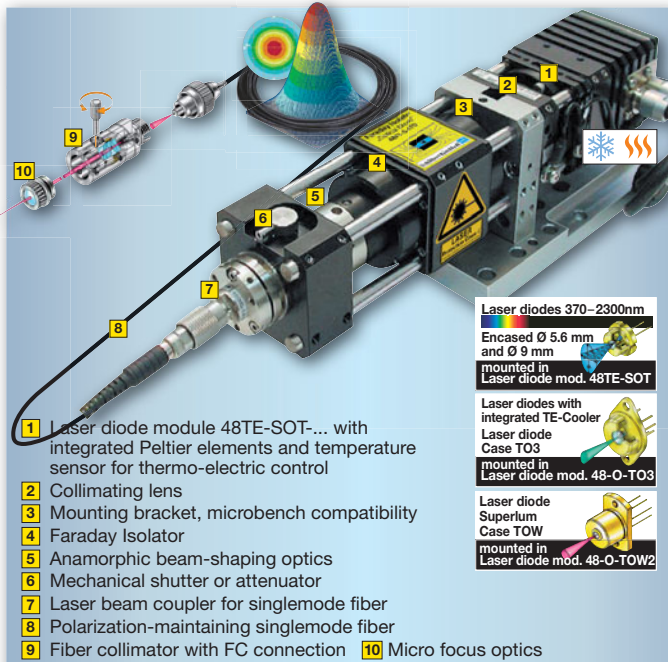


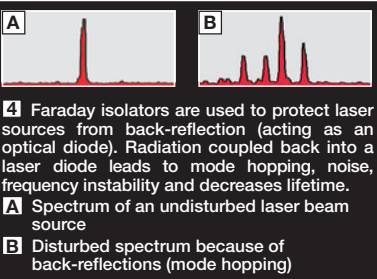
# Laser Diode Collimator 48TE-SOT-...

with polarization-maintaining singlemode fiber, Peltier element / thermosensor and Faraday Isolator



- Laser diodes 370–2300nm**  
Encased Ø 5.6 mm and Ø 9 mm  
mounted in Laser diode mod. 48TE-SOT
- Laser diodes with integrated TE-Cooler**  
Laser diode Case TO3  
mounted in Laser diode mod. 48-O-TO3
- Laser diode Superlum**  
Case TOW  
mounted in Laser diode mod. 48-O-TOW2

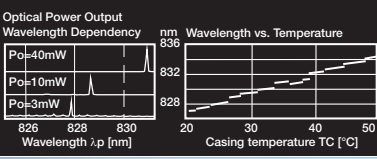
- 1 Laser diode module 48TE-SOT-... with integrated Peltier elements and temperature sensor for thermo-electric control
  - 2 Collimating lens
  - 3 Mounting bracket, microbench compatibility
  - 4 Faraday Isolator
  - 5 Anamorphic beam-shaping optics
  - 6 Mechanical shutter or attenuator
  - 7 Laser beam coupler for singlemode fiber
  - 8 Polarization-maintaining singlemode fiber
  - 9 Fiber collimator with FC connection
  - 10 Micro focus optics
- Wavelength range 390–2300 nm
  - Integrated Peltier element and temperature sensor for thermo-electric temperature control of the laser diode
  - Faraday Isolator 48FI-5-...
  - For encased laser diodes of Ø 5.6 mm and Ø 9 mm, optionally TO3 and TOW2
  - Applicable for DBR laser diodes
- Universal modular system of laser diode collimators, designed for easy customer assembly and adjustment



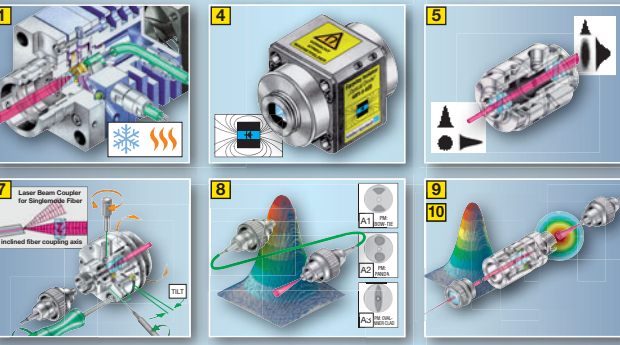
For a detailed description of the modular laser diode beam source 48TE-SOT-... see download: [www.SuKHamburg.de/dl/lcd48te\\_e.pdf](http://www.SuKHamburg.de/dl/lcd48te_e.pdf)

Both the temperature and power influence the emitted wavelength of laser diodes. The wavelength center is shifted by 0.25–0.3 nm/K of temperature and either the modes 'hop', one-by-one, or many modes may be excited simultaneously. The wavelength center can drift by 2.5–3 nm at 20–30°C.

Conversely, when the laser power is increased from a threshold up to the nominal power, the wavelength is increased by 2–4 nm.



