

AKTIENGESELLSCHAFT

User Manual

CMA-1200 AluRepair VISAR | VAS 852 001 A | Part 1



Operating instructions CMA-1200 version 2020/11 | Part 1

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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.

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

Dear Customer,

Many thanks for purchasing our CMA-1200 multi-functional stud and bit welding unit (hereinafter referred to as welding unit). At Carbon, we are convinced that you have chosen a device that will fulfill your future needs and wish you every success in the work you carry out with this device.

Our aim is to ensure the high quality of our products by continuously developing the construction and features of our products and the accessories available for them. As a result of this, the product you have purchased may differ in certain respects from those presented in these operating instructions. For that reason, no entitlements may be directed from the details, illustrations and descriptions contained here.

The data and information contained in this User Manual have been compiled with the greatest possible care. We have done all that we can to ensure that the information contained in this manual was accurate and up to date at the time of dispatch. Nevertheless, we are unable to guarantee that this information is absolutely error-free.

If, after looking through this manual, you should identify any errors or items that are unclear, please let us know.

Please also let us know if you have ideas or complaints about our product. We will be grateful for your feedback.

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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



Glossar

Welding Unit:	Power unit, including welding gun
Rectifier:	An electrical component that changes alternating current into direct current
Capacitor:	A component that stores electrical energy
Power unit:	A device that provides the electrical energy for welding to take place
Electric arc:	An autonomous discharge of gas between two electrodes, if sufficient current is present. A white light is emitted. The electric arc can be used to generate very high temperatures.
Welding element:	A component, such as the stud or pin being welded to the workpiece
Welding parameters:	Mechanical and electrical settings on the welding gun and on the power unit (such as resilience or charge voltage)
Welding gun:	A device used to weld two elements together.
Thyristor:	An electronic component for the contactless switching of high currents. Switching is carried out via the control input.
Workpiece:	Components such as sheet metals, profiles or pipes, onto which welding elements are to be attached

3. Scope of supply

.....

The standard equipment of your power unit consists of the following components:

NUMBER OF	COMPONENT	TYPE	ITEM NO.
1	Power unit		CMA-1200
	MA-1200 VISAR	Anverde	
1	User Manual part 1		
1	User Manual part 2		

- Upon receipt, check that the delivery is complete and has not sustained any visible damage.
- Inform the delivery company or sales representative immediately of any damage that has occurred during transportation, or of any missing components (the address can be found on page 2).

4. Accessories

The accessories supplied can be determined by referring to our product description.

5. Technical data

Welding unit CMA-1200 for arc-ignition stud welding according to the applicable standard.

Welding area	Ø 3 - 12 mm, M3 - M12			
Welding material	Steel (non-alloy and	alloy), aluminı	ım	
Welding sequence	25 °C	100 %	50 %	35 %
	F [studs/min]	11	16	21
	t [ms]	600	600	600
	I ₂ [A]	1200	1200	1200
	U ₂ [V]	30	30	30
Welding current	1200 A			
Permitted current range	25 – 1 200 A			
Welding time	5 – 1500 ms (continu	uous)		
Connection	200 to 600 V, 3 phas	es, 50/60 Hz		
Type of cooling	F (thermally controll	ed ventilator)		
Protection type	IP 23 (use in the ope	n air also perm	itted)	
Ambient air temperature range	0 °C to 40 °C			
Dimensions L x W x H	430 x 288 x 246 mm	(not including	cable)	
Weight	18,5 kg			

6. Appropriate use

Our welding units are constructed and designed exclusively for professional use. Any non-professional use is expressly forbidden, as a non-professional operator may have an insufficient knowledge of applied welding technology and of the applicable standards.

The power unit is exclusively intended for the welding of standard welding elements. Any other use will give rise to a reduction in the required strength of the welded joint.

The following items may be connected to the power unit:

- The A 12 welding gun, for arc-ignition welding

Appropriate use also includes following the instructions in the operating instructions for the welding gun used, in addition to adhering to the intervals and conditions for the inspection and maintenance of the power unit and the components used.

It is essential to check whether your welding gun is compatible with this power unit.

The welding unit must be suitable for welding the elements concerned.

Welding elements produced using the cold-heading process have a flange and a firing tip. During welding, the flange prevents the electric arc from jumping across onto the cylindrical part of the welding element, while also increasing the size of the welding surface.



For details of the welding elements that can be used, please consult the User Manual.

7. Guarantee

The scope of the guarantee can be found in the current version of the "General Terms and Conditions of Business".

The guarantee does not cover any faults that arise due to

- ordinary wear and tear
- improper handling
- failure to follow the instructions in the User Manual
- failure to adhere to the safety rules
- inappropriate use, or
- damage during transportation

Entitlements under the guarantee shall cease to apply, if any alterations, changes, servicing or repairs are carried out by unauthorized persons. We wish to state expressly that the only spare parts, accessory devices or components that may be used are those that have been approved by us.

The same shall accordingly apply to structural components installed by our suppliers.

Structure of the welding unit 8.



Front side:

Control panel with display: - recessed to prevent damage

USB connection

(2)

for easy saving and loading of programs _ and software updates

3 Connecting sockets (Welding current, control and earth cables, protection gas) - recessed and positioned diagonally



9. Structure of the power unit

9.1. Main components



4 IGBT switch

The mains power is rectified in the **assembly (2)** after the main switch and the EMC filter.

The rectified current is smoothed out in the **electrolytic capacitors (3)** and passed to the **IGBT switches (4)**. These switches convert the direct current into a high-frequency 30 kHz alternating current.

The energy is transferred via the **medium-frequency transformer (5)** using **diodes (6)** and rectified. The rectified current is routed to the welding sockets.

The control of the **IGBT switches (4)** takes place in the **control unit (7)**. The control unit also coordinates the mechanical process (the lifting off of the welding element) with the electronic control system (activation of the start-up current, activation of the main current, ending of welding time). The welding time and welding current are infinitely adjustable.

Rating plate

The rating plate can be found on the reverse side of the power unit.

The following details are displayed on the rating plate:

- Manufacturer
- Туре
- Serial number
- Supply voltage
- Power fuse
- Power uptake
- Type of cooling
- Protection type
- Date



9.2. Control panel and display

An illuminated display (LED) with the following meanings is located in the bottom area of the control panel:

	Yellow	flashes quickly	After switching on the device: The capacitors are being charged. The unit is carrying out a self-test.
		flashes slowly	After the self-test the unit switches over to standby mode. The standby mode ends when the welding gun is operated or on contact between the workpiece and the welding gun. The unit now switches over to "Ready".
		illuminates	if the welding unit is ready for welding. After approx. 3 min the unit switches back to standby mode.
		flashes slowly	After switching off the device: The capacitors are being discharged.
	Yellow	illuminates	if electrical contact takes place between the welding element and the workpiece
と	Yellow	illuminates	when activating the welding gun
₿	Yellow	illuminates	The welding unit is locked
			 if the welding unit has been thermally overloaded. Work may be re- sumed after a short period, once the device has cooled down.

