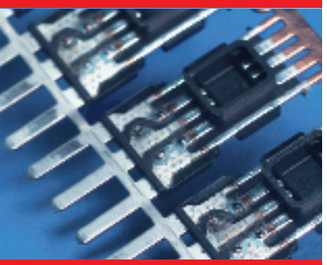
rofin

LASER FINE WELDING

FROM FIBER LASERS TO PULSED YAG LASERS

FOCUS ON FINE SOLUTIONS



Welding lasers from ROFIN

ROFIN's laser sources for welding satisfy all criteria for the optimized laser joining of workpieces. They allow very small seam geometries at very high welding speeds. The welded joints show maximum strength with minimal heat input to the workpieces.

Our lasers realize high pulse peak powers of max. 20 kW, a requirement for processing highly reflective materials like copper or aluminum, or for materials with high thermal conductivity. At the same time, they can deliver weld spot diameters smaller than 50 µm and precisely controlled laser pulses of only a few mJ pulse energy for micro welds of sensitive wires or thin foils.

Sound advice – perfect solution

Our portfolio is not limited to specific technologies. We always recommend the best laser for your special application, be it fiber, CO_2, diode, rod or disc laser. If required, our offer of cw-lasers from our macro division supplements our broad range of lasers for fine welding.

ROFIN combines the benefits of a worldwide leading laser manufacturer with application specific professional competence. We have always developed not only laser sources but also complete turn-key laser systems for most diverse applications. That means more than 35 years of experience – not only in building lasers - but also in application development, in laser systems manufacture and in the entire range of material processing technologies.

You specify your characteristic application data, the material to be processed, the desired welding geometry and constraints of your process environment. We will present you all possible laser concepts for consideration, with benefits and implications and together we will find the perfect solution for your individual laser application.

From rod laser to 600 W fiber laser

Fiber lasers or pulsed YAG rod lasers are used for a great number of welding and cutting applications. With our wide variety of fine welding lasers, employing these two technologies, we can fulfil the requirements of almost any application area. In short the technical data: pulse peak power 10 W - 20 kW, average power 40 - 600 W, pulse width 0.1 - 50 ms or cw, pulse energy 10 mJ – 120 J. All lasers feature the same user interface and system interfaces, and can be operated with fast galvo deflection head technology. All ROFIN laser sources are modular and compact, some of them with removable operator control panel, and can be integrated into automation solutions without any difficulty. A comprehensive transport fiber kit allows the laser source to be sited remotely from the work cells.

StarFiber – the fiber laser

ROFIN provides robust and compact fiber lasers with a power range of 100 – 600 W, especially for finest welding seams. Our fiber lasers feature among others:

- closed loop power control
- power control dependent on travel speed
- safety features (industrial standard)
- convenient operator control
- innovative ROFIN control unit (RCU)

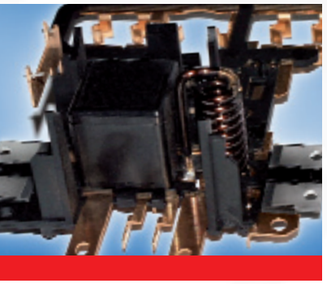
StarPulse – the pulsed YAG rod laser

Our new generation of pulsed rod lasers with 40 to 500 W power feature a wide variety of innovations and unique technological characteristics:

- Double Closed Loop™ power control
- patented Sweet Spot Resonator®
- flexible pulse shaping
- real-time pulse display
- convenient operator control
- innovative ROFIN control unit (RCU)

Pulse Peak Power

Perfect welding quality – even for highly reflective materials

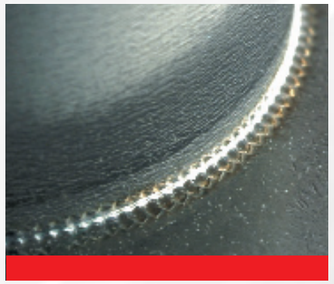


The largest range of pulse peak powers on the market: 10 W – 20 kW allow micro welding of metallic foils as well as welding of highly reflective copper or aluminum of max. 2 mm welding depth.