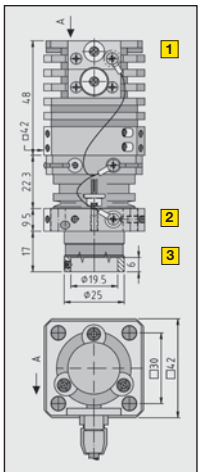
For constant laser power, the thermo-electric temperature control maintains the laser at a constant temperature and wavelength. Peltier elements establish a temperature gradient, which in magnitude and direction is regulated by the Peltier current obtained from the measured signal of the temperature sensor.



## Laser Diode Collimator 48TE-SOT-...

The 48TE-SOT-... consists of three basic elements:

- 1 Laser diode module 48TE-SOT with:
  - integrated Peltier element temperature control
  - for laser diodes with diameter 5.6 and 9 mm
  - easy to handle X/Y adjustment (see next page)
  - solderless contacts
  - optional fan 48L
- 2 Collimating flange 48CFS
  - for system mount Ø 19.5 mm
  - collimator adjustment with indirect clamping, even with adapters
- 3 Diode collimator 60CL-...
  - focal length  $f'$  from 2.7 mm to 8 mm (up to 60 mm with collimator 50CL-...)
  - NA up to 0.55
  - spectral range 400–1800 nm



For more information, see: [http://www.SuKHamburg.com/dl/lcd48te\\_e.pdf](http://www.SuKHamburg.com/dl/lcd48te_e.pdf)

## 4 Faraday Isolator (optical diode) 48FI-5-...

For assembly in microbench systems, high precision through-holes for 4 parallel rod guides ensure high mechanical stability and distortion resistance of the whole system:

- isolation >30 dB
- laser beam aperture max. 5 mm
- attenuation <0.5 dB
- standard wavelengths 400–1080 nm

See page 57

## 5 Anamorphic Beam-shaping Optics 5AN-...

Combination of cylinder lenses with integrated astigmatic correction. Afocal (i.e., non-focussing) beam-shaping optics to transform the elliptical beam profile of the collimated laser diode into a nearly circular profile:

- laser beam aperture max. 6 mm
- beam-shaping factor 2, 2.5, and 3

See page 49

## 6 Mechanical Shutter 48AT-...

To block the laser beam manually

- for system mount Ø 19.5 mm
- aperture Ø 3 mm

See page 64

## 7 Laser Beam Coupler 60SMS-...

Adjustable and focussable for singlemode fiber cable with FC connector

- Inclined (8°-polish, FC-APC) or paraxial fiber-coupling axis
- focal length  $f'$  from 2 mm to 18 mm
- NA up to 0.68
- spectral range 370–2300 nm

From page 9

## 8 Polarization-maintaining and Singlemode Fiber Cables PMC-... / SMC-...

- Singlemode, polarization-maintaining
- MFD 3–10  $\mu$ m
- $\lambda = 360–1800$  nm

Fiber connectors:

FC-APC: 8°-polish of the fiber ferrule, for suppression of back-reflection into the laser source

FC-PC: 0°-polish

From page 20

## Fiber Collimators 60FC-... and Micro Focus Optics 5M-...

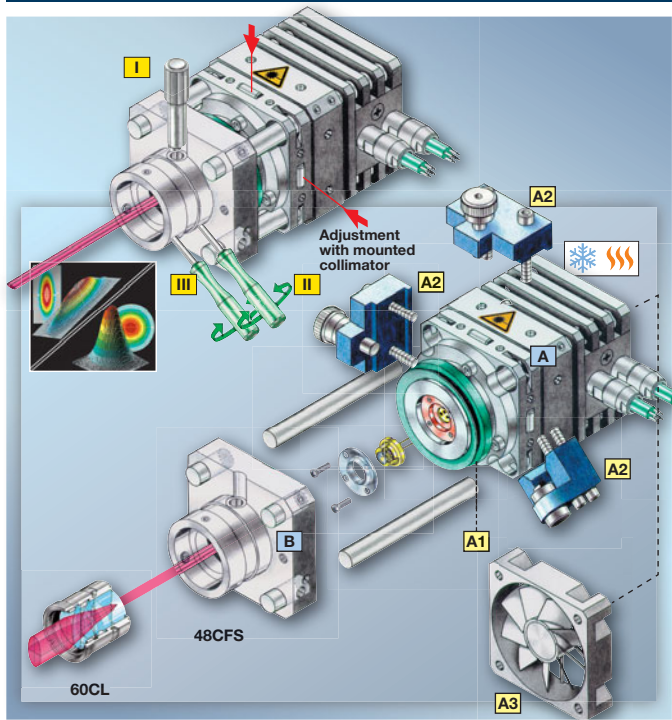
- 9 Fiber Collimator 60FC-... focussable, inclined or paraxial fiber coupling axis. Both beam diameter and divergence are determined by the focal length  $f'$  of the collimating lens:
  - focal length  $f'$  from 2.7 mm to 200 mm
  - NA up to 0.68
  - spectral range 370–2300 nm
  - pilot beam option
- 10 Micro focus optics, Series 5M-... and 13M-...  
The lens attachments for fiber collimators 60FC-... focus the collimated laser beam onto a diffraction-limited area ( $\geq 0.6 \mu$ m)

From page 33

## Order Options

Laser diode beam sources are delivered fully assembled and adjusted, using laser diodes from our own stock or supplied by the client, according to customer specifications. Detailed instructions for assembly and adjustment by the user are included.

