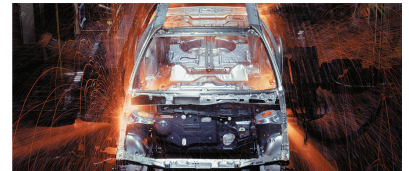
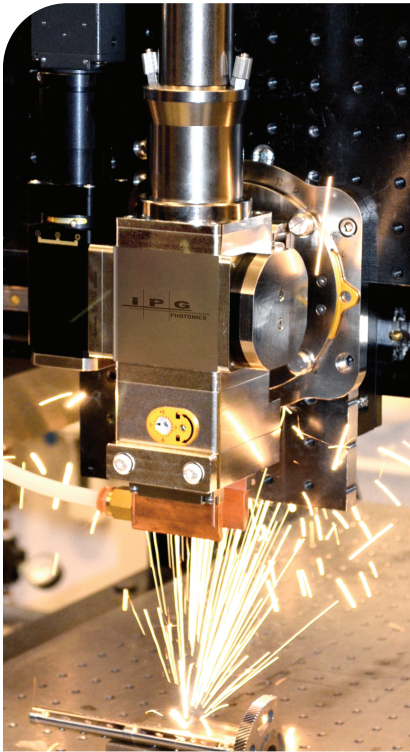




Industrial Fiber Lasers for Materials Processing from the World Leader in Fiber Lasers

PRODUCT GUIDE



Applications



Features



Efficiency



Capabilities

■ FIBER LASER ADVANTAGES

What you can expect from an IPG Fiber Laser



IPG Photonics Corporation is the world leader in high power fiber lasers and amplifiers. Founded in 1990, IPG pioneered the development and commercialization of optical fiber-based lasers for use in a wide range of venues such as materials processing, telecom, medical, scientific and other advanced applications. Fiber lasers have revolutionized the industry by delivering superior performance, reliability and usability at a lower total cost of ownership compared with conventional lasers, allowing end users to increase productivity and decrease operating costs.

IPG is the only company that controls the performance, cost and yield of both active fibers and semiconductor pump diodes- the core technology of the fiber laser. IPG develops and manufactures process fibers, beam couplers and switches, collimators, chillers and most recently processing heads and fully custom laser systems. This innovation, coupled with extensive manufacturing capabilities, places IPG in the rare position of being in full control of every step needed to achieve this mission: to deliver innovative, reliable, high quality and high performance fiber lasers at a cost-effective price.

The product of this mission is exemplified best through IPG's most popular laser family, the YLS Series. Ranging in power from 500 W to over 100 kW, operating in CW or modulated modes up to 5 kHz with wall-plug efficiencies greater than 40%, the dynamic operating range of these devices is available from 10% to full power with no change in beam divergence or beam profile throughout the entire range. This allows a single laser to be utilized for both high and low power applications such as welding, drilling and precision cutting, a previously unheard of capability. IPG lasers' divergence specifications are far superior than other lasers and allow the use of long focal length processing lenses for vastly improved depth of field, less damage to optical components and are ideal for remote applications.

MAIN FEATURES

- Excellent Beam Parameter Product (BPP)
- Constant BPP Over Entire Power Range
- Small Focus over Large Working Distance
- Over 40% Wall-plug Efficiency
- Maintenance-free Operation
- Modular 'Plug & Play' Design
- Compact, Rugged & Easy to Install
- Integrated Coupler or Beam Switch

Fiber lasers deliver their energy through an integrated flexible optical fiber. Fiber lasers have a monolithic, entirely solid state, fiber-to-fiber design that does not require mirrors or optics to align or adjust. These features make fiber lasers easier to integrate and operate in production, medical and other laser-based systems. Fiber lasers are typically smaller and lighter in weight than traditional lasers, saving valuable floor space. While conventional lasers can be delicate due to the precise alignment of mirrors, fiber lasers are more rugged and able to perform in variable working environments. These qualities permit fiber laser systems to be transported easily.

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

FIBER LASER FAMILIES

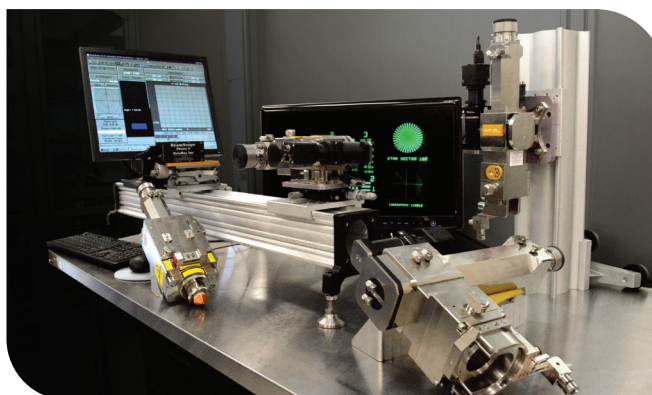
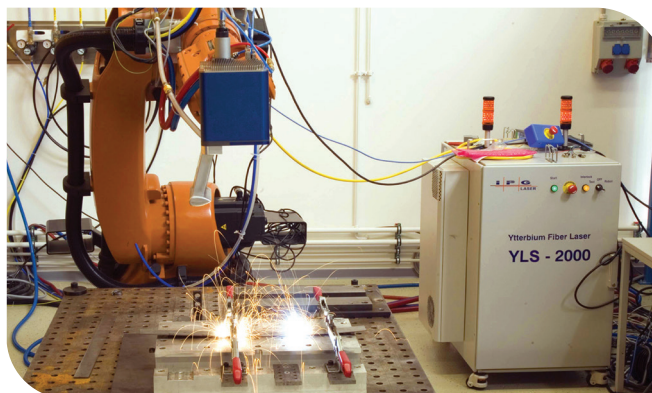
A Diverse Range for a Multitude of Applications

