Fronius

iWave 300i / 400i / 500i DC
iWave 300i / 400i / 500i AC/DC

EN-US

Operating instructions

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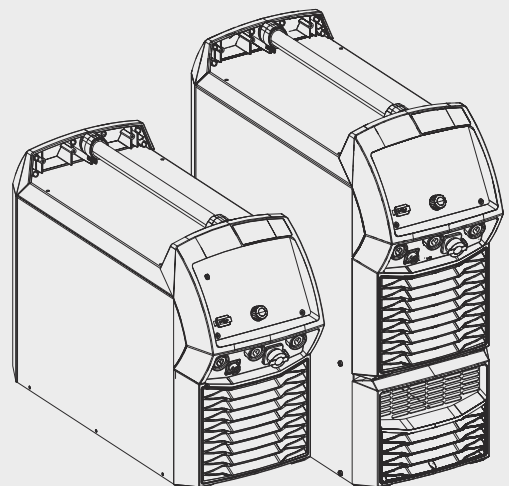
Safety Instructions

Explanation of Safety Instructions

> ⚠️ **DANGER!**

Indicates an immediate danger.
▶ Death or serious injury may result if appropriate precautions are not taken.

> ⚠️ **WARNING!**

Indicates a possibly dangerous situation.
▶ Death or serious injury may result if appropriate precautions are not taken.

> ⚠️ **CAUTION!**

Indicates a situation where damage or injury could occur.
▶ Minor injury or damage to property may result if appropriate precautions are not taken.

> *NOTE!*

Indicates the possibility of flawed results and damage to the equipment.

General

The device has been manufactured using state-of-the-art technology and according to recognized 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 equipment

All persons involved in the commissioning, operation, maintenance, and servicing of the device must
- Be suitably qualified
- Have knowledge of welding
- Have completely read and followed these Operating Instructions

The Operating Instructions must always be at hand wherever the device is being used. In addition to the Operating Instructions, all applicable local rules and regulations regarding accident prevention and environmental protection must also be followed.

All safety and danger notices on the device must
- Be kept in a legible state
- Not be damaged/marked
- Not be removed
- 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, remove any faults that could compromise safety.

Your personal safety is at stake!

Intended Use

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

The device is intended exclusively for the welding process specified on the rating plate. Utilization for any other purpose, or in any other manner, shall be deemed to be "not in accordance with the intended purpose." The manufacturer is not responsible for any damage resulting from improper use.

Proper use also means
- Completely reading and obeying all instructions in the Operating Instructions
- Completely reading and obeying all safety instructions and danger notices
- Carrying out all the specified inspection and servicing work

Never use the device for the following applications:
- Thawing pipes
- Charging batteries
- Starting motors

The device is designed for operation in industry and business. The manufacture shall not be liable for any damage resulting from use in a living area.

The manufacture shall also not be liable for faulty or incorrect work results.

Grid Connection   Devices with a high output can influence the energy quality of the grid due to their current consumption.

This may affect a number of device types in terms of:
- connection restrictions
- criteria regarding maximum permissible grid impedance [*)]
- criteria regarding the minimum required short-circuit power [*)]

[*)] both at the interface with the public grid
See technical data

In this case, the operator or the person using the device should check whether or not the device is allowed to be connected, where appropriate through discussion with the power supply company.

IMPORTANT! Ensure secure grounding of the grid connection!

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 accepts no liability for any damage resulting from improper use.

Temperature range of the ambient air:
- 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)

Ambient air: free of dust, acids, corrosive gases or substances, etc.
Altitude above sea level: up to 2000 m (6561 ft. 8.16 in.)

Obligations of the Operating Company

The operating company must only allow persons to work with the device if they
- Are familiar with the basic occupational safety and accident prevention regulations and are trained in handling the device
- Have read and understood these Operating Instructions, especially the section "Safety Rules," and have confirmed this with their signature
- Are trained according to the requirements for the work results

The safety-conscious work of the personnel must be checked regularly.

Obligations of Personnel

All persons who are assigned to work with the device must do the following before beginning the work:
- Follow the basic regulations for occupational safety and accident prevention
- Read these Operating Instructions, especially the section "Safety Rules," and confirm that they have understood and will follow them by signing

Before leaving the workplace, ensure that no personal injury or property damage can occur in one's absence.

Residual current circuit breaker

Local regulations and national guidelines may mean that a residual current circuit breaker is required when connecting a device to the public grid.
The residual current circuit breaker recommended for the device by the manufacturer can be found in the technical data.

Personal Protection and Protection of Others

You are exposed to numerous hazards while handling the device, for example:
- Flying sparks and pieces of hot metal
- Arc radiation that poses a risk of injury to the eyes and skin
- Hazardous electromagnetic fields that pose a risk of death for individuals with pacemakers
- Electrical risks from grid current and welding current
- Increased noise exposure
- Harmful welding fumes and gases

Wear suitable protective clothing when dealing with the device. The protective clothing must have the following properties:
- Flame resistant
- Insulating and dry
- Covering the entire body and in good condition with no damage
- Safety helmet
- Cuffless pants

Protective clothing involves the following:
- Protecting the face and eyes from UV radiation, heat and flying sparks with a face guard featuring a regulation-compliant filter
- Wearing regulation-compliant protective goggles with side protection behind the face guard
- Wearing rigid, wet-insulating footwear
- Protecting hands with appropriate gloves (featuring electrical insulation and thermal protection)
- Wearing ear protection to reduce noise exposure and protect against injury

Keep persons, especially children, away during the operation of the devices and during the welding process. If persons are in the vicinity, however:
- Instruct them about all hazards (blinding hazard due to arcs, risk of injury from flying sparks, welding fumes hazardous to health, noise exposure, possible hazard due to grid current or welding current, etc.)
- Provide suitable protective equipment or
- Construct suitable protective walls and curtains.

Data on noise emission values

The device produces a maximum noise level of <80 dB(A) (ref. 1pW) when idling and in the cooling phase following operation in relation to the maximum permitted operating point at standard loading in accordance with EN 60974-1.

A workplace-specific emission value for welding (and cutting) cannot be specified because this value depends on the welding process and the environmental conditions. It is influenced by a wide range of parameters, such as the welding process itself (MIG/MAG, TIG welding), the selected current type (direct current, alternating current), the power range, the type of weld metal, the resonance properties of the workpiece, the workplace environment, and many other factors.

Danger from toxic gases and vapors

The fumes produced during welding contain toxic gases and vapors.

Welding fumes contain substances that cause cancer, as stated in monograph 118 from the International Agency for Research on Cancer.

Use at-source extraction source and a room extraction system.
If possible, use a welding torch with an integrated extraction device.

Keep your head out of the welding fumes and gases.

Take the following precautionary measures for fumes and harmful gases:
- Do not breathe them in.
- Extract them from the work area using appropriate equipment.

Ensure that there is a sufficient supply of fresh air. Ensure that there is a ventilation flow rate of at least 20 m³ per hour.

Use a welding helmet with air supply if there is insufficient ventilation.

If there is uncertainty as to whether the extraction capacity is sufficient, compare the measured toxic emission values against the permissible limit values.

The following components are factors that determine how toxic the welding fumes are:
- The metals used for the workpiece
- Electrodes
- Coatings
- Cleaning agents, degreasers, and the like
- The welding process used

Consult the corresponding material safety data sheets and manufacturer's instructions for the components listed above.

Recommendations for exposure scenarios, risk management measures and identifying working conditions can be found on the European Welding Association website under Health & Safety (https://european-welding.org).

Keep flammable vapors (such as solvent vapors) out of the arc radiation range.

When no welding is taking place, close the valve of the shielding gas cylinder or the main gas supply.

Danger from Flying Sparks

Flying sparks can cause fires and explosions.

Never undertake welding near flammable materials.

Flammable materials must be kept at least 11 meters (36 ft. 1.07 in.) from the arc or protected with a certified cover.

Keep suitable, tested fire extinguishers on hand.

Sparks and pieces of hot metal may also get into surrounding areas through small cracks and openings. Take appropriate measures to ensure that there is no risk of injury or fire.

Do not undertake welding in areas at risk of fire and explosion, or on sealed tanks, drums, or pipes if these have not been prepared in accordance with corresponding national and international standards.

Do not undertake welding on containers in which gases, fuels, mineral oils, and the like are/were stored. Residues pose a risk of explosion.

Risks from grid current and welding current

An electric shock can be fatal.

Do not touch voltage-carrying parts inside or outside the device.

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

Always place the wirefeeder on a sufficiently insulated base or use a suitable insulating wirefeeder holder.

Ensure suitable personal protection with dry temporary backing or cover with sufficient insulation against the ground potential. The temporary backing or cover must completely cover the entire area between the body and the ground potential.

All cables and leads must be secured, undamaged, insulated, and adequately dimensioned. Replace loose connections and scorched, damaged, or inadequately dimensioned cables and leads immediately.
Before every use, check power connections for secure fit by hand.
In the case of power cables with bayonet connectors, turn the power cable by at least 180° around the longitudinal axis and pretension.

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

Concerning the electrode (rod electrode, tungsten electrode, welding wire, etc.)
- Never immerse it in liquids to cool it
- Never touch it when the power source is switched on.

The open circuit voltage of a welding system may double, for example, between the electrodes of two welding systems. Touching the potentials of both electrodes at the same time may be life-threatening in some cases.

Have the grid and device supply lead regularly inspected by an electrician to ensure that the ground conductor is functioning properly.

Protection class I devices require a grid with a ground conductor and a connector system with ground conductor contact for proper operation.

Operation of the device on a grid without a ground conductor and on a socket without a ground conductor contact is only permitted if all national regulations for protective separation are observed.
Otherwise, this is considered gross negligence. The manufacturer accepts no liability for any damage resulting from improper use.

Use suitable equipment to ensure that the workpiece is sufficiently grounded if necessary.

Switch off unused devices.

When working at elevated heights, wear a safety harness to prevent falls.

Before working on the device, switch off the device and remove the grid plug.

Secure the device to prevent the grid plug from being connected and switched on again by applying a clearly legible and understandable warning sign.

After opening the device:
- Discharge all electrically charged components
- Ensure that all components are disconnected from the power supply.

If work is needed on voltage-carrying parts, bring in a second person who will switch off the main switch at the correct time.

Stray welding currents

If the following instructions are not observed, stray welding currents may occur, which pose a risk of the following:
- Fire
- Overheating of parts connected to the workpiece
- Irreparable damage to ground conductors
- Damage to the device and other electrical equipment

Ensure that the workpiece clamp is securely connected to the workpiece.

Secure the workpiece clamp as close to the spot to be welded as possible.

Position the device with sufficient insulation against electrically conductive environments, e.g., insulation against electrically conductive floors or electrically conductive mounts.

Observe the following when using power distribution boards, twin-head mounts, etc.:
Even the electrode of the welding torch/electrode holder not in use carries electric potential. Ensure that there is sufficient insulation when the unused welding torch/electrode holder is stored.

In automated MIG/MAG applications, only guide the wire electrode from the welding wire drum, large spool, or wirespool to the wirefeeder with insulation.

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 grid.

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 operating company is obliged to take appropriate action to rectify the situation.

Test and assess the immunity of equipment in the vicinity of the device in accordance with national and international provisions. Examples of interference-prone equipment that could be affected by the device:
- Safety devices
- Grid power lines, signal lines, and data transfer lines
- IT and telecommunications equipment
- Devices for measuring and calibrating

Supporting measures to avoid EMC problems:
1. Grid power supply
   - If electromagnetic interference occurs despite a grid connection that complies with regulations, take additional measures (e.g., use a suitable grid filter).
2. Welding power-leads
   - Keep them as short as possible
   - Route them close together (also to avoid EMF problems)
   - Route them far from other lines
3. Equipotential bonding
4. Workpiece grounding
   - If necessary, establish grounding using suitable capacitors.
5. Shield, if necessary
   - Shield other devices in the vicinity
   - Shield the entire welding installation

EMF measures

Electromagnetic fields may cause health problems that are not yet known:
- Effects on the health of persons close by, e.g., those with pacemakers and hearing aids
- Persons with pacemakers must seek advice from their doctor before staying in the immediate vicinity of the device and the welding process
- Keep distances between welding power-leads and the head/torso of the welder as great as possible for safety reasons
- Do not carry welding power-leads and hosepacks over your shoulder or wrap them around your body or body parts

Particular hazard areas

Keep hands, hair, loose clothing, and tools away from moving parts, such as:
- Fans
- Gears
- Rollers
- Shafts
- Wirespools and welding wires

Do not reach into rotating gears of the wire drive or into rotating drive parts.

Covers and side panels must only be opened/removed during maintenance and repair work.

During operation
- Ensure that all covers are closed, and all side parts have been mounted properly.
- Keep all covers and side parts closed.

The protrusion of welding wire from the welding torch represents a high risk of injury (cuts to the hand, facial and eye injuries, etc.).

Therefore, always hold the welding torch away from the body (devices with wirefeeder) and use suitable protective goggles.

Do not touch the workpiece during or after welding – risk of burns.

Slag may fly off cooling workpieces. Therefore, also wear regulation-compliant protective equipment when reworking workpieces and ensure that other persons are sufficiently protected.

Leave the welding torch and other parts with a high operating temperature to cool before working on them.

Special regulations apply in areas at risk of fire or explosion
– follow the appropriate national and international regulations.

Power sources for work in areas with increased electrical hazard (e.g., boilers) must be labeled with the symbol (Safety). However, the power source may not be located in such areas.

Risk of scalding due to leaking coolant. Switch off the cooling unit before disconnecting connections for the coolant supply or return.

When handling coolant, observe the information on the coolant safety data sheet. The coolant safety data sheet can be obtained from your service center or via the manufacturer's website.

Only use suitable load-carrying equipment from the manufacturer to transport devices by crane.
- Attach chains or ropes to all designated attachments of the suitable load-carrying equipment.
- Chains or ropes must be the smallest angle possible from vertical.
- Remove gas cylinder and wirefeeder (MIG/MAG and TIG devices).

In the event of crane attachment of the wirefeeder during welding, always use a suitable, insulating wirefeeder hoisting attachment (MIG/MAG and TIG devices).

If the device is equipped with a carrier belt or handle, then this is used exclusively for transport by hand. The carrier belt is not suitable for transport by crane, counterbalanced lift truck, or other mechanical lifting tools.

All lifting equipment (belts, buckles, chains, etc.), which is used in association with the device or its components, must be checked regularly (e.g., for mechanical damage, corrosion, or changes due to other environmental influences).
The test interval and scope must at least comply with the respective valid national standards and guidelines.

There is a risk of colorless, odorless shielding gas escaping without notice if an adapter is used for the shielding gas connection. Use suitable Teflon tape to seal the thread of the shielding gas connection adapter on the device side before installation.

Requirement for the shielding gas

Especially with ring lines, contaminated shielding gas can cause damage to equipment and reduce welding quality.
Meet the following requirements regarding shielding gas quality:
- Solid particle size < 40 µm
- Pressure condensation point < -20 °C
- Max. oil content < 25 mg/m³

Use filters if necessary.

Danger from Shielding Gas Cylinders

Shielding gas cylinders contain compressed gas and may explode if damaged. Shielding gas cylinders are an integral part of the welding equipment, so they must be handled very carefully.

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

Mount the shielding gas cylinders vertically and secure them in accordance with instructions so they cannot fall over.

Keep shielding gas cylinders away from 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 weld on a compressed shielding gas cylinder.

Always use suitable shielding gas cylinders for the application in question and the correct matching accessories (controller, hoses, and fittings, etc.) Only use shielding gas cylinders and accessories that are in good condition.

If a valve on a shielding gas cylinder is open, turn your face away from the outlet.

When no welding is taking place, close the valve of the shielding gas cylinder.

Leave the cap on the valve of the shielding gas cylinder when the cylinder is not connected.

Follow the manufacturer's instructions and applicable national and international provisions for shielding gas cylinders and accessories.

Danger Posed by Shielding Gas Leak

Risk of asphyxiation due to uncontrolled shielding gas leak

Shielding gas is colorless and odorless and may suppress the oxygen in the ambient air in the event of leakage.
- Ensure there is a sufficient supply of fresh air with a ventilation flow rate of at least 20 m³ per hour.
- Please observe the safety and maintenance information for the shielding gas cylinder or the main gas supply.
- When no welding is taking place, close the valve of the shielding gas cylinder or the main gas supply.
- Always check the shielding gas cylinder or main gas supply for uncontrolled gas leakage before each start-up.

Safety Measures at the Setup Location and During Transport

A toppling device can be deadly! Set up the device securely on an even, solid surface
- The maximum permitted tilt angle is 10°.

Special regulations apply in areas at risk of fire or explosion
- Follow the appropriate national and international regulations.

Use instructions and checks within the company to ensure that the vicinity of the workplace is always clean and organized.

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

When setting up the device, ensure that there is an all-round clearance of 0.5 m (1 ft. 7.69 in.) to allow cooling air to circulate unhindered.

Take care to ensure that the applicable national and regional guidelines and accident prevention regulations are observed when transporting the device, especially guidelines concerning hazards during transport and shipment.

Do not lift or transport any active devices. Switch off devices before transport or lifting.

Before transporting the device, completely drain the coolant and dismantle the following components:
- wirefeeder
- wirespool
- shielding gas cylinder

It is essential to conduct a visual inspection of the device to check for damage after it has been transported but before commissioning. Have any damage repaired by trained service technicians before commissioning the device.

Safety Measures in Normal Operation

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

Safety devices that are not fully functional must be repaired before the device is switched on.

Never bypass or disable safety devices.

Before switching on the device, ensure that no one can be put in danger.

The device must be examined at least once a week for externally detectable damage and functionality of the safety devices.

Always secure the shielding gas cylinder well and remove before transporting by crane.

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

Only use appropriate original coolant from the manufacturer.

Do not mix original coolant from the manufacturer with other coolants.

Only connect system components from the manufacturer to the cooling unit circuit.

If there is damage due to use of other system components or other coolants, the manufacturer accepts no liability for this and all warranty claims are forfeited.

Cooling Liquid FCL 10/20 is not flammable. The ethanol-based coolant is flammable in certain conditions. Only transport the coolant in closed original containers and keep away from sources of ignition.

Properly dispose of used coolant according to national and international regulations. The coolant safety data sheet can be obtained from your service center or via the manufacturer's website.

When the system is cool, always check the coolant level before starting welding.

Maintenance and repair

It is impossible to guarantee that bought-in parts are designed and manufactured to meet the demands made of them, or that they satisfy safety requirements.
- Use only original spare and wearing parts (also applies to standard parts).
- Do not carry out any modifications, alterations, etc. to the device without the manufacturer's consent.
- Components that are not in perfect condition must be replaced immediately.
- When ordering, please give the exact designation and part number as shown in the spare parts list, as well as the serial number of your device.

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

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

Safety Inspection

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

The manufacturer recommends calibrating power sources within the same 12-month interval.

A safety inspection by a certified electrician is recommended:
- After changes
- After alterations
- After repair, care, and maintenance
- At least every 12 months

For the safety inspection, follow the appropriate national and international standards and guidelines.

You can obtain more information about the safety inspection and calibration from your service center. The service center will provide the necessary documents upon request.

Disposal

Do not dispose of this device with normal domestic waste! To comply with the European Directive on Waste Electrical and Electronic Equipment and its implementation as national law, electrical equipment that has reached the end of its life must be collected separately and returned to an approved recycling facility. Any device that you no longer require must be returned to your dealer, or you must locate 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 label satisfy the essential requirements of the low-voltage and electromagnetic compatibility directive (e.g., relevant product standards of the EN 60974 series).

Fronius International GmbH declares that the device complies with Directive 2014/53/EU. The full text of the EU Declaration of Conformity is available on the following website: http://www.fronius.com

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

Data backup

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

Copyright

Copyright of these Operating Instructions remains with the manufacturer.

Text and illustrations were accurate at the time of printing. Fronius reserves 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 Operating Instructions, we will be most grateful for your comments.

Intended use

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

The device is intended exclusively for the welding process specified on the rating plate and in the Operating Instructions.
Utilization for any other purpose, or in any other manner, shall be deemed to be "not in accordance with the intended purpose." The manufacturer accepts no liability for any damage resulting from improper use.

Intended use also means
- Reading and adhering to all instructions in the Operating Instructions
- Carefully reading and obeying all safety instructions and danger notices
- Carrying out all the specified inspection and maintenance work.

Never use the device for the following applications:
- Thawing pipes
- Charging batteries
- Starting motors

The device is designed for operation in commercial applications. The manufacturer shall not be liable for any damage resulting from use in a living area.

The manufacturer shall also not be liable for faulty or incorrect work results.

General information

General

Device concept
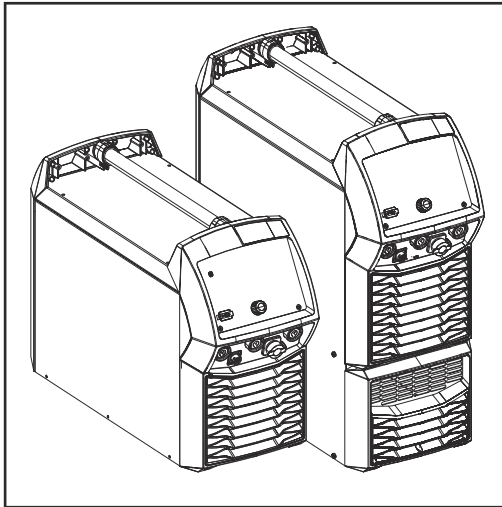
The iWave 300i / 400i / 500i DC and iWave 300i / 400i / 500i AC/DC multiprocess power sources are fully digitized, microprocessor-controlled inverter power sources.

A modular design and easy ability to extend the system guarantee a high degree of flexibility. The devices can be adapted to any 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 commercial applications for manual and automated MIG/MAG and TIG welding with unalloyed and low-alloyed steel, high-alloyed chrome/nickel steel, aluminum, aluminum alloys and magnesium. The power sources are designed for:
- Automotive and supply industry,
- Engineering and rail vehicle manufacturing,
- Chemical plant construction,
- Equipment engineering,
- Shipyards,
- etc.

Conformities

FCC

This device conforms to the limit values for an EMC device class A digital device, pursuant to Part 15 of the FCC regulations. These limit values are designed to provide reasonable protection against harmful interference when operating in a commercial environment. This device generates and uses high-frequency energy and, if not installed and used in accordance with the Operating Instructions, may interfere with radio communications.

Operation of this device in residential areas is likely to cause harmful interference, in which case the user is required to correct the interference at his own expense.

FCC ID: QKWSPBMCU2

Industry Canada RSS

This device complies with Industry Canada license-exempt RSS standards. Operation is subject to the following conditions:

(1)   The device must not cause any harmful interference.

(2)   The device must not be affected by external sources of interference, including interference that may impair operation.

IC: 12270A-SPBMCU2

EU
Compliance with Directive 2014/53/EU - Radio Equipment Directive (RED)

The antennas used for this transmitter must be installed in such a way that a minimum distance of 20 cm from all persons is maintained. They must not be installed or operated in conjunction with another antenna or transmitter. OEM integrators and end users must ensure the operating conditions of the transmitter comply with radio frequency exposure guidelines.

ANATEL / Brazil

This device is operated on a secondary basis. It does not claim to offer protection against harmful interference, even from devices of the same type.
This device can not cause interference in primarily operated systems.
This device complies with ANATEL's specific absorption rate limit values for exposure to high-frequency electrical, magnetic, and electromagnetic fields.

IFETEL / Mexico

Operation of this device is subject to the following two conditions:

(1)   The device must not cause any harmful interference;

(2)   The device must accept any interference, including interference that may cause undesired operation.

NCC / Taiwan

According to the NCC regulations for low-power equipment that generates radio frequency radiation:

Article 12
Certified low-power equipment that generates radio frequency radiation shall not change frequency, increase power or alter the characteristics and functions of the original design without approval.

Article 14
The use of low-power equipment that generates radio frequency radiation shall not adversely affect flight safety and legally operated communication equipment.
An identified malfunction must be deactivated and corrected immediately. All malfunctions must be eliminated.
The legal notice in the preceding paragraph refers to radio communications equipment operated in accordance with the provisions of the Telecommunications Act. Low-power

equipment that generates radio frequency radiation must be able to withstand interference from legally operated communication channels or radiological, radiation electrical devices used in industrial, scientific and medical applications.

Thailand

เครื่องวิทยุคมนาคมนี้ ได้รับยกเว้น ไม่ต้องได้
รับใบอนุญาตให้มี ใช้ซึ่งเครื่องวิทยุคมนาคม
หรือตั้งสถานีวิทยุคมนาคมตามประกาศ กสทช.
เรื่อง เครื่องวิทยุคมนาคม และสถานีวิทยุ
คมนาคมที่ได้รับยกเว้นไม่ต้องได้รับใบอนุญาต
วิทยุคมนาคมตามพระราชบัญญัติวิทยุคมนาคม
พ.ศ. 2498

กสทช.| โทรคมนาคม
กำกับดูแลเพื่อประชาชน
Call Center 1200 (โทรฟรี)

Bluetooth trademarks

The word mark Bluetooth® and the Bluetooth® logos are registered trademarks and property of Bluetooth SIG, Inc. and are used by the manufacturer under license. Other trademarks and trade names are the property of their respective owners.

Warning notices on the device

Warning notices and safety symbols can be found on power sources with the CSA test mark for use in the North American region (USA and Canada). These warning notices and safety symbols must not be removed or painted over. They warn against incorrect operation, as this may result in serious injury and property damage.

Safety symbols on the rating plate:

Welding is dangerous. The following basic requirements must be met:
- Adequate welding qualifications
- Appropriate protective equipment
- Exclusion of unauthorized persons

Do not use the functions described here until you have fully read and understood the following documents:
- These Operating Instructions
- All system component Operating Instructions, especially the safety rules

Options

OPT/i TIG gas regulator

OPT/i TIG 4 Switch SpeedNet
Option if more than one additional SpeedNet connection is required.

OPT/i TIG C Gas flow rate sensor

OPT/i TIG external sensor

OPT/i TIG PowerConnector
2. (-) Current socket on the rear of the power source

OPT/i Gas changeover

OPT/i TIG 2nd SpeedNet
Second SpeedNet connection

OPT/i TIG DC Multiprozess PRO

OPT/i TIG AC Multiprocess PRO

OPT/i TIG 2nd NT242
When using a CU 1400 cooling unit, the OPT/i TIG 2nd NT242 option must be installed in the power sources.

OPT/i TIG NT601

OPT/i TPS dust filter

IMPORTANT! The use of the OPT/i TPS dust filter option on iWave power sources will reduce the duty cycle!

OPT/i CycleTIG
Advanced TIG stitch welding

OPT/i Synergic Lines
Option to enable all available special characteristics of TPSi power sources;
any special characteristics created in the future are thus automatically enabled.

OPT/i GUN Trigger
Option for special functions in conjunction with the torch trigger

OPT/i Jobs
Option for Job Mode

OPT/i Documentation
Option for the documentation function

OPT/i Interface Designer
Option to design a personalized interface

OPT/i WebJobEdit
Option to edit jobs via the SmartManager of the power source

OPT/i Limit Monitoring
Option to set limit values for welding current, welding voltage and wire speed

OPT/i Custom NFC - ISO 14443A
Option to use a customer-specific frequency band for key cards

OPT/i CMT Cycle Step
Option for adjustable, cyclic CMT welding process

OPT/i OPC-UA
Standardized data interface protocol

OPT/i MQTT
Standardized data interface protocol

OPT/i SpeedNet Repeater
Signal amplifier if interconnecting hosepacks or connections from power source to wirefeeder exceed 50 m

KRIS 13 Gouging Machine
Electrode holder with compressed air connection for arc air gouging

OPT/i Wire Sense
Seam tracking / edge detection using wire electrode for automated applications only in conjunction with CMT hardware

Operating controls, connections and mechanical components

Control Panel

General

⚠️ **WARNING!**

Operating the device incorrectly can cause serious injury and damage to property.
▶ Do not use the functions described here until you have fully read and understood the Operating Instructions.
▶ Do not use the functions described here until you have fully read and understood all of the Operating Instructions for the system components, especially the safety rules.

Control panel

43,0001,3547

No.	Function
(1)	**USB port** For connecting USB thumb drives (service dongle, license key, etc.). **IMPORTANT!** The USB port is not electrically isolated from the welding circuit. Devices that make an electrical connection to another device must therefore not be connected to the USB port!
(2)	**Selection dial with rotary/push button function** For selecting elements, setting values, and scrolling through lists
(3)	**Display (with touch function)** - For direct operation of the power source by touching the display - For displaying values - For navigating through the menu
(4)	**Reading zone for NFC keys** - For locking/unlocking the power source using NFC keys - For logging in different users (with active user management and assigned NFC keys) NFC key = NFC card or NFC key fob
(5)	**Wire-threading button** For threading the wire electrode / welding wire into the torch hosepack without gas or current
(6)	**Gas-test button** To set the required quantity of gas on the gas pressure regulator. After pressing the gas-test button, gas flows for 30 s. Pressing the button again ends the process early.

Input options

Touch the display

Touch the display to
- navigate,
- activate functions,
- select options

When you touch and thus select an element on the display, the element is highlighted.

Turn the selection dial

Selecting items on the display:
- Turning the dial clockwise selects the next item in a sequence.
- Turning the dial counterclockwise selects the previous item in a sequence.
- In a vertical list, turning the dial clockwise highlights the item below; turning it counterclockwise highlights the item above.

Changing values:

- Turning the dial clockwise increases the value to be set.
- Turning the dial counterclockwise decreases the value to be set.
- Turning the selection dial slowly will also change the value to be set slowly, e.g., for fine adjustments.
- Turning the selection dial quickly disproportionately changes the value to be set, which means that large changes in value can be entered quickly.

For some parameters, a value that has been changed by turning the selection dial is automatically applied without having to press the selection dial.

Press the selection dial

- Apply selected elements, e.g., to change the value of a welding parameter.
- Apply values of specific parameters.

Display

Display
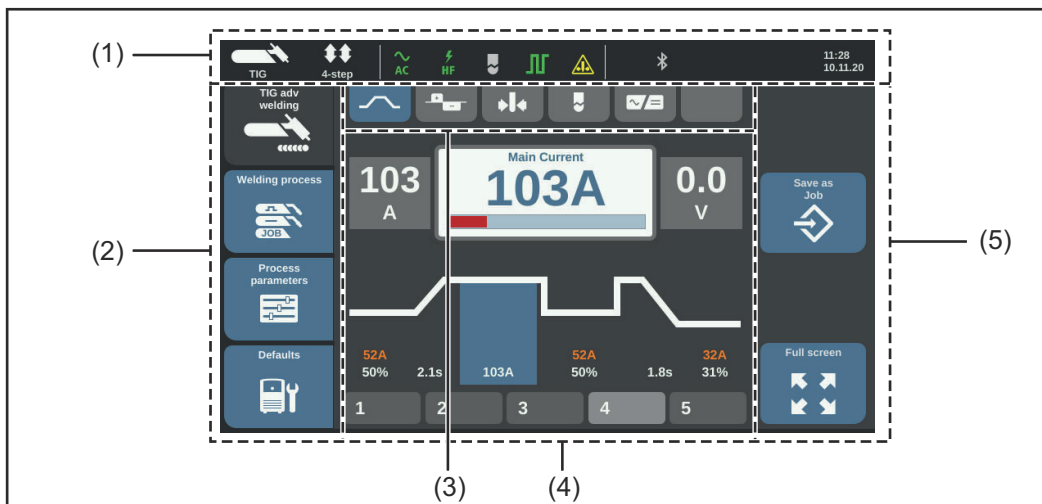
No.	Function

(1) **Status bar**

Contains information about:
- Currently selected welding process
- Currently selected operating mode
- Currently selected polarity
- Currently selected ignition procedure
- Cap mode
- Pulse mode
- Electrode overload
- Bluetooth status indicator
- Currently logged in user (when user management is activated)
  or
  the key symbol when the power source is switched off (e.g., if profile/role "locked" is activated)
- Time and date

The content of the status bar varies according to the selected welding process.

(2) **Left sidebar**

The left sidebar contains the following buttons:
- Welding
- Welding process
- Process parameters
- Defaults

The left sidebar is operated by touching the display.

(3) **Indicator bar**

Overview of the currently available welding parameters;
the individual welding parameters can be selected directly by touching the display. The currently selected parameter is highlighted in blue.

Welding current curve

Balance [1]

Electrode diameter

Cap mode [1]

Polarity [1]

[1] only with iWave AC/DC power sources

[2] only with iWave TIG AC/DC power sources and if polarity is set to AC.

---

(4)   **Main area**

The main area displays welding parameters, EasyJobs, graphics, lists or navigation elements. The main area is divided up differently depending on the application and populated with elements.

The main area is operated
- via the selection dial,
- by touching the display.

---

(5)   **Right sidebar**

The right sidebar can be used as follows, depending on the button selected in the left sidebar:
- As a function bar, consisting of application and function buttons
- To navigate to the 2nd menu level

The right sidebar is operated by touching the display.

Switching to full screen

The display is shown in full screen mode:
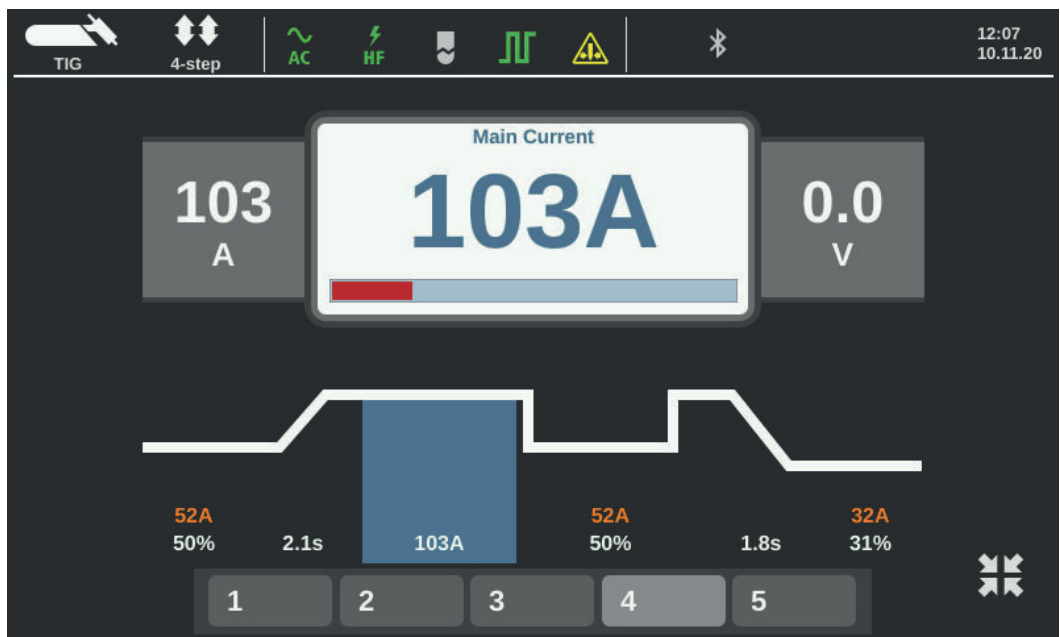
[2] Exit full screen mode:

Connections, Switches, and Mechanical Components

Connections and mechanical components
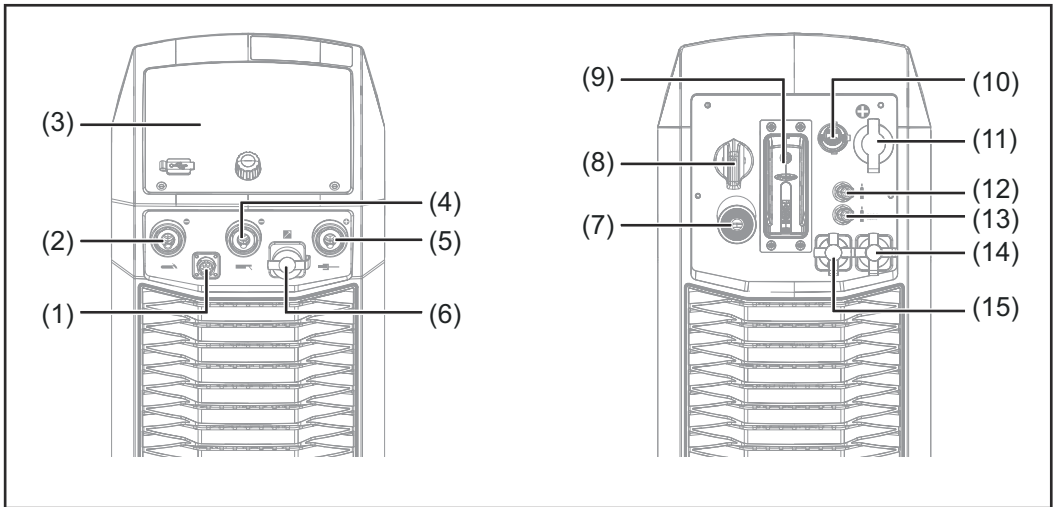
Front/back

No.	Function

(1) **TMC connection**
- For connecting the control plug of the TIG welding torch
- For connecting foot-operated remote controls
- For connecting remote controls

(2) **(-) Current socket with integrated gas connection**
For connecting
- the TIG welding torch

Symbols:

iWave DC   iWave AC/DC
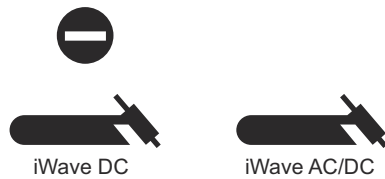
(3) **Control panel with display and control panel cover**
For operating the power source

(4) **(-) Power connection with bayonet latch**
HF-free current socket for manual metal arc welding

Symbols:
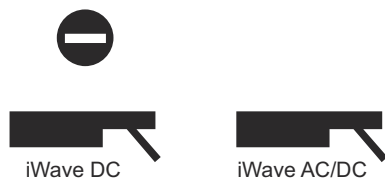
iWave DC   iWave AC/DC

(5) **(+) Current socket**

For connecting the grounding cable
Symbols:

iWave DC   iWave AC/DC

(6) **SpeedNet connection**

For connecting
- remote controls and external sensors
- wirefeeders (for automated applications)

Symbol:

(7) **Connection for MIG/MAG interconnecting hosepack**

(8) **Power switch**

For switching the power source on and off

(9) **Dummy cover/robot interface RI FB Inside /i (option)**

(10) **Ethernet connection**

(11) **Dummy cover/second (-) current socket with bayonet latch (option)**

TIG ground to wirefeeder

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

Main gas solenoid valve

(13) **Dummy cover/auxiliary gas connection**

Additional gas solenoid valve

(14) **Dummy cover/second SpeedNet connection (option) or external sensor (option)**

(15) **Dummy cover/second SpeedNet connection (option) or external sensor (option)**

iWave 300i - 500i AC/DC
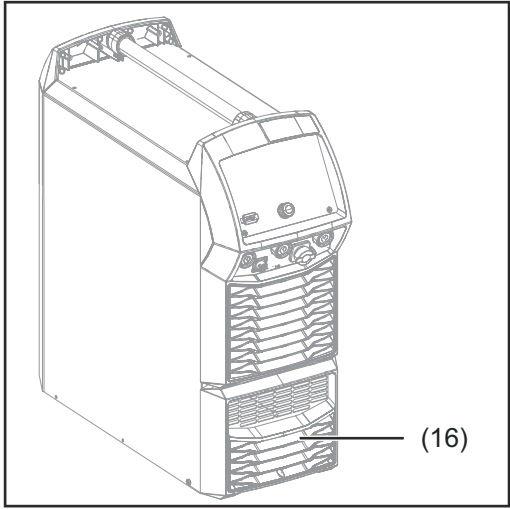
(16)	**AC inverter**
	(only with iWave AC/DC power sources)

Before installation and initial operation

Before installation and initial operation

Safety

> ⚠️ **WARNING!**
>
> **Danger from incorrect operation and work that is not carried out properly.**
> This can result in serious personal injury and damage to property.
> ▶ All the work and functions described in this document must only be carried out by technically trained and qualified personnel.
> ▶ Read and understand this document in full.
> ▶ Read and understand all safety rules and user documentation for this equipment and all system components.

Intended use

The power source is only intended for TIG welding, MIG/MAG welding and MMA welding. Any other use is deemed to be "not in accordance with the intended purpose." The manufacturer shall not be liable for any damage resulting from such improper use.

Intended use also means
- Following all the instructions in these Operating Instructions
- Carrying out all the specified inspection and maintenance work

Setup regulations

The device has been tested according to degree of protection IP23. This means:
- Protection against solid foreign bodies larger than Ø 12.5 mm (0.49 in.)
- Protection against spraywater at any angle up to 60° from the vertical

The device can be set up and operated outdoors in accordance with protection class IP23. Direct moisture (e.g. from rain) must be avoided.

> ⚠️ **WARNING!**
>
> **Toppling or falling devices can be deadly.**
> ▶ Set up devices, upright brackets and trolleys so that they are stable on a flat and solid surface.

The ventilation channel is a very important safety device. When selecting the setup location, ensure that the cooling air can enter or exit unhindered through the vents on the front and back. Any electrically conductive dust (e.g. from grinding work) must not be allowed to be sucked directly into the system.

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 lead is indicated in the technical data.

An inadequately dimensioned electrical installation can cause serious damage.

▶ The mains lead 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_{1max} of the power source must be known in order to select the correct generator output.
The maximum apparent power S_{1max} of the power source is calculated for 3-phase devices as follows:

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

I_{1max} and U_1 according to the device rating plate and technical data

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

$S_{GEN} = S_{1max}$ x 1.35

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

IMPORTANT! The generator apparent power S_{GEN} must not be less than the maximum apparent power S_{1max} of the power source!

NOTE!

The voltage delivered by the generator must never fall outside of the mains voltage tolerance range.
The mains voltage tolerance is specified in the "Technical data" section.

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 start-up.
A universal strain-relief device for cable diameters of 12 - 30 mm (0.47 - 1.18 in.) is mounted on the power source.

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

Safety

> ⚠ **WARNING!**
>
> **Danger from work that is not carried out properly.**
> This can result in severe personal injury and damage to property.
> ▶ The work described below may only be performed by trained specialist personnel.
> ▶ Follow national standards and guidelines.

> ⚠ **CAUTION!**
>
> **Danger from improperly prepared mains cable.**
> Short circuits and damage to property may result.
> ▶ Fit ferrules to all phase conductors and the ground conductor of the stripped mains cable.

Specified mains cable

Europe:

Power source Mains voltage	Mains cable
iWave 300i /nc DC 3 x 400 V 3 x 460 V	 H07RN-F 4G4 H07RN-F 4G4
iWave 300i /MV/nc DC 3 x 200 - 230 V 3 x 400 - 575 V	 H07RN-F 4G6 H07RN-F 4G4
iWave 300i /nc AC/DC 3 x 400 V 3 x 460 V	 H07RN-F 4G4 H07RN-F 4G4
iWave 300i /MV/nc AC/DC 3 x 200 - 230 V 3 x 400 - 575 V	 H07RN-F 4G6 H07RN-F 4G4
iWave 400i /nc DC 3 x 400 V 3 x 460 V	 H07RN-F 4G4 H07RN-F 4G4
iWave 400i /MV/nc DC 3 x 200 - 230 V 3 x 400 - 575 V	 H07RN-F 4G10 H07RN-F 4G4

Power source Mains voltage	Mains cable
iWave 400i /nc AC/DC 3 x 400 V 3 x 460 V	 H07RN-F 4G4 H07RN-F 4G4
iWave 400i /MV/nc AC/DC 3 x 200 - 230 V 3 x 400 - 575 V	 H07RN-F 4G10 H07RN-F 4G4
iWave 500i /nc DC 3 x 400 V 3 x 460 V	 H07RN-F 4G4 H07RN-F 4G4
iWave 500i /MV/nc DC 3 x 200 - 230 V 3 x 400 - 575 V	 H07RN-F 4G10 H07RN-F 4G4
iWave 500i /nc AC/DC 3 x 400 V 3 x 460 V	 H07RN-F 4G4 H07RN-F 4G4
iWave 500i /MV/nc AC/DC 3 x 200 - 230 V 3 x 400 - 575 V	 H07RN-F 4G10 H07RN-F 4G4

USA & Canada:

Power source Mains voltage	Mains cable
iWave 300i /nc DC 3 x 400 V 3 x 460 V	 4 x AWG 10 4 x AWG 10
iWave 300i /MV/nc DC 3 x 200 - 230 V 3 x 400 - 575 V	 4 x AWG 8 4 x AWG 10
iWave 300i /nc AC/DC 3 x 400 V 3 x 460 V	 4 x AWG 10 4 x AWG 10
iWave 300i /MV/nc AC/DC 3 x 200 - 230 V 3 x 400 - 575 V	 4 x AWG 8 4 x AWG 10
iWave 400i /nc DC 3 x 400 V 3 x 460 V	 4 x AWG 10 4 x AWG 10
iWave 400i /MV/nc DC 3 x 200 - 230 V 3 x 400 - 575 V	 4 x AWG 6 4 x AWG 10
iWave 400i /nc AC/DC 3 x 400 V 3 x 460 V	 4 x AWG 10 4 x AWG 10
iWave 400i /MV/nc AC/DC 3 x 200 - 230 V 3 x 400 - 575 V	 4 x AWG 6 4 x AWG 10
iWave 500i /nc DC 3 x 400 V 3 x 460 V	 4 x AWG 8 4 x AWG 8

Power source Mains voltage	Mains cable
iWave 500i /MV/nc DC 3 x 200 - 230 V 3 x 400 - 575 V	4 x AWG 4 4 x AWG 8
iWave 500i /nc AC/DC 3 x 400 V 3 x 460 V	4 x AWG 8 4 x AWG 8
iWave 500i /MV/nc AC/DC 3 x 200 - 230 V 3 x 400 - 575 V	4 x AWG 4 4 x AWG 8

Connecting the mains cable for nc power sources
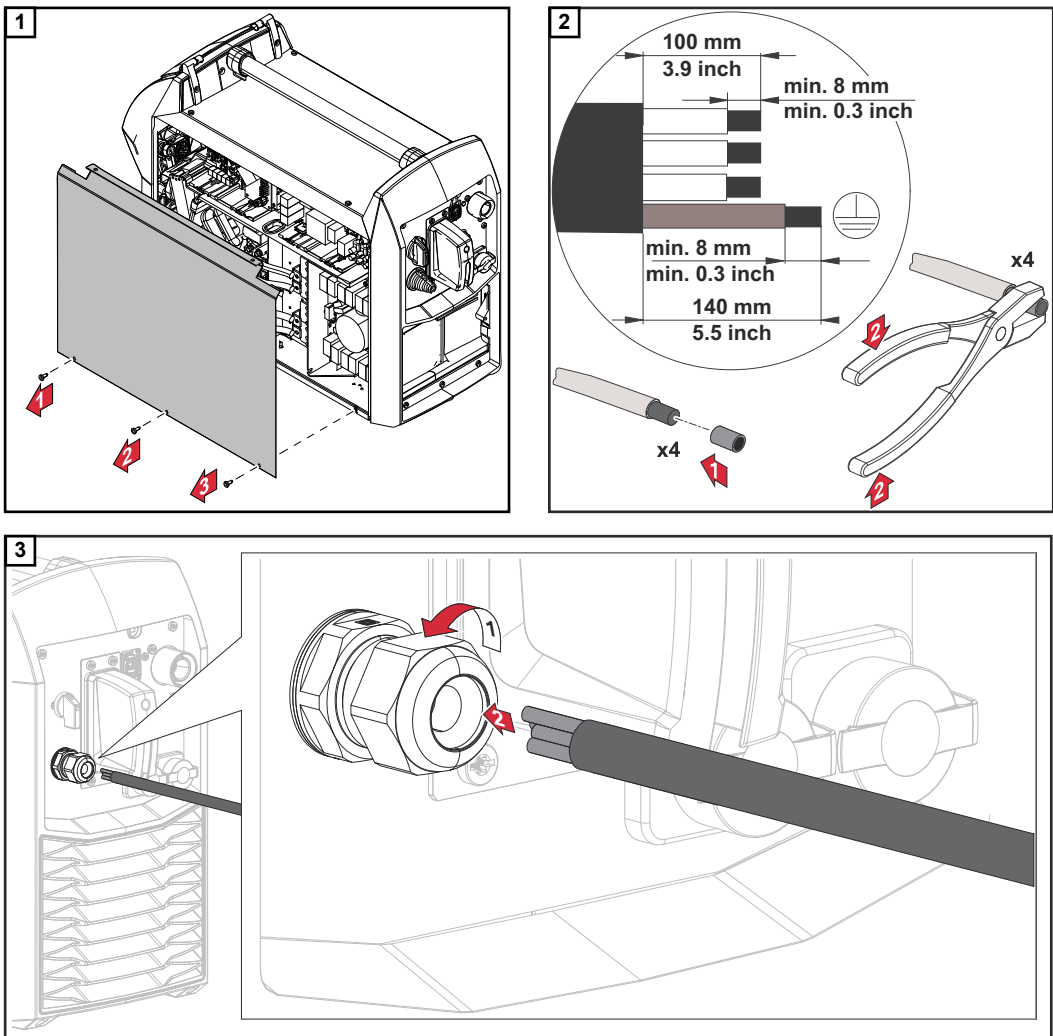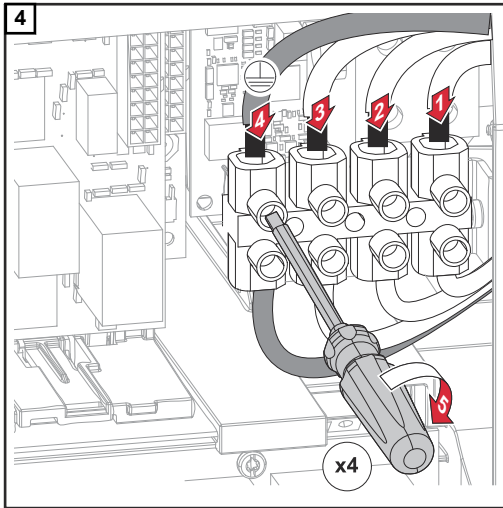
GND - L1 - L2 - L3; 4x TX20, 1.5 Nm / 1.11 lb-ft
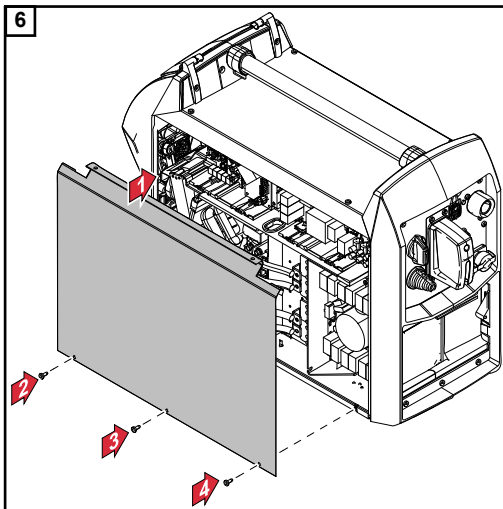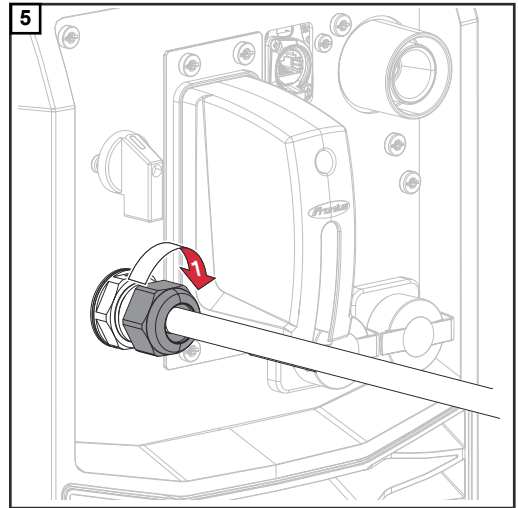
Connecting the mains cable for MV power sources

150 mm
5.9 inch
min. 8 mm
min. 0.3 inch
min. 8 mm
min. 0.3 inch
170 mm
6.7 inch
x4
x4

3
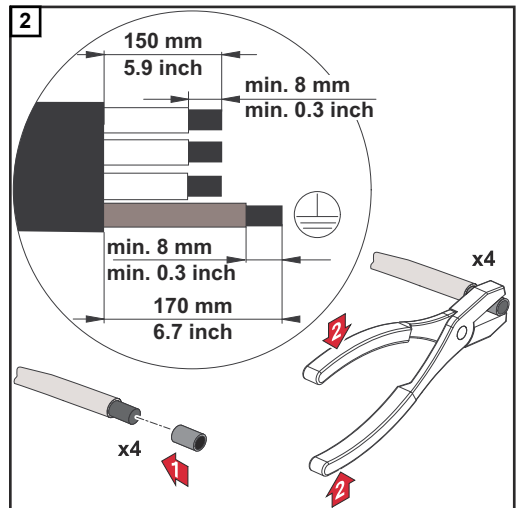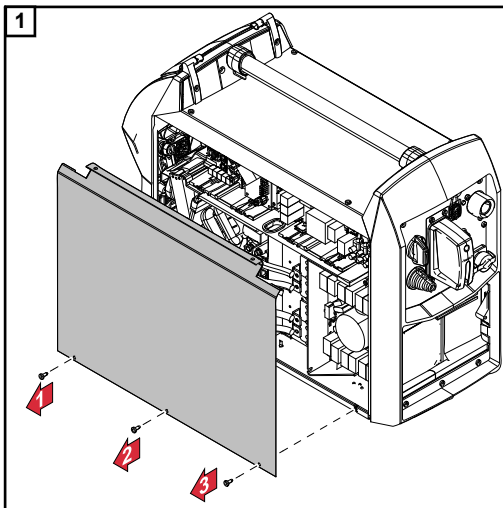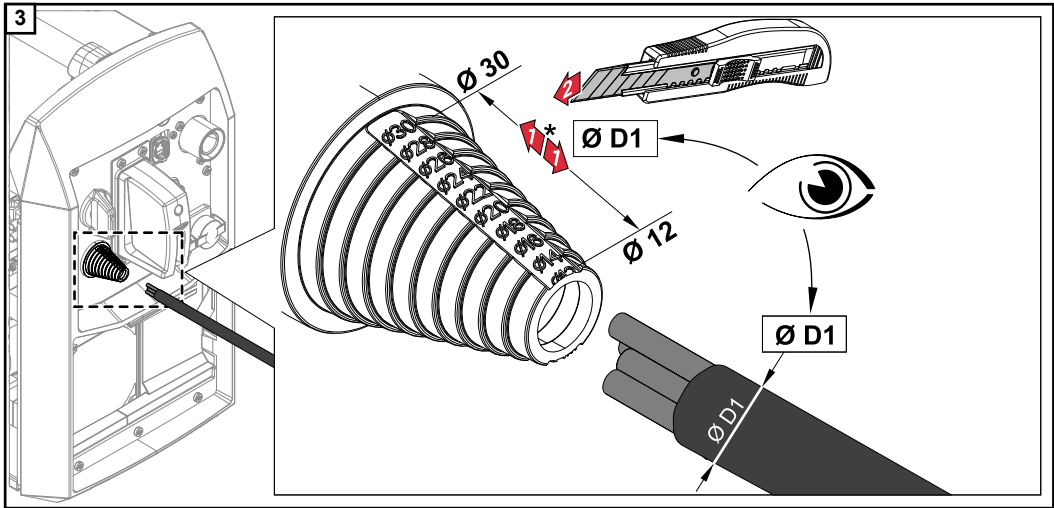
Cut the strain-relief device to length according to the outer diameter of the mains cable

4
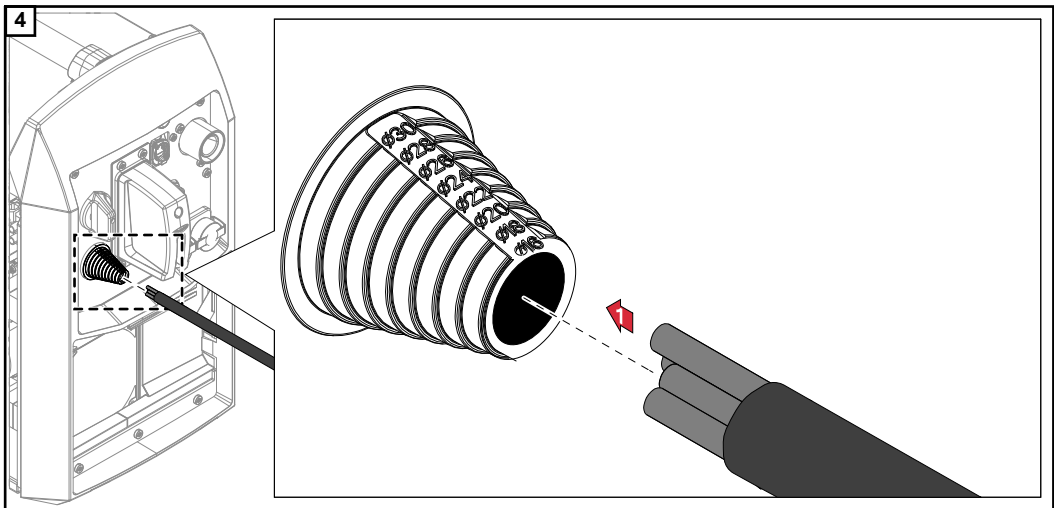
IMPORTANT! When inserting the mains cable, ensure that the cable sheath protrudes approx. 5 - 10 mm beyond the strain-relief device into the device.

