CMT

COLD METAL TRANSFER

TOTALLY STABLE WELDING

WELD LIGHT-GAGE SHEETS AT MAXIMUM SPEED–WITH MINIMAL HEAT INPUT AND VIRTUALLY NO SPATTER

CMT (COLD METAL TRANSFER) has revolutionized welding technology. Thanks to its PRECISE WIRE RETRACTION, the process considerably increases the number of possible welding applications. Wherever adhesive or solder was used before, CMT welding can now be used instead.

The back and forth movement (reversing) of the welding wire–at up to 170 Hertz–produces an exceptionally stable arc. This results in a 33% reduction in heat input and a welding speed almost twice as fast as the conventional dip transfer arc.

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

THE ADVANTAGES OF CMT

REDUCTION
IN REWORK

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

100%
HIGHER SPEED

/ High speed but the same penetration
/ Fast joining of thin sheets

STABLE
ARC

/ 100% CO2 welding
/ High-strength steels
/ Resistant to external influences (change in stick out, workpiece surface)*

**/ Under laboratory conditions.*

ECONOMICAL AND SUSTAINABLE

RESOURCE-CONSERVING

This precisely controlled process reduces spatter, and therefore rework, which lets employees work more efficiently.

MATERIAL SAVINGS

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

ENERGY-SAVING

A stable, precisely controlled arc improves weld quality. This shortens the overall time necessary for welding tasks, resulting in lower energy consumption overall.

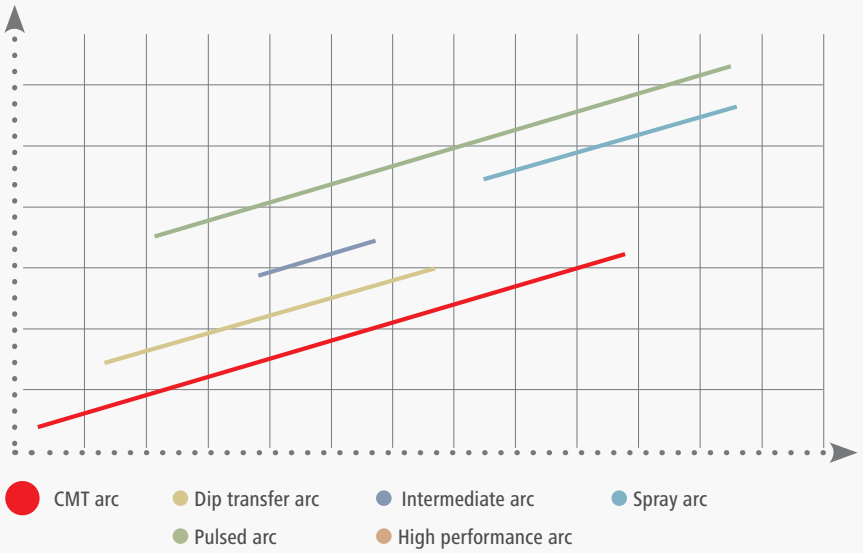
CMT WELDING PROCESS

THE CMT PROCESS IS BASED ON THE MOST ADVANCED TYPE OF DROPLET DETACHMENT. MADE POSSIBLE BY REVERSIBLE WIRE ELECTRODE MOTION.

In a conventional dip transfer arc process, the wire is advanced continuously towards the workpiece. If a short circuit occurs, the current is increased, which breaks the short circuit so the arc can ignite again.

However, in the event of a short circuit while using the CMT process, the reverse motion of the wire electrode produces a more controlled droplet detachment and reignition. This reversing wire motion takes place in a frequency range of 50 to 170 Hz, depending on the filler metal, shielding gas and electrode diameter.

