

/ Perfect Welding / Solar Energy / Perfect Charging



# PMC

## PULSE MULTI CONTROL

THE OPTIMIZED  
PULSED ARC

# IMPRESSIVE SEAM APPEARANCE – STABLE AND REPRODUCIBLE

PMC AND ITS OPTIMIZED PULSE CHARACTERISTICS  
EQUAL HIGH-QUALITY WELDS AT HIGH SPEEDS.  
**THANKS TO THE PENETRATION AND ARC LENGTH  
STABILIZER, CONTROLLING THE ARC HAS  
NEVER BEEN SO EASY.**

PMC takes the pulsed arc and its stabilizers to a whole new level. The modified process is characterized by **PRECISELY REGULATED, LOW-SPATTER DROPLET DETACHMENT**. At the same time, PMC generates a powerful and stable arc which **RESULTS IN PERFECT CONTROL OF THE WELD POOL**. This enables our users to **AVOID IMPERFECTIONS**. The welding results are always reproducible and stable.

**100%**  
CONTROL  
THANKS TO THE USE  
OF STABILIZERS

**What's your  
welding challenge?**  
Let's get connected.

**15%**  
FASTER WELDING SPEED  
COMPARED TO THE  
CONVENTIONAL PULSE  
PROCESS



# THE ADVANTAGES OF PMC

## OPTIMIZED PULSED ARC



- / Enhanced process stability from precision adjustment control
- / Spatter-free ignition (SFI)
- / Improved pulse characteristic
- / 12 pulse characteristics included

## IMPROVED WELD PROPERTIES



- / 15% higher welding speed\*
- / 15% less energy input\*
- / 60% more penetration\*

## HIGH WELD QUALITY AND APPEARANCE



- / Optimized welding for vertical-up seams with the "PMC Mix" characteristic
- / 100% control with arc length and penetration stabilizer
- / TIG-like seam rippling thanks to PMC Ripple Drive



## ECONOMICAL AND SUSTAINABLE

### RESOURCE-CONSERVING

The precisely controlled process means that spatter and therefore rework can be reduced. As a result, employees complete the work more quickly.

### MATERIAL SAVINGS

PMC considerably reduces the consumption of wearing parts and component rejects, which translates directly into greater savings potential.

### ENERGY-SAVING

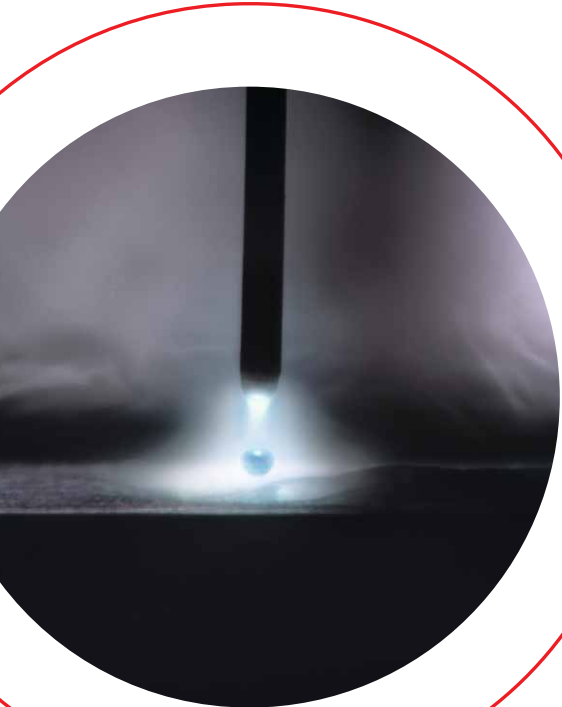
A stable, precisely controlled arc improves welding quality and thus shortens the overall time taken to perform different welding tasks. Lower energy consumption is a direct result.

\* / Compared to a conventional pulsed arc.





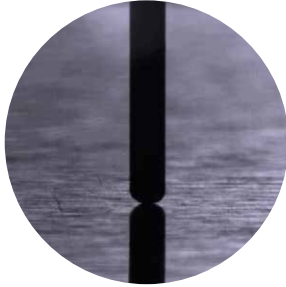
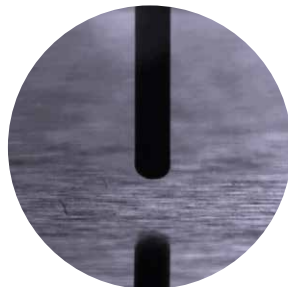
IDEAL  
FOR ALL  
POSITIONS



## SFI SEQUENCE

SPATTER-FREE IGNITION (SFI)

/ Spatter-free ignition means around 250 milliseconds can be saved per ignition.





# THE PMC WELDING PROCESS

**PMC (PULSE MULTI CONTROL) IS A PULSED ARC WITH SELF-CONTROLLING PROPERTIES,** which are generated by the penetration and arc length stabilizers. Advanced control algorithms enable droplet transfer with the shortest possible arc length in the pulsed arc.

