaker	class C 20 A
Surge protection device	type 1/2 / class I/II
I_N rated current per RRH	11.7 A
Item no.	85015659

Optional available with SPD type 1/2, class I/II for common return and ground





MLC – PTTA Power-To-The-Antenna box

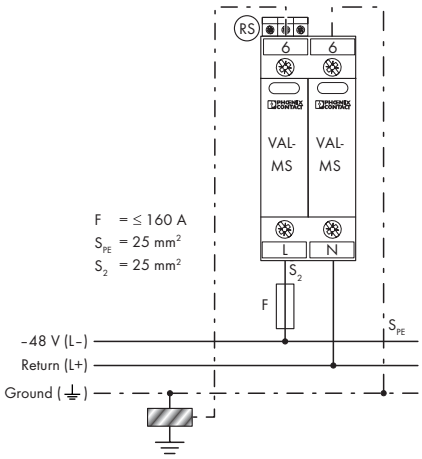
Surge protection device (SPD) type 1/2, Class I/II – for grounded return installation

Features

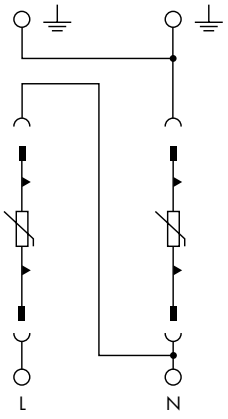
- Lightning protection for RRH with -48 V DC power supply
- Varistor-based lightning arrester for -48 V DC applications with grounded return conductor (positive pole)
- Combined type 1/2 arresters with I_{imp} = 12.5 kA
- High total discharge surge current 25 kA (10/350 µs), 50 kA (8/20 µs) due to deployed high-capacity varistors
- Low voltage protection level
- Operating state / fault indication by indicator flag and with optional remote signaling contacts for the monitoring system
- Easy replacement of protection modules

Specifications

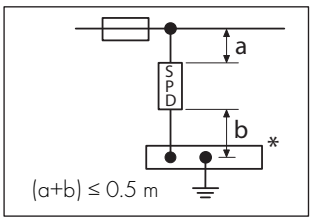
Nominal voltage U_N	60 V AC/DC, -48 V DC (RRH)
Max. continuous operating voltage (U_c)	75 V AC, 100 V DC
Lightning test current I_{imp}	12.5 kA
Nominal discharge surge current (8/20 µs) I_N	12.5 kA
Total discharge current (10/350 µs) I_{tot}	25 kA
Total discharge current (8/20 µs) I_{tot}	50 kA
Voltage protection level U_p	≤ 0.4 kV
Test standards	EN 61643-11: 2012, IEC 61643-11: 2011, UL 1449 3rd edition
IEC category	I, II / T1, T2
Operating state / fault indication	red/defect; green/ok
Operating temperature range	-40 °C ... +80 °C



Stub wiring -48 V DC system 1+1 V



Circuit diagramm



Connection to ground
(a+b) ≤ 0.5 m recommended
maximal 1 m
* equipotential bonding strip

MLC – PTTA Power-To-The-Antenna box

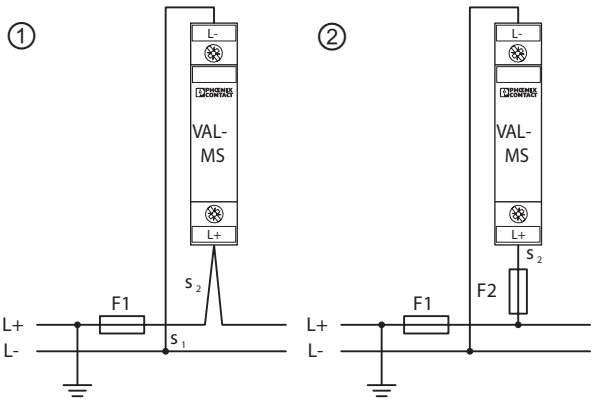
Surge protection device (SPD) type 1/2, class I/II – for common return and ground

Features

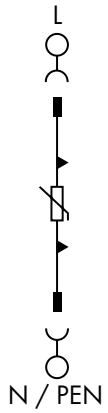
- Lightning protection for RRH with -48 V DC power supply
- Varistor-based lightning arrester for -48 V DC applications with common return conductor (positive pole) and ground
- Combined type 1/2 arresters with I_{imp} = 12.5 kA
- High total discharge surge current 25 kA (10/350 µs), 50 kA (8/20 µs) due to deployed high-capacity varistors
- Low voltage protection level
- Operating state / fault indication by indicator flag and with optional remote signaling contacts for the monitoring system
- Easy replacement of protection modules

Specifications

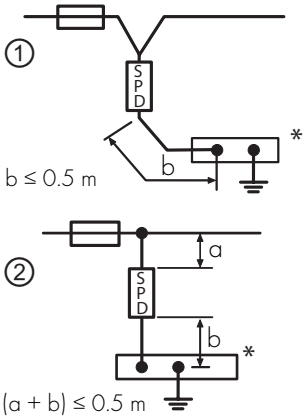
Nominal voltage U_N	60 V AC/DC, -48 V DC (RRH)
Max. continuous operating voltage (U_c)	75 V AC, 100 V DC
Lightning test current I_{imp}	12.5 kA
Nominal discharge surge current (8/20 µs) I_N	12.5 kA
Maximal discharge surge current (8/20 µs) I_{tot}	30 kA
Voltage protection level U_p	≤ 0.4 kV
Test standards	EN 61643-11: 2012, IEC 61643-11: 2011, UL 1449 3rd edition
IEC category	I, II / T1, T2
Operating state / fault indication	red/defect; green/ok
Operating temperature range	-40 °C … +80 °C



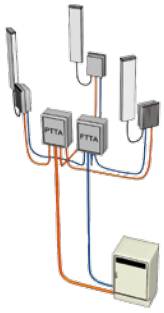
V-shaped wiring



Circuit diagramm



Connection to ground
b / (a+b) ≤ 0.5 m recommended
maximal 1 m
* equipotential bonding strip



MLC – PTTA Power-To-The-Antenna box

Circuit breaker (CB)

Features

- Circuit breaker type 5SY4120-7 with 20 A rated current
- Switching capacity 6 kA
- The devices are approved for worldwide use according to IEC standards for systems up to 60 V DC.

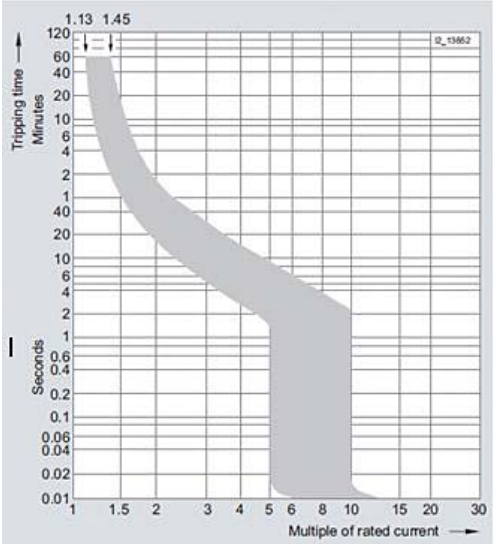
Specifications miniature circuit breaker 5SY4120-7

Standards	EN 60898-1, EN 60947-2
Operational voltage	60 V DC
Rated current (at 30 °C)	20 A
Rated switching capacity	6 kA DC (EN 60898)
Tripping characteristic	C
Poles	1 pole
Conductor cross-sections	0.75 ... 35 mm² (solid and stranded) 0.75 ... 25 mm² (finely stranded, with end sleeve)
Ambient temperature	-25 °C ... +55 °C, max. 95 % humidity
Storage temperature	-40 °C ... +75 °C
Shock	150 m/s² for 11 ms half-sine (IEC 60068-2-27)
Resistance to vibrations	50 m/s² at 25 .. 150 Hz and 60 at 35 Hz (4 sec) (IEC 60068-2-6)

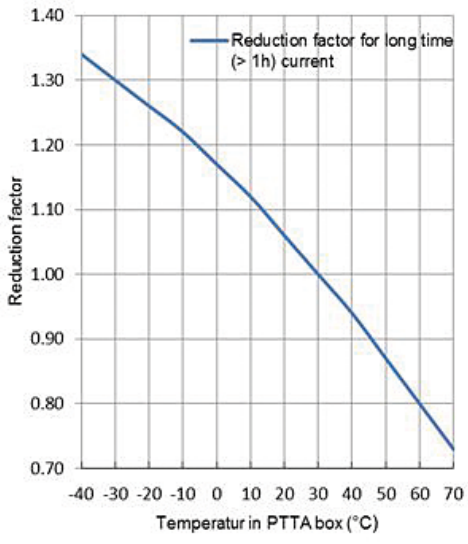
Tripping characteristic C at ambient temperature +30 °C for 5SY4120-7, rated current 20 A

Standard	Thermal trips		Electromagnetic trips	
	limiting test current tripping time > 1h	minimum test current tripping time < 1 h	hold tripping time > 0.1 s	latest tripping instant tripping time < 0.1 s
IEC/EN 60898-1	22.6 A (1.13 x I_N)	29 A (1.45 x I_N)	100 A (5 x I_N)	200 A (10 x I_N)

See picture tripping characteristic C.



Tripping characteristic C at 30 °C



Reduction factor for long time current at different ambient temperatures

MASTERLINE Ultimate Hybrid (MLUH)

Hybrid-riser cable with compact connector head

HUBER+SUHNER launched the most innovative hybrid cabling system 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. The robust connector head with an integrated pulling eye allow for 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. These unique features make MASTERLINE Ultimate Hybrid the best-in-class product in terms of ease of top mast installation, installation robustness and efficiency.

The global product launch in January 2013 has drawn the industry's attention and created huge interest in this world's first modular hybrid cabling system. Several trials and test installations are under way. HUBER+SUHNER is proud to further build our product and innovation leadership for remote radio installation solutions.

MASTERLINE Ultimate Hybrid (MLUH)

Hybrid-riser cable with compact connector head

- Unique «plug & play» system up to 6 RRHs
- Best-in-class and easiest mast top installability
- Global production in North America, Europe and Asia

RF **LISCA RF jumper**
page 132

FTTA **Q-ODC RRH jumpers**
page 34

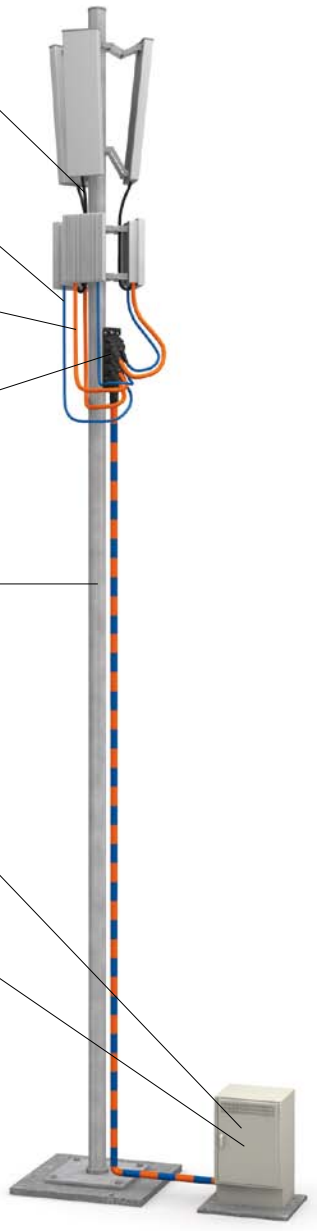
PTTA **Power jumpers**
page 67

HTTA **MASTERLINE Ultimate Hybrid**
page 62

XTTA **Mounting clamps**
page 125

FTTA **CTB 19" patching box** (optional)
page 124

FTTA **LC patchcord** (optional)
page 123



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 and power jumpers
- Encapsulated IP67 sealed connector head housing
- Robust pulling eye for cable lifting, no hoisting grips required, high cable strain relieve
- Space-efficient, low wind-load
- Easy mounting with adaptor plate, mast-, pole-, and wall-mounting
- Integral earth point which can be connected to an earth lead with M8 ring terminal
- Optional protection cover for cable exits available

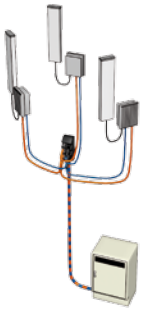
Specifications

		Small	Large
Number of connector pairs		3	6
Dimensions L x W x H		310 x 90 x 97 mm	477 x 90 x 97 mm
Material		plastic PPE black	
Pulling eye force		2000 N (short-term during installation)	
Hybrid cable retention force at enclosure		2000 N	
Connectors for jumper cable	fiber optic power	Q-ODC socket rugged circular plastic socket	
Ambient temperature range		-40 °C to +75 °C	
Ingress protection		IP67	
Impact resistance		IK 7	
Halogen free		IEC 60754-2	
UV resistant for outdoor use		ISO 4892-3	
Material flammability rating		UL94-V0	

MASTERLINE Classic at BTS side

Supplied on a double-flange reel

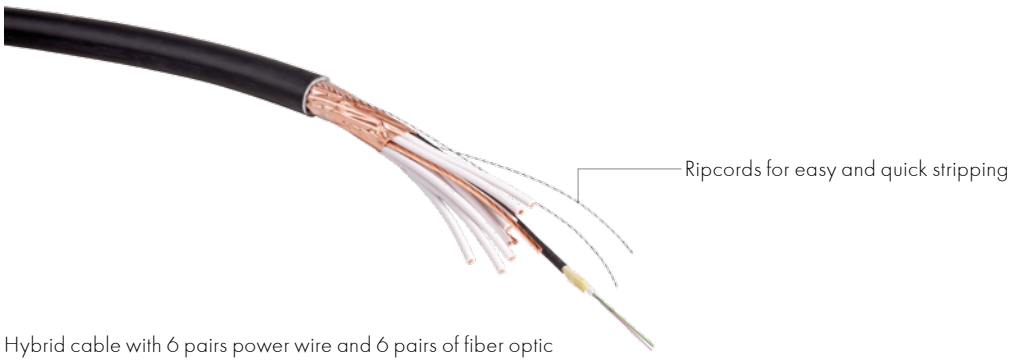
Integral earth connection



MASTERLINE Ultimate Hybrid (MLUH)

Hybrid cable specifications

	LSFH™ hybrid cable Global market	UL listed hybrid cable US market
Jacket material	thermoplastic, low smoke free of halogen (LSFH™)	PVC
Standard	IEC 60502-1:2004-04	UL 1277
Temperature range	-40 °C to +75 °C	
Operating voltage	48 Vdc	
Rated voltage	0.6 kV/1 kV (1.2 kV)	
Conductors	stranded copper class 2 IEC 60228: 2004	stranded copper class C
Drain wire	stranded copper class 2 IEC 60228: 2004	stranded copper class B
Cable shielding	copper foil 100 % coverage (with drain wire)	
Fiber optic	5 mm loose-tube cable with up to 36 fibers singlemode	
Halogen free	yes	no
Flame retardant	IEC 60332-1-2:2004	UL 1685 (UL 1581) vertical tray flame test (70 000 BTU/hr)
UV resistant	IEC 68-2-5	UL1581



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

Connectors

MASTERLINE Ultimate Hybrid allow for quick and reliable connections of fiber optic and power jumpers. The fiber optic connector Q-ODC has a robust push-pull coupling mechanism with two clearly defined mating states for highest outdoor installation safety.

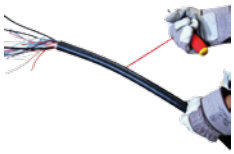
Specification see page 106 (Fiber optic interfaces).

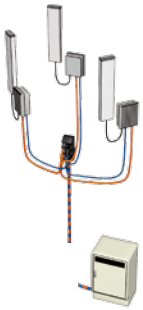
The power connector is a rugged circular connector with a bayonet coupling system which enables a simple and fast mating. With only a 1/3 twist of the coupling ring, connectors are mated with an audible and sensitive «click». The machined 3.6 mm crimp contact ensure a vibration safe termination and a high current rating.

MASTERLINE Ultimate Hybrid (MLUH)

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

Installation features

	**MLUH adaptor plate** The MLUH adaptor plate is fixed to the mast before the MLUH is lifted.
	**Unspooling** The MLEH is supplied on a double-flange reel which allows for easy and straight-forward unspooling while lifting the cable up the mast.
	**Pulling** The robust connector head with an integrated pulling eye allow for easy cable lifting without the need for hoisting grips.
	**Hook-in MLUH head at adaptor plate** The encapsulated MLUH connector head can be locked-in with a single «click» to the pre-mounted adaptor plate.
	**RRH connection** The remote radios are connected with fiber optic jumpers, which are terminated with Q-ODC 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 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.



MASTERLINE Ultimate Hybrid (MLUH)

Ordering information

MASTERLINE Ultimate Hybrid for 3 RRHs – MLUH 3/3

	Radio end side	BTS side
Fiber optic	3 Q-ODC sockets	3 LC uniboot
Power	3 rugged circular metal sockets	3 pairs of wire blunt cut wire cross section 6 mm^2 / AWG 10 or 10 mm^2 / AWG 8 or AWG 6

Power wire	Fiber optic	Market	Jacket material	Wire cross section Cable diameter	Length	Item no.
3 pairs	3 pairs singlemode	global not UL listed	LSFH™	6 mm^2 22 mm (5/8")	10 m	85007726
					20 m	85007727
					30 m	85007728
					40 m	85007729
					50 m	85007731
				10 mm^2 22 mm (5/8")	60 m	85007733
					70 m	85007734
					80 m	85007735
					90 m	85007736
					100 m	85007737
		US UL	PVC	AWG 10 19.6 mm (0.77")	10 m	85007738
					20 m	85007739
					30 m	85007740
					40 m	85007741
					50 m	85007742
				AWG 8 23.4 mm (0.92")	60 m	85007743
					70 m	85007744
					80 m	85007745
					90 m	85007746
					100 m	85007747
				AWG 6 23.9 mm (0.94")	110 m	85016182
					120 m	85018059

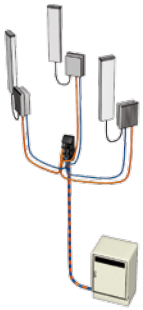
MASTERLINE Ultimate Hybrid (MLUH)

Ordering information

MASTERLINE Ultimate Hybrid for 3 RRHs – MLUH 6/6

	Radio end side	BTS side
Fiber optic	6 Q-ODC sockets	6 LC uniboot
Power	6 rugged circular metal sockets	6 pairs of wire blunt cut wire cross section 6 mm^2 / AWG 10 or 10 mm^2 / AWG 8

Power wire	Fiber optic	Market	Jacket material	Wire cross section Cable diameter	Length	Item no.
6 pairs	6 pairs singlemode	global not UL listed	LSFH™	6 mm^2 27.5 mm (7/8")	10 m	85007748
					20 m	85007749
					30 m	85007750
					40 m	85007751
					50 m	85007752
				10 mm^2 28 mm (7/8")	60 m	85007753
					70 m	85007754
					80 m	85007755
					90 m	85007756
					100 m	85007757
		US	PVC	AWG 10 25.4 mm (1.00")	10 m	85007758
					20 m	85007759
					30 m	85007760
					40 m	85007761
					50 m	85007762
				AWG 8 30 mm (1.18")	60 m	85007763
					70 m	85007764
					80 m	85007765
					90 m	85007766
					100 m	85007767



MASTERLINE Ultimate Hybrid (MLUH)

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 IP67
- Tensile load 450 N

Jumpers for all types of remote radio systems available. Ordering information see page 35 (MLE).

Power jumpers

Features
- Compatible with MLEP, MLEH 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 4 or 6 mm² / AWG 10
- Standard length 2, 5 and 10 m

Specification

Jacket material	thermoplastic, low smoke free of halogen (LSFH™)
Screen	Braided screen of copper wires
Operating voltage	48 V dc
Rated voltage	0.6 / 1.0 kV
Temperature range	-40 °C to 90 °C

Ordering information

Market	Wire cross section Cable diameter	Length	Item no.
Global Not UL listed	4mm² 10.7 mm	2 m	85006013
		5 m	84149463
		10 m	85006014
	6mm² 12.1 mm	2 m	85006015
		5 m	84149464
		10 m	85006016
US UL listed	AWG 10 11.4 mm (0.45")	2 m	85006026
		5 m	84149465
		10 m	85006028

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 4 or 6 mm^2

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 / un-mating sequences

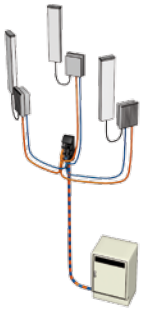
Twist the coupling ring of the plug connector to remove protecting cap as shown.

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.

Power connector specifications

Rated current per contact	42 A (IEC), 44 A (UL), 30 A (CSA)
Rated voltage	230 V (IEC), 600 V (UL), 600 V (CSA)
Operating temperature	-40 °C to 105 °C
Flammability rating	UL 94 V0
Salt spray	>500 hours
UV resistant	yes
Ingress protection mated	IP68 (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



MASTERLINE Ultimate Hybrid (MLUH)

Accessories

Description		Item no.	Page	Picture
Clamps for hybrid cable		depends on cable diameter	125	
Grounding kits		85015070	127	
19" CTB patching box	12 fiber singlemode 24 fiber singlemode	84138010 84125915	124	
LC patchcords	1 m length singlemode	84125519	123	

MASTERLINE Extreme Hybrid (MLEH)

Hybrid-riser cable with compact divider

HUBER+SUHNER's hybrid cabling system is the most efficient and easiest to install product available on the market. Mobile operators on four continents verified that MASTERLINE Extreme Hybrid can be installed in 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.

The pre-terminated hybrid cable assembly minimises the quantity of cables running up the mast. The compact divider splits the optical fiber and DC power cable into individual ruggedised outdoor cables which are linked to the RRHs – either directly or via extension jumpers without the need for bulky mast mount distribution boxes. The RRH jumpers allow an adaptation to different RRH interfaces and therefore make the solution independent from the system vendor's hardware.

