rofin

THE FAMILY OF MANUAL WELDING LASERS

FROM DESKTOP TO OPEN SYSTEM

FOCUS ON FINE SOLUTIONS

Manual Welding with Lasers

The laser is an excellent tool for seam, butt and overlap welding of almost all common metals and their alloys. The wide range of tried and tested applications includes stainless steel, gold, silver, platinum and titanium, as well as shape memory alloys. Amongst these are some materials which are difficult, if not impossible, to join with conventional techniques. Manual laser welding systems from ROFIN – the pioneer and market leader in this field – give extraordinary quality of laser welded joints from a machine that is quick and easy to use. Within a few minutes spot and seam welds can be realized with an accuracy in the micron range – even in complicated areas.

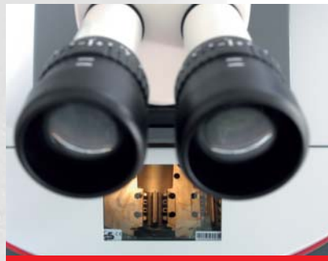
The rule of thumb is: if you can see the joint, it can be laser welded. With a laser, experienced users can join filigree work-pieces with a fineness and precision which no other method can even remotely achieve.

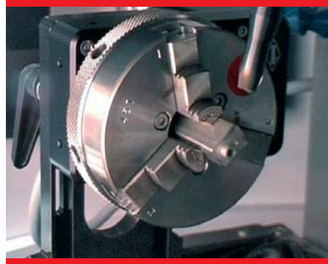
Gentle processing – perfect results
By matching the parameters and shape of the laser pulses to each material, the laser generates a minimal heat affected zone, thus meeting the pre-condition for welding temperature-sensitive components.

Another positive effect of the low thermal load of the two parts is, that unwanted modifications of the joint by the welding process can almost always be avoided. Laser welded joints are of high strength and resist even high mechanical strain without any wear. Other than adhesive seals, they are temperature-resistant and show pore-free surfaces. Compared to other joining techniques, post processing of laser weld is reduced to only a few simple steps – or can be ignored completely.

Benefits:

- **Who invented it?**
  Manual welding laser systems from ROFIN / Baasel Lasertech – inventor and market leader in this field
- **Simple workpiece handling**
  Easy handling and fast operational readiness with extremely short training periods
- **Multifunctional**
  Spot, seam, overlap and deposit welding
- **High flexibility**
  Perfect welds – even in complicated areas
- **Many different materials**
  E. g. stainless steel, gold, silver, platinum, titanium, shape memory alloys
- **Precision**
  Spot-accurate positioning and visual control via stereo microscope
- **Minimal heat input**
  No distortion, no damage to temperature-sensitive components
- **Micro welding**
  Weld seams smaller than 50 microns with high pulse-to-pulse stability
- **Filigree and robust**
  Welds of 50 micron to 2 mm seam depth
- **High-strength joints**
  Robust joints for high-strain work-pieces
- **Flawless surfaces**
  Pore-free, oxidation-free, no burn-off
- **Time and cost-efficient**
  No set-up times, short welding periods, minimal or no post-processing
- **Broad range of applications**
  Made-to-order production, small to large-batch production, repairs
- **Process development**
  Simple entry into innovative laser process technology
- **Easy automation**
  Combination of manual welding laser and CNC-controlled axes





Desktop

Desktop

Desktop – The Smallest One

The Desktop is the smallest and most cost-efficient model of the successful family of manual welding lasers. It is a compact, all-purpose and value-for-money manual welding laser, which was designed for the specific demands of laboratories, workshops and institutes.

With its optimized ergonomic design, it can be placed on any desk. The air-cooled system requires only a 230V power supply. Additional safety measures are not necessary. Reproducible welding results can be achieved thanks to sophisticated laser technology and easy positioning of the work-piece via stereo microscope and cross-hair.

The performance and long lifetime of the Desktop opens up applications in the customized and prototype production, for repair works and just as well for small batch production.

Performance – The Original

The original – the Performance began the era of innovative manual welding laser systems: launched in 1992 by ROFIN / Baasel Lasertech, today in the 6th generation it is in operation all over the world with many thousands of systems installed. The laser design has consequently been optimised for ease of use and handling. The Performance allows you to realize your first manual laser welds in a very short time.