IDEAL
FOR ALL
POSITIONS



APPLICATIONS

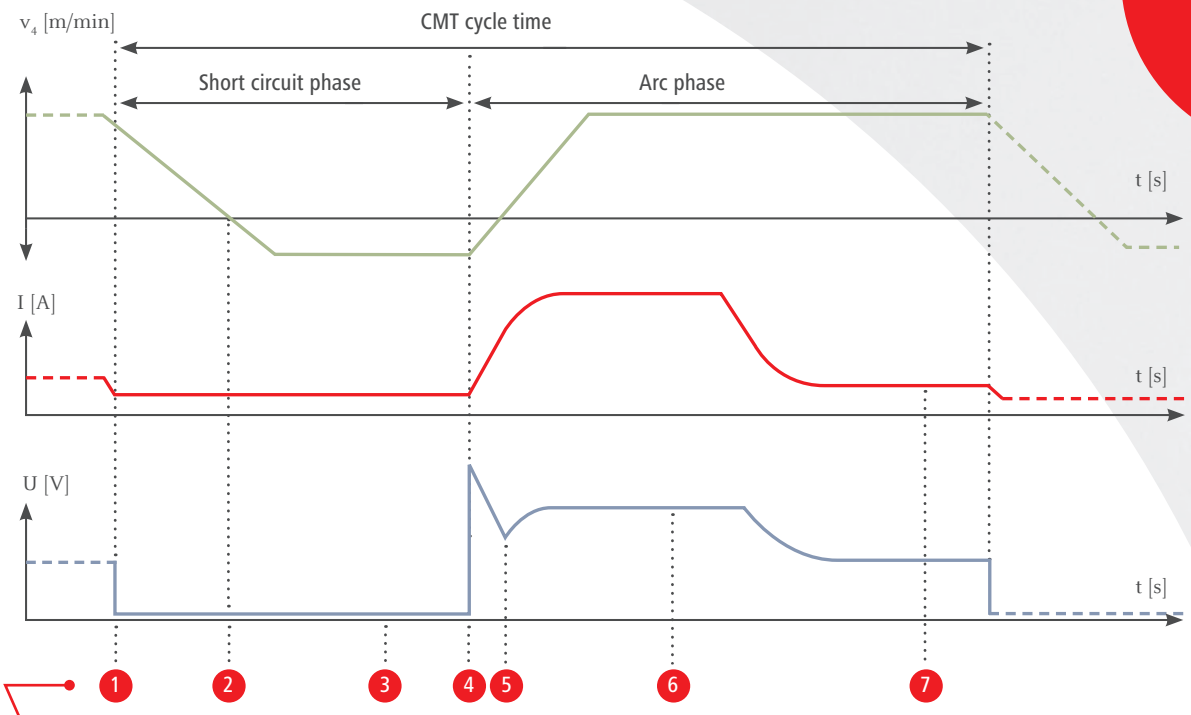
- Joint welding (CrNi applications, food industry)
- Overlay welding
- Rapid prototyping & additive manufacturing
- Brazing, specifically with high demands for speed and process stability
- 100% CO_2 welding on steel
- Root passes
- Thin and medium sheet range
- Special joints, e.g., copper, steel aluminum, titanium

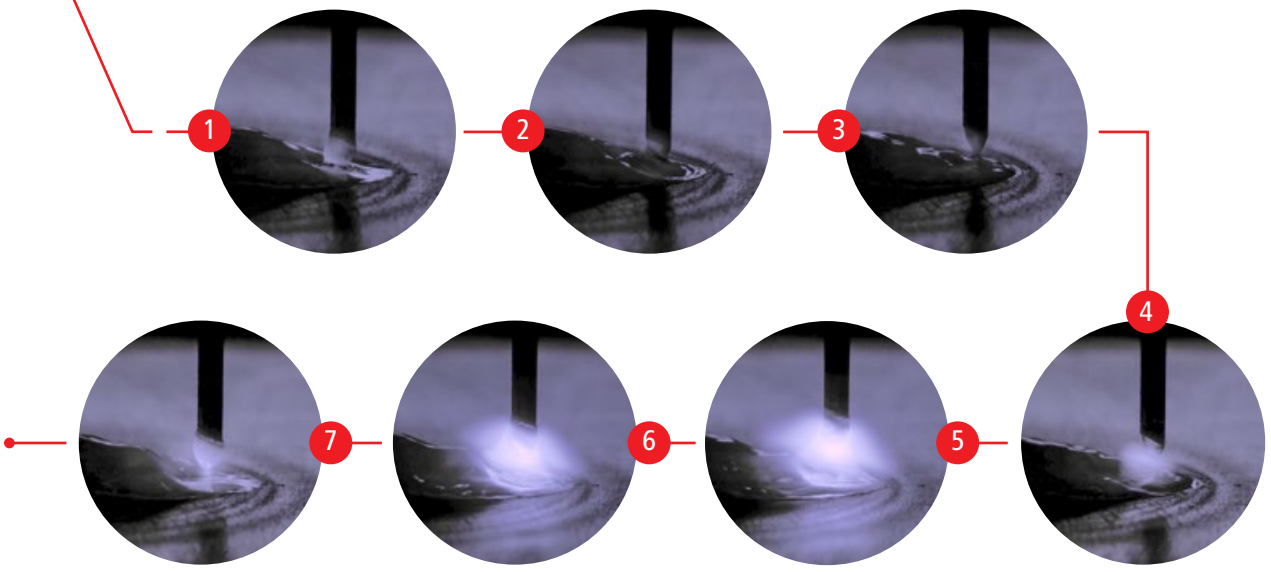
THE SPECIAL FEATURES OF CMT

With its revolutionary reversible wire motion, CMT offers a wide range of advantages, enabling cost-effective and sustainable welding that reduces re-work and minimizes welding defects.

