Low Noise
Laser Diode Module
LNC-Series
Low Noise Laser Line, Micro Focus and Macro Focus Generators  
LNC-Series

<table>
<thead>
<tr>
<th>Low Noise Laser Line Generators with a Fan Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laser line generators with Gaussian intensity distribution</td>
</tr>
<tr>
<td>Laser line generators with homogeneous intensity distribution and very thin lines</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Low Noise Semi-telecentric Laser Line Generators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semi-telecentric laser line generators with constant line length 15 mm</td>
</tr>
<tr>
<td>Semi-telecentric laser line generators with constant line length 4.8 mm / 2.4 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Low Noise Laser Focus Generators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laser focus generators with circular Gaussian beam profile and smaller spots</td>
</tr>
<tr>
<td>Laser Focus Generators with elliptical Gaussian beam profile (Micro) or circular (Macro) spots</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Low Noise Laser Diode Collimators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laser diode collimator with small beam diameters with elliptical beam profile</td>
</tr>
<tr>
<td>Laser Diode Collimator flatbeam® LNC-91CM</td>
</tr>
</tbody>
</table>
Low Noise Micro Line Generator LNC-5L- + 56CM-

- Narrow laser line widths
- High power density in the focal plane
- Fan angle 8°, 15°, 40°, 62°, 84°
- Laser power output up to 36mW
- Reduced coherence
- Integrated focusing mechanism
- Spectral range 405 – 940 nm
- Mode hopping free laser operation

The beam-shaping optics define the beam parameter fan angle

Parameters of the laser diode, such as divergence angle and wavelength, affect the width and Rayleigh range/depth of focus of the laser line:

- Low noise laser module (< 0.1% RMS, < 1 MHz)
- Line width starting at 26 µm, line length 6.6–1800 mm
- Intensity profile in direction of line Gaussian clipped by an aperture of typ. 30% edge intensity, Gaussian across the laser line with constant line width
- Output power adjustable <1 – 100%
- Supply voltage: 5 V DC (> 600 nm) or 12 V DC (< 600 nm)

Further informations

For details on the LNC-series please see p. 18. For appropriate adjustment tools please see page 92. For power supplies, switchboxes etc. see page 84f. Details about the electronics are found on page 83. The Dimensions you will find on page 88.

Combination:

<table>
<thead>
<tr>
<th>LNC-5L + 56CM</th>
<th>Beam Shaping Optics</th>
<th>Laser Diode Collimator</th>
</tr>
</thead>
<tbody>
<tr>
<td>fan angle 8° – 15°</td>
<td>6.6</td>
<td>0.026</td>
</tr>
<tr>
<td>12</td>
<td>0.046</td>
<td>75</td>
</tr>
<tr>
<td>21.8</td>
<td>0.075</td>
<td>143</td>
</tr>
<tr>
<td>47.5</td>
<td>0.136</td>
<td>313</td>
</tr>
<tr>
<td>1.49</td>
<td>0.251</td>
<td>660</td>
</tr>
</tbody>
</table>

| fan angle 40° – 84° | 40 | 0.026 | 46 | 1.0 | 35 – 70 | 2.3 | 18.2 | SLIM-5S0 |
| 101 | 0.075 | 147 | 9.3 | 125 | 0.8 | 18.2 | SLIM-5S88 |
| 226 | 0.136 | 317 | 4.4 | 260 | 0.4 | 18.2 | SLIM-5S150 |
| 62 | 0.026 | 46 | 1.0 | 35 – 70 | 2.3 | 14.2 | SLIM-5S0 |
| 92 | 0.046 | 82 | 3.2 | 125 | 1.3 | 14.2 | SLIM-5S88 |
| 168 | 0.075 | 147 | 9.3 | 125 | 0.8 | 14.2 | SLIM-5S150 |
| 375 | 0.136 | 317 | 4.4 | 260 | 0.4 | 14.2 | SLIM-5S325 |
| 1200 | 0.418 | 1000 | 415 | 0.1 | 14.2 | SLIM-5S500 |

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>56CM - 405</td>
<td>36</td>
<td>X5</td>
<td>A7.5</td>
<td>HP</td>
<td>+</td>
<td>3B</td>
</tr>
<tr>
<td>2</td>
<td>56CM - 450</td>
<td>24</td>
<td>X6</td>
<td>A7.5</td>
<td>HP</td>
<td>+</td>
<td>3B</td>
</tr>
<tr>
<td>3</td>
<td>56CM - 515</td>
<td>30</td>
<td>X7</td>
<td>A7.5</td>
<td>HP</td>
<td>+</td>
<td>3B</td>
</tr>
<tr>
<td>4</td>
<td>56CM - 635</td>
<td>4</td>
<td>H10</td>
<td>A7</td>
<td>H</td>
<td>+</td>
<td>3B</td>
</tr>
<tr>
<td>5</td>
<td>56CM - 639</td>
<td>8</td>
<td>H18</td>
<td>A7</td>
<td>H</td>
<td>+</td>
<td>3B</td>
</tr>
<tr>
<td>6</td>
<td>56CM - 660</td>
<td>8</td>
<td>M01</td>
<td>A7</td>
<td>H</td>
<td>+</td>
<td>3B</td>
</tr>
<tr>
<td>7</td>
<td>56CM - 660</td>
<td>15</td>
<td>M26</td>
<td>A7</td>
<td>H</td>
<td>+</td>
<td>3B</td>
</tr>
<tr>
<td>8</td>
<td>56CM - 685</td>
<td>18</td>
<td>H13</td>
<td>A7</td>
<td>H</td>
<td>+</td>
<td>3B</td>
</tr>
<tr>
<td>9</td>
<td>56CM - 789</td>
<td>27</td>
<td>K06</td>
<td>A7</td>
<td>H</td>
<td>+</td>
<td>3B</td>
</tr>
<tr>
<td>10</td>
<td>56CM - 785</td>
<td>29</td>
<td>K06</td>
<td>A7</td>
<td>H</td>
<td>+</td>
<td>3B</td>
</tr>
<tr>
<td>11</td>
<td>56CM - 830</td>
<td>13</td>
<td>H19</td>
<td>A7</td>
<td>H</td>
<td>+</td>
<td>3B</td>
</tr>
<tr>
<td>12</td>
<td>56CM - 830</td>
<td>39</td>
<td>N23</td>
<td>A7</td>
<td>H</td>
<td>+</td>
<td>3B</td>
</tr>
<tr>
<td>13</td>
<td>56CM - 852</td>
<td>16</td>
<td>H23</td>
<td>A7</td>
<td>H</td>
<td>+</td>
<td>3B</td>
</tr>
<tr>
<td>14</td>
<td>56CM - 940</td>
<td>22</td>
<td>G24</td>
<td>A7</td>
<td>H</td>
<td>+</td>
<td>3B</td>
</tr>
</tbody>
</table>

