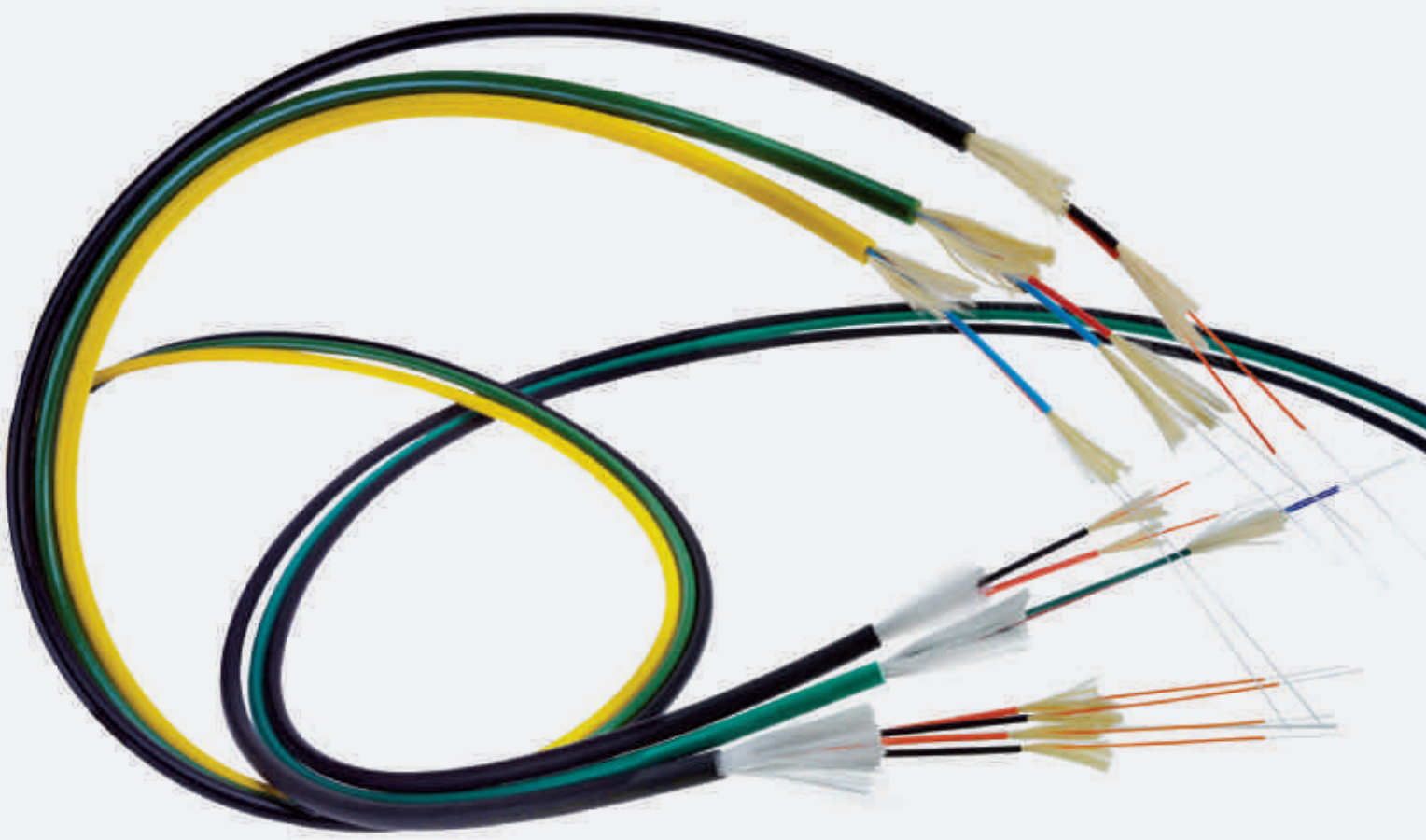


# Fiber Optic Cables

Edition 2012



Optimize your data communication





### Your Partner for System Solutions

HUBER+SUHNER is a leading international producer and supplier of electrical and optical interconnectivity components and systems. Core capabilities in radio frequency, fiber optic and low frequency technology are united under a single roof. The success of the company's high-grade standard products and customised applications based on its cutting edge-know how in radio frequency and microwave technology, supported by advanced simulation processes.

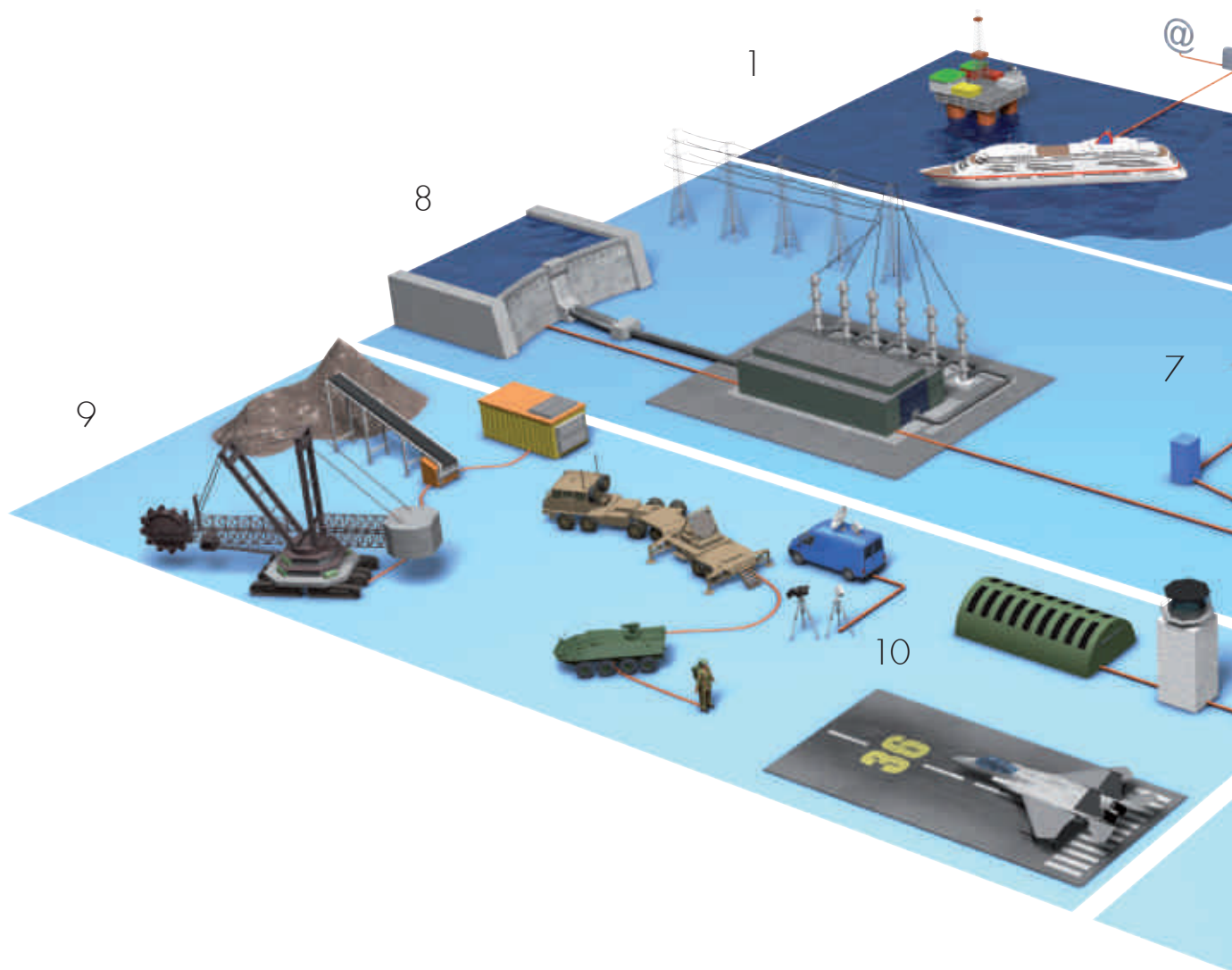
HUBER+SUHNER offers a wide range of fibre optical cables, optimized for fix or mobile applications at indoor and outdoor areas.

Due to new market demands innovative products are developed and tested according to international standards, which fulfil high mechanical and thermal conditions as well as fire requirements.



# Content

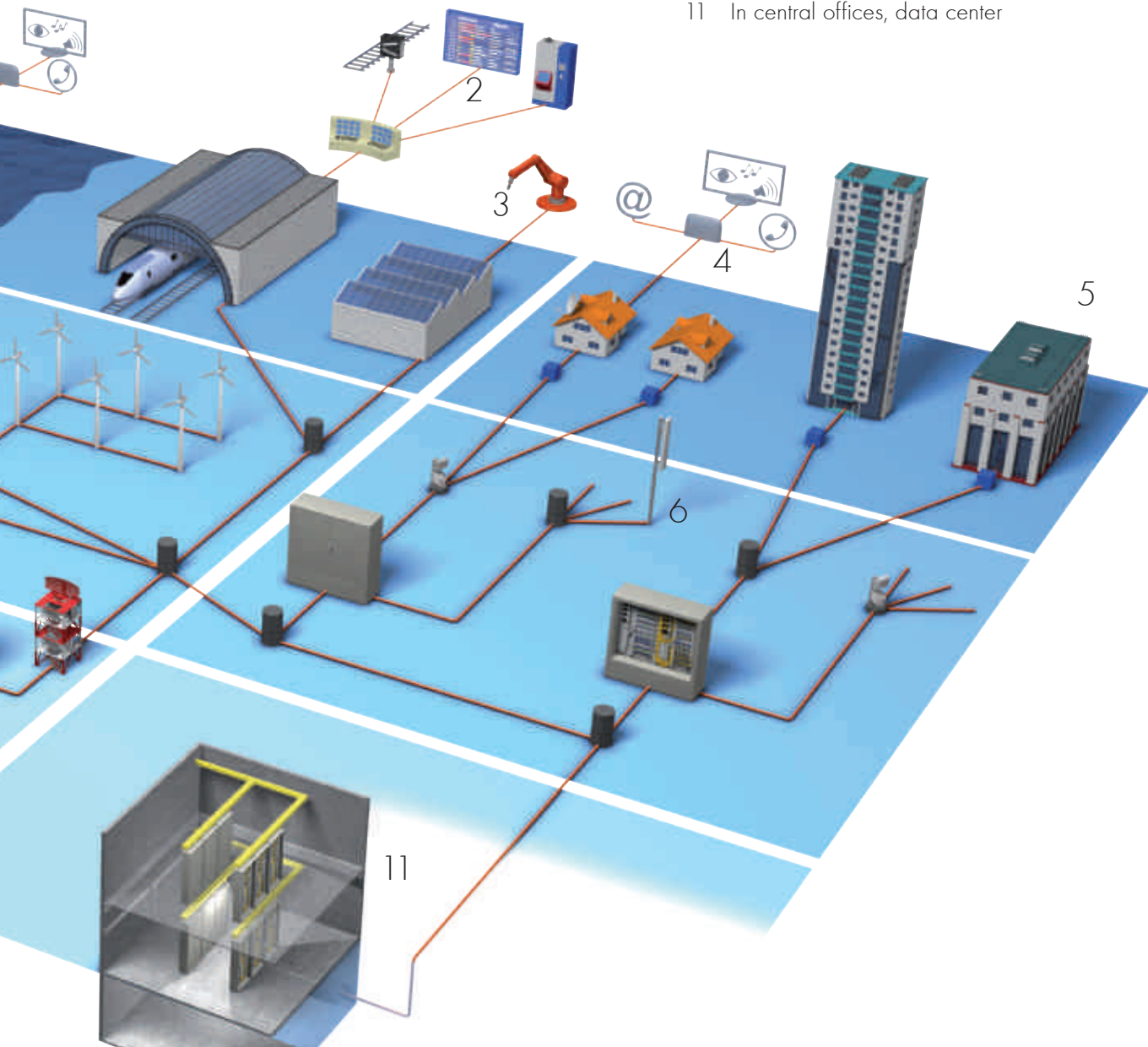
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## Application areas

HUBER+SUHNER offers a range of different fiber optic cables, that are used in various applications.

- 1 On ships and offshore platforms
- 2 On railway infrastructures
- 3 In machinery and automation
- 4 In homes FTTH/FITH
- 5 In office buildings/LAN
- 6 Cables for antennas (FTTA)
- 7 In wind turbines and wind farms
- 8 In technical building, power plants and power transmission stations
- 9 For mining and construction sites
- 10 In mobile vehicles and equipment
- 11 In central offices, data center



# Fiber optic cables

## Benefits of fiber optics

The fiber optic is proved technique for data transmission and offers many advantages compared to copper. The main features are:

- Small loss for long-distance transmission
- Unlimited data volume mainly limited by the electronic of the active equipment
- Lightweight ideal for mobile systems
- Small dimensions cable with 144 fibers is only Ø 15 mm
- No electrical conductivity no potential and lightning problems; no interference of the transmission by electrical fields

## Application of fiber types

The required fiber type depends on the used active equipment (transceiver), that defines the possible transmission distance and data rate.

Fiber type	HUBER+SUHNER fiber code	Core/cladding diameter in µm	Fiber materials (core/cladding)	Applications*	Distance max. [m]**
Singlemode	E9, low bend	9/125	glass / glass	wide-area to access network (FTTH), backbone	> 10'000
Multimode gradient index profile	G50, G62.5	50/125, 62.5/125	glass / glass	LAN, Industrial Ethernet, industrial control systems, cabling in trains	2'000
Multimode step index profile	H200	200/230	glass / plastic	industrial control systems	200
	POF980	980/1000	plastic / plastic	industrial control systems, automobile	100

\* Typical applications, that are not complete.

\*\* The max. distance is not the maximal possible, but based on the usual transmission application defined in standards. Depending on the application, the max. distance can also be shorter

## Characteristics

The cables are designed and tested extensively for highest load, so that they guarantee a secure data transmission in the particular application.

The main properties are:

- High quality fibers for best data transmission qualities
- Adequate fiber coating for highest thermal and mechanical load
- Good to strip for fast and easy installation
- Suitable interface to connectors for functionally secure assemblies und cable systems
- Glass or steel armoured cables prevent damage caused by rodents
- Halogen free materials no toxic gases in case of a fire
- LSFH™ materials highest safety in case of fire
- Metal free cables no earthing required (except metal armoured types)

Each cable type is extensively tested according international and national standards. The most important tests are described from page 24.

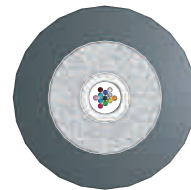
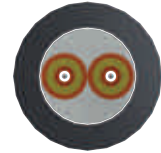


# Fiber optic cables


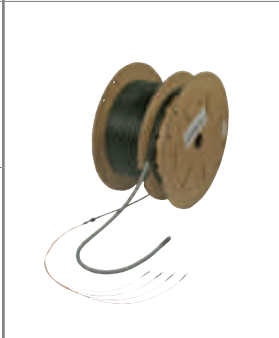
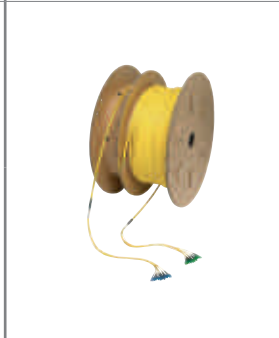

## Cable construction

Cables are basically designed in two different ways:

- Single-coated fibers:  
indoor or special cables  
→ for direct connector termination as single, duplex or multi-fiber patchcord (SMARTLINE)
- Multi-fiber loose tubes (typically 12 fibers in one tube):  
for multi-fiber cables indoors and outdoors  
→ for splicing or as pre-terminated cable system (MASTERLINE)



## Variants of connecting cables

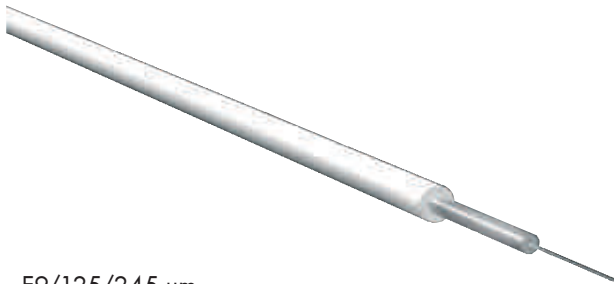
Technique	Splicing	Connectors		
Variant of connecting	install cables and splice fibers afterwards	install and connect pre-terminated cables		install cables, terminate connectors afterwards
Used products	loose tube cables and splice closure <sup>1)</sup> or distribution housing	MASTERLINE <sup>2)</sup> (loose tube cables with divider)	SMARTLINE <sup>2)</sup> (breakout cable)	breakout or distribution cable, connector and fast termination system Quick Assembly <sup>3)</sup>
				
Usage	for fixed installations	types for fixed installations or for mobile application	for fixed installations	for fixed installations
Installation	connection or access of long-haul links mostly used outdoors	connection of two access/distribution points indoor or outdoor	short connection of two distribution points indoors (multi-fiber patchcord)	individual cabling indoors

Also cable assemblies with standard connectors are used as patchcords and with protected connectors for harsh environment.

Further information is in the following catalogues:

- 1) Fiber Optic System Catalogue LiSA – item no. 84101814
- 2) Fiber Optic Cabling Systems – item no. 84104358
- 3) Fiber Optic Connectors and Assemblies – item no. 84101808

# Fiber specification singlemode fiber E9/125/245



E9/125/245  $\mu\text{m}$

## Optical characteristics singlemode fiber

Conditions	E9/125	E9/125 A1	E9/125 A2	NZ-DS		
Standards according ITU-T	G.652.D	G.657.A1	G.657.A2	G.655		
Attenuation typical (in cable)	1310 nm	$\leq 0.34$	$\leq 0.35$	$\leq 0.35$	-	dB/km
	1383 nm	$\leq 0.34$	$\leq 0.35$	$\leq 0.35$	$\leq 0.35$	dB/km
	1550 nm	$\leq 0.20$	$\leq 0.21$	$\leq 0.21$	$\leq 0.20$	dB/km
	1625 nm	$\leq 0.23$	$\leq 0.23$	$\leq 0.23$	$\leq 0.22$	dB/km
Attenuation maximum (in cable) <sup>1)</sup>	1310 nm	$\leq 0.40$	$\leq 0.40$	$\leq 0.40$	-	dB/km
	1383 nm	$\leq 0.40$	$\leq 0.40$	$\leq 0.40$	$\leq 0.40$	dB/km
	1550 nm	$\leq 0.25$	$\leq 0.25$	$\leq 0.25$	$\leq 0.22$	dB/km
	1625 nm	$\leq 0.25$	$\leq 0.25$	$\leq 0.25$	$\leq 0.24$	dB/km
Chromatic dispersion	1285 - 1330 nm	$\leq 3.50$	$\leq 3.50$	$\leq 3.50$	-	ps/nm $\times$ km
	1550 nm	$\leq 18.0$	$\leq 18.0$	$\leq 18.0$	4.00	ps/nm $\times$ km
Cable cut-off wavelength $\lambda_{cc}$	standard	$\leq 1260$	$\leq 1260$	$\leq 1260$	-	nm
	special application	$\leq 1180$	$\leq 1180$	$\leq 1180$	-	nm
Polarization mode dispersion	link value	$\leq 0.06$	$\leq 0.06$	$\leq 0.06$	$\leq 0.06$	ps/ $\sqrt{\text{km}}$
	individual	$\leq 0.20$	$\leq 0.20$	$\leq 0.20$	$\leq 0.10$	ps/ $\sqrt{\text{km}}$
Zero dispersion wavelength $\lambda_0$	1300 - 1324	1300 - 1324	1300 - 1324	-	nm	
Zero dispersion slope $S_0$ at $\lambda_0$		$\leq 0.090$	$\leq 0.092$	$\leq 0.092$	-	
Mode-field diameter	1310 nm	$9.2 \pm 0.4$	8.4 - 9.5		-	
	1550 nm	$10.4 \pm 0.5$	9.5 - 10.5		$9.6 \pm 0.4$	
Group index of refraction typical	1310 nm	1.466	1.466		-	
	1550 nm	1.467	1.467		1.468	
Macrobending loss $r = 7.5$ mm, 1 turn	1550 nm	-	-	$\leq 0.50$	-	dB
	1625 nm	-	-	$\leq 1.00$	-	dB
Macrobending loss $r = 10$ mm, 1 turn	1550 nm	-	$\leq 0.75$	$\leq 0.10$	-	dB
	1625 nm	-	$\leq 1.50$	$\leq 0.20$	-	dB
Macrobending loss $r = 15$ mm, 10 turn	1550 nm	-	$\leq 0.25$	$\leq 0.03$	-	dB
	1625 nm	-	$\leq 1.00$	$\leq 0.10$	-	dB

1) For cables with semi-tight and tight tubes: 1310 nm  $\leq 0.40$  dB/km  
 1550 nm  $\leq 0.30$  dB/km  
 1625 nm  $\leq 0.50$  dB/km

## Fiber specification singlemode fiber E9/125/245

### Geometrical characteristics

	E9/125	E9/125 A1	E9/125 A2	NZ-DS	
Cladding diameter	125 ± 0.7				µm
Coating diameter (uncoloured)	242 ± 7				µm
Concentricity error core / cladding	≤ 0.5				µm
Concentricity error cladding / coating	≤ 12.0				µm
Cladding non-circularity	≤ 0.7				%
Coating non-circularity	≤ 5				%

### Mechanical and environmental characteristics

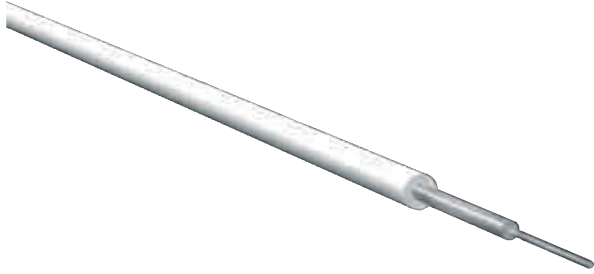
	E9/125	E9/125 A1	E9/125 A2	NZ-DS	
Coating-Material	acrylate				
Tensile proof test (fiber elongation ≤ 1%)	≥ 8.8 (100)				N (Kpsi)
Operation temperature range -60°C to 85°C	1310, 1550 & 1625 nm	≤ 0.05			ΔdB/km
Water immersion 23°C for 30 days	1310, 1550 & 1625 nm	≤ 0.05			ΔdB/km

### Approvals

	E9/125	E9/125 A1	E9/125 A2	NZ-DS
Standards	ITU G.652-D - IEC60793-2-50 Type B1.3 - DIN VDE 0888 Part 3	- ITU G.657.A1 - IEC60793-2-50 Type B6_a1	- ITU G.657.A2 - IEC60793-2-50 Type B6_a2	- ITU G.655 - IEC60793-2-50 Typ B4

Note: E9/125 A2/B3 (A3) with macrobending 5 mm also available.

## Fiber specification multimode fiber



G50/125/245  $\mu\text{m}$

### Optical characteristics multimode fiber

Fiber class		G50/125				
		OM2	OM2 plus	OM3	OM4	
Fiber class available by H+S		Standard	E	F	G	
Bandwidth (overfilled launch) min.	850 nm	500	600	1500	3500	MHz*km
	1300 nm	500	1200	500	500	MHz*km
1 Gigabit Ethernet 1000BASE -	SX 850 nm	500	525	1000	1500	m
	LX 1300 nm	550	2000	550	550	m
10 Gigabit Ethernet 10GBASE	SX 850 nm			300	550	m
	LX4 1300 nm			300	300	m
Bending loss at 850 / 1300 nm	r = 37.5 mm	0.5 / 0.5		0.1 / 0.2 <sup>1)</sup>		dB
	r = 15.0 mm	1.0 / 1.0		0.1 / 0.3 <sup>1)</sup>		dB
	r = 7.5 mm	-/-		0.2 / 0.5 <sup>1)</sup>		dB
Attenuation typical (in cable)	850 nm	2.3				dB/km
	1300 nm	0.5				dB/km
Attenuation maximum (in cable)	850 nm	$\leq 2.7$				dB/km
	1300 nm	$\leq 1.0$				dB/km
Effective group index of refraction	850 nm	1.482				
	1300 nm	1.477				
Numerical aperture		0.200 +/- 0.015				

1) OM3 and OM4 BendOptimized is a HUBER+SUHNER standard

## Fiber specification multimode fiber

### Geometrical characteristics

Fiber class	G50/125				
	OM2	OM2 plus	OM3	OM4	
Core diameter	50 +/- 2.5				µm
Cladding diameter	125 +/- 2				µm
Coating diameter (uncoloured)	245 +/- 10				µm
Concentricity error core/cladding	≤ 1.5				µm
Core non-circularity	≤ 5				µm
Cladding non-circularity	≤ 1				%
Coating non-circularity	≤ 6				%
Tensile proof test at fiber elongation ≤ 1%	≥ 8.8 (100)				N (Kpsi)

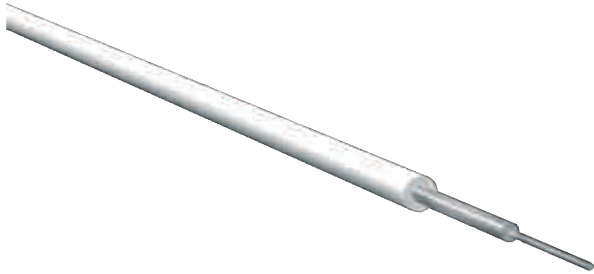
### Mechanical and environmental characteristics

Fiber class	G50/125				
	OM2	OM2 plus	OM3	OM4	
Coating material	acrylate				
Tensile proof test at fiber elongation ≤ 1%	≥ 8.8 (100)				N (Kpsi)
Temperature range max. Δ 0.1 dB/km 850/1300 nm	-60 up to +85				°C
Water immersion max. Δ 0.2 dB/km 850/1300 nm	23 °C more than 30 days				

### Specifications

Fiber class	G50/125		
	OM2	OM3	OM4
Standards	ITU-T G.651 IEC60793-2-10-		
	A1a	A1a.2	A1a.3

## Fiber specification multimode fiber



G62.5/125/245  $\mu\text{m}$

### Optical characteristics multimode fiber

Fiber class		G62.5/125		
		OM1		OM2
Fiber class available by HUBER+SUHNER		Standard		D
Bandwidth (overfilled launch) min.	850 nm	200		MHz*km
	1300 nm	500		MHz*km
1 Gigabit Ethernet 1000BASE -	SX 850 nm	275		m
	LX 1300 nm	550		m
Attenuation typical (in cable)	850 nm	2.7		dB/km
	1300 nm	0.5		dB/km
Attenuation maximum (in cable)	850 nm	$\leq 3$		dB/km
	1300 nm	$\leq 1.0$		dB/km
Effective group index of refraction	850 nm	1.496		
	1300 nm	1.491		
Numerical aperture		0.275 +/- 0.015		

## Fiber specification multimode fiber

### Geometrical characteristics

Fiber class	G62.5/125		
	OM1	OM2	
Core diameter	62.5 +/- 2.5		µm
Cladding diameter	125 +/- 2		µm
Coating diameter (uncoloured)	245 +/- 10		µm
Concentricity error core/cladding	≤ 1.5		µm
Core non-circularity	≤ 5		µm
Cladding non-circularity	≤ 1		%
Coating non-circularity	≤ 6		%
Tensile proof test at fiber elongation ≤ 1%	≥ 8.8 (100)		N (Kpsi)

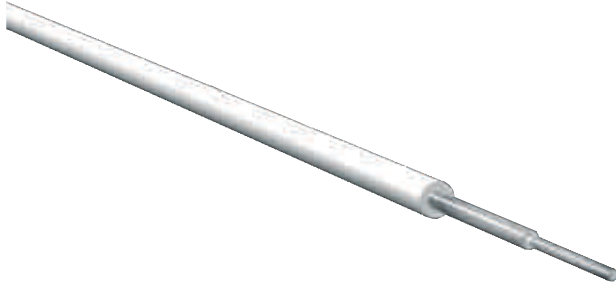
### Mechanical and environmental characteristics

Fiber class	G62.5/125		
	OM1	OM2	
Coating material	acrylate		
Tensile proof test at fiber elongation ≤ 1%	≥ 8.8 (100)		N (Kpsi)
Temperature range max. Δ 0.1 dB/km 850/1300 nm	-60 up to +85		°C
Water immersion max. Δ 0.2 dB/km 850/1300 nm	23 °C more than 30 days		

### Specifications

Fiber class	G62.5/125		
	OM1	OM2	
Standards	ITU-T G.651 IEC60793-2-10 A1b		

## Fiber specification multimode fiber



H200/230/500  $\mu\text{m}$

### Optical characteristics multimode step index fiber (HCS)

Fiber class	H200/230/500	
Bandwidth (overfilled launch)	820 nm	17 MHz*km
Attenuation typical (in cable)	850 nm	5 dB/km
Attenuation maximum (in cable)	850 nm	10 dB/km
Numerical aperture	0.37 +/- 0.02	

### Geometrical characteristics

Fiber class	H200/230/500	
Core diameter	200 +/- 5	$\mu\text{m}$
Cladding diameter	230 - 10	$\mu\text{m}$
Coating diameter (uncoloured)	500 +/- 50	$\mu\text{m}$
Concentricity error core/cladding	5	$\mu\text{m}$

### Mechanical and environmental characteristics

Fiber class	H200/230/500	
Coating-Material	Tefzel	
Tensile proof test at a fiber elongation of $\leq 1\%$	$\geq 8.8$ (100)	N (Kpsi)
Operation temperature range max. $\Delta 0.1$ dB/km 850 / 1300 nm	-65 up to +125	$^{\circ}\text{C}$

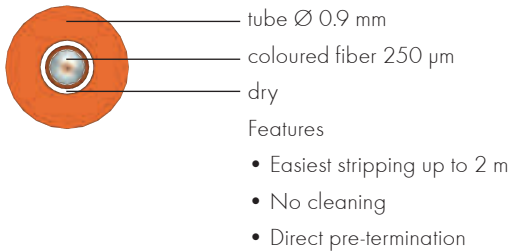
### Approvals

Fiber class	H200/230/500	
Standards	IEC 60793-2-30 A3c	

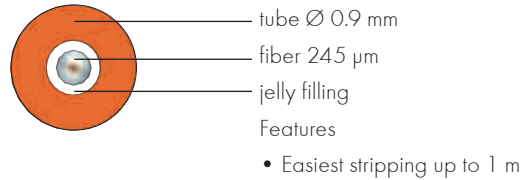


# Terms and definitions

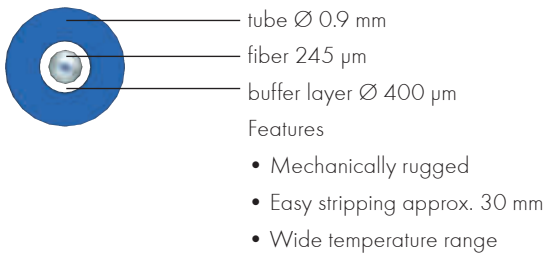
**CH-tube** (semi-tight tube) without jelly  
Standard tube for 0.9 mm



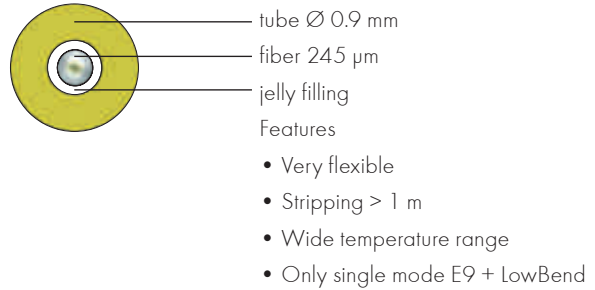
**CW-tube** (semi-tight tube) jelly-filled  
Standard tube for simplex, duplex and breakout cables



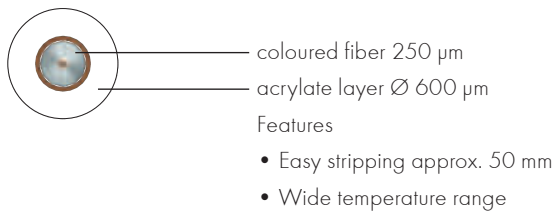
**F-tube** (tight tube)  
For various cable designs, e.g. riser, drag chain



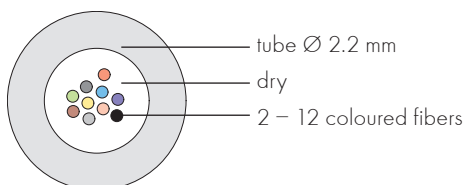
**SW-tube** (soft semi-tight tube) jelly-filled  
Tube for simplex cables



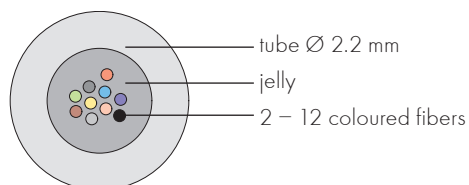
**V-tube** (tight buffered tube)



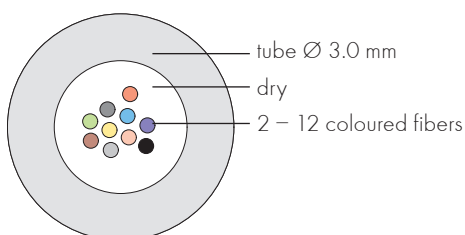
Mini-multi-fiber loose tube, dry for jellyfree cable



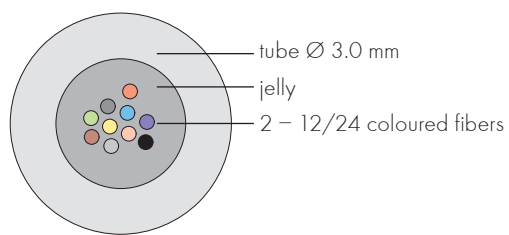
Mini-multi-fiber loose tube, jelly-filled



Multi-fiber loose tube, dry for jellyfree cable



Multi-fiber loose tube, jelly-filled



## Cable jacket materials

Designation	Polyolefine flame retardant	Polyvinylchloride	Polyethylene		Polyurethane flame retardant	Polyurethane	Polybutylenterephthalate	Polyamide	Thermoplastic elastomer
Abbreviation	LSFH™	PVC	LDPE	HDPE	PUR / TPU	PUR / TPU	PBT	PA	TPE
HUBER+ SUHNER code	H	T	Y	V	U	Z	N	N	X

### Combustion properties

Halogen free	yes	no	yes	yes	yes	yes	yes	yes	yes
Flame retardant	yes	yes	no	yes	no	no / yes <sup>1)</sup>	no	no	no
Smoke emission	low	strong	medium	medium	strong	strong	strong	strong	medium
Corrosive gases	low	high	no	low	low	no	no	no	no

### Mechanical properties

Abrasion resistance	low	medium	med.	good	good	good	good	good	good
Flexibility	high	high	med.	low	high	high	low	low	medium
Hardness	medium	soft	med.	hard	soft	soft	hard	hard	soft

### Resistance against

Oil/fuel <sup>2)</sup>	good / satisfactory <sup>3)</sup>	satisfactory	good / satisfactory	satisfactory	good	good	good	good
Water	good / satisfactory <sup>3)</sup>	good	very good	satisfactory	good	satisfactory	satisfactory	satisfactory
Weathering <sup>4)</sup>	good	good	very good	good	very good	satisfactory	good	good

Information given in this table is based on plastic materials used for cable jackets. Properties and resistance for cables cannot be derived from it.

