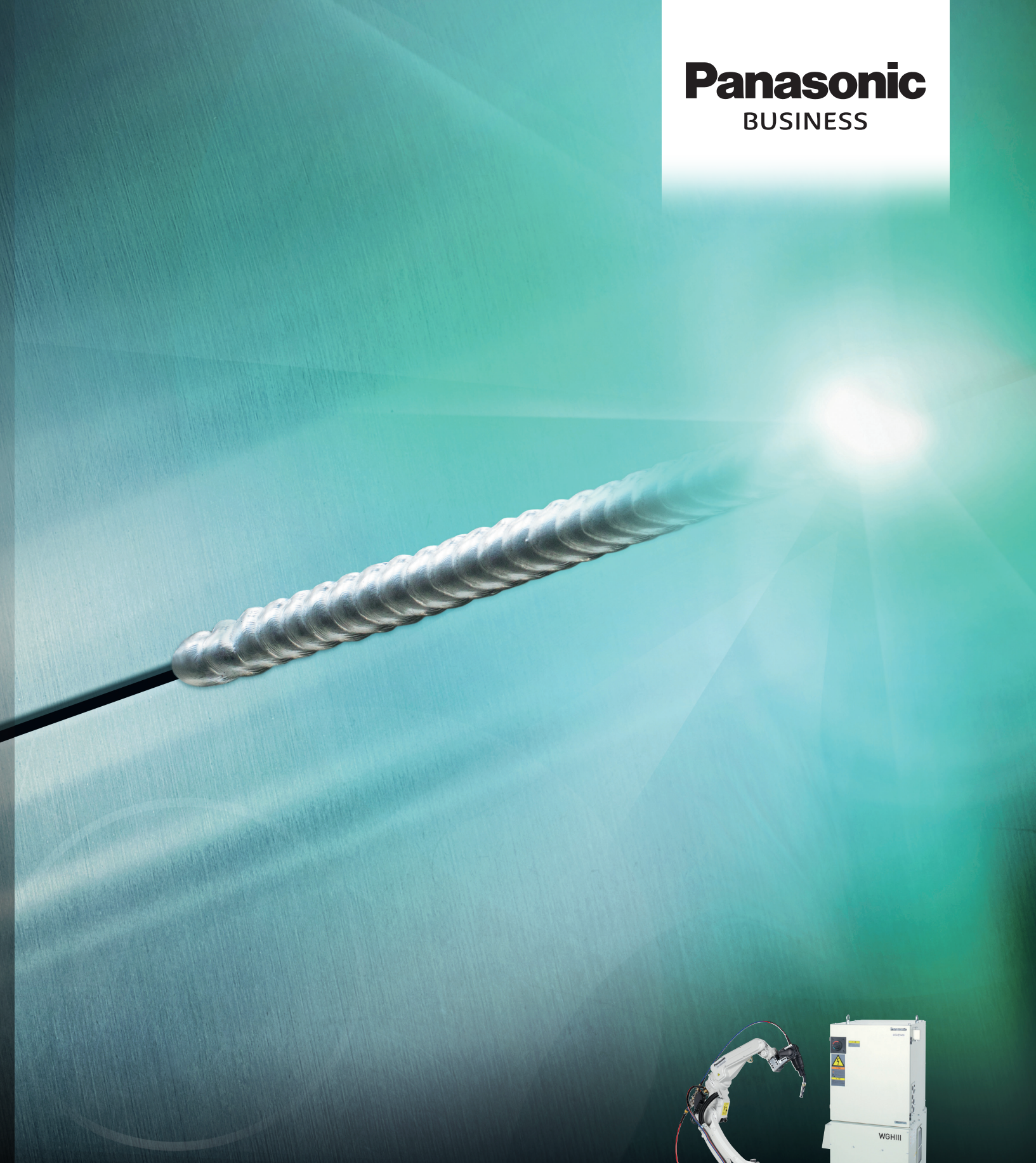


Panasonic
BUSINESS



SIMPLY WELDING.

