



## Model: ZX20

Max. power 200 mW	IP 67	Diode laser	Boresight error < 0.8 mrad	Manual focus or fixed	Serial communication	TTL-modulation	Operating voltage 5 - 30 VDC
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### 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.

#### HIGHLIGHTS

- 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
- I<sup>2</sup>C, RS-232 (5 V)
- Stainless steel housing

#### APPLICATIONS

- Machine Vision
- Triangulation sensors
- 3D-Measurement
- High-precision positioning tasks

#### ORDER CODE

Z??	-	X20	-	?	-	?	-	?	-	?
Power		Product name		Electronics		F = focusable		Wavelength		Optics

## SYSTEM SPECIFICATIONS

Wavelength	nm
Wavelength tolerance	nm (typical)
Wavelength drift	nm / K (typical)
Output power (slp / elp)	mW
Output power (flp)	mW
Spatial mode	(typical)
RMS noise	(20 Hz to 20 MHz, typical)
Peak-to-Peak Noise	(20 Hz to 20 MHz, typical)
Boresight error <sup>(1)</sup>	mrad (typical)
Line orientation <sup>(2)</sup>	mrad
Pointing stability	µrad / K
Long-term power stability	(24 h)
Start-up time	sec
Laser operation mode	

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	≤ 120 mW	≤ 80 mW	≤ 200 mW
≤ 120 mW	≤ 45 mW	≤ 30 mW	≤ 90 mW	≤ 60 mW	≤ 150 mW

Single Transverse Mode

< 0,5 %

< 1 %

< 0.8 mrad (fixed focus)

< 10 mrad

< 10 µrad / K

±3 % over operating temperature range

< 2 s

APC

## ELECTRICAL SPECIFICATIONS

Operating voltage	
Operating current	(max. at 25 °C)
Protection	
Electrical isolation	
Connection	
Power consumption	
Communication interfaces	

9 - 30 VDC	9 - 30 VDC	9 - 30 VDC	5 - 30 VDC	5 - 30 VDC	5 - 30 VDC
< 300 mA	< 300 mA	< 300 mA	< 400 mA	< 500 mA	< 500 mA

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

Potential-free housing

5-pin M12 plug; cable with flying leads or customized

< 2.7 W	< 2.7 W	< 2.7 W	< 2 W	< 2.5 W	< 2.5 W
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I<sup>2</sup>C, RS-232 (5 V)

## OPTICAL SPECIFICATIONS

Fan angles <sup>(3)</sup>	Degrees
Line straightness <sup>(4)</sup>	% (of line length)
Line uniformity <sup>(5)</sup>	% (typical)
Dot	
DOE	
Focus range	mm

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

< 0.05 %

< 25 %

Point elliptical

Multi line, crosses, grids, etc.

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

## KEYNOTES

<sup>(1)</sup> Boresight error *Also known as pitch and skew.*

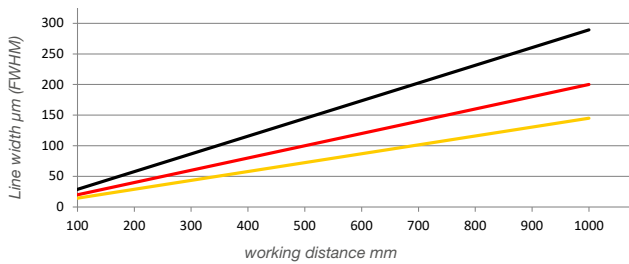
<sup>(2)</sup> Line orientation *Also known as line tilt (roll) with reference to the indentation in the clamping area*

<sup>(3)</sup> Line length / fan angle *at > 13.5 % I<sub>max</sub>*

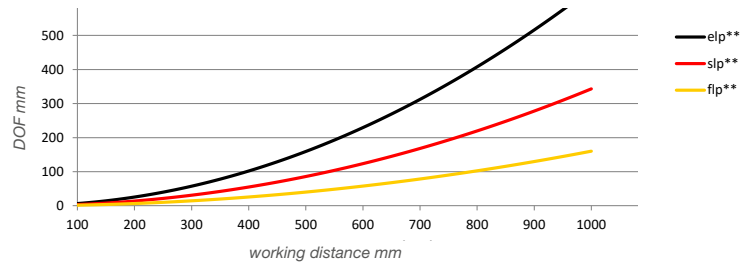
<sup>(4)</sup> Line straightness *Deviation from best fit line over the middle 80% of the line, for homogeneous lines*

<sup>(5)</sup> 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		
	flp**	slp**	elp**	flp**	slp**	elp**
Blue 405 nm	0.66	0.62	0.82	0.75	0.70	1.02
Blue 450 nm	1.03	0.67	1.83	1.49	0.74	4.29
Green 520 nm	0.97	0.78	1.20	0.99	0.80	2.61
Red 640 nm	1.05	1.28	1.00	1.04	0.70	0.95
Red 660 nm	1.00	1.00	1.00	1.00	1.00	1.00
IR 830 nm	1.42	1.30	2.11	1.71	1.03	2.20

Optical configurations for several line settings are available.

