WELD THE WORLD

# MIG/MAG Special Functions

ENG


# The natural increase of productivity

# The natural increase of productivity

Pulse HS is a special function of MIG/MAG Pulse welding, characterized by a very short and intense arc, EASY to manage by the welder.
Pulse HS compared to other high deposit welding processes, supplies an easy-handle arc without extra stress.

Pulse HS allows to:
• Increase considerably execution speed (on average 35%) compare to Standard Pulse.
• Increase deposition rate (Kg/h) of 15%.
• Deeper penetration, lower risk of lack of fusion and deformations.
• Reduce heat input (35% lower) better welding quality with mechanical and metallic properties.
The natural increase of productivity

**Pulse HS stands for:**

**1.Higher execution speed**

**2.Higher deposition rate**

**3.Lower heat input and less plastic deformation**

**4.Better mechanical properties**

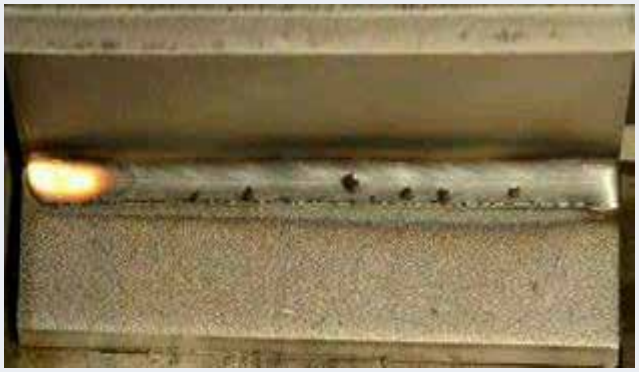
**5.Higher penetration, lower risk of lack of fusion**

**6.Lower production costs and depreciation**

# Higher execution speed

High dynamics applied to the pulsation of HS Pulse arc gives an extremely and focused arc that increases the fluidity and pression of transfer as well as the wettability of joints.
This allows the operator (or automatism) to proceed faster with the torch and a time saving of 35%.

**TEST Standard Pulse**



**TEST Pulse HS**

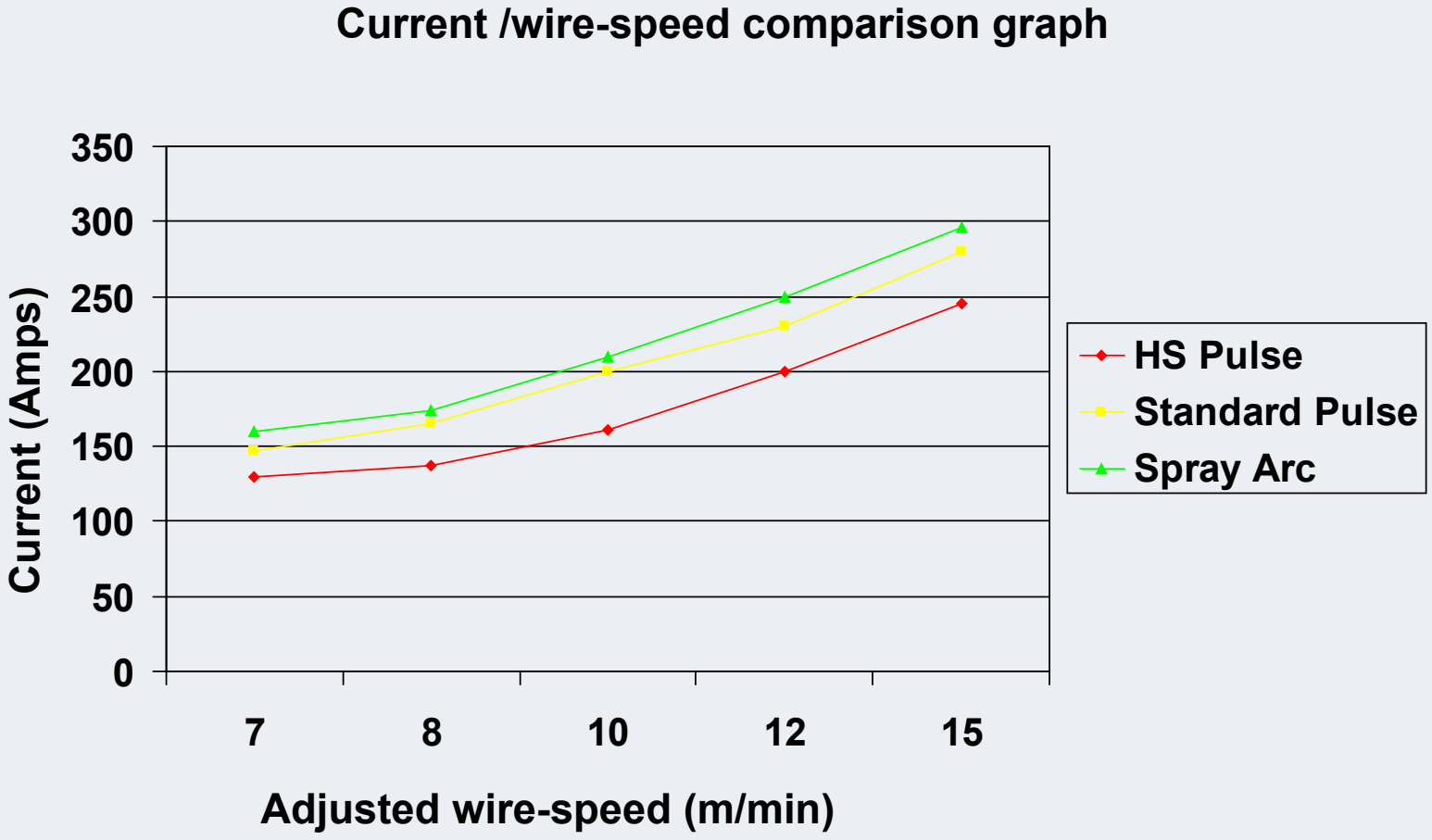
**Standard Pulse**

**Pulse HS**

**Welding made in 24 seconds**

# Higher deposition rate

High dynamics applied to the pulse of Pulse HS arc allows to increase wire's speed while keeping same current value when welding in Standard Pulse. The increase of wire quantity in the pool increases consequently the weight of deposit in the unit of time (Kg/h).