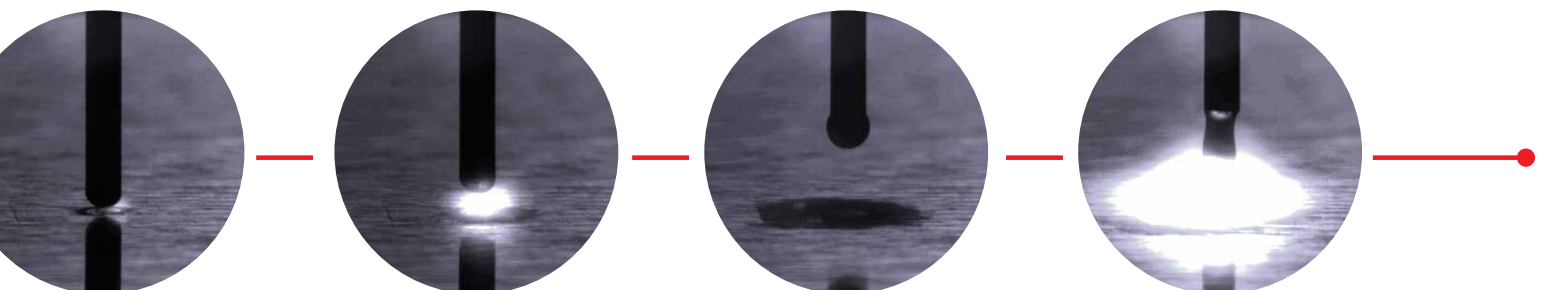
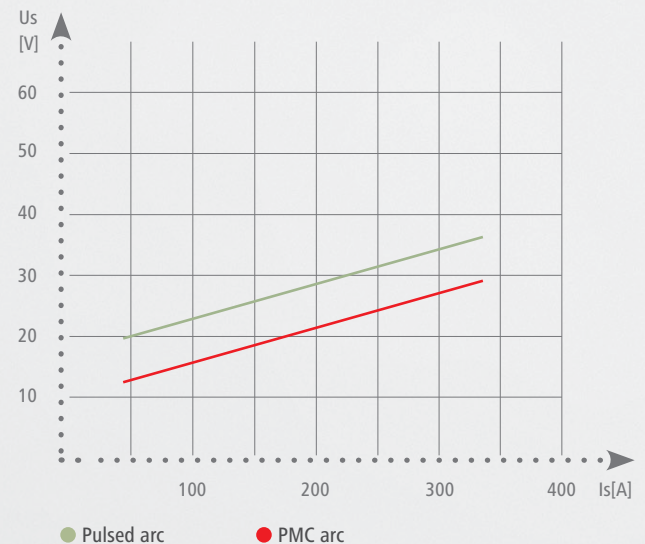
## PMC IS BASED ON THE PULSE PROCESS.

High-speed data processing and precision detection of the process status hugely improve droplet detachment.

## STABLE WELDS, BUT FASTER!

With constant penetration and less heat input:

- ✓ Up to 15% higher welding speeds\*
- ✓ Up to 65% higher productivity\*\*



\* Compared to conventional pulsed arcs, \*\* According to customer calculations.

# MANUAL WELDING WITH PMC

OPTIMALLY  
TAILORED  
TO YOUR  
NEEDS



**WELD VERTICAL-UP SEAMS  
AT TOP SPEED WITHOUT  
OSCILLATING MOTION.**

The PMC Welding Package contains several characteristics which offer welders numerous advantages. This provides optimum support for every application so welders can achieve a perfect seam. For example, PMC Mix is ideal for vertical-up seams, enabling up to 40% higher speeds – and no oscillating motion.

**PACKAGE CONTAINS:**

- / Galvannealed
- / Universal
- / Arc blow
- / Dynamic
- / Galvanized
- / Gap bridging
- / Mix
- / Multi arc
- / PCS



## UNIVERSAL

### ALL-AROUND BETTER WELDS.

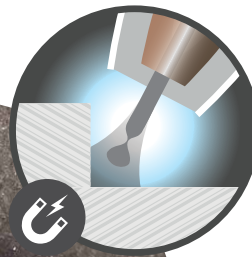
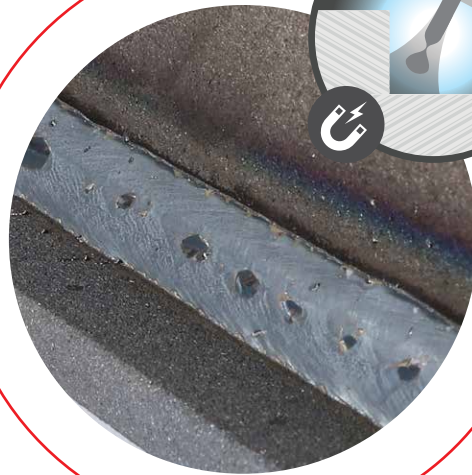
This characteristic can be used for the majority of welds, regardless of seam profile or position.



## PMC ARC BLOW

### STABLE ARC WHEN EXPOSED TO EXTERNAL MAGNETIC FIELDS.

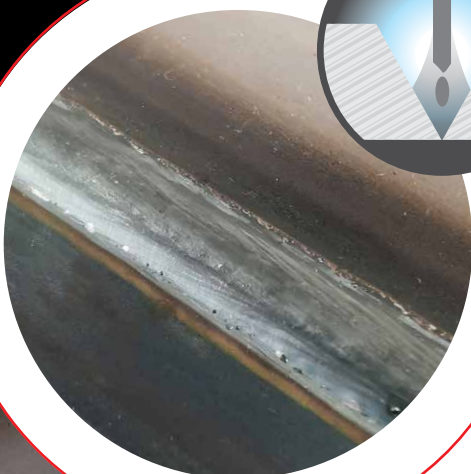
Improved properties against arc break  
– due to arc blow caused by external magnetic fields.



## PMC DYNAMIC

### AGGRESSIVE ARC WITH HIGH ARC PRESSURE – AND SMALL ARC FOCUS.

These properties result from a combination of high current and low voltage. This makes the characteristic ideal for narrow welds with a small opening angle. They are also ideal for applications which require high speeds and high penetration.

