Operating instructions

EN

Welding machine

Pico 200 cel puls

099-002130-EW501 | Observe additional system documents! | 09.09.2024

General instructions

⚠ WARNING

Read the operating instructions!

The operating instructions provide an introduction to the safe use of the products.

- Read and observe the operating instructions for all system components, especially the safety instructions and warning notices!
- Observe the accident prevention regulations and any regional regulations!
- The operating instructions must be kept at the location where the machine is operated.
- Safety and warning labels on the machine indicate any possible risks.
  Keep these labels clean and legible at all times.
- The machine has been constructed to state-of-the-art standards in line with any applicable regulations and industrial standards. Only trained personnel may operate, service and repair the machine.
- Technical changes due to further development in machine technology may lead to a differing welding behaviour.

In the event of queries on installation, commissioning, operation or special conditions at the installation site, or on usage, please contact your sales partner or our customer service department on +49 2680 181-0.

A list of authorised sales partners can be found at www.ewm-group.com/en/specialist-dealers.

Liability relating to the operation of this equipment is restricted solely to the function of the equipment. No other form of liability, regardless of type, shall be accepted. This exclusion of liability shall be deemed accepted by the user on commissioning the equipment.
The manufacturer is unable to monitor whether or not these instructions or the conditions and methods are observed during installation, operation, usage and maintenance of the equipment.

An incorrectly performed installation can result in material damage and injure persons as a result. For this reason, we do not accept any responsibility or liability for losses, damages or costs arising from incorrect installation, improper operation or incorrect usage and maintenance or any actions connected to this in any way.

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The content of this document has been prepared and reviewed with all reasonable care. The information provided is subject to change; errors excepted.

Data security

The user is responsible for backing up data of all changes from the factory setting. The user is liable for erased personal settings. The manufacturer does not assume any liability for this.

1 Contents

1 Contents ... 3
2 For your safety ... 7
2.1 Notes on using these operating instructions ... 7
2.2 Explanation of icons ... 8
2.3 Safety instructions ... 9
2.4 Transport and installation ... 12
3 Intended use ... 14
3.1 Applications ... 14
3.2 Software version ... 14
3.3 Documents which also apply ... 14
3.3.1 Warranty ... 14
3.3.2 Declaration of Conformity ... 14
3.3.3 Welding in environments with increased electrical hazards ... 14
3.3.4 Service documents (spare parts and circuit diagrams) ... 14
3.3.5 Calibration/Validation ... 14
3.3.6 Part of the complete documentation ... 15
4 Machine description – quick overview ... 16
4.1 Front view / rear view ... 16
4.2 Machine control – Operating elements ... 18
4.2.1 Overview of control sections ... 18
4.2.1.1 Control section A ... 19
4.2.1.2 Control section B ... 20
4.3 Operating the machine control ... 21
4.3.1 Main screen ... 21
4.3.2 Welding parameter setting in the operation sequence ... 21
4.3.3 Setting advanced welding parameters (Expert menu) ... 21
4.3.4 Changing basic settings (machine configuration menu) ... 21
5 Design and function ... 22
5.1 Transport and installation ... 22
5.1.1 Transport belt ... 22
5.1.1.1 Adjusting the length of the carrying strap ... 22
5.1.2 Ambient conditions ... 23
5.1.3 Machine cooling ... 23
5.1.4 Workpiece lead, general ... 23
5.1.5 Dirt filter ... 23
5.1.6 Notes on the installation of welding current leads ... 24
5.1.7 Mains connection ... 24
5.1.7.1 Mains configuration ... 25
5.1.8 Protective flap, welding machine control ... 26
5.1.9 Wear part compartment ... 26
5.2 MMA welding ... 27
5.2.1 Connecting the electrode holder and workpiece lead ... 27
5.2.2 Setting welding procedure ... 27
5.2.3 Hotstart ... 27
5.2.3.1 Hotstart current ... 28
5.2.3.2 Hotstart time ... 28
5.2.4 Arcforce ... 28
5.2.5 Antistick ... 29
5.2.6 Average value pulse welding ... 29
5.2.7 Arc length restriction (USP) ... 30
5.2.8 Expert menu (MMA) ... 30
5.3 TIG welding ... 31
5.3.1 Connecting a TIG welding torch with rotating gas valve ... 31
5.3.2 Shielding gas supply (shielding gas cylinder for welding machine) ... 32
5.3.2.1 Pressure regulator connection ... 32
5.3.3 Setting welding procedure ... 32
5.3.4 Arc ignition ... 33
5.3.4.1 Liftarc ... 33

5.3.5 Operating modes (functional sequences) ... 33
5.3.5.1 Explanation of symbols ... 33
5.3.5.2 spotArc ... 34
5.3.6 TIG antistick ... 34
5.3.7 Pulse welding ... 35
5.3.7.1 Average value pulse welding ... 35
5.3.7.2 Automated pulses ... 35
5.3.8 RTF 1 foot-operated remote control ... 36
5.3.8.1 Response ... 36
5.3.8.2 Start program ... 37
5.3.9 Expert menu (TIG) ... 37
5.4 Remote control ... 39
5.4.1 RTF-X TIG 19Pol ... 39
5.4.2 RTF-X TIG BT ... 39
5.4.3 RTF1 19POL ... 39
5.4.4 RT1 19POL ... 39
5.4.5 RTG1 19POL ... 39
5.4.6 RTA PWS2 ... 39
5.5 Access control ... 40
5.6 Arc length restriction (USP) ... 40
5.7 Machine configuration menu ... 41
5.7.1 Selecting, changing and saving parameters ... 41
6 Maintenance, care and disposal ... 43
6.1 General ... 43
6.1.1 Cleaning ... 43
6.1.2 Dirt filter ... 43
6.2 Maintenance work, intervals ... 44
6.2.1 Daily maintenance tasks ... 44
6.2.2 Monthly maintenance tasks ... 44
6.2.3 Annual test (inspection and testing during operation) ... 44
6.3 Calibration / validation ... 45
6.3.1 Machine control – Operating elements ... 45
6.3.2 Activating the calibration and validation mode ... 46
6.3.3 Turning the inverter of the power source on and off ... 46
6.3.4 Deactivating the calibration and validation mode ... 47
6.4 Disposing of equipment ... 47
7 Rectifying faults ... 48
7.1 Software version of the machine control ... 48
7.2 Error messages (power source) ... 48
7.3 Warnings ... 55
7.4 Checklist for rectifying faults ... 56
7.5 Dynamic power adjustment ... 57
7.6 Resetting welding parameters to the factory settings ... 58
7.7 Power-saving mode (Standby) ... 58
8 Technical data ... 59
8.1 Pico 200 cel puls ... 59
8.1.1 Mains voltage 230 V ... 59
8.1.2 Mains voltage 120 V ... 60
9 Accessories ... 61
9.1 Welding torch ... 61
9.2 Shielding gas supply (shielding gas cylinder for welding machine) ... 61
9.3 Transport system ... 61
9.4 19-pole remote control ... 61
9.4.1 Connection cables ... 61
9.5 Option for retrofitting ... 61
9.6 General accessories ... 62
10 Appendix ... 63
10.1 Parameter overview – setting ranges ... 63
10.1.1 MMA welding ... 63

10.1.2 TIG welding 63
10.1.3 Basic parameters (independent of process) 64
10.2 Average shielding gas usage 64
10.3 Searching for a dealer 65

2 For your safety

2.1 Notes on using these operating instructions

⚠ DANGER

Working or operating procedures which must be closely observed to prevent imminent serious and even fatal injuries.

- Safety notes include the "DANGER" keyword in the heading with a general warning symbol.
- The hazard is also highlighted using a symbol on the edge of the page.

⚠ WARNING

Working or operating procedures which must be closely observed to prevent serious and even fatal injuries.

- Safety notes include the "WARNING" keyword in the heading with a general warning symbol.
- The hazard is also highlighted using a symbol in the page margin.

⚠ CAUTION

Working or operating procedures which must be closely observed to prevent possible minor personal injury.

- The safety information includes the "CAUTION" keyword in its heading with a general warning symbol.
- The risk is explained using a symbol on the edge of the page.

☞ ***Technical aspects which the user must observe to avoid material or equipment damage.***

Instructions and lists detailing step-by-step actions for given situations can be recognised via bullet points, e.g.:

- Insert the welding current lead socket into the relevant socket and lock.

2.2 Explanation of icons

Symbol	Description	Symbol	Description
	Indicates technical aspects which the user must observe.		Activate and release / Tap / Tip
	Switch off machine		Release
	Switch on machine		Press and hold
	Incorrect / Invalid		Switch
	Correct / Valid		Turn
	Input		Numerical value – adjustable
	Navigation		Signal light lights up in green
	Output		Signal light flashes green
	Time representation (e.g.: wait 4 s / actuate)		Signal light lights up in red
	Interruption in the menu display (other setting options possible)		Signal light flashes red
	Tool not required/do not use		Signal light lights up in blue
	Tool required/use		Signal light flashes blue

2.3 Safety instructions

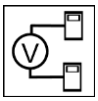
⚠ WARNING

Risk of accidents due to non-compliance with the safety instructions!
Non-compliance with the safety instructions can be fatal!

- Carefully read the safety instructions in this manual!
- Observe the accident prevention regulations and any regional regulations!
- Inform persons in the working area that they must comply with the regulations!

Risk of injury from electrical voltage!
Voltages can cause potentially fatal electric shocks and burns on contact. Even low voltages can cause a shock and lead to accidents.

- Never touch live components such as welding current sockets or stick, tungsten or wire electrodes!
- Always place torches and electrode holders on an insulated surface!
- Wear the full personal protective equipment (depending on the application)!
- The machine may only be opened by qualified personnel!
- The device must not be used to defrost pipes!



Hazard when interconnecting multiple power sources!
If a number of power sources are to be connected in parallel or in series, only a technical specialist may interconnect the sources as per standard IEC 60974-9:2010: Installation and use and German Accident Prevention Regulation BVG D1 (formerly VBG 15) or country-specific regulations.
Before commencing arc welding, a test must verify that the equipment cannot exceed the maximum permitted open circuit voltage.

- Only qualified personnel may connect the machine.
- When taking individual power sources out of operation, all mains and welding current leads must be safely disconnected from the welding system as a whole. (Hazard due to reverse polarity voltage!)
- Do not interconnect welding machines with pole reversing switch (PWS series) or machines for AC welding since a minor error in operation can cause the welding voltages to be combined, which is not permitted.

Risk of injury due to radiation or heat!
Arc radiation can lead to skin and eye injuries.
Contact with hot workpieces and sparks can lead to burns.

- Use hand shield or welding helmet with the appropriate safety level (depends on the application).
- Wear dry protective clothing (e.g. hand shield, gloves, etc.) in accordance with the applicable regulations of your country.
- Persons who are not directly involved should be protected with a welding curtain or suitable safety screen against radiation and the risk of blinding!

⚠ WARNING

Risk of injury due to improper clothing!
During arc welding, radiation, heat and voltage are sources of risk that cannot be avoided. The user has to be equipped with the complete personal protective equipment at all times. The protective equipment has to include:

- Respiratory protection against hazardous substances and mixtures (fumes and vapours); otherwise implement suitable measures such as extraction facilities.
- Welding helmet with proper protection against ionizing radiation (IR and UV radiation) and heat.
- Dry welding clothing (shoes, gloves and body protection) to protect against warm environments with conditions comparable to ambient temperatures of 100 °C or higher and arcing and work on live components.
- Hearing protection against harming noise.

Explosion risk!
Apparently harmless substances in closed containers may generate excessive pressure when heated.

- Move containers with inflammable or explosive liquids away from the working area!
- Never heat explosive liquids, dusts or gases by welding or cutting!

Fire hazard!
Due to the high temperatures, sparks, glowing parts and hot slag that occur during welding, there is a risk of flames.

- Be watchful of potential sources of fire in the working area!
- Do not carry any easily inflammable objects, e.g. matches or lighters.
- Ensure suitable fire extinguishers are available in the working area!
- Thoroughly remove any residue of flammable materials from the workpiece prior to starting to weld.
- Only further process workpieces after they have cooled down. Do not allow them to contact any flammable materials!

⚠ CAUTION

Smoke and gases!

Smoke and gases may lead to shortness of breath and poisoning! The ultraviolet radiation of the arc may also convert solvent vapours (chlorinated hydrocarbon) into poisonous phosgene.

- Ensure sufficient fresh air!
- Keep solvent vapours away from the arc beam field!
- Wear suitable respiratory protection if necessary!
- To prevent the formation of phosgene, residues of chlorinated solvents on workpieces must first be neutralised using appropriate measures.

Noise exposure!

Noise exceeding 70 dBA can cause permanent hearing damage!

- Wear suitable ear protection!
- Persons located within the working area must wear suitable ear protection!

According to IEC 60974-10, welding machines are divided into two classes of electromagnetic compatibility (the EMC class can be found in the Technical data) > *see 8 chapter*:

Class A machines are not intended for use in residential areas where the power supply comes from the low-voltage public mains network. When ensuring the electromagnetic compatibility of class A machines, difficulties can arise in these areas due to interference not only in the supply lines but also in the form of radiated interference.

Class B machines fulfil the EMC requirements in industrial as well as residential areas, including residential areas connected to the low-voltage public mains network.

Setting up and operating

When operating arc welding systems, in some cases, electro-magnetic interference can occur although all of the welding machines comply with the emission limits specified in the standard. The user is responsible for any interference caused by welding.

In order to **evaluate** any possible problems with electromagnetic compatibility in the surrounding area, the user must consider the following: (see also EN 60974-10 Appendix A)

- Mains, control, signal and telecommunication lines
- Radios and televisions
- Computers and other control systems
- Safety equipment
- The health of neighbouring persons, especially if they have a pacemaker or wear a hearing aid
- Calibration and measuring equipment
- The immunity to interference of other equipment in the surrounding area
- The time of day at which the welding work must be carried out

Recommendations for **reducing interference emission**

- Mains connection, e.g. additional mains filter or shielding with a metal tube
- Maintenance of the arc welding system
- Welding leads should be as short as possible and run closely together along the ground
- Potential equalization
- Earthing of the workpiece. In cases where it is not possible to earth the workpiece directly, it should be connected by means of suitable capacitors.
- Shielding from other equipment in the surrounding area or the entire welding system

Electromagnetic fields!

The power source can create electrical or electromagnetic fields that may impair the function of electronic systems such as EDP and CNC devices, telecommunication, power and signal lines as well as pacemakers and defibrillators.

- Follow the maintenance instructions > *see 6 chapter*!
- Unwind the welding leads completely!
- Shield radiation-sensitive equipment or facilities appropriately!
- The function of pacemakers may be impaired (seek medical advice if necessary).

⚠ CAUTION

Obligations of the operator!
The respective national directives and laws must be complied with when operating the machine!

- Implementation of national legislation relating to framework directive 89/391/EEC on the introduction of measures to encourage improvements in the safety and health of workers at work and associated individual guidelines.
- In particular, directive 89/655/EEC concerning the minimum safety and health requirements for the use of work equipment by workers at work.
- The regulations applicable to occupational safety and accident prevention in the country concerned.
- Setting up and operating the machine as per IEC 60974.-9.
- Brief the user on safety-conscious work practices on a regular basis.
- Regularly inspect the machine as per IEC 60974.-4.

☞ ***The manufacturer's warranty becomes void if non-genuine parts are used!***

- ***Only use system components and options (power sources, welding torches, electrode holders, remote controls, spare parts and replacement parts, etc.) from our range of products!***
- ***Only insert and lock accessory components into the relevant connection socket when the machine is switched off.***

Requirements for connection to the public mains network

High-performance machines can influence the mains quality by taking current from the mains network. For some types of machines, connection restrictions or requirements relating to the maximum possible line impedance or the necessary minimum supply capacity at the interface with the public network (Point of Common Coupling, PCC) can therefore apply. In this respect, attention is also drawn to the machines' technical data. In this case, it is the responsibility of the operator, where necessary in consultation with the mains network operator, to ensure that the machine can be connected.