# Laser Diode Collimator 48TE-SOT-...



## Laser Diode Module 48TE-SOT A

### Main specifications:

- X/Y-centering of the laser diode onto the optical axis with adjustment tool 48AD
- Solderless contact using spring-contact connectors ensures laser diode is galvanically isolated from collimator module
- Integrated Peltier element and temperature sensor for thermo-electric closed-loop control of the laser diode temperature
- Peltier element provides up to 2 W of heat transfer power

$$I_{max.} = 1.5 \text{ A}, U_{max.} = 2.8 \text{ V}$$

- Temperature sensor: thermistor (NTC 10 k $\Omega$ )
- Separate connection cables for power supply, for the monitoring of the laser diode and temperature control
- Modular fan 48L A3 for increased thermal transfer efficiency (12 V DC, 0.1 A power supply is not designed for use with vibration-sensitive applications)
- Compatible with microbench (30 mm pitch)
- The components are adjusted and fixed using radially located grub screws for positive locking
- An elastomere diaphragm A1 encloses the laser diode and prevents both laser beam egress and dust ingress

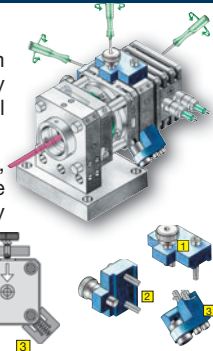
## x/y-Centering of the Laser Diode Module

### Adjustment fixture Order Code 48AD A2

For optimum collimation of the laser beam free of aberration (e.g. coma), it is necessary to launch the emission center onto the optical axis of the collimator optics.

With the tripartite X/Y-centering fixture 48AD, the mounting plate of the laser diode can be adjusted laterally (for details, see assembly instructions).

Lateral displacement is performed using screws 1 and 2, while screw 3 provides the necessary counteractive force.



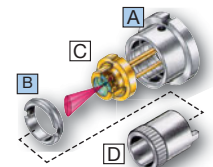
## Adapters for Laser Diodes $\varnothing$ 5.6 mm

**Application:** Laser diodes of  $\varnothing$  5.6 mm size can be inserted into the slot for a  $\varnothing$  9 mm laser diode without altering the active area nor position: the laser diode beam axis and the position of the emitter are unchanged.

### Adapter Order Code 50AL-5.6

- 2 parts: A outer casing  $\varnothing$  9 mm and B Retaining ring for laser diode

- C Laser diode with housing  $\varnothing$  5.6 mm
- D Assembly key Order Code 50LD5.6

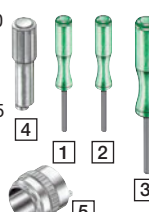


## Collimator flange 48CFS B

- Internal lens focussing: a left or right turn with the eccentric key 1 provides fine adjustment of the collimation lenses and, so, of the focus position and collimation, even with attached adapters.
- Lens locking II
- System mount  $\varnothing$  19.5 mm for attachment of further beam-shaping optics and adapters. The adapters have a tightly fitting cylinder with circular V-groove for fitting into the collimator flange. The adapters can be rotated and are locked by circumferential grub screws III.

## Assembly and Adjustment Tools

- 1 Screwdriver Order Code 48SD-00
- 2 Hex screwdriver SW  $\varnothing$  1.5 mm Order Code 50HD-15
- 3 Hex screwdriver SW  $\varnothing$  2.5 mm for adjustment fixture 48AD Order Code 50HD-25
- 4 Eccentric key for collimation lenses 60CL-... Order Code 60EX-4
- 5 Focussing key for collimation lenses 50CL-... Order Code 50LF-03