INTEGRATED ROBOT WELDING SYSTEM



TAWERS™
The Arc Welding Robot System

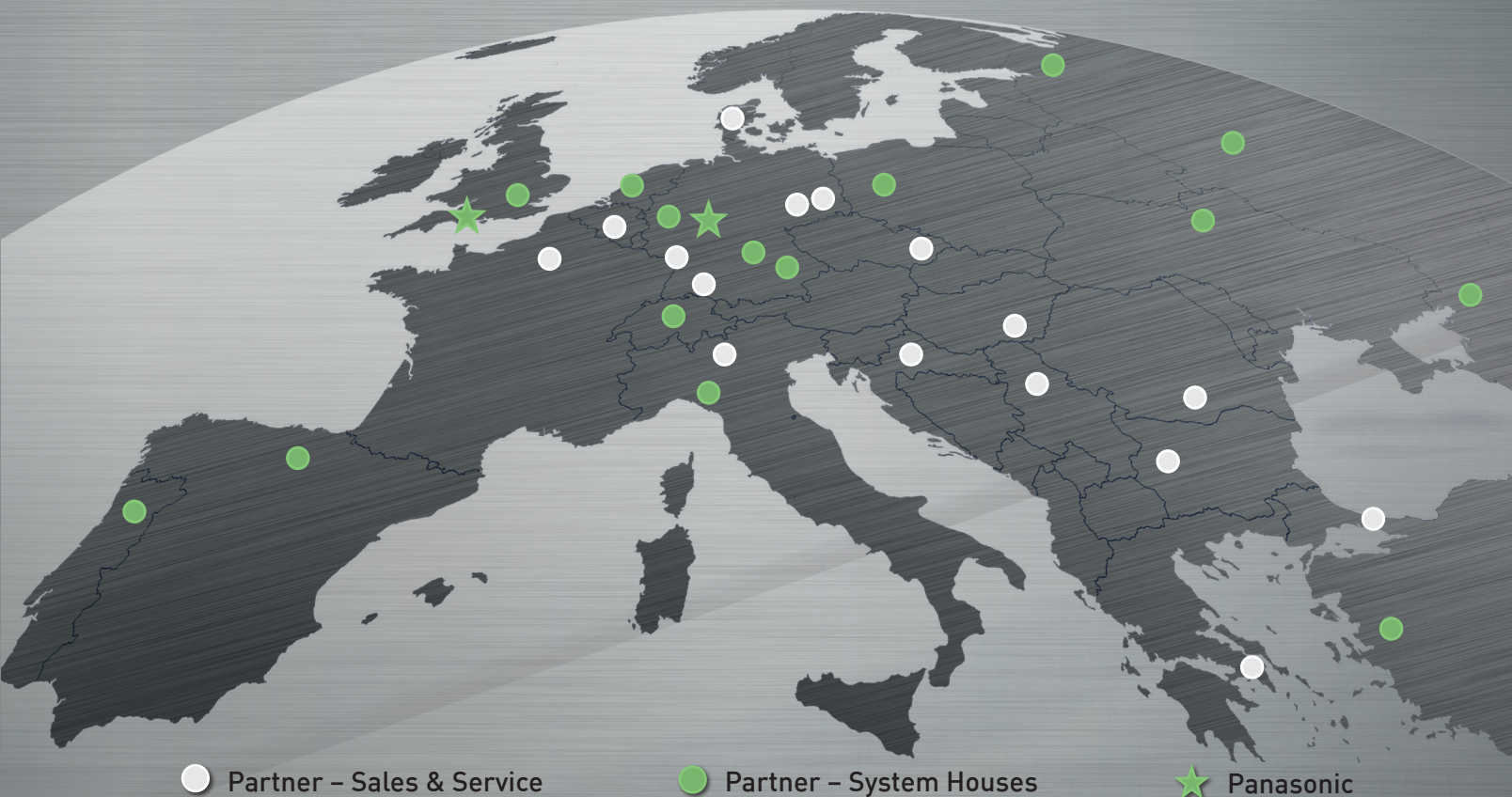
www.panasonicrobotics.eu

COMPANY PROFILE

Since 1957, a total of 60 years, Panasonic has been developing innovative products and processes for welding technology. Areas of application are laser welding, Metal Inert Gas welding (MIG), Metal Active Gas welding (MAG) and Tungsten Inert Gas welding (TIG) for robot as well as manual welding. Panasonic Robot & Welding Systems Europe, headquartered in Neuss, Germany, is the European sales and engineering center for all welding products. The state-of-the-art competence and training center has a welding test area for all actual robot welding systems. Panasonic is also represented in almost every European country with a broad-based system and sales partner network. Our goal is to support the entire industry with “everything from one manufacturer” solutions in the field of robot welding applications.

PRODUCTS & SERVICES

Panasonic Robot & Welding offers turnkey, automated welding systems for arc and laser welding – with welding robots, welding power sources, welding torches etc., void of interface problems for various welding tasks in industrial production. Whether general industry or the automotive industry, we always offer the optimum solution based on user requirements for the product to be produced.



THE ROBOT WELDING TECHNOLOGY

TAWERS

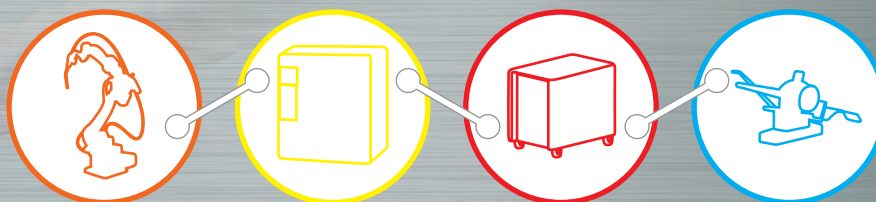
THE ARC WELDING ROBOT SYSTEM

Fusion of robots, robot controller, power source and servo wire feed together in one unit.

Faster, better and worldwide unique. Everything from one manufacturer. The idea behind TAWERS is based on the "fusion technology" contained in TAWERS, whereby the robot controller is fused with the welding power source controller. All control parameters such as data processing and programming sequences for the welding power source, the wire feed and the robot are combined on a 64-bit CPU PCB. This technology enables up to 250 times faster communication, eliminating virtually any delay in information flow between the individual components.

The result is unique and allows many special functions to increase the quality and productivity of TAWERS, e.g. SP-MAG, lift start and lift end, automatic wire distance control, welding data monitoring, collision detection etc.

CONVENTIONAL COMMUNICATION OVER INTERFACES



INTEGRATED ROBOT WELDING SYSTEM



TAWERS[™]
The Arc Welding Robot System

WGIII = 350 A
WGHIII = 450 A

TAWERS - SIMPLY EXPLAINED

NO INTERFACE PROBLEMS

64 BIT CPU

INDUSTRY 4.0

ETHERNET

MAXIMUM FLEXIBILITY
OF WELDING PROCESSES

REDUCTION OF
PRODUCTION COSTS

HIGH PROCESSING
SPEED

OPTIMUM ACCESSIBILITY
THANKS TO THE
SLIM CONSTRUCTION

FAST AND
EFFICIENT



TAWERS
The Arc Welder

Fusion of robots,
robot controller,
power source and
servo wire feed to
a complete system.

Faster, better and
worldwide unique.

Everything from
one manufacturer.





USER-FRIENDLY
HANDLING

WELD DATA
MONITORING
AND RECORDING

EASY CREATION OF
WELDING PARAMETERS
THROUGH WELD
NAVIGATOR

TAWERS™
Arc Welding Robot System



TAWERS 100 KHZ INVERTER TECHNOLOGY

SPATTER REDUCED
WELDING

HEAT INPUT
REDUCED WELDING

THIN AND THICK PLATE WELDING
WITH ONE POWER SOURCE

PREVENTION OF RE-WORK

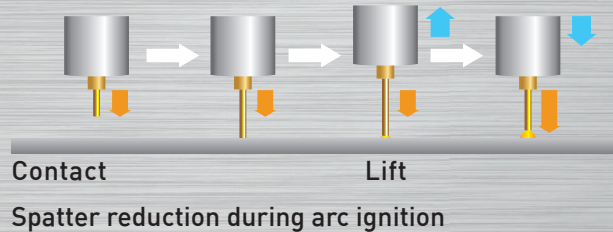


STANDARD FUNCTIONS

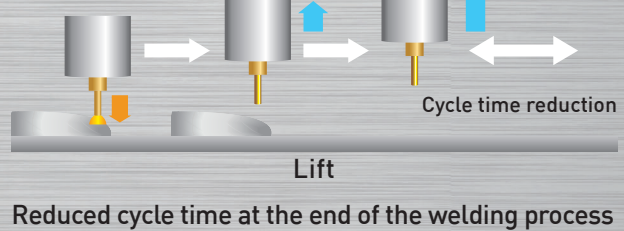
LIFT-START/LIFT-END

At the start and end of the welding process, the robot quickly lifts the welding torch. By coordinating the robot movement with the specified welding parameters and the wire feed control, quality and cycle time are improved.

Lift-Start

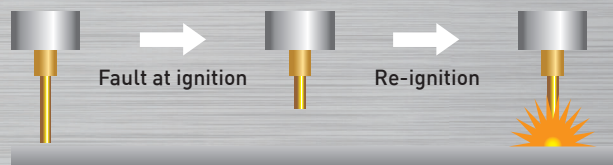


Lift-End



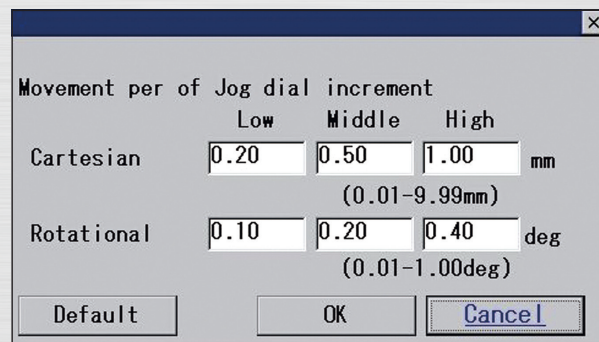
REPEAT FUNCTION FOR ARC IGNITION

If an error is detected when the arc is ignited, the robot automatically starts a new ignition attempt.



INCREMENTAL MOVEMENT

This function allows the robot to move a set distance by clicking on the jog dial. This function is useful when working in narrow and limited spaces, or when fine tuning the robot position.

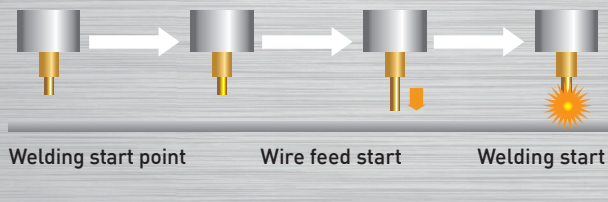


TORCH ANGLE DISPLAY (CONTROL PANEL)

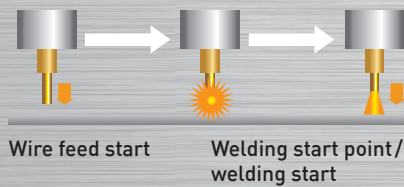
The torch angle display on the robot control panel reduces the component programming time and leads to an improved weld seam appearance.



