Laser Diodes

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
- Analog power adjustment and digital modulation
- Supply voltage 5 – 30 VDC
- Many options and custom designs available

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

Applications

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

Benefits of Single Mode Fiber Coupled Laser Modules

Fig. 1: Standard line laser

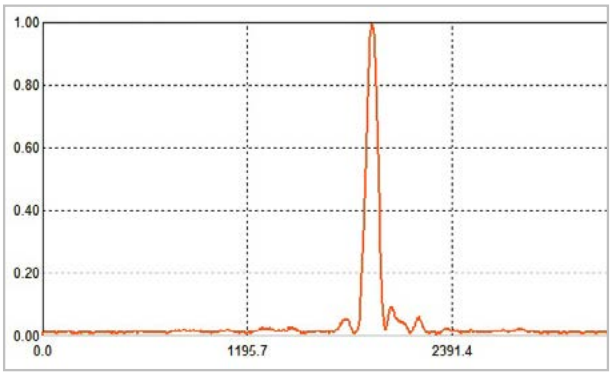


Fig. 2: Fiber coupled line laser

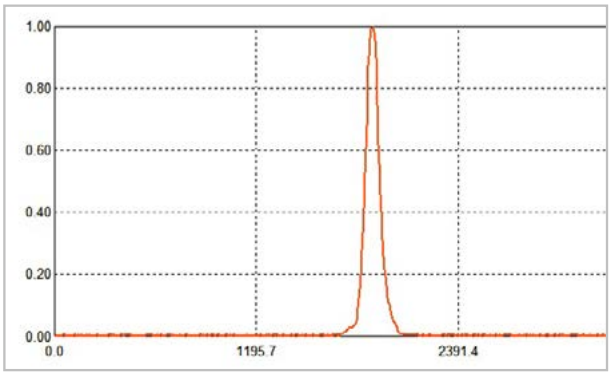


Figure 1 shows a cross section of a laser line which was generated by a free space laser diode. Side modes are visible. These side modes will result in noise on the sensor chip and measurement inaccuracy.

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

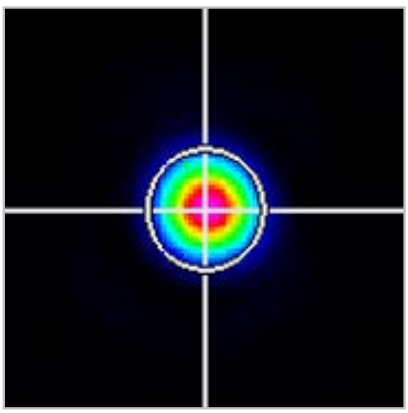
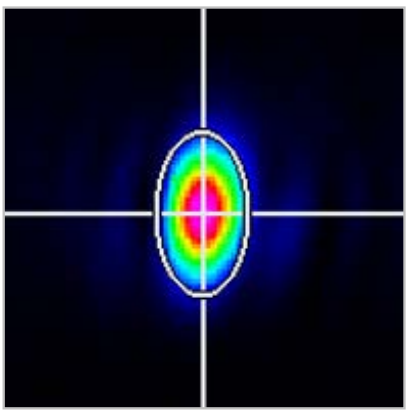


Fig. 4: Standard dot laser



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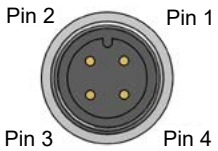
Specifications FP-FCL Laser Modules

Wavelength	405 nm, 450 nm, 520 nm, 635 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)
Modulation options	Dimmable, option D/DI: by 0 – 5V signal, active high/low, see figure 6 Digital, option M/MI: 0 –10 kHz (higher frequency on request), active high/low, see table 1
Operating voltage (VCC)	5 – 30 VDC (635 nm, 660 nm) 10 – 30 VDC (405 nm, 450 nm, 520 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
Minimum bending radius (fiber)	30 mm
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
Connector  Fig.5: M12 connector, laser side	M12 connector, 4-pin, Binder Series 713 Pin1: VCC Pin 2: Option M/MI or D/DI if ordered one of them, option D/DI if ordered both Pin 3: GND Pin 4: Option M/MI if ordered both modulation options Option: 2 m cable instead of M12 connector

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Modulation Options

FP-FCL lasers can either be ordered with digital modulation or analog power adjustment (dimmable). Both modulations are optional.
The digital option is called option 'M', power adjustment is called option 'D'.