An ergonomic relaxed seating and arm position, ample work space and easily legible displays provide for relaxed working – even after hours of use. Wheels make the laser mobile, it is air-cooled and only requires a 230V power supply.

A wide range of options can be supplied for the Performance. We deliver a laser optimized for your application.

Performance

Performance

Select

Select

Select – Three in One

The Select defines a new class of manual welding lasers. A fully integrated system: ergonomically optimized manual welding laser, joystick controlled deposit welding or precise CNC system – an integrated innovative user concept.

Four precision axes, short set-up times, easy CNC programming. As much automation as you want, with minimal programming required. A multi-functional joystick and large color touch-screen are enough for simple and intuitive parameter setting.

The motorized axes of the Select are robust and precise, allowing rapid but accurate positioning of parts, from the most delicate to a maximum load of 50kg. The Joystick mode gives many of the benefits of the motorization, without the need for CNC programming.

The CNC control operates with the common G-code commands and is based on the conventional IEC 61131-3 defaults. Various interfaces allow easy upload and storage of external CNC programs.

Integral – Even Greater

The big brother of the Select - featuring the same integrated user concept, CNC control and technical innovations. But bigger – much bigger:

The XY table moves work-pieces with a maximum weight of 500 kg fast and very precisely in all three dimensions. The working chamber provides space for objects with an edge length of up to 500 mm. As an option, the Integral can be made an open system laser class IV workstation and therewith can hold very large workpieces.

200W of laser power is available. The patented optical system which can be swivelled around 2 axes, allowing processing of perpendicular surfaces, undercuts or deep grooves without turning or tilting the work-piece while keeping the microscope in place.

Integral

Integral

Tool Open

Tool Open

Tool Open – Maximum Flexibility

The Tool Open is an attractive solution for high-value repair of large-size molds and tools on-site – even when built-in. Positioning of the laser to the work-piece can be done quickly and precisely with the weight-compensated articulated arm.

With a range of 1.70 m, even extremely large molds and tools can be reached. The alignment of the motor-driven axes of the processing head, parallel to the welding seam, provides for intuitive use of the travel. During the welding process, the system is joystick controlled, usually a one-axis control is sufficient to achieve a clean and straight seam.

150W of laser power, integral water-air-cooling, positioning system and XYZ axes – everything integrated in a compact, mobile unit. The control box for system control can be dismounted and moved so that all essential parameters can be set or changed near to the work-piece.

Training

Training offered by the Training Center at ROFIN / Baasel Lasertech covers all areas of laser technology in general, and also of manual welding with the laser in particular. In addition, market-specific and customized seminars round off the training range. The courses and workshops are held in training rooms equipped with latest computer technology and several laser systems.

Application Lab

ROFIN / Baasel Lasertech unites the benefits of a worldwide leading laser manufacturer with application competence. In the large application lab, our experts process your applications. Innovative application results are based on the close co-operation with our customers.

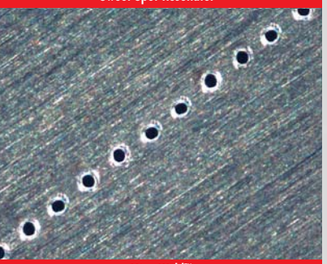
Serial Production

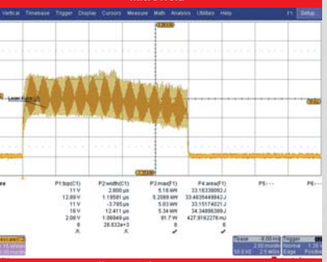
ROFIN / Baasel Lasertech produces manual welding lasers in large numbers – giving many benefits in terms of quality and cost efficiency. The large number of installed systems operating under hard industrial conditions, allows ROFIN to fall back on an enormous wealth of experience. This guarantees high-performance and reliable solutions for practical use, enhancing your productivity and reducing your costs.

Service and Maintenance

ROFIN / Baasel Lasertech has also optimized the design of its manual welding lasers for easy servicing. Maintenance work is reduced to a minimum and can be done without any specific know-how. Just in case: ROFIN's worldwide service network is ready for support on-site.


Sweet Spot Resonator®


MicroWeld™


Intelligent Pulse Management™


TrueView™


EasyTouch™

Why ROFIN

Manual welding lasers from ROFIN are the first choice – not only because of the many years of experience, but in particular because of the steady flow of innovations ROFIN's innovations define the standard in the market of manual welding lasers.

