

VOLKSWAGEN

AKTIENGESELLSCHAFT

User Manual

CMA-1200 AluRepair VISAR | VAS 852 001 A | Part 2



Operating instructions CMA-1200 version 2020/11 | Part 2



The following pages refer to our multi-functional stud and bit welding unit, the Alurepair Visar, as **welding unit**.

Original operating instructions

Retain these instructions for later use and hand over the instructions to other/further users of the welding unit.

The dissemination or reproduction of this document, or the utilization or communication of its contents are not permitted, unless express permission is granted.

All rights reserved, including the right to make technical changes and corrections.

Table of contents

1. Important safety instructions	4
2. Symbols and definitions used	7
3. Structure of the power unit	8
3.1. Process control	8
4. Welding	14
4.1. Basic settings	14
4.1.1. SYN setting - “Stud Welding Mode Synergy”	15
4.2. Program and system management	28
4.2.1. Creating/saving a job	28
4.2.2. Load job	30
4.2.3. Delete job	31
4.3. USB menu	32
4.3.1. Connecting a USB flash drive	32
4.3.2. Saving settings on a USB flash drive	33
4.3.3. Copying saved programs to a USB flash drive	34
4.3.4. Loading programs from a USB flash drive	35
4.3.5. Update / special programs (optional)	37
4.4. ADV – adjusting process parameters	44
5. Fault codes	53

1. Important safety instructions

The target group of this manual are specialist technicians, who, as a result of their specialist training, their expertise and experience and their knowledge of the applicable rules are able to evaluate the tasks assigned to them and identify any potential hazards.



Hazard caused by incorrect application

- ◆ Only use the welding unit for the purpose described in these instructions. Otherwise, you will be putting yourself in danger, or will damage the welding unit itself.

You will also put yourself and other people in danger, if you operate the welding unit incorrectly or if you fail to observe the safety instructions or warnings. Severe injury or considerable material damage may result.



Hazard for unauthorized operating personnel

- ◆ Only make use of the welding unit, if
 - you have received the relevant training, have been briefed and are authorized to do so and
 - you are aware of the contents of this manual and have understood it in full.
- ◆ Never use the welding unit,
 - if you are under the influence
 - of drugs, alcohol or
 - medication.



Hazard due to unauthorized modifications

- ◆ Never make any changes to the welding unit or any of its constituent parts, without obtaining a Certificate of Compliance from the manufacturer.

If you fail to adhere to this rule, you will be putting yourself in danger. Severe injury or considerable material damage may result.



Hazard to life for wearers of pacemakers

- ◆ Never operate the welding unit if you have been fitted with a pacemaker.
- ◆ If fitted with a pacemaker, never remain in the vicinity of the welding unit while welding is being carried out.
- ◆ Never operate the welding unit, if persons fitted with a pacemaker are in the vicinity of the unit.

The reason for this is that while welding is in progress, strong electromagnetic fields will occur in the vicinity of the welding unit. Electromagnetic fields of that type may cause pacemakers to malfunction.



Hazard due to vapors and aerosols

- ◆ Activate the welding fumes extractor in the workplace.
- ◆ Ensure adequate ventilation.
- ◆ Never carry out welding in rooms less than 3 meters in height.
- ◆ Always follow your work instructions and the relevant accident prevention rules.

That way, you will avoid damaging your own and others' health as a result of vapors and aerosols.



Hazard due to glowing metal splashes (fire hazard)

While welding, you must expect to be exposed to red-hot splashes of metal and fluids, an arc of light and a loud bang > 90 dB (A).

- ◆ Before commencing work, inform staff working in the immediate vicinity of the work to be undertaken.
- ◆ Ensure that a fire extinguisher that fulfills the requirements is available in the workplace.
- ◆ While welding, do not wear work clothing that has been contaminated with substances such as oil, grease, petroleum etc.
- ◆ Wear approved personal protective equipment, such as:
 - Protective gloves that fulfill the current standard
 - Protective eyewear with lenses compliant with protection level 2 that fulfill the current standard
 - Non-flammable clothing
 - Capsule hearing protection in accordance with the current standard
 - A protective apron over your clothing
 - Protective headgear if welding above your head
 - Safety shoes
- ◆ Before commencing welding, remove all flammable objects and fluids from the vicinity of the workplace.
- ◆ Welding must be carried out at a sufficient distance from flammable materials or fluids. The safety distance between the welding location and any such materials or fluids must be sufficiently large to prevent any hazards caused by weld splashes.



Protecting the stud welding system

- ◆ Take precautions to prevent foreign bodies or fluids from any grinding or abrasion work in the vicinity of the work location from penetrating the welding unit.

This will extend the service life of your welding unit.

Safety instructions according to the EMF Directive 2013/35/EU

During stud welding, currents flowing through electrical conductors cause electrical and magnetic fields which can occur in particular in the vicinity of manual welding guns, the welding equipment (e.g. welding cables) and welding power sources.

Due to the high currents which are present, high EMF exposure levels may occur.



Hazard for particularly exposed workers within the meaning of the EMF Directive



Specifically endangered persons according to the EMF directive are



- Employees with active implanted medical devices
- Employees with passive implanted medical devices containing metal
- Employees with medical devices worn on the body
- Pregnant employees.

In the vicinity of the stud welding system, strong electromagnetic fields occur during welding.

To reduce hazards arising from the electromagnetic fields, we recommend the following rules:

- ◆ Route all cables as close together as possible.
- ◆ Do not stand between the welding cables.
- ◆ Place the cables to one side and as far away from operators as possible.
- ◆ Do not wind cables around the body, especially not at head height.
- ◆ Fully unwind the welding cables.
- ◆ Use the shortest possible welding cables.
- ◆ During welding place welding power sources as far away as possible.
- ◆ Where possible do not operate welding power sources close to other persons, during work do not sit directly next to the welding power unit and do not lean on it.
- ◆ In addition to these safety instructions, please comply with your work instructions and accident prevention regulations.

2. Symbols and definitions used

The symbols used in this manual have the following meanings:



Hazard

Warns of hazards that may cause injury to people or considerable material damage.



Important

Operational faults may occur, if you fail to observe these instructions.



The unit must not be operated by persons fitted with a pacemaker



Hazard

Warns you of electrical hazards



Hazard

Warns you of electromagnetic fields that may occur during welding



These symbols instruct you to wear your personal protective equipment when handling the welding unit.



**This symbol instructs you to wear hearing protection.
A bang measuring > 90 dB (A) may occur during welding.**



Tip

Notification regarding useful information about the handling of the welding unit



Cross-references in this handbook are marked with this symbol or appear in italics



Fire hazard

Before commencing work, ensure that a suitable fire extinguisher is available nearby.



Instruction to take action



Enumeration

3. Structure of the power unit

3.1. Process control

This welding unit has the “real-time process control” function.

Using the real-time process control (CP) the quality of a product is monitored during production, thereby ensuring that quality specifications are complied with. During the ongoing welding process it captures key physical values which characterize manufacturing quality, or derived characteristics, and assesses them.

This real-time process control couples the quality assessment directly to the welding process, so that during or immediately after completion of the welding process, there is a response showing the quality result. Deviations from the specified tolerances are immediately flagged up after welding, corrective measures can then be taken.

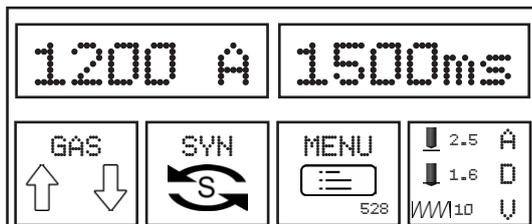
Different measurement values can be stored for different welding tasks. In this way it is possible to carry out custom process assessment for every welding task (stud size/welding position/material and so on).

The setpoints are derived from reference welds.

The current values and setpoints are compared during everyday welding. If the actual values lie within the prescribed tolerance range of target values, the current welding connection is accepted as OK, otherwise rejected as not OK.

The rejection is printed as follows by the welding unit immediately at the end of the relevant welding process:

1. Shown in display:



2. Process interruption:

After a deviation occurs, the unit is locked. After pressing the gun button for a longer period (>2 seconds) is the welding unit ready for welding once more.

To melt the stud and sheet, the electrical work done in the electric arc of $W = I \times t \times U$ is used. This gives the following characteristic physical monitoring values for process control:

- ◆ Welding current profile over the welding time
- ◆ (Welding) voltage profile over the welding time
- ◆ Transition voltages (droplet short-circuits or voltage spikes)
- ◆ Electrical resistance in the welding circuit (resistance of the circuit)



Acoustic signals:

The sound of the electric arc informs the stud welder regarding the process stability and possible droplet short-circuits. In an ideal case it will be even and uninterrupted.

The question of which measurement value should be used for process control, cannot be answered for all cases. The measurement values should reflect the process behavior, thereby enabling conclusions regarding the expected weld seam quality.



Deviations of a parameter compared with the reference welds during arc-ignition stud welding often only have minor impacts on the quality of the weld. The combined breach of multiple welding conditions however can have a significant impact.



During arc-ignition stud welding (ARC) the evaluation of the voltage profile is particularly important.



Short cycle stud welding (short cycle/SC):

Here, even changing one parameter can influence the quality of the weld. Experience from serial application is necessary regarding the specific boundary conditions when applying process control.

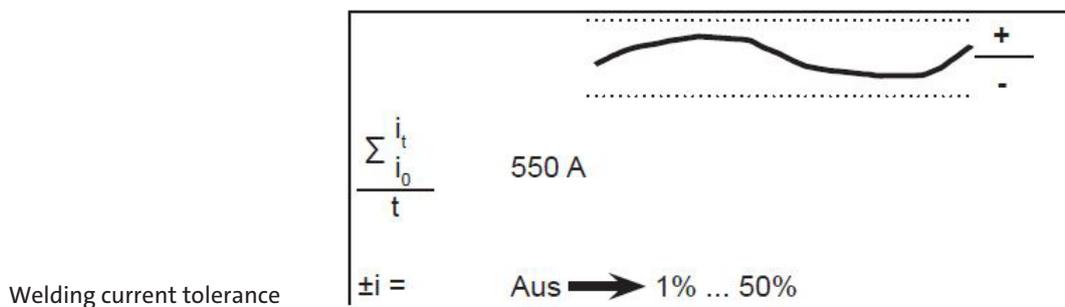
Welding current profile over the welding time

The time profile of the welding current provides important information regarding the individual process steps during the stud welding process.

- ◆ Pre current: Electric arc ignition and stabilization
- ◆ Main current/welding current: Electric arc burning and energy input
- ◆ Submerging current: Short-circuit and process end

The welding current determines the temperature and the “runniness” of the weld pool. To avoid sensitivity to pores, do not drop below the minimum current for a specified diameter.

In every welding process physical influences (workpiece contamination, deviations in tolerance with welding elements and so on) can lead to variation in the welding current. By setting welding current tolerances, limit values the quality criteria can be determined. During the normal work sequence the current value of the welding current is then compared with the reference value.



To more easily set the start parameters, a recommended value of $\pm 10\%$ can be set

Voltage profile over the welding time

The electric arc voltage changes during the welding process for example due to

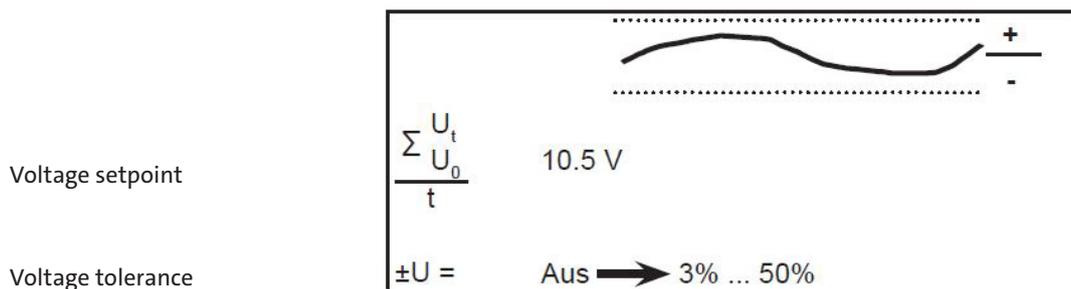
- Welding current
- Lift
- Surface condition of the component surface
- Geometry of the stud tip
- Weld pool protection (protection gas or ceramic ring).

The time profile of the voltage provides important information regarding the individual process steps during the stud welding process - from electric arc ignition to submerging - as well as the length of the electric arc. By setting voltage tolerances, limit values the quality criteria can also be determined here.



During arc-ignition stud welding the voltage profile is relatively constant. So for example the voltage when using ceramic rings is around 30 V, when using protection gas (M21 - DIN EN ISO 14175), it is around 3 V (10%) less.

Damp ceramic rings or strongly oil contaminated surfaces make carrying out welding much harder. This influence can be seen from a significantly higher voltage level (+5 V) compared with reference values.

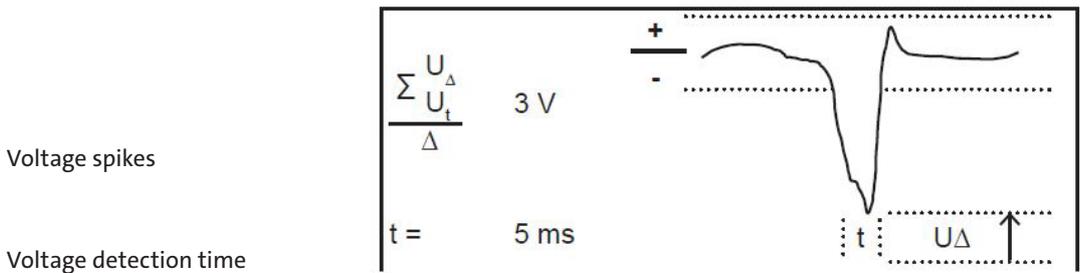


- ◆ You have the option to enter a fixed voltage value manually.
This should be determined beforehand in reference welds.

