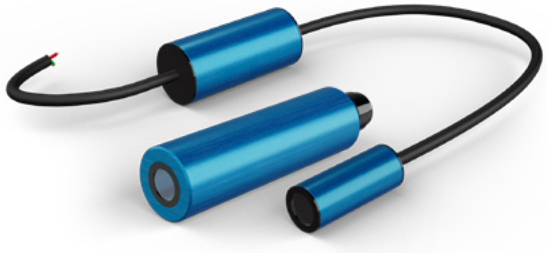
Vision Systems Design 2021 Innovators Awards SILVER HONOREE

LASER COMPONENTS®

MVpulse SERIES WITH PULSE CONTROL

FLEXPOINT® Machine Vision Laser



INCREASED PEAK POWER (UP TO 5 TIMES) STAYING IN THE SAME LASER CLASS.

High light intensity and therefore high laser power is a key factor in various machine vision applications. However, when using laser light, obeying laser class regulations is sometimes a limiting factor.

Laser manufacturers classify their lasers in continuous wave operation which is not the most used operation mode in combination with a camera. The pulse control can align the laser signals with the camera, so that up to 5-times higher peak power (compared to cw mode) can be achieved staying in the same laser class.

The MVpulse is available in 5 wavelengths (450 – 785 nm) at peak powers up to 100 mW. A variation of fan angles (1 – 90°) is available to reach the required line length and six different optic options provide a suitable combination of line thickness and DOF for your application. The modules come with fixed or adjustable focus in different housings: Standard or 2H (separate housing for optics with LD and electronics).

FEATURES

/ Safe laser classes so that no safety equipment is required (can be set to laser class 1, 2 or 3R)
/ High pulse power, low average optical power
/ High output power for high-contrast images and higher accuracy
/ Pulse control by integrated microcontroller

APPLICATIONS

/ 3D Triangulation
/ 3D Laser Scanners
/ Industrial Inspection
/ Structured Lighting

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beyond borders

04/25 / V06 / KS-MaL / laser-modules/flexpoint-mvpulse-machine-vision-laser

SPECIFICATIONS

Model	Line laser with uniform power distribution (FOV correction available)				
Wavelength [nm]	450	520	640	660	785
Wavelength tolerance (typ.) [nm]	±10	±10	±5	±5	±10
Output power (max. peak power) [mW][1]	10 – 80	10 – 80	10 – 100	10 – 100	10 – 100
Power stability at 25 °C (after warm up) [%]	≤ 5				
Operating voltage [VDC]	10 – 30		4.5 – 30		
Operating temperature (housing temp.) [°C][2]	0 to +50	0 to +50	0 to +50	0 to +60	0 to +60

Peak power increase compared to cw mode in same laser class

5x @ pulse length < 0.38 ms, laser off time between pulses > 3.1 ms
4x @ pulse length < 0.9ms, laser off time between pulses > 5.7 ms
3x @ pulse length < 2.8 ms, laser off time between pulses > 12 ms
2x @ pulse length < 15 ms, laser off time > 30 ms

Fan angle [°][3]	5, 10, 15, 20, 30, 45, 60, 75, 90
Focusing range [mm]	50 – 5000
Line intensity variation (typ)[4] [%]	±20 related to average power (within 80 % of the line)
Line straightness[4] [%]	±0.1 (±0.05 as option)
Pointing stability [µrad/K]	≤ 10 (improved pointing stabillity as option)
Boresight deviation [mrad]	≤ 10 (≤ 3 as option)
Current consumption [mA]	< 200 @ 5 VDC
Storage temperature [°C]	-20 to +60
Modulation	Digital Modulation 0 – 20 kHz active high/low (higher frequency on request) Low = 0 V, High = 5 V, input impedance of 10 kOhm at 5 V
Laser class	According to DIN EN 60825-1:2014 Laser class preset at factory (microcontroller controls output power for laser class)
Housing	Aluminium (blue anodized, potential free) ST (Standard) or 2H (separate housing for optics and electronics)
Accessories available (optional, order separately)	Mount; Power supply for 5 V (≥ 640 nm); Power supply for 12 V with M12 connector
Connector	M12 connector: Pin1: +VDC, Pin3: GND, Pin2: Digital Modulation M/MI | Open leads (500 mm): Brown: +VDC, Blue: GND: Black: Digital Modulation M/MI