Sweet Spot Resonator®
ROFIN's patented resonator for consistently good quality welds, even for highly reflective materials, and for constant pulses with large depth of focus. It is insensitive to variations in material, to z-shifts or even to misaligned focus position. There is no overshooting of the first pulse as with standard resonators.

MicroWeld™
An option for generating weld spot diameters smaller than 0.1mm for the finest applications (sweet spot resonator® is required).

Intelligent Pulse Management™
ROFIN's Intelligent Pulse Management guarantees high pulse-to-pulse stability of the laser source even for the finest micro welds.

TrueView™
Enables a 100% hit rate even when working out of focus – the laser beam is always aligned to the cross hair.

EasyTouch™
Easy intuitive parameter setting via a colour touch screen with menu interface – even for beginners.

Ergonomic design
A demanding task like precision laser welding requires a high level of concentration. We have tailored our manual welding lasers to maximize ergonomics and enhance user comfort, with a relaxed seating position, an arm position at the correct height, a spacious work area and clearly legible displays.

Swivelling optics
The patented swivelling optics allows the laser beam to be swivelled in two levels in any angle. Perpendicular surfaces, undercuts, deep grooves or other complicated areas can thus be accessed without any problems without tilting or swivelling the work-piece. The microscope is not moved and remains in a good ergonomic position.

CNC axes
The CNC control operates with the common G-commands and is based on the conventional IEC 61131-3 defaults. Various interfaces allow easy upload and storage of external CNC programs.

SynchroWeld™
SynchroWeld gives consistent spatial pulse overlap for excellent, uniform seam welds independent of path contour and welding speed.

TrackMode™
The TrackMode allows path teaching by moving the positioning axes with intuitive joystick control. Repetitive welding processes can be semi-automated.

AreaFill™
Apply several parallel offset welding seams when 3D surface deposit welding.


Ergonomic design


CNC axes


SynchroWeld™


TrackMode™


AreaFill™

Suitable lasers:
Desktop ■
Performance ■
Select ■
Integral ■
Tool Open ■

Precision Engineering, Thin Foils, Casing Construction

In these applications, precise and high-quality welds of metal parts are required. Demanding tasks such as pressure-tight welds, joints of aluminum parts or invisible weld seams on casings.

Manual and CNC
Manual welding lasers are particularly suited to single part production or individual prototypes, small-batch production or modifications or repairs of parts. They are ready to use and are suitable for both fast joining of parts and high-quality, optically perfect seam welds. Motor-driven axes and CNC control put serial production within the realms of possibility. Simple and fast programming via joystick teach-in allows for automated manufacturing without CNC programming know-how.

Compared to conventional joining techniques, the considerably lower amount of pre- and post-processing of parts helps to save time and money. ROFIN's patented Sweet spot resonator® is the guarantor of best and consistent weld quality during the entire welding process – also when processing fine metal sheets and foils.

Advantages:
- excellent weld quality
- minimal thermal strain of sensitive components
- flawless pore-free surfaces
- can be automated easily
- optimized for highly reflective materials, e. g. aluminum
- micro welding materials thinner than 0.1 mm
- suitable for serial production by CNC
- pressure-tight welds

Sensors, Electronics

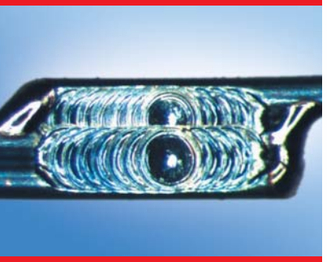
Electrical contacting, as often used for miniaturized components, requires high precision and reliability of the processing method. The same is true for high-quality sensor technology, as used for example in the automotive industry.

Even finest wires
High laser pulse energy and short pulse times generate the high peak powers which allow welding of copper without recourse to solder. Due to low heat input, even fine welds on temperature-sensitive parts such as bimetal springs or spring steel are achievable. The flexible pulse shaping permits optimal matching of the laser to the material and work-piece geometry. The high pulse-to-pulse stability of ROFIN's lasers guarentee excellent reproducibility for multiple contacts, which can easily be automated with the flexible CNC control.