Casing Type:

- Casing Type: standard electronics .......................... H
- 56CM: source ....................... H
- 56CM: laser module .............................. H
- 56CM: electronics options ...................... H
- 56CM: cable ............................... H

Electronics Options:

- Please choose one of the stated options.
- Standard electronics ................................. H
- Cable Options:
  - 1 m shielded connection cable ........................ 1
  - As 1, with connector type
    - Lumberg S550 (electronics type ‘H’, ‘H’), .................. 6
  - Lumberg S440 (electronics type ‘H’), ...................... 4
  - Customer specified cable length .......................... 5

Focussing of the laser line for the working distance

Locking/unlocking of the focus position

Potentiometer for laser power output

Further informations

- info@SuKHamburg.de
- www.SuKHamburg.com
Low Noise Macro Line Generator LNC-5L...M- +56CM-

Low noise laser line with a fan angle, Gaussian intensity distribution and extended depth of focus

- Extended depth of focus
- Larger line widths with lower power density
- Reduced coherence
- Mode hopping free laser operation
- Fan angle 8°, 15°, 40°, 62°, 84°
- Laser power output up to 25 mW
- Integrated focussing mechanism
- Spectral range 405 – 940 nm

Further informations
For details on the LNC-series please see p. 18. For appropriate adjustment tools please see page 92. for power supplies, switchboxes etc. see page 84f. Details about the electronics are found on page 83. The Dimensions you will find on page 88.

Beam Shaping Optics + Laser Diode Collimator

LNC-5L...M +56CM

Combination: Beam Parameter SLMM Beam Parameter SLPM

**Example 1:**
- Fan Angle a [°]: 8
- Line Width [mm]: 0.144
- Working Distance [mm]: 115
- Focus Range [mm]: 250
- Conver. [Deg]: 0.4
- Dim. [x]: 1.0
- SLM5

**Example 2:**
- Fan Angle a [°]: 40
- Line Width [mm]: 0.084
- Working Distance [mm]: 66
- Focus Range [mm]: 250
- Conver. [Deg]: 0.7
- Dim. [x]: 1.2
- SLPM

**Laser Module**

<table>
<thead>
<tr>
<th>Laser Diode Source</th>
<th>Wavel. [nm]</th>
<th>Pmax [mW]</th>
<th>LD Code</th>
<th>Lens</th>
<th>Available Electronics</th>
<th>Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>56CM</td>
<td>405</td>
<td>25</td>
<td>X15</td>
<td>A7.5</td>
<td>HP</td>
<td>6</td>
</tr>
<tr>
<td>56CM</td>
<td>450 - 19</td>
<td>006</td>
<td>A7.5</td>
<td>HP</td>
<td>x</td>
<td>3B 16 0.8</td>
</tr>
<tr>
<td>56CM</td>
<td>515</td>
<td>23</td>
<td>X17</td>
<td>A7.5</td>
<td>HP</td>
<td>x</td>
</tr>
<tr>
<td>46CM</td>
<td>635</td>
<td>4</td>
<td>H10</td>
<td>A8</td>
<td>HP</td>
<td>x</td>
</tr>
<tr>
<td>56CM</td>
<td>639</td>
<td>8</td>
<td>H18</td>
<td>A8</td>
<td>HP</td>
<td>x</td>
</tr>
<tr>
<td>56CM</td>
<td>660 - 5</td>
<td>M01</td>
<td>A8</td>
<td>H</td>
<td>x</td>
<td>3R 1 1.0</td>
</tr>
<tr>
<td>56CM</td>
<td>660 - 11</td>
<td>M26</td>
<td>A8</td>
<td>H</td>
<td>x</td>
<td>3B 0 1.0</td>
</tr>
<tr>
<td>56CM</td>
<td>685 - 12</td>
<td>H13</td>
<td>A8</td>
<td>H</td>
<td>x</td>
<td>3B 1 1.0</td>
</tr>
<tr>
<td>56CM</td>
<td>785</td>
<td>23</td>
<td>N06</td>
<td>A8</td>
<td>H</td>
<td>x</td>
</tr>
<tr>
<td>56CM</td>
<td>785 - 20</td>
<td>Q06</td>
<td>A8</td>
<td>H</td>
<td>x</td>
<td>3B 0 1.2</td>
</tr>
<tr>
<td>56CM</td>
<td>830 - 9</td>
<td>H19</td>
<td>A8</td>
<td>H</td>
<td>x</td>
<td>3B 1 1.3</td>
</tr>
<tr>
<td>56CM</td>
<td>852 - 12</td>
<td>H23</td>
<td>A8</td>
<td>H</td>
<td>x</td>
<td>3B 1 1.3</td>
</tr>
<tr>
<td>56CM</td>
<td>940 - 19</td>
<td>C04</td>
<td>A8</td>
<td>H</td>
<td>x</td>
<td>3B 5 1.4</td>
</tr>
</tbody>
</table>

**Electronics Options:**

- Please choose one of the stated options.
- Standard electronics: 56CM, 56CM, 56CR

**Casing Type:**

- 56CM: Standard electronics, 56CM, 56CR

**Cable Options:**

- 1.5 m shielded connection cable: 56CM, 56CM, 56CR

**Electronics Options**

- As 1. with connector type
- Lumberg SV50 (electronics type ‘H’, 5V) . . . . 6
- Lumberg SV40 (electronics type ‘HP’, 12V) . . . . 4
- Customer-specified cable length . . . . . . . . 5

**Correction factor F:**

Properties of the laser diode, such as divergence angle and wavelength, affect the width and Rayleigh range/depth of focus of the laser line:

- **Line width:** multiply by F
- **Depth of focus:** multiply by F^2

Example:

- LNC-SLMM15-S150-156CM-405-25-X15-A7.5-HP: 6 F = 0.7 (right table last column)
- Line width: \( d_{\text{L}} = 0.144 \, \text{mm} \) \( d_{\text{R}} = 0.144 \, \text{mm} \) \( d_{\text{L}} = 0.101 \, \text{mm} \)
- Depth of focus: \( z_{\text{L}} = 66 \, \text{mm} \) \( z_{\text{R}} = 66 \, \text{mm} \) \( z_{\text{L}} = 53 \, \text{mm} \)

**Beam-shaping optics** define the beam parameter fan angle and line length, the optimum working distance and the focussing range, see left tables. The chosen laser module defines the wave-length and the power output and, thereby, the laser safety class, see right table. The line lengths and line widths in tables (left table) are valid for the nominal working distance of the line optics. Any working distance changes do require refocussing within the available focussing range, with both line length and line width increasing in direct proportion with greater working distance.