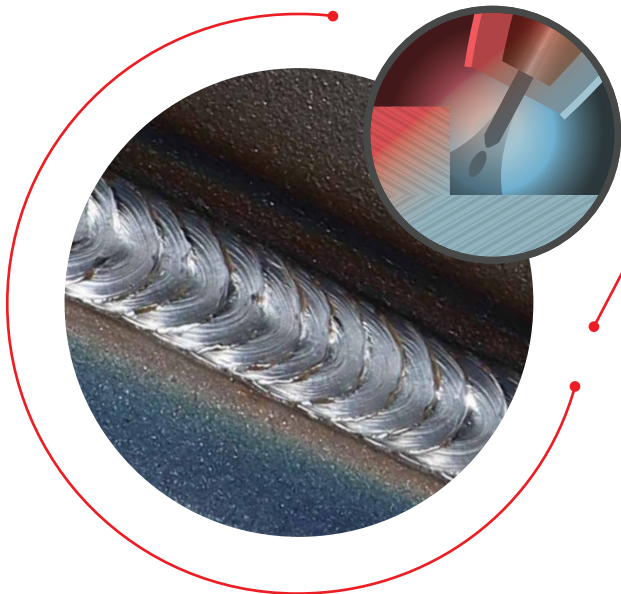




## PMC MIX

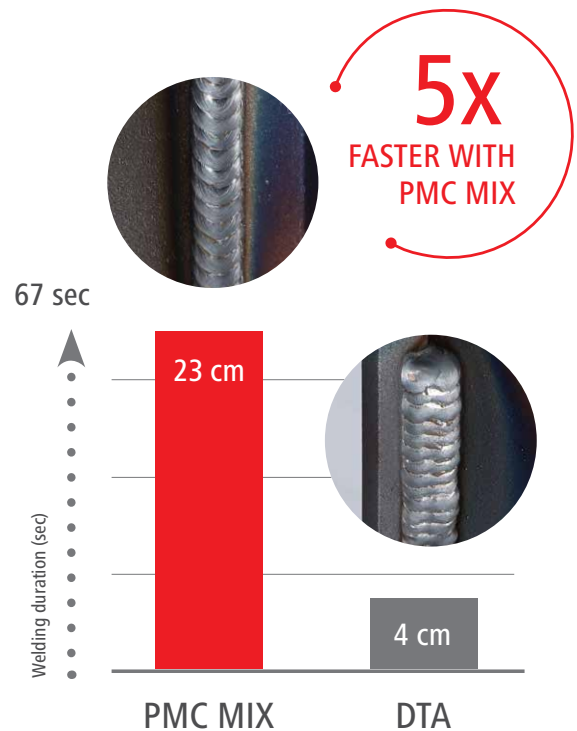
**THE POWERFUL ARC WITH GOOD GAP-BRIDGING ABILITY.**

This characteristic enables high welding speeds compared to a conventional dip transfer arc. This is achieved by combining a pulsed and LSC dip transfer arc.



### THE BENEFITS

- / Vertical-up welding without oscillating motion
- / 5 x quicker on vertical-up seams compared to conventional dip transfer arc
- / Also suitable for inexperienced welders

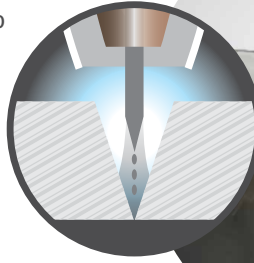




# PCS – PULSE CONTROLLED SPRAY ARC

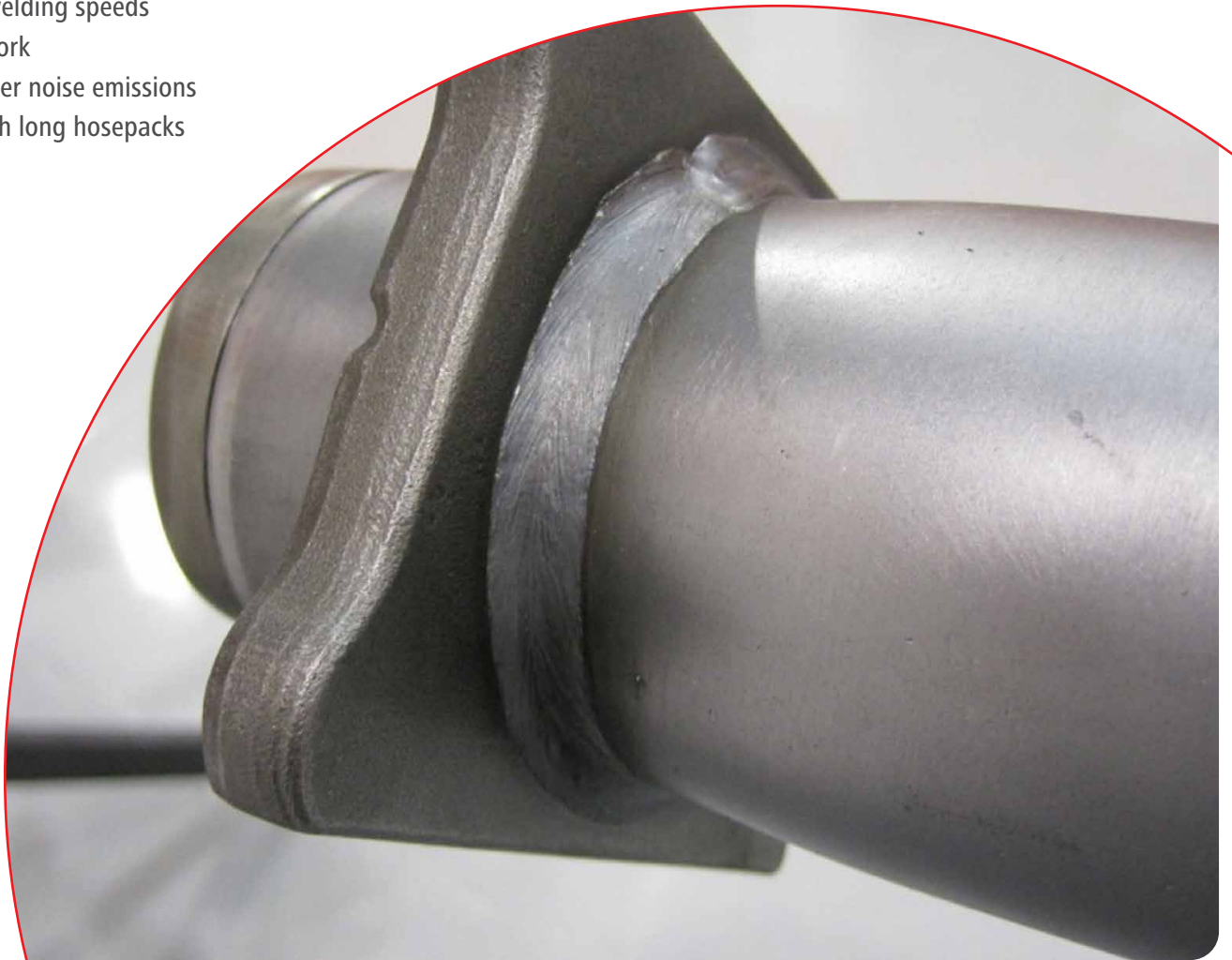
PCS COMBINES THE ADVANTAGES OF PULSED AND SPRAY ARCS IN ONE CHARACTERISTIC AND AVOIDS INTERMEDIATE ARCS.