THE ESSENCE OF CMT

/ FAST
/ VIRTUALLY SPATTER-FREE
/ COLD

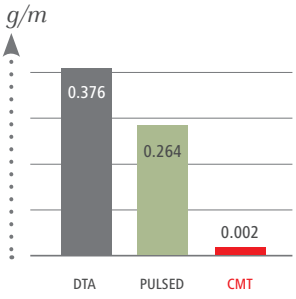




*/ *In comparison with TPS pulsed arc. **In comparison with standard dip transfer arc*

UP TO 99%
LESS SPATTER

Welding does not need to mean spatter and rework. CMT promotes controlled droplet detachment during the short circuit, while the current is kept low. The result is a virtually spatter-free material transfer.

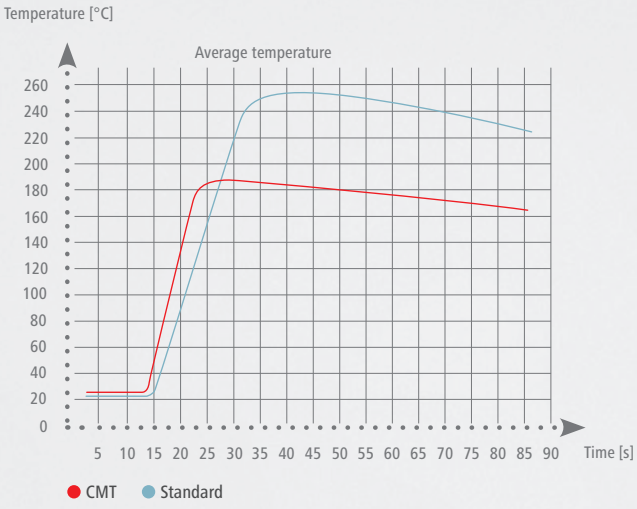


MINIMAL SPATTER EVEN WITH 100% CO_2-SHIELDING GAS

33% LOWER
HEAT INPUT

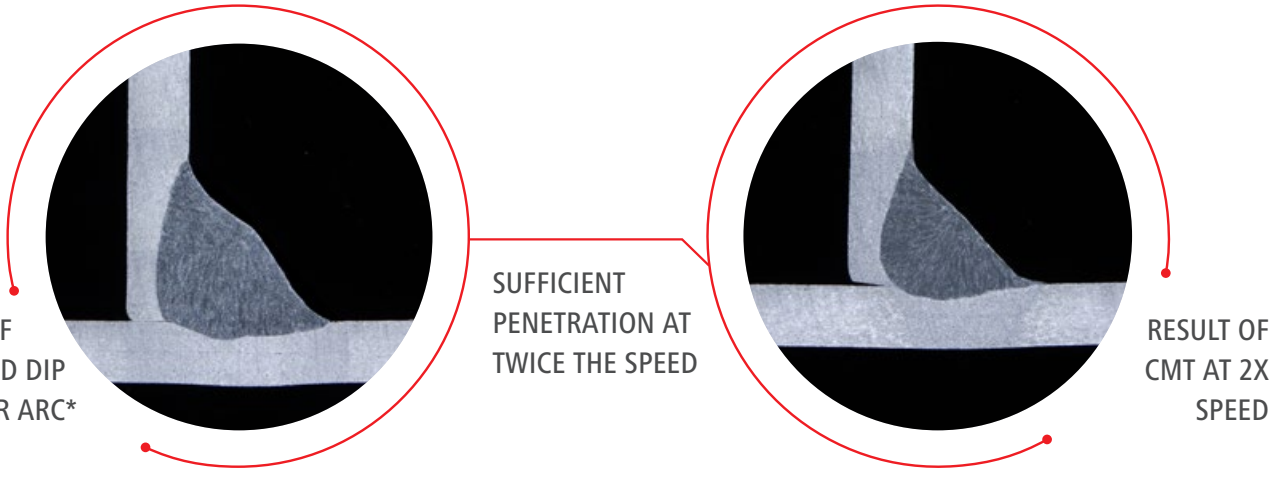
The main feature of the CMT process, the reversing wire movement, allows heat input at the lowest possible level. As soon as the short circuit occurs, the wire is withdrawn. As a result, the arc itself only generates heat briefly during the burning phase.

