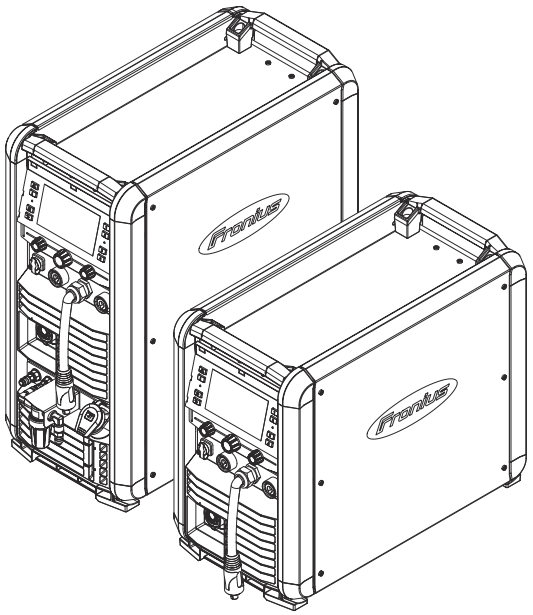
Operating Instructions

Fortis 270 C /G, Fortis 320 C /G
Fortis 320 C /GW, Fortis 400 C /GW
Fortis 500 C /GW
Fortis 320 /GW, Fortis 400 /GW
Fortis 500 /GW



EN-US | Operating instructions

42,0426,0498,EA 005-30092025

Table of contents

General information

General

Explanation of safety instructions

⚠ DANGER!

Indicates an immediate danger.
Could result in major injury or death.
▶ Avoid the described danger.

⚠ WARNING!

Indicates a dangerous situation.
Could result in serious injury or death.
▶ Avoid the dangerous situation.

⚠ CAUTION!

Indicates a harmful situation.
Could result in injury and damage to property.
▶ Avoid the harmful situation.

NOTE!

Indicates the possibility of damage to property and adverse effects on work results, as well as necessary additional information, tips and tricks, recommendations, etc.

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.

Safety symbols

Devices with the CE label meet the requirements of all valid EU Directives, such as:
- Directive 2014/30/EU on electromagnetic compatibility
- Directive 2014/35/EU Low Voltage Directive
- Directive 2014/53/EU Radio Equipment Directive
- EN IEC 60974 Arc welding equipment
- and others

The full text of the EU Declaration of Conformity is available at https://www.fronius.com .

Devices bearing the CSA label satisfy the requirements of the relevant standards for Canada and the USA.

Data security

With regard to data security, the user is responsible for:
- backing up any changes made to the factory settings
- saving and storing personal settings.

Copyright

Text and illustrations were accurate at the time of printing, subject to change. We are grateful for suggestions for improvement and information on any discrepancies in the operating instructions.

Utilization in accordance with "intended purpose"

Intended use

The device has been manufactured in line with the state of the art and according to recognized safety standards.

The welding machine is only intended for MIG/MAG, MMA, and TIG welding in conjunction with Fronius components.

Any other use shall be deemed to be not in accordance with the intended use.

Intended use also means
- Carefully reading and adhering to these operating instructions
- Observing and obeying all safety instructions
- Carrying out all the specified inspection and maintenance work

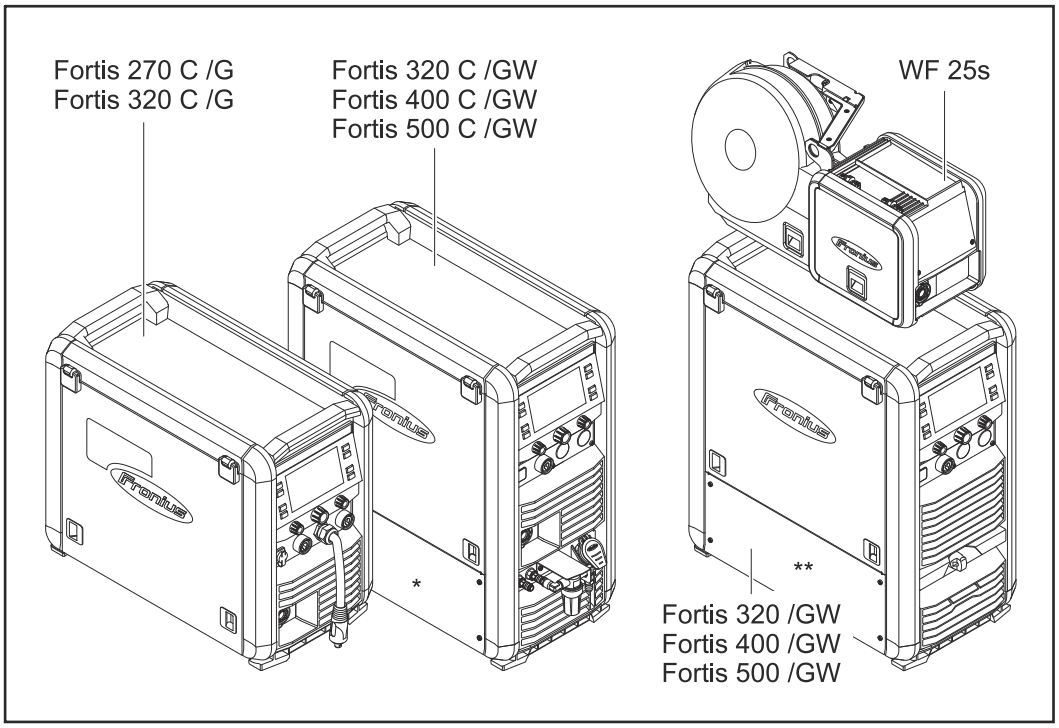
Foreseeable misuse

IMPORTANT! Any use that does not comply with the intended use shall be deemed misuse.

Impermissible misuse includes the following:
- Using the device to thaw pipes
- Using the device to charge batteries/rechargeable batteries
- Using the device to start motors
- Operation or storage of the device outside the environmental conditions specified in the technical data
- Operation or storage of the device outside the protection class specified in the technical data
- ...

Information about the device

Device concept



** Cooling unit option, ** Toolbox option*

The Fortis MIG/MAG welding machine is a digitalized, microprocessor-controlled inverter welding machine.

Depending on the variant, the welding machine is available with integrated 4-roller wire drive or with a separate wirefeeder.

A modular and compact design and the ability to easily extend the system guarantee a high degree of flexibility.

The welding machine can be adapted to any specific situation.

Device overview

Gas-cooled welding machines with integrated wire drive:
- Fortis 270 C /G
- Fortis 320 C /G

Welding machines with integrated wire drive, gas-cooled or optionally water-cooled or optionally with toolbox:
- Fortis 320 C /GW
- Fortis 400 C /GW
- Fortis 500 C /GW

Welding machines with separate WF 25s wirefeeder, gas-cooled or optionally water-cooled or optionally with toolbox:
- Fortis 320 /GW
- Fortis 400 /GW
- Fortis 500 /GW

Explanation of the abbreviations:

C	Welding machine with integrated 4-roller wire drive
/G	Gas-cooled (small machine housing)
/GW	Gas-cooled or water-cooled (large machine housing)

In addition to the standard version, all welding machines are also available in the following versions:

/nc	without mains cable
/XT	Extended (larger voltage range, lower energy consumption, single-phase usage, CEL welding)
/600	Input voltage of 600 V (only for welding machines with 400 A and 500 A)

Operating principle

The central control and regulation unit of the welding machines is coupled with a digital signal processor. The central control and regulation unit and signal processor control the entire welding process.
During the welding process, the actual data is measured continuously and the device responds immediately to any changes. Rule 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 machines are used commercially for manual applications, mainly with steel and galvanized sheets.
However, aluminum, other metals, and alloys as well as flux core wires can also be welded.

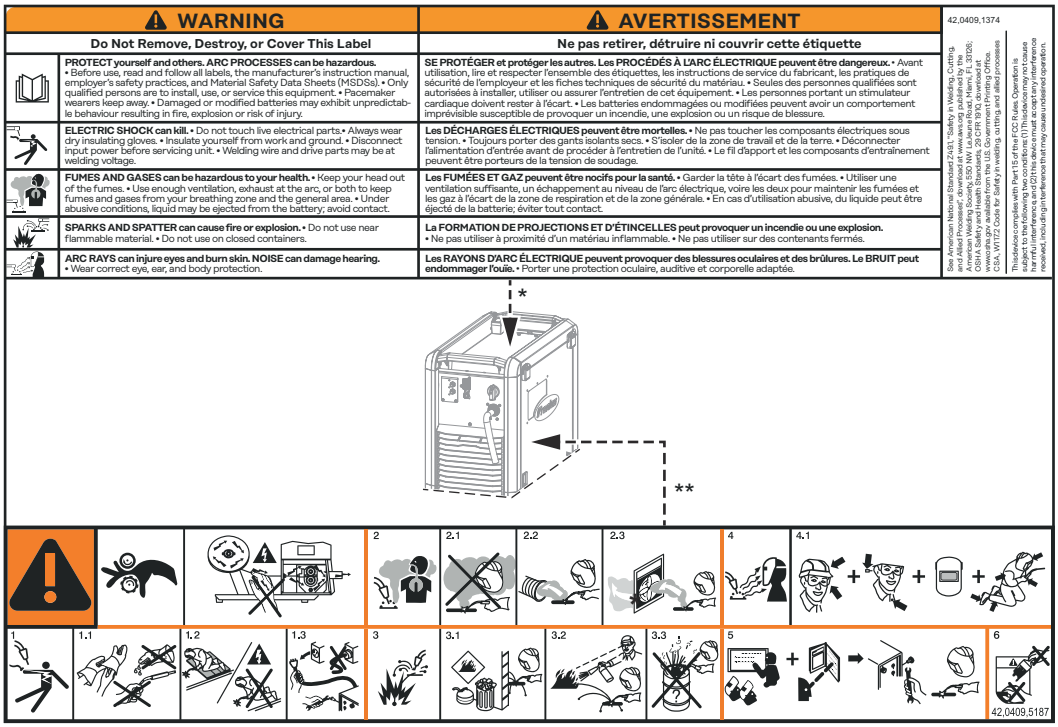
Common areas of application include
- Mechanical and equipment engineering
- Steel construction
- Plant and container construction
- Metal and portal construction
- Rail vehicle construction
- Repair and maintenance
- Assembly in shipyards
- Automotive suppliers
- etc.

Notes on the device

Notes on the device

A rating plate and various safety symbols are attached to the device, depending on the device version.
The safety symbols indicate dangers during welding operation that can result in serious personal injury and damage to property if not observed.

Rating plate and safety symbols
- Must be kept in a legible state
- Must not be damaged
- Must not be removed
- Must not be covered, pasted or painted over



* For all Fortis /XT and Fortis /600V welding machines

** Only for Fortis C /XT and Fortis C /600V welding machines on the inside of the device

Safety symbols on the rating plate:

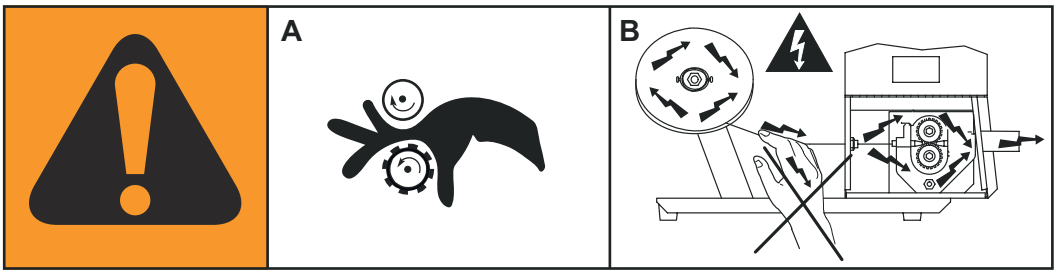
Welding is dangerous. The following basic requirements must be met:
- Adequate welding qualifications
- Appropriate protective equipment
- Exclusion of unauthorized persons

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

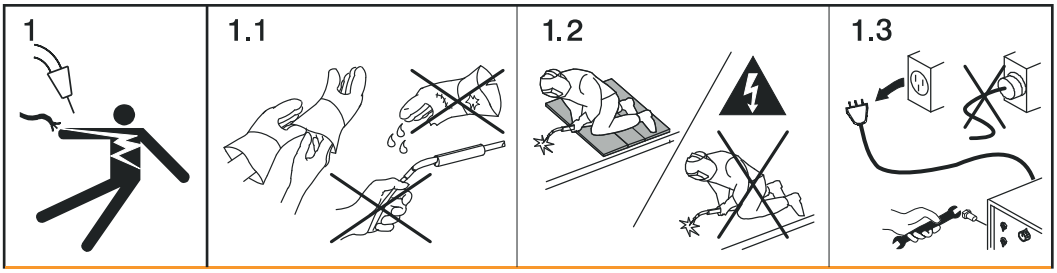
Description of the warnings on the device

Warning notices are attached to the device for certain device versions.

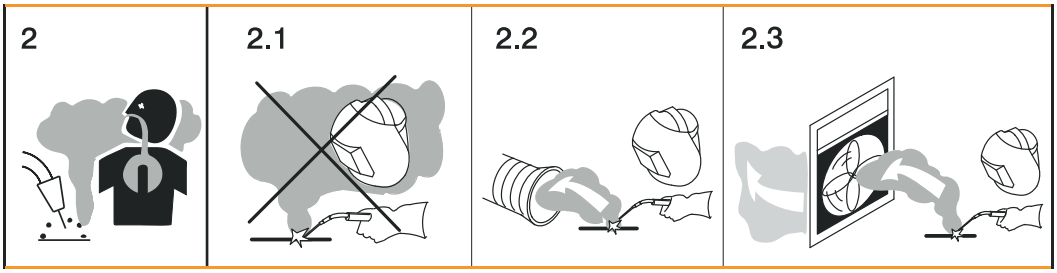
The arrangement of the symbols may vary.



!	**Warning! Caution!** **The symbols represent possible dangers.**
A	Drive rollers can injure fingers.
B	The welding wire and drive parts are under welding voltage during operation. Keep hands and metal objects away!

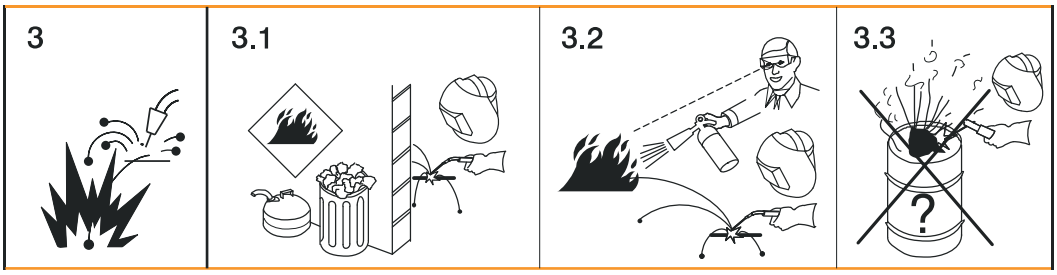


1.	An electric shock can be fatal.
1.1	Wear dry, insulating gloves. Do not touch the wire electrode with bare hands. Do not wear wet or damaged gloves.
1.2	Use a base that is insulated from the floor and work area to protect against electric shock.
1.3	Before working on the device, switch off the device and remove the mains plug or disconnect the power supply.

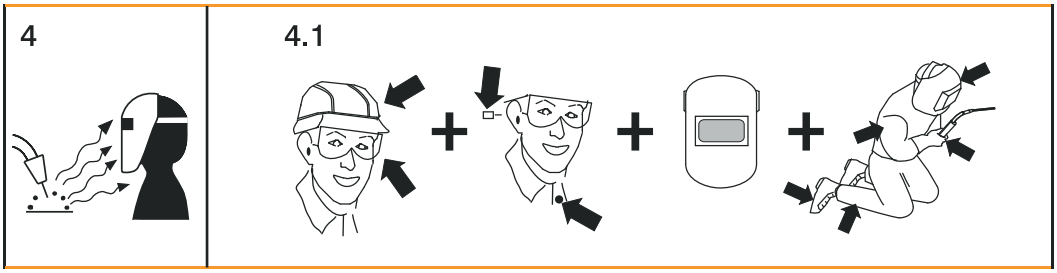


2.	Inhalation of welding fumes can be harmful to health.
2.1	Keep your face away from any welding fumes.

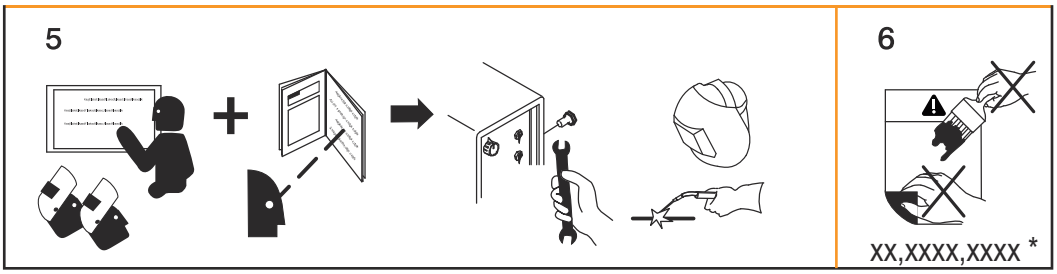
2.2	Use forced-air ventilation or local extraction to remove welding fumes.
2.3	Remove welding fumes with a fan.



3.	Welding sparks can cause an explosion or fire.
3.1	Keep flammable materials away from the welding process. Do not perform welding near flammable materials.
3.2	Welding sparks can cause a fire. Have fire extinguishers ready. If necessary, have a supervisor ready who can operate the fire extinguisher.
3.3	Do not weld on drums or closed containers.

