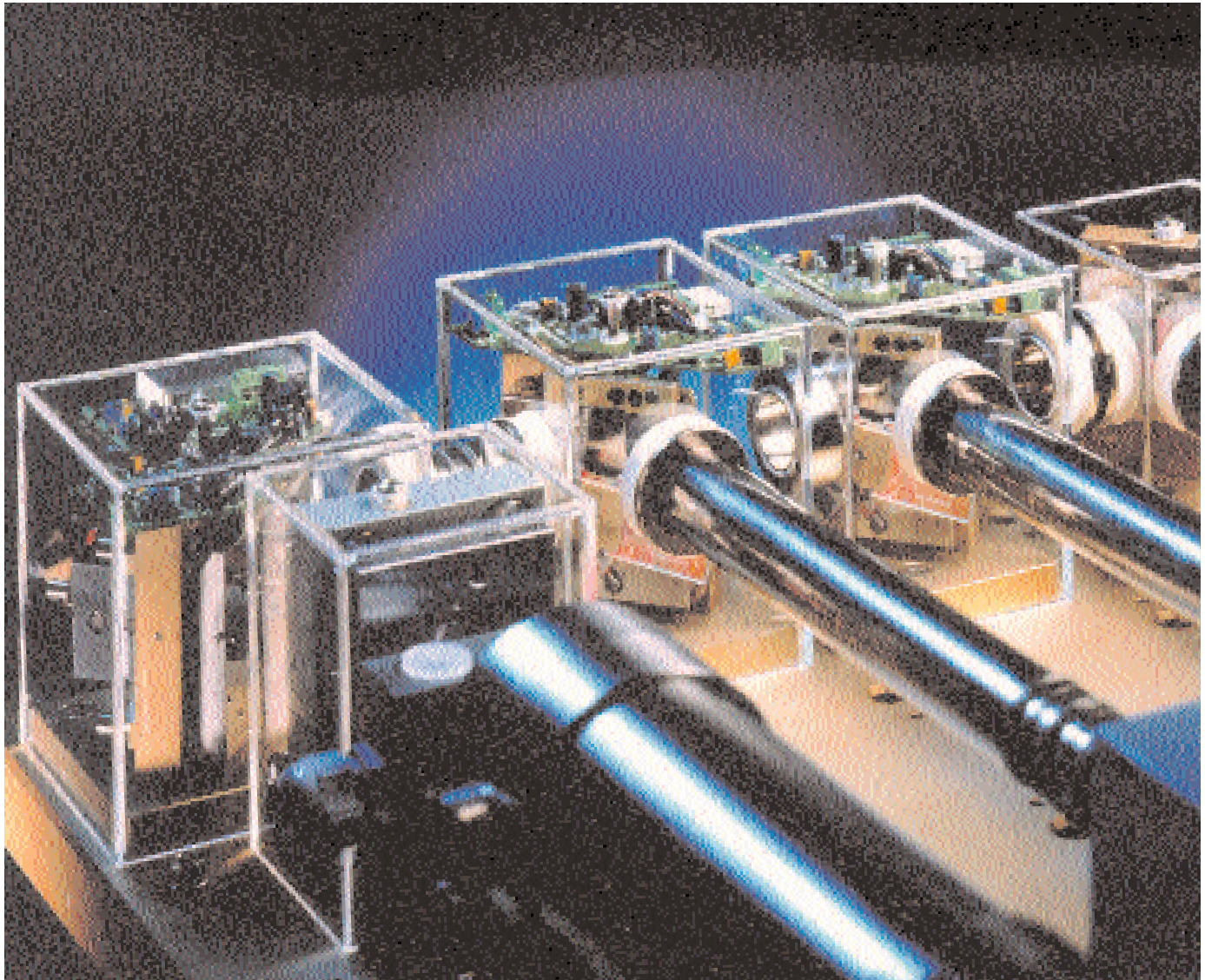


HAAS-LASER



Consistent from Pulse to Pulse

**The Pulsed HL
YAG Lasers**

TRUMPF



The Pulsed Laser Devices

Laser Power

The pulsed HL solid-state lasers are ideal for spot welding, seam welding and for cutting. Lasers are available to match each application, with maximum mean powers ranging from 50 W to 600 W. The nominal power for these lasers ranges from 40 W up to 500 W rated at the workpiece and guaranteed for the life of the excitation lamps.