2.4 Transport and installation

⚠ WARNING

Risk of injury due to improper handling of shielding gas cylinders!
Improper handling and insufficient securing of shielding gas cylinders can cause serious injuries!

- Observe the instructions from the gas manufacturer and any relevant regulations concerning the use of compressed air!
- Do not attach any element to the shielding gas cylinder valve!
- Prevent the shielding gas cylinder from heating up.

⚠ CAUTION

Risk of accidents due to supply lines!

During transport, attached supply lines (mains leads, control cables, etc.) can cause risks, e.g. by causing connected machines to tip over and injure persons!

- Disconnect all supply lines before transport!

Risk of tipping!

There is a risk of the machine tipping over and injuring persons or being damaged itself during movement and set up. Tilt resistance is guaranteed up to an angle of 10° (according to IEC 60974-1).

- Set up and transport the machine on level, solid ground.
- Secure add-on parts using suitable equipment.

Risk of accidents due to incorrectly installed leads!

Incorrectly installed leads (mains, control and welding leads or intermediate hose packages) can present a tripping hazard.

- Lay the supply lines flat on the floor (avoid loops).
- Avoid laying the leads on passage ways.

Risk of injury from heated coolant and its connections!

The coolant used and its connection or connection points can heat up significantly during operation (water-cooled version). When opening the coolant circuit, escaping coolant may cause scalding.

- Open the coolant circuit only when the power source or cooling unit is switched off!
- Wear proper protective equipment (protective gloves)!
- Seal open connections of the hose leads with suitable plugs.

☞ ***The units are designed for operation in an upright position!***

Operation in non-permissible positions can cause equipment damage.

- ***Only transport and operate in an upright position!***

☞ ***Accessory components and the power source itself can be damaged by incorrect connection!***

- ***Only insert and lock accessory components into the relevant connection socket when the machine is switched off.***
- ***Comprehensive descriptions can be found in the operating instructions for the relevant accessory components.***
- ***Accessory components are detected automatically after the power source is switched on.***

☞ ***Protective dust caps protect the connection sockets and therefore the machine against dirt and damage.***

- ***The protective dust cap must be fitted if there is no accessory component being operated on that connection.***
- ***The cap must be replaced if faulty or if lost!***

3 Intended use

⚠ WARNING

§ **Hazards due to improper usage!**

The machine has been constructed to the state of the art and any regulations and standards applicable for use in industry and trade. It may only be used for the welding procedures indicated at the rating plate. Hazards may arise for persons, animals and material objects if the equipment is not used correctly. No liability is accepted for any damages arising from improper usage!

- The equipment must only be used in line with its designated purpose and by trained or expert personnel!
- Do not improperly modify or convert the equipment!

3.1 Applications

Arc welding machine for MMA DC welding with TIG DC welding with lift arc (touch starting) as secondary process.

It may be possible to expand the range of functions by using accessories (see the documentation in the relevant chapter).

3.2 Software version

The software version of the machine control can be displayed in the machine configuration menu (menu Srv) > *see 5.7 chapter*.

3.3 Documents which also apply

3.3.1 Warranty

For more information refer to the "Warranty registration" brochure supplied and our information regarding warranty, maintenance and testing at www.ewm-group.com!

3.3.2 Declaration of Conformity

CE This product corresponds in its design and construction to the EU directives listed in the declaration. The product comes with a relevant declaration of conformity in the original.

The manufacturer recommends carrying out the safety inspection according to national and international standards and guidelines every 12 months (from commissioning).

3.3.3 Welding in environments with increased electrical hazards

S Power sources with this marking can be used for welding in an environment with increased electrical hazard (e.g. boilers). For this purpose, appropriate national or international regulations must be followed. The power source must not be placed in the danger zone!

3.3.4 Service documents (spare parts and circuit diagrams)

⚠ WARNING

No improper repairs and modifications!

To prevent injuries and damage to the machine, only competent personnel (authorised service personnel) are allowed to repair or modify the machine.

Unauthorised manipulations will invalidate the warranty!

- Instruct competent personnel (authorised service personnel) to repair the machine.

Original copies of the circuit diagrams are enclosed with the unit.

Spare parts can be obtained from the relevant authorised dealer.

3.3.5 Calibration/Validation

An original certificate is enclosed with the product. The manufacturer recommends calibration / validation at intervals of 12 months (from commissioning).

3.3.6 Part of the complete documentation

This document is part of the complete documentation and valid only in combination with all other parts of these instructions! Read and observe the operating instructions for all system components, especially the safety instructions!

The illustration shows a general example of a welding system.

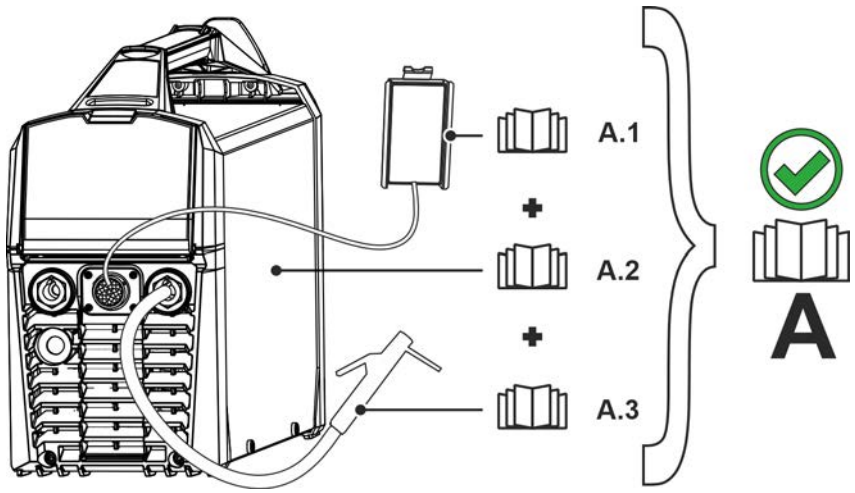


Figure 3-1

Item	Documentation
A.1	Remote control
A.2	Power source
A.3	Electrode holder
A	Complete documentation

4 Machine description – quick overview

4.1 Front view / rear view

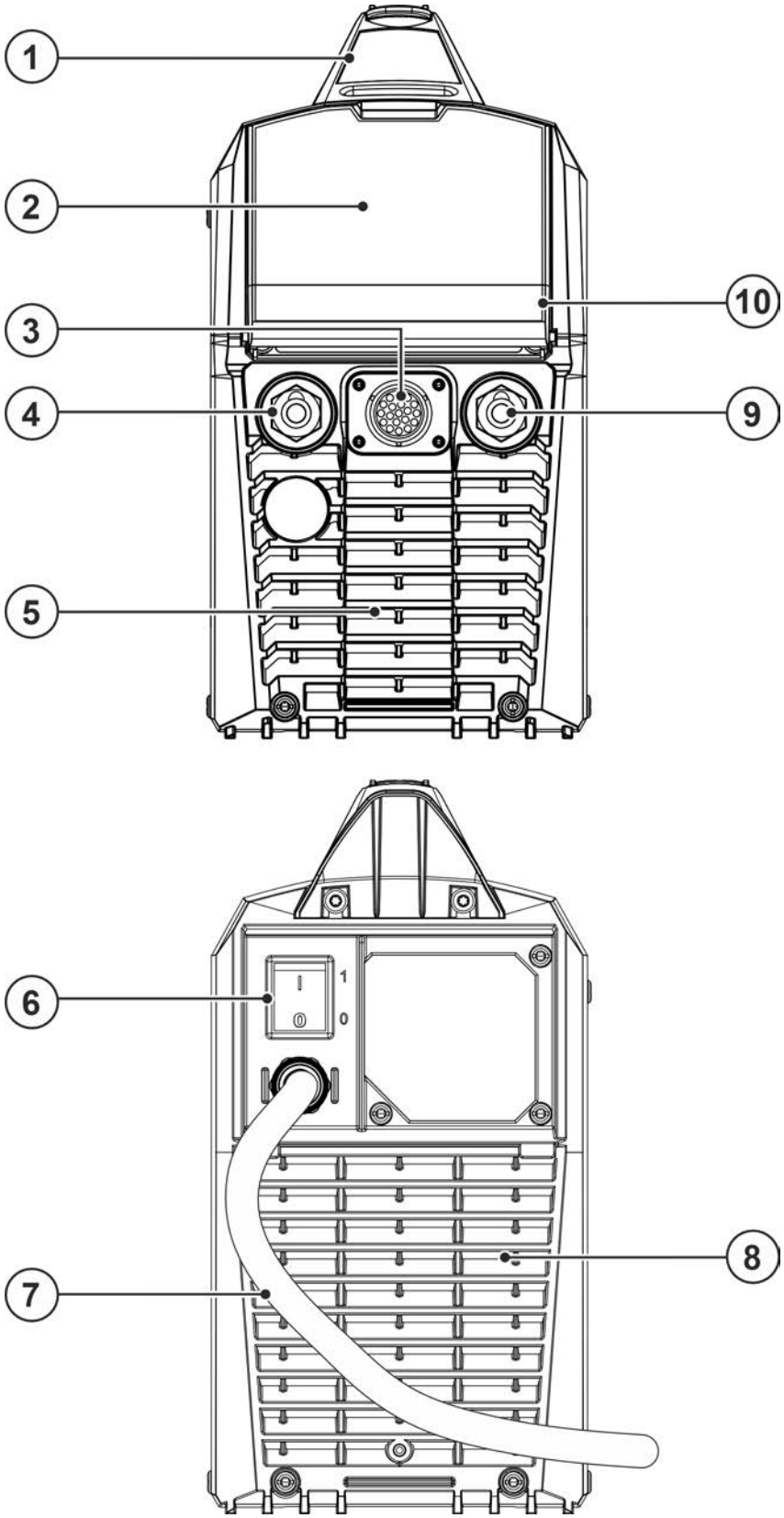


Figure 4-1

Item	Symbol	Description
1		**Transport handle with additional integrated functions** • Wear part compartment *> see 5.1.9 chapter* • Transport belt *> see 5.1.1 chapter*
2		**Machine control *> see 4.2 chapter***
3		**Connection socket 19-pole** Remote control connection
4		**Connection socket (+) welding current** How to connect the accessories depends on the welding procedure. Please observe the connection description for the corresponding welding procedure *> see 5 chapter*.
5		**Cooling air outlet**
6		**Main Switch** Switching the machine on or off.
7		**Mains connection cable *> see 5.1.7 chapter***
8		**Cooling air inlet** Dirt filter optional *> see 9 chapter*
9		**Connection socket (-) welding current** How to connect the accessories depends on the welding procedure. Please observe the connection description for the corresponding welding procedure *> see 5 chapter*.
10		**Protective cap *> see 5.1.8 chapter***

4.2 Machine control – Operating elements

4.2.1 Overview of control sections

For description purposes, the machine control has been divided into two sections (A, B) to ensure maximum clarity. The setting ranges for the parameter values are summarised in the parameter overview section > *see 10.1 chapter*.

Figure 4-2

Item	Symbol	Description
1		**Control section A** *> see 4.2.1.1 chapter*
2		**Control section B** *> see 4.2.1.2 chapter*
3		**Click wheel** Control button for setting the parameters by turning and pressing. •----------Setting the welding power •----------Navigating through menu and parameters •----------Setting the parameter values depending on the preselection.
4	▼	**Push-button for electrode characteristics MMA** To adjust the welding parameters to the electrode type used. Rutile rutile electrode types Basic basic electrode types Cel cellulose electrode types
5	▼	**Push-button for welding procedures** MMA -------MMA welding TIG --------TIG welding spotArc --spotArc (spot welding)

4.2.1.1 Control section A

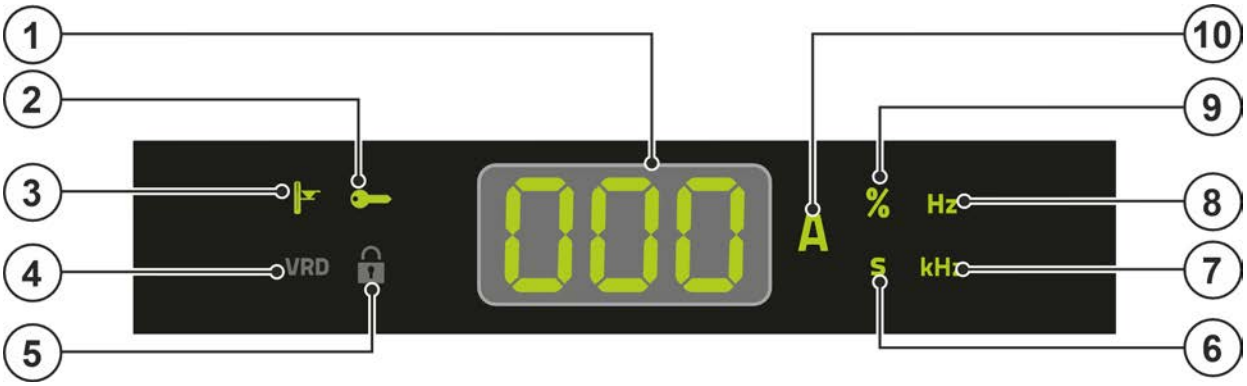


Figure 4-3

Item	Symbol	Description
1	000	**Machine display** The machine display primarily shows the welding power as a nominal value of the current. Other machine or welding parameters and their values are displayed depending on the current operation > *see 10.1 chapter*.
2		**Access control active signal light** Signal light is on when access control is active on the machine control > *see 5.5 chapter*.
3		**Excess temperature signal light** In case of excess temperature, temperature monitors de-activate the power unit, and the excess temperature control lamp comes on. Once the machine has cooled down, welding can continue without any further measures.
4		**Without function in this machine version.**
5		**Without function in this machine version.**
6	S	**Signal light - display value in seconds**
7	kHz	**Signal light - display value in kilohertz**
8	Hz	**Signal light - display value in hertz**
9	%	**Signal light - display value in per cent**
10	A	**Welding current signal light** Display of the welding current in amperes.

4.2.1.2 Control section B

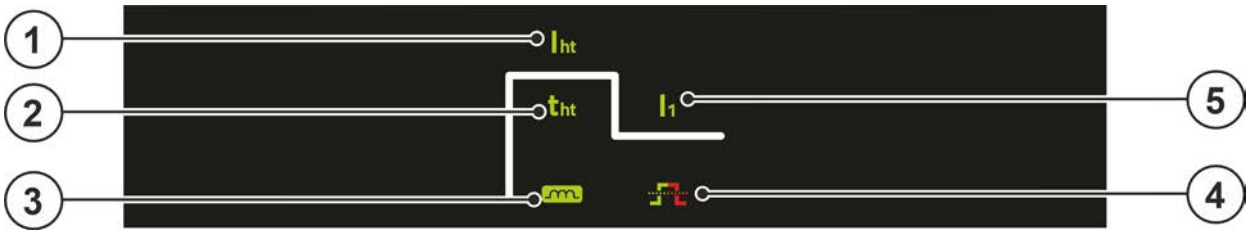


Figure 4-4

Item	Symbol	Description
1	I_{ht}	**Hot-start current signal light**
2	t_{ht}	**Hot-start time signal light**
3		**Signal light for Arcforce - welding characteristics > *see 5.2.4 chapter***
4		**Signal light for pulse welding MMA > *see 5.2.6 chapter*, TIG welding > *see 5.3.7 chapter*** Is not on: function is switched off Lights up green: average value pulsing is activated Lights up red: automatic pulsing is activated
5	I_1	**Signal light for main current**

4.3 Operating the machine control

4.3.1 Main screen

After switching on the machine or finishing a setting, the machine control changes to the main screen. This means that the previously selected settings are adopted (indicated by signal lights where applicable) and the nominal value of the current (A) is shown in the welding data display. The Machine control changes back to the main screen after 4 s.

