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

- With polarization-maintaining singlemode fiber, Peltier element / thermo sensor and Faraday Isolator

For a detailed description of Laser diode module 48TE-SOT-... with integrated Peltier element and temperature sensor for thermo-electric control.

1. Laser diode module 48TE-SOT-... with integrated Peltier element 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 more information, see: http://www.sukhamburg.com/dl/ldc48te_e.pdf

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

For assembly in microbench systems. High precision through-holes for 4 parallel rod guides. Ensures 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 49

Anamorphic Beam Shaping Optics 5AN-...

Combination of cylinder lenses with integrated astigmatic correction. A focal (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 42

Mechanical Shutter 48AT-S

To block the laser beam manually.

- For system mount Ø 19.5 mm
- Aperture Ø 3 mm

See page 52

Laser Beam Coupler 60SMS-...

Adjustable and focussable for singlemode fiber cable with FC connector.

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

See page 7

Polarization-maintaining and Singlemode Fiber Cables PMCO-... 5MO-... 5MC-...

- Singlemode, polarization-maintaining
- MFD 3-10 μm
- λ = 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

See page 16f

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

- Fiber Collimator 60FC-... focussable, inclined or paraxial fiber coupling axis. Both beam diameter and divergence are determined by focal length f' of 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
- Micro-focus optics, Series 5M-... and 13M-...

The lens attachments for fiber collimators 60FC-... focus the collimated laser beam onto a diffraction-limited area (0.8 μm)

See page 30

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 Module 48TE-SOT

Main specifications:
- x/y-centering of the laser diode onto the optical axis with adjustment tool 48AD
- Solderless contact for laser diode using spring contact connectors so laser diode galvanically isolated from collimator module
- Integrated Peltier element and temperature sensor for thermoelectric closed-loop control of the laser diode temperature
- Peltier element provides up to 2 W of heat transfer power
- Temperature sensor: thermistor (NTC 10 kΩ)
- Separate connection cables for power supply, for the monitoring of the laser diode and temperature control
- Modular fan 48L 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 encloses the laser diode and prevents both laser beam egress and dust ingress

Adjustment

For an 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 D and E, while screw C provides the necessary counteractive force.

Adapters for Laser Diodes Ø 5.6 mm

Application: Laser diodes of Ø 5.6 mm size can be inserted into the retainer for laser diodes of Ø 9 mm size without altering the active area nor its position: the laser diode beam axis and the position of the emitter are unchanged.

Adapter Order Code 50AL-5.6
2 parts D outer housing Ø 9 mm Retaining ring for laser diode Laser diode with housing Ø5.6 mm Assembly key Order Code 50LD5.6

Collimator flange 48CFS

- Internal lens focusing: a left or right turn with the eccentric key C provides fine adjustment of the collimation lenses and, so, of the focus position and collimation, even with attached adapters.
- Lens locking D
- System mount Ø 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 F

Assembly and Adjustment Tools

- Screwdriver SS 1.5 mm Order Code 48SD-00
- Hex screwdriver SW Ø 1.5 mm Order Code 50HD-15
- Hex screwdriver SW Ø 2.5 mm for adjustment fixture 48AD Order Code 50HD-25
- Eccentric key E for collimation lenses 60CL-... Order Code 60EX-4
- Focussing key J for collimation lenses 50CL-... Order Code 50LF-03

Order Options

For increased thermal transfer efficiency
Screwdriver
Retaining ring for laser diode
Assembly key
Eccentric key
II and encloses the laser diode and temperature control
Modular fan 48L 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 encloses the laser diode and prevents both laser beam egress and dust ingress

Table 1

<table>
<thead>
<tr>
<th>Beam no</th>
<th>Collimation Lens 50CL-... / 60CL-...</th>
<th>Code no.</th>
<th>48CFS</th>
<th>48KFL</th>
<th>48KFL</th>
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<tbody>
<tr>
<td>1</td>
<td>Lens type</td>
<td>Code no.</td>
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<td>2</td>
<td>Focal length f</td>
<td>Code no.</td>
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<td>Numerical aperture NA</td>
<td>Code no.</td>
<td></td>
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<td>4</td>
<td>Clear aperture [mm]</td>
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<td>Max. active area [mm]</td>
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<td>Lens for LNH-application</td>
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</table>

Beam parameters for the collimated laser beam using a 670 nm laser diode with active area 0.1 x 3 μm and beam divergence 10° x 30° (FWHM), beam-D 1/4 (13.5%), beam cross-section restricted by lens aperture

<table>
<thead>
<tr>
<th>Beams</th>
<th>Code no.</th>
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<th>48KFL</th>
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</tbody>
</table>

Beam parameters for the collimated laser beam using a 635 nm CircuLaser™ diode with beam divergence 8°x 8° (FWHM).