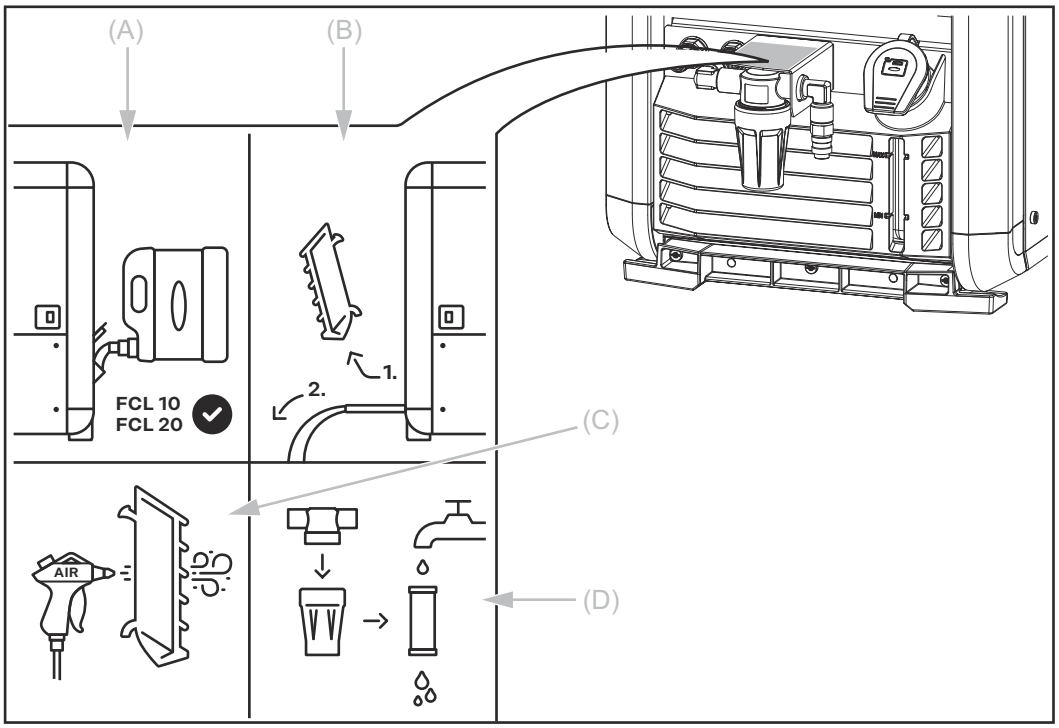


4.	Arc rays can burn the eyes and injure the skin.
4.1	Wear headgear and protective goggles. Use ear protection and wear a shirt collar with button. Use a welding helmet with the correct tinting. Wear suitable protective clothing over the entire body.



5.	Before working on the machine or welding: undertake training on the device and read the instructions!
6.	Do not remove or paint over the sticker with the warnings.
*	Manufacturer order number of the sticker

Notes on the optional cooling unit



(A) The cooling unit must only be operated using Cooling Liquid FCL10/20. Other coolants are not suitable due to their electrical conductivity and insufficient material compatibility.
See also 'Filling the cooling unit' from page 117 onwards.

(B) Draining the coolant
See also 'Replacing the coolant' from page 119 onwards.

(C) Cleaning the fin element using compressed air

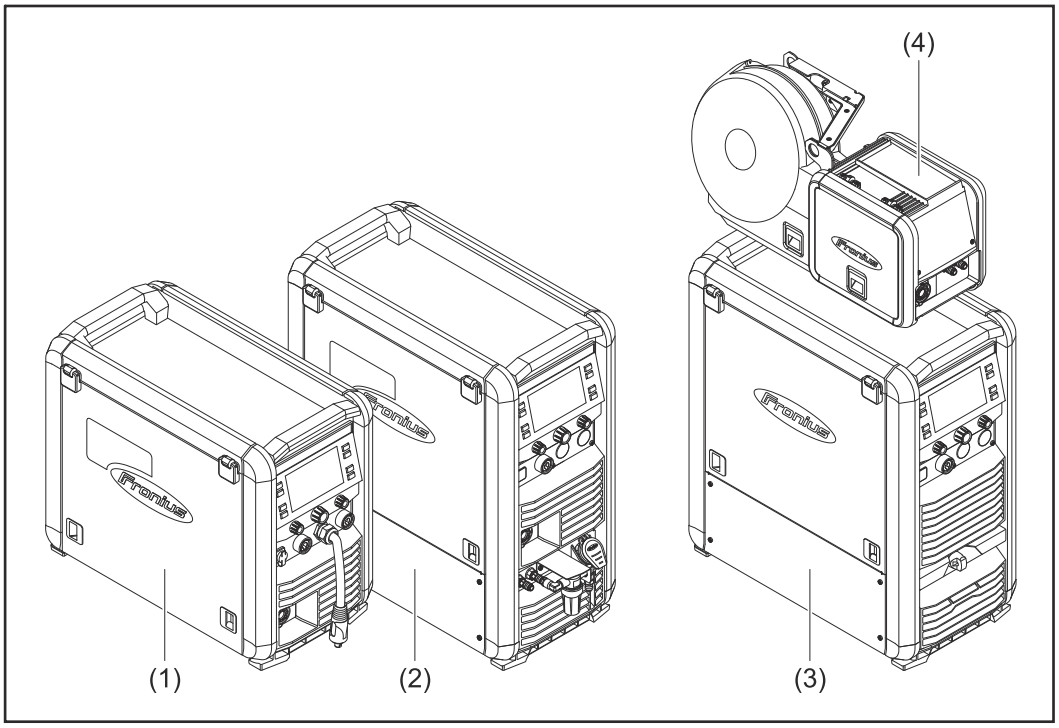
(D) Cleaning the cooling unit filter
See also 'Cleaning the cooling unit filter' from page 270 onwards.

System components

General

The welding machines can be operated with various system components and options. This makes it possible to optimize procedures and to simplify machine handling and operation, depending on the field of application for the welding machine.

System components



System components

(1)	**Fortis 270 - 320 C /G welding machine (with integrated wirefeeder)**
(2)	**Fortis 320 - 500 C /GW welding machine (with integrated wirefeeder)** **+** **optional cooling unit**
(3)	**Fortis 320 - 500 GW welding machine** **+** **optional toolbox**
(4)	**WF 25s wirefeeder**

Other system components (not shown):
- Welding torch
- Remote control RC Bar / RC Panel
- Trolley and gas cylinder holders
- Wirefeeder trolley Trabant WF /s
- Interconnecting hosepacks
- Grounding and electrode cable
- TIG welding torch
- Human /s hosepack boom
- TIG Multi Connector Automatic Interface
- Options

Options

OPT/s Duo
Hardware extension for a C /GW welding machine in order to be able to additionally operate an external WF 25s wirefeeder (= DUO operation)

OPT/s CU 1200
Optional water cooling for the welding machines Fortis 320 - 500 C /GW and Fortis 320 - 500 /GW
incl. start-up monitoring and temperature sensors

OPT/s CU 1200 MC
Optional water cooling for the welding machines Fortis 320 - 500 C /GW and Fortis 320 - 500 /GW, also for DUO operation
incl. temperature sensors, coolant connections at the rear and front, bracket, and flow sensor

The filter can also be mounted on the rear of the device.

DUO operation:
The Fortis 320 - 500 C /GW welding machines are also operated with a separate WF 25s wirefeeder.

OPT/s Water Connection DUO
Double water connections on the cooling unit (required for DUO operation)

The filter can also be mounted on the rear of the device.

OPT/s CU Flow Sensor
Flow sensor for the cooling unit

OPT/s VRD Class A
Safety option to reduce open circuit voltage

OPT/s Toolbox
Removable, lockable toolbox for the gas-cooled welding machines Fortis 320 - 500 C /GW and Fortis 320 - 500 /GW

OPT/s Ethernet
Optional RJ45 Ethernet port to connect the welding machines to a local network

OPT/s MP 400/500, OPT/s MP 400/500 XT /600 V
Multiprocess
incl. additional TIG socket, built-in gas solenoid valve, polarity reverser, and TIG Multi Connector port

- Standard for the welding machines Fortis 270 C /G, Fortis 320 C /G, and Fortis 320 C /GW, in the standard and XT variants
- Optional for the welding machines Fortis 400 C /GW and Fortis 500 C /GW
- Not available for the welding machines Fortis 320 - 500 /GW

OPT/s TMC 400/500
Optional TIG Multi Connector port for non-Multiprocess devices

OPT/s Current Socket Front
Additional current socket on the front for 400 / 500 A welding machines (e.g., for arc air gouging)

OPT/s Welding Torch Holder

OPT/s Organizer
Small parts storage on the top of the welding machine

AI IO TMC /s
Automatic Interface

OPT/s NFC Reader /TMC
External NFC card reader
- To lock or unlock the control panel using an NFC key
- To activate/deactivate user management

OPT/s VRD Class A /IK
VRD Class A functionality

OPT/s MultiProcess
For enhanced TIG and MMA functionality

Standard for the Fortis 270 C /G and Fortis 320 C /G
Optional for the Fortis 400 C and Fortis 500 C

Software options

OPT/s Pulse/Std Mix Fortis
All MIG/MAG mix characteristics and the additional characteristic property "mix" are available on the welding machine.

OPT/s Retro TransSteel
All MIG/MAG standard and pulse characteristics of the TransSteel series and the additional characteristic property "Retro" are available on the welding machine.

OPT/i WeldCube Navigator
Software for creating digital instructions for manual welding processes, which are processed by welders.
The welder is guided through the welding instructions by WeldCube Navigator.

For the OPT/i WeldCube Navigator option to work properly, the OPT/s Job, OPT/s Documentation, and OPT/s NFC Reader options must be available on the welding machine.

For Fortis C devices without multiprocess, the OPT/s TMC 400/500 option must also be available on the welding machine.
For Fortis /GW devices, the OPT/s WF TIG Multi Connector port option must be available on the WF 25s wirefeeder or the OPT/s TMC 400/500 option must be available on the welding machine.

OPT/s Duo
Duo functionality (two welding lines)

For the OPT/s Duo option to work properly, the OPT/s Duo /IK option or the OPT/s Duo CK option must be available on the welding machine.

OPT/s Documentation
To document the welding data

Without OPT/s Documentation only a logbook with events is available.

OPT/s Jobs
With the OPT/s Jobs option, the job process is available, including Load More EasyJobs, Optimize job, Duplicate job, Job correction limits, and Delete job.

Without OPT/s Job, only a maximum of four EasyJobs can be saved and selected.

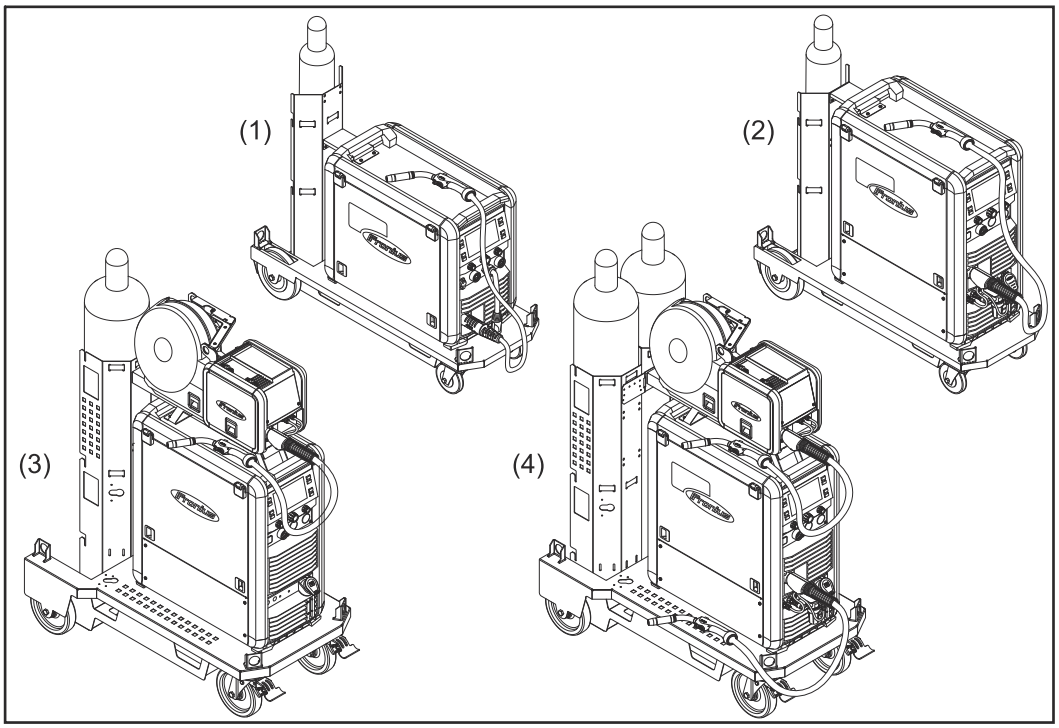
BLE-WIFI24 inside
WLAN and Bluetooth functionality on the welding machine control panel (for certified countries)

Depending on the country, the option is automatically released on the welding machine.

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

Option OPT/s NFC Reader /TMC is required for the option OPT/i Custom NFC - ISO 14443A.

System configurations



(1) Fortis C /G
+
TU Move 4 Standard

(2) Fortis C /GW
+
TU Move 4 Standard

(3) Fortis /GW
+
WF 25s
+
TU Move 4 Pro

(4) DUO
Fortis C /GW
+
OPT/s Duo
+
WF 25s
+
TU Move 4 Pro
+
OPT/TU 2nd gas cylinder /s

Welding packages, welding characteristics and welding processes

Welding Packages

General

The welding machines 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 (WP) are available for the welding machines:

WP Standard Fortis
4,066,023
(enables MIG/MAG standard welding)

WP Pulse Fortis
4,066,024
(enables MIG/MAG pulse welding)

WP Standard/Pulse Fortis
4,066,025
(enables MIG/MAG standard welding and MIG/MAG pulse welding)

IMPORTANT! On a welding machine without Welding Packages, only the following welding processes are available:
- MIG/MAG manual welding
- TIG welding (with gas-valve welding torch)
- Manual metal arc welding
- CEL welding (only with /XT devices)

Welding characteristics

Welding characteristics

Depending on the welding process and shielding gas combination, various process-optimized welding characteristics are available when selecting the filler metal.
The welding characteristics have special properties that provide information about usage.

Special properties and use of the welding characteristics
(described according to the following pattern):

Property
Process

Description

---

dynamic
Puls, Standard

Characteristic for deep penetration and reliable root formation at high welding speeds

---

mix
Puls

Characteristic for the generation of a rippled weld seam.
The heat input into the component is specifically controlled by the cyclic process change between pulse and dip transfer arc.

PCS
Puls + Standard

The characteristic changes directly from the pulsed arc to a concentrated spray arc above a certain power. The advantages of pulsed and spray arcs are combined in one characteristic.

---

retro
Pulse, Standard

The characteristic has the same welding properties as the predecessor TransSteel (TSt) device series.

---

root
Standard

Characteristics for root passes with powerful arc

---

universal
Puls, Standard

The characteristic is very well suited for all common welding tasks.

Welding processes and process functions

MIG/MAG pulse welding

MIG/MAG pulse 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.

MIG/MAG pulse welding can be set on the control panel of the welding machine under "Pulse" in the welding processes.

MIG/MAG standard welding

MIG/MAG standard welding is a MIG/MAG welding process covering the entire power range of the welding machine with the following arc types:

Dip transfer arc
Droplet transfer occurs in the lower power range during the short circuit.

Intermediate arc
The intermediate arc alternates irregularly between short circuits and spray transfers. This results in increased spatter. It is not possible to use this arc effectively, so it is better to avoid it.

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

MIG/MAG standard welding can be set on the control panel of the welding machine under "Standard" in the welding processes.

MIG/MAG manual welding

MIG/MAG manual welding is a MIG/MAG welding process in which the wire speed, the welding voltage, and the arc-force dynamic (a correction parameter) are set separately.

MIG/MAG manual welding can be set on the control panel of the welding machine under "Manual" in the welding processes.

SynchroPulse welding

SynchroPulse is available for all process (Standard / Pulse).
The cyclic change of the welding power between two operating points with SynchroPulse achieves a finely rippled weld appearance and a non-continuous heat input.

Stitch welding

With stitch welding, all welding processes can be interrupted cyclically. As such, the heat input is controlled in a targeted manner.
The welding time, pause time and the number of interval cycles can be set individually (e.g. for producing a rippled weld seam, for tacking thin sheets or, in the case of longer pause times, for simple, automatic spot welding operation).

Stitch welding is possible with every operating mode.
In special 2-step mode and special 4-step mode, no interval cycles are executed during the start and end phases. The interval cycles are only executed in the main process phase.

TIG welding

TIG welding is a welding process in which the arc is ignited between the workpiece and a non-consumable, heat-resistant tungsten electrode. The arc fuses the base material. Depending on the application, filler metal can be fed into the weld pool in the form of rods or welding wires.
The weld pool is surrounded by an inert shielding gas environment in order to protect the weld pool from reactions with the ambient air.

TIG welding can be set on the control panel of the welding machine under "TIG" in the welding processes.

Manual metal arc welding

Manual metal arc welding is a manual welding process in which a sheathed stick electrode is melted.
The sheath of the stick electrode melts during welding, releasing gas and slag that protect the weld pool from reactions with the ambient air.

Manual metal arc welding can be set on the control panel of the welding machine under "MMA" in the welding processes.

Gouging (Arc Air Gouging)

In arc air gouging, an arc is ignited between a carbon electrode and the workpiece; the base material is melted and blown out with compressed air.
The operating parameters for arc air gouging are defined in a special characteristic.

Applications:
- Removal of shrink holes, pores, or slag inclusions from workpieces
- Detaching sprues or the processing of entire workpiece surfaces in foundries
- Edge preparation for heavy plates
- Preparation and repair of weld seams
- Finishing of roots or defects
- Production of air gaps

IMPORTANT! Arc air gouging is only possible with steel materials!

Operating controls, connections and mechanical components

Control Panel

General

The parameters necessary for welding can be easily selected and changed using dials.
The parameters are shown on the display during welding.

