



SHIFTING THE LIMITS

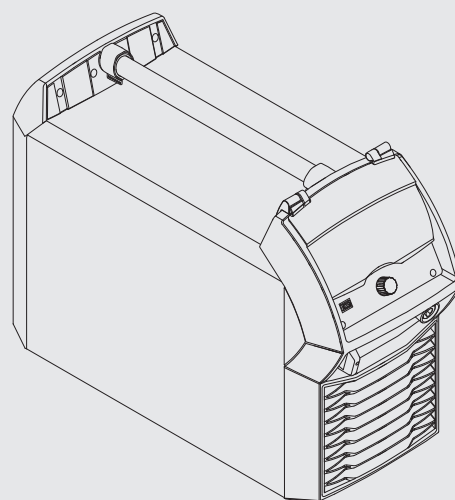


TPS 320i / 400i / 500i
TPS 400i LSC ADV

Operating Instructions

EN

MIG/MAG Power source



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.

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Safety rules

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.

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.

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

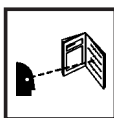


The operator must only allow persons to work with the device who:

- 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.

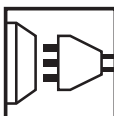
Obligations of personnel



- 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.

Mains connection



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

This may affect a number of device types 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

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 Fronius for the equipment is indicated in the technical data.

Protecting yourself and others



- Persons involved with welding expose 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

Anyone working on the workpiece while welding is in progress must wear suitable protective clothing with 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 or
- 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.

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 system is powerful enough, then the measured toxic emission values should be compared with the permissible limit values.

The following components are responsible, amongst other things, 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 wirepool, the feed rollers and all pieces of metal that are in contact with the welding wire are live.

Always set the wire-feed unit 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. Loose connections, scorched, damaged or inadequately dimensioned cables and leads must be repaired/replaced immediately.

Do not sling 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 be touched 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.

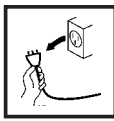
If the device is operated on a mains without a ground conductor and in a socket without a ground conductor contact, this will be deemed gross negligence. The manufacturer shall not be held liable for any damage arising from such usage.

If necessary, provide an adequate ground 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 wirepool 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 to interference of 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.

During operation

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



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.).



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



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

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.

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



Special provisions apply in areas at risk of fire or explosion

- observe relevant national and international regulations.



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.



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



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.

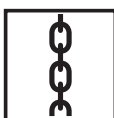


Use only suitable load-carrying equipment supplied by the manufacturer when transporting devices by crane.

- 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).

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.



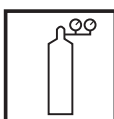
All lifting accessories (straps, handles, chains, etc.) used in connection with the device or its components must be tested regularly (e.g. for mechanical damage, corrosion or changes caused by other environmental factors).

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



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.

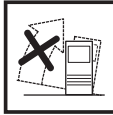
Turn your face to one side when opening the valve of a shielding gas cylinder.

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.

**Safety measures
at the installation
location and dur-
ing 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 escape unhindered.

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.

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

- Wire-feed unit
- 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 opera-
tion**



Only operate the device if 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.

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

The 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.

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 replacement and wearing parts (also applies to standard parts).

Do not make any modifications, alterations, etc. to the device without the manufacturer's consent.

Parts that are not in perfect condition must be replaced immediately.

When ordering, please give the precise designation and part number as shown in the spare parts list, as well as the serial number of your device.

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 2002/96/EC 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

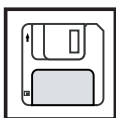


Devices with the CE mark satisfy the essential requirements of the low-voltage and electromagnetic compatibility directive (e.g. relevant product norms from the EN 60 974 series).



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

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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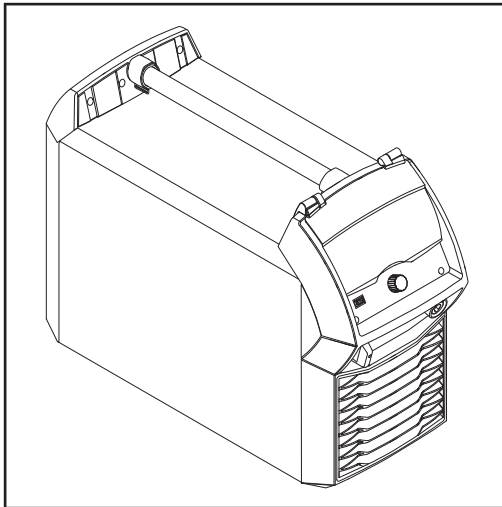


Copyright of these operating instructions remains with the manufacturer.

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

Device concept



The TPS 320i, TPS 400i and TPS 500i MIG/MAG power sources are completely digitised microprocessor-controlled inverter power sources.

The modular design and potential for system add-ons ensure a high degree of flexibility. The devices can be adapted to any specific situation.

Functional principle

The central control and regulation unit of the power sources is coupled with a digital signal processor. The central control and regulation unit and the 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.

This results in:

- a precise welding process
- exact reproducibility of all results
- excellent weld properties.

Application areas








The devices are used in workshops and industry for manual and automated applications with classical steel, galvanised sheets, chrome/nickel and aluminium.

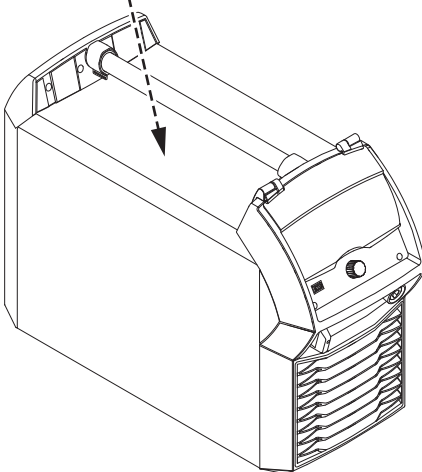
The power sources are designed for:

- Automobile and component supply industry
- Machine manufacturing and rail vehicle construction
- Chemical plant construction
- Equipment construction
- Shipyards, etc.

Warning notices on the device

Warning notices and safety symbols are affixed to power sources without mains cables. These warning notices and safety symbols must not be removed or painted over. They warn against operating the device incorrectly, as this may result in serious injury and damage.

⚠ WARNING		 ARC RAYS can burn eyes and skin; NOISE can damage hearing. <ul style="list-style-type: none"> ● Wear welding helmet with correct filter. ● Wear correct eye, ear and body protection. 	
Do not Remove, Destroy, Or Cover This Label			
ARC WELDING can be hazardous. <ul style="list-style-type: none"> ● Read and follow all labels and the Owner's Manual carefully ● Only qualified persons are to install, operate, or service this unit according to all applicable codes and safety practices. ● Keep children away. ● Pacemaker wearers keep away. ● Welding wire and drive parts may be at welding voltage. 		 EXPLODING PARTS can injure. <ul style="list-style-type: none"> ● Failed parts can explode or cause other parts to explode when power is applied. ● Always wear a face shield and long sleeves when servicing. 	Read American National Standard Z49.1, "Safety in Welding and Cutting" From American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126; OSHA Safety and Health Standards, 29 CFR 1910, from U.S. Government Printing Office, Washington, DC 20402. CSA, W117-2 M87 Code for Safety in Welding and Cutting. 42.0409.5074
 ELECTRIC SHOCK can kill. <ul style="list-style-type: none"> ● Always wear dry insulating gloves. ● Insulate yourself from work and ground. ● Do not touch live electrical parts. ● Disconnect input power before servicing. ● Keep all panels and covers securely in place. 	 ELECTRIC SHOCK can kill; SIGNIFICANT DC VOLTAGE exists after removal of input power <ul style="list-style-type: none"> ● Always wait 60 seconds after power is turned off before working on unit. ● Check input capacitor voltage, and be sure it is near 0 before touching parts. 		
 FUMES AND GASES can be hazardous. <ul style="list-style-type: none"> ● Keep your head out of the fumes. ● Ventilate area, or use breathing device. ● Read Material Safety Data Sheets (MSDSs) and manufacturer's instructions for materials used. 	⚠ AVERTISSEMENT		
 WELDING can cause fire or explosion. <ul style="list-style-type: none"> ● Do not weld near flammable material. ● Watch for fire: keep extinguisher nearby. ● Do not locate unit over combustible surfaces. ● Do not weld on closed containers. 	 UN CHOC ELECTRIQUE peut etre mortel. <ul style="list-style-type: none"> ● Installation et raccordement de cette machine doivent etre conformes a tous les pertinents. SOUDEAGE A L'ARC peut etre hasardeux. <ul style="list-style-type: none"> ● Lire le manuel d' instructions avant utilisation. ● Ne pas installer sur une surface combustible. ● Les fils de soudage et pieces conductrices peuvent etre a la tension de soudage. 		



Safety symbols on the rating plate:

- ⚠ Welding is dangerous. The following basic requirements must be met:
- Welders must be sufficiently qualified
 - Suitable protective equipment must be used
 - All persons not involved in the welding process must be kept at a safe distance
- 📖 Do not use the functions described here 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

Welding processes, processes and welding characteristics

General

TPSi power sources contain a selection of welding processes, procedures and welding characteristics that enable a wide range of materials to be processed in the most effective way.

Welding characteristics

Depending on the material and shielding gas mix, various process-optimised welding characteristics are available when selecting the filler metal.

The additional marking next to the material provides information about the use of the welding characteristic:

Universal Characteristic for conventional welding tasks

Dynamic Characteristic for high welding speeds with concentrated arc

Root Characteristic for root passes with powerful arc

PCS Pulse Controlled Sprayarc

Direct transition from the concentrated pulse to a short spray arc. The advantages of pulse and standard arcs combined in a single characteristic.

Summary of MIG/MAG pulse welding

MIG/MAG pulse synergic

MIG/MAG pulse welding is a pulsed-arc process with controlled material transfer. In the base current phase, the energy supply is reduced to such an extent that the arc is only just stable and the surface of the workpiece is preheated. In the pulsing current phase, a precise current pulse ensures the targeted detachment of a droplet of welding material. This principle guarantees a low-spatter weld and precise working in the lower power range, as unwelcome short circuits with simultaneous droplet explosion and uncontrolled welding spatter are virtually eliminated.

Summary of MIG/MAG standard synergic welding

MIG/MAG standard synergic

The MIG/MAG standard synergic welding process is a MIG/MAG welding process across the entire power range of the power source with the following arc types:

Short circuit arc

Droplet transfer takes place during a short circuit in the lower power range.

Intermediate arc

The droplet increases in size on the end of the wire electrode and is transferred in the mid-power range during the short circuit.

Spray arc

A short circuit-free transfer of material in the high power range.

**Summary of the
PMC process**

PMC = Pulse Multi Control

PMC is a pulsed arc welding process with high-speed data processing, precise recording of the process status and improved droplet detachment. Faster welding possible with a stable arc and even fusion penetration.

**Summary of the
LSC / LSC Ad-
vanced process**

LSC = Low Spatter Control

LSC is a new, low-spatter dip transfer arc process.

The current is reduced before breaking the short-circuit bridge; re-ignition takes place at significantly lower welding current values.

LSC Advanced

The TPS 400i LSC ADV is required for the LSC Advanced process.

The TPS 400i LSC ADV accelerates the reduction in current and improves the LSC properties. The LSC Advanced process is predominantly used when the welding circuit inductivity is higher.

**Summary of the
CMT process**

CMT = Cold Metal Transfer

The CMT process is a special MIG/MAG dip transfer arc welding process.

In the CMT process, the digital process control system detects a short circuit and facilitates droplet detachment by retracting the wire electrode. The wire electrode can be retracted more than 100 times per second.

The special features of the CMT process include low heat input and a controlled, low-current material transfer.

The CMT process is suitable for:

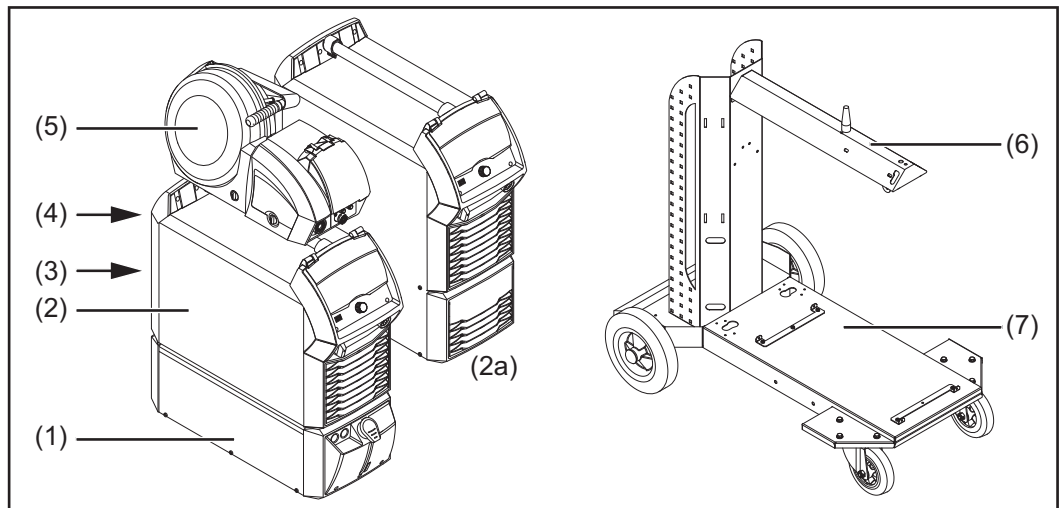
- virtually spatter-free MIG brazing
- welding on light-gauge sheet with minimal distortion
- joining steel and aluminium (weld brazing)

System components

General

The power sources can be operated with various system components and options. This makes it possible to optimise procedures and to simplify machine handling and operation, as necessitated by the particular field of application in which the power source is to be used.

Overview



- (1) Cooling units
- (2) Power sources
- (2a) TPS 400i LSC ADV power source
- (3) Robot accessories
- (4) Interconnecting hosepacks
- (5) Wire-feed units
- (6) Wirefeeder holder
- (7) Trolleys and gas cylinder holders

also:

- Welding torch
- Grounding (earthing) cable and electrode cable
- Dust filter
- Additional current sockets

Controls, connections and mechanical components

Control panel

General

Welding parameters can be easily changed and selected using the adjusting dial. The parameters are shown on the display while welding is in progress.

The synergic function ensures that other welding parameters are also adjusted whenever an individual parameter is changed.



NOTE! As a result of firmware updates, you may find that your device has certain functions that are not described in these operating instructions, or vice versa. Certain 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

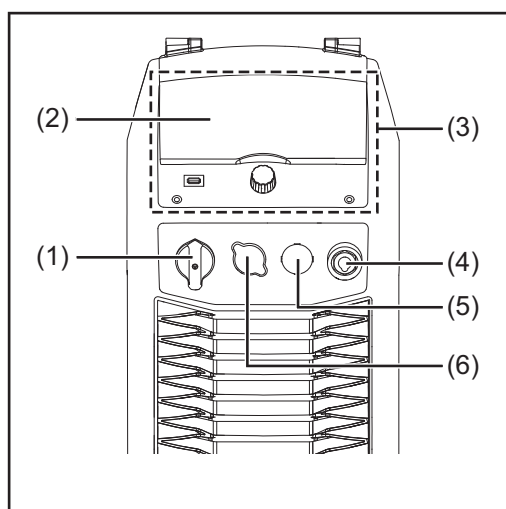
Control panel



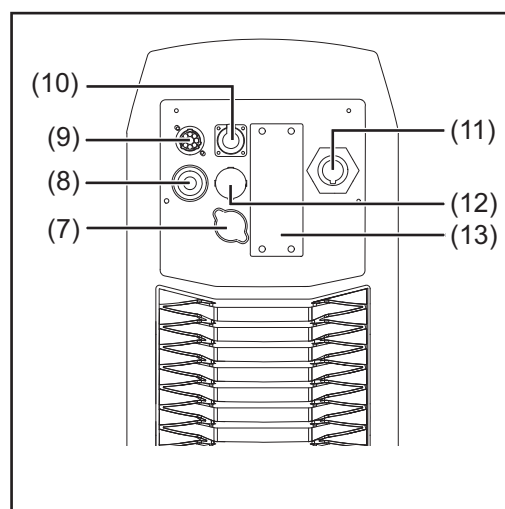
No.	Function
(1)	<p>USB port For connecting USB sticks, hard drives without their own power supply, etc.</p> <p>IMPORTANT: The USB port is not electrically isolated from the welding circuit. Therefore, devices that establish an electrical connection with another device must not be connected to the USB port.</p>
(2)	<p>Adjusting dial with turn/press function for selecting elements, setting values and scrolling through lists.</p>
(3)	<p>Display (touchscreen)</p> <ul style="list-style-type: none"> - to directly operate the power source by pressing the buttons on the display - to show values - to navigate in the menu
(4)	<p>Wire threading button for threading the wire electrode into the torch hosepack with no accompanying flow of gas or current</p>
(5)	<p>Gas test button for setting the required gas flow rate on the gas pressure regulator. After pressing this button, gas flows for 30 seconds. Press the button again to stop the gas test flow before the end of this period.</p>

Connections, switches and mechanical components

TPS 320i / 400i /
500i power
source, TPS 400i
LSC ADV power
source



Front



Rear

No.	Function
(1)	Mains switch for switching the power source on and off
(2)	Control panel cover for protecting the control panel
(3)	Control panel with display for operating the power source
(4)	(-) current socket with bayonet latch for: - connecting the grounding (earthing) cable during MIG/MAG welding
(5)	Blanking cover reserved for second (+) current socket with bayonet latch
(6)	Blanking cover reserved for second SpeedNet connection socket option
(7)	Blanking cover reserved for second SpeedNet connection socket option
(8)	(+) current socket with bayonet latch for: - connecting the current cable from the interconnecting hosepack during MIG/MAG welding
(9)	SpeedNet connection socket for connecting the interconnecting hosepack
(10)	Ethernet port
(11)	Mains cable with strain relief device
(12)	Blanking cover reserved for second (-) current socket option with bayonet latch
	The second (-) current socket is for: - connecting the interconnecting hosepack during MIG/MAG welding for polarity reversal (e.g. for flux-cored wire welding)
(13)	Blanking cover reserved for second SpeedNet connection socket option or robot interface RI FB Inside/i

Operating concept

Input options

General



NOTE! As a result of firmware updates, you may find that there are functions available on your device that are not described in these operating instructions or vice versa. Certain illustrations may also differ slightly from the actual controls on your device, but these controls function in exactly the same way.



WARNING! Incorrect operation may result in serious injury or damage. Do not use the functions described here 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

The following input options are available on the power source control panel:

- Turning/pressing the adjusting dial
- Pressing buttons
- Pressing on the display

Turning/pressing the adjusting dial

Turn/press the adjusting dial to select elements, change values and scroll through lists.

Turn the adjusting dial to:



Select elements from the main area of the display:

- Turning right highlights the next element in the sequence
- Turning left highlights the preceding element in the sequence
- In vertical lists, turn right to scroll down and turn left to scroll up.

Change values:

- Turning to the right increases the value.
- Turning to the left decreases the value.
- Slowly turning the adjusting dial changes the value in very small stages, i.e. for precision adjustments.
- Turning the adjusting dial quickly changes the value in disproportionately large stages, i.e. large value changes can be made quickly.

For certain parameters (wire feed speed, welding current, arc length correction, etc.), a value changed by turning the adjusting dial is applied automatically without having to press the adjusting dial.

Press the adjusting dial to:



Apply the highlighted element, e.g. to change the welding parameter value:

Apply values of certain welding parameters.

Pressing buttons

Pressing buttons triggers the following functions:



When the feeder inching button is pressed, the wire electrode is fed into the torch hosepack with no accompanying flow of gas or current.



When the gas test button is pressed, gas will flow out for 30 seconds. Press the button again to stop the gas test flow before the end of this period.

Pressing on the display



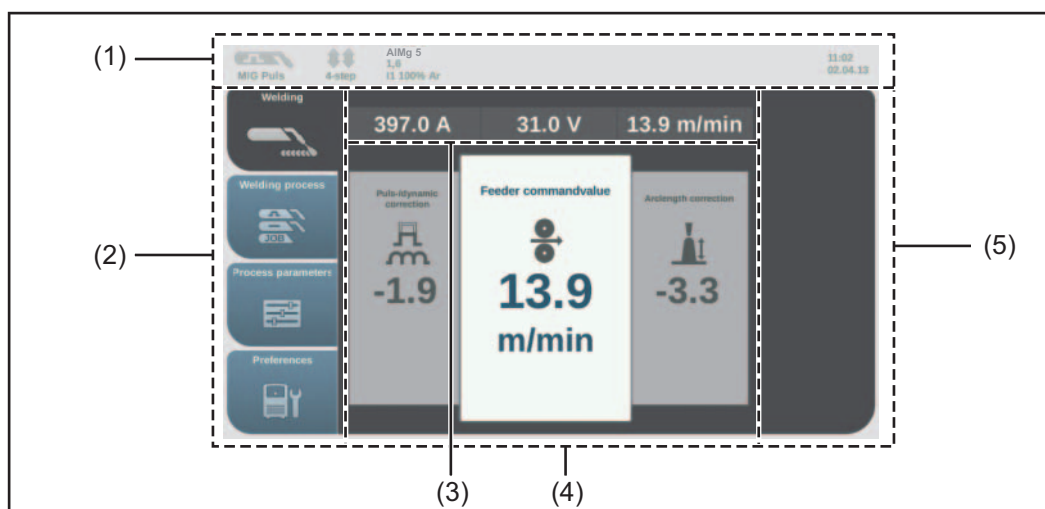
The display can be touched in order to

- navigate,
- trigger functions,
- select options

Pressing on (and therefore selecting) an element on the display highlights this element.

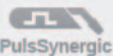


Display and status line

Display



No.	Function
(1)	<p>The status line provides details on:</p> <ul style="list-style-type: none"> - the current welding process - the current operating mode - the current welding program (material, shielding gas and wire diameter) - active faults - time and date
(2)	<p>Left-hand ribbon</p> <p>The left-hand ribbon contains the following buttons:</p> <ul style="list-style-type: none"> - Welding - Welding process - Process parameters - Defaults <p>The buttons in the left-hand ribbon are actuated by touching the display.</p>
(3)	<p>Actual value display</p> <p>Welding current, welding voltage, wire feed speed</p>
(4)	<p>Main area</p> <p>The welding parameters, graphics, lists or navigation elements are shown in the main area. The structure of the main area and the elements shown in it vary according to the application.</p> <p>The main area is controlled</p> <ul style="list-style-type: none"> - with the adjusting dial, - by touching the display.
(5)	<p>Right-hand ribbon</p> <p>Depending on the buttons selected in the left-hand ribbon, the right-hand ribbon may be used as follows:</p> <ul style="list-style-type: none"> - as a function ribbon containing application and function buttons - for navigating through the second menu level <p>The buttons in the right-hand ribbon are actuated by touching the display.</p>

Status line

 PulsSynergic	 4-Takt	CrNi 25 20 - ER 310 Ar+30%He+2%H ₂ +500ppmCO ₂	 1,2 mm		14:23 05/02/10
(1)	(2)	(3)			(4)


The status line is divided into segments and contains the following details:

- (1) Current welding process
- (2) Current operating mode
- (3) Current welding program (material, shielding gas and wire diameter)
- (4) Time and date

A warning symbol is superimposed onto the welding process in segment (1) if the current welding process is not compatible with the current welding program:

 PulsSynergic	 4-Takt	CrNi 25 20 - ER 310 Ar+30%He+2%H ₂ +500ppmCO ₂	 1,2 mm		14:23 05/02/10
------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------	-------------------------------------------------------------------------	------------------------------------------------------------------------------------------	--	-------------------

Any unconfirmed error messages are shown in the status line.

