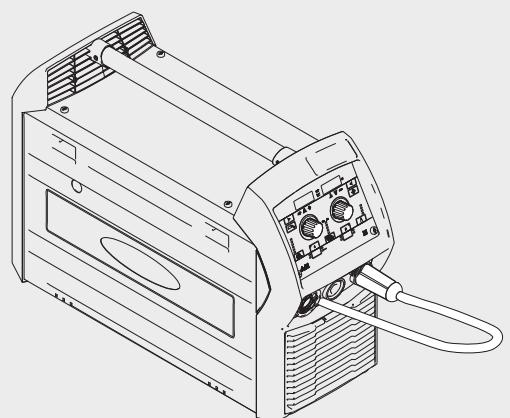


## TransSteel 2200

EN

Operating Instructions

MIG/MAG Power source



42,0426,0241,EN 004-10082018



# Dear reader,

## Introduction

Thank you for the trust you have placed in our company and congratulations on buying this high-quality Fronius product. These instructions will help you familiarise yourself with the product. Reading the instructions carefully will enable you to learn about the many different features it has to offer. This will allow you to make full use of its advantages.

Please also note the safety rules to ensure greater safety when using the product. Careful handling of the product will repay you with years of safe and reliable operation. These are essential prerequisites for excellent results.

## Explanation of safety symbols



**DANGER!** Indicates immediate and real danger. If it is not avoided, death or serious injury will result.



**WARNING!** Indicates a potentially dangerous situation. Death or serious injury may result if appropriate precautions are not taken.



**CAUTION!** Indicates a situation where damage or injury could occur. If it is not avoided, minor injury and/or damage to property may result.



**NOTE!** Indicates a risk of flawed results and possible damage to the equipment.

**IMPORTANT!** Indicates tips for correct operation and other particularly useful information. It does not indicate a potentially damaging or dangerous situation.

If you see any of the symbols depicted in the "Safety rules" chapter, special care is required.



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# **Safety**



# Safety rules

## Explanation of safety symbols



**DANGER!** Indicates immediate and real danger. If it is not avoided, death or serious injury will result.



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If you see any of the symbols depicted in the "Safety rules" chapter, special care is required.

## General



The device is manufactured using state-of-the-art technology and according to recognised safety standards. If used incorrectly or misused, however, it can cause:

- injury or death to the operator or a third party,
- damage to the device and other material assets belonging to the operating company,
- inefficient operation of the device.

All persons involved in commissioning, operating, maintaining and servicing the device must:

- be suitably qualified,
- have sufficient knowledge of welding and
- read and follow these operating instructions carefully.

The operating instructions must always be at hand wherever the device is being used. In addition to the operating instructions, attention must also be paid to any generally applicable and local regulations regarding accident prevention and environmental protection.

All safety and danger notices on the device

- must be in a legible state,
- must not be damaged,
- must not be removed,
- must not be covered, pasted or painted over.

For the location of the safety and danger notices on the device, refer to the section headed "General" in the operating instructions for the device.

Before switching on the device, rectify any faults that could compromise safety.

**This is for your personal safety!**

## Proper use



The device is to be used exclusively for its intended purpose.

The device is intended solely for the welding processes specified on the rating plate.

Any use above and beyond this purpose is deemed improper. The manufacturer shall not be held liable for any damage arising from such usage.

Proper use includes:

- carefully reading and following all the instructions given in the operating instructions
- studying and obeying all safety and danger notices carefully
- performing all stipulated inspection and maintenance work.

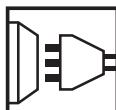
Never use the device for the following purposes:

- Thawing out pipes
- Charging batteries
- Starting engines

The device is designed for use in industry and the workshop. The manufacturer accepts no responsibility for any damage caused through use in a domestic setting.

The manufacturer likewise accepts no liability for inadequate or incorrect results.

## Mains connection



Devices with a higher rating may affect the energy quality of the mains due to their current consumption.



This may affect a number of types of device in terms of:

- connection restrictions
- criteria with regard to the maximum permissible mains impedance \*)
- criteria with regard to the minimum short-circuit power requirement \*)

\*) at the interface with the public grid  
see Technical Data

In this case, the plant operator or the person using the device should check whether the device may be connected, where appropriate by discussing the matter with the power supply company.

**NOTE!** Ensure that the mains connection is earthed properly

## Environmental conditions



Operation or storage of the device outside the stipulated area will be deemed as not in accordance with the intended purpose. The manufacturer shall not be held liable for any damage arising from such usage.

Ambient temperature range:

- during operation: -10 °C to + 40 °C (14 °F to 104 °F)
- during transport and storage: -20 °C to +55 °C (-4 °F to 131 °F)

Relative humidity:

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

The surrounding air must be free from dust, acids, corrosive gases or substances, etc.

Can be used at altitudes of up to 2000 m (6561 ft. 8.16 in.)

## Obligations of the operator



The operator must only allow persons to work with the device who:

- are familiar with the fundamental instructions regarding safety at work and accident prevention and have been instructed in how to use the device
- have read and understood these operating instructions, especially the section "safety rules", and have confirmed as much with their signatures
- are trained to produce the required results.

Checks must be carried out at regular intervals to ensure that operators are working in a safety-conscious manner.

## Obligations of personnel



Before using the device, all persons instructed to do so undertake:

- to observe the basic instructions regarding safety at work and accident prevention
- to read these operating instructions, especially the "Safety rules" section and sign to confirm that they have understood them and will follow them.

Before leaving the workplace, ensure that people or property cannot come to any harm in your absence.

## Residual current protective device



Local regulations and national guidelines may require a residual current protective device when connecting equipment to the public grid.

The type of residual current protective device recommended by the manufacturer for the equipment is indicated in the technical data.

## Protecting yourself and others



Anyone working with the device exposes themselves to numerous risks, e.g.

- flying sparks and hot pieces of metal
- Arc radiation, which can damage eyes and skin



- Hazardous electromagnetic fields, which can endanger the lives of those using cardiac pacemakers



- Risk of electrocution from mains current and welding current



- Greater noise pollution



- Harmful welding fumes and gases

Suitable protective clothing must be worn when working with the device. The protective clothing must have the following properties:

- Flame-resistant
- Insulating and dry
- Covers the whole body, is undamaged and in good condition
- Safety helmet
- Trousers with no turn-ups



Protective clothing refers to a variety of different items. Operators should:

- Protect eyes and face from UV rays, heat and sparks using a protective visor and regulation filter
- Wear regulation protective goggles with side protection behind the protective visor
- Wear stout footwear that provides insulation even in wet conditions
- Protect the hands with suitable gloves (electrically insulated and providing protection against heat)
- Wear ear protection to reduce the harmful effects of noise and to prevent injury



Keep all persons, especially children, out of the working area while any devices are in operation or welding is in progress. If, however, there are people in the vicinity:

- Make them aware of all the dangers (risk of dazzling by the arc, injury from flying sparks, harmful welding fumes, noise, possible risks from mains current and welding current, etc.)
- Provide suitable protective equipment
- Alternatively, erect suitable safety screens/curtains.

#### Noise emission values



The device generates a maximum sound power level of <80 dB(A) (ref. 1pW) when idling and in the cooling phase following operation at the maximum permissible operating point under maximum rated load conditions according to EN 60974-1.

It is not possible to provide a workplace-related emission value during welding (or cutting) as this is influenced by both the process and the environment. All manner of different welding parameters come into play, including the welding process (MIG/MAG, TIG welding), the type of power selected (DC or AC), the power range, the type of weld metal, the resonance characteristics of the workpiece, the workplace environment, etc.

#### Danger from toxic gases and vapours



The fumes produced during welding contain harmful gases and vapours.

Welding fumes contain substances that may, under certain circumstances, cause birth defects or cancer.

Keep your face away from welding fumes and gases.

Fumes and hazardous gases

- must not be breathed in
- must be extracted from the working area using appropriate methods.

Ensure an adequate supply of fresh air with a ventilation rate of at least 20 m<sup>3</sup>/hour.

Otherwise, a protective mask with an air supply must be worn.

Close the shielding gas cylinder valve or main gas supply if no welding is taking place.

If there is any doubt about whether the extraction capacity is sufficient, the measured toxic emission values should be compared with the permissible limit values.

Amongst others, the following components are responsible for the degree of toxicity of welding fumes:

- Metals used for the workpiece
- Electrodes
- Coatings
- Cleaners, degreasers, etc.

The relevant material safety data sheets and manufacturer's specifications for the listed components should therefore be studied carefully.

Flammable vapours (e.g. solvent fumes) should be kept away from the arc's radiation area.

## Danger from flying sparks



Flying sparks may cause fires or explosions.

Never weld close to flammable materials.

Flammable materials must be at least 11 metres (36 ft. 1.07 in.) away from the arc, or alternatively covered with an approved cover.

A suitable, tested fire extinguisher must be available and ready for use.

Sparks and pieces of hot metal may also get into adjacent areas through small gaps or openings. Take appropriate precautions to prevent any danger of injury or fire.

Welding must not be performed in areas that are subject to fire or explosion or near sealed tanks, vessels or pipes unless these have been prepared in accordance with the relevant national and international standards.

Do not carry out welding on containers that are being or have been used to store gases, propellants, mineral oils or similar products. Residues pose an explosive hazard.

## Risks from mains current and welding current



An electric shock is potentially life threatening and can be fatal.

Do not touch live parts either inside or outside the device.



During MIG/MAG welding and TIG welding, the welding wire, the wirespool, the feed rollers and all pieces of metal that are in contact with the welding wire are live.

Always set the wirefeeder up on a sufficiently insulated surface or use a suitable, insulated wirefeeder holder.

Make sure that you and others are protected with an adequately insulated, dry temporary backing or cover for the earth or ground potential. This temporary backing or cover must extend over the entire area between the body and the earth or ground potential.

All cables and leads must be secured, undamaged, insulated and adequately dimensioned. Replace loose connections and scorched, damaged or inadequately dimensioned cables and leads immediately.

Use the handle to ensure the power connections are tight before every use. In the case of power cables with a bayonet connector, rotate the power cable around the longitudinal axis by at least 180° and pre-load.

Do not wrap cables or leads around the body or parts of the body.

The electrode (rod electrode, tungsten electrode, welding wire, etc.) must

- never be immersed in liquid for cooling
- Never touch the electrode when the power source is switched on.

Double the open circuit voltage of a power source can occur between the welding electrodes of two power sources. Touching the potentials of both electrodes at the same time may be fatal under certain circumstances.

Arrange for the mains cable to be checked regularly by a qualified electrician to ensure the ground conductor is functioning properly.

The device must only be operated on a mains supply with a ground conductor and a socket with a ground conductor contact.

Operating the device on a grid without a ground conductor and in a socket without a ground conductor contact will be deemed gross negligence. The manufacturer shall not be held liable for any damage arising from such usage.

If necessary, provide an adequate earth connection for the workpiece.

Switch off unused devices.

Wear a safety harness if working at height.



Before working on the device, switch it off and pull out the mains plug.

Attach a clearly legible and easy-to-understand warning sign to the device to prevent anyone from plugging the mains plug back in and switching it on again.

After opening the device:

- Discharge all live components
- Ensure that all components in the device are de-energised

If work on live parts is required, appoint a second person to switch off the main switch at the right moment.

#### Meandering welding currents



If the following instructions are ignored, meandering welding currents can develop with the following consequences:

- Fire hazard
- Overheating of parts connected to the workpiece
- Irreparable damage to ground conductors
- Damage to device and other electrical equipment

Ensure that the workpiece is held securely by the workpiece clamp.

Attach the workpiece clamp as close as possible to the area that is to be welded.

If the floor is electrically conductive, the device must be set up with sufficient insulating material to insulate it from the floor.

If distribution boards, twin-head mounts, etc., are being used, note the following: The electrode of the welding torch / electrode holder that is not used is also live. Make sure that the welding torch / electrode holder that is not used is kept sufficiently insulated.

In the case of automated MIG/MAG applications, ensure that only an insulated wire electrode is routed from the welding wire drum, large wirefeeder spool or wirespool to the wire-feed unit.

#### EMC Device Classifications



Devices in emission class A:

- Are only designed for use in industrial settings
- Can cause line-bound and radiated interference in other areas

Devices in emission class B:

- Satisfy the emissions criteria for residential and industrial areas. This is also true for residential areas in which the energy is supplied from the public low-voltage mains.

EMC device classification as per the rating plate or technical data.

## EMC measures



In certain cases, even though a device complies with the standard limit values for emissions, it may affect the application area for which it was designed (e.g. when there is sensitive equipment at the same location, or if the site where the device is installed is close to either radio or television receivers).

If this is the case, then the operator is obliged to take appropriate action to rectify the situation.

Check and evaluate the immunity of the device to interference from nearby devices according to national and international regulations. Examples of equipment that may be susceptible to interference from the device include:

- Safety devices
- Power, signal and data transfer lines
- IT and telecommunications devices
- Measuring and calibrating devices

Supporting measures for avoidance of EMC problems:

1. Mains supply
  - If electromagnetic interference arises despite correct mains connection, additional measures are necessary (e.g. use a suitable line filter).
2. Welding power leads
  - must be kept as short as possible
  - must run close together (to avoid EMF problems)
  - must be kept well apart from other leads
3. Equipotential bonding
4. Earthing of the workpiece
  - If necessary, establish an earth connection using suitable capacitors.
5. Shielding, if necessary
  - Shield off other nearby devices
  - Shield off entire welding installation

## EMF measures



Electromagnetic fields may pose as yet unknown risks to health:

- effects on the health of others in the vicinity, e.g. wearers of pacemakers and hearing aids
- wearers of pacemakers must seek advice from their doctor before approaching the device or any welding that is in progress
- for safety reasons, keep distances between the welding cables and the welder's head/torso as large as possible
- do not carry welding cables and hosepacks over the shoulders or wind them around any part of the body

## Specific hazards



Keep hands, hair, clothing and tools away from moving parts. For example:

- Fans
- Cogs
- Rollers
- Shafts
- Wirespools and welding wires

Do not reach into the rotating cogs of the wire drive or into rotating drive components.

Covers and side panels may only be opened/removed while maintenance or repair work is being carried out.

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During operation

- Ensure that all covers are closed and all side panels are fitted properly.
- Keep all covers and side panels closed.

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The welding wire emerging from the welding torch poses a high risk of injury (piercing of the hand, injuries to the face and eyes, etc.).

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Therefore always keep the welding torch away from the body (devices with wire-feed unit) and wear suitable protective goggles.

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Never touch the workpiece during or after welding - risk of burns.

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Slag can jump off cooling workpieces. The specified protective equipment must therefore also be worn when reworking workpieces, and steps must be taken to ensure that other people are also adequately protected.

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Welding torches and other parts with a high operating temperature must be allowed to cool down before handling.

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Special provisions apply in areas at risk of fire or explosion - observe relevant national and international regulations.

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Power sources for work in areas with increased electric risk (e.g. near boilers) must carry the "Safety" sign. However, the power source must not be located in such areas.

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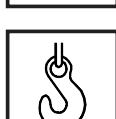
Risk of scalding from escaping coolant. Switch off cooling unit before disconnecting coolant flow or return lines.

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Observe the information on the coolant safety data sheet when handling coolant. The coolant safety data sheet may be obtained from your service centre or downloaded from the manufacturer's website.

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Use only suitable load-carrying equipment supplied by the manufacturer when transporting devices by crane.

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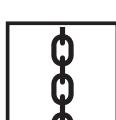
- Hook chains and/or ropes onto all suspension points provided on the load-carrying equipment.
- Chains and ropes must be at the smallest angle possible to the vertical.
- Remove gas cylinder and wire-feed unit (MIG/MAG and TIG devices).

If the wire-feed unit is attached to a crane holder during welding, always use a suitable, insulated wirefeeder hoisting attachment (MIG/MAG and TIG devices).

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If the device has a carrying strap or handle, this is intended solely for carrying by hand. The carrying strap is not to be used if transporting with a crane, counterbalanced lift truck or other mechanical hoist.

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All lifting accessories (straps, handles, chains, etc.) used in connection with the device or its components must be tested regularly (e.g. for mechanical damage, corrosion or changes caused by other environmental factors).

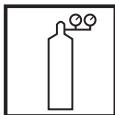
The testing interval and scope of testing must comply with applicable national standards and directives as a minimum.

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Odourless and colourless shielding gas may escape unnoticed if an adapter is used for the shielding gas connection. Prior to assembly, seal the device-side thread of the adapter for the shielding gas connection using suitable Teflon tape.

## Factors affecting welding results



The following requirements with regard to shielding gas quality must be met if the welding system is to operate in a correct and safe manner:

- Size of solid matter particles < 40 µm
- Pressure dew point < -20 °C
- Max. oil content < 25 mg/m³

Filters must be used if necessary.

 **NOTE!** There is an increased risk of soiling if ring mains are being used

## Danger from shielding gas cylinders



Shielding gas cylinders contain gas under pressure and can explode if damaged. As the shielding gas cylinders are part of the welding equipment, they must be handled with the greatest of care.

Protect shielding gas cylinders containing compressed gas from excessive heat, mechanical impact, slag, naked flames, sparks and arcs.

Mount the shielding gas cylinders vertically and secure according to instructions to prevent them falling over.

Keep the shielding gas cylinders well away from any welding or other electrical circuits.

Never hang a welding torch on a shielding gas cylinder.

Never touch a shielding gas cylinder with an electrode.

**Risk of explosion - never attempt to weld a pressurised shielding gas cylinder.**

Only use shielding gas cylinders suitable for the application in hand, along with the correct and appropriate accessories (regulator, hoses and fittings). Only use shielding gas cylinders and accessories that are in good condition.

Turn your face to one side when opening the valve of a shielding gas cylinder.

Close the shielding gas cylinder valve if no welding is taking place.

If the shielding gas cylinder is not connected, leave the valve cap in place on the cylinder.

The manufacturer's instructions must be observed as well as applicable national and international regulations for shielding gas cylinders and accessories.

## Danger from escaping shielding gas



**Risk of suffocation from the uncontrolled escape of shielding gas**

Shielding gas is colourless and odourless and, in the event of a leak, can displace the oxygen in the ambient air.

- Ensure an adequate supply of fresh air with a ventilation rate of at least 20 m³/hour.
- Observe safety and maintenance instructions on the shielding gas cylinder or the main gas supply.
- Close the shielding gas cylinder valve or main gas supply if no welding is taking place.
- Check the shielding gas cylinder or main gas supply for uncontrolled gas leakage before every start-up.

## Safety measures at the installation location and during transport



A device toppling over could easily kill someone. Place the device on a solid, level surface such that it remains stable

- The maximum permissible tilt angle is 10°.



Special regulations apply in rooms at risk of fire or explosion

- Observe relevant national and international regulations.

Use internal directives and checks to ensure that the workplace environment is always clean and clearly laid out.

Only set up and operate the device in accordance with the degree of protection shown on the rating plate.

When setting up the device, ensure there is an all-round clearance of 0.5 m (1 ft. 7.69 in.) to ensure that cooling air can flow in and out freely.

When transporting the device, observe the relevant national and local guidelines and accident prevention regulations. This applies especially to guidelines regarding the risks arising during transport.

Do not lift or transport operational devices. Switch off devices before transport or lifting.

Before transporting the device, allow coolant to drain completely and detach the following components:

- Wirefeeder
- Wirespool
- Shielding gas cylinder

After transporting the device, the device must be visually inspected for damage before commissioning. Any damage must be repaired by trained service technicians before commissioning the device.

## Safety measures in normal operation



Only operate the device when all safety devices are fully functional. If the safety devices are not fully functional, there is a risk of

- injury or death to the operator or a third party
- damage to the device and other material assets belonging to the operator
- inefficient operation of the device

Any safety devices that are not functioning properly must be repaired before switching on the device.

Never bypass or disable safety devices.

Before switching on the device, ensure that no one is likely to be endangered.

Check the device at least once a week for obvious damage and proper functioning of safety devices.

Always fasten the shielding gas cylinder securely and remove it beforehand if the device is to be transported by crane.

Only the manufacturer's original coolant is suitable for use with our devices due to its properties (electrical conductivity, anti-freeze agent, material compatibility, flammability, etc.).

Only use suitable original coolant from the manufacturer.

Do not mix the manufacturer's original coolant with other coolants.

Only connect the manufacturer's system components to the cooling circuit.

The manufacturer accepts no liability for damage resulting from use of other system components or a different coolant. In addition, all warranty claims will be forfeited.

Cooling Liquid FCL 10/20 does not ignite. The ethanol-based coolant can ignite under certain conditions. Transport the coolant only in its original, sealed containers and keep well away from any sources of ignition.

Used coolant must be disposed of properly in accordance with the relevant national and international regulations. The coolant safety data sheet may be obtained from your service centre or downloaded from the manufacturer's website.

Check the coolant level before starting to weld, while the system is still cool.

## Commissioning, maintenance and repair



It is impossible to guarantee that bought-in parts are designed and manufactured to meet the demands made of them, or that they satisfy safety requirements.

- Use only original spare and wearing parts (also applies to standard parts).
- Do not carry out any modifications, alterations, etc. to the device without the manufacturer's consent.
- Components that are not in perfect condition must be replaced immediately.
- When ordering, please give the exact designation and part number as shown in the spare parts list, as well as the serial number of your device.

The housing screws provide the ground conductor connection for earthing the housing parts.

Only use original housing screws in the correct number and tightened to the specified torque.

## Safety inspection



The manufacturer recommends that a safety inspection of the device is performed at least once every 12 months.

The manufacturer recommends that the power source be calibrated during the same 12-month period.

A safety inspection should be carried out by a qualified electrician

- after any changes are made
- after any additional parts are installed, or after any conversions
- after repair, care and maintenance has been carried out
- at least every twelve months.

For safety inspections, follow the appropriate national and international standards and directives.

Further details on safety inspection and calibration can be obtained from your service centre. They will provide you on request with any documents you may require.