5
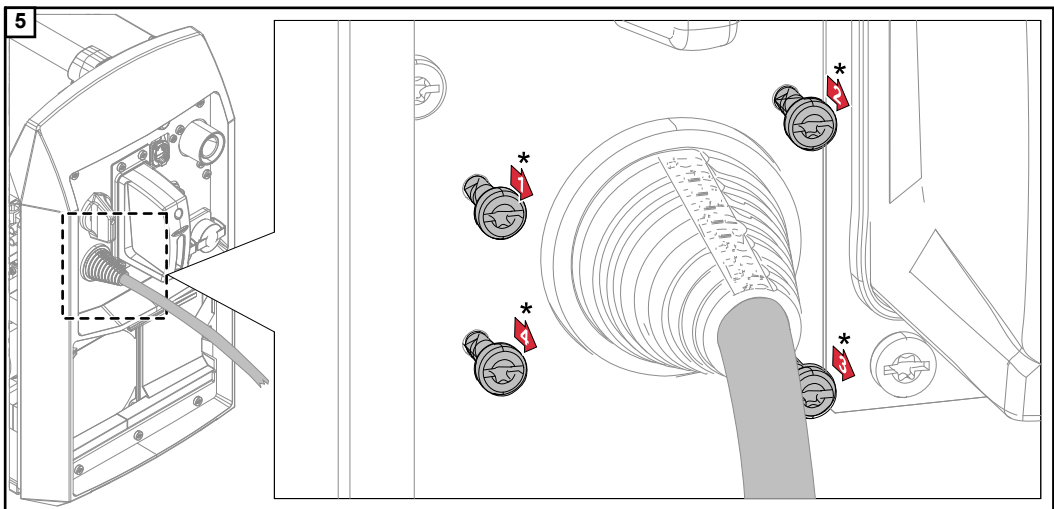
*   Only loosen the 4 TX20 screws, do not remove them

6
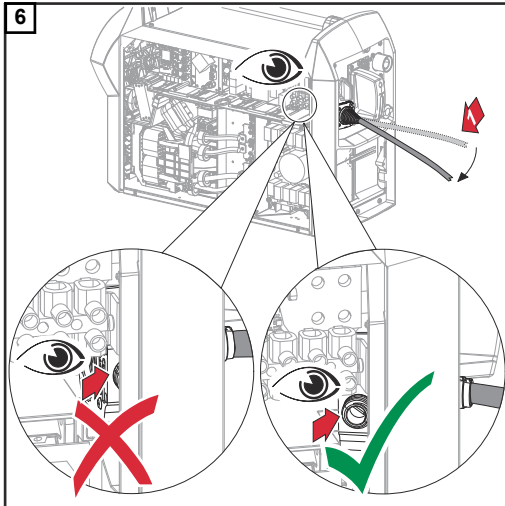
Push the mains cable toward the open side in order to access the strain-relief device clamping screw.

7

8

x4

1,5 Nm
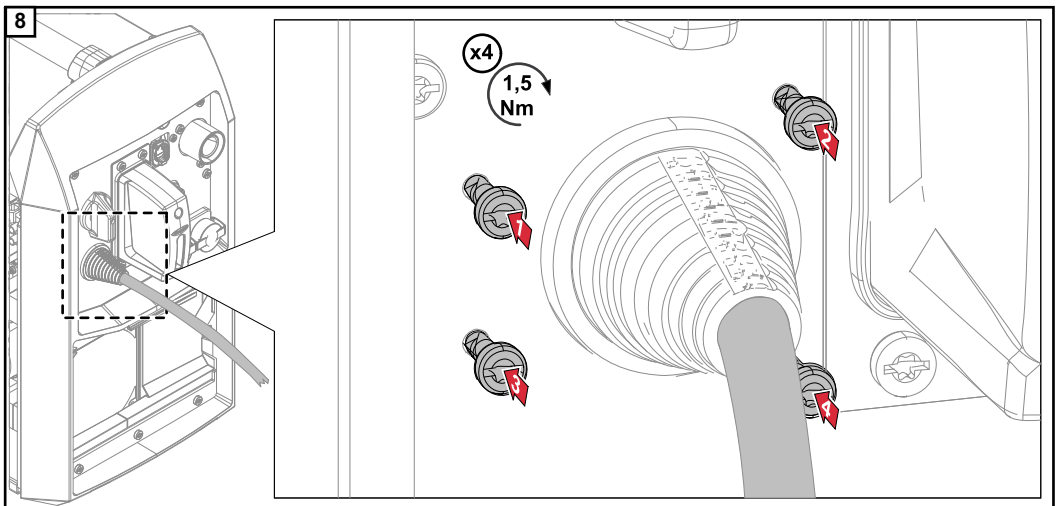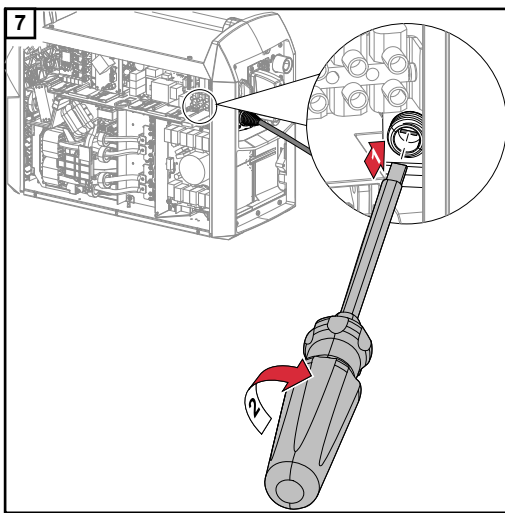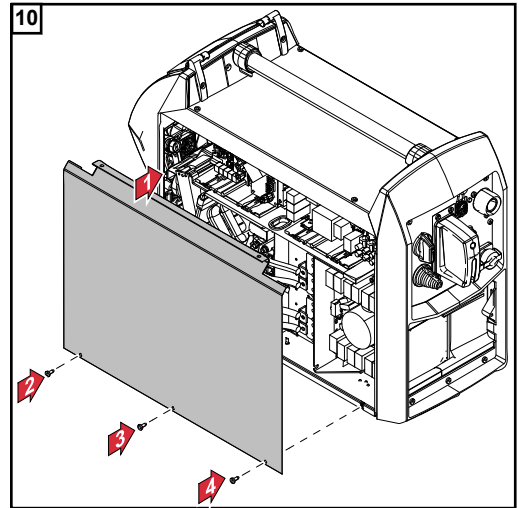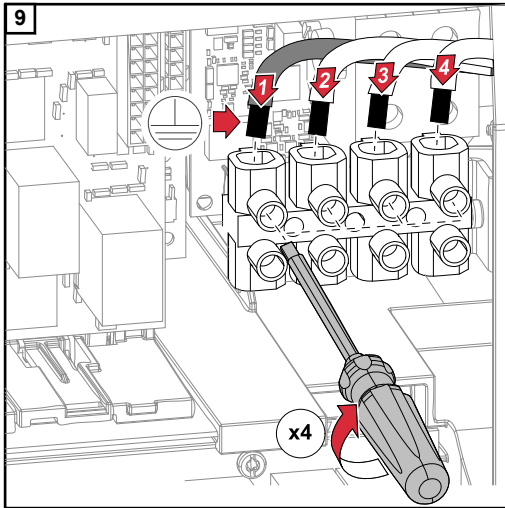
Locking and unlocking the power source using the NFC key

General

NFC key = NFC card or NFC key fob

The power source can be locked by means of an NFC key, e.g., to prevent unauthorized access or the modification of welding parameters.

Locking and unlocking is a contactless operation on the power source control panel.

To lock and unlock the power source, the power source must be turned on.

Locking and unlocking the power source using the NFC key

Lock the power source

1 Hold the NFC key over the reading zone for NFC keys

The key symbol appears briefly on the display.

The key symbol is then displayed in the status bar.

| WIG | 4-Takt | DC− HF TAC ⫪ ⟲ | | ✳ | 🔑 | 10:19 11.08.21 |

The power source is now locked.
Only the welding parameters can be viewed and set using the selection dial.

If the operator attempts to access a locked function, a corresponding message is displayed.

Unlock the power source

1 Hold the NFC key over the reading zone for NFC keys

The crossed-out key symbol appears briefly on the display.

The key symbol is no longer displayed in the status bar.
All power source functions power source are available again without restriction.

NOTE!

Further information on locking the power source can be found in under "Defaults - Administration" starting on page 214.

TIG

System components

System components for manual applications
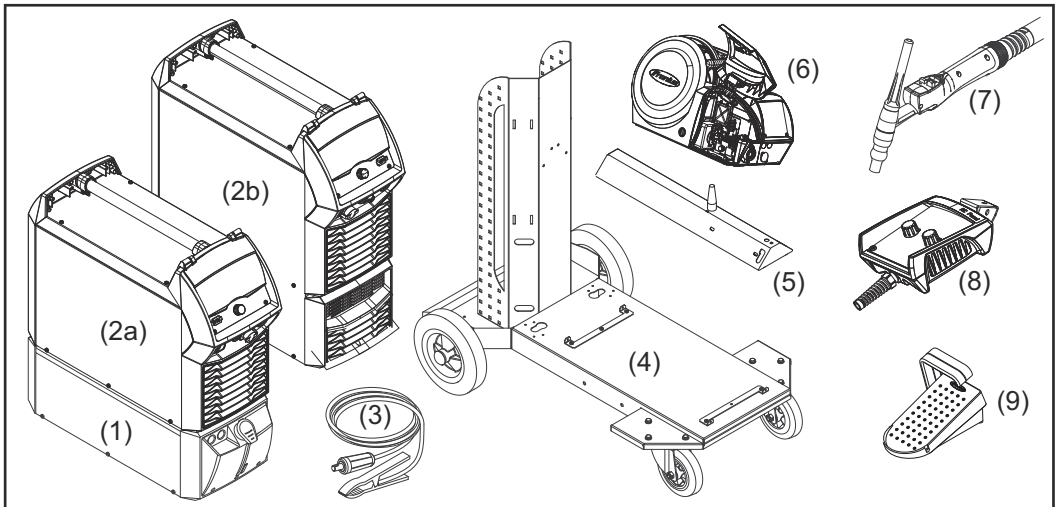
(1)	Cooling unit
(2a)	iWave DC power source
(2b)	iWave AC/DC power source
(3)	Grounding cable
(4)	Trolley and gas cylinder holder
(5)	Swivel pin holder
(6)	Cold wire feeder
(7)	Welding torch
(8)	Remote controls
(9)	Foot-operated remote controls

Notes on the cooling unit

A cooling unit is recommended for the following applications:
- JobMaster TIG welding torch
- Robot mode
- Hosepacks over 5 m in length
- TIG AC welding
- General welding in the higher power range

The cooling unit is supplied with power via the power source. If the power source's power switch is switched to position - I -, the cooling unit is ready for operation.
For more information on the cooling unit, refer to the Operating Instructions for the cooling unit.

Minimum equipment for welding operations

TIG AC welding
- iWave AC/DC power source
- Grounding cable
- TIG welding torch
- Shielding gas supply with gas pressure regulator
- Filler metal depending on application

TIG DC welding
- Power source
- Grounding cable
- TIG welding torch
- Shielding gas supply with gas pressure regulator
- Filler metal depending on application

Commissioning

Safety

> ⚠ **WARNING!**
>
> **Danger from electrical current.**
> This can result in serious personal injury and damage to property.
> ► Before starting work, switch off all devices and components involved, and disconnect them from the grid.
> ► Secure all devices and components involved so they cannot be switched back on.
> ► After opening the device, use a suitable measuring instrument to check that electrically charged components (such as capacitors) have been discharged.

> ⚠ **WARNING!**
>
> **Danger of electrical current due to electrically conductive dust in the device.**
> This can result in severe personal injury and damage to property.
> ► Only operate the device if an air filter is fitted. The air filter is a very important safety device for achieving IP 23 protection.

General

The start-up of the power sources for TIG welding is described on the basis of a manual, water-cooled TIG application.

The following diagrams show an overview of how the individual system components are put together.
For detailed information about the individual steps, please refer to the corresponding Operating Instructions for the system components.

Assembling the system components (overview)

iWave DC power sources
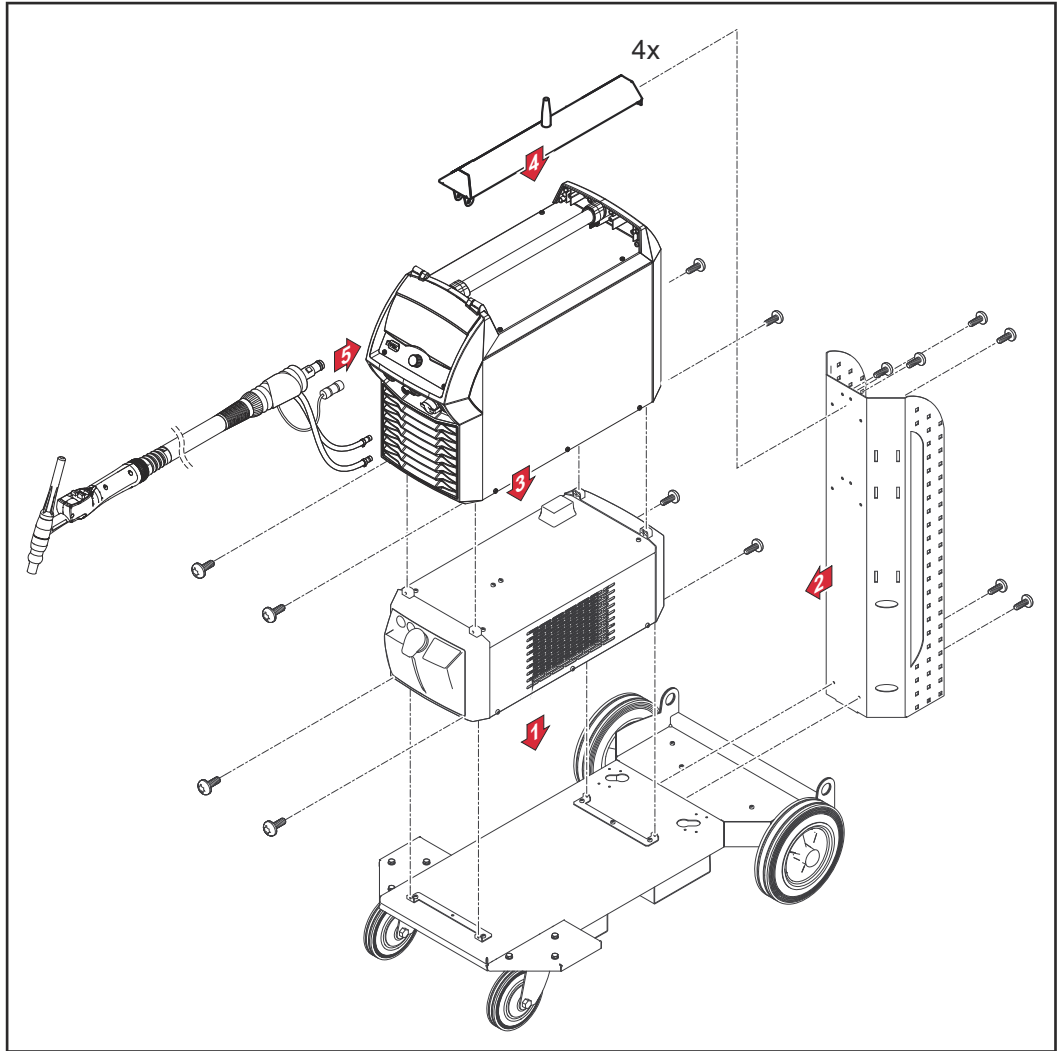
iWave AC/DC power sources
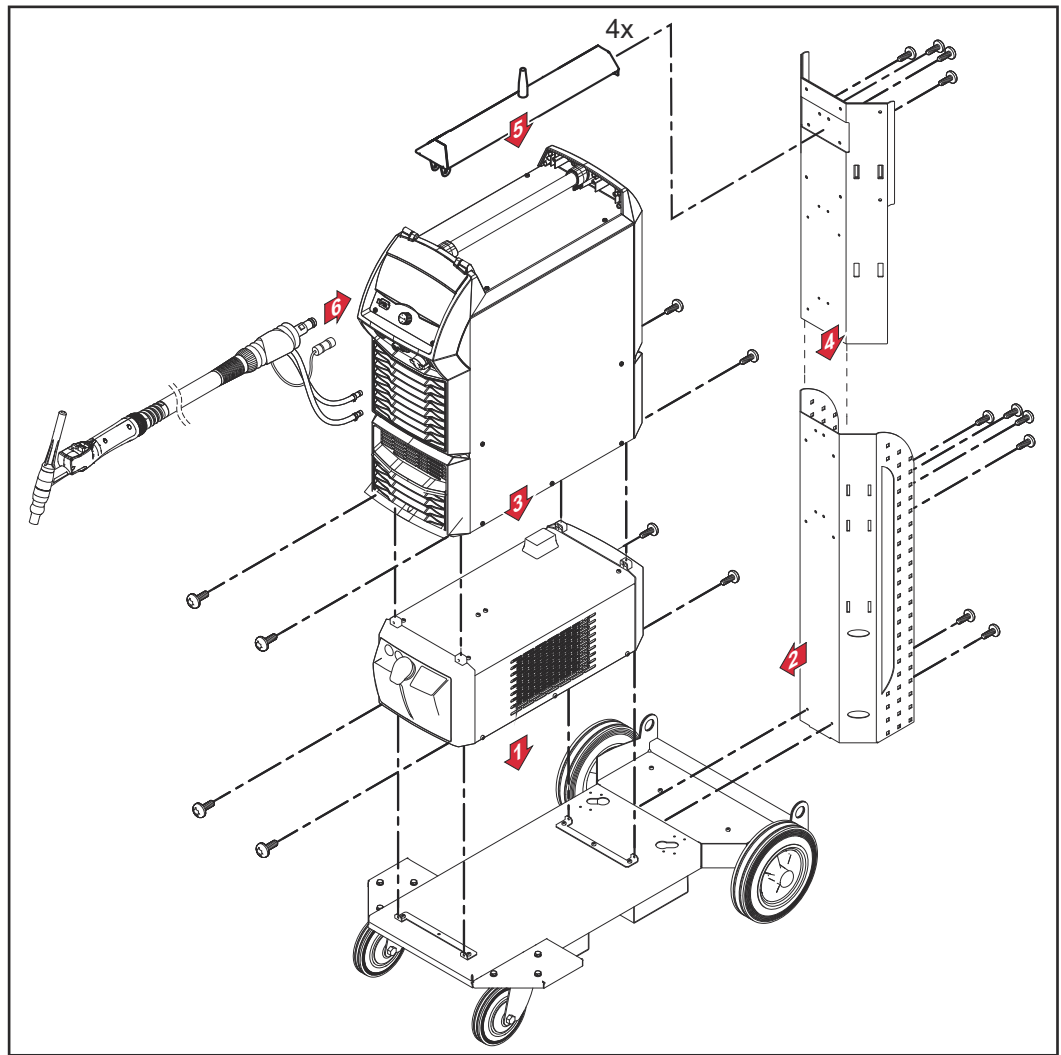
Connecting the gas cylinder

> ⚠️ **WARNING!**
>
> **Danger of severe injury and damage to property if gas cylinders fall over.**
> ▶ Place gas cylinders on a solid, level surface so that they remain stable.
> ▶ Secure the gas cylinders to prevent them from falling over: Secure the safety strap at the height of the upper part of a gas cylinder.
> ▶ Never secure the safety strap to the neck of the cylinder.
> ▶ Observe the safety rules of the gas cylinder manufacturer.
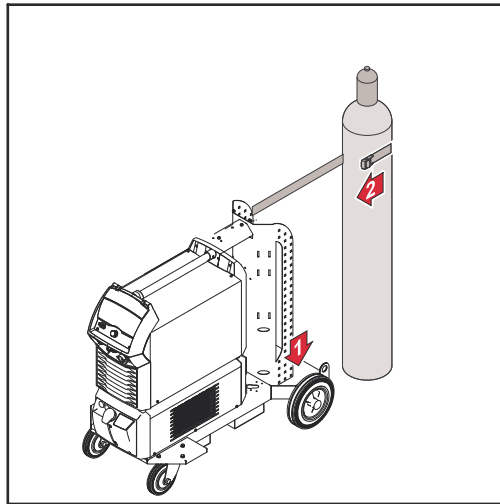
1 Place the gas cylinder on the base of the trolley

2 Attach the cylinder strap to the upper part of the gas cylinder (but not to the neck of the cylinder) to prevent the cylinder from falling over
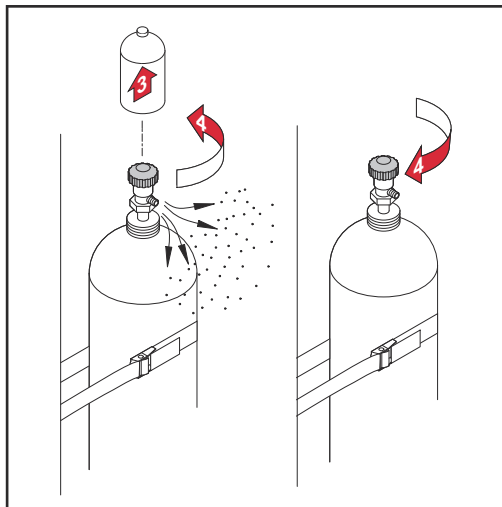
3 Remove the protective cap from the gas cylinder

4 Briefly open the gas cylinder valve to remove any dirt
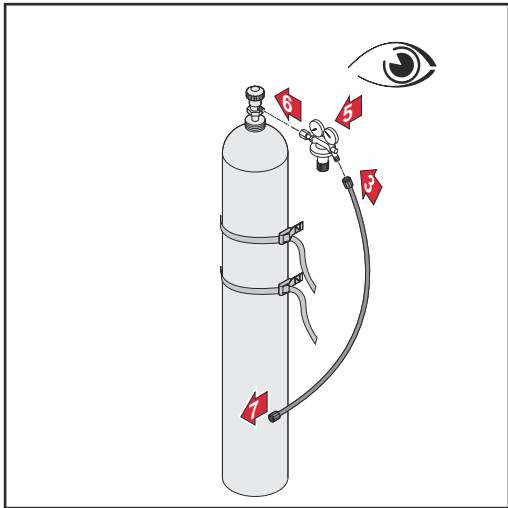
5 Inspect the seal on the gas pressure regulator

6 Screw the pressure regulator onto the gas cylinder and tighten it

When using a TIG welding torch with integrated gas connection:

7 Use a gas hose to connect the gas pressure regulator and shielding gas connection to the rear of the power source

8 Tighten the union nut of the gas hose

When using a TIG welding torch without integrated gas connection:

6 Connect the gas hose of the TIG welding torch to the gas pressure regulator

---

NOTE!

The gas connection when using a MultiControl (MC) cooling unit is described in the Operating Instructions for the cooling unit.

Connecting the welding torch to the power source and cooling unit

NOTE!

Do not use pure tungsten electrodes for TIG DC power sources (color code: green).

NOTE!

Before every start-up:
▶ Check the O-ring at the welding torch connection,
▶ Check the coolant level

---

1 Fit parts to the welding torch according to the Operating Instructions for the welding torch
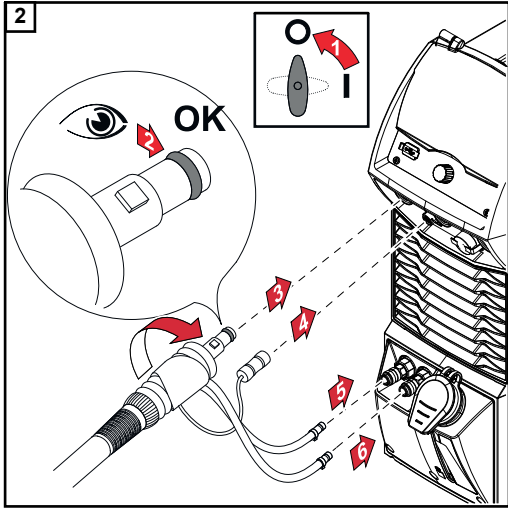
IMPORTANT! Check the coolant flow at regular intervals during welding.

Establishing a ground earth connection to the workpiece

[1] Set the power switch to - O -

[2]
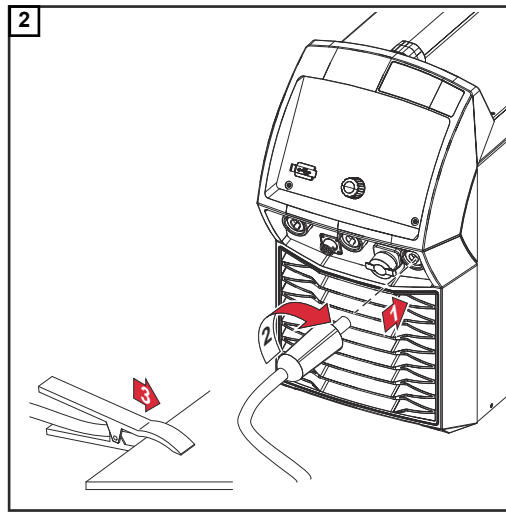
TIG Operating Modes

Safety

Follow the guidelines referring to setting, setting range, and units of measurement for the available parameters in the "Setup Menu" section.

**Symbols and ex-
planations**
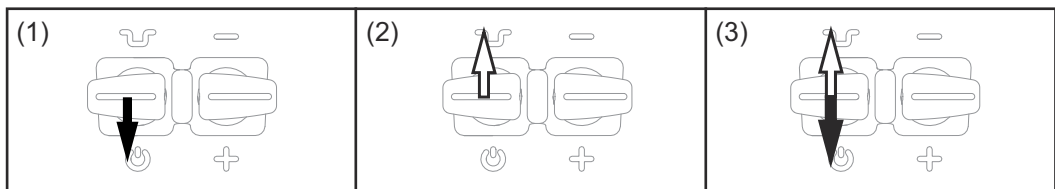
(1) Pull back and hold the torch trigger (2) Release the torch trigger (3) Briefly pull back the torch trigger (< 0.5 s)
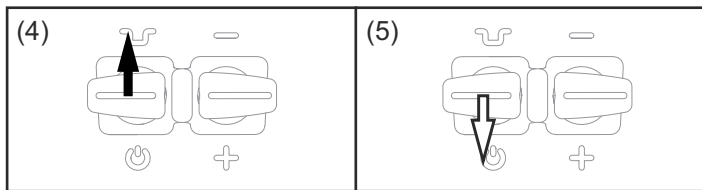
(4) Push the torch trigger forward and hold (5) Release the torch trigger

GPr	Gas pre-flow
SPt	Spot welding time
I_S	Starting current: the temperature is raised gently at low welding current, so that the filler metal can be positioned correctly
I_E	Final current: to avoid local overheating of the parent material caused by heat accumulation at the end of welding. This prevents possible sagging of the weld seam.
t_{UP}	UpSlope: steady rise of the starting current to the main current (welding current) I_1
t_{DOWN}	DownSlope: steady lowering of the welding current until it reaches the final current
I_1	Main current (welding current): uniform thermal input into the parent material, whose temperature is raised by the advancing heat

I_2	Lowering current:
	intermediate lowering of the welding current to avoid local overheating of the parent material

GPO	Gas post-flow

2-step mode
- Welding: Pull back the torch trigger and hold it in this position
- End of welding: Release the torch trigger
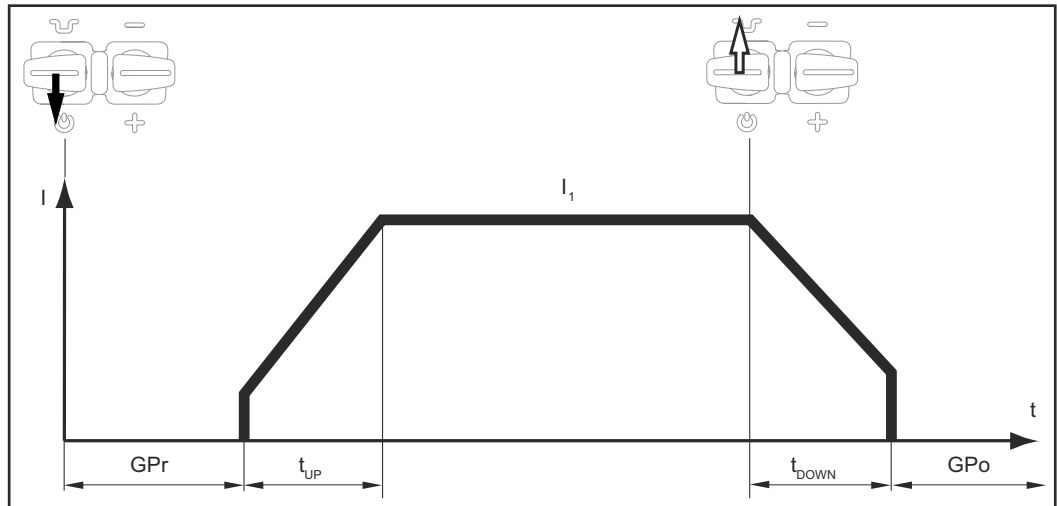
2-step mode

4-step mode
- Start of welding with starting current I_S: Pull back the torch trigger and hold it in this position
- Welding with main current I_1: Release the torch trigger
- Lowering to final current I_E: Pull back the torch trigger and hold it in this position
- End of welding: Release the torch trigger
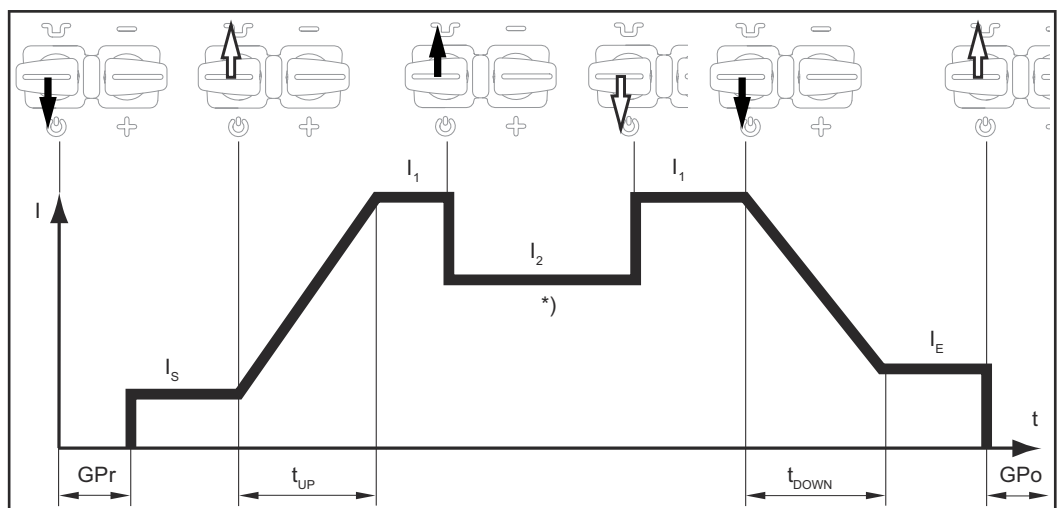
4-step mode

*) Intermediate lowering

With intermediate lowering, the welding current is lowered to the set lowering current I-2 during the main current phase.

- To activate intermediate lowering, push the torch trigger forward and hold it in this position
- Release the torch trigger to resume the main current

Special 4-step mode: Version 1

Intermediate lowering to the set lowering current I_2 is effected by briefly pulling back the torch trigger. Briefly pull back the torch trigger again to return to the main current I_1.
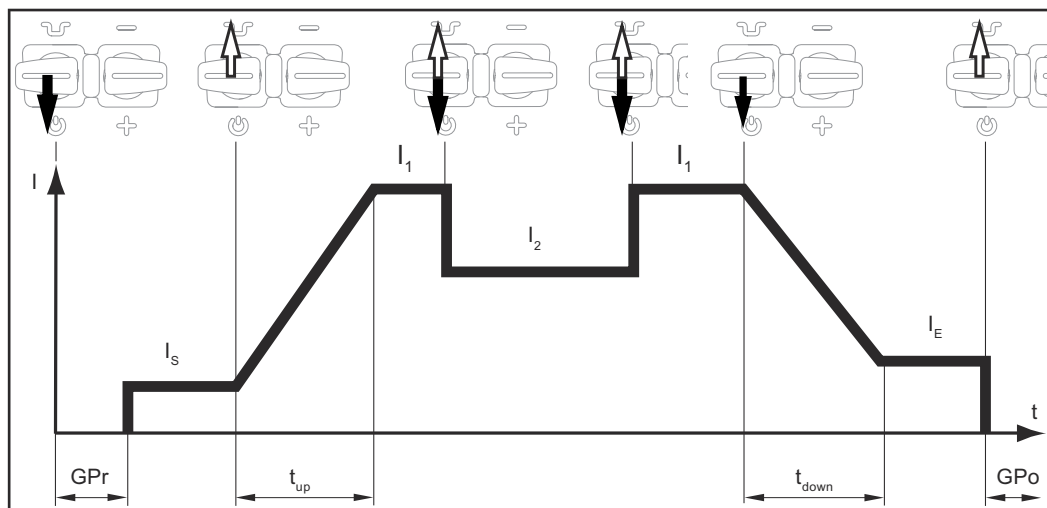
Special 4-step mode: Version 1

Version 1 of special 4-step mode is activated by the following parameter setting:

Process parameters / General / 2-step settings
- Starting current time = off
- Final current time = off

Process parameters / General / 4-step settings
- Lowering current slope 1 = off
- Lowering current slope 2 = off

Process parameters / Ignition & operating mode / Operating mode settings
- I2 via torch trigger = on
- Lowering current button function = I2

Special 4-step mode: Version 2

In version 2, intermediate lowering is also carried out using the set lowering current slope 1/2 values:

- Push the torch trigger forward and hold it in this position: the welding current steadily falls using the set lowering current slope 1 to the set lowering current value I_2. The lowering current I_2 continues until the torch trigger is released.
- After releasing the torch trigger: the welding current rises to the main current I_1 using the set lowering current slope 2.
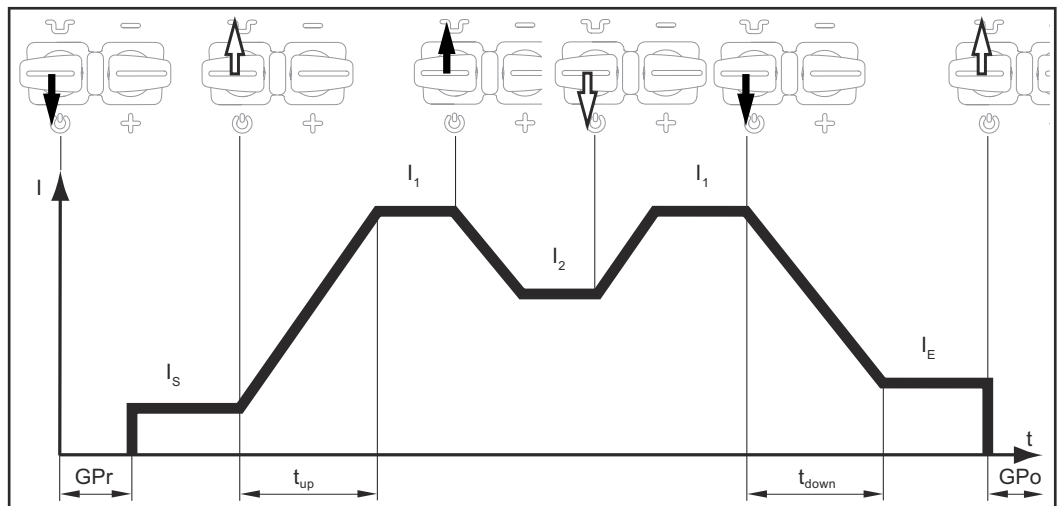
Special 4-step mode: Version 2

Version 2 of special 4-step mode is activated by the following parameter setting:

Process parameters / General / 2-step settings
- Starting current time = off
- Final current time = off

Process parameters / General / 4-step settings
- Lowering current slope 1 = on
- Lowering current slope 2 = on

Process parameters / Ignition & operating mode / Operating mode settings
- I2 via torch trigger = off
- Lowering current button function = I2

Special 4-step mode: Version 3

Intermediate lowering of the welding current in version 3 is triggered by pushing the torch trigger forward and holding it in this position. Following the release of the torch trigger, the main current I_1 is once again available.

Pull back the torch trigger to immediately end welding without a downslope and final current.
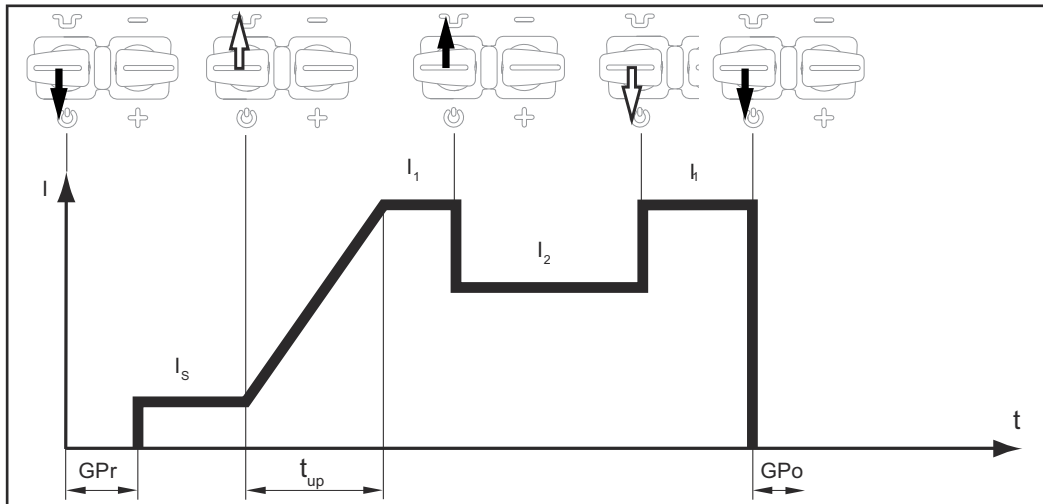
Special 4-step mode: Version 3

Version 3 of special 4-step mode is activated using the following parameter setting:

Process parameters / General / 2-step settings
- Starting current time = off
- Final current time = 0.01 s

Process parameters / General / 4-step settings
- Lowering current slope 1 = off
- Lowering current slope 2 = off

Process parameters / Ignition & operating mode / Operating mode settings
- I2 via torch trigger = off
- Lowering current button function = I2

Special 4-step mode: Version 4

- Start of welding and welding: Briefly pull back the torch trigger and release - the welding current rises from the starting current I_S to the main current I_1 using the set UpSlope.
- Push forward the torch trigger and hold it in this position for intermediate lowering
- Following the release of the torch trigger, the main current I_1 is once again available
- End of welding: Quickly pull back the torch trigger and release
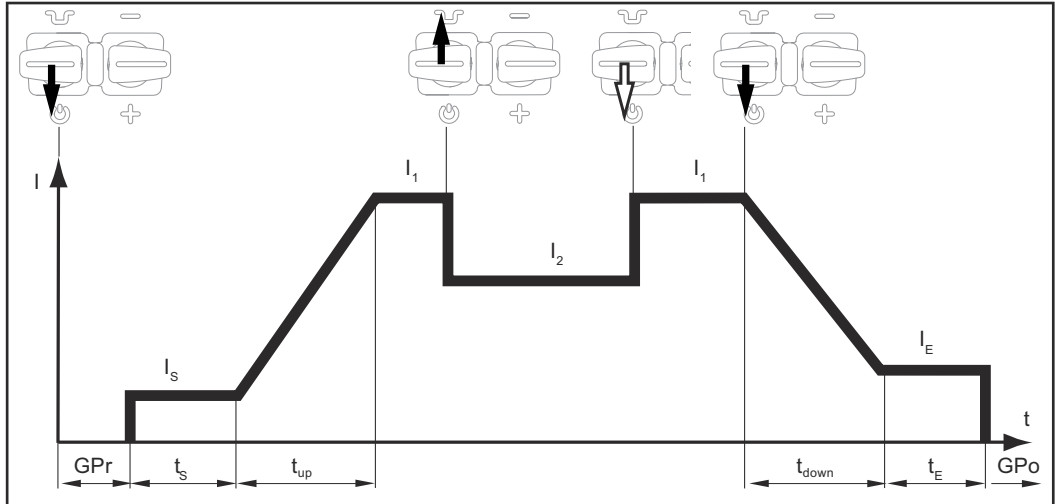
Special 4-step mode: Version 4

Version 4 of special 4-step mode is activated using the following parameter setting:

Process parameters / General / 2-step settings
- Starting current time = on
- Final current time = on

Process parameters / General / 4-step settings
- Lowering current slope 1 = off
- Lowering current slope 2 = off

Process parameters / Ignition & operating mode / Operating mode settings
- I2 via torch trigger = off
- Lowering current button function = I2

Special 4-step mode: Version 5

Version 5 allows the welding current to be increased and decreased without an Up/Down torch.
-    The longer the torch trigger is pressed forward during welding, the further the welding current increases (up to the maximum).
-    After releasing the torch trigger, the welding current remains constant.
-    The longer the torch trigger is pressed forward again, the further the welding current is reduced.
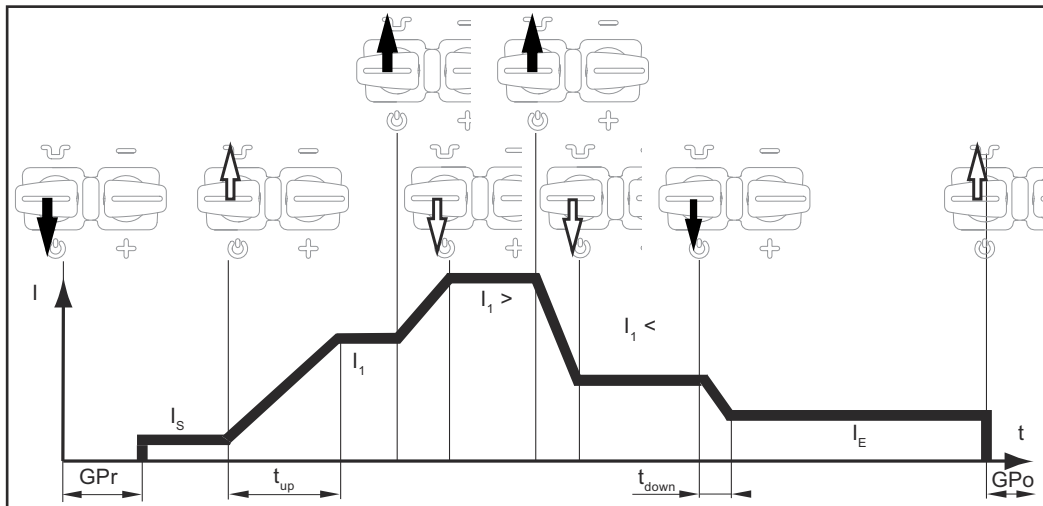
Special 4-step mode: Version 5

Version 5 of special 4-step mode is activated using the following parameter setting:

Process parameters / General / 2-step settings
-    Starting current time = off
-    Final current time = off

Process parameters / General / 4-step settings
-    Lowering current slope 1 = off
-    Lowering current slope 2 = off

Process parameters / Ignition & operating mode / Operating mode settings
-    I2 via torch trigger = off or on
-    Lowering current button function = I1

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Special 4-step mode: Version 6

- Start of welding with starting current I_S and UpSlope: Pull back the torch trigger and hold it in this position
- Intermediate lowering to I_2 and change from I_2 back to main current I_1: briefly press (< 0.5 s) and release torch trigger
- End the welding process: long press (> 0.5 s) and release the torch trigger.

The process is automatically terminated after the DownSlope phase and the final current phase.

