

# Firestar i401 – Industrial CO<sub>2</sub> Laser



**firestar** series  
i401

**400 W average power**

**Exceptional beam quality**

**Superior power stability**

**Field serviceability**

**Synrad performance & reliability**

## Redefining the cutting edge, at 400 Watts

The Firestar i401 laser provides 400 watts of near-perfect beam quality from a single tube. Built around a hybrid waveguide/unstable resonator design, the i401 is driven by four field-replaceable integrated RF modules resulting in a rise time of less than 100  $\mu$ s. Internal beam conditioning before the output aperture first conditions, collimates, and then rotates the linear beam polarization 45° as an aid in applications where a circular polarizer is used.

The i401 operates at duty cycles ranging from 1% all the way up to 100% (full CW operation). With a best-in-class energy efficiency, up to 23% better than other 400 W lasers, the i401 offers immediate savings on energy costs and its single tube design means the i401 weighs 24% less than competing lasers—an important consideration when mounting the laser on moving gantries or robotic motion systems.

Other important design features include a pre-aligned output beam (centered in the aperture within  $\pm 1.0$  mm), an internal electromechanical shutter for maximum operator safety when integrated into the user's control system, a TCP/IP web-based Internet interface for monitoring operating parameters, an internal humidity sensor that allows you to monitor relative humidity levels to prevent condensation damage and a built-in gas purge port for ease of connection to a nitrogen or instrument-grade air purge system. Synrad will release a 10.2 $\mu$ m model soon, for more information, contact the factory for further information.

## Firestar i401 Features and Benefits:

- High output power and cutting performance
- Simple pulse width modulation control
- Exceptional rise times
- No co-alignment issues
- Compact and rugged
- Filtered beam for highest mode quality
- RF drivers offer compact size and high efficiency
- Field serviceable
- Low power consumption and heat dissipation reduces cost of investment and daily operation
- Ethernet serviceable

## Specifications:

Model	i401
Average Output Power (minimum) <sup>(1)</sup>	400 W
Wavelength <sup>(2)</sup>	10.6 $\mu$ m $\pm$ 0.1 $\mu$ m
Rise Time / Fall Time <sup>(3)</sup>	< 100 $\mu$ s / < 100 $\mu$ s
Power Stability from Cold Start	$\pm$ 7%
Power Stability after 3 Minutes (typical)	$\pm$ 5%
Duty Cycle Range	1% - 100%
Operating Frequency	0 - 100 kHz
Beam Waist Diameter (at 1/e <sup>2</sup> )	6.0mm $\pm$ 0.6mm
Beam Diameter at Faceplate (at 1/e <sup>2</sup> )	6.7mm $\pm$ 0.7mm
Beam Divergence Full Angle, (at 1/e <sup>2</sup> )	2.5 mrad $\pm$ 0.7 mrad
Mode Quality	M <sup>2</sup> $\leq$ 1.2
Ellipticity <sup>(4)</sup>	<1.2
Polarization	Linear (45 degrees)
Cooling	Water (18-22° C)
Heat Load (maximum)	6000 W
Flowrate, Air	N/A
Flowrate, Water <sup>(5)</sup>	4.0 GPM, <60 PSI
Input Voltage / Current (maximum)	48VDC / 125A
Dimensions (inches)	49.7 x 8.2 x 12.5
Dimensions (mm)	1262 x 208 x 318
Weight	130.0 lb / 59.0 kg

Specifications subject to change without notice.

1 Power level guaranteed for 24 months from date of shipment, regardless of operating hours, within recommended coolant flowrate & temperature range.

2 Typical wavelength band is 10.6 $\mu$ m nominal but laser can operate in 10.2 $\mu$ m to 10.7 $\mu$ m range. Additional wavelengths available. Contact the factory directly at 425.349.3500