## Disposal



Do not dispose of this device with normal domestic waste! To comply with the European Directive on Waste Electrical and Electronic Equipment and its implementation as national law, electrical equipment that has reached the end of its life must be collected separately and returned to an approved recycling facility. Any device that you no longer require must either be returned to your dealer or given to one of the approved collection and recycling facilities in your area. Ignoring this European Directive may have potentially adverse affects on the environment and your health!

---

**Safety symbols**

Devices with the CE mark satisfy the essential requirements of the low-voltage and electromagnetic compatibility directives (e.g. relevant product standards of the EN 60 974 series).

Fronius International GmbH hereby declares that the device is compliant with Directive 2014/53/EU. The full text on the EU Declaration of Conformity can be found at the following address: <http://www.fronius.com>

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Devices marked with the CSA test mark satisfy the requirements of the relevant standards for Canada and the USA.

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**Data protection**

The user is responsible for the safekeeping of any changes made to the factory settings. The manufacturer accepts no liability for any deleted personal settings.

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**Copyright**

Copyright of these operating instructions remains with the manufacturer.

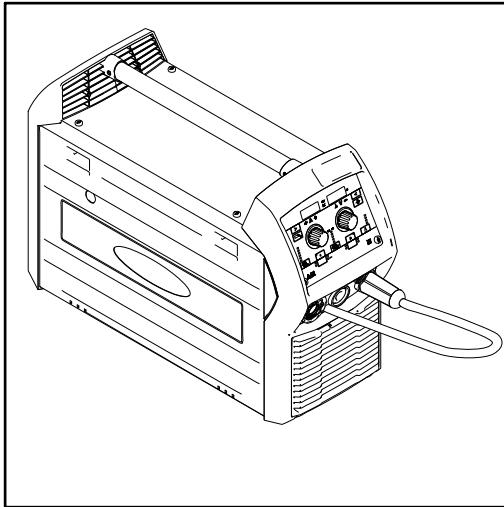
The text and illustrations are all technically correct at the time of printing. We reserve the right to make changes. The contents of the operating instructions shall not provide the basis for any claims whatsoever on the part of the purchaser. If you have any suggestions for improvement, or can point out any mistakes that you have found in the instructions, we will be most grateful for your comments.

# **General information**



# General

## Device concept



The TransSteel (TSt) 2200 power source is a completely digitised, microprocessor-controlled power source.

This power source is designed for the welding of steel and can be used for the following welding processes:

- MIG/MAG welding
- MMA welding
- TIG welding with touchdown ignition

The central control and regulation unit of the power source is coupled with a digital signal processor. The central control and regulation unit and signal processor control the entire welding process.

During the welding process, the actual data is measured continuously and the device responds immediately to any changes. Control algorithms ensure that the desired target state is maintained.

## "Power limitation" function

The power source has a "Power limitation" safety feature.

This function is only available for the MIG/MAG standard synergic welding process.

### Mode of operation:

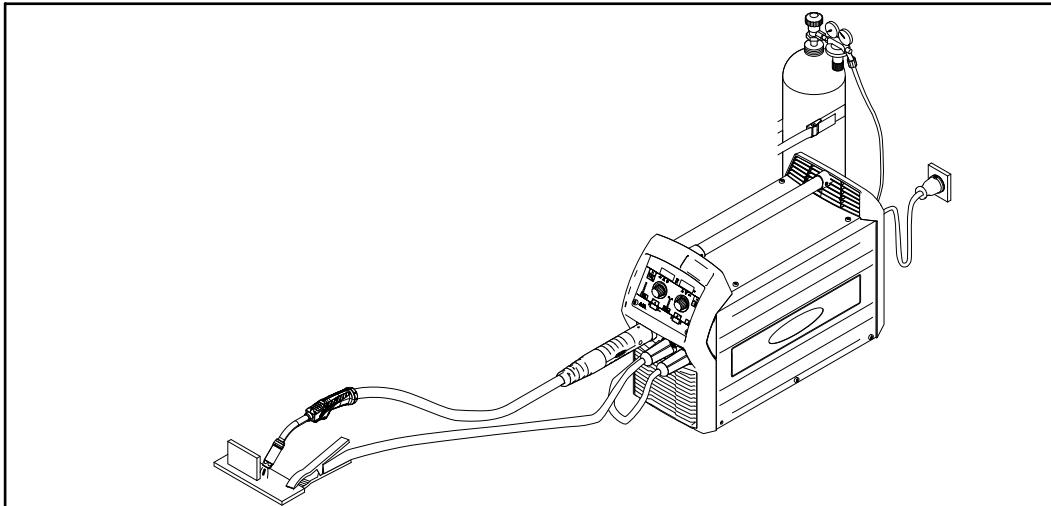
If necessary, the power source reduces the welding power to prevent the arc from being extinguished during welding at the power limit of the power source. The reduced parameters are displayed on the control panel until welding starts again or until the next parameter change.

This results in:

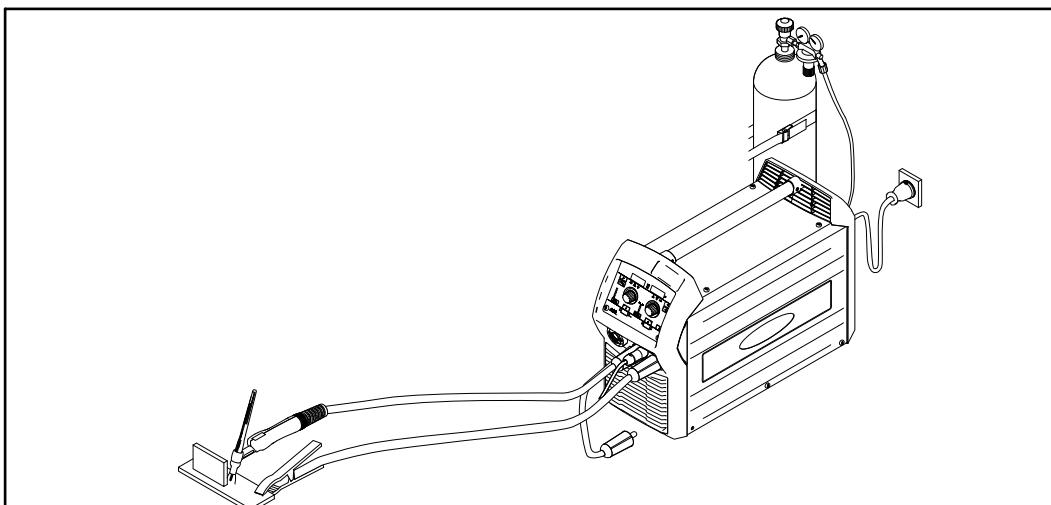
- A more precise welding process
- A high degree of reproducibility of all results
- Exceptional weld properties

→ As soon as the function is active, the indicator for the wire speed parameter on the control panel flashes. The flashing continues until welding starts again or until the next parameter change.

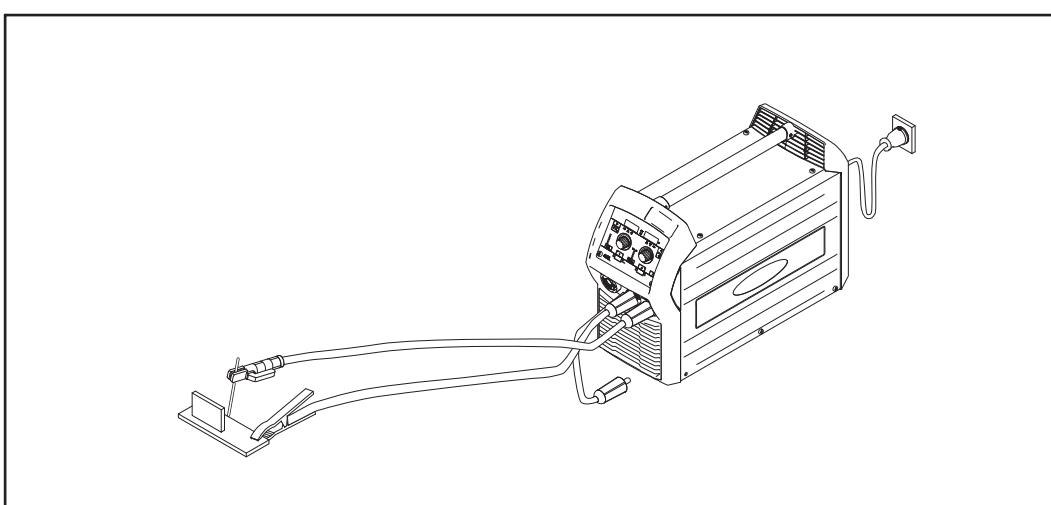
## Application areas



*MIG/MAG welding*



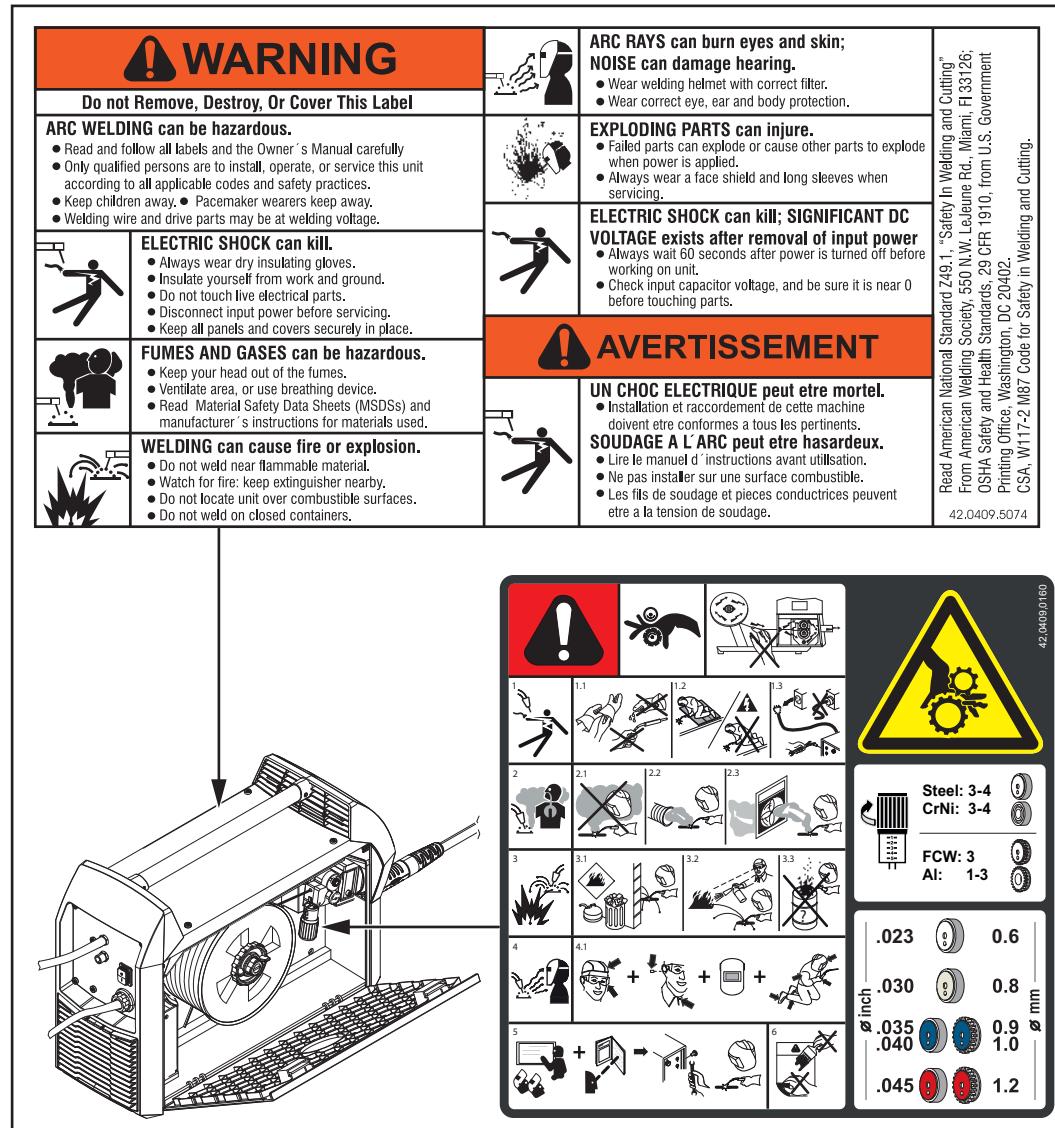
*TIG welding*



*MMA welding*

## Warning notices on the device

Warning notices and safety symbols are affixed to the power source. These warning notices and safety symbols must not be removed or painted over. They warn against incorrect operation, as this may result in serious injury and damage.



Welding is dangerous. The following basic requirements must be met to ensure the equipment is used properly:

- Anyone performing automated welding must be sufficiently qualified
- Suitable protective equipment must be used
- All persons not involved must be kept at a safe distance from the wirefeeder and the welding process



Do not use the functions described here until you have fully read and understood the following documents:

- These Operating Instructions
- All the Operating Instructions for the system components, especially the safety rules



Do not dispose of used devices with domestic waste. Dispose of them according to the safety rules.



Keep hands, hair, clothing and tools away from moving parts. For example:

- Cogs
- Feed rollers
- Wirespools and welding wires

Do not reach into the rotating cogs of the wire drive or into rotating drive components.

Covers and side panels may only be opened / removed while maintenance or repair work is being carried out.

# **Control elements and connections**



# Control panel

## General



**NOTE!** Due to software updates, you may find that your device has certain functions that are not described in these operating instructions or vice versa. Individual illustrations may also differ slightly from the actual controls on your device, but these controls function in exactly the same way.

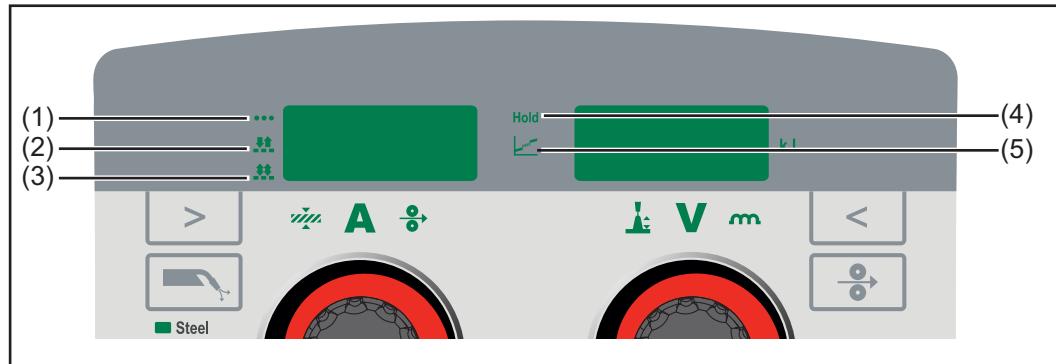
## Safety



**WARNING!** Operating the equipment incorrectly can cause serious injury and damage. Do not use the functions described until you have thoroughly read and understood the following documents:

- these operating instructions
- all the operating instructions for the system components, especially the safety rules

## Control panel



### No. Function

#### (1) Spot welding indicator

The spot welding indicator lights up if:

- Spot welding/stitch welding mode is selected
- The SPt parameter (spot welding time/stitch welding time) in the Setup menu is not set to OFF

#### (2) 2-step stitch welding indicator

The 2-step stitch welding indicator lights up if:

- Spot welding/stitch welding mode is selected and
- The SPb parameter (spot welding/stitch welding pause time) is set to a value greater than 0 and
- The Int (interval) parameter is set to 2T

#### (3) 4-step stitch welding indicator

The 4-step stitch welding indicator lights up if:

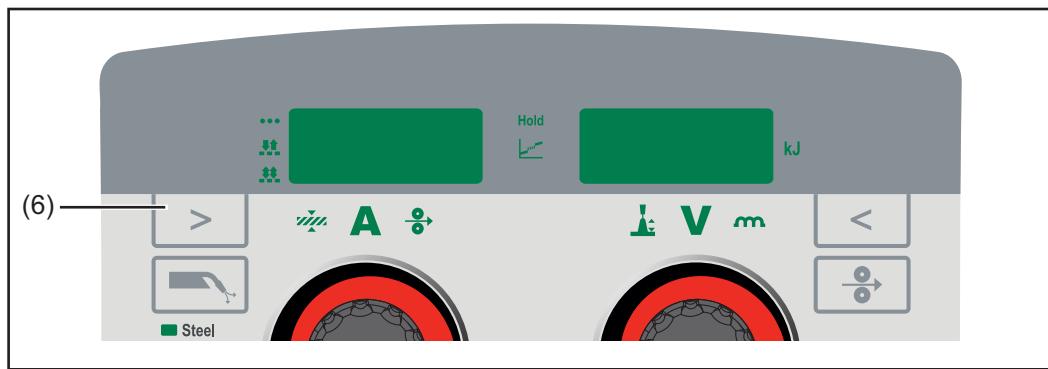
- Spot welding/stitch welding mode is selected and
- The SPb parameter (spot welding/stitch welding pause time) is set to a value greater than 0 and
- The Int (interval) parameter is set to 4T

#### (4) Hold indicator

At the end of each welding operation, the actual values for welding current and welding voltage are stored - the "HOLD" indicator lights up

#### (5) Intermediate arc indicator

A spatter-prone intermediate arc occurs between the dip transfer arc and the spray arc. The intermediate arc indicator lights up to alert you to this critical range



No.	Function
-----	----------

**(6) "Parameter selection" button (left)**

For selecting the parameters listed below

The relevant symbol lights up when a welding parameter is selected.

 **Sheet thickness in mm or in. \*)**

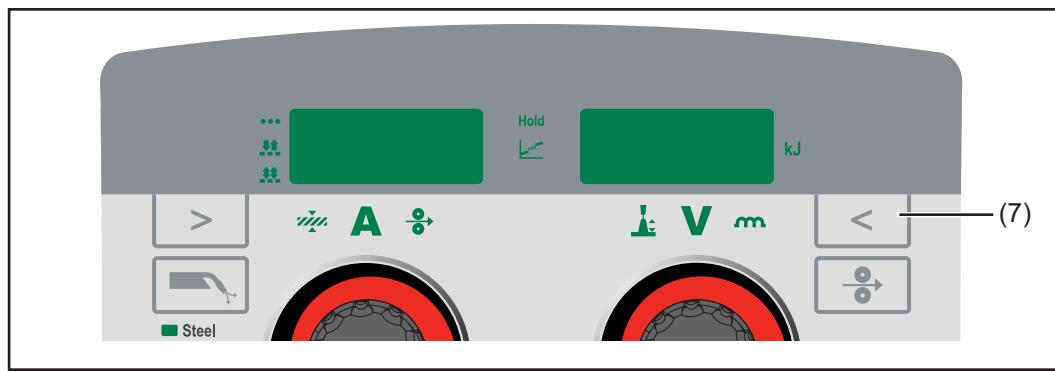
If the welding current to be selected is not known, it is sufficient to enter the sheet thickness. The required welding current and any other parameters marked with \*) will then be adjusted automatically.

**A** **Welding current in amperes \*)**

Before the start of welding, the device automatically displays a standard value based on the programmed parameters. The actual value is displayed during welding.

 **Wire speed in m/min or ipm \*)**

**\*)** If one of these parameters is selected in the MIG/MAG standard synergic welding process, then the synergic function ensures that all other synergic parameters are adjusted automatically.



**No. Function**

**(7) "Parameter selection" button (right)**

For selecting the parameters listed below

The relevant symbol lights up when a welding parameter is selected.

**█ Arc length correction**

For correcting the arc length

**█ Welding voltage in V \*)**

Before the start of welding, the device automatically displays a standard value based on the programmed parameters. The actual value is displayed during welding.

**█ Arc-force dynamic**

For influencing the short-circuiting dynamic at the moment of droplet transfer

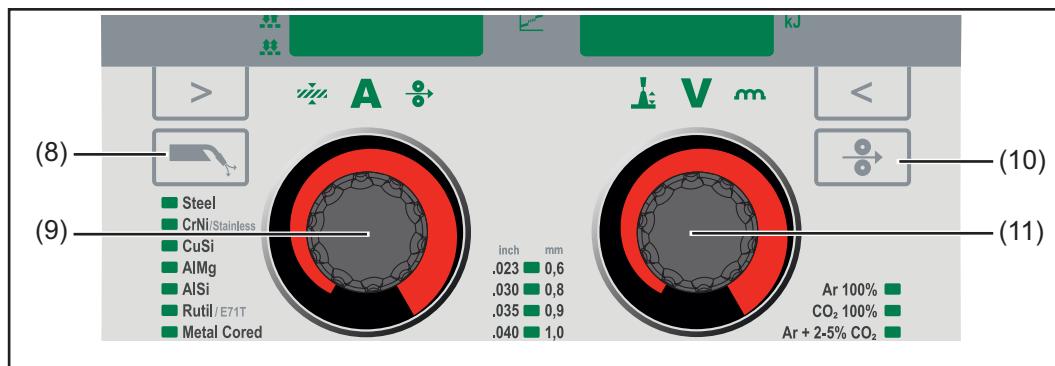
- ... harder, more stable arc
- 0 ... neutral arc
- + ... soft, low-spatter arc

**█ Real Energy Input \*\*)**

For displaying the energy applied during the welding operation

\*) If one of these parameters is selected in the MIG/MAG standard synergic welding process, then the synergic function ensures that all other synergic parameters are adjusted automatically.

\*\*) This parameter can only be selected if the EnE parameter is set to ON in the Level 2 Setup menu. The value continuously rises during welding in line with the permanently increasing energy yield. The final value at the end of welding remains stored until welding starts again or the power source is switched back on - the HOLD indicator lights up.



No.	Function
(8)	<b>Gas-test button</b>
(9)	<b>Adjusting dial (left)</b>
(10)	<b>"Wire threading" button</b>
(11)	<b>Adjusting dial (right)</b>

**(8) Gas-test button**

For setting the required gas flow rate on the gas pressure regulator/for filling the torch hosepack with shielding gas.

When the "Gas-test" button is pressed, shielding gas will flow for 30 s. Press the button again to stop the gas flow prematurely.

