Operating instructions

EN

Welding machine

Pico 350 cel puls pws dgs

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

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

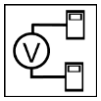
⚠ WARNING

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!



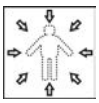
Hazard when interconnecting multiple power sources!
If a number of power sources are to be connected in parallel or in series, only a technical specialist may interconnect the sources as per standard IEC 60974-9:2010: Installation and use and German Accident Prevention Regulation BVG D1 (formerly VBG 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 can lead to breathing difficulties and poisoning. In addition, solvent vapour (chlorinated hydrocarbon) may be converted into poisonous phosgene due to the ultraviolet radiation of the arc!

- Ensure that there is sufficient fresh air!
- Keep solvent vapour away from the arc beam field!
- Wear suitable breathing apparatus if appropriate!

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 may cause electrical or electromagnetic fields to be produced which could affect the correct functioning of electronic equipment such as IT or CNC devices, telecommunication lines, power cables, signal lines and pacemakers.

- Observe the maintenance instructions > *see 6.2 chapter*!
- Unwind welding leads completely!
- Shield devices or equipment sensitive to radiation accordingly!
- The correct functioning of pacemakers may be affected (obtain advice from a doctor 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

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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 system for MMA DC welding with pole reversing switch for quick polarity switching and, as secondary process, TIG DC welding with lift arc (touch starting) or MIG/MAG welding with constant voltage (CV) or constant current (CC).

3.1.1 Degaussing

The degaussing of ferromagnetic workpieces in welding technology is intended to reduce arc deflection, arc instability, uneven droplet detachment, spatter and irregular flank connections.

3.1.2 MIG/MAG standard welding

A suitable wire feed unit (system component) is required in order to operate the welding machine!

	Pico drive 4L	Pico drive 200C
Pico 350, -400	☑	

3.2 Software version

The software version of the machine control can be displayed in the machine configuration menu (menu Srv) > *see 5.10 chapter*.

3.3 Overview of device types

3.3.1 Cellulose electrode types (cel)

CEL device types are equipped with special Arcforce characteristics.
These device types facilitate welding with cellulose electrode types which is safe for vertical-down welding, especially in the lower output range.

3.3.2 Pole reversing switch (pws)

With PWS device types, the polarity of the welding current connections (pole reversal) can be changed using a changeover switch on the machine or on the remote control.
Useful function with frequently changing electrode types without time-consuming reconnection of the welding current connections (also directly at the operating point, in combination with a PWS remote control).

3.4 Voltage reducing device

Only machine variants with the (VRD/SVRD/AUS/RU) code are equipped with a voltage reduction device (VRD). The VRD is used for increased safety, especially in hazardous environments such as shipbuilding, pipe construction or mining.

A VRD is mandatory in some countries and required by many on-site safety instructions for power sources.

The VRD signal light is illuminated when the voltage reduction device is operating without fault and the output voltage is reduced to a value specified in the relevant standard (see technical data).

3.5 Documents which also apply

3.5.1 Warranty

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

3.5.2 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.

3.5.3 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!

3.5.4 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.

3.5.5 Calibration/Validation

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

3.5.6 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.

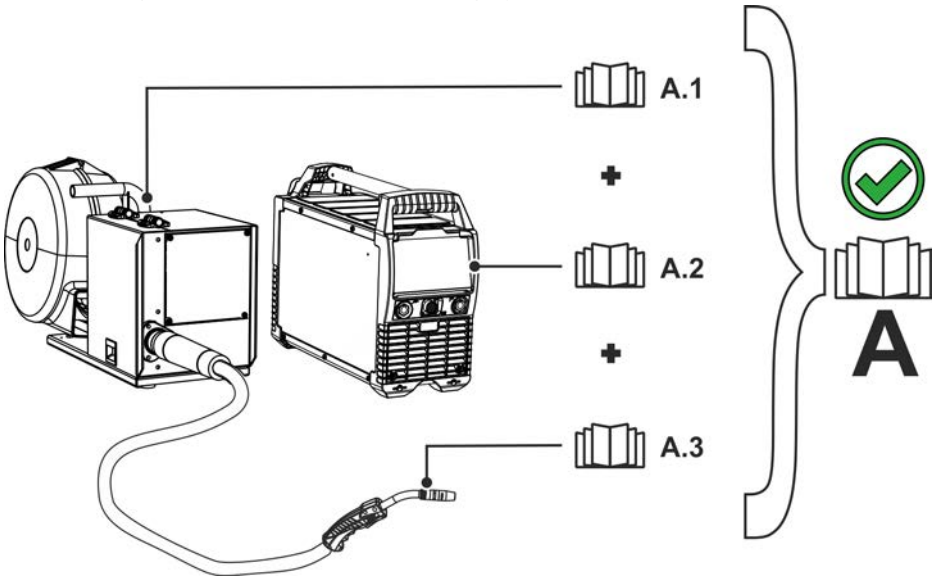


Figure 3-1

Item	Documentation
A.1	Wire feeder
A.2	Power source
A.3	Welding torch
A	Complete documentation

4 Machine description – quick overview

4.1 Front view / rear view

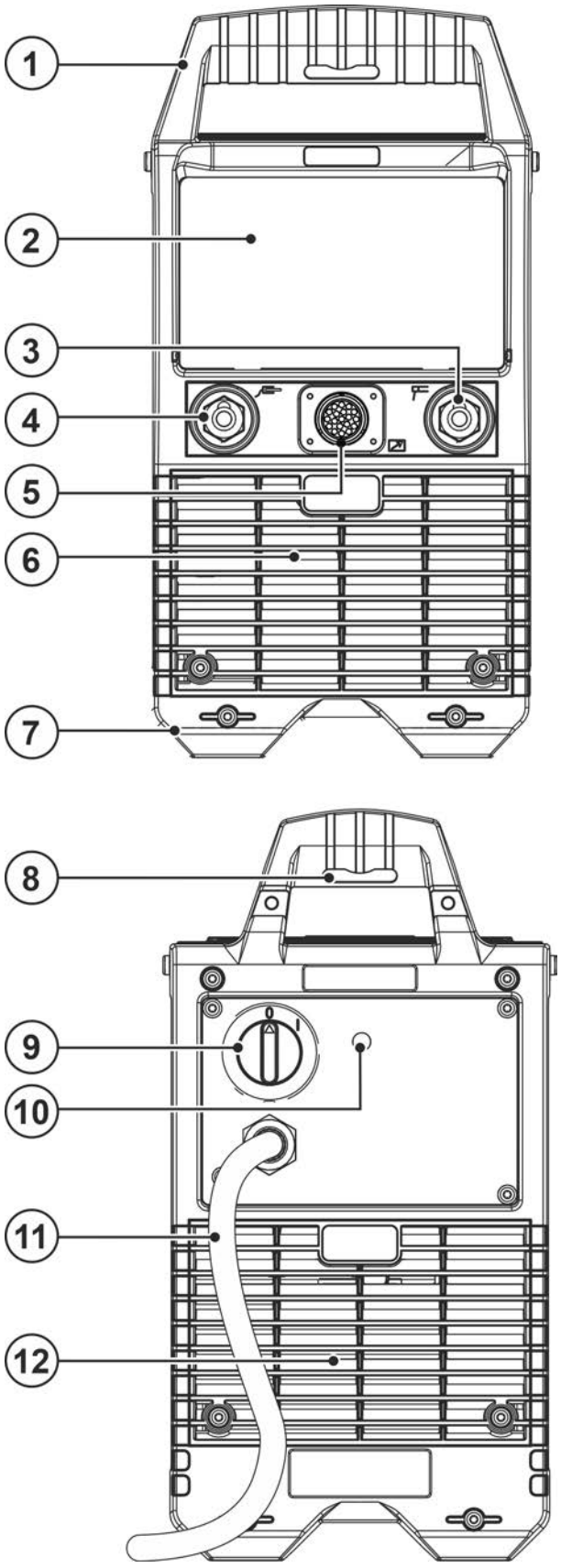


Figure 4-1

Item	Symbol	Description
1		**Transport elements** Transport handle and transport belt > *see 5.1.4 chapter*
2		**Operating elements** Device control > *see 4.2 chapter* and protective cap > *see 5.1.8 chapter*
3		**Connection socket, welding current (electrode holder)** The welding current polarity (+/-) can be reversed by pressing the welding current polarity push-button (except with TIG welding) and is indicated by a signal light above the relevant welding current socket. How to connect the accessories depends on the welding procedure. Please observe the connection description for the corresponding welding procedure > *see 5 chapter*.
4		**Connection socket, welding current (workpiece)** The welding current polarity (+/-) can be reversed by pressing the welding current polarity push-button (except with TIG welding) and is indicated by a signal light above the relevant welding current socket. How to connect the accessories depends on the welding procedure. Please observe the connection description for the corresponding welding procedure > *see 5 chapter*.
5		**19-pole connection socket** Control cable for remote control and/or wire feeder
6		**Cooling air inlet** Dirt filter optional > *see 6.1.2 chapter*
7		**Machine feet**
8		**Carrying strap > *see 5.1.4.1 chapter***
9		**Main Switch** Switching the machine on or off.
10		**Key button, automatic cutout** Wire feed motor supply voltage fuse press to reset a triggered fuse
11		**Mains connection cable > *see 5.1.12 chapter***
12		**Cooling air outlet**

4.2 Machine control – Operating elements

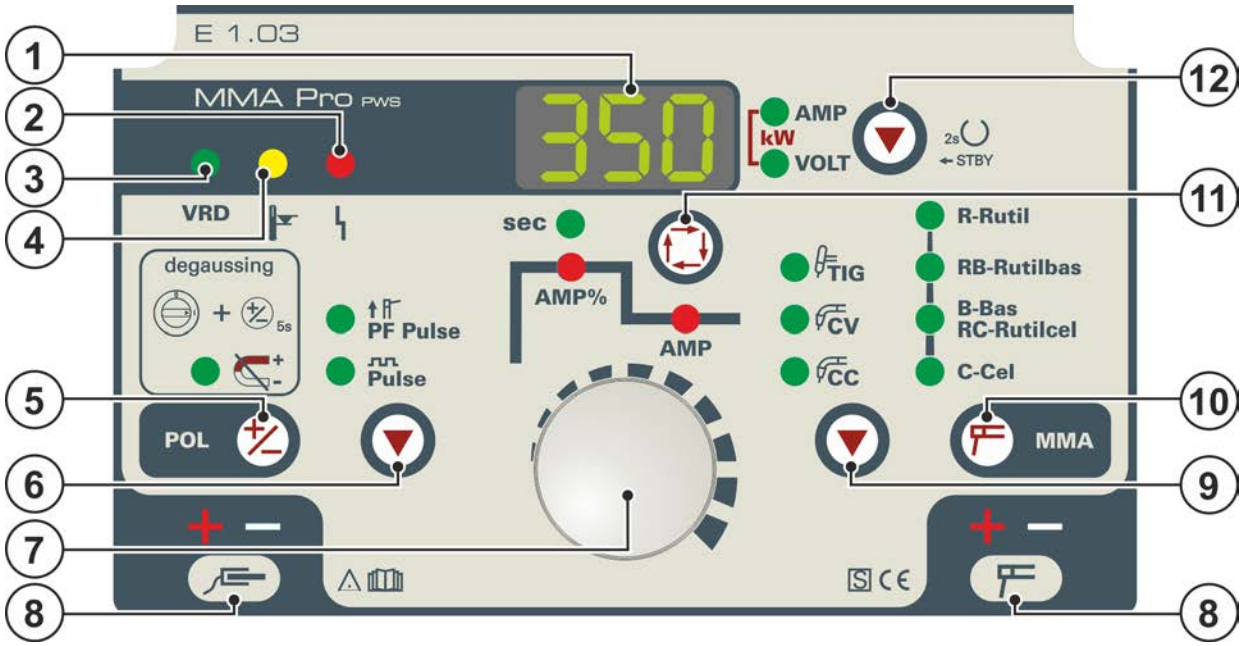


Figure 4-2

Item	Symbol	Description
1	000	**Welding data display (3-digit)** Displays the welding parameters and the corresponding values > *see 4.2.1 chapter*
2		**Collective interference signal light** For error messages, > *see 7.2 chapter*
3	VRD	**Signal light of voltage reduction device (VRD)** Not used in this system!
4		**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.
5		**Push-button for welding current polarity (pole reversal) / degaussing** • ---------- changing the welding current polarity of the welding current sockets > *see 5.7.1.1 chapter* • ---------- degaussing the workpiece > *see 5.6 chapter*
6		**Pulsing push-button** PF pulsing (MMA) ------ Pulsing (MMA/TIG) --------
7		**Welding parameter setting rotary transducer** Setting of welding current and other welding parameter and their values
8	+ −	**Welding current polarity signal light** The signal light shows the selected polarity at the welding current socket below. Use the welding current polarity push-button to reverse the welding current polarity of the welding current sockets.
9		**Welding procedure selection push-button** TIG ------- TIG welding CV -------- MIG/MAG welding with constant voltage characteristics Default characteristics "CV constant voltage" for nearly all MIG/MAG processes CC -------- MIG/MAG welding with constant current characteristics Used for special wires (flux cored wires), which, according to the manufacturer, are to be welded using "CC constant current"

Item	Symbol	Description
10		**Welding procedure/MMA characteristics selection push-button** Select MMA welding procedure and electrode type R---------- Electrode type rutile RB-------- Electrode type rutile-basic B / RC--- Electrode type basic/rutile-cellulose C---------- Electrode type cellulose
11		**Select welding parameters button** This button is used to select the welding parameters depending on the welding process and operating mode used.
12		**Display/Power-saving mode switching push-button** AMP----- Welding current display VOLT---- Welding voltage display kW ------- Welding performance display (both signal lights are illuminated) STBY---- Press for 2 s to put machine into power-saving mode. To reactivate, activate one of the operating elements.

