



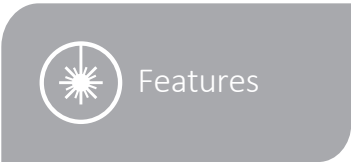
Industrial Fiber Lasers for Materials Processing

from the World Leader in Fiber Lasers

PRODUCT GUIDE



Applications



Features



Efficiency



Capabilities

FIBER LASER ADVANTAGES

What You can Expect from an IPG Fiber Laser

IPG Photonics is the world leader in high power fiber lasers and amplifiers. Founded in 1990, IPG pioneered the development and industrial use of fiber lasers in a wide range of applications, including materials processing, telecom, medical, scientific and others. IPG fiber lasers have revolutionized the industrial use of lasers by delivering superior performance and reliability at a lower total cost of ownership compared with conventional lasers. This transformation empowers IPG customers to increase their productivity while decreasing overall operating costs.

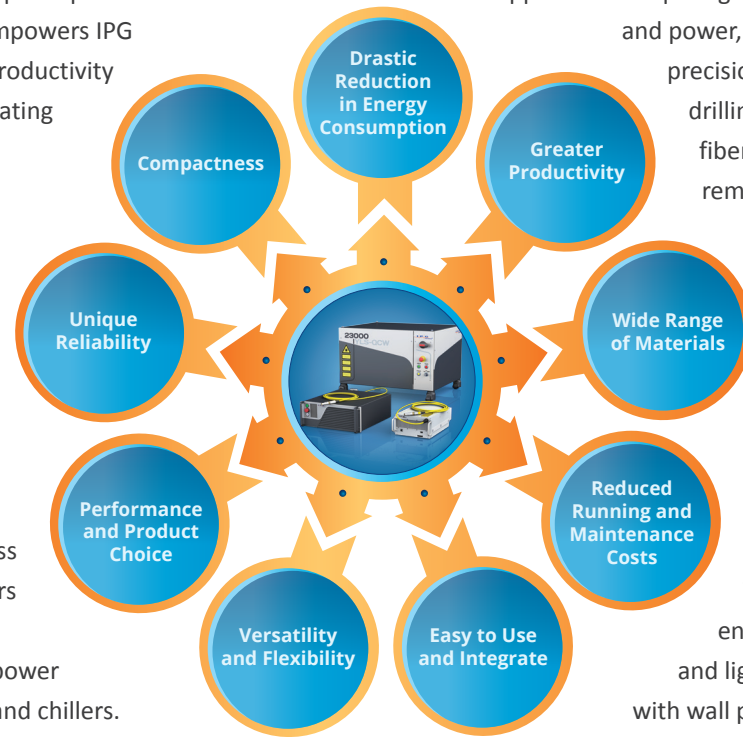
IPG total vertical integration controls the performance, cost and yield of core fiber laser technology — active fibers and semiconductor pump diodes. IPG also develops and manufactures complete lines of optical components, including process fibers, beam couplers, shutters and switches, collimators and processing heads, as well as power supplies, control electronics and chillers. Continuous innovation coupled with extensive manufacturing capabilities enable IPG to control every step needed to achieve its mission: delivering innovative, reliable, high quality, high performance industrial fiber lasers faster and at a lower price.

IPG Photonics is headquartered in Oxford, Massachusetts with additional manufacturing plants, sales, application development and service offices throughout the world.



The Power to Transform®

This mission is best exemplified by the flagship YLS High Power Ytterbium fiber laser series featuring power options from 1 to over 100 kW, industry leading wall plug efficiency up to 50% and reliability for use in high duty 24/7 applications. A variety of beam divergence and intensity profile options and availability of high QCW peak power allow flexible use of a single laser for applications requiring both high and low beam brightness



and power, such as high power cutting, precision cutting, welding, cladding and drilling. The superior divergence of IPG fiber lasers also make them ideal for remote applications.

Fiber lasers have an end-to-end solid state monolithic design without free space precision optics sensitive to alignment or contamination. Unlike conventional lasers, IPG fiber lasers are rugged, easy to transport and install, excelling in the harshest industrial working environments. IPG lasers are smaller and lighter than traditional lasers and with wall plug efficiencies exceeding any competing technology. The unique combination of industry leading power, reliability, compactness, energy efficiency, flexible beam delivery and ease of integration have made IPG fiber lasers the global tool of choice in industrial materials processing.

FIBER LASER FAMILIES

A Diverse Range for a Multitude of Applications

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Application	Laser Product Family									
	YLR	YLS	QCW	YLP	GLP	VLM	ULP	ELR	TLR	
Metal Cutting	●	●	●							
Metal Drilling			●	●						
Metal Welding	●	●	●	●						
Brazing		●								
Soldering	●					●				
Cladding	●	●								
3D Printing/Sintering	●					●				
Marking				●	●		●		●	
Metal Engraving			●	●						
Heat Treating/Annealing	●	●								
Ablation				●	●		●			
Surface Cleaning & Structuring	●	●		●			●			
Non-metal Processing			●	●	●	●	●	●	●	
Micromachining	●		●	●	●	●	●			

YLS SERIES

High Power CW Ytterbium Fiber Laser Systems



Applications

- ▶ Cutting
- ▶ Welding
- ▶ Drilling
- ▶ Cladding
- ▶ Annealing
- ▶ Heat Treating
- ▶ Brazing



