

Model: Z-FIBER

Fiber-coupled laser	Single mode	μ-Line	Max. power 40 mW	Integrated active cooling	M² ~1.05	5 - 30 VDC	IP 50
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High-end laser with active cooling

The structured light fiber laser series Z-FIBER has been developed for the most demanding applications in the market. Wherever an exceptional beam performance for high-resolution measurements or medical use is needed, the Z-FIBER series is the right choice. The user can choose from blue, green, red, and near-infrared wavelengths depending on the application requirements.

The projection quality is superior to any available free-space solution in the market. The laser along with its intelligent monitoring functions enables a high stability in performance. The integrated active cooling system supports an extended lifetime and stable operation. The laser can be integrated efficiently in a sophisticated machine vision, medical or life science setup due to its communication interfaces (RS-232 & I²C).

Highlights

- Single-mode fiber with FC/PC connector
- Unique line uniformity and μ-optics for thin lines (<20 μm)
- Red, green, blue and IR wavelengths
- Optical output power up to 40 mW
- M² ~1.05
- Analog and simultaneous TTL modulation up to 200 kHz
- Fail-safe for critical applications (e.g. medical)
- OEM-version without housing and TEC (PCB-version)

Applications

- 3D-Measurement
- Biophotonics
- Machine Vision
- Machine construction
- Medical
- Metrology
- Science & research

Order code

Z??	-	FSM	-	?	-	?	-	?	-	?
Power		Product name (Fiber/Single Mode)		Wavelength		G = housing		Fiber length		Optics

SYSTEM SPECIFICATION

Wavelength	nm	450 nm	520 nm	635-685 nm	785-830 nm
Wavelength tolerance	nm (typical)	±10 nm	-5 nm +10nm	±5 nm	±10 nm
Wavelength drift	nm (temperature stabilized, over total operating temperature)	<1 nm			
Output power	mW	≤15 mW	≤15 mW	≤40 mW	≤40 mW
Spacial mode	(typical)	Single transversal mode			
RMS noise	(20 Hz bis 20 MHz) (typical)	<0.5 %			
Peak-to-Peak Noise	(20 Hz bis 20 MHz) (typical)	<1 %			
Boresight error ⁽¹⁾	mrad (in x and y)	<3 mrad			
Pointing stability	µrad / °C	<3 µrad / K			
Power stability	(1 h)	< 1 % in steady state			
Start-up time	s	<5 s			
Laser operation mode		Power stabilized (integrated TEC)			

ELECTRICAL SPECIFICATION

Operating voltage	5 - 30 VDC
Operating current	Max. 3 A
Protection	Over temperature protection and LED pre-failure indicator, reverse polarity and transient protection (ESD, burst & surge)
Electrical isolation	Potential-free housing
Connection	M12 plug 4-pin, Sub-D plug 9-pin
Power consumption	<15 W
Communication interfaces	I ² C, RS-232

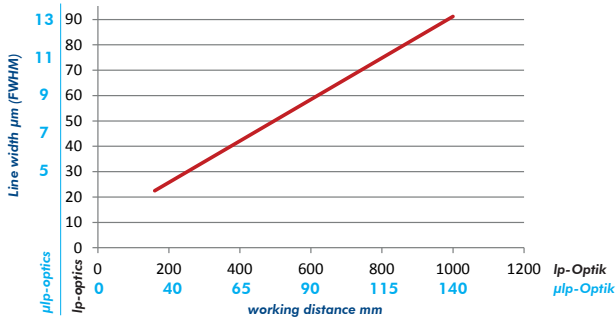
OPTICAL SPECIFICATION

Fan angles ⁽²⁾ µ-optics	Degrees	10°, 20° (homogeneous lines)
Fan angles ⁽²⁾ standard	Degrees	5°, 10°, 20°, 30°, 45°, 60°, 75° (homogeneous lines)
Line straightness ⁽³⁾	% (of line length)	<0.05 %
Line uniformity ⁽⁴⁾	% (typical)	±10 %
M ²		SM ~1.05
Dot		Circular
Focus range	mm	40 - 150 mm (µlp) and 150 - 10,000 mm (lp)
Classification		IEC 60825-1:2014 IEC 60601-2-22 (for laser classes 3R and 3B)

