



Deep penetration fiber laser welds in two types of material. On the left is stainless steel subjected to 50 kW at 60 ipm (1524 mm/min) with a penetration of 1.3" (33 mm). On the right is copper that also has been subjected to 50 kW at 60 ipm with a penetration of 1.125" (28.6 mm).

Fiber Lasers Continue to Gain Market Share in Material Processing Applications

Fiber lasers offer users the lowest price per watt with the highest beam quality

Bill Shiner

Vice President Industrial Lasers
IPG Photonics
Oxford, MA

The first kilowatt-class fiber laser for material processing was introduced by IPG Photonics in early 2002. Since that time, the adoption of fiber lasers for production applications has grown at a rapid rate. Today, fiber lasers are becoming the choice for most major production laser applications as well as converting traditional welding and cutting processes to fiber laser technologies. This is best evidenced by the double-digit year-over-year growth that IPG has experienced over the past several years. During this period, traditional CO₂ and solid-state laser companies, offering material processing lasers, have experienced declining sales growth or low single-digit growth at best. Several other companies have started to introduce fiber lasers in the last several years; however, IPG Photonics has been able to maintain a fiber laser market share in excess of 70%.

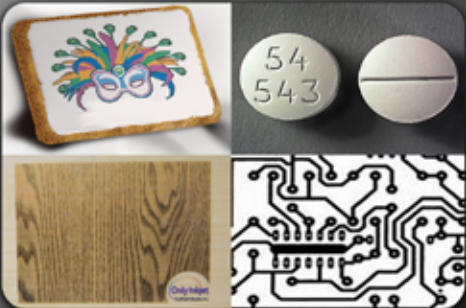
REVOLUTIONIZE YOUR PRODUCTION WITH INKJET

CUSTOM DESIGNED INDUSTRIAL INKJET SOLUTIONS

HIGH VOLUME MANUFACTURING UP TO 2000 FEET PER MINUTE

ZERO SETUP TIME

EXAMPLES INCLUDE:



INQUIRE WITH DTISALES@FUJIFILM.COM

FIBER LASERS

The fundamental reason is easy to understand: fiber lasers offer their users a production laser at the lowest price per watt, with the highest beam quality, the lowest electrical consumption and minimum maintenance. These lightweight compact lasers can be installed in a matter of a few hours



IPG Photonics sales growth.

without the need for special mounting surfaces required by many solid-state lasers. Fiber lasers should not be equated with solid-state disk lasers, which are fiber delivered, as they do not provide the performance benefits provided with a true all-fiber laser. There are several different types of production fiber lasers operating at 1070 nm with the choice dependent upon the application. These include lasers operating in a continuous mode from 50 to 100,000 W. There are also lasers operating in either a high-peak-pulsed mode and a lower average power, known as QCW lasers—for example, pulses of 20 kW in the pulsed mode and 2000 W in the continuous mode. The third major contributor is an extensive product line

Put machining perfection within easy reach.

Target burrs safely, effortlessly and in seconds with Spider Electrochemical deburring technology.



See Spider ECD performance in action



www.getecd.com



6kW fiber laser machines have become more common

of short-pulsed lasers with very high peak power and pulse durations from the picosecond to the nanosecond regime.

Common to all of these lasers is that they are excited with telecom-grade highly reliable laser-pump diodes and a gain medium of Ytterbium active fiber. The multi-kilowatt lasers are manufactured with a modular concept. For example, a 20-kW laser is manufactured with multiple 1200-W modules all combined into a single 100- μm output fiber. This allows the manufacturing of these lasers, with parallel combining to higher and higher output powers without stressing the components or decreasing the reliability. The lower powered CW fiber lasers are manufactured with a single module and are available as air-cooled devices. The pulsed-fiber lasers are typically manufactured with a fiber laser or pump diode delivered through a fiber amplifier. These pulsed units are also available with emission wavelengths in the UV and Green ranges by utilizing frequency doubling and quadrupling crystals.

Production Acceptance of Continuous Fiber Lasers

The acceptance of fiber lasers for production applications in the automotive industry has been rapid and accelerating. Fueled by their ease of integration with industrial robots, the elimination of He as a welding cover gas and the excellent beam quality, all major automotive companies and their suppliers worldwide have adopted fiber lasers to meet their very demanding production requirements. The industry has strived to manufacture lighter weight and safer vehicles. This has resulted in numerous applications for laser processing. The increasing utilization of high-strength steels and aluminum into vehicle designs and

the introduction of lightweight automatic transmissions has proven to be fertile ground for the adoption of fiber-laser technology. The fiber lasers used in automotive production are typically 2–6 kW with the power dependent upon



Better Keyways and More

Polymat series of CNC keyseating machine

From simple keyways to multiple, special profiles, Leistriz Polymat and Polyjet machines have the features to improve quality, shorten cycle times and minimize set-ups.



Leistriz Advanced Technologies Corp.