4.3.2 Welding parameter setting in the operation sequence

Set a welding parameter in the functional sequence by clicking (select) and turning the click wheel (navigate to the desired parameter). Press again to apply the selected parameter as the setting (the parameter value and the corresponding signal light flash). Then turn to set the parameter value.

4.3.3 Setting advanced welding parameters (Expert menu)

The Expert menu contains functions and parameters that cannot be set directly on the machine control or for which regular settings are not required. The number and display of these parameters depend on the previously selected welding procedure or functions.

To select, press and hold the click wheel (> 2 s). Select the appropriate parameter / menu item by turning (navigating) and pressing (confirming) the click wheel.

The control changes from the Expert parameters back to the main view if there is no activity (4 s). When a parameter is selected for adjustment, a long press on the click wheel or 30 seconds of inactivity will switch back to the main view.

4.3.4 Changing basic settings (machine configuration menu)

The basic welding system functions can be adjusted in the machine configuration menu. Only experienced users should change the settings > *see 5.7 chapter*.

5 Design and function

⚠ WARNING

Risk of injury from electrical voltage!
Contact with live parts, e.g. power connections, can be fatal!

- Observe the safety information on the first pages of the operating instructions!
- Commissioning must be carried out by persons who are specifically trained in handling power sources!
- Connect connection or power cables while the machine is switched off!

Read and observe the documentation to all system and accessory components!

5.1 Transport and installation

⚠ WARNING

Risk of accident due to improper transport of machines that must not be lifted!
Do not lift or suspend the machine! The machine can drop and cause injuries! The handles, straps or brackets are suitable for transport by hand only!

- The machine must not be suspended or lifted using a crane.

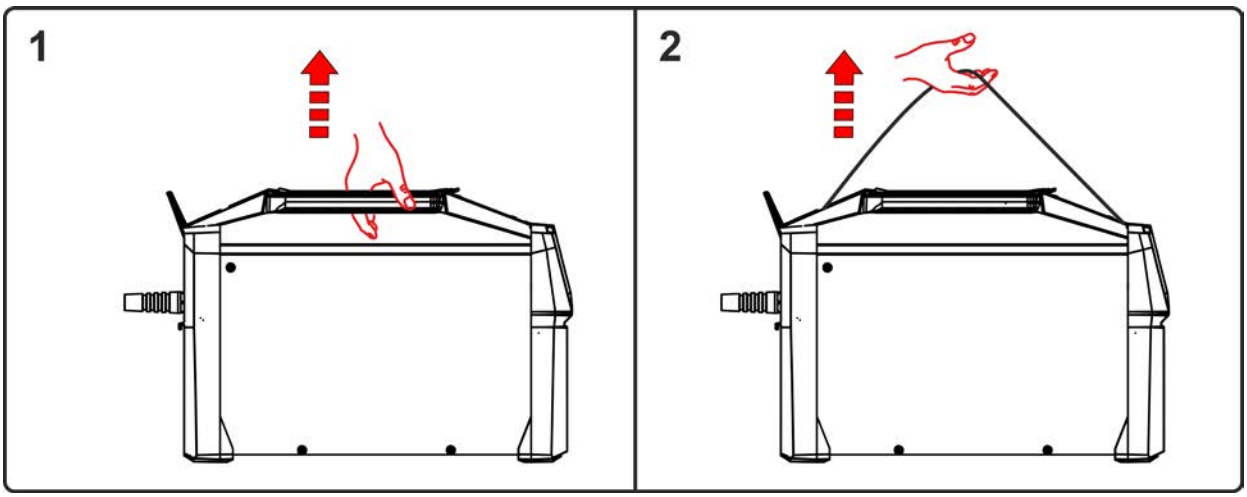


Figure 5-1

The machine can be carried either centrally on the transport handle (1) or using the transport belt (2).

5.1.1 Transport belt

5.1.1.1 Adjusting the length of the carrying strap

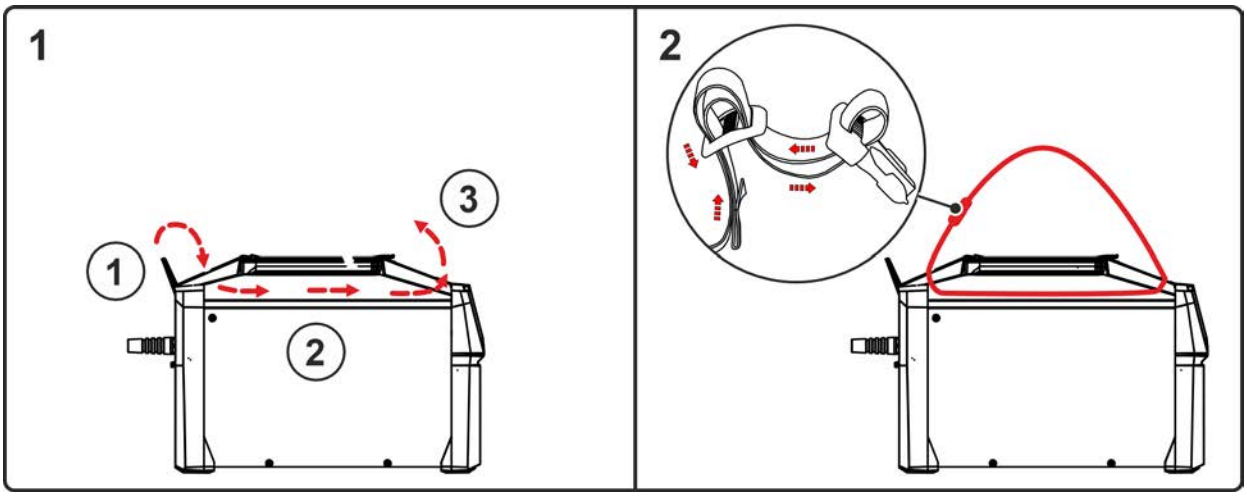


Figure 5-2

5.1.2 Ambient conditions

☞ ***The machine must not be operated in the open air and must only be set up and operated on a suitable, stable and level base!***

- ***The operator must ensure that the ground is non-slip and level, and provide sufficient lighting for the place of work.***
- ***Safe operation of the machine must be guaranteed at all times.***

☞ ***Machine damage due to contamination!***

Unusually high amounts of dust, acid, corrosive gas or substances may damage the machine (note the maintenance intervals > see 6.2 chapter).

- ***Prevent high amounts of smoke, weld spatter, steam, oil vapour, grinding dust and corrosive ambient air from developing!***

In operation

Temperature range of the ambient air:

- -25 °C to +40 °C (-13 °F to 104 °F)

Relative humidity:

- up to 50 % at 40 °C (104 °F)
- up to 90 % at 20 °C (68 °F)

Transport and storage

Storage in a closed room, temperature range of the ambient air:

- -30 °C to +70 °C (-22 °F to 158 °F)

Relative humidity

- up to 90 % at 20 °C (68 °F)

5.1.3 Machine cooling

☞ ***Insufficient ventilation results in a reduction in performance and equipment damage.***

- ***Observe the ambient conditions!***
- ***Keep the cooling air inlet and outlet clear!***
- ***Observe the minimum distance of 0.5 m from obstacles!***

5.1.4 Workpiece lead, general

⚠ CAUTION

Risk of burning due to incorrect welding current connection!
If the welding current plugs (machine connections) are not locked or if the workpiece connection is contaminated (paint, corrosion), these connections and leads can heat up and cause burns when touched!

- Check welding current connections on a daily basis and lock by turning to the right when necessary.
- Clean workpiece connection thoroughly and secure properly. Do not use structural parts of the workpiece as welding current return lead!

5.1.5 Dirt filter

These accessory components can be retrofitted as an option *> see 9 chapter*.

When using a dirt filter, the cooling air throughput is reduced and the duty cycle of the machine is reduced as a result. The duty cycle decreases with the increasing contamination of the filter. The dirt filter must be remove at regular intervals and cleaned by blowing out with compressed air (depending on the level of soiling).

5.1.6 Notes on the installation of welding current leads

- Use an individual welding lead to the workpiece for each welding machine!

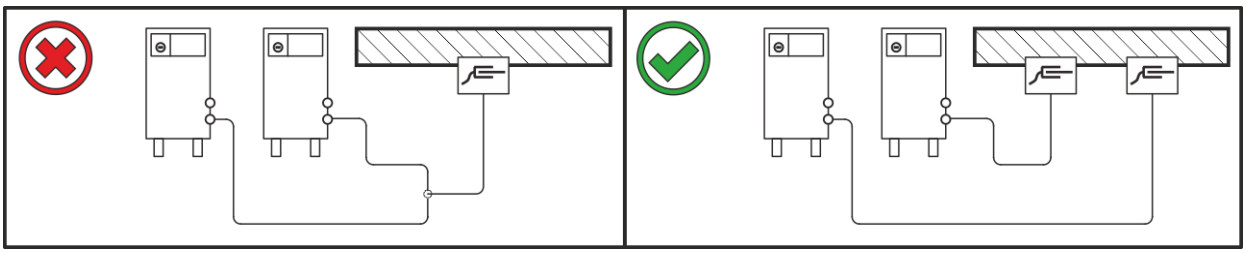


Figure 5-3

- Fully unroll welding current leads, torch hose packages and intermediate hose packages. Avoid loops!
- Always keep leads as short as possible!

Lay any excess cable lengths in meanders.

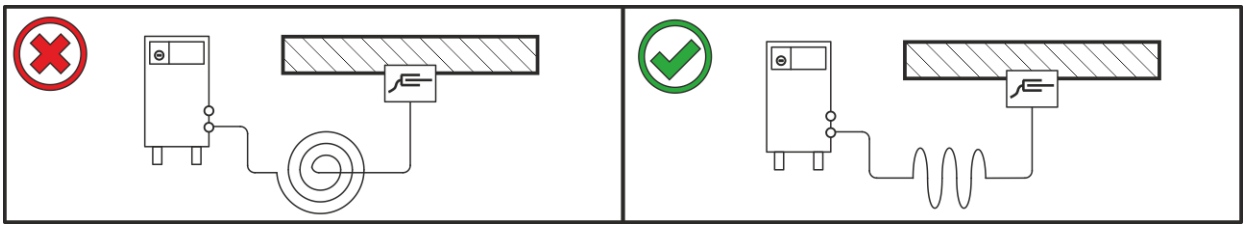


Figure 5-4

5.1.7 Mains connection

⚠ DANGER

Hazards caused by improper mains connection!

An improper mains connection can cause injuries or damage property!

- The connection (mains plug or cable), the repair or voltage adjustment of the device must be carried out by a qualified electrician in accordance with the respective local laws or national regulations!
- The mains voltage indicated on the rating plate must match the supply voltage.
- Only operate machine using a socket that has correctly fitted protective earth.
- Mains plug, socket and lead must be checked by a qualified electrician on a regular basis!
- When operating the generator, always ensure it is earthed as stipulated in the operating instructions. The network created must be suitable for operating machines according to protection class I.

☞ ***To operate with a 120 V mains supply voltage, the standard mains plug must be removed and replaced with a suitable mains plug by a qualified electrician > see 8.1.2 chapter.***

5.1.7.1 Mains configuration

☞ ***The machine may only be connected to a one-phase system with two conductors and an earthed neutral conductor.***

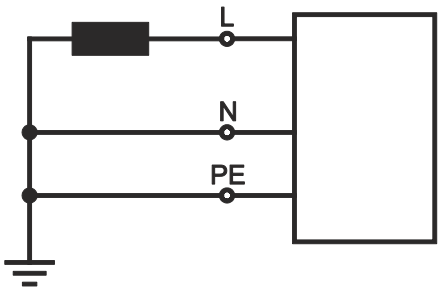


Figure 5-5

Legend

Item	Designation	Colour code
L	Outer conductor	brown
N	Neutral conductor	blue
PE	Protective conductor	green-yellow

- Insert mains plug of the switched-off machine into the appropriate socket.

5.1.8 Protective flap, welding machine control

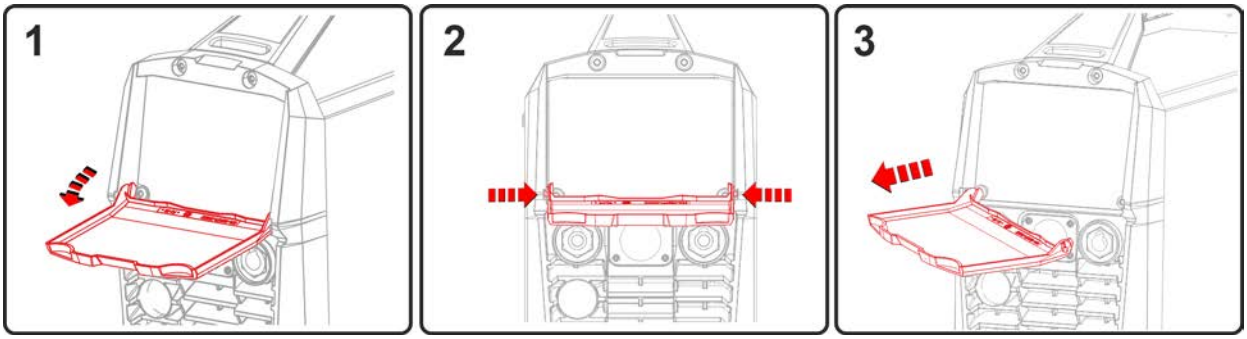


Figure 5-6

- Open the protective cap.
- Apply slight pressure to the left and/or right connecting bridge (illustration) until the protective cap can be removed.

5.1.9 Wear part compartment

The transport handle of this machine series holds a wear parts compartment for storing typical small wear parts. The compartment is closed with a plastic flap.

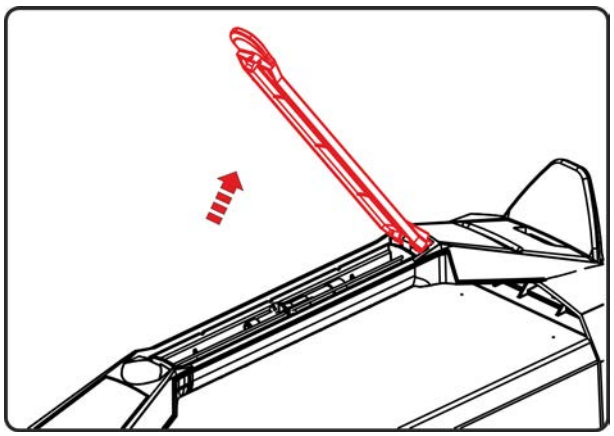


Figure 5-7

5.2 MMA welding

5.2.1 Connecting the electrode holder and workpiece lead

⚠ CAUTION

Risk of crushing and burns!
When changing stick electrodes there is a risk of crushing and burns!
- Wear appropriate and dry protective gloves.
- Use an insulated pair of tongs to remove the used stick electrode or to move welded workpieces.

