SWA

Laser welding and mold repairing system

Technical datasheet

rev. 0 – 04/2021

System description

SWA has been specially designed to perform modifications and repairs to molds damaged by wear or use.

The use of lasers, with the addition of materials, has revolutionized the traditional welding techniques of molds, allowing repairs without the need of preheating of the matrices and with an irrelevant involvement of heat during the deposition process of the filler material. This avoids the classic collateral damage induced by TIG welding, such as: geometric distortions, edge burns and decarburations. Thanks to the properties of the laser beam, complex areas such as narrow and deep grooves or internal and external edges can be welded. Steels, bronze alloys, copper alloys, aluminum and titanium are weldable. The hardness of the welding layers can reach very high values depending on the type of overlay wire used.

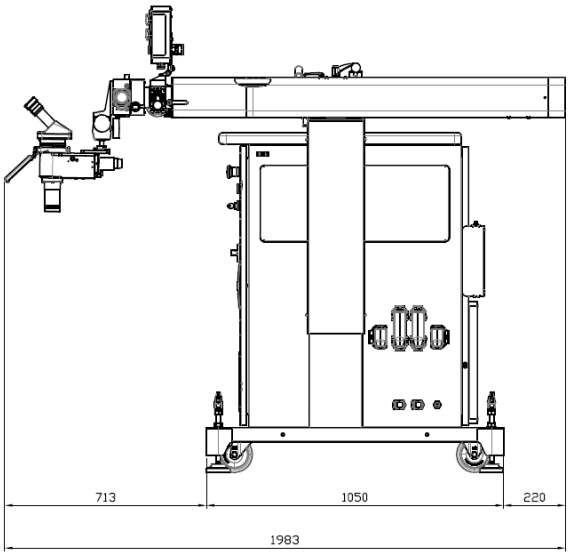
The simple way of operating and the perfect visual control of the coating using a stereo microscope make this technology accessible to everyone, without having to rely on highly qualified technicians.

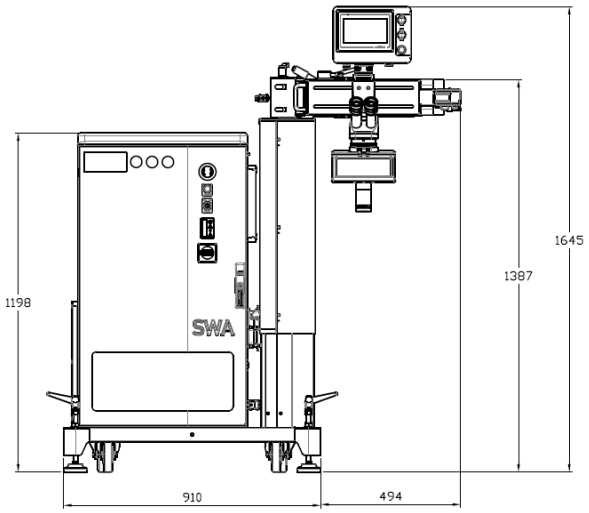
Technical data

	SWA 300 F	SWA 450 F
Laser source		
Source type	Fiber laser	Fiber laser
Wavelenght	1070 mm	1070 mm
Average power (max)	300 W	450 W
Peak power (max)	3 kW	4.5 kW
Pulse energy (max)	30 J	45 J
Pulse duration	0,1 ÷ 10 ms / CW	0,1 ÷ 10 ms / CW
Shot frequency	0,5 ÷ 50 Hz	0,5 ÷ 50 Hz
Spot diameter	0,1 ÷ 2 mm	0,1 ÷ 2 mm
Integrated cooling	Aria	Aria
Focusing optics	120 mm	120 mm
X axis stroke	300 mm	300 mm
Y axis stroke	150 mm	150 mm
Z axis stroke	500 mm	500 mm
Axes speed	0,1 ÷ 30 mm/s	0,1 ÷ 30 mm/s
Power supply (max)	230V 50/60Hz 1ph 2 kW	230V 50/60Hz 1ph 2,6 kW
Weight	320 kg	325 kg

