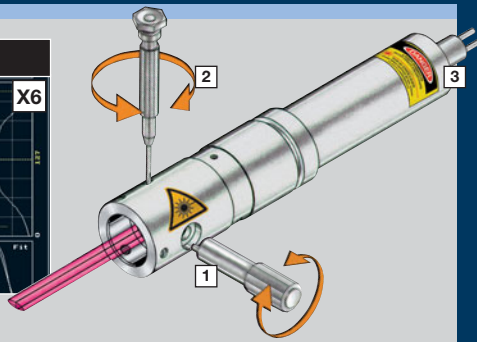
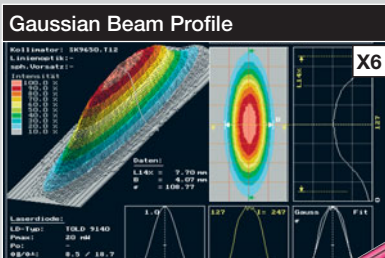


Laser Diode Collimator 25CM-...

Compact collimator with elliptical Gaussian beam profile



Ø12 mm
Casing

Integrated
Electrics

1 MHz
Modulation

λ-Selection

- 1 Collimation adjustment
- 2 Locking / unlocking of the lens position
- 3 Potentiometer for laser power output

- Collimated laser beam
- Gaussian intensity profile $\times 6$
- Laser output power up to 93 mW
- Laser wavelengths from 635 to 852 nm and optionally 1064–1550 nm
- Integrated adjustable power control <30-100%
- External modulation: TTL up to 1 MHz and analog up to 100 kHz
- Supply voltage: 5V DC

Laser diode collimators transform the divergent light of a laser diode into a collimated beam, while maintaining the Gaussian intensity distribution and the elliptical intensity profile. From the two emission angles ϑ_1 and ϑ_2 of the laser diode and the focal length of the collimation optics, the

orthogonal and parallel divergence angles and beam diameter can be determined, which are a function of the laser diode used for the collimation. In the table the beam diameter and divergence values are set in parentheses if the beam is truncated above the $1/e^2$ level.

25CM

Laser Diode Collimator

Example 1: Order Code

25CM - 660 - 41 - M26 - A8 - S - 6

All combinations of beam shaping optics and laser module are possible.

Beam Parameters 25CM	curr. No.	Laser Diode Source	Wave-length [nm]	P _{out} [mW]	LD Code	Lens	Elec-tronics	Cable	Collimated Beam Diameter 1/e ² [mm]		Beam Divergence 1/e ² [mrad]		Collimating Lens f [mm]	Clear Aperture [mm]	
									perp.	par.	perp.	par.			
	1	25CM	405	- 15 -	Y07	-A4	B	- x	3B	1.0	2.2	0.26	0.12	4	4.6
	2	25CM	405	- 15 -	Y07	-A6.2	B	- x	3B	1.6	3.4	0.17	0.07	6.2	4.8
	3	25CM	405	- 14 -	Y07	-A7.5	B	- x	3B	1.9	4.2	0.14	0.06	7.5	4.5
	5	25CM	635	- 7 -	H02	-A4.5	S	- x	3B	1.1	4.0	0.38	0.10	4.51	4.8
	6	25CM	635	- 7 -	H02	-A6.2	S	- x	3B	1.5	(5.5)	0.28	(0.07)	6.2	4.8
	7	25CM	635	- 6 -	H02	-A8	S	- x	3B	1.9	(7.1)	0.21	(0.06)	8	4.8
	8	25CM	635	- 11 -	H10	-A4.5	S	- x	3B	1.1	3.6	0.38	0.11	4.51	4.8
	9	25CM	635	- 10 -	H10	-A6.2	S	- x	3B	1.5	(5.0)	0.28	(0.08)	6.2	4.8
	10	25CM	635	- 9 -	H10	-A8	S	- x	3B	1.9	(6.5)	0.21	(0.06)	8	4.8
	11	25CM	640	- 31 -	H22	-A4.5	S	- x	3B	1.2	2.8	0.34	0.15	4.51	4.8
	12	25CM	640	- 30 -	H22	-A6.2	S	- x	3B	1.7	3.8	0.25	0.11	6.2	4.8
	13	25CM	640	- 29 -	H22	-A8	S	- x	3B	2.1	(4.9)	0.19	(0.08)	8	4.8
	14	25CM	660	- 26 -	M01	-A4.5	S	- x	3B	1.2	2.9	0.35	0.15	4.51	4.8
	15	25CM	660	- 25 -	M01	-A6.2	S	- x	3B	1.7	4.0	0.25	0.11	6.2	4.8
	16	25CM	660	- 24 -	M01	-A8	S	- x	3B	2.1	(5.1)	0.20	(0.08)	8	4.8
	17	25CM	660	- 43 -	M26	-A4.5	S	- x	3B	1.1	2.7	0.37	0.16	4.51	4.8
	18	25CM	660	- 43 -	M26	-A6.2	S	- x	3B	1.6	3.7	0.27	0.11	6.2	4.8
	19	25CM	660	- 41 -	M26	-A8	S	- x	3B	2.0	4.8	0.21	0.09	8	4.8
	20	25CM	685	- 27 -	M21	-A4.5	S	- x	3B	1.4	2.5	0.31	0.17	4.51	4.8
	21	25CM	685	- 27 -	M21	-A6.2	S	- x	3B	1.9	3.4	0.23	0.13	6.2	4.8
	22	25CM	685	- 26 -	M21	-A8	S	- x	3B	2.5	4.5	0.18	0.10	8	4.8
	23	25CM	685	- 38 -	H13	-A4.5	S	- x	3B	1.1	2.8	0.38	0.16	4.51	4.8
	24	25CM	685	- 38 -	H13	-A6.2	S	- x	3B	1.6	3.8	0.28	0.11	6.2	4.8
	25	25CM	685	- 36 -	H13	-A8	S	- x	3B	2.0	(4.9)	0.22	(0.09)	8	4.8
	26	25CM	785	- 3 -	M10	-A8	S	- x	3B	2.6	(6.7)	0.19	(0.07)	8	4.8
	27	25CM	785	- 4 -	M10	-A4.5	S	- x	3B	1.5	3.8	0.34	0.13	4.51	4.8
	28	25CM	785	- 3 -	M10	-A6.2	S	- x	3B	2.0	(5.2)	0.25	(0.10)	6.2	4.8
	29	25CM	785	- 93 -	Q06	-A4.5	S	- x	3B	1.2	2.1	0.42	0.24	4.51	4.8
	30	25CM	785	- 93 -	Q06	-A6.2	S	- x	3B	1.7	2.9	0.30	0.17	6.2	4.8
	31	25CM	785	- 92 -	Q06	-A8	S	- x	3B	2.1	3.8	0.23	0.13	8	4.8
	32	25CM	830	- 36 -	H19	-A8	S	- x	3B	2.1	(5.1)	0.25	(0.10)	8	4.8
	33	25CM	830	- 38 -	H19	-A4.5	S	- x	3B	1.2	2.9	0.44	0.18	4.51	4.8
	34	25CM	830	- 38 -	H19	-A6.2	S	- x	3B	1.7	4.0	0.32	0.13	6.2	4.8

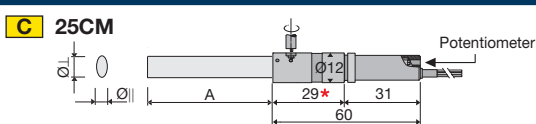
Electronics Type _____
Please note that all values are typical values and can differ slightly in reality.