ROFIN's manual welding lasers have a big edge: the microscopical accuracy. The commonly used focal spot of 0.3 mm is insufficient for specific applications such as welding of extremely thin wires. Together with the Sweet spot resonator®, ROFIN's micro weld module permits welds with a spot diameter smaller than 0.1 mm.

Advantages:
- micro welding of very small parts
- can be automated easily
- optimized for highly reflective materials such as copper
- micro welds smaller than 0.1 mm
- suitable for serial production due to CNC
- high flexibility due to manual processing
- high repeatability

Suitable lasers:
Desktop ■
Performance ■
Select ■
Integral ■
Tool Open ■



Suitable lasers:

- Desktop ■
- Performance ■
- Select ■
- Integral ■
- Tool Open ■

Medical Device Technology

Lasers produce high-strength and pressure-tight welds with pore-free surfaces – these are advantages which make laser welding the ideal joining technique for the medical device industry.

Microscopically precise

For implants or surgical instruments, structures in the micron range are an every day fact of life in the medical device industry. The precision of the processing method has to keep pace with this development. Excellent beam quality, reliable pulse-to-pulse stability and flexible pulse shaping are the prerequisites for weld seams and spots in the micron range. This accuracy is the key to gentle processing of very small and sensitive pieces, such as the microscopic welding of 20 micron thin Nitinol wires, but also to high-strength joints in robust medical instruments. ROFIN / Baasel Lasertech also provides manual welding lasers with CNC axes for serial production.

Practically any kind of material processing leaves unwanted traces which are almost unacceptable in medical device technology. Perfect, hygienically immaculate surfaces, free of burrs and grooves or material residue are a must. Laborious post-processing of surfaces are time and cost-consuming. Laser welds are high-strength and suited for high-temperature sterilization and show pore-free surfaces which can be sterilized without any post-processing. These requirements are absolutely essential for biocompatible parts.

Advantages:

- excellent beam quality
- very good pulse-to-pulse stability
- extraordinary weld quality
- micro welding of very small parts
- minimal thermal load of sensitive components
- bio-compatible, suited for high-temperature sterilization
- perfect, pore-free surfaces
- simple automation of the welding process with manual handling
- process stability
- process documentation
- traceability due to integrable barcode reader

Dental Technology

Since the introduction of the manual welding laser for dental applications by ROFIN / Baasel Lasertech in 1992, laser welding has replaced conventional soldering for construction of crowns, bridges and metal structures.

Time and cost advantages, very high bio-compatibility

Compared to conventional soldering, laser technology does not merely save up to 80% in time for new products and repairs but it also allows the use of new materials which cannot be processed with conventional methods. A good example is the increased use of titanium which can only be welded with the laser. The extremely precise and gentle welding technique allows repair welds very near to heat-sensitive ceramic crowns. Time-consuming pre- and post-processing is no longer required.

Thanks to their high susceptibility to corrosion, bio-compatibility of soldered parts is rather poor. This is one of the reasons why traditional soldering is viewed critically by metallurgists and toxicologists. This is emphasised by the rising number patients suffering allergic reactions. Laser welding which does not require any risky filler materials or material combinations is the ideal solution to these problems.

Advantages:

- time-saving operation
- economic technique: no use of filler materials
- innovative: new materials and constructions can be realised
- bio-compatible: no 'material mix"
- no filler materials or flux material required

Suitable lasers:

- Desktop ■
- Performance ■
- Select ■
- Integral ■
- Tool Open ■

Suitable lasers:

- Desktop
- Performance
- Select
- Integral
- Tool Open

Jewelry

ROFIN is the pioneer in laser processing in the jewelry industry. In 1993, the first all-in-one manual laser was launched by ROFIN / Baasel Lasertech – today, several thousand laser systems are installed worldwide.

Gold, silver, platinum or titanium
Lasers can weld all precious metals and their alloys without any filler or soldering material. Robust, invisible repairs of high quality can be achieved within a short time: cleaning porous surfaces of platinum and gold cast parts, repair of claws, or processing of ring sizes. The laser optimizes the production process and opens up possibilities for completely new designs. The comparatively narrow processing window for highly reflective materials such as silver and gold, requires a perfect and consistent beam quality in order to keep the weld quality constant. ROFIN's patented Sweet spot resonator® guarantees a consistent weld quality throughout the entire welding process independent of the laser power and its improved beam quality compared to conventional lasers. A laser equipped with the Sweet spot resonator® even gives some margin for inaccurate when focussing of the workpiece.