Efficiency

- ▶ >40% Wall Plug Efficiency (WPE)
- ▶ >50% WPE on ECO Series
- ▶ Industry Leading Diode Lifetime
- ▶ Hot Diode Redundancy



Capabilities

- ▶ Plug & Play Design
- ▶ Compact, Rugged & Efficient
- ▶ Output Power up to 120 kW



The YLS series fiber laser, with output powers up to 120 kW, was developed as a complete system for industrial applications. It has garnered wide acceptance in the very demanding automotive, aerospace and oil and gas industries. All YLS systems are housed in a NEMA 12, air-conditioned and sealed cabinet adding to the robustness of the unit. These systems are controlled by either digital I/O, analog control or IPG LaserNet software with the additional option to add either DeviceNet, Profibus or Ethernet interfaces. This design features the widest range of fiber diameters, as well as the option to terminate to up to 6 ports from one power source.

YLS Configurations



YLS-U Series 1-10 kW

The Smallest Form Factor Industrial Lasers in the World!

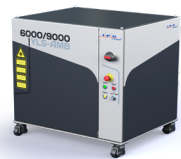
The YLS-U Series is developed specifically for applications where space is a premium. YLS-U lasers provide up to 10 kW average power in the smallest form factor available on the market. Having full featured interfaces and safety electronics of the new generation IPG fiber lasers, the YLS-U design is cost/performance optimized and can be easily integrated within cutting machines. Internal dehumidifier enables the laser to be used in the harshest of production environments.



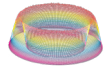
YLS-AMB

Adjustable Mode Beam Capability
Independent Power Control of Core and Ring

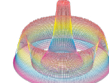
Adjustable Mode Beam (AMB) capability on the flagship YLS family of lasers allows customers to change the output beam mode on-the-fly and increase flexibility in cutting and welding applications. AMB enables programmable adjustment of the output beam mode to any combination of a small-spot high intensity bright core to a larger ring-shaped beam. AMB allows processing a wider range of material thicknesses and improves welding and cutting quality and speed.



Central Beam,
up to 12 kW



Ring Beam,
up to 15 kW



Central + Ring Beam,
up to 20 kW

- ▶ On-the-fly Beam Mode Tunability
- ▶ Widest Range of Applications
- ▶ Process a Variety of Materials
- ▶ Improve Process Quality

YLS

The Highest Laser Powers with Unmatched Flexibility of Options 1-8, 10, 12, 15, 20, 30, 50, 100 and 120 kW
Custom Higher Output Powers are Available.

The low order mode YLS fiber lasers operate in CW/modulated modes up to 5 kHz with wall plug efficiencies >40%. The wide dynamic power range with no change in beam divergence or beam profile allows a single laser to be used for both high and low-power applications such as welding, drilling and cutting, a previously unheard of capability. The high brightness allows the use of long focal length processing lenses for vastly improved depth of field and minimal damage to optical components. The units can be supplied with fiber lengths up to 100 meters, different fiber diameters and variety of multi-port beam switches, beam couplers, termination optics and scanners. The options determine the laser part number and informs cabinet size.



YLS-CUT

The Ultimate Industrial Fiber Laser for the Most Demanding 24/7 Cutting Applications

NEW! Now up to 20 kW!

1-8, 10, 12, 14, 15 and 20 kW
Perfectly suited for applications that cannot tolerate downtime or service intervention.

The YLS-CUT Series is developed specifically for demanding 24/7 laser cutting applications. The CUT Series features a super compact design with the laser housed in an hermetically sealed cabinet containing an internal dryer, enabling the laser to be used in the harshest of production environments. The YLS-CUT incorporates the latest IPG technical innovations in design of diode modules, fiber block, digital power supplies and digital control electronics, resulting in unparalleled reliability and increased control flexibility, stability and precision. The new control system allows integrated control of both laser and process subsystem. The YLS-CUT Series also features the IPG industry leading >40% wall plug efficiency that delivers significant power savings to manufacturers. Hot redundancy ensures 100% up time with no change in power, ensuring record reliability and maintenance-free operation. The CUT series is available from 1-20 kW with a wide variety of fiber delivery options, starting at 50 μm core diameter.



YLS-SM

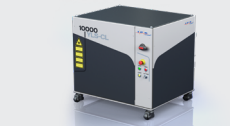
Single-mode Industrial Fiber Lasers
1-10 kW

The YLS-SM Single-mode Ytterbium fiber laser system range up to 10 kW, operating in CW or modulated modes up to 5 kHz. YLS single-mode systems are used in advanced materials processing requiring extremely high power and brightness, as well as in directed energy applications.

YLS-CL

The Fiber Laser for Cladding, Welding, Hardening and Surface Treatment
4, 6, 8 and 10 kW

The YLS-CL Cladding Series of fiber lasers specifically targets cladding, welding, hardening and surface treatment applications. The YLS-CL offers a wide range of output powers, chiller option, different interface configurations and plug-and-play fiber delivery with interchangeable process fibers available in either square or round diameters up to 1 mm.



