

Real Portable

- Fully european Design
- FULL CE Compatible
- 22% more efficient
- 68% smaller
- Ecologic energy class A+++
- EcoEner technology inside



PhotonWeld®

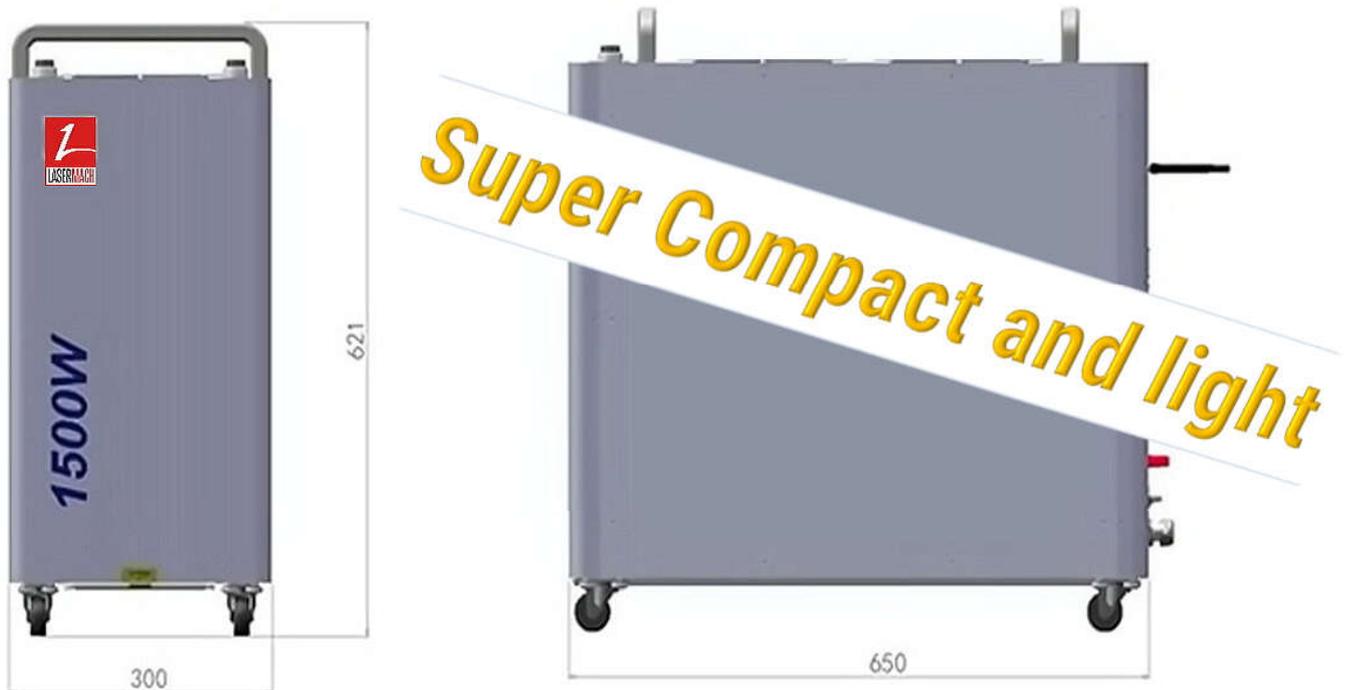
A+ SERIES

850 – 1100 – 1600 Watt

PhotonWeld-A+-Series

Probably the best Real portable Handheld Laser
Welding Machine!

But Surely the most ecological



850 – 1100 – 1600 Watt
Laser Wobble Welding Machine

Next-generation EcolEner welding technology:

Welding till 80% faster
Consume till 90% less energy
Rework till 90% less
Ecologic and GREEN

SUPER HIGH RETURN ON INVESTMENT with PhotonWeld



With PhotonWeld you weld at the lowest cost possible while saving huge energy!

For most laser welded sheet metal parts, the weld quality and the speed of processing are far superior to conventional welding processes, and this ultimately results in increased profit margins. If you consider the complete sheet metal fabrication process (cutting, bending, punching and welding), **welding and refinishing is responsible for approximately 70 percent of the cost per part.** This is mainly due to the length of time required and the high consumption costs associated with these processes. These main cost drivers are drastically reduced by our wobble laser welding's consistent quality and cosmetic seams.

Since sheet metal fabricators benefit from the laser welding process in various ways, the ROI varies based on the production requirements of the shop. However, **a laser welding machine can achieve a very high return on investment.** For example, **pay-off time is roughly 7 to 9 months** when a fabricator processes parts like covers and boxes, or fixtures such as counters and sinks for the medical or food service industries. This is true even when machine utilization is less than 50 percent and only active one shift per day.

90%

Time savings*

65%

Cost savings*

The main benefits:

- ⊕ Time and cost savings
- ⊕ High processing speed
- ⊕ High quality of the final product
- ⊕ Possibility of process quality control (also online)
- ⊕ Easy to automate

* compared to manual TIG welding.

PhotonWeld A+-Series - Fiber Laser Wobble Welder



Model	PhotonWeld-A850	PhotonWeld-A1100	PhotonWeld-A1600
Operating mode	Continuous/ Modulation/pulsing/single pulse/ overpulsed	Continuous/ Modulation/pulsing/single pulse/ overpulsed	Continuous/ Modulation/pulsing/single pulse/ overpulsed
Laser wavelength	±1%	±1%	±1%
Power Requirements	220V-15A	220V 17A	220V 19A
Laser Power Continue/ Max peak Pulse	850w / 1520W	1070W / 1950W	1600W / 2850W
Operating environment temperature range	10-40°C	10-40°C	10-40°C
Working environment humidity range	<70% No condens	<70% No condens	<70% No condens
Welding minimum thickness	≤0,3mm	≤0,3mm	≤0,4mm
Welding speed	0-100mm/s	0-140mm/s	0-160mm/s

The welding sector is facing an ecological turning point!



We face two major challenges in the 21st century: **digital transformation and ecological transition.**

- Ecological transition is an essential objective for humanity.
- Digital technology is one of the greatest transformative forces of our time.

Rethinking Welding for a Greener Tomorrow

As the world moves towards protecting the environment, the welding industry can not leave behind. However, welding is an energy-intensive process and not so friendly to the environment. The industrial world needs welding. As the popularity of metal structures and constructions rises, more skilled welders are required. Currently, the metal welding sector accounts also for of part of global carbon emissions. According to experts, this number is expected to increase dramatically by 2030, which leaves a clear incentive for the industry to deliver significant reductions in emissions in the years to come.

A market that employs over 20.000.000 professionals, with a turnover of over 40 trillion euros, that wants to evolve, innovate and embrace a greener processing policy needs good and efficient solutions.

The welding industry needs to reduce its carbon footprint drastically by reducing the energy they use by making the welding process more efficient and eliminating the use of older energy hungry welding systems. ! Small and big things can help to do this and there are several eco-friendly practices that welders can engage in **to reduce their carbon footprint.**

To do that, welders need to look at the entire welding process to understand which part of the process affects the environment more. From there, the welder can reduce their carbon footprint by tweaking the:

To save the environment, welders around the world need to educate on the above eco-friendly techniques and to replace their energy hungry systems by modern energy saving welding systems like our PhotonWeld.

- Welding speed
- Replace high energy consuming older welding systems with the latest "GREEN" welding systems
- The raw materials
- Reduce the heat input and reduce the HAZ (heat affected zone)
- Processing time
- Reduce the post-processing time
- System costs
- Filler metals, and
- Seam quality
- But mostly look for Energy saving technology in welding like laser welding in general. Our supplementary Ecolener Photon saving technology gives you even a bigger advance in saving energy.



Older systems release huge quantities of gases and fumes that are harmful to the environment. Our PhotonWeld reduces the fume and smoke solution with more than 75%.

Individuals as well as companies, have a role to play in saving energy, making the air cleaner and the environment safer for the generations to come.

What can you do for a more environmentally friendly welding?

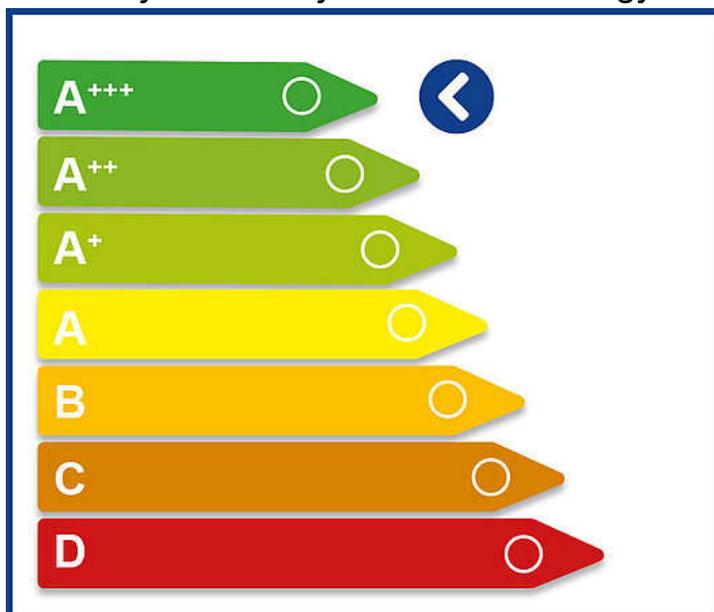
The first step towards greener welding is to improve the energy efficiency of the tools used. An action with a dual value: reduction of emissions and increase in productivity of each welding process.

The **biggest energy savings** can be obtained by changing the conventional welding to the very high efficient wobble laser welding, which can **reduces the energy consumption till 90%!** That means real savings!!!



