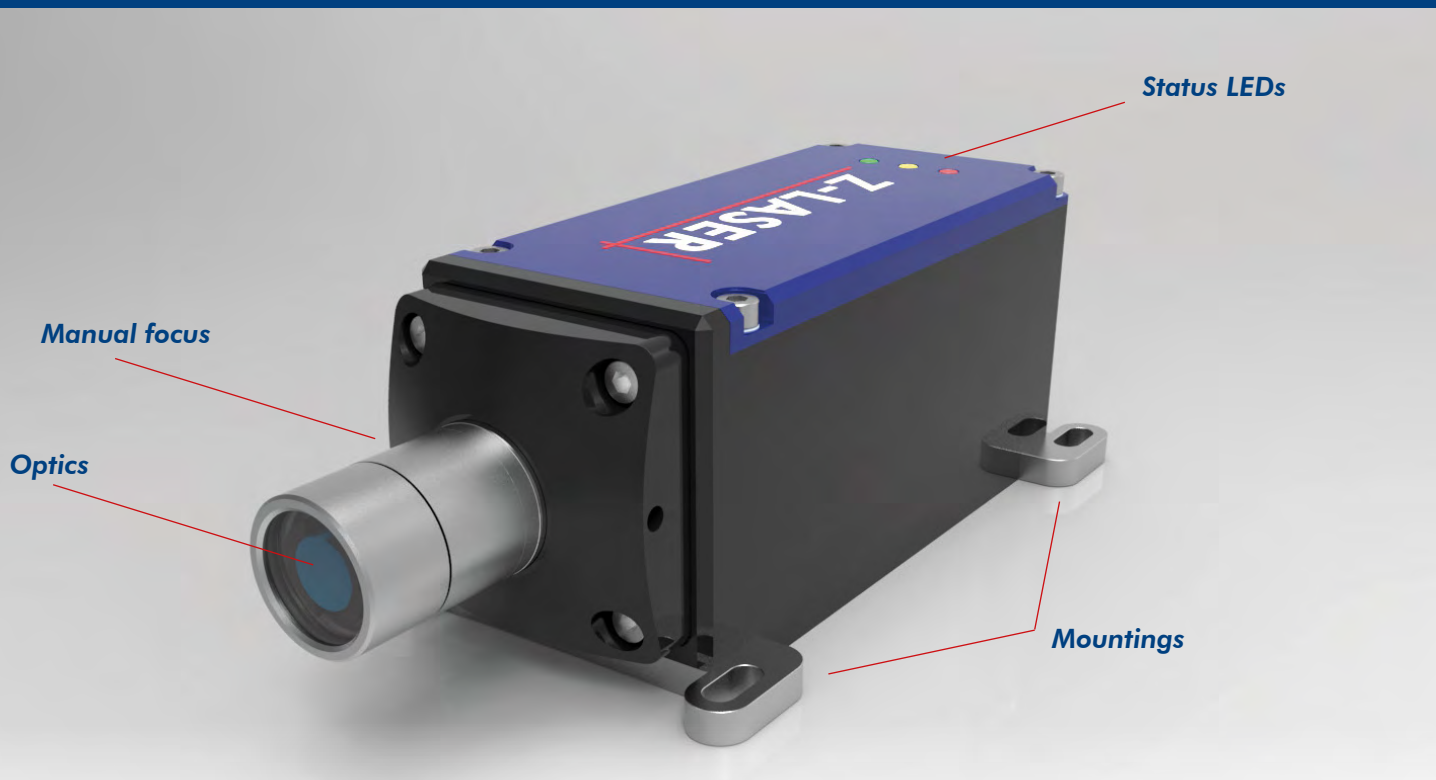
Z-LASER
Intelligent Solutions in Light



Max. power 1.7 W	IP 67	Diode laser	Boresight error <1 mrad	Focusable	Active, integrated cooling	12 - 24 VDC	Serial communication

Compact high-performance laser

The structured light laser series ZQ1 has been developed for the most demanding measurement applications in the market. Wherever a high output power, exceptional beam performance and industrial-suited design is needed, the ZQ1 series is the right choice. The user can easily adjust the right working distance for the application with its manual focus option.

