



Laser Division

Nd:YAG Lasers for Industrial Applications





Industrial Lasers For Next Generation Materials Processing

GSI Lasers has been developing and manufacturing industrial lasers for more than 30 years. In 1985 it introduced the JK700 range, the world's first truly industrial pulsed Nd:YAG lasers, which became the benchmark for industrial lasers. Today's JK range of Pulsed and Continuous Wave (CW) Nd:YAG lasers is no different and sets truly new standards in ruggedness, ease of use and class leading performance.

GSI's Nd:YAG based lasers have been designed from the ground up to maximise welding, cutting and drilling performance. Using GSI's significant applications knowledge and experience, the lasers have been developed to ensure that they deliver the right amount of laser light in the correct way under the ideal conditions to optimise the process. From class leading resonator and power supply designs to patented beam delivery and intuitive software, GSI's Lasers give you the performance advantage you need.

The power of the JK Nd:YAG lasers range from 100W to 600W average power for pulsed operation and 400W to 2000W for continuous wave operation.

With lasers in the pulsed range capable of pulse durations from $15\mu\text{s}$ to $>20\text{ms}$, peak powers up to 18kW and pulse energies up to 100J, these products are ideal for the whole range of laser processing applications.

As well as the more usual mode of operation, the CW range has the patented SuperModulation™ capability unique to the JK laser range, which allows the laser to run in a modulated mode up to twice the maximum average power. This produces faster, deeper welds with lower porosity than with lasers of the same average power used in the conventional CW operation.

All the JK range lasers benefit from the same high speed interfacing allowing on the fly changes of parameter sets. A Graphical User Interface (GUI), that has been developed and refined over several years, acts as the key functional enabler allowing complex tasks to be programmed in a simple yet effective way. It also facilitates class leading performance when linked to other forms of beam delivery and work handling such as scanners and robots.



All the lasers are delivered via the Luminator™ range of Plug-In Pre-Aligned (PIPA) fibers, with patented back reflection protection built in, which then couple directly to a comprehensive suite of process tools. The JK range is the complete solution for your laser processing application.



Industrial Tools For Every Application

Ultimately the laser source itself can only be used successfully if the delivery to the workpiece is optimised and the human interface is easy to use and capable of providing the functionality the process requires.

Process Tools

The JK laser comes complete with a range of processing tools designed specifically for precise cutting and welding applications. The optical delivery train is designed to be rugged to ensure long term maintenance free operation in demanding applications. Options include:

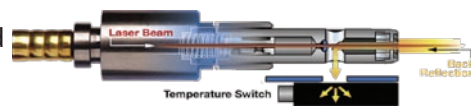
- ✔ Wide range of diffraction limited focusing optics for optimum performance
- ✔ Choice of 40mm or 60mm diameter optic focus heads
- ✔ Co-axial assist gas delivery system
- ✔ Straight and right angle focus heads with a range of cover glasses, air knives and process gas options
- ✔ CCTV viewing options for static and robotic applications
- ✔ Through-the-lens (TTL) illumination
- ✔ Sealing to industrial standard IP54 for work in the most demanding conditions
- ✔ Cutting nozzles route utilities through the focus head, for reduced damage in dynamic applications



Luminator™ PIPA Fiber Delivery

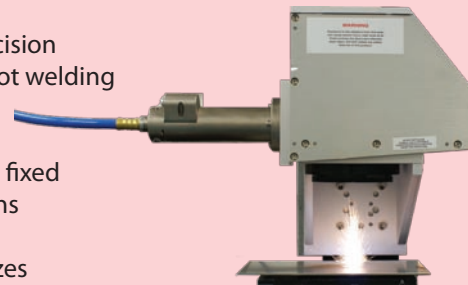
The Luminator fiber-optic delivery system provides reliability, performance and ease of use to industrial laser users. The systems patented terminations, closed-loop feedback and flexible design provide users with a significant reduction in cost of ownership.