If the torch trigger is pressed briefly (< 0.5 s) and released during the DownSlope or final current phase, an UpSlope to the main current is initiated and the welding process continues.
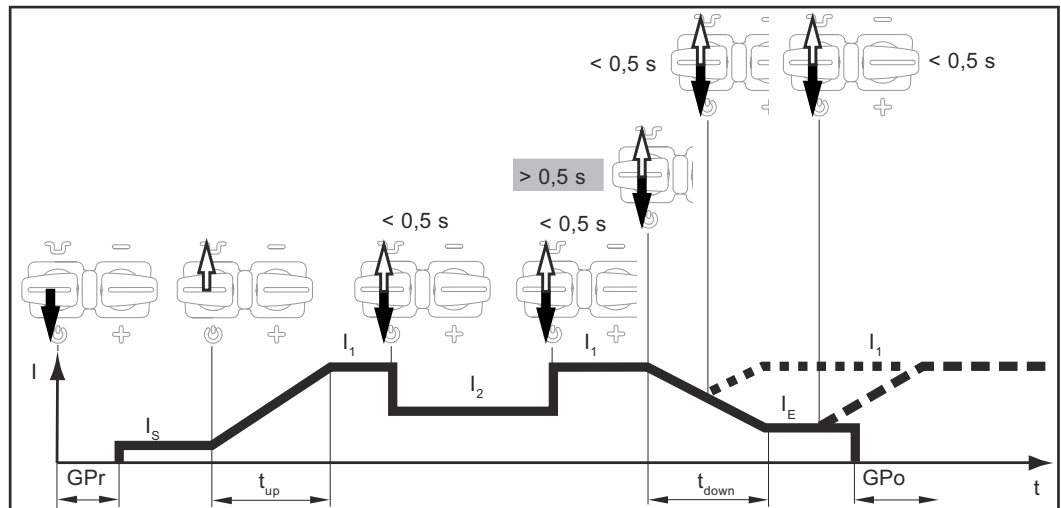
Special 4-step mode: Version 6

Version 6 of special 4-step mode is activated by the following parameter setting:

Process parameters / General / 2-step settings
- Starting current time = off
- Final current time = on

Process parameters / General / 4-step settings
- Lowering current slope 1 = off
- Lowering current slope 2 = off

Process parameters / Ignition & operating mode / Operating mode settings
- I2 via torch trigger = on
- Lowering current button function = I2

Spot welding   -   Welding: Briefly pull back the torch trigger
The duration of welding corresponds to the value that was entered for the "Spot welding time" setup parameter.
-    Premature ending of the welding process: Pull the torch trigger back again

TIG welding

Safety

> ⚠️ **WARNING!**
>
> **Danger from incorrect operation and work that is not carried out properly.**
> This can result in serious personal injury and damage to property.
> ▶ All the work and functions described in this document must only be carried out by technically trained and qualified personnel.
> ▶ Read and understand this document in full.
> ▶ Read and understand all safety rules and user documentation for this equipment and all system components.

> ⚠️ **WARNING!**
>
> **Danger from electrical current.**
> This can result in serious personal injury and damage to property.
> ▶ Before starting work, switch off all devices and components involved, and disconnect them from the grid.
> ▶ Secure all devices and components involved so they cannot be switched back on.
> ▶ After opening the device, use a suitable measuring instrument to check that electrically charged components (such as capacitors) have been discharged.

TIG welding

> ⚠️ **CAUTION!**
>
> **Danger of injury and damage from electric shock.**
> When the power switch is switched to position - I -, the tungsten electrode of the welding torch is live.
> ▶ Ensure that the tungsten electrode is not touching anyone or any electrically conductive or grounded parts (housing, etc.).

1 Set the power switch to - I -

2   Select "Welding process"

3   Select "Process"

An overview of available welding processes is displayed.

4   Select "TIG"

5   Select "Mode"

An overview of operating modes is displayed.
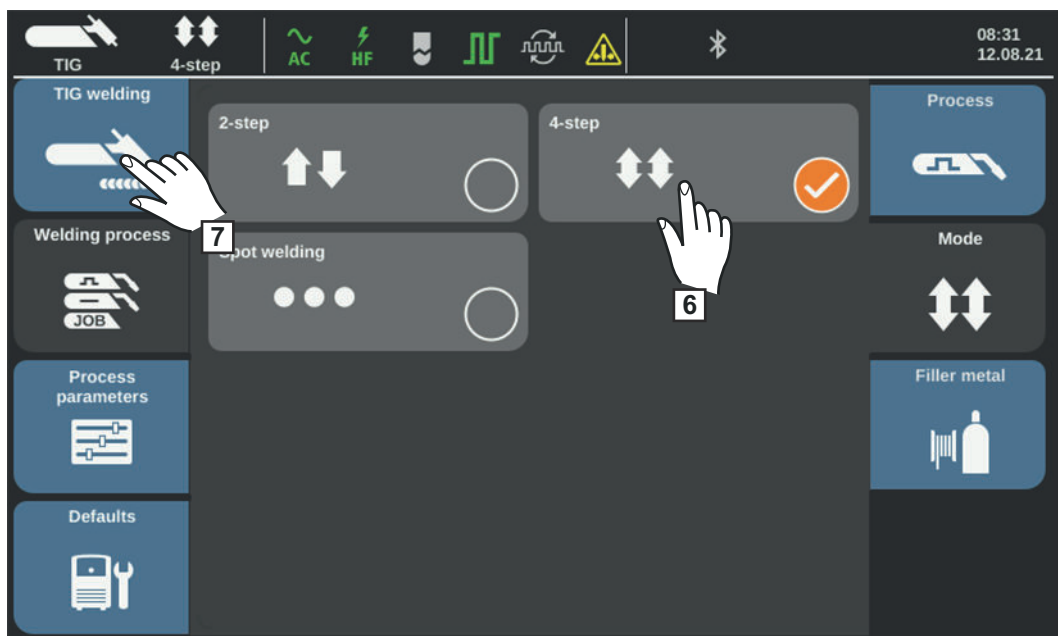
6   Select the desired operating mode

7   Select "TIG welding"

The TIG welding parameters are displayed.

| 8 | Turn the selection dial (or touch the welding parameters symbol in the indicator bar): Select welding parameters |

| 9 | Press the selection dial |

The value of the parameter is highlighted in blue and can now be changed.

| 10 | Turn the selection dial: Change the value of the parameter |

| 11 | If necessary, select the process parameters for user- or application-specific settings on the welding system |

| 12 | Open the gas cylinder valve |

| 13 | Press the gas-test button |

The gas pre-flow test lasts for 30 seconds at the most. Press the button again to stop the gas flow prematurely.

| 14 | Turn the adjusting screw on the bottom of the gas pressure regulator until the manometer displays the desired quantity of gas |

| 15 | Commence the welding process (ignite arc) |

NOTE!

Under certain circumstances, it may not be possible to change parameters that have been set on the control panel of a system component (e.g. wirefeeder or remote control) on the control panel of the power source.

Welding parameters for TIG welding

AC   Welding parameters for TIG AC welding
DC-   Parameters for TIG DC- welding

Starting current (AC / DC-)
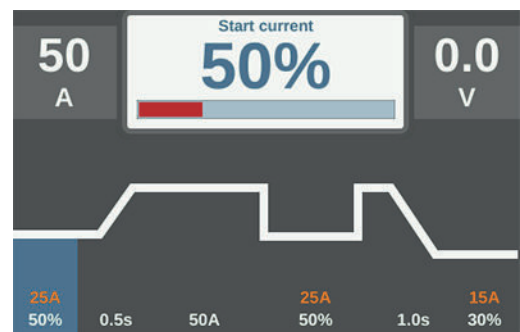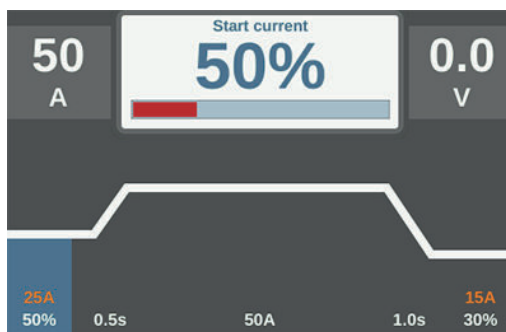
Starting current: 2-step mode | 4-step mode

Setting range: 0 - 200% (of the main current)
Factory setting: 50%

IMPORTANT! The starting current is stored separately for TIG AC welding and TIG DC-welding.

UpSlope (AC / DC-)

UpSlope: 2-step mode and spot welding | 4-step mode

Setting range: off;0.1 - 30.0 s
Factory setting: 0.5 s

IMPORTANT! The stored UpSlope value applies to the 2-step and 4-step modes.

Main current I_1 (AC / DC-)
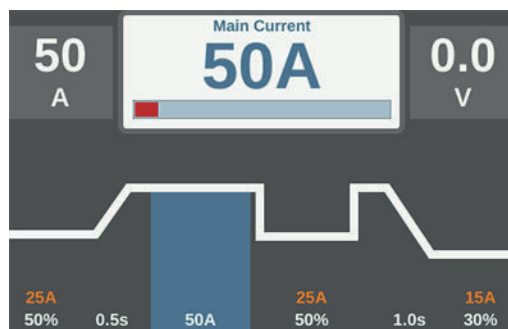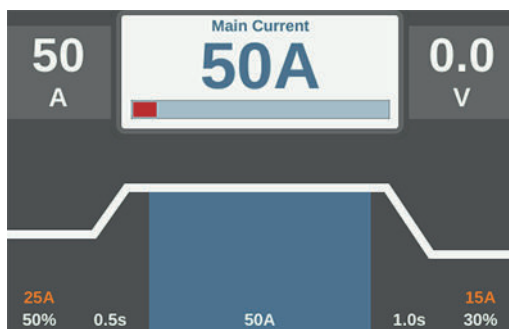
Main current: 2-step mode and spot welding | 4-step mode

Setting range:
iWave 300i DC, iWave 300i AC/DC: 3 - 300 A
iWave 400i DC, iWave 400i AC/DC: 3 - 400 A
iWave 500i DC, iWave 500i AC/DC: 3 - 500 A
Factory setting: -

IMPORTANT! For welding torches with Up/Down function, the full setting range can be selected while the device is on standby.

Lowering current I_2 (AC / DC-)
only in 4-step mode
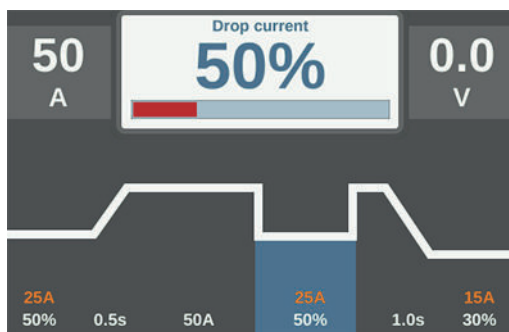
Lowering current I_2 < Main current I_1 | Lowering current I_2 > Main current I_1

Setting range: 0 - 200% (of the main current I_1)
Factory setting: 50%

$I_2 < 100\%$
Brief, adapted reduction of the welding current
(e.g., when changing the welding wire during the welding process)

$I_2 > 100\%$
Brief, adapted increase in the welding current
(e.g., for welding over tacking points with a higher power level)
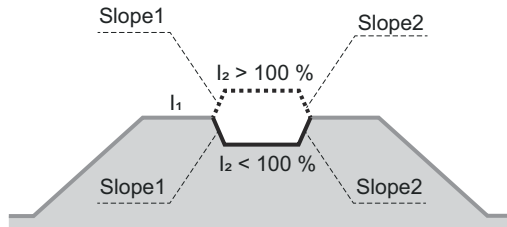
The values for Slope1 and Slope2 can be set in the process parameters.

DownSlope (AC / DC-)

DownSlope: 2-step mode and spot welding | 4-step mode

Setting range: off;0.1 - 30.0 s
Factory setting: 1.0 s

IMPORTANT! The stored DownSlope value applies to the 2-step and 4-step modes.

Final current (AC / DC-)
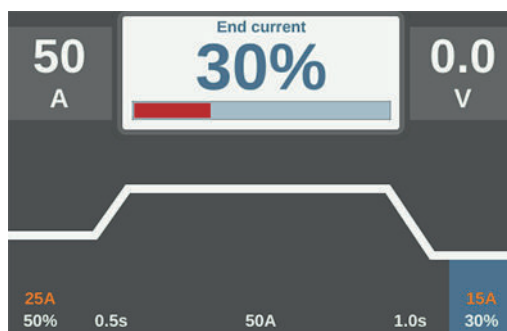
Final current: 2-step mode and spot welding | 4-step mode

Setting range: 0 - 100% (of the main current)
Factory setting: 30%

AC balance (AC)
only with iWave AC/DC
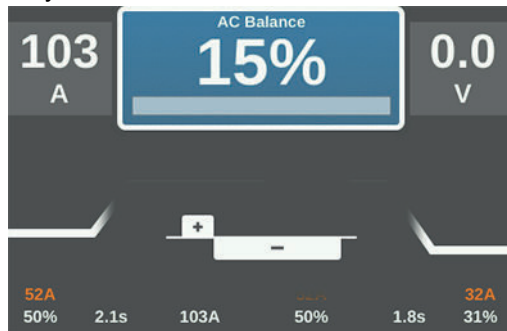
Balance = 15%
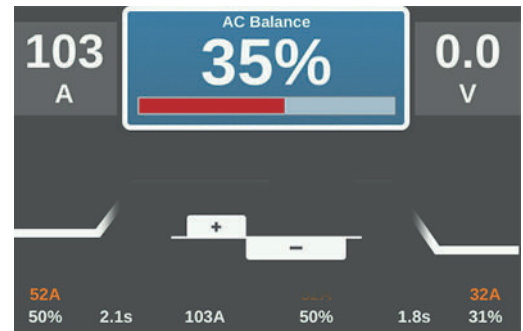
Balance = 35%

Balance = 50%

Setting range: 15 - 50%
Factory setting: 35%

15: Highest melting capacity, lowest cleaning effect

50: Highest cleaning effect, lowest melting capacity

Effect of balance on current flow:
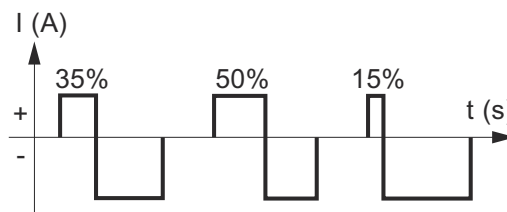
Electrode diameter (AC / DC-)
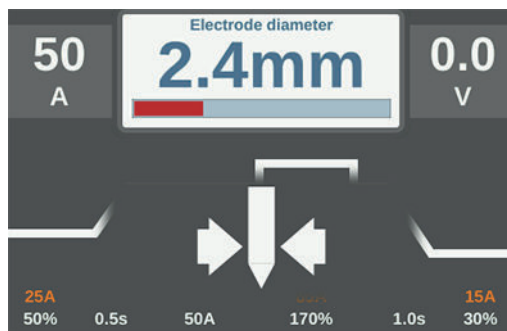
DC-

AC

Setting range: off; 1.0 - 6.4 mm
Factory setting: 2.4 mm

Cap mode (AC)
only with iWave AC/DC
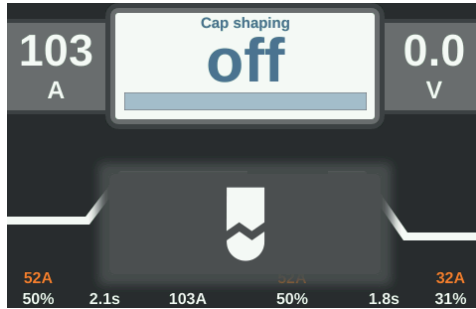
Setting range: off / on
Factory setting: off

off
Automatic cap-shaping function is deactivated

on
The optimum cap for the entered diameter of the tungsten electrode is shaped during the start of welding.
The automatic cap-shaping function is then reset and deactivated.
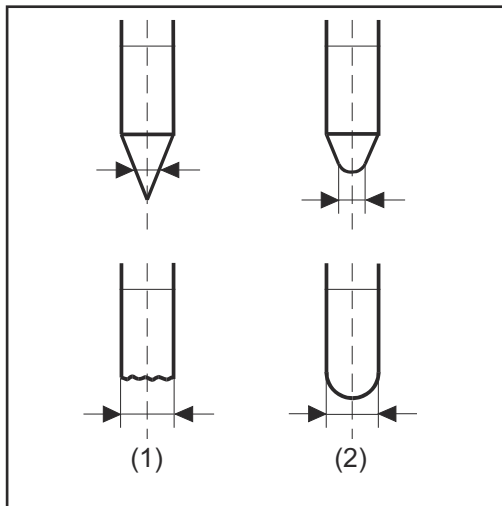
(1) ... before ignition
(2) ... after ignition

Cap mode must be activated separately for each tungsten electrode.

NOTE!

The automatic cap-shaping function is not required if a sufficiently large cap is formed on the tungsten electrode.

Polarity (AC)
only with iWave AC/DC

Polarity

Setting range: DC- / AC
Factory setting: DC-

NOTE!

To add more parameters to the welding parameters, go to Defaults / View / Parameter view setup.
► More information can be found from page **202** onwards.

Igniting the arc

General

In order to ensure an optimal ignition sequence during TIG AC welding, the TIG AC/DC power sources take into account:
- The diameter of the tungsten electrode
- The current temperature of the tungsten electrode, taking into account the previous welding time and break

Igniting the arc using high frequency (HF ignition)

⚠ CAUTION!

Risk of injury due to an electric shock
Although Fronius devices comply with all the relevant standards, high-frequency ignition can transmit a harmless but noticeable electric shock under certain circumstances.
▶ Use prescribed protective clothing, especially gloves!
▶ Only use suitable, completely intact and undamaged TIG hosepacks!
▶ Do not work in damp or wet environments!
▶ Take special care when working on scaffolding, work platforms, in tight, difficult to access or exposed places, or when welding out-of-position!

HF ignition is activated when the "HF ignition" setup parameter is set to "on" under process parameters/ignition parameters.
The HF ignition indicator lights up on the status bar.

Unlike contact ignition, there is no risk of contaminating the tungsten electrode and workpiece during HF ignition.

Procedure for HF ignition:
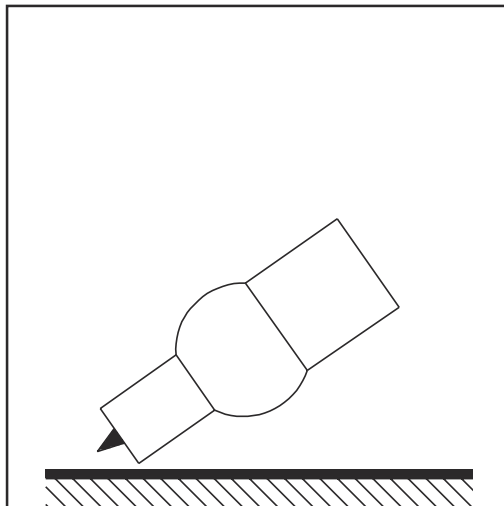
1 Position the gas nozzle at the ignition point so that there is a gap of approximately 2 to 3 mm (5/64 - 1/8 in.) between the tungsten electrode and the workpiece. A gap exists.
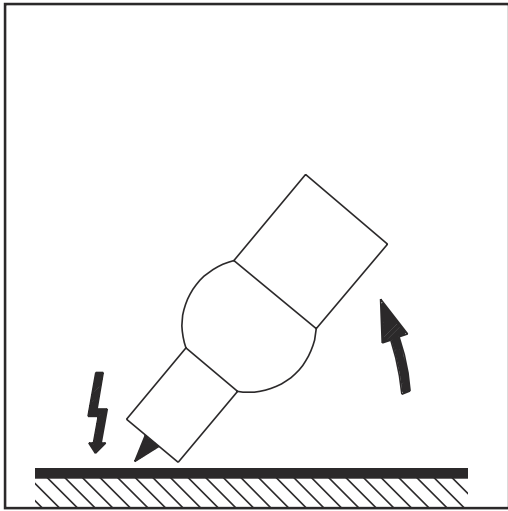
2 Increase the tilt angle of the welding torch and press the torch trigger according to the selected operating mode

The arc ignites without coming into contact with the workpiece.
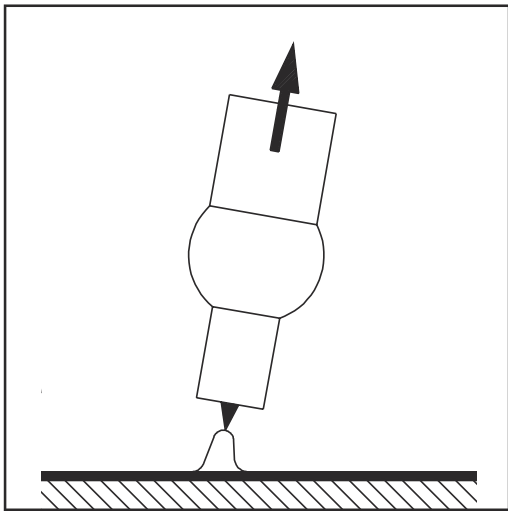
3 Tilt the welding torch to the normal position

4 Carry out welding

Contact ignition

When the "HF ignition" setup parameter is set to "off", HF ignition is deactivated. The arc ignites when the workpiece makes contact with the tungsten electrode.

Procedure for igniting the arc using contact ignition:
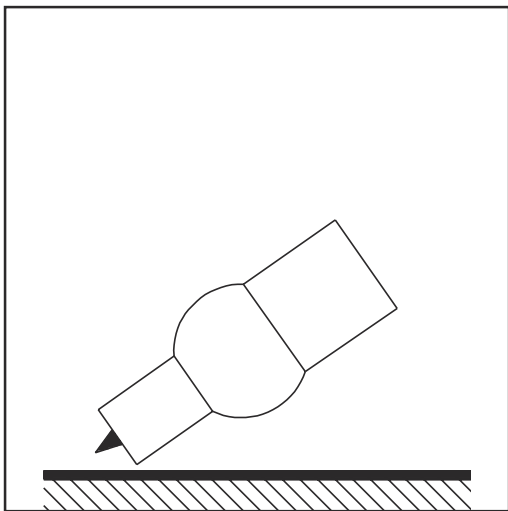
1 Position the gas nozzle at the ignition point so that there is a gap of approximately 2 to 3 mm (5/64 to 1/8 in.) between the tungsten electrode and the workpiece. A gap exists
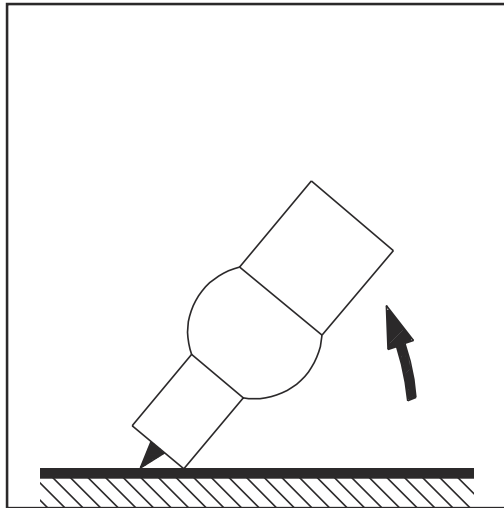
	2	Press the torch trigger

Shielding gas flows

3 Gradually tilt the welding torch up until the tungsten electrode touches the workpiece
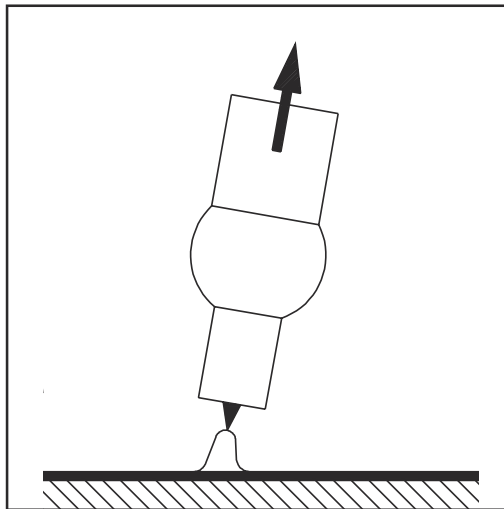
4 Raise the welding torch and rotate it into its normal position

The arc ignites.

5 Carry out welding

Igniting the arc using high-frequency contact (Touch-HF)

⚠ **CAUTION!**

Risk of injury due to an electric shock
Although Fronius devices comply with all relevant standards, the high-frequency ignition can transmit a harmless but noticeable electric shock under certain circumstances.
▶ Use prescribed protective clothing, especially gloves!
▶ Only use suitable, completely intact and undamaged TIG hosepacks!
▶ Do not work in damp or wet environments!
▶ Take special care when working on scaffolds, work platforms, in forced positions, in tight, difficult to access or exposed places!

The welding process is initiated by briefly touching the workpiece with the tungsten electrode. The high-frequency ignition is performed after the set HF ignition delay time has elapsed.

Electrode overload

If the tungsten electrode is overloaded, this can result in material detachment on the electrode, which can cause contamination to enter the weld pool.

If the tungsten electrode is overloaded, the "Electrode overloaded" indicator lights up on the status bar of the control panel.
The "Electrode overloaded" indicator depends on the set electrode diameter and the set welding current.

End of welding

$\boxed{1}$ Depending on the set operating mode, end welding by releasing the torch trigger

$\boxed{2}$ Wait for the set gas post-flow and hold the welding torch in position over the end of the weld seam.

TIG special functions

Ignition timeout function

The power source has an ignition timeout function.

If the torch trigger is pressed, gas pre-flow begins immediately and the ignition procedure is then initiated. If no arc forms during one of the time periods specified under the ignition parameters, the power source automatically switches off.

The setting of the "Ignition timeout" parameter is described in the Process parameters/ ignition and operating mode settings section starting on page **96**.

TIG pulsing

The welding current set at the start of welding may not always be ideal for the entire welding process:
-    If the amperage is too low, the parent material will not be sufficiently melted,
-    If overheating occurs, there is a danger that the liquid weld pool may drip.

The TIG pulsing function is able to help with this (TIG welding with a pulsing welding current):
A low base current (2) rises steeply to a significantly higher pulse current and falls again in line with the set duty cycle (5) to the base current (2).
During TIG pulsing, small sections of the welding area are quickly melted and then allowed to quickly solidify again.
During manual applications, the welding wire is applied in the maximum current phase during TIG pulsing (only possible in the low-frequency range from 0.25 - 5 Hz). Higher pulse frequencies are mostly used in automated applications and mainly serve to stabilize the arc.

TIG pulsing is used to weld steel pipes when welding out-of-position or to weld thin sheet metal.

TIG pulsing in operation with TIG DC welding selected:
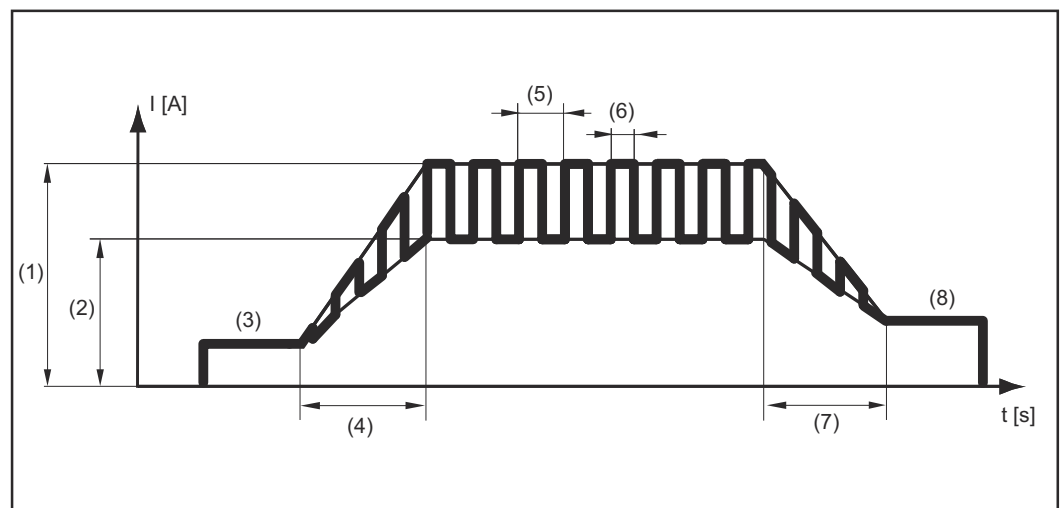
TIG pulsing - welding current curve

Key:
(1) Main current, (2) Base current, (3) Starting current, (4) UpSlope, (5) Pulse frequency *)
(6) Duty cycle, (7) DownSlope, (8) Final current

*) (1/F-P = Time between two pulses)

Tacking function   The tacking function is used for the TIG DC welding process.

Whenever a period of time is set for the "Tacking" (4) parameter under process parameters/TIG DC settings, the tacking function is assigned to the 2-step and 4-step modes.
The sequence of operating modes remains unchanged.
The Tacking (TAC) indicator lights up on the status bar:

During this time, a pulsed welding current is available, which optimizes the merging of the weld pool when tacking two components.

How the tacking function works during TIG DC welding:
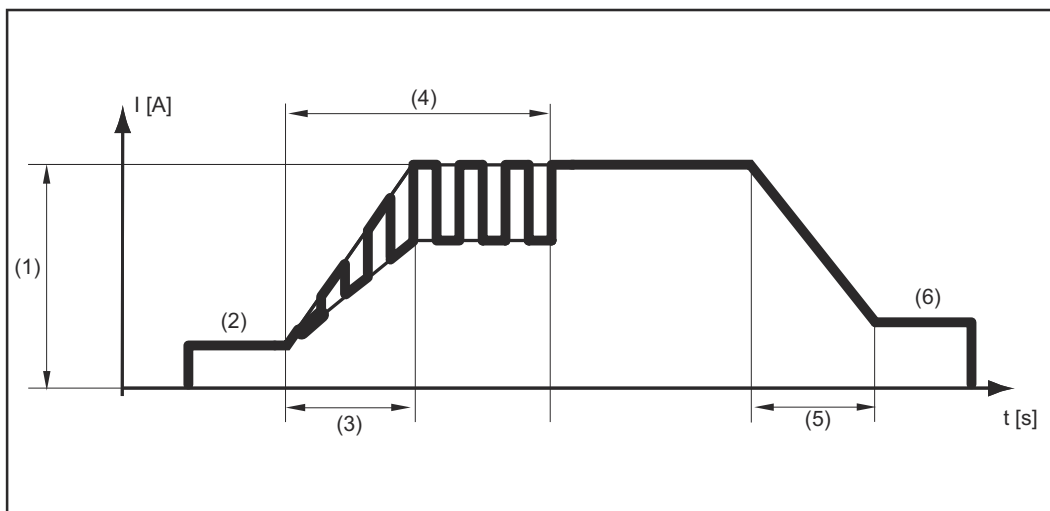
Tacking function - welding current curve

Key:
(1) Main current, (2) Starting current, (3) UpSlope, (4) Duration of pulsed welding current for tacking process, (5) DownSlope, (6) Final current

---
NOTE!

When using a pulsed welding current:
The power source automatically controls the pulse parameters according to the set main current (1).
No pulse parameters need to be set.

The pulsed welding current starts
- After the starting-current phase (2) has finished
- With the UpSlope phase (3)

Depending on the set tacking duration, the pulsed welding current can be stopped up to and including the final current phase (6) ("Tacking" (4) TIG DC parameter to "on").

After the tacking time has passed, further welding is carried out at a constant welding current. Set pulse parameters are available if applicable.

CycleTIG

The CycleTIG interval welding process is available for TIG DC welding.
The welding result is influenced and controlled by different parameter combinations.

The main advantages of CycleTIG are easy control of the weld pool, targeted heat input and fewer temper colors.

CycleTIG variants

CycleTIG + low base current
- For out-of-position welding, edge build-up and orbital welding
- Well suited for thick/light-gage sheet connections
- Excellent weld characteristics
- HF ignition only at start of welding
- Long electrode service life
- Good control of the weld pool
- Targeted heat input

CycleTIG + RPI = on + base current = off
- For repair work (e.g., edge build-up)
- Targeted heat input
- Biggest advantage in combination with HF ignition setting = touch HF
- HF ignition at every cycle (!)
- Very short electrode service life (!)

Recommendation: iWave AC/DC with reversed polarity ignition setting = auto

CycleTIG + Tacking
- For tacking light gage sheets, orbital applications and for thick/light gage sheet joints
- HF ignition only at start of welding
- Long electrode service life
- Good control of the weld pool
- Targeted heat input
- Excellent seam appearance
- Tacking function generates automatic pulse setting

CycleTIG + Pulse
CycleTIG can be used individually with all pulse settings. This allows pulsing in both the high current and low current phases.
- For tacking light gage sheets and for cladding applications
- For thick/light gage sheet joints
- HF ignition only at start of welding
- Long electrode service life
- Good control of the weld pool
- Targeted heat input
- Excellent seam appearance
- Individual pulse settings possible
- More welding parameters to set

TIG process parameters

TIG process parameters
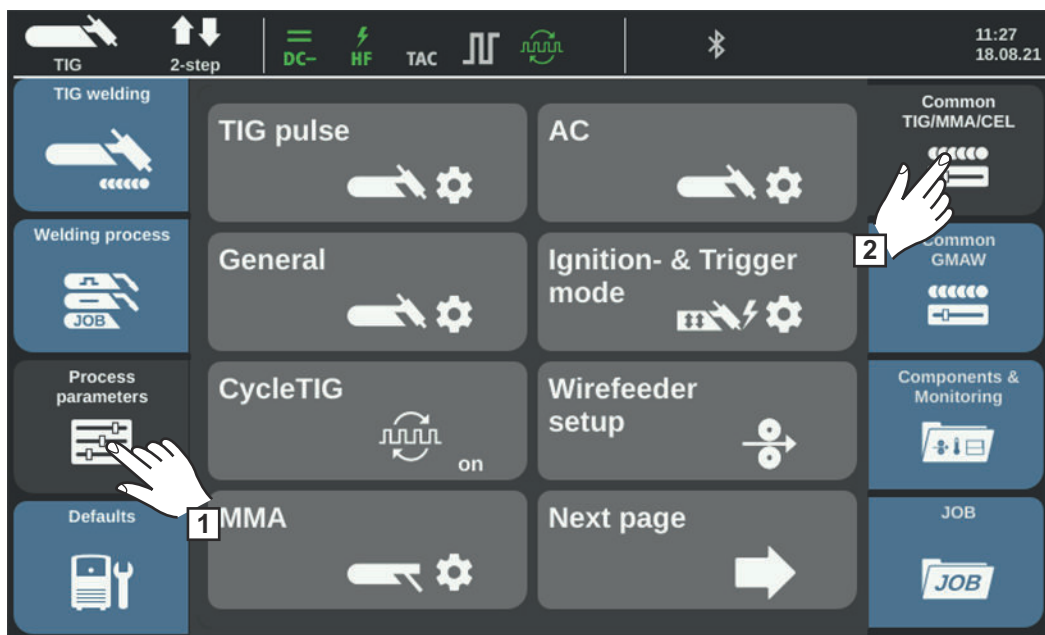
TIG process parameters:
TIG pulse, AC, General, Ignition & trigger mode, CycleTIG, Wirefeeder setup, Gas, R/L-check / alignment

Process parameters for Components and Monitoring see page .

Process parameters for TIG pulse

Tacking
Tacking function - duration of the pulsed welding current at the start of the tacking process

off / 0.1 - 9.9 s / on
Factory setting: off

off
Tacking function is switched off

0.1 - 9.9 s
The selected time begins with the UpSlope phase. After the selected time has passed, further welding is carried out at a constant welding current. The set pulse parameters are available if applicable.

on
The pulsed welding current remains present until the end of the tacking process

The Tacking (TAC) indicator lights up in the status bar on the if a value has been set.

Pulse frequency

off / 0.20 - 2000 Hz (10,000 Hz with OPT/I-Puls Pro option)
Factory setting: off

IMPORTANT! If the pulse frequency is set to "off", the base current and duty cycle parameters cannot be selected.

The selected pulse frequency is also used for the lowering current.

The Pulsing indicator lights up in the status bar if a value for the pulse frequency has been entered.

Base current *

0 - 100% (of the main current I1)
Factory setting: 50%

Duty cycle *
Relationship between pulse duration and base current duration at the set pulse frequency

10 - 90%
Factory setting: 50%

Pulse waveform *
For optimizing the arc pressure

Hard rectangle/Soft rectangle/Sine
Factory setting: Hard rectangle

Hard rectangle:
Purely rectangular curve;
Slightly louder arc noise, rapid current changes
Used, for example, in orbital welding

Soft rectangle:
Rectangular curve with reduced edge steepness, for reduced noise in comparison with the purely rectangular curve;
universal use

Sine:
Sinusoidal shape (default setting for low-noise and stable arc);
Used, for example, for corner seams and cladding applications

Optimizing the arc pressure results in:
- A better flow out of the weld pool (improved welding of butt welds or corner seams)
- A slow rise or fall in current (for fillet welds, high-alloy steels or cladding applications in particular, the filler material or weld pool is not pushed away)
- A reduction in the noise level during welding thanks to rounded waveforms

---

Base current waveform *
For optimizing arc pressure

Hard rectangle/Soft rectangle/Sine
Factory setting: Hard rectangle

Hard rectangle:
Purely rectangular curve;

Slightly louder arc noise, rapid current changes
Used, for example, in orbital welding

Soft rectangle:
Rectangular curve with reduced edge steepness, for reduced noise in comparison with the purely rectangular curve;
universal use

Sine:
Sinusoidal shape (default setting for low-noise and stable arc);
Used, for example, for corner seams and cladding applications

---

*   The parameters are available if the OPT/I-Puls Pro option is present on the power source.

Process parameters for TIG AC

AC frequency

Syn/40 - 250 Hz
Factory setting: 60 Hz

Syn
Setting for synchronous welding (double-side, simultaneous welding with 2 power sources)
For synchronous welding, the AC frequency must be set to "Syn" for both power sources. Synchronous welding is used for thick materials, to achieve a high deposition rate and to minimize inclusions during welding.

IMPORTANT! Due to the phasing of the input voltage, in some cases the synchronization of the two power sources cannot be carried out correctly.
In this case, disconnect the mains plug of the power sources, turn 180° and reconnect to the grid.

Low frequency
Soft, wide arc with shallow heat input

High frequency
Focused arc with deep heat input

Effect of AC frequency on current flow:
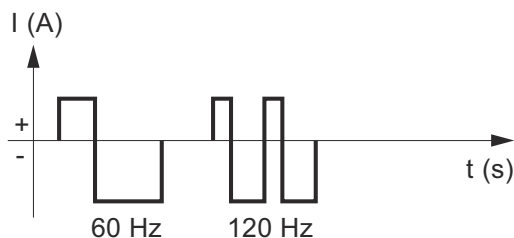
AC current offset

-70 to +70%
Factory setting: 0%

+70%
Wide arc with shallow heat input

-70%
Narrow arc, deep heat input, higher welding speed

Effect of AC current offset on current flow:
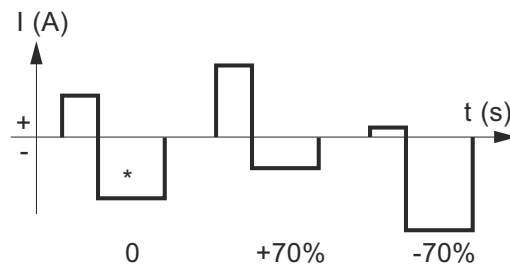
* Factory setting: 0 (corresponds to a 10% shift to negative)

Positive half-wave waveform

Hard rectangle/Soft rectangle/Triangle/Sine
Factory setting: Sine

Hard rectangle
Purely rectangular curve (stable but loud arc)

Soft rectangle:
Rectangular curve with reduced edge steepness, for reduced noise in comparison with the purely rectangular curve

Triangle
Triangular curve

Sine
Sinusoidal curve (default setting for low-noise arc)

Negative half-wave waveform

Hard rectangle/Soft rectangle/Triangle/Sine
Factory setting: Soft rectangle

Hard rectangle
Purely rectangular curve (stable but loud arc)

Soft rectangle:
Rectangular curve with reduced edge steepness, for reduced noise in comparison with the purely rectangular curve

Triangle
Triangular curve

Sine
Sinusoidal curve (default setting for low-noise and stable arc)

Phase synchronization
Synchronizes two AC power sources (simultaneously on both sides)

0 - 5
Factory setting: 0

General TIG process parameters

Welding start / welding end settings

Starting current time

The starting current time indicates the duration of the starting-current phase.

The setting of the Starting current time parameter also influences versions 1 - 6 of special 4-step mode (see page **69** onwards).

off / 0.01 - 30.0 s
Factory setting: off

IMPORTANT! The starting current time is only valid for 2-step mode and spot welding. In 4-step mode, the duration of the starting-current phase is determined by the torch trigger.

Final current time

The final current time indicates the duration of the final current phase.

The setting of the Final current time parameter also influences versions 1 - 6 of special 4-step mode (see page **69** onwards).

off / 0.01 - 30 s
Factory setting: off

IMPORTANT! The final current time is only valid for 2-step mode and spot welding. In 4-step mode, the duration of the final current phase is determined by the torch trigger (section "TIG operating modes").

4-mode settings

Lowering current Slope 1

The setting of the Lowering current slope 1 parameter also influences versions 1 - 6 of special 4-step mode (see page **69** onwards).

off / 0.01 - 30 s
Factory setting: off

If a time value has been entered for the Lowering current Slope 1 parameter, the brief current reduction or current increase is not abrupt, but slow and adapted.
This reduces negative influences on the weld and part, especially with aluminum applications.

Lowering current Slope 2

The setting of the Lowering current slope 2 parameter also influences versions 1 - 6 of special 4-step mode (see page **69** onwards).

off / 0.01 - 30 s
Factory setting: off

If a time value has been entered for the Lowering current Slope 2 parameter, the adaptation from the lowering current to the welding current is not abrupt, but slow and adapted.

In the case of a current increase, for example, the weld pool is heated slowly and not abruptly. This facilitates outgassing of the weld pool and reduces pores during aluminum welding.

Spot welding settings

Spot welding time
(only if the mode is set to spot welding)

0.02 - 120 s
Factory setting: 5.0 s

Process parameters for ignition and operating mode

Ignition parameters

HF ignition

on/off/Touch-HF/external
Factory setting: on

on
High-frequency ignition at the start of welding is activated

off
No high-frequency ignition at the start of welding.
In this case, the welding is started by means of contact ignition.

Touch-HF
The welding process is initiated by briefly touching the workpiece with the tungsten electrode. The high-frequency ignition is performed after the set HF ignition delay time has elapsed.

External
Start with an external ignition device, e.g., plasma welding

The HF ignition indicator lights up in the status bar if HF ignition has been set to on.

> ⚠ **CAUTION!**
>
> **Risk of injury due to an electric shock**
> Although Fronius devices comply with all the relevant standards, high-frequency ignition can transmit a harmless but noticeable electric shock under certain circumstances.
> ▶ Use prescribed protective clothing, especially gloves!
> ▶ Only use suitable, completely intact and undamaged TIG hosepacks!
> ▶ Do not work in damp or wet environments!
> ▶ Take special care when working on scaffolding, work platforms, in tight, difficult to access or exposed places, or when welding out-of-position!

HF ignition delay time
Time after touching the workpiece with the tungsten electrode after which high-frequency ignition takes place.

0.1 - 5.0 s
Factory setting: 1.0 s

Reversed polarity ignition
(only with iWave AC/DC power sources)

To ensure an optimum ignition sequence during TIG DC welding, the polarity is reversed briefly at the start of the welding process. Electrons emerge from the workpiece and hit

the tungsten electrode. This results in rapid heating of the tungsten electrode - an essential prerequisite for optimum ignition properties.

off/on/auto
Factory setting: off

IMPORTANT! Reversed polarity ignition is not recommended for welding light-gage sheets.

Arc monitoring

Ignition timeout
Period of time until the safety cut-out following failed ignition.

0.1 - 9.9 s
Factory setting: 5 s

IMPORTANT! Ignition timeout is a safety function and cannot be deactivated.
The ignition timeout function is described in "TIG welding".

Arc break filter time
Period of time until the safety cut-out following an arc break

If no current flows during the set period of time following an arc break, the power source automatically switches off.
Press any button on the control panel or the torch trigger to restart the welding process.

0.00 - 2.00 s
Factory setting: 0.20 s

Arc break watchdog
Reaction if no current flows within the arc break time

ignore/error
Factory setting: ignore

ignore
The interruption is ignored.

error
An error message is displayed on the power source and must be acknowledged.

Operating mode settings

Torch trigger
Start welding by pressing the torch trigger

on/off
Factory setting: on

on
Welding is started using the torch trigger

on
Welding is started by touching the workpiece with the tungsten electrode;
especially suitable for welding torches without torch triggers, ignition sequence depends on ignition parameters

The symbol for the deactivated torch trigger is shown in the status bar of the display, the option of selecting the operating mode is deactivated.

I2 using torch trigger
to activate / deactivate whether it is possible to switch over to the lowering current I_2 using the torch trigger

The setting of the I2 using torch trigger parameter also influences versions 1 - 6 of special 4-step mode (see page onwards).

on / off
Factory setting: off

Lowering current button function

The setting of the Lowering current button function parameter also influences versions 1 - 6 of special 4-step mode (see page onwards).

I1 / I2
Factory setting: I2

Arc break voltage
To set a voltage value at which the welding process can be ended by lifting the TIG welding torch slightly.
The higher the break voltage value, the higher the arc can be lifted.

The arc break voltage values for 2-step mode, 4-step mode and operation with a foot-operated remote control are all stored together.
If the "Torch trigger" parameter is set to "off", the values are stored separately.

off / 6.0 - 90.0 V
Factory setting: off

Comfort stop sensitivity
The parameter is only available if the "Torch trigger" parameter is set to "off".

off / 0.1 - 10.0 V
Factory setting: off

At the end of the welding process, an automatic shutdown of the welding current follows a significant increase of the arc length. This prevents the arc from having to be unnecessarily lengthened when lifting the TIG welding torch.

Process:
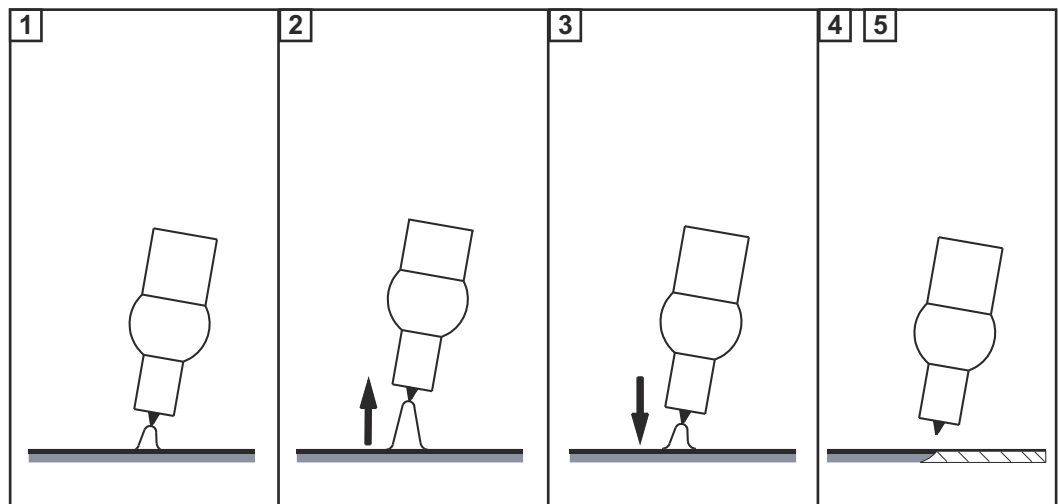
| 1 | Welding |
| 2 | Briefly lift the welding torch at the end of welding |

The arc lengthens significantly.

| 3 | Lower the welding torch |

- The arc shortens significantly
- The Comfort stop function has been activated

| 4 | Maintain height of the welding torch |

- The welding current ramps down continuously (DownSlope).
- The arc goes out.

IMPORTANT! The DownSlope is fixed and cannot be adjusted.

| 5 | Lift the welding torch from the workpiece |

CycleTIG

CycleTIG
to activate / deactivate the CycleTIG function
(extended interval welding process for DC welding)
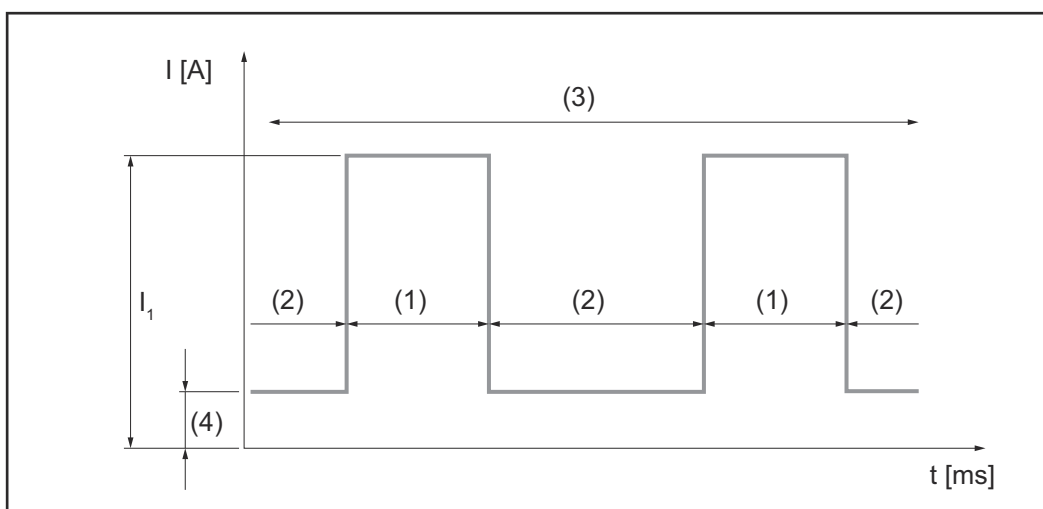
Setting range: on / off
Factory setting: off

(1) Interval time
To set how long the welding current I_1 is active

Setting range: 0.02 - 2.00 s
Factory setting: 0.5 s

(2) Interval pause time
To set how long the base current (4) is active

Setting range: 0.02 - 2.00 s
Factory setting: 0.5 s

(3) Interval cycles
to set how many cycles are to be repeated

Setting range: Constant / 1 - 2000
Factory setting: Constant

(4) base current (DC-)
To set the interval base current (4) to which the current is reduced during the interval pause time (2)

Setting range: off / 3 - max. A
Factory setting: off

NOTE!

For more details on CycleTIG, see page 90 onwards.

Wire speed setting

Wire speed 1
Set value for wire speed

off / 0.1 - 50.0 m/min
Factory setting: 5 m/min

Wire speed 2
Wire speed 2

0 - 100% (of wire speed 1)
Factory setting: 50%

If a value is set for each of the "Wire speed 2" and "Pulse frequency" setup parameters, the wire speed changes between wire speed 1 and wire speed 2 synchronously with the pulse frequency of the welding current.

Main current
Welding current I_1

iWave 300i DC, iWave 300i AC/DC: 3 - 300 A
iWave 400i DC, iWave 400i AC/DC: 3 - 400 A
iWave 500i DC, iWave 500i AC/DC: 3 - 500 A
Factory setting: -

Pulse frequency

off / 0.20 - 5000 Hz, 5000 - 10,000 Hz
Factory setting: off

Wire start-up delay
Feed delay of welding wire from start of main current phase

off / 0.1 - 9.9 s
Factory setting: 5.0 s

Wire end delay
Feed delay of welding wire from end of main current phase

off / 0.1 - 9.9 s
Factory setting: 5.0 s

Wire retraction end
How far the welding wire is retracted after the end of welding

off / 1 - 50 mm
Factory setting: 3 mm

Wire position start
How far the welding wire is from the workpiece before welding starts

off / 1 - 50 mm
Factory setting: 3 mm

Feeder inching speed

0.5 - 100.0 m/min
Factory setting: 5.0 m/min

TIG gas settings

Gas pre-flow
To set the gas flow time before ignition of the arc

0.0 - 9.9 s
Factory setting: 0.4 s

Gas post-flow
To set the gas flow time after the end of the arc

auto / 0 - 60 s
Factory setting: auto

auto
Depending on the electrode diameter and welding current, the power source calculates and automatically adjusts the optimal gas post-flow time.