 Fehler: „Ignition Time-Out“

Installation and commissioning

Minimum equipment needed for welding task

General

Depending on which welding process you intend to use, a certain minimum equipment level will be needed in order to work with the power source.

The welding processes and the minimum equipment levels required for the welding task are then described.

MIG/MAG gas-cooled welding

- Power source
- Grounding (earthing) cable
- MIG/MAG welding torch, gas-cooled
- Shielding gas supply
- Wire-feed unit
- Interconnecting hosepack
- Wire electrode

MIG/MAG water-cooled welding

- Power source
- Cooling unit
- Grounding (earthing) cable
- MIG/MAG welding torch, water-cooled
- Shielding gas supply
- Wire-feed unit
- Interconnecting hosepack
- Wire electrode

Before installation and commissioning

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

Proper use

The power source is designed to be used for MIG/MAG welding. 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:

- complying with all 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 > 12.5 mm (0.49 in.)
- protection against direct sprays of water at any angle up to 60° from the vertical

The device can be set up and operated outdoors in accordance with IP23. Avoid direct wetting (e.g. from rain).



WARNING! If one of these devices topples over or falls it could cause serious or even fatal injury. Place devices, upright consoles and trolleys on a solid, level surface in such a way that they remain stable.

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

Mains connection

- The devices are designed for the mains voltage specified on the rating plate.
- Devices with a nominal voltage of 3 x 575 V must be operated on three-phase systems with earthed star point.
- If your version of the appliance does not come with mains cables and mains plugs ready-fitted, these must be fitted by a qualified person in accordance with national standards.
- The fuse protection for the mains cable is indicated in the technical data.



NOTE! An inadequately dimensioned electrical installation can cause serious damage. The mains cable and its fuse protection must be dimensioned to suit the local power supply. The technical data shown on the rating plate applies.

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:

3-phase devices:

$$S_{1\max} = I_{1\max} \times U_1 \times \sqrt{3}$$

Single-phase devices:

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

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

The generator apparent power S_{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.

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

When using single-phase devices with a 3-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.

Information on system components

The steps and activities described below include references to various system components, including:

- Trolleys
- Cooling units
- Wire-feed unit holders
- Wire-feed units
- Interconnecting hosepacks
- Welding torches
- etc.

For more detailed information about installing and connecting the system components, please refer to the appropriate operating instructions.

Connecting the mains cable

General

If no mains cable is connected, a mains cable that is suitable for the connection voltage must be fitted before commissioning.

A universal strain-relief device for cable diameters from 14 - 16 mm (0.55 - 0.63 in.) is fitted to the power source.

Strain-relief devices for other cable cross-sections must be designed accordingly.

Stipulated mains cables

Power source	Mains voltage	Cable cross-section	
		USA / Canada *	Europe
TPS 320i nc	3 x 400 V	AWG 12	4G 2.5 mm ²
	3 x 460 V	AWG 14	4G 2.5 mm ²
TPS 400i nc	3 x 400 V	AWG 10	4G 4.0 mm ²
	3 x 460 V	AWG 12	4G 4.0 mm ²
TPS 500i nc	3 x 400 V	AWG 8	4G 4.0 mm ²
	3 x 460 V	AWG 10	4G 4.0 mm ²

*

Cable type for USA / Canada: Extra-hard usage

AWG = American wire gauge

Select a strain-relief device based on the cable required.

Connecting the mains cable - general

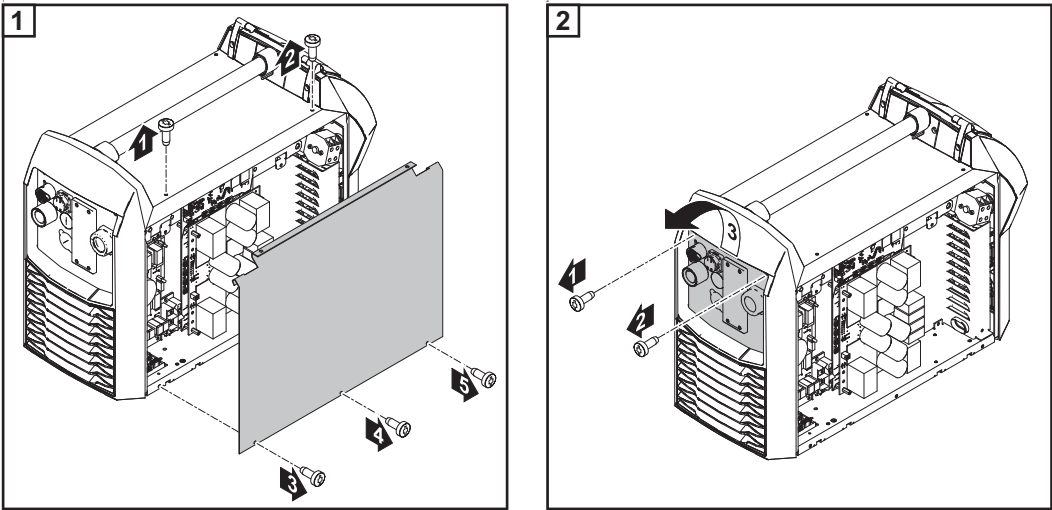
⚠

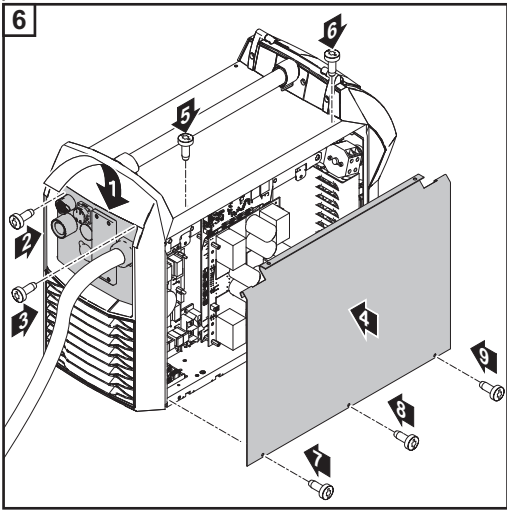
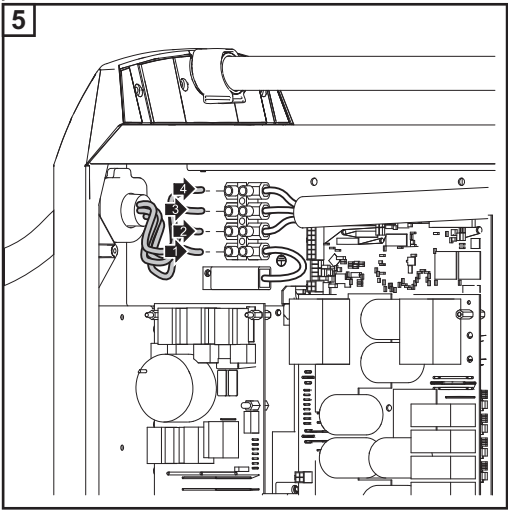
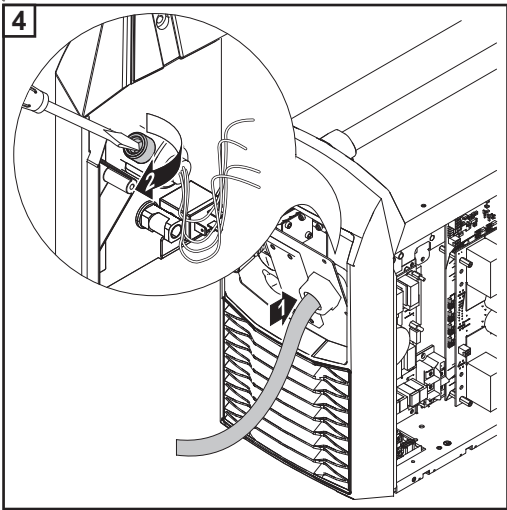
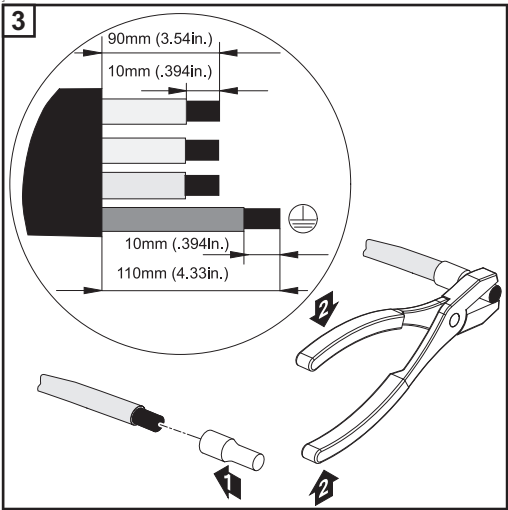
CAUTION! Risk of injury and material damage due to short circuits. Short circuits can occur between the phase conductors or between the phase conductors and the ground conductor unless ferrules are used. Fit ferrules to all phase conductors in an exposed mains cable as well as the ground conductor.

👉

NOTE! Mains cables must be connected to devices in compliance with national standards and guidelines and the work must be carried out by a qualified person.

IMPORTANT! The ground conductor should be approx. 30 mm (1.18 in.) longer than the phase conductors.





Commissioning the TPS 320i / 400i / 500i, TPS 400i LSC ADV

Safety



WARNING! An electric shock can be fatal. If the power source is connected to the mains electricity supply during installation, there is a high risk of very serious injury and damage. Before carrying out any work on the device make sure that:

- the power source mains switch is in the "O" position
- the power source is unplugged from the mains

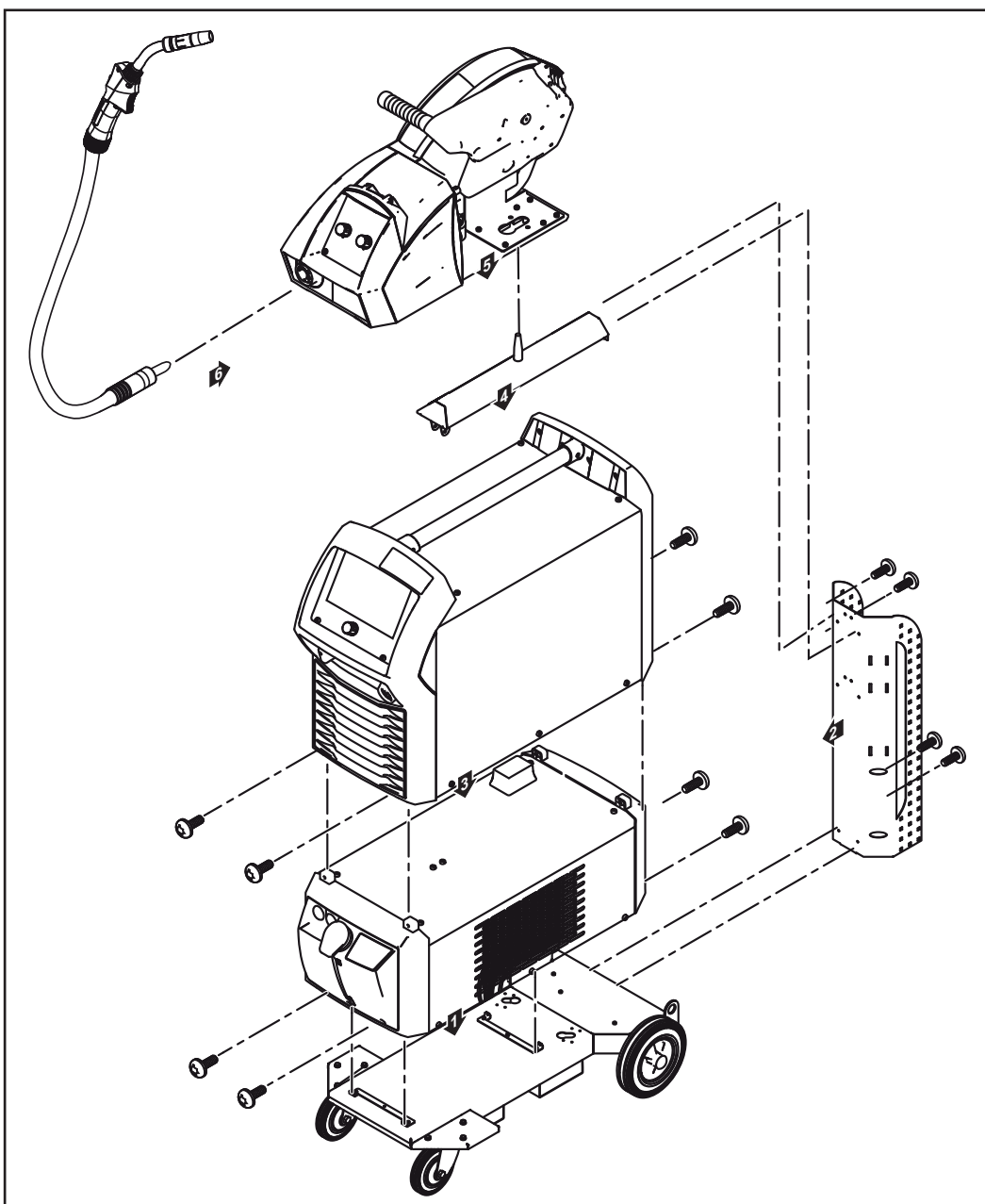
General

A manual water-cooled MIG/MAG application is used to describe how to commission the TPS 320i / 400i / 500i and TPS 400i LSC ADV power sources.

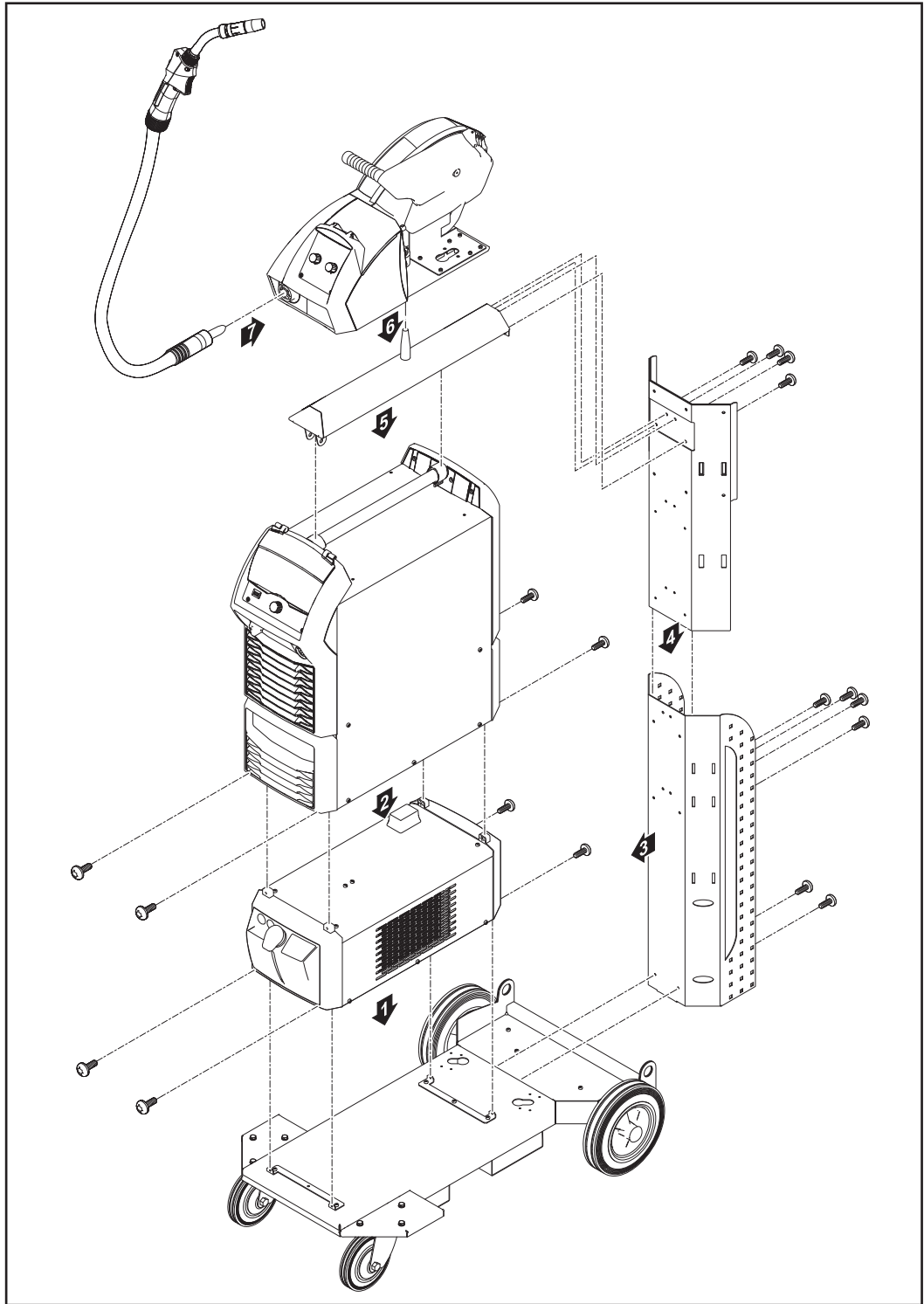
The following illustrations provide an overview of the structure of the individual system components.

Refer to the respective system component operating instructions for detailed information about the various work steps involved.

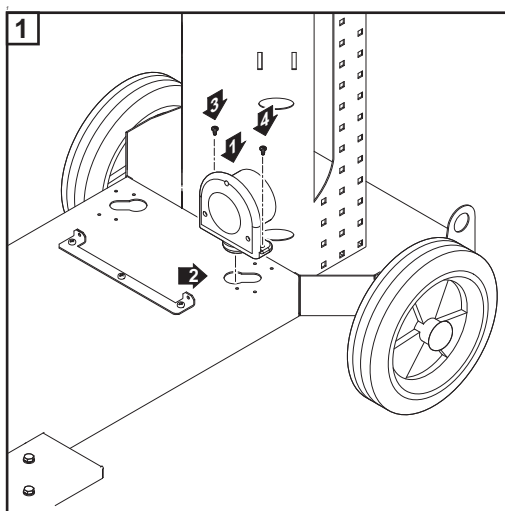
**TPS 320i / 400i /
500i:**
**Fitting the system
components
(overview)**



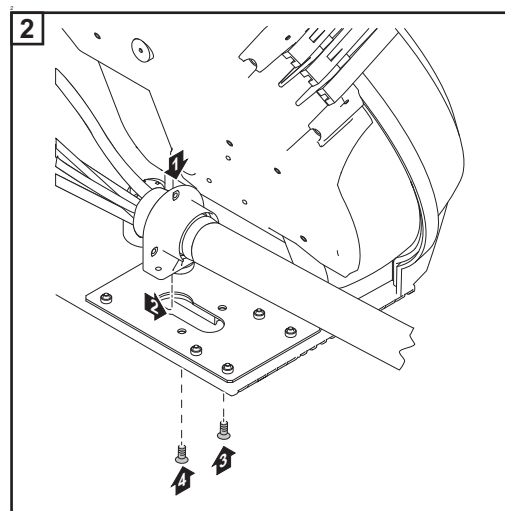
TPS 400i LSC
ADV:
Fitting the system
components
(overview)



Fixing the strain-relief device for the interconnecting hosepack



Fixing the strain-relief device to the trolley

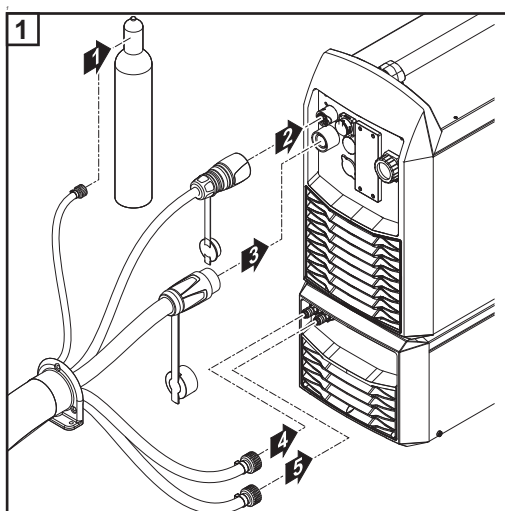


Fixing the strain-relief device to the wire-feed unit

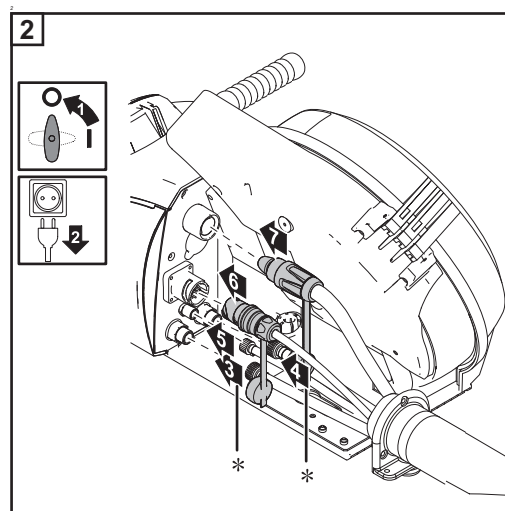
Connecting the interconnecting hosepack



NOTE! There is no cooling unit present in the case of gas-cooled systems. There is no need to attach the water connections in the case of gas-cooled systems.



