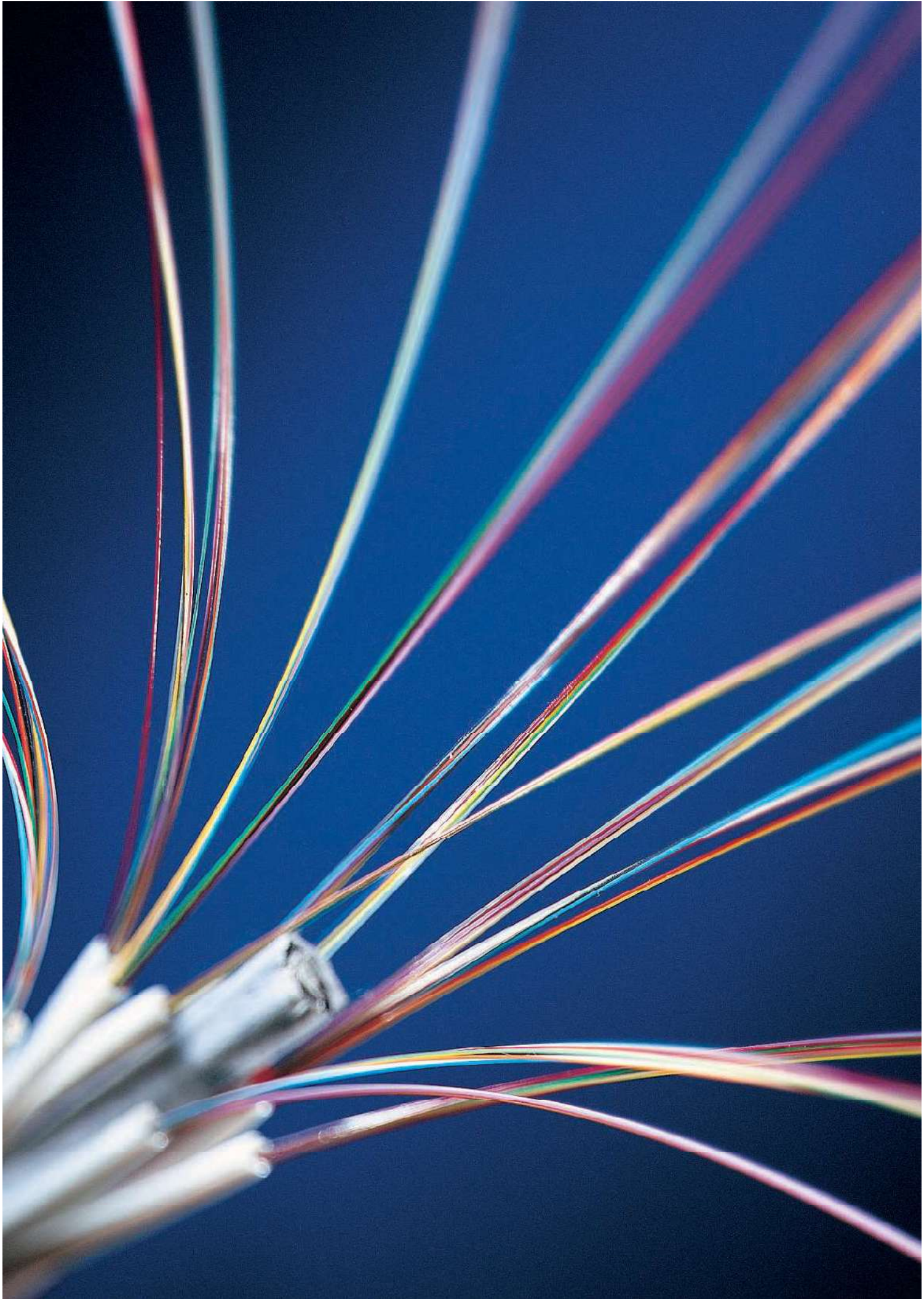


OVERVIEW FO CABLES

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/	Step index fiber 9/125/250	
LEAF/	LEAF fiber	
TW/	TrueWave RS fiber	
G50/	Graded-index fiber 50/125/250	
G62/	Graded-index fiber 62.5/125/250	
H200/	Step-index fiber HCS 200/230/500	
F	Tight tube up to 0.9 mm	(tight tube)
V	Tight tube up to 0.6 mm	(tight tube)
CW	Compact tube 0.9 mm, jelly-filled	(semi-tight tube)
CH	Compact tube 0.9 mm, dry	(semi-tight tube)
SW	Soft compact tube 0.9 mm, jelly-filled	(semi-tight tube)
SH	Soft compact tube 0.9 mm, dry	(semi-tight tube)
W	Multi-fiber loose tube, with jelly (jelly-filled)	
H	Multi-fiber loose tube, without jelly (dry)	
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	
(ZNG)	Glass roving for strain relief/rodent protection	
A-	Steel wire armouring	
H-	Outer jacket of LSFH™	
N-	Outer jacket of PA/PBT	
T-	Outer jacket of PVC	
Y-	Outer jacket of PE	
Z-	Outer jacket of PUR	
A	Outer jacket figure 0”	
Δ	Color of outer jacket please refer to cable color chart	
XX	Outer diameter of the cable [1/10 mm][1)]	

1st option: fiber class or bandwidth length-product [MHz*km], 850/1300 nm

without indication (Standard)	G50: OM2	G62: OM1
-B	G50: 500/800	G62: 250/800
-C	G50: -	G62: 250/1200
-E	G50: 600/1200	G62: OM2
-F	G50: OM3	G62: -

2nd option: fiber color

-FΔ	Fiber colors please refer to fiber color chart

3rd option: special information

-SF	SECUFIRE cable for higest safety requirements
-UN	UL-listed OFN: General purpose UL1685
-UR	UL-listed OFNR: Riser cable UL1666
-UP	UL-listed OFNP: Plenum cable UL910

4th option: electrical elements

+XX-	Amount of conductors respectively units
C	Electrical conductor, copper cords
XX	Conductor cross section [1/10 mm^2]

OM classes please see under section „Fiber types“

HUBER+SUHNER CABLE CODE

Fiber and cable colors Δ	
A	red
B	green
C	blue 1 (dark blue / light blue)
D	orange
E	yellow
F	white
G	black
H	grey
I	brown
K	violet (blue-purple)
L	pink
M	turquoise
N	blue 2 (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

Rules:

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

Example:

02-G50/CWJSN(ZN)H-D27+2-C15
Breakout cable with 2 fiber optic simplex cables 50 µm fiber, individually strain-reliefed, non-metallic common strain-relief, outer jacket orange LSFH, single fiber cable Ø 2.7 mm, 2 electrical conductors with 1.5 mm^2

CABLE MATERIAL

Material designation		Polymer (Low Smoke Free of Halogen)	Polyvinyl-chloride	Poly-ethylene	Poly-urethane	Poly-butylen-tere-phthalate	Polyamide	Thermo-plastic elastomer
Abbreviation		LSFH™	PVC	PE	PUR	PBT	PA	TPE
Code		H	T	Y	Z	N	N	–
Application tempe–rature range [°C]		–20 to +70	–20 to +50	–40 to +70	–50 to +80	–40 to +90	–40 to +90	–50 to+115
Halogen free		yes	no	yes	yes	yes	yes	yes
Fire behaviour		self-extinguishing	self-extinguishing	combustible	self-extinguishing	combustible	combustible	combustible
Con-stancy	to UV-radiation[4]	fair – good	fair	good	fair – good	fair	good	good
	to oil[1]	fair	fair	fair	fair/good[2]	good	good	excellent
	with hydrolysis	fair	good	excellent	fair/good[3]	fair – good	fair	good
Abrasion resistance		good	fair	good	excellent	good	good	good
Mechanical resistance		good	fair	good	good	excellent	good	good

[1] In case of permanent contact with oil, the condition and the oil type have to be known
[2] Depending on plastic basis: fair for polyether/good for polyesther
[3] Depending on plastic basis: good for polyether/fair for polyesther
[4] Smallest aging effect with black colored material, moderate aging with brighter colors. Usually the change of mechanical characteristics and color change are tested for UV radiation resistance.

Rating for indoor applications:
The values refer to standard types of the particular plastic concerned.

excellent	excellently suitable
good	suitable
fair	may pose problems, depending on type or conditions
poor	unsuitable

LSFH™ polymers
LSFH™ materials are as a rule highly filled olefin copolymers (hydrocarbon-based plastic mix).
LSFH™ cables are predominantly applied in enclosed areas (tunnels, hospitals, safety environments, computer rooms), where they mainly replace PVC-jacketed cables.
LSFH™ cables from HUBER+SUHNER FIBER OPTICS are **self-extinguishing in the event of a fire, low smoke and 100% halogen free.** One material fulfills UL 94V-0. LSFH™ is also used for the coating of strength members.

Polyurethane PUR, (TPU)
PUR is the most suitable material when high flexibility and abrasion resistance are demanded. HUBER+SUHNER FIBER OPTICS uses flame-retardant, halogen free PUR versions on polyether basis (LSFH™ materials), with a matt surface.
PUR is oil-resistant and **100% halogen free.**
PUR is offered as a jacketing material for many cable types and as a coating for strength members.

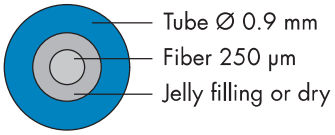
Polyethylene PE
PE is the most suitable cable material for single-fiber and multi-fiber loose tube cables exposed to the influence of the weather. PE is weather-resistant, transverse watertight and has a high aging resistance.
PE is applied as a jacketing material for multi-fiber loose tube cables and as a coating for dummies and strength members.
PE is halogen free. HUBER+SUHNER FIBER OPTICS also offers PE in accordance with DIN/VDE standards.

Polyamide PA/Polyester PBT/ Thermoplastic elastomer TPE
PA/PBT/TPE are used for single-sheathed tubes and as plastic armourings for single-fiber and multi-fiber loose tube cables.

Polyvinylchloride PVC
PVC is still the most widely used jacketing material for indoor cables. However, PVC contains halogen and has disadvantages as regards to the environmental compatibility and the safety of human life.
PVC is being increasingly replaced by LSFH™ materials.

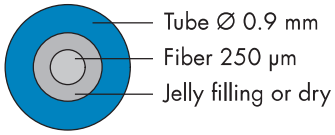
TERMS AND DEFINITIONS

Tube types
0.9 mm-tube



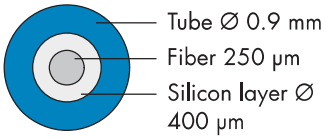
CW-tube
(semi-tight loose tube)

Features:
- standard tube
- easiest stripping > 2 m
- option dry: CH



SW-tube
(soft semi-tight loose tube)

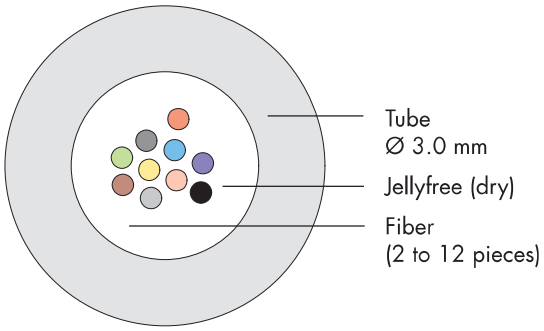
Features:
- very flexible
- stripping > 1 m
- non buckling
- option dry: SH
- wide temperature range



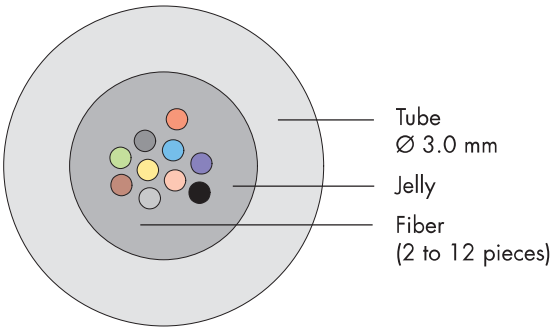
F-tube
(tight buffered tube)

Features:
- mechanically rugged (crush pressure)
- stripping approx. 5 cm
- non-buckling
- very wide temperature range

3.0 mm-tube



Multi-fiber loose tube, dry



Multi-fiber loose tube, jelly-filled

Standard color code (according to Swisscom)

The fibers inside the multi-fiber loose tubes are colored

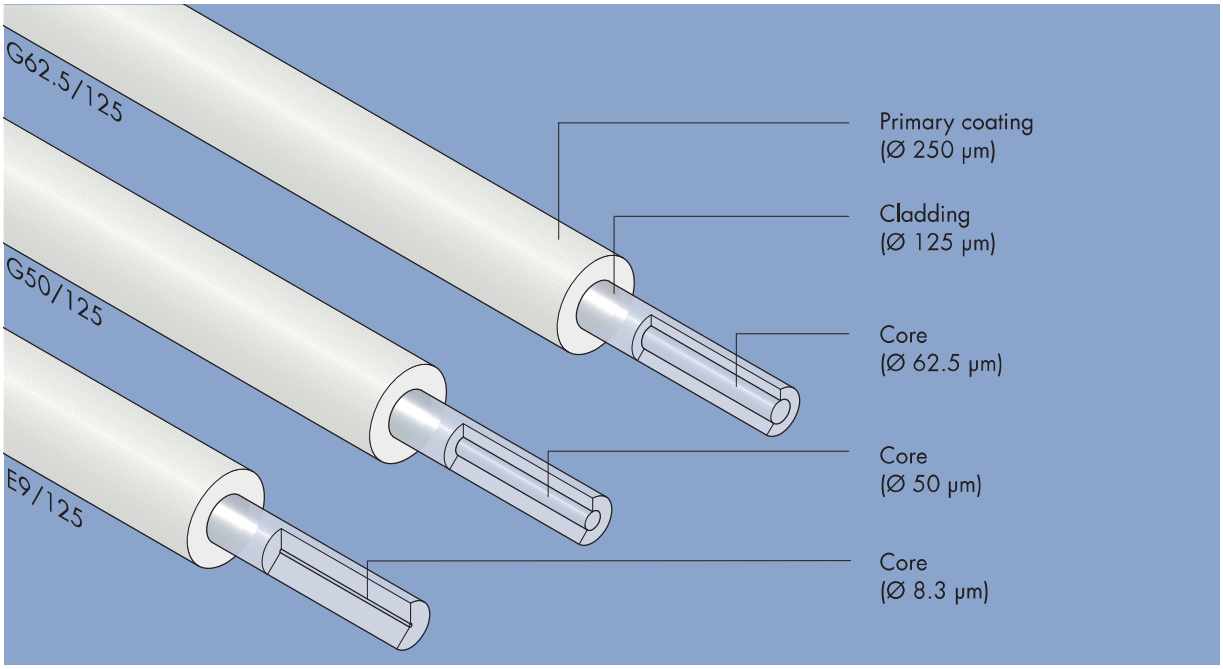
Fiber No	1	2	3	4	5	6	7	8	9	10	11	12
Fiber color	red	green	yellow	blue	natural/ white	violet	orange	black	grey	brown	pink	turquoise

Other color sequences upon request (i.e. according to DIN VDE 0888 part 3)

Fiber No	1	2	3	4	5	6	7	8	9	10	11	12
Fiber color	red	green	blue	yellow	white	grey	brown	violet	turquoise	black	orange	pink

Note: Concerns orders of fiber optic cables with different fiber types (combination SM/MM): if not specified, the first colors of the color code are assigned to the smaller fibers.
Example: Cable with 4xE9, 8xG50 red/green/yellow/blue = E9 fiber, rest to G50 fiber.

FIBER TYPES



Fiber data for transmission wavelength [nm]	Fiber E9/125 1310	1550	LEAF-Fiber 1550	1625	Fiber G50/125 850	1300	Fiber G62.5/125 850	1300	Fiber H200/230 850
Optical data									
Attenuation [dB/km] (typical)	0.36	0.22	0.20	0.22	2.30	0.55	2.7	0.6	3.6
Attenuation [dB/km] (max.)	0.40	0.25	0.22	0.24	2.50	0.8	3.2	0.9	6.0
Fiber class or Minimum bandwidth [MHz * km]					Standard OM2 B 500/800 E 600/1200 F OM3		Standard OM1 B 250/800 C 250/1200 E OM2		17
Chromatic dispersion [ps/nm*km]	≤ 3.5	≤ 18.0	2.0 bis 11.2						
Mode field [µm]	9.2±0.5	10.5±1	9.6±0.4						
Cutoff wavelength [nm]	1100 – 1330								
PMD specification on demand [ps/√km]	typical ≤ 0.2		max. 0.08						
Geometric data									
Core Ø [µm]					50±3.0		62.5±3.0		200±5
Cladding Ø [µm]	125±1		125±0.7		125±2		125±2		230+0/-10
Coating Ø [µm]	245±10		245±5		245±10		245±10		500±50
Non-circularity, cladding [%]	≤ 2.0		≤ 1.0		≤ 2.0		≤ 2.0		
Non-circularity, core [%]	≤ 6.0		n.a.		≤ 6.0		≤ 6.0		
Concentricity error core / cladding [µm]	≤ 0.6		≤ 0.5		≤ 3.0		≤ 3.0		≤ 5.0
Mechanical data									
Strain resistance	8.8 N (100 Kpsi)		8.8 N (100 Kpsi)		8.8 N (100 Kpsi)		8.8 N (100 Kpsi)		8.8 N (100 Kpsi)
Approvals									
Standards	• ITU G.652 • IEC 60793-2-50 Type B1.1 • DIN VDE 0888, part 3		• ITU G.655 • IEC 60793-2-50 Type B4		• ITU G.651 • IEC 60793-2-10 Type A1a + A1a.2 • DIN VDE 0888, part 3		• IEC 60793-2-10 Type A1b		IEC 60793-2-30 Type A3c

Other fibers upon request

Multimode fiber types

Multimode fiber type definition according to standard ISO/IEC 11801 - 2nd edition

Fiber type	Wavelength	OM1	OM2	OM3
Core diameter		50 or 62.5	50 or 62.5	50
Minimal modal bandwidth overfilled launch bandwidth [MHz * km]	850 nm 1300 nm	200 500	500 500	1500 500
Minimal modal bandwidth effective laser launch bandwidth[1] [MHz * km]	850 nm	not specified	not specified	2000

[1] Effective laser launch bandwidth is assured using DMD as specified in IEC/PAS 60793-1-49

Supported applications

With the required channel length and the specified application, the minimal fiber type can be taken from the table below. The order of the minimal to the maximal required fiber type is OM1, OM2, OM3 and OS1. OS1 is a conventional single-mode fiber.

Application IEEE 802.3		Maximal channel length		
		300 m	500 m	2000 m
10MbE	10BASE-	OM1	OM1	OM1
100MbE	100BASE-	OM1	OM1	OM1[3]/OM2
1GbE	1000BASE-	OM1[4]	OM1[3][4]/OM2[4]	OS1
10GbE	10GBASE-	OM3[5]	OS1	OS1

3) OM1 only with large wavelength (1300 nm)
4) Mode offset launch patchcord recommended
5) Only with small wavelength (850 nm)

Channel length

The optical fiber channel definition according to standard ISO/IEC 11801 - 2nd edition

Channel	OF-300	OF-500	OF-2000
Maximum channel length	300 m	500 m	2000 m
Origin	collapsed backbone[2]	building backbone	horizontal cabling + building + campus backbone

[2] actually 600 m (100 + 500 m), but 300 m are sufficient in most applications

INDOOR CABLES

General
Indoor cables are mainly used for building installations. The design of this cable group respects therefore the following special requirements:
- bending capacity
- strippability
- easy termination
- crush resistance capacity
- cable diameter
- temperature capacity

There is also an increasing requirement concerning fire behaviour.

