

## FLEXPOINT® MV fiber FP-FCL Series FP-FLH Series

The FLEXPOINT® MV fiber consists of two parts: a FP-FCL fiber coupled laser module and a FP-FLH optical projection head. Both were developed to offer highest optical beam performance for applications like Machine Vision, 3D measurements, medical applications or bio photonics.

The optical projection heads of the FP-FLH series take advantage of the single mode fiber coupled laser's excellent beam characteristics to project perfect uniform lines and dots.

Due to the separation of the electronics/laser diode and the optical part, there is almost no heat which can generate drifts inside the optical part. This results in an outstanding beam pointing stability of the laser projection. The FP-FLH projection heads can be used with our fiber coupled FLEXPOINT® laser modules or with any other laser with FC fiber connection.

The FP-FCL series is also the right choice for applications with little space for the laser module. The two parts can be mounted meters away as the fiber length can be specified or extended by the customer.



### Features

- Separate optical and laser/electronics part
- Outstanding optical performance
- Outstanding pointing stability
- Output powers up to 50 mW (depending on wavelength)
- Several beam profiles available: dot, uniform line, multilines, DOE pattern generators
- Single mode fibers with FC/PC fiber connection
- Microprocessor controlled
- UART RS-232 communication
- Analog power adjustment and digital modulation integrated as standard
- Supply voltage 5 – 30 VDC
- Many options and custom designs available

## Applications

- High end machine vision applications
- 3D profiling
- BioPhotonics
- Medical

## Benefits of Single Mode Fiber Coupled Laser Modules

Fig. 1: Standard line laser

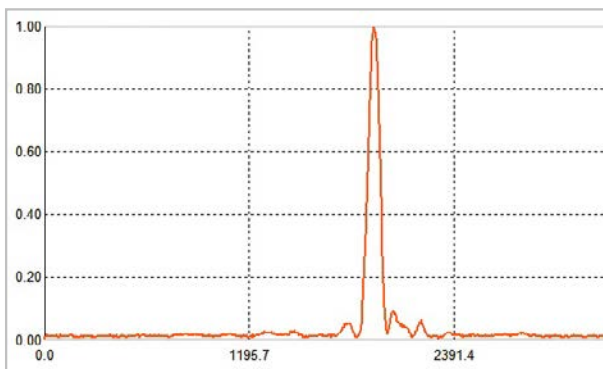


Fig. 2: Fiber coupled line laser

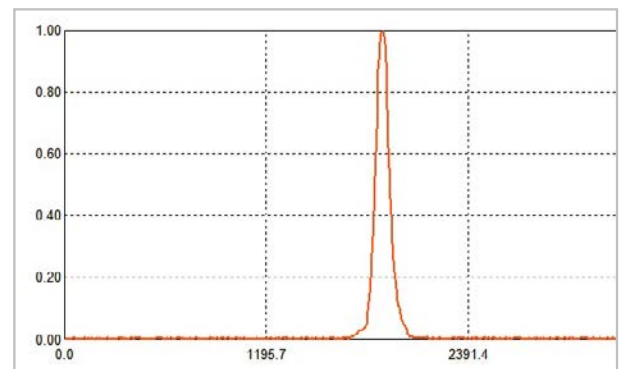


Figure 1 shows a cross section of a laser line which was generated by a free space laser diode. Side modes are visible. These side modes will result in noise on the sensor chip and measurement inaccuracy.

Figure 2 shows a cross section of a laser line which was generated by a single mode fiber coupled FP-FLC laser module. No side modes are visible. The improved line quality will result in a better measurement results.

Figure 3 shows the beam profile of a single mode fiber coupled FP-FLC dot laser. Compared to the beam profile of a standard free space dot laser (figure 4), the fiber coupled laser shows an improved beam quality with a  $M^2$  factor of about 1.2.