The result is a smooth transition from a pulsed to a spray arc, which reduces welding spatter. The PCS characteristic improves results, particularly for small gaps, fillet welds, and root passes.



## THE BENEFITS

- / Reduced joint preparation
- / High deposition rate
- / Higher welding speeds
- / Less rework
- / 50% fewer noise emissions
- / Ideal with long hosepacks



# ROBOTIC WELDING WITH PMC

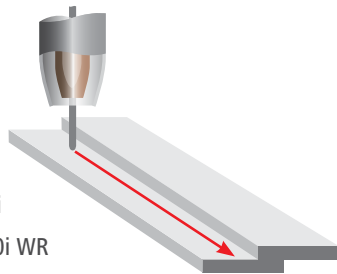
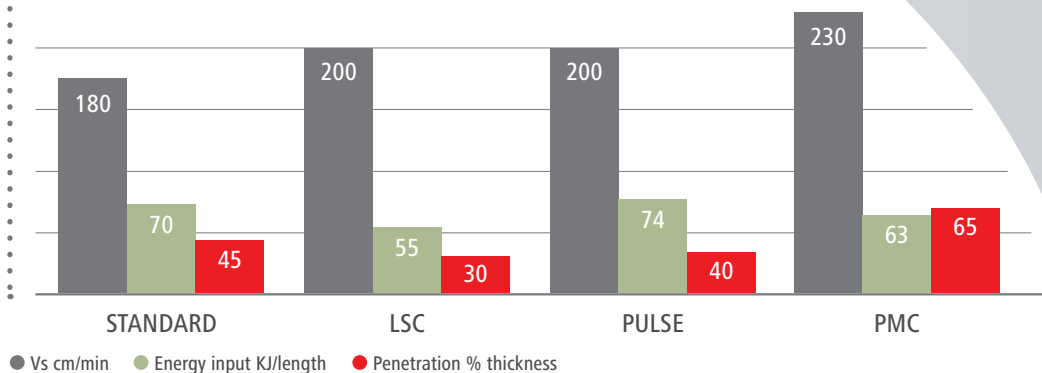
Robotic welding has a wide range of requirements.

Whether it is higher welding speeds, perfect seam appearance, or reproducible quality, Pulse Multi Control meets all these requirements in full. The result is a package of different characteristics that is perfectly tailored to the customer's requirements.

**PACKAGE CONTAINS:**

- / PMC Cladding
- / PMC Mix Drive
- / PMC Arc blow
- / PMC Galvanized
- / PMC Mix Ripple Drive
- / PMC Dynamic
- / PMC Multi arc

## WELDING PACKAGE COMPARISON



- / 1 x TPS 500i
- / 1 x MTB 500i WR
- / 1 x WF 25i
- / 7° Torch Angle slightly pushing 15° Torch Angle to the workpiece and the robot table was set to 30° PG
- / Filler material: Steel (diameter 1.2)
- / Shielding gas: 18% Ar + 82% CO2 (12 l/min)
- / Material: 2 mm blank steel plates

## PMC

offers a considerable speed advantage compared to other welding packages – with the same high penetration and low heat input.

**15%**  
FASTER  
THAN LSC AND  
PULSE ✓

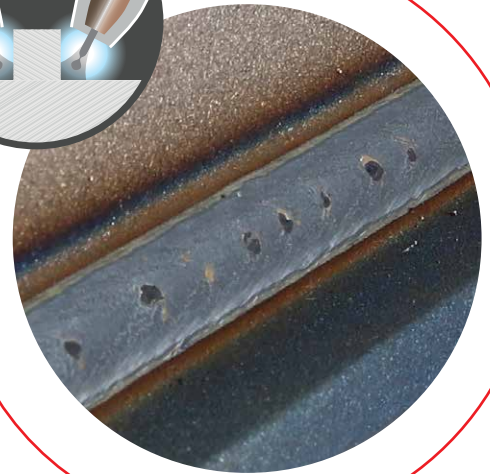
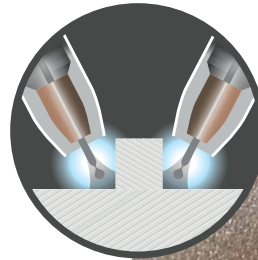
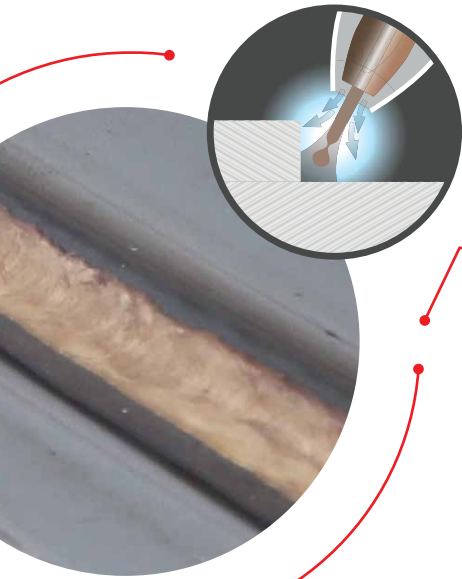