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 controls of your device. These operating controls function in exactly the same way, however.

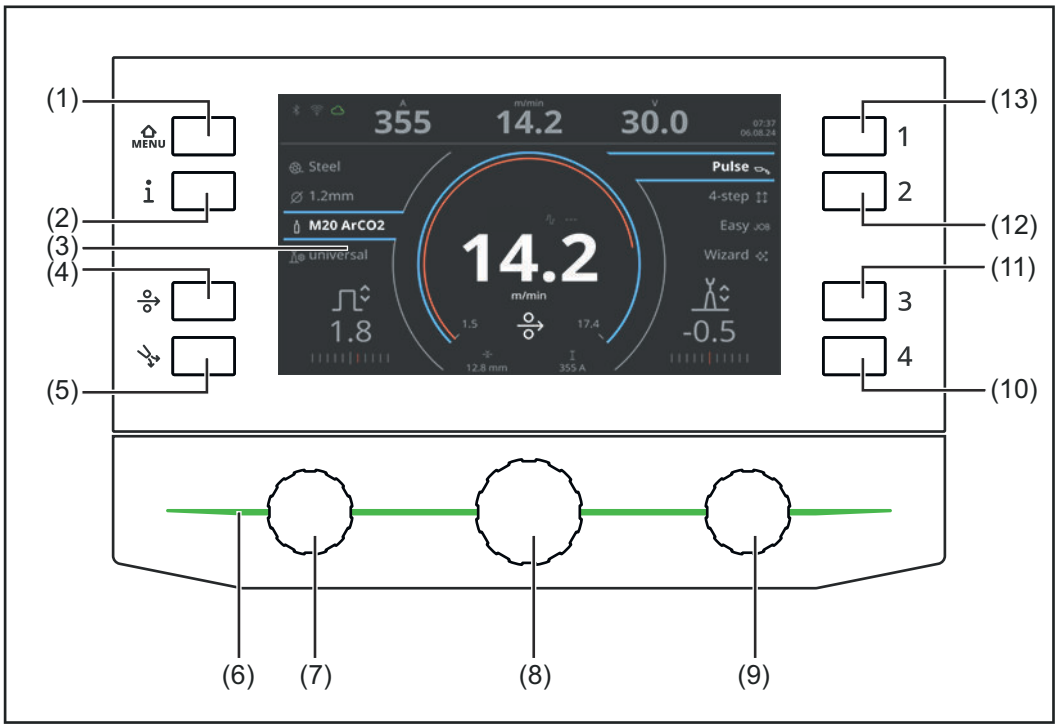
Danger due to incorrect operation

⚠ **WARNING!**

Danger due to incorrect operation and work not carried out correctly.
This may result in serious personal injury and damage to property.

- ▶ All the work and functions described in this document must be carried out by technically trained and qualified personnel only.
- ▶ Read and understand this document in full.
- ▶ Read and understand all safety rules and user documentation for this equipment and all system components.

Control panel



No.	Function
(1)	**Menu button** To open the Setup menu
(2)	**Information button** For retrieving a variety of information on the operation of the welding machine
(3)	**Display**
(4)	**Wire-threading button** For threading the wire electrode into the torch hosepack without gas or current After pressing the button, an animated graphic with motor current, motor power, and conveyed wire length is displayed. The feeder inching speed can be changed immediately using the middle selection dial (8).
(5)	**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 it again ends the process prematurely. The display shows an animated graphic with the remaining gas flow duration.

NOTE!

Pressing the Gas-test button also causes a cooling unit to start working.
After pressing the Gas-test button, the cooling unit will then operate for 3 minutes.
▶ Press the Gas-test button only when the welding torch is connected.

(6) Status indicator
Green animated ... Device starting up or restarting
Lights up green ... Device is ready for welding
Lights up white ... Notification
Lights up orange ... Warning
Lights up red ... Error
Blue animated ... Active welding mode
Yellow animated ... Gas test is active
Mint animated ... Wire threading is active

(7) Left-hand selection dial with rotary/push button function
For selecting and setting correction parameters as well as filler metal and shielding gas during MIG/MAG welding

If the left-hand selection dial is pressed for longer than 2 seconds with the correction parameter selected, an additional menu opens. The additional menu allows you to define which parameter is displayed on the welding screen.
For details on setting the parameter displayed on the welding screen, see from page 43 onwards.

(8) Middle selection dial with rotary/push button function
For selecting and setting the main welding parameters

If the middle selection dial is pressed for more than 2 seconds during MIG/MAG welding, the SynchroPulse and Interval process functions can be activated or deactivated.

(9) Right-hand selection dial with rotary/push button function
For selecting and setting welding processes, operating mode, jobs, the welding parameter wizard, and correction parameters

If the right-hand selection dial is pressed for longer than 2 seconds with the correction parameter selected, an additional menu opens. The additional menu allows you to define which parameter is displayed on the welding screen.
For details on setting the parameter displayed on the welding screen, see from page 43 onwards.

(10) Multifunctional dial

(11) Multifunctional dial

(12) Multifunctional dial

(13) Multifunctional dial

The buttons (10) - (13) can be assigned with an EasyJob or with parameters from the Setup menu.
More information about EasyJobs can be found from page 149 onwards

More information about favorite parameters can be found from page 47 onwards

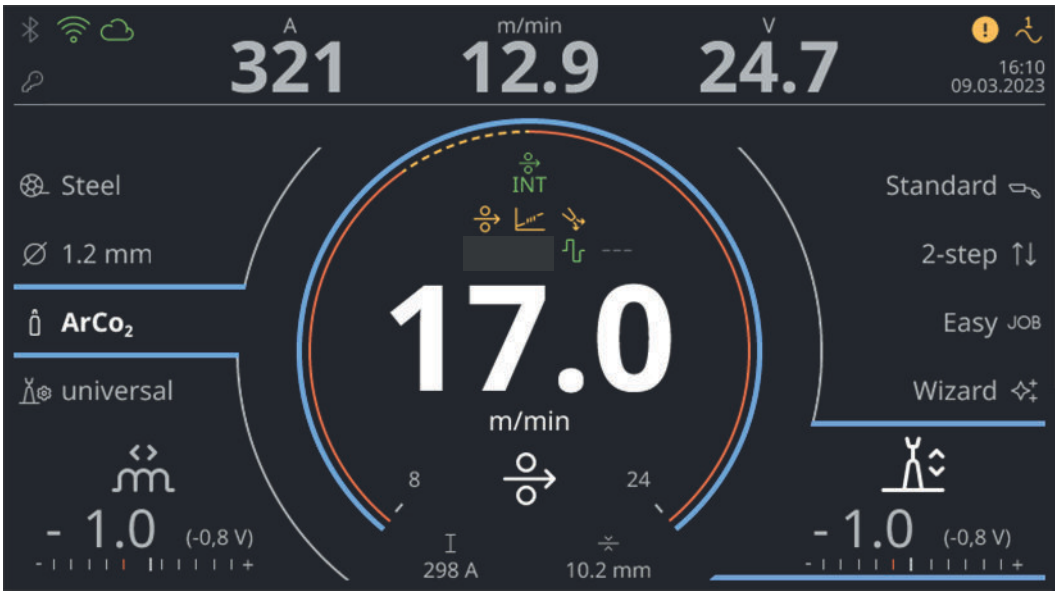
Input options

Turning the selection dial

- Select elements on the display
- Change values

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

A selected element is highlighted in white on the display between two blue lines:





Examples of selected elements

The shielding gas $ArCO_2$ is selected.	The main welding parameter wire speed is selected. The outer circle in the setting area is displayed in blue.	The correction parameter 'arc length correction' is selected.

To change the values of selected elements, press the corresponding selection dial.

Pressing the selection dial

- Open a selected element to change its value.
  The value is changed by turning the selection dial.
- Apply values of specific parameters.
- Confirm or cancel queries, settings, or operations.

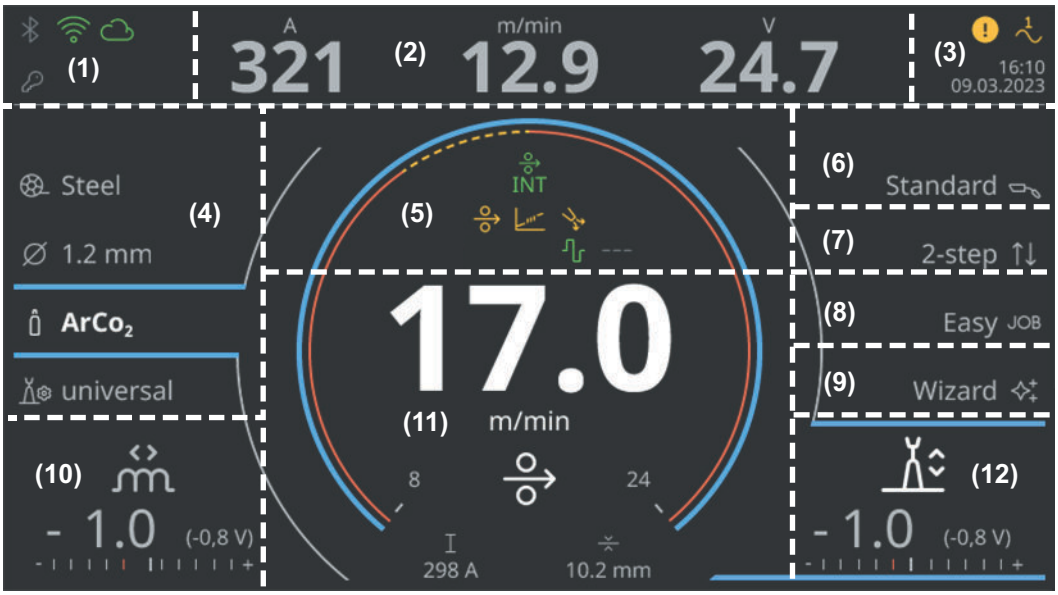
Examples of value changes for selected elements

After pressing the left-hand selection dial, the shielding gas can be changed by turning the left or middle selection dial.

After pressing the middle selection dial, the main welding parameter of wire speed can be changed.
The outer circle in the setting area is displayed in blue.

After pressing the right-hand selection dial, the 4-step operating mode can be changed by turning the right or middle selection dial.

Display



The following information or parameters are displayed in the individual sections of the display.
The displayed parameters vary according to the selected welding process.

No.	Description
(1)	**Bluetooth status indicator (only on certified devices)** - Symbol lights up green: Active connection to a Bluetooth participant - Symbol is gray: Bluetooth activated, no active connection **WLAN status** - Symbol lights up green: Active connection to a WLAN network - Symbol is gray: WLAN is activated but not connected to a WLAN network - Symbol is not displayed: WLAN is deactivated **Cloud status** WeldCube Air The symbol lights up green when there is an active connection to Weld-Cube Air. **Logged-on users / locked state of the welding machine**
(2)	**Welding data** Welding current [A], wire speed [m/min or ipm], welding voltage [V] Different values are displayed depending on the situation: - When setting the standard value - The actual value during welding - The mean value after welding

(3) **Errors, warnings, notes**
Single-phase power supply display (for /XT devices only)
Time
Date

(4) **Filler metal**
Wire diameter
Shielding gas
Characteristic property

(5) Process functions and indicators
The display is gray ... Function possible, but not activated
The indicator lights up green ... Function is activated

Current welding process line
(in Duo operation)

INT = wire drive of the welding machine
EXT = separate wirefeeder

Wire threading indicator
lights up during wire threading if the wire threading graphic is hidden

MIG/MAG:

Intermediate arc indicator during standard welding

TIG:

On Multiprocess welding machines, the symbol for the overloaded electrode is displayed here.

Gas-test indicator
lights up after pressing the Gas-test button if the gas-test graphic is hidden

MIG/MAG:

SynchroPulse indicator

TIG:

During TIG welding, the symbol for TIG pulsing (pulse frequency) is displayed here:

Interval indicator

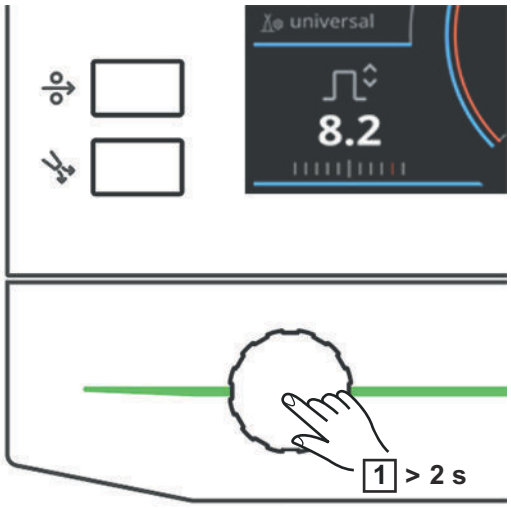
(6) **Welding process**

(7) **Operating mode**

(8)	**Easy JOB / editing JOB** For details see Job Mode from page 150 onwards
(9)	**Welding parameter wizard** For details on the welding parameter wizard, see from page 141 onwards
(10)	**Correction parameters ***
(11)	**Currently set welding parameters (standard value)** + unit **Setting range and symbol of the currently set welding parameter** (setting range depends on the current characteristic) **Symbol and value of the other synergic parameters** Wire speed – welding current – sheet thickness
(12)	**Correction parameters ***
*	Depending on the welding process, the last parameter displayed on the left or right display section can be defined. For details see from page 43 onwards.

Setting the parameter displayed on the welding screen

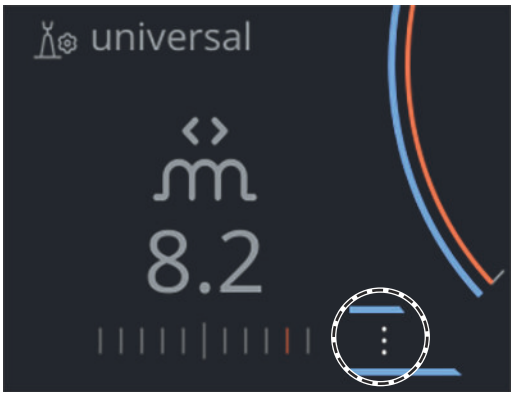
Depending on the selected welding process, an additional menu is available for displaying a parameter on the welding screen.



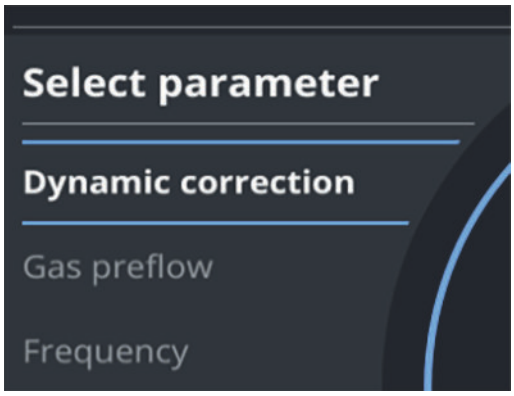
1 With the correction parameter selected, press the left-hand selection dial for longer than 2 seconds

The additional menu is opened and the possible welding parameters are displayed.

Alternative way to open the additional menu:



Additional menu selected (blue line at the top and bottom)



Additional menu

1 Turn the left-hand selection dial and select the additional menu directly

2 Press the left-hand selection dial

The additional menu opens and the possible welding parameters are displayed.

3 Turn the left-hand selection dial and select the desired parameter.

4 Press the left-hand selection dial

The welding parameter is opened for changing.

5 Turn the left-hand selection dial to change the value of the parameter.

6 Press the left-hand selection dial

The value change is accepted.
The parameter is now displayed on the welding screen.

The parameter selection with the right-hand selection dial is performed in the same way.

Animated graphics

For certain parameters, animated graphics are shown on the display.
These animated graphics change when the value of the parameter is changed.

Example: Welding parameters for pulse correction -10 / 0 / +10

Example: Welding parameters for arc length correction -10 / 0 / +10

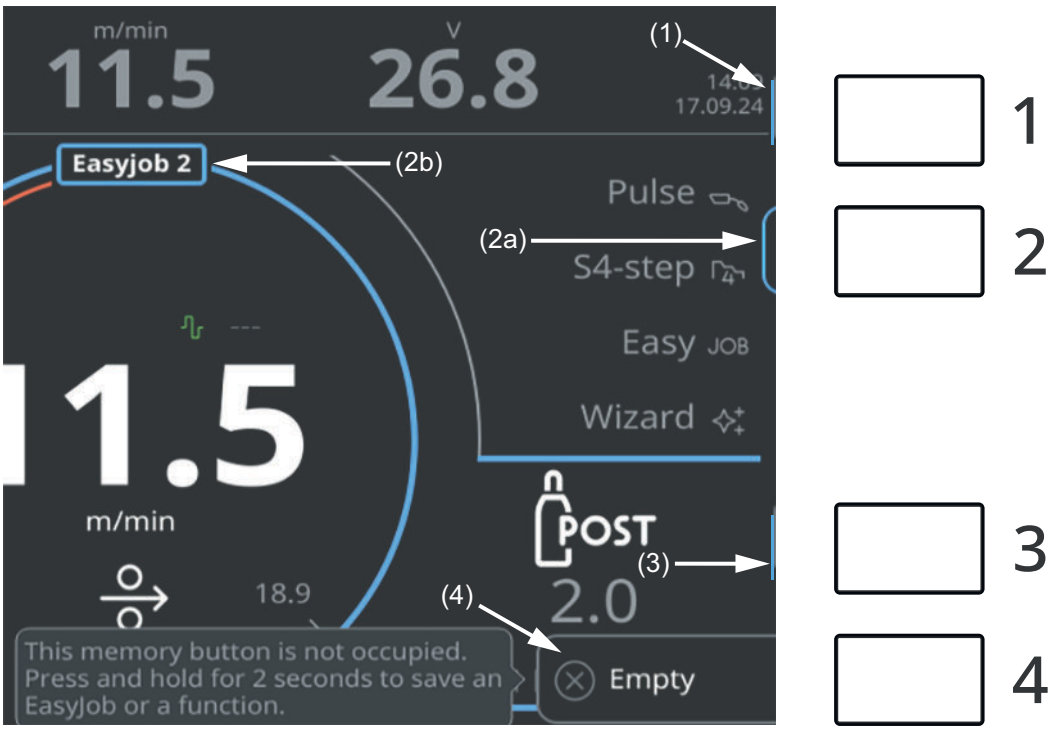
Multifunctional buttons

General

EasyJobs or parameters from the setup menu can be assigned to the four multifunctional buttons on the control panel.
The EasyJobs or the setup parameters can then be easily retrieved with the press of a button.