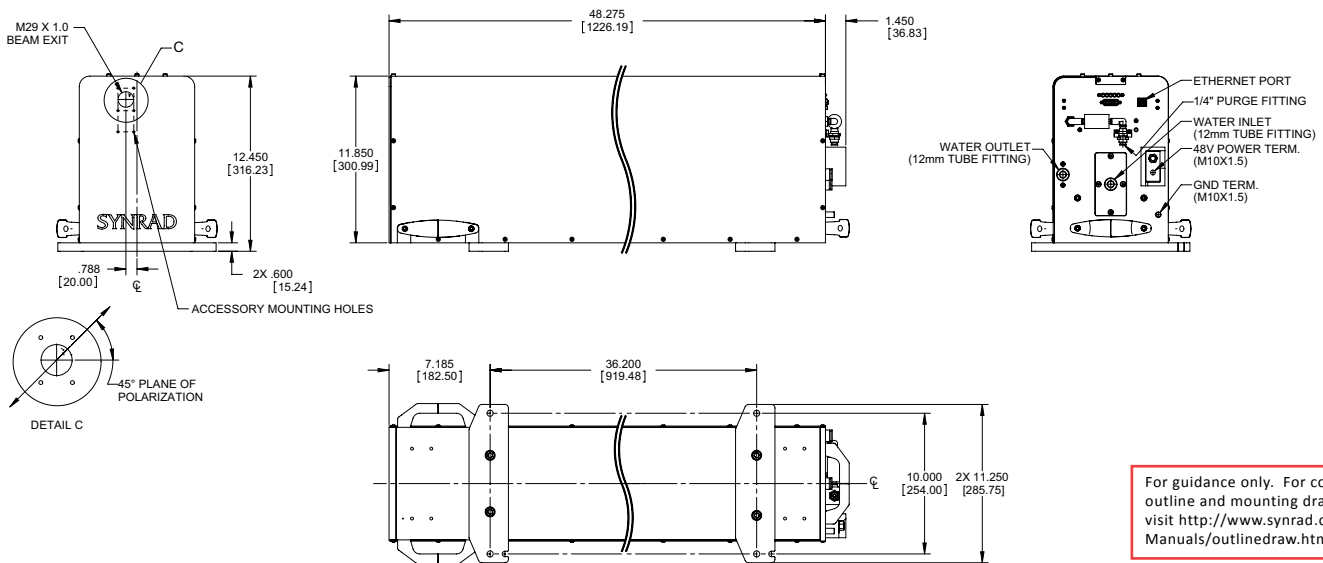
3 Tested at 100Hz, 10% Duty Cycle

4 Measured at Near Field and Far Field.

5 At coolant temperatures above 22°C, derate power 0.5 W/°C to 1 W/°C up to a coolant temperature of 28°C.

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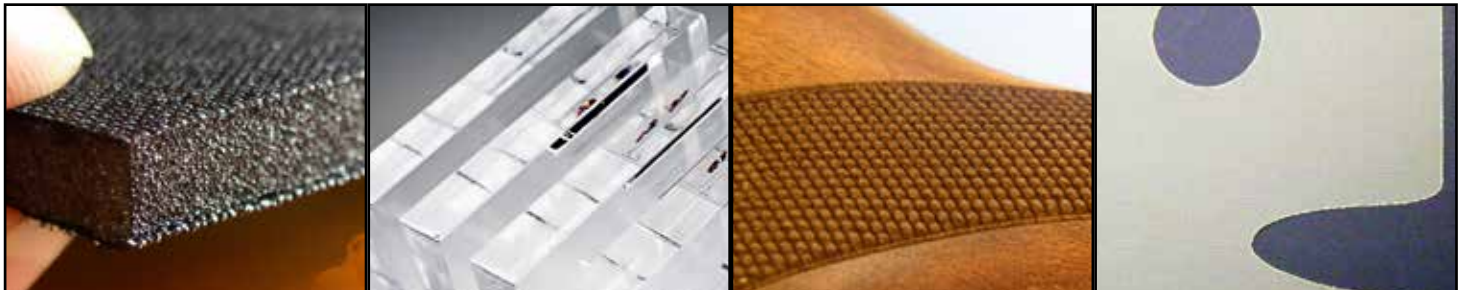
## Outline and Mounting:



For guidance only. For complete outline and mounting drawings visit <http://www.synrad.com/Manuals/outlinedraw.html>

## Typical Applications:

**X-Y Multi-Purpose Cutting Tables:** The exceptional beam quality and excellent power stability of the 10.6 $\mu$ m enables superior cutting of plastics, wood, paper and it really shines when cutting acrylic/plexiglass. As the only 400 W continuous wave (CW) in the market place, the i401's completely CW output allows for the smoothest possible cut edges in acrylic.



Cutting foam

Cutting acrylic

Engraving wood

Cutting fabric

**Converting:** The i401 optimal for specific high-speed processing in the flexible packaging markets for easy open packaging in roll-to-roll converting; and the optimal power stability is ideal for consistent precision cutting of label materials.



Converting - perforating pouches

Converting - Label cutting


Converting - Label cutting

Cutting paper

Note: These are only some examples of potential uses for the **Firestar i401**. Contact your Synrad Representative to determine the best laser for your applications.

To learn more about the Firestar i401, scan here, or visit: <http://www.synrad.com/i401>:



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

