



Product catalog for Machine Vision

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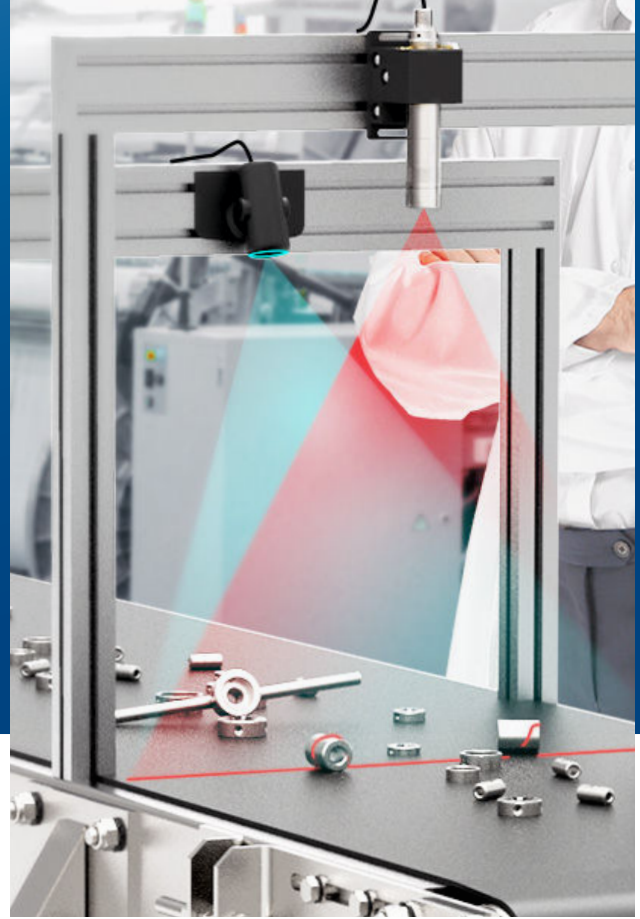
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Triangulation

With the increasing automation and acceleration of manufacturing processes and simultaneously rising quality standards, focus is shifting to optical 3D measuring systems. In applications where the geometry of an object is relevant to a measurement, laser triangulation offers significant advantages over other (classic) 2D inspection methods.

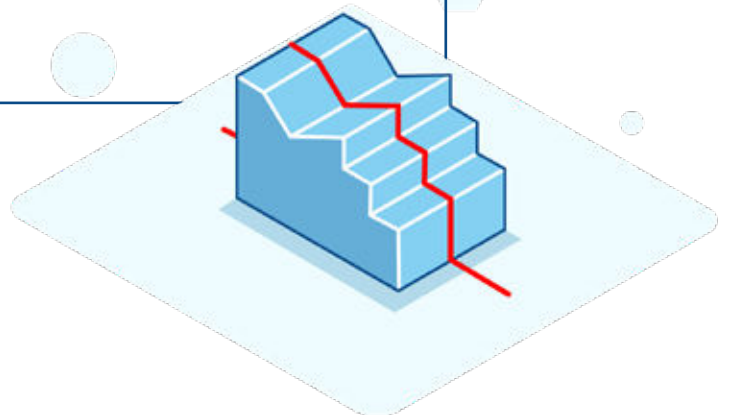


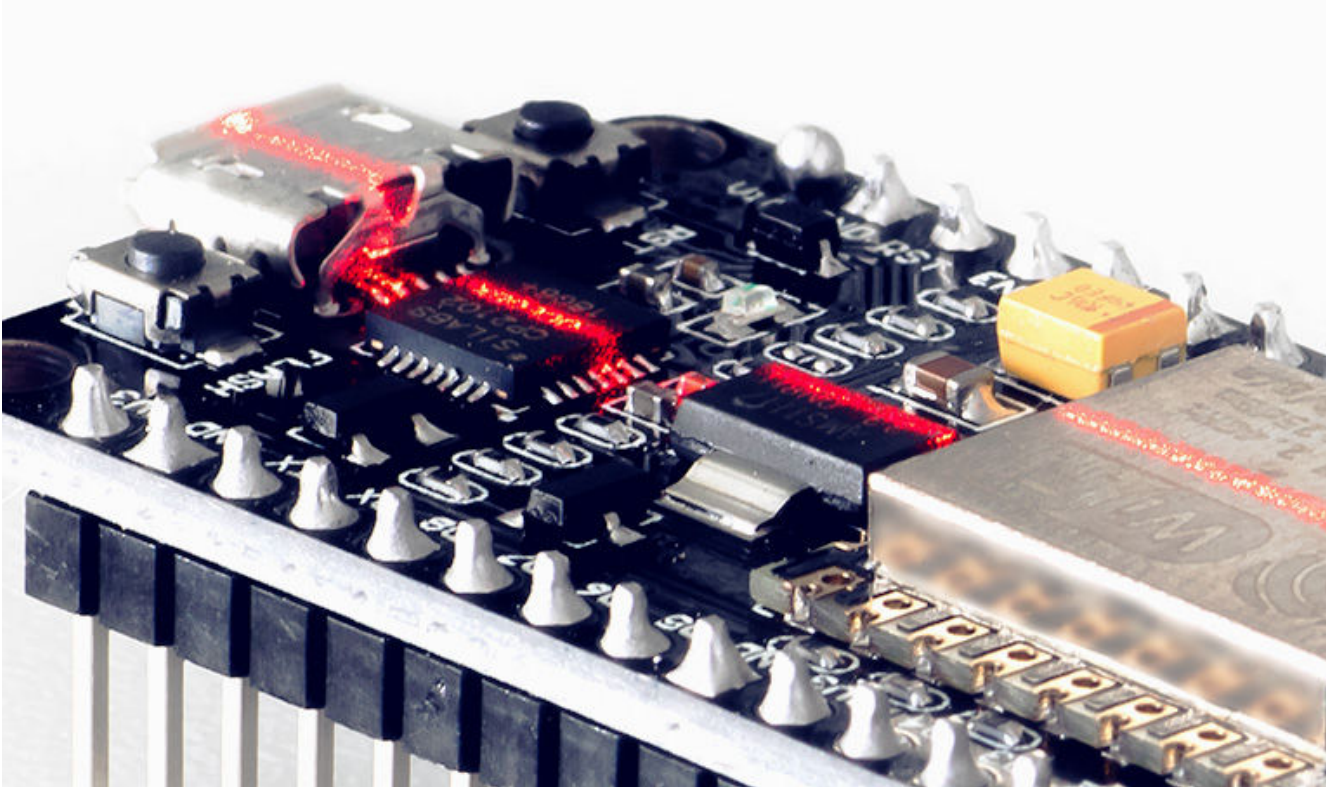
Analyze objects

Laser triangulation is now established as a standard measurement technique. It involves the use of a laser to generate a homogeneous line. This line is projected onto an object and analyzed by an area scan camera at a defined angle. Changes in the laser line due to the object's surface are projected onto the camera sensor.

3D profile measurement

This profile can be translated into height information. 3D data of the complete object is obtained through the constant motion during the measurement and can be compared with the reference or requirement.