With our New PhotonWeld© High Efficient Laser Welding Machine with the revolutionary EcolEner® Energy Saving Technology based on 976nm pumping Technology, we are able to increase the Wall Plug Efficiency to levels over 42% (WPE) and we are able to increase the Energy Conversion Efficiency drastically which is an energy consumption reduction of over 22%

compared to normal laser welding machines.



**PhotonWeld: Class
A+++**

**Minimal 22% less
energy consumption
compared to any other
laser welding Machine**

EcolEner ®: Sustainable Ecological Energy Saving Technology

ECOLENER ® Photon Saving Technology

Sustainability is emerging as an important approach that manufacturing companies employ to improve their economic profitability and competitive advantage by enhancing environmental performance.

Consistent with the contemporary aspects of ecological responsibility, specific forms of **ECOLOGICAL ENERGY** saving used in our PhotonWeld Laser Welding Machines (with **ECOLENER ®** technology), do help positively to improve drastically the relationship between an environmental sustainability orientation and environmental performance.

PhotonWeld Series



Real "ECOLOGICAL" welding!

Currently, the metal welding sector accounts also for of part of global carbon emissions.

According to experts, this number is expected to increase dramatically by 2030, which leaves a clear incentive for the industry to deliver significant reductions in emissions in the years to come.

Standard laser sources are energy class A+ or Class A++ (wobble-6-PRO+ Series) !

Our PhotonWeld® Series with EcoloEner energy saving technology is Class A+++

Rethinking Welding for a Sustainable Future

CO2 : Reducing Your Emissions

CO2 production comparison – energy consumption comparison

Average, welding produces around 300g CO2 per kWh consumed electricity. We do not take in account the smoke produced by the welding!

Average industrial electricity cost for industry in europe is 0.24€/kwh (eurostat 2021 value)

As laser welding goes 7~10 faster than normal welding, laser welding saves huge amount of energy per weld. Our new Ecolener equipped photonweld welding machines add a substantial saving in plus, compared to standard laser welders, as they consume more than 22% less energy than these standard lasers.



MIG VS LASER - CO2 production – energy consumption – Cost Energy

- MIG-Welding machine: 250 A auto mig welder : 5.8kW connecting power
- Laser Welding Machine 1500W : 8.2kW connecting power
- Ecolener laser welding Machine PhotonWeld A1600: 4.8kW connecting power
- Machine consumption: we take an average of 70% of the load = 70% of the connecting power.
- Welding effieency : Working time/ Efficient welding time = 45% is a high rate. With 8h shifts, this means only $8 \times 45\% = 3.6$ h effective welding per 8 hours shift
- Working 44 weeks at 40 h/week: $44w \times 40h \times 45\% = 792$ hours effective welding per week
- Welding speed : As laser Weldingspeed goes up till 10 times the speed of Mig Welding, we can take for our calculations a factor 5 times faster (average)
- MIG Welder needs 3~7 machines to do the same job as laser welding (we take 5 average),



Energy

consumption per year.

- MIG: 44 week x 40h/week x 45% Welding Efficiency = 792h effective welding time per year - 795h x 5 machines x 5.78kw x 70% = **16.075 kWh**
- Laser Welding: 44 week x 40h/week x 45% Welding Efficiency = 792h effective welding time per year - 795h x 1 machines x 8.2kW x 70% = **4546 kWh**
- Laser Welding with EcolEner Technology: 44 week x 40h/week x 45% Welding Efficiency = 792h effective welding time per year - 795h x 1 machines x 4.8kW x 70% = **2661 kWh**

CO2 production/year

- **MIG:** 16.075 kWh x 0.3kg = **4,822 TON CO2/Year**
- **LASER:** 4.546 kWh x 0.3kg = **1.36 TON CO2/Year**
- **EcolEner Laser:** 2.661 kWh x 0.3 kg = **0,79 TON CO2/Year**

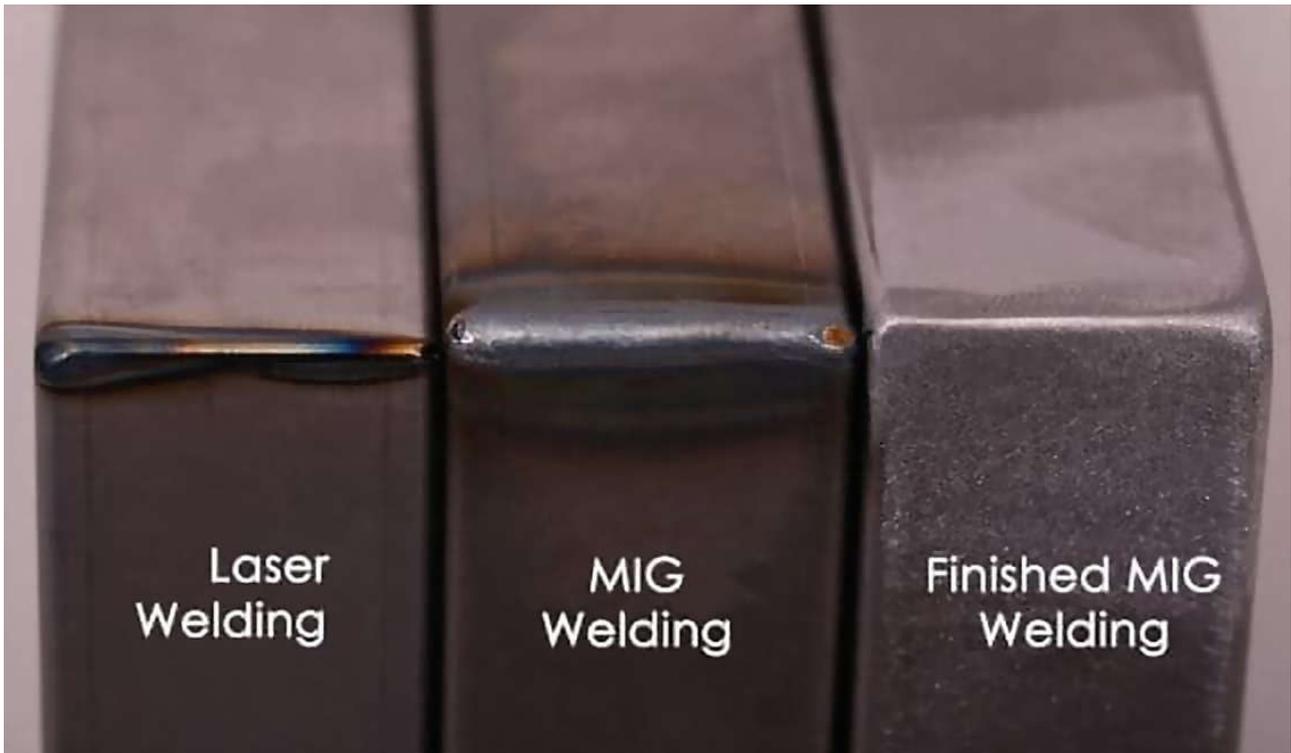


Electricity Cost/year

- **MIG:** 16.075 kWh x 0.24€/kWh = **3.858,€/year**
- **LASER:** 4.546 kWh x 0.24€/kwh = **1.091,€/Year**
- **EcolEner Laser:** 2.661 kWh x 0.24 €/kWh = **638€/year**

Why choose a laser wobble welding machine?

Laser welding machines have many advantages over traditional welding processes :



Lasers provide contact-free, high-speed metal welding solutions for advanced manufacturing across countless industries. With fiber lasers, laser welding has become a highly reliable, easily automated process that provides the highest part quality, typically at the lowest processing costs, and virtually maintenance free.

They are very fast: Laser Welding is much faster and more versatile than traditional welding methods. Laser energy provides consistent energy to the weld spot. This means excellent speed, thermal control, and seam quality. Voids and pockets are eliminated and secondary finishing is unnecessary.

Minimal Heat Input: The laser allows the metal to be heated extremely quickly, while limiting the risk of deformation. It reduces improper alterations to components. Less heat transfer to the surrounding metal also means less distortion at the weld seam. Also a much smaller HAZ (Heat Affected Zones) and much less crackings just beside the weld.

They are highly accurate: They allow a localized, very fine, very clean, almost invisible welding with high precision. The laser beams can be easily controlled to weld the tiniest of parts without damaging them. They are particularly suitable for welding small parts, they are extremely accurate .

They have a high consistency: It delivers consistent repeatability. One weld to the next can be virtually indistinguishable.

They guarantee great strength: Laser Wobble welders do creates very high-strength welds.

They can be adapted to a wide variety of part shapes and materials: You can use them to weld parts with very different shapes and to make complex Joints. It makes welding together materials that differ from each other possible.

They do not wear out: Laser welding machines operate without contact, so there is no risk of wear and tear on the machine. There is also no need to change tools or electrodes, which is a definite advantage in terms of waste reduction. Pure and stable fiber laser source , **100,000 hours of lifetime**, free of maintenance

They are VERY Economical: High electro-optical conversion efficiency (32% standard and up to 50% with our EcolEner Technology), excellent beam quality, high energy density, and reliability, a wide modulation frequency. Low energy consumption, only 20%-30% of the traditional welding machine. They have very low cost of ownership and maintenance costs

They are VERY Profitabl: Fiber laser welding is now with our Lasermach WOBBLE Handheld fiber laser welding machine VERY affordable and accesable for every company

Highest Part Yield: The high stability of the laser power and beam profile of the fiber laser ensures a very repeatable process that delivers the same high-quality weld every time. This non-contact process with no wearing surfaces ensures the last part you produce is the same as the first.

High Throughput: The inherently high speed of laser processing combined with the ease of high-speed automation and elimination of most post-processing steps provide significantly shorter cycle times than competing technologies. Factor in the high-yield process, and WOBBLE fiber laser welding delivers more good parts faster than alternate joining techniques.

Fast ROI: Together with higher-speed and lower-cost processing, the high uptime and availability of the laser welding system enabled by the zero-maintenance fiber laser make for the lowest cost per part welding, and the fastest return on investment.