Foot Note
1 The output power is defined behind optics which means at the beam exit of the laser module
2 Below 0 °C condensate formation must be avoided (due to optical and electronic components)
3 Fan angle: Defined by the ends of the laser line using FWHM based on the average power (within 80 % of line)
4 Line intensity variation and line straightness are measured at 80 % of the fan angle

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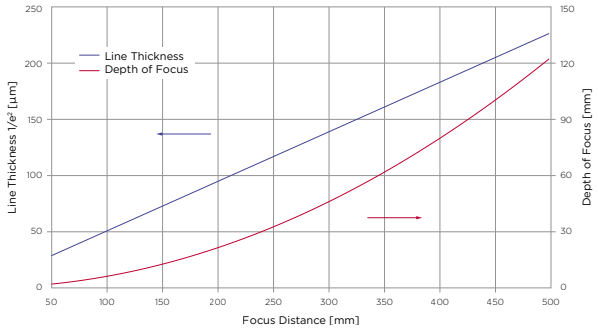
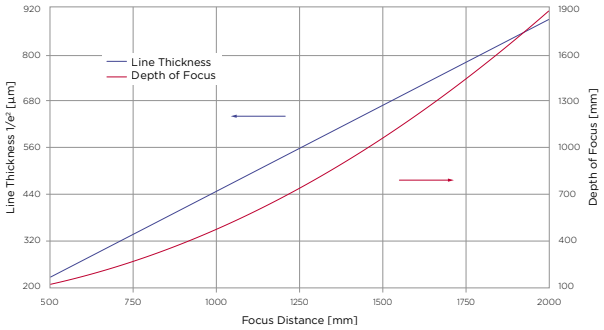
Line Thickness and Depth of Focus (DOF) for Standard (STD) Focus Option at 660 nm



Standard laser line characteristics (short range)



Standard laser line characteristics (long range)

Focus Options

MVpulse lasers are available with different focus options to achieve the right combination of line thickness and depth of focus for the application.

To calculate line thickness and DOF, note the value in the graphs above and multiply them by the factors for your requested wavelength, output power, and focus option listed in the following table.

P_{out} and λ			Focus options (conversion factor related to standard laser marked in red)											
λ	P_out	Δλ	DLSE		DLE		DL		STD		TS1		TS2	
[nm]	[mW]	[nm]	LT	DOF	LT	DOF	LT	DOF	LT	DOF	LT	DOF	LT	DOF
450	1–80	±10	0.25	0.10	0.33	0.16	0.45	0.30	0.69	0.69	1.49	3.25	2.20	7.06
520	1–80	±10	0.29	0.11	0.39	0.19	0.53	0.36	0.78	0.78	1.71	3.69	2.55	8.23
640	1–20	±5	0.39	0.16	0.51	0.27	0.69	0.48	1.02	1.07	1.65	2.79	2.43	6.08
640	21–30	±5	0.39	0.16	0.51	0.27	0.69	0.48	1.02	1.07	1.47	2.23	2.18	4.87
640	31–100	±5	0.47	0.23	0.59	0.36	0.80	0.67	1.20	1.47	1.65	2.79	2.43	6.08
660	1–30	±5	0.39	0.15	0.49	0.24	0.67	0.44	**1.00**	**1.00**	1.51	2.27	2.25	5.07
660	31–100	±5	0.51	0.26	0.65	0.42	0.88	0.78	1.31	1.72	1.51	2.27	2.25	5.07
785	1–10	±10	0.35	0.10	0.45	0.17	0.61	0.31	0.90	0.68	1.65	2.28	2.43	4.96
785	11–100	±10	0.65	0.35	0.82	0.57	1.12	1.05	1.65	2.28	2.00	3.36	2.98	7.45

Foot Note / Abbreviations
LT = Line Thickness DOF = Depth of Focus STD = Standard, good compromise for Line Thickness and Depth of Focus
DL = Thin Line FD = Focus Distance DLE = Thin line enhanced DLSE = Thin line super enhanced
TS1 = Enhanced depth of focus TS2 = Enhanced depth of focus, higher factor