**(9) Adjusting dial (left)**

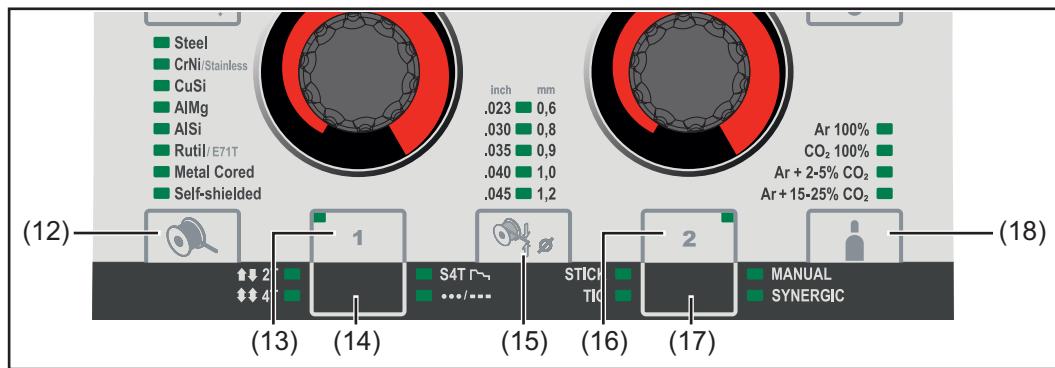
For changing the sheet thickness, welding current and wire speed parameters as well as changing parameters in the Setup menu

**(10) "Wire threading" button**

For threading the wire into the torch hosepack with no accompanying flow of gas. While the button is being held down, the wire drive runs at feeder inching speed

**(11) Adjusting dial (right)**

For changing the arc length correction, welding voltage and arc-force dynamic parameters as well as changing parameters in the Setup menu



#### No. Function

##### (12) "Material" button

For selecting the filler metal to be used

##### (13) "Save" button 1

For saving an EasyJob

##### (14) "Mode" button

For selecting the operating mode

2T = 2-step mode

4T = 4-step mode

S4T = S 4 T = Special 4-step mode

.../... = Spot welding/stitch welding

##### (15) "Wire diameter" button

For selecting the wire diameter to be used

##### (16) "Save" button 2

For saving an EasyJob

##### (17) "Process" button

For selecting the welding process

MANUAL = MIG/MAG standard manual welding

SYNERGIC = MIG/MAG standard synergic welding

STICK = Manual metal arc (MMA) welding

TIG = TIG welding

##### (18) "Shielding gas" button

For selecting the shielding gas to be used

#### Keylock

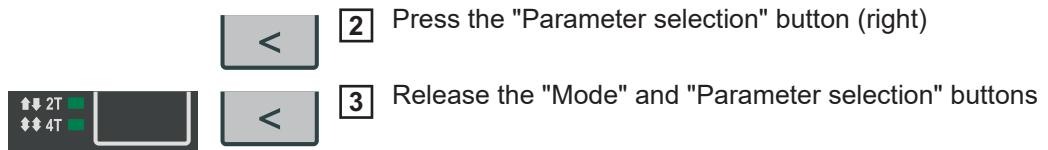
A keylock can be activated to prevent the settings from being inadvertently changed on the control panel. As long as the keylock is active

- Settings cannot be adjusted on the control panel
- Parameter settings can be displayed
- It is possible to switch between EasyJobs if an EasyJob was selected before activating the keylock

Activate/deactivate the keylock as follows:



1 Press and hold the "Mode" button



Keylock activated:  
The message "CLO | SEd" appears on the displays.

Keylock deactivated:  
The message "OP | En" appears on the displays.

# Connections, switches and mechanical components

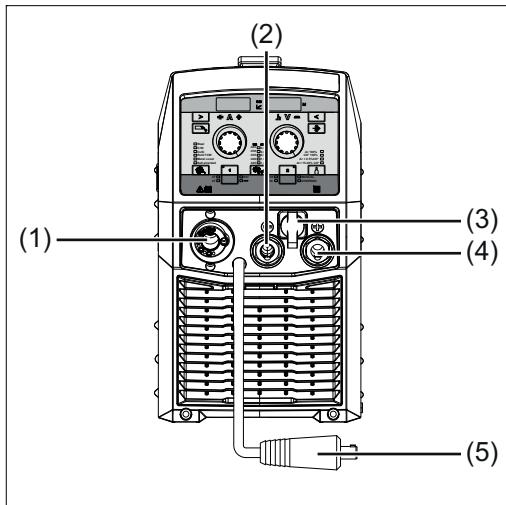
## Safety



**WARNING!** Operating the equipment incorrectly can cause serious injury and damage. Do not use the functions described until you have thoroughly read and understood the following documents:

- these operating instructions
- all the operating instructions for the system components, especially the safety rules

## Front and rear of the power source



### (1) Welding torch connection

For connecting the welding torch

### (2) (-) - current socket with bayonet latch

Used for

- Connecting the grounding cable or polarity reverser during MIG/MAG welding (depending on the wire electrode used)
- Connecting the electrode cable or grounding cable during MMA welding (depending on the type of electrode used)
- Connecting the TIG welding torch

### (3) TMC connection (TIG Multi Connector)

For connecting the TIG welding torch

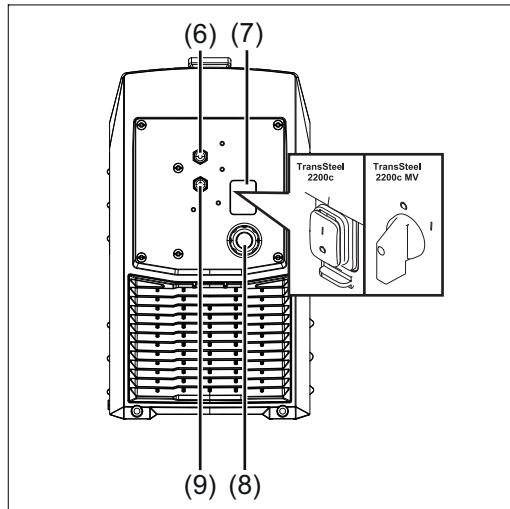
### (4) (+) - current socket with bayonet latch

Used for

- Connecting the polarity reverser or grounding cable during MIG/MAG welding (depending on the wire electrode used)
- Connecting the electrode cable or grounding cable during MMA welding (depending on the type of electrode used)
- Connecting the grounding cable during TIG welding

### (5) Polarity reverser

For selecting the welding potential on the MIG/MAG welding torch



**(6) MIG/MAG shielding gas connection socket**

For the shielding gas supply to the welding torch connection (1)

**(7) Mains switch**

For switching the power source on and off

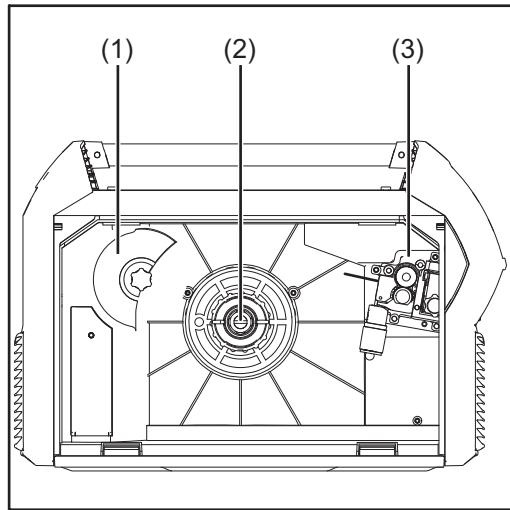
**(8) Mains cable with strain relief device**

Not prefitted on all models

**(9) TIG shielding gas connection socket**

For the shielding gas supply to the (-) - current socket (2)

**Side view**



**(1) D100 wirespool holder with brake**

For holding standard wirespools with a max. diameter of 100 mm (3.94 in)

**(2) D200 wirespool holder with brake**

For holding standard wirespools with a max. diameter of 200 mm (7.87 in.) and a max. weight of 6.8 kg (14.99 lbs.)

**(3) 2-roller drive**



# **Before installation and commissioning**



# General

## Safety



**WARNING!** Incorrect operation or shoddy workmanship can cause serious injury or damage. All activities described in these operating instructions may only be carried out by trained and qualified personnel. All functions described in these operating instructions may only be used by trained and qualified personnel. Do not carry out any of the work or use any of the functions described until you have fully read and understood the following documents:

- these operating instructions
- all the operating instructions for the system components, especially the safety rules

## Proper use

The power source is intended exclusively for MIG/MAG, MMA and TIG welding. Utilisation for any other purpose, or in any other manner, shall be deemed to be not in accordance with the intended purpose. The manufacturer shall not be held liable for any damages arising from such usage.

Proper use also includes

- complying with all the instructions in the Operating Instructions
- performing all stipulated inspection and maintenance work

## Setup regulations

The device is tested to IP 23 protection, meaning:

- Protection against penetration by solid foreign bodies with diameters > 12 mm (0.49 in.)
- Protection against spraywater at any angle up to 60° to the vertical

The device can be set up and operated outdoors in accordance with degree of protection IP 23.

Avoid direct wetting (e.g. from rain).



**WARNING!** If one of these machines topples over or falls it could cause serious or even fatal injury. Place device on a solid, level surface in such a way that it remains stable.



**CAUTION!** Electroconductive metallic dust may damage the device. The air filter is a very important safety device for adhering to IP 23 protection. The device may only be operated with an air filter fitted.

The venting duct is a very important safety device. When choosing the device location, ensure that the cooling air can enter and exit unhindered through the air ducts on the front and back of the device. Electroconductive metallic dust (e.g. from grinding work) must not be allowed to get sucked into the device.

## Mains connection

The devices are designed to run on the mains voltage shown on the respective rating plates. If your version of the device does not come with mains cables and plugs ready-fitted, these must be fitted in accordance with national regulations and standards. For details of fuse protection of the mains lead, please see the Technical Data.



**NOTE!** Inadequately dimensioned electrical installations can cause serious damage. The incoming mains lead and its fuse must be dimensioned to suit the local power supply. The technical data shown on the rating plate applies.

# Generator-powered operation

## Generator-powered operation

The power source is generator-compatible.

The maximum apparent power  $S_{1\max}$  of the power source must be known in order to select the correct generator output.

The maximum apparent power  $S_{1\max}$  of the power source is calculated as follows:

$$S_{1\max} = I_{1\max} \times U_1$$

See device rating plate or technical data for  $I_{1\max}$  and  $U_1$  values

The generator apparent power  $S_{\text{GEN}}$  needed is calculated using the following rule of thumb:

$$S_{\text{GEN}} = S_{1\max} \times 1.35$$

A smaller generator may be used when not welding at full power.



**NOTE!** The generator apparent power  $S_{\text{GEN}}$  must always be higher than the maximum apparent power  $S_{1\max}$  of the power source.

When using single-phase devices with a three-phase generator, note that the specified generator apparent power is often only available as a whole across all three phases of the generator. If necessary, obtain further information on the single-phase power of the generator from the generator manufacturer.



**NOTE!** The voltage delivered by the generator must never exceed the upper or lower limits of the mains voltage tolerance range. Details of the mains voltage tolerance can be found in the "Technical data" section.

# Mains fuse protection

## Adjustable mains fuse protection

The mains fuse protection selected on the power source limits the power drawn in from the mains and in turn the possible welding current. This prevents the automatic circuit breaker (e.g. in the fuse box) from tripping straight away.

The desired mains fuse protection can be selected on the power source depending on the mains voltage and automatic circuit breaker used.

The following table shows which mains voltages and fuse ratings limit the welding current.

### TSt 2200:

Mains voltage	Country-specific setting	Power source fuse rating	Welding current limitation
230 V	Std	10 A	<b>MIG/MAG welding:</b> max. 145 A; 110 A at 100%*
			<b>MMA welding:</b> max. 125 A; 90 A at 100%*
			<b>TIG welding:</b> max. 180 A; 135 A at 100%*
230 V	Std	13 A	<b>MIG/MAG welding:</b> max. 170 A; 140 A at 100%*
			<b>MMA welding:</b> max. 150 A; 120 A at 100%*
			<b>TIG welding:</b> max. 200 A; 160 A at 100%*
230 V	Std	16 A	<b>MIG/MAG welding:</b> max. 210 A; 150 A at 100%*
			<b>MMA welding:</b> max. 180 A; 130 A at 100%*
			<b>TIG welding:</b> max. 230 A; 170 A at 100%*

### TSt 2200 MV:

Mains voltage	Country-specific setting	Power source fuse rating	Welding current limitation
120 V	Std	10 A	<b>MIG/MAG welding:</b> max. 100 A; 75 A at 100%*
			<b>MMA welding:</b> max. 85 A; 55 A at 100%*
			<b>TIG welding:</b> max. 130 A; 95 A at 100%*
120 V	Std	13 A	<b>MIG/MAG welding:</b> max. 105 A; 80 A at 100%*
			<b>MMA welding:</b> max. 90 A; 70 A at 100%*
			<b>TIG welding:</b> max. 135 A; 105 A at 100%*

**TSt 2200 MV:**

Mains voltage	Country-specific setting	Power source fuse rating	Welding current limitation
120 V	US	15 A	<b>MIG/MAG welding:</b> max. 105 A; 80 A at 100%*
			<b>MMA welding:</b> max. 90 A; 70 A at 100%*
			<b>TIG welding:</b> max. 135 A; 105 A at 100%*
120 V	Std	16 A	<b>MIG/MAG welding:</b> max. 115 A; 105 A at 100%*
			<b>MMA welding:</b> max. 100 A; 85 A at 100%*
			<b>TIG welding:</b> max. 140 A; 130 A at 100%*
120 V	US	20 A	<b>MIG/MAG welding:</b> max. 135 A; 105 A at 100%*
			<b>MMA welding:</b> max. 110 A; 90 A at 100%*
			<b>TIG welding:</b> max. 160 A; 130 A at 100%*
230 V	Std	10 A	<b>MIG/MAG welding:</b> max. 145 A; 110 A at 100%*
			<b>MMA welding:</b> max. 125 A; 90 A at 100%*
			<b>TIG welding:</b> max. 180 A; 135 A at 100%*
230 V	Std	13 A	<b>MIG/MAG welding:</b> max. 170 A; 140 A at 100%*
			<b>MMA welding:</b> max. 150 A; 120 A at 100%*
			<b>TIG welding:</b> max. 200 A; 160 A at 100%*
230 V	Std	16 A	<b>MIG/MAG welding:</b> max. 210 A; 150 A at 100%*
			<b>MMA welding:</b> max. 180 A; 130 A at 100%*
			<b>TIG welding:</b> max. 230 A; 170 A at 100%*
240 V	US	15 A	<b>MIG/MAG welding:</b> max. 210 A; 150 A at 100%*
			<b>MMA welding:</b> max. 180 A; 130 A at 100%*
			<b>TIG welding:</b> max. 230 A; 170 A at 100%*

A 20 A fuse can only be selected if:

- The country-specific setting has been set to "US"
- The mains lead has a 20 A fuse
- The power source is supplied with a mains voltage of 120 V

\* 100% values = welding with no time limits and without cooling breaks.

The welding current data applies at an ambient temperature of 40 °C (104 °F).

A safety cut-out prevents the automatic circuit breaker from tripping at higher welding powers. The safety cut-out defines the possible welding duration without the automatic circuit breaker tripping. If the precalculated weld time is exceeded, thus causing the welding cur-

rent to switch off, the service code "toF" is displayed. A countdown immediately appears next to the "toF" indicator, which shows the remaining time until the power source is ready for welding again. After this time, the message disappears and the power source can be used again.

Depending on the selected fuse, the safety cut-out limits the maximum currents of the selected process. As a result, it is possible that welding can no longer occur at the saved operating points if these were saved before selecting the fuse.

If welding is nevertheless carried out at one of these operating points, the power source operates at the limit value of the selected fuse – the power limitation is active. The operating point should be re-saved in accordance with the power limitation.

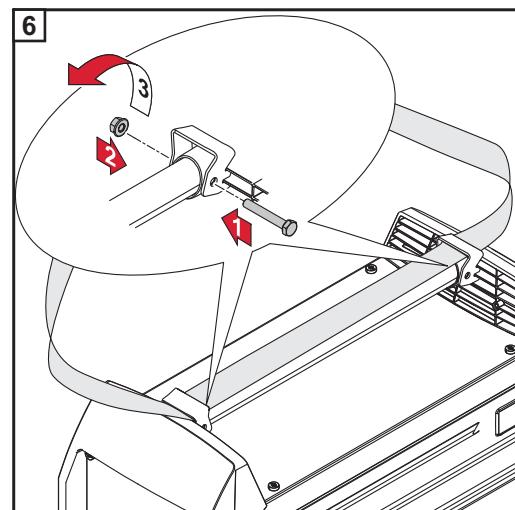
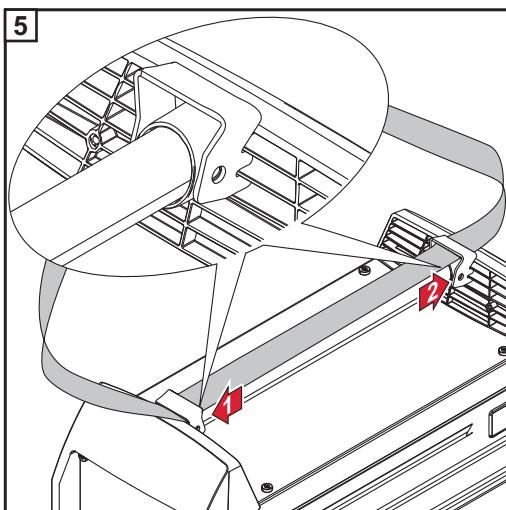
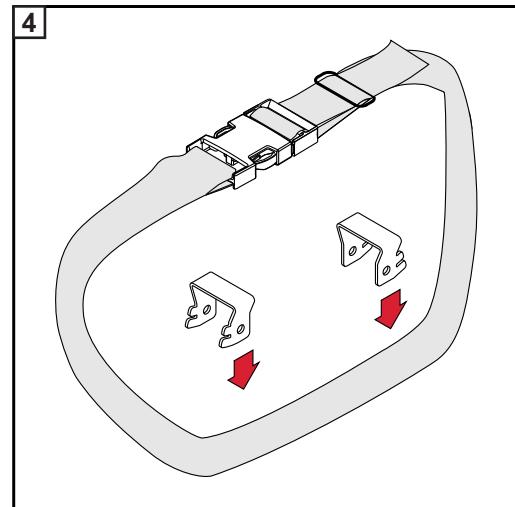
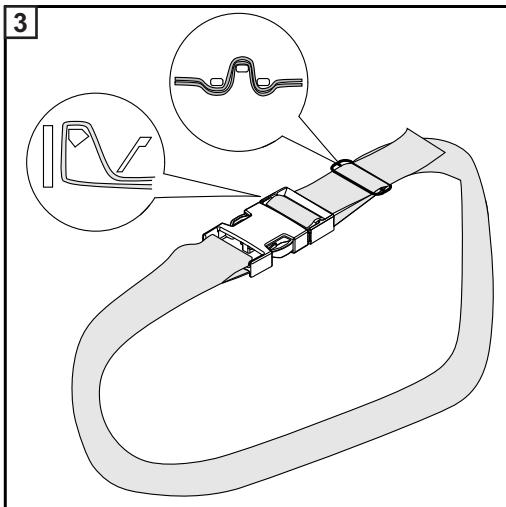
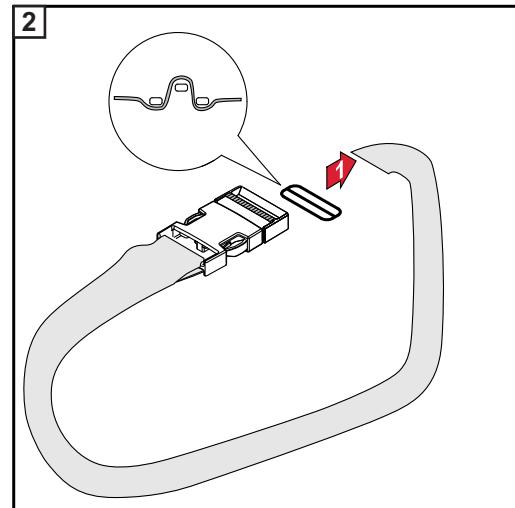
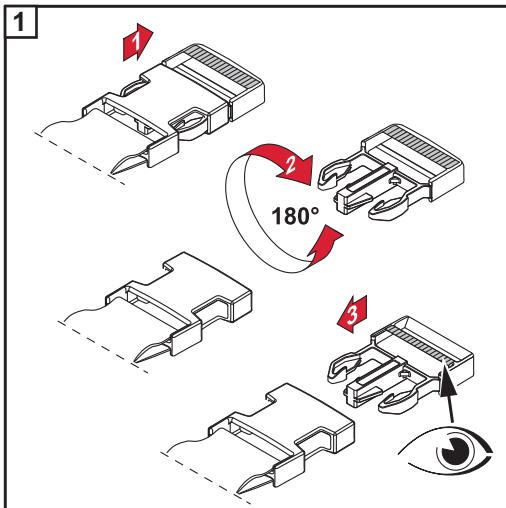


# **Carrying strap option**



# Fitting the carrying strap

Fitting the carrying strap to the power source





**MIG/MAG**

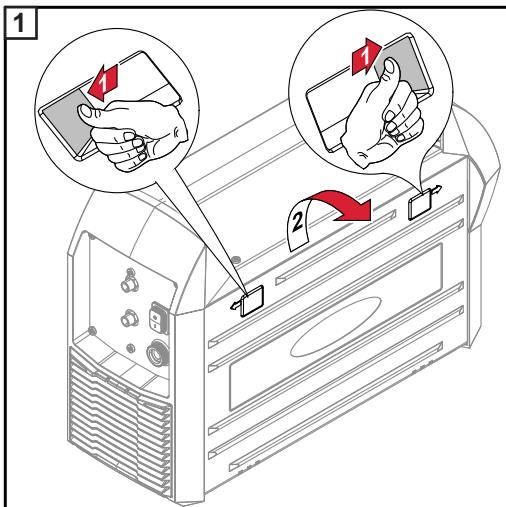


# Start-up

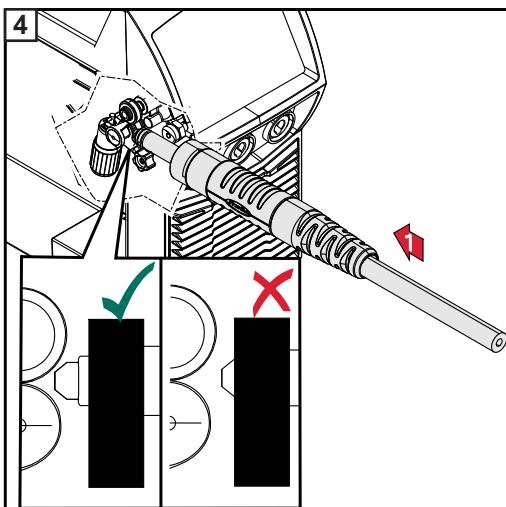
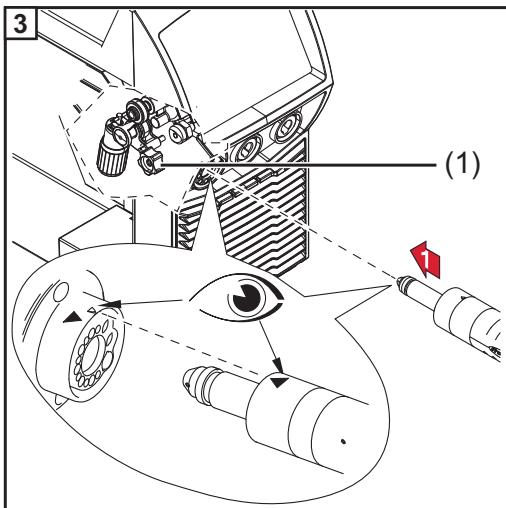
## Connecting a MIG/MAG welding torch



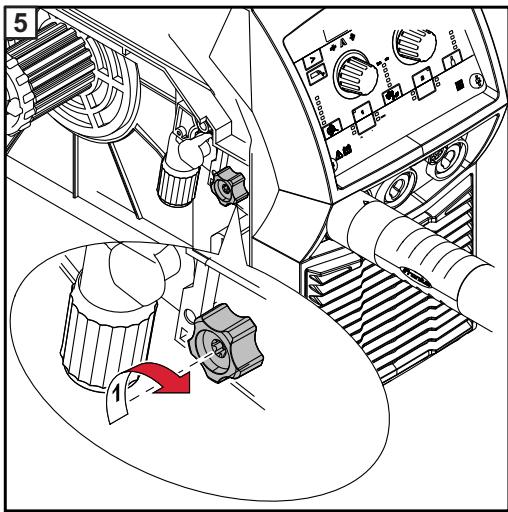
**NOTE!** Before connecting the welding torch to the power source, equip the welding torch according to the welding torch Operating Instructions: fit wearing parts to the torch body, fit the inner liner.