Fig. 3: Fiber coupled dot laser

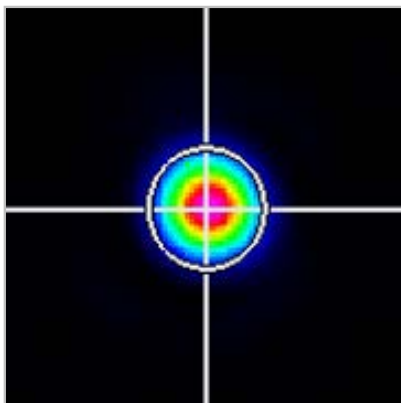
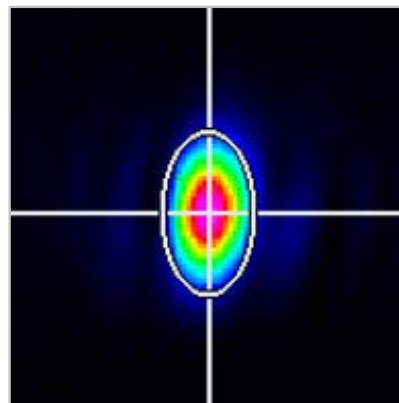


Fig. 4: Standard dot laser



## Specifications FP-FCL Laser Modules

Wavelength	450 nm, 660 nm (other wavelengths on request)
Wavelength stability	≤ 0.25 nm/°C
Output power ex fiber	< 1 mW – 50 mW (depending on wavelength)
Output power stability	< 5% (after warm up at 25 °C)
Digital modulation	Up to 2 MHz, rise time < 50 ns, TTL logic, active low default
Analog power adjustment	Linear range 0 to 5.0 V, max. bandwidth 1 kHz, active low default
Operating voltage	5 – 30 VDC (660 nm) 10 – 30 VDC (450 nm)
Current consumption	< 200 mA (depending on laser diode)
Fiber type	Single mode, core diameter depending on wavelength
Fiber length (standard)	80 cm
Fiber cable type	Fiber with buffer
Bend radius (fiber)	30 mm (max.)
Fiber connector	FC/PC
Operating temperature (housing)	-20 to +50 °C (depends on wavelength)
Storage temperature	-20 to +60 °C
Housing material	Aluminum, black anodized, potential free
Housing dimensions	Ø 19 mm, l = 65 mm
Protection class	IP54, IP67 as option

## RS-232 Commands

Saving data and settings on the internal EEPROM

These modules have the option of storing relevant data and settings on the internal EEPROM. Data such as operating time can be stored; as well as operation parameters and production settings.

Command	Description	Return value
trig_x	x: active high/active low 1: active low (default) 2: active high	
dima xx_yy_z	analog power adjustment: xx → max. power adjustment [00 ... 50] (e.g. 00 $\hat{=}$ 0V ... 50 $\hat{=}$ 5V) yy → min. power adjustment [00 ... 50] (e.g. 00 $\hat{=}$ 0V ... 50 $\hat{=}$ 5V) z → modulation type [0, 1 or 2] 0: no modulation (disabled) 1: active low (default) 2: active high	
mon l	12-bit resolution [0..4095]digits. permanent swm  ESC → end of permanent swm	supply voltage [V] internal voltage [V] laser diode monitor current [ $\mu$ A] laser current [mA]
temp	temperature	temp: c
time	operating hours	days – hours – minuts
lasc	laser current	laser current [mA]

x) recommended terminal program: Tera Term, for communication

## Pin Out

PIN	Description	Comments
1	V <sub>IN</sub>	input voltage
2	V <sub>power</sub>	analog power adjustment input
3	V <sub>Mod</sub>	trigger input
4	RxD	UART; communication interface
5	TxD	
6	C2CK	firmware flash access
7	C2D	
8	GND	ground

## 1. Analog power adjustment

Output power can be adjusted to any desired value within the capabilities of the installed laser diode. Due to safety regulations and laser classifications, the maximum output power can only be set by the factory during manufacture.

Please note: The maximum laser power is set during production; and the user can only reduce the laser power. This is locked via the firmware and password protected.