Beam Quality

Depending on the laser type, beam qualities ranging from 8, 16 or 25 mm · mrad are available. Extremely small spot welds and cutting widths can be achieved while maintaining a substantial clearance between the processing optics and the workpiece. This clearance minimizes contamination of the focusing optic, extending its useful life.

The HL 42 P and the HL 62 P are perfect for precision welding and precision cutting. The HL 204 P, HL 304 P and the HL 506 P all offer high pulse power ranging up to 9 kW. All HL lasers, are easily configured for beam splitting or beam sharing, making them ideal for multiple tasking and for high productivity.

Beam quality at the workpiece is independent of pump power. The focused spot size and position remain constant throughout the whole power range, guaranteeing constant weld and seam quality. Each laser pulse is a working pulse.

Laser Unit

Pulsed solid-state lasers from HAAS-LASER feature an integrated modular system of optical components that is used to separate, deflect, switch, block or measure the laser beam. The laser unit is adjusted via the various optical components so that it suits the desired application precisely. The flexible laser light cables that guide the laser beam from the machine to the workstation are connected to the integrated optic.

Laser, optical components, power supply, cooling unit, and control are all housed in a protection type IP 54 safety cabinet. The laser unit is of modular design, and power supply, cooling unit and control all feature insertion technology, making them maintenance as well as service friendly. It goes without saying that the laser units also conform to CE regulations and fulfill the latest EMC requirements.



The pulsed solid-state laser HL 506 P.

State-Of-The-Art Control Technology

The Laser Control

For optimal adaptation to the respective application task, two different controls are available: the LCB and the LCU.

The LCB has a user friendly control panel with display where laser parameters are set and status and system messages received. For communication with external systems the LCB offers a comfortable PLC interface. Up to 25 sets of parameters can be stored for simple and fast operation.



LCB control panel.

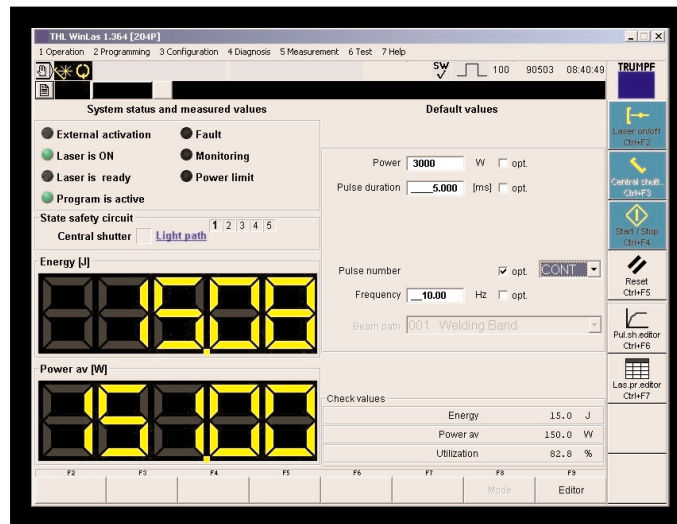
The core of the LCU control is a central computer module, which controls the laser as well as the external beam guidance and monitoring components. Graphical pulse shape generation is also a standard feature on the LCU controller. Laser power regulation within each pulse, as well as pulse energy measurement functions are available as options. A standard PC is used as the display and control unit. Operation is via a Windows interface menu, and the status of laser unit components is displayed online. For individual applications, 79 programs can be stored and externally started with the laser parameters and the beam guidance.