YLS-BR

The Fiber Laser Specifically Developed for Trifocal Brazing and Welding Applications
5, 6 and 8 kW

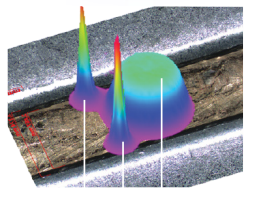
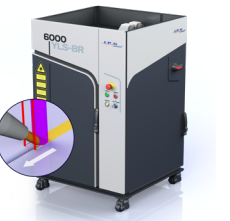


Features and Benefits

- ▶ Cleaning & Joining in One Step
- ▶ Reduction of Manual Cleaning Effort
- ▶ Enables Process Automation
- ▶ Improved Reproducibility
- ▶ Minimized Heat Effects on the Assembly

To obtain high-quality brazed joints, the base metals must be clean and free of oxides. Contamination can cause poor wetting of brazed parts impeding flow of the filler material, compromising the strength and visual appearance of the joint. To address these problems, IPG has introduced a new application based YLS-BR Trifocal Brazing Fiber Laser, available with 5, 6 or 8 kW average output power.

The YLS-BR features a specially designed three-core process fiber and a trifocal laser spot. In trifocal laser brazing the main laser spot is accompanied by two smaller ablation spots that are offset laterally and precede the main spot in the brazing direction. The localized heating of ablation spots allows cleaning of the base metal parts improving filler material flow, resulting in a reproducible brazed joint with an increased strength. This specialized brazing laser allows for both cleaning and joining in one step with improved joint appearance: straight seam borders, smooth surface, no spatter and control of brazing temperature. Through reduction of manual cleaning efforts, utilizing the YLS-BR enables process automation at a fractional cost.



LASER SPOTS

YLS-HPP

High Peak Power Delivers 2X Peak Power Mode in the Latest Releases of YLR and YLS Lasers.

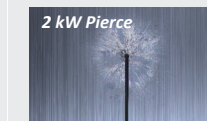


Features and Benefits

- ▶ Faster & Cleaner Piercing
- ▶ Improved Quality
- ▶ Repeatability
- ▶ Less Waste

Cleaner and Faster Piercing

REDUCED SPATTER



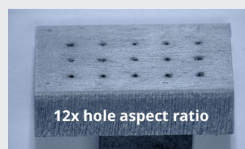
Regular Laser



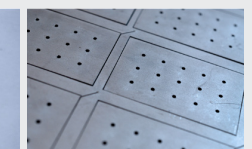
HPP Option

Improved Drilling Quality

FAST REPEATABLE AND CONSISTENT DRILLING



12x hole aspect ratio



0.5 mm holes 6 mm Aluminum

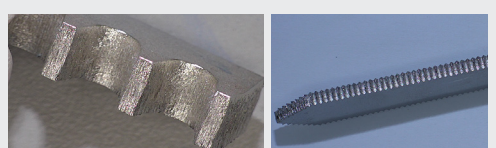
Denser Part Nesting in Thick Materials

SHORTER LEAD-INS REDUCE MATERIAL WASTE



Improved Fine Feature Quality

HIGH QUALITY CUTS OF INTRICATE PARTS & HEAT SENSITIVE MATERIALS



YLR SERIES

Rack Mounted CW Ytterbium Fiber Lasers



Applications

- ▶ Cutting
- ▶ Welding
- ▶ Drilling
- ▶ 3D Printing/Sintering
- ▶ Soldering



Efficiency


- ▶ Over 40% Wall Plug Efficiency
- ▶ Industry Leading Diode Lifetime



Capabilities

- ▶ Pulse Modulation
- ▶ Plug-and-Play Design
- ▶ Multi-port Options
- ▶ Compact, Rugged & Efficient

	YLR	YLR-MM
Wavelength Range, μm	1.01 – 1.07	
Beam Mode Quality	Single-mode	Multi-mode
Average Output Power, W	100-1500	100-3000
Peak Output Power in QCW Mode	2x of Average Output Power	



The YLR Series Ytterbium Fiber Lasers offers a unique combination of output powers (10 Watt to 3 kW), ideal beam quality (single-mode or multi-mode), flexible fiber delivery and high wall plug efficiency in near infrared spectral range (1010-1070 nm).

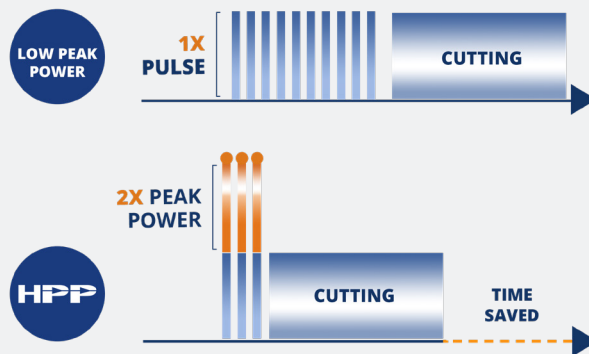
The 19" rack mountable units are a cost-effective, adaptable solution for a clean room system or for integration into a production line. With a rear control via Analog, RS-232 or Ethernet interfaces and an optional front panel touch-screen display, the rack mount configuration is ideal for a multitude of applications such as cutting, welding, drilling and additive manufacturing. The YLR Series features water-cooled (WC) models with output powers up to 3 kW and air-cooled (AC) models up to 700 Watts. External D12.5 delivery optics, collimators and a variety of process heads are available.