LASERS

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APPLICATION GUIDE	YLS	YLR	YLP	QCW	GLR	GLP	TLR
Ablation			○			○	
Annealing	○				○		
Brazing	○						
Cladding	○						
Cutting	○	○	○	○	○	○	
Deep Engraving			○		○	○	
Drilling	○		○	○		○	
Heat Treating	○						
Marking			○		○	○	○
Soldering		○			○		
Welding	○	○		○	○		○

YLS SERIES

High Power CW Ytterbium Fiber Laser Systems



Applications

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



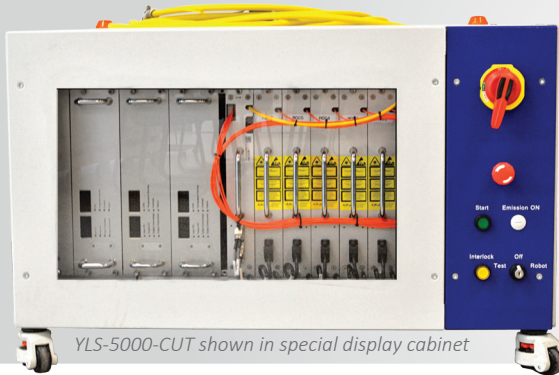
Efficiency

- > 40% Wall-plug Efficiency (WPE)
- > 50% WPE on ECO Series
- Industry Leading Diode Lifetime



Capabilities

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



YLS-5000-CUT shown in special display cabinet



Standard Features

The YLS series fiber laser, with output powers **up to 120 kW**, was developed as a complete system for industrial applications. They have 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 cabinets adding to the robustness of the unit. These systems are controlled by either digital I/O, analog control or IPG's own LaserNet software with the additional option to add either DeviceNet, Profibus or Ethernet interfaces. Developed as a complete system, 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 LASER CONFIGURATIONS

Single-output Identifiers

YLS Series

The YLS Basic fiber laser is available in up to 10 kW single-mode and 100 kW multi-mode output power. The YLS has a direct feeding fiber terminating in either an HLC-8 (QBH-type) or LCA (QD-style) connector in standard lengths of up to 30 meters. This version also can be configured with internal or external couplers, switches or beam sharers. These modifiers may affect the laser part number and cabinet size. The full list of variants is found on the following page, please contact your IPG salesperson for full information.

Part number design: YLS-XXXX, X denotes output power in watts. i.e. YLS-1000

Available output powers:

1,000 • 2,000 • 3,000 • 4,000 • 5,000 • 6,000 • 7,000 • 8,000 • 10,000 • 12,000 • 15,000 • 20,000 • 30,000 • 50,000 • 100,000

YLS-CUT



IPG's family of kW class CUT lasers are specifically designed for high performance in harsh cutting environments. The CUT series features a super compact design with the laser housed in an hermetically sealed cabinet. A dehumidifier is installed within the cabinet to ensure optimal internal humidity. The lasers have a wall-plug efficiency of over 35%, so the electrical cost savings our lasers are famous for continues to improve. Hot redundancy ensures 100% up time with no change in power, ensuring record reliability and maintenance free operation. The CUT series are available from 1-6 kW with a wide variety of fiber delivery options, starting at 50 µm core diameter.

Part number design: YLS-XXXX-CUT, X denotes output power in watts. i.e. YLS-1000-CUT

Available output powers:

1,000 • 1,500 • 2,000 • 3,000 • 4,000 • 5,000 • 6,000 • **8,000 • 10,000 • 12,000 • 15,000**

YLS-ECO

IPG Photonics' YLS-ECO family is a new generation of kW class low-mode Ytterbium fiber lasers with record wall-plug efficiency of over 50%. IPG's Eco series offers a new, unparalleled level of reliability. The ECO series is perfectly suited for applications that cannot tolerate any downtime or service intervention.

Part number design: YLS-XXXX-ECO, X denotes output power in watts. i.e. YLS-1000-ECO

Available output powers:

1,000 • 1,500 • 2,000 • 3,000 • 4,000 • 5,000 • 6,000 • 10,000



Multiple Fiber Outputs: Options & Features

The YLS laser also features the option to terminate up to six ports from one power source. Delivery optics up to four ports can be housed inside the main laser cabinet, with six ports available in a separate NEMA 12 housing for safety and enhanced mobility. IPG develops and manufactures all delivery optics in-house which allows for fast lead times and enhanced in-house support. Available options include couplers, beam shutters, beam switches and shearers in D12.5, D25, D50, and D85 diameters; see page 11 for more information.

Multi-output Capabilities



- Up to 6 Ports for Simultaneous or Alternating Work Cells
- Process Fibers Available in up to 1 μ dia.
- 100 % Beam Switching or Variable Beam Sharing Available
- Beam Dump on Switches
- Multi-application use from one Laser