Standard welding start

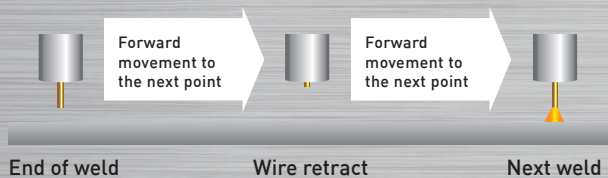


Flying start



FLYING START

Gives the start/end command a short time before the beginning/end.



AUTOMATIC WIRE RETRACT FUNCTION

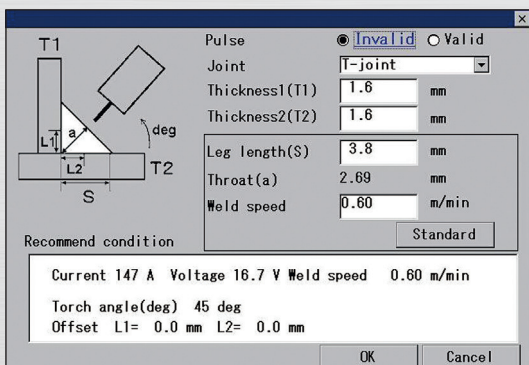
When the robot moves to the next welding start point, the welding wire is automatically retracted, thereby improving the re-ignition.



WELD NAVIGATION ENABLES PARAMETER DETERMINATION

A large parameter database based on our experience is available for your selection.

The weld navigation system guides you quickly and safely to a perfect weld.



SIMPLE CALCULATION OF WELDING PARAMETERS

Input of plate thickness T1 and T2 as well as seam type.

Finished! You immediately receive the recommended parameters.

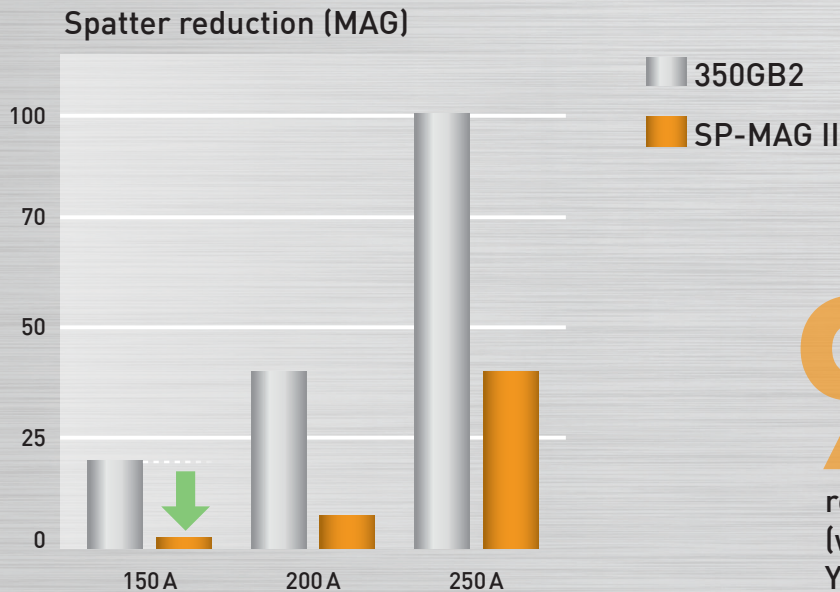
THE OPTIMISED SHORT ARC SUPER IMPOSITION CONTROL SP-MAG-PROCESS

Application: Steel/austenitic stainless steel 1 – 2 mm plate thickness

Arc: Up to 200 A

Advantages: Drastic reduction of the weld spatter, highest seam quality with low heat input

COMPARISON SPATTER GENERATION

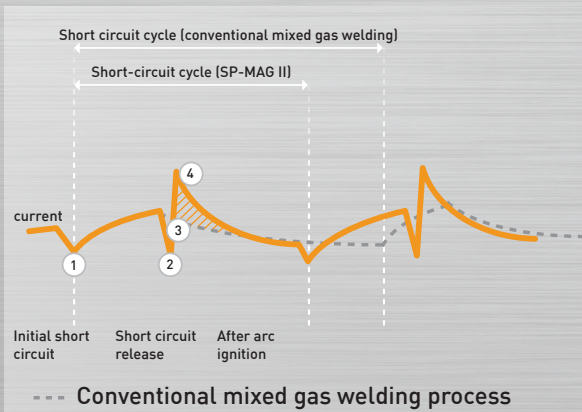


90%

reduction in spatter at 150 A
(when compared with the
YD-35062 power source)

OPERATION PRINCIPLES

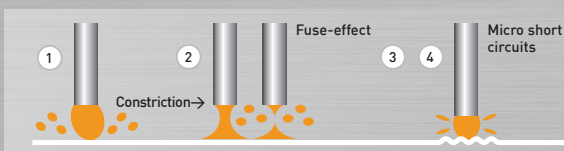
SP-MAG II welding characteristic line



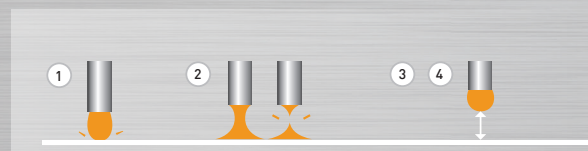
1. A stable short-circuit sequence is achieved by the superimposition of the waveform.
2. The constriction control detects neck constrictions at the droplet and immediately starts the current reduction in order to avoid the fuse-effect.
3. The HS (Hyper-stabilisation) control prevents micro-shorts by reducing bead vibration, resulting in low spatter formation.
4. The perfect super-imposition of the process parameters (SP – super-imposition) allows current increase directly after the short circuit to achieve a significantly higher deposition rate. This control behavior affects the droplet size and shape at the wire end through the “secondary switch” function. This significantly reduces possible welding spatter.