The laser along with its intelligent monitoring functions enables a high stability in performance also in rough environments. The integrated active cooling system keeps the laser diode at a constant temperature. Due to its communication interfaces (RS-232 & I²C) the laser can be integrated efficiently in a sophisticated machine vision setup.

HIGHLIGHTS

- Repeatable high product quality due to automated production process
- Optical output power up to 1,700 mW (IR)
- Standard wavelength from 450 – 808 nm
- Manually focusable
- Active cooling integrated
- TTL modulation up to 200 kHz
- Analog intensity control
- IP 67
- Certified according to the railway standard: DIN EN 61373:2011-04
- PC control via Graphical User Interface (GUI)

APPLICATIONS

Machine Vision

3D-Measurement

Tire industry

Metrology

Road and rail inspection

Metal inspection

Order code

Z??	-	Q1	-	?	-	?	-	?
Power		Product name		F =focussable		Wavelength		Optics

STEMMER IMAGING

SYSTEM SPECIFICATION

		450 nm	638 nm	670 nm	808 nm
Wavelength	nm				
Wavelength tolerance	nm (typical)	±10 nm	±6 nm	±10 nm	±4 nm
Wavelength drift	nm (temperature stabilized, over total operating temperature)	<1 nm			
Output power	mW	≤1300 mW	≤500 mW	≤400 mW	≤1700 mW
Spatial mode		Multi Transverse Mode			
RMS noise	(20 Hz to 20 MHz)	<0,5 %			
Peak-to-Peak Noise	(20 Hz to 20 MHz)	<1 %			
Boresight error [1]	mrad (in x and y)	<1 mrad			
Line orientation [2]	mrad	<10 mrad			
Pointing stability over temp.	µrad / K	<6 µrad / K			
Emission point height [3]	mm	28.3 mm			
Long-term power stability	(24h)	<1 %			
Long-term power stability	(over lifetime)	<5 %			
Warm-up time	min	<2 min			
Laser operation mode		APC			

ELECTRICAL SPECIFICATION

Operating voltage		12 - 24 VDC
Operating current	(max. at 25 °C)	<4 A
Protection		Over temperature protection and LED pre-failure indicator e.g. end of life. Reverse polarity and transient voltage protection (ESD, burst & surge)
Electrical isolation		Connection to GND through 1 MΩ
Connection		5-pin M12 plug; 8-pin M12 plug (communication)
Power consumption		<40 W
Communication interfaces		I²C, RS-232

OPTICAL SPECIFICATION

Fan angles [4]	Degrees (at >13,5 % I_{max})	5°, 10°, 20°, 30°, 45°, 60°, 75°, 90° (homogeneous line profile)
Line straightness [5]	% (of line length)	<0.1 %
Line uniformity [6]	% (typical)	<25 %
Dot		Point elliptical
DOE		Multi line, crosses, grids, etc.
Focus range	mm	>100 mm

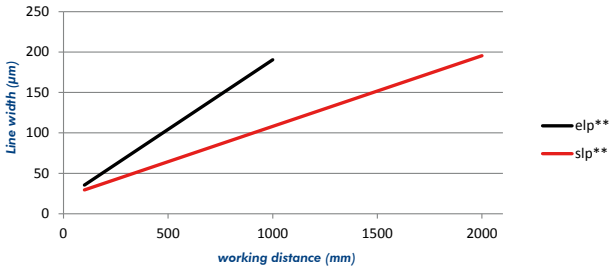
KEYNOTES

[1] Boresight error	Also known as squint angle
[2] Line orientation	Also known as roll, with reference to the ground plate
[3] Emission point height	Offset of optical axis to ground plate
[4] Line length / fan angle	Fan angle is the angle of the projection taken at the 80% clip. Line length is the physical length at the given working distance taken at 80% clip
[5] Line straightness	Deviation from best fit line, for homogeneous lines
[6] Line uniformity	Maximum relative optical power variation over medially 80% of the line, for homogeneous lines