Display



- 7 set welding current
- 8 set welding time
- 9 Gas: On/off (Gas pre-flow time/gas post-flow time)
- 10 SYN: Synergy stud welding mode
- 11 MENU: Program and system management
- 12 ADV: Adjustment of existing programs to local conditions

9.3. Mains switch



9.4. Standby mode

If the welding unit is switched on and no welding takes place, the standby mode is activated, and the internal energy consumption is reduced. The "Ready" LED flashes slowly.

- End the standby mode by
- operating the welding gun start button or
- placing the stud welding gun on the workpiece.

10. Welding process

The power unit must only be used for arc ignition stud welding and for the welding on of aluminum bits.

The front surface of a stud-type welding element/bit and the opposing surface of the workpiece are melted off by means of an electric arc and then jointed. The process is suitable for welding entire surfaces of connecting elements, mainly for pin-shaped metallic components and bits onto metallic workpieces.

10.1. Arc-ignition stud welding

The welding unit from Carbon uses the process known as "arc-ignition stud welding" and complies with the current standard. The standard assigns this process, which involves the joining of pin-shaped components and bits with flat-surfaced workpieces to the category of arc pressure welding (code: BH).

Jointing occurs while the welding zone is in a plastic or liquid state. The process can be carried out mechanically or automatically using welding guns.

Generally speaking, the positive pole (earth) of the power unit is connected to the workpiece. The welding element is manually inserted into the stud holder of the welding gun and applied to the workpiece (see picture, **item 1**). When activating the welding gun key, the welding process will begin automatically, as follows:



- 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 light arc (see image, item 2).
 After that, the main electric arc is created between the surface of the welding element and the workpiece.
- The main electric arc will burn at the welding current that was set and for the welding time pre-selected on the power
 unit. The welding energy selected must be in keeping with the welding element selected. Due to the effects of the
 electric arc, the surface of the welding element and the workpiece are melted together (see image, item 3).
- Once the set welding time has elapsed, the welding element will be mechanically moved towards the workpiece.
 When inserted into the molten metal, both melt areas will be united and will set hard. Once the welding element and workpiece come into contact with one another, the electric arc will be extinguished as a result of the short circuit and the main current will be turned off.
- The melt area will go hard and cool off. The welding element has been fully welded to the workpiece (see image, item 4).
 Once the welded workpiece has cooled, the welding gun can be carefully pulled away from the welding element.
 If protection gas is being used, the protection gas will cease to flow when the welding gun is removed.

Arc-ignition stud welding with protection gas

Stud welding with protection gas is used for welding elements in the diameter range of 3–12 mm and welding times of 5–1500 ms. Arc ignition stud welding with protection gas is therefore suitable for all positions that require welding. Welding is predominantly carried out in the PA position (flat position). During arc ignition stud welding with protection gas, the welding area is protected by an externally applied protection gas. The protection gas, which is applied by means of a gas control system and an additional device displaces the atmosphere within the welding area, thereby considerably reducing the formation of pores.

	RECOMMENDATION ACCORDING TO	RECOMMENDED BY CARBON
Steel (non-alloy and alloy)	DIN EN ISO 14175-M21: (82 % Ar / 18 % CO ₂)	90 % Ar / 10 % CO ₂ *) 92 % Ar / 8 % CO ₂ *)
Al and Al-alloys	DIN EN ISO 14175-11 DIN EN ISO 14175-13	84,985 % Ar / 15 % He / 0,015 % CO ₂



*)

As a result of the increased proportion of CO_2 , the surface tension of the weld pool is reduced. This may give rise to an increase in metal splashes.

The protection gas affects

- The arc and alters the melting behavior of the welding element and the workpiece.
- The change in surface tension also affects the formation of the weld bead and the penetration shape.

The shape of the weld bead cannot be reproduced using stud welding with protection gas, as protection gas does not have any effect on the shape of the melt.

The standard welding studs for electric arc stud welding are described in the standard. Welding elements with a conical front surface and without aluminum spheres are preferred.



Studs with a conical front face must be welded under protection gas.



When protection gas is being used, welding should only take place in PA position (flat position) as the protection gas is unable to prevent the melt from flowing due to the forces of gravity.

Short-cycle stud welding with protection gas

Stud welding with protection gas is used welding elements with a diameter of between 3-12 mm (nominal diameter, not including the flange). The welding times used will be from 5-1500 ms.

As a result of the short welding times, the amount of heat generated in the melt area is so small, the even welding elements of up to 12 mm in diameter can be welded onto thin work pieces.

Generally speaking, welding elements with a compressed flange (in accordance with the current standards) are used. Compared to the shaft diameter, this forms an enlarged welding surface. Despite the presence of pores in the weld area, higher tensile forces can be transferred than are possible in the stud shaft.

11. Preparing the workspace and welding process



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.
- What is more, you must 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.



Risk of fire and explosion

- Remove all flammable objects and fluids from your working area.
- Make sure that no explosive substances are in the vicinity of the working area.
- Ensure that a fire extinguisher that fulfills the requirements is available in the workplace.



Risk of stumbling or falling

- Cables and connecting wires should be laid in such a way that they are protected from damage and
- that neither you or any third-party are likely to stumble or fall over them.



Warning of weld splashes

- Make sure that in the working area of the immediate vicinity, no objects are present that may be sensitive to weld splashes.
- If needed, any such objects may need to be removed.



Warning of electromagnetic fields

- Make sure that in the working area of the immediate vicinity, no objects are present that may be sensitive to magnetic fields.
- If needed, any such objects may need to be removed.



Hazard to life

- Make sure that air is able to circulate freely inside the power unit housing.
- Always stand the power unit on a stable, level and clean surface.
- Check the condition of all cables and cable connections.
- Any defective cables or cable connections must be repaired or replaced by a trained technician.

11.1. Surface preparation

- Remove
- paint, oil and other contaminants
- rust
- non-conductive covering layers (in the case of working materials with a treated surface)

from the surface to be welded and from the attachment points of the earth clips.

In this way, you will be able to ensure that the welded joints are as strong as possible.

• Only weld the welding element onto a smooth surface.

11.2. Checking the welding gun

• Check, whether the welding gun you intend to use is capable of being used with this particular power unit.

Only the following welding guns may be connected to the power unit:

- The A 12 welding gun for stud and bit arc-ignition welding
- Check that the stud or bit holder is correctly located on your welding gun.
- Check whether resilience and lift height are set according to the welding parameter table.



For details, please consult section 13 of this User Manual.

12. Connection



First prepare your workspace.