The LCU interfaces:

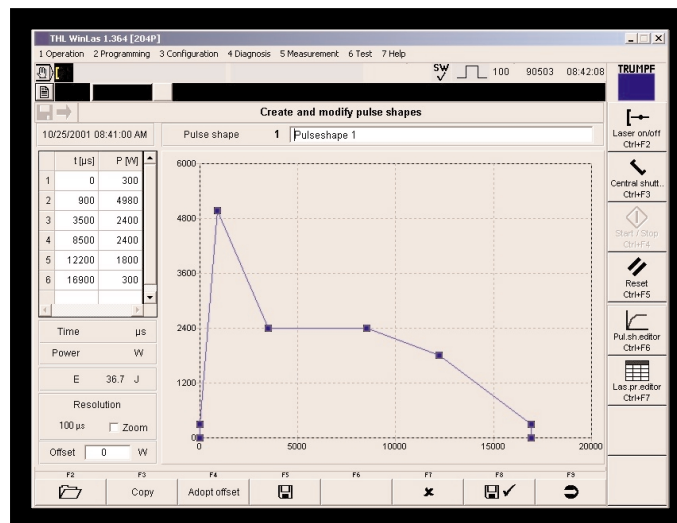
- Parallel port
- ProfiBus DP
- INTERBUS-S
- DeviceNet
- Analog interface for laser power, pulse duration and pulse frequency parameterization
- Digital interface for pulse generation
- Serial RS-232 port

Telepresence

Up to 600 system parameters are continuously monitored, and can be accessed at any time. Connecting with a modem permits the remote transmission of all operating and control data, so that engineers at any service outlet, can diagnose faults and often correct them immediately. Service visits are largely unnecessary and downtime is sharply reduced.



WinLas main menu.



Graphical generation of any desired laser pulse shapes.

Beam Delivery to The Workpiece

The laser light cable

The laser beam is brought to the workpiece via a laser light cable, of fiber core diameters 200 μm , 400 μm or 600 μm . Up to three laser light cables can be connected directly to the laser with the HL 42 P and HL 54 P. With all other pulsed lasers, up to 6 laser light cables can be used. The HL laser light cable can be plugged in by the operator without the need for alignment. Beam splitters or beam switches with switching times of 45 ms, or with a combination of the two, can direct the beam simultaneously or successively through several fiber optic cables. One laser can provide the power for more than one processing task, and the laser light

cables, which are not subject to wear, can be up to 50 meters long. Furthermore, high back reflection from materials such as aluminum or copper does not damage the fiber.

Safety

The laser light cable is monitored over its entire length. The laser unit is shut down immediately if a fault in the fiber is detected or if the laser light cable plug is found to be incorrectly connected to the coupling or the processing optics.

The laser tools

HAAS-LASER offers a wide variety of welding and cutting optics. Focused spot diameters from 100 μm are possible from processing heads with focal lengths from 48 mm to 300 mm, and distances up to 280 mm. High accessibility to the workpiece is achieved, since the focusing angle does not exceed 23° even with minimum focus. HAAS-LASER has a compact beam guidance system specially developed for applications with pulsed lasers: it contains a highly flexible laser light cable and small welding optics, and can therefore be especially well integrated into automatic assembly machinery.



Compact beam guidance system for pulsed lasers.

HAAS-LASER also offers Programmable Focusing Optics (PFO) for welding, which positions the laser beam via galvo-scanners at any preset location within the processing area. Spots and seams can thus be welded without any movement of either the workpiece or the focusing optics.

The options: The following components are available to match the laser perfectly to the application:

- Monocular eyepiece
- Binocular eyepiece
- CCD camera
- 90° beam deflection
- Motorized spot size adjustment
- 2-coordinate beam guidance
- Bifocal optics
- Cutting nozzles



Laserwelding optics with flexible laser light cable.

Versatile Welding and Cutting

Spot and seam welding

On pulsed lasers from HAAS-LASER, the spot weld diameter can be varied between 0.1 and 2.0 mm by the processing optics, while maintaining a constant working distance. Penetration depth, which depends on pulse power and pulse duration, can be as high as 2 mm.

Materials with high melting temperatures as well as with high thermal conductivity can be welded. The combination of the small melt zone, short controlled fusion time, and excellent material absorption allows welding of materials with high melting temperatures and high thermal conductivities. In some cases these factors combine to weld materials that can not otherwise be welded. Filler material can be used if necessary.

The pulse energy can be very precisely controlled. It can be measured and recorded continuously with sensors integrated into the beam guiding system, guaranteeing constant quality.