When using analog power adjustment, there is a distinction between active high and active low.

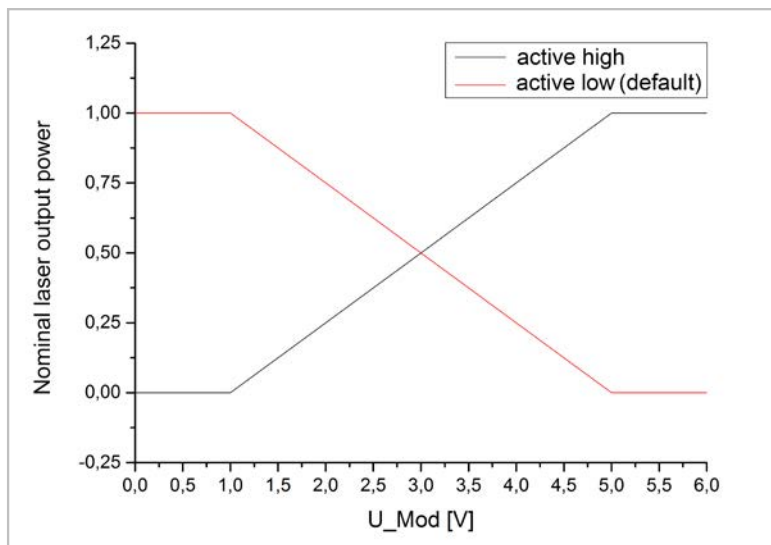
### 1.1. Active high

The output power of the laser is proportional to the input voltage. The input voltage can be set via RS-232 commands in the range 0 – 5 V.

### 1.2. Active low (default)

Inverse power adjustment follows an opposite relationship to the input voltage. The following graph (fig. 5) shows this relationship:

Fig. 5: Analog power adjustment



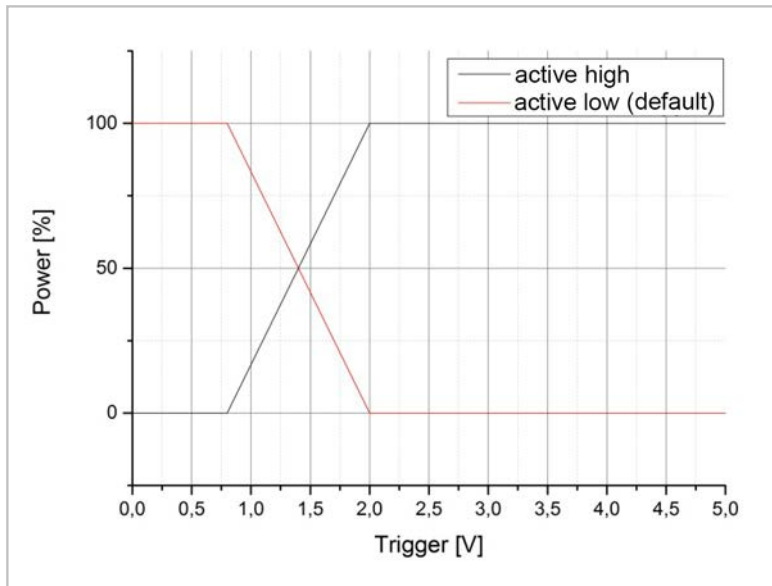
## 2. Digital modulation / Trigger

Triggering is controlled via an external TTL signal (transistor transistor logic).