In this regard, read and observe the stipulations in item 11
 "Preparing the workspace and welding process".



Hazard due to electric current

• While connecting the cables, make sure that the power unit is switched off. That way, you will prevent yourself from accidentally activating the welding process.



Make sure that the cables are firmly connected.
 During the welding process, strong magnetic fields are created that cause the cables to be agitated. This may cause the cables to come away from their sockets.

12.1. Connecting the welding gun to the power unit



Connecting the welding current cable

- Plug the welding current cable into the corresponding plug connection of the welding unit.
- Push on the plug and turn it firmly to the right.



Connecting the control cable

- Plug the control cable into the corresponding plug connection of the welding unit.
- Turn the control cable union nut to the right.



The only type of connections that cause damage are connections that are loosely inserted.

• That is why it is important to check that a plug connection is firmly inserted at all times.

That way, you will prevent poor contact and prevent the plug connection from getting hot.

12.2. Earth connection



Connect earth cable

- Plug the earth cable into the corresponding plug connection of the welding unit.
- Push on the plug and turn it firmly to the right.



The only type of connections that cause damage are connections that are loosely inserted. That is why it is important to check that a plug connection is firmly inserted at all times. That way, you will prevent poor contact and prevent the plug connection from getting hot.



12.3. Changing the polarity of the welding gun



The welding location should be located half-way between the two earth clips.

12.4. Connecting the protection gas



- 1 Gas inlet of protection gas canister
- 2 Gas outlet

- Insert the gas hose of the protection gas supply system to the gas inlet of the power unit.
- Place the welding gun gas hose onto the gas outlet.
- Set the flow meter on the protection gas supply system to 10-16 liters/min.



The minimum flow rate for stud welding with protection gas is 10 liters/min. (The flow rate is measured with the valve open and gas flowing out)



During stud welding, a blend of protection gas defined under the DIN EN ISO 14175 is used.

• For this read the information on page 18 (protection gas recommendations).

12.5. Connecting the power unit to the mains



Hazard due to electric current and voltage

- Have an electrician check whether the socket to which you wish to connect the power unit has the required type of earth.
- Only connect the power unit to a mains with the same mains voltage as the one that can be found on the rating plate.
- Compare the power uptake displayed on the rating plate with the fuse of your mains.
- Check whether the power unit is switched off.
- First insert the plug into the socket provided.

13. Welding

First connect the power unit.

In this regard, read and observe the stipulations in *item 12 "Connection"*.

Hazard to life for wearers of pacemakers or implanted defibrillators

Hazard for particularly exposed workers as defined in 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.
- 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. These fields can compromise the function of pacemakers and harm pregnancies.

13.1. Activating the power unit

	1		 Activate the power unit, using the mains switch (1).
	Yellow	flashes quickly	when switching on: The capacitors are being charged. The unit is carrying out a self-test.
		flashes slowly	After the self-test the unit switches over to standby mode. The standby mode ends when the welding gun is operated or on contact between the workpiece and the welding gun. The unit then switches over to "Ready".
		illuminates	if the welding unit is ready for welding. After approx. 3 min the unit switches back to standby mode.
STOP	♦ Whe	n switching on the u	nit, do not place the welding gun on the workpiece –

When switching on the unit, do not place the welding gun on the workpiece otherwise the unit will not switch over to "Ready".

13.2. Determining the welding current and welding time

Establishing the welding time and current depends on, among other things

- the welding gun that is used
- the material from which the welding element is made -
- the diameter of the welding element
- the material from which the workpiece is made. _
- Use the appended parameter table to determine the values you need to set on the power unit to determine the welding time and welding current.



The welding parameters required for welding of aluminum studs according to **DIN EN ISO 13918** must be determined and checked by the user based on the material properties (differences in alloys) and the protection gas options used. Notes and recommendations for this can be found in **DIN EN ISO 14555.**



When **welding with protection gas** a longer time by around 10% is generally used. If you use the library mode, the values for welding current and welding time are automatically adapted to the welding process.

For alloy steels, a 10% lower current is generally selected.

The indicated values apply for welding in the PA welding position. When welding in welding position PC, the welding time must be reduced.

During short-cycle arc-ignition stud welding the welding time is below 100 ms. It not only depends on the stud diameter, but also on the current available:

(I in A = min. 100 x Ø in mm)

Without a welding backer, the welding time should be kept as short as possible. The welding energy is purely selected through the welding time.

13.3. Available settings

Setting the welding parameters

• To set the necessary welding parameters, you have the following options:



Basic settings

Adjustable welding parameters:

Welding current (A) and welding time (MS) directly via the two push/rotary knobs.



Protection gas

Selection or deselection of protection gas via the option "GAS" within the menu structure, setting of the gas pre- and post-flow time in the menu structure.

SYN Synergy

Synergy stud welding mode

Options which can be selected: "Easy" and "Professional" mode

Welding parameters which can be adjusted in the "Easy" mode:

- Properties of the welding element (stud type, diameter, material)

Welding parameters which can be adjusted in the "Professional" mode:

- Properties of the welding environment (welding position)
- Properties of the welding elements (stud shape: Standard/ISO/customer specific, stud type, diameter, material)
- Properties of the workpiece (material, surface, workpiece thickness)
- Properties of the welding process (protection gas/ceramic ring, welding according to standard: ISO/AWS/JIS, welding gun used, temperature of the workpiece)

MENU Program and system management

- Creating, saving and loading programs
- optional: Locking programs against changes
- Updates and special programs for creating documented welding instructions
- Changing system settings (workpiece counter, unit of measurement, language)



Adjustment of existing programs to customer specific conditions

Using the option "ADV" (advanced) stored programs can be adjusted and welding parameters documented.

Adjustable welding parameters:

- Properties of the welding gun (lift, protrusion, spring force)
- Starting current adjustment
- Process control

Fine adjustment of the welding parameters (starting current, welding current tolerance range).

13.4. Basic settings



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



- To do so turn a push/rotary knob to the right.
- To leave the display, turn a push/rotary knob to the left, until <<<EXIT appears in the display.
- Operate a push-/rotary knob to confirm this selection.

Setting the welding current



- First determine the required welding current.
- In this regard, read and observe the stipulations in item 13.2 "Determining the welding current and welding time".



• Now first set the required welding current (A) using the push/rotary knob.

Setting the welding time



- First determine the required welding time.
- In this regard, read and observe the stipulations in item 13.2 "Determining the welding current and welding time".



• Now first set the necessary welding time (MS) using the push/rotary knob.

13.5. Gas settings

13.5.1. Gas on/off

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

120	JOA	1500ms		
GAS ᠿ ↓	SYN (S)		<u>∎</u> 2.5 Å ∎ 1.6 D WM 6 Ų	

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

GAS K Aus 1.5s 1.5s Gas ein/aus

You can now select or deselect the option "GAS".

