COLD METAL TRANSFER.

The technology.
Ever since 1950, we’ve been developing innovative comprehensive solutions for arc welding and resistance spot-welding. Like our Cold Metal Transfer technology CMT. This revolutionary welding process has swept away one old prejudice: that you can’t weld aluminium and steel to one another. Day-in, day-out, we’re working at full power on our vision: to »decode the DNA of the arc«. So it’s no wonder that we’re the welding-sector’s technological leader worldwide, as well as being the European market leader.

A »COLD« WELD LONG CONSIDER IMPOSSIBILITY. PREPARED TO L
SOME CONVINCING FACTS ABOUT US:

/ Fronius is the world market leader for robot welding.

/ Fronius brings you the very latest technologies for arc welding and resistance spot-welding.

/ Fronius guarantees a perfect interplay between all the components in its welding systems.

/ Fronius offers a perfectly co-ordinated programme of service, training and support.

/ Fronius has mastery of the entire spectrum: MMA, TIG, MIG/MAG, plasma, LaserHybrid.

/ Fronius is a byword for superlative product quality, economy and energy efficiency.

WHAT MAKES US THE WORLDWIDE TECHNOLOGICAL LEADER:

/ Our over 650 active patents.

/ Our prowess at discovering and exploring virgin territory.

/ Our track record of turning visions into cost-saving innovations.

/ The spirit we live out in practice: insisting on quality and sustainability.

/ Developing solutions that are always a leap ahead.
CMT: THREE LETTERS THAT STAND FOR THE STABLEST WELD PROCESS ANYWHERE IN THE WORLD.

The “cold” welding process CMT means outstanding results with all materials, the world’s stablest arc, and precision process-control. What makes this possible is that compared to conventional MIG/MAG welding, this process really is “cold”. Or to put it more accurately, one that constantly alternates between hot and cold. This leads to immaculate results and boundless possibilities – such as spatter-free welding- and brazing seams, welded joins between steel and aluminium, welding ultra-light gauge sheets from only 0.3 mm (0.01 in) thick, and much else besides.

INTEGRATED WIRE MOTIONS
The digital process-control detects a short circuit, then helps to detach the droplet by retracting the wire – up to 90 times a second!

EXTREMELY LOW THERMAL INPUT
During welding, the wire moves forward – and as soon as the short circuit happens, it is pulled back again. This means that in the arcing phase, the arc itself only inputs heat very briefly.

NO SPATTERING
The rearward movement of the wire assists droplet detachment during the short circuit. The short circuit is controlled, and the current is kept small. The result: spatter-free metal transfer.

EXTREMELY STABLE ARC
The arc length is detected and adjusted mechanically. The arc remains stable, no matter what the surface of your workpiece is like or how fast you want to weld. This means that you can use CMT everywhere and in every position.
YOU CAN ALWAYS MAKE A BETTER THING EVEN BETTER: CMT PULSE, CMT ADVANCED AND CMT ADVANCED PULSE.

For extremely difficult seams and very special requirements, we have refined and combined CMT further. The result: three additional processes that let you find the perfect solution for virtually any application. And that ensure outstanding results.

CMT PULSE

This process combines a pulsed cycle with a CMT cycle and so inputs more heat. Introducing pulses in this carefully controlled, adjustable way results in a huge breadth of performance and flexibility.

Comparison of Arc Technologies

\[ \text{Us [V]} \]

\[ \text{Is [A]} \]

CMT Pulse, CMT Advanced, CMT Advanced Pulse
**CMT ADVANCED**

Even «cooler» than CMT. Here, the polarity of the welding current is made an integral part of the process-control. The polarity reversal takes place in the short-circuit phase, thereby ensuring the proven stability of the CMT process. The results: tightly controlled thermal input, extremely high gap bridge-ability and an up to 60% bigger deposition rate.

/ Combination of CMT negative and CMT positive

/CMT negative / Initialisation / CMT positive

**CMT ADVANCED PULSE**

By combining negatively poled CMT cycles and positively poled pulsing cycles, this process achieves absolute precision and the very greatest mastery of the arc.

/ Combination of CMT negative and pulsing cycles

/CMT negative / Initialisation / Pulsed-arc positive
CMT IN PRACTICE: HIGHLIGHTS AND APPLICATIONS.