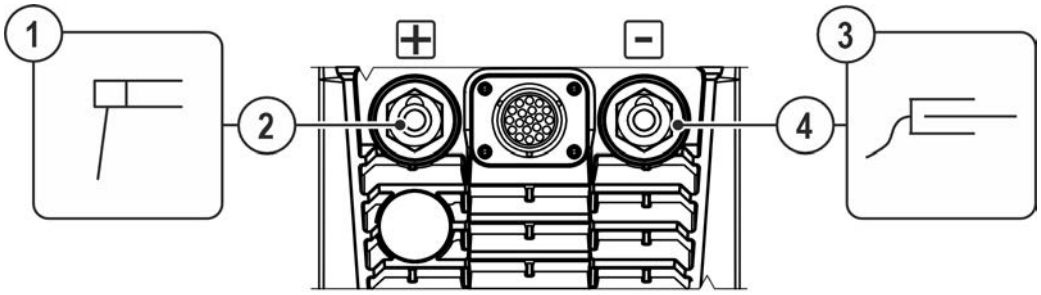


Figure 5-8

Item	Symbol	Description
1		**Electrode holder**
2		**Welding current lead**
3		**Workpiece**
4		**Workpiece lead**

- Insert the electrode holder plug and workpiece lead into the welding current socket depending on application and lock in place by turning to the right. The corresponding polarity will be based on the information of the electrode manufacturer on the electrode packaging.

5.2.2 Setting welding procedure

The following welding task selection is an example of use. In general, the selection process always has the same sequence. Signal lights (LED) will show the selected combination.

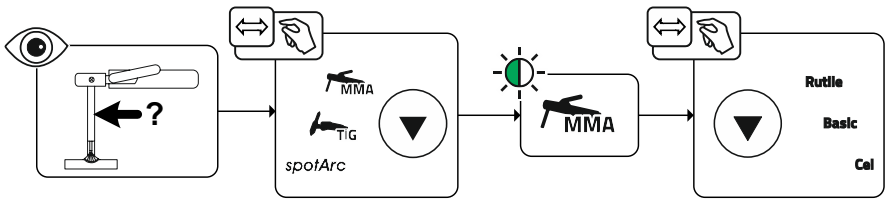
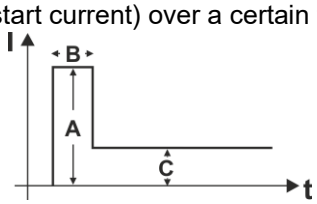


Figure 5-9

5.2.3 Hotstart

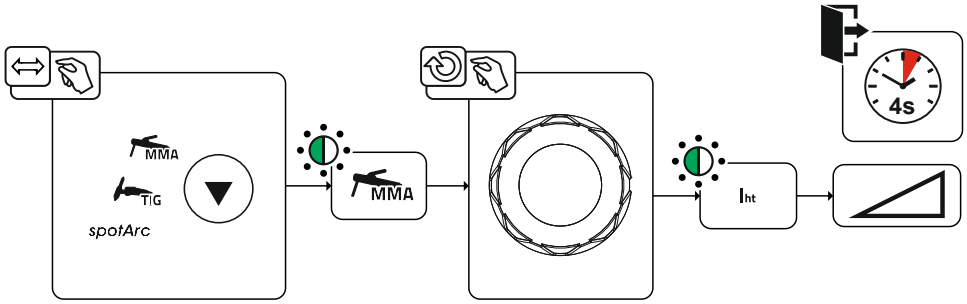
The function hot start ensures a secure igniting of the arc and a sufficient heating to the still cold parent metal at the beginning of the welding process. The ignition takes place here with increased current (hot start current) over a certain time (hot start time).



A = Hot start current
B = Hot start time
C = Main current
I = Current
t = Time

Figure 5-10

5.2.3.1 Hotstart current



The hot-start current is set directly using the machine control.

Figure 5-11

5.2.3.2 Hotstart time

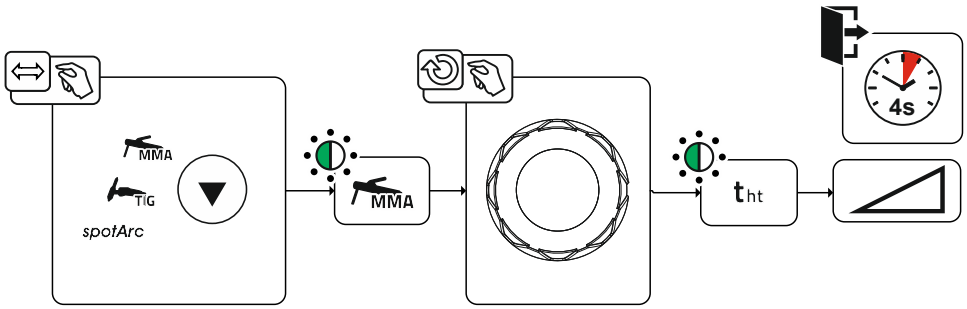


Figure 5-12

The hot-start time is set directly using the machine control.

5.2.4 Arcforce

During the welding process, arcforce prevents the electrode sticking in the weld pool with increases in current. This makes it easier to weld large-drop melting electrode types at low current strengths with a short arc in particular.

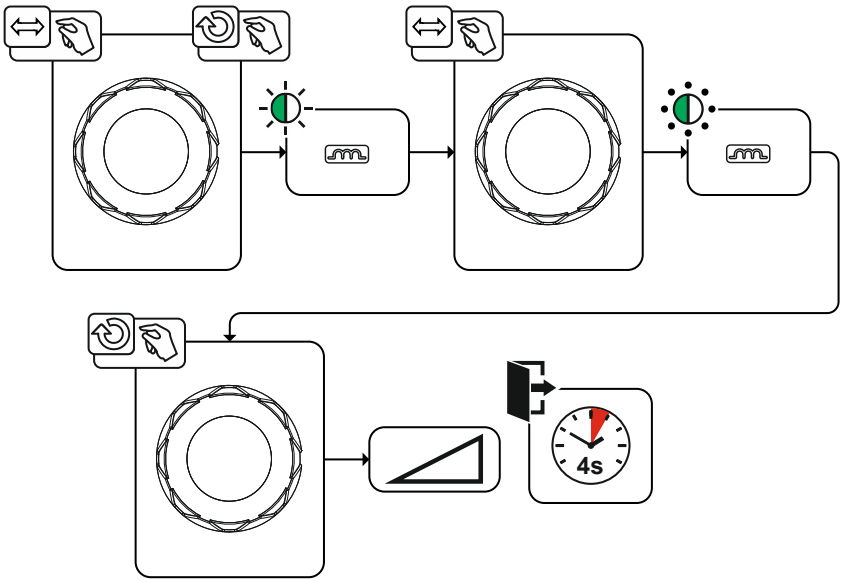
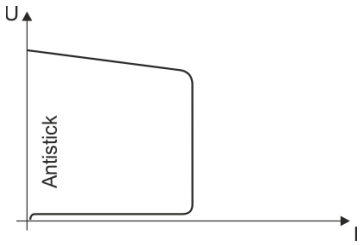


Figure 5-13

5.2.5 Antistick



The Antistick feature prevents the electrode from annealing.
Should the electrode stick despite the Arcforce feature, the machine automatically switches to the minimum current within approx. one second. This prevents the electrode from annealing. Check the welding current setting and correct for the welding task in hand.

Figure 5-14

5.2.6 Average value pulse welding

A special feature with average value pulses is that the power source will always maintain the preset average value. This makes this method especially suitable for welding according to welding procedure specifications.

For average value pulsing AuG, switching takes place periodically between two currents whereby an average current value I 1, a pulse current I PL, pulse balance (bAL) and pulse frequency (FrE) must be specified. The set average current value in amperes is decisive. The pulse current is specified as a percentage of the average value current.

The pulse pause current (IPP) is not set. This value is calculated by the machine control to ensure that the average value of the welding current is maintained.

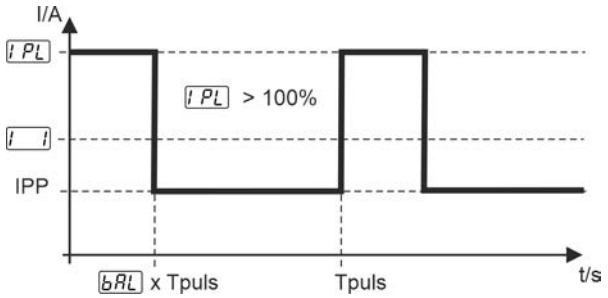


Figure 5-15

Setting the pulse current, pulse frequency and pulse balance

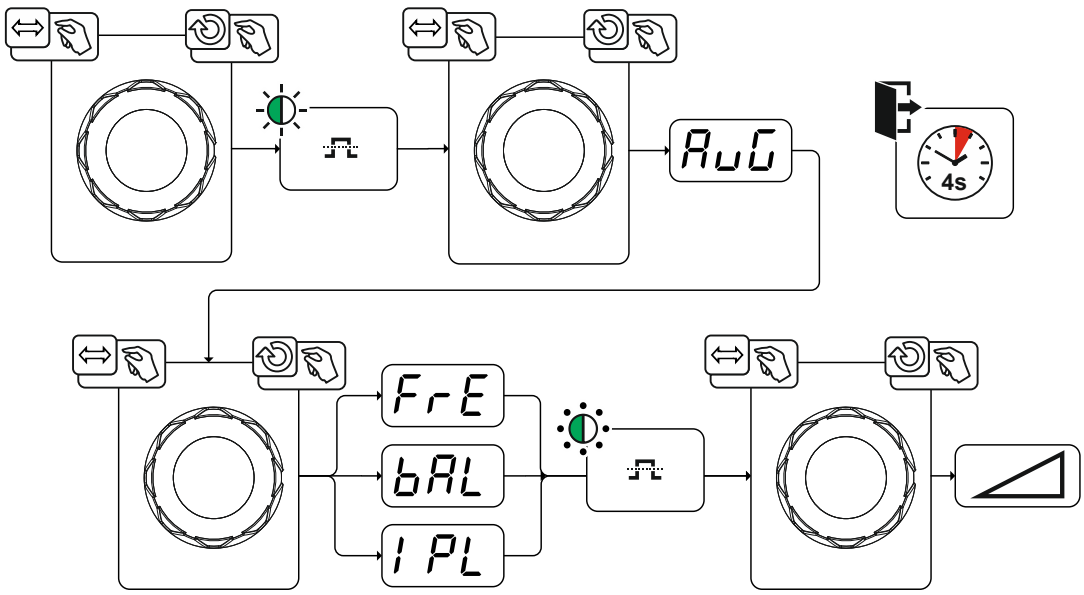


Figure 5-16

5.2.7 Arc length restriction (USP)

The function of arc length restriction USP stops the welding process when an excessive arc voltage is detected (an unusually large gap between electrode and workpiece). This function can be switched on or off in the Expert menu > *see 5.2.8 chapter*.

The arc length restriction cannot be used for cel characteristics (if available).

5.2.8 Expert menu (MMA)

The Expert menu has adjustable parameters stored that don't require regular setting. The number of parameters shown may be limited, e.g. if a function is deactivated.

The setting ranges for the parameter values are summarised in the Parameter overview section > *see 10.1 chapter*.

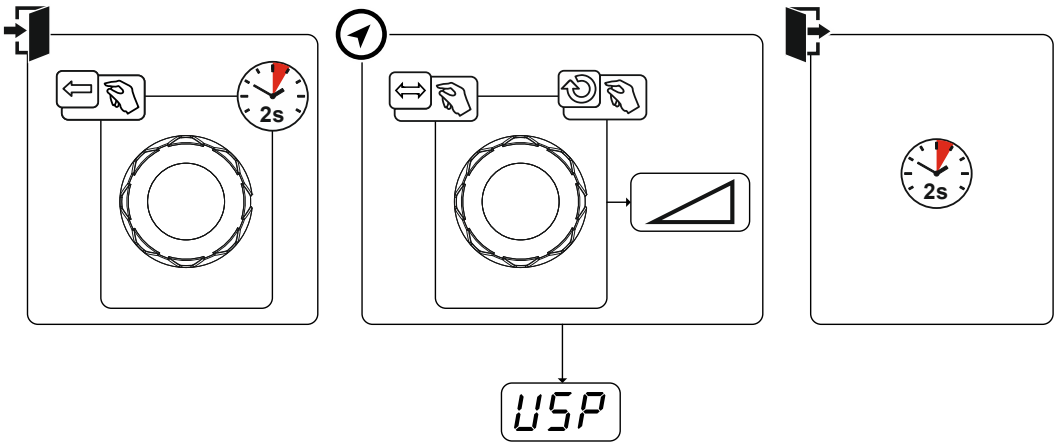


Figure 5-17

Display	Setting/selection
USP	**Arc length restriction > *see 5.6 chapter***
	on ------ Function switched on
	oFF ------ Function switched off

5.3 TIG welding

5.3.1 Connecting a TIG welding torch with rotating gas valve

Prepare welding torch according to the welding task in hand (see operating instructions for the torch).

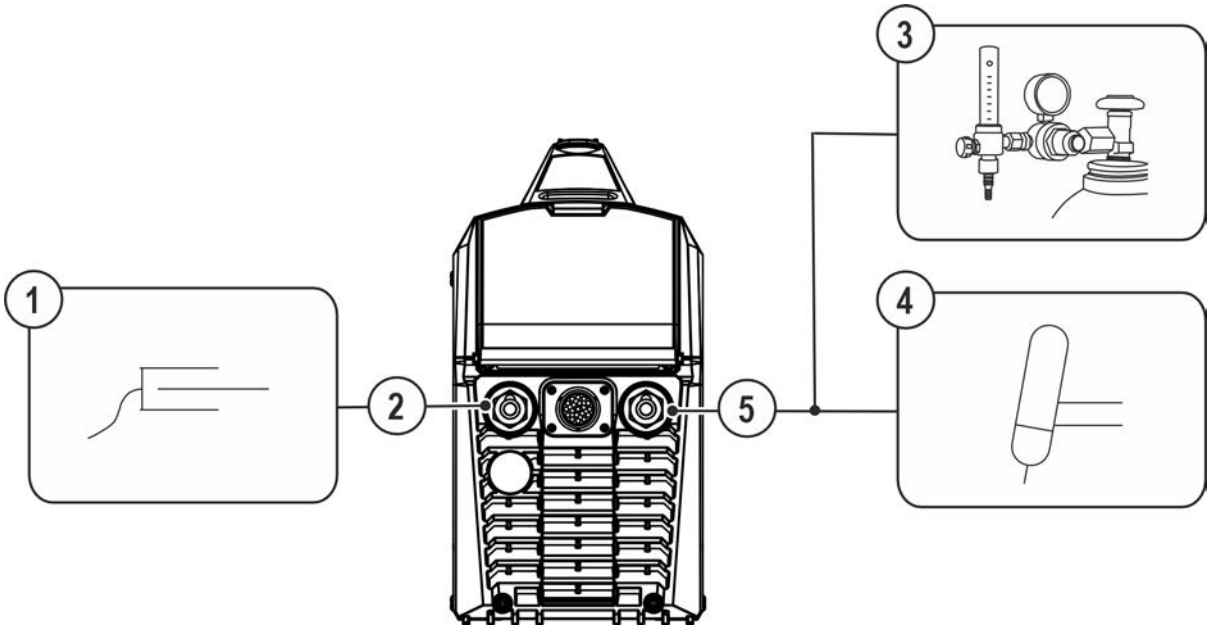


Figure 5-18

Item	Symbol	Description
1		**Workpiece**
2		**Connection socket for (+) welding current** Workpiece lead connection
3		**Output side of the pressure regulator**
4		**Welding torch with rotary gas valve**
5		**Connection socket (-) welding current** Welding current lead connection for TIG welding torch

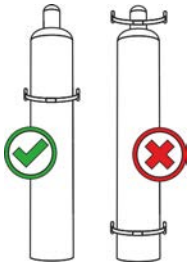
- Insert the welding current plug on the welding torch into the welding current connection socket and lock by turning to the right.
- Insert the cable plug on the work piece lead into the "+" welding current connection socket and lock by turning to the right.
- Screw the shielding gas hose of the welding torch to the pressure regulator outlet.