# Higher deposition rate

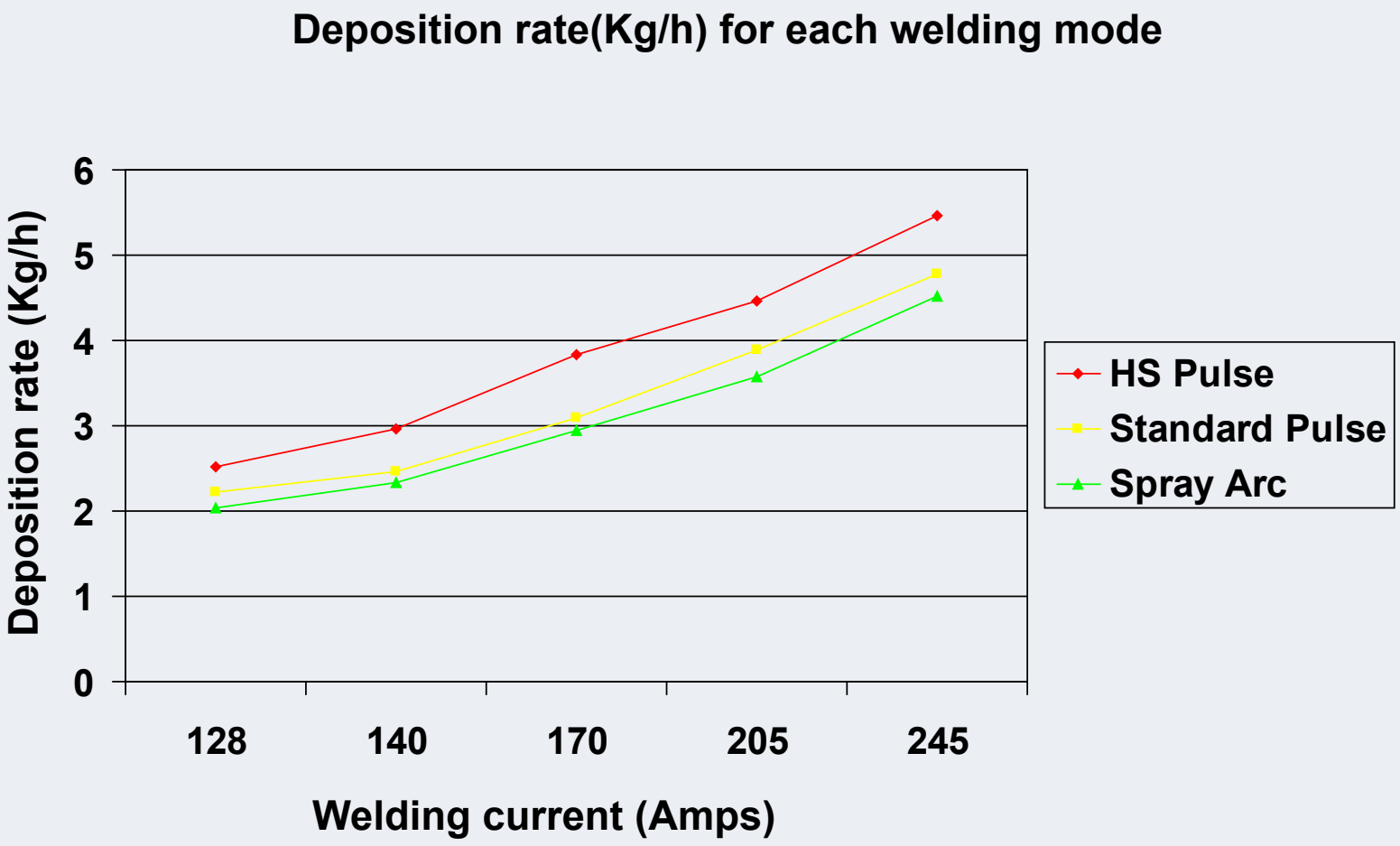
Tests made highlight deposition rate (Kg(h) obtained in fillet welding 10mm thickness in Spray Arc, Standard Pulse and HS Pulse at same current

| Spray Arc | |
|---|---|
| Wire diameter | 1,0 mm |
| Wire weight | 6,0625 g/m |
| **Current** | **255A** |
| Voltage | 30V |
| **Wire speed** | **12,4m/min** |
| Joint thickness | 10mm |
| Joint lenght | 20cm |
| Welding time | 37sec |
| **Deposition rate** | **4,52Kg/h** |

| Standard Pulse | |
|---|---|
| Wire diameter | 1,0 mm |
| Wire weight | 6,0625 g/m |
| **Current** | **255A** |
| Voltage | 30V |
| **Wire speed** | **13,1m/min** |
| Joint thickness | 10mm |
| Joint lenght | 20cm |
| Welding time | 37sec |
| **Deposition rate** | **4,77Kg/h** |

| HS Pulse | |
|---|---|
| Wire diameter | 1,0 mm |
| Wire weight | 6,0625 g/m |
| **Current** | **255A** |
| Voltage | 30,5V |
| **Wire speed** | **15m/min** |
| Joint thickness | 10mm |
| Joint lenght | 20cm |
| Welding time | 24sec |
| **Deposition rate** | **5,46Kg/h** |

# Higher deposition rate



# Lower heat input and less plastic deformation

Previous tests data show the difference of the heat imput.

**Formula Heat Imput**

$$Q = \frac{\text{Voltage (V) x Current (A)}}{\text{Welding speed (mm/min)}} \times 60$$

**Heat Input Standard Pulse**
Current: 255A
Voltage: 30,0V
Joint length: 20mm
Welding time: 37,0seconds
Welding speed: 320mm/min

**Q1=1,4344 (KJ/mm)**

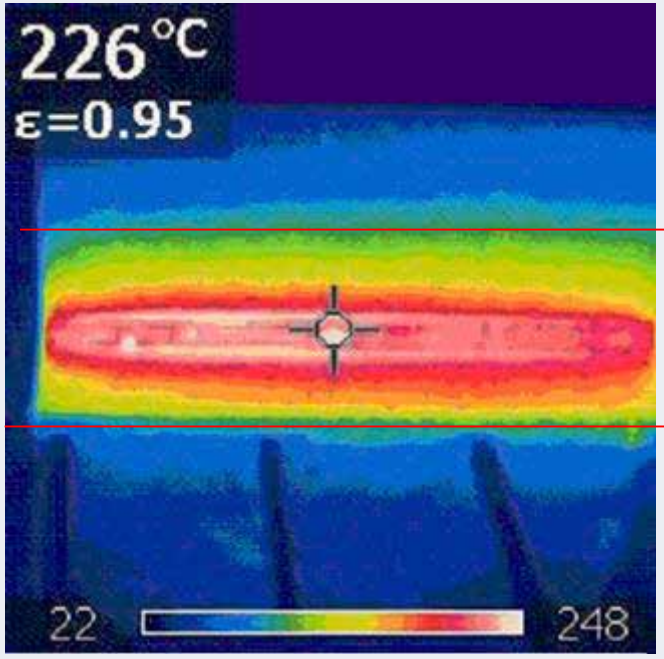
**Apporto Termico Pulsato HS**
Current: 255A
Voltage: 30,5V
Joint length: 20mm
Welding time: 24,0secondi
Welding speed: 500mm/min

**Q1=0,9333 (KJ/mm)**

In Pulse HS heat input is lower (35%) than Standard Pulse. Pulse HS is particularly suitable for high quality welding.

