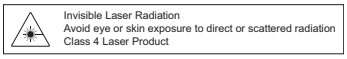
Firestar i401 Data Sheet

The new 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 µs. 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 < 10% 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 ± 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.



Firestar i401 specifications*

Output Specifications

Wavelength†	10.5–10.7 microns
Power output, continuous[1, 2]	400 Watts
Power Stability[3]	± 7%
Power Stability[4]	± 5%
Mode Quality[5]	$M^2 \leq 1.2$
Beam Waist Diameter (at $1/e^2$)[6]	6.0 ± 0.6 mm
Beam Divergence, full angle, (at $1/e^2$)	2.5 ± 0.3 mrad
Ellipticity	< 1.2
Polarization	linear, rotated 45°
Extinction Ratio	> 100:1
Rise Time[7]	< 100 µs
Modulation (Optical response)	up to 100 kHz

Input Specifications

DC Power Requirement

Voltage	48 VDC
Maximum Current[8]	125 A
Inrush Current (max.)	170 A for < 10 ms

PWM Command Signal

Voltage	+3.5 to +6.7 VDC
Current (max., continuous)	10 mA @ +6.7 VDC
Frequency	DC–100 kHz
Duty Cycle	< 10%–100% (CW)
Logic Low State (Vmin–Vmax.)	0.0 to +0.8 VDC
Logic High State (Vmin–Vmax.)	+3.5 to +6.7 VDC

Cooling Specifications

Maximum Heat Load	6000 Watts
Flow Rate (minimum)	4 GPM at < 60 PSI
Pressure Drop	10 PSI at 4 GPM
Coolant Temperature[9]	18 °C to 22 °C

Environmental Specifications

Operating Temperature[10]	15 °C – 40 °C
Humidity, non-condensing	0–95%

Physical Specifications

Length	48.3 in (122.7 cm)
Width	8.2 in (20.8 cm)
Height	11.8 in (30.0 cm)
Weight	130 lbs (59.0 kg)

* Specifications subject to change without notice.

† Typical. Actual wavelength range may vary from 10.2–10.8 µm.

1 This power level is guaranteed for 12 months regardless of operating hours.

2 48 VDC input voltage to obtain guaranteed output power.

3 Measured from cold start with tube at 20 °C for 30 minutes at start running 99% duty cycle with 4 GPM flow and 20 °C coolant temperature.

4 After two minutes (typ) at 99% duty cycle, 4 GPM flow, and 20 °C coolant temperature.

5 Measured at 5 kHz, 99% duty cycle, 20 °C coolant temp, 30 minute warm-up.

6 Measured at beam waist (see Final Test Report for beam waist location).

7 Measured at 100 Hz, 10% duty cycle.

8 Measured at 48 VDC input, 100% duty cycle.

9 Firestar i401 lasers can operate at coolant temperatures up to 28 °C to reduce problems associated with condensation; however, this may result in decreased laser performance and/or reduced laser lifetime.

10 Published specifications guaranteed at a cooling temperature of 20 °C.

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Firestar i401 Outline and Mounting Drawing