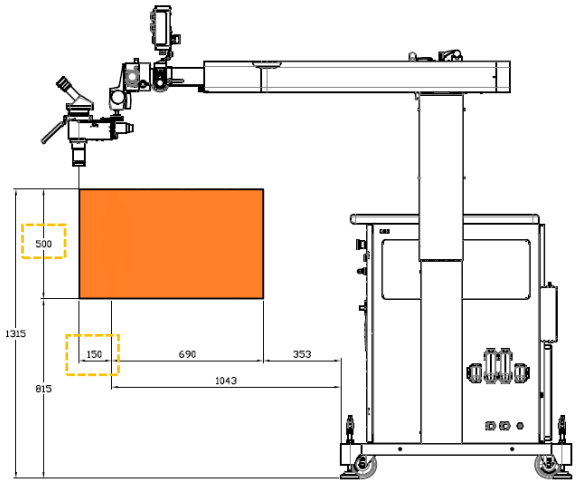
Dimensions of SWA 300 F and 450 F

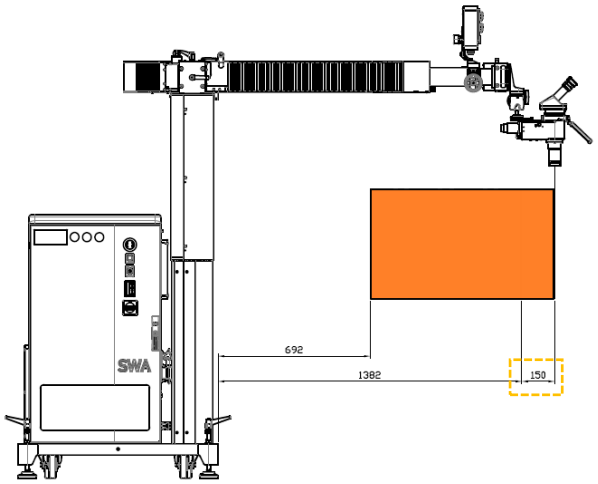
Width 1260 mm (1410 mm with joint accessory) x Depth 1980 mm x Height 1650 mm.
Maximum height with display down 1490 mm.





Dimensions of the maximum working area considering manual, motorized strokes and 90° rotation of the arm.
The values in the dashed boxes refer to motorized strokes.





SWA main components:

7” color touch screen display with USB and ethernet connections. Industry 4.0 ready.

Y axis manual stroke 700 mm and arm rotation 90° for a quick positioning.

Motorized X axis Stroke 300 mm

Motorized Y axis Stroke 150 mm

Gas flow meter with display. It allows to view and set a minimum flow threshold and it alerts the operator in the event of a gas run out.

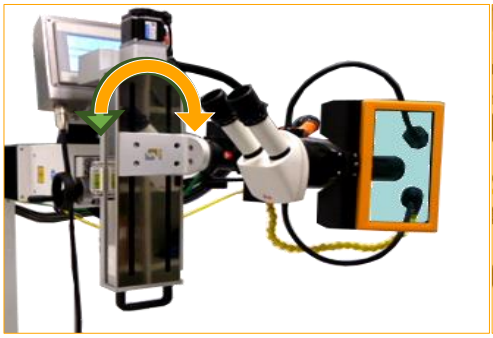
Laser emission controlled by certified devices that allow to reach a PL d (performance level).

Motorized Z axis Stroke 500 mm

Base with wheels and parking supports.

Wide positioning flexibility:

Thanks to the fiber transport the welding head is very compact, using various manual adjustments you will get a high degree of flexibility to reach inclined surfaces and inaccessible areas.



Welding head rotation ± 90°

360° rotation microscope

Welding head inclination ± 45°

The machine can be associated with a joint including manual movement that allows the laser focus to be positioned down to approximately 300 mm from the floor.

This allows to repair large molds without having to lift and handle the mold.

Tray for accessories and consumables such as optics, additional spacers, mandrel and containers for welding wires.

Main components:

Welding head

Leica stereo microscope with 10X eyepieces (framed area Ø 16 mm).

Laser protection window. Protects the face from reflections.

Lights with flexible tube.

Protective gas hose with ceramic nozzle to bear high temperatures.

Flexible hose for connection to external aspirator.