MASTERLINE Extreme Hybrid (MLEH)

Hybrid-riser cable with compact divider

- Easiest-to-install hybrid product available on market
- Globally most often installed hybrid system
- «Plug & play» system for up to 9 RRHs

RF LISCA RF jumper
page 132

FTTA Q-ODC RRH jumpers
page 34

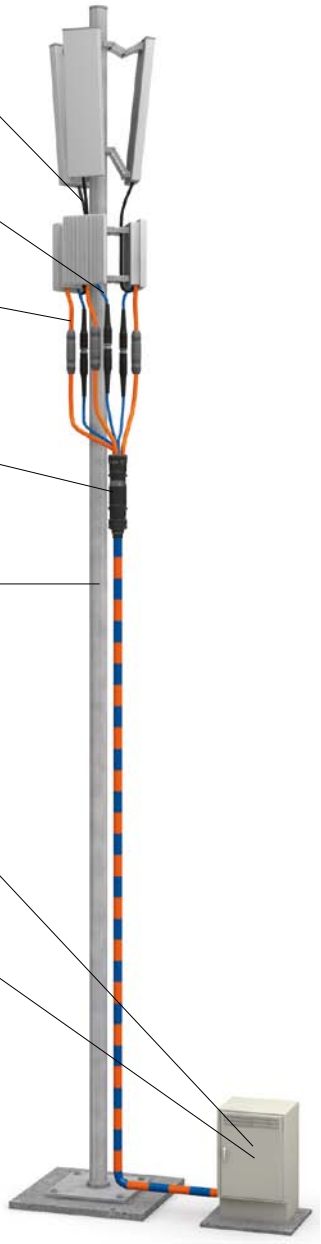
PTTA Power jumpers (optional)
page 67

HTTA MASTERLINE Extreme Hybrid
page 72

XTTA Mounting clamps
page 125

FTTA CTB 19" patching box (optional)
page 124

FTTA LC patchcord (optional)
page 123



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)

Features

- Hybrid cabling system for up to 9 RRHs
- Flexible hybrid cable with low bending radius and excellent cable routing properties
- Overlength management – cable jacket with ripcords for easy and quick stripping
- Ruggedised plastic enclosure with robust break-out cables
- No special installation tools required
- Robust braided sleeve with pulling eye for cable lifting
- Supplied on double-flange reels for straight forward unspooling
- Fiber optic breakout cables terminated with Q-ODC extensions to connect with Q-ODC RRH jumpers
- Power cable connectorised or blunt cut
- Integral earth point which can be connected to an earth lead with M8 ring terminal

Specifications

		Small divider	Large divider
Number of power pairs		Up to 6	Up to 9
Number of fiber optic pairs		Up to 8	Up to 18
Dimensions		Ø 69 mm, height 315 mm	Ø 96 mm, height 300 mm
Material		plastic PPE black	
Pulling force	radio end	2000 N (short-term during installation)	
Temperature range	operation installation	-40 °C to +75 °C -25 °C to +65°C	
Cable retention force at enclosure	fiber break-out cable power break-out cable hybrid cable	500 N 500 N 2000 N	
Ingress protection	radio end base station	IP67 IP65 (with protection tube)	
IK class		IK 10	
Flammability		UL94-V0	
UV resistant		ISO 4892-2	
Salt mist, IEC 61300-2-26		96 h	
Vibration, IEC 61300-2-1		10 - 500 Hz / 10 g	
Shock, IEC 61300-2-9		100 g	

MASTERLINE Classic at BTS side

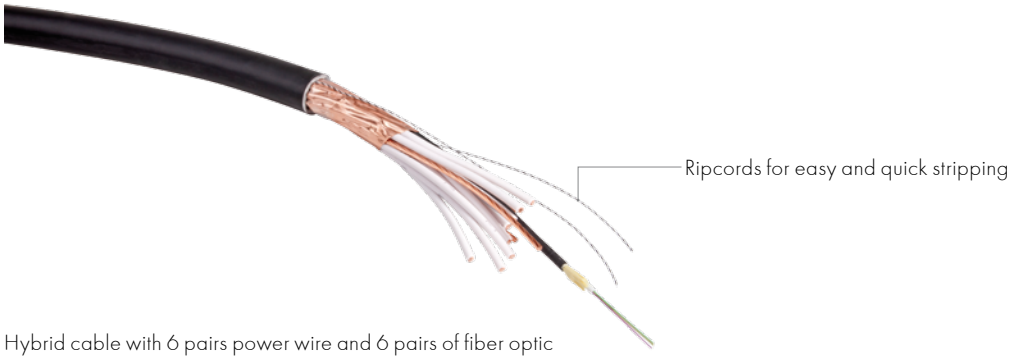
MLEH supplied on a double-flange reel

Integral earth connection

MASTERLINE Extreme Hybrid (MLEH)

Hybrid cable specifications

	LSFH™ hybrid cable Global market	UL listed hybrid cable US market
Jacket material	thermoplastic, low smoke free of halogen (LSFH™)	PVC
Standard	IEC 60502-1:2004-04	UL 1277
Temperature range	-40 °C to +75 °C	
Operating voltage	48 Vdc	
Rated voltage	0.6 kV/1 kV (1.2 kV)	
Conductors	stranded copper class 2 IEC 60228: 2004	stranded copper class C
Drain wire	stranded copper class 2 IEC 60228: 2004	stranded copper class B
Cable shielding	copper foil 100 % coverage (with drain wire)	
Fiber optic	5 mm loose-tube cable with up to 24 fibers singlemode	
Halogen free	yes	no
Flame retardant	IEC 60332-1-2:2004	UL 1685 (UL 1581) vertical tray flame test (70 000 BTU/hr)
UV resistant	IEC 68-2-5	UL1581



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

Global supply chain for hybrid assemblies

HUBER+SUHNER operates hybrid assembly shops in Poland, Mexico, China and has plans to expand the manufacturing network to other regions as well. Being close to our customers is a must for bulky hybrid assemblies with weights exceeding 100 kg. Our operations network enables HUBER+SUHNER to respond immediately to our customers' needs and to provide a fast and flexible delivery performance.

MASTERLINE Extreme Hybrid (MLEH)

Easiest-to-install hybrid product available on market

Installation features

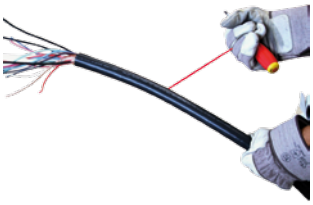
Unspooling
The MLEH is supplied on a double-flange reel which allows for easy and straight-forward unspooling while lifting the cable up the mast.

Pulling
The radio end is equipped with a robust braided sleeve with pulling eye which protects and keeps the break-out cables in vertical position during installation. With the hoisting grip, attached below the divider, the cable system is lifted up to the mast.
It withstands an installation tensile load of 5000 N.

RRH connection
The remote radios are connected with fiber optic jumpers, which are terminated with Q-ODC connectors and RRH compatible interfaces. The copper cable is cut to the correct length and either clamped or connected with a field-terminated power connector.

Earthing
The MLEH enclosure 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 break-out cables and the individual copper/ground wires.



Overlength management
The hybrid cable is designed in a way that the outer jacket and shielding can be easily stripped off with a ripcord 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.

MASTERLINE Extreme Hybrid (MLEH)

Available configurations

Configuration	Pairs of power wires	Pairs of fiber optic	Market	Wire cross section	Power connector	Fiber connector
MLEH 3/3	3	3	global US	6, 10 mm² 10, 8, 6 AWG	connectorised or blunt cut	Q-ODC on radio end LC uniboot on base station side
MLEH 3/6	3	6	global US	6, 10 mm² 10, 8, 6 AWG		
MLEH 4/4	4	4	global US	6, 10 mm² 8, 6 AWG		
MLEH 4/8	4	8	global US	6, 10 mm² 8, 6 AWG		
MLEH 5/6	5	6	US	10, 8, 6 AWG		
MLEH 6/6	6	6	global US	6, 10 mm² 10, 8, 6 AWG		
MLEH 6/7	6	7	global US	6, 10 mm² 10, 8, 6 AWG		
MLEH 6/12	6	12	global US	6, 10 mm² 10, 8, 6 AWG		
MLEH 8/8	8	8	US	8, 6 AWG		
MLEH 9/18	9	18	US	6, 10 mm² 10, 8 AWG		

Optional available also with a 4-fiber outdoor connector ODC-4 extension for RRHs with 2 fiber optic interfaces.

Market	Hybrid cable jacket material	UL listing	Wire cross section
Global	LSFH™	none	in mm²
US	PVC	yes	American Wire Gauge (AWG)

Customer voices – best system to install

Installers are impressed by how easy and fast the MASTERLINE Extreme Hybrid can be installed. An experienced rigger in UK brought it to the point: «this is the best system to install». The HUBER+SUHNER hybrid cable is flexible, easy to pull up the mast and to route inside of conduits or monopoles. Competitive solutions suffer from stiff corrugated cables designs and a Latin American operator wrote in an installation report «difficult to install due to cable's inflexibility, handling problems to install the cable up the mast, long time to install the boxes on the top». HUBER+SUHNER's MLEH is a boxless solution, all connectors have quick-lock mechanisms and overlength management is efficiently solved.

MASTERLINE Extreme Hybrid (MLEH)

Ordering information

MASTERLINE Extreme Hybrid for 3 RRHs – MLEH 3/3

	Radio end side	BTS side
Fiber optic	Q-ODC breakout length 0.50 m	LC uniboot
Power	blunt cut wire cross section 6 mm^2 / AWG 10 breakout length 4 m	blunt cut wire cross section 6 mm^2 / AWG 10 or 10 mm^2 / AWG 8

Power wire	Fiber optic	Market	Jacket material	Wire cross section Cable diameter	Length	Item no.
3 pairs	3 pairs singlemode	global not UL listed	LSFH™	6 mm^2 22 mm (5/8")	10 m	85006998
					20 m	85006999
					30 m	85007000
					40 m	85007001
					50 m	85007002
				10 mm^2 22 mm (5/8")	60 m	85007003
					70 m	85007004
					80 m	85007005
					90 m	85007006
					100 m	85007007
		US	PVC	AWG 10 19.6 mm (0.77")	10 m	85007008
					20 m	85007009
					30 m	85007010
					40 m	85007011
					50 m	85007012
				AWG 8 23.4 mm (0.92")	60 m	85007013
					70 m	85007014
					80 m	85007015
					90 m	85007016
					100 m	85007017

Longer length on request.

MASTERLINE Extreme Hybrid (MLEH)

Ordering information

MASTERLINE Extreme Hybrid for 3 RRHs – MLEH 3/6 with power connector

	Radio end side	BTS side
Fiber optic	Q-ODC breakout length 0.50 m / 0.62 m	LC uniboot
Power	power connector wire cross section 6 mm^2 breakout length 0.50 m	blunt cut wire cross section 6 mm^2 or 10 mm^2

Power wire	Fiber optic	Market	Jacket material	Wire cross section Cable diameter	Length	Item no.
3 pairs	6 pairs singlemode	global not UL listed	LSFH™	6 mm^2 22 mm (5/8")	10 m	85018574
					20 m	85011141
					30 m	85011142
					40 m	85009251
					50 m	85011143
				10 mm^2 22 mm (5/8")	60 m	85011154
					70 m	85011155
					80 m	85011156
					90 m	85011157
					100 m	85011158

Longer length on request.

MASTERLINE Extreme Hybrid is currently deployed nationwide in US

Two US operators (T-Mobile and Sprint) have selected MLEH for their nationwide network rollout. No other hybrid cabling system can be installed faster and more efficiently. The «plug & play» solution has excellent installation features like robust pulling tubes or a field-manageable method to strip and cut the excess power cable at the base station. These unique features convince operators and installers at the same time – there no other hybrid solution which comes close.

MASTERLINE Extreme Hybrid (MLEH)

Ordering information

MASTERLINE Extreme Hybrid for 6 RRHs – MLEH 6/6 with power connector

	Radio end side	BTS side
Fiber optic	Q-ODC breakout length 0.50 m / 0.62 m	LC uniboot
Power	power connector wire cross section 6 mm^2 breakout length 0.5 m / 0.62 m	blunt cut wire cross section 6 mm^2 or 10 mm^2

Power wire	Fiber optic	Market	Jacket material	Wire cross section Cable diameter	Length	Item no.
6 pairs	6 pairs singlemode	global not UL listed	LSFH™	6 mm^2 27.5 mm (7/8")	10 m	85001318
					20 m	85001319
					30 m	85001320
					40 m	85001321
					50 m	85001322
				10 mm^2 28 mm (7/8")	60 m	85001323
					70 m	85001324
					80 m	85001325
					90 m	85001326
					100 m	85001327

Longer length on request.

MASTERLINE Extreme Hybrid (MLEH)

Ordering information

MASTERLINE Extreme Hybrid for 6 RRHs – MLEH 6/6

	Radio end side	BTS side
Fiber optic	Q-ODC breakout length 0.50 m / 0.62 m	LC uniboot
Power	blunt cut wire cross section 6 mm^2 / AWG 10 breakout length 4 m	blunt cut wire cross section 6 mm^2 / AWG 10 or 10 mm^2 / AWG 8

Power wire	Fiber optic	Market	Jacket material	Wire cross section Cable diameter	Length	Item no.
6 pairs	6 pairs singlemode	global not UL listed	LSFH™	6 mm^2 27.5 mm (7/8")	10 m	85020114
					20 m	85014799
					30 m	85014800
					40 m	85014801
					50 m	85014802
				10 mm^2 28 mm (7/8")	60 m	85014798
					70 m	85014797
					80 m	85014796
					90 m	85014795
					100 m	85009156
		US UL	PVC	AWG 10 25.4 mm (1.00")	10 m	85020115
					20 m	85020116
					30 m	85020117
					40 m	85020118
					50 m	85020119
				AWG 8 30.0 mm (1.18")	60 m	85020120
					70 m	85020121
					80 m	85020122
					90 m	85020123
					100 m	85020124

Longer length on request.

MASTERLINE Extreme Hybrid (MLEH)

Ordering information

MASTERLINE Extreme Hybrid for 6 RRHs – MLEH 6/7 with power connector

	Radio end side	BTS side
Fiber optic	Q-ODC breakout length 0.50 m / 0.62 m	LC uniboot
Power	power connector wire cross section 6 mm^2 breakout length 0.5 m / 0.62 m	blunt cut wire cross section 6 mm^2 or 10 mm^2

Power wire	Fiber optic	Market	Jacket material	Wire cross section Cable diameter	Length	Item no.
6 pairs	7 pairs singlemode	global not UL listed	LSFH™	6 mm^2 27.5 mm (7/8")	10 m	85001328
					20 m	85001329
					30 m	85001330
					40 m	85001331
					50 m	85001332
				10 mm^2 28 mm (7/8")	60 m	85001333
					70 m	85001334
					80 m	85001335
					90 m	85001336
					100 m	85001337

Longer length on request.

MASTERLINE Extreme Hybrid (MLEH)

Ordering information

MASTERLINE Extreme Hybrid for 6 RRHs – MLEH 6/7

	Radio end side	BTS side
Fiber optic	Q-ODC breakout length 0.50 m / 0.62 m	LC uniboot
Power	blunt cut wire cross section 6 mm^2 / AWG 10 breakout length 4 m	blunt cut wire cross section 6 mm^2 / AWG 10 or 10 mm^2 / AWG 8

Power wire	Fiber optic	Market	Jacket material	Wire cross section Cable diameter	Length	Item no.
6 pairs	7 pairs singlemode	global not UL listed	LSFH™	6 mm^2 27.5 mm (7/8")	10 m	85007042
					20 m	85007043
					30 m	85007044
					40 m	85007045
					50 m	85007046
				10 mm^2 28 mm (7/8")	60 m	85007050
					70 m	85007052
					80 m	85007053
					90 m	85007054
					100 m	85007055
		US UL	PVC	AWG 10 25.4 mm (1.00")	10 m	85007056
					20 m	85007057
					30 m	85007058
					40 m	85007061
					50 m	85007062
				AWG 8 30.0 mm (1.18")	60 m	85007063
					70 m	85007064
					80 m	85007065
					90 m	85007066
					100 m	85007067

Longer length on request.

MASTERLINE Extreme Hybrid (MLEH)

Ordering information

MASTERLINE Extreme Hybrid for 6 RRHs – MLEH 6/12

12 x Q-ODC

	Radio end side	BTS side
Fiber optic	Q-ODC breakout length 0.50 m / 0.62 m / 0.74 m / 0.86 m	LC uniboot
Power	blunt cut wire cross section 6 mm^2 / AWG 10 breakout length 4 m	blunt cut wire cross section 6 mm^2 / AWG 10 or 10 mm^2 / AWG 8

Power wire	Fiber optic	Market	Jacket material	Wire cross section Cable diameter	Length	Item no.
6 pairs	12 pairs singlemode	global not UL listed	LSFH™	6 mm^2 27.5 mm (7/8")	10 m	85019957
					20 m	85019958
					30 m	85019959
					40 m	85019960
					50 m	85019961
				10 mm^2 27.5 mm (7/8")	60 m	85019962
					70 m	85019963
					80 m	85019964
					90 m	85019965
					100 m	85019966
		US	PVC	AWG 10 25.4 mm (1.00")	10 m	85019974
					20 m	85019976
					30 m	85019977
					40 m	85019978
					50 m	85019979
				AWG 8 30.0 mm (1.18")	60 m	85019980
					70 m	85019981
					80 m	85019982
					90 m	85019983
					100 m	85019984

Longer length on request.

MASTERLINE Extreme Hybrid (MLEH)

Ordering information

MASTERLINE Extreme Hybrid for 9 RRHs – MLEH 9/18

18 x Q-ODC

	Radio end side	BTS side
Fiber optic	Q-ODC breakout length 0.50 m / 0.62 m / 0.74 m / 0.86 m / 0.98 m / 1.10 m	LC uniboot
Power	blunt cut wire cross section AWG 10 breakout length 4 m	blunt cut wire cross section 6mm2 /AWG 10 or 10mm2 / AWG 8

Power wire	Fiber optic	Market	Jacket material	Wire cross section Cable diameter	Length	Item no.
9 pairs	18 pairs singlemode	global not UL listed	LSFH™	6 mm² 36.0 mm	10 m	85021731
					20 m	85021732
					30 m	85021733
					40 m	85021734
					50 m	85021735
				10 mm² 36 mm	60 m	85021736
					70 m	85021737
					80 m	85021738
					90 m	85021739
					100 m	85021740
		US	PVC	AWG 10 29.2 mm (1.15")	10 m	85007085
					20 m	85007087
					30 m	85007088
					40 m	85007089
					50 m	85007090
				AWG 8 36.8 mm (1.45")	60 m	85007091
					70 m	85007092
					80 m	85007093
					90 m	85007094
					100 m	85007095

Longer length on request.

MASTERLINE Extreme Hybrid (MLEH)

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 IP67 (Q-ODC)
- Tensile load 450 N

Jumpers for all types of remote radio systems available. Ordering information see page 35 (MLE).