**2** Unscrew the knurled screw (1) slightly so that the welding torch can be easily pushed into the welding torch connection.



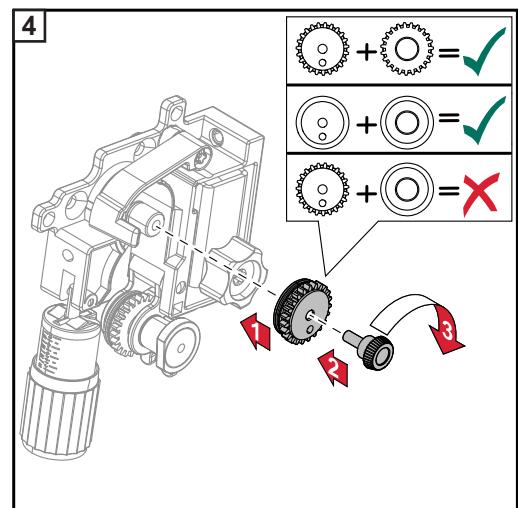
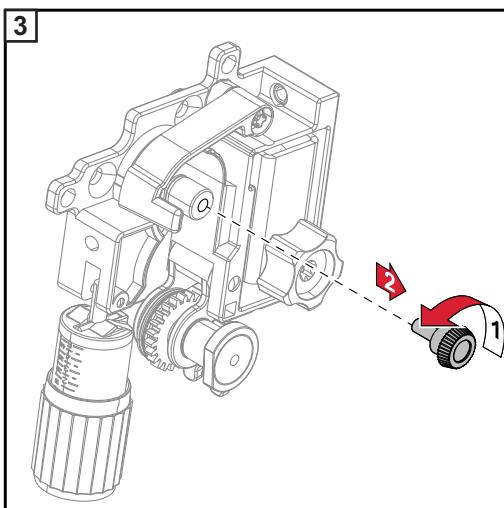
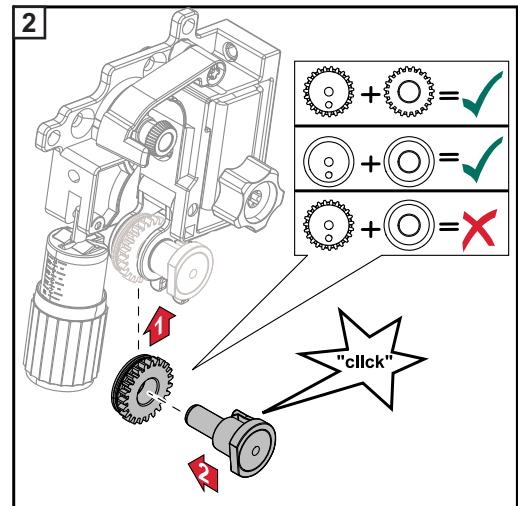
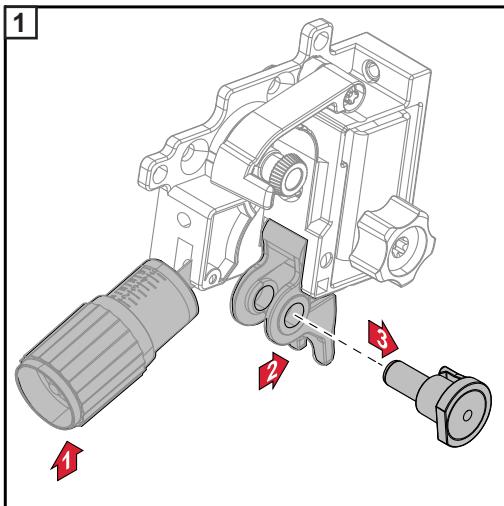
**CAUTION!** Risk of damage if the welding torch is not fully inserted. After inserting the welding torch, it must be in the end position shown.



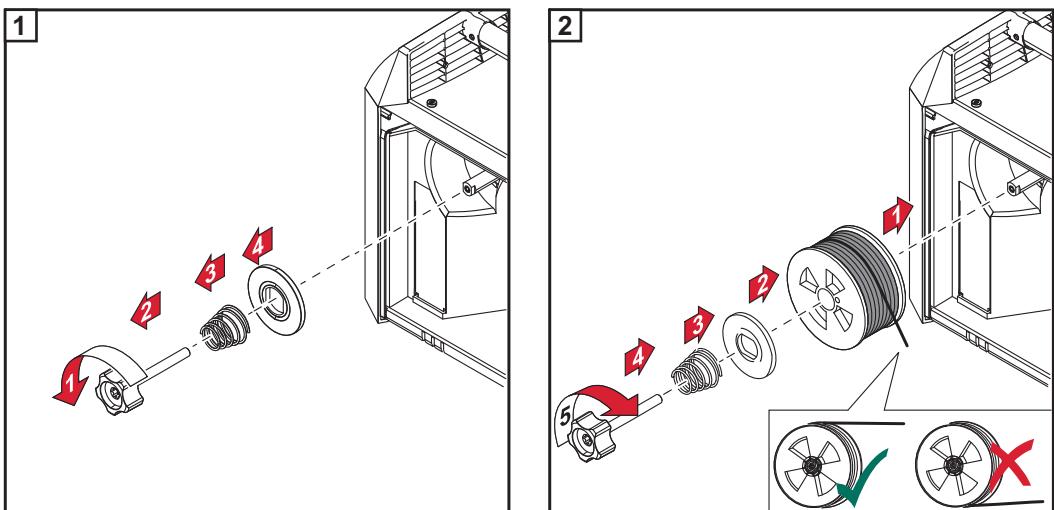
### Inserting the feed rollers



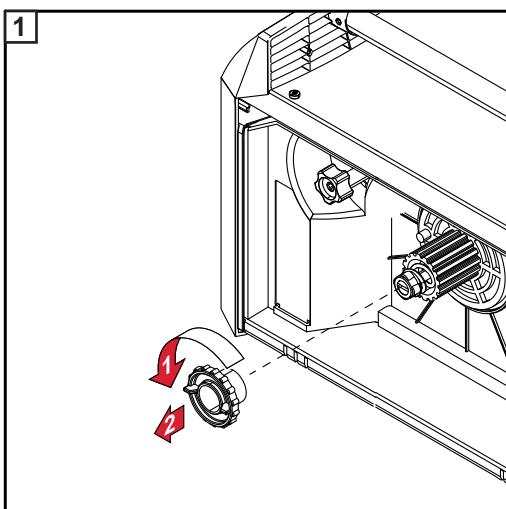
**NOTE!** In order to achieve optimum wire electrode feed, the feed rollers must be suitable for the diameter and alloy of the wire being welded.



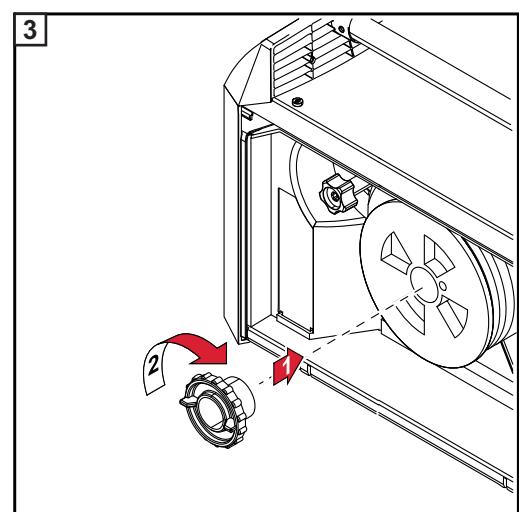
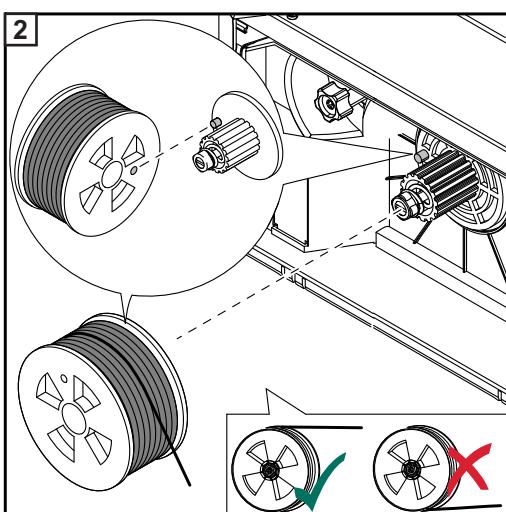
## Inserting the D100 wirespool



## Inserting the D200 wirespool



**CAUTION!** Risk of injury and material damage if the wirespool topples over because the locking ring has been placed the wrong way around. Always secure the locking ring as shown below.

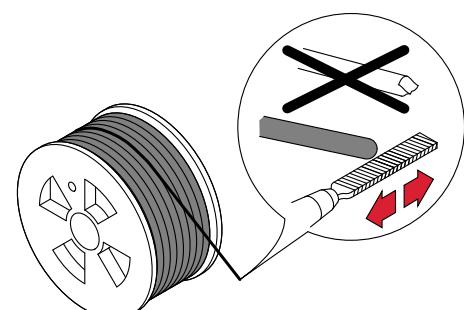


## Feeding in the wire electrode

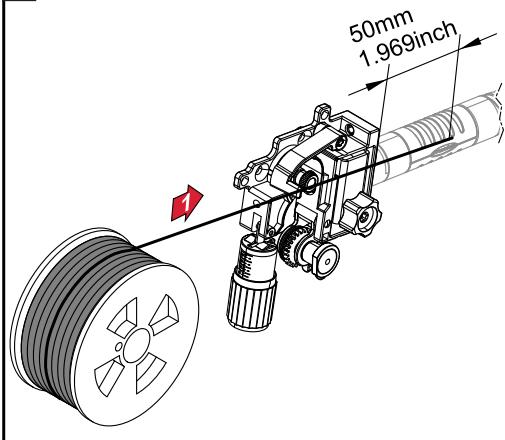


**CAUTION!** Risk of injury due to elasticity of spooled wire electrode. When inserting the wire electrode into the wire drive, hold the end of the wire electrode firmly to avoid injuries caused by the wire springing back.

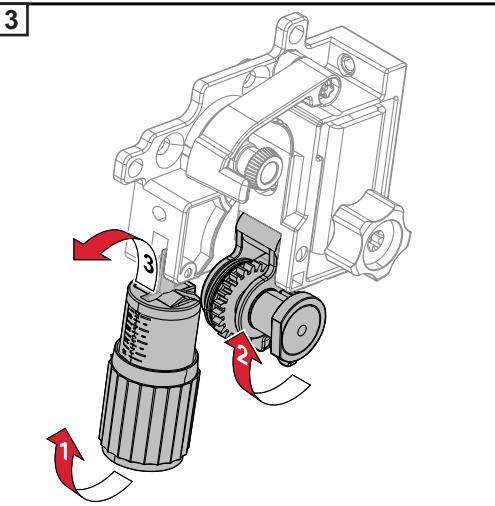
1



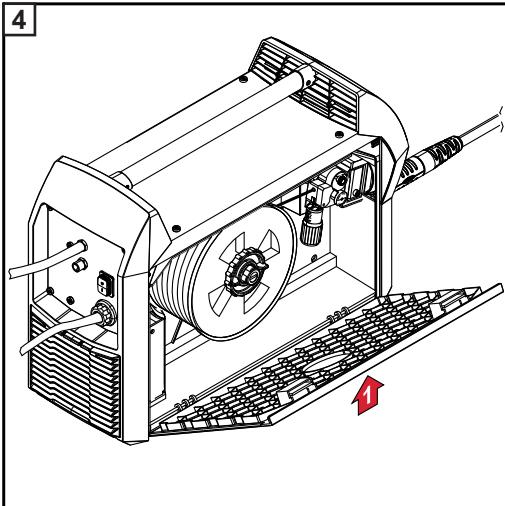
2



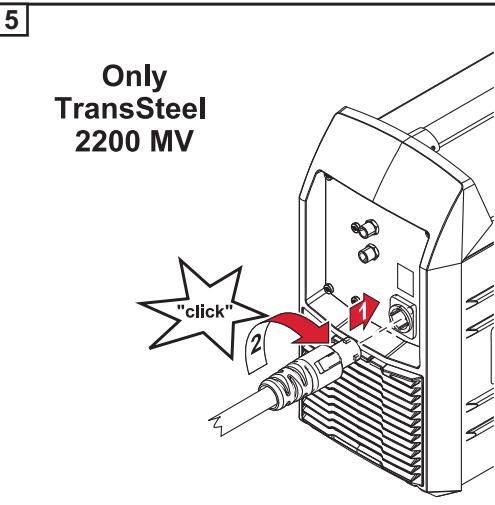
3



4



5

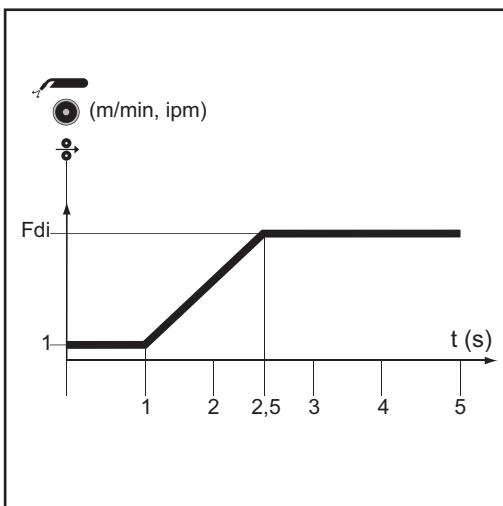
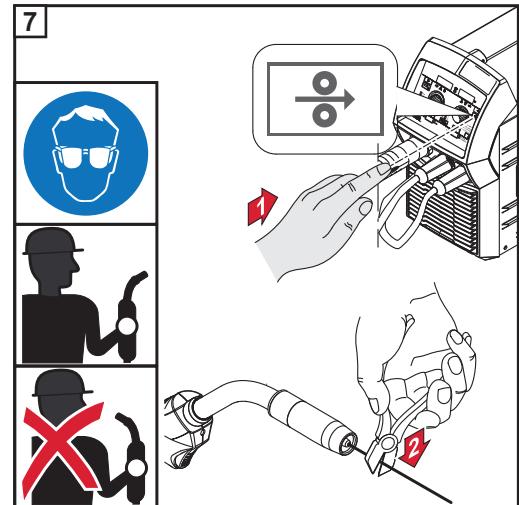
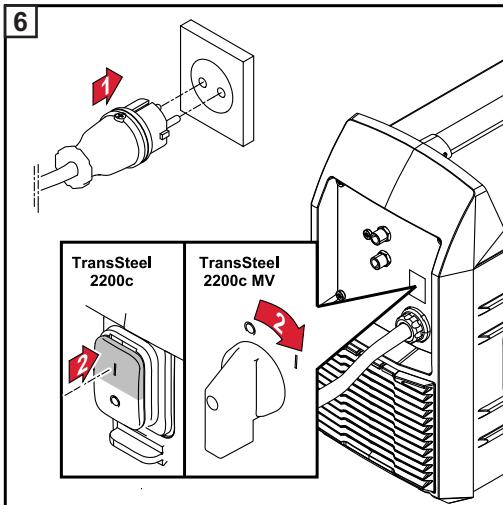


**NOTE!** It is only necessary to connect the mains cable to the power source for multivoltage power sources.



**CAUTION!** Risk of injury from emerging wire electrode. When pressing the "Wire threading" button/the torch trigger:

- Keep the welding torch away from your face and body
- Wear suitable protective goggles
- Do not point the welding torch at people
- Make sure that the wire electrode does not touch any conductive or earthed parts (e.g. housing)



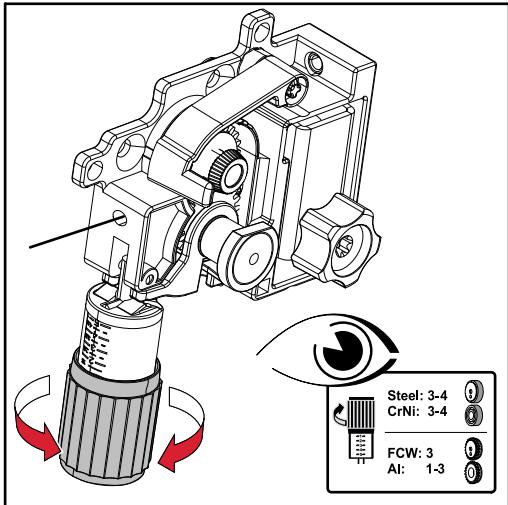
**Wire threading process (press the "Wire threading" button on the control panel):**

- Hold down the button for up to **one second** (briefly press the button): the wire speed stays at 1 m/min (39.37 ipm) for the first second
- Hold down the button for up to **2.5 seconds**: after one second, the wire speed increases over the next 1.5 seconds.
- Hold down the button for **longer than 2.5 seconds**: after 2.5 seconds, the wire is fed at a constant rate equal to the wire speed set for the Fdi welding parameter.

**Setting the contact pressure**



**NOTE!** Set the contact pressure according to the table below, so that the wire electrode is not deformed and proper wirefeeding is ensured.



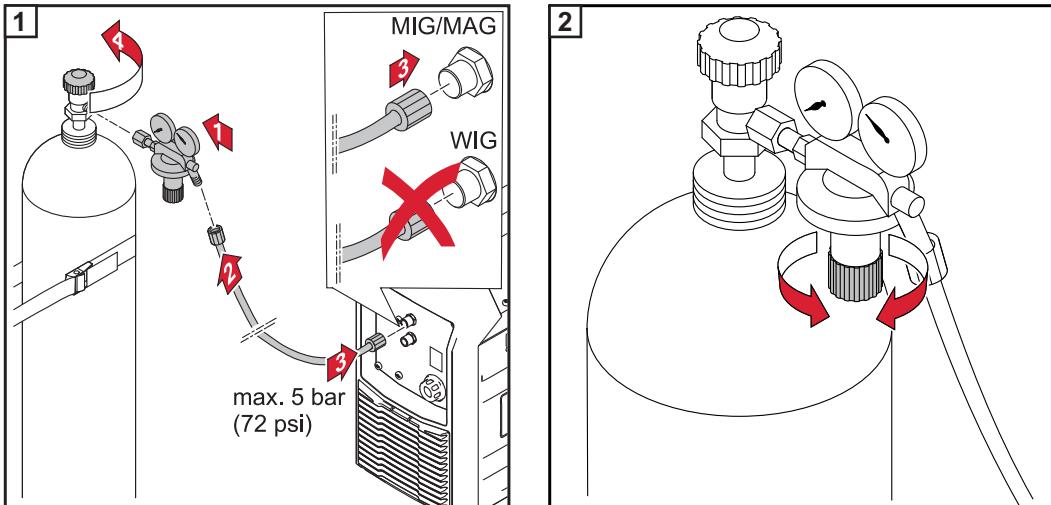
## Connecting the gas cylinder



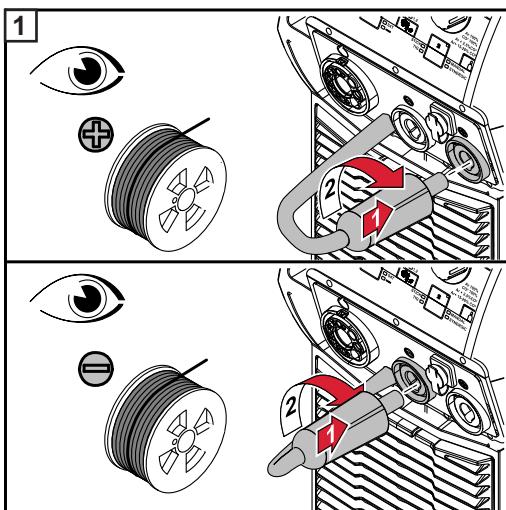
**WARNING!** There is a high risk of very serious injury and damage if a gas cylinder falls over. When using gas cylinders:

- Place them on a solid, level surface in such a way that they remain stable
- Secure the gas cylinders to prevent them from falling over

Observe the safety rules of the gas cylinder manufacturer.



