



LU_LWL_xxxx Fiber Patchcord



Lumics offers high quality fiber optic multimode patch cables as best and most reliable choice for all LuOcean diode laser modules

Please request advise for your fiber cable choice from Lumics

Features:

- Cables designed for LuOcean diode laser modules
- Low-OH material for long wavelength up to 2µm

Benefits:

- Bending limit protection
- Passive and water cooling
- Outgoing inspection and dust cap

Applications:

- Material processing
- Medical

Fiber Properties

Parameter								Unit
Core diameter	50	100	200	400	600	800	1000	µm
Cladding diameter	125	125	280	440	720	880	1100	µm
Large Cladding diameter option *	no	660	500	480	720	880	1200	µm
Buffer(Silicon) /Coating (Nylon or Tefzel or Vestamid)	250	780/1100	640/1300	700/1300	880/1320	1050/1350	1200/1400	
Numerical aperture	0.22 ± 0.02	0.22 ± 0.02	0.22 ± 0.02	0.22 ± 0.02	0.22 ± 0.02	0.22 ± 0.02	0.22 ± 0.02	
Mechanical/optical (NA 0.21) minimum bend radius **	30/50	100/50	75/100	72/200	108/300	132/400	180/800	mm
Effective NA at mechanical min. bend radius ***	-	0.215	0.206	0.192	0.192	0.189	0.192	
Operating and storage temperature	0 to +60	0 to +60	0 to +60	0 to +60	0 to +60	0 to +60	0 to +60	°C

* A large cladding diameter must be used only if a free standing fiber <600µm core or mode stripper is required. Cladding layer thickness to prevent leaky waveguide loss must be >10 times wavelength, ** mechanical limit to prevent cracks long term is 150x cladding diameter, short term 60x largest cladding diameter. *** Optical limit for NA 0.2/0.210/0.218 is 250/500/2000 x core diameter and typical fiber loss from core to cladding for Lumics LuOcean diode laser between lowering NA from 0.22 to 0.20 is 2%. Minimum bending radius must be the larger value of the mechanical and optical minimum radius given above. Fiber cables with end cap, free standing connector or mode stripper are limited to a maximum of one 360° turn per cable. The refractive index of the buffer is lower than the one of the cladding thus power is guided in the buffer.



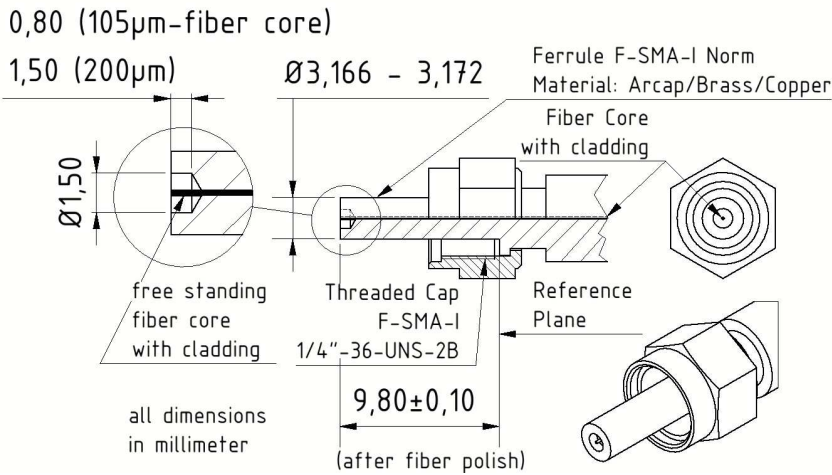
Cable / Connector Options

Parameter & Option	/Connector type	F-SMA	HP-F-SMA with cooling	D80 with cooling	Unit
Maximum operating power range (1)		<=70	<=270	<=1000	W
Core fiber diameter corresponding to power		>=600/400/200/105	>=600/400/200/105	>=400/200/105	µm
Large fiber cladding required		no	mandatory	mandatory	
Ferrule diameter (2)		3.166 - 3.172	3.166 - 3.172	3.996 - 4.000	mm
End face ferrule to flange distance (2)		9.70 - 9.90	9.70 - 9.90	9.900 - 10.000	mm
Fiber center core centricity		<=10 core (100-400)µm	<=12 core (100-400)µm	<=12 core (100-400)µm	µm
with relation to the ferrule outer surface (2)		<=12 core >=600µm	<=15 core >=600µm	<=15 core >=600µm	µm
Fiber tip arrangement (3)		<=15 core >=1000µm	<=20 core >=1000µm	<=20 core >=1000µm	µm
Operating and storage temperature		Non-free standing both ends	Free standing both ends	Only free standing both ends	
Cooling options (water also for FSMA available) (4)		<=60°C	<=60°C	<=60	°C
Cladding mode stripper (4)		no	(>130W forced) air cooling with stripper	optional water (>270W) air cooling	
Fiber end cap OD/thickness, depends on power level (5)		optional 1.5/3.8	optional (module side)	optional (module side)	
AR coating on end cap (increase of power ~ 2%)		optional 1.5/3.8 <=200µm	yes	yes	
Angular ferrule position fixed by key lock (6)		yes	no	yes	
Ferrule material (7)		no	yes	no	
Best choice for LuOcean diode laser		Arcap (AP1D CuNi25Zn12)	Copper	Copper	
		Mini (4/8), P2, M4	Mini (4/8), P2, M4	M4	

