MASTERLINE Extreme Hybrid Solution

Reference, training and order guide – Edition 2017/07

HUBER+SUHNER

Excellence in Connectivity Solutions

Count on proven wireless technology

Your partner for system solutions

We offer our customers around the globe outstanding products and services for their electrical and optical connectivity needs. We focus on combining products from the three technologies of radio frequency, fiber optics and low frequency into system solutions for communication, transportation and industrial applications. When developing these systems, our engineers often work so closely with customers that they are included in their projects as partners and experts from the very start.

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

HUBER+SUHNER Australia contact

PO BOX 6201, Frenchs Forest DC NSW 2086
Phone 02 89771200
webenq.au@hubersuhner.com
sales.au@hubersuhner.com

Content

Work with the leader for remote radio installation solutions

Remote radio technology

HUBER+SUHNER is the global leader for remote radio installation solutions. We have a comprehensive offer-ing of FTTA (fiber-to-the-antenna) and PTTA (power-to-the-antenna) products which are tailored to the cus-tomer's needs. We advise operators about which installation methods are available and what are their ad-vantages. 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 accept-ance in other global markets.

HUBER+SUHNER's hybrid cabling systems are the most efficient and easiest-to-install product available on the market. Mobile operators on three continents verified that MASTERLINE Extreme Hybrid can be installed in approximately half of the time of competitive hybrid solutions based on corrugated coax cable de-signs. The factory-terminated plug and 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.

Tower mast installation

MASTERLINE Extreme Hybrid MLEH

Hybrid riser cable with environmentally sealed compact divider

This factory-terminated hybrid cable assembly minimizes the amount of cables running up the mast. A compact divider splits the multi-fiber/wire cable into individual ruggedized outdoor cables which are linked to the RRHs – either directly or via extension jumpers. The jumpers allow an adaptation to different RRH interfaces and therefore make the solution independent from the system vendor's hardware.

MASTERLINE Extreme Hybrid is tailored for mobile operators who do not have own tower infrastructure but rent the majority of their tower cell sites. A common cost model is that the tower owner charges a variable rental fee based on the amount of cables running up the mast. The hybrid solution minimizes the annually recurring rental fee at the one-time cost of a more expensive and complex cable infrastructure.

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 and play» system for up to 10 RRHs

LISCA RF jumper

Bird proofed ODC-4

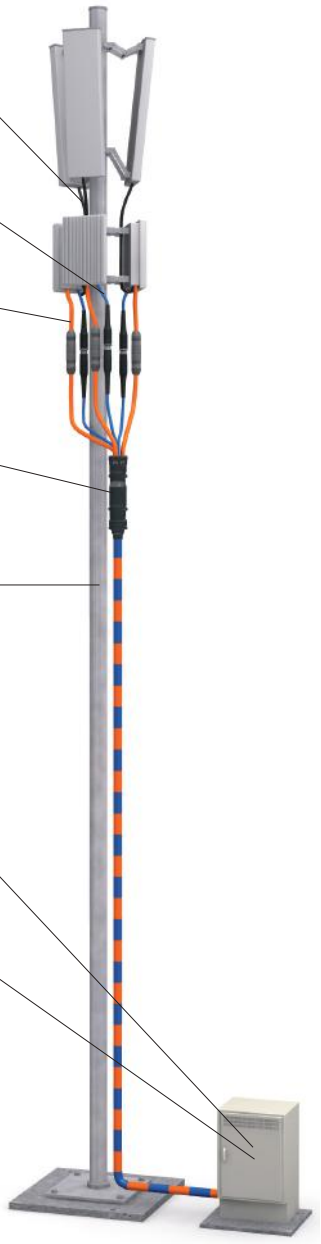
Bird proofed power jumpers (optional)

MASTERLINE Extreme Hybrid

Mounting clamps

CTB 19" patching box (optional)

LC patchcord (optional)



Bird proof parts

Breco

Made of 2 half shell, easy to mount and fixing with metal tie wrap or hose clamp. Shroud is located by the breakouts and fixed on the divider.

Breco for MLEH 4/8 and 6/12

Breco for MLEH 9/18

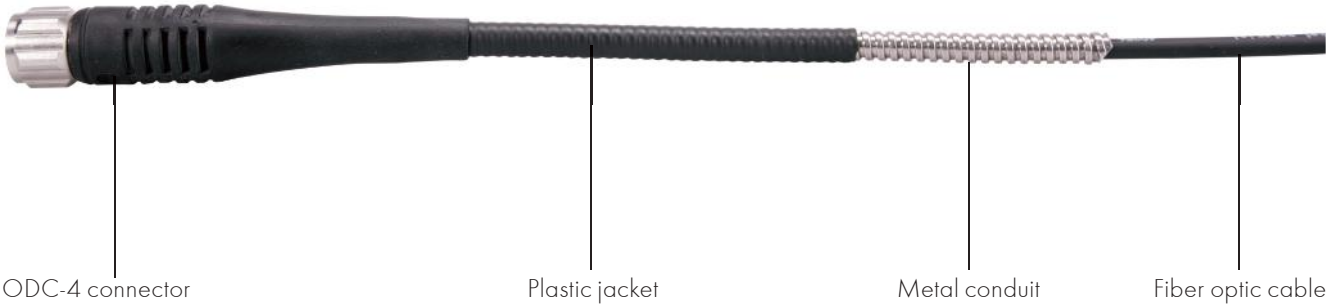
Order information

Description	Item no.
Breco-kit for MLEH 4/8 and 6/12 incl. cable ties	85028770
Breco-kit for MLEH 9/18 and 10/24 incl. cable ties	85028769

Bird proof parts

Metal protection conduit for fiber optic

All fiber optic cables are protected by a metal-plastic UV protected conduit.



Protection conduit for DC breakouts

Global supply chain for hybrid assemblies

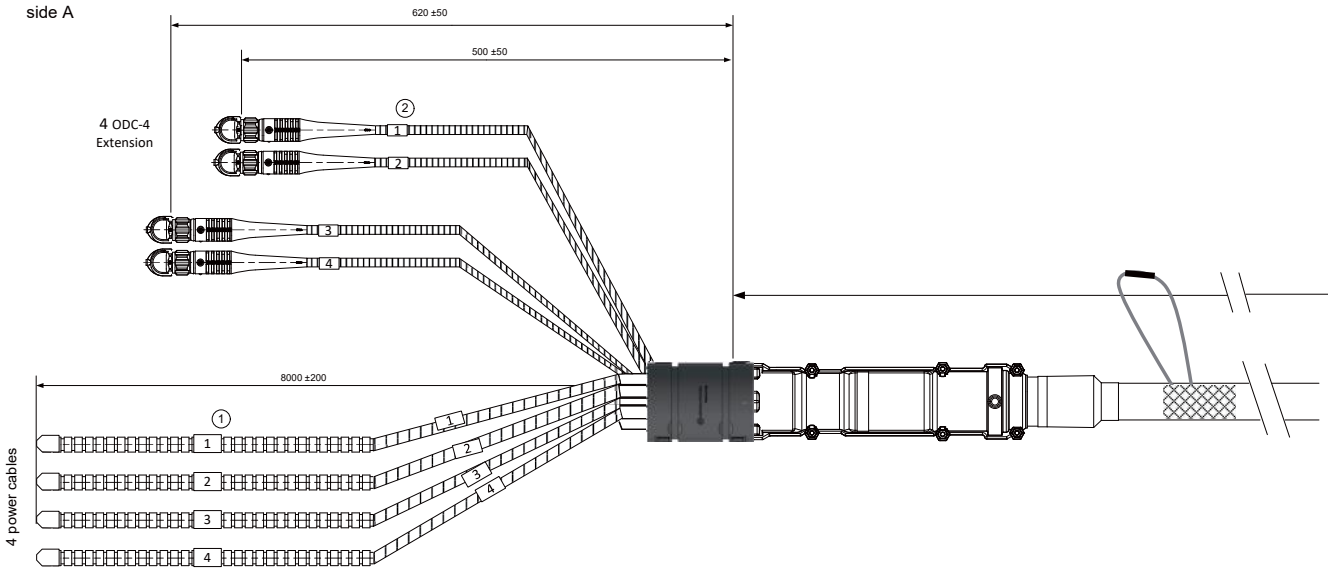
HUBER+SUHNER operates hybrid assembly shops in Poland, Mexico, China and has plans to expand the manufacturing network to other regions as well. Being close to our customers is a must for bulky hybrid assemblies with weights exceeding 100 kg. Our operations network enables HUBER+SUHNER to respond immediately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

MLEH 4/8

RRH side

4 × ODC-4
outdoor connector

4 × DC
power breakout



MLEH 4/8

General specifications

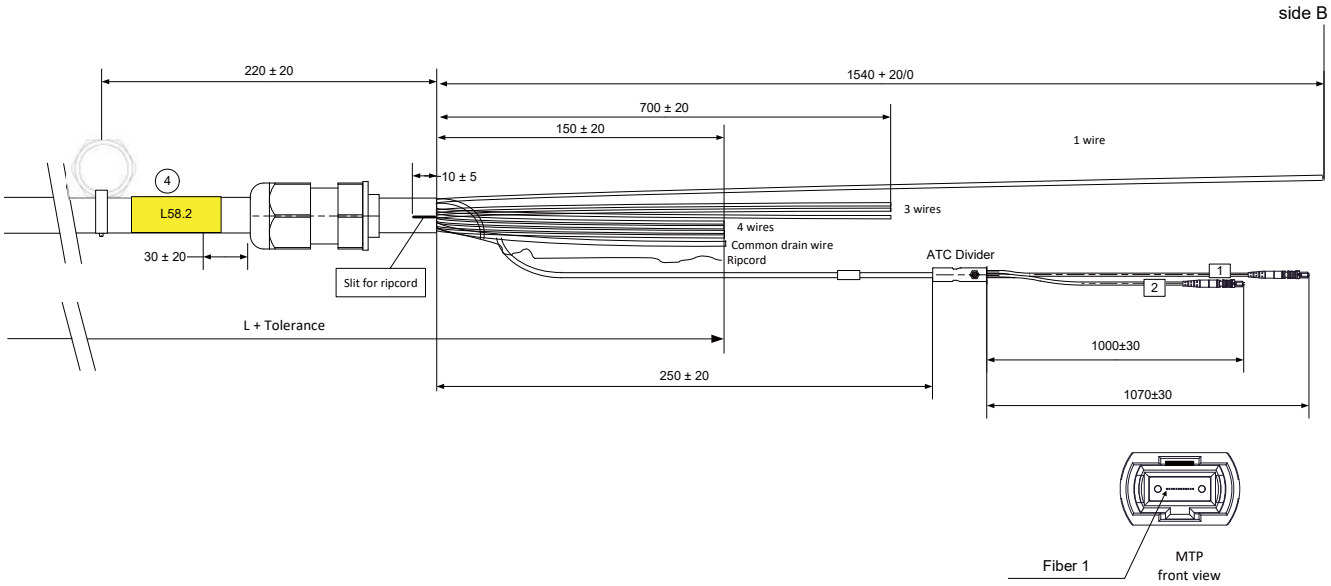
Cable head connectors (radio end)	fiber power	4 × ODC-4 outdoor connector 4 × DC power breakout
Cable head connectors (base station)	fiber power	MASTERLINE MTP® open end
Break-out cable length	fiber power	shortest 0.5 m, longest 0.62 m blunt cut 8 m
Packaging		individual double-flange reels various sizes

Enclosure specifications

Dimensions		Ø 70 mm, height 300 mm
Material		plastic PPE black
Cable retention force at front of enclosure	fiber break-out cable power break-out cable	500 N 500 N
Cable retention force at back of enclosure	hybrid cable	4500 N (only with hoisting grip)
Temperature range	service installation	–40 to +75 °C -–25 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	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 to 500 Hz/10 g
Shock, IEC 61300-2-9		100 g
HiPot testing with water on enclosure		passed

MLEH 4/8

2 MTP connectors



Fiber optic				
RRH	Side A		Side B	
#	ODC-4 plug	PIN	MTP 1	MTP 2
1	1	1	3	
		2	4	
		3	5	
		4	6	
2	2	1	7	
		2	8	
		3	9	
		4	10	
3	3	1		3
		2		4
		3		5
		4		6
4	4	1		7
		2		8
		3		9
		4		10

Power						
RRH	Jumper power cable	Side A				Side B
#		Pin souriau conn.	Souriau conn. #	Ref. Hook-up	H+S cable	Wire number
1	brown	1	1	0 V	brown	1
	blue	2		−48 V	blue	2
	ground	⏚		ground	drain	common drain
2	brown	1	2	0 V	brown	1
	blue	2		−48 V	blue	2
	ground	⏚		ground	drain	common drain
3	brown	1	3	0 V	brown	1
	blue	2		−48 V	blue	2
	ground	⏚		ground	drain	common drain
4	brown	1	4	0 V	brown	1
	blue	2		−48 V	blue	2
	ground	⏚		ground	drain	common drain

MLEH 4/8

BTS side

Specifications

Sealing feature	M50 × 1.5 mm cable gland
Sealing during installation	ruggedized pulling tube
Pulling force to apply	500 N
Ingress protection base station	IP65 (with protection tube)
Crush resistance	250 N/cm
FO protection inside pulling tube	M20 plastic tube
Ingress protection of FO protection tube	IP50