The HUBER+SUHNER LSFH™-type cables excel by:
- self-extinguishing characteristics (i.e. IEC 60332-1 or IEC 60332-3)
- halogen free
- low smoke development
- low fire load (MJ/m)

The following cable families are part of the Indoor cable group:

0.9mm tubes
Semi-tight tube (Cx and Sx design) or tight tube design (F and V tubes) are used as:
- Cx and Sx tube as splice pigtails in cable termination boxes or distribution boxes. SW tubes with multimode fibers are not available.
- F tubes for the internal cabling of closed devices.
- V tubes for termination of MT-RJ connectors and all others

Simplex cables
0.9mm tubes with aramide yarn strain relief and additional outer jacket, used as:
- splicing cable
- jumper cable
- patch cables

Duplex cables fig. 0
Two simplex cables with additional outer jacket, used as:
- point-to-point connections
- patch cables
- jumper cables
- floor cabling (horizontal cablings)

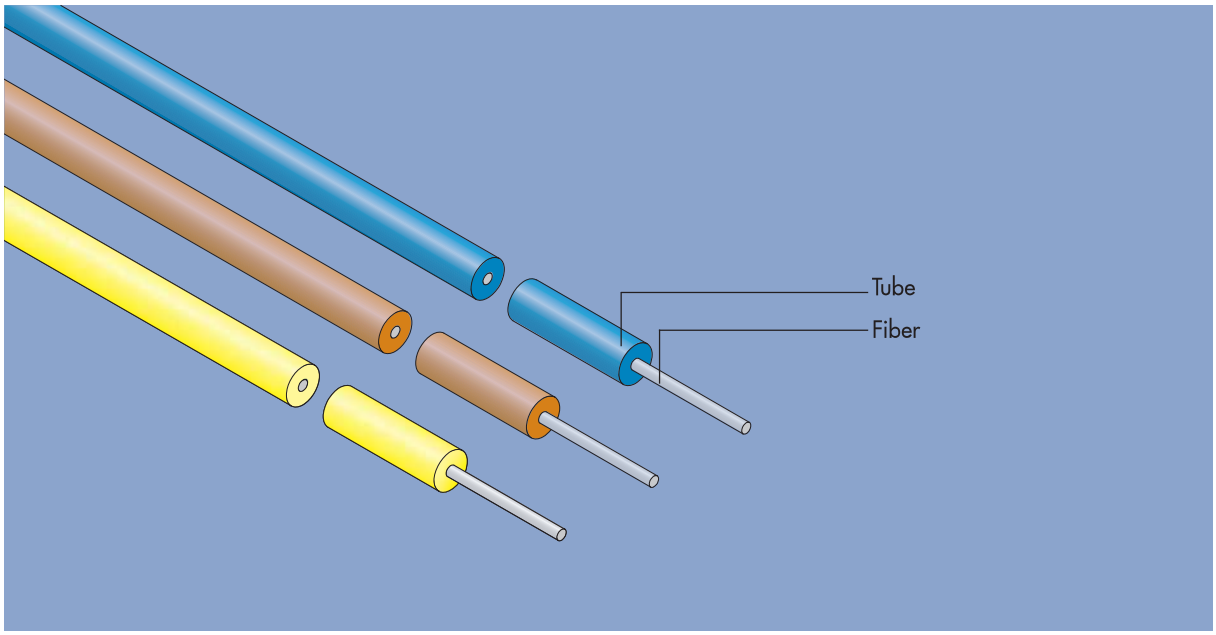
Duplex cables fig. 8
Two simplex cables with connection gate, used as:
- patch cables
- jumper cable

Breakout cables
4 to 12 simplex cables, stranded around a central strength member, with a common round outer jacket, used as:
- unit cablings
- riser zone cablings
- floor distribution (Horizontal zone)
- connections in telecom distribution centers

Riser cables
4 to 16 tight tubes, non stranded or stranded around a central strength member, with common strain releif, used as:
- riser zone cablings
- floor cablings (horizontal zone)
- collapsed backbone
- unit cablings

Jellyfree cables
Cable design: 1 to 12 dry multi-fiber loose tubes, strain releived with aramide and jacketed with LSFH™ material. The cable types of this cable family are absolutely free of cable-filling compounds. Therefore, they are especially suitable for the use in riser zones.
The low fire load and the time-saving cable end preparation for the purpose of a termination or splicing are further arguments for the use of these cables.

TIGHT AND SEMI-TIGHT TUBE CABLES



The 0.9 mm buffer tubing is made from either PA for semi-tight tube or TPE for soft semi-tight tube and tight tube. At least 1 m of the semi-tight tube can be stripped in one piece, and approx. 5 cm of the tight tube. The cavity between the fiber and the inner wall of the semi-tight tube is either dry or jelly-filled, the tight tube contains a silicon layer.
The tubes are available with three different fiber types. The fiber type is identified by the tube colors.

Properties:

- High buckling resistance
- Tight bending radius
- Halogen free

Semi-tight tube:

- > 2.0 m can be stripped in one piece
- Semi-tight tube and soft semi-tight tube

Tight tube:

- Broad temperature range
- Up to about 5 cm can be stripped in one piece

Field of application:
Semi-tight tube:

- As pigtail assemblies for fusion or mechanical splicing within distribution frames and termination boxes
- As mini patch cables within protected enclosures

Tight tube:

- As patch cable within distribution frames and termination boxes
- In thermally critical environments

Standard tubes:

- CH (dry) for tubes
- CW (jellyfilled) for cables
- SW (jellyfilled) for cables
- F, V for tubes and cables

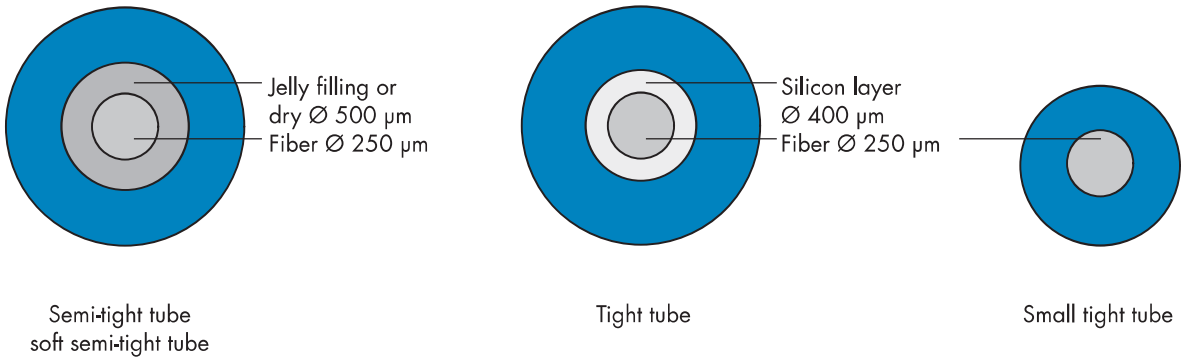
TIGHT AND SEMI-TIGHT TUBE CABLES

Specification:

		Semi-tight tube (Cx)	Tight tube (F)	Soft semi-tight tube (Sx)*	
Tube Ø [mm]		0.9	0.9	0.9	with 1 fiber
Approx. weight [kg/km]		0.7	0.74	0.7	
Max. allowable tensile load [N]	during install.	20	10	20	IEC 60794-1-2 E1
Min. bending radius [mm]		25	25	25	IEC 60794-1-2 E11
Crush resistance [N/cm]	short-term	100	100	100	IEC 60794-1-2 E3
	long term	50	50	50	
Temperature range [°C]	during install.	–10 to +50	–10 to +60	–10 to +60	IEC 61300-2-22
	in service	–20 to +70	–40 to +80	–40 to +80	
	in storage	–25 to +60	–40 to +80	–40 to +80	

Technical data valid for 0.9 mm tubes; for other types values might vary.

* Jelly-filled tube (SW) only with singlemode, dry tube (SH) with all fiber types available.



Semi-tight tube
soft semi-tight tube

Tight tube

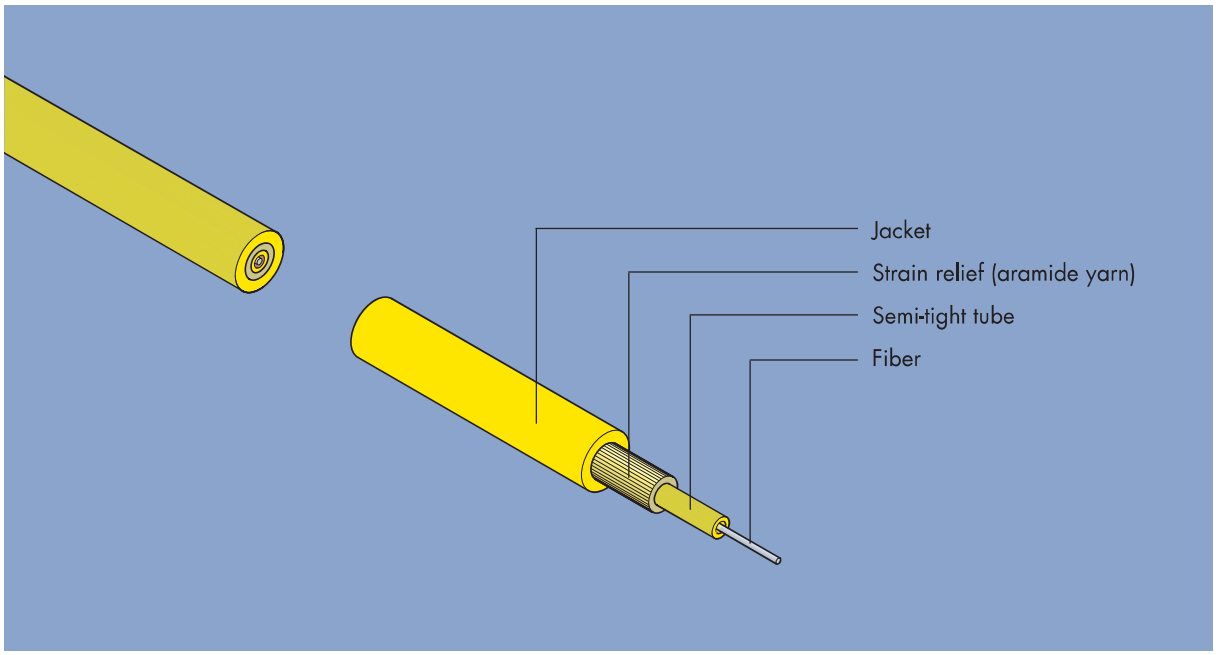
Small tight tube

Ordering information:

Tube type	Fiber type	Color	Type	Part no.
Semi-tight tube	**E9/125**	**yellow**	**01-E9/CH-E9-FE**	**22521983**
(Ø 0.9 mm)	**G50/125**	**orange**	**01-G50/CH-D9-FC**	**22520626**
	G50/125-OM3	**turquoise/aqua**	**01-G50/CH-M9-F-FM**	**84005132**
	G62.5/125	**blue**	**01-G62/CH-C9-FC**	**22520967**
Tight tube	**E9/125**	**yellow**	**01-E9/F-E9**	**22521478**
(Ø 0.9 mm)	E9/125	green	01-E9/F-B9	22521477
	G50/125	**orange**	**01-G50/F-D9**	**22521479**
	G62.5/125	**blue**	**01-G62/F-C9**	**22523050**
Tight tube	G50/125	orange	01-G50/V-D6	23025920
(Ø 0.6 mm)	G62.5/125	blue	01-G62/V-C6	23025921

Types printed in bold are stock items

SIMPLEX CABLES WITH SEMI-TIGHT TUBE



These Simplex cables with an outer diameter of 2.0 mm, 2.7 mm or 3.0 mm contain semi-tight tubes, are strain-relieved and jacketed with LSFH™ or PVC material.

Properties:
- Tight bending radius
- Rugged construction
- Can be assembled with spring-loaded connectors
- LSFH™ variants are self-extinguishing and low smoke
- non-toxic and halogen free

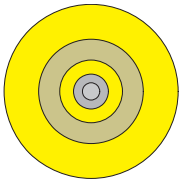
Field of application:
- Installation in indoor area
- As measurement cable withstanding mechanical loading
- As patch cable in distribution centres
- As data cable in distribution networks
- As strain-relieved pigtail
- LSFH™ variant ideal for applications involving high safety requirements in case of a fire

SIMPLEX CABLES WITH SEMI-TIGHT TUBE

Specification:

		Simplex	
Jacket Ø [mm]		2.7/3.0	
Tube Ø [mm]		0.9	with 1 fiber
Weight approx. [kg/km]		6.4/8.0	
Max. allowable tensile load [N]	during installation	200	IEC 60794-1-2 E1
	in service	100	
Min. Bending radius [mm]	during installation	50	IEC 60794-1-2 E11
	in service	30	
Crush resistance [N/cm]	short-term	500	IEC 60794-1-2 E3
	long-term	100	
Impact resistance [impacts]	Wp = 0.74 Nm/ r = 25 mm	20	IEC 60794-1-2 E4
Temperature range [°C] PVC	during installation	–10 to +50	IEC 60794-1-2 F1
	in service	–20 to +50	
	in storage	–25 to +50	
Temperature range [°C] LSFH™	during installation	–10 to +50	IEC 61300-2-22
	in service	–20 to +70	
	in storage	–25 to +60	
Fire load [MJ/m] LSFH™		0.13/0.18	
Fire propagation LSFH™		passed	IEC 60332-1
		passed	IEC 60332-3 Cat.C

Technical data for cable types with diameter 2.0 mm or H200 fiber might vary



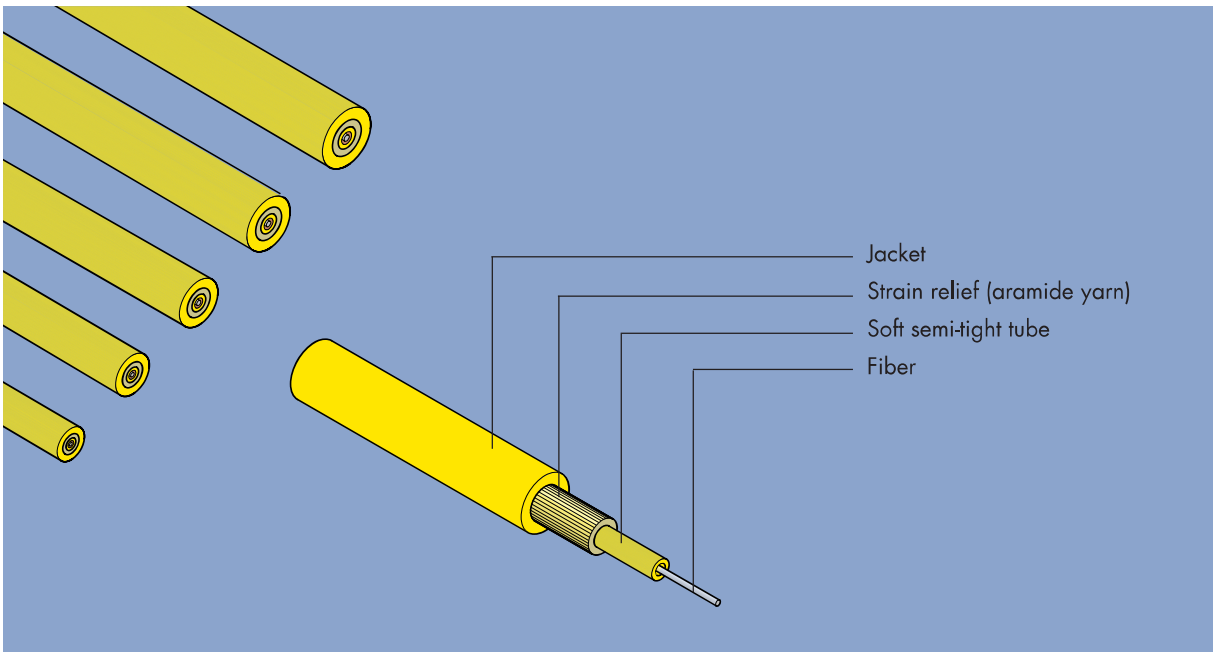
Simplex cable cross-section

Ordering information:

Number of fibers	Fiber type	Color	Type	Part no.
1 LSFH™	**G50/125**	**orange**	**01-G50/CWJH-D20**	**84000564**
1 LSFH™	**G62.5/125**	**orange**	**01-G62/CWJH-D20**	**84000565**
1 LSFH™	**E9/125**	**yellow**	**01-E9/CWJH-E27**	**22523125**
1 LSFH™	**G50/125**	**orange**	**01-G50/CWJH-D27**	**22523126**
1 LSFH™	**G62.5/125**	**orange**	**01-G62/CWJH-D27**	**22523127**
1 LSFH™	**H200/230**	**orange**	**01-H200/FJH-D27**	**23031085**
1 LSFH™	**E9/125**	**yellow**	**01-E9/CWJH-E30**	**22523128**
1 PVC	**E9/125**	**orange**	**01-E9/CWJT-D27**	**22521459**
1 PVC	**G50/125**	**orange**	**01-G50/CWJT-D27**	**22521460**
1 PVC	**G62.5/125**	**orange**	**01-G62/CWJT-D27**	**22521461**

Types printed in bold are stock items

SIMPLEX CABLES WITH SOFT SEMI-TIGHT TUBE



These cables with an outer diameter of 1.7 to 3.0 mm contain soft semi-tight tubes, are strain-relieved and jacketed with LSFH™.
With a small diameter of 1.7 mm this cable is ideal to terminate small form factor connectors.
Cables and cable assemblies allow the use in a wide temperature range as well as at high wavelengths (1550 and 1625 nm) and are therefore especially suitable telecom applications.