165 Chestnut Street, Allendale, NJ 07401

201 934-8262

www.leistrizcorp.com

whether it is for cutting or welding. Applications include the welding of tailored blanks, cutting and welding of high-strength steel, welding of air bag components, welding of aluminum door inners and frames to mention a few.

The two- and three-axis cutting market has made a major shift away from CO₂ lasers to fiber-laser technology. At the 2015 FABTECH show in Chicago, 12 companies displayed their cutting machines using IPG multi-kilowatt

fiber lasers. These lasers have demonstrated higher processing speeds than CO₂ technology, at a lower cost with the ability to cut materials such as copper and brass not possible with CO₂ technology. The trend in the cutting industry is toward higher fiber-laser power as the builders increase the speed of their machines and the thickness capability. Standard

PBA/Atlas Workholding Highest Quality CNC Lathe Chucks and a Name You Trust!

PBA/Atlas Workholding ATL Series Chucks are interchangeable with Kitagawa® B200 Series Chucks

- Ⓜ Free Chuck Inspection and Repair Estimate for your Kitagawa® B200, BT200 BB200
- Ⓜ We offer in house machining for Chuck Connectors, Chuck Modifications and Full Service Repair Shop with a Fully Qualified Staff to Answer all Technical Questions
- Ⓜ ATL Chuck Components are Hardened and Ground
- Ⓜ ISO 9002
- Ⓜ Full 1 year Warranty on Parts and Labor
- Ⓜ Interchangeable Top Tooling with 1.5mm Master Jaws Free Set of Soft Top Jaws with every ATL Series Chuck
- Ⓜ We also stock 2 Jaw, 4-Jaw and Large Thru-Hole Chucks, Quick Change Jaw Chucks up to 24" and Cylinders



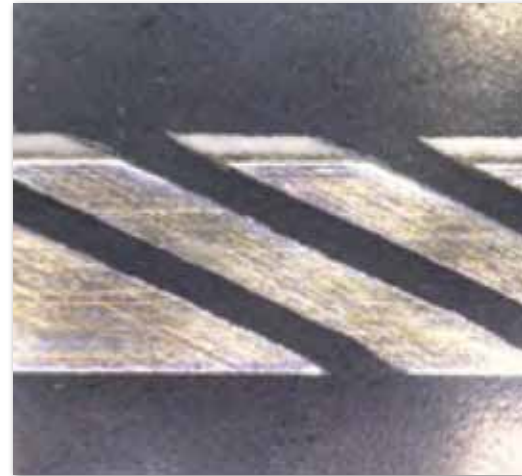
ATL Series Power Chucks New Great Low Prices...

- 6" Chuck \$1575.00
- 8" Chuck \$1850.00
- 10" Chuck \$2375.00
- 12" Chuck \$2975.00
- 15" Chuck \$4995.00

Chuck price includes Standard A mounting plate, 1 set of Soft Top Jaws
1 set of T-nuts and Manual.
Contact PBA/Atlas Workholding for our local Distributor in your area.

Best Prices
Best Warranty

Kitagawa® is a registered trademark of Kitagawa-North-Tech



A fiber laser with 15 kW peak power operating at 20 Hz for 1 ms and 10 pulses was used to drill holes in this TBC-coated 0.080" Inconel 718 aerospace part.

machines have moved up from 2-kW power, with 6-kW machines becoming more common. The speed increase and thickness capability has easily justified this shift. The company Megafab (Rockford, IL), demonstrated a cutting machine with a 12-kW IPG Photonics fiber laser, cutting 5/8" (16-mm) material at over 500 ipm (12,700 mm/min) at FABTECH. Of particular note is that fiber-laser technology can now outperform plasma in cutting that thickness.

The major portion of the welding market utilizes fiber lasers from the



Pratt Burnerd America

1919 N. Pitcher Street • Kalamazoo, Michigan 49007
Phone: 800-253-0820 • Fax: 269-384-3201

e-mail: info@prattburnerd.com • Web Site: www.prattburnerd.com



✂ Cut Out and Save

2 to 6-kW power levels and are employed for welding, brazing and cladding. These lasers, usually integrated with robots, are employed on applications too numerous to mention as they are deployed in virtually all disciplines of manufacturing. The growth in this sector has been attributed not only to the replacement of legacy technology but also from a switch from MIG and TIG welding systems. There is also a market expansion toward higher fiber-laser power. This has been somewhat fueled by decreasing cost of ownership but more so by the increased awareness of the potential that high-power fiber lasers offer in the welding of thick structures. With 10–100 kW of continuous power available, these lasers have gained wide acceptance in the oil and gas and aerospace industries as well as various R&D labs around the world dedicated to investigating the advancement of welding technology. Several of these super-high-powered continuous wave lasers have been implemented on outdoor mobile material processing applications not possible before compact, electrically efficient fiber lasers were available. The first production US-installed 50-kW system was delivered by IPG in the fall of 2015. The system, dedicated to deep penetration welding, is producing high-quality welds in excess of 25 mm in a variety of materials including copper. The first 100-kW fiber laser was shipped to the Asian market during 2014. The 100-kW is launched from a 300- μ m feed fiber and produced weld penetration depths in excess of 125 mm. These super-high-power lasers will continue to encroach on applications usually dedicated to electron beam welding machines with the added advantage that they do not require a vacuum.