- Cable Options: 1.5 m shielded connection cable1
 As 1, with connector type Lumberg SV40 (electronics type B only)4
 As 1, with connector type Lumberg SV50 (electronics type S only)6
 customer-specified cable length5

Beam diameter and divergence values are set in parentheses if the beam is truncated above the $1/e^2$ level.

For adequate adjustment tools please see page 74; for power supplies, switchboxes etc. see page 69f. **Details about the electronics are found on page 67.**

Dimensions



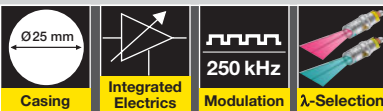
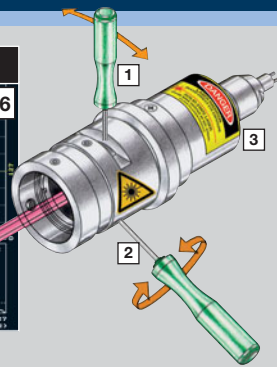
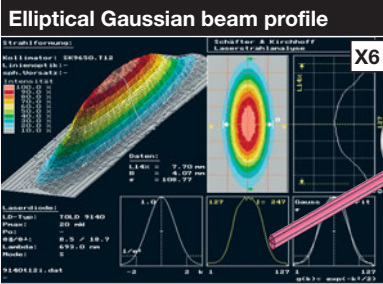
A = working distance Ø₁ = beam diameter perpendicular Ø₁ = beam diameter parallel * Clamping region for mounting



Elliptical, collimated beam

Laser Diode Collimator 55CM-... / 55CR-...

Collimator with **elliptical** Gaussian beam profile and integrated electronics



- 1 Collimation adjustment
- 2 Locking/unlocking of the lens position
- 3 Potentiometer for laser power output

optional:

RS232

**PC
INTER-
FACE**

Schäfer + Kirchhoff

- Collimated laser beam
- Gaussian intensity profile **X6**
- Laser output power up to 117 mW
- Integrated adjustable power control <1-100%
- Supply voltage: 5V DC
- Laser wavelengths from 405 to 830 nm and optionally 1064 – 1550 nm
- External modulation: TTL up to 250 kHz and analog up to 100 kHz

Laser Diode Collimator 55CM:
Axial cable connection

Laser Diode Collimator 55CR:
Cable connection set to 90°

- Option: PC-interface (RS232) - electr. types CS or PS. For details see p. 19.

Laser diode collimators transform the divergent light of a laser diode into a collimated beam, while maintaining the Gaussian intensity distribution and the elliptical intensity profile. From the two emission angles θ_x and θ_y of the

laser diode and the focal length of the collimation optics, the orthogonal and parallel divergence angles and beam diameter can be determined, which are a function of the laser diode used for the collimation.

55CM / 55CR

Laser Diode Collimator

Example 1: **Order Code**
Example 2: **Order Code**

55CR - 660 - 26 - M01 - T12 - CS - 7
55CM - 660 - 26 - M01 - T12 - C - 6

All combinations of beam shaping optics and laser module are possible.

Beam Parameters 55CM / 55CR	curr. No.	Laser Diode Source	Wave-length [nm]	P _{out} [mW]	LD Code	Lens	Available Electronics Options	Cable
	1	55CM*	405	- 15	- Y07	- A4	- P/PS	- x
	2	55CM*	405	- 14	- Y07	- A7.5	- P/PS	- x
	4	55CM*	405	- 15	- Y07	- A15	- P/PS	- x
	5	55CM*	405	- 93	- X15	- A4	- P/PS	- x
	6	55CM*	405	- 89	- X15	- A7.5	- P/PS	- x
	8	55CM*	405	- 93	- X15	- A15	- P/PS	- x
	9	55CM*	515	- 78	- X17	- A4	- P/PS	- x
	10	55CM*	515	- 73	- X17	- A7.5	- P/PS	- x
	12	55CM*	515	- 76	- X17	- A15	- P/PS	- x
	13	55CM	635	- 10	- H10	- A6.2	- C/CS	- x
	14	55CM	635	- 11	- H10	- A8	- C/CS	- x
	15	55CM	635	- 11	- H10	- T12	- C/CS	- x
	16	55CM	639	- 21	- H18	- A6.2	- C/CS	- x
	17	55CM	639	- 22	- H18	- A8	- C/CS	- x
	18	55CM	639	- 22	- H18	- T12	- C/CS	- x
	19	55CM	660	- 25	- M01	- A6.2	- C/CS	- x
	20	55CM	660	- 26	- M01	- A8	- C/CS	- x
	21	55CM	660	- 26	- M01	- T12	- C/CS	- x
	22	55CM	660	- 43	- M26	- A6.2	- C/CS	- x
	23	55CM	660	- 43	- M26	- A8	- C/CS	- x
	24	55CM	660	- 43	- M26	- T12	- C/CS	- x
	25	55CM*	660	- 109	- M25	- A6.2	- P/PS	- x
	26	55CM*	660	- 109	- M25	- A8	- P/PS	- x
	27	55CM*	660	- 109	- M25	- T12	- P/PS	- x
	28	55CM	685	- 38	- H13	- A6.2	- C/CS	- x
	29	55CM	685	- 38	- H13	- A8	- C/CS	- x
	30	55CM	685	- 38	- H13	- T12	- C/CS	- x
	31	55CM	785	- 93	- Q06	- A6.2	- C/CS	- x
	32	55CM	785	- 93	- Q06	- A8	- C/CS	- x
	33	55CM	785	- 93	- Q06	- T12	- C/CS	- x
	34	55CM	830	- 38	- H19	- A6.2	- C/CS	- x
	35	55CM	830	- 38	- H19	- A8	- C/CS	- x
	36	55CM	830	- 38	- H19	- T12	- C/CS	- x
	37	55CM	830	- 117	- N23	- A6.2	- C/CS	- x
	38	55CM	830	- 117	- N23	- A8	- C/CS	- x
	39	55CM	830	- 117	- N23	- T12	- C/CS	- x

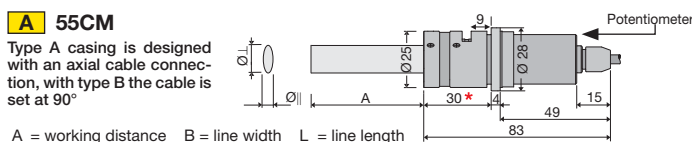
For adequate adjustment tools please see page 74; for our power supplies, switchboxes etc. see page 69f.

Laser Class	Collimated Beam Diameter [mm]		Beam Divergence [mrad]		Collimating Lens f [mm]	Clear Aperture [mm]
	perp.	par.	perp.	par.		
3B	1.0	2.2	0.26	0.12	4	4.6
3B	1.9	4.2	0.14	0.06	7.5	4.5
3B	3.8	8.3	0.07	0.03	15	11.5
3B	1.1	2.3	0.24	0.11	4	4.6
3B	2.0	4.3	0.13	0.06	7.5	4.5
3B	4.0	8.6	0.06	0.03	15	11.5
3B	1.0	2.5	0.33	0.13	4	4.6
3B	1.9	(4.7)	0.17	(0.07)	7.5	4.5
3B	3.8	9.4	0.09	0.03	15	11.5
3B	1.5	(5.0)	0.28	(0.08)	6.2	4.9
3B	1.9	6.5	0.21	0.06	8	8.0
3B	2.8	9.7	0.14	0.04	12	13.0
3B	1.5	(5.5)	0.28	(0.07)	6.2	4.9
3B	1.9	7.1	0.21	0.06	8	8.0
3B	2.8	10.7	0.14	0.04	12	13.0
3B	1.7	4.0	0.25	0.11	6.2	4.9
3B	2.1	5.1	0.20	0.08	8	8.0
3B	3.2	7.7	0.13	0.05	12	13.0
3B	1.6	3.7	0.27	0.11	6.2	4.9
3B	2.0	4.8	0.21	0.09	8	8.0
3B	3.0	7.2	0.14	0.06	12	13.0
3B	1.9	3.0	0.22	0.14	6.2	4.9
3B	2.4	3.9	0.17	0.11	8	8.0
3B	3.6	5.8	0.12	0.07	12	13.0
3B	1.6	3.8	0.28	0.11	6.2	4.9
3B	2.0	4.9	0.22	0.09	8	8.0
3B	3.0	7.4	0.14	0.06	12	13.0
3B	1.7	2.9	0.30	0.17	6.2	4.9
3B	2.1	3.8	0.23	0.13	8	8.0
3B	3.2	5.6	0.16	0.09	12	13.0
3B	1.7	4.0	0.32	0.13	6.2	4.9
3B	2.1	5.1	0.25	0.10	8	8.0
3B	3.2	7.7	0.17	0.07	12	13.0
3B	1.5	2.9	0.36	0.18	6.2	4.9
3B	1.9	3.8	0.28	0.14	8	8.0
3B	2.8	5.6	0.19	0.09	12	13.0

