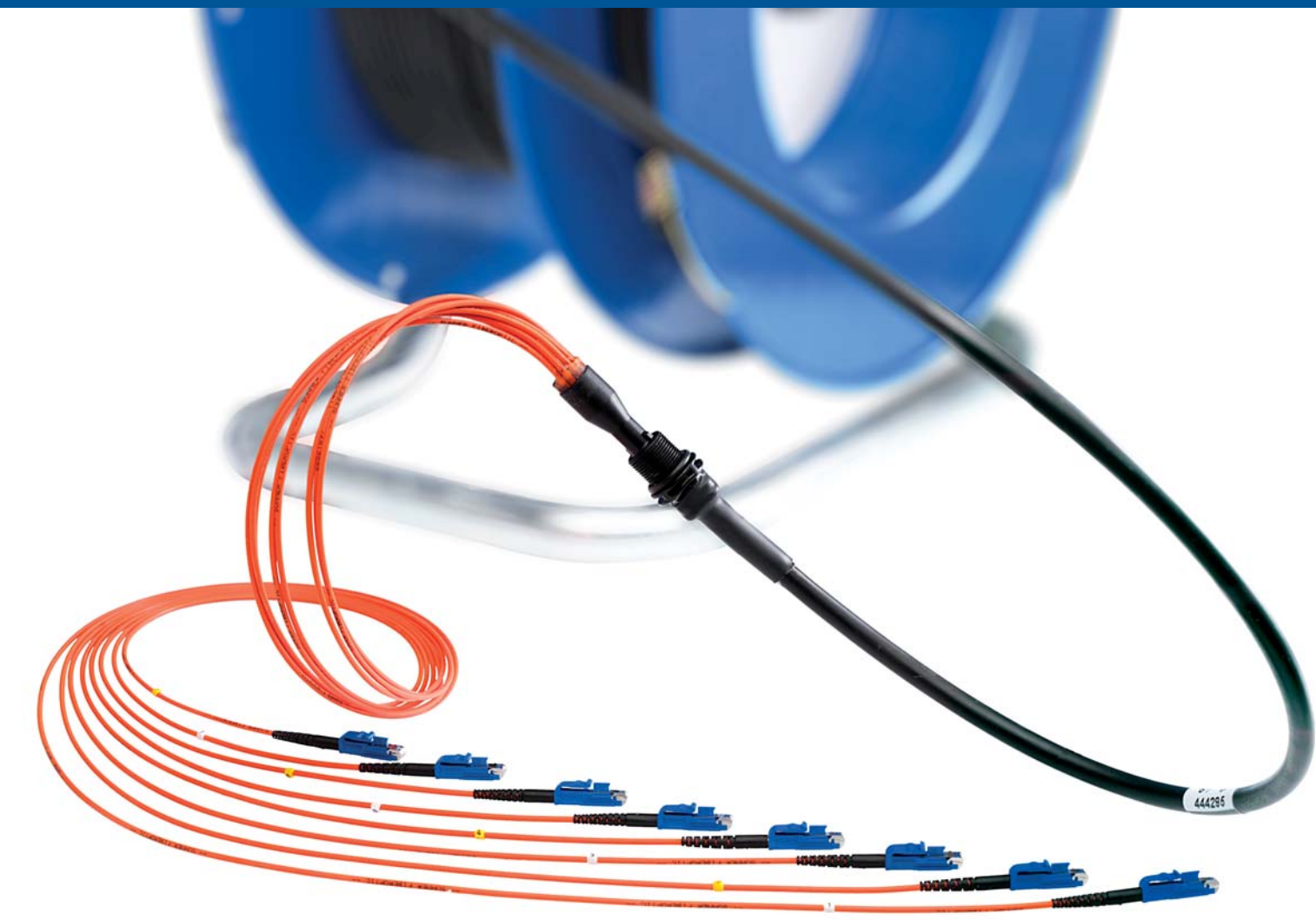
FIBER OPTIC CABLING SYSTEMS GENERAL CATALOGUE

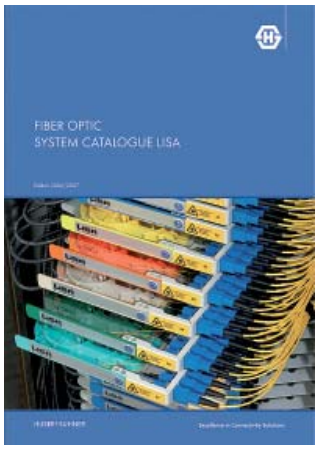
Edition 2008



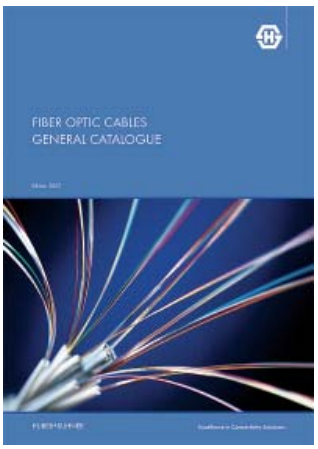
HUBER+SUHNER

Excellence in Connectivity Solutions

FURTHER FIBER OPTIC CATALOGUES

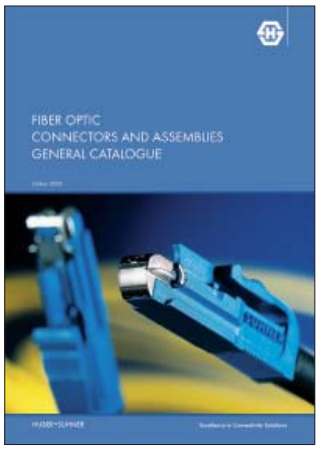


System catalogue LISA
Item no. 23040188



Cables
Item no. 84019826

Passive Components
Item no. 84019859



Connectors and Assemblies
Item no. 84019828

Contents

MASTERLINE – the pre-assembled Cable Systems

MASTERLINE pre-assembled fiber optic cable systems are designed to be safe, quick and easy to install. After laying or pulling the cable, the protective tube can be removed allowing access to the internal connectors. The pre-assembled cable system is then ready to use, with no splicing required and no need for special tools or equipment to fit connectors on site.

Five variants for different applications are available:

MASTERLINE classic
MASTERLINE lite
MASTERLINE compact
MASTERLINE mobile
MASTERLINE quick

Special features

- broad temperature range
- high mechanical tensile strength based on professional fixing of the cable strength members (no clamping on the cable jacket)
- reusable protection tube that protects the manifold cables effectively against damage, dust and water (IP67 with MASTERLINE classic and mobile)
- fast fixing of the divider with thread or groove in cutout (details see page 5)
- choice between different cabling systems; for each application the optimal cable system
- optimal design compatibility of the components and manufacturing processes (connector, cable and process are completely developed and manufactured by H+S)
- big cost-saving by time-saving installation without splicing or connector termination

The combination of these features are unique!

For detailed description of the features please see chapter 2.

SMARTLINE – the pre-assembled Cable Systems

SMARTLINE are pre-terminated, installation friendly and ready-to-use cable systems. Connectors are terminated directly to a breakout or riser cable. Such a system saves installation time and reduces cable entanglement compared to singly installed patch cables.

Two variants for different applications are available:

SMARTLINE breakout
SMARTLINE riser

Special features

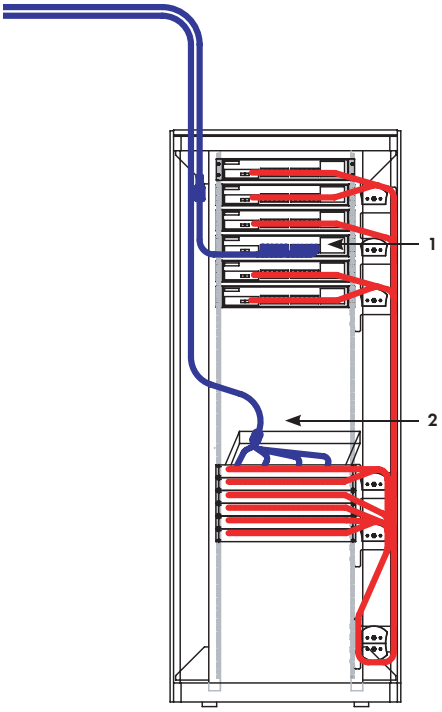
- broad temperature range
- LSFH cables with strong fire-retardant and self-extinguishing behaviour, halogen free compound and low smoke emission
- strain-relieved connectors with SMARTLINE breakout
- fast and easy installation without splicing and connector termination (ready-to-use)
- optimal design compatibility of the components and manufacturing processes (connector, cable and process are completely developed and manufactured by HUBER+SUHNER)
- big-cost saving by time-saving installation without splicing or singly installed patchcords

The combination of these features are unique!

For detailed description of the features please see chapter 2.

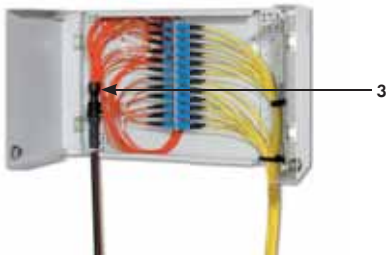
Installation possibilities

The cable systems allow a fast and easy point-to-point connection of systems and can be installed in different distribution racks and small distribution housings.
Dedicated distribution housings of HUBER+SUHNER offer easy fixing variants and allow a fast installation.
Accessories have to be ordered separately.



Example system rack with passiv/activ equipment:
MASTERLINE ends can be directly connected (1) to active devices or with a MASTERLINE cable termination box (2) and patch cables to the active devices.

MASTERLINE cable termination box (2).

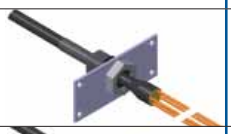
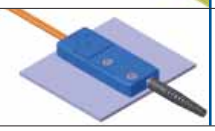


Example connection of a wall box WBC:
Fixing of the MASTERLINE divider in a u-shape cutout (3). The MASTERLINE ends can be connected directly to the adapters in the patch field.

Fixing and comparisons

Fixing of the divider

Different fixing possibilities are available for a secure and fast fixing.

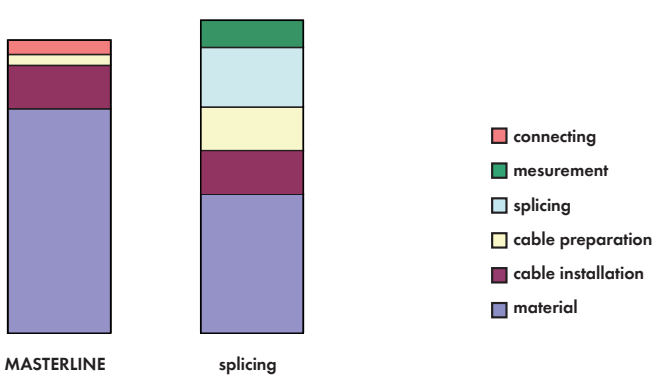
Type of fixing	MASTERLINE					SMARTLINE	
	classic	lite	compact	mobile	quick	breakout	riser
through hole with nut [1] 	✓	✓	–	✓	–	–	–
in U-shaped cutout 	✓	✓	✓	✓	–	–	–
with cable ties [2] 	(✓)	✓	✓	(✓)	✓	✓	✓
with screws 	–	–	–	–	✓	–	–

1) nut or fixing kit separately available

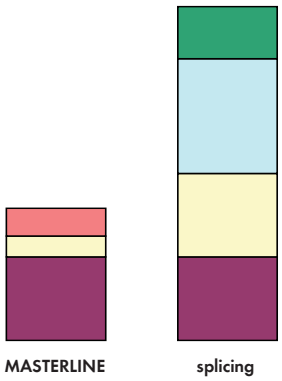
2) cable ties should fix the divider

Comparison of cost and installation time

To compare the costs of material / labour and installation times respectively are added in graph 1 and 2 of a pre-terminated cable system MASTERLINE and an installation of a cable including splicing. Graph 1 shows that the splice installation cost is slightly higher. A much bigger benefit offers MASTERLINE, as shown in graph 2, based on a much faster installation time. Beside the time benefit the installation of MASTERLINE requires no special know-how.



Graph 1 – comparison of total cost

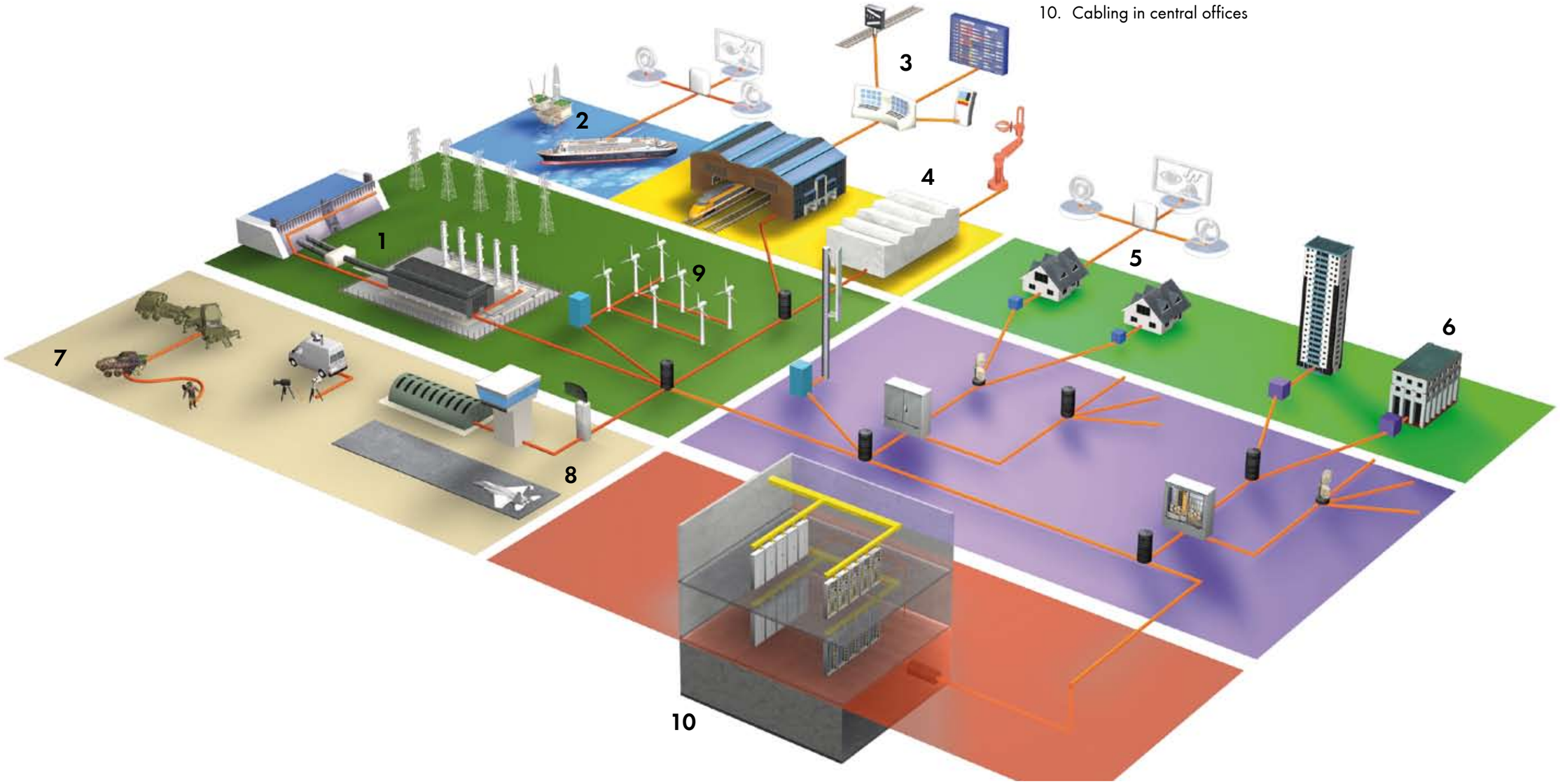


Graph 2 – comparison of installation time

Scope of system: Installation of a complete link with 24 fibers of a length of 100 m, ready-to-connect on each end with a cable termination box including each 24 adapters.