**CHARACTERISTIC FOR  
MIG/MAG BRAZING.**

High brazing speed, reliable wetting, and good flow of braze material.

# PMC BRAZE



# PMC MULTI ARC

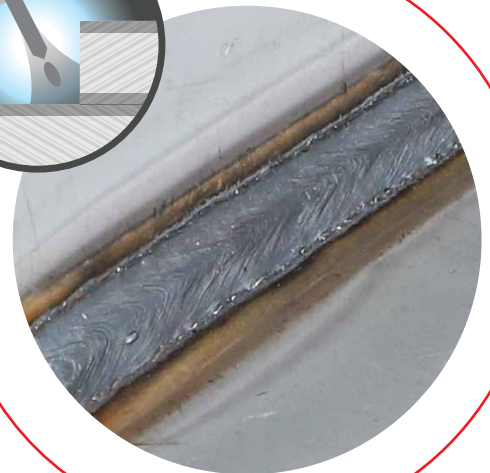
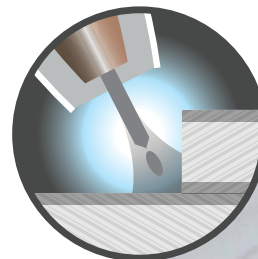
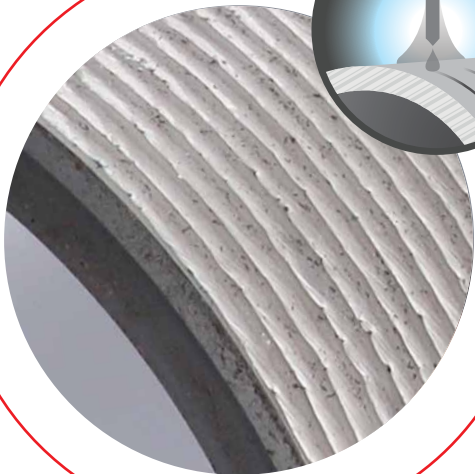
**INFLUENCE OF SEVERAL ARCS.**

Improved properties when a part is being welded by several arcs that influence one another.

**CHARACTERISTIC FOR  
OVERLAY WELDING.**

Low penetration, low dilution, and wide seam flow for better wetting.

# PMC CLADDING



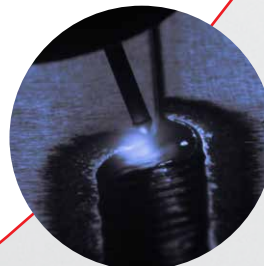
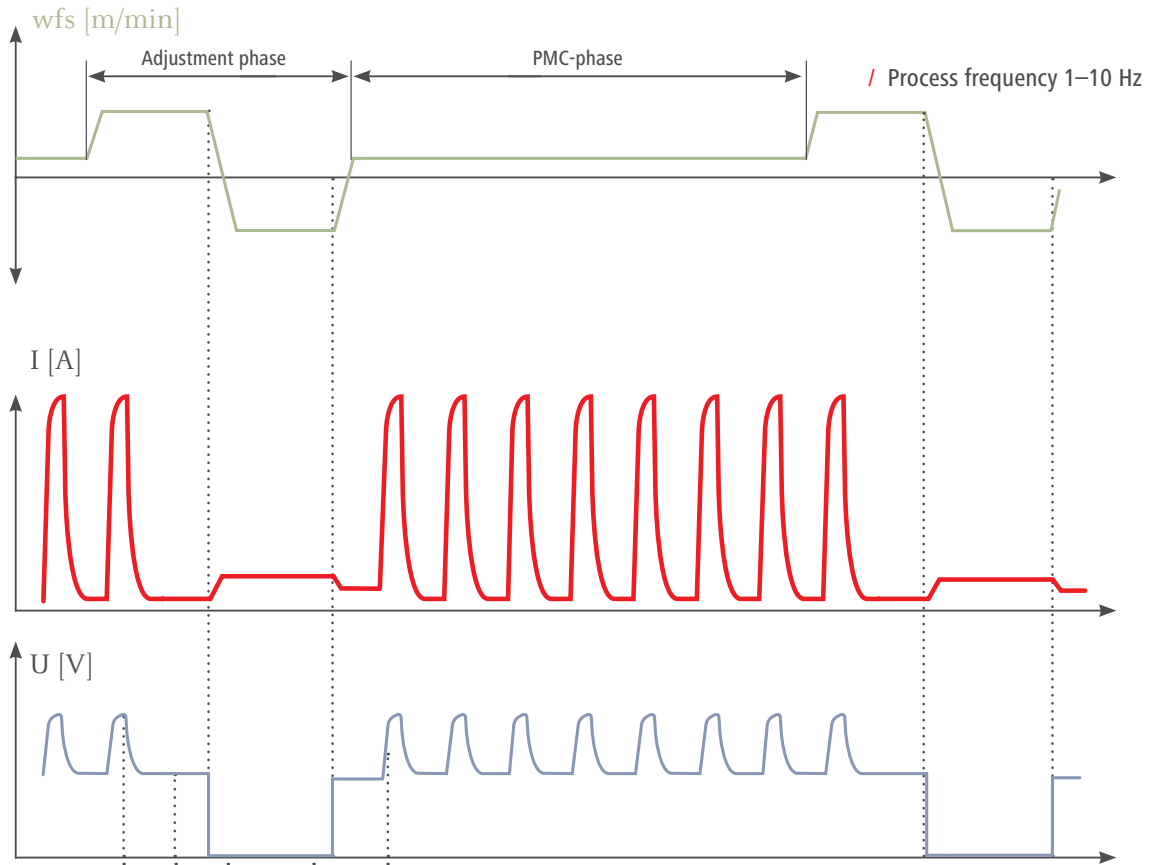
# PMC GALVANIZED