4.2.1 Welding data display

All relevant welding parameters with their values are shown depending on the welding procedure selected and the associated functions. Machine parameters and error codes are shown as well in a unique manner. The meaning of the parameters and values shown is explained in the relevant chapter for the function.

Next to the display is the Display/Power-saving mode switching push-button. Each time the push-button is pressed the display switches between the desired parameters.

Depending on the process, the parameters are shown as nominal values (before welding), actual values (during welding) or hold values (after welding):

MMA welding, TIG welding and MIG/MAG welding with constant current (CC):

	Nominal values	Actual values	Hold values (5 s)
Welding current (AMP)	☑	☐/☑ [*]	☐/☑ [*]
Welding voltage (VOLT)	☐	☑	☑
Welding performance (kW)	☐	☑	☑
Open circuit voltage	☑	☐	☐

By turning the rotary transducer for the welding parameter settings the display automatically switches to the welding current display.

MIG/MAG welding with constant voltage (CV):

	Nominal values	Actual values	Hold values (5 s)
Welding current (AMP)	☑	☑	☑
Welding voltage (VOLT)	☑	☑	☑
Welding performance (kW)	☑	☑	☑

By turning the rotary transducer for the welding parameter settings the display automatically switches to the welding voltage display.

[*] optionally adjustable – *> see 5.10 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.

5.1.1 Ambient conditions

☞ ***The machine may only be placed and operated on a suitable, load-bearing and even surface (according to IP 34s in case of outside operation as well)!***
- ***Ensure the machine is operated on an even, anti-slip floor and provide sufficient lighting of the work area.***
- ***Safe operation of the machine must be guaranteed at all times!***

☞ ***Equipment damage due to contamination!***
Unusually high amounts of dust, acids, corrosive gases or substances can damage the machine (observe maintenance intervals > see 6.2 chapter).
- ***Avoid large amounts of smoke, steam, oily fumes, grinding dust and corrosive ambient air!***

In operation

Temperature range of the ambient air:
- -25 °C to +40 °C (-13 °F to 104 °F) [1]

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) [1]

Relative humidity
- up to 90 % at 20 °C (68 °F)

[1] Ambient temperature dependent on coolant! Observe the coolant temperature range of the torch cooling

5.1.2 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!***

5.1.3 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!

5.1.4 Transport belt

5.1.4.1 Adjusting the length of the carrying strap

To demonstrate adjustment, lengthening the strap is shown in the figure. To shorten, the strap's loops must be inched in the opposite direction.

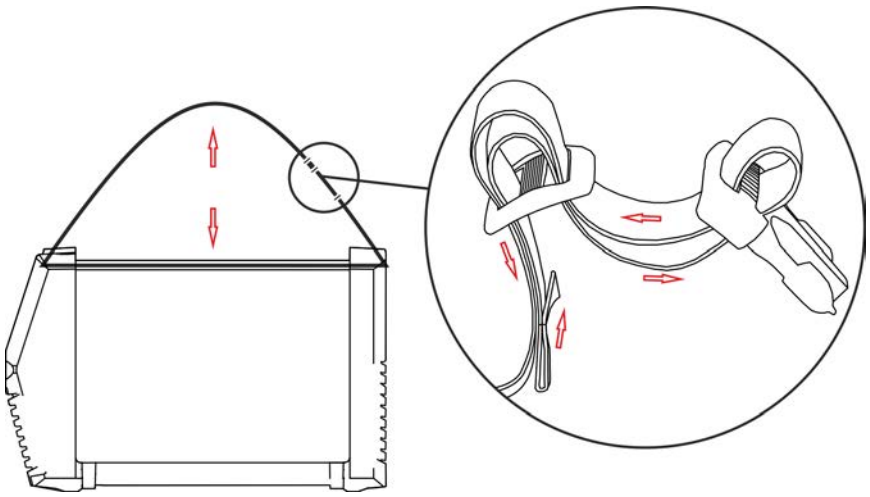


Figure 5-1

5.1.5 Cable strap

In the delivery state, the machine has a cable strap for easy and orderly transport of earth lead, welding torch, electrode holder etc. The following figure shows the fastened strap and how the components can be secured.

The machine itself may not be transported with this cable strap!

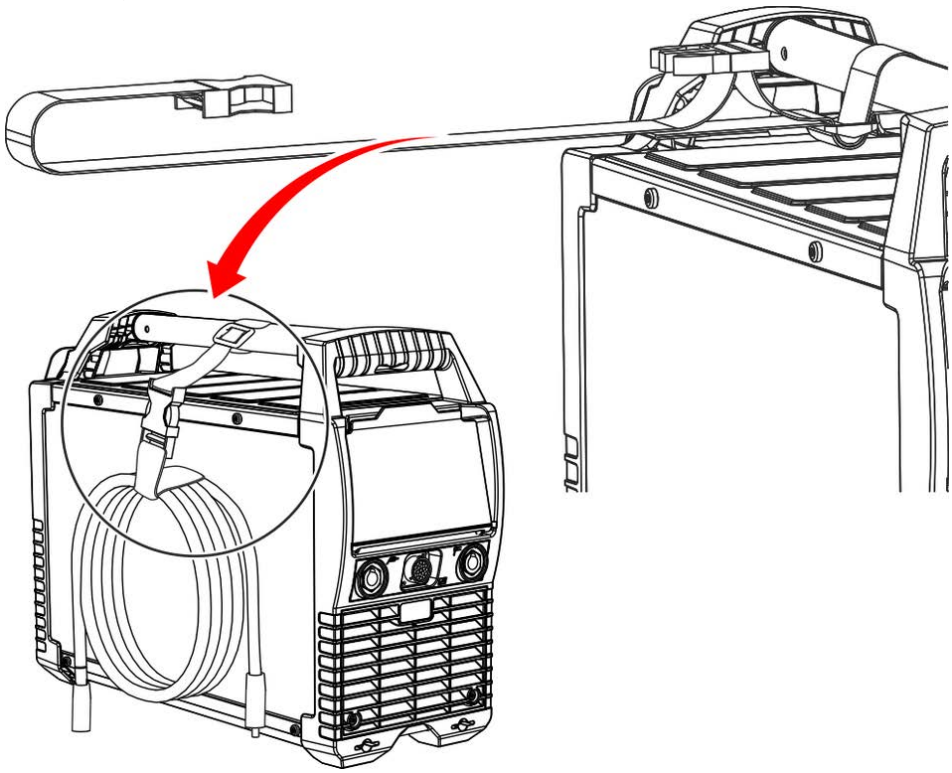


Figure 5-2

5.1.6 Cable holder

The machine is supplied with a cable holder with mounting material. This cable holder can be used to coil and conveniently transport the mains cable. Install the cable holder as shown in the figure.