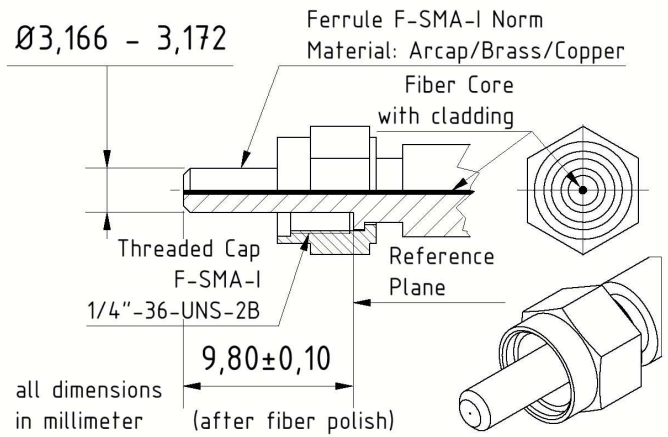
Notes: (1) Lumics laser diode fiber coupling technology ensures loss of the total power into the fiber cladding down to <3% for LuOcean Series with fiber core >=200µm and wavelength <1500nm if the fiber centricity error is below the given values above and the cladding thickness >=10 times wavelength. (2) **The critical parameter is the maximum distance of the fiber core center after one 360° ferrule turn to the geometric circular center of the ferrule referred here as fiber core centricity and the ferrule diameter tolerance which must tightly match the diode laser module receptacle of ID = 3.173mm - 3.178mm.** Use a fiber microscope to check fiber centricity and dust free fiber end facet. For cleaning and polishing refer to products and instructions from vendors of standard fiber kits for this purpose and the Lumics fiber cable manual. We recommend link-free cleaning cloth integrated in dispensers for non-free standing fibers and IPA rinse with blow dry by compressed nitrogen or clean dry air for free-standing fibers. (3) Advantage of free standing fibers are first much higher tolerance to centricity error and higher power in the cladding on the exit side because of missing adhesive which may burn close to the fiber end facet or due to power extracted by the adhesive. Disadvantage are higher risk of fiber damage to the fiber tip due to mechanical stress by handling, cleaning and polish. The refractive index of the glue to fix non-free standing fibers is higher than the cladding refractive index thus light in the cladding is coupled to the connector. The refractive index of the fiber cable buffer is lower than that of the cladding refractive index thus light in the cladding is guided unless there is a mode stripper. (4) As an example at 180(70)/(45)W out of 200/100µm a well centered free (non-free) standing fiber only with specification with no cooling and no mode stripper according the table above the temperature of the F-SMA connector with ARCAP ferrule attached to a LuOcean module rises by no more than 20°C at a base module temperature of 25°C. Above 55°C fiber connector temperature, passive forced air cooling or water cooling together with mode stripping and large cladding fibers is necessary depending on the performance of the fiber and the duty cycle of operation. When a mode stripper must used to strip out power from of the fiber cladding which may damage the fiber in bended region in or distorts the focused beam characteristic out of the fiber a cooling option must be used. In this case convection (forced) air cooling works up to 130W (270W). Above that water cooling with quick connector for 6mm outer diameter water hose is required. (5) The fiber end cap must have a length of 3.8mm±0.05mm and a outer diameter (OD) of >=1.5mm and is non-free standing. The end cap must be on the laser module side and the fiber cable is labeled on this side with "Input". The end cap length affects the focus plane thus a different length and tolerance as above reduces the coupling efficiency. For high power density with fiber diameter <=200µm the end cap is mandatory too guarantee diode life time. (6) The advantage of the D80 key lock is that the laser focus spot and the fiber core match always at the same angular position thus the power ex fiber is very stable upon plug in and out. The connector show typically 5% power variation during a 360° turn. (7) Arcap 12% of the thermal conductivity of copper but much better high abrasion resistance than copper and is magnetic which is necessary for the inductive Mini 3 and P2 (external) fiber sensor. Copper does not work for Mini 3 and P2 external sensor.