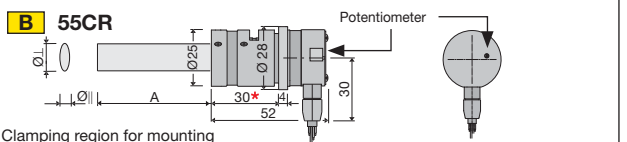
optional: Casing Type **A** 55CM
Casing Type **B** (only electronics type C) 55CR
* not offered with 55CR (Casing type **B**)
Electronics Options: Standard electronics **C or P**
Electronics with RS232 interface **CS or PS**
Please choose one of the stated options.

Cable Options: 1 = 1.5 m shielded connection cable
6 = As 1, with connector type Lumberg SV50 (only electron. types C, P)
7 = 1.5 m shielded connection cable, with connector type Lumberg SV70 (only electronics types with interface CS, PS)
5 = customer-specified cable length

Dimensions

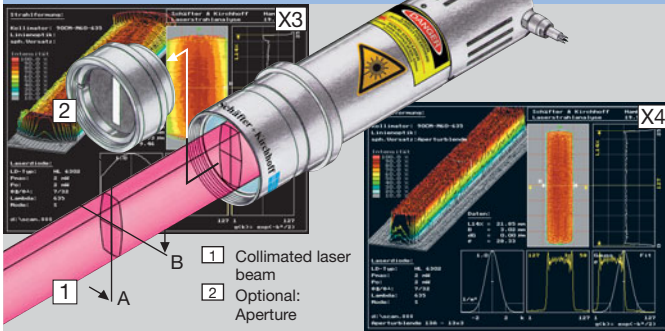


Details about the electronics are found on page 68.



Laser Diode Collimator flatbeam® 90CM-M90-..

Laser Diode Collimator with telecentric laser beam and reduced beam coherence



- Telecentric laser beam [1], beam / intensity distribution [X3]
- Beam divergence: approx. 0.02 mrad
- Edge intensity axis A-A > 80% (typ.)
- Intensity distribution: axis A-A flat top (rectangular)
- Intensity distribution axis B-B: Gaussian distribution of beam
- Beam/intensity profile [X4]: flatbeam®-laser beam restricted by the optional aperture [2]
- Integrated electronics for regulating laser performance level, setting of desired level using a potentiometer
- External modulation: TTL up to 250 kHz and analog up to 100 kHz
- Output performance adjustable from <1-100 %
- Power supply 5V DC
- PC-interface (RS232) for control of laser and data read-out

The laser collimator flatbeam® 90CM-... projects a collimated laser beam with high edge intensity and minimal beam divergence. The correct choice of aperture can ensure the production of an illuminated area of almost constant lighting intensity. Applications include shadow-edge analysis and measurement methods relying upon diffraction.

90CM Laser Diode Collimator flatbeam®

90CM - M60 - 660 - 14 - M01 - C - 6 Order Code - Example

Beam Parameters 90CM-M60-...												
curr. No.	Laser Diode Source	Lens	Wave-length [nm]	P _{out} [mW]	LD Code	Available Electronics Options	Cable	Laser Class	Aperture [mm]	Edge Intensity [%]	90% Range [%]	Beam Divergence [mrad]
1	90CM - M60	- 635	- 3	- H02	- C/CS	- x	3R	17	82	12.2	3.3	0.03
2	90CM - M60	- 640	- 19	- H22	- C/CS	- x	3B	17	65	8.4	3.7	0.03
3	90CM - M60	- 660	- 14	- M01	- C/CS	- x	3B	17	68	8.8	3.7	0.03
4	90CM - M60	- 785	- 64	- Q06	- C/CS	- x	3B	17	48	6.5	3.7	0.03

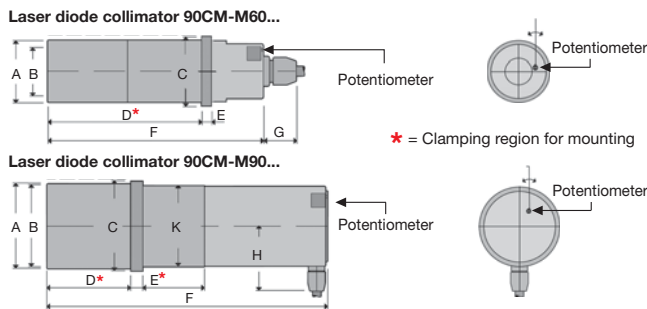
Beam Parameters 90CM-M90-...												
curr. No.	Laser Diode Source	Lens	Wave-length [nm]	P _{out} [mW]	LD Code	Available Electronics Options	Cable	Laser Class	Aperture [mm]	Edge Intensity [%]	90% Range [%]	Beam Divergence [mrad]
1	90CM - M90	- 635	- 4	- H02	- C/CS	- x	3R	32	73	18.3	4.9	0.02
2	90CM - M90	- 640	- 21	- H22	- C/CS	- x	3B	32	51	12.7	5.5	0.02
3	90CM - M90	- 660	- 17	- M01	- C/CS	- x	3B	32	54	13.2	5.5	0.02
4	90CM - M90	- 785	- 77	- Q06	- C/CS	- x	3B	32	32	9.7	5.5	0.02

Electronics Options:
 Standard electronics C
 Electronics with RS232 interface CS
Please choose one of the stated options.

Cable Options:
 1 = 1.5 m shielded connection cable
 6 = As 1, with conn. type Lumberg SV50 (only electronics types C, P)
 7 = 1.5 m shielded connection cable, with conn. type Lumberg SV70 (only electronics with interface CS, PS)
 5 = customer-specified cable length

Details of the electronics of this laser module are on page 68.

Dimensions



	A	B	C	D	E	F	G	H	K
90CM-M60	Ø 25	Ø 19.5	Ø 28	75.9	4	113.9	15	-	-
90CM-M90	Ø 42	40.5x0.5	Ø 44.5	41.5	6	139	-	32	Ø 40

Application: Where there is light, there is a shadow

Laser diffraction measurements of the diameter, geometry and perimeter of a shadow

One of the most popular applications in laser measurement is the evaluation of the shadow thrown by an illuminated object.

A line sensor is set up to receive a collimated laser beam so that an object crossing the beam produces a shadow. The overlapping shadows are captured on the line sensor as Fresnel interference patterns.