Power jumpers

Features
- Compatible with MLEP, MLEH 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 4 or 6 mm² / AWG 10
- Standard length 2, 5 and 10 m

Specification

Jacket material	thermoplastic, low smoke free of halogen (LSFH™)
Screen	Braided screen of copper wires
Operating voltage	48 V dc
Rated voltage	0.6 / 1.0 kV
Temperature range	-40 °C to 90 °C

Ordering information

Market	Wire cross section Cable diameter	Length	Item no.
Global Not UL listed	4 mm² 10.7 mm	2 m	85006013
		5 m	84149463
		10 m	85006014
	6 mm² 12.1 mm	2 m	85006015
		5 m	84149464
		10 m	85006016
US UL listed	AWG 10 11.4 mm (0.45")	2 m	85006026
		5 m	84149465
		10 m	85006028

MASTERLINE Extreme Hybrid (MLEH)

Power connectors

Power connector plug at the jumper

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

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 4 or 6 mm^2 / AWG 10

MASTERLINE Extreme Hybrid is optional available with a rugged circular plastic power connector. 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 / un-mating sequences

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

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

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

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

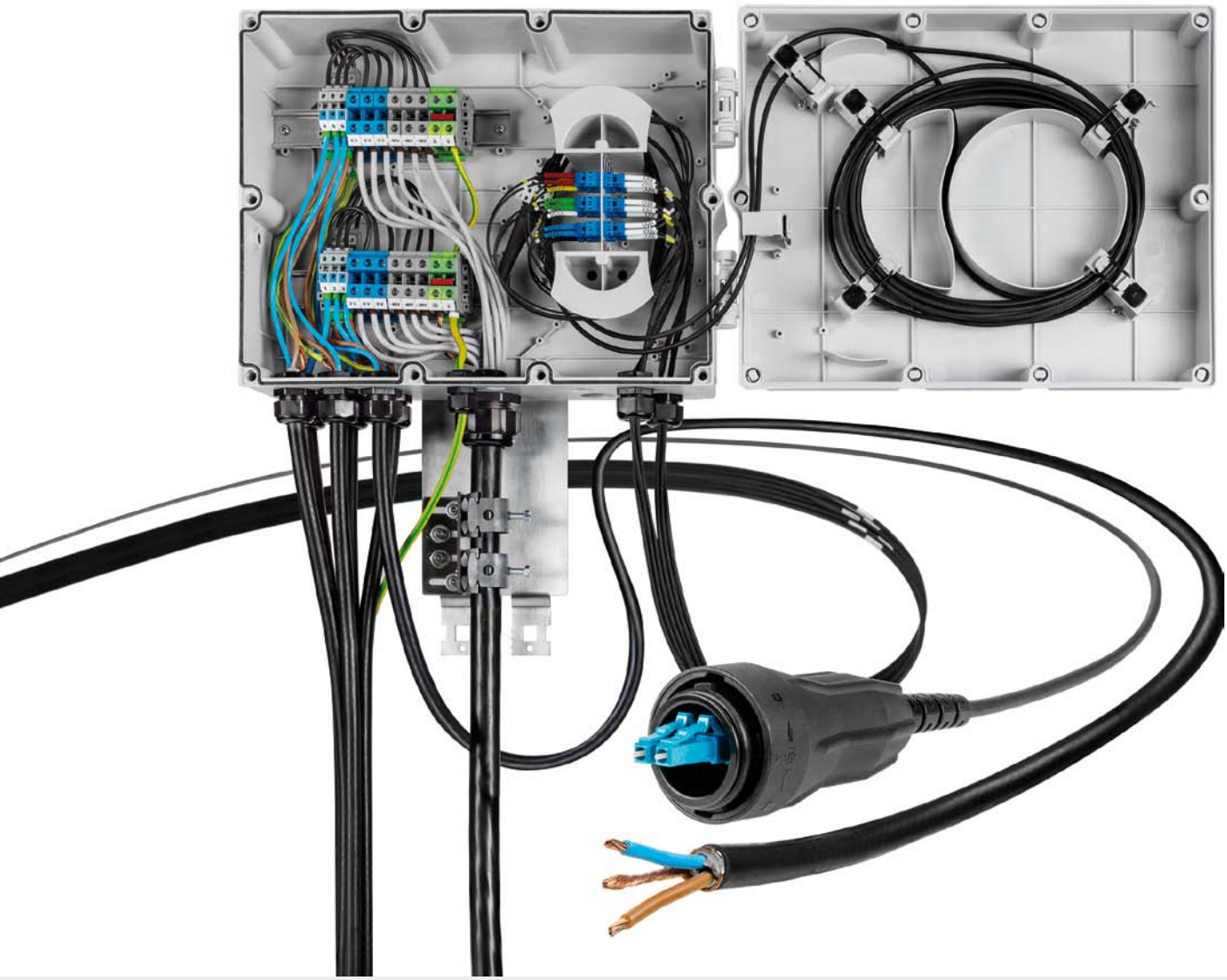
Power connector specifications

Rated current per contact	42 A (IEC), 44 A (UL), 30 A (CSA)
Rated voltage	230 V (IEC), 600 V (UL), 600 V (CSA)
Operating temperature	-40 °C to 105 °C
Flammability rating	UL 94 V0
Salt spray	>500 hours
UV resistant	yes
Ingress protection mated	IP68 (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

MASTERLINE Extreme Hybrid (MLEH)

Accessories

Description		Item no.	Page	Picture
Clamps for hybrid cable		depends on cable diameter	125	
Grounding kits		85015070	127	
19" CTB patching box	12 fiber singlemode 24 fiber singlemode	84138010 84125915	124	
LC patchcords	1 m length singlemode	84125519	123	
3 fold cable clamp suitable for ODC boot to fix the Q-ODC extension connectors		85012939	128	



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 multi-fiber / 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.

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. For that reason, box-less solutions are preferred and MASTERLINE Extreme Hybrid (see page 70) is globally the most often selected and installed hybrid product. 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)

Hybrid-riser cable with distribution box

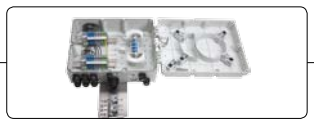
- Bulky mast-head box required
- Increased installation time (compared to MLEH)
- **Configuration with surge protection and circuit breakers possible**

RF **LISCA RF jumper**
page 132

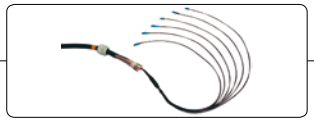
FTTA **LC duplex RRH jumpers**
page 48

PTTA **Power cable**
page 23

HTTA **HTTA box**
page 90



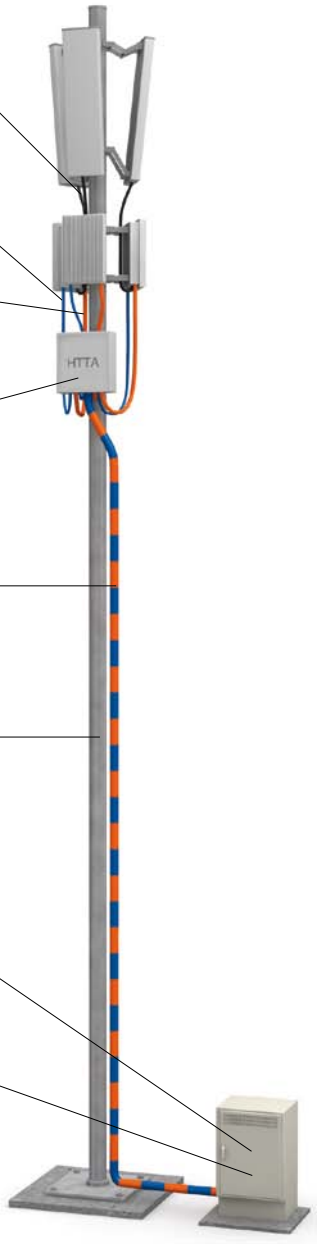
HTTA **MASTERLINE Classic Hybrid**
page 95



XTTA **Hybrid cable clamps**
page 125

FTTA **CTB 19" patching box** (optional)
page 124

FTTA **LC patchcord** (optional)
page 123

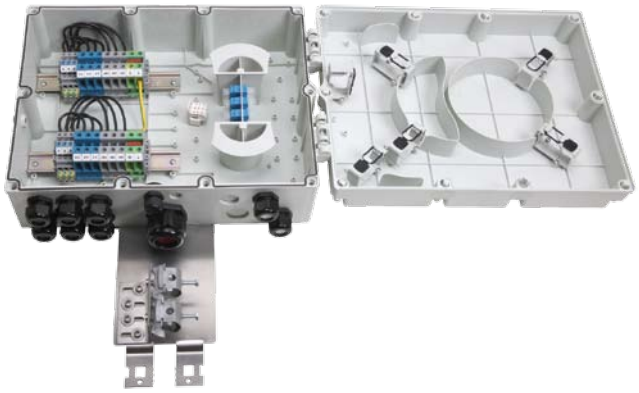


XTTA FTTA, PTTA and HTTA
RF Radio Frequency
FTTA Fiber-To-The-Antenna
PTTA Power-To-The-Antenna
HTTA Hybrid-To-The-Antenna

MASTERLINE Classic Hybrid (MLCH)

HTTA Hybrid-To-The-Antenna box

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.

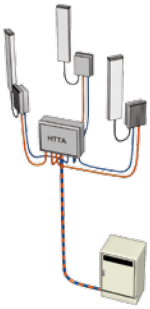


Features

- Ruggedised outdoor distribution box for fiber optic and power supply
- Supports up to 6 remote radio heads
- Fitted with bend radius limiting mandrels or MTP-module
- Power distribution up to 15 A per remote radio head
- 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 x 390 x 159 mm
U_N rated voltage		-48 V DC
I_N rated current per RRH - configuration screw terminals only - configuration with circuit breaker		 15.0 A 11.7 A
Ambient temperature range		-40 °C to + 75 °C (with CB +55 °C)
Box material		glass-filled polycarbonate
Ingress protection		IP67
Impact resistance		IK 07 (EN 62262)
Colour		RAL 7035 grey
Halogen free		IEC 60754-2
UV resistant for outdoor use		ISO 4892-3
Material flammability rating		UL94-V0
Tensile strength hybrid cable clamp		2000 N
Screw terminals	cable entry cable exit	6 mm^2 to 16 mm^2 (25 mm^2 without wire end sleeves) 4 mm^2 to 6 mm^2
Circuit breaker (optional)		miniature circuit breaker C 20A, type 5SY6120-7
Surge protection device (optional)		SPD type 1+2 / class I+II or type 2 / class II



MASTERLINE Classic Hybrid (MLCH)

HTTA Hybrid-To-The-Antenna box

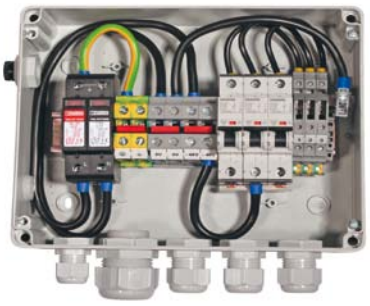
Installation features

Pre-installed power distribution and fiber management components
2 DIN-rails with screw terminals for power distribution for up to 6 RRH. Bend radius limiting mandrels and an LC duplex adaptor plate ensure safe fiber management.

Pulling
The HTTA box has a robust mounting bracket with which the box and hybrid cable can be lifted up the mast. The cable clamp which is integrated on the mounting bracket has a tensile strength of 2000 N.

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.

Optional with circuit breaker and/or surge protection device
Customised box configurations are available, for example with 20 A circuit breaker and / or surge protection devices type 2 (40 kA, 8/20 µs) or type 1+2 (100 kA, 10/350 µs).



MASTERLINE Classic Hybrid (MLCH)

HTTA Hybrid-To-The-Antenna box

Cable entry

The MASTERLINE Classic Hybrid includes in the standard version 12 single mode fibers, 12 power wires with 6 or 10mm^2 cross section and a braided screen of copper foil.

- 1 x M40 cable gland for MLCH Ø 24.0 – 28.0 mm

As an option, the HTTA box can be used for an installation with 1 or 2 power main cables and a separate multi-fiber riser cable (MLC) instead of a hybrid cable.

- 1 x M40 cable gland for power main cable Ø 16.0 - 28.0 mm
- 1 x M32 cable gland for an optional 2nd power main cable Ø 18.0 – 25.0 mm
- 1 x hole 16 mm for MLC 12 fibers and 1 x hole 26 mm or for MLC 24 fibers

Cable exit

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.

- 1 x M32 cable gland with 6-fold seal for 6 jumper cable Ø 4.8 – 7.0 mm
- 6 x M25 cable glands for 6 power jumper cable Ø 9.0 – 16.0 mm

Earthing

The HTTA box can be electrically grounded with an earthing cable with a cross section of up to 16 mm^2.

- 1 x M20 cable gland for grounding cable Ø 6.0 – 12.0 mm

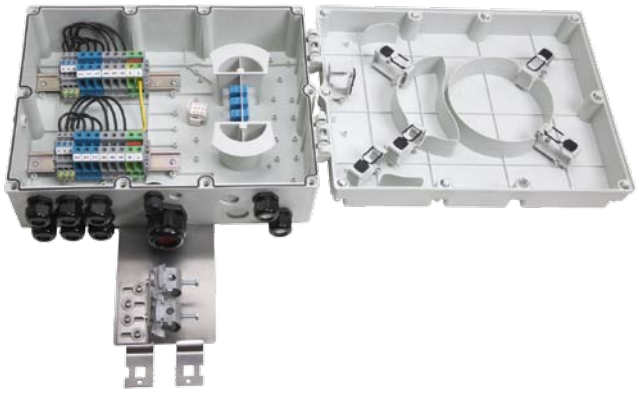
RRH protection

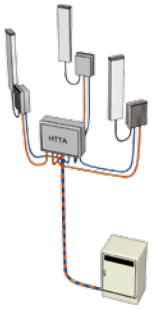
Circuit breaker

The HTTA box can be configurated with up to 6 circuit breakers with 20 A rating per RRH (see page 59 for more information).

Surge protection device

The HTTA box allows for integration of surge protection devices SPD type 2 / class II, capable of handling 40 kA (8/20 µs) or of surge protection SPD type 1 + 2 / class I + II with current discharge capacity of 25 kA (10/350 µs). Please see page 57 for more information.





MASTERLINE Classic Hybrid (MLCH)

HTTA Hybrid-To-The-Antenna box

Ordering information

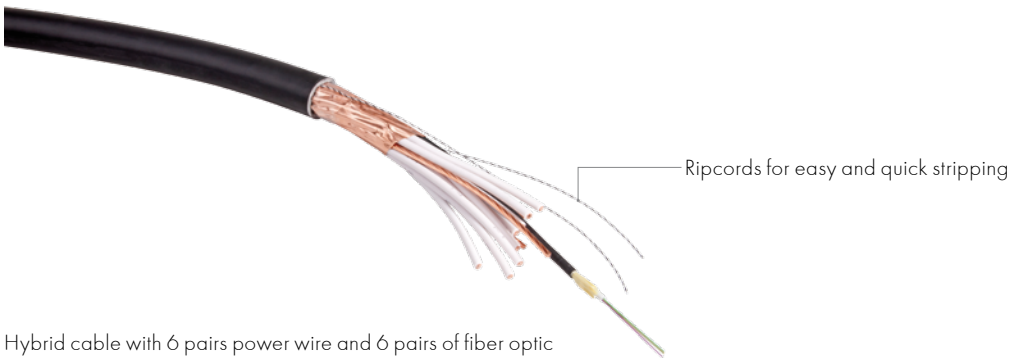
Description		Item no.
HTTA box for 6 RRH, cable glands for jumper cables	singlemode	84143745
HTTA box for 6 RRH with circuit breaker, cable glands for jumper cables	singlemode	85002397
Connectorised HTTA box for 6 RRH (see page 90)	singlemode	85003963
Connectorised HTTA box for 6 RRH with circuit breaker (see page 90)	singlemode	85003964

Other configurations on request.

MASTERLINE Classic Hybrid (MLCH)

Hybrid cable specifications

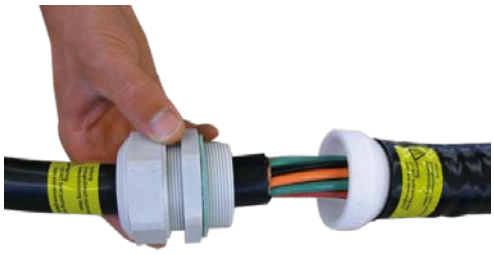
	LSFH hybrid cable Global market	UL listed hybrid cable US market
Jacket material	thermoplastic, low smoke free of halogen (LSFH)	PVC
Standard	IEC 60502-1:2004-04	UL 1277
Temperature range	-40 °C to +75 °C	
Operating voltage	48 Vdc	
Rated voltage	0.6 kV/1 kV (1.2 kV)	
Conductors	stranded copper class 2 IEC 60228: 2004	stranded copper class C
Drain wire	stranded copper class 2 IEC 60228: 2004	stranded copper class B
Cable shielding	copper foil 100 % coverage	
Fiber optic	5 mm loose-tube cable with up to 36 fibers singlemode	
Halogen free	yes	no
Flame retardant	IEC 60332-1-2:2004	UL 1685 (UL 1581) vertical tray flame test (70 000 BTU/hr)
UV resistant	IEC 68-2-5	UL1581



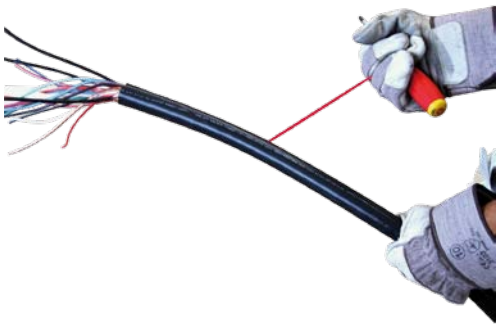
Hybrid cable with 6 pairs power wire and 6 pairs of fiber optic

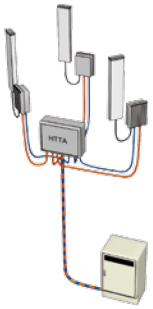
Insulation features

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 break-out cables and the individual copper/ground wires.



Overlength management
The hybrid cable is designed in a way that the outer jacket and shielding can be easily stripped off with a ripcord 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.





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 mm² / AWG 10 or 10 mm² / AWG 8	blunt cut wire cross section 6 mm² / AWG 10 or 10 mm² / AWG 8

Power wire	Fiber optic	Market	Jacket material	Wire cross section Cable diameter	Length	Item no.
6 pairs	6 pairs singlemode	global not UL listed	LSFH	6 mm² 27.5 mm (7/8")	10 m	85007381
					20 m	85007382
					30 m	85007383
					40 m	85007384
					50 m	85007385
				10 mm² 28 mm (7/8")	60 m	85007386
					70 m	85007387
					80 m	85007388
					90 m	85007389
					100 m	85007390
		US	PVC	AWG 10 19.6 mm	10 m	85007392
					20 m	85007393
					30 m	85007394
					40 m	85007395
					50 m	85007396
				AWG 8 23.4 mm	60 m	85007397
					70 m	85007398
					80 m	85007399
					90 m	85007400
					100 m	85007401

Longer length on request.

MASTERLINE Classic Hybrid (MLCH)

LC duplex RRH jumpers

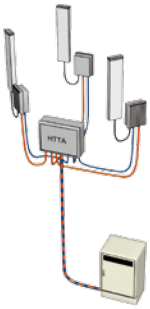
Features
- Jumper available for all types of remote radios
- Cable diameter 4.8 mm, 5.5 mm or 7 mm
- Standard lengths of 2 m and 5 m, any customised length available

The HTTA box enables to use 6 RRH jumper cables (optional 12) through 2 cable glands with pre-splitted sealings.

Ordering information see page 48 (MLC).

Accessories

Description		Item no.	Page	Picture
Clamps for hybrid cable		depends on cable diameter	125	
Grounding kits		85015070	127	
19" CTB patching box	12 fiber singlemode 24 fiber singlemode	84138010 84125915	124	
LC patchcords	1 m length singlemode	84125519	123	



MASTERLINE Classic Hybrid (MLCH)

Connectorised HTTA box

As customised version, the HTTA box can also be configurated with build-in flange connectors which mate directly with Q-ODC fiberoptic and power jumpers.

Q-ODC socket

power flange connector

Q-ODC RRH jumpers

Features

- Compatible with Q-ODC socket
- 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 IP67
- Tensile load 450 N

Jumpers for all types of remote radio systems available. Ordering information see page 34 (MLE).

Power jumpers

Features

- Compatible with MLEP, MLEH, MLUH and connectorized HTTA box
- 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 4 or 6 mm^2 / AWG 10
- Standard length 2, 5 and 10 m

Power connector specifications and order information for power jumper see page 67.

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
- Ruggedized cable design and cable divider
- «Plug & play» installation – no field termination/wrapping/preparation necessary

Specifications

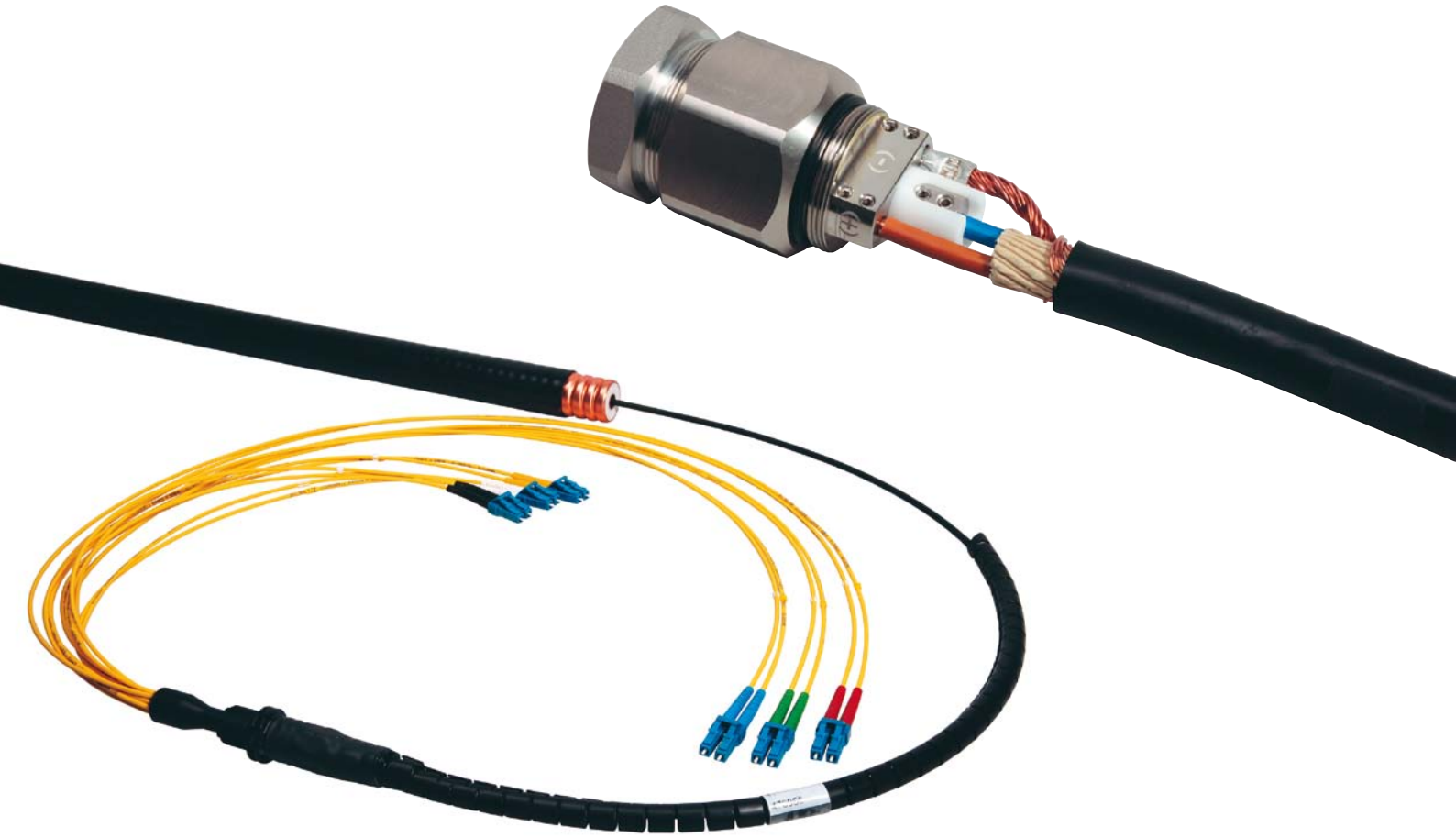
Temperature range	-40 °C to +75 °C	
Operating voltage	49 VDC	
Rated voltage	0.6 kV/1 kV	
	Ericsson	Alcatel-Lucent
Fiber (radio end)	FullAXS connector	LC duplex connector
Power (radio end)	blunt-cut (compatible to Amphenol power connector)	blunt-cut
Fiber (HTTA box)	LC duplex connector	
Power (HTTA box)	blunt-cut	

Portfolio / ordering

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

Please contact HUBER+SUHNER to define your customised product.