Properties:
- Tight bending radius
- Rugged construction
- Can be assembled with spring-loaded connectors
- self-extinguishing and low smoke
- non-toxic and halogen free

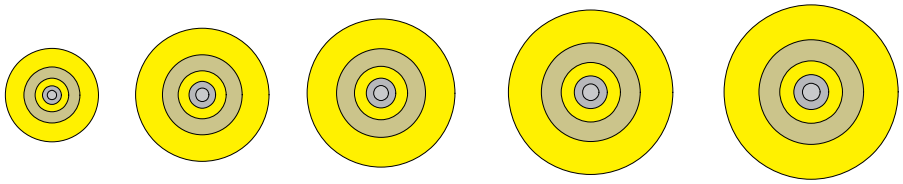
Field of application:
- Installation in indoor area
- As measurement cable withstanding mechanical loading
- As patch cable in distribution centres
- As data cable in distribution networks
- Ideal for applications involving high safety requirements in case of a fire

Cable with 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:

		Simplex					
Jacket Ø [mm]		1.7	2.1	2.4	2.7	3.0	
Tube Ø [mm]		0.9	0.9	0.9	0.9	0.9	with 1 fiber
Approx. weight [kg/km]		2.8	4.0	5.4	7.0	8.9	
Max. allowable tensile load [N]	during install.	100	200	300	400	500	IEC 60794-1-2 E1
	in service	50	100	150	200	250	
Min. Bending radius [mm]	during install.	50	50	50	50	50	IEC 60794-1-2 E11
	in service	25	25	25	25	25	
Crush resistance [N/cm]	short-term	500	500	700	500	500	IEC 60794-1-2 E3
	long-term	300	300	500	300	300	
Impact resistance [impacts]	Wp = 0.74 Nm/r = 25 mm	10	10	10	20	20	IEC 60794-1-2 E4
Temperature range [°C]	during install.	–10/+50	–10/+50	–10/+50	–10/+50	–10/+50	IEC 61300-2-22
	in service	–40/+70	–25/+70	–25/+70	–25/+70	–20/+70	
	in storage	–40/+60	–40/+60	–40/+60	–40/+60	–40/+60	
Fire load [MJ/m]		0.06	0.07	0.1	0.15	0.18	
Fire propagation		–	–	–	passed	passed	IEC 60332-1
		–	–	–	passed	passed	IEC 60332-3 Cat.C



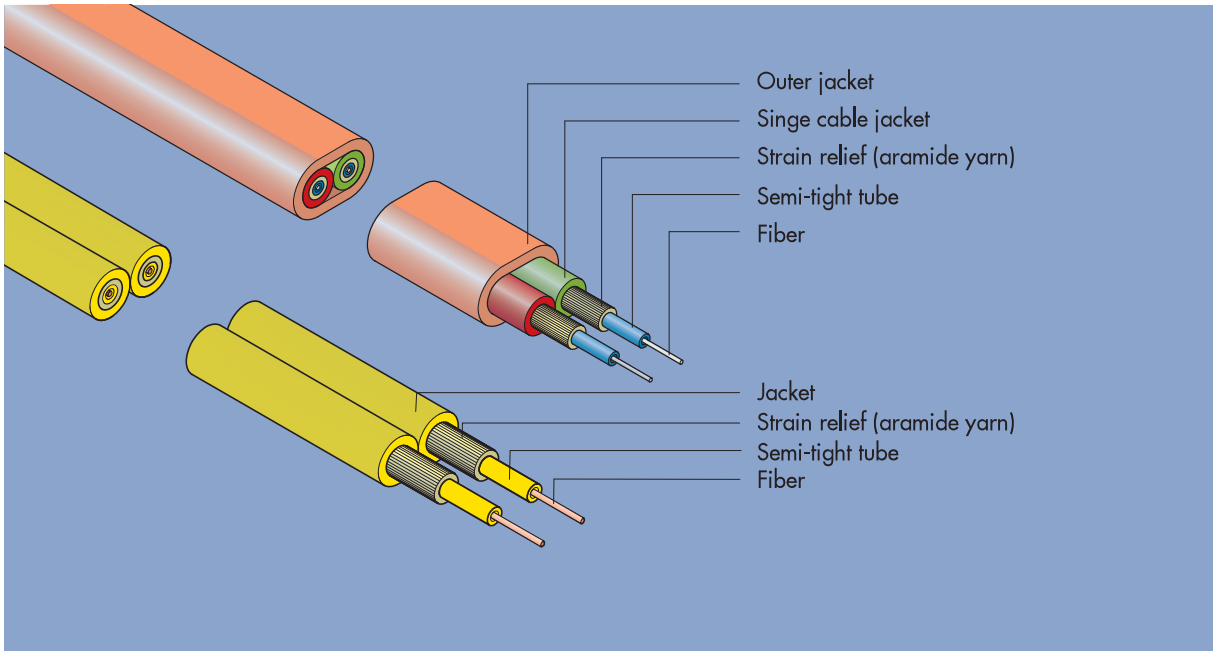
Simplex cable cross-section

Ordering information:

Number of fibers	Fiber type	Color	Type	Part no.
1	E9/125	yellow	**01-E9/SWJH-E17**	**22523105**
1	E9/125	yellow	**01-E9/SWJH-E21**	**23014851**
1	E9/125	yellow	**01-E9/SWJH-E24**	**23013083**
1	E9/125	yellow	01-E9/SWJH-E27	23014852
1	E9/125	yellow	**01-E9/SWJH-E30**	**23014853**

Types printed in bold are stock items

DUPLEX CABLES



Duplex cables consist of 2 single-fiber cables (semi-tight tube with strain relief and jacket). The "figure 0" duplex cable has a common second flat jacket.

LSFH™ and PVC cable types are available.

Properties:

- Tight bending radius (flat side)
- Rugged construction
- Can be assembled with spring-loaded connectors
- LSFH™ variants are self-extinguishing, low smoke, non-toxic and halogen free
- "figure 8": easy to divide

Field of application:

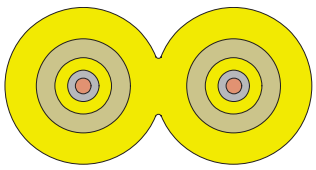
- Installation in indoor area
- As patch cable in distribution centres
- As data cable in distribution networks
- LSFH™ variant ideal for applications involving high safety requirements in case of a fire

DUPLEX CABLES

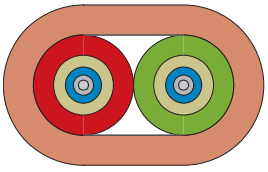
Specification:

		Figure 8	Figure 0	
Jacket Ø [mm]	PVC	2.7 x 5.4	3.9 x 6.6	
	LSFH™	2.7 x 5.4	3.5 x 6.2	
Single-fiber cable Ø [mm]		2.7	2.7	with 1 tube each
Semi-tight tube Ø [mm]		0.9	0.9	with 1 tube each
Approx. weight [kg/km]		14	27	
Max. allowable tensile load [N]	during installation	2 x 200	2 x 200	IEC 60794-1-2 E1
	in service	2 x 100	2 x 100	
Min. Bending radius	during installation	50	50	IEC 60794-1-2 E11
(flat side) [mm]	in service	30	30	
Crush resistance [N/cm]	short-term	1000	1000	IEC 60794-1-2 E3
	long-term	100	100	
Impact resistance [impacts]	Wp = 0.74 Nm/ r = 25 mm	20	50	IEC 60794-1-2 E4
Temperature range [°C] PVC	during installation	–10 to +50		IEC 60794-1-2 F1
	in service	–20 to +50		
	in storage	–25 to +50		
Temperature range [°C] LSFH™	during installation	–10 to +50		IEC 61300-2-22
	in service	–20 to +70		
	in storage	–25 to +60		
Fire load [MJ/m] LSFH™		0.30	0.45	
Fire propagation LSFH™		passed passed	passed passed	IEC 60332-1 IEC 60332-3 Cat. C

Technical data for cable types with H200 fiber might vary.



Cable cross-section „figure 8"



Cable cross-section „figure 0"

Ordering information
please see next page

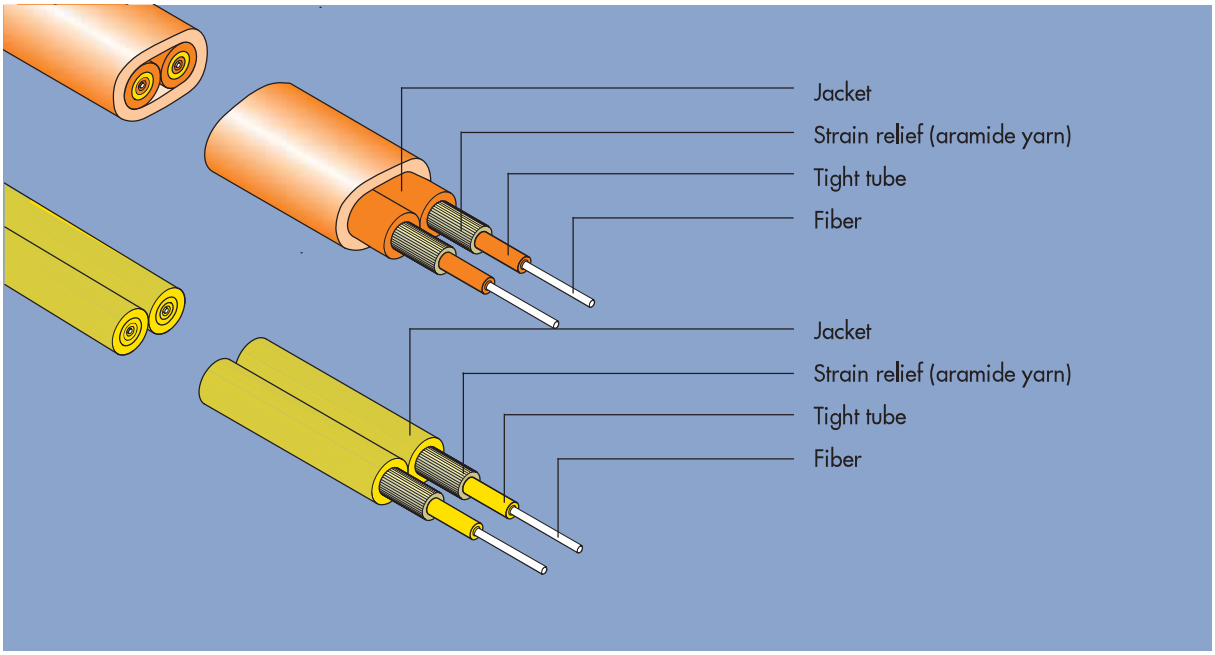
DUPLEX CABLES

Ordering information:

Number of fibers			Fiber type	Color	Type	Part no.
2	fig. 8	LSFH™	E9/125	yellow	**02-E9/CWJH-E27**	**22523202**
2	fig. 8	LSFH™	G50/125	orange	**02-G50/CWJH-D27**	**22523203**
2	fig. 8	LSFH™	G50/125-OM3	turquoise/aqua	02-G50/CWJH-M27-F	84005133
2	fig. 8	LSFH™	G62.5/125	orange	**02-G62/CWJH-D27**	**22523204**
2	fig. 0	LSFH™	E9/125	yellow	**02-E9/CWJH-AE27**	**22523252**
2	fig. 0	LSFH™	G50/125	orange	**02-G50/CWJH-AD27**	**22523253**
2	fig. 0	LSFH™	G50/125-OM3	turquoise/aqua	02-G50/CWJH-AD27-F	84005135
2	fig. 0	LSFH™	G62.5/125	orange	**02-G62/CWJH-AD27**	**22523254**
2	fig. 0	LSFH™	H200/230	orange	**02-H200/FJH-AD27**	**23031087**
2	fig. 8	PVC	E9/125	orange	**02-E9/CWJT-D27**	**22521465**
2	fig. 8	PVC	G50/125	orange	**02-G50/CWJT-D27**	**22521466**
2	fig. 8	PVC	G62.5/125	orange	**02-G62/CWJT-D27**	**22521467**
2	fig. 0	PVC	E9/125	orange	**02-E9/CWJT-AD27**	**22521470**
2	fig. 0	PVC	G50/125	orange	**02-G50/CWJT-AD27**	**22521469**
2	fig. 0	PVC	G62.5/125	orange	**02-G62/CWJT-AD27**	**22521468**

Types printed in bold are stock items

MINI DUPLEX CABLES



Mini Duplex Figure 8

Figure 8 cables are made of two single-fiber cables which integrate small tight tubes. Cables and cable assemblies with singlemode fibers allow the use in a wide temperature range as well as at high wavelengths (1550 nm) and therefore are especially suitable for telecom applications.

Properties:
- Self-extinguishing, low smoke, non-toxic and halogen free
- Low fire load
- Rugged construction
- Easy stripping of jacket
- Can be assembled with spring-loaded connectors, including MT-RJ
- Two step stripping of full-tight tube
- Easy to divide the channels
- Wide temperature range

Field of application:
- Installation in indoor areas
- As patch cable in distribution centres
- data cable in distribution networks
- Applications with high safety requirements in case of fire

Mini Duplex Figure 0

Figure 0 cables contain two single-fiber cables (semit-tight tubes with strain-relief and jacket) and an oval second coating.

Properties:
- Self-extinguishing, low smoke, non-toxic and halogen free
- Low fire load
- Rugged construction
- Easy stripping of jacket and tube
- Can be assembled with spring-loaded connectors

Field of application:
- Installation in indoor areas
- As patch cable in distribution centres
- data cable in distribution networks
- Applications with high safety requirements in case of fire

MINI DUPLEX CABLES

Specification:

		Figure 8	Figure 0	
Jacket Ø [mm]	LSFH™	1.7 x 3.5	3.1 x 5.2	
Single-fiber cable Ø [mm]		1.7	2.0[1]	
Channel marking on single-fiber cable		text on 1 side	numbered	
Tube Ø [mm]		0.6[2]	0.9	
Tube type		Full-tight[3]	Semi-tight	
Approx. weight [kg/km]		5.6	15.2	
Max. allowable tensile load [N]	during installation	2 x 100	2 x 200	IEC 60794-1-2 E1
	in service	2 x 50	2 x 100	
Min. Bending radius [mm]	during installation	50	50	IEC 60794-1-2 E11
	in service	25	25	
Crush resistance [N/cm]	short-term	100	500	IEC 60794-1-2 E1
	long-term	50	100	
Impact resistance [impacts]	Wp=2.8Nm, r=25mm	3	-	IEC 60794-1-2 E4
Temperature range [°C]	during installation in service in storage	–10 to +60 –40 to +70 –40 to +60	–10 to +60 –20 to +70 –25 to +60	IEC 61300-2-22
Fire load [MJ/m]		0.12	0.3	
Fire propagation		passed	passed	IEC 60332-1

1) Usually single-fiber cables are manufactured in average slightly over 2.0 mm in order to get a better jacket strength. Therefore these cables might also be declared and sold as 2.1 mm duplex cables
2) Cables contain small tight tubes with a diameter of 600 µm, suitable for MT-RJ connector termination
3) Stripping of full-tight tubes 0.6 mm in two steps:
Step 1: Strip secondary coating (600 µm) with small T-stripper (9801.22.A) and hole AWG26, resp. AWG 28 over a length of approx. 2 cm. As the primary coating is stripped off in a second step there is no problem if the 250 µm coating is already partially removed
Step 2: Remove the primary coating (250 µm) with the coating stripper (9801.10.E) or with a similar tool

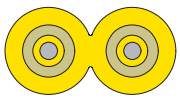


Figure 8

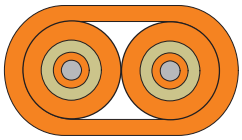


Figure 0

Ordering information: Mini Duplex Figure 8

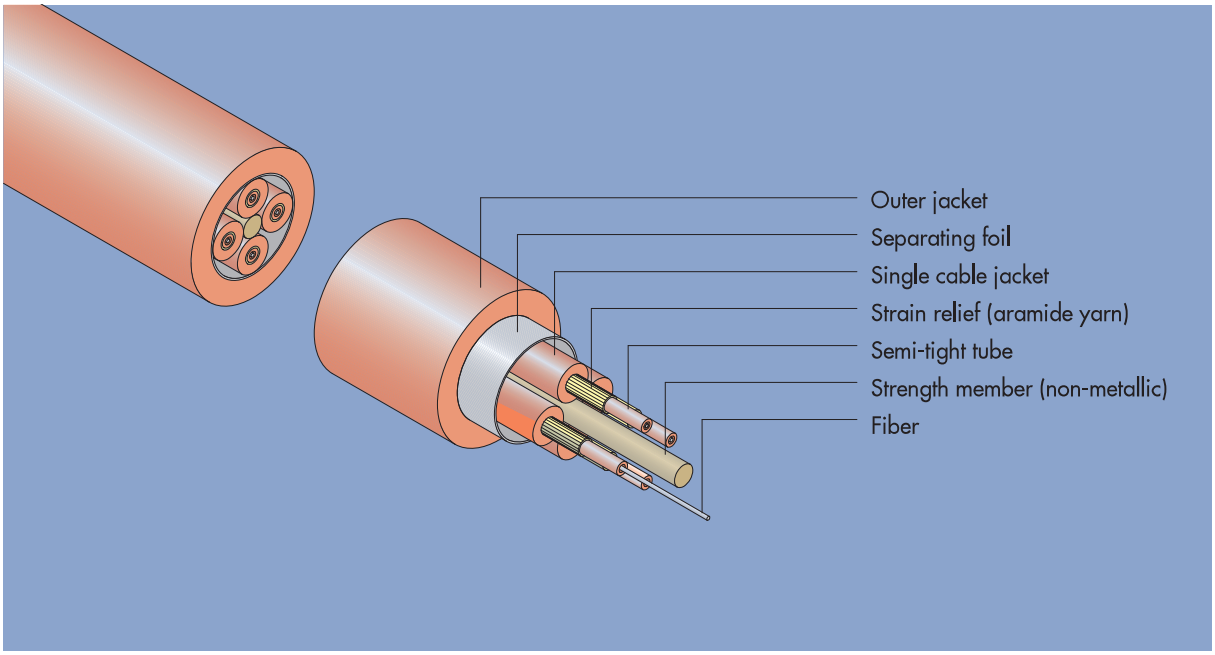
No. of fibers	Fiber type	Color	Type	Part no.
2 figure 8	E9/125	yellow	**02-E9/VJH-E17**	**23040758**
2 figure 8	G50/125	orange	**02-G50/VJH-D17**	**23040759**
2 figure 8	G50/125-OM3	turquoise/aqua	**02-G50/VJH-M17-F**	**84005418**
2 figure 8	G62.5/125	orange	**02-G62/VJH-D17**	**23040760**

Ordering information: Mini Duplex Figure 0

No. of fibers	Fiber type	Color	Type	Part no.
2 figure 0	E9/125	yellow	**02-E9/CWJH-AE20**	**23039888**
2 figure 0	G50/125	orange	**02-G50/CWJH-AD20**	**23039889**
2 figure 0	G50/125-OM3	turquoise/aqua	**02-G50/CWJH-AM20-F**	**84005553**
2 figure 0	G62.6/125	orange	**02-G62/CWJH-AD20**	**23039891**

Types printed in bold are stock items

BREAKOUT CABLES



This cable consists of 4 to 12 simplex cables which are SZ-stranded around a central strength member and unified in a single cable by a second outer jacket.