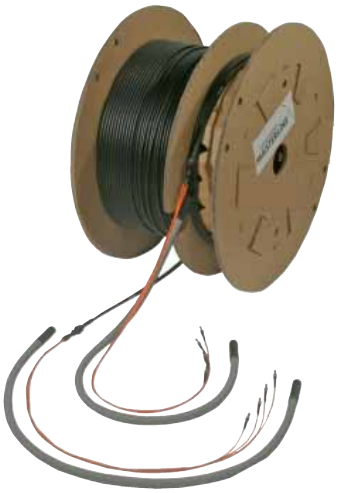
Application examples for MASTERLINE and SMARTLINE

1. Cabling of subsystems to technical building at dams, power plants and power transmission stations
2. Cabling on ships and ship-to-shore
3. Cabling of displays and ticket vending machines
4. Cabling of factories
5. Cabling of homes (FTTH)
6. Cabling of office buildings
7. Cabling of mobile vehicles and equipment
8. Cabling of buildings and premises
9. Cabling of wind mills and wind farms
10. Cabling in central offices

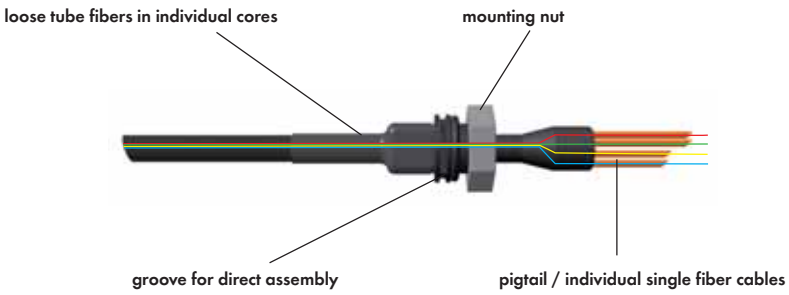


Terms and Definitions

MASTERLINE
MASTERLINE are supplied on reels and ready-to-install. The effective protection of the single fiber cables by the protection tube allows the operation in harsh environment conditions indoors and outdoors.



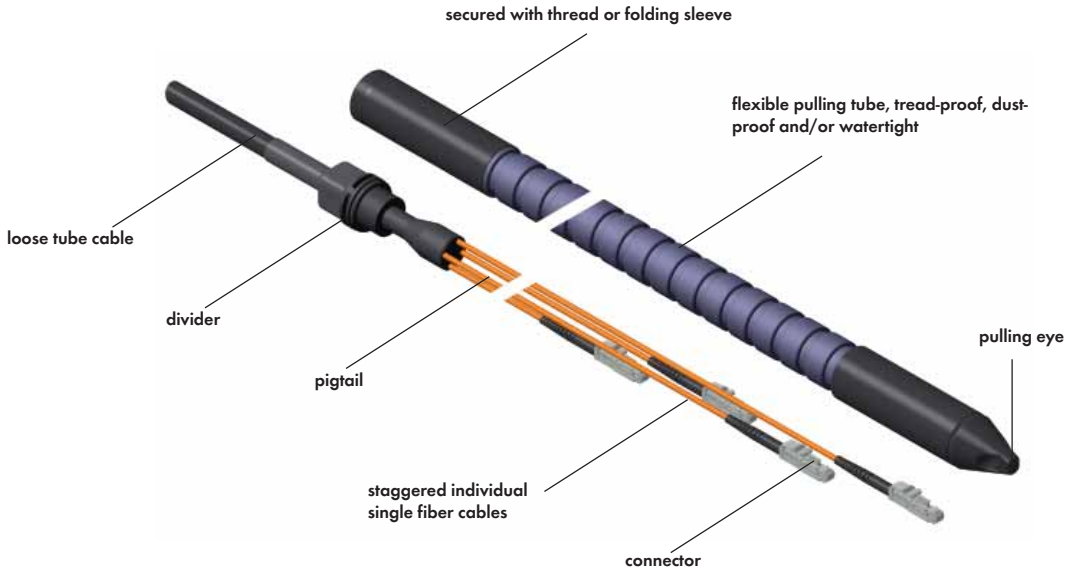
Divider
All MASTERLINE cabling systems are based on cable dividers that are specially designed by HUBER+SUHNER. Inside the divider, the optical fibers from loose tube cables are fitted into individual strain-relieved single fiber cables to which connectors are then fitted. The divider protects the optical fibers mechanically and thermally in the transition from the loose tube cable to the individual single fiber cables.
For easy attachment, e.g. in a distributor housing, the divider can be secured with a counter nut or affixed directly using the groove on the divider.



Pigtail / individual single fiber cables
The pigtail protects the optical fiber into individual single fiber cables, which are then labelled for identification purposes. Each single fiber cable is strain-relieved with aramid yarn. The halogen-free, self-extinguishing and low-smoke LSFH™ jacket material around the individual cables fulfils fire safety requirements.
In the case of MASTERLINE cable systems with a pulling tube, the pigtails are staggered to standard lengths, i.e. allowing the smallest diameter tube to be fitted.

Terms and Definitions

Pulling tube (protection tube)
The pulling tube has two functions: it helps to manually or mechanically draw in the cable in pipes or cable ducts and it provides mechanical protection for the connectors. The robust pulling tube is tread-proof and either dust-proof (IP50) or watertight (IP67) depending on the version.



Pulling eye
Each pulling tube has an eye for attaching a pulling apparatus. The specially designed shape allows the cable system to be drawn in quickly and easily, without getting jammed, even under force.

Loose tube cable
Loose tube cables contain several fibers inside one tube or loose tube. The advantage of this design is that cables with 2 to 144 fibers still have a small outer diameter. Their mechanical and thermal properties make loose tube cables suitable for outdoor and indoor applications.

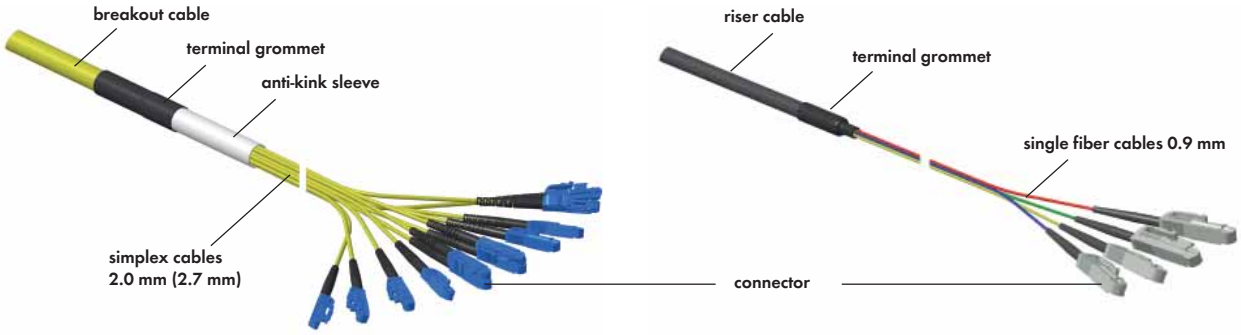
Loose tube cables for outdoor use with rodent protection or for indoor use with LSFH™ jacket.

up to 12 LWL | up to 24 LWL | up to 144 LWL | up to 12 LWL (jellyfree) | up to 144 LWL

Connector
MASTERLINE cable systems can be fitted with all HUBER+SUHNER standard connectors.

Terms and Definitions

SMARTLINE
Pre-terminated cable systems with internal ruggedized fibers of 0.9 mm, 2 mm or 2.7 mm jackets. The added protection given to the fibers, means that connectors can be directly terminated without the need of a divider. The SMARTLINE breakout cable offers the most protection and this is commonly used as a "multi-patch" cable for point to point connections. The SMARTLINE riser combines an element of protection with the added advantage of being compact, flexible and easy to splice at one end if required.



Breakout cable
Breakout cables contain several 2.0 mm simplex cables (2.7 mm optional) strengthened with aramid and bundled into a single cable.

Riser cable
Riser cables are several 0.9 mm tight tube cables bound in a strain-relieving material to form a single cable.

Terminal grommet / anti-kink sleeve
The outer jacket of breakout or riser cables is stripped off depending on the required length of the simplex or single cores. A shrink fit grommet with additional anti-kink sleeve is fixed at the transition point of the SMARTLINE breakout cable and in the case of SMARTLINE riser, a rubber terminal grommet is used.
SMARTLINE cable systems do not include a pulling tube as standard. The length of the simplex cable or individual fiber cables can be manufactured to an equal or staggered length.

Connector
MASTERLINE cable systems can be assembled with all HUBER+SUHNER standard connectors.

Colour Codes

Fiber colour codes for cable systems equipped on one side

No.	Swisscom[1]	DIN[2]	ISO	IEC[3]
1	red	red	blue	blue
2	green	green	orange	yellow
3	yellow	blue	green	red
4	blue	yellow	red	natural/white
5	natural/white	natural/white	grey	green
6	violet	grey	yellow	violet
7	orange	brown	brown	orange
8	black	violet	violet	grey
9	grey	turquoise	natural/white	turquoise
10	brown	black	black	black
11	pink	orange	pink	brown
12	turquoise	pink	turquoise	pink

1 Standard unless otherwise stated
2 DIN VDE 0888 Part 3
3 IEC 60794-2

Strands as defined by Swisscom[1]

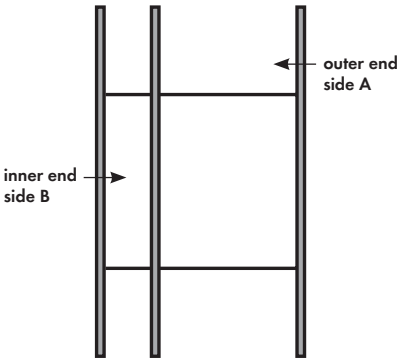
Loose tube cables

1	red
2	green
3	white 1
4	white 2
5	white 3
...	.....
Dummies	black

1 Standard unless otherwise stated

loose tube cable, stranded up to 144 fibers

loose tube cable up to 12 fibers



Length Definition

L1 = cable length / divider to divider

L2 = installed length of divider (dependent on divider type)

L3 = Pigtail length

L1, cable length	Tolerance
Up to 0.5 m	+ 4 cm
Up to 1 m	+ 6 cm
Up to 5 m	+ 30 cm
Up to 25 m	+ 50 cm
> 25 m	+ 2 %
L3, pigtail length	**Tolerance**
All	± 5 cm

Overview of Cabling Systems



Cabling systems	MASTERLINE classic	MASTERLINE lite	MASTERLINE compact
For details see	page 14	page 18	page 20
Number of fibers	2 up to 144	2 up to 24	2 up to 12
Divider	yes	yes	yes
Pigtail length, standard	staggered	staggered	not staggered
Diameter of single fiber cables	2.1 mm /1.7 mm (3.0 mm or 3.4 mm optional)	2.1 mm	2.1 mm
Protective pulling tube	yes	yes	no
Seal integrity	IP 67	IP 50	–
Mechanical characteristics			
Max. tensile strength	1000 / 1200 N	500 / 700 N	800 N
Crush resistance	200 / 250 N/cm	120 / 150 N/cm	–
Thermal characteristics			
In service	–25 °C up to +70 °C	–15 °C up to +70 °C	–25 °C up to +70 °C
In storage	–25 °C up +70 °C	–20 °C up to +70 °C	–25 °C up to +70 °C
Application	indoor and outdoor	indoor	indoor

Overview of Cabling Systems

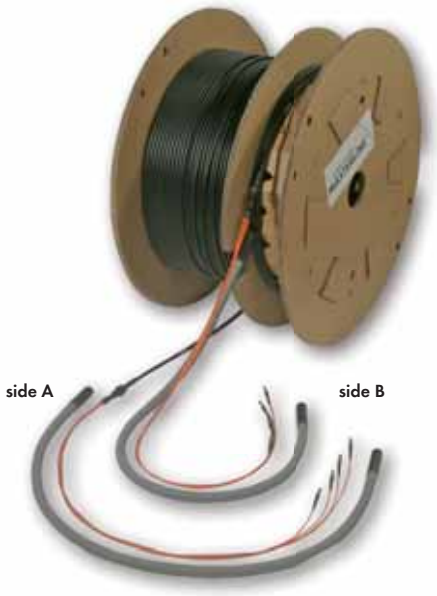



MATERLINE quick	MASTERLINE mobile	SMARTLINE riser	SMARTLINE breakout
page 22	page 24	page 28	page 30
2 up to 12	2 up to 12	4 up to 16	2 up to 16
yes	yes	no	no
not staggered	staggered	not staggered	not staggered
1.7 mm	2.7 or 3.4 mm	0.9 mm	2.0 mm (2.7 mm optional)
no	yes	no	no
–	IP 67	–	–
50 N	1000 N	[1]	[1]
[1]	200 / 250 N/cm	[1]	[1]
–25 °C up to +70 °C	–40 °C up to +70 °C	–25 °C up to +70 °C	–25 °C up to +70 °C
–25 °C up to +70 °C	–40 °C up to +70 °C	–25 °C up to +70 °C	–25 °C up to +70 °C
indoor (protected environment)	indoor and outdoor	indoor	indoor

1) See detailed specifications in data sheet for cable type

MASTERLINE classic

Can be drawn directly into pipes and ducts for demanding indoor and outdoor applications



General features

- ready to use, plug and play system
- fast and simple installation
- no splicing or connector assembly required
- single-sided or double-sided equipment versions available
- tread-proof, waterproof pulling tube with high tensile strength (IP 67)

Properties

- 2 – 48 fibers
- robust divider with screw-on mounting
- cable for indoor and outdoor use, with or without rodent protection
- can be assembled with all standard connector types
- reusable, highly robust pulling tube
- can be supplied as a cable coil, on cardboard or wooden reel

Applications

MASTERLINE classic is a robust, pre-assembled cable system for mechanically demanding indoor and outdoor applications.

- building backbone (horizontal wiring) or campus backbone (exterior wiring)
- wiring in MAN, WAN, SAN and private networks and computer centres
- wiring in industrial environments

Accessories

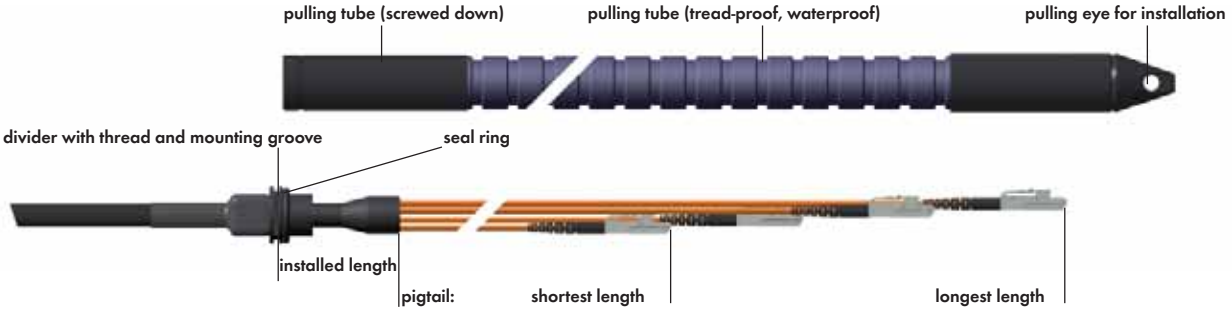
Mounting nut for divider	Item no.
M 16 x 1; 2 up to 12 fibers	23040541
M 26 x 2; up to 24 fibers	22649055
PG 29; up to 48 fibers	22649056

Adapter for fitting a larger pulling tube	Item no.
Small/medium adapter	23039455
Medium/large adapter	23039454

MASTERLINE classic

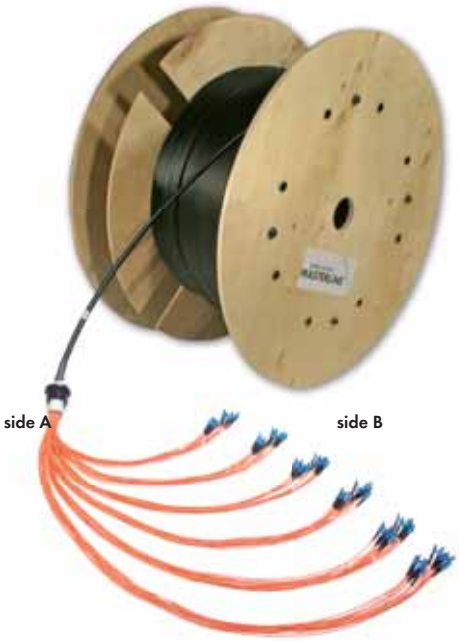
Specification		MASTERLINE classic		
Number of fibers		up to 12	up to 24	up to 48
Divider				
Outer diameter		22 mm	31 mm	45 mm
Installed length		48 mm	58 mm	70 mm
Bore diameter for mounting		15.6 – 16.4 mm	25.5 – 26.5 mm	37.0 – 39.0 mm
Thread size for mounting		M16 x 1	M26 x 2	PG29
Size of mounting groove		15.2 mm	19.2 mm	30.2 mm
Maximum tensile load on divider		1000 N	1000 N	1200 N
Pigtail / breakout cable				
Diameter of single fiber cable		2.1 mm	2.1 mm	2.1 mm
Standard pigtail length (staggered)[1]	longest lenght	1165 mm +/–50	1045 mm +/–50	1455 mm +/–50
	shortest lenght	450 mm +/–50	520 mm +/–50	520 mm +/–50
Identification of single fiber cable		coded numbers		
Jacket material		LSFH™ low-smoke, halogen-free and self-extinguishing		
Connector		all HUBER+SUHNER standard connector		
Pulling tube with pulling eye [2]				
Outer diameter		23.5 mm	31 mm	45 mm
Maximum tensile strength [2]		1000 N	1000 N	1200 N
Crush resistance		200 N/cm	250 N/cm	250 N/cm
Watertightness		IP 67	IP 67	IP 67
Cable				
Maximum length [3]		4000 m	4000 m	4000 m
Cable diameter		5.0 / 8.5 mm	10 / 12 / 15 mm	12 / 15 mm
Cable types (with / without rodent protection)		LSFH™ for indoor applications, halogen-free and self-extinguishing		
		PE for outdoor applications, longitudinal and transversal watertight		
Temperature range [4]				
During installation		–10 °C up to +50 °C		IEC 61300-2-22
In service		–25 °C up to +70 °C		
In storage		–25 °C up to +70 °C		

1) Length of pigtail can be freely defined, but max. of 5.0 m. Pulling tube cannot be fitted without staggered setup. Larger pulling tube with adapter can be fitted by agreement with technical support.
2) Tensile load on entire cable system, including pulling tube. For tensile load on cable, see data sheet for cable type.
3) Longer cable lengths by agreement with technical support.
4) Temperature range for entire cable system.



