

Product Update Information

Synrad 48-2 CO₂ Laser



Synrad vi30+ CO₂ Laser



Previous Product Description Synrad 48-2 CO₂ Laser

Previous Part Numbers

Standard Air & Fan:	48-2SAN, 48-2SAN-FAN
Standard Water:	48-2SWN, 48-2SWN-9.3, 48-2SWN-CL
Key-switch Air & Fan:	48-2KAN, 48-2KAM-FAN
Key-switch Water:	48-2KWN, 48-2KWN-9.3, 48-2KWN-CL

Updated Product Description Synrad vi30+ CO₂ Laser

Updated Part Numbers**

Standard Air:	FSVi30SAD-10.6, FSVi30SAD-10.2, FSVi30SAD-9.3
Standard Fan:	FSVi30SFD-10.6, FSVi30SFD-10.2, FSVi30SFD-9.3

***Note: Key-switch, water, and shutter options are not available on the vi30+ laser. Contact your local sales manager if fan kits are needed.*

Synrad's vi30+ laser is a common choice for customers looking to upgrade from the 48-2 laser. The vi30+ laser is a newer design with more output power and a significantly smaller footprint than the 48-2 laser. This document summarizes some of the key differences that OEMs should consider when updating to the vi30+ laser.

Product Update Information



Contents

- Laser Specification Differences3
- Technical Drawing: 48-24
- Technical Drawing: vi30+.....5
- I/O Connections.....6
- I/O Signals.....7
- Appendix..... 10
 - Updating Reversed 48-2 Configurations 10
 - Support & Updating Other Configurations..... 11

Product Update Information

Laser Specification Differences

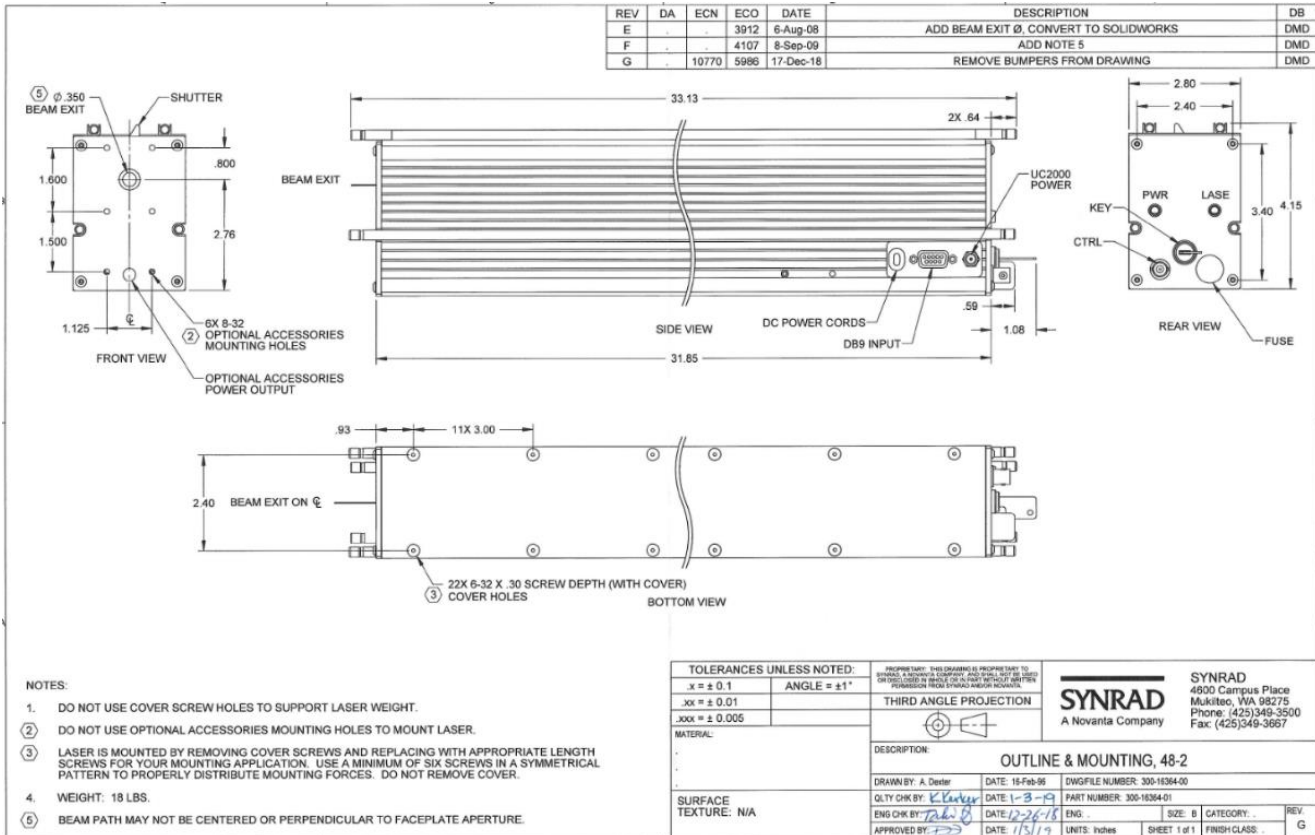
The following table summarizes the specification differences between the 48-2 laser and the vi30+ laser.

