

Fiber Optic Cables Assemblies, Connectors and Accessories



The Quality Connection

LEONI

LEONI Fiber Optics

LEONI Fiber Optics is your specialist for the fiber optics you use in your industrial applications. Our product range includes POF (plastic) and PCF cables, ready-made cables, connectors and accessories.

In addition to supplying these hardware items, we would also be pleased to advise you on any issues relating to active components that may arise during the development of your fiber optic system. You can count on the more than ten years of experience that we have accumulated in the development of fiber optic systems (and which is not limited to POF and PCF fiber optics). We also work very closely with the POF Applications Center at the University of Applied Sciences in Nuremberg.

We actively and regularly participate in conferences in this specialist area, and we remain in close contact with other companies in the industry. This network gives us access to a wealth of knowledge and experience, which is an advantage that our customers value very highly.



Edition: September 2007
Subject to change and error.

Your specialist for fiber optics

LEONI has been involved in the development and production of plastic fiber optic cables for quite some time. The LEONI iQ-LINE product line was introduced primarily to provide an optimal solution for the industrial applications market.

LEONI Fiber Optics GmbH evolved from the FO-Systems GmbH company, a wholly owned subsidiary of LEONI. Our team at LEONI Fiber Optics combines expertise acquired through many years of experience in developing, producing and distributing fiber optic cables as well as through in-depth exchange of ideas on-site with our customers about their application requirements.

The term "fiber optic" comprises fibers for telecommunications applications and fiber optic cables made of polymer or glass/polymer combinations, an area that is becoming increasingly interesting. By specialising in and pooling such extraordinary areas of expertise we are responding not only to the current market trend, but are also able to provide professional support in all areas of fiber optic technology.

In addition to our line of standard products, which continue to deliver dependable performance in the field, we can also offer you tailored cable solutions to meet your exact requirements.

This catalogue is intended to give you an initial look at what we have to offer in the field of fiber optics. We would be pleased to provide any advice you might need.

Contents

Preface	4
Quality & environmental management	5
Jacket material	6
Attenuation test	7
Labelling code	8
Part number codes for ordering	9
POF	
Cables	10
Fiber specifications	18
Connectors	20
PCF	
Cables	24
Fiber specifications	30
Connectors	32
Quartz fiber from UV to IR	
Cables	36
Fiber specifications	40
Connectors	45
Assembly tools	
Stripping tools	46
Crimp and cleave tools	47
Polishing tools	48
Measuring equipment	50
Termination kit	52
LEONI	
LEONI service	54
LEONI also produces...	55



Plastics are attracting increasing attention as a means to transmit information. Pure **fiber optics (POF – polymer optical fiber)** and **plastic-coated glass fiber optics** with step index profile have been on the market for years.

POF & PCF

The future transmission media

Plastics are attracting increasing attention as a means to transmit information. Pure polymer optical fibers (POF) and polymer clad silica fibers (PCF) with step index profile have been on the market for years. They have been used primarily in high-range digital audio systems, the automotive industry, some segments of lighting technology, medical technology, and on bus systems in industrial applications. Bus system applications are found primarily where there are significant EMC issues and the transmission path is relatively short.

Compared to conventional glass fiber optics, plastic fiber optics have the advantage of greater flexibility (high alternate bending stress with small bend radii), and they are also a low-cost connection and transmission solution. These factors are particularly important in mechanical engineering and automation applications. Polymer fiber optics also have all the essential properties – including low EMC susceptibility, perfect galvanic isolation, low susceptibility to electronic surveillance, no cross talk, low weight, etc. – that are generally associated with fiber optics.

Compared to common single-mode and multi-mode fiber optics, polymer fiber optics have a higher attenuation, which reduces their range, and they have a smaller bandwidth. The latest developments (e.g. gradient index POF), which are currently in the market introduction phase, show that there is still significant potential for improved

performance. With the introduction of Ethernet technology and LAN networking in industrial applications, designers and planners have been taking a closer look at POF and PCF.

The distances that can now be bridged are 70 m for POF fibers and 500 m for PCF fibers, regarded as sufficient for industrial applications. If you consider that the average length from the floor distribution board to a workstation in a local network is 45 m, then it would appear that using POF/PCF is not so unrealistic. Solutions are already available for small office and home networks.

Once the necessary hardware is available in sufficient quantities and at an affordable price, POF/PCF will certainly become an attractive option in many office networks. Despite the drive towards higher and higher bandwidths, 125 Mbit/sec Ethernet connections will be adequate for most applications in the near future, especially if the user focuses on the cost-benefit aspect.

The “LEONI iQ-LINE” offers you various cable designs using plastic or PCF fiber optics to enhance our existing broad range of fiber optic cables and to allow you to select the best transmission medium for your application.

Current certificates:
 ISO TS 16949,
 DIN EN ISO 9001:2000,
 DIN EN ISO 14001



We must consistently maintain the high quality level of our products. To accomplish this, we permanently monitor the entire process, from planning right through to the final production step of a product. Our quality management system has been certified to DIN/ISO 9001 and QS 9000/VDA 6.1.

LEONI iQ-LINE – Innovative Quality Surveillance

All cables that leave our factory are tested to ensure that they comply with attenuation specifications. We are one of the few manufacturers worldwide who use a method which enables us to measure attenuation over a length of 500 m. This reduces measurement errors, and it allows us to produce longer cables.

Information printed on the cable includes a combination of production order and drum number that provides complete traceability for the production process, starting from incoming inspection of the fibers right through shipment of the cable. Years later we will still be able to recall, for example, the parametric measurement data for a particular cable.

We see no conflict between business success and responsibility for the environment. As a corporation with production facilities around the globe, we recognize our responsibility to make our contribution to preserving the natural basis for life. We attempt to strike a balance between what is good for the environment and what is good for the company. This makes environmental protection a compulsory element of our corporate activities.

We encourage our business partners to act according to the same environmental guidelines we use, and we provide advice to our customers about how to use and dispose of our products in a way that is gentle on the environment.

Our environment management system, which has been certified to DIN EN ISO 14001, ensures that our environmental policy is effectively implemented.

Jacketing material

- ++ excellent
 + good
 ● depends on recipe
 - weak
 -- inadequate

- 1) increase in UV resistance by addition of black color pigments or UV stabilizers
- 2) permeation depends on type of gas, e.g. Ar, CH₄, N₂, O₂ low gas permeation, CO₂, H₂, He higher gas permeation
- 3) low swelling in saturated hydrocarbons; significant swelling in aromatic hydrocarbons and aliphatic esters cause swelling, highly polar organic solvents dissolve causing extreme swelling
- 4) swelling in aliphatic and aromatic hydrocarbons and in chlorinated hydrocarbons
- 5) not resistant to chlorinated hydrocarbons, resistant to hydrocarbons and aliphatic and aromatic solvents

Core sheath (POF only)

material properties	PE	PA	PVC
non-aging	+	+	+
halogen-free	+	+	--
non-flammability	- -/●	-	+
elasticity	-	+	●
abrasion resistance	+/-	+	+
low fume generation	- -/●	+	-
low emission of corrosive gases	+ /●	++	--
low fume toxicity	+ /●	++	--
no toxicological risk	+ /●	++	-

Cable sheath material

TPE-O (FRNC)	TPE-U (PUR)	PVC	PE
+	+	+	+
+	+	--	+
+	+	+	- -/●
-	+	●	-
-	++	+	+/-
++	●	-	- -/●
++	●	--	+ /●
++	●	--	+ /●
++	●	-	+ /●

general resistance to	PE	PA	PVC
UV light	1)	+	+
water absorption	+	--	+
gas diffusion	●		
fuels	+/-	+	+
petroleum/lubricants	+	+	●
organic solvents	+ 4)	+ 5)	-
alcohol	+	+	+
oxidants	-	-	+
acids	++	-	+
alkaline solutions	+	+	+
saline solutions	+	-	+

TPE-O (FRNC)	TPE-U (PUR)	PVC	PE
1)	1)	1)	1)
-	-	+	+
-	2)		●
-	+	+/-	+
-	++	●	+
-	+ 3)	-	+ 4)
-	-	+	+
-	-	+	-
+	--	+	++
+	--	+	+
	-	+	+

Balancing application and fire protection criteria

The core and sheath materials are designed to protect the fiber(s) from mechanical, thermal or chemical effects and prevent the penetration of moisture. On the other hand, in case of fire the materials should not spread the fire and there should be no build up of toxic and corrosive fumes. Halogen-free and flame-retardant materials should be used to protect equipment, buildings and above all people. PUR and PVC are the solution of choice for use in hard industrial environments because of their high resistance to oil and their abrasion resistance. PE is commonly used as a sheath material in outdoor applications.

It is difficult to fulfill all the requirements with just one sheath material. To find the best solution given the conditions on-site, LEONI offers a choice of standard materials.

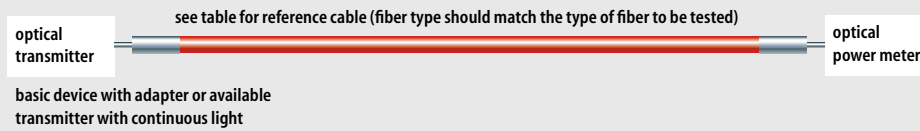
If your application criteria cannot be met with the cable designs and materials that appear in this catalogue, please contact us. It is often possible to meet additional requirements by making specific changes to the sheath design (for example, aluminum tape or special material mixtures).

LEONI

Attenuation test

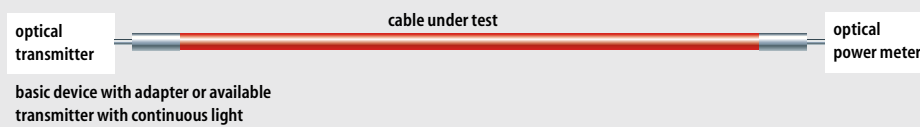
1. Reference measurement

Measure the light power after the reference cable – P_S in [dBm]



2. Measurement of the cable under test

Measure light power at the remote end of the cable under test – P_L in [dBm]



3. Analysis

3.1 Attenuation $A = P_L - P_S$

3.2 Attenuation coefficient $\alpha = \frac{A}{L}$ dB/km (L stands for length of the cable under test in km)

4. Comparison with allowable threshold

4.1 Attenuation

Find the maximum allowable attenuation in the description of the system you are using. This value must always be greater than attenuation A which you measured. You should leave a reserve of 3 dB.

4.2 Attenuation coefficient

α_{\max} for POF typ. 230 dB/km at 660 nm

α_{\max} for PCF typ. 10 dB/km at 660 nm

typ. 8 dB/km at 850 nm

The method described above gives you a simple and quick way how to determine the attenuation of a ready-made cable.

Measuring attenuation – an uncomplicated method for use in practical applications

Tip

If you use PCF fiber optics in systems for POF, in other words 660 nm and your system is not explicitly specified for PCF fibers, proceed as follows:

- use a POF cable instead of a PCF cable as a reference cable

- attenuation:

$$A = P_L (\text{PCF cable}) - P_S (\text{POF reference})$$

In our analysis (4.1), the maximum allowable attenuation must be greater than the attenuation you have measured.

Experience shows that this method is one of the most reliable, but you cannot determine the attenuation coefficient (3.2) in this way.

It is better to use the transmitter that is built into the system (and not the transmitter described above).

Reference cable for attenuation measurement

Order No.	Connector type	Fiber type
KXST-XST 11001m	ST (BFOC)	POF
KSMA-SMA 11001m	FSMA	POF
KF05-F0511001m	F05	POF
KHPS-HPS11001m	HP	POF
KXST-XST72001m	ST (BFOC)	PCF
KSMA-SMA72001m	FSMA	PCF
KF05-F0572001m	F05	PCF
KHPS-HPS72001m	HP	PCF

Labelling code for LEONI iQ-LINE POF and PCF cables

**POF cables**

- 1** **Product code**
A- → Outdoor-cable | AT- → Breakout-cable |
I- → Indoor-cable
- 2** **V**
Tight-buffered construction
- 3** **Material of the inner jacket**
4Y → PA | 2Y → PE | Y → PVC
- 4** **(ZN)** Non-metallic pull elements
(can also be at pos. 2, if a pull element is in center)
- 5** **Material of the outer jacket**
11Y → PUR | 2Y → PE | Y → PVC
H → Halogen-free and flame retardant
- 6** **Number of fibers**
- 7** **P**
PMMA-Fiber with step index profile
- 8** **Core diameter**
(980 μm)
- 9** **Cladding diameter**
(1000 μm)
- 10** **Attenuation**
(dB/km)
- 11** **Wavelength**
(A = 650 nm)
- 12** **Bandwidth**
(MHz x 100 m)
- 13** **Supplemental information**
e.g. hybrid cables

**PCF cables**

- 1** **Product code**
A- → Outdoor-cable | AT- → Breakout-cable |
I- → Indoor-cable
- 2** **V**
Tight-buffered construction
- 3** **(ZN)** Non-metallic pull elements
(can also be at pos. 2, if a pull element is in center)
- 4** **Material of the outer jacket**
11Y → PUR | 2Y → PE | Y → PVC
H → Halogen-free and flame retardant
- 5** **Number of fibers**
resp. (no. of tubes) x (no. of fibers per tube)
→ (n x m)
- 6** **K**
Polymer cladded fibers with step index profile
- 7** **Core diameter**
(200 μm)
- 8** **Cladding diameter**
(230 μm)
- 9** **Attenuation**
(dB/km)
- 10** **Wavelength**
(A = 650 nm | B = 850 nm)
- 11** **Bandwidth**
(MHz x km)
- 12** **Supplemental information**
e.g. hybrid cables

Short type identifiers for POF and PCF cables, according to DIN VDE 0888 Parts 3 to 6 (3/96).

POF Cables

POF – Polymer Optical Fibers

Polymer optical fiber (POF) is a pure plastic fiber that consists of a transparent core and a cladding, which has a smaller refraction index than the core material. Compared to silica fiber, POF has much higher attenuation values and a larger diameter of 980/1,000 μm . The standard POF has a 2.2 mm diameter fiber jacket. It is economical, lightweight, easy to install and, just like optical fiber, does not have any problems with EMC as well as making clean galvanic isolation possible.