Droplet short-circuits or voltage spikes

The complete voltage profile can be viewed as a combined value with reference to the welding power over time. When welding during (droplet) arc formation, these short-circuits are shown as characteristic drops in the characteristic curve.

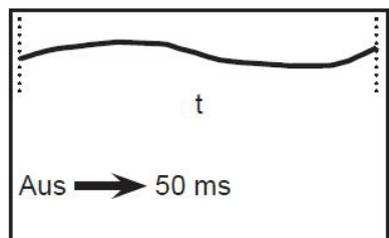
Therefore for process monitoring it is sensible to observe the voltage separately in the process phases and to evaluate it.



Voltage spikes

Voltage detection time

Set time tolerance

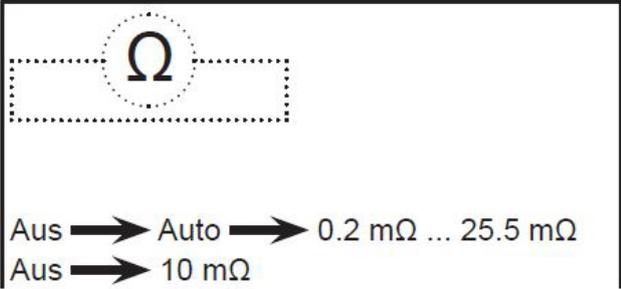


Welding time tolerance

Electrical resistance of the circuit

Welding gun, welding and earth cables, workpiece and welding elements form a closed welding circuit with a defined electrical resistance during the welding process. This resistance is influenced by external mechanical influences due to the components used (loose earth connections, burnt stud holders, broken cables, condition of the component surface and so on). This can lead to a gradual change of the quality results.

By determining the resistance in the welding circuit, and establishing limit values (tolerances) a condition monitoring function is integrated within the process control, to detect faults at an early stage and to report them.



Resistance of the circuit

Resistance tolerance



For easier setting of the properties, when in the “auto” setting, the system independently (automatically) determines a reference value.

The process control is divided into two phases:

- Learning and validation phase » reference welds
- Application phase » series operation

Learning phase: Reference welds

The welding process is observed during a “learning phase” based on a definable number of reference welds (“monitored learning”).

To more easily define the setpoints and tolerances, each physical measurement value can be set to “AUTO”.

These measurement values are stored during subsequent welding. In this way a target range with defined tolerances is determined for process control.



Only the **OK welds** are used for reference values.



- ◆ Carry out reference welds in such a way that they reflect your welding task.
- ◆ For different welding tasks carry out your own reference welds in each case, and store them accordingly.

Application phase: Series operation

- ◆ Call up the corresponding reference values.

The welding process can now be started.

In series operation the current actual values are compared with the setpoint values in real time and evaluated as OK or not OK.

An intervention into the manufacturing process then takes place in the event of identifying welds which are not OK.

The welding results can be recorded for later evaluation.

- Onto the front surface of the welding element and the workpiece (see figure, **item 3**).

4. Welding

4.1. Basic settings

Gas pre-flow time:

- ◆ Turn a push/rotary knob to the right and select the symbol .
- ◆ Operate a push-/rotary knob to confirm this selection.



You can now set the gas pre-flow time directly.

- ◆ To do so turn a push/rotary knob to the right (larger) or left (smaller).
- ◆ Operate a push-/rotary knob to confirm this selection.



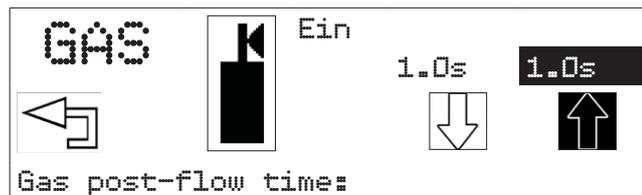
Gas post-flow time:

- ◆ Turn a push/rotary knob to the right and select the symbol .
- ◆ Operate a push-/rotary knob to confirm this selection.

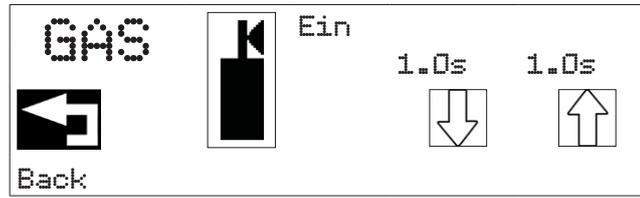


You can now set the gas post-flow time directly.

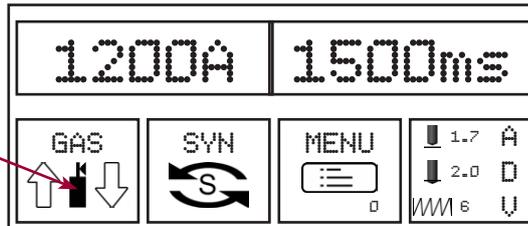
- ◆ To do so turn a push/rotary knob to the right (larger) or left (smaller).
- ◆ Operate a push-/rotary knob to confirm this selection.



- ◆ Turn a push/rotary knob to the left onto “back”, to leave the menu for the option “GAS”.
- ◆ Operate a push-/rotary knob to confirm this selection.

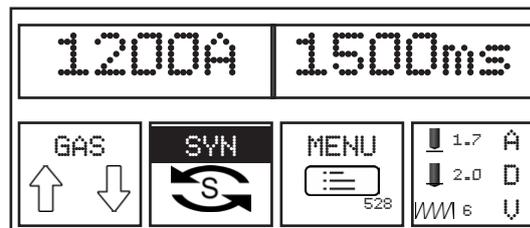


The “GAS” option is now shown in the display.



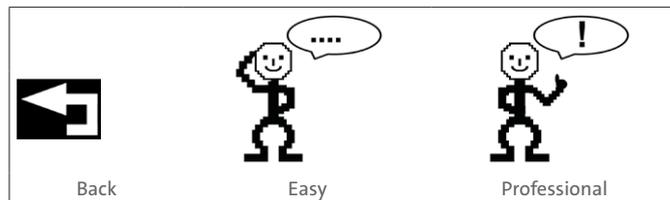
4.1.1. SYN setting - “Stud Welding Mode Synergy”

- ◆ Press both push/rotary knobs at the same time.
- ◆ Select **SYN**.
- ◆ Operate a push-/rotary knob to confirm this selection.



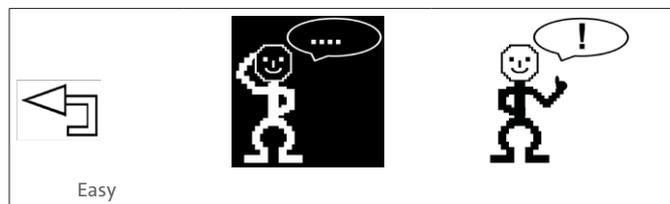
You can now choose between “Easy” and “Professional” modes.

- ◆ To do so turn a push/rotary knob to the right.
- ◆ Operate a push-/rotary knob to confirm this selection.



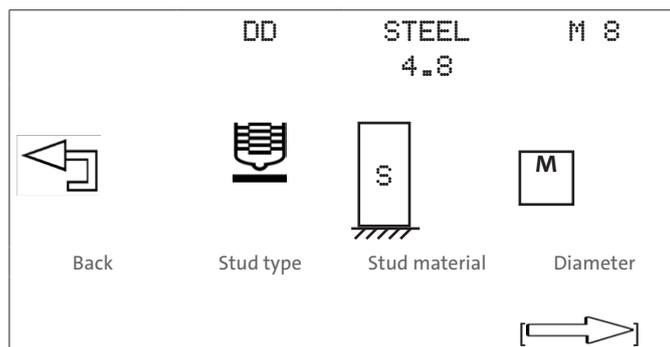
“Easy” mode

- ◆ Turn a push/rotary knob to the right onto the symbol “Easy”.
- ◆ Operate a push-/rotary knob to confirm this selection.



You can now define the properties of the welding elements.

- ◆ To do so turn a push/rotary knob to the right.
- ◆ Operate a push-/rotary knob to confirm this selection.



The following selection options are available:

STUD TYPE		DIAMETER (WELDING AREA)		
(metric)				
DD ¹⁾		DD_CF ²⁾		M6 to M16
PD ¹⁾		PD_CF ²⁾		M6 to M16
RD ¹⁾		RD_CF ²⁾		M6 to M16
UD ¹⁾		UD_CF ²⁾		6 mm to 14.6 mm
ID ¹⁾		ID_CF ²⁾		M6 to M10
SD ¹⁾		SD_CF ²⁾		10 mm to 13 mm
PS		PT		M3 to M10
US		UT		3 mm to 8 mm
IS		IT		M3 to M6

¹⁾ for stud welding with protection gas or without a weld pool protection

²⁾ for stud welding with a ceramic ring (CF)

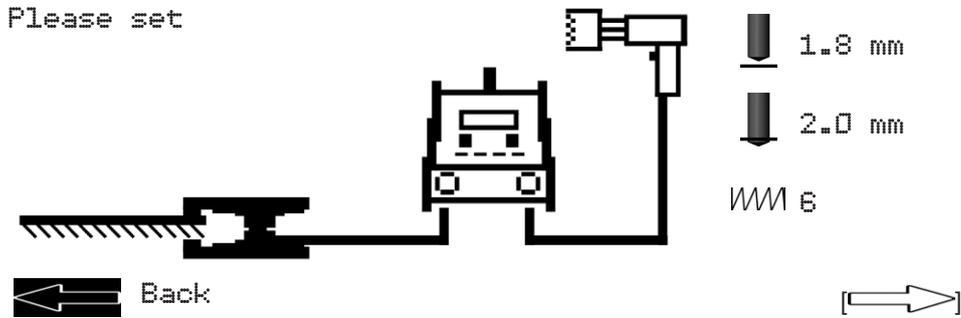
– Stud material

4.8 (S235), 5.8 (S355), 6.8, 8.8, A2-50 (1.4301), A4-50 (1.4571), 16Mo3, AlMg3 (5754), AlMg4.5, Al99.5, AlSi12

◆ Select the stud type, the welding area and the stud material according to your welding task.

Adjusting welding gun

- ◆ Now set the parameters for lift, submerging dimension and resilience according to the display on your welding gun:



To do so read the operating instructions of your welding gun.

Using the  arrow you can exit the “Easy” mode.



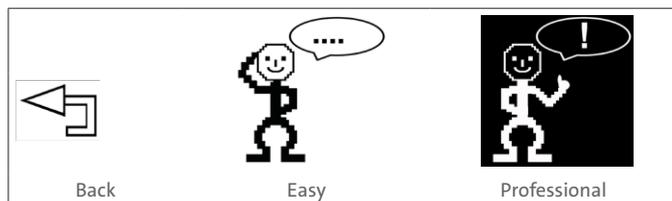
If you wish to weld with protection gas, you must now switch on the GAS option.

- ◆ For this proceed as described under *point 12.3.1 Basic settings, section option “GAS”-protection gas settings.*

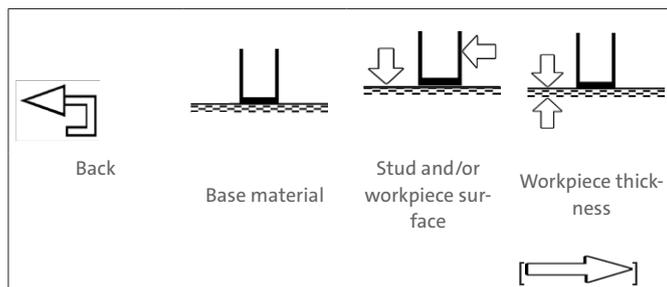
“Professional” mode

In the “Professional” mode, additional parameters can be set.

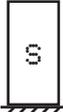
- ◆ Turn a push/rotary knob to the right onto the symbol “Professional”.
- ◆ Operate a push-/rotary knob to confirm this selection.



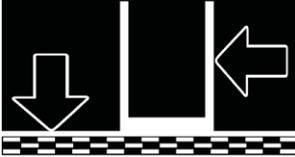
- ◆ Now select the workpiece properties according to your work task:



Base material and stud material - combination options:

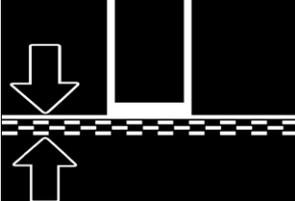
BASE MATERIAL:		STUD MATERIAL:	
	Steel S235 / Steel S355 / DC01, Usibor		4.8 (S235) / Steel 5.8 / Steel 6.8 / Steel 8.8
	16Mo3		16Mo3
	1.4301		A2-50 (1.4301)
	1.4541 / 1.4571		A4-50 (1.4571)
	AlMg3, AlMg4.5, Al99		AlMg3 (5754), AlMg4.5, Al99.5, AlSi12

Stud and/or workpiece surface:

	Bright
	Galvanized *)
	Nickel-plated *)
	Copper-plated *)
	Oiled
	Base-coated

*) Galvanic surface $\leq 7 \mu\text{m}$

Workpiece thickness:

	from 0.5 mm	to 200.0 mm
---	-------------	-------------

You can move to the next selection window using the  arrow.