MASTERLINE classic with more than 72 Fibers

Can be drawn directly into pipes and ducts for demanding indoor and outdoor applications



General features

- ready to use, plug and play system
- fast and simple installation
- no splicing or connector assembly required
- single-sided or double-sided equipment versions available
- tread-proof, waterproof pulling tube with high tensile strength (IP 67)

Properties

- 72 – 144 fibers
- robust divider with screw-on mounting
- cable for indoor and outdoor use, with or without rodent protection
- can be assembled with all standard connector types
- reusable, highly robust pulling tube
- can be supplied as a cable coil, on cardboard or wooden reel

Applications

MASTERLINE classic is a robust, pre-assembled cable system for mechanically demanding indoor and outdoor applications.

- building backbone (horizontal wiring) or campus backbone (exterior wiring)
- wiring in MAN, WAN, SAN and private networks and computer centres
- wiring in industrial environments

Accessory

Mounting nut for divider	Item no.
PG 29, 72 up to 144 fibers	22649056

MASTERLINE classic with more than 72 Fibers

Specification	MASTERLINE classic	
Number of fibers	up to 72	up to 144
Divider		
Outer diameter	45 mm	45 mm
Installed length	70 mm	70 mm
Bore diameter for mounting	37.0 – 39.0 mm	37.0 – 39.0 mm
Thread size for mounting	PG29	PG29
Size of mounting groove	30.2 mm	30.2 mm
Maximum tensile load on divider	1200 N	1200 N
Pigtail / breakout cable		
Diameter of single fiber cable	1.7 mm	1.7 mm
Standard pigtail length	gradation on request	gradation on request
Identification of single fiber cable	coded numbers	
Jacket material	LSFH™ low-smoke, halogen-free and self-extinguishing	
Connector	all HUBER+SUHNER standard connectors	
Pulling tube with pulling eye		
Outer diameter	on request depending on connector type and pigtail	on request depending on connector type and pigtail
Maximum tensile strength		
Crush resistance		
Watertightness		
Cable		
Maximum length	on request	on request
Cable diameter max.	16.5 mm	22.0 mm
Cable types (with / without rodent protection)	LSFH™ for indoor applications, halogen-free and self-extinguishing	
	PE for outdoor applications, longitudinal and transversal watertight	
Temperature range [1]		
During installation	–10 °C up to +50 °C	IEC 61300-2-22
In service	–25 °C up to +70 °C	
In storage	–25 °C up to +70 °C	

1) Temperature range for entire cable system.

MASTERLINE lite

Low-cost, lightweight cable system for quick, easy installation in indoor applications

General features

- ready to use, plug and play system
- fast and simple installation
- no splicing or connector assembly required
- Single-sided or double-sided equipment assemblies
- tread-proof and dust-proof pulling tube (IP50)

Properties

- 2 – 24 fibers
- easy-to-mount dividers (with slot or screw-on fixture)
- cable for indoor use, with or without anti-rodent protection
- can be assembled with all standard connector types
- reusable pulling tube with hinged fixing sleeve
- can be supplied as a cable coil, on cardboard or wooden reel

Applications

MASTERLINE lite is a low-cost, pre-assembled cable system designed primarily for indoor applications.

- building backbone (horizontal wiring)
- LAN wiring and private networks

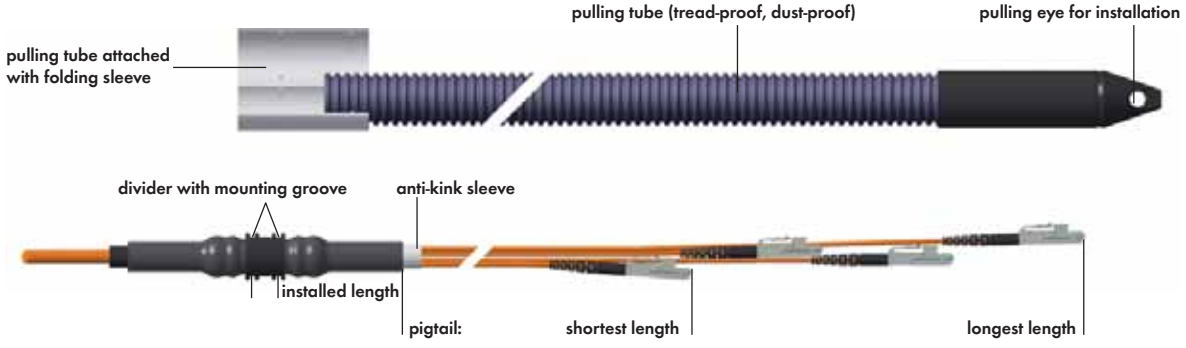
Accessories

Mounting kit (thread retainer and nut)	Qty.	Item no.
ML lite up to 12 fibers	1	84016231
ML lite up to 24 fibers	1	84016234

MASTERLINE lite

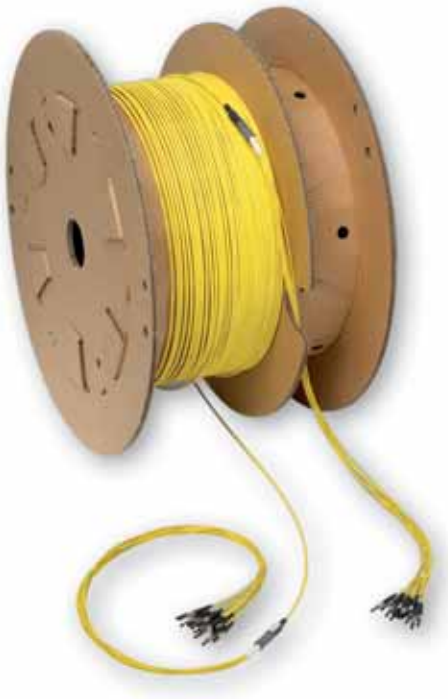
Specification		MASTERLINE lite	
Number of fibers		up to 12	up to 24
Divider			
Outer diameter		18 mm	25 mm
Installed length, two mounting grooves		50 mm / 60 mm	50 mm / 60 mm
Size of mounting groove		15 mm / 15 mm	19 mm / 15 mm
Optional accessories: thread size for mounting min. bore for mounting width across flats		PG 16 22.5 mm 26 mm	PG 21 28.5 mm 32 mm
Maximum tractive force on divider		500 N	700 N
Pigtail / breakout cable			
Diameter of single fiber cable		2.1 mm	2.1 mm
Standard pigtail length (staggered)[1]	longest length	1235 mm +/–50 mm	1235 mm +/–50 mm
	shortest length	910 mm +/–50 mm	520 mm +/–50 mm
Identification of single fiber cable		coded numbers	
Jacket material		LSFH™ low-smoke, halogen-free and self-extinguishing	
Connector		all HUBER+SUHNER standard connector	
Pulling tube with pulling eye [2]			
Outer diameter, pulling tube		22 mm	25 mm
Outer diameter, folding sleeve, pulling tube		26 mm	30 mm
Maximum tensile strength [2]		500 N	700 N
Crush resistance		120 N/cm	150 N/cm
Dust-proofing		IP 50	IP 50
Cable			
Maximum length [3]		2000 m	2000 m
Cable diameter		5.0 mm / 8.5 mm	8.5 mm / 10 mm
Cable types (with / without rodent protection)		LSFH™ for indoor applications, halogen-free and self-extinguishing	
Temperature range [4]			
During installation		–5 °C up to +50 °C	IEC 61300-2-22
In service [5]		–15 °C up to +70 °C	
In storage		–20 °C up to +70 °C	

1) Length of pigtail can be freely defined, but max. of 5.0 m. Pulling tube cannot be fitted without staggered setup.
2) Tensile load on entire cable system, including pulling tube. For tensile load on cable, see data sheet for cable type.
3) Longer cable lengths by agreement with technical support.
4) Temperature range for entire cable system.
5) Standard with 1300 nm, single-mode with 1550 nm in service –5 °C - 60 °C.



MASTERLINE compact

Compact and robust cable system for indoor applications with restricted available space



General features

- ready to use, plug and play system
- narrow cable divider
- good thermal properties
- fast and simple installation
- no splicing or connector assembly required
- single-sided or double-sided equipment assemblies

Properties

- 2 – 12 fibers
- dividers with mounting slot to fix in distribution boxes
- cable for indoor use, with or without rodent protection
- can be assembled with all standard connector types
- can be supplied as a cable coil, on cardboard or wooden reel

Applications

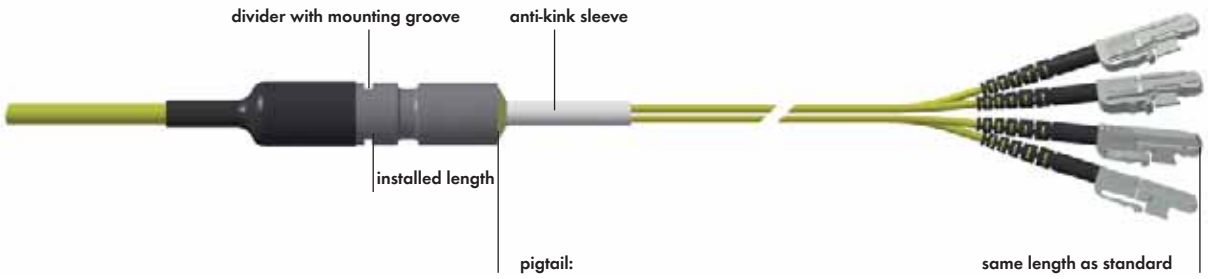
MASTERLINE compact is a pre-assembled cable system which is extremely suitable as a patch or connecting cable between two distributor units for short to medium distances.

- external patch / connecting cable (interconnection)
- as a connection between the main distribution device and transmitters
- as a connection between the main distribution device and terminal area

MASTERLINE compact

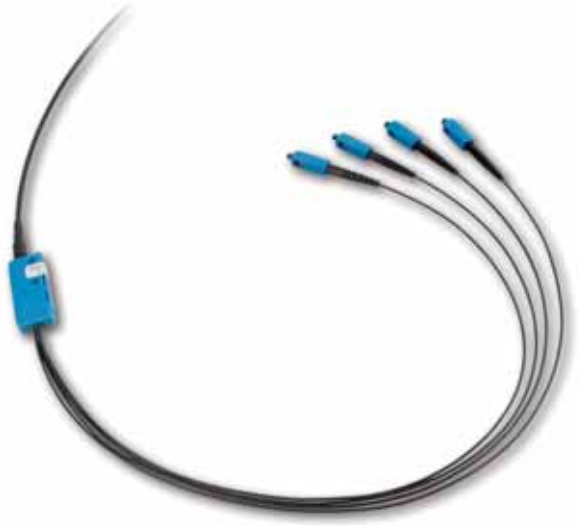
Specification	MASTERLINE compact	
Number of fibers	up to 12	
Divider		
Outer diameter	15 mm	
Installed length	30 mm	
Size of mounting groove	12 mm	
Maximum tractive force on divider [1]	800 N	
Pigtail / breakout cable [2]		
Diameter of single fiber cable	2.1 mm	
Pigtail length, standard	1000 mm – available as staggered (optional)	
Identification of single fiber cable	coded numbers	
Jacket material	LSFH™ low-smoke, halogen-free and self-extinguishing	
Connector	all HUBER+SUHNER standard connector	
Pulling tube	no	
Cable		
Maximum length [3]	2000 m	
Cable diameter	5.0 mm / 8.5 mm	
Cable types (with / without anti-rodent protection)	LSFH™ for indoor applications, halogen-free and self-extinguishing	
Temperature range [4]		
During installation	–10 °C up to +50 °C	IEC 61300-2-22
In service	–25 °C up to +70 °C	
In storage	–25 °C up to +70 °C	

1) Tensile load on entire cable system. For tensile load on cable, see data sheet for cable type.
2) Length of pigtail can be freely defined, but max. of 5.0 m.
3) Longer cable lengths by agreement with technical support.
4) Temperature range depends on cable type.



MASTERLINE quick

Guarantee a simple and fast connection, especially in Fiber To The Home (FTTH)



General features

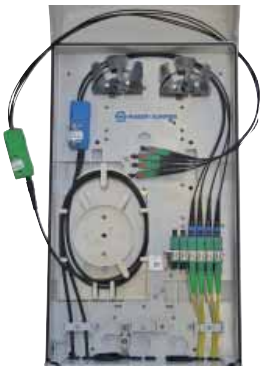
- compact flat divider in „one piece design"
- cost optimised dividing solution
- less space required
- no splicing required
- divider available in different colours
- as pre-terminated cable system or mounting set for field termination

Properties

- 2 – 12 fibers
- each single fiber cables 1.7 mm strain-relieved
- compatible with different supply cables
- can be assembled with all standard connector types
- different fixation of the divider

Applications

MASTERLINE quick is an optimised divider solution as pre-terminated MASTERLINE or as mounting set for field termination.



- for FTTH (Fiber to the home) – home side
- divider system in building backbone and FTTD
- cable divider for protected industry application

MASTERLINE quick as mounting set

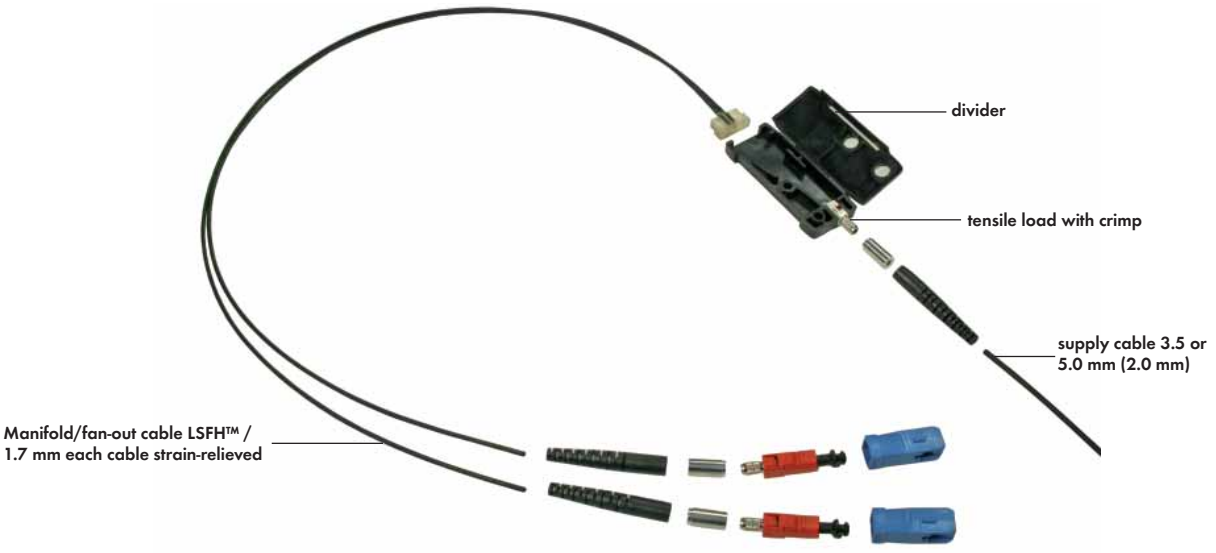
MASTERLINE quick as mounting set for direct field pre-termination.