<i>Specification</i>	<i>48-2 laser</i>	<i>vi30+ laser</i>	<i>Description of difference</i>
Beam exit height	78 mm, or 35 mm if mounted upside down	74 mm	4 mm lower, or 39 mm higher if the if the 48-2 is mounted upside down. See the section “ Updating Reversed 48-2 Configurations ” for more information.
Output power (minimum)	25 W	30 W	More power, same warranty period.
Wavelengths	10.6 ± 0.03 μm	10.6 ± 0.03 μm	No difference in linewidth at 10.6 μm. Both lasers are available at 9.3 μm, but the vi30+ is also available at 10.2 μm.
Rise and fall time	< 150 μs	< 100 μs	Faster rise and fall times. Note that the 48-2 laser is tested at 1 kHz, 10% duty cycle, and the vi30+ laser is tested at tested at 500 Hz, 50% duty cycle.
Power stability from cold start	± 5%	± 5%	No difference
Duty cycle range	1% - 100%	1% - 100%	No difference
Operating frequency	0-20 kHz	0-100 kHz	Faster pulsing, up to 100 kHz
Beam diameter at faceplate (at 1/e²)	3.5 mm	2.5 ± 0.5 mm	About 1 mm smaller
Maximum divergence, full angle (at 1/e²)	4.0 mrad	7.0 mrad	Diverges more quickly, up to 3 mrad faster
Beam quality (M²)	< 1.2	< 1.2	No difference
Ellipticity	< 1.2	< 1.2	No difference
Polarization	Linear (Vertical)	Linear (Horizontal)	Rotated 90 degrees
Maximum heat load	500 W	480 W	Lower power consumption
Flowrate, air	250 CFM x 4	140 CFM x 2	Lower air flow rate required
Flowrate, water	0.8 GPM, < 60 PSI	1.0 GPM, < 60 PSI	Higher water flow rate required
Input voltage and current	30 VDC / 14 A	48 VDC / 10 A	Voltage standardized at 48 V and current lowered to 10 A
Dimensions (mm)	841 x 71 x 107	425 x 89 x 138	Shorter length, wider & taller
Weight	18.0 lb / 8.2 kg	13.0 lb / 5.9 kg	About 5 lb lighter
I/O Connection	Female DB-9 connector	Female DB-9 connector	Same number of pins, different control signals. See the sections “ I/O Connections ” and “ I/O Signals ” for more information.