The individual options are:

- M: digital modulation, active low
- MI: digital modulation (inverted), active high
- D: Dimmable, active low
- DI: Dimmable (inverted), active high

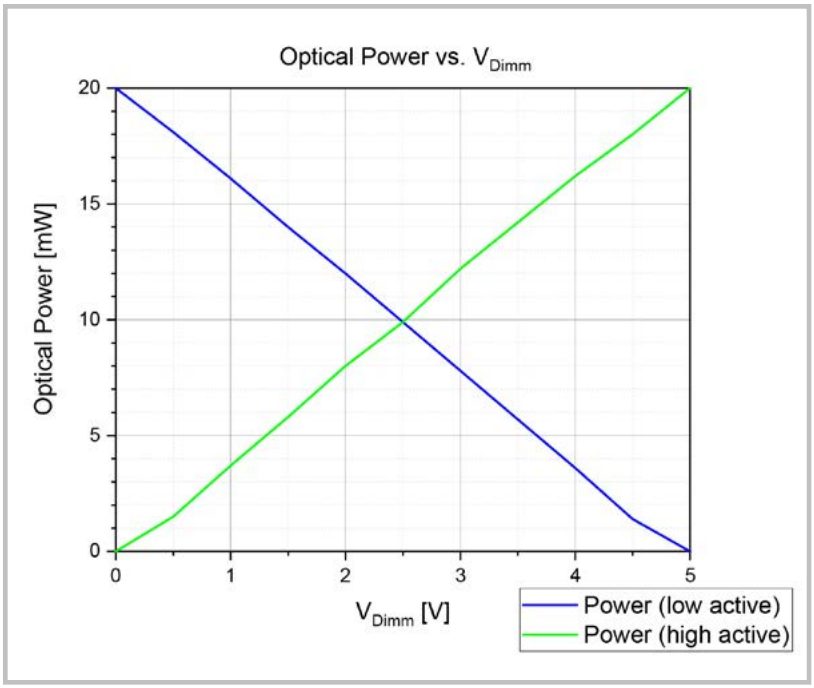

Fig. 6: Typical graph of an active high/active low logic for option D/DI (dimmable)

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Digital Modulation with External Trigger

$V_{Modulation}$	State	Laser	
		Low active	High active
–0.3 V to +0.8 V	Low	on	off
2.0 to 5.3 V	High	off	on

Table1: Definition of state of laser

For voltages of 0.8 V < $V_{Modulation}$ < 2.0 V, the state of the laser is not defined.
The frequency and duty cycle are determined by the external modulation voltage $V_{Modulation}$.

In order to obtain reasonable pulses, the following values should be taken into account:

- Maximum frequency f_{Max} = 3 MHz
- Minimum pulse width t_{ON_min} = 200 ns

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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 (350 – 700nm) NIR (650 – 1050nm) (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^2 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
Fiber connector	FC/PC

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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 √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)

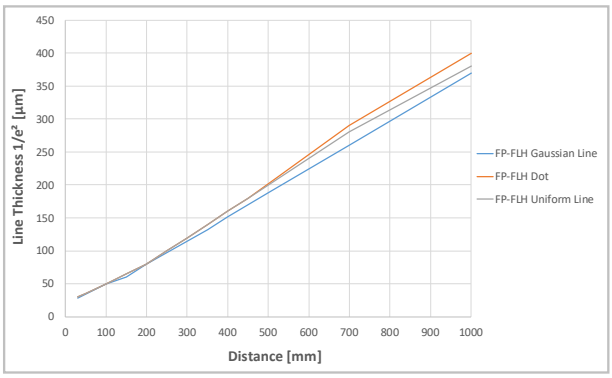


Fig. 8: Line thickness nearfield (P = 0…30 mW)