# Lower heat input and less plastic deformation

**Fillet welding 10,0mm**
**Standard Pulse**

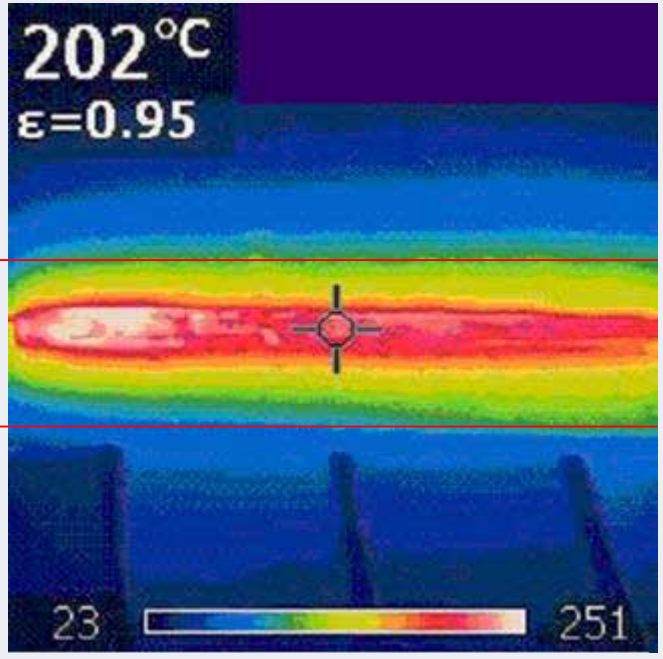



Joint temperature at the end of welding (226°C)

**HAZ1**

**HAZ2**

**Fillet welding 10,0mm**
**HS Pulse**

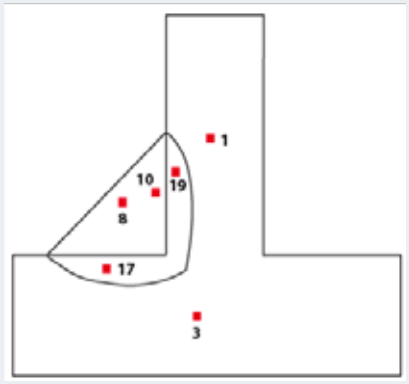



Joint temperature at the end of welding (202°C)

When welding in HS Pulse, temperatures are lower and the Heat affected zone (HAZ) is smaller. This means that mechanical and metallic joints' properties are considerably higher compare to Standard Pulse welding.

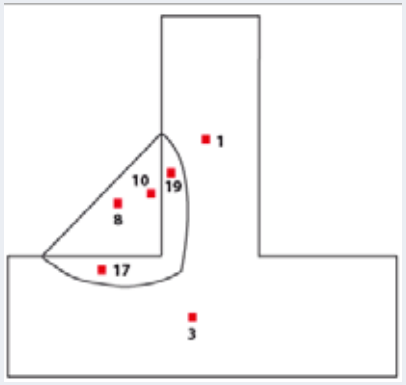
# Better mechanical properties

## Standard Pulse




| Measured hardness + Tensile strength | | | |
|---|---|---|---|
| Zone | Position | Hardness HV10 | Tensile strength Mpa |
| Base Mat. | 1 | 160 | 510 |
| | 3 | 159 | 495 |
| Pure Deposit | 8 | 236 | 770 |
| | 10 | 245 | 785 |
| HAZ | 17 | 309 | 995 |
| | 19 | 345 | 1125 |

## HS Pulse




| Measured hardness + Tensile strength | | | |
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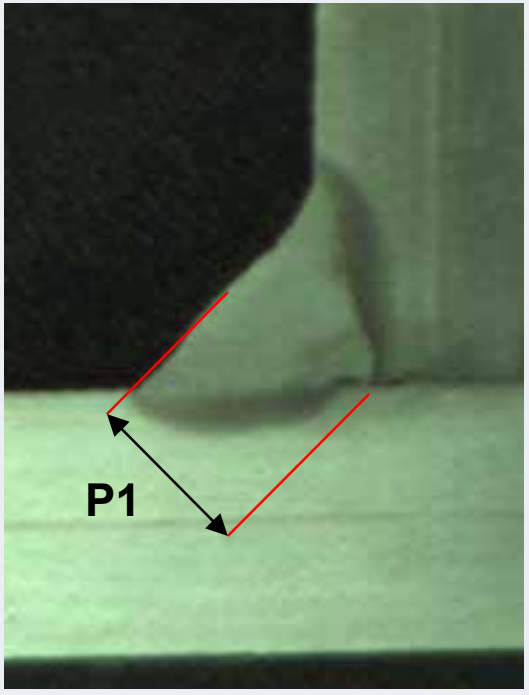
| Base Mat. | 1 | 160 | 510 |
| | 3 | 159 | 495 |
| Pure Deposit | 8 | 236 | 770 |
| | 10 | 245 | 785 |
| HAZ | 17 | 309 | 995 |
| | 19 | 345 | 1125 |

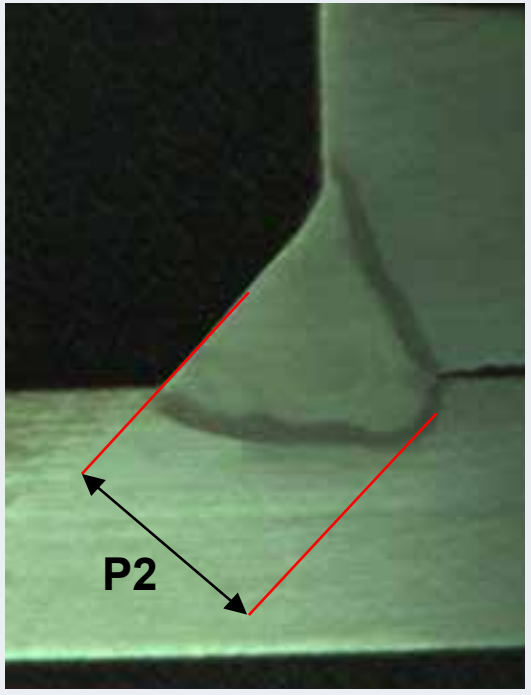
Conversion tables highlight that tensile strengths values in the Pure Deposit and Heat Affected Zone (HAZ) are much higher in Standard Pulse. This means that a higher heat input increased considerably tensile strengths. In HS Pulse, hardness and tensile strengths are in line with the class of metal the base material belongs to, therefore the heat input is non influential in the welded material.

# Higher penetration, lower risk of lack of fusion

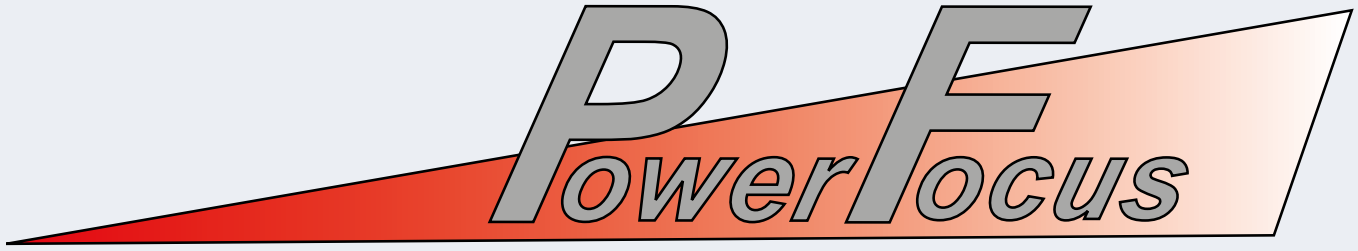
**Fillet weld 10,0mm thickness**
**Standard Pulse**




**Fillet weld 10,0mm thickness**
**HS Pulse**



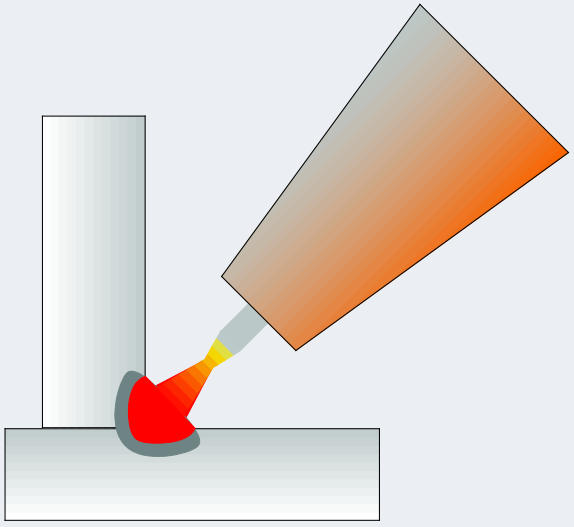

Penetration obtained in HS Pulse (P2is considerably higher compare to Standard Pulse (P1). Moreover weld face is smoother thanks to the excellent joints' wettabiltiy.