Properties:

- Rugged construction
- Can be assembled with spring-loaded connectors
- LSFH™ and PUR variants are self-extinguishing, low smoke, non-toxic and halogen free
- Each tube strain-relieved

Field of application:

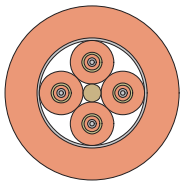
- Installation in indoor areas
- As a data cable in distribution networks
- For installation in cable ducts
- LSFH™ and PUR variants ideal for applications involving high safety requirements in case of a fire
- For horizontal and Collapsed Backbone cabling

BREAKOUT CABLES

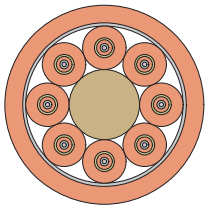
Specification:

		Stranding 4-way	8-way	12-way	
Jacket Ø [mm]		10	13	16	
Single cable Ø [mm]		2.7	2.7	2.7	with 1 tube each
Semi-tight tube Ø [mm]		0.9	0.9	0.9	with 1 fiber each
Approx. weight [kg/km]		90	160	225	
Max. allowable tensile load [N]	during installation	4 x 300	8 x 300	12 x 300	IEC 60794-1-2 E1
	in service	4 x 200	8 x 200	12 x 200	
Min. Bending radius [mm]	during installation	150	150	200	IEC 60794-1-2 E11
	in service	100	150	120	
Crush resistance [N/cm]	during installation	1000	1000	1000	IEC 60794-1-2 E3
	in service	200	200	200	
Impact resistance [Impacts]	Wp = 2.21 Nm/r = 25 mm	30	50	50	IEC 60794-1-2 E4
Temperature range [°C] PVC	during installation		–10 to +50		IEC 60794-1-2 F1
	in service		–20 to +50		
	in storage		–25 to +50		
Temperature range [°C] LSFH	during installation		–10 to +50		IEC 61300-2-22
	in service		–20 to +70		
	in storage		–25 to +60		
Fire load	LSFH	1.9	3.4	5.5	
Fire propagation	LSFH	passed	passed	passed	IEC 60332-1

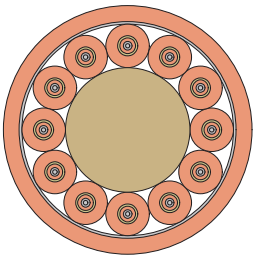
Technical data valid for PVC and LSFH jacketed cable types, other types might vary



4-way stranding



8-way stranding



12-way stranding

Ordering information
please see next page

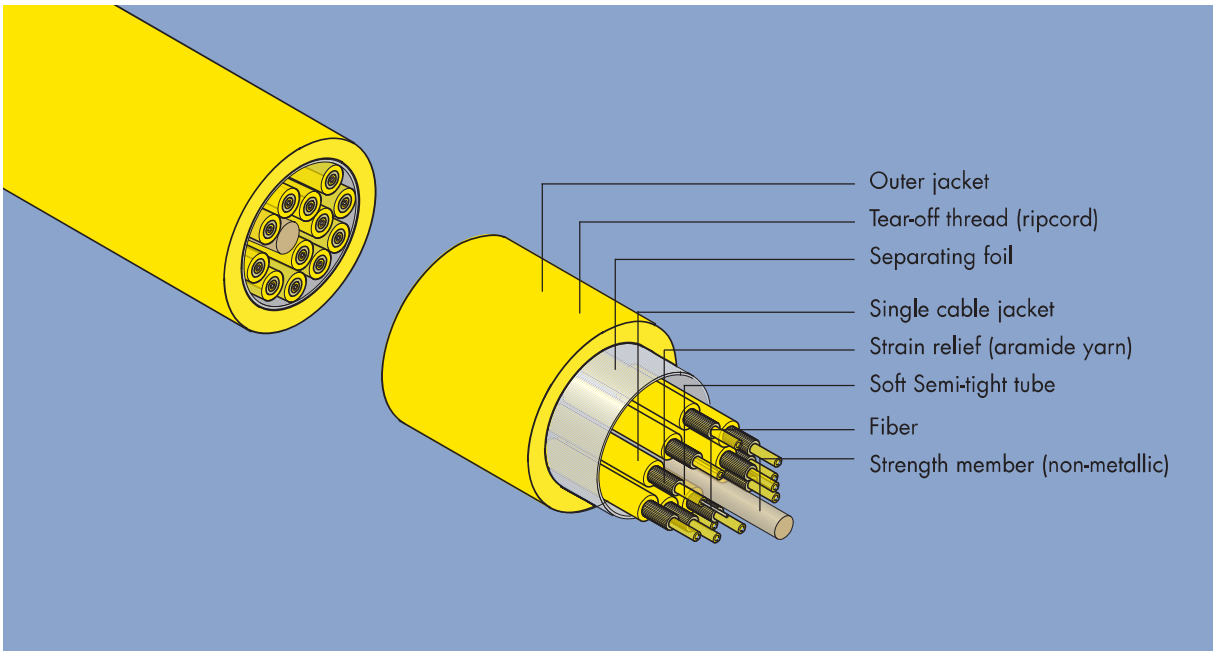
BREAKOUT CABLES

Ordering information:

No of fibers	Fiber type	Color	Coding of individual cables	Type	Part. No
4	LSFH™ G50/125	orange	orange/numbered	04-G50/CWJSNH-D27	22523300
4	LSFH™ G62.5/125	orange	orange/numbered	04-G62/CWJSNH-D27	23026402
12	LSFH™ G50/125	orange	orange/numbered	12-G50/CWJSNH-D27	23026403
12	LSFH™ G62.5/125	orange	orange/numbered	12-G62/CWJSNH-D27	23026404
4	PVC E9/125	orange	orange/numbered	04-E9/CWJSNT-D27	
4	PVC G50/125	orange	orange/numbered	04-G50/CWJSNT-D27	22521464
4	PVC G62.5/125	orange	orange/numbered	04-G62/CWJSNT-D27	22521462
8	PVC E9/125	orange	orange/numbered	08-E9/CWJSNT-D27	
8	PVC G50/125	orange	orange/numbered	08-G50/CWJSNT-D27	22521737
8	PVC G62.5/125	orange	orange/numbered	08-G62/CWJSNT-D27	22521736
12	PVC E9/125	orange	orange/numbered	12-E9/CWJSNT-D27	22523302
12	PVC G50/125	orange	orange/numbered	12-G50/CWJSNT-D27	22521734
12	PVC G62.5/125	orange	orange/numbered	12-G62/CWJSNT-D27	22521735
5	PUR H200/230	black	orange/numbered	05-H200/VJSN(ZN)Z-G26	22521540
9	PUR H200/230	black	orange/numbered	09-H200/VJSN(ZN)Z-G26	22521541

Types printed in bold are stock items

MINICORD BREAKOUT CABLES



Minicord Breakout Cables consists of 12 simplex cables (soft semi-tight tubes with strain relief and outer jacket), which are bundled around a central strength member and integrated into one cable by a second outer jacket of 10 mm diameter.

The small outer diameter of the cable allows a connection of 12 fibers using little space. The small diameter of the simplex cables enables the utilization of Small-Form-Factor connectors. The cable resp. the cable assembly allows applications with a big temperature range and with high wavelengths (1550 and 1625 nm). Therefore the cable is an excellent product for Telecom applications.

Properties:
- Rugged construction
- Can be assembled with spring-loaded connectors
- self-extinguishing, low smoke, non-toxic and halogen free

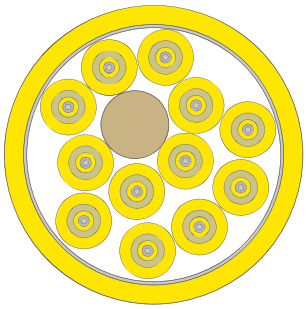
Field of application:
- Indoor applications
- Connection between system rack and optical distributor
- Connection between distributors
- Applications with high safety requirements
- with tear-off thread
- SMARTLINE

SMARTLINE the pre-terminated cabling system is shown in the chapter "Systems".

MINICORD BREAKOUT CABLES

Specification:

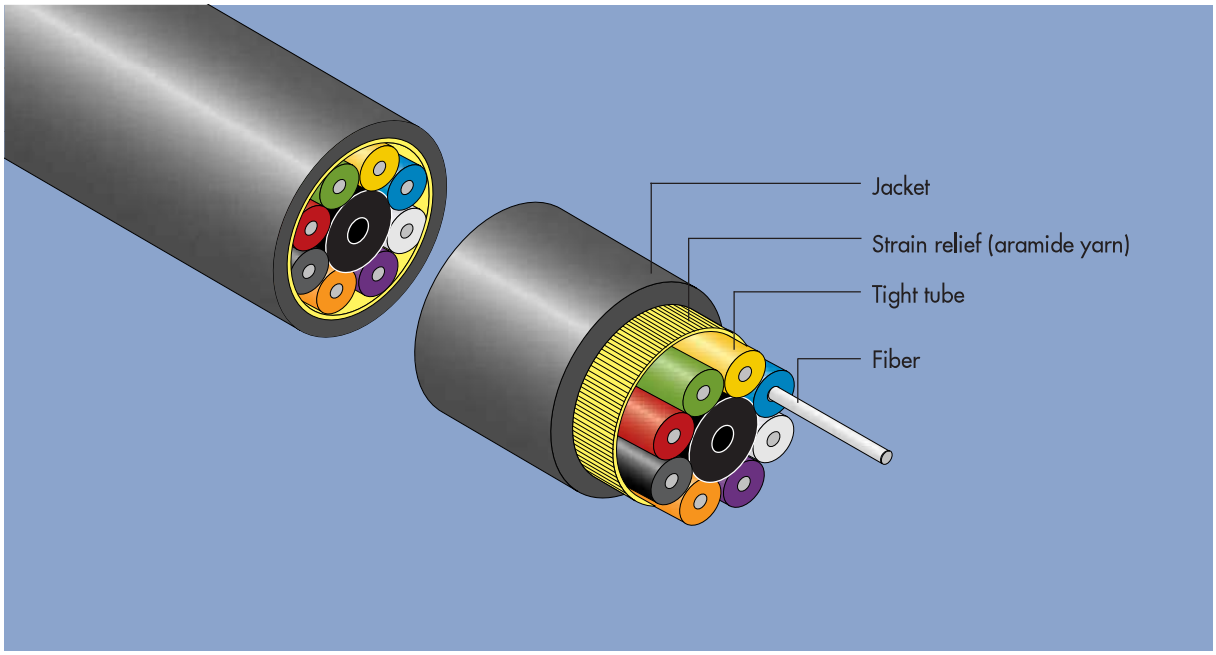
		Breakout	
Jacket Ø [mm]	LSFH™	10.0	
Single cable Ø [mm]	LSFH™	1.7	with 1 tube each
Soft-Semi-tight tube		0.9	with 1 fiber each
Approx. weight [kg/km]		70	
Max. allowable tensile load [N]	during installation	12 x 100	IEC 60794-1-2 E1
	in service	12 x 50	
Min. Bending radius [mm]	in service	75	IEC 60794-1-2 E11
Crush resistance [N/cm]	short-term	600	IEC 60794-1-2 E3
	long-term	200	
Impact resistance [Impacts]	Wp=2.21 Nm, R=25 mm	15	IEC 60794-1-2 E4
Repeated bending [cycles]	r=100mm, force=25N	2500	IEC 60794-1-2 E6
Temperature range [°C]	during installation	–10 to +50	IEC 61300-2-22
	in service	–25 to +70	
	in storage	–25 to +60	
Fire load [MJ/m]		1.41	
Fire propagation		passed	IEC 60332-1
		passed	IEC 60332-3- Cat.C



Number of fibers	Fiber type	Color outer jacket	Type	Part no.
12	E9/125	yellow	**12-E9/SWJSNH-E17**	**23020148**

The yellow simplex cables are numbered individually.

RISER CABLES (DISTRIBUTION CABLES)



Riser cables contain 4 to 16 individually coloured tight tube fibers, it is highly flexible and easy to prepare. Once the outer jacket is removed, the individual fibers are ready for fast and easy termination with connectors.

Properties:
- For direct, spliceless connector assembling
- High compactness/small dimensions
- High mechanical and thermal resistance
- Cost effective
- self-extinguishing, low smoke, non-toxic and halogen free
- Longitudinal and transversal watertight construction
- Tear-off thread

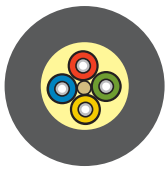
Field of application:
- Internal building distribution
- LAN
- For installation in cable ducts
- FTTD (fiber-to-the-desk)
- Application with high safety requirements
- For horizontal and Collapsed Backbone cabling

Special riser cables:
4 or 8 fiber field cable with PUR jacket for highest mechanical and thermal requirements.

RISER CABLES (DISTRIBUTION CABLES)

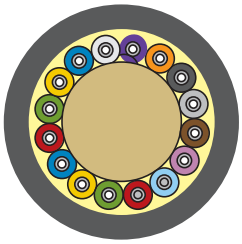
Specification:

Stranding		Standard types 4	6	8	12	16 way	
Jacket Ø [mm]		5.0	5.5	6.0	7.0	8.5	
Tight tube Ø [mm]		0.9	0.9	0.9	0.9	0.9	with 1 fiber each
Approx. weight [kg/km]		28	30	33	52	65	
Max. allowable tensile load [N]	during installation	1200	1600	2400	3000	4200	IEC 60794-1-2 E1
	in service	400	550	800	1000	1400	
Min. Bending radius [mm]	during installation	100	100	120	130	130	IEC 60794-1-2 E11
	in service	50	50	60	70	85	
Crush resistance [N/cm]	during installation	1800	1800	1800	1800	1800	IEC 60794-1-2 E3
	in service	300	300	300	300	300	
Impact resistance [Impacts]	Wp = 2.21 Nm/ r = 25 mm	100	100	100	100	100	IEC 60794-1-2 E4
Temperature range [°C]	during installation	–10 to +50					IEC 60794-1-2 F1
	in service	–20 to +70					
	in storage	–25 to +70					
Fire load [MJ/m]		0.4	0.6	0.8	1.1	1.9	
Fire propagation		passed	passed	passed	passed	passed	IEC 60332-1



4-way Stranding

up to



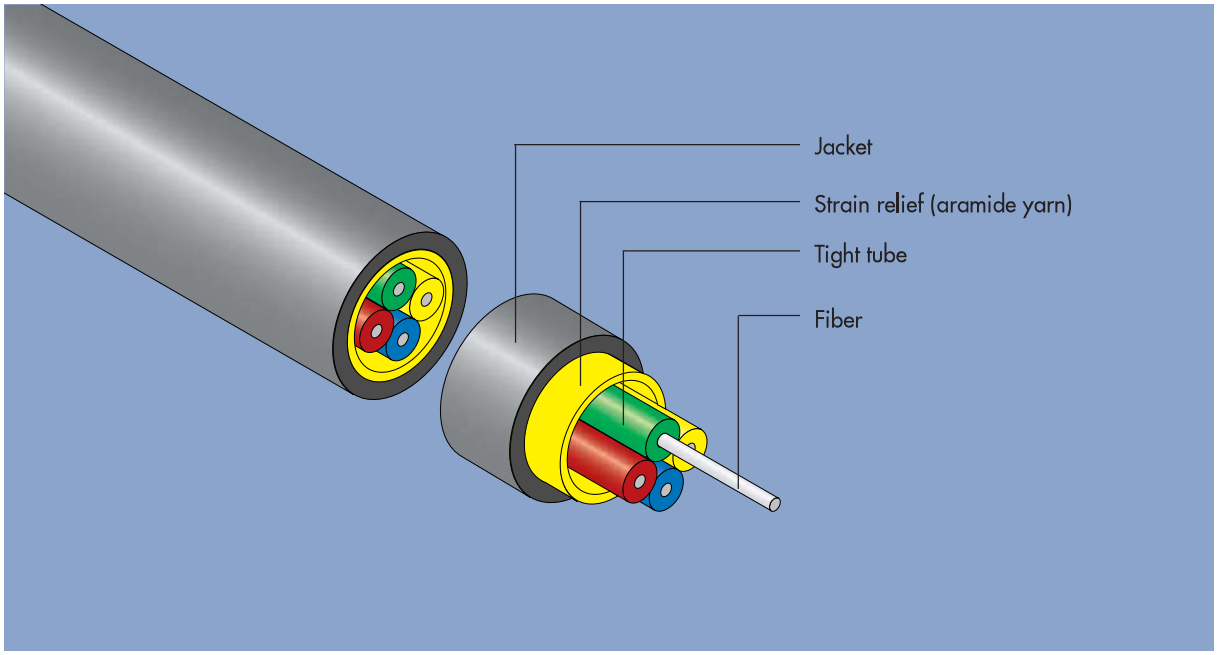
16-way Stranding

Ordering information:

Number of fibers	Fiber type	Color	Type (outer jacket: LSFH™)	Part no.
4	E9/125	black	04-E9/FSN(ZN)H-G50	22523404
4	G50/125	black	**04-G50/FSN(ZN)H-G50**	**22521830**
4	G62.5/125	black	**04-G62/FSN(ZN)H-G50**	**22521829**
6	E9/125	black	06-E9/FSN(ZN)H-G55	22523405
6	G50/125	black	06-G50/FSN(ZN)H-G55	22521833
6	G62.5/125	black	06-G62/FSN(ZN)H-G55	22521834
8	E9/125	black	08-E9/FSN(ZN)H-G60	22523406
8	G50/125	black	08-G50/FSN(ZN)H-G60	22521836
8	G62.5/125	black	08-G62/FSN(ZN)H-G60	22521837
12	E9/125	black	12-E9/FSN(ZN)H-G70	22523407
12	G50/125	black	**12-G50/FSN(ZN)H-G70**	**22521838**
12	G62.5/125	black	**12-G62/FSN(ZN)H-G70**	**22521839**
16	E9/125	black	16-E9/FSN(ZN)H-G85	
16	G50/125	black	16-G50/FSN(ZN)H-G85	
16	G62.5/125	black	16-G62/FSN(ZN)H-G85	

Types printed in bold are stock items

MINI RISER CABLES



MINI Riser cables consist of 4 single buffered fibers, these so called full-tight tubes have a small outer diameter of 0.6mm. Aramide yarn and an LSFH™ jacket surround the tubes.
Mini Riser cable assemblies with singlemode fibers can be used in a wide temperature range and at high wavelength (1550 and 1625nm) and are therefore especially suitable for telecom applications.

