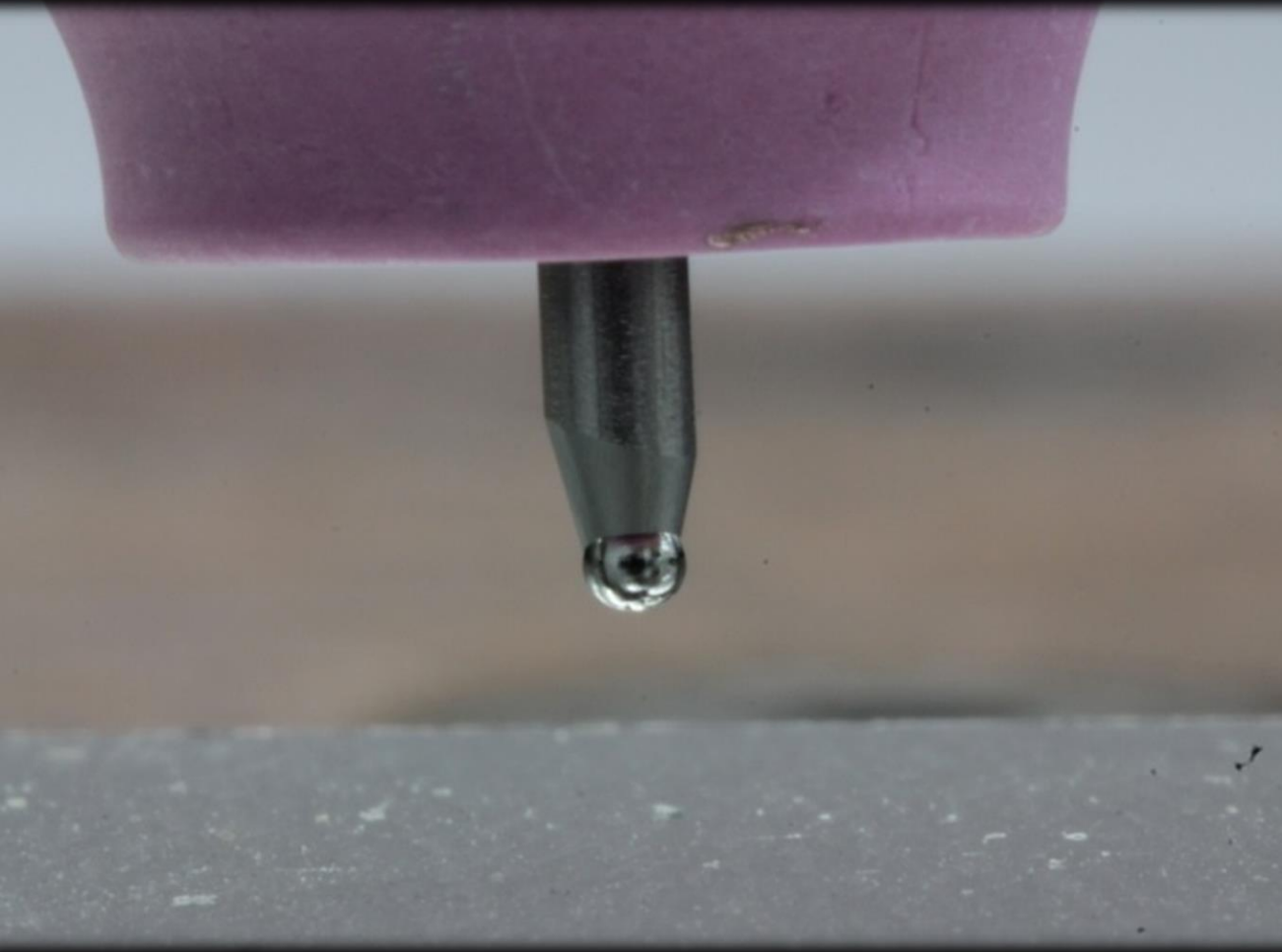


# TIG – Training/ AC

**ewim**<sup>®</sup>

WE ARE WELDING

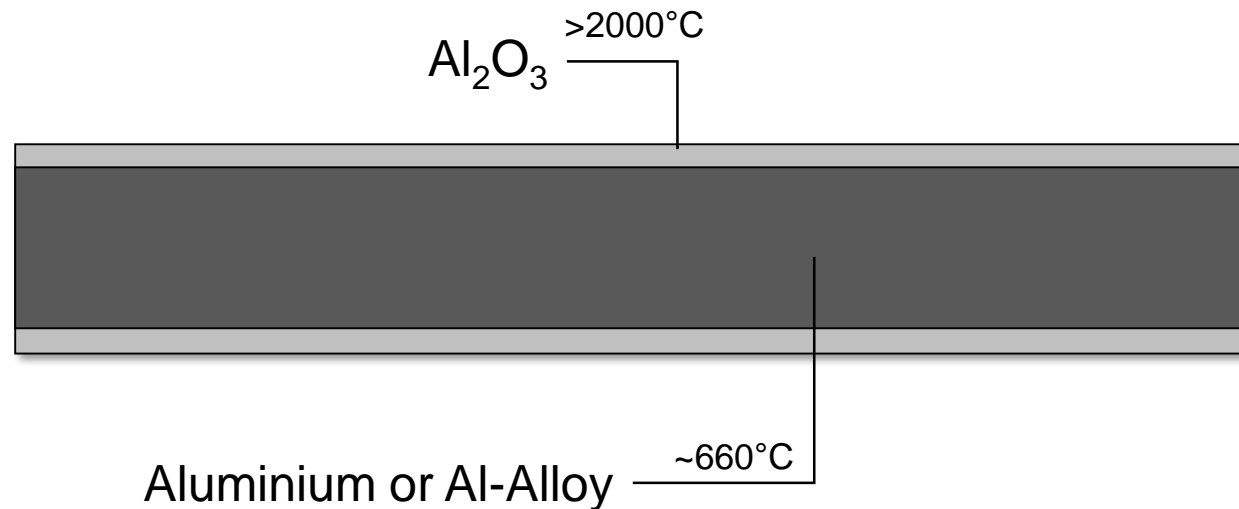


**AC**



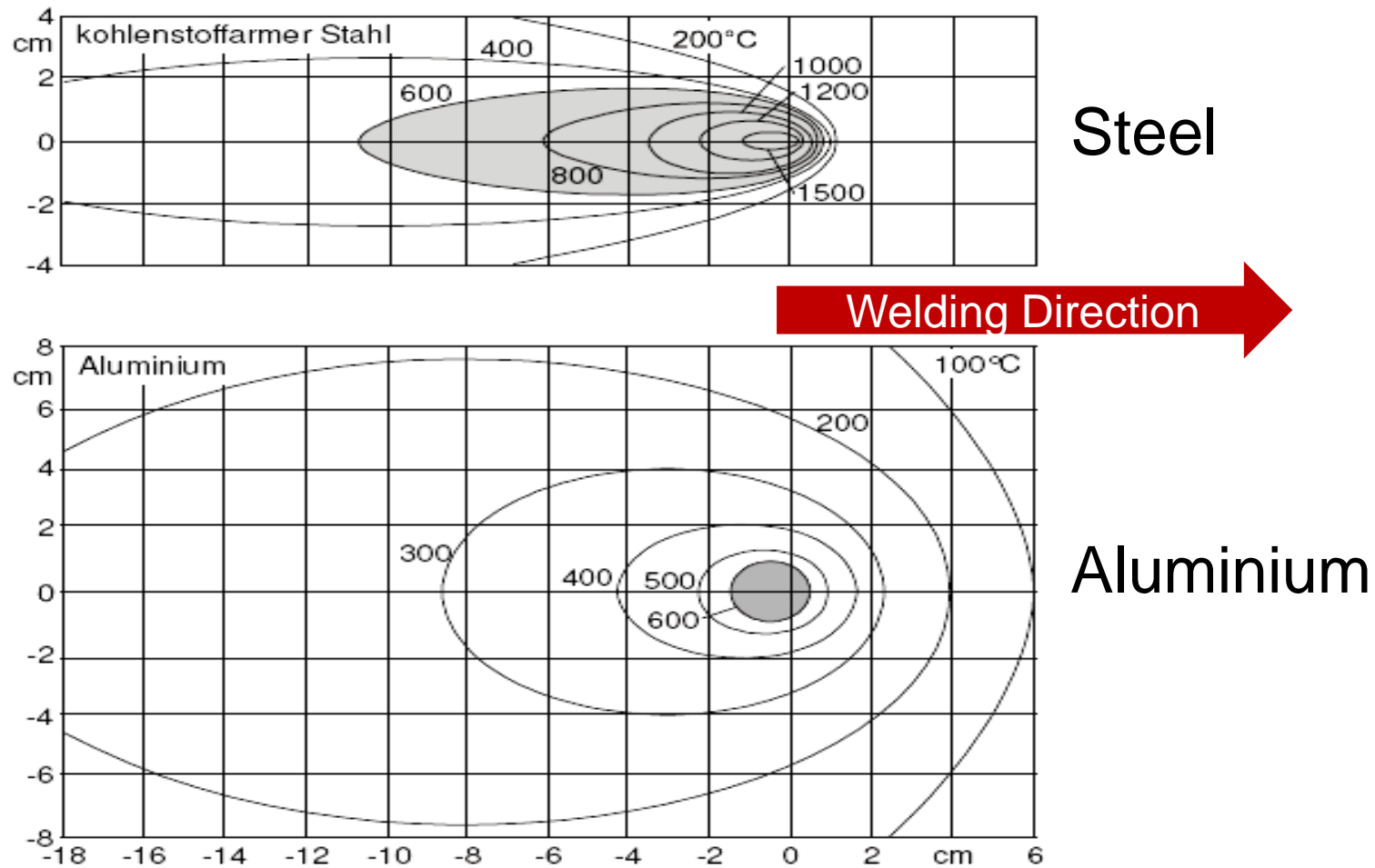
# Properties Aluminium

- / Aluminum alloys (and magnesium) build an oxide-skin on their own
- / Very adherent oxide layer, it forms very quickly
- / Oxide-skin grows depending on environmental conditions (humidity, temperature)
- / High melting point differences between aluminum and aluminum oxide



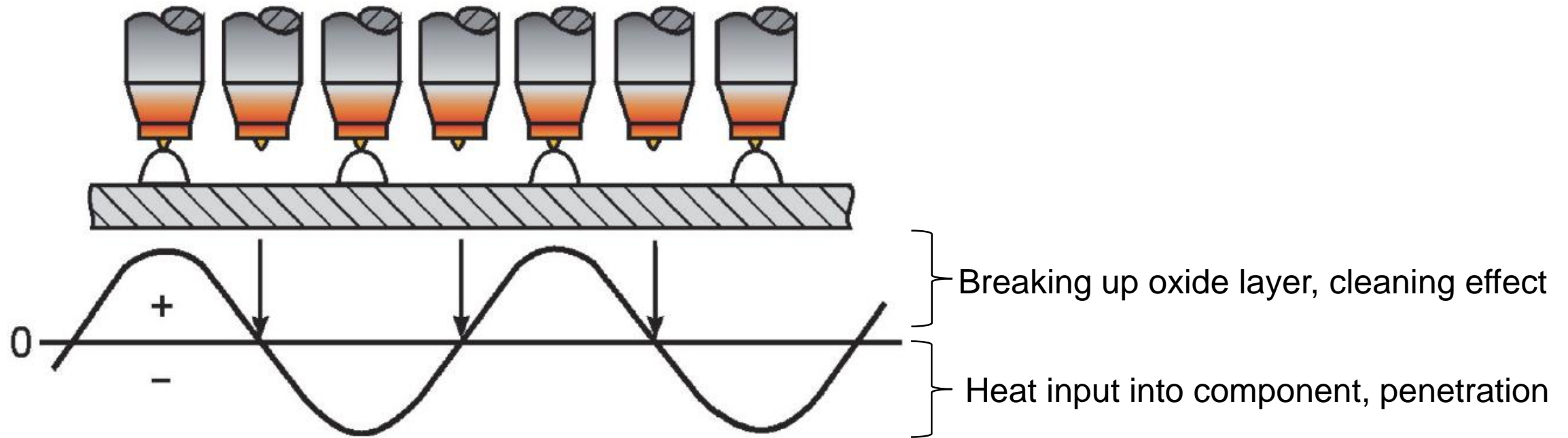
# Properties from Aluminium

Temperature distribution during TIG welding of steel and aluminium under the same welding conditions