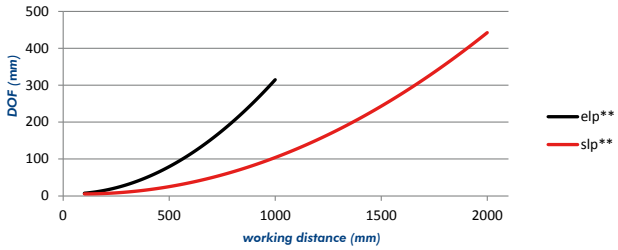
$$\Delta = \Delta 1 + \Delta 2$$
$$S = (\Delta / L) \times 100$$

$$\frac{P_{high} - P_{low}}{P_{high} + P_{low}}$$

Line width vs. working distance*



DOF vs. working distance*



Wavelength		Line width		Depth of focus	
		elp**	slp**	elp**	slp**
Blue	450 nm	0,90	1,03	1,03	1,78
Red	638 nm	0,98	0,90	0,90	0,98
Red	670 nm	1,00	1,00	1,00	1,00
IR	808 nm	1,16	1,14	1,14	1,24

Explanation to the calculation:
- slp** = standard line Powell; standard setup with medium line width, depth of focus, and best line homogeneity
- elp** = extended line Powell; lines with advanced depth of focus and thicker lines

The graphs above show the values for line width and depth of focus of a 670 nm laser. To get the values for a different wavelength the factor from the table has to be multiplied by the values from the graphs.

Example: 670 nm laser focused at 1 m working distance:
line width appox. 108 µm; Depth of focus approx. 104 mm (@ slp** optic, values from the graphs)

Calculated: 450 nm laser focused at 1m working distance:
line width ca. 108 µm x 1,03 = 111 µm; Depth of focus approx. 104 mm x 1,78 = 185 mm

* Values in the graphs for homogenous line profiles.

** Fan angle: 5° - 90°

SOFTWARE

Serial communication I²C and RS-232	Features (e.g.): - Status query - Output power control - System configuration - Digital Modulation - Intensity control - End of life indication

DIGITAL MODULATION

Maximum frequency	up to 200 kHz
Rise time (Mod High ➡ 90 %)	<500 ns
Fall time (Mod Low ➡ 10 %)	<350 ns
Signaling levels	VIL_max < +1.1 V VIH_min > +2.5 V
Operation range	0-30 VDC

ANALOG MODULATION

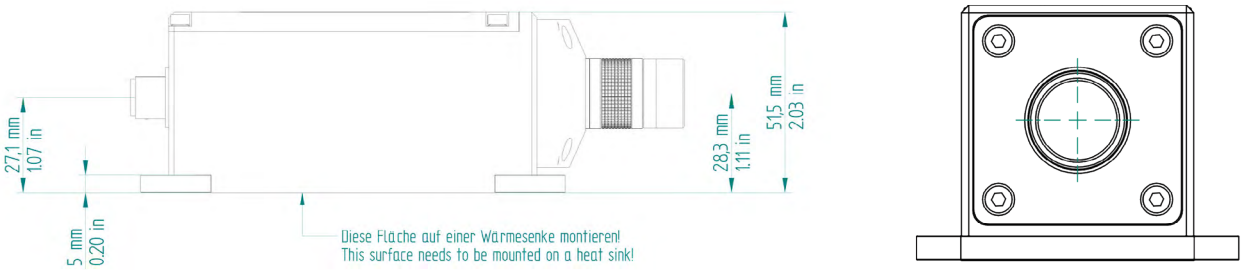
Maximum bandwidth	<10 Hz
Linearity	<5 % (from 5 % to 100 % of laser power)
Active range	0-2 VDC
Operation range	0-30 VDC