Quality, speed and clean processing makes our handheld PhotonWeld laser welding machine a favorite for fabricators and manufacturers.

Standard Welding technologies against fiber laser wobbling welding: We beat them ALL

Comparison welding	Traditional welding	Laser welding	Wobble-+ laser welding
Heat input to the workpiece	Very high	Low	Low
Deformation of the workpiece, undercut	Big	Small	Very Small
Bond strength to base metal	General	Good	Very good
Follow up treatment	Polishing	No need to polishing or rarely polished	No need to polishing or rarely polished
Welding speed	General	More than 2 times argonarc welding	More than 2 times argonarc welding
Applicable material	Stainless Steel, Carbon steel, Galvanized sheet	Stainless Steel, Carbon steel, Galvanized sheet	Stainless Steel, Carbon steel, Galvanized sheet
Consumables	More consumables	Less consumables	Less consumables
Operation difficulty	Complicated	General	Simple
Operator safety	Unsafety	Safety	Safety
Environmental protection impact	Not environmentally friendly	Environmentally friendly	Environmentally friendly
Welding fault tolerance	Good	Bad	Very Good
Wobble/Swing welding	No	No	Yes
Spot width adjustable	No	No	Yes
Welding quality comparison	Bad	General	Good
Porosity off weld	Bad	Fair	Good
Cracking of Weld	General	Fair	Very Good

Laser Welding with Wobbling

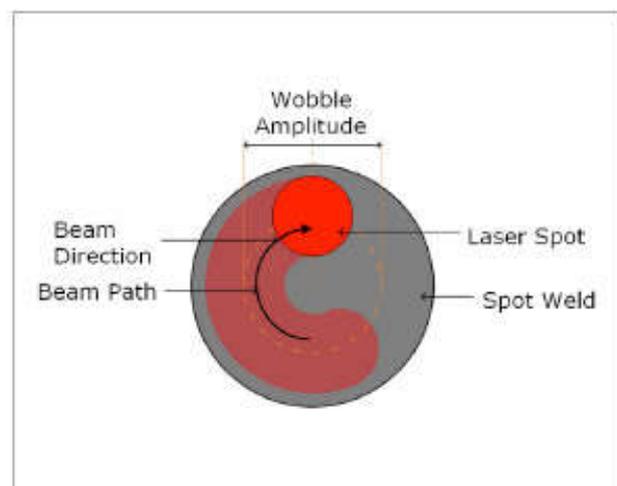
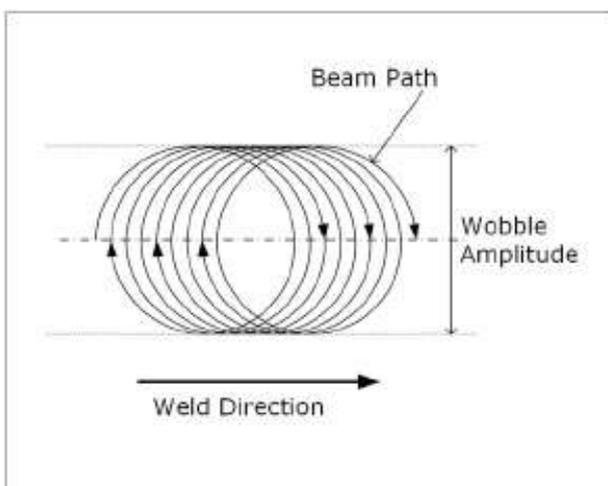
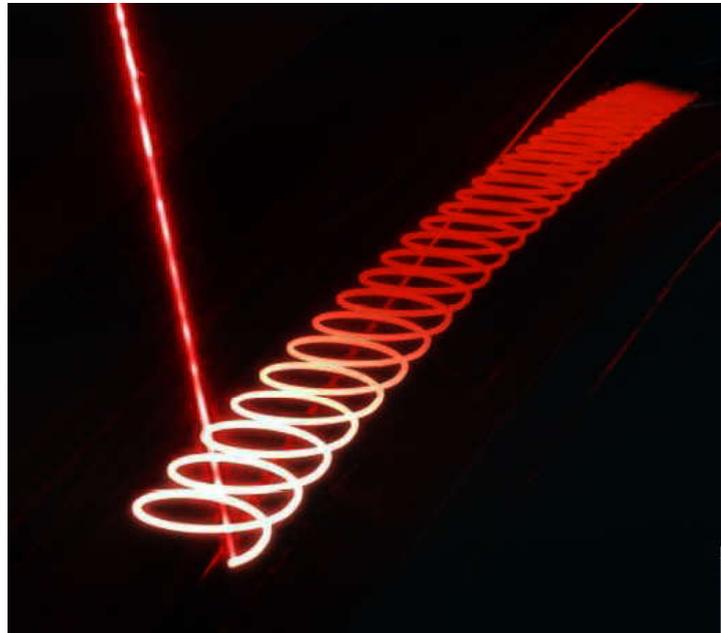
Recently, the introduction of a new, cost-effective, easy-to-integrate technology, based on a beam wobbling technique, is helping to overcome some of these difficulties in welding materials such as copper and aluminum. This technique is helping to overcome porosity and hot cracking issues with laser welding of some materials, while helping to make part fit-up 3X more forgiving.

What is Fiber laser WOBBLE Welding?

Standard welding heads are designed to focus a collimated laser beam to a required spot size, keeping the beam path static through the pulsing beam delivery and a static spot at the focal plane. This standard configuration limits each setup to a specific application and more negative is that pulsing laser sources do not give optimal welding result.

Wobble heads with continuous laser beam, on the other hand, incorporate scanning mirror or/and rotating lenses technology inside a standard weld head. By moving the beam with internal mirrors or lenses, the focal spot is no longer static, and can be dynamically adjusted by changing the shape, amplitude, and frequency.

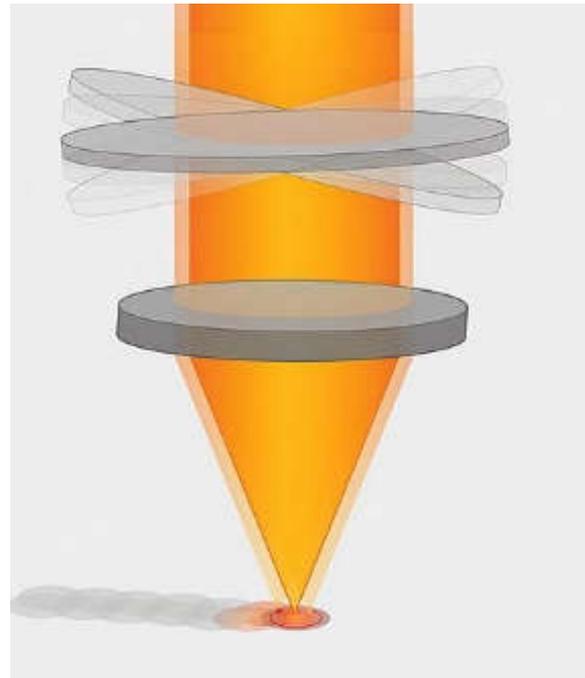
This allows the laser beam to move within a defined distance or radius and makes it possible to reliably bridge larger gap sizes than were possible in the past. The result is that less material is deposited, the heat input is reduced and precisely defined weld edges that require almost no retouching are achieved.



Beam oscillation in laser material processing makes it possible to influence process behavior in terms of energy distribution, stability, melt pool dynamics and solidification.

Wobble welding technology allows to skip the filler material while achieving a high quality welding seam

Thanks to the use of the Wobbling weaving technique, it is possible to bridge gaps that are up to 30%~50% wider than is possible using conventional laser welding systems while retaining the same high quality or even achieving better quality. A factor of 2-3 increase in both process parameters can be achieved compared to conventional laser welding without Wobbling! The wider you weld with the same power, the less deep is the welding.



Circle (CW & CCW)		
Linear		

Wobble Head Welding - Seam Gap and Seam Offset

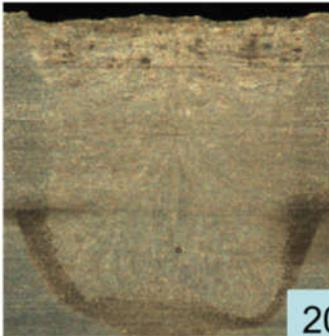
	Varying seam gap											Varying seam offset													
0	Good weld																								
Δ	Acceptable																								
x	Unacceptable/ Not welded																								
	Gap (μm)	0	50	100	150	200	250	300	350	400	450	500	Offset (μm)	0	50	100	200	300	400	500	600	700	800	900	1000
Conventional laser welding		0	0	Δ	Δ	x	x	x	x	x	x	x		0	0	0	0	Δ	x	x	x	x	x	x	x
Laser welding with wobble		0	0	0	0	0	0	Δ	Δ	Δ	Δ	x		0	0	0	0	0	0	0	Δ	Δ	Δ	Δ	x

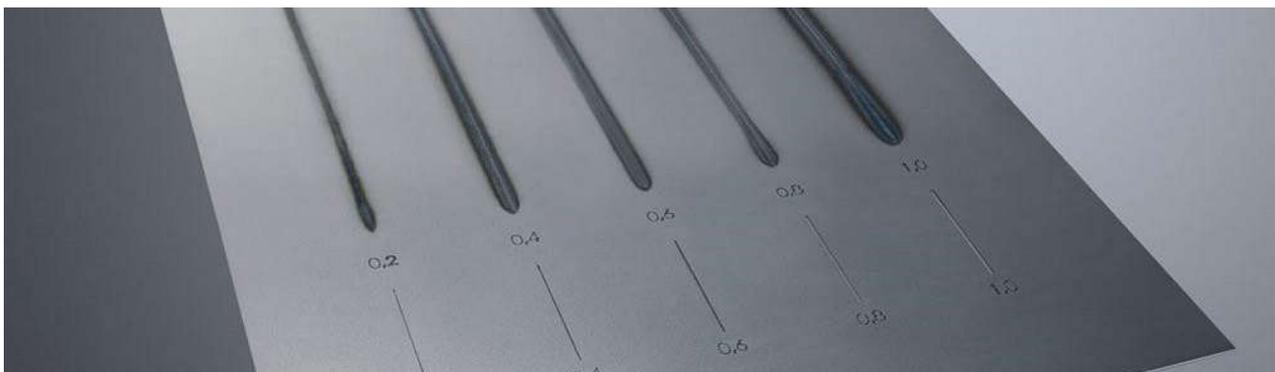
Laser weld requirements

Laser welding is in many ways different from laser-cutting and drilling. The goal of laser cutting and drilling is to remove material as cleanly as possible. These processes typically benefit from a **small spot size** and high intensity to produce holes and cuts with minimum metallurgical effects. A narrow weld interface seam in a lap weld will generally mean **lower strength** (due to the lower cross-sectional area) compared to welds with larger cross-sectional area produced with lower energy density arc or resistance welding processes.