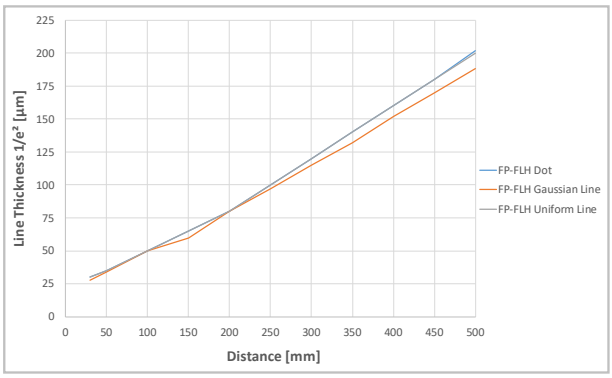


Fig. 9: Depth of focus farfield

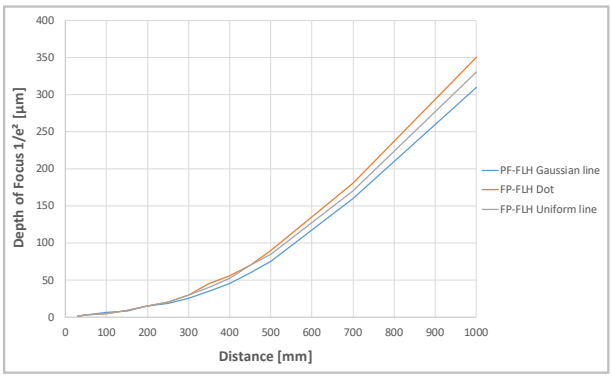
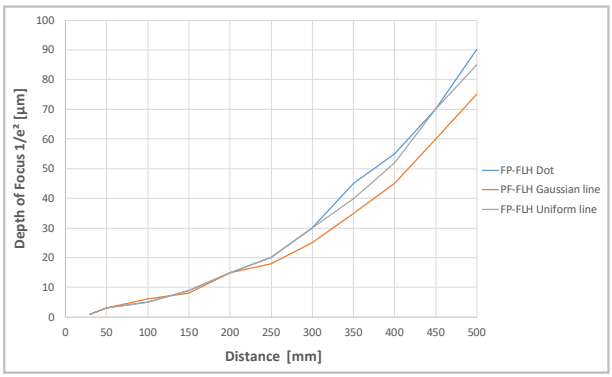


Fig. 10: Depth of focus nearfield



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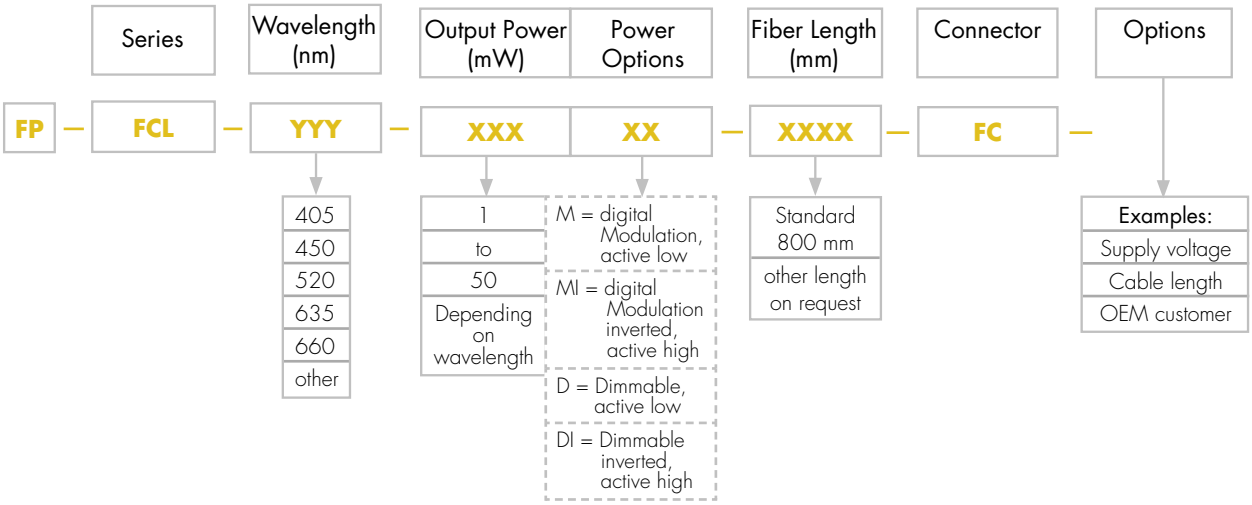
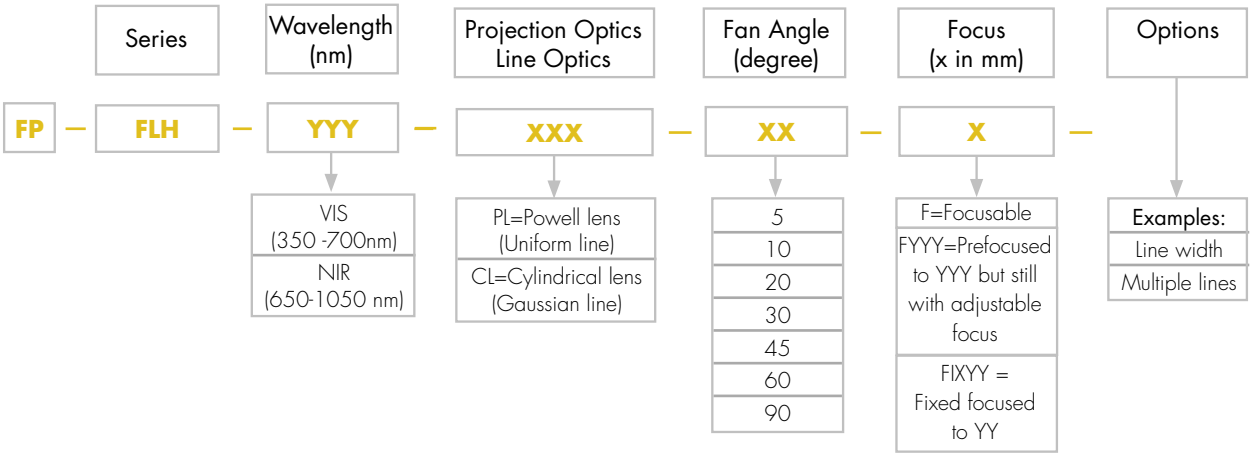
Ordering Code FLEXPOINT® Fiber Coupled Laser Modules and Optical Projection Heads