Properties:
- Self-extinguishing, low smoke, non-toxic and halogen free
- Very low fire load for highest safety
- Easy stripping of jacket
- Two-step stripping of full-tight tubes
- Can be assembled with all spring-loaded connectors including MT-RJ
- Wide temperature range

Field of application:
- Telecom applications
- Indoor installations
- Distribution cabling (FttD or Ftt0)
- Everywhere where four fibers are needed and only little space is available
- Where smallest fire load is required

MINI RISER CABLES

Specification:

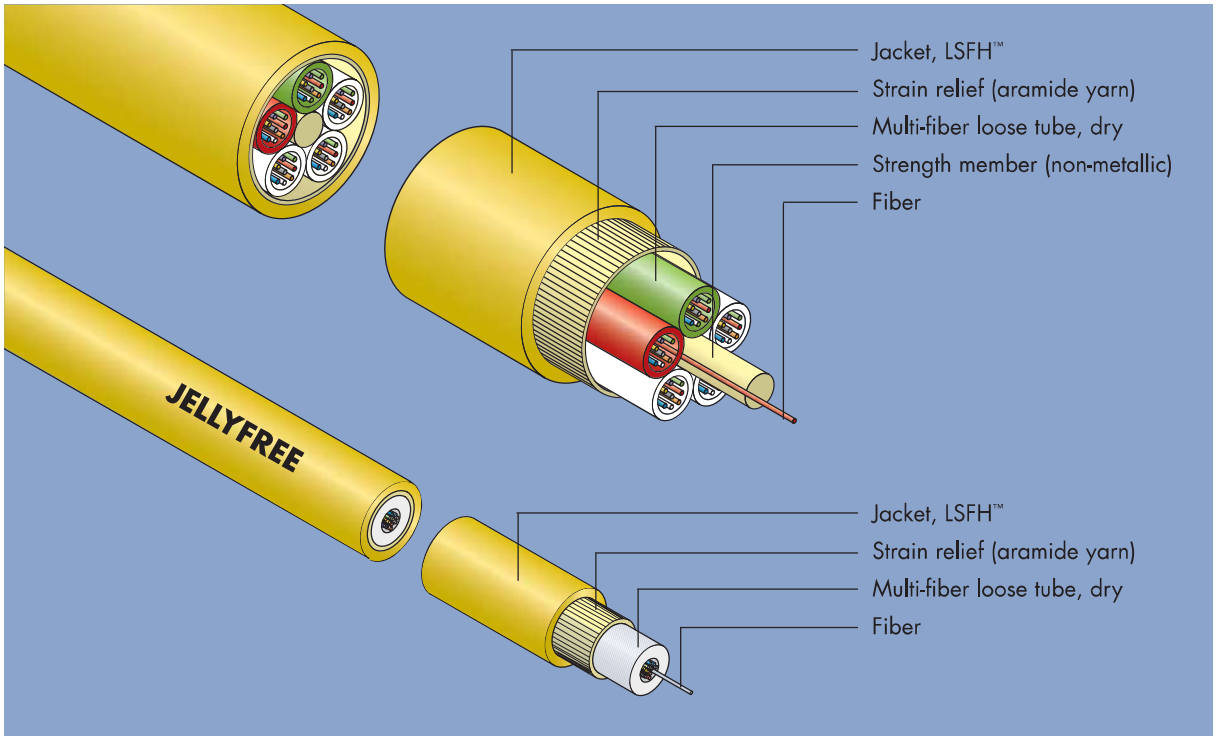
		Mini Riser	
Number of fibers		4	
Jacket Ø [mm]		3.0	
Tight tube Ø [mm]		0.6	color coded
Approx. weight [kg/km]		7	
Max. allowable tensile load [N]	during installation	400	IEC 60794-1-2 E1
	in service	200	
Min. Bending radius [mm]	during installation	50	IEC 60794-1-2 E11
	in service	25	
Crush resistance [N/cm]	short-term	75	IEC 60794-1-2 E3
	long-term	50	
Impact resistance [Impacts]	Wp = 2.21 Nm/r = 25 mm	25	IEC 60794-1-2 E4
Repeated bending [Cycles]	R=60mm, F=10N	1000	IEC 60794-1-2 E6
Temperature range [°C]	during installation	–10 to +60	IEC 60794-1-2 F1
	in service	–40 to +70	
	in storage	–40 to +60	
Fire load [MJ/m]		0.14	
Fire propagation		passed	IEC 60332-1

Note:
- Cables contain small tight tubes with a diameter of 600 mm, suitable for MT-RJ connector termination
- Stripping of full-tight tubes 0.6 mm in two steps:
  - Step 1: Strip secondary coating (600 mm) with small T-stripper (9801.22.A) and hole AWG26, rsp. AWG 28 over a length of approx. 2 cm. As the primary coating is stripped off in a second step there is no problem if the 250 mm coating is already partially removed
  - Step 2: Remove the primary coating (250 mm) with the coating stripper (9801.10.E) or with a similar tool

Ordering information:

Number of fibers	Fiber type	Color	Type (outer jacket: LSFH™)	Part no.
4	E9/125	yellow	**04-E9/V(ZN)H-E30**	**84001652**
4	G50/125	orange	**04-G50/V(ZN)H-D30**	**84001655**
4	G62.5/125	orange	04-G62/V(ZN)H-D30	84001656

JELLYFREE



Jellyfree cables consist of dry multi-fiber loose tubes, each of which contains up to 12 fibers and is strain-relieved and LSFH™ jacketed. The tubes are also color-coded:

Simplex:	white	
Stranded:	red	(counting tube)
	green	(direction of counting)
	white	(others)
	black	(dummies)

Field of application:

- Installation in indoor areas
- As a data cable in distribution networks
- For vertical applications up to 500 m
- For installation in cable ducts
- Ideal for applications involving high safety requirements in case of a fire

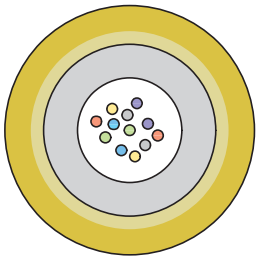
Properties:

- No need for cleaning the fibers
- Self-extinguishing, halogen free, non-toxic, low smoke
- Very low fire load for high safety requirements
- Rugged construction
- No contamination of the installation materials by jelly
- easy stripping

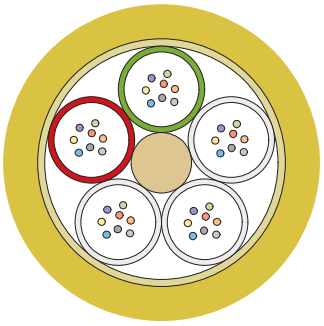
JELLYFREE

Specification:

		Simplex	Stranding 5-way	
Jacket Ø [mm]		5.0	11	
Multi-fiber loose tube Ø [mm]		3.0	3.0	with 4 to 12 fibers per multi-fiber loose
Approx. weight [kg/km]		25	95	
Max. allowable tensile load [N]	during installation	600	2500	IEC 60794-1-2 E1
	in service	400	1000	
Min. Bending radius [mm]	during installation	80	170	IEC 60794-1-2 E11
	in service	50	120	
Crush resistance [N/cm]	during installation	300	500	IEC 60794-1-2 E3
	in service	150	200	
Impact resistance [Impacts]	Wp = 2.21 Nm/ r = 25 mm	50	100	IEC 60794-1-2 E4
Temperature range [°C]	during installation	–5 to +50	–10 to +60	IEC 60794-1-2 F1
	in service	–5 to +60	–25 to +70	
	in storage	–20 to +50	–40 to +70	
Fire load [MJ/m]		0.6	2.2	
Fire propagation		passed	passed	IEC 60332-1



Simplex (up to 12 fibers)



Stranding >12–144 fibers

Ordering information
please see next page

Loose tubes x fibers	Fiber type	Type	Part no.
SIMPLEX-TYPE			
1 x 4	E9/125	04-4E9/H(ZN)H-E50	
1 x 4	G50/125	04-4G50/H(ZN)H-D50	22521820
1 x 4	G62.5/125	04-4G62/H(ZN)H-D50	22521821
1 x 6	E9/125	06-6E9/H(ZN)H-E50	
1 x 6	G50/125	06-6G50/H(ZN)H-D50	22521822
1 x 6	G62.5/125	06-6G62/H(ZN)H-D50	22521823
1x 8	E9/125	08-8E9/H(ZN)H-E50	
1 x 8	G50/125	08-8G50/H(ZN)H-D50	22521595
1 x 8	G62.5/125	08-8G62/H(ZN)H-D50	22521596
1 x 12	E9/125	**12-12E9/H(ZN)H-E50**	**22523600**
1 x 12	G50/125	12-12G50/H(ZN)H-D50	22521597
1 x 12	G62.5/125	12-12G62/H(ZN)H-D50	22521598
5-way stranding			
2 x 8	E9/125	16-8E9/HSN(ZN)H-E110	
2 x 8	G50/125	16-8G50/HSN(ZN)H-D110	
2 x 8	G62.5/125	16-8G62/HSN(ZN)H-D110	
3 x 8	E9/125	24-8E9/HSN(ZN)H-E110	
3 x 8	G50/125	24-8G50/HSN(ZN)H-D110	
3 x 8	G62.5/125	24-8G62/HSN(ZN)H-D110	
3 x 12	E9/125	36-12E9/HSN(ZN)H-E110	
3 x 12	G50/125	36-12G50/HSN(ZN)H-D110	
3 x 12	G62.5/125	36-12G62/HSN(ZN)H-D110	
4 x 12	E9/125	48-12E9/HSN(ZN)H-E110	
4 x 12	G50/125	48-12G50/HSN(ZN)H-D110	
4 x 12	G62.5/125	48-12G62/HSN(ZN)H-D110	
5 x 12	E9/125	60-12E9/HSN(ZN)H-E110	
5 x 12	G50/125	60-12G50/HSN(ZN)H-D110	
5 x 12	G62.5/125	60-12G62/HSN(ZN)H-D110	

Types printed in bold are stock items.

OUTDOOR CABLES

General
Outdoor cables are mainly designed for metropolitan area networks (MAN) and access networks.
Non-stranded cable types and especially jellyfree cables are also often used for indoor installations because of their characteristics.
The most important requirements on outdoor cables are:
- Tensile load
- Crush resistance
- Longitudinal water-tightness
- Weathering resistance
- Temperature resistance

Concerning indoor use, the following criteria are important when choosing a cable type:

- Flectional resistance
- Stripping ability
- Fire behaviour (LSFH™ types) i.e. circuit integrity in case of fire

Non- and glass armoured multi-fiber loose tube designs of SUHNER FIBEROPTIC are available up to 144 fibers.

PMD value
The PMD value plays a major role when installing single-mode fibers, as it influences the transmission rate.
SUHNER FIBEROPTIC guarantees a very low PMD value of the processed fibers by the selection of high-quality fiber suppliers and by a stress-free and careful fiber manufacturing procedure.

Logitudinal and transverse water-thightness
The cables are protected against permeation (transverse water-tightness) and propagation (longitudinal water-tightness).

The transverse water-tightness describes the permeation of humidity into the core of the cable.
PE material guarantees best protection against water and humidity. For outdoor applications with frequent or permanently wet environments we recommend cable with PE or PUR material. If the cable is exposed to a humid environment occasionally LSFH cable from SUHNER FIBEROPTIC can also be used.

The longitudinal water-tightness of cables is accomplished by using swelling materials. SUHNER cables comply with tests according to IEC60794-1-2 F5A/B. In addition the glass roving and aramide have an absorbent respectively swellable coating material.

Further protection layers like the tube around the mulit-fiber loose tube und the primary coating of the fiber keep water away from the fiber.
SUHNER FIBEROPTIC cables are free from petrolates (oils) in the space between the multi-fiber loose tube and the outer coating. So there is no need for time-consuming cleaning.

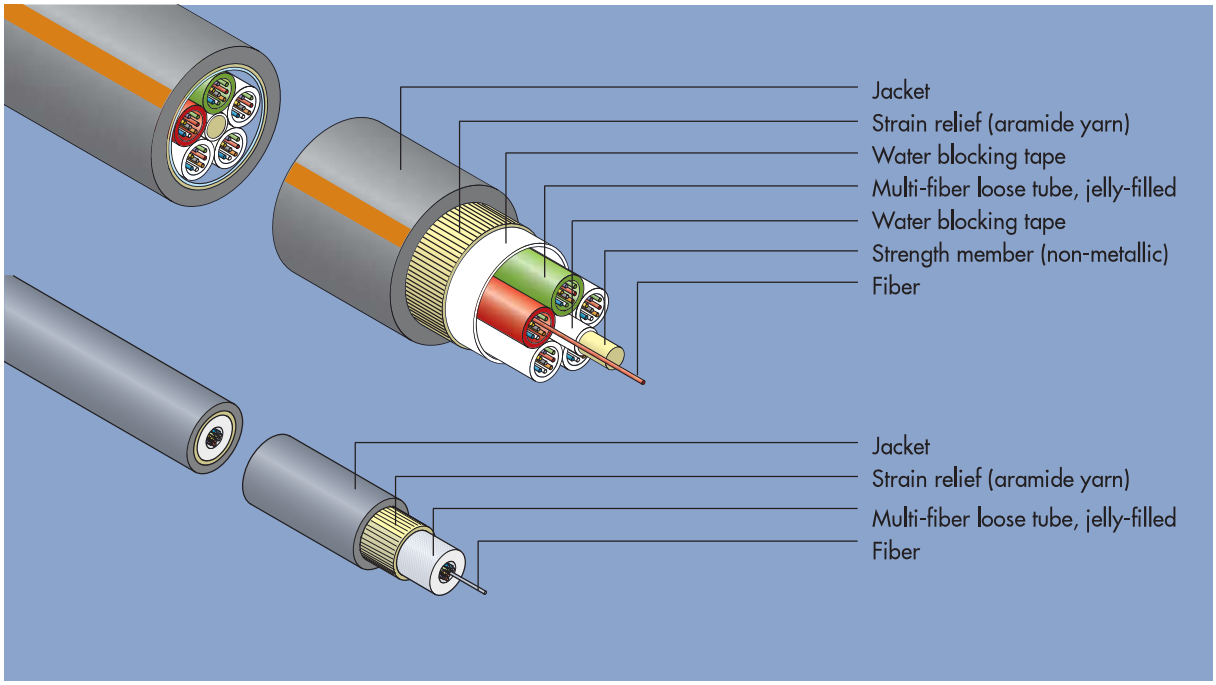
Non-armoured multi-fiber loose tube cables
The products of this cable family are available with 1 to 12 jelly-filled multi-fiber loose tubes, aramide strain relief and jackets made of PE or LSFH™.
Non-armoured multi-fiber loose tube cables are also used for indoor applications (non-stranded cable types) as well as for outdoor applications.

Glass-armoured multi-fiber loose tube cables
The products of this cable family are available with 1 to 12 jelly-filled multi-fiber loose tubes, glass-roving strain relief and jackets made of PE and LSFH™ material. The glass-roving layer around the multi-fiber loose tubes fulfills the following four functions:
- strain relief
- high crush resistance
- high resistance to biting
- longitudinal water tightness

Glassroving-armoured multi-fiber loose tube cables allow a wide range of applications because of their specific characteristics. The applications reach from indoor cablings to direct outdoor burial.

Steel-armoured multi-fiber loose tube cables
The products of this cable family feature one jelly-filled multi-fiber loose tube, they are strain-relieved with aramide and have two PE or LSFH™ layer jackets with a braided steel wire armouring. Steel-armouring provides an excellent protection against rodents.

NON-ARMOURED MULTI-FIBER LOOSE TUBE CABLES



These cable types contain 2 to 12 fibers per loose tube.
The tubes are also color-coded:

Simplex:	white	
Stranded:	red	(counting tube)
	green	(direction of counting)
	white	(others)
	black	(dummies)

Properties:

- Rugged construction
- Halogen free, non-toxic
- Wide temperature range
- LSFH™ variant self-extinguishing and low smoke
- Tight bending radius
- Longitudinal/transverse watertight

Field of application:

- As a data cable in distribution networks
- Installation indoor areas
- Installation outdoors, in moist, wet cable ducts
- Ideal as distributor-to-distributor patch cable
- As LSFH™ variant ideal for applications involving high safety requirements in case of a fire
- Maximum 12 loose tubes with maximum 12 fibers = 144 fibers

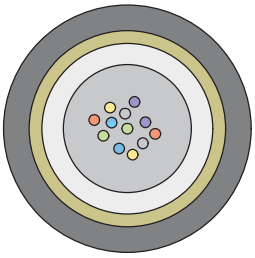
Cables with approbation
Also available approved by Swisscom acc. to specification 6PHETOP_1069_00E_1

NON-ARMOURED MULTI-FIBER LOOSE TUBE CABLES

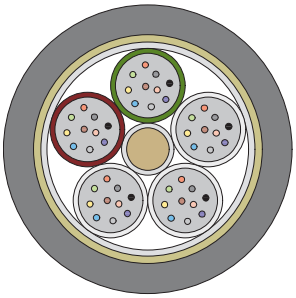
Specification:

		Simplex	Stranding 5-way	
Jacket Ø [mm]		5.0	11.5	
Multi-fiber loose tube Ø [mm]		3.0	3.0	with 2 to 12 fibers per loose tube
Approx. weight [kg/km]		20	100	
Max. allowable tensile load [N]	during installation	600	2000	IEC 60794-1-2 E1
	in service	400	1000	
Min. Bending radius [mm]	during installation	80	170	IEC 60794-1-2 E11
	in service	50	120	
Crush resistance [N/cm]	during installation	300	500	IEC 60794-1-2 E3
	in service	150	200	
Impact resistance [Impacts]	Wp=2.21Nm/ r=25 mm	50	100	IEC 60794-1-2 E4
Temperature range [°C]	during installation	–10 to +50	–10 to +60	IEC 60794-1-2 F1
	in service	–20 to +70	–25 to +70	
	in storage	–40 to +70	–40 to +70	
Fire load [MJ/m]	PE	0.72	2.8	
	LSFH™	0.6	2.6	
Fire propagation	LSFH™	passed	passed	IEC 60332-1

Technical data for cable types with LSFH™ jacket might vary slightly.



Simplex (up to 12 fibers)



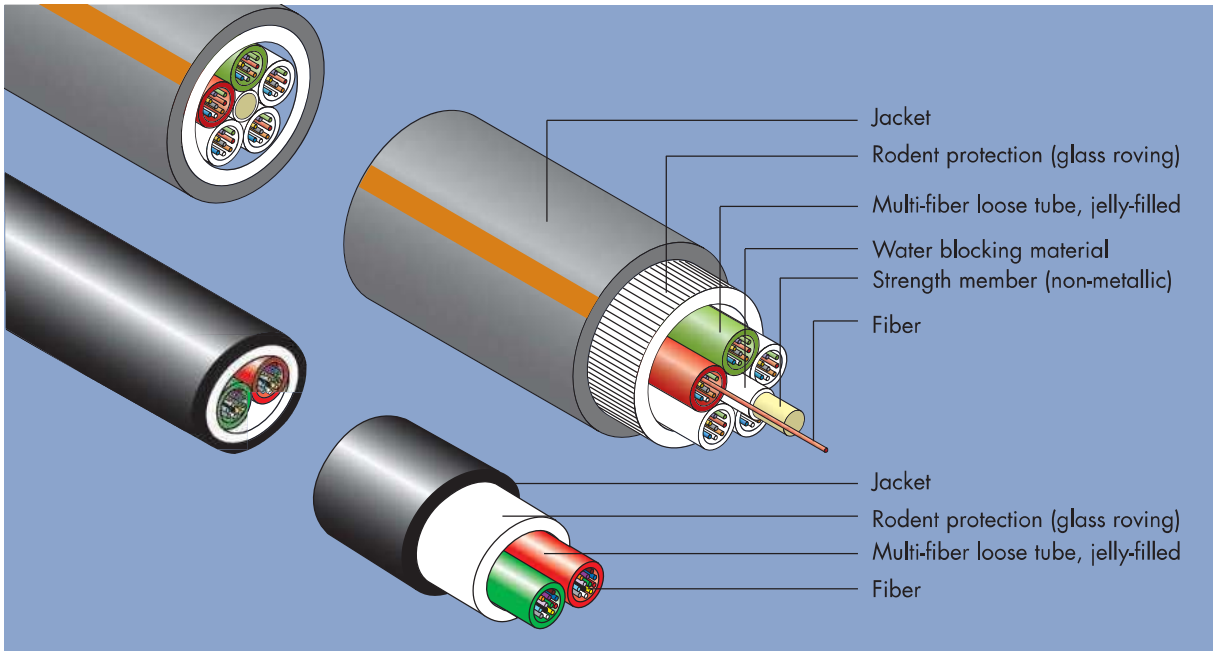
Stranding >12–144 fibers

Ordering information
please see next page

NON-ARMOURED MULTI-FIBER LOOSE TUBE CABLES

Loose tubes x fibers	Fiber type	Type	Part no.
SIMPLEX-TYPE			
1 x 4	E9/125	04-4E9/W(ZN)Y-G50	
1 x 4	G50/125	04-4G50/W(ZN)Y-G50	22520723
1 x 4	G62.5/125	04-4G62/W(ZN)Y-G50	22520687
1 x 6	E9/125	06-6E9/W(ZN)Y-G50	
1 x 6	G50/125	06-6G50/W(ZN)Y-G50	22520678
1 x 6	G62.5/125	06-6G62/W(ZN)Y-G50	22520707
1 x 8	E9/125	08-8E9/W(ZN)Y-G50	
1 x 8	G50/125	08-8G50/W(ZN)Y-G50	22520688
1 x 8	G62.5/125	08-8G62/W(ZN)Y-G50	22520740
1 x 12	E9/125	12-12E9/W(ZN)Y-G50	
1 x 12	G50/125	12-12G50/W(ZN)Y-G50	22521250
1 x 12	G62.5/125	12-12G62/W(ZN)Y-G50	22521251
5-way stranding			
2 x 8	E9/125	16-8E9/WSN(ZN)Y-Z115	
2 x 8	G50/125	16-8G50/WSN(ZN)Y-Z115	
2 x 8	G62.5/125	16-8G62/WSN(ZN)Y-Z115	
2 x 12	E9/125	24-12E9/WSN(ZN)Y-Z115	22523700
2 x 12	G50/125	24-12G50/WSN(ZN)Y-Z115	22521813
2 x 12	G62.5/125	24-12G62/WSN(ZN)Y-Z115	22521814
3 x 12	E9/125	36-12E9/WSN(ZN)Y-Z115	
3 x 12	G50/125	36-12G50/WSN(ZN)Y-Z115	
3 x 12	G62.5/125	36-12G62/WSN(ZN)Y-Z115	
4 x 12	E9/125	48-12E9/WSN(ZN)Y-Z115	
4 x 12	G50/125	48-12G50/WSN(ZN)Y-Z115	
4 x 12	G62.5/125	48-12G62/WSN(ZN)Y-Z115	
5 x 12	E9/125	60-12E9/WSN(ZN)Y-Z115	
5 x 12	G50/125	60-12G50/WSN(ZN)Y-Z115	
5 x 12	G62.5/125	60-12G62/WSN(ZN)Y-Z115	

RODENT-PROTECTED MULTI-FIBER LOOSE TUBE CABLES (GLASS-ARMOURED)



Glass-armoured cable types excel in an increased biting consistency and contain 2 to 12 fibers per loose tube.