**Table 1** Beam parameters Collimation Lens 50CL-... / 60CL-...

row	curr. no	1	2	3	4	5	6	7	8	9	10	11	12	13
Collimation lens		60CL						50CL						
Collimator flange		48CFS						48CFL						
1	Lens type	G2.7	A3,1	A4	A4.5	T5	M5	A6.2	A8	A8	T12	T12F	M12	M60
2	Focal length f'	2.7	3.1	4	4.5	5	5.1	6.2	8	8	12.5	12.5	12.1	60
3	Numerical aperture NA	0.35	0.68	0.6	0.55	0.5	0.16	0.4	0.3	0.5	0.54	0.54	0.22	0.14
4	Clear aperture [mm]	1.9	4.2	4.8	4.95	5	2.5	5	4.8	8	13.5	13.5	5.5	17
5	Max. active area [mm]	0.1	0.05	0.05	0.18	0.14	0.1	0.2	0.1	0.1	0.2	0.2	0.2	0.2
6	Lens for UHV application	x	x	x	x			x	x	x	x	x		
Spectral range		Code no. of AR coating												
7	370 - 600 nm	01								01				01
8	600 - 1050 nm	02			02	02				02				02
9	1050 - 1550 nm	03			03	03	03			03				03
10	1300 - 1750 nm	45			45	45	45			45				45
11	650 - 1350 nm	07								07				
12	390 - 670 nm	33											33	33
13	600 - 1020 nm	05					05							
14	630 - 980 nm	10	10									10	10	10
15	830 - 1550 nm	25										25	25	
16	1550 - 1750 nm	22			22	22	22			22				22
17	1750 - 2300 nm	09			09	09	09			09				09
Beam parameters for the collimated laser beam using a 670 nm laser diode with active area 0.1 x 3 $\mu$ m and beam divergence 10°x 30° (FWHM), beam- $\varnothing$ 1/e <sup>2</sup> (13.5%). # beam cross-section restricted by lens aperture.		0.8	0.9	1.2	1.3	1.5	1.5	1.8	2.4	2.4	3.7	3.7	3.6	#17
18	Beam- $\varnothing$ II [mm]	1.9	2.7	3.4	3.9	4.3	#2.5	#5.0	#4.8	#6.9	10.8	10.8	#5.5	#17
19	Beam- $\varnothing$ $\perp$ [mm]	0.53	0.47	0.36	0.32	0.29	0.28	0.23	0.18	0.18	0.12	0.12	0.12	0.03
20	Divergence II [mrad]	0.22	0.16	0.12	0.11	0.1	0.17	0.09	0.09	0.06	0.04	0.04	0.08	0.03
Beam parameters for the collimated laser beam using a 635 nm CircuLaser™ diode with beam divergence 8°x 8° (FWHM)		0.6	0.7	0.9	1.1	1.2	1.2	1.5	1.9	1.9	3.0	3.0	2.9	14.2
22	Beam- $\varnothing$ 1/e <sup>2</sup> (13.5%) [mm]	0.63	0.55	0.43	0.38	0.34	0.33	0.28	0.21	0.21	0.14	0.14	0.14	0.03
23	Divergence [mrad]													

## Order Options

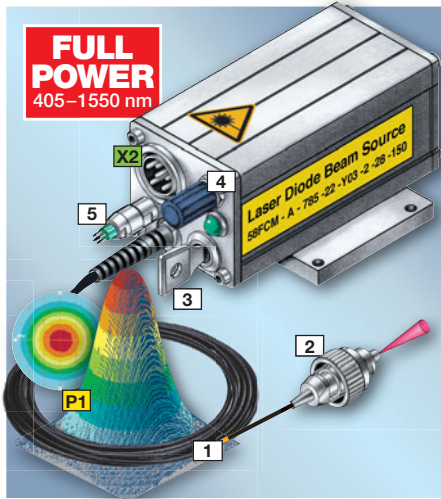
The 48TE-SOT-... laser diode collimator is supplied as a completely adjusted system consisting of laser diode module 48TE-SOT, with integrated Peltier element, diode collimator 60CL-... (50CL-...), Faraday Isolator 48FI-5-..., anamorphic optics 5AN-..., shutter 48AT-S, laser beam coupler with FC-APC connector 60SMS-..., PM fiber or singlemode fiber cable PMC-.../ SMC-... and fiber collimator 60FC.

### On ordering, please specify:

- Laser Diode wavelength, module type and output power
- Fiber Cable length and type
- Fiber Collimator focus size or collimation diameter
- Fan module option: with or without

Please contact Schäfter+Kirchhoff for details of suitable laser diode beam sources or for laser diode collimators with other specifications.





- Laser diode beam source 58FCM-...**
- 1 Singlemode fiber cable with
  - 2 FC-APC connector
  - 3 Key switch: ON/OFF - LED ON
  - 4 Potentiometer (reduction of laser output power)
  - 5 Cable for power supply
  - X2 Connector, ext. modulation and interlock

**Accessories**

**Connectors**

Lumberg connector (female) according IEC 60130-9

**Order Code BC 01 06 F**  
Type KV 60 (6-pin) for connection to interlock chain and for ext. modulation

**Order Code BC 01 03 F**  
Type KV 30 (3-pin) for 5 V power supply

**Order Code BC 01 04 F**  
Type KV 40 (4-pin) for 12 V power supply

**Power Supplies for 58FCM-...**

Power supply for laser diode beam sources, electrically isolated, 1.5 m cable with connector (IEC60130-9) Lumberg series KV (female).