- Singlemode or multimode, 2 or 4 fibers
- Cross section of copper wires (2 x 4 mm^2, 2 x 6 mm^2, or 2 x 10 mm^2)
- 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



Re-use of corrugated coax cables

Conversion from coax to RRHs

For network upgrades, conventional cell sites using corrugated coax cables are often converted into remote radio systems. The installed corrugated cables are decommissioned, cut at both ends and re-used as supply lines for the RRHs. The inner and outer conductor of a corrugated cable are used for the power supply. The special Smart DC adaptor is fitted at both ends of the corrugated cable, guaranteeing secure and reliable contacts. Short jumper cables connect to the base station and the box on the mast (or directly the RRH). For data transmission, a thin multi-riser fiber optic cable (∅ 3.5 mm) is drawn into the inner conductor of a second corrugated cable from «above» (RRH side). The multi-riser cable can be either terminated as MASTERLINE Classic (MLC) with HTTA box or as MASTERLINE Extreme (MLE) with Q-ODC connectors on the top to connect with jumpers to the RRHs. The cable is spliced on the base station side.
This installation method saves expensive work on the «cable path» and consequently, no structural work is required for wall and roof ducts, cable conduits do not need to be opened and no new cables need to be laid.

This installation method enables an efficient migration from corrugated copper systems to RRH systems while keeping the real-estate changes at the cell site to an absolute minimum.

Re-use of corrugated coax cables

For conversion of corrugated copper system to RRHs

Significant copper savings per converted cell site

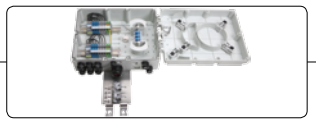
Fiber splicing required at base station

RF LISCA RF jumpers
page 132

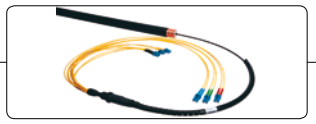
LC duplex RRH jumpers
page 34

Power cable
page 23

HTTA box
page 90



MLC with 3.5 mm cable
MLE with 3.5 mm cable
page 104

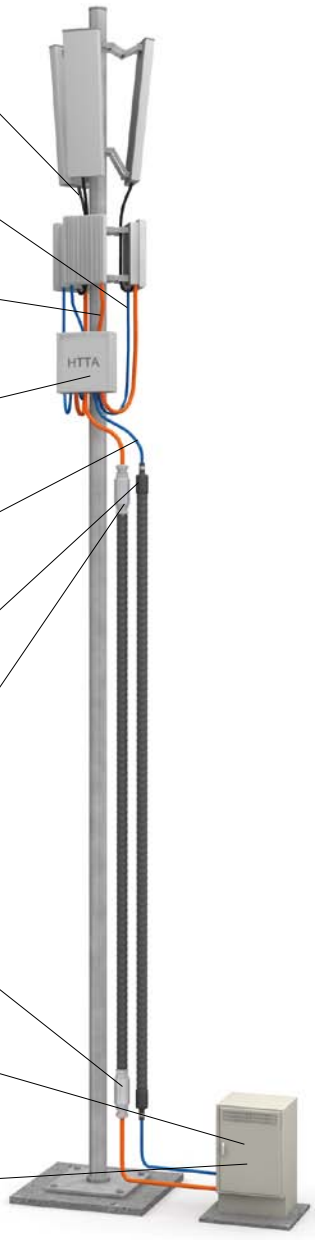


Seal kit
page 105

Smart DC kit
page 102

CTB 19" splicing box (optional)
page 124

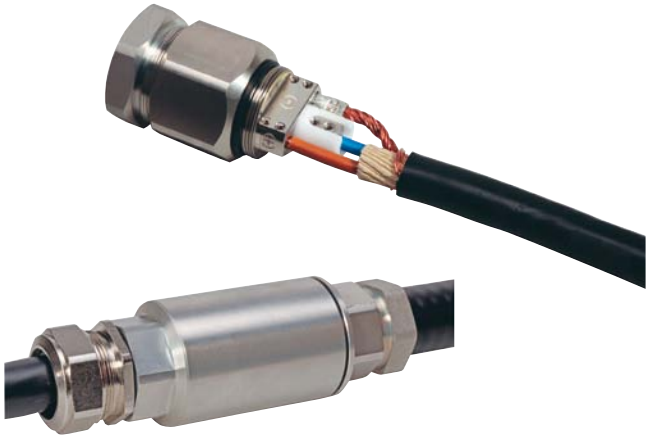
LC patchcord
page 123



XTTA FTTA, PTTA and HTTA
RF Radio Frequency
FTTA Fiber-To-The-Antenna
PTTA Power-To-The-Antenna
HTTA Hybrid-To-The-Antenna

Re-use of corrugated coax cables

Smart DC kits



Features

- For the connection of DC power cable to corrugated copper cable
- Kits for cables sizes 7/8", 1 1/4" and 1 5/8"
- Available as stand-alone kit or pigtail version with 2 x 10 mm^2 or 2 x 16 mm^2 DC cable (solid or stranded wire)
- DC current rating 40/60 A
- Lightning current handling 50 kA
- Multi-brand corrugated cable compatibility

Benefits

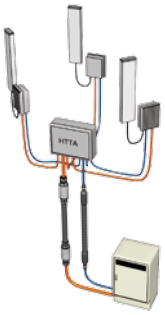
- Saves installation time and costs
- Quick and easy field installation
- Tooling support for both stripping and easy coax flaring

Specifications

Product conformity (TÜV approved)	IEC/EN 61984
Corrugated cable compatibility list	refer to datasheets
DC current rating	7/8": 40 A; 1 1/4" and 1 5/8": 60 A [1]
DC voltage rating	100 V
Rated impulse voltage	1.5 kV, 1.2/50 µs
Overvoltage category IEC 60664-1	III
Partial lightning current handling	50 kA, 10/350 µs, 3 pulses
IP rating IEC 60529	IP67
Pollution degree	1
Upper limiting temperature	+85 °C
Lower limiting temperature	-40 °C
Cable retention / cable gland	≥ 70 N, typ. 105 N

Material	
Body	brass, nickel plated
Contact holder	brass, nickel plated
Centre contact	CuBe or bronze, nickel plated
Cable gland	brass, nickel plated

[1] With 2 x 10 mm^2 DC cable 40 A only.



Re-use of corrugated coax cables

Ordering information

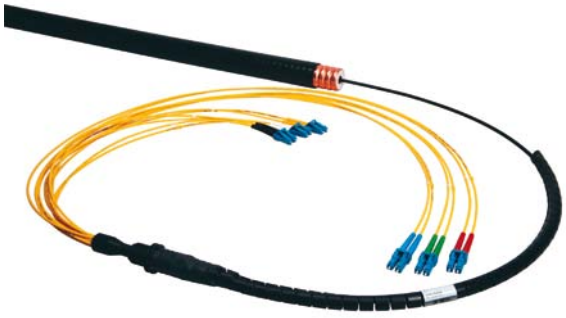
Size	Description	Item no.
Smart DC kits for solid wire 2 x 10 mm² cable NYCWY 2 x 10RE/10		
7/8"	no pigtail	84117348
	assembled with 5 m DC cable	84123654
	assembled with 10 m DC cable	84123656
1 1/4"	no pigtail	84122432
	assembled with 5 m DC cable	84123745
	assembled with 10 m DC cable	84123754
1 5/8"	no pigtail	84122550
	assembled with 5 m DC cable	84123742
	assembled with 10 m DC cable	84123743
Smart DC kits for solid wire 2 x 16 mm² cable NYCWY 2 x 16RE/16		
7/8"	no pigtail	84117348
	assembled with 5 m DC cable	84115873
	assembled with 10 m DC cable	84115875
1 1/4"	no pigtail	84122432
	assembled with 5 m DC cable	84122548
	assembled with 10 m DC cable	84122549
1 5/8"	no pigtail	84122550
	assembled with 5 m DC cable	84122553
	assembled with 10 m DC cable	84122557
Smart DC kits for stranded wire 2 x 16 mm² cable N2XC2Y 2 x 16		
7/8"	no pigtail	84123563
1 1/4"	no pigtail	84123734
1 5/8"	no pigtail	84123746
Trimming and flaring tools for coaxial cable		
7/8"	trimming tool	84074476
1 1/4"	jacket stripping	23010533
	flaring tool	84120843
1 5/8"	jacket stripping	23010534
	flaring tool	84085074

Re-use of corrugated cables – HUBER+SUHNER pioneered first successful roll-out with Vodafone Germany

An increasing number of traditional base stations using corrugated feeder cables are converted into RRH systems. With the use of HUBER+SUHNER's Smart DC kits and MASTERLINE Classic, cell sites can be upgraded with minimum downtime and with completely avoiding expensive cable routing. These advantages saved millions of Euros of installation costs for Vodafone Germany. HUBER+SUHNER was the preferred partner to upgrade the 3G network. More conversions all over Europe are on their way, especially with the increasing number of LTE installations.

Re-use of corrugated coax cables

MASTERLINE Classic for corrugated cables



Features

- Special cabling system pulled into inner conductor of corrugated copper cable
- Cable diameter 3.5 mm
- Compatible with 7/8", 1 1/4" and 1 5/8" cables
- Cable drawn from «above» (RRH side) – tested for cable runs up to 50 m (with repeated bendings)
- System supports up to 12 fibers (6 RRHs)
- Compatible with FTTA box or HTTA box
- Spliced at base station
- Easy and time-saving installation

Specifications

General MASTERLINE Classic specifications		see page 46
Cable type		multifiber loose-tube cable
Cable jacket		PE flame retardant / halogen free
Cable diameter		3.5 mm
Tensile strength	during installation in service	900 N 250 N
Crush resistance	short-term long-term in service	300 N/cm 100 N/cm 35 mm
Temperature range	installation in service	-25 °C to +50 °C -40 °C to +70 °C

Ordering information

Description	Fiber type	Cable type	Length	Item no.
MLC for corrugated cables with LC duplex connector at RRH side	singlemode	Ø 3.5 mm 12 fibers	50 m	84131114
			100 m	84132020
			150 m	85003324

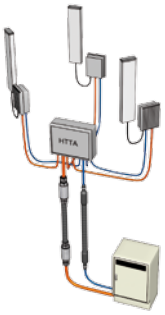
MASTERLINE Extreme for corrugated cables

Features

- Special cabling system pulled into inner conductor of corrugated copper cable
- Cable diameter 3.5 mm
- Compatible with 7/8", 1 1/4" and 1 5/8" cables
- Cable drawn from «above» (RRH side) - tested for cable runs up to 50 m (with repeated bendings)
- System supports up to 12 fibers (6 RRHs)
- Terminated with Q-ODC at RRH side
- Spliced at base station
- Easy and time-saving installation

Ordering information

Description	Fiber type	Cable type	Length	Item no.
MLE for corrugated cables with Q-ODC at RRH side	singlemode	Ø 3.5 mm 12 fibers	50 m	85007777
			100 m	85007778
			150 m	85007779



Re-use of coax copper cables

Seal kit for corrugated cables

Features
- Sealing of fiber optic cable entry into corrugated feeder
- Field mountable kit
- Seal kits for 7/8", 1 1/4" and 1 5/8" cables
- Ingress protection IP67

Ordering information

Description	Item no.
Seal kit 7/8", 2 seals	84074074
Seal kit 1 1/4" and 1 5/8", 2 seals	84074075

HTTA Hybrid-To-The-Antenna box

Features
- Compatible with MLC for corrugated cables
- Ruggedised outdoor distribution box for fiber optic and power supply
- Supports up to 6 remote radio heads
- Power distribution up to 15 A per remote radio head
- Optional with circuit breaker or / and surge protection devices

HTTA box specification see page 90 (MLCH)

Ordering information

Description	Item no.
HTTA box for MLC for corrugated cables and power distribution for 6 RRH	85007300

19" CTB splicing box

Features
- Splicing box for MLC for corrugated cables
- Space saving 19" rack installation
- Cable entry from the front
- Front plate with mounted LC duplex adaptors
- Pullout tray for easy access
- Interface for MCM splice cassette with bend radius 35 mm throughout
- LC pigtails for splicing included
- Material powder coated aluminum

Ordering information

Description	No. of fibers	Fiber type	Item no.
CTB 19" fiber frame, MCM splice cassette, LC pigtails, LC adaptors	12	singlemode	84138011
	24		84125914

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 andmust 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 the ODC.

Content

Fiber optic interfaces for remote radio heads

Q-ODC® outdoor connector plug / socket

Features

- 2 fibers, singlemode or multimode
- Compact design with 2 x 1.25 mm ferrules
- Built-in socket with square 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
- EMI protected
- RoHs compliant
- Fulfills performance standard IEC 61753-1 Cat. E

Specifications

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	≤ 450 N tensile load ≤ 30 N static side load
	Q-ODC socket	≤ 30 N tensile load
Operating temperature[1)]	IEC 61300-2-22	-40 °C up to +85 °C
Mating durability	IEC 61300-2-2	200 cycles[2)]
Ingress protection (mated)	IEC 60529	IP67
Salt mist	IEC 61300-2-26	30 days passed
Vibration	IEC 61300-2-1 IEC 61373	passed 10 Hz - 500 Hz / 10 g passed category 1A/B, 2, 3
Shock	IEC 61300-2-9 IEC 61373	passed 50 g passed category 1, 2

[1)] depending on cable type

[2)] with repeated cleaning

Optical performance

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

Mating / un-mating 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 un-mate.

Fiber optic interfaces for remote radio heads

Q-ODC® outdoor connector plug / socket

Overview of Q-ODC connector types

Type	Connector	Dust cap	
QA	Q-ODC plug 	push-on 	IP67
QC		snap-on 	IP67
QB		snap-on with chain 	IP67
QE	Q-ODC extension 	push-on 	IP67
QF		snap-on 	IP67
QG		snap-on with chain 	IP67
QS	Q-ODC socket square 	push-on 	IP67
QT		snap-on 	IP67
QU		snap-on with chain 	IP67
QI	Q-ODC socket hexagonal, mounted from the rear, simplex cable 	snap-on 	IP67
QJ		snap-on with chain 	IP67
QM	Q-ODC socket hexagonal, mounted from the rear, field cable 	snap-on 	IP67
QN		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 outdoor connector plug / socket

Available Q4 / 2013.

Features

- Up to 12 fibers, singlemode or multimode
- Compact design with MT 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 static side load
Operating temperature[1)]	IEC 61300-2-22	-40 °C up to +85 °C
Mating durability	IEC 61300-2-2	100 cycles[2)]
Ingress protection (mated)	IEC 60529	IP68
Salt mist	IEC 61300-2-26	30 days passed
Vibration	IEC 61300-2-1	passed 10 – 500 Hz / 10 g
Shock	IEC 61300-2-9 IEC 61373	passed 50 g 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)
Multimode	0.35	0.60
Standard singlemode	0.25	0.75
Low-loss singlemode (SM MT Elite)	0.1	0.30
Low-loss multimode (MM MT Elite)	0.1	0.30

Fiber optic interfaces for remote radio heads

Q-ODC® -12 outdoor connector plug / socket

Overview of Q-ODC connector types

Type	Connector		Dust cap		
QX	Q-ODC®12 plug		push-on		IP67
			snap-on		IP68
			snap-on with chain		IP68
QY	Q-ODC®12 extension		push-on		IP67
			snap-on		IP68
			snap-on with chain		IP68
QZ	Q-ODC®12 socket square		push-on		IP67
			snap-on		IP68
			snap-on with chain		IP68
QW	Q-ODC®12 socket hexagonal, mounted from the rear, simplex cable		push-on		IP67
			snap-on		IP68
			snap-on with chain		IP68

Fiber optic interfaces for remote radio heads

ODC®-2 outdoor connector plug / socket

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
- Fulfills performance standard IEC 61753-1 Cat. E

Specifications

Technology		full ceramic ferrule and sleeve
Housing material		nickel-plated brass
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 °C up to +85 °C
Mating durability		1000 cycles[2)]
Ingress protection (mated)	IEC 60529	IP 68
Salt mist	IEC 61300-2-26	30 days passed
Vibration	IEC 61300-2-1	passed 10 - 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	singlemode	typ. ≤ 0.20 dB	97 % ≤ 0.45 dB
	multimode	typ. ≤ 0.20 dB	97 % ≤ 0.50 dB
Return loss	singlemode	≥ 50 dB	

Fiber optic interfaces for remote radio heads

ODC®-2 outdoor connector plug / socket

Overview of ODC-2 connector types

Type	Connector	Dust cap
A1	ODC-2 plug 	screwed cap with chain 
A4		screwed cap with pulling feature 
E1	ODC-2 extension (socket type) 	screwed cap 
E3		screwed cap with chain 
C1	ODC-2 socket, square small 	screwed cap 
C3		screwed cap with chain 

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 plug / socket

Features

- 4 fibers, singlemode or multimode
- Compact design with 4 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
- Fulfills performance standard IEC 61753-1 Cat. E

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 tensile load
Installation torque force	min. 1 Nm	max. 2 Nm
Operating temperature[1)]	IEC 61300-2-22	-40 °C 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 - 500 Hz / 10g
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	singlemode	typ. ≤ 0.20 dB	97 % ≤ 0.45 dB
	multimode	typ. ≤ 0.20 dB	97 % ≤ 0.50 dB
Return loss	singlemode	≥ 50 dB	

Fiber optic interfaces for remote radio heads

ODC®-4 outdoor connector plug / socket

Overview of ODC-4 connector types

Type	Connector	Dust cap
J2	ODC-4 plug 	screwed cap with pulling feature 
J3		screwed cap with chain 
E4	ODC-4 extension (socket type) 	screwed cap 
E6		screwed cap with chain 
K2	ODC-4 socket, hexagonal 	screwed cap 
K3		screwed cap with chain 
K6	ODC-4 socket, square small 	screwed cap 
K7		screwed cap with chain 

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 x 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

Specifications

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 °C to +85 °C
	installation	-40 °C to +55 °C
Ingress protection	IEC 60529-20	IP67 (mated or with dust cap)
Salt mist 84108683 85006151	IEC 61300-2-26, MIL-STD-202G Method 101E IEC 61300-2-26	192 h 720 h
Vibration	IEC 61300-2-1, MIL-STD-202G, Method 204G	passed 10 Hz – 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 @ 2000 MJ/m^2

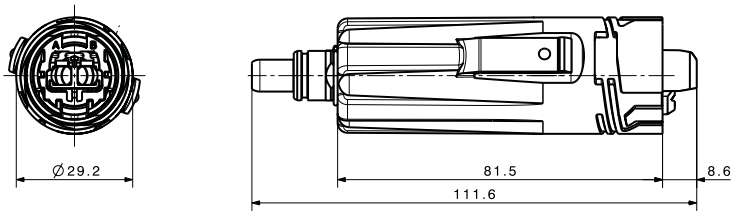
Optical performance

Insertion loss	singlemode	typ. ≤ 0.20 dB	97 % ≤ 0.45 dB
	multimode	typ. ≤ 0.20 dB	97 % ≤ 0.50 dB
Return loss	singlemode	≥ 50 dB	

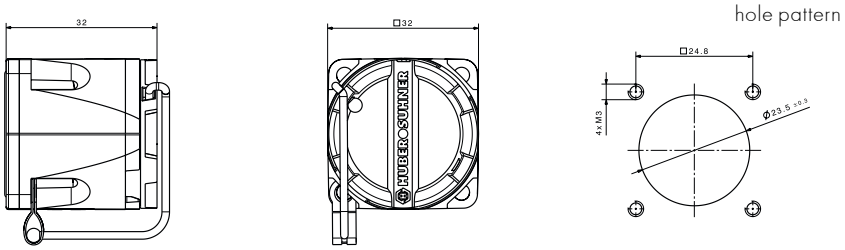
Fiber optic interfaces for remote radio heads

Q-XCO – quick-lock ruggedised SFP connector

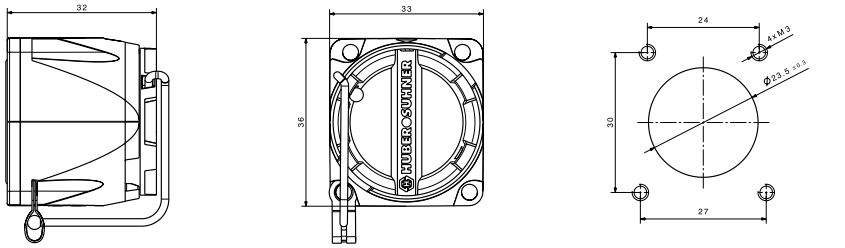
Q-XCO plug



Q-XCO flange small



Q-XCO flange large with asymmetric build-in dimension



Description		Picture	Dust cap
XA (for assembly code)	Q-XCO connector		
Item no. 84108683	Q-XCO flange small		
Item no. 84108684	Q-XCO flange large		
Item no. 85006151	Q-XCO flange small e-coating		

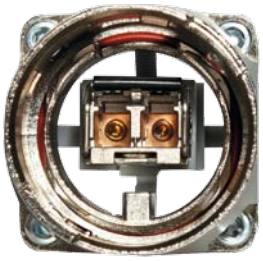
Fiber optic interfaces for remote radio heads

Q-XCO – Quick-lock ruggedised SFP connector

Installation safety for LTE and microwave links

Q-XCO is the most installation safe fiber optic interface on the market. The connector is designed for harsh outdoor applications and for installation in challenging environments such as high up on radio masts under any atmos-pheric condition. Its "one-hand" blind mating performance in combination with full SFP tolerance compensation makes this connector the best in its class. For that reason, leading system vendors have chosen Q-XCO as the fiber optic interface for LTE remote radios and for state-of-the-art microwave backhaul systems – simply to have better connections.

