
Fronius
CMT
COLD METAL TRANSFER
Cold
Metal
Transfer
CMT
Unleash
your welding
potential

Thin sheets



Practically spatter-free welding with top speed and low heat input

Parts that were previously bonded or soldered can be welded with CMT (Cold Metal Transfer). With oscillating wire motion, CMT has revolutionised welding technology and opened up the range of applications.

The forwards-backwards motion (oscillating) of the welding wire – at up to 170 Hertz – allows for an exceptionally stable arc. This means you can achieve 33% less heat input and almost twice the welding speed compared to conventional dip transfer arcs.

* under laboratory conditions
** compared to the standard dip transfer arc

CMT – your advantages



Less rework

- 99% less spatter*
- 33% less heat input reduces distortion
- Perfect ignition (SFI)



100% higher speed**

- Same penetration with high speed
- Fast joining of thin sheets



Stable arc

- 100% CO_2 welding
- Even with high-strength steels
- Not susceptible to external influences (changes in stickout or workpiece surface)*



CMT

Welding process



The most advanced method of droplet detachment thanks to oscillating wire motion.

In the conventional dip transfer arc process, the wire is continuously fed to the workpiece. When a short circuit occurs, the current is increased. This breaks the short circuit and the arc is reignited.

The CMT process differs here in that the wire electrode moves backwards when the short circuit occurs resulting in a much more controlled droplet detachment and reignition process. Depending on the filler metal, shielding gas and electrode diameter, this oscillating wire motion occurs within a frequency range of 50 to 170 Hz.



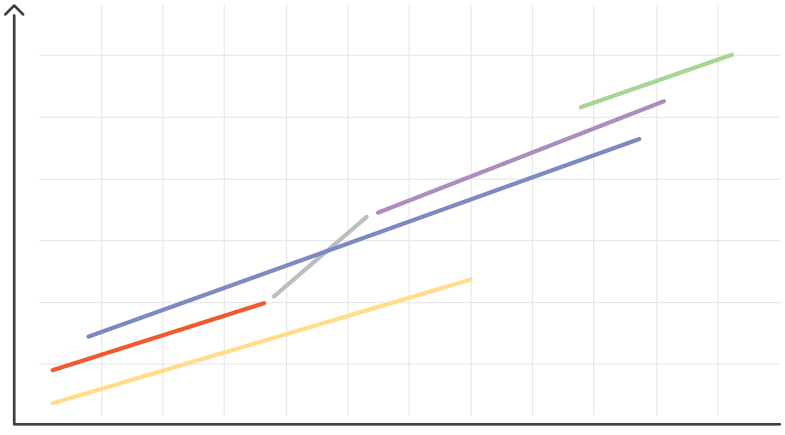
Perfect

for all positions



Applications

- Joint welding (CrNi applications, food industry)
- Overlay welding
- Rapid Prototyping and Fronius Additive
- Brazing, particularly where there are high demands in terms of speed and process stability
- 100% CO_2 welding on steel
- Root passes
- Welding of light- and medium-gauge sheets
- Special joints such as copper, steel-aluminium, titanium



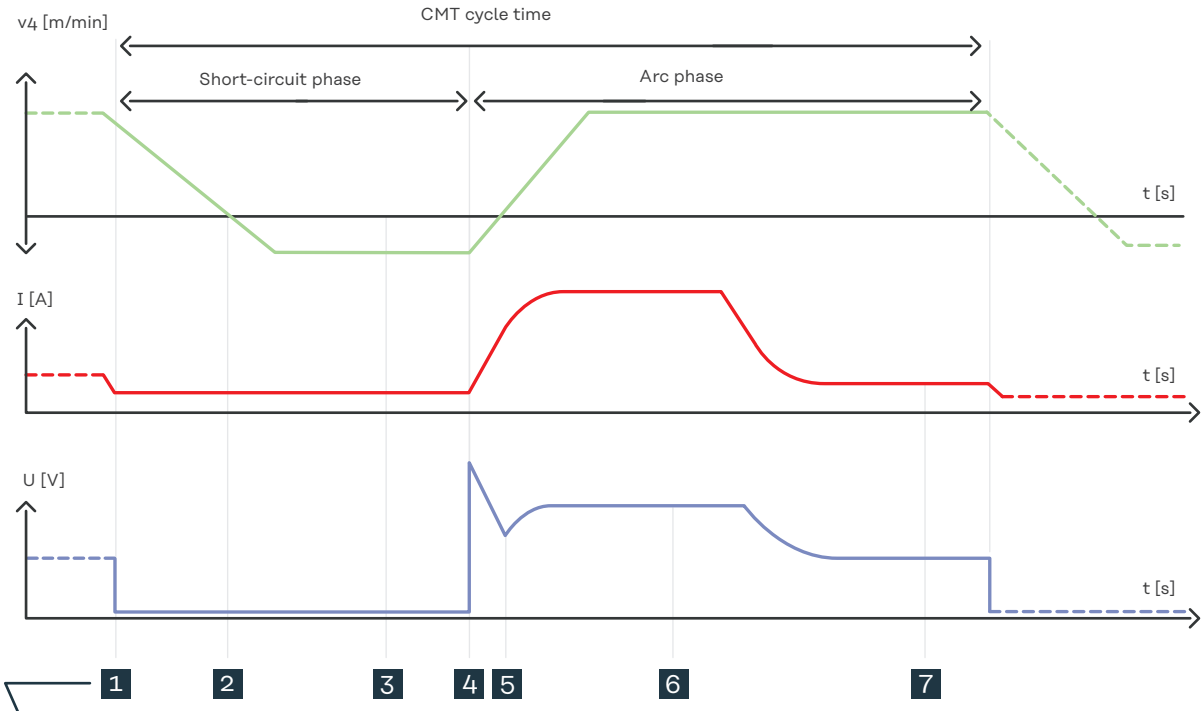
CMT arc
Dip transfer arc
Intermediate arc
Spray arc
Pulsed arc
Rotating arc