Tubes are color-coded as follows:

Simplex:	white	
Non-stranded:	red	
	green	
Stranded:	red	(counting tube)
	green	(direction of counting)
	white	(others)
	black	(dummies)

TWINTUBE cables have additional characteristics
- Small dimension and low weight for 24 fibers
- Low fire load
- As LSFH™ variant: high safety in case of fire with circuit integrity over 90 minutes
- Fast stripping and exposure of loose tubes
- No twisted loose tubes, as caused by stranding
- Time-saving as no need to heat twisted loose tubes to achieve a straight form
- Slightly oval, which helps to compensate the fiber lengths when bent

Properties:
- Rodent-protected
- Rugged construction
- Halogen free, non-toxic
- Wide temperature range
- LSFH™ variant self-extinguishing and low smoke
- Tight bending radius
- Longitudinal/transverse water tight

Field of application:
- For installation directly in the ground and in mechanically unprotected environments
- For installation in indoor areas
- As data cable in distribution networks
- For installation outdoors, in moist, wet cable ducts and in pipes
- As LSFH™ variant ideal for applications involving high safety requirements in case of a fire
- Maximum 12 loose tubes with maximum 12 fibers = 144 fibers

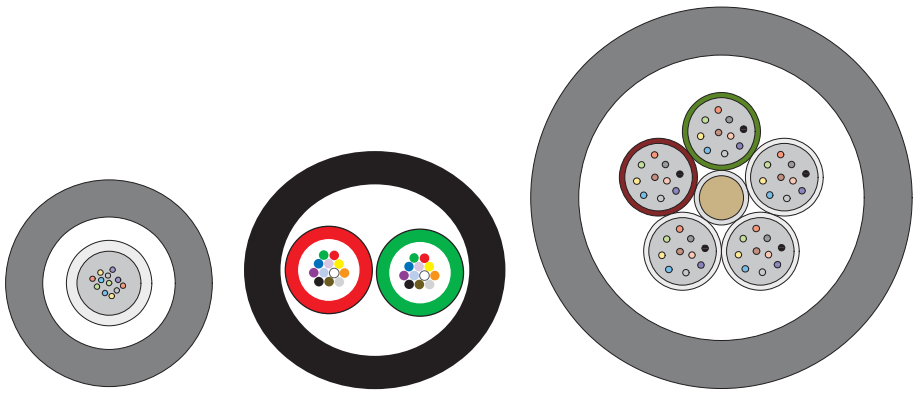
Cables with approbation
- Connector cables also available acc. to SBB requirements 3001.92.1000.
- Communication cables also available acc. to Swisscom requirements 6PHETOP_1069_00E_1

RODENT-PROTECTED MULTI-FIBER LOOSE TUBE CABLES (GLASS-ARMOURED)

Specification:

		Simplex	TWINTUBE	5-way Stranding	
Jacket Ø [mm]		8.5	9.4x8.8	15	
Multi-fiber loose tube Ø [mm]		3.0	3.0	3.0	with 2 to 12 fibers per loose tube
Approx. weight [kg/km]	PE	62	69	178	
	LSFH™	82	90	225	
Max. allowable tensile load [N]	during installation	3000	3000	9000	IEC 60794-1-2 E1
	in service	1500	1500	4500	
Min. Bending radius [mm]	during installation	130	150	225	IEC 60794-1-2 E11
	in service	80	100	150	
Crush resistance [N/cm]	during installation	400	800	800	IEC 60794-1-2 E3
	in service	200	400	300	
Impact resistance [Impacts]	Wp = 4.41 Nm/ r = 25 mm	30	–	100	IEC 60794-1-2 E4
Torsion resistance [rotations]	L=1m, 3 cycles, –40°C	±4	–	–	IEC 60794-1-2 E7
Temperature range [°C]	during installation	–10 to +50	–10 to +50	–10 to +60	IEC 60794-1-2 F1
	in service	–40 to +70	–20 to +70	–40 to +70	
	in storage	–40 to +70	–40 to +70	–40 to +70	
Fire load [MJ/m]	PE	1.7	1.8	5.0	
	LSFH™	1.5	1.7	4.4	
Fire propagation	LSFH™	passed	passed	passed	IEC 60332-1
Fire propagation with circuit integrity	LSFH™	30 minutes	90 minutes	30 minutes	IEC 60331

Technical data for LSFH™ cable types might vary slightly.



Simplex
up to 12 fibers

TWINTUBE
non-stranded
up to 24 fibers

Stranding
>12–144 fibers

Ordering information
please see next page

RODENT-PROTECTED MULTI-FIBER LOOSE TUBE CABLES (GLASS-ARMOURED)

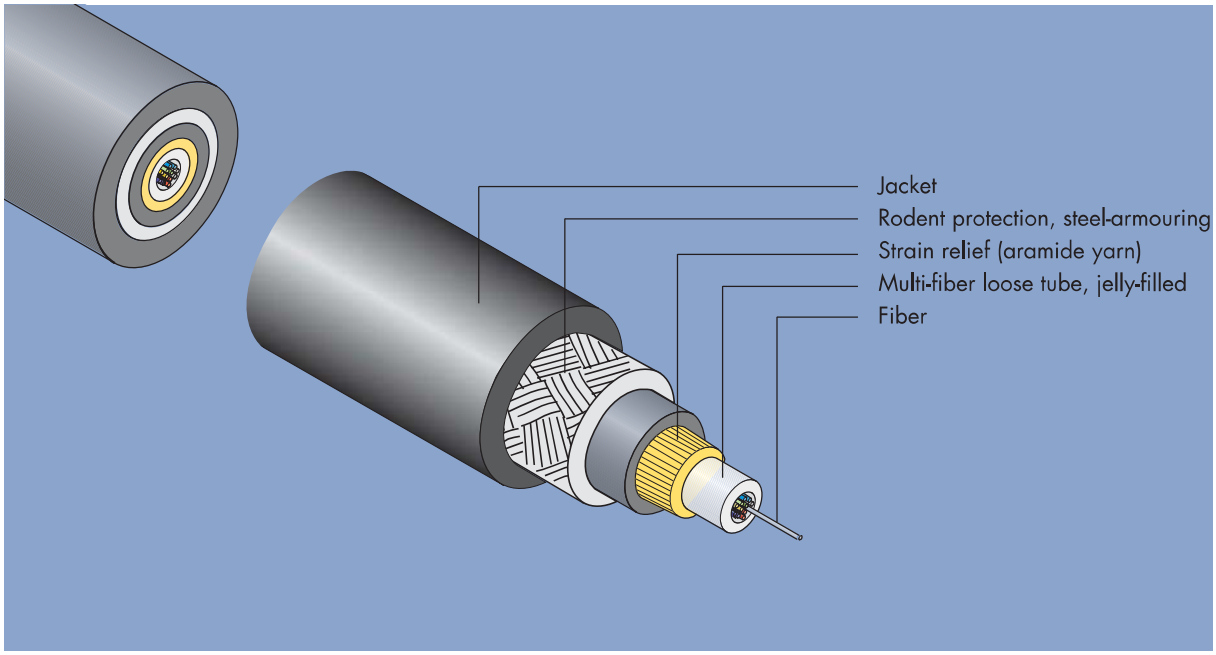
No. loose tubes x no. fibers	Fiber type	Type	Part no.
LSFH™-Types Simplex			
1 x 4	G50/125	**04-4G50/W(ZNG)H-G85**	**22523601**
1 x 4	G62.5/125	**04-4G62/W(ZNG)H-G85**	**22523603**
1 x 8	G50/125	**08-8G50/W(ZNG)H-G85**	**22523602**
1 x 8	G62.5/125	**08-8G62/W(ZNG)H-G85**	**22523604**
1 x 12	E9/125	**12-12E9/W(ZNG)H-G85**	**22523654**
1 x 12	G50/125	**12-12G50/W(ZNG)H-G85**	**22521943**
1 x 12	G50/125-OM3	**12-12G50/W(ZNG)H-M85-F**	**84005134**
1 x 12	G62.5/125	**12-12G62/W(ZNG)H-G85**	**22521884**
LSFH™-Types TWINTUBE non-stranded			
2 x 12	E9/125	24-12E9/W(ZNG)H-G94	23041032
2 x 12	G50/125	**24-12G50/W(ZNG)H-G94**	**23038139**
2 x 12	G50/125-OM3	**24-12G50/W(ZNG)H-M94-F**	**84003522**
2 x 12	G62/125	**24-12G62/W(ZNG)H-G94**	**23041033**
LSFH™-Types 5-way Stranding			
2 x 12	E9/125	**24-12E9/WSN(ZNG)H-G150**	**23011674**
2 x 12	G50/125	**24-12G50/WSN(ZNG)H-G150**	**22523750**
2 x 12	G62.5/125	24-12G62/WSN(ZNG)H-G150	22523751
4 x 12	G50/125	**48-12G50/WSN(ZNG)H-G150**	**22521908**
4 x 12	G62.5/125	48-12G62/WSN(ZNG)H-G150	22521885
PE types Simplex			
1 x 2	E9/125	02-2E9/W(ZNG)Y-G85	
1 x 2	G50/125	02-2G50/W(ZNG)Y-G85	22521811
1 x 2	G62.5/125	02-2G62/W(ZNG)Y-G85	22521749
1 x 2	H200/230	**02-2H200/W(ZNG)Y-G85**	**22523652**
1 x 4	E9/125	**04-4E9/W(ZNG)Y-G85**	**22523661**
1 x 4	G50/125	**04-4G50/W(ZNG)Y-G85**	**22521750**
1 x 4	G62.5/125	**04-4G62/W(ZNG)Y-G85**	**22521751**
1 x 4	H200/230	04-4H200/W(ZNG)Y-G85	22523653
1 x 6	E9/125	06-6E9/W(ZNG)Y-G85	
1 x 6	G50/125	**06-6G50/W(ZNG)Y-G85**	**22521752**
1 x 6	G62.5/125	06-6G62/W(ZNG)Y-G85	22521753
1 x 8	E9/125	**08-8E9/W(ZNG)Y-G85**	**23017688**
1 x 8	G50/125	**08-8G50/W(ZNG)Y-G85**	**22521754**
1 x 8	G62.5/125	**08-8G62/W(ZNG)Y-G85**	**22521755**
1 x 10	E9/125	10-10E9/W(ZNG)Y-G85	
1 x 10	G50/125	10-10G50/W(ZNG)Y-G85	22521817
1 x 10	G62.5/125	10-10G62/W(ZNG)Y-G85	22521819
1 x 12	E9/125	**12-12E9/W(ZNG)Y-G85**	**22521756**
1 x 12	G50/125	**12-12G50/W(ZNG)Y-G85**	**22521757**
1 x 12	G50/125-OM3	**12-12G50/W(ZNG)Y-G85-F**	**23027099**
1 x 12	G62.5/125	**12-12G62/W(ZNG)Y-G85**	**22521758**

RODENT-PROTECTED MULTI-FIBER LOOSE TUBE CABLES (GLASS-ARMOURED)

No. loose tubes x no. fibers	Fiber type	Type	Part no.
Glass-armoured cables with enhanced crush resistance			
1 x 12	E9/125	**12-12E9/W(ZNG)Y-Z120**	**22523657**
1 x 12	G50/125	**12-12G50/W(ZNG)Y-Z120**	**22523655**
1 x 12	G62/125	12-12G62/W(ZNG)Y-Z120	22523656
PE types, TWINTUBE non-stranded			
2 x 12	E9/125	**24-12E9/W(ZNG)Y-G94**	**23038137**
2 x 12	G50/125	**24-12G50/W(ZNG)YG94**	**23038138**
2 x 12	G50/125-OM3	24-12G50/W(ZNG)Y-G94-F	23041030
2 x 12	G62/125	**24-12G62/W(ZNG)Y-G94**	**23041031**
PE types, 5-way stranding			
2 x 12	E9/125	**24-12E9/WSN(ZNG)Y-Z150**	**22523758**
2 x 12	G50/125	**24-12G50/WSN(ZNG)Y-Z150**	**22521815**
2 x 12	G62.5/125	**24-12G62/WSN(ZNG)Y-Z150**	**22521816**
3 x 12	E9/125	36-12E9/WSN(ZNG)Y-Z150	
3 x 12	G50/125	36-12G50/WSN(ZNG)Y-Z150	
3 x 12	G62.5/125	36-12G62/WSN(ZNG)Y-Z150	
4 x 12	E9/125	**48-12E9/WSN(ZNG)Y-Z150**	**22523759**
4 x 12	G50/125	**48-12G50/WSN(ZNG)Y-Z150**	**22523761**
4 x 12	G62.5/125	48-12G62/WSN(ZNG)Y-Z150	22523762
5 x 12	E9/125	60-12E9/WSN(ZNG)Y-Z150	22523760
5 x 12	G50/125	60-12G50/WSN(ZNG)Y-Z150	
5 x 12	G62.5/125	60-12G62/WSN(ZNG)Y-Z150	
Enforced cable types acc. to customer specifications			
1 x 12	E9/125	E-1NDZ-GGT-12FS/A (SBB)	22523650
2 x 12	E9/125	**E-2DZ-GGT-24FS/A (Diax)**	**22521973**
5 x 12	E9/125	**E-5DZ-GGT-60FS/A (Diax)**	**22521987**

Types printed in bold are stock types.

RODENT-PROTECTED MULTI-FIBER LOOSE TUBE CABLES (STEEL-ARMOURED)



This cable type contains one multi-fiber loose tube up to max. 12 fibers. A first jacket includes the strain-relief and the multi-fiber loose tube. On this first jacket a steel wire armouring is applied, which offers excellent protection against rodent attacks. The outer jacket consists of the same material as the inner jacket.

Properties:

- Excellent rodent-protection
- Mechanically extremely robust
- Wide temperature range
- Halogen free, non-toxic
- Installation-friendly
- Tight bending radius
- LSFH™ variant self-extinguishing and low smoke

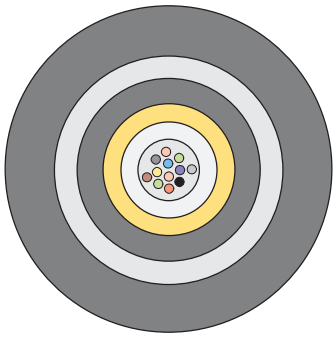
Field of application:

- For outdoor and indoor installations and in mechanically unprotected environments
- For installations directly in the ground
- For underwater applications up to 10 m (cable is 1.3 times heavier than water)
- LSFH™ variant is ideal for applications involving high safety requirements in case of fire

RODENT-PROTECTED MULTI-FIBER LOOSE TUBE CABLES (STEEL-ARMOURED)

Specification:

		Simplex	
Jacket Ø [mm]		8.0	
Multi-fiber loose tube Ø [mm]		3.0	with 2 to 12 Fibers
Approx. weight [kg/km]		65	
Max. allowable tensile load [N]	during installation (r > 130mm)	1000	IEC 60794-1-2 E1
	in service (r > 80mm)	500	
Min. Bending radius [mm]	during installation	130	IEC 60794-1-2 E11
	in service	80	
Crush resistance [N/cm]	during installation	400	IEC 60794-1-2 E3
	in service	200	
Impact resistance [Impacts]	Wp = 1.5 Nm/r = 25 mm	50	IEC 60794-1-2 E4
Repeated bending [Cycles]	r = 30 mm/Zug = 100 N	1000	IEC 60794-1-2 E6
Temperature range [°C]	during installation	–10 to +50	IEC 60794-1-2 F1
	in service	–25 to +70	
	in storage	–40 to +70	
Fire load [MJ/m]	LSFH™	1.45	
	PE	1.6	
Fire propagation	LSFH™	passed	IEC 60332-1

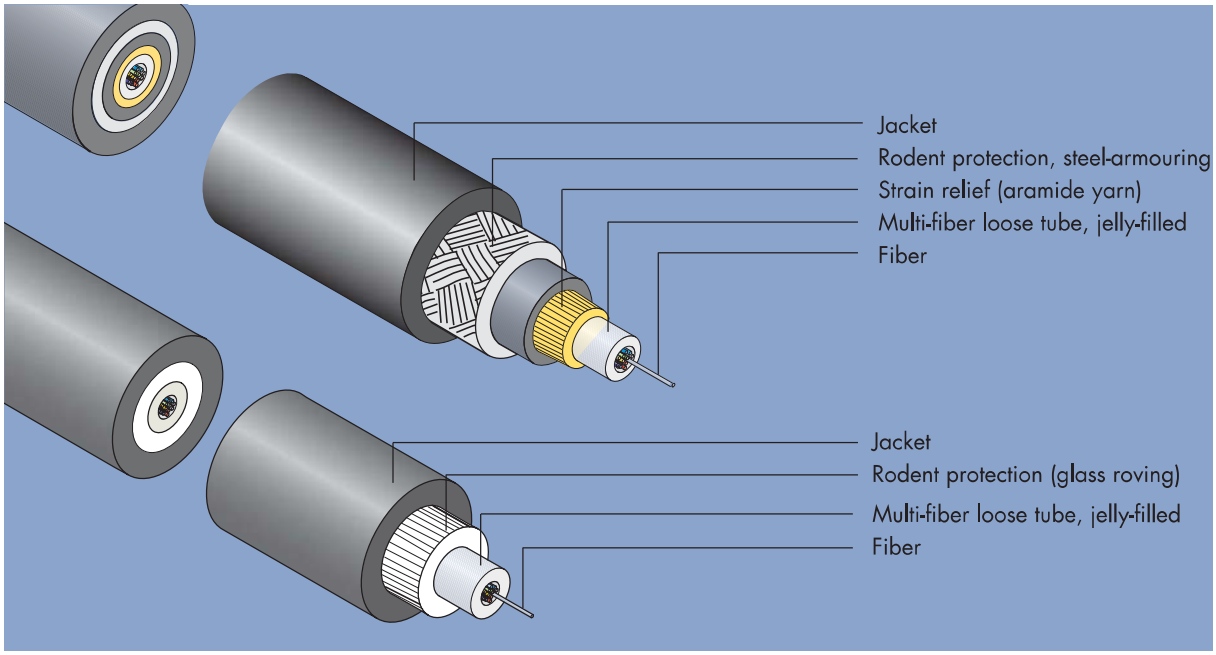


Ordering information:

Loose tubes x no. fibers	Fiber type	Color	Type	Part no.
1 x 12	E9/125	black	12-12E9/W(ZN)YAY-G80	22523660
1 x 12	G50/125	black	12-12G50/W(ZN)YAY-G80	22523658
1 x 12	G62/125	black	12-12G62/W(ZN)YAY-G80	22523659

Types printed in bold are stock items

SECUFIRE



SECUFIRE cables meet the highest safety requirements due to a jacket made of enhanced LSFH™ material. They contain 2 up to 12 fibers, have glass roving or braided steel wires for rodent protection. The construction guarantees a working data transmission in case of fire.
Fire damming due to strong self-extinguishing characteristics, low fire load and minimal fire propagation. High protection for humans and objects as only very little and non-toxic smoke is produced; therefore escape routes stay visible.