At an inverter frequency of 100 kHz

Conventional mixed gas welding process



SP-MAG II



THE INNOVATIVE IMPULSE ARC HYPER DIP PULSE HD PULSE PROCESS

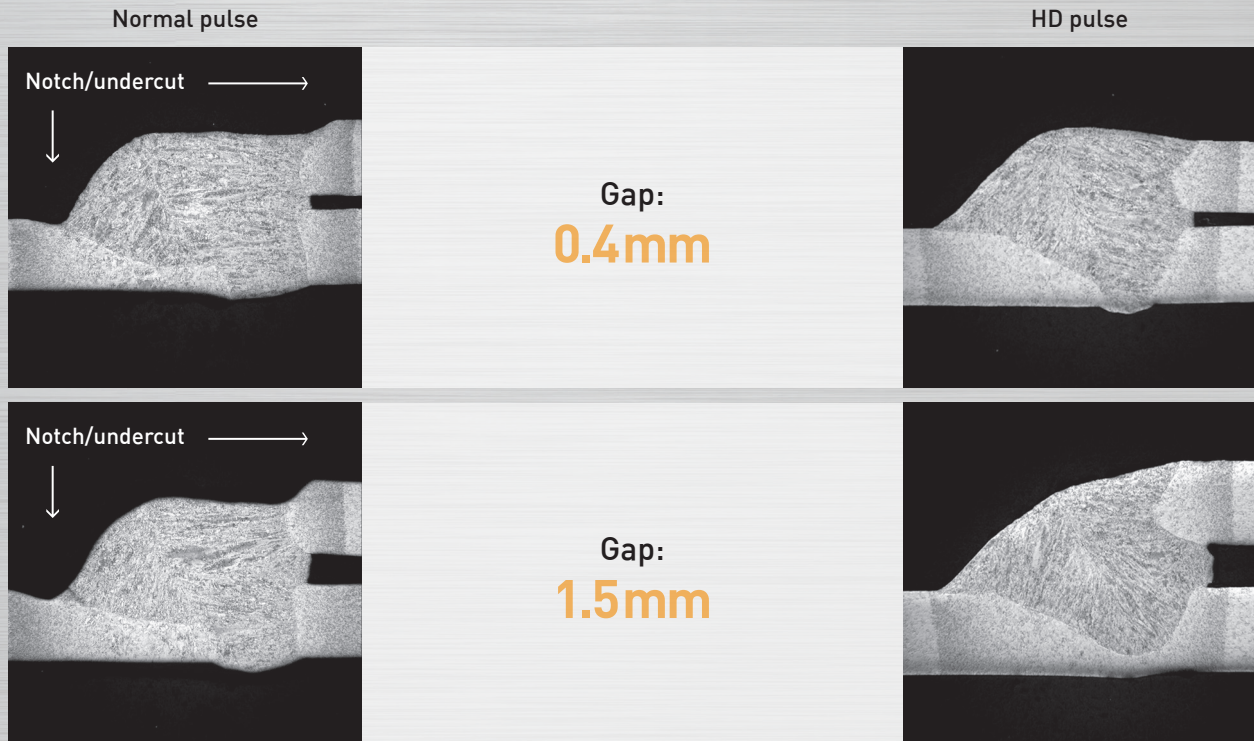
Application: Steel > 3 mm sheet thickness

Arc: Up to 350A

**Advantages: Better penetration/better quality at higher welding speeds,
low notch/undercut effect**

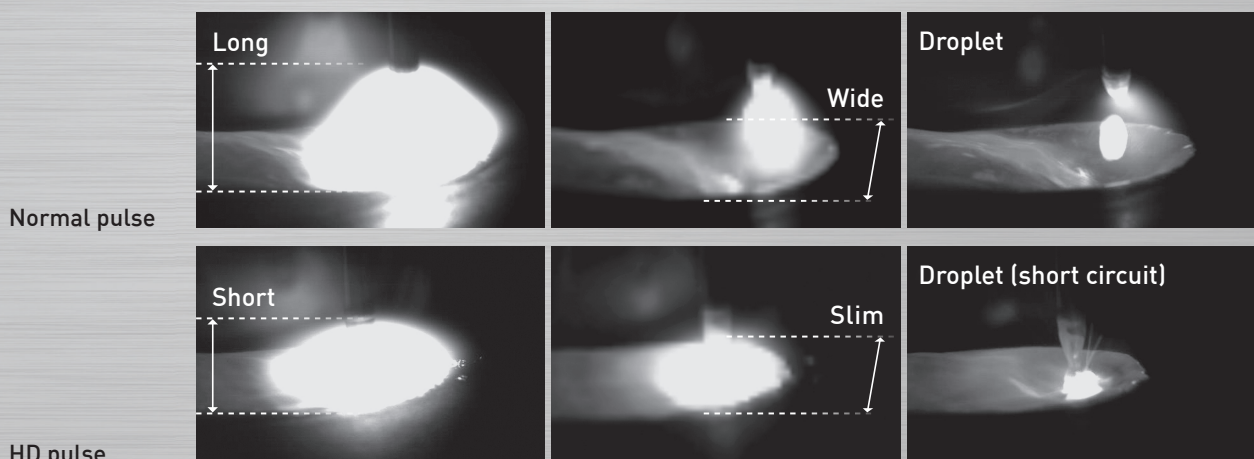
ADVANTAGES

HD pulse allows high-speed pulse welding

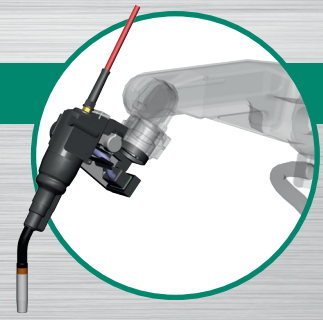


OPERATION PRINCIPLES

Type of droplet transfer



THE COLD WELDING PROCESS FOR BEST QUALITY ACTIVE WIRE PROCESS (AWP)



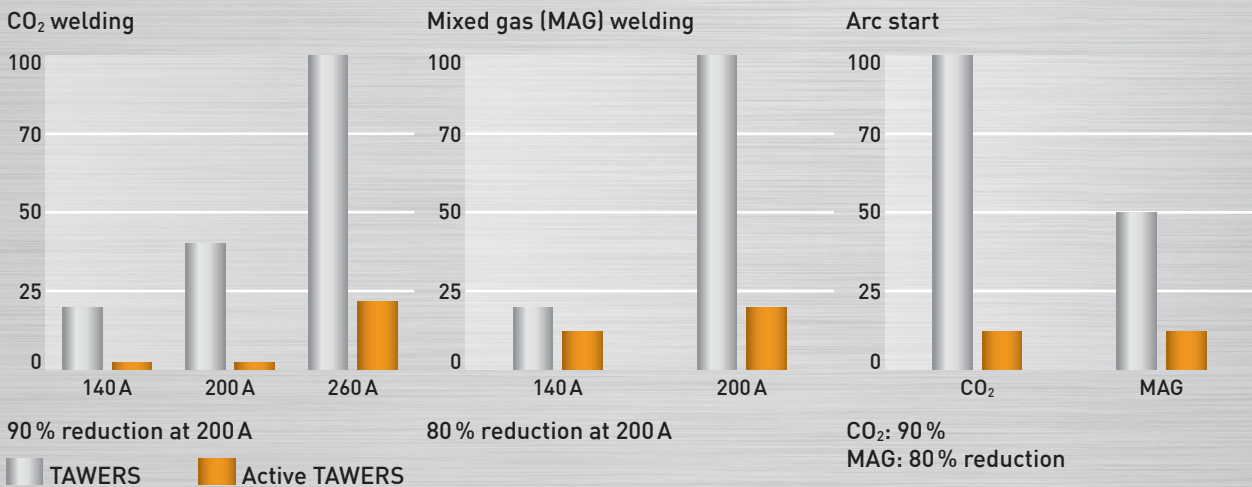
Application: (stainless) steel < 2 mm plate thickness

Current: Up to 200 A

Advantages: - Reduction of weld spatter in general and in case of unfavorable torch settings

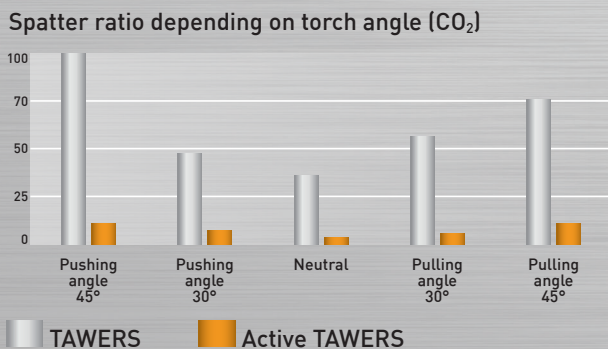
- Adhesion reduction of the weld spatter to the components due to smaller spatter volume and finer grain size

ADVANTAGES

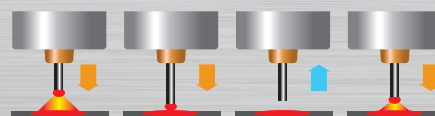


- Very good weld seam quality in thin plate welding
- Virtually spatter-free even when welding out of position thanks to reciprocating wire feed
- Reduction of the weld spatter by approx. 80% at arc start with mixed gas at 200 A
- High quality in CO₂ welding, 90% less welding spatter development during arc start at 200 A

OPERATION PRINCIPLES



Active Wire wire feeding process



Continuous reciprocating wire feed
Spatter reduction through a very stable short arc cycle

Standard process



Constant wire feeding speed
Limited spatter control

Reduction of weld spatter even with unfavorable torch push or pull angles caused by torch access limitations.