For overlap joints, the strength of the weld is mainly determined by its width.

When conducting thick material welding or applications where increased weld strength is required, the Wobble function makes the laser beam oscillate in order to widen the weld and increases the welding strength.

	
<input type="checkbox"/> No oscillation	<input type="checkbox"/> Beam oscillation: 25Hz
<input type="checkbox"/> Weld Interface width: 0.4 mm	<input type="checkbox"/> Weld Interface width: 2.4 mm
<input type="checkbox"/> Tensile strength: 8.5 kN	<input type="checkbox"/> Tensile strength: 28 kN
 0 Hz	 20 Hz
<input type="checkbox"/> Material thickness: 2 mm	
<input type="checkbox"/> Weld length: 20 mm	



Non-wobbling and Wobbling laser Welding

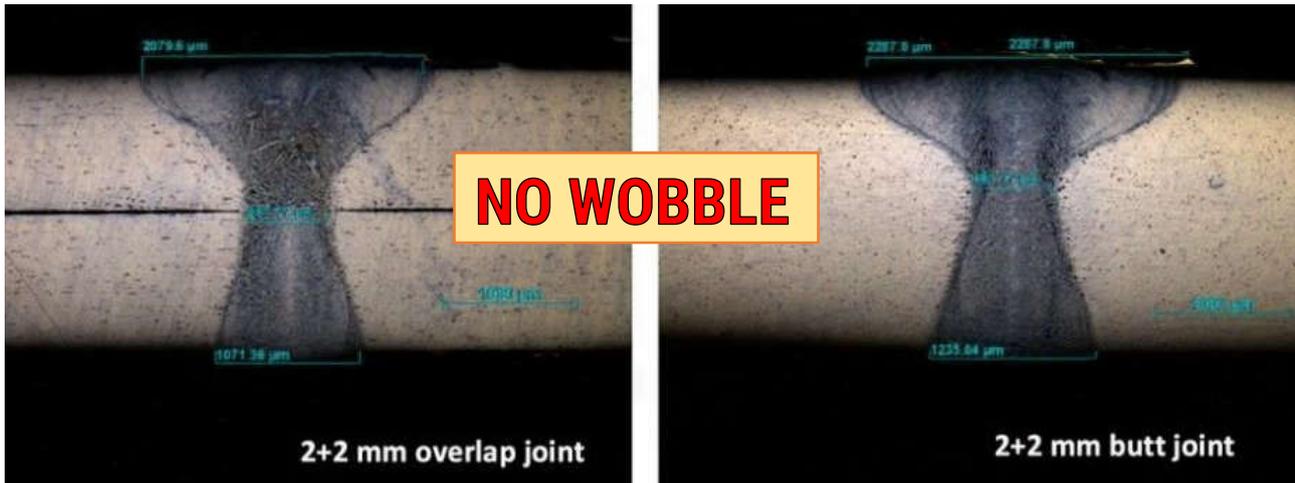


Figure up shows the comparison of two high-strength steel welds which were welded with and without beam oscillation (wobble). By weaving/wobbling the laser beam at 25Hz (= 1500 rpm wobbling speed) the weld interface width was increased from 0.4 mm to 2.4 mm, which resulted in a shear tensile strength increase from 8.5 kN to 28 kN.



Wobbling effectively increases the beam diameter during laser welding to increase the width of the weld while maintaining the high efficiency of deep keyhole welding. The increase in effective beam diameter occurs by superimposing movement of the laser beam in a linear or circular pattern onto the normal motion required to follow the weld joint.

Wobbling helps to meet the requirements

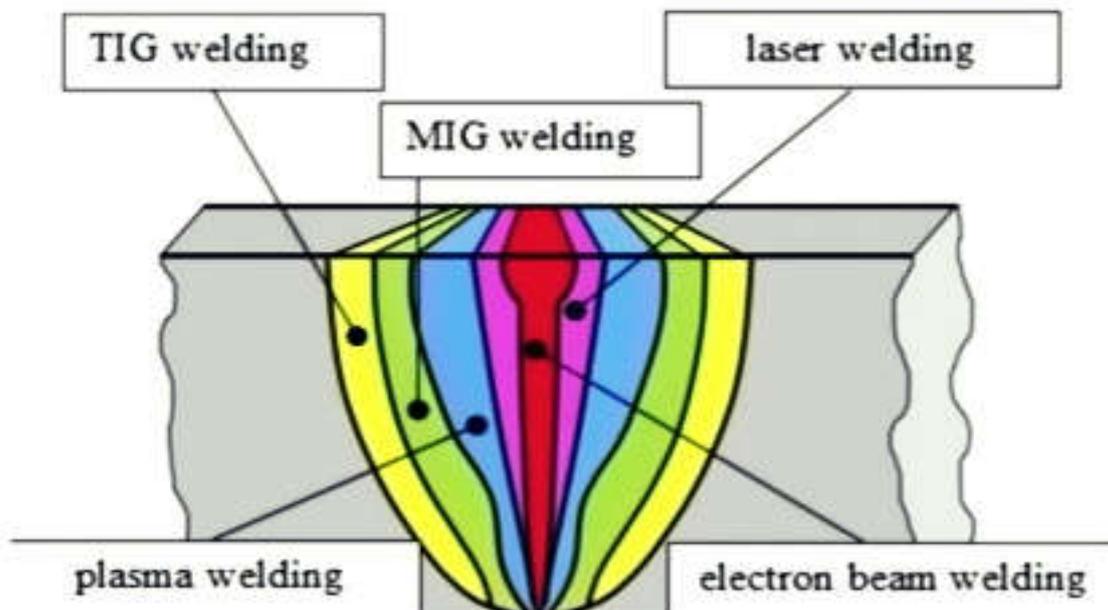
Postprocessing is reduced with minimal 85%.



The welding speed is 2-10 times faster than the traditional welding speed.

Due to the small spot size of the laser, the **heat input is typically 200 times lower** than with MIG, TIG or arc welding processes. Due to this VERY HIGH Concentrated Heat input, our Wobble Laser Welding Machines create almost NO Heat Affected Zone (HAZ) resulting in almost NO deformation of the workpiece.

Comparison of HAZ



PhotonWeld-A850

Product characteristics

- **Maximum continue output power 830W, Maximum Pulse Peak Power = 1520 W**
- **Welding depth in Continue mode reach to 3mm**
- **976nm pump technology - high efficiency WPE $\geq 42\%$**
- **Simple pendulum welding head, adjustable welding width 0-5mm**
- **High Frequency wobbling : max 300Hz**
- **Laser frequency = 1070 +-10nm**
- **Weight < 54kg, compact design ,small size, portable**
- **Air cooling technology, ultra energy-saving inverter drive**
- **Supply voltage 220VAC-50/60Hz – 14A – Standard 220V plug**
- **Triple safety protection**
- **build-in gaz/air pressure monitoring**
- **Works with most protection-gasses : Argon, Nitrogen, Ar+/CO2mix, compressed air,..**
- **Dimensions : 650 x 300 x 621 mm (with wheels)**
- **With EcolEner Energy saving technologie**

Material Welding Range PhotonWeld-A850

Material	Thickness single side	Thickness both sides
Stainless steel	$\leq 2.5\text{mm}$	$\leq 6\text{mm}$
Mild steel	$\leq 2.5\text{mm}$	$\leq 6\text{mm}$
Aluminum	$\leq 1.5\text{mm}$	$\leq 3\text{mm}$
Brass	$\leq 1\text{mm}$	$\leq 1.5\text{mm}$
Copper	$\leq 1\text{mm}$	$\leq 1.5\text{mm}$

These values are indicational and depend of the material welded

PhotonWeld-A1100

Product characteristics

- **Maximum continue output power 1070W, Maximum Pulse Peak Power = 1950 W**
- **Welding depth in Continue mode reach to 4mm**
- **976nm pump technology ,high efficiency WPE $\geq 42\%$**
- **Simple pendulum welding head,adjustable welding width 0-5mm**
- **High Frequency wobbling : max 300Hz**
- **Laser frequency = 1070 +-10nm**
- **Weight < 58kg, compact design ,small size, portable**
- **Air cooling technology, ultra energy-saving inverter drive**
- **Supply voltage 220VAC-50/60Hz – 16A – Standard 220V plug**
- **Triple safety protection**
- **build-in gaz/air pressure monitoring**
- **Works with most protection-gasses : Argon, Nitrogen, Ar+/CO2mix, compressed air,..**
- **Dimensions : 650 x 300 x 621 mm (with wheels)**
- **With EcolEner Energy saving technology**