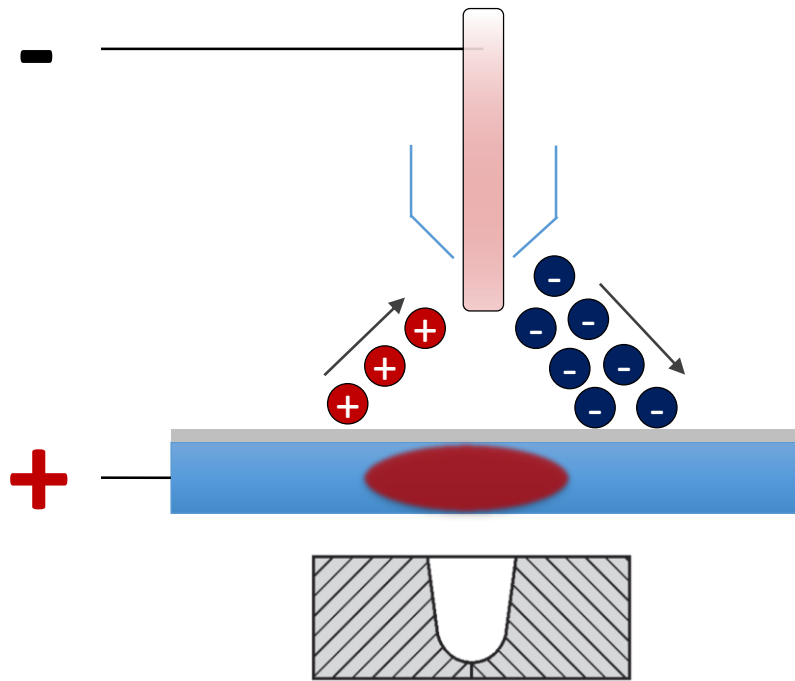
# Tig AC Basics

- / AC offers combination DC+ and DC-
- / Thermal stress on the tungsten electrode is reduced and penetration is generated
- / Breaking up the oxide layer in DC+ phase

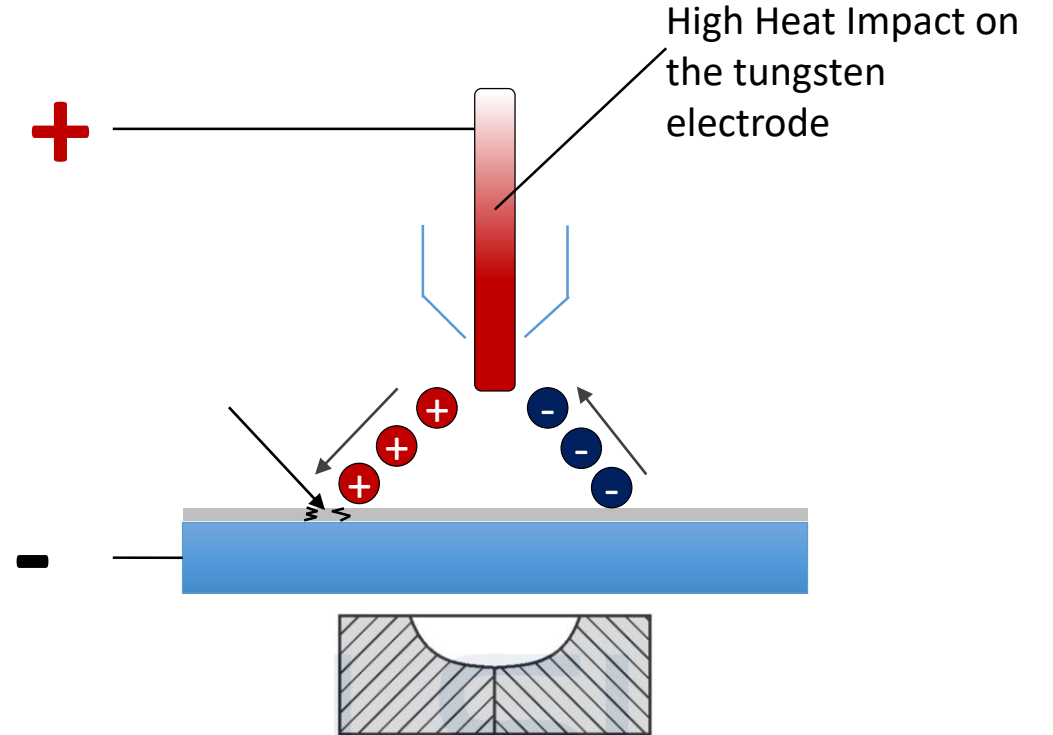


# TIG AC Basics

/ Polarity must be reversed to break the oxide skin



- / No breaking of the oxide layer
- / Deep penetration by electrons



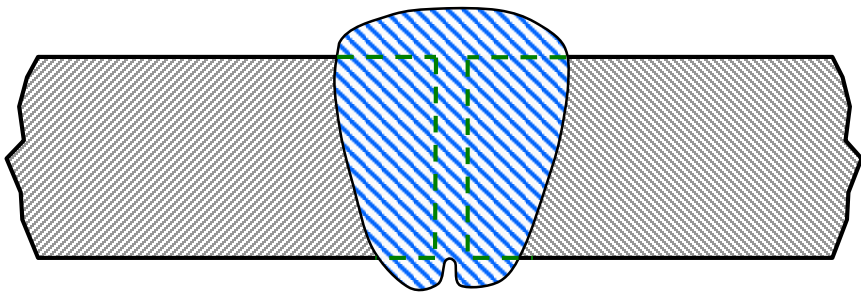
- / Ions break up the oxide layer
- / Shallow burn

# Weldpreperation

- / Absolute cleanliness of the welding area required!
- / mechanical removal of the oxide layer (grinding, brushing, scraping, milling)
- / chemical removal (pickling)
- / cleaning effect of the arc (AC – balance)
- / the edges on the root side have to be removed



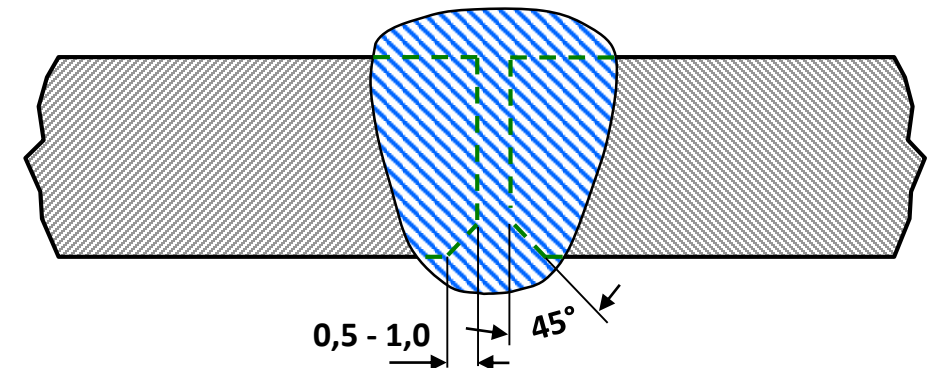
**FALSE, NOT OK**  
Edge is not broken



Oxides from the root faces  
are not completely flushed out  
**OXIDE CUT**



**CORRECT, OK**  
Edge is broken, removed



Oxides from the root faces  
are completely flushed out  
Good root characteristics

# Welding consumables / Aluminium-Alloys



Alloygroup  - Serie -	- Mainalloys	Internationale numeric description	DIN EN- Norm		Welding Suitability	Applications
			Example			
			Numeric	Chemical		
1xxx		AA 1xxx	EN AW-1050A	Al 99,5	Excellent weldability and good welding strength	<ul style="list-style-type: none"> <li>- Packaging industry e.g. foils</li> <li>- Electrical industry e.g. cathode sheets</li> </ul>
2xxx	Copper - Cu -	AA 2xxx	EN AW-2219	AlCu6Mn	Poor weldability and sweat resistance	<ul style="list-style-type: none"> <li>- Mold making e.g. injection moulds</li> <li>- Aircraft construction, e.g. planking sheets</li> <li>- Space travel e.g. ARIANE tank</li> </ul>
3xxx	Mangan - Mn -	AA 3xxx	EN AW-3003	AlMn1Cu	Excellent weldability and good weld strength	<ul style="list-style-type: none"> <li>- Bands for the production of thermal exchangers, deep-drawn parts, building products</li> </ul>
4xxx	Silizium - Si -	AA 4xxx	EN AW-4043	AlSi5	Excellent weldability and good weld strength	<ul style="list-style-type: none"> <li>- Architectural Applications</li> </ul>
5xxx	Magnesium - Mg -	AA 5xxx	EN AW-5083	AlMg4,5Mn0,7	Excellent weldability and good weld strength	<ul style="list-style-type: none"> <li>- Shipbuilding</li> <li>- Vehicle construction (silo and tank vehicles)</li> <li>- mold construction (blow moulds)</li> </ul>
6xxx	Magnesium + Silizium Mg + Si	AA 6xxx	EN AW-6061	AlMg1SiCu	Good weldability and good weld strength	<ul style="list-style-type: none"> <li>- Apparatus construction (machine housing)</li> <li>- mold making</li> <li>- Extruded profiles (shipbuilding: decks rail vehicle construction)</li> </ul>
7xxx	Zinc + Magnesium Zn + Mg	AA 7xxx	EN AW-7020	AlZn4,5Mg1	Poor weldability and poor weld strength	<ul style="list-style-type: none"> <li>- Structural parts in aircraft construction</li> <li>- tank bridges</li> <li>- mold making</li> </ul>



non-hardenable (NHT) alloys



hardenable (HT) Alloys



# Welding Consumables

## Welding consumables must be clean and dry!

Storage of filler materials:

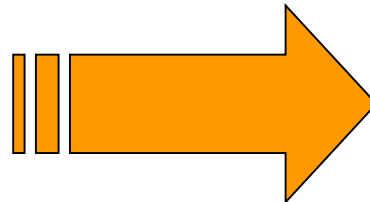
- / At room temperature
- / No longer than a year
- / Protect from contamination
- / Pack airtight after welding (tip: enclose silicate gel or rice to remove moisture)

/ Target:

- / Reduction of hydrogen absorption (pores, hot cracks, aging, hardness)
- / Increasing the quality of the welded joint.



Note: Filler materials with a larger diameter have a larger volume



oxidation surface and surface contamination (based on the volume)



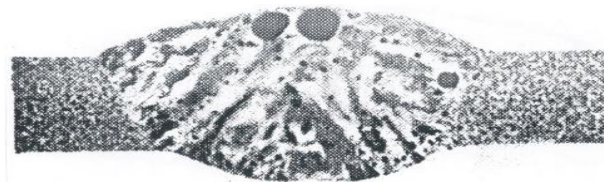
# Weld Aluminium – Problem Porosity

## Cause of Porosity

The main reason for the formation of pores is the sudden decrease in gas solubility during solidification.