Order information

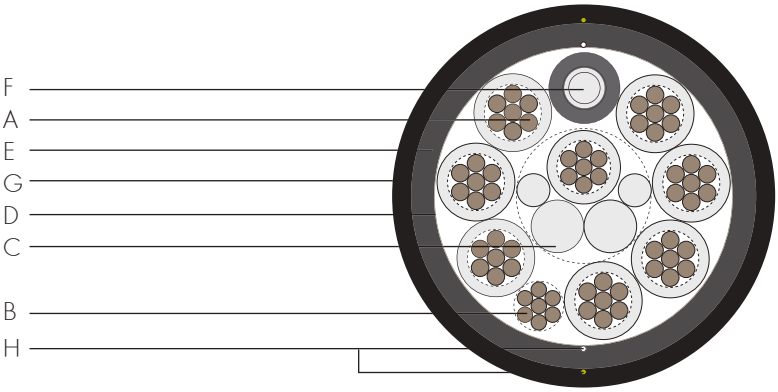
	Product description	Item	Length m	Cross section mm^2
MLEH 4/8, bird proofed	MLEH 4/8 ODC-4, MTP, bird proofed	85025177	20	6
	MLEH 4/8 ODC-4, MTP, bird proofed	85025178	30	6
	MLEH 4/8 ODC-4, MTP, bird proofed	85025179	40	6
	MLEH 4/8 ODC-4, MTP, bird proofed	85025180	50	6
	MLEH 4/8 ODC-4, MTP, bird proofed	85025181	60	6
	MLEH 4/8 ODC-4, MTP, bird proofed	85025182	70	10
	MLEH 4/8 ODC-4, MTP, bird proofed	85025183	80	10
	MLEH 4/8 ODC-4, MTP, bird proofed	85025184	90	10
	MLEH 4/8 ODC-4, MTP, bird proofed	85025185	100	10
	MLEH 4/8 ODC-4, MTP, bird proofed	85025186	110	10
	MLEH 4/8 ODC-4, MTP, bird proofed	85025187	120	10
	MLEH 4/8 ODC-4, MTP, bird proofed	85025188	130	10
	MLEH 4/8 ODC-4, MTP, bird proofed	85025189	140	10
	MLEH 4/8 ODC-4, MTP, bird proofed	85025201	150	10

MLEH 4/8

BTS side

Hybrid cable specifications

	LSFH hybrid cable EMEA and Asian-Pacific market
Jacket material	thermoplastic, low smoke free of halogen with avian cable jacket
Standard	IEC 60502-1:2004-04
Temperature range	–40 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
Drain wire	stranded copper class 2 IEC 60228: 2004
Cable shielding	copper foil > 100 % coverage
Fiber optic	5 mm loose-tube cable with up to 24 fibers single mode
Halogen free	yes
Flame retardant	IEC 60332-1-2:2004
UV resistant	yes, according IEC 68-2-5



A Conductors (power wire)
B Ground wire/drain wire
C Flame resistant non hygroscopic fillers
D Copper tape layer
E LSFH jacket
F Fiber optic cable, OD = 5 mm
G Avian resistant cable jacket
H 4 × Rip cord

Cable mechanical information

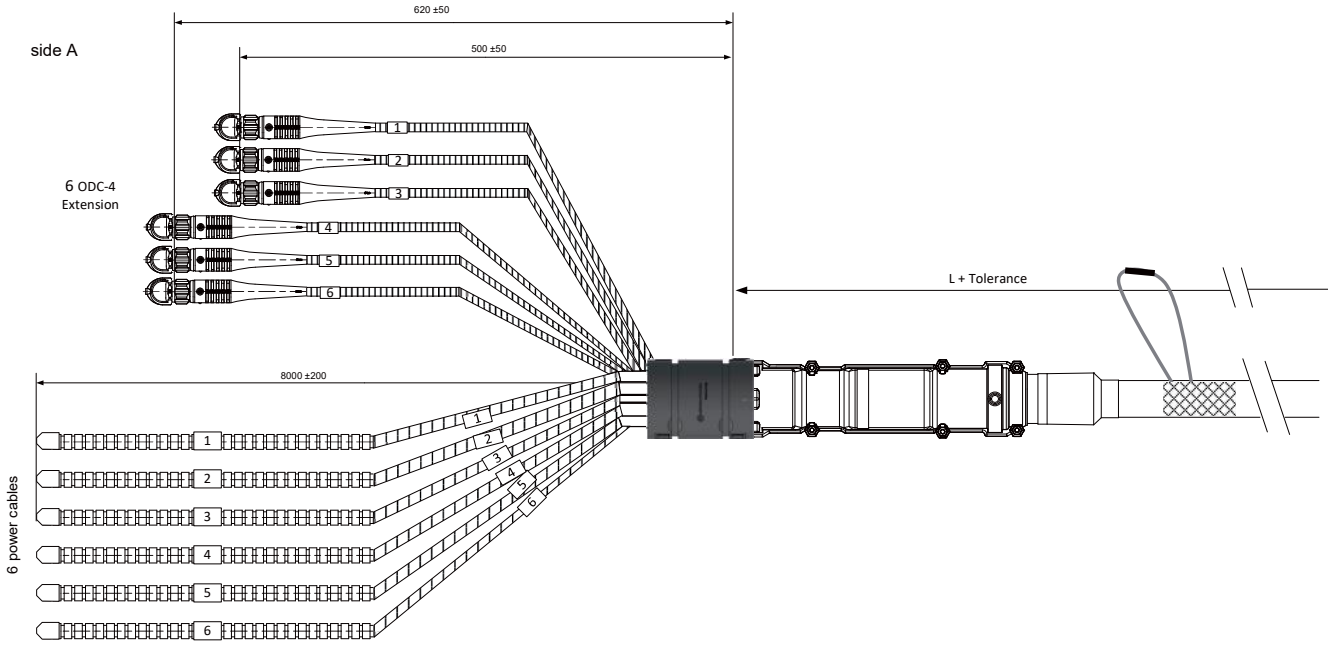
		≤ 60 m (6 mm²)	> 60 m (10 mm²)
Ammount of fiber optic fibers		16	
Outer diameter of cable		27.5 ±1.0 mm	27.5 ±1.0 mm
Minimum bend radius	during installation	385 mm	
	fixed installation	330 mm	
	with drum	250 mm	
Cable weight		≈ 1.13 kg/m	≈ 1.43 kg/m

MLEH 6/12

RRH side

6 × ODC-4
outdoor connector

6 × DC
power breakout



MLEH 6/12

General specifications

Cable head connectors (radio end)	fiber power	6 × ODC-4 outdoor connector 6 × DC power breakout
Cable head connectors (base station)	fiber power	MASTERLINE MTP® open end
Break-out cable length	fiber power	shortest 0.5 m, longest 0.62 m blunt cut 8 m
Packaging		individual double-flange reels various sizes

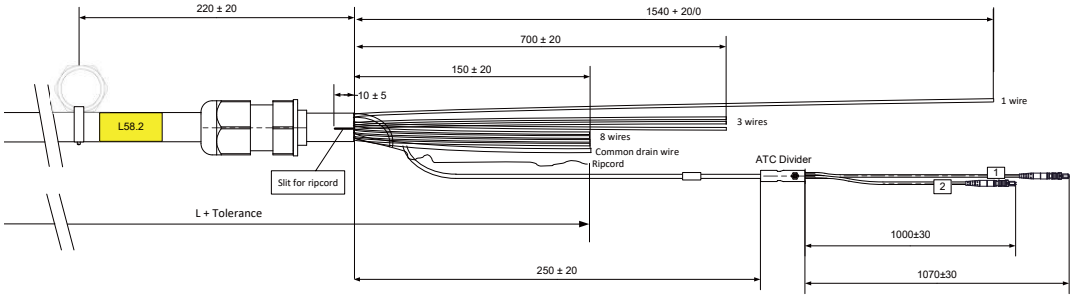
Enclosure specifications

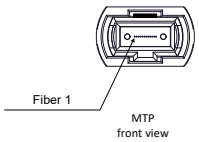
Dimensions		Ø 70 mm, height 300 mm
Material		plastic PPE black
Cable retention force at front of enclosure	fiber break-out cable power break-out cable	500 N 500 N
Cable retention force at back of enclosure	hybrid cable	4500 N (only with hoisting grip)
Temperature range	service installation	–40 to +75 °C –25 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	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 to 500 Hz/10 g
Shock, IEC 61300-2-9		100 g
HiPot testing with water on enclosure		passed

MLEH 6/12

BTS side

2 MTP connectors





Fiber optic				
RRH	Side A		Side B	
#	ODC-4 plug	PIN	MTP 1	MTP 2
1	1	1	1	
		2	2	
		3	3	
		4	4	
2	2	1	5	
		2	6	
		3	7	
		4	8	
3	3	1	9	
		2	10	
		3	11	
		4	12	
4	4	1		1
		2		2
		3		3
		4		4
5	5	1		5
		2		6
		3		7
		4		8
6	6	1		9
		2		10
		3		11
		4		12

Power						
RRH	Jumper power cable	Side A				Side B
#		Pin souriau conn.	Souriau conn. #	Ref. Hook-up	H+S cable	Wire number
1	brown	1	1	0 V	brown	1
	blue	2		−48 V	blue	2
	ground	⏚		ground	drain	common drain
2	brown	1	2	0 V	brown	3
	blue	2		−48 V	blue	4
	ground	⏚		ground	drain	common drain
3	brown	1	3	0 V	brown	5
	blue	2		−48 V	blue	6
	ground	⏚		ground	drain	common drain
4	brown	1	4	0 V	brown	7
	blue	2		−48 V	blue	8
	ground	⏚		ground	drain	common drain
5	brown	1	5	0 V	brown	9
	blue	2		−48 V	blue	10
	ground	⏚		ground	drain	common drain
6	brown	1	6	0 V	brown	11
	blue	2		−48 V	blue	12
	ground	⏚		ground	drain	common drain

MLEH 6/12

BTS side

Specifications

Sealing feature	M50 × 1.5 mm cable gland
Sealing during installation	ruggedized pulling tube
Pulling force to apply	500 N
Ingress protection base station	IP65 (with protection tube)
Crush resistance	250 N/cm
FO protection inside pulling tube	M20 plastic tube
Ingress protection of FO protection tube	IP50

Order information

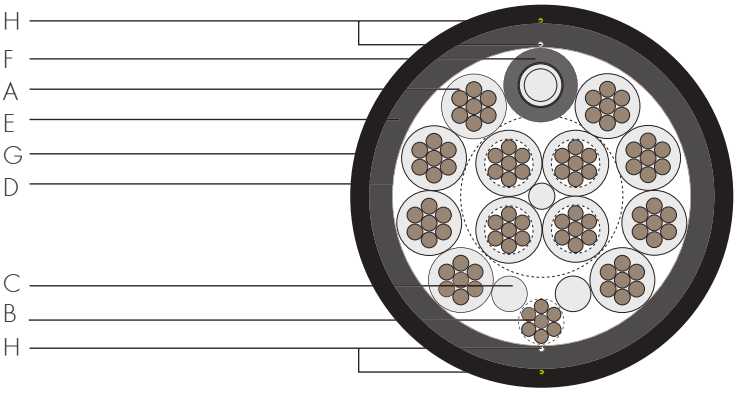
	Product description	Item	Length m	Cross section mm^2
MLEH 6/12, bird proofed	MLEH 6/12 ODC-4, MTP, bird proofed	85024673	20	6
	MLEH 6/12 ODC-4, MTP, bird proofed	85024674	30	6
	MLEH 6/12 ODC-4, MTP, bird proofed	85024675	40	6
	MLEH 6/12 ODC-4, MTP, bird proofed	85024676	50	6
	MLEH 6/12 ODC-4, MTP, bird proofed	85024677	60	6
	MLEH 6/12 ODC-4, MTP, bird proofed	85024678	70	10
	MLEH 6/12 ODC-4, MTP, bird proofed	85024679	80	10
	MLEH 6/12 ODC-4, MTP, bird proofed	85024680	90	10
	MLEH 6/12 ODC-4, MTP, bird proofed	85024681	100	10
	MLEH 6/12 ODC-4, MTP, bird proofed	85024682	110	10
	MLEH 6/12 ODC-4, MTP, bird proofed	85024683	120	10
	MLEH 6/12 ODC-4, MTP, bird proofed	85024684	130	10
	MLEH 6/12 ODC-4, MTP, bird proofed	85024685	140	10
	MLEH 6/12 ODC-4, MTP, bird proofed	85024686	150	10

MLEH 6/12

BTS side

Hybrid cable specifications

	LSFH hybrid cable EMEA and Asian-Pacific market
Jacket material	thermoplastic, low smoke free of halogen with avian cable jacket
Standard	IEC 60502-1:2004-04
Temperature range	–40 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
Drain wire	stranded copper class 2 IEC 60228: 2004
Cable shielding	copper foil > 100 % coverage
Fiber optic	5 mm loose-tube cable with up to 24 fibers single mode
Halogen free	yes
Flame retardant	IEC 60332-1-2:2004
UV resistant	yes, according IEC 68-2-5



A Conductors (power wire)
B Ground wire/drain wire
C Flame resistant non hygroscopic fillers
D Copper tape layer
E LSFH jacket
F Fiber optic cable, OD = 5 mm
G Avian resistant cable jacket
H 4 × Rip cord