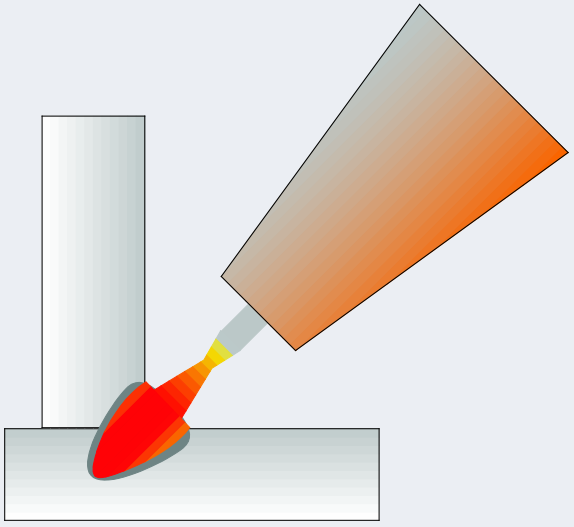

**The solution that allows a higher productivity**

# Difference between standard Mig Mag Arc and Power Focus

The difference between Standard Mig Mag welding and Power Focus is to be found on the concentration and precision of the arc.
The concentration on the Power Focus mode allows to focalize the high arc temperature precisely on the middle of the deposition, avoiding overheating on the weld edges.



