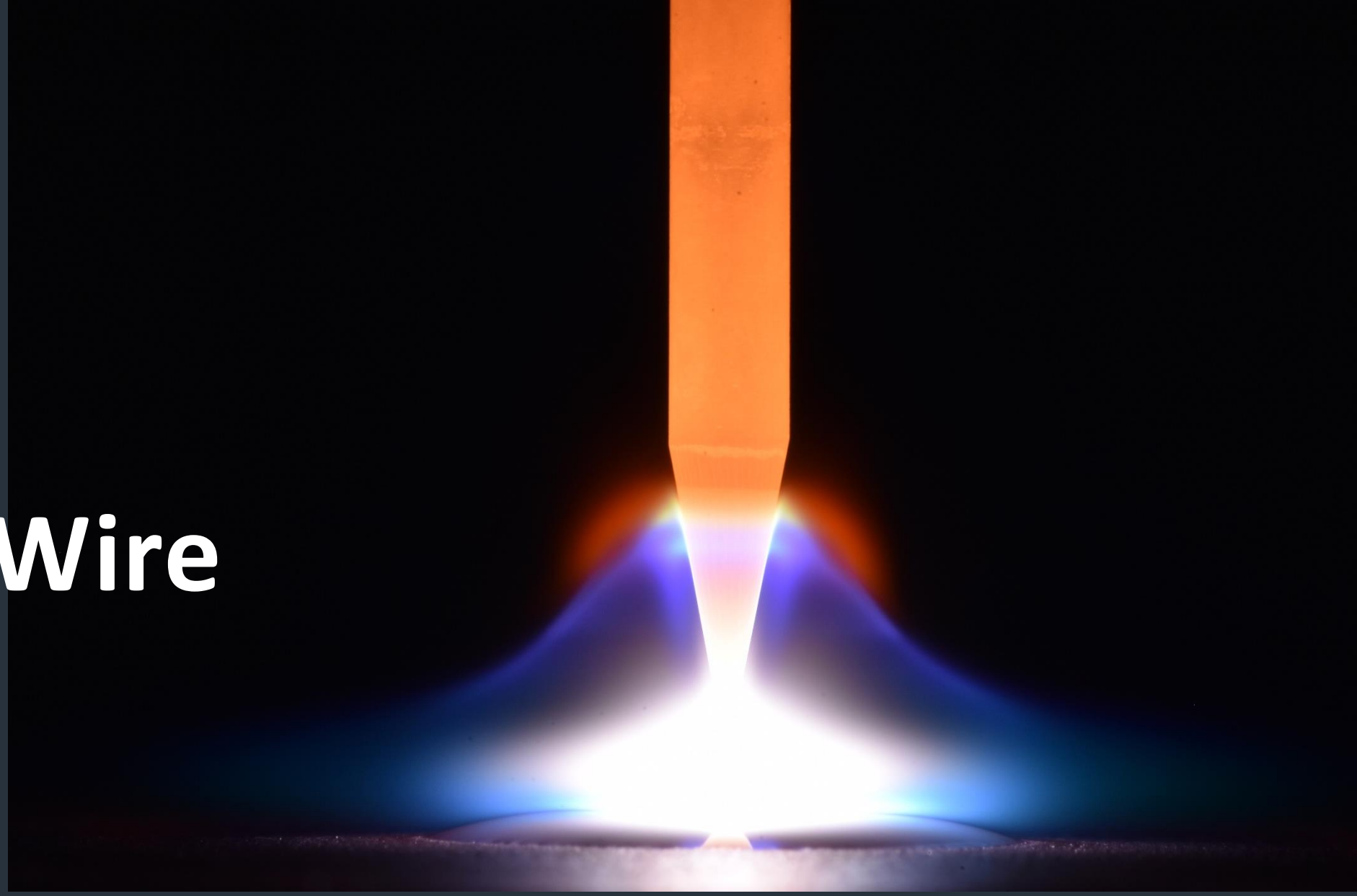
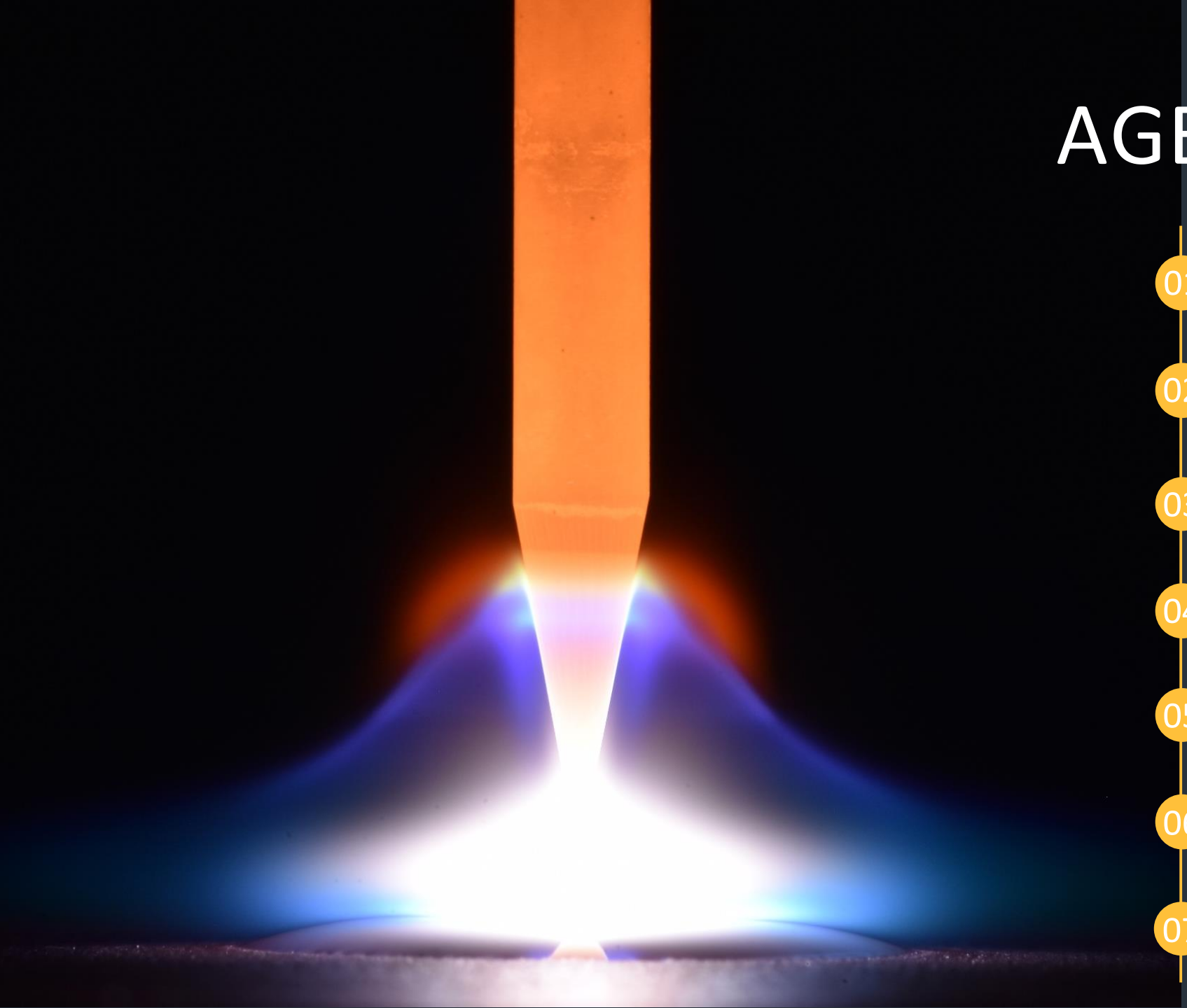
TIG DynamicWire



Fronius International, Willinger Martin, Lattner Peter, Sider Josef, Ahörndl Julian, 07-2024-v04
Information Class: Official



AGENDA

01 Introduction & definition

02 Basic principle

03 Process videos

04 Application advantages

05 Comparison
Cold- vs. DynamicWire

06 How-to
(incl. wire feed speed correction)

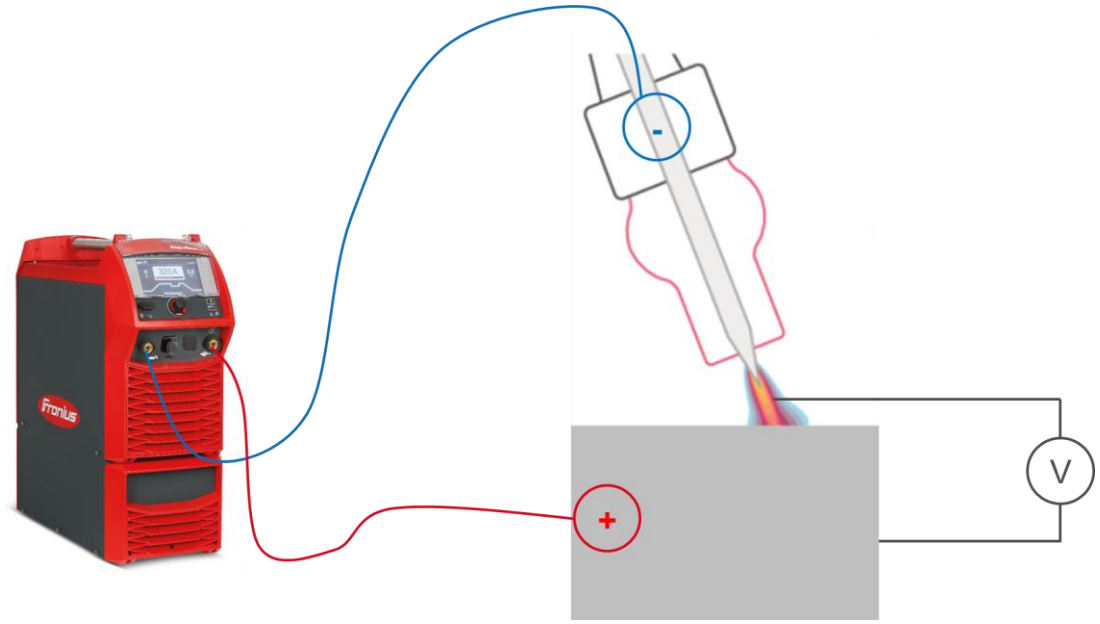
07 Welding demo

Introduction & definition

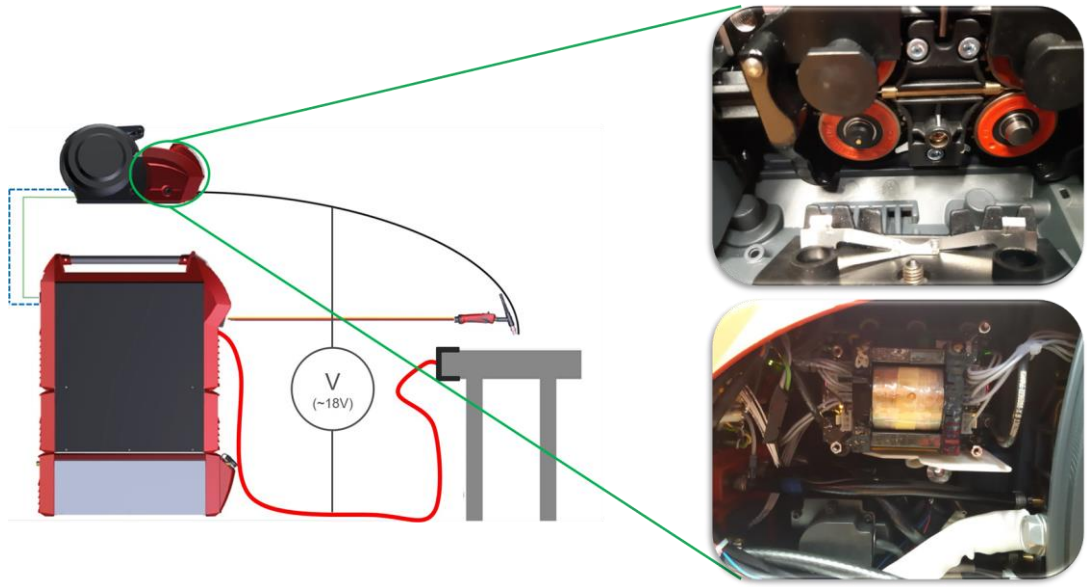
TIG DynamicWire is based on active control of the wire feed.

- The actively interacting wire control expands the parameter window and simplifies handling.
- The wire feed speed automatically adjusts to the amperage, arc length and seam type.
- TIG DynamicWire works in Synergic mode!
  Current and wire feed speed do not have to be set separately.
- There are individual characteristics for different wire diameters and alloys.
- The fine-tuning of the wire feed speed can be done using the wire correction.