Button assignment display

The assignment of the multifunctional buttons is shown on the display as per the following example:



Example of different button assignments

Button 1:
The button is assigned but not currently activated.
A thin line (1) is shown on the right edge of the display at the height of the button.

Button 2:
The button is assigned and currently activated.
At the right edge of the display, the left end of a button (2a) is shown at the height of the button.
In addition, the currently active function (2b) is shown in the central display section (e.g., EasyJob 2, as shown in the figure).

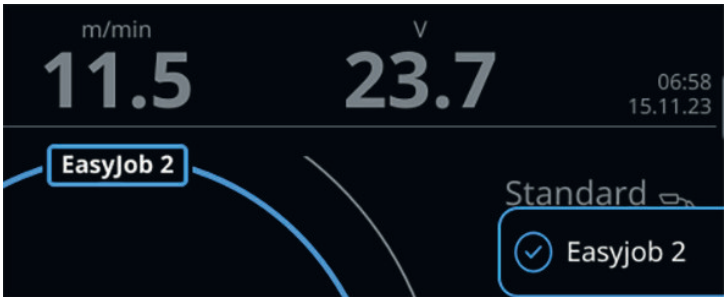
Button 3:
Same as button 1

Button 4:
The button is not assigned.
When the button is pressed, a symbolized empty button (4) is displayed along with info text.

Retrieving an EasyJob

1 To retrieve a saved EasyJob, briefly press the corresponding multifunctional button (< 3 seconds)

A symbolized EasyJob button is shown on the right edge of the display at the height of the button, and the active EasyJob is shown in the central display section.



Example: EasyJob 2

Assigning setup parameters to multifunctional buttons

NOTE!

Instead of EasyJobs, the multifunctional buttons can also be assigned with setup parameters.
A combination of EasyJobs and setup parameters is also possible.
▶ Saving a setup parameter overwrites an EasyJob or setup parameter already saved under the same multifunctional button!

1 Access the Setup menu (press the Menu button)
2 Select the desired menu
3 Select the desired setup parameter
4 Press one of the multifunctional buttons for approx. 3 seconds to store the parameter

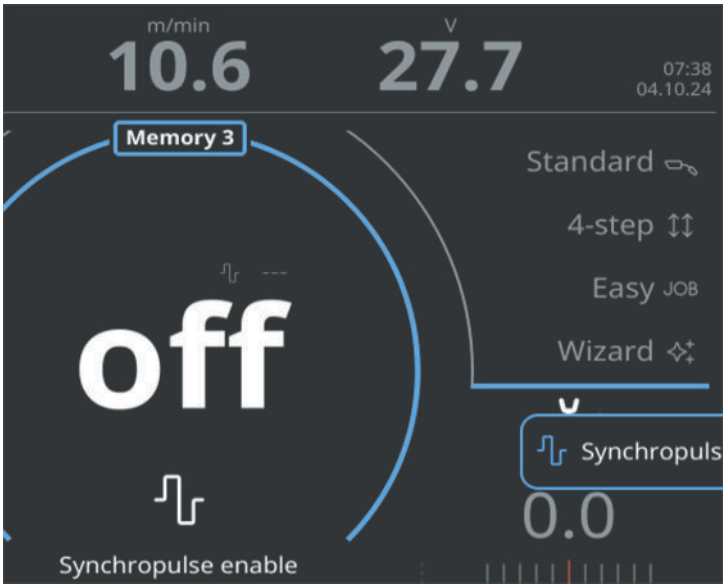
After approx. 3 seconds, a symbolized button with a green frame, the parameter, and the Save symbol are shown on the display, e.g.:

The parameter has been saved under the selected multifunctional button and can be retrieved using this button.

Retrieving setup parameters

1 To retrieve a saved setup parameter, briefly press the corresponding multifunctional button (< 3 seconds)

A symbolized button with the saved parameter is shown on the right edge of the display at the height of the button, and the active storage location is shown in the central display section.



Example: Multifunctional button 3 is assigned SynchroPulse, storage location "Memory 3"

The parameter can now be changed.

Deleting Easy-Jobs or setup parameters from the multifunctional button

1 To delete an EasyJob or a setup parameter, press the corresponding multifunctional button for approx. 5 seconds

After approx. 3 seconds, a symbolized button with a green frame and the Save symbol is shown on the display.
The EasyJob or setup parameter saved under the multifunctional button is overwritten with the current settings.

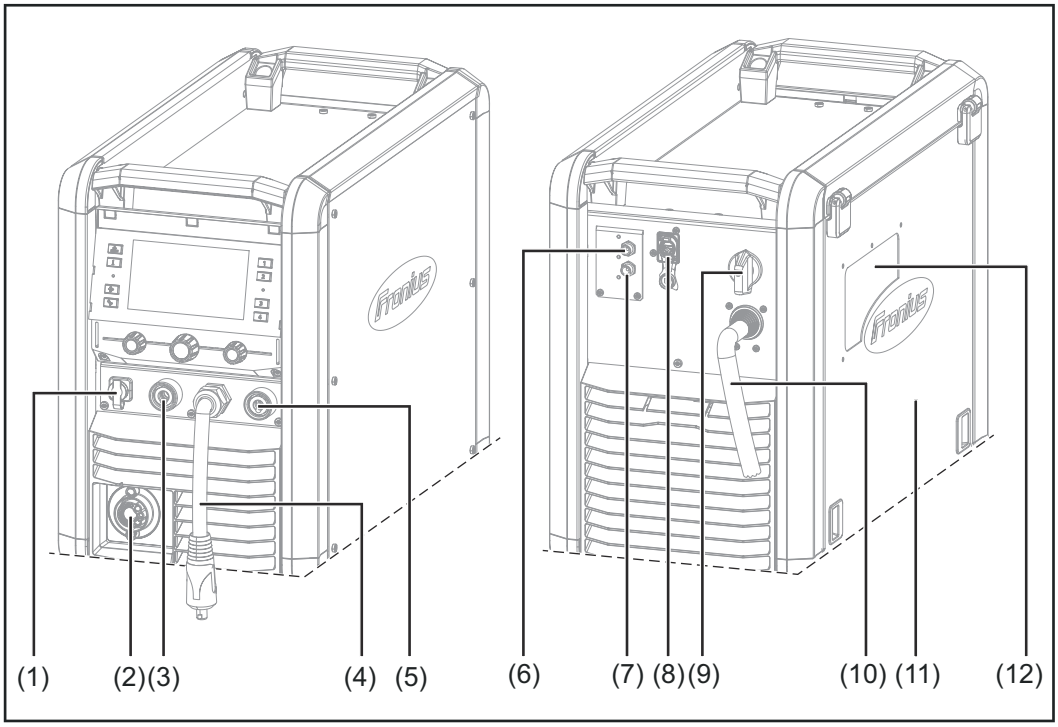
After a total of approx. 5 seconds, the symbolized button is displayed with a red frame and the Delete symbol.

The EasyJob or setup parameter has been deleted from the storage location.

Connections, Switches, and Mechanical Components

Welding machines with integrated wire drive

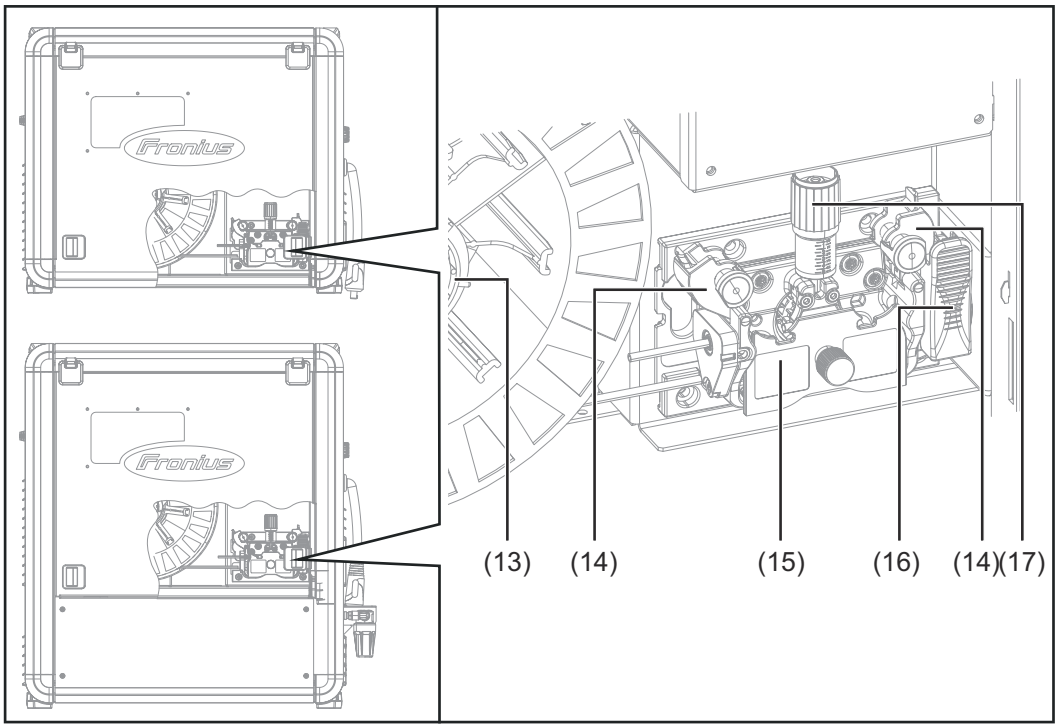
Fortis 270 C /G, Fortis 320 C /G
Fortis 320 C /GW, Fortis 400 C /GW, Fortis 500 C /GW



No.	Function
(1)	**TIG Multi Connector port** included in the option Multiprocess or as a separate option OPT/s TMC 400/500 optional for Fortis 400 C / 500 C for connecting TIG welding torches, remote controls, etc.
(2)	**Welding torch connection** for connecting the FSC welding torch
(3)	**(-) Current socket with bayonet latch** for connecting the return lead cable for MIG/MAG welding; in conjunction with the option Multiprocess with integrated shielding gas connection
(4)	**Polarity reverser** in conjunction with the option Multiprocess To set the welding potential for MIG/MAG welding. No function for TIG and manual metal arc welding.
(5)	**(+) Current socket with bayonet latch** in conjunction with the option Multiprocess or the option front current socket

(6)	**MIG/MAG shielding gas connection socket**
(7)	**TIG shielding gas connection socket** in conjunction with the option Multiprocess
(8)	**RJ45 Ethernet connection** Option
(9)	**Power switch** for switching the welding machine on and off
(10)	**Mains cable with strain relief**
(11)	**Wire spool cover**
(12)	**Viewing window**

4-roller wire drive

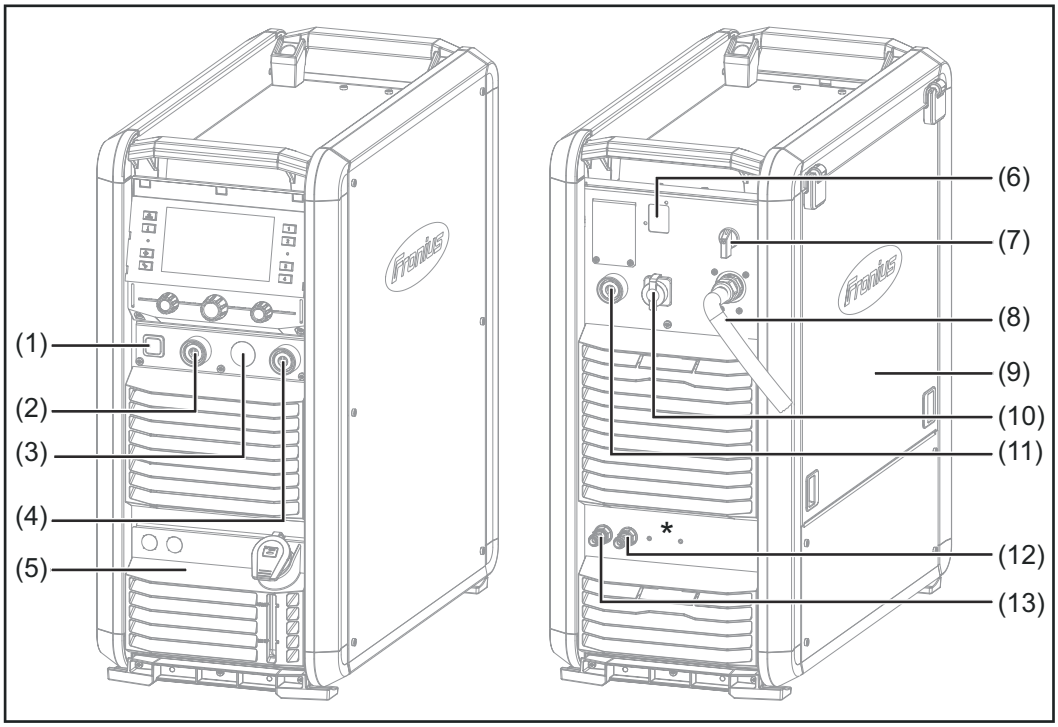


No.	Function
(13)	**Wire spool holder with brake** For holding standard wire spools with a max. outer diameter of 300 mm (11.81 in.) and a max. weight of 19 kg (41.89 lbs.)
(14)	**Swivel levers** for holding the feed rollers
(15)	**Protective cover of the 4-roller drive**
(16)	**Welding torch clamping lever**
(17)	**Clamping lever** for adjusting the contact pressure

For the welding machines Fortis 320 C /GW, Fortis 400 C /GW, and Fortis 500 C /GW, a cooling unit or a toolbox is optionally available.
For details on the optional cooling unit, see from page 53 onwards.
For details on the optional toolbox, see from page 54 onwards.

Welding machines with separate wirefeeder

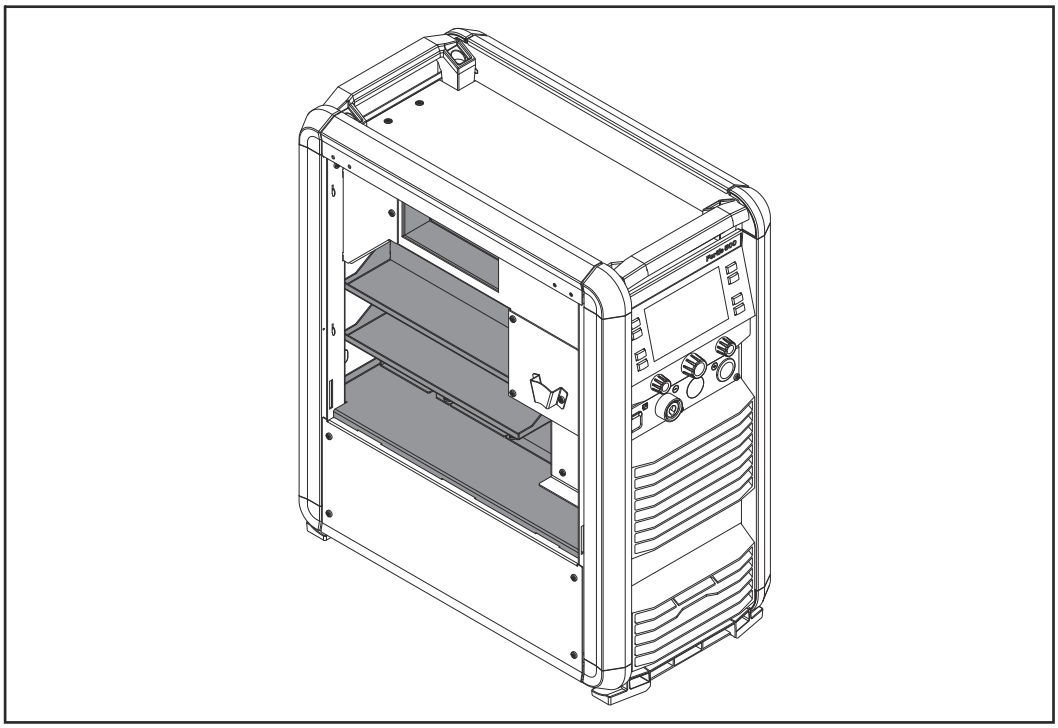
Fortis 320 /GW, Fortis 400 /GW, Fortis 500 /GW



No.	Function
(1)	**Dummy cover** Optional TIG Multi Connector port
(2)	**(-) Current socket with bayonet latch** for connecting the return lead cable for MIG/MAG welding
(3)	**Dummy cover**
(4)	**Front current connection** Option
(5)	**Cooling unit** Option For details on the optional cooling unit, see from page 53 onwards.
(6)	**Dummy cover** Ethernet RJ45 connection option
(7)	**Power switch** for switching the welding machine on and off
(8)	**Mains cable with strain relief**
(9)	**Side cover**
(10)	**Wirefeeder control cable connection** for connecting the control cable from the interconnecting hosepack for MIG/MAG welding
(11)	**(+) Current socket with bayonet latch** for connecting the mains cable from the interconnecting hosepack for MIG/MAG welding

(12)	**Dummy cover** without optional cooling unit or **Coolant return connection (red)** with optional cooling unit
(13)	**Dummy cover** without optional cooling unit or **Coolant supply connection (blue)** with optional cooling unit
*	Coolant filter not shown