POFs enable data to be transmitted at up to 125 Mbit/s over distances of up to 70 m, which is normally sufficient for industrial environments and smaller office as well as home networks. It is even possible to cover distances up to 150 m by selecting suitable active components.



V-2Y 1P980/1000

Order No.: 84A00100S000

Code no.: 11

Application: for simple mechanical load
Assembly: direct connector pre-assembly

Length: 2100 m



V-2Y 1P980/1000

POF cables are available for both indoor and outdoor applications. We offer many different designs to meet the large variety of applications in the industrial environment. Special requirements in terms of flexibility, resistance to oil, resistance to UV-light, halogen-free or flame-retardant properties are met by selecting suitable materials.

Construction

Fiber sheath material	PE
Number of POF elements	1
Outer diameter	2.2 mm

Mechanical properties

Bending radius min.	short term	25 mm
	during operation	25 mm
Tensile strength max.	short term	15 N
	during operation	5 N
Weight	approx. 3.8 kg/km	
Ambient temp. during operation	-55 °C to +85 °C	

Transfer characteristics

Attenuation	at 650 nm (Laser)	< 160 dB/km
	at 660 nm (LED)	< 230 dB/km



V-Y 1P980/1000

Order No.: 84A00200S777

Code no.: 14
Application: for simple mechanical load
Assembly: direct connector pre-assembly
Length: 500 m



V-4Y 1P980/1000

Order No.: 84A00300S000

Code no.: 12
Application: for strong mechanical load and highly flexible applications with small bending radii
Assembly: direct connector pre-assembly
Length: 5000 m



V-4Y 1P980/1000

Order No.: 84A00300S262

Code no.: 16
Application: for strong mechanical load and highly flexible applications with small bending radii
Assembly: direct connector pre-assembly
Length: 500 m



V-2Y 2x1P980/1000

Order No.: 84B00100S000

Code no.: 13
Application: for simple mechanical load
Assembly: direct connector pre-assembly
Length: 500 m



V-Y 1P980/1000



V-4Y 1P980/1000



V-4Y 1P980/1000



V-2Y 2x1P980/1000

PVC
1
2.2 mm

PA
1
2.2 mm

PA
1
2.2 mm

PE
2
2.2 x 4.4 mm

short term	25 mm
during operation	25 mm
short term	15 N
during operation	5 N
approx. 3.8 kg/km	
-40 °C to +85 °C	

short term	20 mm
during operation	20 mm
short term	60 N
during operation	10 N
approx. 4.3 kg/km	
-55 °C to +85 °C	

short term	20 mm
during operation	20 mm
short term	60 N
during operation	10 N
approx. 4.3 kg/km	
-55 °C to +85 °C	

(over flat side)	
short term	25 mm
during operation	25 mm
short term	20 N
during operation	10 N
approx. 7.6 kg/km	
-55 °C to +85 °C	

at 650 nm (Laser)	< 160 dB/km
at 660 nm (LED)	< 230 dB/km

at 650 nm (Laser)	< 160 dB/km
at 660 nm (LED)	< 230 dB/km

at 650 nm (Laser)	< 160 dB/km
at 660 nm (LED)	< 230 dB/km

at 650 nm (Laser)	< 160 dB/km
at 660 nm (LED)	< 230 dB/km



I-V4Y(ZN)11Y 1P980/1000 HEAVY

Order No.: 84C00100S333

Code no.: 21

Application: in harsh industrial environment, suitable for drag chain

Assembly: direct connector pre-assembly

Length: 500 m



I-VY(ZN)Y 1P980/1000

Order No.: 84C00200S333

Code no.: 26

Application: flexible applications within ranges with small dynamic stress

Assembly: direct connector pre-assembly

Length: 500 m



I-V2Y(ZN)11Y 1P980/1000

Order No.: 84C00800S333

Code no.: 23

Application: flexible applications within ranges with small dynamic stress

Assembly: direct connector pre-assembly

Length: 500 m

POF Cables



I-V4Y(ZN)11Y 1P980/1000 HEAVY



I-VY(ZN)Y 1P980/1000



I-V2Y(ZN)11Y 1P980/1000

Construction

Fiber sheath material	PA	PVC	PE
Outer jacket material	PUR	PVC	PUR
Number of POF elements	1	1	1
Outer diameter	6.0 mm	3.6 mm	3.6 mm

Mechanical properties

Bending radius min.	short term	50 mm	short term	70 mm	short term	70 mm
	during operation	30 mm	during operation	50 mm	during operation	50 mm
Tensile strength max.	short term	500 N	short term	250 N	short term	250 N
	during operation	200 N	during operation	100 N	during operation	100 N
Weight	approx. 32 kg/km		approx. 12 kg/km		approx. 11 kg/km	
Ambient temp. during operation	-20 °C to +70 °C		-20 °C to +70 °C		-20 °C to +70 °C	

Transfer characteristics

Attenuation	at 650 nm (Laser)	< 160 dB/km	at 650 nm (Laser)	< 190 dB/km	at 650 nm (Laser)	< 160 dB/km
	at 660 nm (LED)	< 230 dB/km	at 660 nm (LED)	< 290 dB/km	at 660 nm (LED)	< 230 dB/km



I-V2Y(ZN)11Y 1P980/1000

Order No.: 84C010005333

Code no.: 22
Application: in harsh industrial environment, suitable for drag chain
Assembly: direct connector pre-assembly
Length: 500 m



I-V2Y(ZN)HH 2x1P980/1000

Order No.: 84D009005222

Code no.: 32
Application: flexible applications within ranges with small dynamic stress, for fix installation
Assembly: direct connector pre-assembly
Length: 500 m



I-V2Y(ZN)H 2x1P980/1000

Order No.: 84D030005222

Code no.: 31
Application: flexible applications within ranges with small dynamic stress, for fix installation
Assembly: direct connector pre-assembly
Length: 500 m



I-V2Y(ZN)11Y 1P980/1000



I-V2Y(ZN)HH 2x1P980/1000



I-V2Y(ZN)H 2x1P980/1000



PE
PUR
1
6.0 mm

PE
FRNC
2
4.7 x 8.2 mm

PE
FRNC
2
3.6 x 7.5 mm

short term	70 mm
during operation	50 mm
short term	400 N
during operation	100 N
approx. 32 kg/km	
-20 °C to +70 °C	

(over flat side)	
short term	70 mm
during operation	50 mm
short term	400 N
during operation	100 N
approx. 43 kg/km	
-20 °C to +70 °C	

(over flat side)	
short term	70 mm
during operation	50 mm
short term	400 N
during operation	100 N
approx. 28 kg/km	
-20 °C to +70 °C	

at 650 nm (Laser)	< 160 dB/km
at 660 nm (LED)	< 230 dB/km

at 650 nm (Laser)	< 190 dB/km
at 660 nm (LED)	< 290 dB/km

at 650 nm (Laser)	< 190 dB/km
at 660 nm (LED)	< 290 dB/km



I-V4Y(ZN)11Y 2P980/1000 HEAVY

Order No.: 84D01100S333

Code no.: 24
Application: in harsh industrial environment
Assembly: direct connector pre-assembly
Length: 500 m



I-V2Y(ZN)Y 2P980/1000

Order No.: 84D01600S333

Code no.: 33
Application: flexible applications within ranges with small dynamic stress, for fix installation
Assembly: direct connector pre-assembly
Length: 500 m



I-V2Y(ZN)11Y 2P980/1000

Order No.: 84D02000S333

Code no.: 34
Application: in harsh industrial environment
Assembly: direct connector pre-assembly
Length: 500 m

POF Cables



I-V4Y(ZN)11Y 2P980/1000 HEAVY



I-V2Y(ZN)Y 2P980/1000



I-V2Y(ZN)11Y 2P980/1000

Construction

Fiber sheath material	PA	PE	PE
Outer jacket material	PUR	PVC	PUR
Number of POF elements	2	2	2
Number of Cu elements	0	0	0
Outer diameter	6.0 mm	6.0 mm	5.6 mm

Mechanical properties

Bending radius min.	short term	60 mm	short term	90 mm	short term	90 mm
	during operation	40 mm	during operation	60 mm	during operation	60 mm
Tensile strength max.	short term	500 N	short term	400 N	short term	400 N
	during operation	200 N	during operation	100 N	during operation	100 N
Weight	approx. 33 kg/km		approx. 54 kg/km		approx. 28 kg/km	
Ambient temp. during operation	-20 °C to +70 °C		-20 °C to +70 °C		-20 °C to +70 °C	

Transfer characteristics

Attenuation	at 650 nm (Laser)	< 160 dB/km	at 650 nm (Laser)	< 200 dB/km	at 650 nm (Laser)	< 200 dB/km
	at 660 nm (LED)	< 230 dB/km	at 660 nm (LED)	< 290 dB/km	at 660 nm (LED)	< 290 dB/km



I-V2Y(ZN)11Y 2P980/1000 FLEX

Order No.: 84D00500S333

Code no.: 25

Application: in harsh industrial environment suitable for drag chain

Assembly: direct connector pre-assembly
Length: 500 m

The dummy elements can be replaced with Cu elements.



I-V4Y(ZN)11Y 2P980/1000 FLEX

Order No.: 84D00300S383

Code no.: 36

Application: in harsh industrial environment suitable for drag chain

Assembly: direct connector pre-assembly
Length: 500 m

The dummy elements can be replaced with Cu elements.



I-(ZN)V2Y11Y 2P980/1000 + 2x1,0qmm

Order No.: 84D00600S333

Code no.: 29

Application: in harsh industrial environment suitable for drag chain

Assembly: direct connector pre-assembly
Length: 500 m



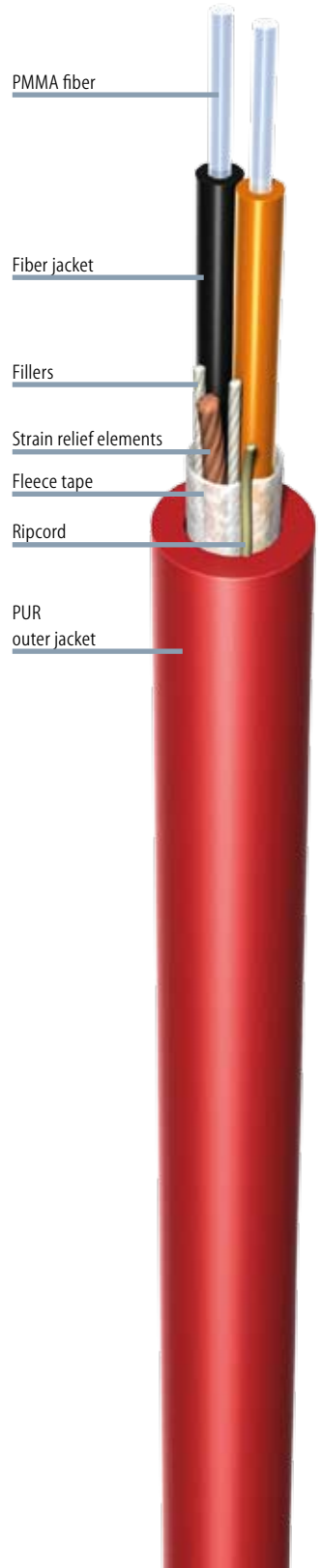
I-V2Y(ZN)11Y 2P980/1000 FLEX



I-V4Y(ZN)11Y 2P980/1000 FLEX



I-(ZN)V2Y11Y 2P980/1000+2x1,0qmm



PE
PUR
2
0
6.4 mm

PA
PUR
2
0
8.0 mm

PE
PUR
2
2
7.5 mm

short term	90 mm
during operation	60 mm
short term	200 N
during operation	100 N
approx. 30 kg/km	
-20 °C to +70 °C	

short term	60 mm
during operation	40 mm
short term	400 N
during operation	100 N
approx. 55 kg/km	
-20 °C to +70 °C	

short term	90 mm
during operation	60 mm
short term	200 N
during operation	100 N
approx. 62 kg/km	
-20 °C to +70 °C	

at 650 nm (Laser)	< 220 dB/km
at 660 nm (LED)	< 350 dB/km

at 650 nm (Laser)	< 190 dB/km
at 660 nm (LED)	< 290 dB/km

at 650 nm (Laser)	< 220 dB/km
at 660 nm (LED)	< 350 dB/km

POF Cables



AT-(ZN)V2Y2Y 2P980/1000

Order No.: 84D025005000

Code no.: 37
Application: outbreak cable for fix outdoor installation
Assembly: direct connector pre-assembly
Length: 500 m



I-(ZN)V4Y11Y 2P980/1000

Order No.: 84D028005333

Code no.: 38
Application: in harsh industrial environment, suitable for drag chain
Assembly: direct connector pre-assembly
Length: 500 m

Instead of the dummy elements, additional POF or Cu elements can be stranded.



AT-(ZN)V2Y2Y 2P980/1000



I-(ZN)V4Y11Y 2P980/1000

Construction

Fiber sheath material	PE
Outer jacket material	PE
Number of POF elements	2
Number of Cu elements	0
Outer diameter	7.0 mm

PA
PUR
2
2
7.5 mm

Mechanical properties

Bending radius min.	short term	90 mm
	during operation	60 mm
Tensile strength max.	short term	200 N
	during operation	100 N

short term	70 mm
	during operation
short term	400 N
	during operation

Weight approx. 33 kg/km

approx. 42 kg/km

Ambient temp. during operation **-25 °C to +70 °C**

-20 °C to +70 °C

Transfer characteristics

Attenuation	at 650 nm (Laser)	< 220 dB/km
	at 660 nm (LED)	< 350 dB/km

at 650 nm (Laser)	< 190 dB/km
	at 660 nm (LED)



I-V4Y11Y 4P980/1000

84E00200S333

Code no.: 39

Application: in harsh industrial environment, suitable for drag chain

Assembly: direct connector pre-assembly
Length: 500 m



I-(ZN)V4Y11Y 2P980/1000 + 4x1,5qmm

Order No.: 84D01400S444

Code no.: 41

Application: in harsh industrial environment, suitable for drag chain

Assembly: direct connector pre-assembly
Length: 500 m
The number of PMMA, Cu or possible dummy elements can vary.

I-(ZN)V4YY 2P980/1000 + 3x1,5qmm

Order No.: 84D01800S707

Code no.: 42

Application: for flexible applications within ranges with small dynamic stress

Assembly: direct connector pre-assembly
Length: 500 m
The number of PMMA, Cu or possible dummy elements can vary.