LASER OPTIC OPTIONS

Optic Diameter	Optic Style	# of Channels	Connector Style	Max Output Power	Features	Options
D12.5	Coupler	1	HLC-8 LCA	3 kW	Internal integration or external laser setup. Allows for a multitude of passive fiber lengths & widths. Provides extra protection if damage occurs.	YLR compatible option
	Beam Shutter	1			Internal integration or external laser setup. Allows for a multitude of passive fiber lengths & widths. Provides extra protection as well as faster on/off.	
	Beam Switch	2, 4			Internal integration or external laser setup for beam switching between multiple ports. Allows for multi-station and application processing.	
D25	Coupler	1	HLC-8 LCA HLC-16	10 kW	Integrated internally to laser cabinet. Allows for a multitude of passive fiber lengths & widths. Provides extra protection if damage occurs.	Plug & Play Design 4D Weld Monitor Flange Purge
	Beam Shutter	1			Internal 1" shutter. Allows for a multitude of passive fiber lengths & widths. Provides extra protection as well as faster on/off.	
	Beam Switch	2, 3, 4, 6			Internal 1" beam switching between multiple ports. Allows for multi-station and application processing.	
	Beam Sharer	2, 3, 4, 6			Internal 1" beam shearer for simultaneous operation of multiple stations, available with varied power percentages. 3, 4 and 6 port options can be configured with both switching and sharing.	
D50	Coupler	1	HLC-8 LCA HLC-16	15 kW	Integrated internally to laser cabinet. Allows for a multitude of passive fiber lengths & widths. Provides extra protection if damage occurs.	
	Beam Shutter	1			Integrated internally to laser cabinet. Allows for a multitude of passive fiber lengths & widths. Provides extra protection if damage occurs.	
	Beam Switch	2, 4, 6		30 kW	Internal 2" beam switching between multiple ports. Allows for multi-station and application processing.	
	Beam Sharer	2, 4, 6			Internal 2" beam shearer, for simultaneous operation of multiple stations each at varied power percentages. 4 and 6 port options can be configured with both switching and sharing.	2 Port: 50/50 with 100% switching option 4 Port: 100/100/50/50, 50/50/50/50 6 Port: 50/50/100/100/100/100
D85	Coupler	1	HLC-16 HLC-24	30 kW 100 kW	Integrated internally to laser cabinet. Allows for a multitude of passive fiber lengths & widths. Provides extra protection if damage occurs.	

YLR SERIES

Rack Mounted CW Ytterbium Fiber Lasers

YLR LASER CONFIGURATIONS



Applications

- Cutting
- Soldering
- Drilling
- Welding



Efficiency

- Over 40% Wall-plug Efficiency
- Industry Leading Diode Lifetime



Capabilities

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



Standard Features



IPG's YLR Series represents a new generation of diode-pumped CW fiber lasers of near infrared spectral range (1060-1080 nm) with a unique combination of high power, ideal beam quality, fiber delivery and high wall-plug efficiency. The YLR laser is offered as a cost-effective, adaptable solution for a clean room system or for integration into a production line. Featuring a front panel touch-screen display or rear control via Analog, RS-232, or Ethernet interfaces, the rack mount configuration is ideal for a multitude of applications from cutting, welding and drilling to medical device manufacturing.

Features Output powers up to 1.5 kW water-cooled (WC) with air-cooled (AC) models up to 500 Watts. IPG D12.5 external delivery optics are available for the YLR Series (see page 5).

YLR LASER PART NUMBERS

CABINET SIZE DENOTED BY GRADIENT

3U 19" rack W 448 x D 403 x H 132	4U 19" Rack W 449 x D 503 x H 177	6U 19" Rack W 448 x D 502 x H 266						
OUTPUT POWER (WATTS)								
100 W	200 W	300 W	400 W	500 W	600 W	700 W	1,000 W	1,500 W

Multi-mode YLR

100 to 1,500 W lasers equipped with a standard 50 μ m feeding fiber to HLC-8 connector. Additional options include 100 or 200 μ m diameters to HLC-8 connector or 50, 100 or 200 μ m to an affixed collimator. Available focal lengths: 20, 38 or 53 mm.

YLR-100-MM-AC	YLR-200-MM-AC	YLR-300-MM-AC	YLR-400-MM-AC	YLR-500-MM-AC	YLR-600-MM-WC	YLR-700-MM-WC	YLR-1000-MM-WC	YLR-1500-MM-WC
50 μ m feed fiber to HLC-8 Connector								

Single-mode YLR

100 to 1,000 W lasers equipped with a 5 mm beam diameter affixed collimator for powers up to 400 Watts; 500- 1,000 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.

YLR-100-AC	YLR-200-AC	YLR-300-AC	YLR-400-AC	YLR-500-AC	YLR 600 WC	YLR 700 WC	YLR 1000 WC
Single-mode feed fiber to Affixed Collimator (5 mm beam diameter)				Single-mode feed fiber to HLC-8 Connector			

ELR, TLM & TLR LASER CONFIGURATIONS

Erbium or Thulium lasers are also available in a rack design, available models listed below. Green (532 nm) offerings can be found on page 8.

The Erbium fiber laser (ELR Series), operating in the 1530-1620 nm "eye-safe" wavelength with output powers up to 200 Watts, is a unique instrument that provides a diffraction-limited, high-power CW light source. Typical industrial applications include plastic and polymer welding.

AVAILABLE MODELS: Single-mode: ELR-20-AC, ELR-30-AC, ELR-50-AC, & ELR-50-WC

The Thulium fiber laser (TLR Series), operating in the 1900-2050 nm wavelength range, offers output powers up to 120 Watts. Typical industrial applications include plastic cutting and marking, non-metal materials processing and solid state IR laser pumping.

AVAILABLE MODELS: Single-mode: TLR-50-AC, TLM-50- WC, TLR-100-AC, TLM-100-WC

Multi-mode: TLR-50-MM-AC, TLM-50-MM-WC, TLR-100-MM-AC, TLM-100-MM-WC, TLR-200-MM-WC

QCW SERIES

Quasi-CW Ytterbium Fiber Lasers

QCW LASER CONFIGURATIONS



Applications

- Cutting
- Drilling
- Welding



Efficiency

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



Capabilities

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



Standard Features

Quasi-continuous wave (QCW) fiber lasers are ideally suited for numerous industrial applications requiring a long pulse duration and high peak power such as spot welding, seam welding and drilling. Designed to displace existing YAG lasers due to their minimal maintenance costs and low upfront costs, the QCW is easily able to be retrofitted into most existing systems.