5.3.2 Shielding gas supply (shielding gas cylinder for welding machine)

⚠ WARNING

Risk of injury due to improper handling of shielding gas cylinders!
Improper handling and insufficient securing of shielding gas cylinders can cause serious injuries!

- Place shielding gas cylinder into the designated holder and secure with fastening elements (chain/belt)!
- Attach the fastening elements within the upper half of the shielding gas cylinder!
- The fastening elements must tightly enclose the shielding gas cylinder!



☞ ***An unhindered shielding gas supply from the shielding gas cylinder to the welding torch is a fundamental requirement for optimum welding results. In addition, a blocked shielding gas supply may result in the welding torch being destroyed.***

- ***All shielding gas connections must be gas tight.***

5.3.2.1 Pressure regulator connection

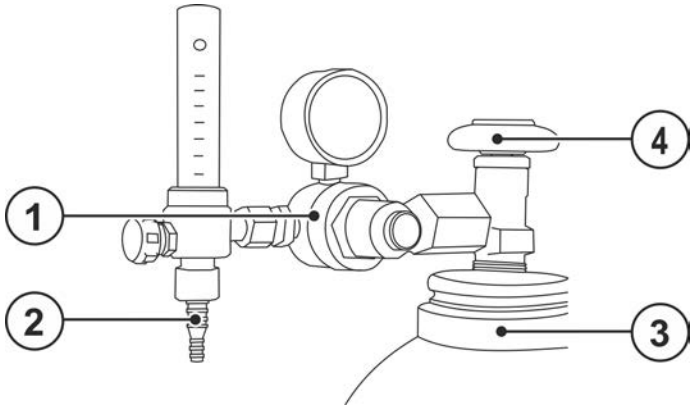


Figure 5-19

Item	Symbol	Description
1		**Pressure regulator**
2		**Output side of the pressure regulator**
3		**Shielding gas cylinder**
4		**Cylinder valve**

- Before connecting the pressure regulator to the gas cylinder, open the cylinder valve briefly to blow out any dirt.
- Tighten the pressure regulator screw connection on the gas bottle valve to be gas-tight.
- Screw the gas hose connection to the outlet side of the pressure regulator gas-tight.

5.3.3 Setting welding procedure

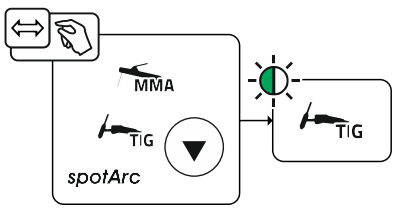


Figure 5-20

5.3.4 Arc ignition

5.3.4.1 Liftarc

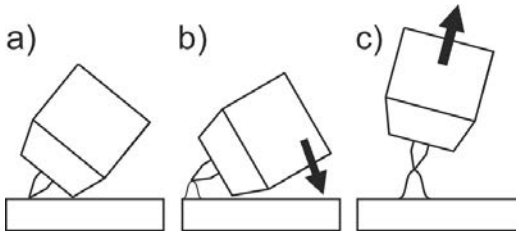


Figure 5-21

The arc is ignited on contact with the workpiece:

a) Carefully place the torch gas nozzle and tungsten electrode tip against the workpiece (lift arc current flows independently of the set main current)

b) Angle the welding torch above the torch gas nozzle until the distance between the electrode tip and the workpiece is approx. 2–3 mm (arc ignites, current increases to the set main current).

c) Lift the welding torch and swing it into the normal position.

Completing the welding task:

- By briefly forcing an increased arc voltage (greater distance between the workpiece and welding torch), the end of the welding process is signalled and the power source goes into the final current phase in a controlled manner until the welding voltage is switched off (down-slope / end current). The sensitivity of the arc length restriction USP *> see 5.3.9 chapter* parameter can be adjusted in several steps. The higher the set value, the greater the welding torch distance until detection.
- Remove the welding torch from the workpiece until the arc breaks (with the arc length restriction parameter switched off USP).

5.3.5 Operating modes (functional sequences)

5.3.5.1 Explanation of symbols

Symbol	Meaning
I St	Ignition current
t St	Start time
t UP	Up-slope time
t P	Spot time
I I	Main current (minimum to maximum current)
t dn	Down-slope time
I Ed	End-crater current
t Ed	End current time
I PL	Pulse current (average value pulsing)
bAL	Balance (average value pulsing)
Fr E	Frequency (average value pulsing)

5.3.5.2 spotArc

The procedure can be used for spot welding.

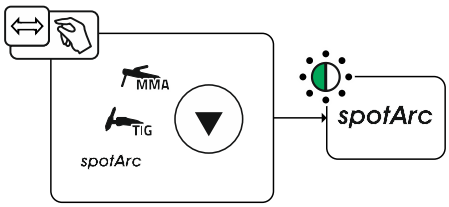


Figure 5-22

With the spotArc function enabled, automated pulsing is activated as well. If required, pulse welding can also be deactivated oFF using the pulse LED during the process or you can switch between the pulse variants average value pulsing AuG or automatic pulsing AUt.

To achieve an effective result, the slope times tUP and tdn are deactivated after the function spotArc has been activated. If required, the slope times can also be activated and displayed using the parameter SLo in this operating mode.

Example display with factory settings of the parameters:

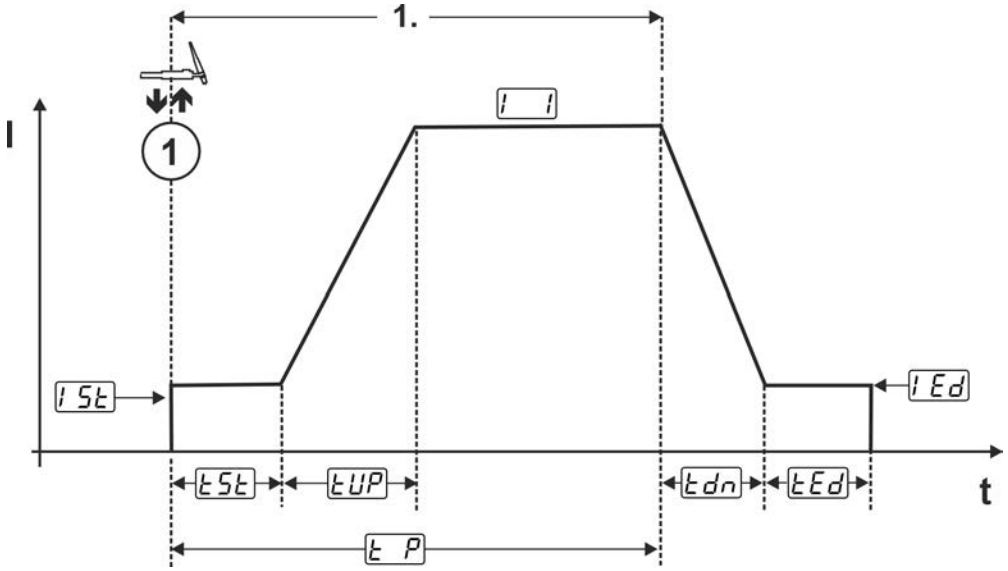


Figure 5-23

Item	Symbol	Description
1		**Liftarc** Contact ignition

Procedure:

- Position and remove the electrode.
- The welding current flows and immediately assumes the value of the start current I St.
- The start current I St flows for the ignition current time tSt.
- The welding current ramps up to the main current tUP within the set up-slope time I 1.
- After the set spotArc time t P has elapsed, the welding current drops to the end current I Ed with the set down-slope time tdn.
- After the end current time tEd has elapsed, the welding process ends.

5.3.6 TIG antistick

The function prevents uncontrolled re-ignition following the sticking of the tungsten electrode in the weld pool by switching off the welding current. In addition, wear at the tungsten electrode is reduced.

After the function is triggered, the welder starts a new process by lifting the tungsten electrode and anew Liftarc contact ignition. The user can switch the function on or off (parameter tAS°) > *see 5.7 chapter*.

5.3.7 Pulse welding

5.3.7.1 Average value pulse welding

A special feature with average value pulses is that the power source will always maintain the preset average value. This makes this method especially suitable for welding according to welding procedure specifications.

For average value pulsing AuG, switching takes place periodically between two currents whereby an average current value I, a pulse current IPL, pulse balance (bAL) and pulse frequency (FrE) must be specified. The set average current value in amperes is decisive. The pulse current is specified as a percentage of the average value current.

The pulse pause current (IPP) is not set. This value is calculated by the machine control to ensure that the average value of the welding current is maintained.

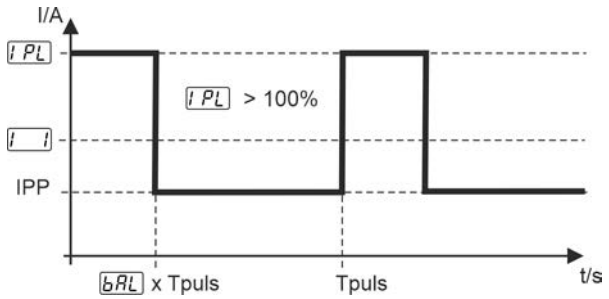


Figure 5-24

Setting the pulse current, pulse frequency and pulse balance

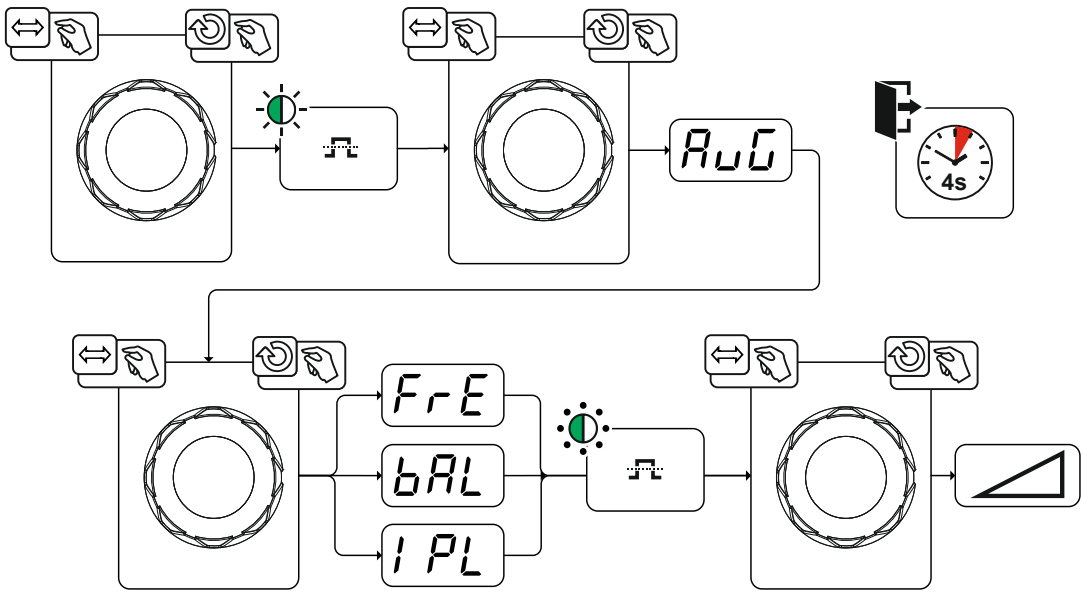


Figure 5-25

5.3.7.2 Automated pulses

The current-dependent pulse frequency and balance create vibrations in the weld pool that have a positive effect on the gap bridging. The machine control specifies the required pulse parameters automatically.

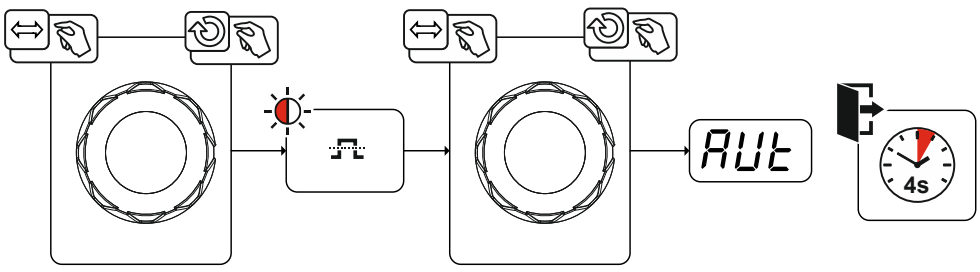


Figure 5-26

5.3.8 RTF 1 foot-operated remote control

The remote control allows the continuous adjustment of the welding current (0% to 100%) depending on the preselected main current [I] on the welding machine.

Further individual parameter settings affect the remote control behaviour:

- Switching between linear and logarithmic responses [Frt].
- Start program [SFr] to optimise the arc stability.
- Start/stop operation [Fto] to start and end the welding process without setting the current using the remote control.

5.3.8.1 Response

This function controls the responsiveness of the welding current during the main current phase. The user can choose between linear and logarithmic responsiveness. The logarithmic setting is particularly suitable for welding with low current, e.g., for thin panels as the logarithmic responsiveness enables better control of the welding current.

The responsiveness function can be switched in the machine configuration menu between the parameters for linear and logarithmic responsiveness (factory set) > *see 5.7 chapter*.

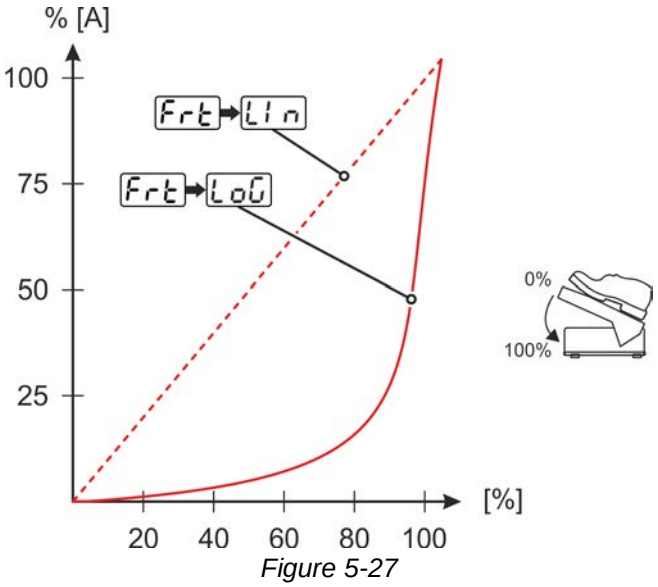


Figure 5-27

5.3.8.2 Start program

The start program "SFr" can be enabled or disabled in the machine configuration menu > *see 5.7 chapter*.

Enabled start program

At the start of the process, the start program ensures the necessary arc stability until the main current "I 1" is reached. The start current "I St", the ignition current time "tSt" and the ramp "tUP" can be adjusted individually according to the welding task. In the main program, the welding current can be freely regulated using the foot-operated remote control (factory setting).

Disabled start program

Without the start program, the current jumps immediately to the main current (according to the specification of the foot-operated remote control). The start current "I St" can be used for arc stabilisation. In this case, the operation with the foot-operated remote control is only enabled when the start current is exceeded. Until then, the welding current corresponds to the start current "I St".

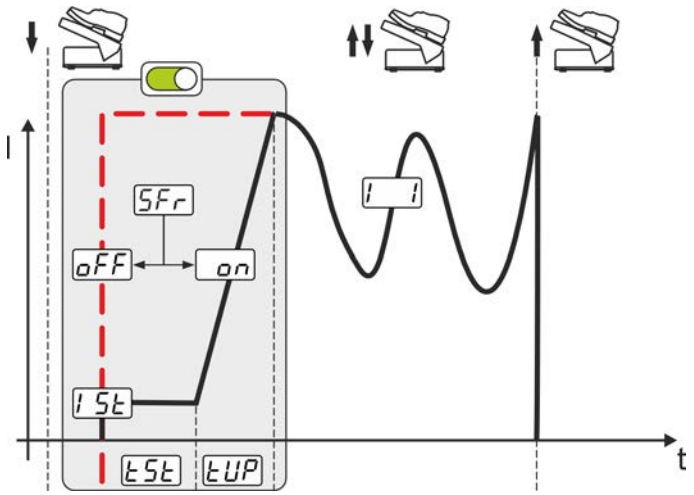


Figure 5-28

5.3.9 Expert menu (TIG)

The Expert menu has adjustable parameters stored that don't require regular setting. The number of parameters shown may be limited, e.g. if a function is deactivated.