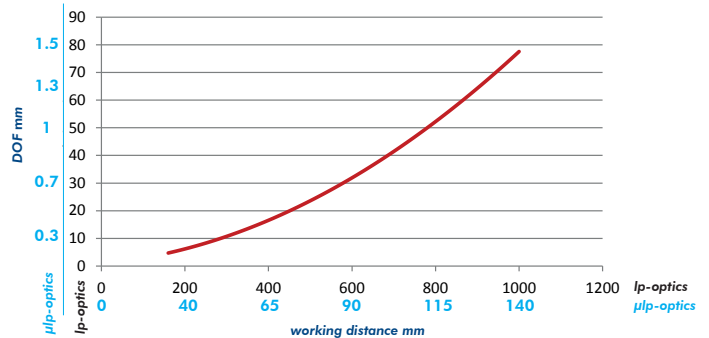
KEYNOTES

⁽¹⁾ Boresight error	Also known as pitch and skew.
⁽²⁾ Line length / fan angle	at >13.5 % I _{max}
⁽³⁾ Line straightness	Deviation from best fit line over the middle 80% of the line, for homogeneous lines
⁽⁴⁾ Line uniformity	Maximum relative optical power variation over the middle 80% of the line, for homogeneous lines and fixed focus

Line width vs. working distance*



DOF vs. working distance*



	Wavelength	Calculation factor for line width		Calculation factor for depth of focus	
		μlp**	lp**	μlp**	lp**
Blue	450 nm	1.00	1.00	1.00	1.00
Green	520 nm	1.10	1.10	1.10	0.80
Red	640 nm	1.20	1.20	1.20	1.00

- μlp** = μ-line Powell; very thin lines with smaller depth of focus (only available for fan angles 10° and 20° at working distances <150 mm)

- lp** = line Powell; standard setup for working distances >150 mm

The graphs above show the values for line width and depth of focus of a 450 nm laser. To get the values for a different wavelength the factor from the table above has to be multiplied by the values from the graphs.

Example: 450 nm laser focused at 90 mm working distance:

line width approx. 9 μm (@ μlp** optic); Depth of focus approx. 0.7 mm (values from the graphs)

Calculated: 640 nm laser focused at 90 mm working distance:

line width approx. 9 μm x 1.20 = 11 μm; Depth of focus approx. 0.7 mm x 1.20 = 0.85 mm

* Values in the graphs for homogenous line profiles

** Fan angle

SOFTWARE FEATURES

GUI
Serial communication
I²C and RS-232

Features (e.g.):

- Status query
- Output power control
- System configuration
- Digital Modulation
- Intensity control
- End of life indication

Classification

Software according to IEC 62304

DIGITAL MODULATION

Maximum frequency	Up to 200 kHz
Rise time (Mod High ⇒ 90%)	<650 ns
Fall time (Mod Low ⇒ 10%)	<350 ns
Signaling levels	VIL_max < +1.2 V VIH_min > +2.8 V
Operation range	0 - 30 VDC

ANALOG MODULATION

Maximum bandwidth	<100 kHz
Linearity	<5 % (from 5 % to 100 % of laser power)
Active range	0 - 2 VDC
Impedance	100 kΩ to internal VCC (3.3 V)
Operation range	0 - 30 VDC

ENVIRONMENTAL CONDITIONS

Operating temperature	°C / °F
Storage temperature	°C / °F
Humidity	%
Dissipated heat	W
Shock and vibration	

-10 °C up to +50 °C / -14 °F up to 122 °F (housed version)
0 °C up to +50 °C / 32 °F up to 122 °F (PCB-version)

-20 °C up to +80 °C / -4 °F up to +173 °F

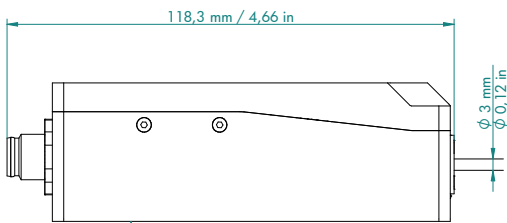
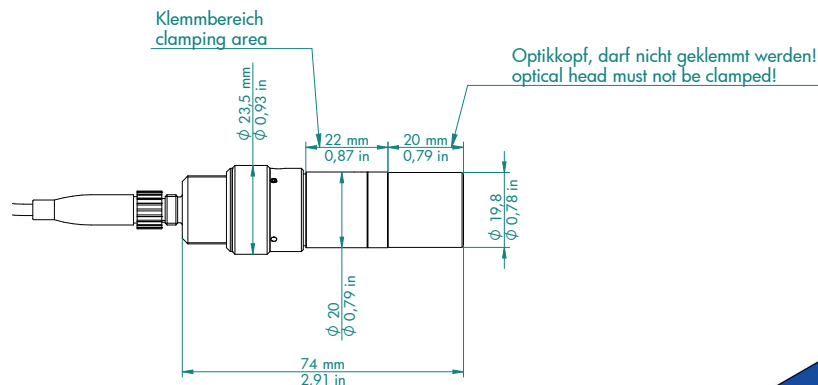
<90 %, non-condensing