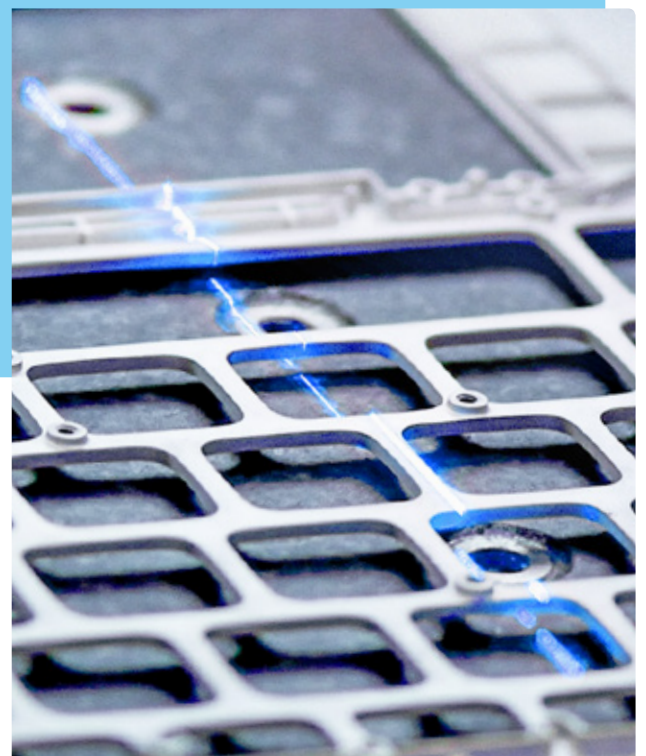
PCB inspection

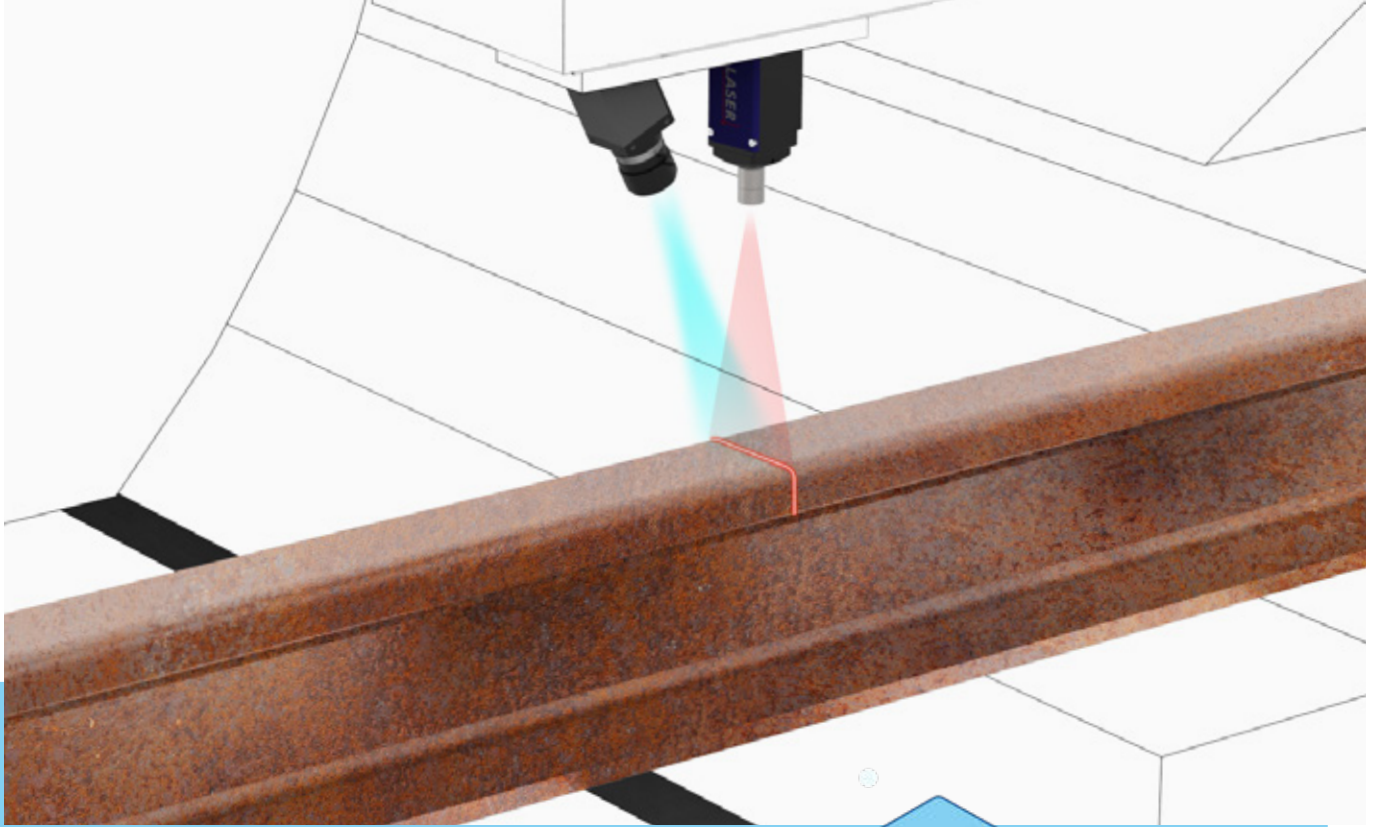
In particular with PCB inspection or comparable applications in which the measured objects are very small, extremely high demands are placed on the projection quality. This application is mainly used for checking component presence and position as well as performing solder

paste inspections. Very fine lines enabling resolutions of less than $10\ \mu\text{m}$ represent one important aspect. With the simultaneously high peak power of the thin lines, the very high inspection speeds essential to mass production can be achieved.

Especially in PCB inspection, the materials pose tremendous challenges to the measuring systems.

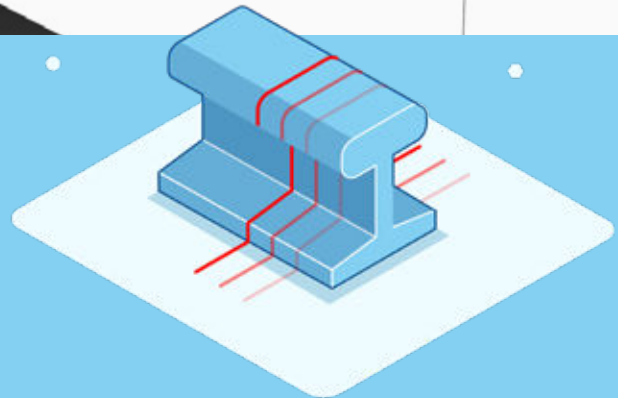
Both strongly absorbing materials (e.g. IC housings) and highly reflective metal materials (e.g. pins) must be reliably surveyed. It is precisely for these applications that blue lasers offer the best compromise between very thin and clean line projections and good visibility on shiny surfaces.





Rail inspection

Laser triangulation is a proven technique for rail inspection. Continuous quality inspections are required to keep track of the rails abrasion. Cracks, flaking, and chipping can lead to serious problems and major accidents.

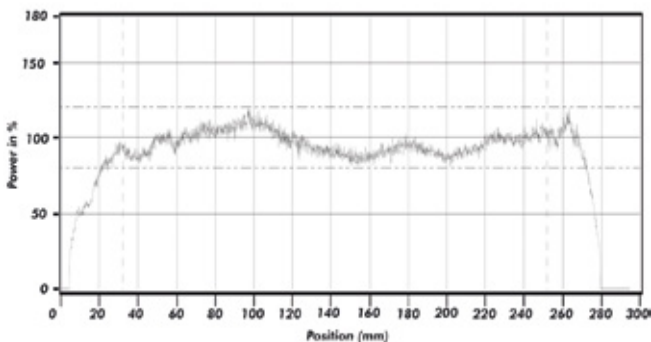


High power lasers with uniform lines are used in combination with two or more cameras, to generate data of the condition of tracks. This construct is placed on a maintenance train which collects data along the track. This configuration allows the direct measurement of many different types of rail defects by simultaneously acquiring high resolution 3D and intensity data.

This system is married to sensors, custom filters, GPS-coordinates, and camera images of the surrounding to synchronize the data. Z-LASER can support these applications with its structured light laser series. The laser 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 laser along with its intelligent monitoring functions enables a high stability in performance also in rough environments.

It is IP67 rated and shock and vibration proof according to DIN EN 61373:2011-04, Cat 2. The integrated active cooling system keeps the laser diode at a constant temperature. The laser can be integrated efficiently in a sophisticated machine vision set-up, due to its communication interfaces (RS-232 & I2C). The user can easily adjust the right working distance for the application with its manual focus option.





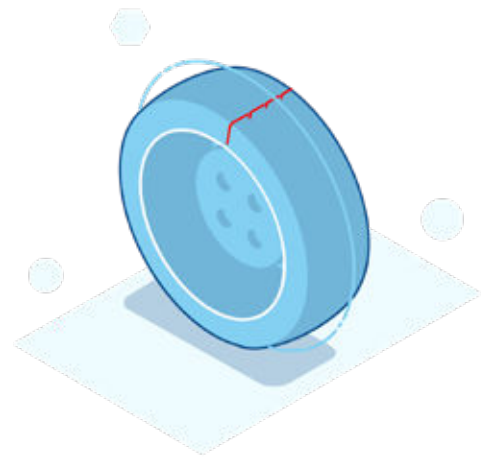
Tire applications

A tire profile depth of at least 1.6 mm is compulsory in Germany. However at a 3 mm tire profile depth, the tire reaches an efficiency of only approx. 70%. Therefore, more and more garages are installing automatic measurement stations.

This is based on a laser triangulation system which can measure the profile depth quickly, precisely and regardless of the lack of contrast, while the car drives past the 3D scanner.