Cable mechanical information

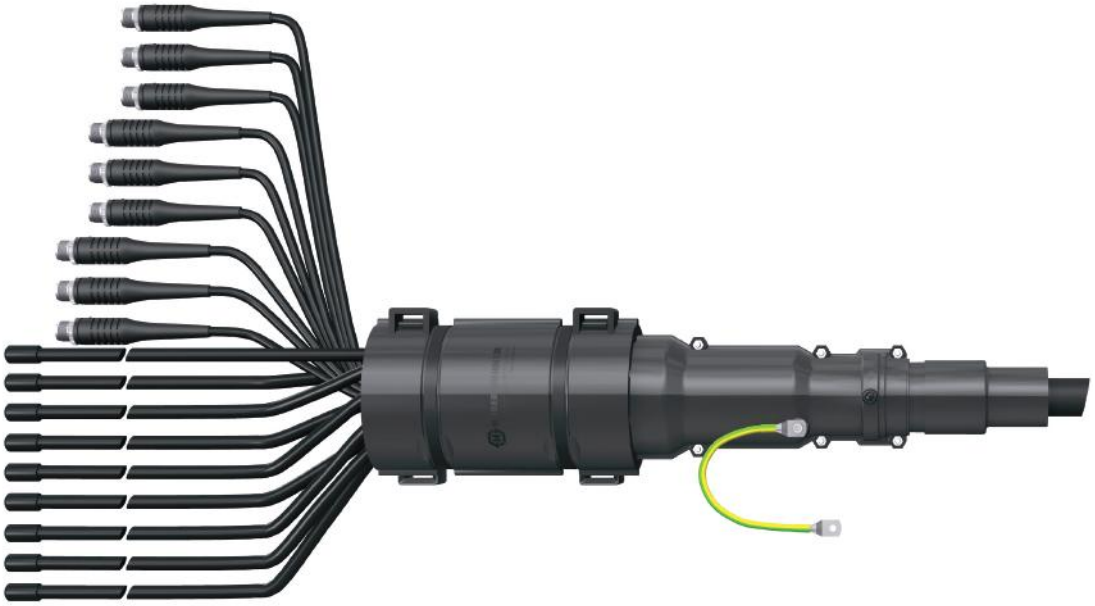
		≤ 60 m (6 mm²)	> 60 m (10 mm²)
Ammount of fiber optic fibers		24	
Outer diameter of cable		27.5 ±1.0 mm	33.5 ±1.0 mm
Minimum bend radius	during installation	385 mm	
	fixed installation	330 mm	
	with drum	250 mm	
Cable weight		≈ 1.32 kg/m	≈ 1.97 kg/m

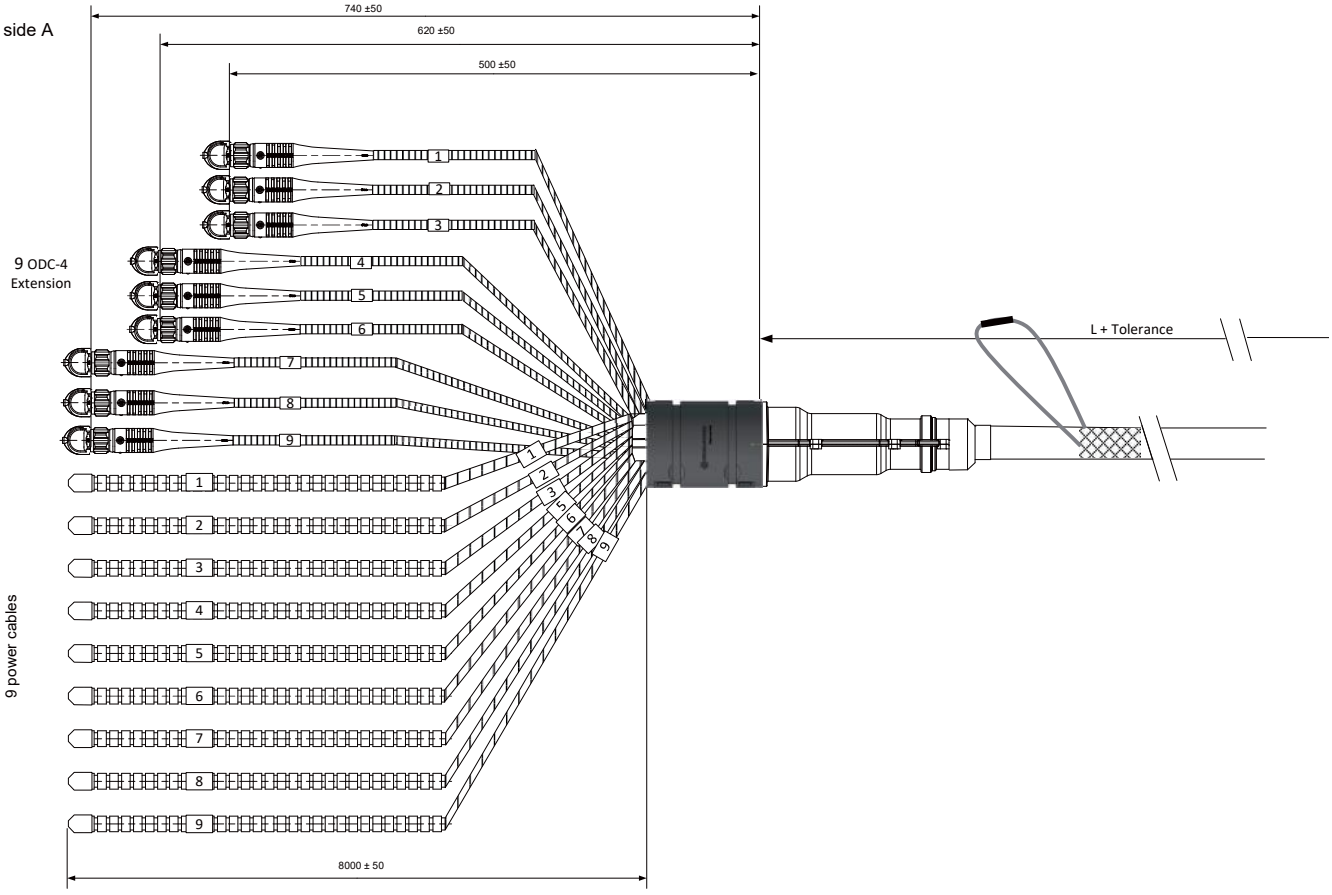
MLEH 9/18

RRH side

9 × ODC-4
outdoor connector

9 × DC
power breakout





MLEH 9/18

General specifications

Cable head connectors (radio end)	fiber power	9 × ODC-4 outdoor connector 9 × DC power breakout
Cable head connectors (base station)	fiber power	MASTERLINE MTP® open end
Break-out cable length	fiber power	shortest 1.25 m, longest 1.52 m blunt cut 8 m
Packaging		individual double-flange reels various sizes

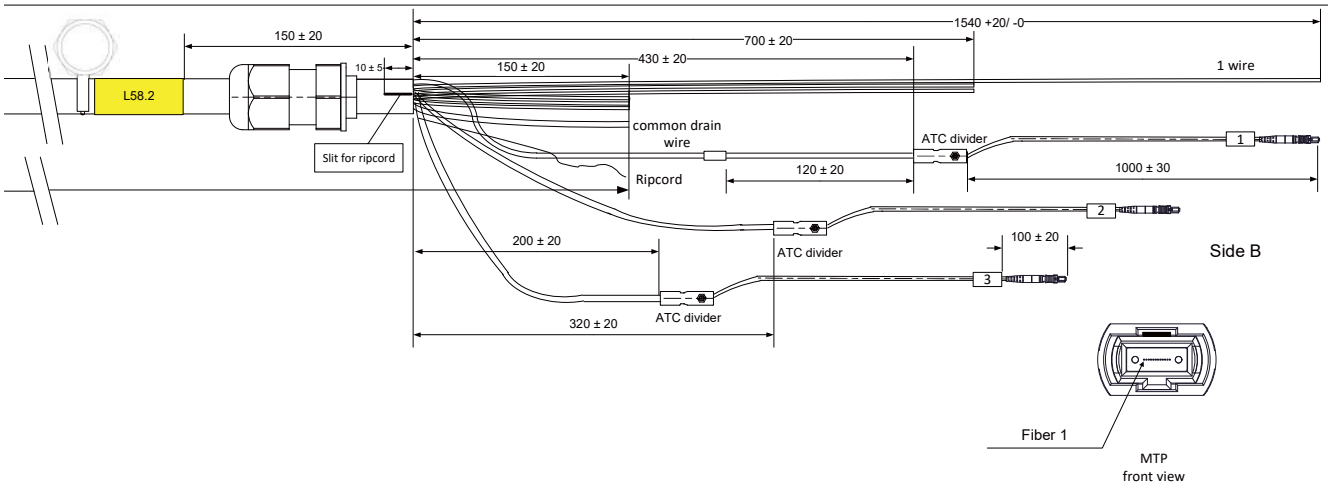
Enclosure specifications

Dimensions		Ø 96 mm, height 300 mm
Material		plastic PPE black
Earthing		10 mm^2 earth wire, for 6 mm metric screw
Cable retention force at front of enclosure	fiber break-out cable power break-out cable	500 N 500 N
Cable retention force at back of enclosure	hybrid cable	4500 N (only with hoisting grip)
Temperature range	service installation	–40 to +75 °C –25 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	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 to 500 Hz/10 g
Shock, IEC 61300-2-9		100 g
HiPot testing with water on enclosure		passed

MLEH 9/18

BTS side

3 MTP connectors



MLEH 9/18

Fiber optic					
RRH	Side A		Side B		
#	ODC-4 plug	PIN	MTP 1	MTP 2	MTP 3
1	1	1	1		
		2	2		
		3	3		
		4	4		
2	2	1	5		
		2	6		
		3	7		
		4	8		
3	3	1	9		
		2	10		
		3	11		
		4	12		
4	4	1		1	
		2		2	
		3		3	
		4		4	
5	5	1		5	
		2		6	
		3		7	
		4		8	
6	6	1		9	
		2		10	
		3		11	
		4		12	
7	7	1			1
		2			2
		3			3
		4			4
8	8	1			5
		2			6
		3			7
		4			8
9	9	1			9
		2			10
		3			11
		4			12

Power						
RRH	Jumper power cable	Side A				Side B
#		Pin souriau conn.	Souriau conn. #	Ref. Hook-up	H+S cable	Wire number
1	brown	1	1	0 V	brown	1
	blue	2		−48 V	blue	2
	ground	⏚		ground	drain	common drain
2	brown	1	2	0 V	brown	3
	blue	2		−48 V	blue	4
	ground	⏚		ground	drain	common drain
3	brown	1	3	0 V	brown	5
	blue	2		−48 V	blue	6
	ground	⏚		ground	drain	common drain
4	brown	1	4	0 V	brown	7
	blue	2		−48 V	blue	8
	ground	⏚		ground	drain	common drain
5	brown	1	5	0 V	brown	9
	blue	2		−48 V	blue	10
	ground	⏚		ground	drain	common drain
6	brown	1	6	0 V	brown	11
	blue	2		−48 V	blue	12
	ground	⏚		ground	drain	common drain
7	brown	1	7	0 V	brown	13
	blue	2		−48 V	blue	14
	ground	⏚		ground	drain	common drain
8	brown	1	8	0 V	brown	15
	blue	2		−48 V	blue	16
	ground	⏚		ground	drain	common drain
9	brown	1	9	0 V	brown	17
	blue	2		−48 V	blue	18
	ground	⏚		ground	drain	common drain

MLEH 9/18

BTS side

Specifications

Sealing feature	M50 × 1.5 mm cable gland
Sealing during installation	ruggedized pulling tube
Pulling force to apply	500 N
Ingress protection base station	IP65 (with protection tube)
Crush resistance	250 N/cm
FO protection inside pulling tube	M20 plastic tube
Ingress protection of FO protection tube	IP50

Order information

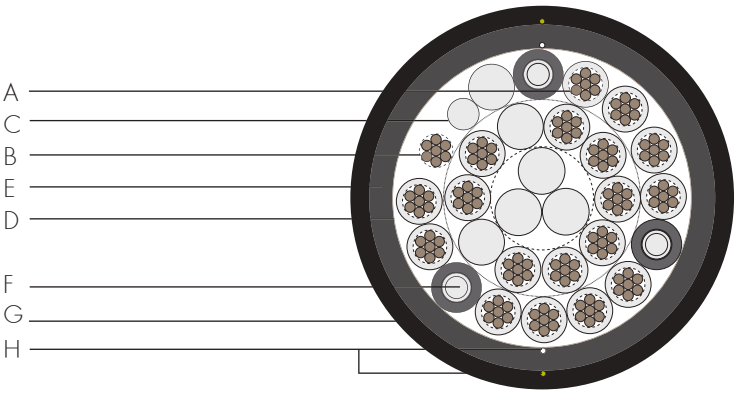
	Product description	Item	Length m	Cross section mm^2
MLEH 9/18, bird proofed	MLEH 9/18 ODC-4, MTP, bird proofed	85024687	20	6
	MLEH 9/18 ODC-4, MTP, bird proofed	85024688	30	6
	MLEH 9/18 ODC-4, MTP, bird proofed	85024689	40	6
	MLEH 9/18 ODC-4, MTP, bird proofed	85024690	50	6
	MLEH 9/18 ODC-4, MTP, bird proofed	85024691	60	6
	MLEH 9/18 ODC-4, MTP, bird proofed	85024692	70	10
	MLEH 9/18 ODC-4, MTP, bird proofed	85024693	80	10
	MLEH 9/18 ODC-4, MTP, bird proofed	85024694	90	10
	MLEH 9/18 ODC-4, MTP, bird proofed	85024695	100	10
	MLEH 9/18 ODC-4, MTP, bird proofed	85024696	110	10
	MLEH 9/18 ODC-4, MTP, bird proofed	85024697	120	10
	MLEH 9/18 ODC-4, MTP, bird proofed	85024698	130	10
	MLEH 9/18 ODC-4, MTP, bird proofed	85024699	140	10
	MLEH 9/18 ODC-4, MTP, bird proofed	85024700	150	10