TIG Ar He changeover
for individual selection of the gas shield

auto / 1 / 2
Factory setting: auto

auto:
- The shielding gas (gas 1) is used during the starting-current phase and during the UpSlope.
- When the main current phase is reached, shielding gas (gas 2) is used.
- When the welding process is finished, the shielding gas (gas 1) is used during the DownSlope and the final current phase.

1:
Shielding gas (gas 1) is used for the entire welding process.

2:
Working gas (gas 2) is used for the entire welding process.

Gas regulator 1

Gas set value 1 - TIG shielding gas
Shielding gas flow
(only in conjunction with option OPT/i TIG gas flow sensor)

off / 0.5 - 30.0 l/min
Factory setting: 15.0 l/min

IMPORTANT! If the set value for the shielding gas flow rate is high (e.g., 30 l/min), ensure that the gas line is adequately dimensioned!

Gas factor 1 - TIG shielding gas

depends on the shielding gas used
(only in connection with the OPT/i TIG gas regulator option)

auto / 0.90 / 20.0
Factory setting: auto

Gas regulator 2

Gas set value 2 - TIG working gas

off / 0.5 - 30.0 l/min
Factory setting: 15.0 l/min

Gas factor 2 - TIG working gas

0.90 - 20.0
Factory setting: 11.82

Conducting an R/L alignment

NOTE!

The R/L alignment must be carried out separately for each welding process.

Welding circuit resistance R [mOhm]

The welding circuit resistance is calculated to provide information about the total resistance of the torch hosepack, welding torch, workpiece and grounding cable.

If, for example, the welding circuit resistance increases after the welding torch has been changed, the following components may be faulty:
-    Torch hosepack
-    Welding torch
-    Ground earth connection to the workpiece
-    Grounding cable

Welding circuit inductance L [µH]
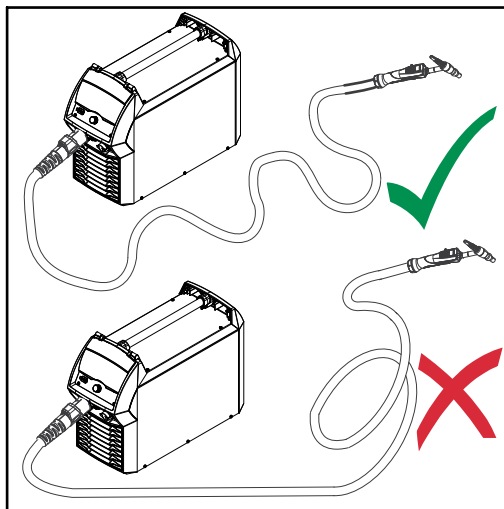
The routing of the hosepack has a significant impact on the weld properties.
A high degree of welding circuit inductance can occur, especially during pulsing and AC welding, depending on the length and routing of the hosepack. The increase in current is limited.

The welding result can be optimized by changing the routing of the torch hosepack.
The hosepack must always be routed as shown.

Perform R/L alignment

1 Process parameters / General / R/L-check / alignment

The current values are displayed.

2 Select Next

The 2nd R/L alignment screen is displayed.

3 Follow the instructions on the screen
4 Select Next

The 3rd R/L alignment screen is displayed.

5 Follow the instructions on the screen
6 Select Next

The current values are determined.

After R/L alignment has been performed, a confirmation and the current values are displayed.

MIG/MAG

Welding packages, welding characteristics and welding processes

General

The power sources have a number of different Welding Packages, welding characteristics and welding processes so that the broadest range of materials can be effectively processed.

Welding Packages

The following Welding Packages are available:
- Welding Package Standard
  (enables MIG/MAG standard synergic welding)
- Welding Package Pulse
  (enables MIG/MAG pulse-synergic welding)
- Welding Package LSC *
  (enables the LSC process)
- Welding Package PMC **
  (enables the PMC process)
- Welding Package CMT ***
  (enables the CMT process)

*   only in combination with Welding Package Standard

**   only in combination with Welding Package Pulse

***   only in combination with Welding Package Standard and Welding Package Pulse

IMPORTANT! On a power source without any Welding Packages, only MIG/MAG standard manual welding is available.

Welding characteristics

Depending on the welding process and shielding gas combination, various process-optimized welding characteristics are available when selecting the filler metal.

Examples of welding characteristics:
- MIG/MAG 3700 PMC Steel 1,0mm M21 - arc blow *
- MIG/MAG 3450 PMC Steel 1,0mm M21 - dynamic *
- MIG/MAG 3044 pulse AlMg5 1.2 mm I1 - universal *
- MIG/MAG 2684 Standard Steel 0.9 mm M22 - root *

The welding process suffix (*) provides information about special properties and the use of the welding characteristic.
The characteristics are described as follows:

Name
Process
Properties

ADV *
CMT

Also required:
Inverter module for an alternating current process

Negatively poled process phase with less heat input and higher deposition rate

---

ADV ***
LSC

Also required:
Electronic switch for current interruption

Maximum current reduction by opening the circuit in any desired process phase

Only in conjunction with TPS 400i LSC ADV

---

arc blow
PMC
Characteristics with improved arc break properties through deflection when exposed to external magnetic fields

---

arcing
Standard
Characteristics for a special form of hardfacing on dry and wet substrates
(e.g., on crushing rollers in the sugar and ethanol industries)

---

braze:
CMT, LSC, PMC
Characteristics for brazing processes (high brazing speed, reliable wetting and good flow of braze material)

---

braze+
CMT
Optimized characteristics for brazing processes using the special "Braze+" gas nozzle (narrow gas nozzle opening, high shielding gas flow rate)

---

cladding:
CMT, LSC, PMC
Characteristics for cladding with low penetration, low dilution and wide weld flow for improved wetting

---

dynamic
CMT, PMC, Pulse, Standard
Characteristics for high welding speeds with concentrated arc

---

flanged edge
CMT
Characteristics for flanged welds with adjustment of frequency and energy input;
The edge is fully detected but not melted down.

---

galvanized
CMT, LSC, PMC, Pulse, Standard
Characteristics for galvanized sheet surfaces (low risk of zinc pores, reduced zinc burn-off)

---

galvannealed
PMC
Characteristics for iron-zinc coated sheet surfaces

---

gap bridging
CMT, PMC
Characteristics with very low heat input for best gap-bridging ability

---

hotspot
CMT
Characteristics with hot start sequence, especially for plug welds and MIG/MAG spot welds

---

mix ** /***
PMC

Also required:
Pulse and PMC Welding Packages

Characteristics with a process change between pulsed and dip transfer arc
Especially for welding vertical-up seams with cyclic change between a hot and cold sup-
porting process phase.

mix ** /**
CMT

Also required:
CMT Drive Unit WF 60i Robacta Drive CMT
Pulse, Standard and CMT Welding Packages

Characteristics with a process change between pulsed and CMT, where the CMT pro-
cess is initiated by a reversal of the wire movement.

mix drive *
PMC

Also required:
WF 25i Robacta Drive PushPull drive unit or WF 60i Robacta Drive CMT
Pulse and PMC Welding Packages

Characteristics with a process change between pulsed and dip transfer arc, where the
dip transfer arc is initiated by a reversal of the wire movement.

multi arc
PMC
Characteristics for parts being welded by multiple interacting arcs

PCS **
PMC
Pulse Controlled Sprayarc - Direct transition from concentrated pulsed to short spray arc.
PCS combines the advantages of pulsed and standard arcs in one characteristic.

pipe
PMC
Characteristics for pipe applications and positional welding on narrow gap applications

retro
CMT, Pulse, PMC, Standard
Characteristics with the properties of TransPuls Synergic (TPS), the previous device
series

ripple drive *
PMC
Also required:
CMT drive unit, WF 60i Robacta Drive CMT

Characteristics with a behavior like interval operation for pronounced seam rippling, es-
pecially with aluminum

root
CMT, LSC, Standard
Characteristics for root passes with a powerful arc

seam track
PMC, pulse
Characteristics with a more powerful seam tracking signal, especially when using mul-
tiple welding torches on one part.

TIME
PMC

Characteristics for welding with long stick-out and TIME shielding gases
(T.I.M.E. = Transferred Ionized Molten Energy)

TWIN
PMC
Synchronized characteristics for two wire electrodes in a common weld pool (tandem welding process)

universal
CMT, PMC, pulse, standard
Characteristics for conventional welding tasks

WAAM
CMT
Characteristics with reduced heat input and more stability with higher deposition rate for bead to bead welding of adaptive structures

weld+
CMT
Characteristics for welding with short stick out and the Braze+ gas nozzle (gas nozzle with small orifice and high flow rate)

**   Mixed process characteristics

***   Welding characteristics with special properties due to additional hardware

Brief description of MIG/MAG pulsed synergic welding	MIG/MAG pulsed synergic

MIG/MAG pulsed synergic welding is a pulsed arc process with a controlled material transfer.
In the base current phase, the energy input is reduced to such an extent that the arc barely burns steadily and the surface of the workpiece is preheated. In the pulsing current phase, an accurately timed current pulse guarantees a precise detachment of the weld material droplet.
This principle guarantees low-spatter welding and precise operation throughout the entire power range.

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 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.

Summary of SynchroPulse welding	SynchroPulse is available for all processes (standard/pulsed/LSC/PMC). Due to the cyclical change of welding power between two operating points, SynchroPulse achieves a flaking seam appearance and non-continuous heat input.

Summary of the CMT process

CMT = Cold Metal Transfer

A special CMT drive unit is required for the CMT process.

The reversing wire movement in the CMT process results in a droplet detachment with improved dip transfer arc properties.
The advantages of the CMT process are as follows
- Low heat input
- Less spattering
- Reduced emissions
- High process stability

The CMT process is suitable for:
- Joint welding, cladding and brazing – particularly in the case of high requirements in terms of heat input and process stability
- Welding on light-gauge sheet with minimal distortion
- Special connections, such as copper, zinc, and steel/aluminium

NOTE!

A CMT reference book is available complete with typical applications; see ISBN 978-3-8111-6879-4.

Brief description of the CMT Cycle Step welding process

CMT Cycle Step is a further development of the CMT welding process. It also requires a special CMT drive unit.

CMT Cycle Step is the welding process with the lowest heat input.
The CMT Cycle Step welding process alternates cyclically between CMT welding and pauses of an adjustable duration.
The welding pauses mean there is less heat input, while the continuity of the weld is maintained.
Individual CMT cycles are also possible. The size of the CMT welding spots is determined by the number of CMT cycles.

System components

Overview
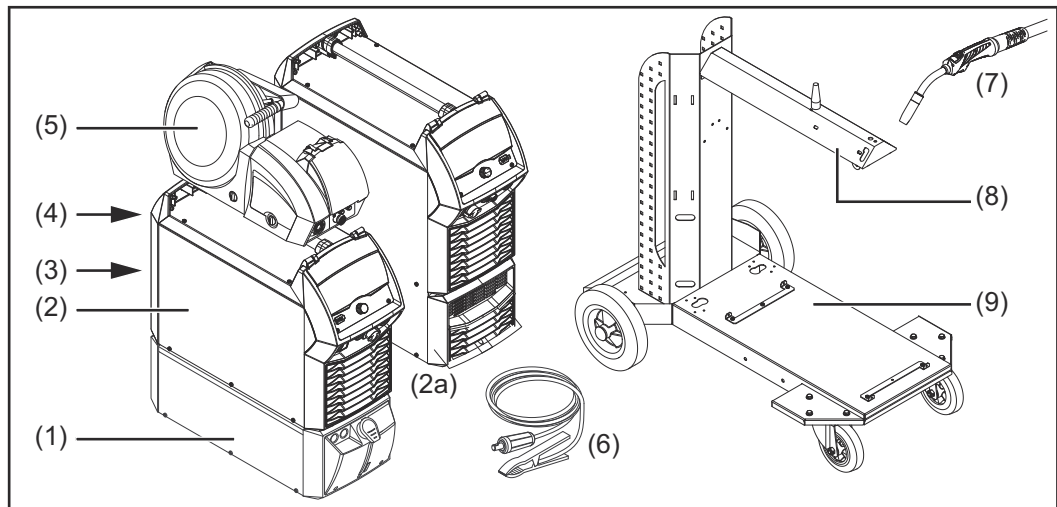
(1)   Cooling units
(2)   iWave DC power sources
(2a)   iWave AC/DC power sources
(3)   Robot accessories
(4)   Interconnecting hosepacks (max. 50 m)*
(5)   Wirefeeders
(6)   Grounding cable
(7)   Welding torch
(8)   Wirefeeder holder
(9)   Trolley and gas cylinder holders

*   Interconnecting hosepacks > 50 m only in conjunction with the
        OPT/i SpeedNet Repeater option

Other:
-   Remote controls
-   Dust filter
-   Additional current sockets

Minimum equipment for welding operations

General   Depending on the welding process, a minimum level of equipment is required to work with the power source.
The following describes the welding processes and the corresponding minimum equipment for welding operations.

Gas-cooled
MIG/MAG welding
- Power source
- Grounding cable
- MIG/MAG welding torch, gas-cooled
- Shielding gas supply
- Wirefeeder
- Interconnecting hosepack
- Wire electrode

Water-cooled
MIG/MAG welding
- Power source
- Cooling unit
- Grounding cable
- MIG/MAG welding torch, water-cooled
- Shielding gas supply
- Wirefeeder
- Interconnecting hosepack
- Wire electrode

Automated
MIG/MAG welding
- Power source
- Robot interface or Fieldbus connection
- Grounding cable
- MIG/MAG robot welding torch or MIG/MAG machine welding torch

    With water-cooled robot or machine welding torches, a cooling unit is also required.

- Gas connection (shielding gas supply)
- Wirefeeder
- Interconnecting hosepack
- Wire electrode

CMT welding
manual
- Power source
- Standard, Pulse and CMT Welding Packages enabled on the power source
- Grounding cable
- PullMig CMT welding torch incl. CMT drive unit and CMT wire buffer

    IMPORTANT! For water-cooled CMT applications, an additional cooling unit is required!

- OPT/i PushPull
- Wirefeeder
- CMT interconnecting hosepack
- Wire electrode
- Gas connection (shielding gas supply)

CMT welding automated

- Power source
- Standard, Pulse and CMT Welding Packages enabled on the power source
- Robot interface or Fieldbus connection
- Grounding cable
- CMT welding torch incl. CMT drive unit
- Cooling unit
- Unreeling wirefeeder (WFi REEL)
- Interconnecting hosepack
- Torch hosepack
- Wirefeeding hose
- Media separation point (e.g., SB 500i R, SB 60i R)
- CMT wire buffer (included with SB 60i R)
- Wire electrode
- Gas connection (shielding gas supply)

MIG/MAG Operating Modes

General

⚠️ **WARNING!**

Danger from incorrect operation.
Possible serious injury and damage to property.

▶ Do not use the functions described here until you have read and completely understood these Operating Instructions.

▶ Do not use the functions described here until you have fully read and understood all of the Operating Instructions for the system components, in particular 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
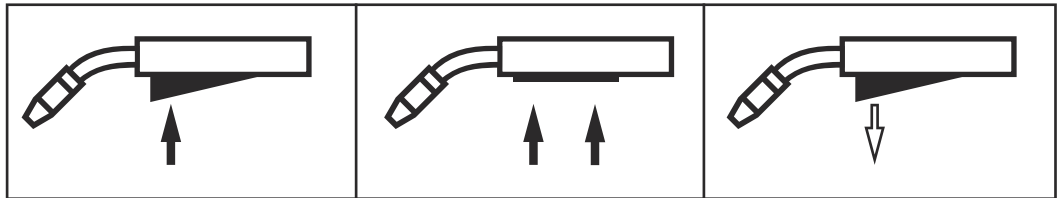
Press the torch trigger | Hold the torch trigger | Release the torch trigger

GPr
Gas pre-flow

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

t-S
Starting current time

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.

t-E
Final current time

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
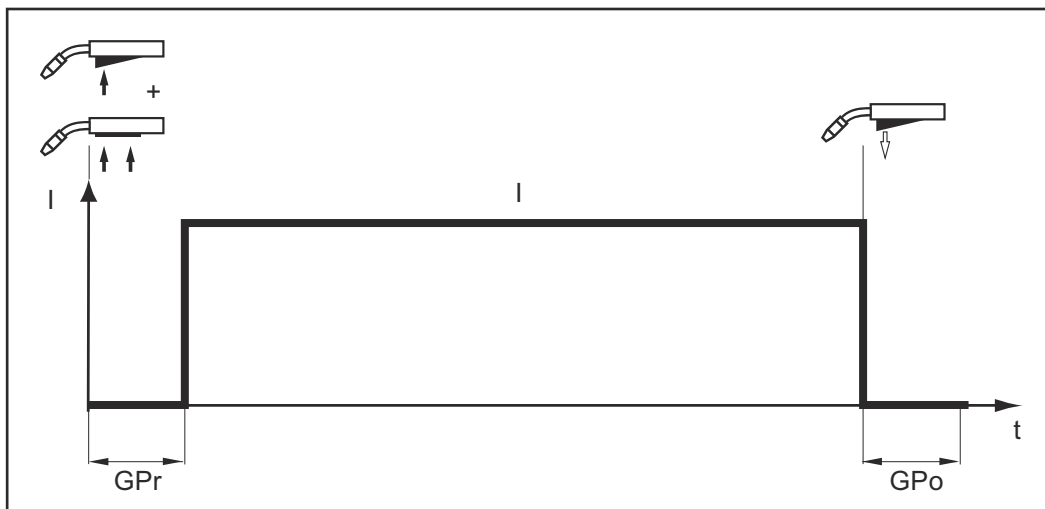
"2-step mode" is suitable for
- Tacking work
- Short weld seams
- Automatic and robot operation

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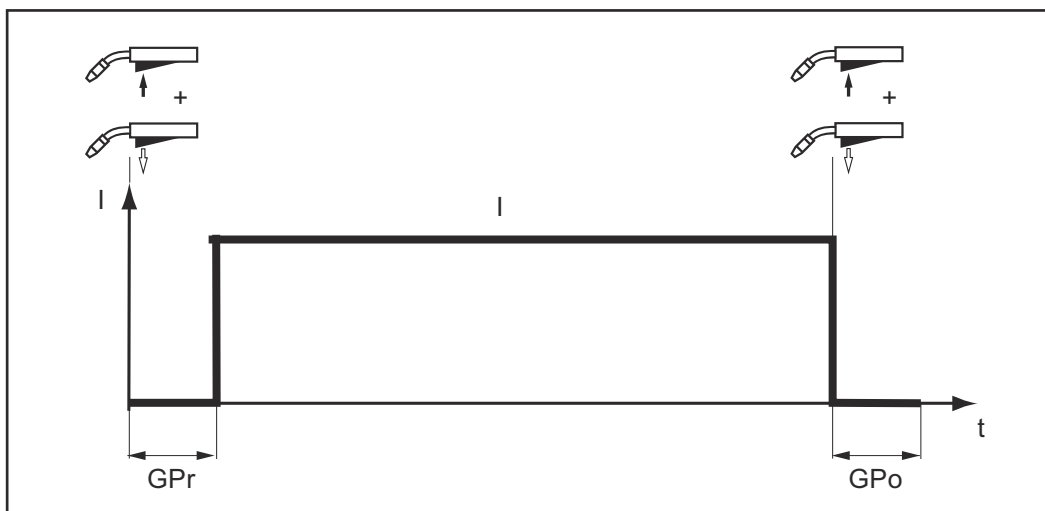
"4-step mode" is suitable for longer weld seams.

Special 4-step mode
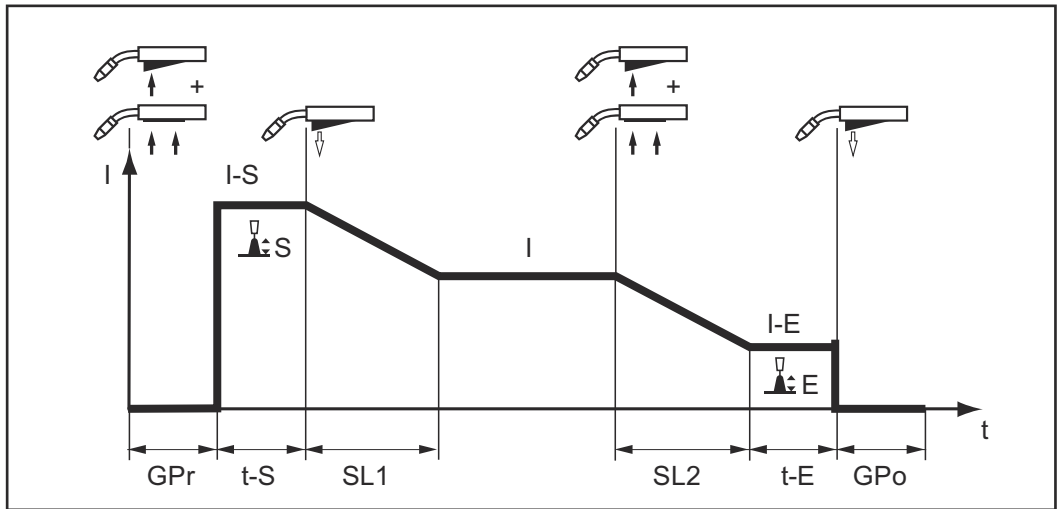
"Special 4-step mode" is ideal for welding aluminum materials. The high thermal conductivity of aluminum is taken into account by the special welding current profile.

Special 2-step mode
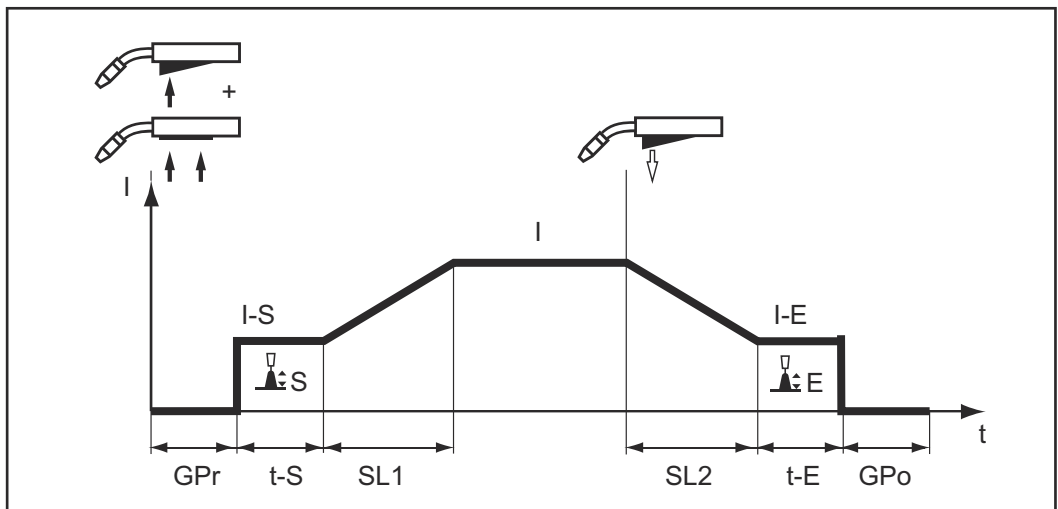
"Special 2-step mode" is ideal for welding in higher power ranges. In special 2-step mode, the arc starts at a lower power, which makes it easier to stabilize.

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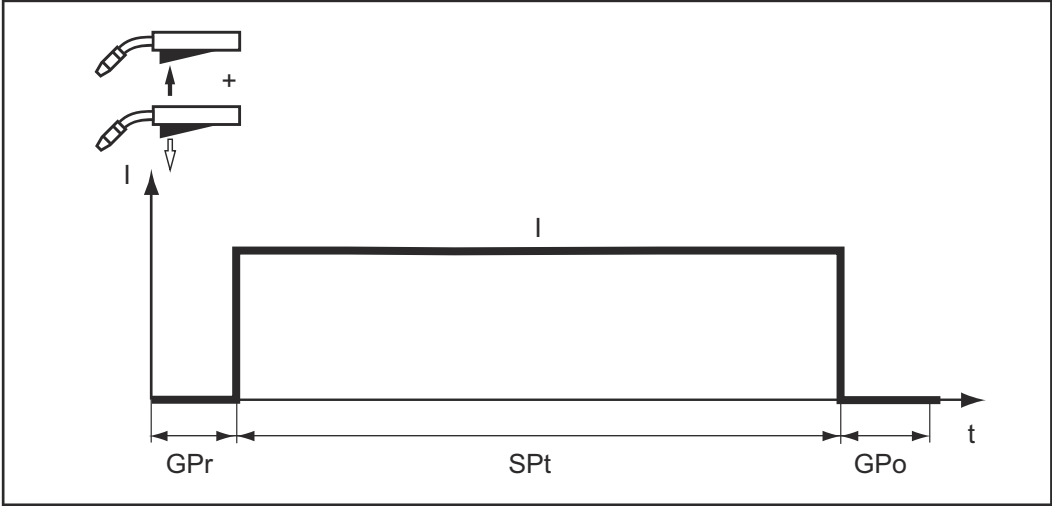
The "Spot welding" mode is suitable for welded joints on overlapped sheets.

MIG/MAG and CMT welding

Safety

<table>
<tr><td>⚠️ WARNING!</td></tr>
</table>

Danger from incorrect operation and work that is not carried out properly.
This can result in serious personal injury and damage to property.
▶ All the work and functions described in this document must only be carried out by technically trained and qualified personnel.
▶ Read and understand this document in full.
▶ Read and understand all safety rules and user documentation for this equipment and all system components.

<table>
<tr><td>⚠️ WARNING!</td></tr>
</table>

Danger from electrical current.
This can result in serious personal injury and damage to property.
▶ Before starting work, switch off all devices and components involved, and disconnect them from the grid.
▶ Secure all devices and components involved so they cannot be switched back on.
▶ After opening the device, use a suitable measuring instrument to check that electrically charged components (such as capacitors) have been discharged.

MIG/MAG and CMT welding - Overview

The "MIG/MAG and CMT welding" section includes the following steps:
- Switch on the power source
- Select the welding process and operating mode
- Select the filler metal and shielding gas
- Set the welding and process parameters
- Adjust the quantity of shielding gas
- MIG/MAG or CMT welding

<table>
<tr><td>NOTE!</td></tr>
</table>

If using a cooling unit, observe the safety rules and operating conditions in the Operating Instructions for the cooling unit.

Switching on the power source

[1] Plug in the mains cable

[2] Set the power switch to - I -

A cooling unit in the welding system starts to work.

IMPORTANT! For optimum welding results, the manufacturer recommends carrying out an R/L alignment when using the device for the first time and whenever changes are made to the welding system.
Further information on the R/L alignment can be found under "R/L alignment" in the section "Process parameters" in the "MIG/MAG process parameters" chapter (page **144**).

Selecting the welding process and operating mode

Select the welding process
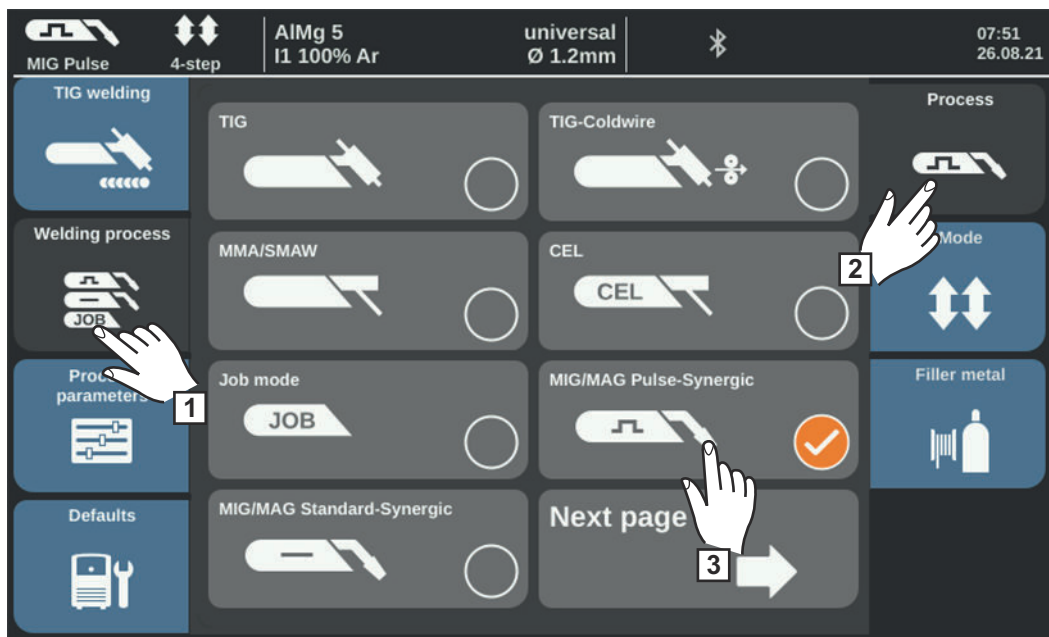
*   Next page: Electrode, CEL, Job

[1] Select "Welding process"

[2] Select "Process"

An overview of the welding processes is displayed.
Various welding processes are available depending on the type of power source or the function package installed.

[3] Select the desired welding process

Set the operating mode
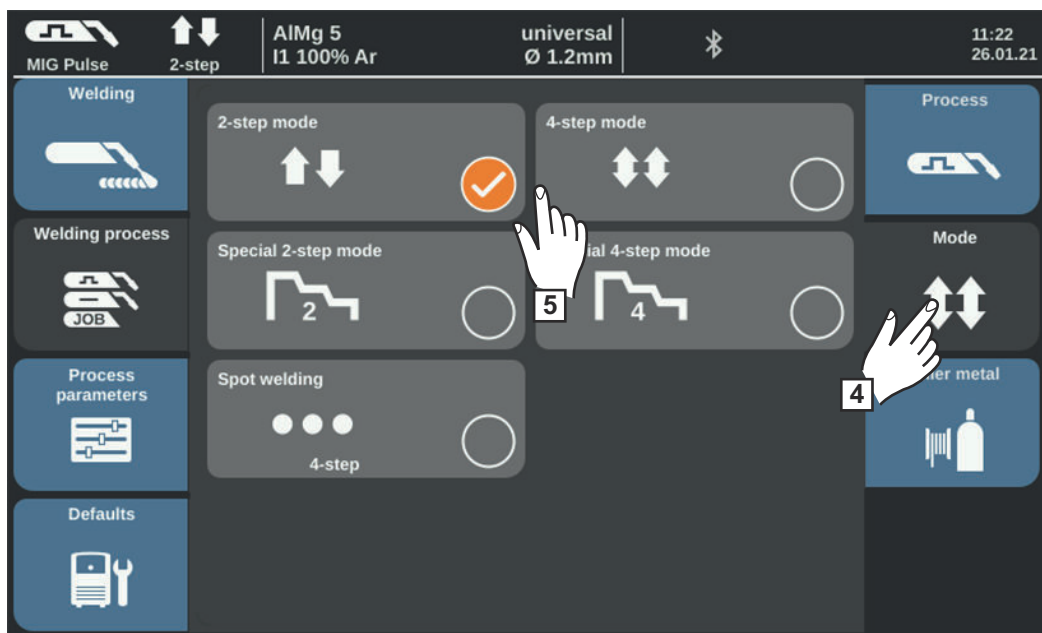
[4] Select "Mode"

An overview of operating modes is displayed:

- 2-step mode
- 4-step mode
- Special 2-step mode
- Special 4-step mode
- Spot welding

5   Select the desired operating mode

Selecting the filler metal and shielding gas
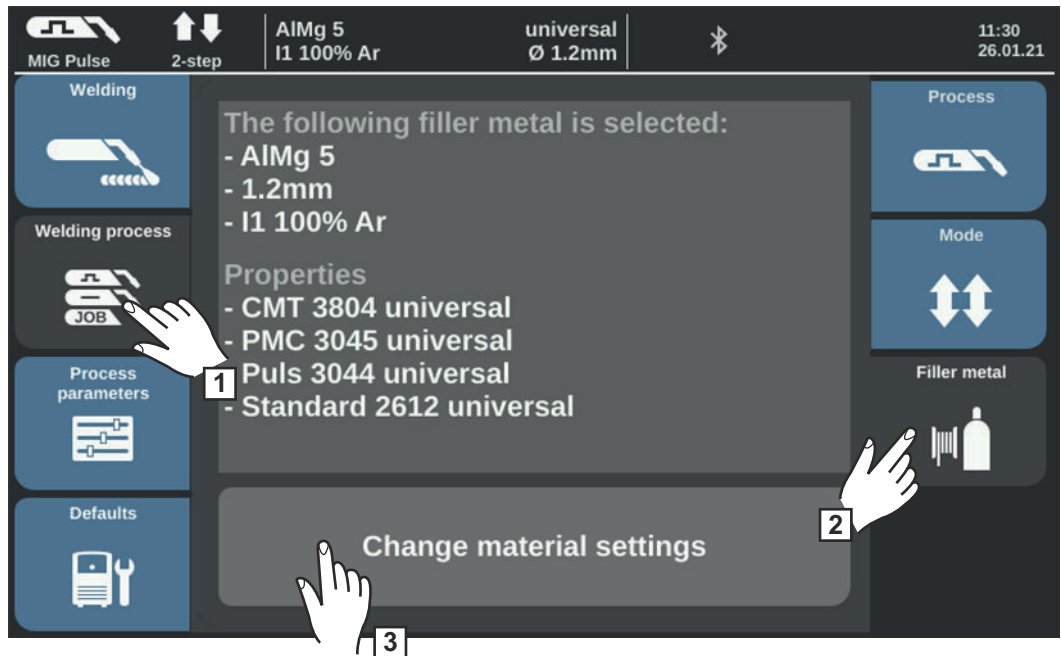
1   Select "Welding process"

2   Select "Filler metal"

3   Select "Change material settings"

4   Turn the selection dial and select the desired filler metal

5   Select "Next"/press the selection dial

6   Turn the selection dial and select the desired wire diameter

7   Select "Next"/press the selection dial

8   Turn the selection dial and select the desired shielding gas

9   Select "Next"/press the selection dial

NOTE!

The available characteristics for each process are not displayed if only one characteristic is available for the selected filler metal.
The confirmation step of the filler metal wizard follows directly, steps 10 - 14 are omitted.

---

10   Turn the selection dial and select the desired process

11   Press the selection dial to select the desired characteristic (blue background)

12   Turn the selection dial and select the desired characteristic

13   Press the selection dial and accept the selected characteristic (white background)

14   Select "Next"

The confirmation step of the filler metal wizard is displayed:

15 Select "Save"/press the selection dial

The selected filler metal and associated characteristics for each process are saved.

Setting the welding parameters
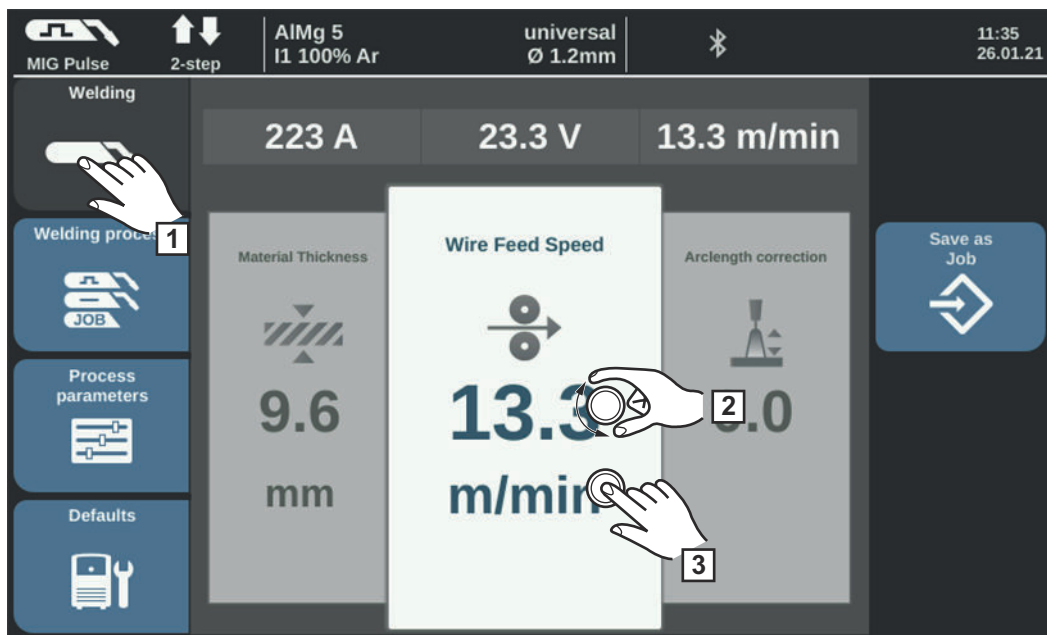
1 Select "Welding"

2 Turn the selection dial to select the desired welding parameter

3 Press the selection dial to change the parameter

The value of the parameter is displayed as a horizontal scale:
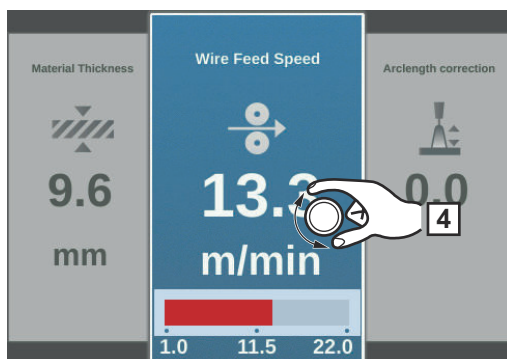
e.g., wire feed speed parameter

The selected parameter can now be changed.

4 Change the parameter by turning the selection dial

The new parameter value is applied immediately.
If one of the wire feed speed, sheet thickness, welding current or welding voltage parameters is changed during Synergic welding, all the other parameters are immediately modified accordingly.

5 Press the selection dial to access the welding parameters overview

6 If necessary, select the process parameters for user- or application-specific settings on the welding system

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 or CMT welding

1. Select "Welding" to display the welding parameters

> ⚠️ **CAUTION!**
>
> **Danger of injury and damage from electric shock and from the wire electrode emerging from the torch.**
> When you press the torch trigger
> ▶ Keep the welding torch away from your face and body
> ▶ Do not point the welding torch at anyone
> ▶ Make sure that the wire electrode does not touch any conductive or grounded parts (e.g., housing, etc.)

2. Press the torch trigger and start welding

At the end of each welding operation, the actual values for welding current, welding voltage and wire speed are stored - "HOLD" is displayed on the screen.

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

MIG/MAG and CMT welding parameters

Welding parameters for MIG/MAG pulse-synergic welding, for CMT welding and for PMC welding

For MIG/MAG pulse-synergic welding, CMT welding and PMC welding, the following welding parameters can be set and displayed under the "Welding" button:

Current [1] **[A]**

Setting range: depends on the selected welding process and welding program

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

Voltage [1] **[V]**

Setting range: depends on the selected welding process and welding program

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

Material thickness [1]

0.1 - 30.0 mm [2] / 0.004 - 1.18 [2] in.

Wire speed [1]

0.5 - max [2] [3] m/min / 19.69 - max [2] [3] ipm.

Arc length correction
For correcting the arc length;

-10 - +10
Factory setting: 0

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

Pulse/dynamic correction
For correcting the pulse energy in the pulsed arc

-10 - +10
Factory setting: 0

- ... lower droplet detachment force
0 ... neutral droplet detachment force
+ ... increased droplet detachment force

Welding parameters for MIG/MAG standard synergic welding and LSC welding

For MIG/MAG standard synergic welding and LSC welding, the following welding parameters can be set and displayed in the "Welding" menu item:

Current [1] **[A]**

Setting range: depends on the selected welding process and welding program

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

Voltage [1] **[V]**

Setting range: depends on the selected welding process and welding program

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

Material thickness [1]

0.1 - 30.0 mm [2] / 0.004 - 1.18 [2] in.

Wire speed [1]

0.5 - max [2] [3] m/min / 19.69 - max [2] [3] ipm.

Arc length correction
For correcting the arc length;

-10 - +10
Factory setting: 0

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

Pulse/dynamic correction
For correcting the pulse energy in the pulsed arc

-10 - +10
Factory setting: 0

- ... lower droplet detachment force
0 ... neutral droplet detachment force
+ ... increased droplet detachment force

Welding parameters for MIG/MAG standard manual welding

For MIG/MAG standard manual welding, the following welding parameters can be set and displayed in the "Welding" menu item:

Voltage [1] **[V]**

Setting range: depends on the selected welding process and welding program

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

Arc-force dynamic
For influencing the short-circuiting dynamic at the instant of droplet transfer

0 - 10
Factory setting: 0

0 ... harder and more stable arc
10 ... softer and low spatter arc

Wire speed [1]
To set a harder and more stable arc

0.5 - max [2] m/min / 19.69 - max [2] ipm.

Explanation of footnotes

1) Synergic parameters
   If a synergic parameter is changed, all other synergic parameters are automatically set as well due to the synergic function.

   The actual setting range depends on the power source and wire speed, as well as which welding program was selected.

2) The actual setting range depends on the selected welding program.

3) The maximum value depends on the actual wire speed.

Spot welding

Spot welding
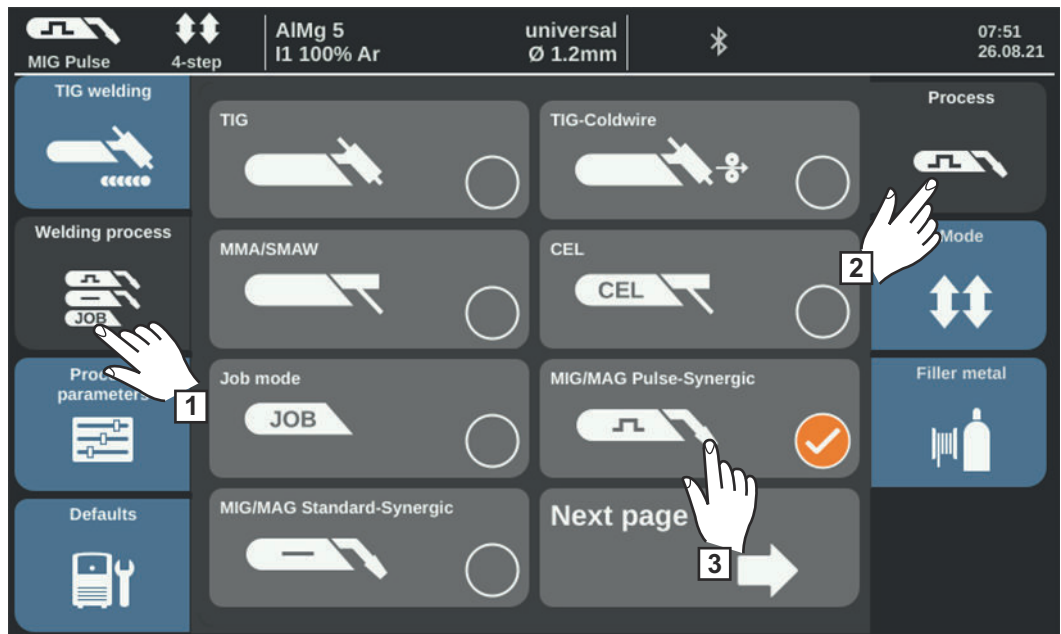
1	Select "Welding process"
2	Select "Process"
3	Select the desired welding process
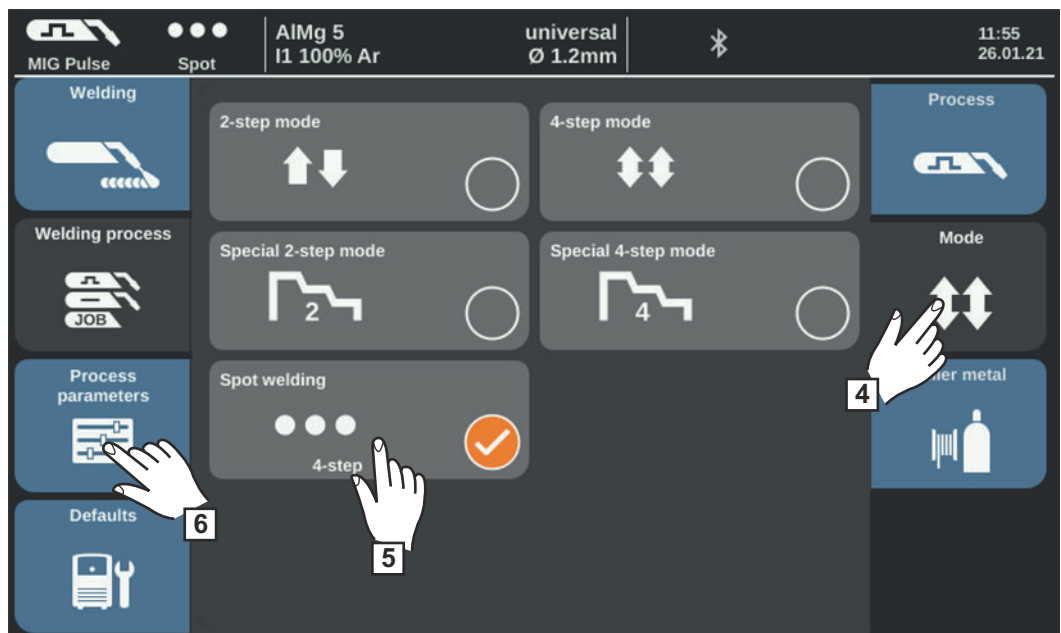
4	Select "Mode"
5	Select "Spot welding"
6	Select "Process parameters"
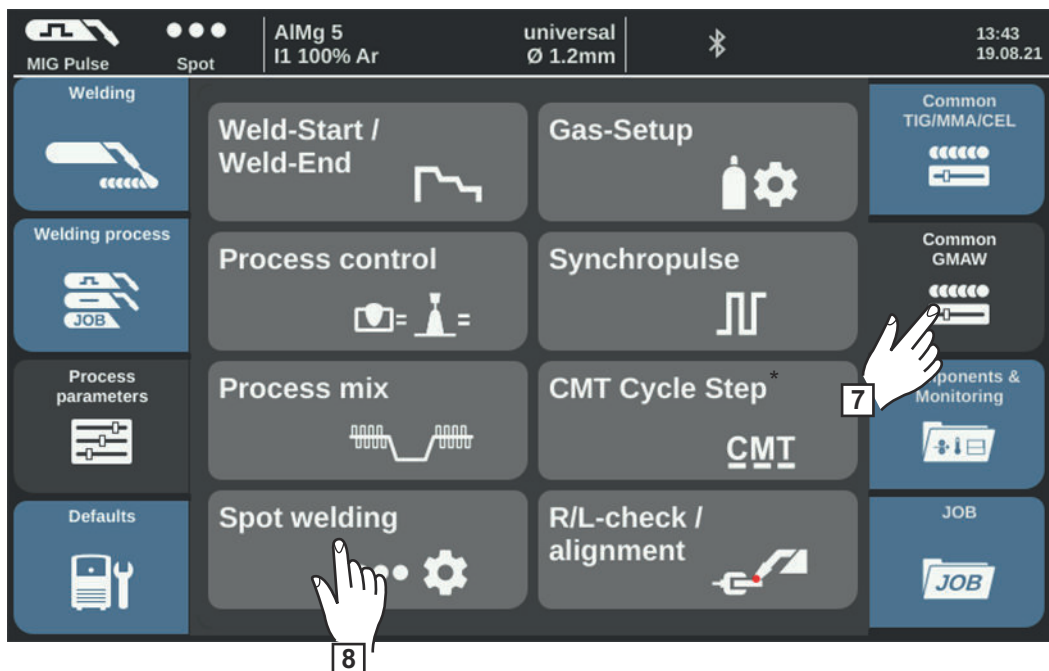
* Displayed only when the OPT/i CMT Cycle Step option is present on the power source. In TWIN mode, the TWIN Process control button is displayed after the Process Mix button. In this case, the Spot welding button is on the next page.

| 7 | Select "General MIG/MAG" |
| 8 | Select "Spot welding" |

The spot welding time parameter is displayed.

| 9 | Enter the desired value for the spot welding time: Press and turn the selection dial |

Setting range: 0.1 - 10.0 s
Factory setting: 1.0 s

| 10 | Accept value with OK |

NOTE!

4-step mode is set by default for spot welding.
Press torch trigger - The spot welding process runs until end of the spot welding time - pressing again stops spot welding prematurely
► The spot welding parameter can be changed to 2-step under Defaults / System / Mode Setup
(further information on 2-step and 4-step mode for spot welding can be found from page **119** onwards)

11	Select filler metal, wire diameter and shielding gas
12	Open the gas cylinder valve
13	Adjust the quantity of shielding gas

Danger of injury and damage from electric shock and from the wire electrode emerging from the torch.
When you press the torch trigger

▶ Keep the welding torch away from your face and body

▶ Wear suitable protective goggles

▶ Do not point the welding torch at anyone

▶ Make sure that the wire electrode does not touch any conductive or grounded parts (e.g., housing, etc.)

---

14 Spot welding

Procedure for creating a welding spot:

1 Keep the welding torch vertical

2 Press and release the torch trigger

3 Maintain the position of the welding torch

4 Wait for the gas post-flow time

5 Raise the welding torch

The selected weld start and weld end parameters are also active when spot welding.

▶ Under Process parameters / General MIG/MAG / Weld-Start/Weld-End, a weld start/ weld end treatment can thus be stored for spot welding.

▶ If final current time is active, the end of welding is not after the set spot welding time, but only after the set slope and final current times have elapsed.

MIG/MAG process parameters

MIG/MAG process parameters
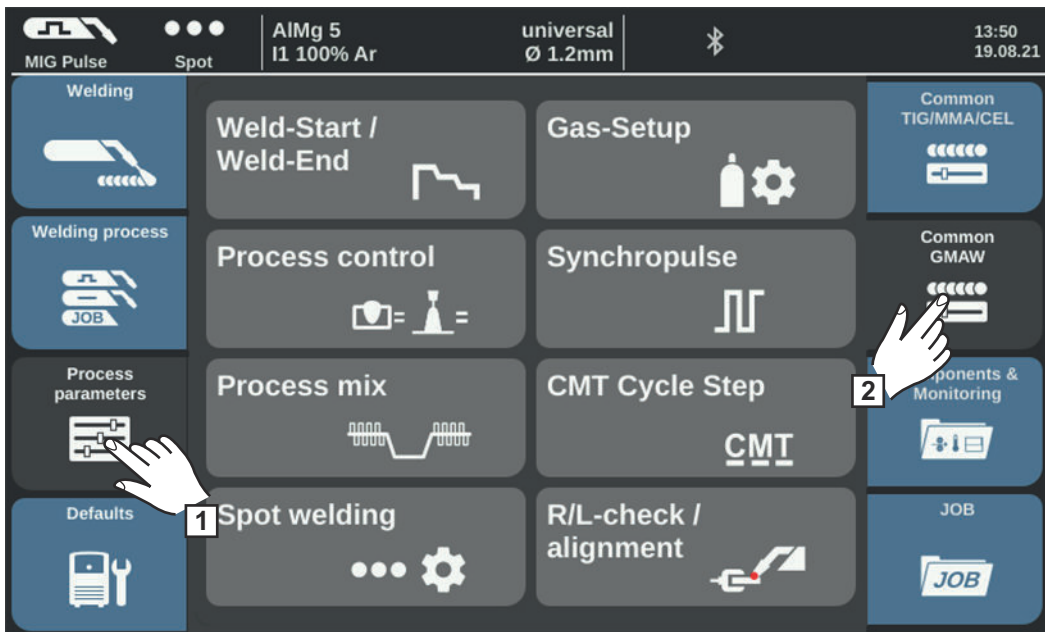
MIG/MAG process parameters:
Weld start / Weld end, Gas setup, Process control, SynchroPulse, Process mix, CMT Cycle Step, Spot welding, R/L-check / alignment

Process parameters for components and monitoring see page .