Storage compartments with open side cover

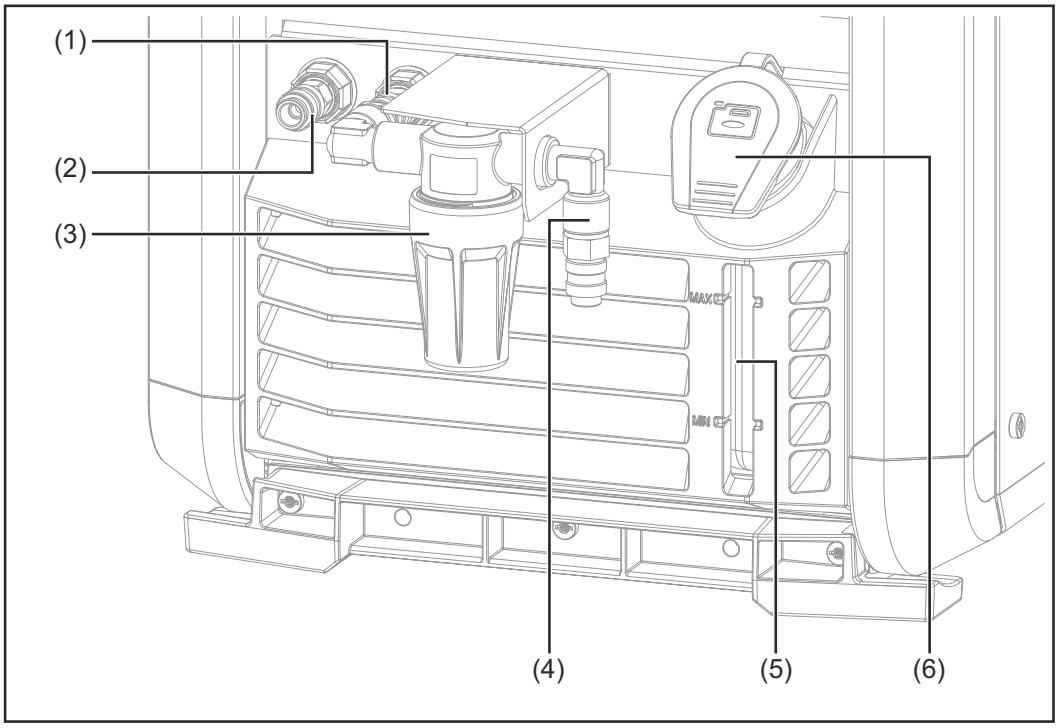


Welding machine without cooling unit and without toolbox, side cover not shown

For the welding machines Fortis 320 /GW, Fortis 400 /GW, and Fortis 500 /GW, a cooling unit or a toolbox is optionally available.
For details on the optional cooling unit, see from page 53 onwards.
For details on the optional toolbox, see from page 54 onwards.

Cooling unit option (OPT/s CU 1200)

Fortis 320 C /GW, Fortis 400 C /GW, Fortis 500 C /GW
Fortis 320 /GW, Fortis 400 /GW, Fortis 500 /GW

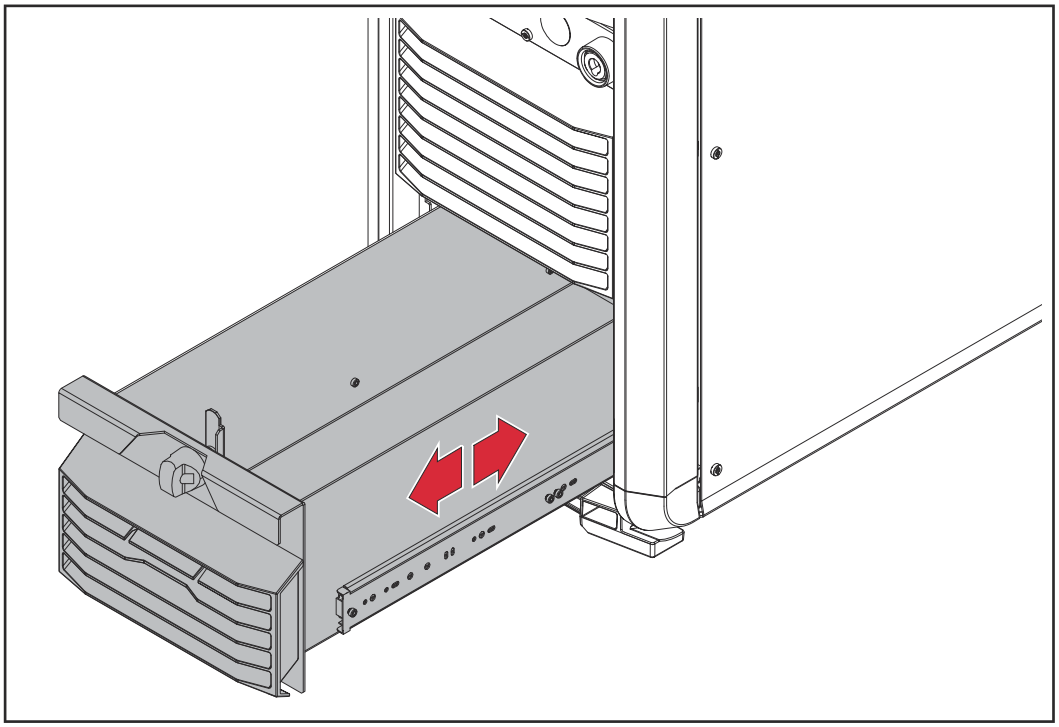


No.	Function
(1)	**Coolant return connection (red)**
(2)	**Coolant supply connection (blue)** The coolant connections can optionally or additionally also be attached to the rear. For cooling units for welding machines with a separate wirefeeder, the coolant connections are fitted on the rear of the cooling unit as standard.
(3)	**Coolant filter**
(4)	**Coolant return connection** with a fitted coolant filter
(5)	**Viewing window of the coolant tank**
(6)	**Filler pipe of the coolant tank**

Toolbox option

Fortis 320 C /GW, Fortis 400 C /GW, Fortis 500 C /GW
Fortis 320 /GW, Fortis 400 /GW, Fortis 500 /GW

The toolbox option can only be installed on gas-cooled welding machines.



Lockable toolbox

A standard padlock with a shackle diameter of 6-8 mm is required to lock the toolbox.

Before installation and initial operation

Minimum equipment for welding operations

General

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

Gas-cooled MIG/MAG welding

For welding machines with Integrated wire drive:
- Welding machine
- Return lead cable
- MIG/MAG welding torch, gas-cooled
- Shielding gas supply
- Wire electrode

In addition, for welding machines with separate wirefeeder:
- Wirefeeder
- Interconnecting hosepack

Water-cooled MIG/MAG welding

For welding machines with Integrated wire drive:
- Welding machine with cooling unit
- Return lead cable
- MIG/MAG welding torch, water-cooled
- Shielding gas supply
- Wire electrode

In addition, for welding machines with separate wirefeeder:
- Wirefeeder
- Interconnecting hosepack

TIG DC welding

- Welding machine
- Return lead cable
- TIG gas-valve welding torch
- Shielding gas supply
- Filler metal, depending on application

Manual metal arc welding

- Welding machine
- Return lead cable
- Electrode holder with welding power-lead
- Stick electrodes

Arc air gouging

- Welding machine (400 / 500 A)
- Return lead cable 120 mm^2
- KRIS 13 arc air gouging torch
- Compressed air supply

Before installation and initial operation

Danger due to incorrect operation

⚠ WARNING!

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

Generator-powered operation

The welding machine is generator-compatible.

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

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

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:

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

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 welding machine!

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.

Information on system components

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

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

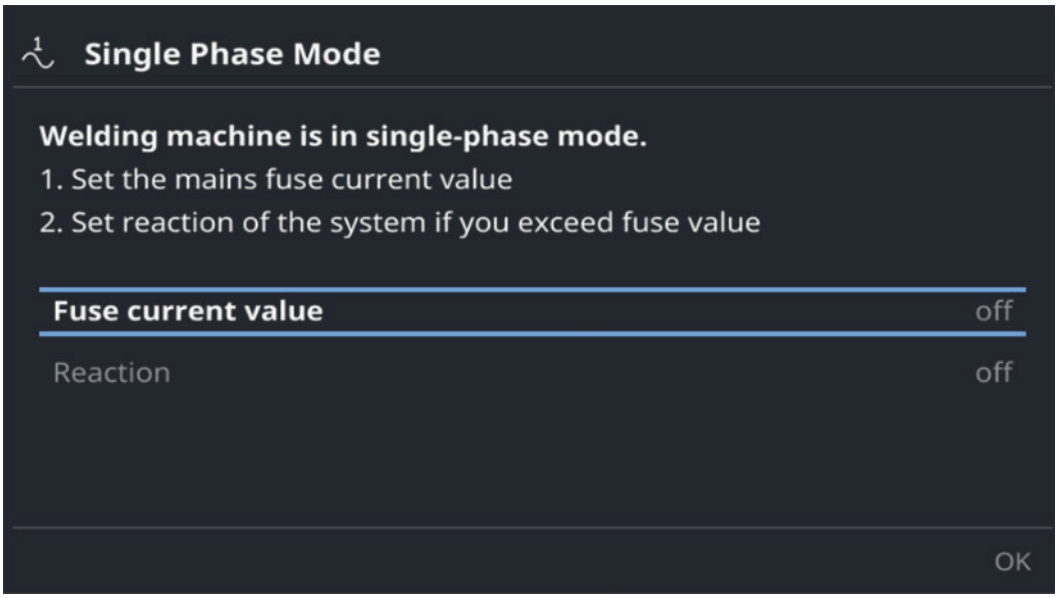
For more detailed information about installing and connecting the system components, please refer to the appropriate operating instructions.

Single-phase power supply

Single-phase power supply

The XT variants of the welding machines can also be operated with a single-phase power supply.

With a single-phase power supply, a corresponding message is shown on the display every time the welding machine is started up:



Welding machine is in single-phase mode.
Mains fuse and reaction must be checked or set.

This message can be confirmed or disappears after a timer has expired.
Once the message has been confirmed/disappears, the symbol for single-phase mode remains on the display.
The symbol can change color, for example, if "warning" or "power limitation" has been set for the reaction.

For details on the mains fuse and reaction, see from page 228 onwards.

IMPORTANT! With a single-phase power supply, the output power of the welding machines is reduced as follows:

	Max. output power		
	MIG/MAG	TIG	MMA
Fortis 270 XT	max. 240 A	max. 240 A	< 240 A
Fortis 320 XT	max. 270 A	max. 270 A	< 270 A
Fortis 400 XT	max. 320 A	max. 320 A	< 320 A
Fortis 500 XT	max. 320 A	max. 320 A	< 320 A

For a single-phase power supply of the welding machine, the mains cable must be correctly connected.
For details on connecting a single-phase mains cable, see from page 66 onwards.

Connecting the mains cable to the welding machine

Specified mains cable

In the case of /nc and /XT welding machines, no mains cable is connected when delivered.
Before commissioning, a mains cable corresponding to the connection voltage must be installed with a minimum cross-section according to the following table.

Welding machine	Mains cable
Fortis 270 C /nc	4G2,5
Fortis 270 C /XT/nc 1 ~ 3 ~	 3x AWG8 (3G6) 4x AWG10 (4G4)
Fortis 320 C/nc Fortis 320 /nc	4G2,5
Fortis 320 C/XT/nc Fortis 320 /XT/nc 1 ~ 3 ~	 3x AWG8 (3G6) 4x AWG8 (4G6)
Fortis 400 C/nc Fortis 400 /nc	4G4
Fortis 400 C/XT/nc Fortis 400 /XT/nc 1 ~ 3 ~	 3x AWG6 (3G10) 4x AWG6 (4G10)
Fortis 400 C/600/nc Fortis 400 /600/nc	4x AWG12 (4G2,5)
Fortis 500 C/nc Fortis 500 /nc	4G6
Fortis 500 C/XT/nc Fortis 500 /XT/nc 1 ~ 3 ~	 3x AWG6 (3G10) 4x AWG6 (4G10)
Fortis 500 C/600/nc Fortis 500 /600/nc	4x AWG12 (4G2,5)

Safety grid cable connection

⚠ WARNING!

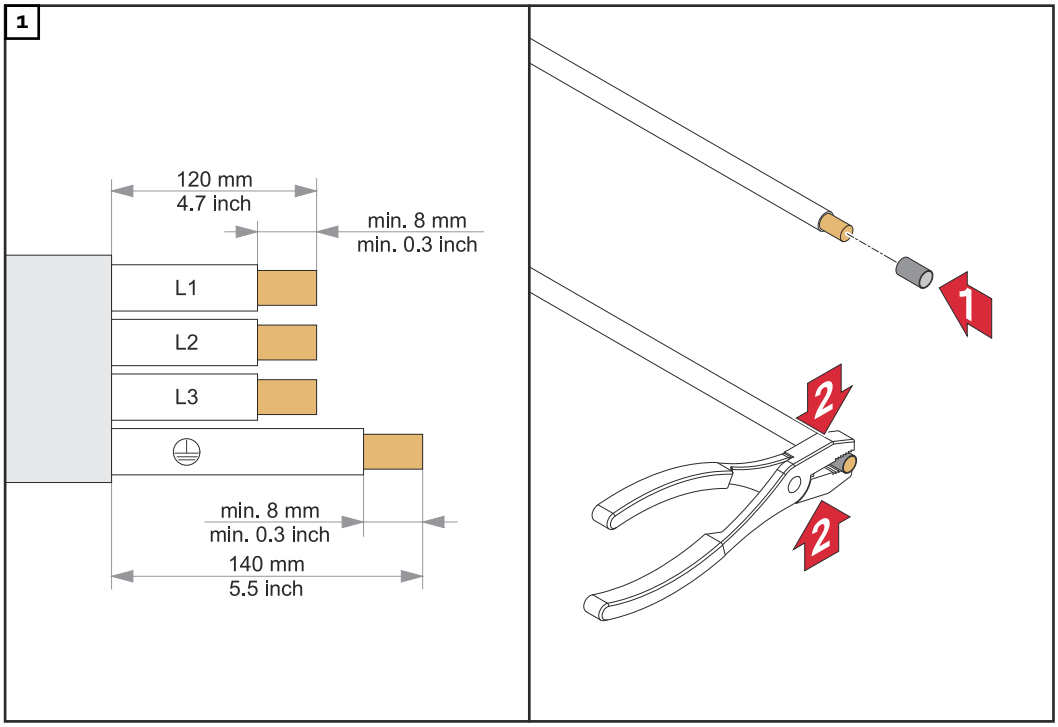
Danger from work that is not carried out properly.
This may result in serious personal injury and damage to property.
- ▶ The work described below may only be performed by trained specialist personnel.
- ▶ Follow national standards and guidelines.

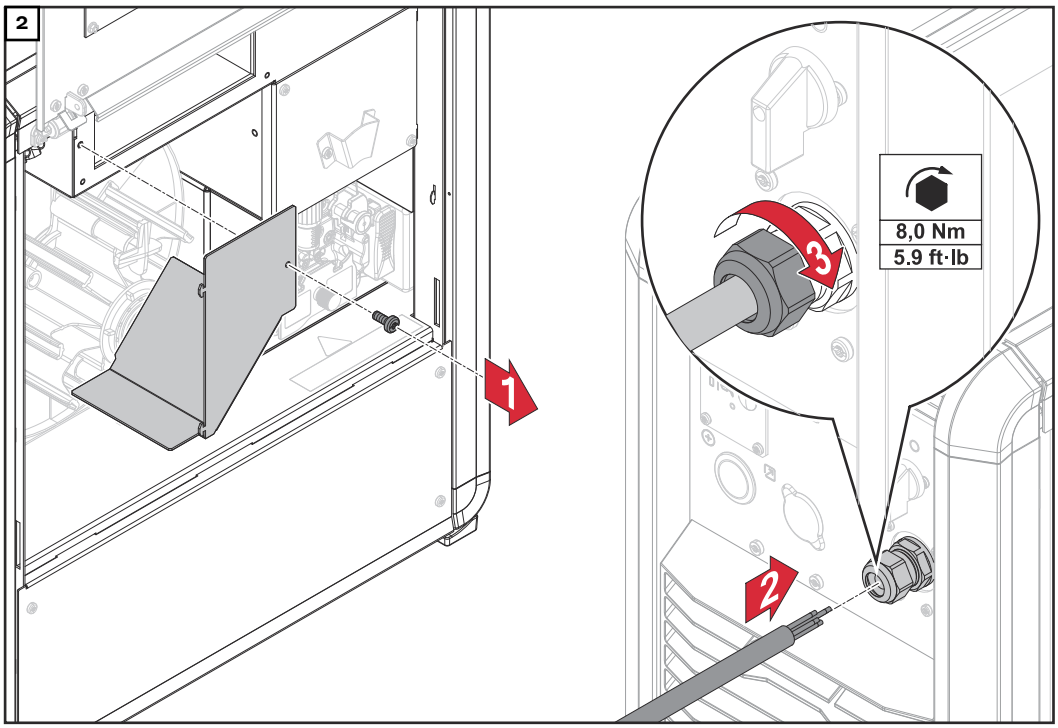
⚠ CAUTION!