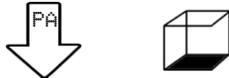
◆ Now select the welding position according to your welding task:

					
Back, current position	PA Position	PE Position	PC Position	Through-deck stud welding	

The following selection options are now available:

Welding position

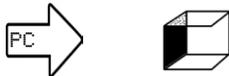
PA Position
(flat position)



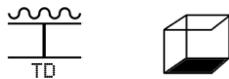
PE Position
(overhead position)



PC Position
(horizontal position)

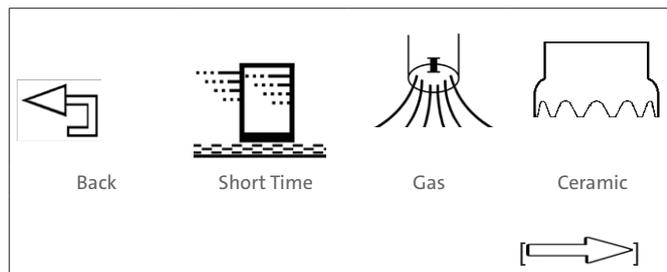


Through-deck stud welding

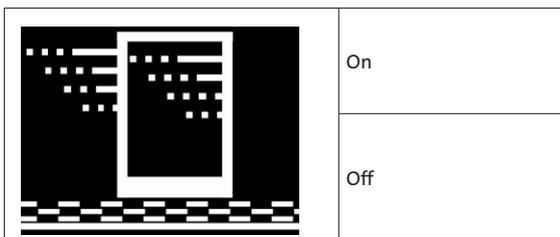


- ◆ Select a welding position.
- ◆ To do so turn a push/rotary knob to the right.
- ◆ Operate a push-/rotary knob to confirm this selection

- ◆ Now select the welding process according to your welding task:

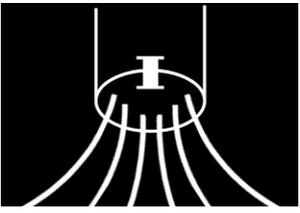


- Short Time:

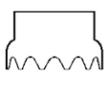


Optimization of the welding time with adjustment of the welding current

Gas / protection gas option:

	Off	Aluminum, very thin sheets Steel, stainless steel Aluminum, thicker sheets
	100Ar	
	98Ar/2CO ₂	
	95Ar/5CO ₂	
	92Ar/8CO ₂	
	90Ar/10CO ₂	
	82Ar/18CO ₂	
	85Ar/15He	
	70Ar/30He	

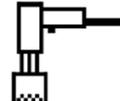
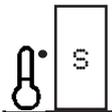
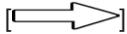
Ceramic / welding with ceramic ring

	PA
	No ceramic

Welding with ceramic ring only in PA position (flat position)
 Welding without ceramic ring

You can move to the next selection window using the  arrow.

◆ Now select the working environment according to your welding task:

			
Back	Process control	Welding gun	Temperature
			

Process control:

	Off
	On

The process control set via SYN is a real-time process control. Deviations from the specified tolerances are immediately flagged up after welding, corrective measures can then be taken.



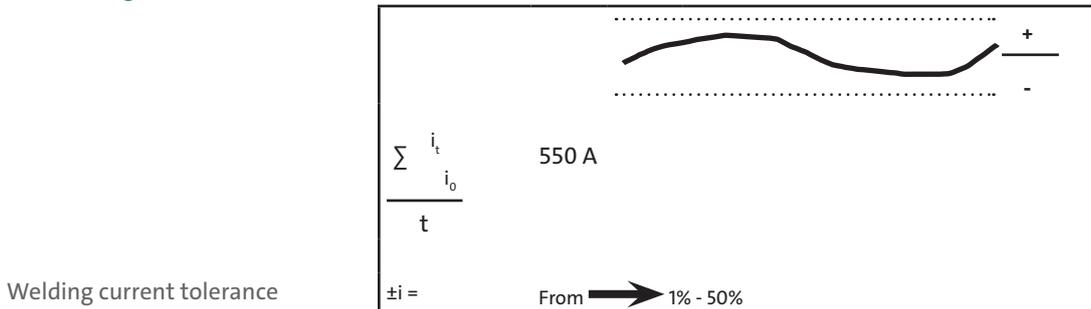
◆ For this read section 8.4 "Process control".

Setting the welding process control for reference welds (Learning phase)

This is how you activate the control:

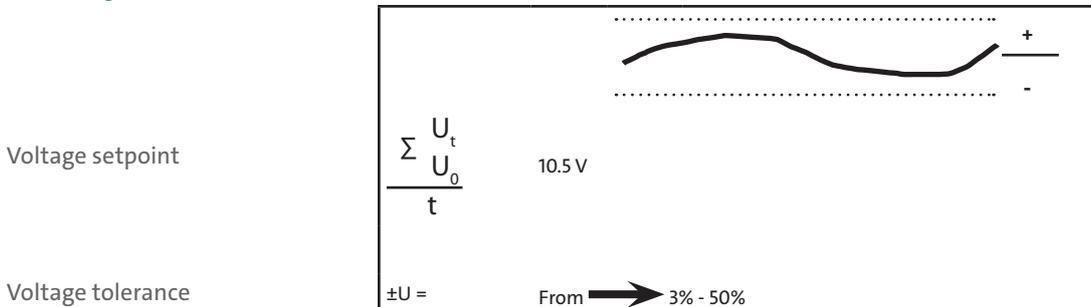
- ◆ Turn a push/rotary knob to the right onto the symbol  "Process control".
- ◆ Select "Process control - on".
- ◆ Operate a push-/rotary knob to confirm this selection.
- ◆ Now set your tolerances:

Set welding current tolerances



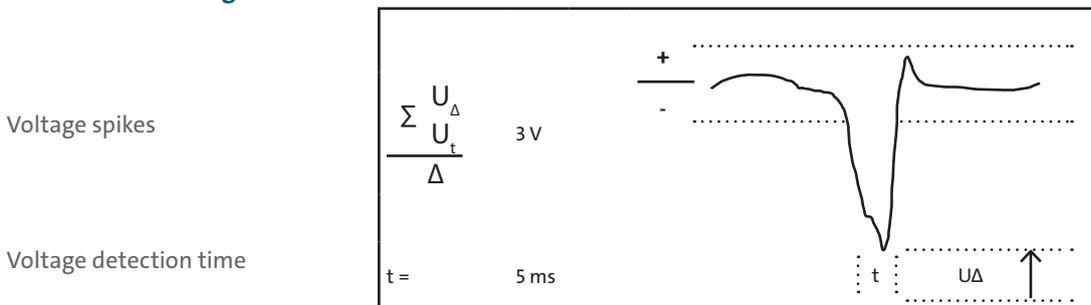
- ◆ Set your welding current tolerances.

Set voltage tolerances



- ◆ Set your voltage tolerances.

Set transition voltage



- ◆ Set the tolerances for the transition voltage.

Set the resistance of the circuit

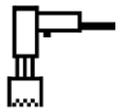


Resistance of the circuit From  Auto  0.2 mΩ - 25.5 mΩ

Resistance tolerance From  10 mΩ

- ◆ Set the resistance of the circuit.
- ◆ Now select the additional working environment according to your welding task:

Welding gun:

	A 12
	A 12-FL
	A 16

Temperature of the workpiece:





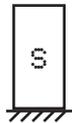
from 0 °C / 32 °F to 800 °C / 1472 °F

You can move to the next selection window using the  arrow.

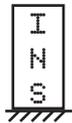
- ◆ Now select the welding element according to your welding task:



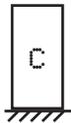
Back



Standard studs

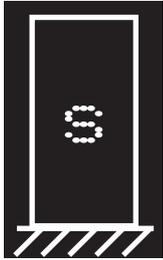


ISO studs



Special studs

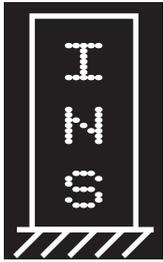
Folgende Auswahlmöglichkeiten stehen zur Verfügung:



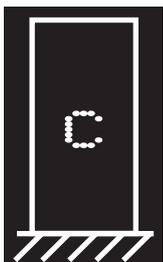
STANDARD STUDS				
- Stud type				- Diameter (Welding area)
				metric:  /  or
				imperial:  / 
DD ¹⁾		DD_CF ²⁾		M6 to M16
PD ¹⁾		PD_CF ²⁾		M6 to M16
RD ¹⁾		RD_CF ²⁾		M6 to M16
UD ¹⁾		UD_CF ²⁾		6 mm to 14.6 mm
ID ¹⁾		ID_CF ²⁾		M6 to M10
SD ¹⁾		SD_CF ²⁾		10 mm to 13 mm
PS		PT		M3 to M10
US		UT		3 mm to 8 mm
IS		IT		M3 to M6

¹⁾ für Bolzenschweißen mit Schutzgas oder ohne Schweißbadschutz

²⁾ für Bolzenschweißen mit Keramikring (CF)



ISO STUDS			
- Stud type (design)		- Basis and welding area (Diameter or surface)	
ISO-1			
ISO-2			
ISO-3		(Basis: Ø): 	(Basis: area):
ISO-4			
ISO-5			
		0.5 mm to 10.0 mm	0.8 mm ² to 31.2 mm ²



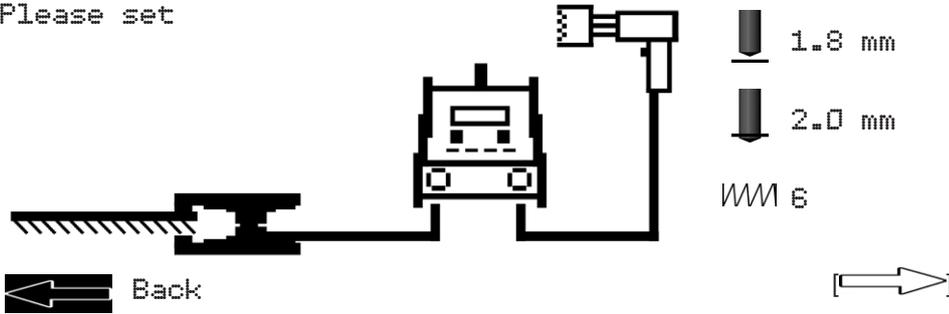
SPECIAL STUDS			
- Stud type		- Diameter (welding area)	
C1			(Basis: area): 0.8 mm ² to 193.5 mm ²
C2			
C3			
C4			
C5			

– Stud material and base material - combination options:

STUD MATERIAL:		BASE MATERIAL:	
	4.8 (5235) / Steel 5.8 / Steel 6.8 / Steel 8.8		Steel S235 / Steel S355 / DC01, Usibor
	16Mo3		16Mo3
	A2-50 (1.4301)		1.4301
	A4-50 (1.4571)		1.4541 / 1.4571
	AlMg3 (5754), AlMg4.5, Al99.5, AlSi12		AlMg3, AlMg4.5, Al99

- ◆ Now set the parameters for lift, submerging dimension and resilience according to the display on your welding gun:

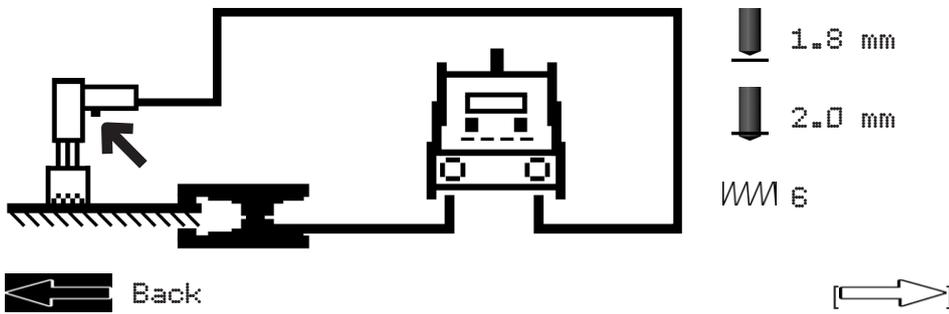
Please set



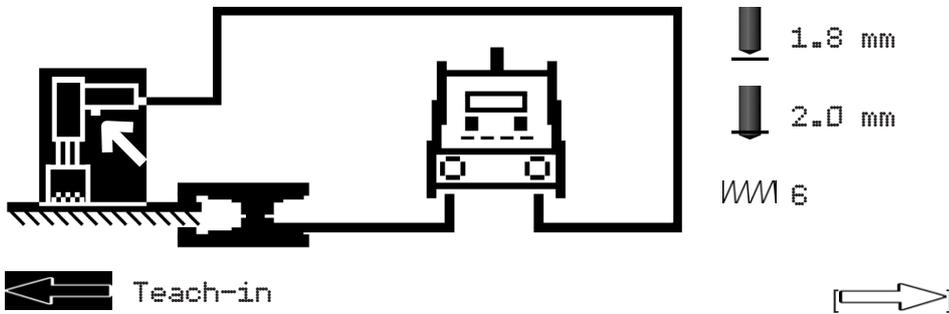
- ◆ To do so read the operating instructions of your welding gun.

You can enter the Tech-in mode via the  arrow.