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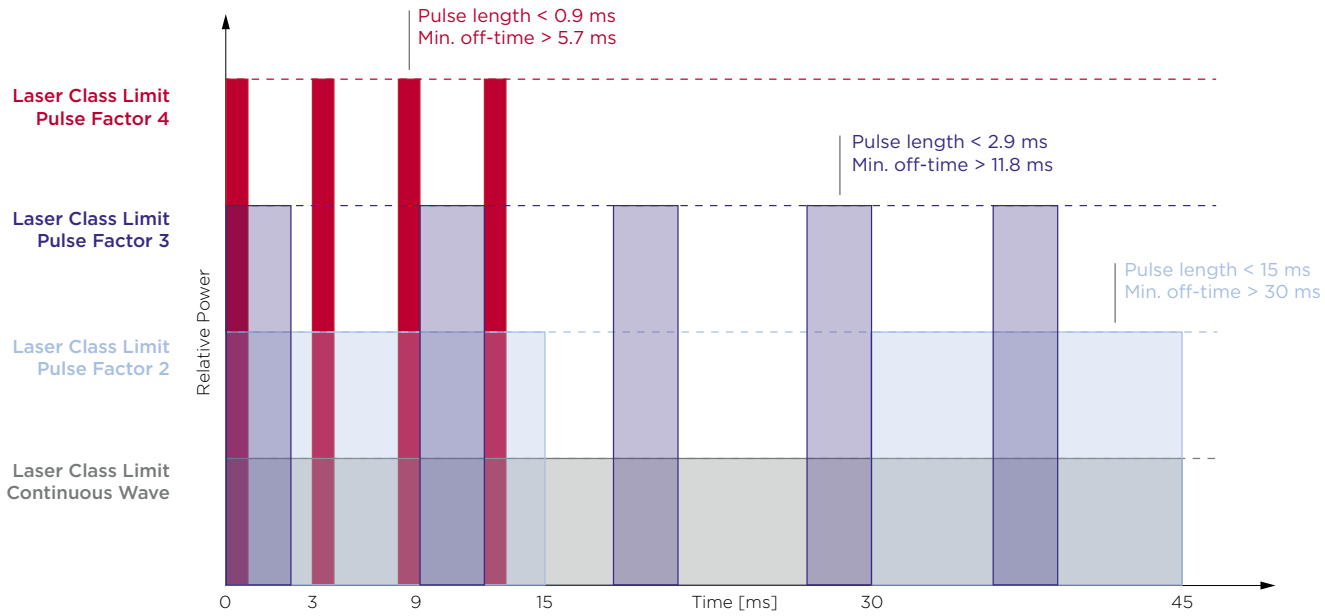
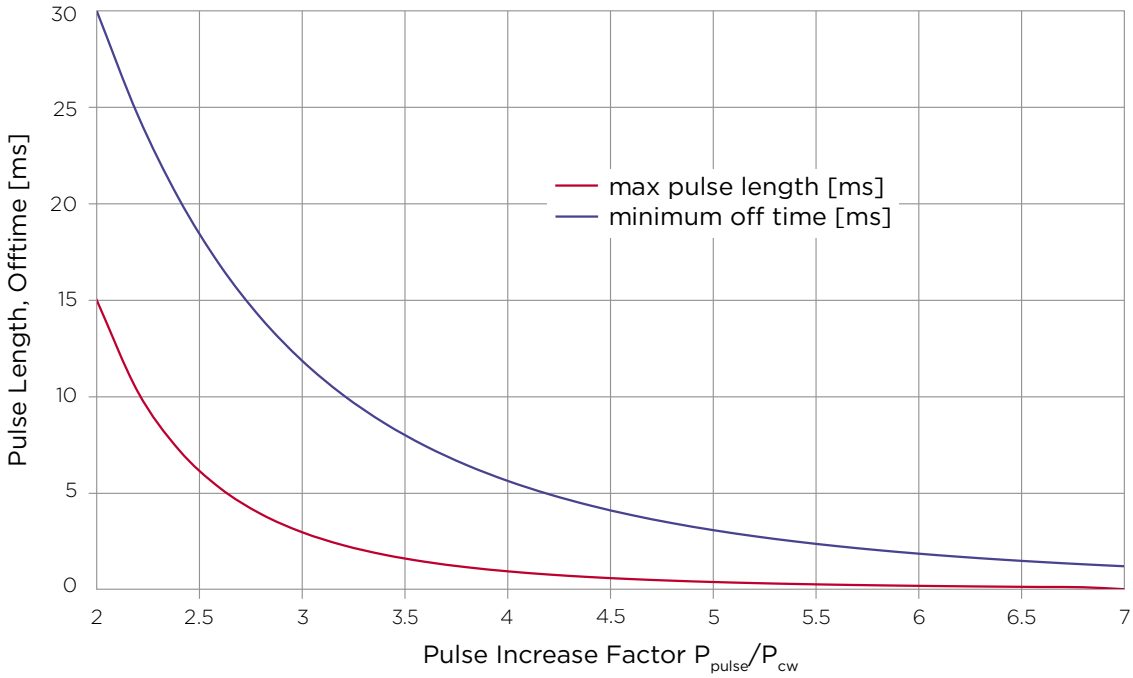
Pulse and Monitor / Control Features

The pulse peak power can be increased by the factor 2/3/4/5 compared to the maximum continuous wave average power whilst the laser still stays within the limits of laser class 2 or laser class 3R. By increasing the pulse peak power, the maximum pulse length has to be limited.