CMT allows the heat input to be continuously regulated from cold to hot, resulting in higher welding speeds with maximum welding quality for a wider range of applications.



TWICE THE WELDING SPEED**

With CMT, the welding speed can be doubled while sufficient penetration is maintained, thanks to the highly dynamic Robacta CMT Drive wire feed unit.



*/1.5 mm steel plate FW, PB

THE CMT WELDING PACKAGE INCLUDES SEVERAL CHARACTERISTICS.

This means the welder can enjoy a range of benefits:
We offer optimal support for perfect seams in every application.
For example, CMT Mix is ideal for aluminum applications–or for visible seams requiring outstanding seam joining.

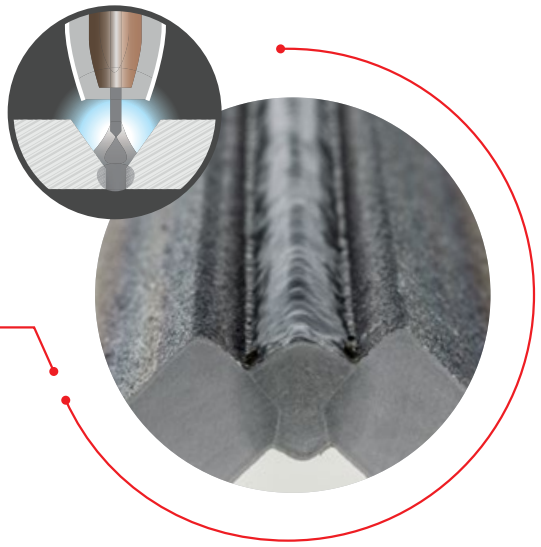
PACKAGE CONTAINS:

- / Universal
- / Dynamic
- / Galvanized
- / Braze
- / Braze +
- / Cladding
- / Gap Bridging
- / Hotspot
- / Mix

TAILOR-MADE FOR YOUR NEEDS

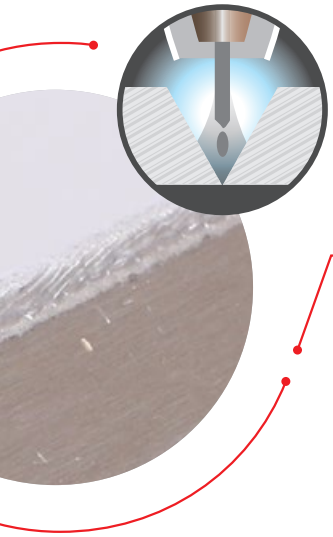
CMT UNIVERSAL

SIMPLE, TIME-SAVING WELDING SETTINGS
for standard applications, with easily controllable arc



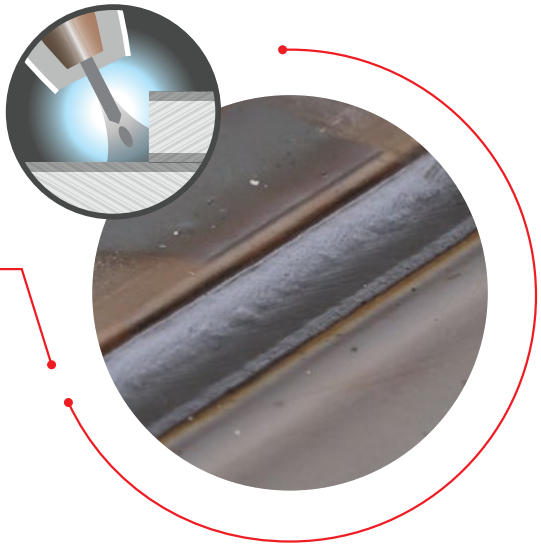
CMT ROOT

POWERFUL ARC WITH GOOD GAP-BRIDGING ABILITY
for simple root pass welding and position welding



CMT DYNAMIC

CONCENTRATED ARC
with deep penetration, high welding speeds and reliable root formation in thicker sheets



CMT GALVANIZED

GALVANIZED SHEETS
welding with lower risk of zinc porosity and reduced zinc burnoff

