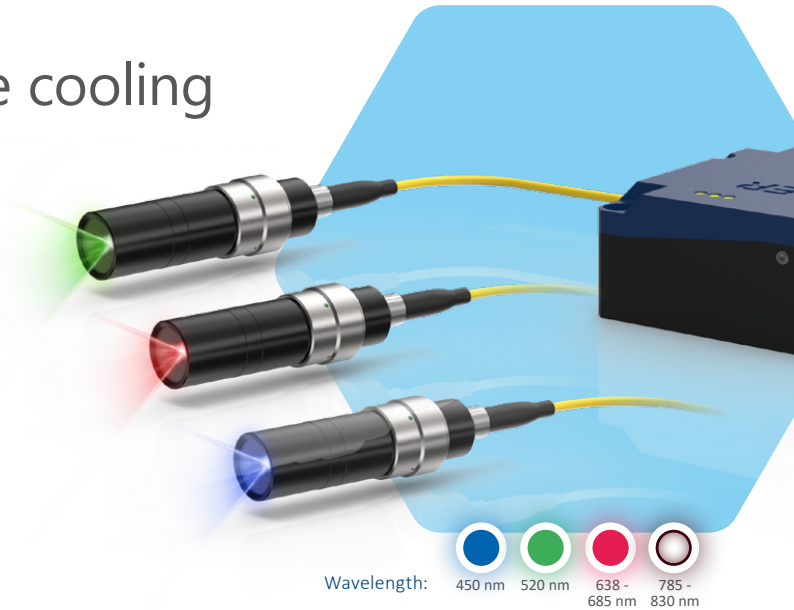


# Z-Fiber

## High-end laser with active cooling

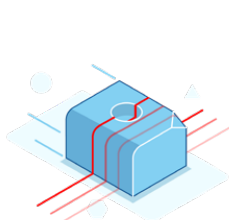
The structured light fiber laser series Z-FIBER has been developed for the most demanding applications in the market. Wherever an exceptional beam performance for high-resolution measurements or medical use is needed, the Z-FIBER series is the right choice. The user can choose from blue, green, red, 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 & I<sup>2</sup>C).

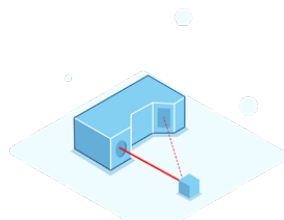


## Highlights

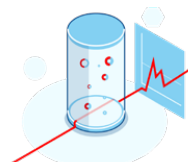
- Single-mode fiber with FC/PC connector
- Unique line uniformity and  $\mu$ -optics for thin lines (<20  $\mu$ m)
- Red, green, blue, and IR wavelengths
- Optical output power up to 40 mW
- M2 ~1.05
- Analog and simultaneous TTL modulation up to 200 kHz
- Fail-safe for critical applications (e. g. medical)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



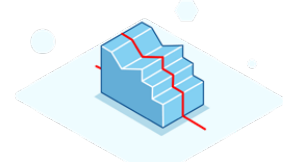
Machine Vision



Triangulation



Analytics



3D-Measurement

### Order Code

Z??	FSM	?	?	?	?
Power	Product family Size of head	Electronics	F-Focusable	Wavelength	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	≤ 20 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 (typical)	<3 mrad			
Pointing stability	μrad / °C	< 10 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 <sup>2</sup> C, RS-232

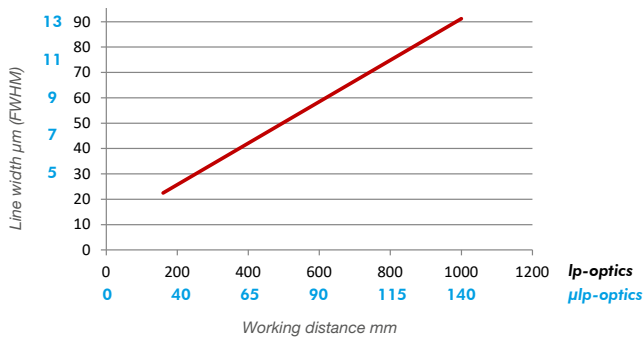
## Optical specification

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 <sup>2</sup>		SM ~1.05
Dot		Circular
Focus range	mm	40 - 150 mm (μp) and 150 - 10,000 mm (lp)
Classification		IEC 60825-1:2014 IEC 60601-2-22 (for laser classes 3R and 3B)

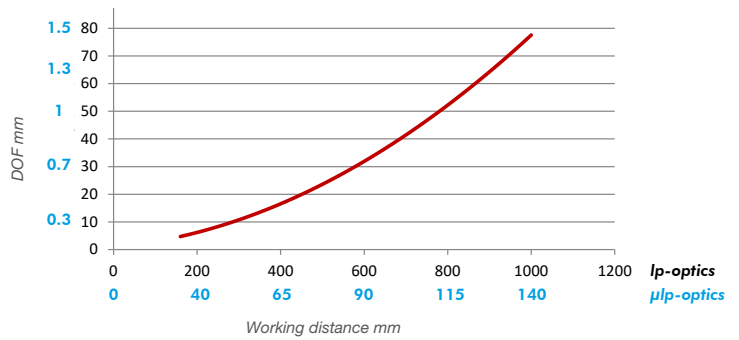
## Keynotes

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

## Line width vs. working distance\*



## DOF vs. working distance\*



Wavelength	Calculation factor for line width		Calculation factor for depth of focus	
	$\mu\text{lp}^{**}$	$\text{lp}^{**}$	$\mu\text{lp}^{**}$	$\text{lp}^{**}$
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