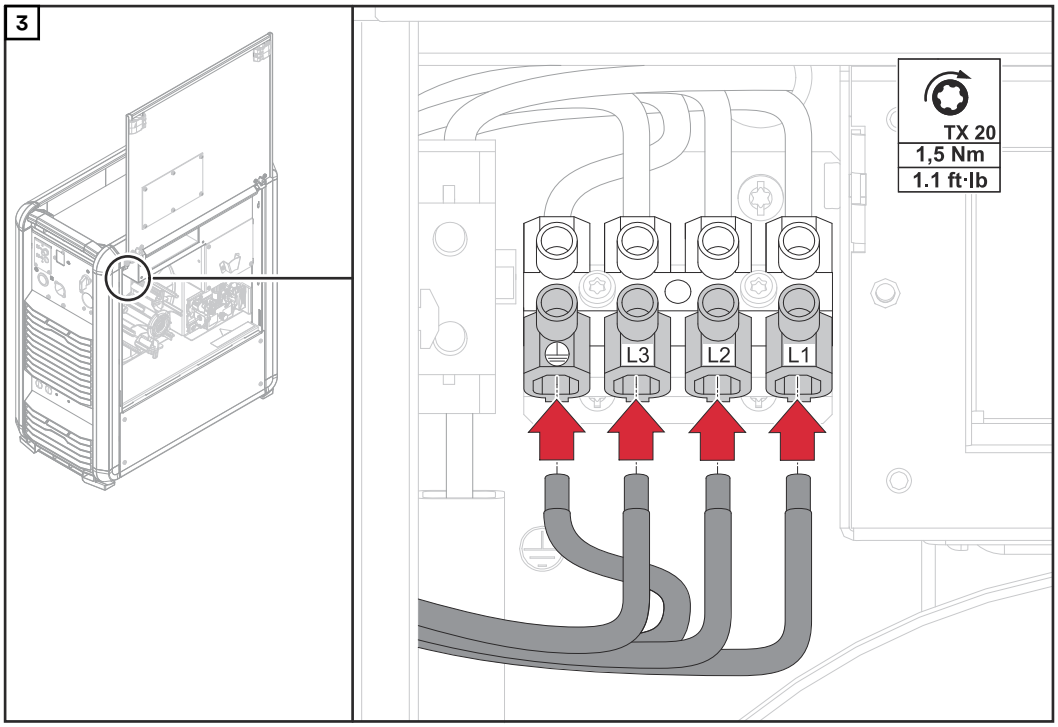
Danger from improperly prepared grid cable.
Short circuits and damage to property may result.
▶ Fit ferrules to all phase conductors and the ground conductor of the stripped grid cable.

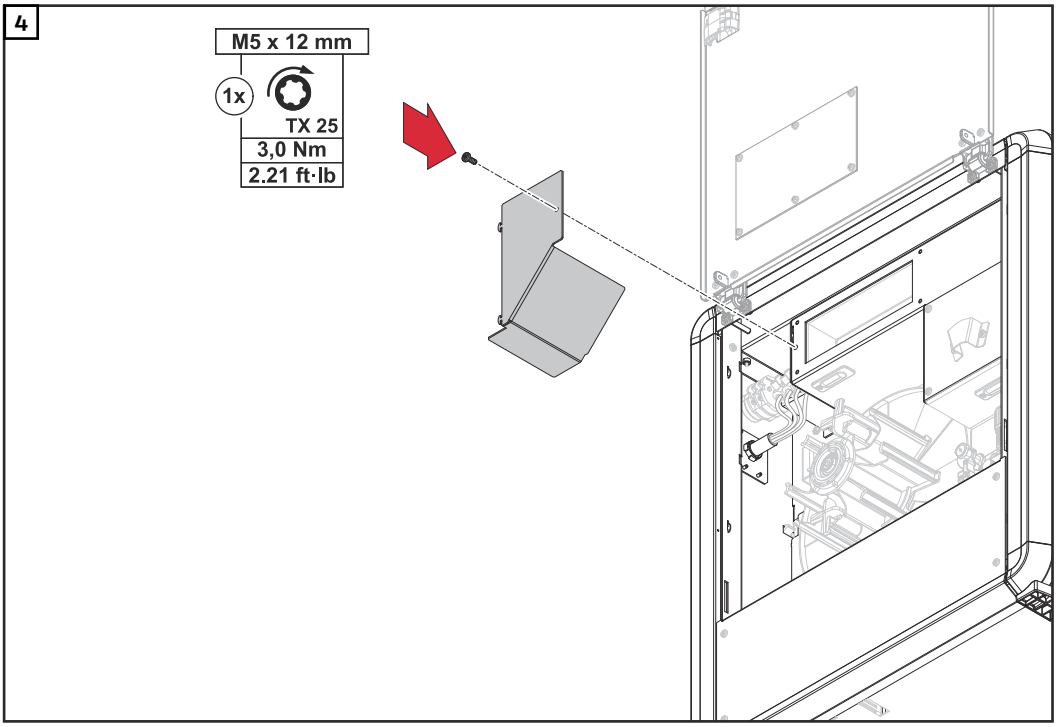
Connecting the mains cable to /nc welding machines

IMPORTANT! The ground conductor should be approx. 20-25 mm (0.8-1 in.) longer than the phase conductors.



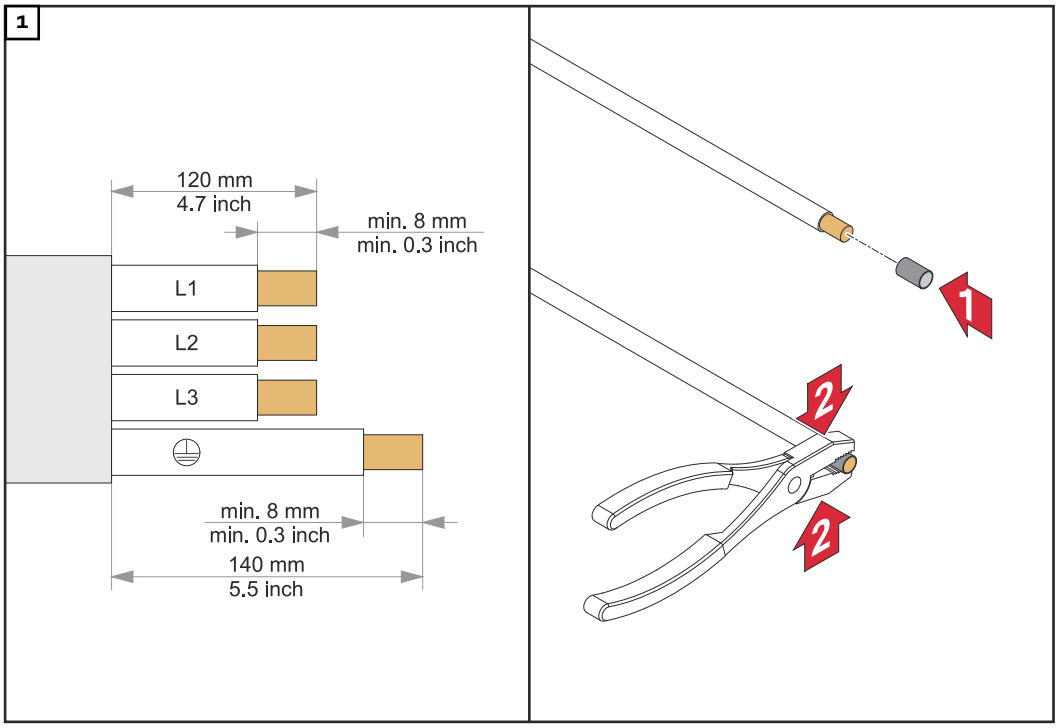


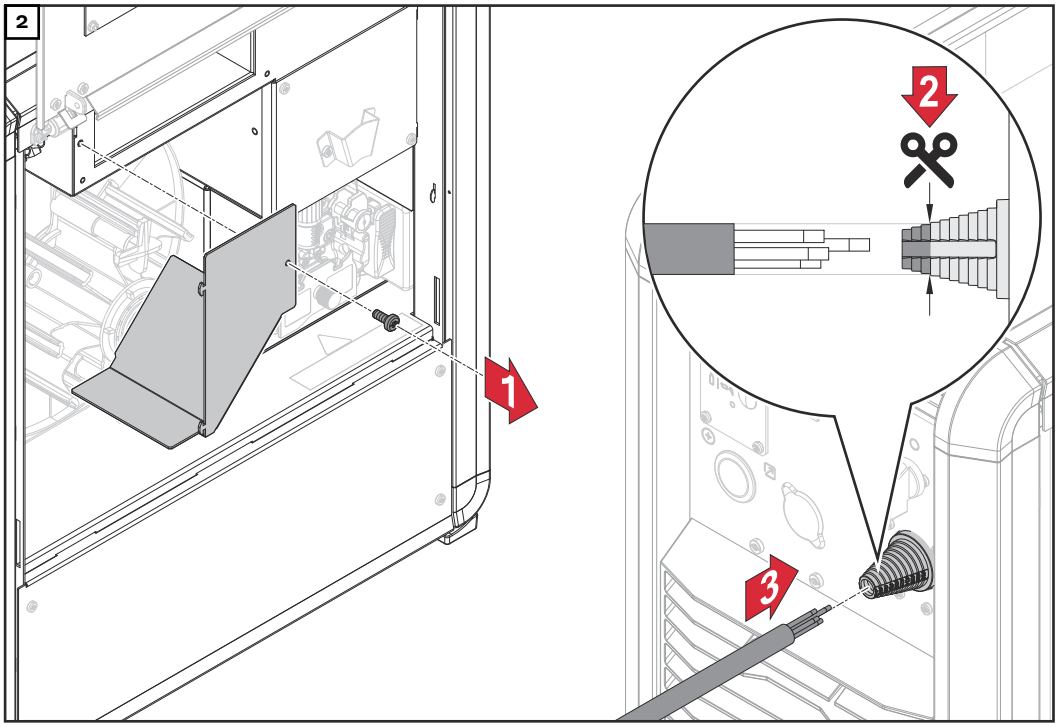


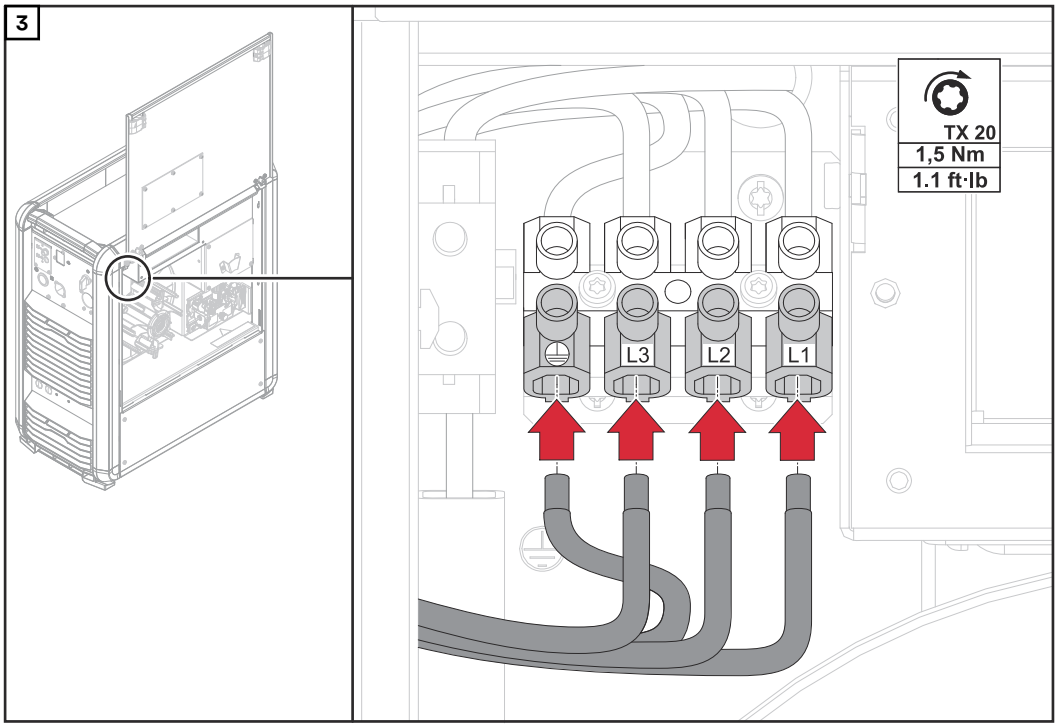


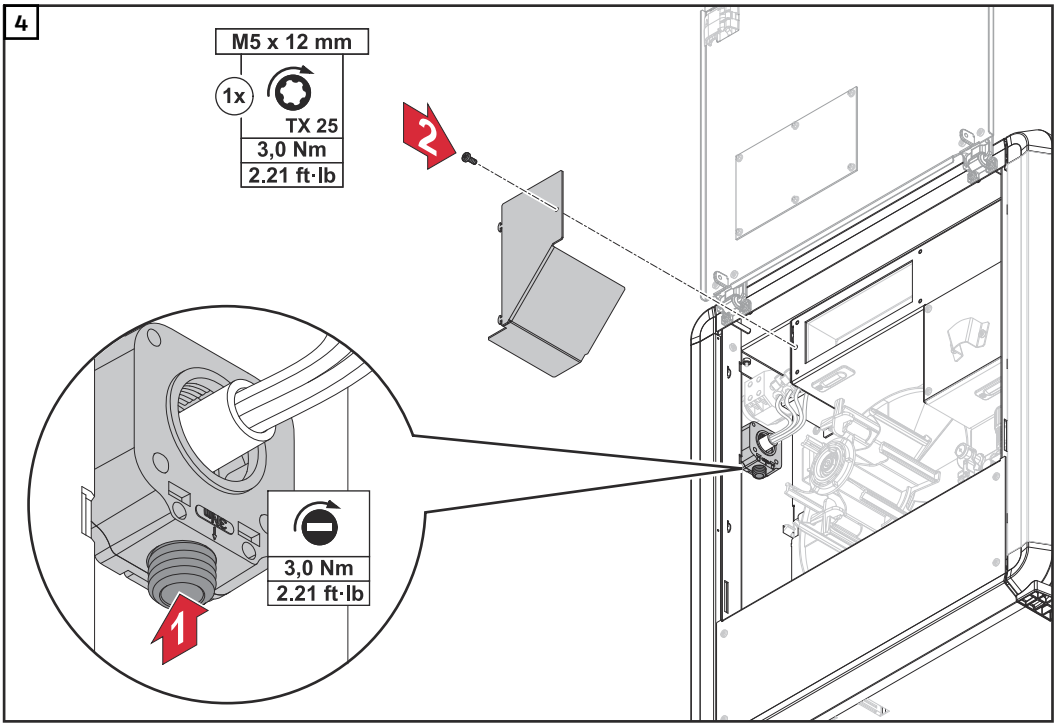
Connecting the mains cable to /XT welding machines

IMPORTANT! The ground conductor should be approx. 20-25 mm (0.8-1 in.) longer than the phase conductors.


1
120 mm
4.7 inch
min. 8 mm
min. 0.3 inch
L1
L2
L3
min. 8 mm
min. 0.3 inch
140 mm
5.5 inch
1
2
2