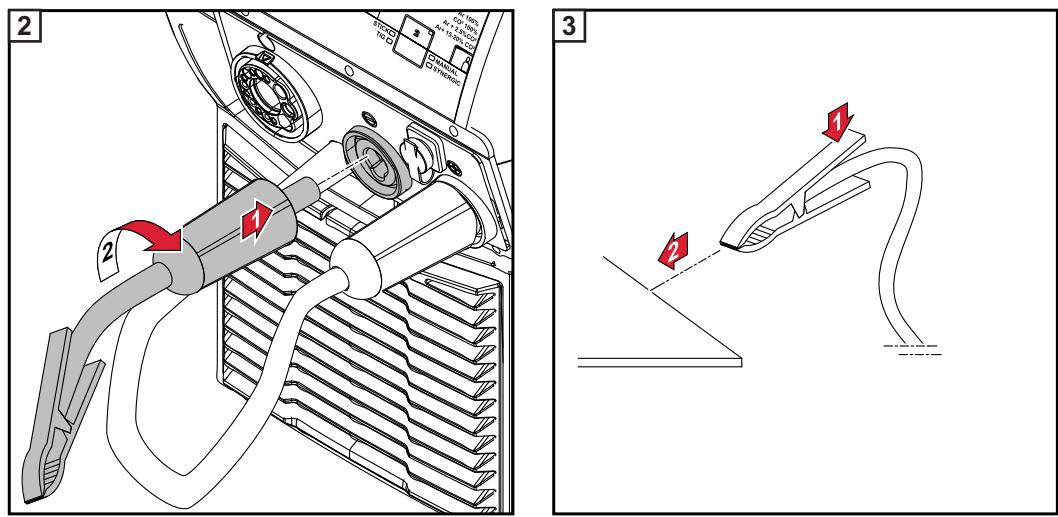
## Connecting the polarity reverser and establishing a grounding (earthing) connection



**NOTE!** Connect the polarity reverser according to the wire electrode used.



**NOTE!** Check the wire electrode packaging to determine whether the wire electrode is for (+) or (-) welding



# Adjusting the brake of the wirespool holders

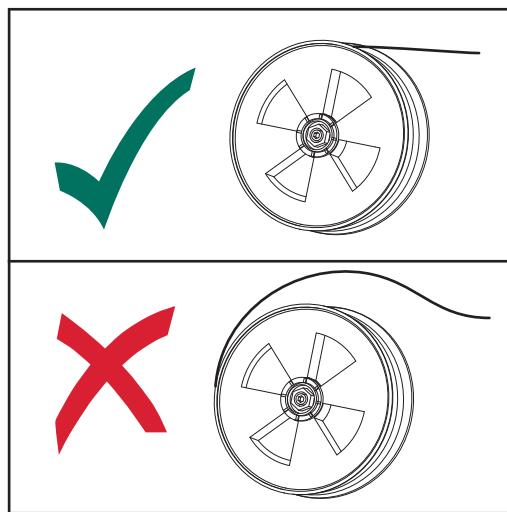
## General

### D200 wirespool holder:

Adjust the brake when using the wirespool holder for the first time and after changing the wirespool. To do so, proceed as described in the following section "Adjusting the brake of the D200 wirespool holder".

### D100 wirespool holder:

Adjust the brake when using the wirespool holder for the first time and after changing the wirespool. To do so, proceed as described in the following section "Adjusting the brake of the D100 wirespool holder".



**NOTE!** After releasing the torch trigger (end of welding, end of wirefeeding), the wirespool must stop unreeling. If it continues unreeling, adjust the brake.

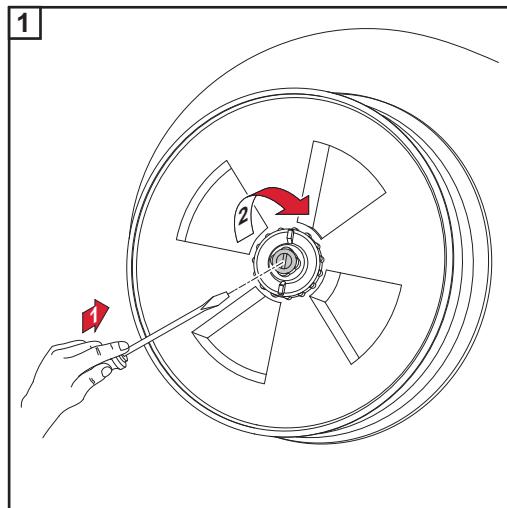
## Adjusting the brake of the D200 wirespool holder



**CAUTION!** Risk of injury and material damage from an emerging wire electrode and moving parts due to inadvertent activation of the power source. Before commencing work:

- Turn the power source mains switch to the "O" position
- Disconnect the power source from the mains
- Ensure that the power source remains disconnected from the mains until all work has been completed

Adjust the brake:



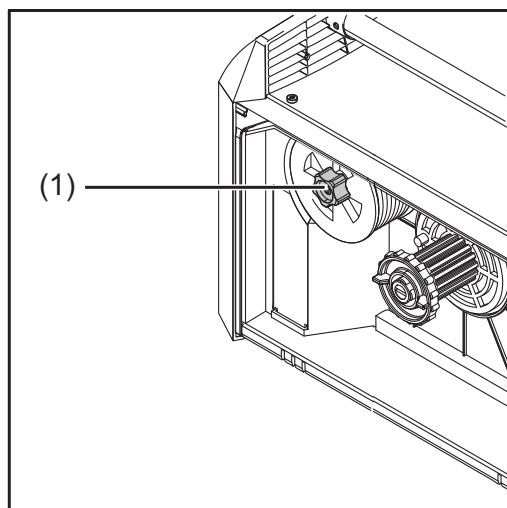
- Turn the brake to the right = increase braking force
- Turn the brake to the left = decrease braking force

## Adjusting the brake of the D100 wirespool holder



**CAUTION!** Risk of injury and material damage from an emerging wire electrode and moving parts due to inadvertent activation of the power source. Before commencing work:

- Turn the power source mains switch to the "O" position
- Disconnect the power source from the mains
- Ensure that the power source remains disconnected from the mains until all work has been completed



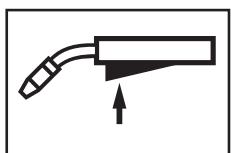
Adjust the brake:

**1** Tighten the knurled screw (1)

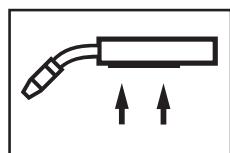
- Knurled screw fully tightened = high braking force
- Knurled screw slightly tightened = low braking force

# Description of MIG/MAG operating modes

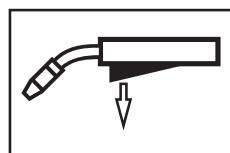
## Symbols



press

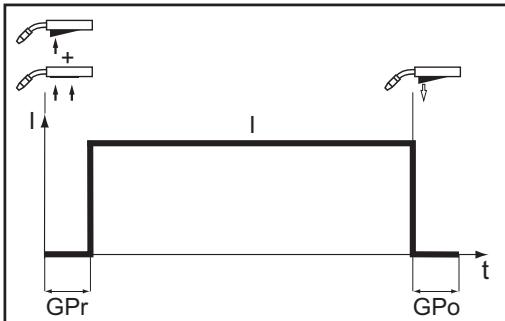


hold



release

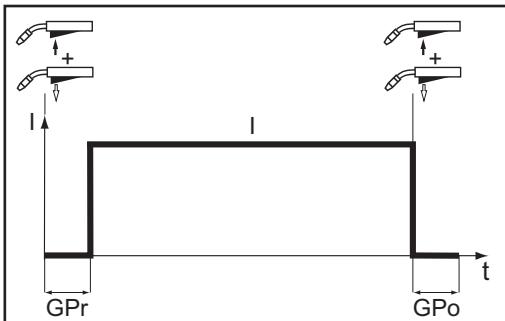
## 2-step mode



"2-step mode" is suitable for

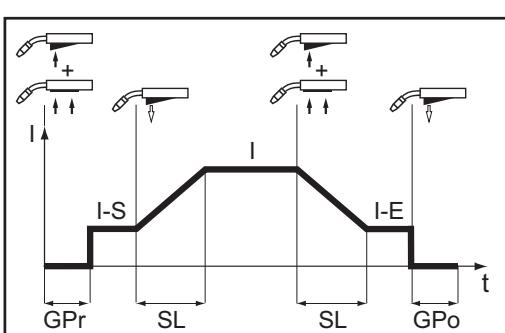
- Tacking work
- Short weld seams

## 4-step mode

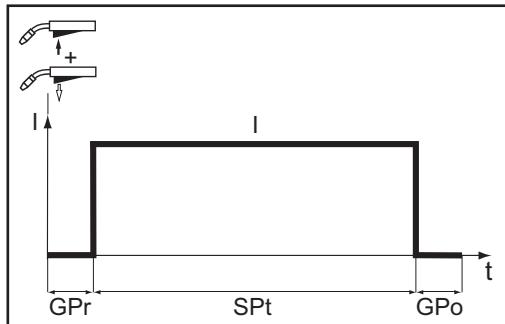


"4-step mode" is suitable for longer weld seams.

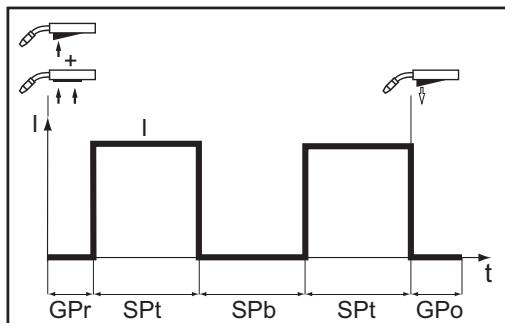
## Special 4-step mode



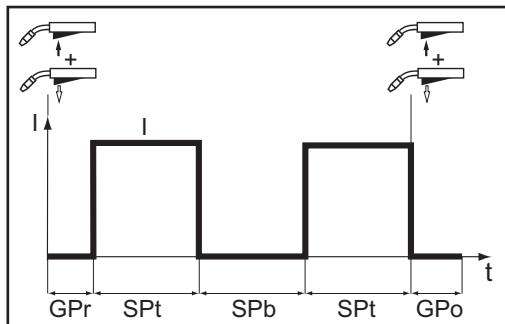
"Special 4-step mode" is ideal for welding in higher power ranges. In special 4-step mode, the arc starts at a low power, which makes it easier to stabilise.

**Spot welding**

The "Spot welding" mode is suitable for welded joints on overlapped sheets.

**2-step stitch welding**

The "2-step stitch welding" mode is suitable for welding short weld seams on thin sheets, to prevent the weld seams from dropping through the base material.

**4-step stitch welding**

The "4-step stitch welding" mode is suitable for welding longer weld seams on thin sheets, to prevent the weld seams from dropping through the base material.

# MIG/MAG standard manual welding

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<b>General</b>	The MIG/MAG standard manual welding process is a MIG/MAG welding process with no synergic function. Changing one parameter does not result in any automatic adjustments to the other parameters – all variable parameters must be adjusted individually.
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<b>Available parameters</b>	The following parameters are available for MIG/MAG manual welding:
-----------------------------	--

- ⌚ Wire speed
- ⓧ Welding voltage
- ⌚ Arc-force dynamic  
For influencing the short-circuiting dynamic at the instant of droplet transfer
- Ⓐ Welding current  
Only the actual value is displayed

---

<b>MIG/MAG standard manual welding</b>	<p><b>1</b> Press the "Process" button to select MANUAL</p> <p><b>2</b> Press the "Mode" button to select the desired MIG/MAG mode:</p> <ul style="list-style-type: none"><li>↑↓ 2-step mode</li><li>↔ 4-step mode</li><li>....-.. Spot welding/stitch welding</li></ul>
	<p><b>3</b> Select and set the wire speed parameter</p> <p><b>4</b> Select and set the welding voltage parameter</p> <p>All parameter set values remain stored until the next time they are changed. This applies even if the power source is switched off and on again.</p> <p><b>5</b> Ensure that the grounding (earthing) connection has been established</p> <p><b>6</b> Ensure that the shielding gas supply has been established</p> <ul style="list-style-type: none"><li>- Power source is ready for welding</li></ul>

---

<b>Corrections during welding</b>	The arc-force dynamic parameter can be used to optimise the welding result.
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The arc-force dynamic parameter is used to influence the short-circuiting dynamic at the moment of droplet transfer:

- = hard, stable arc
- 0 = neutral arc
- + = soft, low-spatter arc

# MIG/MAG standard synergic welding

EN

## MIG/MAG standard synergic welding

- 1** Press the "Process" button to select SYNERGIC
- 2** Press the "Mode" button to select the desired MIG/MAG mode:
  - ↑↓** 2-step mode
  - ↑↑** 4-step mode
  - S4T ↵** S 4 T - Special 4-step mode
  - ....** Spot welding/stitch welding



**NOTE!** Under certain circumstances, it may not be possible to change welding parameters that have been set for a system component (remote control, etc.) on the control panel of the power source.

- 3** Press the "Material" button to select the filler metal to be used
- 4** Press the "Wire diameter" button to select the diameter of the wire electrode used
- 5** Press the "Shielding gas" button to select the shielding gas used
- 6** Use the "Parameter selection" buttons to select and set the welding parameters to be used to specify the welding power:
  - Sheet thickness
  - A** Welding current
  - ⌚** Wire speed
  - V** Welding voltage

All parameter set values remain stored until the next time they are changed. This applies even if the power source is switched off and on again.

- 8** Ensure that the grounding (earthing) connection has been established
- 9** Ensure that the shielding gas supply has been established
  - Power source is ready for welding

## Corrections during welding

The arc length correction and arc-force dynamic parameters can be used to optimise the welding result.

### Arc length correction:

- = shorter arc, reduced welding voltage
- 0 = neutral arc
- + = longer arc, increased welding voltage

### Arc-force dynamic:

For influencing the short-circuiting dynamic at the moment of droplet transfer

- = hard, stable arc
- 0 = neutral arc
- + = soft, low-spatter arc

# Spot and stitch welding

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## General

The spot and stitch welding modes are MIG/MAG welding processes.

Spot welding is used on overlapping sheets that are only accessible on one side.

Stitch welding is used for light-gauge sheets.

As the wire electrode is not fed continuously, the weld pool can cool down during the intervals. Local overheating leading to the base material being melted through is largely avoided.

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## Spot welding

- 1** Press the "Process" button to select MANUAL or SYNERGIC
- 2** Press the "Mode" button to select the spot welding/stitch welding mode:  
..... = spot welding/stitch welding
- 3** Set the SPt parameter in the Setup menu (spot welding time/stitch welding time) to the desired value
- 4** Set the desired parameters depending on the process (MANUAL or SYNERGIC)
- 5** Ensure that the grounding (earthing) connection has been established
- 6** Ensure that the shielding gas supply has been established
  - Power source is ready for welding

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## Stitch welding

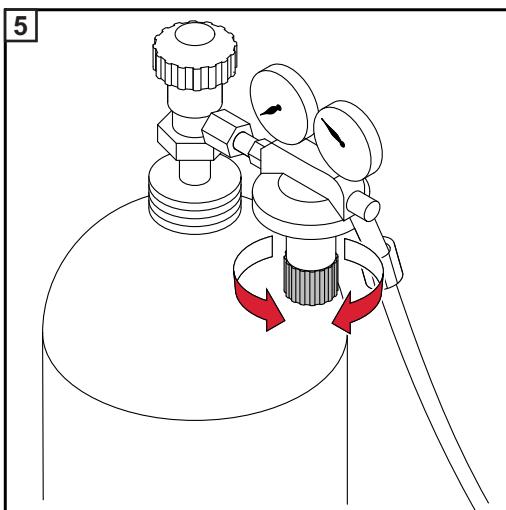
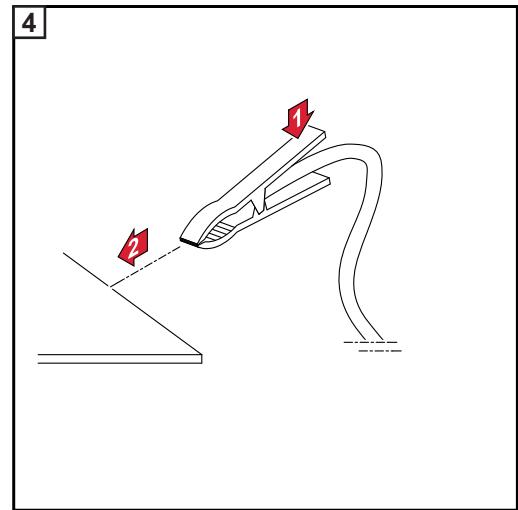
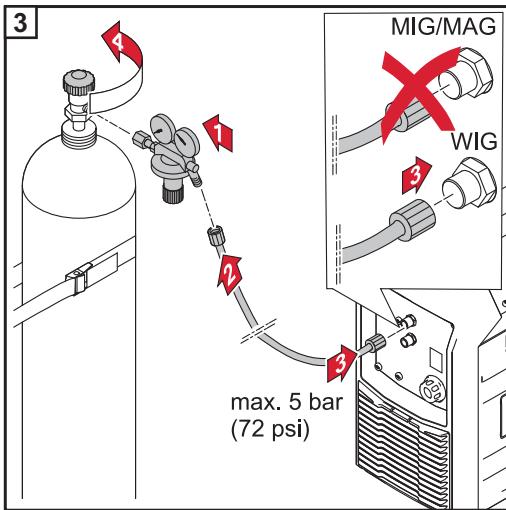
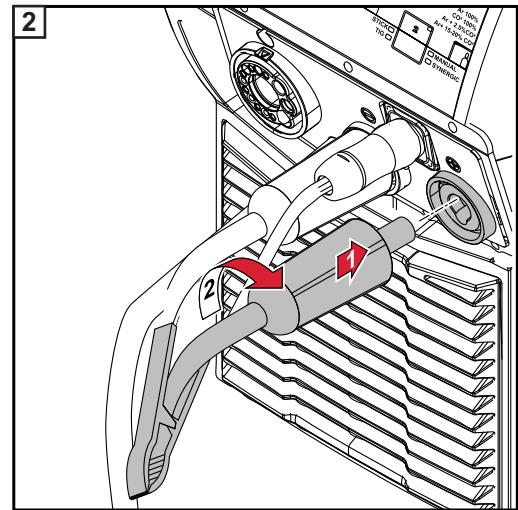
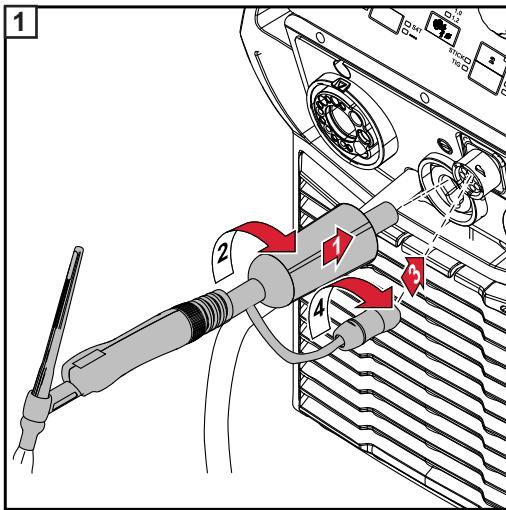
- 1** Press the "Process" button to select MANUAL or SYNERGIC
- 2** Press the "Mode" button to select the spot welding/stitch welding mode:  
..... = spot welding/stitch welding
- 3** Set the SPt parameter in the Setup menu (spot welding time/stitch welding time) to the desired value
- 4** Set the SPb parameter in the Setup menu (spot welding/stitch pause time) to the desired value
- 5** Set the Int parameter in the Setup menu (interval) to the desired value
- 6** Set the desired parameters depending on the process (MANUAL or SYNERGIC)
- 7** Ensure that the grounding (earthing) connection has been established
- 8** Ensure that the shielding gas supply has been established
  - Power source is ready for welding

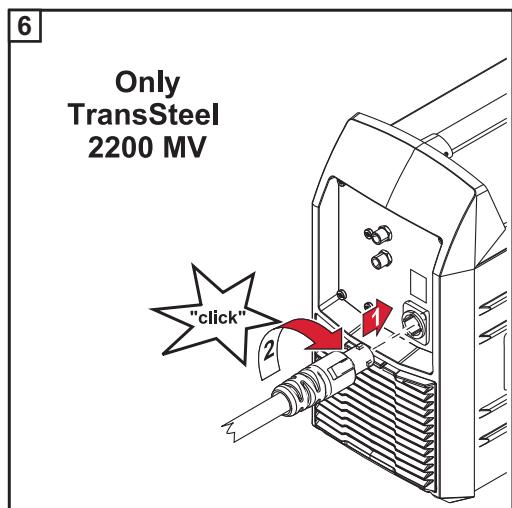
**TIG**



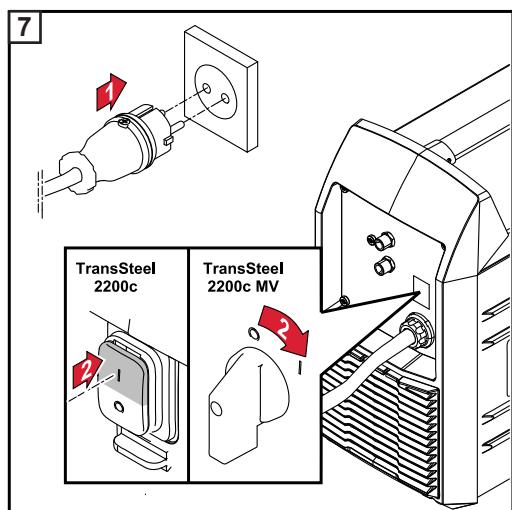
# Start-up

## Commissioning





**NOTE!** It is only necessary to connect the mains cable to the power source for multivoltage power sources.



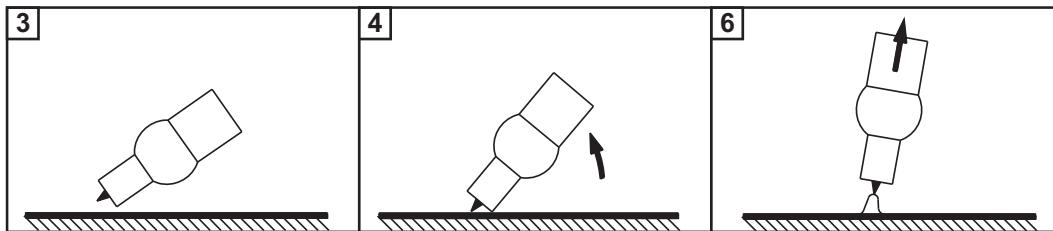
**CAUTION!** Risk of injury and damage from electric shock. As soon as the power source is switched on, the tungsten electrode in the welding torch is live. Make sure the electrode does not touch any persons or electrically conductive or earthed parts (e.g. the housing, etc.).