-  $\mu\text{lp}^{**}$  =  $\mu$ -line Powell; very thin lines with smaller depth of focus (only available for fan angles 10° and 20° at working distances < 150 mm)

-  $\text{lp}^{**}$  = 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  $\mu\text{m}$  (@  $\mu\text{lp}^{**}$  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  $\mu\text{m}$  x 1.20 = 11  $\mu\text{m}$ ; Depth of focus approx. 0.7 mm x 1.20 = 0.85 mm

\* Values in the graphs for homogenous line profiles

\*\* Fan angle

## Software

GUI  
Serial communication  
I<sup>2</sup>C 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 $\Rightarrow$ 90%)	< 650 ns
Fall time (Mod Low $\Rightarrow$ 10%)	< 350 ns
Signaling levels	V <sub>L_max</sub> < +1.2 V V <sub>H_min</sub> > +2.8 V
Operation range	0 - 30 VDC

## Analog modulation

Maximum bandwidth	< 100 kHz
Linearity	< 5 % (from 10 % to 100 % of laser power)
Active range	0 - 2 VDC
Impedance	100 k $\Omega$ 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

-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

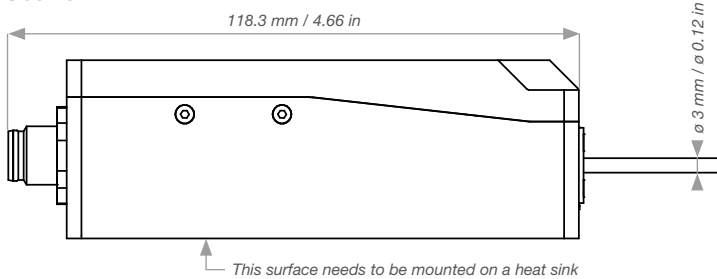
< 90 %, non-condensing

< 15 W

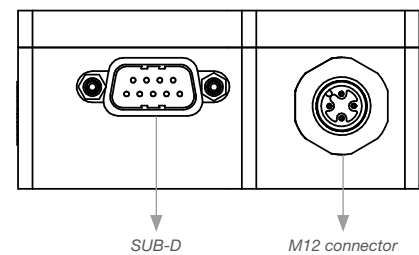
## Mechanical Specifications

<b>Weight</b>		
Head	g / lbs	60 g / 0.13 lbs
Electronics (housed version)	g / lbs	410 g / 0.9 lbs
<b>Dimensions</b>	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) Fiber length 450 mm / 17.72 (plus FC / PC connector)
<b>Diameter head <math>\phi</math></b>	mm / inch	20 mm / 0,79 in
<b>Material</b>		Aluminum (black anodized)
<b>Protection class</b>		IP 50
<b>Mounting</b>		20 mm mount

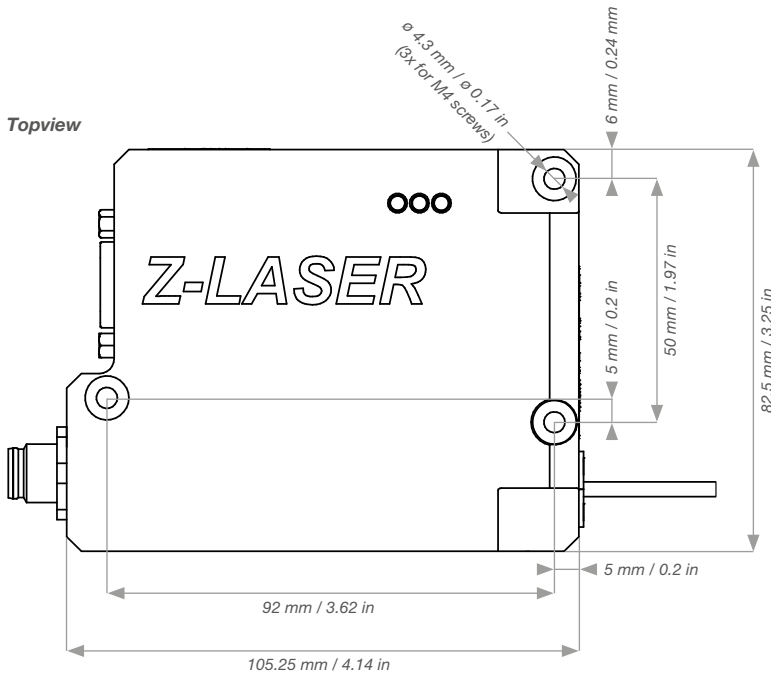
Side view



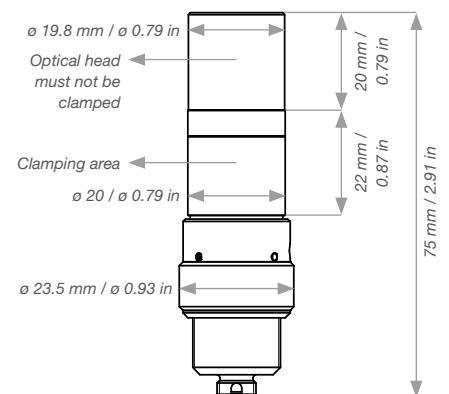
Rear view



Topview



Optical head



## 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)