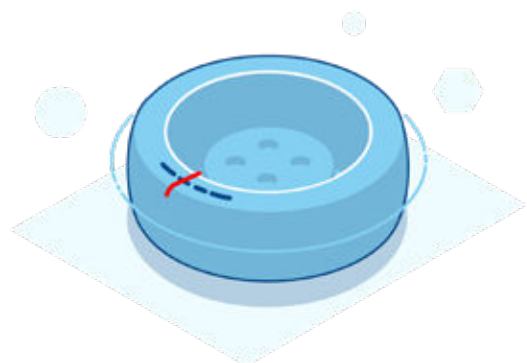
Tire Profile Measurement

The 3D scanner projects a highly precise laser line onto the tire tread which is detected by the camera. As the tire moves through the laser line, the laser line changes shape and interruptions of the projected laser line occur. These interruptions are then computed into a height profile. The measurement can be performed even in running traffic, thanks to the strong light intensity of the laser.



DOT-Code-Reading

With the help of 3D laser profilometry, coded or embossed numbers and letters on the tire wall can be read. This capability allows for automatic detection of the tire type and important serial or batch numbers. This makes it that much easier to automate subsequent quality inspection steps and any other processing needed.



Products



—• Laser

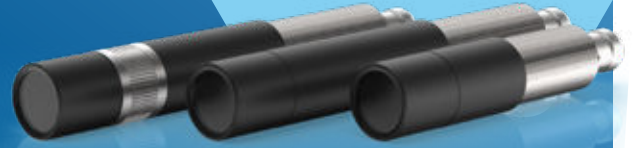
- ZM18 - Product Family 8
- ZX20 - Product Family 9
- ZXS - OEM 10
- ZXS - Product Family 12
- ZX10-TTL 13
- Z-Fiber 14
- ZQ1 15

Product Family ZM18

The perfect allrounder

The ZM18 family is a long-proven product line that is useful as a positioning aid and in image processing applications. With a Ø20mm laser head and an M18 thread, they are easy to mount and can be used in a variety of ways.

The ZM18 lasers are available in blue, green, red, or infrared wavelengths and offer various electronic features. The modular product selector allows the assembly of product features either for a standard positioning task as well as for a high-end machine vision application with demands towards the communication and modulation of the laser. An easy-to-use focusing mechanics, optical output power up to 200mW, and the IP67 water and dust protection are standard features of this product family.



- Manual or fixed focus
- TTL modulation up to 500 kHz
- Analog intensity control
- Optical output power up to 200 mW
- Wavelengths from 405 - 830 nm
- Industrial standard
- IP 67

Specifications

Wavelength	nm
Wavelength tolerance	nm (typical)
Wavelength drift	nm / K (typical)
Output power	mW
Operating voltage	
Operating current	(max. at 25°C)
Protection	
Fan angles	Degrees
Further projections	
Focus range	mm
Electronic versions	
Digital modulation	
Analog modulation	
Weight	g/lbs
Length	mm/in
Diameter head Ø	mm/in
Operating temperature	°C / °F

405-450	520	532	635-685	785-830
±10	-5 +10	± 1	±10	±4
0,06	0,06	0,06	0,25	0,25
≤160	≤40	≤40	≤120	≤200
5 - 30 VDC	5 - 30 VDC	5 - 30 VDC	5 - 30 VDC	5 - 30 VDC
<300 mA	<300 mA	<300 mA	<400 mA	<500 mA

Over temperature protection and LED pre-failure indicator, reverse polarity and transient protection (ESD, burst & surge), Potential-free housing

5°, 10°, 20°, 30°, 45°, 60°, 75°, 90° (homogeneous lines)
3°, 5°, 10°, 15°, 20°, 30°, 90° (Gaussian line profile)

Point elliptical, point circular, Multi line, crosses, grids, etc.

100 mm up to 10.000 mm (or customized fixed focus available)

B	B3	S3	H3
na	na	<500 kHz	<200 kHz
na	na	<10 Hz	<10 Hz
75 g / 0.17 lbs	75 g / 0.17 lbs	85 g / 0.19 lbs	90 g / 0.20 lbs
108 mm / 4,25 in 136 mm (532nm)	108 mm 4,25 in	128 mm 5,04 in	138 mm 5,43 in

20 mm / 0.79 in

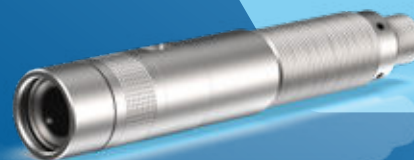
-10 °C to +50 °C / 14 °F to +122 °F

Product Family ZX20

The high-precision laser module

The structured light laser ZX20 sets new standards for machine vision illumination due to its automated production in which all optical components are aligned by a high-accuracy robot.

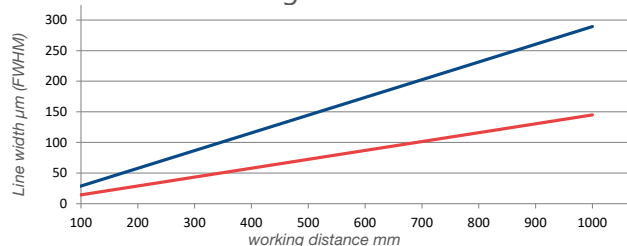
The ZX laser reaches an unrivalled accuracy with its boresight error of less than 0.8 mrad. The user can choose from IR, red, green, or blue wavelengths depending on the application and material to be inspected. The right working distance can easily be adjusted with the tool-free manual focus option. The ZX20 with its industrial-suited design and stable performance works perfectly as an integrated module in machine vision applications, sensors, or processing machines.



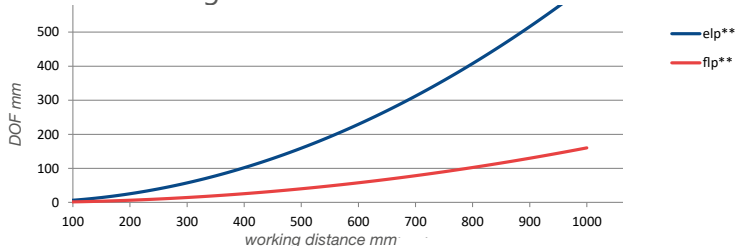
- IP 67
- Repeatable product performance due to automated production processes
- Highest reproducibility of beam quality
- Optical output power up to 200 mW
- Wavelengths from 405 – 830 nm
- Manually focusable (optional)
- TTL modulation up to 400 kHz
- Analog intensity control
- I²C, RS-232 (5 V)
- Stainless steel housing

Specifications

Line width vs. working distance



DOF vs. working distance



Wavelength	nm
Wavelength tolerance	nm (typical)
Wavelength drift	nm / K (typical)
Output power (elp)	mW
Output power (flp)	mW
Boresight error	mrad (typical)
Operating voltage	
Protection	
Communication interfaces	
Fan angles	Degrees
Further projections	
Focus range	mm
Digital modulation	
Analog modulation	
Operating temperature	°C / °F

405 nm	450 nm	520 nm	635-685 nm	785 nm	830 nm
±10 nm	±10 nm	-5 nm +10 nm	±10 nm	±10 nm	±4 nm
0,06 nm	0,02 nm	0,06 nm	0,25 nm	0,25 nm	0,25 nm
≤ 160 mW	≤ 60 mW	≤ 40 mW	≤ 100 mW	≤ 80 mW	≤ 200 mW
≤ 120 mW	≤ 45 mW	≤ 30 mW	≤ 90 mW	≤ 60 mW	≤ 150 mW

Boresight error					
< 0.8 mrad (fixed focus)					
Operating voltage					
9 - 30 VDC	9 - 30 VDC	9 - 30 VDC	5 - 30 VDC	5 - 30 VDC	5 - 30 VDC

Over temperature protection and LED pre-failure indicator, reverse polarity and transient protection (ESD, burst & surge), potential-free housing

I²C, RS-232 (5 V)

5°, 10°, 20°, 30°, 45°, 60°, 75°, 90° (homogeneous lines)
3°, 5°, 10°, 15°, 20°, 30°, 90° (Gaussian line profile)

Point elliptical, Multi line, crosses, grids, etc.

100 mm up to 10,000 mm (or customized fixed focus available)

up to 400 kHz

< 10 Hz

-10 °C to +50 °C / 14 °F to +122 °F

Length	mm / inch
Diameter head Ø	mm / inch

ZX20	ZX20-F
97 mm / 3.82 in (fix focus)	116 mm / 4.57 in
20h7 mm / 0.79 in	

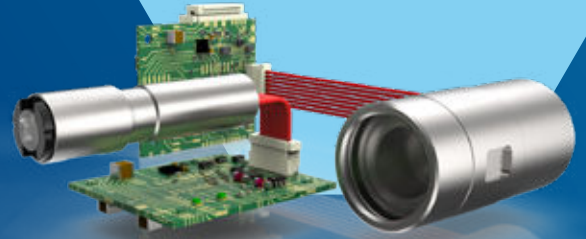
ZXS-OEM

The flexible laser module

The structured light laser ZXS sets new standards for machine vision illumination due to its automated production in which all optical components are aligned by a high-accuracy robot.

