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 MOST STABLE WELD PROCESS 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.

REVERSING 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 SPATTER

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.

/ During the arcing period, the filler metal is moved towards the weld-pool.
/ When the filler metal dips into the weld-pool, the arc is extinguished. The welding current is lowered.
/ The rearward movement of the wire assists droplet detachment during the short circuit. The short-circuit current is kept small.
/ The wire motion is reversed and the process begins all over again.
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 widespread performance and flexibility.

COMPARISON OF ARC MODES

/ Combination of CMT cycles and pulsing cycles

/ CMT positive / Pulsed-arc positive / Pulsed-arc positive / CMT positive
**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: precisely controlled thermal input, extremely high gap-bridging ability and an up to 60% bigger deposition rate.

/ Combination of CMT negative and CMT positive

/ CMT negative / 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 greatest mastery of the arc.

/ Combination of CMT negative and pulsing cycles

/ CMT negative / Initialisation / Pulsed-arc positive / 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-BRIDGING-ABILITY

With CMT Advanced, gap-bridging-ability 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 SPATTER

/ Spatter 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**

2X FASTER

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<thead>
<tr>
<th></th>
<th>DTA</th>
<th>CMT</th>
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<tbody>
<tr>
<td>cm/min</td>
<td>70/27</td>
<td>150/59</td>
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</table>

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

/ CMT
I: 200 A, U: 16.2 V

**EXTREMELY LOW SPATTER**

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

99% LESS SPATTER

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<th>DTA</th>
<th>PULSED</th>
<th>CMT</th>
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<tbody>
<tr>
<td>g/m</td>
<td>0.376</td>
<td>0.264</td>
<td>0.002</td>
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</tbody>
</table>

/ Dip-transfer arc
/ Pulsed arc
/ CMT

**EXTREMELY LOW THERMAL INPUT**

(MIXED GAS M21)

Material: steel 1 mm (0.04 in)

50% LESS THERMAL INPUT

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<th>DTA</th>
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<tbody>
<tr>
<td>kl/cm</td>
<td>1.96</td>
<td>1.12</td>
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</table>

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

/ CMT
I: 98 A, U: 11.8 V
CMT ON ALUMINIUM

ULTRA-LIGHT-GAUGE JOINTS, HIGHER WELDING SPEEDS

/ Material: aluminium 0.3 mm (0.01 in)

/ Material: aluminium 3 mm (0.12 in)

EXEMPLARY LOW THERMAL INPUT, HIGHER WELDING SPEEDS
/ Material: aluminium 1.6 mm (0.06 in)

90% LESS THERMAL INPUT

10 X FASTER

EXCELLENT GAP-BRIDGING-ABILITY
/ Material: aluminium 2 mm (0.08 in)

2.5 MM (0.1 IN) GAP

/ Pulsed-arc

/ Pulsed-arc – V_{weld} = 1.1 m/min (3.6 ft/min)

/ CMT – V_{weld} = 6.4 m/min (21 ft/min)

/ CMT – V_{weld} = 1.7 m/min (5.6 ft/min)

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

/ Pulsed-arc – I: 88 A, U: 18.6 V, V_{weld}: 100 cm/min (40 in/min)

/ CMT – I: 99 A, U: 16.7 V, V_{weld}: 200 cm/min (80 in/min)

/ CMT Pulse – I: 97 A, U: 16.9 V, V_{wire}: 5 m, V_{weld}: 60 cm/min (23 in/min)

/ CMT Advanced Pulse – I: 97 A, U: 11.9 V, V_{wire}: 6 m, V_{weld}: 60 cm/min (23 in/min)
CMT STEEL/ALUMINIUM, CrNi, CLADDING

STEEL/ALUMINIUM HYBRID JOINT

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

I: 84 A, U: 17.4 V, Vweld: 24 cm/min (9.45 in/min)
I: 138 A, U: 19 V, Vweld: 130 cm/min (51.12 in/min)

5X FASTER

EXTREMELY LOW DILUTION DURING CLADDING

75% LESS DILUTION 2X FASTER

% Fe content in 1st pass

TIG-CW  CMT

Vweld: 40 cm/min (15.75 in/min)  Vweld: 80 cm/min (31.5 in/min)
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

Extremely low spatter with CO₂ shielding gas
/ Steel, measured over 1 m (3.2 ft) length of weld-seam

99% less spatter

Ultra-high-precision mig/mag weld process
/ The exceedingly high precision of CMT Pin and CMT Print broadens the potential applications of the process

World’s stablest mig/mag weld process

Copper fume concentration, mg/m³

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<tbody>
<tr>
<td>PULSED</td>
<td>1.8</td>
<td>1.5</td>
<td>0.2</td>
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Zinc concentration, mg/m³

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<tbody>
<tr>
<td>PULSED</td>
<td>2.7</td>
<td>1.7</td>
<td>1.0</td>
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Spattering, g/m

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<tbody>
<tr>
<td>DTA</td>
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<td>0.01</td>
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/CMT Pin Pike / CMT Pin Cylindrical / CMT Pin Ball / CMT Print
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.
Robacta Drive CMT Welding Torch

Integrated robot welding torch, equipped with a gearless and highly dynamic AC servo motor that moves the welding wire forward and back up to 90 times a second. It ensures accurate wirefeed and constant contact pressure.

Contec Contacting System

Two moveable half-shells keep the contact surfaces and the contact forces between the contacting system and the welding wire exactly in the defined target range. The contact tip abrades uniformly – which minimises the adverse and hard-to-calculate consequences of uneven wear upon the process. Contec is suitable for all diameters and materials of wire.

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.

// 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 photovoltaic systems, we are now one of the leading suppliers in solar electronics.

// 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.

// 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.

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