The new low noise laser diode modules from Schäfter+Kirchoff have reduced power noise and reduced coherence length as a result of internal RF-modulation. The low noise (< 0.1% RMS, 0/1 MHz) and the mode-hopping free laser operation makes these laser diode modules ideal for particle measurements or advanced medical and biotechnological applications. Due to the reduced coherence length speckle contrast might be lowered. This effect, however, becomes smaller for smaller lines/spots.

**LNC-5LPM 56CM**

- Fan angle 8° – 15°
- Beam parameter: SLMM
- Line width 144 µm, line length 6.6 – 1800 mm
- Output power adjustable <1 – 100%
- Supply voltage: 5 V DC (> 600 nm) or 12 V DC (< 600 nm)
- Fan angle 8°, 15°, 40°, 62°, 84°
- Mode hopping free laser operation
- Reduced coherence
- Laser power output up to 25 mW
- Integrated focussing mechanism
- Spectral range 405 – 940 nm
- Extended depth of focus
- Larger line widths with lower power density
- Reduced coherence
- Mode hopping free laser operation
- Fan angle 8°, 15°, 40°, 62°, 84°
Low Noise Laser Micro Line LNC-13LN- + 91CM-

Low noise laser line with a fan angle with uniform intensity distribution and constant line width

- Narrower laser line widths
- High power density in the focal plane
- Low noise laser module (0.1% RMS, @<1 MHz)
- Reduced coherence
- Mode hopping free laser operation
- Laser wavelengths 635 to 940 nm
- Line width starting at 8 µm (1/e²)

- Fan angles 0°–17° (depending on working distance)
- Line width constant with values acc. to Table 1.1 along 60% of the central area, outside this area the line width differs up to 30%
- Intensity profile uniform X1 in line direction, Gaussian across the laser line
- Laser power output up to 26 mW
- Integrated power control, adjustable from <1%–100%
- External modulation: TTL up to 100 kHz and analog up to 100 kHz
- Supply voltage: 5 V DC (> 600 nm) or 12 V DC (< 600 nm)

The beam-shaping optics define the beam parameters, fan angle and line length, the optimum working distance and the focusing range, see left table. The chosen laser module defines the wavelength and the power output and, thereby, the laser safety class, see right table. The new low noise laser diode modules from Schäfer+Kirchhoff have reduced power noise, reduced coherence length and low speckle contrast as a result of internal RF-modulation.

The low noise (< 0.1% RMS, @<1 MHz) and the mode-hopping free laser operation makes these laser diode modules ideal for particle measurements or advanced medical and biotechnological applications. Due to the reduced coherence length, speckle contrast might be lowered. This effect, however, becomes smaller for narrow lines/spots.

Further informations
For details on the LNC-series please see p. 18. For appropriate adjustment tools please see page 92 for power supplies, switchboxes etc. see page 84f. Details about the electronics are found on page 83. The Dimensions you will find on page 89.
Low Noise Laser Macro Line LNC-13LNM- + 91CM-

Laser line with a fan angle, uniform intensity distribution, constant line width and extended depth of focus.

- Low noise laser module (0.1% RMS, @<1 MHz)
- Reduced coherence
- Mode hopping free laser operation
- Laser wavelengths 635 to 940 nm
- Line width starting at 14 µm (1/e²)
- Extended depth of focus density
- Laser power output up to 19 mW

- Larger Line widths with lower power density
- Fan angles 0°-17° (depending on working distance)
- Line width constant with values acc. to Table 2.1 along 60% of the central area, outside this area the line width differs up to 30%
- Intensity profile uniform in line direction, Gaussian across the laser line
- Integrated power control, adjustable from <1% – 100%
- External modulation: TTL up to 100 kHz and analog up to 100 kHz
- Supply voltage: 5 V DC (> 600 nm) or 12 V DC (< 600 nm)
- Reduced coherence length and low speckle contrast as a result of internal RF-modulation.

The beam-shaping optics define the beam parameters, fan angle and line length, the optimum working distance and the focussing range, see left table. The chosen laser module defines the wavelength and the power output and, thereby, the laser safety class, see right table. The new low noise laser diode modules from Schäfer+Kirchhoff have reduced power noise, reduced coherence length and low speckle contrast as a result of internal RF-modulation.

The low noise (< 0.1% RMS, @<1 MHz) and the mode-hopping free laser operation makes these laser diode modules ideal for particle measurements or advanced medical and biotechnological applications. Due to the reduced coherence length, speckle contrast might be lowered. This effect, however, becomes smaller for narrow lines/spots.

Further informations
For details on the LNC-series please see p. 18. For appropriate adjustment tools please see page 92. For power supplies, switchboxes etc. see page 84f. Details about the electronics are found on page 83. The Dimensions you will find on page 89.
**Low Noise Micro Line Generator LNC-13LT- + 91CM-**

Low noise semi-telecentric laser line with constant line length 15 mm

- Low noise laser module (<0.1% RMS, Ø<1 MHz)
- Narrow laser line widths
- High power density in the focal plane
- Reduced coherence
- Mode hopping free laser operation
- Fan angle Ø° (semi-telecentric)
- Line length constant 15 mm

- Laser power up to 18 mW
- Spectral range 405 – 940 nm
- Line width starting at 12 µm (1/e²) as a function of working distance
- Intensity profile X: Gaussian in line direction clipped by an aperture with typ. 80% edge intensity; Gaussian across the laser line
- Integrated power control <1 – 100 %
- External modulation: TTL up to 100 kHz and analog up to 100 kHz
- Supply voltage: 5 V DC (>600 nm) or 12 V DC (<600 nm)

The beam-shaping optics define the beam parameter line length, the optimum working distance and the focusing range, see left table. The chosen laser module defines the wavelength and the power output and, thereby, the laser safety class, see right table. The line lengths and line widths (left table) are valid for the nominal working distance of the line optics. Minimal line width is achieved by adjusting the working distance.

The new low noise laser diode modules from Schäfer+Kirchhoff have reduced power noise, reduced coherence length and low speckle contrast as a result of internal RF-modulation. The low noise (<0.1% RMS, Ø<1 MHz) and the mode-hopping free laser operation makes these laser diode modules ideal for particle measurements or advanced medical and biotechnological applications. Due to the reduced coherence length, speckle contrast might be lowered. This effect, however, becomes smaller for smaller lines.