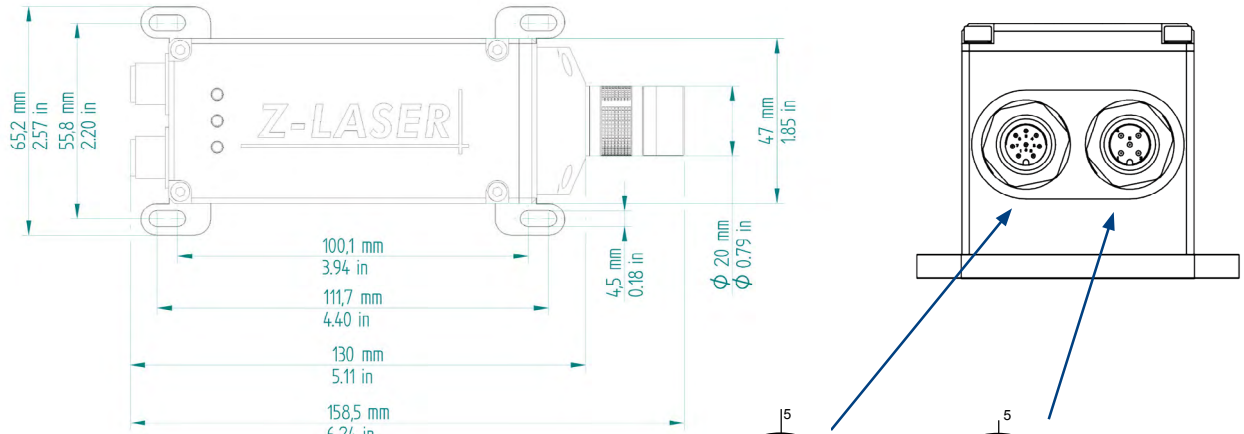
ENVIRONMENTAL CONDITIONS

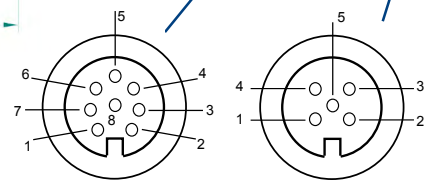
Operating temperature	°C / °F	-10 °C to +50 °C / 14 °F to +122 °F
Storage temperature	°C / °F	-40 °C to +85 °C / -40 °F to +185 °F
Humidity	%	<90 %, non-condensing
Dissipated heat	W	Max. 35 W
Shock and vibration		According to DIN EN 61373:2011-04 Railway applications - Rolling stock equipment - Shock and vibration tests (IEC 61373:2010)

MECHANICAL SPECIFICATIONS

Weight	kg / lbs	0,69 kg / 1.52 lbs
Dimension	mm / inch	158,5 x 65,2 x 51,5 mm / 6.24 x 2.57 x 2.07 in
Diameter head Ø	mm / inch	20 mm / 0.79 in
Material		Aluminum (black anodized/blue-lacquered), Optic head: stainless steel
Protection class		IP 67
Mounting		4x M4 screws







M12 8-Pin: A-Coding Male Connector

According to IEC 61076-2-101

X 2.1	RX IN (RS-232)
X 2.2	TX OUT (RS-232)
X 2.3	SCL (I²C)
X 2.4	SDA (I²C)
X 2.5	RDY FAIL OUT
X 2.6	System Enable OUT
X 2.7	GND
x 2.8	System Enable IN

M12 5-Pin: A-Coding Male Connector

According to IEC 61076-2-101

X 1.1	12-24 VDC, 40 VA
X 1.2	Digital-Modulation TTL
X 1.3	GND
X 1.4	Analog-Modulation (0-2 VDC)
X 1.5	Fail out (open-drain)

CE CE-Conformity according to the directives 2004/108/EC and 73/23/ECC. Subject to technical change, May 2017