THE OPTIMISED AND INNOVATIVE SHORT-ARC HOT ACTIVE PROCESS (HOT-AWP) – OPTION

Application: (stainless) steel < 3 mm sheet thickness

Short arc: Extension of the short arc range up to approx. 250 A

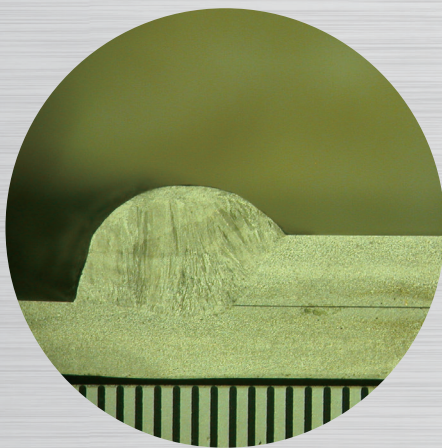
Advantages: • **Deep penetration guaranteed**

- **Excellent gap bridging**
- **Major reduction of welding spatter and combustion residue on welded components**
- **Outstanding weld pool control**

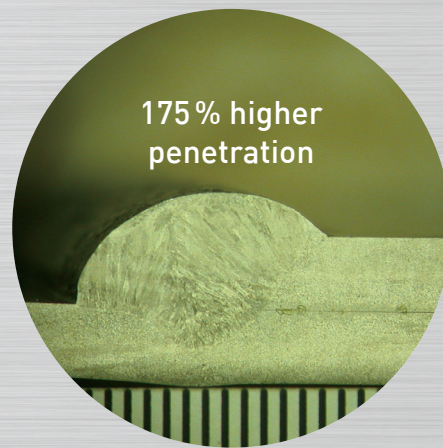
ADVANTAGES

Higher wire deposition and better heat transfer improve the seam shape

AWP

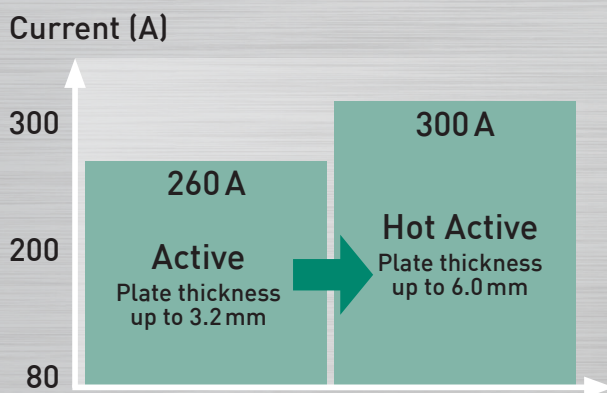


Hot-AWP

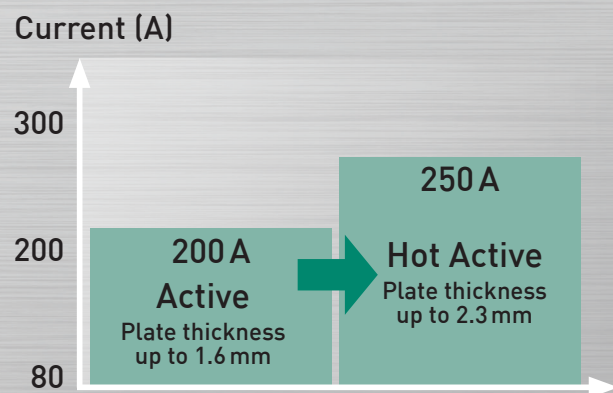


Stainless steel (current: 230 A)

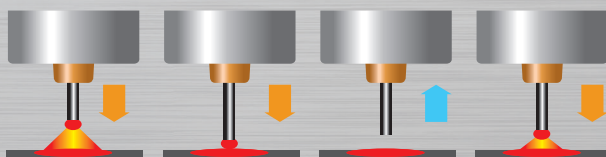
OPERATION PRINCIPLES



Recommended current range for CO₂ welding



Recommended current range for MAG welding



The new AWP process Hot Active enables optimised heat input and a higher current in the short arc range.

ACTIVE ALUMINUM PROCESS

Application: (stainless) steel < 2 mm plate thickness

Current: 200 A

Advantages: - Very good seam appearance

- Targeted droplet release by controlled wire feed
- Strong reduction of welding spatter as well as combustion residue
- Precise aluminum wire feeding guaranteed by torch integrated servo motor feeder

ADVANTAGES

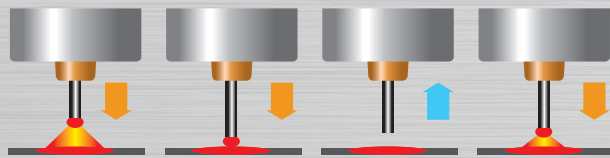
Comparison between welds of the same width



Conventional TAWERS (DC pulse)

Active TAWERS Aluminum

OPERATION PRINCIPLES



Prevention of welding spatter through active wire feed reciprocation

“RECOGNIZING OUR
RESPONSIBILITIES
AS INDUSTRIALISTS,

we will devote ourselves to the progress and development of society and the wellbeing of people through our business activities, thereby enhancing the quality of life throughout the world.”

– Matsushita Konōsuke
Founder of Panasonic

ACTIVE WIRE SOLDERING PROCESS – OPTION

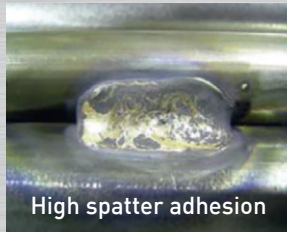
Application: (stainless) steel < 2 mm plate thickness

Current: 200 A

Advantages: Very good gap bridging

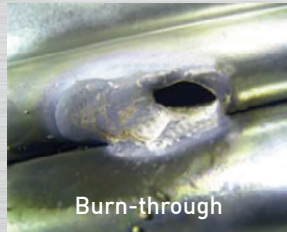
ADVANTAGES

Combination of soldering and the Active Wire Process. Great for thin plate welding

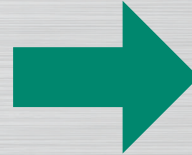


High spatter adhesion

Standard MIG soldering



Burn-through



Less spatter,
no burn-through

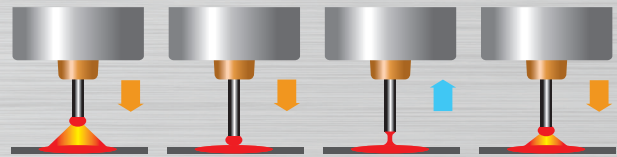
Active soldering

OPERATION PRINCIPLES

Welding characteristics

Wire material	Silicon (Si) Soldering	Aluminum (Al) Soldering
Protective gas	Ar 100 %	Ar 100 %
Wire (mm)	Ø 1.0	Ø 1.0

Active Wire feeding process



Continuous reciprocating movement of the wire causes a very stable short arc

ZI-TECH SOFTWARE ACTIVE WIRE PROCESS - OPTION

- With the Zi-Active Wire Process, a further reduction of the spatter of up to 81 % when compared to standard CO₂ welding is possible using CO₂ shielding gas.