1) For multi-fiber loose tube a non flame resistant plastic type is used, whereas a flame resistant type is used for semi-tight tubes (compact tubes)

2) This information is meant as decision guidance to the best of our today's knowledge, it is based on typical values. The resistance of cables has to be verified due to the wide variety of oils and fuels.

3) Depending on the cable design different types of LSFH™ materials are used for the cable jacket.

4) The UV resistance depends highly on the colour of the plastic used, black offers the best resistance.

# Colour codes

## Colour code for fiber

according to standard

Number	Swisscom <sup>1</sup>	DIN <sup>2</sup>	TIA/EIA-598 <sup>3</sup>	IEC <sup>4</sup>
1	red	red	blue	blue
2	green	green	orange	yellow
3	yellow	blue	green	red
4	blue	yellow	brown	white
5	white	white	grey	green
6	violet	grey	white	violet
7	orange	brown	red	orange
8	black	violet	black	grey
9	grey	turquoise	yellow	turquoise
10	brown	black	violet	black
11	pink	orange	pink	brown
12	turquoise	pink	turquoise	pink

Multi fiber loose tube up to 24 fibers, fiber number 13 - 24 with black ring.

<sup>1</sup> standard, unless otherwise specified

<sup>2</sup> DIN VDE 0888 part 3

<sup>3</sup> EN 50174-1

<sup>4</sup> IEC 60794-2

Note: Orders of fiber optic cables with different fiber types (combination SM/MM): unless otherwise specified, the first colours of the colour code are assigned to the smaller fiber count. Example of a cable with 4xE9, 8xG50: red, green, yellow, blue = E9 fiber, remaining colours = G50 fiber

## Stranding

according to Swisscom<sup>1</sup>

Multi-fiber loose tube elements

1	red
2	green
3	white 1
4	white 2
5	white 3
...	... etc.
dummies	black

Semi-tight tubes 0.9 mm according to HUBER+SUHNER<sup>1</sup>

E9/125 <sup>2</sup>	yellow
G50/125	orange
G62/125	blue
G50/125 OM3	turquoise
G50/125 OM4	heather violet

<sup>1</sup> Standard, unless otherwise specified

<sup>2</sup> Low bend with black coloured fiber

## Inscription

standard according to HUBER+SUHNER

xxxxxxx zzzzzz/yy HUBER+SUHNER FIBEROPTIC  
. x ... 00000 m

xxxxxxx	item number ( 8 digits)
zzzzzz	production number (6 digits)
yy	production year
. x ...	amount of fibers x fiber type
00000 m	consecutive numbering

Single fiber cables according to HUBER+SUHNER<sup>1</sup>

E9/125	yellow
G50/125	orange
G62/125	orange
G50/125 OM3	turquoise
G50/125 OM4	heather violet

# HUBER+SUHNER cable code

XXX-									total number of optical fibers in cable, always indicated with two or three digits	
	1-12								1 to 12 optical fibers per multi-fiber loose tube	
		E9/							singlemode fiber 9/125/250 µm	
		E9A1/							singlemode fiber low bend 9/125/250 µm A1	
		E9A2/							singlemode fiber low bend 9/125/250 µm A2	
		LEAF/							LEAF fiber (NZ-DS)	
		TW/							TrueWave RS fiber (NZ-DS)	
		G50/							multimode fiber 50/125/250 µm	
		G62/							multimode fiber 62.5/125/250 µm	
		H200/							step-index fiber HCS 200/230/500 µm	
			F						tight tube 0.9 mm	
			V						tight tube up to 0.6 mm	
			CW						semi-tight tube 0.9 mm, jelly-filled	
			CH						semi-tight tube 0.9 mm, dry	
			SW						soft semi-tight tube 0.9 mm, jelly-filled	
			W						multi-fiber loose tube, jelly-filled 3.00 mm Ø	
			H						multi-fiber loose tube, dry 3.00 mm Ø	
			BW						mini multi-fiber loose tube, jelly-filled 2.20 mm Ø	
			BH						mini multi-fiber loose tube, dry 2.20 mm Ø	
			J						strain relief for each separate optical fiber	
			SN						central strength member, non-metallic	
				DN					de-centralized strength member, non-metallic	
				(ZN)					strain-relief, non-metallic (aramide)	
				(ZNG)					glass roving for strain relief/rodent protection	
					A-				steel wire armouring	
					H-				outer jacket material LSFH™	
					R-				beam crosslinked (RADOX®)	
					I-				mica tape (flame barrier)	
					K-				anti-termite	
					N-				outer jacket material PA/PBT	
					T-				outer jacket material PVC	
					U-				outer jacket material PUR, flame retardant (FR)	
					V-				outer jacket material PE (HD-PE)	
					X-				outer jacket material TPE	
					Y-				outer jacket material PE (LD-PE)	
					Z-				outer jacket material PUR	
					A				outer jacket figure O	
					Δ				colour of outer jacket please refer to cable colour chart	
						XX			diameter of the cable [1/10 mm]	
							-xx		options 1 - 4, see next page	
02-		G50/	CW	J		H-	M	27	-F	example I
60-	12	E9/	W	SN	(ZNG)	Y-	G	150		example II

# HUBER+SUHNER cable code

## Rules

- For cables where each 0.6 or 0.9 mm tube is individually strain relieved (code = J) , the termination diameter is specified. For cables where all tubes have a common strain relief (code = ZN or ZNG) the cable diameter is specified. If both are true, the termination diameter is specified.
- The fiber colour is only indicated if not standard
- All options follow the basic code :  
basic key - 1st - 2nd - 3rd - 4th option
- The Cable Code has no spaces
- Items not used are left out

1st option: fiber class or bandwidth length-product [MHz*km], 850/1300 nm		
	G50	G62
Standard without indication	OM2	OM1
-D		OM2: 500/500
-E	OM2: 600/1200	
-F	OM3: 1500/500	
-G	OM4: 3500/500	

OM classes please see under section „Fiber types“

2nd option: fiber colour	
-FΔ	Fiber colours refer to fiber colour chard

3rd option: special information	
-UN	UL-listed OFNG: General purpose UL1685
-UR	UL-listed OFNR: Riser cable UL1666
-UP	UL-listed OFNP: Plenum cable UL910
-L*	temperature range -40° C up to +85° C at 1310 nm
-H*	temperature range -40° C up to +85° C at 1310 nm and 1550 nm

\* singlemode 3STAR cable only

4th option: electrical elements (hybrid cable)	
+XX-	Number of conductors respectively units
C	Electrical conductor, copper cords
XX	Conductor cross section [1/10 mm <sup>2</sup> ]
+02- C 15	Example

Fiber and cable colours Δ	
A	red
B	green
C	blue
D	orange
E	yellow
F	white
G	black
H	grey
I	brown
K	violet

L	heather violet
M	turquoise
N	light blue
O	ochre-brown
P	purple
Q	yellow-green
R	olive-green
T	transparent
U	nature (milky or beige)
Z	black with orange stripes

## DIN/VDE 0888 cable code

<b>Application</b>	A	outdoor cable
	I	indoor cable
	U	universal cable
	AT	breakout outdoor
	IT	breakout indoor
<b>Tube type</b>	V	tight tube (acc. vde)
	H	loose tube jellyfree and 1 fiber
	W	loose tube with jelly and 1 fiber
	B	loose tube jellyfree
	D	loose tube with jelly
<b>Cable design</b>	Q	dry and longitudinal watertight
	(ZN)	strain-relief non-metallic
	(ZS)	strain-relief with steel
	B	glass roving strain-relief/anti rodent
	I	mica tape / flame barrier
	W	corrugated steel
<b>Jacket material</b>	H	acc. LSFH (FRNC, LSOH etc.)
	2Y	PE, polyethylene
	4Y	PA, polyamide
	11Y	PUR, polyurethane, rubber-like e.g. for drag chain
<b>Quantity of fiber resp. tube</b>	n	amount of fiber
	n x m	amount of loose tube x amount of fiber per tube
<b>Fiber type</b>	E	singlemode fiber (glass/glass)
	G	multimode graded index fiber (glass/glass)
	S	multimode step index fiber (glass/glass)
	K	PCF, multimode step index fiber (glass/plastic)
	GK	PCF, multimode graded index fiber (glass/plastic)
	P	POF, plastic fiber (plastic/plastic)
<b>Core diameter</b>	µm	diameter (e.g. 9, 50, 62,5, 200,...)
<b>Cladding diameter</b>	µm	diameter (e.g. 125, 230,...)
<b>Attenuation</b>	dB/km	attenuation at wave length
<b>Wave length</b>	A	650 nm
	B	850 nm
	F	1300 nm
	H	1550 nm
<b>Bandwidth</b>	MHz x km	bandwidth with MM fibers (POF MHz x 100 m)
	ns/km	at SM fibers also ps/nm x km

## Conformity and certificate

### RoHS Conformity

The HUBER+SUHNER companies aim to comply with all relevant legal requirements at all time. This also holds true for the European Union Directive 2002/95/EC restriction of the use of certain hazardous substances in electrical and electronic equipment commonly referred to as the Restriction of Hazardous Substances Directive or RoHS. We are proud to state that we are able to supply components fully compliant with the RoHS directive.



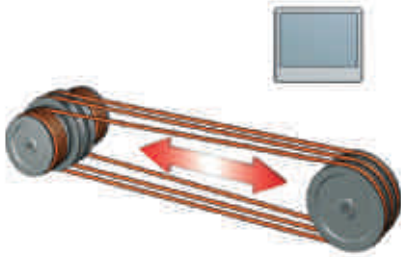
This directive restricts the use of six hazardous materials: Lead (Pb), Mercury (Hg), Cadmium (Cd), hexavalent Chromium (Cr VI), and two types of brominated flame retardants, Polybrominated Biphenyls (PBB) and Polybrominated Diphenyl Ethers (PBDE) in the manufacture of various types of electronic and electrical equipment to reduce generation of toxic waste from discarded electrical and electronic equipment

### ISO Certificate

High-quality products and supplier relationships have always been a top priority for HUBER+SUHNER. After having already been confirmed by the Swiss forerunner movement, the HUBER+SUHNER quality system was very soon acknowledged by the international ISO quality certificate. This much sought-after certificate according to ISO 9001, which must be earned over and over again, has been awarded to HUBER+SUHNER without interruption since 1990. The fact that HUBER+SUHNER is also prepared to meet specific customer quality standards exceeding those of ISO 9001 is amply proved by a large number of successfully passed customer audits.



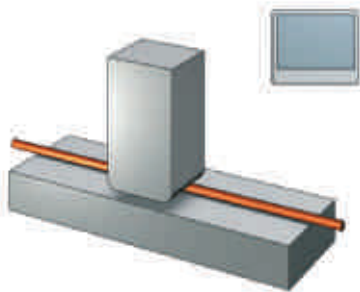
## Test procedures



### Tensile performance

Examines the behaviour of the attenuation and/or the fiber elongation strain as a function of the load on a cable design which may occur during installation (short term load or maximum specified load for the cable) and operation (long term load). This method is intended to be non-destructive.

Standards • IEC 60794-1-2 E1 (future IEC 60794-1-21 E1)



### Crush resistance

Examines the ability of an optical fiber cable to withstand crushing (transverse compression load) for long term (operation) and for short term (installation) loads. The load is uniformly applied on the cable sample..

Standards • IEC 60794-1-2 E3 (future IEC 60794-1-21 E3)



### Impact

Examines the ability of an optical fiber cable to withstand repeated impacts such as dropping of tools or stones.

Standards • IEC 60794-1-2 E4 (future IEC 60794-1-21 E4)



### Repeated bending

Examines the ability of an optical fiber cable to withstand repeated bending. The stress occurs by repeated bending the cable back and forth by 90°.

Standards • IEC 60794-1-2 E6 (future IEC 60794-1-21 E6)



## Test procedures



### Torsion

Examines the ability of a fibre optic cable to withstand mechanical twisting. The primary purpose of this procedure is to measure any variation in the optical power transmittance of a fiber when the cable is subjected to external torsional forces. A secondary purpose is to evaluate the possibility of physical damage that may occur as a result of such stresses.

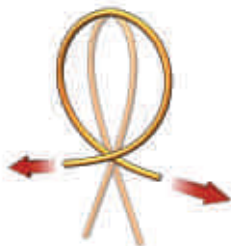
Standards • IEC 60794-1-2 E7 (future IEC 60794-1-21 E7)



### Cable bend

Examines the ability of an optical fiber cable or cable element to withstand bending around a test mandrel.

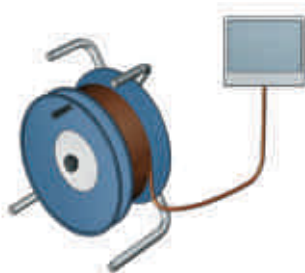
Standards • IEC 60794-1-2 E11A (future IEC 60794-1-21 E11A)



### Kink

Examines the minimum loop diameter at the onset of the kinking of an optical fiber cable.

Standards • IEC 60794-1-2 E10 (future IEC 60794-1-21 E10)

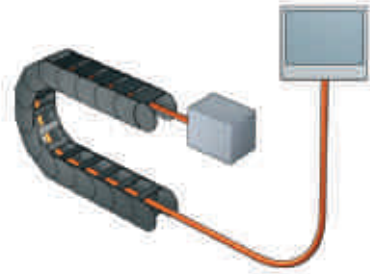


### Coiling Capability

Shows the ability of a fiber optic cable to withstand winding and unwinding. The purpose is to measure variation of the optical power transmittance of a fiber and to evaluate possible physical damage when the cable is wound and unwound on a reel.

Standards • HUBER+SUHNER

## Test procedures

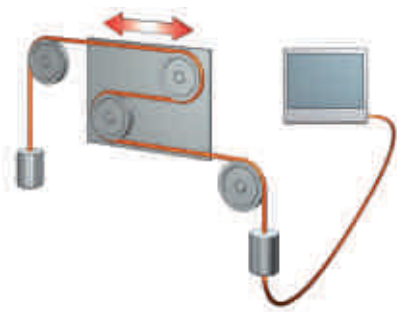


### Drag Chain Capability

Determines the ability of a fiber optic cable to withstand movement in drag chains.

The purpose is to measure variation of the optical power transmittance of a fiber and to evaluate possible physical damage when the cable is exposed to external bending and tensile force.

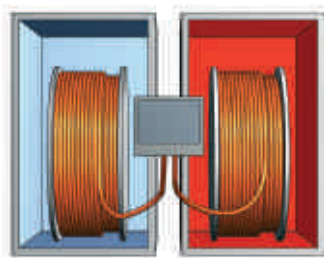
Standards • HUBER+SUHNER



### Flexing

Examines the ability of a fiber optic cable to withstand repeated flexing in service. The primary purpose of this procedure is to measure any variation in the optical power transmittance of a fiber when the cable is subjected to external bending and tensional forces. A secondary purpose is to evaluate the possibility of physical damage that may occur as a result of such stresses. This is a specialized test intended for specific types of cable, such as elevator cable or the like.

Standards • IEC 60794-1-2 E8 (future IEC 60794-1-21 E8)



### Temperature cycling (change)

Long length cables

Examines the stability behaviour of the attenuation of cables submitted to temperature changes. Test conditions for temperature-dependent measurements simulate the worst conditions.

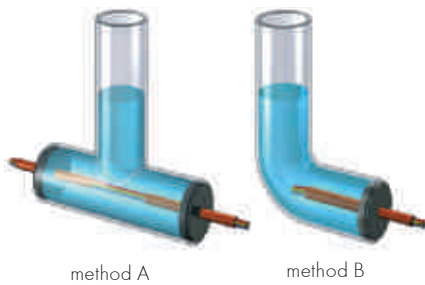
Standards • IEC 60794-1-2 F1 (future IEC 60794-1-22 F1)

Short length cables (i.e. cables for patchcords)

Examines the attenuation behaviour (change in attenuation) when optical fibre cables for use in patch cords are subjected to temperature cycling.

Standard • IEC 60794-2-50 F12 (future IEC 60794-1-22 F12)  
(IEC 601300-2-22)

## Test procedures



### Water penetration

Examines the ability of a cable to block water migration along a specified length.

Standards      • IEC 60794-1-2 F5A/B (future IEC 60794-1-22 F5A/B/C)

### Ageing

Examines the life-time behaviour of the attenuation of cables, or physical attributes specified in the detail specification.

Standards:      • IEC 60794-1-2 F10 (future IEC 60794-1-22 F10)



### Fire propagation on a vertical single cable

Cables for information transmission inside buildings installed on the surface of walls are a potential source for fire propagation.

A 60 cm long cable is mounted vertically. The flame must extinguish itself and the fire damage must not reach the upper end of sample

Standards      • IEC 60332-1  
• (DIN VDE 0472-804B)  
• DIN VDE 0482-265



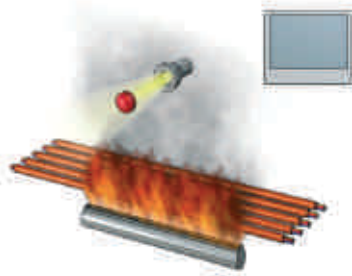
### Fire propagation on a vertical cable bundle

Depending on the volume of flammable material the cable bundles are fixed on a 3.5 m long ladder and a test flame is applied at the base during 20 minutes. The height of fire damage must not exceed 2.5 m.

This simulates a simplified chimney effect in a cable duct. Cables which pass this test have a improved characteristics regarding fire propagation.

Standards      • IEC 60332-3  
• (DIN VDE 0472-804C)  
• DIN VDE 0482-260...

## Test procedures



### Smoke emission

In a defined test environment the cable is exposed to an open fire of burning alcohol. The smoke density is determined with an optical transmission measurement.

This test allows a statement of the expected line-of-sight obstruction in case of fire.

- Standards
- IEC 61034
  - (DIN VDE 0472-816)
  - DIN VDE 0482-268



### Fire test with circuit integrity

A test fire is applied horizontally from a distance of 60 cm to a single suspended cable during a specified time. The test is passed when there was continuous circuit integrity and no extremely increased attenuation values during and after the test respectively. For instance FE 90 cables have endured at least 90 minutes, „FE“ stands for flame exposure.

This fire test shows the functional integrity duration (minutes) of a mechanically unloaded connection with a flame exposure of minimum 750 °C in a dry environment.

- Standards
- IEC 60331-25
  - DIN VDE 0472-814

### Fire with shock, circuit integrity

In addition to the fire test with circuit integrity, a test flame is applied to a specified test layout and the cable is exposed to mechanical impacts at regular intervals.

This test simulates how many minutes a cable exposed to fire of at least 750°C and mechanical impacts keeps minimum insulation efficiency (circuit integrity) in a dry environment.

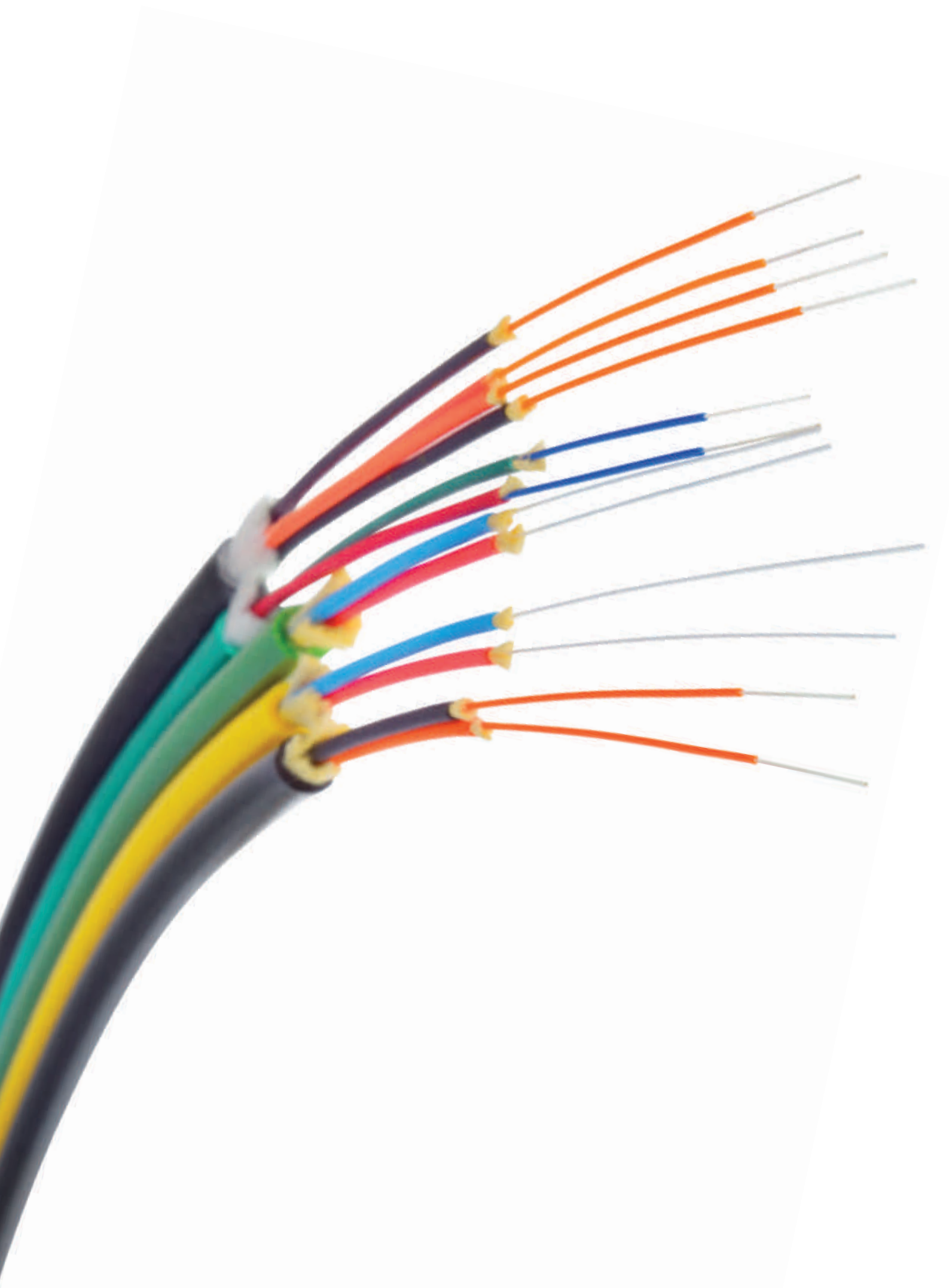
- Standards
- IEC 60331-31

### Corrosive fire gases and free of halogen











Flammable materials are combusted at over 900°C. Resulting fire gases are washed out in water bottles and the corrosiveness of this solution is determined by means of ph-values and electric conductivity.

Halogen free products contain hardly any elements of fluorine, chlorine, bromine or iodine. Materials containing halogen can release a considerable quantity of corrosive gases. These gases can cause consequential damage to the surrounding area as well as respiratory problems.

- Standards
- IEC 60754-1 / 60754-2
  - (DIN VDE 0472-819)
  - DIN VDE 0482-267



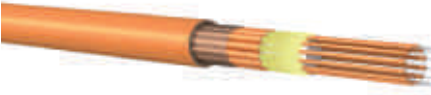







## Indoor cables

	Cable type	Page	Ordering key	Weight [kg/km]	Number of fibers
	Semi-tight tubes 0.9 mm	34	01-.../CH-...9	0.68	1
	Tight tubes 0.9 mm	36	01-.../F-...9	0.76	1
	Tight tubes 0.6 mm	38	01-.../V-T6-F...	0.3	1
	Simplex with tight tube 0.6 mm	40	01-.../VJH-...14	2.0	1
	Simplex with semi-tight tubes 0.9 mm	42	01-.../CWJH-...20 01-.../CWJH-...27 01-.../CWJH-...30	3.7 6.4 8.5	1 1 1
	Simplex with soft semi-tight tubes	44	01-.../SWJH-...17 01-.../SWJH-...21 01-.../SWJH-...24 01-.../SWJH-...27 01-.../SWJH-...30	2.8 3.8 5.3 7.0 8.9	1 1 1 1 1
	Duplex round with tight tube	46	02-.../V(ZN)H-...21	4.1	2
	Duplex figure 8 (Zip cord) 1.7 mm	48	02-.../FJH-...17	6.0	2
	Duplex figure 8 (Zip cord) 2.0/2.7 mm	50	02-.../CWJH-...20 02-.../CWJH-...27	7.8 12.5	2 2
	Duplex figure 0	52	02-.../CWJH-A-...20 02-.../CWJH-A-...27	18 24.2	2 2

	Tube Ø [mm]	Ø Single fiber cable [mm]	Jacket Ø [mm]	Jacket material	Direct connector assembly	Tensile strength in service [N]	Min. bend radius in service [mm]	Crush resistance short-term [N/cm]	Impact resistance [impacts]	Temperature range in service [°C]	Fire propagation IEC 60332-1	Fire propagation IEC 60332-3
	0.9		0.9	PPE	•	10	25	100	3	-40 to +85		
	0.9		0.9	TPE	•	10	25	100	100	-40 to +80		
	0.6		0.6	Acrylate	•	10	25	50		-40 to +85		
	0.6		1.4	LSFH™	•	75	10	200	10	-25 to +70		
	0.9		2.0	LSFH™	•	100	25	250	20	-25 to +70	p	
	0.9		2.7	LSFH™	•	100	30	500	20	-20 to +70	p	p
	0.9		3.0	LSFH™	•	200	30	500	20	-25 to +70	p	p
	0.9		1.7	LSFH™	•	50	25	500	10	-40 to +70		
	0.9		2.1	LSFH™	•	100	25	500	10	-25 to +70		
	0.9		2.4	LSFH™	•	150	25	700	10	-25 to +70	p	
	0.9		2.7	LSFH™	•	200	25	700	10	-25 to +70	p	p
	0.9		3.0	LSFH™	•	250	25	700	10	-20 to +70	p	p
	0.6		2.1	LSFH™	•	100	10	500		-25 to +70	p	p
	0.9	1.7	1.7 x 3.5	LSFH™	•	2 x 50	25	100	3	-40 to +70	p	
	0.9	2.0	2.0 x 4.1	LSFH™	•	2 x 100	25	500	40	-25 to +70	p	p
	0.9	2.7	2.7 x 5.5	LSFH™	•	2 x 100	30	1000	40	-20 to +70	p	p
	0.9	2.0	3.1 x 5.2	LSFH™	•	2 x 100	25	500	40	-20 to +70	p	p
	0.9	2.7	3.5 x 6.2	LSFH™	•	2 x 200	30	1000	40	-20 to +70	p	p

p = passed

## Indoor cables (continuance)

	Cable type	Page	Ordering key	Weight [kg/km]	Number of fibers
	Breakout 1.4 mm	54	04-.../VJSNH-...14 08-.../VJSNH-...14 12-.../VJSNH-...14 16-.../VJSNH-...14 24-.../VJSNH-...14	31 50 85 81 105	4 8 12 16 24
	Breakout 2.0 mm	56	04-.../CWJSNH-...20 08-.../CWJSNH-...20 12-.../CWJSNH-...20 16-.../CWJSNH-...20	47 82 144 135	4 8 12 16
	Fire resistant breakout 2.0 mm	58	04-.../CWJSNHIH-...20 08-.../CWJSNHIH-...20 12-.../CWJSNHIH-...20	96 141 219	4 8 12
	Riser	60	04-.../FSN(ZN)H-...50 06-.../FSN(ZN)H-...55 08-.../FSN(ZN)H-...60 12-.../FSN(ZN)H-...70 16-.../FSN(ZN)H-...85 24-.../FSN(ZN)H-...88	28 30 33 52 64 77	4 6 8 12 16 24
	FTTH simplex with semi-tight tube	62	01-E9A2/CWJH-...27-FG	7.5	1
	FTTH indoor with semi-tight tube	64	04-.../CWSN(ZN)H-...42	16	4
	FTTH indoor	66	04-E9A2/V(ZN)H-...28	8	4
	FTTH indoor HOMESTAR	68	01-E9A1/F(ZN)H-...48 02-E9A1/FSN(ZN)H-...48 04-E9A1/FSN(ZN)H-...48	26 25 25	1 2 4



	Tube Ø [mm]	Ø Single fiber cable [mm]	Jacket Ø [mm]	Jacket material	Direct connector assembly	Tensile strength in service [N]	Min. bend radius in service [mm]	Crush resistance short-term [N/cm]	Impact resistance [impacts]	Temperature range in service [°C]	Fire propagation IEC 60332-1	Fire propagation IEC 60332-3
	0.6	1.4	5.4	LSFH™	•	4 x 70	50	400	50	-25 to +70	p	p
	0.6	1.4	7.0	LSFH™	•	8 x 70	70	400	100	-25 to +70	p	p
	0.6	1.4	9.0	LSFH™	•	12 x 70	90	400	100	-25 to +70	p	p
	0.6	1.4	9.0	LSFH™	•	16 x 70	90	400	100	-25 to +70	p	p
	0.6	1.4	10.6	LSFH™	•	24 x 70	100	400	100	-25 to +70	p	p
	0.9	2.0	7	LSFH™	•	4 x 100	70	750	50	-25 to +70	p	p
	0.9	2.0	9	LSFH™	•	8 x 100	80	750	50	-25 to +70	p	p
	0.9	2.0	12	LSFH™	•	12 x 100	120	750	50	-25 to +70	p	p
	0.9	2.0	12	LSFH™	•	16 x 100	120	400	50	-25 to +70	p	p
	0.9	2.0	10.0	LSFH™	•	4 x 100	95	400	50	-25 to +70	p	p
	0.9	2.0	12.0	LSFH™	•	8 x 100	115	400	50	-25 to +70	p	p
	0.9	2.0	15.0	LSFH™	•	12 x 100	145	400	50	-25 to +70	p	p
	0.9		5.0	LSFH™	•	400	50	1800	100	-20 to +70	p	p
	0.9		5.5	LSFH™	•	550	50	1800	100	-20 to +70	p	p
	0.9		6.0	LSFH™	•	800	60	1800	100	-20 to +70	p	p
	0.9		7.0	LSFH™	•	1000	70	1800	100	-20 to +70	p	p
	0.9		8.5	LSFH™	•	1400	85	1800	100	-20 to +70	p	p
	0.9		8.8	LSFH™	•	1500	100	1500	100	-20 to +70	p	p
	0.9		2.7	LSFH™	•	200	7.5	500	100	-25 to +70	p	
	0.9		4.2	LSFH™	•	300	15	800	100	-25 to +70	p	
	0.6		2.8	LSFH™	•	200	10	200	5	-40 to +70	p	
	0.9		4.8	LSFH™	•	200	10	2000	100	-25 to +70	p	
	0.9		4.8	LSFH™	•	300	10	1500	100	-25 to +70	p	
	0.9		4.8	LSFH™	•	300	10	1500	100	-25 to +70	p	

p = passed

## Semi-tight tubes 0.9 mm



### Design

Tube	coloured fiber in dry tube (jelly free)	
Tube material	halogen free	
Tube colour	E9	yellow
	OM2	orange
	OM3	turquoise
	OM4	heather violet
	G62.5	blue
	other colours on request	

### Properties

- For direct connector assembly
- Tube can be stripped up to 2 m in one piece
- Tight bending radii
- High flexibility
- Halogen free and non-corrosive fire gases
- Jelly free

### Applications

- Pigtail assemblies for fusion or mechanical splicing within distribution frames and termination boxes
- Mini patch cables within protected enclosures
- For termination with passive optical components such as connectors

According to IEC 60794-1-2

### Ordering information

01-.../CH-...9

Please see page 136

## Semi-tight tubes 0.9 mm

Specification		Semi-tight tube dry		
Tube Ø		0.90	mm	
Approx. weight		0.68	kg/km	

Mechanical properties				
Tensile strength	during installation	20	N	IEC 60794-1-2 E1
	in service	10	N	
Min. bend radius	during installation	25	mm	IEC 60794-1-2 E11
	in service	25	mm	
Crush resistance	short-term	100	N/cm	IEC 60794-1-2 E3
	long-term	50	N/cm	
Impact resistance	$W_p = 0.74 \text{ J}$ , $r = 25 \text{ mm}$	3	impacts	IEC 60794-1-2 E4
Torsion	$\pm 360^\circ$ , length = 1000 mm, $F = 5 \text{ N}$	3	cycles	IEC 60794-1-2 E7

Thermal properties				
Temperature range	during installation	-10 to +60	°C	IEC 60794-2-50 F12
	in service	-40 to +85	°C	
	in storage	-40 to +85	°C	

Specification for singlemode at 1310 nm, for multimode at 1300 nm

Combustion properties				
Fire load		0.016	MJ/m	
2002/95/EC (RoHS)		compliant		

## Tight tubes 0.9 mm



### Design

Tube	buffer layer on fiber	
Tube material	halogen free (TPE)	
Tube colour	E9	yellow
	OM2	orange
	OM3	turquoise
	OM4	heather violet
	G62.5	blue
	other colours on request	

### Properties

- For direct connector assembly
- Tube can be stripped up to 30 mm in one piece
- Tight bending radii
- For high mechanical and thermal stability
- Halogen free and non-corrosive fire gases
- Improved crush resistance

### Applications

- Patch cable within distribution frames and termination boxes
- In thermally and mechanically critical environments
- For mobile or flexible systems

According to IEC 60794-1-2

### Ordering information

01-.../F-...9

Please see page 136

## Tight tubes 0.9 mm

Specification		Tight tube	
Tube Ø		0.90	mm
Approx. weight		0.76	kg/km

Mechanical properties				
Tensile strength	during installation ( $r \geq 25\text{mm}$ )	20	N	IEC 60794-1-2 E1
	in service ( $r \geq 25\text{mm}$ )	10	N	
Min. bend radius	during installation	25	mm	IEC 60794-1-2 E11
	in service	25	mm	
Crush resistance	short-term	100	N/cm	IEC 60794-1-2 E3
	long-term	50	N/cm	
Impact resistance	$W_p = 0.74\text{ J}$ , $r = 25\text{ mm}$	100	impacts	IEC 60794-1-2 E4
Torsion	$\pm 360^\circ$ , length = 1000 mm, $F = 5\text{ N}$	3	cycles	IEC 60794-1-2 E7

Thermal properties				
Temperature range	during installation	-10 to +60	°C	IEC 60794-2-50 F12
	in service	-40 to +80	°C	
	in storage	-40 to +80	°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

Combustion properties			
Fire load		0.019	MJ/m
2002/95/EC (RoHS)		compliant	

## Tight tubes 0.6 mm



### Design

Tube	coloured fiber with a buffer layer on transparent fiber	
Tube material	Acrylat	
Tube colour	E9	yellow
	OM2	orange
	OM3	turquoise
	OM4	heather violet
	G62.5	blue

### Properties

- Metal free indoor cable
- For direct connector assembly
- Tube can be stripped up to 50 mm in one piece
- Tight bending radii
- Halogen free and non-corrosive fire gases

### Applications

- Data cable in distribution network - FTTH
- Installation in indoor area

According to IEC 60794-1-2

### Ordering information

01-.../V-T6-F...