Product Update Information

Technical Drawing: 48-2

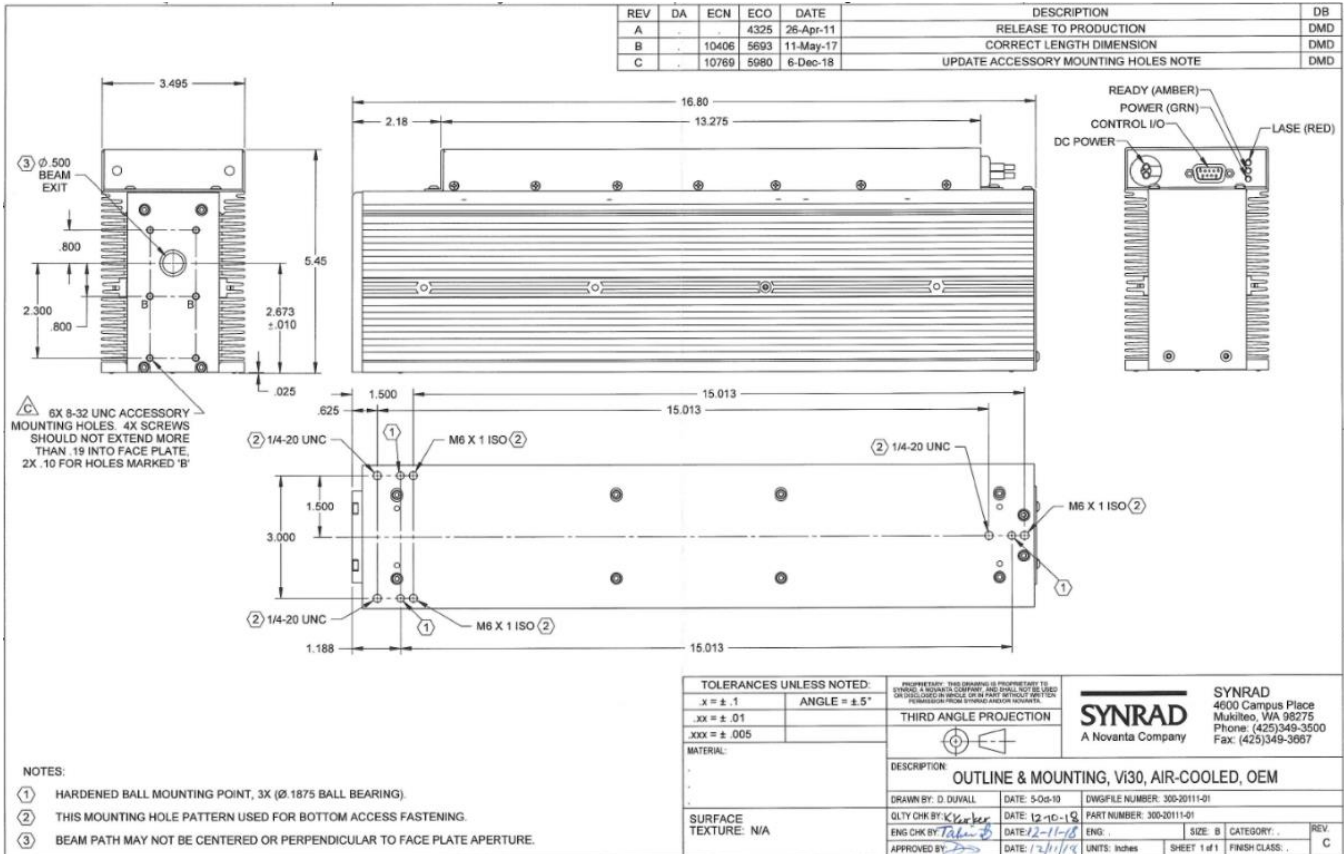
Outline and mounting features for the air-cooled 48-2 lasers. Units are in inches.



