FiberTech
Solutions for Laser Beam Transmission

The Quality Connection

LEONI

Our product brand FiberTech

Experience in laser technology

Applications:

LEONI Fiber Optics Laser cables are based on **LOSCH High-Power Technology** and are specially designed for transferring laser beam energy generated by industrial and medical laser systems.

In contrast to fibers widely used in datacom and telecom applications these fiber cables have to withstand much higher power levels, which typically are in the range from several Watt up to several Kilowatt.

The applications for LEONI laser cables include all fiber-coupled laser systems emitting in the UV to IR wavelength region, as for example high-power semiconductor lasers, solid-state lasers and fiber lasers.

We are able to influence the product design **at every stage of the process** according to your wishes.

Optical technologies at LEONI

LEONI Fiber Optics is one of the leading providers of optical fiber technology for communication as well as for special applications in industry, sensor technology and analytics, in science and laser technology. LEONI Fiber Optics is offering a unique product range at every stage along the value chain: from the preform, to the fibers, up to fiber optic cables and complete fiber optic systems.

Product portfolio

LEONI laser cables with **LOSCH High-Power Technology** include several features which make these products unique, tailored to the needs of our customers in the laser industry.

Fused silica fibers and capillaries

LEONI produces a variety of fused silica step-index and graded-index laser fibers with different fiber dimensions and coating/jacket material. LEONI has performed intensive research to experimentally determine the laser beam damage threshold of these fibers, and can therefore assist customers to exactly find the right product (➔ *www.leoni-fiber-optics.com*). Silica capillaries are also available, used for beam guiding of ultra-short pulses in the femto-second range.

Laser cables with SMA and FC interface

LEONI offers a variety of different laser cables with F-SMA/SMA905 connectors, depending on the beam power levels. All SMA connectors have a free-standing fiber tip. **CuSMA** cables with their distinctive copper alloy ferrule and excellent fiber alignment provide good heat removal and fiber centration. Maximum laser power transmission can be achieved with the **SMA500** and **CuFC** cables, with an even superior heat transfer capability. The CuFC connectors provide a connector interface for FC-style applications including a key employed as an anti-rotation feature.

Laser cables with LD-80 interface

The **LD-80** is compatible with the Ø 4x10 mm Industrial Industry Standard. The extremely accurate, keyed connector allow for plug- and play connections. High power transmission is achieved by the copper alloy ferrule and the excellent fiber alignment. Laser safety is ensured by using steel-armored protection tubes and, in some of the products, by an electrical fiber break-detect system.

Laser cables with ModeStrip technology

Fiber cladding modes are the radiation modes within a fiber which are not confined within the fiber core but guided within the fiber cladding, due to the beam reflection at the interface between the silica clad and coating material. Some laser applications require that the fiber radiation is limited to the fiber core, in this case the cladding modes have to be removed or stripped. **LOSCH High-Power Technology** has integrated the mode-stripping feature into the connector and offers different cooling solutions for managing the heat dissipation.

Robotic laser cables

These cables are optimized to effectively transport highest laser powers of up to several kW from the laser system to the workpiece. Main applications are the beam delivery to an optical system mounted on an industrial robot, therefore these cables are known in the market as robotic cables. Different standardized connector interfaces with nozzle diameters of 10 mm (LLK-LP) and 15 mm (LLK-HP) are available to achieve compatibility with common laser systems. Fiber break-detection and thermal control of the connector ensure laser safety requirements during operation. The robotic laser cables are based on the proven **LOSCH High-Power Technology** and include efficient heat removal by using copper alloy material and the high-accuracy fiber centration.

Our product portfolio
for the laser market

Overview laser cables

Two key parameters of laser systems are necessary to select the appropriate fiber cable.

At first, the laser beam quality defines the minimum core diameter and the numerical aperture of the optical fiber. Secondly, the laser average power has to be taken into account to select the connector type. Due to reflection losses at the fiber-to-air interface inside the connector part of the laser energy will be dissipated.

LEONI laser cables with LOSCH Technology, besides of it's excellent fiber alignment, include several features to efficiently remove heat energy from the inner part of the connector.

Also, the maximum average power depends on the coupling conditions between laser system and optical fiber, in the case of optimum coupling 100% of the laser power is coupled into the fiber core. Therefore, as the specific coupling conditions are not known, the maximum power rating in the following overview can only be meant as a guide-line.

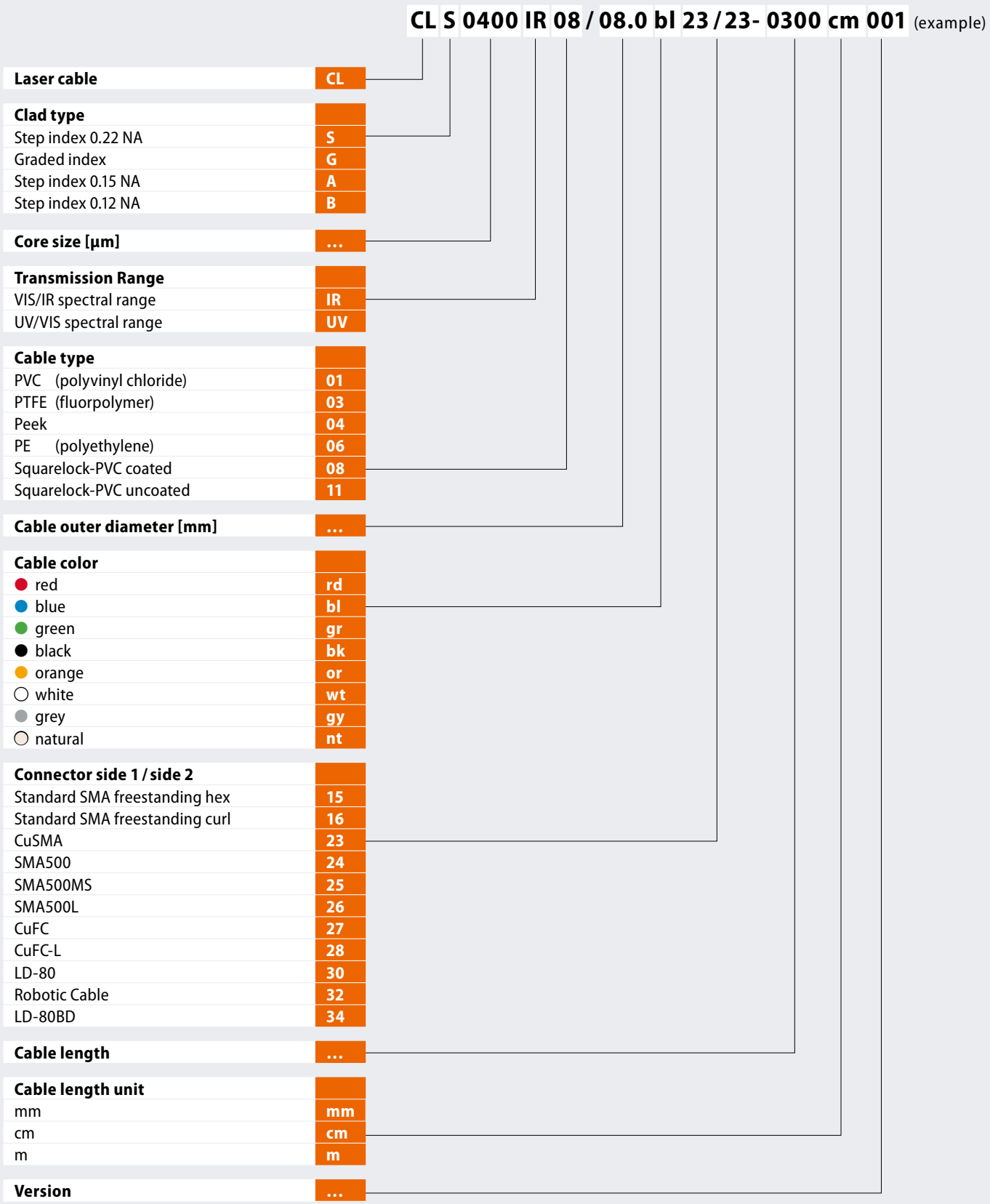
Product and fiber core diameter	Connector	Connector cooling	Max. average power W*	Mode stripping	Part no. family
Standard SMA fiber cables					
200 µm	Standard SMA free-standing	Air convection	50	NO	FCL15-x FCL16-x
400 µm			100		
600 µm			100		
800 µm			100		
1000 µm			100		
CuSMA fiber cables					
100 µm	Cu ferrule, SMA free-standing	Air convection	50	NO	FCL23-x
200 µm			200		
400 µm			400		
600 µm			400		
800 µm			400		
1000 µm			400		
SMA500 fiber cables					
100 µm	Cu ferrule, SMA free-standing	Air convection/ conduction cooling	50	NO	FCL24-x
200 µm			250		
400 µm			500		
600 µm			500		
800 µm			500		
SMA500MS fiber cables					
100 µm	Cu ferrule, SMA free-standing	Air convection/ conduction cooling	50	YES	FCL25-x
200 µm			200		
400 µm			200		
SMA500L fiber cables					
100 µm	Cu ferrule, SMA free-standing	Liquid cooling	50	YES	FCL26-x
200 µm			200		
400 µm			200		
CuFC fiber cables					
100 µm	Cu ferrule, SMA free-standing	Air convection	50	NO	FCL27-x
200 µm			200		
400 µm			400		