Connecting the interconnecting hosepack to the power source and cooling unit



Connecting the interconnecting hosepack to the wire-feed unit

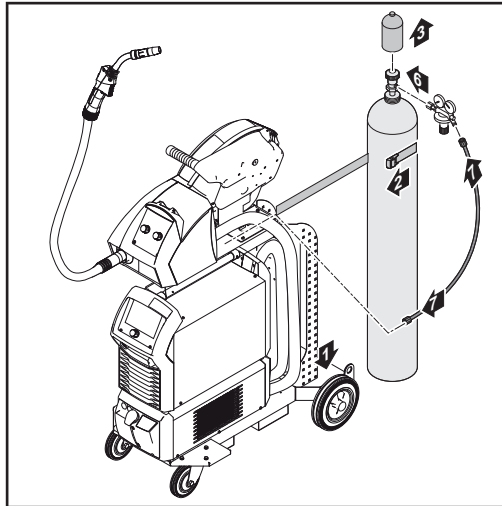
* (only if coolant connections are installed in the wire-feed unit and a water-cooled interconnecting hosepack is being used)

Connecting the gas cylinder



WARNING! If gas cylinders topple over, there is a risk of very serious injury and damage. Place gas cylinders on a solid, level surface so that they remain stable. Secure gas cylinders to prevent them from toppling over.

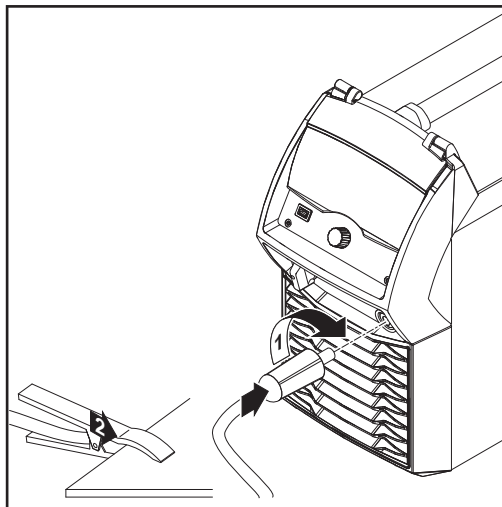
Observe the safety rules of the gas cylinder manufacturer.



Fixing the gas cylinder on the trolley

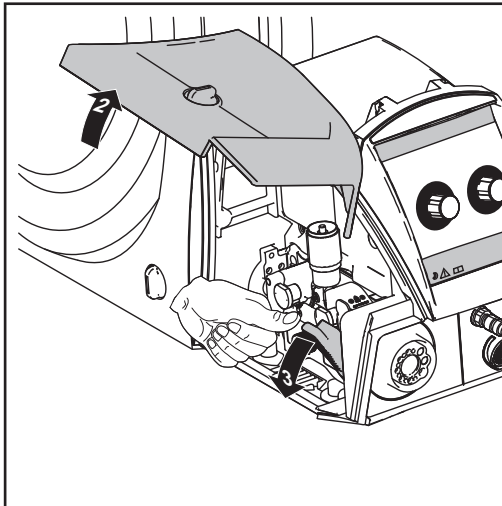
- 1 Place the gas cylinder on the base of the trolley
- 2 Secure the gas cylinder by fixing the cylinder strap around the upper part of the cylinder (but not around the neck) to prevent it from toppling over
- 3 Take the protective cap off the gas cylinder
- 4 Briefly open the gas cylinder valve to blow off any dust or dirt
- 5 Check the seal on the pressure regulator
- 6 Screw the pressure regulator onto the gas cylinder and tighten it
- 7 Connect the shielding gas hose of the interconnecting hose pack to the pressure regulator using the gas hose

Establishing a ground (earth) connection

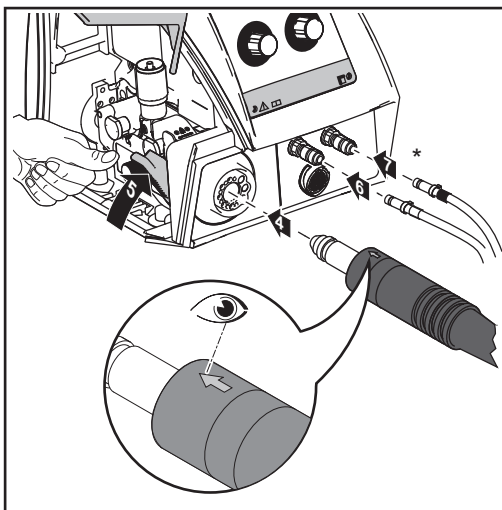


- 1 Plug the grounding (earthing) cable into the (-) current socket and twist to fasten it
- 2 Use the other end of the grounding (earthing) cable to establish a connection to the workpiece

Connecting MIG/ MAG welding torches to the wire-feed unit



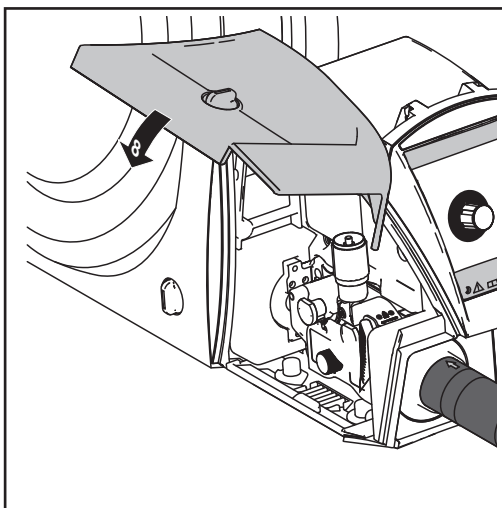
- 1 Check that all cables, leads and hose-packs are undamaged and correctly insulated
- 2 Open the wire drive cover
- 3 Open the clamping lever on the wire drive



- 4 Check that the welding torch is correctly and completely tooled up. Insert it - marking at the top first - into the welding torch connection on the wire-feed unit
- 5 Close the clamping lever on the wire drive

* On water-cooled welding torches:

- 6 Connect the coolant flow hose to the coolant flow connection (blue)
- 7 Connect the coolant return hose to the coolant return connection (red)



- 8 Close the wire drive cover
- 9 Check that all connections are connected properly

Other tasks

Carry out the following steps in accordance with the wire-feed unit operating instructions:

- 1** Insert the feed rollers in the wire-feed unit
- 2** Insert the wirepool or basket-type spool with adapter in the wire-feed unit
- 3** Feed in the wire electrode
- 4** Set the contact pressure
- 5** Adjust the brake

Welding

MIG/MAG modes

General

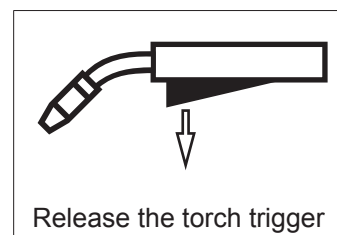
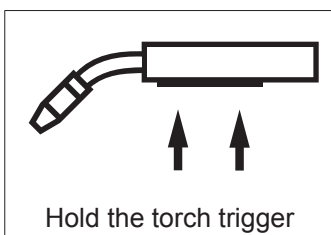
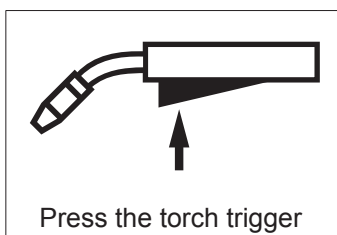


WARNING! Operating the equipment incorrectly can cause serious injury and damage. Do not use the functions described until you have thoroughly read and understood the following documents:

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

See the Setup menu for information on settings, setting range and units of measurement for the available parameters.

Symbols and their explanations



GPr

gas pre-flow time

I-S

Starting-current phase: the base material is heated up rapidly, despite the high thermal dissipation that occurs at the start of welding



Start arc length correction

SL1

Slope 1: the starting current is steadily lowered until it reaches the welding current

I

Welding-current phase: uniform thermal input into the base material, whose temperature is raised by the advancing heat

I-E

Final current phase: to prevent any local overheating of the base material due to heat build-up towards the end of welding. This eliminates any risk of weld seam drop-through.



End arc length correction

SL2

Slope 2: the welding current is steadily lowered until it reaches the final current

GPo

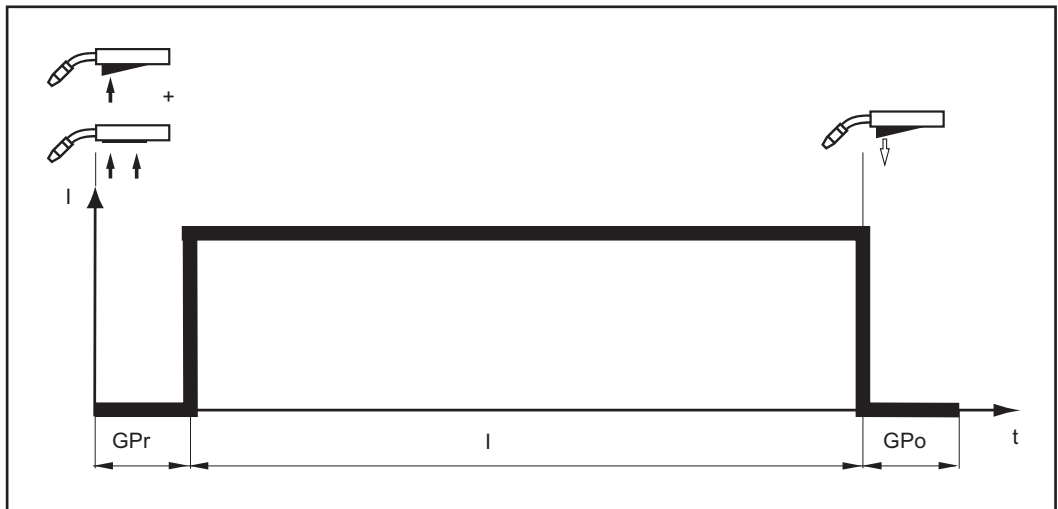
Gas post-flow

A detailed explanation of the parameters can be found in the section headed "Process parameters"

2-step mode

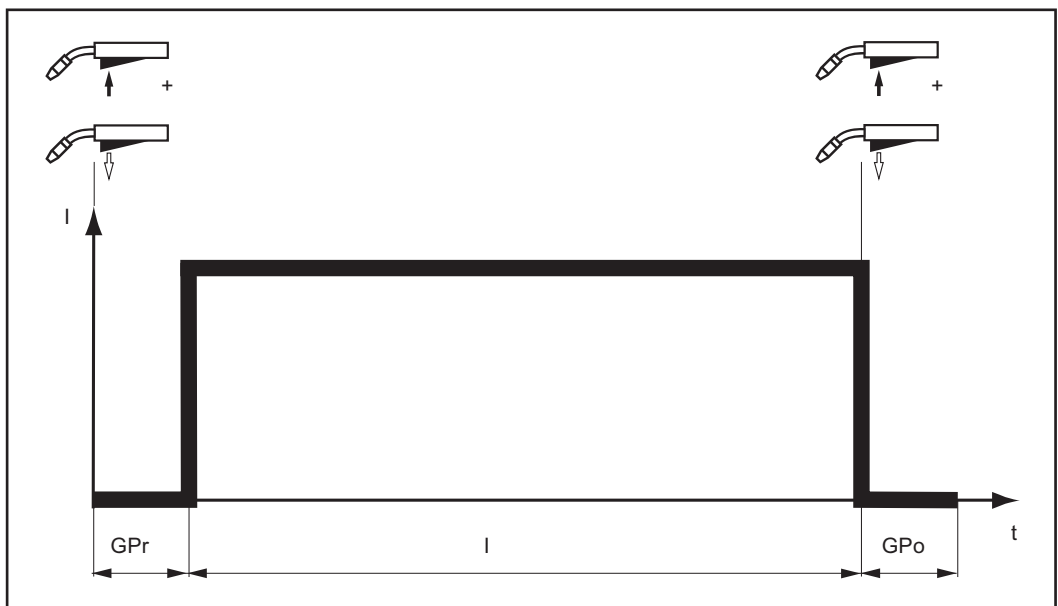
"2-step mode" is suitable for

- Tacking work
- Short weld seams
- Automated and robot welding



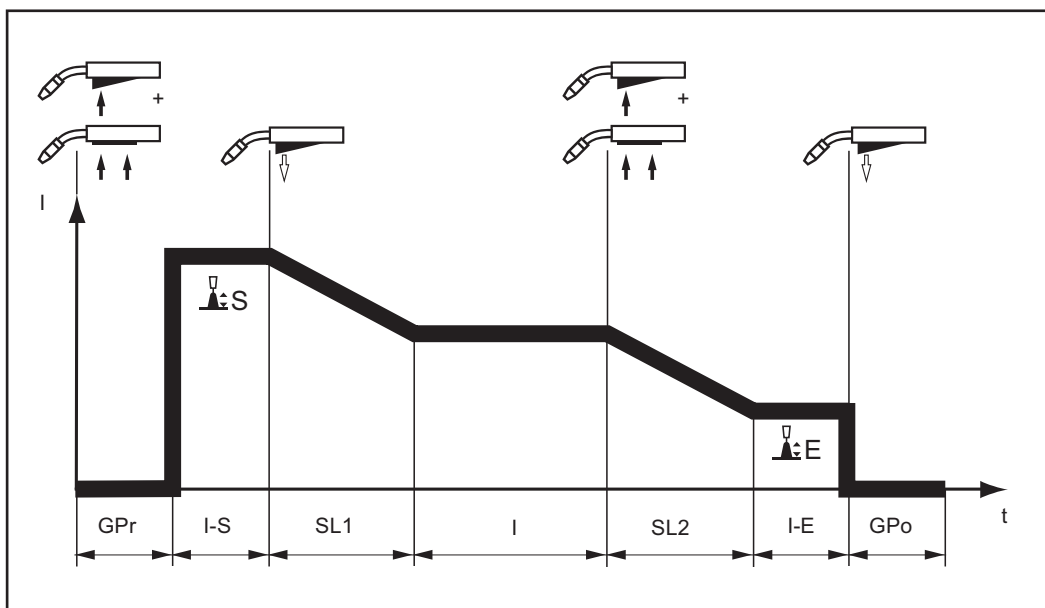
4-step mode

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



Special 4-step mode

"Special 4-step mode" is particularly suitable for welding aluminium materials. The special slope of the welding current curve takes account of the high thermal conductivity of aluminium.



MIG/MAG welding

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



WARNING! An electric shock can be fatal. If the power source is connected to the mains electricity supply during installation, there is a high risk of very serious injury and damage. Before carrying out any work on the device make sure that:

- the power source mains switch is in the "O" position
- the power source is unplugged from the mains

MIG/MAG welding - overview

The "MIG/MAG welding" section comprises the following steps:

- Switching on the power source
- Selecting the welding process and operating mode
- Selecting the filler metal
- Setting the welding and process parameters
- Setting the shielding gas flow rate
- MIG/MAG welding



NOTE! If using a cooling unit, follow the safety rules and note the operating conditions in the cooling unit operating instructions.

Switch on the power source

- 1 Insert the mains cable
- 2 Move the mains switch to the I position

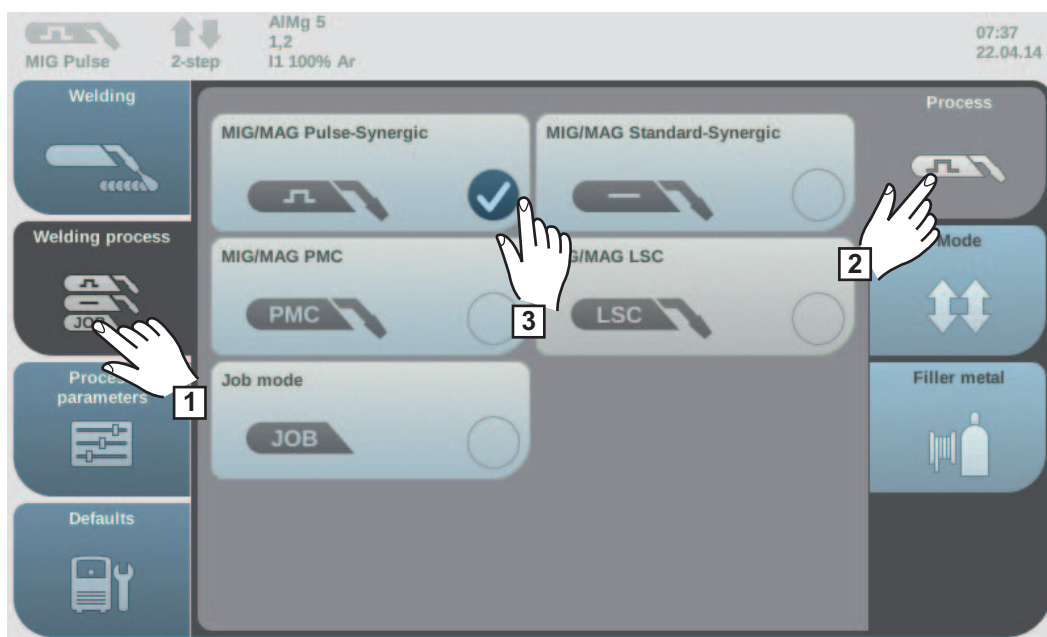
A cooling unit connected to the system will begin to operate.

For the best welding results, Fronius recommends that an R/L adjustment is carried out every time the device is switched on.

More information about the R/L adjustment can be found under "R/L adjustment" in the "Process parameters" section of this chapter.

Setting the welding process and operating mode

Setting the welding process



1 Select the "Welding process" button in the left-hand ribbon

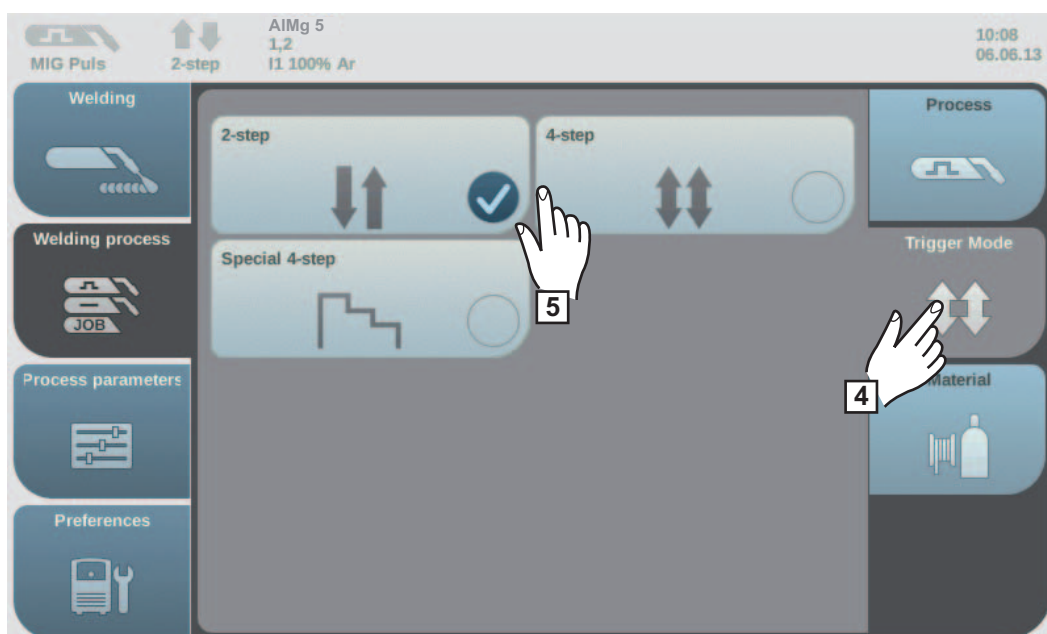
2 Select the "Process" button in the right-hand ribbon

An overview of the welding processes is displayed:

- MIG/MAG pulse synergic welding
- MIG/MAG standard synergic welding

3 Select the desired welding process

Setting the operating mode



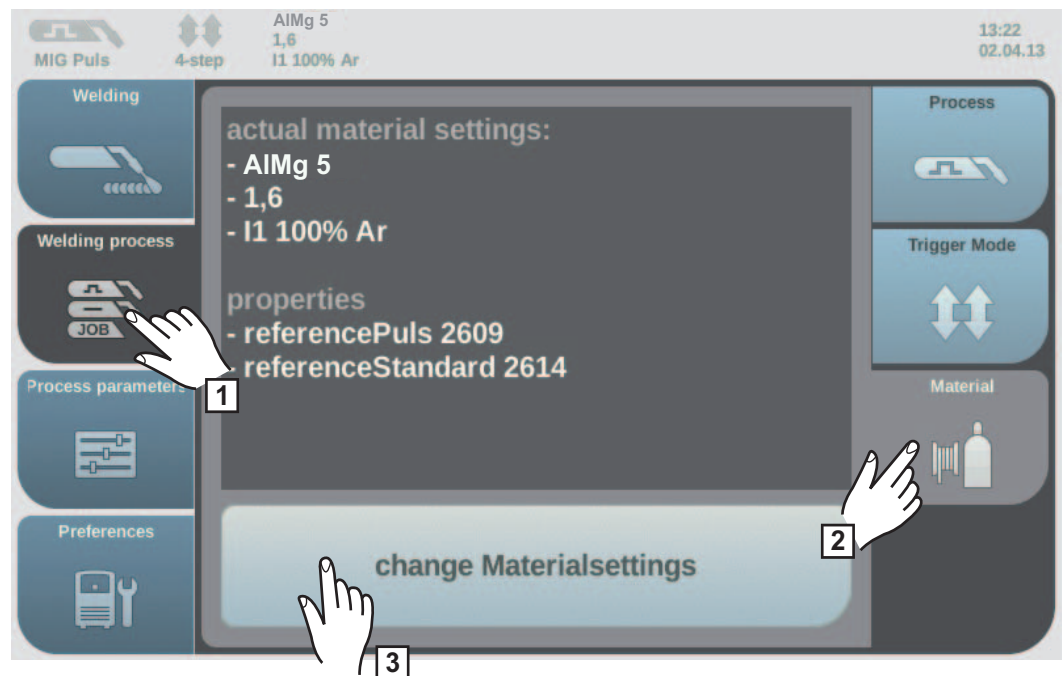
4 Select the "Operating mode" button in the right-hand ribbon

An overview of the operating modes is displayed.