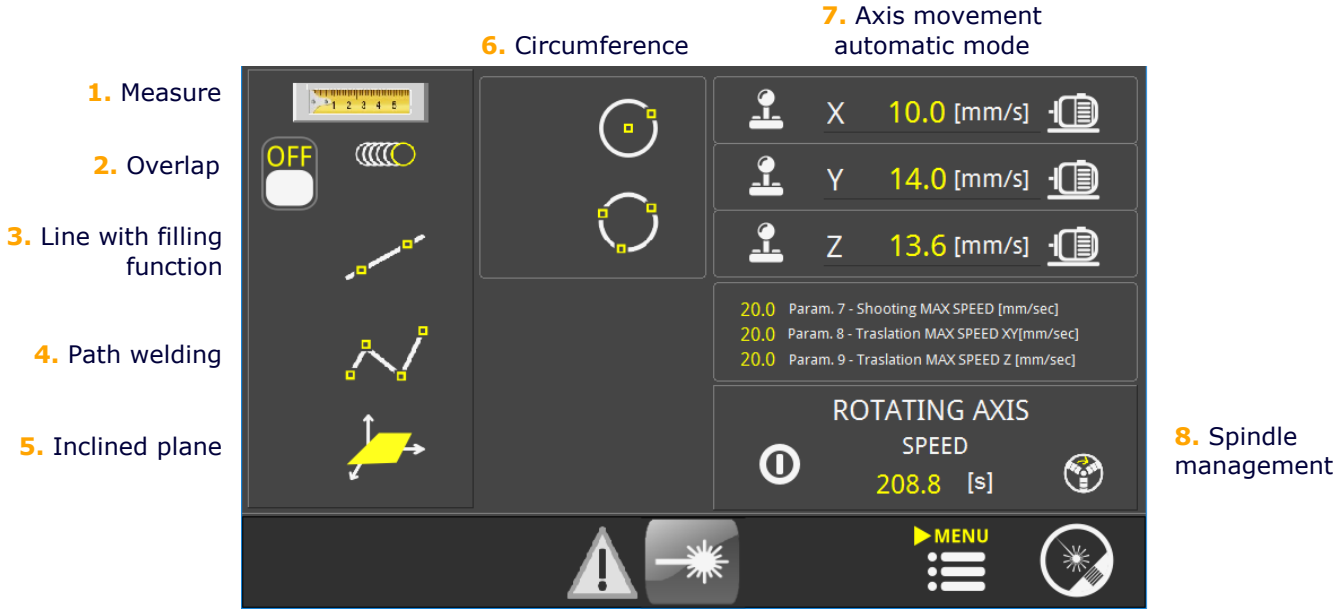
Console

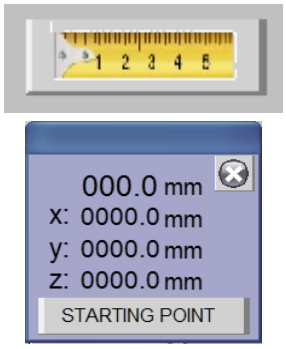
The console includes a device that checks the presence of the operator in order to block the laser emission and the movement of the axes in a safe way.

In the console there is a multifunctional mouse to set the welding parameters and the joystick.

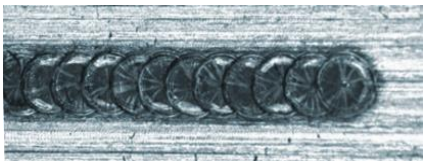
SWA main functionalities:

Software functions – Tracked routes

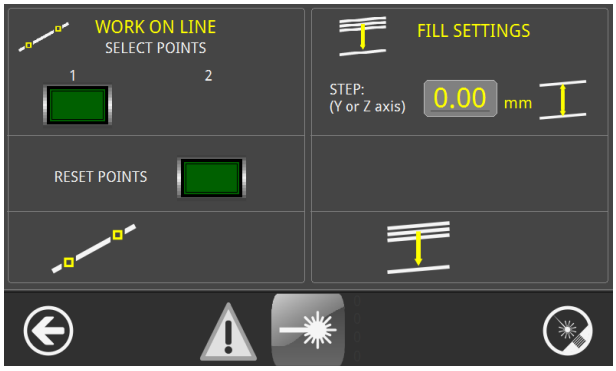




1. MEASURE
The MEASURE function can be useful to quickly determine the distance between two points or to estimate the thickness of a filling.