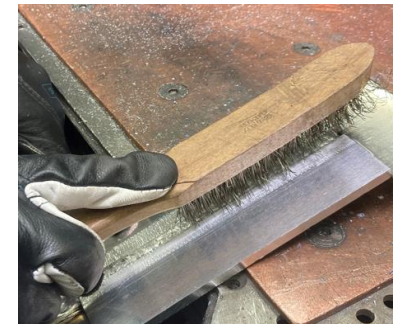
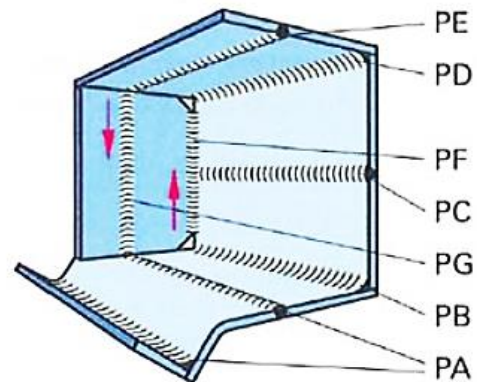
The de-gassing is therefore not complete at high welding speeds or rapid solidification and pores are forming in the weld seam (mainly due to hydrogen).

In general, the risk of pore formation is greater with MIG welding than with TIG welding

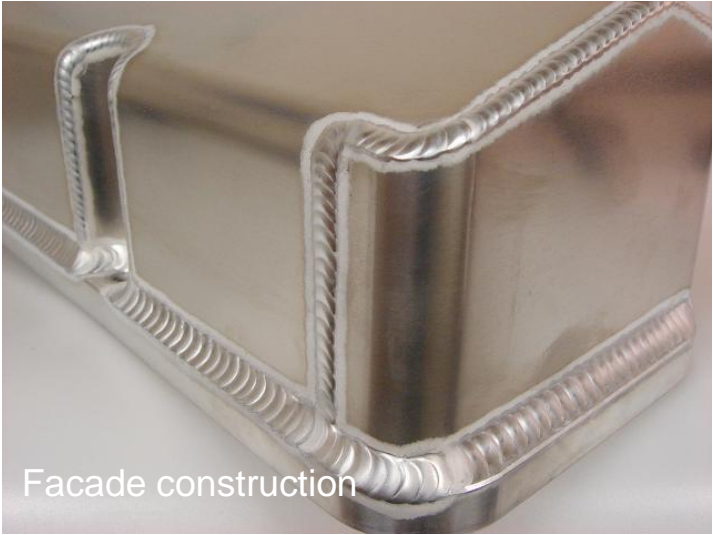


# Measures to avoid pores / preparation for welding

- / Clean and dry surfaces of base material and welding consumables
- / Pre-treatment by grinding, brushing, pickling, degreasing, milling
- / Smooth arc and smooth torch movement
- / Turbulence-free shielding gas flow with the right dosage and purity
- / Generously (bigger) dimensioned and clean shielding gas nozzle
- / Keep the hose package short (easier wire feed) (MIG)
- / Use torches with a closed cooling system
- / Flush hosepacks for a sufficiently long time before welding
- / preheat
- / If possible, weld in position PA or PF
- / **Avoid welding positions PE**
- / **Check, if wire is allowed for position PC.**




# Areas of application Aluminium – Application





# TIG Weld-/ Shieldinggas AC Welding

Gas	Suitable for	Particularities
Argon [Ar] Inert	All weldable metals, all unalloyed and alloyed steels, non-ferrous metals	
Helium [He] Inert	All weldable metals, all unalloyed and alloyed steels, non-ferrous metals	There are advantages with <b>aluminum materials</b> , but the gas consumption increases due to the lower density and the ignition behavior deteriorates
Argon-Hydrogen [ArH <sub>2</sub> ]	Ni-based Austenitic stainless steels, -Alloys	<b>Not suitable for fine-grain structural steel, heat-resistant steel, aluminum materials.</b> Cracking due to hydrogen

Shieldinggas	Correctionfactor to 100% Ar
75% Ar + 25% He	1,14
50% Ar + 50% He	1,35
25%Ar + 75% He	1,75
100% He	3,16

The flow rate must be adapted to the density of the gases!

# EWM TIG AC Processes

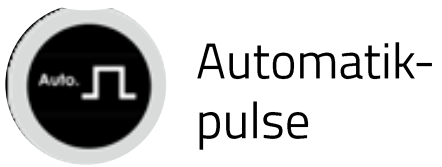
## Pulsprocesses +



Thermal Pulse



Average Value Pulse



Automatik-pulse



AC-Special

## Weldprocesses +



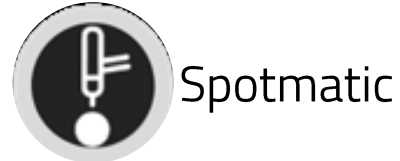
Standard-DC



Standard-AC



spotArc



Spotmatic



activArc



TIG-Antistick

## Ignition +



HF-Ignition

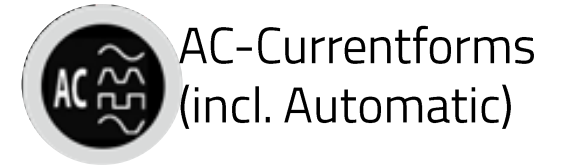


Liftarc

## AC-Adjustment +



AC-Balling



AC-Currentforms (incl. Automatic)



AC-Frequence

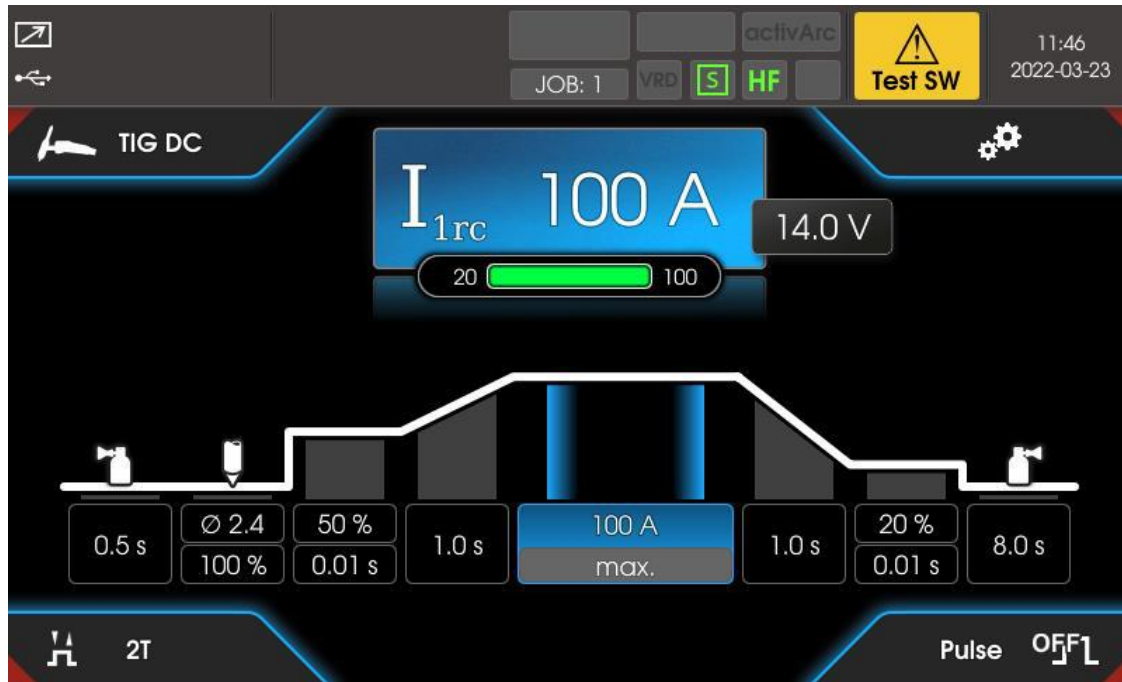


AC-Balance

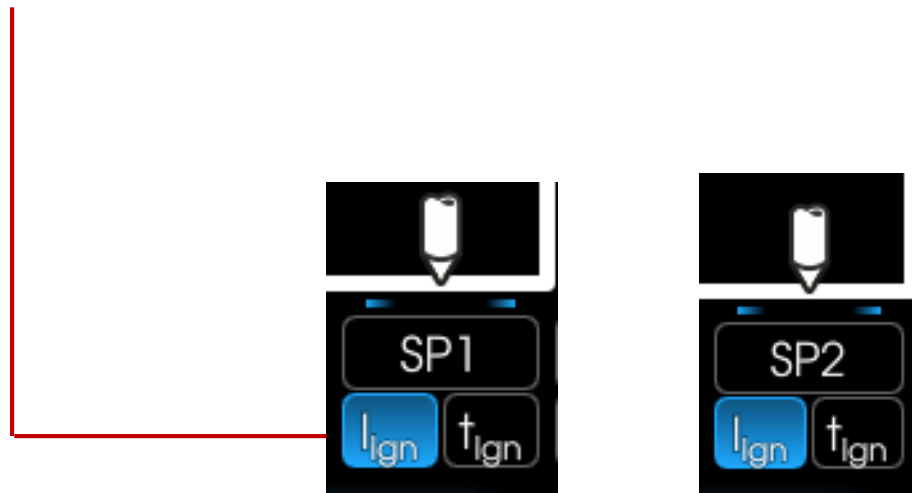


AC-Amplitude-Balance

# Ignition by AC Current



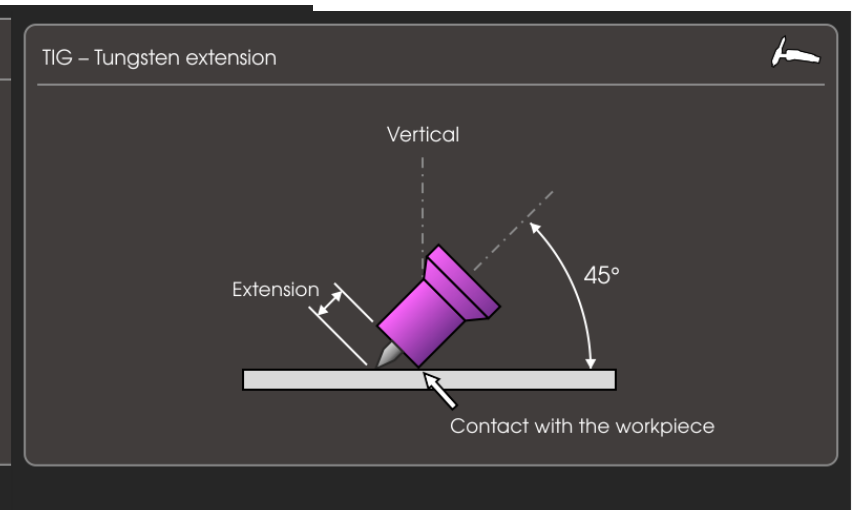
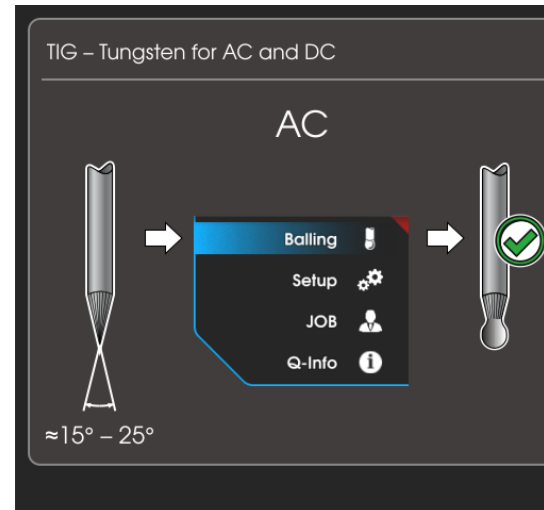
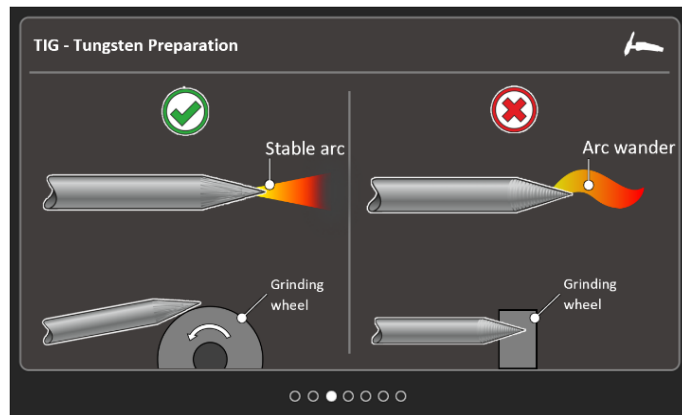
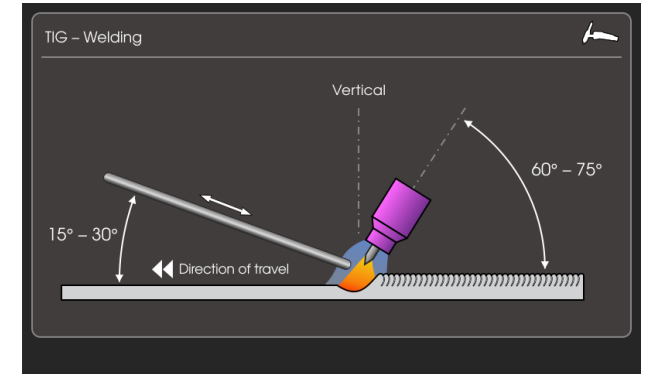
- / Adjustment of the electrode diameter
- / Correction factor for ignition parameters
- / Optimized ignition parameters
- / AC ignition with multiple positive half waves