Basic principle

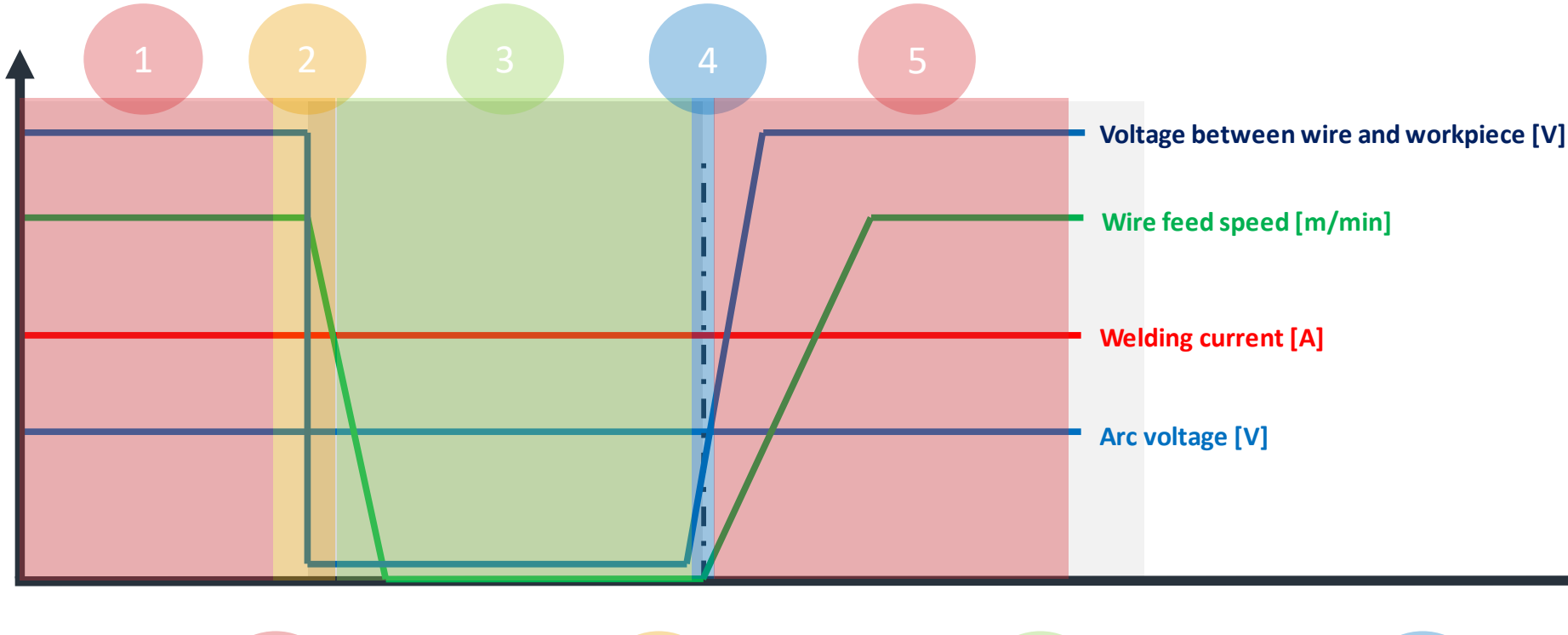


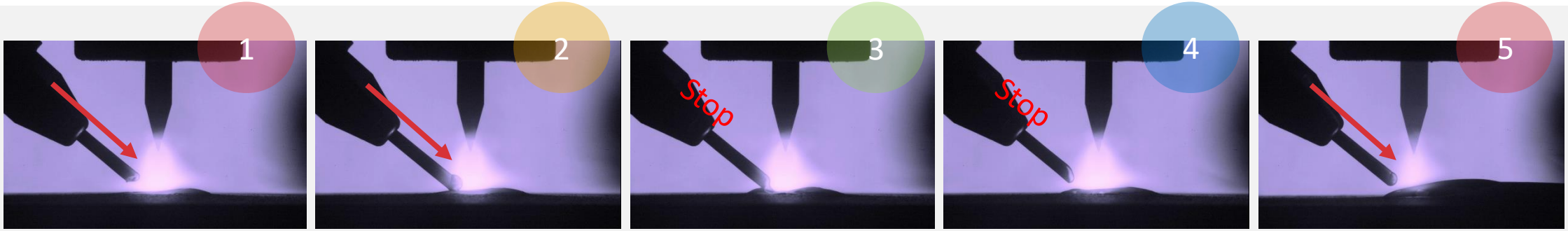
A **voltage** can be measured between the workpiece and the wire.



An **additional sensing interface** has been added to the existing SR63. In addition, the print "**WiVolt**" is needed to measure the voltage between the base material and the wire.

Basic principle TIG DynamicWire

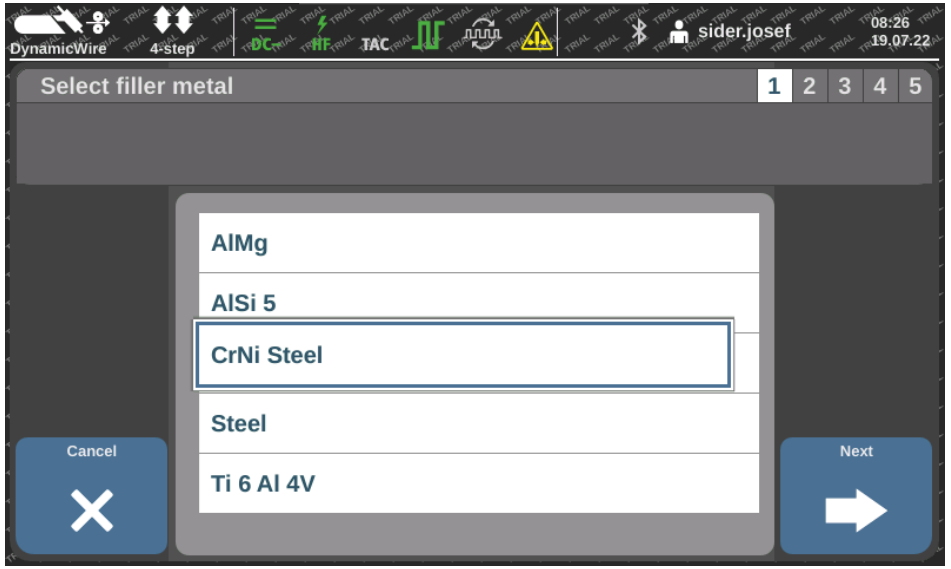




TIG synergic lines

Different synergic lines for the most common filler materials are available as soon as the welding package TIG DynamicWire is activated!

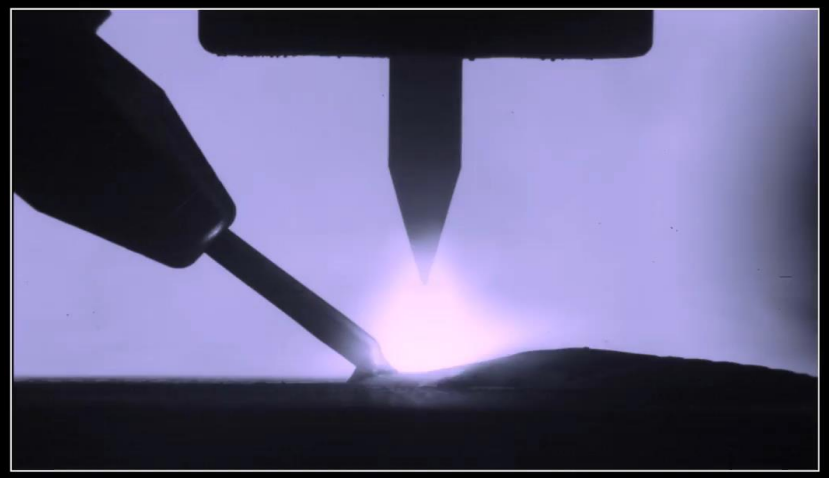
Fronius is the world's first provider of an active wire regulation for TIG cold wire welding!



TIG DynamicWire

Videos [1/2]

TIG DynamicWire / Pulse



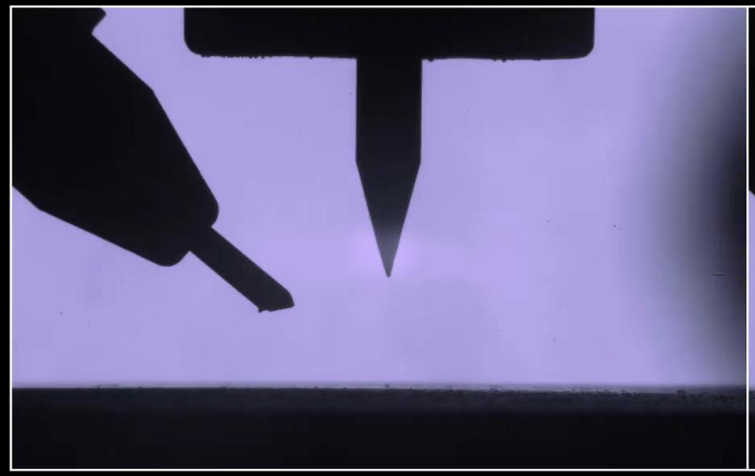
TIG wire correction

-5 0 +5

Videos [2/2]

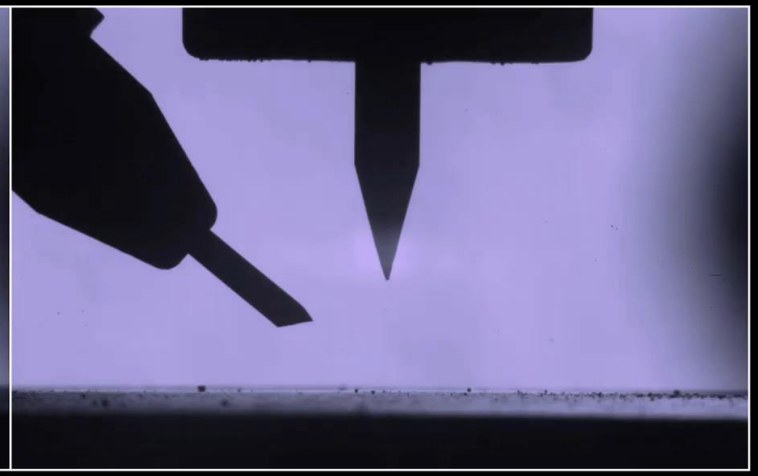
Drahtposition Start

2mm



* Wire position (start): 2mm
  Start delay: 0,3s
  End delay: 0,3s
  Wire retract (end): 2mm

aus

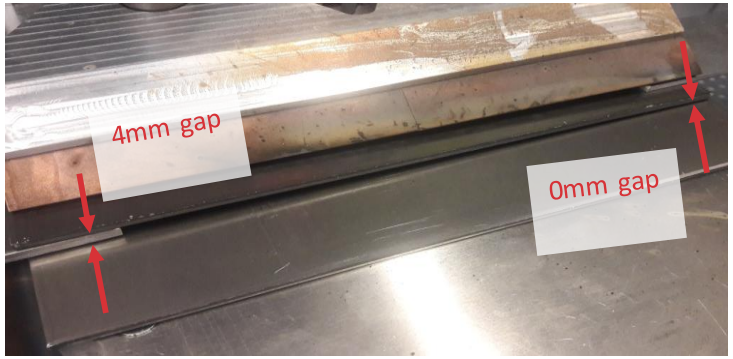


* Wire position (start): off
  Start delay: off
  End delay: off
  Wire retract (end): off

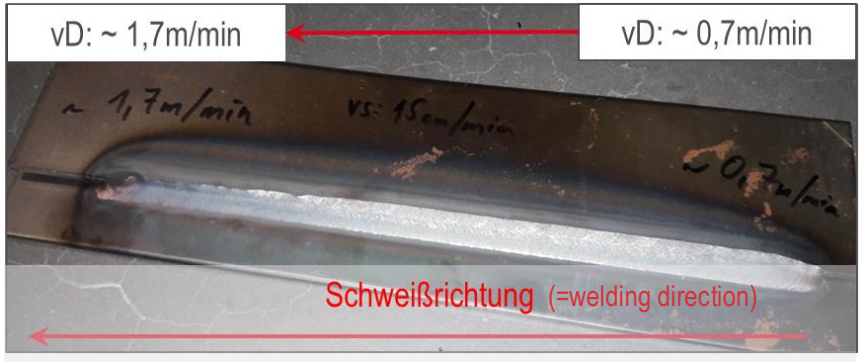
Start – stop with TIG DynamicWire

Wire control in case of tolerances

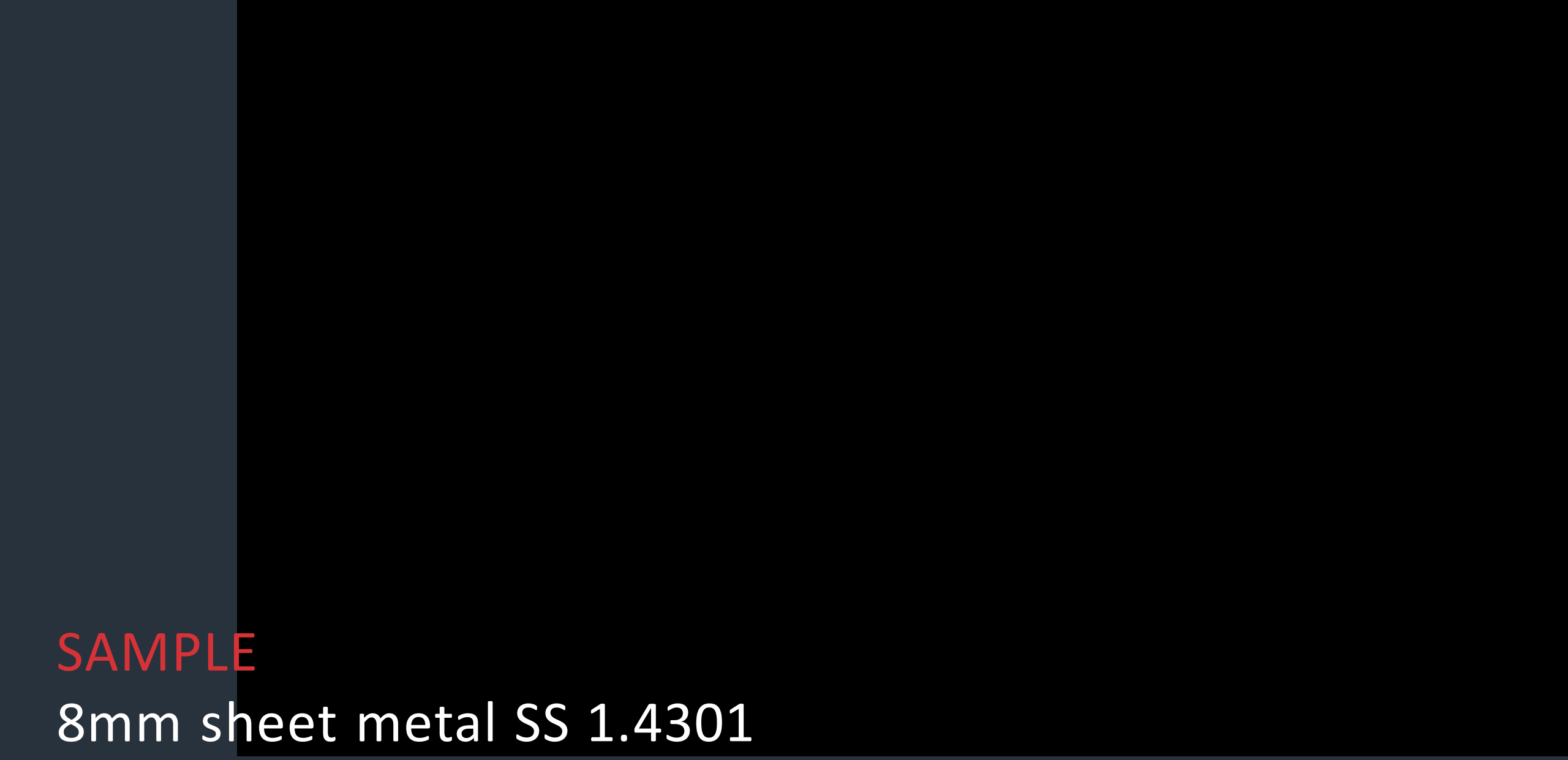
The average wire feed speed adapts to the arc length or to the gap that has to be bridged because of TIG DynamicWire, e.g. variating gap between 4 and 0mm



Weaving OFF



Weaving ON



SAMPLE

8mm sheet metal SS 1.4301

fillet weld

Practical advantages

Dynamic wire control results in a number of application-related advantages, e.g.