Please see page 136

## Tight tubes 0.6 mm

Specification		Tight tube	
Tube Ø		0.6	mm
Approx. weight		0.3	kg/km

Mechanical properties				
Tensile strength	during installation	20	N	IEC 60794-1-2 E1
	in service	10	N	
Min. bend radius	during installation	25	mm	IEC 60794-1-2 E11
	in service	25	mm	
Crush resistance	short-term	50	N/cm	IEC 60794-1-2 E3
	long-term	25	N/cm	

Thermal properties				
Temperature range	during installation	-10 to +60	°C	IEC 60794-2-50 F12
	in service	-40 to +85	°C	
	in storage	-40 to +60	°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

Combustion properties			
Fire load		0.01	MJ/m
2002/95/EC (RoHS)		compliant	

## Simplex cables 1.4 mm with tight tube 0.6 mm



### Design

Tube	1 tight buffered tube 0.6 mm	
Strain relief	Aramide yarn	
Jacket material	LSFH™	
Jacket colour	E9	yellow
	OM2	orange
	OM3	turquoise
	OM4	heather violet
	G62.5	orange

### Properties

- Metal free indoor cable
- Strain relieved with aramide yarn
- For direct connector assembly with strain relief
- Tight bending radii
- High flexibility
- Halogen free and non-corrosive fire gases
- Jacket material according to UL 94V-0

### Applications

- Patch cables for data centers
- Terminations possible for SFF connectors only

According to IEC 60794-1-2

### Ordering information

01-.../VJH-...14

Please see page 137



## Simplex cables 1.4 mm with tight tube 0.6 mm

Specification			
Jacket Ø		1.4	mm
Tube Ø		0.6	mm
Approx weight		2.0	kg/km

Mechanical properties				
Tensile strength	during installation	150	N	IEC 60794-1-2 E1
	in service	75	N	
Min. bend radius	during installation	15	mm	IEC 60794-1-2 E11
	in service	10	mm	
Crush resistance	short-term	200	N/cm	IEC 60794-1-2 E3
	long-term	100	N/cm	
Impact resistance	W <sub>p</sub> = 0.74 J	10	impacts	IEC 60794-1-2 E4
Repeated bending	r = 25 mm, weight = 0.35 kg	1000	cycles	IEC 60794-1-2 E6
Kink resistance	radius 5 mm	p		IEC 60794-1-2 E10

Thermal properties				
Temperature range	during installation	-10 to +50	°C	IEC 60794-2-50 F12
	in service	-25 to +70	°C	
	in storage	-25 to +70	°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

Combustion properties				
Fire load		0.05	MJ/m	
Smoke density		p		IEC 61034-2
Halogen acid gas	jacket material	p		IEC 60754-1
Degree of acidity	jacket material	p		IEC 60754-2
2002/95/EC (RoHS)		compliant		

p = passed

## Simplex cables with semi-tight tube



### Design

Tube	semi-tight tubes 0.9 mm	
Strain relief	Aramide yarn	
Jacket material	LSFH™	
Jacket colour	E9	yellow
	OM2	orange
	OM3	turquoise
	OM4	heather violet
	G62.5	orange

### Properties

- Metal free indoor cable
- Each fiber strain relieved
- For direct connector assembly with strain relief
- Tube can be stripped up to 2 m
- Halogen free and non-corrosive fire gases
- Jacket material according to UL 94V-0
- Low fire load for high safety requirements

### Applications

- Installation in indoor area
- Measurement cable withstanding mechanical loading
- Patch cable in distribution centres
- Data cable in distribution networks
- Strain-relieved pigtail
- Ideal for applications involving safety requirements in case of fire

According to IEC 60794-1-2

### Ordering information

01-.../CWJH-...

Please see page 137

## Simplex cables with semi-tight tube

Specification					
Jacket Ø		2.0	2.7	3.0	mm
Tube Ø		0.9	0.9	0.9	mm
Approx weight		3.7	6.4	8.5	kg/km

Mechanical properties						
Tensile strength	during installation	200	200	300	N	IEC 60794-1-2 E1
	in service	100	100	200	N	
Min. bend radius	during installation	50	50	50	mm	IEC 60794-1-2 E11
	in service	25	30	30	mm	
Crush resistance	short-term	250	500	500	N/cm	IEC 60794-1-2 E3
	long-term	100	100	100	N/cm	
Impact resistance	$W_p = 0.74 J, r = 25 \text{ mm}$	20	20	20	impacts	IEC 60794-1-2 E4
Repeated bending	$r = 25 \text{ mm, weight} = 0,5 \text{ kg}$	5000	5000	5000	cycles	IEC 60794-1-2 E6

Thermal properties						
Temperature range	during installation	-10 to +50			°C	IEC 60794-2-50 F12
	in service	-20 to +70			°C	
	in storage	-25 to +60			°C	

Specification for singlemode at 1310 nm, for multimode at 1300 nm

Combustion properties						
Fire load		0.08	0.13	0.18	MJ/m	
Fire propagation	on a vertical single cable	p	p	p		IEC 60332-1
	on a vertical cable bundle		p	p		IEC 60332-3-24
Halogen acid gas	jacket material	p	p	p		IEC 60754-1
Degree of acidity	jacket material	p	p	p		IEC 60754-2
2002/95/EC (RoHS)		compliant				

p = passed

Technical data for cable types with H200 fiber might vary

## Simplex cables with soft semi-tight tube



### Design

Tube	soft semi-tight tubes 0.9 mm
Strain relief	Aramide yarn
Jacket material	LSFH™
Jacket colour	E9 yellow

### Properties

- Metal free indoor cable
- Each fiber strain relieved
- For direct connector assembly with strain relief
- Tube can be stripped up to 1 m with a special tool
- Low fire load for high safety requirements
- Jacket material according to UL 94V-0
- Halogen free and non-corrosive fire gases
- Only available with singlemode E9 fibers

### Applications

- Installation in indoor area
- Measurement cable withstanding mechanical loading
- Patch cable in distribution centres
- Data cable in distribution networks
- Ideal for applications involving safety requirements in case of fire

According to IEC 60794-1-2

### Ordering information

01-.../SWJH-...

Please see page 138

### Approvals

Cable Ø 2.4 mm for assemblies approved as patch cable by the Deutsche Telekom AG (DTAG)

## Simplex cables with soft semi-tight tube

Specification							
Jacket Ø	1.7	2.1	2.4	2.7	3.0	mm	
Tube Ø	0.9	0.9	0.9	0.9	0.9	mm	
Approx. weight	2.8	3.8	5.3	7.0	8.5	kg/km	

Mechanical properties								
Tensile strength	during installation	100	200	300	400	500	N	IEC 60794-1-2 E1
	in service	50	100	150	200	250	N	
Min. bend radius	during installation	50	50	50	50	50	mm	IEC 60794-1-2 E11
	in service	25	25	25	25	25	mm	
Crush resistance	short-term	500	500	700	700	700	N/cm	IEC 60794-1-2 E3
	long-term	300	300	500	300	300	N/cm	
Impact resistance	Wp = 2.21 J, r = 25 mm	10	10	10	10	10	impacts	IEC 60794-1-2 E4
Repeated bending	r = 25 mm, weight = 0,5 kg	5000	5000	5000	5000	5000	cycles	IEC 60794-1-2 E6

Thermal properties							
Temperature range	during installation	-10 to +50				°C	IEC 60794-2-50 F12
	in service	-40/+70	-25 to +70		-20/+70	°C	
	in storage	-40 to +60				°C	

Combustion properties							
Fire load		0.06	0.08	0.11	0.15	0.18	MJ/m
Fire propagation	on a vertical single cable			p	p	p	IEC 60332-1
	on a vertical cable bundle				p	p	IEC 60332-3-24
Halogen acid gas	jacket material	p	p	p	p	p	IEC 60754-1
Degree of acidity	jacket material	p	p	p	p	p	IEC 60754-2
2002/95/EC (RoHS)		compliant					

p = passed

Specification for singlemode at 1550 nm

## Duplex round cables (LC uniboot compatible)



### Design

Tube	2 tight buffered tubes 0.6 mm	
Strain relief	Aramide yarn	
Jacket material	LSFH™	
Jacket colour	E9	yellow
	OM2	orange
	OM3	turquoise
	OM4	heather violet
	G62.5	orange

### Properties

- Metal free indoor cable
- Strain relieve with Aramide yarn
- For direct connector assembly
- Tube can be stripped up to 50 mm in one piece
- Tight bending radii
- High flexibility
- Low smoke, halogen free and self-extinguishing
- Jacket material according to UL 94V-0
- LC Uniboot compatible

### Applications

- Patch cables for data centers
- Duplex cable for LC Uniboot

According to IEC 60794-1-2

### Ordering information

02-.../V(ZN)H-...21

Please see page 138

## Duplex round cables (LC uniboot compatible)

### Specification

Jacket Ø		2.1	mm	
Tube Ø		0.6	mm	
Approx. weight		4.1	kg/km	

### Mechanical properties

Tensile strength	during installation	200	N	IEC 60794-1-2 E1
	in service	100	N	
Min. bend radius	during installation	10	mm	IEC 60794-1-2 E11
	in service	10	mm	
Crush resistance	short-term	500	N/cm	IEC 60794-1-2 E3
	long-term	90	N/cm	
Kink resistance	radius 3 mm	p		IEC 60794-1-2 E10

### Thermal properties

Temperature range	during installation	-25 to +70	°C	IEC 60794-1-2 F1
	in service	-25 to +70	°C	
	in storage	-25 to +70	°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

### Combustion properties

Fire load		0.082	MJ/m	
Fire propagation	on a vertical single cable	p		IEC 60332-1-2
	on a vertical cable bundle	p		IEC 60332-3-25
Halogen acid gas	jacket material	p		IEC 60754-1
Degree of acidity	jacket material	p		IEC 60754-2
2002/95/EC (RoHS)		compliant		

p = passed

## Duplex cables figure 8 (zip cord) - 1.7 mm



### Design

Tube	2 tight buffered tubes 0.9 mm	
Strain relief	Aramide yarn	
Jacket material	LSFH™	
Jacket colour	E9	yellow
	OM2	orange
	OM3	turquoise
	OM4	heather violet
	G62.5	orange

### Properties

- Metal free indoor cable
- Each fiber strain relieved
- For direct connector assembly with strain relief
- Tube can be stripped up to 30 mm in one piece
- Tight bending radii
- For high thermal stability
- Halogen free and non-corrosive fire gases
- Jacket material according to UL 94V-0
- Low fire load for high safety requirements

### Applications

- Installation in indoor area
- Patch cable in distribution centres
- Data cable in distribution networks
- Ideal for applications involving safety requirements in case of fire

According to IEC 60794-1-2

### Ordering information

02-.../FJH-...17

Please see page 138



## Duplex cables figure 8 (zip cord) - 1.7 mm

Specification			
Jacket Ø		1.7 x 3.5	mm
Single fiber Ø		1.7	mm
Tube Ø		0.9	mm
Channel marking on single fiber			with one fiber each inscription on one side
Approx. weight		6.0	kg/km

Mechanical properties				
Tensile strength	during installation	2 x 100	N	IEC 60794-1-2 E1
	in service	2 x 50	N	
Min. bend radius	during installation	50	mm	IEC 60794-1-2 E11
	in service	25	mm	
Crush resistance	short-term	100	N/cm	IEC 60794-1-2 E3
	long-term	50	N/cm	
Impact resistance	Wp = 2.94 J, r = 25 mm	3	impacts	IEC 60794-1-2 E4

Thermal properties				
Temperature range	during installation	-10 to +60	°C	IEC 60794-2-50 F12
	in service	-40 to +70	°C	
	in storage	-40 to +70	°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

Combustion properties				
Fire load		0.13	MJ/m	
Fire propagation	on a vertical single cable	p		IEC 60332-1
Halogen acid gas	jacket material	p		IEC 60754-1
Degree of acidity	jacket material	p		IEC 60754-2
2002/95/EC (RoHS)		compliant		

p = passed

## Duplex cables figure 8 (zip cord) – 2.0 and 2.7 mm



### Design

Tube	2 semi-tight tubes 0.9 mm	
Strain relief	Aramide yarn	
Jacket material	LSFH™	
Jacket colour	E9	yellow
	OM2	orange
	OM3	turquoise
	OM4	heather violet
	G62.5	orange

### Properties

- Metal free indoor cable
- Each fiber strain relieved
- For direct connector assembly with strain relief
- Tube can be stripped up to 1 m in one piece
- Tight bending radii
- Low smoke, halogen free and self-extinguishing
- Jacket material according to UL 94V-0
- Low fire load for high safety requirements

### Applications

- Installation in indoor area
- Patch cable in distribution centres
- Data cable in distribution networks
- Ideal for applications involving high safety requirements in case of fire

According to IEC 60794-1-2

### Ordering information

02-.../CWJH-...

Please see page 139

## Duplex cables figure 8 (zip cord) – 2.0 and 2.7 mm

Specification					
Jacket Ø		2.0 x 4.1	2.7 x 5.5	mm	
Single fiber Ø		2.0	2.7	mm	
Tube Ø		0.9	0.9	mm	with one fiber each
Channel marking on single fiber					inscription on one side
Approx. weight		7.8	12.5	kg/km	

Mechanical properties					
Tensile strength	during installation	400	400	N	IEC 60794-1-2 E1
	in service	2 x 100	2 x 100	N	
Min. bend radius	during installation	50	50	mm	IEC 60794-1-2 E11
	in service	25	30	mm	
Crush resistance	short-term	500	1000	N/cm	IEC 60794-1-2 E3
	long-term	200	200	N/cm	
Impact resistance	Wp = 0.74 J, r = 25 mm	40	20	impacts	IEC 60794-1-2 E4
Repeated bending	r = 25 mm, weight = 0.5 kg	5000	5000	cycles	IEC 60794-1-2 E6
Torsion	±360°, length = 1000 mm, F = 20 N	10	10	cycles	IEC 60794-1-2 E7

Thermal properties					
Temperature range	during installation	-10 to +60	-10 to +50	°C	IEC 60794-2-50 F12
	in service	-25 to +70	-20 to +70	°C	
	in storage	-40 to +60	-25 to +60	°C	

Specification for singlemode at 1310 nm, for multimode at 1300 nm

Combustion properties					
Fire load		0.16	0.25	MJ/m	
Fire propagation	on a vertical single cable	p	p		IEC 60332-1
	on a vertical cable bundle	p	p		IEC 60332-3-24
Halogen acid gas	jacket material	p	p		IEC 60754-1
Degree of acidity	jacket material	p	p		IEC 60754-2
2002/95/EC (RoHS)		compliant			

p = passed

Technical data for cable types with H200 fiber might vary.

## Duplex cables figure 0



Ø 2.0 mm - inner jacket numbered



Ø 2.7 mm - inner jacket red and green

### Design

Tube	2 simplex cables with semi-tight tubes 0.9 mm	
Strain relief	Aramide yarn	
Jacket material	LSFH™	
Outer jacket colour	E9	yellow
	OM2	orange
	OM3	turquoise
	OM4	heather violet
	G62.5	orange

### Properties

- Metal free indoor cable
- Each fiber strain relieved
- For direct connector assembly with strain relieved
- Tube can be stripped up to 1 m in one piece
- Low smoke, halogen free and self-extinguishing
- Jacket material according to UL 94V-0

### Applications

- Installation in indoor areas
- Patch cable in distribution centres
- Data cable in distribution networks
- Applications with high safety requirements in case of fire

According to IEC 60794-1-2

### Ordering information

02-.../CWJH-A...

Please see page 139

## Duplex cables figure 0

Specification				
Jacket Ø		3.1 x 5.2	3.5 x 6.2	mm
Single fiber cable Ø		2.0	2.7	mm
Tube Ø		0.9	0.9	mm
Channel marking on single fiber cable		numbered	coloured	
Approx. weight		18	24.2	kg/km

Mechanical properties					
Tensile strength	during installation	400	600	N	IEC 60794-1-2 E1
	in service	2 x 100	2 x 200	N	
Min. bend radius	during installation	50	50	mm	IEC 60794-1-2 E11
	in service	25	30	mm	
Crush resistance	short-term	500	1000	N/cm	IEC 60794-1-2 E3
	long-term	100	100	N/cm	
Impact resistance	Wp = 0.74 J, r = 25 mm	40	40	impacts	IEC 60794-1-2 E4
Repeated bending	r = 25 mm, weight = 2 kg	10'000	10'000	cycles	IEC 60794-1-2 E6

Thermal properties					
Temperature range	during installation	-10 to +60	-10 to +50	°C	IEC 60794-2-50 F12
	in service	-20 to +70	-20 to +70	°C	
	in storage	-25 to +60	-25 to +60	°C	

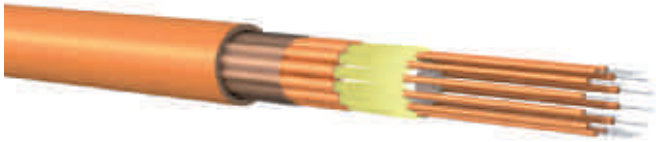
Specification for singlemode at 1310 nm, for multimode at 1300 nm

Combustion properties					
Fire load		0.35	0.46	MJ/m	
Fire propagation	on a vertical single cable	p	p		IEC 60332-1
	on a vertical cable bundle	p	p		IEC 60332-3-24
Halogen acid gas	jacket material	p	p		IEC 60754-1
Degree of acidity	jacket material	p	p		IEC 60754-2
2002/95/EC (RoHS)		compliant			

p = passed

Technical data for cable types with H200 fiber might vary

## Breakout cables 1.4 mm



### Design

Cable design	central strength member (non metallic) 4-24 single fiber cables with tight buffered tube 0,6mm strain relief (Aramide yarn) separating tape and 1 ripcord	
Channel marking	single fiber cable numbred	
Jacket material	LSFH™	
Outer jacket colour	E9	yellow
	OM2	orange
	OM3	turquoise
	OM4	heather violet
	G62.5	orange

### Properties

- Metal free indoor and outdoor cable
- Each fiber strain relieved
- For direct connector assembly with strain relieved
- Ripcord for easy jacket removal
- Low smoke, halogen free and self-extinguishing
- Cable with improved fire performance
- For SMARTLINE applications

### Applications

- Installation in indoor areas
- Data cable in distribution networks
- For installations in cable ducts
- For horizontal and collapsed backbone cabling
- Terminations possible for SFF connectors only

According to IEC 60794-1-2

### Ordering information

04-.../VJSNH-...14

08-.../VJSNH-...14

12-.../VJSNH-...14

16-.../VJSNH-...14

24-.../VJSNH-...14

Please see page 140

## Breakout cables 1.4 mm

Specification	4	8	12	16	24		stranding
Jacket material	LSFH™	LSFH™	LSFH™	LSFH™	LSFH™		
Jacket Ø	5.4	7.0	9.0	9.0	10.6	mm	
Single fiber cable Ø	1.4	1.4	1.4	1.4	1.4	mm	with one tube each
Tube Ø	0.6	0.6	0.6	0.6	0.6	mm	with one fiber each
Streight member	0.7	2.4	4.1	1.0	2.8	mm	
Channel marking on single fiber cable	numbered						
Approx. weight	31	50	85	81	105	kg/km	

Mechanical properties								
Tensile strength	during installation	1000	2000	3000	4000	5000	N	IEC 60794-1-2 E1
	in service	4x70	8x70	12x70	16x70	24x70	N	
Min. bend radius	during installation	80	100	130	130	160	mm	IEC 60794-1-2 E11
	in service	50	70	90	90	100	mm	
Crush resistance	short-term	400	400	400	400	400	N/cm	IEC 60794-1-2 E3
	long-term	200	200	200	200	200	N/cm	
Impact resistance	Wp = 2.21 J	50	100	100	100	100	impacts	IEC 60794-1-2 E4
Repeated bending	r = 100 mm, weight = 4 kg	2000	2000	2000	2000	2000	cycles	IEC 60794-1-2 E6

Thermal properties						
Temperature range	during installation	-10 to +60			°C	IEC 60794-2-50 F1
	in service	-25 to +70			°C	
	in storage	-40 to +60			°C	

Specification for singlemode at 1310 nm, for multimode at 1300 nm

Combustion properties							
Fire load		0.85	1.40	2.30	2.40	3.10	MJ/m
Fire propagation	on a vertical single cable	p	p	p	p	p	IEC 60332-1
	on a vertical cable bundle	p	p	p	p	p	IEC 60332-3-25
Smoke density		p	p	p	p	p	IEC 61034-2
Halogen acid gas	jacket material	p	p	p	p	p	IEC 60754-1
Degree of acidity	jacket material	p	p	p	p	p	IEC 60754-2
2002/95/EC (RoHS)		compliant					

p = passed

## Breakout cables 2.0 mm



Lloyd's  
Register



### Design

Cable design	central strength member, non-metallic 4 to 16 single fiber cables with semi-tight tubes strain relief (Aramide yarn) separating tape and 1 ripcord	
Channel marking	single fiber cable numbered	
Jacket material	LSFH™	
Outer jacket colour	E9	yellow
	OM2	orange
	OM3	turquoise
	OM4	heather violet
	G62.5	orange

### Properties

- Metal free indoor cable
- Each fiber strain relief
- For direct connector assembly with strain relief
- Ripcord for easy jacket removal
- Low smoke, halogen free and self-extinguishing
- Cable with improved fire performance
- For SMARTLINE applications

### Applications

- Installation in indoor areas
- Data cable in distribution networks
- For installation in cable ducts
- Deal for applications involving high safety requirements in case of fire
- For horizontal and collapsed backbone cabling

According to IEC 60794-1-2

### Approvals

Germanischer Lloyd,  
GL-approval certificate no. 24 367-04 HH  
Lloyd's Register  
LR-approval certificate no. 05/200 44

### Ordering information

04-.../CWJSNH-...20  
08-.../CWJSNH-...20  
12-.../CWJSNH-...20  
16-.../CWJSNH-...20  
Please see page 140



## Breakout cables 2.0 mm

Specification	4	8	12	16		stranding
Jacket Ø	7.0	9.0	12.0	12.0	mm	
Single cable Ø	2.0 <sup>1)</sup>	2.0 <sup>1)</sup>	2.0 <sup>1)</sup>	2.0	mm	with one tube each
Tube Ø	0.9	0.9	0.9	0.9	mm	with one fiber each
Strength member	1.0	3.2	5.8	1.6	mm	
Channel marking on single fiber cable	numbered					
Approx. weight	47	82	144	135	kg/km	

1) also available with Ø 2.7 mm single cable

Mechanical properties							
Tensile strength	during installation	1200	2400	4000	4800	N	IEC 60794-1-2 E1
	in service	4 x 100	8 x 100	12x100	16x100	N	
Min. bend radius	during installation	100	120	180	180	mm	IEC 60794-1-2 E11
	in service	70	80	120	120	mm	
Crush resistance	short-term	750	750	750	400	N/cm	IEC 60794-1-2 E3
	long-term	200	200	200	200	N/cm	
Impact resistance	Wp = 2.21 J, r = 25 mm	50	50	50	50	impacts	IEC 60794-1-2 E4
Repeated bending	r = 100 mm, weight = 5.4 kg	1000	1000	1000	1000	cycles	IEC 60794-1-2 E6
Flexing		10'000	10'000	10'000	10'000	cycles	IEC 60794-1-2 E8
Torsion	± 360°, l = 1000 mm m = 2 kg	25'000	25'000	25'000	25'000	cycles	IEC 60794-1-2 E7

Thermal properties						
Temperature range	during installation	-10 to +60			°C	IEC 60794-2-50 F1
	in service	-25 to +70			°C	
	in storage	-40 to +60			°C	

Specification for singlemode at 1310 nm, for multimode at 1300 nm

Combustion properties							
Fire load		1.09	1.63	3.15	2.95	MJ/m	
Fire propagation	on a vertical single cable	p	p	p	p		IEC 60332-1
	on a vertical cable bundle	p	p	p	p		IEC 60332-3-24
Smoke density		p	p	p	p		IEC 61034-2
Halogen acid gas	jacket material	p	p	p	p		IEC 60754-1
Degree of acidity	jacket material	p	p	p	p		IEC 60754-2
2002/95/EC (RoHS)		compliant					

p = passed

Technical data for cable types with H200 fiber might vary

# Fire resistant breakout cables 2.0 mm



## Design

Cable design	central strength member, non-metallic 4 - 12 single fiber cables with semi-tight tubes strain relief (Aramide yarn) separating tape and 1 ripcord
Channel marking	single fiber cable numbered
Jacket material	LSFH™ - double jacket with flame barrier
Outer jacket colour	E9                    yellow OM2                  orange OM3                  turquoise OM4                  heather violet G62.5                orange

## Properties

- Metal free indoor cable
- Each fiber strain relief
- For direct connector assembly with strain relief
- Ripcord for easy jacket removal
- Low smoke, halogen free and self-extinguishing
- Cable with improved fire performance
- For SMARTLINE applications

## Applications

- Installation in indoor areas
- Data cable in distribution networks
- For installation in cable ducts
- Ideal for applications involving high safety requirements in case of fire
- For horizontal and collapsed backbone cabling

According to IEC 60794-1-2

## Ordering information

04-.../CWJSNHH-...20  
08-.../CWJSNHH-...20  
12-.../CWJSNHH-...20  
Please see page 141

## Approvals

Germanischer Lloyd,  
GL-approval certificate no. 26 976-05 HH  
Lloyd's Register  
LR-approval certificate no. 06/20007

## Fire resistant breakout cables 2.0 mm

Specification	4	8	12		stranding
Jacket Ø	10.0	12.0	15.0	mm	
Single cable Ø	2.0	2.0	2.0	mm	with one tube each
Tube Ø	0.9	0.9	0.9	mm	with one fiber each
Strength member	1.0	3.2	5.8	mm	
Channel marking on single fiber cable	numbered				
Approx. weight	96	141	219	kg/km	

Mechanical properties						
Tensile strength	during installation	1200	2400	4000	N	IEC 60794-1-2 E1
	in service	4 x 100	8 x 100	12x100	N	
Min. bend radius	during installation	145	175	220	mm	IEC 60794-1-2 E11
	in service	95	115	145	mm	
Crush resistance	short-term	400	400	400	N/cm	IEC 60794-1-2 E3
	long-term	200	200	200	N/cm	
Impact resistance	Wp = 2.21 J, r = 25 mm	50	50	50	impacts	IEC 60794-1-2 E4
Repeated bending	r = 100 mm, weight = 5.4 kg	1000	1000	1000	cycles	IEC 60794-1-2 E6

Thermal properties						
Temperature range	during installation	-10 to +60			°C	IEC 60794-2-50 F1
	in service	-25 to +70			°C	
	in storage	-40 to +60			°C	

Specification for singlemode at 1310 nm, for multimode at 1300 nm

Combustion properties						
Fire load		2.00	2.74	4.56	MJ/m	
Fire propagation	on a vertical single cable	p	p	p		IEC 60332-1
	on a vertical cable bundle	p	p	p		IEC 60332-3-24
Fire test	with circuit integrity (CI)	180	180	180	min.	IEC 60331-25
Fire test	with circuit integrity (CI) with shock	180	180	180	min.	IEC 60331-31
Smoke density		p	p	p		IEC 61034-2
Halogen acid gas	jacket material	p	p	p		IEC 60754-1
Degree of acidity	jacket material	p	p	p		IEC 60754-2
2002/95/EC (RoHS)		compliant				

p = passed

Technical data for cable types with H200 fiber might vary

## Riser cables (distribution cables)



### Design

Cable design	central strength member (non-metallic) 4 to 24 tight tube fibers strain relief (Aramide yarn) 1 ripcord
Tube colour	according to colour code
Jacket material	LSFH™
Jacket colour	black

### Properties

- Metal free indoor cable
- Strain relief with Aramide yarn
- For direct connector assembly
- Ripcord for easy jacket removal
- For high mechanical and thermal stability
- Low smoke, halogen free and self-extinguishing
- For SMARTLINE applications

### Applications

- Internal building distribution
- Rising zone
- LAN
- For installation in cable ducts
- FTTD (fiber to the desk)
- Applications with high safety requirements
- For horizontal and collapsed backbone cabling

According to IEC 60794-1-2

### Ordering information

04-.../FSN(ZN)H-...50  
06-.../FSN(ZN)H-...55  
08-.../FSN(ZN)H-...60  
12-.../FSN(ZN)H-...70  
16-.../FSN(ZN)H-...85  
24-.../FSN(ZN)H-...88  
Please see page 142