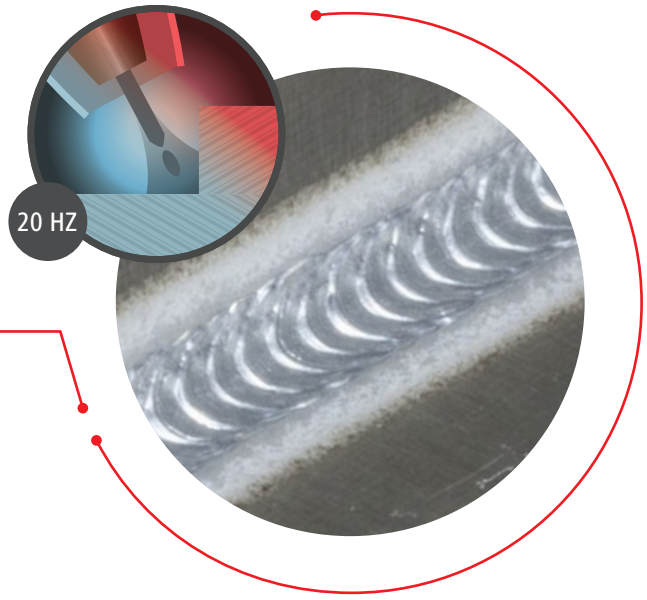
CMT GAP BRIDGING

OPTIMIZED GAP-BRIDGING ABILITY
thanks to waveform characteristics with improved properties

CMT MIX

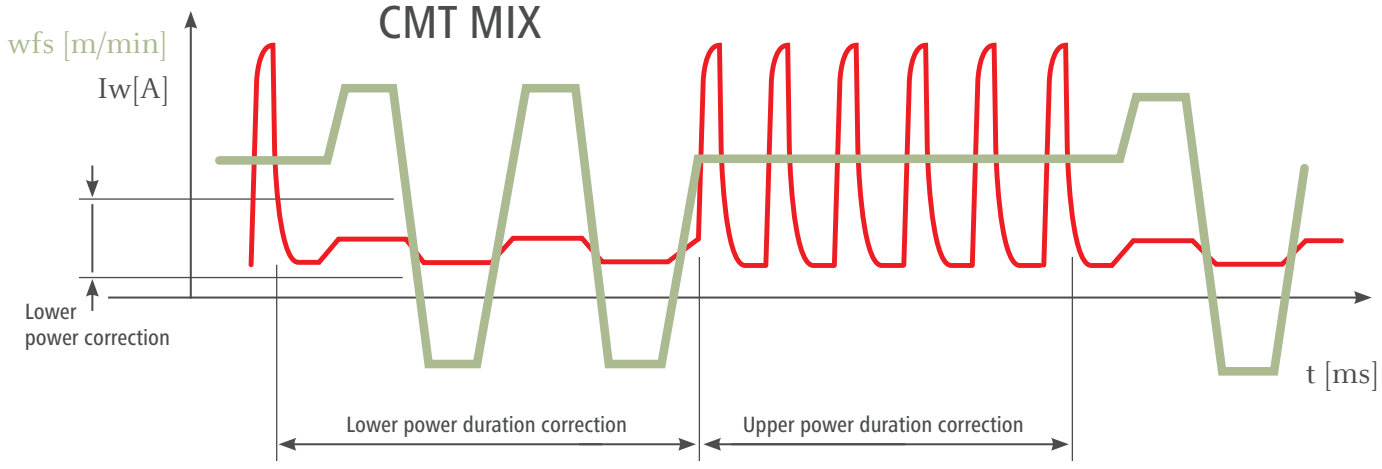
OPTIMAL COMBINATION OF STABILITY AND HEAT INPUT

The CMT MIX characteristic combines CMT and pulsed arcs: Hotter pulsed process cycles alternate with colder CMT process cycles to give a particularly stable and rapid welding process– with perfectly controlled heat input.