5.1.7 Deinstallation/Installation

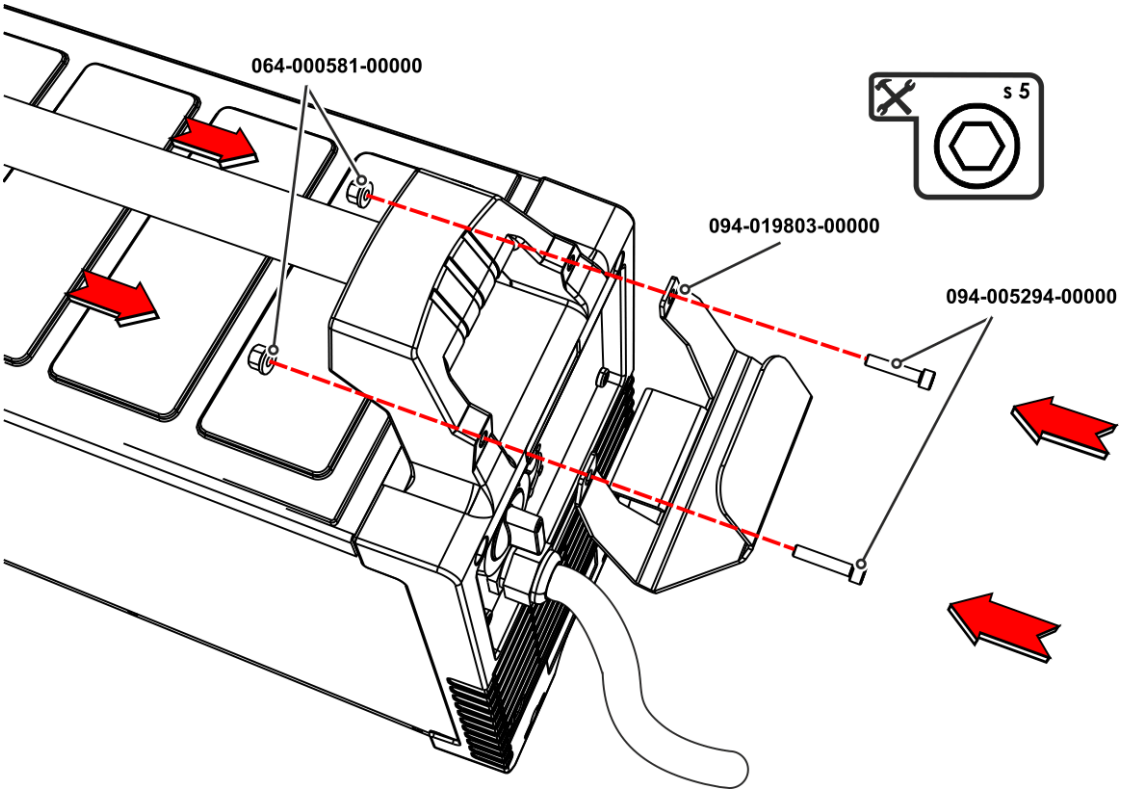


Figure 5-3

5.1.7.1 Application

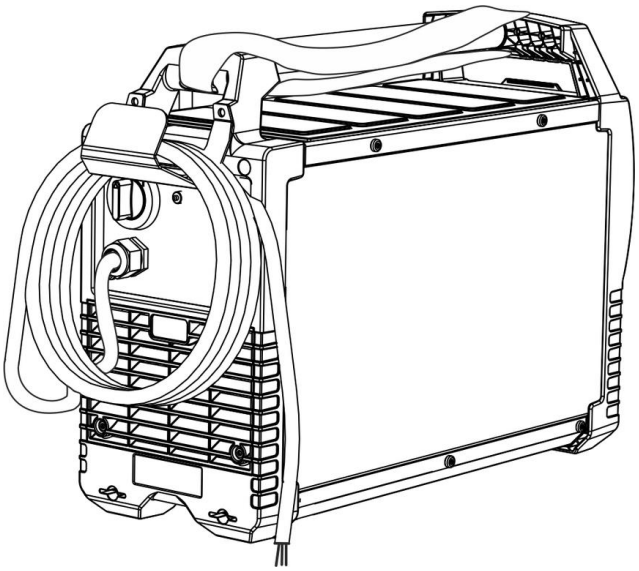


Figure 5-4

5.1.8 Protective flap, welding machine control

5.1.9 Deinstallation/Installation

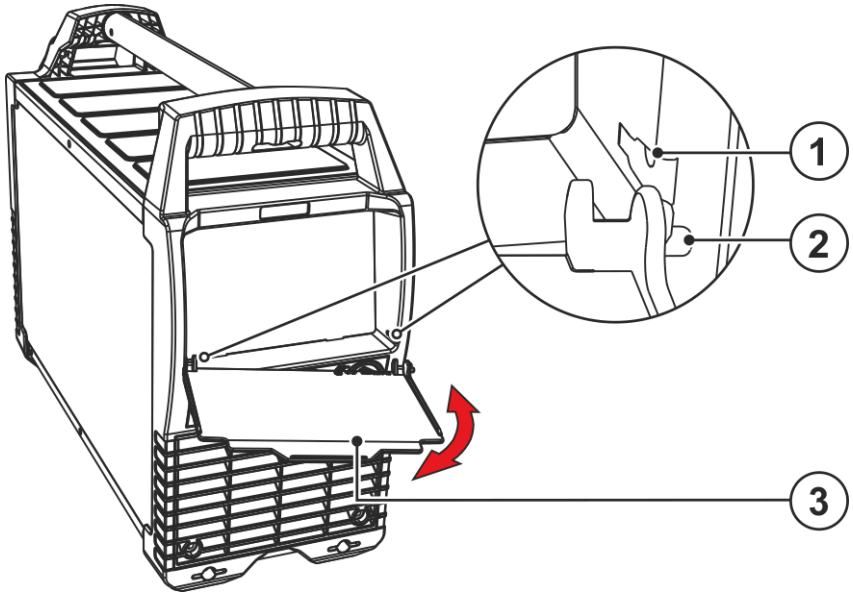


Figure 5-5

Item	Symbol	Description
1		**Seating hole for mounting nipple**
2		**Mounting nipple, protective cap**
3		**Protective cap**

- Remove the protective cap by gently pressing from the side while simultaneously pulling. To attach, insert and snap into place.

5.1.10 Notes on the installation of welding current leads

- Incorrectly installed welding current leads can cause faults in the arc (flickering).
- Lay the workpiece lead and hose package of power sources without HF igniter (MIG/MAG) for as long and as close as possible in parallel.
- Lay the workpiece lead and hose package of power sources with HF igniter (TIG) for as long as possible in parallel with a distance of 20 cm to avoid HF sparkover.
- Always keep a distance of at least 20 cm to leads of other power sources to avoid interferences
- Always keep leads as short as possible! For optimum welding results max. 30 m (welding lead + intermediate hose package + torch lead).

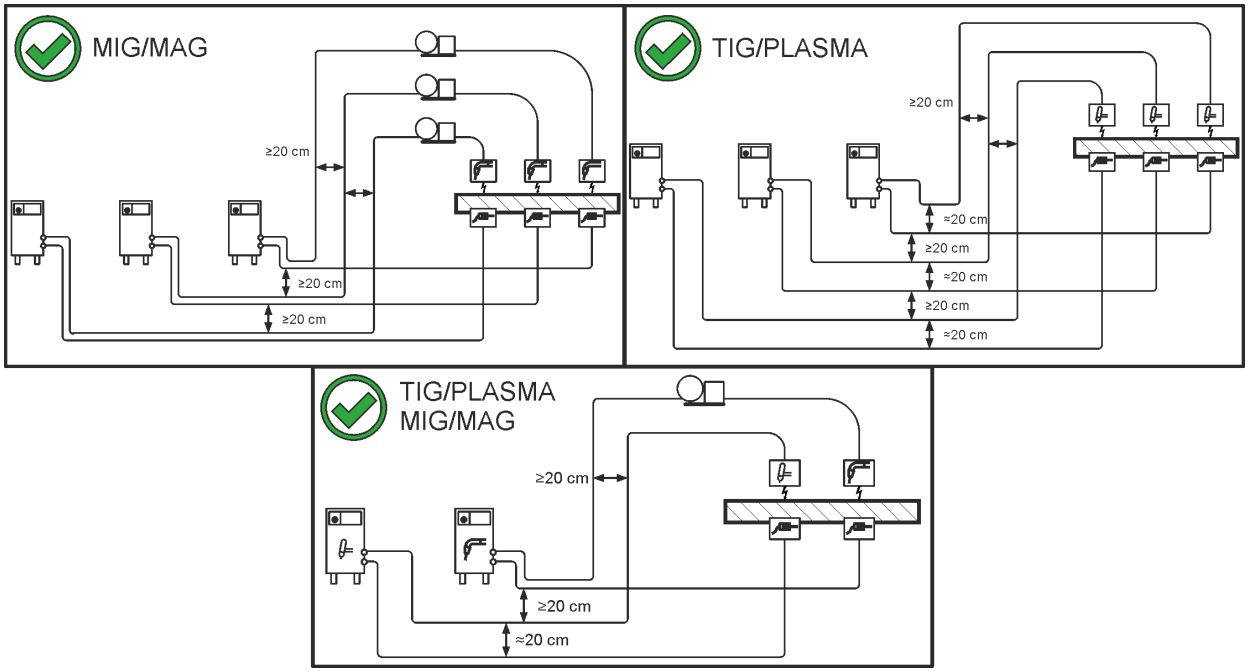


Figure 5-6

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

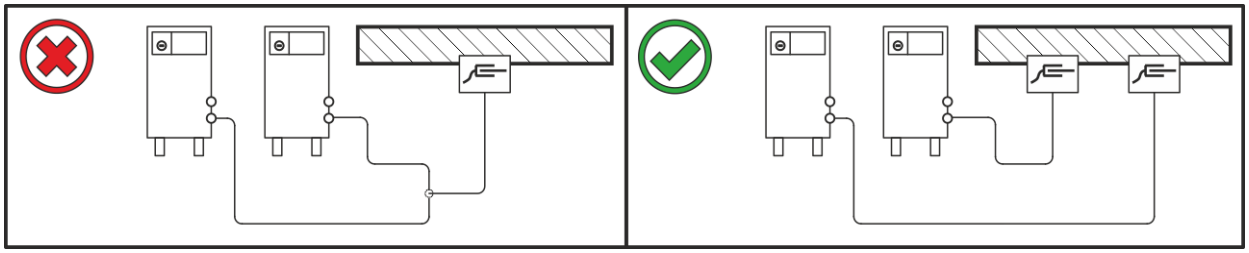


Figure 5-7

- 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.

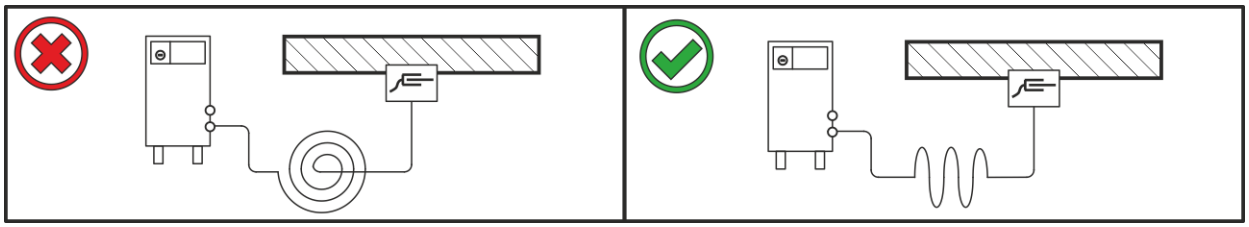


Figure 5-8

5.1.11 Stray welding currents

⚠ WARNING

Risk of injury due to stray welding currents!
Stray welding currents can destroy protective earth conductors, damage machines and electronic devices and cause overheating of components, leading to fire.

- Check that all welding current connections are firmly secured and electrical connections are in perfect condition.
- Set up, attach or suspend all conductive power source components such as casing, transport vehicles and crane frames so they are insulated.
- Do not place any other electronic devices such as drills or angle grinders on the power source, transport vehicle or crane frames unless they are insulated.
- Always put welding torches and electrode holders on an insulated surface when they are not in use.

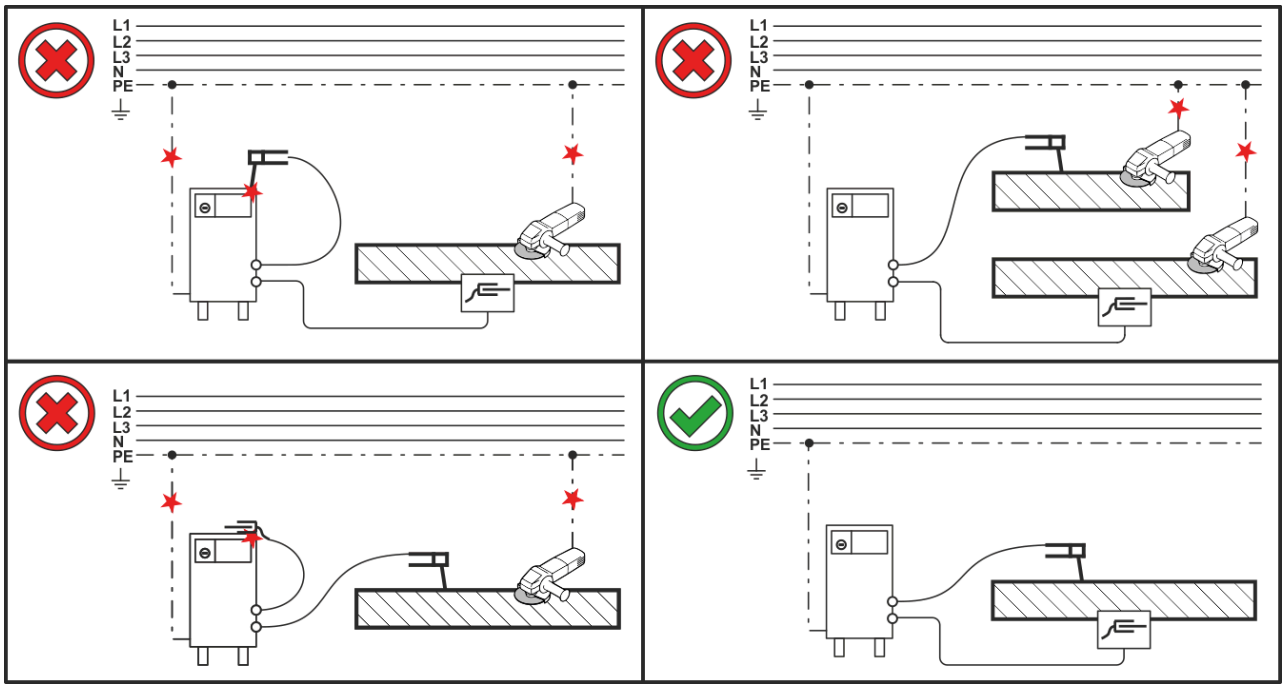


Figure 5-9

5.1.12 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.

5.1.12.1 Mains configuration

The machine may be connected to:

- **a three-phase system with four conductors and an earthed neutral conductor**
- **a three-phase system with three conductors of which any one can be earthed,**

e.g. the outer conductor

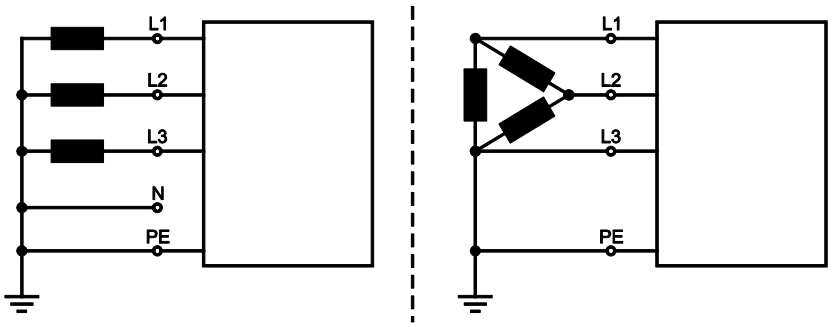


Figure 5-10

Legend

Item	Designation	Colour code
L1	Outer conductor 1	brown
L2	Outer conductor 2	black
L3	Outer conductor 3	grey
N	Neutral conductor	blue
PE	Protective conductor	green-yellow

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

5.1.13 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!