# AC Help Menü

TIG – Tungsten Electrode

Identification	Weight of oxide %	Oxide	Colour	AC	DC
E3®	Mixed oxides	Noble metals	Purple	X	X
Lymox®	Mixed oxides	Rare earths	Pink	X	X
Lymox Lux®	Mixed oxides	Rare earths	Pink Grey	X	X
WR 2	Mixed oxides	Noble metals	Turquoise	X	X
WZ 3	0.15 – 0.50	Zirconium	Brown	X	
WZ 8	0.70 – 0.90	Zirconium	White	X	
WL 10	0.90 – 1.20	Lanthanum	Black	X	X
WL 15	1.40 – 1.60	Lanthanum	Gold	X	X
WL 20	1.80 – 2.20	Lanthanum	Dark blue	X	X
WC 20	1.80 – 2.20	Ceroxide	Grey	X	X
WP	-	-	Green	X	

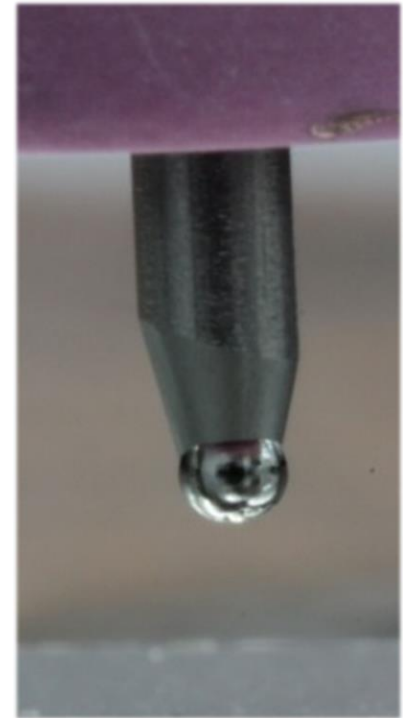
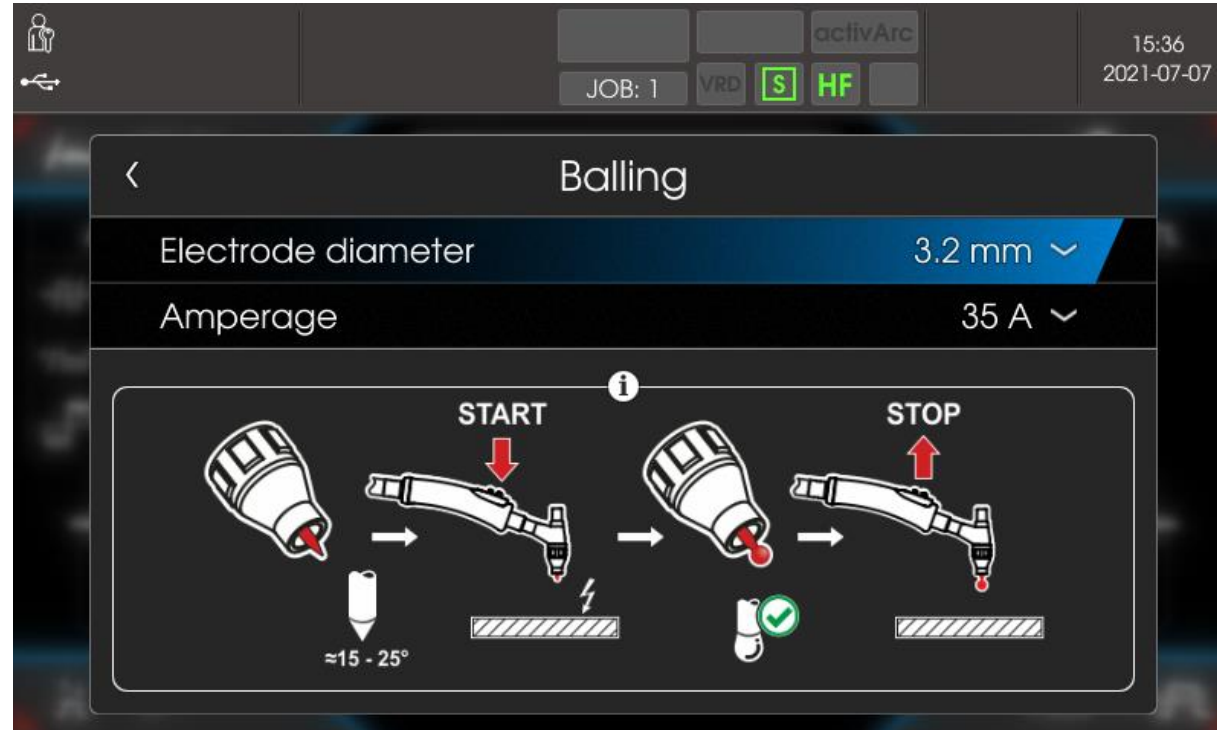
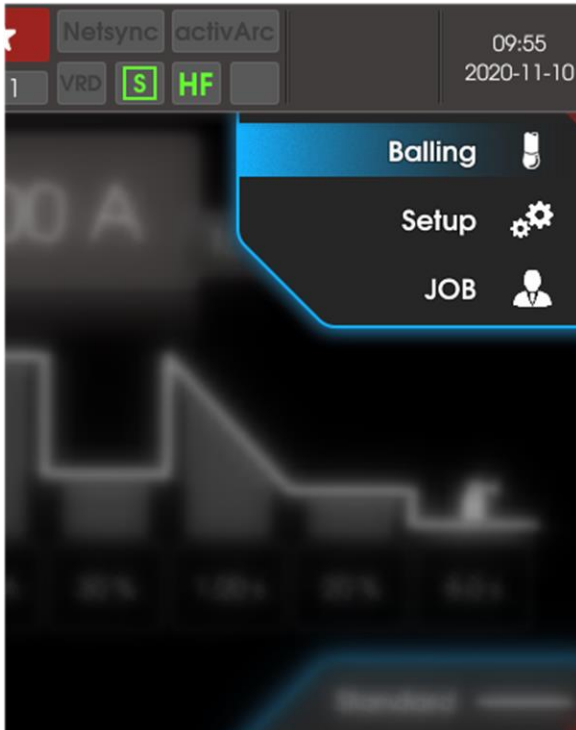


/ Instructions for grinding angles, tungsten electrodes, torch holder, etc...

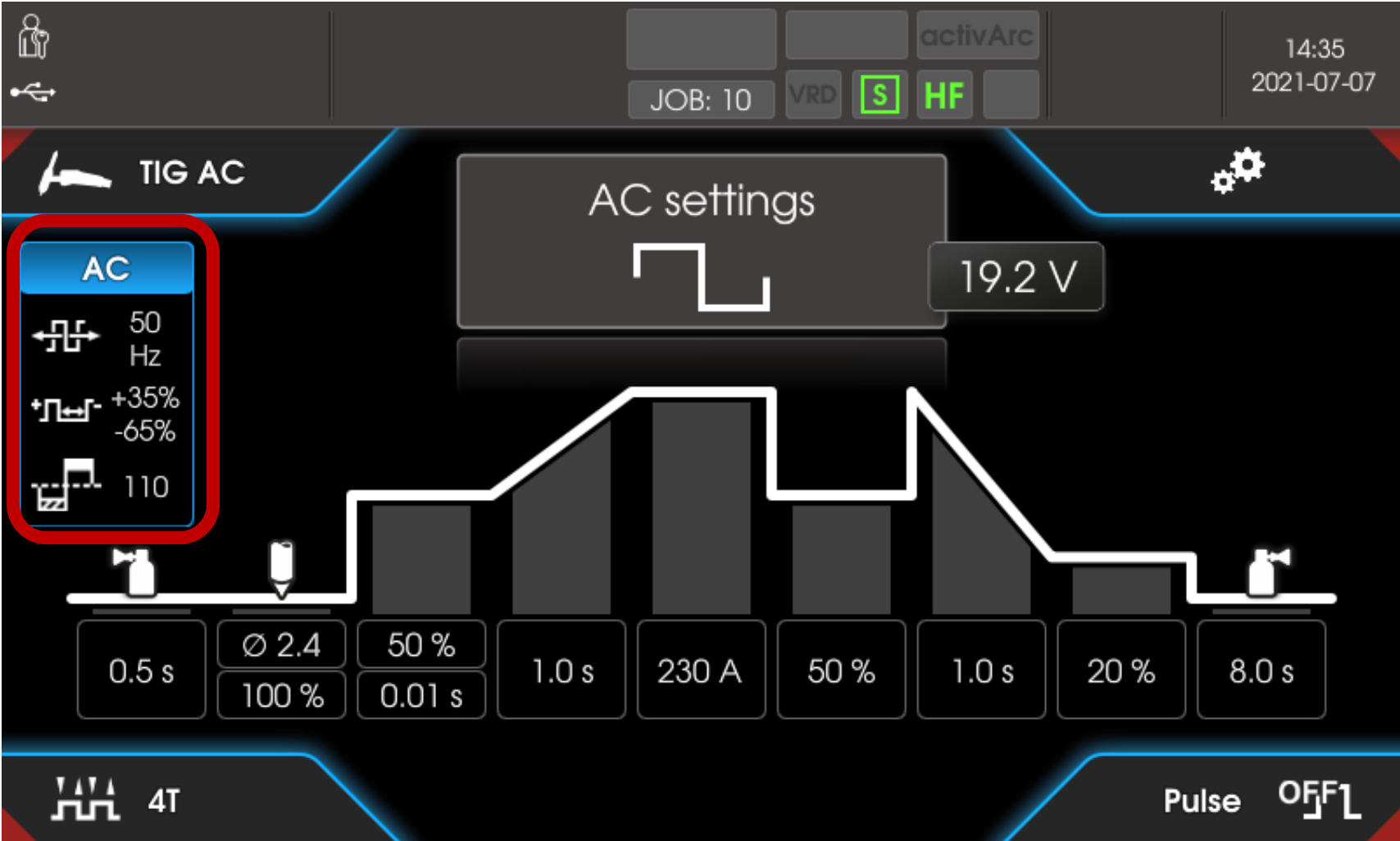


# Balling-Function

- / A rounded electrode end is required for a stable arc in AC welding
- / A calotte will be optimally preconditioned
- / Simple calotte-building-function dependent on electrode diameter