The ZXS laser reaches an unrivalled accuracy with its boresight error of less than 0.8 mrad.

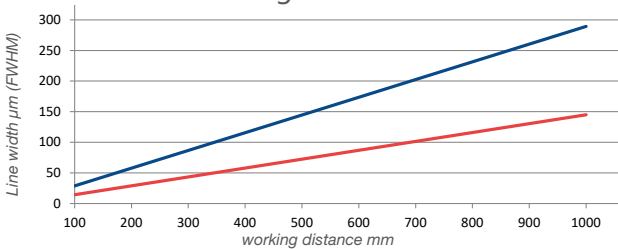
The separated electronics enables the user to mount the laser individually.



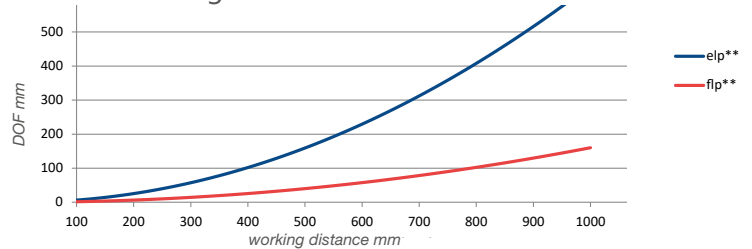
- Industrial standard
- Repeatable product performance due to automated production processes
- Highest reproducibility of beam quality
- Optical output power up to 200 mW
- Wavelengths from 405 – 830 nm
- Manually focusable (ZXS20)
- TTL modulation up to 150 kHz
- Analog intensity control

Specifications

Line width vs. working distance



DOF vs. working distance



Wavelength	nm
Wavelength tolerance	nm (typical)
Wavelength drift	nm / K (typical)
Output power ZXS10	mW
Output power ZXS20 (elp)	mW
Output power ZXS20 (flp)	mW
Boresight error	mrad (typical)
Operating voltage	
Protection	
Communication interfaces	
Fan angles	Degrees
Further projections	
Focus range	mm
Digital modulation	
Analog modulation	
Operating temperature	°C / °F

405 nm	450 nm	520 nm	635-685 nm	785 nm	830 nm
±10 nm	±10 nm	-5 nm +10 nm	±10 nm	±10 nm	±4 nm
0,06 nm	0,02 nm	0,06 nm	0,25 nm	0,25 nm	0,25 nm
n. a.	≤ 45 mW	≤ 35 mW	≤ 100 mW	≤ 100 mW	≤ 100 mW
≤ 160 mW	≤ 60 mW	≤ 40 mW	≤ 100 mW	≤ 80 mW	≤ 200 mW
≤ 120 mW	≤ 45 mW	≤ 30 mW	≤ 90 mW	≤ 60 mW	≤ 150 mW

< 0.8 mrad (fixed focus)

9 - 30 VDC 9 - 30 VDC 9 - 30 VDC 5 - 30 VDC 5 - 30 VDC 5 - 30 VDC

Over temperature protection and LED pre-failure indicator, reverse polarity and transient protection (ESD, burst & surge), potential-free housing

I²C, RS-232 (5 V)

5°, 10°, 20°, 30°, 45°, 60°, 75°, 90° (homogeneous lines)
3°, 5°, 10°, 15°, 20°, 30°, 90° (Gaussian line profile)

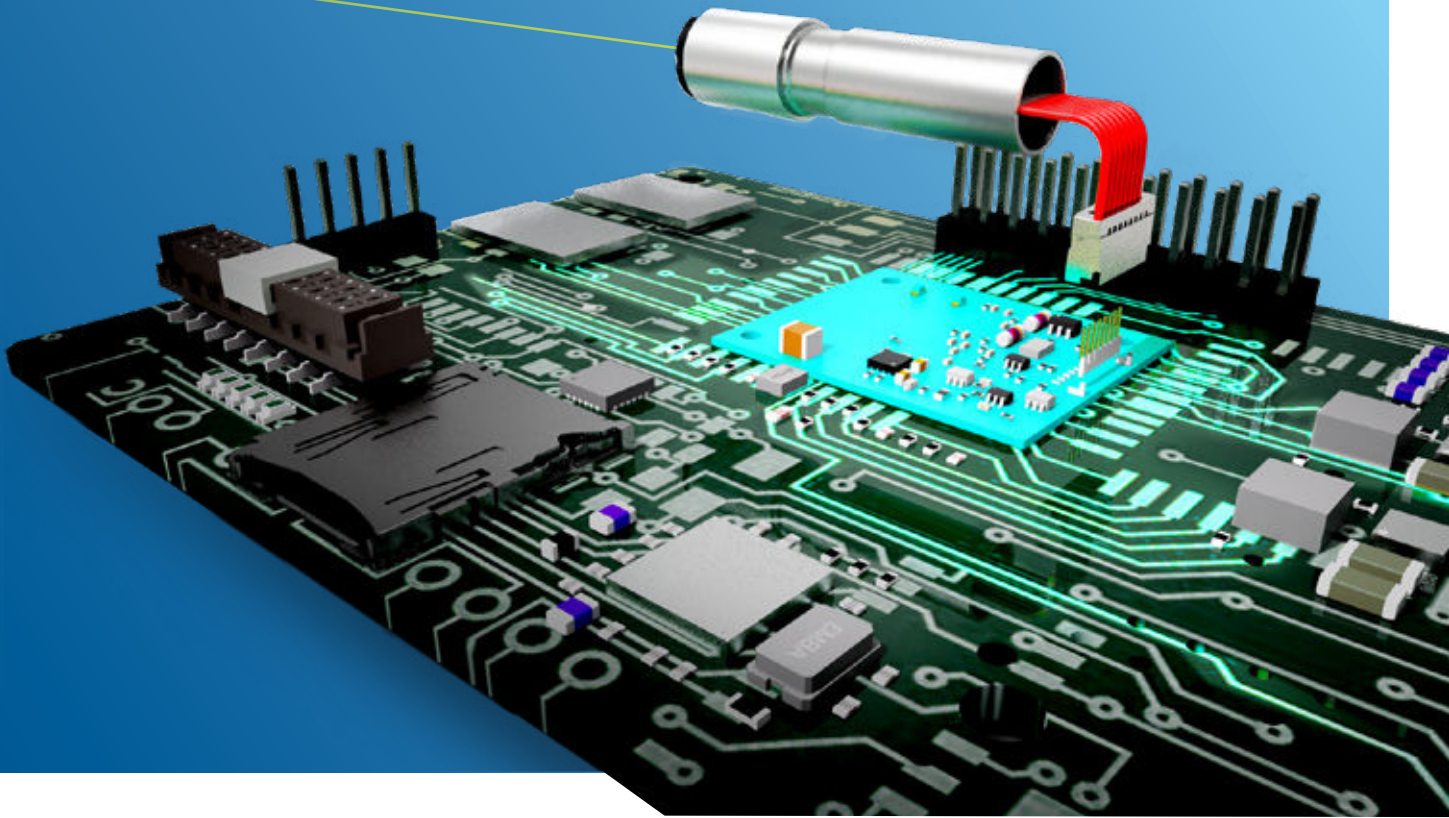
Point elliptical, Multi line, crosses, grids, etc.