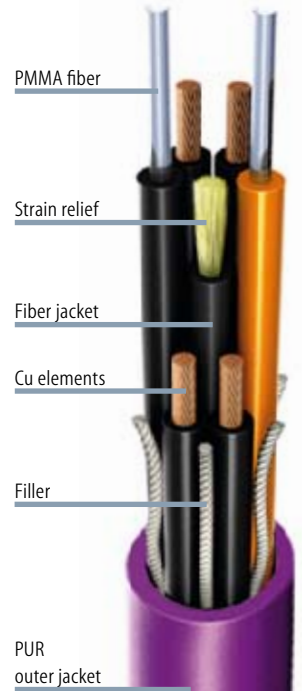
I-V4Y11Y 4P980/1000



I-(ZN)V4Y11Y 2P980/1000+4x1,5qmm



I-(ZN)V4YY 2P980/1000+3x1,5qmm



PA
PUR
4
0
7.5 mm

PA
PUR
2
4
10.6 mm

PA
PVC
2
3
10.7 mm

short term	70 mm
during operation	50 mm
short term	500 N
during operation	200 N
approx.	42 kg/km
-20 °C to +70 °C	

short term	110 mm
during operation	70 mm
short term	400 N
during operation	100 N
approx.	146 kg/km
-20 °C to +70 °C	

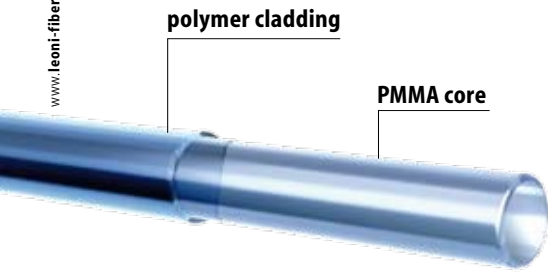
short term	110 mm
during operation	70 mm
short term	200 N
during operation	100 N
approx.	132 kg/km
-20 °C to +70 °C	

at 650 nm (Laser)	< 190 dB/km
at 660 nm (LED)	< 290 dB/km

at 650 nm (Laser)	< 230 dB/km
at 660 nm (LED)	< 330 dB/km

at 650 nm (Laser)	< 230 dB/km
at 660 nm (LED)	< 330 dB/km

Fiber Type
Standard

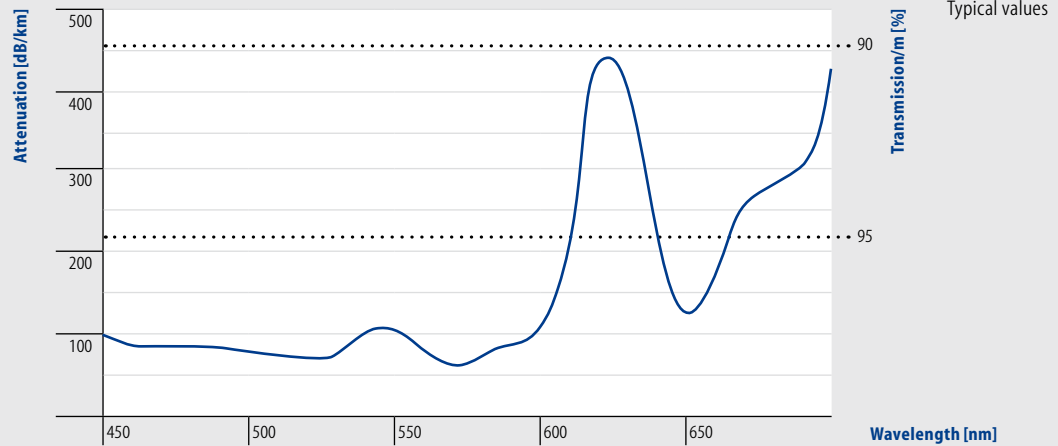


Standard POF is made of a super pure polymethylmethacrylate (PMMA) fiber core, which is cladded with a sheath of fluoropolymer. The large fiber core facilitates coupling to transmitter and receiver elements and allows the use of low-cost connector systems some of which have been specially developed for plastic fiber optics.

LEDs in the wavelength range of $\lambda = 650 \dots 670$ nm are used as transmitter elements. POF has a relative attenuation minimum of 160 dB/km in this range. The attenuation can be increased slightly (up to 200 dB/km for example) depending on the cable design. PIN diodes are used as receivers at the other end of the transmission path.

Because of the attenuation, the link length is typically limited to less than 100 m. Nowadays, green LEDs are used to get a smaller attenuation of about 100 dB/km.

POF Fiber Specifications



Standard POF

Description	P980/1000	P240/250	P486/500	P735/750	P1470/1500	P1960/2000
	A4a		A4c	A4b		
Geometric/thermal properties						
Core diameter	980 ± 60 μm	240 ± 23 μm	486 ± 30 μm	735 ± 45 μm	1470 ± 90 μm	1960 ± 120 μm
Cladding diameter	1000 ± 60 μm	250 ± 23 μm	500 ± 30 μm	750 ± 45 μm	1500 ± 90 μm	2000 ± 120 μm
Working temperature	-55 °C to +85 °C	-55 °C to +70 °C	-55 °C to +70 °C	-55 °C to +70 °C	-55 °C to +70 °C	-55 °C to +70 °C
Transmission properties						
Wavelength	650 nm	650 nm	650 nm	650 nm	650 nm	650 nm
Attenuation max.	160 dB/km	300 dB/km	200 dB/km	180 dB/km	180 dB/km	180 dB/km
Min. bandwidth (MHz x 100 m)	10					
Numerical aperture	0.5	0.5	0.5	0.5	0.5	0.5

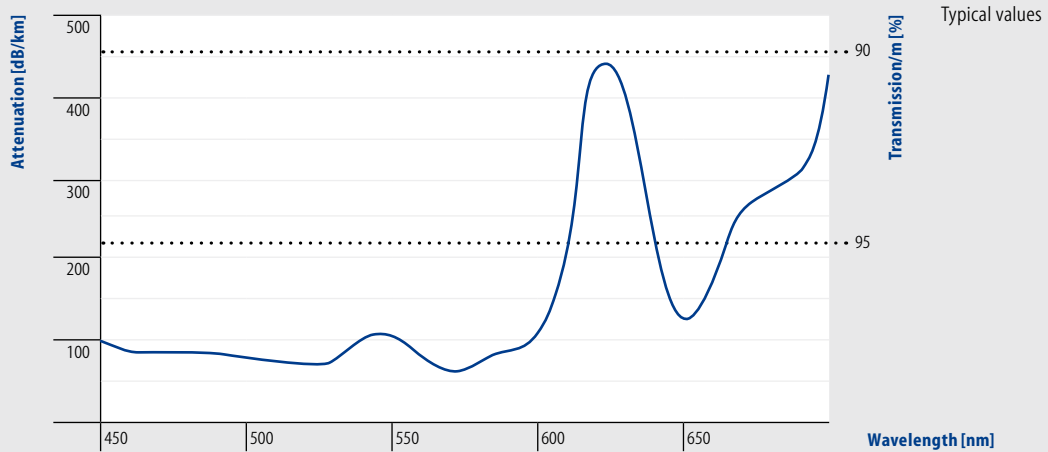


The low numerical aperture POF (low NA POF) is used to get higher data rates compared to the standard POF.

With increasing NA the acceptance angle of the signal coupled in increases, too. Therefore, the power budget of the system can be increased for transmitters with broad angle emission. The same fiber and jacket dimension like the standard POFs allows an easy assembly of low-cost connectors.

These fibers are developed for temperatures up to 105 °C. Short term temperatures application of up to 115 °C produces only a small rising of the attenuation.

The applications of this fiber are both in the automotive and industrial environment.



Low NA/high NA POF

High temperature-POF

P980/1000 low NA	P980/1000 high NA	P980/1000 high temperature POF

P980/1000 high temperature POF	P485/500 high temperature POF

980 ± 60 μm	980 ± 60 μm	980 ± 60 μm
1000 ± 60 μm	1000 ± 60 μm	1000 ± 60 μm
-40 °C to +70 °C	-40 °C to +85 °C	-55 °C to +105 °C

980 ± 60 μm	485 ± 30 μm
1000 ± 60 μm	500 ± 30 μm
-55 °C to +105 °C	-55 °C to +105 °C

650 nm	650 nm	650 nm
160 dB/km	160 dB/km	200 dB/km
150		
0.25	0.6	0.58

650 nm	650 nm
200 dB/km	200 dB/km
0.58	0.58

POF Connectors



Connectors for POF are different not only in terms of their construction, but also in the technology used to attach them to the cable (crimping or clamping) and in the technology used to process the endface. The focus here is on grinding and polishing as well as on hotplate technology.

F05 connector POF

Order No.: **SF05-SS0-20-0010**

Color: black
Fiber Ø: 1000 µm
Cable Ø: 2.2 mm
Assembly: crimp/polish
Ferrule: metal
 crimp sleeve, black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KF05-F0511050cm

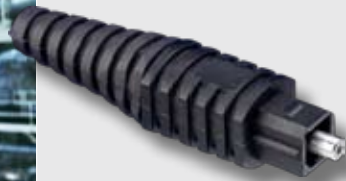
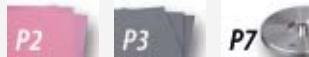
Stripping tool (Page 46)



Crimp tool (Page 47)



Polishing tool (Page 48)



SF05-SS0-20-0010

F05 connector POF

Order No.: **SF05-SG0-02-0010**

Color: black
Fiber Ø: 1000 µm
Cable Ø: 2.2 mm
Assembly: clamp/Hotplate
Ferrule: plastic
 dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KF05-F0511050cm

Stripping tool (Page 46)



Polishing tool (Page 48)



SF05-SG0-02-0010

F05 connector POF

Order No.: **SF05-SV0-02-0010**

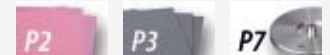
Color: black
Fiber Ø: 1000 µm
Cable Ø: 2.2 mm
Assembly: clamp/polish
Ferrule: plastic
 dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KF05-F0511050cm

Stripping tool (Page 46)



Polishing tool (Page 48)



SF05-SV0-02-0010

SXHP-SS0-19-0020



SF07-DG0-08-0010



HP connector POF

Order No.: **SXHP-SS0-19-0020**

compatible to HFBR4501
Color: grey
Fiber Ø: 1000 µm
Cable Ø: 2.2 mm
Assembly: crimp/polish
Ferrule: plastic
 crimp sleeve and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KHPS-HPS11050cm

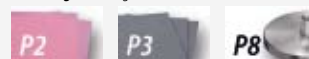
Stripping tool (Page 46)



Crimp tool (Page 47)



Polishing tool (Page 48)



F07 connector POF

Order No.: **SF07-DG0-08-0010**

Color: black
Fiber Ø: 1000 µm
Cable Ø: 2.2 mm
Assembly: clamp/Hotplate
Ferrule: plastic
 dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KF07-F0713050cm

Stripping tool (Page 46)



Polishing tool (Page 48)



HP connector POFOrder No.: **SXHP-SS0-20-0020**

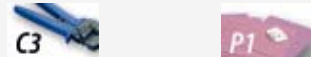
Color: metallic
Fiber Ø: 1000 µm
Cable Ø: 2.2 mm
Assembly: crimp/polish
Ferrule: metal
 crimp sleeve, green boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KHPS-HPS11050cm

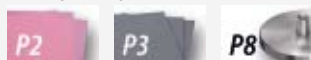
Stripping tool (Page 46)



Crimp tool (Page 47)



Polishing tool (Page 48)

**HP connector POF**Order No.: **SXHP-SS0-19-0010**

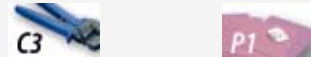
compatible to HFBR4511
Color: blue
Fiber Ø: 1000 µm
Cable Ø: 2.2 mm
Assembly: crimp/polish
Ferrule: plastic
 crimp sleeve and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KHPS-HPS11050cm

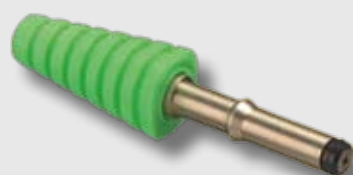
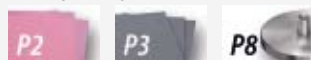
Stripping tool (Page 46)



Crimp tool (Page 47)



Polishing tool (Page 48)



SXHP-SS0-20-0020



SXHP-SS0-19-0010

SXHP-DS0-19-0010



SXHP-SV0-19-0010

SKNS-CZ0-20-0010
SKNS-GZ0-20-0010

SSCR-DV0-02-0010

**HP connector duplex POF**Order No.: **SXHP-DS0-19-0010**

compatible to HFBR 4506
Color: white
Fiber Ø: 1000 µm
Cable Ø: 2.2 mm
Assembly: crimp/polish
Ferrule: plastic
 crimp sleeve and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KHPD-HPD13050cm

Stripping tool (Page 46)



Crimp tool (Page 47)



Polishing tool (Page 48)

**HP connector POF**Order No.: **SXHP-SV0-19-0010**

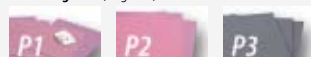
compatible to HFBR 4531
Color: black
Fiber Ø: 1000 µm
Cable Ø: 2.2 mm
Assembly: clamp/polish
Ferrule: plastic
 dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KHPS-HPS11050cm

Stripping tool (Page 46)



Polishing tool (Page 48)

**HP F05 connector**Order No.: **SKNS-CZ0-20-0010**

Boot for HP connector compatible to
 HFBR 4501, 4503, 4511 and 4513
Color: blue

Order No.: **SKNS-GZ0-20-0010**

Boot for HP connector compatible to
 HFBR 4501, 4503, 4511 and 4513
Color: grey

SCRJ connector duplex IP20Order No.: **SSCR-DV0-02-0010**

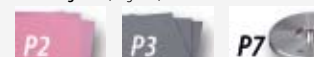
Color: black
Fiber Ø: 1000 µm
Cable Ø: 2.2 mm
Assembly: clam/polish
Ferrule: metal
 inclusive black boot and dust cap

Ref. cable for attenuation measurement (0.5 m)
 KSCR-SCR13050cm

Stripping tool (Page 46)