CMT has some crucial advantages going for it – as our sample applications impressively demonstrate.

EXCELLENT GAP BRIDGEABILITY

With CMT Advanced, gap bridgeability increases on e.g. 2 mm (0.08 in) aluminium from 1 mm to 2.5 mm (0.04 to 0.1 in) as compared with pulsed-arc welding.

50% LESS DILUTION OF BASE AND FILLER METAL

Dilution of base and filler metal is as much as 50% lower, cutting costs when cladding.

ULTRA-HIGH-PRECISION WELD PROCESS

Boasting 100% reproducibility and the best process-control you’ll find anywhere in the world, CMT opens up radically new fields of application like CMT Pin and CMT Print.
EXTREMELY LOW SPATTERING

/ Spattering on e.g. steel is cut by as much as 99% compared to pulsed-arc and dip-transfer welding.

MINIMAL DISTORTION

/ The lower heat input leads to less distortion on e.g. thinner steel. This reduces the need for weld preparation and finishing work.

EXTREMELY LOW THERMAL INPUT

/ Up to 90% less thermal input than with TIG cold-wire, e.g. when using CMT on aluminium.

HIGHER WELDING SPEEDS

/ Up to 10 times faster for the same seam quality and same sidewall-wetting behaviour, e.g. on chrome-nickel – with excellent seam appearance.
CMT ON STEEL

**HIGHER WELDING SPEEDS**

+50% VS

**EXTREMELY LOW SPATTERING**

Steel, measured over 1 m (3.2 ft) length of weld-seam

-99% SPATTER

**EXTREMELY LOW THERMAL INPUT**

(MIXED GAS M21)

Material: steel 1 mm (0.04 in)

-50% THERMAL INPUT

**DTA**

<table>
<thead>
<tr>
<th>Method</th>
<th>Dip-transfer arc</th>
<th>Pulsed arc</th>
<th>CMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (A)</td>
<td>185</td>
<td>97</td>
<td>200</td>
</tr>
<tr>
<td>U (V)</td>
<td>17.6</td>
<td>18.1</td>
<td>16.2</td>
</tr>
<tr>
<td>g/m</td>
<td>0.376</td>
<td>0.264</td>
<td>0.002</td>
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<tr>
<td>cm/min</td>
<td>70/27</td>
<td>150/59</td>
<td></td>
</tr>
<tr>
<td>kl/cm</td>
<td>1.96</td>
<td>1.12</td>
<td></td>
</tr>
</tbody>
</table>

/ Dip-transfer arc
I: 185 A, U: 17.6 V

/ CMT
I: 200 A, U: 16.2 V

/ Dip-transfer arc
I: 97 A, U: 18.1 V

/ Pulsed arc

/ CMT
I: 98 A, U: 11.8 V

1 mm / 0.04 in

1 mm / 0.04 in
CMT ON ALUMINIUM

ULTRA-LIGHT-GAUGE JOINTS,
HIGHER WELDING SPEEDS

/ Material: aluminium 0.3 mm (0.01 in)

/ Not possible

/ Pulsed-arc
/CMT – Vs = 6.4 m/min (21 ft/min)

/ Material: aluminium 3 mm (0.12 in)

/ Pulsed-arc – Vs = 1.1 m/min (3.6 ft/min)
/CMT – Vs = 1.7 m/min (5.6 ft/min)

EXTREMELY LOW THERMAL INPUT,
HIGHER WELDING SPEEDS

/ Material: aluminium 1.6 mm (0.06 in)

/TIG cold-wire – I: 84 A, U: 17.4 V, Vs: 24 cm/min (9.45 in/min)

/Pulsed-arc – I: 88 A, U: 18.6 V, Vs: 100 cm/min (40 in/min)
/CMT – I: 99 A, U: 16.7 V, Vs: 200 cm/min (80 in/min)

/CMT Advanced Pulse – I: 97 A, U: 11.9 V, Vs: 60 cm/min (23 in/min)

EXCELLENT GAP BRIDGEABILITY

/ Material: aluminium 2 mm (0.08 in)