- 2-step mode
- 4-step mode
- Special 4-step mode

5 Select the desired operating mode

Selecting the filler metal



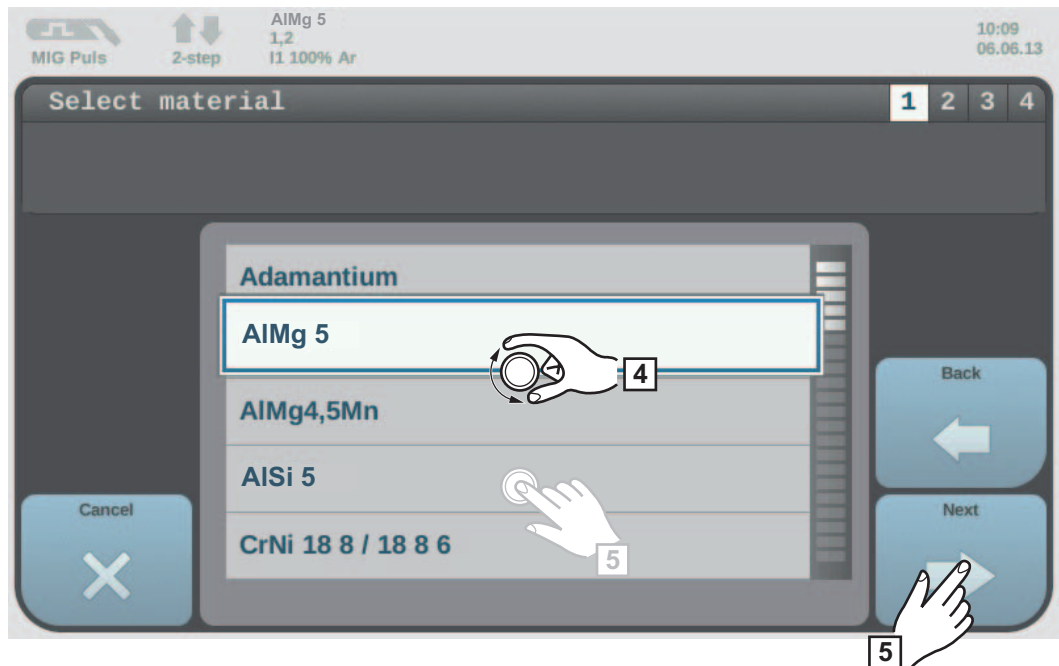
1 Select the "Welding process" button in the left-hand ribbon

2 Select the "Filler metal" button in the right-hand ribbon.

An overview of the filler metals is displayed.

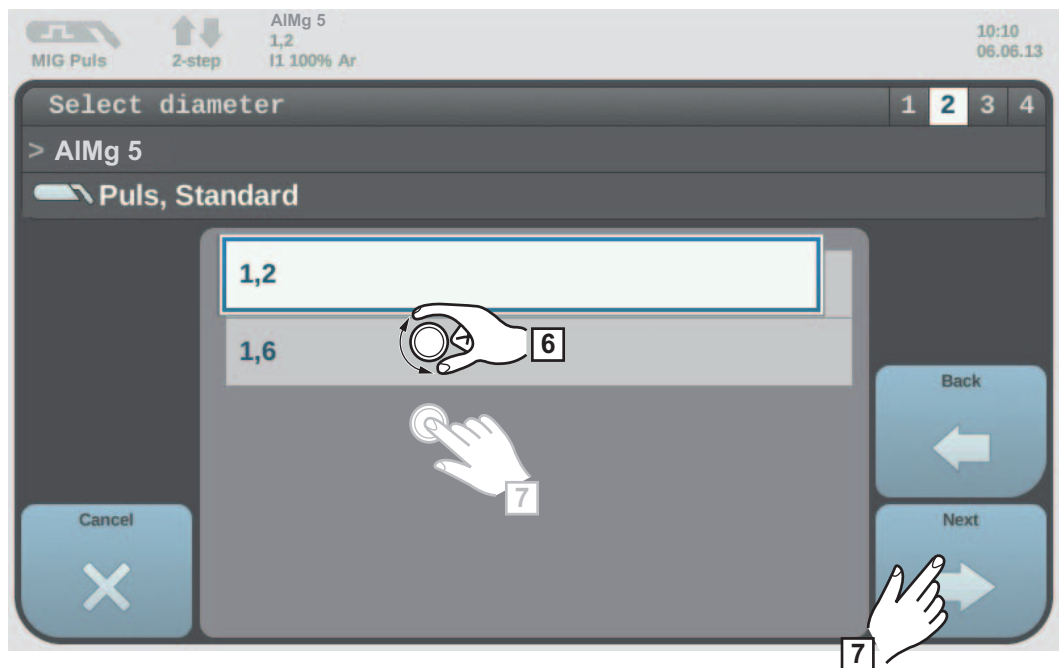
3 Press the "Change material settings" button

The first step of the filler metal wizard is displayed:



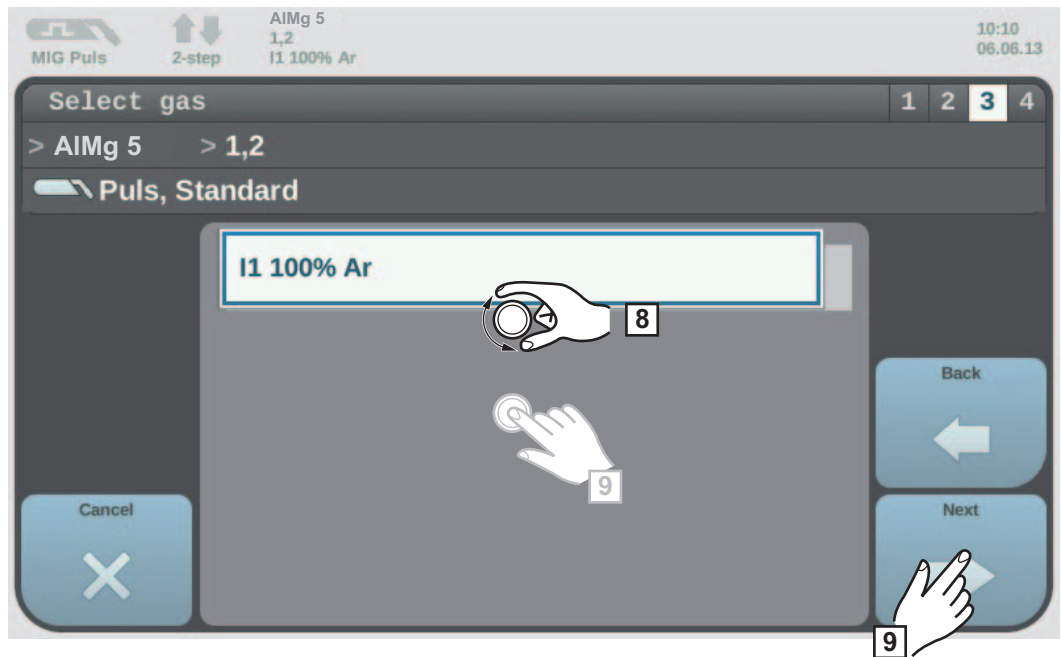
- 4** Select the desired filler metal by turning the adjusting dial
- 5** Press "Next"
(or press the adjusting dial)

The next step of the filler metal wizard is displayed:



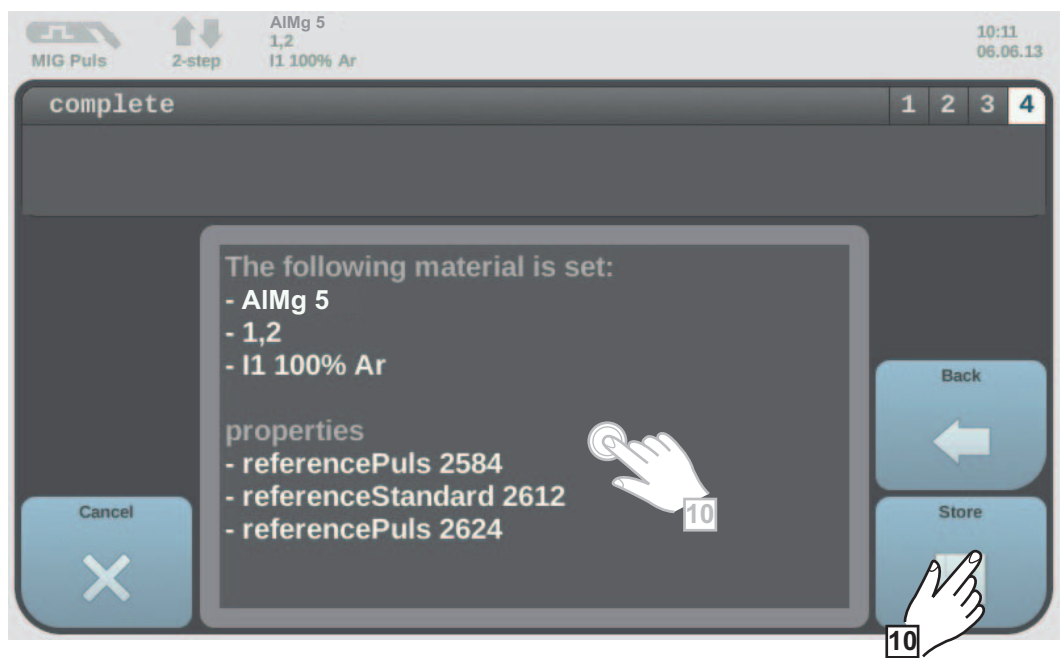
- 6** Select the desired wire diameter by turning the adjusting dial
- 7** Press "Next"
(or press the adjusting dial)

The next step of the filler metal wizard is displayed:



- 8** Select the desired shielding gas by turning the adjusting dial
- 9** Press "Next"
(or press the adjusting dial)

The confirmation step of the filler metal wizard is displayed:



- 10** Press "Save"
(or press the adjusting dial)

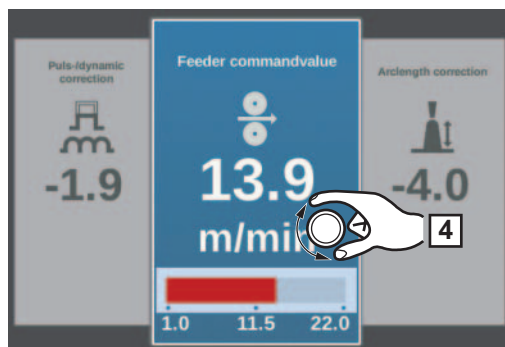
The set welding program is applied and the filler metal overview is displayed.

Setting the welding parameters



- 1 Select the "Welding" button in the left-hand ribbon
- 2 Select the desired welding parameter by turning the adjusting dial
- 3 Press the adjusting dial to change the parameter

The value of the parameter is displayed as a horizontal scale:



e.g. on the wire-feed unit

The value of the selected parameter can now be changed.

- 4 Turn the adjusting dial to change the parameter

The adjusted value of the parameter is applied immediately.

If one of the parameters feeder command value, sheet thickness, welding current or welding voltage is changed during synergic welding, the other parameters are immediately adjusted accordingly.

- 5 Press the adjusting dial to call up the welding parameters overview
- 6 Adjust the process parameters accordingly to make user- or application-specific settings on the welding device

Setting the shielding gas flow rate

- 1 Open the gas cylinder valve
- 2 Press the gas test button

Shielding gas flows out

- 3 Turn the adjusting screw on the underside of the pressure regulator until the pressure gauge shows the required shielding gas flow rate
- 4 Press the gas test button

The flow of gas stops.

MIG/MAG welding



- 1 Select the "Welding" button in the left-hand ribbon



CAUTION! Risk of injury and damage from electric shock and from the wire electrode emerging from the torch. When pressing the torch trigger:

- keep the torch away from your face and body
- do not point the welding torch at people
- make sure that the wire electrode does not touch any electrically conducting or earthed (grounded) parts, such as the housing, etc.

- 2 Press the torch trigger and start welding

Whenever welding ends, the actual values for welding current, welding voltage and wire feed speed are stored, and HOLD appears on the display.



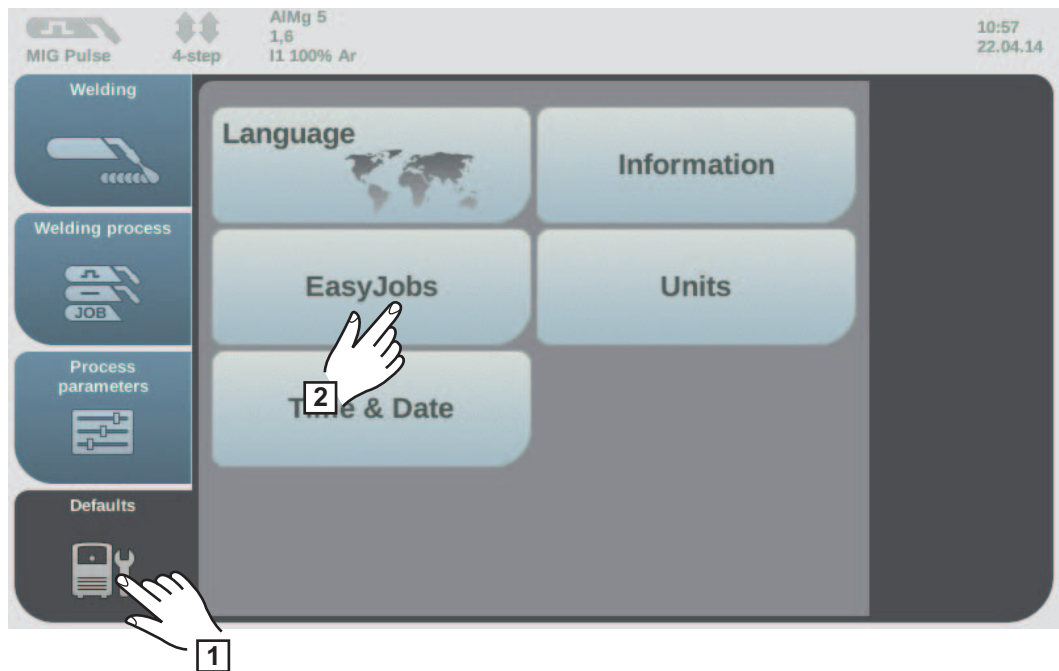
NOTE! Parameters that have been set on a system component control panel (e.g. wire feed unit or remote control) might not be able to be changed on the power source control panel.

EasyJob mode

General

If EasyJob mode has been activated, 5 additional buttons appear on the display. These enable up to 5 operating points to be saved at the touch of a button. The current welding settings are saved.

Activating Easy-Job mode



1 Select the "Defaults" button in the left-hand ribbon

2 Select the "EasyJobs" button

The overview to activate / deactivate EasyJob mode is displayed.



3 Select the "EasyJobs on" button

A tick appears in the "EasyJobs on" tick box.

7 Touch the "OK" button

EasyJob mode is activated, the default settings are displayed.

5 Select the "Welding" button in the left-hand ribbon

The 5 EasyJob buttons are displayed.



Storing EasyJob operating points



NOTE! The EasyJobs are stored under job numbers 1 - 5 and can also be retrieved using "Job mode".
Storing an EasyJob overwrites any other job saved under the same number!

1 To store the current welding settings, touch one of the EasyJob buttons for about 3 seconds

The size and colour of the button changes. After about 3 seconds, the button is displayed with a frame.

The settings have now been stored. The most recently stored settings will be active. An active EasyJob is indicated by a tick in the EasyJob button.



1 ~ 3 sec.



Retrieving Easy-Job operating points

- 1 To retrieve a saved EasyJob operating point, touch the corresponding EasyJob button briefly (< 3 seconds)

The size and colour of the button changes briefly; it is then displayed with a tick.



1 < 3 sec.

If a tick is not displayed after touching an EasyJob button, this means that there is no operating point saved under this button.

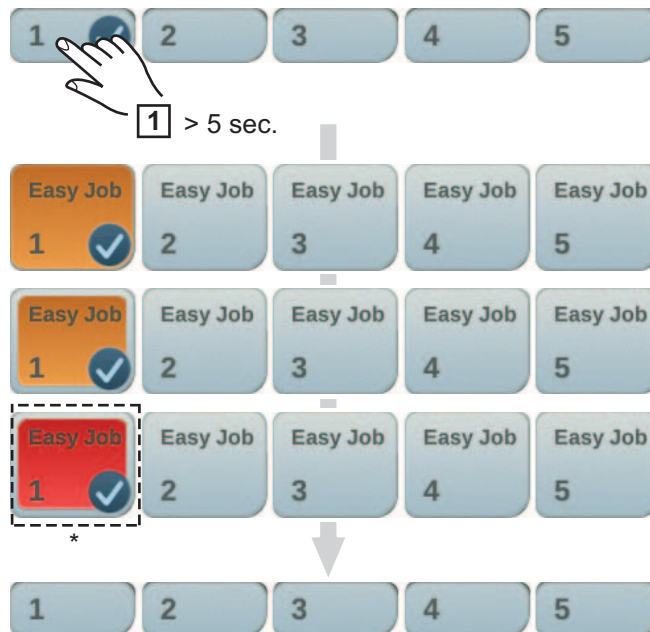
Deleting EasyJob operating points

- 1 To delete an EasyJob operating point, touch the relevant EasyJob button for approximately 5 seconds

The button

- first changes its size and colour;
- is displayed with a frame after about 3 seconds; the saved operating point is overwritten with the latest settings.
- is highlighted in red (= delete) after a total of 5 seconds.

The EasyJob operating point has been deleted.



* ... highlighted in red

Job mode

General

Up to 1000 jobs can be stored and retrieved in the power source. This eliminates the need for manual documenting of the welding parameters. "Job mode" enhances the quality of automated and manual applications.

Jobs can only be stored when in welding mode. When storing jobs, the process parameters and certain machine defaults are taken into account in addition to the present welding settings.

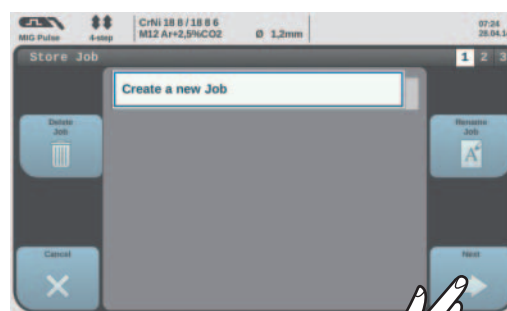
Store settings as a job

- 1 Setting the parameters that are to be stored as a job:
 - Welding parameters
 - Welding process
 - Process parameters
 - Machine defaults (if necessary)

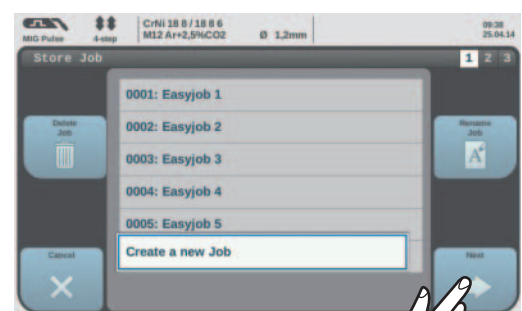


- 2 Touch "Store as job" in the right-hand ribbon

The list of empty jobs is displayed.



Empty list



List with already stored jobs, e.g. EasyJobs

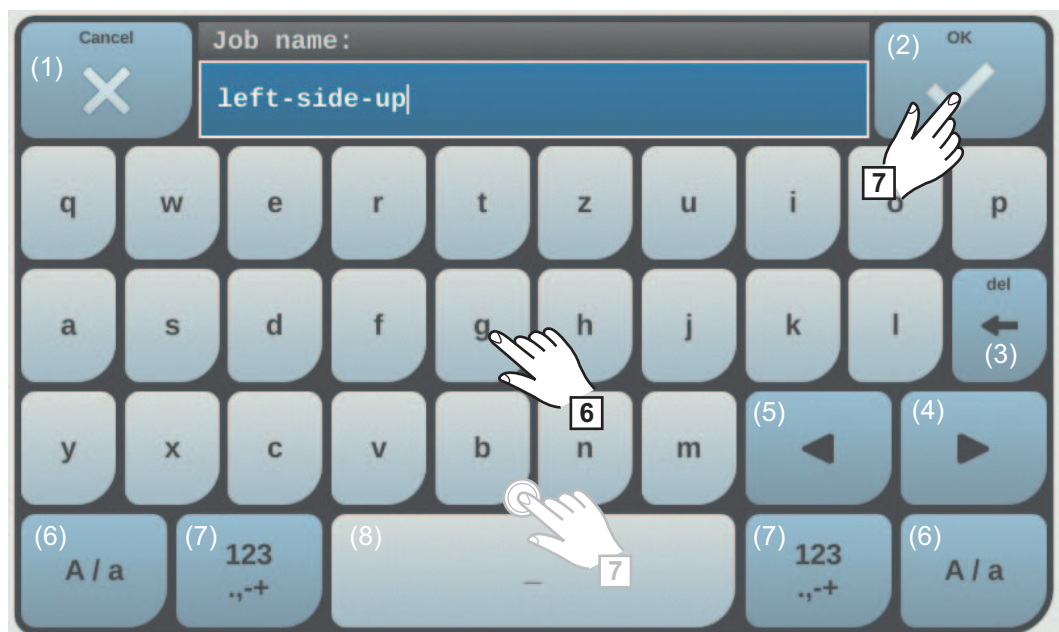
- 3 Touch the "Next" button

The next free job is displayed.



- 4** Turn the adjusting dial to select the desired location
- 5** Press the adjusting dial (or touch the "Next" button)

The keyboard is displayed.



- (1) Cancel button
- (2) OK button (Confirm)
- (3) Delete button (Delete)
- (4) Cursor back button
- (5) Cursor forward button
- (6) Upper/lower case button
- (7) Numbers / Special characters button
- (8) Space bar

- 6 Enter a job name from the keyboard
- 7 Touch "OK" and confirm the job name (or press the adjusting dial)

The name is saved and a confirmation that the job has been stored is displayed.

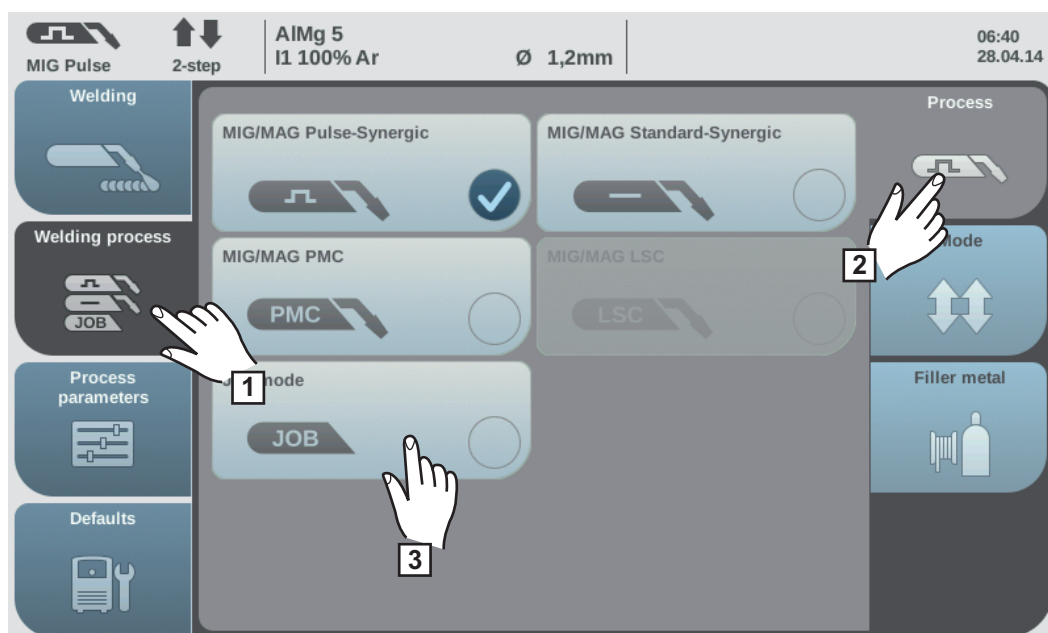


- 8 To exit, touch the "Finish" button (or press the adjusting dial)

NOTE! If an already occupied location is selected when storing a job, a prompt is displayed asking you to confirm that you want to overwrite the existing job.