- **Improved wetting behaviour** (exitation of the weld pool)
- Helps in case of **component tolerances** because the wire feeding regulates the amount of filler material
- Component tolerances up to 30% are automatically compensated

  ** Example: With a corner joint of CrNi steel (1.4301 / X5CrNi18-10) and a material thickness of 10mm, a gap bridging of 3mm (30%) is achieved in PA position.*
- **Application-specific set-ups / characteristics** available
- **Simplified operation & paramet** (set only 1 parameter)
  - Wire and current no longer have to be set separately thanks to **TIG SynergicMode**

Wire feeding variants

Wire feeding for manual applications

Change of tungsten electrode with TFC system

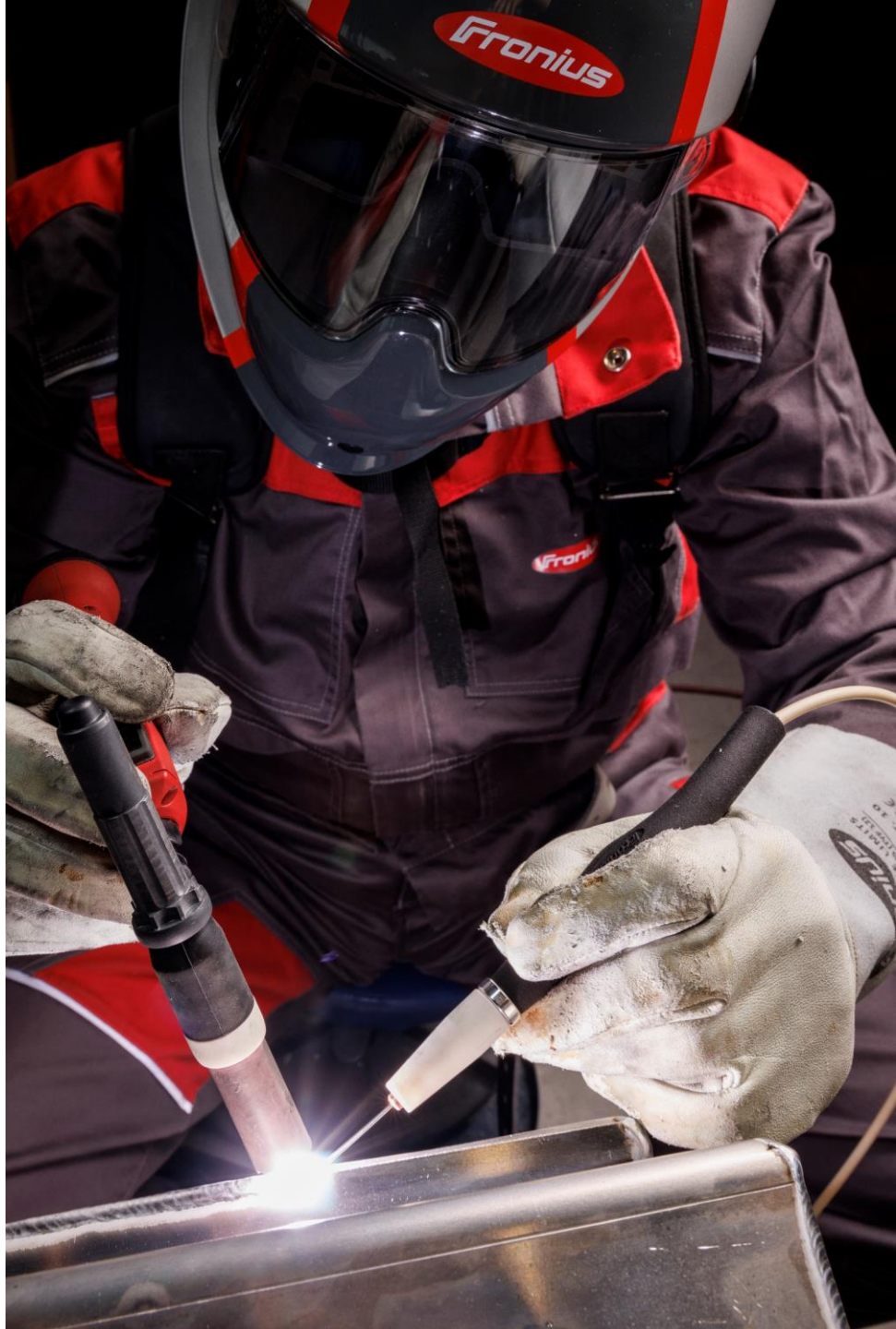
(Tungsten Fast Clamp, similar to „lead pencil system“)

Decoupled wire feeding system

DynamicPen

The DynamicPen is now available as an alternative to the standard cold wire feeding system (CW-Feeding Standard). The decoupled cold wire feeding system offers maximum flexibility for difficult accessibilities.

Details can be found in the presentation „TIG manual welding torches next generation“.

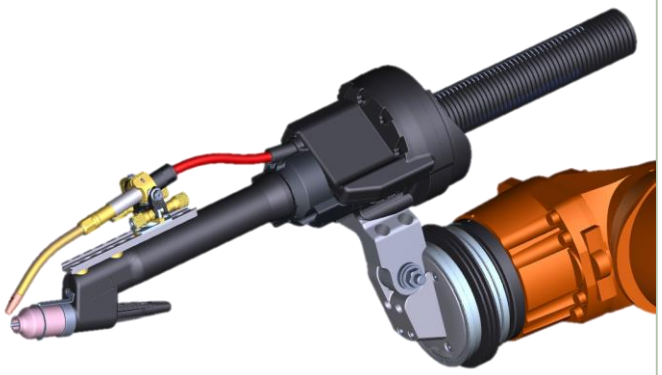


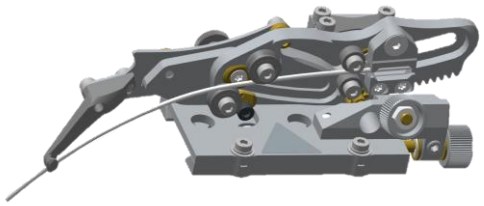
Wire feeding for automated applications

CW-Feeding Standard

recommended for CONV applications!

Detailed information on automated wire feedings can be found in the presentation „TIG torches automated“.





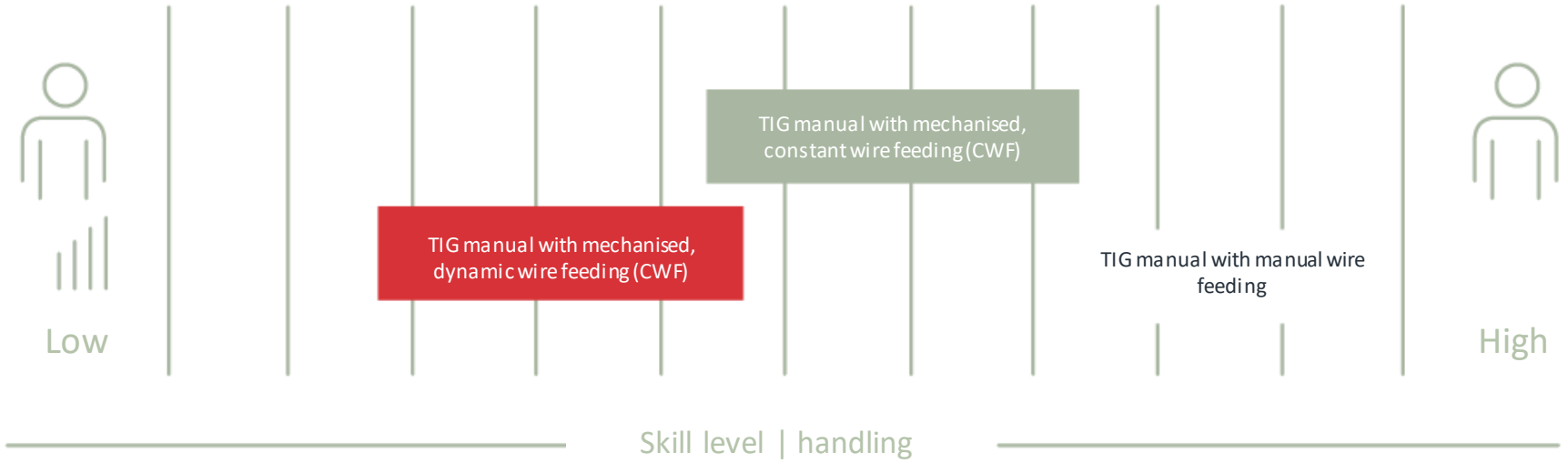
CW-Feeding Low Friction

recommended for PAP applications!

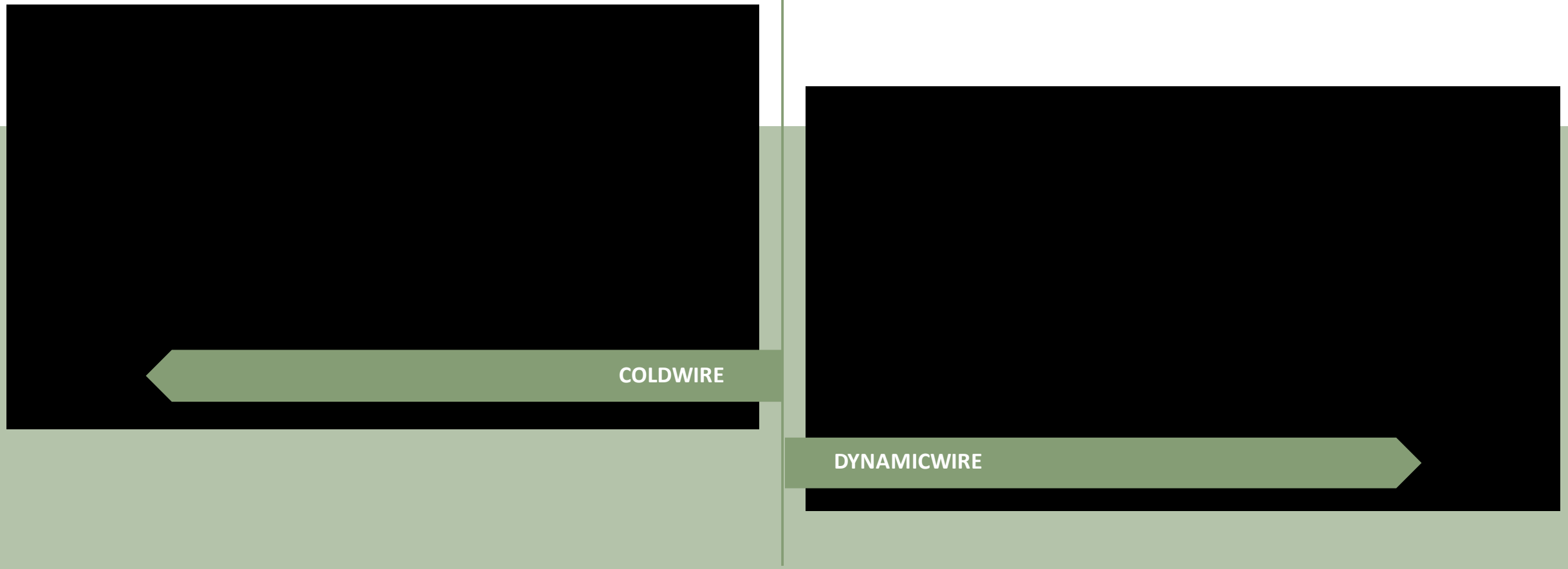
Detailed information on automated wire feedings can be found in the presentation „TIG torches automated“.