The lower power CW fiber lasers which are available in either a single-mode or multi-mode configuration have also experienced double-digit growth. The single-mode version in the 400–1000 W output power range has become the



When something exceptional develops between us:
That's the MAPAL effect.

AERODEF
.....
Stand 309

You
continuously develop
more innovative solutions
so that flying becomes
more efficient.

We
Get a
boost
supply you with machining
solutions that give your
production more momentum
even with completely new
materials.

Discover tool and service solutions now that give you a successful start:
www.mapal.com | Your technology partner for machining



WWW.KEOCUTTERS.COM



MILLING CUTTERS



A Family of Products

From a Name You Can Trust

PROUDLY MADE IN THE USA

Combined Drill & Countersinks

Spotting Drills

Countersinks

Counterbores

Keyseat Cutters

Milling Cutters

Shank-Type Tooling

Arbor-Type Tooling



A Division of:

ARCH
GLOBAL PRECISION



**AMERICAN MANUFACTURING
SERVING THE WORLD**

Discover All ARCH Companies at...

archglobalprecision.com

FIBER LASERS

dominate choice for 3D power bed manufacturing machines. The requirement to produce 40–60 μm spot sizes with a consistent melt pool, and rapid response times is ideally accomplished with IPG's single-mode fiber lasers. The single-mode lasers are also widely used in the high-speed cutting of thin materials required in the battery industry as well as producing micron-sized holes in a variety of applications. The multi-mode version with their CW power and high modulation frequency continue to gain substantial market share in the sensor industry, medical device industry and computer industries. The cutting of medical stents, welding of pressure transducers and the welding of stainless steel razor blades are examples of high-volume applications that have switched to fiber lasers.

Production Acceptance of QCW Lasers

The QCW fiber lasers were developed for those applications that require a pulse of high-peak laser energy for laser welding, cutting or drilling with the added ability to operate in the continuous mode for additional capability. The lasers can be switched dynamically between the two modes of operation and power levels on the fly. The product range is from a 1.5 kW peak with a 250-W CW power to a 20-kW peak with CW power to 2000 W with several other models



The primary application of pulsed fiber lasers is for marking

in between. The applications for this product include extensive micro welding, cutting and drilling applications at the lower power levels with extensive acceptance by the medical device, computer, cell phone and battery industries. The higher peak power offerings such as 20 kW/2000 is rapidly replacing YAG lasers in the aerospace industry for the very demanding drilling of thousands of cooling holes required in the manufacture of the modern jet engines. These lasers drill higher quality holes at much higher speeds while meeting the demanding specifications consistently. They are a direct replacement for pulse YAG lasers on spot-welding applications requiring a high-peak pulse as well as operating

in the CW mode for high-speed seam welding. The opportunity for replacement of YAG lasers on the thousands of existing production machines around the world has contributed to the huge success of the QCW fiber laser. The ease of adapting these lasers to existing machines has allowed manufacturers to enjoy the benefits that fiber lasers offer with no lost production time and minimal capital investment.

Acceptance of Pulsed-Fiber Lasers

Pulsed-fiber lasers, with the primary application of marking, have completely revolutionized this industry. IPG provided over 13,000 units during 2014. Units were sold through marking system providers with end users from all disciplines of manufacturing. Large users include battery, medical device, computer, cell phone and consumer product manufacturers. Fiber lasers for metal marking are estimated as having greater than 80% market share. The other high-volume applications are in the solar industries for ablation of coatings, glass and sapphire cutting for the cell phone industry and a variety of cleaning procedures required by automotive and battery manufacturers. The new additions to the pulse- laser product line include UV lasers at 355 nm and lasers operating at 532 nm. These lasers are already making inroads in markets dominated by traditional technologies.

Future of Fiber Lasers

Fiber-laser technology has a bright future in materials processing as new fiber lasers are now entering the market offering additional wavelengths, peak powers, performance characteristics and cost advantages that will continue to take market share from current laser technologies.

Several competitors have entered the arena, with fiber laser offerings, in an effort to regain their market share, which will further enhance the growth of this exciting transition to fiber laser technology. ➔

Introducing the Ultimate Precision Chuck



Advanced new design will increase your machining speed and tool life to the highest possible levels.

Mechanical drive actuated with a hex wrench. Simple design, highly accurate.

NEW Emuge FPC Mill / Drill Chucks

- Patented design with 1:16 worm gear
- Vibration dampening / high stiffness
- Outperforms hydraulic & shrink fit
- Milling and drilling applications
- Internal & peripheral coolant options
- MQL adaptable
- CAT 40 & CAT 50 styles

Learn more about the new design at Emuge.com

EMUGE *in Partnership with*

800-323-3013 • www.emuge.com

ALBRECHT
Precision Chucks