

## Technical Data

# NEW 32-1 CO<sub>2</sub> Laser

Ultra compact 5 Watt CO<sub>2</sub> laser for precise marking and coding applications



High performance CO<sub>2</sub> laser engineered for easy integration and mounting onto compact coding and marking systems.

- Easily fits into tight spaces and onto weight-sensitive marking and coding systems
- Outstanding maximum operating environment temperature (up to 40° C) ensures reliable operation in a wide range of conditions



The perfect ultra-compact, low-power CO<sub>2</sub> laser source for PCB marking and coding applications.

Versatile low-power CO<sub>2</sub> laser source that delivers clean, consistent results on a variety of materials.



## Specifications

*Specifications are preliminary and are subject to change without notice*

Output Specifications	
Wavelength, $\mu\text{m}$	10.57 - 10.63
Power Output	5 W
Power Stability (cold start)	$\pm 15\%$
Beam Diameter, mm (at $1/e^2$ )	$2.3 \pm 0.5$
Beam Divergence, full angle at $1/e^2$	$\leq 8.0 \text{ mrad}$
Ellipticity	$<1.2$
Polarization	Random
Rise Time (measured at 1 kHz, 50% duty cycle)	$<150 \mu\text{sec}$
Fall Time (measured at 1 kHz, 50% duty cycle)	$<150 \mu\text{sec}$
Input Specifications	
Power Supply Voltage	30 VDC $\pm 2.0$ VDC
Power Supply Maximum Current	4.0 A
Input Signals	
Frequency	DC - 25kHz
Cooling Specifications	
Maximum Heat Load	150 Watts
Maximum Tube Temperature	60° C
Minimum Flow Rate	150 CFM per fan (2 required)
Environmental Specifications	
Operating Ambient Temperature Range	5° C - 40° C
Humidity	$\leq 80\% \text{ RH}$ , non-condensing
Physical Specifications	
Length	11.2 in. (284 mm)
Width	2.8 in. (71 mm)
Height	4.2 in. (106 mm)
Weight	7 lbs. (3.18 kg)

## Synrad's Smallest Laser

At a fraction over 11 inches (284 mm) long and only 2.8 inches (71 mm) wide, the 32-1 is Synrad's smallest laser. Engineered for compact laser processing systems, the 32-1 easily fits into desk-top sized models. At 7 lbs. (3.18 kg) the 32-1 adds

*The Synrad 32-1 shown side-by-side with the 48-1 laser. The 32-1 is 34% smaller and 22% lighter than the 48-1.*



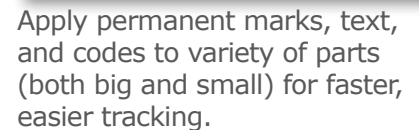
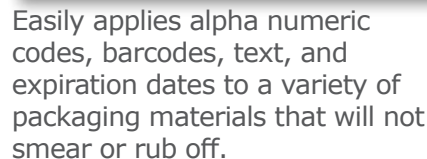
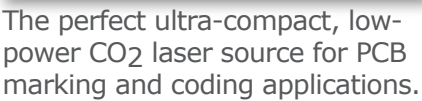
minimal weight, maintains portability, and can easily be integrated into small systems. Built to operate reliably, Synrad's ultra compact 32-1 delivers a high quality laser beam, even in the most demanding conditions.



Invisible Laser Radiation  
Avoid eye or skin exposure to direct or scattered radiation  
Class 4 Laser Product.

**SYNRAD**  
A Novanta Company

## Technical Illustrations dimension are in inches (mm)



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A Novanta Company

- 10, 25 & 50W models
- Low cost design
- Rugged & reliable
- Proven operating lifetimes > 45,000 hours



## Synrad's **series48** - setting the industry standard

Synrad's original "all-metal" tube technology opened the door for sealed CO<sub>2</sub> lasers in many industrial applications. After 15 years, it remains the industry standard for performance, reliability, long lifetime, and low cost.

The laser tube is a rigid box structure design that provides an ultra-stable platform for the laser resonator. Synrad's 48-series tubes are mounted into an H-shaped heat sink extrusion that also serves as the chassis for the drive electronics. This guarantees that the laser will withstand the harsh requirements of modern industrial environments.

The all-metal sealed tube design and proprietary manufacturing process ensure high gas purity, essential for long operating lifetimes. With over 100,000 Synrad lasers operating worldwide, Synrad is the only CO<sub>2</sub> laser manufacturer that can boast of proven operating lifetimes in excess of 45,000 hours (at which time, a simple and inexpensive gas refill returns the laser to full operation).