NEW! QCW Option on High Power Lasers 2X Peak Power Boost in Pulsed Mode

The QCW capability provides peak powers up to 2X average power, allowing increases in speed, improved piercing quality and piercing of thicker materials. The reduced heat input in the 2X Peak Power mode results in higher quality cuts of intricate parts along with cleaner and more controlled drilling of thicker materials.

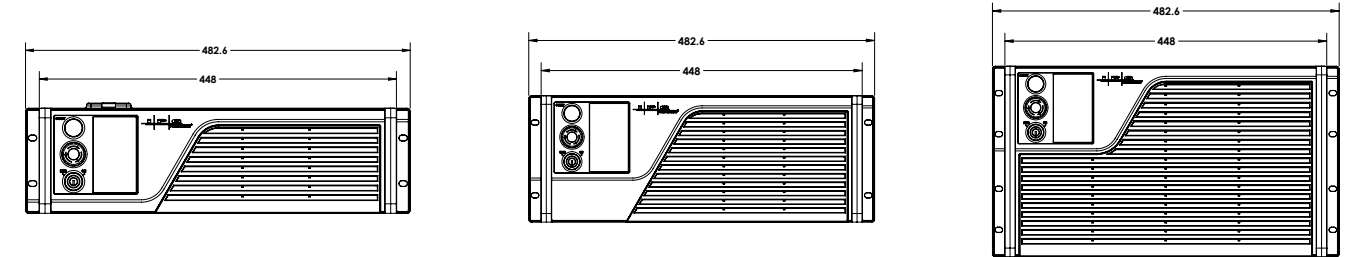
- ▶ Reduced Heat Input
- ▶ Higher Quality Cuts of Fine Features
- ▶ Higher Piercing Quality
- ▶ Shorter Piercing Time
- ▶ Piercing of Thicker Materials
- ▶ Enhanced Welding and Drilling Capabilities

This unique capability is made possible by unique IPG QCW diode designs, which have the ability to provide very high peak power for short duty cycles. Available exclusively from IPG in the latest releases of YLR and YLS lasers, the QCW 2X Peak Power mode is developed to increase the overall throughput, while saving material, time and operating costs.



Rack Mount Unit Dimensions

All rack mountable units have a width of 448 mm. Unit heights are 133 mm (3RU), 177 mm (4RU) and 266 mm (6RU).



YLR-MM multi-mode lasers are equipped with a standard 50 μm feeding fiber to an HLC-8 connector. Additional options include 100 or 200 μm diameters to an HLC-8 connector or 50, 100 or 200 μm to an affixed collimator. Available focal lengths: 20, 38 or 53 mm.

Single-mode YLR models with a 5 mm diameter beam are equipped with an affixed collimator for powers up to 400 Watts; 500-1,500 Watt lasers terminate to an HLC-8 connector. Interchangeable collimators and processing heads connect easily to the HLC-8, options listed on page 9. Affixed collimator options include beam diameters in either 2.5 or 7.5 mm.

Power Range, Watt	Unit Height	Cooling	Unit Depth, mm
100	3RU, 133 mm	Air-cooled	400
100-700		Water-cooled	580
200-400	4RU, 177 mm	Air-cooled	500
100-700		Water-cooled	500
1000-1500			680
2000-3000			800
500-700	6RU, 266 mm	Air-cooled	500

ELR and TLR SERIES

Rack Mounted CW Erbium and Thulium Fiber Lasers



Applications

- ▶ Non-metal Materials Processing
- ▶ Plastics Cutting and Welding
- ▶ Polymer Marking

Laser Series	ELR Erbium Fiber Lasers		TLR Thulium Fiber Lasers	
Wavelength Range	1.53-1.57 μm		1.9-2.05 μm	
Maximum Output Power	100 W Single-mode	150 W Multi-mode	200 W Single-mode	500 W Multi-mode

The ELR Erbium fiber lasers operate in the 1530-1570 nm "eye-safe" wavelength range with output powers up to 150 Watts. The TLR Thulium fiber lasers operate in the 1900-2050 nm wavelength range, offering output powers up to 500 Watts.

These lasers have typical industrial applications in plastics/polymer cutting, welding and marking. They are also used in various scientific, advanced and medical applications including telecom, IR pumping, remote sensing, surgery and dermatology.

Air- and water-cooled modules are also available at selected power levels for OEM integrators.



QCW SERIES

Quasi-CW Ytterbium Fiber Lasers

- Applications**

 - Cutting
 - Drilling
 - Welding
 - Metal Engraving
 - Non-metal Processing
 - Micromachining

Efficiency

 - Over 30% Wall Plug Efficiency
 - Industry Leading Diode Lifetime

Capabilities

 - Long Pulse Operation
 - Plug-and-Play Design
 - Maintenance-free Design



Air-cooled OEM Module	Air-cooled Rack Mountable Laser with Touch-screen Display	Air-cooled Ytterbium Laser System	Water-cooled Ytterbium Laser System
Analog/RS-232/and Ethernet Control Interfaces		Lasernet/Analog/ RS-232/and Ethernet Control Interfaces	

QCW fiber lasers provide multiple Joules of pulse energy at multi-kW peak powers with μ s to ms pulse duration. They are ideally suited for industrial applications requiring a high peak power and pulse energy in a long pulse regime, such as spot welding, seam welding and drilling. Designed to displace legacy YAG lasers due to their minimal maintenance costs and low upfront costs, QCW lasers are easily retrofitted into most existing systems.