Weld job - retrieving a job

NOTE! Before retrieving a job, make sure that the welding system has been installed and set up for the job.

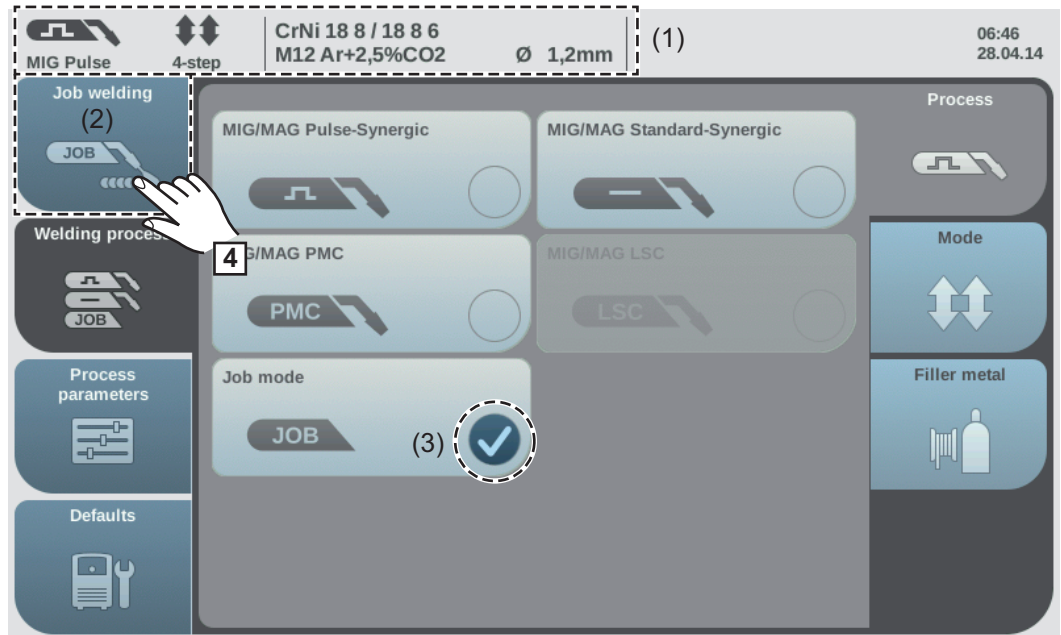


- 1 Select the "Welding process" button in the left-hand ribbon
- 2 Select the "Process" button in the right-hand ribbon
- 3 Select the "Job mode" button

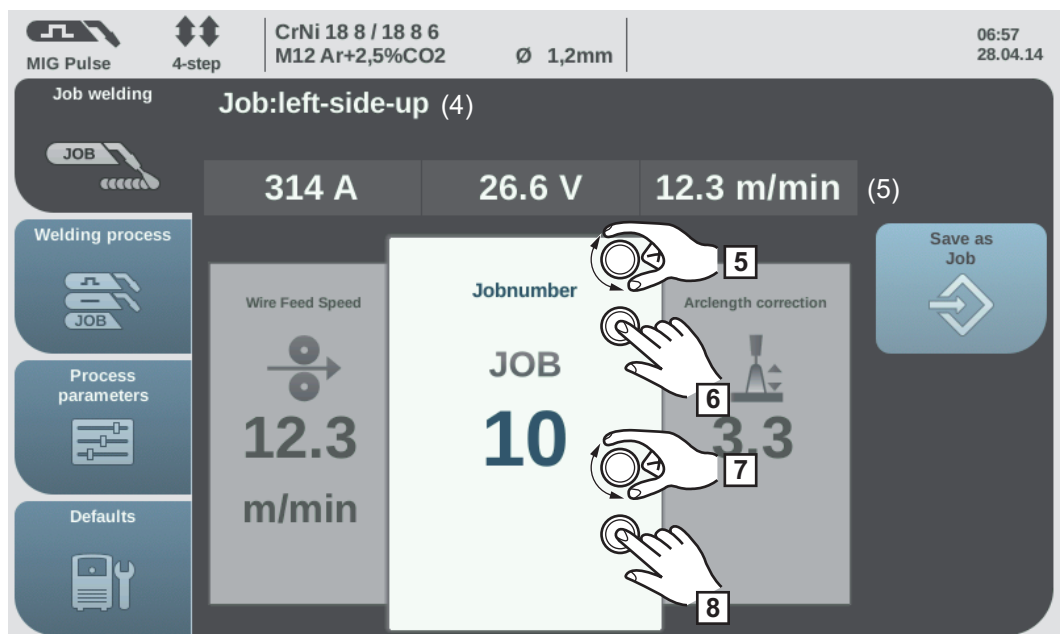
A tick (3) appears in the "Job mode" list box.

Job mode is activated.

In addition, "Weld job" (2) and the data from the most recently retrieved job (1) are displayed.



- 4 Select "Weld job" in the left-hand ribbon



- 5 Turn the adjusting dial to select the "Job number" welding parameter (white background)
- 6 To select the desired job, press the adjusting dial (blue background)
- 7 Turn the adjusting dial to select the desired job number (blue background)
The name of the selected job (4) is displayed above the actual value display (5).
- 8 Press the adjusting dial to accept the selected job number (white background)

9 Start welding

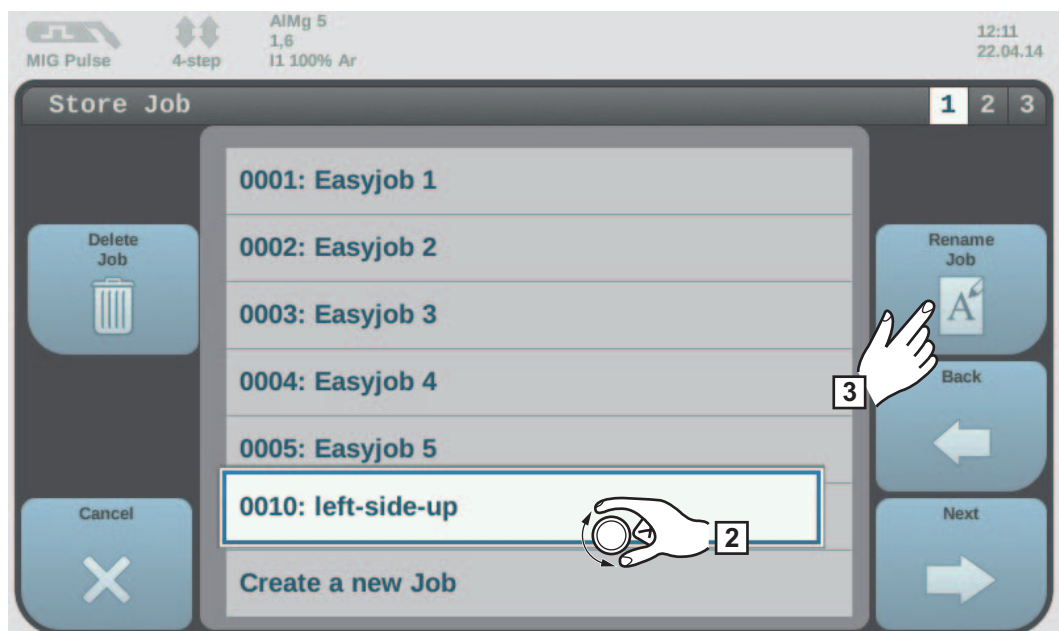
Important! "Job number" is the only parameter that can be altered in "Job mode", all the others are read-only

Renaming a job



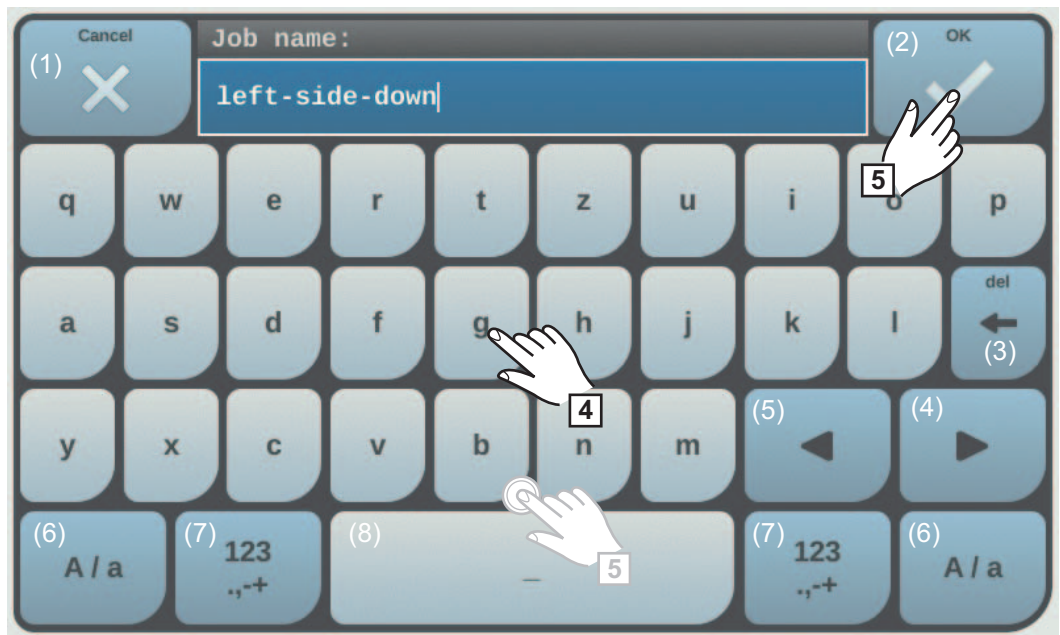
- 1 Touch "Store as job" in the right-hand ribbon (also works in "Job mode")

The job list is displayed.



- 2 Turn the adjusting dial to select the job that you want to rename
- 3 Touch the "Rename job" button

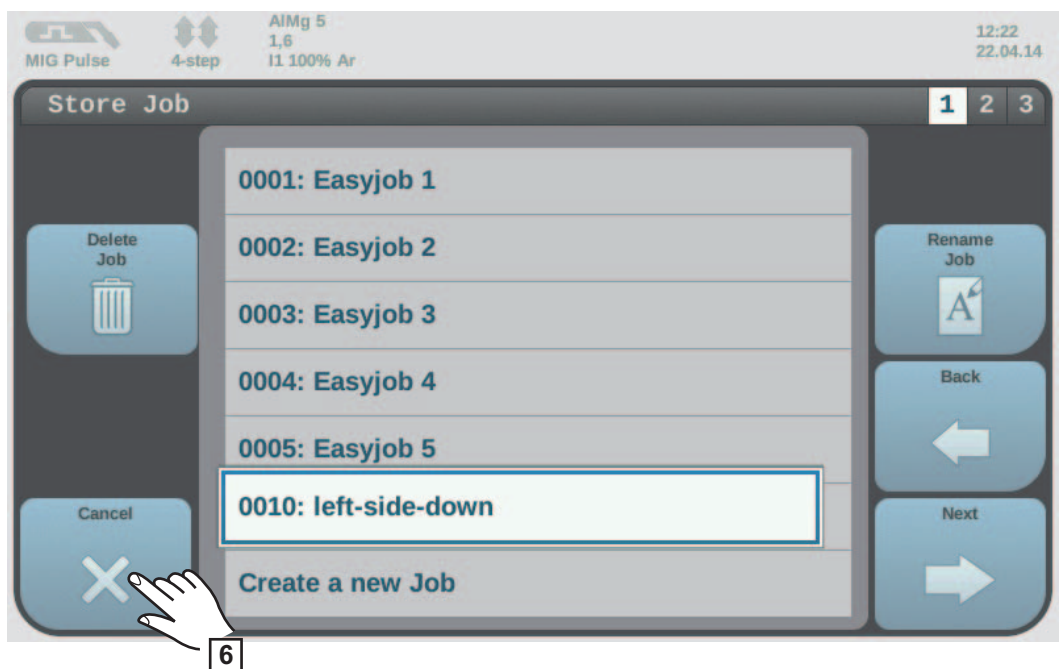
The keyboard is displayed.



- (1) Cancel button
- (2) OK button (Confirm)
- (3) Delete button (Delete)
- (4) Cursor back button
- (5) Cursor forward button
- (6) Upper/lower case button
- (7) Numbers / Special characters button
- (8) Space bar

- 4** Change the job name using the keyboard
- 5** Touch the "OK" button and confirm the changed job name (or press the adjusting dial)

The job name is changed, the job list is displayed.



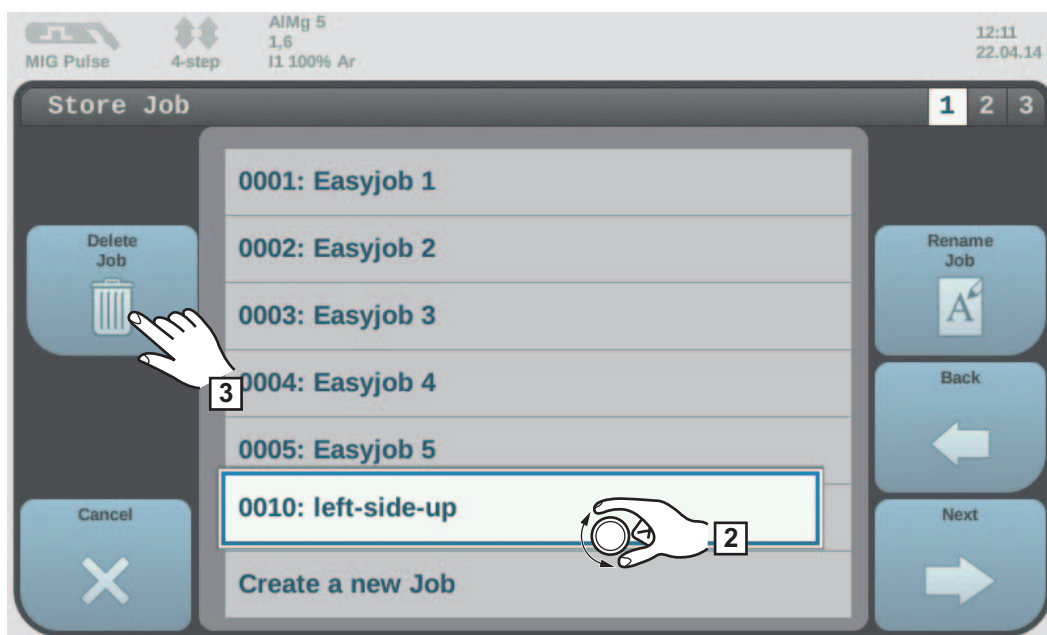
- 6** To exit, touch the "Cancel" button in the left-hand ribbon

Deleting a job



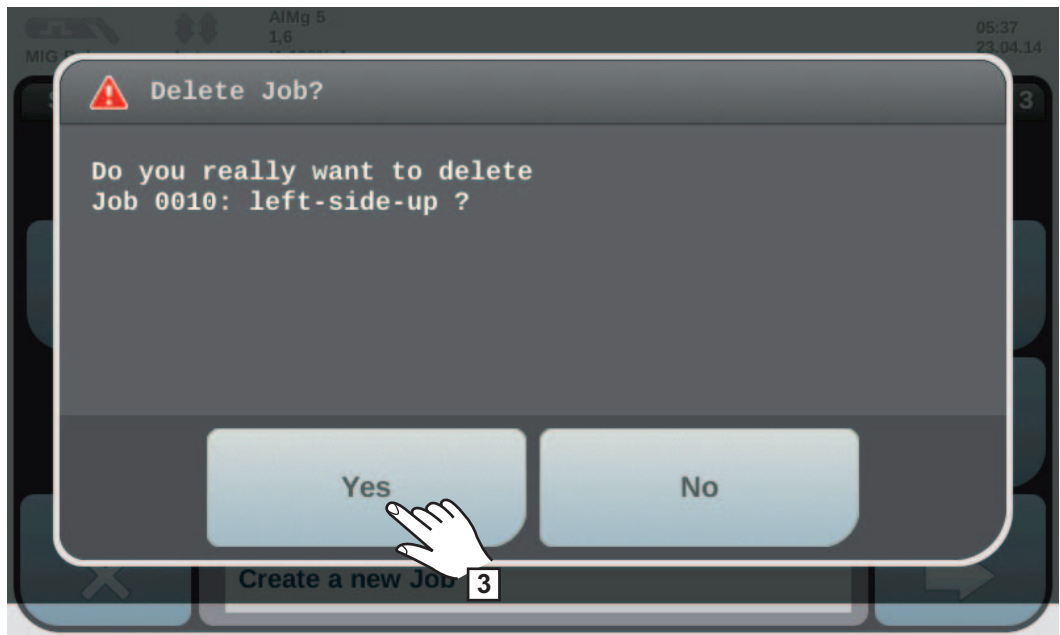
- 1 Touch "Store as job" in the right-hand ribbon (also works in "Job mode")

The job list is displayed.



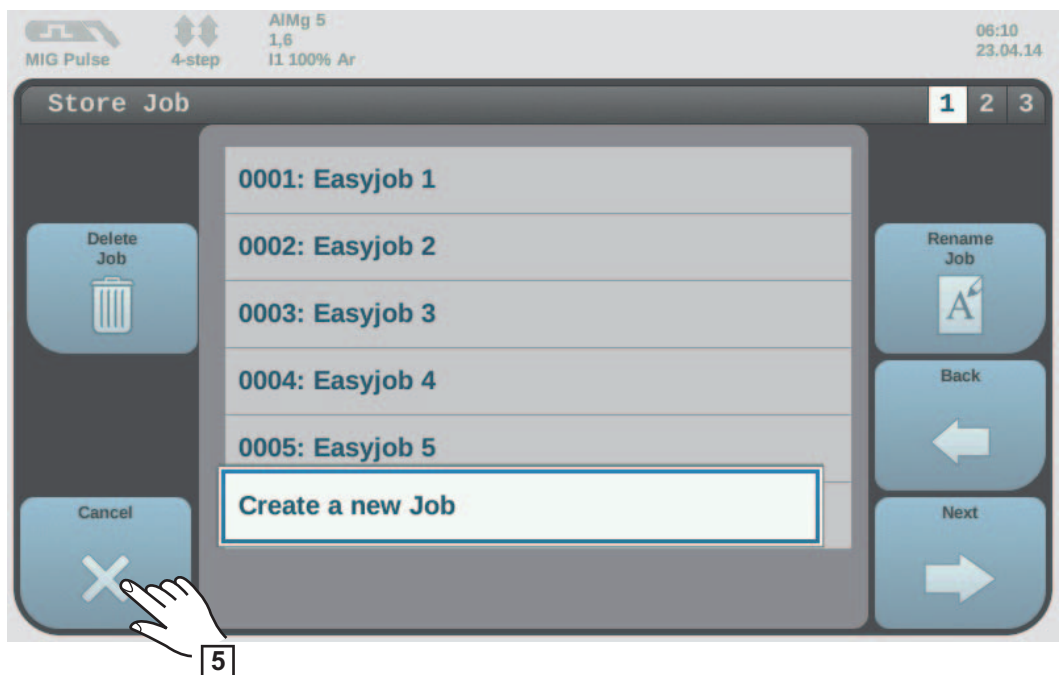
- 2 Turn the adjusting dial to select the job to be deleted
- 3 Select "Delete job" in the left-hand ribbon

A confirmation prompt asking whether you really want to delete the job is displayed.



4 Touch the "Yes" button to delete the selected job

The job name is deleted, the job list is displayed.



5 To exit, touch the "Cancel" button in the left-hand ribbon

Welding parameters

Welding parameters for MIG/MAG pulse synergic welding

The following welding parameter for MIG/MAG pulse synergic welding can be set and displayed by pressing the "Welding" button:

Current ¹⁾

Unit	A
Setting range	Depends on the welding process and welding program selected

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

Voltage ¹⁾

Unit	V
Setting range	Depends on the welding process and welding program selected

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

Material thickness ¹⁾

Unit	mm	in.
Setting range	0.1 - 30.0 mm ²⁾	0.004 - 1.18 ²⁾

Wire feed speed ¹⁾

Unit	m/min	ipm.
Setting range	0.5 - max. ²⁾	19.69 - max. ²⁾

Arc length correction

For correcting the arc length

Setting range	-10 - +10
Factory setting	0
-	Shorter arc length
0	Neutral arc length
+	Longer arc length

Pulse/dynamic correction

For correcting the pulsing energy of a pulsed arc

Setting range	-10 - +10
Factory setting	0
-	Lower droplet detachment force
0	Neutral droplet detachment force
+	Higher droplet detachment force

Welding parameters for MIG/MAG standard synergic welding

The following welding parameters for MIG/MAG standard synergic welding can be set and displayed by selecting the "Welding" menu button:

Current recomm value ¹⁾

Unit	A
Setting range	depends on the welding process and welding program selected

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

Voltage recomm value ¹⁾

Unit	V
Setting range	depends on the welding process and welding program selected

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

Material command value ¹⁾

Unit	mm	in.
Setting range	0.1 - 30.0 mm ²⁾	0.004 - 1.18 ²⁾

Feeder command value ¹⁾

for setting a harder, more stable arc

Unit	m/min	ipm.
Setting range	0.5 - max. ²⁾	19.69 - max ²⁾

Arc length correction

for correcting the arc length

Setting range	-10 - +10
Factory setting	0
-	shorter arc length
0	neutral arc length
+	longer arc length

Pulse/dynamic correction

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

Setting range	-10 - +10
Factory setting	0
-	harder, more stable arc
0	neutral arc
+	soft, low-spatter arc

Explanation of footnotes

- 1) Synergic parameter
When a synergic parameter is changed, the synergic function automatically changes all other synergic parameters to match.

The real setting range depends on power source and wire feeder used and on the welding program.
- 2) The real setting range depends on the welding program.
- 3) The maximum value depends on the wire feeder used.