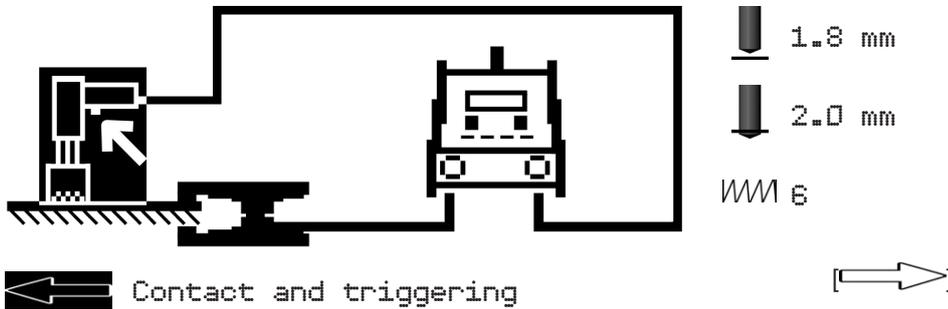
Teach-in mode



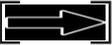
- ◆ Turn a push/rotary knob to the right.
The Teach-in mode starts:



- ◆ Operate a push-/rotary knob to confirm this selection.



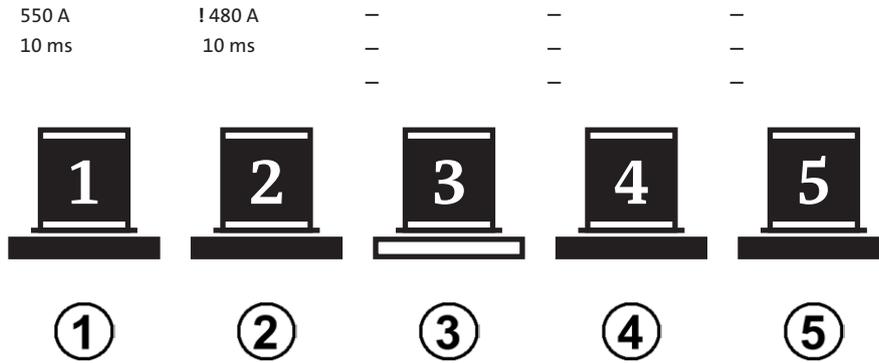
- ◆ Place the welding gun **without a welding element** onto the workpiece, and operate the button on the gun. The previously set parameters, especially the welding time, are now adjusted to the welding gun used.

You can cancel the Teach-in process via the  arrow.

Carry out reference welds

- ◆ Now carry out your reference welds. The progress of the welds is displayed:





①

The weld was successful. The actual values lie within the set tolerances.

②

The weld was not successful. The tolerance deviation is indicated by a !. The welding unit is locked.

After pressing the gun button for a longer period (>2 seconds) is the welding unit ready for welding once more.

③

The bottom bar flashes. This weld is now ready to take place.

④

This reference weld has not been carried out yet.

⑤

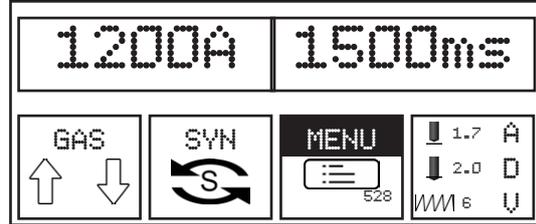
This reference weld has not been carried out yet.



- ◆ If, after welding, you identify that the tolerances have not been met due to external influences, you can delete this welding result and repeat the weld.

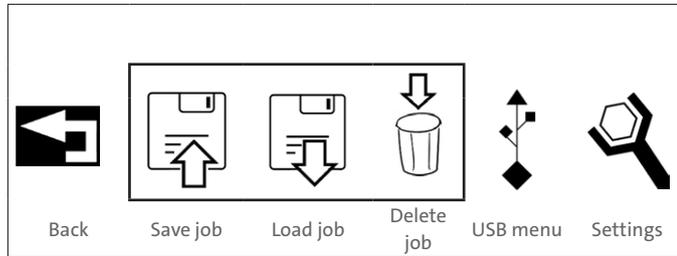
4.2. Program and system management

- ◆ Press both push/rotary knobs at the same time.
- ◆ Select **MENU**.
- ◆ Operate a push-/rotary knob to confirm this selection.



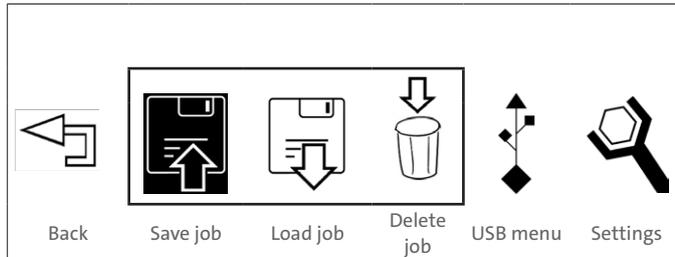
You can now select between the mode “Save job”, “Load job” or “Delete job”. Here you also have the options “USB menu” and “Settings”.

- ◆ Turn a push/rotary knob to the right.
- ◆ Operate a push-/rotary knob to confirm this selection.



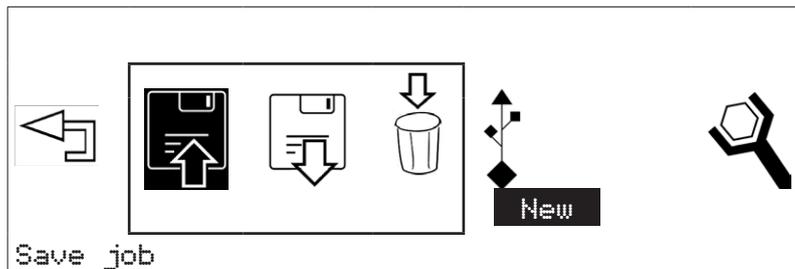
4.2.1. Creating/saving a job

- ◆ Turn a push/rotary knob to the right onto the symbol “Save job”.



- ◆ Operate a push-/rotary knob to confirm this selection.

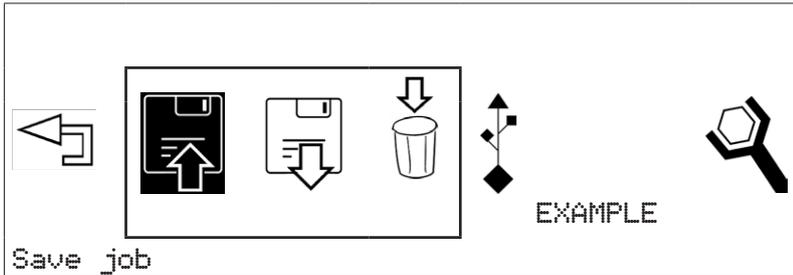
In the display next to the “USB menu” symbol, there is a remark “New”:



- ◆ Operate a push-/rotary knob to confirm this selection.

An input window now appears. Using the push/rotary knob (turn to the right or to the left) you can select digits and letters, to name the program.

- ◆ Operate a push-/rotary knob to confirm this selection.
- ◆ Turn the push/rotary knob fully to the left, until the  symbol appears, to delete the previous entry.
- ◆ Turn the push/rotary knob fully to the right, until the  symbol appears, to end the input.
- ◆ Operate a push-/rotary knob to confirm this input:

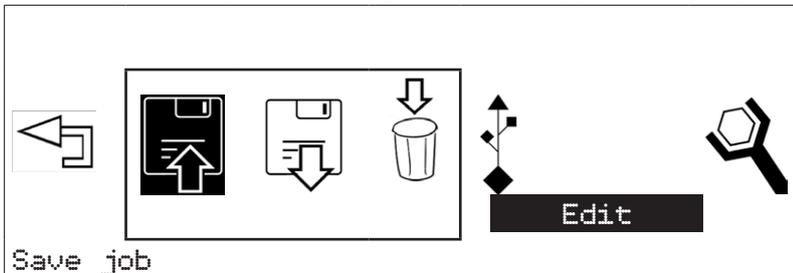


- ◆ You can enter a name with **up to eight characters** to name your settings.

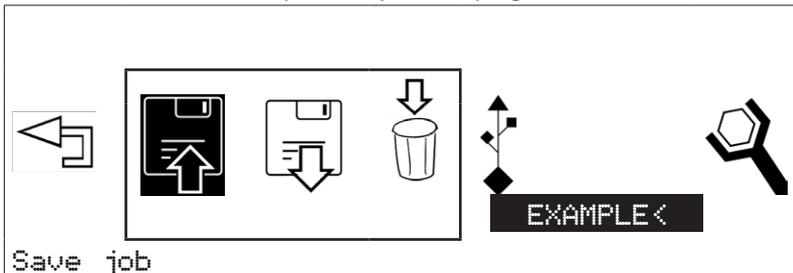
Using the  arrow you can exit the “Save job” mode.

Changing program name

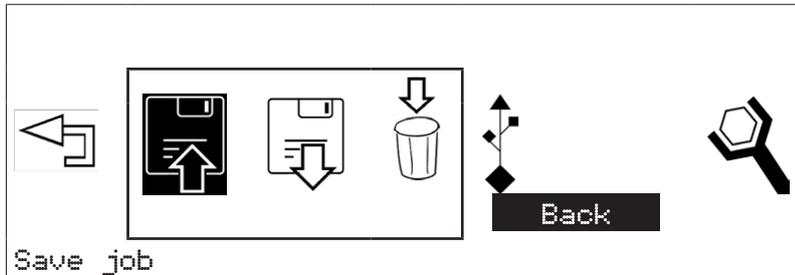
- ◆ Turn a push/rotary knob to the right, until “Edit” appears in the display.



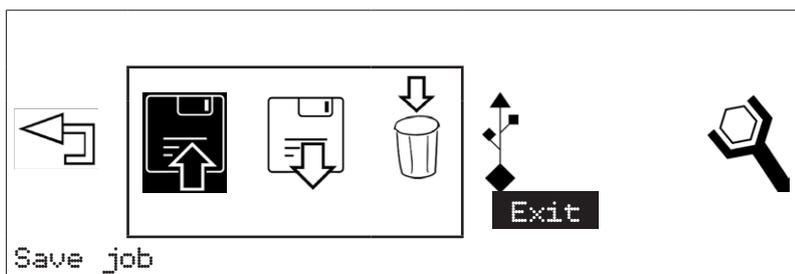
- ◆ Operate a push-/rotary knob to confirm this selection.
- ◆ Turn a push/rotary knob to the right and select the program which you would like to rename.
- ◆ Operate a push-/rotary knob to confirm this selection.
- ◆ You can now rename a previously named program:



- ◆ Turn the push/rotary knob fully to the left, until the  symbol appears, to delete the previous entry.
- ◆ Turn the push/rotary knob fully to the right, until the  symbol appears, to end the input.
- ◆ Turn the push/rotary knob fully to the left, until “Back” is shown in the display, to leave the “Edit” menu without applying changes.



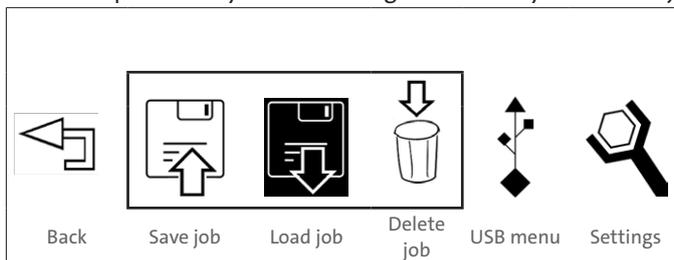
- ◆ Operate a push-/rotary knob to confirm this selection. Turn the push/rotary knob completely to the right, until the display shows “Exit”, to end the menu “Save job”.



- ◆ Operate a push-/rotary knob to confirm this selection.

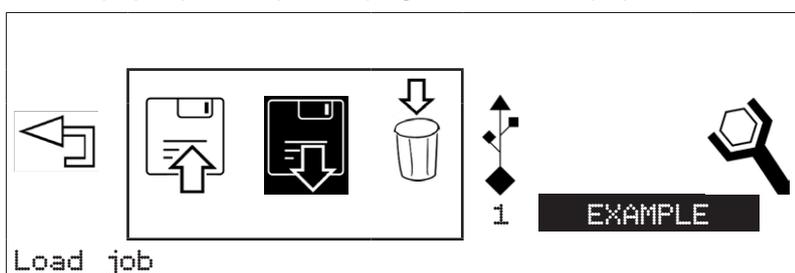
4.2.2. Load job

- ◆ Turn a push/rotary knob to the right onto the symbol “Load job”.

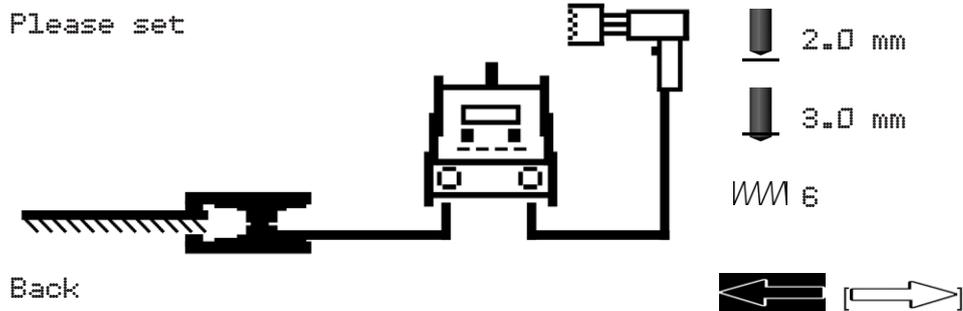


- ◆ Operate a push-/rotary knob to confirm this selection.