1. Laser (Fiber Coupled Laser)



2. Optical Projection Head (Fiber Laser Head)



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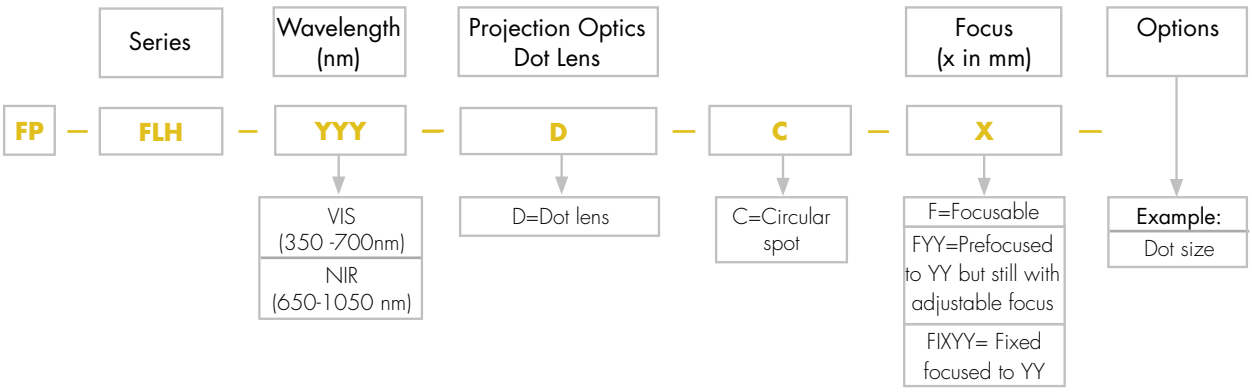


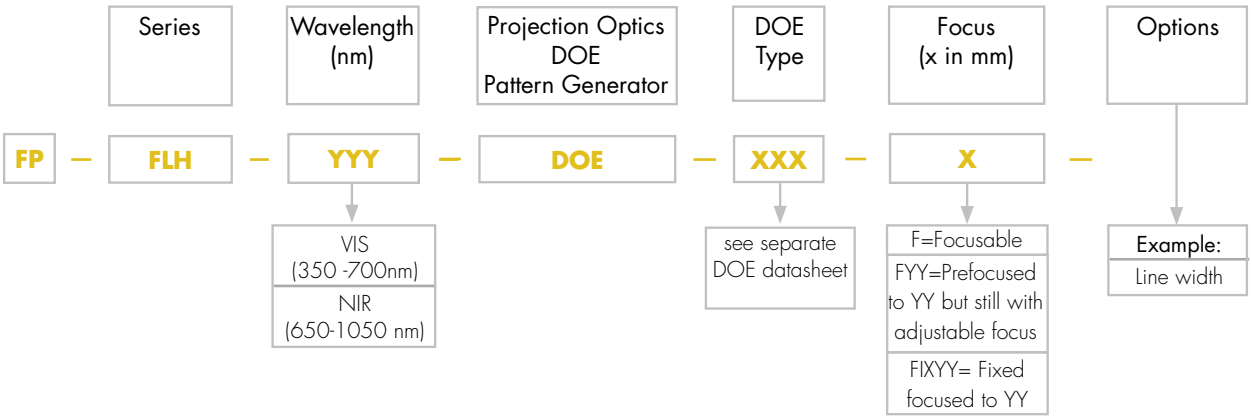
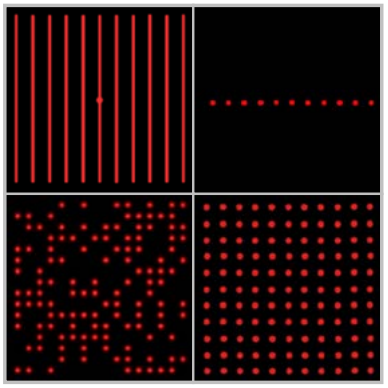