- 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.

☞ ***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.***

- ***Always re-fit the yellow protective cap when not using the shielding gas connection.***
- ***All shielding gas connections must be gas tight.***

5.1.14 Pressure regulator connection

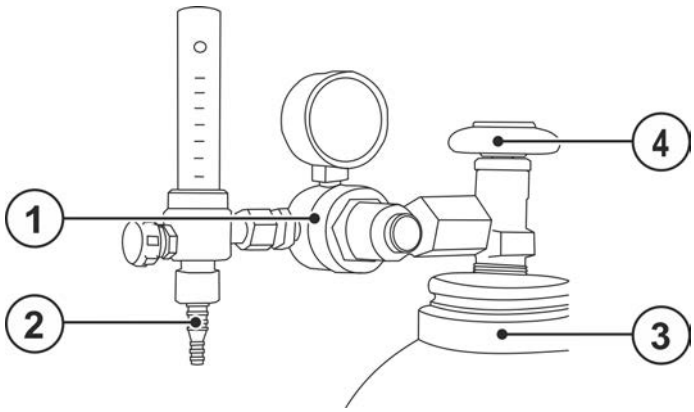


Figure 5-11

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.

5.2 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.

The signal lights above the welding current sockets show the welding current polarity (+/-), depending on the electrode type selected at the machine control.

Use the welding current polarity push-button (pole reversal) to reverse the welding current polarity (+/-) without having to change the electrode holder or workpiece lead > *see 5.7.1.1 chapter*. This reversal can also be effected using a suitable remote control (PWS).

The polarity cannot be reversed during welding.

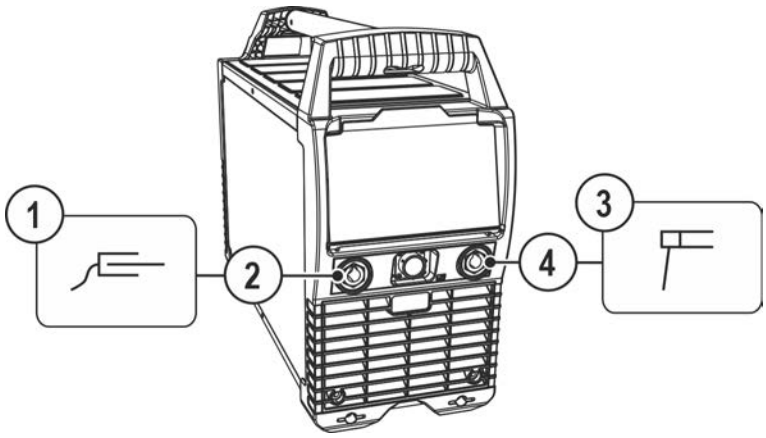


Figure 5-12

Item	Symbol	Description
1		**Workpiece**
2		**Connection socket, welding current (workpiece)**
3		**Electrode holder**
4		**Connection socket, welding current (electrode holder)**

- Insert cable plug on the workpiece lead into the welding current socket “” and lock by turning to the right.
- Insert cable plug on the electrode holder into the welding current socket “” and lock by turning to the right.

5.2.2 Welding task selection

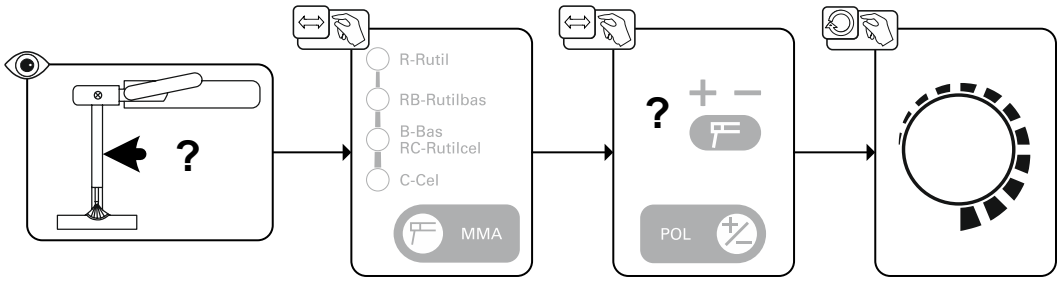
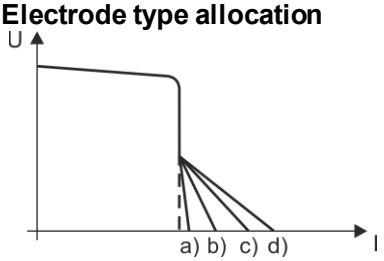


Figure 5-13

5.2.2.1 Arcforce (welding characteristics)

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.

Electrode type allocation



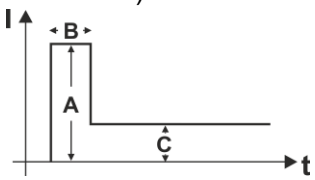
Item	Electrode type	
a)	R	rutile
b)	RB	rutile basic
c)	B/RC	basic and rutile/cellulose
d)	C	cellulose

Figure 5-14

The electrode characteristics you can select at the machine control are guiding values. Each characteristic can be optimised according to electrode type and the related welding properties > *see 5.2.6 chapter*.

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 5-15

5.2.3.1 Hotstart time

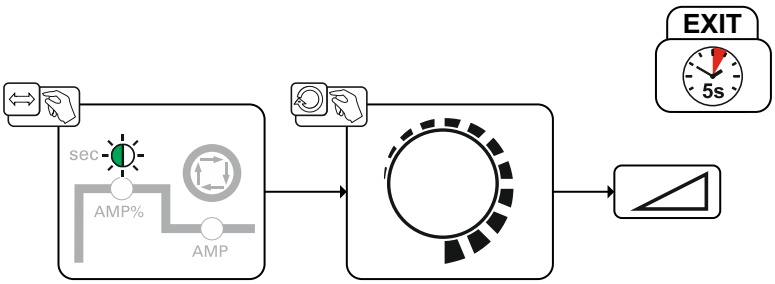


Figure 5-16

5.2.3.2 Hotstart current

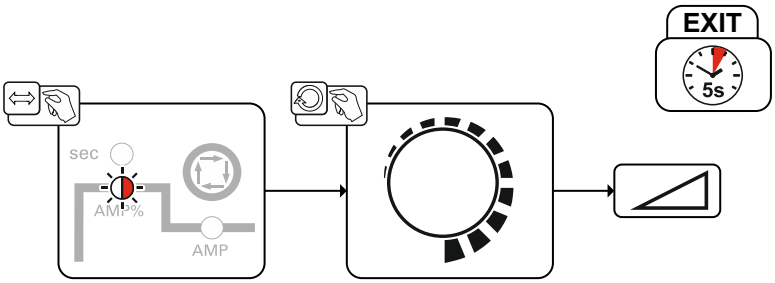
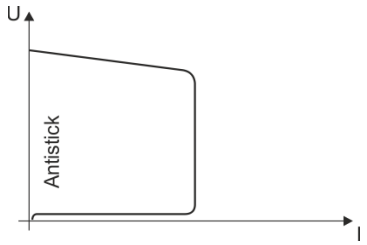


Figure 5-17

5.2.4 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 5-18

5.2.5 Average value pulse welding

Average value pulse welding means that two currents are switched periodically, a current average value (AMP), a pulse current (Ipuls), a balance (bAL) and a frequency (FrE) having been defined first. The predefined ampere current average value is decisive, the pulse current (Ipuls) is defined by the IPL parameter as a percentage of the current average value (AMP). The pulse pause current (IPP) requires no setting. This value is calculated by the machine control, so that the welding current average value (AMP) is maintained at all times.

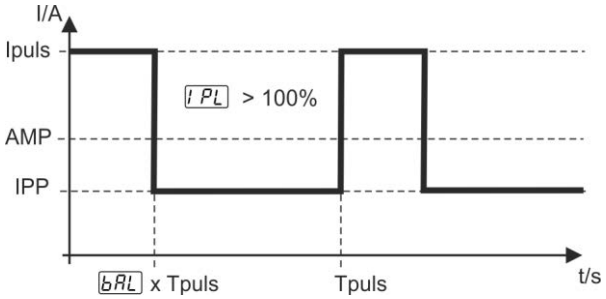


Figure 5-19

AMP = Main current; e.g. 100 A
Ipuls = Pulse current = IPL x AMP; e.g. 140% x 100 A = 140 A
IPP = Pulse pause current
Tpuls = Duration of one pulse cycle = 1/FrE; e.g. 1/1 Hz = 1 s
bAL = Balance

The pulse pause current (IPP) requires no setting. This value is calculated by the machine control, so that the welding current average value always corresponds to the main current selected.

For parameter setting, *> see 5.2.6 chapter*.

Selection

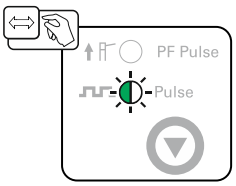


Figure 5-20

5.2.5.1 Average value pulsing in the vertical-up position (PF)

This pulse variant was developed for welding in the PF position. Where necessary, the user can adjust the preset welding parameters:

Parameter cPL is used for pulse current correction I PL

Parameter cFr is used for frequency correction FrE

Parameter cbA is used for balance correction bAL

Selection

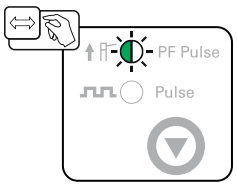


Figure 5-21

5.2.6 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*.

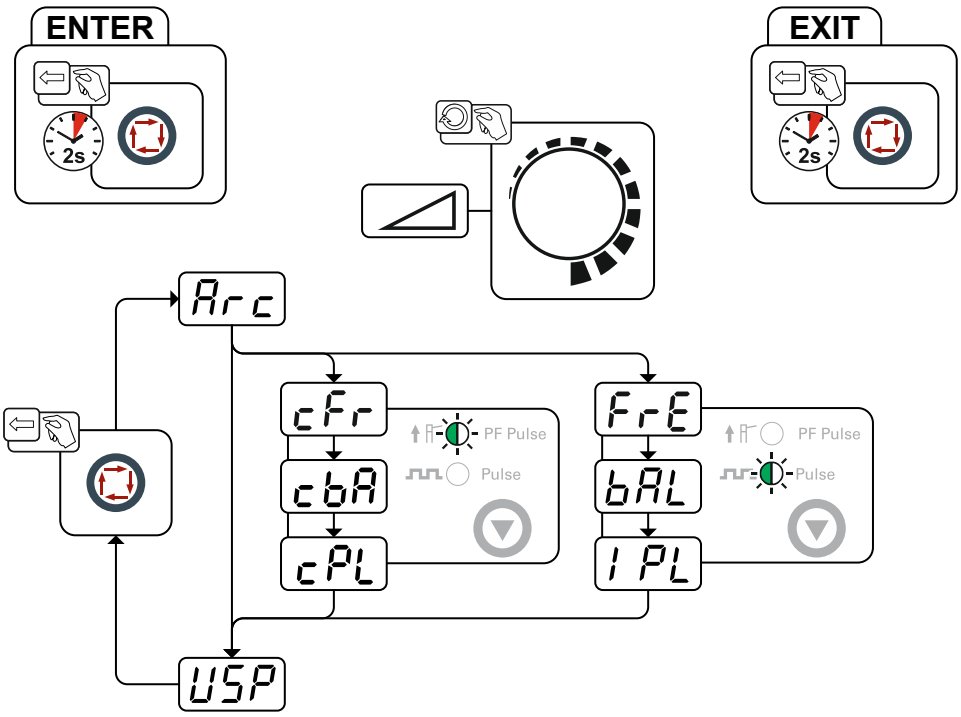


Figure 5-22

Display	Setting/selection
Arc	**Arcforce correction** • Increase value > harder arc • Decrease value > softer arc
cFr	**Frequency correction** Frequency correction of the PF Pulse parameter in per cent.
cbA	**Balance correction** Balance correction of the PF Pulse parameter in per cent
cPL	**Pulse current correction** Pulse current correction of the PF Pulse parameter in per cent.
FrE	**Pulse frequency**

Display	Setting/selection
bAL	**Pulse balance**
I PL	**Pulse current > *see 5.2.5 chapter***
USP	**Arc length restriction > *see 5.7 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).