Material Welding Range PhotonWeld-A1100

Material	Thickness single side	Thickness both sides
Stainless steel	$\leq 4\text{mm}$	$\leq 8\text{mm}$
Mild steel	$\leq 3\text{mm}$	$\leq 6\text{mm}$
Aluminum	$\leq 2\text{mm}$	$\leq 6\text{mm}$
Brass	$\leq 1\text{mm}$	$\leq 2\text{mm}$
Copper	$\leq 1\text{mm}$	$\leq 2\text{mm}$

These values are indicational and depend of the material welded

PhotonWeld-A1600

Product characteristics

- **Maximum continue output power 1580W, Maximum Pulse Peak Power = 2850 W**
- **Welding depth in Continue mode reach to 6 mm**
- **976nm pump technology ,high efficiency WPE $\geq 42\%$**
- **Simple pendulum welding head,adjustable welding width 0-5mm**
- **High Frequency wobbling : max 300Hz**
- **Laser frequency = 1070 +-10nm**
- **Weight < 62kg, compact design ,small size**
- **Air cooling technology, ultra energy-saving inverter drive**
- **Supply voltage 220VAC-50/60Hz – 16A – Standard 220V plug**
- **Triple safety protection**
- **build-in gaz/air pressure monitoring**
- **Works with most protection-gasses : Argon, Nitrogen, Ar+/CO2mix, compressed air,..**
- **Dimensions : 650 x 300 x 621 mm (with Wheels)**
- **With EcolEner Energy saving technologie**

Material Welding Range PhotonWeld-A1600

Material	Thickness single side	Thickness both sides
Stainless steel	$\leq 5\text{mm}$	$\leq 10\text{mm}$
Mild steel	$\leq 4\text{mm}$	$\leq 8\text{mm}$
Aluminum	$\leq 3\text{mm}$	$\leq 6\text{mm}$
Brass	$\leq 1\text{mm}$	$\leq 2\text{mm}$
Copper	$\leq 1\text{mm}$	$\leq 2\text{mm}$

These values are indicational and depend of the material welded

Our newest designed PhotonWeld-A+ Series, is completely re-engineered with as target to be the best, the most compact, the most economical and the most safe Handheld Laser welding machine on the market:

Safety: The integrated workpiece detection

When developing the Wobble6-PRO+ system, particular attention was paid to laser safety. The Wobble-PRO+ series integrates all safety-relevant components of the laser source and uses them in during operation.

The integrated workpiece detection with the Wobble-PRO+ laser Welder ensures that welding is only possible when the handset touches the workpiece with the nozzle. This prevents uncontrolled emission of laser radiation.

In principle, 5 pre-requisites must be met in order for the laser beam to be triggered !

- First, the laser beam must be set active in the controller after the laser source is on, before starting to weld.
- Second the welding torch must be touching the component so that a test current can

TÜV has tested and approved that this type of safety concept meets the high safety requirements at **performance level d.**

(EN ISO 13849-2:2012 - Performance Levels).

flow between the welding nozzle and the control box. If the torch is lifted up from the workpiece, the laserbeam is immediatly interrupted.

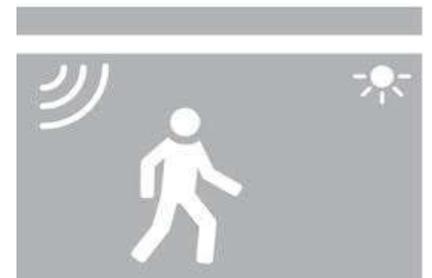
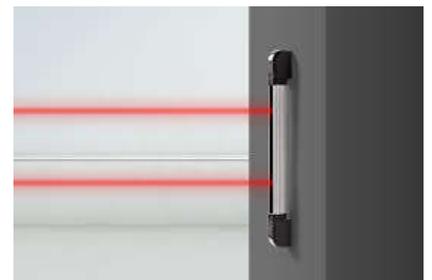
- Third, the welding torch button/switch must be pressed.
- Fourth : the (optional) footswitch must be actuated by the operator and
- Fifth : the external switch (optional) preventing people of entering the room when the laser is on, must be closed (closed door) or nobody could interupt the optional IR barriers
- If one of the 5 conditions is not met, the laser does not start and no laser beam comes out of the welding gun or when in action the safety controller shut down immediatly the laser beam. All safety control elements are designed to be fail-safe and consist of modules from well-experienced manufacturers.

Laser beam Emission indicator + external emission warning indicator control

The smallest sized with the biggest power (62% smaller size than wobble+ Series)

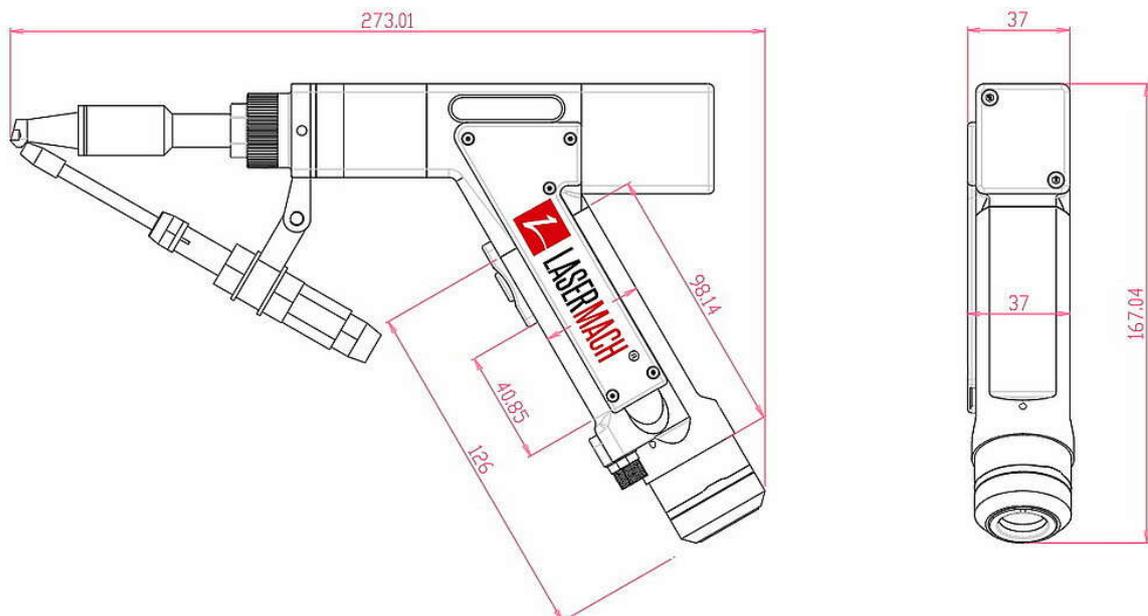
- The most energy efficient of the market (22 % less energy consumption)
- The only Continue Wave Laser Welder fully designed in Europe .
- The Safest handheld laser welding machine respecting on all following CE regulations:
 - EC 2006/42/EC – EC Directive Machinery
 - EC 2006/35/EU – Low voltage directive
 - ISO 12100 P1,P2 – Basic Standards Safety of Machinery
 - ISO 13857 Generic Standards Safety on hazard zones around Machinery
 - ISO 13849-1 Generic Standards Safety related Parts of Control System
 - ISO 13850 Generic standards Safety design of emergency stops
 - ISO 14119 Generic standards interlocking devices associated with guards
 - ISO 11145 laser equipment Vocabulary and symbols
 - ISO 11553-1 Safety standards of laser processing devices
 - ISO 11553-2 Safety standards of handheld laser processing devices
 - EN 60204-1
 - EN 60825-1
- Triple protection of the fiber laser Cable (10m QHB standard maxi 10 kW CW laser power)
- Laser beam Emission indicator + external emission warning indicator control
- Remote interlock connector with Multi safety interlocks: nozzle contact interlock, door contact (external) interlock, foot pedal (dead's men pedal) interlock (opt.), key control lock, internal and external emergency stop (opt.)
- Failsafe start-stop control

- Automatic control of external fume extraction device with delayed stop



Superior High Tech Intelligent and portable Handheld Fiber Laser Welder

PhotonWeld-A+Series: Lasermach's Handheld Fiber Laser Welding Machine is a new type high-tech, high-power and super high-end continuous welding tool which adopts a high-quality fiber laser source to produce a fiber optic beam. After transmission processing, the light is focused on the workpiece to achieve continuous welding. It avoids the two thresholds of thermal strain and post-treatment, and is environmentally friendly and pollution-free, greatly improving the joint strength and quality of welding.



Lasermach High-Tech High speed axis Wobbling Fiber laser Welding Torch

The Intelligent Laser Welding System is specially developed for complex and High-Tech handheld laser welding applications. Really simple and easy to operate, no technical knowledge required. It is a multi-functional application system, which is able to control the laser power, frequency, and it has a variety of welding functions suitable for spot welding scenes and seam welding, the beam can be dithered with a width of 0,2-4mm, suitable for welding with complex, High-Tech and irregular workpiece. Simple works also done faster!

Dust/fume-Proof Design : Patented Double Protection windows against dust and spatter

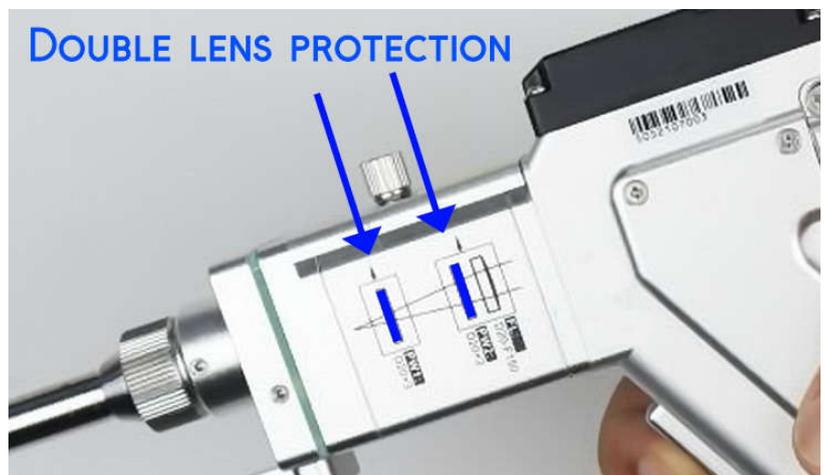
Never change your expensive lenses again!