### LNC-13LT + 91CM - Combination:

**Beam Shaping Optics + Laser Diode Collimator**

**Example 1:**
- LNC - 13LT-250
- 91CM - 830 - 6 - H19 - M60 - H - 6

**Example 2:**
- LNC - 13LT-250
- 91CM - 405 - 18 - X15 - M60 - HP - x

### Laser Module

<table>
<thead>
<tr>
<th>Laser Diode Source</th>
<th>Wavelength [mm]</th>
<th>P [mW]</th>
<th>LD Code</th>
<th>Lens</th>
<th>Available Electronics Options</th>
<th>Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>91CM - 405 - 18</td>
<td>X15</td>
<td>M60</td>
<td>HP</td>
<td>x</td>
<td>3B</td>
</tr>
<tr>
<td>2</td>
<td>91CM - 450 - 12</td>
<td>006</td>
<td>M60</td>
<td>HP</td>
<td>x</td>
<td>3B</td>
</tr>
<tr>
<td>3</td>
<td>91CM - 515 - 15</td>
<td>X17</td>
<td>M60</td>
<td>HP</td>
<td>x</td>
<td>3B</td>
</tr>
<tr>
<td>4</td>
<td>91CM - 635 - 2</td>
<td>H10</td>
<td>M60</td>
<td>H</td>
<td>x</td>
<td>3B</td>
</tr>
<tr>
<td>5</td>
<td>91CM - 639 - 4</td>
<td>H18</td>
<td>M60</td>
<td>H</td>
<td>x</td>
<td>3B</td>
</tr>
<tr>
<td>6</td>
<td>91CM - 660 - 4</td>
<td>010</td>
<td>M60</td>
<td>H</td>
<td>x</td>
<td>3B</td>
</tr>
<tr>
<td>7</td>
<td>91CM - 660 - 8</td>
<td>M26</td>
<td>M60</td>
<td>H</td>
<td>x</td>
<td>3B</td>
</tr>
<tr>
<td>8</td>
<td>91CM - 685 - 9</td>
<td>H13</td>
<td>M60</td>
<td>H</td>
<td>x</td>
<td>3B</td>
</tr>
<tr>
<td>9</td>
<td>91CM - 785 - 14</td>
<td>N06</td>
<td>M60</td>
<td>H</td>
<td>x</td>
<td>3B</td>
</tr>
<tr>
<td>10</td>
<td>91CM - 785 - 17</td>
<td>006</td>
<td>M60</td>
<td>H</td>
<td>x</td>
<td>3B</td>
</tr>
<tr>
<td>11</td>
<td>91CM - 830 - 6</td>
<td>H19</td>
<td>M60</td>
<td>H</td>
<td>x</td>
<td>3B</td>
</tr>
<tr>
<td>12</td>
<td>91CM - 830 - 24</td>
<td>N23</td>
<td>M60</td>
<td>H</td>
<td>x</td>
<td>3B</td>
</tr>
<tr>
<td>13</td>
<td>91CM - 852 - 8</td>
<td>H23</td>
<td>M60</td>
<td>H</td>
<td>x</td>
<td>3B</td>
</tr>
<tr>
<td>14</td>
<td>91CM - 940 - 10</td>
<td>M40</td>
<td>M60</td>
<td>H</td>
<td>x</td>
<td>3B</td>
</tr>
</tbody>
</table>

### Further informations

For details on the LNC-series please see p. 18. For appropriate adjustment tools please see page 92. For power supplies, switchboxes etc. see page 84f. Details about the electronics are found on page 83. The Dimensions you will find on page 89.
Low Noise Macro Line Generator LNC-13LTM- + 91CM-

- Low noise laser module (0.1% RMS, @<1 MHz)
- Reduced coherence
- Mode hopping free laser operation
- Fan angle 0° (semi-telecentric)
- Line length constant 15 mm
- Laser power up to 8 mW
- Extended depth of focus

- Larger line widths with lower power density
- Laser wavelengths 405 to 940 nm
- Line width starting at 39 μm (1/e²) as a function of working distance
- Intensity profile X₁ Gaussian in line direction clipped by an aperture with typ. 80% edge intensity; approx. Gaussian across the laser line
- Integrated power control <1–100 %
- External modulation: TTL up to 100 kHz and analog up to 100 kHz
- Supply voltage: 5 V DC (> 600 nm) or 12 V DC (< 600 nm)

The beam-shaping optics define the beam parameter line length, the optimum working distance and the focusing range, see left table. The chosen laser module defines the wavelength and the power output and, thereby, the laser safety class, see right table. The line lengths and line widths (left table) are valid for the nominal power output and, thereby, the laser safety class, see right table. The new low noise laser diode modules from Schäfter+Kirchhoff have reduced power noise, reduced coherence length and low speckle contrast as a result of internal RF-modulation. The low noise (<0.1% RMS, @<1 MHz) and the mode-hopping-free laser operation makes these laser diode modules ideal for particle measurements or advanced medical and biotechnological applications. Due to the reduced coherence length, speckle contrast might be lowered. This effect, however, becomes smaller for smaller lines.

The beam-shaping optics are laser diode collimators with Gaussian beam propagation in line direction clipped by an X₁ factor. The properties of the laser diode, such as divergence angle and Rayleigh range/depth of focus of the laser line: the correction factor F defines the line length and line width (left table). The chosen laser module defines the wavelength and the power output and, thereby, the laser safety class, see right table. The new low noise laser diode modules from Schäfter+Kirchhoff have reduced power noise, reduced coherence length and low speckle contrast as a result of internal RF-modulation. The low noise (<0.1% RMS, @<1 MHz) and the mode-hopping-free laser operation makes these laser diode modules ideal for particle measurements or advanced medical and biotechnological applications. Due to the reduced coherence length, speckle contrast might be lowered. This effect, however, becomes smaller for smaller lines.

Further informations
For details on the LNC-series please see p. 18. For appropriate adjustment tools please see page 92, for power supplies, switchboxes etc. see page 84f. Details about the electronics are found on page 83. The dimensions you will find on page 89.
Low noise semi-telescopic laser line with constant line length 4.8 / 2.0 mm

- Low noise laser module (< 0.1% RMS, @<1 MHz)
- Narrow laser line widths
- High power density in the focal plane
- Reduced coherence
- Mode hopping free laser operation
- Fan angle 0° (semi-telescopic)
- Constant line lengths of 4.8 or 2.0 mm

- Line width starting at 26 µm (1/e2) as a function of working distance
- Intensity profile X2: Gaussian in line direction (for SLT...-1 it is clipped by an aperture with <40% edge intensity); Gaussian across the laser line
- Laser power up to 37 mW
- Spectral range 405 – 940 nm
- Integrated power control <1–100 %
- External modulation: TTL up to 100 kHz and analog up to 100 kHz
- Supply voltage: 5 V DC (> 600 nm) or 12 V DC (< 600 nm)

The beam-shaping optics define the beam parameter line length, the optimum working distance and the focusing range, see left tables. The chosen laser module defines the wavelength and the power output and, thereby, the laser safety class, see right table. The line lengths and line widths (left table) are valid for the nominal working distance of the line optics. Minimal line width is achieved by adjusting the working distance. The new low noise laser diode modules from Schäfter+Kirchhoff have reduced power noise, reduced coherence length and low speckle contrast as a result of internal RF-modulation. The low noise (<0.1% RMS, @<1 MHz) and the mode-hopping free laser operation makes these laser diode modules ideal for particle measurements or advanced medical and biotechnological applications. Due to the reduced coherence length, speckle contrast might be lowered. This effect, however, becomes smaller for narrow lines.