**Standard**



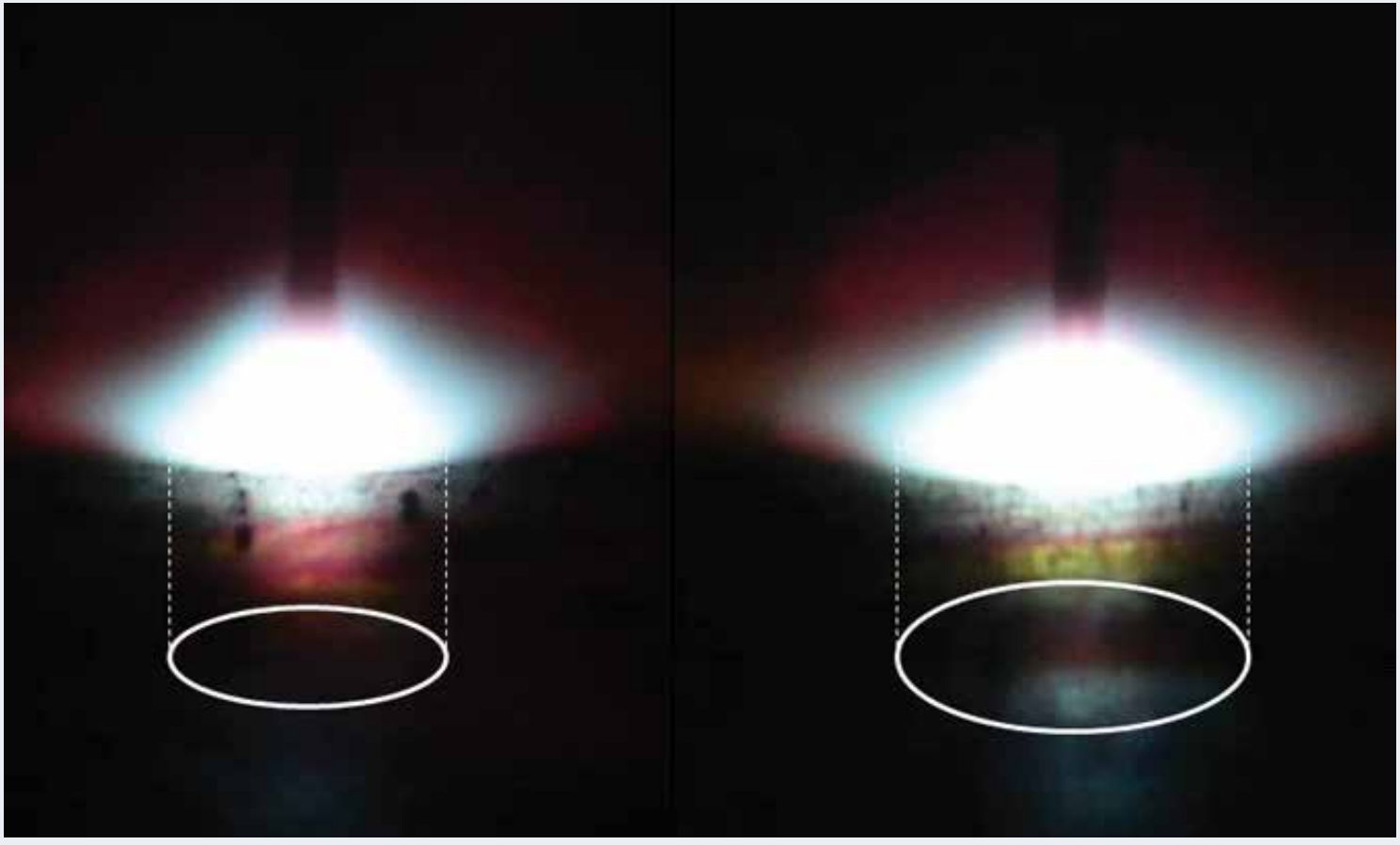
**Power Focus**

The heat affected zone (HAZ) is by Power Focus mode less expanded

# Arc differences

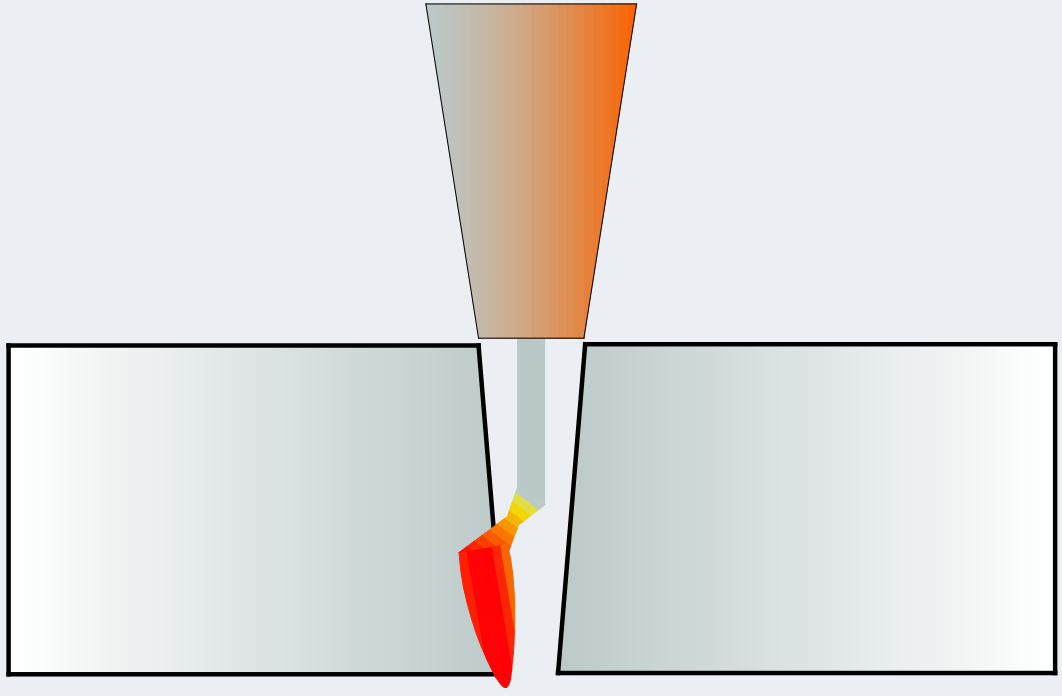
**Power Focus ARC**

**Standard ARC**



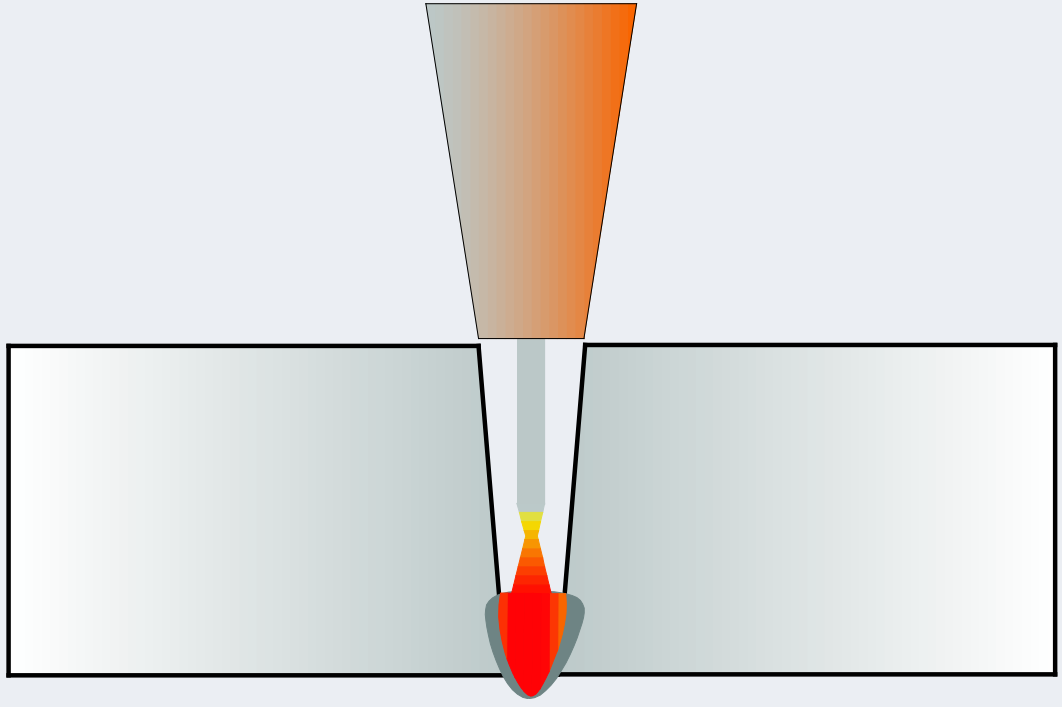
# Specifications of Standard Arc

In case of butt weld, if the plates caulker presents narrow angles, the standard arc has the tendency to get out from the caulker and to focus only on one of the two plate corners. In this situation, it is normally necessary to increase the caulker's angle degree (during the preparation) with consequent need of more filling passes.



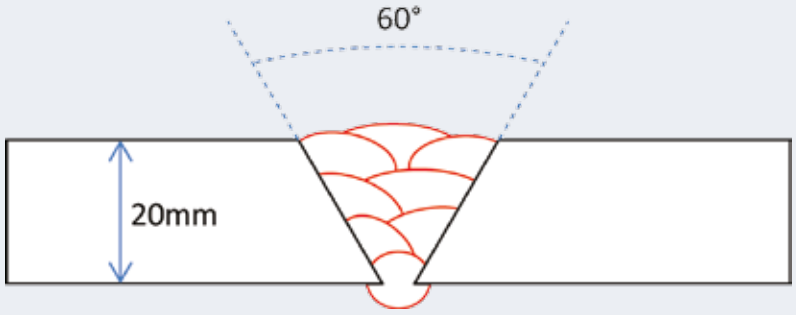
# Power Focus Specifications

On the butt welding applications the Power Focus Arc keeps on staying concentrated in the exact middle of the caulker, so that full penetration is granted. In this way, it is possible to work on very narrow caulkers, which demands less mechanical preparation and of course, also less filling passes.