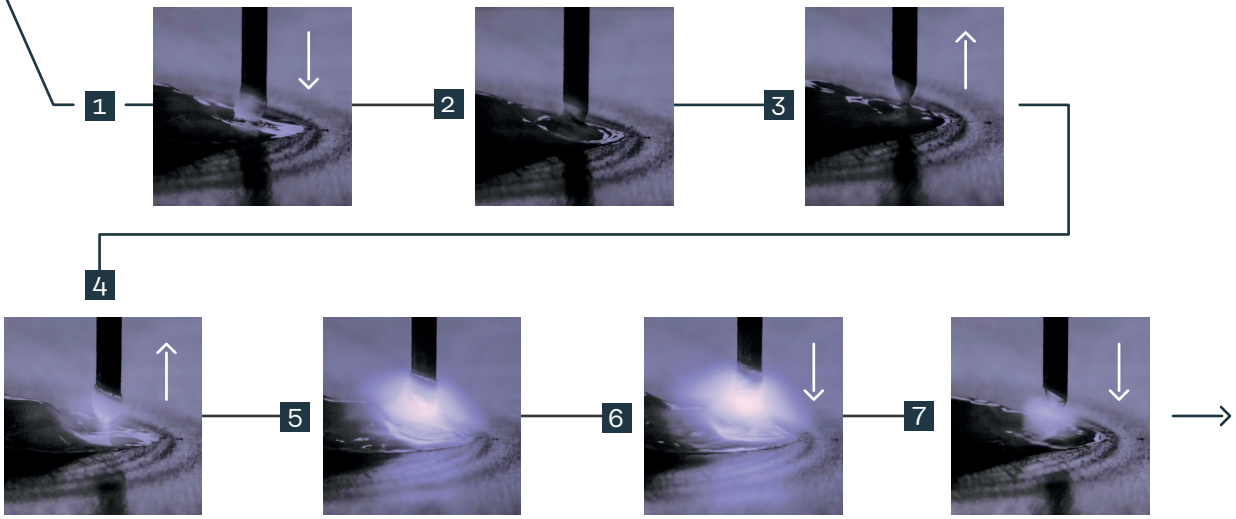
CMT

special features

– Fast
– Practically spatter-free
– Cold

Cost-effective, sustainable welding: With its revolutionary wire motion, CMT offers an array of advantages. Rework and welding errors are reduced to a minimum.



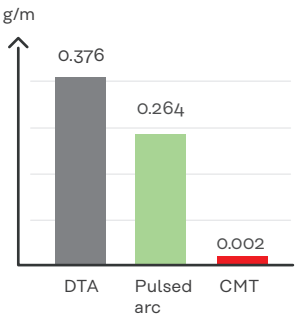


* 1.5 mm steel plate FW, PB 1.5 mm steel plate FW-TJ PB
* Vs dip transfer arc 100 cm/min; Vs CMT 200 cm/min, weld seam length = 230 mm

** Compared to the standard-dip transfer arc

Up to 99% less spatter**

Welding spatter – and thus rework – isn't inevitable. The backward motion of the wire in the CMT process supports droplet detachment during the short circuit. This allows for a controlled process and the current is kept low. The result is practically spatter-free material transfer.