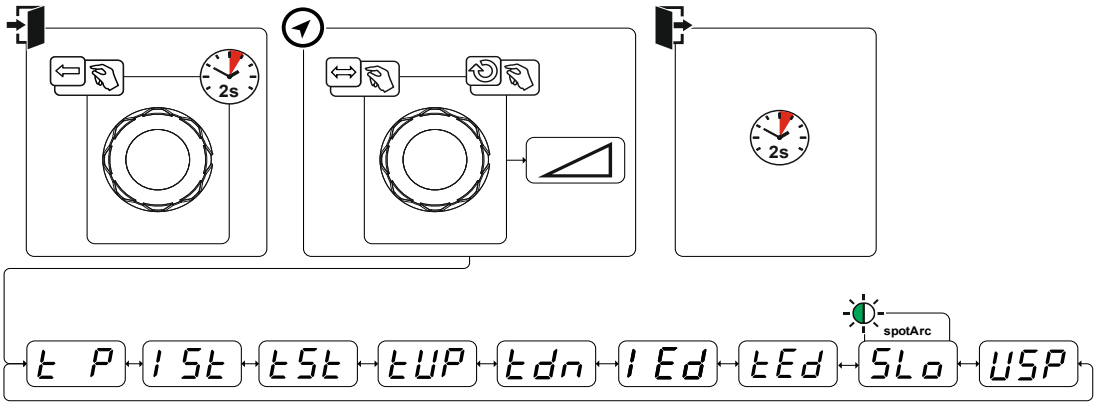


Figure 5-29

Display	Setting/selection
t P	**Spot time**
I St	**Start current as percentage - dependent on main current**
tSt	**Start time - duration of start current**
tUP	**Upslope time to main current**

Display	Setting/selection
tdn	**Downslope time**
I Ed	**End current as a percentage - dependent on main current**
tEd	**End current time - duration of end current**
SLo	**Slope times (*spotArc*)** Slope times (t_{up} tUP and t_{dn} tdn) on -------Slope times are activated. oFF-------Slope times are deactivated (hidden).
USP	**Arc length restriction > *see 5.6 chapter*** 1-12 ------Function is switched on (the smaller the value, the earlier the arc shut-down begins) oFF-------Function switched off

5.4 Remote control

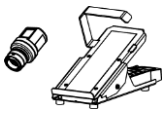
The remote controls are operated on the 19-pole remote control connection socket (analogue).

5.4.1 RTF-X TIG 19Pol

Functions

- Infinitely adjustable welding current (0% to 100%) depending on the main current preselected at the welding machine.
- Welding process start/stop (TIG)

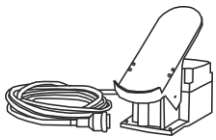
5.4.2 RTF-X TIG BT



Functions

- Infinitely adjustable welding current (0% to 100%) depending on the main current preselected at the welding machine.
- Welding process start/stop (TIG)
- Radio link (BT)

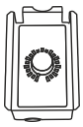
5.4.3 RTF1 19POL



Functions

- Infinitely adjustable welding current (0% to 100%) depending on the preselected main current on the welding machine.
- Start/stop welding operation (TIG)

5.4.4 RT1 19POL



Functions

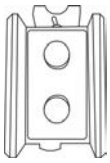
- Infinitely adjustable welding current (0% to 100%) depending on the preselected main current on the welding machine.

5.4.5 RTG1 19POL

Functions

- Infinite setting of the welding current (0% to 100%) depending on the main current preselected at the welding machine

5.4.6 RTA PWS2



Functions

- Welding current setting (0 % to 100 %)
- Switch for changing the polarity. Only active in machines with pole reversing switch (PWS).
- Setting the Arcforce

5.5 Access control

The machine control can be locked to prevent unauthorised or accidental adjustments. The access lock has the following effect:

- The parameters and their settings in the machine configuration menu, expert menu and the function sequence can only be viewed but not changed.
- The welding procedure cannot be switched.

The parameters for setting the access block are configured in the machine configuration menu > *see 5.7 chapter*.

Enabling access block

- Assign the access code for the access block: Select parameter cod and select a number code (0–999).
- Enable access block: Set parameter Loc to access block enabled on.

The access block activation is indicated by the "Access block active" signal light > *see 4.2 chapter*.

Disabling access block

- Enter the access code for the access block: Select parameter cod and enter the previously selected number code (0–999).
- Disable access block: Set parameter Loc to access block disabled oFF. The only way to disable the access block is to enter the selected number code.

5.6 Arc length restriction (USP)

The arc length restriction USP function stops the welding process when an excessive arc voltage is detected (unusually high gap between electrode and workpiece). This function can be adjusted in the corresponding Expert menu, depending on the process:

MMA welding > *see 5.2.8 chapter*

TIG welding > *see 5.3.9 chapter*

The arc length restriction cannot be used for cel characteristics (if available).

5.7 Machine configuration menu

Basic machine settings are defined in the machine configuration menu.

5.7.1 Selecting, changing and saving parameters

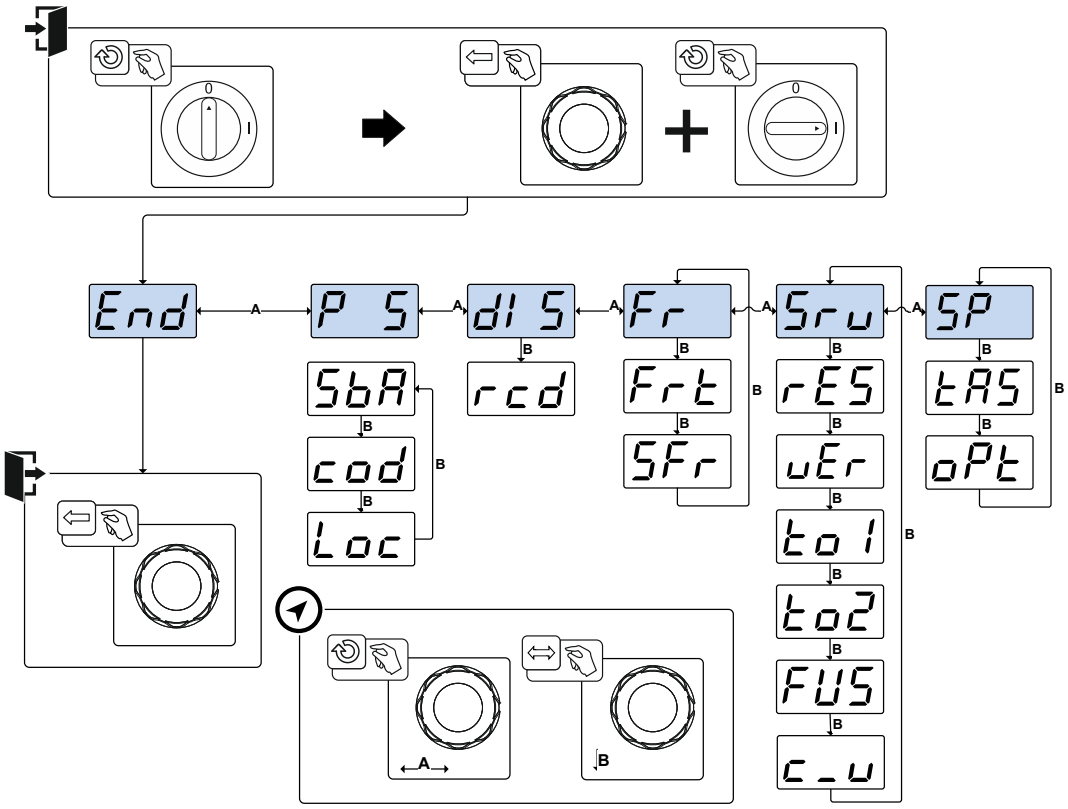


Figure 5-30

Display	Setting/selection
End	**Exit the menu** Exit
PS	**Power source menu**
SbA	**Time-based power-saving mode > *see 7.7 chapter*** Time to activation of the power-saving mode in case of inactivity. Setting oFF = disabled or numerical value 5-60 min..
cod	**Access control – access code** Setting: 000 to 999 (000 ex works)
Loc	**Access control > *see 5.5 chapter*** on -------Function enabled oFF -------Function disabled (ex works)
dI S	**Machine display menu**
rcd	**Welding current actual value display > *see 4.3.1 chapter*** on -------Actual value display oFF -------Nominal value display
Fr	**Remote control menu**
FrE	**Responsiveness > *see 5.3.8.1 chapter*** Lin -------Linear responsiveness LoG -------Logarithmic responsiveness (factory setting)

Display	Setting/selection
SFr	**Start program of foot-operated remote control > *see 5.3.8.2 chapter*** on ------- Function enabled (factory setting). oFF ------ Function disabled.
Srv	**Service menu** Any changes to the service menu should be agreed with the authorised service personnel.
rES	**Reset (resetting to factory settings)** oFF ------ Switched off (factory setting) cFG ------ Reset all values and adjustments to ------ Reset the operating time ti ------ Reset the arc time toi ------ Reset the operating time and arc time Reset by pressing the rotary encoder.
vEr	**Software version of the machine control** Display of the software version (scrolling text).
to1	**Operating time/arc time (resettable)** to1 ------ Display of the resettable operating time in hours and minutes (can be reset using the parameter rES). ti1 ------ Display of resettable arc time in hours and minutes (can be reset using the parameter rES)
to2	**Operating time/arc time (total)** to2 ------ Display of the operating time in hours and minutes (total) ti2 ------ Display of the arc time in hours and minutes (total)
FUS	**Dynamic power adjustment > *see 7.5 chapter***
C_u	**Calibration and validation mode > *see 6.3 chapter*** oFF ------ Function disabled (factory setting) on ------- Function enabled
SP	**Special parameters menu**
tAS	**TIG antistick > *see 5.3.6 chapter*** on ------ function active (factory setting) oFF ------ function inactive
oPt	**Arc detection for welding helmets (TIG)** Modulated waviness for better arc detection 0 ------ Function disabled (factory setting) 1 ------ Medium intensity 2 ------ High intensity

6 Maintenance, care and disposal

6.1 General

⚠ DANGER

Risk of injury due to electrical voltage after switching off!
Working on an open machine can lead to fatal injuries!
Capacitors are loaded with electrical voltage during operation. Voltage remains present for up to four minutes after the mains plug is removed.

1. Switch off machine.
2. Remove the mains plug.
3. Wait for at last 4 minutes until the capacitors have discharged!

⚠ WARNING

Improper maintenance, testing and repairs!
Maintenance, testing and repair of the machine may only be carried out by skilled and qualified personnel (authorised service personnel). A competent person is someone who, based on training, knowledge and experience, can recognize the hazards and possible consequential damage that may occur when testing power sources and can take the necessary safety precautions.

- Follow the maintenance instructions > *see 6.2 chapter*.
- If any of the test requirements below are not met, the unit must not be put back into operation until it has been repaired and tested again.

Repair and maintenance work may only be performed by qualified authorised personnel; otherwise the right to claim under warranty is void. In all service matters, always consult the dealer who supplied the machine. Return deliveries of defective equipment subject to warranty may only be made through your dealer. When replacing parts, use only original spare parts. When ordering spare parts, please quote the machine type, serial number and item number of the machine, as well as the type designation and item number of the spare part.

Under the specified ambient conditions and normal working conditions this machine is essentially maintenance-free and requires just a minimum of care.

Contamination of the machine may impair service life and duty cycle. The cleaning intervals depend on the ambient conditions and the resulting contamination of the machine. The minimum interval is every six months.

6.1.1 Cleaning

- Clean the outer surfaces with a moist cloth (no aggressive cleaning agents).
- Purge the machine venting channel and cooling fins (if present) with oil- and water-free compressed air. Compressed air may overspeed and destroy the machine fans. Never direct the compressed air directly at the machine fans. Mechanically block the fans, if required.
- Check the coolant for contaminants and replace, if necessary.

6.1.2 Dirt filter

When using a dirt filter, the cooling air throughput is reduced and the duty cycle of the machine is reduced as a result. The duty cycle decreases with the increasing contamination of the filter. The dirt filter must be remove at regular intervals and cleaned by blowing out with compressed air (depending on the level of soiling).

6.2 Maintenance work, intervals

6.2.1 Daily maintenance tasks

Visual inspection

- Mains supply lead and its strain relief
- Gas cylinder securing elements
- Check hose package and power connections for exterior damage and replace or have repaired by specialist staff as necessary!
- Gas tubes and their switching equipment (solenoid valve)
- Check that all connections and wearing parts are hand-tight and tighten if necessary.
- Check correct mounting of the wire spool.
- Wheels and their securing elements
- Transport elements (strap, lifting lugs, handle)
- Other, general condition

Functional test

- Operating, message, safety and adjustment devices (Functional test)
- Welding current cables (check that they are fitted correctly and secured)
- Gas tubes and their switching equipment (solenoid valve)
- Gas cylinder securing elements
- Check correct mounting of the wire spool.
- Check that all screw and plug connections and replaceable parts are secured correctly, tighten if necessary.
- Remove any spatter.
- Clean the wire feed rollers on a regular basis (depending on the degree of soiling).

6.2.2 Monthly maintenance tasks

Visual inspection

- Casing damage (front, rear and side walls)
- Wheels and their securing elements
- Transport elements (strap, lifting lugs, handle)
- Check coolant tubes and their connections for impurities

Functional test

- Selector switches, command devices, emergency stop devices, voltage reducing devices, message and control lamps
- Check wire guide elements (wire feed roll holder, wire feed nipple, wire guide tube) for tight fit. Recommendation for replacing the wire feed roll holder (eFeed) after 2000 hours of operation, see replacement parts).
- Check coolant tubes and their connections for impurities
- Check and clean the welding torch. Deposits in the torch can cause short circuits and have a negative impact on the welding result, ultimately causing damage to the torch.

6.2.3 Annual test (inspection and testing during operation)

A periodic test according to IEC 60974-4 "Periodic inspection and test" has to be carried out. In addition to the regulations on testing given here, the relevant local laws and regulations must also be observed.

For more information refer to the "Warranty registration" brochure supplied and our information regarding warranty, maintenance and testing at www.ewm-group.com!

6.3 Calibration / validation

In this mode, the inverter can be started and stopped and the current can be adjusted from minimum to maximum without being disturbed by welding process characteristics.

6.3.1 Machine control – Operating elements

Figure 6-1

Item	Symbol	Description
1	000	**Display of the nominal and actual value of the current** The current is shown as a nominal or actual value. Switching is done by pressing the rotary transducer.
2	I_1	**Signal light for the actual value of the current** The signal light flashes when the current is displayed as the actual value.
3	Rutile	**Signal light for inverter On/Off** Lights up when the inverter is switched on.
4	▼	**Push-button for inverter On/Off** Pressing this push-button turns on the inverter of the power source. Pressing it again switches the inverter off.
5	Cel	**Signal light for the current flow** Lights up when current is flowing.
6		**Click wheel to set the current** The welding current can be adjusted by turning. Press to switch the current display between nominal and actual value.

