

High consistency of performance among fiber lasers of a given type means that the degree of repeatability between workstations is also much higher. For the end-user, this means setting up and maintaining multiple lines to produce identical high quality components has never been easier.

In general, the choice of workstation for any application comes down to determining the required performance followed by a trade-off between initial cost, component yield, uptime and maintenance. While the initial cost for the new workstation will be higher, Braman is confident that rapid ROI due to high yield, near 100% up-time and near-zero maintenance, means that less demanding manufacturing processes can also benefit from the technology.

The Standard of the Future

There is little doubt that FiberStar Workstations offers distinct performance advantages, including a higher level of weld precision and quality. End-user's will be able to rapidly expand their range of micro-welding and cutting applications while focusing on their growing business demands rather than having to become laser maintenance experts. Into the future, as the market for fiber lasers matures, the specialists at Crafford-LaserStar Technologies expect to see more widespread adoption of the fiber laser engine for more general tasks. Likewise, as the laser engine performance window expands, we can expect to see greater diversification of FiberStar product line use, as well as penetration into new application areas, yet to be defined.

FiberStar Workstations can be demonstrated in any of Crafford-LaserStar's national applications centers in the USA (Rhode Island, Florida and California) and will be available internationally through established distribution channels in Europe, the Far East and Australia.

Authors:

David P. Braman, VP Engineering
Crafford-LaserStar Technologies Corp.
Riverside, Rhode Island, USA
Tel. +1 401 438 1500,
Fax: +1 401 434 7260
Email: dbraman@laserstar.net
web: www.laserstar.net

John Tinson
Vice President Sales
SPI Lasers UK Limited
Tel. +44 1489 779668
Fax: +44 1489 779698
Email: john.tinson@spilasers.com
web: www.spilasers.com

Gregory Flinn
Putting Photonics into Context
Munich, Germany
Tel. +49 89 95420457
EMail: gregory.flinn@gmx.net
web: www.gregory.flinn@gmx.net



Crafford-LaserStar Technologies Corporation

RI LaserStar Sales Center
One Industrial Court, P.O. Box 15155
Riverside, Rhode Island 02915 USA
401-438-1500 • Fax: 401-434-7260
Email: ri.sales@laserstar.net

FL LaserStar Sales Center
8615 Commodity Circle, Suite 19
Orlando, Florida 32819 USA
407-248-1142 • Fax: 407-248-1168
Email: fl.sales@laserstar.net

CA LaserStar Sales Center
510 West Sixth Street, Suite 1030
Los Angeles, California 90014 USA
213-612-0622 • Fax: 213-612-0623
Email: ca.sales@laserstar.net

Regional Sales Representatives
North Carolina: 704-839-9589
Illinois: 847-340-9270
New Mexico: 505-440-6878



Crafford-LaserStar's New 7500 Series FiberStar Workstations Extend the Capabilities of Fiber Laser Micro-Welding Applications

FEBRUARY 2006 - Crafford-LaserStar Technologies Corp., of Rhode Island, USA, a worldwide supplier of laser micro welding, cutting and marking workstations for industrial applications, premiered its first FiberStar laser welding workstation earlier this year and is already examining other workstation products featuring fiber laser engines.

This addition to the Crafford-LaserStar product range is in recognition of the growing acceptance of fiber lasers for materials processing applications as a cost-effective alternative to conventional laser design. The new welding workstations provide a better quality output combined with improved process yield, reduced running costs and have lower maintenance demands, heralding a major breakthrough in welding performance.

Tougher Demands for Laser-Based Manufacturing

For all of the typical laser materials processing applications there is an almost universal requirement for consistent high quality results. For a large proportion of these applications, workstations that make use of conventional laser engines are more than satisfactory for the task.

Some industries are nonetheless subject to particularly stringent quality requirements, in particular the manufacture of medical devices and electronics. Medical devices, medical implants and components for the electronics industry often use 300-series stainless steel, with wall thicknesses of 0.1 to 0.5mm. The specifications for the size, quality, durability and performance of such welds are set very high, although the weld process for such thin materials is actually very difficult - too much power can result in excessive penetration and thus to weak points and perforation, while too little power can result in weak weld strength.

Crafford-LaserStar Technologies Corp., of Rhode Island, USA, is a worldwide supplier of benchtop and portable laser micro welding, cutting and marking workstations for industrial applications. LaserStar workstations are frequently used in low and high volume production environments; to produce high value assemblies; and enhance precision assembly environments. LaserStar welding systems are capable of welding a wide variety of medical-grade metals, and are highly valued for their low running costs and compact ergonomic design.