## TIG welding

- 1** Press the "Process" button to select TIG
- 2** Set the desired welding current

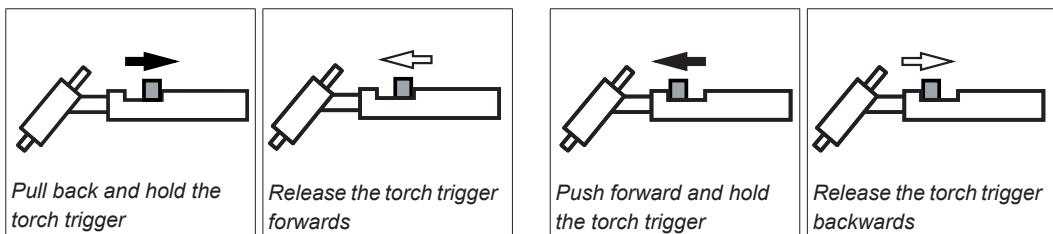
**When using a welding torch with a torch trigger and TIG Multi Connector plug (with 2-step mode factory setting):**

- 3** Place the gas nozzle down on the ignition location in such a way that there is a gap of approx. 2 to 3 mm (0.078 to 0.118 in.) between the tungsten electrode and the workpiece
- 4** Gradually tilt the welding torch up until the tungsten electrode touches the workpiece
- 5** Pull back and hold the torch trigger
  - Shielding gas flows
- 6** Raise the welding torch and rotate it into its normal position
  - The arc ignites
- 7** Carry out welding



# Description of TIG operating modes

## Symbols and their explanations



### GPr

Gas pre-flow time

### I-S

Starting-current phase: the temperature is raised gently at low welding current, so that the filler metal can be positioned correctly

### $t_s$

Starting current duration

### $t_{up}$

UpSlope phase: the welding current is continually increased  
Duration: 0.5 seconds

### I-1

Main current phase (welding current phase): uniform thermal input into the base material, whose temperature is raised by the advancing heat

### GPo

Gas post-flow time

### I-E

Final current phase: to prevent crater cracks or cavitations

### $t_E$

Final current duration

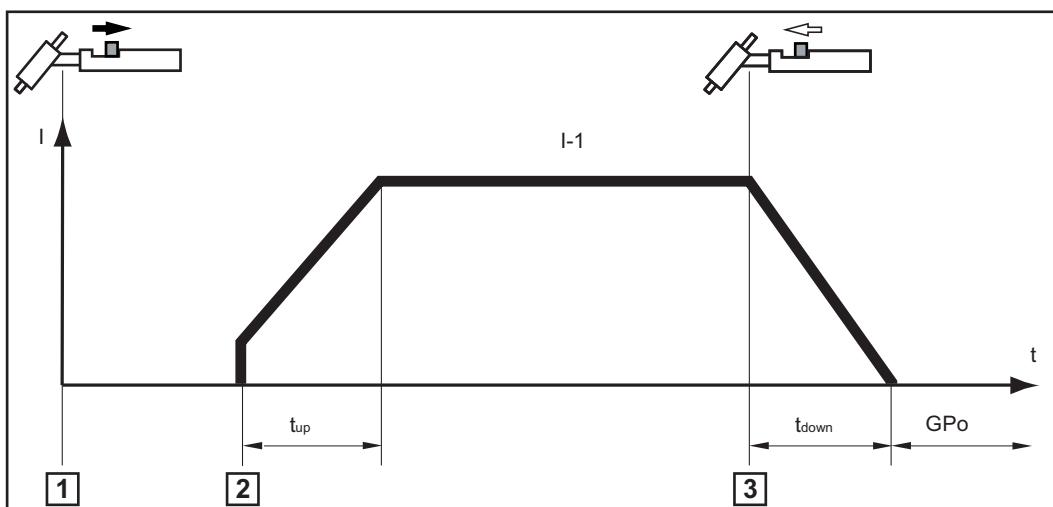
### $t_{down}$

DownSlope phase: the welding current is continuously reduced  
Duration: 0.5 seconds

### I-2

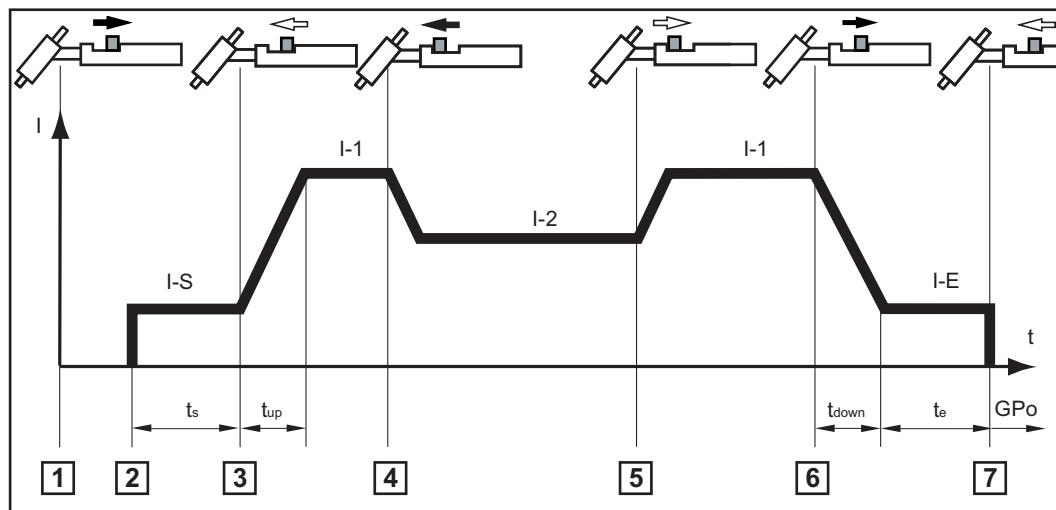
Reduced current phase: intermediate lowering of the welding current in order to prevent any local overheating of the base material

## 2-step mode



- 1 Place the tungsten electrode onto the workpiece and then pull the torch trigger back and hold => shielding gas flows
- 2 Raise the tungsten electrode => arc ignites
- 3 Release torch trigger => end of welding

## 4-step mode



4-step mode with intermediate lowering I-2

Intermediate lowering means that the welder uses the torch trigger during the main current phase to lower the welding current to the specified reduced current I-2.

- 1** Place the tungsten electrode onto the workpiece and then pull the torch trigger back and hold => shielding gas flows
- 2** Raise the tungsten electrode => start of welding with starting current I-S
- 3** Release torch trigger => welding with main current I-1
- 4** Push forward and hold the torch trigger => activation of intermediate lowering with reduced current I-2
- 5** Release torch trigger => welding with main current I-1
- 6** Pull back and hold the torch trigger => lowering to final current I-E
- 7** Release torch trigger => end of welding

# Pulse welding

## Pulse welding

Pulse welding is welding with a pulsing welding current. It is used for out-of-position welding of steel pipes or when welding thin sheets.

In these applications, the welding current set at the start of welding is not always ideal for the whole welding process:

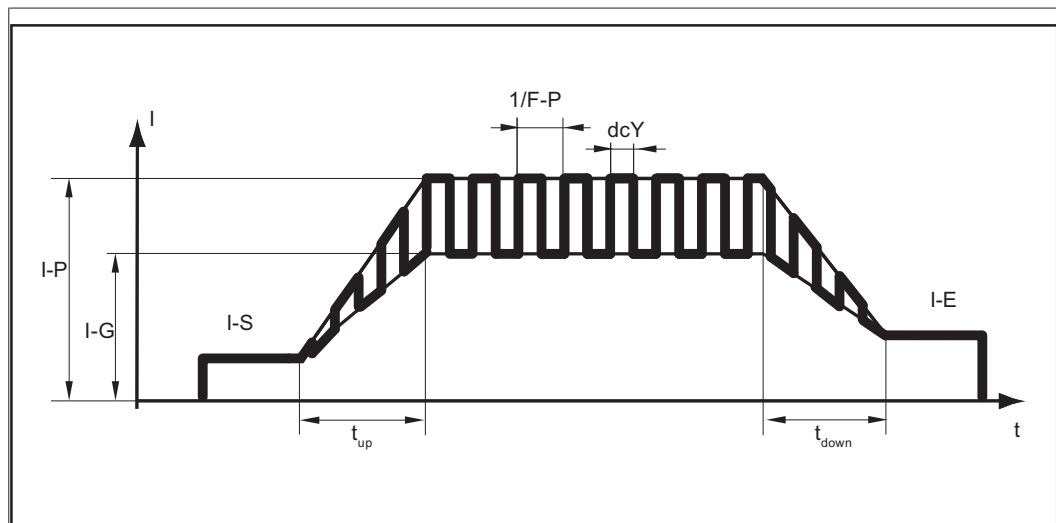
- if the amperage is too low, the base material will not melt sufficiently
- if overheating occurs, the liquid weld pool may drip.

**Setting range:** 1 - 990 Hz

**Operating principle:**

- A low base current  $I-G$  rises steeply to the significantly higher pulse current  $I-P$  and drops back to the base current  $I-G$  after the Duty cycle  $dcY$  time.
- This results in an average current that is lower than the set pulse current  $I-P$ .
- During pulse welding, small sections of the welding location melt quickly and then rapidly re-solidify.

 **NOTE!** The power source controls the Duty cycle  $dcY$  parameter and base current  $I-G$  according to the set pulse current (welding current) and pulse frequency.



### Adjustable parameters:

$I-S$ = Starting current	$F-P$ = Pulse frequency ( $1/F-P$ = time interval between two pulses)
$I-E$ = Final current	$I-P$ = Pulse current (set welding current)

### Fixed parameters:

$t_{up}$ = UpSlope	$dcY$ = Duty cycle
$t_{Down}$ = DownSlope	$I-G$ = Base current

### Activating pulse welding:

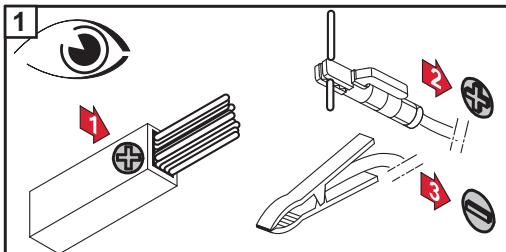
- 1 Set a value for the  $F-P$  setup parameter (pulse frequency)

# **Rod electrode**

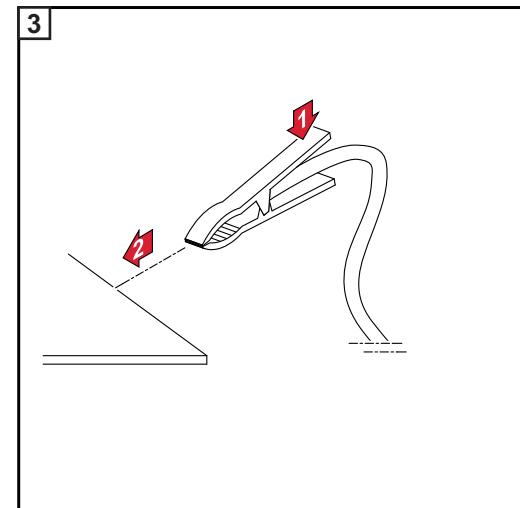
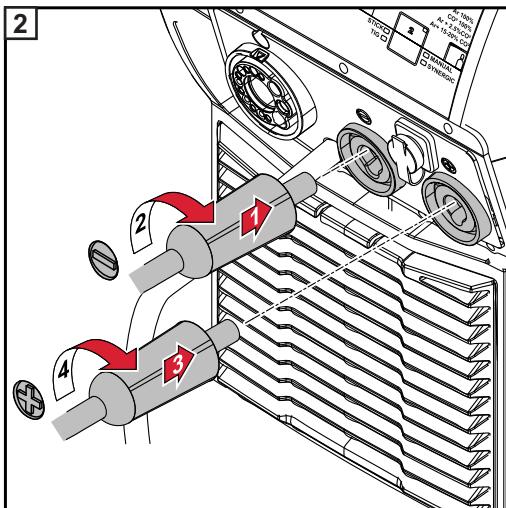
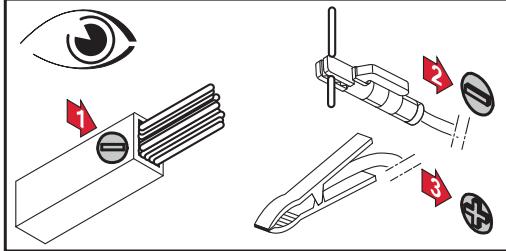


# Start-up

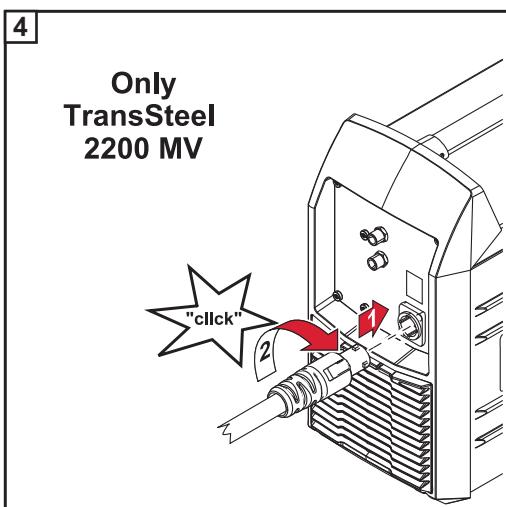
## Preparatory work



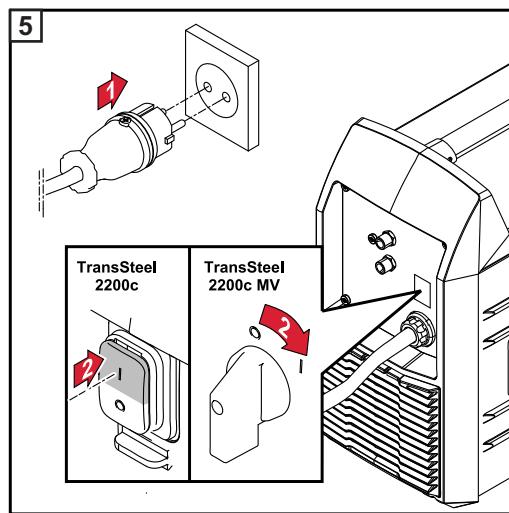
**NOTE!** Check the rod electrode packaging to determine whether the rod electrode is for (+) or (-) welding



**CAUTION!** Risk of injury and damage from electric shock. As soon as the power source is switched on, the rod electrode is live. Make sure the rod electrode does not touch any persons or electrically conductive or earthed parts (e.g. the housing, etc.).



**NOTE!** It is only necessary to connect the mains cable to the power source for multivoltage power sources.



#### MMA welding

- 1** Press the "Process" button to select STICK
- 2** Set the desired welding current
  - Power source is ready for welding

# Functions for optimising the welding process

## Arc-force dynamic

The arc-force dynamic is used to influence the short-circuiting dynamic at the moment of droplet transfer.

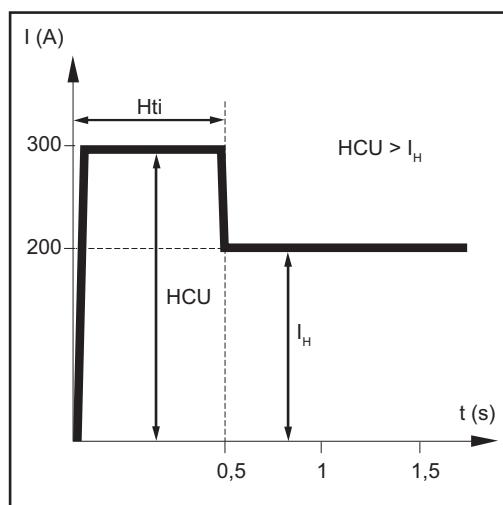
- = hard, stable arc
- 0 = neutral arc
- + = soft, low-spatter arc

## HotStart (Hti) function

This function is activated at the factory.

### Advantages

- Improved ignition properties, even when using electrodes with poor ignition properties
- Better fusion of the base material during the start-up phase, meaning fewer cold-shut defects
- Largely prevents slag inclusions



### Legend

Hti: Hot-current time, 0 - 2 s, factory setting 0.5 s

HCU: HotStart current,

100 - 200%, factory setting 150%

$I_H$ : Main current = set welding current

 **NOTE!** The Hti and HCU parameters can be set in the Setup menu.

### Function

During the specified hot-current time (Hti), the welding current is increased to a certain value. This value (HCU) is higher than the selected welding current ( $I_H$ ).

## Anti-stick (Ast) function

This function is activated at the factory.

As the arc becomes shorter, the welding voltage may drop so far that the rod electrode will tend to stick. This may also cause the rod electrode to burn out.

Electrode burn-out is prevented by activating the anti-stick function. If the rod electrode begins to stick, the power source immediately switches the welding current off. After the rod electrode has been detached from the workpiece, the welding process can be continued without any problems.

Deactivating the function:

- 1 Set the Ast (anti-stick) setup parameter to OFF



**EasyJobs**



# Saving and retrieving EasyJobs

## General

The "Save" buttons allow two EasyJobs to be saved. The adjustable parameters on the control panel are saved as EasyJobs.



**NOTE!** Setup parameters are not saved as EasyJobs.

## Saving an Easy- Job

- 1 Press and hold one of the "Save" buttons to save the current settings on the control panel, e.g.:
 

1

  - The left indicator displays "Pro"
  - After a short time, the left indicator switches to the original value
- 2 Release the "Save" button

## Retrieving an EasyJob

- 1 To retrieve saved settings, press the corresponding "Save" button briefly, e.g.:
 

1

  - The control panel will show the saved settings

## Deleting an Easy- Job

- 1 Press and hold the relevant "Save" button to delete the memory content of that "Save" button, e.g.:
 

1

  - The left indicator displays "Pro".
  - After a short time, the left indicator switches to the original value
- 2 Keep the "Save" button held down
  - The left display shows "CLR".
  - After a while, both displays show "---
- 3 Release the "Save" button



# **Setup menu**



# Operation

## Operation



**NOTE!** Accessing the Setup menu is described with reference to the MIG/MAG standard synergic (SYNERGIC) welding process. Access is the same for the other welding processes.

### Accessing the Setup menu:



- 1 Press the "Process" button to select the SYNERGIC welding process (to access the Setup menu for MIG/MAG standard manual welding, press the "Process" button and select the MANUAL welding process)



- 2 Press and hold the "Mode" button



- 3 Press the "Process" button



- 4 Release the "Mode" and "Process" buttons

### Changing welding parameters



- 5 Select the desired setup parameter using the left-hand adjusting dial



- 6 Alter the setup parameter value using the right-hand adjusting dial

### Exiting the Setup menu



- 7 Press and hold the "Mode" button



- 8 Press the "Process" button



- 9 Release the "Mode" and "Process" buttons

# Parameters for MIG/MAG standard manual welding

Parameters for MIG/MAG standard manual welding	<b>GPr</b> <b>Gas pre-flow time</b> Unit: Seconds Setting range: 0 - 9.9 Factory setting: 0.1
	<b>GPo</b> <b>Gas post-flow time</b> Unit: Seconds Setting range: 0 - 9.9 Factory setting: 0.5
	<b>Fdi</b> <b>Feeder inching speed</b> Unit: m/min (ipm) Setting range: 1 - 18.5 (39.37 - 728.35) Factory setting: 10 (393.7)
	<b>bbc</b> <b>Burn-back effect</b> Burn-back effect through wire withdrawal at the end of welding Unit: - Setting range: Aut (automatic), 0 - 0.3 Factory setting: 0
	<b>IGc</b> <b>Ignition current</b> Unit: Ampere Setting range: 100 - 390 Factory setting: 300
	<b>Ito</b> <b>Length of wire that is fed before the safety cut-out trips</b> Unit: mm (in.) Setting range: OFF, 5 - 100 (OFF, 0.2 - 3.94) Factory setting: OFF
	 <b>NOTE!</b> The ignition time-out function (Ito) is a safety feature – if the power source determines that no ignition has occurred after the preset wire length has been fed, wirefeeding is stopped.
	<b>SPt</b> <b>Spot welding time</b> Unit: Seconds Setting range: OFF, 0.3 - 5 Factory setting: 1
	<b>SPb</b> <b>Spot pause time</b> Unit: Seconds Setting range: OFF, 0.3 - 10 (in 0.1 s increments) Factory setting: OFF
	<b>Int</b> <b>Interval</b> Unit: - Setting range: 2T (2-step), 4T (4-step) Factory setting: 2T (2-step)
	<b>FAC</b> <b>Reset power source to factory settings</b> Press and hold one of the "Parameter selection" buttons for two seconds to restore the factory settings - when "PrG" appears on the digital display, the power source has been reset



**NOTE!** If the power source is reset, the majority of the applied settings are deleted. The following values remain:

- Welding circuit resistance and welding circuit inductivity
- Country-specific setting

---

**2nd    Second level of the Setup menu (see "Setup menu - level 2")**

---

# Parameters for MIG/MAG standard synergic welding

Parameters for  
MIG/MAG stand-  
ard synergic  
welding

<b>GPr</b>	<b>Gas pre-flow time</b> Unit: Seconds Setting range: 0 - 9.9 Factory setting: 0.1
<b>GPo</b>	<b>Gas post-flow time</b> Unit: Seconds Setting range: 0 - 9.9 Factory setting: 0.5
<b>SL</b>	<b>Slope</b> Unit: Seconds Setting range: 0 - 9.9 Factory setting: 1
<b>I-S</b>	<b>Starting current</b> Unit: % of welding current Setting range: 0 - 200 Factory setting: 100
<b>I-E</b>	<b>Final current</b> Unit: % of welding current Setting range: 0 - 200 Factory setting: 50
<b>t-S</b>	<b>Starting current duration</b> Unit: Seconds Setting range: 0 - 9.9 Factory setting: 0
<b>t-E</b>	<b>Final current duration</b> Unit: Seconds Setting range: 0 - 9.9 Factory setting: 0
<b>Fdi</b>	<b>Feeder inching speed</b> Unit: m/min (ipm) Setting range: 1 - 18.5 (39.37 - 728.35) Factory setting: 10 (393.7)
<b>bbc</b>	<b>Burn-back effect</b> Burn-back effect through wire withdrawal at the end of welding Unit: - Setting range: Aut (automatic), 0 - 0.2 Factory setting: Aut
<b>Ito</b>	<b>Length of wire that is fed before the safety cut-out trips</b> Unit: mm (in.) Setting range: OFF, 5 - 100 (OFF, 0.2 - 3.94) Factory setting: OFF



**NOTE!** The ignition time-out function (Ito) is a safety feature – if the power source determines that no ignition has occurred after the preset wire length has been fed, wirefeeding is stopped.