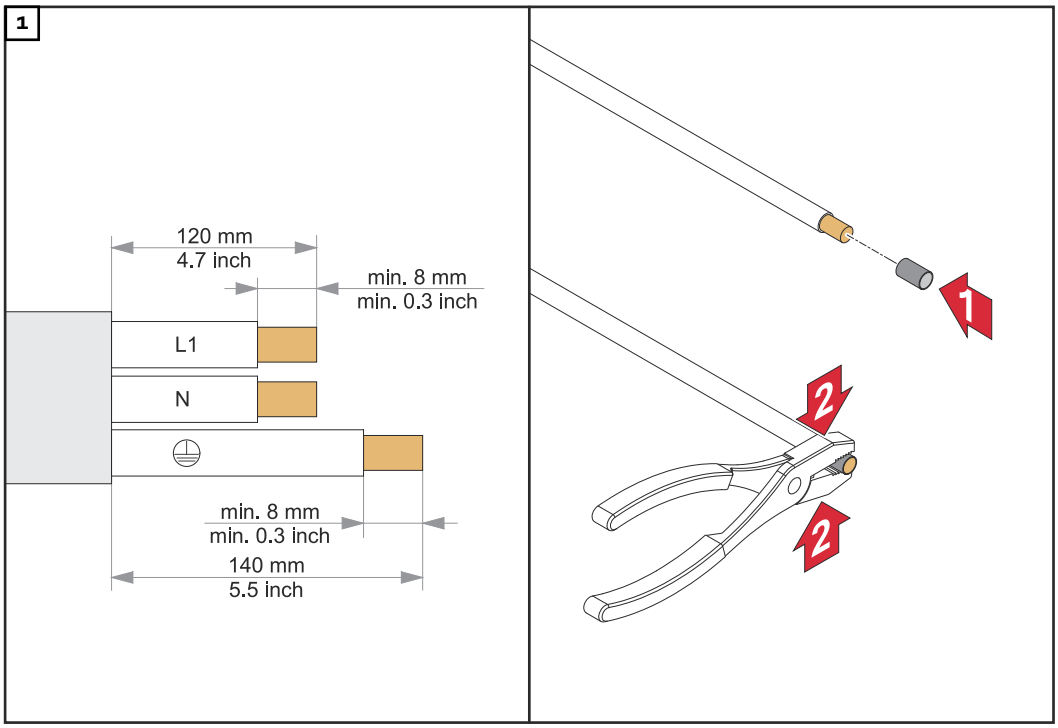

2
1
2
3

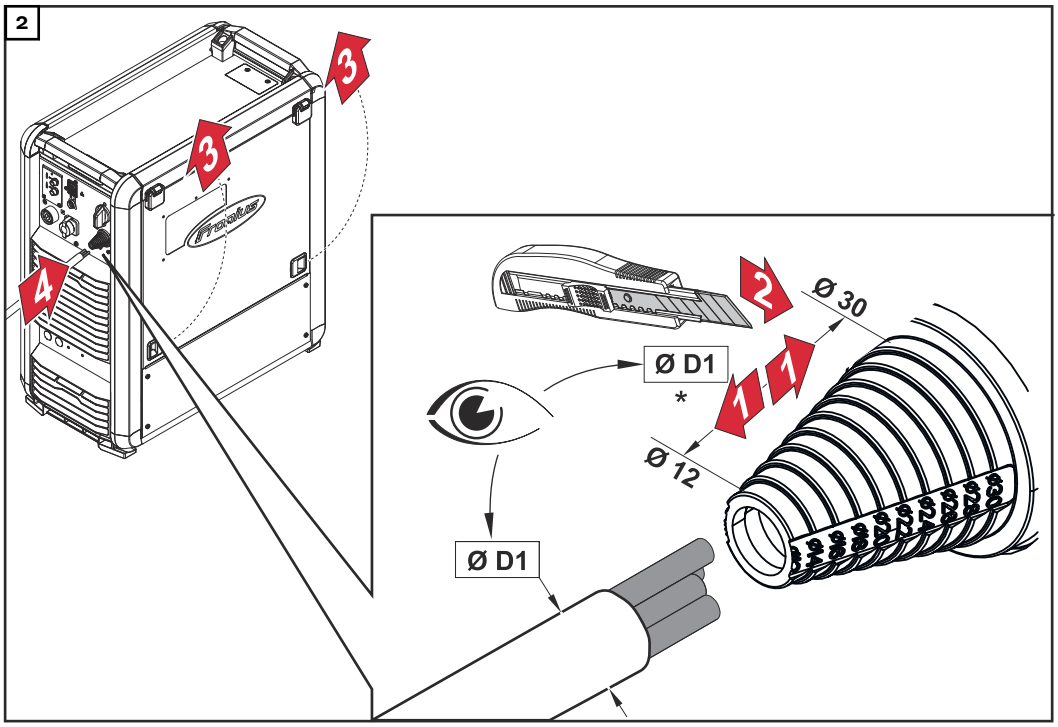

3
TX 20
1,5 Nm
1.1 ft·lb
L3
L2
L1

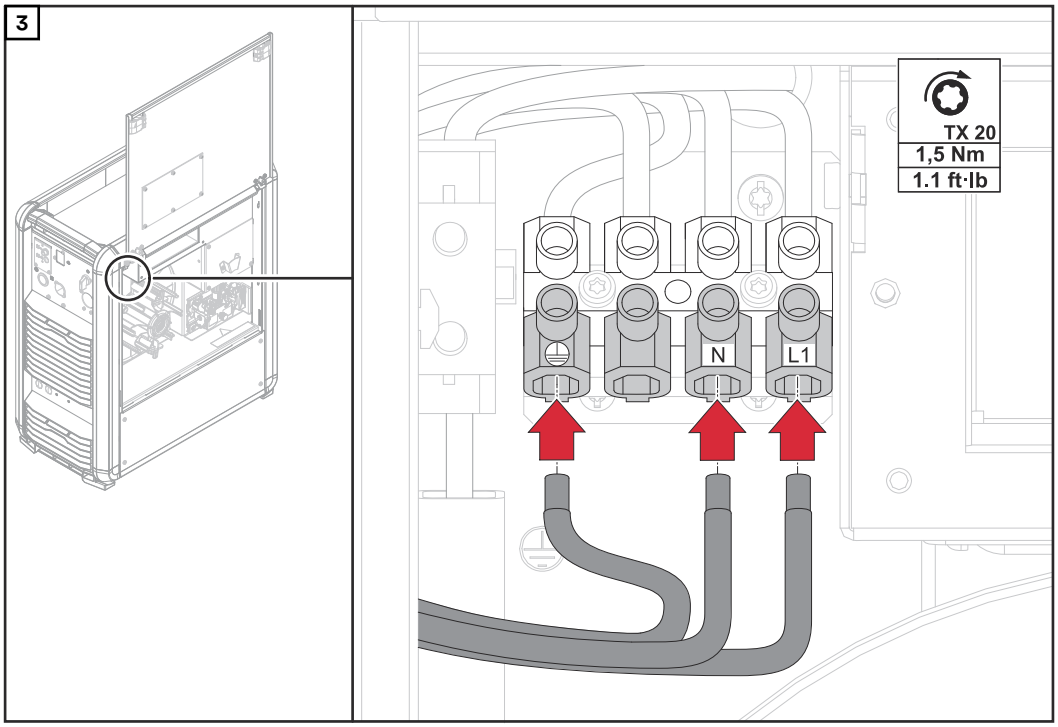

4
M5 x 12 mm
1x
TX 25
3,0 Nm
2.21 ft·lb
2
3,0 Nm
2.21 ft·lb
1

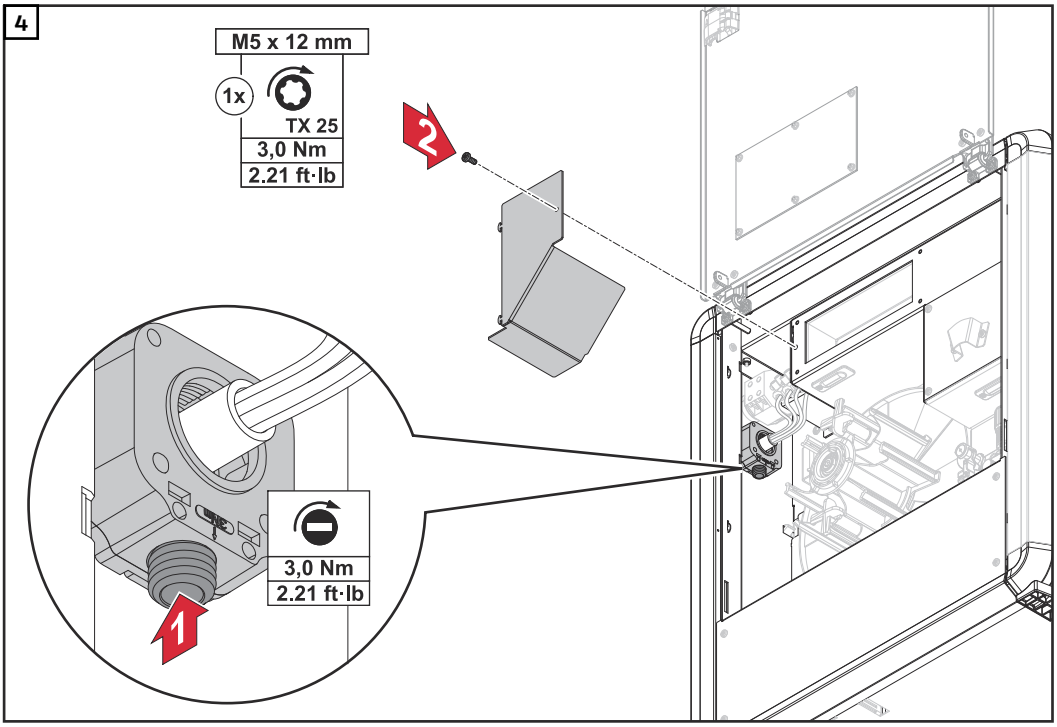
Connecting the mains cable to /XT welding machines for single-phase operation

IMPORTANT! The ground conductor should be approx. 20-25 mm (0.8-1 in.) longer than the phase conductors.






3
TX 20
1,5 Nm
1.1 ft·lb
N
L1


4
M5 x 12 mm
1x
TX 25
3,0 Nm
2.21 ft·lb
2
3,0 Nm
2.21 ft·lb
1

Transport and setup regulations

Transporting individual devices

⚠ WARNING!

Danger from electrical current.
Serious personal injuries may result.
- ▶ Do not lift or transport any active devices.
- ▶ Switch off and disconnect devices from the grid before transport or lifting.
- ▶ Close ground earth connections before transport.

⚠ WARNING!

Danger from falling objects.
Serious personal injury and damage to property may result.
- ▶ Only use suitable transportation equipment from the manufacturer to transport devices by crane.
- ▶ Attach chains or ropes to all designated attachment points on the transportation equipment.
- ▶ The chains or ropes must form the smallest angle possible from vertical.
- ▶ Observe and comply with valid national and regional guidelines for accident prevention and hazards during transport and shipment.

⚠ CAUTION!

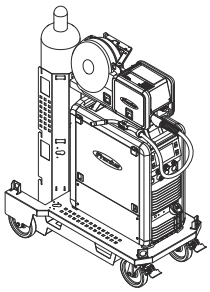
Danger from damaged devices.
This can result in personal injury and damage to property.
- ▶ After transport and before commissioning, visually inspect the device for damage.
- ▶ Have any damage repaired by trained service technicians before commissioning the device.

NOTE!

The carrying handle on the device is only to be used for transport by hand.
- ▶ The carrying handle is not suitable for transport by crane, counterbalanced lift truck, or other mechanical lifting tools.

Transporting welding systems

Example of a welding system with the following components:



- Trolley
- Cooling unit
- Welding machine
- Wirefeeder mount
- Wirefeeder
- Gas cylinder holder
- Shielding gas cylinder
- Welding torch

⚠ WARNING!

Danger from devices or components falling.
Serious personal injury and damage to property may result.

- ▶ Before transporting the welding system, detach the wirefeeder and the shielding gas cylinder, and completely drain the coolant.
- ▶ Ensure that the remaining system components are securely seated on the trolley.
- ▶ Only use suitable transportation equipment from the manufacturer to transport welding systems by crane.
- ▶ Attach chains or ropes to all designated attachment points on the transportation equipment.
- ▶ The chains or ropes must form the smallest angle possible from vertical.
- ▶ Observe and comply with valid national and regional guidelines for accident prevention and hazards during transport and shipment.

Checking lifting equipment

⚠ WARNING!

Danger from devices and components falling as a result of damaged lifting equipment.
This may result in serious personal injury and damage to property.

- ▶ Regularly check all lifting equipment used for crane transport such as straps, buckles, chains, etc., for mechanical damage, corrosion, and changes due to other environmental influences.
- ▶ The inspection interval and scope of the inspection must comply with the relevant valid national standards and guidelines.

Welding during crane transport

Welding during crane transport is possible and permissible if this is stated in the intended use of the device (for intended use, see from page 15 onwards).

Setup regulations

⚠ WARNING!

Danger from devices or welding systems toppling over.
This may result in serious personal injury and damage to property.

- ▶ Set up the device securely on an even, solid surface.
- ▶ The maximum permitted tilt angle is 10°.
- ▶ Check all screw connections are tightly fastened after installation.

⚠ WARNING!

Danger from areas at risk of fire and explosion as well as from areas with increased electrical hazard.
This may result in serious personal injury and damage to property.
- ▶ Follow national and international regulations for areas at risk of fire and explosion.
- ▶ Follow national and international regulations for areas with increased electrical hazard.

⚠ CAUTION!

Danger due to selecting an unsuitable installation location.
This can result in damage to property.
- ▶ Only set up and operate the device in accordance with the protection class shown on the rating plate.
- ▶ The ambient air must be free of dust, acids, corrosive gases or substances, and other similar substances.
- ▶ Do not set up and operate the device over 2000 m (6561 ft. 8.16 in.) above sea level.

The device has been tested according to protection class 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.

Mains connection

Mains connection

⚠ WARNING!

Danger of electric shock due to insufficient mains connection.
Could result in serious injury or death.

- ▶ Only connect the device to a grid with a ground conductor.
- ▶ Only connect the device to the grid via a plug-in system with a ground conductor contact.
- ▶ If operating the device on a grid without a ground conductor and on a socket without a ground conductor contact, observe all national regulations for protection by electrical separation.

Due to local regulations and national guidelines, a residual-current circuit breaker may be required when connecting a device to the public grid. The residual-current circuit breaker recommended for the device can be found in the technical data.

NOTE!

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

- ▶ Before connecting the device to the mains, check with the grid operator whether or not the device is allowed to be connected.
- ▶ The maximum permissible grid impedance that is decisive for a mains connection is stated in the technical data.

Fortis mains connection

- The devices are designed for the mains voltage stated on the rating plate.
- Devices with a rated welding voltage of 3 x 600 V and XT devices operated with 3 x 600 V must be operated on three-phase grids grounded at the neutral point.
- If the mains cable or mains plug has not been attached to your version of the appliance, these must be installed by qualified personnel according to national standards.
- The fuse protection of the mains lead is specified in the technical data.

⚠ CAUTION!

An inadequately dimensioned electrical installation can lead to serious damage to property.

- ▶ The mains lead and its fuse protection should be designed to suit the existing power supply.
  The technical data on the rating plate should be followed.

Dangers when welding

Danger from incorrect operation or misuse

Danger from incorrect operation and misuse

⚠ WARNING!

Danger from incorrect operation or misuse.
This can result in serious personal injury - including injury to third parties, damage to property, and impaired welding results.

- ▶ All persons involved in the commissioning, operation, maintenance, and servicing of the device must be appropriately qualified and have knowledge of welding.
- ▶ Read these operating instructions in full and follow them carefully and precisely.
- ▶ The operating instructions must always be kept to hand wherever the device is being used.
- ▶ Observe generally applicable and regional regulations regarding accident prevention and environmental protection.

Danger from grid current and welding current

Danger from grid current and welding current

⚠ WARNING!

Danger of electric shock.
Could result in serious injury or death.

- ▶ Do not touch live parts inside or outside the device.
  During MIG/MAG welding, the welding wire, the wirespool, the feed rollers, as well as any pieces of metal in contact with the welding wire, are live.
- ▶ Always place the wirefeeder on a sufficiently insulated base or use a suitable insulating wirefeeder mount.
- ▶ Use a dry backing bar or cover with sufficient insulation against the ground potential.
  The backing bar or cover must completely cover the entire area between the body and the ground potential.
- ▶ Only use undamaged, insulated, and adequately dimensioned cables and leads.
- ▶ Do not wrap cables or leads around your body or parts of the body.
- ▶ Never touch the welding wire, tungsten electrode, or the stick electrode when the welding machine is switched on.
- ▶ Ground the workpiece.
- ▶ Switch off unused devices.
- ▶ Before working on the device, switch it off, remove the grid plug, and attach a clearly legible and understandable warning sign to prevent the grid plug from being connected and the device switched on again.
- ▶ After opening the device, ensure that all components are disconnected from the power supply – especially all electrically charged components.

⚠ WARNING!

Danger due to electromagnetic fields.
These can damage your health and the health of persons in the vicinity, e.g., anyone fitted with a pacemaker or wearing a hearing aid.

- ▶ Keep distances between welding power-leads and the head/torso of the welder as great as possible.
- ▶ Do not carry welding power-leads and hosepacks over your shoulder or wrap them around your body or body parts.
- ▶ Anyone wearing a pacemaker must seek advice from their doctor before spending any time in the immediate vicinity of the device and the welding process.

⚠ CAUTION!

Danger due to stray welding currents.
Overheating of components, fire, destruction of ground conductors, and damage to the device and other electrical equipment may result.

- ▶ 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 so that it is sufficiently insulated against electrically conductive environments, e.g., insulation against electrically conductive floors or electrically conductive mounts.
- ▶ Ensure that the unused welding torch / electrode holder is adequately insulated when using power distribution boards, twin-head mounts, etc.
- ▶ In automated MIG/MAG applications, the wire electrode must be insulated when feeding it from the welding wire drum, large spool, or wirespool to the wirefeeder.

Danger due to electromagnetic emissions

Electromagnetic compatibility (EMC) describes the unwanted mutual influence of electrical/electronic devices.

The EMC device classification is shown on the rating plate of the device or in the technical data.

Despite compliance with the standardized emission limit values, electrical devices can, in certain cases, influence each other in the intended application area.

Interference-prone equipment that could be affected by the device includes:
- Safety devices
- Grid leads, signal lines, and data transfer lines
- IT and telecommunications equipment
- Measuring and calibrating devices
- Medical devices
- etc.

⚠ CAUTION!

Danger due to electromagnetic emissions.
Operational disruptions and malfunctions as well as resulting damage may result.

- ▶ Use suitable grid filters.
- ▶ Keep welding power-leads as short as possible, route them close together and far from other lines.
- ▶ Perform equipotential bonding.
- ▶ Ground the workpiece, e.g., using suitable capacitors.
- ▶ Shield the entire welding system.
- ▶ Shield other devices in the vicinity.

Danger from flying sparks, arc radiation, and noise

Danger from flying sparks

⚠ WARNING!

Danger from flying sparks.
Could result in 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 using a certified cover.
- ▶ Keep suitable, certified fire extinguishers on hand.
- ▶ Take appropriate measures to ensure that sparks and hot metal particles do not get into surrounding areas through small cracks and openings.
- ▶ Only undertake welding in areas at risk of fire and explosion, or on sealed tanks, drums, or pipes, if these have been prepared in accordance with corresponding national and international standards.
- ▶ Do not undertake welding on containers in which gases, fuels, mineral oils, etc. are/were stored.
- ▶ Keep flammable vapors (such as solvent vapors) out of the arc radiation range.

⚠ WARNING!

Danger from flying sparks and flying hot metal particles.
Could result in injury.
- ▶ Wear suitable protective clothing when working with the device.
  The protective clothing must be flame retardant, insulating, dry, and undamaged, must cover the whole body, and the pants must be cuffless.
- ▶ Wear rigid, wet-insulating footwear.
- ▶ Wear appropriate, electrically insulating, and heat protective gloves.
- ▶ Wear a safety helmet.

Danger from arc radiation

⚠ WARNING!

Danger from arc radiation, UV radiation, heat, and flying sparks that pose a risk of injury to the eyes and skin
Could result in injury.
- ▶ Use a face guard with a regulation-compliant filter insert.
- ▶ Wear regulation-compliant protective goggles with side protection behind the face guard.

Danger due to noise

⚠ CAUTION!

Danger due to increased noise exposure.
Could result in hearing damage.
- ▶ Use hearing protection during welding.

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 welding operation

⚠ WARNING!

Danger from welding operation (blinding hazard, flying sparks, harmful welding fume, noise, etc.)
Personal injury may result.

- ▶ Keep unauthorized people away during the operation of the devices and during the welding process.
- ▶ Inform people in the vicinity about all the dangers of the welding operation.
- ▶ Provide suitable protective equipment.
- ▶ Construct suitable protective walls and curtains.

Danger from toxic gases and vapors

Danger from toxic gases and vapors

⚠ WARNING!

Danger from toxic gases and vapors.
Fumes produced during welding contain substances that cause cancer, as stated in monograph 118 from the International Agency for Research on Cancer.