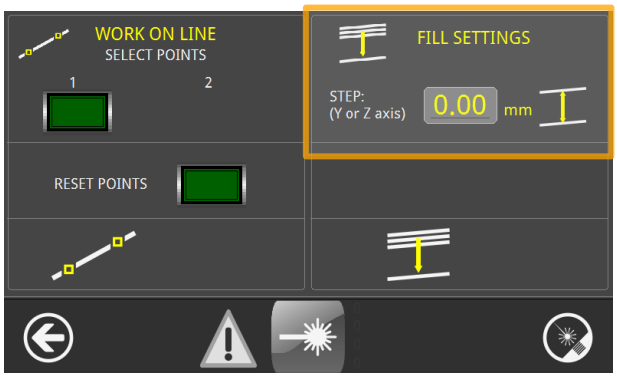


2. OVERLAP
The OVERLAP function allows to shoot with equidistant laser spots, where the distance of the shots is automatically calculated based on the diameter of the spot, the speed of the axes and the set overlap value.

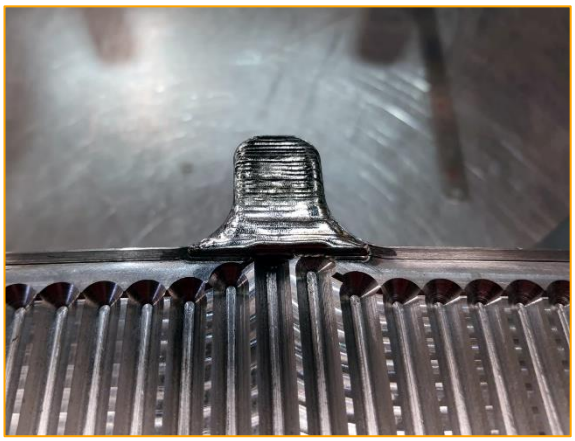


3. LINE
The LINE function is used every time you have to move along a straight path. By acquiring the two points that identify the path to follow, and enabling the function, the system will always move according to the trajectory identified by the previously acquired points.

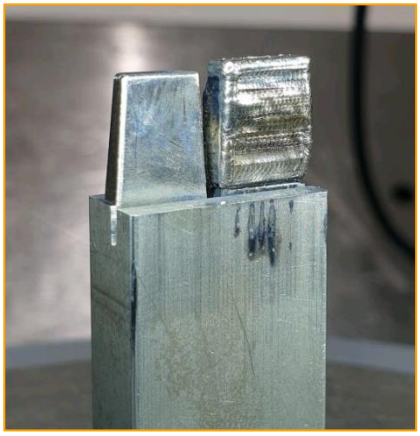
Line welding



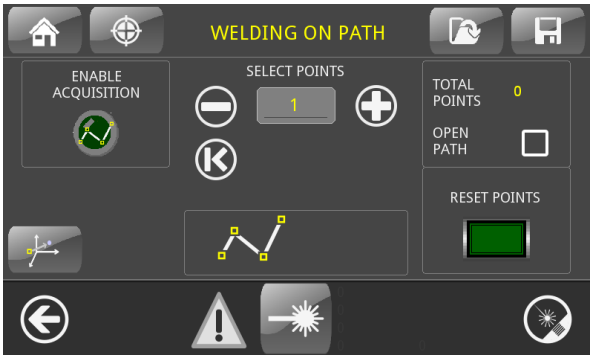
3. FILLING (included with the LINE function)
The filling function is useful to fill smaller or bigger areas with filler material. In particular, it allows to perform straight welds side by side and equally spaced.



Reconstruction of an area with various parallel lines.

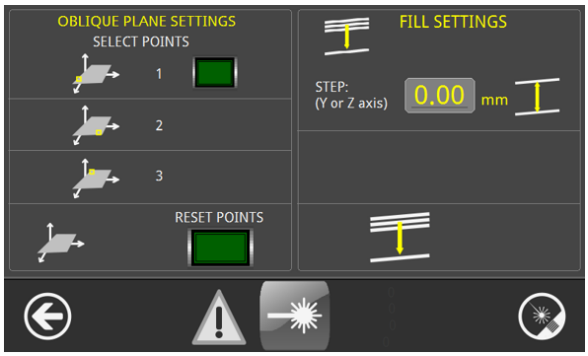


Reconstruction of a wall using the filling function.