Properties:

- Halogen free, non-toxic
- Strong self-extinguishing characteristics
- Minimal fire propagation
- Low smoke emission
- Circuit integrity over 90 minutes
- Low fire load
- Rodent-protected
- Wide temperature range

Field of application:

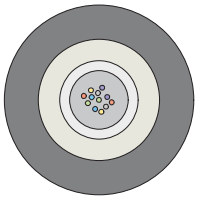
- Tunnels
- Underground railways
- Ships
- Premises cabling (e.g. airports, tower blocks, buildings)
- Other applications with highest safety requirements

SECUFIRE

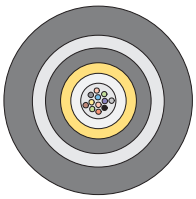
Specification:

		Glass-armoured	Steel-armoured	
Jacket Ø [mm]		8.0	8.0	
Multi-fiber loose tube Ø [mm]		3.0	3.0	
Approx. weight [kg/km]		82	82	
Max. allowable tensile load [N]	during installation	3000	1000	IEC 60794-1-2 E1
	in service	1000	500	
Min. bending radius [mm]	during installation	120	120	IEC 60794-1-2 E11
	in service	80	80	
Crush resistance [N/cm]	during installation	400	400	IEC 60794-1-2 E3
	in service	200	200	
Temperature range [°C]	during installation	–10 to +60		IEC 60794-1-2 F1
	in service	–40 to +70		
	in storage	–40 to +70		
Fire load [MJ/m]		1.2	1.3	
Fire propagation		passed	passed	IEC 60332-1
		passed*	passed*	IEC 60332-3 Cat. C
Fire test with circuit integrity		30 minutes	-	IEC 60331
Fire resistance for use in emergency circuits		90 minutes	-	EN 50200
Smoke emission		passed	passed	IEC 61034-2

* including optional circuit integrity during 20 minutes flame application and afterwards



Glass-armoured



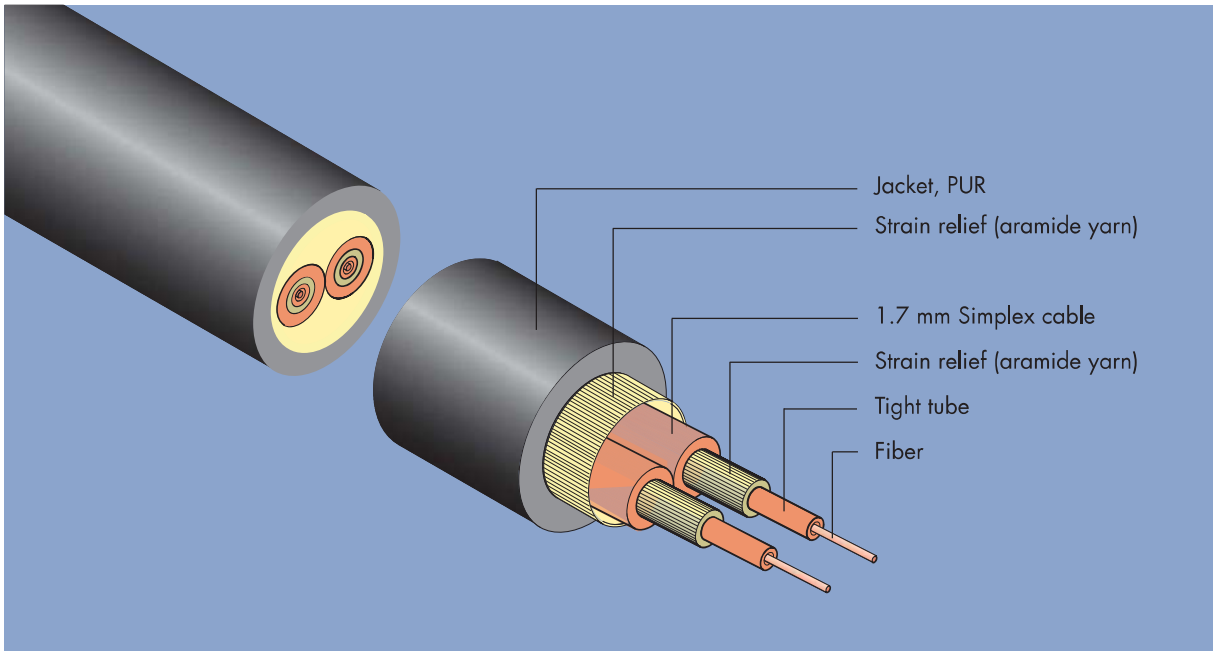
Steel-armoured

Ordering information:

No. of fibers	Armouring	Type	Part no.
Max. 12	glass-armoured	...-.../W(ZNG)H-...80-SF	
Max. 12	steel-armoured	...-.../W(ZN)HAH-...80-SF	

Example: 12-12G50/W(ZNG)H-G80-SF
Description: 12 x 50 micron multimode fiber, glass-armoured, LSFH black, Ø 8.0 mm, SECUFIRE

MINICORD BREAKOUT CABLES (RUGGEDISED)



This cable consists of 2 simplex cables which have additional strain relief yarn and a round outer jacket.
The small diameter of the 1.7 mm cables is suitable for terminations of Small-Form-Factor connectors.
The cable with its rugged construction features excellent mechanical, thermal and chemical resistance.

Properties:
- Rugged construction
- Single fiber strain relief for direct connector termination
- Suitable for repeated coiling and drag chain applications
- For spring-loaded connectors
- Very flexible
- Halogen free and low smoke

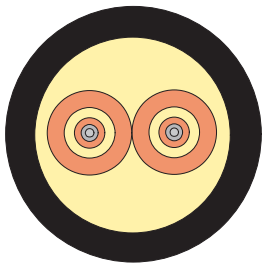
Field of application:
- Industry-LAN
- Machine cablings
- Mobile data cablings
- Connection of outdoor devices
- As data cable in distribution networks
- Drag chains

MINICORD BREAKOUT CABLES (RUGGEDISED)

Specification:

		2-way	
Jacket Ø [mm]		6.0	
Single fiber cable Ø [mm]		1.7	
Tight tube Ø [mm]		0.9	with 1 fiber
Approx. weight [kg/km]		28	
Max. allowable tensile load [N]	during installation (r > 90mm)	2000	IEC 60794-1-2 E1
	in service (r > 60mm)	1000	
Min. Bending radius [mm]		25	IEC 60794-1-2 E11
Crush resistance [N/cm]	short-term	600	IEC 60794-1-2 E3
	long-term	200	
Impact resistance [Impacts]	Wp = 1.5 Nm, r = 25 mm	200	IEC 60794-1-2 E4
Coiling capability [Cycles]	L=200m, reel d=240mm	5	HUBER+SUHNER
Torsion resistance [Rotations]	L=1m, 3 cycles, –40°C	±4	IEC 60794-1-2 E7
Drag chain capability [Cycles]	R=77mm, L=2.0m, v=2.2m/s	100000	HUBER+SUHNER
Temperature range [°C]	during installation	–20 to +60	IEC 61300-2-22
	in service	–40 to +70	
	in storage	–40 to +60	
Fire load [MJ/m]		0.6	

Technical data for cable with H200 fiber might vary slightly.



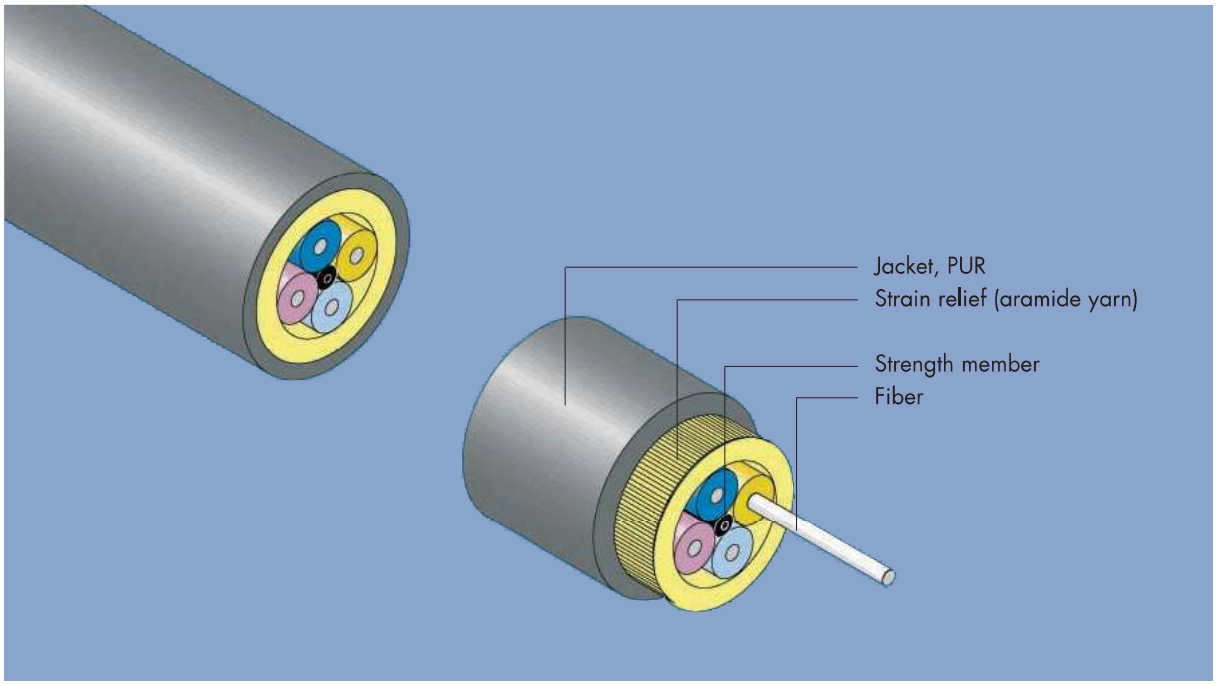
Ordering information:

Number of fibers	Fiber type	Color	Type	Part No.
2	G50/125	black	02-G50/FJ(ZN)Z-G17	23037747
2	G62/125	black	02-G62/FJ(ZN)Z-G17	23037748
2	H200/230	black	02-H200/FJ(ZN)Z-G17	23037749

Types printed in bold are stock items

Coding of single fiber cable: orange numbered
Material of single fiber cable: LSFH™

FIELD CABLES



Field cables excel by their high mechanical loading capacy and a good chemical constancy and are therefore ideal for rough industrial and military applications. Due to the rugged, but flexible construction this cable is suitable for drag chains or coiling applications.

Properties:
- Operational temperature: –40°C to +80°C
- Longitudinal and transversal watertight
- MIL- and DOD-proven
- halogen free
- very flexible

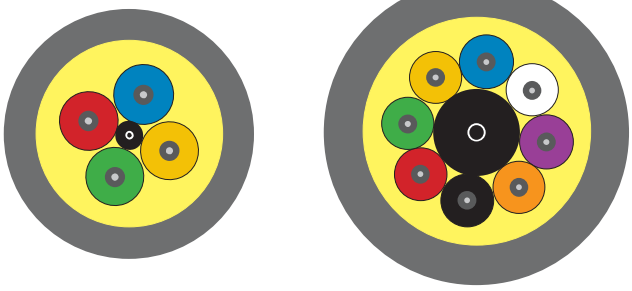
Field of application:
- Mobile data cablings
- Drag chains
- Riser zone cablings
- Machine cablings
- Military cablings

FIELD CABLES

Specification:

		Field cable 4-way	8-way	
Jacket Ø [mm]		6.0	7.0	
Tight tube Ø [mm]		0.9	0.9	with 1 fiber
Approx. weight [kg/km]		26	39	
Max. allowable tensile load [N]	during installation (r > 90/100mm)	4000		DOD-STD 1678, Meth. 3019
	in service (r > 60/75mm)	2000		
Min. Bending radius [mm]	during installation	90	100	IEC 60794-1-2 E11
	in service	60	75	
Crush resistance [N/cm]	during installation	4000	4000	DOD-STD 1678, Meth. 2040
	in service	1000	1000	
Impact resistance [Impacts]	Wp = 2.25 Nm/ r = 25 mm	200	-	DOD-STD 1678, Meth. 2030
Repeated bending [Cycles]	r = 30 mm/ Zug = 100 N	20000	-	DOD-STD 1678, Meth. 2010
Torsion resistance [rotations]	L=1m, 3 cycles, –40°C	±4	-	IEC 60794-1-2 E7
Coiling capability [Cycles]	L=200m, reel d=240mm	5	5	HUBER+SUHNER
Drag chain capability [Cycles]	r=77mm, L=2.0m, V=2.2m/s	100000		HUBER+SUHNER
Temperature range [°C]	during installation	–40 to +80		IEC 60794-1-2 F1/61300-2-22
	in service	–40 to +80		MIL-STD 810, Meth. 501
	in storage	–60 to +80		
Fire load [MJ/m]		0.5	0.78	

Technical data for cable with H200 fiber might vary slightly.

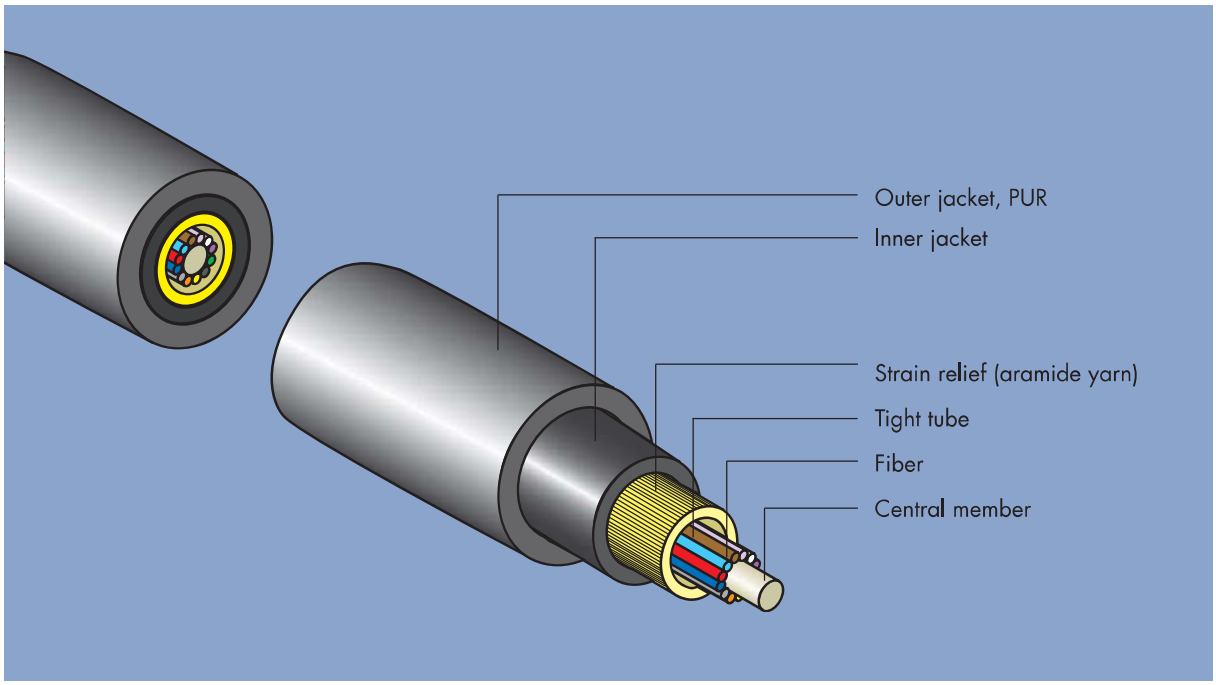


Ordering information:

No. of fibers	Fiber type	Color	Type	Part no.
4	E9/125	black	04-E9/FSN(ZN)Z-G60	23026401
4	**G50/125**	**black**	**04-G50/FSN(ZN)Z-G60**	**22523400**
4	**G62.5/125**	**black**	**04-G62/FSN(ZN)Z-G60**	**22523401**
4	H200/230	black	04-H200/FSN(ZN)Z-G60	23027971
8	G50/125	black	08-G50/FSN(ZN)Z-G70	23032139

Types printed in bold are stock items

DRAG CHAIN CABLES



Constructed with an optimized high mechanical flexibility and high kink resistance, this cable is designed for medium to big drag chains with lengths up to several hundred meters. The cable contains up to 12 tight buffered fibers, an aramide yarn for reinforcement and two thermoplastic jackets. The outer jacket is made out of polyurethan and excels with a high abrasion and good environmental resistance.