Polishing tool (Page 48)



POF Connectors



FSMA connector POF

Order No.: **SSMA-SH0-02-0020**

Color: metallic
Fiber Ø: 1000 µm
Cable Ø: 6.0 mm
Assembly: crimp/Hotplate
Ferrule: metal
 crimp sleeve, black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KSMA-SMA11050cm

Stripping tool (Page 46)



Crimp tool (Page 47)



Polishing tool (Page 48)



FSMA connector POF

Order No.: **SSMA-SS0-02-0020**

Color: metallic
Fiber Ø: 1000 µm
Cable Ø: 6.0 mm
Assembly: crimp/polish
Ferrule: metal
 crimp sleeve, black boot and dust cap inclusive, also with knurling union nut available

Ref. cable for attenuation measurement (0.5 m)
 KSMA-SMA11050cm

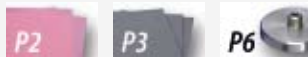
Stripping tool (Page 46)



Crimp tool (Page 47)



Polishing tool (Page 48)



FSMA connector POF

Order No.: **SSMA-SS0-02-0030**

Color: metallic
Fiber Ø: 1000 µm
Cable Ø: 3.6 mm
Assembly: crimp/polish
Ferrule: metal
 crimp sleeve, red boot and dust cap inclusive, also with knurling union nut available

Ref. cable for attenuation measurement (0.5 m)
 KSMA-SMA11050cm

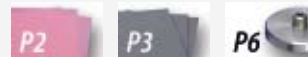
Stripping tool (Page 46)



Crimp tool (Page 47)



Polishing tool (Page 48)



SSMA-SH0-02-0020

SSMA-SS0-02-0020

SSMS-SS0-02-0030

SSMA-SS0-02-0050

SSMA-SH0-02-0010



FSMA connector POF

Order No.: **SSMA-SS0-02-0050**

Color: metallic
Fiber Ø: 1000 µm
Cable Ø: 2.2 mm
Assembly: crimp/polish
Ferrule: metal
 crimp sleeve, black boot and dust cap inclusive, hexagonal available

Ref. cable for attenuation measurement (0.5 m)
 KSMA-SMA11050cm

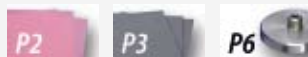
Stripping tool (Page 46)



Crimp tool (Page 47)



Polishing tool (Page 48)



FSMA connector POF

Order No.: **SSMA-SH0-02-0010**

Color: metallic
Fiber Ø: 1000 µm
Cable Ø: 2.2 mm
Assembly: crimp/Hotplate
Ferrule: metal
 black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KSMA-SMA11050cm

Stripping tool (Page 46)



Crimp tool (Page 47)



Polishing tool (Page 48)



FSMA connector POFOrder No.: **SSMA-SS0-02-0070**

Color: metallic
Fiber Ø: 1000 µm
Cable Ø: 6.0 mm
Assembly: crimp/polish
Ferrule: plastic
 crimp sleeve, black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KSMA-SMA11050cm

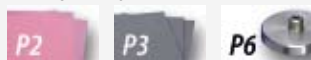
Stripping tool (Page 46)



Crimp tool (Page 47)



Polishing tool (Page 48)

**FSMA connector POF**Order No.: **SSMA-SV0-02-0010**

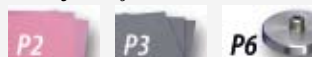
Color: metallic
Fiber Ø: 1000 µm
Cable Ø: 2.2 mm
Assembly: clamp/polish
Ferrule: metal
 black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KSMA-SMA11050cm

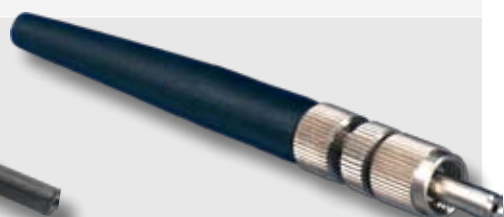
Stripping tool (Page 46)



Polishing tool (Page 48)



SSMA-SS0-02-0070



SSMA-SV0-02-0010

SSMA-SS0-02-0060

SXST-SS0-22-0010

SXST-SV0-02-0010

FSMA connector POFOrder No.: **SSMA-SS0-02-0060**

Color: metallic
Fiber Ø: 1000 µm
Cable Ø: 2.2 mm
Assembly: crimp/polish
Ferrule: plastic
 crimp sleeve, black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KSMA-SMA11050cm

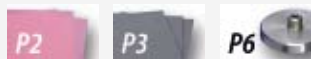
Stripping tool (Page 46)



Crimp tool (Page 47)



Polishing tool (Page 48)

**ST connector (BFOC) POF**Order No.: **SXST-SS0-22-0010**

Color: metallic
Fiber Ø: 1000 µm
Cable Ø: 2.2 mm
Assembly: crimp/polish
Ferrule: metal
 crimp sleeve, black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KXST-XST11050cm

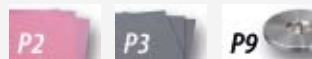
Stripping tool (Page 46)



Crimp tool (Page 47)



Polishing tool (Page 48)

**ST connector (BFOC) POF**Order No.: **SXST-SV0-02-0010**

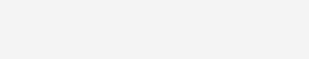
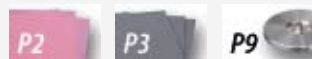
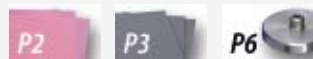
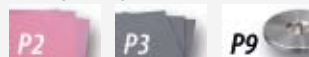
Color: black
Fiber Ø: 1000 µm
Cable Ø: 2.2 mm
Assembly: clamp/polish
Ferrule: metal
 black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KXST-XST11050cm

Stripping tool (Page 46)



Polishing tool (Page 48)



PCF – Polymer Cladded Fibers

Beside pure polymer fibers, the category of polymer optical fibers also includes hybrid fibers, a combination of glass fiber and plastic jacketing, such as Polymer Cladded Silica Fiber (PCF). These are characterised by being highly robust and easy to assemble. Compared with thick-core glass fibers, they are also significantly more economical.

PCF is a hybrid optical fiber that falls in the category of step-index profiled fibers. In the case of plastic cladding silica fiber, the core is made of silica and the cladding is made of plastic. What is especially important here is good adhesion of the cladding material to the silica core, which does not go without saying because of the different expansion coefficients especially at high temperatures. Another point is the refraction index which can differ and cause different numerical apertures. There are various product designations in the market for PCFs, such as PCS, HCS, HPCF, etc...

Low attenuation makes it possible to cover distances up to 500 m with systems designed for POF at 650 nm, and up to 4 km with 850 nm systems.



I-V(ZN)Y 1K200/230

Order No.: 84P00300T222

Code no.: 72

Application: for flexible applications within ranges with small dynamic stress

Assembly: direct connector pre-assembly

Length: 2000 m

PCF Cables



I-V(ZN)Y 1K200/230

PCF cables are available for both indoor and outdoor applications. We offer many different designs to meet the large variety of applications in the industrial environment. Special requirements in terms of flexibility, resistance to oil, resistance to UV-light, halogen-free or flame-retardant properties are met by selecting suitable materials.

Construction

Inner jacket material	
Outer jacket material	PVC
Number of PCF elements	1
Inner jacket diameter	
Outer diameter	2.2 mm

Mechanical properties

Bending radius min.	short term	60 mm
	during operation	30 mm
Tensile strength max.	short term	300 N
	during operation	100 N
Weight	approx. 5 kg/km	
Ambient temp. during operation	-20 °C to +70 °C	

Transfer characteristics

Attenuation	at 650 nm (Laser)	< 10 dB/km
	at 850 nm (LED)	< 8 dB/km



A-V(ZN)11Y 1K200/230

Order No.: 84P00600T000

Code no.: 74

Application: in harsh industrial environment, flexible indoor and outdoor installation

Assembly: direct connector pre-assembly
Length: 2000 m



I-V(ZN)Y 2X 1K200/230

Order No.: 84Q00300T222

Code no.: 61

Application: for flexible applications within ranges with small dynamic stress

Assembly: direct connector pre-assembly
Länge: 2000 m



I-V(ZN)H 2X 1K200/230

Order No.: 84Q01000T222

Code no.: 66

Application: for flexible applications within ranges with small dynamic stress

Assembly: direct connector pre-assembly
Length: 2000 m



I-V(ZN)YY 1K200/230

Order No.: 84P00900T333

Code no.: 71

Application: for flexible applications within ranges with small dynamic stress

Assembly: direct connector pre-assembly
Length: 2000 m



A-V(ZN)11Y 1K200/230



I-V(ZN)Y 2X 1K200/230



I-V(ZN)H 2X 1K200/230



I-V(ZN)YY 1K200/230

PUR
1
3.0 mm

PVC
2
2.2 x 4.5 mm

FRNC
2
2.2 x 4.5 mm

PVC
PVC
1
2.2 mm
5.0 mm

short term	60 mm
during operation	30 mm
short term	800 N
during operation	400 N
approx. 6.5 kg/km	
-20 °C to +70 °C	

(over flat side)	
short term	60 mm
during operation	30 mm
short term	300 N
during operation	100 N
approx. 10 kg/km	
-20 °C to +70 °C	

(over flat side)	
short term	60 mm
during operation	30 mm
short term	300 N
during operation	100 N
approx. 11 kg/km	
-20 °C to +70 °C	

short term	60 mm
during operation	40 mm
short term	300 N
during operation	100 N
approx. 28 kg/km	
-20 °C to +70 °C	

at 650 nm (Laser)	< 10 dB/km
at 850 nm (LED)	< 8 dB/km

at 650 nm (Laser)	< 10 dB/km
at 850 nm (LED)	< 8 dB/km

at 650 nm (Laser)	< 10 dB/km
at 850 nm (LED)	< 8 dB/km

at 650 nm (Laser)	< 10 dB/km
at 850 nm (LED)	< 8 dB/km

PCF Cables



I-V(ZN)HH 2X 1K200/230
 Order No.: 84Q00700T222
 Code no.: 64
 Application: for flexible applications within ranges with small dynamic stress
 Assembly: direct connector pre-assembly
 Length: 2000 m



I-V(ZN)H2Y 2K200/230
 Order No.: 84Q00400T000
 Code no.: 63
 Application: outbreak cable for fix indoor and outdoor installation
 Assembly: direct connector pre-assembly
 Length: 2000 m



I-V(ZN)HH 2X 1K200/230



I-V(ZN)H2Y 2K200/230

Construction

Inner jacket material	FRNC
Outer jacket material	FRNC
Number of PCF elements	2
Number of Cu elements	0
Inner jacket diameter	2.9 mm
Outer diameter	3.9 x 6.8 mm

Mechanical properties

Bending radius min.	(over flat side)	
	short term	50 mm
	during operation	30 mm
Tensile strength max.	short term	800 N
	during operation	200 N
Weight	approx. 31 kg/km	
Ambient temp. during operation	-20 °C to +70 °C	

Inner jacket material	FRNC
Outer jacket material	PE
Number of PCF elements	2
Number of Cu elements	0
Inner jacket diameter	2.2 mm
Outer diameter	7.0 mm

Bending radius min.	short term	70 mm
	during operation	50 mm
Tensile strength max.	short term	800 N
	during operation	200 N
Weight	approx. 38 kg/km	
Ambient temp. during operation	-20 °C to +70 °C	

Transfer characteristics

Attenuation	at 650 nm (Laser)	< 10 dB/km
	at 850 nm (LED)	< 8 dB/km

Attenuation	at 650 nm (Laser)	< 10 dB/km
	at 850 nm (LED)	< 8 dB/km



AT-VQ(ZN)HB2Y 2K200/230

Order No.: 84Q00200T000

Code no.: 75
Application: outbreak cable for fix installation, longitudinally water resistant
Assembly: direct connector pre-assembly
Length: 2000 m



I-V(ZN)H11Y 2K200/230

Order No.: 84Q01500T333

Code no.: 67
Application: outbreak indoor cable for harsh industrial environment, for fix installation, suitable for drag chain
Assembly: direct connector pre-assembly
Length: 2000 m



I-V(ZN)Y11Y 2K200/230 + 2x1 qmm

Order No.: 84Q03000T333

Code no.: 62
Application: outbreak indoor cable for harsh industrial environment, for fix installation, suitable for drag chain
Assembly: direct connector pre-assembly
Length: 2000 m



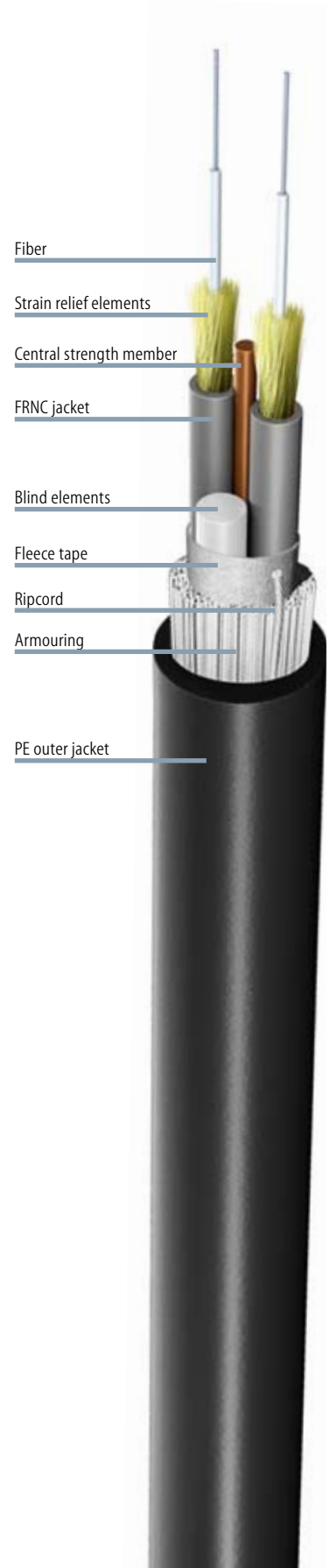
AT-VQ(ZN)HB2Y 2K200/230



I-V(ZN)H11Y 2K200/230



I-V(ZN)Y11Y 2K200/230 + 2x1 qmm



FRNC
PE
2
0
2.9 mm
10.5 mm

FRNC
PUR
2
0
2.2 mm
7.4 mm

PVC
PUR
2
2
2.2 mm
7.6 mm

short term	150 mm
during operation	200 mm
short term	1500 N
during operation	500 N
approx. 90 kg/km	
-20 °C to +70 °C	

short term	70 mm
during operation	50 mm
short term	800 N
during operation	200 N
approx. 45 kg/km	
-20 °C to +70 °C	