Properties

- fast and easy mounting
- field termination
- prepared fan-out 2 up to 12 fibers
- each cable strain-relieved (LSFH™ black Ø 1.7mm)
- termination instruction
- divider housing available in blue, green, beige or black

MASTERLINE quick

Specifications	MASTERLINE quick	
Number of fibers	2 up to 12	
Divider		
Dimensions	55 × 24 × 9 mm (L×W×H)	
Colours of dividers	blue, green, beige, black	
Opening security device	warranty void	
Mounting possibilities	2 mounting holes 3.5 mm (M3); groove for cable tie	
Max. tensile load; supply cable – divider	50 N	
Max. tensile load; fan-out cable – divider	20 N	
Manifold / fan-out cables LSFH™		
Diameter	1.7 mm (2.0 mm)	
Bend radius in service / during installation	25 mm / 50 mm	
Length	0.5 +/– 0.06 m (optional possible 2.0 m)	
Identification of single fiber cable	coded numbers	
Colour	black (optional orange, yellow)	
Jacket material	LSFH™ low-smoke, halogen-free and self-extinguishing	
Connector	all HUBER+SUHNER standard connectors	
Supply cable		
Diameter	3.5 mm	5.0 mm
Bend radius in service / during installation	35 mm / 52.5 mm	50 mm / 75 mm
Outer jacket	LSFH™	LSFH™ / PE
Temperature range		
During installation	–15 °C up to +50 °C	
In service	–25 °C up to +70 °C	
In storage	–25 °C up to +70 °C	



MASTERLINE mobile

The ready-to-use fiber optic cabling system for mobile applications in the field

General features

- mobile, ready-to-operate cable system
- highly robust, specially designed for in-the-field applications
- cable types suitable for use in the field
- choice of different reels
- tread-proof, waterproof protection tube with high tensile strength (IP 67)

Properties

- 2 – 12 fibers
- robust divider with screw-on mounting
- used with cable types suitable for use in the field (up to 12 fibers)
- can be assembled with all standard connector types
- reusable, highly robust protection tube
- can be supplied on metal or plastic reel for mobile applications

Applications

The MASTERLINE mobile fiber optic cabling system, available in different versions, can be used as temporary emergency wiring or for mobile signal transmission in indoor and outdoor applications.

- broadcasting, e.g. mobile deployment for TV broadcasting
- emergency wiring, as temporary replacement for when sections of fiber optic break down
- military and security applications
- events
- industry, flexible wiring solution for moving system parts

Note: Please order the mobile reel separately.

Accessories

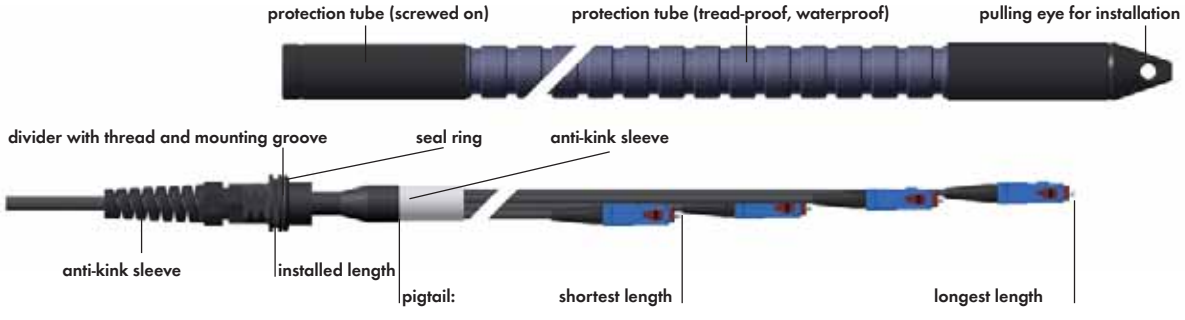
Mounting nut for divider	Item no.
M 16 x 1; small	23040541
M 26 x 2; medium	22649055

Adapter for fitting a larger protection tube	Item no.
Small/medium adapter	23039455

MASTERLINE mobile

Specification		MASTERLINE mobile				
Number of fibers		up to 4		up to 8		up to 12
Dividers		**small**	**medium**	**small**	**medium**	**medium**
Outer diameter		22 mm	31 mm	22 mm	31 mm	31 mm
Installed length		48 mm	58 mm	48 mm	58 mm	58 mm
Bore for mounting		15.6 – 16.4 mm	25.5 – 26.5 mm	15.6 – 16.4 mm	25.5 – 26.5 mm	25.5 – 26.5 mm
Thread size for mounting		M16 x 1	M26 ×2	M16 x 1	M26 × 2	M26 × 2
Size of mounting groove		15.2 mm	19.2 mm	15.2 mm	19.2 mm	19.2 mm
Maximum tensile strength on divider		1000 N	1000 N	1000 N	1000 N	1000 N
Pigtail / breakout cable						
Diameter of single fiber cables		2.7 mm 3.4 mm optional		2.7 mm	2.7 3.4 mm opt.	2.7 mm 3.4 mm optional
Standard pigtail length (staggered)[1]	longest length	1165 mm +/–50		1165 mm +/–50		1165 mm +/–50
	shortest length	970 mm +/–50		710 mm +/–50		450 mm +/–50
Identification of single fiber cables black		coded numbers				
Jacket material		LSFH™ low-smoke, halogen-free and self-extinguishing				
Connector		all HUBER+SUHNER standard connector				
Protection tube with pulling eye [2]		**small**	**medium**	**small**	**medium**	**medium**
Outer diameter		23.5 mm	31 mm	23.5 mm	31 mm	31 mm
Maximum tractive force [2]		1000 N	1000 N	1000 N	1000 N	1000 N
Crush resistance		200 N/cm	250 N/cm	200 N/cm	250 N/cm	250 N/cm
Watertightness		IP 67	IP 67	IP 67	IP 67	IP 67
Cable		**mobile field cable**		**mobile field cable**		**drag chain cable**
Outer diameter		5.6 mm		6.8 mm		13.0 mm
Outer jacket material		PUR		PUR		PUR
Maximum length [3]		on request				
Temperature range [4]						
During installation		–10 °C up to +50 °C				IEC 61300-2-22
In service		–40 °C up to +70 °C				
In storage		–40 °C up to +70 °C				

1) Length of pigtail can be freely defined, but max. of 2.0 m. Protection tube cannot be fitted without staggered setup. Larger protection tube with adapter can be fitted by agreement with technical support.
2) Tensile load on entire cable system, including protection tube. For tensile load on cable, see data sheet for cable type.
3) Cable length depends on selected reel.
4) Temperature range for entire cable system.



Mini Cable Divider

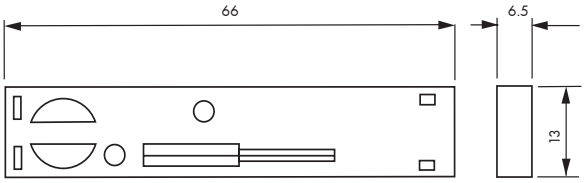
Compact cable dividers are suitable for the division of non-stranded multi-fiber loose tube cables in protected areas such as cable ducts, wall outlets and for the simplification of patch areas.

Description	Unit	Item no.
Mini cable divider	1	22653064

Features

- easy, time-saving installation
- built-in fiber insertion aid
- compact design
- up to 12 fibers

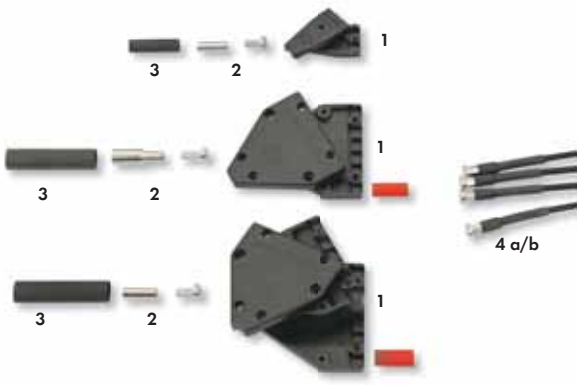
Dimensions in mm:



Scope of supply

- housing
- 900 µm PE tube, 15 m
- shrink tube

Cable Dividers



Features

- allows division of multi-fiber loose tube cable with up to 12 fibers
- connectors can directly be terminated on the supplied, strain-relieved empty tube cables
- multi-fiber loose tube cables and empty tube cables are anti-rotation protected inside the divider

Scope of supply

1 housing
2 cable entry and crimp sleeve
3 shrink tube
4a ATO/ATM/ATF:
1 m length of fiber sleeving material with outside Ø of 3.4 mm, PE jacket black, inside Ø min. 1.0 mm, insertion of fibers
4b ATOS/ATMS:
1 m length of fiber sleeving material with outside Ø of 2.1 mm, LSFH jacket black, inside Ø min. 0.55 mm, insertion of standard and H200 fibers

Not included:
Glue to fix cable jacket of glass-armoured and field cables

Type	Cable divider
ATO...	for non-armoured mulit-fiber loose tube cables
ATM...	for glass-armoured mulit-fiber loose tube cables
ATF	for field cables; for insertion of 0.9 mm tubes

Cable divider

Divider	Use with following cable types	Diameter [mm]	Dimensions [L×W×H]	Type 3.4 mm	Type 2.1 mm	Unit
2 way	02-2..../...(ZN)...	5.0	40 × 21 × 11	ATO-BK-2	ATOS-BK-2	1
	02-2..../W(ZNG)...	8.5	40 × 21 × 11	ATM-BK-2	ATMS-BK-2	1
	02-.../FSN(ZN)Z-...	6.0	40 × 21 × 11	ATF-BK-2	–	1
4 way	04-4..../...(ZN)...	5.0	60 × 60 × 11	ATO-BK-4	ATOS-BK-4	1
	04-4..../W(ZNG)...	8.5	60 × 60 × 11	ATM-BK-4	ATMS-BK-4	1
	04-.../FSN(ZN)Z-...	6.0	60 × 60 × 11	ATF-BK-4	–	1
6 way	06-6..../...(ZN)...	5.0	60 × 60 × 11	ATO-BK-6	ATOS-BK-6	1
	06-6..../W(ZNG)...	8.5	60 × 60 × 11	ATM-BK-6	ATMS-BK-6	1
10 way	10-10..../...(ZN)...	5.0	60 × 60 × 22	ATO-BK-10	ATOS-BK-10	1
	10-10..../W(ZNG)...	8.5	60 × 60 × 22	ATM-BK-10	ATMS-BK-10	1
12 way	12-12..../...(ZN)...	5.0	60 × 60 × 22	ATO-BK-12	ATOS-BK-12	1
	12-12..../W(ZNG)...	8.5	60 × 60 × 22	ATM-BK-12	ATMS-BK-12	1

SMARTLINE riser

Pre-assembled riser cable for indoor use

General features

- ready to use, plug and play system
- without divider, no strain relief for connectors
- fast and simple installation
- no splicing or connector assembly required
- single-sided or double-sided equipment assemblies

Properties

- 4 – 16 fibers
- single fiber cables 0.9 mm not strain-relieved
- connectors mounted directly on single fiber cables without divider
- LSFH™ riser cable: halogen-free, low-smoke and self-extinguishing
- can be assembled with all standard connector types
- can be supplied as cable coil, on cardboard or wooden reel

Applications

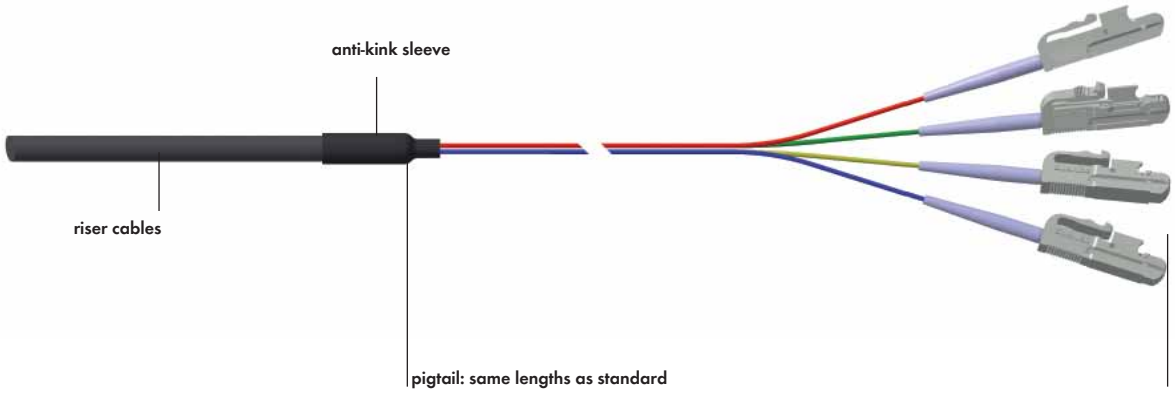
SMARTLINE riser is a lightweight pre-assembled cable system with small cable diameters, suitable for protected installation.

- installation inside buildings
- distributor cable system for indoor use in protected environment
- FTTD (fibre to the desk)

SMARTLINE riser

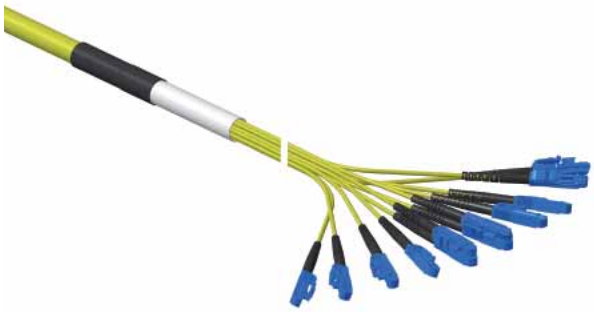
Specification	SMARTLINE riser				
Number of fibers	4	8	12	(16)	
Riser cables					
Outer diameter	5.0 mm	6.0 mm	7.0 mm	8.5 mm	
Weight	28 kg/km	33 kg/km	52 kg/km	64 kg/km	
Max. tensile strength during installation	1200 N	2400 N	3000 N	4200 N	IEC 60794-1-2 E1
Min. bend radius in service	50 mm	60 mm	70 mm	85 mm	IEC 60794-1-2 E11
Maximum length [1]	500 m				
Jacket material	LSFH™ low-smoke, halogen-free and self-extinguishing				
Pigtail / breakout cable					
Diameter of single fiber cable	0.9 mm tight tube cable				
Max. tensile strength in service per single fiber cable	10 N				IEC 60794-1-2 E1
Min. bend radius in service	25 mm				IEC 60794-1-2 E11
Pigtail length, standard [2]	as requested by customer				
Identification of single fiber cable	colour-coded				
Jacket material	TPE, halogen-free				
Connector	all HUBER+SUHNER standard connectors				
Pulling tube	no				
Temperature range [3]					
During installation	–10 °C up to +50 °C				IEC 61300-2-22
In service	–20 °C up to +70 °C				
In storage	–25 °C up to +70 °C				

1) Longer cable lengths by agreement with technical support.
2) Length of pigtail can be defined: standard 1.0 m unless specified otherwise, not staggered.
3) Specifications for single-mode fibers at 1550 nm, for multi-mode fibers at 1300 nm.



SMARTLINE breakout

Pre-assembled breakout cable for primarily indoor use



General features

- ready to use, plug and play system
- without divider, with protected transition
- each fiber enclosed in strain-relieved individual core
- fast and simple installation
- no splicing or connector assembly required
- single-sided or double-sided equipment assemblies

Properties

- 4 – 16 fibers
- individual single fiber cables: 2.0 mm standard, 2.7 mm optional
- LSFH™ breakout cable: halogen-free, low-smoke and self-extinguishing
- without divider, with protected transition
- can be assembled with all standard connector types
- can be supplied as cable coil, on cardboard or wooden reel

Applications

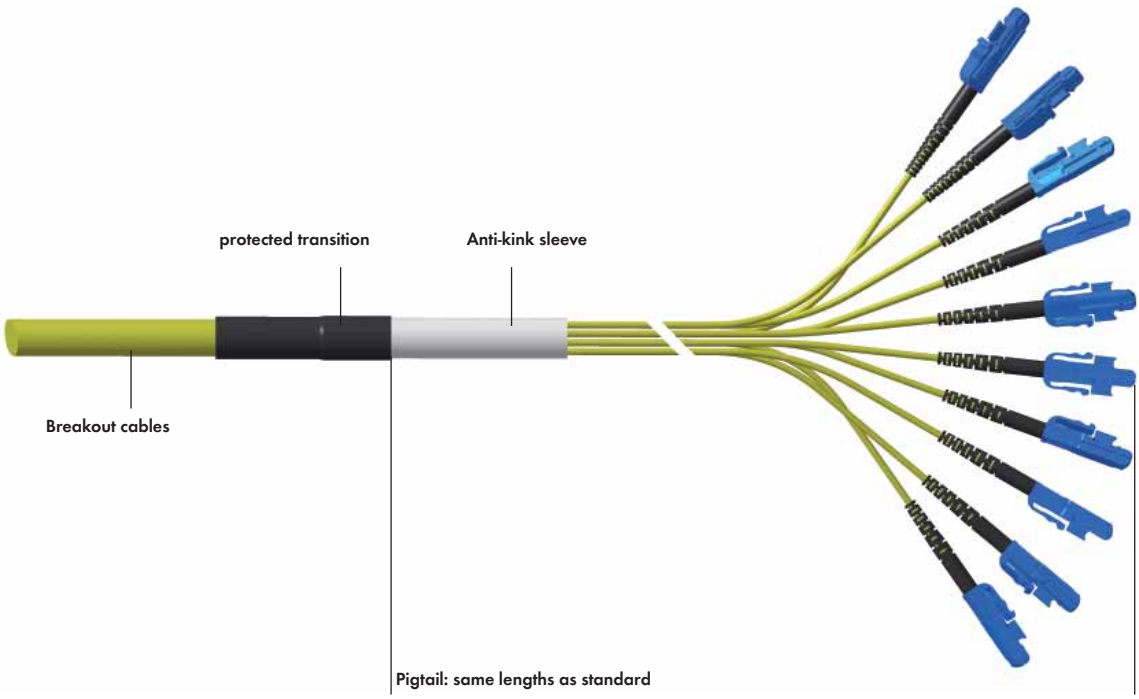
The SMARTLINE breakout cable is suitable for shorter link lengths and it is commonly used as a "multi-patch" cable for point-to-point connections.