## Riser cables (distribution cables)

Specification	4	6	8	12	16	24		stranding	
Jacket Ø	5.0	5.5	6.0	7.0	8.5	8.8	mm		
Tube Ø	0.9	0.9	0.9	0.9	0.9	0.9	mm	with one fiber each	
Strength member Ø	0.44	0.9	1.5	2.8	3.9	1.8	mm		
Channel marking on single fiber cable	coloured								
Approx. weight	28	30	33	52	64	77	kg/km		

### Mechanical properties

Tensile strength	during installation	1200	1600	2400	3000	4200	4500	N	IEC 60794-1-2 E1
	in service	400	550	800	1000	1400	1500	N	
Min. bend radius	during installation	100	100	120	130	130	130	mm	IEC 60794-1-2 E11
	in service	50	50	60	70	85	100	mm	
Crush resistance	short-term	1800	1800	1800	1800	1800	1500	N/cm	IEC 60794-1-2 E3
	long-term	300	300	300	300	300	200	N/cm	
Impact resistance	Wp = 2.21 J, r = 25 mm	100	100	100	100	100	100	impacts	IEC 60794-1-2 E4
Repeated bending	r = 40 mm, weight = 2 kg	1000	2000	2000	2000	2000	2000	cycles	IEC 60794-1-2 E6
	r = 50 mm, weight = 2.5 kg								

### Thermal properties

Temperature range	during installation	-25 to +50					°C	IEC 60794-1-2 F1
	in service	-20 to +70					°C	
	in storage	-25 to +70					°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

### Combustion properties

Fire load		0.4	0.6	0.8	1.1	1.8	1.8	MJ/m	
Fire propagation	on a vertical single cable	p	p	p	p	p	p		IEC 60332-1
Fire propagation	on a vertical cable bundle	p	p	p	p	p	p		IEC 60332-3
Smoke density		p	p	p	p	p	p		IEC 61034-2
Halogen acid gas	jacket material	halogen free							IEC 60754-1
Degree of acidity	jacket material	p	p	p	p	p	p		IEC 60754-2
2002/95/EC (RoHS)		compliant							

p = passed

## FTTH simplex indoor cables with semi-tight tube



### Design

Cable design	1 semi-tight tube
Strain relief	Aramide yarn
Jacket material	LSFH™
Jacket colour	white

### Properties

- Metal free indoor cable
- Strain relief with Aramide yarn
- For direct connector assembly
- Tight bending radii
- Low smoke, halogen free and self-extinguishing
- Jacket material according to UL94V-0

### Applications

- Data cable in distribution network - FTTH
- Installation in indoor areas
- For horizontal and collapsed backbone cabling

According to IEC 60794-1-2

### Ordering information

01-E9A2/CWJH-...27-FG  
Please see page 142

## FTTH simplex indoor cables with semi-tight tube

### Specification

Jacket Ø		2.7	mm	
Tube Ø		0.9	mm	
Approx. weight		7.5	kg/km	

### Mechanical properties

Tensile strength	during installation	400	N	IEC 60794-1-2 E1
	in service	200	N	
Min. bend radius	during installation	7.5	mm	IEC 60794-1-2 E11
	in service	7.5	mm	
Crush resistance	short-term	500	N/cm	IEC 60794-1-2 E3
	long-term	100	N/cm	
Impact resistance	W <sub>p</sub> = 0.74 J	100	impacts	IEC 60794-1-2 E4
Repeated bending	r = 25 mm, weight = 0.25 kg	5000	cycles	IEC 60794-1-2 E6
Kink resistance	r = 7.5 mm	p		IEC 60794-1-2 E10

### Thermal properties

Temperature range	during installation	-25 to +70	°C	IEC 60794-1-2 F1
	in service	-25 to +70	°C	
	in storage	-25 to +70	°C	

Specification for singlemode at 1550 nm

### Combustion properties

Fire load		0.15	MJ/m	
Fire propagation	on a vertical single cable	p		IEC 60332-1
	on a vertical cable bundle	p		IEC 60332-3-24
Halogen acid gas	jacket material	p		IEC 60754-1
Degree of acidity	jacket material	p		IEC 60754-2
2002/95/EC (RoHS)		compliant		

p = passed

## FTTH indoor cables with semi-tight tubes



### Design

Cable design	central strength member (non-metallic) 4 semi-tight tubes
Strain relief	Aramide yarn
Jacket material	LSFH™
Jacket colour	white

### Properties

- Metal free indoor and outdoor cable
- Strain relief with Aramide yarn
- For direct connector assembly
- Tight bending radii
- Low smoke, halogen free and self-extinguishing

### Applications

- Data cable in distribution network - FTTH
- Installation in indoor areas
- For horizontal and collapsed backbone cabling

According to IEC 60794-1-2

### Ordering information

04-.../CWSN(ZN)H-...42  
Please see page 142



## FTTH indoor cables with semi-tight tubes

Specification			
Number of fibers		4	
Jacket Ø		4.2	mm
Tube Ø		0.9	mm
Approx. weight		16	kg/km

Mechanical properties				
Tensile strength	during installation	1000	N	IEC 60794-1-2 E1
	in service	300	N	
Min. bend radius	during installation	10	mm	IEC 60794-1-2 E11
	in service	15	mm	
Crush resistance	short-term	800	N/cm	IEC 60794-1-2 E3
	long-term	300	N/cm	
Impact resistance	Wp = 2.21 J	100	impacts	IEC 60794-1-2 E4
Repeated bending	r = 30 mm, weight = 1 kg	1000	cycles	IEC 60794-1-2 E6
Kink resistance	r = 6 mm	p		IEC 60794-1-2 E10
Coiling capability	length = 50 m/r = 115 mm	3	cycles	HUBER+SUHNER
Torsion	angle = ±360°/length=500 mm	100	cycles	IEC 60794-1-2 E7
H+S crush resistance	short-term	800	N/5 mm	HUBER+SUHNER
	long-term	150	N/5 mm	

Thermal properties				
Temperature range	during installation	-10 to +60	°C	IEC 60794-1-2 F1
	in service	-25 to +70	°C	
	in storage	-40 to +70	°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

Combustion properties				
Fire load		0.35	MJ/m	
Fire propagation	on a vertical single cable	p		IEC 60332-1-2
Halogen acid gas	jacket material	p		IEC 60754-1
Degree of acidity	jacket material	p		IEC 60754-2
2002/95/EC (RoHS)		compliant		

p = passed

## FTTH indoor cables with tight tubes 0.6 mm



### Design

Cable design	4 tight tubes buffered 0.6 mm (easy stripping)
Strain relief	Aramide yarn
Jacket material	LSFH™
Jacket colour	grey

### Properties

- Metal free indoor and outdoor cable
- Strain relief with Aramide yarn
- For direct connector assembly
- Tight bending radii
- Low smoke, halogen free and self-extinguishing
- Easy stripping

### Applications

- Data cable in distribution network - FTTH
- Installation in indoor areas
- For horizontal and collapsed backbone cabling

According to IEC 60794-1-2

### Ordering information

04-E9A2/V(ZN)H-...28  
Please see page 143

## FTTH indoor cables with tight tubes 0.6 mm

Specification			
Jacket Ø		2.8	mm
Tube Ø		0.6	mm
Approx. weight		8	kg/km

Mechanical properties			
Tensile strength	during installation	400	N
	in service	200	N
Min. bend radius	during installation	10	mm
	in service	10	mm
Crush resistance	short-term	200	N/cm
	long-term	100	N/cm
Impact resistance	W <sub>p</sub> = 1 J	5	impacts
Repeated bending	r = 30 mm, weight = 1 kg	5000	cycles
Kink resistance	r = 6 mm	3	cycles
Coiling capability	length = 100 m / r = 70 mm	3	cycles
H+S staple test	distance 0.7 cm / number of 50	p	

Thermal properties			
Temperature range	during installation	-20 to +70	°C
	in service	-40 to +70	°C
	in storage	-40 to +70	°C

Specification for singlemode at 1550 nm, for multimode at 1300 nm

Combustion properties			
Fire load		0.185	MJ/m
Fire propagation	on a vertical single cable	p	IEC 60332-1
Smoke density		p	IEC 61034-2
Halogen acid gas	jacket material	p	IEC 60754-1
Degree of acidity	jacket material	p	IEC 60754-2
2002/95/EC (RoHS)		compliant	

p = passed

## FTTH indoor cables HOMESTAR



### Design

Cable design	central strength member (non metallic) 1, 2 to 4 tight buffered tubes
Strain relief	Aramide yarn
Jacket material	LSFH™
Jacket colour	grey

### Properties

- Metal free indoor and outdoor cable
- Strain relief with Aramide yarn
- For direct connector assembly
- Easy stripping
- Tight bending radii
- Low smoke, halogenfree and self-extinguishing

### Applications

- Data cable in distribution network - FTTH
- Installation in indoor areas
- For horizontal and collapsed backbone cabling

According to IEC 60794-1-2

### Ordering information

01-E9A1/F(ZN)H-...48  
02-E9A1/FSN(ZN)H-...48  
04-E9A1/FSN(ZN)H-...48  
Please see page 143

## FTTH indoor cables HOMESTAR

### Specification

Number of fibers		1	2	4		
Jacket Ø		4.8	4.8	4.8	mm	
Tube Ø		0.9	0.9	0.9	mm	
Approx. weight		25.6	24.5	24.8	kg/km	

### Mechanical properties

Tensile strength	during installation	400	500	500	N	IEC 60794-1-2 E1
	in service	200	300	300	N	
Min. bend radius	during installation	10	10	10	mm	IEC 60794-1-2 E11
	in service	10	10	10	mm	
Crush resistance	short-term	2000	1500	1500	N/cm	IEC 60794-1-2 E3
	long-term	150	150	150	N/cm	
Impact resistance	Wp = 2.21 J	100	100	100	impacts	IEC 60794-1-2 E4
Repeated bending	r = 30 mm, weight = 1 kg	5000	5000	5000	cycles	IEC 60794-1-2 E6
Kink resistance	r = 7.5 mm	p	p	p		IEC 60794-1-2 E10
Torsion	angle = ± 360° / length = 500 mm	1000	1000	1000	cycles	IEC 60794-1-2 E7
H+S staple test	distance 2 cm / number of 50	p	p	p		HUBER+SUHNER

### Thermal properties

Temperature range	during installation		-25 to +70	°C	IEC 60794-1-2 F1
	in service		-25 to +70	°C	
	in storage		-25 to +70	°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

### Combustion properties

Fire load		0.6	0.58	0.59	MJ/m	
Fire propagation	on a vertical single cable	p	p	p		IEC 60332-1-2
Smoke density		p	p	p		IEC 61034-2
Halogen acid gas	jacket material	p	p	p		IEC 60754-1
Degree of acidity	jacket material	p	p	p		IEC 60754-2
2002/95/EC (RoHS)		compliant				

p = passed

Universal cables						
	Cable type	Page	Ordering key	Weight [kg/km]	Amount of fibers	
	Jellyfree up to 12 fibers and 24 fibers	72	12.../BH(ZN)H...35 12.../H(ZN)H...50 24.../H(ZN)H...50F	11 25 50	2 - 12 2 - 12 2 - 24	
	Jellyfree up to 60 fibers	74	60.../HSN(ZN)H...110	96	- 60	
	Non-armoured multi-fiber loose tube	76	12.../BW(ZN)H...35 12.../W(ZN)H...50 24.../W(ZN)H...50	11 27 27	2 - 12 2 - 12 24	
	Glass-armoured multi-fiber loose tube up to 24 fibers	78	12.../W(ZNG)H...85 24.../W(ZNG)H...85 12.../W(ZNG)H...120	83 83 178	2 - 12 24 2 - 12	
	Glass-armoured multi-fiber loose tube, TWINTUBE up to 24 fibers	80	24.../W(ZNG)H...94	101	- 24	
	Glass-armoured multi-fiber loose tube up to 60 fibers	82	60.../BWSN(ZNG)H...105 60.../WSN(ZNG)H...116	108 148	- 60	
	Glass-armoured multi-fiber loose tube up to 144 fibers	84	72.../BWSN(ZNG)H...117 96.../BWSN(ZNG)H...130 120.../BWSN(ZNG)H...140 144.../BWSN(ZNG)H...150	135 154 197 244	- 72 - 96 - 120 - 144	
	Steel-armoured multi-fiber loose tube, up to 12 fibers	86	12.../W(ZN)HAH...80	82	2 - 12	
	Steel-armoured multi-fiber loose tube, TWINTUBE up to 24 fibers	86	24.../W(ZNG)HAH...125	215	- 24	
	Steel-armoured multi-fiber loose tube, up to 72 fibers	88	60.../BWSN(ZNG)HAH...140 72.../BWSN(ZNG)HAH...152	235 275	- 60 - 72	

	Multi-fiber loose tube-Ø [mm]	Jacket Ø [mm]	Jacket material	Rodent protection	Tensile strength in service [N]	Min. bend radius in service [mm]	Crush resistance (short term) [N/cm]	Impact resistance [impacts]	Temperature range (in service) [°C]	Fire propagation IEC 60332-1	Fire propagation IEC 60332-3
	mini standard standard	3.5 5.0 5.0 x 10.2	LSFH™		250 400 2 x 400	35 50 50	300 300 300	50 50	-25 to +70 -5 to +70 -5 to +70		
	standard	11.0	LSFH™		1000	110	500	100	-25 to +70	p	
	mini standard standard	3.5 5.0 5.0	LSFH™ LSFH™ LSFH™		250 400 400	35 50 50	300 300 300	50 50 50	-40 to +70 -25 to +70 -25 to +70	p p	
	standard standard standard	8.5 8.5 12.0	LSFH™ LSFH™ LSFH™	p p p	1500 1500 4500	80 80 120	1000 1000 3000	30 30 30	-40 to +70 -20 to +70 -20 to +70	p p p	p p p
	standard	9.4 x 8.8	LSFH™	p	1500	100	800		-20 to +70	p	p
	mini standard	10.5 11.6	LSFH™ LSFH™	p p	3000 3500	100 120	800 800	50 50	-40 to +70 -40 to +70	p p	p p
	mini mini mini mini	11.7 13.0 14.0 15.0	LSFH™ LSFH™ LSFH™ LSFH™	p p p p	4500 4500 6000 7500	110 120 135 150	800 800 800 800	50 50 50 50	-40 to +70 -40 to +70 -40 to +70 -40 to +70	p p p p	p p p p
	standard	8.0	LSFH™	p	500	80	400	50	-40 to +70	p	p
	standard	12.5	LSFH™	p	1500	125	800	3	-20 to +70	p	p
	mini	14 15.2	LSFH™	p	3000 4500	125 165	800	50	-40 to +70	p	p

p = passed

# Jellyfree multi-fiber loose tube cables – up to 24 fibers



Central tube Ø 3.5 mm or Ø 5.0 mm



Duplex tube Ø 5 × 10.2 mm

## Design

Cable design	dry multi-fiber loose tube with 2 up to 24 fibers	
Strain relief	Aramide yarn	
Fiber colour	according to colour code	
Jacket material	LSFH™	
Jacket colour	E9	yellow
	OM2	orange
	OM3	turquoise
	OM4	heather violet
	G62.5	orange

## Properties

- Metal free indoor cable
- Strain relief with Aramide yarn
- For vertical application
- Easy stripping
- No need for cleaning the fibers
- Low smoke, halogen free and self-extinguishing
- Low fire load for high safety requirements
- For MASTERLINE applications (valid for simplex only)
- Jelly free

## Applications

- Installation in indoor areas
- Data cable in distribution networks
- For vertical applications up to 500 m
- For installation in cable ducts
- For high safety requirements in case of fire

According to IEC 60794-1-2

## Ordering information

12-.../BH(ZN)H-...35  
12-.../H(ZN)H-...50  
24-.../H(ZN)H-...50F  
Please see page 144



## Jellyfree multi-fiber loose tube cables – up to 24 fibers

Specification						
Jacket material		LSFH™	LSFH™	LSFH™		
Jacket Ø		3.5	5.0	5 × 10.2	mm	
Number of fibers each bundle		2 - 12	2 - 12	12 - 24		
Multifiber loose tube		mini	standard	standard	mm	
Approx. weight		11.4	25.0	50.0	kg/km	

Mechanical properties						
Tensile strength	during installation	900	600	2 × 600	N	IEC 60794-1-2 E1
	in service	250	400	2 × 400	N	
Min. bend radius	during installation	50	80	80*	mm	IEC 60794-1-2 E11
	in service	35	50	50*	mm	
Crush resistance	short-term	300	300	300*	N/cm	IEC 60794-1-2 E3
	long-term	150	150	150*	N/cm	
Impact resistance	W <sub>p</sub> = 2.21 J		50	50*	impacts	IEC 60794-1-2 E4
Repeated bending	r = 30 mm / 1 kg	5000				
	r = 50 mm / 1 kg		5000	5000	cycles	IEC 60794-1-2 E6

\* = refers to the flat side of the cable

Thermal properties						
Temperature range	during installation	-25 to +70	-5 to +50	-5 to +50	°C	IEC 60794-1-2 F1
	in service	-25 to +70	-5 to +70	-5 to +70	°C	
	in storage	-25 to +70	-20 to +70	-20 to +70	°C	

Specification for singlemode at 1310 nm, for multimode at 1300 nm

Combustion properties						
Fire load		0.24	0.59	1.18	MJ/m	
Fire propagation	on a vertical single cable			p		IEC 60332-1
Smoke density				p		IEC 61034-2
Halogen acid gas	jacket material	p	p	p		IEC 60754-1
Degree of acidity	jacket material	p	p	p		IEC 60754-2
2002/95/EC (RoHS)		compliant				

p = passed

# Jellyfree multi-fiber loose tube cables – up to 60 fibers



## Design

Cable construction	dry multi-fiber loose tube with up to 5 × 12 fibers 2 ripcords	
Strain relief	Aramide yarn	
Fiber colour	according to colour code	
Jacket material	LSFH™	
Jacket colour	E9	yellow
	OM2	orange
	OM3	turquoise
	OM4	heather violet
	G62.5	orange

## Properties

- Metal free indoor cable
- Strain relief with Aramide yarn
- For vertical application
- No need for cleaning the fibers
- Low smoke, halogen free and self-extinguishing
- For MASTERLINE applications
- Jelly free

## Applications

- Installation in indoor areas
- Data cable in distribution networks
- For vertical applications up to 500 m
- For installation in cable ducts
- For high safety requirements in case of fire

According to IEC 60794-1-2

## Ordering information

60-.../HSN(ZN)H-...110  
Please see page 145

## Jellyfree multi-fiber loose tube cables - up to 60 fibers

Specification			
Jacket Ø		11.0	mm
Multi-fiber loose tube		standard	2 up to 12 fibers
Approx. weight		96.0	kg/km

Mechanical properties				
Tensile strength	during installation	2500	N	IEC 60794-1-2 E1
	in service	1000	N	
Min. bend radius	during installation	170	mm	IEC 60794-1-2 E11
	in service	110	mm	
Crush resistance	short-term	500	N/cm	IEC 60794-1-2 E3
	long-term	200	N/cm	
Impact resistance	Wp = 2.21 J, r = 25 mm	100	impacts	IEC 60794-1-2 E4
Repeated bending	r = 110 mm, weight = 2.5 kg	2000	cycles	IEC 60794-1-2 E6

Thermal properties				
Temperature range	during installation	-5 to +50	°C	IEC 60794-1-2 F1
	in service	-25 to +70	°C	
	in storage	-40 to +70	°C	

Specification for singlemode at 1310 nm, for multimode at 1300 nm

Combustion properties				
Fire load		2.2	MJ/m	
Fire propagation	on a vertical single cable	p		IEC 60332-1
Halogen acid gas	jacket material	p		IEC 60754-1
Degree of acidity	jacket material	p		IEC 60754-2
2002/95/EC (RoHS)		compliant		

p = passed

More than 60 fibers on request.

## Non-armoured multi-fiber loose tube cables – up to 24 fibers



### Design

Cable design	multi-fiber loose tube, jelly-filled
Strain relief	Aramide yarn
Jacket material	LSFH™
Jacket colour	black

### Properties

- Metal free indoor / outdoor cable
- Strain relief with Aramide yarn
- Halogen free and non-corrosive fire gases
- High chemical resistance against acids and alkalis
- Low smoke and self-extinguishing
- Low fire load for high safety requirements
- For MASTERLINE applications

### Applications

- Data cable in distribution networks
- Installation in indoor and outdoor areas
- For installation in cable ducts

According to IEC 60794-1-2

### Ordering information

12-.../BW(ZN)H-...35  
12-.../W(ZN)H-...50  
24-.../W(ZN)H-...50  
Please see page 145

## Non-armoured multi-fiber loose tube cables – up to 24 fibers

### Specification

Jacket material	LSFH™	LSFH™	LSFH™		
Jacket Ø	3.5	5.0	5.0	mm	
Number of fibers each bundle	2 - 12	2 - 12	24		
Multi fiber loose tube	mini	standard	standard		
Approx. weight	11.4	27	27	kg/km	

### Mechanical properties

Tensile strength	during installation	900	600	600	N	IEC 60794-1-2 E1
	in service	250	400	400	N	
Min. bend radius	during installation	50	80	80	mm	IEC 60794-1-2 E11
	in service	35	50	50	mm	
Crush resistance	short-term	300	300	300	N/cm	IEC 60794-1-2 E3
	long-term	100	150	150	N/cm	
Impact resistance	W <sub>p</sub> = 1.4 J	50			impacts	IEC 60794-1-2 E4
	W <sub>p</sub> = 2.21 J		50	50		
Repeated bending	r = 35 mm / 1 kg	5000			cycles	IEC 60794-1-2 E6
	r = 50 mm / 1 kg		5000	5000		
Torsion	± 1440°	3			cycles	
Water penetration	h = 1 m, 24 h, p < 3 m	p				IEC 60794-1-2 F5B

### Thermal properties

Temperature range	during installation	-25 to +50	-10 to +50	°C	IEC 60794-1-2 F1
	in service	-40 to +70	-25 to +70	°C	
	in storage	-40 to +70	-40 to +70	°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

### Combustion properties

Fire load		0.43	0.66	0.72	MJ/m	
Fire propagation	on a vertical single cable		p	p		IEC 60332-1
Fire propagation	on a vertical cable bundle		p	p		IEC 60332-3-24
Halogen acid gas	jacket material	p	p	p		IEC 60754-1
Degree of acidity	jacket material	p	p	p		IEC 60754-2
2002/95/EC (RoHS)		compliant				

p = passed

# Glass-armoured multi-fiber loose tube cables – up to 24 fibers



## Design

Cable design	multi-fiber loose tube, jelly-filled
Strain relief and rodent protection	glass-armoured
Jacket material	LSFH™
Jacket colour	black

## Properties

- Metal free indoor / outdoor cable
- Rodent protection (glass-armoured)
- For high mechanical requirements
- Halogen free and non-corrosive fire gases
- Low fire load for high safety requirements
- Longitudinal and transversal watertight cable
- For MASTERLINE applications

## Applications

- For installation directly in the ground and in mechanically unprotected environments
- Data cable in distribution networks
- For installation outdoor, in wet cable ducts and pipes
- Ideal for high safety requirements in case of a fire

According to IEC 60794-1-2

## Approvals

UL listed acc. OFN / OFNG

## Ordering information

12-.../W(ZNG)H-...85  
12-.../W(ZNG)H-...85-UR (optional)  
24-.../W(ZNG)H-...85  
24-.../W(ZNG)H-...85-UR (optional)  
12-.../W(ZNG)H-...120  
Please see page 147

## Glass-armoured multi-fiber loose tube cables – up to 24 fibers

Specification						
Jacket material		LSFH™	LSFH™	LSFH™		
Jacket Ø		8.5	8.5	12.0	mm	
Number of fibers each bundle		2 - 12	24	2 - 12		
Multi fiber loose tube		standard	standard	standard		
Approx. weight		83	83	178	kg/km	

Mechanical properties						
Tensile strength	during installation	3000	3000	9000	N	IEC 60794-1-2 E1
	in service	1500	1500	4500	N	
Min. bend radius	during installation	130	130	180	mm	IEC 60794-1-2 E11
	in service	80	80	120	mm	
Crush resistance	short-term	1000	1000	3000	N/cm	IEC 60794-1-2 E3
	long-term	300	300	1500	N/cm	
Impact resistance	Wp = 4.41 J	30	30	30	impacts	IEC 60794-1-2 E4
Repeated bending	r = 80 mm / 2.5 kg	5000	5000	5000	cycles	IEC 60794-1-2 E6
Torsion	± 1440°	3	3	3	cycles	IEC 60794-1-2 E7
Water penetration	h = 1 m, 24 h, p < 3 m	p	p	p		IEC 60794-1-2 F5B

Thermal properties						
Temperature range	during installation	-10 to +50	-10 to +50	-10 to +50	°C	IEC 60794-1-2 F1
	in service	-40 to +70	-20 to +70	-20 to +70	°C	
	in storage	-40 to +70	-40 to +70	-25 to +70	°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

Combustion properties						
Fire load		1.5	1.5	3.1	MJ/m	
Fire propagation	on a vertical single cable	p	p	p		IEC 60332-1
Fire propagation	on a vertical cable bundle	p	p	p		IEC 60332-3-24
Fire test	with circuit integrity (CI)	180		180	min.	IEC 60331-25
Smoke density		p	p	p		IEC 61034-2
Halogen acid gas	jacket material	p	p	p		IEC 60754-1
Degree of acidity	jacket material	p	p	p		IEC 60754-2
2002/95/EC (RoHS)		compliant				

p = passed

# Glass-armoured multi-fiber loose tube cables – TWINTUBE – up to 24 fibers



## Design

Cable design	2 multi-fiber loose tubes, jelly-filled with 2 – 12 fibers 2 ripcords
Strain relief and rodent protection	glass-armoured
Jacket material	LSFH™
Jacket colour	black

## Properties

- Metal free indoor and outdoor cable
- Rodent-protected, glass-armoured
- For use in ducts and unprotected environment
- Ripcord for easy jacket removal
- Low smoke, halogen free and self-extinguishing
- Longitudinal and transversal watertight cable
- For MASTERLINE applications

## Applications

- For installations directly in the ground and in mechanically unprotected environments
- As data cable in distribution networks
- For installation outdoors, in wet cable ducts and pipes
- Ideal for applications involving high safety requirements in case of a fire

According to IEC 60794-1-2

## Ordering information

up to 24-.../W(ZNG)H-...94  
Please see page 148



## Glass-armoured multi-fiber loose tube cables – TWINTUBE – up to 24 fibers

### Specification

Jacket material		LSFH™		
Jacket Ø		9.4 × 8.8	mm	
Multi-fiber loose tube		standard		2 up to 12 fibers
Approx. weight		101	kg/km	

### Mechanical properties

Tensile strength	during installation	3000	N	IEC 60794-1-2 E1
	in service	1500	N	
Min. bend radius	during installation	150*	mm	IEC 60794-1-2 E11
	in service	100*	mm	
Crush resistance	short-term	800*	N/cm	IEC 60794-1-2 E3
	long-term	400*	N/cm	
Water penetration	h = 1 m, 24 h, p < 3 m	p		IEC 60794-1-2 F5B

\* refers to the flat side of the cable

### Thermal properties

Temperature range	during installation	-10 to +50	°C	IEC 60794-1-2 F1
	in service	-20 to +70	°C	
	in storage	-40 to +70	°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

### Combustion properties

Fire load		1.85	MJ/m	
Fire propagation	on a vertical single cable	p		IEC 60332-1
Fire propagation	on a vertical cable bundle	p		IEC 60332-3-24
Fire test	with circuit integrity (CI)	180	min.	IEC 60331-25
Smoke density		p		IEC 61034-2
Halogen acid gas	jacket material	p		IEC 60754-1
Degree of acidity	jacket material	p		IEC 60754-2
2002/95/EC (RoHS)		compliant		

p = passed

# Glass-armoured multi-fiber loose tube cables – up to 60 fibers



## Design

Cable design	5 multi-fiber loose tube, jelly-filled with 2 - 12 fibers strength member 2 ripcords
Strain relief and rodent protection	glass-armoured
Jacket material	LSFH™
Jacket colour	black (optional with 2 orange stripes)

## Properties

- Metal free indoor / outdoor cable
- Rodent protection (glass-armoured)
- Ripcord for easy jacket removal
- For high thermal stability
- Low smoke, halogen free and self-extinguishing
- Optimized outer diameter construction
- Longitudinal and transversal watertight cable

## Applications

- Data cable in distribution networks
- For installation outdoor, in wet cable ducts and pipes
- ideal for applications involving high safety requirements in case of a fire

According to IEC 60794-1-2

## Ordering information

60-.../BWSN(ZNG)H-...105

60-.../WSN(ZNG)H-...116

Please see page 148

## Glass-armoured multi-fiber loose tube cables – up to 60 fibers

### Specification

Jacket material	LSFH™	LSFH™		
Jacket Ø	10.5	11.6	mm	
Multi fiber loose tube	mini	standard		
Approx. weight	108	148	kg/km	

### Mechanical properties

Tensile strength	during installation	6000	7000	N	IEC 60794-1-2 E1
	in service	3000	3500	N	
Min. bend radius	during installation	150	200	mm	IEC 60794-1-2 E11
	in service	100	120	mm	
Crush resistance	short-term	800	800	N/cm	IEC 60794-1-2 E3
	long-term	300	300	N/cm	
Impact resistance	Wp = 2.21 J	50	50	impacts	IEC 60794-1-2 E4
Repeated bending	r = 120 mm / 10 kg		2000	cycles	IEC 60794-1-2 E6
Water penetration	h = 1 m, 24 h, p < 3 m	p	p		IEC 60794-1-2 F5B

### Thermal properties

Temperature range	during installation	-10 to +50	°C	IEC 60794-1-2 F1
	in service	-40 to +70	°C	
	in storage	-40 to +70	°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

### Combustion properties

Fire load		2.6	2.5	MJ/m	
Fire propagation	on a vertical single cable	p	p		IEC 60332-1
Fire propagation	on a vertical cable bundle	p	p		IEC 60332-3-24
Fire test	with circuit integrity (CI)	180	180	min.	IEC 60331-25
Smoke density		p	p		IEC 61034-2
Halogen acid gas	jacket material	p	p		IEC 60754-1
Degree of acidity	jacket material	p	p		IEC 60754-2
2002/95/EC (RoHS)		compliant			

p = passed

# Glass-armoured multi-fiber loose tube cables – from 72 fibers



## Design

Cable design	6 - 12 multi-fiber loose tube, jelly-filled with 2 - 12 fibers strength member 2 ripcords
Strain relief and rodent protection	glass-armoured
Jacket material	LSFH™
Jacket colour	black (optional with 2 orange stripes)

## Properties

- Metal free indoor / outdoor cable
- Rodent protection (glass-armoured)
- Ripcord for easy jacket removal
- For high mechanical requirements
- Low smoke, halogen free and self-extinguishing
- Longitudinal and transversal watertight cable

## Applications

- Data cable in distribution networks
- For outdoor installation in ducts
- For applications involving high safety requirements  
in case of fire
- Maximum 12 loose tubes with maximum  
12 fibers = 144 fibers

According to IEC 60794-1-2

## Ordering information

72-.../BWSN(ZNG)H-...117  
96-.../BWSN(ZNG)H-...130  
120-.../BWSN(ZNG)H-...140  
144-.../BWSN(ZNG)H-...150  
Please see page 149

## Glass-armoured multi-fiber loose tube cables – from 72 fibers

Specification	6	8	10	12		stranding
Fiber up to	72	96	120	144		
Jacket material	LSFH™	LSFH™	LSFH™	LSFH™		
Jacket Ø	11.7	13.0	14.0	15.0	mm	
Multi fiber loose tube	mini	mini	mini	mini		
Approx. weight	135	154	197	244	kg/km	

Mechanical properties							
Tensile strength	during installation	9000	9000	12000	15000	N	IEC 60794-1-2 E1
	in service	4500	4500	6000	7500	N	
Min. bend radius	during installation	165	180	200	225	mm	IEC 60794-1-2 E11
	in service	110	120	135	150	mm	
Crush resistance	short-term	800	800	800	800	N/cm	IEC 60794-1-2 E3
	long-term	300	300	300	300	N/cm	
Impact resistance	Wp = 2.21 J	50	50	50	50	impact	IEC 60794-1-2 E4
Water penetration	h = 1 m, 24 h, p < 3 m	p	p	p	p		IEC 60794-1-2 F5A

Thermal properties						
Temperature range	during installation	-10 to +50			°C	IEC 60794-1-2 F1
	in service	-40 to +70			°C	
	in storage	-40 to +70			°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

Combustion properties							
Fire load		3.1	3.8	4.9	5.8	MJ/m	
Fire propagation	on a vertical single cable	p	p	p	p		IEC 60332-1
Fire propagation	on a vertical cable bundle	p	p	p	p		IEC 60332-3-24
Smoke density		p	p	p	p		IEC 61034-2
Halogen acid gas	jacket material	p	p	p	p		IEC 60754-1
Degree of acidity	jacket material	p	p	p	p		IEC 60754-2
2002/95/EC (RoHS)		compliant					

p = passed

# Glass-armoured multi-fiber loose tube cables – simplex and TWINTUBE



Simplex - up to 12 fibers



TWINTUBE - up to 24 fibers

## Design

Cable design	1 – 2 multi-fiber loose tubes, jelly-filled with 2 – 12 fibers
Strain relief	glass-roving
Rodent protection	steel-armoured
Jacket material	LSFH™
Jacket colour	black