* Note: The maximum Average laser power rating is based on the feedback from our customers and can only be meant as a guide-line, as it depends of the coupling conditions.

Product and fiber core diameter	Connector	Connector cooling	Max. average power W*	Mode stripping	Part no. family
CuFC-L fiber cables					
100 µm	Cu ferrule, FC free-standing	Liquid cooling	50	YES	FCL28-x
200 µm			200		
400 µm			400		
LD-80 fiber cables					
100 µm	Cu ferrule, 4 mm diameter free-standing	Air convection	100	NO	FCL30-x
200 µm			300		
300 µm			600		
400 µm			800		
600 µm			800		
800 µm			800		
1000 µm			800		
LD-80MS fiber cables					
100 µm	Cu ferrule, 4 mm diameter free-standing	Air convection/ conduction cooling	50	YES	FCL31-x
200 µm			200		
400 µm			200		
LD-80BD fiber cables with break detect					
100 µm	Cu ferrule, 4 mm diameter free-standing	Air convection	100	NO	FCL34-x
200 µm			300		
300 µm			600		
400 µm			800		
600 µm			800		
800 µm			800		
1000 µm			800		
LD-80R Robotic fiber cables					
300 µm	Cu ferrule, 10 or 15 mm diameter	Air convection	2000	NO	FCL32-x
400 µm			3000		
600 µm			5000		
800 µm			5000		
1000 µm			5000		

* Note: The maximum Average laser power rating is based on the feedback from our customers and can only be meant as a guide-line, as it depends of the coupling conditions.

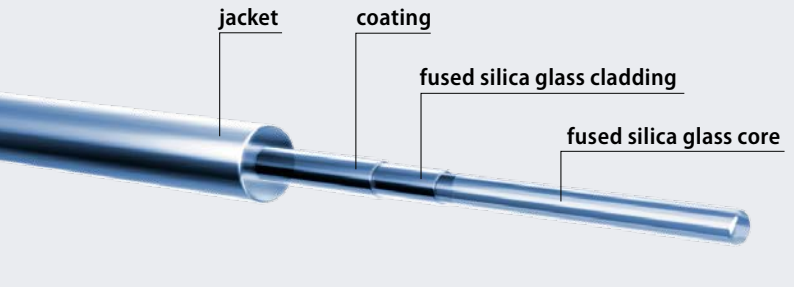
Type designation for laser cables



Laser cable	**CL**
Clad type	
Step index 0.22 NA	S
Graded index	G
Step index 0.15 NA	A
Step index 0.12 NA	B
Core size [µm]	...
Transmission Range	
VIS/IR spectral range	IR
UV/VIS spectral range	UV
Cable type	
PVC (polyvinyl chloride)	01
PTFE (fluorpolymer)	03
Peek	04
PE (polyethylene)	06
Squarelock-PVC coated	08
Squarelock-PVC uncoated	11
Cable outer diameter [mm]	...
Cable color	
red	rd
blue	bl
green	gr
black	bk
orange	or
white	wt
grey	gy
natural	nt
Connector side 1 / side 2	
Standard SMA freestanding hex	15
Standard SMA freestanding curl	16
CuSMA	23
SMA500	24
SMA500MS	25
SMA500L	26
CuFC	27
CuFC-L	28
LD-80	30
Robotic Cable	32
LD-80BD	34
Cable length	...
Cable length unit	
mm	mm
cm	cm
m	m
Version	...

VIS-IR fiber specifications

Step-index multimode
VIS-IR



Business Units Fiber Optics' Step-Index multimode fibers with a fused silica core are the material of choice for laser beam transmission. The low OH content and the uniform refractive index guarantees low beam distortion and low absorption in the VIS-IR wavelength range of 400 nm–2400 nm.

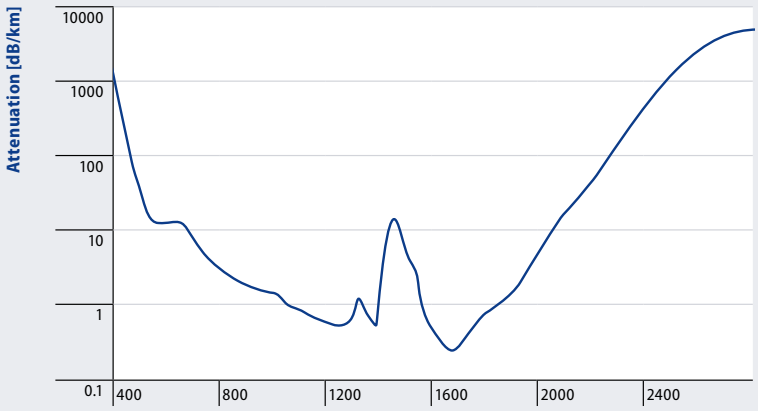
The cladding consists of fluorine-doped fused silica and defines the beam-guiding properties and the numerical aperture of the fiber. The standard numerical aperture is 0.22, other apertures are available on request.

Tailored to the various applications the fibers are available with different coating and jacket materials. Silicone and hard-clad (fluorine-doped high-temperature acrylate) enables high power laser beam transmission with average power levels of up to several kilowatts. For both materials the refractice index lower is lower than the refractive index of the fiber cladding. Therefore radiation not confined within the fiber core will propagate along the fiber as cladding modes. Special connectors are available to remove or strip these cladding modes.

LEONI Fiber Optics has performed extensive research to experimentally determine the laser beam damage threshold for the fiber and coating materials using laser probe beams and can therefore assist customers to exactly find the right product.