Max. 15 W

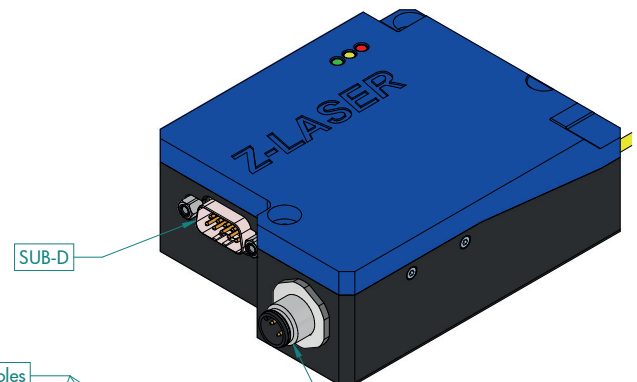
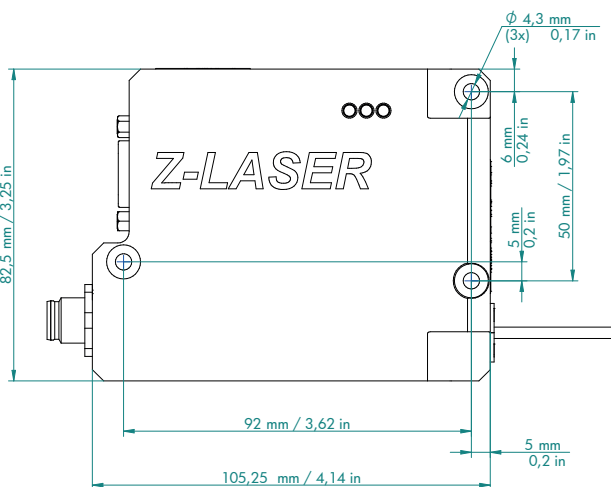
According to DIN EN 60068-2-6

MECHANICAL SPECIFICATIONS

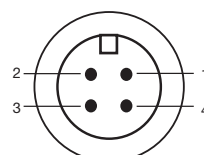
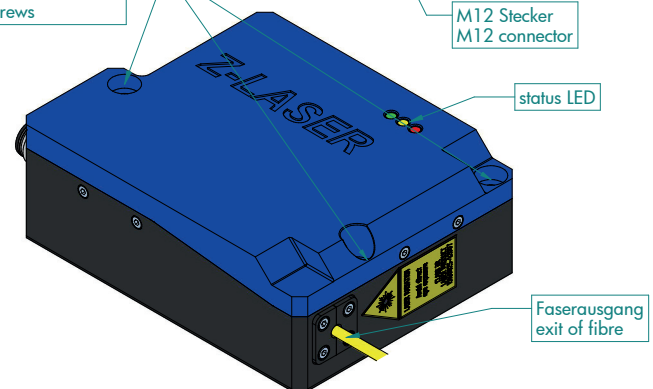
Weight		
Head:	g / lbs	60 g / 0.13 lbs
Electronics (housed version)	g / lbs	410 g / 0.9 lbs
Dimensions		
	mm / inch	Housing 105.25 x 82.5 x 36.6 mm / 4.14 x 3.25 x 1.44 in PCB 70 x 60 mm / 2.76 x 2.36 in (PCB-version) 450 mm / 17.72 in standard fiber length (others on request)
Diameter head Ø		
	mm / inch	20 mm / 0.79 in
Material		
		Aluminum (black anodized/blue-lacquered)
Protection class		
		IP 50
Mounting		
		20 mm mount



Diese Fläche auf einer Wärmesenke montieren
this surface needs to be mounted on a heat sink



Bohrungen für / m. holes
3x M4 Schrauben
3x M4 screws



M12 4-Pin: A-Coding Male Connector

X 2.1	5 - 30 VDC, 20 VA
X 2.2	Digital-Modulation TTL
X 2.3	GND
X 2.4	Analog-Modulation (0-2 VDC)