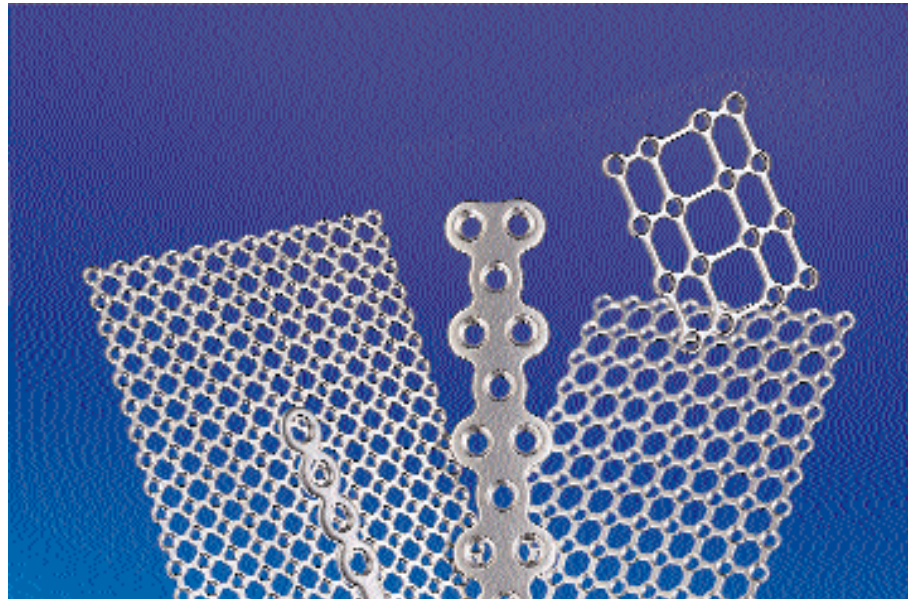


Laser welded pressure gauge.

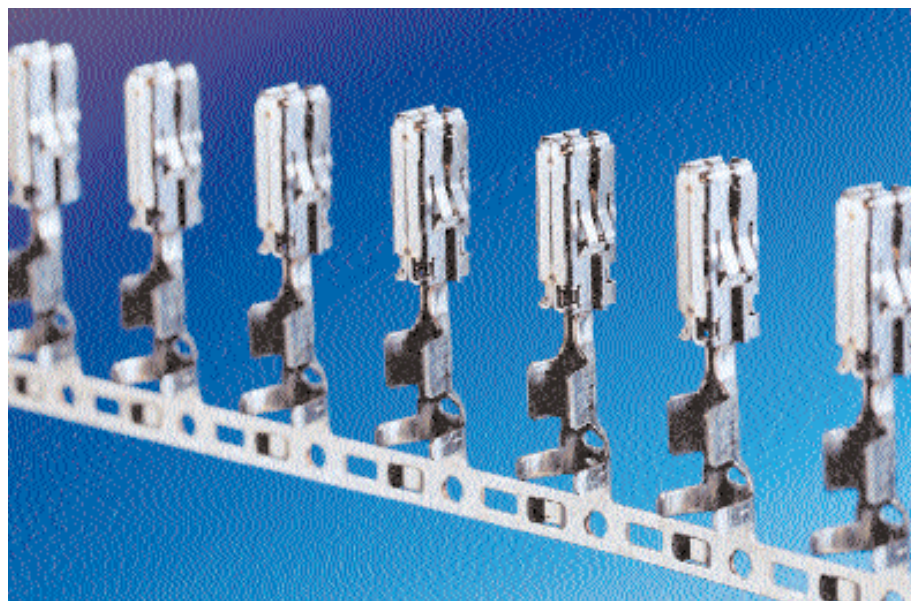
Cutting

Due to the excellent beam quality, the lasers can be used to cut materials up to 4 mm thick. With the small cutting kerf width, it is even possible to produce precision contours in the tenths-of-a-millimeter range, eliminating the need for secondary machining operations.

For precision cutting and drilling, HAAS-LASER developed the pulsed lasers HL 101 P and HL 201 P. The characteristics of these two units are listed and explained in the separate brochure „Drilling and Precision Cutting – HL 101 P, HL 201 P“.



Laser-cut titanium implants.



Laser welded connectors.