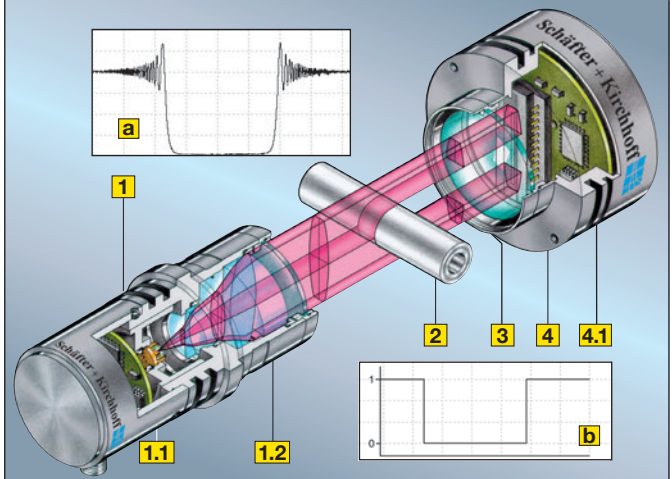


Figure 1: Schematic laser diffraction measurement and illumination

1 laser diode collimator, 1.1 laser diode, 1.2 lens for collimation of the divergent laser diode beam, 2 object to be measured, 3 partially blocked laser beam, 4 line scan camera, 4.1 line sensor. The collimated beam is elliptical (beam height = 32 mm).

Figure 2 shows the magnified edge of the characteristic interference patterns of the measured object (1a) captured by the line sensor. In the absence of an object, the continually falling elliptical form of the collimated laser beam impinges on the line sensor.

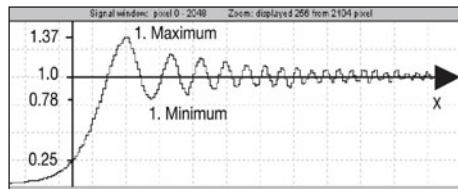
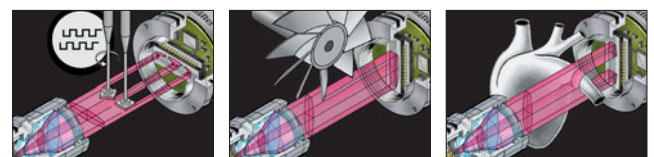


Figure 2: Intensity of the beam perpendicular to the interference patterns

The threshold value assessment concentrates on the flank of the interference pattern and determines the intensity threshold beneath the oscillating area. A binary signal is produced (cf. 1b) from the camera exposure and is output as the pixel position of the shadow edge in the line signal. Measurement frequencies of over 30 kHz can be achieved at accuracies below 7 µm.

The laser diffraction method uses the oscillating area of the Fresnel interference patterns. Evaluation of the position and the intensities of the minima and maxima increases the precision of the measurements to under 1 µm. The increased CPU overhead, resulting from the calculations, reduces the frequency of measurements using laser diffraction by less than 3 kHz, in comparison with the assessment by threshold value. The interference patterns at a defined wavelength can also provide information about the precise distance between the measured object and the line sensor.



Micropositioning and alignment of SMD components Circular integrity of blade mounting for large diameter turbines Measuring contractions, dynamic diameter monitoring

Laser Module 40TE-PO-..., 40-0-PO-..., 40TE-NO-..., 40-0-NO-...

with integrated controller for laser diode and temperature stability

Laser Module 40TE-PO-.../40-0-PO-...

Laser Module with integrated controller for laser diode and temperature stability for diodes with higher powers

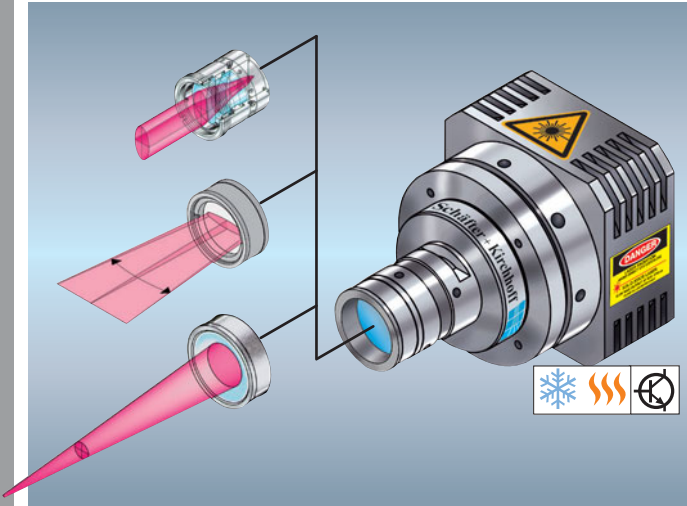
Laser Module 40TE-NO-.../40-0-NO-...

Laser Module with integrated controller for laser diode and temperature stability for DFB, DBR, superluminescent and VCSEL diodes

- Laser Module 40-0-... with integrated controller for laser diode and temperature stability for laser diodes with integrated TEC/NTC
- Laser Module 40-TE-... with integrated controller for laser diode and temperature stability, temperature sensor and Peltier element for laser diodes without integrated TEC/NEC

Two Electronics Types:

- ...-PO-...: Specially developed for laser diodes with higher powers up to 500 mW
- ...-NO-...: Specially developed electronics with low noise for DFB, DBR, superluminescent and VCSEL diodes
- Suitable for a variety of laser diodes
- Spectral range 405-850 nm, 1064-1550 nm
- Integrated adjustable power control via PC interface
- Integrated adjustable temperature control via PC interface
- Attachable beam shaping optics for the generation of micro spots, laser lines or fiber coupling



40 TE- PO-...

Electronics Type
PO = for laser diodes with higher output powers
NO = low-noise electronics

Casing Type
TE = with integrated Peltier element and temperature sensor
-0 = without integrated Peltier element and temperature sensor (diode already has integrated TEC)

Application: 3D profiling measurement



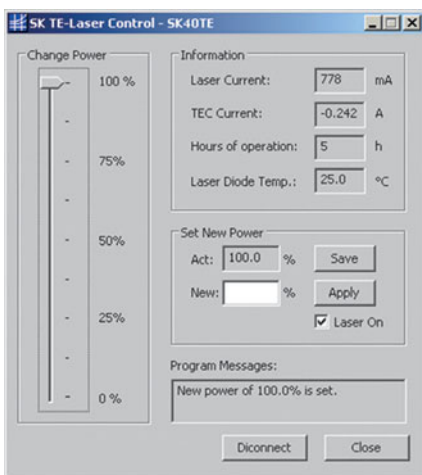
The laser module 40-... is perfect for sensitive and sophisticated diodes. The design of the module includes integrated electronics for the management of a constant current and temperature and can accommodate a variety of diodes and casings that already have an integrated TEC/NTC (40-0-...). For laser diodes without integrated TEC/NTC the laser module 40TE-... additionally has a Peltier element and temperature sensor. Tuning can be performed easily via serial RS232 interface using a PC.

Depending on the application the laser module has two electronics types: The modules 40-0-PO-.../40TE-PO-... are specially developed for laser diodes with higher output powers. The modules 40-0-NO-.../

40TE-NO-... are specially developed for laser diodes that are designed to be longitudinally singlemode such as DFB, DBR, and some VCSEL diodes as well as for superluminescent diodes. The integrated electronics are low-noise to ensure a low-noise (power and wavelength) laser behavior. The laser modules can be expanded with optics for collimated beams, focussing optics for micro spots, laser lines or fiber couplings.

All laser modules with beam shaping optics and laser diode sources 55CM, 90CM or 95CM on pages 22-66p, e.g. 13LR-... or 13LM-... can also be used with the laser source 40-... .