	Step-index multimode: VIS-IR								
Core Ø [µm] (±2 %)	40	50	60	90	100	100	100	105	200
Cladding Ø [µm] (±2 %)	125	125	125	125	110	120	140	125	220
Fibers with coating									
Coating – single acrylate	Numerical aperture 0.22 (0.1 on request) Temperature range –40 °C to 85 °C								
Coating-Ø [µm] (±3 %)	200	200	200	200	200	200	220	200	345
Order no.:	84810001N	84810003N	84810004	84810005N	84810006N	84810007N	84810008N	84810009N	848100010N
Coating – dual acrylate	Numerical aperture 0.22 (0.1 on request) Temperature range –40 °C to 85 °C								
Coating-Ø [µm] (±3 %)	245	245	245	245	230	240	260	245	400
Order no.:	84810041N	84810043N	84810044N	84810045N	84810046N	84810047	84810048N	84810049N	84810050N
Fibers with coating and jacket									
Coating – acrylate / jacket – Polyamid	Numerical aperture 0.22 (0.1 on request) Temperature range –40 °C to 85 °C								
Jacket-Ø [µm] (±5 %)	500	500	500	500	500	500	500	500	500
Order no.:	84810101N	84810103N	84810104N	84810105N	84810106N	84810107N	84810108N	84810109N	84810119N
Coating – silicone / jacket – ETFE	Numerical aperture 0.22 (0.1 on request) Temperature range –40 °C to 150 °C								
Jacket-Ø [µm] (±5 %)	500	500	500	500	500	500	500	500	500
Order no.:	84810161N	84810162N	84810163N	84810164N	84810165N	84810166N	84810167N	84810168N	84810169N

Short-term bending radius: 100 x jacket radius | long-term bending radius: 600 x jacket radius
Fibers with jacket are available in different colours | ETFE: black, blue, transparent | Polyamid: black, blue, transparent, yellow, red, white
Note:Fiber code no. applies to black, other colours on request



Typical values

	Step-index multimode: VIS-IR									
Core Ø [µm] (±2 %)	200	200	365	400	400	500	600	800	1000	1500
Jacket Ø [µm](±2 %)	240	280	400	440	480	550	660	880	1100	1650
Fibers with coating										
Coating – single acrylate	Numerical aperture 0.22 (0.1 on request) Temperature range –40 °C to 85 °C									
Coating-Ø [µm](±3 %)	400	450	550	560	660	700	840	1000	1350	1850
Order no.:	84810011N	84810012N	84810014N	84810015N	84810016N	84810017N	84810583N	84810020N	84810022N	84810024N
Coating – dual acrylate	Numerical aperture 0.22 (0.1 on request) Temperature range –40 °C to 85 °C									
Coating-Ø [µm](±3 %)	400	500	—	—	—	—	—	—	—	—
Order no.:	84810051N	84810052N	—	—	—	—	—	—	—	—
Fibers with coating and jacket										
Coating – acrylate / jacket – Polyamid	Numerical aperture 0.22 (0.1 on request) Temperature range –40 °C to 85 °C									
Jacket-Ø [µm](±5 %)	600	600	800	800	800	1000	1000	1300	1600	2000
Order no.:	84810110N	84810111N	84810113N	84810114N	84810115N	84810116N	84810117N	84810118N	84810525N	84810537N
Coating – hardclad / jacket – ETFE	Numerical aperture 0.22 (0.1 on request) Temperature range –40 °C to 150 °C									
Jacket-Ø [µm](±5 %)	—	—	580	650	—	—	880	1200	1400	—
Order no.:	—	—	84810304N	84810306N	—	—	84810310N	84810312N	84810313N	—
Coating – silicone / jacket – ETFE	Numerical aperture 0.22 (0.1 on request) Temperature range –40 °C to 150 °C									
Jacket-Ø [µm](±5 %)	600	600	800	800	800	1000	1000	1300	1500	2250
Order no.:	84810170N	84810171N	84810173N	84810174N	84810175N	84810176N	84810177N	84810178N	84810121N	84810179N

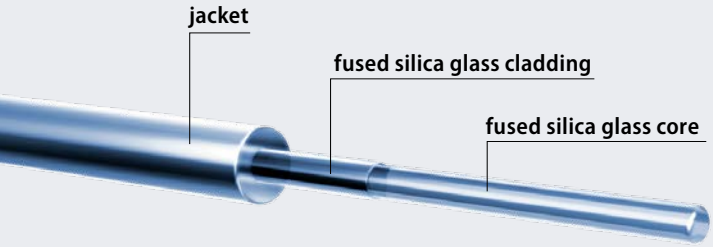
Short-term bending radius: 100 x jacket radius | long-term bending radius: 600 x jacket radius

Fibers with jacket are available in different colours | ETFE: black, blue, transparent | Polyamid: black, blue, transparent, yellow, red, white

Note:Fiber code no. applies to black, other colours on request

VIS-IR fiber specifications

Graded-index multimode
VIS-IR



The Busines Unit Fiber Optics is a leading producer of high-quality multimode fibers with graded index profile used for data transmission. Based on this expertise LEONI Fiber Optics offers an extended product range of graded-index fibers for laser beam transmission applications.

The light rays within graded-index fibers will not follow a zigzag-path as in the case of a step-index profile. The fiber acts as a lens duct with the advantage that the input NA and the beam diameter at the fiber input will be preserved. Due to the doping of the fiber core graded-index fibers have a lower laser damage threshold and a higher numerical aperture in comparison with step-index fibers.

	Gradient index Multimode: VIS-IR						
Core Ø [µm] (±2 %)	50	62.5	85	100	200	400	600
Jacket Ø [µm] (±2 %)	125	125	125	140	280	560	840
	Fibers with coating						
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 x km]	300/600	300/400	200	200	150	100	100
Bandwidth at 1300 nm [MHz x km]	600/1200	550/1000	200	200	150	100	100
	Coating – Acrylat Temperature range –40 °C to 85 °C						
Coating-Ø [µm](±3 %)	250	250	250	260	450	700	1050
Order no.:	84810501N	84810502N	84810503N	84810504N	84810505N	84810506N	84810507N

Polyamid or ETFE jackets are optionally available.
Fibers with jacket are available in different colours | ETFE: black, blue, transparent | Polyamid: black, blue, transparent, yellow, red, white

Standard SMA laser cables with hex nut

Laser cable with F-SMA freestanding fiber connectors and PVC protection tube and stainless steel connector cuffs. Applicable for laser beam delivery of up to 100 W.

- VIS-IR All-Silica Step-Index Fiber with NA=0.22
  NA=0.12 on request
- SMA905 (F-SMA) connectors with Free-Standing Fiber Tip
- Hex Nut
- Aramid yarn, blue PVC protection tube
- Stainless –steel connector cuffs
- Average laser power up to 100 W

Fiber core Ø [µm]	Cable length [m]	Type designation	Order no.
200	2	CLS0200IR01/05.5bl15/15-0200cm100	**FCL15-20200-1000**
400		CLS0400IR01/05.5bl15/15-0200cm100	**FCL15-40200-1000**
600		CLS0600IR01/05.5bl15/15-0200cm100	**FCL15-60200-1000**
800		CLS0800IR01/05.5bl15/15-0200cm100	**FCL15-80200-1000**
1000		CLS1000IR01/05.5bl15/15-0200cm100	**FCL15-90200-1000**
200	3	CLS0200IR01/05.5bl15/15-0300cm100	**FCL15-20300-1000**
400		CLS0400IR01/05.5bl15/15-0300cm100	**FCL15-40300-1000**
600		CLS0600IR01/05.5bl15/15-0300cm100	**FCL15-60300-1000**
800		CLS0800IR01/05.5bl15/15-0300cm100	**FCL15-80300-1000**
1000		CLS1000IR01/05.5bl15/15-0300cm100	**FCL15-90300-1000**
200	5	CLS0200IR01/05.5bl15/15-0500cm100	**FCL15-20500-1000**
400		CLS0400IR01/05.5bl15/15-0500cm100	**FCL15-40500-1000**
600		CLS0600IR01/05.5bl15/15-0500cm100	**FCL15-60500-1000**
800		CLS0800IR01/05.5bl15/15-0500cm100	**FCL15-80500-1000**
1000		CLS1000IR01/05.5bl15/15-0500cm100	**FCL15-90500-1000**

Standard SMA laser cables with knurled nut

Laser cable with F-SMA freestanding fiber connectors and PVC protection tube and stainless steel connector cuffs. Connector with curl nut for easy connector attachment without tools. Applicable for laser beam delivery of up to 100 W.