MLEH 9/18

BTS side

Hybrid cable specifications

	LSFH hybrid cable EMEA and Asian-Pacific market
Jacket material	thermoplastic, low smoke free of halogen with avian resistant cable jacket
Standard	IEC 60502-1:2004-04
Temperature range	–40 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
Drain wire	stranded copper class 2 IEC 60228: 2004
Cable shielding	copper foil > 100 % coverage
Fiber optic	5 mm loose-tube cable with up to 36 fibers single mode
Halogen free	yes
Flame retardant	IEC 60332-1-2:2004
UV resistant	yes, according IEC 68-2-5



A Conductors (power wire)
B Ground wire/drain wire
C Flame resistant non hygroscopic fillers
D Copper tape layer
E LSFH jacket
F Fiber optic cable, OD = 5 mm
G Avian resistant cable jacket
H 4 × Rip cord

Cable mechanical information

		≤ 60 m (6 mm²)	> 60 m (10 mm²)
Ammount of fiber optic fibers		36	
Outer diameter of cable		39.5 ±1.0 mm	39.5 ±1.0 mm
Minimum bend radius	during installation	553 mm	
	fixed installation	474 mm	
	with drum	250 mm	
Cable weight		≈ 2.11 kg/m	≈ 2.76 kg/m

Fiber optic bird proof jumper

Specifications

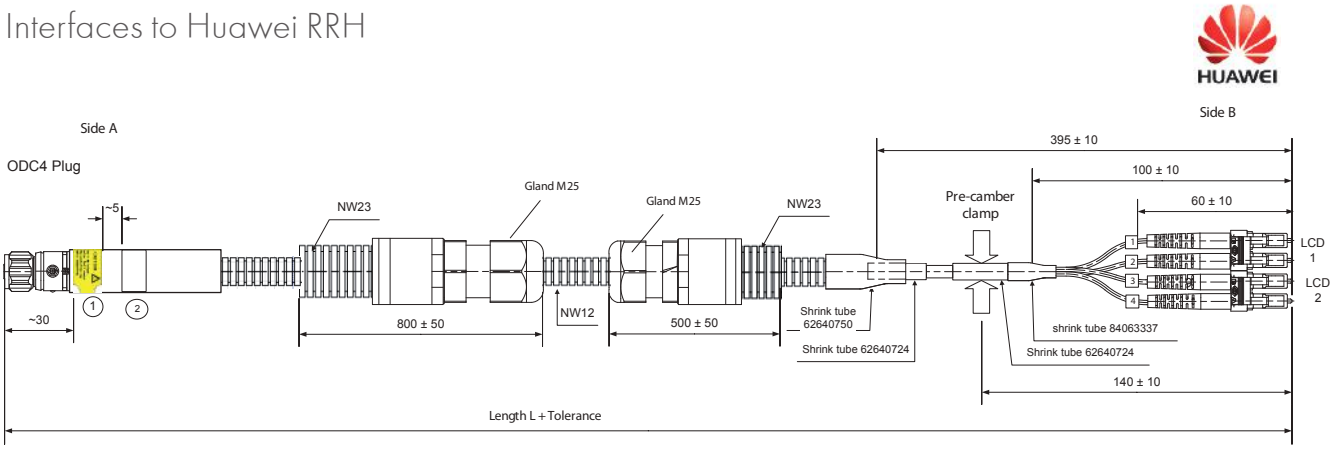
Bird Proofing on Jumpers	Heavy duty tubes fitted to FO/power fanouts
Material	Polyamide 12, black
Impact strength	>9 Joule
Compression strength	>250 N
Temperature range tube	–50 up to 95 °C
Flamability	UL94V2
Free of halogen	yes
RoHS and reach conformity	yes
Connector	ODC-4 Plug to 2x LC-Duplex (to suit RRU/RRH types)
Assembly length	2/3/5/7.5/10 m

Order information

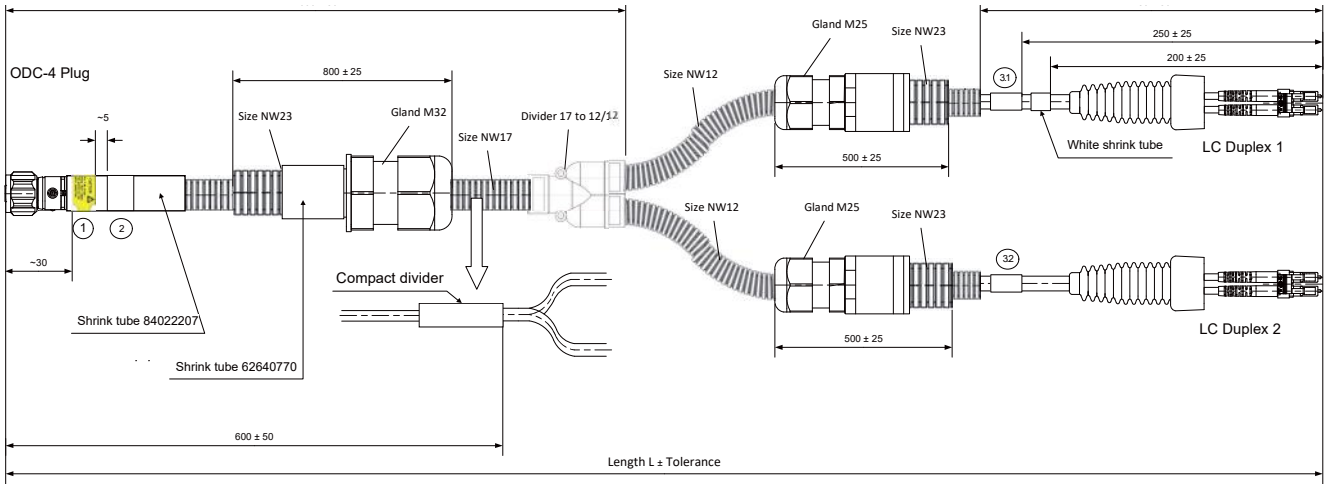
	Product description	Length m	Item
Jumpers, bird proofed	NOKIA radio head, ODCP-4, NOKIA compatible angled LC	2	85009626
		3	85009627
		5	85009471
		7.5	85009628
		10	85016409
	NOKIA radio head, ODCP-4, NOKIA compatible straight LC	2	85009709
		3	85009710
		5	85009714
		7.5	85009715
		10	85016403
	Huawei, ODCP-4, LC	2	85009632
		3	85009633
		5	85007155
		7.5	85009634
		10	85016396

Fiber optic bird proof jumper

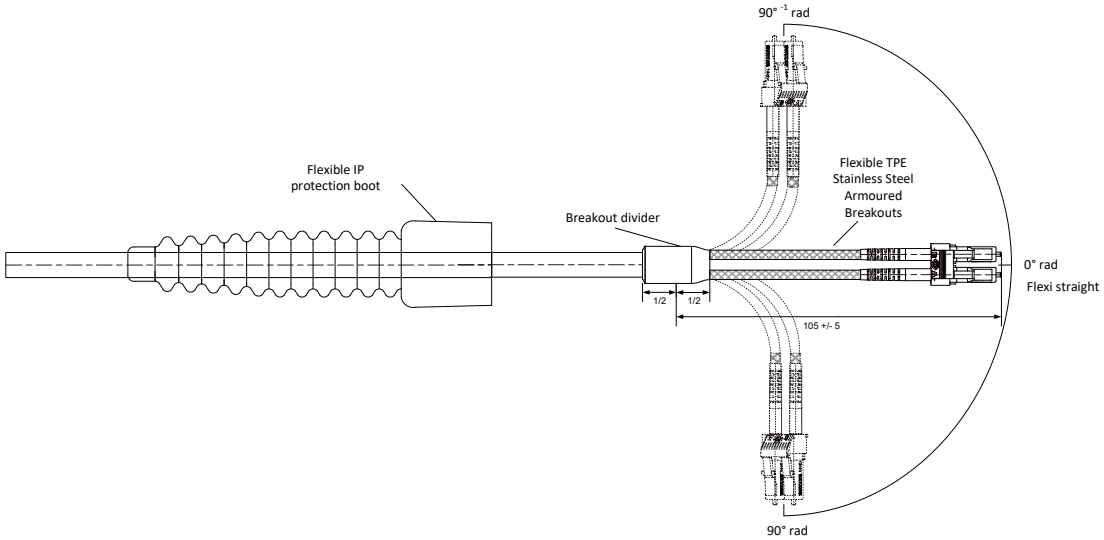
Interfaces to Huawei RRH



Interface to NOKIA radio head



Detail view



Remote Radio Installation Power Connector Single Components

Single components of the power connector for field termination are available, as well the hand tool for crimp contacts.

Plug power connector

Description	Item No.
Plug connector body and backshell	84148238
Crimp contact pin 4mm^2	85015923
Crimp contact pin 6mm^2	84148265
Plug cap	84148321

Extension (receptacle) power connector

Description	Item No.
Extension (receptacle) connector body and backshell	84148241
Crimp contact socket 6mm^2	85015921
Extension (receptacle) cap	84148319

Description	Item No.
Shrink Tube (9.5mm*50mm) shrink characteristic 3xOD	62640731

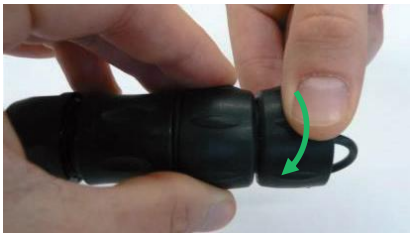
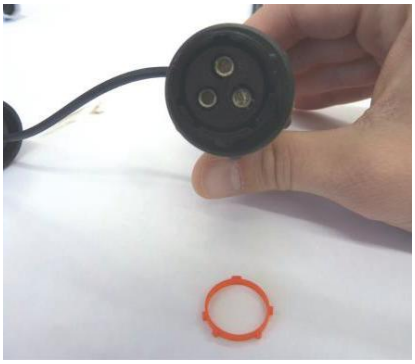
Tooling

Hand tool for 4mm^2 to 10mm^2 crimp contacts.

Description	Item No.
DMC hand tool	84151287
DMC locator	84151288

Description	Item No.
Shrink Tube (9.5mm x 50mm) shrink characteristic 3xOD	62640731

Power Connector for Remote Radio Installations

Step	Description	Picture
1	**Socket preparation** Remove the protection cap. Therefore hold the connector on the back and turn the cap counter-clock wise approx.. 90°.	
2	Pull the cap off the connector.	
3	Check if the sealing is proper inserted.	
4	If the sealing falls of the connector take it and insert it carefully as in the picture above. Make sure that the turn keys are allocated correctly.	
5	Use a small screw driver (size 0 or 1) to push down the sealing evenly all around the nut. **Caution** Do not use any spiky or sharp tools as they may damage the sealing thus will lead to loss of waterproofness.	
6	**Plug preparation** Hold the connector on the back shell and turn the coupling ring clock wise to remove the protection cap as shown.	

Power Connector for Remote Radio Installations

7	Pull off the cap	
8	**Mating of a plug and socket pair** Find the key position of both socket and plug. Check that the large key is showing towards the same direction before mounting.	
9	Align the large keys to each other before mating	
10	Turn the coupling ring counter-clock wise of the plug until the locking cams get hooked.	
11	Continue turning the coupling ring clock wise until you hear and feel the arresting "click"	
12	Check that the connectors are fully connected. The fins on the back shell are parallel and the gap between is maximum 1.5mm when the connectors are properly mated.	

Power Connector for Remote Radio Installations

13	**Un-mating of a plug and socket pair** To unlock the coupling ring of the plug hold the back shell of the socket. Turn the coupling ring clock wise.	
14	It will not work when holding the back shell of the plug, as the socket has not a turnable coupling ring.	
15	Place the protection cap onto the socket whenever it is not in use. Therefore place the protection cap onto the connector.	
16	Turn the cap clock wise until the arresting “click” is reached.	
17	Place the protection cap onto the plug whenever it is not in use. Therefore check the key positions and find the large keys which have to be mated together like in step 9.	
18	Hold the cap and turn the coupling ring counter-clock wise. Turn the coupling ring until the arresting “click”.	