Synrad lasers can be operated from 0 - 100% duty cycle, with laser power adjusted using a pulse width modulation (PWM) control. The laser is controlled directly with a TTL signal (rear-mounted BNC connector). Alternatively, a DB-9 connector provides remote access to all laser functions, including laser control, fault conditions monitoring, remote interlock, and failure shutdown options.

All 48-series lasers operate from standard 30VDC power supplies, and can be either fan-cooled (48-1 and 48-2 models) or water-cooled.

With output powers of 10, 25, or 50W, and available in either OEM or keyswitch configurations, Synrad's 48-series lasers are ideal for incorporation into marking, engraving, and small cutting systems, where performance, low price and high reliability are essential.

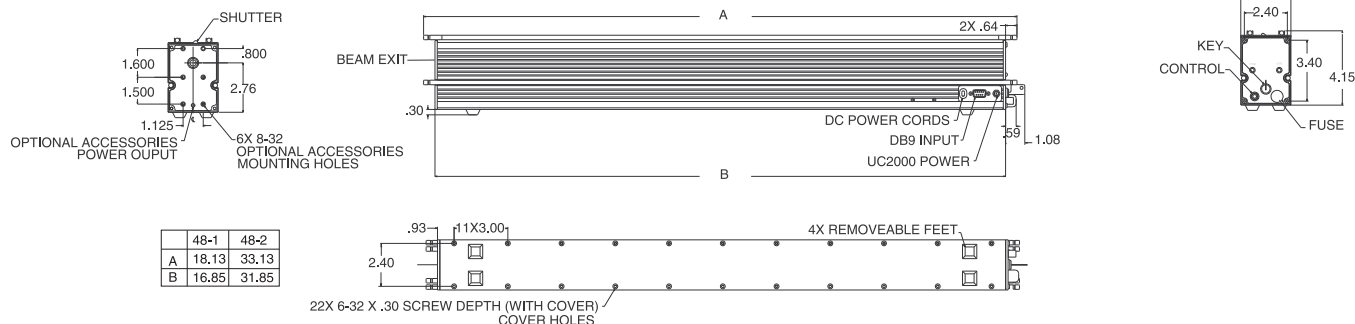
## • Specifications

Model	48-1(S)	48-1(S)W	48-2(S)	48-2(S)W	48-5(S)W
Output Power	10W		25W		50W
Mode Quality	TEM <sub>00</sub> , 95% Purity M <sup>2</sup> <1.2		TEM <sub>00</sub> , 95% Purity M <sup>2</sup> <1.2		TEM <sub>00</sub> , 95% Purity M <sup>2</sup> <1.2
Ellipticity	<1.2		<1.2		<1.2
Rise Time	<150μsec		<150μsec		<150μsec
Beam Diameter	3.5mm		3.5mm		3.5mm
Beam Divergence (full angle)	4mR		4mR		4mR
Wavelength	10.57-10.63μm*		10.57-10.63μm*		10.57-10.63μm*
Power Stability, from cold start (guaranteed)	±10		±5%		±5%
Polarization	Linear (Vertical)		Linear (Vertical)		Random
Cooling	Air	Water	Air	Water	Water
Heat Load (max)	300W		500W		800W
Flow Rate, Air	250 CFM x 2	N/A	250 CFM x 4	N/A	N/A
Flow Rate, Water (18-22°C)	N/A	0.5 GPM	N/A	0.8 GPM	1.5 GPM
Input Voltage / Current	30 VDC / 7A		30 VDC / 14A		30 VDC / 28A
Dimensions (in)	16.9 x 2.8 x 4.2		31.9 x 2.8 x 4.2		34.9 x 5.3 x 4.5
(mm)	429 x 71 x 107		810 x 71 x 107		886 X 135 X 114
Weight	9 lbs / 4.1 kg		18 lbs / 8.2 kg		44 lbs / 20 kg