- VIS-IR All-Silica Step-Index Fiber with NA=0.22
  NA=0.12 on request
- SMA905 (F-SMA) connectors with Free-Standing Fiber Tip
- Knurled Nut
- Aramid yarn, blue PVC protection tube
- Stainless –steel connector cuffs
- Average laser power up to 100 W

Fiber core Ø [µm]	Cable length [m]	Type designation	Order no.
200	2	CLS0200IR01/05.5bl16/16-0200cm100	FCL16-20200-2000
400		CLS0400IR01/05.5bl16/16-0200cm100	FCL16-40200-2000
600		CLS0600IR01/05.5bl16/16-0200cm100	FCL16-60200-2000
800		CLS0800IR01/05.5bl16/16-0200cm100	FCL16-80200-2000
1000		CLS1000IR01/05.5bl16/16-0200cm100	FCL16-90200-2000
200	3	CLS0200IR01/05.5bl16/16-0300cm100	FCL16-20300-2000
400		CLS0400IR01/05.5bl16/16-0300cm100	FCL16-40300-2000
600		CLS0600IR01/05.5bl16/16-0300cm100	FCL16-60300-2000
800		CLS0800IR01/05.5bl16/16-0300cm100	FCL16-80300-2000
1000		CLS1000IR01/05.5bl16/16-0300cm100	FCL16-90300-2000
200	5	CLS0200IR01/05.5bl16/16-0500cm100	FCL16-20500-2000
400		CLS0400IR01/05.5bl16/16-0500cm100	FCL16-40500-2000
600		CLS0600IR01/05.5bl16/16-0500cm100	FCL16-60500-2000
800		CLS0800IR01/05.5bl16/16-0500cm100	FCL16-80500-2000
1000		CLS1000IR01/05.5bl16/16-0500cm100	FCL16-90500-2000

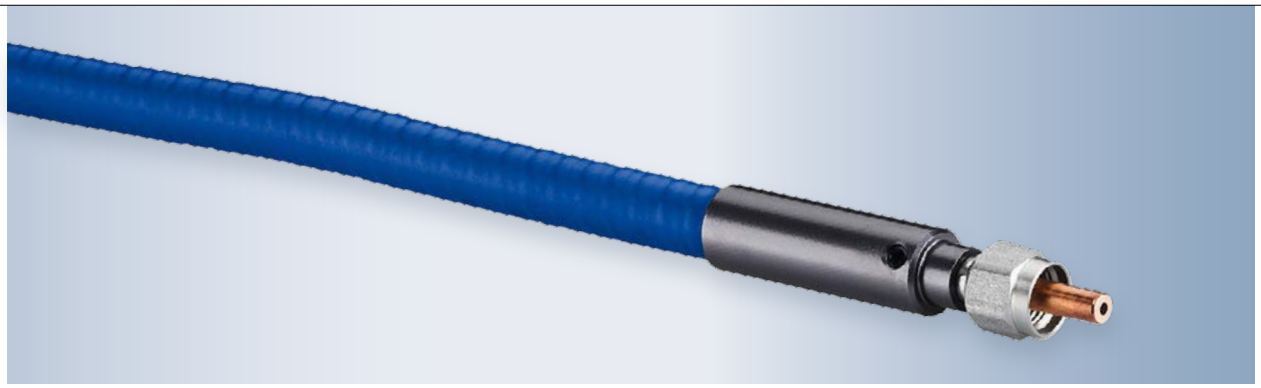
Standard SMA laser cables with squarelock tube

Laser cable with F-SMA freestanding fiber connectors and PVC coated steel-armored protection tube. Applicable for laser beam delivery of up to 100 W.

- VIS-IR All-Silica Step-Index Fiber with NA=0.22
  NA=0.12 on request
- SMA905 (F-SMA) connectors with Free-Standing Fiber Tip
- Hex Nut
- Squarelock, black PVC-coated protection tube
- Electrical isolation from end to end
- Average laser power up to 100 W

Fiber core Ø [µm]	Cable length [m]	Type designation	Order no.
200	2	CLS0200IR08/08.0bk15/15-0200cm100	FCL15-20200-2000
400		CLS0400IR08/08.0bk15/15-0200cm100	FCL15-40200-2000
600		CLS0600IR08/08.0bk15/15-0200cm100	FCL15-60200-2000
800		CLS0800IR08/08.0bk15/15-0200cm100	FCL15-80200-2000
1000		CLS1000IR08/08.0bk15/15-0200cm100	FCL15-90200-2000
200	3	CLS0200IR08/08.0bk15/15-0300cm100	FCL15-20300-2000
400		CLS0400IR08/08.0bk15/15-0300cm100	FCL15-40300-2000
600		CLS0600IR08/08.0bk15/15-0300cm100	FCL15-60300-2000
800		CLS0800IR08/08.0bk15/15-0300cm100	FCL15-80300-2000
1000		CLS1000IR08/08.0bk15/15-0300cm100	FCL15-90300-2000
200	5	CLS0200IR08/08.0bk15/15-0500cm100	FCL15-20500-2000
400		CLS0400IR08/08.0bk15/15-0500cm100	FCL15-40500-2000
600		CLS0600IR08/08.0bk5/15-0500cm100	FCL15-60500-2000
800		CLS0800IR08/08.0bk15/15-0500cm100	FCL15-80500-2000
1000		CLS1000IR08/08.0bk15/15-0500cm100	FCL15-90500-2000

CuSMA laser cables



Laser cable with F-SMA freestanding fiber connectors and PVC coated steel-armored protection tube. Copper based high-accuracy fiber ferrule for effective heat removal and high fiber centricity. Applicable for laser beam delivery of up to 400 W.

- VIS-IR All-Silica Step-Index Fiber with NA=0.22
  NA=0.12 on request
  Graded-Index Fiber on request
- SMA905 (F-SMA) connectors with Free-Standing Fiber Tip, hex nut
- Keyed SMA905 (F-SMA) connectors on request
- All copper alloy parts for improved heat removal
- Fiber centricity < 5 µm fiber core to ferrule
- Squarelock, blue PVC-coated protection tube
- Metal connector cuffs to cable
- Electrical isolation from end to end
- Average laser power up to 400 W

Fiber core Ø [µm]	Cable length [m]	Type designation	Order no.
100	2	CLS0100IR08/08.0bl23/23-0200cm100	FCL23-10200-2000
200		CLS0200IR08/08.0bl23/23-0200cm100	FCL23-20200-2000
400		CLS0400IR08/08.0bl23/23-0200cm100	FCL23-40200-2000
600		CLS0600IR08/08.0bl23/23-0200cm100	FCL23-60200-2000
800		CLS0800IR08/08.0bl23/23-0200cm100	FCL23-80200-2000
1000		CLS1000IR08/08.0bl23/23-0200cm100	FCL23-90200-2000
100	3	CLS0100IR08/08.0bl23/23-0300cm100	FCL23-10300-2000
200		CLS0200IR08/08.0bl23/23-0300cm100	FCL23-20300-2000
400		CLS0400IR08/08.0 bl23/23-0300cm100	FCL23-40300-2000
600		CLS0600IR08/08.0bl23/23-0300cm100	FCL23-60300-2000
800		CLS0800IR08/08.0bl23/23-0300cm100	FCL23-80300-2000
1000		CLS1000IR08/08.0bl23/23-0300cm100	FCL23-90300-2000
100	5	CLS0100IR08/08.0bl23/23-0500cm100	FCL23-10500-2000
200		CLS0200IR08/08.0bl23/23-0500cm100	FCL23-20500-2000
400		CLS0400IR08/08.0bl23/23-0500cm100	FCL23-40500-2000
600		CLS0600IR08/08.0bl23/23-0500cm100	FCL23-60500-2000
800		CLS0800IR08/08.0bl23/23-0500cm100	FCL23-80500-2000
1000		CLS1000IR08/08.0bl23/23-0500cm100	FCL23-90500-2000

SMA500 laser cables

Laser cable with F-SMA freestanding fiber connectors and PVC coated steel-armored protection tube. Copper based high-accuracy fiber ferrule for effective heat removal and high fiber centricity. Applicable for laser beam delivery of up to 500 W.