In order to provide the industry with a wider welding performance envelope, Crafford-LaserStar began exploring alternative laser engine options for a new line of FiberStar Workstation products with fiber laser specialist SPI Lasers plc (Southampton, UK). Over the last few years, and in close cooperation with strategic partners such as Crafford-LaserStar, SPI's intensive R&D program has evolved the fiber laser engine into a real-world industrial welding, cutting and marking tool.

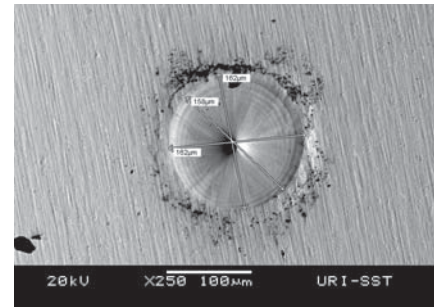


Fig. 7: 250X magnification demonstrates the high level of spot size dimensional accuracy provided by the FiberStar Workstation.

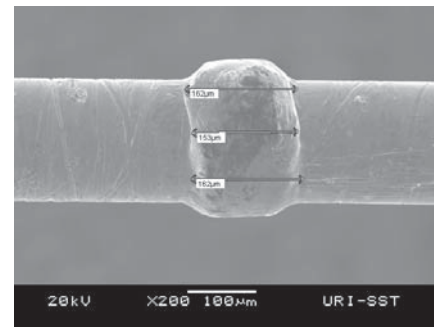


Fig. 8: 200X magnification demonstrates the uniform butt weld accomplished with .007" (.18mm) diameter Nitonal wire.

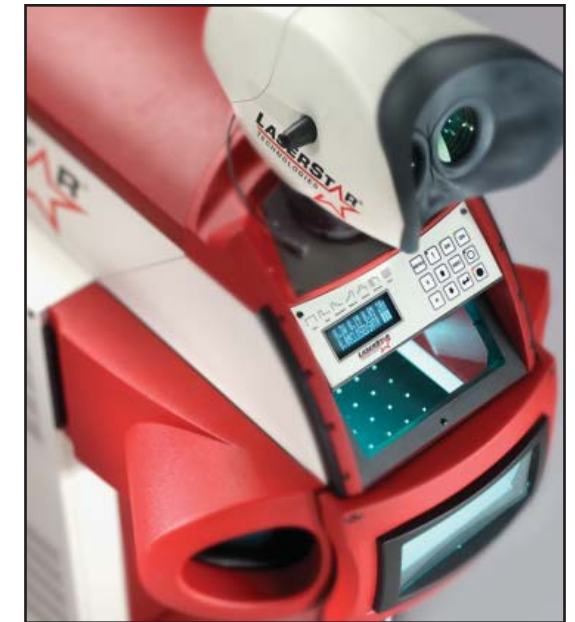




Fig. 1: Crafford-LaserStar's new FiberStar fully integrated welding workstation solution retains the classic trademark of compact, ergonomic and practical design.

Application Specialists at Crafford-LaserStar, with more than 50 years of combined experience in industrial manufacturing, are now confident that fiber lasers have matured beyond the performance window offered by conventional laser design and are the key to the rapidly expanding workstation performance.

New Performance Envelope

The worldwide premier of Crafford-LaserStar's new 7500 Series FiberStar product line (Fig. 1) was recently unveiled at the Medical Design & Manufacturing Show (MD&M West - Anaheim, CA) in February, 2006 and the Westec Advanced Productivity Exposition (Los Angeles, CA, USA) a month later.

"MD&M West and Westec were the ideal forums to introduce the new FiberStar product line. All of the leading edge medical device manufacturers, as well as other advanced technology producers, consider these events as their main resource for emerging technologies" states James E. Gervais, Executive Vice President of Crafford-LaserStar Technologies.

Designed for stringent welding and cutting applications, FiberStar Workstations are equipped with an air-cooled, CW modulated fiber laser from SPI and are the first fully integrated portable fiber laser welding workstation of this type in the world. Production versions of this workstation are available with 100, 200, 300 and 400 watt laser engines.

The new workstation has been designed with the needs of the precision micro-welding and micro-cutting industry in mind, providing a level of accuracy and consistency previously unavailable. This is made possible due to the unique capabilities of the fiber laser engine, including sub 0.5% pulse to pulse energy variation, +/-0.5% CW power stability over time, single-mode (TEM₀₀) beam quality and focused spot sizes down to 10µm. These features, coupled with close-loop power feedback, pulse profiling, high energy efficiency and no optical parts to align or calibrate, makes the FiberStar an attractive laser engine for practical shop floor environments.