Input	100-240 V AC		Connector (fem.) 5-pin KV50 for 5 V (pin comp. to SV30) or 4-pin KV40 for 12 V DC version
Output with connector	5 V DC/1 A BC0103F	12 V DC/0.5 A ABC0104F	
Order Code	PS051003E	PS120516E	

**Power cord for Power Supplies**  
1.5 m, IEC320 female 3-pin plug, 10 A, 250 V AC IEC-connector (IEC-60320) with country-specific male 3-pin plug

Country	Europe	USA/Canada	Great Britain
Order Code	PC150DE	PC150US	PC150UK

**Electrical Data**

Electronics Type		C	P
Supply voltage	standard	5 V DC (±0.2 V)	
	optional	12 V DC (±0.2 V)	
Laser diode operation mode		constant power	
	optional	constant current	
Max. operating current		250 mA	
Ambient temperature range		15-35°C	
Modulation frequency	analog	100 kHz	10 Hz
	TTL	100 kHz	250 kHz
Laser power output potentiometer		<1-100%	<5-100%
TTL modulation logic	Laser ON	TTL high	
Analog control voltage P <sub>min</sub> to P <sub>max</sub>		0-2.5 V	

**Timing Diagram**

Modulation: The laser has two AND-wired modulation input channels, U<sub>analog</sub> 1 and U<sub>TTL</sub> 2. The laser is OFF when the modulation input is open. The laser can be modulated digitally. If only one modulation input is used then the other has to be set to +5V (see timing diagram). The voltage U<sub>analog</sub> at analog modulation input 1 linearly controls laser output power between ±1% and 100% of the optical power set by the potentiometer.

**Laser Diode Beam Source 58FCM-...**

Fiber-coupled, singlemode and polarization-maintaining with FC-APC connector

- Rotationally symmetric beam profile with Gaussian intensity distribution [P1]
- Singlemode fiber cable or polarization-maintaining singlemode fiber cable (polarization extinction ratio >23 dB)
- Spectral range 405 nm to 1550 nm
- Laser output power up to 70 mW
- Fiber cable with strain-relief and protective sleeving (Ø 3 mm)
- FC-APC connector (8°-polish) reducing power noise caused by back-reflection into the laser
- Output power adjustable using potentiometer or external voltage control input (0-2.5 V)
- AND-wired modulation inputs, analog and TTL, f<sub>max</sub> = 100 kHz
- Operation mode: constant power (standard) and constant current

**Laser safety specification according IEC 825 / EN 60825 from:**

- Key switch 3 and LED-indicator for laser operation
- Interlock connection X2

**Options:**

- To fulfill lower laser safety requirements (e.g. laser class 2), the laser source can be delivered with reduced maximum output power
- Supply voltage 5 V (standard) or 12 V (exception: Table 6, row 1 is available with 12 V supply voltage only), reverse voltage protection
- Protective cap to prevent damage to the potentiometer

**Related products**

- **Laser diode beam source 52FCM:** Version without key switch nor interlock (for OEM purposes only)
- **Laser diode beam source 51nanoFCM:** Low Noise version with reduced coherence length and speckle contrast
- **Laser diode beam source 51nanoFI:** Low Noise version with integrated Faraday Isolator (reduced coherence length and speckle contrast)

**Table 6 Laser Diode Beam Source 51nanoFCM-...**

Row	1	2	3	4	5	6	7	8	9	10	12	
Cur. No.	Type	Wave-length (nm)	P <sub>out</sub> * (mW)	Laser diode code	LD operation mode**	Supply power (V)	Electronics Type	Electr. connection	Fiber type	Fiber connec. option	Fiber length (cm)	*** MFD (µm)
1	58FCM	405	40	M29	P/C	5/12	P	..	..	..	..	2.9
2	58FCM	635	1	H01	P/C	5/12	C	..	..	..	..	4.5
3	58FCM	637	5	H10	P/C	5/12	C	..	..	..	..	4.5
4	58FCM	640	25	H22	P/C	5/12	C	..	..	..	..	4.5
5	58FCM	660	14	M01	P/C	5/12	C	..	..	..	..	4.7
6	58FCM	660	24	M26	P/C	5/12	C	..	..	..	..	4.7
7	58FCM	660	70	M25	P/C	5/12	P	..	..	..	..	4.7
8	58FCM	675	3	H03	P/C	5/12	C	..	..	..	..	4.8
9	58FCM	685	24	H13	P/C	5/12	C	..	..	..	..	4.9
10	58FCM	785	23/29	H06	P/C	5/12	C	..	..	..	..	5.6
11	58FCM	830	18	H19	P/C	5/12	C	..	..	..	..	5.9
12	58FCM	980	6	W22	P/C	5/12	C	..	..	..	..	6.9
13	58FCM	1080	28	EY10	P/C	5/12	C	..	..	..	..	7.6
14	58FCM	1310	2.4	M06	P/C	5/12	C	..	..	..	..	9.2
15	58FCM	1550	2	M15	P/C	5/12	C	..	..	..	..	10.9

58FCM - 637 - 5 - H10 - P - 5 - C - 2 - 28 - 0 - 150 Order Code

**Laser diode beam source** (see Table 6)

**Laser diode operation mode:**  
constant power (standard) ..... P  
constant current ..... C

**Supply voltage:**  
5 V DC (standard) ..... 5  
12 V DC ..... 12

**Electronics Type** (see Table 6):  
The electronics type depends on the laser diode. Details about types C and P are found in table of electrical data, see left.

**Electrical cable**  
1.5 m shielded 3 x 0.14 mm<sup>2</sup> ..... 1  
as for 1, with connector SV30 (5 V) ..... 2  
as for 1, with connector SV40 (12 V) ..... 4  
cable length specified by customer ..... 5

\* Typical laser output power.  
For the lower of two specified power outputs, the housing length L = 146 mm (standard). For the higher power value, the housing length L = 166 mm, see dimensions below.