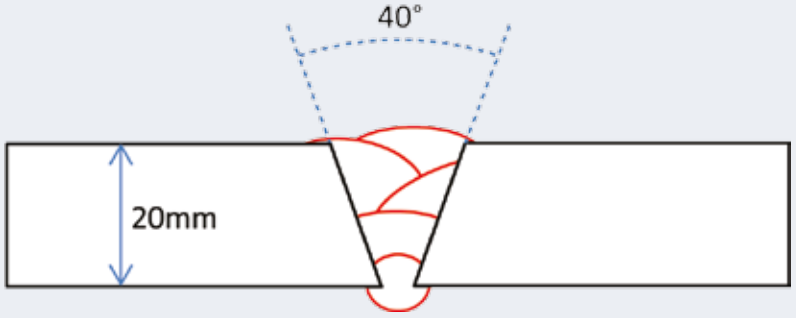


# Difference joint geometry

**Joint Geometry with Standard Arc**




**Joint Geometry with Power Focus**

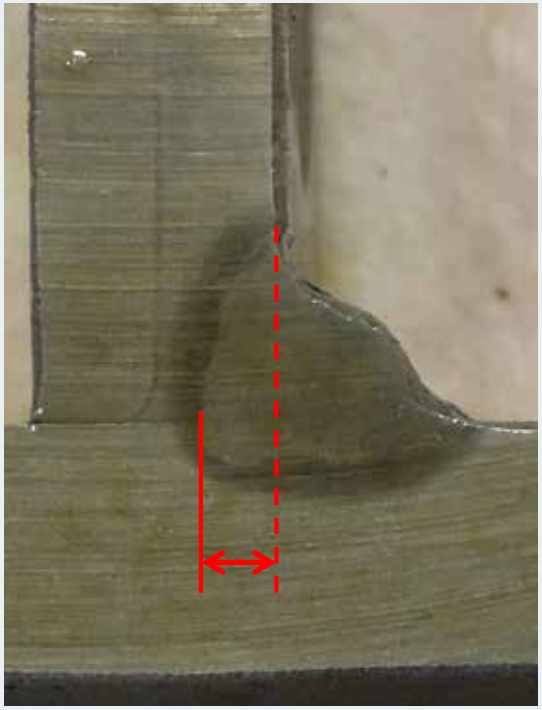



**Until 40% less volume to fill!**

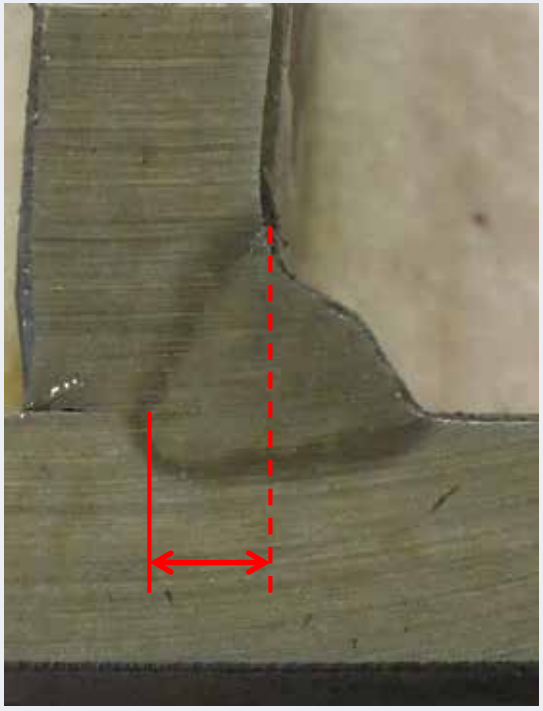
**Power Focus provides a stable arc even with stick-out very long (50mm)**

# Penetration by Power Focus

**Standard Arc**



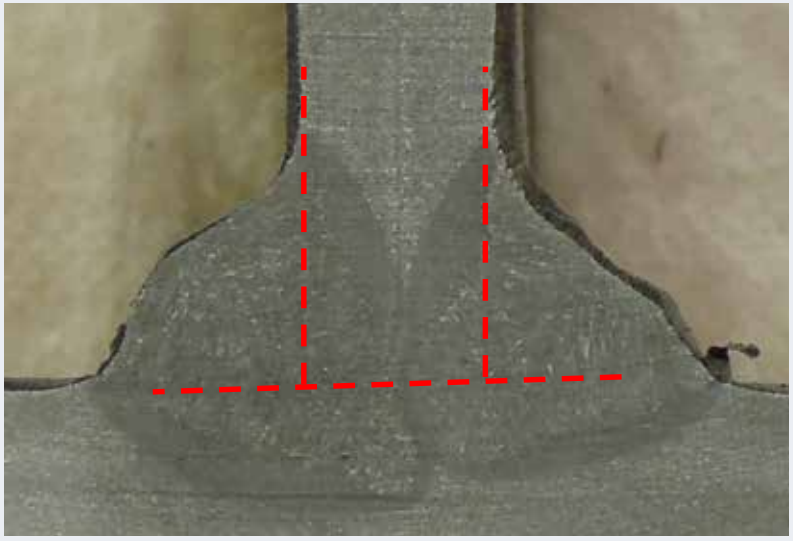
**Power Focus Arc**



The difference, as well as in the size of the penetration, is also in the extent of the heat affected zone (HAZ). It is less because the execution speed with the Power Focus is higher.

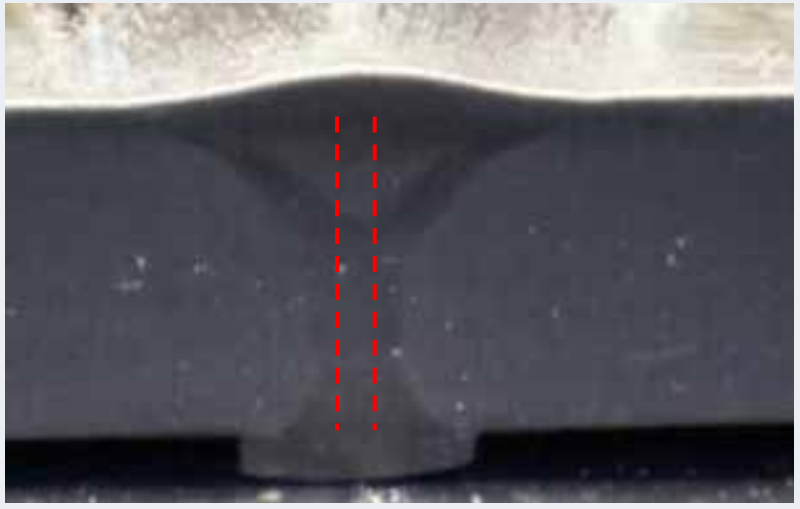
# Penetration by Power Focus

## WELD ON BOTH SIDES



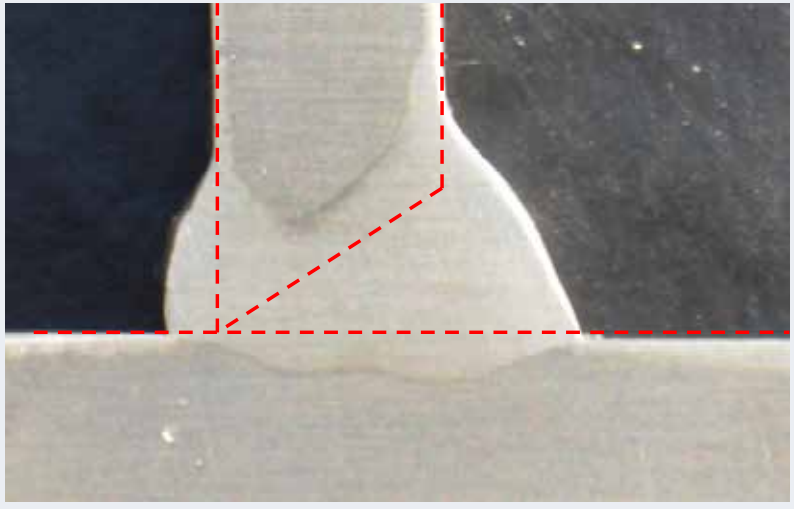
Penetration by Power Focus on a T joint (10 mm thickness), when welded on the two sides, it comes up to interesect crossing.