Process parameters for weld start / weld end

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

Starting current
To set the starting current for MIG/MAG welding (e.g., start of welding for aluminum)

0 - 200% (of welding current)
Factory setting: 135%

Start arc length correction
For correcting arc length at weld start

-10.0 - +10.0% (of the welding voltage)
Factory setting: 0.0%

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

Starting current time
For specifying how long the starting current is to be active

off / 0.1 - 10.0 s
Factory setting: off

Slope 1
To set the time during which the starting current is reduced or increased to the welding current

0.0 - 9.9 s
Factory setting: 1.0 s

Slope 2
To set the time during which the welding current is reduced or increased to the final current.

0.0 - 9.9 s
Factory setting: 1.0 s

Final current
To set the final current in order to
a)   prevent a build-up of heat at the end of welding and
b)   fill the end-crater in the case of aluminum

0 - 200% (of the welding current)
Factory setting: 50%

End arc length correction
For correcting the arc length at the end of welding

-10.0 - +10.0% (of the welding voltage)
Factory setting: 0.0%

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

Final current time
For specifying how long the final current is to be active

off / 0.1 - 10.0 s
Factory setting: off

SFI
To activate / deactivate the SFI function (Spatter Free Ignition of the arc)

off / on
Factory setting: off

SFI Hotstart
To set a hotstart time in conjunction with SFI ignition

During SFI ignition, a spray arc phase runs within the set hotstart time. This increases the heat input regardless of the operating mode and thus ensures a deeper penetration from the start of welding.

off / 0.01 - 2.00 s
Factory setting: off

Wire retraction
To set the wire retraction value (= combined value from wire retraction and a time)
The wire retraction depends on the equipment on the welding torch.

0.0 - 10.0
Factory setting: 0.0

Ignition current (manual)
To set the ignition current for MIG/MAG standard manual welding

100 - 550 A (TPS 320i)
100 - 600 A (TPS 400i, TPS 400i LASC ADV)
100 - 650 A (TPS 500i, TPS 600i)
Factory setting: 500 A

Wire retraction (manual)
To set the wire retraction value (= combined value from wire retraction and a time) in MIG/MAG standard manual welding
The wire retraction depends on the equipment on the welding torch.

0.0 - 10.0
Factory setting: 0.0

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

Gas pre-flow
To set the gas flow time before the arc is ignited

0 - 9.9 s
Factory setting: 0.1 s

Gas post-flow
To set the gas flow time after the arc has gone out

0 - 60 s
Factory setting: 0.5 s

Gas set value
Shielding gas flow rate
(only in conjunction with OPT/i gas flow sensor option)

off / 0.5 - 30.0 l/min
Factory setting: 15.0 l/min

IMPORTANT! If the set value for the shielding gas flow rate is high (e.g., 30 l/min), ensure that the gas line is adequately dimensioned!

Gas factor
Depends on the shielding gas used
(only in conjunction with the OPT/i gas controller option)

auto / 0.90 - 20.00
Factory setting: auto
(for standard gases from the Fronius welding database, the correction factor is set automatically)

In job mode, the values of the above parameters can be saved individually for each job.

Process parameters for process control	The following process parameters can be set and displayed for process control: - Penetration stabilizer - Arc length stabilizer - Combination of penetration stabilizer and arc length stabilizer

**Penetration sta-
bilizer**

The penetration stabilizer is used to set the max. permitted change in the wire speed to ensure that the welding current and hence the penetration is kept stable or constant with variable stick out.

The penetration stabilizer 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.

0 - 10.0 m/min (ipm)
Factory setting: 0 m/min

0
The penetration stabilizer is not activated.
The wire speed remains constant.

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

Application examples

Penetration stabilizer = 0 m/min (not activated)
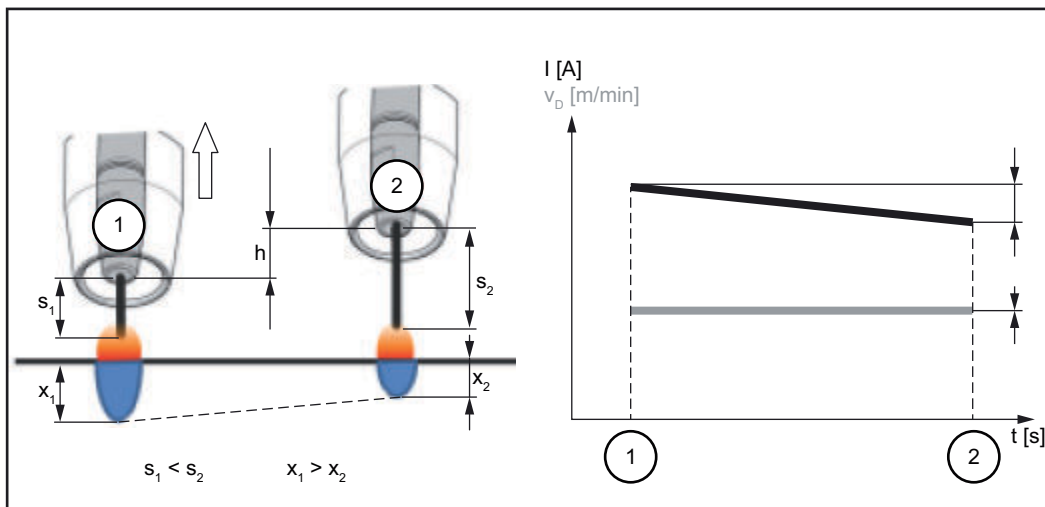
Penetration stabilizer = 0 m/min (not activated)

Changing the contact tube distance (h) alters the resistance in the welding circuit due to the longer stick out (s_2).
The constant voltage control for constant arc length causes a reduction in the mean current value and hence a smaller penetration (x_2).

Penetration stabilizer = n m/min (activated)
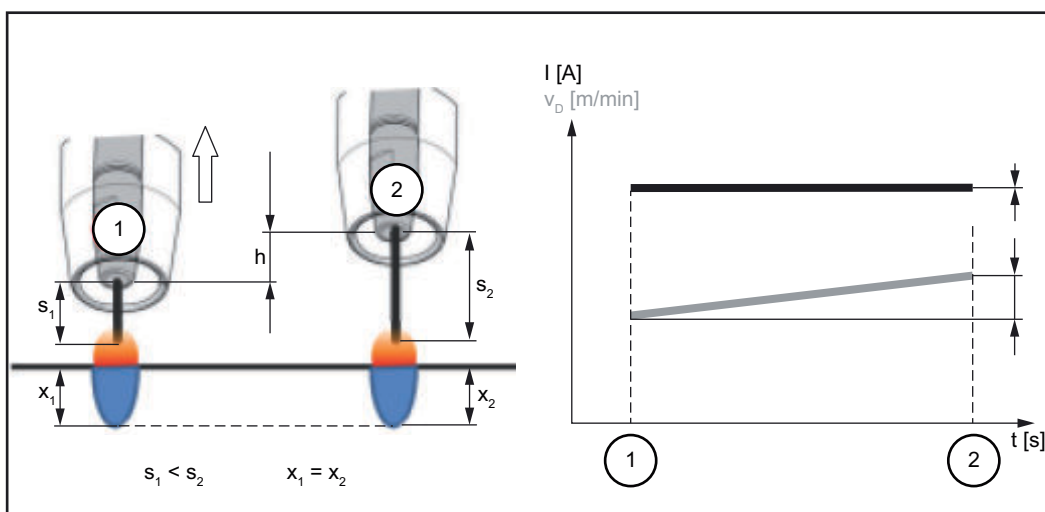
Penetration stabilizer = n m/min (activated)

Specifying a value for the penetration stabilizer ensures a constant arc length without large current variations if the stick out is changed ($s_1 ==> s_2$).
The penetration (x_1, x_2) remains virtually unchanged and stable.

Penetration stabilizer = 0.5 m/min (activated)
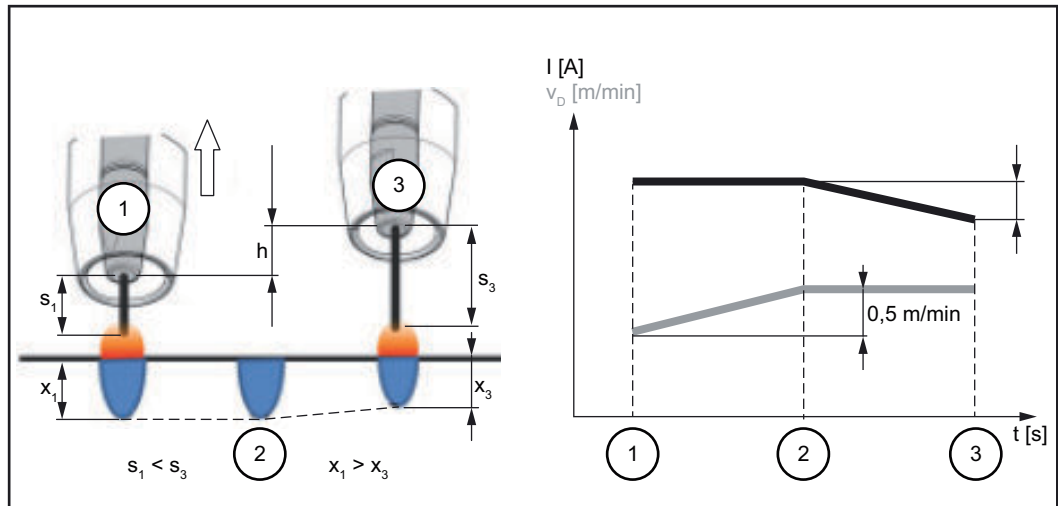
Penetration stabilizer = 0.5 m/min (activated)

To minimise the change in welding current if the stick out is changed (s_1 ==> s_3), the wire speed is increased or reduced by 0.5 m/min.
In the example shown, the stabilising effect is obtained without a change in current up to the set value of 0.5 m/min (Position 2).

I ... Welding current v_D ... Wire speed

Arc length stabilizer

Arc length stabilizer
The arc length stabilizer forces short arcs, advantageous for welding, via a short-circuit current control and keeps them stable even with a variable stick out or external interference.

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

0.0 - 5.0 (effect of stabilizer)
Factory setting: 0.0

0.0
The arc length stabilizer is deactivated.

0.1 - 5.0
The arc length stabilizer is activated.
The arc length is decreased until short circuits start to occur.

Application examples

Arc length stabilizer = 0 / 0.5 / 2.0

[1] Arc length stabilizer = 0

[2] Arc length stabilizer = 0.5

[3] Arc length stabilizer = 2
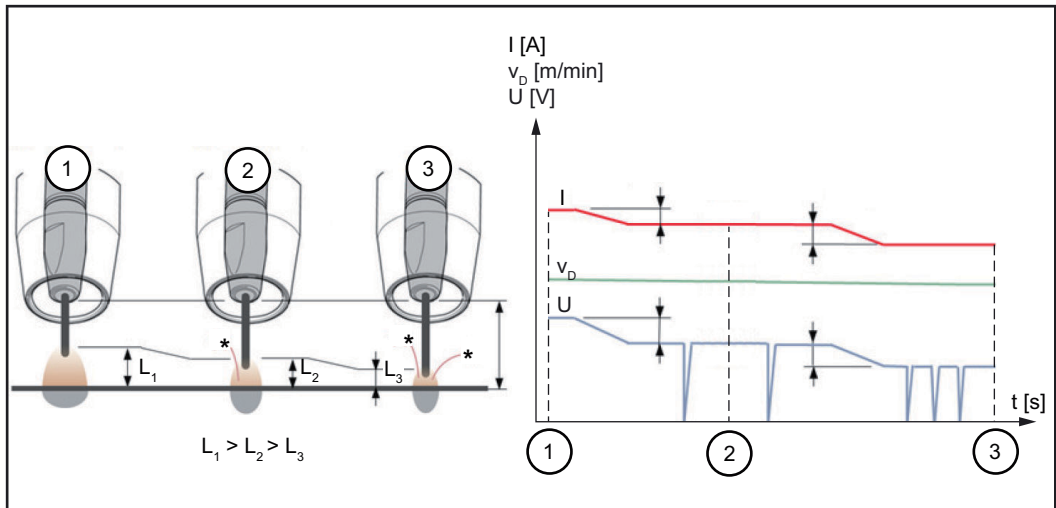
Arc length stabilizer = 0 / 0.5 / 2.0

Activating the arc length stabilizer reduces the arc length until short circuits start to occur. The frequency of the short circuits is controlled and kept stable.

Increasing the arc length stabilizer causes a further shortening of the arc length (L1 ==> L2 ==> L3). The advantages of a short, stable and controlled arc can be used more effectively.

Arc length stabilizer with change of weld seam profile and position
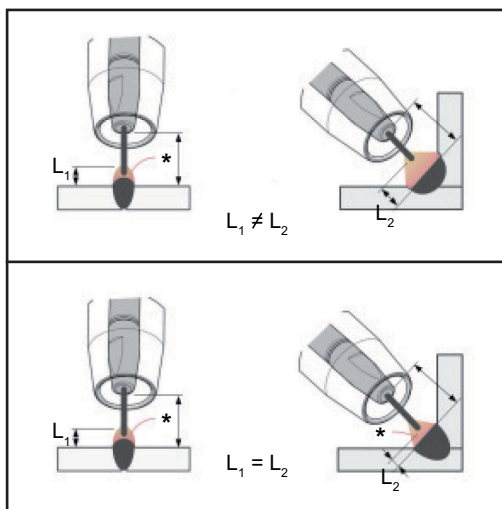
Arc length stabilizer not activated

A change of weld seam profile or welding position can negatively affect the welding result

Arc length stabilizer activated

Since the number and duration of the short circuits is controlled, the properties of the arc stay the same if the weld seam profile or welding position is changed.

I ... Welding current v_D ... Wire speed U ... Welding voltage
* ... Number of short circuits

Combination of penetration stabilizer and arc length stabilizer

Example: Stick out change

Arc length stabilizer without penetration stabilizer
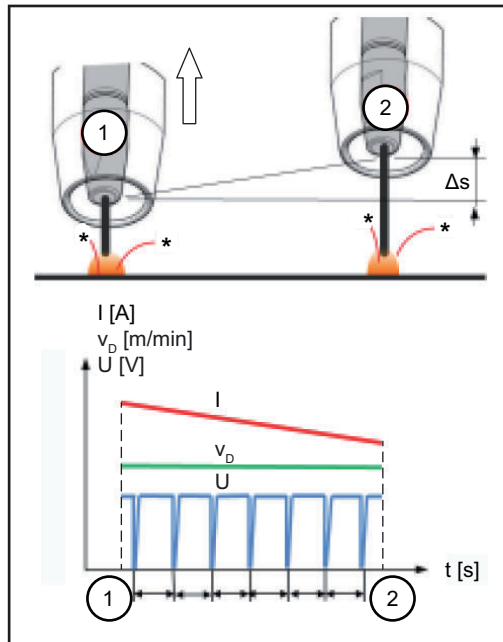
The advantages of a short arc are maintained even if the stick out is changed, since the short-circuit properties stay the same.

Arc length stabiliser with penetration stabilizer
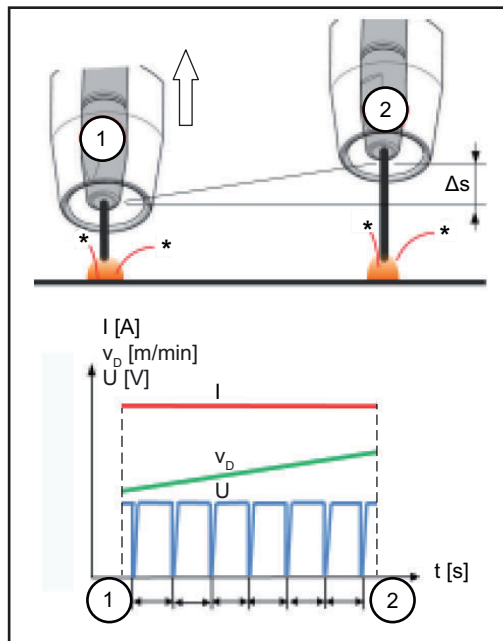
If the stick out is changed with the penetration stabilizer activated, the penetration also stays the same.
The short circuit behaviour is controlled by the arc length stabilizer.

I ... Welding current v_D ... Wire speed U ... Welding voltage
* ... Number of short circuits Δs ... Stick out change

Process parameters for SynchroPulse

The following process parameters can be set for SynchroPulse welding:

(1) SynchroPulse
to activate/deactivate SynchroPulse

off / on
Factory setting: on

(2) Wire speed
To set the average wire speed and therefore the welding power for SynchroPulse

For example: 2 - 25 m/min (ipm)
(Depending on wire speed and welding characteristic)
Factory setting: 5.0 m/min

(3) Delta wire feed
To set the Delta wire feed:
With SynchroPulse, the set wire speed is alternately increased/decreased by the Delta wire feed. The parameters concerned are modified accordingly to match the acceleration/deceleration of the wire speed.

0.1 - 6.0 m/min / 5 - 235 ipm
Factory setting: 2.0 m/min

(4) Frequency
To set the SynchroPulse frequency

0.5 - 3.0 Hz
Factory setting: 3.0 Hz

(5) Duty Cycle (high)
For weighting the duration of the higher operating point in a SynchroPulse period

10 - 90%
Factory setting: 50 Hz

(6) Arc correction high
For correcting the arc length with SynchroPulse at the higher operating point (= average wire speed plus Delta wire feed)

-10.0 - +10.0
Factory setting: 0.0

- ... short arc
0 ... uncorrected arc length
+ ... longer /arc

(7) Arc correction low
For correcting the arc length with SynchroPulse at the lower operating point (= average wire speed less Delta wire feed)

-10.0 - +10.0
Factory setting: 0.0

- ... short arc
0 ... uncorrected arc length
+ ... longer /arc
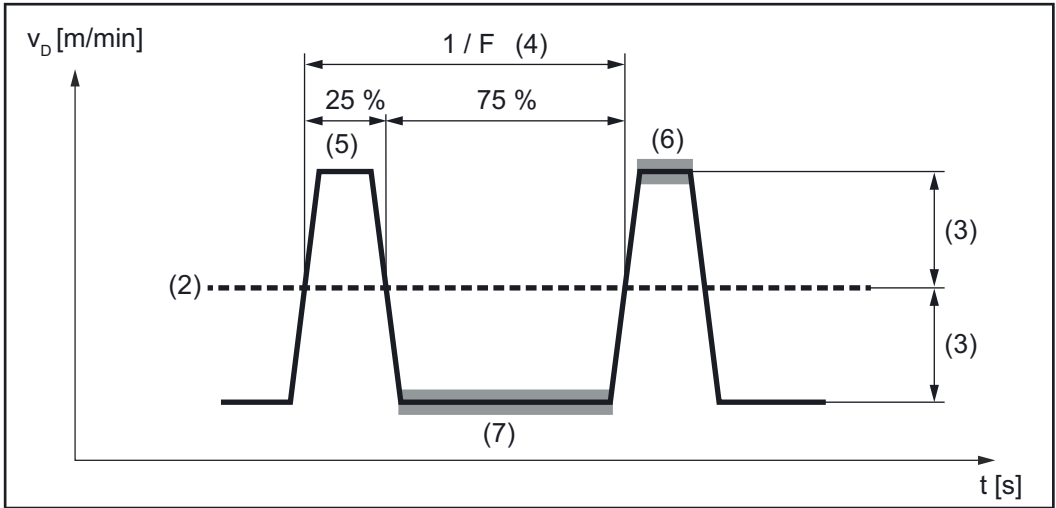
Example: SynchroPulse, duty cycle (high) = 25%

Process parameters for Process Mix

For mixing processes, the following process parameters can be set under Process Mix:

Wire speed v_D *
Wire speed

1.0 - 25.0 m/min / 40 - 985 ipm

The wire speed value is taken from the welding parameters or can be specified and changed in the Process Mix parameters.

Arc length correction

-10.0 - +10.0

The arc length correction value is taken from the welding parameters or can be specified and changed in the Process Mix parameters.

Pulse/dynamic correction
For changing the pulse energy in the pulsed arc process phase

-10.0 - +10.0

The pulse/dynamic correction value is taken from the welding parameters or can be specified and changed in the Process Mix parameters.

Upper power time correction (3) *
To set the duration of the hot process phase in a mixed process

-10.0 - +10.0
Factory setting: 0

Upper and lower power time correction is used to define the relationship between the hot and cold process phases.

If the lower power time correction is increased, the process frequency reduces and the PMC process phase becomes longer.

If the lower power time correction is reduced, the process frequency increases and the PMC process phase becomes shorter.

Lower power time correction (2) *
To set the duration of the cold process phase in a mixed process

-10.0 - +10.0
Factory setting: 0

Upper and lower power time correction is used to define the relationship between the hot and cold process phases.

If the lower power time correction is increased, the process frequency reduces and the LSC process phase becomes longer or, in the case of CMT mix, the CMT process phase becomes longer.

If the lower power time correction is reduces, the process frequency increases and the LSC process phase becomes shorter or, in the case of CMT mix, the CMT process phase becomes shorter.

Lower power correction (1) *
To set the energy input in the cold process phase in a mixed process

-10.0 - +10.0
Factory setting: 0

If the lower power correction is increased, this results in a higher wire speed and there-
fore a higher energy yield in the cold LSC process phase or the cold CMT process
phase.

* Representation of the parameters in the following diagrams

PMC mix
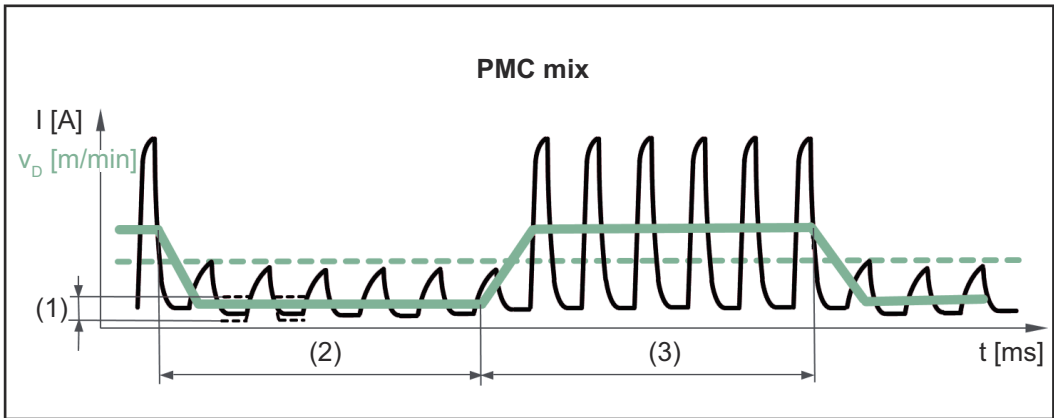
Mixed process between PMC and LSC welding process. A cold LSC process phase follows a hot PMC process phase as part of a cycle.

PMC mix drive
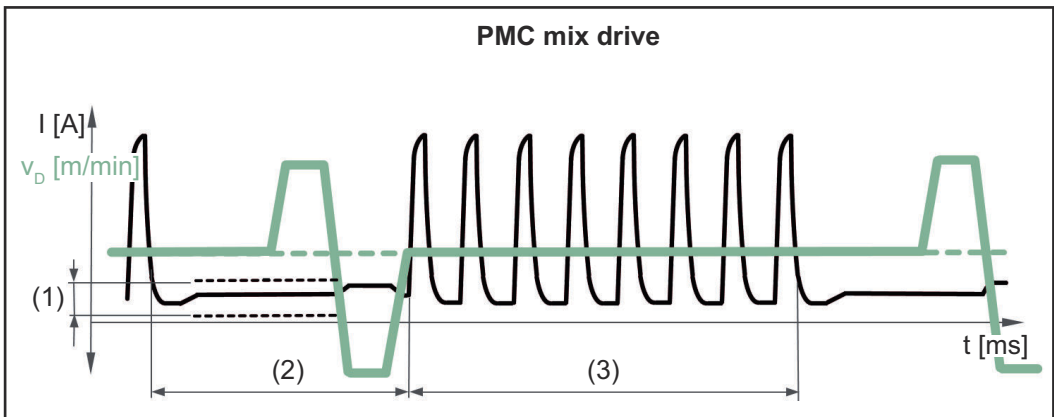
Mixed process between PMC and wire movement reversal using a PushPull drive unit. A cold low power phase with calibration movement follows a hot PMC process phase.

CMT mix
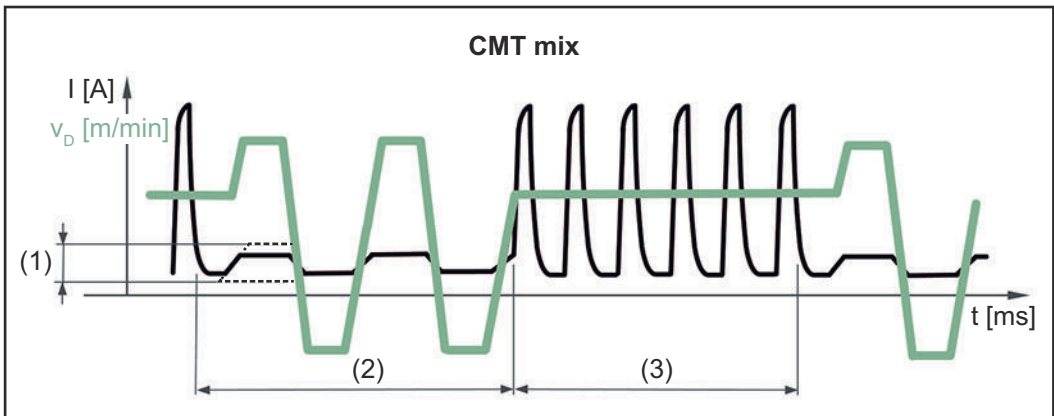
Mixed process between CMT and PMC welding process. Cold CMT process phases follow hot PMC process phases.

(1)   Lower power correction

(2)   Lower power time correction

(3)   Upper power time correction

v_D Wire speed

Process parameters for CMT Cycle Step	**CMT Cycle Step** To activate / deactivate the function CMT Cycle Step
	On/Off
	Wire feed Wire speed, defines the deposition rate in the welding process phase and thus the size of the welding spot; Setting range: in m/min (ipm), depending on the welding characteristic The value for the wire speed is applied; it can also be specified or changed in the CMT Cycle Step parameters.
	Cycles (spot size) To set the number of CMT cycles (welding droplets) for a spot; The number of CMT cycles and the set wire speed define the size of the welding spot. 1 - 2000
	Interval pause time To set the time between the individual welding spots 0.01–2.00 s The higher the value for the interval pause time, the cooler the welding process (coarser rippling).
	Interval cycles To set the number of CMT cycle repetitions incl. pause until the end of welding Continuous / 1 - 2000 Continuous The repetitions are continued continuously; Welding stop e.g., via "Arc Off"

Process parameters for spot welding	**Spot welding time** 0.1 - 10.0 s Factory setting: 1.0 s

R/L alignment

Align the welding circuit resistance (R) and inductance (L) if one of the following welding system components is changed:
- Torch hosepacks
- Interconnecting hosepacks
- Grounding cable, welding power-lead
- Wirefeeders
- Welding torches, electrode holders
- PushPull units

Prerequisites for R/L alignment:

The welding system must be complete: closed welding circuit with welding torch and torch hosepack, wirefeeders, grounding cable, interconnecting hosepacks.

Perform R/L alignment:

1 Select Process parameters / General MIG/MAG / R/L-check / alignment

The actual values for welding circuit inductance and welding circuit resistance are displayed.

2 Select "Next" / press selection dial / press torch trigger

The second step of the R/L alignment wizard is displayed.

3 Follow the on-screen instructions

IMPORTANT! Contact between the earthing clamp and the workpiece must be made on a cleaned workpiece surface.

4 Select "Next" / press selection dial / press torch trigger

The third step of the R/L alignment wizard is displayed.

5 Follow the on-screen instructions
6 Select "Next" / press selection dial / press torch trigger

The fourth step of the R/L alignment wizard is displayed.

7 Follow the on-screen instructions
8 Press torch trigger / select "Next" / press selection dial

The actual values are displayed when the measurement is complete.

9 Select "End" / press selection dial

Manual Metal Arc Welding, CEL, Arc air gouging

System components

Safety

⚠️ **WARNING!**

Danger from electrical current.
This can result in serious personal injury and damage to property.

▶ Before starting work, switch off all devices and components involved, and disconnect them from the grid.

▶ Secure all devices and components involved so they cannot be switched back on.

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

⚠️ **WARNING!**

Danger of electrical current due to electrically conductive dust in the device.
This can result in severe personal injury and damage to property.

▶ Only operate the device if an air filter is fitted. The air filter is a very important safety device for achieving IP 23 protection.

System components
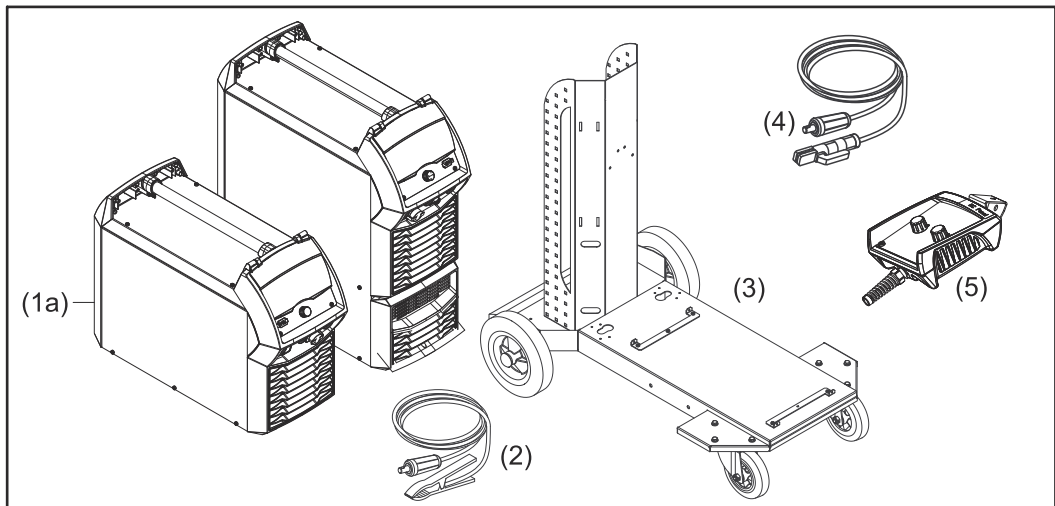
(1a)	iWave DC power sources
(1b)	iWave AC/DC power sources
(2)	Grounding cable
(3)	Trolley and gas cylinder holders
(4)	Electrode holder
(5)	Remote controls

Minimum equipment for welding operations

MMA welding
- Power source
- Grounding (earthing) cable
- Electrode holder with welding cable
- Rod electrodes

Commissioning

Preparation

IMPORTANT! A grounding cable with PowerConnector is required for manual metal arc welding. For other grounding cables, the OPT/i TPS 2. positive socket option must be installed on the power source.

1 Set the power switch to - O -

2 Unplug the mains plug

3 Remove the MIG/MAG welding torch

> **NOTE!**
>
> **Check the rod electrode packaging or label to determine whether the rod electrodes are to be welded on the positive pole (+) or the negative pole (-).**

4 Depending on the type of electrode, insert the grounding cable into the (-) current socket or into the (+) current socket and lock

5 Connect the other end of the grounding cable to the workpiece

6 Depending on the type of electrode, insert the bayonet connector of the electrode holder cable into the free current socket with opposite polarity and twist it clockwise to lock

7 Insert the mains plug

Manual Metal Arc Welding

Safety

<table>
<tr><td>⚠️ WARNING!</td></tr>
</table>

Danger from incorrect operation and work that is not carried out properly.
This can result in serious personal injury and damage to property.
▶ All the work and functions described in this document must only be carried out by technically trained and qualified personnel.
▶ Read and understand this document in full.
▶ Read and understand all safety rules and user documentation for this equipment and all system components.

<table>
<tr><td>⚠️ WARNING!</td></tr>
</table>

Danger from electrical current.
This can result in serious personal injury and damage to property.
▶ Before starting work, switch off all devices and components involved, and disconnect them from the grid.
▶ Secure all devices and components involved so they cannot be switched back on.
▶ After opening the device, use a suitable measuring instrument to check that electrically charged components (such as capacitors) have been discharged.

Manual metal arc welding

<table>
<tr><td>⚠️ CAUTION!</td></tr>
</table>

Danger of injury and damage from electric shock.
When the power switch is in position - I -, the stick electrode in the electrode holder is live.
▶ Ensure that the stick electrode is not touching anyone or any electrically conductive or grounded parts (housing, etc.)

1 Set the power switch to - I -
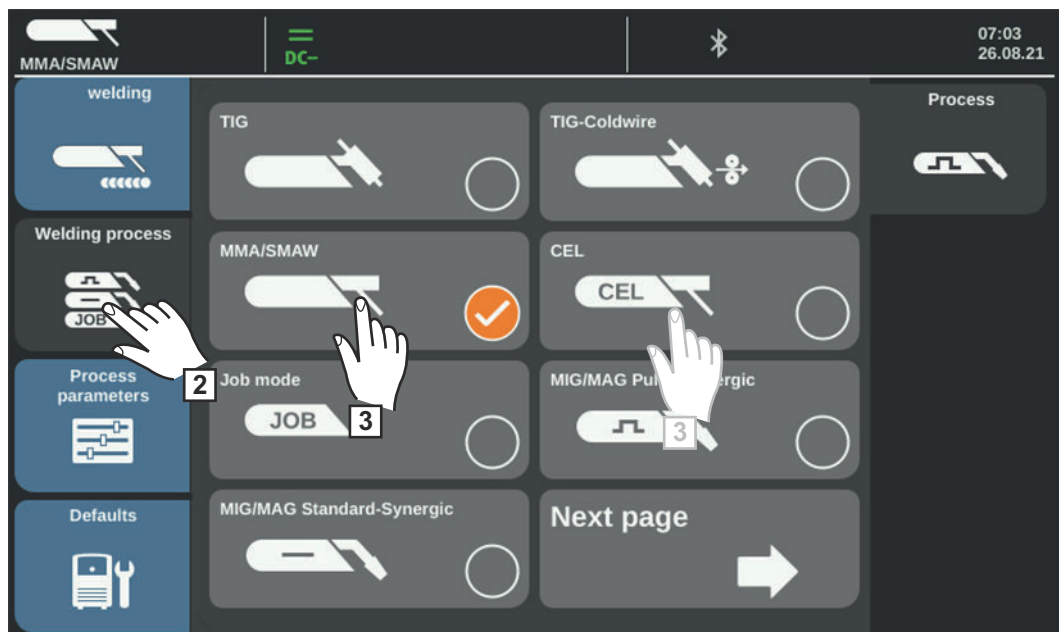
2 Select "Welding process"

An overview of the welding processes is displayed.
Various welding processes are available depending on the type of power source or the function package installed.

3 Select the MMA or CEL welding process

The welding voltage is applied to the welding socket with a three second delay.

If the MMA or CEL welding process is selected, a cooling unit, if present, is automatically deactivated. It is not possible to turn it on.

NOTE!

Under certain circumstances, it may not be possible to change parameters that have been set on the control panel of a system component (e.g. wirefeeder or remote control) on the control panel of the power source.

---

4 Select "MMA welding"

The MMA welding parameters are displayed.
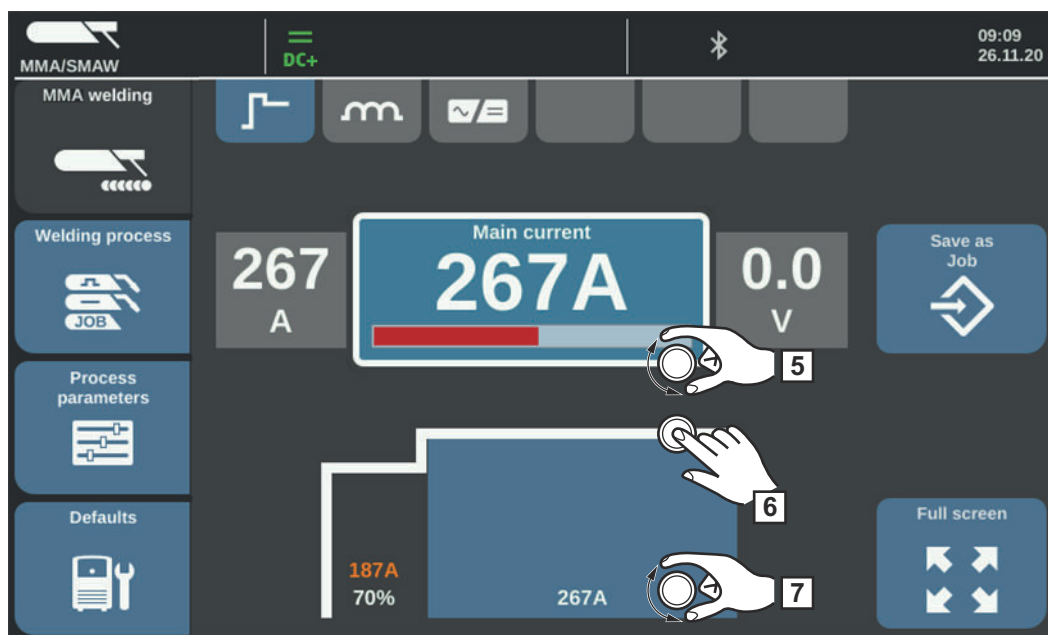
5 Turn the selection dial and select the desired welding parameter

6 Press the selection dial to change the parameter

7 Turn the selection dial and adjust the parameter

8 If necessary, select the process parameters for user- or application-specific settings on the welding system

9 Initiate welding process

Welding parameters for manual metal arc welding and CEL welding

Hot start current
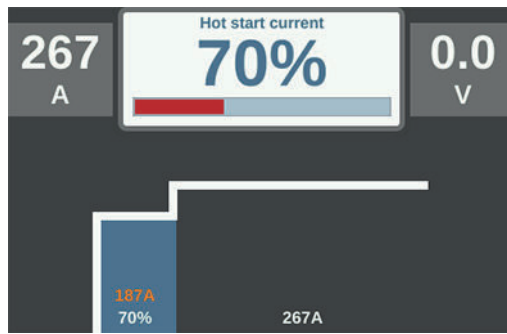
Setting range: 0 - 200% (of the main current)
Factory setting: 150%

Main current
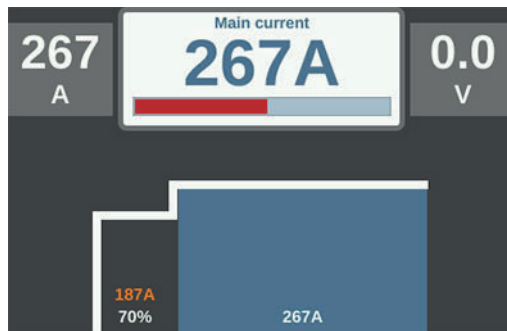
Setting range:
iWave 300i DC, iWave 300i AC/DC:
3 - 300 A
iWave 400i DC, iWave 400i AC/DC:
3 - 400 A
iWave 500i DC, iWave 500i AC/DC:
3 - 500 A
Factory setting:-

Dynamic
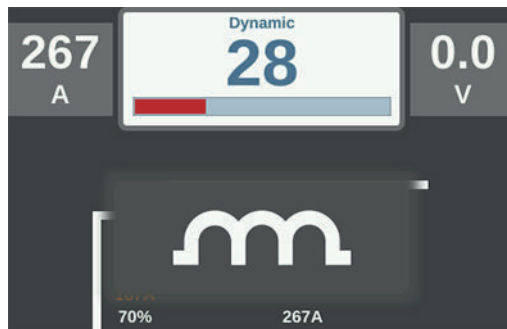
To obtain the best possible welding results, the arc-force dynamic will sometimes need to be adjusted.

Setting range: 0 - 100% (of the main current)
Factory setting: 20

0 ... soft and low-spatter arc
100 ... harder and more stable arc

Functional principle:
At the moment of droplet transfer or in event of a short circuit, a short-term increase in the amperage will occur. To maintain a stable arc, the welding current temporarily rises. If the stick electrode is at risk of sinking into the weld pool, this action prevents the weld pool from solidifying, as well as reducing the duration of the arc's short circuit. The risk of the stick electrode sticking is therefore largely ruled out.

Polarity
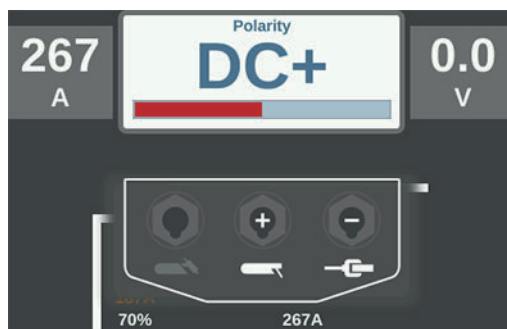
Setting range: DC- / DC+ / AC
Factory setting: DC-

Hot-Start, Soft-Start, Anti-Stick Functions

Starting current > 100 % (Hot-Start)

Advantages
- Improved ignition properties, even when using electrodes with poor ignition properties
- Better fusion of parent material in the start phase, therefore less neutralization
- Slag inclusions largely avoided
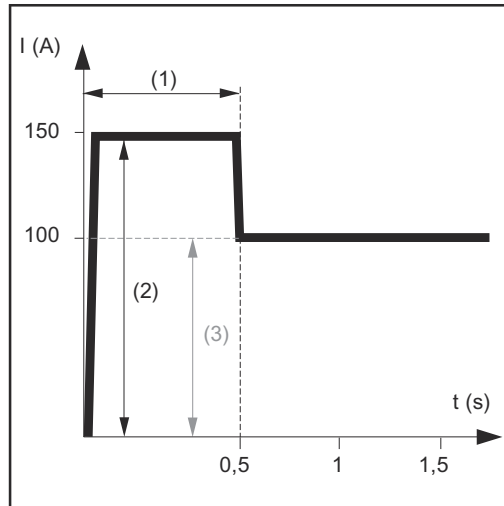
Example of a starting current > 100% (HotStart)

(1) Starting current time
0-2 s, factory setting 0.5 s

(2) Starting current
0-200%, factory setting 150%

(3) Main current = set welding current I_1

Operation
During the set starting current time (1), the welding current I_1 (3) rises to the starting current (2).

The starting current time is set in the Setup menu.

Starting current < 100 % (SoftStart)

A starting current of < 100% (SoftStart) is suitable for basic electrodes. Ignition is carried out with a low welding current. As soon as the arc is stable, the welding current increases until it reaches the set welding current command value.
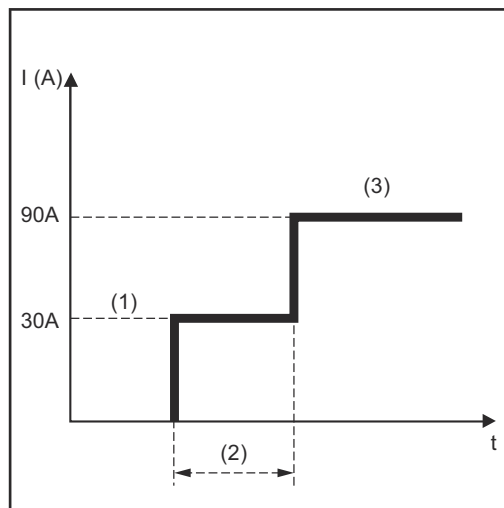
Example of a starting current < 100% (SoftStart)

Advantages:
- Improvement of ignition properties with electrodes that ignite at a low welding current
- Slag inclusions largely avoided
- Reduction of welding spatter

(1) Starting current
(2) Starting current time
(3) Main current

The starting current time is set in the MMA menu.

Anti-stick function

As the arc becomes shorter, the welding voltage may also fall so that the stick electrode is more likely to stick to the workpiece. This may also cause the stick electrode to burn out.

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

The anti-stick function is activated and deactivated under:
Process parameters / Common TIG/MMA/CEL / Electrode.

Stick electrode / CEL Process parameters

Stick electrode / CEL Process parameters
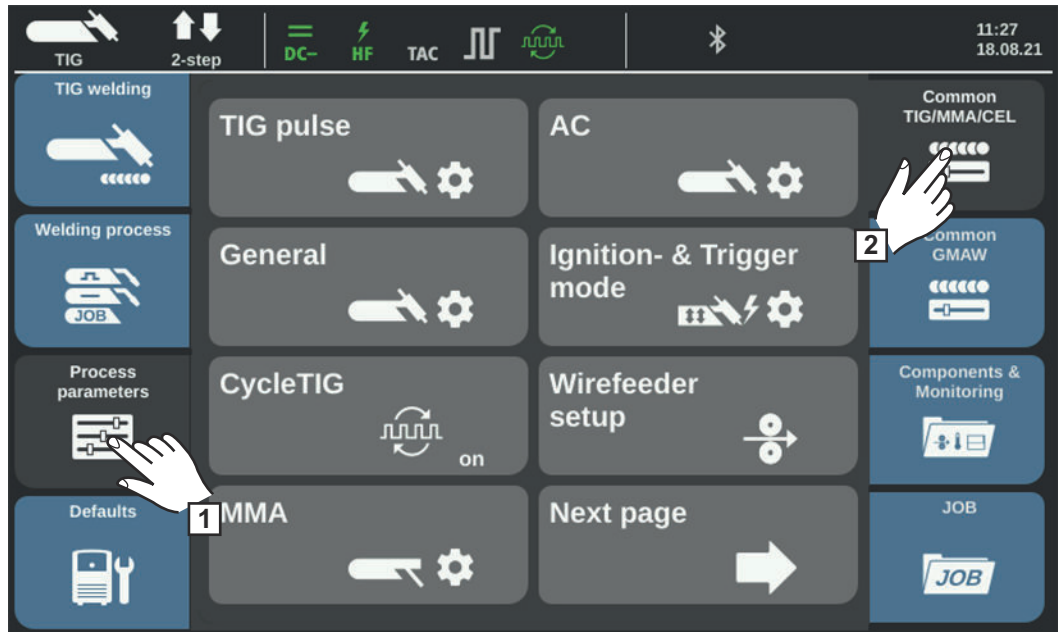
Stick electrode / CEL Process parameters:
Electrode, CEL

Process parameters for Components and Monitoring see page **186**.

Process parameters for stick electrode

Starting current time
HotStart

0.0 - 2.0 s
Factory setting: 0.5 s

To obtain the best possible welding result, the HotStart function will sometimes need to be adjusted.

Advantages:
- Improved ignition properties, even when using electrodes with poor ignition properties
- Better fusion of parent material in the start phase, therefore less neutralization
- Slag inclusions largely avoided

Characteristic
For selecting the electrode characteristic

I-constant / 0.1 - 20.0 A/V / P-constant / Arc air gouging (iWave 500 DC and AC/DC only)
Factory setting: I-constant
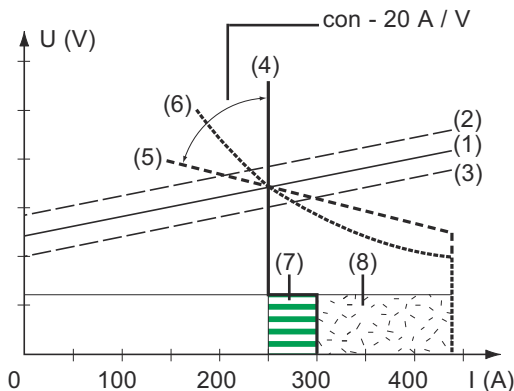
(1) Working line for stick electrode
(2) Working line for stick electrode with increased arc length
(3) Working line for stick electrode with reduced arc length
(4) Characteristic for selected parameter "I-constant" (constant welding current)
(5) Characteristic for selected parameter "0.1 -20" (drooping characteristic with adjustable gradient)
(6) Characteristic for selected parameter "P-constant" (constant welding power)

(7) Example of set arc-force dynamic with selected characteristic (4)
(8) Example of set arc-force dynamic with selected characteristic (5) or (6)

I-constant (constant welding current)
-    If the "I-constant" parameter is set, the welding current is kept constant regardless of the welding voltage. The result is a vertical characteristic (4).
-    The "I-constant" parameter is particularly suitable for rutile electrodes and basic electrodes.

0.1 - 20.0 A/V (drooping characteristic with adjustable slope)
-    A drooping characteristic (5) can be set using parameter "0.1 - 20". The setting range is from 0.1 A/V (very steep) to 20 A/V (very flat).
-    Setting a flat characteristic (5) is only recommended for cellulose electrodes.

P-constant (constant welding power)
-    If the "P-constant" parameter is set, the welding power is kept constant regardless of the welding voltage and current. The result is a hyperbolic characteristic (6).
-    The "P-constant" parameter is particularly suitable for cellulose electrodes.

Arc air gouging
-    Special characteristic for arc air gouging with a carbon electrode
     (for iWave 500 DC and iWave 500 AC/DC only)
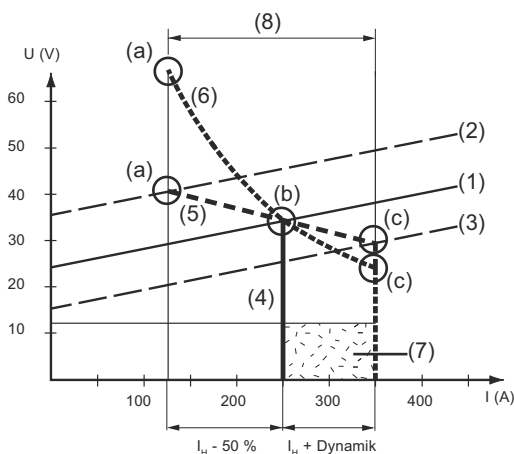
(1) Working line for stick electrode
(2) Working line for stick electrode with increased arc length
(3) Working line for stick electrode with reduced arc length
(4) Characteristic for selected parameter "I-constant" (constant welding current)
(5) Characteristic for selected parameter "0.1 -20" (drooping characteristic with adjustable gradient)
(6) Characteristic for selected parameter "P-constant" (constant welding power)

(7) Example of set arc-force dynamic with selected characteristic (5) or (6)
(8) Possible current change with selected characteristic (5) or (6) depending on the welding voltage (arc length)

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(a)   Operating point with high arc length

(b)   Operating point with set welding current I_H

(c)   Operating point with low arc length

The characteristics (4), (5) and (6) shown apply when using a stick electrode whose characteristic at a certain arc length corresponds to the working line (1).