In the display all previously stored programs are now displayed:



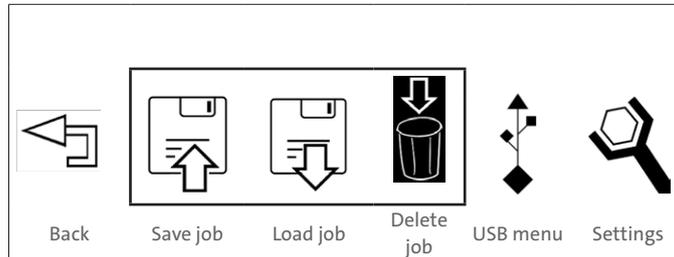
- ◆ Turn a push/rotary knob to the right, to display further programs.
- ◆ Operate a push-/rotary knob to confirm the selection.
- ◆ Now set the settings for lift and resilience according to the display on your welding gun:



You can end the “Menu” option using the [→] arrow.

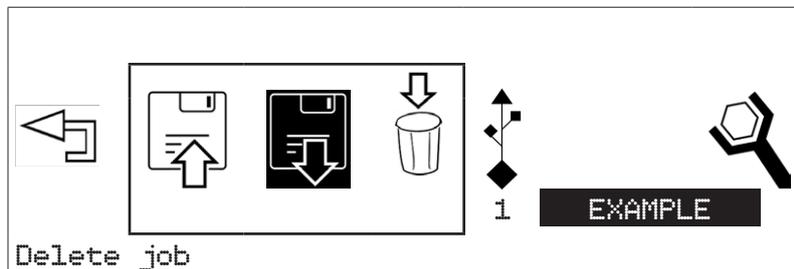
4.2.3. Delete job

- ◆ Turn a push/rotary knob to the right onto the symbol “Delete job”.



- ◆ Operate a push-/rotary knob to confirm this selection.

At the bottom right of the display the first available program appears:



- ◆ Turn a push/rotary knob to the right, to display further programs.
- ◆ Operate a push-/rotary knob to confirm the selection.

 Deleted programs cannot be restored!

Using the [←] arrow you can exit the “Delete job” mode.

4.3. USB menu

 This menu can only be accessed with a **USB flash drive inserted**.

4.3.1. Connecting a USB flash drive

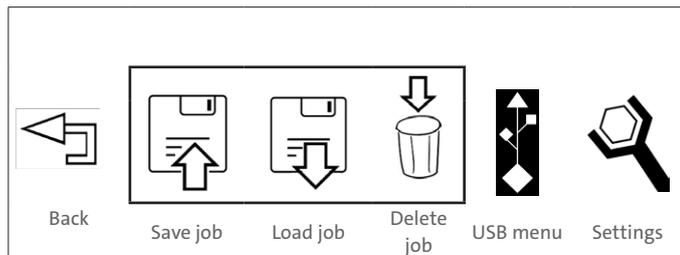


Connecting a USB flash drive

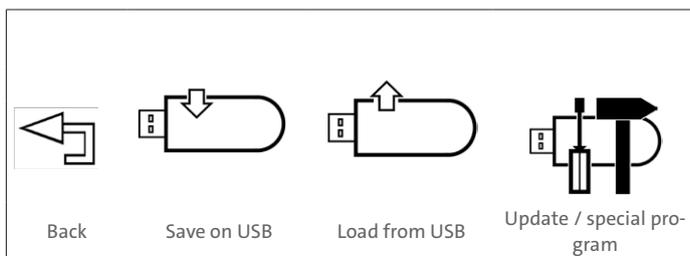
Using the USB access, existing welding programs can be loaded and new welding programs can be stored.

The USB access is protected with a protective cap against dirt and damage.

- ◆ Turn a push/rotary knob to the right onto the symbol “USB menu”.
- ◆ Operate a push-/rotary knob to confirm this selection.



The following selection options are now available:

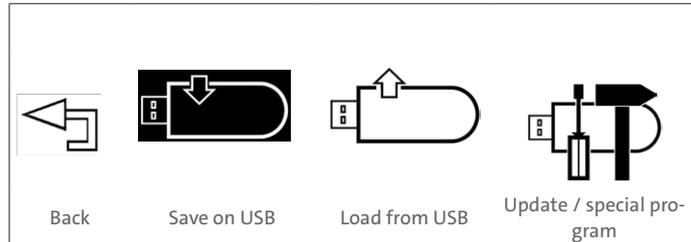


4.3.2. Saving settings on a USB flash drive

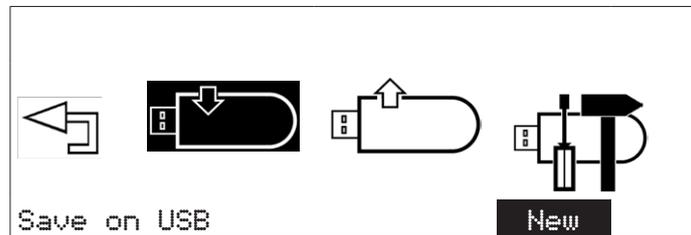
In this menu you have the option to store programs on a USB flash drive.

Turn a push/rotary knob to the right onto the symbol “Save on USB”.

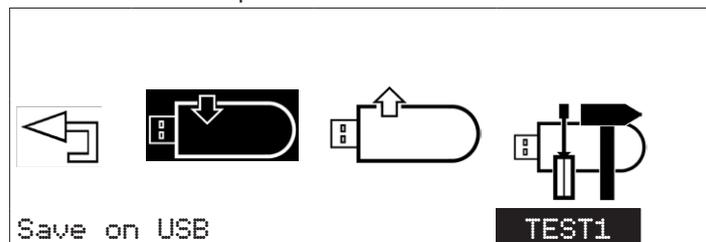
Operate a push-/rotary knob to confirm this selection.



The remark “New” appears in the bottom right of the display:



- ◆ Operate a push-/rotary knob to confirm this selection.
- ◆ An input window now appears. Using the push/rotary knob (turn to the right or to the left) you can select digits and letters, to name the program.
- ◆ Operate a push-/rotary knob to confirm this selection. Turn the push/rotary knob fully left, until the symbol  appears, to delete the last entry.
- ◆ Turn the push/rotary knob fully to the right, until the  symbol appears, to end the input.
- ◆ Operate a push-/rotary knob to confirm this input

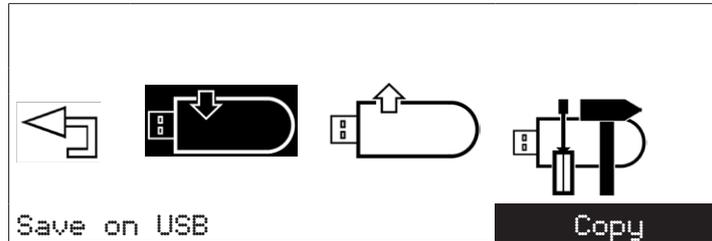


You can enter a name with **up to eight characters** to name your program.

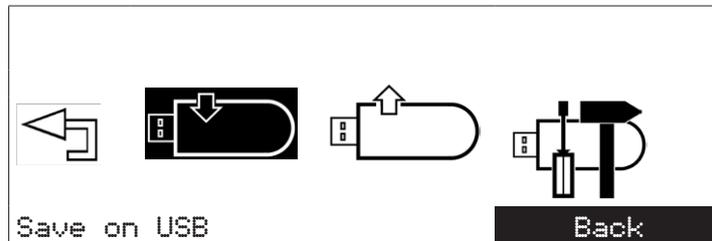
Using the  arrow you can exit the “Save on USB” mode.

4.3.3. Copying saved programs to a USB flash drive

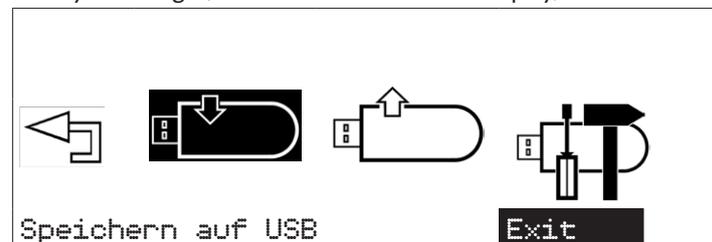
- ◆ Turn a push/rotary knob to the right, until “Copy” appears in the display.



- ◆ Operate a push-/rotary knob to confirm this selection.
- ◆ Turn a push/rotary knob to the right and select the program which you would like to copy to the USB flash drive.
- ◆ Turn the push/rotary knob fully to the left, until “Back” is shown in the display, to leave the “Copy” menu without applying changes.



- ◆ Operate a push-/rotary knob to confirm this selection.
- ◆ Turn the push/rotary knob fully to the right, until “Exit” shown in the display, to end the menu “Save on USB”.

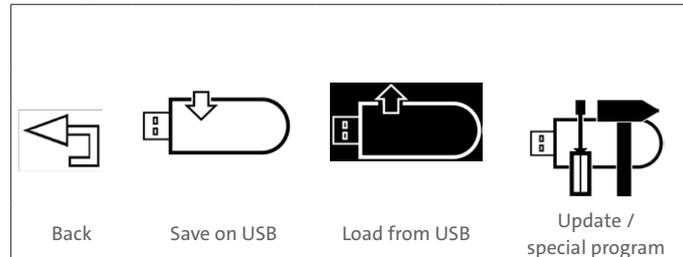


- ◆ Operate a push-/rotary knob to confirm this selection.

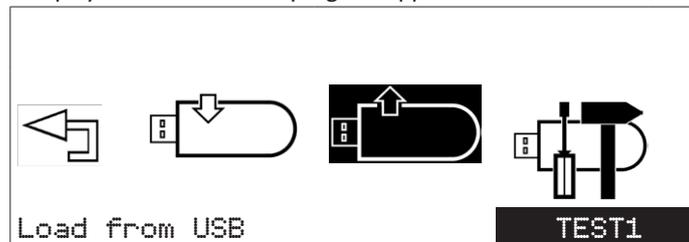
4.3.4. Loading programs from a USB flash drive

In this menu you have the option to load programs from a USB flash drive.

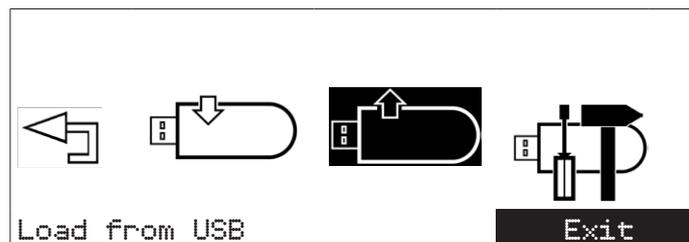
- ◆ Turn a push/rotary knob to the right onto the symbol “Load from USB”.



- ◆ Operate a push-/rotary knob to confirm this selection.
- ◆ At the bottom right of the display the first available program appears:

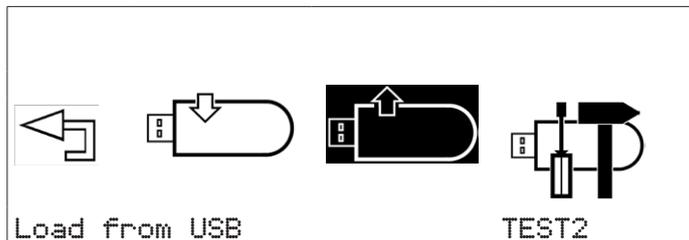


- ◆ Turn the push/rotary knob fully to the left, until “Exit” appears in the display, to end the menu “load from USB”, without loading a program.

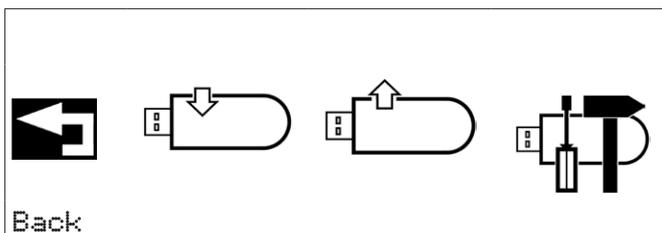


- ◆ Drücken Sie einen Druck-/Drehknopf, um diese Auswahl zu bestätigen.

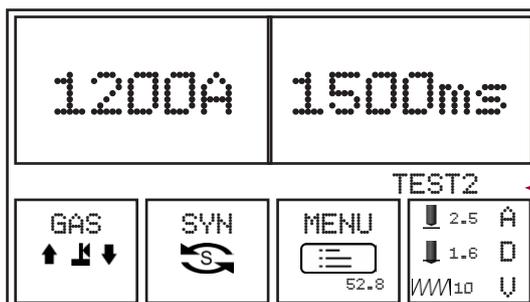
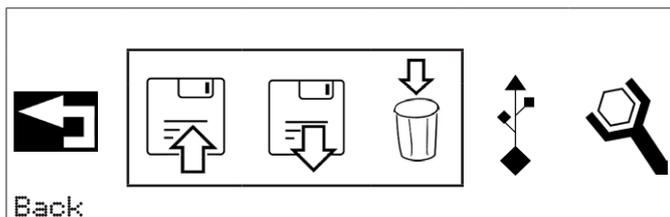
- ◆ Turn a push/rotary knob to the right and select the program which you would like to load from the USB flash drive.
- ◆ Operate a push-/rotary knob to confirm this selection.



- ◆ Turn a push/rotary knob to the left onto symbol “Back”, to end the menu “USB-Menu”.
- ◆ Operate a push-/rotary knob to confirm this selection.



- ◆ Turn a push/rotary knob to the left onto symbol “Back”, to end the “Menu” option.
- ◆ Operate a push-/rotary knob to confirm this selection.