## BUTT JOINT



Thickness 10mm
1 Layer
Gap 2mm
Ceramic backing support

## FILLET WELD



Thickness 8mm
Angle 30°
No gap

POWER ROOT

# The solution for root pass in MAG welding

# Features

1 - Optimized root pass welding

2 - Vertical down in sound weld quality

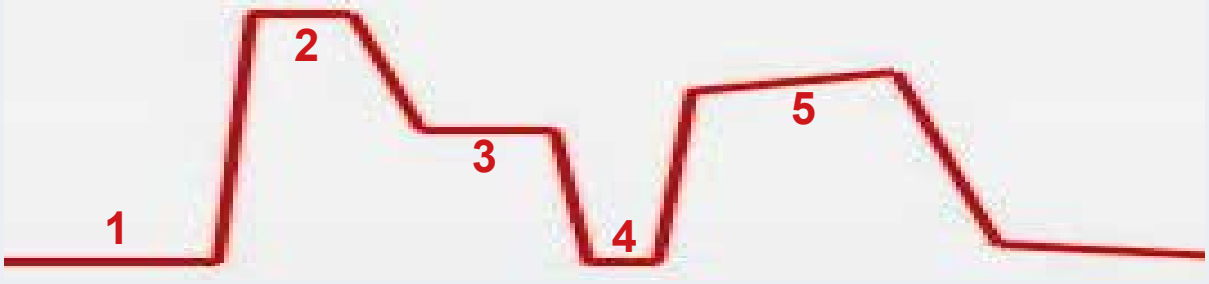
3 - Better modelability

4 - ``Cold`` droplet transfer

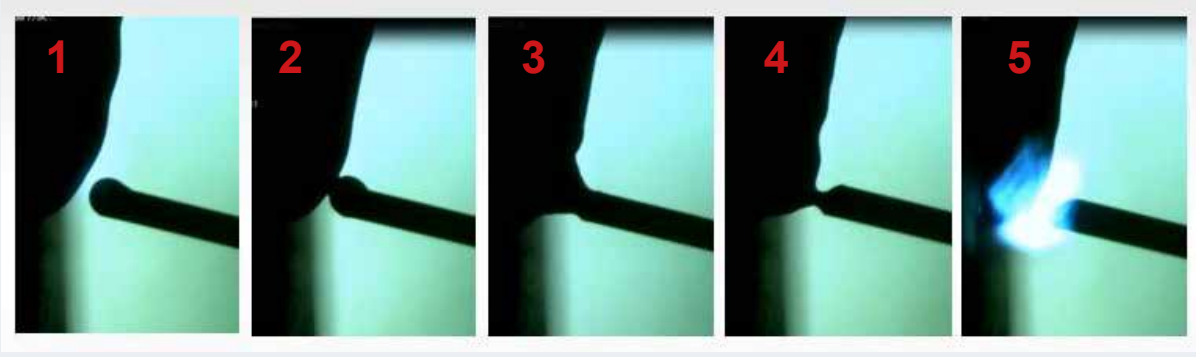
5 - Thinsheet welding

# The POWER ROOT concept

Power Root is an optimized short arc welding process with a cold droplet transfer.
It allows unique weld quality for root pass welding.



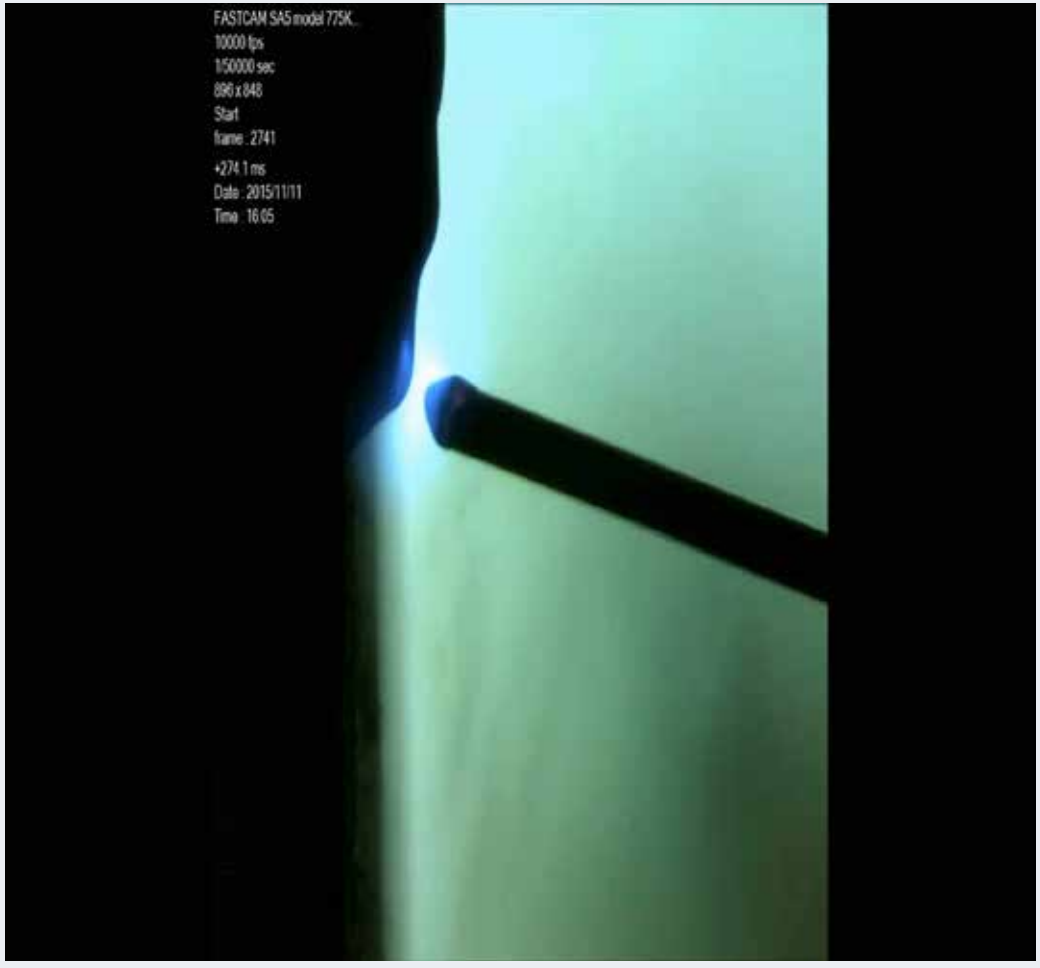

**Current behaviour**




**Drop behaviour**

1: A smooth ball is formed on the tip of the wire (basecurrent)
2: When the wire reaches shortcut, the current increases for a short cycle
3: Controlled reduction of the amperage to optimize the pinch - effect
4: ``Cold`` droplet transfer
5: reignition of the arc

# Optimized weld results




Power Root reduces the danger of root concavity:

- The weld puddle is oscillating.
- This provides a good root penetration.
- Convex (positive) root even in constrained weld positions.

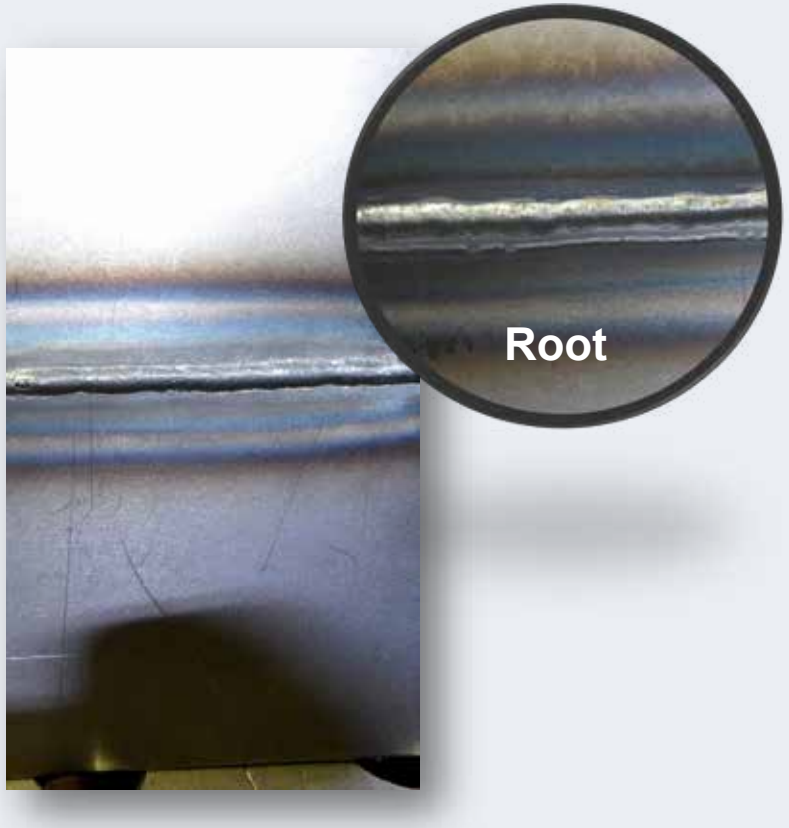
Main benefits:

- Wide weld gaps possible / safe on irregular preparation
- Vertical down welding (PG)
- Overhead welding (PE)
- Root pass welding for pipes

# Thinsheet

The low heat input allows  weldments on thinsheet  without time consuming changes of the welding wire diameter.