Depending on the set welding current (I), the intersection (operating point) of the characteristics (4), (5) and (6) is shifted along the working line (1). The operating point provides information about the current welding voltage and current welding current.

With a fixed welding current (I_H), the operating point can travel along the characteristics (4), (5) and (6) depending on the current welding voltage. The welding voltage U depends on the arc length.

If the arc length changes, e.g., according to the working line (2), the operating point is the point where the corresponding characteristic (4), (5) or (6) intersect the working line (2).

Applies to characteristics (5) and (6): Depending on the welding voltage (arc length), the welding current (I) is also lower or higher, with a constant value for I_H.

Anti-stick

on/off
Factory setting: on

As the arc becomes shorter, the welding voltage may also fall so that the stick electrode is more likely to stick to the workpiece. This may also cause the stick electrode to burn out.

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

Break voltage
Limitation of the welding voltage

20 - 90 V
Factory setting: 20 V

In principle, the arc length depends on the welding voltage. To end the welding process, a significant lifting of the stick electrode is usually required. The parameter allows the welding voltage to be limited to a value, which permits the welding process to be ended by only slightly lifting the stick electrode.

NOTE!

If the welding process regularly comes to an unintentional end, set the break voltage parameter to a higher value.

AC frequency
Only for AC manual metal arc welding ("Polarity" welding parameter = AC)

40 - 250 Hz
Factory setting: 60 Hz

**Process paramet-
ers for CEL**

Starting current time
HotStart

0.0 - 2.0 s
Factory setting: 0.5 s

To obtain the best possible welding result, the HotStart function will sometimes need to be adjusted.

Advantages:
- Improved ignition properties, even when using electrodes with poor ignition properties
- Better fusion of parent material in the start phase, therefore less neutralization
- Slag inclusions largely avoided

Anti-stick

on/off
Factory setting: on

As the arc becomes shorter, the welding voltage may also fall so that the rod electrode is more likely to stick to the workpiece. This may also cause the rod electrode to burn out.

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

Break voltage
Limitation of the welding voltage

20 - 90 V
Factory setting: 20 V

In principle, the arc length depends on the welding voltage. To end the welding process, a significant lifting of the rod electrode is usually required. The parameter allows the welding voltage to be limited to a value, which permits the welding process to be ended by only slightly lifting the rod electrode.

> **NOTE!**
>
> **If the welding process regularly comes to an unintentional end, set the break voltage parameter to a higher value.**

Arc air gouging (iWave 500 DC and iWave 500 AC/DC)

Safety

⚠️ **WARNING!**

Danger from incorrect operation and work that is not carried out properly.
This can result in serious personal injury and damage to property.
▶ All the work and functions described in this document must only be carried out by technically trained and qualified personnel.
▶ Read and understand this document in full.
▶ Read and understand all safety rules and user documentation for this equipment and all system components.

⚠️ **WARNING!**

Danger from electrical current.
This can result in serious personal injury and damage to property.
▶ Before starting work, switch off all devices and components involved, and disconnect them from the grid.
▶ Secure all devices and components involved so they cannot be switched back on.
▶ After opening the device, use a suitable measuring instrument to check that electrically charged components (such as capacitors) have been discharged.

Preparation

IMPORTANT! A grounding cable with a PowerConnector and a cable cross-section of 120 mm² is required for arc air gouging. For other grounding cables, the OPT/i TPS 2. Positive option must be installed at the power source.
Furthermore, a Dinse PowerConnector adapter is required for the connection of the gouger.

1 Set the power switch to - O -

2 Unplug the mains plug

3 Remove the MIG/MAG welding torch

4 Insert the grounding cable into the (-) current socket and lock

5 Connect the other end of the grounding cable to the workpiece

6 Attach the Dinse PowerConnector adapter to the (+) current socket

7 Insert the bayonet connector of the arc air gouging torch into the (+) current socket and twist it clockwise to lock

8 Connect the compressed air connection of the arc air gouging torch to the compressed air supply
Working pressure: 5 - 7 bar (constant)

9 Clamp the carbon electrode so that the electrode tip protrudes approx. 100 mm from the arc air gouging torch;
the air outlet openings of the arc air gouging torch must be at the bottom

10 Insert the mains plug

Arc air gouging

⚠ **CAUTION!**

Danger of injury and damage from electric shock.
When the power switch is switched to position - I -, the electrode in the arc air gouging torch is live.
▶ Ensure that the electrode is not touching anyone or any electrically conductive or grounded parts (housing, etc.)

⚠ **CAUTION!**

Risk of personal injury due to loud operating noise.
▶ Use suitable hearing protection during arc air gouging!

1 Set the power switch to - I -

2 Under Process parameters / Common TIG/MMA/CEL / Electrode, set the "Characteristic" parameter to "Gouging" (last entry)

NOTE!

The settings for break voltage and starting current time are ignored.

3 Select OK

4 Under Welding process / Process, select Electrode

If the MMA welding process is selected, a cooling unit, if present, is automatically deactivated. It is not possible to turn it on.

NOTE!

Under certain circumstances, it may not be possible to change parameters that have been set on the control panel of a system component (e.g. wirefeeder or remote control) on the control panel of the power source.

5 Select "MMA welding"

The arc air gouging parameters are displayed.

6 Set the main current according to the electrode diameter and as specified on the electrode packaging

NOTE!

At higher amperages, use both hands to guide the arc air gouging torch!
▶ Use a suitable welding helmet.

7 Open the compressed air valve on the arc air gouging torch handle

8 Initiate the gouging operation

The contact angle of the carbon electrode and gouging speed determine the depth of an air gap.

The parameters for arc air gouging correspond to the welding parameters for MMA welding, see page **154**.

Job Mode

EasyJob mode

General

When EasyJob mode is activated, the display shows 5 additional buttons that enable fast saving of up to 5 operating points.
The current welding-relevant settings are saved.

Activating Easy-Job mode
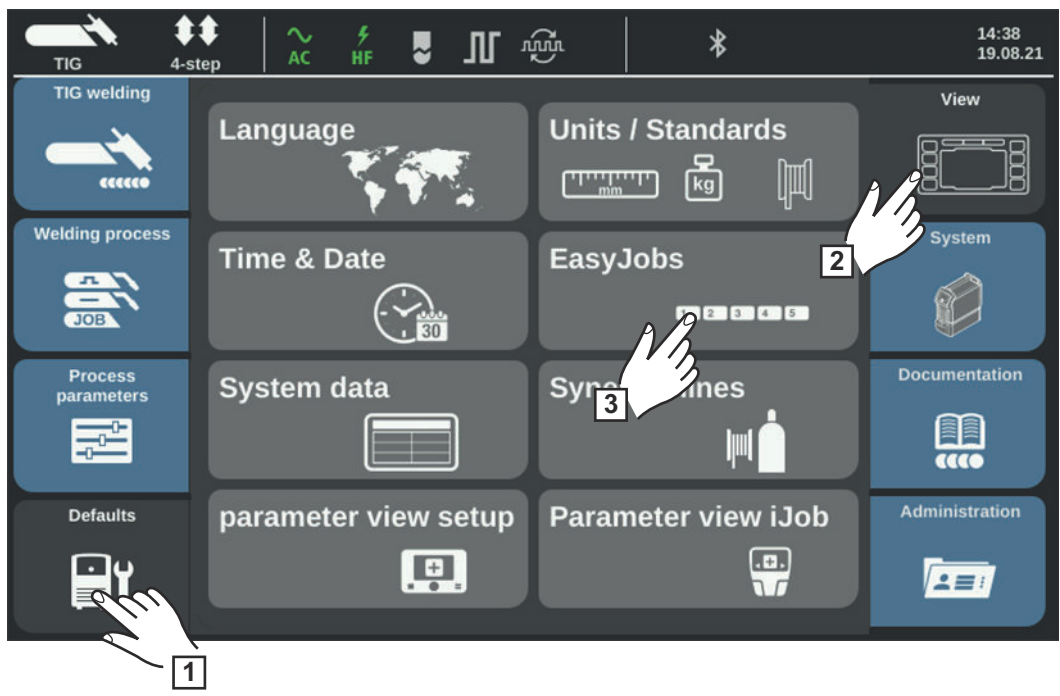
1	Select "Defaults"
2	Select "View"
3	Select "EasyJobs"

The overview for activating/deactivating EasyJob mode is displayed.

| 4 | Select "EasyJobs On" |
| 5 | Select "OK" |

EasyJob mode is activated, the defaults are displayed.

| 6 | Select "Welding" |

The five EasyJob buttons are displayed with the welding parameters.

Storing EasyJob operating points

> **NOTE!**
>
> **The EasyJobs are stored under job numbers 1 - 5 and can also be retrieved via job mode.**
> Storing an EasyJob overwrites a job stored under the same job number!
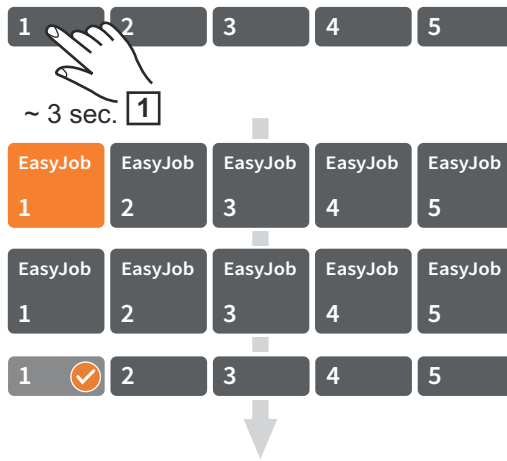
1 Touch one of the EasyJob buttons for approx. 3 seconds to store the current welding settings

The button initially changes in size and color. After approx. 3 seconds, the button changes color again.
The settings have now been stored.

The most recently stored settings are enabled. An active EasyJob is displayed by a check mark on the EasyJob button.

Unused EasyJob buttons are shown in dark gray.

Example:
EasyJobs 1 and 4 are occupied;
EasyJobs 2, 3 and 5 are not occupied;
EasyJob 1 is active

Retrieving Easy-Job operating points
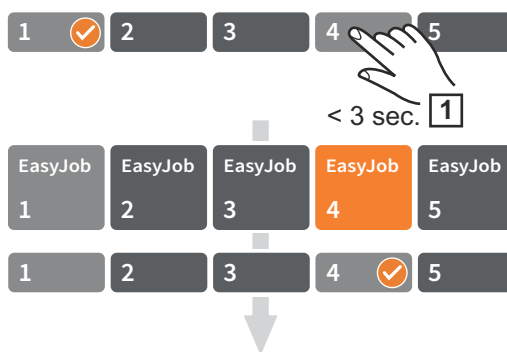
1 To retrieve a stored EasyJob operating point, briefly touch the corresponding EasyJob button (< 3 seconds)

The button briefly changes in size and color and is then displayed with a check mark:

If no check mark is displayed after touching an EasyJob button, an operating point is not stored under this button.

Deleting EasyJob operating points
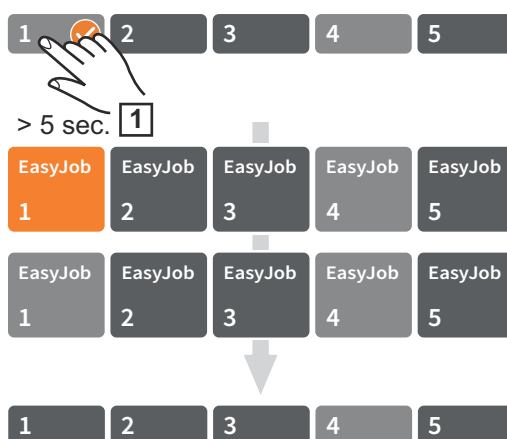
1 To delete an EasyJob operating point, touch the corresponding EasyJob button for approx. 5 seconds

The button
- initially changes in size and color;
- color changes again after approx. 3 seconds
  The stored operating point is overwritten with the current settings.
- is highlighted in red after a total of approx. 5 seconds (= delete).

The EasyJob operating point has been deleted.

Job Mode

General

Up to 1000 jobs can be stored and reproduced on the power source.
This eliminates the need to manually document the welding parameters.
Job mode thereby increases the quality of automated and manual applications.

Jobs can only be saved during welding mode. In addition to the current welding settings, the process parameters and certain machine defaults are also taken into account when saving jobs.

Saving settings as a job

[1] Set the parameters to be saved as a job:
  - Welding parameters
  - Welding process
  - Process parameters
  - Machine defaults, if applicable
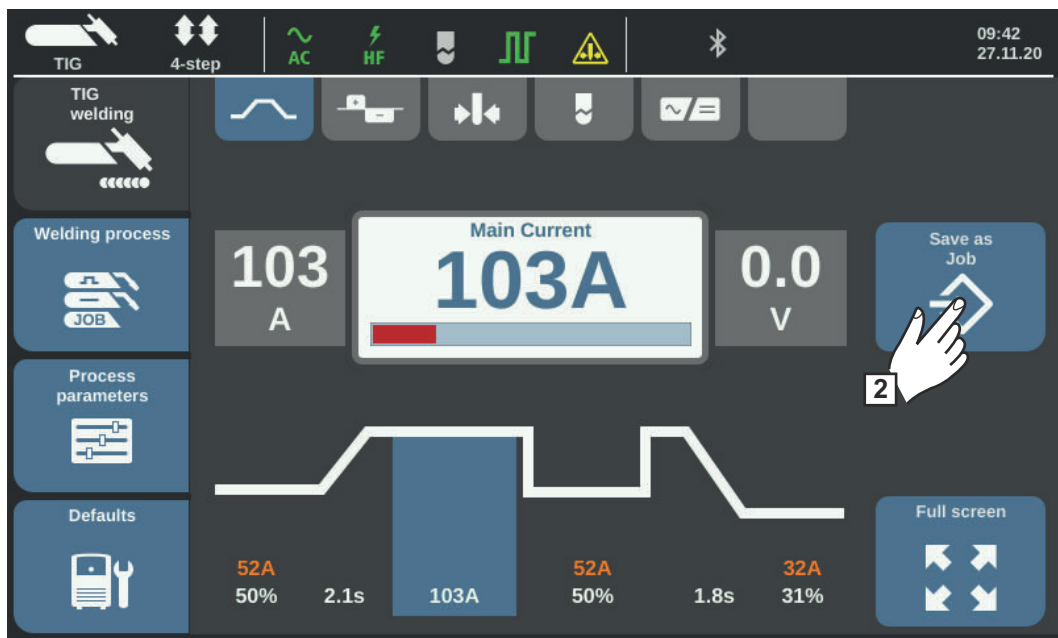
[2] Select "Save as Job"

The list of jobs is displayed.

To overwrite an existing job, select the job by turning and pressing the selection dial (or select "Next page").
After a prompt appears, the selected job can be overwritten.

For a new job, select "Create a new Job"

[3] Press the selection dial/select "Next page"

The next free job number is displayed.

[4] Turn the selection dial and select the desired storage location
[5] Press the selection dial/select "Next page"

The keyboard is displayed.

6	Enter a job name
7	Select "OK" and confirm the job name/press the selection dial

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

8	Select "Exit" to exit/press the selection dial

Welding job - re-trieving jobs

<table>
<tr><td colspan="2">NOTE!</td></tr>
<tr><td colspan="2">Before retrieving a job, ensure that the welding system is set up and installed according to the job in question.</td></tr>
</table>

1	Select "Welding process"
2	Select "Process"
3	Select "JOB"

Job mode is activated.
"Welding job" and the data for the last job retrieved are displayed.

4	Select "Welding job"
5	Turn the selection dial and select "Job number" (white background)
6	Press the selection dial to select the desired job (blue background)
7	Turn the selection dial and select the desired job number (blue background) The name of the selected job is displayed above the actual value display.
8	Press the selection dial and accept the selected job number (white background)
9	Initiate welding process

IMPORTANT! In job mode, only the "Job number" welding parameter can be changed; the remaining welding parameters can only be viewed.

Optimizing a job
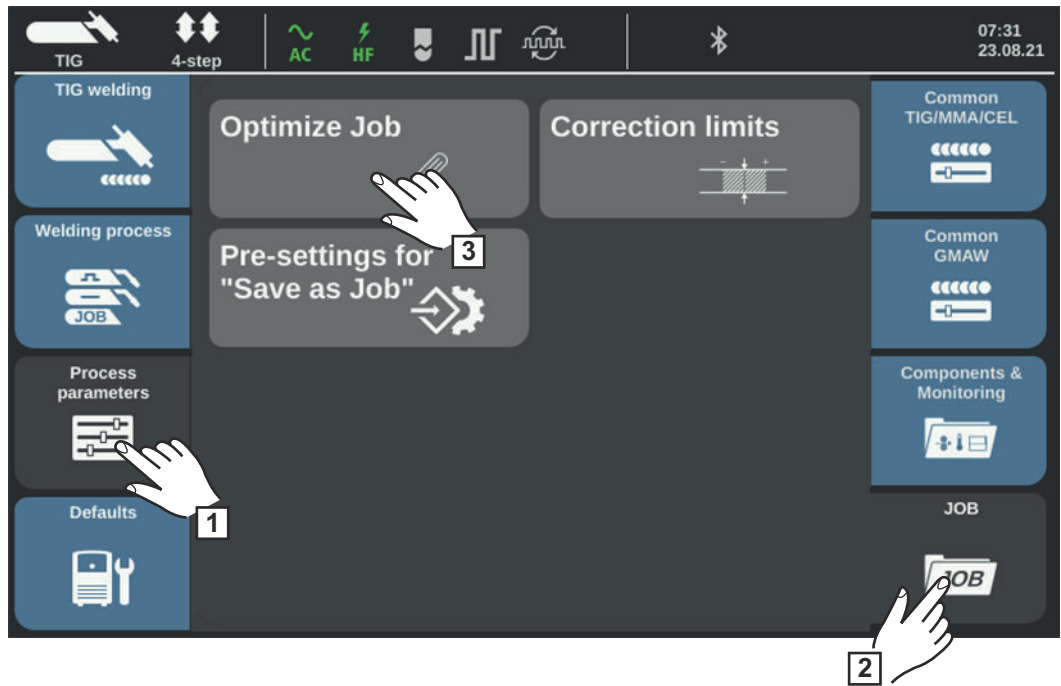
1 Select "Process parameters"

2 Select "JOB"

3 Select "Optimize Job"

The overview of the last optimized job is displayed.

4 Turn the selection dial and select either the job or the parameters of the job to be modified

You can also select between job and job parameters by touching the "Job number/Job parameter" button.
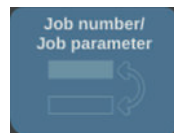
Select a job:
- Press the selection dial

   The job number is highlighted in blue and can now be changed.

- Turn the selection dial to select the job to be changed
- Press the selection dial to change the job

Select a job parameter:
- Turn the selection dial and select the parameter to be changed
- Press the selection dial

   The value of the parameter is highlighted in blue and can now be changed.

- Turn the selection dial; the change of value is applied immediately
- Press the selection dial to select other parameters

5 Select "Exit"

Renaming a job
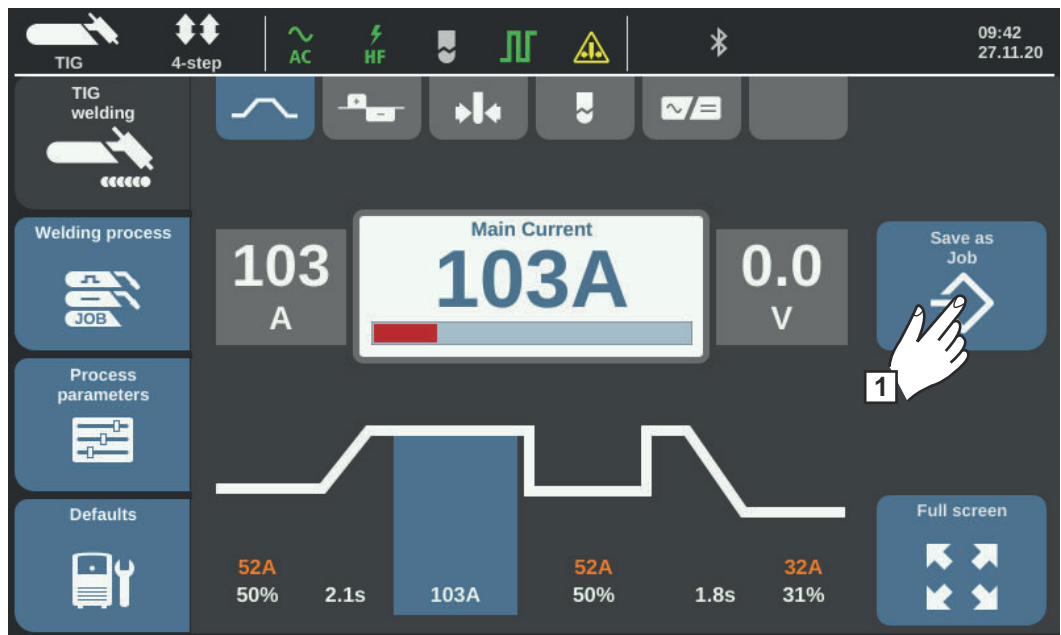
| 1 | Select "Save as Job"
(also works in job mode)

The list of jobs is displayed.
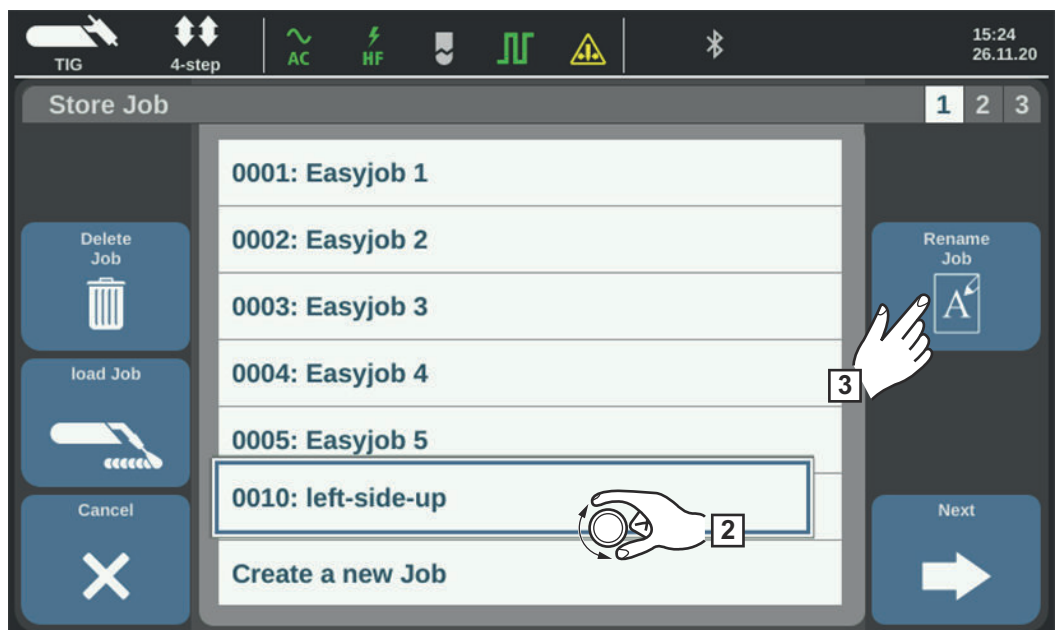
| 2 | Turn the selection dial and select the job to be renamed

| 3 | Select "Rename Job"

The keyboard is displayed.

| 4 | Use the keyboard to change the job name

| 5 | Select "OK" and confirm the changed job name/press the selection dial

The job name has been changed and the list of jobs is displayed.

| 6 | Select "Cancel" to exit

Deleting a job
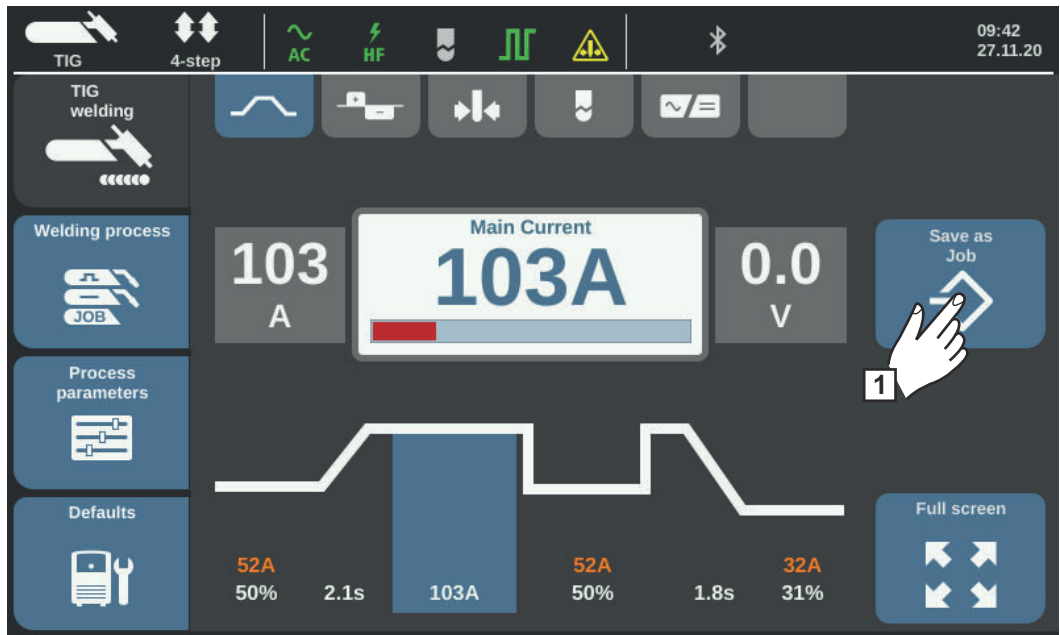
[1] Select "Save as Job"
(also works in job mode)

The list of jobs is displayed.
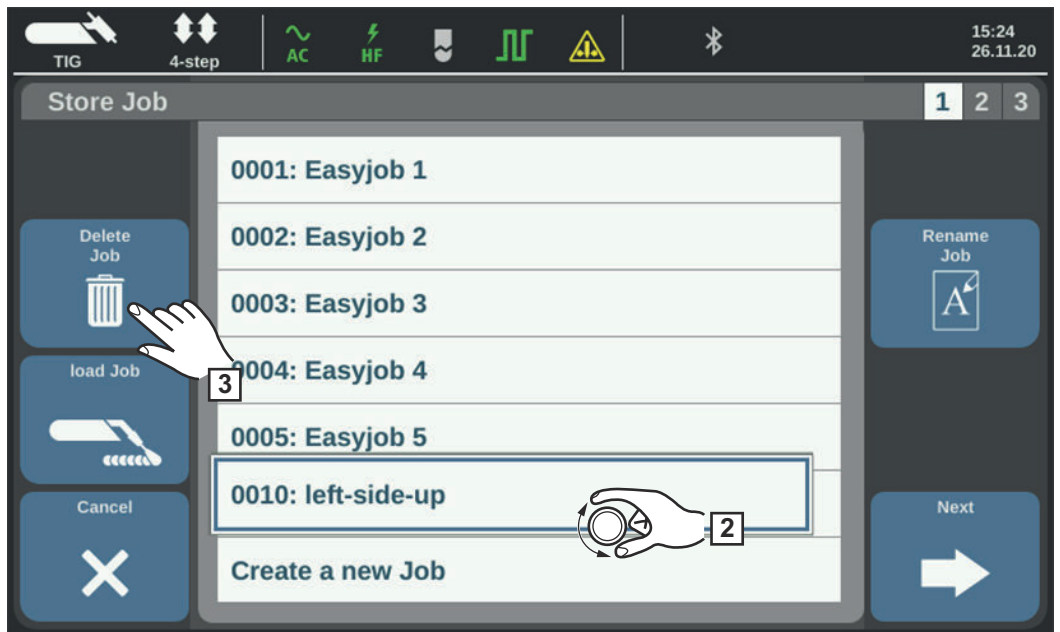
[2] Turn the selection dial and select the job to be deleted

[3] Select "Delete Job"

The prompt to delete the job is displayed.

[4] Select "Yes" to delete the selected job

The job has been deleted and the list of jobs is displayed.

[5] Select "Cancel" to exit

Loading a job

Use the Load Job function to load the data for a stored job or EasyJob into the Welding area. The corresponding data for the job is displayed in the welding parameters and can be welded, modified or saved as a new job or EasyJob.
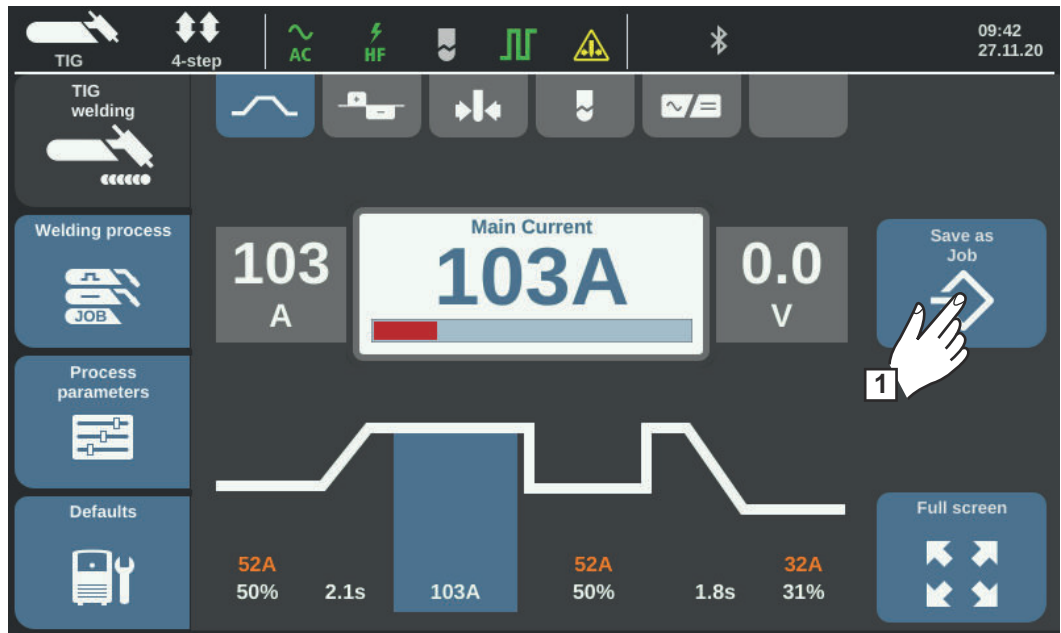
1 Select "Save as Job"
(also works in job mode)

The list of jobs is displayed.

2 Turn the selection dial and select the job to be loaded

3 Select "Load Job"

The Load Job information is displayed.

4 Select "Yes"

The data for the selected job is loaded in the Welding area.

The data for the loaded job can now be welded (no job mode), modified or saved as a new job or EasyJob.

Job process parameters

JOB process parameters
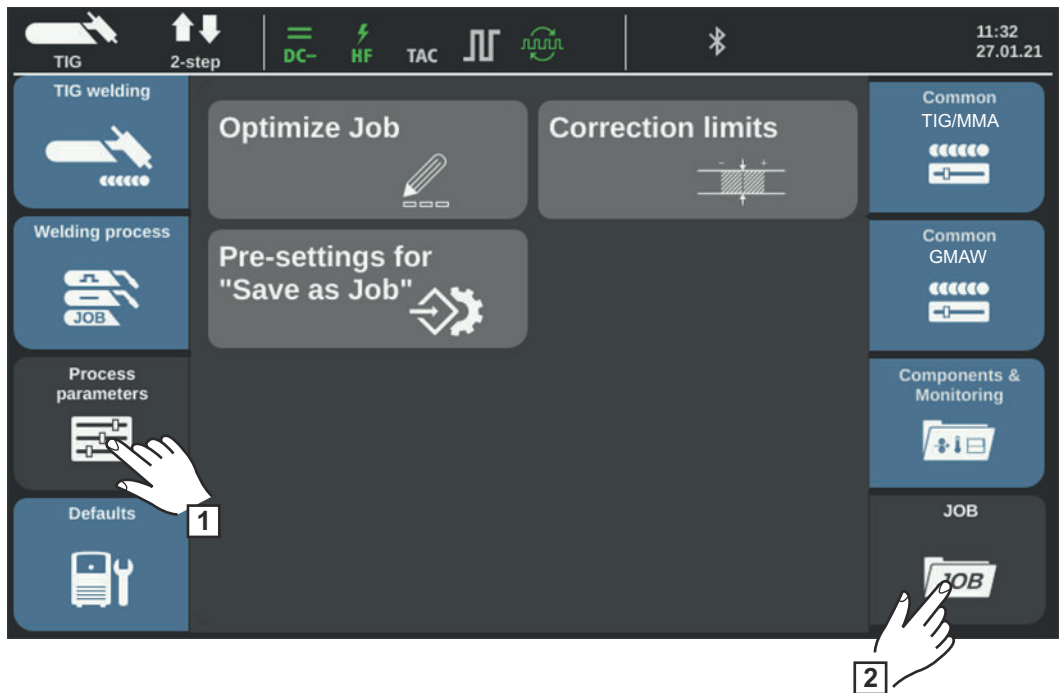
Process parameters for Components and Monitoring see page **186**.

Process parameters for "Optimize Job"

The following process parameters can be set for "Optimize Job":

Working parameters

Starting current [% of main current]	see page **78**
UpSlope [s]	see page **79**
Main current [A]	see page **79**
Lowering current for 4-step mode [% of main current]	see page **79**
DownSlope [s]	see page **80**
Final current [% of main current]	see page **80**
AC Balance iWave AC/DC power sources only [%]	see page **81**
Electrode diameter [mm]	see page **78**

Welding process settings

Polarity [DC-/AC]	see page
TIG welding torch mode [2-step mode/4-step mode/spot welding]	see page **68**

TIG pulse settings

Tacking [s]	see page **91**
Pulse frequency [Hz]	see page **91**
Base current [% of main current]	see page **91**
Duty cycle [%]	see page **91**
Pulse waveform [rectangle/triangle/sine]	see page **91**
Base current waveform [rectangle/triangle/sine]	see page **91**

TIG AC Settings
(iWave AC/DC power sources only)

AC frequency [Hz]	see page **93**
AC current offset [%]	see page **93**
Positive half-wave waveform [rectangle/triangle/sine]	see page **93**
Negative half-wave waveform [rectangle/triangle/sine]	see page **93**

Wire speed settings

TIG wire correction	-10 - 10 Factory setting: 0
Wire speed 1 [m/min]	see page **100**
Wire speed 2 [%]	see page **100**
Start-up delay wire [s]	see page **100**
End delay wire [s]	see page **100**
Wire retraction end [mm]	see page **100**
Wire position Start [mm]	see page **100**

Feeder inching speed [m/min]	see page **100**

Ignition & operating mode settings

HF ignition [on/off/Touch-HF/external]	see page **96**
HF ignition delay [s]	see page **96**
Reversed polarity ignition [off/on]	see page **78**

Arc monitoring

Ignition timeout [s]	see page **96**
Arc break filter time [s]	see page **96**
Arc break watchdog [ignore/error]	see page **96**
Lowering current for 4-step mode [% of main current]	see page **78**
DownSlope [s]	see page **78**
Final current [% of main current]	see page **78**
AC Balance iWave AC/DC power sources only [%]	see page **81**
Electrode diameter [mm]	see page **78**

Operating mode defaults

Arc break voltage [V]	see page **96**
Comfort stop sensitivity [V]	see page **96**

TIG - General settings

Starting current time [s]	see page **94**
Final current time [s]	see page **94**
Lowering current Slope 1 [s]	see page **94**
Lowering current Slope 2 [s]	see page **94**
Spot welding time [s]	see page **94**

Gas pre-flow [s]	see page **101**
Gas post-flow [s]	see page **101**

TIG job correction limits

Upper main current limit [%]	0 - 50% Factory setting: 0%
Lower main current limit [%]	-50 - 0% Factory setting: 0%
Job slope Defines the time between the currently selected job and the next job [s]	0.0 - 10.0 s Factory setting: 0 s

CycleTIG

CycleTIG activated	see page **99**
Interval time [s]	see page **99**
Interval pause time [s]	see page **99**
Interval cycles	see page **99**
Base current [A]	see page **99**

Limit Monitoring

Voltage setpoint [V]	0.0 - 100.0 V Factory setting: 100.0 V
Lower voltage limit [V]	-10.0 - 0.0 V Factory setting: -1.0 V
Upper voltage limit [V]	0.0 - 10.0 V Factory setting: 1.0 V
Maximum time of voltage deviation [s]	off / 0.1 - 10.0 s Factory setting: off
Current setpoint [A]	0.0 - 1000.0 A Factory setting: -
Lower current limit [A]	-100 - 0 A Factory setting: - 10 A
Upper current limit [A]	0 - 100 A Factory setting: 10 A
Maximum time for current deviation [s]	off / 0.1 - 10.0 s Factory setting: off
Wire speed setpoint [m/min]	see page **100**
Lower wire speed limit [m/min]	-10.0 - 0.0 m/min Factory setting: -1.0 m/min

Upper wire speed limit [m/min]	0.0 - 10.0 m/min Factory setting: 1.0 m/min
Maximum time of wire feed deviation [s]	off / 0.1 - 10.0 s Factory setting: off
Welding time setpoint [s]	0.0 - 999.9 s Factory setting: 5.0 s
Lower welding time limit [s]	-50.0 - 0.0 s Factory setting: -1.0 s
Upper welding time limit [A]	0.0 - 50.0 s Factory setting: 1.0 s
Monitor welding time	off/on Factory setting: off
Energy setpoint [kJ]	0.0 - max. kJ Factory setting: 1.0 kJ
Lower energy limit [kJ]	-100.0 - 0.0 kJ Factory setting: 0.0 kJ
Upper energy limit [kJ]	0.0 - 100.0 kJ Factory setting: 1.0 kJ
Monitor energy	off/on Factory setting: off
Reaction if exceeded	ignore/warning/error Factory setting: ignore

Setting correction limits for a job

For each job, individual correction limits can be set for welding power and arc length. If correction limits are set for a job, the welding power and arc length of the job can be corrected within the specified limits.
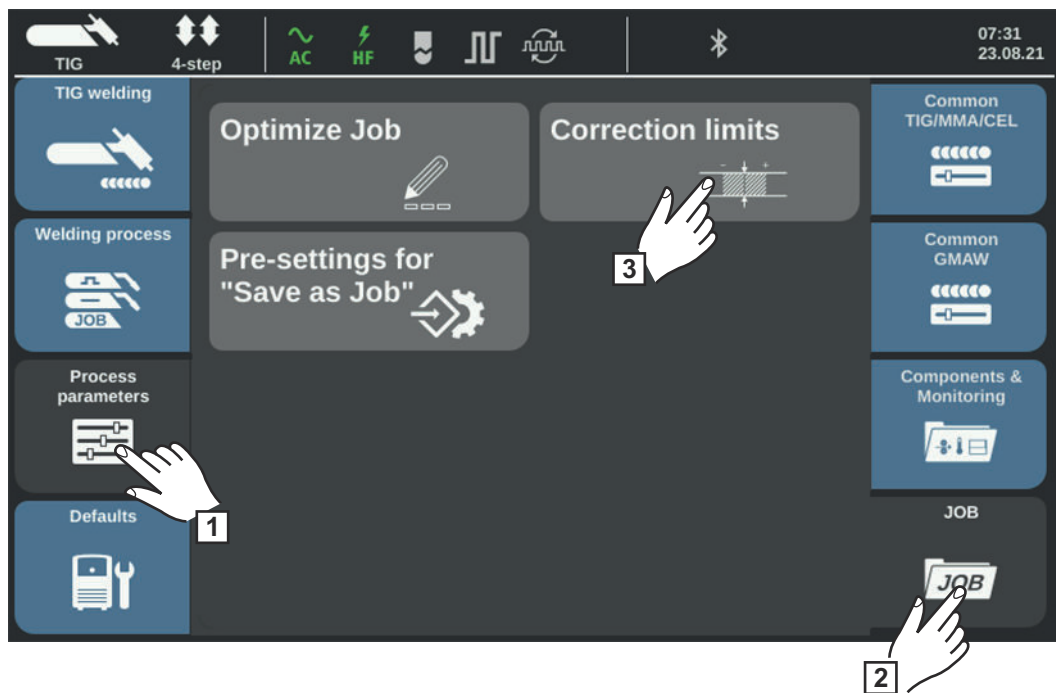
1 Select "Process parameters"

2 Select "JOB"

3 Select "Correction limits"

An overview of job correction limits for the most recently accessed job is displayed.

4 Turn the selection dial and select either the job or the limits of the job to be modified

You can also select between job and job limits by touching the "Job number/Job parameter" button.
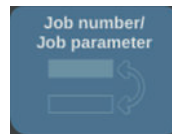
Select a job:
- Press the selection dial

    The job number is highlighted in blue and can now be changed.

- Turn the selection dial to select the job to be changed
- Press the selection dial to change the job

Select job limits:
- Turn the selection dial and select the desired limit group
- Press the selection dial

    The selected limit group is opened.

- Turn the selection dial and select the upper or lower limit
- Press the selection dial

    The value of the limit parameter is highlighted in blue and can now be changed.

- Turn the selection dial; the change of value is applied immediately
- Press the selection dial to select other limit parameters

5 Select "Exit"

Pre-settings for "Save as Job"

Under "Pre-settings for "Save as Job", you can set default values that are applied to each new job you create.
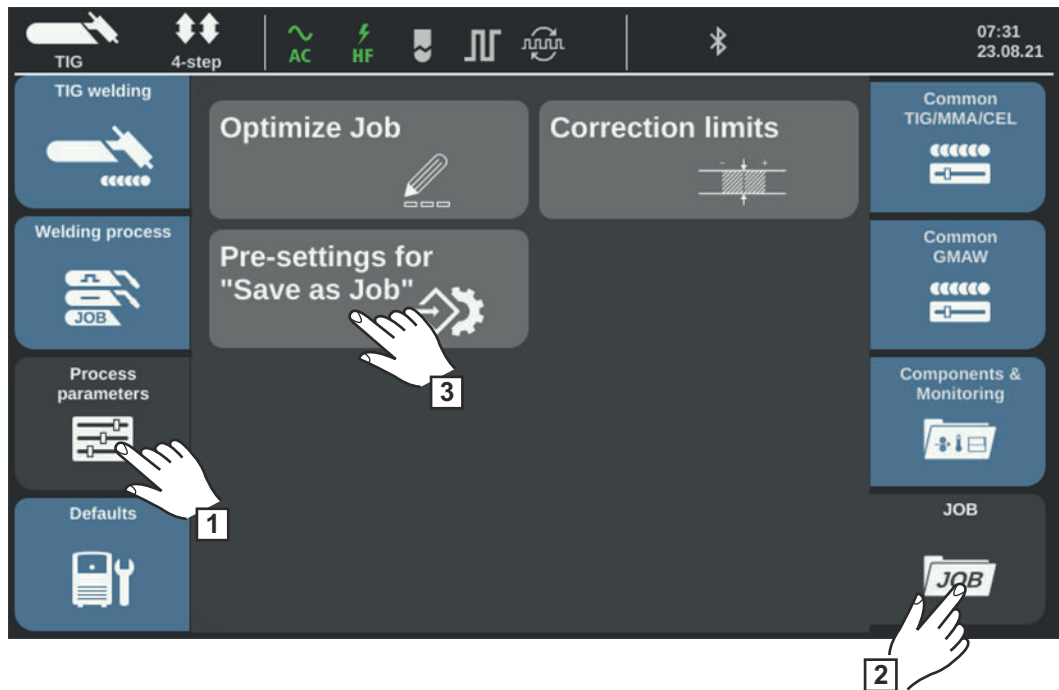
1	Select "Process parameters"
2	Select "JOB"
3	Select "Pre-settings for "Save as Job"
4	Confirm the displayed information

The pre-settings for saving new jobs are displayed.

5	Turn the selection dial and select the desired parameter
6	Press the selection dial
7	Turn the selection dial and adjust the value
8	Press the selection dial
9	Select "Exit"

Process parameters

Overview

Overview

Process parameters / Common TIG/MMA/CEL ... see page **91**

Process parameters / Common MIG/MAG ... see page **131**

Process parameters / Components & Monitoring ... see page **186**

Process parameters / JOB ... see page **175**

Process parameters - Components & monitoring

Process parameters - Components & Monitoring
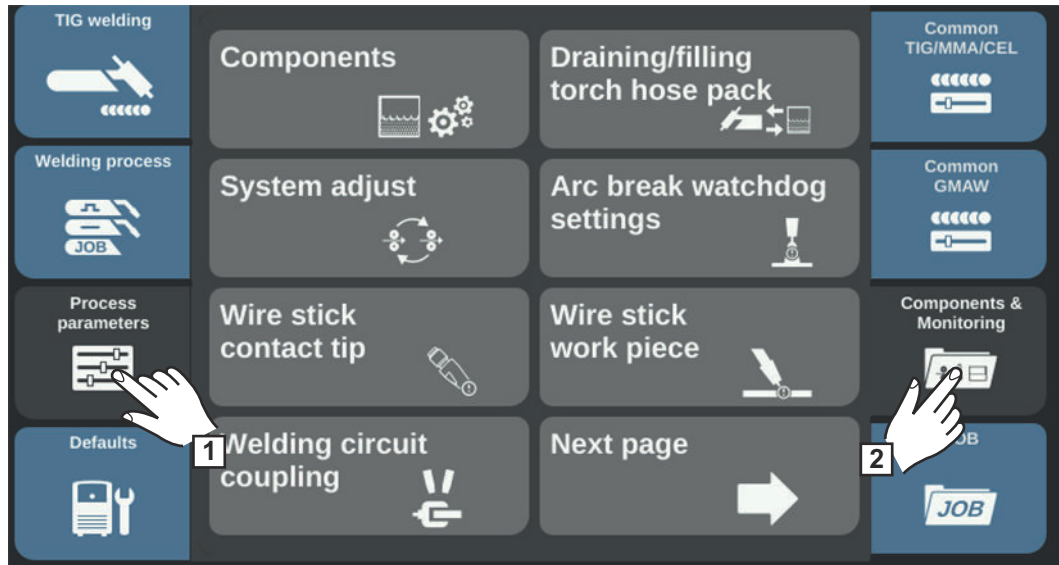
Process parameters - Components & Monitoring: Components, Empty / Fill torch hosepack, System adjustment, Arc break watchdog, Wire stick contact tip, Wire stick workpiece, Welding circuit coupling, Wire end monitoring, Gas monitoring, Motor force monitoring

Process parameters for components

Cooling unit

Cooling unit operating mode
For controlling a cooling unit

eco / auto / on / off
Factory setting: auto

auto
When welding starts, the cooling unit starts to operate (fan and coolant pump running). After the end of welding, the cooling unit continues to operate for 2 minutes. When the 2 minutes have elapsed, the cooling unit also switches off.

on
Continuous operation
As soon as the power source is switched on, the cooling unit starts to operate (fan and coolant pump running continuously)

off
No operation, even when welding starts

eco
The coolant pump starts to operate when welding starts.
The fan starts to operate from a coolant return temperature of 40 °C (104 °F) (only in conjunction with the flow temperature sensor option).

When filling the torch hosepack, the coolant pump will run for 10 seconds as soon as the flow reaches > 0.7 l/min.

After the end of welding, the cooling unit continues to operate for at least 15 seconds. As soon as the coolant return temperature reaches < 40 °C, the cooling unit shuts down. The maximum after-run time is 2 minutes.

Flow sensor filter time
(only if the flow temperature sensor option is available on the cooling unit)
To set the time from when the flow sensor is triggered until a warning message is output

5 - 25 s
Factory setting: 10 s

Cooler flow warning limit
(only if the flow temperature sensor option is available on the cooling unit)
If the parameter is activated, a warning is generated when the value entered is undershot.

off / 0.75 / 0.8 / 0.85 / 0.9 / 0.95
Factory setting: off

Wirefeeder

Feeder inching speed
To set the wire speed at which the wire electrode or welding wire is fed into the torch hosepack

For example: 2 - 25 m/min / 20 - 3935 ipm
(depending on wire speed)
Factory setting: 10 m/min

Power source

Ignition timeout
Length of wire that is fed before the safety cut-out trips

off / 5 - 100 mm (0.2 - 3.94 in.)
factory setting: off

NOTE!

The Ignition timeout process parameter is a safety function.
At high wire speeds in particular, the length of wire fed until the safety cut-out trips can deviate from the set wire length.

How it works:
If the torch trigger is pressed, the gas pre-flow begins immediately. Wire feeding and the ignition process then begin. If there is no current flow within the specified fed wire length, the system switches off automatically.
Press the torch trigger again for a further attempt.

Sense line

off/on
Factory setting: off

Robot settings

TouchSensing sensitivity
To set the sensitivity of TouchSensing for the surfaces of different parts and to cater for external factors

(TouchSensing = finding the seam position by means of an applied sensor voltage during automated welding)

TouchSensing takes place via the gas nozzle or the wire electrode.

TouchSensing using the gas nozzle only works if the OPT/i WF gas nozzle position search option is installed in the robot wirefeeder and if the robot interface is present.

0 - 10
Factory setting: 1

0
for bare surfaces, long and dead short circuit, robust and immune to interference

10
for scaly surfaces, high measurement-related sensitivity to interference

Not suitable for welding with multiple power sources on one part!

Insulated surfaces cannot be detected.

Procedure for determining TouchSensing sensitivity:
- Start with the factory-set value 1
- If no trigger signal is generated, increase TouchSensing sensitivity

Edge detection "WireSense"
to activate / set an edge detection using WireSense (option)

off / 0.5 - 20.0 mm
Factory setting: off

"WireSense" edge detection only works
- On automated applications
- If the OPT/i WireSense is present on the power source (software enable)
- In combination with the CMT system components WF 60i Robacta Drive CMT, SB 500i R with wire buffer or SB 60i R and WFi Reel.

WireSense is usually activated via a robot controller. As soon as a value > 0.5 mm is specified by the robot controller, the value set manually on the power source is overwritten.

If the Ignition timeout parameter is activated, this also applies to WireSense.

For higher-level robot controllers with a small signal range (e.g., linear trolleys), Wire-Sense can be set manually on the power source.

Example Economy-Image:
- Start / Stop comes from the controller.
- The edge height is specified on the power source.

Draining/filling the torch hosepack

Requirements for draining/filling the torch hosepack:
- The OPT/i Torch Deflate option must be available on the cooling unit
- Cooling unit operating mode = eco or auto
- Power source must not be in welding mode
- The torch hosepack must not be filled at this time
- The torch body must be assembled
- The torch hosepack must be correctly connected

> **NOTE!**
>
> **When draining long hosepacks > 4 m, a fully filled coolant tank can overflow - risk of slipping!**
> ▶ Observe the Operating Instructions and safety instructions for the cooling unit!