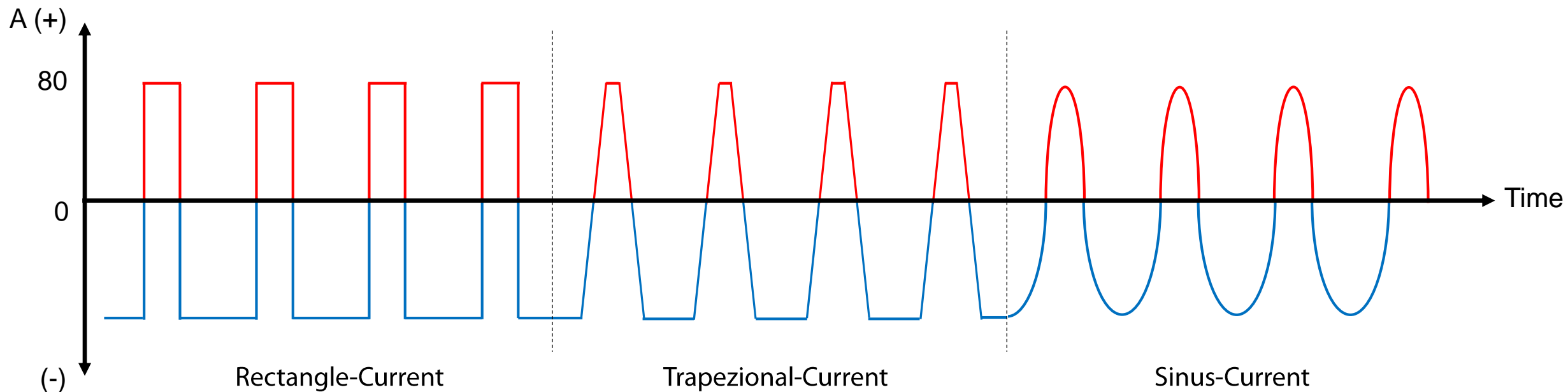


# Adjustment Possibilities AC-Welding



# TIG AC Current forms

/ Depending on the application, different current forms are possible



/ **Rectangle:** For high performance and stability requirements (aluminium)

/ **Sinus:** low arc noise, low-vibration weld pool

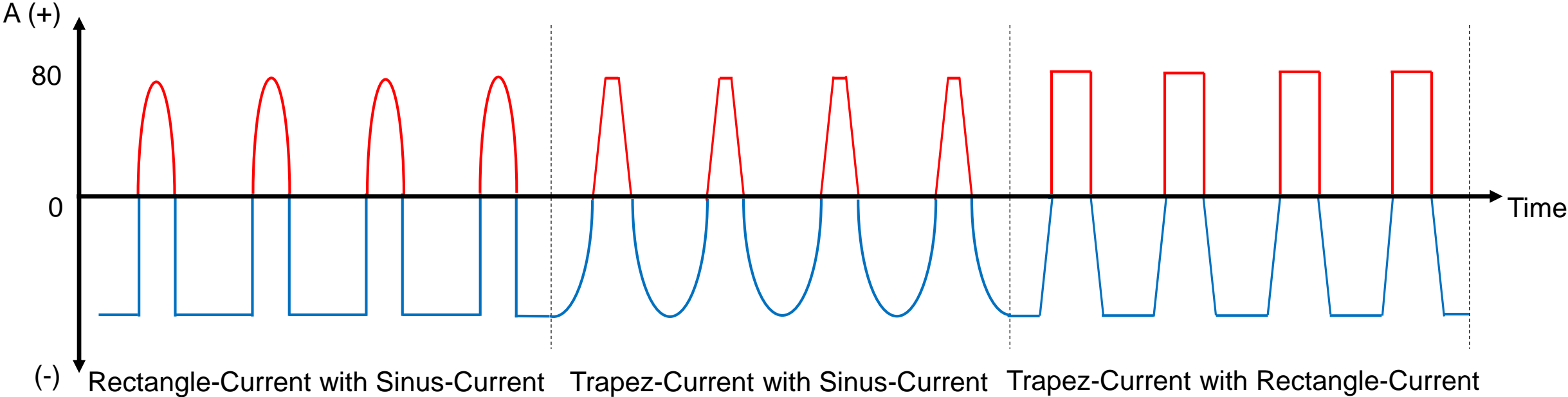
/ **Trapeze:** all-rounder

/ **Mix :** individual current form for the user

# TIG AC Current forms

/ Different current forms for positive and negative half-wave possible

NEW



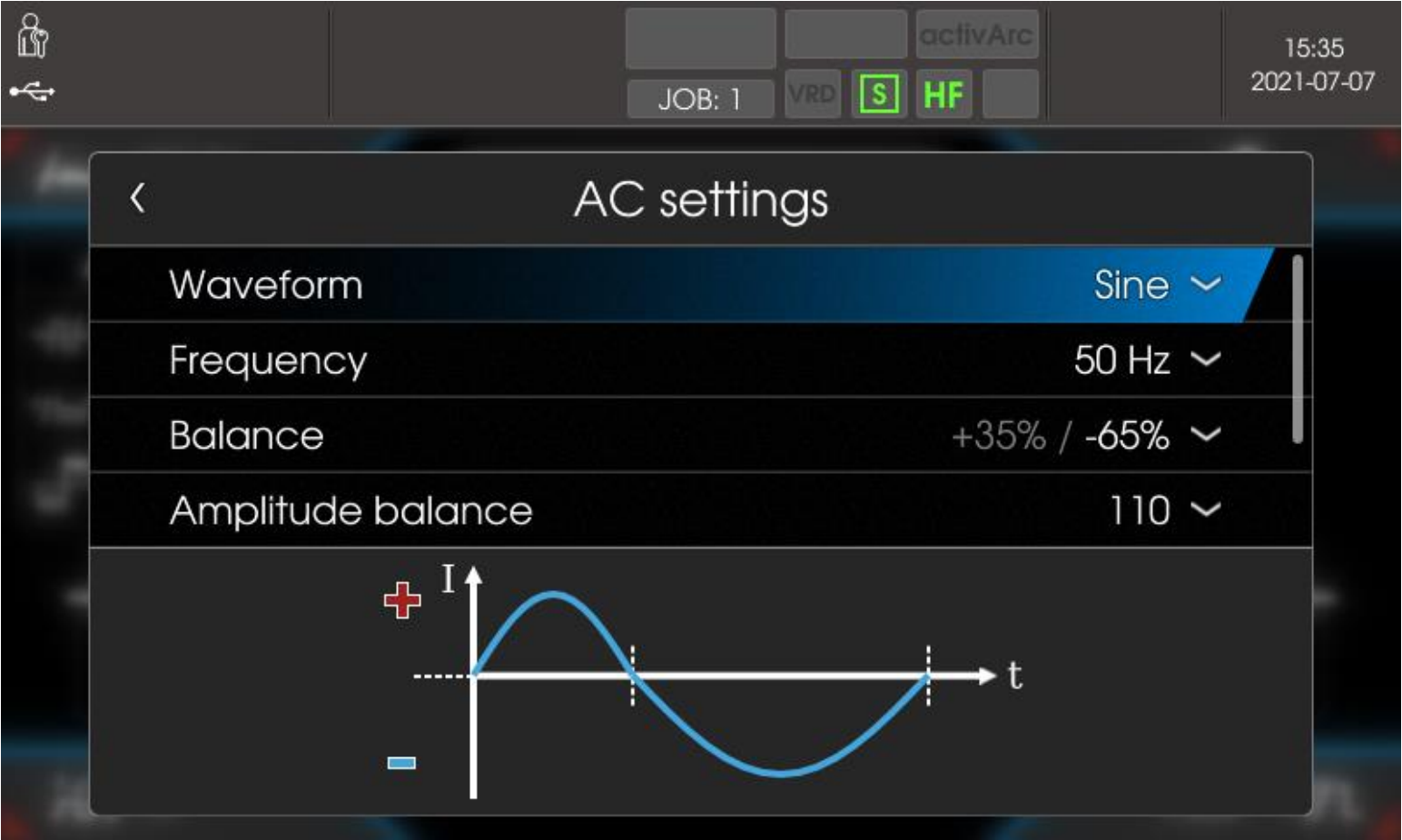
/ Ideal e.g. for Aluminium:

Rectangle in the negative half-wave, Sinus in the positive half-wave

# Selection Waveform Expert 3.0

/ Graphic support of the corresponding half-wave

/ Hide the irrelevant information



# Selection Waveform Expert 3.0

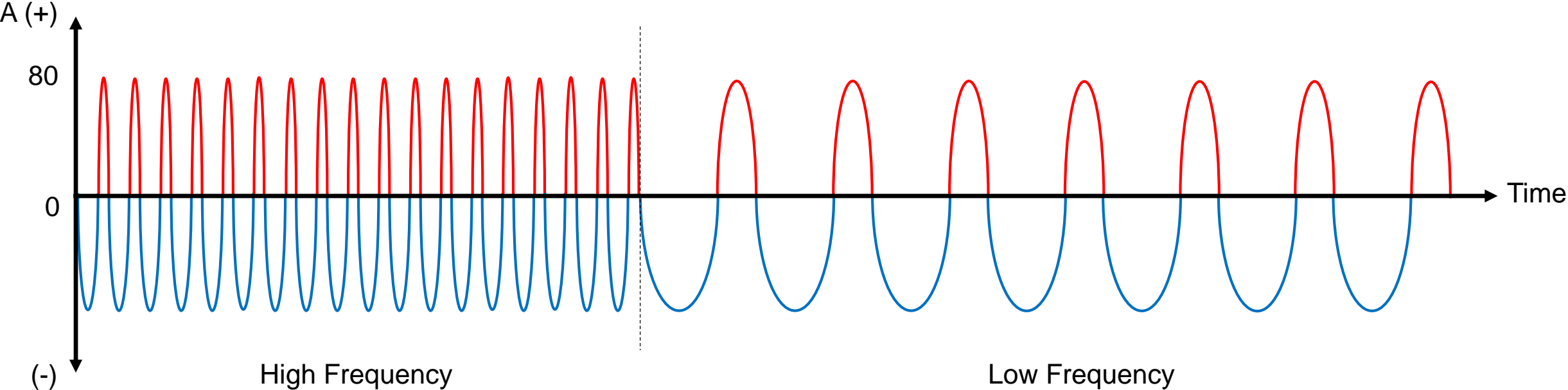
/ Graphic support of the corresponding half-wave