The triggering signal can be switched between 2 input types:

- active high
- active low (default)

Fig. 6: Digital modulation / trigger



## Specifications FP-FLH Optical Projection Heads

Available beam profiles	Uniform lines (Powell Lens) Multiple uniform lines Gaussian lines Circular dots DOE patterns
Wavelength type	VIS (450 nm) NIR (650 nm) (other wavelength on request)
Fan angle for uniform and Gaussian lines	5, 10, 20, 30, 45, 60, 75, 90 deg.
Line uniformity (with Powell Lens)	< ± 20% (related to average power, within 80% of the line)
Multiple uniform lines	5 lines with 1.54° interbeam angle 11 lines with 1.6° interbeam angle
M <sup>2</sup> for dot laser	M= 1.2
Bore sighting	≤ 10 mrad
Pointing stability	<< 3 μrad/°C
Focus	Adjustable, preset or fixed
Focus range	30 mm to ∞
Operating temperature	-20 to +50 °C
Storage temperature	-20 to +60 °C
Housing material	Aluminum, black anodized, potential free
Housing dimensions	Ø 19 mm, l = 50.5 mm
Protection class	IP54, IP67 as option
Fiber connector	FC/PC

## Line Width and Depth of Focus

The following figures show the typical minimum line width / dot size (at  $1/e^2$ ) and the typical focal depth that can be achieved with FLEXPOINT® fiber coupled laser modules at different distances. The depth of focus is defined as the range in which the minimum line width or dot size increases by factor  $\sqrt{2}$ . The optical projection heads of the FP-FLH series can be focused between 30 mm and infinity/collimation. The projection heads can be ordered with either adjustable focus, preset focus but still focusable or with fixed focus.

Fig. 7: Line thickness farfield (P = 0...30 mW)

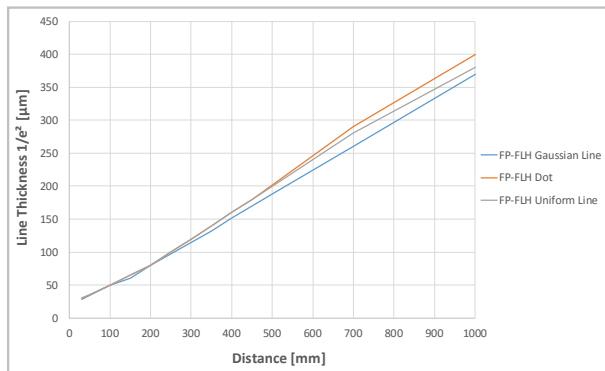


Fig. 8: Line thickness nearfield (P = 0...30 mW)

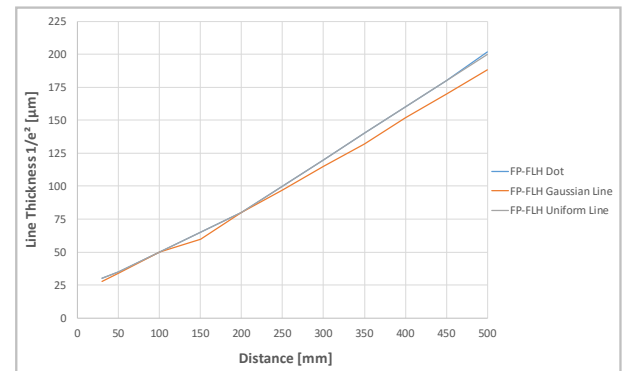


Fig. 9: Depth of focus farfield

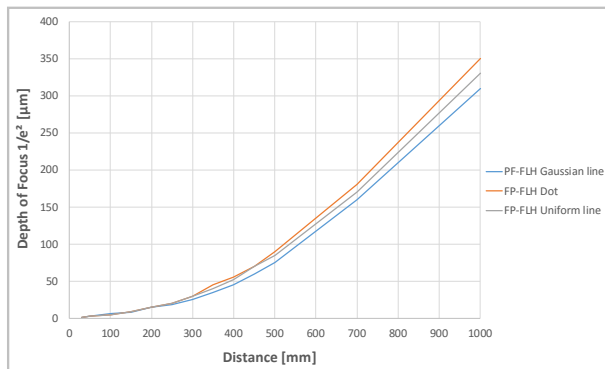
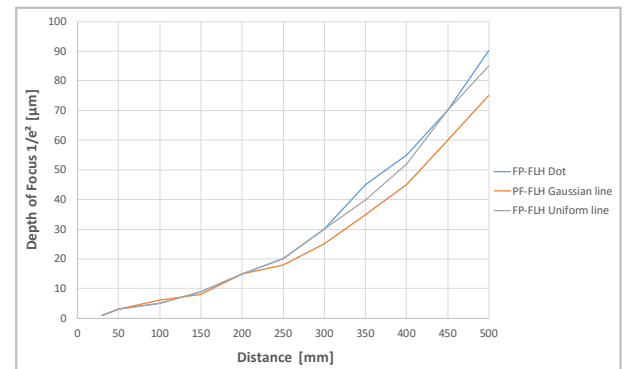