QCW Laser Models	Max. Average Power in QCW Mode, Watts	Maximum Peak Power, Watts	Maximum Pulse Energy, Joule	Feeding Fiber
YLM-75/750-QCW-A	75	750	7.5	Single-mode 50, 100 or 200 μ m
YLM-150/1500-QCW-AC YLR-150/1500-QCW-AC YLM-150/1500-QCW-MM-AC YLR-150/1500-QCW-MM-AC	150	1500	15	
YLM-200/2000-QCW-AC YLM-200/2000-QCW-MM-AC	200	2000	20	Single-mode
YLM-300/3000-QCW-MM-AC YLR-300/3000-QCW-MM-AC	300	3000	30	
YLM-450/4500-QCW-MM-AC YLM-450/4500-QCW-MM-WC YLR-450/4500-QCW-MM-AC YLR-450/4500-QCW-MM-WC	450	4500	45	50, 100 or 200 μ m
YLM-600/6000-QCW-MM-AC YLM-600/6000-QCW-MM-WC YLR-600/6000-QCW-MM-AC	600	6000	60	
YLS-900/9000-QCW-WC YLS-1200/12000-QCW-WC YLS-1500/15000-QCW-WC YLS-1800/18000-QCW-WC YLS-2000/20000-QCW-WC YLS-2300/23000-QCW-WC	900 1200 1500 1800 2000 2300	9000 12000 15000 18000 20000 23000	90 120 150 180 200 230	100, 200 or 300 μ m

YLP SERIES

Pulsed Fiber Lasers

- Applications**

 - Marking & Engraving
 - Precision Texturing & Ablation
 - Selective Material Removal
 - Micro Cutting, Scribing & Hole Drilling

Capabilities

 - Optimization of Both Job Quality & Throughput
 - Micromachining Virtually any Type of Material
 - Ultimate Flexibility in Choosing Operating Parameters

YLPN Series - NANOSECOND FIBER LASERS

IPG pulsed YLPN, YLPP and YLPF fiber lasers address a wide range of materials processing and micromachining applications. They feature excellent beam quality, pointing stability, low divergence and can provide the high fluence for processing any kind of material including transparent and reflective parts. A wide variety of models cover output power from 5 to 300 W, pulse duration range from 400 fs to 1.5 μ s and pulse repetition rate range from 1 kHz to 10 MHz. The beam mode quality and pulse energy of pulsed fiber lasers are independent of average output power and pulse repetition rate. By user choice, the lasers are offered with either fixed pulse duration or variable programmable pulse durations, including burst mode for ultrafast models. These features provide the user the ultimate flexibility in optimizing both quality of machining and throughput. IPG pulsed 1 μ m fiber lasers feature naturally built-in fiber delivery with a number of termination options, rugged maintenance-free design and record energy efficiency to meet requirements of the most demanding industrial users.

YLPN Series - NANOSECOND FIBER LASERS

IPG nanosecond fiber lasers are the core products for most industrial materials processing needs. Available in a multitude of different configurations, from 5 to 300 Watts output powers, variable pulse durations and terminations, the YLPN Series has the versatility needed for most standard applications in micro cutting, micro drilling, ablation, marking and engraving.

YLPP Series - PICOSECOND FIBER LASERS

IPG picosecond fiber lasers provide high peak power with scalable average output power up to 100 W and short pulse duration of 1-3 ps at full operational frequency range of 50-2000 kHz. They are ideal for applications in micromachining, photovoltaics, via hole drilling, resistor trimming, wafer scribing and dicing, specialty black marking of stainless steel and aluminum and marking of transparent materials.

YLPF Series - FEMTOSECOND FIBER LASERS

IPG femtosecond lasers provide high peak power with scalable average output power up to 50 W, short pulse duration <500 fs at full operational repetition rate range of 50-2000 kHz. The excellent beam quality, ultrashort pulse duration and high pulse energy combine to provide peak power densities suitable for micromachining virtually any material: metal, glass, ceramics, silicon and plastics.

PULSED FIBER LASERS FOR SURFACE TREATMENT

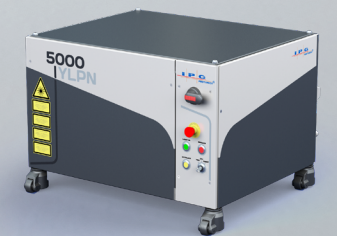
IPG high-power nanosecond fiber lasers are available in powers from 500 W to 5 kW, pulse durations from 100 to 500 ns and pulse energies up to 100 mJ. With pulse repetition rates from 10-500 kHz and larger spot sizes, these lasers are the perfect solution for high throughput surface treatment applications.

- Applications**
- Paint Stripping, Surface Cleaning
 - Surface Texturing, Heat Treating
 - Surface Preparation & Treatment
 - Large Area High Throughput Ablation

- Capabilities**
- Optimization of Both Job Quality & Throughput
 - Ultimate Flexibility in Choosing Operating Parameters
 - Large Range of Materials

NEW! YLPN-50-120-5000-S: MEGAPULSE YTTERBIUM LASER

The new high power, pulsed fiber laser provides an average output power up to 5 kW, a pulse energy up to 50 mJ and a pulse duration of 120 ns. With a wall plug efficiency of 30%, a variety of fiber delivery options, compact size and maintenance-free operation, this new high power pulsed laser is ideally suited to surface preparation and treatment, laser ablation and laser surface cleaning, a process that can be carried out without abrasives, solvents and chemicals.