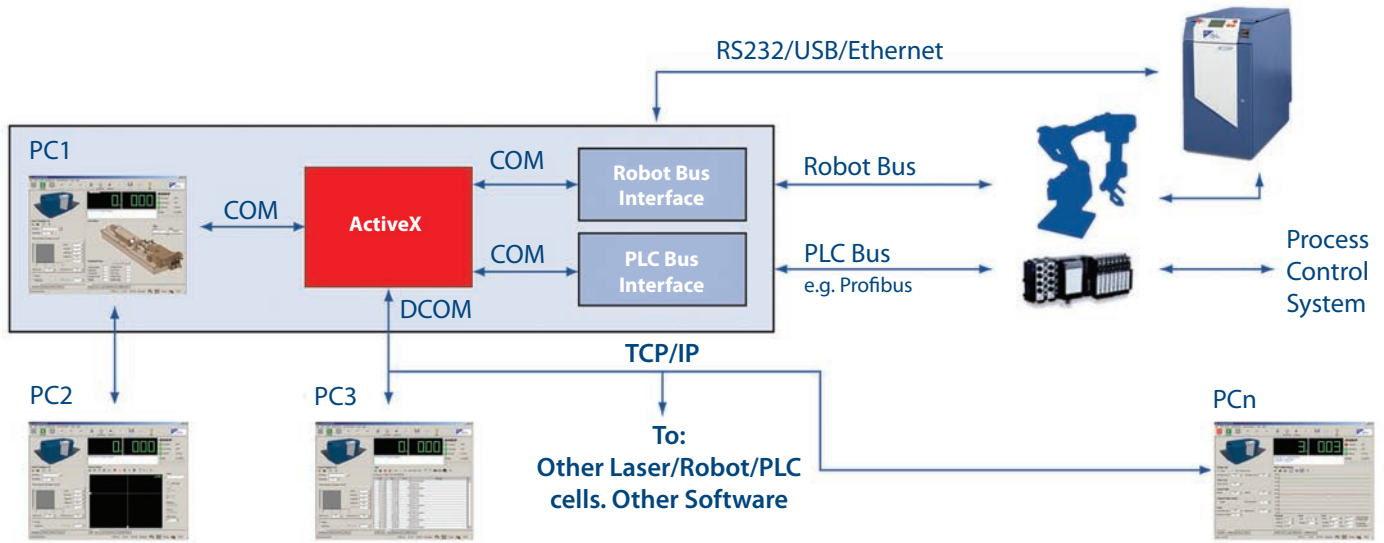
- ✔ Multi station processing enabled via energy/time share units integrated into laser system
- ✔ Plug-In Pre-Aligned (PIPA) coupling eliminates manual fiber alignment, reducing fiber change time requirements from hours to minutes
- ✔ Patented termination design helps eliminate back reflection problems when welding highly reflective materials
- ✔ Integral fiber monitoring system and optional bend lock for robotic applications



Scanner Based Beam Delivery

- ✔ High speed, high precision repeatable seam and spot welding
- ✔ Variable spot size and fixed spot size modular options
- ✔ Wide range of spot sizes
- ✔ Operational scanning fields up to 150mm x 150mm
- ✔ Various configurations available. Single head, twin head, 2D and 3D (variable spot size)
- ✔ Pre-emptive laser control with self optimisation, providing maximum process speed under all scanning conditions





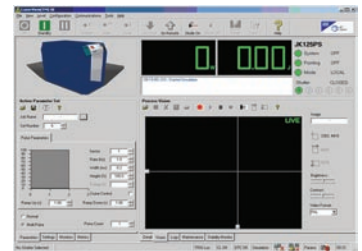
LaserView SE™ Simplifies Integration

LaserView SE™

The JK LaserView SE™ Graphical User Interface (GUI) provides a comprehensive range of software tools and features to get the most out of the lamp pumped CW and Pulsed range of JK lasers and to interface with other Windows applications. LaserView SE™ is a suite of software components designed to enable easy integration into customer applications.

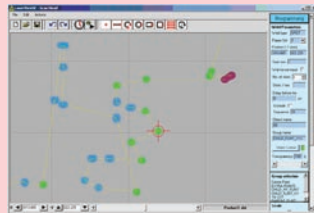
- Automatically detects a connected laser and self configures to support all pulsed and CW lasers in the JK lamp pumped range. This common interface reduces operator training requirements
- Windows style application presenting familiar layout, file management and dialogues.
- Full monitoring and control of all laser system parameters
- Simulation mode for offline operator training
- Four password protected operator access levels