<table>
<thead>
<tr>
<th>Beams</th>
<th>Code no.</th>
<th>48CFS</th>
<th>48KFL</th>
<th>48KFL</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
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<tr>
<td>17</td>
<td>17</td>
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<td></td>
</tr>
</tbody>
</table>

Ordering, please specify:
- Laser Diode wavelength, module type and output power
- Fiber Cable length and type
- Fiber Collimator focus size or collimation diameter
- Optional fan module (with or without).

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

Laser Diode Collimator 48TE-SOT-...
Laser Diode Beam Source 58FCM-...

- Singlemode fiber cable with FC-APC connector
- Key switch: ON/OFF - LED ON
- Potentiometer (reduction of laser power output)
- Cable for power supply
- Connector, ext. modulation and interlock

**Electrical Data**

- Supply voltage: standard 8 V DC (± 0.2 V), optional 12 V DC (± 0.2 V)
- Laser diode operation mode: constant power, constant current
- Max. operating current: 260 mA
- Ambient temperature range: 15 - 35 °C
- Modulation frequency: analog 0 - 100 kHz
- Laser power output: < 1 - 100%
- TTL modulation logic: Laser ON
- Analog control voltage: Pmin to Pmax 0 - 2.5 V

**Timing Diagram**

- Modulation: The laser has two AND-wired modulation input channels, Uin 1 and Uin 2. The laser is OFF when one modulation input is open. If only one modulation input is used, then the other has to be set to -5V (see timing diagram).
- The voltage Uin is linearly controlled laser output power between <1% and 100% of the optical power set by the potentiometer.

**Accessories**

- Lumberg connector (female) according IEC 60130-9
- Type KV 30 [4-pin] for 5 V power supply
- Order Code: BC 01 04 F
- Type KV 30 [4-pin] for 12 V power supply
- Order Code: BC 01 06 F
- Power supply for laser diode beam sources, electrically isolated, 1.5 m cable with connector (IEC60130-9) Lumberg series KF (female).
- Input: 100 - 240 V AC
- Order Code: PS01003E
- Output: 5 V DC/1 A, 12 V 0.5 A
- Order Code: PS12001E

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

- 58FCM singlemode fiber cable, FC-PC connector
- Connector (fem.) 5-pin KV50 for 12 V power conn.
- with connector E0103F
- with connector E0101F
- Power cord for Power Supplies
- 1.5 m, IEC320 female 3-pin plug, USA/Canada
- 3-pin male, 170 V AC IEC-connector (IEC 60320) with country-specific male plug
- Order Code: PC150DE

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

- Fiber-coupled, singlemode and polarization-maintaining with FC-APC connector
- Concentrically symmetric beam profile with Gaussian intensity distribution
- Singlemode fiber cable or polarization-maintaining singlemode fiber cable (polarization axis indicated by connector key index)
- Spectral range: 405 nm to 1550 nm
- Laser power output up to 70 mW
- Fiber cable with strain relief and protective sleeving (0.3 mm)
- FC-APC connector (8°-polish) reducing power noise caused by back-reflection into the laser resonator
- Output power adjustable using potentiometer or external voltage control input (0-2.5 V)
- AND-modulated input, analog and TTL, Typical H = 100 kHz
- Operation mode: constant power (standard) and constant current

**Laser safety specification according IEC 825 / EN 60825 from: Key switch and LED-indicator for laser operation**

**Options:**

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

**Related products:**

- Laser diode beam source 52FCM: Version w/o key switch and w/o interlock (for OEM purposes only)
- Laser diode beam source 51nanoFCM: Low Noise version with reduced coherence length and speckle structure
- Laser diode beam source 51nanoFF: Low Noise version with integrated Faraday isolator (reduced coherence length and speckle contrast)

**Electrical cable**

- Power cord with connector 4-pin KV40 for 12 V power supply
- Connector Lumberg (female) according IEC 60130-9
- 1.5 m cable with connector M26 (8°-polish)
- Connector key index

**Fiber Connector**

- Laser diode operation mode constant power (standard) ..........
- Fiber type: P
- Fiber connector option
- Fiber connection: FC-connector
- Fiber connector: FC-PC connector
- Fiber length: in mm
- Fiber type: de
- Connector option: C = core centered <0.25 μm (singlemode only)

**Dimensions**

- Laser Diode Beam Source 58FCM...
- Singlemode fiber cable Φ 3 mm
- Potentiometer
- Cable for power supply
- Connector Lumberg SV30 (5 V) SV40 (12 V)
- FC connector
- Singlemode fiber cable Φ 3 mm
- Lumberg connector (female) according IEC 60130-9
- Fiber collimator, focussable, 60FCM...
- Micro-focus optics 5M....
- Fiber connector

**Attachments:**

- Fiber Optics
- E0103F
- E0101F
HeNe Laser with Fiber Optics
Singlemode and polarization-maintaining