6.3.2 Activating the calibration and validation mode

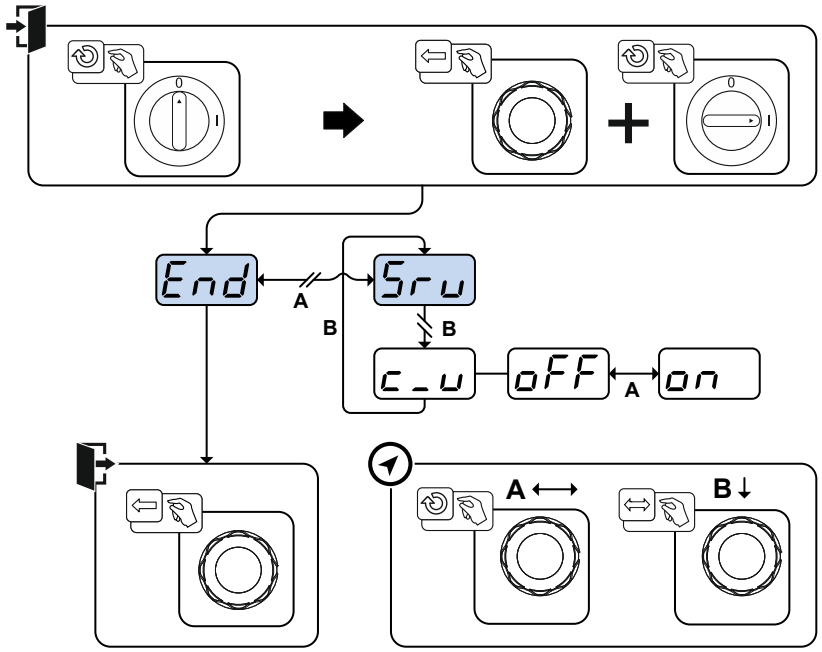


Figure 6-2

Display	Setting/selection
c_u	**Calibration and validation mode > *see 6.3.2 chapter*** oFF ------ Function disabled (factory setting) on ------- Function enabled

6.3.3 Turning the inverter of the power source on and off

⚠ WARNING

Risk of injury from electrical voltage!
When the inverter is switched on, the welding current sockets are live.
- Do not touch the welding current sockets or connected components directly!

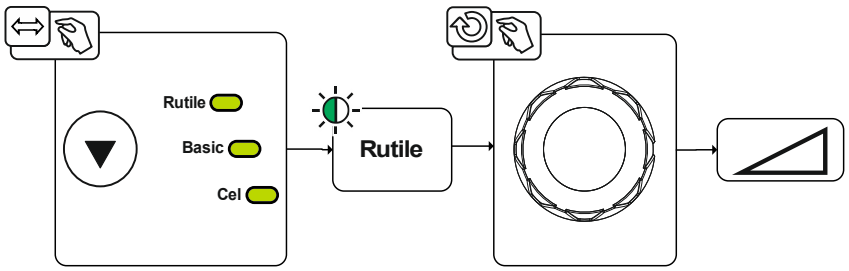


Figure 6-3

When the set mains fuse value is exceeded, the maximum output current is reduced and signalled by the flashing display FUS. Please refer to the chapter “Dynamic power adjustment” > *see 7.5 chapter*.

6.3.4 Deactivating the calibration and validation mode

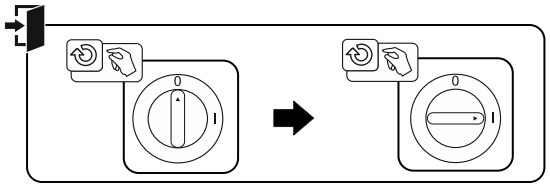


Figure 6-4

6.4 Disposing of equipment

Proper disposal!
The machine contains valuable raw materials, which should be recycled, and electronic components, which must be disposed of.

- **Do not dispose of in household waste!**
- **Observe the local regulations regarding disposal!**

In addition to the national or international regulations mentioned below, it is mandatory to follow the respective national laws and regulations on disposal.

- According to European provisions (Directive 2012/19/EU on Waste of Electrical and Electronic Equipment), used electric and electronic equipment may no longer be placed in unsorted municipal waste. It must be collected separately. The symbol depicting a waste container on wheels indicates that the equipment must be collected separately.
  This machine has to be disposed of, or recycled, in accordance with the waste separation systems in use.

According to German law (law governing the distribution, taking back and environmentally correct disposal of electrical and electronic equipment (ElektroG)), used machines are to be placed in a collection system separate from unsorted municipal waste. The public waste management utilities (communities) have created collection points at which used equipment from private households can be disposed of free of charge.

The deletion of personal data is the responsibility of the end user.

Lamps, batteries or accumulators must be removed and disposed of separately before disposing of the device. The type of battery or accumulator and its composition is marked on the top (type CR2032 or SR44). The following EWM products may contain batteries or accumulators:

- Welding helmets
  Batteries or accumulators are easy to remove from the LED cassette.
- Device controls
  Batteries or accumulators are located on the back of these in corresponding sockets on the circuit board and are easy to remove. The controls can be removed using standard tools.

Information on returning used equipment or collections can be obtained from the respective municipal administration office. Devices can also be returned to EWM sales partners across Europe.

Further information on the topic of the disposal of electrical and electronic equipment can be found on our website at: https://www.ewm-group.com/de/nachhaltigkeit.html.

7 Rectifying faults

All products are subject to rigorous production checks and final checks. If, despite this, something fails to work at any time, please check the product using the following flowchart. If none of the fault rectification procedures described leads to the correct functioning of the product, please inform your authorised dealer.

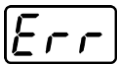
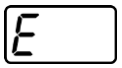
7.1 Software version of the machine control

The query of the software versions only serves to inform the authorised service staff. It is available in the machine configuration menu > *see 5.7 chapter*.

7.2 Error messages (power source)

The possible error numbers displayed depend on the machine series and version!

Depending on the options of the machine display, a fault is shown as follows:

Display type - machine control	Display
Graphic display	
two 7-segment displays	
one 7-segment display	

The possible cause of the fault is signalled by a corresponding fault number (see table). In the case of an error, the power unit shuts down.

- Document machine errors and inform service staff as necessary.
- If multiple errors occur, these are displayed in succession.

Reset error (category legend)

A The error message disappears when the error is eliminated.

B The error message can be reset by pressing a push-button ◀.

All other error messages can only be reset by switching the machine off and on again.

Error 3: Tacho error

Categories A, B

- Fault in the wire feeder.
  - Check the electrical connections (connectors, lines).
- Permanent overload of the wire drive.
  - Do not lay the liner in tight radii.
  - Check the wire in the liner for ease of movement.

Error 4: Excess temperature

Category A

- The power source is overheating.
  - Allow the switched-on machine to cool.
- Fan is blocked, dirty or defective.
  - Check the fan and clean or replace.
- Air inlet or outlet is blocked.
  - Check the air inlet and outlet.

Error 5: Mains overvoltage

Category A [1]

- Mains voltage is too high.
  - Check the mains voltages and compare them with the connection voltages of the power source.

Error 6: Mains undervoltage

Category A [1]

- Mains voltage is too low.
  - Check the mains voltages and compare them with the connection voltages of the power source.

Error 7: Low coolant level

Category B

- Low flow rate.
  - Fill with coolant.
  - Check coolant flow - remove kinks in the hose package.
  - Adjust the flow threshold [2].
  - Clean the cooler.
- The pump does not turn.
  - Turn the pump shaft.
- Air in the coolant circuit.
  - Vent the coolant circuit.
- The hose package is not filled with coolant.
  - Switch the machine off and on > pump running > filling process.
- Operation with a gas-cooled welding torch.
  - Deactivate the torch cooling.
  - Connect the coolant feed and return with a hose bridge.

Error 8: Shielding gas error

Categories A, B

- No gas.
  - Check the gas supply.
- The pre-pressure is too low.
  - Remove kinks in the hose package (nominal value: 4-6 bar pre-pressure).

Error 9: Secondary overvoltage

- Overvoltage at the output: Inverter error.
  - Request service.

Error 10: Earth fault (PE error)

- Connection between welding wire and machine casing.
  - Remove the electrical connection.
- Connection between welding circuit and machine casing.
  - Check the connection and routing of the earth wire / welding torch.

Error 11: Fast shut-down

Categories A, B

- Remove the logical signal "Robot ready" during the process.
  - Eliminate errors in the higher-level control.

Error 16: Pilot arc power source - collective error

Category A

- The external emergency stop circuit has been interrupted.
  - Check the emergency stop circuit and eliminate the cause of the error.
- The emergency stop circuit of the power source has been activated (internally configurable).
  - Deactivate the emergency stop circuit.
- The power source is overheating.
  - Allow the switched-on machine to cool.
- Fan is blocked, dirty or faulty.
  - Check the fan and clean or replace it.
- Air inlet or outlet is blocked.
  - Check the air inlet and outlet.
- Short circuit on welding torch.
  - Check the welding torch.
  - Request service.

Error 17: Cold wire error

Category B

- Fault in the wire feeder.
  - Check the electrical connections (connectors, lines).
- Permanent overload of the wire drive.
  - Do not lay the liner in tight radii.
  - Check the liner for ease of movement.

Error 18: Plasma gas error

Category B

- No gas.
  - Check the gas supply.
- The pre-pressure is too low.
  - Remove kinks in the hose package (nominal value: 4-6 bar pre-pressure).

Error 19: Shielding gas error

Category B

- No gas.
  - Check the gas supply.
- The pre-pressure is too low.
  - Remove kinks in the hose package (nominal value: 4-6 bar pre-pressure).

Error 20: Low coolant level

Category B

- Low flow rate.
  - Fill with coolant.
  - Check coolant flow - remove kinks in the hose package.
  - Adjust the flow threshold [2].
  - Clean the cooler.
- The pump does not turn.
  - Turn the pump shaft.
- Air in the coolant circuit.
  - Vent the coolant circuit.
- The hose package is not filled with coolant.
  - Switch the machine off and on > pump running > filling process.
- Operation with a gas-cooled welding torch.
  - Deactivate the torch cooling.
  - Connect the coolant feed and return with a hose bridge.

Error 22: Excess coolant temperature

Category B

- Coolant is overheating [2].
  - Allow the switched-on machine to cool.
- Fan is blocked, dirty or faulty.
  - Check the fan and clean or replace it.
- Air inlet or outlet is blocked.
  - Check the air inlet and outlet.

Error 23: Excess temperature

Category A

- External component (e.g. HF ignition units) overheated.
- The power source is overheating.
  - Allow the switched-on machine to cool.
- Fan is blocked, dirty or faulty.
  - Check the fan and clean or replace it.
- Air inlet or outlet is blocked.
  - Check the air inlet and outlet.

Error 24: Pilot arc ignition error

Category B

- The pilot arc cannot ignite.
  - Check the welding torch equipment.

Error 25: Forming gas error

Category B

- No gas.
  - Check the gas supply.
- The pre-pressure is too low.
  - Remove kinks in the hose package (nominal value: 4-6 bar pre-pressure).

Error 26: Excess pilot arc module temperature

Category A

- The power source is overheating.
  - Allow the switched-on machine to cool.
- Fan is blocked, dirty or faulty.
  - Check the fan and clean or replace it.
- Air inlet or outlet is blocked.
  - Check the air inlet and outlet.

Error 32: Error I>0

- The current detection is incorrect.
  - Request service.

Error 33: Error UIST

- Voltage recording is faulty.
  - Eliminate the short circuit in the welding circuit.
  - Remove the external sensor voltage.
  - Request service.

Error 34: Electronics error

- A/D channel error
  - Switch the machine off and on.
  - Request service.

Error 35: Electronics error

- Slope error
  - Switch the machine off and on.
  - Request service.

Error 36: [S] fault

- [S] conditions violated.
  - Switch the machine off and on.
  - Request service.

Error 37: Excess temperature / electronics error

- The power source is overheating.
  - Allow the switched-on machine to cool.
- Fan is blocked, dirty or faulty.
  - Check the fan and clean or replace it.
- Air inlet or outlet is blocked.
  - Check the air inlet and outlet.

Error 38: Error IIST

- Short circuit in the welding circuit before welding.
  - Eliminate the short circuit in the welding circuit.
  - Request service.

Error 39: Electronics error

- Secondary overvoltage
  - Switch the machine off and on.
  - Request service.

Error 40: Electronics error

- Error in the power supply of the electronics
  - Request service.

Error 47: Radio link (BT)

Category B

- Connection error between the welding machine and peripheral unit.
  - Note the documentation for the data interface with radio transmission.

Error 48: Ignition error

Category B

- No ignition at process start (automated machines).
  - Check the wire feeding
  - Check the load cable connections in the welding circuit.
  - Clean corroded surfaces on the workpiece before welding if necessary.

Error 49: Arc interruption

Category B

- An arc interruption occurred during welding with an automated system.
  - Check the wire feeding.
  - Adjust the welding speed.

Error 50: Program number

Category B

- Internal error.
  - Request service.

Error 51: Emergency stop

Category A

- The external emergency stop circuit has been interrupted.
  - Check the emergency stop circuit and eliminate the cause of the error.
- The emergency stop circuit of the power source has been activated (internally configurable).
  - Deactivate the emergency stop circuit.

Error 52: No wire feeder

- After switching on the automated system, no wire feeder (DV) was detected.
  - Check or connect the control cables of the wire feeders.
  - Check the identification number of the automated wire feeder (for 1DV: number 1, for 2DV: each a wire feeder with number 1 and a wire feeder with number 2).

Error 53: No wire feeder 2

Category B

- Wire feeder 2 was not detected.
  - Check the control cable connections.

Error 54: VRD fault

- Error in the voltage reduction device.
  - If necessary, disconnect the external machine from the welding circuit.
  - Request service.

Error 55: Excess wire feeder current

Category B

- Excess current detected in the wire feed mechanism.
  - Do not lay the liner in tight radii.
  - Check the liner for ease of movement.

Error 56: Mains phase failure

- One phase of the mains voltage has failed.
  - Check the mains connection, mains plug and mains fuses.

Error 57: Slave tacho error

Category B

- Fault in the wire feeder (slave drive).
  - Check the connections (connectors, lines).
- Permanent overload of the wire drive (slave drive).
  - Do not lay the liner in tight radii.
  - Check the liner for ease of movement.

Error 58: Short circuit

Category B

- Short circuit in the welding circuit.
  - Eliminate the short circuit in the welding circuit.
  - Place the welding torch on an insulated surface.

Error 59: Incompatible machine

- A machine connected to the system is not compatible.
  - Disconnect the incompatible machine from the system.

Error 60: Incompatible software

- The software of a machine is not compatible.
  - Disconnect the incompatible machine from the system
  - Request service.

Error 61: Welding monitoring

- The actual value of a welding parameter is outside the specified tolerance range.
  - Maintain the tolerance ranges.
  - Adjust the welding parameters.

Error 62: System component

- The system component was not found.
  - Request service.

Error 63: Mains voltage error

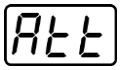
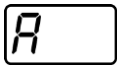
- Operating and mains voltage are incompatible.
  - Check or adjust the operating and mains voltage.

[1] only Picotig 220 pulse

[2] See technical data for values and other switching thresholds > *see 8 chapter*.

7.3 Warnings

Depending on the display options of the machine display, a warning message is displayed as follows:

Display type - machine control	Display
Graphic display	
two 7-segment displays	
one 7-segment display	

The cause of the warning is indicated by a corresponding warning number (see table).

- In case of multiple warnings, these are displayed in sequence.
- Document machine warning and inform service personnel, if required.