Further informations
For details on the LNC-series please see p. 18. For appropriate adjustment tools please see page 92. for power supplies, switchboxes etc. see page 84f. Details about the electronics are found on page 83. The Dimensions you will find on page 88.
Low Noise Macro Line Generator LNC-5LTM- + 56CM-

Low noise semi-telescopic laser line with constant line length 4.8 / 2.0 mm and extended depth of focus

- Low noise laser module
- (< 0.1% RMS, @<1 MHz)
- Extended depth of focus
- Reduced coherence
- Mode hopping free laser operation
- Fan angle 0° (semi-telescopic)
- Laser power up to 25 mW
- Spectral range 405 – 940 nm
- Depth of Focus 1.50 – 1.50 mm
- Rayleigh Range 0 – 0 mm
- Rayleigh convergence 0
- Line width starting at 48 µm (1/e²)
- Beam locking/unlocking of the focus position
- Potentiometer for laser power output
- Beam shaping optics define the beam parameter line length, the optimum working distance and the focussing range, see left tables.

The new low noise laser diode modules from Schäfter+Kirchhoff have reduced power noise, reduced coherence length and low speckle contrast as a result of internal RF-modulation. The low noise (< 0.1% RMS, @<1 MHz) and the mode-hopping free laser operation makes these laser diode modules ideal for particle measurements or advanced medical and biotechnological applications. Due to the reduced coherence length, speckle contrast might be lowered. This effect, however, becomes smaller for narrow lines.

Further informations
For details on the LNC-series please see p. 18. For appropriate adjustment tools please see page 92. For power supplies, switchboxes etc. see page 84. Details about the electronics are found on page 83. The Dimensions you will find on page 88.

Configuration Options
Line optics 5LT...-1: Configuration
Line length L = Øl
The beam diameter Øl of the collimated beam is focussed. The line length is constant and is equal to the beam diameter Øl.

Line optics 5LT...-2: Configuration
Line length L = Øll
The beam diameter Øll of the collimated beam is focussed. Line length is constant and is equal to the beam diameter Øll. Line length and width are less than in configuration 1.

Example 2: LNC - 5LTM-50-11 + 56CM - 660 - 8 - M26 - A8 - H - x

Schäfter+Kirchhoff

info@SuKHamburg.de | www.SuKHamburg.com
Low noise laser focus generator with rotationally symmetric, Gaussian intensity profile

- Low noise laser module (< 0.1% RMS, Ø < 1 MHz)
- Reduced coherence
- Small laser spot diameters
- High power density in the focal plane
- Mode hopping free laser operation
- Rotationally symmetric focus

Focus ∅ starting at 7 µm

Beams are divergence angle and wavelength, affect the spot diameter and Rayleigh range/depth of focus of the laser focus.

\[ \text{Spot diameter} = \frac{1}{\beta} \times \text{Wavelength} \]

\[ \text{Rayleigh range} = \frac{\lambda^2}{\pi} \left( \frac{1}{\beta} \right) \]

Focussing of the spot for the working distance

Potentiometer for laser power output

Locking/unlocking of the focus position

Laser Line, Micro Focus and Macro Focus Generators Low Noise LNC-Series

LNC-13MC + 96CM

Parameter

<table>
<thead>
<tr>
<th>Diameter at Collimator [mm]</th>
<th>Correction Factor F</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>14.0</td>
</tr>
<tr>
<td>3</td>
<td>14.0</td>
</tr>
<tr>
<td>3</td>
<td>14.0</td>
</tr>
<tr>
<td>3</td>
<td>14.0</td>
</tr>
</tbody>
</table>

Casing Type: Casing Type MT . . . . . . . 96CM

Casing Type HT . . . . . . . 96CR

Cable Options: 1.5 m shielded connection cable . . . . . . . . . . . 1

As 1, with connector type Lumberg SV50 (electronics type’H’, 15 V) . . . . 6

Lumberg SV40 (electronics type’HP’, 12 V) . . . . 4

Further informations

For details on the LNC-series please see page 18. For appropriate adjustment tools please see page 92. For power supplies, switchboxes etc. see page 84f. Details about the electronics are found on page 83. The Dimensions will be found on page 89.

www.SuKHamburg.com

info@SuKHamburg.de | www.SuKHamburg.com
Low noise laser focus generator with rotationally symmetric, Gaussian intensity profile

- Low noise laser module (< 0.1% RMS, @<1 MHz)
- Extended depth of focus
- Reduced coherence
- Mode hopping free laser operation
- Rotationally symmetric focus
- Approx. Gaussian intensity profile
- Laser power up to 10 mW

- Focus Ø starting at 8 µm
- Larger spot diameters with lower power density
- Integrated focussing mechanism
- Laser wavelengths 635 – 828 nm
- Output power adjustable <1 – 100%
- External modulation: TTL up to 100kHz and analog up to 100kHz
- Output power adjustable <1 – 100%
- Laser wavelengths 635 – 828 nm
- Integrated focussing mechanism
- Larger spot diameters with lower power density

Laser micro focus generators of type 13MMC..., +96CM, use CircuLaser diodes (Blue Sky Inc.) with integrated micro-optics. The micro-optics transform the elliptical radiation emitted by the laser diode into circular radiation with a deviation maximum of 1:1.2. The beam-shaping optics define the optimum working distance and the focussing range, see left table. The chosen laser module determines the wavelength and the output power and, thereby, the laser safety class, see right table.

The new low noise laser diode modules from Schäfter+Kirchhoff have reduced power noise, reduced coherence length and low speckle contrast as a result of internal RF-modulation. The low noise (< 0.1% RMS, @<1 MHz) and the mode-hopping free laser operation make these laser diode modules ideal for particle measurements or advanced medical and biotechnological applications. Due to the reduced coherence length, speckle contrast might be lowered. This effect, however, becomes smaller for smaller spots.