- VIS-IR All-Silica Step-Index Fiber with NA=0.22
  NA=0.12 on request
  Graded-Index Fiber on request
- SMA905 (F-SMA) connectors with Free-Standing Fiber Tip, hex nut
- Keyed SMA905 (F-SMA) connectors on request
- All copper alloy parts for improved heat removal
- Fiber centricity < 5 µm fiber core to ferrule
- Squarelock, blue PVC-coated protection tube
- Metal connector cuffs to cable
- Electrical isolation from end to end
- Average laser power up to 500 W with adequate convection cooling means

Fiber core Ø [µm]	Cable length [m]	Type designation	Order no.
100	2	CLS0100IR08/08.0bl24/24-0200cm100	FCL24-10200-2000
200		CLS0200IR08/08.0bl24/24-0200cm100	FCL24-20200-2000
400		CLS0400IR08/08.0bl24/24-0200cm100	FCL24-40200-2000
600		CLS0600IR08/08.0bl24/24-0200cm100	FCL24-60200-2000
800		CLS0800IR08/08.0bl24/24-0200cm100	FCL24-80200-2000
1000		CLS1000IR08/08.0bl24/24-0200cm100	FCL24-90200-2000
100	3	CLS0100IR08/08.0bl24/24-0300cm100	FCL24-10300-2000
200		CLS0200IR08/08.0bl24/24-0300cm100	FCL24-20300-2000
400		CLS0400IR08/08.0 bl24/24-0300cm100	FCL24-40300-2000
600		CLS0600IR08/08.0bl24/24-0300cm100	FCL24-60300-2000
800		CLS0800IR08/08.0bl24/24-0300cm100	FCL24-80300-2000
1000		CLS1000IR08/08.0bl24/24-0300cm100	FCL24-90300-2000
100	5	CLS0100IR08/08.0bl24/24-0500cm100	FCL24-10500-2000
200		CLS0200IR08/08.0bl24/24-0500cm100	FCL24-20500-2000
400		CLS0400IR08/08.0bl24/24-0500cm100	FCL24-40500-2000
600		CLS0600IR08/08.0bl24/24-0500cm100	FCL24-60500-2000
800		CLS0800IR08/08.0bl24/24-0500cm100	FCL24-80500-2000
1000		CLS1000IR08/08.0bl24/24-0500cm100	FCL24-90500-2000

SMA500 MS ModeStrip laser cables

Laser cable with F-SMA freestanding fiber connectors and PVC coated, steel-armored protection tube. Copper based high-accuracy fiber ferrule for effective heat removal and high fiber centricity. Integrated convection-cooled cladding-mode stripper. Applicable for laser beam delivery of up to 200 W

- VIS-IR All-Silica Step-Index Fiber with NA=0.22
  NA=0.12 on request
  Graded-Index Fiber on request
- SMA905 (F-SMA) connectors with Free-Standing Fiber Tip, hex nut
- Keyed SMA905 (F-SMA) connectors on request
- All copper alloy parts for improved heat removal
- Fiber centricity < 5 µm fiber core to ferrule
- Squarelock, blue PVC-coated protection tube
- Metal connector cuffs to cable with heatsink
- Convection-Cooled ModeStripper for Cladding Mode Removal
- Electrical isolation from end to end
- Average laser power up to 200 W with adequate convection cooling means

Fiber core Ø [µm]	Cable length [m]	Type designation	Order no.
100	2	CLS0100IR08/08.0bl25/25-0200cm100	FCL25-10200-2000
200		CLS0200IR08/08.0bl25/25-0200cm100	FCL25-20200-2000
400		CLS0400IR08/08.0bl25/25-0200cm100	FCL25-40200-2000
100	3	CLS0100IR08/08.0bl25/25-0300cm100	FCL25-10300-2000
200		CLS0200IR08/08.0bl25/25-0300cm100	FCL25-20300-2000
400		CLS0400IR08/08.0 bl25/25-0300cm100	FCL25-40300-2000
100	5	CLS0100IR08/08.0bl25/25-0500cm100	FCL25-10500-2000
200		CLS0200IR08/08.0bl25/25-0500cm100	FCL25-20500-2000
400		CLS0400IR08/08.0bl25/25-0500cm100	FCL25-40500-2000

SMA500L Liquid-Cooled ModeStrip laser cables

Laser cable with F-SMA freestanding fiber connectors and PVC coated, steel-armored protection tube. Copper based high-accuracy fiber ferrule for effective heat removal and high fiber centricity. Integrated liquid-cooled cladding-mode stripper. Applicable for laser beam delivery of up to 500 W.

- VIS-IR All-Silica Step-Index Fiber with NA=0.22
  NA=0.12 on request
  Graded-Index Fiber on request
- SMA905 (F-SMA) connectors with Free-Standing Fiber Tip, hex nut
  Keyed SMA905 (F-SMA) connectors on request
- All copper alloy parts for improved heat removal
- Fiber centricity < 5 µm fiber core to ferrule
- Squarelock, blue PVC-coated protection tube
- Metal connector cuffs to cable
- Liquid-Cooled ModeStripper for Cladding Mode Removal
- Electrical isolation from end to end
- Average laser power up to 500 W

Fiber core Ø [µm]	Cable length [m]	Type designation	Order no.
100	2	CLS0100IR08/08.0bl26/26-0200cm100	FCL26-10200-2000
200		CLS0200IR08/08.0bl26/26-0200cm100	FCL26-20200-2000
400		CLS0400IR08/08.0bl26/26-0200cm100	FCL26-40200-2000
100	3	CLS0100IR08/08.0bl26/26-0300cm100	FCL26-10300-2000
200		CLS0200IR08/08.0bl26/26-0300cm100	FCL26-20300-2000
400		CLS0400IR08/08.0 bl26/26-0300cm100	FCL26-40300-2000
100	5	CLS0100IR08/08.0bl26/26-0500cm100	FCL26-10500-2000
200		CLS0200IR08/08.0bl26/26-0500cm100	FCL26-20500-2000
400		CLS0400IR08/08.0bl26/26-0500cm100	FCL26-40500-2000

CuFC laser cables

Laser cable with keyed FC-type freestanding fiber connectors and PVC coated, steel-armored protection tube. Copper based high-accuracy fiber ferrule for effective heat removal and high fiber centricity. Applicable for laser beam delivery of up to 400 W.

- VIS-IR All-Silica Step-Index Fiber with NA=0.22
  NA=0.12 on request
  Graded-Index Fiber on request
- FC connectors with key, Free-Standing Fiber Tip, hex nut
- All copper alloy parts for improved heat removal
- Fiber centricity < 5 µm fiber core to ferrule
- Squarelock, blue PVC-coated protection tube
- Metal connector cuffs to cable with heatsink
- Electrical isolation from end to end
- Average laser power up to 400 W with adequate convection cooling means

Fiber core Ø [µm]	Cable length [m]	Type designation	Order no.
100	2	CLS0100IR08/08.0bl27/27-0200cm100	**FCL27-10200-2000**
200		CLS0200IR08/08.0bl27/27-0200cm100	**FCL27-20200-2000**
400		CLS0400IR08/08.0bl27/27-0200cm100	**FCL27-40200-2000**
100	3	CLS0100IR08/08.0bl27/27-0300cm100	**FCL27-10300-2000**
200		CLS0200IR08/08.0bl27/27-0300cm100	**FCL27-20300-2000**
400		CLS0400IR08/08.0 bl27/27-0300cm100	**FCL27-40300-2000**
100	5	CLS0100IR08/08.0bl27/27-0500cm100	**FCL27-10500-2000**
200		CLS0200IR08/08.0bl23/23-0500cm100	**FCL27-20500-2000**
400		CLS0400IR08/08.0bl27/27-0500cm100	**FCL27-40500-2000**

CuSMA500 Liquid-Cooled ModeStrip laser cables

Laser cable with keyed FC-type freestanding fiber connectors and PVC coated, steel-armored protection tube. Copper based high-accuracy fiber ferrule for effective heat removal and high fiber centricity. Integrated liquid-cooled cladding-mode stripper. Applicable for laser beam delivery of up to 400 W.