Traditional manual welding lasers usually have a minimal focal spot of approx.0.3 mm which is too big for specific applications such as welding of extremely thin wires, filling of micro pores, or processing very near heat-sensitive precious stones. A much smaller diameter is required as well as absolute precision. ROFIN's MicroWeld module allows welds with a spot diameter smaller than 0.1 mm. The MicroWeld option allows welding of 20 micron thin wires or even 10 micron thin films with excellent and reproducible quality.

Advantages:

- optimized for highly reflective materials
- micro welding of seam widths smaller than 0.1 mm
- no thermal load of sensitive precious stones
- fast and easy handling
- welding with and without filler material

Tool and Mold

Experience has shown that a system for laser deposit welding pays off in a very short time – even for only occasional use. This is in particular true for specialized jobshoppers and manufacturing companies: complex time and cost-consuming transports of damaged forms and repair costs caused by external companies can be saved.

As good as new repairs on-site
Repairs or processing of forms can be done with the Tool Open on-site. Only minimal pre- and past-processing is necessary, and a material quality which almost comes near the original one, can be achieved. The laser beam produces a highly focussed weld-pool and deposits are made by manually guiding a filler wire to that point. Surface deposits with a wire diameter of 0.1 mm to 0.8 mm can be realized. The heat input which is limited to the melting zone, fast heating up and cooling down times, exact control of the laser power via pulse shaping – all these factors provide for minimal thermal loading of the workpiece. Materials which tend to break easily do not require any pre-heating of the form.

Even small and complex geometries or complicated areas can be handled. The tilt-adjustable optical system allows to processing even of perpendicular surfaces without tilting or swivelling the form. The precision of laser welding saves complex post-processing. In most cases only post-processing of the seam weld, e.g. with the drawing die is necessary.

Advantages:

- fast, on-site repairs, no pre-processing and minimal post-processing
- surface deposits with wire diameters of 0.1 mm to 0.8 mm
- processing narrow and complicated areas
- hardness up to 64 HRC
- gentle processing, almost no distortion, micro crack formation or loss of strength
- flexible: processing even high-alloy tool steel such as aluminium, copper and nickel
- precise: welding very near high-value surfaces

Suitable lasers:

- Desktop
- Performance
- Select
- Integral
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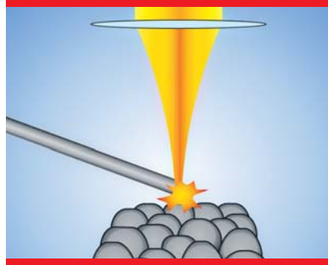