Below is a visualization how the pulse peak power can be increased to the limits of laser class 2 and how the pulse length and the minimum off-time will change accordingly.



The following graph shows the relation between the pulse increase factor, the max. pulse length and the minimum off-time valid for both laser class 2 and laser class 3R.



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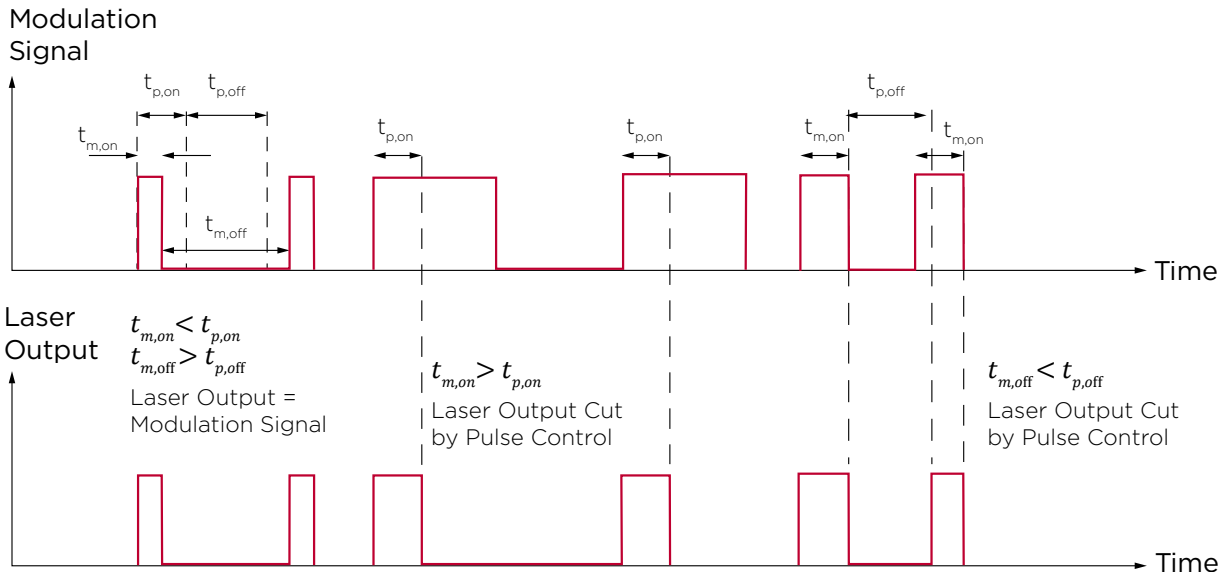
Pulse increase factor compared to cw	5x	4x	3x	2x
Max. Pulse Length [ms]	0.38	0.9	2.9	15
Min. Laser off time [ms]	3.1	5.7	11.8	30

The MVpulse driver electronics automatically monitors and controls the pulse modulation function. If the user applies a higher duty cycle or longer pulse length to the modulation input of the laser which would lead to an exceedance of the laser class, the driver electronics will ignore the signal and will limit the laser output power to stay in the specified laser class. Refer to the examples below.

$t_{m,on}$ | $t_{m,off}$ Modulation signal: on time | off time
$t_{p,on}$ | $t_{p,off}$ Pulse control: factory preset maximum on time | minimum off time