As the name suggests, protective lenses are protecting the laser welding head. To prevent dust and slag make damage to the internal lens of the laser head, one extra protection lens has been mounted. Pay attention to the fact that the laser head protection lens is a wearing part.

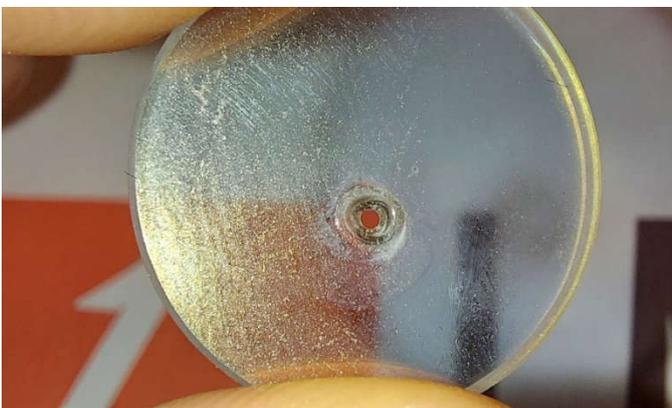
Double protection lens design, better dust resistance: By adding a second

protection window, dust, fume, spatter and dirt never get a chance anymore to contaminate your main lenses and reduce the efficiency of welding. While exchanging the first protection window, your valuable lenses stay fully protected with a second protection window. This

feature keeps your lenses and mirror always clean and results in almost never needed to change your lenses! this creates an annual money and time saving!.



This is why you need double lens protection!



This picture shows the result of a “splash” from galvanised steel welding, when the zink vapor explodes and one spatter enters in full force into the laser channel. If no second protection window behind, the lenses and mirror could be heavily damaged! With the wobble6-PRO+ this will never happen again!

Fast adjustable and changeable Nozzle



- Weld always with the perfect nozzle and the exact focus length
- Adjust the focus length of your welding nozzle in seconds
- Change your nozzle, and only the top of the nozzle in a flash
- Custom made nozzles are easy to make
- different nozzle-ends available for specific use
- A Full package of 8 different welding nozzles come standard with the machine, there is no job you can not handle anymore!
- Cutting nozzle with nozzle top replacing insert for perfect laser cutting



Do I need a Continue Wave laser welding Machine or a Modulated pulse laser welding Machine?

You do NOT have to choose anymore! With our PhotonWeld® you can do so much more: Continue wave welding, modulated pulse welding, high energy pulse welding, stitch welding, precision timed pulse welding, auto fish scale welding,..

- We have developed the most high Tech laser Wobble Welding controller on the Market available today!
- Our controller offers extreme precise Laser Welding capability with a perfect finish of every job!
- Controller with **smart Welding Technology database integrated!**
- **Material Welding database integrated : 55 fixed welding settings for most materials and thicknesses are standard inside:** Welding Technology Database available with recommended settings for most of the materials: steel, stainless steel, aluminium, brass

Quick query table with Preset parameters for the PhotonWeld A1500+						
Material / Working Mode /thickness		0.5 mm	1 mm	2 mm	3 mm	4 mm
Stainless Steel	Continuous Mode	S.00	S.01	S.02	S.03	S.04
	Modulation Mode	S.05	S.06	S.07	S.08	S.09
	With wire feeding	S.10	S.11	S.12	S.13	S.14
Carbon steel	Continuous Mode	S.15	S.16	S.17	S.18	S.19
	The pulse Mode	S.20	S.21	S.22	S.23	S.24
	With wire feeding	S.25	S.26	S.27	S.28	S.29
Aluminum	Continuous Mode	S.30	S.31	S.32	S.33	
	The pulse Mode	S.34	S.35	S.36	S.37	
	With wire feeding	S.38	S.39	S.40	S.41	
Brass	Continuous Mode	S.42	S.43	S.44	S.45	
	The pulse Mdoe	S.46	S.47	S.48	S.49	
Copper	Continuous Mode	S.50	S.51	S.52		
	The pulse Mdoe	S.53	S.54	S.55		

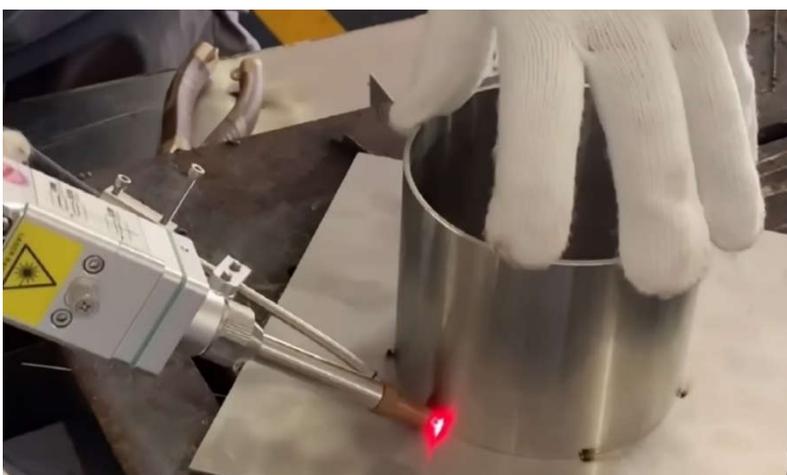
- Your own **specific Welding settings: 20 customized welding and material settings** can be programmed, this never to forget your "special" settings: Never forget a special welding parameter setting anymore. Keep special jobs with special settings in the memory!
- let the controller advise you and you can make the fine tuning, this to make the welding even better adapted to your specific job
- Super fast changeover to another welding job



Continuous Wave Laser welding: optimal seam welding

CW Laser Welding Machine have the characteristics of continuous precision welding of various materials which is optimal for seam welding, assembly welding,..: you weld with a continuous meltpool like all good welding machines wwith the very best results for the strength, quality and porosity of your welding seam. in combination with our Wobble technology you can weld virtually every metal.

Modulated pulse laser welding: perfect pre-assembly



Fully digital controlled Single Pulses from 0 to 1000msec

Optimal for fixing components before welding,

mould repair, super thin material welding,

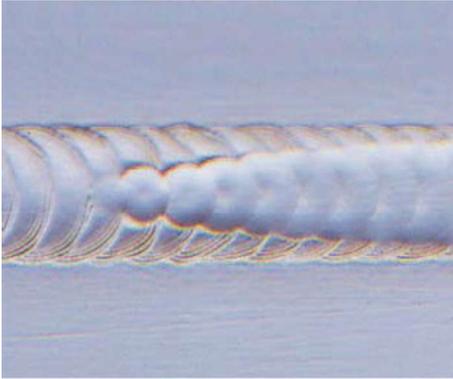
pointwelding with identical welds for perfect assembly

Advanced parameter settings: optimized Laser welding!

- Every aspect of your welds can be adjusted set by the parameters to give you the very best result.
- Extreme possibilities of Finetuning to be able to run your Wobble laser welder like a winning F1-pilot. Ramping, pregas, aftergas, continuous welding, modulated pulse welding, high energy pulse welding,

wobble speed adjusting, wobble dimension, wobble frequency, pulse speed, pulse length, single pulse welding, multi pulse welding, etc

Soft Start - Soft Stop Function



SOFT Start is a software function developed by lasermach that affects the laser welding process by optimizing its performance, specifically at two critical points: **the start and end of the welding process**. By modulating the power delivered by the laser beam in the initial and final phases of the process, SOFT Start/Stop is able to avoid the onset of porosity and cracks, marginal incisions – surface depressions that can be generated at the end of the weld bead, as well as prevent the formation of any other aesthetic and functional defects.

Power Ramp: optimized welding at critical points

POWER RAMP operates, at the start of the welding process, by reducing the power supplied by the laser beam and gradually increasing it until the selected nominal value is reached. In the final phase, SOFT POWER RAMP operates inversely, reducing the nominal power delivered by the laser beam to obtain a gradual shutdown. Seam Weld power ramping tapers power for optimal overlap and crack-free hermetic welds.

It allows optimizing the metal solidification and melting phases so as to avoid sudden temperature changes, thus reducing the shrinkage tensions of the material. As result :

- The machined piece is free from functional defects, and therefore conforms to its original design intent.
- The welding bead appears aesthetically uniform and does not require subsequent polishing jobs.