- To do so turn a push/rotary knob to the right. ("on") or left ("off").
- Operate a push-/rotary knob to confirm this selection.



- 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.







13.5.1.2. Setting the gas post-flow time

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

The "GAS" option is now shown in the display.

GAS 📕 On	1.0s	1 . 5s			
	$\overline{\mathbf{V}}$	$\hat{\mathbf{U}}$			
Gas post-flow time:					





14. A12 welding gun

In this section, you will find out how the welding gun is constructed and how you can make use of the various settings available.





The basic body of the welding gun consists of a stable, two-part plastic housing (2).

The control cable and the welding current cable (3) are led through the handle of the welding gun. On the front side of the welding gun are the welding iron and the union nut (6) that serve to accommodate and attach the bit holder or the manual stud holder. At the front end of the welding gun can be found the foot ring stand (5). Behind this is the adjustment for the lift setting (8), the turnable scale ring (7) and the resilience setting (1). At the front of the welding gun handle is the welding gun key (4) which triggers the welding process.

The serial number is embossed into the welding gun handle.

14.1. Setting the lift height

The scale ring for the lift is not fixed and can be moved. When the device is in the correct basic setting, the "0" value will be aligned with the middle of the rating plate sticker. Before commencing work, please check that the scale ring is in the correct position.



Pull the settings wheel backwards out of its locked position. Now you can set the settings wheel to the required lift by turning it counter-clockwise in steps of 0.2 mm. (The empty range between 0 and 0.2 is used for the mechanical compensation of the lift ring construction). No move the settings wheel forwards again and return it to the locked position. The lift settings range from 0 to 4 mm.

Lift for the welding on of aluminum bits and studs

For welding on aluminum bits and studs a value of 1.4 is recommended (see parameter list).

14.2. Setting the resilience / adjusting the resilience scale

Turn the settings wheel to the selected reference value in order to determine the effective initial resilience.

You are able to change the resilience on an individual basis, according to your welding task.

Turning the settings wheel clockwise reduces the initial resilience of the welding iron.

Turning the settings wheel counter-clockwise increases the initial resilience of the welding iron. The reference point for resilience is the white line on the scale ring.



Important!

The maximum number of turns of the settings wheel is one (1) turn. The application of force in cases where the wheel resists movement may cause the mechanical failure of individual components.

When welding on aluminum bits, the resilience should be set to a value of 6. In the case of stud welding, guideline values and the welding parameters, such as the welding current and welding time that need to be set can be found in section 13.3.




15. Aluminum bits technology

Using the welding unit, aluminum bits can be welded on quickly and with a high degree of processing certainty. If the system is operated correctly, an excellent surface weld with high tensile strength will be obtained.

15.1. Arc-ignition bit and stud welding

Using the CMA-1200 welding unit, Miracle aluminum bits, aluminum studs and metallic studs of different diameters can be welded on. What follows below is an explanation of the technology that is used - art-ignition stud welding.

The front surface of a bit or a stud-type element and the opposing surface of the workpiece are melted off using an electric arc and then jointed.

The process is suitable for welding entire surfaces of connecting elements, mainly for pin-shaped metallic components onto metallic workpieces.

Arc-ignition welding

The CMA-1200 welding unit utilizes the process of light "electric arc stud welding with arc ignition" in accordance with the current standard (see Annex). The standard assigns this process, which involves the joining of pin-shaped components with flat-surfaced workpieces to the category of electric arc pressure welding.

Jointing occurs while the welding zone is in a plastic or liquid state. The process can be carried out mechanically using the bit welding gun or the stud welding attachment.

For welding on bits, the earth clamps are clamped onto the workpiece, and the cables are connected into the socket "earth" of the welding unit. For welding on studs, the earth clamps are clamped onto the workpiece, and the cables are connected into the socket "gun" of the welding unit ("polarity reversed").

The welding element is manually inserted into the stud holder of the welding gun or welding head manually and applied to the workpiece (see picture, item 1).



When activating the welding gun key, the welding process will begin automatically, as follows:

- The protection gas is set to pre-flow in accordance with the pre-flow time set (only when protection gas is being used to protect the weld pool)
- 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 light arc (see image, item 2).
 After that, the main electric arc is created between the surface of the welding element and the workpiece.
- The main electric arc will burn at the welding current that was set and for the welding time pre-selected on the power unit. The welding energy selected must be in keeping with the welding element selected. Due to the effects of the electric arc, the surface of the welding element and the workpiece are melted together (see image, item 3).
- Once the set welding time has elapsed, the welding element will be mechanically moved towards the workpiece.
 When inserted into the molten metal, both melt areas will be united and will set hard. Once the welding element and workpiece come into contact with one another, the electric arc will be extinguished as a result of the short circuit and the main current will be turned off. The protection gas continues to flow as per the post-flow time set.
- The melt area will go hard and cool off. The welding element has been fully welded to the workpiece (see image, item 4). Once the welded workpiece has cooled, the welding gun can be carefully pulled away from the welding element.



15.2. Short-cycle stud welding with protection gas

Stud welding with protection gas is used welding elements with a diameter of 3 - 12 mm (nominal diameter, not including the flange). The welding times used will be from 5 - 1500 ms.

As a result of the short welding times, the amount of heat generated in the melt area is so small, the even welding elements of up to 10 mm in diameter can be welded onto thin work pieces. Generally speaking, welding elements with a compressed flange are used. Compared to the shaft diameter, this forms an enlarged welding surface. Despite the presence of pores in the weld area, higher tensile forces can be transferred than are possible in the stud shaft.

16. Welding on of aluminum bits

16.1. Converting the welding gun in order to weld aluminum bits



- Deploy the stand, align it and secure it using the three Allen screws
- Slide the bit holder into the welding gun and tighten the nut (not too tightly)
- Connect the protection gas pipe.
- Insert a bit into the bit-holder the end with the pulling eye is inserted first
- Set the stand (as described in 16.3)

16.2. Inserting the bits

Insert a bit into the bit-holder. The end with the pulling eye must be at the back. The bit needs to be inserted until it engages. The holder can be used for all types of bit of between 1.0 mm and 2.0 mm.

Important: Make sure that the stamped side of the bits points upwards.

16.3. Setting the welding gun stand

1. Opening

Turn the handle of the stand clockwise in order to open the stand.

2. Setting the height

Stand the gun vertically on the sheet metal and set the stand in such a way that its tip touches the upper surface. It is important to make sure that the stand is only placed on top and not pressed into place.

3. Tightening

Lock the stand by turning the handle counter-clockwise.

The insertion measurement of 2 mm is ensured by means of the limit stop.