Minimal spattering, even in conjunction with 100% CO_2 shielding gas

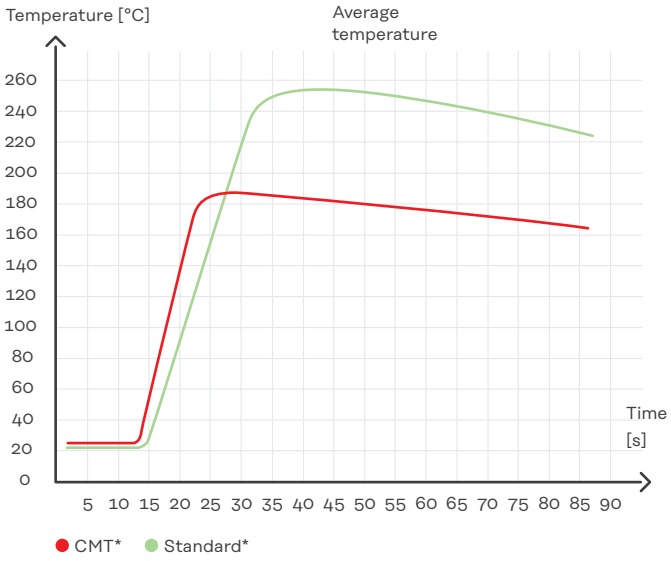


Dip transfer arc | Pulsed arc | CMT

33% less heat input**

Heat input at a very low level: With the CMT process, the wire is retracted again as soon as the short circuit occurs. This means the arc itself inputs heat very briefly.

As a result, CMT enables continuous regulation of the heat input from cold to hot. What's more, faster welding speeds and a wider range of applications* are possible, all with maximum welding quality.



Double

the welding speed**

With CMT, you can achieve double the welding speed with sufficient penetration, thanks to the highly dynamic wirefeeder Robacta Drive CMT.

Result with standard dip-transfer arc*

Sufficient penetration at double the speed

Result with CMT at double the speed



A highly versatile

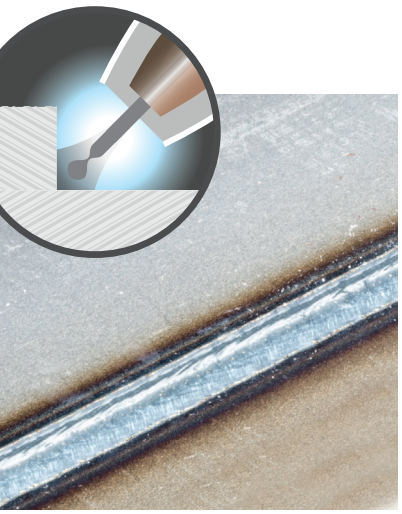
CMT

welding package

Whatever the application, we offer the ideal support needed to create perfect weld seams. For example, CMT Mix is ideal for aluminium applications – or for visible seams which require outstanding seam rippling.

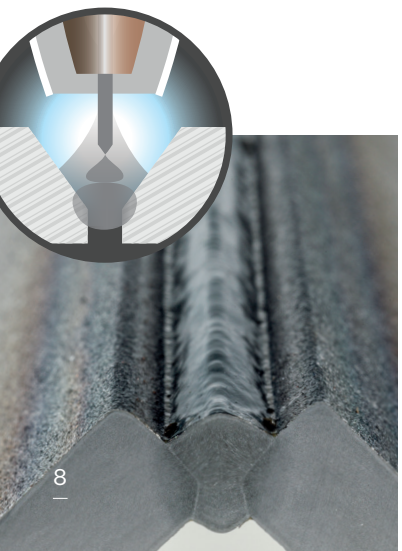
Perfectly

tailored to your needs



Uni-versal

Time-saving, easy welding settings for standard applications, with easy-to-control arc



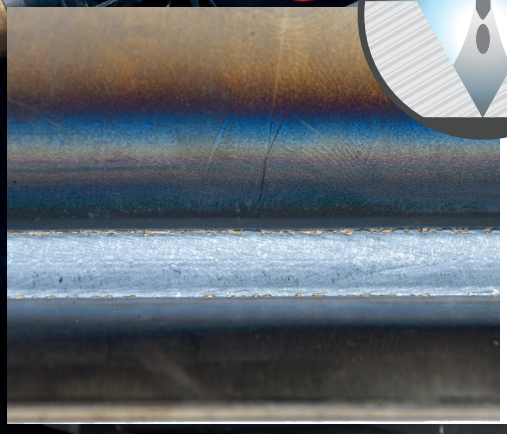
Root

Powerful arc with good gap-bridging with easy root pass and during positional welding