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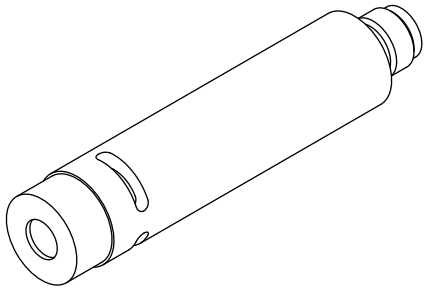
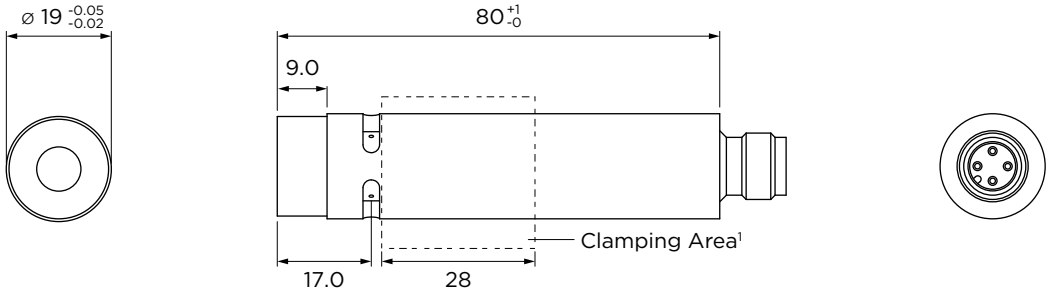
TECHNICAL DRAWING

MVpulse with adjustable focus and standard housing (ST-F)





MVpulse ST-F

[1] For optimal heat dissipation in a mount, we recommend to apply thermal paste on the surface overlap.

Units: mm

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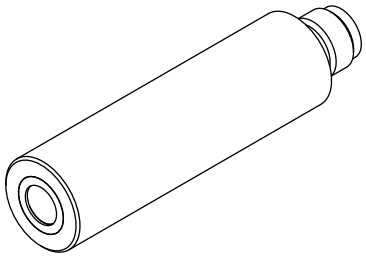
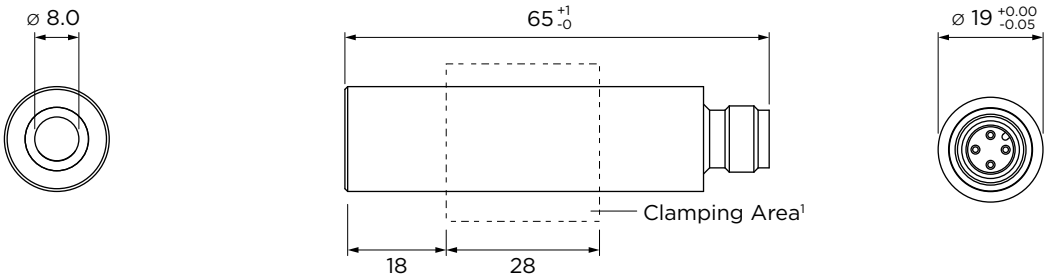
TECHNICAL DRAWING

MVpulse with fixed focus and standard housing (ST-FIX)





MVpulse ST-FIX

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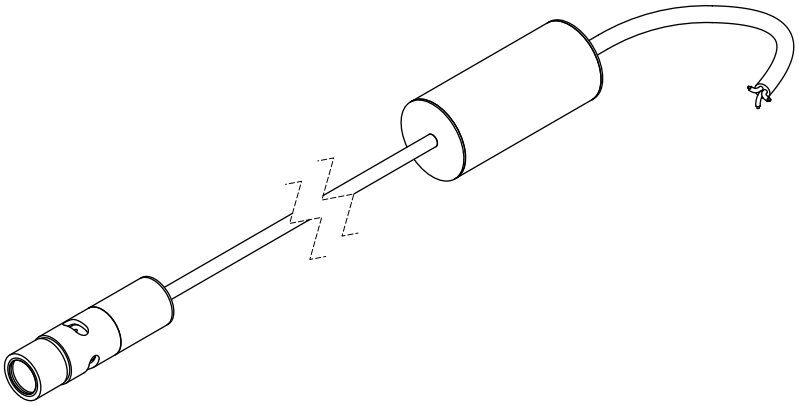
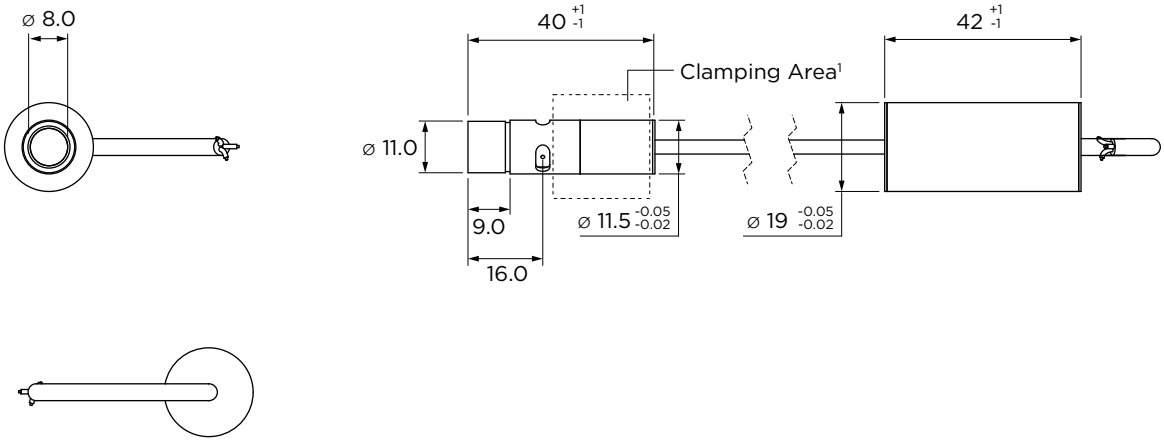
TECHNICAL DRAWING