16.4. Flushing the protection gas pipe

Before the first welding operation, briefly activate the trigger on the welding gun. The protection gas will start to flow. This will ensure that sufficient protection gas will be in the supply pipe when the first item is welded. If you have been working for a long time and take a break from your work, you could repeat this action before resuming work again.

16.5. Attaching the gun

Place the welding gun vertically onto the workpiece and press the gun so firmly against the workpiece that sufficient pre-tension is achieved.

- Hold the welding gun firmly, calmly and straight.
- Make sure that no metallic components are touching the welding gun.
- During welding, the blue gas hose must be left free and must not be enclosed in your hand, as the lift may otherwise be affected.

16.6. Commencing the welding process

- Then press the button on the welding gun.
- The welding process will be activated.
- Once the gas pre-flow time has elapsed, welding will take place.

The welding process can only be set in motion, if the welding circuit has been completed, in other words, if the welding element has made electrical contact with the workpiece.

- The gas continues to flow as per the post-flow time set.
- Pull the welding gun vertically upwards to remove it from the bit that has been welded on.

You can then insert a new bit into the holder and repeat the welding process.



16.7. Miracle aluminum bits

The Miracle aluminum bits are welded to the bare metal using the special welding gun. Depending on the aluminum alloy used to make the bodywork and the type of damage that has occurred, a variety of bits may be used.

16.8. Material and construction

The Miracle aluminum bits are available in 14 different versions:

ltem no.	Description	Material	Strength	Version	Numbering	No. in pack
CMA-130-s	Aluminum bits	AlSi	1 mm	straight	1/1.0	50 units
CMA-130-r	Aluminum bits	AlSi	1 mm	turned	1/1.0	50 unit
CMA-131-s	Aluminum bits	AlSi	1.5 mm	straight	1/1.5	50 units
CMA-131-r	Aluminum bits	AlSi	1.5 mm	turned	1/1.5	50 units
CMA-132-s	Aluminum bits	AlMg3	1 mm	straight	2/1.0	50 units
CMA-132-r	Aluminum bits	AlMg3	1 mm	turned	2/1.0	50 units
CMA-133-s	Aluminum bits	AlMg3	1.5 mm	straight	2/1.5	50 units
CMA-133-r	Aluminum bits	AlMg3	1.5 mm	turned	2/1.5	50 units
CMA-134-s	Aluminum bits	Al 99.5	1 mm	straight	3/1.0	50 units
CMA-134-r	Aluminum bits	Al 99.5	1 mm	turned	3/1.0	50 units
CMA-135-s	Aluminum bits	Al 99.5	1.5 mm	straight	3/1.5	50 units
CMA-135-r	Aluminum bits	Al 99.5	1.5 mm	turned	3/1.5	50 units
CMA-136-s	Aluminum bits	Al 99.5	2.0 mm	straight	3/2.0	50 units
CMA-136-r	Aluminum bits	Al 99.5	2.0 mm	turned	3/2.0	50 units



Straight bits

The standard version for normal working



Turned bits

Pulling at the edges and increased stability as a result of improved longitudinal pulling. Optimum distribution of forces along the pulling edge by reducing lateral forces.

16.9. Removal/separation of aluminum bits

Using special pliers, the welded-on aluminum bits are cut off very short. The benefit of this is that very little sanding work is required and no material will be removed unnecessarily. Once the bits have been removed and assuming no further pulling is required, preparations for painting can begin.

16.10. Labeling

The bits are embossed with 2 numbers.

The first number denotes the material - 1 stands for AlSi, 2 for AlMg3 and 3 for pure aluminum AI 99.5. The second number denotes the strength of the material. Bits with a strength of 2.0 mm are capable of withstanding higher tensile forces and are used on items such as sills.

The material to be selected will be determined in accordance with the material of which the panels being aligned are constructed. Generally speaking, it is advisable to begin with Al 99.5% (no. 3). If the weld proves to be unsatisfactory, please try selecting a different material. AlMg3-Bits are suitable for higher tensile forces.



17. Stud welding using the CMA-1200

The CMA-1200 is not only capable of welding aluminum bits, but also studs and threaded studs made from steel or aluminum.

A typical application for stud welding when repairing aluminum panels is for the welding on of threaded studs for the removal of blind screws or threaded studs that have sheared off.



17.1. Set of accessories for stud welding

Supplied with your welding unit is a set of accessories for stud welding. The set consists of a gas jet holder with protection gas pipe - the protection gas pipe L = 42, 48, 58 mm and the stud holder 4 / 5 / 6 / 8 / 10 mm - 3 / 12 mm are available as options.

Stud holders	Item no.
12 mm	CMA-184
10 mm	CMA-176
8 mm	CMA-175
6 mm	CMA-172
5 mm	CMA-171
4mm	CMA-170
3 mm	CMA-168

		6		6		ß
5	3	5	50			

P	
0	

Protection gas pipes
L = 42 mm for 3/4 / 5 / 6 mm
L = 48 mm for 8 mm

Protection gas pipes	ltem no.
L = 42 mm for 3/4 / 5 / 6 mm	CMA-177
L = 48 mm for 8 mm	CMA-175-1
L = 58 mm for 10/12 mm	CMA-176-1

17.2. Converting the welding gun for stud welding



- Attach the gas jet holder and secure it using the three Allen screws.
- Connect the protection gas pipe.
- Insert the stud in the stud holder and set the stop screw in such a way, that the stud to be welded has a thread projection of 2 mm, and tighten the nut of the stop screw (not too tight). Slide the stud holder with the stud into the welding gun and tighten the nut hand tight.
- Place the gas nozzle onto the contact surface of the gas nozzle holder and pull the stud holder out or push it in, until the welding surface of the stud projects by 2 mm versus the gas nozzle.
- Tighten the nut on the welding gun (not too tight) and screw the gas nozzle onto the gas nozzle holder.
- Verify that the welding surface of the stud projects by 2 mm versus the gas nozzle only in this way can the correct pre-tension for the defined liftoff be guaranteed.



17.3. Converting the welding gun for welding on machine studs

- Attach the gas jet holder and secure it using the three Allen screws.
- Connect the protection gas pipe.
- Place a stud in the stud holder and set the stop screw in such a way that the stud to be welded has a thread projecting by 2 mm and tighten the nut on the stop screw (not too tight) - for stud holders without a stop screw, insert the stud into the stud holder as far as it will go. Slide the stud holder with the stud into the welding gun and tighten the nut hand tight.
- Place the gas nozzle onto the contact surface of the gas nozzle holder and pull the stud holder out or push it in, until the welding surface of the stud projects by 2 mm versus the gas nozzle.
- Tighten the nut on the welding gun (not too tight) and screw the gas nozzle onto the gas nozzle holder.
- Verify that the welding surface of the stud projects by 2 mm versus the gas nozzle only in this way can the correct pre-tension for the defined liftoff be guaranteed.