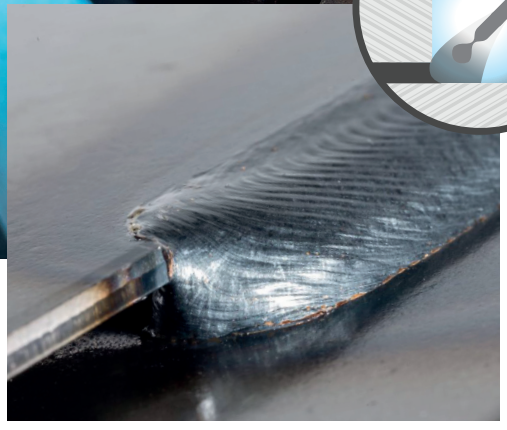
Galvanised

Weld galvanised sheet metal with low zinc pore risk and reduced zinc melting loss



Dynamic

Concentrated arc with deep penetration at high welding speeds. Outstanding for applications with a small included angle



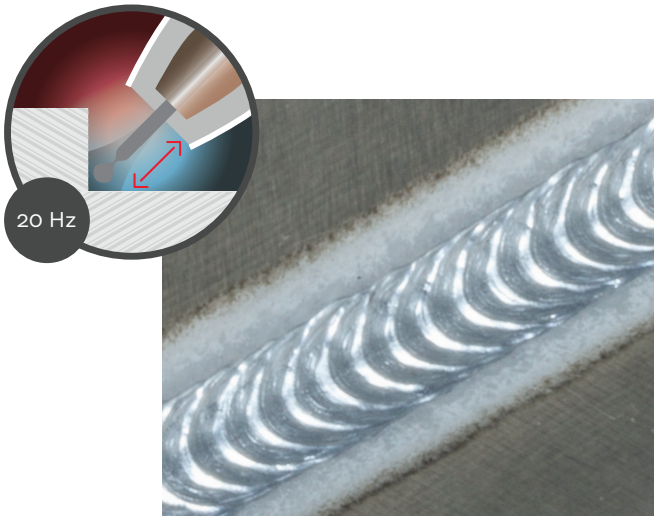
Gap Bridging

Optimised gap-bridging due to low arc pressure

CMT Mix

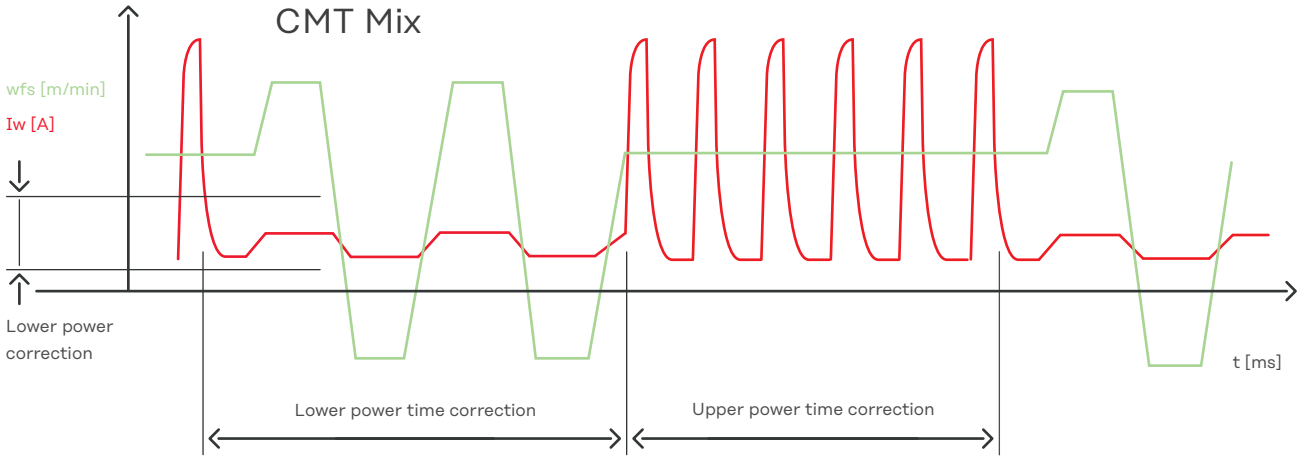
Optimum combination of stability and heat input

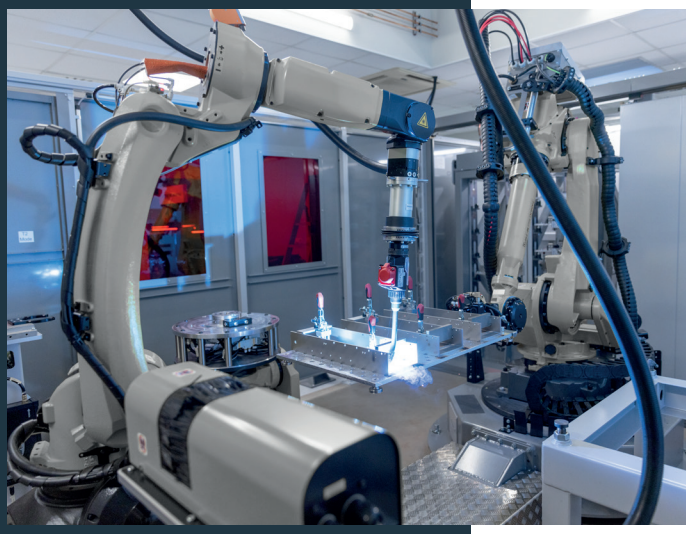
This welding characteristic combines CMT and pulsed arc. It alternates between hotter pulse process cycles and colder CMT process cycles. The result is a highly stable, quick welding process with perfectly controlled heat input.