← The loaded program is now shown in the display.

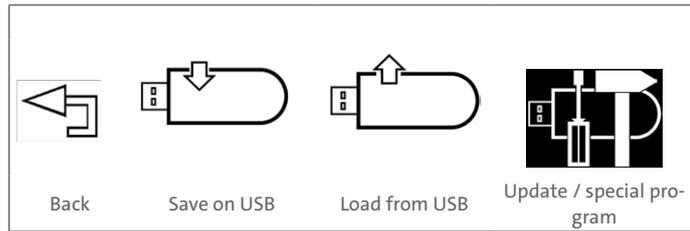
 The program is reset as soon as settings are changed using the push/rotary knobs. The welding program must then be loaded once more.

As an option special programs can be loaded, which lock the rotary/push knobs, so that unintentional changes of welding parameters are no longer possible.

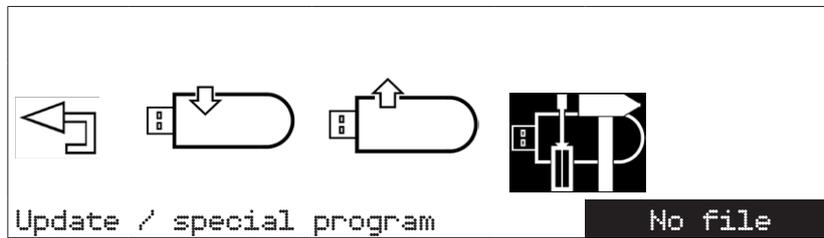
- ◆ For this ask your application adviser.

4.3.5. Update / special programs (optional)

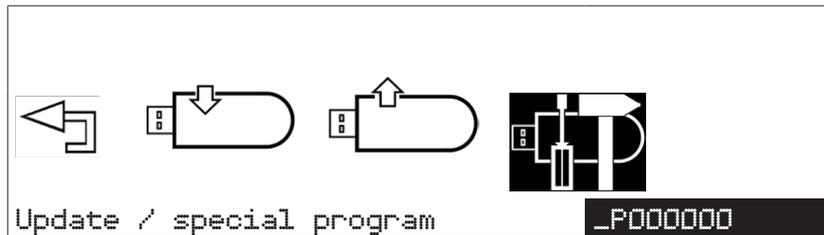
- ◆ Turn a push/rotary knob to the right onto the symbol “Update”.
- ◆ Operate a push-/rotary knob to confirm this selection.



If no update is available, the following display appears:



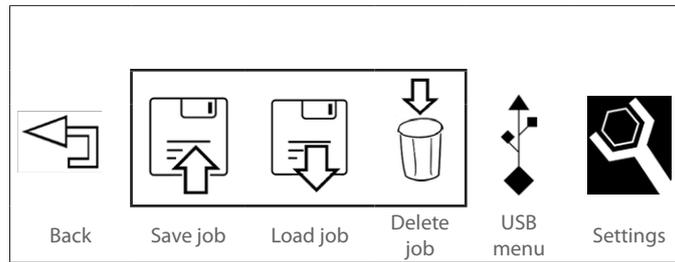
During updates please follow the instructions on the display



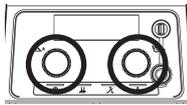
Updates and additional programs are sent to you as required and explained by Carbon.

Using the  arrow you end the “Update/special program” mode

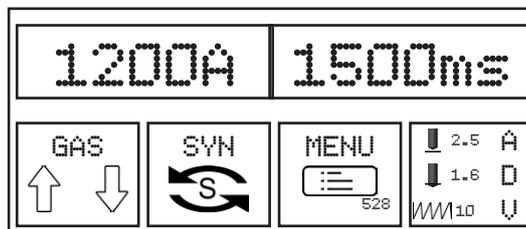
Settings



In this menu you can set the welding unit according to your work environment.



- ◆ Press both push/rotary knobs at the same time. You can now display the preselected settings:

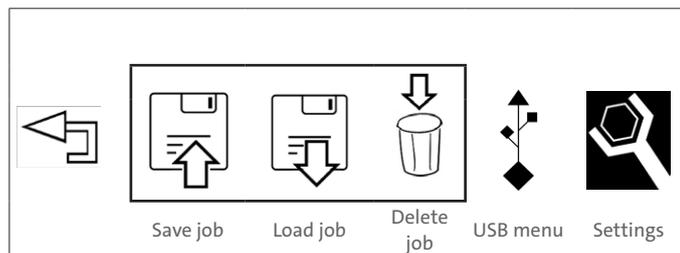


- ◆ Turn a push/rotary knob to the right onto the symbol **MENU**.
- ◆ Operate a push/rotary knob to confirm this selection.

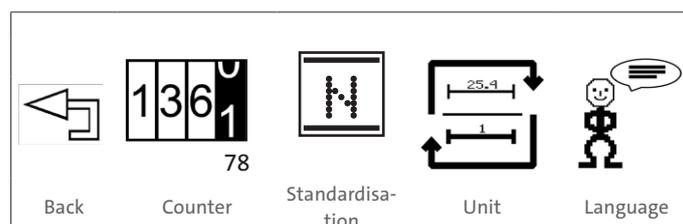
The following system settings are possible:

- Workpiece counter
- Standardisation (ISO, AWS, JIS)
- Unit metric (mm) / imperial (inch)
- Language

- ◆ Drehen Sie einen Druck-/Drehknopf nach rechts auf das Symbol „Einstellungen“.
- ◆ Drücken Sie einen Druck-/Drehknopf, um diese Auswahl zu bestätigen.

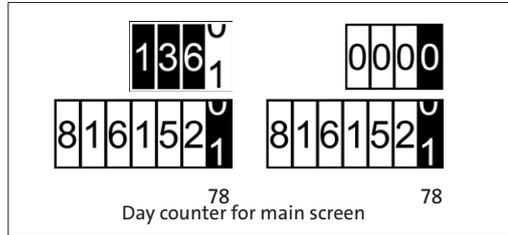


The following selection options are now available:

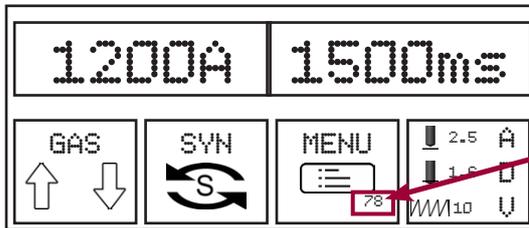


Day counter for main screen

- ◆ Turn a push/rotary knob to the right onto the symbol “Day counter for main screen”.
- ◆ Operate a push-/rotary knob to confirm this selection.



Using the  arrow you can exit the “COUNTER” mode.

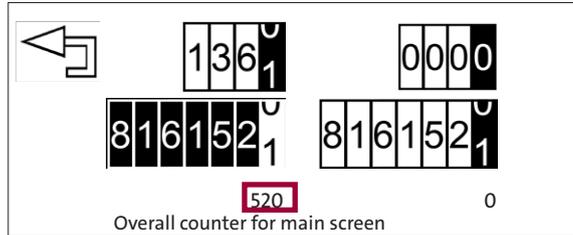


The day counter is now shown in the display.

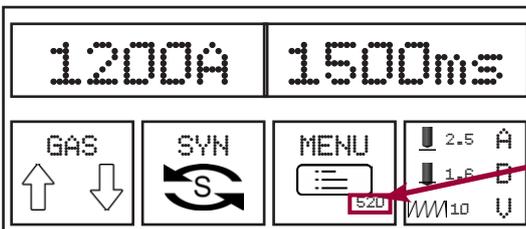
Overall counter for main screen

- ◆ Turn a push/rotary knob to the right onto the symbol “Overall counter for main screen”.
- ◆ Operate a push-/rotary knob to confirm this selection.

The total number of welds is displayed at the bottom right.



Using the  arrow you can exit the “COUNTER” mode.

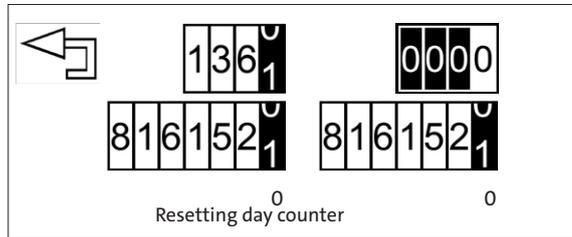


The total counter is now shown in the display.

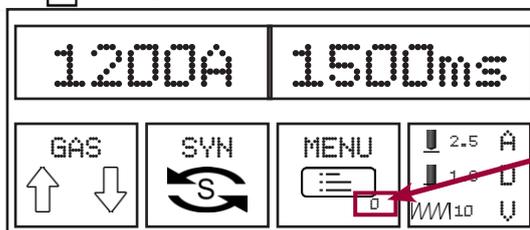
Resetting day counter

- ◆ Turn a push/rotary knob to the right onto the symbol “Reset day counter”.
- ◆ Operate a push-/rotary knob to confirm this selection.

The day counter is now reset to zero.



Using the  arrow you can exit the “COUNTER” mode.



The day counter is now shown in the display with “0”.

Standardisation

In this menu you can preselect, according to which standard welding should take place.

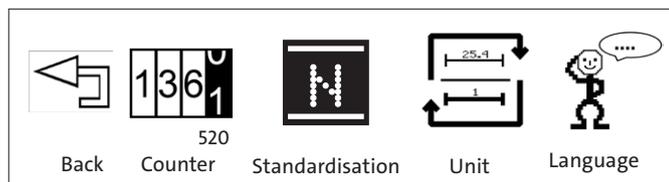
- ◆ Turn a push/rotary knob to the right onto the symbol “Standardisation”.
- ◆ Operate a push-/rotary knob to confirm this selection.



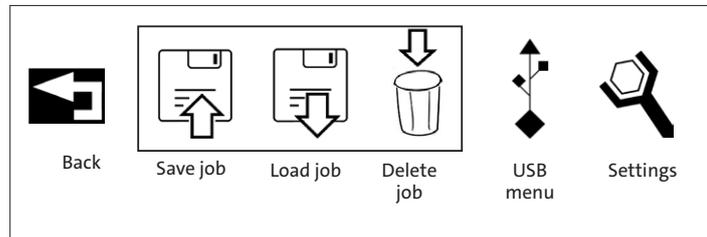
Folgende Norm-Einstellungen sind möglich:

- ISO: weltweit gültiger Standard
- AWS: nationaler US-Standard (American Welding Society)
- JIS: nationaler Standard in Japan

- ◆ Drehen Sie einen Druck-/Drehknopf nach links auf das Symbol „Zurück“, um das Menü „Normierung“ zu beenden.
- ◆ Drücken Sie einen Druck-/Drehknopf, um diese Auswahl zu bestätigen.



- ◆ Turn a push/rotary knob to the left onto symbol “Back”, to end the option “Settings”.
- ◆ Operate a push-/rotary knob to confirm this selection.

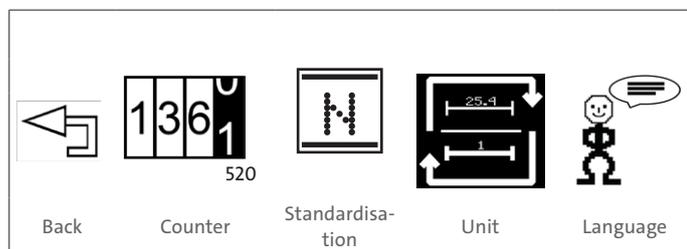


The following settings are now based on the standardisation which has been set.

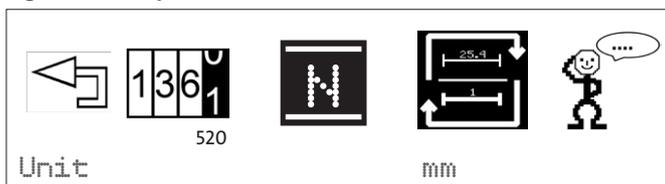
Unit

In this menu you can change the unit of measurement from mm to inch.

- ◆ Turn a push/rotary knob to the right onto the symbol “Unit”.
- ◆ Operate a push-/rotary knob to confirm this selection.



The following selection options are now available:

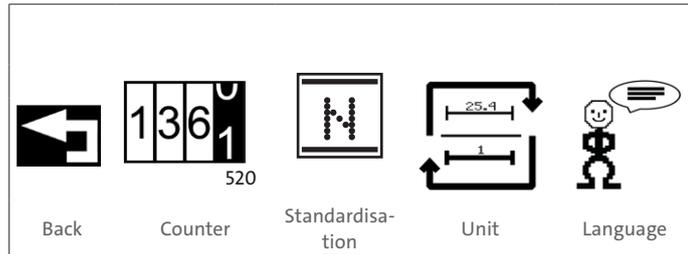


Im Display erscheint nun die zuletzt eingestellte Maßeinheit:

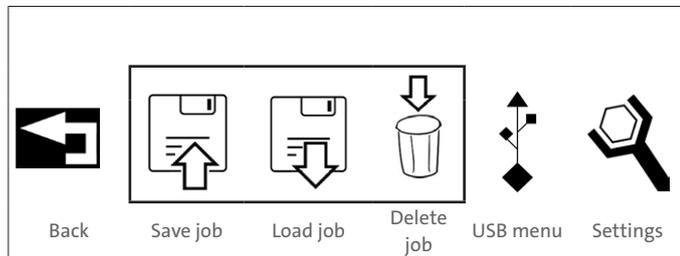


- ◆ Turn a push/rotary knob to the right or left and select “mm” or “inch”.
- ◆ Operate a push-/rotary knob to confirm this selection.