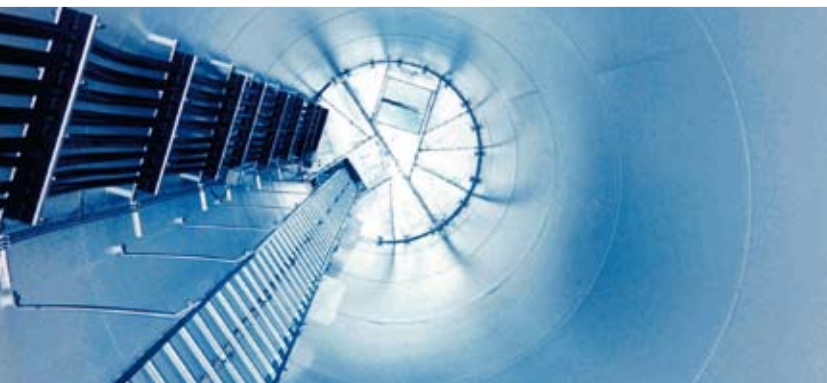
short term	70 mm
during operation	50 mm
short term	800 N
during operation	200 N
approx. 65 kg/km	
-20 °C to +70 °C	

at 650 nm (Laser)	< 10 dB/km
at 850 nm (LED)	< 8 dB/km

at 650 nm (Laser)	< 10 dB/km
at 850 nm (LED)	< 8 dB/km

at 650 nm (Laser)	< 10 dB/km
at 850 nm (LED)	< 8 dB/km

PCF Cables



I-V(ZN)Y11Y 2K200/230

Order No.: 84Q03100T333

Code no.: 65

Application: outbreak indoor cable for harsh industrial environment, for fix installation

Assembly: direct connector pre-assembly

Length: 2000 m



A-DQ(ZN)BH 12K200/230

Order No.: 84S00200T000

Code no.: 79

Application: longitudinally waterproof cable, non metallic rodent protection, for fix indoor and outdoor installation

Length: 2000 m



I-V(ZN)Y11Y 2K200/230



A-DQ(ZN)BH 12K200/230

Construction

Inner jacket material	PVC	
Outer jacket material	PUR	FRNC
Number of PCF elements	2	12
Inner jacket diameter	2.2 mm	
Outer diameter	7.4 mm	8.5 mm

Mechanical properties

Bending radius min.	short term	70 mm	short term	170 mm
	during operation	50 mm	during operation	130 mm
Tensile strength max.	short term	800 N	short term	1500 N
	during operation	200 N	during operation	1200 N
Weight	approx. 45 kg/km		approx. 82 kg/km	
Ambient temp. during operation	-20 °C to +70 °C		-20 °C to +70 °C	

Transfer characteristics

Attenuation	at 650 nm (Laser)	< 10 dB/km	at 650 nm (Laser)	< 10 dB/km
	at 850 nm (LED)	< 8 dB/km	at 850 nm (LED)	< 8 dB/km



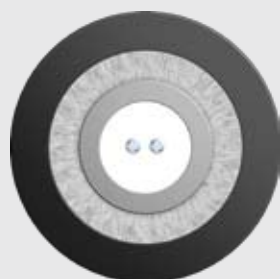
A-DQ(ZN)B2Y 2K200/230

Order No.: 84500400T000

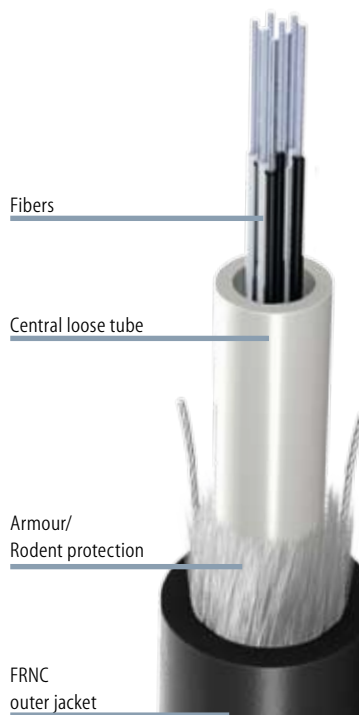
Code no.: 76

Application: longitudinally waterproof cable, non metallic rodent protection, for fix outdoor installation, installation directly in the ground

Length: 2000 m



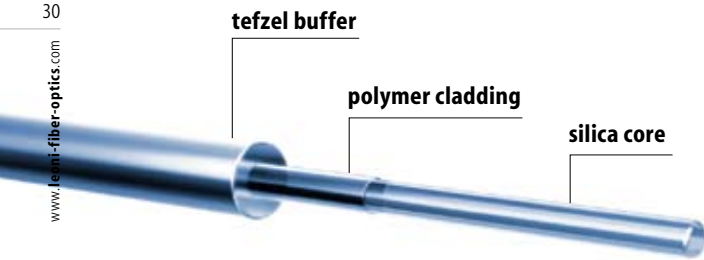
A-DQ(ZN)B2Y 2K200/230



PE	
2	
7.5 mm	

short term	150 mm
during operation	110 mm
short term	1500 N
during operation	1200 N
approx. 47 kg/km	
-20 °C to +70 °C	

at 650 nm (Laser)	< 10 dB/km
at 850 nm (LED)	< 8 dB/km



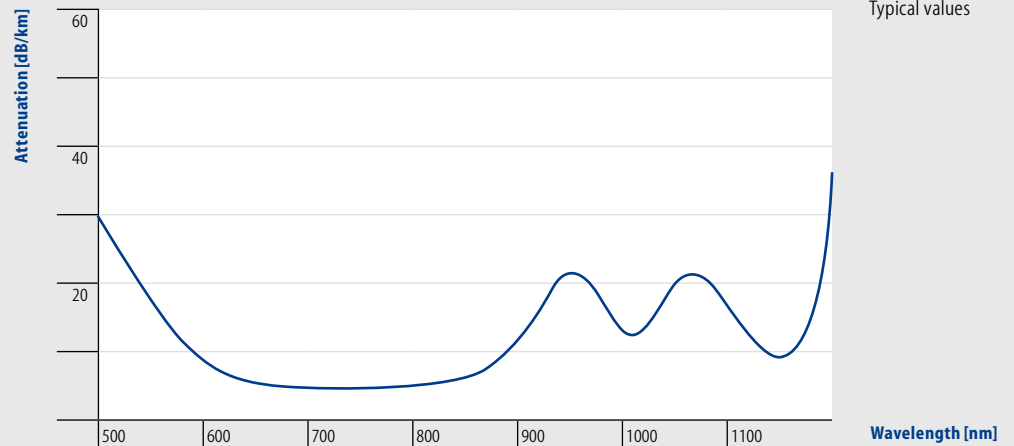
Fiber Type
Standard

PCF has a silica core and a plastic cladding. There is an additional tefzel layer to improve mechanical and thermal properties.

The same transmitting and receiving elements are used for PCF and POF. Because attenuation is lower, distances up to 500 m can be bridged.

They can also be used at a wavelength of $\lambda = 850$ nm.

PCF Fiber specifications



Polymer Cladded Fiber (PCF) K200/230

Description	K200/230	
Description IEC 60793-2		
Geometric/thermal properties		
Core diameter	200 μm	
Cladding diameter	230 μm	
Tefzel buffer	500 μm	
Transmission properties		
Wavelength	650 nm	850 nm
Attenuation max.	10 dB/km	8 dB/km
Min. bandwidth	17 MHz x km	20 MHz x km
Numerical aperture	0.37	0.37

Fiber Type
Special

PCF can differ in diameter, in the OH content, in the transmission spectrum, in the numerical aperture and the bandwidth.

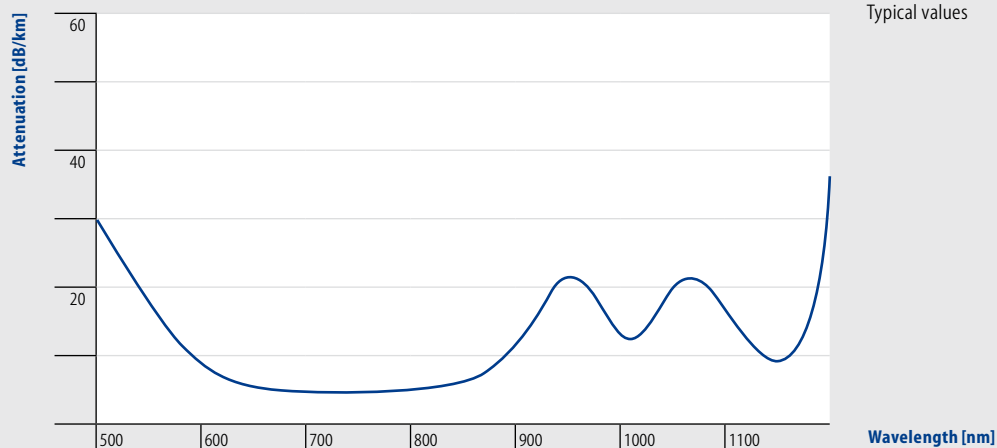
The high OH fibers are typically used for a wavelength between 400 and 800 nm, the low OH fibers in the range between 600 and 1300 nm.

The numerical aperture can differ between 0.35 and 0.48.

While the standard fibers have a bandwidth of 17 MHz x 100 m, there are also fibers with 40 MHz x 100 m and higher.

The fibers are also available with zero halogen coating instead of the standard tefzel buffer.

Please inform us on your special application.



Polymer Cladded Fiber (PCF)

K125/140 K200/230 K300/330 K400/430 K600/630 K800/830 K1000/1035 K1500/1535

125 μm	200 μm	300 μm	400 μm	600 μm	800 μm	1000 μm	1500 μm
140 μm	230 μm	330 μm	430 μm	630 μm	830 μm	1030 μm	1530 μm
250 μm	500 μm	650 μm	730 μm	1040 μm	1040 μm	1400 μm	2000 μm
9 mm	10 mm	15 mm	29 mm	58 mm	73 mm	73 mm	182 mm
15 mm	16 mm	24 mm	47 mm	94 mm	118 mm	118 mm	295 mm
12	6	8	8	8	8	8	15

Geometric/thermal properties

Core ($\pm 2\%$)
Cladding ($\pm 2\%$)
Buffer ($\pm 5\%$)
Bend. radius short term
Bend. radius long term
Attenuation at 850 nm

PCF Connectors



Connectors for PCF are different not only in terms of their construction, but also in the technology used to attach them to the cable (crimping or clamping) and in the technology used to process the endface.

The focus here is on grinding and polishing as well as on hotplate technology.

F05 connectors PCF

Order No.: **SF05-SC0-08-0010**

Color: black
Fiber Ø: 230 µm
Cable Ø: 2.2 mm
Assembly: crimp/cleave
Ferrule: metal
 crimp sleeve, black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KF05-F05 72050cm

Assembly tools (Page 52)



F07 connectors PCF

Order No.: **SF07-DC0-08-0010**

Color: black
Fiber Ø: 230 µm
Cable Ø: 3.0 mm
Assembly: crimp/cleave
Ferrule: metal
 crimp sleeve, black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KF07-F07 61050cm

Assembly tools



FCPC connectors PCF

Order No.: **SFCP-SK0-04-0080**

Color: metallic
Fiber Ø: 230 µm
Cable Ø: 2.2 mm
Assembly: crimp/glue/polish
Ferrule: ceramic
 crimp sleeve, black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KSCR-SCR 72050cm

Assembly tools
 on demand



SF05-SC0-08-0010



SF07-DC0-08-0010



SFCP-SK0-04-0080

SXHP-SC0-32-0010



SXLC-SK0-01-0030



HP connectors PCF

Order No.: **SXHP-SC0-32-0010**

compatible to HFBR 4521
Color: black
Fiber Ø: 230 µm
Cable Ø: 2.2 mm
Assembly: crimp/cleave
Ferrule: plastic
 crimp sleeve and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KHPS-HPS 72050cm

Assembly tools (Page 52)



LC connectors PCF

Order No.: **SXLC-SK0-01-0030**

Color: white
Fiber Ø: 230 µm
Cable Ø: 3.0 mm
Assembly: crimp/glue/polish
Ferrule: metal
 crimp sleeve, white boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KXLC-XLC 72050cm

Assembly tools
 on demand

SC connectors PCFOrder No.: **SXSC-SK0-02-0010**

Color: white/red
Fiber Ø: 230 µm
Cable Ø: 3.0 mm
Assembly: crimp/glue/polish
Ferrule: metal
 crimp sleeve, black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KXSC-XSC 72050cm

Assembly tools
 on demand

SC connectors PCFOrder No.: **SXSC-SK0-02-0020**

Color: white/red
Fiber Ø: 230 µm
Cable Ø: 2.2 mm
Assembly: crimp/glue/polish
Ferrule: metal
 crimp sleeve, black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KXSC-XSC 72050cm

Assembly tools
 on demand



SXSC-SK0-02-0010

SXSC-SK0-02-0020

SSMA-SK0-02-0010

SSMA-SK0-02-0011

SSMA-SW0-02-0010

**FSMA connectors PCF**Order No.: **SSMA-SK0-02-0010**

Color: metallic
Fiber Ø: 230 µm
Cable Ø: 2.2 mm
Assembly: crimp/glue/polish
Ferrule: metal
 crimp sleeve, black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KSMA-SMA 72050cm

Assembly tools
 on demand

FSMA connectors PCFOrder No.: **SSMA-SK0-02-0011**

Color: metallic
Fiber Ø: 230 µm
Cable Ø: 3.0 mm
Assembly: crimp/glue/polish
Ferrule: metal
 crimp sleeve, black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KSMA-SMA 72050cm

Assembly tools
 on demand

FSMA connectors PCFOrder No.: **SSMA-SW0-02-0010**

Color: metallic
Fiber Ø: 230 µm
Cable Ø: 2.2 mm
Assembly: clamp/cleave
Ferrule: metal
 crimp sleeve, black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KSMA-SMA 72050cm