Typical applications

- Automotive industry: Battery trays and aluminium applications
- Stainless steel applications such as on exhaust systems
- Greater wall thicknesses
- For all visible seams with perfect seam rippling

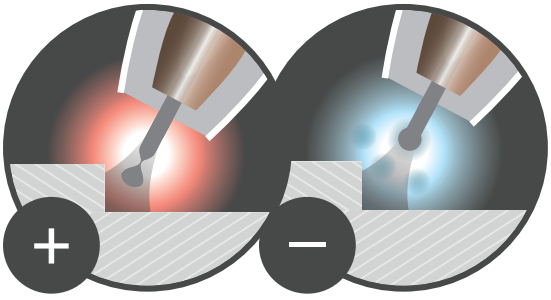




CMT AC

Pole reversal of the wire electrode

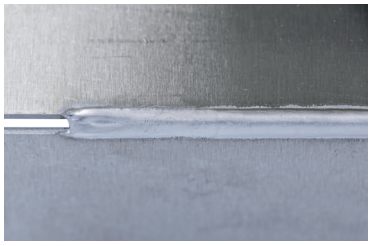
A notably lower heat input with the same deposition rate, thanks to the CMT-AC process with its oscillating wire motion and pole reversal of the wire electrode. The positive and negative portion can be easily adjusted with the aid of the correction parameters, enabling exceptionally precise control of the heat input.



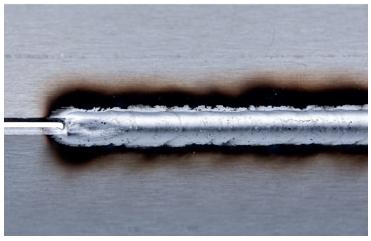
The advantages

- CMT AC is the process with the lowest heat input
- Very good gap-bridging
- Perfect for additive welding
- Highly controllable heat input, especially for additive manufacturing processes
- Polished welds thanks to reduced magnesium oxide (for AlMg wires)
- This process has the lowest welding fume emissions

CMT AC is available on the **iWave AC/DC** with **Multiprocess Pro**.



CMT AC



CMT DC+

Base material: AlMg3;
Filler metal: AlMg4.5;
Sheet thickness: 1.5 mm; air gap: 1.5 mm



75%*

less dilution of base and filler metal

CMT Cladding

Characteristics for overlay welding with low penetration, low dilution and wide weld seam flow for improved wetting

* Mix of base and overlay material compared to TIG KD



With conventional overlay welding, the arc melts the base material relatively intensely.

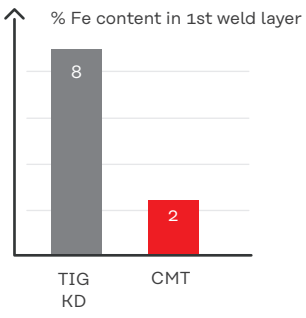
Dilution and mixing with the filler material reduce the hot gas corrosion resistance of the applied layer. In contrast, the base material is not as intensely melted during the CMT process, due to the lower heat input. As a result, the base and overlay material mix metallurgically up to 75% less – this saves money during overlay welding.