Accessories for remote radio installation solutions

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

Excess cable boxes help to safely store fiber optic cable at the bottom of the mast or in 19" racks. The 19" CTB patching box with a pullout tray for easy access fits to the MASTERLINE cable system. Further, we offer a basic cable clamp portfolio, which covers most of the RRH installation solutions and cable combinations. The used clamps are field-proven, easy to install and allow for an up-grade or exchange of cables.

Cleaning kits and robust fiber-check tools enable installers to detect and potentially eliminate failures directly on-site.

Accessories and packaging

BTS connection/MTP module fitted to 19" rack

Complete fitted MTP modules and MTP panel

Description		Item no.	Picture
19" CTB with MTP Box 48 (4 × 12) [1]		85010326	
LC - LC patchcord	2 m	85009700	
	3 m	85013608	
	5 m	85013609	
	10 m	85015616	

1) MTP Modules fitted to 1U Panel

High Density ½ U MTP-module, MTP connection from the back of the module

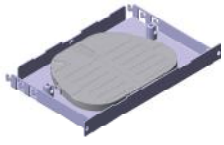
MTP Repair Kit

Description	Item no.
MTHDM-BK-0000-XX-24-SPL-MODULE 1	85074223
MA12_MTAF_MTAF_A230y_01.0_BB	84122726

Excess length box

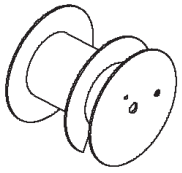
Description	Item no.	Picture
Excess length box	84103325	
ODC-4 loopback	85012332	

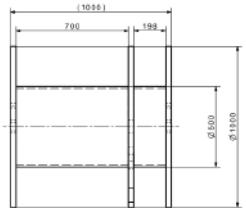
Spleissbox

Description	Item no.	Picture
Spleissbox	85074223	

Packaging/drum

MASTERLINE Extreme Hybrid is deployed on a double flange wooden reel with the inner and outer ends presented on different sections of the reel to allow easy installation whilst protecting the assembly. Normally delivered strapped to a euro pallet for ease of shipping – once removed from pallet can be rolled on-site if necessary (taking care not to damage assembly by running across excessively rough terrain). Care must be taken when removing assemby from the reel so as not to damage assembly – installation instructions should be followed closely.





Accessories and packaging

Mounting clamps

	Description	Item no.	Part no.	Picture
MASTERLINE Extreme Hybrid 6/12 6 mm² (≤ 60 m)	Hanger kit (box of 10)	84234316	HS-SH-S78	
MASTERLINE Extreme Hybrid 6/12 10 mm² (> 60 m)	Hanger kit (box of 10)	84234318	HS-SH-S114	
	Cushion insert (box of 10)	84236364	HS-CIN33114X	
MASTERLINE Extreme Hybrid 9/18 6 mm² (≤ 60 m)	Hanger kit (box of 10)	84234318	HS-SH-S114	
MASTERLINE Extreme Hybrid 6/12 10 mm² (> 60 m)	Hanger kit (box of 10)	84234318	HS-SH-S114	

Heavy-duty cable stripping tool for power and hybrid cable

Description	Item no.	Picture
Adjustable heavy-duty cable stripping tool Wire size: 4.5 to 40 mm/0.18" to 1.57" Stripping dimensions adjustable up to 4.5 mm/0.18" insulation thickness	85029959	
Spare blade for adjustable heavy-duty cable stripping tool (85029959)	85032058	

ODC torque wrench

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

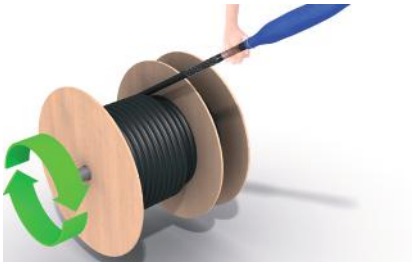
Installation manual

If you are looking for the shortest possible installation time, great installation flexibility, global cost and logistics-optimised production availability and market-oriented production sites, then MASTERLINE Extreme Hybrid (MLEH) is the right system for you.

Installation manual has been created to make an installation of the MASTERLINE Extreme Hybrid system easy.

MLEH installation manual

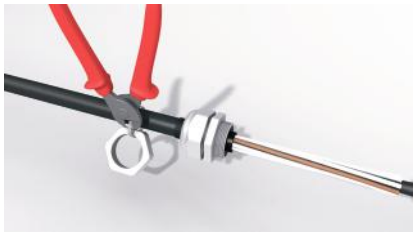
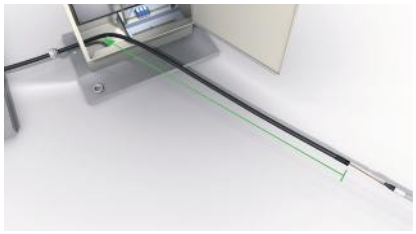
Installation of RRH side of assembly

Step	Description	Picture
1	Locate Cable reel at base of installation. Carefully unpack 'A' side with the MLEH housing from cable reel.	
2	Hoist the MLEH assembly using the hole on the top of the housing (attaching a suitable lifting hook) – managing the cable smoothly via its pre-determined route to the head of the installation. The cable is supported via a pre-mounted cable hoist which is located below the MLEH housing and should be used to help pull the cable up the riser. 84206194 HOISTING GRIP_30-20 7/8" MLEH 4/8 6mm² and 10 mm² MLEH 6/12 6 mm² Lifting hoist suitable only for this cable Max weight/pull force 240kg/2400N 85009338 HOISTING GRIP_44-36 1-1/4" MLEH 6/12 10 mm² MLEH 9/18 6mm² and 10 mm² Lifting hoist suitable only for this cable Max weight/pull force 630kg/6300N	
3	Fix the mounting bracket on the top of the mast/tower/rooftop using retaining bands or screws – whichever is most suitable for application. Mount the MLEH housing to the mounting bracket base if supplied.	
4	Cable should be attached to the tower/mast/riser/along its entire route from base to MLEH mounting position using suitable cable clamps which ensure the cable is retained without damaging/crushing the cable. Suggested distance between clamps is 1 m.	

MLEH installation manual

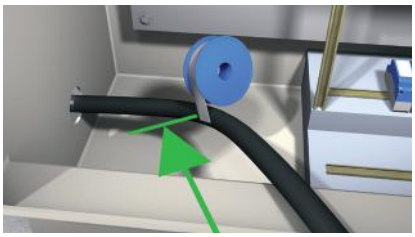
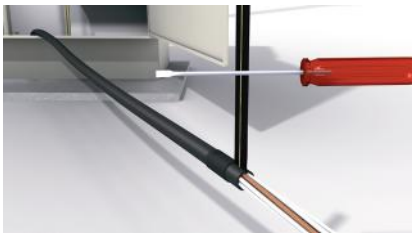
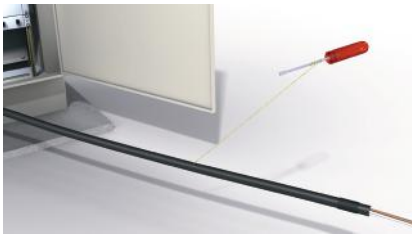
5	Cut cable ties securing blue mesh from tails and remove this protective mesh. Remove clear plastic cover from the tails to reveal the FO and DC tails within. Handle these tails with care and route them to their required locations towards RRH positions.	
6	Connecting tails/jumpers to MLEH Jumper cable connection – as required connect the FO jumper cables to the MLEH tails The FO connection is an ODC4. It should be located using the keyway in connector and adapter then pushed in and retained by screwing the connector nut by hand until it is tight. FO connector should then be tightened to required torque figure of 1 to 2 Nm using torque wrench. DC connection is a direct cabled link from the MLEH to the DC termination point within the RRU – or via a field terminated DC connector (please follow manufacturer's termination procedures) Seal the gap between the end of the protection conduit and the RRH interface ⇒ tape to prevent water ingress	 
7	Fitting birdproof shroud to MLEH housing Clip the shroud onto the MLEH divider and secure it with tie wraps or hose clamps into the grooves in the shroud. The shroud is fixed over the breakouts of the divider to aid the transition of birdproofing.	
8	After unwinding the whole assembly from the reel and while handling the assembly, **make sure that the pulling tube (on side B) is left on the assembly for as long as possible.** The pulling tube ensures IP65 protection to both the DC and FO tails.	
9	At the base of the installation route the side 'B' into the BTS enclosure/cabin using the protective pullsock – maintaining a nice smooth route. **Important**: Pull **ALL** cable over-length into the Base Station/cabin for later stripping and cutting leaving a small loop (1-2m) for flexibility.	

MLEH installation manual

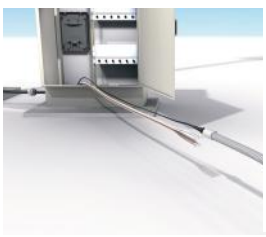
10	Once installed – To remove the protection tube, first loosen the cable gland then unscrew the cable gland from the protection tube while keeping the protection tube stationary. **Important**: Do **NOT** twist or turn the pulling tube at any time.	 
11	Once loose, finish unscrewing the gland from the pulling tube by hand, and carefully remove it from the assembly. Comment: Inside the pulling tube are the 'exposed' power wires and the protected fibre optic connectors. Be sure to leave all protection over copper and fibre optics in place at this stage and for as long as possible to reduce the possibility of damage to either.	  
12	Remove the nut attached to the hybrid cable. This nut is needed to ensure a sealed entrance of the cable to the knock-out hole at the bottom of the base station/cabin.	
13	Feed the hybrid cable through the cable entry point in the base station/cabinet. Leave the protection tubes in place. Important: Pull ALL cable over-length into the base station/cabin for later stripping and cutting leaving a small loop (1 to 2 m) to aid flexibility at a later stage.	

MLEH installation manual

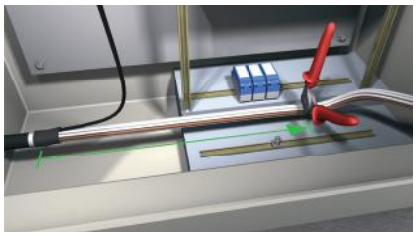
Over-length management

Step	Description	Picture
14	Measure how much hybrid cable needs to be stripped back. Mark the location on the cable with self-adhesive tape. Please note this needs to be very carefully measured to ensure the FO and DC are able to be managed effectively to their termination points.	
15	Check the length of DC a second time – just to be sure.	
16	Remove tape securing the ripcords (shown here on the right) – do not at this stage remove the protective conduit over cable Unwrap ripcords from their 'parking' position	
17	Stripping the jackets Both layers of jacket have their own pair of diametri-cally opposite ripcords which have been pre-started to make stripping easier. Protective tube over FO and DC tails should still be in position (not shown on images on the right). 1. Wrap one of the outer ripcord yarns to a screwdriver or similar. Important: For stripping and cutting of power compo-nents, wear gloves for protection. 2. Pull the ripcord yarn with some force and strip the outer nylon jacket from the hybrid cable. 3. Cut off the rest of the jacket as far as necessary using cable snips (cutters) – taking care not to damage FO or DC cores.	  

MLEH installation manual

18	Remove the excess copper foil from the cable by holding the DC wires and FO cores still and unwinding the foil from the wires/ fibres – taking care to wear protective gloves.	
19	Ensure that there are no sharp edges where the copper foil goes under the jacket: carefully remove excess foil with a Needle Nose plier and then cover with tape (see picture on right).	
20	Remove the protective tube covering the FO and DC tails exposing the tape securing the FO core and protective boot to the DC cores. Remove this tape and re-use it to secure the protective tube over the FO tails.	
21	Create a loop with the fiber optic protection tube and start coiling the fiber optic cable while holding the copper wires still.	 
22	Once the fiber optic cable is separated from the DC wires, temporarily attach it to the base station/tower/mast to keep it secure and free from contamination.	
23	Position the cable sheath at the correct point on the entry point to the cabinet/ base station and secure using cable entry gland mounted to the cable assembly if required.	

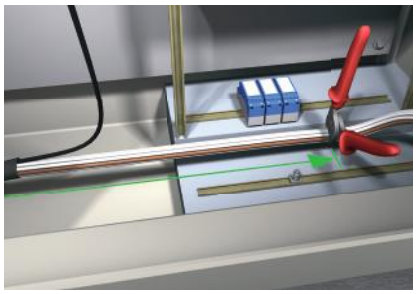
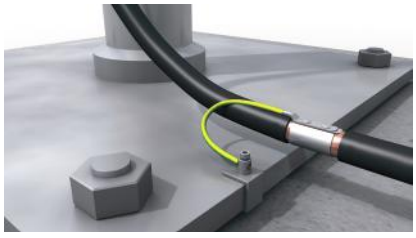
MLEH installation manual

24	Cut power wires and drain wire to the correct length. Do NOT cut fiber optic cable.	 

Connect fiber in base station

Step	Description	Picture
25	After stripping cable jacket and trimming the DC cores to length connect to the power distribution module within base station/cabinet according to the colour coding below.	

Connect power in base station

Step	Description	Picture
26	Connect drain wire to ground (safety earth) inside the base station.	
27	Earthing requirements vary between countries and customers' specific rules. Recommendation: install grounding kit prior to building entry. Comment: The cable has a copper shielding. Universal grounding kit can be used – follow separate instructions.	