<table>
<thead>
<tr>
<th>Color</th>
<th>Green</th>
<th>Yellow</th>
<th>Red</th>
<th>Infrared</th>
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</thead>
<tbody>
<tr>
<td>Wavelength (nm)</td>
<td>543.5</td>
<td>594.1</td>
<td>632.8</td>
<td>632.8</td>
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<tr>
<td>Output Power ex Fiber (mW)</td>
<td>0.7</td>
<td>1.4</td>
<td>1-12</td>
<td>28</td>
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<tr>
<td>Freq. Stabilized</td>
<td>-</td>
<td>-</td>
<td>yes</td>
<td>-</td>
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<tr>
<td>Picture</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

**Application**

**Interferometry**

- Polarization-maintaining singlemode fiber
- Wavelength 632.8 nm
- Output power >0.6 mW to >12 mW ex fiber
- Polarization-maintaining singlemode fiber
- Wavelength 543.5 nm
- Output power >0.7 mW ex fiber
- Polarization-maintaining singlemode fiber
- Wavelength 594.1 nm
- Output power >1.0 mW ex fiber
- HeNe - 633 nm
- Polarization-maintaining singlemode fiber
- Wavelength 632.8 nm
- Output power >0.6 mW to >12 mW ex fiber
- HeNe - 633 - 28 - P - MG926 - ...  
- Polarization-maintaining singlemode fiber
- Wavelength 632.8 nm
- Output power >28 mW ex fiber
- HeNe - 633 - 0.7 - P - REO32734 - ... Frequency stabilized
- Polarization-maintaining singlemode fiber
- Wavelength 632.8 nm
- Output power >0.7 mW ex fiber
- Overall length of system approximately 520 mm
- Faraday Isolator for frequency-stabilized fiber coupling
- Infrared HeNe Laser HeNe - 1523 - 0.6 - P - LIP171 - ...  
- Polarization-maintaining singlemode fiber
- Wavelength 1523 nm
- Output power >0.6 mW ex fiber

**Options**

- Adapter flange 60A19.5-F, standard adapter
- Mechanical attenuator 60A19.5-F-AT
- Adapter flange with integrated shutter 60A19.5-F-S
- Vibration-absorbing mounting bracket MC-MG-44.5-R
- Mounting bracket with integrated flange for fiber coupling (increased long-term stability) MC-MG-44.5-F-R, standard mount
- Mounting bracket with integrated flange for fiber coupling (increased long-term stability) and with steel shock absorbers MC-MG-44.5-F-S
- Electromagnetic bistable shutter EMS-3-30
- Faraday Isolator 48FI-5-...

**Fiber-Optics Accessories**

- Fiber Collimators 60FC...
- Micro-focus optic 5M...
- Vacuum Feed-throughs V...
- Fiber-optic Beam Splitters FBS...
Overview: HeNe lasers 633, 543, 594 and 1523 nm
Output power 0.6 - 28 mW ex fiber

Table 1. HeNe Laser

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Wavelength [nm]</th>
<th>Power ex fiber [mW]</th>
<th>Laser Type</th>
<th>Polarization</th>
<th>Supply Voltage</th>
<th>Fiber Diameter [mm]</th>
<th>Mechanical Shutter/Attenuator</th>
<th>Power Supply</th>
<th>Hex Key [mm]</th>
<th>Adapter Flange</th>
<th>Adapter Flange with shutter controller</th>
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<tbody>
<tr>
<td>60A19.5-F-MS</td>
<td>633</td>
<td>633</td>
<td>P</td>
<td>LHP-151</td>
<td>2</td>
<td>. . .</td>
<td>X</td>
<td>31.6</td>
<td>178</td>
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<td>60A19.5-F-AT</td>
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<td>543</td>
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<td>LHP-152</td>
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<td>44.5</td>
<td>355</td>
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<td>C</td>
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<td>594</td>
<td>P</td>
<td>LHP-153</td>
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<td>405</td>
<td>3B</td>
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</tr>
</tbody>
</table>

Adapters for laser beam couplers 60SMS-...

Schäfer + 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

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 damping of shock, vibrations and avoidance of thermal deformations.

The adapter 60A19.5-F, 60A19.5-F-AT, or 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 damping of shock, vibrations and avoidance of thermal deformations in all xyz-directions. For optimum stability, the mounting 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 damping 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-3-20 and shutter controller SK97120. For more information, see page 50

Faraday Isolator 48FI-5.... See page 49 for more information

Dimensions of Power Supplies

HeNe lasers from Schäfer + Kirchhoff are supplied with power supplies. Desktop power supplies are available for 230 V and 110 V line voltage. For some HeNe lasers, there are OEM power supplies with input voltage 12 V DC or 230/100 V AC.

Power supply 115/230 V AC

Power supply 12 V DC:

OEM power supplies with input voltage 12 V DC or 230/100 V AC are available for HeNe laser HeNe-633-0.6-P-LHP213 (Table 1, line 1). OEM power supplies for other HeNe lasers are available on request.

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