Process parameters

Overview

The "Process parameters" menu button contains the following selection options:

- Start of welding / end of welding
- Gas setup
- Process control
- R/L alignment
- Components



Process parameters for start of welding / end of welding

The following parameters can be set and displayed for the start and end of welding:

Starting current

for setting the starting current for MIG/MAG welding (e.g. aluminium welding start-up)

Unit	% (of welding current)
Setting range	0 - 200
Factory setting	135

Start arc length correction

for correcting the arc length at the start of welding

Unit	% (of welding voltage)
Setting range	-10 - +10
Factory setting	0

-	shorter arc length
0	neutral arc length
+	longer arc length

Slope 1

for setting the time during which the starting current is decreased or increased to the welding current

Unit	s
Setting range	0 - 9.9
Factory setting	1

Slope 2

for setting the time during which the welding current is decreased or increased to the final current.

Unit	s
Setting range	0 - 9.9
Factory setting	1

Final current

for setting the final current so that

- a) heat build-up towards the end of welding is prevented and
- b) the crater is filled (in the case of aluminium)

Unit	% (of welding current)
Setting range	0 - 200
Factory setting	50

End arc length correction

for correcting the arc length at the end of welding

Unit	% (of welding voltage)
Setting range	-10 - +10
Factory setting	0

-	shorter arc length
0	neutral arc length
+	longer arc length

Wire withdrawal

for setting the wire withdrawal value (= composite value based on backward movement of wire and a time)

The wire withdrawal depends on the features of the welding torch.

Unit	-
Setting range	0 - 10
Factory setting	0

Process parameters for gas setup

The following parameters can be set and displayed for the gas setup:

Gas pre-flow

for setting the gas flow time before the arc is ignited

Unit	s
Setting range	0 - 9.9
Factory setting	0.1

Gas post-flow

for setting the gas post-flow time after the arc has gone out

Unit	s
Setting range	0 - 9.9
Factory setting	0.5

Process parameters for process regulation

The following parameters can be set and displayed for the process control:

Fusion penetration stabiliser

For setting the max. permitted change in the wire feed speed to ensure that the welding current and hence the fusion penetration is kept stable or constant

The fusion penetration stabiliser parameter is only available when the WP PMC (Welding Process Pulse Multi Control) or WP LSC (Welding Process Low Spatter Control) option has been enabled on the power source.

Unit	m/min
Setting range	0 - 10.0
Factory setting	0

0	The penetration stabiliser is not activated. The wire feed speed remains constant.
---	---------------------------------------------------------------------------------------

0.1 - 10.0	The penetration stabiliser is activated. The welding current remains constant.
------------	-----------------------------------------------------------------------------------

Arc length stabiliser

To activate/deactivate the arc length stabiliser in order to stabilise the short circuit behaviour of arcs that are subject to short circuits (irrespective of the welding position, the seam geometry or external interference)

The arc length stabiliser enables the advantages of a short, stable and controlled arc to be used more effectively.

The arc length stabiliser parameter is only available on the power source if the WP PMC (Welding Process Pulse Multi Control) option has been enabled.

Unit -

Setting range 0 - 2.0

Factory setting 0

0 The arc length stabiliser is deactivated.

0.1 - 2.0 The arc length stabiliser is activated.
The arc length is decreased until short circuits start to occur.

R/L adjustment

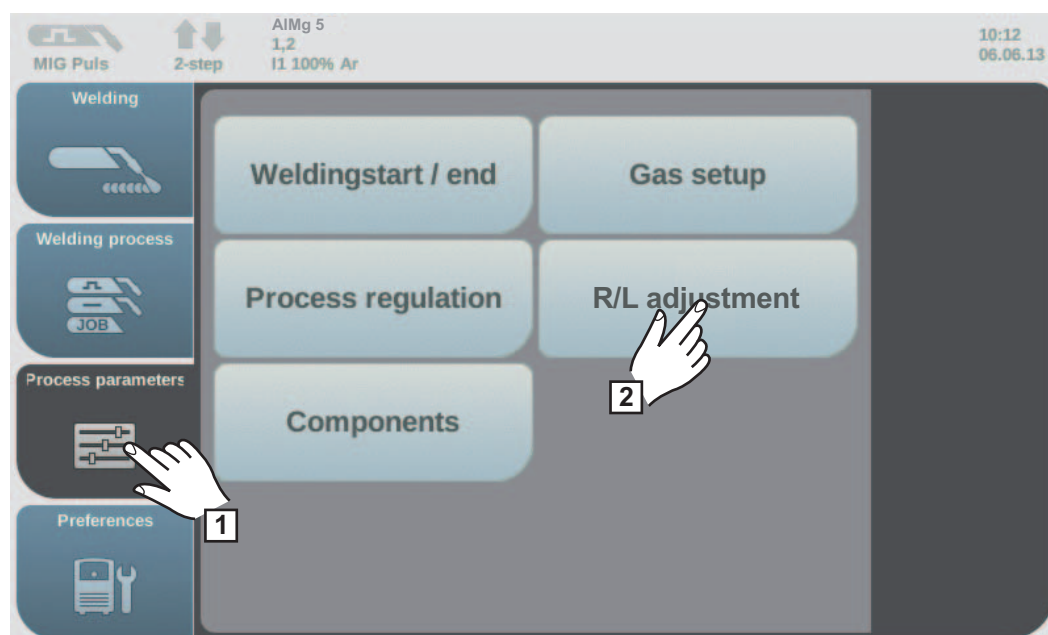
Align the welding circuit resistance (R) and welding circuit inductivity (L) if one of the following components of the welding device is changed:

- Torch hosepacks
- Interconnecting hosepacks
- Grounding (earthing) cables, welding cables
- Wire-feed units
- Welding torches, electrode holders
- Push-pull units

Prerequisites for R/L adjustment

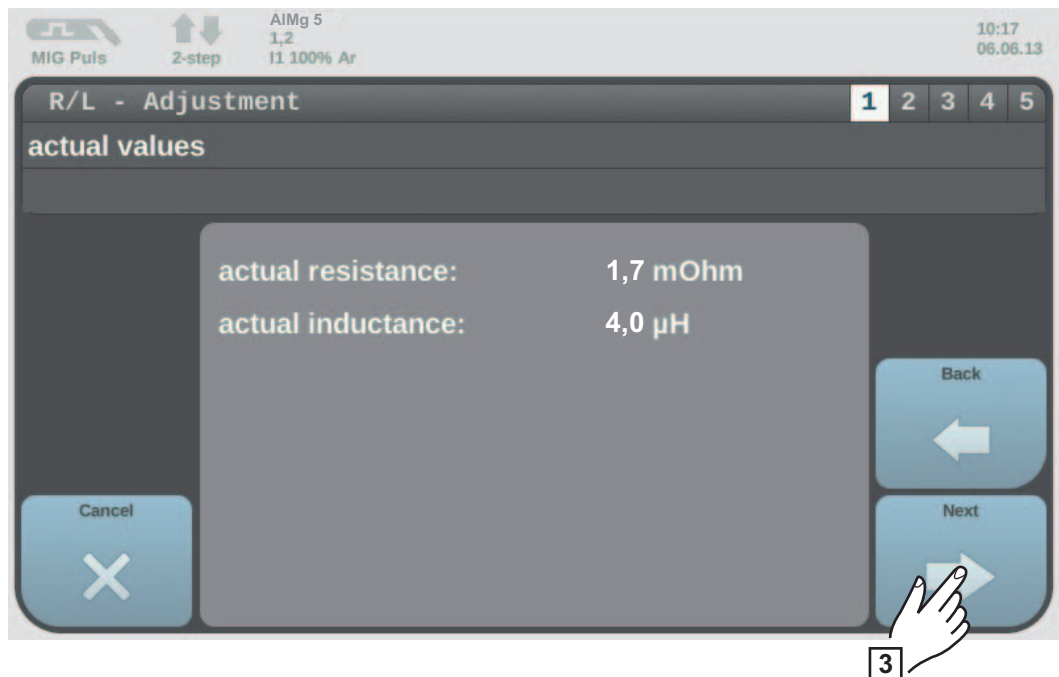
The welding system must be complete: closed welding loop with torch and torch hosepack, wire-feed units, grounding (earthing) cable, interconnecting hosepacks.

Performing R/L adjustment



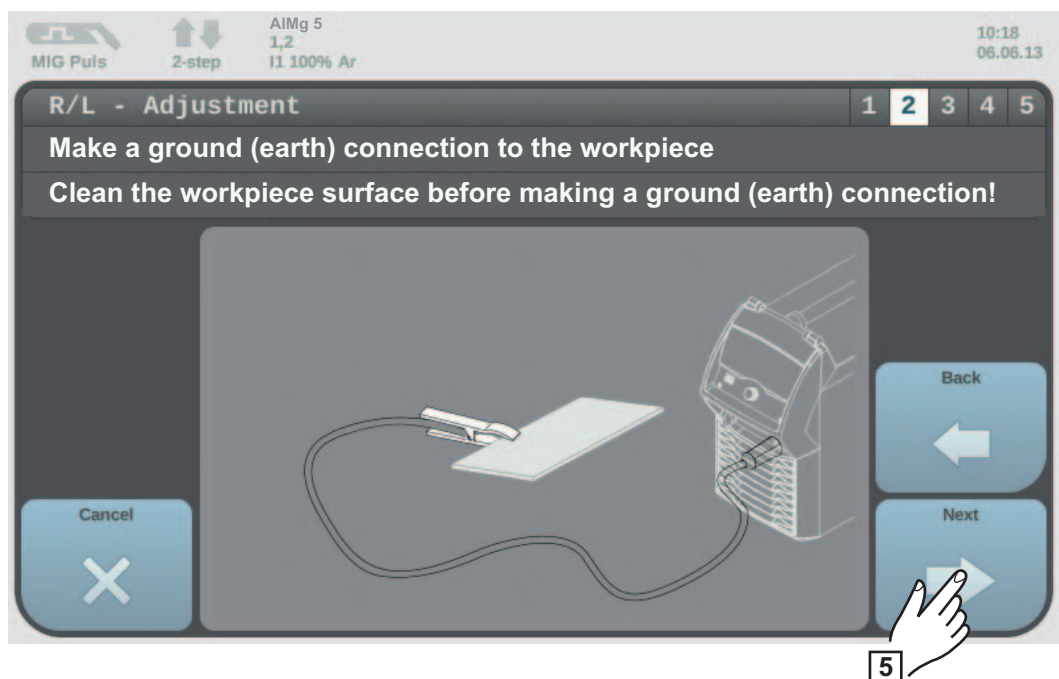
- 1 Select the "Process parameters" button in the left-hand ribbon
- 2 Select the "R/L adjustment" button

The current welding circuit inductivity and welding circuit resistance values are displayed:



- 3 Touch "Next"
(or press the adjusting dial or the torch trigger)

The second step of the R/L adjustment wizard appears:



- 4 Follow the displayed instructions

IMPORTANT! Contact between the earthing clamp and workpiece must be established on a cleaned area of the workpiece.

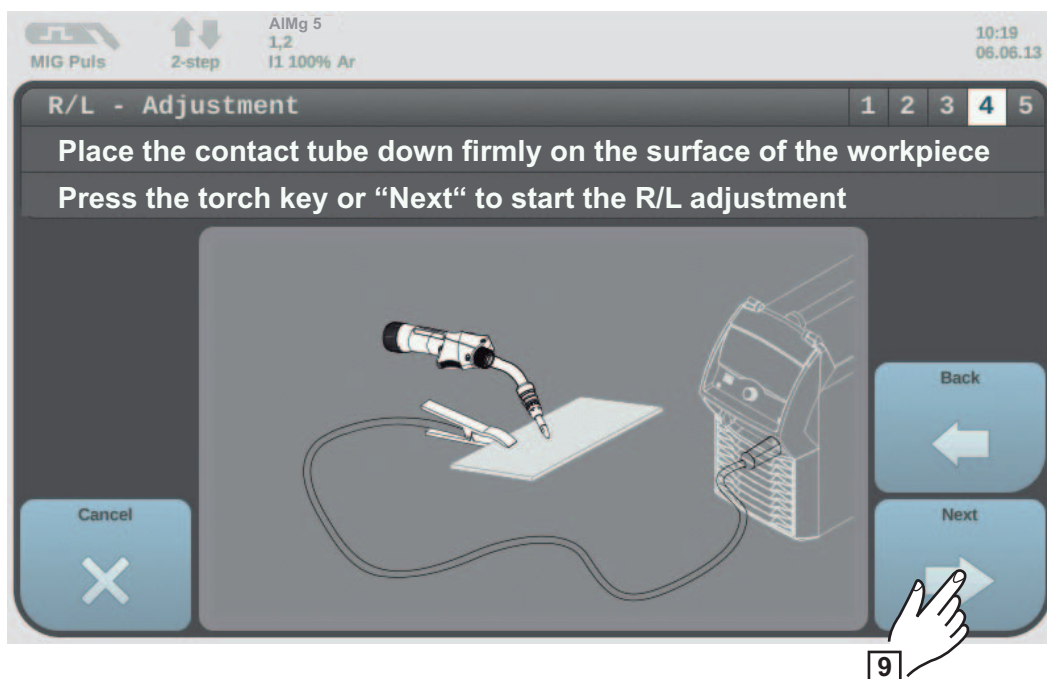
- 5 Touch "Next"
(or press the adjusting dial or the torch trigger)

The third step of the R/L alignment wizard appears:



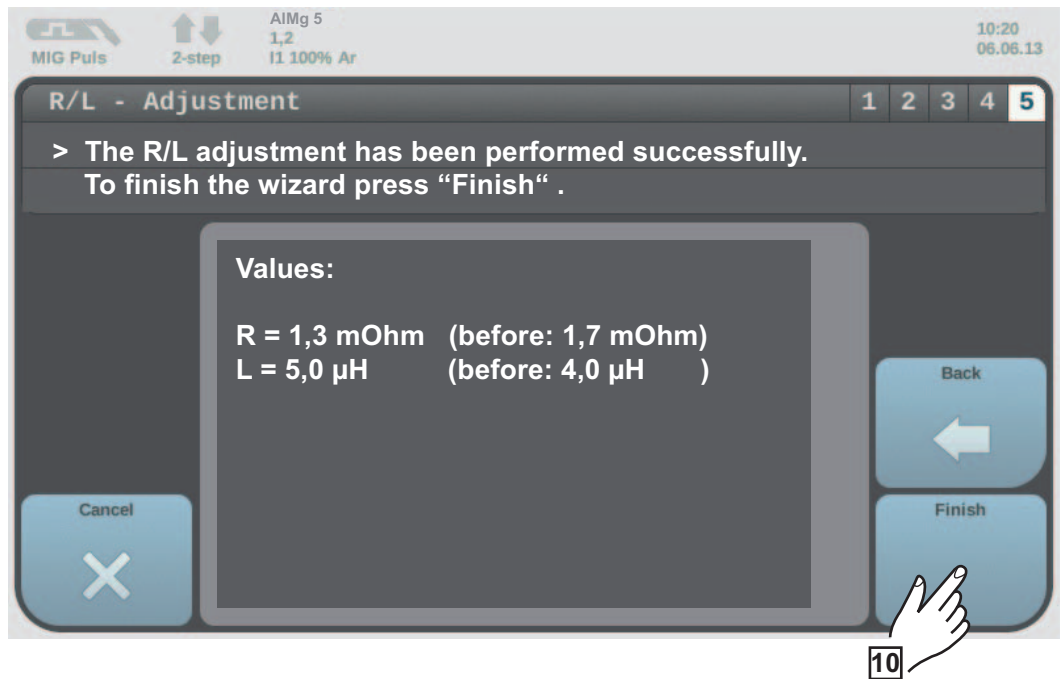
- 6 Follow the displayed instructions
- 7 Touch "Next"
(or press the adjusting dial or the torch trigger)

The fourth step of the R/L alignment wizard appears:



- 8 Follow the displayed instructions
- 9 Press the torch trigger
(or touch "Next" or press the adjusting dial)

After a successful measurement, the current values are displayed:



- 10** Press "Finish"
(or press the adjusting dial)

Process parameters for components

The following process parameters can be set and displayed for the system components of a welding device:

Cooling unit mode

to determine whether a cooling unit is to be switched on or off, or operated automatically

Setting range	eco / auto / on / off (depending on the cooling unit)
Factory setting	auto

Flow watchdog filter time

for setting the time from when the flow watchdog responds until a warning message is output

Unit	s
Setting range	5 - 25
Factory setting	5

Feeder inching speed

for setting the wire feed speed at which the wire electrode is threaded into the torch hose-pack

Unit	m/min
Setting range	min. - max.
Factory setting	-

Defaults

Defaults

General remarks



NOTE! As a result of firmware updates, you may find that there are functions available on your unit that are not described in these operating instructions or vice versa. Certain illustrations may also differ slightly from the actual control elements on your device. However, these controls function in exactly the same way.



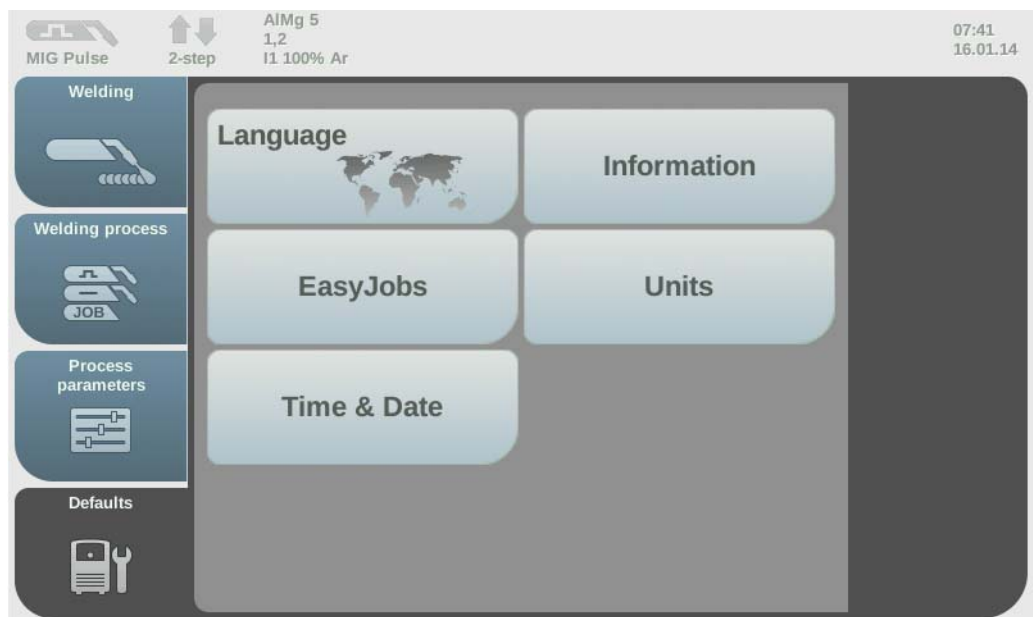
WARNING! Operating the equipment incorrectly can cause serious injury and damage. Do not use the functions described until you have thoroughly read and understood the following documents:

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

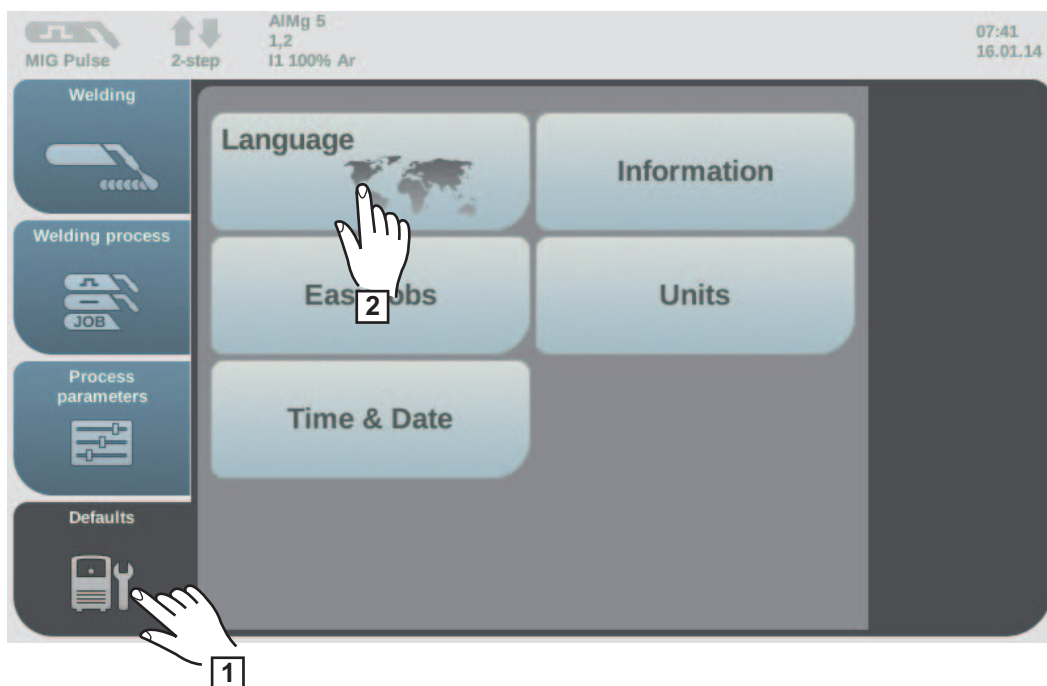
Overview

The "defaults" offer the following options:

- Language
- Information
- EasyJobs
- Units
- Date & time



Setting the language



- 1 Select the "Defaults" button in the left-hand ribbon
- 2 Select the "Language" button

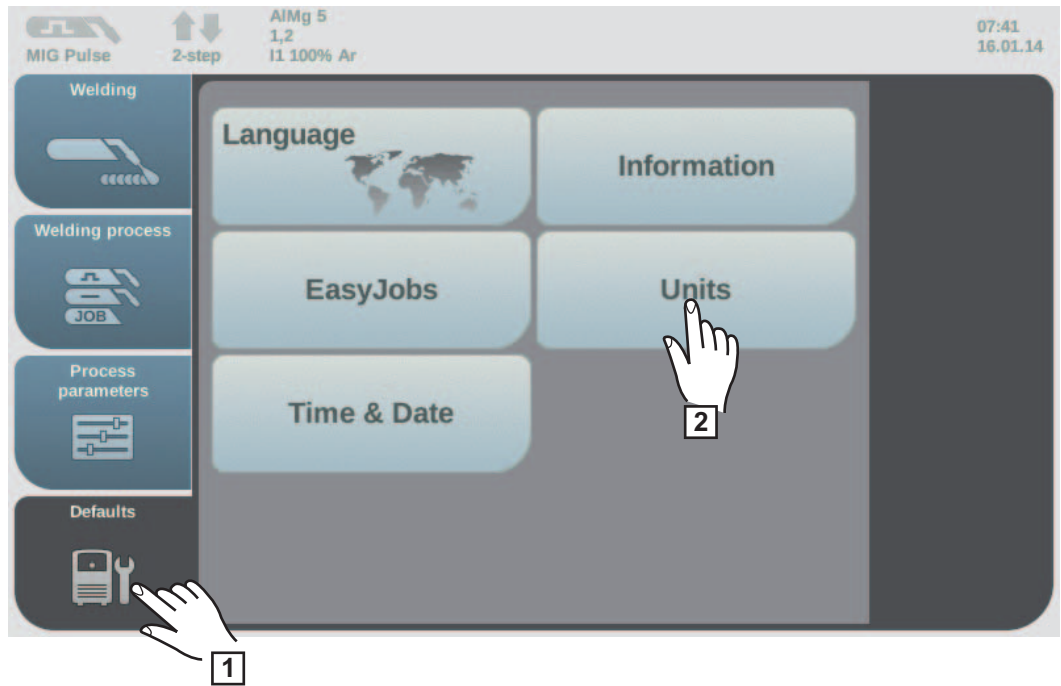
An overview of the available languages is displayed.