Software



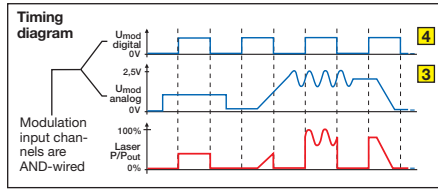
- Easy parametrization of laser 40TE-... via serial RS232 PC interface.
- Adjustment of output power between 0.1 and 100 % with slider control or direct input.
- Optional: Temperature setting of Peltier-cooling and window for actual and set temperature.
- Read-out of applied current.

Electronics

Modulation: The laser has two AND-wired modulation input channels, U_{analog} [3] and U_{TTL} [4].

If one of the modulation inputs is zero then the laser is OFF. The laser is modulated using the digital modulation input. If only one modulation input channel is used, the other has to be set to +5 V (see timing diagram).

The voltage U_{analog} in the analog modulation input [3] linearly controls the laser power output between $\leq 5\%$ and 100% of the optical power set by the potentiometer.



Cable specification

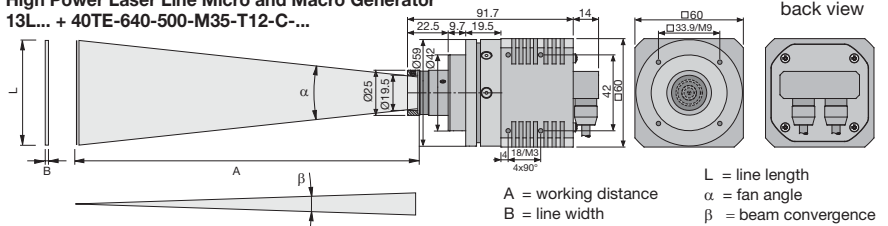
Communication 3x AWG26CUL		Supply/Modulation 6x AWG26CUL	
black	GND	black	GND
brown	Rx	red	+11V...24V DC
red	Tx	brown	U_{mod} analog
		orange	U_{mod} TTL
		yellow	analog GND
		green	5 V out

Integrated Electronics

Electronics type	40TE-...
Supply voltage	+11V ... 24V DC
Current consumption	max. 1.5 A @12 V
Max. modulation frequency	analog 10 Hz TTL 250 kHz
Laser power output potentiometer	< 1-100 %
TTL modulation logic	Laser On TTL high
Analog control voltage	P_{min} to P_{max} 0 ... 2.5 V

Dimensions

High Power Laser Line Micro and Macro Generator 13L... + 40TE-640-500-M35-T12-C-...



L = line length
 α = fan angle
 β = beam convergence


Electronics for Laser Line, Laser Spot and Laser Pattern Generators

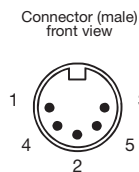
Electronics for 25CM-.../29CM-... (Electronics type S/B)

Integrated Electronics type:		S
Supply voltage		+5 V ± 0.5 V
Current consumption	max.	250 mA
Max. modulation frequency	analog TTL	100 kHz 1 MHz
Laser power output potentiometer		< 30-100 %
TTL modulation logic	TTL high	Laser ON
TTL or analog input	open or low	Laser OFF
Analog control voltage	P _{min} to P _{max}	0 ... 2.2 V
Cable type		LiY(st)CY 4x0.08mm ²

Integrated Electronics type:		B
Supply voltage	with connector w/o connector	+12 V ± 0.5 V +9 V ± 0.5 V
Current consumption	max.	250 mA
Max. modulation frequency	TTL	200 Hz
Laser power output potentiometer		< 30-100 %
TTL modulation logic	TTL high	Laser ON
TTL	open or low	Laser OFF
Cable type		LiFYCY 3x0.08mm ²


Pin-out for electronics S

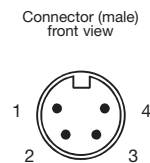
Pin-out		
Cable	Conn.	
black	1	GND
red	2	+5 V
brown	3	U _{mod} analog
orange	4	U _{mod} TTL
	5	n.c.
shield	case	



Circular connector **Lumberg SV50** (IEC-60130-9) for power supply and external modulation (pin U_{mod}). Cable shielding and casing are connected and galvanically decoupled from the laser diode and the electronics.

Pin-out for electronics B

Pin-out		
Cable	Conn.	
white	1	GND
brown	2	+12 V
green	3	U _{mod} TTL
	4	n.c.
shield	case	

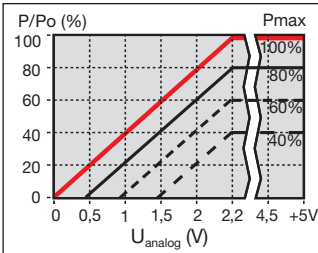


Circular connector **Lumberg SV40** (IEC-60130-9) for power supply and external modulation (pin U_{mod}). Cable shielding and casing are connected and galvanically decoupled from the laser diode and the electronics.

Modulation for electronics S

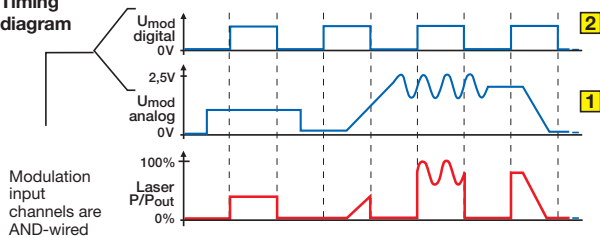
The laser has two AND-wired modulation input channels, U_{analog} **1** and U_{TTL} **2**. The laser is OFF in case of an open modulation input. If only one modulation input channel is used the other has to be set to +5 V. (see timing diagram).

The voltage U_{analog} at analog modulation input **1** linearly controls the laser output power between ≤1% and 100% of the optical power set with the potentiometer.



Connecting analog voltage (U_{analog} ranging from 0 to 2.2 V) to modulation input **1** gives linear control of the laser output power from approximately zero to the power level given by the potentiometer setting (see plot).

Timing diagram



Modulation input channels are AND-wired

Modulation for electronics B

Laser modules with electronics B have one modulation input channel U_{TTL} **2** and no analog modulation input. The laser is OFF in case of an open modulation input.

Electronics for Laser Line, Laser Spot and Laser Pattern Generators

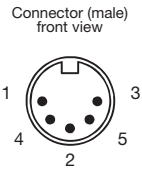
Electronics for 55CM/55CR-..., 56CM-..., 90CM/90CR-..., 91CM-...
95CM/95CR-... and 96CM-...

(Electronics type P/C/H/HP/CS/PS)

Integrated Electronics type:	C	P	H	HP	CS	PS
Supply voltage	+5 V ± 0.2 V		+5 V ± 0.2 V	+11...12 V	+5 V ± 0.2 V	+5 V ± 0.2 V
Current consumption max.	250 mA		250mA	250mA	250 mA	250mA
Max. modulation frequency	analog	100 kHz	10 Hz	100 kHz	1 Hz	1 Hz
	TTL	100 kHz	250 kHz	100 kHz	250 kHz	1 MHz
Laser power output potentiometer	< 1-100 %	< 5-100 %	< 1-100 %	< 5-100 %	< 1-100 %	< 5-100 %
TTL modulation logic	TTL high			Laser ON	Laser ON	Laser ON
TTL or analog input	open or low			Laser OFF	Laser OFF	Laser OFF
Analog control voltage P_{min} to P_{max}	0 ... 2.5 V	0 ... 2.5 V	0 ... 2.5 V	0 ... 2.5 V	0 ... 2.5 V	0 ... 2.5 V
Modulation Input Resistance [Ohm]	22k	9k	22k	9k	9k	9k
Cable type	4xAWG 26CUL 0.14 mm ²	4xAWG 26CUL 0.14 mm ²	LiY(st)CY 4x0.08mm ²	LiY(st)CY 4x0.08mm ²	6xAWG 26CUL 0.14 mm ²	6xAWG 26CUL 0.14 mm ²

Pin-out for electronics C/P/H

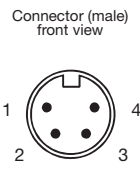
Pin-out C/P/H	Cable	Conn.	
	black	1	GND
	red	2	+5 V
	brown	3	U_{mod} analog
	orange	4	U_{mod} TTL
		5	n.c.
	shield	case	⏏



Circular connector **Lumberg SV50** (IEC-60130-9) for power supply and external modulation (pin U_{mod}). Cable shielding and casing are connected and are galvanically decoupled from the laser diode and the electronics.