- flp\*\* = fine line Powell; thin lines for all working distances with smaller depth of focus (recommended for fan angles between 5° - 60° at working distances < 500 mm and for fan angle of 90° at working distances > 500 mm). This optical configuration cannot supply the maximum output mentioned on page 2. Only approx. 75% can be achieved.

- slp\*\* = standard line Powell; standard setup with medium line thickness and depth of focus.

- elp\*\* = extended line Powell; lines with advanced depth of focus and thicker lines. Recommended for fan angles > 75° at working distances < 500 mm.

The graphs above show the values for line width and depth of focus of a 660 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: 660 nm laser focused at 1 m working distance: line width approx. 200 µm (@ slp\*\* optic); Depth of focus approx. 350 mm (values from the graphs)

Calculated: 450 nm laser focused at 1 m working distance: line width approx. 200 µm x 0.67 = 134 µm; Depth of focus approx. 350 mm x 0.74 = 259 mm

\* Values in the graphs for homogenous line profiles

\*\* Fan angle: 5° - 90°

## SOFTWARE

GUI  
Serial communication  
I<sup>2</sup>C and RS-232 (5V)

Features (e. g.):

- Status query
- Output power control
- System configuration
- Digital modulation
- Intensity control
- Weighted end of life indication

## DIGITAL MODULATION

Maximum frequency	up to 400 kHz
Rise time (Mod High ⇒ 90%)	< 100 ns
Fall time (Mod Low ⇒ 10%)	< 100 ns
Signaling levels	VIL_max < +0.9 V VIH_min > +2.2 V
Operation range	0 - 30 VDC

## ANALOG MODULATION

Maximum bandwidth	< 10 Hz
Linearity	< 5 % (from 10 % 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

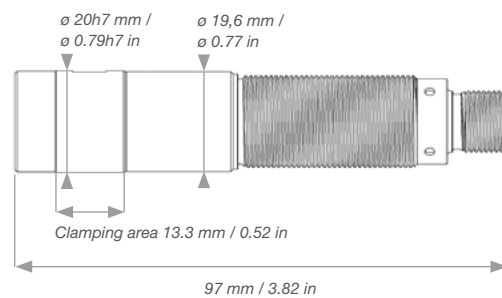
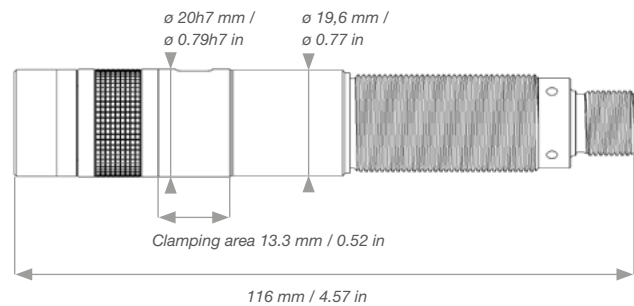
Operating temperature	°C / °F
Storage temperature	°C / °F
Humidity	%
Dissipated heat	W
Shock and vibration	

-10 °C to +50 °C / 14 °F to +122 °F
-40 °C to +85 °C / -40 °F to +185 °F
< 90 %, non-condensing
< 1 W
According to IEC EN 61373:2011, cat. 2

## MECHANICAL SPECIFICATIONS

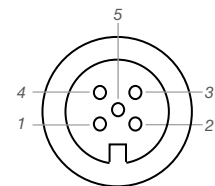
Weight	g / lbs
Length	mm / inch
Diameter head Ø	mm / inch
Material	
Protection class	
Mounting	(Option)

ZX20	ZX20-F
110 g / 0.24 lbs	155 g / 0.34 lbs
97 mm / 3.82 in	116 mm / 4.57 in
20h7 mm / 0.79 in	
Stainless steel	
IP 67	
20 mm mount (alternative M18-thread)	



## M12 5-PIN: A-CODING MALE CONNECTOR

	405 nm - 520 nm: 9 - 30 VDC, 15 VA	635 nm - 830 nm: 5 - 30 VDC, 15 VA
X 1.1		
X 1.2	Digital modulation TTL	
X 1.3	GND	
X 1.4	Analog modulation (0-2 VDC)	
X 1.5	Fail out	



Coding scheme shows default configuration at delivery, individual setup possible.