Comparison of TIG Cold- vs. DynamicWire

„The easiest way of manual TIG cold wire welding!“

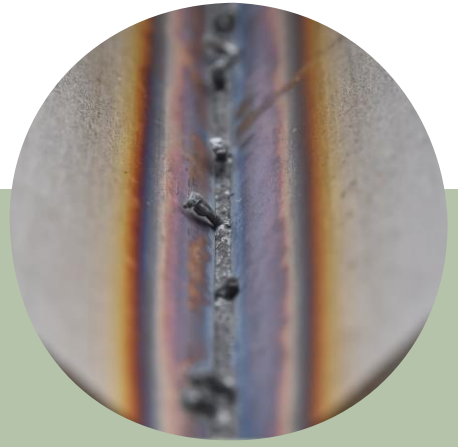


Comparison | V-seam

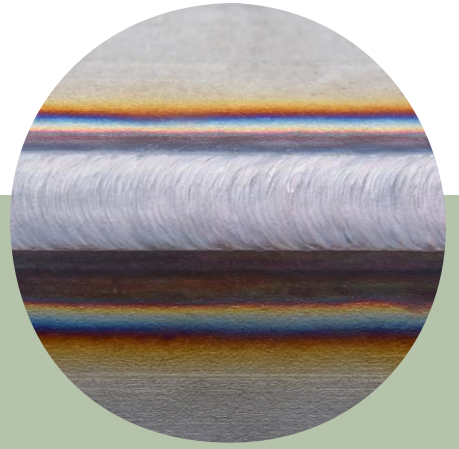


Comparison | V-seam

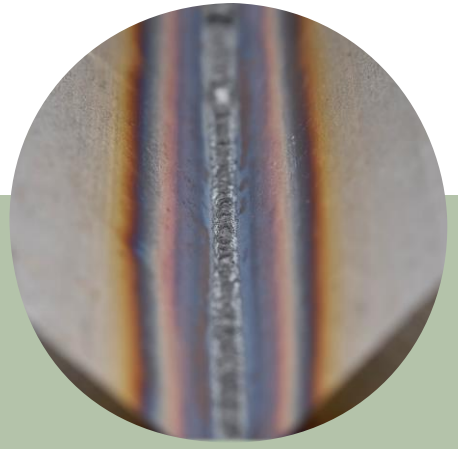
Weld seam



Root



Weld seam



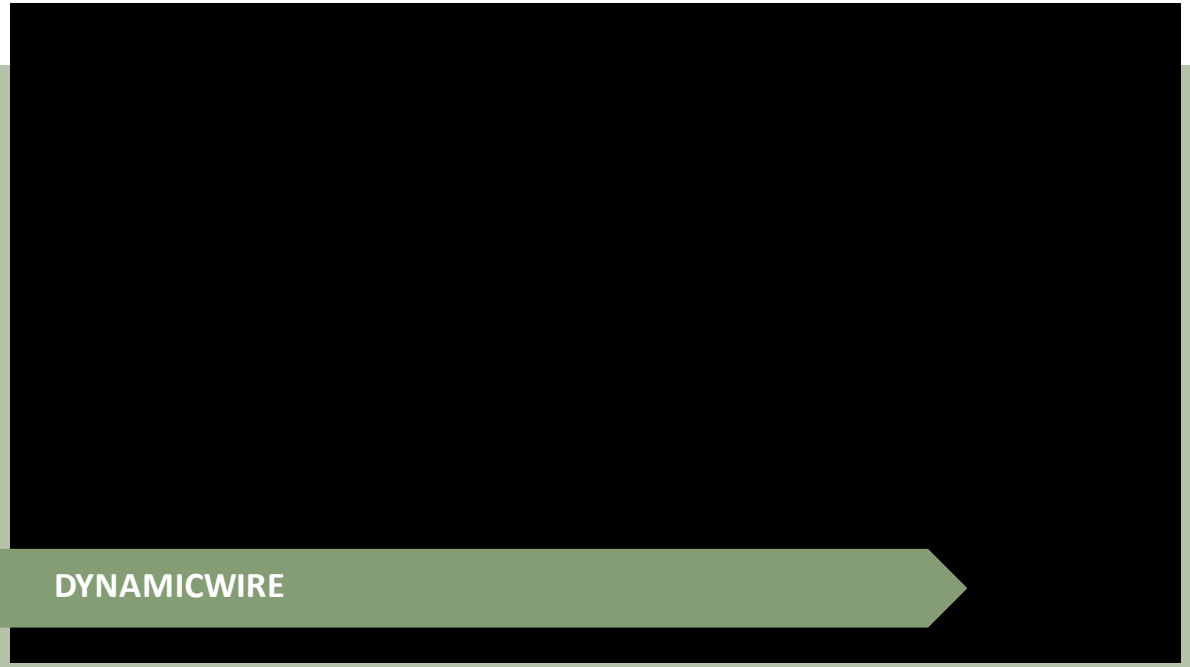
Root

COLDWIRE

DYNAMICWIRE

Comparison | Z-weaving

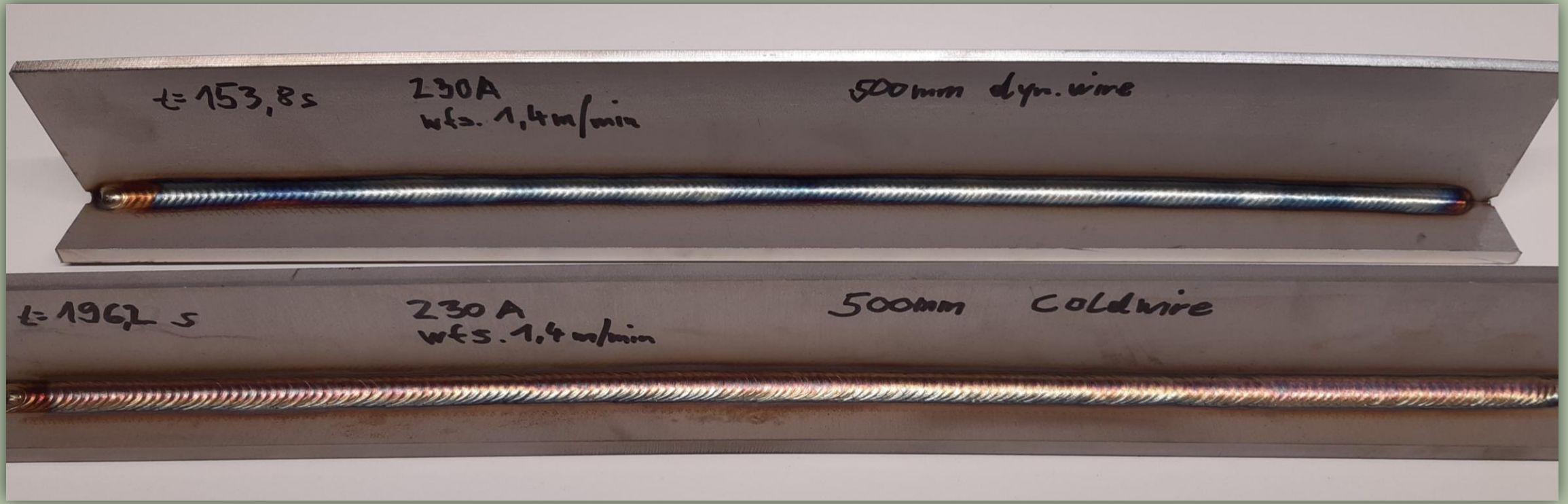
COLDWIRE



DYNAMICWIRE

Comparison TIG ColdWire vs. DynamicWire manual

Comparison TIG CW vs. DynamicWire



Manual weld
Test blade Stainless Steel 1.4301
Dimension: 500 x 50 x 6 mm

Fillet weld
Position: PB (2F)
Filler material: ER 316LSi ø1.2mm

Comparison TIG CW vs. DynamicWire

WeldCube documentation data

ColdWire

Seam

Welding state	Ok
Weld details	Details
Weld date	3/14/2023 8:42:47 AM +01:00
Duration	196.2 s
Wire consumption (length)	4.474 m
Energy	404.67 kJ
Wire consumption (volume)	5059.9731 mm³

Machine

Name	GTSMiWave500i MP+CWF
Machine serial number	33414261
Firmware version	3.5.2-30264.29663
Model	iWave 500i AC/DC
Machine location	Fronius Wels/GTSM WAC/Manual Booth/Portable Machine
IP address	10.6.47.65

DynamicWire

Seam

Welding state	Ok
Weld details	Details
Weld date	3/14/2023 8:49:11 AM +01:00
Duration	153.8 s
Wire consumption (length)	4.278 m
Energy	322.7 kJ
Wire consumption (volume)	4838.5422 mm³

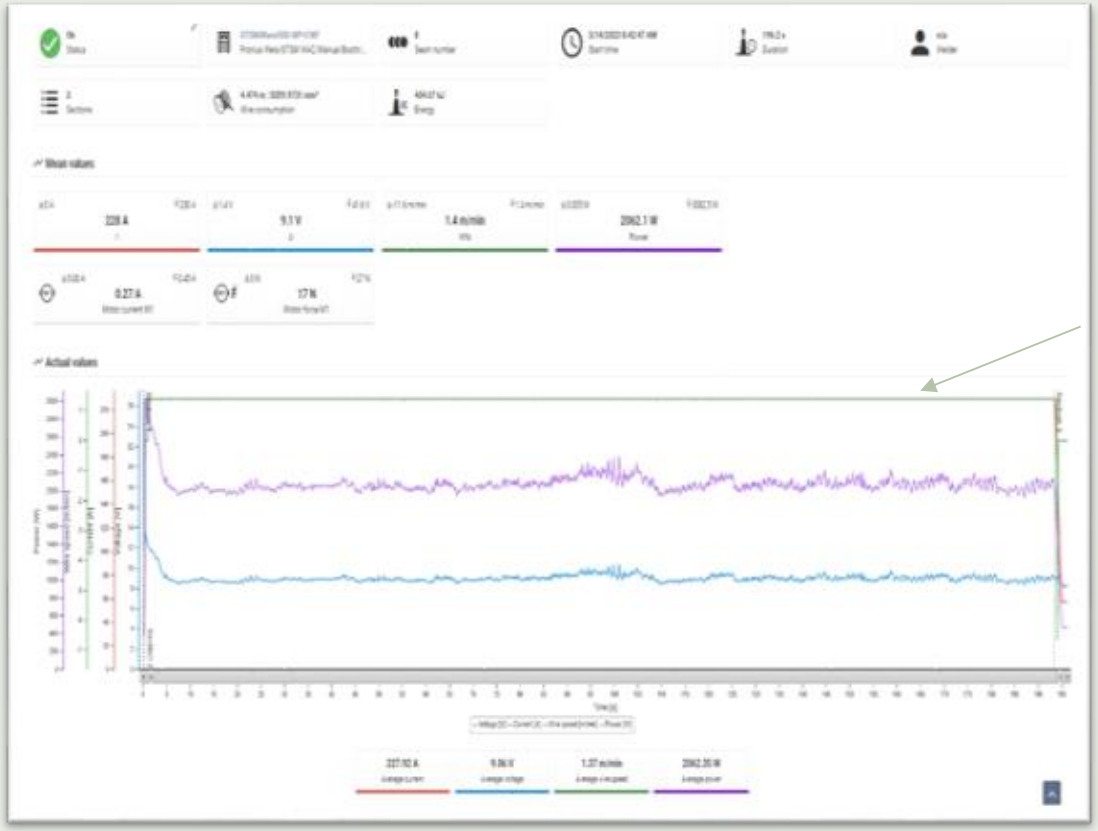
Machine

Name	Joe*s500erl-Wave+CWF
Machine serial number	33246853
Firmware version	3.5.2-30264.29663
Model	iWave 500i AC/DC
Machine location	Wels/Labormeile/PlasmaLab
IP address	10.6.47.20