100 mm up to 10,000 mm (or fixed focus available)

up to 150 kHz

< 10 Hz

-10 °C to +50 °C / 14 °F to +122 °F

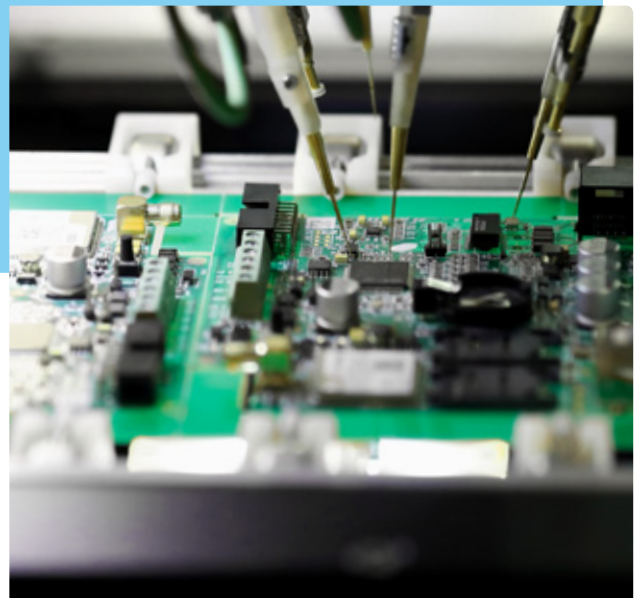


Embedded Vision

Machine vision lasers tend to become a deeper integrated part into optical measurement systems like 3D-displacement sensors. The form factor and cost structure of the laser system can be reduced significantly however, it is essential to preserve a high degree of flexibility. Otherwise the high number of variants that are typically required to cover all use cases of a product

platform cannot be provided (wavelength, optics, laser power). Further considerations include issues such as field exchange without calibration of the laser, support of all possible lasers without impact on the system integration and preserving laser safety.

In order to further aid the OEM in reducing cost and form factor the driver electronics circuit can be integrated directly into the customer's PCB design with our software running under license. At the same time the embedded laser system should provide means of predictive maintenance by flagging a calculated imminent EOL (end of life) situation.



Product Family ZXS

The flexible laser module

The structured light laser ZXS sets new standards for machine vision illumination due to its automated production in which all optical components are aligned by a high-accuracy robot.

The ZXS laser reaches an unrivalled accuracy with its boresight error of less than 0.8 mrad.

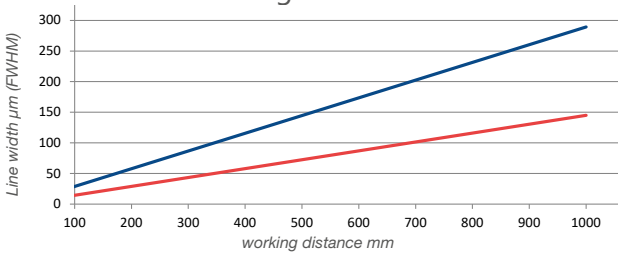
The separated electronics enables the user to mount the laser individually. An OEM Version with a customized electronics for the integration onto an existing PCB is also available.



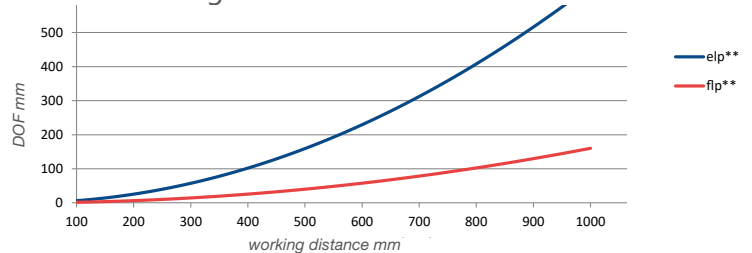
- Industrial standard
- Repeatability product performance due to automated production processes
- IP 67
- Highest reproducibility of beam quality
- Optical output power up to 200 mW
- Wavelengths from 405 – 830 nm
- Manually focusable (ZXS20)
- TTL modulation up to 150 kHz

Specifications

Line width vs. working distance



DOF vs. working distance



Wavelength	nm
Wavelength tolerance	nm (typical)
Wavelength drift	nm / K (typical)
Output power ZXS10	mW
Output power ZXS20 (elp)	mW
Output power ZXS20 (flp)	mW
Boresight error	mrad (typical)
Operating voltage	
Protection	
Communication interfaces	
Fan angles	Degrees
Further projections	
Focus range	mm
Digital modulation	
Analog modulation	
Operating temperature	°C / °F

405 nm	450 nm	520 nm	635-685 nm	785 nm	830 nm
±10 nm	±10 nm	-5 nm +10 nm	±10 nm	±10 nm	±4 nm
0,06 nm	0,02 nm	0,06 nm	0,25 nm	0,25 nm	0,25 nm
n. a.	≤ 45 mW	≤ 35 mW	≤ 100 mW	≤ 100 mW	≤ 100 mW
≤ 160 mW	≤ 60 mW	≤ 40 mW	≤ 100 mW	≤ 80 mW	≤ 200 mW
≤ 120 mW	≤ 45 mW	≤ 30 mW	≤ 90 mW	≤ 60 mW	≤ 150 mW

< 0.8 mrad (fixed focus)

9 - 30 VDC 9 - 30 VDC 9 - 30 VDC 5 - 30 VDC 5 - 30 VDC 5 - 30 VDC

Over temperature protection and LED pre-failure indicator, reverse polarity and transient protection (ESD, burst & surge), potential-free housing

I²C, RS-232 (5 V)

5°, 10°, 20°, 30°, 45°, 60°, 75°, 90° (homogeneous lines)
3°, 5°, 10°, 15°, 20°, 30°, 90° (Gaussian line profile)

Point elliptical, Multi line, crosses, grids, etc.

100 mm up to 10,000 mm (or fixed focus available)

up to 150 kHz

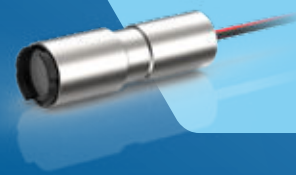
< 10 Hz

-10 °C to +50 °C / 14 °F to +122 °F

Model ZX10-TTL

Small size, high performance

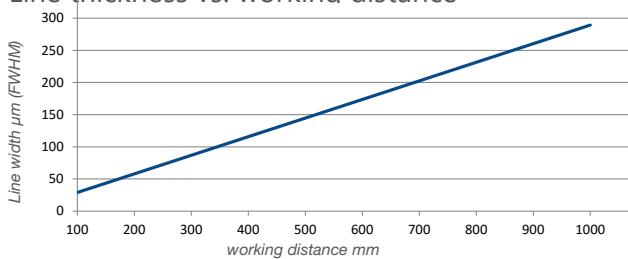
The ZX laser series offers diverse, application specific customization possibilities. The user can choose from IR and red wavelengths depending on the application and material to be inspected. The ZX laser reaches an unrivalled accuracy with its boresight error of less than 0.8 mrad. The industrial-suited design along with stable performance works perfectly as an integrated module in machine vision applications, sensors, or processing machines.



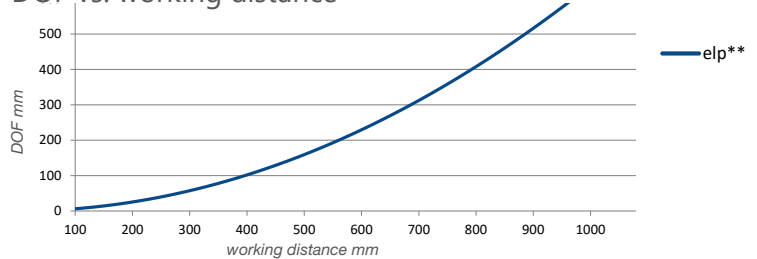
- Repeatable high product quality due to automated production processes
- Highest reproducibility of beam quality
- Optical output power up to 100 mW
- Wavelengths from 635 nm - 830 nm
- TTL-modulation
- Fixed focus
- IP 50 (optional IP 67)

Specifications

Line thickness vs. working distance



DOF vs. working distance



Wavelength	nm
Wavelength tolerance	nm (typical)
Output power	mW
Operating voltage	VDC
Protection	
Fan angles	Degrees
Further projections	
Digital modulation	
Length	mm / inch
Diameter head \varnothing	mm / inch
Length of cable	mm / inch
Operating temperature	$^{\circ}\text{C}$ / $^{\circ}\text{F}$

635-685 nm	785-830 nm
± 10 nm	± 4 nm
≤ 100 mW	≤ 100 mW

3.5 - 5.5 VDC

LED status indicator, reverse polarity protection, ESD, potential-free housing

5°, 10°, 20°, 30°, 45°, 60°, 75°, 90° (homogeneous line)
90° (Gaussian line profile)

Point elliptical, Multi line, crosses, grids, etc.