- 3 Turn the adjusting dial to select the desired language
- 4 Touch the "OK" touch button to exit the language selection (or press the adjusting dial)

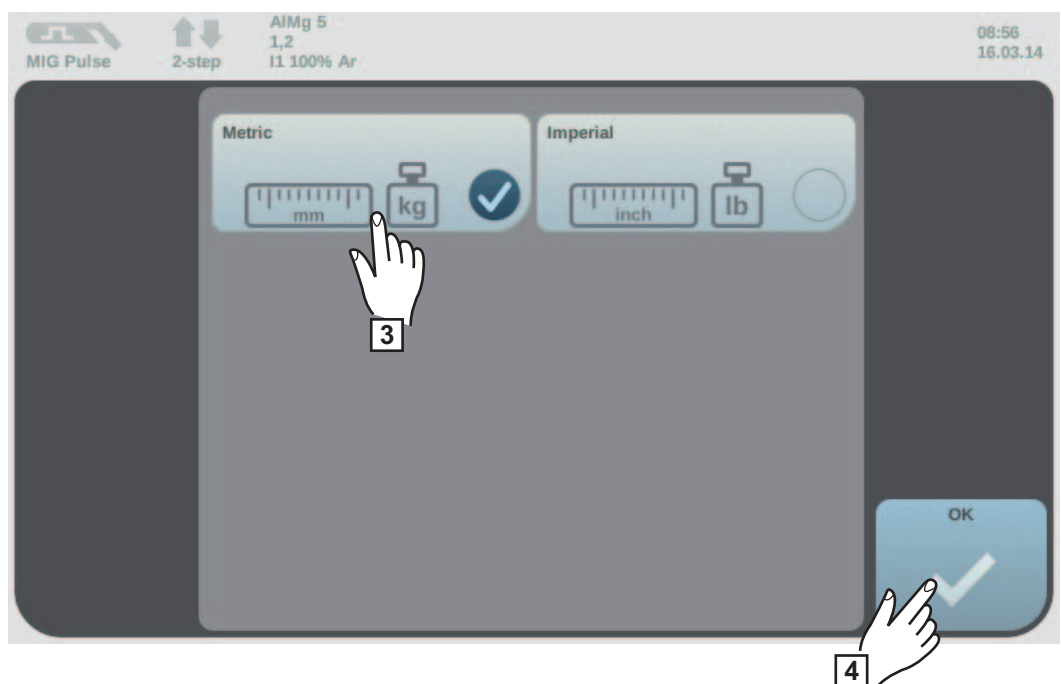
The welding parameters are displayed in the selected language.

Setting the units



- 1** Select the "Defaults" button in the left-hand ribbon
- 2** Select the "Units" button

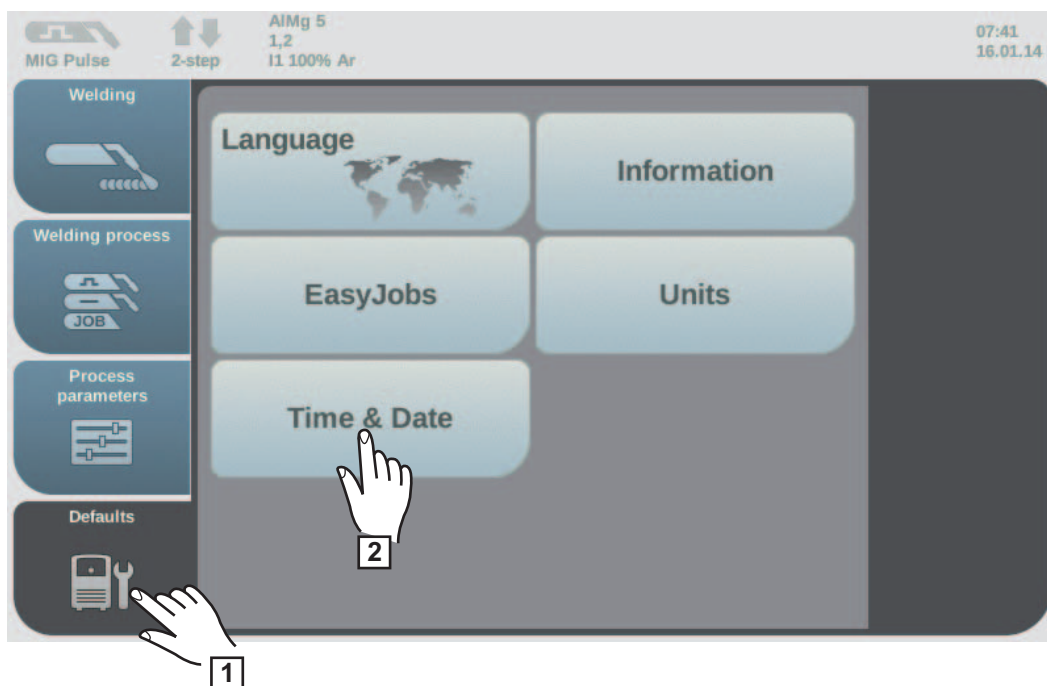
An overview of the units is displayed.



- 3** Select the desired unit
- 4** Touch the "OK" button to exit the unit selection

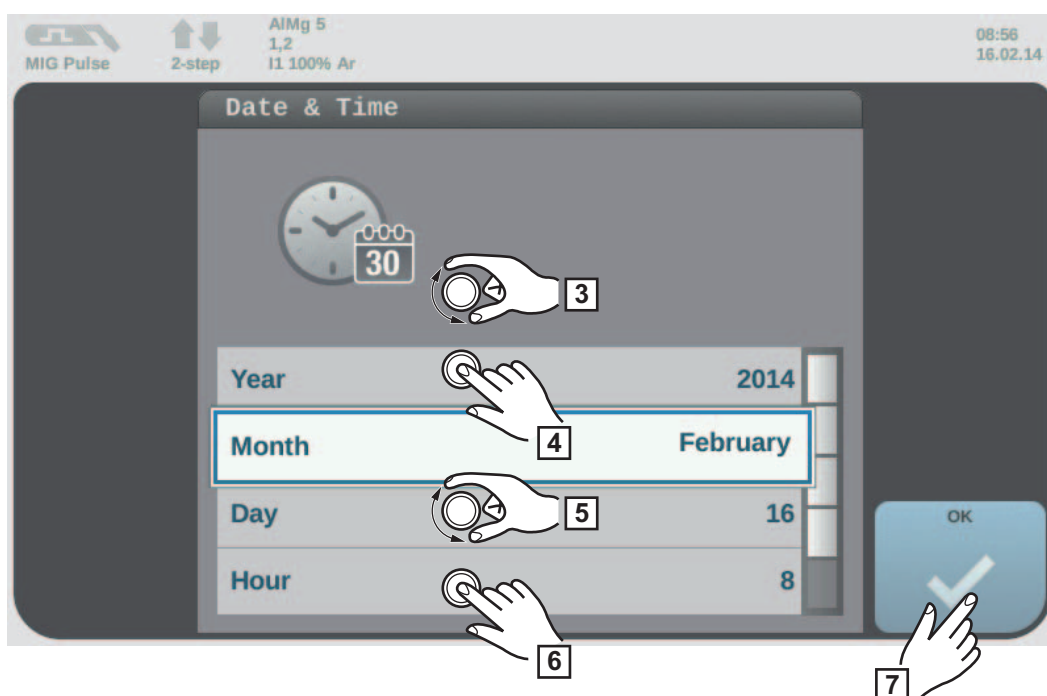
An overview of the units is displayed.

Setting date and time



- 1** Select the "Defaults" button in the left-hand ribbon
- 2** Select the "Date & time" button

An overview of the date and time is displayed.



- 3** Turn the adjusting dial to select the desired parameter
Year / Month / Day / Hour / Minute
(white background)
- 4** Press the adjusting dial to set the parameter (blue background)
- 5** Turn the adjusting dial to set the required value (blue background)
- 6** Press the adjusting dial to apply the set value (white background)

- 7 Touch the "OK" button to exit the Set date and time routine (or press the adjusting dial)

The settings are displayed.

Troubleshooting and maintenance

Troubleshooting

General

The power sources are equipped with an intelligent safety system, meaning it has been possible to dispense with nearly all fuses. After a possible malfunction has been remedied, the power source can be used again as normal.

Possible malfunctions, warning notices or status codes are shown on the display as plain text dialogues.

Safety



WARNING! An electric shock can be fatal. Before opening the device

- Turn the mains switch to the "O" position
- Unplug the machine from the mains
- Prevent it from being switched on again
- Using a suitable measuring instrument, check to make sure that electrically charged components (e.g. capacitors) have discharged



CAUTION! Inadequate PE conductor connections can cause serious injury and damage. The housing screws provide a suitable PE conductor connection for earthing (grounding) the housing and must NOT be replaced by any other screws which do not provide a reliable PE conductor connection.

Power source - troubleshooting

Power source does not 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 is faulty

Remedy: Change the mains fuse protection

No welding current

mains switch is on, overtemperature is displayed

Cause: Overload; the duty cycle has been exceeded

Remedy: Check duty cycle

Cause: Thermostatic automatic circuit breaker has 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: Ensure accessibility to cooling-air ducts

Cause: The fan in the power source is faulty

Remedy: Replace the fan (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 and terminal for correct polarity

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

Remedy: Replace welding torch

Nothing happens when torch trigger is pressed

mains switch is on and indicators are lit up

Cause: The control plug is not plugged in

Remedy: Plug in the control plug

Cause: Welding torch or welding torch control line is faulty

Remedy: Replace welding torch

Cause: The interconnecting hosepack is faulty or not connected properly

Remedy: Check interconnecting hosepack

No protective gas shield

all other functions are OK

Cause: Gas cylinder is empty

Remedy: Change the gas cylinder

Cause: Gas pressure regulator is faulty

Remedy: Change the gas pressure regulator

Cause: The gas hose is not connected, or is damaged or kinked

Remedy: Connect/replace the gas hose, or straighten out kinks

Cause: Welding torch is faulty

Remedy: Change the welding torch

Cause: Gas solenoid valve is faulty

Remedy: Replace gas solenoid valve

Poor weld properties

Cause: Incorrect welding parameters

Remedy: Check the settings

Cause: Poor grounding (earthing) 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; check the weldability of the base metal
Cause:	The shielding gas is not suitable for this wire alloy
Remedy:	Use the correct shielding gas

Irregular wire feed 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.
Cause:	The feed 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

when using long hosepacks

Cause:	Incorrect arrangement of hosepack
Remedy:	Arrange the hosepack in as straight a line as possible, avoid tight bends

The welding torch becomes very hot

Cause:	The specification of the welding torch is inadequate
Remedy:	Observe the duty cycle and loading limits
Cause:	Only on water-cooled machines: Inadequate coolant flow
Remedy:	Check coolant fill level, coolant flow, for coolant contamination, etc.

Care, maintenance and disposal

General

Under normal operating conditions, the power source 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! An electric shock can be fatal. Before opening the device

- Turn the mains switch to the "O" position
 - Unplug the machine from the mains
 - Prevent it from being switched on again
 - Using a suitable measuring instrument, check to make sure that electrically charged components (e.g. capacitors) have discharged
-

At every start-up

- Check mains plug, mains cable, welding torch, interconnecting hosepack and grounding (earthing) connection for damage
- Check whether the all-round clearance of 0.5 m (1 ft. 8 in.) is kept to ensure that the cooling air can easily flow and escape.



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

Every 2 months

- If present: clean air filter
-

Every 6 months



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

- open the device
 - clean out the device interior using dry compressed air at reduced pressure
 - if a lot of dust has accumulated, clean the cooling air ducts.
-

Updating firmware

Important! To update the firmware you need a PC or laptop that is connected to the power source via an Ethernet network.

- 1 Get latest firmware (e.g. from the DownloadCenter)
File format: official_tpsi_x.x.x-xxxx.ffw
 - 2 Establish Ethernet connection between PC/laptop and power source
 - 3 Transfer the firmware to the power source
-

Disposal

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

Appendix

Technical data

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

For all machines with a permitted mains voltage of up to 460 V: The standard mains plug allows the user to operate with a mains voltage of up to 400 V. For mains voltages up to 460 V fit a mains plug permitted for such use or install the mains supply directly.

TPS 320i

Mains voltage (U_1)	3x	400 V
Max. effective primary current ($I_{1\text{eff}}$)		12.3 A
Maximum primary current ($I_{1\text{max}}$)		19.4 A
Mains fuse		35 A slow-blow
Mains voltage tolerance		+/- 15 %
Mains frequency		50 / 60 Hz
Cos phi (1)		0.99
Max. permitted mains impedance Z_{max} on PCC ¹⁾		95 mOhm
Recommended earth-leakage circuit breaker		Type B
Welding current range (I_2)		
MIG/MAG		3 - 320 A
Rod electrode		10 - 320 A
Welding current at 10 min / 40 °C (104 °F)	40 % 320 A	60 % 260 A
		100 % 240 A
Output voltage range according to standard characteristic (U_2)		
MIG/MAG		14.2 - 30.0 V
Rod electrode		20.4 - 32.8 V
Open circuit voltage (U_0 peak / U_0 r.m.s)		73 V
Degree of protection		IP 23
Type of cooling		AF
Overvoltage category		III
Pollution level according to IEC60664		3
EMC device class		A
Safety symbols		S, CE
Dimensions l x w x h		706 x 300 x 510 mm 27.8 x 11.8 x 20.1 in.
Weight		35.0 kg 77.16 lb.
Max. shielding gas pressure		7.0 bar 101.49 psi
Coolant		Original Fronius

1) Interface to a 230/400 V, 50 Hz public grid

TPS 320i /nc

Mains voltage (U_1)	3x	380 V	400 V	460 V
Max. effective primary current ($I_{1\text{eff}}$)		12.7 A	12.3 A	11.4 A
Maximum primary current ($I_{1\text{max}}$)		20.1 A	19.4 A	18.0 A
Mains fuse			35 A slow-blow	
Mains voltage tolerance				+/- 15 %
Mains frequency				50 / 60 Hz
Cos phi (1)				0.99
Max. permitted mains impedance Z_{max} on PCC ¹⁾				95 mOhm
Recommended earth-leakage circuit breaker				Type B
Welding current range (I_2)				
MIG/MAG				3 - 320 A
Rod electrode				10 - 320 A
Welding current at 10 min / 40 °C (104 °F)		40 %	60 %	100 %
$U_1 = 380 - 460 \text{ V}$		320 A	260 A	240 A
Output voltage range according to standard characteristic (U_2)				
MIG/MAG				14.2 - 30.0 V
Rod electrode				20.4 - 32.8 V
Open circuit voltage (U_0 peak / U_0 r.m.s)				84 V
Degree of protection				IP 23
Type of cooling				AF
Overvoltage category				III
Pollution level according to IEC60664				3
EMC device class				A
Safety symbols				S, CE, CSA
Dimensions l x w x h		706 x 300 x 510 mm		27.8 x 11.8 x 20.1 in.
Weight				33.7 kg 74.30 lb.
Max. shielding gas pressure				7.0 bar 101.49 psi
Coolant				Original Fronius

1) Interface to a 230/400 V, 50 Hz public grid

TPS 320i /600V/nc

Mains voltage (U_1)	3x	575 V
Max. effective primary current ($I_{1\text{eff}}$)		10.6 A
Maximum primary current ($I_{1\text{max}}$)		16.7 A
Mains fuse		35 A slow-blow
Mains voltage tolerance		+/- 10 %
Mains frequency		50 / 60 Hz
Cos phi (1)		0.99
Recommended earth-leakage circuit breaker		Type B
Welding current range (I_2)		
MIG/MAG		3 - 320 A
Rod electrode		10 - 320 A
Welding current at 10 min / 40 °C (104 °F)	40 %	60 % 100 %
$U_1 = 380 - 460 \text{ V}$	320 A	260 A 240 A
Output voltage range according to standard characteristic (U_2)		
MIG/MAG		14.2 - 30.0 V
Rod electrode		20.4 - 32.8 V
Open circuit voltage (U_0 peak / U_0 r.m.s)		67 V
Degree of protection		IP 23
Type of cooling		AF
Overvoltage category		III
Pollution level according to IEC60664		3
Safety symbols		S, CSA
Dimensions l x w x h		706 x 300 x 510 mm 27.8 x 11.8 x 20.1 in.
Weight		32.7 kg 72.09 lb.
Max. shielding gas pressure		7.0 bar 101.49 psi
Coolant		Original Fronius

TPS 320i /MV/nc

Mains voltage (U_1)	3x	200 V	230 V
Max. effective primary current (I_{1eff})		22.0 A	19.0 A
Maximum primary current (I_{1max})		34.7 A	30.1 A
Mains fuse		35 A slow-blow	
Mains voltage (U_1)	3x	380 V	400 V 460 V
Max. effective primary current (I_{1eff})		12.0 A	11.6 A 10.7 A
Maximum primary current (I_{1max})		19.0 A	18.3 A 16.8 A
Mains fuse		35 A slow-blow	
Mains voltage tolerance		-10 / +15 %	
Mains frequency		50 / 60 Hz	
Cos phi (1)		0.99	
Max. permitted mains impedance Z_{max} on PCC ¹⁾		54 mOhm	
Recommended earth-leakage circuit breaker		Type B	
Welding current range (I_2)			
MIG/MAG		3 - 320 A	
Rod electrode		10 - 320 A	
Welding current at 10 min / 40 °C (104 °F)	40 %	60 %	100 %
$U_1 = 200 - 230$ V	320 A	260 A	240 A
$U_1 = 380 - 460$ V	320 A	260 A	240 A
Output voltage range according to standard characteristic (U_2)			
MIG/MAG		14.2 - 30.0 V	
Rod electrode		20.4 - 32.8 V	
Open circuit voltage (U_0 peak / U_0 r.m.s)		68 V	
Degree of protection		IP 23	
Type of cooling		AF	
Overvoltage category		III	
Pollution level according to IEC60664		3	
EMC device class		A	
Safety symbols		S, CE, CSA	
Dimensions l x w x h		706 x 300 x 510 mm 27.8 x 11.8 x 20.1 in.	
Weight		42.8 kg 94.36 lb.	
Max. shielding gas pressure		7.0 bar 101.49 psi	
Coolant		Original Fronius	

1) Interface to a 230/400 V, 50 Hz public grid

TPS 400i

Mains voltage (U_1)	3x	400 V
Max. effective primary current ($I_{1\text{eff}}$)		15.9 A
Maximum primary current ($I_{1\text{max}}$)		25.1 A
Mains fuse		35 A slow-blow
Mains voltage tolerance		+/- 15 %
Mains frequency		50 / 60 Hz
Cos phi (1)		0.99
Max. permitted mains impedance Z_{max} on PCC ¹⁾		92 mOhm
Recommended earth-leakage circuit breaker		Type B
Welding current range (I_2)		
MIG/MAG		3 - 400 A
Rod electrode		10 - 400 A
Welding current at	10 min / 40 °C (104 °F)	40 % 60 % 100 % 400 A 360 A 320 A
Output voltage range according to standard characteristic (U_2)		
MIG/MAG		14.2 - 34.0 V
Rod electrode		20.4 - 36.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)		73 V
Degree of protection		IP 23
Type of cooling		AF
Overvoltage category		III
Pollution level according to IEC60664		3
EMC device class		A
Safety symbols		S, CE
Dimensions l x w x h		706 x 300 x 510 mm 27.8 x 11.8 x 20.1 in.
Weight		36.5 kg 80.47 lb.
Max. shielding gas pressure		7.0 bar 101.49 psi
Coolant		Original Fronius

1) Interface to a 230/400 V, 50 Hz public grid

TPS 400i /nc

Mains voltage (U_1)	3x	380 V	400 V	460 V
Max. effective primary current ($I_{1\text{eff}}$)		16.5 A	15.9 A	14.6 A
Maximum primary current ($I_{1\text{max}}$)		26.1 A	25.1 A	23.5 A
Mains fuse			35 A slow-blow	
Mains voltage tolerance				+/- 15 %
Mains frequency				50 / 60 Hz
Cos phi (1)				0.99
Max. permitted mains impedance Z_{max} on PCC ¹⁾				92 mOhm
Recommended earth-leakage circuit breaker				Type B
Welding current range (I_2)				
MIG/MAG				3 - 400 A
Rod electrode				10 - 400 A
Welding current at 10 min / 40 °C (104 °F)		40 %	60 %	100 %
$U_1 = 380 - 460 \text{ V}$		400 A	360 A	320 A
Output voltage range according to standard characteristic (U_2)				
MIG/MAG				14.2 - 34.0 V
Rod electrode				20.4 - 36.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)				83 V
Degree of protection				IP 23
Type of cooling				AF
Overvoltage category				III
Pollution level according to IEC60664				3
EMC device class				A
Safety symbols				S, CE, CSA
Dimensions l x w x h		706 x 300 x 510 mm		27.8 x 11.8 x 20.1 in.
Weight				35.2 kg 77.60 lb.
Max. shielding gas pressure				7.0 bar 101.49 psi
Coolant				Original Fronius

1) Interface to a 230/400 V, 50 Hz public grid

TPS 400i /600V/nc

Mains voltage (U_1)	3x	575 V
Max. effective primary current ($I_{1\text{eff}}$)		14.3 A
Maximum primary current ($I_{1\text{max}}$)		22.6 A
Mains fuse		35 A slow-blow
Mains voltage tolerance		+/- 10 %
Mains frequency		50 / 60 Hz
Cos phi (1)		0.99
Recommended earth-leakage circuit breaker		Type B
Welding current range (I_2)		
MIG/MAG		3 - 400 A
Rod electrode		10 - 400 A
Welding current at 10 min / 40 °C (104 °F)	40 %	60 % 100 %
$U_1 = 575 \text{ V}$	400 A	360 A 320 A
Output voltage range according to standard characteristic (U_2)		
MIG/MAG		14.2 - 34.0 V
Rod electrode		20.4 - 36.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)		68 V
Degree of protection		IP 23
Type of cooling		AF
Overvoltage category		III
Pollution level according to IEC60664		3
Safety symbols		S, CSA
Dimensions l x w x h		706 x 300 x 510 mm 27.8 x 11.8 x 20.1 in.
Weight		34.6 kg 76.28 lb.
Max. shielding gas pressure		7.0 bar 101.49 psi
Coolant		Original Fronius