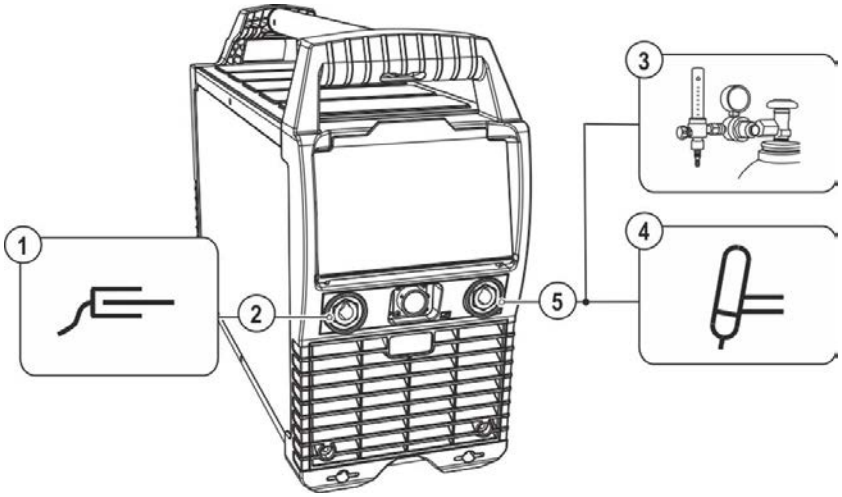


Figure 5-23

Item	Symbol	Description
1		**Workpiece**
2		**Connection socket, welding current (workpiece)**
3		**Output side of the pressure regulator**
4		**Welding torch**
5		**Connection socket, welding current (electrode holder)** Welding current lead connection for TIG welding torch

- Insert cable plug on the workpiece lead into the welding current socket "" and lock by turning to the right.
- Plug the welding current plug of the welding torch into the connection socket and lock by turning to the right.
- Screw the shielding gas hose of the welding torch to the pressure regulator outlet.
- Slowly open the gas cylinder valve.
- Open the welding torch rotary valve.

If the rotary gas valve is open, the shielding gas flows permanently from the welding torch (no adjustment with a separate gas valve). The rotary valve must be opened before each welding procedure and closed after each welding procedure.

- Set the required shielding gas quantity at the pressure regulator.

If the shielding gas setting is too low or too high, this can introduce air to the weld pool and may cause pores to form. Adjust the shielding gas quantity to suit the welding task!

Rule of thumb for the gas flow rate:

Diameter of gas nozzle in mm corresponds to gas flow in l/min.
Example: 7mm gas nozzle corresponds to 7l/min gas flow.

5.3.2 Welding task selection

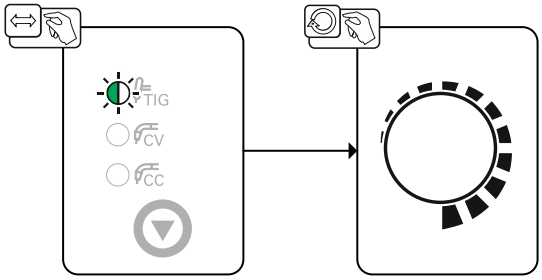


Figure 5-24

5.3.3 Arc ignition

5.3.3.1 Liftarc

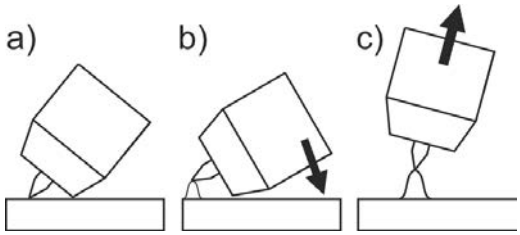


Figure 5-25

The arc ignites through contact with the workpiece:

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

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

c) Lift the torch off and bring into normal position.

Complete the welding task: Remove the torch from the workpiece so that the arc extinguishes.

5.3.4 Average value pulse welding

Average value pulse welding means that two currents are switched periodically, a current average value (AMP), a pulse current (Ipuls), a balance (bAL) and a frequency (FrE) having been defined first. The predefined ampere current average value is decisive, the pulse current (Ipuls) is defined by the IPL parameter as a percentage of the current average value (AMP). The pulse pause current (IPP) requires no setting. This value is calculated by the machine control, so that the welding current average value (AMP) is maintained at all times.

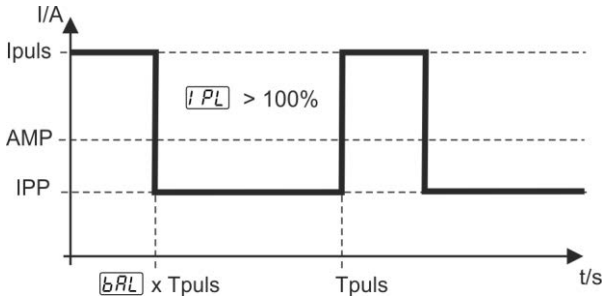


Figure 5-26

AMP = Main current; e.g. 100 A
Ipuls = Pulse current = IPL x AMP; e.g. 140% x 100 A = 140 A
IPP = Pulse pause current
Tpuls = Duration of one pulse cycle = 1/FrE; e.g. 1/1 Hz = 1 s
bAL = Balance

The pulse pause current (IPP) requires no setting. This value is calculated by the machine control, so that the welding current average value always corresponds to the main current selected.

For parameter setting, > *see 5.3.5 chapter*.

Selection

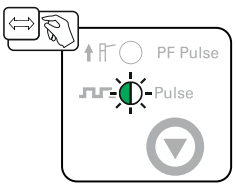


Figure 5-27

5.3.5 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.

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

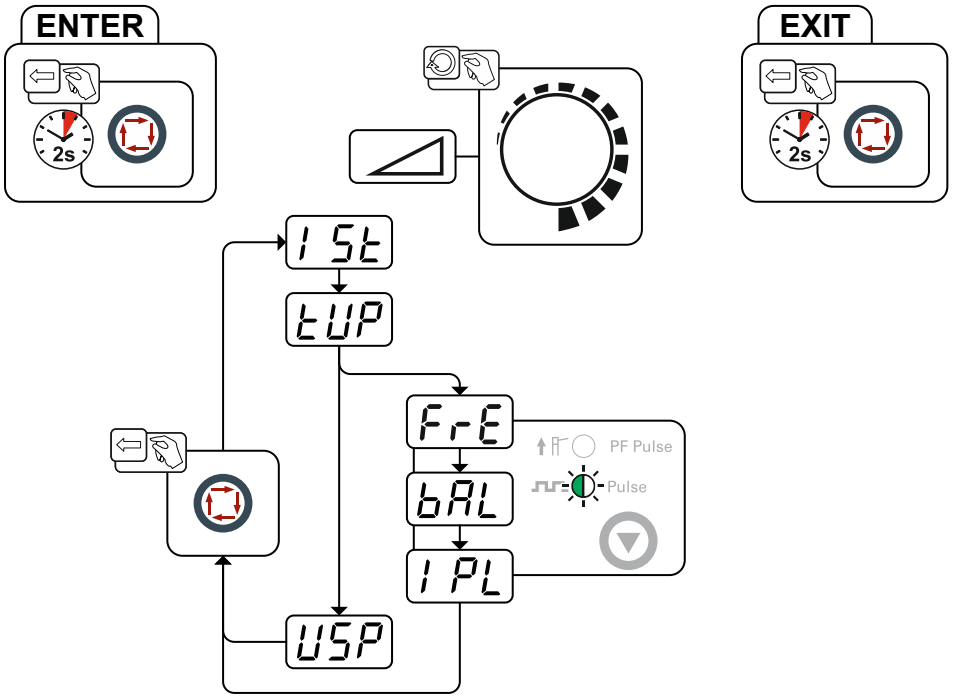


Figure 5-28

Display	Setting/selection
1 St	**Start current (as percentage, dependent on main current)**
tUP	**Upslope time to main current**
FrE	**Pulse frequency**
bAL	**Pulse balance**
1 PL	**Pulse current > *see 5.3.4 chapter***
USP	**Arc length restriction > *see 5.7 chapter*** on --------Function switched on oFF -------Function switched off

5.4 MIG/MAG welding

5.4.1 Connecting the intermediate hose package to the power source

☞ ***With this machine series, the earth cable on the intermediate hose package must not be connected to the welding machine or wire feeder! Remove the earth cable or push back into the hose package!***

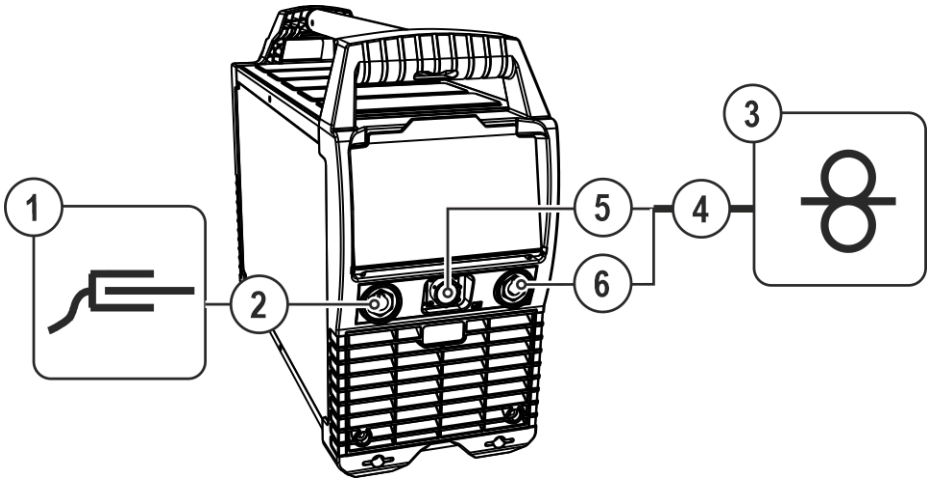


Figure 5-29

Item	Symbol	Description
1		**Workpiece**
2		**Connection socket, welding current (workpiece)**
3		**Wire feed unit**
4		**Intermediate hose package**
5		**19-pole connection socket** Control cable for remote control and/or wire feeder
6		**Connection socket, welding current (electrode holder)** Welding current connection for wire feeder

- Insert cable plug on the workpiece lead into the welding current socket "" and lock by turning to the right.
- Insert cable plug on the control lead into the 19-pole connection socket and secure with crown nut (the plug can only be inserted into the connection socket in one position).
- Plug the welding current lead plug (wire feeder) into the connection socket and lock by turning to the right.

Some wire electrodes (e.g. self-shielded flux cored wire) must be welded using negative polarity. Use the push-button for welding current polarity (pole reversal) to reverse the welding current polarity (+/-) without having to swap the welding current leads. Signal lamps located above the welding current sockets indicate the selected welding current polarity (+/-).

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

- Place the shielding gas cylinder into the relevant cylinder bracket.
- Secure the shielding gas cylinder using a securing chain.