**FAST WELDING OF GALVANIZED SHEET METAL.**

Thanks to the penetration and arc length stabilizers, this characteristic enables galvanized sheet metal to be welded at top speed. It also reduces the risk of zinc pores and zinc burn-off.

# PMC MIX DRIVE

OUTSTANDING  
IN ALL WELDING  
POSITIONS

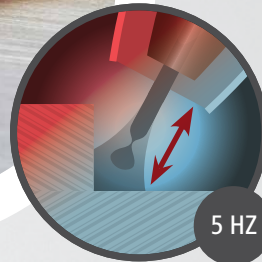




## PMC MIX DRIVE

### GOOD GAP-BRIDGING ABILITY.

Here we are using a push-pull welding torch. The combination of reversing wire movement and cyclical process switch enables us to accelerate the welding of vertical-up seams. The bonus is a TIG seam appearance at high speed – with ultra-light sheet gauge applications up to 3mm.

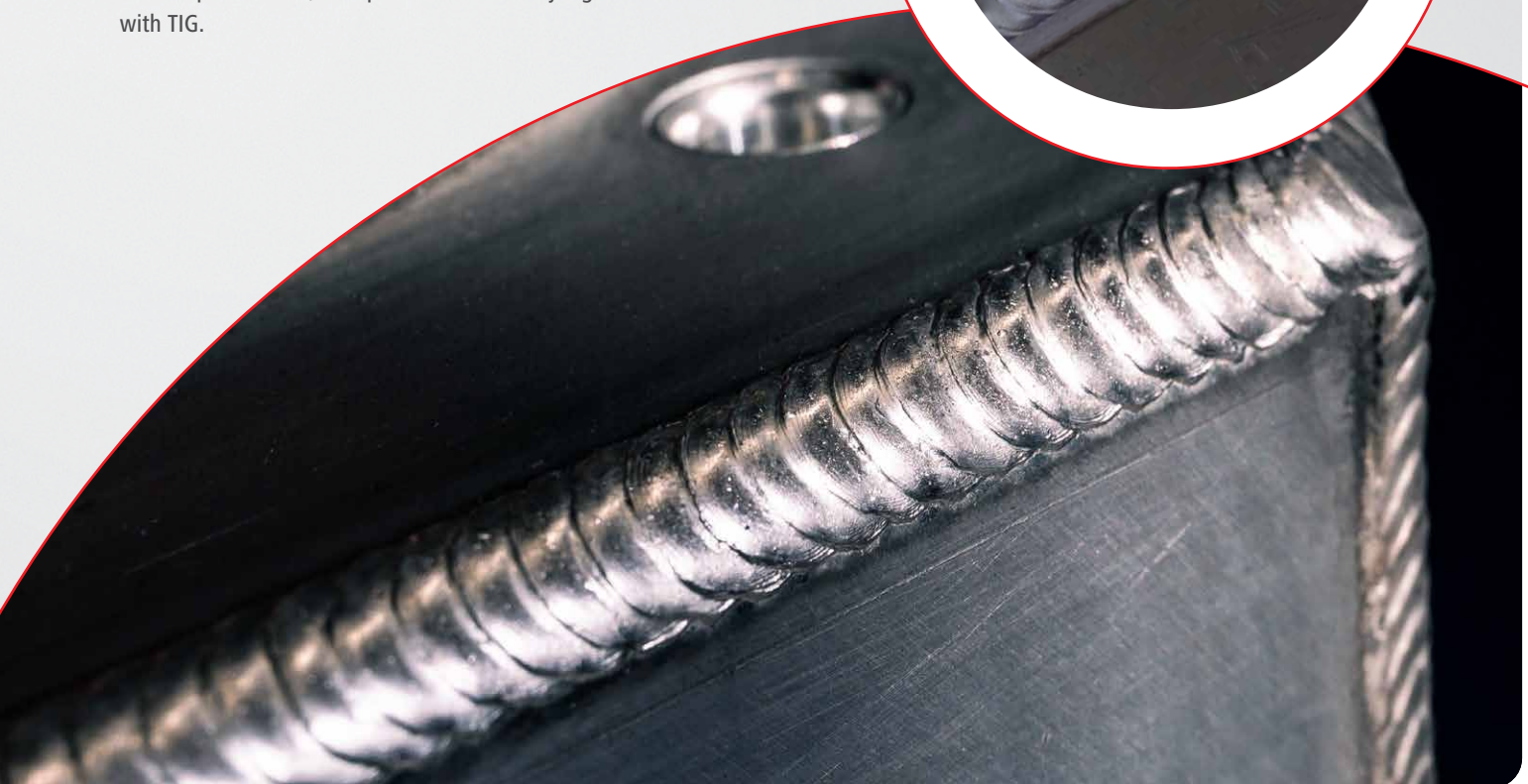
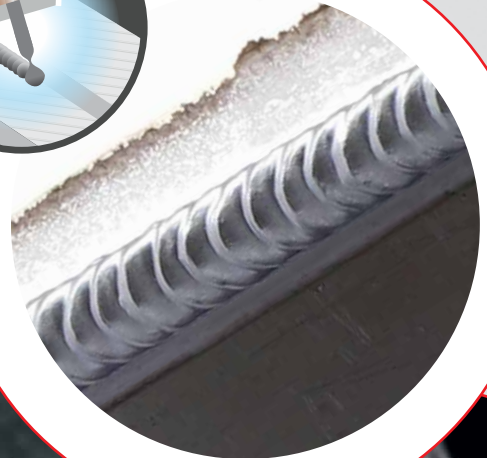
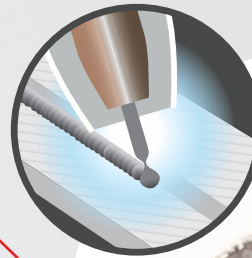