TYPICAL APPLICATIONS:

- Automotive industry–battery trays and aluminum applications
- Stainless steel applications–e.g., in exhaust systems
- Thicker walls
- For all visible seams with perfect seam joining




CMT
Contact Pre

CMT CLADDING

75%* LESS DILUTION OF BASE AND FILLER METALS

CHARACTERISTIC FOR OVERLAY WELDING

With low penetration, low dilution, and wide weld seam flow for better wetting

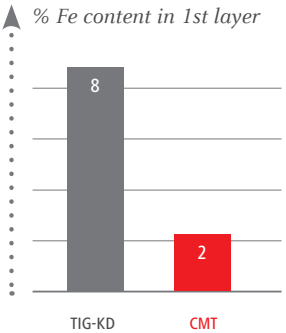
*/ *Mixing of base and overlay material in comparison with TIG KD*

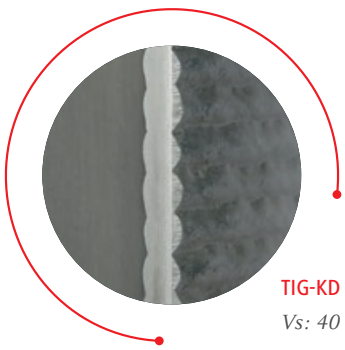
IN CONVENTIONAL OVERLAY WELDING, THE ARC FUSES A RELATIVELY LARGE AMOUNT OF THE BASE MATERIAL.

The typical dilution and mixing of base material with filler material reduces the corrosion resistance of the applied layer. However, the low heat input of the CMT process keeps dilution equally low. This results in up to 75% less metallurgical mixing of the base and filler materials, and reduces costs for overlay welding.

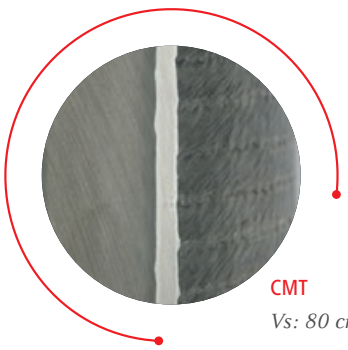
-75%
DILUTION

+50%
WELDING SPEED





TIG-KD
Vs: 40 cm/min

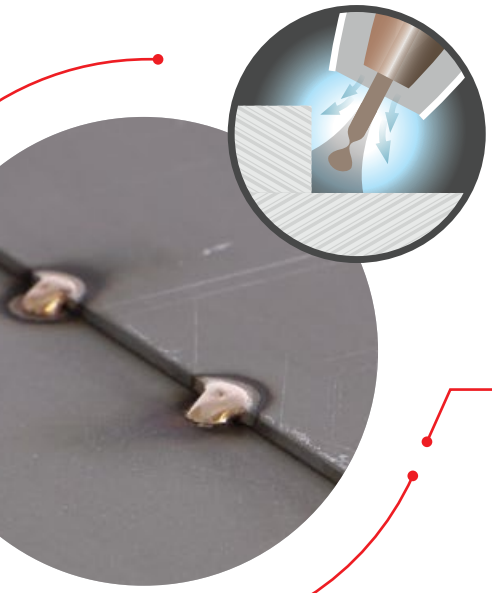


CMT
Vs: 80 cm/min

CMT BRAZE & BRAZE+

LIGHT BRAZING HEATS THE WORKPIECES, WHICH MEANS THE LIQUEFIED SOLDER BONDS WITH IT BETTER.

Welding demands deeper penetration, but in arc brazing, bonding only takes place through diffusion and adhesion in the brazing area.