- Easy programming of multi-sector pulse shapes
- Maintenance functions and automatic maintenance prompts
- Full alarm and warning logging with history and comprehensive diagnostic help
- Integrated process vision feature obviates the need for an external CRT and cross hair generator. Process images may be taken, stored and printed
- Fast machine interface for on-the-fly synchronisation
- Process cycles feature allows complex laser process sequences to be easily created and then run from a single button push
- Active real-time power control provides pulse to pulse stability down to +/- 0.5%. Pulse on demand feature ensures high stability from cold start

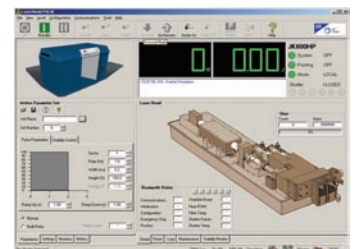


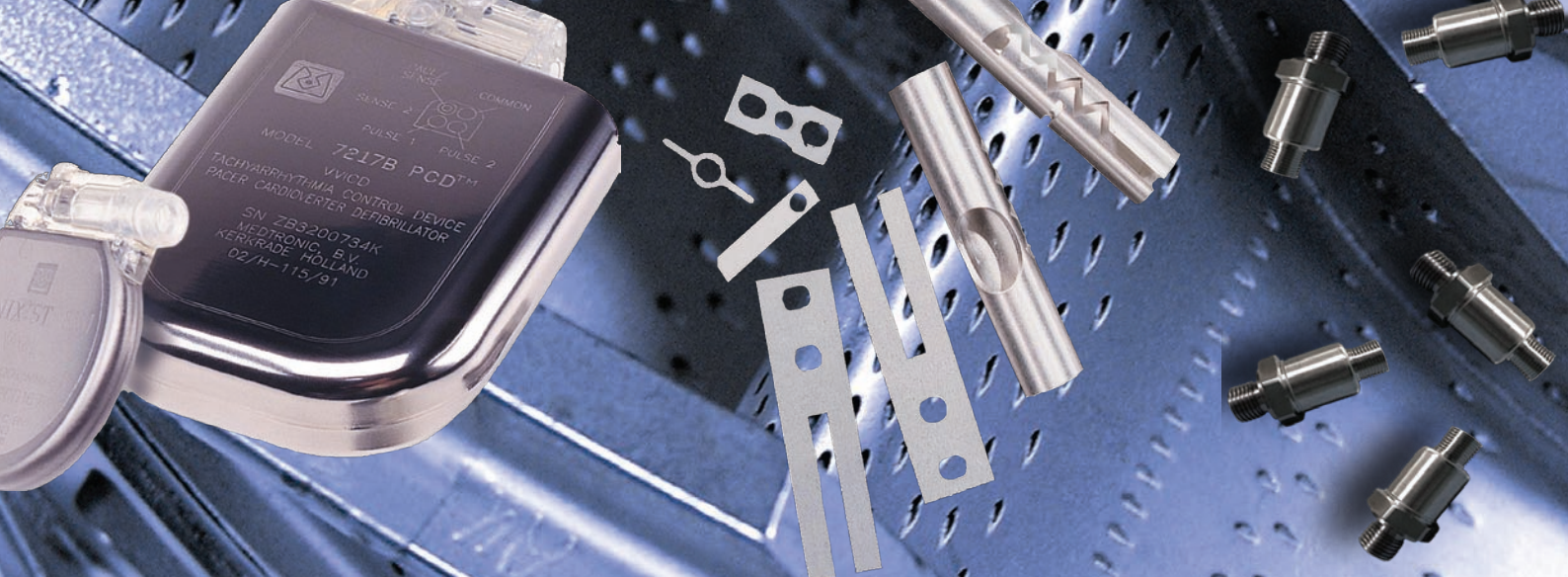
LaserView SE™ ScanHead User Interface (SHUI)

- LaserView SE™ fully integrated intuitive user interface
- Seamless programmability of scanner and laser parameters through a single operational screen
- Scan head tracking allows real time adjustment of processing features.
- Eliminates the need to purchase 3rd party scan head software.