/ Hide the irrelevant information



# AC-Frequency

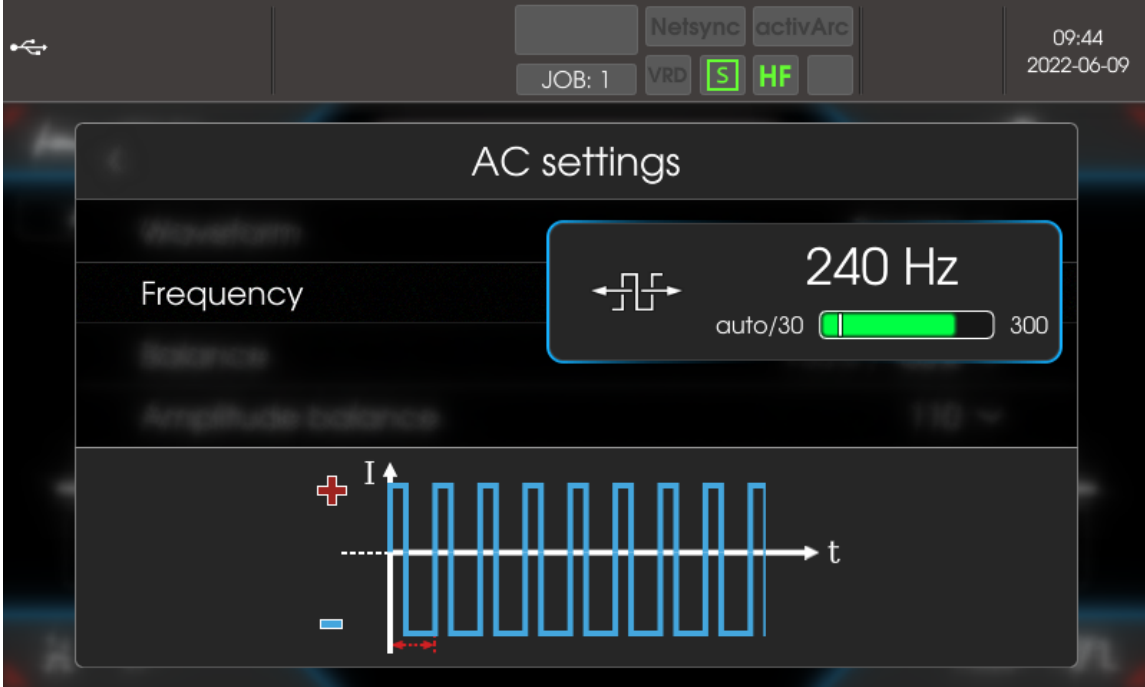
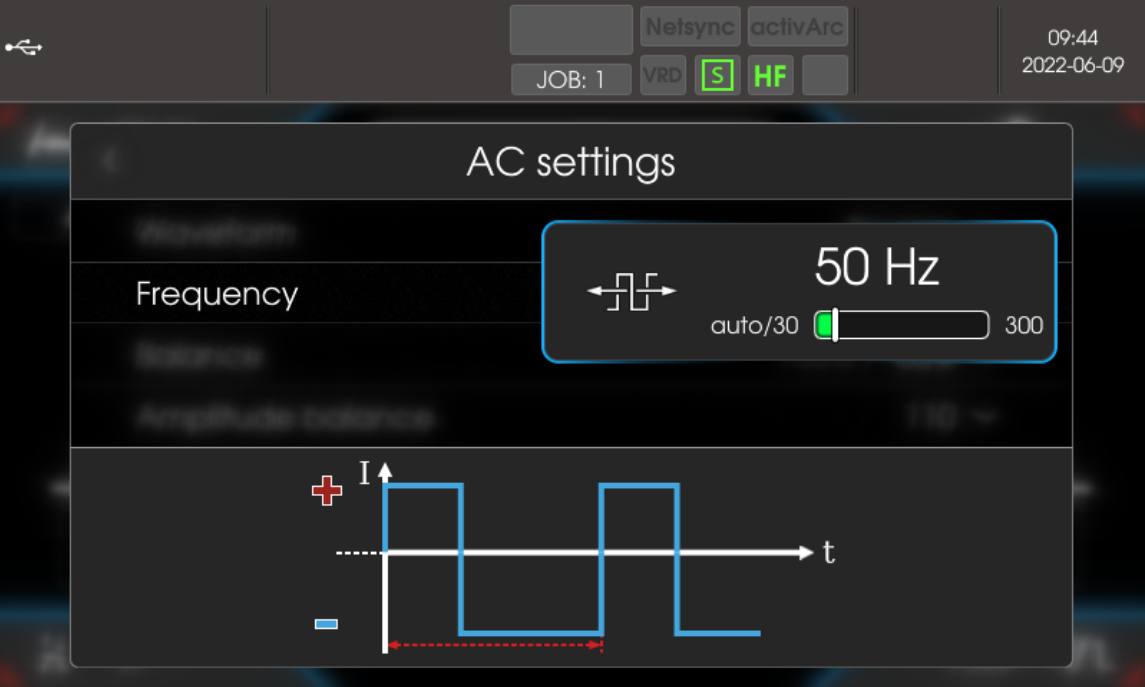
- / adjustment from the Arc-width
- / Ideal for thin sheets or fillet welds





# AC-Frequency Expert 3.0

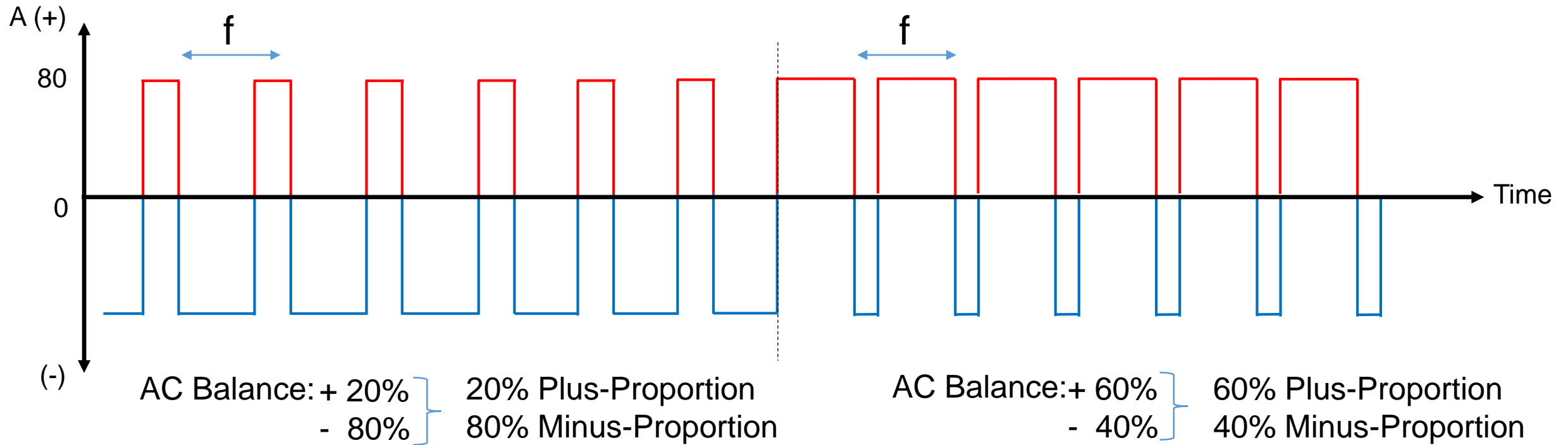
## / Graphical Support



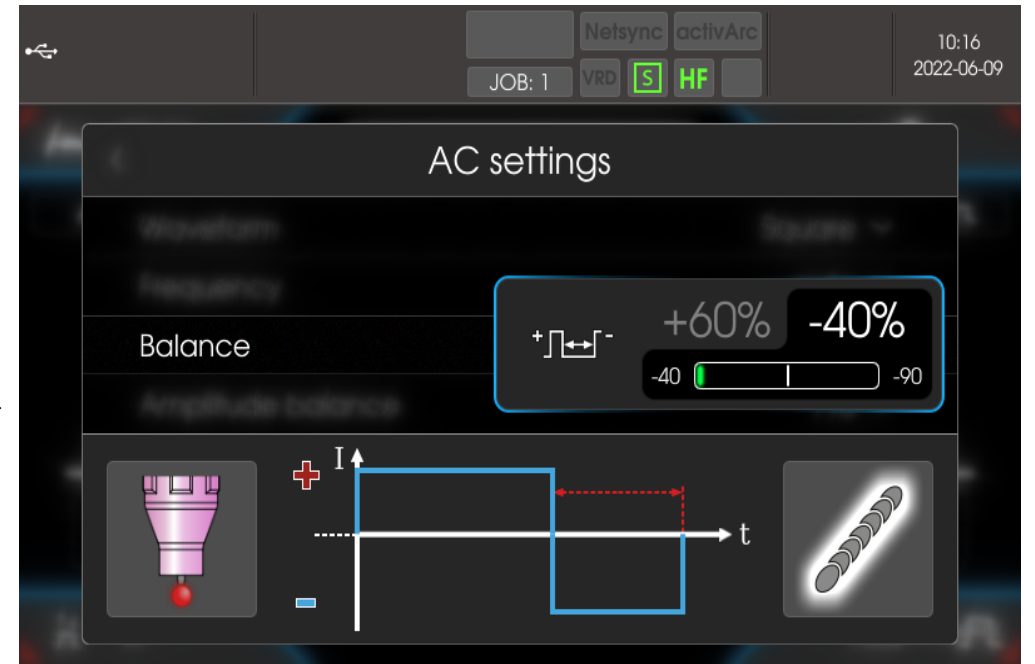
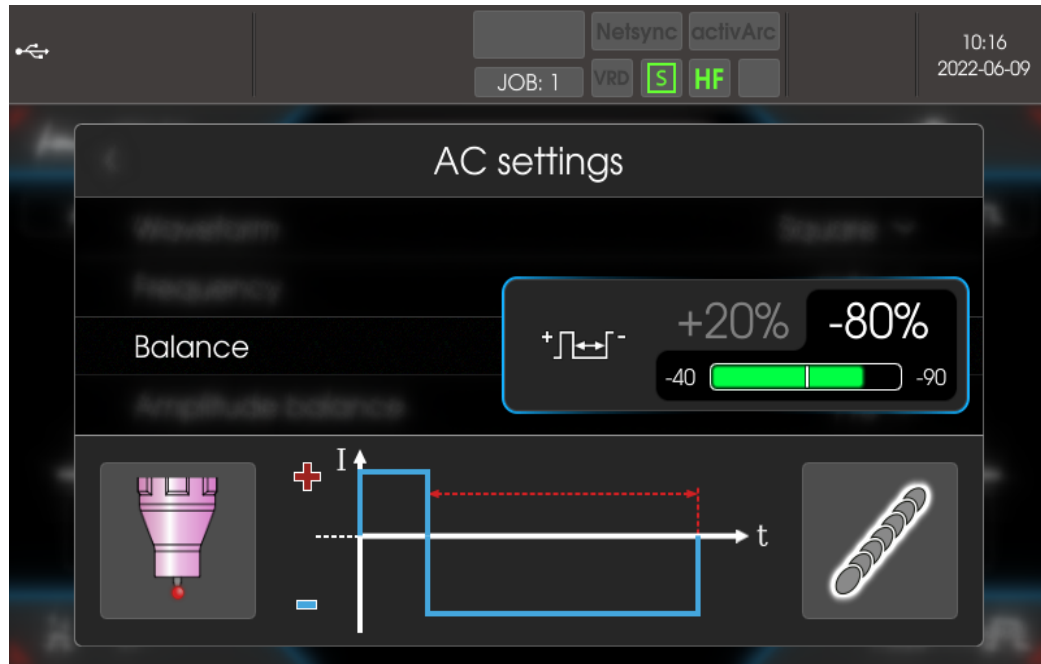
Sets the optimum frequency depending on the current

# AC-Balance

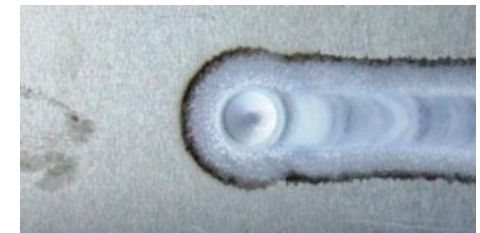
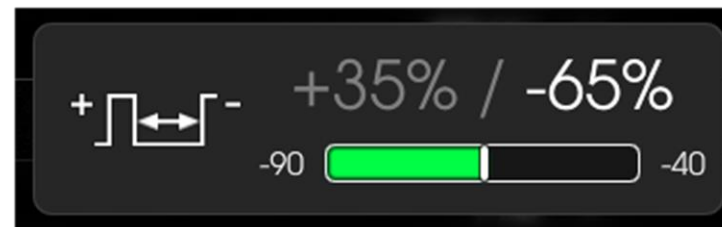
- / Controls the relationship between penetration and cleaning zone
- / Proportion of the positive half-wave in the total proportion
- / EWM factory setting 65% minus, 35% plus share.