GREEN FIBER LASERS

VLM-532, VLR-532 and GLPN FIBER LASERS



Applications

GLPN-M and GLPN-R

High Pulse Energy Green Lasers

- ▶ Ablation
- ▶ Microcutting & Scribing
- ▶ Microdrilling
- ▶ Texturing
- ▶ Marking

VLM-532 and VLR-532

High Power Green Lasers

- ▶ Wafer Annealing
- ▶ Additive Manufacturing
- ▶ Welding of Highly Reflective Materials
- ▶ Soldering



Capabilities

- ▶ 532 nm Wavelength*
 - ▶ High Peak Power
 - ▶ 3-Burst Pulsed Mode
 - ▶ Compact & Efficient
- * Wavelengths in 515-540 nm range are available upon request.

IPG develops and manufactures a wide range of green fiber lasers from CW to ultra-short pulse duration. IPG green fiber lasers serve diverse materials processing markets such as medical device manufacturing, solar, semiconductor, electronics and mass consumer product manufacturing. The GLPN lasers with three-pulse burst capability are ideally suited

for micromachining applications. Our Prism Award winning high repetition rate VLM and VLR green lasers provide unrivalled performance with output power up to 500 Watts with single-mode beam quality, ease of use and high reliability at a lower cost, enabling new applications and accelerating customer ROI.

Green Laser Modules	Models	Pulse Duration, ns	Mode	Average Power, W	Pulse Energy, μ J	Repetition Rate, kHz
	GLPN 16-1-10-M	1.3-2.0, typ. 1.5	Pulsed	10	16	10-250
	GLPN 40-1-10-M		Pulsed, 3-pulse Burst		40	
	GLPN 40-1-20-M			20	10-500	
	GLPN 30-1-30-M		30	30		
	GLPN 16-1-10-R	1.3-2.0, typ. 1.5	Pulsed	10	16	10-250
	GLPN 40-1-10-R		Pulsed, 3-pulse Burst		40	
	GLPN 40-1-20-R			20	10-500	
	GLPN 30-1-30-R		30	30		
	GLPN 500-1-50-M	1.5; 4; 6	Pulsed	50	500	10-600
	GLPN 500-1-50-R					

All GLPN models are air-cooled.

	VLM-532-100-AC	Air	~1.4	100	2-100	30
	VLM-532-100-WC	Water				
	VLR-532-100-AC	Air				
	VLR-532-100-WC	Water	~1.2	200	1-100	150
	VLM-532-200-WC	Water				
	VLR-532-200-WC					
	VLM-532-500-WC	Water				
	VLR-532-500-WC		500			

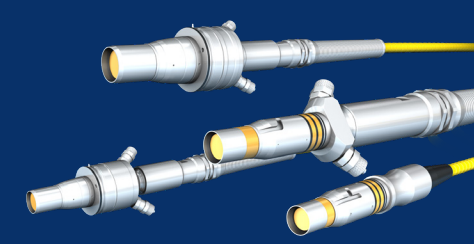
The Power to Transform®

FIBER BEAM DELIVERY

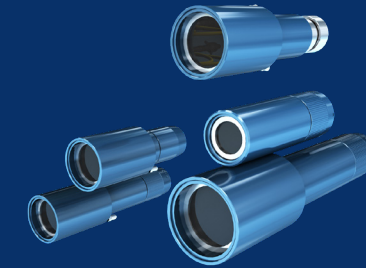
Flexible Beam Delivery

IPG industrial lasers are very flexible and adaptable with the ability to be optimized for various applications requiring different brightness and spot sizes. Standard utilization of these lasers is through a permanently built in feeding fiber of a determined core diameter; the diameter of the feeding fiber places the limit on the maximum brightness provided by the laser. In some instances, particularly when a laser is dedicated to a single work cell, the feeding fiber can be connected directly

to a process head or a collimator. However, when a high power kW class laser is used, the user can further customize the build of the system, due to the flexibility of the laser. Such customizations include increasing the number of output ports through beam splitting or switching or simply increasing the versatility of a single port through optical coupling or shuttering the beam.



Process Fibers



Adaptable Collimators



Beam Switches

Process fibers of various lengths and core diameters are fitted with a range of connectors. The fibers are available in 100, 150, 200, 300, 400, 600, 800, and 1,000 μ m diameters with lengths up to 100 meters. The process fibers are available with either industry standard connectors (HLC-8, LCA) or with IPG exclusive high-power connectors (HLC-16, HLC-24) which can handle output powers up to 100 kW.

