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Single Mode Fiber Lasers

for Industrial and Scientific Applications





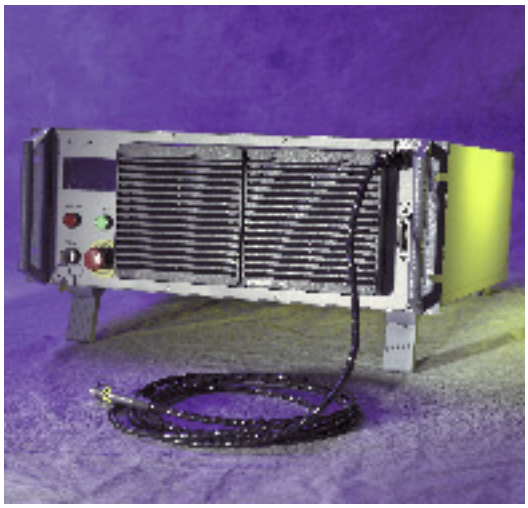
IPG PHOTONICS

The Power to Transform™

IPG's Single Mode Fiber Lasers Advantages

IPG's YLR-SM Series represents a break-through generation of diode pumped single mode CW Ytterbium fiber lasers of near infrared spectral range (~1070nm) with a unique combination of high power, ideal beam quality, fiber delivery, high wall-plug efficiency, compactness and reliability.

These lasers possess a reliability that is unmatched by conventional solid state or gas laser. Selectivity of operating wavelengths, ultra-low amplitude noise, high stability and ultra-long pump diode lifetime completes an impressive list of advantages of this modern fiber laser system. The YLR-SM Series was developed to meet fast growing demand of industrial, R&D and medical markets for a compact, robust, turnkey and maintenance-free solution that can be easily integrated into an industrial manufacturing system, scientific experiment, OEM machine or an automated production line.



YLR-200-SM 200W CW Fiber Laser

Main Features:

- ✓ **10W to 2kW Output Optical Power**
- ✓ **TEM_{00} (M^2<1.1) Beam Quality**
- ✓ **Over 25% Wall-Plug Efficiency**
- ✓ **Maintenance Free Operation**
- ✓ **Compact 'Plug & Play' Design**
- ✓ **Air or Water Cooled Versions**
- ✓ **Estimated Diode Lifetime > 100,000 hrs**
- ✓ **Single Mode Fiber Delivery**
- ✓ **CW or Modulated Operation**
- ✓ **Extended Warranty Program**

Practical and convenient front panel interface and RS232 or parallel and analog interfaces easily allow you to integrate this fiber laser to your setup. Each laser is provided with an integrated single-mode fiber delivery cable, of customer selected length, terminated by state-of-the-art output collimator or by industrial QBH-connector.

Users can customize the YLR-SM Series to meet their requirements by selecting output power, wavelength, polarization, delivery fiber length, cooling method and computer interface. All YLR Series laser systems are factory sealed so there is no need for alignment or maintenance. The laser system plugs into a standard power line, and can operate immediately. An another attractive features are no warm up time (laser could operate from "cold" start immediately) and ability to directly modulate laser up to 50kHz.

Typical Specifications

Optical Parameters

	Unit	YLR-50	YLR-100	YLR-200	YLR-500-SM	YLR-1000-SM
Nominal Output Power	W	50	100	200	500	1000*
Mode of Operation			CW or directly modulated			
Beam Quality	M^2	<1.05	<1.05	<1.1	<1.1	<1.15
Linewidth	nm	<2	<3	<3	<4	<5
Polarization		random**	random**	random**	random**	random
Output Power Stability	%	+/-2	+/-2	+/-2	+/-2	+/-2

Electrical Parameters

	Unit	YLR-50	YLR-100	YLR-200	YLR-500-SM	YLR-1000-SM
Electrical Requirements	V AC	110-230	110-230	110-230	190-250	360-520
Typical Power Consumption	W	200	400	800	2000	4000
Standard Interfaces			Digital I/O, Analog			
Direct Modulation	kHz	0-50	0-50	0-50	0-5	0-5

General Parameters

	Unit	YLR-50	YLR-100	YLR-200	YLR-500-SM	YLR-1000-SM
Cooling Method ***	V AC	air or water	air or water	air or water	water	water
Cooling Water Temperature Range	°C	20-30	20-30	20-30	20-30	20-30
Dimensions (W x H x D)	cm	3RU 19"	3RU 19"	4RU 19"	6RU 19"	60x80x80
Weight	kg	25	30	40	50	150

* Output power up to 2kW available on request with single mode (TEM_{00}) output. Please contact IPG Photonics with your requirements.