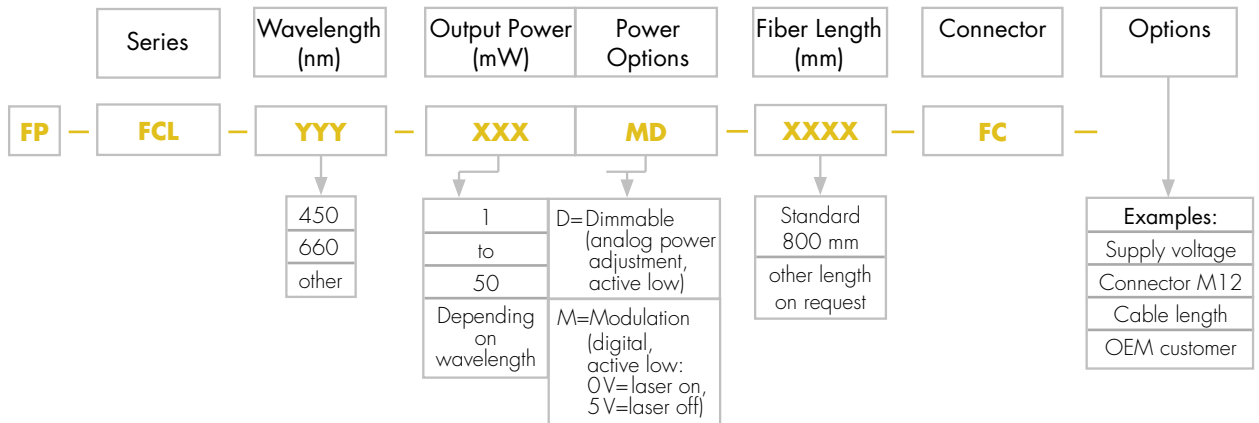
Fig. 10: Depth of focus nearfield



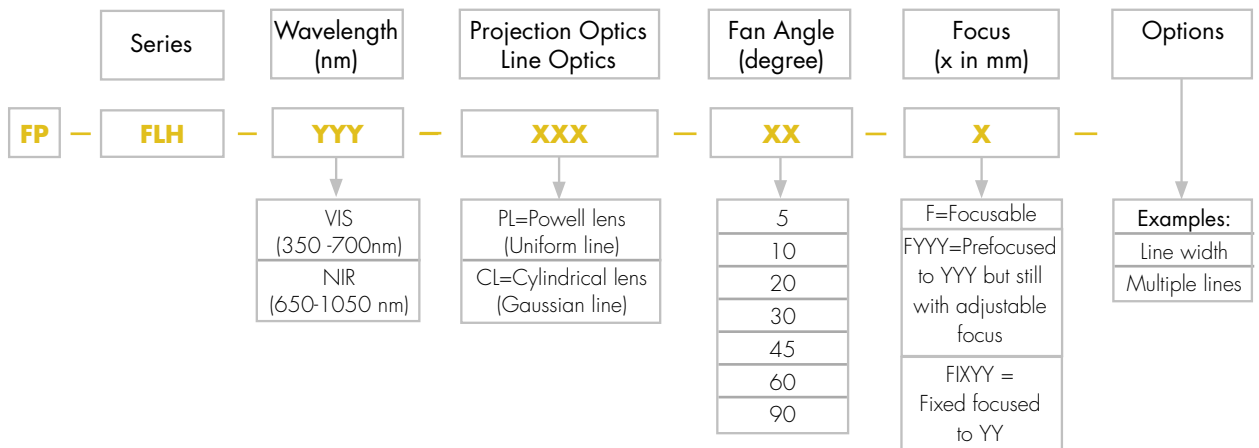


## Ordering Code FLEXPOINT® Fiber Coupled Laser Modules and Optical Projection Heads

### 1. Laser (Fiber Coupled