Draining the torch hosepack

1. Select Process parameters / Components / Drain/fill torch hosepack

2. Follow the on-screen instructions

3. Select "Start" and follow the on-screen instructions

or
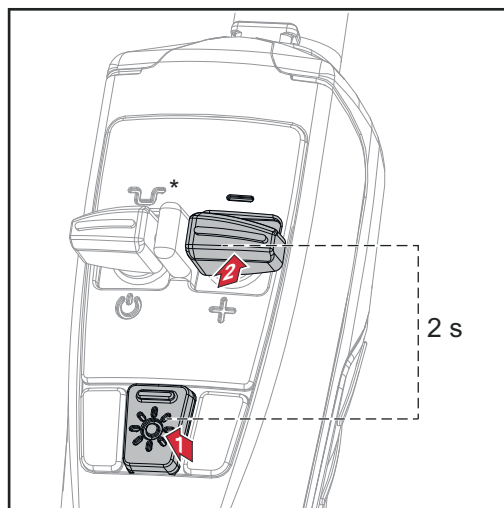
3. Press and hold the LED button on the welding torch

4. Press the Down (-) button and hold for 2 seconds

5. Follow the on-screen instructions

* Press the intermediate lowering button to stop the process

If the coolant temperature is too high, a cooling phase is executed. During the cooling phase, the LED on the welding torch flashes approx. 2 x per second.

The draining process is then started. The draining process takes approx. 30 seconds. During the draining process, the LED on the welding torch flashes approx. 1 x per second

A confirmation is displayed after the draining process has been completed.
The torch body can now be changed.
If the torch hosepack is to be changed, the power source must be switched off first.

IMPORTANT! Welding is not possible if the torch hosepack has been drained.

Filling the torch hosepack

| 1 | Press the gas-test button and follow the on-screen instructions |

or
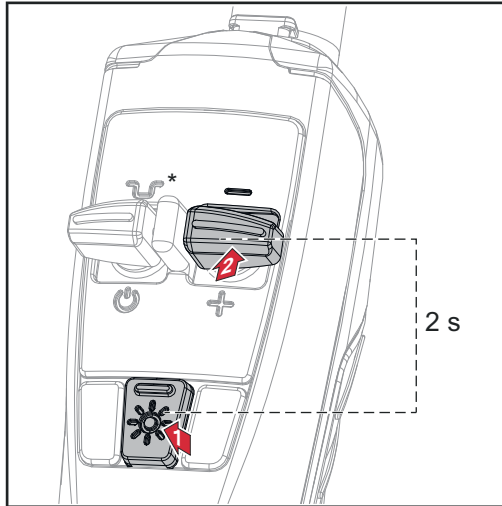
1	Press and hold the LED button on the welding torch
2	Press the Down (-) button and hold for 2 seconds
3	Follow the on-screen instructions

A confirmation is displayed after the filling process has been successfully completed.

| 4 | Complete filling process by pressing OK |

System adjustment

If two motors are used in a welding system, they must be calibrated to maintain process stability.

For welding systems with PushPull units or unreeling wirefeeders, a system adjustment must be carried out whenever the wirefeeders are installed or replaced.

A corresponding message is displayed.

| 1 | Select "OK" and start the system adjustment |

The System adjustment wizard is started.

| 2 | Follow the on-screen instructions |

The system adjustment can also be started manually.

Perform system adjustment:

| 1 | Select Process parameters / Components & Monitoring / System adjust |

If a system adjustment is required, the System adjustment wizard is started. The first step of the System adjustment wizard is displayed:

| 2 | Follow the on-screen instructions |
| 3 | To call up each step of the System adjustment wizard in sequence, select "Next page" / press the selection dial |

A confirmation message is displayed once the system adjustment has finished.

4 To exit the System adjustment wizard, select "Exit" / press the selection dial

---

Arc break watch-dog

1 Select Process parameters / Components & Monitoring / Arc break watchdog settings

The "Arc break watchdog" overview is displayed.

2 Turn the selection dial and select the desired parameter

3 Press the selection dial (blue background)

4 Turn the dial and change the value of the parameter (blue background)

Arc break reaction = ignorieren (deactivated):
The power source remains in operation and no error message is displayed.

Arc break reaction = Fehler (activated):
If the arc breaks and there is no current flow within a set arc break time period, the system switches off automatically and an error message is displayed.

Factory setting = ignorieren

Arc break time = 0 - 2.00 s
If the set time period is exceeded, an error is displayed.

Factory setting = 0.2 s

5 Select "OK" to activate the arc break watchdog

Wire stick contact tip

1 Select Process parameters / Components & Monitoring / Wire stick contact tip

The "Wire stick contact tip - Setup menu" is displayed.

2 Turn the selection dial and select the desired parameter

3 Press the selection dial (blue background)

4 Turn the selection dial and change the value of the parameter (blue background)

Wire stick on contact tip = ignore:
Monitoring of a wire stick on the contact tip is deactivated.

Wire stick on contact tip = Fehler (activated):
If the wire is sticking to the contact tip, the welding process is interrupted.

IMPORTANT! Monitoring is only possible with dip transfer arc processes.

Factory setting = ignorieren

Filter time = 0.5 - 5.0 s
Maximum period without arc short circuit until the welding process is interrupted.

Factory setting = 0.5 s

5 Select "OK" to confirm the settings

Wire stick work-piece

1 Select Process parameters / Components & Monitoring / Wire stick work piece

The "Wire stick workpiece - Setup menu" is displayed.

2 Turn the selection dial and select the desired parameter

3 Press the selection dial (blue background)

4 Turn the selection dial and change the value of the parameter (blue background)

Wire stick on workpiece = ignorieren:
Monitoring of a wire stick on the workpiece is deactivated.

Wire stick on workpiece = Fehler (activated):
If the wire is sticking to the workpiece, the welding process is interrupted.

Factory setting = ignorieren

5 Select "OK" to confirm the settings

Welding circuit coupling

1 Select Process parameters / Components & Monitoring / Welding circuit coupling

2 Follow the on-screen instructions

A confirmation message is displayed once the welding circuit is coupled.

Wire end monitoring

1 Select Process parameters / Components & Monitoring / Next page / Wire end monitoring

2 "Components & Monitoring"

The "Wire end monitoring setup menu" overview is displayed.

4 Turn the selection dial and select the desired parameter depending on the existing wire end monitoring:

Wire end ring sensor	(1) **error**
Wire end drum sensor	(2) **error**
Wire end wire spool	(3) **error**
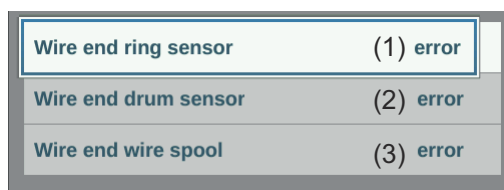
(1)   Wire end reaction for OPT/i WF R WE ring sensor 4,100,878,CK

(2)   Wire end reaction for OPT/i WF R WE drum 4,100,879,CK

(3)   Wire end reaction for OPT/i WF R wire end 4,100,869,CK

5 Press the selection dial (blue background)

6   Turn the selection dial and change the value of the parameter (blue background)

Reaction = Error:
Wire end error, the welding process is interrupted immediately. The error is shown on the display.

Reaction = After seam end:
The wire end error is shown on the display once the current welding process is complete.

Reaction = Ignore (deactivated):
No reaction on wire end detection

Factory setting = Error

7   Select "OK" to confirm the settings

Gas monitoring

The gas monitoring parameters are only available if the OPT/i gas flow sensor option is present on the wirefeeder or SplitBox.

A lower gas flow limit can be defined for gas monitoring. If the gas flow drops below a specified level for a defined time, an error message is immediately displayed and the welding process stops.

1   Select Process parameters / Components & Monitoring / Next page / Gas monitoring

The "Gas monitoring" overview is displayed.

2   Turn the selection dial and select the desired parameter:

Lower gas flow limit
Setting range: 0.5 - 30.0 l/min
Factory setting: 7.0 l/min

Maximum time of gas deviation
Setting range: off / 0.1 - 10.0 s
Factory setting: 2.0 s

Sensor gas factor
Setting range: auto / 0.90 - 20.00

Overview of important gas factors:
1.00 - C1 (CO_2)
1.52 - M21 ArC-18
1.69 - M12 ArC-2.5
1.72 - I1 (Argon)
11.8 - I2 (Helium)

Factory setting: auto

NOTE!

An incorrectly set gas factor can have a massive influence on the shielding gas quantity and thus on the welding result.
Under the "auto" setting, all standard gases from the Fronius welding database are taken into account.
▶   Manual adjustment of the gas factor is only recommended for special gases and only after a discussion with Fronius.

<p>3 Press the selection dial (blue background)</p>

<p>4 Turn the dial and change the value of the parameter (blue background)</p>

<p>5 Select "OK" to confirm the settings</p>

Motor force monitoring

1 Select Process parameters / Components & Monitoring / next page / Motor force monitoring

The "Motor force monitoring" overview is displayed.

2 Turn the selection dial and select the desired parameter:

Wirefeed force monitoring

Setting range:
Ignore (no reaction)
Warning (a warning is displayed)
Error (welding process is interrupted, an error message is displayed)
Factory setting: Ignore

Maximum force
Adjustment range: 0 - 999 N
Factory setting: 0 N

Maximum time of force deviation
Setting range: 0.1 - 10.0 s
Factory setting: 3 s

3 Press the selection dial (blue background)

4 Turn the dial and change the value of the parameter (blue background)

5 Select "OK" to confirm the settings

Defaults

Defaults

General

> ### NOTE!
>
> **Because of firmware updates, certain functions may be available for your device but not described in these operating instructions or vice versa.**
> In addition, individual figures may also differ slightly from the operating elements of your device. However, the function of these operating elements is identical.

> ### ⚠ WARNING!
>
> **Operating the device 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 operating instructions for system components, especially the safety rules.

Overview

The "Defaults" contain the following options:
- Display
- System
- Documentation
- Management

Defaults - View

Defaults screen
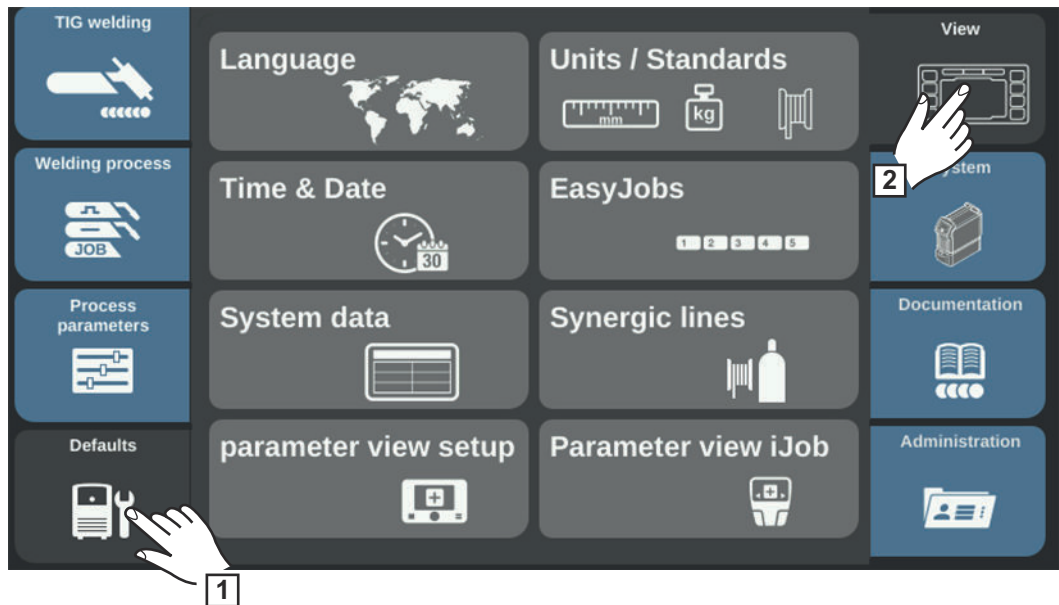
Selecting the language

1	Select Defaults / View / Language
2	Turn the selection dial and select the desired language
3	Select "OK"/press the selection dial

Selecting units/ standards

1	Select Defaults / View / Units/Standards
2	Select the desired unit
3	Select the desired standard:

EN
Designation of the filler metal according to European standards

AWS
Designation of the filler metal according to American Welding Standards

| 4 | Select OK |

The overview of units and standards is displayed.

Setting the date and time

The date and time can be assigned via NTP (Network Time Protocol) or set manually.

| 1 | Select Defaults / View / Time & Date |

Setting the date and time via NTP
A DNS server must be reachable or must be configured when manually setting the network parameters (see Setting network parameters manually, page **207**).

| 2 | Turn the selection dial and select "Time & Date Automatic" |

| 3 | Enter the address of the local time server
The address of the local time server can be obtained from your IT administrator or via the Internet (e.g., pool.ntb.org).

| 4 | Enter the time zone
The time zone must match the location of the power source.

| 5 | Select "Time Server Test" to start time synchronization

The time of the NTP server is synchronized with the power source. If NTP is set, the time is also synchronized after the power source is restarted, provided a connection to the time server can be established.

| 6 | Select "Transfer"

Setting the date and time manually
To set the date and time manually, "Time & Date Automatic" must not be selected.

| 2 | Turn the selection dial and select the desired parameter:
Year/Month/Day/Hour/Minute
(white background)

| 3 | Press the selection dial to change the parameter (blue background)

| 4 | Turn the selection dial and set the desired value (blue background)

| 5 | Press the selection dial and apply the set value (white background)

| 6 | Select "OK"/press the selection dial

The View defaults are displayed.

Retrieving system data

| 1 | Select Defaults / View / System data

The current system data is displayed.

Real-time arc power in kW

IP provides the correct average arc power as a result of the high measurement sampling rate for non-continuous welding processes.

If the welding speed is known, the electrical energy input can be calculated:

$$E = IP / vs$$

E	Electrical energy input in kJ/cm
IP	Arc power in kW
vs	Welding speed in cm/s

Arc energy in kJ

IE provides the correct total arc energy as a result of the high measurement sampling rate for non-continuous welding processes.
Arc energy is the accumulated arc power over the entire welding time.
If the weld length is known, the electrical energy per unit length can be calculated:
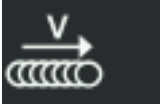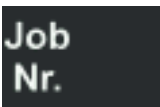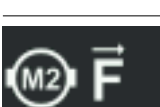
$$E = IE / L$$
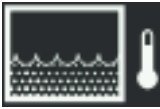
E	Electrical energy input in kJ/cm
IE	Arc energy in kJ
L	Length of weld in cm

Arc energy is generally used in manual welding to calculate the energy input.

Symbol	Description
V →	Current welding speed in cm/min
Job Nr.	Currently set job
Nr.	Current weld
(clock)	Duration of weld in s
M1	Present motor current in A, wirefeeder 1 (wirefeeder closest to the arc)
M2	Present motor current in A, wirefeeder 2 (e.g., the rear wirefeeder in a push/pull system)
M3	Present motor current in A, wirefeeder 3 (e.g., an unreeling wirefeeder in a push/pull system with an unreeling wirefeeder)
M1 $\vec{F}$	Present motor force in N, wirefeeder motor 1
M2 $\vec{F}$	Present motor force in N, wirefeeder motor 2
M3 $\vec{F}$	Present motor force in N, wirefeeder motor 3
→	Present flow rate in l/min at the cooling unit (if OPT/i CU flow temperature sensor option is installed)\n\nError output if the flow rate is < 0.7 l/min
→	Present shielding gas flow (if OPT/i gas regulator option is available)

	Total shielding gas consumption (if OPT/i gas regulator option is available)
	Present coolant temperature in °C at the cooling unit (if OPT/i CU flow temperature sensor option is installed) Error output if the coolant temperature is > 70 °C (measured at coolant return)
	Arc time in h
	Total operating hours of the power source in h

2 Select "OK" to exit the system data

The View defaults are displayed.

Displaying characteristics

1 Select Defaults / View / Characteristic

The options for displaying the characteristics are displayed.

2 Select the desired display option

Show current characteristics:
Only the current characteristics are displayed in the material settings.

Show replaced characteristics:
In addition to the current characteristics, replaced, older characteristics are also displayed in the material settings. These can also be selected while completing the material settings.

3 Select OK

The View defaults are displayed.

Parameter view setup

This function enables additional parameters or settings for the TIG welding parameters to be displayed.

- Working parameters:
  AC Balance, electrode diameter

- Welding process parameters:
  cap mode, polarity, TIG torch operating mode

- TIG pulse settings:
  tacking, pulse frequency, base current, duty cycle, waveform pulse, waveform base current

- AC settings:
  AC frequency, AC current offset, waveform positive half-wave, waveform negative half-wave

- Ignition parameters:
  HF ignition, HF ignition delay, reversed polarity ignition

- Operating mode - default settings:
  torch trigger, arc break voltage, comfort stop sensitivity

- Start/end settings:
  starting current time, final current time

- 4-step settings:
  lowering current slope 1, lowering current slope 2

- Spot welding settings:
  spot welding time

- Gas defaults:
  gas pre-flow, gas post-flow

- Cycle TIG:
  CycleTIG activated, interval time, interval pause time, interval cycles, base current

- Wirefeeder settings:
  wire speed 1/2, wire start-up delay, wire end delay, wire retract end, wire position start

- Dynamic Wire:
  TIG wire correction

Expand parameter view:

1 Select Defaults / View / Parameter view setup

2 Turn the selection dial and select the desired parameter

3 Press the selection dial

4 Select "OK" to exit Parameter view setup

The parameter is displayed in the welding parameters, from where it can also be changed.

Parameter view iJob

This function can be used to save additional parameters or settings for jobs.

- Working parameters:
  starting current, UpSlope, lowering current, DownSlope, final current, AC balance, electrode diameter

- Welding process parameters:
  cap mode, polarity

- TIG pulse settings:
  tacking, pulse frequency, base current, duty cycle, waveform pulse, waveform base current

- AC settings:
  AC frequency, AC current offset, waveform positive half-wave, waveform negative half-wave

- Ignition parameters:
  reversed polarity ignition

- Operating mode - default settings:
  torch trigger, arc break voltage, comfort stop sensitivity

- Start/end settings:
  starting current time, final current time

- 4-step settings:
  lowering current slope 1, lowering current slope 2

- Spot welding settings:
  spot welding time

- Cycle TIG:
  CycleTIG activated, interval time, interval pause time, interval cycles, base current

- Wire speed settings:
  Wire speed 1

- Dynamic Wire:
  TIG wire correction

Expand parameter view iJob:

1 Select Defaults / View / Parameter view iJob
2 Turn the selection dial and select the desired parameter
3 Press the selection dial
4 Select "OK" to quit the parameter view iJob setup

The parameter is displayed with the jobs, from where it can also be changed.

Defaults - System

Defaults - System
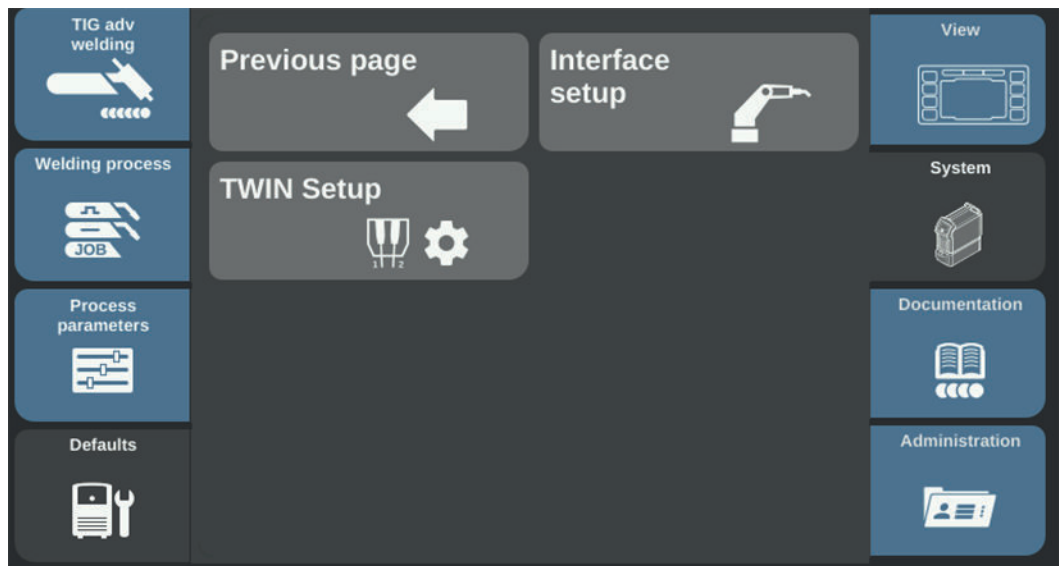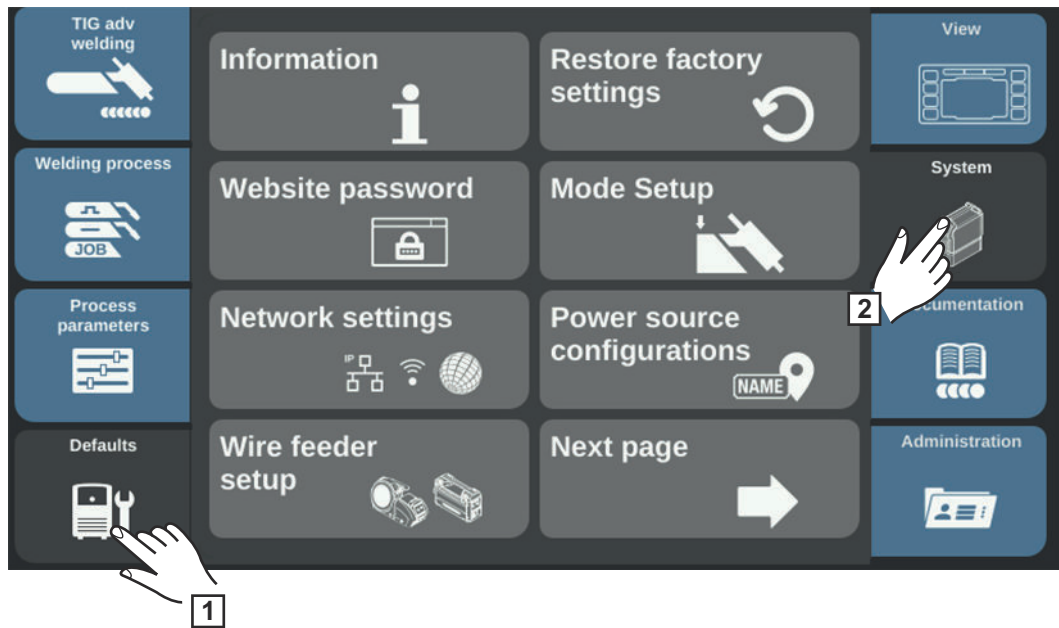
Retrieving device information

[1] Select Defaults / System / Information

The device information is displayed:
serial number, image version, software version, IP address

[2] Select "OK" to quit the device information

Restoring factory settings

[1] Select Defaults / System / Restore factory settings

The confirmation prompt for the factory settings appears.

[2] Select "Yes" to reset the values to their factory settings

The process parameter and machine default values are reset to their factory settings and the overview of system defaults is displayed.

Restoring the website password

[1] Select Defaults / System / Website password

The confirmation prompt for resetting the website password appears.

[2] Select "Yes" to reset the website password

The website password is reset to its factory setting:
User name = admin
Password = admin

The overview of system defaults is displayed.

Setup mode

[1] Select Defaults / System / Setup mode
[2] Turn dial and select
MIG/MAG welding torch setup
or
TIG welding torch setup

[3] Press the selection dial
[4] Turn the selection dial and select the desired parameter
[5] Press the selection dial to change the parameter
[6] Press the selection dial to adjust the value of the parameter
[7] Press the selection dial to apply the value
[8] Select OK to accept the setting and to exit Setup mode

MIG/MAG welding torch setup

Special 4-step = Guntrigger

In conjunction with a JobMaster welding torch and with the special 4-step mode selected, this function enables the torch trigger to be used to switch between jobs during welding. Job switching takes place within defined job groups.
A job group is defined by the next non-programmed job.

Example:
Job group 1: Job no. 3 / 4 / 5
Job no. 6 is not occupied ==> End of job group1
Job group 2: Job no. 7 / 8 / 9

- When welding is started, the job with the lowest number within the job group is automatically selected.
- Switching within a job group to the job with the next higher number is done by briefly pressing the torch trigger (< 0.5 seconds).
- To end the welding process, press the torch trigger for more than 0.5 seconds.
- To change to the next job group, press the parameter setting button on the Jobmaster welding torch for more than 5 seconds.
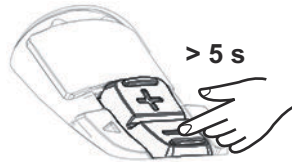
Spot welding

2-step = Spot welding in 2-step mode:
The spot welding process runs while the torch trigger remains pressed and ends at the latest after the spot welding time has elapsed.
Releasing the torch trigger stops the spot welding process before the spot welding time has elapsed.

4-step = Spot welding in 4-step mode:
The spot welding process starts when the torch trigger is pressed and ends at the latest when the spot welding time has elapsed.
Pressing the torch trigger again stops the spot welding process before the spot welding time has elapsed.

For more information about spot welding:
- Page **144** (spot welding in general)
- Page **144** (spot welding time)

Special JobMaster display = on

The following items can now be set and implemented on the Jobmaster welding torch:
- Operating mode
- SynchroPulse
- Gas test

Torch trigger job selection = on

The function enables the torch trigger to be used to switch to the next job. Switching takes place within defined job groups.
A job group is defined by the next non-programmed job.

Example:
Job group 1: Job no. 3 / 4 / 5
Job no. 6 is not occupied ==> End of job group1
Job group 2: Job no. 7 / 8 / 9

- When welding is started, the job with the lowest number within the job group is automatically selected.
- Switching within a job group to the job with the next higher number is done by briefly pressing the torch trigger (< 0.5 seconds).
- To end the welding process, press the torch trigger for more than 0.5 seconds.
- To switch to the next job group, briefly double-press the torch trigger
  (< 0.3 s, 2 x).

Switching can take place when idle or during welding.

TIG welding torch setup
Activate / deactivate cap mode via torch trigger

Torch trigger I2 - cap mode = on:
Cap mode can be activated by a long press of the torch trigger

Torch trigger I2 - cap mode = off:
Cap mode cannot be activated by a long press of the torch trigger.

Setting network parameters manually

1. Select Defaults / System / Network Settings

2. Select "Network"

The overview of network settings is displayed.
If DHCP is activated, the IP Address, Network Mask and Default Gateway network parameters are grayed out and cannot be set.

3. Turn the selection dial and select DHCP

4. Press the selection dial

DHCP is deactivated and the network parameters can now be set.

5. Turn the selection dial and select the desired network parameter

6. Press the selection dial

The numeric keypad for the selected network parameter is displayed.

7. Enter a value for the network parameter

8. Select "OK" and confirm the value for the network parameter/press the selection dial

The value for the network parameter is applied and the overview of network settings is displayed.

9. Select "Save" to apply the changes to the network settings

---

Setting up WLAN

1. Select Defaults / System / Network settings

2. Select WLAN

The overview of WLAN settings is displayed.

Setting the country code

1. Select "Set Country Code"

2. Press the selection dial

3. Turn the selection dial and select the appropriate country

4. Select OK

Activating WLAN

1. Select "Activate WLAN"

When WLAN is activated, a check mark appears in the button, and the "Add Network" and "Delete Network" buttons are active.

Adding a network

|1| Select "Add Network"

The available WLAN networks are displayed.

|2| Turn the selection dial and select the desired WLAN network

|3| Press the selection dial or select "Insert"

|4| Enter data:
- Activate DHCP
  or
- Manual entry of IP address, network mask, default gateway, DNS server 1 and DNS server 2:
  Turn the selection dial and select the desired element,
  press the selection dial,
  enter the data using the numeric keypad,
  confirm by pressing "OK"

|5| Select "OK" and add the WLAN network

Deleting a network

|1| Turn the selection dial and select the WLAN network you want to delete

|2| Select "Delete Network"

|3| Confirm the prompt

The WLAN network is deleted.

Bluetooth setup

General

Each Bluetooth device has its own MAC address. The MAC address allows the device to be assigned to a specific power source, thus preventing any mix-ups.

The power source can communicate with the following Bluetooth devices:
- RC Panel Basic /BT remote control
- RC Pedal TIG /BT foot-operated remote control
- Vizor Connect /BT welding helmet

An active Bluetooth connection is indicated in the status bar of the display by a blue Bluetooth symbol.

In the case of Bluetooth devices of the same type, only one device can be actively connected to the power source for safety reasons.
Active Bluetooth connections to several Bluetooth devices of different types are possible.

An existing, active Bluetooth connection cannot be interrupted or influenced by another Bluetooth device.

Bluetooth remote controls have priority over wired remote controls or manual welding torches.

If the connection between wired or Bluetooth remote controls and the power source is interrupted during the welding process, the welding process is terminated.

Configuring the Bluetooth setup

|1| Select Defaults / System / Network Settings

|2| Select "Bluetooth setting"

The Bluetooth setup screen appears.

Activating or deactivating the Bluetooth function on the power source
- Select the "Activate Bluetooth" button

Adding a Bluetooth device
- Turn on the Bluetooth device
- Select the "Add Device" button

    A list of all detected Bluetooth devices is displayed with their names, MAC addresses, and other info.

- Use the selection dial to select the desired Bluetooth device
- Compare the displayed MAC address with the MAC address on the device
    Select the "Add" button to establish an active connection to the selected device
- Select the "Save" button

    The active connection is displayed under Info.

Symbols displayed under Info:

Active Bluetooth connection
An active change can be made to the power source via the Bluetooth device.
Depending on the availability of the data, additional information such as battery status, signal strength, etc. of the Bluetooth device is displayed.
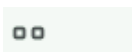
Paired
A Bluetooth device has already been actively connected to a power source and appears in the list of Bluetooth devices.

Inactive
A new Bluetooth device was found or the Bluetooth device was removed by the user.

Deleting a Bluetooth device
- Use the selection dial to select the Bluetooth device to be deleted
- Select the "Delete Device" button
- Confirm the prompt to delete the device by pressing "OK"

3 Select "OK" to exit the Bluetooth setup

Power source configuration

|1| Select Defaults / System / Power source configuration

The power source configuration is displayed.

|2| Turn the selection dial and select a configuration point
|3| Press the selection dial

The keyboard is displayed.

|4| Enter the desired text using the keyboard (max. 20 characters)
|5| Select "OK" to apply the text/press the selection dial

The text is applied and the power source configuration is displayed.

|6| Select "Save" to apply the changes

Wirefeeder setup

In the wirefeeder setup, potentiometers present on a wire feeder can be activated or de-activated.

|1| Select Defaults / System / Wire feeder setup
|2| Press the selection dial
|3| Turn dial and activate or deactivate potentiometer
|4| Select OK

Interface setup

The interface setup allows you to define whether the welding parameters are specified externally by the robot controller or internally by the power source.

|1| Select Defaults / System / Next page
|2| Select Interface setup
|3| Set the "Welding parameters" parameter to "External" or "Internal"

External:
All parameter settings are made via the robot controller (including the welding parameters).

Internal:
The welding parameter settings are made via the power source, the control signals run via the robot controller.

Factory setting:
External

|4| Select OK

TWIN Setup

In TWIN Setup, welding lines 1 and 2 are assigned to the power sources.

|1| Switch on power source 2, leave power source 1 switched off
|2| Place sticker 2 in a clearly visible location on power source 2
|3| For power source 2, select Defaults / System / Next page

4. Select TWIN Setup

5. Change the parameter to 2, select Next

6. Switch on power source 1

7. Place sticker 1 in a clearly visible location on power source 1

8. For power source 1, select Defaults / System / Next page

9. Select TWIN Setup

10. Check that the parameter is set to 1

Defaults - Documentation

Defaults - Documentation
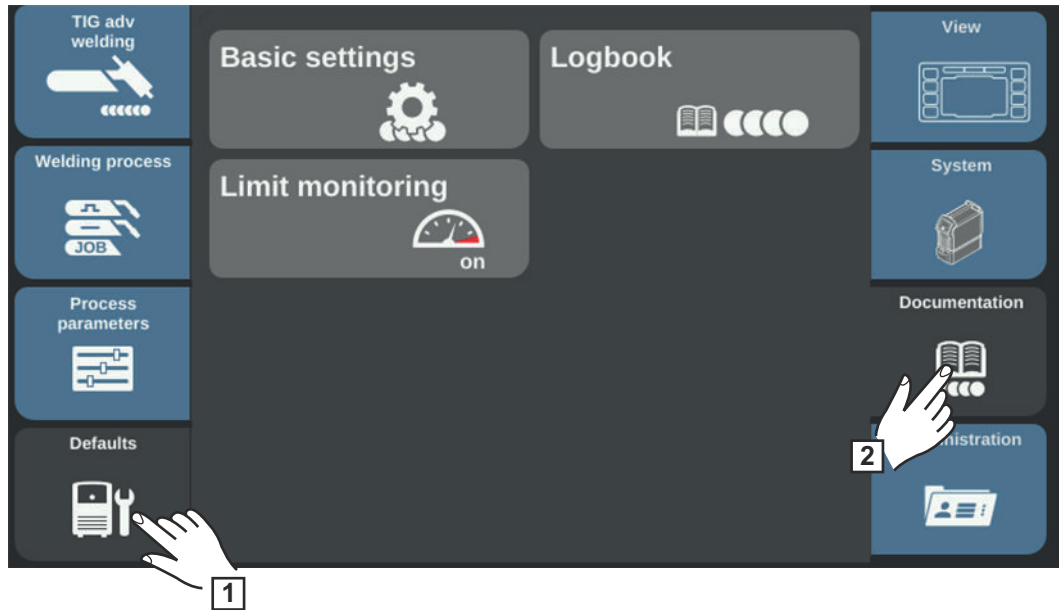
Setting the sample rate

[1] Select Defaults / Documentation / Basic settings

[2] Press the selection dial

[3] Turn the selection dial and change the sample rate value:

off
Sample rate is deactivated, only mean values are saved.

0.1 - 100.0 s
Documentation is saved at the set sample rate.

[4] Select "OK" to apply the sample rate

The documentation overview is displayed.

Viewing the logbook

[1] Select Defaults / Documentation / Logbook

The logbook is displayed.
The buttons can be used to display welds, events, errors, warnings or notifications.

The following data is logged:

No. (1)	ddmmyy (2)	hhmmss (3)	s (4)	A (5)	U V (6)	m/min (7)	kJ (8)	Job No. (9)

(1)   Number of the weld
(2)   Date (ddmmyy)
(3)   Time (hhmmss)

(4)   Duration of welding in s

(5)   Welding current in A (average)

(6)   Welding voltage in V (average)

(7)   Wire speed in m/min

(8)   Arc energy in kJ (for details see page **199**)

(9)   Job No.

Turn the selection dial to scroll through the list.

| 2 | Select "OK" to exit the logbook

Switching limit value monitoring on/off

Limit value monitoring is only available in conjunction with the OPT/i LimitMonitoring option.

| 1 | Select Defaults / Documentation / Limit monitoring

| 2 | Press the selection dial

| 3 | Turn the selection dial and change the value for Limit Monitoring:

off:
Limit value monitoring is deactivated.

on:
The limit values are monitored according to the settings

Factory setting:
off

| 4 | Select OK to apply the settings for limit value monitoring

The documentation overview is displayed.

Defaults Administration

Defaults Adminis-
tration

User management

General

User management is useful if multiple users are working with the same power source. User management is carried out using different roles and with the help of NFC keys.

Users are assigned different roles depending on their level of training or qualification.

Explanation of terms

Administrator

An administrator has full access to all power source functions. An administrator's tasks include:
- Creating roles
- Setting up and managing user data
- Assigning access rights
- Updating the firmware
- Backing up data, etc.

User management

User management includes all users registered on the power source. Users are assigned different roles depending on their level of training or qualification.

NFC card

An NFC card or and NFC key fob is assigned to a specific user who is registered on the power source.
NFC cards and NFC key fobs are commonly referred to as an NFC key in these Operating Instructions.

IMPORTANT! Each user should be assigned their own NFC key.

Role

Roles are used to manage registered users (= user management). The roles define access rights and the work activities that users can perform.

Predefined roles and users

Two roles are predefined in the factory under Defaults / Administration / User management:

administrator
with all rights and options

The "administrator" role cannot be deleted, renamed or edited.

The "administrator" role contains the predefined "admin" user, which cannot be deleted. The "admin" user can be assigned a name, language, unit, web password and NFC key. Once "admin" has been assigned an NFC key, user management is activated.

locked
preset in the factory with access rights to the welding processes, without process parameters and defaults

The "locked" role
- Cannot be deleted or renamed,
- Can be edited in order to activate various functions as required,

NFC keys cannot be assigned to the "locked" role.

If no NFC key is assigned to the predefined "Admin" user, each NFC key functions to lock and unlock the power source (no user management, see also section "Locking and unlocking the power source using an NFC key", page **54**).

User administration overview

User management contains the following sections:
- Creating administrator and roles
- Creating users
- Editing roles/users, deactivating user management

Create administrator and roles

Recommendation for creating roles and users

A systematic procedure is required when creating roles and NFC keys.

Fronius recommends that you create one or two administrator keys. In the worst case scenario, a power source can no longer be operated without administrator rights.

Procedure

NOTE!

The loss of an administrator NFC key may affect power source usability, depending on your settings. Store one of the two administrator NFC keys in a safe place.

1. In the "administrator" role, create two equivalent users

   This ensures that access to the administrator function is retained even if an administrator NFC key is lost.

2. Consider other roles:
   - How many roles are required?
   - Which rights are assigned to the respective roles?
   - How many users are there?

3. Create roles

4. Assign users to roles

5. Check whether the created users have access to the respective roles with their NFC keys.

Creating an administrator key

1 Select Defaults / Administration / User management

User management is displayed, "Administrator" is selected.

2 Press the selection dial
3 Turn the selection dial and select "Admin"
4 Press the selection dial
5 Turn the selection dial and select NFC card
6 Press the selection dial

The info for transferring the NFC card is displayed.

7 Follow the on-screen instructions
(hold the new NFC key on the reading zone for NFC keys and wait for confirmation that it has been recognized)
8 Select OK

The message confirming that user management is activated is displayed.

9 Select OK

The number of the assigned NFC key is displayed under Admin / NFC card.

To create a 2nd administrator key:
- Copy "Admin" (Create new from selection - see also page **220**)
- Enter a user name
- Assign a new NFC card

Creating roles

1 Select Defaults / Administration / User management

User management is displayed.

2 Select "Create role"

create
role
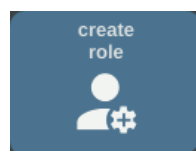
The keyboard is displayed.

3 Enter the desired role name using the keyboard (max. 20 characters)
4 Select "OK" to apply the role name/press the selection dial

The functions that can be executed within a role are displayed.

Symbols:

👁̸   ... hidden

👁   ... read only

✎   ... read and write

5 Specify functions that a user can execute with this role
- Select functions by turning the selection dial
- Press the selection dial
- Select settings from the list
- Press the selection dial

6 Select OK

Copying roles

1 Select Defaults / Administration / User management

User management is displayed.

2 Turn the selection dial and select the role to be copied

3 Select "new from"
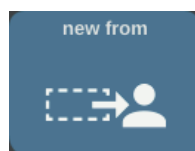
4 Enter the name of the new role using the keyboard

5 Select OK

6 Specify the functions that can be executed within the role
- Select the function by turning the selection dial
- Press the selection dial
- Select settings for the functions from the list

7 Select OK

Creating users

NOTE!

For data privacy reasons, only personal ID numbers and no full names should be entered when creating users.

1 Select Defaults / Administration / User management

User management is displayed.

2 Select "create user"
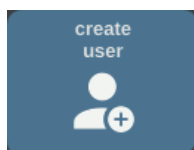
The keyboard is displayed.

3 Enter the desired user name using the keyboard (max. 20 characters)
4 Select "OK" to apply the user name/press the selection dial
5 Enter additional user data
  - Select the parameter by turning the selection dial
  - Press the selection dial
  - Select Role, Language, Unit, and Standard from the list
  - Enter first name, last name and web password using the keyboard
6 Turn the selection dial and select NFC card
7 Press the selection dial

The info for transferring the NFC card is displayed.

8 Follow the on-screen instructions
(hold the new NFC key on the reading zone for NFC keys and wait for confirmation that it has been recognized)

Copying users

NOTE!

For data privacy reasons, only personal ID numbers and no full names should be entered when creating users.

1 Select Defaults / Administration / User management

User management is displayed.

2 Turn the selection dial and select the role to which the user to be copied is assigned
3 Press the selection dial
4 Turn the selection dial and select the user to be copied

5 Select "new from"
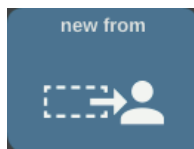
6 Enter the name of the new user using the keyboard

7 Select OK

8 Enter additional user data

9 Assign a new NFC key

10 Select OK

Editing roles/users, deactivating user management

Editing roles

☐1 Select Defaults / Administration / User management

User management is displayed.

☐2 Turn the selection dial and select the desired role

☐3 Select "Edit user/role"
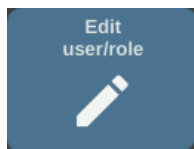
The role opens, the functions can be changed:
- Select the function by turning the selection dial
- Press the selection dial
- Change the role name using the keyboard
- Select settings for the functions from the list

☐4 Select OK

If no user is stored for a role, the editing of the role can also be started by pressing the selection dial.

Deleting roles

☐1 Select Defaults / Administration / User management

User management is displayed.

☐2 Turn the selection dial and select the role to be deleted

☐3 Select "Delete user/role"
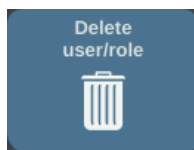
☐4 Confirm the prompt

The role and all assigned users are deleted.

Editing users

☐1 Select Defaults / Administration / User management

User management is displayed.

☐2 Turn the selection dial and select the role to which the user to be edited is assigned

☐3 Press the selection dial

The users assigned to the role are displayed.

☐4 Turn the selection dial and select the user to be edited

5 Select "Edit user/role" (or press the selection dial)
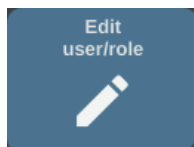
- Select the parameter by turning the selection dial
- Press the selection dial
- Change the name and web password using the keyboard
- Select other settings from the list

Replacing the NFC card:
- Turn the selection dial and select "NFC card"
- Press the selection dial
- Select "Replace"
- Hold the new NFC key on the reading zone for NFC keys and wait for confirmation that it has been recognized
- Select OK

6 Select OK

Deleting users

1 Select Defaults / Administration / User management

User management is displayed.

2 Turn the selection dial and select the role to which the user to be deleted is assigned
3 Press the selection dial
4 Turn the selection dial and select the user to be deleted
5 Select "Delete user/role"
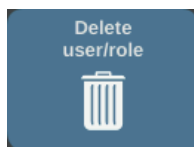
6 Confirm the prompt

The user is deleted.

Deactivating user management

1 Select the predefined "Admin" user under Defaults / Administration / User management / Administrator
2 Turn the selection dial and select NFC card
3 Press the selection dial

The prompt to delete or replace the NFC card is displayed.

NOTE!

If the NFC card for the predefined "Admin" user is deleted, user management is deactivated.

4 Select "Delete"

User management is deactivated, the power source is locked.
The power source can be unlocked and locked again with any NFC key (see also page).

Lost administrator NFC key?

Procedure if
- user management is activated
- the power source is locked
  and
- the administrator NFC key has been lost:

1 Touch the key symbol in the status bar on the display

The information regarding the loss of the administrator card is displayed.

2 Note down the IP address of the power source

3 Open the SmartManager for the power source (enter the IP address of the power source in a browser)

4 Contact the Fronius service team

CENTRUM - Central User Management

Activating the CENTRUM server

CENTRUM is a piece of software used for central user management. For detailed information, refer to the CENTRUM Operating Instructions (42,0426.0338,xx).

THE CENTRUM server can also be activated directly on the power source as follows:

1 Select Defaults / Administration / CENTRUM Server

The Central User Management Server is displayed.

2 Activate CENTRUM Server (press selection dial)
3 Select CENTRUM Server, press the selection dial and enter the address of the CENTRUM server using the keyboard
4 Select the Verify CENTRUM button
5 Save

SmartManager – The Website of the Power Source

SmartManager – The Website of the Power Source

General

With the SmartManager, the power sources have their own website.
Once the power source is connected to a computer via a network cable or is integrated into a network, the SmartManager of the power source can be accessed via the IP address of the power source.
IE 10 or higher or another modern browser is required in order to access the SmartManager.

The entries displayed on the SmartManager may vary depending on the system configuration, software extensions and options available.

Examples of displayed entries:

- Current system data
- Documentation logbook
- Job data
- Power source settings
- Save and restore

- User management
- Overview
- Update
- Function packages
- Screenshot

Opening and logging into the SmartManager for the power source
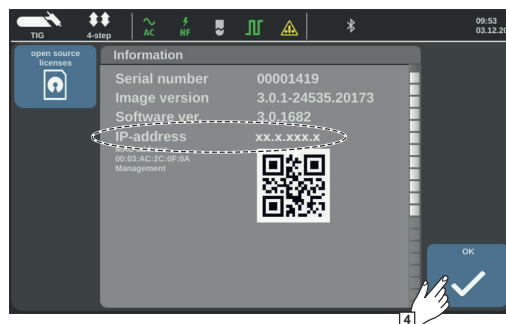
[1] Defaults / System / Information ==> note down the IP address of the power source

[2] Enter the IP address into the search field of the browser

[3] Enter user name and password

Factory setting:
User name = admin
Password = admin

[4] Confirm the displayed message

The SmartManager for the power source is displayed.

Help functions if logging in does not work

There are two help functions when logging into the SmartManager:
- Start activation function?
- Forgot your password?

Start unlock function?

This feature allows you to unlock an unintentionally locked power source and enable it for all functions.

1 Click on "Start unlock function?"

2 Create a verification file:
  click on "Store"

A .txt file with the following file name is saved in the computer's download folder:

unlock_SN[serial number]_YYYY_MM_DD_hhmmss.txt

3 Send this verification file via e-mail to the Fronius tech support team at:
  welding.techsupport@fronius.com

Fronius will reply by e-mail with a one-time unlock file with the following file name:

response_SN[serial number]_YYYY_MM_DD_hhmmss.txt

4 Save the unlock file to the computer

5 Click on "Find unlock file"

6 Save the unlock file

7 Click on "Load unlock file"

The power source is unlocked once.

Forgot your password?

After clicking on "Forgot your password?", a note appears indicating that the password can be reset on the power source (see also "Restoring the website password", page **205**).

Changing the password/ logging out
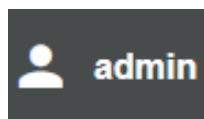
Click on this symbol to
- change the user password
- log out of the SmartManager

Changing the password for the SmartManager:

1 Enter the old password

2 Enter a new password

3 Repeat the new password

4 Click on "Store"

Settings

Click on this symbol to expand the display of characteristics, material specifications and certain welding parameters on the SmartManager for the power source.

The settings depend on the user who is logged in.

Selecting the language

Click on the language abbreviation to display the languages available for the SmartManager.

The currently set language is highlighted in white.

To change the language, click on the desired language.

Status indicator   The current status of the power source is displayed between the Fronius logo and the selected power source.

⚠	Caution/warning
❗	Error on the power source
🔧	Power source is welding
✔	Power source is ready for use (online)
❓	Power source is not ready for use (offline)

*   In the event of an error, a red error line with the error number appears above the line with the Fronius logo.

After clicking on the error line, an error description is displayed.

Fronius

Click on the Fronius logo to open the Fronius homepage: www.fronius.com

Current system data

Current system data

The current data for the welding system is displayed according to the selected welding process.

For TIG AC, for example:

Machine name Installation location	Hall	Cell Additional info

Welding process

ACTUAL		
Main current	Lowering current	Balance
Starting current	Final current	Electrode diameter
UpSlope	DownSlope	Polarity
		IP
		IE
		Total gas quantity
	Arc time	Total operating hours

Operating mode | Polarity | Ignition procedure | Special functions

Set values, actual values, hold values for welding current and welding voltage, various other actual values as well as general system data are displayed.

Documentation, logbook

Documentation

The Documentation entry shows the last 100 logbook entries. These logbook entries can be welds, errors, warnings, notifications and events.
The "Time filter" button can be used to filter the displayed data by a specific time period.
This is entered using date (yyyy MM dd) and time (hh mm), each from - to.
An empty filter reloads the most recent welds.
The display of welds and events can be deactivated.

The following data is displayed:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

(1)	Number of the weld
(2)	Start time (date and time)
(3)	Duration of welding in s
(4)	Welding current in A (average)
(5)	Welding voltage in V (average)
(6)	Wire speed in m/min
(7)	IP - arc power in W (based on real-time values according to ISO/TR 18491)
(8)	IE - arc energy in kJ (as the total throughout the entire welding process according to ISO/TR 18491)

If present in the system, robot speed and jobs are also displayed.

Clicking on a logbook entry will display the details for that entry.

Details for welds:

Section No.

(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)

(9)	Duration of the welding section in s
(10)	Welding current in A (average)
(11)	Welding voltage in V (average)
(12)	Wire speed in m/min
(13)	Welding speed (cm/min)
(14)	Arc power from instantaneous values in W (for details see page **199**)
(15)	Arc energy in kJ (for details see page **199**)
(16)	Job No.
(17)	Process

Additional values can be also displayed by clicking on the "Insert column" button:

-    I max / I min: maximum/minimum welding current in A
-    Power max / Power min: maximum/minimum arc power in W
-    Start time (power source time); date and time
-    U max / U min: maximum/minimum welding voltage in V
-    Vd max / Vd min: maximum/minimum wire speed in m/min

If the OPT/i Documentation option is present on the power source, individual sections of welds can also be displayed.

The documentation can be exported in the desired format using the "PDF" and "CSV" buttons.
For CSV exports, the OPT/i Documentation option must be present on the power source.

Job data

Job data

If the OPT/i Jobs option is available on the power source, the following can be carried out under the Job data entry:
- Existing jobs in the welding system can be viewed *
- Existing jobs in the welding system can be optimized
- Externally stored jobs can be transferred to the welding system
- Existing jobs in the welding system can be exported as PDF * or CSV files

* Viewing and exporting as a PDF also works if the OPT/i Jobs option is not available on the power source.

Job overview

The job overview lists all jobs stored in the welding system.
After clicking on a job, the data and parameters stored for this job are displayed.
Job data and parameters can only be viewed in the job overview. The column width for parameters and values can be easily adjusted by dragging with the mouse pointer.
Further jobs can be easily added to the list with the displayed data by clicking on the "Add job" button.

All added jobs are compared with the selected job.

Editing a job

Existing jobs in the welding system can be optimized, provided the OPT/i Jobs option is available on the power source.