\*\* Constant power: An internal control-loop maintains constant laser power. Advantage: compensates for temperature variations or ageing of laser diode.

\*\*\* With fiber NA 0.11

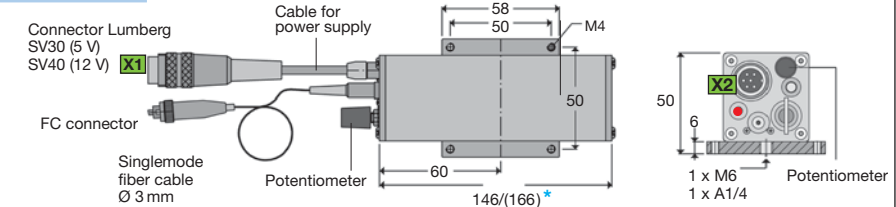
**Fiber length in cm, standard**

**Connector option:**  
0 = standard  
C = core centered <0.25 µm (singlemode only)

**Fiber type:**  
10 = singlemode fiber cable, FC-PC connector (0°-polish)  
18 = singlemode fiber cable, FC-APC connector (8°-polish)  
20 = PM singlemode fiber cable, FC-PC connector (0°-polish)  
28 = PM singlemode fiber cable, FC-APC connector (8°-polish)  
Connector type ST, DIN-Avio, and E-2000 on request

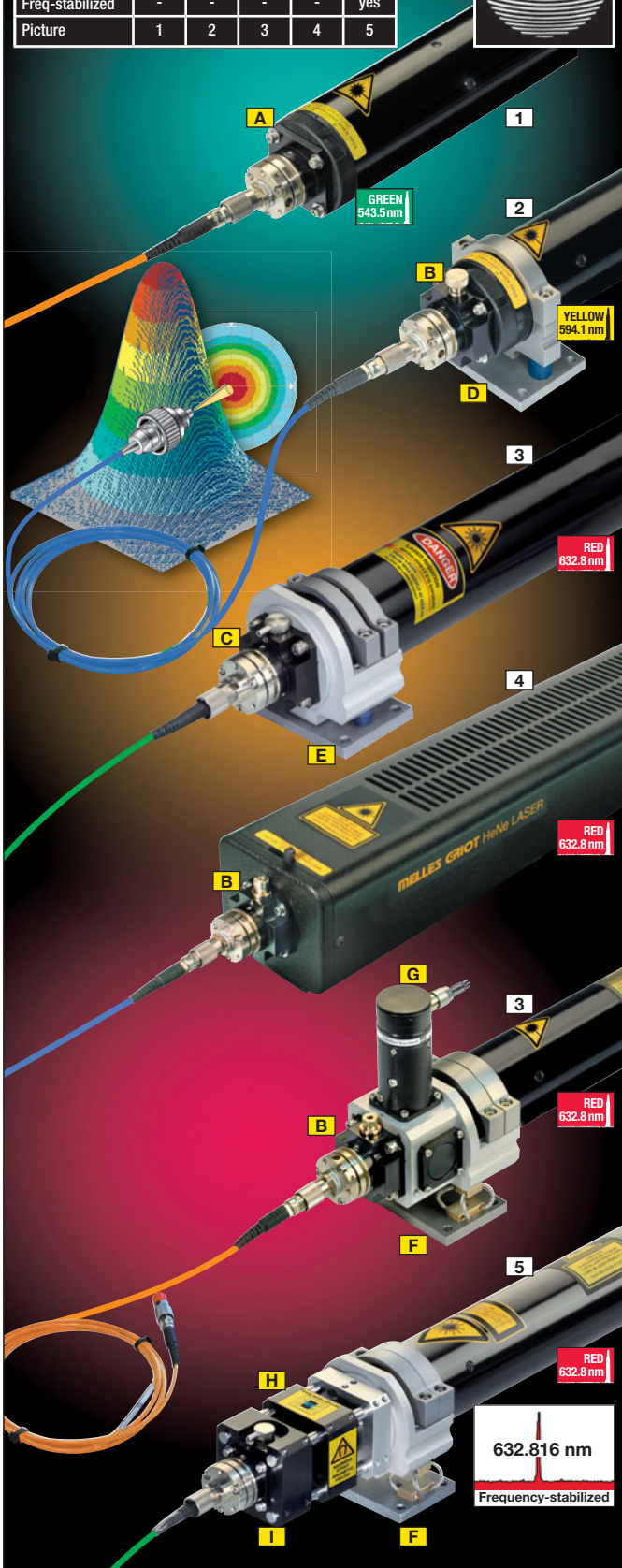
**Constant current:** The internal control-loop maintains constant laser current. The power output depends on temperature. Advantage: reduced laser noise.