Product Update Information

Technical Drawing: vi30+

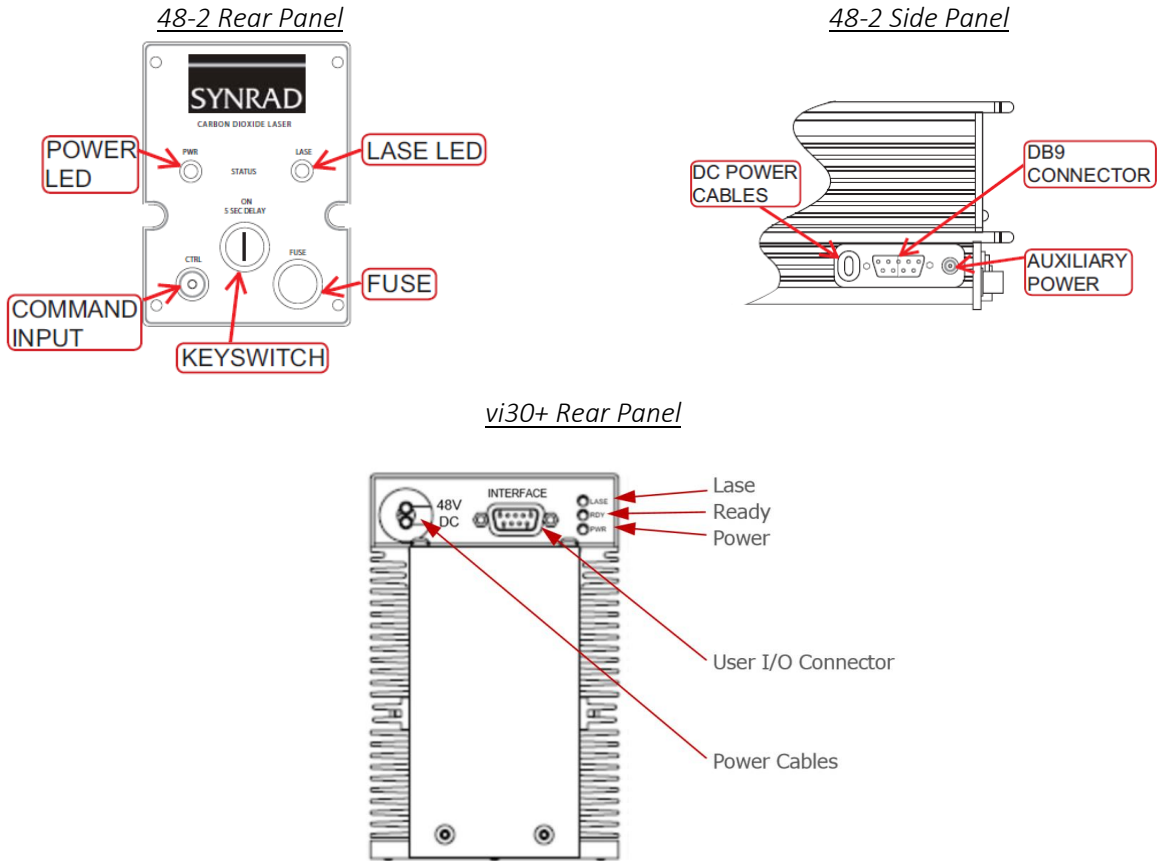
Outline and mounting features for the air-cooled vi30+ lasers. Units are in inches.