Properties:
- Rugged construction
- Excellent mechanical flexibility
- Small bending radius
- High tensile strength
- Wide temperature range
- Halogen free, non-toxic
- High kink resistance

Field of application:
- Medium to large drag chains
- Cabling in industrial applications

DRAG CHAIN CABLES

Specification:

		up to 12 fibers	
Jacket Ø [mm]		13.0	
Tight tubes Ø [mm]		0.9	color coded
Approx. weight [kg/km]		133	
Max. allowable tensile load [N]	during installation	4000	IEC 60794-1-2 E1
	in service	2000	
Min. Bending radius [mm]	during installation	200	IEC 60794-1-2 E11
	in service	100	
Crush resistance [N/cm]	short-term	400	IEC 60794-1-2 E3
	long-term	200	
Repeated bending [Cycles]	R = 100mm, F = 50N	5000	IEC 60794-1-2 E6
Drag chain capability [Cycles]	R=100mm, L=2.0m, v=2.0m/s	1 Mio.	HUBER+SUHNER
Temperature range [°C]	during installation	–10 to +50	IEC 60794-1-2 F1
	in service	–30 to +90	
	in storage	–40 to +90	
Fire propagation		passed	IEC 60332-1
Fire load [MJ/m]		3.5	

Ordering information:

No. of fibers	Fiber type	Color	Type	Part no.
Max. 12			.../FSN(ZN)YZ-..130	

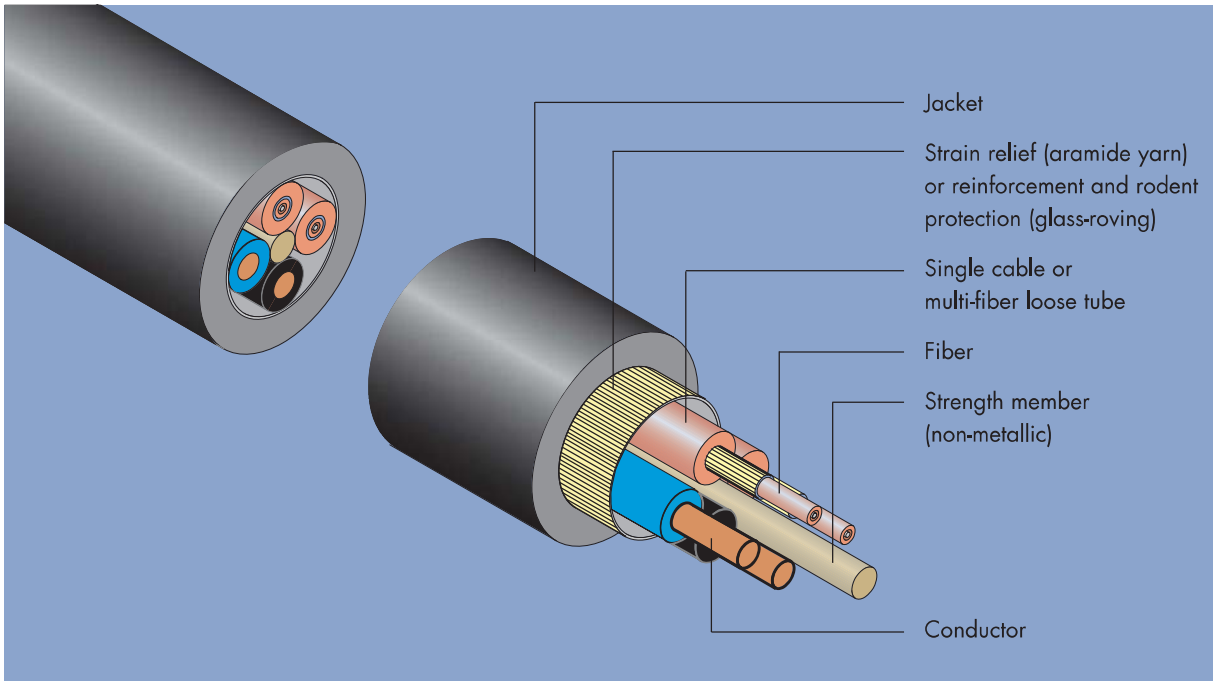
Example: 12-12G50/FSN(ZN)YZ-G130
Description: 12 x 50 micron multimode fiber, glass-armoured, PUR black, Ø 13 mm

Fiber configurations:

4 fibers	2 dummies	between 2 single buffered fibers
6 fibers	1 dummy	between 2 single buffered fibers
8 fibers	1 dummy	between 2 pairs of buffered fiber
12 fibers	no dummies	buffered fibers are side by side

Buffered fibers are color coded according to the standard color code, dummies are black

HYBRID CABLES



Copper and glass
Hybrid cables integrate fiber optic and electrical conductors in one jacket. High data quantities can be transmitted via optical fibers; the energy supply occurs through the electrical conductors. The installation of two cables is thus avoided. Four basic types of hybrid cables may be configured within the defined frame.

Properties:

- Combination of fiber-optic cables with Cu power cables
- Use of commercial connectors
- Jacket material selection same as with fiber-optic cables (e.g. flame-retardant, halogen free)
- Glass-armoured cables possible

Field of application:

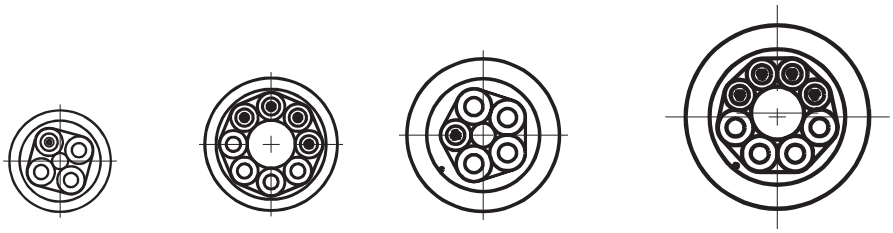
- As data and power cable for industry, LAN, video, telephone, customer-specific applications, etc.

Types:

Breakout cable: …–…/CWJSN(ZN)H-D27+x-Cyy
Multi-fiber loose tube: …–…/WSN(ZNG)…-G…+x-Cyy

yy: Conductor diameter in 1/10mm²
C: Conductors
x: Number of copper conductors

HYBRID CABLES



Specification:

The configuration occurs according to the following specification:

	4-way Breakout	**8-way Breakout**	**5-way Multi-fiber loose tube**	**8-way Multi-fiber loose tube**
Amount of elements for the configuration	4	8	5	8
Fiber optic cable Ø2.7mm, numbered channels, orange	1 to 4 pieces	4 to 8 pieces	–	–
Multi-fiber loose tube Ø3.0mm	–	–	1 to 5 bundles à 2/4/6/8/10/12 fibers per bundle	1 to 8 bundles à 2/4/6/8/10/12 fibers per bundle
1.5mm² conductor[1)]	0 to 3 pieces	0 to 4 pieces	0 to 4 pieces	0 to 4 pieces
2.5mm² conductor[1)]	–	–	0 to 4 pieces	0 to 4 pieces
3.0mm empty elements	–	–	0 to 2 pieces	0 to 2 pieces
LWL-Fiber types	E9, G50 oder G62			
Jacket material for Ø2.7mm FO cable	LSFH™	LSFH™	–	–
Jacket material for outer jacket	LSFH™	LSFH™	PE or LSFH™	PE or LSFH™
Strain-relief/Armouring	Aramide	Aramide	Glasroving	Glasroving
Outer diameter	10 mm	13 mm	15 mm	18 mm
Jacket color	black	black	black	black
Inscription	H+S Standard	H+S Standard	H+S Standard	H+S Standard

[1)] Conductor in black, blue or yellow/green
Selection: 2 conductors – one in black and one in blue
3 conductors – one of each: black, blue and yellow/green
4 conductors – three black and one yellow/green

Please note:
Max. delivery length is 4000 m

HYBRID CABLES

Technical data breakout cables:

		4-way	8-way	
Weight [kg/km]		to 110	to 173	
Allowable tensile load [N]	during installation	2000	4000	IEC 60794-1-2 E1B
	in service	1000	2000	
Min. Bending radius [mm]	during installation	150	200	IEC 60794-1-2 E11B
	in service	100	130	
Crush resistance	during installation	1000	1000	IEC 60794-1-2 E3
[N/cm]	in service	200	200	
Impact resistance [Impacts]	Wp = 2.21 Nm/r = 25 mm	50	50	IEC 60794-1-2 E4
Temperature range [°C]	during installation	–10 to +50	–10 to +50	IEC 61300-2-22
LSFH™	in service	–20 to +70	–20 to +70	
	in storage	–25 to +70	–25 to +70	

Technical data multi-fiber loose cables:

		5-way	8-way	
Weight [kg/km]		to 300	to 385	
Allowable tensile load [N]	during installation	9000	13000	IEC 60794-1-2 E1B
	in service	4500	6500	
Min. Bending radius [mm]	during installation	225	270	IEC 60794-1-2 E11B
	in service	150	180	
Crush resistance	during installation	800	800	IEC 60794-1-2 E3
[N/cm]	in service	300	300	
Impact resistance [Impacts]	Wp = 4.41 Nm/r = 25 mm	100	100	IEC 60794-1-2 E4
Temperature range [°C]	during installation	–10 to +60	–10 to +60	IEC 60794-1-2 F1
PE	in service	–40 to +70	–40 to +70	
	in storage	–40 to +70	–40 to +70	
Temperature range [°C]	during installation	–10 to +60	–10 to +60	IEC 60794-1-2 F1
LSFH™	in service	–25 to +70	–25 to +70	
	in storage	–40 to +70	–40 to +70	

Specification of electrical conductors:

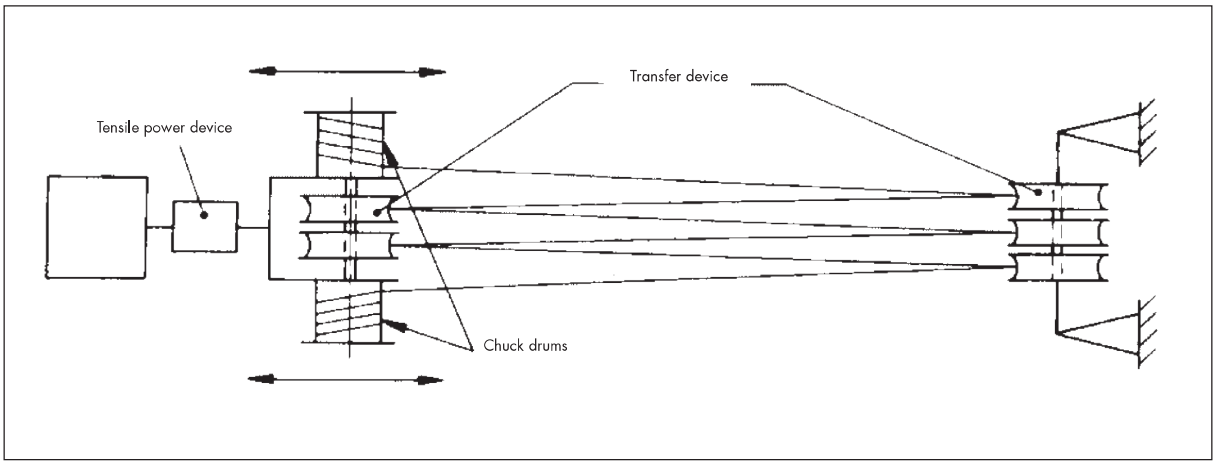
Conductor profile	**[mm²]**	**1.5**	**2.5**
Conductor type		Tinned copper cords	Tinned copper cords
Diameter conductor	[mm]	1.5	2.1
Diameter insulation	[mm]	2.7	3.5
Test voltage U_0/U	[V]	600/1000	600/1000
Electrical resistance	[Ω/km]	13.7	8.2
Jacket material		RADOX® 125, halogen free	RADOX® 125, halogen free

SUHNER FIBEROPTIC test procedures: the guarantee for highest quality

SUHNER FIBEROPTIC cables are oriented towards the utility, the needs of the customer and the market: they fulfil highest safety and reliability requirements. To guarantee this standard on a long-term basis, each product has to undergo a complete standardized test procedure before delivery, so that the function is maintained also under the hardest conditions.

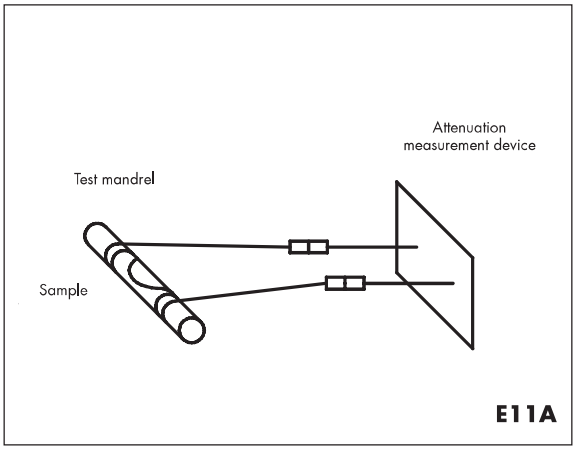
Tensile test acc. to IEC 60794-1-2 E1

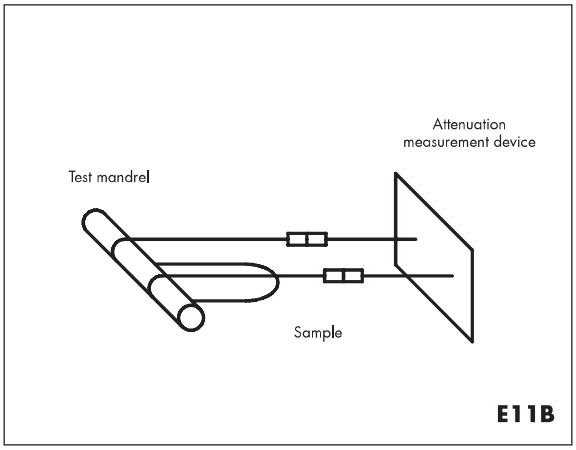
The tensile test determines the attenuation behaviour of the cable design under tensile load.



Bending behaviour acc. to IEC 60794-1-2 E11A/B

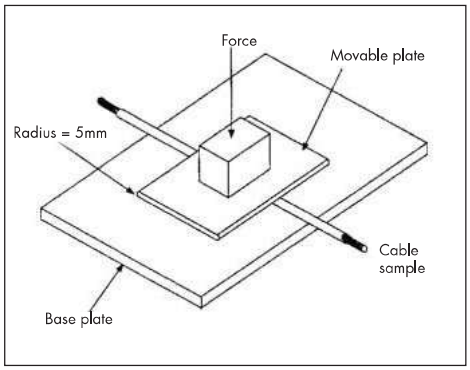
This test determines the resistance of a optical fibre cable under a bending load.



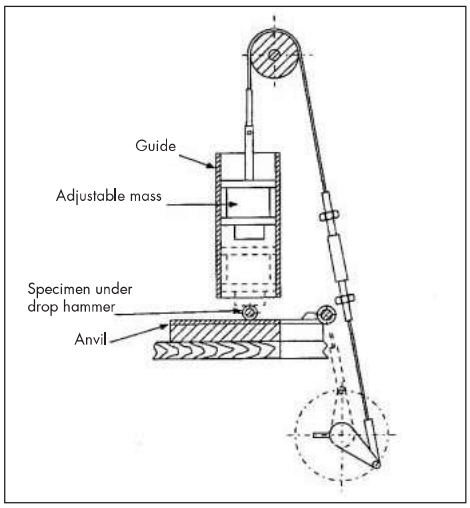


TESTING METHODS

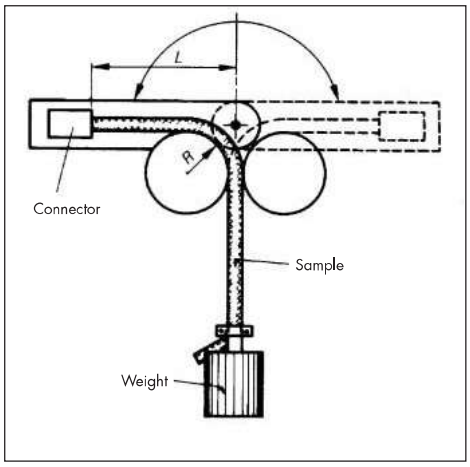
Compressive strength acc. to IEC 60794-1-2 E3
The purpose of this test if to determine the ability of an optical fibre cable to withstand crushing.



Impact strength acc. to IEC 60794-1-2 E4
To determine the resistance of an fibre optic cable towards imptacts, a weight is dropped vertically on a steel plate.
The cable jacket may not show any damage.



Repeated bending acc. to IEC 60794-1-2 E6
The purpose of this test is to determine the ability of an optical fibre cable to withstand repeated bending under tension. This occurs by bending the cable sample forwards and backwards by 180°.

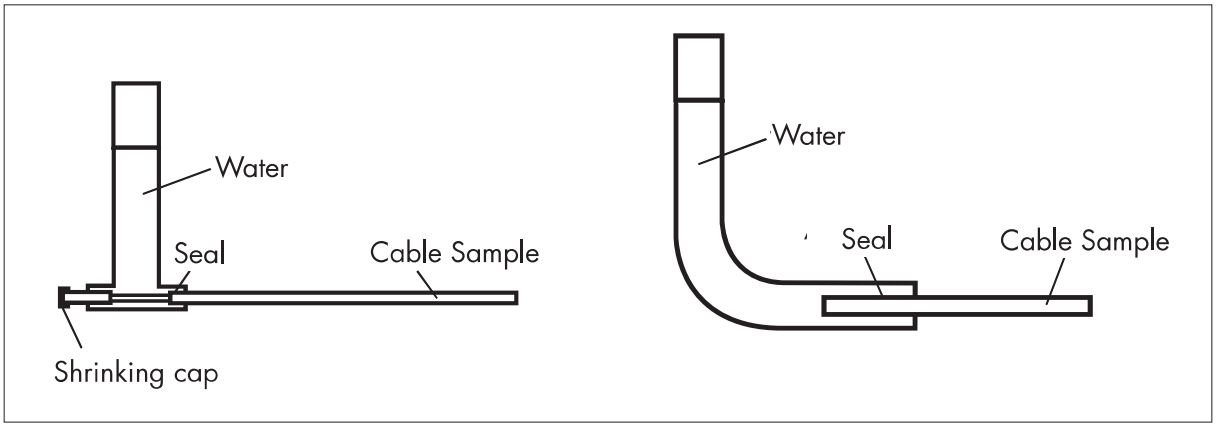


TESTING METHODS

Temperature stress acc. to IEC 60794-1-2 F1
The temperature test determines the cable's resistance respectively the attenuation stability at changing temperatures. The smaller the attenuation change the more suitable the cable design is for use at extreme temperatures.

Temperature stress acc. to IEC 61300-2-22
In this test, assemblies (patch cables) are exposed to changing temperatures in order to be able to measure the effect on the attenuation. The measurement values show the quality of the cable, of the connector and the combination of both components. The testing method represents the real application of the components as assembly.

Longitudinal water tightness acc. to IEC 60794-1-2 F5A/B
A damage of the cable jacket can cause the penetration of water or humidity into the cable core. This test determines the resistance of the cable towards water penetration.

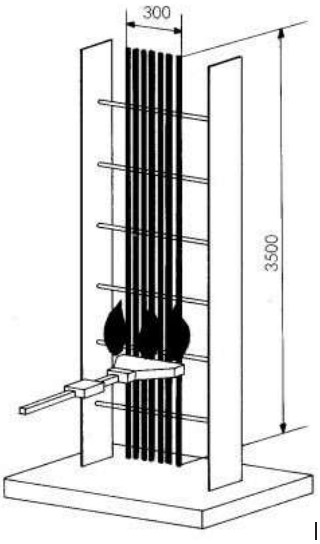


Fire behaviour acc. to IEC 60332-1/-3
The test arrangement checks the self-extinguishing characteristics of a cable mounted vertically under defined conditions.

IEC 60332-1: on a single cable
IEC 60332-3: on a cable bundle

Fire test with circuit integrity according to IEC 60331
The purpose of this test is to determine the circuit integrity in case of a fire on a horizontal single cable.

Fire test with circuit integrity acc. to EN 50200, method of tests for resistance to fire of unprotected small cables used in emergency circuits. During the test duration of 90 minutes every 5 minutes a hammer inpact is applied on the support plate holding the sample.



IEC 60332-3