MLEH installation manual

28	Any larger diameter fibre overlength can be stored in a 1U over-length panel which can be located within a 19" rack, on a wall or pole (depending on situation). Smaller diameter fibre overlength is dealt with as below	
29	Mount 1U Fibre termination panel into 19" rack Store fibre optic cable over-length inside the base station/cabinet using the cable management module fitted to the rear of the FO termination panel. Loop the fibre in using a nice smooth route leaving enough of the MTP tails to reach the MTP Module MTP module is fitted and secured to the 1U 19" panel using the push-clips provided.	 
30	CAREFULLY Remove inner protection tube to gain access to the fibre optic connectors.	
31	Remove dust caps from MTP connectors and plug into MTP modules. Channel allocation is according to the number on MTP cable – MTP1 on Cable to be plugged into MTP1 on rear of Module, MTP2 on cable to be plugged into MTP2 on rear of Module. Important: Do NOT clean MTP before connecting them to the module. MTP's are factory cleaned and verified to ensure optimal performance. Any cleaning during installation potentially decreases performance.	

MLEH installation manual

32	A verification (visible light) test can be carried out at this stage to confirm continuity of links. In order to do this an ODC4 loopback test lead will be required and is to be connected to each ODC4 output of the MLEH in turn. This will then allow a signal to be sent up from Fibre 1 in the BBU end and received back down fibre 2, the same for Fibre 3 and Fibre 4 in each leg of the MLEH ODC4's (this loopback negates the requirement to have test equipment at each end of the link). At each stage, after mating, the connectors should be inspected and cleaned if required to ensure cleanliness is maintained – especially when re-using the loopback.	
33	Fiber optic cable Connect LC duplex connector to the remote radio head Jumper cable runs between MLEH and RRU's should follow a smooth route according to the customers' guidelines and space and facilities available on the mast head or rooftop – ensuring the cable is protected from damage as much as possible. Cable clamps should be used where available to support and safely route cables along their route. Do not use cable ties to secure Fibre Optic Cables	 

Cable overlength storage box

The HUBER+SUHNER AG cable overlength storage box is designed to keep excess cable neat and tidy at installation sites and avoids unsightly tangles of surplus cables.

The cable overlength box from HUBER+SUHNER AG can be mounted almost anywhere, on poles, in racks or on walls see examples overleaf. The overlength box comes supplied with angle fixing brackets and with attach-ment screws for the brackets, a Laser warning label and some hook and loop cable ties are also included.

The box has a strong glass filled polycarbonate construction and sufficient room for 20 m of 7.0 mm diameter cable or 30 m of 5.5 mm cable. The box also comes with a lid that can be screwed into place or, if required multiple boxes can be stacked together (maximum 6) to increase the storage capacity (N.B: the cover must be removed when stacking, except for the top box).

Fig.1: The Box and Lid as it will be delivered.

List of Accessories provided (packed in self sealing bag):
- 1 × Laser Warning Label to be applied as required
- 6 × M6 × 16 mm Button Head Set Screws, Plastic Washers and Cage Nuts
- (all metal parts Stainless Steel)
- 2 × Fixing Brackets (also Stainless Steel) for Multipurpose use.
- 4 × Hook and Loop Cable Ties

The following pictures demonstrate how the box can be installed in various scenarios (see also overleaf):

Fig.2: Mounting brackets fitted to long or short sides for wall mounting (Laser warning label can be applied either inside or outside (i.e.: on Cover), at customer's discretion

Fig. 3: Mounting brackets fitted to sides for 19 inch rack mounting, with or without cover.

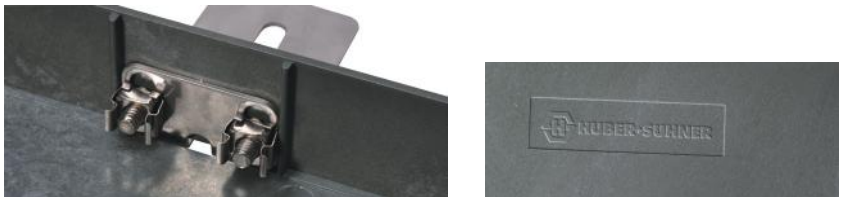


Fig. 4: How to use the screw fittings/Exchangeable Logo Field for Customer Logo (large orders only, please contact H+S)

When there is a requirement for more cable to be stored in the box than will comfortably fit, subsequent boxes can be stacked together. This is done by rotating the subsequent box(es) through 180 degrees and using the cover screws to fix the boxes together (a maximum of 6 boxes can be secured as one unit in this way). When such stacking is done there are plenty of holes for the cable to be fed through into the follow on Boxes, either inside the box(es) or outside (as shown in the pole mount image below).

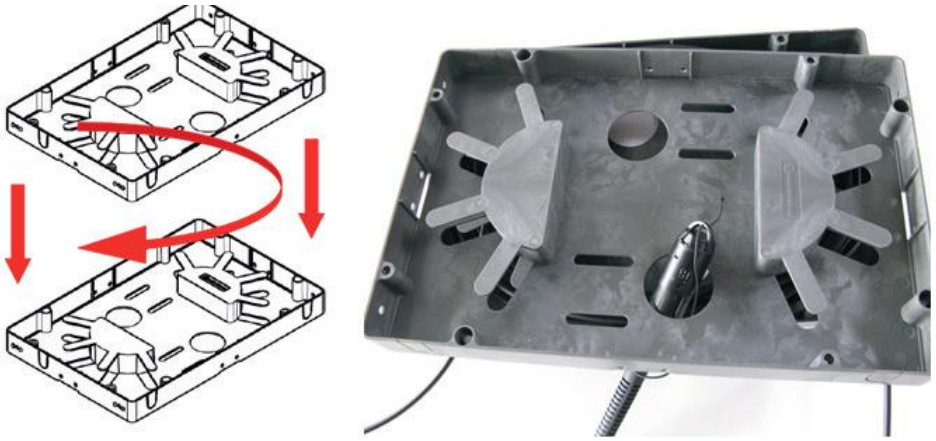


Fig. 5: Box stacking/Cable feed through to 2nd, 3rd etc... subsequent boxes.

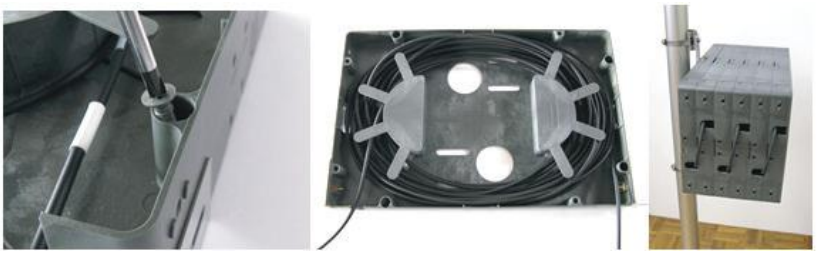


Fig. 6: Screws for stacking/cable in box/boxes stacked on pole (N.B.: max.6).

Grounding kit (incl. Stripping Process)

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 16mm^2 (AWG 6), stranded copper wire with a one-hole lug (Ø 8.5mm) provides a lowinductance transfer of lightning induced current from the hybrid cable to your system earth. Installation of ground kits is recommended at the top and bottom of each vertical run, at 60 m (200 ft.) increments and just prior to building entry. Sizing of the ground strap is accomplished by selecting the correct cable size from the chart, and removing the excess material above the corresponding cribed line.

Notice

Installation of this product should only be performed by trained, qualified and experienced personnel. Installation instructions for this product should be read thoroughly before installation is performed. The manufacturer and supplier of this product disclaim any liability or responsibility for the results of improper or unsafe installation practice.

Material list of installation

- Tinned Copper Strap Assembly with 0.5m grounding wire and one-hole lug (Ø 8.5mm)
- 50.8mm x 6.1m (2" x 20`) Roll Electrical Tape (PVC)
- 63.5mm x 0.4m (2-1/2" x 15") Roll Butyl Mastic
- Coiling tool
- Installation Manual

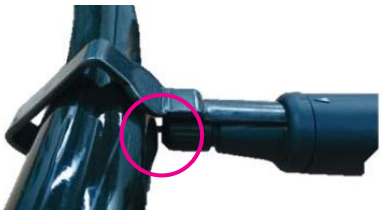
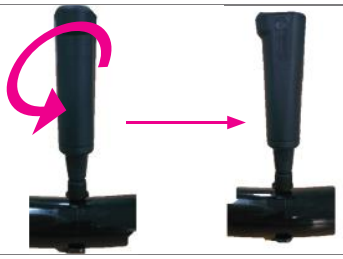
Required tools

- Stripping Tool
- Standard tipped screwdriver or 1/4" nut driver
- Scissors
- Gloves

Grounding kit installation

Step	Description	Picture
1	Verify that all parts are present as outlined in the material list.	
2	Remove approximately 51mm (2") of the outer jacket from a straight section of hybrid cable according to the following steps. NOTE: Take care not to cut or score the screen.	
2.1	The stripping tool is supplied with two different hooks: Small: Ø 4.5 – 25 mm Large: Ø 20 – 40 mm	
2.2	If the cable diameter is not in the range of the small hook, exchange it with the larger one. Therefore open the sealing cap and push the large hook into the hole to release the small hook.	
2.3	Pull out the small hook and push in the large one until you hear a "click"	
2.4	Adjust the blade to the correct length, therefore use the adjustment wheel on the top of the stripping tool.	
2.5	IMPORTANT: The length of the blade must be no longer than the thinnest part of the outer sheath! We do highly recommend to remove sheath by sheath and not both sheaths together.	

Grounding kit installation

2.6	Add the stripping tool the hybrid cable.	
2.7	Seesaw the stripping tool carefully until the blade is in the outer sheath.	
2.8	Rotate the stripping tool at least one time around the cable.	
2.9	Rotate the stripping tool around 90 degrees 	
2.10	Seesaw the blade to ensure it has found its final position and to prevent that the blade gets broken. Pull the stripping tool along the cable to the required length. (50–100mm)	
2.11	Rotate the stripping tool back (90 degrees) Seesaw the tool to ensure the blade has its correct direction. 	

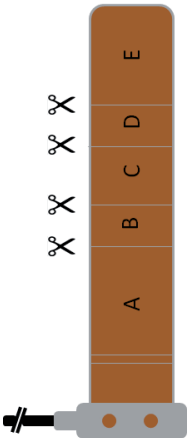
Grounding kit installation

2.12	Rotate the stripping tool again at least one time around the cable.	
2.13	Remove the stripping tool from the cable.	
2.14	Remove the outer sheath with the help of a screwdriver. NOTE! Do not push the screwdriver to the cable, just use it to lift the outer sheath.	 
2.15	Cut the two rip cords (placed opposite) away.	
2.16	The following steps descripe the removing of the inner sheath. Adjust the blade of the stripping tool again. IMPORTANT: The length of the blade must be no longer than the thinnest part of the inner sheath!	

Grounding kit installation

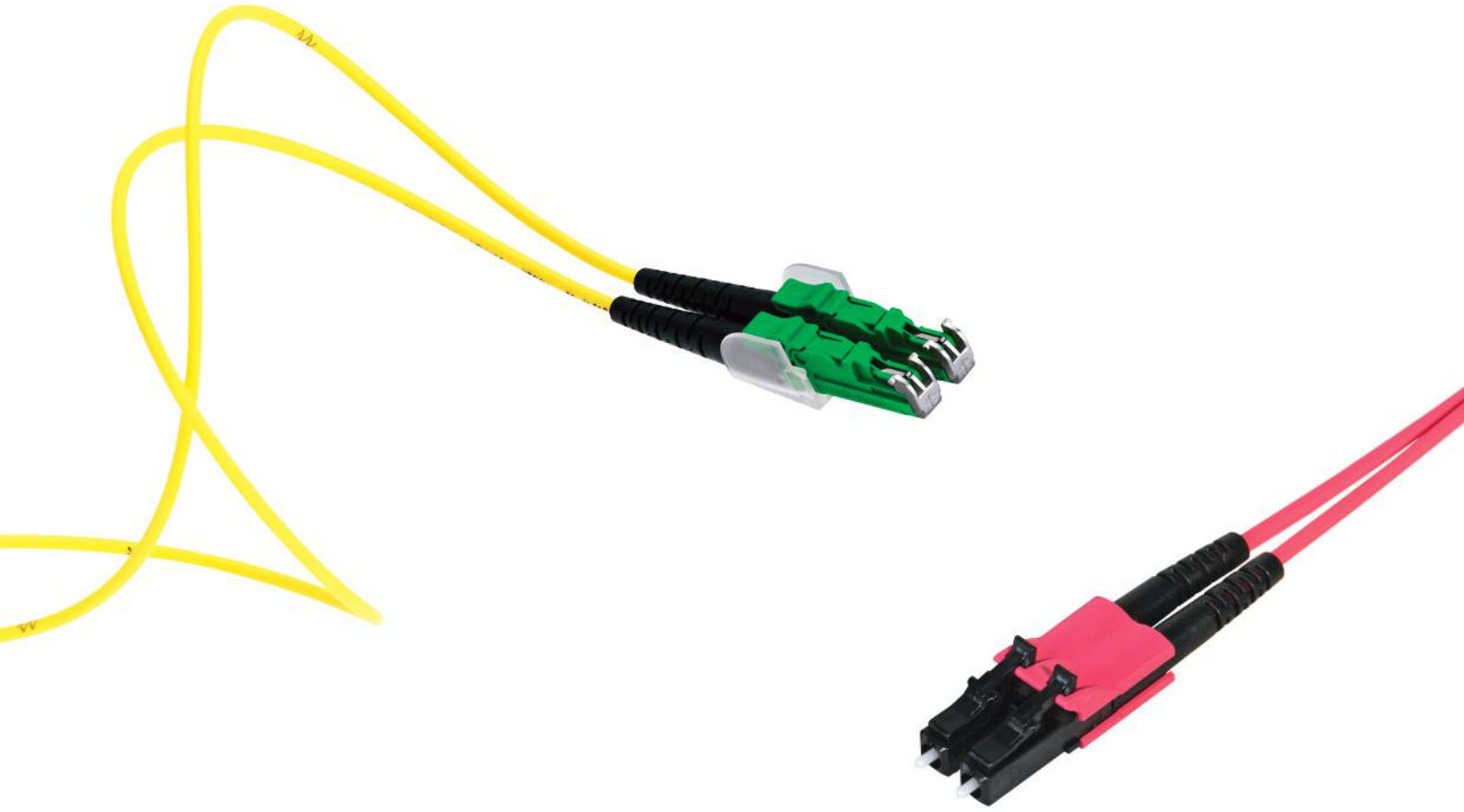
2.17	Add the stripping tool back to the cable and rotate it at least one time around the cable. IMPORTANT: The blade must not come into contact of the copper tape at any time during the stripping process.	
2.18	Rotate the stripping tool around 90 degrees 	
2.19	Seesaw the stripping tool to ensure it has found its final position. Pull the stripping tool along the cable.	
2.20	Rotate the stripping tool back (90 degrees) Seesaw the tool to ensure the blade has its correct direction. 	
2.21	Rotate the stripping tool again at least one time around the inner sheath and then remove the tool from the cable.	
2.22	At this step we no longer use the stripping tool as we have cut-off the outer sheath and the inner sheath is ready for removal.	