We manufacture diode lasers.

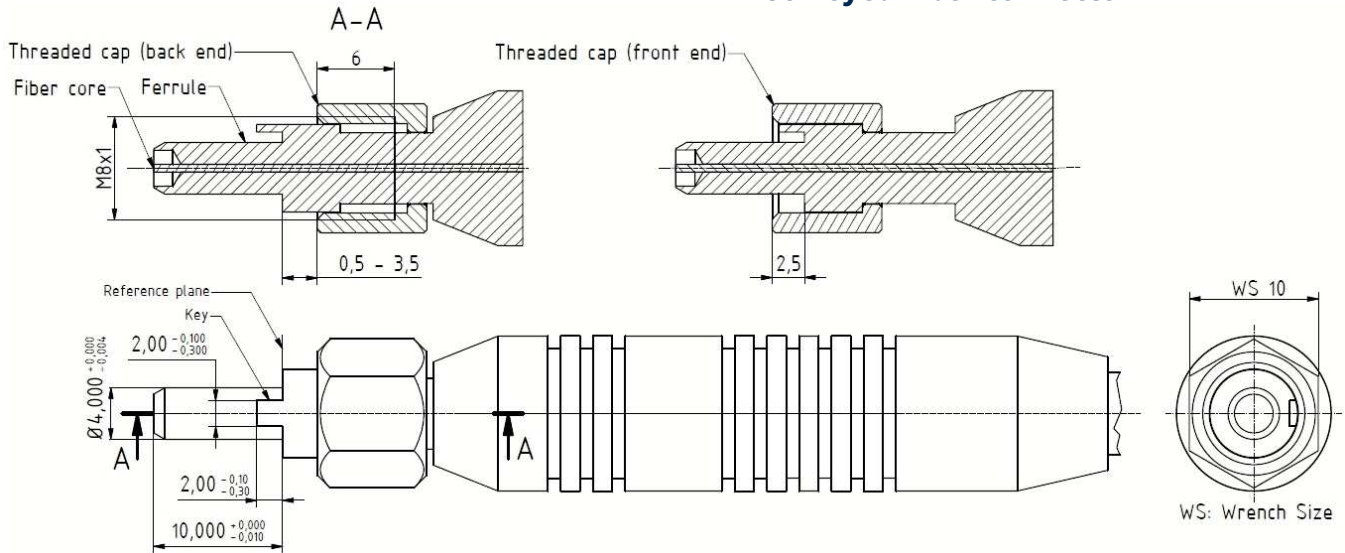
F-SMA free standing



F-SMA non free standing fiber connector

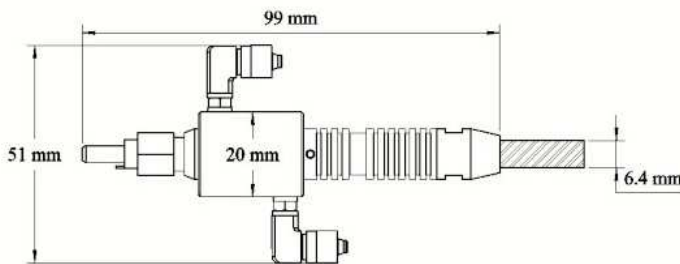


D80 keyed fiber connector



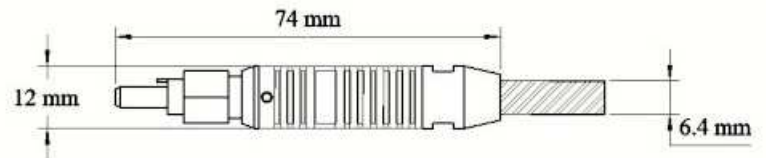
Connector with water cooling

Note : All fibers are glue fixed to the cooling connector body



Connector with air cooling

Note : All fibers are glue fixed to the cooling connector body



Protection Tube Options

Parameter	Outer diam. (mm)	Features
Metal tube, strain relieve, bending limit, PVC coating (yellow color)	6.4	Robust tube, with bend-limiting

General Parameters

Type / Parameter		Unit
Storage temperature	(-)10 - (+)55	°C
Humidity / non condensing atmosphere	90	RH%
Compliance	ROHS	

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