Assembly tools (Page 52)



K1

PCF Connectors



FSMA connectors PCF

Order No.: **SSMA-SW0-02-0020**

Color: metallic
Fiber Ø: 230 µm
Cable Ø: 3.0 mm
Assembly: clamp/cleave
Ferrule: metal
 black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KSMA-SMA 72050cm

Assembly tools (Page 52)



ST connectors (BFOC) PCF

Order No.: **SXST-SK0-01-0020**

Color: metallic
Fiber Ø: 230 µm
Cable Ø: 2.2 mm
Assembly: crimp/glue/polish
Ferrule: metal
 crimp sleeve, black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KXST-XST 72050cm

Assembly tools
 on demand

ST connectors (BFOC) PCF

Order No.: **SXST-SK0-01-0030**

Color: metallic
Fiber Ø: 230 µm
Cable Ø: 3.0 mm
Assembly: crimp/glue/polish
Ferrule: metal
 crimp sleeve, black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KXST-XST 72050cm

Assembly tools
 on demand

SSMA-SW0-02-0020

SXST-SK0-01-0020

SXST-SK0-01-0030

SXST-SK0-04-0030

SXST-SW0-02-0010



ST connectors (BFOC) PCF

Order No.: **SXST-SK0-04-0030**

Color: metallic
Fiber Ø: 230 µm
Cable Ø: 3.0 mm
Assembly: crimp/glue/polish
Ferrule: ceramic
 crimp sleeve, black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KXST-XST 72050cm

Assembly tools
 on demand

ST connectors (BFOC) PCF

Order No.: **SXST-SW0-02-0010**

Color: black
Fiber Ø: 230 µm
Cable Ø: 2.2 mm
Assembly: clamp/cleave
Ferrule: metal
 black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KXST-XST 72050cm

Assembly tools (Page 52)



K2

ST connectors (BFOC) PCFOrder No.: **SXST-SW0-02-0020**

Color: black
Fiber Ø: 230 µm
Cable Ø: 2.5 mm
Assembly: clamp/cleave
Ferrule: metal
 black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KXST-XST 72050cm

Assembly tools (Page 52)



K2

ST connectors (BFOC) PCFOrder No.: **SXST-SW0-02-0030**

Color: black
Fiber Ø: 230 µm
Cable Ø: 3.0 mm
Assembly: clamp/cleave
Ferrule: metal
 black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KXST-XST 72050cm

Assembly tools (Page 52)



K2



SXST-SW0-02-0020

SXST-SW0-02-0030

SSCR-DK0-02-0030

SSCR-DK0-02-0040

SSCR-DK0-02-0020

**SCRJ connectors duplex**

IP20

Order No.: **SSCR-DK0-02-0030**

Color: black
Fiber Ø: 230 µm
Cable Ø: 2.2 mm
Assembly: crimp/glue/polish
Ferrule: metal
 crimp sleeve, black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KSCR-SCR 61050cm

Assembly tools
 on demand

SCRJ connectors duplex

IP20

Order No.: **SSCR-DK0-02-0040**

Color: black
Fiber Ø: 230 µm
Cable Ø: 3.0 mm
Assembly: crimp/glue/polish
Ferrule: metal
 crimp sleeve, black boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KSCR-SCR 61050cm

Assembly tools
 on demand

SCRJ connectors duplex

IP67

Order No.: **SSCR-DK0-02-0020**

Color: grey
Fiber Ø: 230 µm
Cable Ø: 2.2 – 3.0 mm
Assembly: crimp/glue/polish
Ferrule: metal
 grey boot and dust cap inclusive

Ref. cable for attenuation measurement (0.5 m)
 KSCR-SCR 61050cm

Assembly tools
 on demand

LEONI Prinz Fiber Optics has drawing equipment that draws UV-conducting quartz fibers (high OH), IR-conducting quartz fibers (low OH) and large-diameter capillary cables.

The fibers are available either individually or in a variety of core and cable designs. The length of the fibers or cable on the reels depends on their diameter. The core diameters range from 3 µm to 10 µm for single-mode applications and from 20 µm to 2 mm for multimode applications.

Quartz fibers are coated with acrylate, double-acrylate, high-temperature acrylate, silicone or polyimide. The fibers can be covered with an additional sheath of either nylon or tefzel, for example, to enable their use in various temperature ranges and chemical environments. The apertures of quartz optical fibers can vary from 0.1 to 0.4.



Simplex cable

Order No.: I-V (ZN) H 1

Application: indoor

Length: from 500 m

Quartz fiber from UV to IR Cables



I-V (ZN) H 1

Single fibers of high-purity quartz are used to achieve optimum light transmission in the UV to the IR range.

E.g. for multimode applications such as spectroscopy, medical equipment, energy transmission (laser equipment) and sensor technology.

We can offer our customers ideal solutions for specific UV-IR fiber applications. Instead of the widely used method of drawing the fiber into a tube, producing cable with lengths of 500 m is already feasible at LEONI Fiber Optics and is usually more cost effective than the tube method.

Construction

Outer jacket material	FRNC
No. of fibers	1
typ. core diameter	2.2 mm

Mechanical properties

Bending radius min.	60 mm
Tensile strength max.	Depending on fiber specification, information on demand
Ambient temp. during operation	-20 °C to +70 °C

Transfer characteristics

Addition of fiber specification at 650 and 850 nm	approx. 1 dB/km
---	-----------------



Simplex cable

Order No.: **A-V (ZN) 11Y 1**

Application: outdoor
Length: from 500 m



Duplex cable

Order No.: **I-V (ZN) H 2x1**

Application: indoor
Length: from 500 m



Duplex cable

Order No.: **I-V (ZN) H 2X1G**

Application: indoor
Length: from 500 m



Laser protection cable with metal pipe

Order No.: **I-V (ZN) Y 2X 1S**

Application: high power delivery and medical application
Length: from 500 m



A-V (ZN) 11Y 1



I-V (ZN) Y 2x1



I-V (ZN) H 2x1



I-V (ZN) Y W 2G

PUR
1
2.2 mm

PVC
2
2.2 x 4.5 mm

FRNC
2
2.2 x 4.5 mm

Silicone
≥ 1
≥ 4.6 mm

60 mm
Depending on fiber specification, information on demand
-20 °C to +70 °C

60 mm
Depending on fiber specification, information on demand
-20 °C to +70 °C

60 mm
Depending on fiber specification, information on demand
-20 °C to +70 °C

100 mm
Depending on fiber specification, information on demand
-20 °C to +70 °C

approx. 2 dB/km

approx. 2 dB/km

approx. 2 dB/km

approx. 1 dB/km

Quartz fiber from UV to IR Cables



Examples of very different cable designs: Cable elements like jacket, strain relief as well as both dummy and support elements add mechanical strength. A metal braid or a flexible metal tube serves to protect against escaping laser rays in case of the glass fiber breaking.



Laser protection cable with metal pipe

Order No.: I-V (ZN)Y W Y
 Application: for power transmission
 Length: from 1 m

Multi strand cable

Order No.: I-V (ZN) H 2Y
 Application: indoor
 Length: from 500 m



I-V (ZN)Y W Y



I-V (ZN) H 2Y

	Construction	
Outer jacket material	PVC	PE
Number of fibers	≥ 1	≥ 2
typ. core diameter	≥ 4.6 mm	≥ 7.0 mm
	Mechanical properties	
Bending radius min.	100 mm	70 mm
Tensile strength max.	Depending on fiber specification, information on demand	Depending on fiber specification, information on demand
Ambient temp. during operation	-20 °C to +70 °C	-20 °C to +70 °C
	Transfer characteristics	
Addition on fiber specification at 650 and 850 nm	approx. 1 dB/km	approx. 2 dB/km



Multi strand cable

Order No.: **AT-VQ (ZN) HB 2Y**

Application: outdoor
Length: from 500 m



Multi strand cable

Order No.: **I-V (ZN) H 11Y**

Application: indoor
Length: from 500 m



Cable with silica fiber loose tube construction

Order No.: **ADQ (ZN) BH**

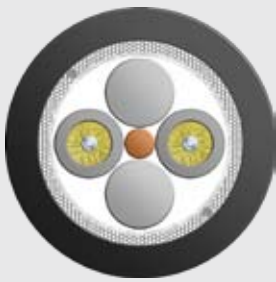
Application: outdoor
Length: from 500 m



Cable with silica fiber loose tube construction

Order No.: **ADQ (ZN) B2Y**

Application: outdoor
Length: from 500 m



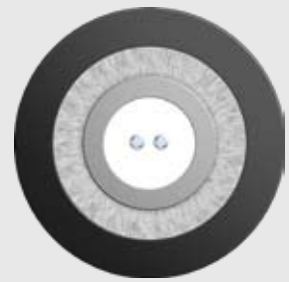
AT-VQ (ZN) HB 2Y



I-V (ZN) H 11Y



ADQ (ZN) BH



ADQ (ZN) B2Y

PE
≥ 2
≥ 10.5 mm

PUR
≥ 2
≥ 7.0 mm

FRNC / PE
≥ 2
7.5 mm

PE
≥ 2
7.5 mm

200 mm
Depending on fiber specification, information on demand
-20 °C to +70 °C

70 mm
Depending on fiber specification, information on demand
-20 °C to +70 °C

150 mm
Depending on fiber specification, information on demand
-20 °C to +70 °C

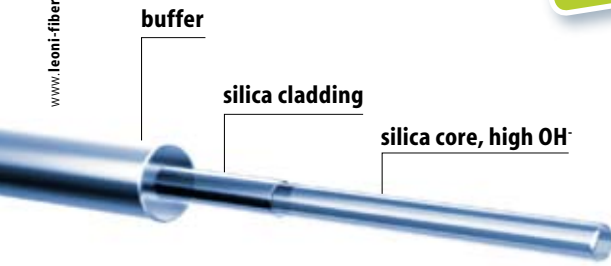
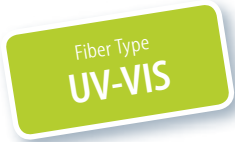
150 mm
Depending on fiber specification, information on demand
-20 °C to +70 °C

approx. 2 dB/km

approx. 2 dB/km

approx. 1 dB/km

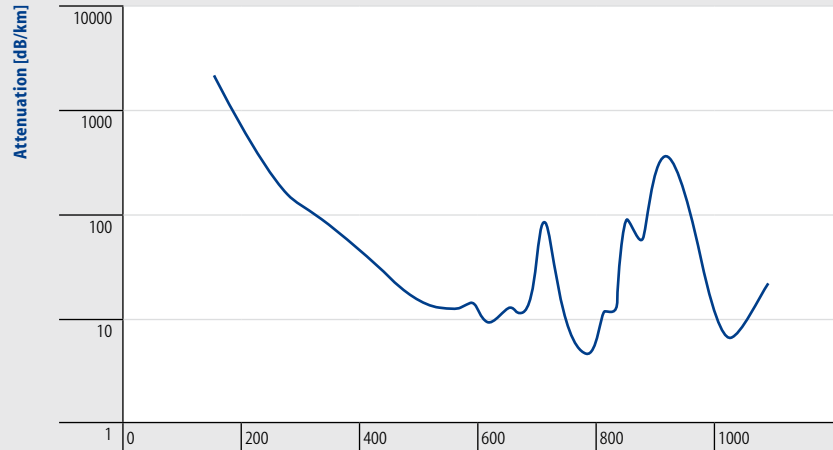
approx. 1 dB/km



Quartz fiber from UV to IR Fiber specifications

The core and cladding of these step index fibers consist of pure silica with a high OH⁻ content. They are used for a wavelength between 180 and 1100 nm (UV to NIR). The fibers are coated with acrylate, silicon or polyimide.

The multimode fibers are not only used in optical data communication, but also in applications of sensors, spectroscopy, medical techniques and lasers. The laser damage threshold of silica fibers is higher than POF or PCF. Thus, silica fibers are also used for power transfer. Mostly, laser sources are used in the wavelength range from about 400 and 2400 nm because of the small aperture of 0.22. We offer fibers with different transmission behaviour especially in the UV-range. Other core and buffer diameters are available upon request. Please indicate the wavelength range when ordering.



Typical values

Step index multimode: UV-VIS

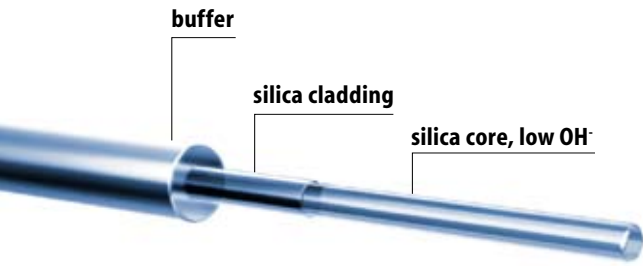
Geometry: core and cladding

Core diameter [μm]	50	100	100	150	200	200	300	400	500	600	800	1000	1500
Cladding diameter [μm]	55	110	120	165	220	240	330	440	550	660	880	1100	1650

Geometry: buffer

Buffer diameter [μm] acrylate	125	180	200	280	350	450	500	550	700	800	1000	1250	1800
Buffer diameter [μm] silicone	125	180	200	280	350	450	500	550	700	800	1000	1250	1800
Buffer diameter [μm] polyimide	65	120	140	195	235	280	345	460	590	680	900		

Fiber Type
VIS-IR

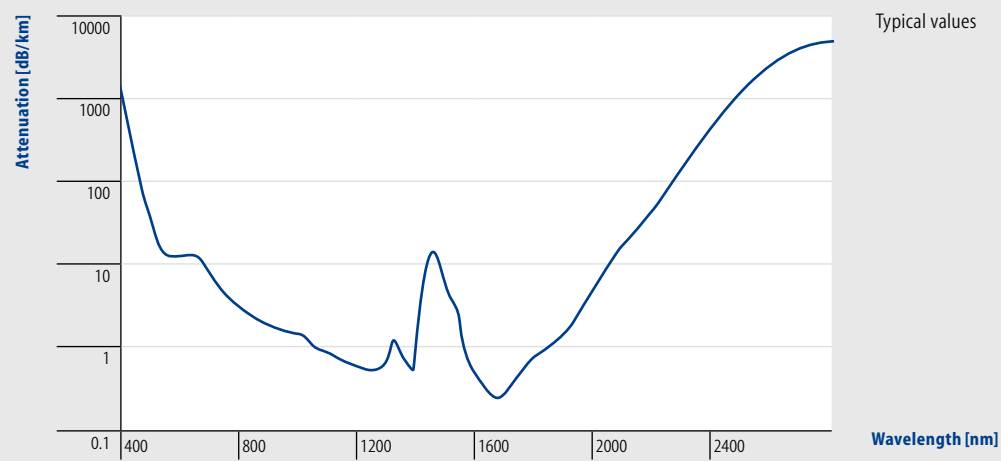


The light diffuses through a multimode fiber in a few hundreds of modes which limits the bandwidth to a maximum 100 Mhz · km.