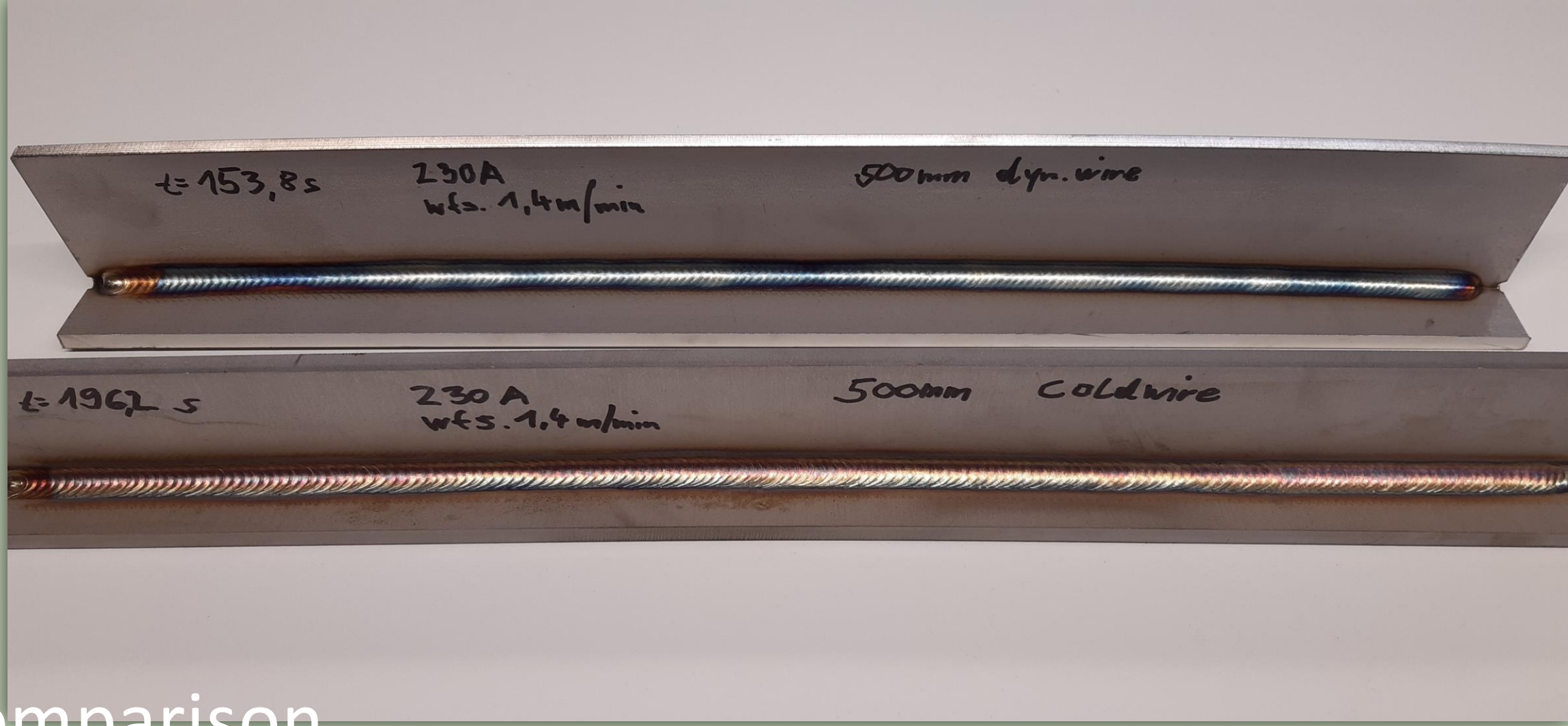
Comparison TIG CW vs. DynamicWire

Screenshot WeldCube

ColdWire wfs: 1.4m/min



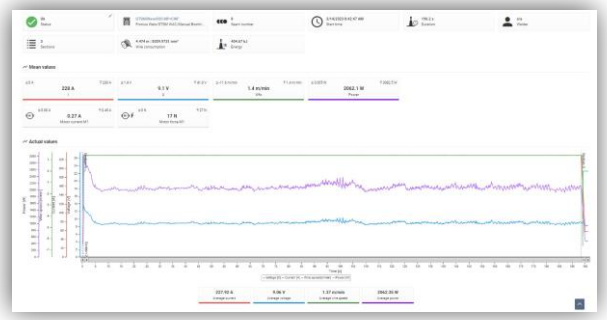
DynamicWire average wfs: 1.4m/min



Comparison

TIG CW vs. DynamicWire

Time saving with TIG DynamicWire



ColdWire

Energy input: 404.67 kJ
Seam length: 480mm

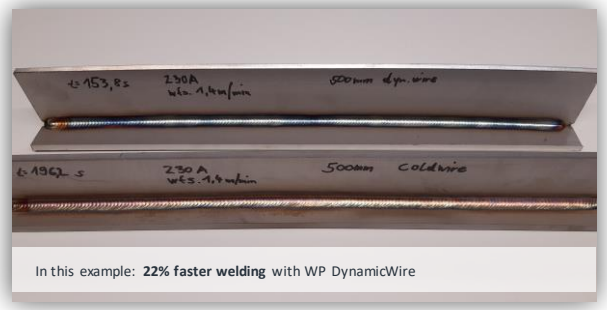
196.2 sec.

vs.

DynamicWire

Energy input: 322.7 kJ
Seam length: 480mm

153.8 sec.



In this example: **22% faster welding** with WP DynamicWire

Time saving with DynamicWire
... compared to ColdWire (mit CWF 25i)

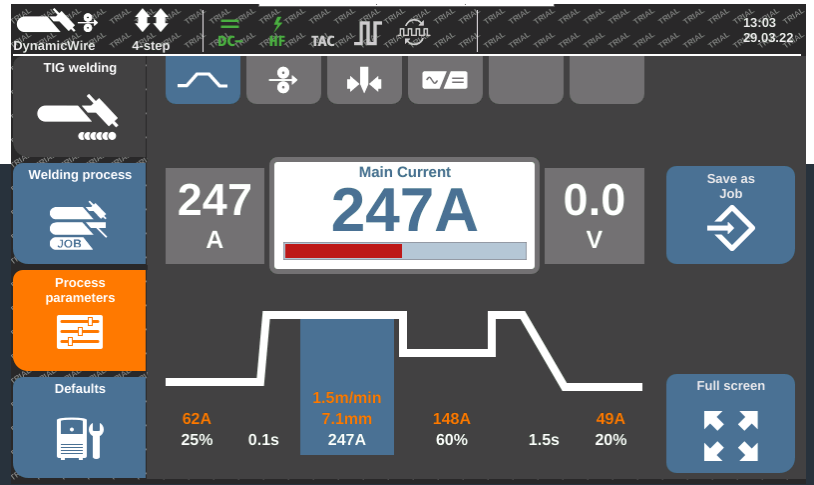
[wfs: 1.4m/min, 500mm sheet metal, 230A]

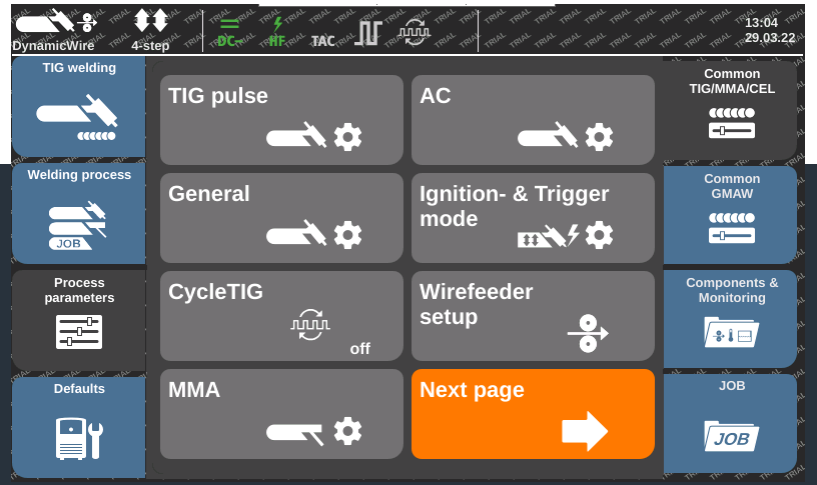
42.4 sec.

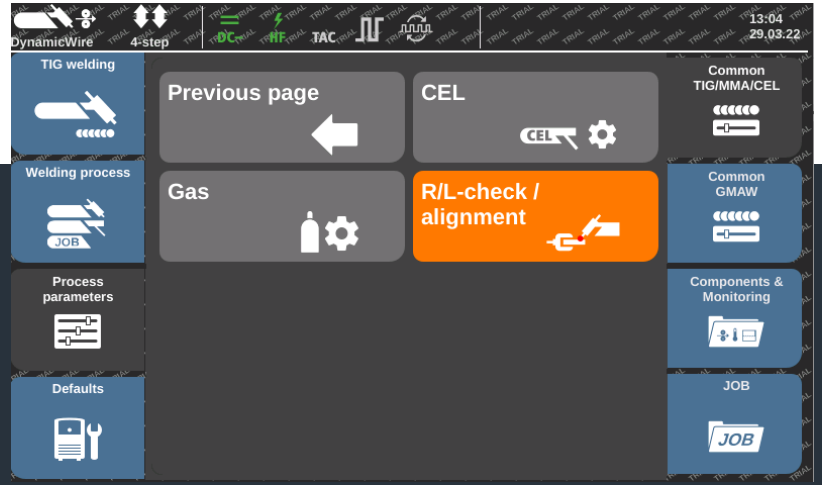
[22% faster welding]

How-to

Resistance alignment (R/L)





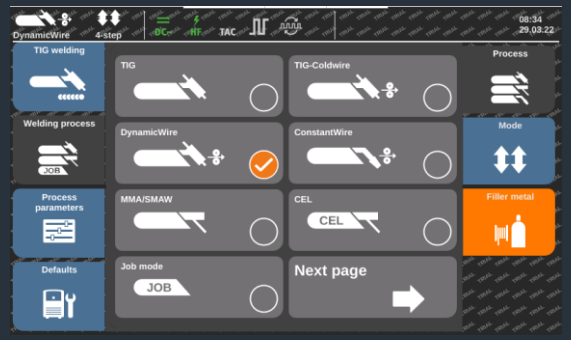


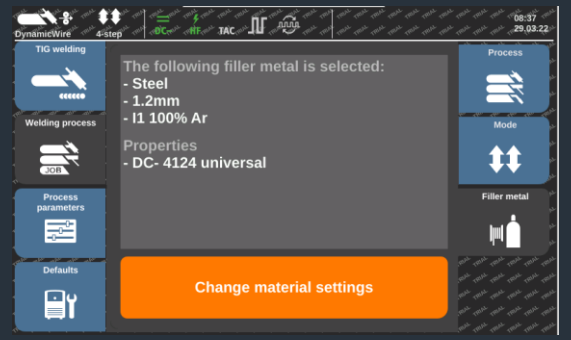
MOST IMPORTANT SET-UP FOR SUCCESSFUL TIG DYNAMICWIRE WELDING !

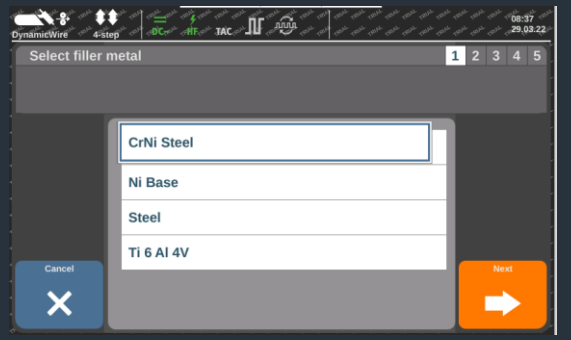
Steps to follow on the MCU

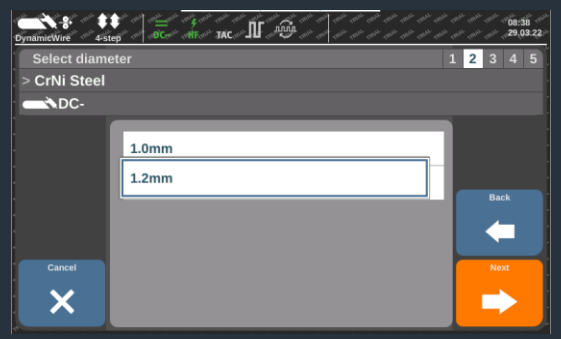
EXAMPLE

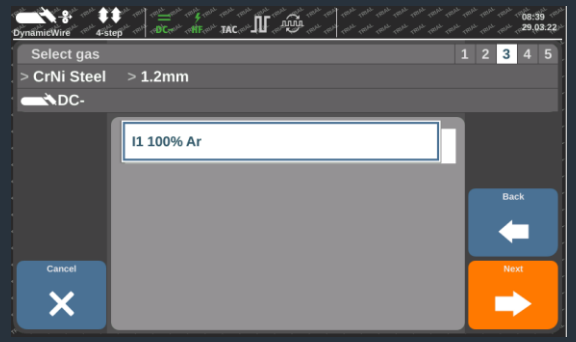
Sample setup for 8mm SS1.4301 sheet metal (500mm) fillet weld with Filler Material ER316LSi 1.2mm PA-position