... and Pin-out for electronics HP

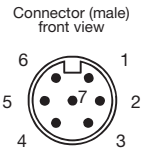
Pin-out HP	Cable	Conn.	
	black	1	GND
	red	2	+12 V
	brown	3	U_{mod} analog
	orange	4	U_{mod} TTL
	shield	case	⏏



Circular connector **Lumberg SV40** (IEC-60130-9) for power supply and external modulation (pin U_{mod}). Cable shielding and casing are connected and are galvanically decoupled from the laser diode and the electronics.

Pin-out for electronics CS/PS

Pin-out CS/PS	Cable	Conn.	
	black	1	GND
	red	2	+5 V
	brown	3	U_{mod} analog
	orange	4	U_{mod} TTL
	yellow	5	RS232Tx
	green	6	RS232Rx
		7	n.c.
	shield	case	⏏

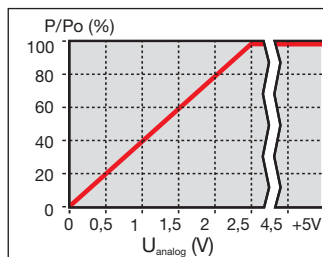


Circular connector **Lumberg SV70** (IEC-60130-9) for power supply and external modulation (pin U_{mod}) and RS232 interface. Cable shielding and casing are connected and are galvanically decoupled from the laser diode and the electronics.

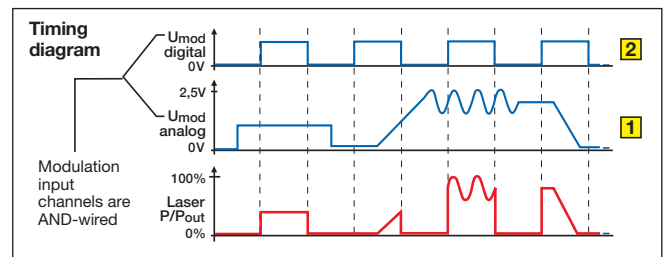
Modulation

The laser has two AND-wired modulation input channels, U_{analog} 1 and U_{TTL} 2. The laser is OFF in case of an open modulation input. If only one modulation input channel is used the other has to be set to +5 V. (see timing diagram).

The voltage U_{analog} at analog modulation input 1 linearly controls the laser output power between ≤1% and 100% of the optical power set with the potentiometer.



Connecting analog voltage (U_{analog} ranging from 0 to 2.5 V) to modulation input 1 gives linear control of the laser output power from approximately zero to the power level given by the potentiometer setting (see plot).



Software Parameters for RS232 interface (electronics CS/PS)

The RS232 interface (or the USB connection using the switchbox SBS 070701-USB) allows laser control and reating out of laser data:

- Input parameters:**
- laser power
 - laser power limit
 - mode of operation

- Output parameters**
- laser current (mA)
 - photo diode current (μA)
 - temperature
 - laser output power (%)
 - operating voltage
 - hours of operation
 - min./max. temperature

Switchbox and Power Supply

Figure 1



A Switchbox SBN050501,
B Switchbox with integrated power supply SBP 05-C-2-1

The switch box is the interface between power supply and laser diode beam source. The integrated key switch and interlock mechanism ensure concordance with laser safety regulations. In addition, the inputs for analog and TTL modulation are made available via simple to use BNC connectors, the time-consuming wiring of a special adapter cable is avoided.

Schäfter+Kirchhoff laser diode beam sources are off if either one or both modulation inputs are open. Internal pull-up resistors used in the switch box however ensure that the beam source is instantly ready for use.

The switch box can be grounded using either a clamping screw or a 4 mm phone jack. With a

grounded switch box, the phone jack can also be used to connect an antistatic wristband or mat. The shielded metal housing also isolates the contents from electro-magnetic irradiation.

The operation of a laser source must conform to EN 60825 and this switch box also provides the following safety features:

- Interlock chain for the remote deactivation of the laser
- Laser power-up is only possible using the key switch
- LED status indicator for "Laser ON"
- Switch also provides output for external status indicator "Laser ON" (only with type SBP).

Laser Interlock:

An external laser interlock is mandatory in most countries for laser class 3B and beyond, so that a break in the laser interlock chain will cause an immediate shutdown of the laser power.

An automatic shutdown system (e.g., a door or enclosure-opening switch) has to be used for the immediate disconnection of the interlock chain in order to prevent any exposure of an unprotected person to the hazardous laser radiation.

The interlock mechanism in the **Schäfter+Kirchhoff** laser beam sources requires no external power supply and its absence is detected by an integral surge tripswitch that must be bridged by the interlock chain before the laser source can be used!

Choosing the right switchbox and power supplies for the laser diode modules depending on electronics type

Electronics type:	S	B	C and P (standard)	CS and PS (RS232 interface)	H	HP
Voltage	5V	12V (with connector)	5V	5V	5V	11...12V
Power Supply	PS051003E	PS120516E	PS051003E	PS051007E	PS051003E	PS120516E
Key features: (For details see page 70)	5V / 2.6A 5-pin KV 50 connector, female	12V / 1.25A 4-pin KV 40 connector, female	5V / 2.6A 5-pin KV 50 connector, female	5V / 2.6A 7-pin KV 70 connector, female	5V / 2.6A 5-pin KV 50 connector, female	12V / 1.25A 4-pin KV 40 connector, female
Power Cords (EU, USA/Can and GB see page 70)						
Switchbox	SBN 050501	SBN 040401	SBN 050501	SBN 070701-USB	SBN 050501	SBN 040401
Key features: (For details see below)	• Two separate modulation input connectors (BNC)	• Two separate modulation input connectors (BNC)	• Two separate modulation input connectors (BNC)	• Mini USB 2.0 connection for laser control/ read out • Two separate modulation input connectors (BNC)	• Two separate modulation input connectors (BNC)	• Two separate modulation input connectors (BNC)
Switchbox with integrated Power Supply	SBP-05-...	SBP-12-...	SBP-05-...		SBP-05-...	SBP-12-...
Key features: (For details see page 70)	• Desk or 19" version • 115 or 230 V input • Two separate modulation input connectors (BNC)	• Desk or 19" version • 115 or 230 V input • Two separate modulation input connectors (BNC)	• Desk or 19" version • 115 or 230 V input • Two separate modulation input connectors (BNC)		• Desk or 19" version • 115 or 230 V input • Two separate modulation input connectors (BNC)	• Desk or 19" version • 115 or 230 V input • Two separate modulation input connectors (BNC)

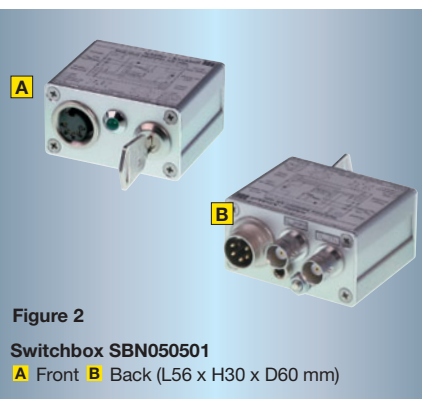
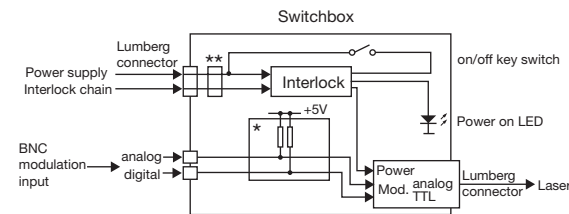


Figure 2
Switchbox SBN050501
A Front **B** Back (L56 x H30 x D60 mm)

Switchbox SBN 050501

The switchbox is the interface between the power supply and laser diode beam source. Features: Reverse voltage protection, key switch, "Laser ON" LED, grounding connector, two separate modulation input connectors (BNC), interlock and Lumberg input and output connectors according to IEC 60130-9.