Warning		Potential cause / remedy
1	Excess temperature	A shutdown is imminent due to excess temperature.
2	Half-wave failures	Check process parameters.
3	Welding torch cooling warning	Check the coolant level and top up if necessary.
4	Shielding gas	Check the shielding gas supply.
5	Coolant flow	Check min. flow rate. [2]
6	Wire reserve	Only a small amount of wire is left on the spool.
7	CAN bus failure	The wire feeder is not connected; the automatic circuit-breaker of the wire feed motor (reset the tripped automatic circuit breaker by actuating).
8	Welding circuit	The inductance of the welding circuit is too high for the selected welding task.
9	WF configuration	Check WF configuration.
10	Partial inverter	One of several partial inverters is not supplying welding current.
11	Excess temperature of the coolant [1]	Check temperature and switching thresholds. [2]
12	Welding monitoring	The actual value of a welding parameter is outside the specified tolerance range.
13	Contact error	The resistance in the welding circuit is too high. Check the earth connection.
14	Alignment error	Switch the machine off and on. If the error persists, notify Service.
15	Mains fuse	The power limit of the mains fuse is reached and the welding power is reduced. Check the fuse setting.
16	Shielding gas warning	Check the gas supply.
17	Plasma gas warning	Check the gas supply.
18	Forming gas warning	Check the gas supply.
19	Gas warning 4	reserved
20	Coolant temperature warning	Check the coolant level and top up if necessary.
21	Excess temperature 2	reserved
22	Excess temperature 3	reserved
23	Excess temperature 4	reserved

Warning		Potential cause / remedy
24	Coolant flow warning	Check the coolant supply. Check the coolant level and top up if necessary. Check flow and switching thresholds. [2]
25	Flow 2	reserved
26	Flow 3	reserved
27	Flow 4	reserved
28	Wire stock warning	Check the wire feeding.
29	Low wire 2	reserved
30	Low wire 3	reserved
31	Low wire 4	reserved
32	Tacho error	Fault of the wire feeder - permanent overload of the wire drive.
33	Wire feed motor excess current	Excess current detected on wire feed motor.
34	JOB unknown	JOB selection was not carried out because the JOB number is unknown.
35	Wire feed motor slave excess current	Excess current detected on wire feed motor slave (push/push system or intermediate drive).
36	Slave tacho error	Fault of the wire feeder - permanent overload of the wire drive (push/push system or intermediate drive).
37	FAST bus failure	The wire feeder is not connected (reset by actuating the automatic circuit breaker of the wire feed motor).
38	Incomplete component information	Check the Xnet component management.
39	Halfwave failure	Check supply voltage.
40	Weak power grid	Check supply voltage.
41	Cooling unit not recognised	A liquid-cooled welding torch was connected but no cooling unit has been detected. • Check the connection of the cooling unit • Use a gas-cooled welding torch
47	Battery (remote control, type BT)	Battery level is low (replace battery)

[1] only for the XQ machine series

[2] See technical data for values and other switching thresholds > *see 8 chapter*.

7.4 Checklist for rectifying faults

The correct machine equipment for the material and process gas in use is a fundamental requirement for perfect operation!

Legend	Symbol	Description
	↯	Fault/Cause
	🛠	Remedy

Mains fuse triggers

↯ Mains fuse triggers - unsuitable mains fuse

🛠 Set up recommended mains fuse > *see 8 chapter*.

🛠 Adapt the power source to the mains fuse > *see 7.5 chapter*.

Functional errors

- Several parameters cannot be set (machines with access block)
  - Entry level is blocked, disable access lock > *see 5.5 chapter*
- All machine control signal lights are illuminated after switching on
- No machine control signal light is illuminated after switching on
- No welding power
  - Phase failure > check mains connection (fuses)
- Connection problems
  - Make control lead connections and check that they are fitted correctly.
- Loose welding current connections
  - Tighten power connections on the torch and/or on the workpiece
  - Tighten contact tip correctly

Bad arc ignition

- Material inclusions in the tungsten electrode due to contact with filler material or workpiece
  - Regrind or replace the tungsten electrode

Welding torch overheated

- Loose welding current connections
  - Tighten power connections on the torch and/or on the workpiece
  - Tighten contact tip correctly
- Overload
  - Check and correct welding current setting
  - Use a more powerful welding torch

Unstable arc

- Material inclusions in the tungsten electrode due to contact with filler material or workpiece
  - Regrind or replace the tungsten electrode
- Incompatible parameter settings
  - Check settings and correct if necessary

Pore formation

- Inadequate or missing gas shielding
  - Check shielding gas setting and replace shielding gas cylinder if necessary
  - Shield welding site with protective screens (draughts affect the welding result)
  - Use gas lens for aluminium applications and high-alloy steels
- Unsuitable or worn welding torch equipment
  - Check size of gas nozzle and replace if necessary
- Condensation in the gas tube
  - Purge hose package with gas or replace

7.5 Dynamic power adjustment

This requires use of the appropriate mains fuse.

Observe mains fuse specification > *see 8 chapter*!

This function enables aligning the machine to the mains connection fusing to avoid continuous tripping of the mains fuse. The maximum power input of the machine is limited by an exemplary value for the existing mains fuse (several levels available).

You can predefine this value in the machine configuration menu > *see 5.7 chapter* using parameter FUS. The selected value will be shown on the machine display cAL for two seconds after the machine has been switched on.

The function automatically adjusts the welding power to an uncritical level for the mains fuse.

☞ ***When using a 20-A mains fuse, a suitable mains plug has to be installed by a qualified electrician.***

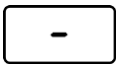
7.6 Resetting welding parameters to the factory settings

All customised welding parameters that are stored will be replaced by the factory settings.

To reset the welding parameters or machine settings to the factory settings, select parameter rES in the service menu Sru > *see 5.7 chapter*.

7.7 Power-saving mode (Standby)

Using the parameter SbA in the machine configuration menu, the time for the power-saving mode can be set or the mode can be deactivated > *see 5.7 chapter*.



When power-saving mode is activated, the machine displays show the horizontal digit in the centre of the display only.

Actuating any operating element (e.g., turning a rotary knob) cancels the power-saving mode and the machine switches back to ready-to-weld mode.

8 Technical data

Performance specifications and guarantee only in connection with original spare and replacement parts!

8.1 Pico 200 cel puls

8.1.1 Mains voltage 230 V

	TIG	MMA
Welding current I_2	5 A to 220 A	5 A to 200 A
Welding voltage according to standard U_2	10,2 V to 18,8 V	20,2 V to 28,0 V
Duty cycle DC at 40° C [1]	220 A (40 %) 190 A (60 %) 160 A (100 %)	200 A (30 %) 155 A (60 %) 125 A (100 %)
Open circuit voltage U_0	97 V	
Mains voltage (Tolerance)	1 x 230 V (-40 % to +15 %)	
Frequency	50/60 Hz	
mains fuse [2]	1 x 16 A	
Mains connection cable	H07RN-F3G2,5	
max. Connected load S_1	4,9 kVA	6,7 kVA
Rec. Puissance du générateur	6,6 kVA	9,0 kVA
Power consumption P_i [3]	10 W	
Cos φ / efficiency	0,99 / 84 %	
Protection class	I	
Overvoltage category	III	
Contamination level	3	
Insulation class / protection classification	H / IP 23	
Residual current circuit breaker	Type B (recommended)	
Noise level [4]	<70 dB(A)	
Ambient temperature	-25 °C to +40 °C	
Machine cooling	Fan (AF)	
Torch cooling	gas	
Workpiece lead (min.)	35 mm^2	
EMC class	A	
Test mark	S / CE / EAC / UKCA	
Standards used	See declaration of conformity (appliance documents)	
Dimensions (l x b x h)	454 x 165 x 321 mm 17.9 x 6.5 x 12.6 inch	
Weight	10,0 kg 22.0 lb	

[1] Load cycle: 10 min. (60 % DC ≙ 6 min. welding, 4 min. pause) AC power sources: 50 Hz - waveform = square.

[2] Safety fuses are recommended DIAZED xxA gG. When using automatic cutouts, the "C" trigger characteristic must be used.

[3] Power in idle state without external or internal peripherals.

[4] Noise level during idle mode and operation under standard load according to IEC 60974- 1 at the maximum operating point.

8.1.2 Mains voltage 120 V

The performance specifications refer to machines with several mains voltage variants (multivolt capability). Please note the information on the relevant rating plate.

☞ ***The increased current consumption at a lower mains voltage requires the installation of a suitable mains plug > see 5.1.7 chapter.***

	TIG	MMA
Welding current I_2	5 A to 170 A	5 A to 120 A
Welding voltage according to standard U_2	10,2 V to 16,8 V	20,2 V to 24,8 V
Duty cycle DC at 40° C [1]	170 A (40 %) 150 A (60 %) 120 A (100 %)	120 A (40 %) 100 A (60 %) 85 A (100 %)
Open circuit voltage U_0	97 V	
Mains voltage (Tolerance)	1 x 120 V (-15 % to +15 %)	
Frequency	50/60 Hz	
mains fuse [2]	1 x 20 A	
Mains connection cable	H07RN-F3G2,5	
max. Connected load S_1	3,4 kVA	3,5 kVA
Rec. Puissance du générateur	4,6 kVA	4,7 kVA
Power consumption P_i [3]	10 W	
Cos φ / efficiency	0,99 / 84 %	
Protection class	I	
Overvoltage category	III	
Contamination level	3	
Insulation class / protection classification	H / IP 23	
Residual current circuit breaker	Type B (recommended)	
Noise level [4]	<70 dB(A)	
Ambient temperature	-25 °C to +40 °C	
Machine cooling	Fan (AF)	
Torch cooling	gas	
Workpiece lead (min.)	35 mm^2	
EMC class	A	
Test mark	S / CE / EAC / UKCA	
Standards used	See declaration of conformity (appliance documents)	
Dimensions (l x b x h)	454 x 165 x 321 mm 17.9 x 6.5 x 12.6 inch	
Weight	10,0 kg 22.0 lb	

[1] Load cycle: 10 min. (60 % DC ≙ 6 min. welding, 4 min. pause) AC power sources: 50 Hz - waveform = square.

[2] Safety fuses are recommended DIAZED xxA gG. When using automatic cutouts, the "C" trigger characteristic must be used.

[3] Power in idle state without external or internal peripherals.

[4] Noise level during idle mode and operation under standard load according to IEC 60974- 1 at the maximum operating point.

9 Accessories

Performance-dependent accessories like torches, workpiece leads, electrode holders or intermediate hose packages are available from your authorised dealer.

9.1 Welding torch

Type	Designation	Item no.
TIG 26 GDV 4m	TIG welding torch, rotary gas valve, gas-cooled, decentral	094-511621-00100
TIG 26 GDV 8m	TIG welding torch, rotary gas valve, gas-cooled, decentral	094-511621-00108

9.2 Shielding gas supply (shielding gas cylinder for welding machine)

Type	Designation	Item no.
Proreg Ar/CO2 230bar 15l D	Pressure regulator with manometer	394-008488-10015
Proreg Ar/CO2 230bar 30l D	Pressure regulator with manometer	394-008488-10030
DM 842 Ar/CO2 230bar 15l D	Pressure regulator with manometer	394-002910-00015
GH 2X1/4" 2M	Gas hose	094-000010-00001
GH 2x1/4" 3m	Gas hose	094-000010-00003
GH 2X1/4" 5m	Gas hose	094-000010-00005
GH 2X1/4" 10 m	Gas hose	094-000010-00011
GH 2X1/4" 15m	Gas hose	094-000010-00015

9.3 Transport system

Type	Designation	Item no.
Trolly 35-1	Transport vehicle	090-008629-00000

9.4 19-pole remote control

Type	Designation	Item no.
RT1 19POL	Remote control current	090-008097-00000
RTG1 19POL 5m	Remote control, current	090-008106-00000
RTG1 19POL 10m	Remote control, current	090-008106-00010
RTF1 19POL 5 M	Foot-operated remote control current with connection cable	094-006680-00000
RTF-X TIG 19pol 5 m	Foot-operated remote control, current, with connection cable	090-008855-00005
RTA PWS2	Remote control, welding current setting (0 % to 100 %), pole reversing switch, setting Arcforce	090-008856-00000
RTF-X TIG BT	Foot-operated remote control, current, Wireless	090-008854-00000
Type	**Designation**	**Item no.**
DONGLE BT 19POL	Dongle	090-005702-00000

9.4.1 Connection cables

Type	Designation	Item no.
RA5 19POL 5M	Remote control e.g. connection cable	092-001470-00005
RA10 19POL 10m	Remote control e.g. connection cable	092-001470-00010
RA20 19POL 20m	Remote control e.g. connection cable	092-001470-00020

9.5 Option for retrofitting

Type	Designation	Item no.
ON Filter TG.12	Dirt filter for the air inlet	092-004516-00000
ON TG	Carrying strap	092-004310-00000
ON AL D13/27	Cap for load sockets	092-003282-00000

9.6 General accessories

Type	Designation	Item no.
SKGS 16A 250V CEE7/7, DIN 49440/441	Protective contact plug, solid rubber	094-001756-00000
32A 5POLE/CEE	Machine plug	094-000207-00000
ADAP CEE16/SCHUKO	Earth contact coupling/CEE16A plug	092-000812-00000
KLF-L1-N-PE-NETZ	Mains-cable label	094-014869-00001

10 Appendix

10.1 Parameter overview – setting ranges

10.1.1 MMA welding

Display	Parameter / function	Setting range				
		Standard (factory setting)	min.		max.	Unit
I_{ht}	Hot-start current	120	1	-	200	%
t_{ht}	Hot-start time	0,5	0,1	-	20,0	s
I_1	Main current	100	5	-	200	A
	Pulse welding (AUS)	off	off	-	AUS	-
FrE	Pulse frequency	1,2	0,2	-	500	Hz
bAL	Pulse balance	30	1	-	99	%
I PL	Pulse current	142	1	-	200	%
	Arcforce correction	0	-10	-	10	-
USP	Arc length restriction	off	off	-	on	-

10.1.2 TIG welding

Display	Parameter / function	Setting range				
		Standard (factory setting)	min.		max.	Unit
I St	Ignition current	50	1	-	200	%
tSt	Start time	0	0		20	s
tUP	Up-slope time	1	0	-	20	s
tdn	Down-slope time	0,1	0		20	s
I Ed	End current	20	1		200	%
tEd	End current time	0	0		20	s
I_1	Main current	100	5	-	220	A
	Pulse welding (AUS / AUt)	off	off	-	AUt	-
FrE	Pulse frequency - (average value pulsing AUS)	2,0	0,2	-	2000	Hz
bAL	Pulse balance - (average value pulsing AUS)	50	1	-	99	%
I PL	Pulse current - (average value pulsing AUS)	140	1	-	200	%
SLo	Slope times (spotArc)	off	off	-	on	-
t P	Spot time - spotArc®	2,0	0,1	-	20,0	s
USP	Arc length restriction	8	off	-	12	-

10.1.3 Basic parameters (independent of process)

Display	Parameter / function	Setting range				
		Standard (factory set-ting)	min.		max.	Unit
SbA	Time-based energy-saving function	off	off	-	60	min
FUS	Dynamic power adjustment (230V)	16	10	-	20	A
	Dynamic power adjustment (120V)	20	10	-	20	A
rcd	Current display switching	off	off	-	on	-
Frt	Remote control response	LoG	LIn	-	LoG	-
SFr	Start program of the remote control	on	off	-	on	-
tAS	Antistick for TIG	on	off	-	on	-
oPt	Arc detection for welding helmets (TIG)	0	0	-	2	-
c_u	Calibration and validation mode	off	off	-	on	-

10.2 Average shielding gas usage

	Gas nozzle number	4	5	6	7	8	10
	Ø mm	6.5	8.0	9.5	11	12.5	16
	Ø inch	0.26	0.31	0.37	0.43	0.5	0.63
l/min		6	8	10	12		15
gal/min		1.58	2.11	2.64	3.17		3.96

10.3 Searching for a dealer

Sales & service partners
www.ewm-group.com/en/specialist-dealers

"More than 400 EWM sales partners worldwide"