ADVANTAGES

Coating weight: 190 g/m²

	Conventional TAWERS CO ₂	TAWERS Zi-Active (Active CO ₂)
Weld appearance	 Major spatter adhesion	 Very small spatter adhesion
X-ray	 Major porosity	 Minimal porosity

Between 75% –
95%

spatter reduction compared to
the conventional CO₂ process

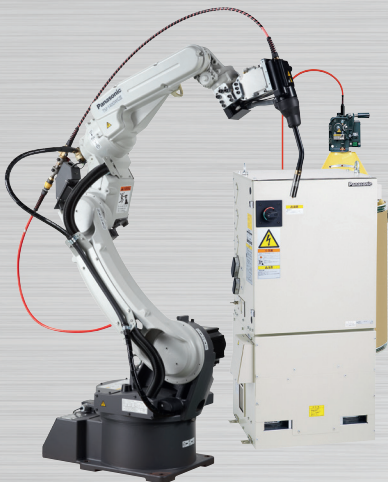
SUPER ACTIVE WIRE PROCESS (S-AWP)

Application: (stainless) steel, aluminum, galvanized plate up to approx. 3.2 mm thickness
 Current: up to 350 A, 100 % duty cycle at 310 A (with a 1.2 mm steel wire, CO₂ gas and the air cooling unit)

Advantages: Achieve a much higher welding speed of up to 2 m/min with greatly reduced spatter

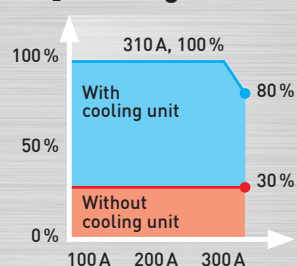
ADVANTAGES

- Higher performance guaranteed with the extremely accurate servo motor
- Improved performance of the reciprocating wire feeder to increase short circuit cycles
- Direct drive: The wire feed servo motor is now connected directly to the feed rollers ensuring the best wire transportation
- The air-cooled torch unit is designed for high performance
- The torch is available for many Panasonic robots: TM-1100/1400/1600/1800WG3, TL-1800WG3
- Select your preferred hose package: separate/internal/external

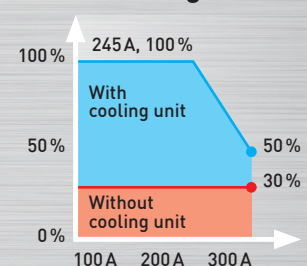


The new Super Active torch with air cooling mechanism increases the duty cycle and allows use in higher current ranges.

CO₂ welding



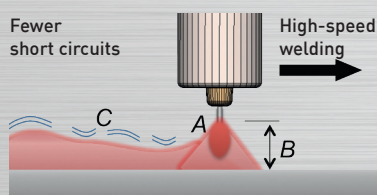
MAG welding



OPERATION PRINCIPLES

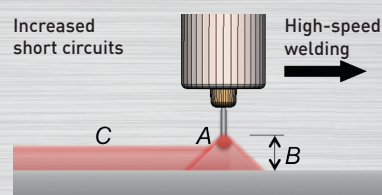
The number of possible short circuits is almost doubled when compared with the standard Active System – Super Active allows a perfect welding seam at the highest welding speed.

Active TAWERS



Rough surface
 A Droplet size: large
 B Arc length: long
 C Weld pool vibration: high

Super Active TAWERS



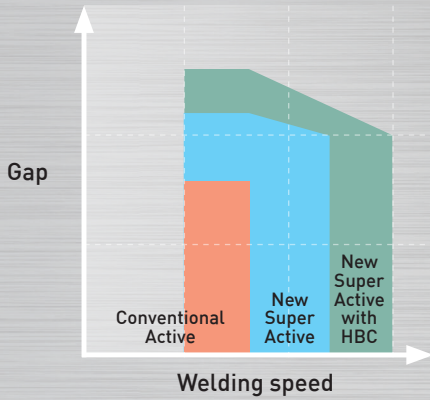
Flat surface
 A Droplet size: small
 B Arc length: short
 C Weld pool vibration: low

SUPER ACTIVE WIRE – OPTIONS

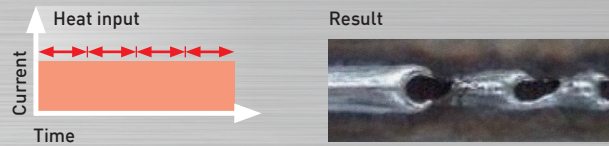
HBC SOFTWARE (HEAT BALANCE CONTROL)

Optimized for welding progressively thinner gauge, high-strength steels

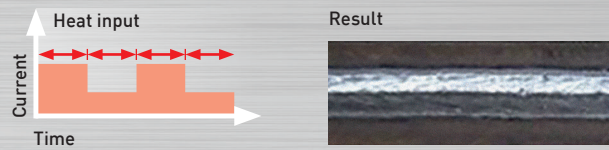
Tolerance range of welding conditions



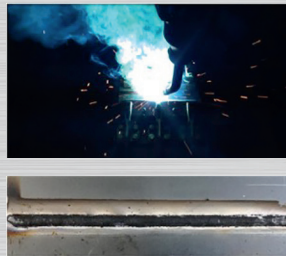
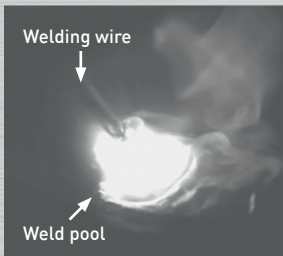
Active TAWERS



Super Active TAWERS with HBC (new)



THE SUPER ZI-ACTIVE SOFTWARE

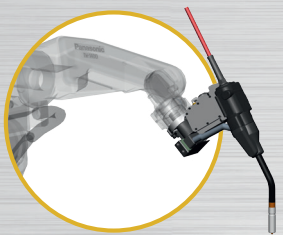


Improvement of the weld pool through widening the arc and using reciprocating wire feed and allowing a periodic and proactive de-gassing of the zinc layer.

This reduces a very large proportion of spatter and porosity.

Welding Super Zi-Active with excellent results

THE SUPER ACTIVE TAWERS ALUMINUM SYSTEM



- Advantages:**
- **Less spatter – reduced spatter formation due to improved wire feed accuracy**
 - **Excellent seam appearance with reduced combustion deposits**
 - **Smooth bead surface**
 - **Extended range of available plate thicknesses through extending the available current range**

Wire diameter	Protective gas	Current limit	Active Aluminum		Super Active Aluminum (new)	
			Hard Aluminum	Soft Aluminum	Hard Aluminum	Soft Aluminum
1.2 mm	Ar	recommended ¹⁾	150 A	120 A	180 A	180 A
		available ²⁾	180 A	150 A	220 A	220 A
1.6 mm	Ar	recommended ¹⁾	210 A	200 A	220 A	220 A
		available ²⁾	230 A	230 A	280 A	280 A

¹⁾Recommended current range to guarantee a stable process

²⁾Usable current range: Maximum useable current range, also if a higher value is selected



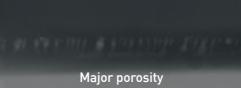
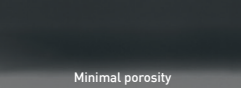
ZI-TECH SOFTWARE PROCESS – OPTION

Allows low-spatter welding of zinc galvanized components. Two Zi-Tech processes are available: Zi-Tech HD Pulse and Zi-Tech Active Wire Process.