Further informations
For details on the LNC-series please see p. 18. For appropriate adjustment tools please see page 92. For power supplies, switchboxes etc. see page 84f. Details about the electronics are found on page 83. The Dimensions you will find on page 89.
Low Noise Micro Line Generator LNC-13M- + 56CM-

- Low noise laser module (<0.1% RMS, @<1 MHz)
- Reduced coherence
- Mode hopping free laser operation
- Elliptical beam profile 2G
- Gaussian intensity profile
- Focus Ø starting at 8 x 20 µm
- Laser power up to 31 mW
- Integrated focussing mechanism
- Spectral range 405–940 nm
- Output power adjustable <1 – 100 %
- Supply voltage: 5 V DC (> 600 nm) or 12 V DC (< 600 nm)
- External modulation: TTL up to 100 kHz and analog up to 100 kHz
- Small laser spot diameters
- High power density in the focal plane

Laser micro focus generators of type LNC-13MM-+56CM generate a circular laser spot with extended depth of focus and have integrated electronics that can be modulated externally. The beam-shaping optics define the optimum working distance and the focussing range, see left table. The chosen laser module defines the wavelength and the output power and, thereby, the laser safety class, see right table. The spot diameters (left table) are valid for the nominal working distance of the micro focus optics. Any working distance changes require refocussing within the available focussing range, with the spot diameter increasing in direct proportion with the greater working distance.

The new low noise laser diode modules from Schäfter+Kirchhoff have reduced power noise, reduced coherence length and low speckle contrast as a result of internal RF-modulation. The low noise (<0.1% RMS, @<1 MHz) and the mode-hopping free laser operation makes these laser diode modules ideal for particle measurements or advanced medical and biotechnological applications. Due to the reduced coherence length, speckle contrast/size might be lowered. This effect, however, gets smaller for smaller spots.

**Parameters**

- Laser Module
  - Laser Diode Source Wave-length [nm] Pout [mW] LD Code Lens Available Electro-Optics Options Cable
  - 1 56CM - 405 - 39 - X15 - T15 - HP - x 3B 8.6 4.0 0.6
  - 2 56CM - 450 - 27 - Q06 - T15 - HP - x 3B 9.4 3.3 0.7
  - 3 56CM - 515 - 33 - X17 - T15 - HP - x 3B 9.4 3.8 0.7
  - 4 56CM - 635 - 6 - H10 - T12 - H - x 3B 3.7 9.7 2.8 10
  - 5 56CM - 639 - 11 - H18 - T12 - H - x 3B 10.7 2.8 1.0
  - 6 56CM - 660 - 9 - M01 - T12 - H - x 3B 7.7 3.4 0.9
  - 7 56CM - 660 - 17 - M26 - T12 - H - x 3B 7.2 3.0 1.0
  - 8 56CM - 685 - 20 - H13 - T12 - H - x 3B 7.5 3.4 0.9
  - 9 56CM - 785 - 30 - N06 - T12 - H - x 3B 7.4 2.5 1.4
  - 10 56CM - 785 - 31 - Q06 - T15 - HP - x 3B 5.6 3.2 1.1
  - 11 56CM - 830 - 15 - H19 - T12 - H - x 3B 7.7 3.2 1.2
  - 12 56CM - 830 - 42 - N23 - T12 - H - x 3B 5.6 2.8 1.3
  - 13 56CM - 852 - 18 - H23 - T12 - H - x 3B 7.7 3.2 1.2
  - 14 56CM - 940 - 28 - CD4 - T12 - H - x 3B 9.7 2.8 1.5

**Casing Type**

- Casing Type 56CM
- Casing Type 56CR

**Cable Options**

- 1.5 m shielded connection cable ........................................ 1
- As 1, with connector type Lumberg SV40 (electronics type H, 12 V) ........................................ 6
- Customer-specified cable length ........................................ 5
Low noise laser focus generator with circular beam profile and extended depth of focus

- Low noise laser module (<0.1% RMS, <1 MHz)
- Reduced coherence
- Mode hopping free laser operation
- Circular beam profile
- Approx. Gaussian intensity profile
- Focus Ø starting at 19 µm
- Laser power up to 23 mW
- Integrated focussing mechanism
- Spectral range 405 – 940 nm
- Output power adjustable <1 – 100 %
- Supply voltage: 5 V DC (> 600 nm) or 12 V DC (< 600 nm)
- External modulation: TTL up to 100 kHz and analog up to 100 kHz
- Extended depth of focus
- Larger spot diameters with lower power density

Laser micro focus generators of type 13MMC...+96CM use CircuLaser diodes (Blue Sky Inc.) with integrated micro-optics. The micro-optics transform the elliptical radiation emitted by the laser diode into circular radiation with a deviation maximum of 1.1:2. The integrated electronics allow external modulation. The beam-shaping optics define the optimum working distance and the focussing range, see left table. The chosen laser module determines the wavelength and the output power and, thereby, the laser safety class, see right table.

The new low noise laser diode modules from Schäfter+Kirchhoff have reduced power noise, reduced coherence length and low speckle contrast as a result of internal RF-modulation. The low noise (< 0.1% RMS, <1 MHz) and the mode-hopping free laser operation makes these laser diode modules ideal for particle measurements or advanced medical and biotechnological applications. Due to the reduced coherence length, speckle contrast might be lowered. This effect, however, becomes smaller for smaller spots.

### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>13MM</th>
<th>56CM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spot Diameter [mm]</td>
<td>0.020</td>
<td>0.20</td>
</tr>
<tr>
<td>Working Distance [mm]</td>
<td>45</td>
<td>5</td>
</tr>
<tr>
<td>Depth of Focus [mm]</td>
<td>0.7</td>
<td>0.3</td>
</tr>
<tr>
<td>Focussing Range [mm]</td>
<td>40 – 80</td>
<td>815 – 1295</td>
</tr>
<tr>
<td>Convergence [ deg]</td>
<td>2.9</td>
<td>0.3</td>
</tr>
<tr>
<td>Dim. X [mm]</td>
<td>16.4</td>
<td>16.4</td>
</tr>
<tr>
<td>13MM</td>
<td>M60-4</td>
<td>S60-5</td>
</tr>
</tbody>
</table>

### Correction factor F:

Focussing range: multiply by \( F \) (right table last column)  

Example: LNC-13M-M60-4+56CM-660-9-M01-T12-H-6  

<table>
<thead>
<tr>
<th>Laser Module</th>
<th>Beam Diode Collimator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laser Diode</td>
<td>Wave-length [nm]</td>
</tr>
<tr>
<td>Code Lens</td>
<td>P [mW]</td>
</tr>
<tr>
<td>Options Cable</td>
<td></td>
</tr>
<tr>
<td>Class</td>
<td>Beam Diameter at Collimator [mm]</td>
</tr>
<tr>
<td>Correction factor</td>
<td>F'</td>
</tr>
</tbody>
</table>