YLM Module



YLR Rackmount



YLS System

- OEM Module design. Air-cooled cabinet with Analog/ RS-232/ and Ethernet control interfaces.

Rack mountable housing. Air-cooled cabinet with touch-screen display. Analog/ RS-232/ and Ethernet interfaces included.

Ytterbium Fiber Laser System. Lasernet/ Analog/ RS-232/ and Ethernet interfaces included.

- 4U Rack Dimensions available on page 6
- 6U Rack

- Air-cooled NEMA Housing.
- Water-cooled NEMA 12 Housing.

QCW LASER PART NUMBERS

	CW	PEAK	FEEDING FIBER	ENCLOSURE
	OUTPUT POWER (WATTS)			W X D X H (mm)
• YLM-150/1500-QCW-AC	150 W	1,500 W	Single mode	OEM Module, 264 x 432 x 150
• YLM-150/1500-QCW-MM-AC	150 W	1,500 W	50, 100 or 200 μ m	OEM Module, 264 x 432 x 150
• YLM-300/3000-QCW-MM-AC	300 W	3,000 W	50, 100 or 200 μ m	OEM Module, 336 x 432 x 150
• YLM-450/4500-QCW-MM-AC	450 W	4,000 W	50, 100 or 200 μ m	OEM Module, 416 x 556 x 148
• YLR-150/1500-QCW-AC	150 W	1,500 W	Single mode	4U Rack mount, 449 x 503 x 177
• YLR-150/1500-MM-AC	150 W	1,500 W	50, 100 or 200 μ m	4U Rack mount, 449 x 503 x 177
• YLR-300/3000-QCW-MM-AC	300 W	3,000 W	50, 100 or 200 μ m	6U Rack mount, 448 x 502 x 266
• YLR-450/4500-QCW-MM-AC	400 W	4,000 W	50, 100 or 200 μ m	6U Rack mount, 449 x 665 x 266
• YLS-300/3000-QCW-AC	300 W	3,000 W	50, 100 or 200 μ m	NEMA housing, 804 x 604 x 605
• YLS-450/4500-QCW-AC	450 W	4,500 W	50, 100 or 200 μ m	NEMA housing, 804 x 604 x 605
• YLS-600/6000-QCW-AC	600 W	6,000 W	50, 100 or 200 μ m	NEMA housing, 804 x 604 x 605
• YLS-900/9000-QCW-WC	900 W	9,000 W	100, 200 or 300 μ m	12U NEMA 12 Housing, 558 x 790 x 815
• YLS-1200/12000-QCW-WC	1,200 W	12,000 W	100, 200 or 300 μ m	12U wide NEMA 12 Housing, 1186 x 856 x 806
• YLS-1500/15000-QCW-WC	1,500 W	15,000 W	100, 200 or 300 μ m	12U wide NEMA 12 Housing, 1186 x 856 x 806
• YLS-1800/18000-QCW-WC	1,800 W	18,000 W	100, 200 or 300 μ m	12U wide NEMA 12 Housing, 1186 x 856 x 806
• YLS-2000/20000-ACW-WC	2,000W	20,000W	100, 200 or 300 μ m	12U wide NEMA 12 Housing, 1186 x 856 x 806

YLP SERIES

Pulsed Fiber Lasers

PULSED FIBER LASERS FOR MICROPROCESSING



Applications

- Marking & Engraving
- Precision Texturing & Ablation
- Selective Material Removal
- Micro cutting, Scribing & Hole drilling



Capabilities

- Allows user to optimize both job quality and throughput
- Can Micromachine Virtually any type of material
- Ultimate flexibility in choosing operating parameters



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 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. Featuring naturally built-in fiber delivery and a number of termination options, rugged maintenance-free design and record energy efficiency, IPG's unparalleled offering of pulsed 1 micron fiber lasers will meet requirements of the most demanding industrial users.

Standard Features



IPG's 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 range from 5 to 100 W, pulse duration range from 400 fs to 200 ns and pulse repetition rate range from, 10 kHz to 10 MHz.

YLPN Series ▼

NANOSECOND FIBER LASERS

IPG's nanosecond fiber lasers are the core products for most industrial materials processing needs. Available in a multitude of different configurations, from 5- 1,000 Watts output powers, variable pulse durations and terminations, the YLPN Series has the versatility needed for most standard applications.

YLPP Series ▼

PICOSECOND FIBER LASERS

IPG's short picosecond fiber lasers provide high peak power with scalable average output power of 50 W and short pulse duration of 1-3 ps at full operational frequency range of 50-2000 kHz. It is ideal for applications in micromachining, solar/photovoltaic, via hole drilling, resistor trimming and marking of transparent materials.

YLPF Series ▼

FEMTOSECOND FIBER LASERS

IPG's femtosecond lasers provide high peak power with scalable average output power of 10 W, short pulse duration of less than 500 fs at full operational repetition rate range of 50-1000 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, ceramic, silicon and plastics.

PULSED FIBER LASERS FOR SURFACE TREATMENT



Standard Features

IPG's high-power Q-switched fiber lasers are available in power ranges from 100 watts to 4 kilowatts, pulse durations from 100 to 500 ns and up to 100 mJ pulse energies. With high throughput, pulse repetition rates from 10-500 kHz and an M² optimized for most surface preparation and treatment applications, these high energy lasers are the perfect solution for your heat-treating needs.