- accurately controlled minimal pulse peak powers down to 10 W allow precise welding of finest components, foils and thin wires with reproducible quality
- up to 20 kW pulse peak power with 500 W average power makes high-quality welding of highly reflective materials like copper or aluminum possible, with large welding depth and high processing speed
- very low heat input on the workpiece at high powers with pulsed StarPulse lasers from ROFIN

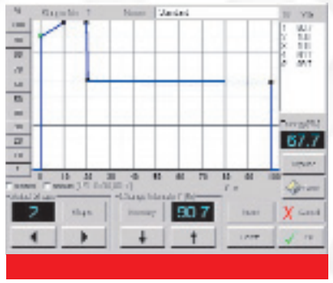
Double Closed Loop™

Dependable application quality



The Double Closed Loop™ control system guarantees best pulse-to-pulse stability and an excellent intra-pulse control which is independent of back reflections during the welding process.

- optimal welding quality due to best pulse-to-pulse stability < 1 %, even for lowest pulse energies
- best pulse-to-pulse stability under back reflection conditions due to an additional electrical loop
- consistent weld quality including overlap welding using power ramping
- best pulse rise time with intelligent power supply technology



- precise pulse shaping and energy of any user-defined shape can be stored
- real-time pulse control with self-monitoring for highest repeatability and reliability
- reliable pulse shaping and energy are independent of lamp age

Teach Mode™

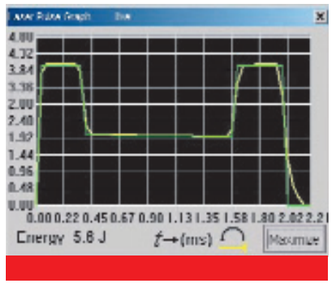
Perfect pulses for complex welding processes

This method (patent pending) is based on a self-teaching system and ensures optimal pulse shaping – especially for complex welding processes.

- self-teaching system optimizes pulse shape in seconds
- even with extremely short pulses (< 0.5 ms) teach mode guarantees optimal pulse shaping
- no degradation of pulse shaping caused by back reflections from the workpiece
- perfect quality even in difficult processes
- reliable and optimal process stability

Real Time Application Monitor™

Online process viewing and analysis



The display of the measured pulse in real-time allows the operator to view and precisely adjust the pulse shape during production.

- variance comparison for each welding pulse during operation
- on demand graphical feedback of laser pulse
- simple optimization of process and application parameters

Fiber and Optics Kit

The best beam delivery for your application

ROFIN offers a number of flexible and compact modules for distributing, guiding and focusing the laser beam, as well as for process viewing via camera.

- precise energy distribution with up to 6 outputs (energy sharing)
- fast beam switch for beam distribution (time sharing)
- large variety of laser transport fibers with different diameters and lengths in plug & play technology
- best beam quality and small fiber diameters provide high flexibility in beam focusing, i. e. very small spot sizes and large operational distances - all this with high power
- robust and low-maintenance optical components for beam focusing
- patented coupling/decoupling solutions for high pulse energies
- integrated fiber monitoring
- various adjustment possibilities to process requirements like spot size and interfering contours
- no interfering contours through process monitoring as the camera is integrated into the optics system
- Vario processing head for progammable spot size

Direct Beam
Sweet Spot™

Finest weld spots over a large area

The patented Sweet Spot Resonator® provides finest weld spot diameters with large processing fields via galvo head.

Sweet Spot™

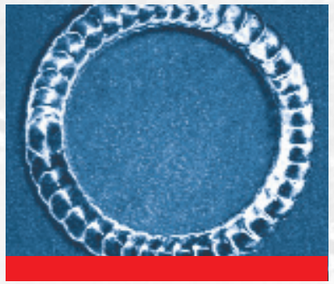
- excellent beam quality, independent of parameters
- no first-pulse effect, consistent beam quality starting from the first pulse
- large processing fields with very small weld spot diameters

Deflection Head Technology

Spot and seam welding with high throughput rates

The fast and compact solution with low-inertia, precise beam positioning. Mechanical positioning systems for workpiece positioning are not necessary.