TIG KD
Vs: 40 cm/min



CMT
Vs: 80 cm/min





+50%

Welding speed

CMT

Braze and Braze+



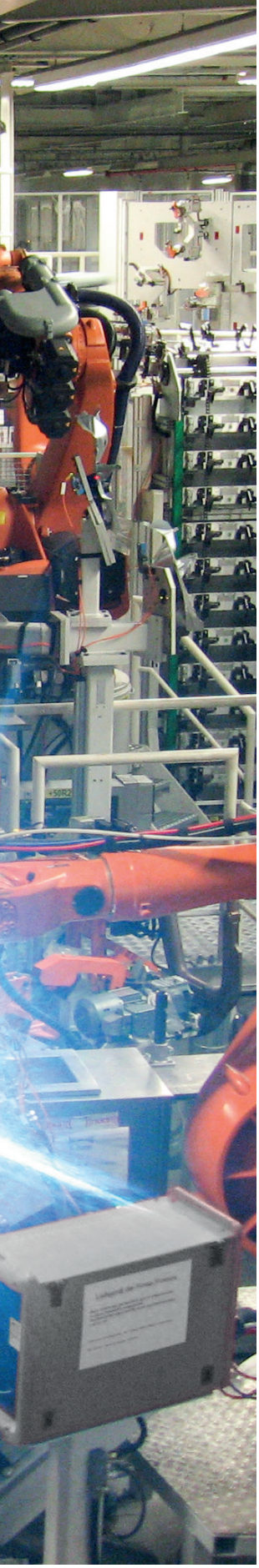
While deep penetration is desirable when welding, the bond is only formed through diffusion and adhesion processes with arc brazing.

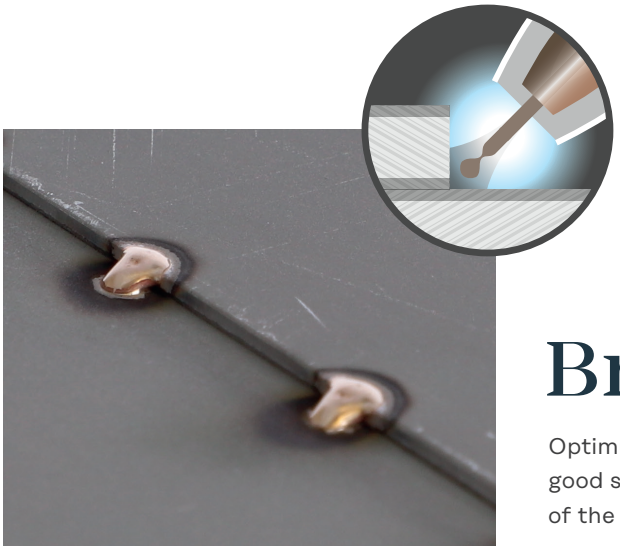
Some tasks require less heat and can only be carried out with sensitive metals. This is where CMT Braze and Braze+ come into play. Brazing only heats the workpiece gently. In doing so, the liquid solder binds better to it – and with considerably less fume formation.

70%

less soldering fume thanks to CMT*

* Emissions when brazing electrogalvanised sheets of a thickness of 1.5 mm at lap joints and with a seam length of 25 cm; filler metal: Ø 1.0 mm / SG-CuSi3; gas: AR4.6 / 13 l/min





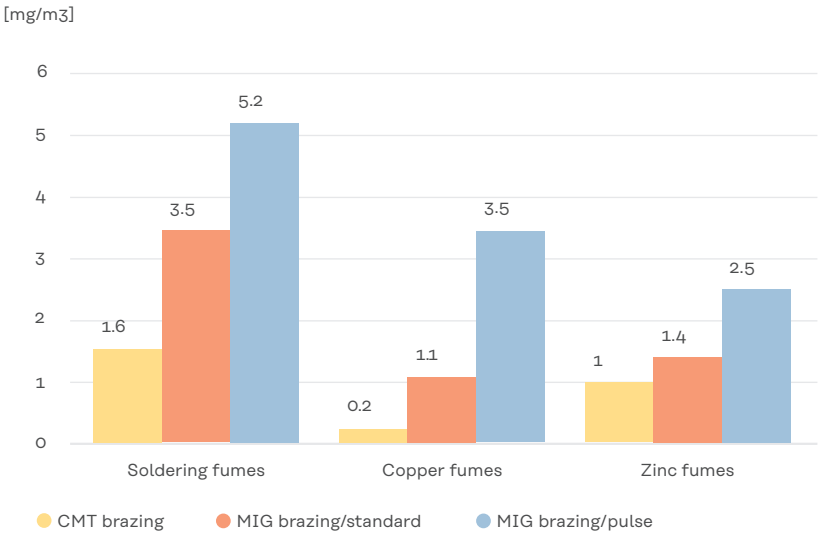
Braze

Optimum for reliable wetting and good sidewall-wetting behaviour of the braze material



Braze+

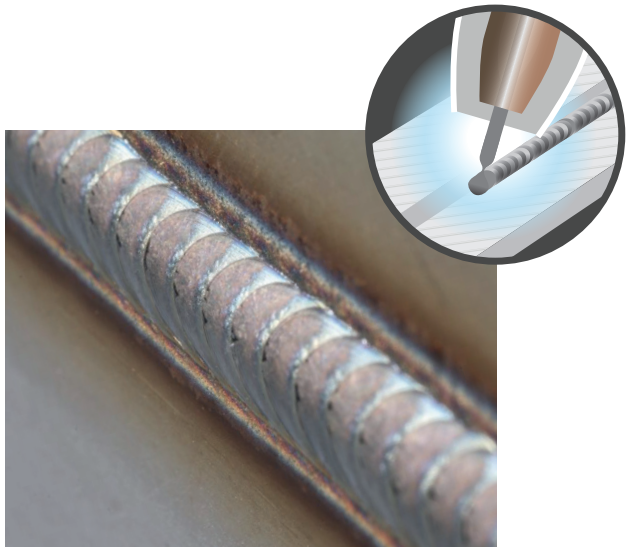
High brazing speeds thanks to a special gas nozzle with small opening and high shielding gas flow velocity