Switchbox SBN050501

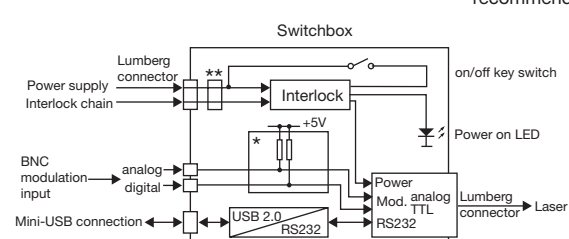
for laser diode beam sources with 5 V power supply, recommended power supply module **PS051003E**
Switchbox SBN040401
for laser diode beam sources with 12 V power supply, recommended power supply module **PS120516E**.



Figure 3
Switchbox SBS 070701-USB
A Front **B** Back (L56 x H30 x D60 mm)

Switchbox SBS 070701-USB for laser diode modules with RS232 interface

The switchbox is the interface between the power supply and laser diode beam source. Features: Mini USB 2.0 connection for laser control and reading out of laser data, e.g. hours of operation, reverse voltage protection, key switch, "Laser ON" LED, grounding connector, two separate modulation input



connectors (BNC), interlock and Lumberg input and output connectors according to IEC 60130-9.

Switchbox SBS 070701-USB

for laser diode beam sources with 5 V power supply and RS232 interface; recommended power supply module **PS051007E**

Figure 4

- C Desk switchbox**
B 106 x H 40 x D 120 mm
- D 19"-rack switchbox**
3 U x 10 HP
W 51 x H 129 x D 120 mm



Switchbox with integrated Power Supply SBP-...

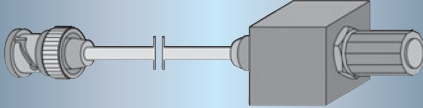
Low-noise linear power supply

IN: 115 or 230 V AC, OUT: 5 V or 12 V DC, 250 mA
Interlock, key switch, "Laser ON" LED, switch provides output for external status indicator "Laser ON", ground connector, two separate modulation input connectors (BNC), metal housing for protection against electromagnetic irradiation, Lumberg input and output connectors, according to IEC 60130-9.

Specification			
Output voltage	5V DC	Input resistance	8.2 kΩ
max. output current	250 mA	Switching contact:	
Supply voltage (VAC)	100 - 130	max. voltage / current	48V / 1A
	200 - 250	Fuse	2x 0.16 AT
Line frequency (Hz)	50 - 60	Ambient temperature	5 - 40° C
Power consumption	< 7 W	Weight (kg)	0.65

Order Code SBP - 05 - B - 2 - 1				
Output voltage	Housing	Supply voltage	Version	
5V: 05	Desktop: B	230V	2	standard 1
12V: 12	19" Cassette: C	115V	1	pot.meter 2

Figure 5
SBCTRL-50



Switchbox Accessories

Order Code SBCTRL-50

Control cable for external output power adjustment for the laser beam sources of series 13 and 90. Remote precision potentiometer with BNC connector. Shielded coaxial cable with 500 mm cable length (as standard, other cable lengths on request).

Connecting scheme

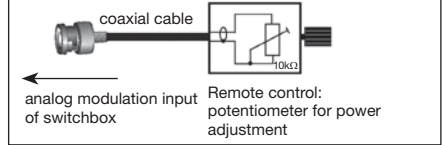
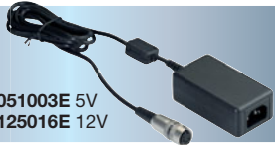


Figure 6
Power Supply

- Order Code PS051003E 5V**
- PS125016E 12V**



Power Supply

Specification:
IN: 100-240 V AC, Class 1 protective ground, IEC320-C14 chassis plug
OUT: 1.5 m shielded cable with connector (IEC 60130-9) Lumberg series KV (female)

Depiction



Power supply for lasers w/o RS232 interface and operation with or w/o switchbox SBN...	Order Code	OUTPUT
	PS051003E	5 V / 2.6 A
	PS120516E	12 V / 1.25 A

Connector (female)
5 V : 5-pin, KV 50
12 V: 4-pin, KV 40

Power supply for lasers with RS232 interface and operation with or w/o switchbox SBS...	Order Code	OUTPUT
	PS051007E	5 V / 2.6 A

Connector (female)
5 V : 7-pin, KV 70

Power cord for Power Supply PS.....E IEC320 3-pin 1.5 m cable, 10 A, 250 V AC	Order Code	Country
	PC150DE	Europe
	PC150US	USA / Canada
	PC150UK	Great Britain



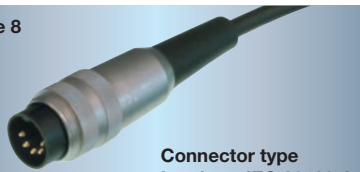
Figure 7

Linear power supply for mounting rail EN60715 (TH35), 230 V AC, 5 V DC, 0.3 A with 1.5 m cable and Lumberg connector type KV50 female IEC 60130-9 (H 76 x W 45 x D 100 mm)



Order Code PS050302E for operation with switchbox SBN... or laser without switchbox

Figure 8



Connector type
Lumberg IEC 60130-9

Accessories

Order Code BC 01 09 F
Lumberg IEC 60130-9 connector type: KV 50 (female 5-pin). For connection between a customer power supply and laser (with connector SV30 and SV50) or switchbox.



Order Code BC 01 05 M
connector Lumberg IEC 60130-9 Type: SV 50 (male 5-pin). For connecting a customer laser to the switchbox.



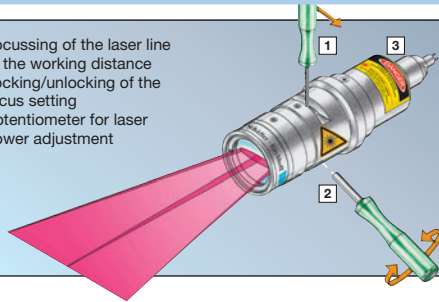
Order Code BC 01 04 F
connector Lumberg IEC 60130-9 Type: KV 40 (female 4-pin). For connection of a customer power supply to the laser or switchbox.