17.4. Converting the welding gun for welding on T-studs



- Attach the gas jet holder and secure it using the three Allen screws.
- Connect the protection gas pipe.
- Place the T-stud in the stud holder. Slide the stud holder with the stud into the welding gun and tighten the nut hand tight.
- Place the gas nozzle onto the contact surface of the gas nozzle holder and pull the stud holder ut or push it in, until the welding surface of the stud projects by 2 mm versus the gas nozzle.
- Tighten the nut on the welding gun (not too tight) and screw the gas nozzle onto the gas nozzle holder.
- Verify that the welding surface of the stud projects by 2 mm versus the gas nozzle only in this way can the correct pre-tension for the defined liftoff be guaranteed.

18. Welding on of studs

- Place the stud inside the holder.
- Place the gun vertically on top of the workpiece.
- Firmly press the welding gun against the workpiece with both hands, until the welding gun attachment (spacer device) is sitting evenly on top of the workpiece.
- Hold the welding gun firmly, calmly and straight.
- Make sure that no metallic components are touching the welding gun
- Then press the button on the welding gun.
- Activate the trigger on the welding gun.

The welding process will be activated.



The welding process can only be set in motion, if the welding circuit has been completed, in other words, if the welding element has made electrical contact with the workpiece.



Once welding is complete, pull the welding gun vertically up from the welding element. If you pull the welding gun away at an angle, you will stretch the stud holder, thereby reducing its service life.

You can then insert a new welding element into the stud holder and repeat the welding process as described.



18.1. Converting the welding gun for the welding of tension studs



- Attach the gas jet holder and secure it using the three Allen screws
- Connect the protection gas pipe.
- Slide the stud holder into the welding gun and tighten the nut (not too tightly).
- Screw on the gas jet. The correct overlap of the stud will have been achieved if you have fully inserted the stud holder and have screwed on the gas jet until it engages.
- For this application only use the stainless steel studs produced by our company

18.2. Long stud holder and long protection gas pipe

CMA-178	Stud holder, long, 4 mm
CMA-179	Stud holder, long, 5 mm
VAS 852 001/4	Stud holder, long, 6 mm

CMA-178-1 Protection gas pipe, long, 110 mm (for the CMA-178, CMA-179 and VAS 852 001/4 long stud holder)



18.3. Changing the polarity of the welding gun



This illustration shows the welding unit with inserted connector cables for welding on bits.

This illustration shows the welding unit with inserted connector cables for welding on studs ("polarity reversed").

R

For stud welding, apply both earth cables to the workpiece, so as to obtain a more effective earthing and to preclude any problems during welding, as a result of any blowing effect.

18.4. Carrying out the welding process

• First set the required welding time.

In this regard, read and observe the stipulations in item 13.4 "Setting the welding time".



First set the required welding current.

In this regard, read and observe the stipulations in *item 13.4 "Setting the welding current"*.



Hazard due to electric shock and electric arcing

- During the welding process never touch the welding elements, the stud holder, the union nut or any electrically conductive parts in the vicinity of these.
- All of those components will be electrically live.
- During the welding process, never wear metallic items of jewelry, or a wristwatch.

That way, you will avoid injuries and damage caused by electrical current or electromagnetic fields.



Hazard due to electric shock and electric arcing

- Stand on an insulated surface if welding under any of the following conditions:
- In confined spaces constructed from electrically conductive walls
- In restrictive situations between or against electrically conductive components
- In areas allowing only limited movement on electrically conductive components
- In damp, wet or warm spaces.



Hazard due to deflagration of explosive gases and substances

- Never weld in spaces, in which a risk of explosion exists.
- Never weld onto hollow bodies that contain, or have contained, substances that
- are flammable or promote combustion,
- may emit gases, vapors or suspended matter that are harmful to health.
- may cause explosions.

Any such tasks may only be carried out by a specialist, trained technician.

Never carry out work of this type if you have not received suitable specialist training.



Risk of fire or burns due to red-hot welding splashes

- Wear your personal protection equipment and
- your protective eyewear with a category 2 protective lens.
- Wear protective headgear if welding above your head.
- Before commencing welding, remove all flammable objects and fluids from the vicinity of the workplace.
- Ensure that a fire extinguisher that fulfills the requirements is available in the workplace.
- Always follow your work instructions and the relevant accident prevention rules.

Red-hot splashes of weld and fluids occur during the welding process.



Hazard due to noise

- While welding, you should wear hearing protectors.
- Always follow your work instructions and the relevant accident prevention rules.
- Before commencing work, inform staff working in the immediate vicinity of the work to be undertaken.

A bang measuring > 90 dB (A) may occur during welding.



• Ensure that the welding gun was prepared in accordance with the User Manual.

- Check whether a welding element has been inserted into the welding gun.
- If necessary, insert the welding element yourself.
- Place the welding gun vertically onto the workpiece, as soon as the power unit is ready for welding.
- Firmly press the welding gun against the workpiece with both hands, until the welding gun attachment (spacer device) is sitting evenly on top of the workpiece.
- Hold the welding gun firmly, calmly and straight.
- Make sure that no metallic components are touching the welding gun.
- Now press the key on the welding gun.
- The welding process will be activated.



Once welding is complete, always pull the welding gun vertically up from the welding element.

If you pull the welding gun away at an angle, you will stretch the stud holder, thereby reducing its service life.



Hazard of burns

During the welding process, the head of the welding gun will become extremely hot. The same thing applies to the element being welded on, as well as to the workpiece itself.

• Wear your personal protection equipment.



- On each occasion, use only welding elements from a single batch.
- Strictly ensure that different batches are not mixed.
- After changing batches, carry out further test welding.

The smallest changes of geometry, especially at the tip of the welding elements, will require different settings to be specified for the welding process.



- Check the quality of the welded joint immediately, before inserting a new welding element and repeating the welding process.
- To that end, proceed in accordance with *item 19 below*.

19. Testing the quality of the welded joint

You can determine the quality of the welded joint by means of:

- status displays and messages appearing on the display of the welding unit
- A visual check
- A torque test
- Macrosection and hardness test and
- tensile test.

The number of and/or the method used when carrying out tests, in addition to the acceptance criteria, can be derived from the current standard governing the quality requirements.

19.1. Quality testing – arc-ignition stud welding

19.1.1. Carrying out a visual check

The criteria are:

- The viability of the thread
- The evenness of the welding bead
- Splashes and
- Porosity
- Carry out the visual check on all welded elements.