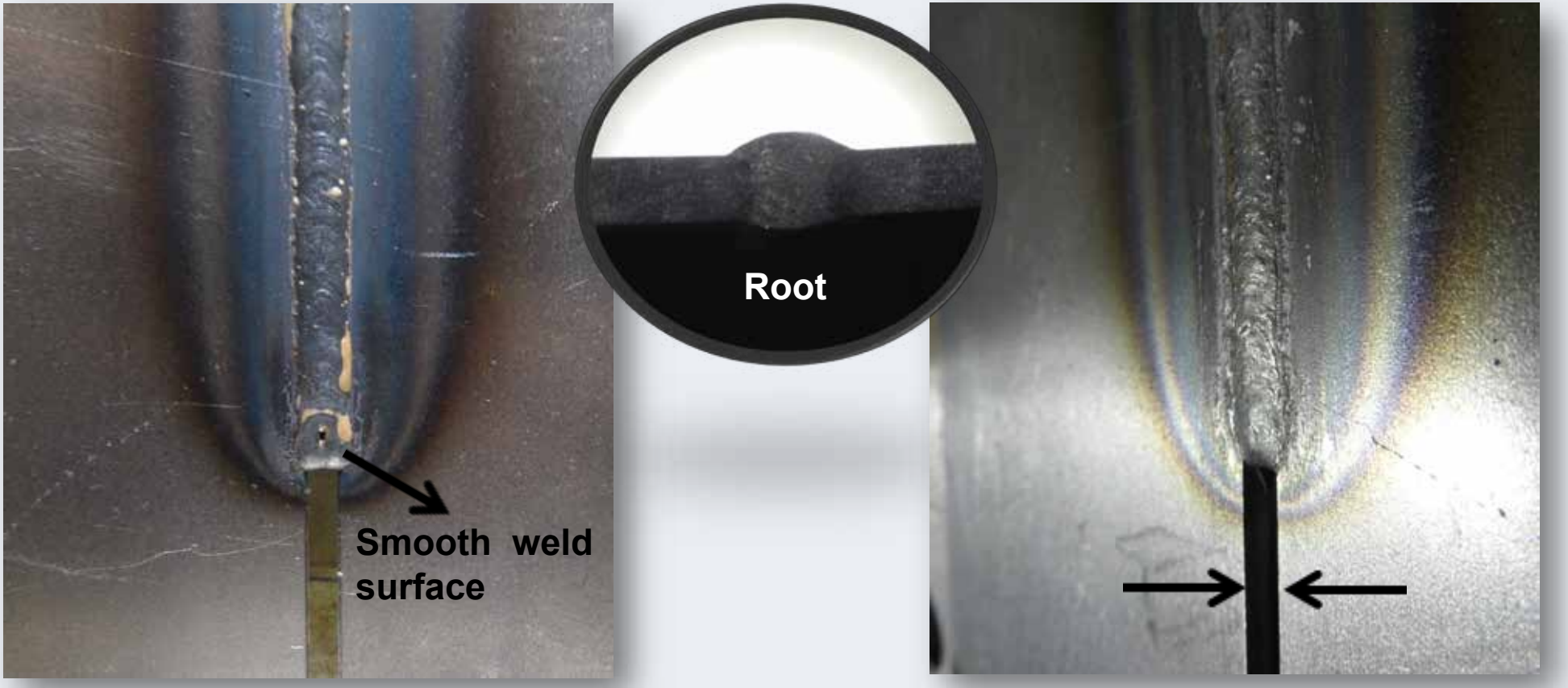

Joint: Cornerweld
Thickness: 1,0mm
Position: vertical  down
Ø wire: 1,0mm




Joint: Butt joint
Thickness: 0,6mm
Position: PC
Ø wire: 1,0mm

# Gap bridging

The cold droplet transfer provides process stable welding even with wide gaps.
The modelability is  significant improved.
The weld puddle is smooth, combined with a high viscousity.

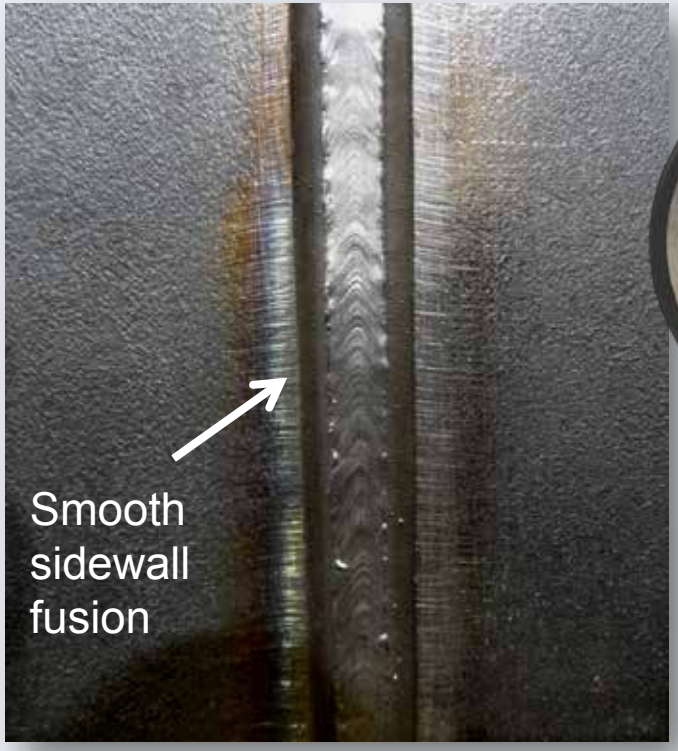



Joint: Butt joint
Thickness: 2,0mm
Position: vertical  down
Ø wire: 1,0mm

**No root concavity !**

# V-GROOVE / Pipe Welds

The optimized short arc cycle guarantees a high arc pressure – even in constrained positions.
No matter if vertical down or overhaed welding, the root pass quality will be assured.
Root pass welding with up to 4 times higher welding speed compared to vertical up.





Joint: Butt joint
Thickness: 10,0mm angle 60°
Position: vertical  down
Ø wire: 1,0mm

**Perfect Root on back side**

# Generators equipped with MIG MAG Special Functions

MicroPulse 302MFK

Pioneer Pulse 321MKS

Pioneer Pulse 321MSR

3x400Vac

Power Pulse 402-502

Power Pulse 402T - 502T

Power Pulse 402AC/DC - 502AC/DC

WELD THE WORLD

WECO srl
Via S. Antonio 22 - Loc. Belvedere
36050 Tezze sul Brenta (Vicenza) - Italy
Tel +39 0424 561 943 - fax +39 0424 561 944
www.weco.it

Distributor