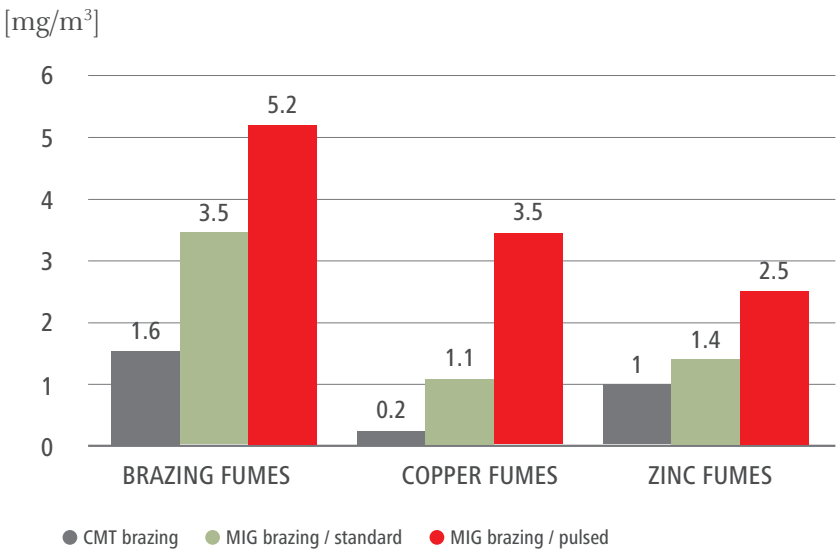
CMT BRAZE

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

CMT BRAZE+

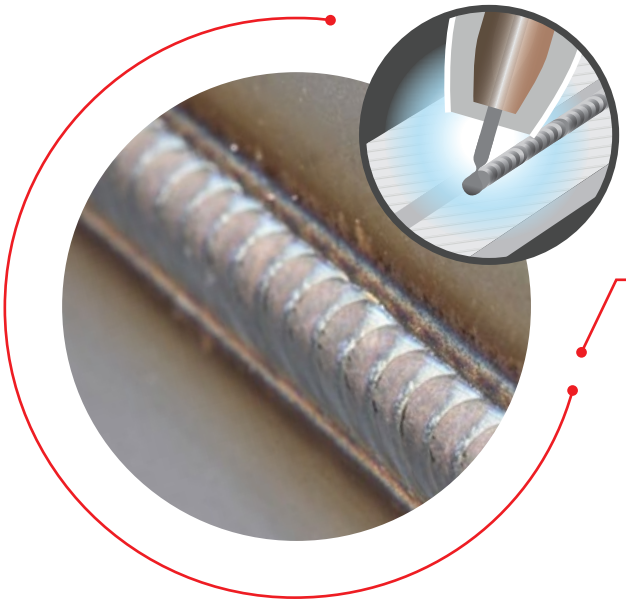
Improved brazing due to a specialized
gas nozzle featuring a small opening
and high flow speed.

225%
LOWER
BRAZING FUMES
WITH CMT



*/ *Emissions during brazing of electrolytically galvanized sheets with a thickness of 1.5 mm at lap joints and a seam length of 25 cm. Filler metal: Ø1.0 mm / SG-CuSi3; gas: AR4.6 / 13 l/min.*

CMT CYCLE STEP



CMT CYCLE STEP DEFINES THE CYCLES AND THUS THE WELDING TIME WITH PINPOINT ACCURACY. THIS ENABLES PERFECT CONTROL OF DROPLET DETACHMENT.

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

CMT CYCLE STEP

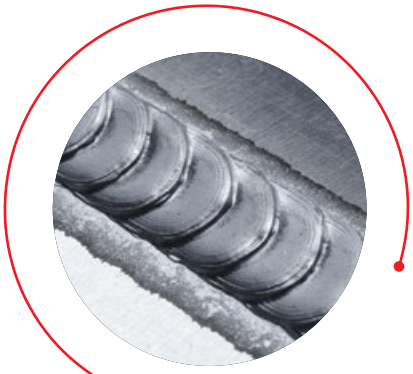
DIFFERENCES

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

EXACT SETTING OF SPOT SIZE POSSIBLE BY CYCLE NUMBER

CYCLE STEP APPLICATIONS

- Visible seams with defined seam joining
- Welding thin sheets with tolerances
- Fine overlay welding
- Additive welding applications
- Supporting bonding processes by defined spacings (spacer points)
- Hold points for bonded joints
- Welding in position



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

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

SIMPLE SETTINGS WITH ONLY 3 PARA-METERS

Hold point
1 mm electro-galvanized
Vd: 11.5 m/min

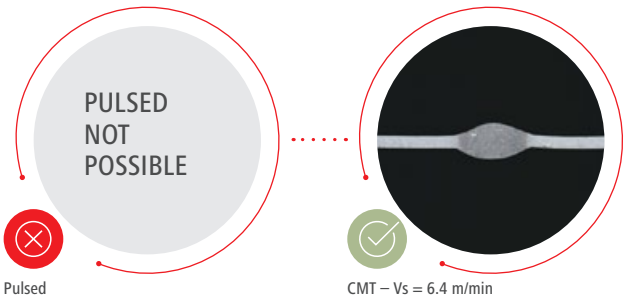
Filler wire: CuSi3, 1 mm
Number of CMT cycles: 8

WELDING ALUMINUM WITH CMT

LIGHT GAGE (≤ 1 mm) ALUMINUM SHEETS CAN BE WELDED.

The low heat input of this process means that a support backer isn't necessary to keep the weld seam from falling through.