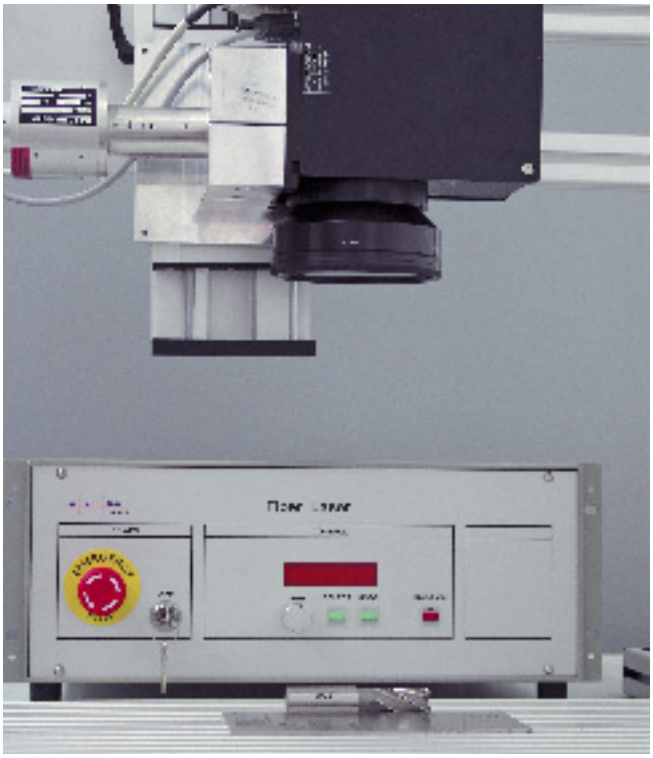
** Linear polarization is available on request for up to 500W output power.

*** Customer can select cooling method.

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IPG YLR Lasers Offer Versatility and Ease of Integration



YLR-200-SM laser integrated with a scanner in an engraving machine

Compact in size, user-friendly, highly reliable, and broadly versatile, IPG's diode-pumped fiber lasers bring revolutionary solutions to multiple applications. Depending on output optics used, spot sizes of less than 10 µm can be achieved by keeping focal lengths of more than 200 mm. This leads to large working areas for galvo scanning systems and user-friendly long working distances. Already 50-100 W output powers at 10-20 µm spot size is enough for fine cutting applications such as cutting of coronal stents or hole drilling.

IPG single mode fiber lasers can be quickly integrated into a variety of different work stations including robots, cartesian co-ordinate systems and high speed scanners. These units can be provide with integrated collimators or plug and play connectors that plug into available standard beam delivery systems. In many cases the lasers can replace conventional YAG and gas lasers on existing work stations to allow the user to take advantage of the tremendous reliability and cost savings that this technology offers. For new systems, IPG can recommend an integrator from a long list of qualified system integrators familiar with our technology.

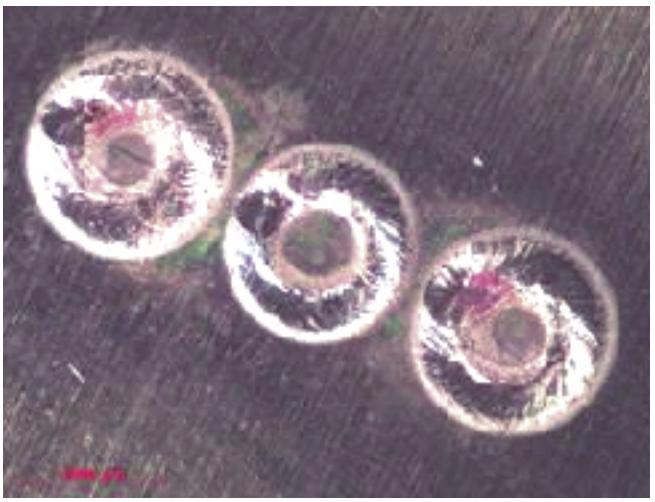
Due to small spot sizes of down to 10 µm, the heat affected zone stays small and fine contours are able to be cut. Precision spot and seam welding applications for all metals are done with either direct optics or galvo scanning heads.

Depending on needed spot diameters, working distances and material properties, IPG's single mode YLR-SM lasers cover all applications of precision spot and seam welding applications in fine mechanics, electronics and medical device industries.