## Properties

- Steel-armoured indoor and outdoor cable
- Rodent-protected (steel-armoured)
- For use in ducts and unprotected environment
- For high mechanical requirements
- Halogen free and non-corrosive fire gases
- Longitudinal and transversal watertight cable

## Applications

- For outdoor and indoor installations and in mechanically unprotected environments
- As data cable in distribution networks
- For installations directly in the ground

According to IEC 60794-1-2

## Ordering information

12-.../W(ZN)HAH-...80  
24-.../W(ZNG)HAH-...125  
Please see page 150

## Glass-armoured multi-fiber loose tube cables – simplex and TWINTUBE

Specification	Simplex	TWINTUBE		
Jacket material	LSFH™	LSFH™	mm	
Jacket Ø	8.0	12.5	mm	
Multi-fiber loose tube	standard	standard	mm	
Approx. weight	82	215	kg/km	

Mechanical properties					
Tensile strength	during installation	1000	3000	N	IEC 60794-1-2 E1
	in service	500	1500	N	
Min. bend radius	during installation	120	190	mm	IEC 60794-1-2 E11
	in service	80	125	mm	
Crush resistance	short-term	400	800	N/cm	IEC 60794-1-2 E3
	long-term	200	400	N/cm	
Impact resistance	W <sub>p</sub> = 4.41 J	50		impacts	IEC 60794-1-2 E4
	W <sub>p</sub> = 15 J		3	impacts	
Repeated bending	r = 80 mm, weight = 2.5 kg	5000		cycles	IEC 60794-1-2 E6
Water penetration	h = 1 m, 24 h, p < 3 m		p		IEC 60794-1-2 F5B

\* refers to the flat side of the cable

Thermal properties					
Temperature range	during installation	-10 to +60	-10 to +50	°C	IEC 60794-1-2 F1
	in service	-40 to +70	-20 to +70	°C	
	in storage	-40 to +70	-40 to +70	°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

Combustion properties					
Fire load		1.32	3.17	MJ/m	
Fire propagation	on a vertical single cable	p	p		IEC 60332-1
Fire propagation	on a vertical cable bundle	p			IEC 60332-3-23
Fire propagation	on a vertical cable bundle		p		IEC 60332-3-24
Smoke density		p	p		IEC 61034-2
Halogen acid gas	jacket material	p	p		IEC 60754-1
Degree of acidity	jacket material	p	p		IEC 60754-2
Fire test	with circuit integrity (CI)	180	180	min.	IEC 60331-25
2002/95/EC (RoHS)		compliant			

p = passed

## Steel-armoured multi-fiber loose tube cables – up to 72 fibers



### Design

Cable design	5 - 6 multi-fiber loose tube, jelly-filled with 2 - 12 fibers strength member 2 ripcords
Strain relief and Rodent protection	glass-rovng steel-armoured
Jacket material	LSFH™
Jacket colour	black

### Properties

- Steel-armoured indoor and outdoor cable
- Rodent-protected (steel-armoured)
- For use in ducts and unprotected environment
- For high mechanical requirements
- Halogen free and non-corrosive fire gases
- Longitudinal and transversal watertight cable

### Applications

- For outdoor and indoor installations and in mechanically unprotected environments
- As data cable in distribution networks
- For installations directly in the ground

According to IEC 60794-1-2

### Ordering information

60-.../BWSN(ZNG)HAH-...140

72-.../BWSW(ZNG)HAH-...152

Please see page 150



## Steel-armoured multi-fiber loose tube cables – up to 72 fibers

Specification	5	6		stranding
Jacket material	LSFH™	LSFH™	mm	
Jacket Ø	14	15.2	mm	
Fiber quantity up to	60	72		
Multi-fiber loose tube Ø	mini	mini		
Approx. weight	235	275	kg/km	

Mechanical properties					
Tensile strength	during installation	6000	9000	N	IEC 60794-1-2 E1
	in service	3000	4500	N	
Min. bend radius	during installation	210	230	mm	IEC 60794-1-2 E11
	in service	125	165	mm	
Crush resistance	short-term	800	800	N/cm	IEC 60794-1-2 E3
	long-term	300	300	N/cm	
Impact resistance	Wp = 2.21 J	50	50	impacts	IEC 60794-1-2 E4








Thermal properties					
Temperature range	during installation	-10 to +50		°C	IEC 60794-1-2 F1
	in service	-40 to +70		°C	
	in storage	-40 to +70		°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

Combustion properties					
Fire load		3.95	4.5	MJ/m	
Fire propagation	on a vertical single cable	p	p		IEC 60332-1
Fire propagation	on a vertical cable bundle	p	p		IEC 60332-3-25
Halogen acid gas	jacket material	p	p		IEC 60754-1
Degree of acidity	jacket material	p	p		IEC 60754-2
2002/95/EC (RoHS)		compliant			

p = passed

## Outdoor cables

	Cable type	Page	Ordering key	Weight [kg/km]	Amount of fibers
	Non-armoured multi-fiber loose tube, up to 24 fibers	92	12.../BW(ZN)V...35 12.../W(ZN)Y...50 24.../W(ZN)Y...50	8 20 27	2 - 12 2 - 12 24
	ADSS non-armoured multi-fiber loose tube cables, up to 12 fibers	94	12.../BW(ZN)V...55	23	2 - 12
	Glass-armoured multi-fiber loose tube, up to 24 fibers	96	12.../W(ZNG)Y...85 24.../W(ZNG)Y...85 12.../W(ZNG)Y...120	63 63 135	2 - 12 24 2 - 12
	Glass-armoured multi-fiber loose tube, TWINTUBE, up to 24 fibers	98	24.../W(ZNG)Y...94	69	- 24
	Glass-armoured multi-fiber loose tube, up to 72 fibers	100	60.../BWSN(ZNG)V...105 60.../WSN(ZNG)Y...150 72.../BWSN(ZNG)V...117 72.../WSN(ZNG)Y...160	88 178 112 178	- 60 - 60 - 72 - 72
	Glass-armoured multi-fiber loose tube, up to 144 fibers	102	96.../BWSN(ZNG)V...130 96.../WSN(ZNG)Y...180 144.../BWSN(ZNG)V...150 144.../WSN(ZNG)Y...220	130 263 194 385	- 96 - 96 - 144 - 144
	Steel-armoured multi-fiber loose tube, up to 12 fibers	104	12.../W(ZN)YAY...80	70	- 12
	Steel-armoured multi-fiber loose tube, TWINTUBE up to 24 fibers	104	24.../W(ZNG)YAY...125	152	- 24
	Steel-armoured multi-fiber loose tube, up to 72 fibers	106	60.../BWSN(ZNG)VAV...140 72.../BWSN(ZNG)VAV...152	185 220	- 60 - 72

	Multifiber loose tube-Ø [mm]	Jacket Ø [mm]	Jacket material	Rodent protection	Tensile strength in service [N]	Min. bend radius in service [mm]	Crush resistance (short term) [N/cm]	Impact resistance [impacts]	Temperature range (in service) [°C]
	mini standard standard	3.5 5.0 5.0	HDPE LDPE LDPE		250 400 400	35 50 50	300 300 300	50 50 50	-20 to +70 -20 to +70 -20 to +70
	mini	5.5	HDPE		1400	55	500		-10 to +70
	standard standard standard	8.5 8.5 12.0	LDPE LDPE LDPE	p p p	1500 1500 4500	80 80 120	1000 1000 3000	30 30 30	-40 to +70 -25 to +70 -40 to +70
	standard	9.4×8.8	LDPE	p	1500	100	800		-20 to +70
	mini standard mini standard	10.5 15.0 11.7 16.0	HDPE LDPE HDPE LDPE	p p p p	3000 4500 4500 6500	100 150 110 160	800 800 800 800	50 100 50 100	-40 to +70 -40 to +70 -40 to +70 -40 to +70
	mini standard mini standard	13.0 18.0 15.0 22.0	HDPE LDPE HDPE LDPE	p p p p	4500 6500 7500 9000	120 180 150 220	800 800 800 800	50 100 50 100	-40 to +70 -40 to +70 -40 to +70 -40 to +70
	standard	8.0	LDPE	p	500	80	400	50	-40 to +70
	standard	12.5	LDPE	p	1500	125	800	3	-20 to +70
	mini mini	14.0 15.2	HDPE HDPE	p	3000 4500	125 165	800 800	50 50	-40 to +70

p = passed

## Non-armoured multi-fiber loose tube cables – up to 24 fibers



### Design

Cable design	multi-fiber loose tube, jelly-filled
Strain relief	Aramide yarn
Jacket material	PE
Jacket colour	black

### Properties

- Metal free outdoor cable
- Strain relief with Aramide yarn
- For use in ducts and unprotected environment
- High chemical resistance against acids and alkalis
- Halogen free and non-corrosive fire gases
- For MASTERLINE applications

### Applications

- Data cable in distribution networks
- For outdoor installations in humid and wet cable ducts
- Ideal as distributor-to-distributor patch cable

According to IEC 60794-1-2

### Ordering information

12-.../BW(ZN)V-...35  
12-.../W(ZN)Y-...50  
24-.../W(ZN)Y-...50  
Please see page 151

## Non-armoured multi-fiber loose tube cables – up to 24 fibers

Specification						
Jacket material		HDPE	LDPE	LDPE		
Jacket Ø		3.5	5.0	5.0	mm	
Number of fibers each bundle		2 - 12	2 - 12	24		
Multi fiber loose tube		mini	standard	standard		
Approx. weight		8	20	27	kg/km	

Mechanical properties						
Tensile strength	during installation	900	600	600	N	IEC 60794-1-2 E1
	in service	250	400	400	N	
Min. bend radius	during installation	50	80	80	mm	IEC 60794-1-2 E11
	in service	35	50	50	mm	
Crush resistance	short-term	300	300	300	N/cm	IEC 60794-1-2 E3
	long-term	100	150	150	N/cm	
Impact resistance	W <sub>p</sub> = 1.4 J	50			impacts	IEC 60794-1-2 E4
	W <sub>p</sub> = 2.21 J		50	50		
Repeated bending	r = 35 mm/1 kg	5000			cycles	IEC 60794-1-2 E6
	r = 50 mm/1 kg		5000	5000		
Water penetration	h = 1 m, 24 h, p < 3 m	p				IEC 60794-1-2 F5B

Thermal properties						
Temperature range	during installation	-10 to +50	-10 to +50		°C	IEC 60794-1-2 F1
	in service	-20 to +70	-20 to +70		°C	
	in storage	-40 to +70	-40 to +70		°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

Combustion properties						
Fire load		0.5	0.7	0.7	MJ/m	
2002/95/EC (RoHS)		compliant				

p = passed

## ADSS\* – non-armoured multi-fiber loose tube cables – up to 12 fibers



\*ADSS = All-Dielectric, Self-Supporting

### Design

Cable design	multi-fiber loose tube, jelly-filled
Strain relief	Aramide yarn
Jacket material	HDPE
Jacket colour	black

### Properties

- Extremely light weight cable construction
- Optimized diameter for easy installation
- Metal free outdoor cable
- Strain relief with Aramide yarn
- For high mechanical requirements
- Surface resistance properties

### Applications

- Areal use
- Self-supporting

Note: Installation material such as support-anchor and dead-end-anchor's are additionally available.

According to IEC 60794-1-2

### Ordering information

12-.../BW(ZN)V-...55  
Please see page 151

## ADSS – non-armoured multi-fiber loose tube cables – up to 12 fibers

Specification			
Jacket material		HDPE	
Jacket Ø		5.5	mm
Multi fiber loose tube		mini	
Approx. weight		23	kg/km

Mechanical properties				
Tensile strength	during installation	2800	N	IEC 60794-1-2 E1
	in service	1400	N	
Min. bend radius	during installation, 6 turns	82.5	mm	IEC 60794-1-2 E11
	in service, 6 turns	55	mm	
Crush resistance	short-term	500	N/cm	IEC 60794-1-2 E3
	long-term	300	N/cm	
Surface resistance		> 12 kV		EN 50305 § 6.6

Thermal properties				
Temperature range	during installation	-10 to +70	°C	IEC 60794-1-2 F1
	in service	-10 to +70	°C	
	in storage	-10 to +70	°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

Combustion properties				
Fire load		0.81	MJ/m	
2002/95/EC (RoHS)		compliant		

Performance under load				
Span length (m)	Sag (%)	Sag (m)	Wind load (km/h)	Tensile load with wind load (N)
50	1.5	0.75	100	694
100		1.25		1664
150		2.25		2081
200		3.00		2774

## Glass-armoured multi-fiber loose tube cables – up to 24 fibers



### Design

Cable design	multi-fiber loose tube, jelly-filled
Strain relief and rodent protection	glass-armoured
Jacket material	PE
Jacket colour	black at Ø 8.5 mm black at Ø 12.0 mm

### Properties

- Metal free outdoor cable
- Rodent protection (glass-armoured)
- High chemical resistance against acids and alkalis
- For high mechanical requirements
- Halogen free and non-corrosive fire gases
- Longitudinal and transversal watertight cable
- For MASTERLINE applications

### Applications

- For installation directly in the ground and in mechanically unprotected environments
- Data cable in distribution networks
- For installation outdoor, in wet cable ducts and pipes

According to IEC 60794-1-2

### Ordering information

12-.../W(ZNG)Y-...85  
24-.../W(ZNG)Y-...85  
12-.../W(ZNG)Y-...120  
Please see page 152



## Glass-armoured multi-fiber loose tube cables – up to 24 fibers

Specification					
Jacket material		LDPE	LDPE	LDPE	
Jacket Ø		8.5	8.5	12.0	mm
Number of fibers each bundle		2 - 12	24	2 - 12	
Multi fiber loose tube		standard	standard	standard	
Approx. weight		63	63	135	kg/km

Mechanical properties						
Tensile strength	during installation	3000	3000	9000	N	IEC 60794-1-2 E1
	in service	1500	1500	4500	N	
Min. bend radius	during installation	130	130	180	mm	IEC 60794-1-2 E11
	in service	80	80	120	mm	
Crush resistance	short-term	1000	1000	3000	N/cm	IEC 60794-1-2 E3
	long-term	300	300	1500	N/cm	
Impact resistance	W <sub>p</sub> = 4.41 J	30	30	30	impacts	IEC 60794-1-2 E4
Repeated bending	r = 80 mm/2.5 kg	5000	5000	5000	cycles	IEC 60794-1-2 E6
	r = 120 mm/2.5 kg					
Torsion	± 1440° ± 360°	3	3	3	cycles	IEC 60794-1-2 E7
Water penetration	h = 1 m, 24 h, p < 3 m	p	p	p		IEC 60794-1-2 F5B

Thermal properties						
Temperature range	during installation	-10 to +50	-10 to +50	-10 to +50	°C	IEC 60794-1-2 F1
	in service	-40 to +70	-25 to +70	-40 to +70	°C	
	in storage	-40 to +70	-25 to +70	-40 to +70	°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

Combustion properties					
Fire load		1.7	1.7	3.4	MJ/m
2002/95/EC (RoHS)		compliant			

p = passed

## Glass-armoured multi-fiber loose tube cables – TWINTUBE – up to 24 fibers



### Design

Cable design	2 multi-fiber loose tubes, jelly-filled with 2 – 12 fibers 2 ripcords
Strain relief and rodent protection	glass-armoured
Jacket material	PE
Jacket colour	black

### Properties

- Metal free outdoor cable
- Rodent-protected, glass-armoured
- For use in ducts and unprotected environment
- Ripcord for easy jacket removal
- High chemical resistance against acids and alkalis
- Halogen free and non-corrosive
- Longitudinal and transversal watertight cable
- For MASTERLINE applications

### Applications

- For installations directly in the ground and in mechanically unprotected environments
- As data cable in distribution networks
- For installation outdoors, in wet cable ducts and pipes

According to IEC 60794-1-2

### Ordering information

up to 24-.../W(ZNG)Y-...94  
Please see page 153

## Glass-armoured multi-fiber loose tube cables – TWINTUBE – up to 24 fibers

### Specification

Jacket material	LDPE		
Jacket Ø	9.4 × 8.8	mm	
Multi-fiber loose tube	standard		2 up to 12 fibers
Approx. weight	69	kg/km	

### Mechanical properties

Tensile strength	during installation	3000	N	IEC 60794-1-2 E1
	in service	1500	N	
Min. bend radius	during installation	150*	mm	IEC 60794-1-2 E11
	in service	100*	mm	
Crush resistance	short-term	800*	N/cm	IEC 60794-1-2 E3
	long-term	400*	N/cm	
Repeated bending	r = 150 mm, weight = 5 kg	5000*	cycles	IEC 60794-1-2 E6
Water penetration	h = 1 m, 24 h, p < 3 m	p		IEC 60794-1-2 F5B

\* refers to the flat side of the cable

### Thermal properties

Temperature range	during installation	-10 to +50	°C	IEC 60794-1-2 F1
	in service	-20 to +70	°C	
	in storage	-40 to +70	°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

### Combustion properties

Fire load	1.8	MJ/m	
2002/95/EC (RoHS)	compliant		

p = passed

# Glass-armoured multi-fiber loose tube cables - up to 72 fibers



## Design

Cable design	5 - 6 multi-fiber loose tube, jelly-filled with 2 - 12 fibers strength member 2 ripcords
Strain relief and rodent protection	glass-armoured
Jacket material	PE
Jacket colour	black with 2 orange stripes

## Properties

- Metal free outdoor cable
- Rodent protection (glass-armoured)
- For use in ducts and unprotected environment
- Ripcord for easy jacket removal
- High chemical resistance against acids and alkalis
- For high mechanical requirements
- Halogen free and non-corrosive fire gases
- Longitudinal and transversal watertight cable

## Applications

- For installation directly in the ground and in mechanically unprotected environments
- Data cable in distribution networks
- For installation outdoor, in wet cable ducts and pipes

According to IEC 60794-1-2

## Ordering information

60-.../BWSN(ZNG)V-...105  
60-.../WSN(ZNG)Y-...150  
72-.../BWSN(ZNG)V-...117  
72-.../WSN(ZNG)Y-...160  
Please see page 154

## Glass-armoured multi-fiber loose tube cables - up to 72 fibers

Specification	5	5	6	6		stranding
Fiber up to	60	60	72	72		
Jacket material	HDPE	LDPE	HDPE	LDPE		
Jacket Ø	10.5	15.0	11.7	16.0	mm	
Multi fiber loose tube	mini	standard	mini	standard		
Approx. weight	88	178	112	178	kg/km	

Mechanical properties							
Tensile strength	during installation	6000	9000	9000	13000	N	IEC 60794-1-2 E1
	in service	3000	4500	4500	6500	N	
Min. bend radius	during installation	150	225	165	240	mm	IEC 60794-1-2 E11
	in service	100	150	110	160	mm	
Crush resistance	short-term	800	800	800	800	N/cm	IEC 60794-1-2 E3
	long-term	300	300	300	300	N/cm	
Impact resistance	W <sub>p</sub> = 2.21 J	50		50		impacts	IEC 60794-1-2 E4
	W <sub>p</sub> = 4.41 J		100		100		
Repeated bending	r = 50 mm/1 kg	1000				cycles	IEC 60794-1-2 E6
	r = 150 mm/10 kg		3000				
	r = 160 mm/10 kg				3000		
Water penetration	h = 1 m, 24 h, p < 3 m	p	p	p	p		IEC 60794-1-2 F5B

Thermal properties					
Temperature range	during installation		-10 to +50	°C	IEC 60794-1-2 F1
	in service		-40 to +70	°C	
	in storage		-40 to +70	°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

Combustion properties					
Fire load	2.8	5.1	3.3	4.7	MJ/m
2002/95/EC (RoHS)	compliant				

p = passed

# Glass-armoured multi-fiber loose tube cables – up to 144 fibers



## Design

Cable design	8 - 12 multi-fiber loose tubes, jelly-filled with 2 - 12 fibers strength member 2 ripcords
Strain relief and rodent protection	glass-armoured
Jacket material	PE
Jacket colour	black with 2 orange stripes

## Properties

- Metal free outdoor cable
- Rodent-protected, glass-armoured
- For use in ducts and unprotected environment
- Ripcords for easy jacket removal
- High chemical resistance against acids and alkalis
- For high mechanical requirements
- Halogen free and non-corrosive fire gases
- Longitudinal and transversal watertight cable

## Applications

- For installations directly in the ground and in mechanically unprotected environments
- As data cable in distribution networks
- For installation outdoors, in wet cable ducts and pipes

According to IEC 60794-1-2

## Ordering information

96-.../BWSN(ZNG)V-...130  
96-.../WSN(ZNG)Y-...180  
144-.../BWSN(ZNG)V-...150  
144-.../WSN(ZNG)Y-...220  
Please see page 155

## Glass-armoured multi-fiber loose tube cables – up to 144 fibers

Specification	8	8	12	12		stranding
Fiber up to	96	96	144	144		
Jacket material	HDPE	LDPE	HDPE	LDPE		
Jacket Ø	13.0	18.0	15.0	22.0	mm	
Multi fiber loose tube	mini	standard	mini	standard		
Approx. weight	130	263	194	385	kg/km	

Cables with 120 fibers are available on request

### Mechanical properties

Tensile strength	during installation	9000	13000	15000	18000	N	IEC 60794-1-2 E1
	in service	4500	6500	7500	9000	N	
Min. bend radius	during installation	180	270	225	330	mm	IEC 60794-1-2 E11
	in service	120	180	150	220	mm	
Crush resistance	short-term	800	800	800	800	N/cm	IEC 60794-1-2 E3
	long-term	300	300	300	300	N/cm	
Impact resistance	W <sub>p</sub> = 2.21 J	50		50		impacts	IEC 60794-1-2 E4
	W <sub>p</sub> = 4.41 J		100		100		
Repeated bending			3000		3000	cycles	IEC 60794-1-2 E6
Water penetration	h = 1 m, 24 h, p < 3 m	p	p	p	p		IEC 60794-1-2 F5B

### Thermal properties

Temperature range	during installation	-10 to +50			°C	IEC 60794-1-2 F1
	in service	-40 to +70			°C	
	in storage	-40 to +70			°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

### Combustion properties

Fire load	4.0	6.8	6.3	11.1	MJ/m	
2002/95/EC (RoHS)	compliant					

p = passed

Cable with 120 fibers on request.

# Steel-armoured multi-fiber loose tube cables – simplex and TWINTUBE



Simplex - up to 12 fibers



TWINTUBE - up to 24 fibers

## Design

Cable design	1 – 2 multi-fiber loose tubes, jelly-filled with 2 – 12 fibers
Strain relief	Aramid yarn / glass-roving
Rodent protection	steel-armoured
Jacket material	PE
Jacket colour	black

## Properties

- Steel-armoured outdoor cable
- Rodent-protected (steel-armoured)
- High chemical resistance against acids and alkalis
- Halogen free and non-corrosive fire gases
- Longitudinal and transversal watertight cable

## Applications

- For outdoor installations and in mechanically unprotected environments
- As data cable in distribution networks
- For installations directly in the ground

According to IEC 60794-1-2

## Ordering information

12-.../W(ZN)YAY-...80  
24-.../W(ZNG)YAY-...125  
Please see page 155



## Steel-armoured multi-fiber loose tube cables – simplex and TWINTUBE

Specification	Simplex	TWINTUBE		
Jacket material	LDPE	LDPE	mm	
Jacket Ø	8.0	12.5	mm	
Fiber quantity up to	12	24		
Multi-fiber loose tube Ø	standard	standard		
Approx. weight	70	152	kg/km	

Mechanical properties					
Tensile strength	during installation	1000	3000	N	IEC 60794-1-2 E1
	in service	500	1500	N	
Min. bend radius	during installation	120	190*	mm	IEC 60794-1-2 E11
	in service	80	125*	mm	
Crush resistance	short-term	400	800*	N/cm	IEC 60794-1-2 E3
	long-term	200	400*	N/cm	
Impact resistance	W <sub>p</sub> = 4.41 J	50		impacts	IEC 60794-1-2 E4
	W <sub>p</sub> = 15 J		3	impacts	
Repeated bending	r = 80 mm, weight = 2.5 kg	5000		cycles	IEC 60794-1-2 E6
Water penetration	h = 1 m, 24 h, p < 3 m		p		IEC 60794-1-2 F5B

\* refers to the flat side of the cable

Thermal properties					
Temperature range	during installation	-10 to +50	-10 to +50	°C	IEC 60794-1-2 F1
	in service	-40 to +70	-20 to +70	°C	
	in storage	-40 to +70	-40 to +70	°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

Combustion properties				
Fire load	1.78	3.51	MJ/m	
2002/95/EC (RoHS)	compliant			

p = passed

## Steel-armoured multi-fiber loose tube cables – up to 72 fibers



### Design

Cable design	5 - 6 multi-fiber loose tubes, jelly-filled with 2 – 12 fibers strength member 2 ripcords
Strain relief	glass-roving
Rodent protection	steel-armoured
Jacket material	HDPE
Jacket colour	black

### Properties

- Steel-armoured outdoor cable
- Rodent-protected (steel-armoured)
- For use in ducts and unprotected environment
- Halogen free and non-corrosive fire gases
- Longitudinal and transversal watertight cable

### Applications

- For outdoor installations and in mechanically unprotected environments
- As data cable in distribution networks
- For installation directly in the ground

According to IEC 60794-1-2

### Ordering information

60-.../BWSN(ZNG)VAV-...140  
72-.../BWSW(ZNG)VAV-...152  
Please see page 156

## Steel-armoured multi-fiber loose tube cables - up to 72 fibers

Specification	5	6		stranding
Jacket material	HDPE	HDPE		
Jacket Ø	14.0	15.2	mm	
Fiber quantity up to	60	72		
Multi-fiber loose tube Ø	mini	mini		
Approx. weight	185	220	kg/km	













Mechanical properties					
Tensile strength	during installation	6000	9000	N	IEC 60794-1-2 E1
	in service	3000	4500	N	
Min. bend radius	during installation	210	230	mm	IEC 60794-1-2 E11
	in service	125	165	mm	
Crush resistance	short-term	800	800	N/cm	IEC 60794-1-2 E3
	long-term	300	300	N/cm	
Impact resistance	W <sub>p</sub> = 2.21 J	50	50	impacts	IEC 60794-1-2 E4
Water penetration	h = 1 m, 24 h, p > 3 m	p	p		IEC 60794-1-2 F5B

Thermal properties					
Temperature range	during installation	-10 to +50		°C	IEC 60794-1-2 F1
	in service	-40 to +70		°C	
	in storage	-40 to +70		°C	

Specification for singlemode at 1550 nm, for multimode at 1300 nm

Combustion properties				
Fire load	4.4	5	MJ/m	
2002/95/EC (RoHS)	compliant			

p = passed

Special cables	Cable type	Page	Ordering key	Weight [kg/km]	Amount of fibers
	Simplex cables with tight tube	110	01-.../FJU-...19	3	1
	Rugged simplex cables	112	01-.../FJH(ZN)Z-...27	40	1
	Rugged minicord breakout cables and industry link TWINFLEX	114	02-.../FJ(ZN)Z-...17 02-.../...(ZN)Z-...22	28 46	2 2
	Industry Link TWINFIX	116	02-.../...(ZNG)H-...22 02-.../...(ZNG)H-...22_UN (optional)	59 59	2 2
	Industry link QUADFIX	118	04-.../FJ(ZNG)H-...22 04-.../FJ(ZNG)H-...22_UN (optional)	90 90	4 4
	Mobile field cables	120	02-.../FSN(ZN)Z-...56 04-.../FSN(ZN)Z-...56 08-.../FSN(ZN)Z-...68	24 26 40	2 4 8
	Field cables	122	02-.../FSN(ZN)Z-...55 04-.../FSN(ZN)Z-...55	25 26	2 4
	Glass-armoured riser cables 2 tubes	124	02-E9A.../F(ZNG)H-...48 02-.../F(ZNG)H-...55 02-.../F(ZNG)H-...55_UR (option) 02-.../F(ZNG)H-...70 02-.../F(ZNG)H-...70_UR (option)	26 33 33 55 55	2 2 2 2 2
	Glass-armoured riser cables 4 tubes	126	04-.../FSN(ZNG)H-...55	34	4
	Field cables 3STAR	128	02-.../FSN(ZN)HZ-...70 04-.../FSN(ZN)HZ-...70	52 53	2 4
	Drag chain cables	130	12-.../FSN(ZN)YZ-...130	133	- 12
	Hybrid breakout and multi-fiber loose tube cables	132	04-.../CWJSNH-...27+...-C15 08-.../CWJSNH-...27+...-C15 60-.../WSN(ZNG)Y-...150+...-C... 96-.../WSN(ZNG)Y-...180+...-C...		- 4 - 8 - 60 - 96

	Amount of conductors	Tube Ø [mm]	Simplex cable Ø [mm]	Jacket Ø [mm]	Jacket material	Direct connector termination	Tensile strength in service [N]	Min. bend radius in service [mm]	Crush resistance (short-term) [N/cm]	Impact resistance [impacts]	Temperature range in service [°C]	Fire propagation IEC 60332-1-2	Fire propagation IEC 60332-3-24
		0.9		1.9	TPU	•	90	30	1000	30	-40 to +85		
		0.9	2.7	6.0	TPU	•	1500	60	2000	150	-25 to +70	p	
		0.9 0.9	1.7 2.2	6.0 7.5 x 8	TPU TPU	• •	1000 1000	25 25	600 600	200 200	-40 to +80 -40 to +85		
		0.9 0.9	2.2 2.2	7.5 7.5	LSFH™ LSFH™	• •	1000 1000	70 70	500 500	200 200	-20 to +70		p
		0.9 0.9	2.2 2.2	9.0 9.0	LSFH™ LSFH™	• •	1000 1000	90 90	1500 1500	- -	-40 to +70 -40 to +70		p
		0.9		5.6 5.6 6.8	TPU TPU TPU	• • •	2000 2000 2000	45 45 45	1900 1900 1900	300 300 300	-60 to +85 -60 to +85 -60 to +85		
		0.9 0.9		5.5 5.5	TPU TPU	• •	1000 1000	60 60	400 400	300 300	-40 to +85 -40 to +85		
		0.9 0.9 0.9 0.9 0.9		4.8 5.5 5.5 7.0 7.0	LSFH™ LSFH™ LSFH™ LSFH™ LSFH™	• • • • •	300 500 500 650 650	20 30 30 40 40	2000 400 400 400 400	- 50 50 50 50	-40 to +90 -40 to +75 -40 to +75 -40 to +75 -40 to +75	p p p p p	p p p p p
		0.9		5.5	LSFH™	•	500	60	600	200	-40 to +75	p	p
		0.9 0.9		7.0 7.0	TPU TPU	• •	1000 1000	40 40	800 800		-40 to +85 -40 to +85	p p	p p
		0.9		13.0	TPU	•	2000	100	400		-30 to +90		
	-4 -4 -4 -4	0.9 0.9 3.0 3.0	2.7 2.7	10.0 13.0 15.0 15.0	LSFH™ LSFH™ PE PE	• •	1000 2000 4500 6500	100 130 150 180	1000 1000 800 800	50 50 100 100	-20 to +70 -20 to +70 -40 to +70 -40 to +70	p p p p	p p p p

p = passed

## Simplex cables with tight tube



### Design

Tube	tight tube 0.9 mm
Strain relief	Aramide yarn
Jacket material	TPU
Jacket colour	E9 yellow
	OM2 orange
	OM3 turquoise
	OM4 heather violet
	G62.5 orange

### Properties

- Metal free indoor and outdoor cable
- For direct connector assembly with strain relief
- Tube can be stripped minimal 30 mm in one piece
- Tight bend radii
- For high mechanical and thermal stability
- Halogen free and non-corrosive fire gases
- Jacket material according to UL94V-2

### Applications

- For outdoor and indoor installations
- Patch cable in distribution centres

According to IEC 60794-1-2

### Ordering information

01-.../FJU-...19

Please see page 157

## Simplex cables with tight tube

Specification			
Jacket Ø		1.9	mm
Tube Ø		0.9	mm
Approx. weight		3	kg/km

Mechanical properties				
Tensile strength	during installation	180	N	IEC 60794-1-2 E1
	in service	90	N	
Min. bend radius	during installation	50	mm	IEC 60794-1-2 E11
	in service	30	mm	
Crush resistance	short-term	1000	N/cm	IEC 60794-1-2 E3
	long-term	200	N/cm	
Impact resistance	Wp = 0.74 J	30	impacts	IEC 60794-1-2 E4
Repeated bending	r = 30 mm, weight = 1 kg	10'000	cycles	IEC 60794-1-2 E6

Thermal properties				
Temperature range	during installation	-10 to +50	°C	IEC 61300-2-22
	in service	-40 to +85	°C	
	in storage	-40 to +85	°C	

Specification for singlemode at 1310 nm, for multimode at 1300 nm

Combustion properties			
Fire load		0.11	MJ/m
2002/95/EC (RoHS)		compliant	

## Rugged simplex cables



### Design

Cable design	1 single fiber cable with tight tubes	
Strain relief	Aramide yarn	
Outdoor jacket material/colour	TPU / black	
Indoor jacket material/colour	LSFH™ / E9	yellow
	OM2	orange
	OM3	turquoise
	OM4	heather violet
	G62.5	orange

### Properties

- Metal free indoor and outdoor cable
- For direct connector assembly with strain relief
- Tube can be stripped minimal 30 mm in one piece
- High chemical resistance against acids and alkalis
- For high mechanical and thermal stability
- Halogen free and non-corrosive fire gases
- Improved crash resistance

### Applications

- Industry LAN
- Mobile data cablings in harsh environment
- Machinery cablings, drag chains

According to IEC 60794-1-2

### Ordering information

01-.../FJH(ZN)Z-...27  
Please see page 157



## Rugged simplex cables

### Specification

Jacket Ø	6.0	mm	
Single fiber cable Ø	2.7	mm	
Tube Ø	0.9	mm	
Approx. weight	40	kg/km	

### Mechanical properties

Tensile strength	during installation	4000	N	IEC 60794-1-2 E1
	in service	1500	N	
Min. bend radius	during installation	90	mm	IEC 60794-1-2 E11
	in service	60	mm	
Crush resistance	short-term	2000	N/cm	IEC 60794-1-2 E3
	long-term	1000	N/cm	
Impact resistance	Wp = 2.25J	150	impacts	IEC 60794-1-2 E4
Repeated bending	r = 30 mm, weight = 2.5 kg	10'000	cycles	IEC 60794-1-2 E6
	r = 77 mm velocity = 2.2 m/s L = 2 m	100'000	cycles	HUBER+SUHNER drag chain test

### Thermal properties

Temperature range	during installation	-10 to +60	°C	IEC 60794-1-2 F1
	in service	-25 to +70	°C	
	in storage	-40 to +70	°C	

Specification for singlemode at 1310 nm, for multimode at 1300 nm

### Combustion properties

Fire load		0.73	MJ/m	
Fire propagation	on a vertical single cable	p		IEC 60332-1-2
Halogen acid gas	jacket material	p		IEC 60754-1
Degree of acidity	jacket material	p		IEC 60754-2
2002/95/EC (RoHS)		compliant		

p = passed

# Rugged minicord breakout and industry link-TWINFLEX cables



Rugged minicord breakout



Industry Link TWINFLEX

## Design

Cable design	2 single fiber cables with tight tubes 1 ripcord
Strain relief	Aramide yarn
Jacket material	TPU
Jacket colour	black

## Properties

- For indoor and outdoor
- For direct connector assembly with strain relief
- Strain relieved with Aramide yarn
- Ripcord for easy jacket removal
- Halogen free and non-corrosive fire gases
- Metal free
- Improved crush resistance
- For high thermal and mechanical stability
- High chemical resistance against fluids
- High abrasive resistance

## Applications

- For flexible, moved and fixed use
- Industrial Ethernet and LAN
- Machine cabling, drag chains
- As control or data cable in factory automation
- Mobile data cabling for harsh environment
- Connection to outdoor devices

According to IEC 60794-1-2

## Conformance

TWINFLEX cables with H200 and POF meet PROFINET specification.