- installation inside buildings
- data cable in distribution networks
- for horizontal cabling and collapsed backbone

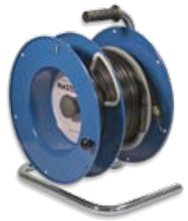
SMARTLINE breakout

Specification	SMARTLINE breakout				
Number of fibers	4	8	12	16	
Breakout cable 2.0 mm					
Outer diameter	7.0 mm	9.0 mm	12.0 mm	12.0 mm	
Weight	47 kg/km	82 kg/km	144 kg/km	135 kg/km	
Max. tensile strength during installation	1200 N	2400 N	4000 N	4000 N	IEC 60794-1-2 E1
Min. bend radius in service	70 mm	80 mm	120 mm	120 mm	IEC 60794-1-2 E11
Maximum length [1]	2000 m				
Jacket material	LSFH™ low-smoke, halogen-free and self-extinguishing				
Pigtail / breakout cable					
Diameter of single fiber cable	2.0 mm (2.7 mm optional)[2]				
Max. tensile strength in service per single fiber cable	100 N				IEC 60794-1-2 E1
Min. bend radius in service	25 mm				IEC 60794-1-2 E11
Pigtail length, standard [3]	as requested by customer				
Identification of single fiber cable	coded numbers				
Jacket material	LSFH™ low-smoke, halogen-free and self-extinguishing				
Connector	all HUBER+SUHNER standard connectors				
Protection tube	on request				
Temperature range [4]					
During installation	–10 °C up to +60 °C				IEC 61300-2-22
In service	–25 °C up to +70 °C				
In storage	–25 °C up to +70 °C				

1) Longer cable lengths by agreement with technical support.
2) With single fiber cables of diameter 2.7 mm, the outer diameter of the cable is larger.
3) Length of pigtail can be defined: standard 1.0 m unless specified otherwise, not staggered.
4) Specifications for single-mode fibers at 1310 nm, for multi-mode fibers at 1300 nm.



Overview of Mobile Cable Systems

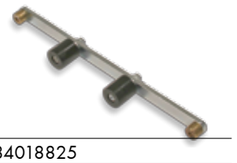




Mobile cable systems	Metal drum no. 1 – 6/500	Metal drum no. 2 – 6/220	Plastic drum no. 3 – 6/350
More details	page 34	page 35	page 36
Item no.	84018823	84018826	84018827
Weight	10 kg	7 kg	7.5 kg
Standard colour	blue	blue	black
Other colours available as option	yes	yes	no
Outer diameter, drum	442 mm	410 mm	445 mm
Width of cable drum	408 mm	300 mm	315 mm
Core diameter of cable drum	215 mm	225 mm	295 mm
Maximum cable length with diameter of 5mm	750 m	400 m	500 m
Maximum cable length with diameter of 8 mm	300 m	125 m	200 m

Accessories
Carriage with handle

Item no.	84018824
Weight	5.0 kg

84018981
4.0 kg



Reinforced reel kit > 12 kg

Item no.	84018825
Weight	1.0 kg

Overview of Mobile Cable Systems




Metal drum no. 4 – 6/800	Metal drum no. 5 – 6/1240	Backpack	Cable bag
page 37	page 38	page 39	page 40
84040374	84020552	on request	84018822
12 kg	18.8 kg	9.6 kg / 11 kg	0.5 kg
blue	orange / metal	camouflage green	grey / black
yes	no	yes	no
380 mm	460 mm	280 mm / 410 mm	330 mm
732 mm	695 mm (with crank)	–	400 mm
222.5 mm	280 mm	90 mm	–
1000 m	1240 m	300 m / 700 m	50 m
480 m	800 m	–	30 m

Metal Drum no. 1–6/500

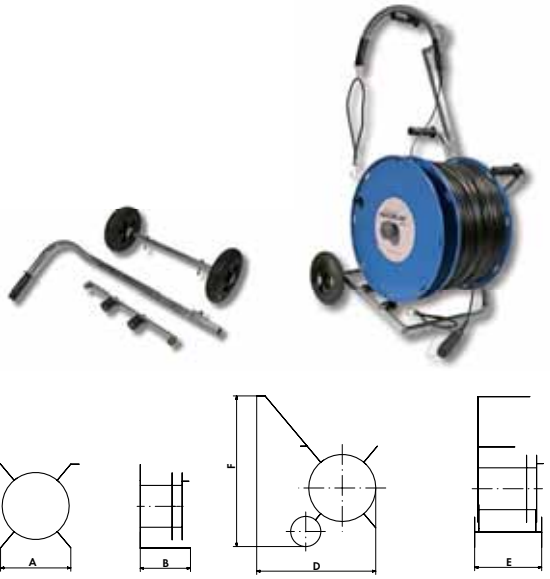
Metal cable drum for mobile deployment of suitable fiber optic cables in indoor and outdoor applications. Can be fitted with transport frame and handle for easier mobility and transportation.

General features

- metal support drum
- easy handling for indoor and outdoor applications
- two-part drum for protected inner cable end
- both cable ends accessible
- easy-to-attach cable ends
- cable drum fitted with brake/anti-rotation protection
- minimal bend radius (limited by optimised drum core)
- easy-to-retrofit optional extras

Optional

- transport frame with large rubber wheels for all terrains
- reinforced reel kit for cable weight 12 kg up to max. 30 kg
- drum colour: standard blue



Applications

Portable metal drum for mobile applications involving MASTERLINE mobile or in combination with cables and connectors suitable for use in the field.

- temporary fiber optic networks
- emergency wiring for when sections of fiber optic break down (disaster recovery)
- general mobile deployment of fiber optic cables in the field

Description	Weight	Qty.	Item no.
Metal drum no. 1 – 5/500 blue	10.0 kg	1	84018823
Carriage with handle	5.0 kg	1	84018824
Reinforced reel kit for cable weight 12 kg – 30 kg	1.0 kg	1	84018825

Dimensions (mm)

A	B	C	D	E	F	core-Ø
442	408	574	667	545	1096	215

Cable volume

Cable diameter	5 mm	6 mm	7 mm	8 mm	13 mm
Max. length [1]	750 m	500 m	400 m	300 m	70 m
Approx. cable weight	16.5 kg	14 kg	15.6 kg	15.6 kg	15.4 kg

1) cable lengths available from 12 kg with reinforced reel kit

Metal Drum no. 2–6/220

Lightweight metal cable drum for mobile deployment of fiber optic cable systems suitable for use in the field over short distances.

General features

- metal support drum
- easy handling for indoor and outdoor applications
- two-part drum for protected inner cable end
- both cable ends accessible
- easy-to-mount cable ends
- cable drum fitted with brake / anti-rotation protection
- minimal bend radius (limited by optimised drum core)

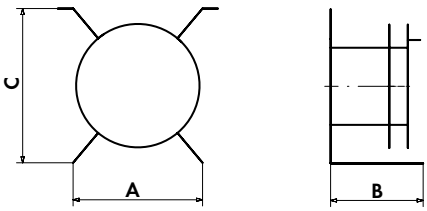
Optional

- drum colour: standard blue

Applications

Lightweight, portable metal drum for mobile applications involving MASTERLINE mobile or in combination with cables and connectors suitable for use in the field.

- temporary fiber optic networks
- emergency wiring for when sections of fiber optic break down (disaster recovery)
- general mobile deployment of fiber optic cables in the field



Description	Weight	Qty.	Item no.
Metal drum no. 2–6/220 blue	7.0 kg	1	84018826

Dimensions (mm)

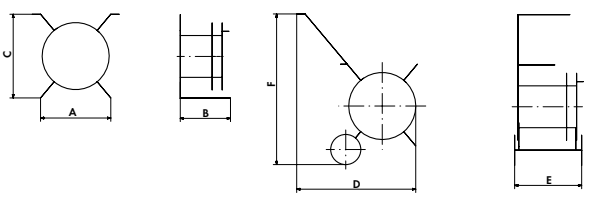
A	B	C	core-Ø
410	300	500	225

Cable volume

Cable diameter	5 mm	6 mm	7 mm	8 mm	13 mm
Max. length	400 m	220 m	160 m	125 m	45 m
Approx. cable weight	11 kg	6.1 kg	6.2 kg	6.5 kg	10 kg

Plastic Drum no. 3–6/350

Lightweight plastic cable drum for mobile deployment of fiber optic cables for use in the field in indoor and outdoor applications. Can be fitted with transport frame and handle for easy mobility and transport of cable drum.



General features

- plastic support drum
- easy handling for indoor and outdoor applications
- two-part drum for protected inner cable end
- both cable ends accessible
- easy-to-mount cable ends
- cable drum fitted with brake / anti-rotation protection
- minimal bend radius (ensured by optimised drum core)
- easy-to-retrofit transport frame

Optional

- transport frame with rubber wheels and handle for mobile applications

Applications

The plastic drum, which is either portable or mobile, is ideal for mobile applications involving MASTERLINE mobile or in combination with cables and connectors suitable for use in the field.

- temporary fiber optic networks
- broadcasting, equipment in TV broadcasting trucks
- emergency wiring for when sections break down (disaster recovery)
- general mobile deployment of fiber optic cables in the field

Description	Weight	Qty.	Item no.
Plastic drum no. 3–6/350 black	7.5 kg	1	84018827
Carriage with handle	4.0 kg	1	84018981

Dimensions (mm)

A	B	C	D	E	F	core-Ø
445	315	555	440	550	916	295

Cable volume

Cable diameter	5 mm	6 mm	7 mm	8 mm	13 mm
Max. length	500 m	350 m	260 m	200 m	75 m
Approx. cable weight	11.0 kg	9.8 kg	10.1 kg	10.4 kg	16.5 kg

Metal Drum no. 4–6/800

Mobile metal drum with light weight construction and big wheels for an easy handling of the cable in the field.

General features

- sturdy metal design
- big wheels for easy transport
- easy to handle, for use in the field
- two-part drum for protected inner cable end so both cable ends are accessible
- suitable for MASTERLINE mobile or tactical assembly
- max. length is 800 m with cable diameter of 6 mm

Properties

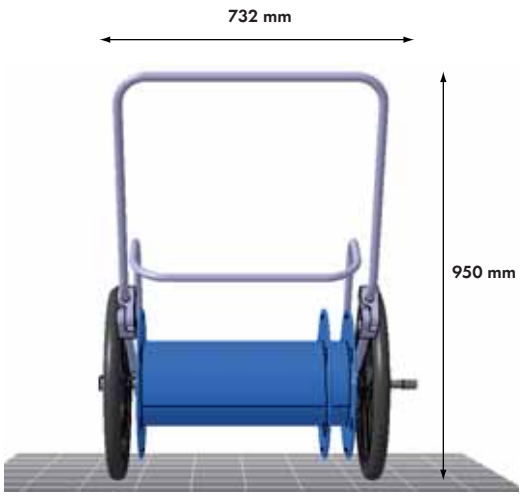
Due to the new drum design long cable lengths can be easily installed. The frame can be fold up for an easy coiling and recoiling of the cable or for a space-saving transport.

Applications

As a moveable drum for mobile and temporary application with MASTERLINE mobile or tactical assembly.

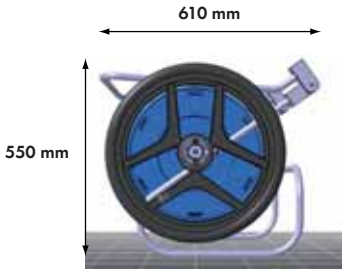
- temporary network
- emergency connection for long distances
- general for mobile and outdoor use

Description	Weight	Qty.	Item no.
Metal drum no. 4–6/800	12.0 kg	1	84040374



Dimensions (mm)

Flange	width	core-Ø	
380	445/50	222.5	mm

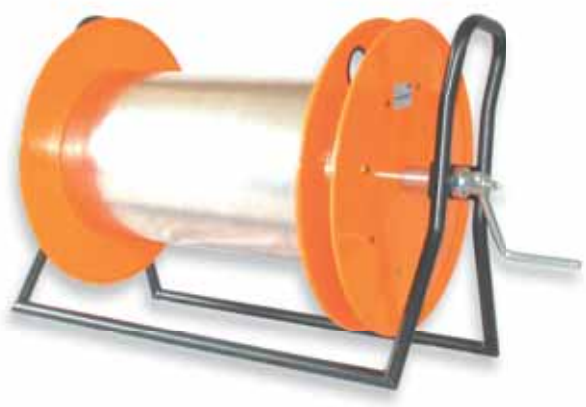


Cable volume

Cable diameter	5.5 mm	6 mm	7 mm	8 mm
Max. length	950 m	800 m	630 m	480 m
Approx. cable weight	24.7 kg	22.4 kg	24.6 kg	25 kg

Metal Drum no. 5–6/1240

Sturdy metal cable drum for mobile deployment of fiber optic cable systems suitable for use in the field over long distances.



General features

- sturdy metal design
- easy to handle, with removable crank
- two-part drum for protected inner cable end
- cable feeds through 60 mm central flange
- both cable ends accessible
- easy-to-attach cable ends
- free-standing drum
- minimal bend radius (limited by optimised drum core)

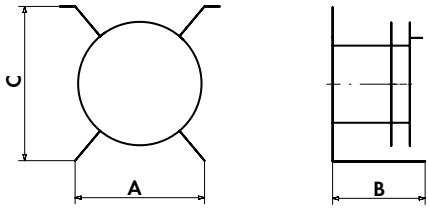
Options

- military version in camouflage green

Applications

Sturdy metal drum with longer cable lengths for mobile applications involving MASTERLINE mobile or in combination with cables and connectors suitable for use in the field.

- temporary fiber optic networks for civilian or military applications
- general deployment of fiber optic cable in the field



Description	Weight	Qty.	Item no.
Metal drum no. 5-6/1240 orange	18.8 kg	1	84020552
Metal drum no. 5-6/1240 military version: camouflage green	18.8 kg	1	84020553

Dimensions (mm)

A	B	B incl. crank	C	core-Ø
460	695	829	550	280

Cable volume

Cable diameter	5 mm	6 mm	7 mm	8 mm	13 mm
Max. length	1500 m	1240 m	900 m	700 m	260 m
Approx. cable weight	33 kg	35 kg	35 kg	36 kg	38 kg

Mobile Backpack

The backpack system is designed and tested under extreme conditions for deployment in harsh environments in the field.

carrier frame

large cable reel

lateral adjustment of shoulder strap

lock against rotation

General features

- robust carrier frame with metal drum
- cable drum easily removable
- carrying strap with adjustable length and sides
- reinforced hip belt
- both cable ends accessible
- easy-to-attach connectors
- continuous bend radius guidance
- cable drum fitted with anti-rotation protection
- pocket for crank and documents

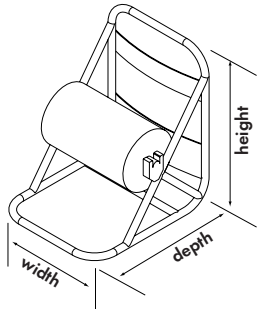
Applications

Backpack for mobile deployment of fiber optic cable in the field in military / defence applications.

Description	Max. cable length with cable Ø of 6.0 mm	Weight without cable	Flange Ø of reel
Backpack 1 army green	300 m	9.6 kg	280 mm
Backpack 2 army green	700 m	11.0 kg	410 mm

Backpack

Description	Width	Depth	Height
Backpack 1 300 m	435 mm	360 mm	555 mm
Backpack 2 700 m	400 mm	470 mm	555 mm



Specification

Shock	30 g, 11 ms	MIL-STD 810D Method 516.3 EN 60068-2-27
Vibration	passed	MIL-STD 810D Method 514.3
Salt mist	passed	MIL-STD 810D Method 509.4 IEC 60068-1

Cable Bag

This handy, lightweight cable bag is made of high-quality Cordura nylon. It is suitable for transporting mobile fiber optic cables with a length no greater than 50 m.

General features

- cordura nylon bag with padded inside compartment
- dirt-repellent, moisture-repellent surface
- velcro-type fastening
- front flap with zip fastening
- 2 document pockets
- sturdy shoulder belt
- max. air ring length of 50 m with cable diameter of 5 – 6 mm

Applications

This handy, lightweight cable bag is suitable for transporting MASTERLINE mobile and field assemblies.