MVpulse focusable with 2 housings (separate housing for optics and electronics) (2H-F)





MVpulse 2H-F

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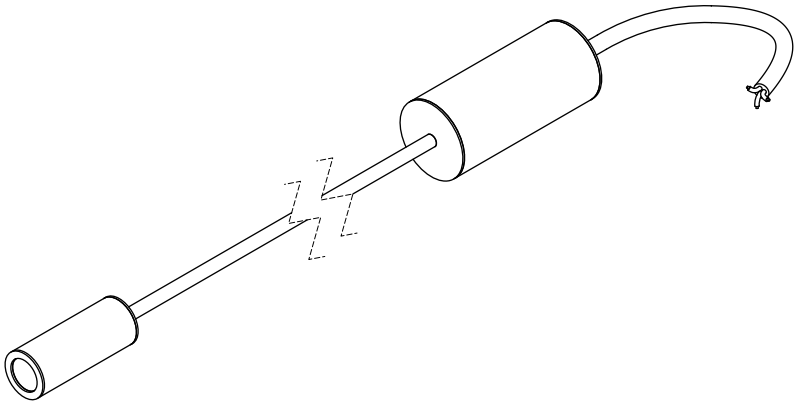
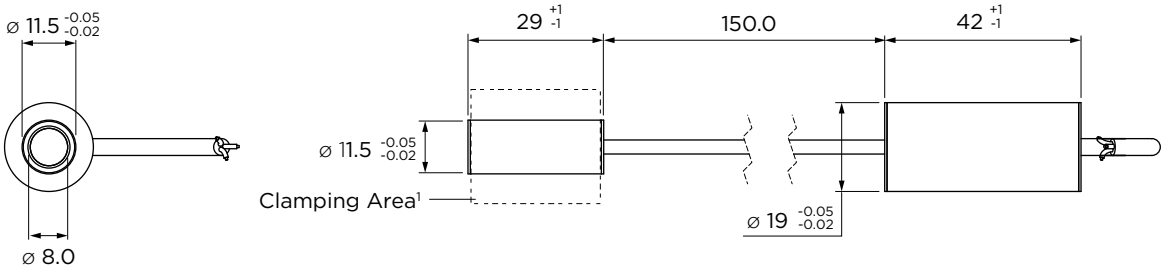
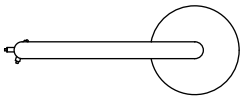
TECHNICAL DRAWING

MVpulse with fixed focus and 2 housings (separate housing for optics and electronics) (2H-FIX)







MVpulse 2H-FIX

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ORDERING CODE

		Housing	Wavelength [nm]	Output Power [mW]	Modulation / Power Adjustment	Fan Angle [°]	Focus [mm]	Optics	Laser Class	Pulse Increase Factor
FP-MVpulse	-	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
		ST **2H**	**450** **520** **640** **660** **785**	**1–80** **1–100**	**M** | Digital Modulation, active low **MI** | Digital Modulation inverted, active high	**5** **10** **15** **20** **30** **45** **60** **75** **90**	**F** | Focusable **FYYY** | Pre-focused to YYY mm, but still focusable **FIXYYY** | Fixed focus to YYY mm	**STD** **DL** **DLE** **DLSE** **TS1** **TS2**	**1** **2** **3R**	**2x** **3x** **4x** **5x**

Example: FP-MVpulse-ST-785-50M-30-F-DL-1-2x

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