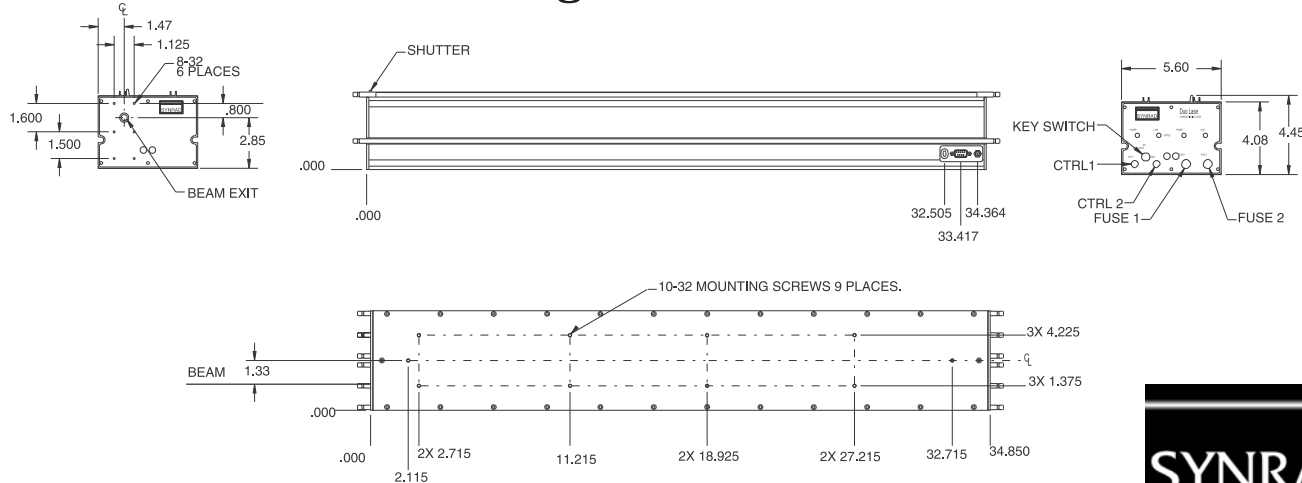
(S) in the model number designates OEM configuration (does not include keyswitch or shutter switch).  
Beam specifications measured at 1/e<sup>2</sup>.

\*Typical. Actual wavelength range may vary from 10.2-10.8μm  
Specifications subject to change without notice.

## • 48-1/48-2 Outline & Mounting



## • 48-5 Outline & Mounting







*firestar* *V*series

30 & 40W CO<sub>2</sub> Lasers



Whether your application calls for a perfect beam for marking a tiny 2D bar code, the most compact laser for integrating into a tabletop engraver, or a laser with a proven track record of reliability to withstand a harsh industrial environment - one of our lasers will meet your requirements.

Synrad developed the *firestar v-series* with a goal of producing the highest quality, low power CO<sub>2</sub> lasers in the most compact package possible. Available in 30 and 40W models, the *v-series* lasers are ideal for integration into desktop engravers and compact marking and coding systems. The *v30*, available only as an OEM model, was designed specifically for these manufacturers.

*Firestar v-series* models are available in the following configurations:

### **firestar v30:**

- OEM, air-cooled (SA\*)
- OEM, fan-cooled (SF)
- OEM, water-cooled (SW)

### **firestar v40:**

- OEM, air-cooled (SA\*)
- OEM, fan-cooled (SF)
- OEM, water-cooled (SW)
- Keyswitch, fan-cooled (KF)
- Keyswitch, water-cooled (KW)

\* Air-cooled SA model lasers require the addition of customer-supplied cooling fans.

- 30 & 40W models
- Integrated RF Supply
- Superior Near-Field Beam Quality
- Excellent Power Stability
- Fast Rise/Fall Time
- Rugged, 3-point Mounting (available in Metric & English units)
- RoHS Compliant
- Easily integrated with our FH Series Marking Head

Outstanding performance, combined with compact size and air-cooled operation, make the *firestar v-series* lasers perfect for incorporation into high-performance laser engravers and high speed marking systems.

Based on a waveguide design, Synrad's *v-series* resonator technology guarantees a circular beam (typical  $M^2 = 1.1$ ) in both the near and far field. This near-perfect beam can be focused to the smallest achievable spot size, thereby creating the maximum possible power density on a work surface. This results in faster processing speeds and higher resolution for cutting or engraving applications.

The resonator design features a small diameter bore and high gas fill pressure for fast rise/fall times (typically 80-90  $\mu$ sec), while the large gas ballast ensures the long operating lifetimes expected of all Synrad lasers. Long term power stability of better than  $\pm 3\%$  is typical.

As with all Synrad lasers, the *v-series* can be operated up to 100% duty cycle, with laser power adjusted using a pulse width modulation (PWM) control. Both *v-series* models incorporate an internal RF supply, and are driven by standard 30VDC power supplies.