The multimode fibers are not only used in optical data communication, but also in applications of sensors, spectroscopy, medical techniques and lasers. The laser damage threshold of silica fibers is higher than of POF or PCF.

The step index fiber presents the oldest and simplest construction of silica fibers. The core of silica fibers for IR consists of pure silica with a low content of OH⁻ with an uniform refraction index over the hole diameter. The cladding is slightly homogeneous doped with a lower refraction index. The fibers are coated with acrylate, silicone or polyimide.

Silica fibers are also used for power transfer. Mostly, laser sources are used in the wavelength range from about 400 and 2400 nm because of the small aperture of 0.22. A good choice of the right core diameter is given by the so-called beam parameter product: the product of the beam divergence and the beam width.



Step index multimode: VIS-IR

50	100	100	150	200	200	300	400	500	600	800	1000	1500
70	120	140	165	220	280	330	440	550	660	880	1100	1650

125	180	200	280	350	500	500	550	700	800	1000	1250	1800
125	180	200	280	350	500	500	550	700	800	1000	1250	1800
85	140	155	195	235	295	345	460	590	680	900		

Fiber Type
Monomode



Quartz fiber from UV to IR Fiber specifications

The monomode fibers (also called single-mode fibers) are used for a standard laser wavelength between 400 and 1550 nm. The small core diameter allows a propagation of only one mode in the fibers. This mode is directed parallel to the optical axis. Therefore nearly no mode dispersion appears. The monomode fibers are mainly applied in sensor applications and data transfer such as LAN. Higher bandwidths with more than 1 GHz-km are reached and exceed the values of the multimode fibers. The fibers are matched cladding type with a 125 or 80 micron cladding.

A low attenuation sensitivity due to bending can be achieved at a large numerical aperture. The 125 μm cladding diameter is compatible to low cost telecommunication connectors.



Step index monomode: VIS-IR

Transmission properties

Wavelength [nm]	400	480	630	630	780	810	810	980	980/1060	1300	1300	1550	1550
Cut-off-wavelength [nm]	340	420	620	620	720	780	780	950	950	1260	1270	1500	1500
Attenuation [dB/km]	65	30	12	12	5	5	5	3.5	8	0.8	2	2	2
Numerical aperture	0.12	0.12	0.12	0.16	0.12	0.12	0.16	0.13	0.24	0.12	0.16	0.19	0.16

Geometry: core and cladding

Mode field diameter [μm]	2.7	3.2	4	3.3	5.5	5.5	4.3	6.6	3	9.5	6.6	6	7.8
Cladding diameter [μm]	125	125	125	80	125	125	80	125	125	125	125	80	125

Geometry: buffer

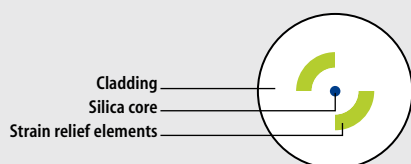
Buffer diameter [μm] acrylate	250	250	250	200	250	250	200	250	250	250	250	165	250
Buffer diameter [μm] silicone	145	145	145		145	145		145		145			

Fiber Type Polarisation maintaining

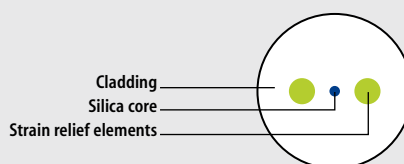


Polarisation maintaining fibers are special single-mode fibers that also maintain the polarisation of the light in the single-mode fiber. When the fiber is drawn, strain relief elements are created in the cladding that generate a birefringence inside the fiber core. The fiber is used in fiber optic networks, for pumping lasers and in microscopy.

Bow Tie



Panda



Polarisation maintaining fibers: VIS-IR

488	514	633	688	780	810	810	980	1064	1300	1300	1550	1550
400	450	600	620	720	720	720	910	1000	1200	1200	1500	1500
100	90	15	15	8	4	4	3	3	2	2	2	2
0.12	0.12	0.14	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16

3.6	3.6	3.2	3.2	3.6	4	4	4.2	6	6.6	6.6	7.9	7.9
125	125	125	125	125	125	80	125	125	125	80	125	80

245	245	245	245	245	245	245	250	245	245	245	245	245
400	400	400	400	400	400	400	400	400	400	400	400	400

Transmission properties

Designed wavelength [nm]

Cut-off-wavelength [nm]

Attenuation [dB/km]

Numerical aperture

Geometry: core and cladding

Mode field diameter [μm]

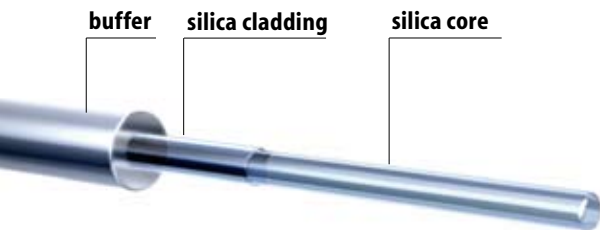
Cladding diameter [μm]

Geometry: buffer

Buffer diameter [μm] 2xAcrylat

Buffer diameter [μm] 2xAcrylat

Fiber Type
Gradient index



Due to its core profile the gradient index multimode fiber is a silica fiber possessing a reduced mode dispersion compared to a normal step index multimode fiber. The optical density of the core material decreases continuously in a gradient fiber from the middle to the borders. Because of this, the mode 0 along the optical axis which possesses the shortest path in the fiber, will diffuse in the densest medium. Higher modes with longer paths will diffuse mostly in the less dense medium. Thus, the diffusion velocity and the dispersion will be reduced. A bandwidth of up to 1GHz · km is reached. Due to the core profile the light does not spread in zigzag but bended paths.

Quartz fiber from
UV to IR Fiber specifications

The pulse form in the gradient index fiber remains more stable compared to the pulse form observed at the end of a step index fiber. If the gradient index fiber is for example not completely illuminated the diameter of the beam will be almost kept to the end of the fiber. There are fibers of different quality and cladding designed for power delivery and data transfer.



Gradient index multimode: UV-IR

Labelling

Gradient index multimode fiber: G-core-cladding-buffer GI buffer material; e.g. S-200-280-450 GI 1

Transmission properties

Numerical aperture	0.2	0.275	0.26	0.29	0.29	0.29	0.29
Attenuation at 850 nm [dB/km]	3/2.7*	3.5/3.2*	3.5/3*	4/3.5*	6	8	10
Attenuation at 1300 nm [dB/km]	1/0.7*	1/0.9*	1/0.9*	1.5/1.0	3	4	5
Bandwidth at 850 nm [MHz·km]	300/600*	300/400*	200	200	150	100	100
Bandwidth at 1300 nm [MHz·km]	600/1200*	550/1000*	200	200	150	100	100

Geometry: core and cladding

Core diameter [µm]	50	62,5	85	100	200	400	600
Cladding diameter [µm]	125	125	125	140	280	560	840

Geometry: buffer

Buffer diameter [µm] Acrylate	250*	250*	250*	200	450	700	1000
Buffer diameter [µm] Silicone				200	450	700	1000
Buffer diameter [µm] Polyimid	140	140	140	155	300	580	

* double acrylate cladding, for telecommunications

ST connector (BFOC) UV-IROrder No.: **SXST-SK0-M**

Color: metallic
Fiber Ø: 125 µm – 1000 µm
Assembly: crimp/glue/polish
Ferrule: metal
 orange or black boot and dust cap inclusive

Stripping tool (Page 46)
 on demand

Crimp tool (Page 47)
 on demand

Polishing tool (Page 48)

**ST connector (BFOC) UV-IR**Order No.: **SXST-SK0-C**

Color: metallic
Fiber Ø: 125 µm – 600 µm
Assembly: crimp/glue/polish
Ferrule: ceramic
 black boot and dust cap inclusive

Stripping tool (Page 46)
 on demand

Crimp tool (Page 47)
 on demand

Polishing tool (Page 48)

**FC PC connector UV-IR**Order No.: **SFCPC-SK0-M**

Color: metallic
Fiber Ø: 125 µm – 1000 µm
Assembly: crimp/glue/polish
Ferrule: metal, Ferrule with spring or fixed
 red boot and dust cap inclusive

Stripping tool (Page 46)
 on demand

Crimp tool (Page 47)
 on demand

Polishing tool (Page 48)



SXST-SK0-M

SXST-SK0-C

SFCPC-SK0-M

SFCPC-SK0-C

SFCA-SK0-C

SSMA-SK0-M



Quartz fiber from UV to IR Connectors



We offer connectors for UV-IR fibers to match all fiber diameters and a range of cable diameters.

Connectors with metal ferrules are available from 125 µm to 1000 µm, and we provide connectors with ceramic ferrules from 125 µm up to 600 µm.

FC PC connector UV-IROrder No.: **SFCPC-SK0-C**

Color: metallic
Fiber Ø: 125 µm – 600 µm
Assembly: crimp/glue/polish
Ferrule: ceramic
 black boot and dust cap inclusive

Stripping tool (Page 46)
 on demand

Crimp tool (Page 47)
 on demand

Polishing tool (Page 48)

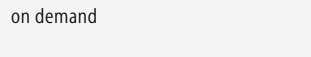
**FC APC connector UV-IR**Order No.: **SFCA-SK0-C**

Color: metallic
Fiber Ø: 125 µm – 600 µm
Assembly: crimp/glue/polish
Ferrule: ceramic
 black boot and dust cap inclusive

Stripping tool (Page 46)
 on demand

Crimp tool (Page 47)
 on demand

Polishing tool (Page 48)

**SMA connector UV-IR**Order No.: **SSMA-SK0-M**

Color: black
Fiber Ø: 125 µm – 1500 µm
Assembly: crimp/glue/polish
Ferrule: metal
 black boot and dust cap inclusive

Stripping tool (Page 46)
 on demand

Crimp tool (Page 47)
 on demand

Polishing tool (Page 48)



Assembly tools for POF and PCF

We have the right tools for all the processing stages, from stripping to crimping and endface processing and through to final testing.

Thus the POFs assembly is a more child's play.

The tools for assembling POF and PCF are specifically tailored to LEONI Fiber Optics' cable designs and connectors.

Stripping tools



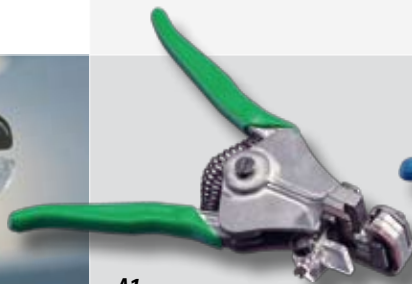
We have the right tools for all the processing stages, from stripping to crimping, endface processing and through to final testing.

The method of a two-compound adhesive and grinding/polishing familiar from glass-based fiber optics is also commonly used.

Stripping tool

Order No.: **Z012-SA0-3,6-6,0**

for Ø 6.0 + Ø 3.6 mm
Simplex cable



A1

Stripping tool

Order No.: **Z010-SA0-2,2**

for Ø 2.2 mm cable
specially for PCF and PA jacketed POF

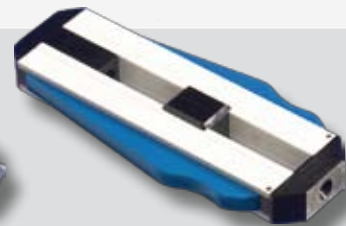


A2

Buffer stripper

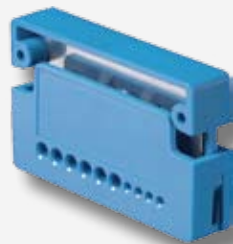
Order No.: **Z004-TA0-0,5**

for 230 µm
PCF fiber



A3

A4



Cutter

Order No.: **ZXXX-TD0**

for POF jacketed fibers and fibers
up to Ø 2.3 mm

A5

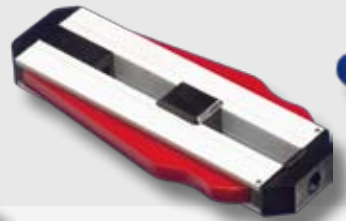


Stripping tool

Order No.: **Z004-TA0-0,5-2,2**

for PCF jacket and buffer

A6



Stripping tool

Order No.: **Z011-SA0-2,2**

for Ø 2.2 mm
PE jacketed fiber

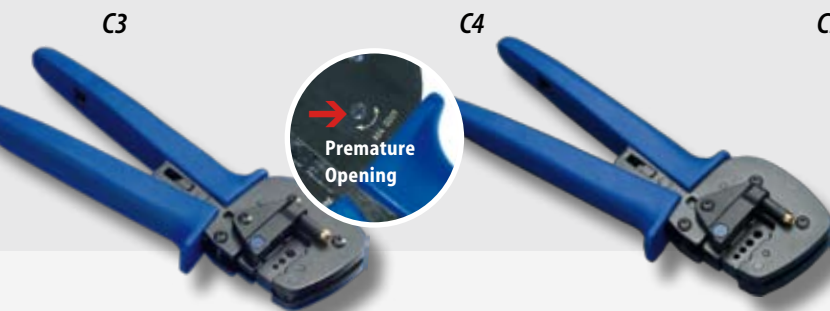
Crimp tool POFOrder No.: **ZSMA-CC0**for FSMA connectors POF
Ø 2.2 / 3.6 / 6.0 mm cable**Crimp tool POF**Order No.: **ZXST-CC0**

for ST connectors POF



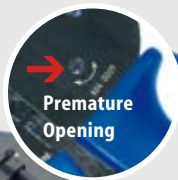
C1

C2



C3

C4

Premature
Opening

C5

**Universal crimp tool POF**Order No.: **ZXXX-CB0** see chart

for ST, FSMA, V-PIN (HP)

Connector	Order No.	Crimp Ø mm
V-PIN	SHP-SV0-19-0010	5.0
V-PIN	SHP-DS0-19-0010	5.0
V-PIN Metall	SHP-SS0-20-0010	3.0
F05 Metall	SF05-SS0-20-0010	5.0
FSMA	SSMA-SS0-02-0050	3.0
FSMA	SSMA-SH0-02-0010	3.0
ST	SXST-SS0-22-0010	3.5

Universal crimp tool PCFOrder No.: **ZXXX-CC0** see chart

für ST-, FSMA- und FCPC-Stecker

Connector	Order No.	Crimp Ø mm
FSMA	SHP-SV0-19-0010	anchor 3.3
ST	SXST-SK0-01-0020	anchor 4.5
ST	SXST-SK0-01-0030	anchor 4.5

Cleave tool PCFOrder No.: **ZSMA-TW0**
for FSMA connectors
PCF (clamp and cleave version)Order No.: **ZXST-TW0**
for ST connectors
PCF (clamp and cleave version)Order No.: **ZXHP-TW0**
for connectors (V-PIN)
PCF (crimp and cleave version)Order No.: **ZF07-TW0**
for F05/F07 connectors
PCF (crimp and cleave version)Order No.: **ZXSC-TW0**
for SC connectors
(clamp and cleave version)

Crimp and cleave tools



PCF cables are quick and easy to assemble by crimping, clamping and cleaving methods. This technique is widely in the industry.