Applications

- Paint Stripping
- Laser Surface Cleaning
- Surface Preparation and Treatment
- Large Area High Throughput Ablation



Capabilities

- Allows user to optimize both job quality and throughput
- Ultimate flexibility in choosing operating parameters
- Large Range of Processable Materials



NEW! YLPN-50-120-4000-S: MEGAPULSE YTTERBIUM LASER

IPG Photonics' new high power, pulsed fiber laser is designed with an average output power of 4 kW at the work piece, a pulse energy of 40 mJ and a pulse duration of 120 ns. With a wall-plug efficiency of 30%, a variety of fiber delivery options, a small form factor and maintenance-free operation, IPG's 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 SERIES

CW & Pulsed 532 nm Fiber Lasers

GLR & GLP CONFIGURATIONS



Applications

CW/ QCW GREEN

- Annealing
- Additive Manufacturing
- Cutting
- Soldering
- Welding

PULSED GREEN

- Ablating
- Cutting
- Deep Engraving
- Drilling
- Marking



Efficiency

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



Capabilities

- High Brightness
- Compact & Efficient



Standard Features

Fiber Lasers in the green spectrum range enable IPG to serve new markets and applications. At output wavelengths of 532 nm, the new pulsed green fiber laser and continuous wave (CW) green fiber laser provide the high single-mode beam quality, ease of use and high reliability that IPG's fiber lasers are known to deliver at lower prices than competitive green lasers.



GLP Module

- OEM Module design. Air cooled laser with Analog/ RS-232/ and Ethernet control interfaces. Single-mode free launch beam output. *Displayed on left.*

GLR Rackmount

Rack mountable housing. Air-cooled cabinet with touch-screen display. Analog/ RS-232/ and Ethernet interfaces included. Single-mode free launch beam output. *Displayed above.*

- 3U Rack
- 4U Rack
- 6U Rack

GLR PART NUMBERS

	MODE	WATTS	COOLING	CABINET DIMENSIONS	HEAD DIMENSIONS W X D X H (mm)
○ GLR-10	CW	10 W	Air	3U Rack mount, 448 x 403 x 132	130 x 250 x 45 mm
○ GLR-20	CW	20 W	Air	3U Rack mount, 448 x 403 x 132	130 x 250 x 45 mm
● GLR-30	CW	30 W	Air	4U Rack mount, 448 x 503 x 176	130 x 250 x 45 mm
● GLR-50	CW	50 W	Air	4U Rack mount, 448 x 503 x 176	130 x 250 x 45 mm
● GLPN-100-M	QCW	100 W	Air	OEM Module, 264 x 148 x 384	105 x 213 x 60 mm
● GLPN-500-R	QCW	500 W	Water	6U Rack mount, 448 x 678 x 176	105 x 213 x 60 mm

Kilowatt class CW green lasers are also available, please contact your nearest sales office for further information.

GLP PART NUMBERS

	MODE	WATTS	COOLING	CABINET DIMENSIONS	HEAD DIMENSIONS W X D X H (mm)
● GLPN-M-10	Q-SWITCH	10 W	Air	OEM Module, 270 x 220 x 86	105 x 213 x 60
○ GLPN-10	Q-SWITCH	10 W	Air	3U Rack mount, 448 x 418 x 133	65 x 216 x 70
○ GLPN-30	Q-SWITCH	30 W	Air	3U Rack mount, 448 x 418 x 133	65 x 216 x 70
○ GLPN-50	Q-SWITCH	50 W	Air	3U Rack mount, 448 x 418 x 133	65 x 216 x 70

PRODUCT SPOTLIGHT

IPG's New Product Releases & Standout Accessories

IPG's vast array of products serve to satisfy a broad range of applications. With that, IPG regularly strives for new laser developments to open up new markets to laser utilization through product innovation and low overall costs. Please contact us for more details on the full range of YLS lasers.

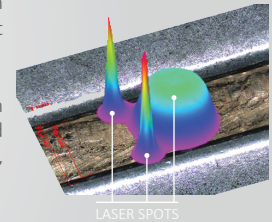


NEW PRODUCT FEATURE: IPG's YLS-5000-BR Trifocal Brazing Laser



IPG Photonics introduces a new application based laser to the YLS family with the release of the YLS-BR Brazing Fiber Laser, currently available with 4, 5 or 6 kW average output power. The YLS-BR features a trifocal spot achieved through a specially designed three-beam process fiber. Developed with multiple core sizes to achieve the desired brazing result, the YLS-BR maximizes joint strength while increasing brazing speed and joint appearance.

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 the reduction of manual cleaning efforts, utilizing the YLS-BR can enable process automation at a fractional cost.



Advantages

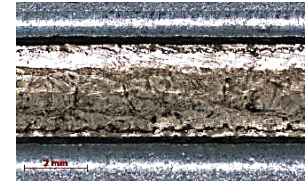
- Cleaning and Joining in One Step
- Reduction of Manual Cleaning Effort
- Enables Process Automation
- Improved Reproducibility
- Minimized Heat Effects on the Assembly

SINGLE SPOT



3.5 kW, Main Spot only

TRIFOCAL



3.5 kW Main, 0.85 kW Cleaning Spot

IPG'S COMPACT LASER SEAM STEPPERS:

A HIGH PRODUCTIVITY, HIGH-EFFICIENCY, CLASS I LASER SAFETY DEVICE; THE IDEAL REPLACEMENT FOR RESISTANCE SPOT WELDING.

IPG Photonics' Compact Laser Seam Steppers (LSS) are the ideal solution for freehand laser welding and as a replacement for resistance spot welding. Presenting two distinct units: the robot or gantry mounted LSS-2 and the hand-operated LSS-3, each stepper offers a unique laser clamping and welding tool that operates laser output powers up to 4000 Watts. With an adaptable clamping force of up to 3 kN and a fixed focal length of 250- 300 mm, the LSS allows for a laser wobble seam weld up to 40 mm in length.