Laser)



### 2. Optical Projection Head (Fiber Laser Head)



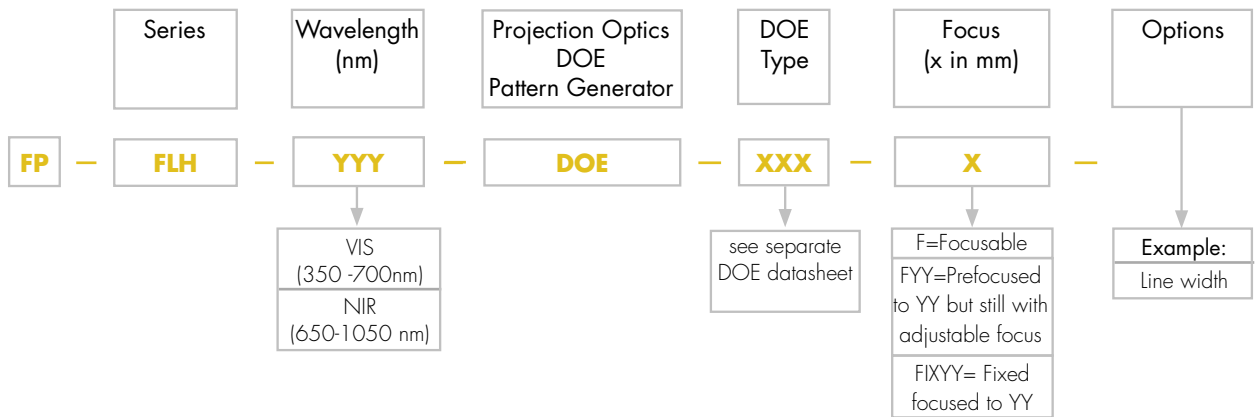
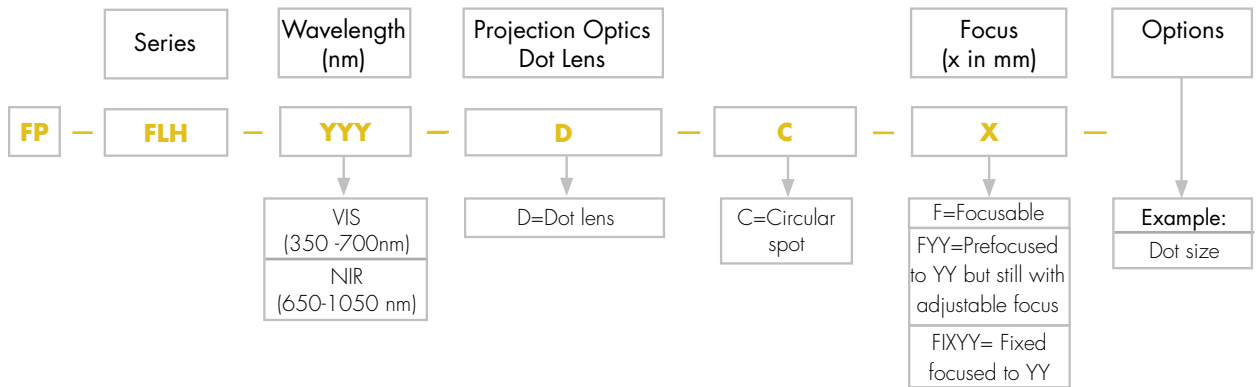
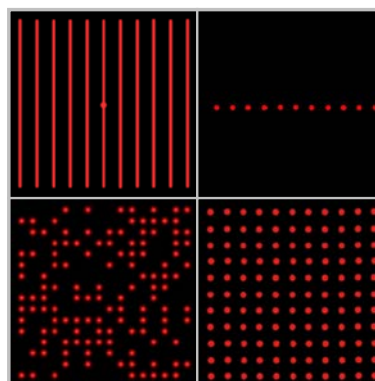
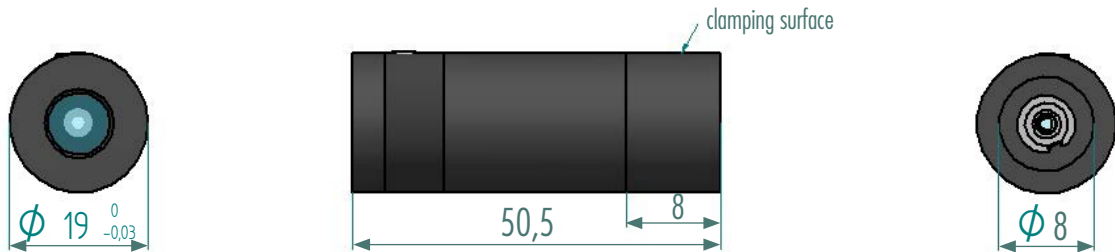