- broadcasting, events and other mobile applications
- for short jumper cables, emergency wiring and other temporary uses
- wherever you need a simple, cost-effective solution for a mobile cable system

Description	Weight	Qty.	Item no.
Cable bag: silver/black outside blue/black inside	0.5 kg	1	84018822

Dimensions

Length	depth	height
400 mm	120 mm	330 mm

Cable volume

Cable diameter	5 mm	6 mm	7 mm	8 mm	13 mm
Max. length	50 m	50 m	40 m	30 m	20 m
Approx. cable weight	1.3 kg	1.4 kg	1.5 kg	1.5 kg	4.4 kg

MASTERLINE Order Code

Order code										Description		
										Version	side A	side B
1										100		
5										500		
	1									**Fiber type**	singlemode 9/125 µm	
	2										HCS 200/230 µm	
	3										multimode G50/125 µm - OM3	
	5										multimode G50/125 µm	
	6										multimode G62.5/125 µm	
										Max. number of fibers 144		
		nn-								always 2 digits (e.g. 4 fibers = 04)		
										Cable type		
			1							PE jacket, glass-armoured	≤ 12 fibers ...(ZNG)Y-G... > 12 fibers ...SN(ZNG)Y-Z...	
			2							LSFH™ jacket, glass-armoured	≤ 12 fibers ...(ZNG)H-G... > 12 fibers ...SN(ZNG)H-...	
			3							according to customer specification		
			4							LSFH™ jacket, non-armoured, jellyfree	≤ 12 fibers ...H(ZN)H-...	
			5							LSFH™ twin-tube, glass-armoured, jellyfree	≤ 24 fibers ...H(ZNG)H-...	
			6							PE twin-tube, glass-armoured	≤ 24 fibers ...W(ZNG)Y-...	
			7							LSFH™ twin-tube, glass-armoured	≤ 24 fibers ...W(ZNG)H-...	
			8							LSFH™ jacket, non-armoured	≤ 24 fibers, d=5mm	
			9							field cable		
										Connector side A		
				20-						for code for connector type see page 42 below		
										Connector side B		
					20-					for code for connector type see page 42 below		
										Cable length in m		
						0150-				always 4 digits (e.g. 150 m = 0150)		
							A-			**MASTERLINE type**	classic	
							C-				compact	
							L-				lite	
							M-				mobile	
										Attenuation classes.1letter side A, 2nd. letter side B		
									A	LAN-ECO		
									B	high-end	(standard for singlemode)	
									D	UPC		
									M	multimode		
									K	no connector		
1	5	24-	1–	20-	20-	0150-	A–		-BB	example: MASTERLINE classic, version 100		

Note: mobile cable drum has to be ordered separately for MASTERLINE mobile.

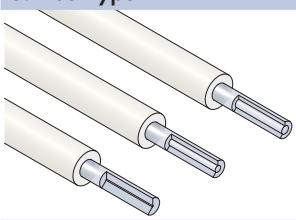
SMARTLINE Order Code

Order code									Description	
SB-									SMARTLINE breakout	
SR-									SMARTLINE riser	
									Fibre type	
	1-								singlemode	9 µm
	2-								HCS	200 µm
	3-								multimode	50 µm OM3
	5-								multimode	50 µm
	6-								multimode	62.5 µm
									Number of fibers	
		12-							(e.g. 8 fibers = 08) always 2 digits, max. 16 fibers	
									Cable type	
			2-						breakout cable LSFH™ 2.0 mm	
			3-						breakout cable LSFH™ 2.7 mm	
			4-						riser cable LSFH™	
									Connectors side 1/side 2	
				30/30-					for connector code, see list below	
									Pigtail length side 1/side 2 in cm all fiber cables are same length	
					150/150-				always 3 digits (e.g. 150 cm = 150)	
									Cable length between dividing points in m	
							0075		(e.g. 75 m = 0075) always 4 digits	
									Attenuation class side 1 / side 2	
								A	ECO	
								B	high-end (standard for singlemode)	
								C	0.1 dB	
								D	0.1 dB UPC	
								F	high-end UPC	
								M	multimode	
SB-	5-	12-	2-	30/30-	150/150-		0075	BB	example	

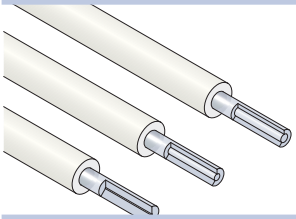
Connector type		Attenuation class					
x = on request		A	B	C	D	E	F
00	no connector						
10	FSMA						
20	ST-HQ						
22	SC-Security						
24	ST-LEAN						
30	FCPC	•	•	•	•		•
33	FCPC APC wide key		•	•			
40	LSA (DIN)						
43	LSA APC (DIN)						
70	SC	•	•	•	•	•	•
73	SC APC 8°	•	•	•		•	
77	SC Duplex	•	•		•		

Connector type		Attenuation class						
x = on request		A	B	C	D	E	F	M
78	SC APC Duplex		•					
80	LX.5		•	•	•	•	•	•
81	LX.5 Duplex		•	•	•	•	•	•
83	LX.5 APC		•	•		•		
84	LX.5 APC Duplex		•	•		•		
85	LC		•	•	•	x	•	•
86	LC APC		•	•		x		
88	LC Duplex		•	•	•	x	•	•
89	LC APC Duplex		•	•		x		
90	LSH (E-2000™)	•	•	•	•	•	•	•
93	LSH (E-2000™) APC		•	•	•	•		
97	LSH (E-2000™) Duplex	•	•	•	•	•	•	•

MASTERLINE Checklist

1. Application and use			Requirem.
	**ML classic** 2 - 144 fibers	for outdoor and indoor applications with pulling tube (highly robust)	
	**ML lite** 2 - 24 fibers	for indoor applications with pulling tube	
	**ML compact** 2 - 12 fibers	for indoor applications without pulling tube	
2. Cable type			
	for outdoor use, with rodent protection and PE outer jacket for indoor use, with rodent protection and LSFH™ outer jacket		
	for indoor use, without rodent protection and with LSFH™ outer jacket		
3. Cable length			
	cable length in m, from divider side A to divider side B		
4. Number of fibers			
		ML classic	ML lite	ML compact
				
	small divider	2 - 12 fibers	2 - 12 fibers	2 - 12 fibers
	medium divider	up to 24 fibers	up to 24 fibers	n/a
	large divider	up to 72 / 144 fibers	n/a	n/a
5. Fiber type				
		singlemode	E9/125/250 µm	
		multimode	G50/125/250 µm G62.5/125/250 µm	(OM2 and OM3)
		step index (HCS)	H200/230/500 µm	
6. Connector type				
				
LSH (E-2000)	SC	FCPC	ST-LEAN	ST-security
				
LX.5	LC	MU	FSMA	LSA (DIN)
Optional: pigtail length				
	length of pigtail; pulling tube cannot be used without staggered pigtail			

MASTERLINE mobile Checklist

1. Application and use					Requirem.
		**ML mobile** 2 – 12 fibers	for mobile outdoor and indoor applications with protection tube		
2. Cable type					
		**mobile field cable, up to 8 fibers** with PUR outer jacket			
		**mobile drag chain cable, up to 12 fibers** with PUR outer jacket			
3. Cable length					
		**cable length in m**, from divider side A to divider side B			
4. Number of fibers					
	**Cable type**	**Divider**	**Protection tube**	**Ø of pigtail**	
	up to 4 fibers 04-.../FSN(ZN)Z-.56	small; Ø = 22 mm	small, medium with adapter	2.7 mm	
				3.4 mm optional	
		medium; Ø 31 mm	medium size	2.7 mm	
				3.4 mm optional	
	up to 8 fibers 08-.../FSN(ZN)Z-.68	small; Ø = 22 mm	small, medium with adapter	2.7 mm	
				n/a	
		medium; Ø 31 mm	medium size	2.7 mm	
				3.4 mm optional	
	up to 12 fibers 12-.../FSN(ZN)Z-.130	medium; Ø 31 mm	medium size	2.7 mm	
				3.4 mm optional	
5. Fiber type					
		singlemode	E9/125/250 µm		
		multimode	G50/125/250 µm G62.5/125/250 µm	(OM2 and OM3)	
		step index (HCS)	H200/230/500 µm		
6. Connector type					
					
LSH (E-2000)	SC	FCPC	ST-LEAN	ST-security	
					
LX.5	LC	MU	FSMA	LSA (DIN)	
Optional: pigtail length					
	length of pigtail; protection tube cannot be used without staggered pigtail				

MASTERLINE quick Checklist

When ordering, the following options are possible and have to be defined:

1.	cable type supply cable	3.5 mm or 5.0 mm
2.	length of supply cable	from divider to divider
3.	number of fibers	2 up to max. 12
4.	fiber type	SM (E9), MM (G50-OM2, G50-OM3, G62.5)
5.	connector type / attenuation class	all H+S standard connectors possible
6.	colour of divider housing	blue, green, beige, black
7.[*)]	fiber colour code	acc. to SWISSCOM, DIN, ISO, etc.

[*)] **as one-side terminated cable**

Remark:
As standard the lengths of the manifold (fan-out cable 1.7 mm LSFH™ black) will be 50 cm. Customer applications on request.

Order information

MLQ								MASTERLINE quick	
1-								**Colour of divider**	blue
2-									green
3-									beige
4-									black
	1-							**Fiber type**	singlemode 9 µm
	3-								multimode 50 µm OM3
	5-								multimode 50 µm OM2
	6-								multimode 62.5 µm
		12-						**Number of fibers**	(always 2 digits, max. 12 fibers)
			35-					**Cable type**, cable-Ø respectively	35= 3.5 mm
			50-						50= 5.0 mm
				30/30-				**Connector side 1 / side 2**	(connector code see list page 42)
					S-			**Length of pigtail**	standard (50 cm all same length)
					X-				customer specific
						0075-		**Cable length between dividers (always 4 digits in m)**	
							B	**Attenuation classes side 1+2**	high-end (standard SM)
							D		APC (SM)
							M		multimode

MLQ3 -5 -04 -35 -85/85 –S -0050 -MM	Example MASTERLINE quick

MASTERLINE quick kit Checklist

When ordering, the following options are possibles and have to be defined:

1.	outer diameter supply cable	3.5 mm, 5.0 mm (H+S standard) or 2.0 mm
2.	number of fibers and single cables respectively	2-way, 4-way oder 12-way
3.	colour of divider housings	blue, green, beige, black

Order information

MLQ-KIT	MASTERLINE quick-kit	
1-	blue divider	(singlemode PC)
2-	green divider	(singlemode APC)
3-	beige divider	(multimode PC)
4-	black divider	
02-	2-way pigtail	
04–	4-way pigtail	
12–	12-way pigtail	
050–	pigtail length 50 cm	(3 digits 50 cm = 050)
17-	1.7 mm diameter pigtail cable	(standard, black)
21–	2.1 mm diameter pigtail cable	(optional)
20-	2.0 mm diameter pigtail cable	
35-	3.5 mm diameter pigtail cable	
50-	5.0 mm diameter pigtail cable	

Example: MLQ-SET-2-04-050-17-35	green divider, fourfold with 1.7 mm / 50 cm pigtail LSFH™ and 3.5 mm supply cable

Reels Checklist

1. Reels for MASTERLINE mobile

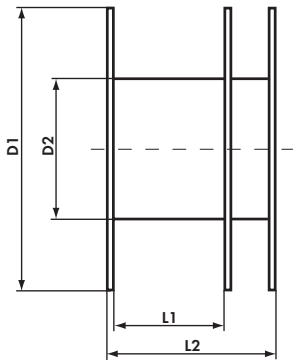
Name	Type		Empty weight	Maximum length with cable diameter of 5 mm	6 mm	7 mm	8 mm	13 mm
Metal drum optional: mobile	No. 1 – 6/500		10 kg	750 m	500 m	400 m	300 m	70 m
Metal drum	No. 2 – 6/220		7 kg	400 m	220 m	160 m	125 m	45 m
Plastic drum optional: mobile	No. 3 – 6/350		7.5 kg	500 m	350 m	260 m	200 m	75 m
Metal drum	No. 4 – 6/800		12 kg	1000 m	800 m	630 m	480 m	180 m
Metal drum	No. 5 – 6/1240		18.8 kg	1500 m	1240 m	900 m	700 m	260 m
Cable bag			0.5 kg	50 m	50 m	40 m	30 m	20 m

What details are required for reel definition?

- total cable length, length of cable inner end
- cable diameter
- cable weight

2. Standard supply reels for MASTERLINE classic, lite and compact

Type	Small cardboard reel	Large cardboard reel	Wooden reel 900	Wooden reel 1250
Flange-Ø D1	700 mm	900 mm	900 mm	1250 mm
Core Ø D2	500 mm	700 mm	600 mm	880 mm
Overall width L2	405 mm	415 mm	510 mm	710 mm
Winding width L1	250 mm	245 mm	360 mm	630 mm
Empty weight	2 kg	6 kg	40 kg	67 kg



D1 = flange diameter **L1 = winding width**

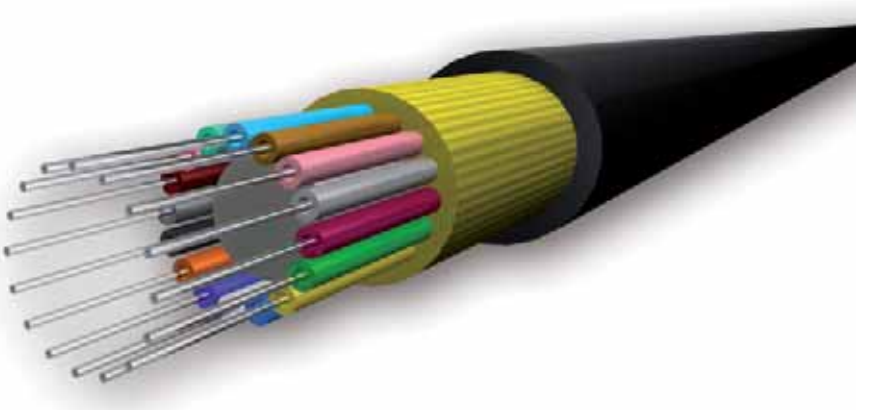
D2 = core diameter **L2 = overall width**

Maximum possible cable length per reel type

Standard supply reel	Maximum length with cable diameter of 5 mm	8.5 mm	10 mm	12 mm	15 mm
cable coil without reel	50 m	50 m	50 m	30 m	30 m
small cardboard reel	600 m	200 m	120 m	100 m	80 m
large cardboard reel	1000 m	300 m	210 m	160 m	100 m
wooden reel	2000 m	1200 m	980 m	720 m	400 m
wooden reel 1250	[1]	3500 m[1]	2500 m[1]	2000 m[1]	1650 m[1]

1) maximum length intended for use of MASTERLINE

All reels are designed in two sections, to keep the inner end protected and permanently accessible.



Connecting Systems

Connector Overview





Connector type		LX.5	LC	MU	LSH (E-2000™)	FCPC
Compliance		IEC 61754-23 TIA 604-13	IEC 61754-20 TIA 604-10-A	IEC 61754-6	IEC 61754-15 TIA 604-16	IEC 61754-13 TIA 604-4-A
Tuning						PC infinitely
in steps		45°	45°	90°	60°	APC 60°
Mech./therm. perform.						
Tensile load [N]		100	100	70	100	100
Mating durability [cycles]		1000	1000	1000	1000	1000
Operating temperature		-40 up to +85 °C	-40 up to +85 °C	-40 up to +85 °C	-40 up to +85 °C	-40 up to +85 °C
Flammability						
UL 94-V0		•	•	•	•	
Colour of housing						
SM PC		blue	blue	brown	blue	
SM APC		green	green		green	
MM		beige	beige		beige	
Brass nickel-plated						•
Fiber type						
E9/125		•	•	•	•	•
G50/125/OM3		•	•	•	•	•
G62.5/125		•	•	•	•	•
HCS200/230		–	–	–	•	•
Features						
One piece design		•	•	–	•	•
Automatic metal shutter		•	–	–	•	–
SFF connector		•	•	•	–	–
Colour coding		•	•	–	•	–
For HighPower applications		•	•	–	•	–
Cable diameter [mm]		0.6 up to 2.8	0.6 up to 2.8	0.6 up to 2.0	0.6 up to 3.5	0.6 up to 3.5
Insertion loss [dB]*						
Multimode	typ. ≤	0.20	0.20	0.20	0.20	0.20
	97 % ≤	0.50	0.50	0.50	0.50	0.50
SM 0.1dB	typ. ≤	0.06	0.06	n/a	0.06	0.06
	97 % ≤	0.15	0.15	n/a	0.15	0.15
SM High-End	typ. ≤	0.12	0.12	0.12	0.12	0.12
	97 % ≤	0.25	0.25	0.25	0.25	0.25
SM LAN-Eco	typ. ≤	0.25	0.25	0.25	0.25	0.25
	97 % ≤	0.70	0.70	0.70	0.70	0.70
Return loss [dB]						
Singlemode	PC >	45	45	45	45	45
	UPC >	50	50	50	50	50
	APC >	85	85	–	85	85

* each-to-each

Further information is available in the Fiber Optic Connectors General Catalogue (Item Nr. 84019828) or online under www.hubersuhner.com