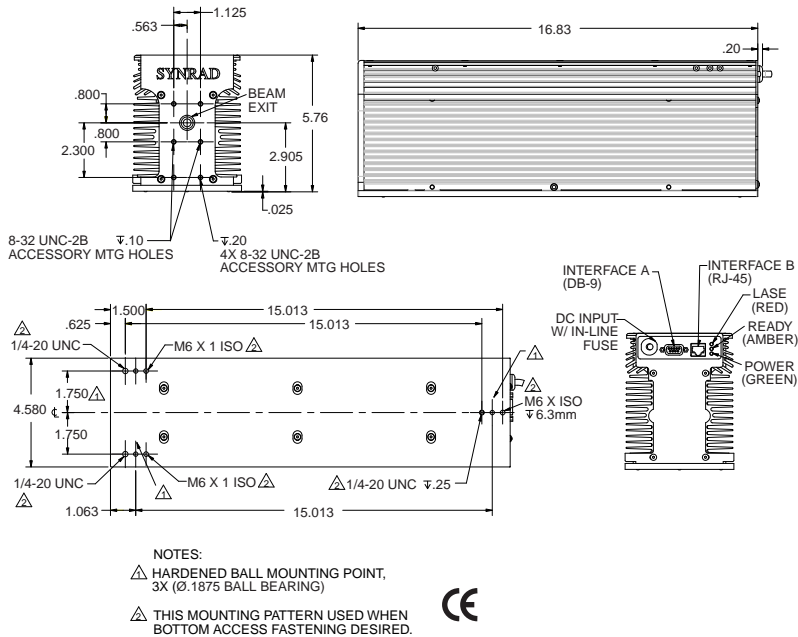


Designed for ease-of-integration, the *firestar v30* and *v40* lasers incorporate a unique 3-point mounting system for easy removal and replacement. The *firestar v-series* and *t-series* lasers share common beam exits, ensuring virtual drop-in replaceability up to 100 watts.

Synrad's *v40*, available in both keyswitch or OEM configurations, features an onboard tickle generator, an industry standard 5-24VDC I/O port and 15-pin D-Sub connector for remote control and status lines. The *v40* is available in either air (SA\*), fan (SF/KF), or water-cooled (SW/KW) configurations.

The *v30*, available strictly as an OEM laser, does not incorporate a built-in tickle generator, and features simplified LEDs and an I/O interface using DB-9 and RJ-45 connectors. The OEM *v30* laser is available in your choice of models: air-cooled (SA\*), fan-cooled (SF), or water-cooled (SW).

## Built for OEMs - the *firestar v30*



All dimensions are in inches

OEM air-cooled model shown  
For more drawings, visit [www.synrad.com/vseries](http://www.synrad.com/vseries)

### firestar V30



The 30 watt *firestar v30* is designed primarily for OEM usage. Available in air, fan and water-cooled models with a simple base plate-mounting scheme, the *v30* provides a simple interface based on TTL level input and I/O signals via a DB-9 or RJ45 connector. Built to withstand the hottest environments, the excellent performance of this laser, combined with its compact size and air-cooling, make it a perfect fit for OEM marking and engraving systems.