# AC-Balance Expert 3.0

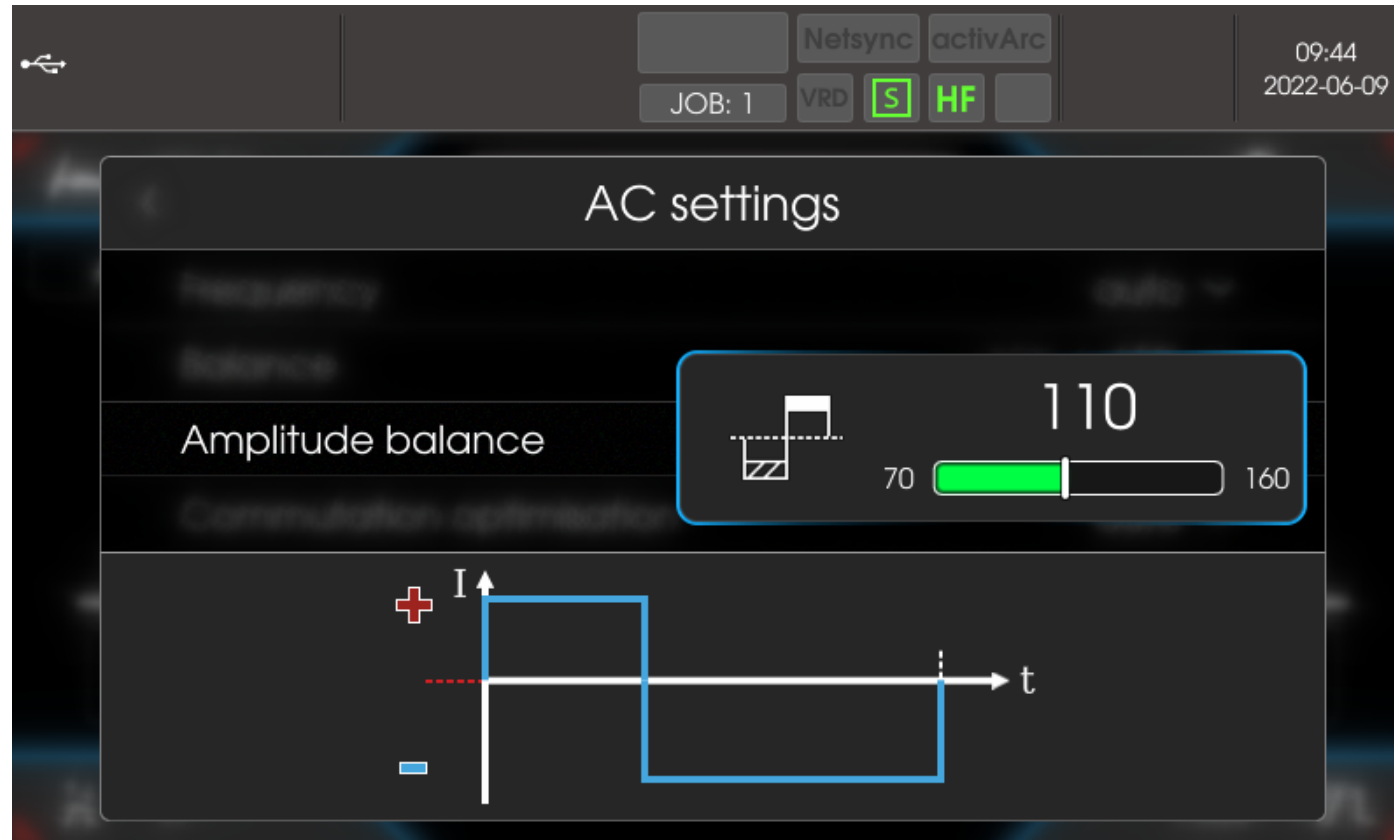


Factory-Setting



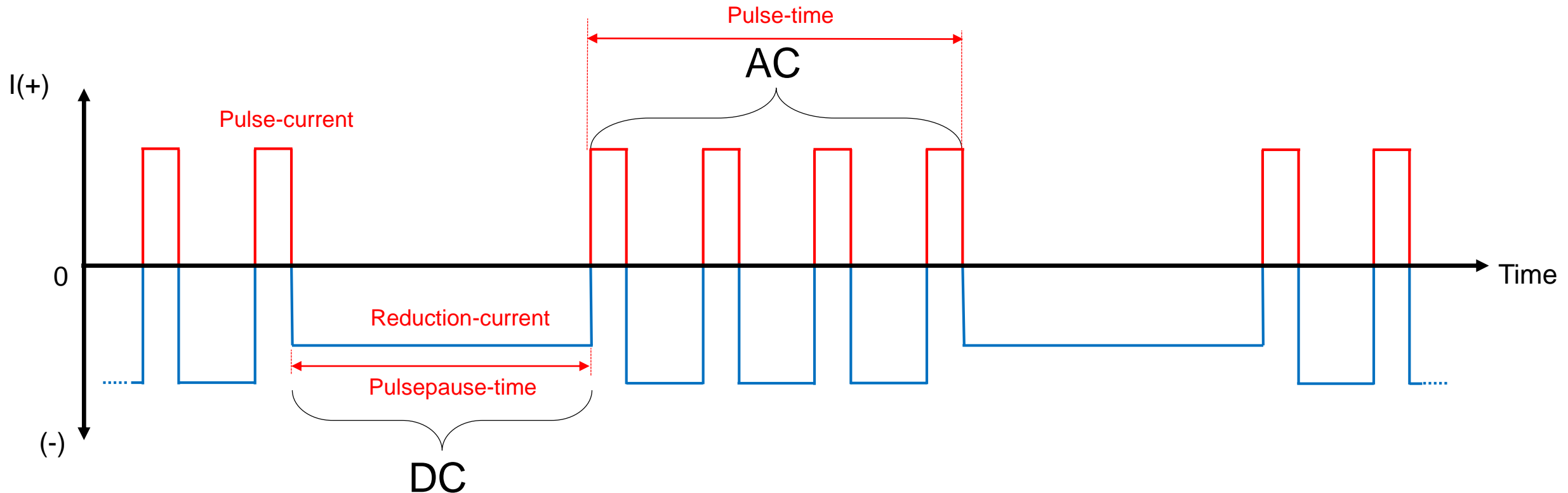
# AC – Amplitude Balance

- / increases the area in the negative pole
- / particularly suitable for thick/thin applications



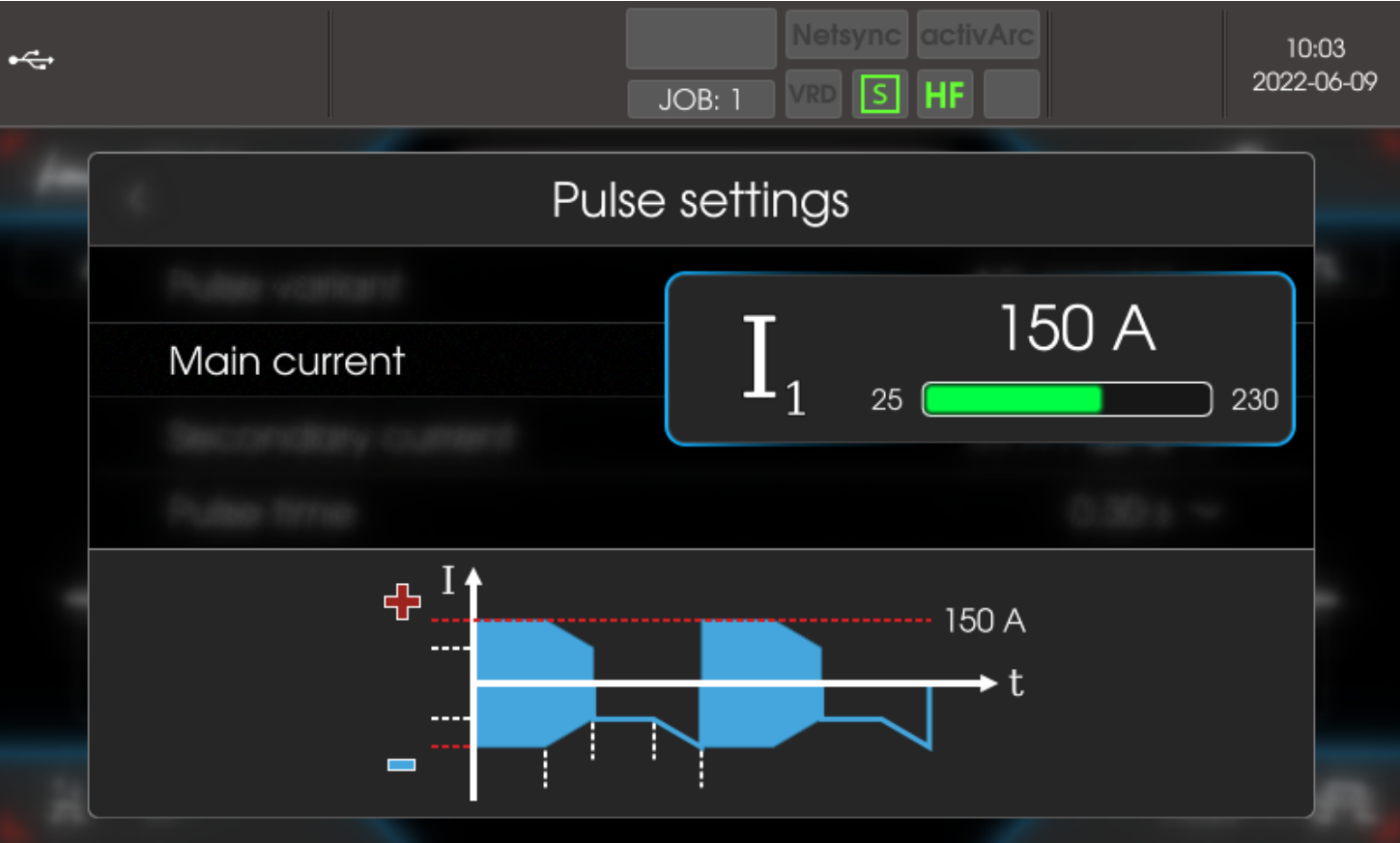
# AC-Pulsefunction AC Special

- / Time-controlled pulsing with DC component
- / Ideal for controlling the upstreaming heat => constant welding speed possible
- / Sheet metal combination thin (1mm) to thick (10mm')