## Ordering information

Rugged minicord breakout  
TWINFLEX  
Please see page 157

02-.../FJ(ZN)Z-...17  
02-.../...(ZN)Z-...22

## Rugged minicord breakout and industry link-TWINFLEX cables

Specification							
Cable type	rugged minicord breakout		Industry Link TWINFLEX				
Fiber types	E9, G50, G62	H200	G50, G62	H200	POF980		
Jacket Ø	6.0		7.5 x 8	7.5 x 8	7.5 x 8	mm	
Single fiber cable Ø	1.7		2.2	2.2		mm	
Tube Ø	0.9		0.9	0.9	2.2	mm	
Channel marking on single fiber	numbered		black and orange with arrows				
Approx. weight	28		46	46	46	kg/km	

Mechanical properties								
Tensile strength	during installation	2000	2000	2000	2000	2000	N	IEC 60794-1-2 E1
	in service	1000	500	1000	1000	1000	N	
Min. bend radius	during installation	25	25	40	60	25	mm	IEC 60794-1-2 E11
	in service	25	25	25	50	25	mm	
Crush resistance	short-term	600	200	600	600	600	N/cm	IEC 60794-1-2 E3
	long-term	200	100	200	200	400	N/cm	
Impact resistance	W <sub>p</sub> = 1.5 J W <sub>p</sub> = 2.2 J	200	200	200	200	200	impacts	IEC 60794-1-2 E4
Repeated bending	r = 30 mm / 10 kg r = 60 mm / 1 kg	20'000		10'000	10'000	10'000	cycles	IEC 60794-1-2 E6
Flexing	r = 77 mm <sup>1)</sup> r = 70 mm r = 80 mm	100'000		100'000	100'000	100'000	cycles	HUBER+SUHNER IEC 60794-1-2 E8 IEC 60794-1-2 E8
Torsion	± 360° ± 1440°	3		100	10	10	cycles	IEC 60794-1-2 E7

1) Drag chain test

Thermal properties								
Temperature range	during installation	-20 to +60	-20 to +60	-20 to +60	-20 to +60	-30 to +60	°C	IEC 60794-1-2 F1
	in service	-40 to +80 <sup>3)</sup>	-40 to +80 <sup>3)</sup>	-40 to +85	-40 to +85	-40 to +85	°C	
	in storage	-40 to +80 <sup>3)</sup>	-40 to +80 <sup>3)</sup>	-45 to +85	-45 to +85	-40 to +85	°C	

Combustion properties								
Fire load	0.6	0.6	0.75	0.75	0.93	MJ/m		
2002/95/EC (RoHS)	compliant							

Conformance							
PROFINET	Specification <sup>2)</sup>				yes	yes	

2) Standard with H+S marking. According to PROFINET specification with PROFINET marking (PROFINET Type C 2K200/230 or PROFINET Type C 2P980/1000)

3) Maximal temperature for single fiber cables without cable jacket +70 °C

# Industry link TWINFIX – glass-armoured breakout cables



## Design

Cable design	2 single fiber cables with tight tubes
Strain relief	glass-armoured
Jacket material	LSFH™
Jacket colour	black

## Properties

- For indoor and outdoor
- For direct connector assembly with strain relief
- Rodent-protected, glass-armoured
- Easy stripping
- Low smoke, halogen free and self-extinguishing
- Metal free
- Improved crush resistance
- For high thermal and mechanical stability
- UV protected, suitable for outdoor use
- Longitudinal and transversal watertight cable

## Applications

- For fixed installation
- Industrial Ethernet and LAN
- Machine cabling
- As control or data cable in factory automation
- Data cabling for harsh environment
- Connection to outdoor devices
- LSFH™ - for applications involving high safety requirements in case of fire

According to IEC 60794-1-2

## Conformance

TWINFIX cables with H200 and POF meet PROFINET specification

## Approvals

UL listed acc. OFN / OFNG

## Ordering information

02-.../(ZNG)H-...22

02-.../(ZNG)H-...22\_UN (optional)

Please see page 158

## Industry link TWINFIX – glass-armoured breakout cables

Specification					
Cable type	Industry Link TWINFIX				
Fiber types	E9, G50, G62	H200	POF980		
Jacket Ø	7.5	7.5	7.5	mm	
Single fiber cable Ø	2.2	2.2		mm	
Tube Ø	0.9	0.9	2.2	mm	
Channel marking on single fiber	black and orange with arrows				
Approx. weight	59	67	67	kg/km	

Mechanical properties						
Tensile strength	during installation	2000	2000	2000	N	IEC 60794-1-2 E1
	in service	1000	1000	1000	N	
Min. bend radius	during installation	40	105	25	mm	IEC 60794-1-2 E11
	in service	25	70	25	mm	
Crush resistance	short-term	600	600	500	N/cm	IEC 60794-1-2 E3
	long-term	200	200	200	N/cm	
Impact resistance	Wp = 2.2 J	200	200	200	impacts	IEC 60794-1-2 E4
Repeated bending	r = 60 mm / 1 kg	10'000	10'000	10'000	cycles	IEC 60794-1-2 E6
Torsion	± 360°	10	10	10	cycles	IEC 60794-1-2 E7
Water penetration	h=1m, 24d, p<3m	p	p	p		IEC 60794-1-2 F5A

Thermal properties						
Temperature range	during installation	-20 to +60	-20 to +60	-20 to +60	°C	IEC 60794-1-2 F1
	in service	-40 to +70	-20 to +70	-30 to +70	°C	
	in storage	-45 to +70	-25 to +70	-30 to +70	°C	

Combustion properties						
Fire load		1.1	1.1	1.25	MJ/m	
Fire propagation	on a vertical cable bundle	p	p			IEC 60332-3-24
Fire test	with circuit integrity (CI)	90	90		min	IEC 60331-25
Halogen acid gas	jacket material	p	p	p		IEC 60754-1
Degree of acidity	jacket material	p	p	p		IEC 60754-2
2002/95/EC (RoHS)		compliant				

Conformance						
PROFINET	specification <sup>1)</sup>		yes	yes		

1) Standard black jacket and with H+S marking. According to PROFINET specification with green jacket and PROFINET marking (PROFINET Type B 2K200/230 or PROFINET Type B 2P980/1000)

p = passed

## Industry link QUADFIX – glass-armoured breakout cables



### Design

Cable design	4 single fiber cables with tight tubes
Strain relief	glass-armoured
Jacket material	LSFH™
Jacket colour	black

### Properties

- Metal free indoor and outdoor cable
- Rodent-protected, glass-armoured
- For direct connector assembly with strain relief
- Easy stripping
- UV-protected, suitable for outdoor use
- For high thermal and mechanical stability
- Low smoke, halogen free and self-extinguishing
- Improved crush resistance
- Longitudinal and transversal watertight cable

### Applications

- For fixed installation
- Industrial Ethernet and LAN
- As control or data cable in industrial plants
- Cabling in harsh environment conditions
- LSFH™ - for applications involving high safety requirements in case of fire

According to IEC 60794-1-2

### Approvals

UL listed acc. OFN / OFNG

### Ordering information

04-.../FJ(ZNG)H-...22

04-.../FJ(ZNG)H-...22\_UN (optional)

Please see page 158

## Industry link QUADFIX – glass-armoured breakout cables

Specification			
Jacket Ø		9	mm
Single fiber cable Ø		2.2	mm
Tube Ø		0.9	mm
Approx. weight		90	kg/km

Mechanical properties				
Tensile strength	during installation	2000	N	IEC 60794-1-2 E1
	in service	1000	N	
Min. bend radius	during installation	135	mm	IEC 60794-1-2 E11
	in service	90	mm	
Crush resistance	short-term	1500	N/cm	IEC 60794-1-2 E3
	long-term	400	N/cm	
Water penetration	h=1m, 24 h, p < 3 m	p		IEC 60794-1-2 F5B

Specification for singlemode at 1310 nm and for multimode at 1300 nm

Thermal properties				
Temperature range	during installation	-20 to +60	°C	IEC 60794-1-2 F1
	in service	-40 to +70	°C	
	in storage	-40 to +70	°C	

Combustion properties				
Fire load		1.6	MJ/m	
Fire propagation	on a vertical cable bundle	p		IEC 60332-3-24
Fire test	with circuit integrity (CI)	180	min	IEC 60331-25
Halogen acid gas	jacket material	p		IEC 60754-1
Degree of acidity	jacket material	p		IEC 60754-2
2002/95/EC (RoHS)		compliant		

p = passed

## Mobile field cables



### Design

Cable design	2, 4 and 8 tight tubes
Strain relief	Aramide yarn
Jacket material	TPU
Jacket colour	black

### Properties

- High tensile strength
- For direct connector assembly
- Excellent coiling capability
- High chemical resistance against acids and alkalis
- For high mechanical and thermal stability
- Halogen free and non-corrosive fire gases
- Improved crush resistance
- UV-protected, suitable for outdoor use
- Metal free
- Easy stripping
- High tensile strength, high abrasion and cut resistance

### Applications

- Fixed or mobile data cabling (MASTERLINE mobile)
- Data cabling for harsh environment
- Military tactical field use
- Field video broadcast
- Machine cabling, drag chains

According to IEC 60794-1-2

### Ordering information

02-.../FSN(ZN)Z-...56

04-.../FSN(ZN)Z-...56

08-.../FSN(ZN)Z-...68

Please see page 158



## Mobile field cables

Specification					
Jacket Ø	5.6	5.6	6.8	mm	
Tube Ø	0.9	0.9	0.9	mm	
Number of tight tubes	2	4	8		
Channel marking on single fiber	coloured				
Approx. weight	24	26	40	kg/km	

Mechanical properties						
Tensile strength	during installation	4000	4000	4000	N	IEC 60794-1-2 E1
	in service	2000	2000	2000	N	
Min. bend radius	during installation	90	90	90	mm	IEC 60794-1-2 E11
	in service	45	45	45	mm	
Crush resistance <b>SM</b>	short-term	2100	2100	1900	N/cm	IEC 60794-1-2 E3
	long-term	600	600	200	N/cm	
Crush resistance <b>MM</b>	short-term	1900	1900	2100	N/cm	
	long-term	800	800	600	N/cm	
Impact resistance	Wp = 2.21 J	300	300	300	impacts	IEC 60794-1-2 E4
Repeated bending	r = 50 mm, weight = 2 kg	20'000	10'000	10'000	cycles	IEC 60794-1-2 E6
	r = 100 mm, weight = 1 kg r = 120 mm, weight = 2 kg Velocity = 1.44 m/s	100'000	100'000	100'000	cycles	IEC 60794-1-2 E8
Coiling capability	l = 500 m, r = 45 mm	5	5	5	cycles	HUBER+SUHNER
	l = 500 m, r = 80 mm					
Torsion	±1440°, l = 1000 mm	1000	1000	1000	cycles	IEC 60794-1-2 E7

Thermal properties					
Temperature range	during installation	-46 to +85		°C	IEC 60794-1-2 F1
	in service	-60 to +85		°C	
	in storage	-60 to +85		°C	

Combustion properties					
Fire load	0.5	0.5	0.75	MJ/m	
2002/95/EC (RoHS)	compliant				

## Field cables



### Design

Cable design	2 up to 4 tight tubes
Strain relief	Aramide yarn
Jacket material	TPU
Jacket colour	black

### Properties

- For indoor and outdoor
- Strain relief with Aramide yarn
- For direct connector assembly
- Ripcord for easy jacket removal
- For high chemical resistance against fluids
- For high thermal and mechanical stability
- Halogen free and non-corrosive fire gases
- Metal free
- Longitudinal and transversal watertight cable
- Improved crush resistance

### Applications

- For fixed installation
- Data cabling for harsh environment
- Connection of outdoor devices (e.g. FTTA)

According to IEC 60794-1-2

### Ordering information

02-.../FSN(ZN)Z-...55

04-.../FSN(ZN)Z-...55

Please see page 159

## Field cables

Specification				
Number of fibers		2	4	
Jacket Ø		5.5	5.5	mm
Tube Ø		0.9	0.9	mm
Approx. weight		25	26	kg/km

Mechanical properties					
Tensile strength	during installation	2000	2000	N	IEC 60794-1-2 E1
	in service	1000	1000	N	
Min. bend radius	during installation	90	90	mm	IEC 60794-1-2 E11
	in service	60	60	mm	
Crush resistance	short-term	400	400	N/cm	IEC 60794-1-2 E3
	long-term	100	100	N/cm	
Impact resistance	Wp = 2.25 J	300	300	impacts	IEC 60794-1-2 E4
Repeated bending	r = 30 mm, weight = 10 kg	20'000	20'000	cycles	IEC 60794-1-2 E6
Torsion	± 1400°, 1m	3	3	cycles	IEC 60794-1-2 E7
Water penetration	h = 1 m, 24h, p<3m	p	p		IEC 60794-1-2 F5A

Thermal properties					
Temperature range	during installation	-40 to +85		°C	IEC 60794-1-2 F1
	in service	-40 to +85		°C	
	in storage	-60 to +85		°C	

Combustion properties					
Fire load		0.44	0.47	MJ/m	
2002/95/EC (RoHS)		compliant			

p = passed

## Glass-armoured riser cables – 2 fibers



### Design

Cable design	2 tight tubes
Strain relief and Rodent protection	glass-armoured
Jacket material	LSFH™
Jacket colour	black

### Properties

- Metal free indoor and outdoor cable
- Rodent-protected, glass-armoured
- For vertical applications
- For direct connector assembly
- Low smoke, halogen free and self-extinguishing
- Low fire load for high safety requirements

### Applications

- For FTTA installation
- For installation directly in the ground and in mechanically unprotected environments
- Data cable in distribution networks
- For installation outdoor, in wet cable ducts and pipes
- For installation in cable ducts
- For high safety requirements in case of fire

According to IEC 60794-1-2

### Approvals

UL listed acc. OFNR

### Ordering information

02-E9A../F(ZNG)H-...48

02-.../F(ZNG)H-...55

02-.../F(ZNG)H-...55\_UR (optional)

02-.../F(ZNG)H-...70

02-.../F(ZNG)H-...70\_UR (optional)

Please see page 159

## Glass-armoured riser cables – 2 fibers

Specification						
Jacket Ø		4.8	5.5	7.0	mm	
Tube Ø		0.9	0.9	0.9	mm	
Approx. weight		26	33	55	kg/km	

Mechanical properties						
Tensile strength	during installation	450	1000	1000	N	IEC 60794-1-2 E1
	in service	300	500	650	N	
Min. bend radius	during installation	20	83	105	mm	IEC 60794-1-2 E11
	in service	20	30	40	mm	
Crush resistance	short-term	2000	400	400	N/cm	IEC 60794-1-2 E3
	long-term	600	200	200	N/cm	
Impact resistance	Wp = 2.21 J		50		impacts	IEC 60794-1-2 E4
	Wp = 2.25 J			50	impacts	
Water penetration	h = 1 m, 24h, p < 3 m	p				IEC 60794-1-2 F5B

Thermal properties						
Temperature range	during installation	-40 to +70	-40 to +70	-25 to +50	°C	IEC 60794-1-2 F1
	in service	-40 to +90	-40 to +75	-40 to +75	°C	
	in storage	-60 to +70	-40 to +75	-40 to +75	°C	

Combustion properties						
Fire load		0.456	0.63	1.2	MJ/m	
Fire propagation	on a vertical single cable	p	p	p		IEC 60332-1-2
	on a vertical cable bundle	p				IEC 60332-3-24
	on a vertical cable bundle		p	p		IEC 60332-3-25
	on a vertical cable bundle		p	p		UL 1666
Halogen acid gas	jacket material	p	p	p		IEC 60754-1
Degree of acidity	jacket material	p	p	p		IEC 60754-2
2002/95/EC (RoHS)		compliant				

p = passed

## Glass-armoured riser cables – 4 fibers



### Design

Cable design	central strength member (non metallic) 4 tight tubes
Strain relief and Rodent protection	glass-armoured
Jacket material	LSFH™
Jacket colour	black

### Properties

- Metal free indoor and outdoor cable
- Rodent-protected, glass-armoured
- For vertical applications
- For direct connector assembly
- Low smoke, halogen free and self-extinguishing
- Low fire load for high safety requirements

### Applications

- For FTTA installation
- Installation directly in the ground and in mechanically unprotected environments
- Data cable in distribution networks
- For installation outdoor, in wet cable ducts and pipes
- For installation in cable ducts
- For high safety requirements in case of fire

According to IEC 60794-1-2

### Ordering information

04-.../FSN(ZNG)H-...55  
Please see page 159

## Glass-armoured riser cables – 4 fibers

Specification				
Jacket Ø		5.5	mm	
Tube Ø		0.9	mm	
Strength member		0.45	mm	
Approx. weight		33.5	kg/km	

Mechanical properties				
Tensile strength	during installation	1000	N	IEC 60794-1-2 E1
	in service	500	N	
Min. bend radius	during installation	83	mm	IEC 60794-1-2 E11
	in service	60	mm	
Crush resistance	short-term	600	N/cm	IEC 60794-1-2 E3
	long-term	100	N/cm	
Impact resistance	Wp = 1.53 J	200	impacts	IEC 60794-1-2 E4
Water penetration	h = 1 m, 24h, p < 3 m	p		IEC 60794-1-2 F5B

Thermal properties				
Temperature range	during installation	-25 to +50	°C	IEC 60794-1-2 F1
	in service	-40 to +75	°C	
	in storage	-40 to +75	°C	

Combustion properties				
Fire load		0.7	MJ/m	
Fire propagation	on a vertical single cable	p		IEC 60332-1-2
	on a vertical cable bundle	p		IEC 60332-3-24
	on a vertical cable bundle	p		UL 1666
Halogen acid gas	jacket material	p		IEC 60754-1
Degree of acidity	jacket material	p		IEC 60754-2
2002/95/EC (RoHS)		compliant		

p = passed

## Field cables 3STAR



### Design

Cable design	2 to 4 tight tubes
Strain relief	Aramide yarn
Jacket material	LSFH™/TPU
Jacket colour	black

### Properties

- For indoor and outdoor
- Strain relief with Aramide yarn
- Tube can be stripped minimal 30 mm in one piece
- Low smoke, halogen free and self-extinguishing
- Jacket material according to UL 94V-0
- Metal free
- Tight bend radii
- For high thermal and mechanical stability

### Applications

- For fixed installation
- Data cabling for harsh environment
- Connection of outdoor devices (e.g. FTTA)
- LSFH™ –for applications involving high safety requirements in case of fire

According to IEC 60794-1-2

### Ordering information

02-.../FSN(ZN)HZ-...70

04-.../FSN(ZN)HZ-...70

Please see page 160



## Field cables 3STAR

Specification				
Number of fibers		2	4	
Jacket Ø		7.0	7.0	mm
Tube Ø		0.9	0.9	mm
Approx. weight		52	53	kg/km

Mechanical properties					
Tensile strength	during installation	2500	2500	N	IEC 60794-1-2 E1
	in service	1000	1000	N	
Min. bend radius	during installation	40	40	mm	IEC 60794-1-2 E11
	in service	40	40	mm	
Crush resistance	short-term	SM: 1500 MM: 800	SM: 1500 MM: 800	N/cm	IEC 60794-1-2 E3
	long-term	SM: 900 MM: 400	SM: 900 MM: 400	N/cm	
Torsion	±1080°, l = 2000 mm	10'000	10'000	cycles	IEC 60794-1-2 E7

Thermal properties				
Temperature range	during installation	-25 to +60	°C	IEC 60794-1-2 F1
	in service	-40 to +85	°C	
	in storage	-40 to +60	°C	

Combustion properties				
Fire load		1.1	1.2	MJ/m
Fire propagation	on a vertical single cable	p	p	IEC 60332-1-2
	on a vertical cable bundle	p	p	IEC 60332-3-24
Fire test	on a vertical cable bundle	p	p	UL 1666
Halogen acid gas	jacket material	p	p	IEC 60754-1
Degree of acidity	jacket material	p	p	IEC 60754-2
2002/95/EC (RoHS)		compliant		

p = passed

## Drag chain cables



### Design

Cable design	up to 12 tight tubes strength member
Strain relief	Aramide yarn
Jacket material	TPU
Jacket colour	black

### Properties

- Strain relieved with Aramide yarn
- For direct connector assembly
- Tube can be stripped minimal 30 mm in one piece
- High chemical resistance against acids and alkalis
- For high mechanical and thermal stability
- Halogen free and non-corrosive fire gases
- Improved crush resistance
- Longitudinal and transversal watertight cable
- Metal free

### Applications

- Medium to large drag chains
- Cabling in industrial applications
- As control or data cable in industry robots, cranes, production lines and automation systems
- Cable design allows for a permanent load with more than one million drag chain cycles

According to IEC 60794-1-2

### Ordering information

up to 12-.../FSN(ZN)YZ-...130  
Please see page 160

## Drag chain cables

### Specification

Jacket Ø	13	mm	
Tube Ø	0.9	mm	
Channel marking on single fiber	coloured		
Approx. weight	133	kg/km	

### Mechanical properties

Tensile strength	during installation	4000	N	IEC 60794-1-2 E1
	in service	2000	N	
Min. bend radius	during installation	200	mm	IEC 60794-1-2 E11
	in service	100	mm	
Crush resistance	short-term	400	N/cm	IEC 60794-1-2 E3
	long-term	200	N/cm	
Repeated bending	r = 100 mm, weight = 5 kg	5000	cycles	IEC 60794-1-2 E6
Flexing	r = 100 mm velocity = 2 m/s, L = 2.0 m	1 Mio.	cycles	HUBER+SUHNER drag chain test
Water penetration	h = 1 m, 24 h, p < 3 m	p		IEC 60794-1-2 F5A

### Thermal properties

Temperature range	during installation	-10 to +50	°C	IEC 60794-1-2 F1
	in service	-30 to +90	°C	
	in storage	-40 to +90	°C	

### Combustion properties

Fire load	3.49	MJ/m	
2002/95/EC (RoHS)	compliant		

p = passed

## Hybrid cables



Hybrid breakout cable



Hybrid multi-fiber loose tube cable

### Design of hybrid breakout cables

Cable design	single fiber semi-tight tubes, orange, numbered
Conductor	1.5 mm <sup>2</sup> up to 4 conductors
Strain relief	Aramide yarn
Jacket material	LSFH™
Jacket colour	black

### Design of hybrid multi-fiber loose tube cables

Cable design	multi-fiber loose tubes
Conductor	1.5 mm <sup>2</sup> up to 4 conductors
Conductor	2.5 mm <sup>2</sup> up to 4 conductors
Strain relief	glass-armouring
Jacket material	PE (optional LSFH™)
Jacket colour	black

### Properties

- Custom designed cable configuration
- High chemical resistance against acids and alkalis
- For high mechanical requirements
- Low smoke, halogen free and self extinguishing
- Hybrid multi-fiber loose tube cables are rodent protected (glass armoured)

### Applications

- As data and power cable for industry, LAN, video, telephone or customer-specific applications
- Installation outdoors, in moist, wet cable ducts
- With LSFH™ jacket ideal for applications involving high safety requirements in case of a fire (installation indoors)





According to IEC 60794-1-2

### Ordering information

- Hybrid breakout cables  
up to 04-.../CWJSN(ZN)H-...27+...-C15  
up to 08-.../CWJSN(ZN)H-...27+...-C15
- Hybrid multi-fiber loose tube cables, PE jacket / LSFH™  
up to 60-.../WSN(ZNG)Y-...150+...-C...  
up to 96-.../WSN(ZNG)Y-...180+...-C...

Please see page 161

## Hybrid cables

Specification fiber optic components						
	4-way Breakout	8-way Breakout	5-way Multi-fiber loose tube	8-way Multi-fiber loose tube		
Jacket Ø	10.0	13.0	15.0	18.0	mm	
Single fiber cable Ø/multi-fiber loose tube Ø	2.7	2.7	3.0	3.0	mm	
Channel marking on single fiber	numbered		coloured			

Specification conductor							
Outer Ø conductor <sup>1)</sup>	1.5 mm <sup>2</sup>	2.7	2.7	2.7	2.7	mm	
	2.5 mm <sup>2</sup>			3.5	3.5	mm	
Rated voltage U <sub>0</sub> /U	1.5 mm <sup>2</sup>	600/1000				V	
	2.5 mm <sup>2</sup>	600/1000				V	
Electrical resistance	1.5 mm <sup>2</sup>	13.7	13.7	13.7	13.7	Ω/km	
	2.5 mm <sup>2</sup>			8.2	8.2		
Jacket material	Radox 125, halogen free						

1) Customer-specific order of colours for conductors. Available colours are black, red, white, blue, yellow/green

Mechanical properties							
Tensile strength	during installation	2000	4000	9000	13000	N	IEC 60794-1-2 E1
	in service	1000	2000	4500	6500	N	
Min. bend radius	during installation	150	200	225	270	mm	IEC 60794-1-2 E11
	in service	100	130	150	180	mm	
Crush resistance	short-term	1000	1000	800	800	N/cm	IEC 60794-1-2 E3
	long-term	200	500	300	300	N/cm	
Impact resistance	r = 25 mm	50	50	100	100	impacts	IEC 60794-1-2 E4
	W <sub>p</sub> =	2.21	2.21	4.41	4.41	J	

Thermal properties							
Temperature range	during installation	-10 to +60				°C	IEC 60794-1-2 F1
	in service	-20 to +70		-40 to +70		°C	
	in storage	-25 to +70		-40 to +70		°C	


Combustion properties							
Fire propagation		p	p	p <sup>2)</sup>	p <sup>2)</sup>		IEC 60332-1
2002/95/EC (RoHS)	compliant						

2) only applies to LSFH™, PE jacket material 'not passed'

p = passed

Other hybrid cable types available upon request.