- 30W • Air, Fan or Water-Cooled • Compact Footprint
- OEM Model Only

## Near-perfect beam quality in a 40W laser

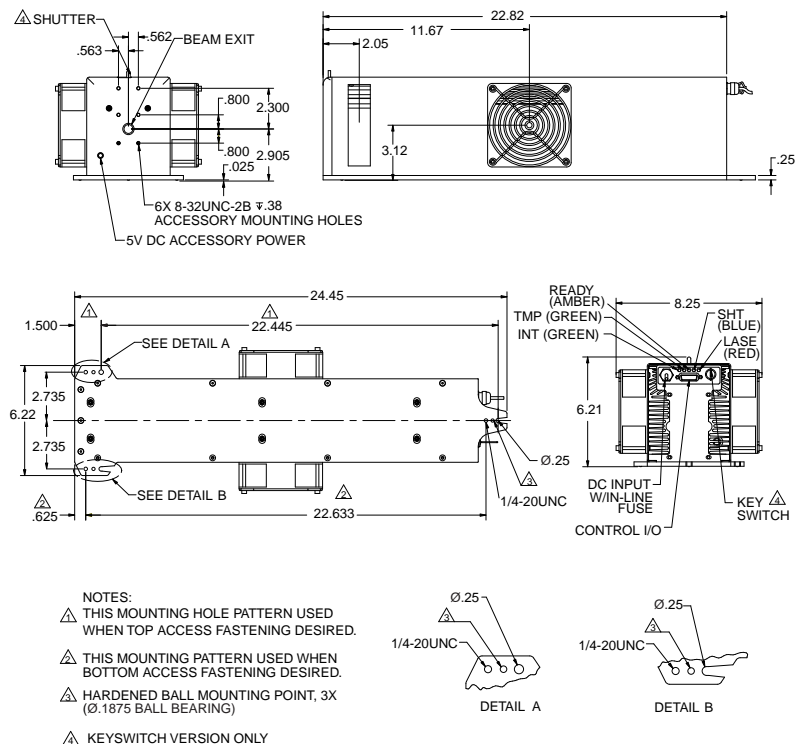
### firestar V40



For applications with higher power requirements, Synrad offers the *firestar v40*.

The *v40* comes in both OEM and keyswitch versions, and can be either air- or water-cooled. Air-cooled models can be supplied with or without fans. The *v40*'s powerful control panel includes a 5-24V I/O port and 15-pin D-Sub connector, plus LED indicator lights to make testing of laser functions quick and easy. Common mounting and beam exits with our *firestar t-series* lasers ensure an upgrade path for the future.

The high power output of the *v40* with a near-perfect beam provides the ideal source for laser engravers and small-area cutting systems.



All dimensions are in inches

Keyswitch fan-cooled model shown  
For more drawings, visit [www.synrad.com/vseries](http://www.synrad.com/vseries)

- 40W • Air & Water-Cooled models • Compact Footprint
- OEM and Keyswitch Models

## Specifications

Model	v30	v30W	v40	v40W
Output Power	30W		40W	
Mode Quality	$M^2 \leq 1.2$		$M^2 \leq 1.2$	
Ellipticity	<1.2		<1.2	
Rise Time	<100µsec		<100µsec	
Beam Diameter	2.5±0.5 mm		2.5±0.5 mm	
Beam Divergence (full angle)	<7.0mR		<7.0mR	
Wavelength	10.57-10.63µm*		10.57-10.63µm*	
Power Stability, from cold start (guaranteed) after 2 minutes (typical)	±5%		±5%	
	±3%		±3%	
Polarization	Linear (Horizontal)		Linear (Horizontal)	
Cooling	Air	Water	Air	Water
Heat Load (max)	450W		540W	
Flow Rate, Air	140 CFM x 2	N/A	140 CFM x 2	N/A
Flow Rate, Water (18-22°C)	N/A	1.0 GPM, <60 PSI	N/A	1.0 GPM, <60 PSI
Input Voltage / Current	Air-Cooled - 30 VDC / 15A (24A peak for 0.5ms min.)		30 VDC / 18A	
	Fan-Cooled - 30 VDC / 16A (24A peak for 0.5ms min.)			
Dimensions** (in) (mm)	16.8 x 4.6 x 5.8		22.8 x 4.6 x 5.8	
	428 x 117 x 146		579 x 117 x 146	
Weight	18 lbs / 8.2 kg	19 lbs / 8.7 kg	23 lbs / 10.4 kg	24 lbs / 10.9 kg

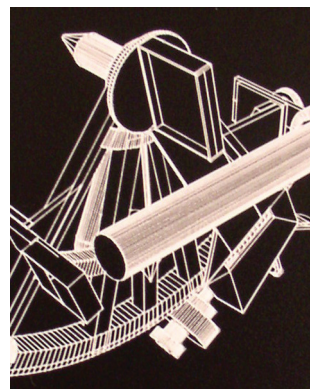
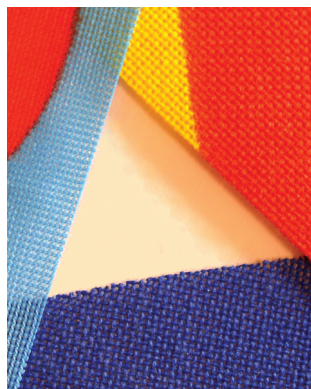
Beam specifications measured at 1/e<sup>2</sup>.

\*Typical. Actual wavelength may vary from 10.2-10.8µm

\*\*Air-cooled models are measured without optional fans.  
Specifications subject to change without notice.