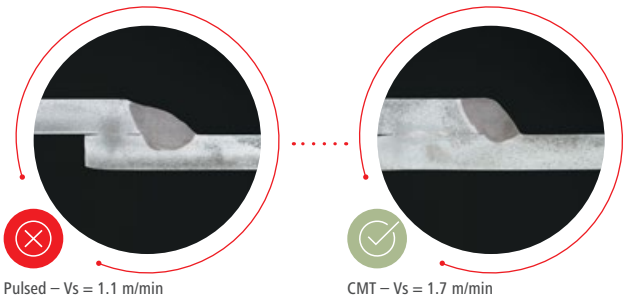
LIGHT GAGE SHEET 0.3 MILLIMETERS



/ Material: aluminum 0.3 mm

CMT
ON ALUMINUM
Ultra-light gage sheet joints, higher welding speed

+50% VS



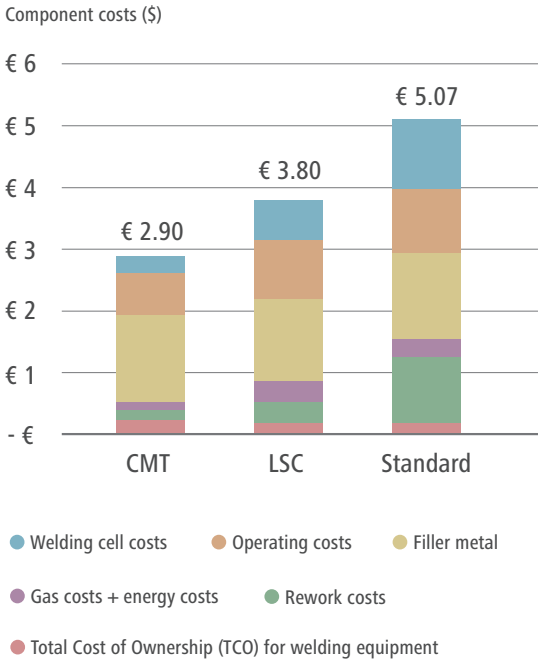
/ Material: aluminum 3 mm

AN INVESTMENT THAT PAYS OFF

THE MANY ADVANTAGES OF CMT MEAN THE HIGHER INVESTMENT COSTS ARE REPAID IN NO TIME. CALCULATED PER COMPONENT, UP TO 43% OF THE COSTS CAN BE SAVED.

ADVANTAGES

- Reduced investment in welding cells: better utilization and useful life of the cells, thanks to higher welding speeds
- Less rework and fewer rejections thanks to the stable process and lower spatter
- Shorter maintenance times, since soiling by spatter is kept to a minimum
- Lower gas costs due to reduced welding time



SAVING PER COMPONENT*	WELDING PACKAGE CMT	WELDING PACKAGE LSC	WELDING PACKAGE STANDARD
	43%	25%	–
Costs per meter weld with CrNi	€ 2.90	€ 3.80	€ 5.07
Total Cost of Ownership (TCO) for 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

**/ In relation to the Standard Welding Package*

OVERVIEW FRONIUS WELDING PACKAGES

	WELDING PACKAGE STANDARD	WELDING PACKAGE LSC	WELDING PACKAGE PULSE	WELDING PACKAGE PMC	WELDING PACKAGE 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	●●●●○	●●●●●	●●○○○	●●●○○	●●●●○
Mechanized root passes	●●●○○	●●●●○	●●●○○	●●●●○	●●●●●
MATERIALS					
Steel	●●●●○	●●●●○	●●●●○	●●●●●	●●●●●
CrNi	●●●○○	●●●○○	●●●●○	●●●●●	●●●●●
Aluminum	●○○○○	●●○○○	●●●●○	●●●●●	●●●●●
Other materials	●●○○○	●●●○○	●●●○○	●●●●○	●●●●●

HARDWARE NEEDED FOR CMT

/ Robacta Drive CMT drive unit

/ SB60 wire buffer

/ 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**

Fronius Canada Ltd.
2875 Argentia Road, Units 4,5 & 6
Mississauga, ON L5N 8G6
Canada
T +1 905 288-21 00
F +1 905 288-21 01
sales.canada@fronius.com
www.fronius.ca

Fronius USA LLC
6797 Fronius Drive
Portage, IN 46368
USA
T +1 877 FRONIUS
sales.usa@fronius.com
www.fronius-usa.com

Fronius UK Limited
Maidstone Road, Kingston
Milton Keynes, MK10 0BD
United Kingdom
T +44 1908 512 300
F +44 1908 512 329
info-uk@fronius.com
www.fronius.co.uk

Fronius International GmbH
Froniusplatz 1
4600 Wels
Austria
T +43 7242 241-0
F +43 7242 241-95 39 40
sales@fronius.com
www.fronius.com

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