Connector Overview





Connector type		LSA (DIN)	ST-LEAN	ST- HQ	ST-SEC	FSMA
Compliance		IEC 61754-3 DIN 47256	IEC 61754-2 TIA 604-2	IEC 61754-2 TIA 604-2	IEC 61754-2 TIA 604-2	
Tuning						
in steps		60°				
Mech./therm. perform.						
Tensile load [N]		100	100	100	100	100
Mating durability [cycles]		1000	1000	1000	1000	1000
Operating temperature		-40 up to +85 °C	-40 up to +85 °C	-40 up to +85 °C	-40 up to +85 °C	-40 up to +85 °C
Flammability						
UL 94-V0						
Colour of housing						
SM PC						
SM APC						
MM						
Brass nickel-plated		•	• (black nut)	•	•	•
Fiber type						
E9/125		•	–	•	•	–
G50/125/OM3		•	•	•	•	•
G62.5/125		•	•	•	•	•
HCS200/230		–	–	•	–	•
Features						
One piece design		•	•	•	•	•
Automatic metal shutter		–	–	–	–	–
SFF connector		–	–	–	–	–
Colour coding		–	–	–	–	–
For HighPower applications		–	–	–	–	–
Cable diameter [mm]		0.6 up to 3.5	0.6 up to 3.5	0.6 up to 3.5	0.6 up to 3.5	0.6 up to 4.5
Insertion loss [dB]*						
Multimode	typ. ≤	0.20	0.25	0.20	0.20	1.00
	97 % ≤	0.50	0.70	0.50	0.50	1.50
SM 0.1dB	typ. ≤	n/a	n/a	n/a	n/a	n/a
	97 % ≤	n/a	n/a	n/a	n/a	n/a
SM High-End	typ. ≤	0.12	n/a	n/a	n/a	n/a
	97 % ≤	0.25	n/a	n/a	n/a	n/a
SM LAN-Eco	typ. ≤	0.25	n/a	0.25	0.25	n/a
	97 % ≤	0.70	n/a	0.70	0.70	n/a
Return loss [dB]						
Singlemode	PC >	45	–	45	45	–
	UPC >	50	–	–	–	–
	APC >	85	–	–	–	–

Manufacturing of E-2000™-connectors under licence of DIAMOND SA, CH-Losone

Cables Overview

Multi-fiber loose tube	Jellyfree	Glass-armoured		Glass-armoured TWINTUBE		Glass-armoured stranded		Steel-armoured	
Number of fibers	2 to 12	2 to 12 (24)		up to 24		up to 60		2 to 12 (24)	
Multi-fiber loose tube Ø	3.0 mm jellyfree	3.0 mm		3.0 mm		3.0 mm		3.0 mm	
Single fiber Ø	–	–		–		–		–	
Outer cable Ø	5.0 mm	8.5 mm		9.4 mm		15.0 / 11.6 mm		8.0 mm	
Armouring	none	glass-armoured		glass-armoured		glass-armoured		steel-armoured	
Rodent protection	no	yes		yes		yes		yes	
Jacket material	LSFH™	PE	LSFH™	PE	LSFH™	PE	LSFH™	PE	LSFH™
Cable weight kg/km	25	63	83	69	90	178	130	70	90
Combustion properties									
Fire load in MJ/m	0.59	1.7	1.5						
Fire propagation IEC 60332-1	–	–	passed	–	passed	–	passed	–	passed
Fire propagation IEC 60332-3	passed	–	passed	–	passed	–	passed	–	passed
Mechanical properties									
Tensile strength									
during installation	600 N	3000 N		3000 N		9000 / 7000 N		1000 N	
in service	400 N	1500 N		1500 N		4500 / 3500 N		500 N	
Crush resistance									
short-term	300 N/cm	400 N/cm		800 N/cm		800 N/cm		400 N/cm	
long-term	150 N/cm	200 N/cm		400 N/cm		300 N/cm		200 N/cm	
Min. bend radius									
during installation	80 mm	130 mm		150 mm		225 / 200 mm		120 mm	
in service	50 mm	80 mm		100 mm		150 / 120 mm		80 mm	
Thermal properties									
Temperature range									
in service	-5 to +70 °C	-40 to +70 °C		-20 to +70 °C		-40 to +70 °C		-25 to +70 °C	
in storage	-20 to +70 °C	-40 to +70 °C		-40 to +70 °C		-40 to +70 °C		-40 to +70 °C	
Application									
MASTERLINE classic	x	x		x		x		x	
MASTERLINE lite	x	x		x					
MASTERLINE compact	x	x							
MASTERLINE quick	x								
MASTERLINE mobile		(x)							
SMARTLINE breakout									
SMARTLINE riser									

Further cable types, please see the Fiber Optic Cables General Catalogue (item no. 84019826)

Cables Overview

Simplex cables	Field cable	Drag chain cable	Riser cable	Breakout cable	Standards
Number of fibers	4 / 8	up to 12	4/8/12/(16)	4/8/12/16	
Multi-fiber loose tube Ø	–	–	–	–	
Single fiber Ø	0.9 mm	0.9 mm	0.9 mm	2.0 mm	
Outer cable Ø	5.6 / 6.8 mm	13.0 mm	5.0 / 6.0 / 7.0 / 8.5 mm	7.0 / 9.0 / 12.0/ 12.0 mm	
Armouring	none	none	none	none	
Rodent protection	no	no	no	no	
Jacket material	PUR	PUR	LSFH™	LSFH™	
Cable weight kg/km	26 / 39	133	28/33/52/69	47/82/144/135	
Combustion properties					
Fire load in MJ/m	0.5 / 0.7	3.49	0.4/1.1/ 1.8/1.8	1.09/1.63/ 3.15/2.95	
Fire propagation IEC 60332-1	–	–	passed	passed	IEC 60332-1
Fire propagation IEC 60332-3	–	–	passed	passed	IEC 60332-3-24
Mechanical properties					
Tensile strength					
during installation	2000/3000 N	4000 N	1200 - 3000 N	1200 - 4800 N	
in service	1000/1500 N	2000 N	400 - 1000 N	400 - 1600 N	IEC 60794-1-2 E1
Crush resistance					
short-term in	1000/800 N/cm	400 N/cm	1800 N/cm	400 N/cm	
long-term in	100/200 N/cm	200 N/cm	300 N/cm	200 N/cm	IEC 60794-1-2 E4
Min. bend radius					
during installation in mm	90 / 100 mm	200 mm	100 - 130 mm	100 - 180 mm	
in service in mm	55 / 70 mm	100 mm	50 - 70 mm	70 - 120 mm	IEC 60794-1-2 E11
Thermal properties					
Temperature range					
in service	-40 to +85 °C	-30 to +90 °C	-20 to +70 °C	-25 to +70 °C	IEC 60794-1-2 F1
in storage	-60 to +85 °C	-40 to +90 °C	-25 to +70 °C	-40 to +60 °C	
Application					
MASTERLINE classic					
MASTERLINE lite					
MASTERLINE compact					
MASTERLINE quick					
MASTERLINE mobile	x	x			
SMARTLINE breakout				x	
SMARTLINE riser			x		

Fiber Management Systems

ETS rack FrontAcces

ETS rack SideAccess

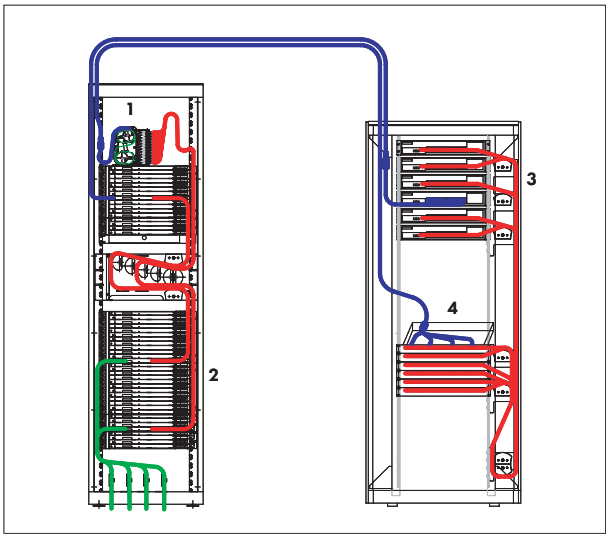
For central offices (WAN)

- two systems: front and side facing fiber position (Front-Access/SideAccess)
- high fiber density per footprint
- different rack dimensions for max. 120 to 1920 fibers per rack
- easy access to fibers from the front side
- continuous bend radius limitation
- clearly arranged and secure fiber, patchcord and cable management
- SingleCircuit or MultiCircuit fiber management
- integration of splice and splitter modules
- seamless interface to cable ducting system

M3K – the ready to use cabling system with fiber tray

Point-to-point cabling system

Beside standard cabling systems like MASTERLINE and SMARTLINE we offer tailor-made solutions for fast and secure point-to-point connections between two or more distribution racks.



Example:
Optical fiber connection from line to system rack

The fiber tray end (1) of M3K can be mounted directly into the rack and its fibers can be connected to the fibers of the line side with patchcords (2).

The MASTERLINE end can be connected directly to active devices (**3**) or via MASTRLINE CTB to active devices within racks with patchcords (**4**).

Distribution solutions please see LISA system catalogue (Item no. 23040188).

Fiber Management Systems

outdoor cabinets

splice closures

For outside plant (WAN)

- outdoor cabinets for multiple fiber connections and installation of active equipment
- modular subracks in FrontAccess or SideAccess technology
- easy access to fibers from the front
- integration of splice and splitter modules
- for passive optical networks, FTTx, etc.
- splice closures for permanent fiber connections and fiber branchings
- highest protection class
- for mounting at mast, in duct or in the soil

outdoor wall boxes

For network termination (WAN)

- wall boxes as transfer point from carrier to private networks (FTTx)
- SingleCircuit or MultiCircuit fiber management
- different configuration variants (splice through, splice/patch, patch through)
- weather-proof housings for indoor and outdoor applications

19" rack

wall box

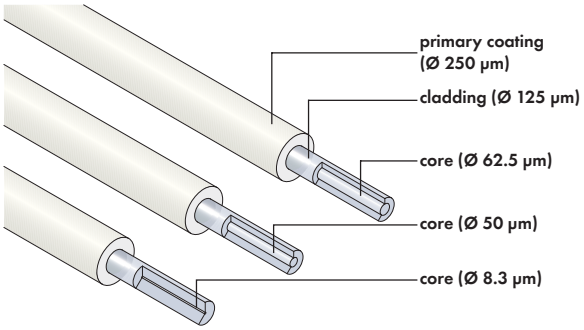
CTB

For building, backbone and horizontal cabling (LAN)

- 19" rack for installation of modular subracks, CTB's, active devices, etc.
- components for optimal guidance of patchcords
- Integration of splice and splitter modules
- wall boxes as distribution points on floors for up to 144 fibers
- SingleCircuit or MultiCircuit fiber management
- different configuration variants (splice through, splice/patch, patch through)
- customer/subscriber separation with two doors

Distribution solutions please see LISA system catalogue (Item no. 23040188).

Overview Fiber Types



Fiber types

- singlemode 9 µm
- multimode 50 µm (OM2 and OM3), 62.5 µm (OM1 and OM2) and 200 µm

Fiber data for transmission	Fiber E9/125		Fiber H200	Fiber G50/125		Fiber G62.5/125	
Wavelength [nm]	1310	1550	850	850	1300	850	1300
Attenuation [dB/km] (typical)	0.35	0.21	3.10	2.30	0.55	2.7	0.6
Attenuation [dB/km] (max.)	0.40	0.25	6.0	2.50	0.7	3.0	0.8
Core Ø [µm]	9.2±0.4[1)]	10.4±0.8[1)]	200 ± 5	50±2		62.5±3	
Cladding Ø [µm]	125±1		230 – 10	125±2.5		125±2	
Coating Ø [µm]	245±10		500 ± 50	245±10		245±10	
Standards	• ITU G.652-D • IEC 60793-2-50 type B1.3 • DIN VDE 0888, part 3		• IEC 60793-2-30	• ITU G.651 • IEC 60793-2-10 type A1a + A1a.2 • DIN VDE 0888, part 3		• IEC 60793-2-10 type A1b	

Other fibers on request
1) Mode field Ø

Link lengths for standardized fiber types

		Multimode G50/125				Multimode G62.5/125	
Fiber class according to HUBER+SUHNER[1)]		standard	E	F	G	standard	D
Standardized fiber types		OM2	OM2 plus	OM3	OM3 plus	OM1	OM2
Min. modal bandwith overfilled launch bandwidth [MHz*km]	850 nm	500	600	1500	3500	200	500
	1300 nm	500	1200	500	500	500	500
Min. modal bandwith effective laser launch bandwith[2)] [MHz*km]	850 nm	n/s	n/s	2000	4700	n/s	n/s
Gigabit Ethernet 1000 BASE							
-SL	850 nm	550 m	750 m	1000 m	1100 m	275 m	550 m
-LX	1300 nm	550 m	2000 m	550 m	550 m	550 m	550 m
10 gigabit Ethernet 10 GBASE							
-SX		–	–	300 m	550 m		
-LX4	850 nm	–	–	300 m	550 m	– –	– –

According to IEEE 802.3, ISO / IEC 11801-2nd edition

n/s = not standardized

1) Fiber class allocation for HUBER+SUHNER cable codes

2) Effective laster launch bandwidth is assured using DMD as specified in IEC/PA 60793-1-49

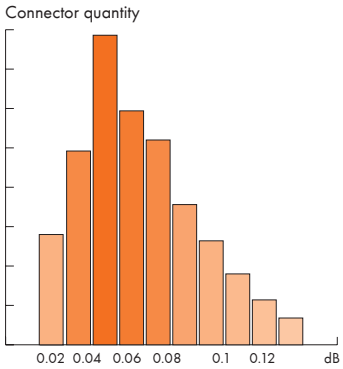
Assembly Classes

HUBER+SUHNER Cable assemblies stand for PERFORMANCE and RELIABILITY

Features

- available in 3 attenuation classes to meet different customer requirements
- full ceramic ferrules as a base for highest performance and reliability
- optimized products and assembling processes due to HUBER+SUHNER in-house connector and cable development and manufacturing
- outstanding mechanical and thermal strengths exceeding requirements of international standards

0.1 dB Class



Applications

- long haul transmissions saving costs for signal amplification
- low loss budget transmissions
- transmissions where uniform channel losses are required
- replacement of splices by keeping the same loss level

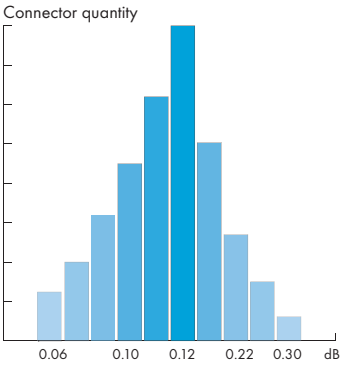
Compatibility

- all connectors are tuned
- fiber according to ITU-T G.652
- premium ferrule with low eccentricity

Attenuation

	Each-to-each		Against ref.	
IL[1)]	IEC 61300-3-34		IEC 61300-3-4	
	97%	0.15 dB	max.	0.15 dB
	mean	0.06 dB		
RL	IEC 61300-3-6			
	>45 dB		PC	
	>50 dB		UPC	
	>85 dB		APC	

High-End Class



Applications

- CATV / Video
- Passive Optical Networks PON
- WDM /DWDM

Compatibility

- all connectors are tuned
- fiber according to ITU-T G.652

Attenuation

	Each-to-each		Against ref.	
IL[1)]	IEC 61300-3-34		IEC 61300-3-4	
	97%	0.25 dB	max.	0.35 dB
	mean	0.12 dB		
RL	IEC 61300-3-6			
	>45 dB		PC	
	>50 dB		UPC	
	>85 dB		APC	

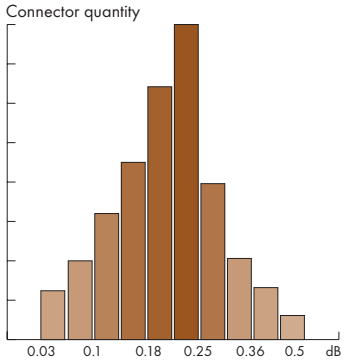
1) at 1310 nm

Please note

0.1 dB Assemblies have max. losses lower than today's measurement accuracy in the field. Measurement equipment (power meter/OTDR) and measurement set-up, reference cables and adapters, environmental conditions and dirt easily cause measurement uncertainities of > 0.2 dB. Reliable and reproducible measurements at accuracies below 0.1 dB are feasible under laboratory conditions only.