Fig. 11: Examples of DOE patterns



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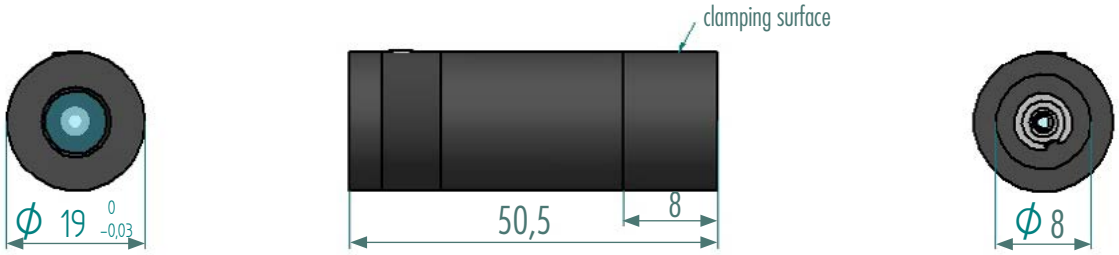
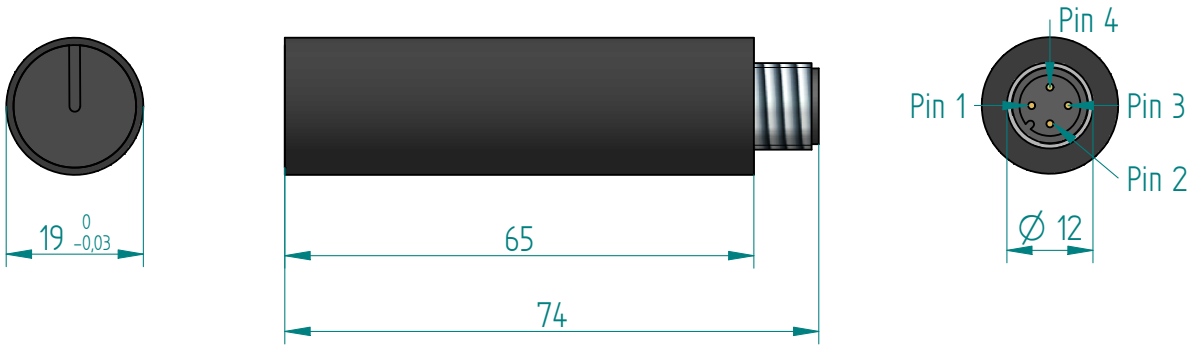
Housing Dimensions

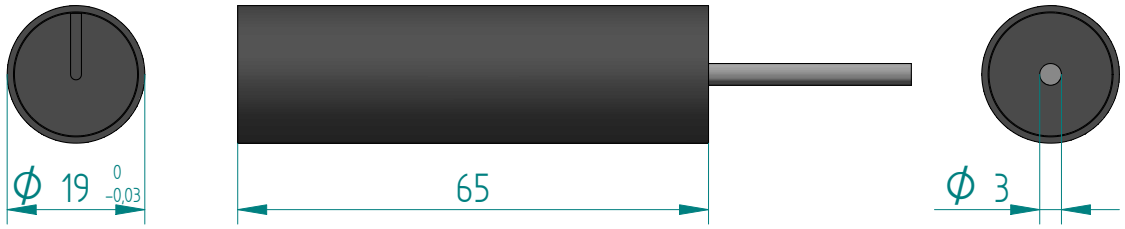
Optical Projection Head



Laser Module with M12 Connector



Laser Module with Cable (Option)



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