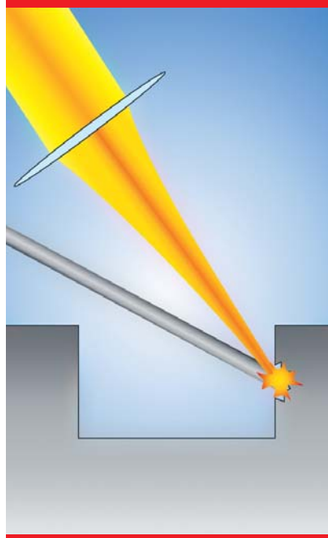

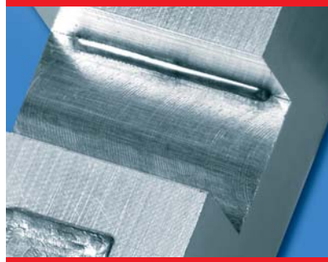

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Laser Sources





		Desktop	Performance	Performance	Select	Select	Integral	Tool Open
Laser Source				**Sweet Spot**		**Sweet Spot**	**Sweet Spot**	**fiber-coupled**
Type		pulsed Nd:YAG, 1064 nm	pulsed Nd:YAG, 1064 nm	pulsed Nd:YAG, 1064 nm	pulsed Nd:YAG, 1064 nm	pulsed Nd:YAG, 1064 nm	pulsed Nd.YAG, 1064 nm	pulsed Nd:YAG, 1064 nm
Nominal power	W	30	50	40	100	80	200	150
Pulse peak power	kW	3.5	6	4	12	10	12	10
Pulse energy	J	35	80	60	120	100	100	100
Pulse duration	ms	0.5 - 20	0.5 - 50	0.5 - 50	0.3 - 50	0.3 - 50	0.5 - 20	0.3 - 20
Pulse frequency	Hz	single pulse up to 10	single pulse up to 20	single pulse up to 20	single pulse up to 20	single pulse up to 20	single pulse up to 20	single pulse up to 20 Hz
Focal diameter	mm	0.3 - 2	0.3 - 2	0.2 - 1.5	0.2 - 1.5	0.3 - 2.5	0.3 - 2.5	0.4 - 2
				0.1 with MicroWeld™		0.1 - 0.5 with MicroWeld™	0.1 - 0.5 with MicroWeld™	
Pulse shaping, number of memory capacity		optional, 3 fixed	optional, 3 fixed, 3 variable	optional, 3 fixed, 3 variable	standard, 15 variable	standard, 15 variable	standard, 15 variable	standard, 16 variable
Parameter storage		10	99	99	100	100	100	15
User Interface								
Display and operation		LCD display, membrane keyboard joystick switch in working chamber	graphic display, membrane keyboard joystick switch in working chamber	graphic display, membrane keyboard joystick switch in working chamber	color TFT, touch screen	color TFT, touch screen	color TFT, touch screen	graphic display membrane keyboard
Interfaces					2 x USB, Ethernet, serial	2 x USB, Ethernet, serial	2 x USB, Ethernet, serial	
Positioning axes			optional	optional	optional	optional		
Travel	x-y-z mm		80 x 80 x 140	80 x 80 x 140	207 x 170 x 200	207 x 170 x 200	400 x 200 x 430	75 x 75 x 50 optional 150 x 75 x 50
Loading	kg		20	20	50	50	500	∞
Resolution	µm		2,5	2,5	2.5	2.5	2.5	
Repeatability per axis	µm		± 20	± 20	± 20	± 20	100	
Speed	mm/sec		20	20	20	20	20	5
Proportional joystick					x	x	x	x
CNC			via external PC	via external PC	optional (integrated)	optional (integrated)	optional (integrated)	
Utilities								
Electrical	V	230	230	230	230	230	400	400
	Hz	50/60	50/60	50/60	50/60	50/60	50/60	50/60
	A	10	16	16	16	16	16	16
	Ph	1	1	1	1	1	3	3
Power consumption at nominal power	kW	1.2	1,7 (2.1 with axis)	1.7 (2.1 with axis)	3	3	6	5
Cooling		internal water-air-heat exchanger	internal water-air-heat exchanger	internal water-air-heat exchanger	internal water-air-heat exchanger	internal water-air-heat exchanger	internal water-air-heat exchanger	water-air-cooler/ no water required
Shielding gas, pressure air (workpiece cooling)		quick connector	quick connector	quick connector	quick connector	quick connector	quick connector	quick connector
Measures								
Weight	kg	85	125 (155 incl. positioning axes)	125 (155 incl. positioning axes)	250	250	750	265
Dimenions (wxhxd)	mm	640 x 465 x 882	580 x 1230 x 853	580 x 1230 x 853	790 x 1262 x 1258	790 x 1262 x 1258	1200 x 1400 x 1600	575 x 1280 x 1190 (transport dimensions)
Ambient temperature	°C	30°	30°	30°	35°	35°	35°	35°
Configuration								
MicroWeld™				optional		optional	optional	
Fixed shielding gas nozzle		x	x	x	x	x		
Flexible shielding gas nozzle		x	x	x	x	x	x	x
Flexible cooling air nozzle		x	x	x	x	x	x	
LED ring light		optional	optional	optional	optional	optional	optional	x
Pilot laser								optional
Exhaustion		integrated	integrated, filtration efficiency 99,997% acc. DIN24184	integrated, filtration efficiency 99,997% acc. DIN24184	integrated, filtration efficiency 99,997% acc. DIN24184	integrated, filtration efficiency 99,997% acc. DIN24184	integrated, filtration efficiency 99,997% acc. DIN24184	optional
Microscope: LEICA 10-x, optional 16-x		x	x	x	x	x	x	x
Vision System (camera, monitor)		optional	optional	optional	optional	optional	optional	optional

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The new laser family for fine welding

Application-specific laser systems

The family of manual welding lasers

LASER MICRO

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WE THINK LASER