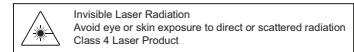


# Firestar i401 Data Sheet

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  $\mu$ 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 < 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  $\pm 1.0$  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.



## Firestar i401 specifications\*

### Output Specifications

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

### Input Specifications

#### DC Power Requirement

Voltage .....	48 VDC
Maximum Current <sup>8</sup> .....	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 <sup>9</sup> .....	18 °C to 22 °C

### Environmental Specifications

Operating Temperature <sup>10</sup> .....	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  $\mu$ m.

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.