**Dimensions Laser Diode Beam Source 58FCM-...**



# HeNe Laser with Fiber Optics Singlemode and polarization-maintaining

Color	Green	Yellow	Red		
Wavelength [nm]	543.5	594.1	632.8	632.8	632.8
Output Power ex Fiber [mW]	0.7	0.7	0.35-12	28	0.7
Freq-stabilized	-	-	-	-	yes
Picture	1	2	3	4	5




## Universal Beam Source for Interferometry and Frequency Standards

The Schäfter+Kirchhoff HeNe lasers and fiber optics are polarization-maintaining and provide a high coupling efficiency with extremely resilient transport capabilities. A large selection of coupling lenses is provided that match the different laser beam diameters with the particular PM fiber chosen for use. Both ends of the singlemode fibers have 8°-polish (connectors Type FC-APC) in order to minimize laser back-reflection and power noise effectively.


- Coupling efficiency >75%, typically 80%
- Polarization extinction ratio >23 dB
- Fiber cable MFD = 4.4 μm, NA = 0.12
- FC-APC type connector for coupler and fiber end (others available on request)
- Fiber-coupling solutions for HeNe lasers supplied by the customer
- Mechanical shutter or attenuator locked by a grub screw, for release by a special tool to ensure laser safety
- Electromagnetic shutter for all HeNe laser types
- Mounting brackets for strainless mounting, with shock absorbers to avoid vibration, shocks and thermal deformation: highly suitable for industrial environments
- Standard and customized power supplies

For more information and technical drawings of the laser sources, please contact Schäfter+Kirchhoff or download product information from [www.SuKHamburg.com/pdf/HeNe-Laser\\_e.pdf](http://www.SuKHamburg.com/pdf/HeNe-Laser_e.pdf)


### 1 Green HeNe Laser HeNe - 543 - 0.7 - P - LGP193 - ...

- Polarization-maintaining singlemode fiber
- Wavelength **543.5 nm** 
- Output power >0.7 mW ex fiber


### 2 Yellow HeNe Laser HeNe - 594 - 0.7 - P - LYP173 - ...

- Polarization-maintaining singlemode fiber
- Wavelength **594.1 nm** 
- Output power >0.7 mW ex fiber


### 3 HeNe - 633 - ...

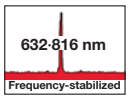
- Polarization-maintaining singlemode fiber
- Wavelength **632.8 nm** 
- Output power >0.35 mW to >12 mW ex fiber

### 4 HeNe - 633 - 28 - P - MG928 - ...

- Polarization-maintaining singlemode fiber
- Wavelength **632.8 nm** 
- Output power >28 mW ex fiber

### 5 HeNe - 633 - 0.8 - P - REO32734 - ... Frequency-stabilized

- Polarization-maintaining singlemode fiber
- Wavelength **632.8 nm** 
- Output power >0.8 mW ex fiber
- Overall length of system approximately 520 mm
- Faraday Isolator for frequency-stabilized fiber coupling

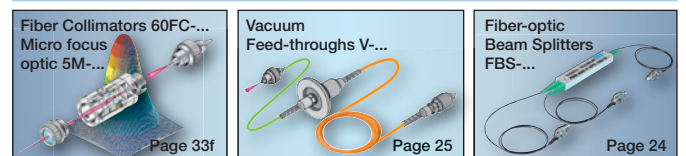


### Options

All HeNe laser sources can be combined with following options:

- A** Adapter flange **60A19.5-F**, standard adapter
- B** Mechanical attenuator **60A19.5-F-AT**
- C** Adapter flange with integrated shutter **60A19.5-F-S**
- D** Vibration-absorbing mounting bracket **MC-MG-44.5-R**
- E** Mounting bracket with integrated flange for fiber coupling (increased long-term stability) **MC-MG-44.5-F-R**, standard mount
- F** Mounting bracket with integrated flange for fiber coupling (increased long-term stability) and with steel shock absorbers **MC-MG-44.5-F-S**
- G** Electromagnetic bistable shutter **EMS-3-30**  
For more information on the shutter EMS-3-30, see page 56
- H** Faraday Isolator **48FI-5-...**, see page 57
- I** Mechanical attenuator **48AT-A**, see page 64