Tolerance compensation



The connector compensates for all tolerances of SFP modules and for mounting tolerances

Exchange of SFP module
Release and pull SFP module

Mating sequence

Rotate to find correct keying position

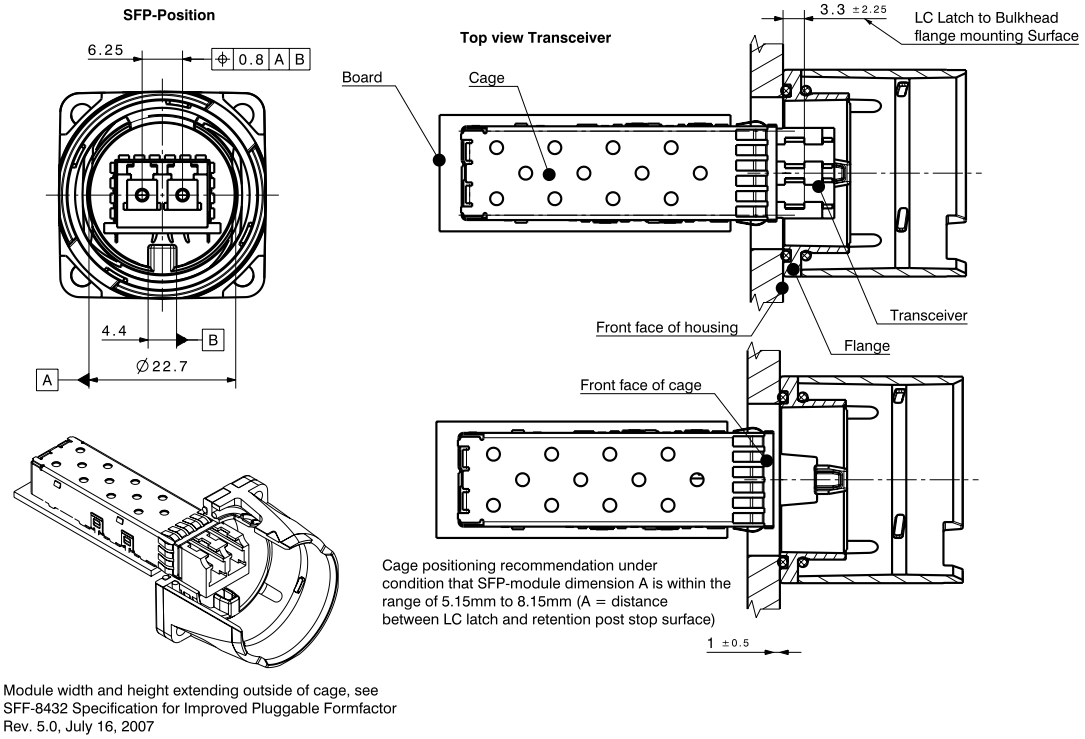
Slide connector into flange and rotate 155° until snap-in position

Connector mated with visual reference for correct installation

Fiber optic interfaces for remote radio heads

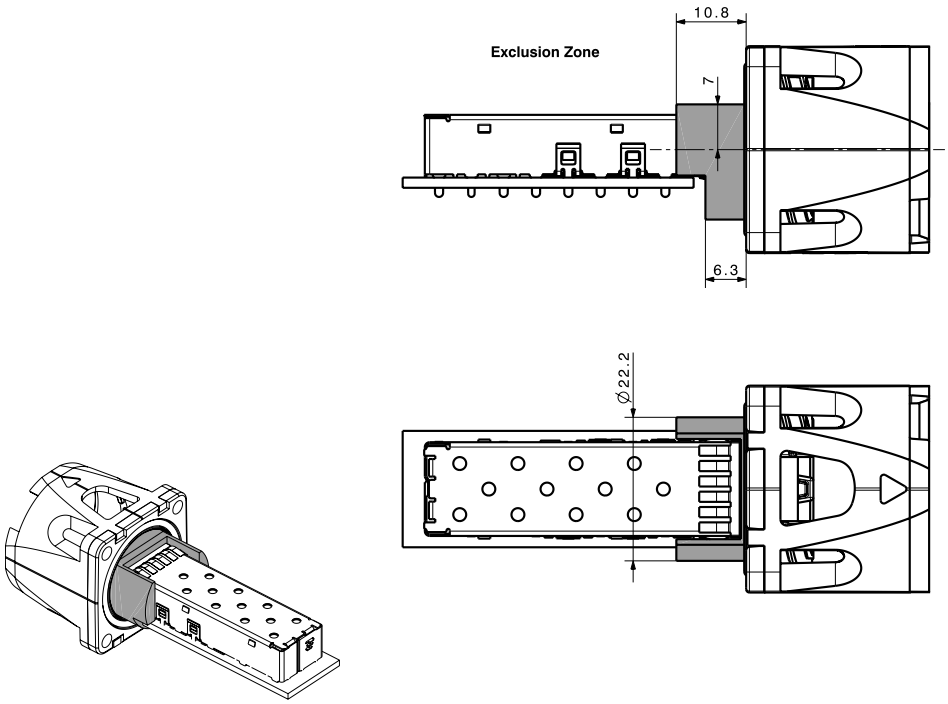
Q-XCO – Quick-lock ruggedised SFP connector

SFP cage positioning specification



Module width and height extending outside of cage, see
SFF-8432 Specification for Improved Pluggable Formfactor
Rev. 5.0, July 16, 2007

Exclusion zone for connector mating



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 (IP65), 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		-40 °C to +70 °C
Mating durability	IEC 61300-2-2	100 cycles
Ingress protection (mated)	IEC 60529	IP65
Vibration	IEC 61300-2-1	passed 10 Hz - 500 Hz / 10 g
Performance standards	IEC 61753-1 cat. E	compliant
	Telcordia GR 3120	compliant

Optical performance

Insertion loss	singlemode	typ. ≤ 0.20 dB	97 % ≤ 0.45 dB
	multimode	typ. ≤ 0.20 dB	97 % ≤ 0.50 dB
Return loss	singlemode	≥ 50dB	

Item no.	Connector	Picture	Dust cap
Z4	FullAXS plug		
84131095	FullAXS build-in flange		

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FullAXS is a registered trademark of TE.

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 upgrade or exchange of cables.
Cleaning kits and robust fiber-check tools enable installers to detect and potentially eliminate failures directly on-site.

Accessories

Excess length box

Features
- Outdoor and indoor installation
- Store up to 20 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

Ordering information

Description	Item no.
Excess length box	84103325

LC patchcord

Features
- LC patchcord to connect 19" CTB to active equipment (base station)
- Robust 2 mm cable
- Simplex and multimode patchcords available

Ordering information

Description	Fiber type	Length	Item no.
LC uniboot patchcord	singlemode	0.5 m	84138001
		0.7 m	84125518
		1.0 m	84125519
		1.5 m	84138003

Accessories

19" CTB patching box

Features
- Space saving 19" rack installation
- Cable entry from the front
- Front plate with mounted LC duplex adaptors
- Pullout tray for easy access
- 3 mandrels for overlength management of the MASTERLINE cable system
- Material powder coated aluminium
- Material powder coated aluminum

Ordering information

Description	No. of fibers	Fiber type	Item no.
CTB 19" patching box with LC adaptors and mandrels	12	singlemode	84138010
	24		84125915

19" CTB splicing box

Features
- Space saving 19" rack installation
- Cable entry from the front
- Front plate with mounted LC duplex adaptors
- Pullout tray for easy access
- Interface for MCM splice cassette with bend radius 35 mm throughout
- LC pigtails for splicing included
- Material powder coated aluminum

Ordering information

Description	No. of fibers	Fiber type	Item no.
CTB 19" patching box with MCM splice cassette, LC pigtails and LC adaptors	12	singlemode	84138011
	24		84125914

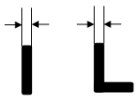
Accessories

Combined cable clamps for fiber optic and power cables

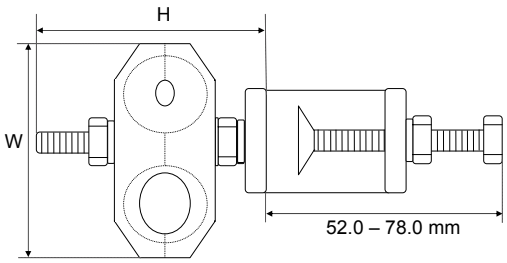
Features

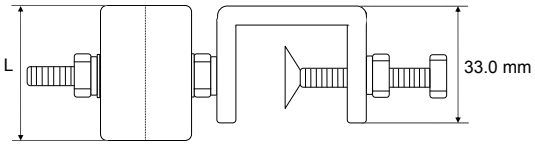
- Combined cable clamps for 1 or 3 pairs of fiber optic and power feeders
- Easy and quick installation
- Stainless steel bracket
- Double saddle with rubber cushions

Specifications

Mounting profile	 2 – 26 mm
Threated bar M8	installation with 13 mm hex wrench and torque 6 – 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

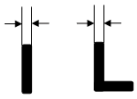
No. of cable pairs	Diameter range fiber optic cable	Diameter range power cable	Hole size without cushion	Dimensions H x W x L	Weight	Item no.
1	4.8 - 7.0 mm	10.0 - 13.0 mm	18 mm	70 x 53 x 40 mm	0.170 kg	85011985
		13.0 - 16.0 mm			0.167 kg	85012013
3		10.0 - 13.0 mm		130 x 53 x 40 mm	0.261 kg	85011986
		13.0 - 16.0 mm			0.250 kg	85012014
1	5.5 - 7.0 mm	17.5 - 20.0 mm	28 mm (7/8")	85 x 91 x 50 mm	0.242 kg	85012007
		20.5 - 23.0 mm			0.236 kg	85012005
	8.0 - 9.0 mm	17.5 - 20.0 mm			0.240 kg	85012012
		20.5 - 23.0 mm			0.234 kg	85012006

Accessories

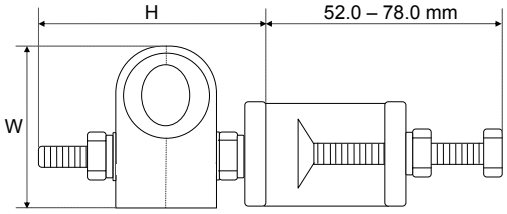
Cable clamps for power and hybrid cables

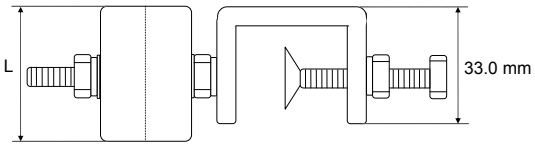
Features
- Cable clamp for power and hybrid cables
- Easy and quick installation
- Stainless steel bracket
- Standard size without rubber cushion

Specifications

Mounting profile	 2 – 26 mm
Threated bar M8	installation with 13 mm hex wrench and torque 6 – 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	Diameter range	Hole size without cushion	Cushion	Dimensions H x W x L	Weight	Item no.
3	10.5 – 14.0 mm	28.0 mm (7/8")	yes	175 x 55 x 51 mm	0.404 kg	85012935
	14.5 – 16.0 mm				0.386 kg	85012936
	16.0 – 18.0 mm				0.366 kg	85012938
	18.5 – 22.0 mm				0.344 kg	85012939
1	21.0 – 23.0 mm	22.0 mm (5/8")	no	80 x 46 x 38 mm	0.160 kg	85015525
	18.5 – 23.0 mm	28.0 mm (7/8")	yes	100 x 55 x 51 mm	0.200 kg	85013127
	27.0 – 29.0 mm	28.0 mm (7/8")	no		0.183 kg	85013128
	30.0 – 32.0 mm	39.0 mm (1 1/4")	yes	120 x 59 x 76 mm	0.230 kg	85014014
	32.0 – 34.5mm				0.225 kg	85014015
	37.0 – 40.0mm	39.0 mm (1 1/4")	no		0.205 kg	85014016

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 mm^2
- Tin plated copper lug for M8 screw

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 mm^2 (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 60 m (200 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 °C 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 x 6.1 m (2" x 20") roll electrical tape (PVC) • 63.5 mm x 0.4 m (2-1/2" x 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.	 
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

Fiber optic cleaning, checking and installation tools

Description	Item no.	Picture
Installation and cleaning kit. Content : 1a, 1b, 1c (2x), 1d (2x25 pcs.)	84038056	
1a. red bag 1b. QbE cube cleaning system (FW2150 electro-wash MX) 1c. MX cleaning pen 1d. fiber optic cleaning swabs (51121)	– 84041085 84041105 84041108	
Cleaner 1.25 mm ferrule for ODC, Q-ODC, LC, FullAXS, Q-XCO	84108852	
Cleaner 2.5 mm ferrule for SC, ST, E2000	84095170	
Torque wrench 1 Nm	84016417	
Fiber check tool for 2.5 mm ferrule connectors	23032064	
ODC adaptor for fiber check tool	84041807	

Instruction for fiber optic connector cleaning see DOC-0000415541.

Conventional cell site solutions

Content

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 customized 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

- Excellent RF performance
- High RF shielding efficiency
- Low attenuation
- Moisture protection IP68
- High flexibility and small bending radius
- Low PIM

Customised LISCA assemblies

HUBER+SUHNER's strengths 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.

Additional features

- Improved return loss values
  - Example: better –28 dB at 2.2 GHz with straight N or DIN 7/16 connectors
- 100 % factory tested products for intermodulation
  - Example: max. –155 dBc at 1.8 GHz with 2 x 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

LISCA – RF jumpers

Assembly performance code

Performance code		LIS...-51	LIS...-52		LIS...-71	LIS...-81	LIS...-01
Description		Standard	LTE*		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		≤ 10 m	≤ 5 m	≤ 12 m	≤ 5 m	≤ 5 m	≤ 120 m
Return loss	DC ..1.0 GHz >1.0 .. 2.2 GHz >2.2 .. 2.7 GHz >2.2 .. 4.0 GHz >4.0 .. 6.0 GHz	≥ 28 dB ≥ 26 dB – – –	≥ 28 dB ≥ 26 dB ≥ 23 dB – –	≥ 28 dB ≥ 26 dB ≥ 21 dB – –	≥ 28 dB ≥ 26 dB – ≥ 22 dB –	≥ 24 dB ≥ 24 dB – – –	open
Intermodulation	IM3 (2 x 20 W)	-162 dBc (typical)	-150 dBc -162 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

LISCA standard type (-51) availability matrix

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)		
	pattern code		cable/ connec-tor codes	716	4195	N	QN	4310	4310X [1]	4310Y [2]	4310Z [3]
Straight plug (male)	11	1/4" HF	C5	✓	–	✓	✓	n/a	–	–	–
		3/8" HF	C7	✓	–	✓	✓		–	–	–
		1/2" HF	C9	✓	✓	✓	✓		✓	✓	✓
		1/2	C12	✓	✓	✓	✓		✓	–	–
Right angle plug (male)	16	1/4" HF	C5	✓	–	✓	✓	n/a	–	–	–
		3/8" HF	C7	✓	–	✓	✓		–	–	–
		1/2" HF	C9	✓	✓	✓	✓		–	–	–
		1/2	C12	✓	–	✓	–		–	–	–
Straigh jack (female)	21	1/4" HF	C5	✓	–	✓	–	–	–	–	–
		3/8" HF	C7	✓	–	✓	–	–	–	–	–
		1/2" HF	C9	✓	–	✓	–	–	–	–	–
		1/2	C12	✓	–	✓	–	–	–	–	–

[1] screw type
[2] hand screw type
[3] push-pull type

LISCA – RF jumpers

Order number for standard LISCA

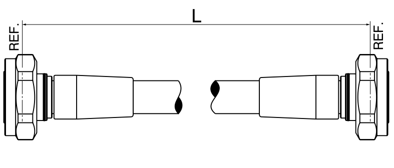
Example: LIS - C9 F - 11 716 - 16 716 - 02000 - 51

Option		Code	Field
			Product name: LIS
SUCOFEED_1/4_HF		C5	Cable type
SUCOFEED_3/8_HF		C7	
SUCOFEED_1/2_HF		C9	
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
DIN 7/16		716	Connector interface 1 2
4.1-9.5 Mini DIN		4195	
N		N	
QN		QN	
4.3-10 jack (f)		4310	
4.3-10 plug (m)	screw type	4310X	
	hand screw type	4310Y	
	push-pull type	4310Z	
			Assembly length in mm
Jumper performance code	example: 51		Technical performance

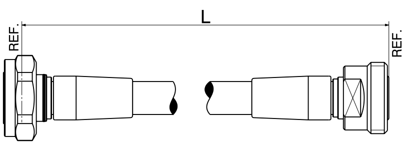
Rules for connector 1 and connector 2 description

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.

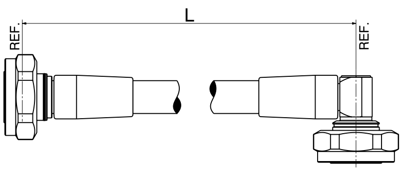
Assembly length: tolerance +/– 1 %



Plug to plug



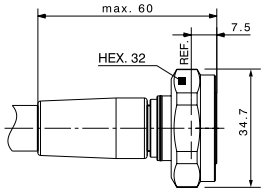
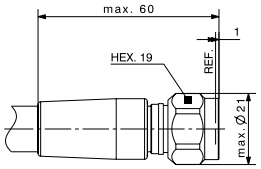
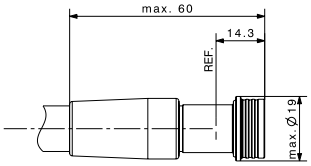
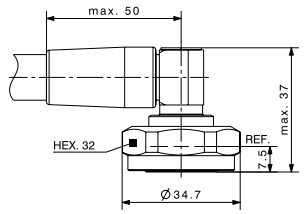
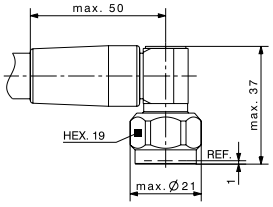
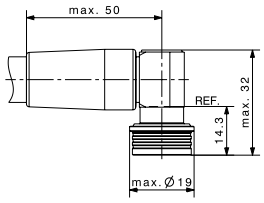
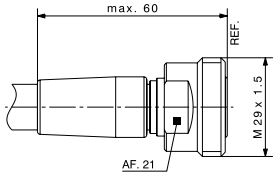
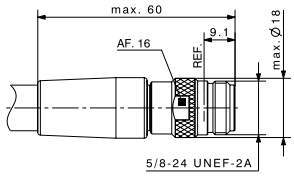
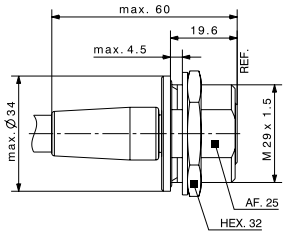
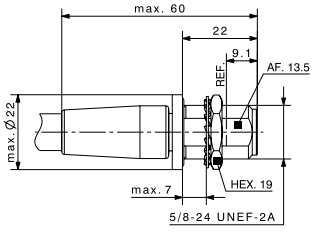
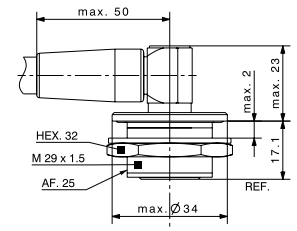
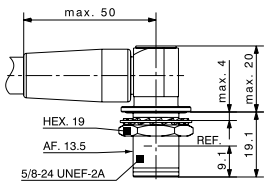
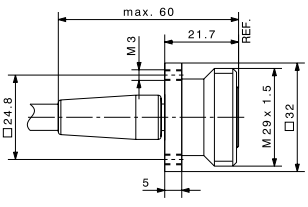
Plug to jack



Plug to right angle plug

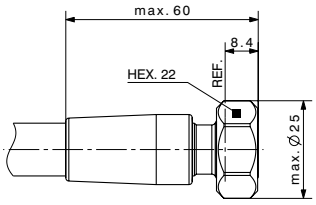
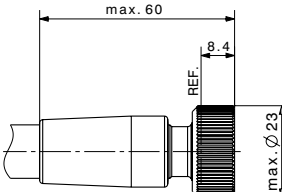
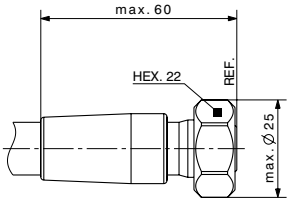
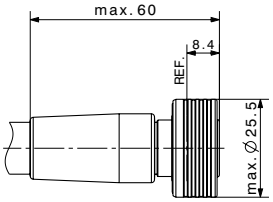
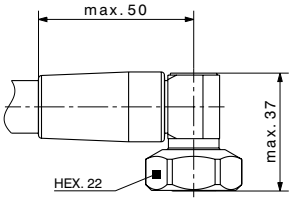
LISCA – RF jumpers

LISCA connector pattern

Description	Series DIN 7/16	Series N	Series QN
Straight male (Pattern code: 11)			
	cable: C5, C7, C9, C12	cable: C5, C7, C9, C12	cable: C5, C7, C9, C12
Right angle male (Pattern code: 16)			
	cable: C5, C7, C9, C12	cable: C5, C7, C9, C12	cable: C5, C7, C9, C12
Straight female (Pattern code: 21)			
	cable: C5, C7, C9, C12	cable: C5, C7, C9, C12	
Straight bulkhead female (Pattern code: 24)			
	cable: C5, C7, C9	cable: C5, C7	
Right angle bulkhead female (Pattern code: 29)			
	cable: C5, C7	cable: C7	
Straight bulkhead female (Pattern code: 25)			
	cable: C5, C7		

LISCA – RF jumpers

LISCA connector pattern

Description	Series 4310	Series 4310	Series 4195
Straight male (Pattern code: 11)			
	X | cable: C9, C12	Y | cable: C9	cable: C9, C12
			
	Z | cable: C9		
Right angle male (Pattern code: 16)			
			cable: C9

SUCOFEED – corrugated cables

HUBER+SUHNER SUCOFEED product range of foam corrugated coaxial cables with suitable stripping tools and connectors has excellent electrical, mechanical and climatic properties for indoor as well as for outdoor installations.