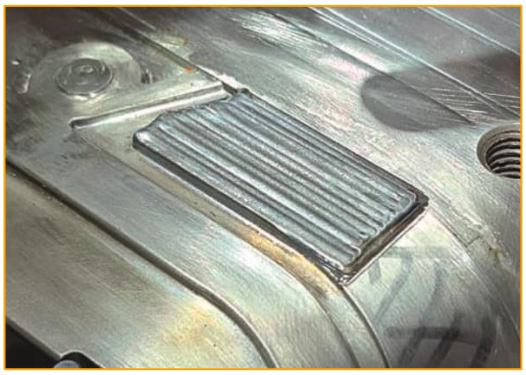


4. PATH WELDING
This function is useful whenever you want to follow a predefined path, facilitating the operator in the phase of adding material on uneven surfaces.
This function allows to acquire up to 255 points, follow the trajectory acquired using the joystick and adjust the speed of movement of the axes without the risk of missing the identified path.
The function allows to manage up to 4 interpolated axes (X-Y-Z and spindle).
The various routes can also be saved on USB memory.

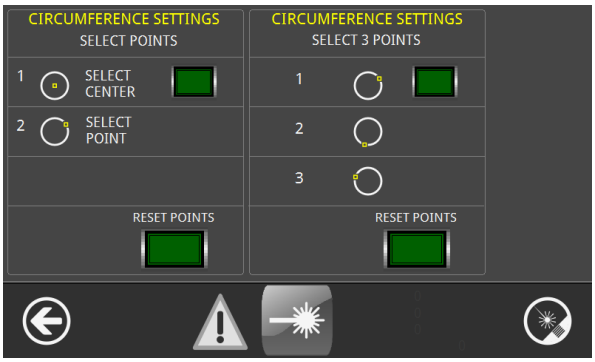
Reconstruction of a damaged area with path welding.



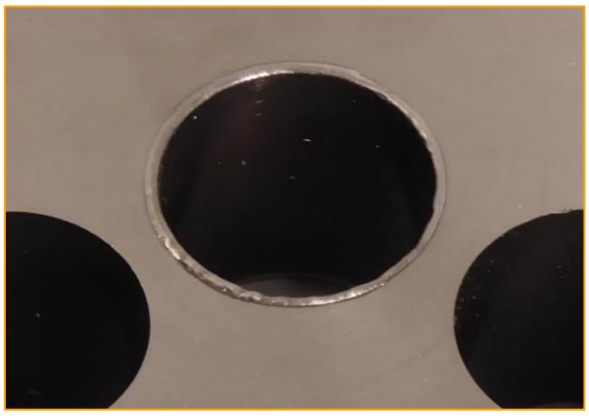
5. INCLINED PLANE
Useful function to manage inclined surfaces where it is necessary to move freely with the X and Y axes while keeping the laser focus point at a constant distance from the piece.



Reconstruction of the damaged area on an oblique surface.

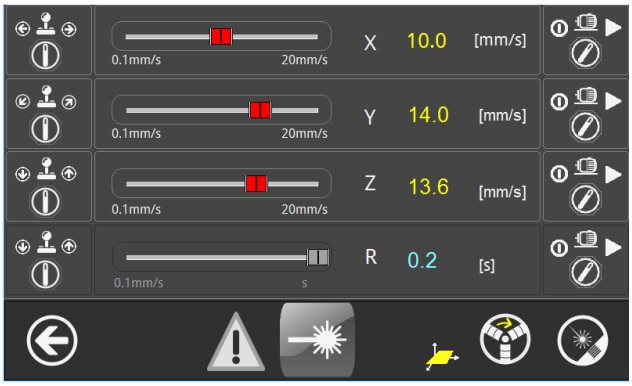


6. CIRCUMFERENCE
Function that allows to weld along a circular path and/or an arc.
It is possible to acquire the points of the circumference and then control the speed and direction of the axes movement with the joystick.
It is also possible to scale the diameter to add material in concentric circles.
The CIRCUMFERENCE function can be used in combination with the INCLINED PLANE function to perform circular welds on flat but not horizontal surfaces.