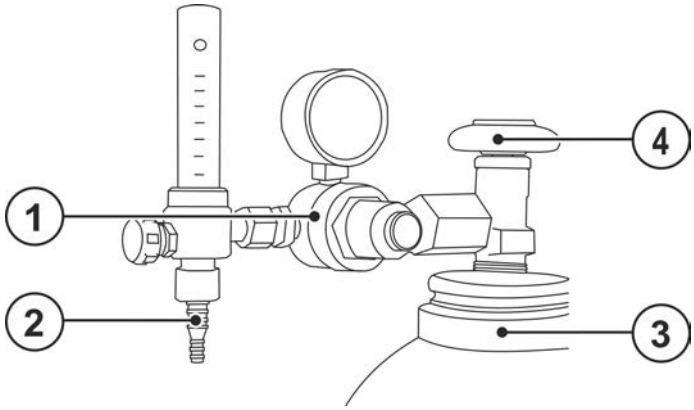


Figure 5-30

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

- Tighten the pressure regulator screw connection on the gas bottle valve to be gas-tight.
- Screw the gas hose connection nipple (intermediate hose package) onto the output side of the pressure regulator.

5.4.3 Gas test – setting the shielding gas volume

If the shielding gas setting is too low or too high, this can introduce air to the weld pool and may cause pores to form. Adjust the shielding gas quantity to suit the welding task!

Welding process	Recommended shielding gas quantity
MAG welding	Wire diameter x 11.5 = l/min
MIG brazing	Wire diameter x 11.5 = l/min
MIG welding (aluminium)	Wire diameter x 13.5 = l/min (100 % argon)

Helium-rich gas mixtures require a higher gas volume!

The table below can be used to correct the gas volume calculated where necessary:

Shielding gas	Factor
75% Ar/25% He	1.14
50% Ar/50% He	1.35
25% Ar/75% He	1.75
100% He	3.16

5.4.4 MIG/MAG welding with constant voltage characteristics (CV)

Default characteristics "CV constant voltage" for nearly all MIG/MAG processes

5.4.5 Welding task selection

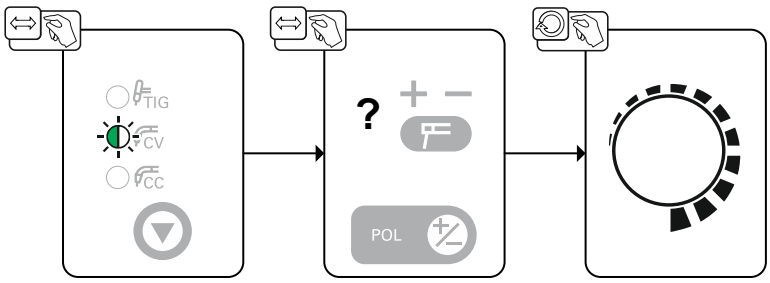


Figure 5-31

5.4.6 Expert menu

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*.

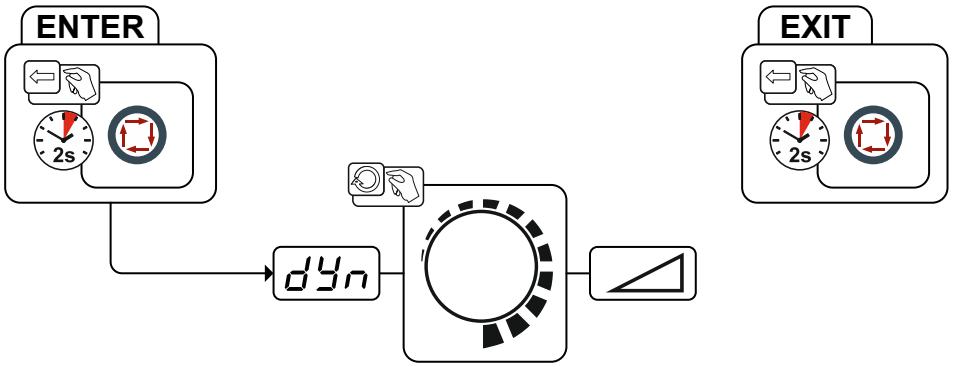


Figure 5-32

Display	Setting/selection
dyn	**Dynamic correction** • Increase value > harder arc • Decrease value > softer arc

5.4.7 MIG/MAG welding with constant current characteristics (CC)

Used for special wires (flux cored wires), which, according to the manufacturer, are to be welded using "CC constant current"

5.4.8 Welding task selection

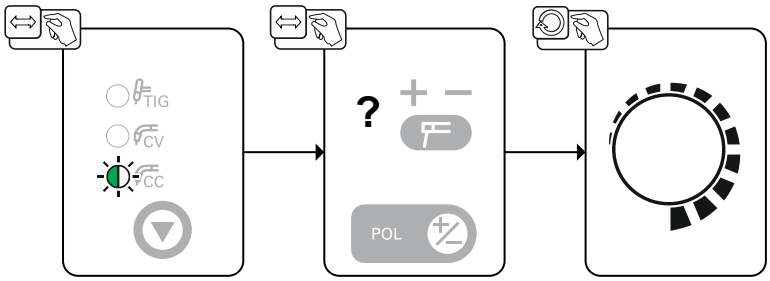


Figure 5-33

5.4.9 Expert menu

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*.

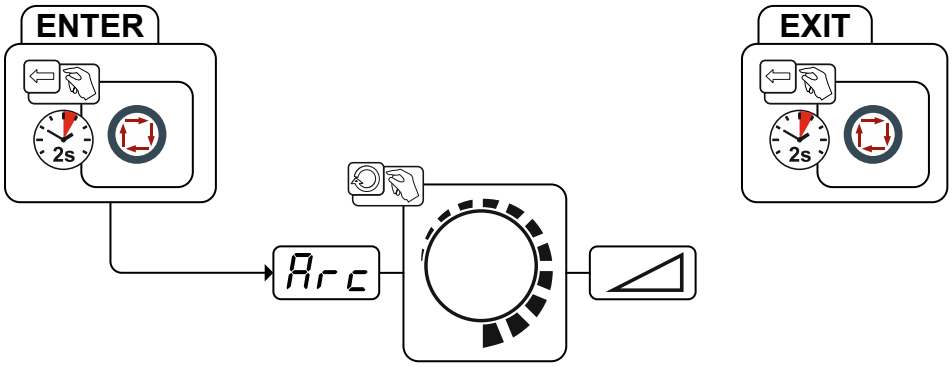


Figure 5-34

Display	Setting/selection
Arc	**Arcforce correction** • Increase value > harder arc • Decrease value > softer arc

5.4.10 MIG/MAG welding – voltage-sensing

This welding machine supports wire feeders with voltage detection (voltage-sensing). Voltage is supplied to these wire feeders solely by the welding voltage. The wire feeder has a lead to connect to the workpiece, to ensure voltage detection and supply. No other control cables are required. When activated, the power source provides a permanent supply and welding voltage for the wire feeder.

If a wire feeder without control cable or connection lead is connected to the power source and one of the MIG/MAG characteristics (CC/CV) is selected, the open circuit voltage is provided as supply voltage for the wire feeder at the welding current sockets.

5.5 Connection plan

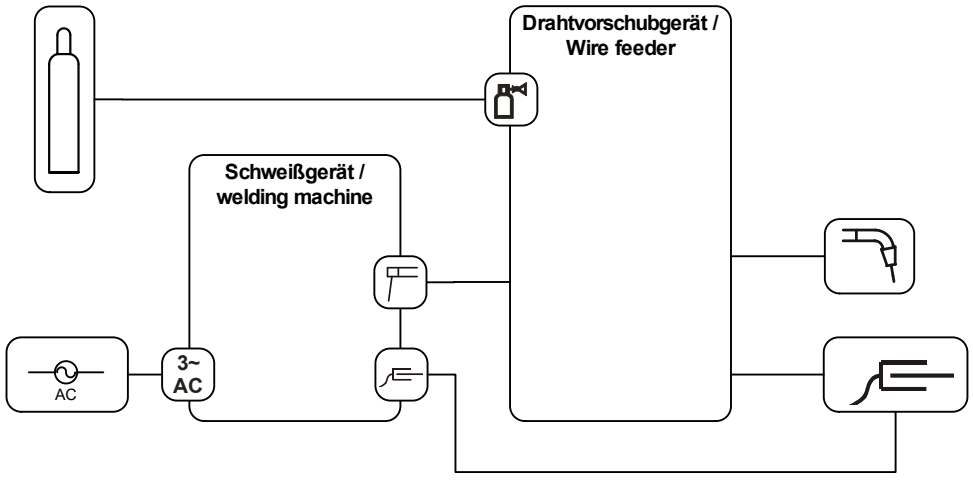


Figure 5-35

5.5.1 Legend

Symbol	Description
	Shielding gas
3~ AC	**Welding machine supply voltage**
	Welding torch
	Workpiece
	Electrode holder

5.5.2 Connecting the supply lines

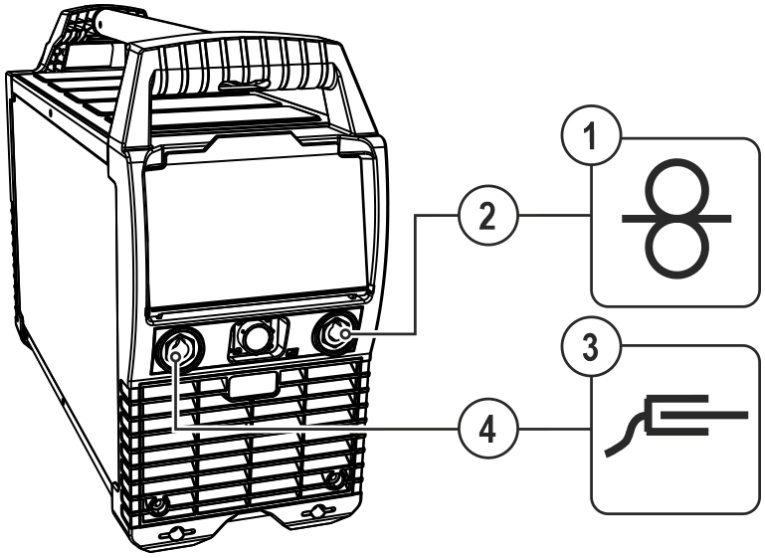


Figure 5-36

Item	Symbol	Description
1		**Wire feed unit**
2		**Connection socket, welding current (electrode holder)** Welding current connection for wire feeder
3		**Workpiece**
4		**Connection socket, welding current (workpiece)**

- Plug the welding current lead plug (wire feeder) into the connection socket and lock by turning to the right.
- Insert cable plug on the workpiece lead into the welding current socket " " and lock by turning to the right.

Some wire electrodes (e.g. self-shielded flux cored wire) must be welded using negative polarity. Use the push-button for welding current polarity (pole reversal) to reverse the welding current polarity (+/-) without having to swap the welding current leads. Signal lamps located above the welding current sockets indicate the selected welding current polarity (+/-).

5.6 Degaussing

⚠ CAUTION

Movement forces due to electromagnetic fields!
Electromagnetic fields may exert movement forces on unsecured metal objects! This may result in injury for example by tools that are set in motion uncontrolled, etc.

- Remove metal objects lying around from the working area or secure against movement.

5.6.1 Description of procedure

The degaussing of ferromagnetic workpieces in welding technology is intended to reduce arc deflection, arc instability, uneven droplet detachment, spatter and irregular flank connections.

To degauss the workpiece successfully and demonstrably, the magnetic flux density must be measured in millitesla (mT). This requires a field strength or magnetic flux density meter.

This device offers two methods for degaussing a workpiece:

- Method degauss - degaussing the workpiece before welding.
  With this method, an alternating magnetic field is applied to the component. The magnetic field decreases with each change of polarity (+/-) ensuring that the workpiece can be completely degaussed along the hysteresis curve.
  It does not make economic sense to completely degauss long components such as pipes. In this case, the remaining magnetic field moves towards the degaussed area and we recommend using the activgauss method.
- Method activgauss - generating an opposing magnetic field during welding.
  With this method, an adjustable direct current generates an opposing magnetic field. The opposing magnetic field is applied during the welding process and counteracts the magnetism present in the workpiece. This reduces arc deflection (arc instability) irregular droplet detachment, spatter and irregular flank connections.
  When using the activgauss method, only the magnetic fields in which the opposing field is identical are compensated. The magnetic field along the welding joint is usually not constant. This means that in practical use the field around the welding start should be compensated. The welder begins to weld. If the arc becomes unstable, the magnetic flux density must be measured and re-compensated. Continue until the pipe root welding is complete. Experience has shown that this process must be carried out 3 to 4 times over the circumference. As the root welding progresses, the existing magnetic field decreases to 0.