---

**SPt** **Spot welding time**

Unit: Seconds

Setting range: 0.3 - 5

Factory setting: 1

---

**SPb** **Spot pause time**

Unit: Seconds

Setting range: OFF, 0.3 - 10 (in 0.1 s increments)

Factory setting: OFF

---

**Int** **Interval**

Unit: -

Setting range: 2T (2-step), 4T (4-step)

Factory setting: 2T (2-step)

---

**FAC** **Reset power source to factory settings**

Press and hold one of the "Parameter selection" buttons for two seconds to restore the factory settings

- when "PrG" appears on the digital display, the power source has been reset.



**NOTE!** If the power source is reset, the majority of the applied settings are deleted. The following values remain:

- Welding circuit resistance and welding circuit inductivity
- Country-specific setting

---

**2nd** **Second level of the Setup menu (see "Setup menu - level 2")**

# Parameters for TIG welding

## Parameters for TIG welding

<b>F-P</b>	<b>Pulse frequency</b> Unit: Hertz Setting range: OFF; 1 - 990 (up to 10 Hz: in 0.1 Hz increments) (up to 100 Hz: in 1 Hz increments) (over 100 Hz: in 10 Hz increments) Factory setting: OFF
<b>tUP</b>	<b>UpSlope</b> Unit: Seconds Setting range: 0.01 - 9.9 Factory setting: 0.5
<b>tdo</b>	<b>DownSlope</b> Unit: Seconds Setting range: 0.01 - 9.9 Factory setting: 1
<b>I-S</b>	<b>Starting current</b> Unit: % of main current Setting range: 1 - 200 Factory setting: 35
<b>I-2</b>	<b>Reduced current</b> Unit: % of main current Setting range: 1 - 100 Factory setting: 50
<b>I-E</b>	<b>Final current</b> Unit: % of main current Setting range: 1 - 100 Factory setting: 30
<b>GPo</b>	<b>Gas post-flow time</b> Unit: Seconds Setting range: 0 - 9.9 Factory setting: 9.9
<b>tAC</b>	<b>Tacking</b> Unit: Seconds Setting range: OFF, 0.1 - 9.9 Factory setting: OFF
<b>FAC</b>	<b>Reset power source to factory settings</b> Press and hold one of the "Parameter selection" buttons for two seconds to restore the factory settings - when "PrG" appears on the digital display, the power source has been reset.



**NOTE!** If the power source is reset, the majority of the applied settings are deleted. The following values remain:

- Welding circuit resistance and welding circuit inductivity
- Country-specific setting

**2nd** **Second level of the Setup menu (see "Setup menu - level 2")**

# Parameters for MMA welding

## Setup parameters for MMA welding

**HCU** **HotStart current**  
 Unit: %  
 Setting range: 100 - 200  
 Factory setting: 150

**Hti** **Hot current time**  
 Unit: Seconds  
 Setting range: 0 - 2.0  
 Factory setting: 0.5

**Ast** **Anti-stick function**  
 Unit: -  
 Setting range: On, OFF  
 Factory setting: On

### **FAC** **Reset power source to factory settings**

Press and hold one of the "Parameter selection" buttons for two seconds to restore the factory settings  
 - when "PrG" appears on the digital display, the power source has been reset.



**NOTE!** If the power source is reset, the majority of the applied settings are deleted. The following values remain:

- Welding circuit resistance and welding circuit inductivity
- Country-specific setting

## 2nd **Second level of the Setup menu (see "Setup menu - level 2")**



# **Setup menu - Level 2**



# Operation

## Operation

### Accessing the Setup menu:



**1** Press the "Process" button to select the SYN-  
ERGIC welding process (to access the Setup  
menu for MIG/MAG standard manual welding,  
press the "Process" button and select the MAN-  
UAL welding process)

**2** Press and hold the "Mode" button

**3** Press the "Process" button

**4** Release the "Mode" and "Process" buttons

**5** Select the "2nd" setup parameter using the left-  
hand adjusting dial

**6** Press and hold the "Mode" button

**7** Press the "Process" button

### Changing welding parameters



**1** Select the desired setup parameter using the  
left-hand adjusting dial

**2** Alter the setup parameter value using the right-  
hand adjusting dial

### Exiting the Setup menu



**1** Press and hold the "Mode" button

**2** Press the "Process" button

**3** Release the "Mode" and "Process" buttons  
- A parameter is displayed in the first level of  
the Setup menu

**4** Press and hold the "Mode" button

**5** Press the "Process" button

**6** Release the "Mode" and "Process" buttons

# Parameters for MIG/MAG standard manual welding

## Parameters for MIG/MAG welding

SEt	Country-specific setting (Standard/USA) Std/US
	<p>Unit: - Setting range: Std, US (Standard/USA)</p> <p>If Std is selected, the EURO welding programs are used as stated in the welding program table. If US is selected, the US welding programs are used as stated in the welding program table.</p> <p>Factory setting: Standard version: Std (measurements: cm/mm) USA version: US (measurements: inches)</p>
FUS	<p><b>Mains fuse protection</b> The maximum possible welding power is limited by the rating of the mains fuse protection.</p> <p>Unit: A The available mains fuse ratings are determined by the SEt parameter setting: SEt parameter set as Std: OFF / 10 / 13 / 16 SEt parameter set as US: OFF / 15 / 20 (only for 120 V mains voltage) Factory setting: OFF</p>
r	<p><b>Welding circuit resistance (in mOhm)</b> See section "Measuring welding circuit resistance r"</p>
L	<p><b>Welding circuit inductivity (in microhenrys)</b> See section "Displaying welding circuit inductivity L"</p>
EnE	<p><b>Real Energy Input</b></p> <p>Unit: kJ Setting range: ON / OFF Factory setting: OFF</p> <p>Since the full range of values (1 kJ - 99999 kJ) cannot be displayed on the three-digit display, the following display format has been selected:</p> <p>Value in kJ: 1 to 999 / indicator on display: 1 to 999 Value in kJ: 1000 to 9999 / indicator on display: 1.00 to 9.99 (without unit digit, e.g. 5270 kJ -&gt; 5.27) Value in kJ: 10000 to 99999 / indicator on display: 10.0 to 99.9 (without unit digit or tens digit, e.g. 23580 kJ -&gt; 23.6)</p>

# Parameters for MIG/MAG standard synergic welding

EN

<b>Parameters for MIG/MAG welding</b>	<b>SEt</b>	<b>Country-specific setting (Standard/USA) Std/US</b>
		<p>Unit: - Setting range: Std, US (Standard/USA)</p> <p>If Std is selected, the EURO welding programs are used as stated in the welding program table. If US is selected, the US welding programs are used as stated in the welding program table.</p> <p>Factory setting: Standard version: Std (measurements: cm/mm) USA version: US (measurements: inches)</p>
	<b>FUS</b>	<b>Mains fuse protection</b> The maximum possible welding power is limited by the rating of the mains fuse protection.
		<p>Unit: A The available mains fuse ratings are determined by the SEt parameter setting: SEt parameter set as Std: OFF / 10 / 13 / 16 SEt parameter set as US: OFF / 15 / 20 (only for 120 V mains voltage) Factory setting: OFF</p>
	<b>r</b>	<b>Welding circuit resistance (in mOhm)</b> See section "Measuring welding circuit resistance r"
	<b>L</b>	<b>Welding circuit inductivity (in microhenrys)</b> See section "Displaying welding circuit inductivity L"
	<b>EnE</b>	<b>Real Energy Input</b>
		<p>Unit: kJ Setting range: ON / OFF Factory setting: OFF</p> <p>Since the full range of values (1 kJ - 99999 kJ) cannot be displayed on the three-digit display, the following display format has been selected:</p> <p>Value in kJ: 1 to 999 / indicator on display: 1 to 999 Value in kJ: 1000 to 9999 / indicator on display: 1.00 to 9.99 (without unit digit, e.g. 5270 kJ -&gt; 5.27) Value in kJ: 10000 to 99999 / indicator on display: 10.0 to 99.9 (without unit digit or tens digit, e.g. 23580 kJ -&gt; 23.6)</p>
	<b>ALC</b>	<b>Arc length correction display</b> (For setting how the arc length correction parameter is displayed)
		<p>Setting range: ON / OFF Factory setting: OFF</p> <p><b>Set to ON if the welding voltage parameter is selected and set on the control panel</b></p> <ul style="list-style-type: none"><li>- The left-hand display shows the arc correction value for three seconds</li><li>- The right-hand display shows the value for the welding voltage at the same time</li></ul>

# Parameters for MMA welding

## Parameters for MMA welding

SEt	Country-specific setting (Standard/USA) Std/US
	<p>Unit: - Setting range: Std, US (Standard/USA)</p> <p>If Std is selected, the EURO welding programs are used as stated in the welding program table. If US is selected, the US welding programs are used as stated in the welding program table.</p>
	<p>Factory setting: Standard version: Std (measurements: cm/mm) USA version: US (measurements: inches)</p>
<b>r</b>	<b>Welding circuit resistance (in mOhm)</b> See section "Measuring welding circuit resistance r"
<b>L</b>	<b>Welding circuit inductivity (in microhenrys)</b> See section "Displaying welding circuit inductivity L"
<b>FUS</b>	<b>Mains fuse protection</b> The maximum possible welding power is limited by the rating of the mains fuse protection.  Unit: A The available mains fuse ratings are determined by the SEt parameter setting: SEt parameter set as Std: OFF / 10 / 13 / 16 SEt parameter set as US: OFF / 15 / 20 (only for 120 V mains voltage) Factory setting: OFF

# Parameters for TIG welding

Parameters for  
TIG welding in the  
Setup menu  
level 2

SEt	<b>Country-specific setting (Standard/USA) Std/US</b>
	Unit: - Setting range: Std, US (Standard/USA) Factory setting: Standard version: Std (measurements: cm/mm) USA version: US (measurements: inches)
FUS	<b>Mains fuse protection</b> The maximum possible welding power is limited by the rating of the mains fuse protection.
	Unit: A The available mains fuse ratings are determined by the SEt parameter setting: SEt parameter set as Std: OFF / 10 / 13 / 16 SEt parameter set as US: OFF / 15 / 20 (only for 120 V mains voltage) Factory setting: OFF



# **Optimising welding quality**



# Measuring welding circuit resistance $r$

## General

Measuring the welding circuit resistance  $r$  makes it possible to have a constant welding result at all times, even with hosepacks of different lengths. The welding voltage at the arc is then always precisely regulated, regardless of the length and cross-sectional area of the hosepack. The use of arc length correction is no longer required.

The calculated welding circuit resistance is shown on the display.

$r$  = welding circuit resistance in milliohm (mOhm)

If the welding circuit resistance  $r$  has been measured correctly, the set welding voltage will correspond exactly to the welding voltage at the arc. If you manually measure the voltage on the output jacks of the power source, this voltage will be higher than the welding voltage at the arc - that is, higher by the same amount as the voltage drop of the hosepack.



**NOTE!** The welding circuit resistance  $r$  depends on the hosepack used:

- If the length or cross-sectional area of the hosepack has changed, measure the welding circuit resistance  $r$  again
- Measure the welding circuit resistance for every welding process separately with the appropriate welding power-leads

## Measure the welding circuit resistance $r$



**NOTE!** In order to obtain good welding results, it is essential to measure the welding circuit resistance correctly. Make sure that the contact between the earthing clamp and the workpiece is on a cleaned workpiece surface.

- 1** Establish a grounding (earthing) connection to the workpiece
- 2** Accessing the Level 2 (2nd) Setup menu
- 3** Select parameter " $r$ "
- 4** Remove the gas nozzle from the welding torch
- 5** Screw on the contact tip



**NOTE!** Make sure that the contact between the contact tip and the workpiece is on a cleaned workpiece surface.

- 6** Place the contact tip flush against the workpiece surface
- 7** Press the torch trigger briefly
  - The welding circuit resistance is calculated. "run" is shown on the display during the measurement

The measurement is finished when the welding circuit resistance is shown on the display in mOhm (for example, 11.4).

- 8** Fit the gas nozzle back onto the welding torch

# Displaying welding circuit inductivity L

## General

Laying of the hosepacks has a significant effect on welding circuit inductivity and therefore affects the welding process. It is important to lay the hosepacks correctly in order to obtain the best possible welding result.

## Displaying welding circuit inductivity L

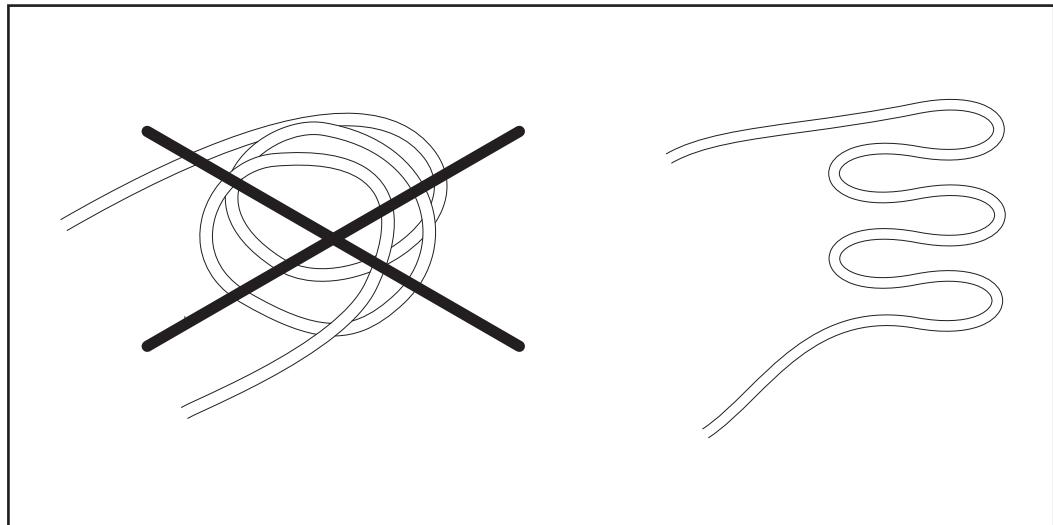
The setup parameter "L" is used to display the most recently calculated welding circuit inductivity. The welding circuit inductivity is calibrated at the same time as the welding circuit resistance  $r$  is calculated. Detailed information can be found in the "Measuring welding circuit resistance  $r$ " section.

- 1** Access the setup menu level 2 (2nd)
- 2** Select parameter "L"

The most recently calculated welding circuit inductivity L is shown on the right-hand digital display.

**L** ... Welding circuit inductivity (in microhenry)

## Laying the hosepacks correctly



# **Troubleshooting and maintenance**

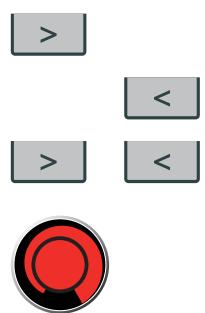


# Display service parameters

## Service parameters

Various service parameters can be retrieved by pressing the left and right-hand "Parameter selection" buttons at the same time.

### Opening the display



1 Press and hold the "Parameter selection" button (left)

2 Press the "Parameter selection" button (right)

3 Release the "Parameter selection" buttons

- The first welding parameter, "Firmware version", is displayed

4 Select the desired service parameter using the left-hand adjusting dial

### Available parameters

Firmware version	Example: 1.00   4.21
Welding program configuration	Example: 2   491
Number of the currently selected welding program	Example: r 2   290
Indicates the actual arc time since first use Note: The arc time indicator is not suitable as a basis for calculating hiring fees, warranty services, etc.	Example: 654   32.1 = 65,432.1 hours = 65,432 hours 6 mins
Motor current for wire drive in amperes (The value changes as soon as the motor is running)	Example: iFd   0.0
2nd menu level for service technicians	2nd

# Troubleshooting

## Safety



**WARNING!** Work that is carried out incorrectly can cause serious injury and damage. All the work described below must only be carried out by trained and qualified personnel. Do not carry out any of the work described below until you have fully read and understood the following documents:

- This document
- all the operating instructions for the system components, especially the safety rules



**WARNING!** An electric shock can be fatal. Before starting the work described below:

- Turn the power source mains switch to the "O" position
- Disconnect the power source from the mains
- Ensure that the power source remains disconnected from the mains until all work has been completed

After opening the device, use a suitable measuring instrument to check that electrically charged components (e.g. capacitors) have been discharged.



**WARNING!** An inadequate ground conductor connection can cause serious injury or damage. The housing screws provide a suitable ground conductor connection for grounding the housing and must NOT be replaced by any other screws that do not provide a reliable ground conductor connection.

## Fault diagnosis

Make a note of the serial number and configuration of the device and contact our After-Sales Service team with a detailed description of the error, if

- errors occur that are not listed below
- the troubleshooting measures listed are unsuccessful

### Power source has no function

Mains switch is on, but indicators are not lit up

Cause: There is a break in the mains lead; the mains plug is not plugged in

Remedy: Check the mains lead, ensure that the mains plug is plugged in

Cause: Mains socket or mains plug faulty

Remedy: Replace faulty parts

Cause: Mains fuse protection

Remedy: Change the mains fuse protection

### Nothing happens when the torch trigger is pressed

Power source mains switch is ON and indicators are lit up

Cause: Welding torch or welding torch control line is faulty

Remedy: Replace the welding torch

### No welding current

Mains switch is on, one of the overtemperature service codes "to" is displayed. Detailed information on the service codes "to0" to "to6" can be found in the section "Displayed service codes".

Cause: Overloading

Remedy: Check duty cycle

Cause: Thermostatic automatic circuit breaker has been tripped

Remedy: Wait until the power source automatically comes back on after the end of the cooling phase

Cause: Limited supply of cooling air

Remedy: Clean air filter, ensure accessibility to cooling air ducts

Cause: The fan in the power source is faulty

Remedy: Contact After-Sales Service

---

### No welding current

Mains switch is ON and indicators are lit up

Cause: Grounding (earthing) connection is incorrect

Remedy: Check the grounding (earthing) connection for correct polarity

Cause: There is a break in the power cable in the welding torch

Remedy: Replace the welding torch

---

### No shielding gas

All other functions are OK

Cause: Gas hose is not connected to the correct connection socket for the current welding process

Remedy: Connect the gas hose to the correct connection socket for the current welding process

Cause: Gas cylinder is empty

Remedy: Change the gas cylinder

Cause: Gas pressure regulator faulty

Remedy: Replace gas pressure regulator

Cause: Gas hose is not fitted or is damaged

Remedy: Fit or change the gas hose

Cause: Welding torch is faulty

Remedy: Change the welding torch

Cause: Gas solenoid valve faulty

Remedy: Contact After-Sales Service

### **Irregular wire speed**

Cause: Braking force has been set too high

Remedy: Loosen the brake

Cause: Hole in the contact tip is too narrow

Remedy: Use a suitable contact tip

Cause: Faulty inner liner in welding torch

Remedy: Check the inner liner for kinks, dirt, etc. and replace if necessary

Cause: The wirefeeder rollers are not suitable for the wire electrode being used

Remedy: Use suitable feed rollers

Cause: Feed rollers have the wrong contact pressure

Remedy: Optimise the contact pressure

---

### **Wirefeed problems**

Cause: Incorrect arrangement of welding torch hosepack

Remedy: Arrange the welding torch hosepack in as straight a line as possible, avoiding bends

---

### **Welding torch becomes very hot**

Cause: The design dimensions of the welding torch are not sufficient for this task

Remedy: Observe the duty cycle and loading limits

---

### **Poor weld properties**

Cause: Incorrect welding parameters

Remedy: Check the settings

Cause: Poor ground earth connection

Remedy: Ensure good contact to workpiece

Cause: Inadequate or no protective gas shield

Remedy: Check the pressure regulator, gas hose, gas solenoid valve, torch gas connection, etc.