A VISUAL CHECK				
SUITABILITY		POSSIBLE CAUSE	CORRECTIVE MEASURES	
	The welding bead is even, shiny and sealed. The length of the welding element is within tolerance after welding.	Correct settings	None	
	Contraction at the weld Welding element too long	Insertion measurement or lift too short	Increase insertion measurement; check the lift and the centering of the ceramic ring	
		Welding energy too high	Reduce current and/or time	
		Ceramic ring not centered	Check centering	
		Damping effect too strong	Reduce damping effect	
	Weakly formed, uneven welding bead	Welding energy too low	Increase current and/or time	
	Welding element too long	Ceramic ring is damp	Dry ceramic rings in oven	
		Lift is too low	Increase lift	
	Welding bead is one-sided	Blowing effect	See "Blowing effect"	
	Undercutting	Ceramic ring not centered	Check centering	
	Welding bead low, surface glowing with	Welding energy too high	Reduce current and/or time	
	pronounced spatters Welding element too short	Insertion speed too high	Adjust insertion measurement and/or damping	

19.1.2. Carrying out a bending test

A bending device with inserts for welding elements of various diameters is available for purchase.

The bending test serves as a simple working test and as an approximate means of testing the welding parameters selected. The welded joint is therefore subjected to an undefined bending load.



- 1 Welding element
- 2 Welded joint
- Attach the bending device onto the welding element (1) and



Bend the welding element (1) once to an angle of 60° in any direction.

The bending test will have been completed successfully, if no cracks or breaks can be observed inside the welding area.



• It is not necessary to test all welding elements.

It is sufficient if you carry out spot checks on a number of welding elements during the course of routine testing.

 BEND TESTING/FRACTURE TESTING

 NATURE OF FRACTURE
 POSSIBLE CAUSE
 CORRECTIVE MEASURES

 Detachment of basic material
 Correct settings
 None

	Fracture above the weld bead following sufficient deformation	Correct settings	None
(10,00,00) (10,00,00,00) (10,00,00,00,00) (10,00,00,00,00,00) (10,00,00,00,00,00,00,00,00,00,00,00,00,0	Fracture in the weld Large quantity of pores	Welding energy too low Contaminated surface Working material not suitable for stud welding	Increase current and/or time Clean Select a suitable working material
	Fracture in the weld area Surface of break is shiny.	Welding time too short	Extend welding time

If the strength of the welded joint is insufficient:

- Check the settings in the welding unit.
- Check whether the surfaces of the welding elements and the workpiece are clean and electrically conductive.

These must be free of scale, oil, paint and oxide deposits.

- Grind the hardened surfaces of the workpiece (e.g. rolling hardening areas).
- Check whether the welding iron in the welding gun will move freely.

19.2. Optimizing the welding parameters

First, check the settings in the welding gun.
Then check the welding time and welding current settings.

19.3. Blowing effect and remedies

A blowing effect can sometimes occur if the earth connection is asymmetrical, if the distribution of materials is different or when welding at the edge of a workpiece. This is caused by an undesirable diversion of the electric arc. This results in the melting of the stud material on one side, an increase in pore-formation and undercuts in the welding area.

The blowing effect is proportional to the strength of the current and can be compensated for by ensuring that the earth clips are attached symmetrically, by connecting compensatory earths or (in the case of welding guns with an external welding cable) by turning the welding gun around the vertical axis.



20. Fault detection and rectification



Hazard due to insufficiently qualified operating personnel

• Only carry out the tasks described here on your welding unit or stud welding gun.

- Repairs may only be carried out by qualified personnel.
- For further information, please contact your specialist dealer or your maintenance department.

FAULTS	POSSIBLE CAUSE	FAULT TRACING	RECTIFYING FAULTS	IMPLEMENTATION
Mains switch does not remain in position 1	Mains switch is faulty	Check mains switch*)	Replace mains switch*)	Specialist trained personnel
	Mains cable faulty	Check mains cable for breaks*)	Replace mains switch*)	Specialist trained personnel
No mm display	No earth connection	Check workpiece earth connection	Attach earth connection correctly	Instructed personnel
	Stud welding gun not connected	Check gun connection	Connect stud welding gun correctly	Instructed personnel
	Transfer resistor (between stud and workpiece) too	Check workpiece surface	Clean and sand workpiece surface	Instructed personnel
	high Break in earth cable	Check earth cable*)	Replace earth cable*)	Specialist trained personnel
	Stud welding gun cable break	Check welding gun cable*)	Replace welding gun cable*)	Specialist trained personnel
No display	Fault in welding gun connec- tion line of stud welding gun	Check whether connection line is working correctly*)	Replace connection line*)	Specialist trained personnel
	Welding gun start button faulty	Press start button and test control cable for continuity*)	Replace welding gun start button*)	Specialist trained personnel
	Cable break in control line	Test control cable for continuity*)	Replace control cable*)	Specialist trained personnel

FAULTS	POSSIBLE CAUSE	FAULT TRACING	RECTIFYING FAULTS	IMPLEMENTATION
Continuous yellow 🖁	Welding sequence too high	Welding unit resets itself	Allow switched on welding unit to cool down	Instructed personnel
Stud welding gun will not lift up despite and	No lift has been set	Check the welding gun settings	Change parameters set	Instructed personnel
mm	Short-circuit in the magnetic circuit of the stud welding gun	Measure resistance value at pin 1 and pin 2 on the control cable plug (18 Ω to 22 Ω)*)	Replace control cable plug, control cable and arc magnet*)	Specialist trained personnel
	Arc magnet faulty	Measure arc magnet (18 Ω to 22 Ω)*)	Replace arc magnet*)	Specialist trained personnel
Air shot not possible	Break in magnetic circuit	Measure resistance value at pin 1 and pin 2 on the control cable plug (18 Ω to 22 Ω)*)	Replace arc magnet or control line*)	Specialist trained personnel
No protection gas	Protection gas not connected	Check protection gas connection	Connecting the protection gas	Instructed personnel
	Protection gas control not activated	Test protection gas control is activated	Activate protection gas control	Instructed personnel
	Protection gas valve faulty	Test protection gas valve*)	Replace protection gas valve*)	Specialist trained personnel



Tasks labeled *) may only be carried out by specialist electricians!

- Please contact our service department, if none of the measures named above proves successful.
- When sending in the power unit, please use our repair form at http://www.carbon.ag/unternehmen/service-reparaturen/.

21. 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></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

22. Decommissioning

- Switch off the power unit.
- Pull out the mains plug.
- Disconnect the control cable and the welding cables from the welding unit.
- Protect the welding unit and its components against penetration by liquids or foreign bodies.

23. Care and maintenance

Hazard due to electric current and voltage



- Always switch off the power unit before any care is carried out.
- Pull out the mains plug.



Hazard due to insufficiently qualified operating personnel

- Only carry out the tasks described here on your power unit.
- Repairs may only be carried out by qualified personnel.
- For further information, please contact your specialist dealer or your maintenance department.

23.1. Cleaning

- Clean the surface of the power unit if needed, using a slightly damp cloth.
- Add some household washing-up liquid to the cleaning water.