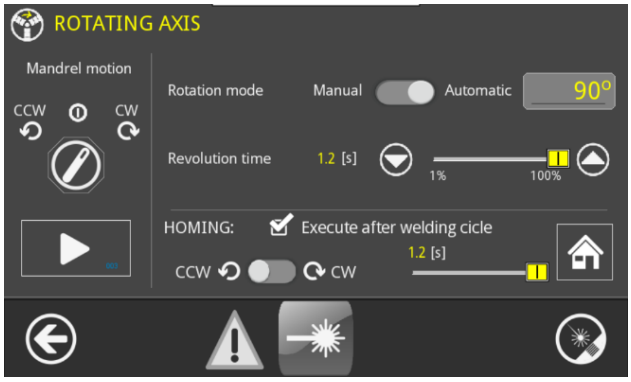


Edge repair of a hole.

Area reparation with arch and fill functions.



7. SEMI-AUTOMATIC mode
It allows to set a fixed movement speed for each axis, releasing it from the progressive control of the joystick.



8. SPINDLE parameters setting
To weld circular profile pieces, a rotating spindle (optional) is used, which rotates the piece during welding, working in synchronism with the laser.
You can set speed, direction of rotation and angle of rotation in the appropriate menu.
The spindle can also be controlled by a joystick that manages the direction of rotation and the speed of rotation.

Welding on a circular piece.

Pulse Shaping

It operates on laser welding by optimizing its qualitative and functional performance, specifically in two critical areas: the beginning and the end. During the welding pulse, PULSE SHAPING is able to modulate the power delivered by the laser beam in these two particular points, to avoid the arise of porosity, incisions on the edges or surface depressions that can be generated in the stream, ensuring a correct thermal cycle of heating, melting and cooling. This in addition to avoiding the challenges mentioned above, allows welding varieties of steel with a high content of carbon, materials sensitive to cracks and metals with different welding points.

Smart Pulse

It manages welds that require very low laser power. Commonly fiber sources do not allow low values of power, therefore precision welding (using wires with a diameter of less than 0.3 mm) often shows over-penetration or incision defects at the edges. Thanks to SMART PULSE it is possible to control the power delivered even down to reduced values and will guarantee a deposit result without defects.

Remote assistance

SWA can connect to the company network to manage and optimize every phase of the process, giving access to data and information in real time, and allowing to make decisions quickly and intelligently to increase efficiency and profitability.
Remote assistance can also be performed without having to physically intervene on the machine.

Suggested wires for mold repairing:

	SWA 300 F	SWA 450 F
Material	**Ø of the suggested welding wire min/max**	**Ø of the suggested welding wire min/max**
Steel	0,2 – 1,0 mm	0,2 – 1,2 mm
Aluminum alloys	0,2 – 0,8 mm	0,2 – 1 mm
Copper alloys	0,2 – 0,3 mm	0,2 – 0,6 mm

Main accessories

697033L	Pair of 16x eyepieces for microscope. Framed area Ø 10 mm	
697079L	Pair of 25x eyepieces for microscope. Framed area Ø 6.5 mm	
292263L	Ergo Module for microscope height adjustment. Allows tilting of the microscope from -20° / + 5° compared to the standard position.	
292407L	Leica digital camera. Allows viewing of the welding images on screen or on a PC while using the microscope at the same time. USB and HDMI video outputs available.	
292603L	Adjustable spherical support with magnetic base. Suitable to tilt small molds and access the areas to be repaired Ø spherical support 158 mm Magnetic piece support base Ø 100 mm Maximum workpiece weight 7 kg Maximum piece weight at 90 ° 2 Kg	
695395L	TBH fume extraction unit with cartridge prefilter. With combined HEPA + activated carbon filter. Suction volume max. 260 mc / h. 230 V 50/60 Hz single-phase power supply The machine is prepared for connection To the suction system (Ø 40 mm) The vacuum cleaner can be electrically connected to the machine to activate the suction only during the welding phases. The machine also checks the saturation status of the filters of the aspirator, notifying the operator when the filters reach the 75% of the maximum occupancy.	

694667L

Motorized spindle with manual fixing.

Diameter minimum/maximum	*3- 80 mm*
Adjustable	from 0° to 90°
Maximum piece weight	5 Kg
Precision	1600 passi / giro
Through hole	Ø 16 mm

The spindle is managed by the system's touch screen
where you can set speed, direction and angle of rotation.

695579L

Lens spacer (55mm length).