- With the Zi-Tech HD-Pulse, zinc galvanized steel can be welded with mixed gas, and a spatter reduction of up to 63% is possible when compared to standard CO₂ welding
- Uses standard welding wire 1.2 mm
- Uses mixed gas 90% argon and 10% CO₂ (HD pulse welding process)
- Optimal for a zinc coating between 45 – 60 g/m²

ADVANTAGES

Weight of zinc layer: 45 g/m²

	80% Argon, 20% CO ₂	90% Argon, 10% CO ₂ (Zi-Pulse)
Weld appearance	 Major spatter adhesion	 Very small spatter adhesion
X-ray	 Major porosity	 Minimal porosity

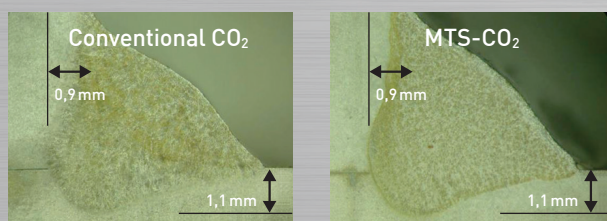
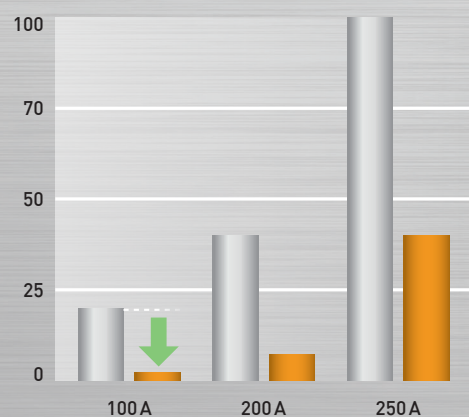
30% up to
60%

spatter reduction compared to mixed gas 80% AR and 20% CO₂

MTS-CO₂

ADVANTAGES

Spatter Generation (MAG)



75%

Spatter reduction at 150A compared to the 350GB2 power source

■ 350GB2
■ SP-MAG II

Penetration comparison
CO₂ welding provides a much more even penetration

HF TIG PROCESS – OPTION

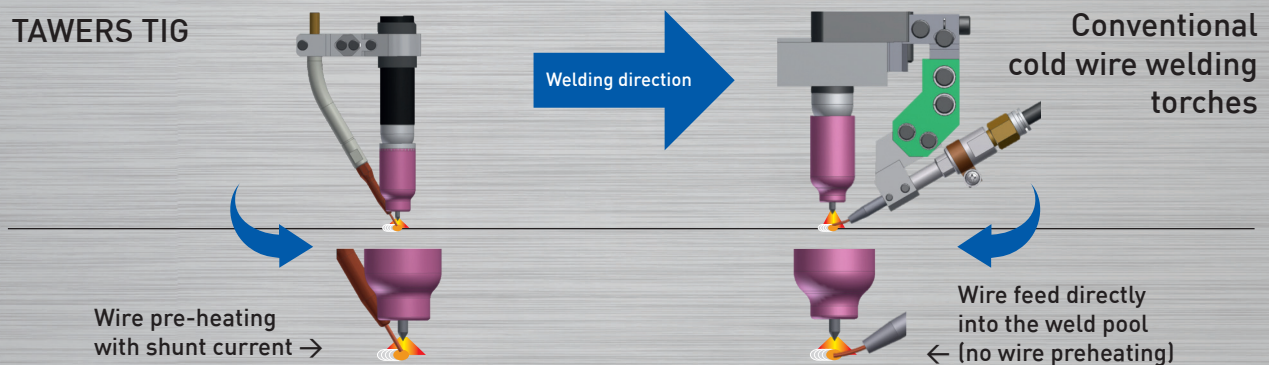
Application: (stainless) steel < 2 mm sheet thickness

Current: Sufficient for application

Advantages: 3 times higher welding speed than conventional TIG welding

WHY WELD TIG WITH TAWERS?

TAWERS TIG is only one of the members of our TAWERS solution. TIG welding is possible with the same robot and welding power source by simply changing to TIG welding components. Just like the TAWERS-MIG/MAG solution, TAWERS TIG also offers unique properties which improve the welding process.



COMPACT GAS NOZZLE

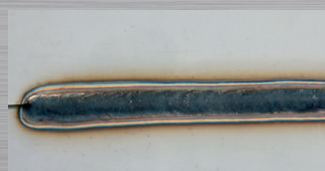
The TAWERS TIG welding torch is extremely compact even though it is equipped with wire feeding hardware. The space-saving design allows the use of filler wire even in narrow space conditions and thus offers greater freedom of design for clamping jigs.

HIGH-SPEED TIG WELDING

As far as robot arc welding is concerned, the MIG/MAG process is far more common than TIG welding, in particular because of the higher available productivity. In general, TIG welding is a slow process. However, the compact TAWERS TIG welding torch increases the TIG welding speed in addition to allowing better welding accessibility. This is possible thanks to a unique sophisticated technical solution!

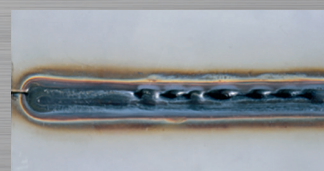
Normally, during TIG welding with filler wire, the cold filler wire is directly immersed into the weld pool independently and in front of the arc. The filler wire from the TAWERS TIG welding torch is fed at a steeper angle and behind the arc, and therefore, along its free length, at a significantly reduced distance from the arc. This causes a shunt current to be induced by the arc into the filler wire, which preheats it before immersion into the weld pool. This shortens the duration of and the energy required to complete the melting process and leads to a higher deposition rate, which allows an increased wire feed and faster welding speed. This makes our TAWERS TIG solution superior to regular cold wire TIG process.

TAWERS TIG



80 cm/min

Conventional



80 cm/min

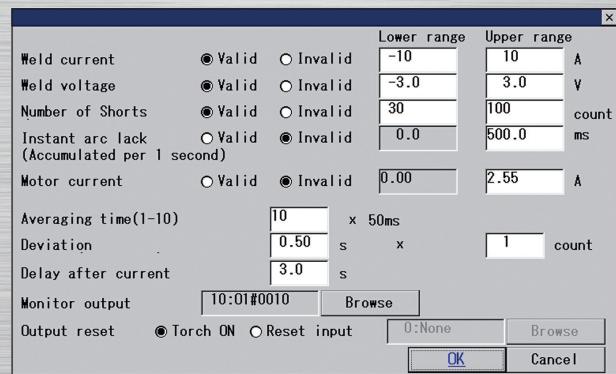
OPTIONAL SOFTWARE

WELDING DATA MANAGEMENT

The welding data management software includes 3 main functions:

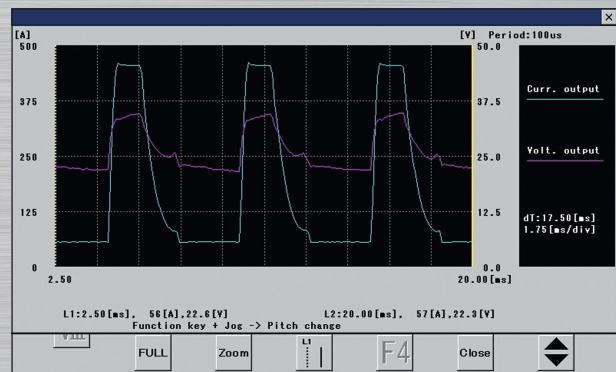
Welding data monitoring (extended):

Monitoring the compliance within set limit values and outputting signals when the limit value is exceeded. In contrast to the standard system, up to 50 different “welding parameters” can be set with two different signal outputs (error/alarm).