up to 200kHz

40 mm / 1.57 in

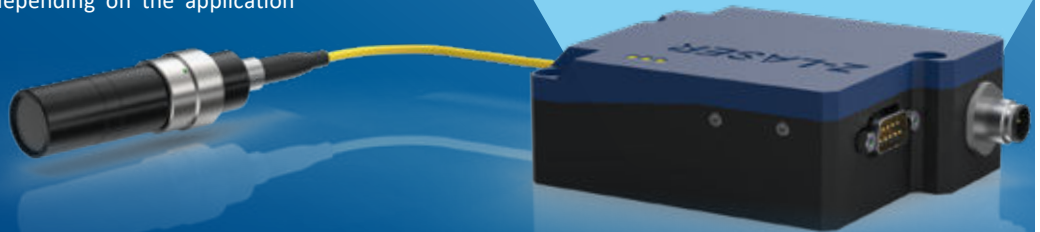
10h7 mm / 0.39 in

2,000 mm / 78.74 in

-10 $^{\circ}\text{C}$ to +50 $^{\circ}\text{C}$ / 14 $^{\circ}\text{F}$ to +122 $^{\circ}\text{F}$

Z-Fiber High-end laser with active cooling

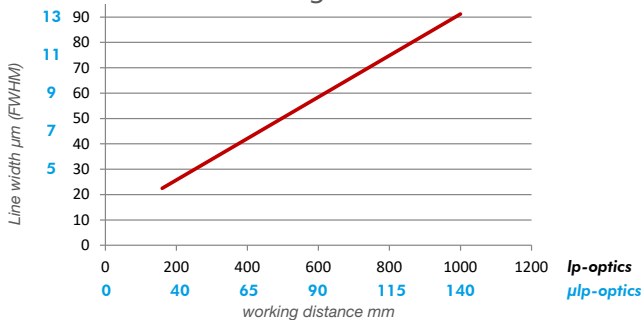
The structured light fiber laser series Z-FIBER has been developed for the most demanding applications in the market. Whenever an exceptional beam performance for high-resolution measurements or medical use is needed, the Z-FIBER series is the right choice. The user can choose from blue, green, red,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



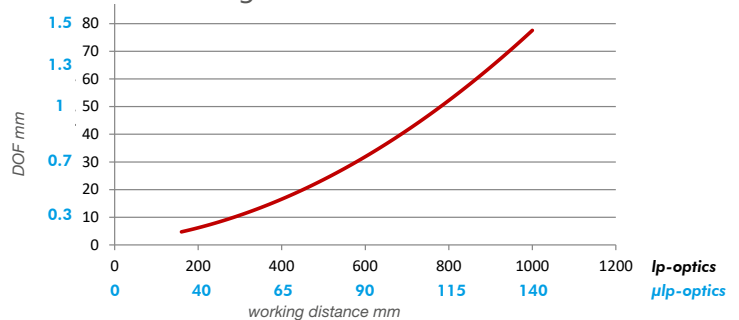
- Single-mode fiber with FC/PC connector
- Unique line uniformity and μ -optics for thin lines (<20 μm)
- Red, green, blue, and IR wavelengths
- Optical output power up to 40 mW
- M2 \sim 1.05
- Analog and simultaneous TTL modulation up to 200 kHz
- Fail-safe for critical applications (e. g. medical)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

Specifications

Line width vs. working distance



DOF vs. working distance



Wavelength	nm
Wavelength tolerance	nm (typical)
Output power	mW
Laser operation mode	
Operating voltage	
Protection	
Communication interfaces	
Fan angles μ -optics	Degrees
Fan angles standard	Degrees
Line uniformity	% (typical)
Classification	
Digital modulation	
Analog modulation	
Operating temperature	$^{\circ}\text{C}$ / $^{\circ}\text{F}$

450 nm	520 nm	635-685 nm	785-830 nm
± 10 nm	-5 nm +10nm	± 5 nm	± 10 nm
≤ 20 mW	≤ 15 mW	≤ 40 mW	≤ 40 mW
Power stabilized (integrated TEC)			
5 - 30 VDC			
Over temperature protection and LED pre-failure indicator, reverse polarity and transient protection (ESD, burst & surge), potential-free housing			
I ² C, RS-232			
10°, 20° (homogeneous lines)			
5°, 10°, 20°, 30°, 45°, 60°, 75° (homogeneous lines)			
± 10 %			
IEC 60825-1:2014 IEC 60601-2-22 (for laser classes 3R and 3B) Software according to IEC 62304			
up to 200 kHz			
< 100 kHz			
-10 $^{\circ}\text{C}$ up to +50 $^{\circ}\text{C}$ / -14 $^{\circ}\text{F}$ up to 122 $^{\circ}\text{F}$ (housed version) 0 $^{\circ}\text{C}$ up to +50 $^{\circ}\text{C}$ / 32 $^{\circ}\text{F}$ up to 122 $^{\circ}\text{F}$ (PCB-version)			

ZQ1

Compact high-performance laser

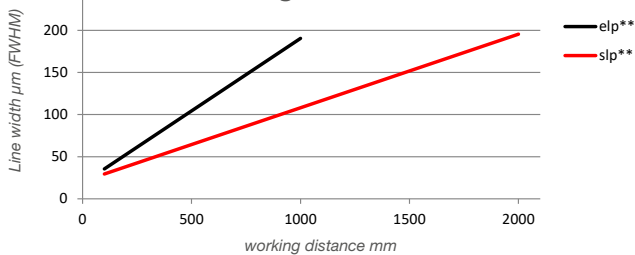
The structured light laser series ZQ1 has been developed for the most demanding measurement applications in the market. Wherever a high output power, exceptional beam performance, and industrial-suited design is needed, the ZQ1 series is the right choice. The user can easily adjust the right working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



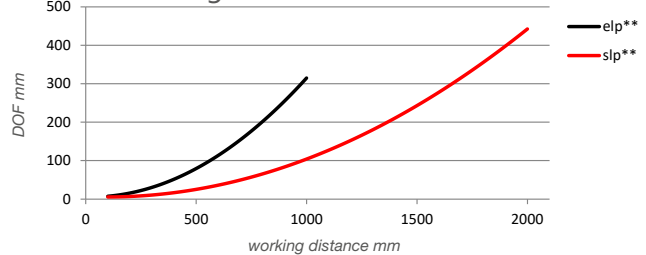
- Repeatable high product quality due to automated production process
- Optical output power up to 1,700 mW (IR)
- Manually focusable
- Standard wavelengths from 405 - 808 nm
- Active cooling integrated
- TTL modulation up to 200 kHz
- Analog intensity control
- IP 67
- Certified according to the railway standard: DIN EN 61373:2011-04
- PC control via Graphical User Interface (GUI)