YLR-1000-SM 1kW fiber laser integrated in a cutting cell

Flexibility for a Variety of Applications

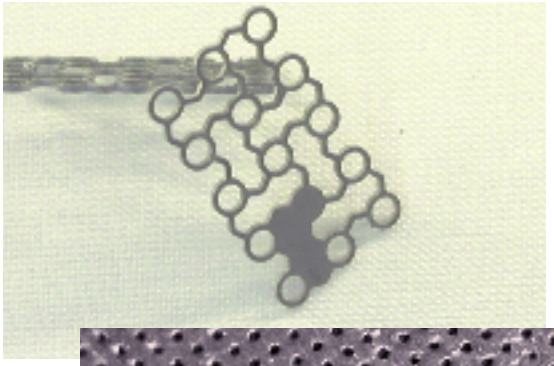


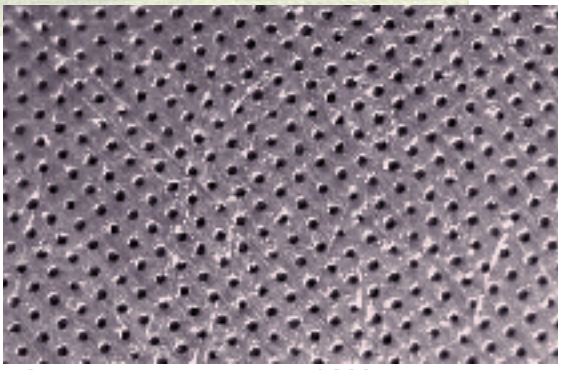
Copper contacts welding sample

Single mode fiber lasers have gained rapid acceptance on a large variety of welding applications including batteries, medical assemblies, fuel cells, wire welding, flexures for hard disc drives, and thicker assemblies such as transmission components where deep narrow welds are required. The optimization is very rapid as these lasers can operate in a continuous mode or a modulated mode, with no spot size change over the 10%-105% dynamic operating range. The low divergence allows for long working distances that makes focus control very forgiving and repeatable. On single spot welds, the pulse duration can be set from a few microseconds to continuous operation and operate up to 50 kHertz. The control of both spot size and heat control cannot be matched by any other industrial material processing laser.

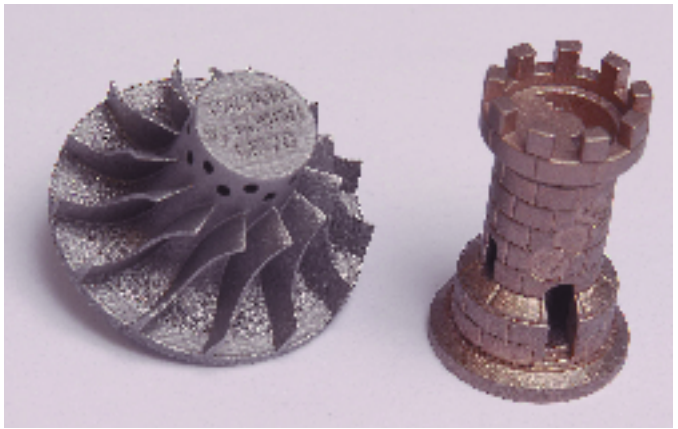
On cutting applications, single mode fiber lasers are utilized for precise cutting of very delicate structures such as stents, silicon wafers, surgical knifes as well as thicker materials at the higher power levels. Because of the high fluence, only possible with single mode fiber lasers, combined with long standoff distance fiber lasers are achieving speeds and heat profiles never before achieved with laser processing. When operating in the modulated mode, these lasers are ideal for producing small holes at a rapid rate. For example, 50 micron holes in .012" Titanium at a rate of 300 holes per second with a 600 Watt single mode fiber laser. In drilling holes required by the printing and engraving industries, single mode fiber lasers have become the dominant technology achieving precise holes at rates above 100 kHertz.

Precise stent cutting by YLR-200-SM





50um holes drilled at speed of 300 holes per second



3D stereo-lithography samples

Fiber lasers are also used extensively by OEMs offering sintering machines to produce three-dimensional parts from metal powders. On this application the consistent CW power that can be focused to a very precise spot size (in case of single mode laser down to ~10 micron) is ideal for manufacturing very precise parts while minimizing the powder consumption. IPG`s YLR series has been widely deployed for this unique application over last few years.

IPG PHOTONICS

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IPG Photonics Corporation

World Headquarters

50 Old Webster Road

Oxford, MA 01540 USA

+1 508 373 1100 ■ +1 508 373 1103 (fax)

sales.us@ipgphotonics.com

www.ipgphotonics.com

IPG Laser GmbH

European Headquarters

Siemenstrasse 7

D-57299, Burbach, Germany

+49 2736 4420 100 ■ +49 2736 4420 160 (fax)

sales.europe@ipgphotonics.com

USA ■ Germany ■ Russia ■ Italy ■ Japan ■ India ■ UK ■ China ■ Korea

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