### Fiber-optics Accessories





# Fiber-coupled HeNe lasers: 633, 543, 594 and 1523 nm

## Output power: 0.6–28 mW ex fiber

**Table 1. HeNe Laser**

Column	1	2	3	4	5	6	7	8	9	10	Laser				Fiber Cable		
											Shutter*	Laser Dia-meter (mm)	Length (mm)	Laser Class	Power Supply Style	NA	MFD 1/e <sup>2</sup> (µm)
No.	Wavelength [nm]	Power ex fiber [mW]	Polarization	Laser Type	Laser Power [mW]	Supply Voltage	Shutter/Attenuator	Fiber Type	Fiber Connector Option	Fiber Length [cm]							
<b>Red</b>																	
1	HeNe 633	0.35	P	LHP 213	0.5	..	..	..	..	..	X	31.6	178	1	B	0.12	4.1
2	HeNe 633	1.5	P	LHP 121	2	..	..	..	..	..	X	44.5	272	3B	B	0.12	4.1
3	HeNe 633	3.5	P	LHP 151	5	..	..	..	..	..	X	44.5	396	3B	B	0.12	4.1
4	HeNe 633	7	P	LHP 991	10	..	..	..	..	..	X	44.5	484	3B	C	0.12	4.1
5	HeNe 633	12	P	LHP 925	17	..	..	..	..	..	X	44.5	637	3B	C	0.12	4.1
6	HeNe 633	28	P	LHP 928	35	..	..	..	..	..	X	rect.	1030	3B	C	0.12	4.1
<b>Green</b>																	
7	HeNe 543	0.7	P	LGP 193	1	..	..	..	..	..	X	44.5	510	3B	B	0.12	3.5
<b>Yellow</b>																	
8	HeNe 594	0.7	P	LYP 173	1	..	..	..	..	..	X	44.5	456	3B	B	0.12	3.9
<b>Red (frequency-stabilized) ** Faraday Isolator required, add FI to Order Code</b>																	
9	HeNe 633	0.8	P	RE032734	1.5	4	..	..	..	..	X	50	381	3B		0.12	4.1

**HeNe - 633 - 3.5 - P - LHP151 - 2 - A - 28 - 0 - 150** **Order Code**

**Wavelength [nm]**  
**Optical power ex fiber [mW]**  
**Polarization:**  
 linear (standard) ..... P  
 random (option) ..... R  
**Laser type**  
 230 V (standard) ..... 2  
 110 V ..... 1  
 12 V DC ..... 3  
 230/110V (Laser no. 9 only) . . 4  
 add. Faraday Isolator \*\*\* . . . FI

**Fiber length [cm]**  
**Connector option:**  
 0 = standard  
 C = core centered (singlemode only)

**Fiber / connector type:**  
 18 = singlemode fiber cable, FC-APC conn. (8°-polish)  
 28 = PM singlemode fiber cable, FC-APC connector (8°-polish), standard  
 Connector type ST, DIN-Avio, and E-2000 on request

**Shutter/Attenuator**  
 mechanical shutter \* ..... S  
 mechanical attenuator ..... A  
 w/o ..... 0

Using fiber connectors of type FC-PC with 0°-polish, even for cable output, produces back-reflections into the laser, resulting in the noisy operation of the HeNe laser.

### Adapters for laser beam couplers 60SMS-...

Schäfter+Kirchhoff offers different adapters for attaching the laser beam couplers 60SMS-... to a HeNe laser with a standard fitting 4x 4-40, □1".

Mounting set with screws and washers

**Order Code 60A19.5-F-MS**

**A** Adapter flange  
**Order Code 60A19.5-F**

**B** Adapter flange with attenuator  
**Order Code 60A19.5-F-AT**

**C** Adapter flange with integrated shutter  
**Order Code 60A19.5-F-S**

\* When the laser has its own shutter, see Table 1, column 11, an external shutter is not required.

### Mounting Brackets and Accessories

**Mounting Bracket MC-MG-44.5-R** for lasers with diameter 44.5 mm / 1.75" (set of two). Elastomer shock absorbers are used for dampening of shock, vibrations and avoidance of thermal deformations.

The adapter **A** 60A19.5-F, **B** 60A19.5-F-AT, or **C** 60A19.5-F-S is attached to the front plate of the laser.

**Mounting Bracket MC-MG-44.5-F-S** for lasers with diameter 44.5 mm / 1.75" (set of two). Wire-spring shock absorbers for improved dampening of shock, vibrations and avoidance of thermal deformations in all xyz-directions. For optimum stability, the bracket **MC-MG-44.5-F-S** holds both laser and adapter.

**Mounting Bracket MC-MG-44.5-F-R** for HeNe lasers with diameter 44.5 mm/1.75" (set of two). Elastomer shock absorbers for dampening of shock, vibrations and avoidance of thermal deformations. For optimum stability, the **mounting bracket MC-MG-44.5-F-R** holds both laser and adapter.

**Electromagnetic Shutter EMS-3-30** and shutter controller **SK97120**. For more information, see page 56.

**Faraday Isolator 48FI-5-... \*\***  
See page 57 for more information

### Dimensions of Power Supplies

The HeNe lasers from Schäfter+Kirchhoff are shipped with power supplies. Desktop power supplies are available for 230 V and 110 V line voltage. OEM power supplies can often be provided for HeNe lasers upon request, including 12 V DC or 230/100 V AC.

**Style A**  
Key switch 205, Power On/OFF, 160, HV connect, Remote/interlock

**Style B**  
Key switch 129, Power On/OFF, 136, HV connect, Main power

**Style C**  
Key switch 161, Power On/OFF, 241, HV connect, Remote/interlock

### Accessories

Mounting set:  
 Socket head screws (similar to DIN912)  
 4-40 UNC x 3/8", set of 4 pcs.  
 with washer and hex key 3/32

**Order Code 60A19.5-F-MS**



### Couplers and Collimators

Laser beam couplers 60SMS-... see page 9

Fiber collimators 60FC-L... see page 36