Automatic Seam Rippling or Fish scale patternwelding function included in our new PhotonWeld© Laser Welding Machine

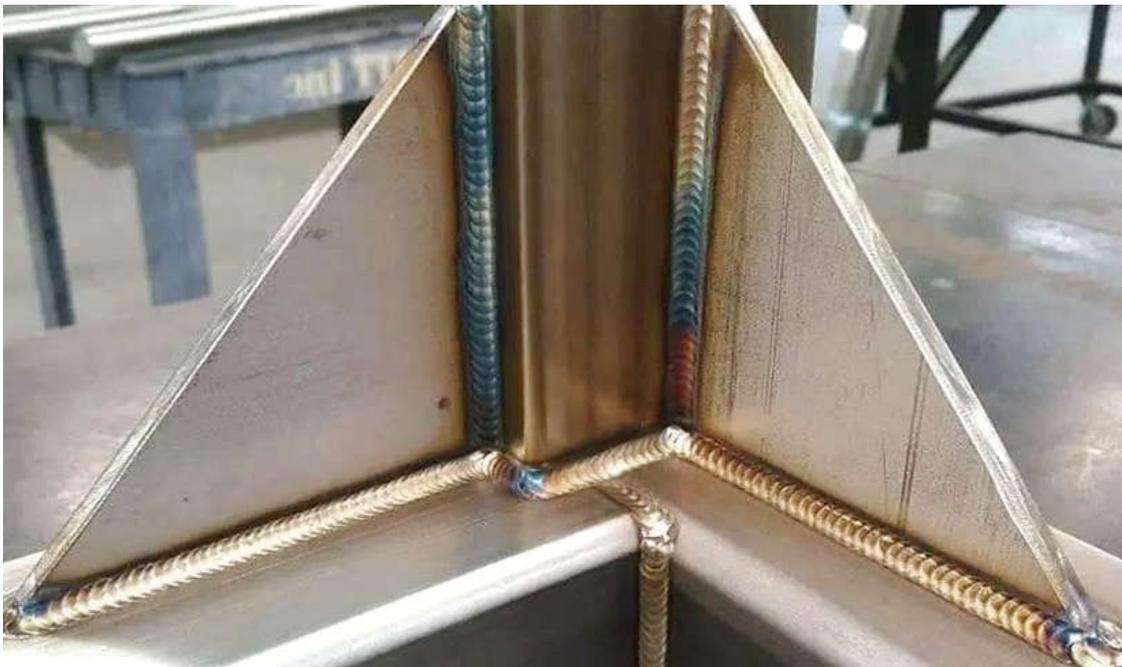


 Fish Scale

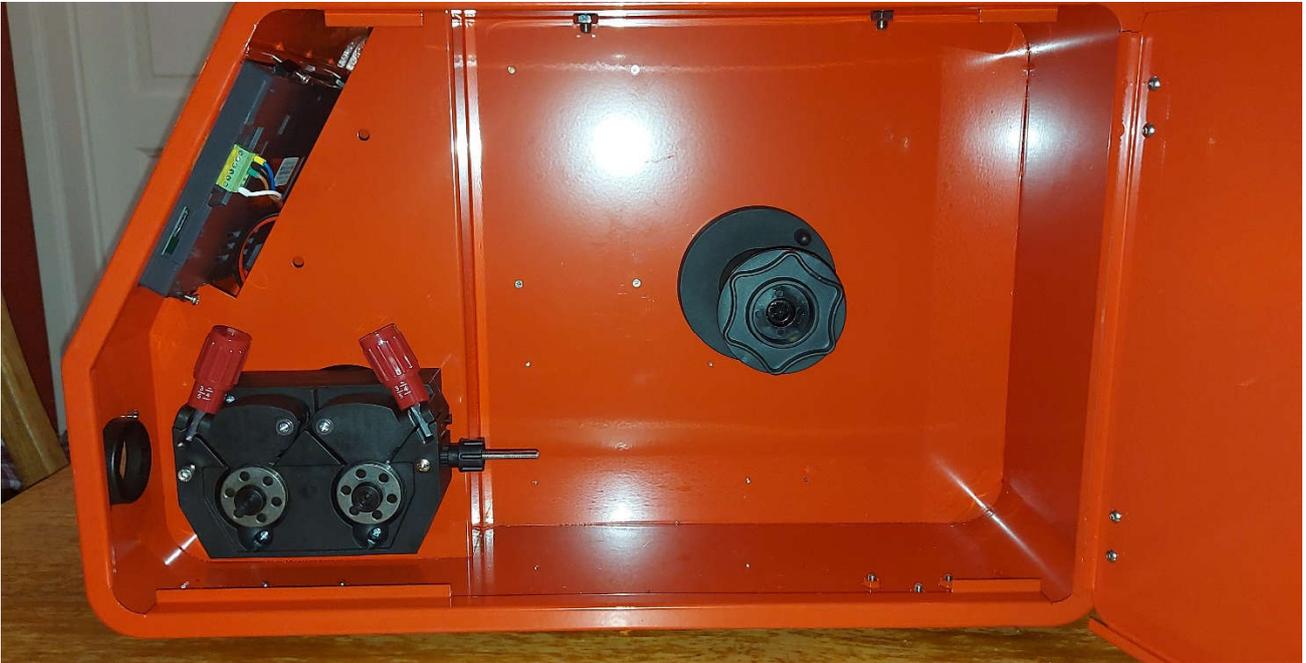
Seam optics – Seam rippling – Fish scale pattern

With visible seams, a flawless appearance is vital. A smoothly rippled seam appearance with an extremely fine texture is often required

Seam rippling or Fish scale welding represents the highest level of welders in the industry and, of course, with the highest salary. As a matter of fact, it is not difficult to understand fish-scale welding, because the surface after welding looks like fish-scale. Fish scale welding is also known as continuous spot welding. Fish scales welding is the most professional technique, the shape is beautiful, it's anti-oxidation for no oxide inside of the materials, nor other harmful air, and it can bear heavy force, frame welded by this technique is a guarantee for long time use.



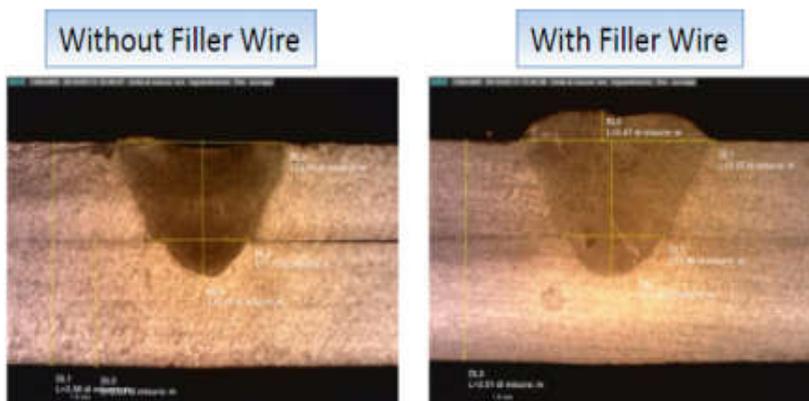
PhotonWeld+ Series: Standard equipped with our Wobble-Drive4 high precision full digital wire feeder with touch screen.



WOBBLE-DRIVE4 – precise wire feeding for professional welding seam results

The new wire feeding unit WOBBLE-DRIVE4 of Lasermach equipped with the special 4-roller drive (2 + 2) offers a constantly precise wire feeding for manual and automated laser welding. With the intuitive menu guidance in touch screen of the wire feeder, individual settings of wire feeding are simple. The detailed customization possibilities to each welding task lead to an optimal result.

Together with the PhotonWeld+ Laser Welding Machine, the wire feeding unit WOBBLE-DRIVE-4 forms the ideal system for welding long seams in a time-saving, comfortable and process-safe manner. The wire feeding system can be easily adapted to various welding processes via customized wire guides.



***Fiber laser welding
gun with digital
wire feed
STANDARD***



The advantages of the compact and robust WOBBLE-DRIVE4 at a glance:

Wire speed adjustable from 0.2 to 8.0 m/min

- Fine adjustment of wire speed in steps of 0.02 m/min
- prepared for wires of 0,8 - 1,0 - 1,2 - 1,6mm
- 2 driven wire feeding rolls for minimal slippage and maximum feed constancy
- Fully integrated into welding system Controller
- Full digital motor control - speed - forward - backward - retract
- Individually customizable wire retraction
- Finely adjustable interval function to define the seam shaping and optics
- Standard remote controller (potentiometer or up/down) – for automated laser welding
- Single standard low voltage connection / quick coupling



Our PhotonWeld-A+ Series Combines laser welding, laser cutting and Laser cleaning in one Machine !

Today's fiber laser sources have the power and beam quality needed to cut and join metal in an expeditious and repetitious manner. The market demands that type of flexible production, so those characteristics are basic requirements in modern laser devices.

Market demands also have promoted the idea of multifunctional processing. That has led to the development of a combination head capable of laser cutting and welding 3-D metal workpieces.

The "wobble-4+," can perform 3-D cutting and welding in an arbitrary sequence without retooling. Part handling, positioning, and clamping steps are eliminated with this approach. The result is reduced production time and costs, as well as improved manufacturing accuracy.

Moreover, the combi-head opens up the door to fabricating complex metal components with a range of variants, which could not be produced cost-efficiently before.



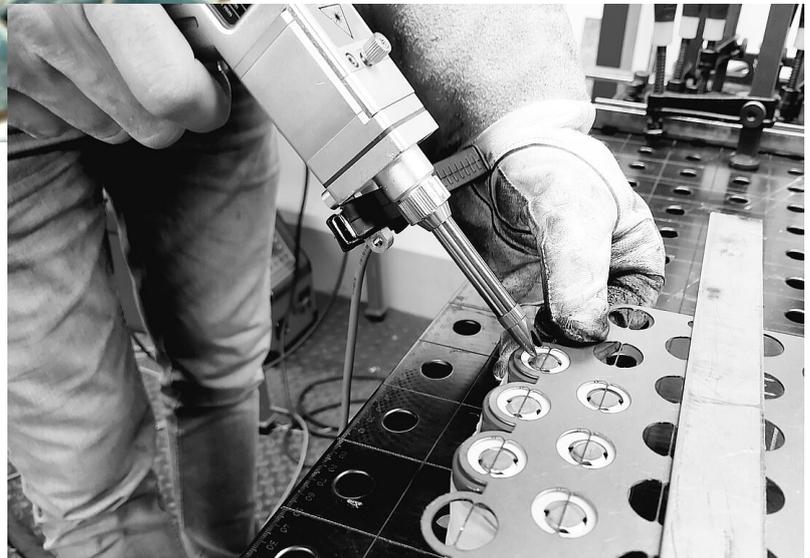
While the concept of multifunctional laser processing is straightforward and the market seems to be ready for such a device, some technical problems had to be solved before it became reality.