5.6.2 Notes on laying power cables

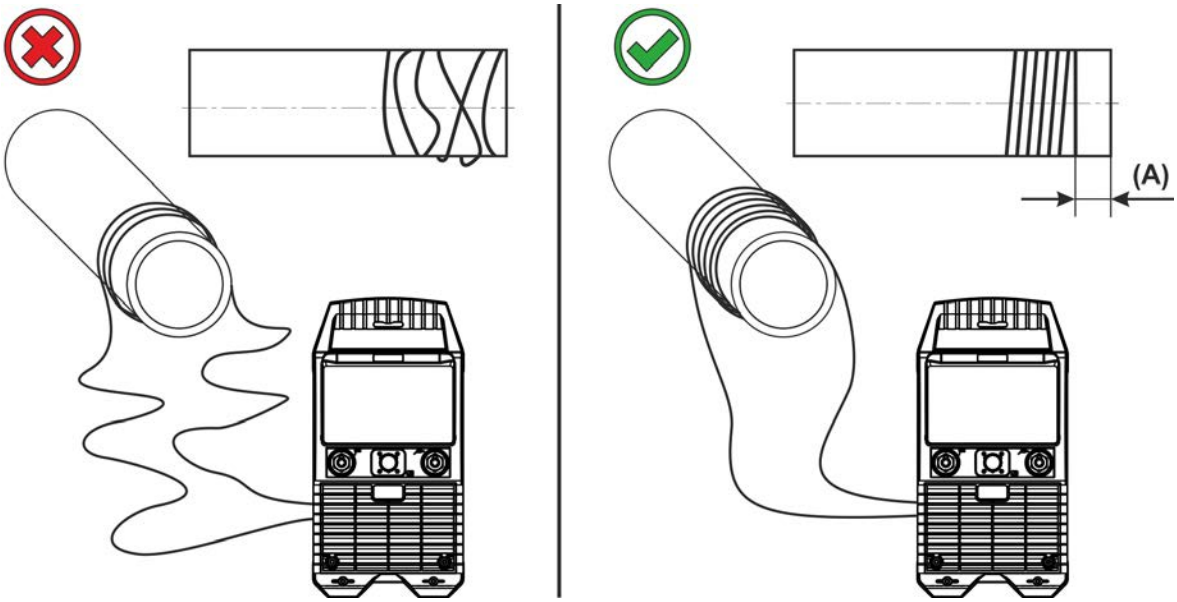


Figure 5-37

- Lay power cables close together around the component.
- The greater the distance to the welding-relevant area (A), the greater the number of turns you must select. Using the activgauss method, it is possible to increase the degaussing current as an alternative or in addition.

Large or long workpieces

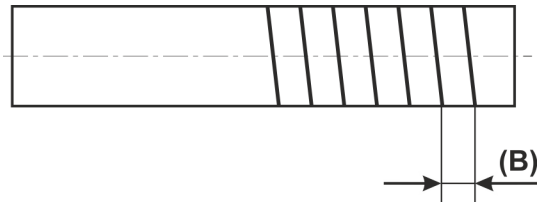


Figure 5-38

- Lay power cables tightly around the component.
- Lay power cables up to the welding-relevant area, such as the sidewall of the joint.

If the space required by the power lines is too large, the turns can also be placed on top of each other. This has no significant influence on the degaussing process.

As the distance between the individual turns (B) increases, the current must be corrected upwards to achieve the desired result.

5.6.3 Degaussing the workpiece before welding (degauss)

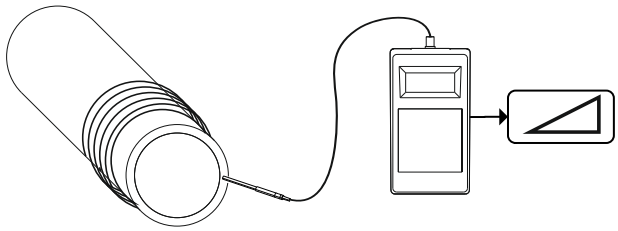


Figure 5-39

- Measure the magnetic flux density.

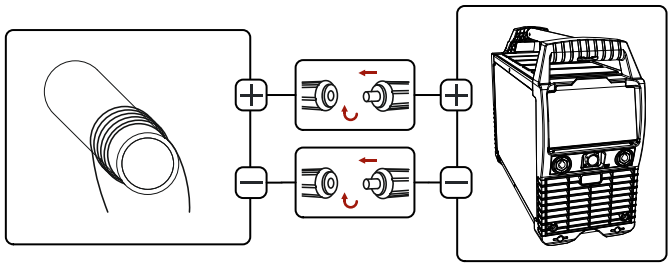


Figure 5-40

- Determine power cables with the corresponding number of turns according to table “Magnetic flux density - adjustment aid” > *see 10.2 chapter* and lay them around the component accordingly > *see 5.1.10 chapter*.
- Connect power cables to the power source (the polarity is freely selectable).

The degaussing process (degauss) must be activated before use. The subsequent restarting of the power source switches back to the last active welding procedure.

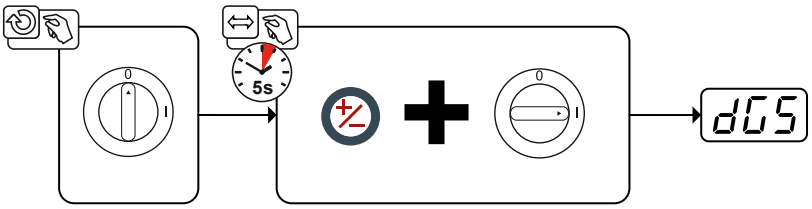


Figure 5-41

Display	Setting/selection
dGS	**Degaussing is activated.**

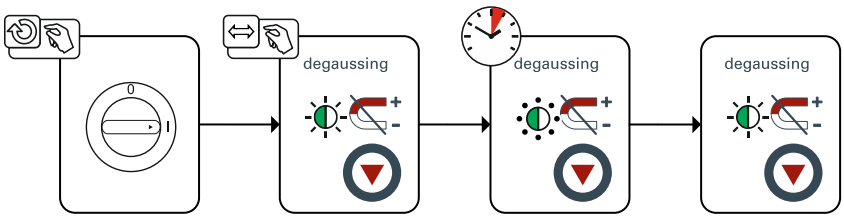


Figure 5-42

- Press the welding current polarity (pole reversal)/degaussing push-button.
- The signal light flashes.
- The degaussing process runs automatically.
- The signal light flashes continuously.
- The degaussing process is complete.

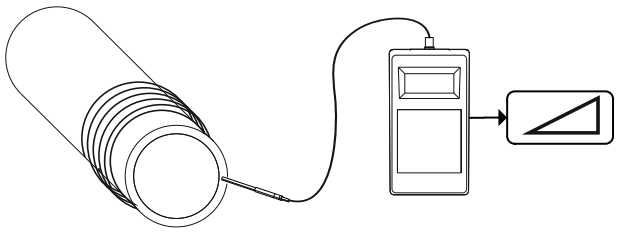


Figure 5-43

- Measure the magnetic flux density.
- Compare the measured magnetic flux density with the table “Guide values for residual flux density” > *see 10.3 chapter* for the corresponding welding process.

If the residual field strength is too high, the process of degaussing can be repeated as often as desired (increase the number of turns if necessary).

5.6.3.1 Automatic cut-out

The demagnetization process is stopped within 5 seconds if no current flow can be established. The display shows the message bre (interruption). Check all circuit connections and repeat the process.

5.7 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 5.2.6 chapter*

TIG welding > *see 5.3.5 chapter*

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

5.7.1.1 Welding current polarity reversal (polarity reversal)

This function can be used to reverse the welding current polarity electronically.

For example, when welding with different electrode types for which different polarities are stipulated by the manufacturer, the welding current polarity can be switched easily on the control.

Operating element	Action	Result
		Use this push-button to reverse the welding current polarity of the welding current sockets. Signal lights at the welding current sockets show the polarity selected.
+ −	-	The signal light shows the selected polarity at the welding current socket below.

Please note the different functionality in case a RT PWS 1 19POL remote control is connected > *see 5.8 chapter*.

5.8 Remote control

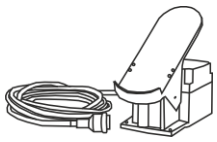
The remote controls are operated on the 19-pole remote control connection socket (analogue).

5.8.1 RT1 19POL

Functions

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

5.8.2 RTF1 19POL

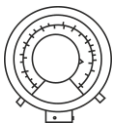


Features

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

5.8.3 RT PWS1 19POL

When a remote control is connected, the polarity is changed at the changeover switch of the remote control (ex works). If you wish to change the polarity at the welding machine control (with a remote control connected) you can set this option in the machine configuration menu (parameter rCP).

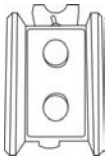


Functions

- Infinitely adjustable welding current (0% to 100%) depending on the preselected main current at the welding machine
- Pole reversing switch, suitable for machines with PWS function

5.8.4 RTA PWS2

When a remote control is connected, the polarity is changed at the changeover switch of the remote control (ex works). If you wish to change the polarity at the welding machine control (with a remote control connected) you can set this option in the machine configuration menu (parameter rCP) > *see 5.10 chapter*.

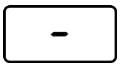


Functions

- Welding current setting (0 % to 100 %)
- Pole reversing switch
- Setting Arcforce

5.9 Power-saving mode (Standby)

You can activate the power-saving mode by either pressing the push-button > *see 4.2 chapter* for a prolonged time or by setting a parameter in the machine configuration menu (time-controlled power-saving mode SbA) > *see 5.10 chapter*.



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

Pressing any operating element (e.g. turning a rotary knob) deactivates power-saving mode and the machine is ready for welding again.

5.10 Machine configuration menu

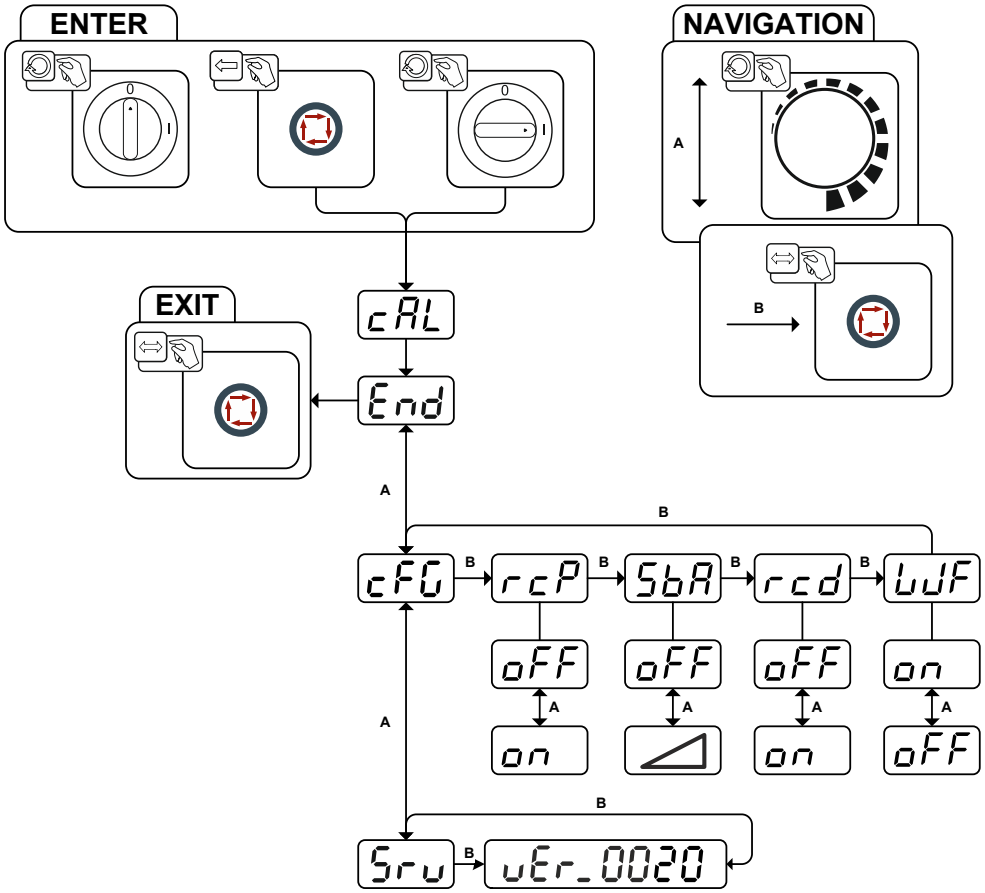


Figure 5-44

Display	Setting/selection
cAL	**Calibration** The machine will be calibrated for approx 2 seconds each time it is switched on.
End	**Exit the menu** Exit
cFG	**Machine configuration** Settings for machine functions and parameter display
rcP	**Welding current polarity switching** [1] on --------polarity switching at the RT PWS 1 19POL remote control (ex works) oFF -------polarity switching at the welding machine control
SbA	**Time-based power-saving mode > *see 5.9 chapter*** Time to activation of the power-saving mode in case of inactivity. Setting oFF = disabled or numerical value 5-60 min..
rcd	**Welding current actual value display > *see 4.2.1 chapter*** on --------Actual value display oFF--------Nominal value display
uJF	**Use of accessories** on --------Operation with wire feeder oFF -------Operation with foot-operated remote control
Sru	**Service menu** Any changes to the service menu should be agreed with the authorised service personnel.
uEr	**Software version of the machine control** Version display

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 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!**

- 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 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

Excess temperature signal light illuminates

↯ Excess temperature, welding machine
- 🛠 Allow the machine to cool down whilst still switched on

Functional errors

↯ Polarity switching at the welding machine control is not working
- 🛠 The changeover switch at the remote control defines the welding current polarity. Unplug remote control or set parameter rCD (machine configuration) to the value off.