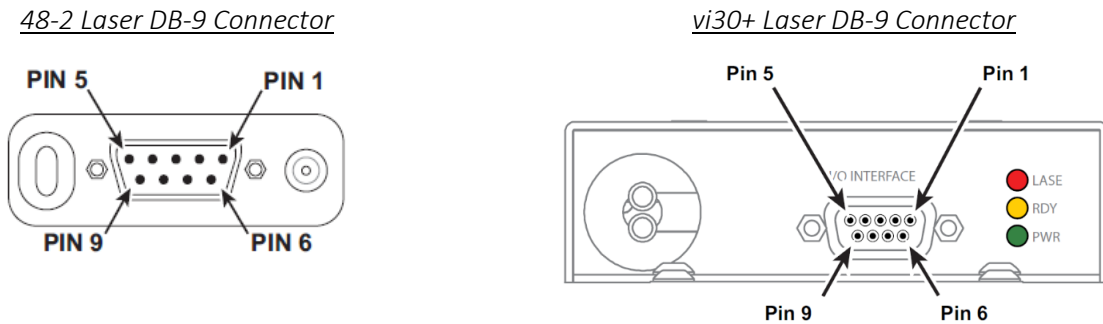
Product Update Information

I/O Connections

The following diagrams show the I/O connections for the 48-2 laser and the vi30+ laser.



Both the 48-2 laser and the vi30+ laser have a female DB-9 connector for I/O signals, as shown in the following diagrams.



Product Update Information

I/O Signals

Although both the 48-2 and vi30+ connectors have 9 pins, the functions and control signals are very different, as is shown in the following table. Please refer to the manuals for more information on the circuits and specifications for each of the control signals.

		<i>Pin # and Description</i>		
<i>Function</i>	<i>48-2 Laser</i>	<i>vi30+ Laser</i>		
PWM Command	<ul style="list-style-type: none"> BNC Command Input Not controlled with the DB-9 connector. There is a separate BNC connector on the rear panel of the laser, labeled CTRL, that accepts tickle and PWM signal inputs. This signal is connected to an optoisolator, the output of which is applied to the PWM switch control circuit. The PWM switch control circuit gates the PWM switch off and on at the frequency and duty cycle controlled by the modulation source. When the PWM switch closes, a potential of +30 VDC is applied to the RF driver. <ul style="list-style-type: none"> Laser off: +0 VDC (+0.0 to +0.5 VDC) Laser on: +5 VDC (+3.5 to +10 VDC) at 5 kHz nominal and up to 20 kHz External tickle signal: +5 VDC at 5 kHz for 1 μs \pm0.2 μs 	<ul style="list-style-type: none"> Pin 1 = PWM Positive Input Use this optoisolated voltage input for tickle and PWM signals referenced to PWM Negative (Pin 6). When the PWM command signal is high, a potential of +48 VDC is applied to the RF driver. <ul style="list-style-type: none"> Laser off: +0 VDC (+0.0 to +0.8 VDC) Laser on: +5 VDC (+3.5 to +6.7 VDC) at 5 kHz nominal and up to 100 kHz External tickle signal: +5 VDC at 5 kHz for 1 μs \pm0.2 μs Pin 6 = PWM Negative Input This input provides the negative or return side of the opto-isolated tickle / PWM Command signal reference to PWM Positive (Pin 1). 		
Signal Ground	<ul style="list-style-type: none"> Pin 2 and Pin 4 Signal ground/chassis ground for Pins 1, 3, 5, 8, and 9. 	<ul style="list-style-type: none"> Pin 8 This connection is the ground reference for all inputs and outputs except PWM Positive. 		
Fault Shutdown	<ul style="list-style-type: none"> Pin 1 = Fault Shutdown Output Indicates failure of internal circuitry or existence of over temperature (>60°C \pm 2°C), over voltage, or under voltage fault. This active low signal (referenced to Pin 2 or Pin 4) transitions from +15 V (normal operation) to 0 VDC when a fault occurs. Use this output signal to disable external processes during a fault. 	<ul style="list-style-type: none"> The fault output has been separated into two pins to distinguish between voltage faults and temperature faults. See “DC Voltage Fault” and “Over Temp Fault”. 		
DC Voltage Fault	<ul style="list-style-type: none"> This fault is indicated with the output from Pin 1. See “fault shutdown”. 	<ul style="list-style-type: none"> Pin 7 = DC Voltage Fault Output This output is logic high (+5 V) if the DC input voltage is under or over voltage limits 		

Product Update Information

(PWR indicator flashes a sequence of 2 blinks, pauses ½ second, then repeats). The output is low (0 V) when DC input voltage is within limits. The DC Voltage Fault output sources 20 mA typical, 40 mA maximum.