# AC-Special Expert 3.0

/ Adjustable Main-Current



# AC-Special Expert 3.0

/ Reduction-Current and Pulsepause-time

10:03  
2022-06-09

Netsync activArc  
JOB: 1 VRD **S** **HF**

### Pulse settings

Secondary current  $I_2$  30 A 20 %

1

150 A

09:46  
2022-06-09

Netsync activArc  
JOB: 1 VRD **S** **HF**

### Pulse settings

Pulse pause time  $t_2$  0.25 s

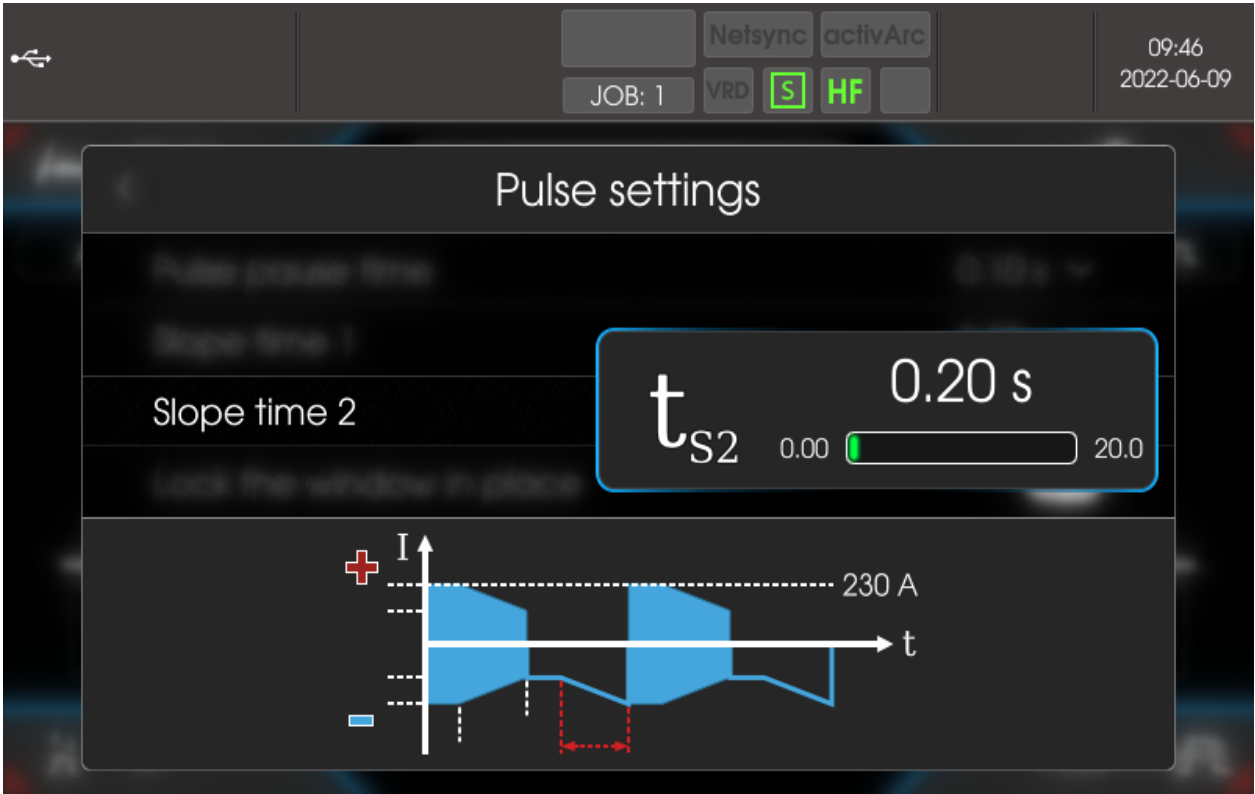
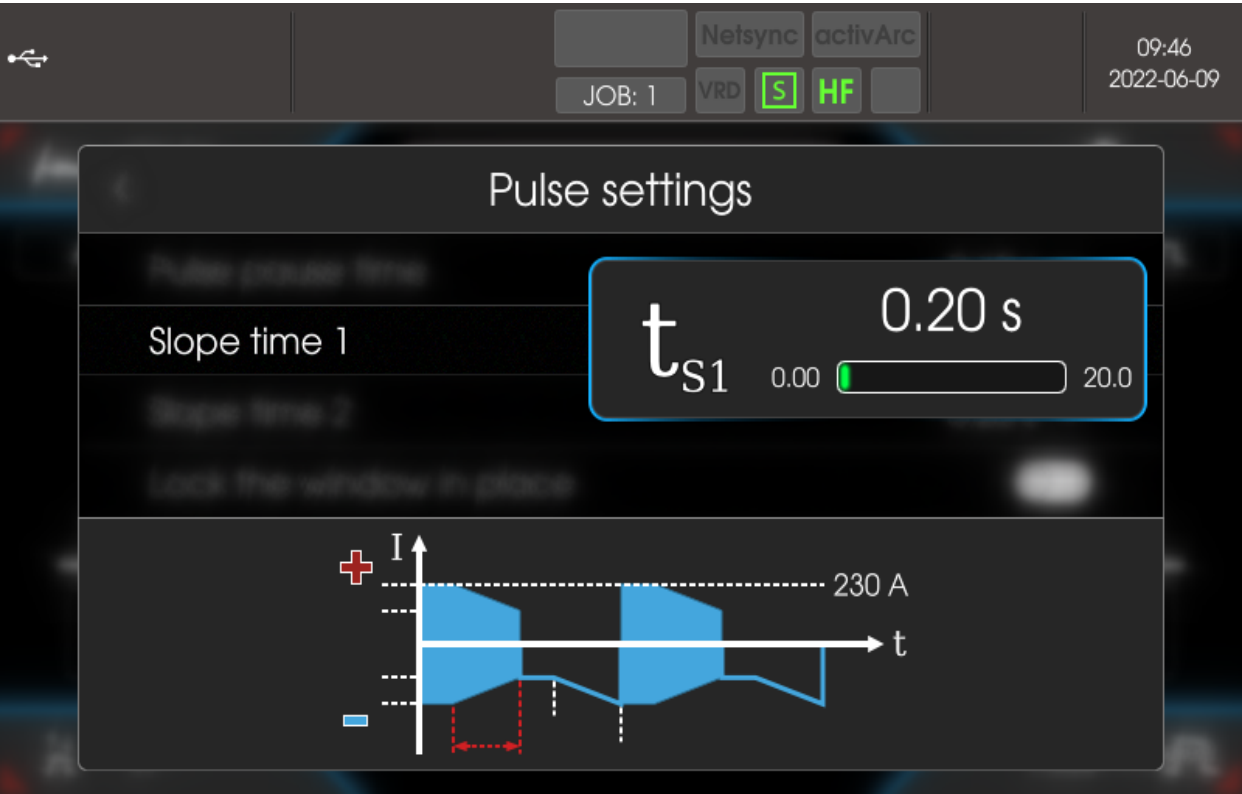
0.00

230 A

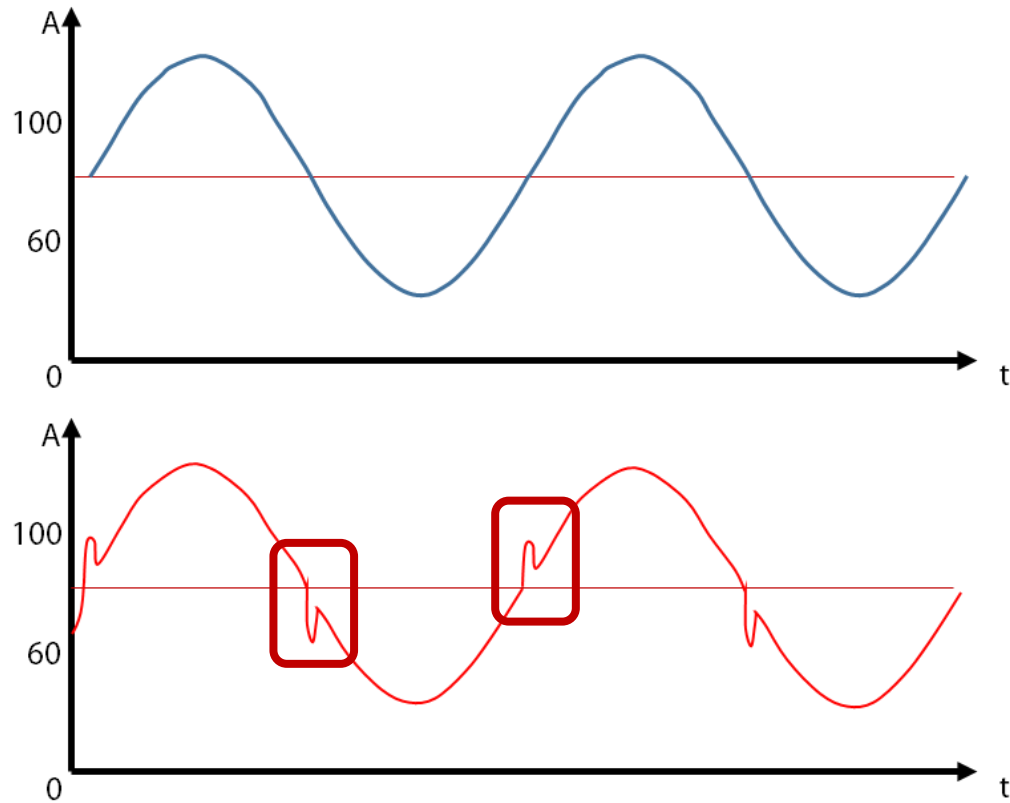


# AC-Special Expert 3.0

/ AC-Ramp and Pulsepause-Ramp



# AC-Welding – Automatic commutation support (ICO)



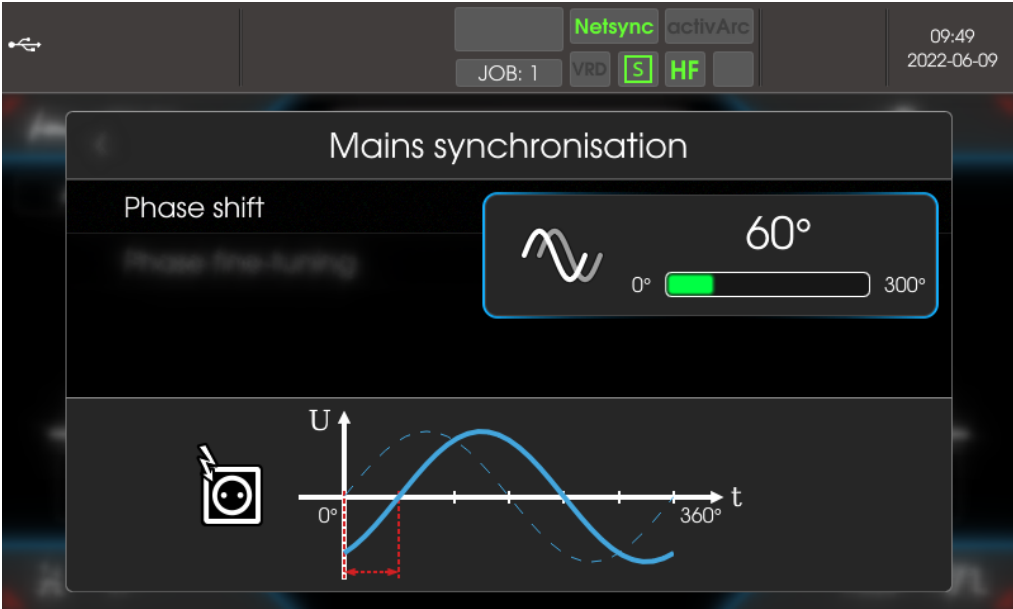
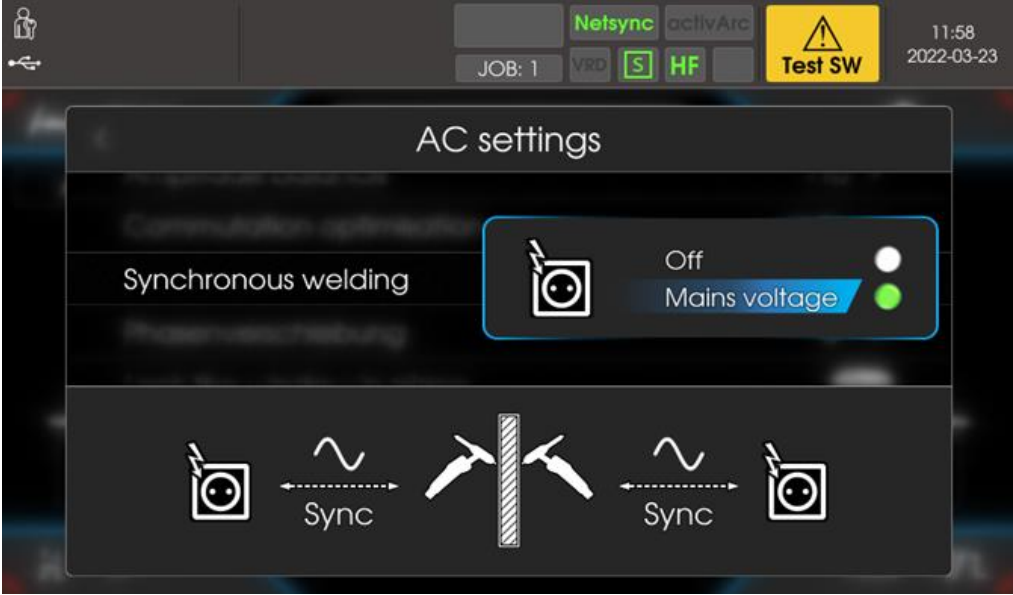
Automatic detection of the ignition quality - adjustment of the ignition voltage against half-wave failures

**NEW**

- **Power source is quieter in regular operation**
- **Stability is automatically controlled**

# AC Synchron Welding

/ Synchronwelding for TIG AC





WE ARE WELDING

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E-Mail: info@ewm-group.com



Thank you for your interest,  
we hope to see you here again next time 😊

**#WEAREWELDING**

Folgen Sie uns