MIX DRIVE

## PMC MIX RIPPLE DRIVE

### TIG-LEVEL SEAM APPEARANCE.

The PMC characteristic for visually impressive seams. The result is elegant seam rippling with a TIG appearance. However, thanks to the combination of a coordinated pulse process and defined pause times, the speed is considerably higher than with TIG.



# PAVING THE WAY TO THE PERFECT WELD – INTEGRATED

# ASSISTANCE SYSTEMS

Our penetration and arc length stabilizers provide perfect support for welders. Both stabilizers in the PMC Welding Package enable consistently high welding quality at high welding speeds.

## PENETRATION STABILIZER CONCRETE BENEFITS

The penetration stabilizer provides support in a wide range of applications. It enables higher welding speeds with robotic welding. And for manual welding, it compensates for stick out changes, paving the way for an almost constant level of weld seam quality.

### THE BENEFITS

- / Improved welding quality
- / Savings in rework and costs
- / Ideal support in case of insufficient visibility or accessibility = stick out fluctuations are automatically compensated for
- / Ideal for out-of-position welding
- / Narrower included angles can be used, saving on filler material

## HOW IT WORKS

### IT'S ALL ABOUT THE WIRE SPEED

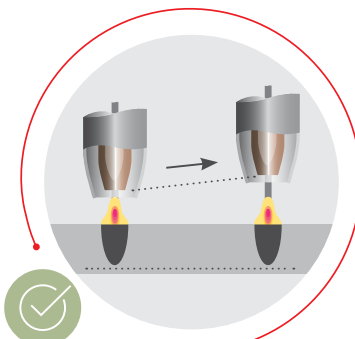
With an activated penetration stabilizer, the TPS/i readjusts the wire speed instead of the welding current. The result is constant penetration.

If the distance between the welding torch and the part changes, an additional wire control keeps the current and penetration constant, resulting in a significantly more stable arc.

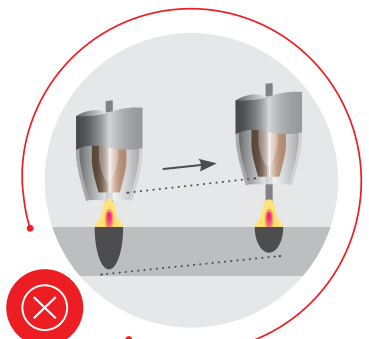
### PENETRATION STABILIZER SETTING OPTIONS

Delta control wire speed:

- / Min: 0 m/min
- / Max: 10 m/min



RESULT WITH  
PENETRATION STABILIZER



RESULT WITHOUT  
PENETRATION STABILIZER



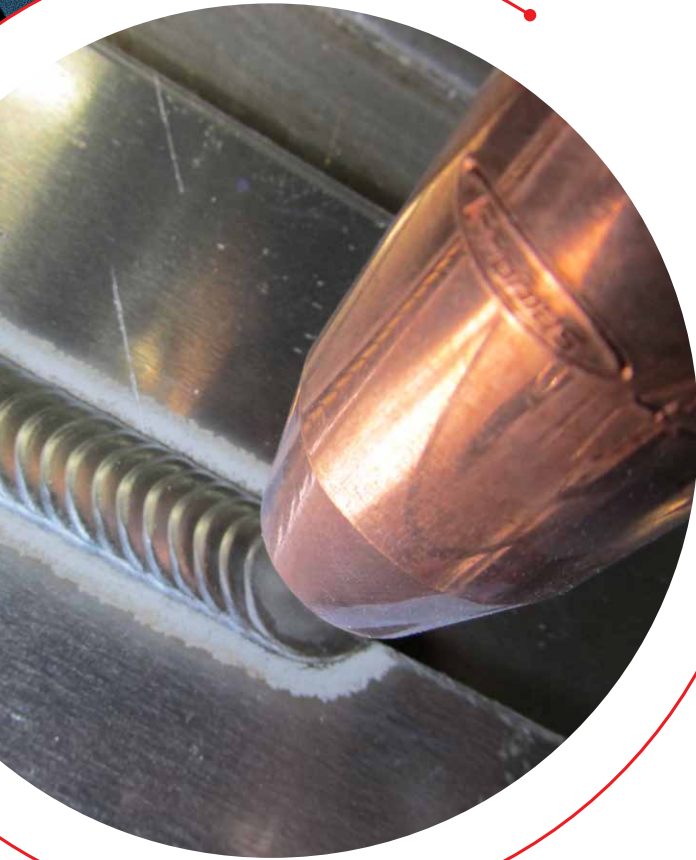
# ARC LENGTH STABILIZER

## CONSISTENT ARC LENGTH

The arc length stabilizer automatically compensates for imperfections. The arc length is kept constant regardless of the welding voltage. As a result, the seam quality and appearance remain unchanged even if the torch position changes or component tolerances vary.