- Compact Design: Controller Dimensions (mm) 806 x 856 x 1508
- Up to 4 kW Laser Power with Laser Safety Class I
- Laser Welding with Simple Clamping Technology
- Reduced Processing Time due to Higher Joining Strength
- Compact Laser and C-gun Control in a Single Housing
- Real Time Welding Quality Control & Data Record of each Welding Seam
- Programmable Clamping with Long-term Repeatability
- Repeatable Processing with Multi-layer Sheet Joining
- Higher Component Strength and Rigidity Due to Joint Quality
- Smart Welding Option

LSS-2

The LSS-2 has high beam quality and ideal beam monitoring as well as an integrated protective cover allowing the Class 1 Laser classification. Powerful enough to easily weld even hot-formed materials, the LSS-2 cuts traditional weld speeds in half. Weighing in at only 45 kg, the design is compact and saves compressed air, allowing for operation below 70 dB.



LSS-3

IPG's LSS-3 Compact Laser Hand Seam Stepper represents a new generation of laser seam steppers. With a total weight of just 35 kg, the LSS 3 allows you to make welding seams by hand. The LSS-3 is unique in that it combines a clamping and laser welding tool which operates in power range up to 4 kW.



IPG continues to develop a wide range of products across a broad wavelength range, from continuous wave to ultra-short pulse duration. These new lasers open up new application areas to IPG and allow the company to provide unrivalled performance to new markets and industries such as medical, solar and semiconductor. Please contact us for more details on the full range of picosecond and femtosecond lasers.



NEW PRODUCT FEATURE: IPG's GLPN-500-R Green Quasi-CW Laser

IPG introduces a new green fiber laser with ground-breaking maximum average power of 500 W in a perfectly single-mode output beam. IPG's GLPN-500-R takes advantage of the quasi-CW operation mode to allow for a high-efficiency super compact optical head that does not require any cooling. The optical head is connected to a water-cooled rack-mounted main laser console that houses highly-efficient and reliable fiber amplifier, pioneered by IPG. The result is a rugged industrial-grade high-power green fiber laser with unmatched performance and remarkable wall-plug efficiency.

In addition, IPG's CW Ytterbium fiber laser modules can be ordered for single-mode operation or with step index fibers from 50 – 200 microns, allowing optimal performance for welding, cutting and drilling applications.



Applications

- Solar Cell Manufacturing
- Semiconductor Wafer Annealing
- Laser Shows
- Laser Projectors
- Welding & Cutting of Highly-Reflective Materials



Standard Features

- 532 nm Wavelength
- 500 Watt Output Power
- $M^2 < 1.2$ Beam Quality
- 1% Power Stability
- Linear Polarization $> 100:1$
- 2800 W Power Consumption
- Super Compact Head
- Industrial Performance

ACCESSORIES

DELIVERY OPTICS IPG's 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, due to the flexibility of the laser the user can further customize the build of the system. 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.

IPG offers beam couplers, switches, shearers, and shutters in D12.5, D25, D50 and D85 sizes. All delivery optics are designed and manufactured by IPG and are tailored specifically for fiber lasers. Beam switches are offered with 2, 3, 4 or 6 output ports with customized options in terms of which ports are dedicated with either switching or time-sharing functionality as well as which connections are supplied with each output. Connections offered are HLC-8, HLC-16, HLC-24 or LCA. All switches or couplers do 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 as outlined in the text below.

PROVIDING TOTAL SOLUTIONS



PROCESS FIBERS IPG offers process fibers of various lengths and core diameters fitted with a range of connectors. Whereas the feeding fiber is the 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 able to be changed in-field with minimal effort and without requiring an IPG technician. This advantage 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 such as in a robotic application.

The fibers are available in 100, 150, 200, 300, 400, 600, 800, and 1,000 μm diameters with lengths up to 100 meters. The process fibers are available with either industry standard connectors (HLC-8, LCA) or with IPG's exclusive high-power connectors (HLC-16, HLC-24) which can handle output powers up to 100 kW. All components are manufactured and designed by IPG Photonics ensuring a high level of customization, fast turnaround and end-to-end quality assurance.

ADAPTABLE COLLIMATORS 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.

PROCESSING HEADS

Cutting & Welding Heads for Fiber Lasers



Standard Features

IPG Photonics has revolutionized the cutting and welding industry, providing customers with reliable, compact and energy efficient fiber lasers. IPG now offers a range of optical heads to accompany its fiber lasers including the FLW-D30, FLW-D50 and FLW-85 welding heads and FLC-D30 cutting head. IPG designs and manufactures all process heads utilizing the highest quality optics produced by IPG's proprietary optical manufacturing and coating technologies, minimizing thermal effects and providing stable welding and cutting processes.

The FLW welding heads have multiple features, including vertical or horizontal configuration, real time contamination monitoring functionality, camera options, fine focus adjustment and wide range of collimator and focus lens options, all packaged in a compact, lightweight form. IPG welding heads are available with a broad range of accessories including air-knife, gas assist/plume suppression, coaxial nozzle and a variety of add-on modules for advanced welding applications.

IPG's FLC-D30 cutting heads are designed to provide the highest laser power handling capability in the industry in a completely sealed and lightweight package. The FLC-D30 provides effortless integration with IPG lasers and third-party machine controls and offers precise monitoring of height even under high-power and high-pressure cutting processes. Available in multiple configurations with the broadest focus and collimator and lens options, FLC-D30 is the ultimate tool to cut a multitude of different material types and thicknesses.

D30 CUTTING HEAD

FLC-D30

IPG Cutting Head with Manual Focus
Allows manual adjustment of the focal plane.