Cause: Welding torch is leaking

Remedy: Change the welding torch

Cause: Wrong contact tip, or contact tip is worn out

Remedy: Replace the contact tip

Cause: Wrong wire alloy or wrong wire diameter

Remedy: Check the wire electrode that has been inserted

Cause: Wrong wire alloy or wrong wire diameter

Remedy: Check weldability of the base material

Cause: The shielding gas is not suitable for this wire alloy

Remedy: Use the correct shielding gas

---

**Displayed service codes** If an error message that is not described here appears on the displays, proceed as follows to resolve the problem:

- 1** Turn the power source mains switch to the "O" position
- 2** Wait 10 seconds
- 3** Turn the mains switch to the "I" position

If the error occurs again despite several attempts to eliminate it, or if the troubleshooting measures listed here are unsuccessful:

- 1** Make a note of the error message displayed
- 2** Note down the configuration of the power source
- 3** Contact our After-Sales Service team with a detailed description of the error

#### **ELn | 13**

**Cause:** Invalid change of welding process during welding  
**Remedy:** During welding do not carry out any illegal change of the welding process, reset error message by pressing any button

#### **Err | IP**

**Cause:** The control unit of the power source has detected a primary overvoltage  
**Remedy:** Check mains voltage, if the service code still remains, switch off the power source, wait for 10 seconds and then switch the power source on again, if the error keeps recurring, contact After-Sales Service

#### **Err | 51**

**Cause:** Mains undervoltage: the mains voltage has fallen below the tolerance range  
**Remedy:** Check the mains voltage. If the service code remains, contact After-Sales Service

#### **Err | 52**

**Cause:** Mains overvoltage: the mains voltage has risen above the tolerance range  
**Remedy:** Check the mains voltage. If the service code remains, contact After-Sales Service

#### **EFd | 14, EFd | 81, EFd | 83**

**Cause:** Fault in the wirefeed system - overcurrent in the wirefeeder motor (2-roller drive)  
**Remedy:** Arrange the hosepack in as straight a line as possible; check that there are no kinks or dirt in the inner liner; check the contact pressure on the 2-roller drive; check that there is no entangled wire in the 2-roller drive

**Cause:** Wirefeeder motor is sticking or defective

**Remedy:** Check the wirefeeder motor or contact After-Sales Service

#### **to0 | xxx**

Note: xxx stands for a temperature value

**Cause:** Overtemperature on the PC board LSTMAG20 (secondary circuit)

**Remedy:** Allow power source to cool down, check air filter and clean if necessary, check that fan is on

**to2 | xxx**

Note: xxx stands for a temperature value

Cause: Overtemperature in the secondary circuit of the power source

Remedy: Allow power source to cool down, check air filter and clean if necessary, check that fan is on

---

**to3 | xxx**

Note: xxx stands for a temperature value

Cause: Overtemperature on the PC board LSTMAG20 (wirefeeder)

Remedy: Allow power source to cool down, check air filter and clean if necessary, check that fan is on

---

**to6 | xxx**

Note: xxx stands for a temperature value

Cause: Overtemperature on the PC board LSTMAG20 (voltage doubler)

Remedy: Allow power source to cool down, check air filter and clean if necessary, check that fan is on

---

**to7 | xxx**

Note: xxx stands for a temperature value

Cause: Overtemperature in the power source

Remedy: Allow power source to cool down, check air filter and clean if necessary, check that fan is on

---

**to8 | xxx**

Note: xxx stands for a temperature value

Cause: Overtemperature on the power module

Remedy: Allow power source to cool down, check that fan is on

---

**to9 | xxx**

Note: xxx stands for a temperature value

Cause: Overtemperature on the PFC module

Remedy: Allow power source to cool down, check that fan is on

---

**toA | xxx**

Note: xxx stands for a temperature value

Cause: Overtemperature on the PC board LSTMAG20(PFC)

Remedy: Allow power source to cool down, check that fan is on

---

**toF | xxx**

Cause: The power source's safety cut-out reacted in order to prevent tripping of the mains fuse.

Remedy: After a pause in welding of around 90 s, the message disappears and the power source is operational again.

---

**tu0 | xxx**

Note: xxx stands for a temperature value

Cause: Undertemperature on the PC board (secondary circuit)

Remedy: Place power source in a heated room and allow it to warm up

---

**tu2 | xxx**

Note: xxx stands for a temperature value

Cause: Undertemperature in the power source secondary circuit

Remedy: Place power source in a heated room and allow it to warm up

---

**tu3 | xxx**

Note: xxx stands for a temperature value

Cause: Undertemperature on the PC board LSTMAG20 (wirefeeder)

Remedy: Place power source in a heated room and allow it to warm up

---

**tu6 | xxx**

Note: xxx stands for a temperature value

Cause: Undertemperature on the PC board LSTMAG20 (voltage doubler)

Remedy: Place power source in a heated room and allow it to warm up

---

**tu7 | xxx**

Note: xxx stands for a temperature value

Cause: Undertemperature in the power source

Remedy: Place power source in a heated room and allow it to warm up

---

**tu8 | xxx**

Note: xxx stands for a temperature value

Cause: Undertemperature on the power module

Remedy: Place power source in a heated room and allow it to warm up

---

**tu9 | xxx**

Note: xxx stands for a temperature value

Cause: Undertemperature on the PFC module

Remedy: Place power source in a heated room and allow it to warm up

---

**tuA | xxx**

Note: xxx stands for a temperature value

Cause: Undertemperature on the PC board LSTMAG20(PFC)

Remedy: Place power source in a heated room and allow it to warm up

---

**no | Prg**

Cause: No saved program selected

Remedy: Select saved program

---

**no | IGr**

Cause: "Ignition time out" function is active; no current started flowing before the length of wire specified in the set-up menu had been fed. The power source safety cut-out has tripped.

Remedy: Shorten the wire end; press the torch trigger again; clean the surface of the workpiece; if necessary, increase the wire length until the safety cut-out trips in "Set-up menu: Level 2".

---

**no | ARC**

Cause: Arc break during TIG welding

Remedy: Press the torch trigger repeatedly, clean the surface of the workpiece

---

**EPG | 17**

Cause: The welding program selected is invalid

Remedy: Select valid welding program

---

**EPG | 35**

Cause: Measurement of the welding circuit resistance "r" failed

Remedy: Check grounding cable, current cable or hosepack and replace if necessary, recalculate welding circuit resistance "r"

---

# Care, maintenance and disposal

## General

Under normal operating conditions, the welding system requires only a minimum of care and maintenance. However, it is vital to observe some important points to ensure the welding system remains in a usable condition for many years.

## Safety



**WARNING!** Work that is carried out incorrectly can cause serious injury and damage. All the work described below must only be carried out by trained and qualified personnel. Do not carry out any of the work described below until you have fully read and understood the following documents:

- This document
- all the operating instructions for the system components, especially the safety rules



**WARNING!** An electric shock can be fatal. Before starting the work described below:

- Turn the power source mains switch to the "O" position
- Disconnect the power source from the mains
- Ensure that the power source remains disconnected from the mains until all work has been completed

After opening the device, use a suitable measuring instrument to check that electrically charged components (e.g. capacitors) have been discharged.



**WARNING!** An inadequate ground conductor connection can cause serious injury or damage. The housing screws provide a suitable ground conductor connection for grounding the housing and must NOT be replaced by any other screws that do not provide a reliable ground conductor connection.

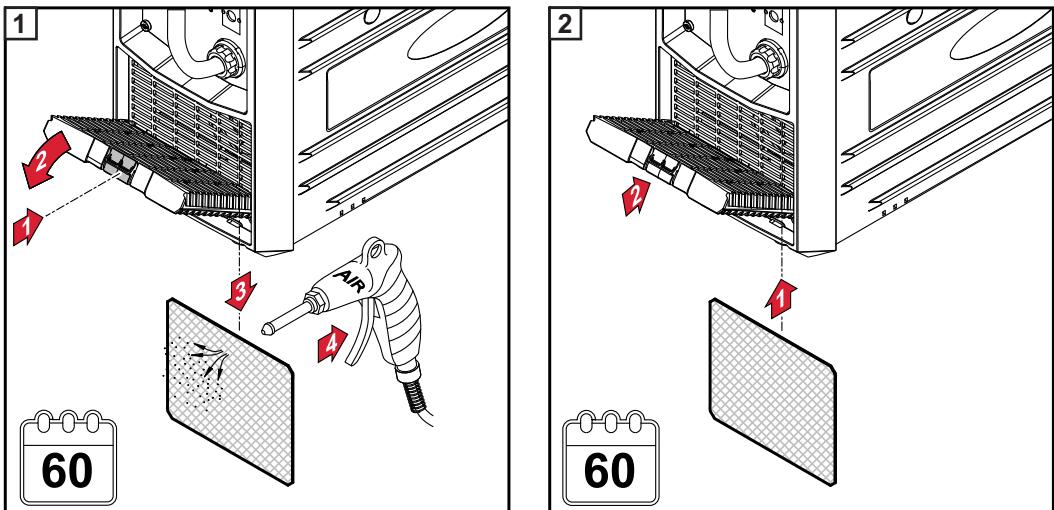
## At every start-up

- Ensure that the mains plug and mains cable as well as the welding torch / electrode holder are undamaged. Replace any damaged components
- Ensure that a proper ground earth connection has been established to the workpiece
- Check that there is an all-round clearance of 0.5 m (1 ft. 8 in.) around the device to ensure that cooling air can flow in and out freely



**NOTE!** Air inlets and outlets must never be covered, not even partially.

As required, at least every two months



**CAUTION!** Risk of damage. Ensure that the air filter is dry when it is fitted.

Every 6 months



**NOTE!** Risk of damage to electronic components. Do not bring the air nozzle too close to electronic components.

- Dismantle device side panels and clean inside of device with dry, reduced compressed air
- If a lot of dust has accumulated, clean the cooling air ducts

Disposal

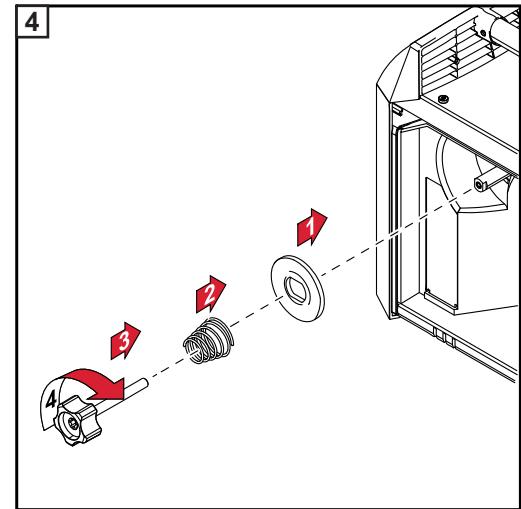
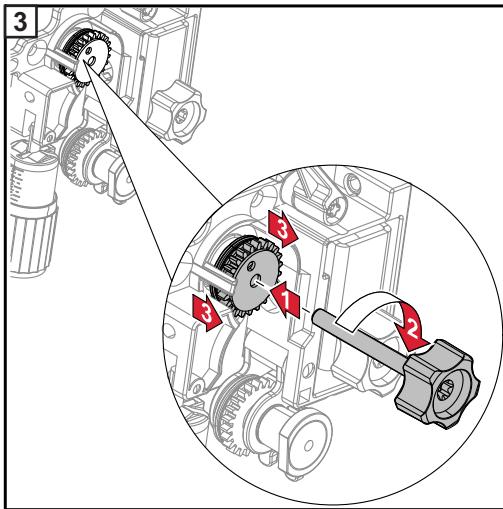
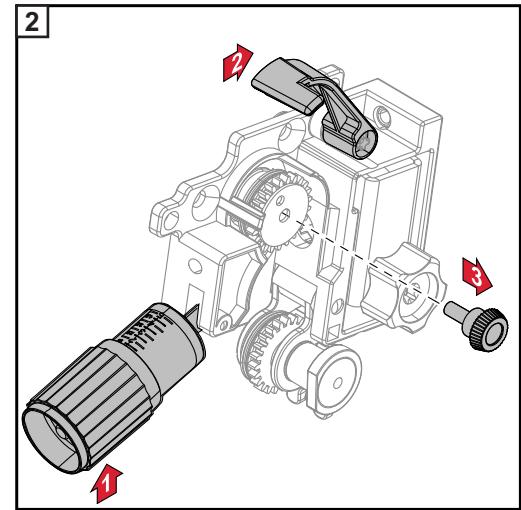
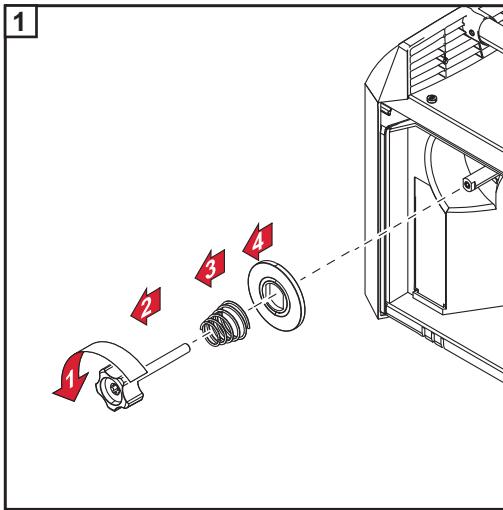
Dispose of in accordance with the applicable national and local regulations.

# Removing stiff drive rollers

## Removing a stiff drive roller



**NOTE!** If a drive roller is difficult to remove by hand, the knurled screw on the D100 brake can be used to remove it.





# **Technical data**



# Technical data

**Special voltages** For devices designed for special voltages, the technical data on the rating plate applies.

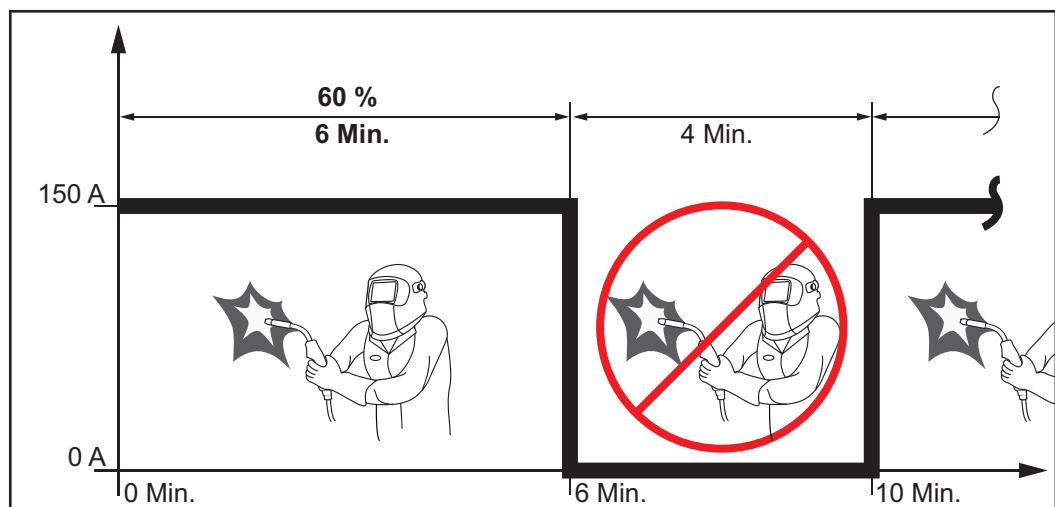
**Explanation of the term "duty cycle"** Duty cycle (D.C.) is the proportion of time in a 10-minute cycle at which the device may be operated at its rated output without overheating.



**NOTE!** The D.C. values specified on the rating plate are based on an ambient temperature of 40°C. If the ambient temperature is higher, either the D.C. or output must be reduced accordingly.

Example: Welding at 150 A at 60% D.C.

- Welding phase = 60% of 10 minutes = 6 minutes
- Cooling phase = remaining time = 4 minutes
- After the cooling phase, the cycle begins anew.



If the device is to be continuously operated without stopping:

- 1** look in the technical data for a D.C. value of 100% for the reigning ambient temperature.
- 2** Reduce the output or amperage in line with this value so that the device can remain in use without observing a cooling phase.

**TSt 2200**

Mains voltage ( $U_1$ )	1 x	230 V	
Max. effective primary current ( $I_{1\text{eff}}$ )		16 A	
Max. primary current ( $I_{1\text{max}}$ )		26 A	
Mains fuse protection		16 A slow-blow	
Max. apparent power ( $S_{1\text{max}}$ )		5.98 kVA	
Mains voltage tolerance		-20 / +15%	
Grid frequency		50/60 Hz	
Cos phi (1)		0.99	
Max. permissible mains impedance $Z_{\text{max}}$ on PCC <sup>1)</sup>		250.02 mOhm	
Recommended earth-leakage circuit breaker		Type B	
Welding current range ( $I_2$ )			
MIG/MAG		10 - 210 A	
Rod electrode		10 - 180 A	
TIG		10 - 230 A	
Welding current at 10 min/40 °C (104 °F)	30%	60%	100%
MIG/MAG $U_1$ 230 V	210 A	170 A	150 A
Welding current at 10 min/40 °C (104 °F)	35%	60%	100%
Rod electrode $U_1$ 230 V	180 A	150 A	130 A
Welding current at 10 min/40 °C (104 °F)	35%	60%	100%
TIG $U_1$ 230 V	230 A	200 A	170 A
Output voltage range according to standard characteristic ( $U_2$ )			
MIG/MAG		14.5 – 24.5 V	
Rod electrode		20.4 - 27.2 V	
TIG		10.4 - 19.2 V	
Open circuit voltage ( $U_0$ peak / $U_0$ r.m.s)		90 V	
Degree of protection		IP 23	
Type of cooling		AF	
Overvoltage category		III	
Pollution level according to IEC60664		3	
Safety symbols		S, CE	
Dimensions l x w x h		560 x 215 x 370 mm 22.05 x 8.46 x 14.57 in.	
Weight		15 kg 33.07 lb.	
Max. shielding gas pressure		5 bar 72.52 psi	
Wire speed		1.5 - 18 m/min 59.06 - 708.66 ipm	
Wire drive		2-roller drive	

Wire diameter	0.6 - 1.2 mm 0.025 - 0.047 in.
Wirespool diameter	max. 200 mm max. 7.87 in.
Wirespool weight	max. 6.8 kg max. 14.99 lb
Max. noise emission (LWA)	65.5 dB

1) Interface to a 230 V, 50 Hz public grid

**TSt 2200 MV**

Mains voltage ( $U_1$ )	1 x	120 V		
Max. effective primary current ( $I_{1\text{eff}}$ )		15 A		
Max. primary current ( $I_{1\text{max}}$ )		20 A		
Mains fuse protection		15 A slow-blow		
Max. apparent power ( $S_{1\text{max}}$ )		2.40 kVA		
Mains voltage ( $U_1$ )	1 x	120 V		
Max. effective primary current ( $I_{1\text{eff}}$ )		20 A		
Max. primary current ( $I_{1\text{max}}$ )		29 A		
Mains fuse protection		20 A slow-blow		
Max. apparent power ( $S_{1\text{max}}$ )		3.48 kVA		
Mains voltage ( $U_1$ )	1 x	230 V		
Max. effective primary current ( $I_{1\text{eff}}$ )		16 A		
Max. primary current ( $I_{1\text{max}}$ )		26 A		
Mains fuse protection		16 A slow-blow		
Max. apparent power ( $S_{1\text{max}}$ )		5.98 kVA		
Mains voltage ( $U_1$ )	1 x	240 V		
Max. effective primary current ( $I_{1\text{eff}}$ )		15 A		
Max. primary current ( $I_{1\text{max}}$ )		26 A		
Mains fuse protection		15 A slow-blow		
Max. apparent power ( $S_{1\text{max}}$ )		6.24 kVA		
Mains voltage tolerance		-20 / +15%		
Grid frequency		50/60 Hz		
Cos phi (1)		0.99		
Max. permissible mains impedance $Z_{\text{max}}$ on PCC <sup>1)</sup>		250.02 mOhm		
Recommended earth-leakage circuit breaker		Type B		
Welding current range ( $I_2$ )				
MIG/MAG		10 - 210 A		
Rod electrode		10 - 180 A		
TIG		10 - 230 A		
Welding current at	10 min/40 °C (104 °F)	30%	60%	100%
MIG/MAG	$U_1$ 120 V (15 A)	105 A	95 A	80 A
	$U_1$ 120 V (20 A)	135 A	120 A	105 A
	$U_1$ 230 V	210 A	170 A	150 A
Welding current at	10 min/40 °C (104 °F)	35%	60%	100%
Rod electrode	$U_1$ 120 V (15 A)	90 A	80 A	70 A
	$U_1$ 120 V (20 A)	110 A	100 A	90 A
	$U_1$ 230 V	180 A	150 A	130 A
Welding current at	10 min/40 °C (104 °F)	35%	60%	100%
TIG	$U_1$ 120 V (15 A)	135 A	120 A	105 A

U <sub>1</sub> 120 V (20 A)	160 A	150 A	130 A
U <sub>1</sub> 230 V	230 A	200 A	170 A
Output voltage range according to standard characteristic (U <sub>2</sub> )			
MIG/MAG	14.5 – 24.5 V		
Rod electrode	20.4 - 27.2 V		
TIG	10.4 - 19.2 V		
Open circuit voltage (U <sub>0</sub> peak / U <sub>0</sub> r.m.s)	90 V		
Degree of protection	IP 23		
Type of cooling	AF		
Overvoltage category	III		
Pollution level according to IEC60664	3		
Safety symbols	S, CE, CSA		
Dimensions l x w x h	560 x 215 x 370 mm 22.05 x 8.46 x 14.57 in.		
Weight	15.2 kg 33.51 lb.		
Max. shielding gas pressure	5 bar 72.52 psi		
Wire speed	1.5 - 18 m/min 59.06 - 708.66 ipm		
Wire drive	2-roller drive		
Wire diameter	0.6 - 1.2 mm 0.025 - 0.047 in.		
Wirespool diameter	max. 200 mm max. 7.87 in.		
Wirespool weight	max. 6.8 kg max. 14.99 lb		
Max. noise emission (LWA)	65.5 dB		

1) Interface to a 230 V, 50 Hz public grid







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