Polishing tools



Polishing kit

Order No.: **ZHP-PS0**

HFBR-4593

Capacity: Polishing film 600
Polishing film 3µm
Polish Disc

Packaging unit: 1 sheet per film
Sheet size: 100 x 100 mm



P1

Polishing film 3µm

Order No.: **Z001-PS1**

Grain/Material: 3 µm – Al₂O₃
Packaging unit: 10 sheets
Sheet size: 216 x 279 mm



P2

Polishing film 600

Order No.: **Z002-PS1**

Granulation: 600
Packaging unit: 10 sheets
Sheet size: 230 x 280 mm



P3



P4



P5

Polishing film diamond 9 µm grain

Order No.: **Z005-PS1**

Grain/Material: 9 µm – C (diamond)
Packaging unit: 15 sheets
Sheet size: 230 x 280 mm

Polishing film diamond 1 µm grain

Order No.: **Z007-PS1**

Grain/Material: 1 µm – C (diamond)
Packaging unit: 10 sheets
Sheet size: 230 x 280 mm

Polish Disc FSMAOrder No.: **FSMA-SP0**

for FSMA connector (metal)

Polish Disc F05Order No.: **ZF05-SP0-L**for F05 connector (metal)
with wear indicator**P6****P7****P8****P9****P10****Polish Disc HP**Order No.: **ZHP-TPO**for HP (HFBR) connector
Ø 2.2 mm**Polish Disc Universal 2.5 mm**Order No.: **ZXXX-SP0-2.5**for connectors with 2.5 mm ferrule:
BFOC (ST) FCPC
SCPC DIN**Hotplate incl. power supply POF**Order No.: **ZSMA-TH0** incl. power supply for FSMA and F05/F07Order No.: **ZXST-TH0** incl. power supply for BFOC (ST) connector**Hotplate for fiber optic assembly**

The hotplate method is an alternative to grinding and polishing equipment for preparing the end surface of POF fibers. Its principal advantages are good reproducibility and ease of use.

With this method, the fiber end surfaces are melted at a temperature of about 140 °C and put into their final form. Nearly all POF connectors can be used with this special assembly method.

System voltage: 24 V / 1 A
Power input: 24 W
Temperature: approx. 140 °C

Power transformer
Input: 220 V a.c. / 50 Hz / 38 W
Output: 24 V d.c. / 1 A / 24 W
Connector: DIN-connector

Measuring equipment



Fiber optic measurements and optical inspections are indispensable in the context of quality assurance and error tracing. Our measurement systems especially for harsh environments characterised in particular by a high flexibility at the transmitter side.

Adapter passive

Order No.: see chart

Includes adapter system which accommodates all standard fiber optic connectors.

Connector	Order No.	
ST (BFOC)	ZXST-TX0	
FSMA	ZSMA-TX0	
F05	ZF05-TX0	
HP	ZHP-TX0	
HP	ZHPD-TX0	
FCPC	ZFCPC-TX0	

Optical power meter with digital display

Order No.: see chart

Use this meter to determine the power of a light source (LED or Laser) or to measure the attenuation of a fiber optic cable when used in conjunction with a stabilized light source. Micro-processor technology allows you to measure two wave lengths and display results in μW or dBm. Automatic zero adjustment during power-on sequence. Includes adapter system which accommodates all standard fiber optic connectors.

Order information

Please order separately the corresponding connector adapter and reference cable for the FO connectors.

Opt. detector Silicon PIN diode

Detector surface 2.65 x 2.65 mm

Opt. connector removable adapter, screw-on

Display -50.0 to $+3$ dBm


Optical power meter Wavelength	Order No.
660 / 850 nm	ZXXX-TM0
1300 / 1550 nm	ZXXX-TM0_1300
520 / 660 / 850 / 940 nm	ZXXX-TM0-4W



Adapter active

Order No.: see chart

The interchangeable adapter system accommodates a wide variety of fiber optic connectors. The active adapters are available with different wavelengths.

Connector	Order No.	
ST (BFOC)	ZXST-TS0-660	
FSMA	ZSMA-TS0-660	
F05	ZF05-TS0-660	
HP	ZHP-TS0-650	
HP	ZHPD-TS0-650	

Further types on demand.

Optical transmitter Wavelength depends on the adapter

Order No.: see chart

Basic device with BNC adapter for connection of various fiber optic plug adapters. Plug adapters with wavelengths of 650 nm, 660 nm and 850 nm can be supplied. The part numbers below show adapters for a wavelength of 660 nm as an example.

Order information

Please order separately the corresponding connector adapter and reference cable for the FO connectors.

For further information please visit www.leoni-fiber-optics.com

Optical transmitter Wavelength	Order No.
520 to 940 nm	ZXXX-TS0
1300 nm	ZXXX-TS0-1300
1550 nm	on demand

Note for measuring POF with 2.2 mm fiber jacket diameter without connector

The ends of the POF to be measured must be cut cleanly (e.g. using the ZXXX-TD0 POF fiber cutter). The SMA 2.2 mm connector SSMA-SV0-02-0020 must be fitted to the prepared fiber jacket ends in such a way that fiber end face is in line with the ferrule. The "assembled" POF can now be measured with the measuring device (with FSMA adapter) and the connectors can subsequently be removed again.

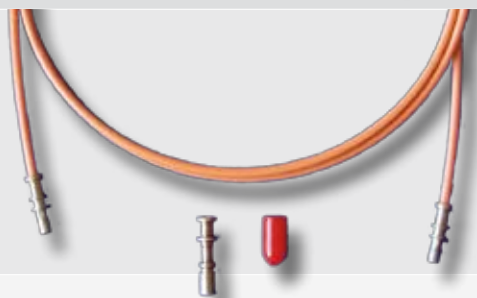
Microscope

Order No.: ZXXX-TF0-V1

Magnification 100 times

The tools commonly used to assess the quality of the polished fiber endfaces of POF (plastic optical fiber) are hand microscopes providing 100 times enlargement. It is not unusual for users to show signs of tiring when using such microscopes over prolonged periods, especially in mass production.

A camera-based microscope now provides a remedy. The newly developed device is suited to all common POF connectors. The interchangeable adapter is the same as the one used for the attenuation measurement tool. This microscope can enlarge up to 200 times. The product supplied also comprises a small monitor as well as the power supply connector. The device is suited for use both in mass production and on-site.



Golden fiber

Order No.: see chart

Length: 1 m

Version: Pin – Pin,
Pin – Socket

POF reference cable,
2 polished MOST pin or socket contacts

Connector	Order No.
ST (BFOC) Pin – Pin	KMIP-MIP17001M
FSMA Pin – Socket	KMIP-MIS17001M

Measurement kit

Order No.: see chart

With transmitter, power meter and different adapter available.

Measurement kit includes

Order No.	Description
page 50	Optical power meter with digital display
page 50	Optical transmitter, basic device with BNC adapter
page 50	Adapter active
page 50	Adapter passive
page 49	2 power supplies for worldwide use
page 7	Reference cable

Connector	Order No.
ST (BFOC)	ZXST-KM0
FSMA	ZSMA-KM0
F05	ZF05-KM0
HP	ZXHP-KM

Termination kit



↑
K1 + K2
↓

Termination kit for FSMA connectors PCF

Order No.: **ZSMA-KW0**

The following connectors can be assembled with this device:

- SSMA-SW0-02-0010** Simplex connector FSMA for PCF-cable 2.2 mm
- SSMA-SW0-02-0020** Simplex connector FSMA for PCF-cable 3.0 mm

Please refer to the table below for contents and cable choice. The cleave tool and the microscope adapter are the only parts in which the K1 and K2 termination kits differ.

Order No.	Description
ZSMA-TW0	Cleave tool – FSMA PCF
ZSMA-AF0-V1	Microscope adapter

Termination kit for ST connectors PCF

Order No.: **ZXST-KW0**

The following connectors can be assembled with this device:

- SXST-SW0-02-0010** Simplex connector ST for PCF-cable 2.2 mm
- SXST-SW0-02-0020** Simplex connector ST for PCF-cable 2.5 mm
- SXST-SW0-02-0030** Simplex connector ST for PCF-cable 3.0 mm

Termination kit includes

Order No.	Description
Z004-TA0-0,5-2,2	Stripper for 230 µm PCF-fiber
ZXXX-TN0	Kevlar scissor
ZXST-TW0	Cleave tool – PCF ST
00405402	Fiber container
ZXX-TL0	Card cleaner
ZXX-TF0-V1	Microscope 100 ×
ZXST-AF0-V1	Adapter for microscope ST connector



K3



K4

Termination kit for F05/F07 connectors PCF

Order No.: **ZF0507-KC0**

The following connectors can be assembled with this device:

- SF05-SC0-08-0010** Simplex connector F05 for PCF-cable 2.2 mm
Compatible to TOCP 151 QK
- SF07-DC0-08-0010** Duplex connector F07 for PCF-cable 2.2 mm

Termination kit includes

Order No.	Description
Z004-TA0-0,5-2,2	Stripper for 230 µm PCF-fiber
ZXXX-TN0	Kevlar scissor
ZF0507-CC0-REN	Crimp plier for F05/F07 plug – PCF
ZXST-TW0	Cleave tool – PCF ST
00405402	Fiber container
ZXX-TL0	Card cleaner
ZXX-TF0-V1	Microscope 100 ×
ZXST-AF0-V1	Adapter for microscope F05 connector

Termination kit for HP connectors PCF

Order No.: **ZXHP-KW0**

The following connectors can be assembled with this device:

- SXHP-SC0-32-0010** Simplex connector HP for PCF cable 2.2 mm
Compatible to HP HFBR 4521 and V-Pin 200S
- SXHP-DC0-32-0010** Duplex housing with two simplex connectors

Termination kit includes

Order No.	Description
Z004-TA0-0.5-2.2	Stripper for 230 µm PCF-fiber
ZXXX-TN0	Kevlar scissor
ZXHP-CC0	Crimp plier for HP Connectors V-Pin PCF
ZXHP-TW0	Cleave tool – PCF HP
00405402	Fiber container
ZXX-TL0	Card cleaner
ZXX-TF0-V1	Microscope 100 ×
ZXHP-AF0-V1	Adapter for microscope

LEONI service

In response to customer enquiries, we set up a team at the beginning of 2004 to handle on-site service and repair of fiber optic cables of all kinds. The team has already handled numerous service orders worldwide.

Working together with our service team provides major benefits for both parties. Our service person has the necessary expertise to help quickly and immediately. In addition, he can respond specifically to customer requirements and suggest solutions. In return, we welcome receiving ideas and suggestions on-site to improve our products.

In the process, our service frequently also goes beyond matters relating to our products. When needed, we also provide on-site problem analyses and suggest solutions with respect to the active components.

We shall be pleased to be at your disposal also for installation projects or repair jobs.

Do you have any questions in this regard?
Then please contact

Bernd Froetschner

Phone +49 (0)36764-81-427

Fax +49 (0)36764-81-110

E-mail Bernd.Froetschner@leoni.com



It is also always worth having a look
at our website:
www.leoni-fiber-optics.com



We have the latest information for you.

Our up-to-date information services including *LEONI infoLine* or *LEONI infoMail* provide current information by post or e-mail about the latest developments at LEONI Fiber Optics and in the market, and will also inform you on important dates and events.

LEONI also produces...

Cable

- Automotive wires
- UL and CSA approved cables
- Insulated power cables
- Earthing ropes
- Control cables, shielded and unshielded
- Insulated Hook-up wires according to DIN, VDE
- Fiber optic cables with glass and plastic optical fibers
- Copper data cables
- Coaxial cables
- Customised special cables for robotics, seismology, medicine, sensor systems, audio/video, environmental engineering ...
- Cord sets
- Spiral cables
- Cable assemblies
- Special cables assembled to customer specification
- Connection cables and car kits for mobile phones
- Automotive cables for electronic drive controls, engine management, mobile communication
- Extruded flat cables
- Battery, starter and generator cables with copper and aluminium conductors

Wiring Systems

- Wiring systems for automobiles, trucks and buses tractors and forklifts
- Conventional and preformed cable harnesses
- Plastic mouldings, also in foamed version
- Electronic solutions for automobile construction (part and full multiplex)
- Cable assemblies for ABS systems and sensors

Wire

- Single wires, tin, silver, gold and nickel plated made of copper and copper based alloys
- Bunched and stranded conductors for the cable industry
- Highly flexible copper strands, ropes and braids
- Tinsel conductors and braided tubes
- Copper alloy wires (resistance wires)
- Metallic gold and silver threads; bouillon



**LEONI Fiber Optics
GmbH**

Muehldamm 6
96524 Neuhaus-Schierschnitz
Germany
Phone +49 (0)36764-81100
Fax +49 (0)36764-81110
E-mail fiber-optics@leoni.com
www.leoni-fiber-optics.com