Welding data recording:

Recording the welding parameters in milli- or microseconds of a weld. The recorded data can be exported and checked by means of suitable software (e.g. EXCEL). Then the current/voltage history settings are visible.



Welding data storage (log function):

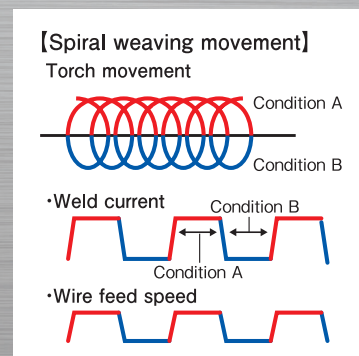
Recording the set and actual welding parameters as average values for each welding section (weld seam) in synchronisation with the welding program.

The screenshot shows a table titled "溶接ログ" (Welding Log) with the following columns: H, M, S, Prog, Posi, A, V, Speed, ReA, ReV, Sht, Error, AD, VD, SD. The table contains 20 rows of data, representing recorded welding parameters for different sections of a weld.

H	M	S	Prog	Posi	A	V	Speed	ReA	ReV	Sht	Error	AD	VD	SD
13	16	34	Prog0023	P2	120	16.1	0.50	122	16.2	78	0	0	0	0
13	16	44	Prog0023	P4	140	16.8	0.50	141	16.9	80	0	0	0	0
13	17	45	Prog0023	P6	120	16.1	0.50	123	16.1	76	0	0	0	0
13	17	56	Prog0023	P2	120	16.1	0.50	118	16.1	81	0	0	0	0
13	21	4	Prog0023	P4	140	16.8	0.50	139	16.7	82	0	0	0	0
13	21	15	Prog0023	P6	120	16.1	0.50	122	16.2	76	0	0	0	0
13	24	0	Prog0023	P2	120	16.1	0.50	122	16.2	81	0	0	0	0
13	26	25	Prog0023	P4	140	16.8	0.50	141	16.9	70	0	0	0	0
13	26	36	Prog0023	P6	120	16.1	0.50	123	16.2	80	0	0	0	0
13	26	47	Prog0023	P2	120	16.1	0.50	123	16.2	80	0	0	0	0
13	28	34	Prog0023	P4	140	16.8	0.50	144	16.9	76	0	0	0	0
13	28	44	Prog0023	P6	140	16.8	0.50	141	16.9	81	0	0	0	0
13	32	58	Prog0100	P2	140	16.8	0.50	144	16.9	69	0	0	0	0
13	33	9	Prog0100	P4	140	16.8	0.50	151	16.8	90	1	0	0	0
13	33	45	Prog0100	P2	140	16.8	0.50	141	16.8	70	0	0	0	0
13	35	54	Prog0100	P4	140	16.8	0.50	141	16.8	69	0	0	0	0
13	36	5	Prog0023	P4	120	16.1	0.50	118	16.2	80	0	0	0	0
14	9	53	Prog0023	P2	120	16.1	0.50	122	16.2	73	0	0	0	0
14	9	59	Prog0023	P2	120	16.1	0.50	123	16.2	80	0	0	0	0

TAWERS SPIRAL WEAVE FUNCTION

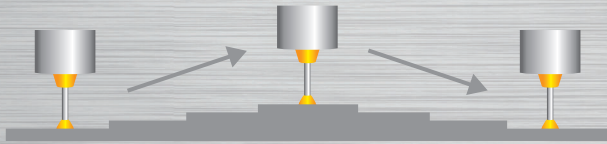
Welding in helical movements together with synchronised welding parameters and wire feed speed produces an ideal welding result for aluminum MIG welding. Included in this option are the TAWERS aluminum MIG function and the TAWERS synchronous weave low-pulse function. These spiral weave functions are used for perfect aluminium welding of varying plate thicknesses, e.g. 2 mm plate to 6 mm plate.



OPTIONAL HARD- AND SOFTWARE

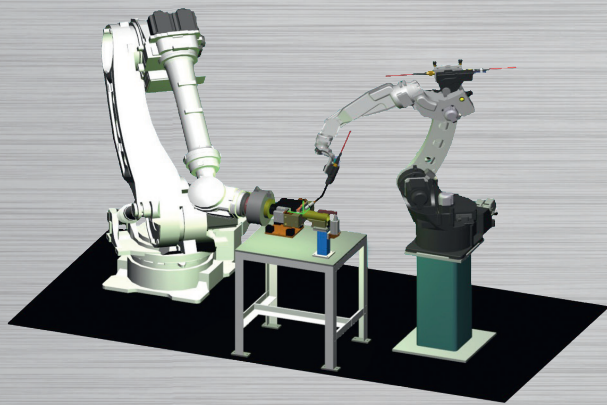
AUTOMATIC DISTANCE CONTROL

AUTO EXTENSION (available for MIG/MAG & TIG)



Simplified programming for uneven-shaped workpieces and adaptive control for heat distortion compensation. The robot detects changes in the distance between the contact tip/tungsten electrode and the workpiece and automatically compensates for this.

COOPERATIVE MULTI-ROBOT CONTROL MASTER/SLAVE FUNCTION



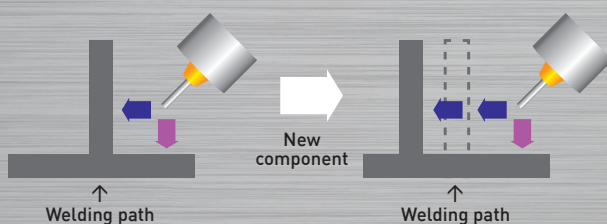
Enables communication between multiple robots.

Harmonic movement:

Panasonic offers software solutions that allow for harmonious movement between the external axis and robot or multiple robots. The software ensures that the relative speeds and the relative speed of the path are synchronized with each other.

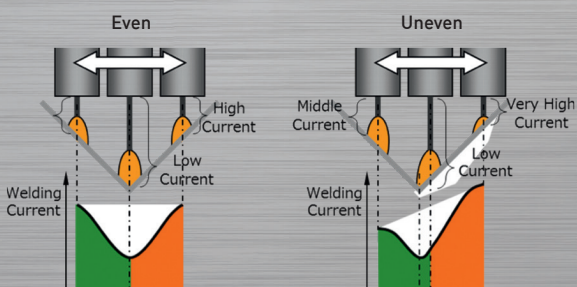
The original position is stored by the robot

The robot captures the new position and moves the start points



CONTACT SENSOR SYSTEM

The contact sensor can detect deviations between the programmed and actual welding start point and correct these automatically.



ARC SENSOR SYSTEM

During weave or pendulum weave welding, the arc sensor can measure the changes in the welding current, which occur during welding, and automatically correct to maintain correct welding parameters.