Do not use solvents for cleaning purposes.

Solvents may damage the surface of your power unit.

23.2. Checking and testing

- Check the condition of the mains cable.
- If any damage is found, please inform your specialist dealer or maintenance department.
- Before each use, check whether the displays on the power unit are still legible.
- Clean the display and keyboard whenever they become dirty.

• Replace any labels that have been removed or damaged:

A pull out the plug before opening the device openi



Follow the instructions in the User Manual



Warns of hazardous electrical current

24. Storage

- When not being used, store the power unit in a secure and dust-free location.
- Protect the power unit from moisture and contamination from metals.



• Only store the power unit in the ambient conditions described below.

Storage temperature: -5°C to +50°C

Relative air humidity: 0 % - 50 % bei +40 °C 0 % - 90 % bei +20 °C

25. Disposal



• Only dispose of your power unit using the manufacturer's scheme or by using a specialist disposal company.

• Never dispose of your power unit in the household waste collection.

26. EC Declaration of Conformity

EC Declaration of Conformity

according to Directive 2006/42/EC, Annex II 1 A

(Original EC Declaration of Conformity)

The manufacturer

Carbon GmbH Haldenhöfe 3 78253 Eigeltingen-Heudorf Tel. +49 7465 466 Fax +49 7465 2217,

hereby declares that the following product

Stud welding unit
CMA-1200
191XXXX
2019

meets all applicable provisions of the above-mentioned directive, including any modifications applicable at the time of this declaration.

The product complies with the following additional EU directives, including any modifications applicable at the time of this declaration:

"Low voltage" 2014/35/EU "Electromagnetic compatibility" 2014/30/EU "Restriction of the use of certain hazardous substances in electrical and electronic equipment" 2011/65/EU

The following harmonized standards (or parts thereof) were applied:

DIN EN 60974-1	Arc welding equipment - Part 1: Welding power sources
DIN EN 60974-10	Arc welding equipment - Part 10: Requirements for electromagnetic compatibility (EMC)
DIN EN 60204-1	Safety of machinery - Electrical equipment of machines; Part 1

The following national standards and other specifications (or parts thereof) were applied:

VDE 0544-1

Person who is part of the organization and is duly authorized to compile the technical documentation:

Name: Edeltraud Holle

Address: see manufacturer

Hole

Eigeltingen, 02.02.2019 Place of issue, date

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AKTIENGESELLSCHAFT

User Manual

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



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

i

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.

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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



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 x t X 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.



Welding current tolerance



To more easily set the start parameters, a recommended value of ±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.

R

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.



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.

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



- 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.



Gas post-flow time:

- 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.





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.

12	JŪÅ	1500ms				
GAS 介 - 八	SYN		<u>∎</u> 17 Ĥ ∎ 2.0 D WW 6 U			

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.



STUD T	YPE			DIAMETER (WELDING AREA)
				(metric)
DD ¹⁾	Û	DD_CF ²⁾	Ş	M6 to M16
PD ¹⁾	U	PD_CF ²⁾	Ş	M6 to M16
RD ¹⁾	IJ	RD_CF ²⁾	Ē	M6 to M16
UD ¹⁾	\bigcup	UD_CF ²⁾	\bigvee	6 mm to 14.6 mm
ID ¹⁾	\bigcup	ID_CF ²⁾	\bigvee	M6 to M10
SD ¹⁾	\bigcup	SD_CF ²⁾	\bigcup	10 mm to 13 mm
PS	Ē	PT		M3 to M10
US	\bigcup	UT	Ļ	3 mm to 8 mm
IS	$\overline{\frown}$	IT	Ļ	M3 to M6

The following selection options are available:

 $^{1)}$ 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	s		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 ≤ 7 μm	

Galvanic surface ≤ 7 µm

Workpiece thickness:



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

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

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



Ceramic / welding with ceramic ring

РА
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:



Process control:



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:

- 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 transition voltage



• Set the tolerances for the transition voltage.

Set the resistance of the circuit



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

Welding gun:



Temperature of the workpiece:



You can move to the next selection window using the

 Now select the welding element according to your welding task:



Folgende Auswahlmöglichkeiten stehen zur Verfügung:



STANDARD STUDS							
- Stud type				- Diameter (Welding area)			
				metric: Ø / in or imperial: Ø / 1"			
DD 1)	<u>e</u>	DD_CF ²⁾	I	M6 to M16			
PD 1)	U	PD_CF ²⁾	U I	M6 to M16			
RD 1)	U	RD_CF ²⁾	Ę	M6 to M16			
UD ¹⁾	\bigvee	UD_CF ²⁾	\bigvee	6 mm to 14.6 mm			
ID 1)	\bigvee	ID_CF 2)	\bigvee	M6 to M10			
SD ¹⁾	\bigcup	SD_CF ²⁾	\bigvee	10 mm to 13 mm			
PS	Ē	PT	單	M3 to M10			
US	\bigcup	UT		3 mm to 8 mm			
IS	\bigcup	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	$\mathbf{\nabla}$	Ø		
ISO-2	Ř		B	
ISO-3	\bigvee	(Basis: Ø):	(Basis: area):	
ISO-4			<u> </u>	
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	$\mathbf{\nabla}$			
C2	R			
С3	\checkmark	(Basis area)		
C4		0.8 mm ² to 193.5 mm ²		
С5				

- Stud material and base material - combination options:

STUD MATERIAL:			ATERIAL:	BASE MATERIAL:		
Г			4.8 (5235) / Steel 5.8 / Steel 6.8 / Steel 8.8		Steel S235 / Steel S355 / DC01, Usibor	
	s		16Mo3		16Mo3	
`			A2-50 (1.4301)		1.4301	
7		-	A4-50 (1.4571)		1.4541 / 1.4571	
			AIMg3 (5754), AIMg4.5, Al99.5, AlSi12		AlMg3, AlMg4.5, Al99	

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

R

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

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



Left and triggering

• 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.



ACTUAL welding current ACTUAL Welding time ACTUAL welding voltage Number of the weld

Welding sample

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





2

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

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.



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



This reference weld has not been carried out yet.



This reference weld has not been carried out yet.

- R
- 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 <u>both push/rot</u>ary 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 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 I 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.
- ◆ 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 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.





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 counter arrow you can exit the "COUNTER" mode.



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.





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.



Delete

job

USB menu

Unit

Settings

Language

Load job

- 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.

Back

Back

Save job

520

Counter

Standardisa-

tion

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 D
- 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 □. ↓



• 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:



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)

1

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



This reference weld has not been carried out yet.



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:

120	JØÅ	150	Oms
!619 A !32.9 V 193ms			
GAS	SYN	MENU	<u> </u>
IL IL			1.6
\sqcup \lor		528	WW 10 🔱

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></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		

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