Specifications

Line width vs. working distance

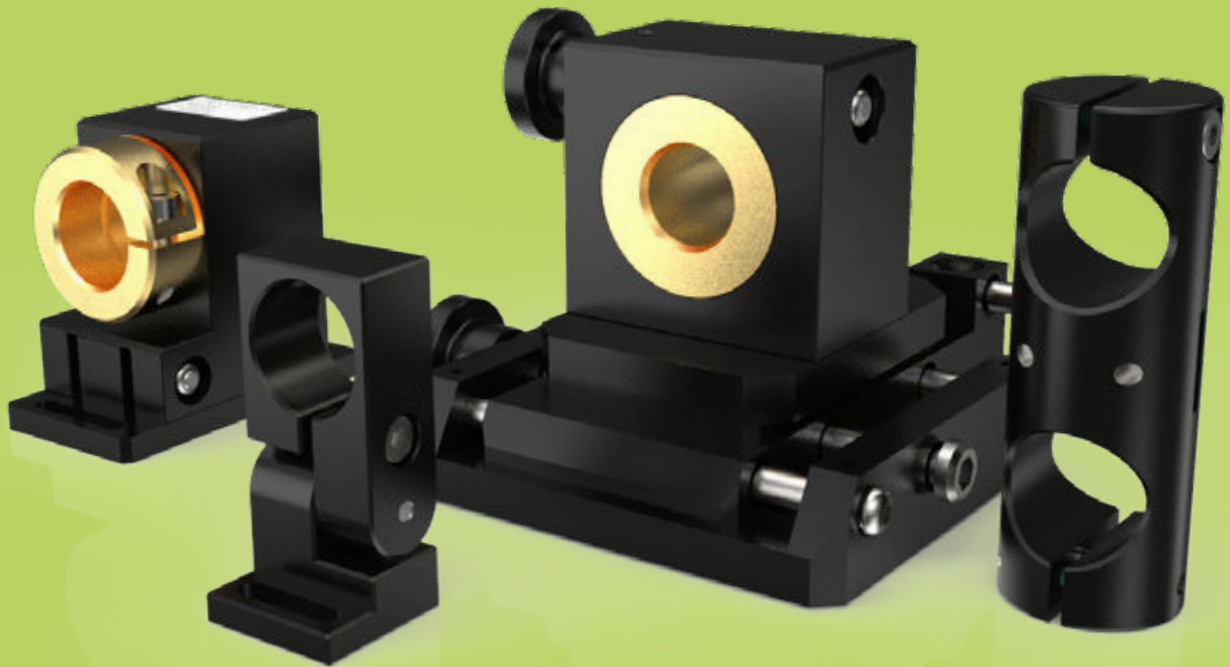


DOF vs. working distance



Wavelength	nm	405 nm	450 nm	520 nm	638 nm	670 nm	808 nm
Wavelength tolerance	nm (typical)	±10 nm	±10 nm	±10 nm	±6 nm	±3 nm	±4 nm
Output power (elp)	mW	≤900 mW	≤1300 mW	n. a.	≤500 mW	≤400 mW	≤1700 mW
Output power (slp)	mW	≤700 mW	≤1100 mW	≤700 mW	≤400 mW	≤350 mW	≤1200 mW
Operating voltage		12 - 24 VDC					
Protection		Over temperature protection and LED pre-failure indicator, reverse polarity and transient protection (ESD, burst & surge)					
Communication interfaces		I ² C, RS-232					
Fan angles	Degrees	5°, 10°, 20°, 30°, 45°, 60°, 75°, 90° (homogeneous line profile)					
Dot		Dot elliptical					
Focus range	mm	100 mm up to 10,000 mm					
Digital modulation		up to 200 kHz					
Analog modulation		< 10 Hz					
Operating temperature	°C / °F	-10 °C to +50 °C / 14 °F to +122 °F					
Shock and vibration		According to DIN EN 61373:2011-04, cat. 2, Railway applications – Rolling stock equipment – Shock and vibration tests (IEC 61373:2010)					

Products



Accessories

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H-20-20	- Mounting	18
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Precision Mount H6-20

Precision mount for Ø20 mm laser modules

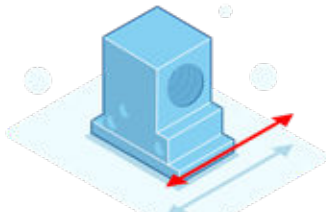
Aluminum mount for laser modules with a laser head diameter of Ø 20 mm. The aluminum block casing ensures optimal heat transfer. The stainless steel screw set allows for coaxial rotation, angular rotation, and parallel displacement of the laser module.

Also available for lasers with thread diameters of Ø12mm (M12), Ø18 mm (M18), as well as Ø40 mm.

- coaxially pivotable
- angle adjustable
- parallelly shiftable
- maintenance-free
- self-locking



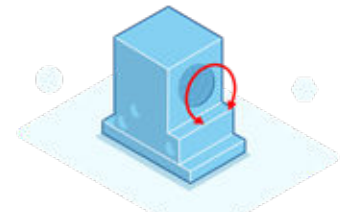
Specifications



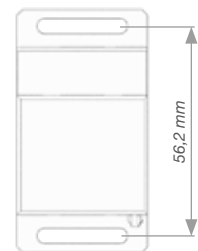
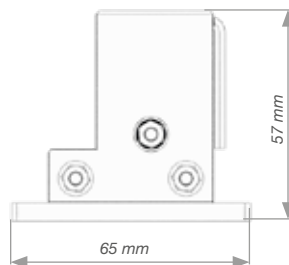
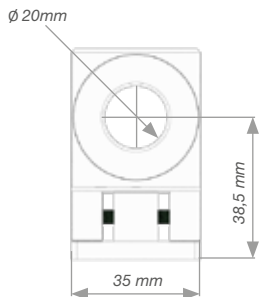
parallelly shiftable



angle adjustable



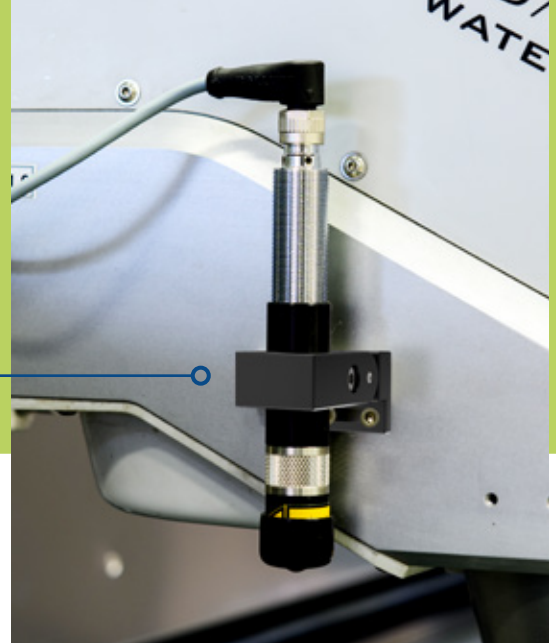
coaxially pivotable



General specifications

Housing	65mm x 35mm x 57mm (L, W, H)
Material	Anodised aluminum

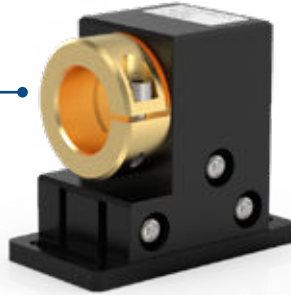
Mountings



ZM-18 & H2 | STM - 3d/68 WATERJET

H6-20

Aluminum mount for laser modules with a laser head diameter of \varnothing 20 mm. The aluminum block casing ensures optimal heat transfer. Also available with M18 thread.



H8-20

This aluminum precision mount is suitable for all laser with a head diameter of \varnothing 20 mm. The aluminum block casing ensures optimal heat transfer. The stainless steel screw set allows for coaxial rotation, angular rotation, and parallel displacement of the laser module. Also available with M18 thread.



H0-20-20

Aluminum mount for laser modules with a 20 mm laser head. The mount is 360° rotatable and mountable on a \varnothing 20mm shaft.

The aluminum block casing ensures optimal heat transfer.



H2

The mount can be tilted 60°. Available for \varnothing 40mm, \varnothing 20mm or M12-thread, with a slot for fixing.

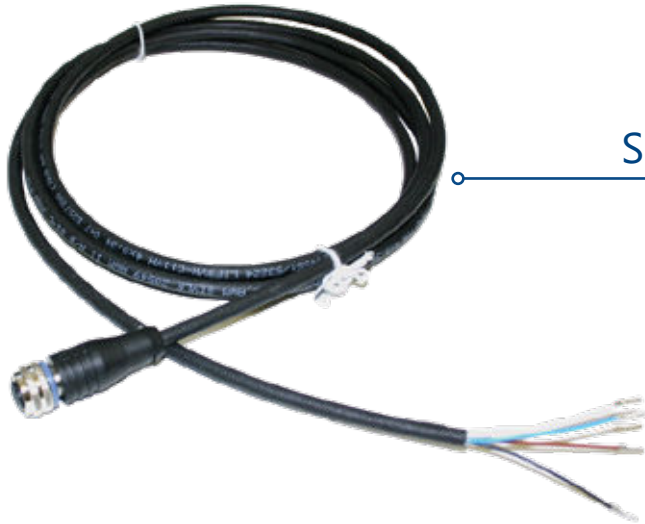


MXYZ-20B

Precision mount for laser modules with \varnothing 20 mm

Aluminum mount for lasers with a \varnothing 20mm diameter. Coaxially rotatable by 360°, angle-twistable by 20°, parallel displaceable by 20 mm; maintenance-free, backlash-free, self-locking.

Power Supply & Cable



Shielded connection cable

(shielding not connected), with "screw plug",
ZM12 / ZM18 / ZX / ZQ1 / Z-Fiber

KB4g 2m / 5m / 10m / 25m

KB5g 2m / 5m / 10m / 25m

KB8g 2m / 5m / 10m / 25m

WPS-9-M12

Power supply with M12 socket,
9VDC output voltage,
For Europe and US/Japan or UK plug



ZM18 Cap for replacement

Cap for M18 lasers
with 400-700nm wavelength
with non reflecting glass-pane



Clamping ring

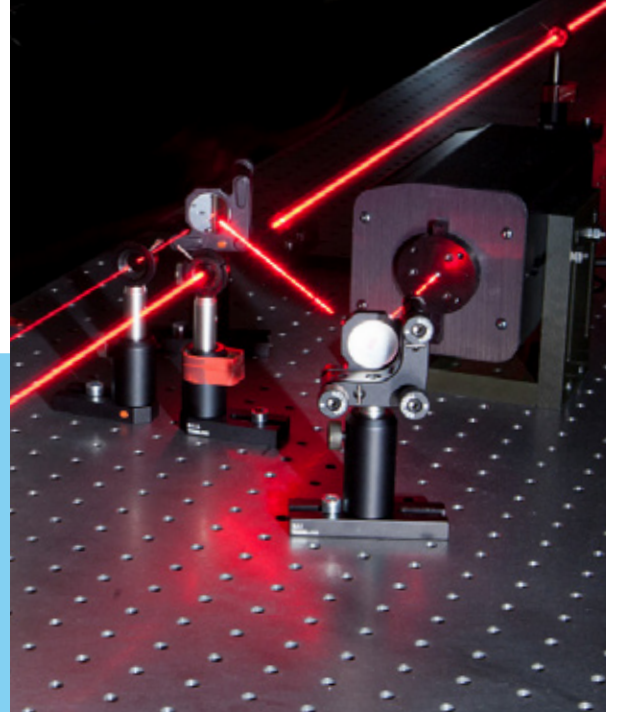
ZM18
Keeps focus ring in position

Z-LASER process structure

Z-LASER offers over 70 different projections.