- VIS-IR All-Silica Step-Index Fiber with NA=0.22
  NA=0.12 on request
  Graded-Index Fiber on request
- FC connectors with key, Free-Standing Fiber Tip, hex nut
- All copper alloy parts for improved heat removal
- Fiber centricity < 5 µm fiber core to ferrule
- Squarelock, blue PVC-coated protection tube
- Metal connector cuffs to cable
- Liquid-Cooled ModeStripper for Cladding Mode Removal
- Electrical isolation from end to end
- Average laser power up to 400 W

Fiber core Ø [µm]	Cable length [m]	Type designation	Order no.
100	2	CLS0100IR08/08.0bl28/28-0200cm100	FCL28-10200-2000
200		CLS0200IR08/08.0bl28/28-0200cm100	FCL28-20200-2000
400		CLS0400IR08/08.0bl28/28-0200cm100	FCL28-40200-2000
100	3	CLS0100IR08/08.0bl28/28-0300cm100	FCL28-10300-2000
200		CLS0200IR08/08.0bl28/28-0300cm100	FCL28-20300-2000
400		CLS0400IR08/08.0 bl28/28-0300cm100	FCL28-40300-2000
100	5	CLS0100IR08/08.0bl28/28-0500cm100	FCL28-10500-2000
200		CLS0200IR08/08.0bl28/28-0500cm100	FCL28-20500-2000
400		CLS0400IR08/08.0bl28/28-0500cm100	FCL28-40500-2000

LD-80 laser cables

Laser cable with LD-80 freestanding fiber connectors and PVC coated steel-armored protection tube. Copper based high-accuracy fiber ferrule for effective heat removal and high fiber centricity. Applicable for laser beam delivery of up to 800 W.

- VIS-IR All-Silica Step-Index Fiber with NA=0.22
  NA=0.12 on request
  Graded-Index Fiber on request
- Ø 4 mm x 10 mm connectors with key, Free-Standing Fiber Tip, hex nut
- All copper alloy parts for improved heat removal
- Fiber centricity < 5 µm fiber core to ferrule
- Squarelock, green PVC-coated protection tube
- Metal connector cuffs to cable
- Electrical isolation from end to end
- Average laser power up to 800 W

Fiber core Ø [µm]	Cable length [m]	Type designation	Order no.
100	2	CLS0100IR08/08.5gr30/30-0200cm100	FCL30-10200-2000
200		CLS0200IR08/08.5gr30/30-0200cm100	FCL30-20200-2000
400		CLS0400IR08/08.5gr30/30-0200cm100	FCL30-40200-2000
600		CLS0600IR08/08.5gr30/30-0200cm100	FCL30-60200-2000
800		CLS0800IR08/08.5gr30/30-0200cm100	FCL30-80200-2000
1000		CLS1000IR08/08.5gr30/30-0200cm100	FCL30-90200-2000
100	3	CLS0100IR08/08.5gr30/30-0300cm100	FCL30-10300-2000
200		CLS0200IR08/08.5gr30/30-0300cm100	FCL30-20300-2000
400		CLS0400IR08/08.5gr30/30-0300cm100	FCL30-40300-2000
600		CLS0600IR08/08.5gr30/30-0300cm100	FCL30-60300-2000
800		CLS0800IR08/08.5gr30/30-0300cm100	FCL30-80300-2000
1000		CLS1000IR08/08.5gr30/30-0300cm100	FCL30-90300-2000
100	5	CLS0100IR08/08.5gr30/30-0500cm100	FCL30-10500-2000
200		CLS0200IR08/08.5gr30/30-0500cm100	FCL30-20500-2000
400		CLS0400IR08/08.5gr30/30-0500cm100	FCL30-40500-2000
600		CLS0600IR08/08.5gr30/30-0500cm100	FCL30-60500-2000
800		CLS0800IR08/08.5gr30/30-0500cm100	FCL30-80500-2000
1000		CLS1000IR08/08.5gr30/30-0500cm100	FCL30-90500-2000

LD-80MS ModeStrip laser cables

Laser cable with LD-80 freestanding fiber connectors and PVC coated steel-armored protection tube. Copper based high-accuracy fiber ferrule for effective heat removal and high fiber centricity. Integrated convection-cooled cladding-mode stripper. Applicable for laser beam delivery of up to 200 W.

- VIS-IR All-Silica Step-Index Fiber with NA=0.22
  NA=0.12 on request
  Graded-Index Fiber on request
- Ø 4 mm x 10 mm connectors with key, Free-Standing Fiber Tip, hex nut
- All copper alloy parts for improved heat removal
- Fiber centricity < 5 µm fiber core to ferrule
- Squarelock, green PVC-coated protection tube
- Metal connector cuffs to cable
- Convection-Cooled ModeStripper for Cladding Mode Removal
- Electrical isolation from end to end
- Average laser power up to 200 W with adequate convection cooling means

Fiber core Ø [µm]	Cable length [m]	Type designation	Order no.
100	2	CLS0100IR08/08.5gr31/31-0200cm100	**FCL31-10200-2000**
200		CLS0200IR08/08.5gr31/31-0200cm100	**FCL31-20200-2000**
400		CLS0400IR08/08.5gr31/31-0200cm100	**FCL31-40200-2000**
100	3	CLS0100IR08/08.5gr30/30-0300cm100	**FCL30-10300-2000**
200		CLS0200IR08/08.5gr31/31-0300cm100	**FCL31-20300-2000**
400		CLS0400IR08/08.5gr31/31-0300cm100	**FCL31-40300-2000**
100	5	CLS0100IR08/08.5gr30/30-0500cm100	**FCL30-10500-2000**
200		CLS0200IR08/08.5gr31/31-0500cm100	**FCL31-20500-2000**
400		CLS0400IR08/08.5gr31/31-0500cm100	**FCL31-40500-2000**

LD-80BD laser cables with fiber break detection

Laser cable with LD-80 freestanding fiber connectors and PVC coated steel-armored protection tube. Copper based high-accuracy fiber ferrule for effective heat removal and high fiber centricity. Fiber break detection ensures laser safety requirements. Applicable for laser beam delivery of up to 800 W.