↯ Polarity switching at the remote control is not working
- 🛠 Set parameter rCD (machine configuration menu) to the value on.

↯ 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.

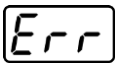
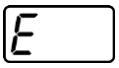
↯ Loose welding current connections
- 🛠 Tighten power connections on the torch and/or on the workpiece
- 🛠 Tighten contact tip correctly

Overheating of TIG welding torch (tungsten electrode) when remote control is connected RT PWS 1 19POL / RTA PWS2

↯ Welding current polarity setting not suitable
- 🛠 Set changeover switch for welding current polarity to (-) position.

7.2 Error messages (power source)

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.

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

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

Error message	Possible cause	Remedy
E 0	Start signal set in the event of errors	Do not press the torch trigger or the foot-operated remote control
E 4	Temperature error	Allow the machine to cool down
E 5	Mains overvoltage	Switch off the machine and check the mains voltage
E 6	Mains undervoltage	
E 7	Electronics error	Switch the machine off and on again. If the error persists, notify service department
E 9	Secondary overvoltage	
E12	Voltage reduction error (VRD)	
E13	Electronics error	
E14	Alignment error in current recording	Switch off the machine, place the electrode holder in an insulated position and switch the machine back on. If the error persists, notify service department
E15	Error in one of the electronics supply voltages	Switch the machine off and on again. If the error persists, notify service department
E23	Temperature error	Allow the machine to cool down
E32	Electronics error	Switch the machine off and on again. If the error persists, notify service department
E33	Alignment error in voltage recording	Switch off the machine, place the electrode holder in an insulated position and switch the machine back on. If the error persists, notify service department
E34	Electronics error	Switch the machine off and on again. If the error persists, notify service department
E37	Temperature error	Allow the machine to cool down
E40	Motor fault	Check wire feed mechanism, switch the machine off and on again, inform the service department if the fault persists.
E51	Earth fault (PE error)	Connection between welding wire and machine casing

Error message	Possible cause	Remedy
E55	Failure of a mains phase	Switch off the machine and check the mains voltage
E58	Short circuit in welding circuit	Switch off the machine and check welding current leads for correct installation, e.g. by placing the electrode holder in an insulated position; detach current lead from degaussing.

7.3 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 5.10 chapter*.

7.4 Resetting welding parameters to the factory settings

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

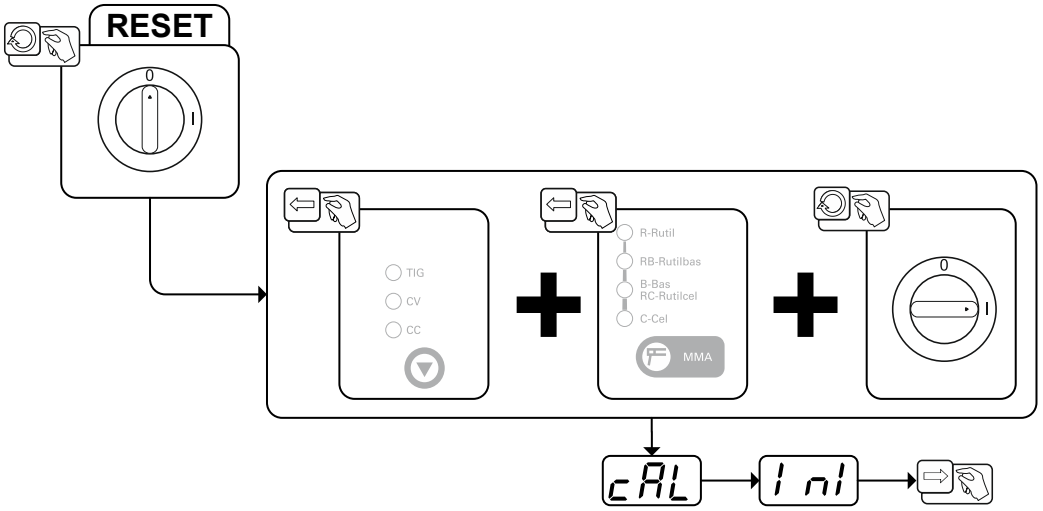


Figure 7-1

Display	Setting/selection
cAL	**Calibration** The machine will be calibrated for approx 2 seconds each time it is switched on.
Ini	**Initialising** Keep the push-button pressed until Ini is shown on the display.

8 Technical data

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

8.1 Pico 350 cel puls pws dgs

	MMA	TIG	MIG/MAG
Welding current (I_2)	10 A to 350 A		
Welding voltage according to standard (U_2)	20,4 V to 34,0 V	10,4 V to 24,0 V	14,5 V to 31,5 V
Duty cycle DC at 40° C [1]			
	350 A (35 %) / 280 A (60 %) / 230 A (100 %)		
Open circuit voltage (U_0)	95 V		
Mains voltage (Tolerance)	3 x 400 V (-25 % to +20 %)		
Frequency	50/60 Hz		
mains fuse [2]	3 x 16 A	3 x 10 A	3 x 16 A
Mains connection cable	H07RN-F4G2,5		
max. Connected load (S_1)	15,0 kVA	10,6 kVA	13,9 kVA
Generator rating (Rec.)	20,3 kVA		
Cos φ / efficiency	0,99 / 88 %		
Protection class / Overvoltage category	I / III		
Contamination level	3		
Insulation class / protection classification	H / IP34		
Residual current circuit breaker	Type B (recommended)		
Noise level [3]	<70 dB(A)		
Ambient temperature	-25 °C to +40 °C		
Machine cooling / Torch cooling	Fan (AF) / gas		
Workpiece lead (min.)	50 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)	539 x 210 x 415 mm 21.2 x 8.3 x 16.3 inch		
Weight	25 kg 55.1 lb.		

[1] Load cycle: 10 min. (60 % DC ≙ 6 min. welding, 4 min. pause)

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

[3] 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 System components

9.1.1 Wire feed unit

Type	Designation	Item no.
Pico drive 4L	Wire feeder	090-002121-00502
Pico drive 200C	Wire feeder	090-002124-00502

9.2 19-pole remote control

Type	Designation	Item no.
RT1 19POL	Remote control current	090-008097-00000
RT PWS1 19POL	Remote control, vertical-down weld current, pole reversal	090-008199-00000
RTA PWS2	Remote control, welding current setting (0 % to 100 %), pole reversing switch, setting Arcforce	090-008856-00000
RTF1 19POL 5 M	Foot-operated remote control current with connection cable	094-006680-00000

9.2.1 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

9.2.2 Extension cable

Type	Designation	Item no.
RV5M19 19POLE 5M	Extension cable	092-000857-00000
RV5M19 19POL 10M	Extension cable	092-000857-00010
RV5M19 19POL 15M	Extension cable	092-000857-00015
RV5M19 19POL 20M	Extension cable	092-000857-00020

9.3 Options

Type	Designation	Item no.
ON Filter TG.0001	Dirt filter for air inlet	092-002756-00000

9.4 General accessories

Type	Designation	Item no.
16A 5POLE/CEE	Mains plug	094-000712-00000
KLF-L1-L2-L3-PE	Label of mains cable	094-023697-00000
ON AL D13/27	Cap for load sockets	092-003282-00000
Set LC 35 mm²	Set: Two 5-metre load cables (35 mm²) and one 20-metre load cable (35 mm²) for degaussing	092-002921-00000

10 Appendix

10.1 Parameter overview – setting ranges

Welding data display (3-digit)	Parameters/function	Setting range				
		Standard (ex works)	Min.		Max.	Unit
MMA						
	Hot start current	120	50	-	200	%
	Hot start time	0,5	0,1	-	20,0	s
Arc	Arcforce correction	0	-10	-	20	
cFr	Frequency correction (PF Pulse)	0	-99	-	99	%
cbA	Balance correction (PF Pulse)	0	-99	-	99	%
cPL	Pulse current correction (PF Pulse)	0	-99	-	99	%
FrE	Pulse frequency	5,0	0,2	-	500	Hz
bAL	Pulse balance	50	1	-	99	%
I PL	Pulse current	140	1	-	200	%
USP	Arc length restriction	off	off	/	on	
MIG/MAG						
Arc	Arcforce (CC)	0	-10	-	20	
dyn	Dynamic correction (CV)	0	-40	-	40	
TIG						
I St	Start current	20	1	-	200	%
tUP	Up-slope time	1,0	0,0	-	20,0	s
FrE	Pulse frequency	2,8	0,2	-	2000	Hz
bAL	Pulse balance	50	1	-	99	%
I PL	Pulse current	140	1	-	200	%
USP	Arc length restriction	on	off	-	on	
Basic parameters (independent of procedure)						
SbA	Time-based power-saving mode	off	5	-	60	min.
rcP	Welding current polarity switching	on	off	/	on	
rbd	Current display switching (MMA)	off	off	/	on	
UJF	Use of accessories	on	off	/	on	

10.2 Magnetic flux density - adjustment aid

Depending on the material used, the thickness of workpieces and the measuring instrument used, the winding numbers or current values may vary. Ideally, the measured flux density should be in the middle of the parameter field.

Number of turns	Degaussing current						
	50 A	100 A	125 A	150 A	175 A	200 A	250 A
	Magnetic flux density mT						
2	3	4	5	5	6	6	8
3	4	6	7	8	9	10	10
4	4	7	8	9	10	12	13
5	5	8	9	11	12	14	16
6	5	9	11	12	14	16	18
7	5	10	12	14	16	19	21
8	7	12	15	18	21	24	27
9	8	13	17	22	25 [1]	29	34
10	10	15	20	26	30	34	40
11	12	16	23	27	35	39	46
12	15	18	26	29	39	45	53
13	16	20	29	30	44	50	59
14	18	22	32	32	48	55	66
15	18	24	35	33	53	61	72

[1] Example of use:
The measured value is 25 mT. This results in a number of turns of 9 and a degaussing current of 175 A if the activgauss process is used.

10.3 Guide values of magnetic flux density, weldability

TIG welding		GMAW welding	
Magnetic flux density	Weldability	Magnetic flux density	Weldability
<0.5 mT	very good	<3 mT	very good
0.5-1 mT	good	3-4 mT	good
1-2 mT	possible	4-6 mT	possible
2-5 mT	poor	6-8 mT	poor
>5 mT	unsuitable	>8 mT	unsuitable

10.4 Searching for a dealer

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

"More than 400 EWM sales partners worldwide"