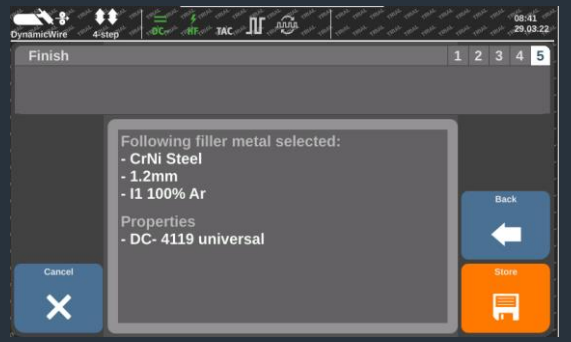


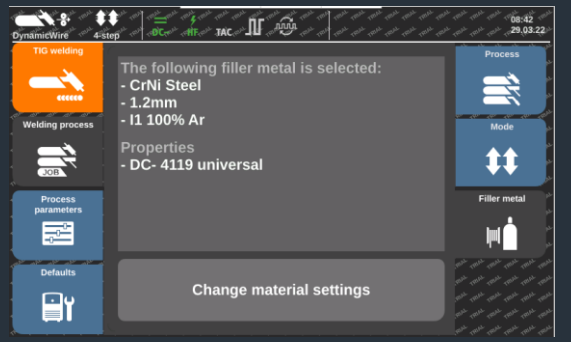




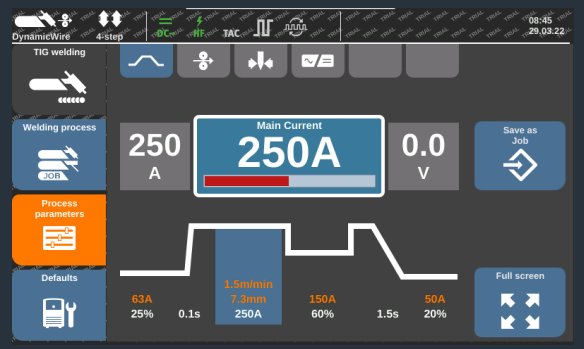


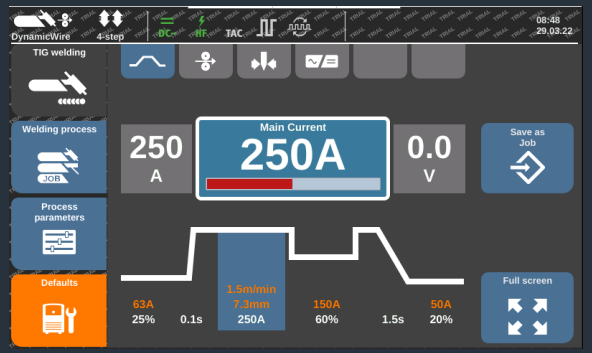


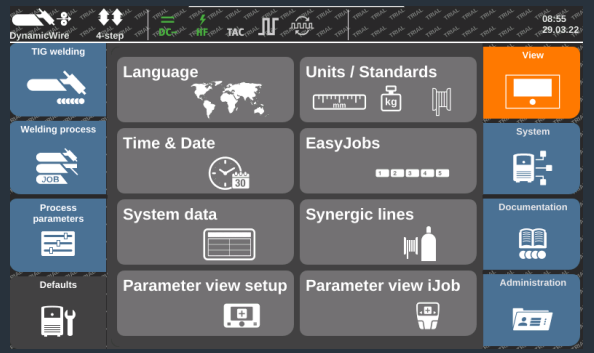


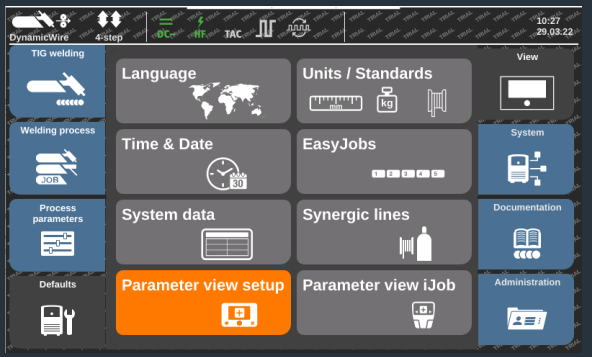


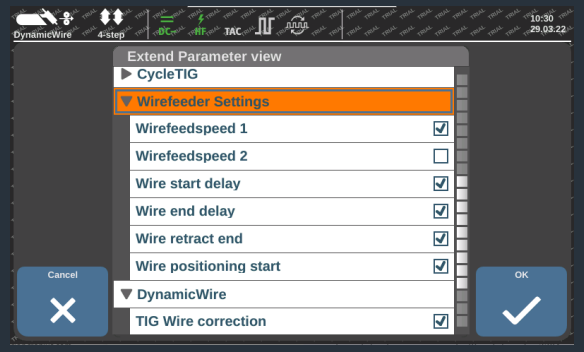
Additional settings on the MCU

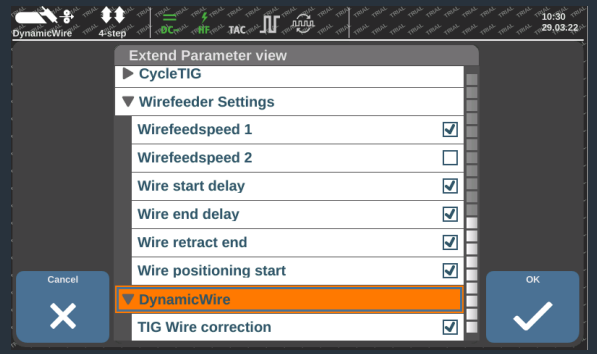


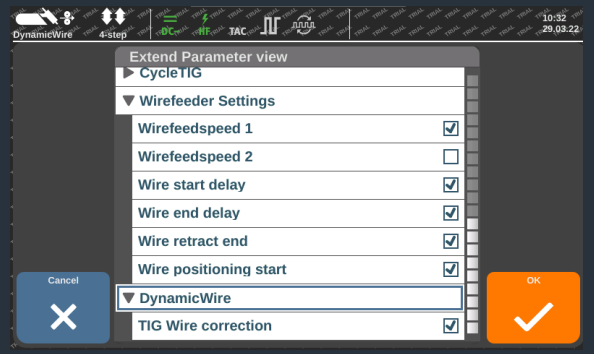




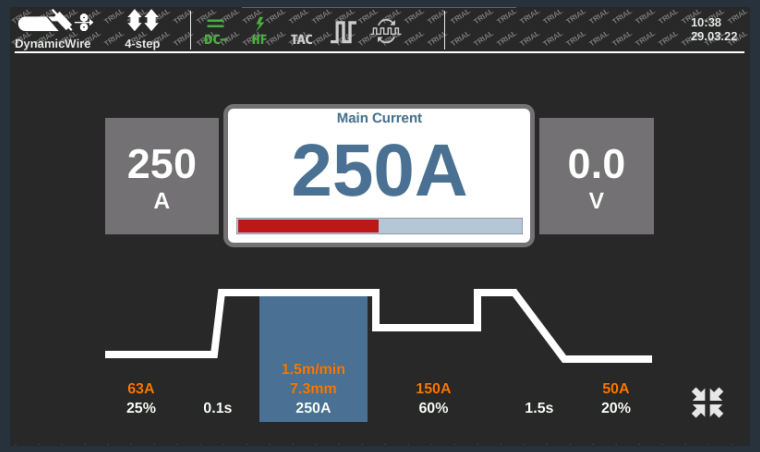


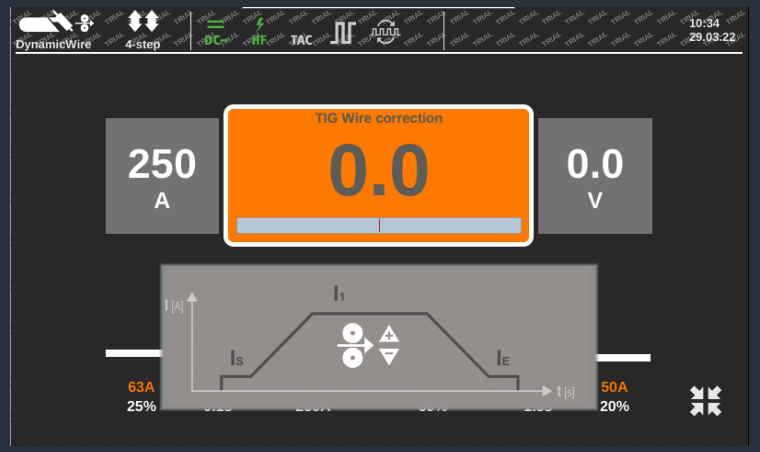


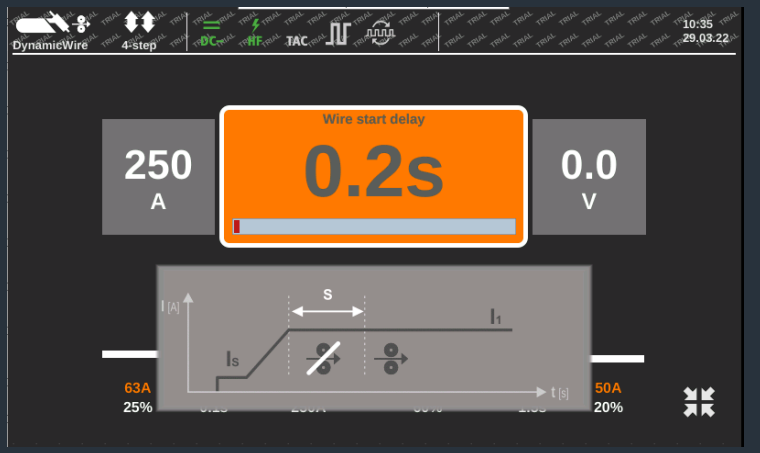


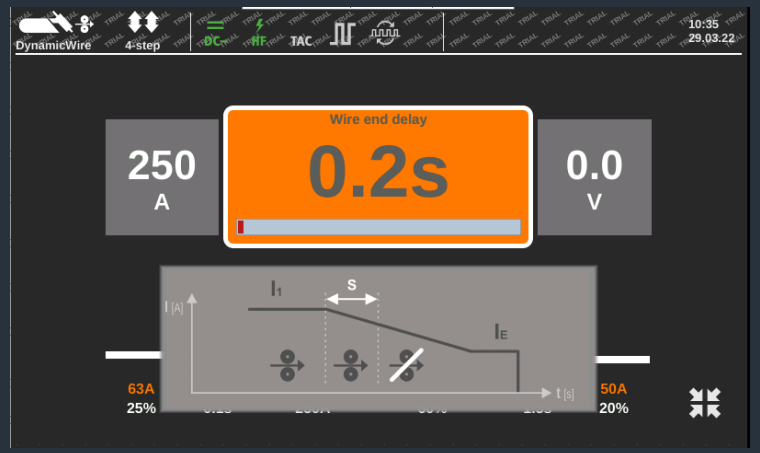


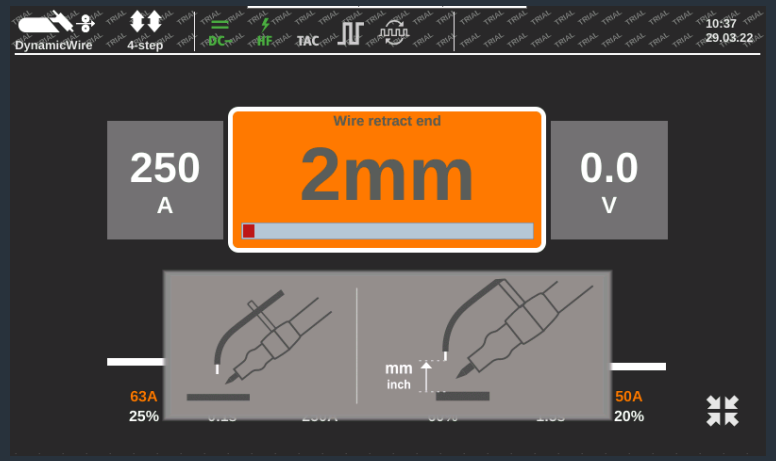
Additional settings on the MCU









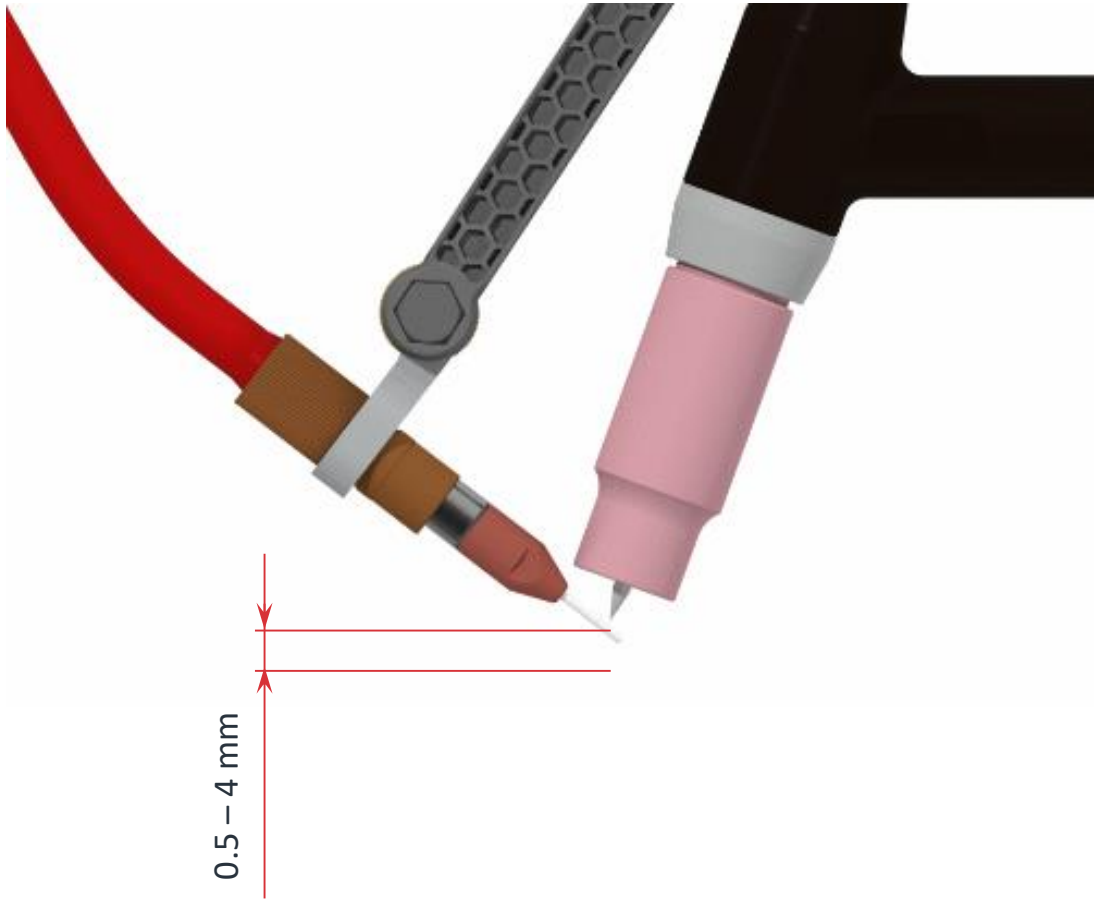


Recommended wire distance

Wire distance to the tungsten electrode

Current range [A]	Wire distance to tungsten elctrode [mm]
40 - 150	0.5 – 1.5
150 - 260	1.5 – 2.5
260 – 320	2.4 - 4

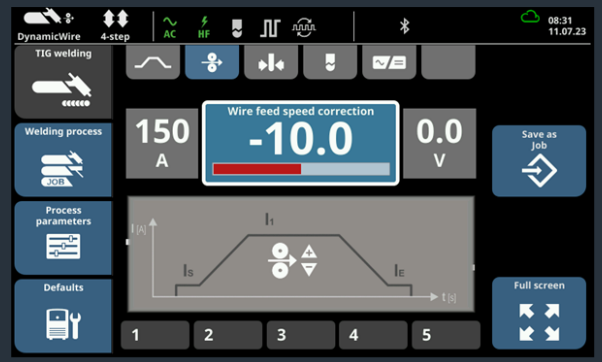
Universal setting: 2 mm

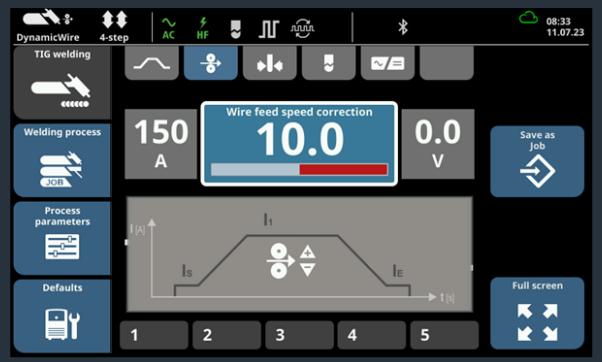


Wire feed speed correction

Wire feed speed correction

The parameter „wire feed speed correction“ allows the welder to correct the wire feed in the positive or negative range. This setting influences the pentration depth, weld seam surface, effective throat thickness and welding speed.