- VIS-IR All-Silica Step-Index Fiber with NA=0.22
  NA=0.12 on request
  Graded-Index Fiber on request
- Ø 4 mm x 10 mm connectors with key, Free-Standing Fiber Tip, hex nut
- All copper alloy parts for improved heat removal
- Fiber centricity < 5 µm fiber core to ferrule
- Squarelock, green PVC-coated protection tube
- Metal connector cuffs to cable
- Fiber Break Detection
- Electrical isolation from end to end
- Average laser power up to 800 W

Fiber core Ø [µm]	Cable length [m]	Type designation	Order no.
100	2	CLS0100IR08/08.5gr34/34-0200cm100	FCL34-10200-2000
200		CLS0200IR08/08.5gr34/34-0200cm100	FCL34-20200-2000
400		CLS0400IR08/08.5gr34/34-0200cm100	FCL34-40200-2000
600		CLS0600IR08/08.5gr34/34-0200cm100	FCL34-60200-2000
800		CLS0800IR08/08.5gr34/34-0200cm100	FCL34-80200-2000
1000		CLS1000IR08/08.5gr34/34-0200cm100	FCL34-90200-2000
100	3	CLS0100IR08/08.5gr34/34-0300cm100	FCL34-10300-2000
200		CLS0200IR08/08.5gr34/34-0300cm100	FCL34-20300-2000
400		CLS0400IR08/08.5gr34/34-0300cm100	FCL34-40300-2000
600		CLS0600IR08/08.5gr34/34-0300cm100	FCL34-60300-2000
800		CLS0800IR08/08.5gr34/34-0300cm100	FCL34-80300-2000
1000		CLS1000IR08/08.5gr34/34-0300cm100	FCL34-90300-2000
100	5	CLS0100IR08/08.5gr34/34-0500cm100	FCL34-10500-2000
200		CLS0200IR08/08.5gr34/34-0500cm100	FCL34-20500-2000
400		CLS0400IR08/08.5gr34/34-0500cm100	FCL34-40500-2000
600		CLS0600IR08/08.5gr34/34-0500cm100	FCL34-60500-2000
800		CLS0800IR08/08.5gr34/34-0500cm100	FCL34-80500-2000
1000		CLS1000IR08/08.5gr34/34-0500cm100	FCL34-90500-2000

LD-80R Robotic laser cables

Laser cable with industrial standard 10 mm x 54 mm and 15 mm x 54 mm high power fiber connectors and highly flexible polymer-aramid protection tube. Copper based high-accuracy fiber ferrule for effective heat removal and high fiber centricity. Fiber break detection and connector temperature monitoring circuit complies with laser safety requirements. Applicable for laser beam delivery of up to 5000 W.

- VIS-IR All-Silica Step-Index Fiber with NA=0.22
  NA=0.12 on request
  Graded-Index Fiber on request
- Standard fiber core diameters
  200 µm, 300 µm, 400 µm, 600 µm, 800 µm, 1000 µm
- Industrial-Standard Connector Interface
  Ø 10 mm x 54 mm or Ø 15 mm x 54 mm nozzles compatible with LLK-LP and LLK-HP
- All copper alloy parts for improved heat removal
- Highly flexible polymer-aramid protection tube
- Fiber Break Detection with electrical Inter-Lock
- Connector temperature monitoring
- Average laser power up to 5000 W

Info

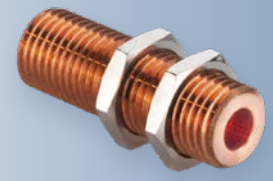
Due to the custom-specific cable length this product is available on request.

Please ask us for more information.

Adapters and receivers
Fiber protection

Adapters and receivers





	Adapter for FCPC PCF	Adapter for F-SMA	Adapter for F-SMA, copper
Order no.	SKUP-2XFCP-0010	SXUP-2XSMA-0010	FCLA-23A-2000
Application	Connection of FC fiber connectors	Connection of F-SMA fiber connectors	Connection of F-SMA fiber connectors

Adapters and receivers


	Adapter for LD-80, Liquid-Cooled	Receiver for LD-80
Order no.	FCLA-30A-2010	FCLA-30R-2000
Application	Connection of LD-80 fiber connectors	Front-plate attachment of LD-80 fiber connector, free-space coupling

Fiber protection


	SMA Fiber protection cap, stainless steel	LD-80 Fiber protection cap, stainless steel, O-ring sealed
Order no.	FCLA-15D-2000	FCLA-30D-2000
Application	F-SMA fiber cables	LD-80 fiber cables

Learn more about our product families

Fiber**Connect** Light Guide Fiber and Cable Solutions

We offer you fibers and cables with optical fibers made from glass (singlemode and multimode), plastic optical fibers (POF), plastic cladded fibers (PCF) and large-core fibers (silica/silica). All fiber types are also available in a radiation-resistant version. We manufacture different cable designs from central core cables to breakout cables with all buffered fiber types and specific inner and outer jacketing materials as well as customised according to your needs. We use all fiber types to produce hybrid cables with optical fibers and electrical conductors.

Fiber**Tech** Special Optical Fiber Technologies

We manufacture multimode and singlemode fibers and fiber bundles with different numerical apertures, coatings and claddings. We specialise in special fibers and special coatings. All fibers can be assembled to the customer's specific needs for high-performance laser cables or, for example, spectroscopic applications. We manufacture medical fibers for laser energy transmission and also offer series production of surgical, ophthalmological, urological, dental and endovascular laser probes with biocompatible materials.

Fiber**Switch** Light Switching for Optical Systems

Our fiber optical switches are based on a patented micromechanical/micro-optical design. This guarantees excellent properties, considerable flexibility and maximum long-term stability for many applications. The switches are available for wide wavelength ranges from the visible to the infrared and for a wide variety of fiber types. Our switches are designed for applications with the highest requirements in the telecommunications area, in measurement and testing and in the biomedical area. Examples of these complex applications include spectroscopy, laser scan microscopy, multi-channel optical performance monitoring, fiber bragg sensors, testing of fiber optical cables and environmental trace analysis.

Fiber**Split** Light Distribution for Optical Systems

Based on optical chip technology, the FiberSplit product portfolio includes standard components such as 1N or 2N splitters as well as customised modules or systems with integrated complex functionality for fiber optical singlemode and multimode systems. FiberSplit products guarantee expandability with wide optical bandwidth and maximum bit rates thanks to extremely low PDL/PMD. Our products meet TELCORDIA standards and have been failure-free in the field for the past 17 years. We also produce customer-specific chips, components and modules, for example optical waveguide structures for wavelength ranges between 600 and 1700 nm with various waveguide properties and functions including optical chips and fiber arrays.

Damage threshold measurement of silica fibers

Report from the lab (Dr. Guido Mann, Dr.-Ing. Mohammadali Zoheidi, Dr. Jörg Krüger)

A series of joint projects run by LEONI Fiber Optics and the BAM Federal Institute for Materials Research and Testing have studied the damage properties of silica glass fibers when exposed to nanosecond (ns) laser pulses in the visible and infrared spectral range. In many cases, the damage occurs on the end facets of the fibers, leading investigations to focus on these surfaces.

The studies have established the influence of varying fiber drawing speeds and different methods of preparing the end facets of the fibers on the damage threshold.

The investigations were carried out on frequently used fiber types with different core diameters, and were accompanied by basic experiments on the preform material (initial fiber material) and compact specimens (models of the cladding and coating material). As part of the collaboration, the BAM came up with a measurement system to determine laser-induced damage thresholds on the surface of specimens complying with the ISO 11254-1 and ISO 11254-2 standards (determination of laser-induced damage threshold of optical surfaces, Part 1: "1-on-" test and Part 2: "S-on-1" test) for wavelengths of 532 and 1064 nm and ns laser pulses.

The measurement method used to determine laser-induced damage thresholds (LIDT) involves applying a fixed number of laser pulses (1 or S >1) with a defined energy and specified focusing to a site on the specimen to be investigated, and establishing the energy density at which damage occurs. In this context, damage is viewed as changes to the surface of the specimen material that can be detected by light microscopy. The energy of the laser pulse, the area of the laser beam on the specimen and the temporal shape of the laser pulses are incorporated directly or indirectly into the analysis and have a major influence on the accuracy of the measuring method, which is at least ±30 percent for the experiments presented here.

For the experiments a q-switched Nd:YAG laser emitting at 1064 nm and 532 nm was used. The pulse duration and beam quality at 1064 nm and 532 nm was 12 ns, M^2=1.6 and 8.5 ns, M^2=1.2 respectively. The pulse energy can be continuously varied in the range 0.2 to 30 mJ (1064 nm) or up to 12 mJ (532 nm) and is applied to the surface of the specimen using the focusing lens. The surface of the specimen is observed using a CCD camera coupled to a microscope objective.