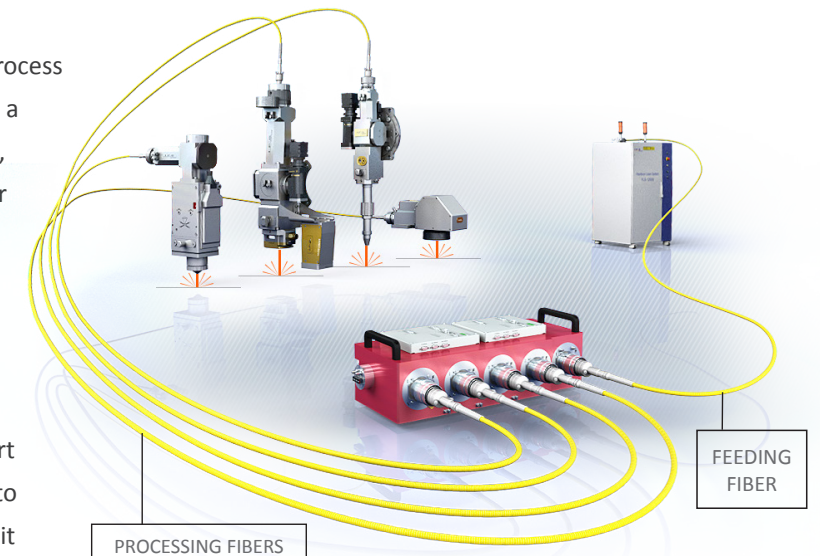
IPG also manufactures its own line of collimators. These collimators are available from 50 to 200 mm focal length in D25, D30 and D50 packages. The collimators are available with either water-cooled or air-cooled optics, an adjustable focus and are fitted with QBH/FCH-8, QD/FCA and FCH-16 bayonet types for easy connection to any of our feed or process fibers.

IPG offers beam couplers, switches, shearers, and shutters in D12.5, D25, D50 and D85 sizes. Beam switches are offered with 2, 3, 4 or 6 output ports with customized options for energy switching or/ or timesharing as well output connection type (HLC-8, HLC-16, HLC-24 or LCA). All switches or couplers require the use of a step-indexed process fiber to connect the laser source to the process head or collimator, this greater increases the versatility of the laser.

All delivery optics are designed and manufactured by IPG and are tailored specifically for fiber lasers.

TIME AND ENERGY SHARING

The ability to couple light from one fiber to one or more process fibers greatly expands upon fiber laser functionality. While a feeding fiber is a connection directly from the laser source, process fibers are the link from the beam switch or coupler to the processing head or collimator. Process fibers are essential for industries that benefit from multiple workstations or multi-application processing. They also provide the option for a long stand-off distance from the laser to the process area for manufacturing space flexibility. They are interchanged in field with minimal effort without an IPG technician. This allows the user to be able to change between different diameter and length fibers to suit changing applications as well as decrease down-time risk if, on the odd chance, any damage were to happen to the fiber.



PROCESSING HEADS

Cutting & Welding Heads for Fiber Lasers

Welding Heads

FLW-D30	FLW-D50-L/S/HP	FLW-D85-HP
		
Up to 6 kW	Up to 10/30/50 kW	Up to 100 kW

IPG welding heads are designed to deliver the highest amounts of power in a compact and cost-effective package. They are offered in a range of models that have various power levels as well as numerous features and accessories to fit specific application needs.

Wobble Heads

FLW-D30-W	FLW-D50-W	FLW-D85-W
		
Up to 6 kW	Up to 12 kW	30 kW +

IPG offers welding heads with Beam Wobbler capability which broaden weld seams and provide high-quality welds even in the presence of a gap. Available in multiple configurations with the broadest focus and collimator lens options, the wobblers are the ultimate tool to weld a multitude of different material types and thicknesses.

Cutting Heads

Micro	Compact	FLC-D30	HP
			
Up to 1 kW	Up to 4 kW	Up to 10 kW	20 kW +

IPG cutting heads are designed to provide the highest laser power handling capability in the industry in a completely sealed and lightweight package; increasing optics lifetimes, preventing gas leakages and providing easy optics service access. These heads come with the widest selection of collimator and focusing optics as well as additional accessories and optimal features.

Cladding Head

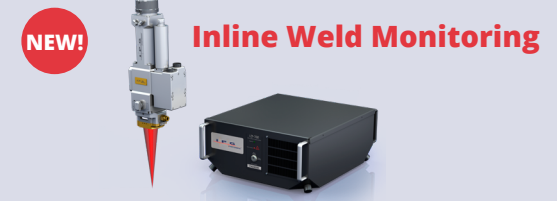

IPGClad-D50

Up to 10 kW

IPG Cladding Heads are designed to provide various deposition rates at various laser powers with integrated Fraunhofer Coax 8 Powder Nozzle in a completely sealed package. They are the ultimate tool to clad a multitude of different material types at high deposition rates for additive manufacturing applications.



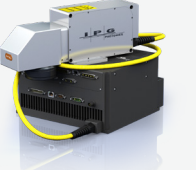

Welding/Wobbler Accessories

IPG offers many options for customizing your application needs through modules for seam tracking, wire feeding, beam spot shaping, dual beam spot creation and a comprehensive, real-time weld monitoring system as well as cameras, gas assists and air knives.

			
LDD Weld Depth Monitoring System offers five monitoring modes: keyhole depth, seam profile, workpiece height, finished weld surface height, and bead profile – all in real-time from a single instrument.	Dual Spot Module – 50/50 power distribution with beam separation in the X or Y direction. Beam Shaper – available in 6x6 mm square and 6 mm diameter circular outputs.	WHAM (Welding Head Alarm Monitor) Monitors cover slide window presence, contamination and temperature.	Wire Feeder Module – enables integration of commercially available wire feeders with IPG welding heads.