Fig. 11: Examples of DOE patterns

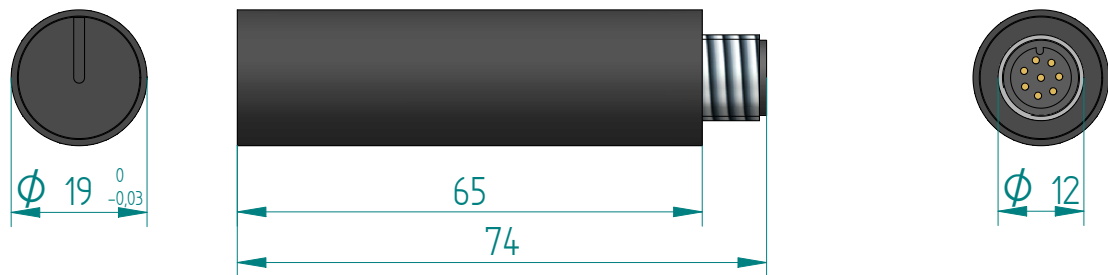


## Housing Dimensions

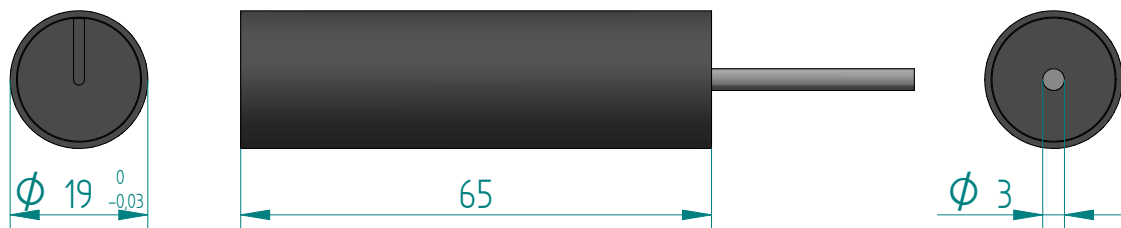
### Optical Projection Head



### Laser Module with M12 Connector



### Laser Module with Cable (Option)



## Product Changes

LASER COMPONENTS reserves the right to make changes to the product(s) or information contained herein without notice. No liability is assumed as a result of their use or application.

## Ordering Information

Products can be ordered directly from LASER COMPONENTS or its representatives. For a complete listing of representatives, visit our website at [www.lasercomponents.com](http://www.lasercomponents.com)

Custom designed products are available on request.