# Application overview of field cables and riser cables

Application	Application fields	Cable assembling with industrial and standard connectors	Cable type	
	In-house, in riser zone, distribution networks FTTH and for direct connector assembly	standard connectors	riser cable	
	Fixed cabling of mobile antennas, monitoring cameras, displays, communication and controlling systems	standard connectors	riser cable	
	In telecommunications, broadcasting, wind power stations, ship-building, defence, infrastructure and manufacturing plants	ODC and FTTA interfaces   MASTERLINE cable system 	field cable	    3STAR field cable   riser cable 
	Temporary cabling of equipment and vehicles in defence, broadcasting and industrial applications	EBC and ODC connectors  or MASTERLINE cable system with ODC and standard connector 	mobile field cable	
	Moving applications in cranes, excavator, railways, industrial plants, etc.	divider with standard connector (quick assembly)  or MASTERLINE cable system with standard connector 	mobile field cable	  drag chain cable 

Page	Ordering code	Number of fibers	Jacket Ø (mm)	Fire protection		Rodent protection		Notes
				yes	no	yes	no	
60	04.../FSN(ZN)H...50	4	5.0					
	06.../FSN(ZN)H...55	6	5.5					
	08.../FSN(ZN)H...60	8	6.0					
	12.../FSN(ZN)H...70	12	7.0	x			x	
	16.../FSN(ZN)H...85	16	8.5					
	24.../FSN(ZN)H...88	24	8.8					
68	01.../F(ZN)H...48	1						
	02.../FSN(ZN)H...48	2	4.8	x			x	HOMESTAR
	04.../FSN(ZN)H...48	4						
122	02.../FSN(ZN)Z-G55	2						
	04.../FSN(ZN)Z-G55	4	5.5		x		x	
128	02.../FSN(ZN)HZ-G70	2						
	04.../FSN(ZN)HZ-G70	4	7.0	x			x	for greater demands
126	02.../F(ZNG)H-G55	2	5.5					
	04.../FSN(ZNG)H-G55	4		x		x		
	02.../F(ZNG)H-G70	2	7					larger cable Ø
120	02.../FSN(ZN)Z-G56	2	5.6					
	04.../FSN(ZN)Z-G56	4	5.6		x		x	optimized for coiling on reels and uncoiling
	08.../FSN(ZN)Z-G68	8	6.8					
	04.../FSN(ZN)Z-G60	4	6		x		x	tested in drag chain
130	12.../FSN(ZN)YZ-G130	up to 12	13		x		x	tested in drag chain; flexible with kink stability

## Order information for indoor cables

### Semi-tight tubes

available as standard spool only: 2000 m



Fibers	Fiber type	Type	Item no.	Tube colour	Outer Ø
1	E9/125	01-E9/CH-E9-FE	22521983*	yellow	0.9 mm
1	E9A2/125	01-E9A2/CH-E9-FG	84065234*	yellow	0.9 mm
1	G50/125-OM2	01-G50/CH-D9-FD	22520626*	orange	0.9 mm
1	G50/125-OM3	01-G50/CH-M9-F-FM	84005132*	turquoise	0.9 mm
1	G50/125-OM4	01-G50/CH-I9-G-FL	84121373 *	heather violet	0.9 mm
1	G62.5/125	01-G62/CH-C9-FC	22520967*	blue	0.9 mm

\* min. order length 2000 m

### Tight tubes 0.9 mm

available as standard spool only: 2000 m



Fibers	Fiber type	Type	Item no.	Tube colour	Outer Ø
1	E9/125	01-E9/F-E9	22521478*	yellow	0.9 mm
1	E9/125	01-E9/F-F9	23012983*	white	0.9 mm
1	E9/125	01-E9/F-B9	22521477*	green	0.9 mm
1	G50/125-OM2	01-G50/F-D9	22521479*	orange	0.9 mm
1	G62.5/125	01-G62/F-C9	22523050*	blue	0.9 mm

\* min. order length 2000 m

### Tight tubes 0.6 mm

available as standard spool only: 2000 m



Fibers	Fiber type	Type	Item no.	Tube colour	Outer Ø
1	E9A2/125	01-E9A2/V-T6-FA	84077172*	red	0.6 mm
1	E9A2/125	01-E9A2/V-T6-FB	84077173*	green	0.6 mm
1	E9A2/125	01-E9A2/V-T6-FE	84077174*	yellow	0.6 mm
1	E9A2/125	01-E9A2/V-T6-FC	84077175*	blue	0.6 mm

\* min. order length 2000 m



## Order information for indoor cables

### Simplex with tight tubes

LSFH™ jacket with tight tube 0.6 mm



Fibers	Fiber type	Jacket	Type	Item no.	Tube colour	Outer Ø
1	E9A2/125	LSFH™	01-E9A2/VJH-E14	84099204	yellow	1.4 mm
1	G50/125-OM2	LSFH™	01-G50/VJH-D14	n/a	orange	1.4 mm
1	G50/125-OM3	LSFH™	01-G50/VJH-M14-F	84093690	turquoise	1.4 mm
1	G50/125-OM4	LSFH™	01-G50/VJH-L14-G	n/a	heather violet	1.4 mm
1	G62/125	LSFH™	01-G62/VJH-D14	n/a	orange	1.4 mm

### Simplex with semi-tight tubes

LSFH™ jacket with 0.9 mm semi-tight tube (CW tube)



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
1	E9/125	LSFH™	01-E9/CWJH-E20	84012397	yellow	2.0 mm
1	E9A2/125	LSFH™	01-E9A2/CWJH-E20-FG	84065255	yellow	2.0 mm
1	G50/125-OM2	LSFH™	01-G50/CWJH-D20	84000564	orange	2.0 mm
1	G50/125-OM3	LSFH™	01-G50/CWJH-M20-F	84033249	turquoise	2.0 mm
1	G50/125-OM4	LSFH™	01-G50/CWJH-L20-G	84121677	heather violet	2.0 mm
1	G62.5/125	LSFH™	01-G62/CWJH-D20	84000565	orange	2.0 mm
1	E9/125	LSFH™	01-E9/CWJH-E27	22523125	yellow	2.7 mm
1	G50/125-OM2	LSFH™	01-G50/CWJH-D27	22523126	orange	2.7 mm
1	G62.5/125	LSFH™	01-G62/CWJH-D27	22523127	orange	2.7 mm
1	H200/230	LSFH™	01-H200/FJH-D27 <sup>1)</sup>	23031085	orange	2.7 mm
1	E9/125	LSFH™	01-E9/CWJH-E30	22523128	yellow	3.0 mm
1	H200/230	PUR	01-H200/VJZ-D26 <sup>2)</sup>	22521050	orange	2.6 mm
1	H200/230	PUR	01-H200/VJZ-E26 <sup>2)</sup>	22521067	yellow	2.6 mm

1) Tight tube 0.9 mm

2) Without tube 0.9 mm

## Order information for indoor cables

### Simplex with soft semi-tight tubes

LSFH™ jacket with 0.9 mm soft semi-tight tubes (SW tube)



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
1	E9/125	LSFH™	01-E9/SWJH-E17	22523105	yellow	1.7 mm
1	E9/125	LSFH™	01-E9/SWJH-E21	23014851	yellow	2.1 mm
1	E9/125	LSFH™	01-E9/SWJH-E24	23013083	yellow	2.4 mm
1	E9/125	LSFH™	01-E9/SWJH-E27	23014852	yellow	2.7 mm
1	E9/125	LSFH™	01-E9/SWJH-E30	23014853	yellow	3.0 mm
1	E9/125	LSFH™	S-VH1E9/125 24	22521624*	yellow	2.4 mm

\* For pigtail cable assemblies, DTAG approved

### Duplex round tight tubes

LSFH™ jacket with 0.6 mm semi-tight tubes, buffered



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2	E9A2/125	LSFH™	02-E9A2/V(ZN)H-E21	84107633	yellow	2.1 mm
2	G50/125-OM2	LSFH™	02-G50/V(ZN)H-D21	n/a	orange	2.1 mm
2	G50/125-OM3	LSFH™	02-G50/V(ZN)H-M21-F	84107634	turquoise	2.1 mm
2	G50/125-OM4	LSFH™	02-G50/V(ZN)H-L21-G	84124505	heather violet	2.1 mm
2	G62.5/125	LSFH™	02-G62/V(ZN)H-D21	n/a	orange	2.1 mm

### Duplex figure 8 (zip cord) - 1.7 mm

LSFH™ jacket with 0.6 mm tight tubes, buffered



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2	E9/125	LSFH™	02-E9/FJH-E17	23040758	yellow	1.7 x 3.5 mm
2	G50/125-OM2	LSFH™	02-G50/FJH-D17	23040759	orange	1.7 x 3.5 mm
2	G50/125-OM3	LSFH™	02-G50/FJH-M17-F	84005418	turquoise	1.7 x 3.5 mm
2	G50/125-OM4	LSFH™	02-G50/FJH-L17-G	84121679	heather violet	1.7 x 3.5 mm
2	G62.5/125	LSFH™	02-G62/FJH-D17	23040760	orange	1.7 x 3.5 mm

## Order information for indoor cables

### Duplex figure 8 (Zip cord) – 2.0 and 2.7 mm

with 0.9 mm semi-tight tube (CW tube)



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2	E9/125	LSFH™	02-E9/CWJH-E20	84008151	yellow	2.0 x 4.1 mm
2	E9A2/125	LSFH™	02-E9A2/CWJH-E20-FG	84065256	yellow	2.0 x 4.1 mm
2	G50/125-OM2	LSFH™	02-G50/CWJH-D20	84008152	orange	2.0 x 4.1 mm
2	G50/125-OM3	LSFH™	02-G50/CWJH-M20-F	84008169	turquoise	2.0 x 4.1 mm
2	G50/125-OM4	LSFH™	02-G50/CWJH-L20-G	84121856	heather violet	2.0 x 4.1 mm
2	G62.5/125	LSFH™	02-G62/CWJH-D20	84008153	orange	2.0 x 4.1 mm
2	E9/125	LSFH™	02-E9/CWJH-E27	22523202	yellow	2.7 x 5.5 mm
2	G50/125-OM2	LSFH™	02-G50/CWJH-D27	22523203	orange	2.7 x 5.5 mm
2	G50/125-OM3	LSFH™	02-G50/CWJH-M27-F	84005133	turquoise	2.7 x 5.5 mm
2	G50/125-OM4	LSFH™	02-G50/CWJH-L27-G	84121857	heather violet	2.7 x 5.5 mm
2	G62.5/125	LSFH™	02-G62/CWJH-D27	22523204	orange	2.7 x 5.5 mm

### Duplex figure 0 – 2.0 and 2.7 mm

with 0.9 mm semi-tight tube (CW tube)



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2	E9/125	LSFH™	02-E9/CWJH-AE20	23039888	yellow	2.0 mm
2	G50/125-OM2	LSFH™	02-G50/CWJH-AD20	23039889	orange	2.0 mm
2	G50/125-OM3	LSFH™	02-G50/CWJH-AM20-F	84005553	turquoise	2.0 mm
2	G50/125-OM4	LSFH™	02-G50/CWJH-AL20-G	84121859	heather violet	2.0 mm
2	G62.5/125	LSFH™	02-G62/CWJH-AD20	23039891	orange	2.0 mm
2	E9/125	LSFH™	02-E9/CWJH-AE27	22523252	yellow	2.7 mm
2	G50/125-OM2	LSFH™	02-G50/CWJH-AD27	22523253	orange	2.7 mm
2	G50/125-OM3	LSFH™	02-G50/CWJH-AM27-F	84005135	turquoise	2.7 mm
2	G50/125-OM4	LSFH™	02-G50/CWJH-AL27-G	n/a	heather violet	2.7 mm
2	G62.5/125	LSFH™	02-G62/CWJH-AD27	22523254	orange	2.7 mm
2	H200/230	LSFH™	02-H200/FJH-AD27 <sup>1)</sup>	23031087	orange	2.7 mm
2	H200/230	PUR	02-H200/VJZ-AD26 <sup>2)</sup>	22521399	orange	2.6 mm

1) Tight tube 0.9 mm

2) Without tube 0.9 mm

## Order information for indoor cables

### Breakout cable 1.4 mm

With LSFH™ jacket

Simplex 1.4 mm with 0.6 mm tight tubes, buffered



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
4	E9/125	LSFH™	04-E9/VJSNH-E14	n/a	gelb	5.4 mm
8	E9/125	LSFH™	08-E9/VJSNH-E14	n/a	gelb	7.2 mm
12	E9/125	LSFH™	12-E9/VJSNH-E14	n/a	gelb	9.0 mm
16	E9/125	LSFH™	16-E9/VJSNH-E14	n/a	gelb	9.0 mm
24	E9/125	LSFH™	24-E9/VJSNH-E14	n/a	gelb	10.6 mm

### Breakout cable 2 mm

With LSFH™ - jacket (GL and LR approved)

Simplex 2.0 mm with 0.9 mm semi-tight tube(CW tube)



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
4	E9/125	LSFH™	04-E9/CWJSNH-E20	84008843	yellow	7.0 mm
4	G50/125-OM2	LSFH™	04-G50/CWJSNH-D20	84008846	orange	7.0 mm
4	G50/125-OM3	LSFH™	04-G50/CWJSNH-M20-F	84033250	turquoise	7.0 mm
4	G50/125-OM4	LSFH™	04-G50/CWJSNH-L20-G	n/a	heather violet	7.0 mm
4	G62.5/125	LSFH™	04-G62/CWJSNH-D20	84008847	orange	7.0 mm
8	E9/125	LSFH™	08-E9/CWJSNH-E20	84009199	yellow	9.0 mm
8	G50/125-OM2	LSFH™	08-G50/CWJSNH-D20	84009200	orange	9.0 mm
8	G50/125-OM3	LSFH™	08-G50/CWJSNH-M20-F	84033251	turquoise	9.0 mm
8	G50/125-OM4	LSFH™	08-G50/CWJSNH-L20-G	n/a	heather violet	9.0 mm
8	G62.5/125	LSFH™	08-G62/CWJSNH-D20	84009201	orange	9.0 mm
12	E9/125	LSFH™	12-E9/CWJSNH-E20	84009443	yellow	12.0 mm
12	G50/125-OM2	LSFH™	12-G50/CWJSNH-D20	84009444	orange	12.0 mm
12	G50/125-OM3	LSFH™	12-G50/CWJSNH-M20-F	84033252	turquoise	12.0 mm
12	G50/125-OM4	LSFH™	12-G50/CWJSNH-L20-G	n/a	heather violet	12.0 mm
12	G62.5/125	LSFH™	12-G62/CWJSNH-D20	84009445	orange	12.0 mm
16	E9/125	LSFH™	16-E9/CWJSNH-E20	84015387	yellow	12.0 mm

## Order information for indoor cables

### Breakout cable

Fire resistant, with LSFH™- jacket (GL and LR approved)  
 Simplex 2.0 mm with 0.9 mm semi-tight tube (CW tube)



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
4	E9/125	LSFH™	04-E9/CWJSNHIH-E20	84018102	yellow	10.0 mm
4	G50/125-OM2	LSFH™	04-G50/CWJSNHIH-D20	84018103	orange	10.0 mm
4	G62.5/125	LSFH™	04-G62/CWJSNHIH-D20	84018104	orange	10.0 mm
4	H200/230	LSFH™	04-H200/VJSNHIH-D20	n/a	orange	10.0 mm
8	E9/125	LSFH™	08-E9/CWJSNHIH-E20	84018106	yellow	12.0 mm
8	G50/125-OM2	LSFH™	08-G50/CWJSNHIH-D20	84018107	orange	12.0 mm
8	G62.5/125	LSFH™	08-G62/CWJSNHIH-D20	84018108	orange	12.0 mm
8	H200/230	LSFH™	08-H200/VJSNHIH-D20	n/a	orange	12.0 mm
12	E9/125	LSFH™	12-E9/CWJSNHIH-E20	84018109	yellow	15.0 mm
12	G50/125-OM2	LSFH™	12-G50/CWJSNHIH-D20	84018110	orange	15.0 mm
12	G62.5/125	LSFH™	12-G62/CWJSNHIH-D20	84018111	orange	15.0 mm
12	H200/230	LSFH™	12-H200/VJSNHIH-D20	n/a	orange	15.0 mm

Can be produced in other fibers and colours.

## Order information for indoor cables

### Riser cables

with 0.9 mm tight tube (mini breakout cables)



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
4	E9/125	LSFH™	04-E9/FSN(ZN)H-G50	22523404	black	5.0 mm
4	G50/125-OM2	LSFH™	04-G50/FSN(ZN)H-G50	22521830	black	5.0 mm
4	G62.5/125	LSFH™	04-G62/FSN(ZN)H-G50	22521829	black	5.0 mm
6	E9/125	LSFH™	06-E9/FSN(ZN)H-G55	22523405	black	5.5 mm
6	G50/125-OM2	LSFH™	06-G50/FSN(ZN)H-G55	22521833	black	5.5 mm
6	G50/125-OM3	LSFH™	06-G50/FSN(ZN)H-M55-F	84075237	turquoise	5.5 mm
6	G62.5/125	LSFH™	06-G62/FSN(ZN)H-G55	22521834	black	5.5 mm
8	E9/125	LSFH™	08-E9/FSN(ZN)H-G60	22523406	black	6.0 mm
8	G50/125-OM2	LSFH™	08-G50/FSN(ZN)H-G60	22521836	black	6.0 mm
8	G62.5/125	LSFH™	08-G62/FSN(ZN)H-G60	22521837	black	6.0 mm
12	E9/125	LSFH™	12-E9/FSN(ZN)H-G70	22523407	black	7.0 mm
12	G50/125-OM2	LSFH™	12-G50/FSN(ZN)H-G70	22521838	black	7.0 mm
12	G50/125-OM3	LSFH™	12-G50/FSN(ZN)H-M70-F	84067095	turquoise	7.0 mm
12	G62.5/125	LSFH™	12-G62/FSN(ZN)H-G70	22521839	black	7.0 mm
16	G50/125-OM2	LSFH™	16-G50/FSN(ZN)H-G85	22523402	black	8.5 mm
16	G62.5/125	LSFH™	16-G62/FSN(ZN)H-G85	22523403	black	8.5 mm
24	E9/125	LSFH™	24-E9/FSN(ZN)H-G88	84066463*	black	8.8 mm
24	G50/125-OM2	LSFH™	24-G50/FSN(ZN)H-G88	84066644*	black	8.8 mm
24	G50/125-OM4	LSFH™	24-G50/FSN(ZN)H-G88-G	84110821*	black	8.8 mm

\* If not standard MOQ 2 km

### FTTH indoor cables

with 0.9 mm semi-tight tube (CW tube)



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
1	E9A2/125	LSFH™	01-E9A2/CWJH...27-FG	84075437	grey	2.7mm

## Order information for indoor cables

### FTTH indoor cables

with 0.9 mm semi-tight tube (CW tube)



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
4	E9A2/125	LSFH™	04-E9A2/CWSN(ZN)H-F42	84121023	white	4.2 mm

### FTTH indoor cables

with 0.6 mm tight tube, buffered (mini riser cable)



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
4	E9A2/125	LSFH™	04-E9A2/V(ZN)H-H28	84067597	grey	2.8 mm

### FTTH indoor cables HOMESTAR

with 0.9 mm tight tube



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
1	E9A1/125	LSFH™	01-E9A1/F(ZN)H-H48	84067283	grey	4.8 mm
2	E9A1/125	LSFH™	02-E9A1/FSN(ZN)H-H48	84060987	grey	4.8 mm
4	E9A1/125	LSFH™	04-E9A1/FSN(ZN)H-H48	84063363	grey	4.8 mm

## Order information for universal cables

### Non-armoured jellyfree mini multi-fiber loose tube – up to 12 fibers

with LSFH™ jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
12	E9/125	LSFH™	12-12E9/BH(ZN)H-E35	84097664	yellow	3.5 mm
12	G50/125-OM3	LSFH™	12-12G50/BH(ZN)H-M35-F	84097603	turquoise	3.5 mm
12	G50/125-OM4	LSFH™	12-12G50/BH(ZN)H-L35-G	84121860	heather violet	3.5 mm

Other types on request.

### Jellyfree multi-fiber loose tube – up to 12 fibers

with LSFH™ jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
4	E9/125	LSFH™	04-4E9/H(ZN)H-E50	84010374	yellow	5.0 mm
4	G50/125-OM2	LSFH™	04-4G50/H(ZN)H-D50	22521820	orange	5.0 mm
4	G62.5/125	LSFH™	04-4G62/H(ZN)H-D50	22521821	orange	5.0 mm
6	G50/125-OM2	LSFH™	06-6G50/H(ZN)H-D50	22521822	orange	5.0 mm
6	G62.5/125	LSFH™	06-6G62/H(ZN)H-D50	22521823	orange	5.0 mm
8	G50/125-OM2	LSFH™	08-8G50/H(ZN)H-D50	22521595	orange	5.0 mm
8	G62.5/125	LSFH™	08-8G62/H(ZN)H-D50	22521596	orange	5.0 mm
12	E9/125	LSFH™	12-12E9/H(ZN)H-B50	84005865	green	5.0 mm
12	E9/125	LSFH™	12-12E9/H(ZN)H-E50	22523600	yellow	5.0 mm
12	E9A1/125	LSFH™	12-12E9A1/H(ZN)H-E50	84073651	yellow	5.0 mm
12	G50/125-OM2	LSFH™	12-12G50/H(ZN)H-D50	22521597	orange	5.0 mm
12	G50/125-OM3	LSFH™	12-12G50/H(ZN)H-M50-F	84075870	turquoise	5.0 mm
12	G62/125	LSFH™	12-12G62/H(ZN)H-D50	22521598	orange	5.0 mm

### Jellyfree multi-fiber loose tube – up to 24 fibers

with LSFH™ jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2 x 12	E9/125	LSFH™	24-12E9/H(ZN)H-E50F	84015522	yellow	5.0 x 10.2 mm
2 x 12	G50/125-OM2	LSFH™	24-12G50/H(ZN)H-D50F	n/a	orange	5.0 x 10.2 mm
2 x 12	G50/125-OM3	LSFH™	24-12G50/H(ZN)H-M50F-F	84013731	turquoise	5.0 x 10.2 mm
2 x 12	G62.5/125	LSFH™	24-12G62/H(ZN)H-D50F	n/a	orange	5.0 x 10.2 mm



## Order information for universal cables

### Jellyfree multi-fiber loose tube - up to 60 fibers

with LSFH™ jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2 x 12	E9/125	LSFH™	24-12E9/HSN(ZN)H-E110	84004279	yellow	11.0 mm
4 x 12	E9/125	LSFH™	48-12E9/HSN(ZN)H-E110	8466395	yellow	11.0 mm

Other types on request.

### Non-armoured mini multi-fiber loose tube - up to 12 fibers

with LSFH™ jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2	E9/125	LSFH™	02-2E9/BW(ZN)H-G35	84047515	black	3.5 mm
2	G50/125-OM2	LSFH™	02-2G50/BW(ZN)H-G35	84047672	black	3.5 mm
2	G50/125-OM3	LSFH™	02-2G50/BW(ZN)H-G35-F	84047677	black	3.5 mm
2	G62.5/125	LSFH™	02-2G62/BW(ZN)H-G35	84047683	black	3.5 mm
4	E9/125	LSFH™	04-4E9/BW(ZN)H-G35	84047624	black	3.5 mm
4	G50/125-OM2	LSFH™	04-4G50/BW(ZN)H-G35	84047675	black	3.5 mm
4	G50/125-OM3	LSFH™	04-4G50/BW(ZN)H-G35-F	84047679	black	3.5 mm
4	G62.5/125	LSFH™	04-4G62/BW(ZN)H-G35	84047685	black	3.5 mm
12	E9/125	LSFH™	12-12E9/BW(ZN)H-G35	84041870	black	3.5 mm
12	E9/125	LSFH™	12-12E9/BW(ZN)H-E35	84081525	yellow	3.5 mm
12	G50/125-OM2	LSFH™	12-12G50/BW(ZN)H-G35	84041871	black	3.5 mm
12	G50/125-OM2	LSFH™	12-12G50/BW(ZN)H-D35	84081526	orange	3.5 mm
12	G50/125-OM3	LSFH™	12-12G50/BW(ZN)H-G35-F	84047681	black	3.5 mm
12	G50/125-OM3	LSFH™	12-12G50/BW(ZN)H-M35-F	84081528	turquoise	3.5 mm
12	G62.5/125	LSFH™	12-12G62/BW(ZN)H-G35	84047687	black	3.5 mm
12	G62.5/125	LSFH™	12-12G62/BW(ZN)H-D35	84081527	orange	3.5 mm

## Order information for universal cables

### Non-armoured multi-fiber loose tube - up to 12 fibers

with LSFH™ jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2	G62/125	LSFH™	02-2G62/W(ZN)H-G50	84108343	black	5.0 mm
2	H200/230	LSFH™	02-2H200/W(ZN)H-G50	84108894	black	5.0 mm
4	E9/125	LSFH™	04-4E9/W(ZN)H-G50	84108346	black	5.0 mm
4	G50/125-OM2	LSFH™	04-4G50/W(ZN)H-G50	84069256	black	5.0 mm
8	G50/125-OM2	LSFH™	08-8G50/W(ZN)H-G50	84108344	black	5.0 mm
12	E9/125	LSFH™	12-12E9/W(ZN)H-G50	84132158	black	5.0 mm

### Non-armoured mini multi-fiber loose tube - 24 fibers

with LSFH™ jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
24	E9/125	LSFH™	24-24E9/W(ZN)H-E50	84024357	yellow	5.0 mm
24	G50/125-OM2	LSFH™	24-24G50/W(ZN)H-D50	84024358	orange	5.0 mm
24	G50/125-OM3	LSFH™	24-24G50/W(ZN)H-M50-F	84037217	turquoise	5.0 mm
24	G50/125-OM4	LSFH™	24-24G50/W(ZN)H-L50-G	84121409	heather violet	5.0 mm

## Order information for universal cables

### Glass-armoured multi-fiber loose tube - up to 12 fibers

with LSFH™ jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
4	E9/125	LSFH™	04-4E9/W(ZNG)H-G85	84126548	black	8.5 mm
4	G50/125-OM2	LSFH™	04-4G50/W(ZNG)H-G85	22523601	black	8.5 mm
4	G50/125-OM3	LSFH™	04-4G50/W(ZNG)H-M85-F	84033253	turquoise	8.5 mm
4	G62.5/125	LSFH™	04-4G62/W(ZNG)H-G85	22523603	black	8.5 mm
6	G50/125-OM2	LSFH™	06-6G50/W(ZNG)H-G85	84090674	black	8.5 mm
6	G50/125-OM3	LSFH™	06-6G50/W(ZNG)H-M85-F	84099044	turquoise	8.5 mm
8	E9/125	LSFH™	08-8E9/W(ZNG)H-G85	84080161	black	8.5 mm
8	G50/125-OM2	LSFH™	08-8G50/W(ZNG)H-G85	22523602	black	8.5 mm
8	G62.5/125	LSFH™	08-8G62/W(ZNG)H-G85	22523603	black	8.5 mm
12	E9/125	LSFH™	12-12E9/W(ZNG)H-G85	22523654	black	8.5 mm
12	G50/125-OM2	LSFH™	12-12G50/W(ZNG)H-G85	22521943	black	8.5 mm
12	G50/125-OM3	LSFH™	12-12G50/W(ZNG)H-M85-F	84005134	turquoise	8.5 mm
12	G50/125-OM4	LSFH™	12-12G50/W(ZNG)H-L85-G	84121676	heather violet	8.5 mm
12	G62.5/125	LSFH™	12-12G62/W(ZNG)H-G85	22521884	black	8.5 mm

### Glass-armoured multi-fiber loose tube - 24 fibers

with LSFH™ jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
24	E9/125	LSFH™	24-24E9/W(ZNG)H-G85	84127251	black	8.5 mm
24	G50/125-OM2	LSFH™	24-24G50/W(ZNG)H-G85	84127282	black	8.5 mm
24	G50/125-OM3	LSFH™	24-24G50/W(ZNG)H-M85-F	n/a	turquoise	8.5 mm

### Rugged glass-armoured multi-fiber loose tube - up to 12 fibers

with LSFH™ jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
12	E9/125	LSFH™	12-12E9/W(ZNG)H-Z120	84021028	black / orange	12.0 mm
12	G50/125-OM3	LSFH™	12-12G50/W(ZNG)H-Z120-F	84021029	black / orange	12.0 mm

## Order information for universal cables

### Glass-armoured multi-fiber loose tube - TWINTUBE - up to 24 fibers

with LSFH™ jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2 x 12	E9/125	LSFH™	24-12E9/W(ZNG)H-G94	23041032	black	9.4 x 8.8 mm
2 x 12	G50/125-OM2	LSFH™	24-12G50/W(ZNG)H-G94	23038139	black	9.4 x 8.8 mm
2 x 12	G50/125-OM3	LSFH™	24-12G50/W(ZNG)H-M94-F	84003522	turquoise	9.4 x 8.8 mm
2 x 12	G50/125-OM4	LSFH™	24-12G50/W(ZNG)H-L94-G	84121635	heather violet	9.4 x 8.8 mm
2 x 12	G62.5/125	LSFH™	24-12G62/W(ZNG)H-G94	23041033	black	9.4 x 8.8 mm

### Glass-armoured mini multi-fiber loose tube - up to 60 fibers

with LSFH™ jacket (stranded)



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2 x 12	E9/125	LSFH™	24-12E9/BWSN(ZNG)H-G105	84064304	black	10.5 mm
2 x 12	G50/125-OM2	LSFH™	24-12G50/BWSN(ZNG)H-G105	84064305	black	10.5 mm
2 x 12	G50/125-OM3	LSFH™	24-12G50/BWSN(ZNG)H-G105-F	84064306	black	10.5 mm
2 x 12	G62.5/125	LSFH™	24-12G62/BWSN(ZNG)H-G105	84064307	black	10.5 mm
3 x 12	E9/125	LSFH™	36-12E9/BWSN(ZNG)H-G105	84064393	black	10.5 mm
3 x 12	G50/125-OM2	LSFH™	36-12G50/BWSN(ZNG)H-G105	84064554	black	10.5 mm
3 x 12	G50/125-OM3	LSFH™	36-12G50/BWSN(ZNG)H-G105-F	84064555	black	10.5 mm
3 x 12	G62.5/125	LSFH™	36-12G62/BWSN(ZNG)H-G105	84054557	black	10.5 mm
4 x 12	E9/125	LSFH™	48-12E9/BWSN(ZNG)H-G105	84064353	black	10.5 mm
4 x 12	G50/125-OM2	LSFH™	48-12G50/BWSN(ZNG)H-G105	84064355	black	10.5 mm
4 x 12	G50/125-OM3	LSFH™	48-12G50/BWSN(ZNG)H-G105-F	84064388	black	10.5 mm
4 x 12	G62.5/125	LSFH™	48-12G62/BWSN(ZNG)H-G105	84064392	black	10.5 mm
5 x 12	E9/125	LSFH™	60-12E9/BWSN(ZNG)H-G105	84041948	black	10.5 mm
5 x 12	G50/125-OM2	LSFH™	60-12G50/BWSN(ZNG)H-G105	84041949	black	10.5 mm
5 x 12	G50/125-OM3	LSFH™	60-12G50/BWSN(ZNG)H-G105-F	84064291	black	10.5 mm
5 x 12	G62.5/125	LSFH™	60-12G62/BWSN(ZNG)H-G105	84064300	black	10.5 mm

## Order information for universal cables

### Glass-armoured multi-fiber loose tube - up to 60 fibers

with LSFH™ jacket (stranded)



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2 x 12	E9/125	LSFH™	24-12E9/WSN(ZNG)H-G116	84012363	black	11.6 mm
2 x 12	G50/125-OM2	LSFH™	24-12G50/WSN(ZNG)H-G116	84012364	black	11.6 mm
2 x 12	G62.5/125	LSFH™	24-12G62/WSN(ZNG)H-G116	84012365	black	11.6 mm
4 x 12	E9/125	LSFH™	48-12E9/WSN(ZNG)H-G116	84012387	black	11.6 mm
4 x 12	G50/125-OM2	LSFH™	48-12G50/WSN(ZNG)H-G116	84012366	black	11.6 mm
4 x 12	G50/125-OM3	LSFH™	48-12G50/WSN(ZNG)H-G116-F	84010303	black	11.6 mm
4 x 12	G62.5/125	LSFH™	48-12G62/WSN(ZNG)H-G116	84012367	black	11.6 mm

### Glass-armoured mini multi-fiber loose tube - up to 144 fibers

with LSFH™ jacket (stranded)



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
6 x 12	E9/125	LSFH™	72-12E9/BWSN(ZNG)H-G117	84041959	black	11.7 mm
6 x 12	G50/125-OM2	LSFH™	72-12G50/BWSN(ZNG)H-G117	84041960	black	11.7 mm
6 x 12	G50/125-OM3	LSFH™	72-12G50/BWSN(ZNG)H-G117-F	84064558	black	11.7 mm
6 x 12	G62.5/125	LSFH™	72-12G62/BWSN(ZNG)H-G117	84064559	black	11.7 mm
8 x 12	E9/125	LSFH™	96-12E9/BWSN(ZNG)H-G130	84041963	black	13.0 mm
8 x 12	G50/125-OM2	LSFH™	96-12G50/BWSN(ZNG)H-G130	84041964	black	13.0 mm
8 x 12	G50/125-OM3	LSFH™	96-12G50/BWSN(ZNG)H-G130-F	84064561	black	13.0 mm
8 x 12	G62.5/125	LSFH™	96-12G62/BWSN(ZNG)H-G130	84064562	black	13.0 mm
10 x 12	E9/125	LSFH™	120-12E9/BWSN(ZNG)H-G140	84041968	black	14.0 mm
10 x 12	G50/125-OM2	LSFH™	120-12G50/BWSN(ZNG)H-G140	84041973	black	14.0 mm
10 x 12	G50/125-OM3	LSFH™	120-12G50/BWSN(ZNG)H-G140-F	84064566	black	14.0 mm
10 x 12	G62.5/125	LSFH™	120-12G62/BWSN(ZNG)H-G140	84064568	black	14.0 mm
12 x 12	E9/125	LSFH™	144-12E9/BWSN(ZNG)H-G150	84041980	black	15.0 mm
12 x 12	G50/125-OM2	LSFH™	144-12G50/BWSN(ZNG)H-G150	84041981	black	15.0 mm
12 x 12	G50/125-OM3	LSFH™	144-12G50/BWSN(ZNG)H-G150-F	84064406	black	15.0 mm
12 x 12	G62.5/125	LSFH™	144-12G62/BWSN(ZNG)H-G150	84064407	black	15.0 mm

## Order information for universal cables

### Steel-armoured multi-fiber loose tube – up to 12 fibers

with LSFH™ jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
12	E9/125	LSFH™	12-12E9/W(ZN)HAH-G80	n/a	black	8.0 mm
12	G50/125-OM2	LSFH™	12-12G50/W(ZN)HAH-G80	n/a	black	8.0 mm
12	G62.5/125	LSFH™	12-12G62/W(ZN)HAH-G80	84122522	black	8.0 mm

### Steel-armoured multi-fiber loose tube – TWINTUBE – up to 24 fibers

with LSFH™ jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2 x 12	E9/125	LSFH™	24-12E9/W(ZNG)HAH-G125	84075229	black	12.5 mm
2 x 12	G50/125-OM2	LSFH™	24-12G50/W(ZNG)HAH-G125	n/a	black	12.5 mm

### Mini steel-armoured multi-fiber loose tube – up to 72 fibers

with LSFH™ jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
5 x 12	E9/125	LSFH™	60-12E9/BWSN(ZNG)HAH-G140	84089951	black	14.0 mm
6 x 12	E9/125	LSFH™	72-12E9/BWSN(ZNG)HAH-G152	84092612	black	15.2 mm

## Order information for outdoor cables

### Non-armoured mini multi-fiber loose tube - up to 12 fibers

with PE jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2	E9/125	HDPE	02-2E9/BW(ZN)V-G35	n/a	black	3.5 mm
2	G50/125-OM2	HDPE	02-2G50/BW(ZN)V-G35	n/a	black	3.5 mm
4	E9/125	HDPE	04-4E9/BW(ZN)V-G35	n/a	black	3.5 mm
4	G50/125-OM2	HDPE	04-4G50/BW(ZN)V-G35	n/a	black	3.5 mm
12	E9/125	HDPE	12-12E9/BW(ZN)V-G35	84098852	black	3.5 mm
12	G50/125-OM2	HDPE	12-12G50/BW(ZN)V-G35	n/a	black	3.5 mm