The cables guarantee optimal shielding, low attenuation, low VSWR, excellent intermodulation performance and flexibility for handling and installation on sites. Copper and aluminium types are available.

Applications
- Feederlines to connect antennas with cellular base stations
- Connectivity solution for distributed antenna systems

Features
- Low attenuation design available
- High power capability
- High shielding effectiveness
- UV-resistant
- Guaranteed performance up to 3 GHz

SUCOFEED – corrugated cables

1/4" high-flex

	Order/ type no.	SUCOFEED_1/4_HF	SUCOFEED_1/4_HF_FR
	Dimension	1/4" high-flex	1/4" high-flex
	Cable group	M5	M5
Cable design	Jacket version	standard	flame retardant
Inner conductor	(Ø in mm)	1.90	
Dielectric	(Ø in mm)	4.60	
Outer conductor	(Ø in mm)	6.40	
Jacket	(Ø in mm)	7.60	
Electrical data			
Typ. operating frequency	(GHz)	≤ 18	
Impedance	(Ω)	50 ± 1	
Capacitance	(pF/m)	79.70	
Relative signal propagation	(%)	83.50	
Signal delay	(ns/m)	4.00	
Max. operating voltage	(kVrms)	0.60	
Typ. attenuation @ 1 GHz	(dB/100 m)	19.54	
Typ. attenuation @ 2 GHz	(dB/100 m)	28.45	
Typ. attenuation @ 2.2 GHz	(dB/100 m)	29.98	
Typ. attenuation @ 2.5 GHz	(dB/100 m)	32.17	
Typ. attenuation @ 3.0 GHz	(dB/100 m)	35.60	
Max. power @ 1 GHz (40 °C)	(kW)	≤ 0.290	
Max. power @ 2 GHz (40 °C)	(kW)	≤ 0.205	
Max. power @ 2.2 GHz (40 °C)	(kW)	≤ 0.196	
Max. power @ 2.5 GHz (40 °C)	(kW)	≤ 0.183	
Max. power @ 3.0 GHz (40 °C)	(kW)	≤ 0.167	
General data			
Temp. range operating	(°C)	-55 / +85	-40 / +85
Temp. range installation	(°C)	-25 / +60	
Typ. weight	(kg/100 m)	7.5	8.7
Min. bending radius	(mm)	25	

For detailed data sheets please go to www.hubersuhner.com and then search for type «SUCOFEED».

SUCOFEED – corrugated cables

3/8" high-flex

	Order/ type no.	SUCOFEED_3/8_HF	SUCOFEED_3/8_HF_FR
	Dimension	3/8" high-flex	3/8" high-flex
	Cable group	M7	M7
Cable design	Jacket version	standard	flame retardant
Inner conductor	(Ø in mm)	2.80	
Dielectric	(Ø in mm)	7.00	
Outer conductor	(Ø in mm)	9.50	
Jacket	(Ø in mm)	10.80	
Electrical data			
Typ. operating frequency	(GHz)	≤ 12	
Impedance	(Ω)	50 ± 1	
Capacitance	(pF/m)	79.5	
Relative signal propagation	(%)	83	
Signal delay	(ns/m)	4.00	
Max. operating voltage	(kVrms)	0.9	
Typ. attenuation @ 1 GHz	(dB/100 m)	13.33	
Typ. attenuation @ 2 GHz	(dB/100 m)	19.43	
Typ. attenuation @ 2.2 GHz	(dB/100 m)	20.48	
Typ. attenuation @ 2.5 GHz	(dB/100 m)	21.99	
Typ. attenuation @ 3.0 GHz	(dB/100 m)	24.34	
Max. power @ 1 GHz (40 °C)	(kW)	≤ 0.540	
Max. power @ 2 GHz (40 °C)	(kW)	≤ 0.382	
Max. power @ 2.2 GHz (40 °C)	(kW)	≤ 0.364	
Max. power @ 2.5 GHz (40 °C)	(kW)	≤ 0.342	
Max. power @ 3.0 GHz (40 °C)	(kW)	≤ 0.312	
General data			
Temp. range operating	(°C)	-55 / +85	-40 / +85
Temp. range installation	(°C)	-25 / +60	
Typ. weight	(kg/100 m)	12.2	13.2
Min. bending radius	(mm)	25	

SUCOFEED – corrugated cables

1/2" high-flex

	Order/ type no.	SUCOFEED_1/2_HF	SUCOFEED_1/2_HF_FR
	Dimension	1/2" high-flex	1/2" high-flex
	Cable group	M9	M9
Cable design	Jacket version	standard	flame retardant
Inner conductor	(Ø in mm)	3.60	
Dielectric	(Ø in mm)	9.0	
Outer conductor	(Ø in mm)	12.20	
Jacket	(Ø in mm)	13.40	
Electrical data			
Typ. operating frequency	(GHz)	≤ 10	
Impedance	(Ω)	50 ± 1	
Capacitance	(pF/m)	80.3	
Relative signal propagation	(%)	81	
Signal delay	(ns/m)	4.00	
Max. operating voltage	(kVrms)	1.27	
Typ. attenuation @ 1 GHz	(dB/100 m)	11.77	
Typ. attenuation @ 2 GHz	(dB/100 m)	17.48	
Typ. attenuation @ 2.2 GHz	(dB/100 m)	18.48	
Typ. attenuation @ 2.5 GHz	(dB/100 m)	19.92	
Typ. attenuation @ 3.0 GHz	(dB/100 m)	22.19	
Max. power @ 1 GHz (40 °C)	(kW)	≤ 0.83	
Max. power @ 2 GHz (40 °C)	(kW)	≤ 0.587	
Max. power @ 2.2 GHz (40 °C)	(kW)	≤ 0.56	
Max. power @ 2.5 GHz (40 °C)	(kW)	≤ 0.525	
Max. power @ 3.0 GHz (40 °C)	(kW)	≤ 0.479	
General data			
Temp. range operating	(°C)	-55 / +85	-40 / +85
Temp. range installation	(°C)	-25 / +60	
Typ. weight	(kg/100 m)	20	
Min. bending radius	(mm)	25	

For detailed data sheets please go to www.hubersuhner.com and then search for «SUCOFEED».

SUCOFEED – corrugated cables

1/2" annular

	Order/ type no.	SUCOFEED_1/2	SUCOFEED_1/2_FR
	Dimension	1/2"	1/2"
	Cable group	M12	M12
Cable design	Jacket version	standard	flame retardant
Inner conductor	(Ø in mm)	4.80	
Dielectric	(Ø in mm)	12.10	
Outer conductor	(Ø in mm)	13.80	
Jacket	(Ø in mm)	15.90	
Electrical data			
Typ. operating frequency	(GHz)	≤ 8	
Impedance	(Ω)	50 ± 1	
Capacitance	(pF/m)	75.9	
Relative signal propagation	(%)	88	
Signal delay	(ns/m)	3.80	
Max. operating voltage	(kVrms)	1.60	
Typ. attenuation @ 1 GHz	(dB/100 m)	7.29	
Typ. attenuation @ 2 GHz	(dB/100 m)	10.62	
Typ. attenuation @ 2.2 GHz	(dB/100 m)	11.20	
Typ. attenuation @ 2.5 GHz	(dB/100 m)	12.02	
Typ. attenuation @ 3.0 GHz	(dB/100 m)	13.31	
Max. power @ 1 GHz (40 °C)	(kW)	≤ 1.040	
Max. power @ 2 GHz (40 °C)	(kW)	≤ 0.735	
Max. power @ 2.2 GHz (40 °C)	(kW)	≤ 0.701	
Max. power @ 2.5 GHz (40 °C)	(kW)	≤ 0.658	
Max. power @ 3.0 GHz (40 °C)	(kW)	≤ 0.600	
General data			
Temp. range operating	(°C)	-55 / +85	-40 / +85
Temp. range installation	(°C)	- 25 / + 60	
Typ. weight	(kg/100 m)	25.0	27.6
Min. bending radius	(mm)	70	

SUCOFEED – corrugated cables

7/8" high-flex and annular

	Order/ type no.	SUCOFEED_7/8_HF	SUCOFEED_7/8
	Dimension	7/8" high-flex	7/8"
	Cable group	M24	M23
Cable design	Jacket version	standard	standard
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 @ 1 GHz	(dB/100 m)	4.25	4.11
Typ. attenuation @ 2 GHz	(dB/100 m)	6.42	6.11
Typ. attenuation @ 2.2 GHz	(dB/100 m)	6.81	6.46
Typ. attenuation @ 2.5 GHz	(dB/100 m)	7.37	6.96
Typ. attenuation @ 3.0 GHz	(dB/100 m)	8.26	7.76
Max. power @ 1 GHz (40 °C)	(kW)	≤ 1.940	≤ 2.190
Max. power @ 2 GHz (40 °C)	(kW)	≤ 1.372	≤ 1.549
Max. power @ 2.2 GHz (40 °C)	(kW)	≤ 1.308	≤ 1.476
Max. power @ 2.5 GHz (40 °C)	(kW)	≤ 1.227	≤ 1.385
Max. power @ 3.0 GHz (40 °C)	(kW)	≤ 1.120	≤ 1.264
General data			
Temp. range operating	(°C)	-55 / +85	
Temp. range installation	(°C)	-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 «SUCOFEED».

SUCOFEED – corrugated cables

7/8" annular

	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
	Cable group	M23	M25	M25
Cable design	Jacket version	flame retardant	standard	flame retardant
Inner conductor	(Ø in mm)	9.00	9.50	
Dielectric	(Ø in mm)	22.30	22.70	
Outer conductor	(Ø in mm)	24.80	25.40	
Jacket	(Ø in mm)	27.60	27.90	
Electrical data				
Typ. operating frequency	(GHz)	≤ 5	≤ 5.0	
Impedance	(Ω)	50 ± 1	50 ± 1	
Capacitance	(pF/m)	75.8	73.8	
Relative signal propagation	(%)	88	90.3	
Signal delay	(ns/m)	3.80	3.70	
Max. operating voltage	(kVrms)	2.91	3.00	
Typ. attenuation @ 1 GHz	(dB/100 m)	4.11	3.76	
Typ. attenuation @ 2 GHz	(dB/100 m)	6.11	5.53	
Typ. attenuation @ 2.2 GHz	(dB/100 m)	6.46	5.83	
Typ. attenuation @ 2.5 GHz	(dB/100 m)	6.96	6.28	
Typ. attenuation @ 3.0 GHz	(dB/100 m)	7.76	6.97	
Max. power @ 1 GHz (40 °C)	(kW)	≤ 2.190	≤ 2.440	
Max. power @ 2 GHz (40 °C)	(kW)	≤ 1.549	≤ 1.725	
Max. power @ 2.2 GHz (40 °C)	(kW)	≤ 1.476	≤ 1.645	
Max. power @ 2.5 GHz (40 °C)	(kW)	≤ 1.385	≤ 1.543	
Max. power @ 3.0 GHz (40 °C)	(kW)	≤ 1.264	≤ 1.409	
General data				
Temp. range operating	(°C)	-40 / +85	-55 / +85	-40 / +85
Temp. range installation	(°C)	-25 / +60		
Typ. weight	(kg/100 m)	65.0	48	52
Min. bending radius	(mm)	120		

SUCOFEED – corrugated cables

1 1/4" annular

	Order/ type no.	SUCOFEED_1 _1/4	SUCOFEED_1 _1/4_FR
	Dimension	1 1/4"	1 1/4"
	Cable group	M32	M32
Cable design	Jacket version	standard	flame retardant
Inner conductor	(Ø in mm)	13.10	
Dielectric	(Ø in mm)	32.40	
Outer conductor	(Ø in mm)	35.80	
Jacket	(Ø in mm)	39.50	
Electrical data			
Typ. operating frequency	(GHz)	≤ 3	
Impedance	(Ω)	50 ± 1	
Capacitance	(pF/m)	76.5	
Relative signal propagation	(%)	88	
Signal delay	(ns/m)	3.80	
Max. operating voltage	(kVrms)	4.20	
Typ. attenuation @ 1 GHz	(dB/100 m)	2.94	
Typ. attenuation @ 2 GHz	(dB/100 m)	4.43	
Typ. attenuation @ 2.2 GHz	(dB/100 m)	4.69	
Typ. attenuation @ 2.5 GHz	(dB/100 m)	5.08	
Typ. attenuation @ 2.7 GHz	(dB/100 m)	5.68	
Max. power @ 1 GHz (40 °C)	(kW)	≤ 3.120	
Max. power @ 2 GHz (40 °C)	(kW)	≤ 2.206	
Max. power @ 2.2 GHz (40 °C)	(kW)	≤ 2.104	
Max. power @ 2.5 GHz (40 °C)	(kW)	≤ 1.973	
Max. power @ 2.7 GHz (40 °C)	(kW)	≤ 1.801	
General data			
Temp. range operating	(°C)	-55 / +85	-40 / +85
Temp. range installation	(°C)	-25 / +60	
Typ. weight	(kg/100 m)	92	110.0
Min. bending radius	(mm)	200	

For detailed data sheets please go to www.hubersuhner.com and then search for "SUCOFEED".

SUCOFEED – corrugated cables

1 5/8" annular

	Order/ type no.	SUCOFEED_ 1_5/8	SUCOFEED_ 1_5/8_FR	SUCOFEED_ 1_5/8_LA	SUCOFEED_ 1_5/8_LA_FR
	Dimension	1 5/8"	1 5/8"	1 5/8" low att.	1 5/8" low att.
	Cable group	M42	M42	M43	M43
Cable design	Jacket version	standard	flame retardant	standard	flame retardant
Inner conductor	(Ø in mm)	17.30		17.60	
Dielectric	(Ø in mm)	42.40		41.00	
Outer conductor	(Ø in mm)	46.50		46.50	
Jacket	(Ø in mm)	49.80		50.30	
Electrical data					
Typ. operating frequency	(GHz)	≤ 2.75			
Impedance	(Ω)	50 ± 1			
Capacitance	(pF/m)	76.80		72.50	
Relative signal propagation	(%)	87.50		92	
Signal delay	(ns/m)	3.80			
Max. operating voltage	(kVrms)	5.40		5.50	
Typ. attenuation @ 1 GHz	(dB/100 m)	2.43		2.25	
Typ. attenuation @ 2 GHz	(dB/100 m)	3.71		3.36	
Typ. attenuation @ 2.2 GHz	(dB/100 m)	3.94		3.56	
Typ. attenuation @ 2.5 GHz	(dB/100 m)	4.27		3.84	
Typ. attenuation @ 2.7 GHz	(dB/100 m)	4.48		4.02	
Max. power @ 1 GHz (40 °C)	(kW)	≤ 4.100			
Max. power @ 2 GHz (40 °C)	(kW)	≤ 2.899			
Max. power @ 2.2 GHz (40 °C)	(kW)	≤ 2.764			
Max. power @ 2.5 GHz (40 °C)	(kW)	≤ 2.593			
Max. power @ 2.7 GHz (40 °C)	(kW)	≤ 2.495			
General data					
Temp. range operating	(°C)	-55 / +85	-40 / +80	-55 / +85	-40 / +85
Temp. range installation	(°C)	-25 / +60			
Typ. weight	(kg/100 m)	144.8	160.0	110.0	130.0
Min. bending radius	(mm)	300		300	

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 cables are a cost efficient alternative to the copper transmission lines. The performance of the aluminium cables is equivalent to the copper transmission cables.

Applications

- Feeder lines to connect antennas with cellular base stations
- Connectivity solution for distributed antenna systems (DAS)

Features

- Light weight
- Electrical performance equal to copper cables
- HUBER+SUHNER connectors are fully compatible with aluminium and copper cables
- Available with UV-resistant polyethylene jackets, flame-retardant jackets on request

SUCOFEED aluminium – corrugated cables

1/2" and 7/8" light weight

	Order/type no.	SUCOFEED_1/2_LW	SUCOFEED_7/8_LW_LA
	Dimension	1/2"	7/8" low attenuation
	Cable group	M9	M23
Cable design	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	27.90
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 @ 1 GHz	(dB/100 m)	7.76	4.16
Typ. attenuation @ 2 GHz	(dB/100 m)	11.38	6.08
Typ. attenuation @ 2.2 GHz	(dB/100 m)	12.00	6.41
Typ. attenuation @ 2.5 GHz	(dB/100 m)	12.90	6.88
Typ. attenuation @ 3.0 GHz	(dB/100 m)	14.31	7.62
Max. power @ 1 GHz (40 °C)	(kW)	≤ 1.020	≤ 2.520
Max. power @ 2 GHz (40 °C)	(kW)	≤ 0.721	≤ 1.782
Max. power @ 2.2 GHz (40 °C)	(kW)	≤ 0.688	≤ 1.699
Max. power @ 2.5 GHz (40 °C)	(kW)	≤ 0.645	≤ 1.594
Max. power @ 3.0 GHz (40 °C)	(kW)	≤ 0.589	≤ 1.455
General data			
Temp. range operating	(°C)	-55 / +85	-55 / +85
Tamp. range installation	(°C)	-40 / +60	-40 / +60
Typ. weight	(kg/100 m)	≤ 17.5	≤ 37
Min. bending radius (single/rep.)	(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

	Order/type no.	SUCOFEED_1-1/4_LW	SUCOFEED_1-5/8_LW_LA
	Dimension	1-1/4"	1-5/8" low attenuation
	Cable group	M32	M43
Cable design	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 @ 1 GHz	(dB/100 m)	3.20	2.48
Typ. attenuation @ 2 GHz	(dB/100 m)	4.70	3.69
Typ. attenuation @ 2.2 GHz	(dB/100 m)	4.97	3.91
Typ. attenuation @ 2.5 GHz	(dB/100 m)	5.34	4.21
Typ. attenuation @ 2.7 GHz	(dB/100 m)	5.58	4.41
Max. power @ 1 GHz (40 °C)	(kW)	≤ 3.350	≤ 4.100
Max. power @ 2 GHz (40 °C)	(kW)	≤ 2.369	≤ 2.899
Max. power @ 2.2 GHz (40 °C)	(kW)	≤ 2.259	≤ 2.764
Max. power @ 2.5 GHz (40 °C)	(kW)	≤ 2.119	≤ 2.593
Max. power @ 2.7 GHz (40 °C)	(kW)	≤ 2.039	≤ 2.690
General data			
Temp. range operating	(°C)	-55 / +85	-55 / +85
Tamp. range installation	(°C)	-40 / +60	-40 / +60
Typ. weight	(kg/100 m)	≤ 65	≤ 99
Min. bending radius (single/rep.)	(mm)	200 / 400	280 / 500

For detailed data sheets please go to www.hubersuhner.com and then search for type «SUCOFEED»

QUICK-FIT coaxial connectors

HUBER+SUHNER QUICK-FIT connectors are worldwide approved N and 7/16 connectors for foam dielectric corrugated copper and aluminium 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 PIM (Passive Intermodulation Product) – typically –165 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

Technical data

Electrical data	Requirements
Impedance	50 Ω
Frequency range (for connector interface)	N: DC ... 11 GHz 7/16: DC ... 7.5 GHz
VSWR	≤ 1.06 (RL ≥ 30 dB); f ≤ 2.7 GHz
PIM[1)]	better than -155 dBc

1) Carrier to 3rd order intermodulation product ratio with 2 x 20 W (43 dBm) carrier power, f ≤ 1.88 GHz

Mechanical data	Requirements
Recommended coupling nut torque IEC	N: 0.68 ... 1.13 Nm / 0.49 ... 0.82 ft lb. IEC 61169-16 7/16: 25 ... 30 Nm / 18.05 ... 21.66 ft lb. IEC 61169-4
Recommended coupling nut torque HUBER+SUHNER	N: 3 Nm / 2.2 ft lb. with 100 matings max.
Coupling nut retention force	N: ≥ 450 N / 101.2 lbs. 7/16: ≥ 1000 N / 225.0 lbs.
Centre contact	captivated
Durability (matings)	≥ 500

Environmental data	Requirements
Temperature range	- 40 °C ... + 85 °C / - 40 °F ... + 185 °F
IP rating	IP68 (acc. to IEC 60529)

Material data Connector part	Material	Plating
Cable entry	brass	SUCOPLATE®
Connector head	brass	SUCOPLATE®
Outer contact	brass	SUCOPLATE®
Centre contact	spring bronce/brass	silver
Insulators	PTFE or PFA	
Gaskets	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.

For type specific datasheets, drawings and assembly instructions, please refer to www.hubersuhner.com

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-0-12-11	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 female right angle			
21_N-50-12-50	84201173	N 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 74_Z-0-23-18	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_716-50-23-41	85010074	DIN 7/16 male	DOC-0000243751	74_Z-0-23-16	23035267
21_716-50-23-41	85010190	DIN 7/16 female			
11_N-50-23-41	84024502	N male			
21_N-50-23-41	84024596	N female			

Cable compatibility list on request.

1_1/4", 1_1/4"_FR

HUBER+SUHNER type	Item no.	Connector style	Assembly instruction	Tools	Item no. tools
11_716-50-32-4	84116088	DIN 7/16 male	DOC-0000341341	74_Z-0-32-14/ 74_Z-0-32-15	23010533/ 84120843
21_716-50-32-4	84116150	DIN 7/16 female			

Cable compatibility list on request.

1_5/8"_LA

HUBER+SUHNER type	Item no.	Connector style	Assembly instruction	Tools	Item no. tools
11_716-50-42-4	84079343	DIN 7/16 male	DOC-0000299051	74_Z-0-42-14/ 74_Z-0-42-15	23010534/ 84085074
21_716-50-42-4	84079305	DIN 7/16 female			

Cable compatibility list on request.