- ◆ Turn a push/rotary knob to the left onto symbol “Back”, to end the menu “Unit”.
- ◆ Operate a push-/rotary knob to confirm this selection.



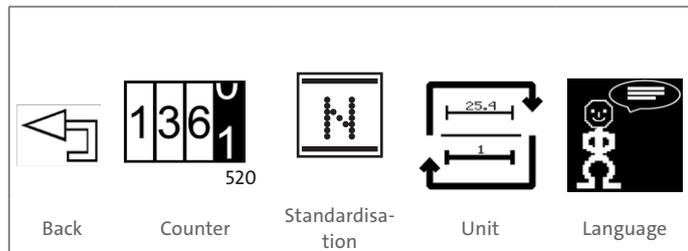
- ◆ Turn a push/rotary knob to the left onto symbol “back”, to end the option “Settings”.
- ◆ Operate a push-/rotary knob to confirm this selection.



The information regarding the diameters in the following menus now appear in the set unit of measurement.

Changing language

- ◆ Turn a push/rotary knob to the right onto the symbol “Language”.
- ◆ Operate a push-/rotary knob to confirm this selection.



You can now change the menu language.

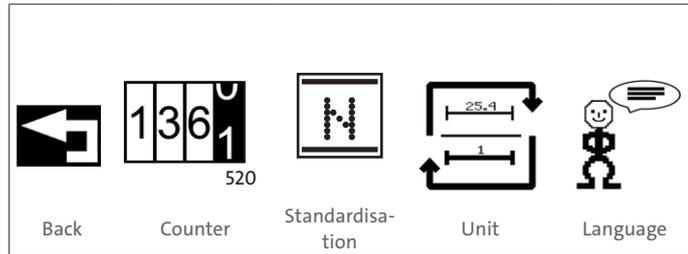
You can select from e.g. the following languages 1):

- German
- English
- Italian.

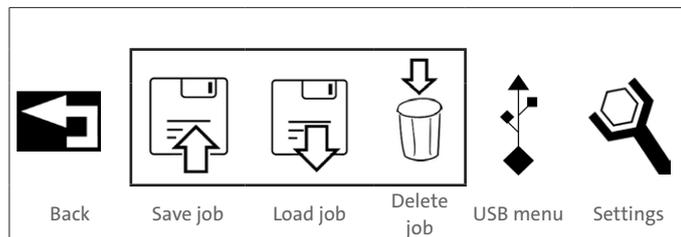
¹⁾ additional languages available on request

- ◆ Turn a push/rotary knob to the right or left and select your language.
- ◆ Operate a push-/rotary knob to confirm this selection.

- ◆ Turn a push/rotary knob to the left onto symbol “Back”, to end the menu “Language”.
- ◆ Operate a push-/rotary knob to confirm this selection.



- ◆ Turn a push/rotary knob to the left onto symbol “Back”, to end the option “Settings”.
- ◆ Operate a push-/rotary knob to confirm this selection.



The menu is now displayed in the selected language.

4.4. ADV – adjusting process parameters

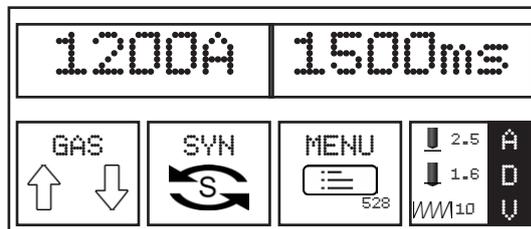
Based on your inputs, and with the aid of the algorithms stored within the system, it calculates various welding parameters, which are necessary for the welding process. In ADV mode you have the option to further optimize these welding parameters.

The ADV mode also offers the option for traceability of every individual weld carried out for your documentation.

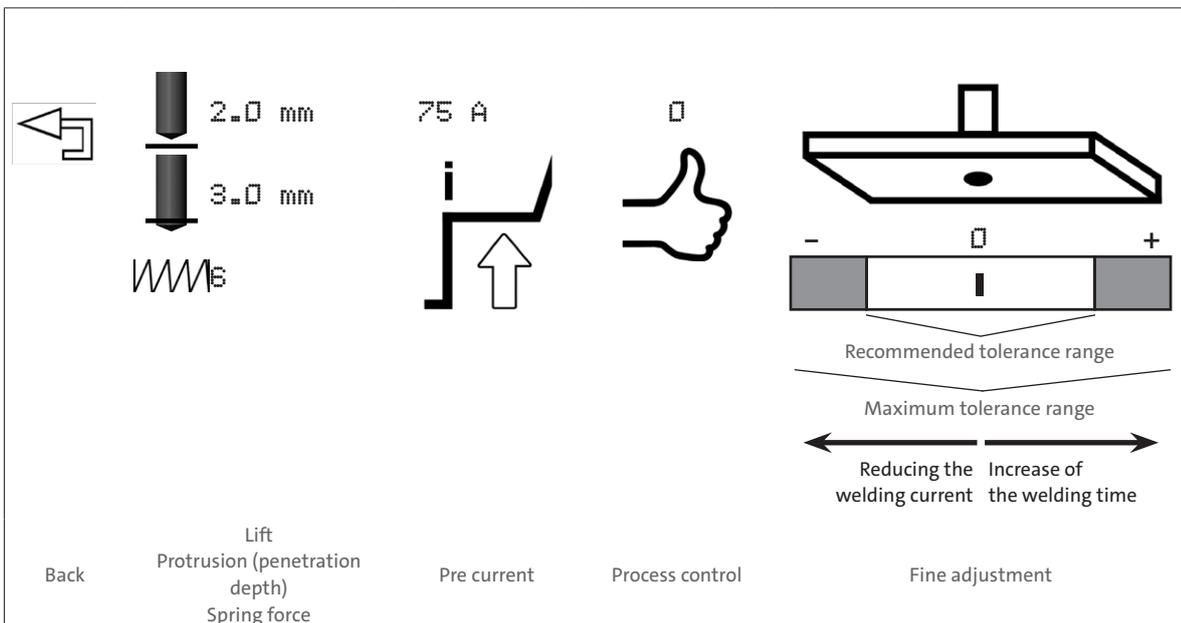
Adjustable welding parameters:

- Properties of the welding gun (lift, protrusion, spring force)
- Starting current adjustment
- Process control
- Fine adjustment of the welding parameters (pre current, welding current tolerance range).

- ◆ Press both push/rotary knobs at the same time.
- ◆ Select **A**
D
U.
- ◆ Operate a push-/rotary knob to confirm this selection.



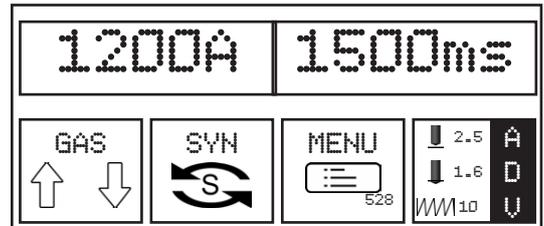
The following selection options are now available:



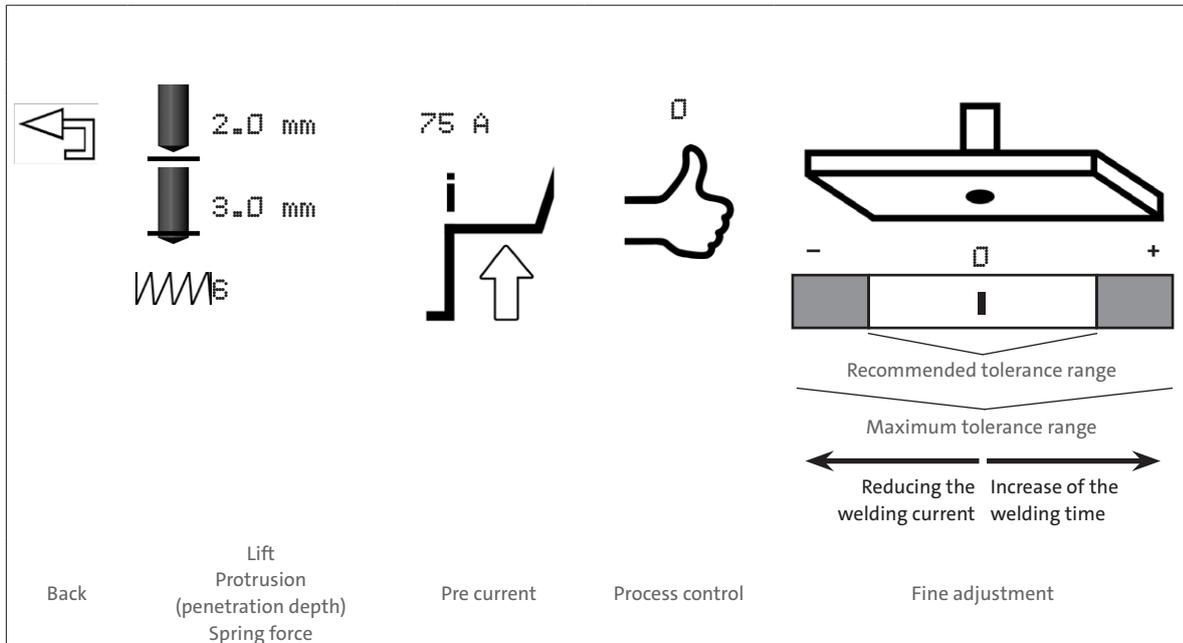
Adjustable welding parameters:

- Properties of the welding gun (lift, protrusion, spring force)
- Starting current adjustment
- Process control
- Fine adjustment of the welding parameters (pre current, welding current tolerance range).

- ◆ Press both push/rotary knobs at the same time.
- ◆ Select **A**
D
U
- ◆ Operate a push-/rotary knob to confirm this selection.



The following selection options are now available:



Parameter	Setting range
Lift	0.3 mm to 10 mm
Protrusion	0 mm to 5.0 mm
Spring force	0 to 10
Pre current	25 A to 1200 A *)
Process control	On/off
Fine adjustment	-20 to +20% *)

*) depending on the setting parameter, however max. 1200 A or 1500 ms.

- ◆ Turn a push/rotary knob to the right onto the relevant symbol.
- ◆ Operate a push-/rotary knob to confirm this selection.

Adjust pre current:



At the start of the welding process, the welding element (the stud) in the welding gun is raised using a lifting mechanism (lifting magnet). The activated start-up current is then used to generate a pilot electric arc.

- ◆ Correct the pre current in the following cases:
 - The melt is only welded point-wise, the stud only “sticks” on the workpiece.

Cause: The pilot electric arc may be too strong, i.e., after lifting off the welding element, the front face of the welding element is molten, which has led to a droplet short-circuit and the auxiliary arc has dissipated.



A lift which is set too low can also lead to the pilot electric arc being extinguished.

- ◆ Before adjusting the pre current, therefore check the lift of the welding gun.
 - The stud has significant spatter rings around the weld.

Cause: The pilot electric arc may be too weak, i.e. the arc tears away during the lift. The front face of the welding element and/or the surface of the workpiece are not sufficiently melted.



A lift which is set too high can also lead to the pilot electric arc being extinguished.

- ◆ Before adjusting the pre current, therefore check the lift of the welding gun.

Process control



The process control set via ADV is a real-time process control. Deviations from the specified tolerances are immediately flagged up after welding, corrective measures can then be taken.

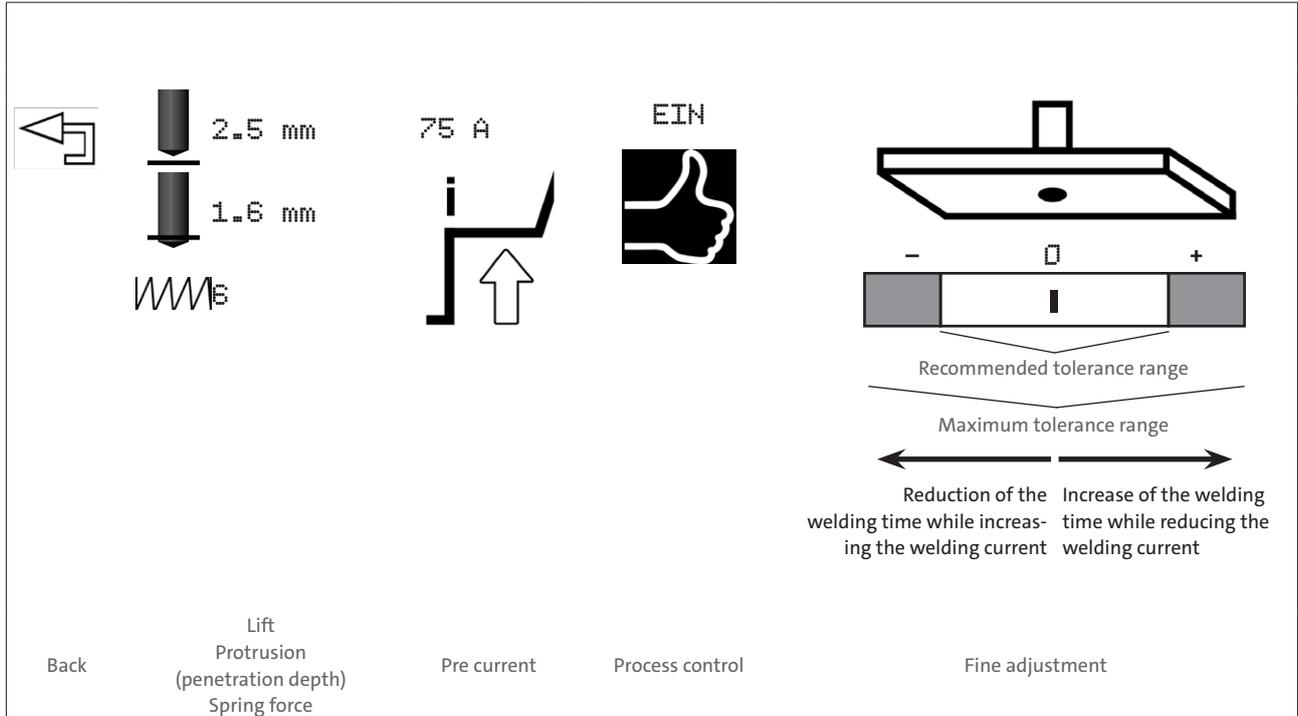


- ◆ For this read section “Process control”.