New PPW- technology : Perfect Pulse Welding



**Fully programmable
pulse from 1 to 1000
msec
with up and down-
ramping**

Super High Precision Pulse
welding for assembly jobs:
Fully programmable pulse (1
till 1000 msec)!



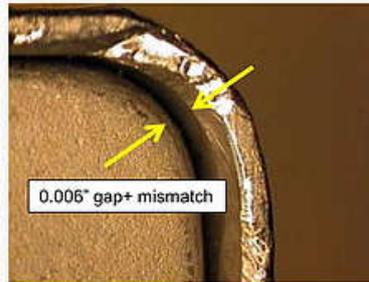
*Battery Welding
with a mili-
second
programmed
pulse with up and
down ramping*

Seam Sealing Butt Weld with Loose tolerance - Bridge wide gaps with our Wobble-technology

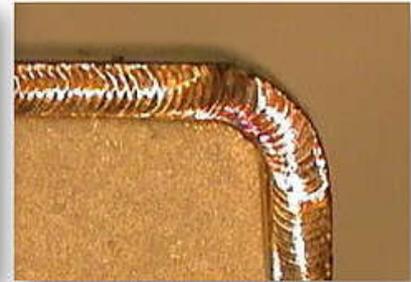
Larger Wobbling Spot Size helps bridging bigger gaps
The required tolerance for fit-up is reduced

The lower tolerances needed reduce the machining costs

None tolerance parts can still be used : less scrap, less losses = big savings = Maximum yield and quality of welded part



Before weld a 0,15mm gap



After welding a perfectly sealed part

Dissimilar Metal Welding

Different metals perfect joining by Fiber laser

A material's weldability is a factor. Most common materials a fab shop will process—be it carbon steel, stainless, or aluminum—have been successfully laser welded for years, using both continuous wave and pulsed modes. Lasers have performed dissimilar-metal welding, and specialized weld joint designs in galvanized material have even accounted for zinc outgassing. Moreover, a multikilowatt fiber laser has been shown to successfully weld even the most challenging of materials, including copper ([Sample picture is copper joined with stainless steel by fiber laser welder](#))



Material 1	Material 2	Comments
Aluminum	Cold rolled steel	Can be bonded; brittle intermetallics are created at the interface. Fitness for purpose testing essential.
Aluminum	Copper	
Stainless steel	Nitinol	
Stainless steel	Titanium	
Stainless steel	Inconel	OK with certain alloys (304 with 600/700), need to watch for cracking. When welding, offset into the steel to promote high Cr/Ni ratio in weld metal
Stainless steel	Copper	OK
Copper	Phosphor bronze	OK
Titanium	Aluminum	OK with certain aluminum alloys (1xxx & Ti-6Al-4V)

Experience has shown that certain metals and alloys are suitable for laser welding. The welding behavior of metals is governed by their metallurgical properties. Next Table shows a comparison of the laser weldability of various metals. A value of 10 represents excellent weldability and a value of 0 represents very poor weldability. Some metals that have a metal constituent with a low boiling point (such as brass) have weldability problems because the low temperature component tends to boil off rapidly. This behavior may lead to porosity and poor-quality welds.

Metal	Laser Weldability (10 = excellent; 0 = very poor)	Comments
304 stainless steel	10	Excellent metallurgy
Low-carbon steel	9	Good metallurgy
Nickel	8	Needs clean surface
Inconel 625 (nickel alloy)	8	Porosity in deep welds
Titanium	8	Needs low oxygen and nitrogen
410 stainless steel	7	May crack
High-carbon steel	6	Cracking at high carbon content
Aluminum	6	High reflectivity
440C stainless steel	3	Needs heat treatment to reduce cracking
6061 aluminum alloy	2	Magnesium may boil off
Brass	2	Zinc boiloff causes porosity
Galvanized steel	1	Zinc boiloff causes porosity
Copper	1	Excessive reflectivity, especially for CO ₂ lasers
Gold	0	Excessive reflectivity



Laser safety: Laser protection class 4 applies to our Wobble manual laser welding equipment when in operation.

Different measures are therefore required on the customer side to ensure laser safety, such as the appropriate training of employees, wearing special protective equipment and setting up a separate laser safety area.

Laser safety = Class 4 Laser

that produce high-output hazardous diffuse reflection. Not merely direct beam contact with the skin or eyes even momentarily is regarded as hazardous, even diffuse reflection is regarded as injurious to skin and eyes. It is also believed to cause fires.

Preventive Measures

There is need to enhance safety measures protecting against laser light to avoid grave injuries and after-effects. Injuries do not occur merely from exposing the body to laser light, secondary injuries are also possible from inhaling toxic gases produced by laser light irradiating objects such as workpieces and peripheral equipment (gases and fine particles). herefore, there is a need for laser workers and managers to take a variety of measures to avoid laser accidents.

Protection with Laser Shield Windows and Curtains

Windows and curtains made of the similar special materials as laser protective eyewear protect the eyes of not only nearby workers, but also the eyes and skin of people nearby. It is necessary to make a selection based on the type of laser oscillator (wave length) and output power.



Protection with Laser Protective Eyewear

Protection of the eyes with eyewear made of special materials is necessary so that laser light does not accidentally strike the eyes. It is necessary to make a selection based on the type of laser oscillator (wave length) and output power.

Safety Display to Inform of Laser Use with Panels and Plates

There are panels and plates to post at the entrances of rooms to inform that lasers are being used in the vicinity.

These panels and plates need to be posted by users of the laser equipment (device) themselves.

Safety Displays with Stick-on Seals and Labels for Laser Oscillators and Devices

Hazard displays with seals and labels draw attention to the hazard of lasers and processors.

In compliance with JIS C6802 the manufacturer of the laser equipments must display the seals and labels.



Wobble+PRO contains a Class 4 Laser that produce high-output hazardous diffuse reflection. Not merely direct beam contact with the skin or eyes even momentarily is regarded as hazardous, even diffuse reflection is regarded as injurious to skin and eyes. It is also believed to cause fires.



We DO care about your health:

Every PhotonWeld laser Welding Machine is delivered with 2 sets of protection Goggles and one quality laser protecting Face Mask with big window: one goggle to wear over standard glasses and one ultra light and super comfortable protection goggle.

These goggles are protection class OD7+ and Full CE, the facemask is protection clas OD6+ and CE

Basic welding penetration thickness ↓					
Laser power	500W	800W	1000W	1500W	2000W
Mild-steel /Carbon steel	≤1.0mm	≤1.2mm	≤3.0mm	≤4.0mm	≤5.0mm
Stainless steel	≤1.0mm	≤1.5mm	≤2.5mm	≤4.0mm	≤5.0mm
Aluminum	NOT	≤1.0mm	≤1.5mm	≤2.5mm	≤3.0mm
Brass	NOT	≤1.0mm	≤1.5mm	≤2.0mm	≤2.5mm
Galvanized sheet	NOT	≤1.2mm	≤1.8mm	≤2.5mm	≤3.0mm

Why PhotonWeld Laser Welding?



Laser welding of sheet metal is very cost-effective

Many customers are misled into thinking that laser welding is out of their price range. However, despite its superior results and use of advanced technology, laser welding is actually highly affordable, with production prices much lower than conventional ARC welding when compared to the total process cost.



Laser welding minimizes drastically the need for grinding or finishing in post-welding.

During both MIG and TIG welding operations, residual spatter can—and often does—occur on the workpiece. In addition, both of these processes usually add filler metal to the weld joint. This excess material must be removed, generally through grinding or similar finishing processes, before the part goes on to further processing operations or into use. By contrast, laser welding employs such a focused, brief application of heat that there is virtually no spatter or material buildup. This quality streamlines the manufacturing process for laser welded parts as the pieces do not need to undergo post-welding grinding or other finishing operations and can proceed directly to painting and/or assembly



Laser welding is very fast and highly efficient.

Faster processing speeds are important to both reducing project lead-times and decreasing overall production costs. Laser welding is far quicker than alternative welding methods.

For example: Laser welding has proven to be...

- Up to 40 times faster than TIG welding
- Up to 10 times faster than MIG welding

By choosing to use the laser welding process for your welding projects, you as industry professionals can drastically cut lead-times and labor costs. The increase in processing speeds when using laser welding techniques is aided

by the employment of eventual advanced robotic technology. The robotic components support even more faster welding speeds (ranging from 1250 to 2500 mm per minute) as well as more precise and accurate weld locations. These qualities translate to quick and consistent results with an extremely low error rate.



Laser welding uses highly focused, high-intensity heat transfer application with very small heat-affected zone

The use of a highly focused, high-intensity laser beam during laser welding operations provides a much higher weld speed and minimizes the size of the workpiece's heat-affected zone (HAZ). This smaller HAZ translates to better functional and aesthetic characteristics—in particular, the main benefit is the mitigation or elimination of thermal warping.

When heat is applied to a large area or for an extended period of time, the metal workpiece often experiences warping, which can weaken the structural integrity and aesthetic quality of the finished piece. The laser welding process addresses both of these concerns as it creates a strong and aesthetically appealing weld.

Preventing warping is especially crucial for parts where the joint may be visible or subjected to heavy loads.



Laser welding creates strong joints comparable to those produced by conventional welding.

During laser welding operations, welders can create two different types of welds: keyhole and cosmetic (or conduction) welds. Keyhole welds are generally deeper than they are wide and are generally not cosmetic in appearance.

In contrast, conduction or cosmetic welds are wider than they are deep and are more likely to be produced with longer applications of continuous waves. Both methods yield extremely strong welds with a high depth-to-width ratio comparable to those produced during conventional welding operations.