Adjustment Tools

Adjustment Tools for Laser Modules based on 55CM/55CR and 56CM/56CR

- 1 Focussing of the laser line to the working distance
- 2 Locking/unlocking of the focus setting
- 3 Potentiometer for laser power adjustment



Adjustment tools for correction 1 and locking 2 of focus setting:

1+2 Hex key WS 1.5

Order Code 50HD-15



Screwdriver for the adjustment of laser power potentiometer 3

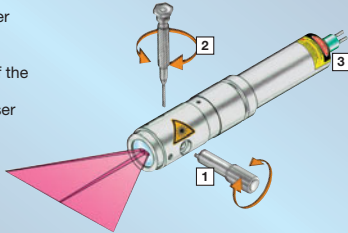
3 Screwdriver WS 1.2

Order Code 9D-12



Adjustment Tools for Laser Modules based on 25CM, 29CM

- 1 Focussing of the laser line to the working distance
- 2 Locking/unlocking of the focus setting
- 3 Potentiometer for laser power adjustment



Adjustment tools for correction 1 and locking 2 of focus setting:

1 Eccentric key

Order Code 60EX-4



as an alternative:

Eccentric key with long handle

Order Code 60EX-4-L



2 Screwdriver WS 1.2

Order Code 9D-12



Screwdriver for the adjustment of laser power potentiometer 3

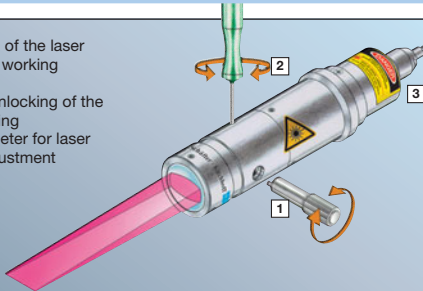
3 Screwdriver WS 1.2

Order Code 9D-12



Adjustment Tools for Laser Modules based on 90CM/90CR, 91CM/91CR, 95CM/95CR and 96CM/96CR

- 1 Focussing of the laser line to the working distance
- 2 Locking/unlocking of the focus setting
- 3 Potentiometer for laser power adjustment



Adjustment tools for correction 1 and locking 2 of focus setting:

1 Eccentric key

Order Code 55EX-5



as an alternative:

Eccentric key with long handle

Order Code 55EX-5-L



2 Hex key WS 1.5

Order Code 50HD-15



Screwdriver for the adjustment of laser power potentiometer 3

3 Screwdriver WS 1.2

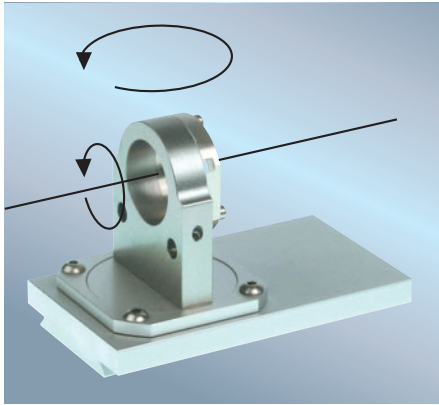
Order Code 9D-12



Choosing the Adequate Adjustment Tools

Row No.	Beam-shaping optics	Laser Diode Module	System used in	50HD-15	60EX-4/ 60EX-4-L	55EX-5/ 55EX-5-L	9D-12	Page
1	13LR... or 13LRM...	55CM	13LR+55CM or 13LRM+55CM	x			x	22/23
2	5L... or 5LM...	25CM	5L+25CM or 5LM+25CM		x		x	24/25
3	5L... or 5LM...	55CM	5L+55CM or 5LM+55CM	x			x	26/27
		56CM	LNC-5L+56CM or LNC-5LM+56CM	x			x	50/51
4	13LN... or 13LNM...	90CM	13LN+ 90CM or 13LNM+ 90CM				x	28/29
		91CM	LNC-13LN+ 91CM or LNC-13LNM+ 91CM				x	52/53
5	13LT... or 13LTM	90CM	13LT+ 90CM or 13LTM+ 90CM				x	30/31
		91CM	LNC-13LT+ 91CM or LNC-13LTM+ 91CM				x	54/55
6	5LT... or 5LTM...	25CM	5LT+25CM or 5LTM+25CM				x	32/33
7	5LT... or 5LTM...	55CM	5LT+ 55CM or 5LTM+ 55CM				x	34/35
		56CM	LNC-5LT+ 56CM or LNC-5LTM+ 56CM				x	56/57
8	13MC... or 13MMC...	95CM	13MC+95CM or 13MMC+95CM			x		36/37
		96CM	LNC-13MC+96CM or LNC-13MMC+96CM			x		58/59
9	5MC...	29CM	5MC+29CM		x		x	38
10	13M... or 13MM...	55CM	13M+55CM or 13MM+55CM	x			x	40/41
		56CM	LNC-13M+56CM or LNC-13MM+56CM	x			x	60/61
11	5M...	25CM	5M+25CM or 5MM+25CM		x		x	42/43
12	-	25CM	25CM		x		x	45
13	-	55CM	55CM	x			x	46
		56CM	LNC-56CM	x			x	62/63
14	-	90CM	90CM				x	47
		91CM	LNC-91CM				x	66
15	-	96CM	LNC-96CM				x	64

Mounting Consoles for Laser Diode Beam Sources Series 55CM... (Housing Ø 25/28 mm)



The mounting consoles 13MK-25-36-10 ... from Schäfter+Kirchhoff allow a precise and mechanically rugged alignment of the laser beam sources 13...

The lasers are held by indirect clamping and the focussing and focus locking mechanisms remain accessible in the clamped state.

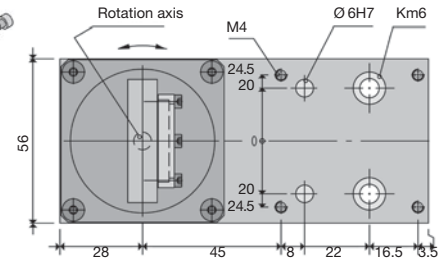
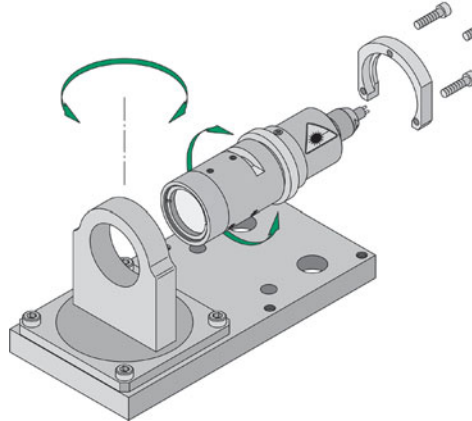
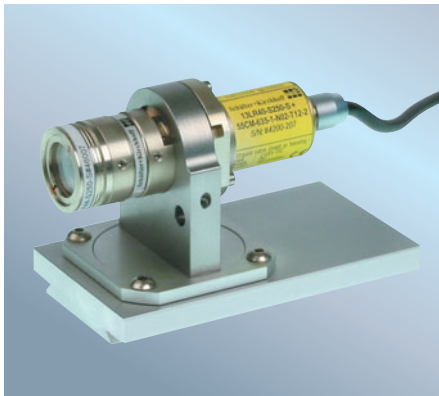
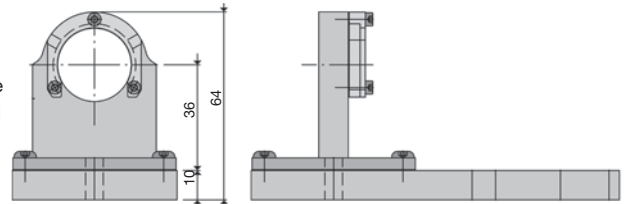
The mounting consoles 13ML-25-36-... supports two degrees of freedom:

1. Rotation 0–360° around the optical axis (roll angle ρ)
2. In-plane rotation 0–360° (azimuth angle Φ)

Versions:

Order Code 13MK-25-36-10-F
Mounting console, flat base plate

Order Code 13MK-25-36-10-M
Mounting console,
base plate with Montech profile
AP-46-50
www.montech.com



Mounting Tools:

- Hex key WS 2 **Order Code 50HD-20**
Hex key WS 2.5 **Order Code 50HD-25**