The necessary optics (lenses or DOEs) are each adapted to the optical parameters of the laser diode in order to obtain the ideal projection result. Many more projections are available and custom developments are available on request.

Most relevant to image processing are homogeneous line projections. Z-LASER offers those in two different versions, depending on the working distance at which the laser is to be focused.



1 Optical head assembly

Laser diode and collimation optics are automatically aligned with a positioning accuracy of $0.2\mu\text{m}$ and then welded together for fixation.

3 Wedding: Optics & electronics

Optical head and electronic module are welded together (ZX20) or connected with a cable (ZXS).

5 Final inspection:

Each laser with a homogeneous line is measured on an automated measuring station before it leaves the factory. Parameters such as line straightness, homogeneity and thickness are checked and documented.

2 End optic adjustment

The projection-forming optics (for lines, crosses, random patterns, etc.) are automatically aligned and fixed using a camera system.

4 Calibration process:

Each individual laser undergoes a 3D calibration process in order to measure the respective laser power and diode current at a temperature range of approx 50°C .



*

The manufacturing process described here does not include each individual step, but is only intended to provide an overview of the most important stages during laser assembly. Necessary and also important steps, such as incoming goods inspections, production of assemblies, intermediate tests, encapsulation of the electronics, permanent comparison with the database are carried out, but are not described in detail.

Electronic highlights

The electronics and software have always been optimized due to the constant development of products for image processing. Standard functions such as TTL modulation, analog intensity control, serial communication, and error messages have been improved and provided with additional features.



Power stabilized



Integrated microcontroller

Each laser contains a microcontroller that precisely regulates the laser current - and thus the optical power. Each laser module is subjected to a complex calibration process, which also runs automatically and records a multidimensional map. All relevant parameters of the laser diode are logged and stored. With the aid of intelligent control algorithms, the laser power can now be kept constant in all operating states.

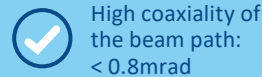
Disturbances such as the coupling of extraneous light, back reflections, or strong temperature fluctuations can also be compensated. This prevents not only a drop in power, but also an

increase, which in the worst case could violate the laser class. These would be safety-relevant breaches that cannot occur with a high-end product from Z-LASER.

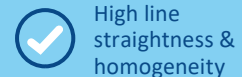
The calibration of the laser power is carried out for the complete laser module, so that all influences which the integrated optical elements exert on the laser power are also taken into account. After a burn-in, i.e. a 12-hour continuous run of the laser, all parameters are checked and corrected if necessary. Above all, early failures of the laser diode are intercepted as well as the aging process.

Optical highlights

By the Z-LASER own robot-controlled adjustment and assembly process, some of the parameters necessary for a good projection could be improved.



High coaxiality of the beam path: < 0.8mrad



High line straightness & homogeneity

It is no longer enough to use lenses and other optical components of the highest quality. The remaining tolerances must be compensated by "active alignment" and precise adjustment. The geometry of the projection pattern and the light distribution in it are permanently measured during the adjustment process. The result is then permanently fixed.

Whereas previously these steps were largely carried out manually and the result then fixed using adhesive techniques, the new ZX family now only uses high-precision assembly robots. These robots position optical elements in several spatial axes

with an accuracy of 0.2 μm . After alignment, ZX modules are laser-welded, whereby the components are melted and joined on their respective contact surfaces. No additional material is introduced.

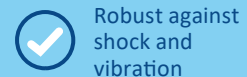
The precision of the optical system is thus not only reproducible at the highest level, it is also no longer reduced by the shrinkage of adhesives and plastics or by joining different materials with different coefficients of thermal expansion. Several of the required properties of a line laser can be controlled very well.

Mechanical highlights

Mechanical highlights: Z-LASER products have not only been developed for robust industrial applications and demanding environmental conditions, but can also to be obtained in various designs.



Protection class IP 67



Robust against shock and vibration

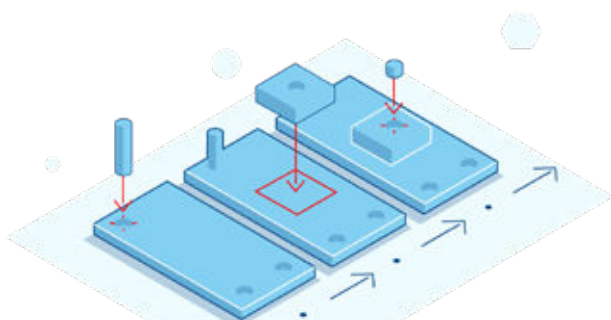
Z-LASER products are protected (IP 67) and robust against shock and vibration. The laser-welded stainless steel housings of the ZX family is ideal for heavy duty industrial applications. ZX laser modules are available in different versions, with 10mm

or 20mm diameter housing, with integrated or remote control electronics, with M18 thread on the housing and optionally with a tool-free focusing option.

About Z-LASER

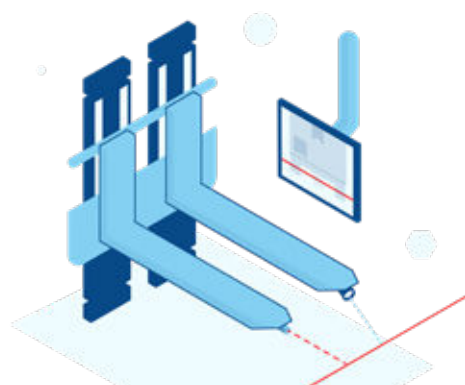
Z-LASER is a German manufacturer of laser sources for innovative customer applications. Over the past 30 years we have successfully established ourselves in the following areas:

- Laser as positioning aid (industry and trade)
- Lasers for image processing
- Laser projectors as positioning aids (industry and trade)
- Customer-specific lasers (OEM laser solutions)



Intelligent Technologies

Our intelligent systems – consisting of mechanics, electronics, and optics – allow a high coverage of all customer requirements and contribute to a clear differentiation from competitors. Numerous patents and utility models have been successfully registered in recent years.



Innovations for the future

Today, the company is also successful in many new, innovative industries that demand advanced laser technologies and designs.

„Quality is when
customers return to us
- not lasers.“

- Kurt-Michael Zimmermann,
Founder Z-LASER GmbH

Quality policy & mission statement

Quality starts with the conversation with the customer. His wishes, needs and expectations determine our entrepreneurial actions. We constantly rethink our activities. Misunderstandings should be avoided and the products and services should meet the customer's quality requirements. Every employee from all areas and in all activities is responsible for quality. This quality cannot be checked, therefore it is consistently produced by us.

Supplier Policies

Z-LASER is a socially responsible company that is committed to the well-being of people and the environment. Compliance with ethical principles and legally binding regulations is a matter of course for us.



We see it as our duty to carry out our business activities accordingly and expect our suppliers to do the same. For this reason, we demand REACH and RoHs conformity from supplied products as well as articles and the avoidance of conflict materials as far as possible.



Z-LASER generates a considerable part of its energy requirements via its own solar system and thus makes an active contribution to climate protection.

Don't hesitate to contact us!

Z-LASER



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V-Card

„Quality is when customers return to us
- not lasers.“

- Kurt-Michael Zimmermann,
Founder Z-LASER GmbH

Our mission is to develop laser sources and laser projectors of the highest quality for our customers. Since founding Z-LASER in 1985 in Freiburg, we supply the industry with top functional and easy-to-use laser systems.

Z-LASER is a socially responsible company that cares about the well-being of people and its environment. A significant part of the energy requirement is gained through the in-house solar system. Furthermore, we only supply civil applications.

Lasertechnology
from Freiburg
made in Germany

Contact us.
We would be happy
to advise you!



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