Setting the welding process control for reference welds (learning phase)

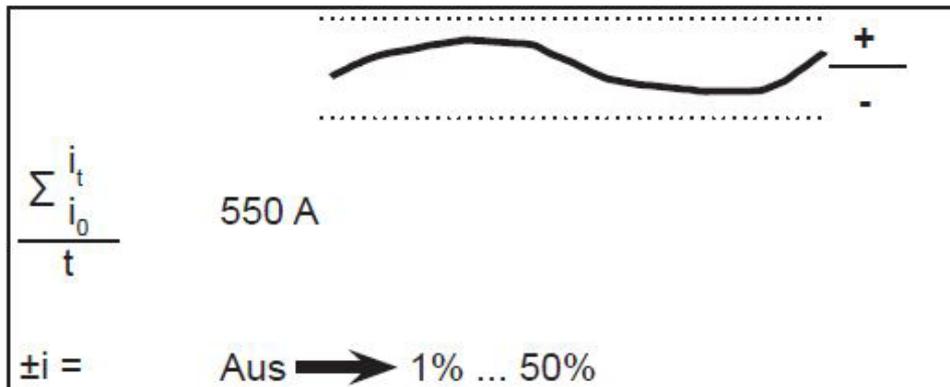
This is how you activate the control:

- ◆ Turn a push/rotary knob to the right onto the symbol “Process control”.
- ◆ Select “Process control – on”.



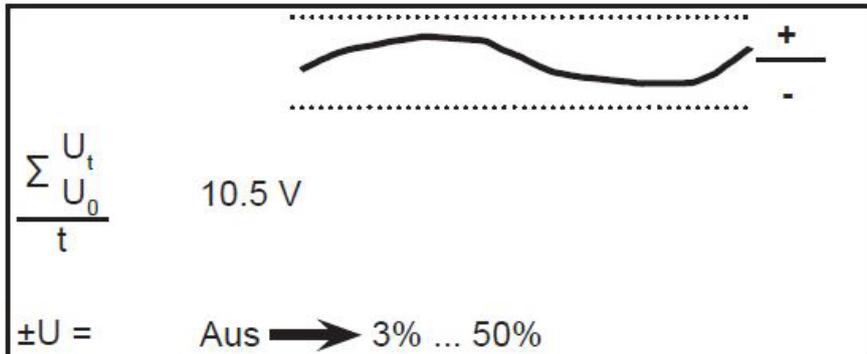
- ◆ Operate a push-/rotary knob to confirm this selection.
- ◆ Now set your tolerances.

Set welding current tolerances



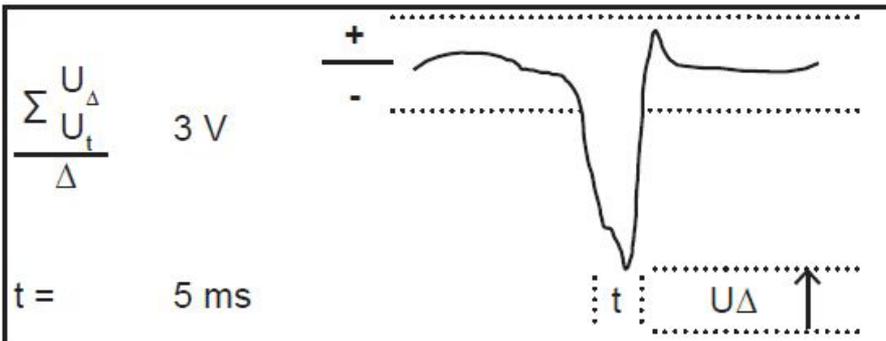
- ◆ Set your welding current tolerances.

Set voltage tolerances



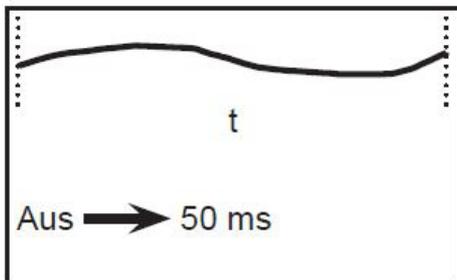
- ◆ Set your voltage tolerances.

Set transition voltage



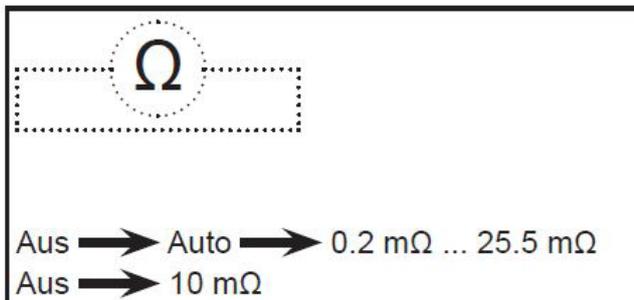
- ◆ Set the tolerances for the transition voltage.

Set time tolerance



- ◆ Set your welding current tolerances.

Set the resistance of the circuit

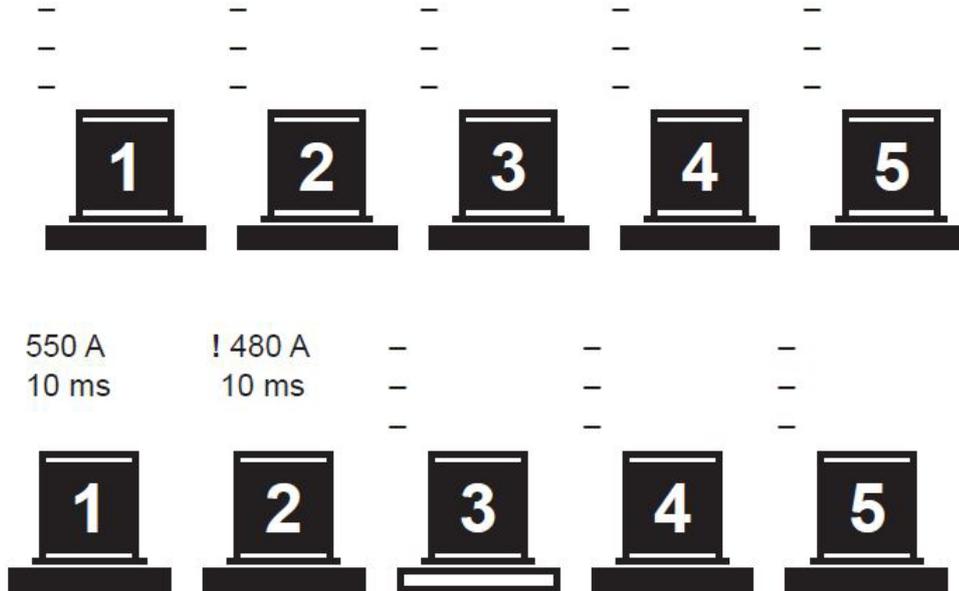


- ◆ Set the resistance of the circuit.

Carry out reference welds

◆ Now carry out your reference welds.

The progress of the welds is displayed:



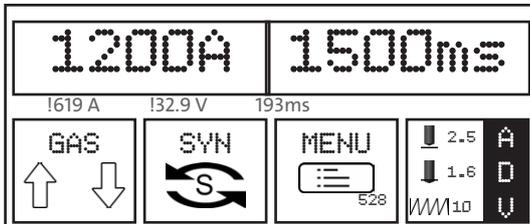
- ① The weld was successful. The actual values lie within the set tolerances.
- ② The weld was not successful. The tolerance deviation is indicated by a !. The welding unit is locked.
After pressing the gun button for a longer period (>2 seconds) is the welding unit ready for welding once more.
- ③ The bottom bar flashes. This weld is now ready to take place.
- ④ This reference weld has not been carried out yet.
- ⑤ This reference weld has not been carried out yet.



◆ If, after welding, you identify that the tolerances have not been met due to external influences, you can delete this welding result and repeat the weld.

Display of deviations to the tolerances in the real welding process

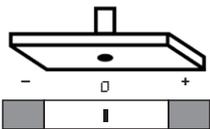
If the set tolerance field is breached, the system shows the deviation in the display:



Triggering of further welding is blocked.

Only after pressing the gun button for a longer period (>2 seconds) is the welding unit ready for welding once more.

Fine adjustment



This function can be used independent of the process control.

Using this function you can more finely tune previously loaded jobs based on your welding task, if the conditions of the jobs change for short periods. The job settings themselves are not changed.

Here you can reduce

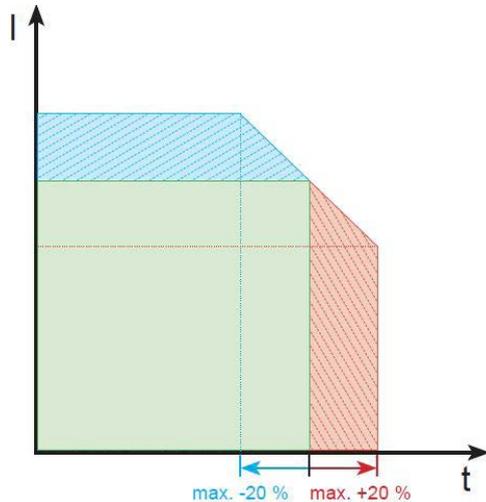
- the welding time by max. 20 % with the energy input remaining constant (with concurrent increase of the welding current*)

or

- increase the welding time by max. 20 %**) with the same reduction of the welding current).

*) max. 1200 A / **) max. 1500 ms

Based on your fine adjustments, the unit calculates the associated second welding parameter:



Verringerung der Schweißzeit Erhöhung der Schweißzeit
 bei Erhöhung des Schweißstroms bei Verringerung des Schweißstroms
 B. bei Arbeiten auf warmen Werkstücken z. B. bei Arbeiten auf kalten Werkstücken



- ◆ The tolerances for the fine adjustment have an impact on the process control.



- ◆ If, with the process control switched on, you select the tolerances for the fine adjustment larger than previously during the process control, faults or error messages may appear during the welding processes.



Recommended by Carbon:

Load a job according to your welding task.

- ◆ Carry out test welds.
- ◆ Check the welding results.
- ◆ Make the fine adjustments, if the welding results do not meet your requirements.



These fine adjustments are not stored in the loaded job, just support you during your short-term work under other conditions.

With the process control switched on and the USB command “documentation” activated, all fine adjustments made via this function are recorded on a USB storage device.

5. Fault codes

Fault codes during operation

ERROR NUMBER	DESCRIPTION	RECTIFYING FAULTS
Control board		
4	Error when loading or saving a job	Load another job, delete the faulty job
5	Error when loading or saving a job	Load another job, delete the faulty job
6	Mains power not stable during welding	Check the mains
<RAM>	Request data RAM	Contact service for data
100	Request Program_P0	Contact service for data
101	Request Program_P1	Contact service for data
102	Request Program_P2	Contact service for data
103	Request Program_P3	Contact service for data

Fault codes during operation

ERROR NUMBER	DESCRIPTION	RECTIFYING FAULTS
Primary board		
201	Logical voltage (primary)	Send in unit for repair
202	Phase stability	Check the mains; if the problem persists, contact service
203	Thermal 1	Contact service
204	Thermal 2	Contact service
205	Inverter current offset	Contact service
206	Mains network check	Check the mains; if the problem persists, contact service
207	DC bus voltage	Contact service
208	Start-up/rush current	Contact service
209	Primary communication	Contact service
210	PFC Primary communication	Contact service
211	PFC Mains network check	Contact service
212	PFC DC bus voltage	Contact service
213	PFC Thermal 1-2	Contact service
214	PFC Offset voltage	Contact service
215	_PFC_OK	Contact service
216	Magnetizing current of the inverter transformer	Switch on unit at room temperature once more; if the problem persists, contact service
Secondary board		
301	Logical voltage (secondary)	Check short-circuit of the output connections; If not, send in unit for repair
302	Primary communication	Contact service
303	Gun button	Switch on unit without gun being connected; if the problem persists, contact service
304	Output voltage	Check short-circuit of the output connections; If not, send in unit for repair
305	Secondary thermal	Contact service
306	Inverter OK	Contact service
307	Inverter relay status	Contact service
308	Program version	Contact service for data
309	Unloading system	Contact service
310	Control panel	Contact service
311	Start	Contact service

CARBON GmbH

Haldenhöfe 3

D-78253 Eigeltingen-Heudorf

Phone +49 7465 466

Fax +49 7465 2217

Mail info@carbon.ag

In collaboration with:

© Volkswagen Aktiengesellschaft

Konzern Abteilung

Mailbox 1848-2

D-38436 Wolfsburg

Germany

© 2020 CARBON | CMA-001 DE | 11/2020