-10.0

Lowest value

(= less wire)

0.0

Standard setting
(wire feed speed according to stored characteristic)

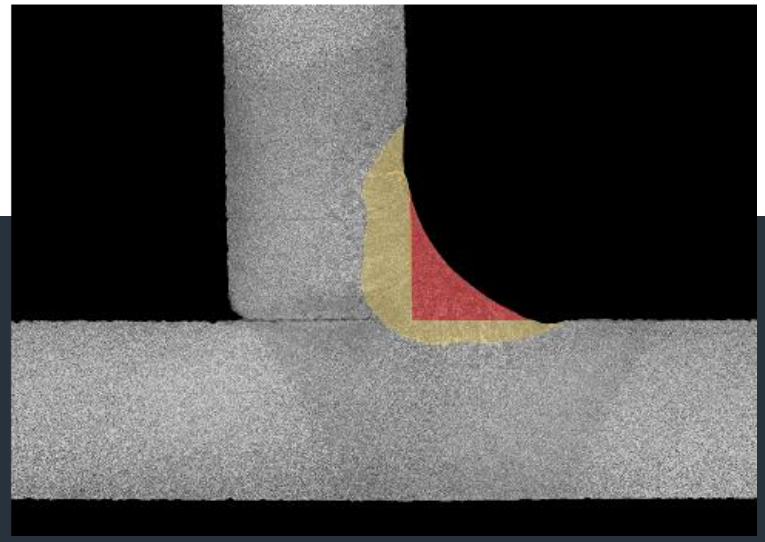
10.0

Highest value

(= more wire)

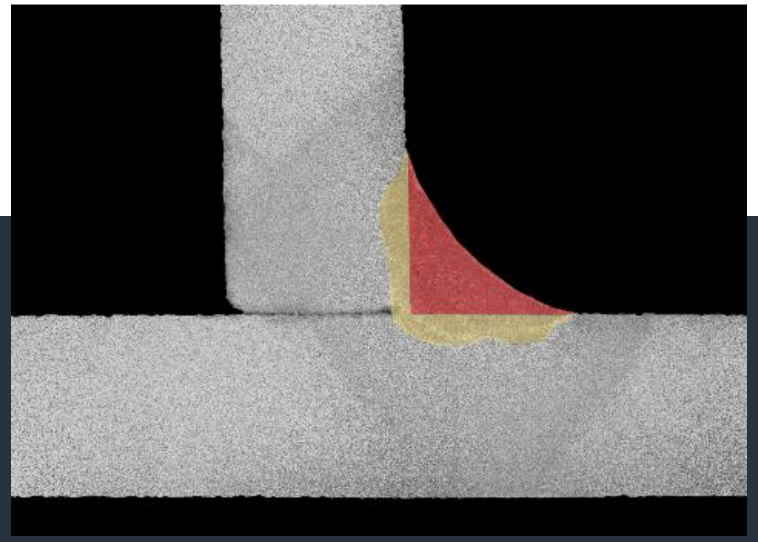
Wire feed speed correction

Influence of wire feed speed correction



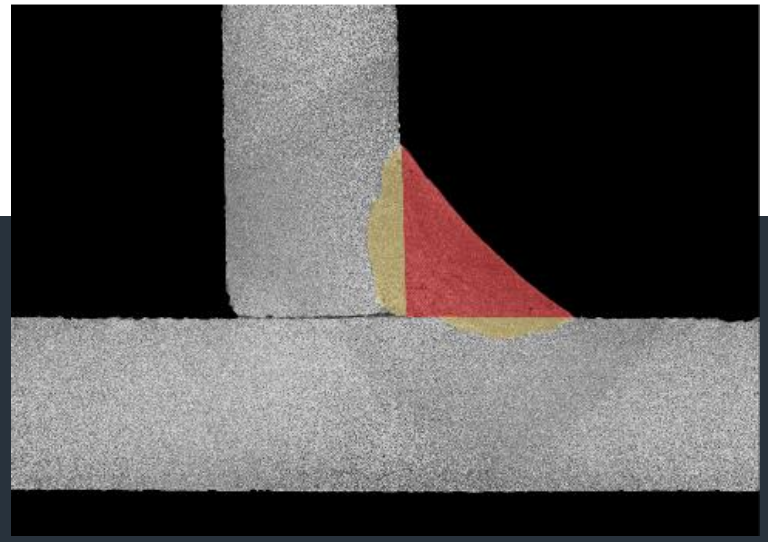
Wire feed speed correction: -10.0

Weld seam surface: 3,98 mm^2
Penetration depth: 8,40 mm^2
Design throat thickness: 1,5 mm
Average wire feed speed: 0,4 m/min



Wire feed speed correction: 0.0

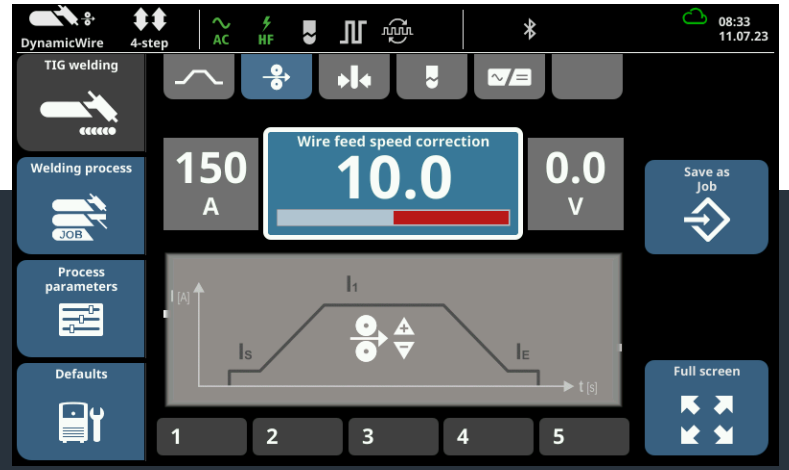
Weld seam surface: 6,84 mm^2
Penetration depth: 5,46 mm^2
Design throat thickness: 2,41 mm
Average wire feed speed: 0,9 m/min



Wire feed speed correction: +7.0

Weld seam surface: 11,48 mm^2
Penetration depth: 4,67 mm^2
Design throat thickness: 3,21 mm
Average wire feed speed: 1,7 m/min

Wire feed speed correction



-10.0

Lowest value

(= less wire)

0.0

Standard setting

(wire feed speed according to stored characteristic)

10.0

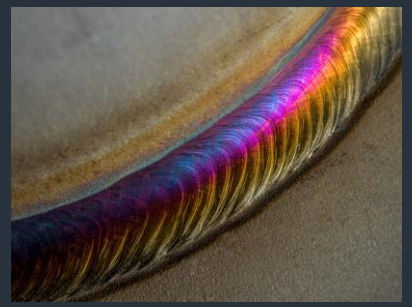
Highest value

(= more wire)

Welding demo

TIG DynamicWire

Pipe-flange connection



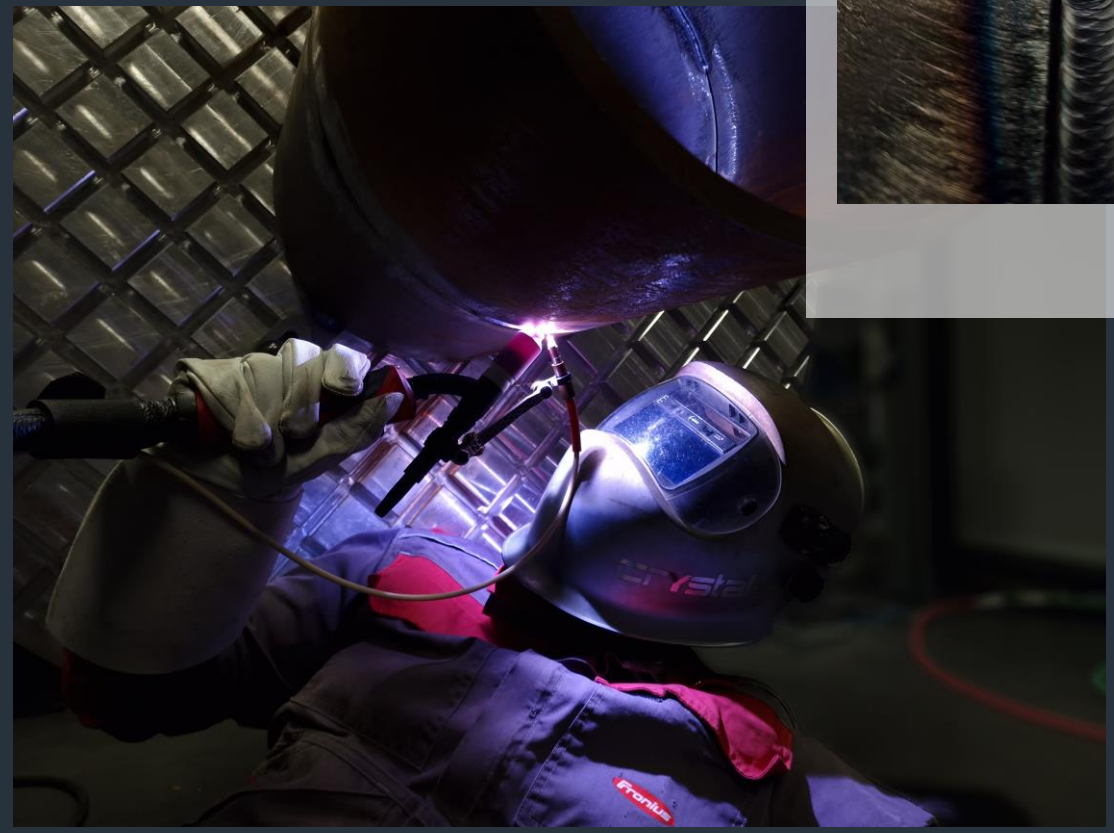
„I went to several customers to demonstrate TIG DynamicWire. All customers became enthusiastic after these demos. They were all a bit sceptical about automatic wire feed system combined with (manual) TIG welding. After seeing the process they all wanted to try the system and the simplicity and easy going with this process convinced all welder that this is a great solution!“

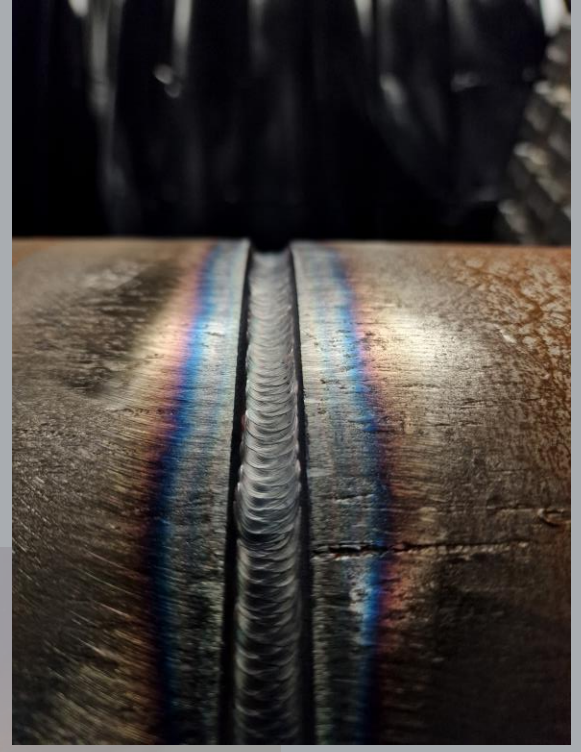
“The best welding demo was at a customer where the welder already tried 4 other systems from competitors / welding equipment manufacturers. He was really mad about the fact that his boss wanted to try another system, again…. We started our demo with a very negative welder but after seeing and trying our system he became enthusiastic. He wanted this system for his tasks! This was such a great experience! All other systems failed at the demo but ours did what a welder wants!!”

Patrick van Deuren, EQIN

Gap bridgeability, e.g.

Pipe welding [1/2]





READ MORE

Pipe welding [2/2]

1 | Root Pass

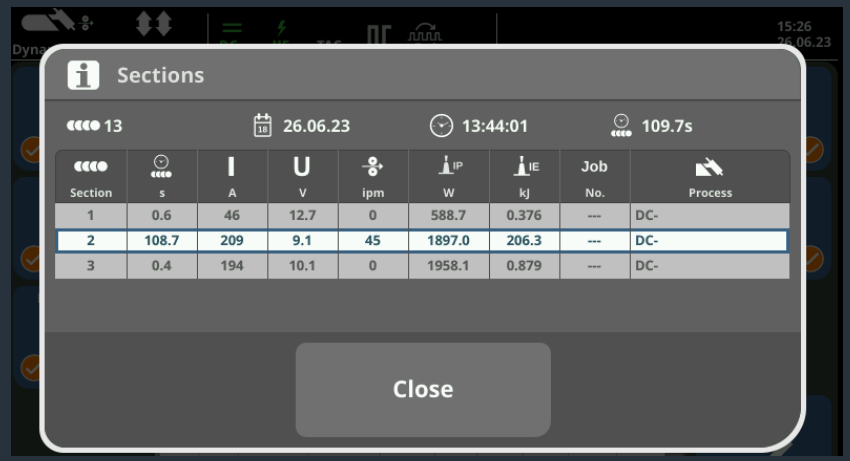
Settings:
150 A 65 IPM (1.7m/min) WFS
Travel speed 3.6 IPM (9.2 cm/min)