- high throughput due to extremely fast laser beam positioning
- large processing fields with very small laser spot size
- small space required, and easy integration solution
- camera viewing via galvo head with internal coaxial illumination
- integrated optical process monitoring as an option for process control



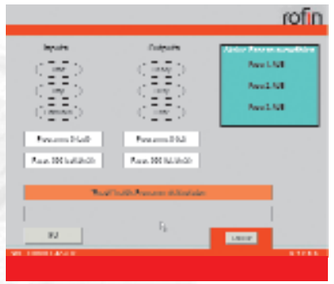
- equidistant pulsing guarantees equal pulse-to-pulse spacing, also for seam and contour welding
- high-precision positioning of each laser pulse via position feedback

Touch Screen and Graphical User Interface

Convenient operator control

Simple and efficient operation of all system functions via colour TFT touch screen with graphical menu navigation and integrated help functions.

- simple operation via colour TFT touch screen
- graphical menu navigation
- integrated online help functions
- real-time display of actual pulse shape
- simple process and parameter setting
- removable user panel, which can also be integrated into handling systems
- multi-level access authorization

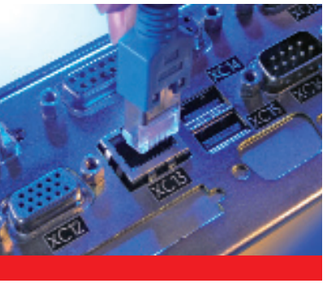


example of customized user menu window

- any customized user menu can be programmed with integrated software PLC - also by the operator

Diagnosis Tele-Service

Perfect network

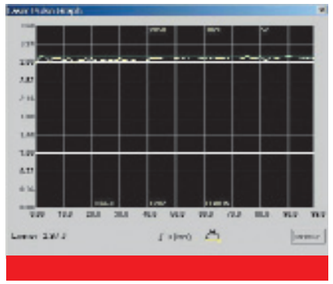


All systems feature a number of interfaces and can easily be integrated into customer networks. Tele-service with extensive remote diagnostics is a routine process.

- safe access via any web browser by entering the controller IP address
- tele-service - remote maintenance via Ethernet, modem and internet
- extensive diagnostic systems remotely accessible via tele-service
- complete access to all system components with high system transparency due to effective monitoring
- wireless operation via W-LAN
- network integration:
  - Ethernet
  - W-LAN access
- system status SMS message to cell phone (optional)

Laser Data Logging and Data Export

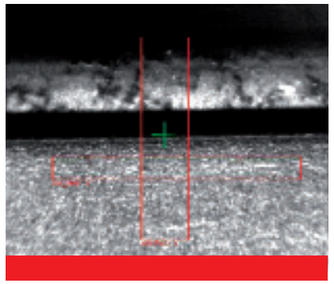
Reliable process stability



The statistical edit and export features for laser data enable complete traceability, process control and documentation.

- online measurement of pulse-to-pulse stability
- display of the energy values within a pulse train with maximum and minimum levels

Pattern Recognition



From special ancillary components to customized system solutions – ROFIN offers a great number of options.

- pattern recognition TTL via galvo deflection head for correcting tolerances of workpiece, fixture and deflection head

Interfaces and integrated software PLC

The software PLC permits easy integration into handling systems.
Simple systems can be completely operated via the laser controller.

- control of handling modules via integrated software PLC
- simple visualization of handling process can be programmed
- other interfaces:
  - USB
  - parallel and serial
  - analog (0 - 10 V)
  - I/O 24 V can be expanded via CAN bus
  - I/O converter to Ethernet/IP; Profibus

And much more...