Technical Data

Laser Device		HL 42 P	HL 54 P	HL 62 P	HL 124 P
Max. output power	[W]	55	65	75	150
Average laser power ¹⁾	[W]	40	50	60	120
Max. pulse power ¹⁾	[kW]	3	5	3	5
Pulse energy ¹⁾	[J]	0.1 – 30	0.1 – 50	0.1– 30	0.1 – 50
Pulse duration	[ms]	0.2 – 20	0.3 – 20	0.2 – 20	0.3 – 20
Beam quality	[mm · mrad]	8	16	8	16
Laser light cable	[µm]	200	400	200	400
Control		LCB	LCB	LCB/LCU	LCB/LCU

¹⁾at the workpiece, controlled over the entire life of the lamps.

Connection and Consumption		HL 42 P	HL 54 P	HL 62 P	HL 124 P
Electrical connection		400 V (± 10%), 3P+N+PE, 50/60 Hz 16 A		400 V (± 10%), 3P+PE, 50/60 Hz 16 A	
Max. power consumption	[kW]	2.5	2.5	3.0	5.5
Max. cooling water consumption at 15°C (59°F)	[m³/h] [f/min.]	0.2 7.1	0.2 7.1	0.25 8.8	0.4 14.1
Cooling water temperature range	[°C] [°F]	6 – 25 42.8 – 77	6 – 25 42.8 – 77	6 – 25 42.8 – 77	6 – 25 42.8 – 77
Protection:					
Laser device		IP 54	IP 54	IP 54	IP 54
Remote control		IP 65	IP 65	IP 65	IP 65

Installation		HL 42 P	HL 54 P	HL 62 P	HL 124 P
Weight	[kg] [lb.]	220 [485]	220 [485]	380 [838]	380 [838]
Dimensions W x H x D	[mm] [in.]	600 x 1020 x 840 23.6 x 40.2 x 33.1	600 x 1020 x 840 23.6 x 40.2 x 33.1	1020 x 1460 x 650 40.2 x 57.5 x 25.6	1020 x 1460 x 650 ²⁾ 40.2 x 57.5 x 25.6 ²⁾
Ambient temperature	[°C] [°F]	10 – 40 [50 – 104]	10 – 40 [50 – 104]	10 – 40 [50 – 104]	10 – 40 [50 – 104]

²⁾with 5 and 6 laser light cables the depth is 850 mm (33.5 in.).

Subject to technical modifications.

Technical Data

Laser Device		HL 204 P	HL 304 P	HL 506 P
Max. output power	[W]	250	400	600
Average laser power ¹⁾	[W]	200	330	500
Max. pulse power ¹⁾	[kW]	8	9	9
Pulse energy ¹⁾	[J]	0.1 – 80	0.1 – 70	0.1– 70
Pulse duration	[ms]	0.3 – 20	0.3 – 20	0.3 – 20
Beam quality	[mm · mrad]	16	16	25
Laser light cable	[µm]	400	400	600
Control		LCB/LCU	LCU	LCU

¹⁾at the workpiece, controlled over the entire life of the lamps.

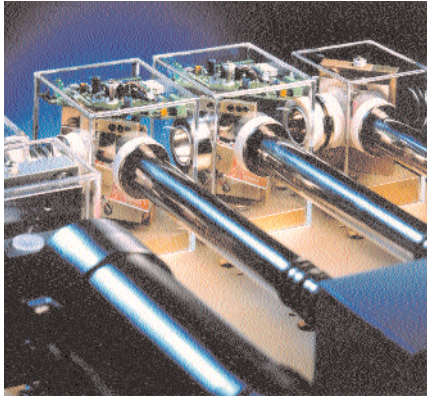
Connection and Consumption		HL 204 P	HL 304 P	HL 506 P
Electrical connection		400 V (± 10%), 3P+PE, 50/60 Hz		
		32 A	63 A	63 A
Max. power consumption	[kW]	9	18	18
Max. cooling water consumption at 15°C (59°F)	[m³/h] [f/min.]	0.5 17.7	1.0 35.3	1.0 35.3
Cooling water temperature range	[°C] [°F]	6 – 25 42.8 – 77	6 – 25 42.8 – 77	6 – 25 42.8 – 77
Protection:				
Laser device		IP 54	IP 54	IP 54
Remote control		IP 65	IP 65	IP 65