HUBER+SUHNER ECO connectors

The ECO Connectors are an economic business approach for Cell Site applications. They comprise straight connectors for ½", 7/8", 1 ¼" and 1 5/8" corrugated antenna feeder installations. Due to certain restriction regarding environmental specifications and in comparison with our QUICK-FIT connectors our ECO connectors are ideally suitable for indoor DAS applications.

Features

- Quick and easy cable termination
- Good RF performance
- Multi design and multi material cable compatibility (copper and aluminium cables)

HUBER+SUHNER ECO connectors

General technical data

Electrical data	Requirements
Impedance (Ω)	50
Return loss*	DC to 2.5 GHz: ≥ 30dB; 2.5 to 2.7 GHz: ≥ 28dB
IM**	typical -155 dBc, better than -150 dBc

* Single connector detail specification is the reference
** Carrier to 3rd order intermodulation product ratio with 2 x 20 W (43 dBm) carrier power

Mechanical data	Requirements
Recommended coupling nut torque IEC	N: 0.68 ... 1.13 Nm / 0.49 ... 0.82 ft lb. IEC 61169-16 7/16: 25 ... 30 Nm / 18.05 ... 21.66 ft lb. IEC 61169-4
Recommended coupling nut torque HUBER+SUHNER for series N	N: 3 Nm / 2.2 ft lb. with 100 matings max.
Coupling nut retention force	N: ≥ 450 N / 101.2 lbs 7/16: ≥ 1000 N / 225.0 lbs
Centre contact	captivated
Durability (matings)	≥ 500

Environmental data	Requirements
Temperature range	-40 °C ... +85 °C / -40 °F ... +185 °F
IP rating	IP67 (acc. to IEC 60529) with taping or similar measures IP68

Material data		
Connector part	Material	Plating
Outer contacts / connector bodies	brass	SUCOPLATE®
Cable entries / coupling nuts	brass	nickel
Centre contacts	bronze or copper beryllium / brass	silver
Insulators	PTFE or TPX	
Gaskets	EPDM	

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.

For type specific datasheets, drawings and assembly instructions, please refer to www.hubersuhner.com

HUBER+SUHNER ECO connectors

Suitable for SUCOFEED corrugated cables in the diameters below

1/2"

HUBER+SUHNER type	Item no.	Interface	Assembly instruction	Tools	Item no. tools
11_716-50-12-100	84125745	DIN 7/16 male	DOC-0000364681	74_Z-0-12-100 74_Z-0-12-17	84133923 84147227
21_716-50-12-100	84125740	DIN 7/16 female			
11_N-50-12-100	84125756	N male	DOC-0000364683		
21_N-50-12-100	84125770	N female			

7/8", 7/8_LA

HUBER+SUHNER type	Item no.	Interface	Assembly instruction	Tools	Item no. tools
11_716-50-23-100	84124984	DIN 7/16 male	DOC-0000363432	74_Z-0-23-100 74_Z-0-23-22 74_Z-0-23-21 74_Z-0-23-20 74_Z-0-23-18	84133924 84147229 84147228 84117046 84074476
21_716-50-23-100	84124988	DIN 7/16 female			
11_N-50-23-100	84125762	N male			
21_N-50-23-100	84125871	N female			

1_1/4", 1_1/4_HF

HUBER+SUHNER type	Item no.	Interface	Assembly instruction	Tools	Item no. tools
11_716-50-32-100	84127325	DIN 7/16 male	DOC-0000364680	74_Z-0-32-15 74_Z-0-32-14	84120843 23010533
21_716-50-32-100	84127329	DIN 7/16 female			
11_N-50-32-100	84132614	N male			
21_N-50-32-100	84132616	N female			

HUBER+SUHNER ECO connectors

Suitable for SUCOFEED corrugated cables in the diameters below

1_5/8"

HUBER+SUHNER type	Item no.	Interface	Assembly instruction	Tools	Item no. tools
11_716-50-42-100	84132564	DIN 7/16 male	DOC-0000375031	74_Z-0-42-15 74_Z-0-42-14	84085074 23010534
21_716-50-42-100	84132566	DIN 7/16 female			
11_N-50-42-100	84132618	N male			
21_N-50-42-100	84132620	N female			

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	84147228	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	23035267	SUCOFEED_7/8_HF	11_716-50-23-41	85010074	
			21_716-50-23-41	85010190	
			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	11_716-50-32-4	84116088	 Jacket stripping only
			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-0-42-14	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	11_716-50-42-4	84079343	 Jacket stripping only
			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

Manual stripping tool

Manual stripping tools			Connector		
Type no.	Item no.	Cable type	Type no.	Item no.	Picture
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_716-50-23-44	84069135	
			21_716-50-23-44	84069194	
			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			Connector		
Type no.	Item no.	Cable type	Type no.	Item no.	Picture
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	11_716-50-32-4	84116088	
			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	11_716-50-42-4	84079343	
			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-0-0-349	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/.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/.157 in. for removing the BIT adapter

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

Lightning protectors

Broadband cellular lightning protectors

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
- Hybrid GDT protectors with bias-T to support active electronics with DC on top of the mast
- Optimised for outdoor installations

	Quarter wave shorting stub protectors			Filter protectors	
	Series 3400			Series 3407	
					
Type no.	3400.17.0431 [1]	3400.41.0266 [1]	3400.41.0267 [1]	3407.17.0086 [1]	3407.41.0051 [1]
Frequency range	690 to 2200 MHz	690 to 2690 MHz	690 to 2690 MHz	690 to 2700 MHz	690 to 2700 MHz
Return loss	≥ 24 dB	≥ 28 dB	≥ 26 dB	≥ 26 dB	≥ 26 dB
Insertion loss	≤ 0.15 dB	≤ 0.1 dB	≤ 0.1 dB	≤ 0.15 dB	≤ 0.1 dB
Supports AISG at	-	-	-	-	-
RF Interface - unprotected/protected side	N male / female	7/16 male / female	7/16 male / female	N female / female	7/16 male / female
DC interface	-	-	-	-	-
PIM 3rd order	≤ -150 dBc	≤ -160 dBc	≤ -160 dBc	≤ -150 dBc	≤ -150 dBc
RF power (CW) max.	≤ 500 W	≤ 1500 W	≤ 1500 W	≤ 260 W	≤ 500 W
RF power (PIP) max.	25 kW	25 kW	25 kW	-	-
Max. DC voltage	no DC	no DC	no DC	no DC	no DC
Surge current (8/20 µs) - single pulse - multiple pulses	 50 kA 50 kA	 100 kA 80 kA	 100 kA 80 kA	 20 kA 10 kA	 25 kA 20 kA
Residual energy (typ.) 4 kV 1.2/50 µs; 2 kA 8/20 µs	10 µJ	11 µJ	11 µJ	0.001 µJ	0.03 µJ
Ingress protection rating	IP67	IP67	IP67	IP68	IP65
Order information					
Item no. Type no.	84080266 3400.17.0431	84143443 3400.41.0266	84150644 3400.41.0267	84099040 3407.17.0086	22659903 3407.41.0051

[1] Supporting LTE (long term evolution) frequency ranges

Lightning protectors

Broadband cellular lightning protectors

	Gas discharge tube protectors				
	Series 3402	Hybrid GTD series 3409		GDT with bias-T series 3410	
					
Type no.	3402.41.A [1), 2)]	3409.41.0090 [1), 2)]	3409.41.0092	3410.41.0029 [1),2)]	3410.41.0030 [1),2)]
Frequency range	DC to 2500 MHz	690 to 2690 MHz	690 to 2690 MHz	690 to 2200 MHz	
Return loss	≥ 20 dB	≥ 28 dB	≥ 26 dB	≥ 24 dB	
Insertion loss	≤ 0.2 dB	≤ 0.1 dB	≤ 0.1 dB	≤ 0.1 dB	
Supports AISG at	2.176 MHz	2.176 MHz	2.176 MHz	2.176 MHz	
RF Interface - unprotected/protected side	7/16 female/female	7/16 male/female	7/16 male/female	7/16 male/female 7/16 female/male	
DC interface	–	–	–	TNC female	
PIM 3rd order	n.a.	≤ -160 dBc	≤ -160 dBc	≤ -155 dBc	
RF power (CW) max.	dependant on GDT	≤ 1500 W	≤ 1500 W	≤ 500 W	
RF power (PIP) max.	dependant on GDT	25 kW	25 kW	25 kW	
GDT max. DC voltage	replaceable not included dep. on GDT	replaceable, 9071.99.0548(90 V) ≤ 48 V	replaceable, 9071.99.0548(90 V) ≤ 48 V	fix installed, 90 V ≤ 48 V	
Surge current (8/20 µs) - single pulse - multiple pulses	 30 kA 20 kA	 30 kA 20 kA	 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	350 µJ	20 µJ	
Ingress protection rating	IP67	IP67	IP67	IP67	

Order information					
Item no. Type no.	22642813 3402.41.A	84142698 3409.41.0090 [1), 2)]	84150561 3409.41.0092 [1), 2)]	84115900 3410.41.0029	84115182 3410.41.0030

[2)] AISG = antenna interface standards group

Lightning protectors

Wireless broadband lightning protectors

	Filter protectors	Quarter wave shorting stub protector	Fine protector hybrid technology
	Series 3407	Series 3400	Series 3403
			
Type no.	3407.17.0085	3400.17.0428	3403.17.0069
Frequency range	2000 to 6000 MHz	2000 to 6000 MHz	2.5 to 400 MHz
Ethernet cabling standard	≥ 20 dB	≥ 20 dB	≥ 26 dB
Insertion loss	≤ 0.2 dB	≤ 0.2 dB	≤ 0.25 dB
RF Interface - unprotected/protected side	N male / female	N male / female	N female / female
PoE acc. IEEE 802.3 at	≤ 300 W	≤ 300 W	≤ 50 W
GDT	-	-	not replaceable, fix installed (90 V)
Max. DC voltage	-	-	≤ 60 V
Surge current (8/20 µs) - single pulse - multiple pulses	 25 kA 50 kA	 25 kA 50 kA	 10 kA 8 kA
Residual energy (typ.) 4 kV 1.2/50 µs; 2 kA 8/20 µs	0.0001 µJ	0.2 µJ	60 µs
Ingress protection rating	IP68	IP68	IP67

Order information			
Item no. Type no.	84092556 3407.17.0085	84048180 3400.17.0428	84144468 3403.17.0069

Lightning protectors

Broadband point-to-point radio lightning protectors

	Gas discharge tube protectors			
	Series 3402		Series 3406	
				
Type no.	3402.17.0088	3402.17.0089	3406.17.0027	3406.17.0028
Frequency range	DC to 2500 MHz		DC to 4000 MHz	
Return loss	≥ 20 dB		≥ 20 dB	
Insertion loss	≤ 0.2 dB		≤ 0.2 dB	
RF Interface - unprotected/protected side	N female / female	N male / female	N female / female	N male / female
RF power (CW) max.	dependant on GDT		≤ 21 W	
GDT	replaceable, not included		not replaceable, fix installed (90 V)	
Max. DC voltage	dependant on GDT		60 V	
Surge current (8/20 µs) - single pulse - multiple pulses	30 kA 20 kA		10 kA 5 kA	
Residual energy (typ.) 4 kV 1.2/50 µs; 2 kA 8/20 µs	350 µJ		250 µJ	
Ingress protection rating	IP65		IP68	

Order information				
Item no. Type no.	84102700 3402.17.0088	84102779 3402.17.0089	84041874 3406.17.0027	84041875 3406.17.0028

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

GPS lightning protectors

Application
- Fine protector hybrid technology to protect GPS electronics

Characteristics and specialities
- Very low residual pulse energy
- Full lightning protection (20kA ; 8/20µs)
- 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

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 ≤ 1 kV
- Isolation @ 1 kHz ≥ 80 dB
- Robust and compact
- Low weight
- IP67 rated

	DC block		DC-DC block	
	Series 9077			
				
Type no.	9077.41.0035		9077.41.0036	
Frequency ranges	350 to 3000 MHz	650 to 2700 MHz	360 to 3000 MHz	650 to 2700 MHz
Return loss	≥ 20 dB	≥ 26.5 dB	≥ 20 dB	≥ 26 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		750 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.	85007661 9077.41.0036	84082135 9077.41.0035

Lightning protectors

Smart Bias-T

Application

- Smart Bias-T´s are used to inject DC and AISG 2.0 control signals into a feeder cable near the BTS or feed devices such as the TMA Remote Electrical Tilt (RET) systems on the antenna side with AISG control signals.
- The Smart Bias-T has an AISG 2.0 modem integrated that converts the 2.176 MHz on/off shift keying signal (OOSK) to RS485 communication

Characteristics

- Full LTE bandwidth 698 to 2690 MHz
- RF Interfaces: 7/16
- Data interface: 8-pin IEC 60139-9
- AISG 2.0 protocol compliant
- Surge protection integrated
- IP67 rated
- Robust die-cast housing
- Weight: 600 g
- Dimensions: 95 x 62 x 40 mm

H+S type	Frequency range	Connectors	IP Rating
	(MHz)	Port 1 (RF) Port 2 (RF+AISG/DC) Port 3* (AISG/DC)	
3410.41.0031	690 – 2700	7/16 (m) - 7/16 (f) 8 pin female connector	IP67
3410.41.0032		7/16 (m) - 7/16 (f) 8 pin female connector	
3410.41.0033		7/16 (f) - 7/16 (f) 8 pin female connector	

* 8 pin connector according to IEC 60130-9

Lightning protectors

Gas discharge tube (GDT)

Gas discharge tubes

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.

Type no.	Item no.	U_{Zstat} (V)	U_{Zdyn} max. (V)	I_S 8/20 µs (kA)	I_{SG} 8/20 µs (kA)	U_{ARC} (V)	Dim. (mm)
9071.99.0547	23011010	230 ± 15 %	675	20	30	10 - 15	6 x 8
9071.99.0548	23034582	90 ± 20 %	500	20	30	10 - 15	6 x 8
9071.99.0549	23039069	350 ± 15 %	875	20	30	10 - 15	6 x 8
9071.99.0550	23039070	470 ± 15 %	1000	20	30	10 - 15	6 x 8
9071.99.0551	23024119	600 ± 15 %	1100	20	30	10 - 15	6 x 8

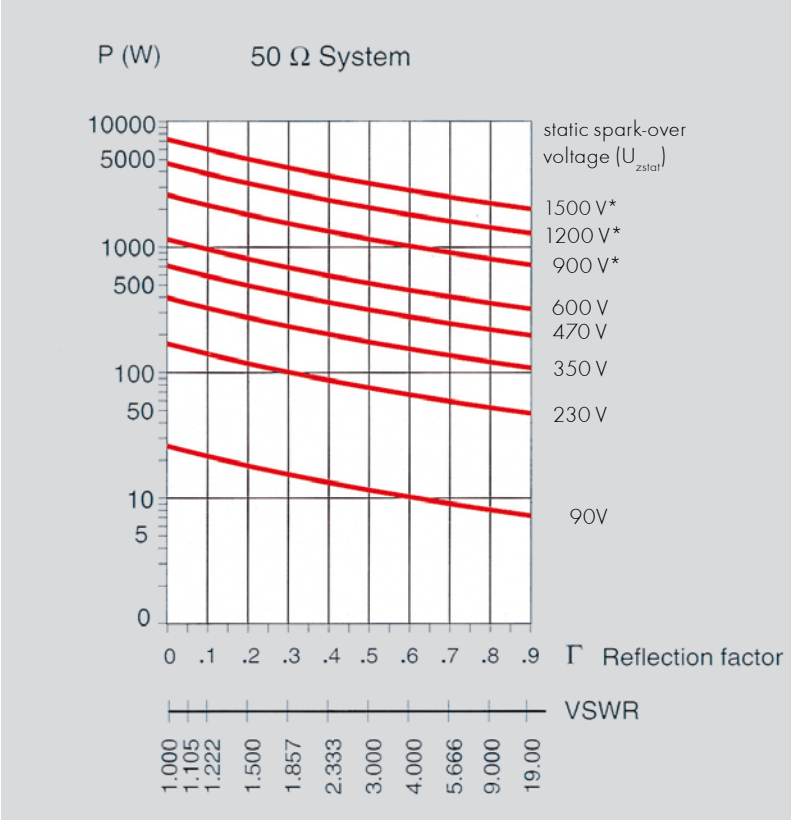


Diagramm of permissible RF power (CW or PEP) for 50 Ω systems.

Lightning protectors

SEMPER™

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

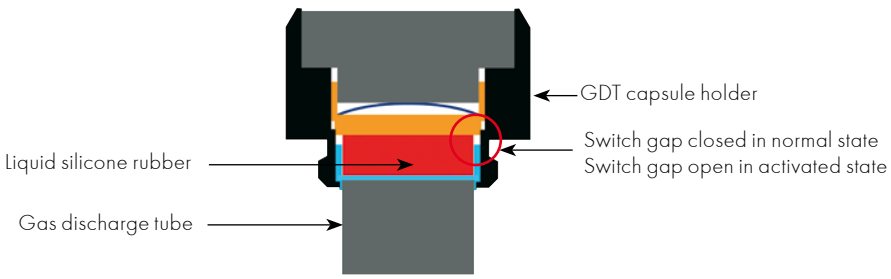
SEMPER™ GDT units for retrofit and replacement for series 3401 and 3402

Type no.	Item no.	U_{Zstat} (V)	U_{Zdyn} max. (V)	I_S 8/20 µs (kA)	I_{SG} 8/20 µs (kA)	U_{ARC} (V)
9071.99.0647	84010427	230 ± 15 %	675	20	30	10 - 15
9071.99.0648	84015426	90 ± 20 %	500	20	30	10 - 15
9071.99.0549	84017487	350 ± 15 %	875	20	30	10 - 15
9071.99.0550	84017488	470 ± 15 %	1000	20	30	10 - 15
9071.99.0551	84017489	600 ± 15 %	1100	20	30	10 - 15

SEMPER™ GDT units for retrofit and replacement for series 3409

Type no.	Item no.	UZ_{stat} (V)	UZ_{dyn} max. (V)	IS 8/20 µs (kA)	ISG 8/20 µs (kA)	U_{ARC} (V)
9071.99.0747	84014462	230 ± 15 %	675	20	30	10 - 15
9071.99.0748	84015401	90 ± 20 %	500	20	30	10 - 15

Sectional view of SEMPER™ GDT module



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.

Accessories

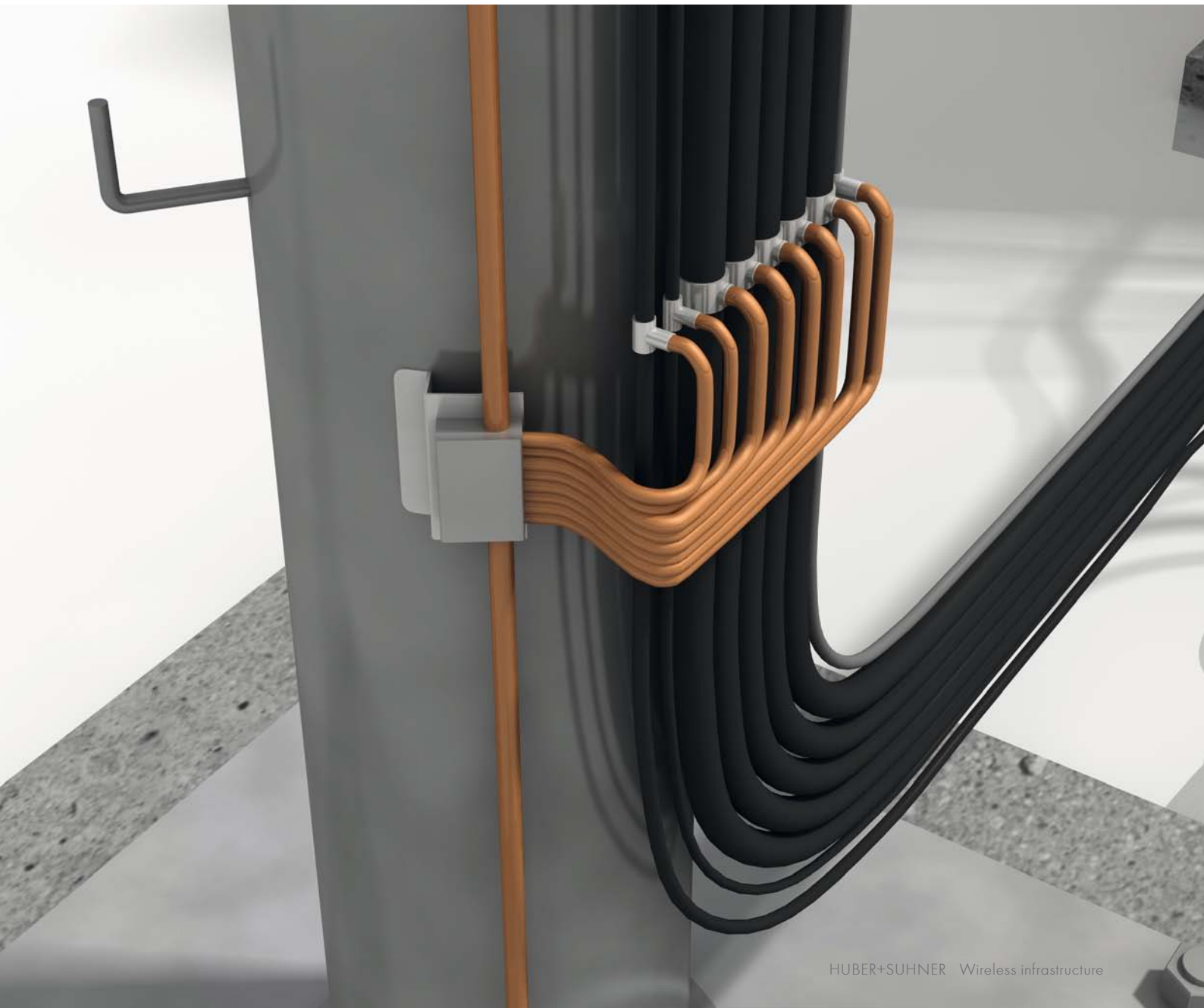
Grounding kits

Application

Series 9076 grounding kits enable reliable outdoor grounding of today's usual corrugated copper and aluminium tube cables for radio transmitter antenna installations.