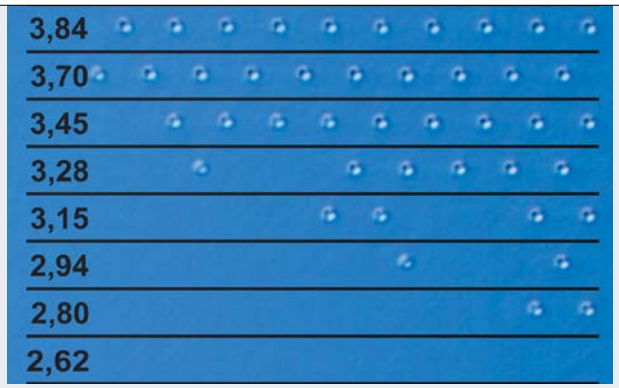


Figure 1: Overview of laser-induced damage spots (horizontal distance between adjacent damage sites 150 µm, pulse energy is given in mJ) on a compact specimen (1-on-1, 1064 nm)

Determining LIDT on fiber end faces

Figures 2 and 3 summarize the surface LIDT measurements (1-on-1) on different fiber types with fiber core diameters in the range 100 to 600 µm. It is obvious that the damage threshold increases as the fiber core diameter rises when using infrared laser pulses *(Fig. 2)*, while no significant dependency of the damage threshold on the fiber core diameter can be identified in the green wavelength range *(Fig. 3)*. The damage to the fibers occurs almost exclusively on the entrance facet. Due to the beam quality of the laser radiation used, small cavities first appear on the surface. Spalling of larger surface areas of the entrance facet occurs only at energy densities significantly above the damage threshold. Additional investigations on the preform material showed that halving the wavelength from 1064 to 532 nm (at a constant pulse duration) reduces the damage threshold by approximately a factor of two. In addition, for both wavelengths no difference was found between the damage threshold of the fiber core material and that of the fluorine doped cladding material.

Figure 3 demonstrates that the quality of the polishing has a major impact on the damage threshold of the fiber end facet at 532 nm, while this effect is far less significant at 1064 nm. In the infrared spectral range, the glass structure that forms due to solidification after the drawing process is the crucial factor for the damage threshold. Based on this interpretation, it should be possible to produce greater radiation resistant thin fibers for a wavelength of 1064 nm by using a slower drawing speed or a subsequent tempering. An increase in the damage threshold of the fibers at 532 nm should be achievable by optimizing the polishing method or using a high quality fiber fracture surface.

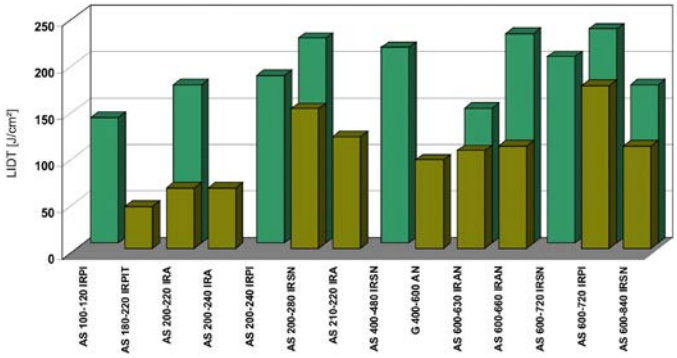


Figure 2: Single shot damage thresholds for LEONI high performance fibers. The first number in the fiber designation indicates the core diameter, which acts as a classifying parameter. Laser: 1064 nm, 12 to 15 ns pulse duration, 50 µm Gaussian beam diameter.

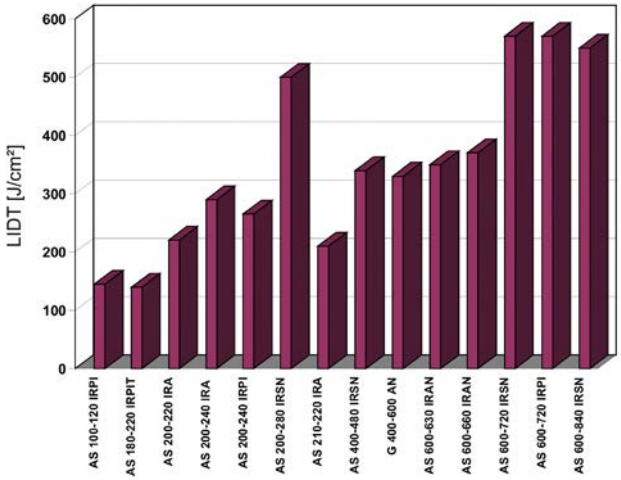


Figure 3: Single shot damage thresholds for LEONI high performance fibers. Laser: 532 nm, 8.5 ns pulse duration, 30 µm Gaussian beam diameter. Dark green: high quality LEONI polishing standard, light green: less polishing.

Factors influencing fiber design

The design of the optical fiber depends primarily on the properties of the laser radiation to be transmitted, along with requirements relating to the beam quality after the fiber section and the nature of the connection (for example the bending radius). Essentially, to maintain the spatial beam quality, the aim should be to use a glass fiber with the smallest possible core diameter. For a given pulse duration t the maximum energy Emax that can be transmitted is limited by the effect of self-focusing (Kerr effect) in the volume, thus: $E_{max} = \tau \times P_{crit}$.
The critical power P_{crit} is a variable that depends on the material, and is approximately 4 MW for fused silica (largely independent of the wavelength). The laser beam diameter or the fiber core diameter can then be specified by using the LIDT values set out above. It is useful to note that the damage threshold of the surface increases approximately with the square root of the pulse duration. Figure 4 illustrates these relationships.

A critical power of 1 MW (regardless of the fiber core diameter), a spatial Gaussian beam profile and a damage threshold of 500 J/cm² at a pulse durationof 10 ns are assumed. Because of the limitation caused by self-focusing, this results in a maximum energy of 10 mJ, which under these conditions (in terms of LIDT) could be transmitted by a fiber with a core diameter of 100 µm. At a pulse duration of 1 µs a maximum energy of 1 J can be transmitted by a fiber with a diameter of at least 220 µm.

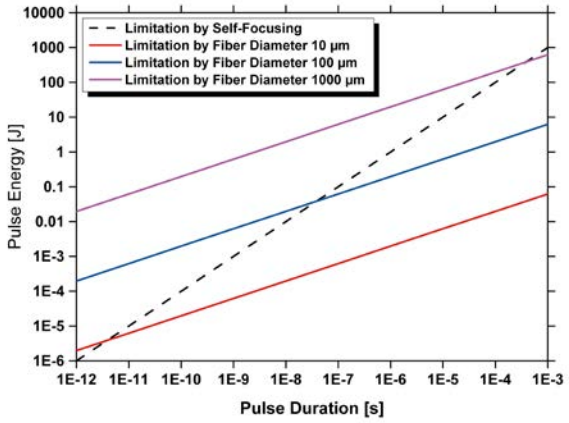


Figure 4: Limitation of maximum laser pulse energy transmitted depending on pulse duration, caused by self-focusing and damage to fiber end facet.

Summary

The design of a high power fiber transmission system must take account of limitations resulting from both surface and volume effects. At a given pulse duration, self-focusing limits the maximum energy that can be transmitted. If the surface damage threshold is known, an appropriate fiber can be selected, and using high quality multimode fiber material with excellent end face preparation allows the smallest possible fiber core diameter to maintain most of the beam quality. These findings are enabling LEONI Fiber Optics to supply optimized products in a range of applications defined by our customers.

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Further information: www.leoni.com

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