Invisible Laser Radiation  
Avoid eye or skin exposure to direct or scattered radiation  
Class 4 Laser Product.



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# High performance *t-series* technology in a fully integrated package

## firestar-*ti* 60, 80 & 100W



Maximum power and performance is the drive behind *firestar t*-technology. Developed in 2001, the highlights of this design are the fast rise/fall time (typically <50µsec) and high beam quality.

In 2009, responding to market demands for more compact and lower cost lasers, while retaining the performance and reliability of the existing *t-series*, we developed a new RF technology to eliminate the separate RF power supply and associated cables.

The resulting *firestar ti-series* is compact, lower cost, more energy efficient, and delivers the high power, fast pulsing, and optical quality essential for applications such as laser coding and large area engraving, where high-speed scanning or modulating of the laser beam is required.

The *ti-series*' combination of compact size, high performance, and low price allows our OEM customers to succeed in their worldwide markets.

### Specifications

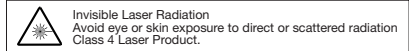
Model	<i>ti60</i>	<i>ti60W</i>	<i>ti80</i>	<i>ti80W</i>	<i>ti100W</i>
Output Power	60W		80W		100W
Mode Quality	$M^2 \leq 1.2$		$M^2 \leq 1.2$		$M^2 \leq 1.2$
Ellipticity	<1.2		<1.2		<1.2
Rise Time	<75µsec		<75µsec		<75µsec
Beam Diameter	2.0 ±0.3mm		2.0 ±0.3mm		2.0 ±0.3mm
Beam Divergence (full angle)	7.0mR		7.0mR		7.0mR
Wavelength	10.57-10.63µm		10.57-10.63µm		10.57-10.63µm
Power Stability, from cold start (guaranteed)	±7%		±7%		±7%
Polarization	Linear (Vertical)		Linear (Vertical)		Linear (Vertical)
Cooling	Air	Water	Air	Water	Water
Heat Load (max)	900W		1200W		1700W
Flow Rate, Air	150 CFM x 2	N/A	190 CFM x 2**	N/A	N/A
Flow Rate, Water (18-22°C)	N/A	1-2 GPM, <60 PSI	N/A	1-2 GPM, <60 PSI	1-2 GPM, <60 PSI
Input Voltage / Current	48 VDC / 18A		48 VDC / 22A		48VDC / 35A
Dimensions* (in)	20.7 x 4.5 x 5.8	21.4 x 4.1 x 5.9	20.7 x 4.5 x 5.8	21.4 x 4.1 x 5.9	21.4 x 4.1 x 5.9
(mm)	526 x 114 x 148	544 x 104 x 150	526 x 114 x 148	544 x 104 x 150	544 x 104 x 150
Weight*	28.9 lbs / 13.1 kg	26.2 lbs / 11.9 kg	28.9 lbs / 13.1 kg	26.2 lbs / 11.9 kg	26.2 lbs / 11.9 kg

\* Air-cooled models are measured and weighed without optional fan cover

\*\*Static air pressure 0.7 inch H<sub>2</sub>O (173Pa)

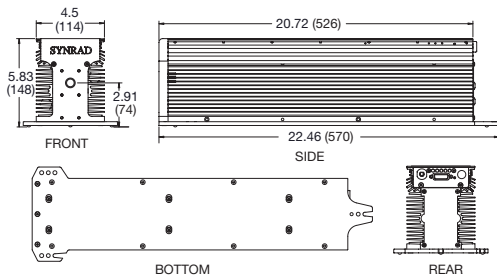
Beam specifications measured at 1/e<sup>2</sup>.

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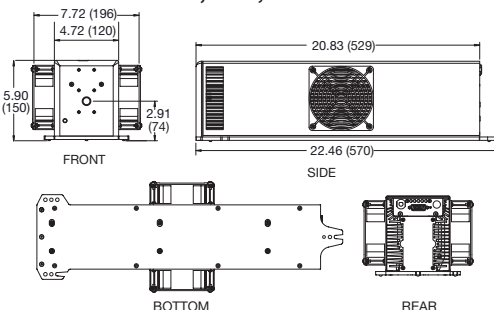