- pilot laser for easy process alignment
- cutting options for flexibility
- laser class I 'stand-alone' systems
- customized specialist material processing systems
- process and application development

Laser Sources

StarFiber 100/200/300

StarFiber 400/500/600

Laser Source		StarFiber 100	StarFiber 200	StarFiber 300	StarFiber 400	StarFiber 500	StarFiber 600
Type		fiber laser	fiber laser	fiber laser	fiber laser	fiber laser	fiber laser
Nominal output power	W	100	200	300	400	500	600
Pulse width	µs	1 - cw	1 - cw	1 - cw	1 - cw	1 - cw	1 - cw
Pulse frequency	kHz	cw - 50	cw - 50	cw - 50	cw - 50	cw - 50	cw - 5
Beam quality	M^2	≤ 1.1	≤ 1.1	≤ 1.1	≤ 1.1	≤ 1.1	≤ 1.1
Wavelength	nm	1070	1070	1070	1070	1070	1070
Utilities							
Electrical		230 V	230 V	230 V	400 V	400 V	400 V
(others available)		1P+N+PE	1P+N+PE	1P+N+PE	3P+N+PE	3P+N+PE	3P+N+PE
		50/60 Hz, 16 A	50/60 Hz, 16 A	50/60 Hz, 16 A	50/60 Hz, 16 A	50/60 Hz, 16 A	50/60 Hz, 16 A
Power consumption at nominal power	kW	1.5	1.5	1.5	2.7	3.1	3.5
Air cooling		x	x	x	x	x	x
Measures							
Weight appr.	kg	130	130	130	250	250	250
(standard configuration as far as fiber adapter)							
Dimensions w x h x d	mm	565x730x1065	565x730x1065	565x730x1065	572x1110x1149	572x1110x1149	572x1110x1149
Ambient temperature	°C	15 - 35	15 - 35	15 - 35	15 - 35	15 - 35	15 - 35
Options							
Scanner system		x	x	x	x	x	x
Pilot laser		x	x	x	x	x	x
Camera viewing		x	x	x	x	x	x
Remote maintenance		x	x	x	x	x	x

StarPulse 40/90/150

StarPulse 500

Laser Source		StarPulse 40	StarPulse 90	StarPulse 150	StarPulse 500
Type		pulsed Nd:YAG	pulsed Nd:YAG	pulsed Nd:YAG	pulsed Nd:YAG
Nominal output power	W	40	90	150	500
Pulse peak power	kW	3.5	6	8	20
Pulse energy max.	J	40	50	70	120
Pulse width	ms	0.3 - 20	0.3 - 20	0.3 - 20	0.3 - 50
Pulse frequency - single pulse up to	Hz	200	200	200	500
Optical fiber*	µm	200 - 600	400 - 600	400 - 600	400 - 600
Wavelength	nm	1064	1064	1064	1064
Utilities					
Electrical		230 V	400 V	400 V	400 V
(others available)		1P+N+PE	3P+N+PE	3P+N+PE	3P+N+PE
		50/60 Hz, 16 A	50/60 Hz, 16 A	50/60 Hz, 16 A	50/60Hz, 63 A
Power consumption at nominal power	kW	3	5	6	26
Air cooling		x	-	-	-
Max. cooling water required at 15° supply temp.	l/min	-	3	7	20
Cooling water: temperature range	°C	-	12 - 18	12 - 18	12 - 18
Measures					
Weight	kg	150	170	170	300
Dimensions w x h x d	mm	520x1235x1100	520x1235x1100	520x1235x1100	1350x1300x700
Ambient temperature	°C	15 - 35	15 - 40	15 - 40	15 - 40
Options					
Scanner system		x	x	x	x
Pilot laser		x	x	x	x
Welding process control		x	x	x	x
Camera viewing		x	x	x	x
Remote maintenance		x	x	x	x
Direct beam		x	x	x	-

* other fiber diameters on request

Laser fine welding

Application-specific laser systems

The family of manual welding lasers

Laser fine cutting

LASER MICRO

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WE THINK LASER