- | | | |
|-------------------------|---|---|
| Over Temp Fault | <ul style="list-style-type: none">• This fault is indicated with the output from Pin 1. See “fault shutdown”. | <ul style="list-style-type: none">• Pin 4 = Over Temp Fault Output
This output goes logic high (+5 V) when an over temperature fault condition is detected, causing the RDY indicator to flash continuously. When the laser is operating within the normal temperature range, this output is at 0 V. This output sources 20 mA typical, 40 mA maximum. |
| Temp Warning | <ul style="list-style-type: none">• Pin 5 = Pre-shutdown Temp Warning Output
This active low signal (referenced to Pin 2 or Pin 4) transitions from +15 V (normal operation) to 0 VDC when a pre-shutdown temperature warning occurs (when laser temperature reaches 54°C ± 2°C) and remains low until temperature falls 2°C. Use this output to notify user of need to increase laser cooling or risk shutdown. | <ul style="list-style-type: none">• Function not available with this laser. |
| Remote Interlock | <ul style="list-style-type: none">• Pin 3 = Remote Interlock Input
Disables the laser when an interlock switch wired to this input from an equipment door or panel is opened. Ground this input to Pin 2 or Pin4 only. Do not apply a voltage to this pin. As shipped, Pins 3 and 4 are connected by the factory installed jumper plug to enable the Remote Interlock function. | <ul style="list-style-type: none">• Function not available with this laser. |
| Remote Keyswitch | <ul style="list-style-type: none">• Pin 6 = Remote Keyswitch Input
Connect a remote relay or switch in series with the laser Keyswitch to control the laser On/Off/Reset functions. Connect Pin 6 to Pin 7 to run; open this connection to halt lasing or reset faults. As shipped, Pins 6 and 7 are connected by the factory-installed jumper plug to enable the Remote Keyswitch function. | <ul style="list-style-type: none">• Function not available with this laser. |

Product Update Information

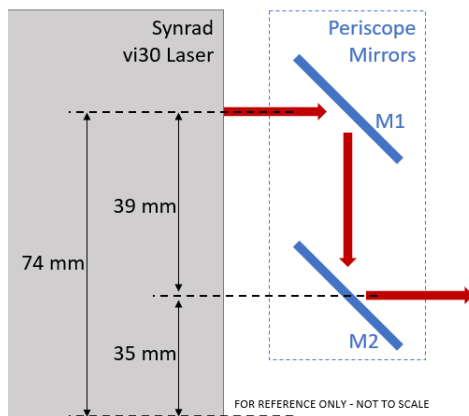
	<ul style="list-style-type: none">• Pin 7 = Remote Keyswitch Output Connect Pin 7 to Pin 6 to enable the Remote Keyswitch function (see Pin 6 description above). Pin 7 is at DC line potential (+30 VDC) only when the Keyswitch is set to ON. As shipped, Pins 6 and 7 are connected by the factory-installed jumper plug.	
Laser Enable	<ul style="list-style-type: none">• Function not available with this laser.	<ul style="list-style-type: none">• Pin 9 = Laser Enable Input When this input is logic high (+5 V) the laser is enabled (RDY indicator illuminates yellow). The laser is disabled when the input is low (0 V). After this input goes high, a five-second delay occurs before tickle or PWM signals are applied to the RF circuit.
Lase Indicator	<ul style="list-style-type: none">• Pin 8 = Remote Lase LED Output Connect an LED or LED-optoisolator between Pin 8 and Signal Ground for a remote LASE indication. The output is limited to 11 mA at 2.4 VDC and is pulse width modulated at the input PWM command signal frequency (i.e. not a steady state on/off signal).	<ul style="list-style-type: none">• Pin 3 = Lase Indicator Output This output is logic high (+5 V) when the laser is actively lasing (LASE indicator illuminated red). The output is low (0 V) when the laser is not lasing (LASE indicator Off). The Lase Indicator output sources 20 mA typical, 40 mA maximum.
Ready Indicator	<ul style="list-style-type: none">• Pin 9 = Remote Ready LED Output Connect an LED or LED-optoisolator between Pin 9 and Signal Ground for a remote Ready (PWR) indication. The output is limited to 11 mA at 2.4 VDC	<ul style="list-style-type: none">• Pin 2 = Laser Ready Output This output is logic high (+5 V) when the laser is ready to lase (RDY indicator illuminated yellow). The output is low (0 V) when the laser is disabled (RDY indicator Off). The Laser Ready output sources 20 mA typical, 40 mA maximum.
DC Out	<ul style="list-style-type: none">• Function not available with this laser.	<ul style="list-style-type: none">• Pin 5 = DC Out This connection provides a +5 VDC, 250 mA maximum user output voltage reference to GND (Pin 8). For example, this voltage can be switched to drive the Laser Enable input.