### Outline & Mounting

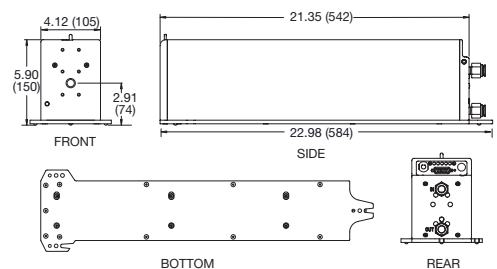
*ti60, ti80, OEM, air-cooled*



*ti60, ti80, fan-cooled*



*ti60, ti80, ti100, water-cooled*



Dimensions are in inches (millimeters)

# Pulstar p100 – Pulsed CO<sub>2</sub> Industrial Laser



**Pulstar** series  
**p100**

**400 W peak pulse power**

**100 W average power**

**Excellent beam quality**

**Highest peak power in class**

**Synrad performance & reliability**

## Putting the power of pulse in your production line

The introduction of the Pulstar **p100** into Synrad's globally acclaimed portfolio of industrial CO<sub>2</sub> lasers signified the arrival of specialized CO<sub>2</sub> laser processing. Featuring 100 W of average power and an impressive 400 W of peak pulse power (typical), the **p100** is ideally suited for a wide variety of applications, including high speed drilling and perforating, where quicker results, deeper cutting/marking, and minimal charring and burning on delicate materials is crucial.

With fully integrated RF components, the **p100** completely eliminates the need for external RF cabling and bulky external RF supplies. And, with the same familiar LED indicators, interface, and I/O signal configuration found on many of Synrad's acclaimed Firestar lasers, installation/operation is a quick and easy.

Lighter than competing lasers on the market with a smaller footprint and compact body size, the **p100's** versatile design and internal beam conditioning make it an excellent choice for manufacturers and OEMs seeking big power in a smaller, easy to handle package.

## Pulstar p100 Features & Benefits:

Feature	Benefit
Peak pulse power of 400 W	Decreasing HAZ on leather and plastics
Average output power of >100 W	Faster processing speed for cutting
Peak pulse energy of 190mJ	Faster processing speed for piercing, drilling, perforating
Max pulse width of 600µs	Deep drilling, scribing ceramics
Fast rise time of <40µs	High quality pulse-to-pulse performance in converting applications e.g. for producing circular holes
Power stability of ±7% (from cold start)	Consistency in materials processing
Duty cycle range from 0% to 37.5%	Expanding materials processing window by offering a range of peak and average powers with one laser

## Specifications:

Model	10.2µm	10.6µm
Peak Pulse Power (typical) <sup>(1)</sup>	375 W	400 W
Average Output Power (minimum) <sup>(2)</sup>	90 W	100 W
Wavelength (typical) <sup>(3)</sup>	10.25µm ± 0.1µm	10.6µm ± 0.1µm
Peak Pulse Energy (maximum) <sup>(4)</sup>	180mJ	190mJ
Pulse Length (maximum)	600µs	600µs
Rise Time / Fall Time <sup>(5)</sup>	< 40µs / < 100µs	< 40µs / < 100µs
Power Stability from Cold Start (typical) <sup>(6)</sup>	± 7%	± 7%
Power Stability after Three Minutes (typical) <sup>(6)</sup>	± 5%	± 5%
Duty Cycle Range	< 37.5%	< 37.5%
Operating Frequency Single Shot to	100 kHz	100 kHz
Beam Waist Diameter (at 1/e <sup>2</sup> ) <sup>(6)</sup>	7.5mm ± 1.1mm	7.5mm ± 1.1mm
Beam Diameter at Faceplate (at 1/e <sup>2</sup> ) <sup>(6)</sup>	7.5mm ± 1.0mm	8.0mm ± 1.0mm
Beam Divergence, Full Angle, (at 1/e <sup>2</sup> ) <sup>(6)</sup>	1.8 mrad ± 0.4 mrad	2.0 mrad ± 0.4 mrad
Mode Quality <sup>(6)</sup>	M <sup>2</sup> ≤ 1.2	M <sup>2</sup> ≤ 1.2
Ellipticity <sup>(6)</sup>	< 1.2	< 1.2
Polarization	Linear (Vertical)	Linear (Vertical)
Pointing Stability	± 10%	± 10%
Cooling <sup>(7)</sup>	Water (18-22° C)	Water (18-22° C)
Heat Load (maximum)	2000 W	2000 W
Flowrate	1.5-2.0 GPM < 60 PSI	1.5-2.0 GPM < 60 PSI
Input Voltage / Current (maximum)	48VDC / 40A	48VDC / 40A
Peak / RMS Currents - Amps	75A (for < 700µs) / 65A	75A (for < 700µs) / 65A
Dimensions (inches) Dimensions (mm)	23.2 x 5.2 x 6.1 590 x 132 x 155	23.2 x 5.2 x 6.1 590 x 132 x 155
Weight	30.0 lbs / 13.6 kg	30.0 lbs / 13.6 kg

Specifications subject to change without notice.