Example: LNC-13M-M60-4+56CM-660-9-M01-T12-H-6  

Casing Type:  

- Casing Type 56CM  
- Casing Type 56CR

<table>
<thead>
<tr>
<th>Cable Options</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 m shielded connection cable</td>
<td>1</td>
</tr>
<tr>
<td>As 1, with connector type Lumberg SV50 (electronics type H, 5 V)</td>
<td>6</td>
</tr>
<tr>
<td>As 1, with connector type Lumberg SV40 (electronics type HP, 12 V)</td>
<td>4</td>
</tr>
<tr>
<td>customer-specified cable length</td>
<td>5</td>
</tr>
</tbody>
</table>

info@SuKHamburg.de | www.SuKHamburg.com
Low Noise Laser Diode Collimators LNC-56CM-x

Low noise laser diode collimator with elliptical Gaussian beam profile (For details on the LNC-series please see page 18)

- Low noise laser module (< 0.1% RMS, @<1 MHz)
- Reduced coherence
- Mode hopping free laser operation
- Elliptical beam profile
- Gaussian intensity profile
- Laser power up to 31 mW
- Supply voltage: 5V DC
- Laser wavelengths from 405 to 830 nm
- Integrated adjustable power control <1-100%
- External modulation: TTL up to 100 kHz and analog up to 100 kHz

Laser diode collimators transform the divergent light of a laser diode into a collimated beam, while maintaining the Gaussian intensity distribution. From the two emission angles (i and j) of the laser diode and the focal length of the collimation optics, the orthogonal and parallel divergence angles and beam diameters can be determined, which are a function of the laser diode used for the collimation. The new low noise laser diode modules from Schäfter+Kirchhoff have reduced power noise, reduced coherence length and low speckle contrast as a result of internal FM-modulation. The low noise (< 0.1% RMS, @<1 MHz) and the mode-hopping free laser operation makes these laser diode modules ideal for particle measurements or advanced medical and biotechnological applications. Due to the reduced coherence length, speckle contrast might be lowered. This effect, however, becomes smaller for smaller spots.

Further informations
For details on the LNC-series please see p. 18. For appropriate adjustment tools please see page 92. for power supplies, switchboxes etc. see page 84. Details about the electronics are found on page 83. The Dimensions you will find on page 90.

### LNC-56CM

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Beam Class</td>
<td>Beam Diameter perp</td>
<td>Beam Diameter par.</td>
<td>Beam Divergence perp</td>
<td>Beam Divergence par.</td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------</td>
<td>---------------------</td>
<td>---------------------</td>
<td>---------------------</td>
<td></td>
</tr>
<tr>
<td>3B</td>
<td>1.1</td>
<td>2.3</td>
<td>0.24</td>
<td>0.11</td>
<td>4</td>
</tr>
<tr>
<td>3B</td>
<td>2.0</td>
<td>4.3</td>
<td>0.13</td>
<td>0.06</td>
<td>7.5</td>
</tr>
<tr>
<td>3B</td>
<td>4.0</td>
<td>8.6</td>
<td>0.06</td>
<td>0.03</td>
<td>15</td>
</tr>
<tr>
<td>3B</td>
<td>1.0</td>
<td>2.5</td>
<td>0.33</td>
<td>0.13</td>
<td>4</td>
</tr>
<tr>
<td>3B</td>
<td>1.9</td>
<td>4.7</td>
<td>0.17</td>
<td>(0.07)</td>
<td>7.5</td>
</tr>
<tr>
<td>3B</td>
<td>3.8</td>
<td>9.4</td>
<td>0.09</td>
<td>0.03</td>
<td>15</td>
</tr>
<tr>
<td>3R</td>
<td>1.5</td>
<td>(5.0)</td>
<td>0.28</td>
<td>(0.08)</td>
<td>6.2</td>
</tr>
<tr>
<td>3B</td>
<td>1.9</td>
<td>6.5</td>
<td>0.21</td>
<td>0.06</td>
<td>8</td>
</tr>
<tr>
<td>3B</td>
<td>2.8</td>
<td>8.7</td>
<td>0.14</td>
<td>0.04</td>
<td>12</td>
</tr>
<tr>
<td>3B</td>
<td>1.5</td>
<td>(5.0)</td>
<td>0.28</td>
<td>(0.07)</td>
<td>6.2</td>
</tr>
<tr>
<td>3B</td>
<td>1.9</td>
<td>7.1</td>
<td>0.21</td>
<td>0.06</td>
<td>8</td>
</tr>
<tr>
<td>3B</td>
<td>2.8</td>
<td>10.7</td>
<td>0.14</td>
<td>0.04</td>
<td>12</td>
</tr>
<tr>
<td>3B</td>
<td>1.7</td>
<td>4.0</td>
<td>0.24</td>
<td>0.11</td>
<td>6.2</td>
</tr>
<tr>
<td>3B</td>
<td>2.2</td>
<td>5.1</td>
<td>0.19</td>
<td>0.08</td>
<td>8</td>
</tr>
<tr>
<td>3B</td>
<td>3.4</td>
<td>7.7</td>
<td>0.12</td>
<td>0.05</td>
<td>12</td>
</tr>
<tr>
<td>3B</td>
<td>1.5</td>
<td>3.7</td>
<td>0.27</td>
<td>0.11</td>
<td>6.2</td>
</tr>
<tr>
<td>3B</td>
<td>2.0</td>
<td>4.8</td>
<td>0.21</td>
<td>0.09</td>
<td>8</td>
</tr>
<tr>
<td>3B</td>
<td>3.0</td>
<td>7.2</td>
<td>0.14</td>
<td>0.06</td>
<td>12</td>
</tr>
<tr>
<td>3B</td>
<td>1.7</td>
<td>3.9</td>
<td>0.25</td>
<td>0.11</td>
<td>6.2</td>
</tr>
<tr>
<td>3B</td>
<td>2.2</td>
<td>5.0</td>
<td>0.19</td>
<td>0.09</td>
<td>8</td>
</tr>
<tr>
<td>3B</td>
<td>3.4</td>
<td>7.5</td>
<td>0.13</td>
<td>0.06</td>
<td>12</td>
</tr>
<tr>
<td>3B</td>
<td>1.7</td>
<td>2.9</td>
<td>0.30</td>
<td>0.17</td>
<td>6.2</td>
</tr>
<tr>
<td>3B</td>
<td>2.1</td>
<td>3.8</td>
<td>0.23</td>
<td>0.13</td>
<td>6.2</td>
</tr>
<tr>
<td>3B</td>
<td>1.7</td>
<td>4.0</td>
<td>0.32</td>
<td>0.13</td>
<td>6.2</td>
</tr>
<tr>
<td>3B</td>
<td>2.1</td>
<td>5.1</td>
<td>0.25</td>
<td>0.10</td>
<td>8</td>
</tr>
<tr>
<td>3B</td>
<td>3.2</td>
<td>7.7</td>
<td>0.17</td>
<td>0.07</td>
<td>12</td>
</tr>
<tr>
<td>3B</td>
<td>1.5</td>
<td>2.7</td>
<td>0.36</td>
<td>0.19</td>
<td>6.2</td>
</tr>
<tr>
<td>3B</td>
<td>3.9</td>
<td>3.5</td>
<td>0.28</td>
<td>0.15</td>
<td>8</td>
</tr>
<tr>
<td>3B</td>
<td>2.8</td>
<td>5.3</td>
<td>0.19</td>
<td>0.10</td>
<td>12</td>
</tr>
<tr>
<td>3B</td>
<td>1.5</td>
<td>2.9</td>
<td>0.36</td>
<td>0.18</td>
<td>6.2</td>
</tr>
<tr>
<td>3B</td>
<td>3.9</td>
<td>3.8</td>
<td>0.28</td>
<td>0.14</td>
<td>8</td>
</tr>
<tr>
<td>3B</td>
<td>2.8</td>
<td>5.6</td>
<td>0.19</td>
<td>0.09</td>
<td>12</td>
</tr>
<tr>
<td>3B</td>
<td>1.7</td>
<td>4.0</td>
<td>0.33</td>
<td>0.14</td>
<td>6.2</td>
</tr>
<tr>
<td>3B</td>
<td>2.1</td>
<td>5.1</td>
<td>0.25</td>
<td>0.11</td>
<td>8</td>
</tr>
<tr>
<td>3B</td>
<td>3.2</td>
<td>7.7</td>
<td>0.17</td>
<td>0.07</td>
<td>12</td>
</tr>
</tbody>
</table>