According to David Braman, VP of Engineering and Operations at Crafford-LaserStar, "full integration of the fiber laser into the FiberStar Workstation provides full control over pulse energy, repetition rate and pulse duration for welding, with the workstation meeting all Class I safety regulations." Braman also noted that the workstation can function in CW mode for cutting applications.

One of the biggest benefits is the improved overall system performance - the FiberStar can be guaranteed to perform to a higher standard, while at the same time simplifying maintenance thus allowing the end-user to focus their expertise on production.

Figure 2

STABLE, RELIABLE, REPEATABLE PULSE AFTER PULSE			
ENERGY (J)	# SHOTS	DURATION	STD. DEV. (mJ)
.150	50	150 SEC.	0.90
.500	50	150 SEC.	1.29
2.00	50	150 SEC.	6.50

7500 Series FiberStar (100 Watt) - Statistical sampling subject to change based on operating conditions and environment

Advantages of FiberStar Lasers



Fig. 3: Medical devices, such as this catheter kit, can benefit from the microwelding and micro cutting abilities of the fiber laser equipped FiberStar workstation from Crafford-LaserStar.

◆ Fiber lasers do not exhibit the shortcomings in output power, spot size, and focal point variations caused by thermal effects on the glass rods of traditional YAG lasers.

◆ Fiber lasers offer true welding consistency at all power levels, across all pulse sequences and during the entire lifetime of the laser. The laser parameters remain predictable and consistent. The reason for this is that the generation and transport of the laser beam to the work-piece takes place entirely within the confines of a single-mode fiber. The beam shaping provided by this fiber neither degrades over time nor changes with laser power - this also makes the laser physically robust and stable, thus suitable for the most challenging of industrial environments.

◆ Additional advantages of fiber lasers are the small spot size and high beam quality that translate to high irradiance at the focal plain (Fig. 4). Workstations equipped with fiber lasers can produce better results at lower power levels. The focused beam of energy consistently affects a very small area of metal, providing the benefit of very little heat generated around the weld point.

◆ High quality, precision welding can be performed extremely close (0.1mm) to the most complicated and intricate component parts.

◆ Fiber laser applications are not limited to just welding. Cutting of medical grade steels and wire end preparation for medical components are both effectively produced with the FiberStar Workstation (Fig. 5 and 6).

◆ From an economics standpoint, the consistent and improved welding performance reduces scrap and generates faster production throughputs, resulting in a lower cost of ownership and improved laser up-times.

◆ These financial and performance advantages mean that fiber laser technology is now frequently chosen as an upgrade over conventional flash-lamp pumped solid state, or even DPSS laser technology in many other laser-based manufacturing segments. In addition, a small footprint and fast ROI open up markets that were previously out of reach for some applications.

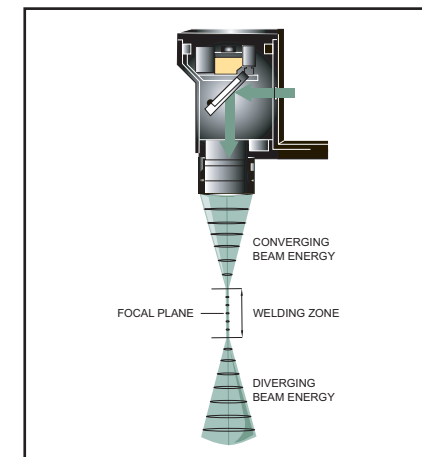


Fig. 4: The focused beam of energy consistently affects a very small area of metal, providing the benefit of very little heat generated around the weld point.

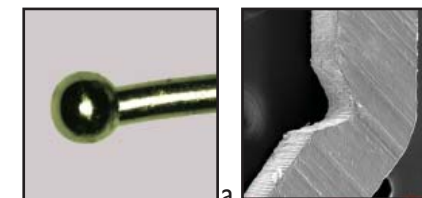


Fig. 5: The FiberStar can be used for welding the fine wire leads used in medical implants - in this case, the laser was also used to prepare the end of this 330µm Platinum wire.

Fig. 6: Fiber Laser Cutting capabilities are illustrated by the ability to produce components Here a medical clip measuring only a few mm in length.

Advantages for Industrial Manufacturing

David Braman highlights the choice of SPI as supplier for the fiber lasers as being due to number of reasons critical to performance in an industrial setting including "First, the output delivery optic is back-reflection hardened, protecting the laser from potentially damaging reflections feeding back into the laser engine. Second, the pump laser diodes are also fiber-coupled to the laser and are rated with 400,000 hours MTTF (mean time to failure) giving a full system design life of 30,000 operational hours (on time). Both of these features help contribute to maximum up-time in the production process by guaranteeing maximum dependability."