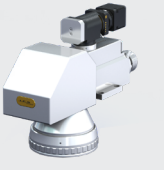


Integrated Marker Modules

IPG brings ease and flexibility to laser marking integrators and OEMs by providing complete laser marking modules in a single compact and cost-effective package. The modules include control electronics, scanning optics and versatile marking software.

IR Integrated	Green Integrated	UV Integrated	Picosecond Integrated
			
IPG marking modules come fully optimized, pre-calibrated and designed to help integrators enhance their laser marking products.			

Scanners

IPG remote laser processing products range from Mid-Power scanners to 2D & 3D High-Power scanning systems. IPG Remote Welding heads integrate seamlessly to IPG Lasers, offer the highest power handling in the industry and utilize a compact and lightweight architecture ideal for integration with a robot or gantry.

Mid-power	2D High Power	3D High Power
		
Up to 2 kW	Up to 12 kW	Up to 12 kW
The scanners are offered with laser power handling of up to 12 kW to optimize applications such as remote welding, remote cutting, and surface cleaning/treatment.		

COMPREHENSIVE SERVICES

What you can expect from IPG Photonics

Premium Warranty & Support

IPG stands behind our commitment to our customers with the best warranty in the industry. All IPG lasers listed in this brochure are warranted against defects in materials and workmanship, under normal use, for minimum two years; three years for the YLS family of lasers with extended warranties available up to ten years.

Unlike conventional laser technologies, IPG fiber lasers require no preventive maintenance. As long as output optics and coolant are properly maintained by the customer, the laser will perform consistently without adjustment or intervention by the customer or IPG. This greatly reduces downtime and maintenance costs to the customer. We have a team of dedicated service professionals and technical support specialists worldwide to provide personal and effective customer support.



Customer satisfaction is our goal at IPG. We strive to make the best lasers and amplifiers in the world and back it up with our commitment to service.

Extensive Laser Solution Development

IPG Photonics offers free applications development through any of our Materials Processing Centers worldwide. We offer prototyping and feasibility studies to our prospective customers to evaluate fiber lasers for their unique applications. Our knowledge of fiber laser applications

can accelerate and improve your application development, from macro machining to micro machining and marking of various materials. Each of our applications labs offers our customers proof of concept, process development, recommendations, consultations, optical metrology, metallurgy, sample processing and an accompanying full results report.


Applications Centers Worldwide

Country	City	Lab Focus	Phone	Email
China	Beijing	Materials Processing	+86 10 6787 3377	application@ipgbeijing.com
China	Shanghai	Materials Processing	+86 21 5058 6577	application@ipgbeijing.com
China	Shenzhen	Materials Processing	+86 755 2399 3780	application@ipgbeijing.com
Germany	Burbach	Materials Processing	+49 (0) 2736/4420 341	mgrupp@ipgphotonics.com
Italy	Legnano	Materials Processing	+39 0331 170 6900	scassarini@ipgphotonics.it
India	Greater Noida	Materials Processing	+91 956 060 8808	sales.india@ipgphotonics.com
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South Korea	Daejeon	Materials Processing	+82 42 930 2000	ipgk@ipgphotonics.com
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APPLICATION REQUEST FORM

Developing Your Laser Solution

Process Request (Please Attach to Samples)

 IPG Application Facilities are available to perform R&D for proof-of-concept through process development for all materials processing applications; end users and systems integration partners are welcome to visit and work at all facilities. If you would like IPG to process your application, please complete the fields below and send to your nearest IPG Applications Center. Please contact the site to schedule your work before submitting samples.

Company Name

Company Address _____

Contact Name _____ Email _____

Title _____ Phone _____

Part Description

Material Type & Designation _____
Describe any Pre- or Post-process, Material Treatments/Coatings, Which May Influence the Application _____

Process: Cut Weld Drill Print Enclosed MSDS Enclosed Other

Production Processing Requirements: (Answer All That Apply)

Parts Per Hour _____ inch mm Surface Finish _____ inch μm

Feedrate _____ inch mm Kerf Width _____ inch mm

Holes/min. _____ inch mm HAZ _____ inch mm

Hole Diameter _____ inch mm Recast _____ inch mm

Weld Depth _____ inch mm Dimensional Tol _____ inch mm

Desired Cycle Time _____

Laser Preference Multi-mode Single-mode Pulsed

Primary Concerns (Assign Applicable Concerns from 1 - 5, 1 Being the Most Important)

Speed _____ Surface Finish _____ Taper _____ Kerf _____ Haz _____ Depth _____ Porosity _____

Others (Specify) _____

Current Process (And/or Alternative Process Being Considered) _____

Description of Current Work Handler _____

Project Funded? Yes No

Please Attach Any Additional Information, Sketches, or Comments to this Sheet and Attach to Processing Samples.



Sales & Service ■
 Development, Sales & Service ■
 Manufacturing, Development, Sales & Service ■

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IPG Photonics manufactures a wide range of laser products with laser classifications ranging from Class I to Class IV. Please review the individual product specification for the optical performance characteristics specific to the device. This information typically includes the wavelength range, output power (CW and/or Peak), Pulse Energy, Pulse Repetition Rate, Pulse Width, etc.