Beam diameter and divergence values are set in parentheses if the beam is truncated above the 1/e2 level.

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

### Casing Type

1. Standard type
2. Low noise version
3. Micro Focus generator
4. Macro Focus generator
5. Elliptical spot

### Cable Options:
1. 1.5 m shielded connection cable
2. As 1, with connector type Lumberg SV50
3. Customer-specified cable length

info@SuKHamburg.de | www.SuKHamburg.com
Low noise LD Collimator flatbeam® LNC-91CM-M90-x

Laser Diode Collimator with telecentric laser beam and reduced coherence

- Low noise laser (< 0.1% RMS, @ <1 MHz)
- Reduced coherence
- Mode hopping free laser operation
- Telecentric laser beam [1] beam / intensity distribution X3
- Beam divergence: min. approx. 0.02 mrad
- Beam aperture: 17 – 32 mm
- Intensity distribution: axis A-A flat top (rectangular)
- Edge intensity axis A-A > 80% (typ.)
- Intensity distribution axis B-B: Gaussian distribution of beam
- Wavelength 635 – 660 nm
- Beam/Intensity profile X4: flatbeam®-laser beam restricted by the optional aperture X2
- Integrated electronics for regulating laser performance level, setting of desired level using a potentiometer
- External modulation: TTL up to 100 kHz and analog up to 100 kHz
- Output performance adjustable from <1 –100 %
- Power supply 5 V DC
- Strong metal casing

The low noise laser collimator flatbeam® LNC-91CM-... 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.

### LNC-91CM-M60-

<table>
<thead>
<tr>
<th>Beam Parameters 90CM-M60-</th>
<th>Laser Diode Collimator flatbeam®</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>91CM</td>
</tr>
<tr>
<td>2</td>
<td>91CM</td>
</tr>
<tr>
<td>3</td>
<td>91CM</td>
</tr>
<tr>
<td>4</td>
<td>91CM</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Laser Class</th>
<th>Aperture [mm]</th>
<th>Edge Intensity [%]</th>
<th>90% Range [%]</th>
<th>Beam Divergence [mrad]</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>17</td>
<td>82</td>
<td>12.2</td>
<td>3.3</td>
</tr>
<tr>
<td>3B</td>
<td>17</td>
<td>65</td>
<td>8.4</td>
<td>3.9</td>
</tr>
<tr>
<td>3R</td>
<td>17</td>
<td>68</td>
<td>13.2</td>
<td>5.8</td>
</tr>
<tr>
<td>3B</td>
<td>17</td>
<td>48</td>
<td>6.5</td>
<td>3.7</td>
</tr>
</tbody>
</table>

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

### LNC-91CM-M90-

<table>
<thead>
<tr>
<th>Beam Parameters 90CM-M90-</th>
<th>Laser Diode Collimator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>91CM</td>
</tr>
<tr>
<td>2</td>
<td>91CM</td>
</tr>
<tr>
<td>3</td>
<td>91CM</td>
</tr>
<tr>
<td>4</td>
<td>91CM</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Laser Class</th>
<th>Aperture [mm]</th>
<th>Edge Intensity [%]</th>
<th>90% Range [%]</th>
<th>Beam Divergence [mrad]</th>
</tr>
</thead>
<tbody>
<tr>
<td>3R</td>
<td>32</td>
<td>73</td>
<td>18.3</td>
<td>4.9</td>
</tr>
<tr>
<td>3B</td>
<td>32</td>
<td>51</td>
<td>12.7</td>
<td>5.5</td>
</tr>
<tr>
<td>3B</td>
<td>32</td>
<td>32</td>
<td>13.2</td>
<td>5.8</td>
</tr>
<tr>
<td>3B</td>
<td>32</td>
<td>32</td>
<td>9.7</td>
<td>5.5</td>
</tr>
</tbody>
</table>

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

Electronics Type

- Cable Options:
  - 1.5 m shielded connection cable ........................................... 1
  - As 1, with connector type Lumberg SV50 (only electronics type C) . . . 4
  - As 1, with connector type Lumberg SV70 (only electronics types with interface CS) .................................... 6
  - Customer-specified cable length ........................................... 5

Further informations

For appropriate adjustment tools please see page 71; for power supplies, switchboxes etc. see page 66f. Details about the electronics are found on page 66. The Dimensions you will find on page 91.

Beam diameter and divergence values are set in parentheses if the beam is truncated above the 1/e² level.
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
The collimated beam is elliptical (beam height = 32 mm).
1 laser diode collimator
2 laser diode
3 lens for collimation of the divergent laser diode beam
4 object to be measured
5 partially blocked laser beam
6 line scan camera
7 line sensor

Figure 2 shows the magnified edge of the characteristic interference patterns of the measured object A 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. Determination of the shadow edge can be calculated in two ways depending on the speed and accuracy required.

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. B) 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.

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

Further Applications

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