FLC-D30-M

IPG Cutting Head with Motorized Focus

In addition to all the benefits of the FLC-D30 cutting heads with manual focus adjustment, the FLC-D30-M motorized focus version enables intuitive focus adjustment through an external controller.

FLC-D30-MP

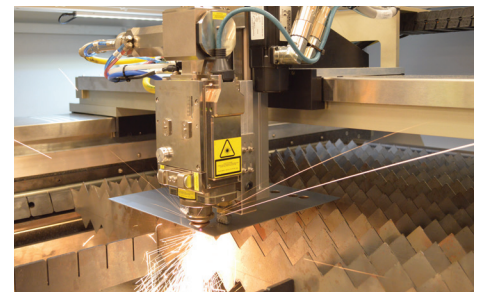
IPG Cutting Head with Motorized Focus & Pierce Sensing

Cutting heads with motorized focus are available with optional pierce sensing capability, monitoring and providing feedback on the piercing process enabling completely automated laser cutting operation.



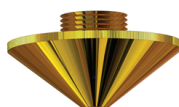
FLC-D30

Laser Power	Up to 12 kW
Weight (V)	≥2.95 kg
Weight (H)	≥3.5 kg
Collimating Lens	50, 60, 85 100 mm
Focusing Lens	125, 150, 200 250 mm



▼ D30 Cutting Head Accessories

- Camera Arm Assembly
- Cover slides
- Cutting Nozzles:



Thick Nozzles
Diameters Available

- 1.0 mm tip
- 1.2 mm tip
- 1.5 mm tip
- 2.0 mm tip
- 2.5 mm tip



Thin Nozzles
Diameters Available

- 0.8 mm tip
- 1.0 mm tip
- 1.2 mm tip
- 1.5 mm tip
- 1.8 mm tip
- 2.0 mm tip
- 2.5 mm tip



Cutting Head Electronics
Motorized option with pierce detection. Monitoring for cover slide presence and contamination. Height sensor maintains constant distance to work piece. Integrated back reflection monitoring.

Camera Arm Assembly

C-mount extension tube to mount camera. Precision image position adjustment. Integrated iris. Image focus and lock. Available for all processing heads.


FLW-D30
FLW-D50-L
FLW-D50-S
FLW-D50-HP
FLW-D85-HP

Laser Power	Up to 6 kW	Up to 10 kW	Up to 30 kW	Up to 50 kW	Up to 65+ kW
Weight (V)	≥2.95 kg	≥2.95 kg	≥2.95 kg	≥2.95 kg	≥2.95 kg
Weight (H)	≥3.5 kg	≥3.5 kg	≥3.5 kg	≥3.5 kg	≥3.5 kg
Collimating Lens	50, 60, 85 100 mm	100, 120, 140 160, 180, 200 mm	100, 120, 140, 150 160, 180, 200 mm	100, 120, 140 150, 180 mm	250, 300 350 mm
Focusing Lens	100, 125, 150, 200 250, 300, 500 mm	150, 200, 250, 300 400, 500, 600 mm	150, 200, 250, 300, 400 500, 600, 700, 800, 1000 mm	300, 400, 500, 600 700, 800, 1000 mm	250, 300, 350 400 mm

Advanced Welding Heads & Adaptors ▼

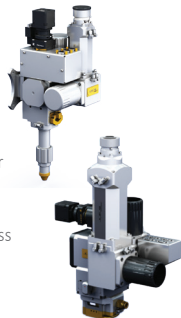
FLW-D30 Wobble

Power Handling up to 6 kW

FLW-D50 Wobble

Power Handling up to 12 kW

► Utilizing the Wobbler allows for exceptional weld quality and uniformity. Features adjustable seam broadening and high process stability & repeatability with a variety of wobble patterns.



Seam Tracking

Complete seam tracking system that increases productivity through automated adjustment of weld location to match varying seam positions. Locates seams with <10 um accuracy while providing increased consistency.



FLW-D50 Dual Spot Module

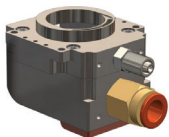
Installed between the collimator and the core block assembly. 50/50 power distribution for beam separation in the X or Y direction possible.

FLW-D50 Beam Shaper Module

Installed between the collimator and the core block assembly. Uniform (Flat-top) power distribution over the area. Long Rayleigh Length.

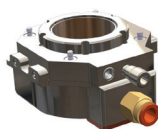


▼ Welding Head Accessories



Air-knife with Purge

Integrated purge module provides additional protection for cover slide
Gas assist can be attached to serve as plume suppression
FLW-D30 Version



Cross-Jet/ Air-knife

Integrated purge module provides additional protection for cover slide
Gas assist can be attached to serve as plume suppression
FLW-D50 Version



Coaxial Nozzle w/ Purge

Shield gas is delivered coaxially to the weld site
Telescoping option available.
Suppresses weld plume
Consult IPG Sales for options
Available for FLW-D30.



Gas Assist

Can be attached to air knife or directly to head
Can be used to deliver off-axis shield gas to weld site
Suppresses weld plume
Multiple inputs
Available for FLW-D30 & FLW-D50



Welding Head Alarm Module

Monitors cover slide presence, contamination and temperature as well as mirror temperature
Available for FLW-D30 & FLW-D50

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 warrantied 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.



IPG PHOTONICS WORLD HEADQUARTERS, OXFORD, MA

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.