### Non-armoured multi-fiber loose tube - up to 12 fibers

with PE jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2	G50/125-OM2	PE	02-2G50/W(ZN)Y-G50	22520627	black	5.0 mm
2	H200/230	PE	02-H200/W(ZN)Y-G50	84040259	black	5.0 mm
4	G50/125-OM2	PE	04-4G50/W(ZN)Y-G50	22520723	black	5.0 mm
4	G62.5/125	PE	04-4G62/W(ZN)Y-G50	22520687	black	5.0 mm
6	G50/125-OM2	PE	06-6G50/W(ZN)Y-G50	22520678	black	5.0 mm
6	G62.5/125	PE	06-6G62/W(ZN)Y-G50	22520707	black	5.0 mm
8	G50/125-OM2	PE	08-8G50/W(ZN)Y-G50	22520688	black	5.0 mm
8	G62.5/125	PE	08-8G62/W(ZN)Y-G50	22520740	black	5.0 mm
12	G50/125-OM2	PE	12-12G50/W(ZN)Y-G50	22521250	black	5.0 mm
12	G62.5/125	PE	12-12G62/W(ZN)Y-G50	22521251	black	5.0 mm

### Non-armoured multi-fiber loose tube - up to 24 fibers

with PE jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
24	E9/125	PE	24-24E9/W(ZN)Y-G50	n/a	black	5.0 mm
24	G50/125-OM2	PE	24-24G50/W(ZN)Y-G50	n/a	black	5.0 mm

### Non-armoured multi-fiber loose tube ADSS - up to 12 fibers

with PE jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
12	E9/125	HDPE	12-12E9/BW(ZN)V-G55	84098041	black	5.5 mm

## Order information for outdoor cables

### Non-armoured multi-fiber loose tube - up to 144 fibers

with PE jacket (stranded)



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2 x 12	E9/125	PE	24-12E9/WSN(ZN)Y-Z115	22523700	black / orange	11.5 mm
2 x 12	G50/125-OM2	PE	24-12G50/WSN(ZN)Y-Z115	22521813	black / orange	11.5 mm
2 x 12	G62.5/125	PE	24-12G62/WSN(ZN)Y-Z115	22521814	black / orange	11.5 mm
4 x 12	E9/125	PE	48-12E9/WSN(ZN)Y-Z115	22523701	black / orange	11.5 mm
6 x 12	E9/125	PE	72-12E9/WSN(ZN)Y-Z125	22523703	black / orange	12.5 mm
8 x 12	E9/125	PE	96-12E9/WSN(ZN)Y-Z145	22523704	black / orange	14.5 mm
10 x 12	E9/125	PE	120-12E9/WSN(ZN)Y-Z165	22523705	black / orange	16.5 mm
12 x 12	E9/125	PE	144-12E9/WSN(ZN)Y-Z180	22523706	black / orange	18.0 mm

### Glass-armoured multi-fiber loose tube - up to 12 fibers

with PE jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2	E9/125	PE	02-2E9/W(ZNG)Y-G85	84091978	black	8.5 mm
2	G50/125-OM2	PE	02-2G50/W(ZNG)Y-G85	22521811	black	8.5 mm
2	G62.5/125	PE	02-2G62/W(ZNG)Y-G85	22521749	black	8.5 mm
2	H200/230	PE	02-2H200/W(ZNG)Y-G85	22523652	black	8.5 mm
4	E9/125	PE	04-4E9/W(ZNG)Y-G85	22523661	black	8.5 mm
4	G50/125-OM2	PE	04-4G50/W(ZNG)Y-G85	22521750	black	8.5 mm
4	G62.5/125	PE	04-4G62/W(ZNG)Y-G85	22521751	black	8.5 mm
4	H200/230	PE	04-4H200/W(ZNG)Y-G85	22523653	black	8.5 mm
6	G50/125-OM2	PE	06-6G50/W(ZNG)Y-G85	22521752	black	8.5 mm
6	G62.5/125	PE	06-6G62/W(ZNG)Y-G85	22521753	black	8.5 mm
8	E9/125	PE	08-8E9/W(ZNG)Y-G85	23017688	black	8.5 mm
8	G50/125-OM2	PE	08-8G50/W(ZNG)Y-G85	22521754	black	8.5 mm
8	G62.5/125	PE	08-8G62/W(ZNG)Y-G85	22521755	black	8.5 mm
12	E9/125	PE	12-12E9/W(ZNG)Y-G85	22521756	black	8.5 mm
12	G50/125-OM2	PE	12-12G50/W(ZNG)Y-G85	22521757	black	8.5 mm
12	G50/125-OM3	PE	12-12G50/W(ZNG)Y-G85-F	23027099	black	8.5 mm
12	G62.5/125	PE	12-12G62/W(ZNG)Y-G85	22521758	black	8.5 mm



## Order information for outdoor cables

### Glass-armoured multi-fiber loose tube - up to 24 fibers

with PE jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
24	E9/125	PE	24-24E9/W(ZNG)Y-G85	84024359	black	8.5 mm
24	G50/125-OM2	PE	24-24G50/W(ZNG)Y-G85	84024360	black	8.5 mm

### Rugged glass-armoured multi-fiber loose tube - up to 12 fibers

with PE jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
12	E9/125	PE	12-12E9/W(ZNG)Y-Z120	22523657	black / orange	12.0 mm
12	G50/125-OM2	PE	12-12G50/W(ZNG)Y-Z120	22523655	black / orange	12.0 mm
12	G62.5/125	PE	12-12G62/W(ZNG)Y-Z120	22523656	black / orange	12.0 mm

### Glass-armoured multi-fiber loose tube - TWINTUBE - up to 24 fibers

with PE jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2 x 12	E9/125	PE	24-12E9/W(ZNG)Y-G94	23038137	black	9.4 x 8.8 mm
2 x 12	G50/125-OM2	PE	24-12G50/W(ZNG)Y-G94	23038138	black	9.4 x 8.8 mm
2 x 12	G50/125-OM3	PE	24-12G50/W(ZNG)Y-G94-F	23041030	black	9.4 x 8.8 mm
2 x 12	G50/125-OM4	PE	24-12G50/W(ZNG)Y-G94-G	84118482	black	9.4 x 8.8 mm
2 x 12	G62.5/125	PE	24-12G62/W(ZNG)Y-G94	23041031	black	9.4 x 8.8 mm

## Order information for outdoor cables

### Mini glass-armoured multi-fiber loose tube - up to 72 fibers

with PE jacket (stranded)



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2 x 12	E9/125	HDPE	24-12E9/BWSN(ZNG)V-Z105	84064408	black / orange	10.5 mm
2 x 12	G50/125-OM2	HDPE	24-12G50/BWSN(ZNG)V-Z105	84064409	black / orange	10.5 mm
2 x 12	G50/125-OM3	HDPE	24-12G50/BWSN(ZNG)V-Z105-F	84064410	black / orange	10.5 mm
2 x 12	G62.5/125	HDPE	24-12G62/BWSN(ZNG)V-Z105	84064411	black / orange	10.5 mm
3 x 12	E9/125	HDPE	36-12E9/BWSN(ZNG)V-Z105	84064412	black / orange	10.5 mm
3 x 12	G50/125-OM2	HDPE	36-12G50/BWSN(ZNG)V-Z105	84064573	black / orange	10.5 mm
3 x 12	G50/125-OM3	HDPE	36-12G50/BWSN(ZNG)V-Z105-F	84064636	black / orange	10.5 mm
3 x 12	G62.5/125	HDPE	36-12G62/BWSN(ZNG)V-Z105	84064651	black / orange	10.5 mm
4 x 12	E9/125	HDPE	48-12E9/BWSN(ZNG)V-Z105	84064413	black / orange	10.5 mm
4 x 12	G50/125-OM2	HDPE	48-12G50/BWSN(ZNG)V-Z105	84064414	black / orange	10.5 mm
4 x 12	G50/125-OM3	HDPE	48-12G50/BWSN(ZNG)V-Z105-F	84064415	black / orange	10.5 mm
4 x 12	G62.5/125	HDPE	48-12G62/BWSN(ZNG)V-Z105	84064416	black / orange	10.5 mm
5 x 12	E9/125	HDPE	60-12E9/BWSN(ZNG)V-Z105	84041955	black / orange	10.5 mm
5 x 12	G50/125-OM2	HDPE	60-12G50/BWSN(ZNG)V-Z105	84041956	black / orange	10.5 mm
5 x 12	G50/125-OM3	HDPE	60-12G50/BWSN(ZNG)V-Z105-F	84064652	black / orange	10.5 mm
5 x 12	G62.5/125	HDPE	60-12G62/BWSN(ZNG)V-Z105	84064653	black / orange	10.5 mm
6 x 12	E9/125	HDPE	72-12E9/BWSN(ZNG)V-Z117	84041957	black / orange	11.7 mm
6 x 12	G50/125-OM2	HDPE	72-12G50/BWSN(ZNG)V-Z117	84041958	black / orange	11.7 mm
6 x 12	G50/125-OM3	HDPE	72-12G50/BWSN(ZNG)V-Z117-F	84064673	black / orange	11.7 mm
6 x 12	G62.5/125	HDPE	72-12G62/BWSN(ZNG)V-Z117	84064677	black / orange	11.7 mm

### Glass-armoured multi-fiber loose tube - up to 72 fibers

with PE jacket (stranded)



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2 x 12	E9/125	PE	24-12E9/WSN(ZNG)Y-Z150	22523758	black / orange	15.0 mm
2 x 12	G50/125-OM2	PE	24-12G50/WSN(ZNG)Y-Z150	22521815	black / orange	15.0 mm
2 x 12	G50/125-OM3	PE	24-12G50/WSN(ZNG)Y-Z150-F	84096440	black / orange	15.0 mm
2 x 12	G62.5/125	PE	24-12G62/WSN(ZNG)Y-Z150	22521816	black / orange	15.0 mm
4 x 12	E9/125	PE	48-12E9/WSN(ZNG)Y-Z150	22523759	black / orange	15.0 mm
4 x 12	G50/125-OM2	PE	48-12G50/WSN(ZNG)Y-Z150	22523761	black / orange	15.0 mm
4 x 12	G50/125-OM4	PE	48-12G50/WSN(ZNG)Y-Z150-G	84123436	black / orange	15.0 mm
4 x 12	G62.5/125	PE	48-12G62/WSN(ZNG)Y-Z150	22523762	black / orange	15.0 mm
5 x 12	E9/125	PE	60-12E9/WSN(ZNG)Y-Z150	22523760	black / orange	15.0 mm
6 x 12	E9/126	PE	72-12E9/WSN(ZNG)Y-Z160	22523754	black / orange	16.0 mm

## Order information for outdoor cables

### Glass-armoured mini multi-fiber loose tube - from 96 up to 144 fibers

with PE jacket (stranded)



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
8 x 12	E9/125	HDPE	96-12E9/BWSN(ZNG)V-Z130	84041966	black / orange	13.0 mm
8 x 12	G50/125-OM2	HDPE	96-12G50/BWSN(ZNG)V-Z130	84041967	black / orange	13.0 mm
8 x 12	G50/125-OM3	HDPE	96-12G50/BWSN(ZNG)V-Z130-F	84064679	black / orange	13.0 mm
8 x 12	G50/125-OM4	HDPE	96-12G50/BWSN(ZNG)V-Z130-G	84121642	black / orange	13.0 mm
8 x 12	G62.5/125	HDPE	96-12G62/BWSN(ZNG)V-Z130	84064689	black / orange	13.0 mm
10 x 12	E9/125	HDPE	120-12E9/BWSN(ZNG)V-Z140	84041978	black / orange	14.0 mm
10 x 12	G50/125-OM2	HDPE	120-12G50/BWSN(ZNG)V-Z140	84041979	black / orange	14.0 mm
10 x 12	G50/125-OM3	HDPE	120-12G50/BWSN(ZNG)V-Z140-F	84064690	black / orange	14.0 mm
10 x 12	G62.5/125	HDPE	120-12G62/BWSN(ZNG)V-Z140	84064691	black / orange	14.0 mm
12 x 12	E9/125	HDPE	144-12E9/BWSN(ZNG)V-Z150	84041982	black / orange	15.0 mm
12 x 12	G50/125-OM2	HDPE	144-12G50/BWSN(ZNG)V-Z150	84041983	black / orange	15.0 mm
12 x 12	G50/125-OM3	HDPE	144-12G50/BWSN(ZNG)V-Z150-F	84064417	black / orange	15.0 mm
12 x 12	G62.5/125	HDPE	144-12G62/BWSN(ZNG)V-Z150	84064418	black / orange	15.0 mm

### Glass-armoured multi-fiber loose tube - from 96 up to 144 fibers

with PE jacket (stranded)



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
8 x 12	E9/125	PE	96-12E9/WSN(ZNG)Y-Z180	22523755	black / orange	18.0 mm
10 x 12	E9/125	PE	120-12E9/WSN(ZNG)Y-Z200	22523756	black / orange	20.0 mm
12 x 12	E9/125	PE	144-12E9/WSN(ZNG)Y-Z220	22521949	black / orange	22.0 mm

### Steel-armoured multi-fiber loose tube - up to 12 fibers

with PE jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
12	E9/125	PE	12-12E9/W(ZN)YAY-G80	22523660	black	8.0 mm
12	G50/125-OM2	PE	12-12G50/W(ZN)YAY-G80	22523658	black	8.0 mm
12	G62.5/125	PE	12-12G62/W(ZN)YAY-G80	22523659	black	8.0 mm

## Order information for outdoor cables

### Steel-armoured multi-fiber loose tube - TWINTUBE - up to 24 fibers

with PE jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2 x 12	E9/125	PE	24-12E9/W(ZNG)YAY-G125	n/a	black	12.5 mm
2 x 12	G50/125-OM2	PE	24-12G50/W(ZNG)YAY-G125	n/a	black	12.5 mm
2 x 12	G62.5/125	PE	24-12G62/W(ZNG)YAY-G125	84102127	black	12.5 mm

### Mini steel-armoured multi-fiber loose tube - up to 72 fibers

with PE jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
5 x 12	E9/125	HDPE	60-12E9/BWSN(ZNG)VAV-G140	n/a	black	14.0 mm
6 x 12	E9/125	HDPE	72-12E9/BWSN(ZNG)VAV-G152	n/a	black	15.2 mm

## Order information for special cables

### Simplex cables

with 0.9 mm tight tube and PUR jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
1	E9/125	PUR	01-E9/FJU-E19	84032682	yellow	1.9 mm
1	E9LB/125	PUR	01-E9LB/FJU-E19-FG	84063323	yellow	1.9 mm
1	G50/125-OM2	PUR	01-G50/FJU-D19	84032683	orange	1.9 mm
1	G50/125-OM3	PUR	01-G50/FJU-D19-F	84032683	orange	1.9 mm
1	G62.5/125	PUR	01-G62/FJU-D19	84037265	orange	1.9 mm

### Rugged simplex cables

Simplex with 2.7 mm, PUR jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
1	E9/125	PUR	01-E9/FJH(ZN)Z-D27	84035181	orange	6.0 mm
1	G50/125-OM2	PUR	01-G50/FJH(ZN)Z-D27	22523102	orange	6.0 mm
1	G62.5/125	PUR	01-G62/FJH(ZN)Z-B27	22523103	green	6.0 mm
1	H200/230	PUR	01-H200/FJH(ZN)Z-D27	84020985	orange	6.0 mm

### Rugged minicord breakout cables

Simplex with 1.7 mm, PUR jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2	E9/125	PUR	02-E9/FJ(ZN)Z-G17	84010318	black	6.0 mm
2	G50/125-OM2	PUR	02-G50/FJ(ZN)Z-G17	23037747	black	6.0 mm
2	G62.5/125	PUR	02-G62/FJ(ZN)Z-G17	23037748	black	6.0 mm
2	H200/230	PUR	02-H200/FJ(ZN)Z-G17	23037749	black	6.0 mm

### Industry Link TWINFLEX

Simplex with 2.2 mm tight tube, PUR jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2	G50/125-OM2	PUR	02-G50/FJ(ZN)Z-G22	84045039	black	7.5 x 8.0 mm
2	G62.5/125	PUR	02-G62/FJ(ZN)Z-G22	84045188	black	7.5 x 8.0 mm
2	H200/230	PUR	02-H200/VJ(ZN)Z-G22	84045184	black	7.5 x 8.0 mm
2	POF980/1000	PUR	02-POF980/M(ZN)Z-G22	84057089	black	7.5 x 8.0 mm

## Order information for special cables

### Industry Link TWINFIX

2.2 mm simplex, LSFH™ jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2	E9/125	LSFH™	02-E9/FJ(ZNG)H-G22	84118658	black	7.5 mm
2	G50/125-OM2	LSFH™	02-G50/FJ(ZNG)H-G22	84045041	black	7.5 mm
2	G50/125-OM2	LSFH™	02-G50/FJ(ZNG)H-G22-UN	84125961	black	7.5 mm
2	G62.5/125	LSFH™	02-G62/FJ(ZNG)H-G22	84045187	black	7.5 mm
2	G62.5/125	LSFH™	02-G62/FJ(ZNG)H-G22-UN	841125963	black	7.5 mm
2	H200/230	LSFH™	02-H200/VJ(ZNG)H-G22	84043741	black	7.5 mm
2	POF980/1000	LSFH™	02-POF980/M(ZNG)H-G22	84057090	black	7.5 mm

### Industry Link QUADFIX

2.2 mm simplex, LSFH™ jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
4	E9/125	LSFH™	04-E9/FJ(ZNG)H-G22	84102119	black	9.0 mm
4	G50/125-OM2	LSFH™	04-G50/FJ(ZNG)H-G22	84092090	black	9.0 mm
4	G62.5/125	LSFH™	04-G62/FJ(ZNG)H-G22	84092091	black	9.0 mm

### Mobile field cables

with 0.9 mm tight tube and PUR jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2	E9/125	PUR	02-E9/FSN(ZN)Z-G56	84096489	black	5.6 mm
2	G50/125-OM2	PUR	02-G50/FSN(ZN)Z-G56	84096494	black	5.6 mm
4	E9/125	PUR	04-E9/FSN(ZN)Z-G56	84035585	black	5.6 mm
4	G50/125-OM2	PUR	04-G50/FSN(ZN)Z-G56	84035586	black	5.6 mm
4	G62.5/125	PUR	04-G62/FSN(ZN)Z-G56	84035587	black	5.6 mm
4	H200/230	PUR	04-H200/FSN(ZN)Z-G60	23027971	black	6.0 mm
8	E9/125	PUR	08-E9/FSN(ZN)Z-G68	84016109	black	6.8 mm
8	G50/125-OM2	PUR	08-G50/FSN(ZN)Z-G68	84016115	black	6.8 mm
8	G62.5/125	PUR	08-G62/FSN(ZN)Z-G68	84013027	black	6.8 mm

## Order information for special cables

### Field cables

with 0.9 mm tight tube and PUR jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2	E9/125	PUR	02-E9/FSN(ZN)Z-G55	84028387	black	5.5 mm
2	G50/125-OM2	PUR	02-G50/FSN(ZN)Z-G55	84028388	black	5.5 mm
2	G62.5/125	PUR	02-G62/FSN(ZN)Z-G55	84058900	black	5.5 mm
4	E9/125	PUR	04-E9/FSN(ZN)Z-G55	84023934	black	5.5 mm
4	G50/125-OM2	PUR	04-G50/FSN(ZN)Z-G55	84031124	black	5.5 mm
4	G50/125-OM3	PUR	04-G50/FSN(ZN)Z-G55-F	84025056	black	5.5 mm
4	G62.5/125	PUR	04-G62/FSN(ZN)Z-G55	n/a	black	5.5 mm

### Glass-armoured riser cables, with two fibers

with 0.9 mm tight tube and LSFH™ jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2	E9A2/125	LSFH™	02-E9A2/F(ZNG)H-G48	84118844	black	4.8 mm
2	G50/125-OM3	LSFH™	02-G50/F(ZNG)H-G48-F	84130268	black	4.8 mm
2	E9A1/125	LSFH™	02-E9A1/F(ZNG)H-G55	84080315	black	5.5 mm
2	E9A1/125	LSFH™	02-E9A1/F(ZNG)H-G55-UR	84128336	black	5.5 mm
2	G50/125-OM2	LSFH™	02-G50/F(ZNG)H-G55	84066685	black	5.5 mm
2	G50/125-OM2	LSFH™	02-G50/F(ZNG)H-G55-UR	84128340	black	5.5 mm
2	G62.5/125	LSFH™	02-G62/F(ZNG)H-G55	84129729	black	5.5 mm
2	E9/125	LSFH™	02-E9/F(ZNG)H-G70	84066362	black	7.0 mm
2	E9A1/125	LSFH™	02-E9A1/F(ZNG)H-G70	84080314	black	7.0 mm
2	E9A1/125	LSFH™	02-E9A1/F(ZNG)H-G70-UR	84128357	black	7.0 mm
2	G50/125-OM2	LSFH™	02-G50/F(ZNG)H-G70-UR	84066684	black	5.5 mm

### Glass-armoured riser cables, with four fibers

with 0.9 mm tight tube and LSFH™ jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
4	E9/125	LSFH™	04-E9A1/FSN(ZNG)H-G55	84104260	black	5.5 mm
4	G50/125-OM2	LSFH™	04-G50/FSN(ZNG)H-G55	84075876	black	5.5 mm

## Order information for special cables

### Field cables 3STAR

with 0.9 mm tight tube and PUR jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
2	E9/125	PUR	02-E9A1/FSN(ZN)HZ-G70-L <sup>1)</sup>	84041804	black	7.0 mm
2	E9/125	PUR	02-E9/FSN(ZN)HZ-G70-H <sup>2)</sup>	84063565	black	7.0 mm
2	G50/125-OM2	PUR	02-G50/FSN(ZN)HZ-G70	84047510	black	7.0 mm
2	G50/125-OM3	PUR	02-G50/FSN(ZN)HZ-G70-F	84073837	schwarz	7.0 mm
4	G50/125-OM2	PUR	04-G50/FSN(ZN)HZ-G70	84048275	black	7.0 mm
4	G62.5/125	PUR	04-G62/FSN(ZN)HZ-G70	84066247	black	7.0 mm

1) -L; specified temperature range -40°C up to +85°C at 1310nm

2) -H; specified temperature range -40°C up to +85°C at 1310nm and 1550nm

### Drag chain cables

with 0.9 mm tight tube and PUR jacket



Fibers	Fiber type	Jacket	Type	Item no.	Jacket colour	Outer Ø
4	G50/125-OM2	PUR	04-G50/FSN(ZN)YZ-G130	84104254	black	13.0 mm
4	G50/125-OM3	PUR	04-G50/FSN(ZN)YZ-G130-F	84074001	black	13.0 mm
4	G62/125	PUR	04-G62/FSN(ZN)YZ-G130	n/a	black	13.0 mm
6	G50/125-OM2	PUR	06-G50/FSN(ZN)YZ-G130	84006996	black	13.0 mm
6	G62/125	PUR	06-G62/FSN(ZN)YZ-G130	84006999	black	13.0 mm
8	G50/125-OM2	PUR	08-G50/FSN(ZN)YZ-G130	84006997	black	13.0 mm
8	G62/125	PUR	08-G62/FSN(ZN)YZ-G130	n/a	black	13.0 mm
12	E9/125	PUR	12-E9/FSN(ZN)YZ-G130	84034417	black	13.0 mm
12	G50/125-OM2	PUR	12-G50/FSN(ZN)YZ-G130	84006998	black	13.0 mm
12	G62/125	PUR	12-G62/FSN(ZN)YZ-G130	84007000	black	13.0 mm



## Order information for special cables

### Hybrid breakout cables

with LSFH™ jacket, up to 4 or 8 elements



Fiber type	Conductor	Elements	Type	Outer Ø
E9/125	1.5 mm <sup>2</sup>	4	04-E9/CWJSN(ZN)H-...27+...-C15	10.0 mm
G50/125-OM2	1.5 mm <sup>2</sup>	4	04-G50/CWJSN(ZN)H-...27+...-C15	10.0 mm
G62.5/125	1.5 mm <sup>2</sup>	4	04-G62/CWJSN(ZN)H-...27+...-C15	10.0 mm
H200/230	1.5 mm <sup>2</sup>	4	04-H200/CWJSN(ZN)H-...27+...-C15	10.0 mm
E9/125	1.5 mm <sup>2</sup>	8	08-E9/CWJSN(ZN)H-...27+...-C15	13.0 mm
G50/125-OM2	1.5 mm <sup>2</sup>	8	08-G50/CWJSN(ZN)H-...27+...-C15	13.0 mm
G62.5/125	1.5 mm <sup>2</sup>	8	08-G62/CWJSN(ZN)H-...27+...-C15	13.0 mm
H200/230	1.5 mm <sup>2</sup>	8	08-H200/CWJSN(ZN)H-...27+...-C15	13.0 mm

Fiber optic and conductor elements are customer specified

### Hybrid multi-fiber loose tube cables

with PE jacket, 5 or 8 elements (optional with LSFH™ jacket)



Fiber type	Conductor	Elements	Type	Outer Ø
E9/125	1.5 / 2.5 mm <sup>2</sup>	5	bis 60-xxE9/WSN(ZNG)Y-...150+...-Cxx	15.0 mm
G50/125-OM2	1.5 / 2.5 mm <sup>2</sup>	5	bis 60-xxG50/WSN(ZNG)Y-...150+...-Cxx	15.0 mm
G62.5/125	1.5 / 2.5 mm <sup>2</sup>	5	bis 60-xxG62/WSN(ZNG)Y-...150+...-Cxx	15.0 mm
E9/125	1.5 / 2.5 mm <sup>2</sup>	8	bis 96-xxE9/WSN(ZNG)Y-...180+...-Cxx	18.0 mm
G50/125-OM2	1.5 / 2.5 mm <sup>2</sup>	8	bis 96-xxG50/WSN(ZNG)Y-...180+...-Cxx	18.0 mm
G62.5/125	1.5 / 2.5 mm <sup>2</sup>	8	bis 96-xxG62/WSN(ZNG)Y-...180+...-Cxx	18.0 mm

Fiber optic and conductor elements are customer specified

## Technical Terms English – German

<b>Tubes</b>	<b>Adern</b>
Tight tube	Vollader
Semi-tight tube	Kompaktader
Suitable for direct connector assembly	Für direkte Steckermontage geeignet
High kink resistance	Hohe Knickfestigkeit
Tight bending radii	Enge Biegeradien
Up to ...m can be stripped in one piece	Abisolierbarkeit der Ader ...m
Optimal for pigtail assemblies for splicing purpose	Optimal für einseitig konfektionierte Leitungen zu Spleisszwecken
High flexibility	Hohe Flexibilität
Suited for high thermal requirements	Breiter Einsatztemperaturbereich

<b>Indoor cables</b>	<b>Innenkabel</b>
Single fiber cable	Simplexkabel (Einzelfaserkabel)
Duplex	Duplexkabel (2-fasrig)
Breakout	Breakout
Riser	Riser
Tactical field cable	Taktisches Feldkabel
Metal free indoor cable	Metallfreies Innenkabel
Each fiber is strain-relieved	Jeder LWL zugentlastet
Single fiber cable easy to separate	Einfach zu trennender Mantelsteg
Easy jacket strippability	Mantel gut absetzbar
Suitable for direct connector assembly	Für direkte Steckermontage geeignet
Self-extinguishing, low smoke and halogen free jacket material	Selbstverlöschendes, halogenfreies und raucharmes Mantelmaterial
Self-extinguishing, low smoke and halogen free	Selbstverlöschend, halogenfrei und raucharm
Up to ...m can be stripped in one piece	Abisolierbarkeit der Ader in ... m an einem Stück
Crush resistant	Trittfest
For high mechanical and thermal requirements	Für hohe mechanische und thermische Ansprüche
Tight tube cable design	Volladeraufbau
Suitable for repeated cable winding	Geeignet für wiederholtes Auf- und Abwickeln
Suited for highest mechanical and thermal requirements	Für höchste mechanische und thermische Ansprüche
Jacket material complies UL94V-0	Mantelmaterial UL94V-0
Tight bending radii	Enge Biegeradien
Compact design saves conduit space	Kompaktes Design, platzsparend
Specification for singlemode at ...nm, for multimode at ...nm	Spezifikationswerte für Singlemode bei ...nm, für Multimode bei ...nm

## Technical Terms English – German

Multi-fiber loose tube	Bündeladerkabel
Loose tube cable	Hohladerkabel
Multi-fiber loose tube cable	Bündeladerkabel
Jellyfree	Gelfrei (trocken)
Metal free outdoor cable	Metallfreies Aussenkabel
Metal free indoor cable	Metallfreies Innenkabel
Longitudinal and transversal watertight cable design	Längs- und querwasserdichter Kabelaufbau
Good mechanical resistance	Gute mechanische Festigkeit
High chemical resistance against acids and alkaline solutions	Hohe chemische Beständigkeit gegen Säuren und Laugen
Jellyfree multi-fiber loose tube design	Trockener Bündeladeraufbau
Good stripping characteristics/properties	Gute Abisolierbarkeit
Installation directly in the ground and in mechanically unprotected environment	Für Verlegung direkt ins Erdreich und in mechanisch ungeschützter Umgebung
Rodant-protected	Nagetiergeschützt
Increased compressive strength	Erhöhte Querdruckfestigkeit
Self-extinguishing, low smoke and halogen free	Selbstverlöschend, raucharm und halogenfrei
Roving armouring	Glasroving-Armierung
Steel armouring	Strahldraht-Armierung
Non-metallic armouring	Nichtmetallische Armierung
Plastic armouring (rodent protection)	Kunststoff-Armierung (Nagetierschutz)
No need for cleaning the fibers	Keine Reinigung der Fasern erforderlich
For vertical applications	Für vertikale Applikationen
Easy stripping and installation	Einfache Abisolierbarkeit und Installation
Low fire load for high safety requirements	Geringe Brandlast für hohe Sicherheitsanforderungen

## Technical Terms English – German

Special terms	Spezielle Begriffe
Standard cable	Standardkabel
PE-tube	PE-Röhrchen
Metal free single fiber cable	Metallfreies Einzelfaserkabel
Metal free loose tube cable	Metallfreies, leeres Hohladerkabel
Metal free multi-fiber loose tube cable	Metallfreies Bündeladerkabel
Not stranded multi-fiber loose tube cable	Unverseiltes Bündeladerkabel
Small fire load	Geringe Brandlast
Resistance against rodent attacks	Nagetiersicher
No contamination of installation material because of jelly	Keine Verschmutzung von Installationsmaterial durch Jelly
Cleaning of the fiber not necessary (time saving)	Reinigung der Faser nicht notwendig (Zeitersparnis)
Mechanically resistant	Mechanisch widerstandsfähig
Tear off thread	Aufreißfaden

For technical data	Für Technische Daten
Tensile strength	Zugbeanspruchung
Minimum bending radius	Min. Biegeradius
Compressive strength	Querdrukfestigkeit
Short-term	Kurzzeitig
Long-term	Langzeitig
Impact strength	Schlagfestigkeit
Repeated bending strength	Wechselbiegefestigkeit
Torsion strength	Torsionsfestigkeit
Coiling capability	Auf-/Abwickelfestigkeit
Drag chain capability	Schleppkettenfestigkeit
Water tightness	Längswasserdichtheit
Temperature range	Temperaturbereich
Fire propagation	Brandfortleitung
Fire test with circuit integrity (CI)	Brandfortleitung mit Funktionserhalt (FE)
Fire load	Brandlast
In service	In Betrieb
During installation	Bei Verlegung
On storage	Am Lager
Cycles	Zyklen
Specifications for singlemode at ___nm, for multimode at ___nm	Spezifikationswerte für Singlemode bei ___nm, für Multimode bei ___nm

## 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 sideways. 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	Digital Subscriber 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	Digital Subscriber 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 Gigabits/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. <a href="http://www.ieee.org">www.ieee.org</a>
IP	Internet Protocol

## Glossary

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.
LWL	Optical wave guides, also called optical fibres, are dielectric wave guides which transmit light through their cores. The cladding surrounding the core has a lower index of refraction (density) than the core. This causes the light at the interface to be totally reflected and to be carried through the core of the optical wave guide. Optical wave guides are made of mineral glass (quartz glass - pure silicon dioxide) or plastic (especially PMMA), depending on the specific application. The cladding is surrounded by a protective layer to prevent mechanical damage. It is made of special plastic, which also protects the fibre against moisture. Today, optical wave guides are especially applied as a medium for transmitting data through optical fibres, for transmitting power in the field of material processing and in medicine, for lighting and imaging purposes and in metrology.
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.

## Glossary

PIGCP	A gland with a boot for ruggedised pigtails that can be incorporated into pre-connectorized fiber trays for low-loss terminations
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, ( <a href="http://www.ul.com">www.ul.com</a> ) 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 up 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









## Further catalogues



System catalogue LiSA

Item no. 84101814



Cabling systems

Item no. 84104358



Connectors and Assemblies

Item no. 84101808



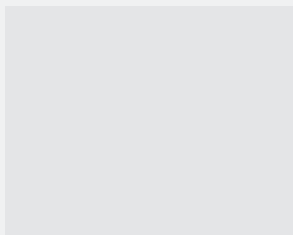
Passive Components

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