[1] Click on "Edit job"

[2] In the list of existing jobs, click on the job to be edited

The selected job opens and the following job data is displayed:
- **Parameters**
  Parameters currently stored in the job
- **Value**
  Parameter values currently stored in the job
- **Change value to**
  For entering the new parameter value
- **Setting range**
  Possible setting range for the new parameter values

[3] Change the values accordingly

[4] Save/discard your changes, save job as/delete

To help when editing the job, further jobs can be easily added to the list with the displayed data by clicking on "Add job".

Creating a new job

[1] Click on "Create new job"

[2] Enter job data

[3] Click on "OK" to apply the new job

Importing a job

This function allows externally stored jobs to be transferred into the welding system, provided the OPT/i Jobs option is available on the power source.

[1] Click on "Find job file"

[2] Select the desired job file

In the preview of the job import list, you can select individual jobs and assign new job numbers.

[3] Click on "Import"

If the import is successful, a confirmation is displayed and the imported jobs are displayed in the list.

Exporting a job

This function allows the power source to store jobs externally, provided the OPT/i Jobs option is available on the power source.

[1] Select the jobs to be exported

[2] Click on "Export"

The jobs are exported as an XML file to the computer's download folder.

Exporting job(s) as ...

Under Job overview and Edit job, existing jobs in the welding system can be exported as PDF or CSV files.
For CSV export, the OPT/i Jobs option must be available on the power source.

[1] Click on "Export job(s) as..."

The PDF settings or CSV settings are displayed.

[2] Select the job(s) to be exported:
Current job/all jobs/job numbers

[3] Click on "Save PDF" or "Save CSV"

A PDF or CSV file of the selected jobs is created and saved depending on the settings for the browser used.

Power source settings

Process parameters

Under Process parameters, you can view and modify general process parameters and process parameters for components & monitoring of a power source.

Changing process parameters

1. Click on Parameter Group/Parameters
2. Change the value of the parameter directly in the display field
3. Save the changes

Designation & location

The power source configuration can be viewed and modified under Designation & location.

Save and restore

General   Under the Save and restore entry

- all welding system data can be saved as a backup (e.g. current parameter settings, jobs, user curves, defaults, etc.)

- existing backups can be saved again in the welding system

- data can be configured for automatic backup

Save and restore   **Starting a backup**

[1] Click on "Start backup" to save the welding system data as a backup

By default, the data is saved in the format MCU1-YYYYMMDTHHmm.fbc in the selected location.

YYYY = year
MM = month
DD = day
HH = hour
mm = minute

Time and date information as per the settings on the power source.

Finding a recovery file

[1] Click on "Find recovery file" to transfer an existing backup to the power source
[2] Select the file and click on "Open"

The selected backup file appears in the SmartManager for the power source under Restore.

[3] Click on "Start restore"

Once the data has been successfully restored, a confirmation is displayed.

Automatic backup

[1] Enable interval settings

[2] Enter the interval settings for the times at which the automatic backup should take place:
- **Interval:**
  daily/weekly/monthly
- **at:**
  time (hh:mm)

[3] Enter the data for the backup destination:
- **Protocol:**
  SFTP (Secure File Transfer Protocol) / SMB (Server Message Block)
- **Server:**
  Enter the IP address of the destination server
- **Port:**
  Enter port number; if no port number is entered, the standard port 22 is automatically used.
  If SMB is set under Protocol, leave the Port field blank.
- **Storage location:**
  Used to configure the subfolder where the backup will be stored.
  If no location is entered, the backup is stored in the server root directory.

  IMPORTANT! For SMB and SFTB, always enter the location with a slash "/".

- **Domain/user, password:**
  User name and password - as configured on the server;
  When entering a domain, first enter the domain, then backslash "\" and then the user name (DOMAIN\USER)

[4] If a connection via proxy server is required, activate and enter the proxy settings:
- Server
- Port
- User
- Password

[5] Save changes

[6] Activate automatic backup

If you have any questions about configuration, contact your network administrator.

User management

General

Under the User administration entry
- users can be viewed, changed and created
- user roles can be viewed, changed and created
- users and user roles can be exported or imported into the power source.
  On import, existing user management data on the power source is overwritten.
- a CENTRUM server can be activated

User management is created on one power source and can then be saved with the export/import function and transferred to other power sources.

Users

Existing users can be viewed, changed and deleted, new users can be created.

Viewing/changing a user:

[1] Select a user

[2] Change user data directly in the display field

[3] Save the changes

Deleting a user:

[1] Select a user

[2] Click on the "Delete user" button

[3] Confirm the prompt with "OK"

Creating a user:

[1] Click on the "Create new user" button

[2] Enter user data

[3] Confirm with OK

User roles

Existing user roles can be viewed, changed and deleted, new user roles can be created.

Viewing/changing a user role:

[1] Select a user role

[2] Change user role data directly in the display field

[3] Save the changes

The "Administrator" role cannot be changed.

Deleting a user role:

[1] Select a user role

[2] Click on the "Delete user role" button

[3] Confirm the prompt with "OK"

The "Administrator" and "locked" roles cannot be deleted.

Creating a user role:

| 1 | Click on the "Create new user role" button |

| 2 | Enter a role name, apply values |

| 3 | Confirm with OK |

Export & import

Exporting users and user roles from a power source

| 1 | Click on "export" |

User management for the power source is stored in the computer's download folder.
File format: userbackup_SNxxxxxxxx_YYYY_MM_DD_hhmmss.user

SN = serial number, YYYY = year, MM = month, DD = day
hh = hour, mm = minute, ss = second

Importing users and user roles into a power source

| 1 | Click on "Find user data file" |

| 2 | Select the file and click on "open" |

| 3 | Click on "import" |

User management is stored on the power source.

CENTRUM

To activate a CENTRUM server
(CENTRUM = Central User Management)

| 1 | Activate CENTRUM Server |

| 2 | In the input field, enter the domain name or IP address of the server on which Central User Management has been installed. |

If a domain name is used, a valid DNS server must be configured under the power source network settings.

| 3 | Click on the "Verify server" button |

The availability of the specified server is checked.

| 4 | Save the changes |

Overview

Overview
The Overview entry displays the components and options in the welding system with all the available information, e.g. firmware version, item number, serial number, production date, etc.

Expanding all groups/ collapsing all groups
Click on the "Expand all groups" button to see further details about the individual system components.

Example power source:
- TPSi Touch: Item number
  MCU1: Item number, version, serial number, production date
  Bootloader: Version
  Image: Version
  Licenses: WP Standard, WP Pulse, WP LSC, WP PMC, OPT/i Guntrigger, etc.
- SC2: Item number
  Firmware: Version

Click on the "Collapse all groups" button to hide the details of the system components.

Saving as an xml file
Click on the "Save as xml file" button to create an XML file from the details of the system components. This XML file can either be opened or saved.

Update

Update

Under the Update entry, the firmware of the power source can be updated.

The current firmware version on the power source is displayed.

Update the power source firmware:

The update file can be downloaded, for example, from the following link:
http://tps-i.com/index.php/firmware

|1| Organize and save the update file

|2| Click on "Find update file" to start the update process

|3| Select the update file

Click on "Update"

After the update has been completed, the power source may need to be restarted.

After the update has been successfully completed, a confirmation message is displayed.

Finding the update file (performing an update)

|1| After clicking on "Find update file", select the desired firmware (*.ffw)

|2| Click on "Open"

The selected update file appears in the SmartManager for the power source under Update.

|3| Click on "Update"

The progress of the update process is displayed.
Once this reaches 100%, the prompt to restart the power source appears.

The SmartManager is not available during the restart.
After the restart, the SmartManager may no longer be available.
If you select No, the new software functions will be activated the next time the power is turned on/off.

|4| To restart the power source, click on "Yes"

The power source restarts, the display goes dark for a short time.
During the restart, the power source display shows the Fronius logo.

After the update has been successfully completed, a confirmation and the current firmware version are displayed.
Then log into the SmartManager again.

Fronius Weld-Connect

Under the Update entry, the Fronius WeldConnect mobile application can also be called up. Fronius WeldConnect supports welders, designers and work planners in estimating various welding parameters.

Fronius WeldConnect

Fronius WeldConnect is available as follows:
- WeldConnect online (direct link)
- As an app for Android
- As an app for Apple/IOS

The parameters found for the mobile application can be transferred to the power source via WLAN connection as a welding job (IP address input required).

Function packages

Function packages

The function packages, special characteristics, options, etc. that are available on the power source can be displayed under the Function packages entry.
New function packages can also be loaded.

Welding packages

Under Welding Packages, the welding packages available on the power source are displayed with the respective item numbers, e.g.:
-    WP Standard (MIG/MAG standard synergic welding)
-    WP Pulse (MIG/MAG pulsed synergic welding)
-    WP LSC (Low Spatter Control, low-spatter dip transfer arc process)
-    WP PMC (Pulse Multi Control, advanced pulsed arc welding process)

Possible extensions:
-    WP CMT
-    etc.

Options

Under Options, the options available on the power source are displayed with the respective item numbers and possible extensions, e.g.:

Options
-    OPT/i GUN Trigger
-    etc.

Possible extensions
-    OPT/i Jobs
-    OPT/i Interface Designer...
-    etc.

Loading a function package

1 Organize and save the function package

2 Click on "Find function package file"

3 Select the desired function package file (*.xml)

4 Click on "Open"

The selected function package file appears in the SmartManager for the power source Function package.

5 Click on "Load function package"

Once the function package has been successfully loaded, a confirmation is displayed.

Screenshot

Screenshot   Under the Screenshot entry, a digital image of the power source display can be created at any time, regardless of navigation or set values.

1   Click on "Take screenshot" to take a screenshot of the display

The screenshot is taken with the settings currently displayed on the display.

Depending on the browser you are using, different functions are available for saving the screenshot, and the display may vary.

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
> ▶ Set power switch to - O - on the welding power supply
> ▶ Unplug the welding power supply from mains power
> ▶ Secure against anyone turning on power again
> ▶ Use a suitable measuring instrument to ensure that electrically charged components (e.g., capacitors) are discharged

> ⚠️ **WARNING!**
>
> **Danger due to insufficient ground conductor connection!**
> This can result in severe personal injury and damage to property.
> ▶ The housing screws provide an adequate ground conductor connection for grounding the housing and should not be replaced under any circumstances by other screws that do not provide a reliable ground conductor connection.

Power Source Troubleshooting

Power source not working

Power source switched on; displays and indicators do not illuminate

Cause:	Mains lead damaged or broken, mains plug not inserted
Remedy:	Check mains lead, if necessary insert mains plug

Cause:	Mains socket or mains plug faulty
Remedy:	Replace faulty parts

Cause:	Mains fuse protection
Remedy:	Replace mains fuse

Cause:	Short circuit on the 24 V power supply of the SpeedNet connection or external sensor
Remedy:	Disconnect connected components

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

Cause: Limited supply of cooling air
Remedy: Ensure accessibility to cooling air ducts

Cause: The fan in the power source is faulty
Remedy: Contact After-Sales Service

No welding current

Power source switched on; displays and indicators light up

Cause: Incorrect ground connection
Remedy: Check ground connection and terminal for polarity

Cause: Power cable in welding torch damaged or broken.
Remedy: Replace the welding torch

Nothing happens after pressing torch trigger

Power source switched on; displays and indicators light up

Cause: Control plug not plugged in
Remedy: Plug in control plug

Cause: Welding torch or welding torch control line faulty
Remedy: Replace the welding torch

Cause: Interconnecting hosepack defective or not correctly connected (not in the case of power sources with integrated wire drive)
Remedy: Check interconnecting hosepack

No shielding gas

All other functions are OK

Cause:	Gas cylinder empty
Remedy:	Change gas cylinder

Cause:	Gas pressure regulator faulty
Remedy:	Replace the gas pressure regulator

Cause:	Gas hose is not fitted or is damaged
Remedy:	Fit or change gas hose

Cause:	Welding torch faulty
Remedy:	Change welding torch

Cause:	Gas solenoid valve faulty
Remedy:	Contact After-Sales Service

Poor-quality weld properties

Cause:	Wrong welding parameters, wrong correction parameters
Remedy:	Check settings

Cause:	Poor ground earth connection
Remedy:	Establish good contact with workpiece

Cause:	Several power sources welding one part
Remedy:	Increase distance between hosepacks and grounding cables; Do not use a common ground.

Cause:	Too little or no shielding gas
Remedy:	Check pressure regulator, gas hose, gas solenoid valve, welding torch gas connection, etc.

Cause:	Welding torch leaks
Remedy:	Change welding torch

Cause:	Incorrect or heavily worn contact tip
Remedy:	Change contact tip

Cause:	Incorrect wire alloy or incorrect wire diameter
Remedy:	Check wire electrode in use

Cause:	Incorrect wire alloy or incorrect wire diameter
Remedy:	Check the weldability of the parent material

Cause:	Shielding gas not suitable for wire alloy
Remedy:	Use correct shielding gas

Excessive weld spatter

Cause: Shielding gas, wirefeeder, welding torch or workpiece contaminated or magnetically charged

Remedy: Perform R/L alignment;
Adjust arc length;
Check shielding gas, wirefeeder, welding torch position or workpiece for contamination or magnetic charge

Wirefeed problems

when using long welding torch hosepacks

Cause: Incorrect arrangement of welding torch hosepack

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

Irregular wire speed

Cause: Braking force has been set too high

Remedy: Loosen the brake

Cause: Contact tip hole too narrow

Remedy: Use suitable contact tip

Cause: Inner liner in the welding torch faulty

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

Cause: Feed rollers not suitable for wire electrode used

Remedy: Use suitable feed rollers

Cause: Feed rollers have the wrong contact pressure

Remedy: Optimize contact pressure

Welding torch gets very hot

Cause: Welding torch is inadequately sized

Remedy: Observe duty cycle and load limits

Cause: For water-cooled systems only: Coolant flow too low

Remedy: Check coolant level, coolant flow rate, coolant contamination, etc.;
coolant pump blocked: Switch on the shaft of the coolant pump at the gland using a screwdriver

Cause: For water-cooled systems only: The "Cooling unit operating mode" setup parameter is set to "off".

Remedy: In the Setup menu, set the "Cooling unit operating mode" parameter to "eco", "on" or "auto" in the component settings.

Service, 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 device from the mains
▶ Ensure the device cannot be switched back on
▶ Using a suitable measuring instrument, check to make sure that electrically charged components (e.g. capacitors) have been 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

⚠ **CAUTION!**

Risk of damage to electronic parts.
▶ Do not bring the air nozzle too close to electronic parts.

- Open the device
- Blow out the inside of the device with dry and reduced compressed air
- Also clean the cooling air ducts if there is a large accumulation of dust

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 Fronius Download Center)
   File format: official_tpsi_x.x.x-xxxx.ffw
2. Establish Ethernet connection between PC/laptop and power source
3. Open the power source SmartManager (see page **229**)
4. Transfer the firmware to the power source (see page **244**)

Disposal   Materials should be disposed of according to valid local and national regulations.

Appendix

Average consumption values during welding

Average shielding gas consumption during TIG welding

Gas nozzle size	4	5	6	7	8	10
Average consumption	6 l/min	8 l/min	10 l/min	12 l/min	12 l/min	15 l/min

Average shielding gas consumption during MIG/MAG welding

Wire electrode diameter	1.0 mm	1.2 mm	1.6 mm	2.0 mm	2 x 1.2 mm (TWIN)
Average consumption	10 l/min	12 l/min	16 l/min	20 l/min	24 l/min

Average wire electrode consumption during MIG/MAG welding

Average wire electrode consumption at a wire speed of 5 m/min			
	1.0 mm wire electrode diameter	1.2 mm wire electrode diameter	1.6 mm wire electrode diameter
Steel wire electrode	1.8 kg/h	2.7 kg/h	4.7 kg/h
Aluminum wire electrode	0.6 kg/h	0.9 kg/h	1.6 kg/h
CrNi wire electrode	1.9 kg/h	2.8 kg/h	4.8 kg/h

Average wire electrode consumption at a wire speed of 10 m/min			
	1.0 mm wire electrode diameter	1.2 mm wire electrode diameter	1.6 mm wire electrode diameter
Steel wire electrode	3.7 kg/h	5.3 kg/h	9.5 kg/h
Aluminum wire electrode	1.3 kg/h	1.8 kg/h	3.2 kg/h
CrNi wire electrode	3.8 kg/h	5.4 kg/h	9.6 kg/h

Technical data

Explanation of the Term Duty Cycle

The duty cycle (D.C.) is the period of a ten minute cycle in which the device may be operated at the stated power without overheating.

> **NOTE!**
>
> **The D.C. values cited on the rating plate relate to an ambient temperature of 40 °C.** If the ambient temperature is higher, the D.C. or power must be lowered accordingly.

Example: Welding with 150 A at 60% D.C.
- Welding phase = 60% of 10 mins = 6 mins
- Cool-down phase = rest time = 4 mins
- Following the cool-down phase, the cycle begins again.
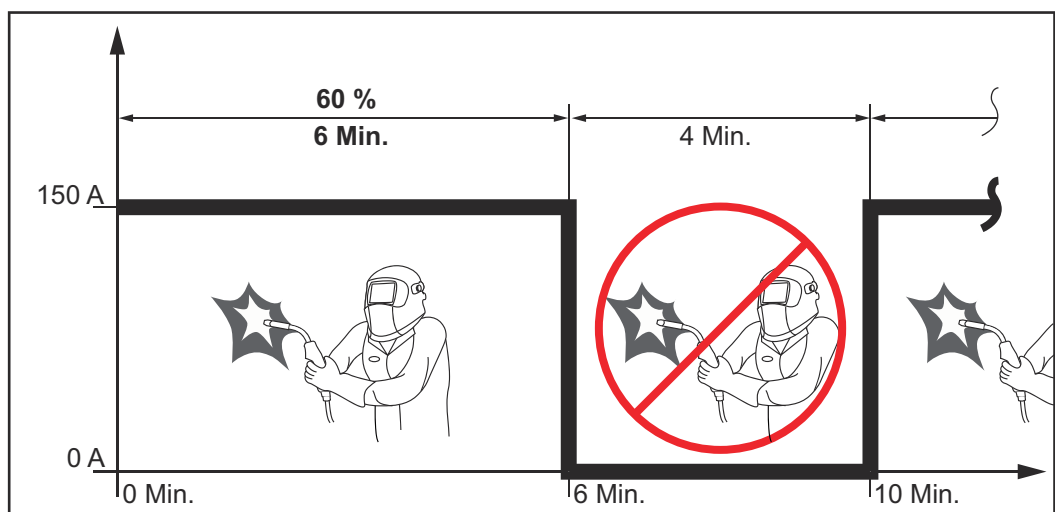
To use the device without interruptions:

1 Search for a 100% D.C. value in the technical data, which corresponds to the existing ambient temperature.

2 Reduce the power or amperage value correspondingly so that the device can operate without a cool-down phase.

Special Voltage

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

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

iWave 300i DC	Mains voltage (U_1)	3 x 400 V
	Max. effective primary current (I_{1eff})	12.7 A
	Max. primary current (I_{1max})	16.9 A
	Mains fuse protection	16 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]	156 mOhm
	Recommended residual-current circuit breaker	Type B
	Welding current range (I_2)	
	TIG	3 - 300 A
	MIG/MAG	3 - 300 A
	MMA	10 - 300 A
	Welding current at 10 min/40 °C (104 °F)	40% / 300 A 60% / 260 A 100% / 240 A
	Output voltage range according to standard characteristic (U_2)	
	TIG	10.1 - 26.0 V
	MIG/MAG	14.2 - 29.0 V
	MMA	20.4 - 32.0 V
	Open circuit voltage (U_0 peak / U_0 r.m.s)	99 V
	Striking voltage (U_P)	10 kV The arc ignition device is suitable for manual operation.
	Protection class	IP23
	Type of cooling	AF
	Overvoltage category	III
	Pollution degree according to IEC60664	3
	EMC emission class	A [2]
	Safety symbols	S, CE
	Dimensions l x w x h	700 x 300 x 510 mm 27.6 x 11.8 x 20.1 in.
	Weight	46.4 kg / 102.29 lb.
	Max. noise emission (LWA)	75 dB (A)
	Idle state power consumption at 400 V	39.7 W
	Power source efficiency at 300 A / 32.0 V	87%
	Max. shielding gas pressure	7 bar / 102 psi

1)   Interface to a 230/400 V and 50 Hz public grid
2)   A device in emission class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
Electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

iWave 300i DC /nc		
Mains voltage (U_1)		3 x 380 / 400 / 460 V
Max. effective primary current (I_{1eff})		
3 x 380 V		13.57 A
3 x 400 V		12.7 A
3 x 460 V		11.2 A
Max. primary current (I_{1max})		
3 x 380 V		18.1 A
3 x 400 V		16.9 A
3 x 460 V		14.8 A
Mains fuse protection		16 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]		156 mOhm
Recommended residual-current circuit breaker		Type B
Welding current range (I_2)		
TIG		3 - 300 A
MIG/MAG		3 - 300 A
MMA		10 - 300 A
Welding current at 10 min/40 °C (104 °F)		40% / 300 A 60% / 260 A 100% / 240 A
Output voltage range according to standard characteristic (U_2)		
TIG		10.1 - 26.0 V
MIG/MAG		14.2 - 29.0 V
MMA		20.4 - 32.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)		99 V
Striking voltage (U_P)		10 kV The arc ignition device is suitable for manual operation.
Protection class		IP23
Type of cooling		AF
Overvoltage category		III
Pollution degree according to IEC60664		3
EMC emission class		A [2]
Safety symbols		S, CE
Dimensions l x w x h		700 x 300 x 510 mm 27.6 x 11.8 x 20.1 in.

Weight	45.1 kg / 99.43 lb.
Max. noise emission (LWA)	75 dB (A)
Idle state power consumption at 400 V	39.7 W
Power source efficiency at 300 A / 32.0 V	87%
Max. shielding gas pressure	7 bar/102 psi

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

2) A device in emission class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
Electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

iWave 300i DC /MV/nc	Mains voltage (U_1)	3 x 200/230/240/380/400/460/600 V
	Max. effective primary current (I_{1eff})	
	3 x 200 V	26.1 A
	3 x 230 V	22.5 A
	3 x 240 V	20.9 A
	3 x 380 V	13.5 A
	3 x 400 V	12.7 A
	3 x 460 V	11.2 A
	3 x 600 V	11.6 A
	Max. primary current (I_{1max})	
	3 x 200 V	35.2 A
	3 x 230 V	30.2 A
	3 x 240 V	28.2 A
	3 x 380 V	13.5 A
	3 x 400 V	12.7 A
	3 x 460 V	11.2 A
	3 x 600 V	14.8 A
	Mains fuse protection 3 x 200/230/240 V 3 x 380/400/460/600 V	35 A slow-blow 16 A slow-blow
	Mains voltage tolerance	-10 / +6%
	Mains frequency	50 / 60 Hz
	Cos phi (1)	0.99
	Max. permitted mains impedance Z_{max} on PCC[1]	172 mOhm
	Recommended residual-current circuit breaker	Type B
	Welding current range (I_2)	
	TIG	3 - 300 A
	MIG/MAG	3 - 300 A
	MMA	10 - 300 A
	Welding current at 10 min/40 °C (104 °F)	40% / 300 A 60% / 260 A 100% / 240 A
	Output voltage range according to standard characteristic (U_2)	
	TIG	10.1 - 26.0 V
	MIG/MAG	14.2 - 29.0 V
	MMA	20.4 - 32.0 V
	Open circuit voltage (U_0 peak / U_0 r.m.s)	104 V

Striking voltage (U_P)	10 kV The arc ignition device is suitable for manual operation.
Protection class	IP23
Type of cooling	AF
Overvoltage category	III
Pollution degree according to IEC60664	3
EMC emission class	A [2]
Safety symbols	S, CE
Dimensions l x w x h	700 x 300 x 510 mm 27.6 x 11.8 x 20.1 in.
Weight	46.5 kg / 102.52 lb.
Max. noise emission (LWA)	75 dB (A)
Idle state power consumption at 400 V	39.7 W
Power source efficiency at 300 A / 32.0 V	87%
Max. shielding gas pressure	7 bar/102 psi

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

2) A device in emission class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
Electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

iWave 400i DC	Mains voltage (U_1)	3 x 400 V
	Max. effective primary current (I_{1eff})	18.4 A
	Max. primary current (I_{1max})	24.9 A
	Mains fuse protection	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 residual-current circuit breaker	Type B
	Welding current range (I_2)	
	TIG	3 - 400 A
	MIG/MAG	3 - 400 A
	MMA	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)	
	TIG	10.1 - 26.0 V
	MIG/MAG	14.2 - 34.0 V
	MMA	20.4 - 36.0 V
	Open circuit voltage (U_0 peak / U_0 r.m.s)	99 V
	Striking voltage (U_P)	10 kV The arc ignition device is suitable for manual operation.
	Protection class	IP23
	Type of cooling	AF
	Overvoltage category	III
	Pollution degree according to IEC60664	3
	EMC emission class	A [2]
	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	49.9 kg / 110.01 lb.
	Max. noise emission (LWA)	75 dB (A)
	Idle state power consumption at 400 V	40.9 W
	Power source efficiency at 400 A / 36.0 V	87%
	Max. shielding gas pressure	7 bar / 5 dB (A)

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

2)   A device in emission class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.

   Electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

iWave 400i DC /nc		
Mains voltage (U_1)		3 x 380 / 400 / 460 V
Max. effective primary current (I_{1eff})		
3 x 380 V		19.3 A
3 x 400 V		18.4 A
3 x 460 V		16.1 A
Max. primary current (I_{1max})		
3 x 380 V		26.2 A
3 x 400 V		24.9 A
3 x 460 V		21.7 A
Mains fuse protection		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 residual-current circuit breaker		Type B
Welding current range (I_2)		
TIG		3 - 400 A
MIG/MAG		3 - 400 A
MMA		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)		
TIG		10.1 - 26.0 V
MIG/MAG		14.2 - 34.0 V
MMA		20.4 - 36.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)		99 V
Striking voltage (U_P)		10 kV The arc ignition device is suitable for manual operation.
Protection class		IP23
Type of cooling		AF
Overvoltage category		III
Pollution degree according to IEC60664		3
EMC emission class		A [2]
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	48.0 kg / 105.82 lb.
Max. noise emission (LWA)	75 dB (A)
Idle state power consumption at 400 V	40.9 W
Power source efficiency at 400 A / 36.0 V	87%
Max. shielding gas pressure	7 bar/102 psi

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

2)   A device in emission class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
Electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

iWave 400i DC /MV/nc	Mains voltage (U_1)	3 x 200/230/240/380/400/460/600 V
	Max. effective primary current (I_{1eff})	
	3 x 200 V	37.8 A
	3 x 230 V	34.1 A
	3 x 240 V	30.7 A
	3 x 380 V	19.3 A
	3 x 400 V	18.4 A
	3 x 460 V	16.1 A
	3 x 600 V	15.7 A
	Max. primary current (I_{1max})	
	3 x 200 V	53.3 A
	3 x 230 V	45.6 A
	3 x 240 V	41.7 A
	3 x 380 V	26.2 A
	3 x 400 V	24.9 A
	3 x 460 V	21.7 A
	3 x 600 V	20.8 A
	Mains fuse protection	
	3 x 200/230/240 V	63 A slow-blow
	3 x 380/400/460 V	35 A slow-blow
	3 x 600 V	16 A slow-blow
	Mains voltage tolerance	-10 / +6%
	Mains frequency	50 / 60 Hz
	Cos phi (1)	0.99
	Max. permitted mains impedance Z_{max} on PCC[1]	97 mOhm
	Recommended residual-current circuit breaker	Type B
	Welding current range (I_2)	
	TIG	3 - 400 A
	MIG/MAG	3 - 400 A
	MMA	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)	
	TIG	10.1 - 26.0 V
	MIG/MAG	14.2 - 34.0 V
	MMA	20.4 - 36.0 V

Open circuit voltage (U_0 peak / U_0 r.m.s)	104 V
Striking voltage (U_P)	10 kV The arc ignition device is suitable for manual operation.
Protection class	IP23
Type of cooling	AF
Overvoltage category	III
Pollution degree according to IEC60664	3
EMC emission class	A [2]
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	49.3 kg / 108.69 lb.
Max. noise emission (LWA)	75 dB (A)
Idle state power consumption at 400 V	40.9 W
Power source efficiency at 400 A / 36 V	87%
Max. shielding gas pressure	7 bar/102 psi

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

2)   A device in emission class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
Electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

iWave 500i DC		
Mains voltage (U_1)		3 x 400 V
Max. effective primary current (I_{1eff})		21.9 A
Max. primary current (I_{1max})		34.4 A
Mains fuse protection		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]		55 mOhm
Recommended residual-current circuit breaker		Type B
Welding current range (I_2)		
TIG		3 - 500 A
MIG/MAG		3 - 500 A
MMA		10 - 500 A
Welding current at 10 min/40 °C (104 °F)		40% / 500 A 60% / 430 A 100% / 360 A
Output voltage range according to standard characteristic (U_2)		
TIG		10.1 - 30.0 V
MIG/MAG		14.2 - 36.5 V
MMA		20.4 - 40.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)		99 V
Striking voltage (U_P)		10 kV The arc ignition device is suitable for manual operation.
Protection class		IP23
Type of cooling		AF
Overvoltage category		III
Pollution degree according to IEC60664		3
EMC emission class		A [2]
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		51.5 kg / 113.54 lb.
Max. noise emission (LWA)		75 dB (A)
Idle state power consumption at 400 V		40.5 W
Power source efficiency at 500 A / 40.0 V		88%
Max. shielding gas pressure		7 bar/102 psi

1)   Interface to a 230/400 V and 50 Hz public grid
2)   A device in emission class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
        Electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

iWave 500i DC /nc	Mains voltage (U_1)	3 x 380 / 400 / 460 V
	Max. effective primary current (I_{1eff})	
	3 x 380 V	22.8 A
	3 x 400 V	21.9 A
	3 x 460 V	19.2 A
	Max. primary current (I_{1max})	
	3 x 380 V	36.0 A
	3 x 400 V	34.4 A
	3 x 460 V	30.0 A
	Mains fuse protection	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]	55 mOhm
	Recommended residual-current circuit breaker	Type B
	Welding current range (I_2)	
	TIG	3 - 500 A
	MIG/MAG	3 - 500 A
	MMA	10 - 500 A
	Welding current at 10 min/40 °C (104 °F)	40% / 500 A 60% / 430 A 100% / 360 A
	Output voltage range according to standard characteristic (U_2)	
	TIG	10.1 - 30 V
	MIG/MAG	14.2 - 36.5 V
	MMA	20.4 - 40.0 V
	Open circuit voltage (U_0 peak / U_0 r.m.s)	99 V
	Striking voltage (U_P)	10 kV The arc ignition device is suitable for manual operation.
	Protection class	IP23
	Type of cooling	AF
	Overvoltage category	III
	Pollution degree according to IEC60664	3
	EMC emission class	A [2]
	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	49.7 kg / 109.57 lb.
Max. noise emission (LWA)	75 dB (A)
Idle state power consumption at 400 V	40.5 W
Power source efficiency at 500 A / 40.0 V	88%
Max. shielding gas pressure	7 bar/102 psi

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

2)   A device in emission class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
Electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

iWave 500i DC /MV/nc	Mains voltage (U_1)	3 x 200/230/240/380/400/460/600 V
	Max. effective primary current (I_{1eff})	
	3 x 200 V	43.1 A
	3 x 230 V	38.9 A
	3 x 240 V	36.2 A
	3 x 380 V	22.8 A
	3 x 400 V	21.9 A
	3 x 460 V	19.2 A
	3 x 600 V	18.4 A
	Max. primary current (I_{1max})	
	3 x 200 V	68.1 A
	3 x 230 V	62.0 A
	3 x 240 V	57.3 A
	3 x 380 V	36.0 A
	3 x 400 V	34.4 A
	3 x 460 V	30.0 A
	3 x 600 V	27.2 A
	Mains fuse protection	
	3 x 200/230/240 V	63 A slow-blow
	3 x 380/400/460/600 V	35 A slow-blow
	Mains voltage tolerance	-10 / +6%
	Mains frequency	50 / 60 Hz
	Cos phi (1)	0.99
	Max. permitted mains impedance Z_{max} on PCC[1]	71 mOhm
	Recommended residual-current circuit breaker	Type B
	Welding current range (I_2)	
	TIG	3 - 500 A
	MIG/MAG	3 - 500 A
	MMA	10 - 500 A
	Welding current at 10 min/40 °C (104 °F)	
	U_1 = 200 - 240 V WIG, MIG/MAG	40% / 500 A 60% / 430 A 100% / 360 A
	U_1 = 200 - 240 V Stick electrode	40% / 450 A 60% / 390 A 100% / 320 A

U_1 = 380 - 600 V	40% / 500 A
	60% / 430 A
	100% / 360 A
Output voltage range according to standard characteristic (U_2)	
TIG	10.1 - 30.0 V
MIG/MAG	14.2 - 36.5 V
MMA	20.4 - 40.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	104 V
Striking voltage (U_P)	10 kV
	The arc ignition device is suitable for manual operation.
Protection class	IP23
Type of cooling	AF
Overvoltage category	III
Pollution degree according to IEC60664	3
EMC emission class	A [2]
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	51.3 kg / 113.10 lb.
Max. noise emission (LWA)	75 dB (A)
Idle state power consumption at 400 V	40.5 W
Power source efficiency at 500 A / 40.0 V	88%
Max. shielding gas pressure	7 bar/102 psi

1)   Interface to a 230/400 V and 50 Hz public grid
2)   A device in emission class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
      Electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

iWave 300i AC/DC		
Mains voltage (U_1)		3 x 400 V
Max. effective primary current (I_{1eff})		15.5 A
Max. primary current (I_{1max})		18.4 A
Mains fuse protection		16 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]		143 mOhm
Recommended residual-current circuit breaker		Type B
Welding current range (I_2)		
TIG		3 - 300 A
MIG/MAG		3 - 300 A
MMA		10 - 300 A
Welding current at 10 min/40 °C (104 °F)		40% / 300 A 60% / 260 A 100% / 240 A
Output voltage range according to standard characteristic (U_2)		
TIG		10.1 - 26.0 V
MIG/MAG		14.2 - 29.0 V
MMA		20.4 - 32.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)		101 V
Striking voltage (U_P)		10 kV The arc ignition device is suitable for manual operation.
Protection class		IP23
Type of cooling		AF
Overvoltage category		III
Pollution degree according to IEC60664		3
EMC emission class		A [2]
Safety symbols		S, CE
Dimensions l x w x h		706 x 300 x 720 mm 27.8 x 11.8 x 28.41 in.
Weight		64.4 kg / 141.98 lb.
Max. noise emission (LWA)		77 dB (A)
Idle state power consumption at 400 V		48.5 W
Power source efficiency at 300 A / 32.0 V		83%
Max. shielding gas pressure		7 bar/102 psi

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

2)   A device in emission class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.

             Electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

iWave 300i AC/DC /nc	Mains voltage (U_1)	3 x 380 / 400 / 460 V
	Max. effective primary current (I_{1eff})	
	3 x 380 V	16.3 A
	3 x 400 V	15.5 A
	3 x 460 V	13.6 A
	Max. primary current (I_{1max})	
	3 x 380 V	19.4 A
	3 x 400 V	18.4 A
	3 x 460 V	16.2 A
	Mains fuse protection	16 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]	143 mOhm
	Recommended residual-current circuit breaker	Type B
	Welding current range (I_2)	
	TIG	3 - 300 A
	MIG/MAG	3 - 300 A
	MMA	10 - 300 A
	Welding current at 10 min/40 °C (104 °F)	40% / 300 A 60% / 260 A 100% / 240 A
	Output voltage range according to standard characteristic (U_2)	
	TIG	10.1 - 26.0 V
	MIG/MAG	14.2 - 29.0 V
	MMA	20.4 - 32.0 V
	Open circuit voltage (U_0 peak / U_0 r.m.s)	101 V
	Striking voltage (U_P)	10 kV The arc ignition device is suitable for manual operation.
	Protection class	IP23
	Type of cooling	AF
	Overvoltage category	III
	Pollution degree according to IEC60664	3
	EMC emission class	A [2]
	Safety symbols	S, CE
	Dimensions l x w x h	706 x 300 x 720 mm 27.8 x 11.8 x 28.41 in.

Weight	63.1 kg / 139.11 lb.
Max. noise emission (LWA)	75 dB (A)
Idle state power consumption at 400 V	48.5 W
Power source efficiency at 300 A / 32.0 V	83%
Max. shielding gas pressure	7 bar/102 psi

1) Interface to a 230/400 V and 50 Hz public grid
2) A device in emission class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
Electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

iWave 300i AC/DC /MV/nc	Mains voltage (U_1)	3 x 200/230/240/380/400/460/600 V
	Max. effective primary current (I_{1eff})	
	3 x 200 V	31.0 A
	3 x 230 V	26.7 A
	3 x 240 V	23.5 A
	3 x 380 V	16.3 A
	3 x 400 V	15.5 A
	3 x 460 V	13.6 A
	3 x 600 V	12.3 A
	Max. primary current (I_{1max})	
	3 x 200 V	37.9 A
	3 x 230 V	32.5 A
	3 x 240 V	28.8 A
	3 x 380 V	19.4 A
	3 x 400 V	18.4 A
	3 x 460 V	16.2 A
	3 x 600 V	14.9 A
	Mains fuse protection	
	3 x 200/230/240 V	35 A slow-blow
	3 x 380/400/460/600 V	16 A slow-blow
	Mains voltage tolerance	-10 / +6%
	Mains frequency	50 / 60 Hz
	Cos phi (1)	0.99
	Max. permitted mains impedance Z_{max} on PCC[1]	121 mOhm
	Recommended residual-current circuit breaker	Type B
	Welding current range (I_2)	
	TIG	3 - 300 A
	MIG/MAG	3 - 300 A
	MMA	10 - 300 A
	Welding current at 10 min/40 °C (104 °F)	40% / 300 A 60% / 260 A 100% / 240 A
	Output voltage range according to standard characteristic (U_2)	
	TIG	10.1 - 26.0 V
	MIG/MAG	14.2 - 29.0 V
	MMA	20.4 - 32.0 V
	Open circuit voltage (U_0 peak / U_0 r.m.s)	102 V

Striking voltage (U_P)	10 kV The arc ignition device is suitable for manual operation.
Protection class	IP23
Type of cooling	AF
Overvoltage category	III
Pollution degree according to IEC60664	3
EMC emission class	A [2]
Safety symbols	S, CE
Dimensions l x w x h	706 x 300 x 720 mm 27.8 x 11.8 x 28.41 in.
Weight	64.5 kg / 142.20 lb.
Max. noise emission (LWA)	77 dB (A)
Idle state power consumption at 400 V	48.5 W
Power source efficiency at 300 A / 32.0 V	83%
Max. shielding gas pressure	7 bar/102 psi

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

2)   A device in emission class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
Electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

iWave 400i AC/DC		
Mains voltage (U_1)		3 x 400 V
Max. effective primary current (I_{1eff})		22.7 A
Max. primary current (I_{1max})		30.8 A
Mains fuse protection		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]		97 mOhm
Recommended residual-current circuit breaker		Type B
Welding current range (I_2)		
TIG		3 - 400 A
MIG/MAG		3 - 400 A
MMA		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)		
TIG		10.1 - 26.0 V
MIG/MAG		14.2 - 34.0 V
MMA		20.4 - 36.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)		101 V
Striking voltage (U_P)		10 kV The arc ignition device is suitable for manual operation
Protection class		IP23
Type of cooling		AF
Overvoltage category		III
Pollution degree according to IEC60664		3
EMC emission class		A [2]
Safety symbols		S, CE
Dimensions l x w x h		706 x 300 x 720 mm 27.8 x 11.8 x 28.41 in.
Weight		68.8 kg / 151.68 lb.
Max. noise emission (LWA)		77 dB (A)
Idle state power consumption at 400 V		46.7 W
Power source efficiency at 400 A / 36.0 V		84%
Max. shielding gas pressure		7 bar/102 psi

1) Interface to a 230/400 V and 50 Hz public grid
2) A device in emission class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
Electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

iWave 400i AC/DC /nc	Mains voltage (U_1)	3 x 380 / 400 / 460 V
	Max. effective primary current (I_{1eff})	
	3 x 380 V	23.9 A
	3 x 400 V	22.7 A
	3 x 460 V	19.8 A
	Max. primary current (I_{1max})	
	3 x 380 V	32.3 A
	3 x 400 V	30.8 A
	3 x 460 V	27.1 A
	Mains fuse protection	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]	97 mOhm
	Recommended residual-current circuit breaker	Type B
	Welding current range (I_2)	
	TIG	3 - 400 A
	MIG/MAG	3 - 400 A
	MMA	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)	
	TIG	10.1 - 26.0 V
	MIG/MAG	14.2 - 34.0 V
	MMA	20.4 - 36.0 V
	Open circuit voltage (U_0 peak / U_0 r.m.s)	101 V
	Striking voltage (U_P)	10 kV The arc ignition device is suitable for manual operation.
	Protection class	IP23
	Type of cooling	AF
	Overvoltage category	III
	Pollution degree according to IEC60664	3
	EMC emission class	A [2]
	Safety symbols	S, CE
	Dimensions l x w x h	706 x 300 x 720 mm 27.8 x 11.8 x 28.41 in.

Weight	66.9 kg / 147.49 lb.
Max. noise emission (LWA)	77 dB (A)
Idle state power consumption at 400 V	46.7 W
Power source efficiency at 400 A / 36.0 V	84%
Max. shielding gas pressure	7 bar/102 psi

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

2)   A device in emission class A is not intended for use in residential areas in which
        the power is supplied via a public low-voltage grid.
        Electromagnetic compatibility may be influenced by conducted or radiated radio
        frequencies.

iWave 400i AC/DC /MV/nc	Mains voltage (U_1)	3 x 200/230/240/380/400/460/600 V
	Max. effective primary current (I_{1eff})	
	3 x 200 V	45.7 A
	3 x 230 V	39.4 A
	3 x 240 V	34.6 A
	3 x 380 V	23.9 A
	3 x 400 V	22.7 A
	3 x 460 V	19.8 A
	3 x 600 V	18.0 A
	Max. primary current (I_{1max})	
	3 x 200 V	63.3 A
	3 x 230 V	54.5 A
	3 x 240 V	47.1 A
	3 x 380 V	32.3 A
	3 x 400 V	30.8 A
	3 x 460 V	27.1 A
	3 x 600 V	25.1 A
	Mains fuse protection	
	3 x 200/230/240 V	63 A slow-blow
	3 x 380/400/460/600 V	35 A slow-blow
	Mains voltage tolerance	-10 / +6%
	Mains frequency	50 / 60 Hz
	Cos phi (1)	0.99
	Max. permitted mains impedance Z_{max} on PCC[1]	~ 90 mOhm
	Recommended residual-current circuit breaker	Type B
	Welding current range (I_2)	
	TIG	3 - 400 A
	MIG/MAG	3 - 400 A
	MMA	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)	
	TIG	10.1 - 26.0 V
	MIG/MAG	14.2 - 34.0 V
	MMA	20.4 - 36.0 V
	Open circuit voltage (U_0 peak / U_0 r.m.s)	1021 V

Striking voltage (U_P)	10 kV
	The arc ignition device is suitable for manual operation.
Protection class	IP23
Type of cooling	AF
Overvoltage category	III
Pollution degree according to IEC60664	3
EMC emission class	A [2]
Safety symbols	S, CE
Dimensions l x w x h	706 x 300 x 720 mm
	27.8 x 11.8 x 28.41 in.
Weight	68.4 kg / 150.80 lb.
Max. noise emission (LWA)	77 dB (A)
Idle state power consumption at 400 V	46.7 W
Power source efficiency at 400 A / 36.0 V	84%
Max. shielding gas pressure	7 bar/102 psi

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

2) A device in emission class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
Electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

iWave 500i AC/DC	Mains voltage (U_1)	3 x 400 V
	Max. effective primary current (I_{1eff})	24.8 A
	Max. primary current (I_{1max})	39.2 A
	Mains fuse protection	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]	50 mOhm
	Recommended residual-current circuit breaker	Type B
	Welding current range (I_2)	
	TIG	3 - 500 A
	MIG/MAG	3 - 500 A
	MMA	10 - 500 A
	Welding current at 10 min/40 °C (104 °F)	40% / 500 A 60% / 430 A 100% / 360 A
	Output voltage range according to standard characteristic (U_2)	
	TIG	10.1 - 30.0 V
	MIG/MAG	14.2 - 36.5 V
	MMA	20.4 - 40.0 V
	Open circuit voltage (U_0 peak / U_0 r.m.s)	101 V
	Striking voltage (U_P)	10 kV The arc ignition device is suitable for manual operation.
	Protection class	IP23
	Type of cooling	AF
	Overvoltage category	III
	Pollution degree according to IEC60664	3
	EMC emission class	A [2]
	Safety symbols	S, CE
	Dimensions l x w x h	706 x 300 x 720 mm 27.8 x 11.8 x 28.41 in.
	Weight	69.6 kg / 153.44 lb.
	Max. noise emission (LWA)	77 dB (A)
	Idle state power consumption at 400 V	48.5 W
	Power source efficiency at 500 A / 40.0 V	85%
	Max. shielding gas pressure	7 bar/102 psi

1)   Interface to a 230/400 V and 50 Hz public grid
2)   A device in emission class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
Electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

iWave 500i AC/DC /nc	Mains voltage (U_1)	3 x 380 / 400 / 460 V
	Max. effective primary current (I_{1eff})	
	3 x 380 V	26.0 A
	3 x 400 V	24.8 A
	3 x 460 V	21.6 A
	Max. primary current (I_{1max})	
	3 x 380 V	41.0 A
	3 x 400 V	39.2 A
	3 x 460 V	34.2 A
	Mains fuse protection	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]	50 mOhm
	Recommended residual-current circuit breaker	Type B
	Welding current range (I_2)	
	TIG	3 - 500 A
	MIG/MAG	3 - 500 A
	MMA	10 - 500 A
	Welding current at 10 min/40 °C (104 °F)	40% / 500 A 60% / 430 A 100% / 360 A
	Output voltage range according to standard characteristic (U_2)	
	TIG	10.1 - 30.0 V
	MIG/MAG	14.2 - 36.5 V
	MMA	20.4 - 40.0 V
	Open circuit voltage (U_0 peak / U_0 r.m.s)	101 V
	Striking voltage (U_P)	10 kV The arc ignition device is suitable for manual operation.
	Protection class	IP23
	Type of cooling	AF
	Overvoltage category	III
	Pollution degree according to IEC60664	3
	EMC emission class	A [2]
	Safety symbols	S, CE
	Dimensions l x w x h	706 x 300 x 720 mm 27.8 x 11.8 x 28.41 in.

Weight	67.8 kg / 149.470 lb.
Max. noise emission (LWA)	77 dB (A)
Idle state power consumption at 400 V	48.5 W
Power source efficiency at 500 A / 40.0 V	85%
Max. shielding gas pressure	7 bar/102 psi

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

2)   A device in emission class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
Electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

iWave 500i AC/DC /MV/nc	Mains voltage (U_1)	3 x 200/230/240/380/400/460/600 V
	Max. effective primary current (I_{1eff})	
	3 x 200 V	44.6 A
	3 x 230 V	44.0 A
	3 x 240 V	43.1 A
	3 x 380 V	26.0 A
	3 x 400 V	24.8 A
	3 x 460 V	21.6 A
	3 x 600 V	18.9 A
	Max. primary current (I_{1max})	
	3 x 200 V	70.5 A
	3 x 230 V	69.9 A
	3 x 240 V	65.5 A
	3 x 380 V	41.0 A
	3 x 400 V	39.2 A
	3 x 460 V	34.2 A
	3 x 600 V	29.8 A
	Mains fuse protection	
	3 x 200/230/240 V	63 A slow-blow
	3 x 380/400/460/600 V	35 A slow-blow
	Mains voltage tolerance	-10 / +6%
	Mains frequency	50 / 60 Hz
	Cos phi (1)	0.99
	Max. permitted mains impedance Z_{max} on PCC[1]	52 mOhm
	Recommended residual-current circuit breaker	Type B
	Welding current range (I_2)	
	TIG	3 - 500 A
	MIG/MAG	3 - 500 A
	MMA	10 - 500 A
	Welding current at 10 min/40 °C (104 °F)	
	U_1 = 200 - 240 V WIG, MIG/MAG	40% / 500 A 60% / 430 A 100% / 360 A
	U_1 = 200 -240V Stick electrode	40% / 450 A 60% / 390 A 100% / 320 A

U_1 = 380 - 600 V	40% / 500 A
	60% / 430 A
	100% / 360 A
Output voltage range according to standard characteristic (U_2)	
TIG	10.1 - 30.0 V
MIG/MAG	14.2 - 36.5 V
MMA	20.4 - 40.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	102 V
Striking voltage (U_P)	10 kV
	The arc ignition device is suitable for manual operation.
Protection class	IP23
Type of cooling	AF
Overvoltage category	III
Pollution degree according to IEC60664	3
EMC emission class	A [2]
Safety symbols	S, CE
Dimensions l x w x h	706 x 300 x 720 mm
	27.8 x 11.8 x 28.41 in.
Weight	69.2 kg / 152.56 lb.
Max. noise emission (LWA)	77 dB (A)
Idle state power consumption at 400 V	48.5 W
Power source efficiency at 500 A / 40.0 V	85%
Max. shielding gas pressure	7 bar/102 psi

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

2)   A device in emission class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
Electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Radio parameters   Compliance with directive 2014/53/EU - Radio Equipment Directive (RED)

The following table provides information on the frequency bands used and the maximum HF transmission power of Fronius wireless radio products sold in the EU, in accordance with Articles 10.8 (a) and 10.8 (b) of the RED.

Frequency range Channels used Power	Modulation
2412 - 2462 MHz Channel: 1 - 11 b, g, n HT20 Channel: 3 - 9 HT40 < 16 dBm	802.11b: DSSS (1 Mbps DBPSK, 2 Mbps DQPSK, 5.5/11 Mbps CCK) 802.11 g: OFDM (6/9 Mbps BPSK, 12/18 Mbps QPSK, 24/36 Mbps 16-QAM, 48/54 Mbps 64-QAM) 802.11n: OFDM (6.5 Mbps BPSK, 13/19 Mbps QPSK, 26/39 Mbps16-QAM, 52/58.5/65 Mbps 64-QAM)
13.56 MHz -14.6 dBµA/m at 10 m	Functions: R/W, card emulation and P2P Protocol standards: ISO 14443A/B, ISO15693, ISO18092, NFCIP-2, Data rate: 848 kbps Reader/writer, card emulation, peer to peer modes
2402 - 2482 MHz 0 - 39 < 4 dBm	GFSK

Overview with critical raw materials, year of production of the device

Overview with critical raw materials:
An overview of which critical raw materials are contained in this device can be found at the following Internet address.
www.fronius.com/en/about-fronius/sustainability.

To calculate the year of production of the device:
- Each device is provided with a serial number
- The serial number consists of 8 digits - for example 28020099
- The first two digits give the number from which the year of production of the device can be calculated
- This figure minus 11 gives the year of production
    - For example: Serial number = **28**020065, calculation of the year of production = **28** - 11 = 17, year of production = 2017

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