### OPTIMUM SUPPORT FOR THE FOLLOWING CIRCUMSTANCES:

- / Dynamic, changing position of the torch
- / Component tolerances: changing sheet thicknesses or gaps
- / Uneven heat dissipation



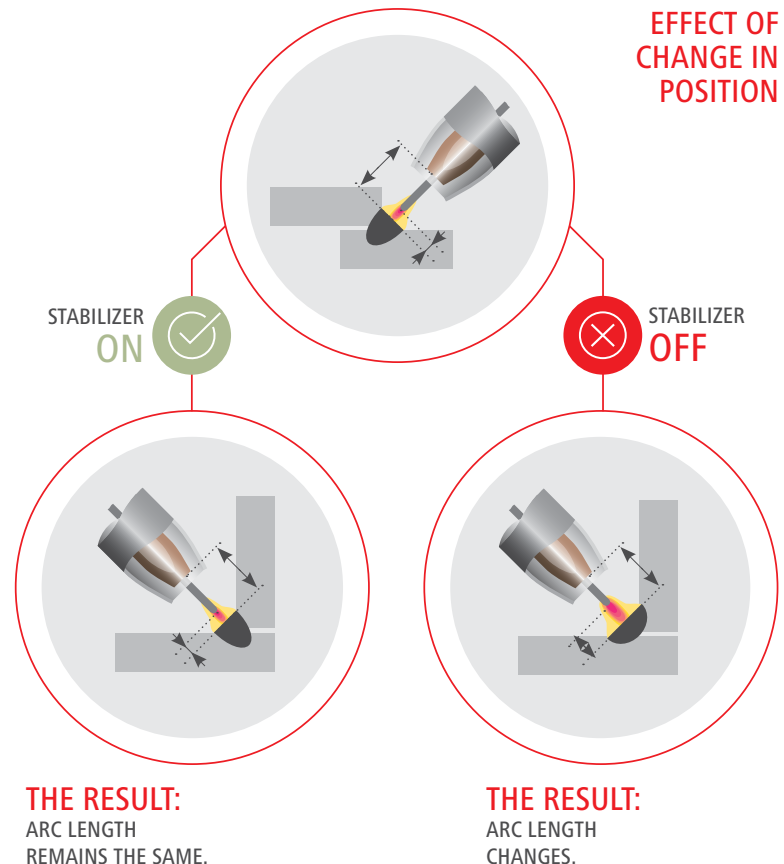
## HOW IT WORKS

The arc length stabilizer regulates the short circuit response to keep a constant arc length, regardless of welding position, seam geometry, or interference.

## THE BENEFITS

- / No need for the welding operation to be interrupted or for manual readjustment of the arc length when the torch position changes
- / Quick determination of parameters
- / Focused arc
- / Faster welding speeds can be achieved

### EFFECT OF CHANGE IN POSITION



# OVERVIEW FRONIUS WELDING PACKAGES

WELDING PACKAGE **STANDARD**

WELDING PACKAGE **LSC**

WELDING PACKAGE **PULSE**

WELDING PACKAGE **PMC**

WELDING PACKAGE **CMT**

| AREAS OF APPLICATION              | STANDARD | LSC  | PULSE | PMC  | CMT  |
|-----------------------------------|----------|------|-------|------|------|
| Sheet thickness up to 1 mm        | ●●●○     | ●●●○ | ●○○○  | ●●●○ | ●●●● |
| Sheet thickness between 1 – 3 mm  | ●●●○     | ●●●○ | ●●●○  | ●●●○ | ●●●● |
| Sheet thickness upwards of 3 mm   | ●●●○     | ●●●○ | ●●●○  | ●●●● | ●●○○ |
| Welding in position               | ●●●○     | ●●●○ | ●○○○  | ●●●○ | ●●●● |
| Welding speed                     | ●●●○     | ●●●○ | ●●●○  | ●●●● | ●●●● |
| Welding with 100% CO <sub>2</sub> | ●●●○     | ●●●○ | ○○○○  | ○○○○ | ●●●● |
| Spatter prevention                | ●○○○     | ●●●○ | ●●●○  | ●●●○ | ●●●● |
| Manual root passes                | ●●●○     | ●●●○ | ●○○○  | ●●●○ | ●●●○ |
| Mechanized root passes            | ●●●○     | ●●●○ | ●●●○  | ●●●○ | ●●●● |

| MATERIALS       | STANDARD | LSC  | PULSE | PMC  | CMT  |
|-----------------|----------|------|-------|------|------|
| Steel           | ●●●○     | ●●●○ | ●●●○  | ●●●● | ●●●● |
| CrNi            | ●●●○     | ●●●○ | ●●●○  | ●●●● | ●●●● |
| Aluminum        | ●○○○     | ●○○○ | ●●●○  | ●●●● | ●●●● |
| Other materials | ●○○○     | ●●●○ | ●●●○  | ●●●○ | ●●●● |



/ Perfect Welding / Solar Energy / Perfect Charging

## THREE BUSINESS UNITS, ONE GOAL: TO SET THE STANDARD THROUGH TECHNOLOGICAL ADVANCEMENT.

What began in 1945 as a one-man operation now sets technological standards in the fields of welding technology, photovoltaics and battery charging. Today, the company has around 5,660 employees worldwide and 1,321 patents for product development show the innovative spirit within the company. Sustainable development means for us to implement environmentally relevant and social aspects equally with economic factors. Our goal has remained constant throughout: to be the innovation leader.

Further information about all Fronius products and our global sales partners and representatives can be found at [www.fronius.com](http://www.fronius.com)

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