2 mm (0.08 in)
1 mm (0.04 in)
2 mm (0.08 in)

/Pulsed arc – I: 100 A, U: 18.9 V, Vd: 4.5 m,
Vs: 60 cm/min (23 in/min)

/CMT Pulse – I: 97 A, U: 16.9 V, Vd: 5 m,
Vs: 60 cm/min (23 in/min)

/CMT Advanced Pulse – I: 97 A, U: 11.9 V, Vs: 60 cm/min (23 in/min)

LIGHT-GAUGE SHEET
0.3 MM (0.01 IN)

+50% VS

–90% THERMAL INPUT

10 X FASTER

2.5 MM (0.1 IN) GAP
CMT STEEL/ALUMINIUM, CrNi, CLADDING

STEEL/ALUMINIUM HYBRID JOIN

HIGHER WELDING SPEEDS
/ Material: CrNi 2 mm (0.08 in)

/TIG cold-wire

* /CMT

% Fe content in 1st pass

- 75% DILUTION
+ 50% VS

EXTRREMELY LOW DILUTION DURING CLADDING
CMT BRAZING, CO2 SHIELDING GAS, CMT PIN, CMT PRINT

EXTREMELY LOW THERMAL INPUT DURING CMT BRAZING
/ Material: hot-dip galvanised sheets
/ Fewer pollutants than with pulsed-arc and dip-transfer arc

![Copper fume concentration comparison graph](image1)
![Zinc concentration comparison graph](image2)

EXTREMELY LOW SPATTERING WITH CO2 SHIELDING GAS
/ Steel, measured over 1 m (3.2 ft) length of weld-seam

![Spattering comparison graph](image3)

ULTRA-HIGH-PRECISION MIG/MAG WELD PROCESS
/ The exceedingly high precision of CMT Pin and CMT Print broadens the potential applications of the process

![Welding precision images](image4)
THE IDEAL WELDING SYSTEM, EVERY TIME.
FOR EITHER AUTOMATED OR MANUAL PROCESSES.

WIREFEEDER
// Wirefeed unit with 4-roller drive for feeding the filler metal precisely and smoothly all the way from the wire-spool to the workpiece.

WIRE BUFFER
// The wire buffer decouples the front and rear wire-drives from one another and ensures smooth wire travel.

DIGITALLY CONTROLLED MIG/MAG WELDING POWER SOURCE
// The fully digitised micro-processor-controlled inverter power source ensures unrivalled precision in the welding process, with exact reproducibility and superlative welding properties.

COOLING UNIT
// The rugged and reliable cooling unit is designed to dovetail with the modular concept of the welding system as a whole. It ensures optimum water cooling of the welding torch.
/ If you want to exploit all these capabilities, excellent welding properties and functions to the very full, you need to think in terms of systems. In conjunction with all their peripherals, the digital power sources constitute thoroughly co-ordinated, highly innovative and intelligent welding systems.
WE HAVE THREE DIVISIONS AND ONE PASSION: SHIFTING THE LIMITS.

What Günter Fronius started in 1945 in Pettenbach, Austria, has now become a modern day success story. Today, the company has more than 3,000 employees worldwide and owns around 650 active patents. Since the very beginning, our goal has not changed: to be the technology and quality leader. We shift the limits of what’s possible. While others progress step by step, we innovate in leaps and bounds.

BATTERY CHARGING SYSTEMS
/ We started a technological revolution with Active Inverter Technology and are now one of the leading suppliers in Europe. We are driven by the aim of providing intelligent energy management systems that ensure mobility stays as economically viable as possible in the twenty-first century.

WELDING TECHNOLOGY
/ We develop welding technologies, such as entire systems for arc and resistance spot welding, and have set ourselves the task of making impossible weld joints possible. Our aim is to decode the »arc welding’s DNA«. We are the technology leader worldwide and the market leader in Europe.

SOLAR ELECTRONICS
/ The greatest challenge of our time is to make the leap to a regenerative energy supply. Our vision is to use renewable energy to achieve energy independence. With our mains-connected inverters and products for monitoring photovoltaics systems, we are now one of the leading suppliers in solar electronics.

Further information about all Fronius products and our global sales partners and representatives can be found at www.fronius.com