TPS 400i /MV/nc

Mains voltage (U_1)	3x	200 V	230 V
Max. effective primary current (I_{1eff})		30.5 A	26.4 A
Maximum primary current (I_{1max})		48.2 A	41.6 A
Mains fuse		35 A slow-blow	
Mains voltage (U_1)	3x	380 V	400 V 460 V
Max. effective primary current (I_{1eff})		16.2 A	15.5 A 14.0 A
Maximum primary current (I_{1max})		25.5 A	24.4 A 22.1 A
Mains fuse		35 A slow-blow	
Mains voltage tolerance		-10 / +15 %	
Mains frequency		50 / 60 Hz	
Cos phi (1)		0.99	
Max. permitted mains impedance Z_{max} on PCC ¹⁾		74 mOhm	
Recommended earth-leakage circuit breaker		Type B	
Welding current range (I_2)			
MIG/MAG			3 - 400 A
Rod electrode			10 - 400 A
Welding current at 10 min / 40 °C (104 °F)	40 %	60 %	100 %
$U_1 = 200 - 230$ V	400 A	360 A	320 A
$U_1 = 380 - 460$ V	400 A	360 A	320 A
Output voltage range according to standard characteristic (U_2)			
MIG/MAG			14.2 - 34.0 V
Rod electrode			20.4 - 36.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)			67 V
Degree of protection			IP 23
Type of cooling			AF
Overvoltage category			III
Pollution level according to IEC60664			3
EMC device class			A
Safety symbols			S, CE, CSA
Dimensions l x w x h		706 x 300 x 510 mm 27.8 x 11.8 x 20.1 in.	
Weight			47.1 kg 103.84 lb.
Max. shielding gas pressure			7.0 bar 101.49 psi
Coolant			Original Fronius

1) Interface to a 230/400 V, 50 Hz public grid

**TPS 400i LSC
ADV**

Mains voltage (U_1)	3x	400 V
Max. effective primary current ($I_{1\text{eff}}$)		16.4 A
Maximum primary current ($I_{1\text{max}}$)		25.1 A
Mains fuse		35 A slow-blow
Mains voltage tolerance		+/- 15 %
Mains frequency		50 / 60 Hz
Cos phi (1)		0.99
Max. permitted mains impedance Z_{max} on PCC ¹⁾		92 mOhm
Recommended earth-leakage circuit breaker		Type B
Welding current range (I_2)		
MIG/MAG		3 - 400 A
Rod electrode		10 - 400 A
Welding current at 10 min / 40 °C (104 °F)	40 % 400 A	60 % 360 A
		100 % 320 A
Output voltage range according to standard characteristic (U_2)		
MIG/MAG		14.2 - 34.0 V
Rod electrode		20.4 - 36.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)		73 V
Degree of protection		IP 23
Type of cooling		AF
Overvoltage category		III
Pollution level according to IEC60664		3
EMC device class		A
Safety symbols		S, CE
Dimensions l x w x h		706 x 300 x 720 mm 27.8 x 11.8 x 28.3 in.
Weight		55.7 kg 122.8 lb.
Max. shielding gas pressure		7.0 bar 101.49 psi
Coolant		Original Fronius

1) Interface to a 230/400 V, 50 Hz public grid

TPS 400i LSC
ADV /nc

Mains voltage (U_1)	3x	380 V	400 V	460 V
Max. effective primary current ($I_{1\text{eff}}$)		17.1 A	16.4 A	14.8 A
Maximum primary current ($I_{1\text{max}}$)		27.0 A	25.9 A	23.4 A
Mains fuse			35 A slow-blow	
Mains voltage tolerance				+/- 15 %
Mains frequency				50 / 60 Hz
Cos phi (1)				0.99
Max. permitted mains impedance Z_{max} on PCC ¹⁾				92 mOhm
Recommended earth-leakage circuit breaker				Type B
Welding current range (I_2)				
MIG/MAG				3 - 400 A
Rod electrode				10 - 400 A
Welding current at 10 min / 40 °C (104 °F)		40 %	60 %	100 %
$U_1 = 380 - 460 \text{ V}$		400 A	360 A	320 A
Output voltage range according to standard characteristic (U_2)				
MIG/MAG				14.2 - 34.0 V
Rod electrode				20.4 - 36.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)				84 V
Degree of protection				IP 23
Type of cooling				AF
Overvoltage category				III
Pollution level according to IEC60664				3
EMC device class				A
Safety symbols				S, CE
Dimensions l x w x h		706 x 300 x 720 mm		27.8 x 11.8 x 28.4 in.
Weight				54.4 kg 119.93 lb.
Max. shielding gas pressure				7.0 bar 101.49 psi
Coolant				Original Fronius

1) Interface to a 230/400 V, 50 Hz public grid

**TPS 400i LSC
ADV /600V/nc**

Mains voltage (U_1)	3x	575 V
Max. effective primary current ($I_{1\text{eff}}$)		14.3 A
Maximum primary current ($I_{1\text{max}}$)		22.6 A
Mains fuse		35 A slow-blow
Mains voltage tolerance		+/- 10 %
Mains frequency		50 / 60 Hz
Cos phi (1)		0.99
Recommended earth-leakage circuit breaker		Type B
Welding current range (I_2)		
MIG/MAG		3 - 400 A
Rod electrode		10 - 400 A
Welding current at 10 min / 40 °C (104 °F)	40 %	60 % 100 %
$U_1 = 575$ V	400 A	360 A 320 A
Output voltage range according to standard characteristic (U_2)		
MIG/MAG		14.2 - 34.0 V
Rod electrode		20.4 - 36.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)		70 V
Degree of protection		IP 23
Type of cooling		AF
Overvoltage category		III
Pollution level according to IEC60664		3
Safety symbols		S, CSA
Dimensions l x w x h		706 x 300 x 720 mm 27.8 x 11.8 x 28.4 in.
Weight		50.2 kg 110.67 lb.
Max. shielding gas pressure		7.0 bar 101.49 psi
Coolant		Original Fronius

TPS 400i LSC
ADV /MV/nc

Mains voltage (U_1)	3x	200 V	230 V
Max. effective primary current (I_{1eff})		30.5 A	26.4 A
Maximum primary current (I_{1max})		48.2 A	41.6 A
Mains fuse		35 A slow-blow	
Mains voltage (U_1)	3x	380 V	400 V 460 V
Max. effective primary current (I_{1eff})		16.2 A	15.5 A 14.0 A
Maximum primary current (I_{1max})		25.5 A	24.4 A 22.1 A
Mains fuse		35 A slow-blow	
Mains voltage tolerance		-10 / +15 %	
Mains frequency		50 / 60 Hz	
Cos phi (1)		0.99	
Max. permitted mains impedance Z_{max} on PCC ¹⁾		45 mOhm	
Recommended earth-leakage circuit breaker		Type B	
Welding current range (I_2)			
MIG/MAG			3 - 400 A
Rod electrode			10 - 400 A
Welding current at 10 min / 40 °C (104 °F)	40 %	60 %	100 %
$U_1 = 200 - 230$ V	400 A	360 A	320 A
$U_1 = 380 - 460$ V	400 A	360 A	320 A
Output voltage range according to standard characteristic (U_2)			
MIG/MAG			14.2 - 34.0 V
Rod electrode			20.4 - 36.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)			67 V
Degree of protection			IP 23
Type of cooling			AF
Overvoltage category			III
Pollution level according to IEC60664			3
EMC device class			A
Safety symbols			S, CE, CSA
Dimensions l x w x h		706 x 300 x 720 mm 27.8 x 11.8 x 28.4 in.	
Weight		63.6 kg 140.24 lb.	
Max. shielding gas pressure		7.0 bar 101.49 psi	
Coolant		Original Fronius	

1) Interface to a 230/400 V, 50 Hz public grid

TPS 500i

Mains voltage (U_1)	3x	400 V
Max. effective primary current ($I_{1\text{eff}}$)		23.7 A
Maximum primary current ($I_{1\text{max}}$)		37.5 A
Mains fuse		35 A slow-blow
Mains voltage tolerance		+/- 15 %
Mains frequency		50 / 60 Hz
Cos phi (1)		0.99
Max. permitted mains impedance Z_{max} on PCC ¹⁾		49 mOhm
Recommended earth-leakage circuit breaker		Type B
Welding current range (I_2)		
MIG/MAG		3 - 500 A
Rod electrode		10 - 500 A
Welding current at	10 min / 40 °C (104 °F)	40 % 60 % 100 % 500 A 430 A 360 A
Output voltage range according to standard characteristic (U_2)		
MIG/MAG		14.2 - 39.0 V
Rod electrode		20.4 - 40.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)		71 V
Degree of protection		IP 23
Type of cooling		AF
Overvoltage category		III
Pollution level according to IEC60664		3
EMC device class		A
Safety symbols		S, CE
Dimensions l x w x h		706 x 300 x 510 mm 27.8 x 11.8 x 20.1 in.
Weight		38 kg 83.8 lb.
Max. shielding gas pressure		7.0 bar 101.49 psi
Coolant		Original Fronius

1) Interface to a 230/400 V, 50 Hz public grid

TPS 500i /nc

Mains voltage (U_1)	3x	380 V	400 V	460 V
Max. effective primary current ($I_{1\text{eff}}$)		24.5 A	23.7 A	21.9 A
Maximum primary current ($I_{1\text{max}}$)		38.8 A	37.5 A	34.7 A
Mains fuse			35 A slow-blow	
Mains voltage tolerance			- 10 / + 15 %	
Mains frequency			50 / 60 Hz	
Cos phi (1)			0.99	
Max. permitted mains impedance Z_{max} on PCC ¹⁾			49 mOhm	
Recommended earth-leakage circuit breaker			Type B	
Welding current range (I_2)				
MIG/MAG				3 - 500 A
Rod electrode				10 - 500 A
Welding current at 10 min / 40 °C (104 °F)		40 %	60 %	100 %
$U_1 = 380 - 460 \text{ V}$		500 A	430 A	360 A
Output voltage range according to standard characteristic (U_2)				
MIG/MAG				14.2 - 39.0 V
Rod electrode				20.4 - 40.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)				82 V
Degree of protection				IP 23
Type of cooling				AF
Overvoltage category				III
Pollution level according to IEC60664				3
EMC device class				A
Safety symbols				S, CE, CSA
Dimensions l x w x h			706 x 300 x 510 mm 27.8 x 11.8 x 20.1 in.	
Weight				36.7 kg 80.9 lb.
Max. shielding gas pressure				7.0 bar 101.49 psi
Coolant				Original Fronius

1) Interface to a 230/400 V, 50 Hz public grid

TPS 500i /600V/nc

Mains voltage (U_1)	3x	575 V
Max. effective primary current ($I_{1\text{eff}}$)		19.7 A
Maximum primary current ($I_{1\text{max}}$)		31.2 A
Mains fuse		35 A slow-blow
Mains voltage tolerance		+/- 10 %
Mains frequency		50 / 60 Hz
Cos phi (1)		0.99
Recommended earth-leakage circuit breaker		Type B
Welding current range (I_2)		
MIG/MAG		3 - 500 A
Rod electrode		10 - 500 A
Welding current at 10 min / 40 °C (104 °F)	40 %	60 % 100 %
$U_1 = 575 \text{ V}$	500 A	430 A 360 A
Output voltage range according to standard characteristic (U_2)		
MIG/MAG		14.2 - 39.0 V
Rod electrode		20.4 - 40.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)		71 V
Degree of protection		IP 23
Type of cooling		AF
Overvoltage category		III
Pollution level according to IEC60664		3
Safety symbols		S, CSA
Dimensions l x w x h		706 x 300 x 510 mm 27.8 x 11.8 x 20.1 in.
Weight		34.9 kg 76.94 lb.
Max. shielding gas pressure		7 bar 101.49 psi
Coolant		Original Fronius

TPS 500i /MV/nc

Mains voltage (U_1)	3x	200 V	230 V
Max. effective primary current (I_{1eff})		43.5 A	37.4 A
Maximum primary current (I_{1max})		68.8 A	59.2 A
Mains fuse		63 A slow-blow	
Mains voltage (U_1)	3x	380 V	400 V 460 V
Max. effective primary current (I_{1eff})		22.7 A	21.6 A 19.2 A
Maximum primary current (I_{1max})		35.9 A	34.1 A 30.3 A
Mains fuse		35 A slow-blow	
Mains voltage tolerance		-10 / +15 %	
Mains frequency		50 / 60 Hz	
Cos phi (1)		0.99	
Max. permitted mains impedance Z_{max} on PCC ¹⁾		38 mOhm	
Recommended earth-leakage circuit breaker		Type B	
Welding current range (I_2)			
MIG/MAG		3 - 500 A	
Rod electrode		10 - 500 A	
Welding current at 10 min / 40 °C (104 °F)	40 %	60 %	100 %
$U_1 = 200 - 230$ V	500 A	430 A	360 A
$U_1 = 380 - 460$ V	500 A	430 A	360 A
Output voltage range according to standard characteristic (U_2)			
MIG/MAG		14.2 - 39.0 V	
Rod electrode		20.4 - 40.0 V	
Open circuit voltage (U_0 peak / U_0 r.m.s)		68 V	
Degree of protection		IP 23	
Type of cooling		AF	
Overvoltage category		III	
Pollution level according to IEC60664		3	
EMC device class		A	
Safety symbols		S, E, CSA	
Dimensions l x w x h		706 x 300 x 510 mm 27.8 x 11.8 x 20.1 in.	
Weight		47.1 kg 103.84 lb.	
Max. shielding gas pressure		7 bar 101.49 psi	
Coolant		Original Fronius	

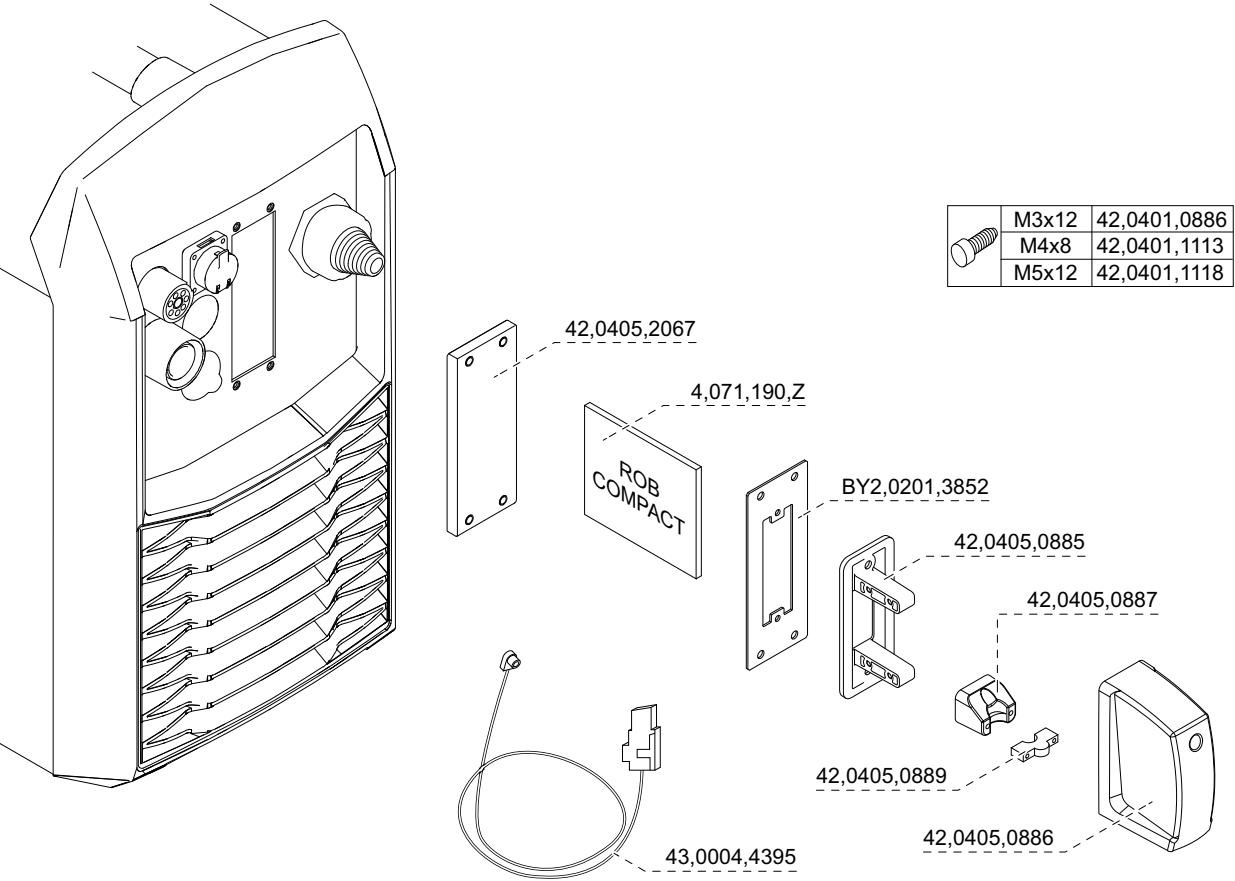
1) Interface to a 230/400 V, 50 Hz public grid

Spare parts list: TPS 320i / 400i / 500i

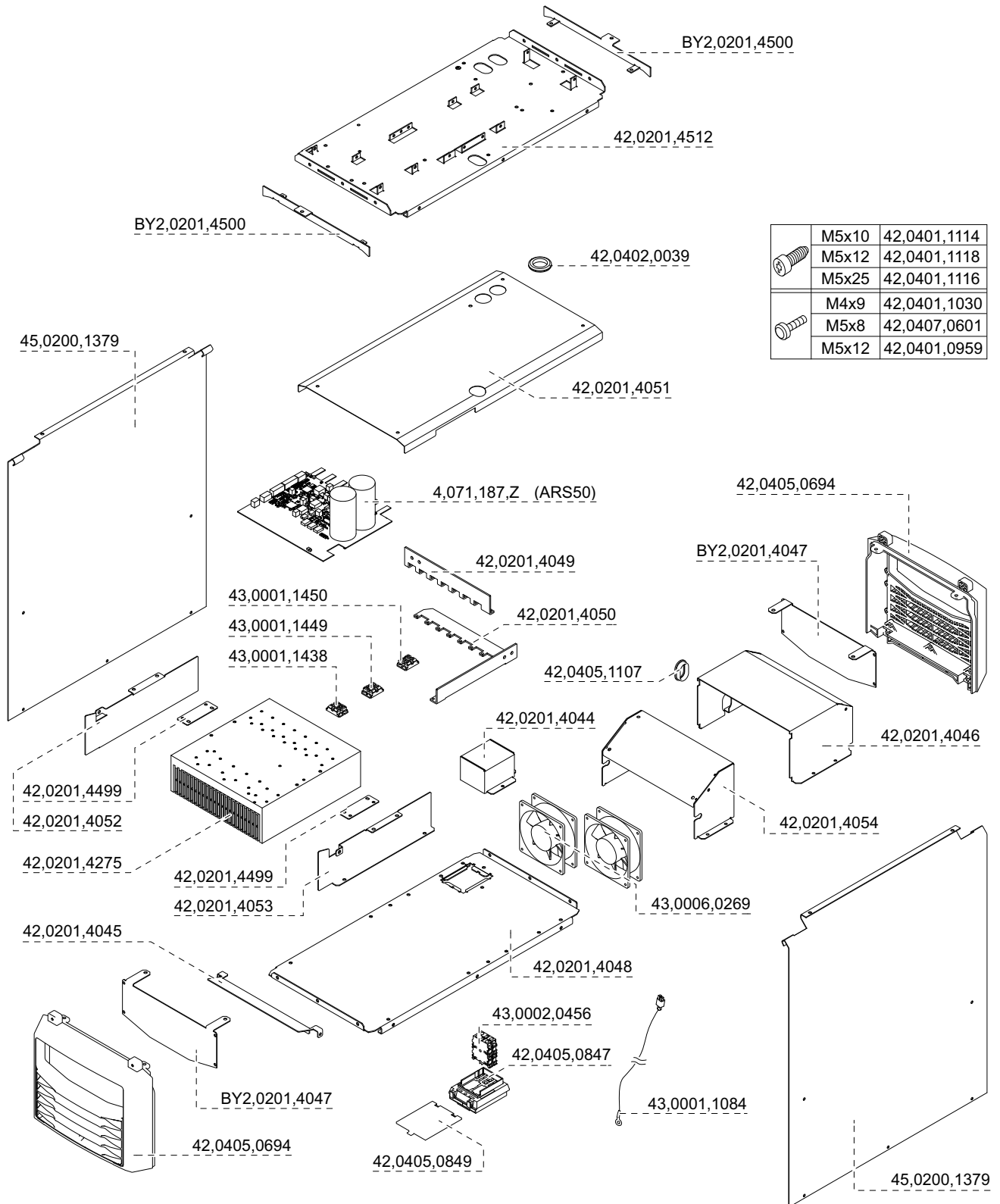
TPS 320i	4,075,172
TPS 320i /nc	4,075,172,800
TPS 320i /MV/nc	4,075,172,830
TPS 320i /600V/nc	4,075,172,970
TPS 320i Pulse	4,075,178
TPS 320i Pulse /nc	4,075,178,830
TPS 320i Pulse /MV/nc	4,075,178,800
TPS 320i Pulse /600V/nc	4,075,178,970

TPS 400i	4,075,174
TPS 400i /nc	4,075,174,800
TPS 400i /MV/nc	4,075,174,830
TPS 400i /600V/nc	4,075,174,970
TPS 400i Pulse	4,075,179
TPS 400i Pulse /nc	4,075,179,800
TPS 400i Pulse /MV/nc	4,075,179,830
TPS 400i Pulse /600V/nc	4,075,179,970

TPS 500i	4,075,176
TPS 500i /nc	4,075,176,800
TPS 500i /MV/nc	4,075,176,830
TPS 500i /600V/nc	4,075,176,970
TPS 500i Pulse	4,075,180
TPS 500i Pulse /nc	4,075,180,800
TPS 500i Pulse /MV/nc	4,075,180,830
TPS 500i Pulse /600V/nc	4,075,180,970



TPS 400i LSC ADV	4,075,175
TPS 400i LSC ADV /nc	4,075,175,800
TPS 400i LSC ADV /MV/nc	4,075,175,830
TPS 400i LSC ADV /600V/nc	4,075,175,970





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