CMT

Cycle Step

Perfect control: CMT Cycle Step precisely defines the cycles and thereby the welding time for optimum droplet detachment.



Cycle Step can be compared to a spot or stitch welding process (weld – pause – weld – pause).

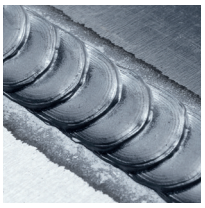
Typical applications

- Visible seams with defined seam rippling
- Welding of thin sheets with tolerances
- Fine overlay welding
- Additive welding applications
- Help with bonding techniques through defined spacing (distance points)
- Holding points for adhesive-bonded joins
- Welding in any position

The differences

- Stitch welding is a time-based process with a defined welding time and a defined pause time.
- CMT Cycle Step is a process based on the number of droplets – the number of cycles defines the welding time, followed by the pause time. The interval cycles can also be defined.

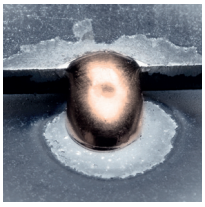
Lap joint
3 mm aluminium
Vd: 7.7m/min
Vs: 50 cm/min



Filler wire:
AlSi5, 1.2 mm
Number of CMT cycles: 18
Pause time: 0.16 sec

Spot size can be precisely set through the number of cycles

Holding point
1 mm electro-galvanised
Vd: 11.5 m/min



Filler wire:
CuSi 3, 1 mm
Number of CMT cycles: 8

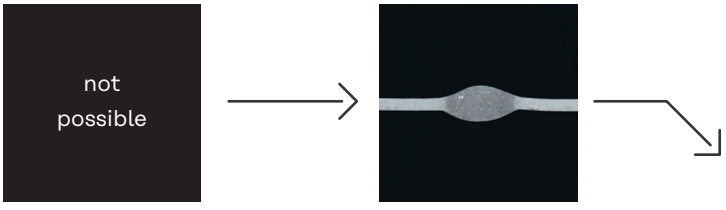
Welding aluminium with CMT



Welding of thin (≤ 1 mm) aluminium sheets possible.

The low level of heat input in the process means that a weld pool is not required; even then there is no risk of weld drop-through.

Thin sheet 0.3 millimetre

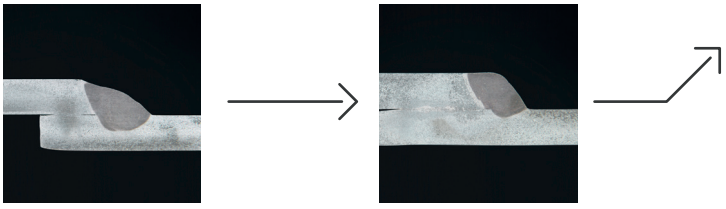


Pulse

CMT
Vs = 6.4 m/min

Material: 0.3 mm aluminium

+50% higher welding speed

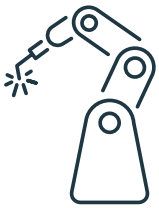


Pulse
Vs = 1.1 m/min

CMT
Vs = 1.7 m/min

Material: 0.3 mm aluminium

CMT enables higher welding speeds on aluminium ultra-light-gauge joints



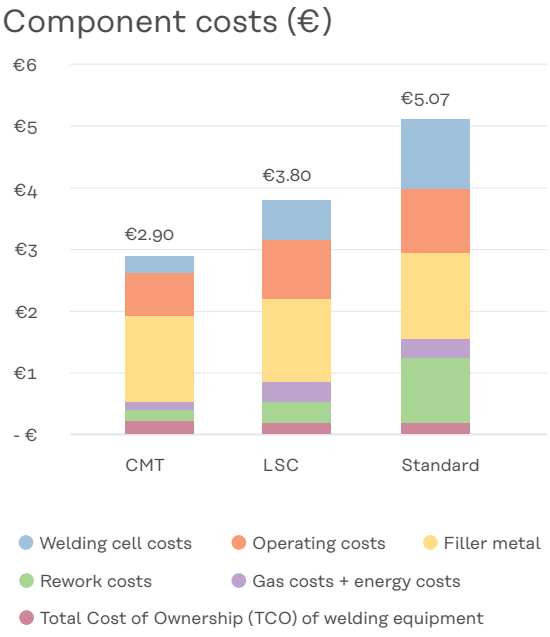


An investment that pays off

Calculated by individual component, up to 43% of the cost can be saved.* This means the higher investment cost of CMT is rapidly recouped.