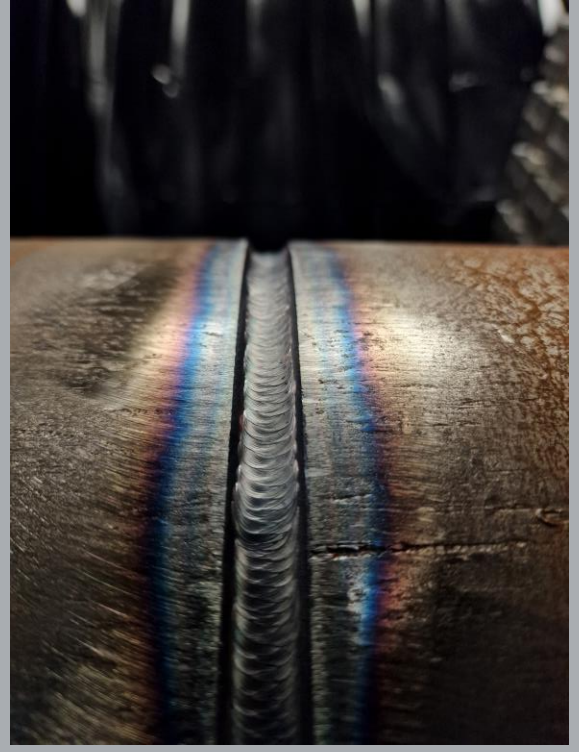
© Fronius

2 | Hot Pass

Settings:
210 A 45 IPM (1.7m/min) WFS
Travel speed 3.6 IPM (9.2 cm/min)

© Fronius

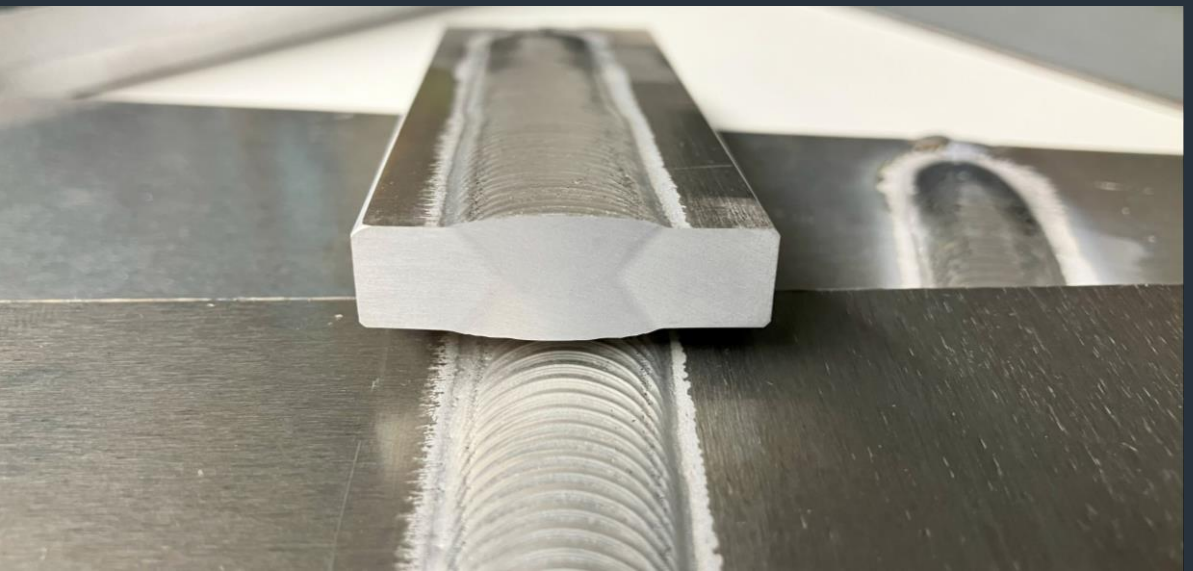


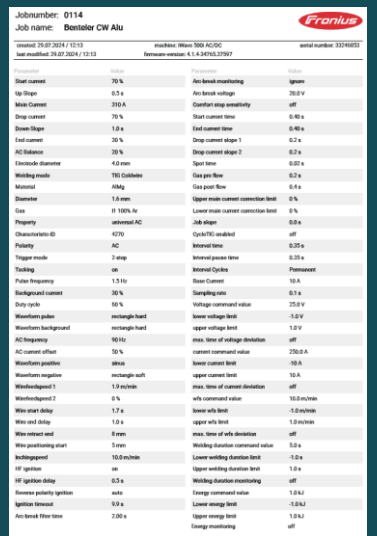


settings

ColdWire welding test

- **Process:** TIG ColdWire
- **Segment of application:** Automotive
- **Type of application:** Sheet metals
- **Base material(s):** Aluminium
- **Surface(s):** Cleaned
- **Additional material(s):** AlMg Zr
- **Filler metal diameter (mm):** 1,2mm
- **Shielding gas:** Argon 100%
- **Welding position:** PA
- **Seam type:** Butt weld



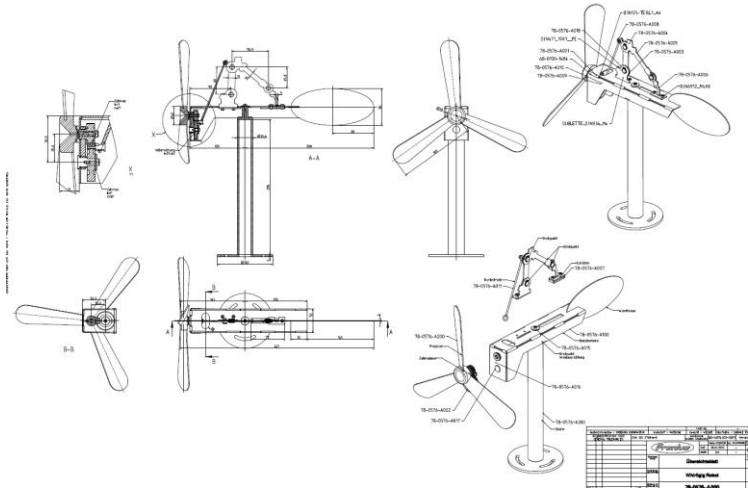


Customer requirements

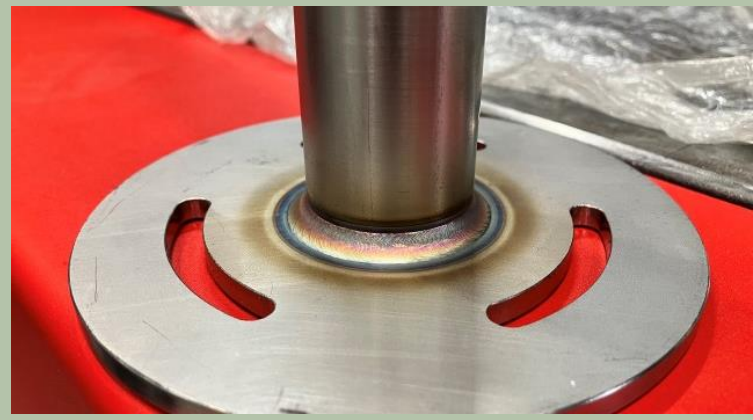
- Comparison of TIG ColdWire and the MIG process on Aluminium metal sheets.
- Aluminium cover for exhaust system
- Material thickness: 8mm
- No seam preparation
- Test welds have been carried out on test plates (200x100x8).

Pipe-flange connection

FCW Smart



- **Process:** TIG DynamicWire / CycleTIG
- **Segment of application:** -
- **Type of application:** Pipe/flange
- **Base material(s):** 1.4301
- **Surface(s):** -
- **Additional material(s):** 316 LSi
- **Filler metal diameter (mm):** 1,2mm
- **Shielding gas:** Argon 100% (12l/min)
- **Welding position:** PA
- **Seam type:** -



Aluminium cap & socket

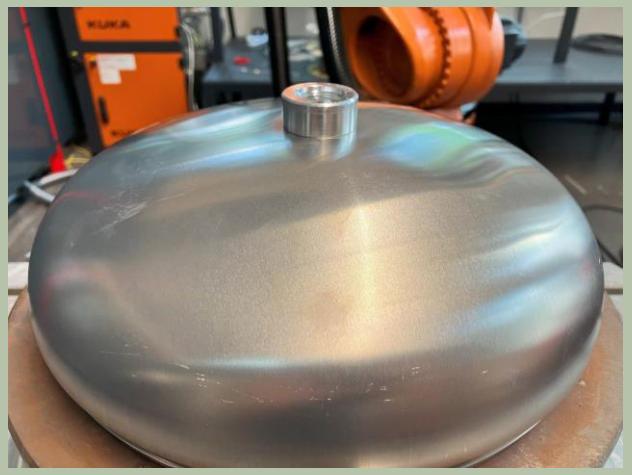
- **Process:** TIG DynamicWire
- **Segment of application:** Tank construction
- **Type of application:** Cap-socket
- **Base material(s):** Aluminium
- **Surface(s):** Cleaned
- **Additional material(s):** AlSi5
- **Filler metal diameter (mm):** 1.20mm
- **Shielding gas:** I1 100% Ar
- **Welding position:** PA
- **Seam type:** fillet weld

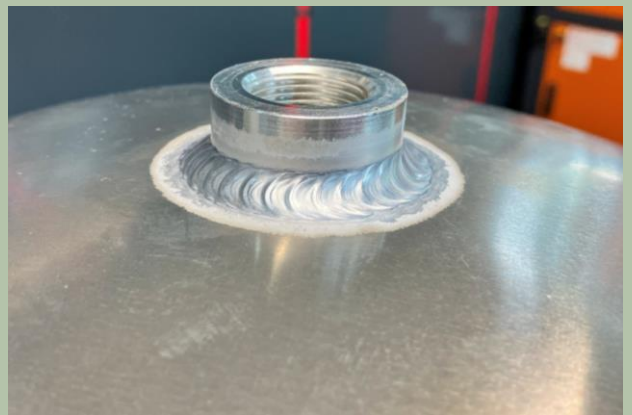
Jobnumber: **0012**
Job name: **SAG**

Fronius

created: 19.07.2024 / 07:59 | machine: iWave 500i AC/DC | serial number: 33246853
last modified: 25.07.2024 / 12:34 | firmware-version: 4.1.4-34765.37597

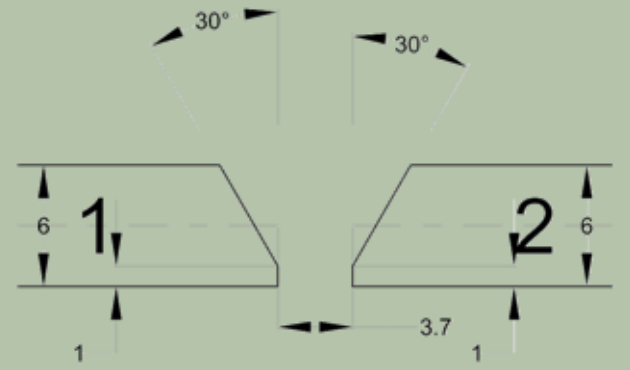
Parameter	Value	Parameter	Value
Start current	160 %	Arc-break voltage	20.0 V
Up-Slope	0.5 s	Comfort stop sensitivity	off
Main Current	190 A	Start current time	1.3 s
Drop current	70 %	End current time	0.60 s
Down-Slope	1.0 s	Drop current slope 1	0.2 s
End current	35 %	Drop current slope 2	0.2 s
AC Balance	40 %	Spot time	0.02 s
Electrode diameter	4.8 mm	Gas pre flow	0.2 s
Welding mode	DynamicWire	Gas post flow	1.4 s
Material	AlSi 5	Upper main current correction limit	0 %
Diameter	1.2 mm	Lower main current correction limit	0 %
Gas	I1 100% Ar	Job slope	0.0 s
Property	universal AC	CycleTIG enabled	off
Characteristic-ID	4392	Interval time	0.50 s
Polarity	AC	Interval pause time	0.40 s
Trigger mode	2-step	Interval Cycles	Permanent
Tacking	off	Base Current	90 A
Pulse frequency	1.0 Hz	Sampling rate	0.1 s
Background current	30 %	Voltage command value	25.0 V
Duty cycle	60 %	lower voltage limit	-1.0 V
Waveform pulse	rectangle hard	upper voltage limit	1.0 V
Waveform background	rectangle soft	max. time of voltage deviation	off
AC frequency	80 Hz	current command value	250.0 A
AC current offset	50 %	lower current limit	-10 A
Waveform positive	sinus	upper current limit	10 A
Waveform negative	rectangle soft	max. time of current deviation	off
Wire feed speed correction	0.0	wfs command value	10.0 m/min
Wire start delay	1.2 s	lower wfs limit	-1.0 m/min
Wire end delay	0.6 s	upper wfs limit	1.0 m/min
Wire retract end	5 mm	max. time of wfs deviation	off
Wire positioning start	5 mm	Welding duration command value	5.0 s
Inchingspeed	10.0 m/min	Lower welding duration limit	-1.0 s
HF ignition	on	Upper welding duration limit	1.0 s
HF ignition delay	0.5 s	Welding duration monitoring	off
Reverse polarity ignition	auto	Energy command value	1.0 kJ
Ignition timeout	9.9 s	Lower energy limit	-1.0 kJ
Arc-break filter time	2.00 s	Upper energy limit	1.0 kJ
Arc-break monitoring	ignore	Energy monitoring	off





DynamicWire | gap bridging capability test

- **Process:** TIG DynamicWire
- **Segment of application:** -
- **Type of application:** Butt weld with clamping device
- **Base material(s):** 304
- **Surface(s):** Chemically cleaned
- **Additional material(s):** CrNi Steel
- **Filler metal diameter (mm):** 1,2mm
- **Shielding gas:** Argon 100%
- **Weld position:** PA
- **Seam preparation:** Y-joint



1. **Layer 1 – root bead** (welded length: 260mm), main current 125A, welding speed 9cm/min
2. **Layer 2 – filler bead** (welded length: 200mm), main current 170A, welding speed 10cm/min
3. **Layer 3 – filler bead** (welded length: 120mm), main current 170A, welding speed 8cm/min
4. **Layer 4 – cap layer** (welded length: 60mm), main current 150A, welding speed 5cm/min

All information is without guarantee in spite of careful editing – liability excluded.

Intellectual property and copyright: all rights reserved.
Copyright law and other laws protecting intellectual property apply to the content of this presentation and the documentation enclosed (including texts, pictures, graphics, animations etc.) unless expressly indicated otherwise. It is not permitted to use, copy or alter the content of this presentation for private or commercial purposes without explicit consent of Fronius.