APPLICATION FACILITY FEATURES:

5 Axis Robotics Welding, Cutting, Drilling

5 Axis CNC Welding, Cutting, Drilling

Tube Cutting Systems

CNC 2D Machines

- Cutting, Welding Thick Plate

- High Speed Cutting

- Micromachining with High Accuracy

Galvo Systems

- Marking, Cutting, Welding



APPLICATIONS CENTERS WORLDWIDE

COUNTRY	CITY	LAB FOCUS	PHONE	EMAIL
China	Beijing	Materials Processing	+86 10 6787 3377	application@ipgbeijing.com
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APPLICATIONS REQUEST FORM

Developing Your Laser Solution

PROCESS REQUEST
(PLEASE ATTACH TO SAMPLES)



IPG's 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 ☐ OTHER ☐

PRINT ENCLOSED ☐ MSDS ENCLOSED ☐

PRODUCTION PROCESSING REQUIREMENTS: (answer all that apply)

PARTS PER HOUR	<input type="radio"/> inch <input type="radio"/> mm	SURFACE FINISH	<input type="radio"/> inch <input type="radio"/> μ m
FEEDRATE	<input type="radio"/> inch <input type="radio"/> mm	KERF WIDTH	<input type="radio"/> inch <input type="radio"/> mm
HOLES/ MIN	<input type="radio"/> inch <input type="radio"/> mm	HAZ	<input type="radio"/> inch <input type="radio"/> mm
HOLE DIA.	<input type="radio"/> inch <input type="radio"/> mm	RECAST	<input type="radio"/> inch <input type="radio"/> mm
WELD DEPTH	<input type="radio"/> inch <input type="radio"/> mm	DIMENSIONAL TOL	<input type="radio"/> inch <input type="radio"/> mm

DESIRED CYCLE TIME:

LASER PREFERENCE: MULTI-MODE ☐ SINGLE-MODE ☐ PULSED ☐

PRIMARY CONCERNS: (assign applicable concerns from 1- 5, 1 being the most important)

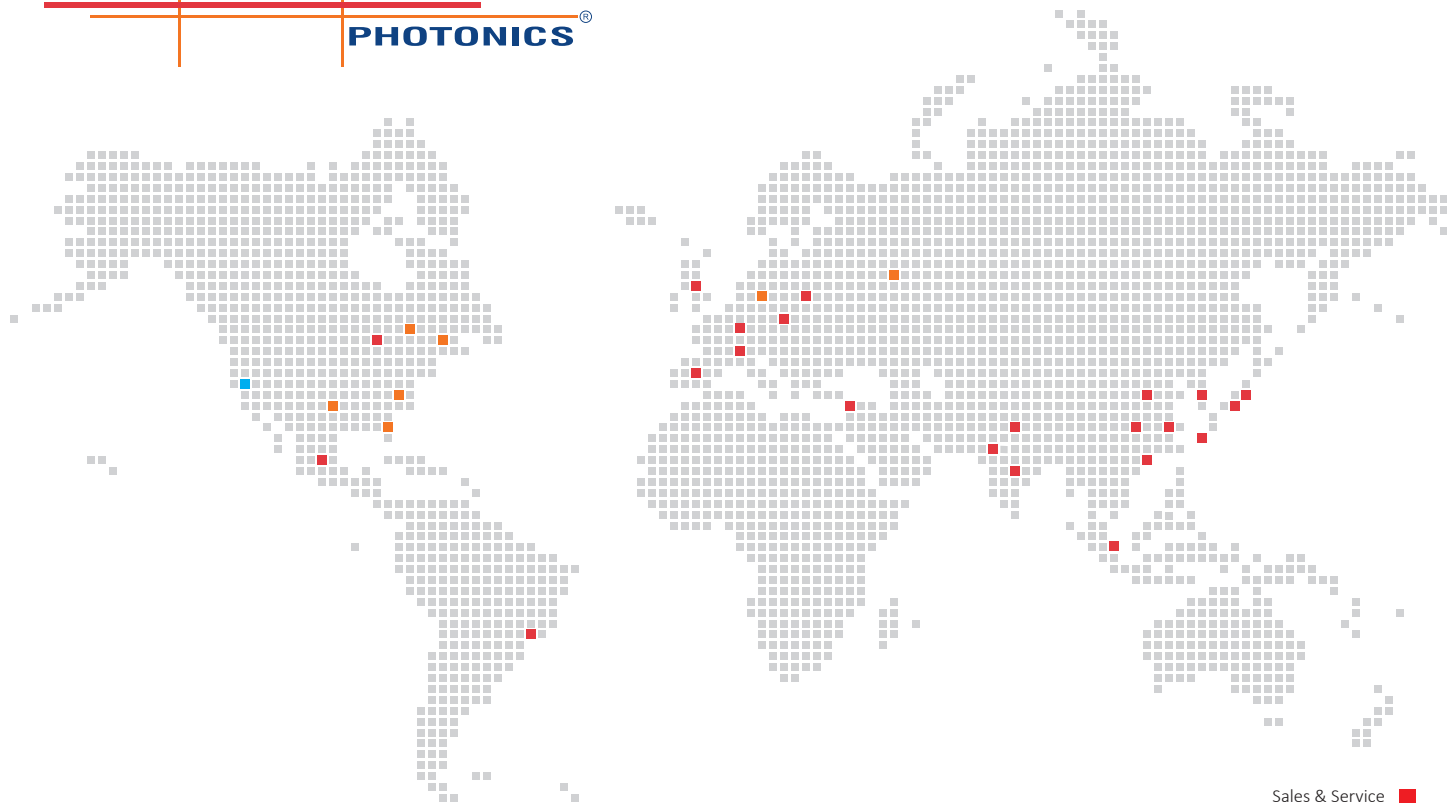
SPEED	SURFACE FINISH	TAPER
KERF	HAZ	OTHER (specify)
DEPTH	POROSITY	

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.

VISIBLE AND/OR INVISIBLE
LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION
CLASS II LASER PRODUCT
Per IEC 60825-1:2007-03, 21 CFR 1040.10(g)