Installation		HL 204 P	HL 304 P	HL 506 P
Weight	[kg] [lb.]	480 [1058]	800 [1764]	800 [1764]
Dimensions W x H x D	[mm] [in.]	1200 x 1460 x 650 ²⁾ 49.6 x 57.5 x 25.6 ²⁾	1608 x 1550 x 750 ²⁾ 63.3 x 61 x 29.5 ²⁾	1608 x 1550 x 750 ²⁾ 63.3 x 61 x 29.5 ²⁾
Ambient temperature	[°C] [°F]	10 – 40 [50 – 104]	10 – 40 [50 – 104]	10 – 40 [50 – 104]

²⁾with 5 and 6 laser light cables the depth is 850 mm (33.5 in.).

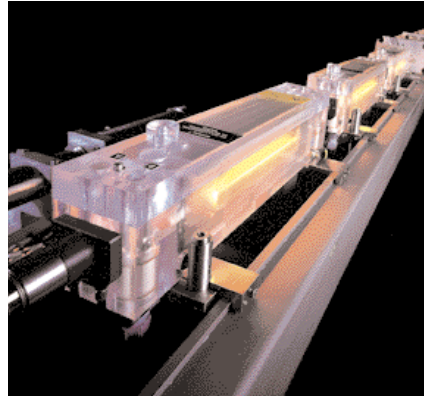
Subject to technical modifications.

Product Range



Pulsed Lasers

Pulsed HL solid-state lasers from 40 W to 600 W are ideal for spot welding, seam welding, drilling and precision cutting. Regardless of the application HAAS-LASER offers a laser for the job with laser power on the workpiece ranging between 20 W and 500 W.



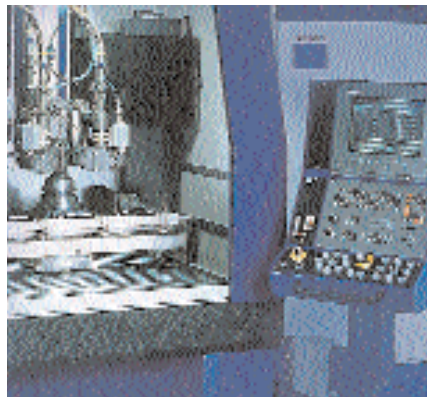
CW Lasers

Lamp and diode-pumped HL cw lasers from 400 W to 6,000 W are continuous-wave solid-state lasers for seam welding and cutting. A wide range of lasers are available that deliver guaranteed powers to the workpiece between 350 W to 4,500 W.



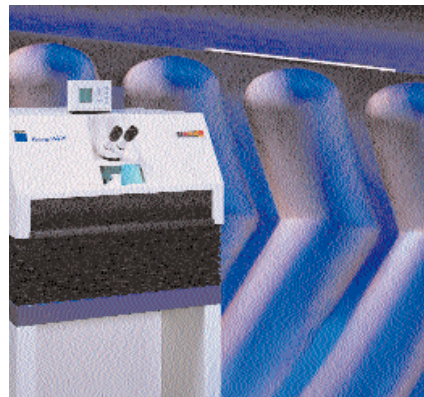
Marking Lasers

Marking lasers from HAAS-LASER are ideal tools for industrial, commercial marking as well as surface modification of virtually all materials and surfaces. The open architecture interface allows online-programming of variable marking-data.



Laser Work Cells

For 2D and 3D laser processing laser cells with up to 5 axis are available. All HL lasers from 40 W to 4,500 W can be integrated to meet any demand.



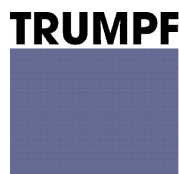
PowerWeld

The laser workstation PowerWeld is particularly well suited for manual and partly automatic welding operations. With aid of the air-cushioned worktable, large and small workpieces can be welded effortlessly with the greatest precision.



PFO – Programmable Focusing Optic

Using the Programmable Focusing Optics (PFO) it is possible to weld spots and seams within the working area without workpiece or focusing optics having to be moved at all.



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