1 Measured at 1 kHz, 10% duty cycle.

2 Power level guaranteed for 24 months from date of shipment, regardless of hours, provided laser is operated within the recommended coolant flowrate and operating temperature range.

3 Typical wavelength band for 10.6µm nominal, but laser can operate in 10.2µm to 10.7µm range

4 Tested at 625Hz, 37.5% Duty Cycle

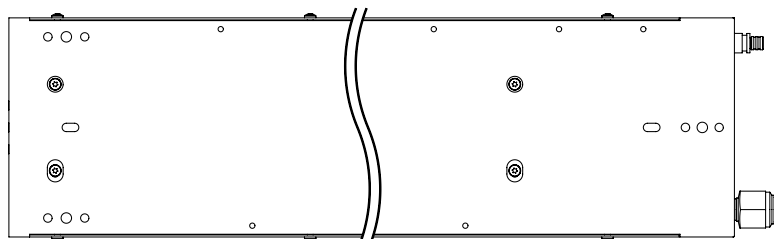
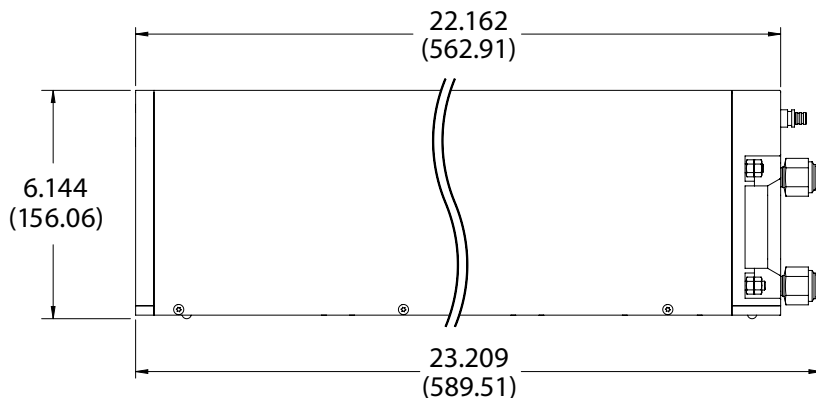
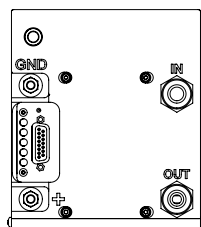
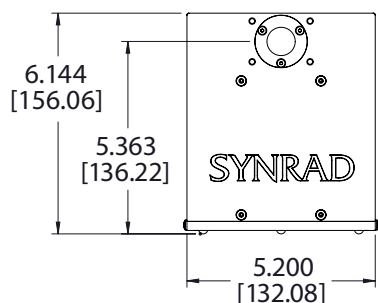
5 Tested at 1kHz, 10% Duty Cycle

6 Measured at 5 kHz, 37.5% Duty Cycle

7 At coolant temperatures above 22°C, allow power drop of 0.5% /°C to 1% /°C up to a coolant temperature of 28°C.

# Pulstar p100 – Pulsed CO<sub>2</sub> Industrial Laser

## Outline and Mounting:



## Typical Applications:

**X-Y Multi-Purpose Cutting Tables:** The p100 10.6μm is well-suited for small multi-purpose cutting environments. A small size profile allows for easy placement on a gantry and high peak power enables it to efficiently process leathers, plastics, paper and ceramics.



Cutting leather



Drilling plastics



Cutting ceramics



Cutting paper

**Converting and Complex Film Processing:** The p100 10.2μm is ideally suited for cutting, drilling, and selective perforating of food packaging films. These processes can be performed at high speed due to its high peak power. Pulstar p100's multiple wavelength options make it a versatile tool for label-cutting applications.



Marking pharmaceuticals



Converting - perforating pouches

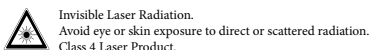


Cutting plastic labels



Microperforating food packaging

These are only some examples of potential uses for the **Pulstar p100**.  
Contact your Synrad Representative to determine the best laser for your applications.



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Pulstar p100, scan here