Assembly Classes

LAN-Eco Class



Applications

- universal premises cabling according to EN 50173-1, EIA/TIA 568
- cost effective connections in PON
- FTTD, FTTH, FTTB, FTTX

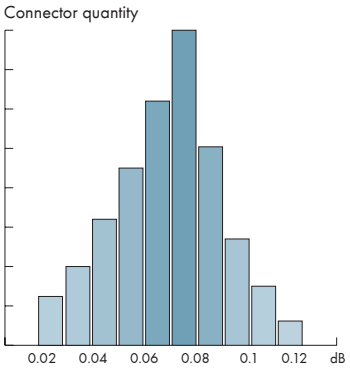
Compatibility

- connectors are not tuned
- fiber according to ITU-T G.652

Attenuation

	Each-to-each		Against ref.	
IL[1)]	IEC 61300-3-34		IEC 61300-3-4	
	97%	0.70 dB	max.	0.35 dB
	mean	0.25 dB		
RL	IEC 61300-3-6			
	>45 dB		PC	
	>50 dB		UPC	
	>85 dB		APC	

HighPower assemblies



Applications

- DWDM / CWDM
- Raman, EDFA amplifications
- long haul transmissions saving costs for signal amplification

Compatibility

- all connectors are tuned
- fiber according to ITU-T G.652
- premium ferrule with low eccentricity

Attenuation

	Each-to-each		Against ref.
IL[1)]	IEC 61300-3-34		IEC 61300-3-4
	97%	0.15 dB	max. 0.15 dB
	mean	0.06 dB	
RL	IEC 61300-3-6		
	>50 dB		UPC
	>85 dB		APC

1) at 1310 nm

Please note

0.1dB Assemblies have max. losses lower than the accuracy of todays field measurements: Measurement equipment (power meter /OTDR) and measurement set-up, reference cables and adapters, environmental conditions and dirt easily cause measurement uncertainities of >0.2dB. Reliable and reproducible measurements below 0.1dB are possible only in laboratory conditions.

Assembly Classes

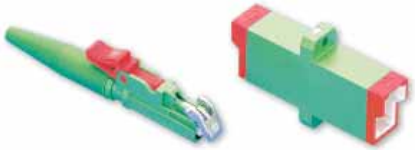
The HighPower concept
HighPower assemblies are HUBER+SUHNER's answer to the ever-increasing transmission requirements of high-performance networks.

Amplifiers used in DWDM applications can easily reach power levels of one Watt (30dBm). The optical power is concentrated on the fiber core of 10 µm diameter which corresponds to power densities larger than 1.3MW/cm2. Slightest impurities or defects on the fiber end-face can thermally destroy the ferrule.

The HighPower manufacturing process is characterized by stringent cleanness, premium polishing procedures, and special cleaning before packing. HUBER+SUHNER's HighPower assemblies guarantee maximal operational safety with their proven long term performance at average power levels up to 2 W and power peaks up to 5 W.

Level	Optical power		Hazard
1	15.6 mW	12 dBm	safe under all foreseeable conditions
1M	42.8 mW	16 dBm	safe, but might be hazardous if magnifying instrument is used
3R	80.0 mW	19 dBm	low risk to eyes and to skin
3B	500 mW	27 dBm	medium risk to eyes and low risk to skin
4	> 500 mW		high risk to eyes and skin, even for stray reflected light beams

The high-performance LSH (E-2000™) and LX.5 connectors meet the most stringent handling and functional safety standards. The full metal protection cap guarantees maximum eye safety and no environmental laser hazard under and unplugged and plugged conditions. The special locking and mechanical coding system avoids unintended or unauthorised plugging.



E-2000™ HighPower

LX.5 HighPower

Upon request FSC-CMAX, FLC and FiberGate HighPower assemblies can be supplied. However these three connectors do not offer the same protection from laser light as they have no shutter.

Manufacturing of E-2000™-connectors under licence of DIAMOND SA, CH-Losone

Glossary

ADSL	Asymmetric Digital Subscriber Line – at the moment the most commonly used communication technique for digital broadband transmission of Internet contents for end-users
Access Network	Sub network for customer access to a carrier network, up to 20 km (12 miles)
Access Node	Network point for the access transfer – usually built as central office including ODR's
APC	Angled Physical Contact is a angled polished endface (usually 8°), so that the reflected light is not travelling back in the fiber, but can escape sidways. Thereby an even lower back reflexion can be achieved as with UPC.
CCTV	Closed Circuit Television – describes a video surveillance system in industrial applications
CTB	Cable Termination Box
CWDM	Coarse Wavelength Division Multiplexing - Various wavelengths are sent through the fiber at the same time. CWDM does not require the same network complexity as DWDM. CWDM is a cost-effective solution for metropolitan area and access networks. According to ITU proposal up to 18 channels can be used in the wavelength range from 1270 to 1610 nm.
DIN	German Institute of Standardization
DSL, DSLx	Digtital Subcriber Line – describes different techniques for transmitting data over two or four copper wires of the phone line, so called network termination, with high speed.
DSLAM	Digtital Subcriber Line Access Multiplexer – part of required infrastructure for operation of DSL. DSLAM's are located at a place where all the lines of network terminations are connected
DWDM	Dense Wavelength Division Multiplexing – WDM using a lot of different wavelength in a wavelength range with a small channel spacing. Commercial DWDM systems put 32 wavelength through one fiber, which corresponds, at a rate of 10 Giagabits/s per signal to a total rate of 320 Gigabits/s.
EFM	Ethernet in the First Mile – using the Ethernet protocol in the access network. The working group for EFM (standard IEEE 802.3ah) wants to replace ATM from the access network.
EN	European Standard
Ethernet	Ethernet for data transmission of 10Mb/s. It is the most widely-used data protocol for premises networks.
FT	Fiber Tray – a splice or distribution cassette with telescopic and hinged functionality holding fibers, splice connections and/or adapters. The FT has lateral fiber access to adapters called Side Access.
FTTB	Fiber-To-The-Building - network access with optical fibers to the building
FTTC	Fiber-To-The-Curb – network access with optical fibers to the curb
FTTD	Fiber-To-The-Desk – structured building cabling system (LAN) using optical fibers up to the workplace
FTTH	Fiber-To-The-Home – network access with optical fibers to the home
FTTO	Fiber-To-The-Office – structured building cabling system (LAN) using optical fibers up to the office
FTTP	Fiber-To-The-Premises – network access with optical fibers to the premises
Fiber	Optical fibers are dielectric waveguides which light is transmitted through the core. The cladding has a lower refractive index than the core. Thus the light is refracted at the boundary layer and is guided through the core. The fibers are made of silica (silica glass – pure silicon dioxide) or plastic (e.g. PMMA). The fiber is protected against mechanical damage and humidity with a special plastic coating. Today optical fibers are used to transmit data, to transmit power in the material processing, for illumination and reproduction purposes and in the measurement technique.
FrontAccess	Access to fibers and adapters from the front of the rack, where usually a door is located
HCS	Hard Clad Silica are optical fibers with a step index profile and with a core made of common mineral glass and the cladding of a special plastic. A known fiber type has a core diameter of 200µm and a cladding diameter of 230 µm. The fibers are used for short distances and in particular for industrial cabling.
HDTV	High Definition TeleVision – television with high resolution (16:9), 1920 x 1080 pixels
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers, Inc. www.ieee.org

Glossary

IP	Internet Protocol
IPxx	Describes the degree of protection by housings according IEC 60529 (DIN 40050). As protection the immersion of water and particles is specified and digits are assigned to it. The first digit describes the protection of particles with 0 to 6 and the second digit the protection against water with 0 to 8. For example IP67 describes the protection against particles with approx. 50µm and against water maximal 1m below the surface for 30 minutes.
ITU	International Telecommunication Union
LAN	Local Area Network – for the transmission of information between independent terminal units
LISA	Leading Interconnect Systems Approach - HUBER+SUHNER is using this term for passive optical network solutions with different application specifications
LSFH™	Low smoke and free of halogen are characteristics of material behaviour. LSFH™® is a Trademark of HUBER+SUHNER AG. Usually these materials are flame retardant and self-extinguishing, they are made of polyethylene and metalhydroxide additives. Similar abbreviations are LSOH and LSZH.
M3K	Pre-terminated and factory tested assembly with maximum 12 fibers including usually a fiber tray at one end and a MASTERLINE manifold at the other
M3KP	A hybrid of the M3K allowing for 24 x 250 µm fibers to be terminated in a single fiber tray
MAN	Metropolitan Area Network – Inter-regional network for the transmission of information
MCM	MultiCircuit Management – MCM splice cassettes incorporate a bend radius limitation of 35 mm, for DWDM applications for example, allowing for secure storage of spliced fibers up to 24 splice connections
ML	MASTERLINE – A pre-terminated, factory tested and ready-to-use cabling system with 2 to 144 fibers, any connector type including SFF and specified length
Multimode	That is a fiber whose core diameter compared to the wavelength of the light is big. Typical core diameters are 50µm (EU standard) and 62.5µm (US standard). In the core a big number of waves can propagate. As a result of many paths signal interference occurs based on running time differences. Multimode fibers are suitable for data transmission over shorter distances.
NT	Network Termination – network termination with fiber or copper technique
OAN	Optical Access Network – access network using optical fibers
ODR	Optical Distribution Rack – interconnects incoming and outgoing optical fibers in a controlled way. Each fiber can be connected to every other fiber within the rack by simple patching
ODU	Optimised Distribution Unit – Subrack that can be front mounted to any standard 19" rack
OLT	Optical Line Termination
OMx	Optical Multimode fiber type describes the types of multimode fibers for different applications classes according ISO/IEC 11801 and EN 50173-1. Three classes are defined: OM1, OM2 and OM3. OM3 ist today the highest class of multimode fibers for transmission of 10 Gigabit Ethernet (10GbE) and link length of 300m. For that purpose a laser source is used at 850nm and light is launched into the inner part of the fiber core.
ONT	Optical Network Termination – network termination with fiber optics
ONU	Optical Network Unit – transfer point from the carrier to the premises network, also called Network Termination
Patchcord	Cable assembly with connectors on both ends
PC	Physical Contact occurs between two endfaces of connectors, if they are pressed together by a spring in the connected situation.
PE	Polyethylene is made of ethene by polymerisation and a thermoplastic. Polyethylene is used for cable jackets, that have a high protection against environmental influences. The material is halogen free and can be recycled without concern.
PIGCP	A gland with a boot for ruggedised pigtails that can be incorporated into pre-connectorized fiber trays for low-loss terminations

Glossary

Pigtail	Cable assembly with connector on one end; typically cable Ø 0.9 mm
PON	Passive Optical Network – an all optical network architecture without electrical/optical conversion and vice versa
POTS	Plain Old Telephone Service – common connection in the conventional telephone network
Primary coating	First buffer around the fiber protecting the fiber against humidity and mechanical stress; typically 250 µm
PUR	Polyurethanes are thermoplastics that are produced from a dialcohol and a polyisocyanate by polyaddition. Because of the excellent mechanical characteristics some polyurethane are suitable for application, where a high abrasive resistance, a high mechanical flexibility and a good fluid resistance are required.
Ruggedised pigtail	Pigtail with reinforced cable than contains usually aramide yarns beneath the outer seath
SCM	The SingleCircuit Management system secures and separates handling of all fibers and fiber pairs for higher reliability and handling requirements. Access to the fibers is possible by folding away of neighbouring cassettes, all previously spliced fibers remain undisturbed.
Secondary coating	Second buffer around the fiber; typically 900 µm
SideAccess	Access to fibers and adapters laterally of the rack, usually facing a side wall
Singlemode	The light travels through the fiber only in one wave, because the core diameter is small compared to the wavelength of the light (approx. 9 µm). Thus long distances and high data volume are possible with the fiber.
SFF	Small-Form-Factor connector with usually Ø 1.25 mm ferrule, the small size allows to have a bigger packing density within a given space. Available types: LX.5, LC, MU etc.
Splice	Permanent joint between 2 optical fibers ruptured in a plane, created by fusion, clamping or gluing
1SU	One width unit for modules vertically mounted to subracks 5.08 mm
TCP	Transport Control Protocol
Triple Play	Includes telephony, internet and television
1U/1HU	One height unit for subracks mounted to equipment racks 44.45 mm
UL94	is defined as a material test from Underwriters Laboratories Inc, (www.ul.com) testing inflammable material in regards to the fiber behaviour. Therefore after exposing a test rot to fire for 60 seconds the self-extinguishing behaviour is analyzed. V describes the test with a vertical test rod, whereas H is with a horizontally fixed rod. The behaviour of the vertical test is classified into 0, 1 or 2 with 0 showing the best self-extinguishing behaviour.
USC	Universal Splice Closure – accommodates splice connection in MultiCircuit or SingleCircuit Management and is suitable for outside plant applications
UPC	Ultra Physical Contact connectors have to have an excellent endface quality and therefore have a lower back reflexion resp. a lower return loss that ordinary PC connectors.
VDSL	Very High Speed Digital Subscriber Line – VSDL is the fastest of all DSL technologies. It allows a data transmission up to 52 Mbit/s over a phone line, though the usable transmission bandwidth declines with the length of the line. For the maximal speed the length may not exceed 300 m; with 900 m it reduces to half and with 1.4 km to a fourth. The speed of the data transmission enables to offer Triple Play via VDSL including television channels, internet and voice traffic. Planned application of VDSL is the transmission of HDTV, whereas also several channels can be transmitted simultaneously.
VDSL2	The successor standard VDSL2 offers a data rate upt to 100 Mbit/s. For that speed the range of 350 m is aimed at, however excellent phone lines and the absence of open line ends are required.
VoIP	Voice over IP – uses the internet to transport the voice
WAN	Wide Area Network – World-spanning network for the transmission of information (long-haul)
WDM	Wavelength Division Multiplexing – WDM using a lot of different wavelength in a wavelength range with a small channel spacing and transmitted through the same fiber simultaneously
XC	Cross-Connect – point where incoming and outgoing fibers are connected accordingly

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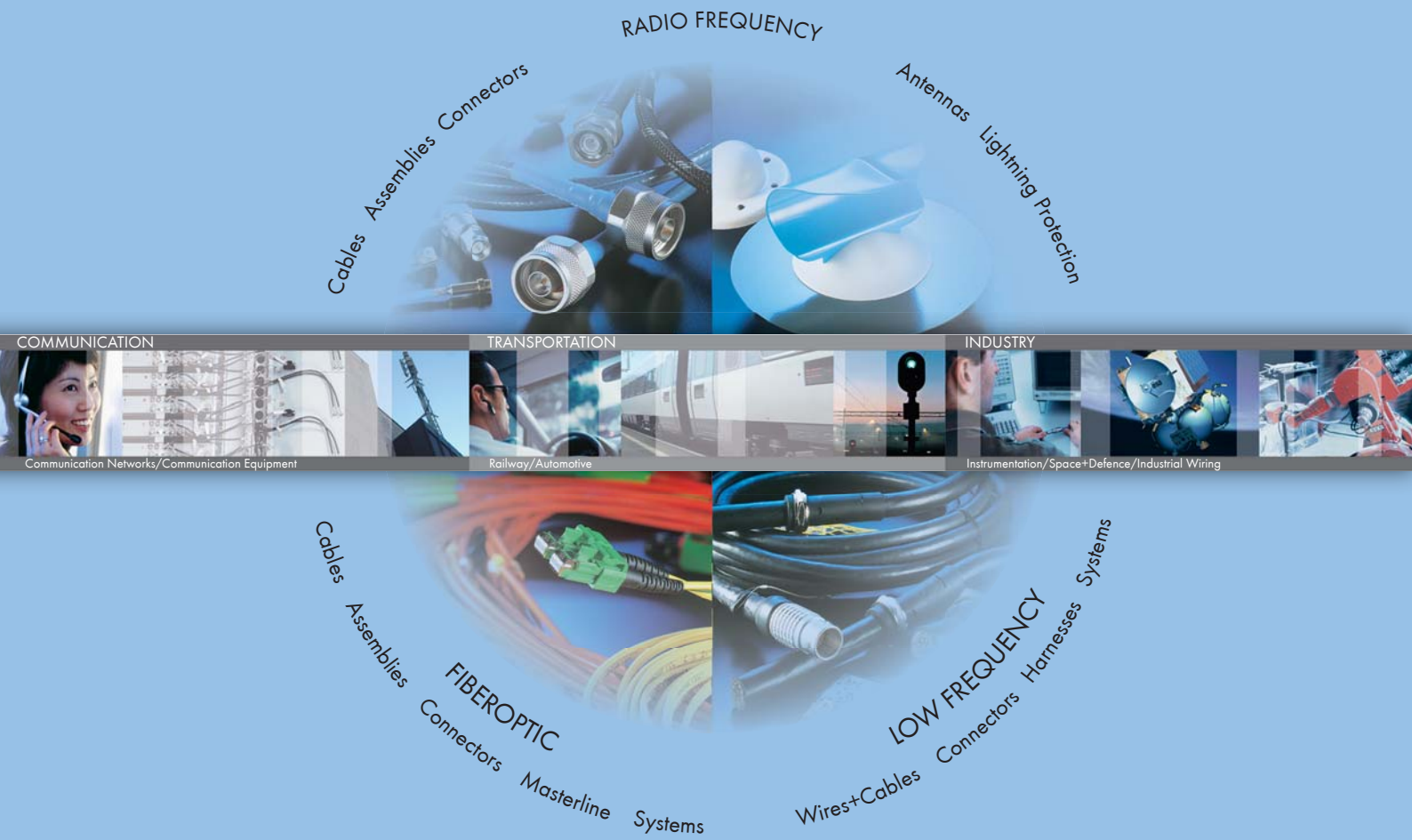

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