Grounding kit installation

2.23	Remove the inner sheath with the help of the screwdriver. NOTE! Do not push the screwdriver to the cable, just use it to lift the inner sheath carefully.	
2.24	Carefully cut off the two rip cords from the cable. IMPORTANT! Remove the transparent plastic foil from the copper tape to ensure the grounding kit has full contact to the copper.	
2.25	Check the cable and the copper tape in regards to any damages.	
3	Determine from the sketch the length of ground strap needed, and cut the strap accordingly. A = 1/2" - 3/8" B = 7/8" (Ø 28mm) C = 1-1/4" D = 2-1/4" - 1-5/8" (Ø 39mm) E = 3"	
4	Wrap the ground strap around the exposed screen with the ground lead pointing downward. Pull the end of the strap firmly through the slot as shown, and bend the strap slightly to hold it in place.	
5	Slide the end of the strap into the slot in the coiling tool and rotate it to tighten the strap using a standard-tip screwdriver or a 1/4" nut driver. Press down on the coiling tool to keep in place while starting. The expansion joint spreading and collapsing provides a visual indication. Stop tightening if expansion joint has been spreading by 1 to 3mm. Leave coiling tool in place after tightening.	

Grounding kit installation

6	Cut three 51mm (2") pieces of butyl mastic.	
7	Place one of the 51mm (2") pieces under the ground wire cable, as close to the clamp as possible.	
8	Roll the two remaining pieces of mastic into tubes and place them on either side of the clamp to act as a filler, working them into place to eliminate air pockets.	
9	Apply one layer of butyl mastic. Overlap each wind by one-half of the width of the mastic. Cut any remaining mastic and dispose of properly. Work the butyl mastic into place, removing any air gaps under the mastic.	
10	Apply three overlapping layers of vinyl electrical tape extending 51mm (2") beyond the mastic. Overlap each wind by one-half the width of the tape. Cut the remaining tape and dispose of properly.	



Cleaning of fiber optic connectors

The optical performance (optical insertion loss and return loss) of fiber-optic connectors is easily and adversely affected by contamination and scratching of the ferrule surfaces. Particles of dust, smears of grease caused by touching the ferrules, or the residue from cleaning agents, can increase insertion losses and, in extreme cases, can culminate in loss of signal. During an installation it is therefore nec-essary to ensure that ferrule end surfaces are clean, which means:

- Stock fiber-optic assemblies only in original packaging
- Do not remove dust caps until immediately before mating
- Connectors should never left lying around without protective caps in place
- Never touch the end surfaces or ‹wipe them down› and
- Always work very carefully and cleanliness is essential

LC connectors tend to be much more prone to contamination and scratching than, for example, robust ODC or Q-ODC connectors on which the ferrules are protected mechanically from physical contact.

Dirty connectors

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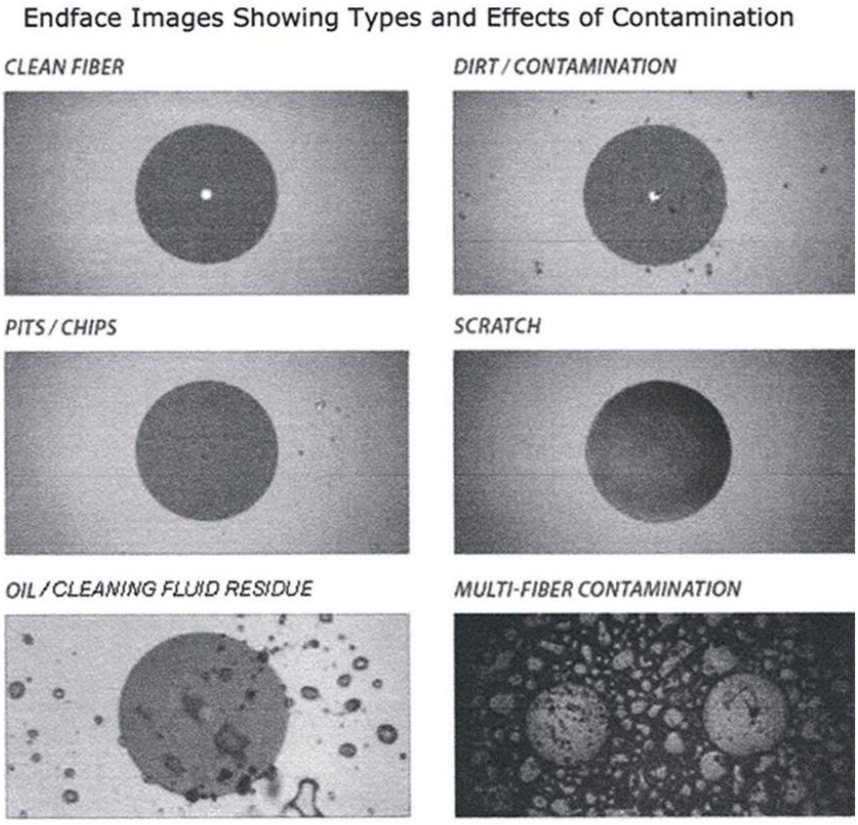
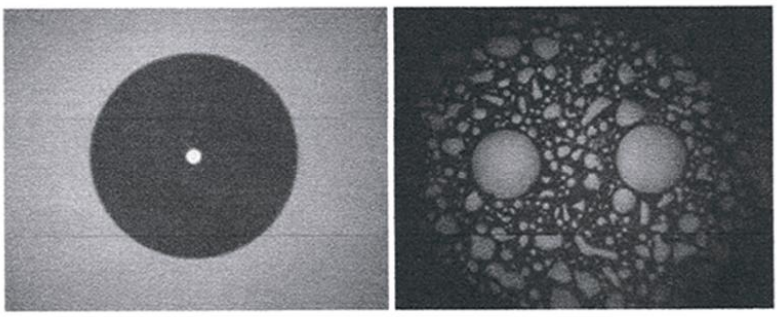


Fibre Connection and Various Connector Endface Views

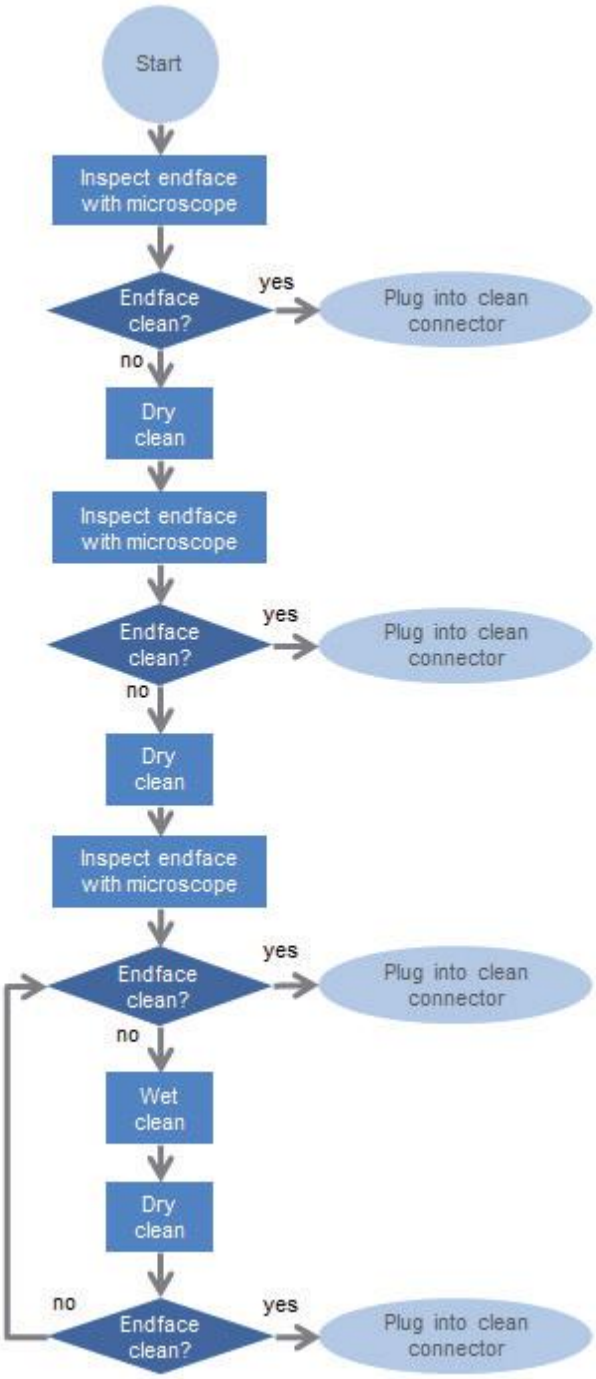
An ideal fibre endface should be free from defects or scratches as shown in the followir figure.



Defect Free Endface View

Dirty connectors

Before any TESTING all TEST EQUIPMENT CONNECTORS INCLUDING PATCHCORDS MUST HAVE the connectors scoped and cleaned if connectors are contaminated.



ALSO SEE HUBER & SUHNER FIBRE OPTIC CLEANING INSTRUCTIONS. ISSUED SEPERATELY.

Testing procedure for power meter results

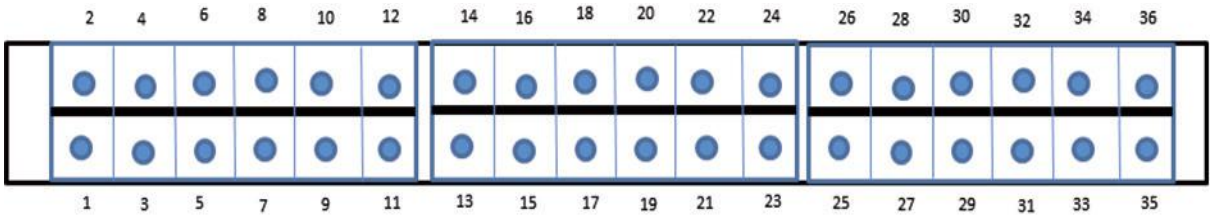
1. Zero power meter and light source using equipment manufacturer's procedures.

2. Connect loopback pigtail at top of tower to the ODC connect-or to be tested.

Note:
ODC connectors are 4 fibres per connector and each connect-or is numbered on the cable. This connector is at the antenna end of the cable (top of mast) .

Connector 1 is fibres 1 to 4
Connector 2 is fibres 5 to 8 etc. (up to 9 connectors)

3. At cabinet end of cable the fibres are presented as fibres 1 to 36 (max.) on LC connectors. Note connector numbering



4. Connect test lead from power meter to connector 1 and receiver lead to connector 2. Record power meter reading.

Note:
There must be a major change to reading on meter from no connection to mated connection. If not then try moving to next fibre. Possible reasons for no reading change on power meter.

A: Broken fibres in cable
B: Faulty connection at power meter
C: Faulty power meter.

5. Move lead from connector 1 to connector 3 and connector 2 lead to connector 4. Record power meter reading

6. Repeat the above and record readings until all fibres have been tested.

7. Important to note that this is a uni-directional test of two fibres. All results are the reading over two fibres and associated connectors and bulkheads.

8. Power meter loss readings should all be within the same region of loss.

If loss is -12 db (example figure only) then all readings should be similar. Major variations mean there is a problem and this must be investigated and reported to Optus/HUBER+SUHNER.

9. The loss over the length of fibre under test will be minimal as the cable lengths are small (fibre is aprox 0.2 to 0.3 db per km)

As a guide
Connectors will add a small loss to the loss. Typically 0.25 to 0.4 db per connector. 2.0 db loss over the total length including connectors should not be more than 2.00 db or close to that figure.