Characteristics and specialities

- Quick and easy installation
- No loose parts
- Low contact transition resistance (1 mΩ max.)
- Grounding cable AWG 6 (16 mm^2)
- Current handling capability 100 kA, 8/20 µs; 25 kA, 10/350 µs
- Waterproof IP67
- Corrosion resistant



Accessories

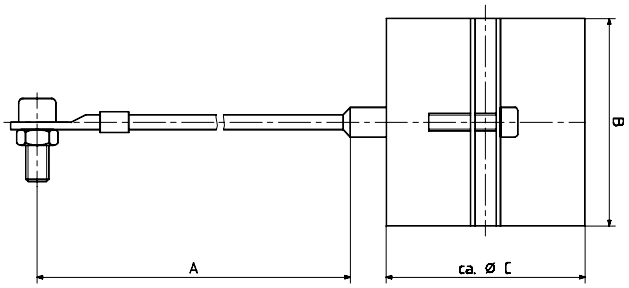
Grounding kits

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



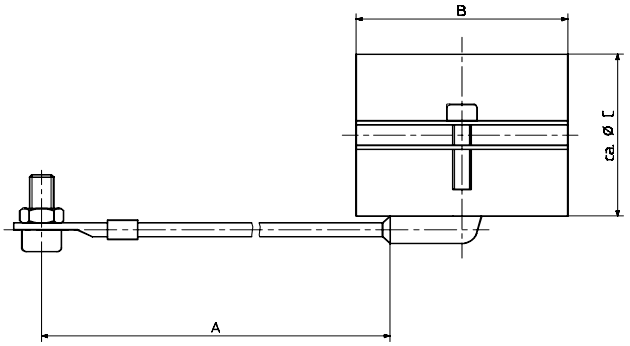
HUBER+SUHNER type	Item no.	For cable size Sucofeed, Andrew, Nokia, Kabelmetal, RFS,Eupen, etc.	«A» (mm)	«B» (mm)	«C» (mm)	Stripping length	Grounding screws
9076.99.N012-50	84124423	1/2"	500	50	32	26	M8
9076.99.N013-50	84124422	1/2" highflex	500	50	32	26	M8
9076.99.N078-50	84069990	7/8" / 7/8" highflex	500	50	44	26	M8
9076.99.N114-50	84069991	1 - 1/4"	500	50	59	26	M8
9076.99.N012	23009965	1/2"	840	50	32	26	M8
9076.99.N013	23012643	1/2" highflex	840	50	32	26	M8
9076.99.N014	23015053	1/4", RG_213/214*	840	50	28	26	M8
9076.99.N038	23012644	3/8"	840	50	28	26	M8
9076.99.N078	23009966	7/8" / 7/8" highflex	840	50	44	26	M8
9076.99.N114	23012646	1 - 1/4"	840	70	59	26	M8
9076.99.N158	23012647	1 - 5/8"	840	70	69	30	M8

* Including 3/8" highflex

Accessories

Grounding kits

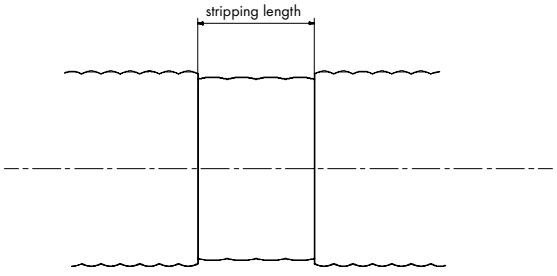
Grounding kit P-style
Parallel grounding cable connection
Alligned to corrugated copper tube cable



HUBER+SUHNER type	Item no.	For cable size Sucofeed,Andrew,Nokia,Kabel metal,RFS,Eupen,etc.	«A» (mm)	«B» (mm)	«C» (mm)	Stripping length (mm)	Grounding screws
9076.99.P012	23011466	1/2"	840	50	32	26	M8
9076.99.P013	23012649	1/2" highflex	840	50	32	26	M8
9076.99.P014	23015054	1/4", RG_213/214*	840	50	28	26	M8
9076.99.P038	23012650	3/8"	840	50	28	26	M8
9076.99.P078	23011467	7/8" / 7/8" highflex	840	50	44	26	M8
9076.99.P114	23012652	1 - 1/4"	840	70	59	26	M8
9076.99.P158	23012653	1 - 5/8"	840	70	69	30	M8

* Including 3/8" highflex

Stripping dimensions
Concerning the necessary cable jacket length which has to be removed, refer the tables above, column «stripping length». Select according to type number.



The mounting instruction is shipped with every kit.

Accessories

Cold shrink tubes for additional protection

This special cold shrink tube reliably protects coaxial connectors against humidity and harsh environmental influences like icy conditions or a polluted atmosphere. It especially allows for outdoor feeder line installations in mobile communications and other wireless systems.
The simple and fast assembly of this cold shrink tube, by pulling out the supporting spiral, enables a reliable installation without special tools. After the assembly the cold shrink tube provides reliable protection by its continuous radial contact pressure.

Features

- Quick and easy installation without tool
- No torches or heat required
- Accommodates a wide range of cable sizes
- Good thermal stability
- Resists acids and bases, ozone and UV radiation
- Water resistant
- Application temperature (shrinking process) –20 °C/+ 50 °C
- Working temperature –20 °C/+ 130 °C

Type no.	Item no.	Material	For connector pair
73_Z-0-0-678/---_-E	84062968	silicone EPDM*	1/2" HF - 1/2" HF 1/2" HF - 1/2" 1/2" HF - 7/8" 1/2" - 1/2" 1/2" - 7/8" 7/8" - 7/8"
73_Z-0-0-339/---_-E	22658885		1/2" HF - 1 1/4" 1/2" HF - 1 5/8" 1/2" - 1 1/4" 1/2" - 1 5/8" 7/8" - 1 1/4" 7/8" - 1 5/8"

* At temperature below 0 °C shrinking process can be supported by hand warmth.

Accessories

Fast-wrap weatherproofing kit

Fast-Wrap is a unique, time saving, weatherproofing solution for the telecom industry. The cross-linked butyl on elastomer carrier becomes a powerful sealing mechanism that can withstand the continued assault of outdoor elements above or below ground. This same material technology has been used successfully for over thirty years in the roofing and construction industries where it is exposed to the harshest environments. In fact, time and heat only serve to enhance it's self amalgamation and sealing properties. Fast-Wrap is a comprehensive replacement for common butyl tape weatherproofing kits and installs three times faster. Unlike butyl tape, Fast-Wrap is clean, easy to cut, simple to wrap, removable, and will not flow after installation.

Applications

- Outdoor corrugated feeder line to jumper cable connections
- Cable to lightning protector or antenna connections
- Grounding kits
- Fiber or dataline connections above or below ground
- Component connections

Colour	Black	
Dimensions	5.4 cm x 150 cm / 2 1/8" x 5 ft per roll	2 rolls per kit
Specific gravity	1.08 +/- 0.05	tested per ASTM D792-79
Penetration	40/120	tested per ASTM D217 (300Cone)
Ozone/UV resistance	high	tested per ASTM D1149-81 with no degradation
Elongation	300 %	tested per ASTM D412-80
Low temperature	-45 °C / -49 °F	tested per ASTM D746
Flash point	175 °C / 350 °F	tested per ASTM D92
Shear strength	1 bar / 15 PSI min.	tested per ASTM D816
Peel strength	0.2 bar / 3 PSI min.	tested per ASTM D413
Tensile strength	3.4 bar / 50 PSI max.	tested per ASTM D412
Odor	nil	
Volatile % by volume	.001 %	
Shelf life	10 years	
Resistance to	5 % acids, 5 % NaOH, water soluble solvents, acid and basic soils, heat up to 90 °C for one year, heat spikes at 130 °C for 24 hrs	
Do not expose to	oil, carbon tetrachloride, naphtha, mineral spirits, gasoline	
Warranty	3 years	
Patent pending		

For connector pair	Connections per kit
1-5/8" to 1/2"	2
1-1/4" to 1/2"	2
7/8" to 1/2"	4

For connector pair	Connections per kit
1/2" to 1/2"	12
7/8" to device	12
1/2" to device	12

Order information
Item no. 84125631

Inquiries to be made at HUBER+SUHNER Inc. (USA)

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, DIN 7/16 and SMA 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. Smaller units with SMA connectors can be provided for picocell wireless communication systems.

Power splitters

DIN 7/16 types with frequency range 800 – 2500 MHz



Type no.	5502.41.0026	5502.41.0027	5502.41.0028
Item no.	84020588	84023443	84023731
Split	2 way	3 way	4 way
Frequency	800 – 2500 MHz	800 – 2500 MHz	800 – 2500 MHz
Input port	7/16 female	7/16 female	7/16 female
Output port	7/16 female	7/16 female	7/16 female
Return loss (input)	min. 20 dB	min. 20 dB	min. 20 dB
Insertion loss	typ. 0.3 dB	typ. 0.3 dB	typ. 0.2 dB
Average power	500 W	500 W	500 W
IP rating	IP65	IP65	IP65
Operating temperature range	-40 °C ... +85 °C / -40 °F ... +185 °F		
Weight	0.85 kg	0.95 kg	1.05 kg
Protective cover kit	73_Z-0-0-614/--_-E	73_Z-0-0-614/--_-E	73_Z-0-0-614/--_-E
Mounting hardware	9075.99.0001 9075.99.0002	9075.99.0001 9075.99.0002	9075.99.0001 9075.99.0002

N types with frequency range 2000 – 6000 MHz


Type no.	5504.17.0004	5504.17.0005
Item no.	84005364	84011465
Split	2 way	2 way
Frequency	2000 - 6000 MHz	2000 - 6000 MHz
Input port	N male	N female
Output port	N female	N female
Return loss (input)	min. 20 dB	min. 20 dB
Insertion loss	typ. 0.2 dB	typ. 0.2 dB
Average power	300 W	300 W
IP rating	IP65	IP65
Operating temperature range	-40 °C ... + 85 °C / -40 °F ... + 185 °F	
Weight	0.8 kg	0.8 kg
Mounting hardware	9075.99.0001 9075.99.0002	9075.99.0001 9075.99.0002

Power splitters – accessories

Protective cover kit

The protective cover kit provides additonal protection for RF power splitters exposed to harsh environmental conditions. Important: The installation of the protective cover kit requires right angle adaptors on all output ports. As the power splitters are supplied with straight connector shapes (female) only, you will have to use either jumpers with right angle interfaces (male) or separately ordering right angle adaptors as listed below.

Type no.	Item no.	Weight (kg)
73_Z-0-0-614/---_-E	84072501	0.4334

The protective cover kit includes the protective cover with screw M8x1 and screw fixation cord and rubber bellows with hose clamp.

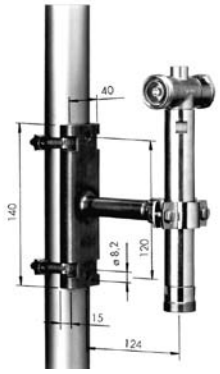
Right angle adaptors to be ordered separately

1 adaptor required per output port

Type no.	53_N-50-0-4/133_UE	53_716-50-0-1/003_-E
Item no.	22658908	22641259
Shape	right angle adaptor	right angle adaptor
Connector series	N	7/16
Connector gender	plug/jack [m/f]	plug/jack [m/f]

Mounting hardware

This mounting hardware allows you to fix RF power splitters on masts of 40 to 360 mm diameter by means of non corrosive steel hose clamps. It can be used for wall mounting (2 x 8.0 mm diameter holes) too.



Type no.	Item no.	For mast diameter	Weight (kg)
9075.99.0001	22648739	40 – 50 mm	0.35
9075.99.0002	22648738	50 – 360 mm	0.45

One set consists of a complete bracket plus two steel hose clamps adjusted to the selected mast diameter.

Power splitters

DIN 7/16 types with frequency range 698 – 2700 MHz for LTE



Type no.	5502.41.0029	5502.41.0030	5502.41.0031
Item no.	84086614	84104878	84104879
Split	2 way	3 way	4 way
Frequency	698 – 2700 MHz	698 – 2700 MHz	698 – 2700 MHz
Input port	7/16 female	7/16 female	7/16 female
Output port	7/16 female	7/16 female	7/16 female
Return loss (input)	min. 24 dB	min. 23 dB	min. 19 dB
Insertion loss	max. 0.05 dB	max. 0.05 dB	max. 0.05 dB
Average power	500 W	500 W	500 W
IP rating	IP67	IP67	IP67
Operating temperature range	-35 °C...+75 °C / -31 °F...+167 °F		
Weight	0.85 kg	1.00 kg	1.15 kg
Mounting hardware	Wall mounting hardware included		

SMA types with frequency range 2000 – 2500 MHz



Type no.	5502.19.0004	5502.19.0005	5502.19.0006
Item no.	22650303	22650304	22650305
Split	2 way	3 way	4 way
Frequency	2000 – 2500 MHz	2100 – 2500 MHz	2100 – 2500 MHz
Input port	SMA male	SMA male	SMA male
Output port	SMA female	SMA female	SMA female
Return loss (input)	min. 19 dB	min. 17.5 dB	min. 16.5 dB
Insertion loss	typ. 0.2 dB	typ. 0.2 dB	typ. 0.2 dB
Average power	100 W	100 W	100 W
IP rating	IP20	IP20	IP20
Operating temperature range	-40 °C ... +85 °C / -40 °F ... +185 °F		
Weight	0.012 kg	0.014 kg	0.015 kg

GPS antennas

Wireless communication applications have taken off over the past years. In addition to voice services, wireless systems are now also handling an increasing volume of data traffic, with the demand being for high transmission capacities.

To provide these capacities, mobile radio cells (GSM, UMTS and LTE) are steadily shrinking, allowing multiple use of frequency bands, which in turn enables capacity to be increased.

HUBER+SUHNER provides application specific antennas for base station synchronisation for Radio Access Networks (RAN).

GPS antennas

Features

- Small and unobtrusive design
- Low-noise preamplifier for compensation of antenna cable loss
- Amplifier feed via antenna cable
- Integrated lightning and overvoltage protection
- Cone-shaped radome prevents snow, ice and dirt deposits
- Mounting bracket for mast and wall mounting included in the scope of supply

Benefits

- Reliably supports timing and frequency synchronisation in mobile communication networks
- Can be used with all standard GPS/GLONASS receivers
- Simple and time-saving installation; no special tools required
- Easy commissioning

Product overview

Type no. Item no.	1315.17.0026 84119684	1315.17.0028 84121280
		
Frequency [MHz]	1565 – 1585 (GPS)	
Antenna gain [dB]	5	
Antenna gain @ 10° elevation [dB]	2	
LNA gain [dB]	31	
Noise figure [dB]	3	
VSWR	1.8	
Operational voltage	4V-6V DC	
Current consumption	50 mA	
Lightning protector	integrated	
Radome colour	RAL 9003 (signal white)	
Mounting bracket	L-shape bracket for pole and wall mounting included	bracket not included

PIM test kit

Low PIM and cable impairment test kit

Features

- Use of high performing PIM components:
  - N and DIN 7/16 adaptors
  - High power load
  - Standard / source
  - Test leads

Benefits

- Existing and approved technology
- All components are available for on-site IM testing
- High mating cycles

PIM test kit

Low PIM and cable impairment test kit

Technical data

Electrical	
Impedance	50 Ω
Frequency range	690 MHz to 2700 MHz
RF CW power	50 W

Environmental	
Operating temperature	0 °C up to +40 °C
RoHS 2011/65/EC	compliant

Mechanical	
Number of matings	500 with max. torque of 30 Nm for DIN 7/16 or max. torque of 1 Nm for N interfaces, increased torque may reduce the number of matings significantly

Material		
Piece part	Material	Surface Plating
Body	brass	tri-metal plating
Centre contact female	copper beryllium alloy	gold plating / silver plating / tri-metal plating
Centre contact male	brass	gold plating / silver plating / tri-metal plating
Case dimensions	520 x 435 x 230 mm (20.5 x 17 x 9 in.)	
Weight	10.3 kg (22.7 lbs.)	

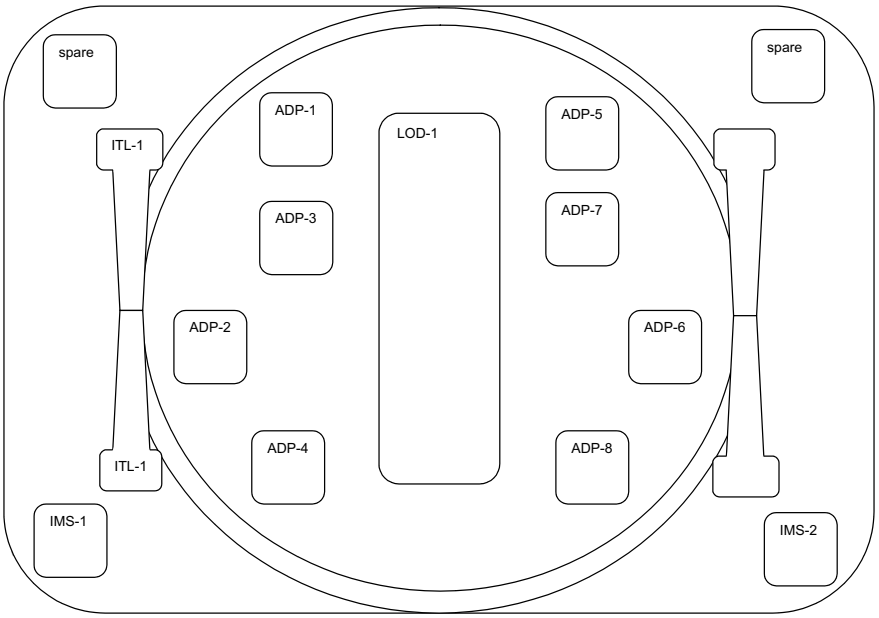
Order information
Low PIM and cable impairment test kit, item no. 84131152

PIM test kit

Low PIM and cable impairment test kit

Kit content

Part ID	Description	Configuration (connector series – gender)
PIM adaptor, ≤ –155dBc, 3rd order IM level, at 2 x 43 dBm (2 x 20 Watt) carrier power		
ADP-1	adaptor 1	DIN 7/16 female – female
ADP-2	adaptor 2	DIN 7/16 male – male
ADP-3	adaptor 3	DIN 7/16 male – female
ADP-4	adaptor 4	N male - DIN 7/16 female
ADP-5	adaptor 5	N female - DIN 7/16 female
ADP-6	adaptor 6	N male - DIN 7/16 male
ADP-7	adaptor 7	DIN 7/16 male – N female
ADP-8	adaptor 8	N female – female
PIM standard, adjusted to –57 dBm for 3rd order IM level, at 2 x 43 dBm (2 x 20 Watt) carrier power		
IMS-1	IM standard 1, at 900 MHz	DIN 7/16 male – female
IMS-2	IM standard 2, at 1800 MHz	DIN 7/16 male – female
PIM load, ≤ –155dBc, 3rd order IM level, at 2 x 43 dBm (2 x 20 Watt) carrier power		
LOD-1	load termination 1	DIN 7/16 male and female
PIM test lead, ≤ –155 dBc, 3rd order intermodulation, at 2 x 43 dBm (2x 20 Watt) carrier power		
ITL-1	IM test lead 3m, 3/8" HF	DIN 7/16 male – female



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		
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-0-0-12-8	85006446	74_Z-0-12-11	84147226
					74_Z-0-23-16	23035267
	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

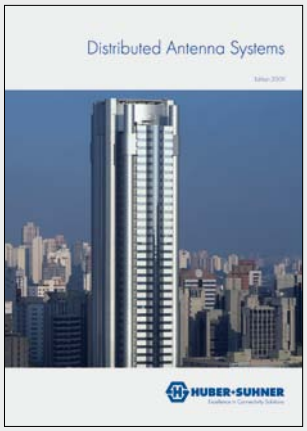
RF Feederline components selection guide

HUBER+SUHNER Eco connectors

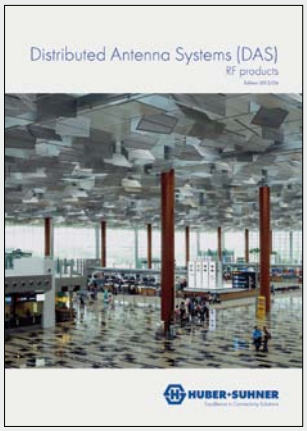
Cable	Grounding kit		Connector		Assembling instruction	
	Type no.	Item no.	Type no.	Item no.		
SUCOFEED_1/2 SUCOFEED_1/2_FR SUCOFEED_1/2_FR_UL SUCOFEED_1/2_LW	9076.99.N012-50	84124423	11_716-50-12-100	84125745	DOC-0000364681	
			21_716-50-12-100	84125740		
			11_N-50-12-100	84125756	DOC-0000364683	
			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-0-12-100	84133923			74_Z-0-12-17	84147227
	Preferred tool: 74_Z-0-23-100 Alternatives: (74_Z-0-23-18) (74_Z-0-23-20)	84133924 (84117046) (84074476)			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

Further catalogues



Distributed antenna systems
Item no. 84078171



Distributed antenna systems (DAS)

Fiber optic cables
Item no. 84019826

Fiber Optic cabling systems
Item no. 23029084

Fiber Optic connectors and assemblies
Item no. 84101808

Lightning protection
Item no. 23002023

RF and microwave components
Item no. 84068668

RF connectors general catalogue
Item no. 84019826

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84126953_Rev. F /03.2014

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