- ActiveX component exposes all of the properties, methods and events that allows a user to create their own user interface or embed laser controls into their own software. This can be done with any programming language including Visual Basic, Visual C++, Delphi including using VBA from a Word document
- Pulsed laser stability monitoring and control
- Modem and network connections available for remote diagnostics and control
- External machine interface I/O status display

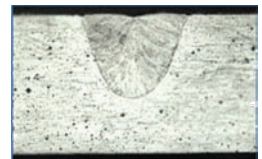




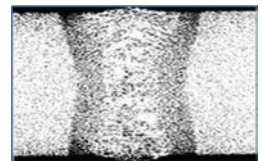
Leading Edge Applications Processing

Laser Welding

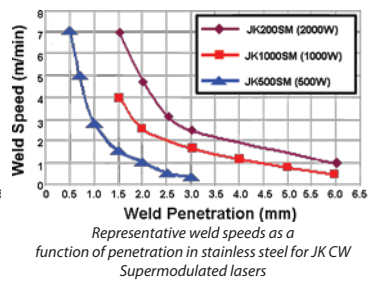
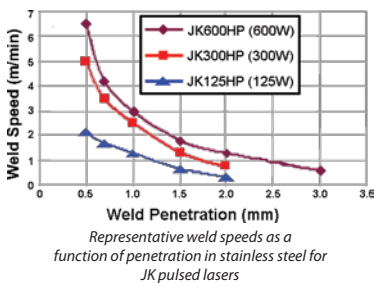
The JK range of lasers are capable of joining similar and dissimilar materials using either conduction or keyhole based weld modes. If components have metallurgical constraints on heat input or there are heat sensitive components nearby such as glass-to-metal seals or o-rings then pulsed JK lasers are ideal in achieving the required processing rate at a heat input low enough not to damage the components. For higher speed operation JK SuperModulated™ CW lasers can produce faster welds with no increase in heat input over conventional CW lasers. SuperModulation™ improves the welding speed or penetration™ by up to 40% when compared to CW-only operation, as well as reducing weld porosity.



Conduction Mode



Keyhole mode



Laser Drilling

Lasers make it possible to machine very small holes, unusual-shaped holes, blind holes, and precisely tapered holes. Laser drilling is used to drill holes at steep angles, and to process difficult-to-machine materials.

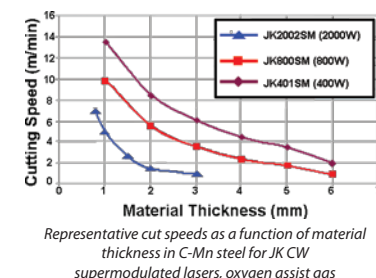
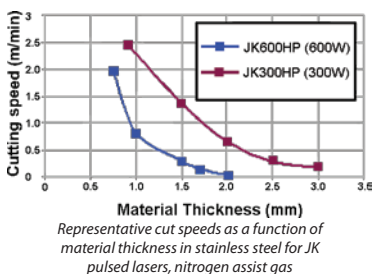
Typical applications include:

- ▶ Vehicle Transmission - air bleed hole
- ▶ Power train - oil hole in clutch plate
- ▶ Oil holes in ABS sensors
- ▶ Rocker arm oil holes
- ▶ Aerospace engine component cooling holes for:
 - blades
 - vanes
 - combustors



Laser Cutting

Laser cutting is a mostly thermal process in which a focused laser beam is used to melt material in a localised area. A co-axial gas jet is used to eject the molten material from the cut and leave a clean edge. At GSI Lasers, our JK range addresses a wide variety of laser cutting applications. Laser cutting makes it possible to cut very fine features in a range of materials including ceramics and semiconductor materials. High average power CW Nd:YAG lasers are suitable for cutting thicker sections in metals e.g. hydroformed tubing. An example of cutting speed as a function of material thickness for a range of lasers (pulsed and CW) and output powers is illustrated in these graphs.



Heat Treatment

Laser heat treatment and surface modification are the key technologies available today to enhance the effective use of materials to achieve the desired properties of the components used in a range of industries. GSI's high power JK SuperModulated™ lasers can be used for heat treatment and surface modification.



GSI Lasers relationship with its customers is based on more than just the specifications of its products. It can develop the best process for your application and help you get the most out of your laser.

The relationship starts at the earliest stages of a new project and continues throughout the life of the equipment.

Our state-of-the-art applications laboratories in Rugby and Suzhou are equipped with the very latest in work handling allowing us to demonstrate processing performance to a production level standard.

Facilities also include a comprehensive metallurgical test capability where material processing performance can be scientifically analysed and demonstrated.

Contact GSI Lasers now to take full advantage of decades of laser welding, cutting and drilling experience.