Cleaning of fiber optic connectors

All quality manufacturers of fiber-optic assemblies conduct a 100 % inspection of insertion losses and of the cleanliness of ferrule end face in an industrial environment governed by controlled processes. Factory-terminated fiber-optic connectors supplied to the market are cleaned and are ready for direct installation.

Do not clean factory terminated connectors before first installation!

A misplaced intention to clean and inspect in the field with uncontrolled processes under usual installation conditions generally gives rise to contamination and to problems in the network. Various statistical investigations and many years of experience within the landline sector confirm this. Experience from many installations shows that contamination problems disappeared overnight when field cleaning work (before first mating) was ceased during installation work.

Disregarding initial installation, field cleaning is however an important process and one that needs to be handled effectively by the installation teams. It can arise that ferrules get dirty during installation work (e.g. through physical contact) and in such cases, cleaning is urgently advised. During a network service or expansion, in many cases existing fiber-optic connections are disconnected and then get reconnected – here too, cleaning is advisable.

Cleaning of ODC connectors

Q-ODC 1.25 mm ferrule	ODC-2 1.25 mm ferrule	ODC-4 1.25 mm ferrule
		

Cleaning tools for ODC connectors	Item no.	Picture
IBC Cleaner for 1.25 mm ferrules	84108852	

Description	Item no.	Picture
Adapter for ODC-4 (plug and socket) inspection (JDSU 5000i probe)	85026608	

Comments
- Same IBC cleaner of all types of ODC connectors
- Wet cleaning for ODC connectors not recommended

Cleaning of ODC connectors

Dry cleaning of endface

ODC plug cleaning

1. Remove the purple guide cap from the device
2. Extend the tip of the cleaner approx. 1 to 2 mm and insert it into the plug straight forward
3. Risk of tip breakage

4. Push device up to the stop twice. A «click» sound indicates the end of each cleaning cycle

ODC socket cleaning

1. Open the guide cap from the device
2. Insert the guide into the socket over the ferrule
3. Push the device up to the stop stop twice. A «click» sound indicates the end of each cleaning cycle

Identification of remaining cleaning yarn

1. The window indicates if there is still cleaning yarn available. When the cleaning yarn is used up the indicator is completely red.
2. Can be used for about 500 cleaning cycles

Cleaning of standard connectors

LC 1.25 mm ferrule	SC 2.5 mm ferrule	E2000 2.5 mm ferrule
		

Cleaning tools for dry-cleaning	Item no.	Picture
IBC Cleaner for 1.25 mm ferrules	84108852	
IBC Cleaner for 2.5 mm ferrules	84095170	

Optional tools for wet cleaning	Item no.	Picture
ITW Chemtronics QbE Cleaning System	84041085	
ITW Chemtronics Electro-Wash MX Fiber Cleaning Pen	84041105	

Cleaning of standard connectors

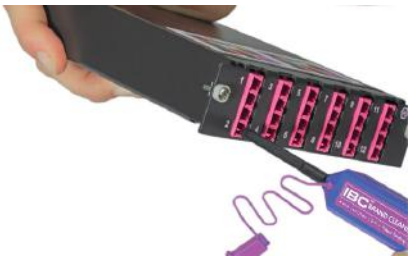
Dry cleaning of endface

Connector cleaning

1. Open the guide cap from the device
2. Insert the connector ferrule into the guide
3. Push the device up to the stop stop twice. A «click» sound indicates the end of each cleaning cycle

Cleaning through adapter

1. Remove guide cap from the device
2. Extend the tip of the cleaner approx. 1 to 2 mm and insert it into the adapter
3. Risk of tip breakage
4. Push device up to the stop twice. A «click» sound indicates the end of each cleaning cycle



Identification of remaining cleaning yarn

1. The window indicates if there is still cleaning yarn available. When the cleaning yarn is used up the indicator is completely red
2. Can be used for about 500 cleaning cycles

Cleaning of Q-XCO and FullAXS

Q-XCO LC with 1.25 mm ferrule	FullAXS LC with 1.25 mm ferrule
	

Cleaning tools for dry-cleaning	Item no.	Picture
IBC Cleaner for 1.25 mm ferrules	84108852	

Dry cleaning of endface

Q-XCO cleaning 1. Open the guide cap from the device and insert the LC ferrule into the guide 2. Push the device up to the stop stop twice. A «click» sound indicates the end of each cleaning cycle	
FullAXS cleaning 1. Open the guide cap from the device and insert the LC ferrule into the guide 2. Push the device up to the stop stop twice. A «click» sound indicates the end of each cleaning cycle	

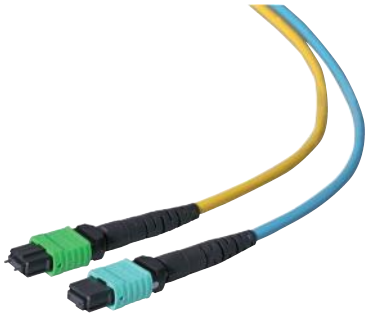
Cleaning of expanded beam connectors

EBC with lenses	Other types e.g. ProBeam Jr.
	

EBC cleaning

1. Wash connector or front of bulkhead with mounted protective cap with fresh and clean water, if they are covered with excessive dirt.
2. IMPORTANT: Clean insert surfaces and lenses only when they are touched or otherwise contaminated.
3. Remove the protective cap. Turn grip of connector and protective cap in opposite directions, until threads are completely free.
4. Blow away dirt particles from the alignment pin, ball lenses and insert surface with clean dry air.
5. Moisten a large swab with isopropyl alcohol, Electro-wash PX or equivalent. Using a back-and-forth or swirling motion, wipe the alignment pin, ball lenses, insert surface and mating surface. Use only light pressure on the ball lenses to avoid scratches.
6. If seal of grip or insert, connector threads, protective cap threads and front surfaces are dirty, then these should also be cleaned with a moistend large swab. Use again isopropyl alcohol, Electro-wash PX or equivalent.
7. Moisten a small swab with isopropyl alcohol, Electro-wash PX or equivalent. Using a back-and-forth or swirling motion, wipe the alignment pin hole.
8. Blow clean dry air over the lenses until remaining solvent and stray particles are removed.
9. Inspect the ball lenses to make sure any contamination is removed. If necessary, repeat steps 4 to 8 until the surfaces are clean.
10. Re-install the protective cap by turing grip of connector and protective cap in opposite directions and tighten them properly.

Cleaning of MTP connectors

MTP connector MT ferrule	MTP adapter
	

Cleaning tools for dry-cleaning	Item no.	Picture
OPTIPOP R cassette for MTP male connectors	84097539	
OPTIPOP R cassette for MTP female connectors	84097538	
OPTIPOP R cassette refill (6 × reels)	84097551	
IBC MTP cleaner male and female	84097537	
MTP cleaning brush	84139205	

Cleaning of MTP connectors

Dry cleaning of endface

MTP connector cleaning

1. Select the appropriate cleaner for male/female.
2. Depress the green lever so that a fresh area of cleaning cloth is exposed.
3. Position the ferrule against the cloth so that the fibers are in contact with the cleaning material. In the case of angled connectors, the ferrule will need to be adjusted accordingly.
4. Wipe the connector in the direction shown on the cassette
5. Release the grip to seal off the cleaning cloth
6. Re-inspect the ferrule with a 200 × microscope
7. If still contaminated repeat all steps once again
8. Ensure that the connector does not touch any hard surfaces

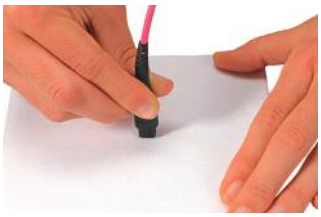
In-port MTP connector cleaning

1. Insert the IBC cleaner into the adaptor where the connector is mated
2. Rotate the tape feeder wheel as indicated on the cleaner (3x)
3. Inspect the connector with a 200 × microscope
4. If still contaminated repeat steps once more

Wet cleaning of endface

MTP connector cleaning

1. Apply an approved cleaning fluid to a small area of lint-free cleaning cloth
2. Wipe the connector over the damp area
3. For female MTP connectors use the cleaning brush and fluid to remove any debris from the pin holes or pins
4. Wipe the connector over a dry area of cloth and allow it to dry
5. Let the ferrule air-dry before inspecting with a 200 × microscope



In-port MTP connector cleaning

1. Insert the cleaning bud through the adaptor and wipe the surface of the connector ferrule
2. Insert the IBC cleaner into the adaptor where the connector is mated
3. Allow to dry and then inspect the connector with a 200 × microscope
4. If still contaminated repeat steps once more

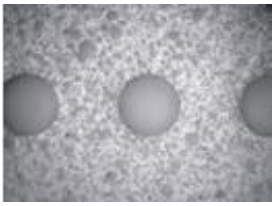
End-face inspection of fiber optic connectors

HUBER+SUHNER recommends inspection microscopes from VIAVI/Westover.

Requirements	Recommended products
Min. 200x magnification Monitor inspection (safety)	VIAVI/Westover

For end-face inspection of different fiber-optic connectors, specific adapters are necessary.

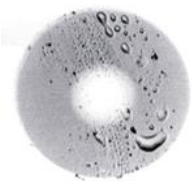
Example for MTP adapter



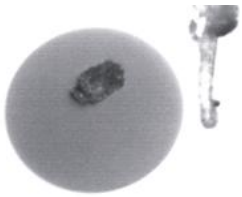
Picture of a clean multifiber connector.

Note:
A MTP/MPO contain at least 12 fibers, every fiber needs to be individually optical inspected according the mentioned parameters at the beginning of the document.

OK



NOT OK



NOT OK

Ordering information from other suppliers

Cleaning tools for ODC connectors	Supplier	Supplier item no.
IBC brand cleaning tool for 1.25 mm ferrules	US Conec Ltd.	IBC - 12910

Cleaning tools for standard connectors/Q-XCO/FullAXS	Supplier	Supplier item no.
IBC brand cleaning tool for 1.25 mm ferrules	US Conec Ltd.	IBC - 12910
IBC brand cleaning tool for 2.50 mm ferrules	US Conec Ltd.	IBC - 9392
ITW Chemtronics QbE cleaning system	ITW Chemtronics	QbE
ITW Chemtronics Electro-Wash MX fiber cleaning pen	ITW Chemtronics	FW2150

Cleaning tools for EBC connectors	Supplier	Supplier item no.
Large swab	ITW Texwipe	TX759B MicroAbsorbant™
Small swab	ITW Texwipe	TX770E MicroAbsorbant™
Isopropyl alcohol	various	–
Electro-wash PX	ITW Chemtronics	ES810, ES1210

Cleaning tools for MTP connectors	Supplier	Supplier item no.
MTP cleaning tool IBC-7104	US Conec Ltd.	IBC-7104
OPTIPOP R cassette for MTP male connectors	US Conec Ltd.	Optipop 6339
OPTIPOP R cassette for MTP female connectors	US Conec Ltd.	Optipop 6338
OPTIPOP R cassette refill (6 × reels)	US Conec Ltd.	Optipop 6232

Supplier information

Supplier	Contact information
US Conec Ltd.	1138 25th Street Southeast Hickory, NC 28602, USA www.usconec.com
ITW Chemtronics	Please check the supplier website for the local office at www.chemtronics.com
VIAVI	Please check the supplier website for the local office at www.viavisolutions.com
ITW Texwipe	Please check the supplier website for the local office at www.texwipe.com

Cleaning and inspection Videos

LC

https://www.youtube.com/watch?v=77bz3Pml8C0&index=12&list=PLcmbwSbNn6k6w0hgph-L7UgbHJgcq7nSz

MTP

https://www.youtube.com/watch?v=_rvQvrj1h3U&list=PLcmbwSbNn6k6w0hgph-L7UgbHJgcq7nSz&index=4

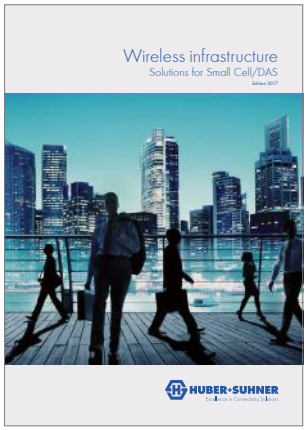
ODC 2 ODC 4
Socket /Extension

" https://www.youtube.com/watch?v=PxLTATzF81M"

FullAXS

"https://www.youtube.com/watch?v=Deye6_GmEHI"

Additional catalogues



Wireless infrastructure –
Solutions for Small Cell/DAS
Item no. 92300349

Further catalogues

All our catalogues are updated regularly. They are available in electronic format and can be accessed from our main HUBER+SUHNER homepage.

Simply go to the "Downloads" section and select "Fiber Optics" and "Catalogues" to filter down your search.

http://hubersuhner.com/en/Service-Contact/Downloads

HUBER+SUHNER AG
Fiber Optics Division
Degersheimerstrasse 14
9100 Herisau
Switzerland
Phone +41 71 353 4111
Fax +41 71 353 4444
hubersuhner.com

4763/4743/07.2017

HUBER+SUHNER is certified according to EN(AS) 9100, ISO 9001, ISO 14001, ISO/TS 16949 and IRIS.