Advantages

- Lower investment in welding cells: Better utilisation of cell capacity thanks to higher welding speeds
- Less rework and fewer rejects thanks to a stable process and reduced spattering
- Maintenance work is quicker, as contamination with spatter is kept to a minimum
- Lower gas costs thanks to shorter welding time



	CMT	LSC	Standard
Saving per component*	**39%**	**22%**	**–**
Cost per metre of weld with CrNi	**€3.04**	**€3.87**	**€4.99**
Total Cost of Ownership (TCO) of welding equipment	€0.19	€0.12	€0.15
Rework costs	€0.15	€0.33	€1.04
Gas costs + energy costs	€0.11	€0.31	€0.31
Filler metal	€1.40	€1.41	€1.47
Operating costs	€0.69	€0.94	€1.02
Welding cell costs	€0.50	€0.76	€1.00

Economical and sustainable

Resource-conserving

Thanks to a precisely regulated process, spatter – and thus rework – can be lowered. This also reduces employee working hours.

Material-saving

CMT considerably reduces the consumption of wearing parts as well as component rejects. This results in greater potential savings.

Energy efficient

A stable, precisely controlled arc improves welding quality. This also shortens the total welding time. And the upshot is lower energy consumption.

* Based on the Standard Welding Package

Hardware needed for CMT





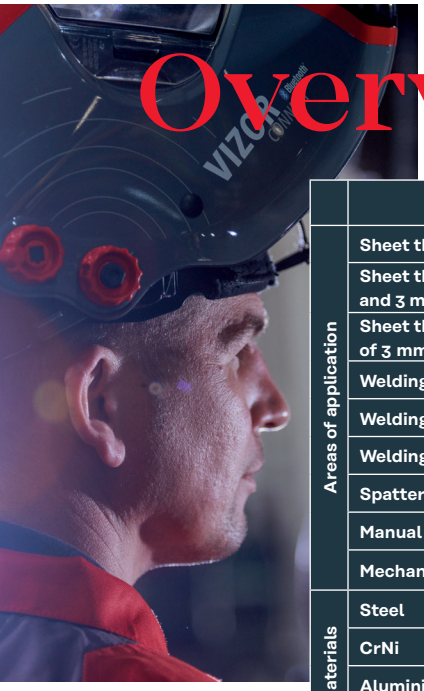
1

Drive unit
Robacta Drive CMT



2

Wire buffer
SB60



Overview

Welding Packages

		Standard	LSC	Pulse	PMC	CMT
Areas of application	Sheet thickness up to 1 mm	●●●○○	●●●●○	●●○○○	●●●○○	●●●●●
	Sheet thickness between 1 and 3 mm	●●●○○	●●●○○	●●●○○	●●●●○	●●●●●
	Sheet thickness upwards of 3 mm	●●●○○	●●●●○	●●●●○	●●●●●	●●●○○
	Welding in position	●●●○○	●●●●○	●●○○○	●●●●○	●●●●●
	Welding speed	●●●○○	●●●●○	●●●●○	●●●●●	●●●●●
	Welding with 100% CO_2	●●●○○	●●●●○	○○○○○	○○○○○	●●●●●
	Spatter prevention	●●○○○	●●●●○	●●●○○	●●●●○	●●●●●
	Manual root passes	●●●●○	●●●●●	●●○○○	●●●○○	●●●●○
	Mechanised root passes	●●●○○	●●●●○	●●●○○	●●●●○	●●●●●
Materials	Steel	●●●●○	●●●●○	●●●●○	●●●●●	●●●●●
	CrNi	●●●○○	●●●○○	●●●●○	●●●●●	●●●●●
	Aluminium	●○○○○	○○○○○	●●●●○	●●●●●	●●●●●
	Other materials	●●○○○	●●●○○	●●●○○	●●●●○	●●●●●

Unleash your welding potential

To ignite the welding potential of our customers: that's our mission. As the innovation leader for arc welding and global market leader for robot-assisted welding, we create both advanced and profitable welding solutions, which are inspired by our sustainable mindset. We enjoy long-standing relationships with our customers. We understand their challenges and perspectives and maintain a close relationship with them through our regional service teams throughout the world. We listen, understand and therefore shape the mindset of the welding industry. Our strengths lie in combining our customers' knowledge with our expertise, which allows them to unleash their full welding potential.

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