Spacing the lens away from the welding head is easier
to access molds with concave and complicated shapes.
The spacer includes extensions for the gas and suction hose.
Up to 6 spacers can be combined.
If more than one spacer is used, the installation of the lights
with extended hose 695898L is recommended.

694694L

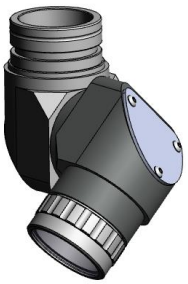
200 mm focal lens kit

To increase the distance from the workpiece to the lens.
It allows access inside narrow cavities avoiding
that the projection of the laser cone hits the adjacent areas.
By replacing the standard 120 mm lens with the 200 mm
the minimum diameter of the laser increases from 0.1 mm to 0.2 mm

696016

Roto-tilting lens.

Allows rotating of 360° and tilting of the lens by +/- 90°,
focusing on reaching inclined surfaces and inaccessible areas.
Although the welding head provides several adjustments,
the roto-tilting lens allows to work in an ergonomic position
when you need to tilt the lens.
The accessory includes a gas hose extension
(an additional focusing lens is not included).

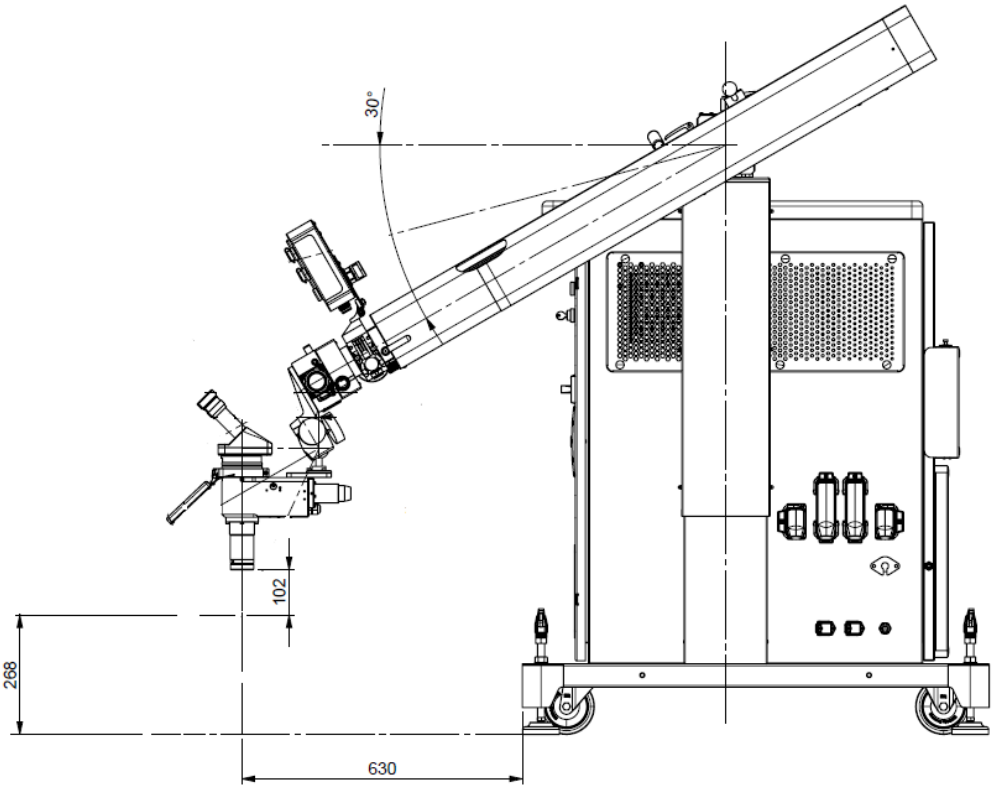


695421L

Ring light.

It is fixed to the lens and allows to project
the light inside narrow cavities where standard lighting
does not offer optimal visibility.
Power supply 100 - 240 V 50/60 Hz -
cable with international connections included.

695609	Joint with manual movement. It allows positioning of the laser focus down to 300 mm from the floor. Tiltable from 0° to 30°. Cushioned descent to avoid collisions. The system provides a secure locking of the rotating joint in case there are no conditions of arm balance. With the joint installed the machine width goes from 1260 mm to 1410 mm.



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