Appendix

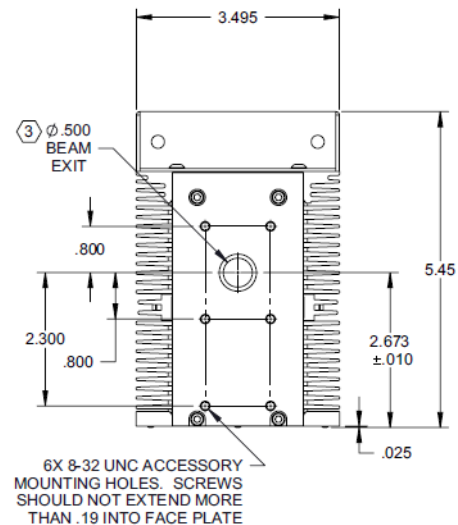
Updating Reversed 48-2 Configurations

Some customers mount the 48-2 laser upside-down, or reversed, to ensure the beam stays as close as possible to the stable base of the system. In this configuration, there is a significant difference in the beam exit height of the reversed 48-2 laser and the vi30+ laser. This height discrepancy can be mitigated with a periscope that mounts on the front face of the vi30+ and redirects the beam to match the beam exit height of a reversed 48-2 laser. The faceplate of the vi30+ laser includes six accessory mounting holes (8-32 UNC) that can be used to mount a periscope. See the following schematic of the vi30+ redirected beam height and the drawing of the vi30+ faceplate with mounting holes.

vi30+ Beam Exit Height and Periscope



vi30+ Faceplate and Periscope Mounting Holes



A small periscope can be mounted to the faceplate of the laser without impacting the laser performance, but mounting other components is strongly discouraged. Any additional weight mounted on the faceplate increases the strain on the housing of the laser, and this can both degrade the optical performance as well as reduce the overall lifetime of the laser. Note that in addition to the overall weight of the periscope, the cantilever distance should also be minimized.

The diameter of the beam exiting the vi30+ laser is typically around 3 mm, so the clear aperture of the periscope mirrors must be at least 1.5x this diameter. Although smaller mirrors add less strain to the laser faceplate, smaller mirrors are also more likely to clip the beam. Inside the laser, Synrad uses mirrors which are much larger than this 1.5x minimum, typically around 15 – 20 mm in diameter.

Please contact Synrad if you have other questions about updating from this configuration.

Product Update Information



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Support & Updating Other Configurations

If you have other concerns about updating your specific system, please let us know. Our expert technical support teams are here to provide you with more information, answer any questions you may have, and offer guidance for installation, operation, and troubleshooting of your laser.

Synrad Technical Support Engineers have an average of 11 years of laser system experience and can connect with you directly via phone or email. With regional offices located in the USA, Europe, China, and Japan, our Technical Support Engineers respond quickly with the precise information you are seeking.

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