- ▶ Use at-source extraction and a room extraction system.
- ▶ If possible, use a welding torch with an integrated extraction device.
- ▶ Keep your face out of the welding fume and gases produced.
- ▶ Do not breathe in fume or harmful gases.
- ▶ Ensure that there is a sufficient supply of fresh air.
  A ventilation flow rate of at least 20 m^3/h (11.77 cfm) must be provided at all times.
- ▶ Use a welding helmet with air supply if there is insufficient ventilation.

Danger due to missing safety equipment and moving components

Danger due to missing safety equipment

⚠ WARNING!

Danger due to missing, defective or circumvented safety equipment.
This can result in serious personal injury - including injury to third parties, damage to property, and undesired welding results.

- ▶ Only operate the device when all safety equipment is fully functional.
- ▶ Any safety equipment that is not fully functional must be repaired by an authorized specialist before the device is switched on.
- ▶ Never bypass or disable safety equipment.
- ▶ Before switching on the device, ensure that no one can be put in danger.

Danger due to rotating parts

⚠ CAUTION!

Danger due to rotating parts such as fans, gears, rollers, shafts or wirespools.
Personal injury may result.

- ▶ Keep hands, hair, loose clothing, and tools away from moving parts.
- ▶ Do not reach into rotating gears of the wire drive or into rotating drive parts.

Danger due to missing covers

⚠ CAUTION!

Danger due to missing or opened covers.
Personal injury may result.

- ▶ Before operation, ensure that all covers and side panels are present and have been correctly fitted.
- ▶ Ensure that all covers and side panels are closed during operation.
- ▶ Only open covers and side panels for the duration of assembly and maintenance activities.

Danger from shielding gas cylinders and shielding gas supply

Danger from shielding gas cylinders and shielding gas supply

⚠ WARNING!

Danger from pressurized shielding gas cylinders.
Serious personal injury and damage to property can result from explosions.

- ▶ Protect pressurized shielding gas cylinders from high heat, mechanical impact, slag, open flames, sparks, and arcs.
- ▶ Do not weld pressurized shielding gas cylinders.
- ▶ Keep shielding gas cylinders away from welding or other circuits.
- ▶ Do not hang the welding torch on a shielding gas cylinder.
- ▶ Leave the protective cap on the valve of the shielding gas cylinder when the cylinder is not connected.
- ▶ Mount shielding gas cylinders vertically and secure them from falling in accordance with the instructions.
- ▶ Observe and follow the manufacturer's instructions and national and international provisions for shielding gas cylinders and accessories.
- ▶ Remove the shielding gas cylinder before transporting a welding system with trolley by crane.
- ▶ Observe the safety and maintenance information on the shielding gas cylinder or a central gas supply.

⚠ WARNING!

Danger from shielding gas escaping without notice.
Shielding gas is colorless and odorless and, in the event of leaks, may replace the oxygen in the ambient air.
Could result in serious injury or death due to suffocation.

- ▶ Ensure that there is a sufficient supply of fresh air.
  There must be a ventilation flow rate of at least 20 m^3 per hour.
- ▶ Close the valve of the shielding gas cylinder or a central gas supply when no welding is taking place.
- ▶ Turn your face away from the outlet when a valve on a shielding gas cylinder is being opened.
- ▶ Check the shielding gas cylinder or central gas supply for uncontrolled gas leakage before each start-up.
- ▶ If an adapter is being used, use suitable Teflon tape to seal the thread of the shielding gas connection on the device side before installation.

⚠ CAUTION!

Danger due to contaminated shielding gas.
This can result in damage to property and undesired weld results.

- ▶ The quality of the shielding gas must meet the following specifications:
  Solid particle size < 40 µm
  Pressure condensation point < -20 °C
  Max. oil content < 25mg/m^3

Danger due to hot parts and slag

Danger due to hot parts and slag

⚠ CAUTION!

Danger due to hot components, parts, and liquids.
Could result in burns and injury.
- ▶ Do not touch the workpiece during and after welding.
- ▶ Allow hot components, hot parts, and hot liquids to cool before touching (e.g., the welding torch).
- ▶ If a cooling unit is being used, switch it off before disconnecting coolant hoses.

⚠ CAUTION!

Danger due to slag flying off cooling workpieces.
Could result in burns and injury.
- ▶ Also wear protective equipment when reworking workpieces and ensure that other persons are sufficiently protected.

Commissioning

Commissioning of Fortis C

Danger from electrical current

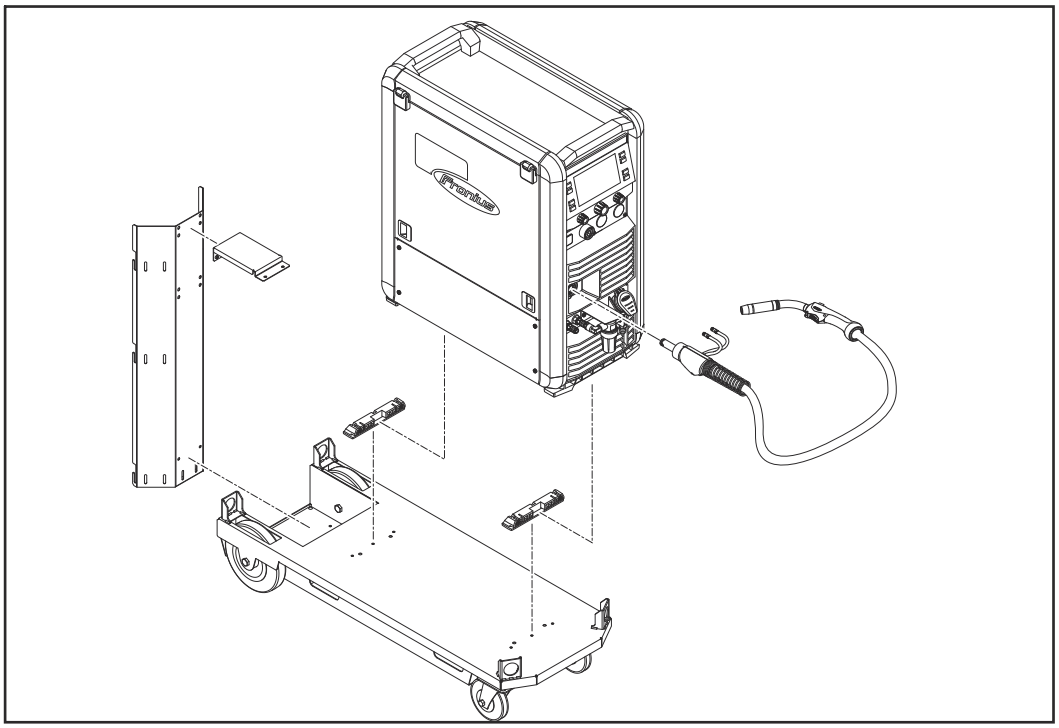
⚠ WARNING!

Danger from electrical current.
This may result in serious personal injury and damage to property.
- ▶ Before starting work, switch off all the devices and components involved and disconnect them from the grid.
- ▶ Secure all these devices and components so they cannot be switched back on.

⚠ WARNING!

Danger of electrical current due to electrically conductive dust in the device.
This may result in serious 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.

Fortis C: Assembling the system components (overview)



Inserting/changing feed rollers

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

NOTE!

Only use feed rollers which match the wire electrode.
An overview of the available feed rollers and their possible uses can be found in the online spare parts catalog (O-ETK).

Online spare parts catalog (O-ETK):

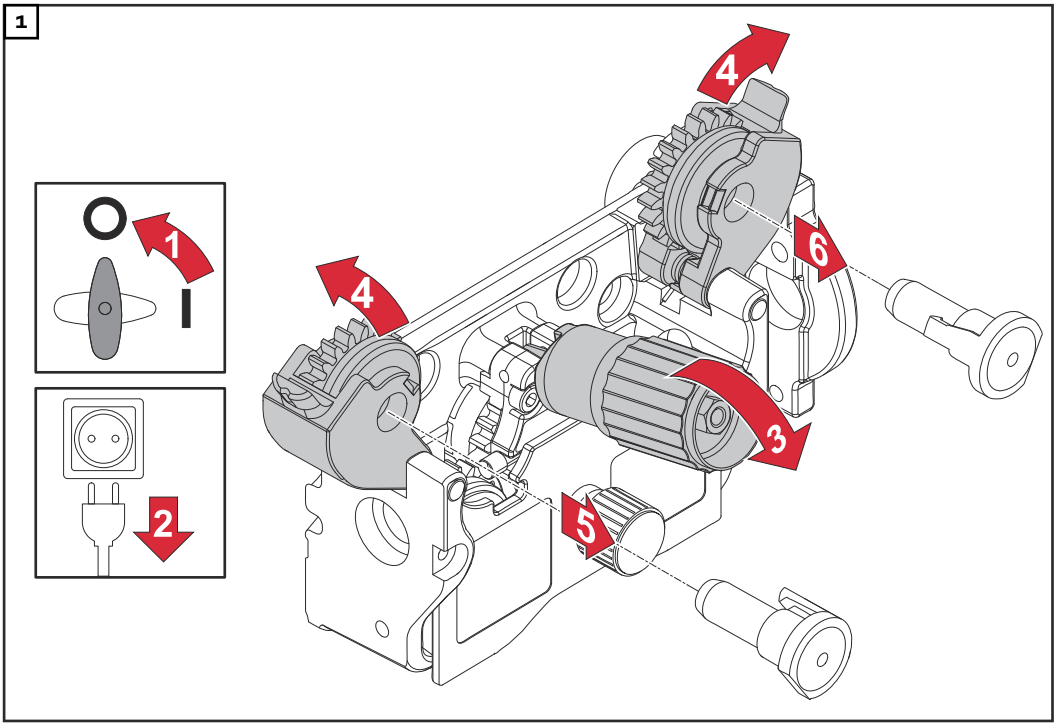
https://spareparts.fronius.com

⚠ **CAUTION!**

Danger due to feed roller holders shooting upwards.
This can result in personal injury.

▶ When unlocking the lever, keep fingers away from the area to the left and right of the lever.

1



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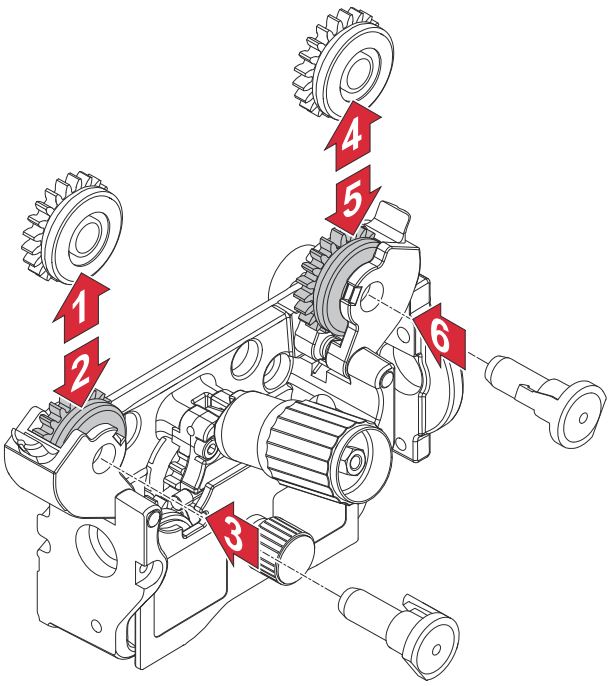

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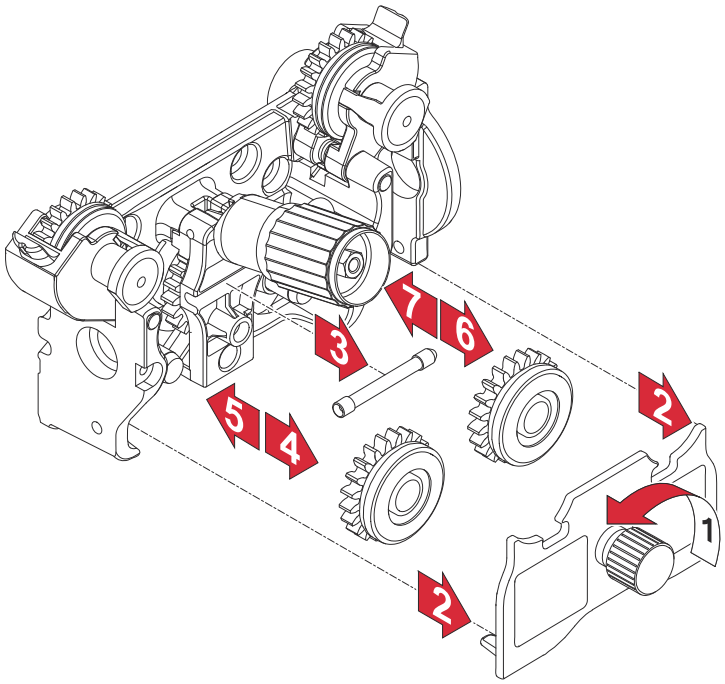

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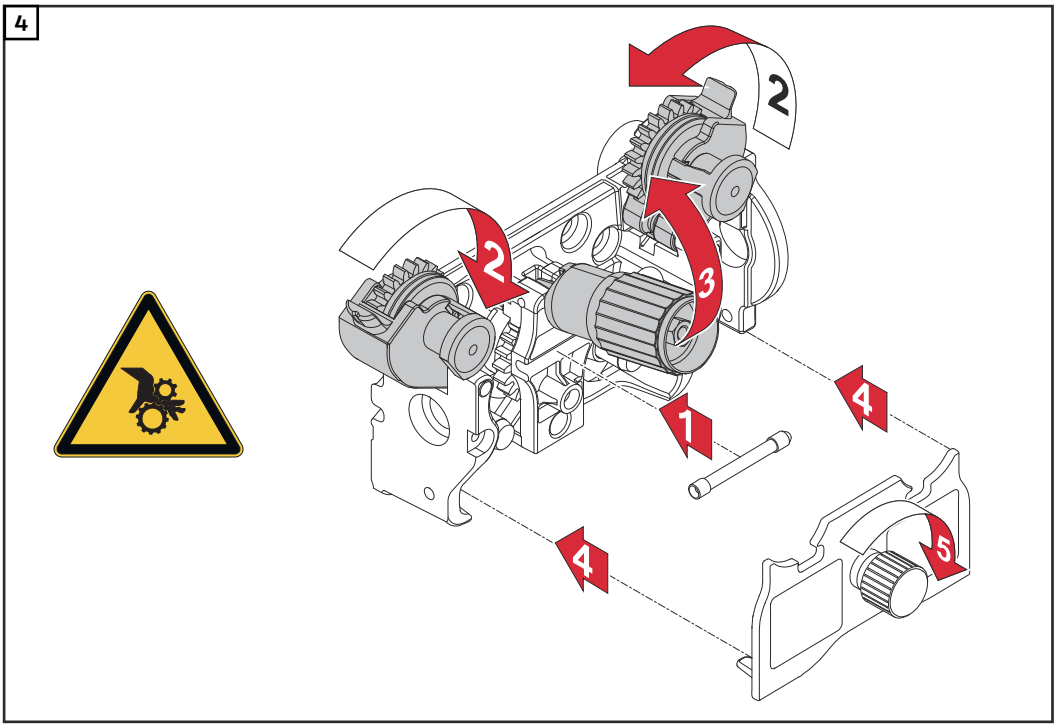
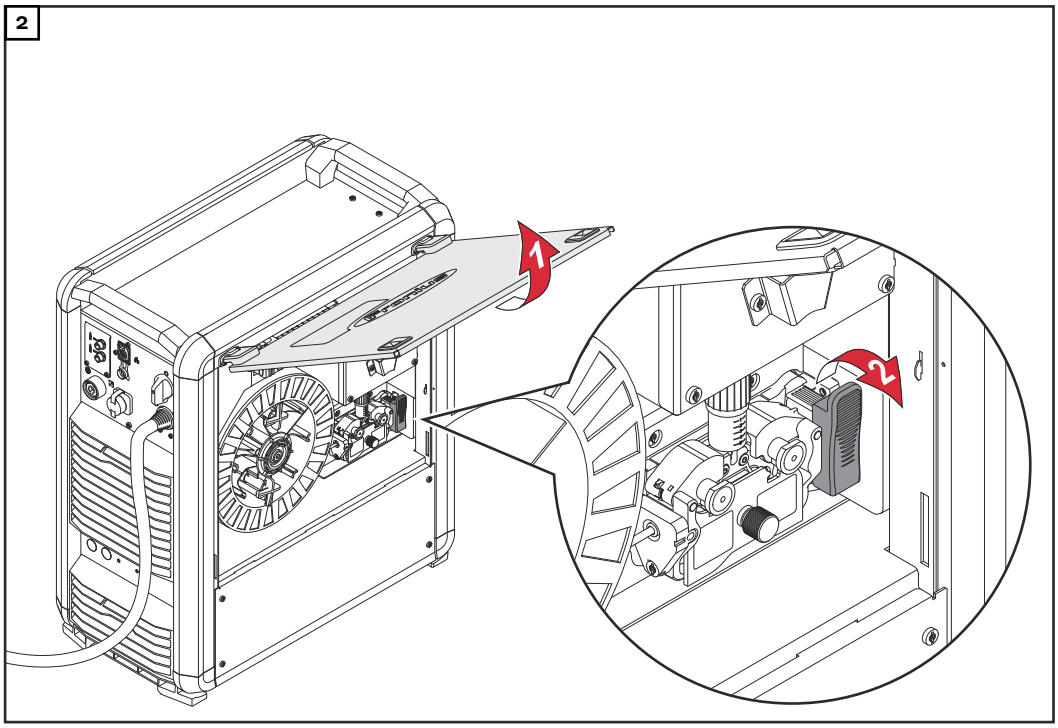


Connecting the welding torch

1 Before connecting the welding torch, check that all cables, leads, and hosepacks are undamaged and correctly insulated.

2



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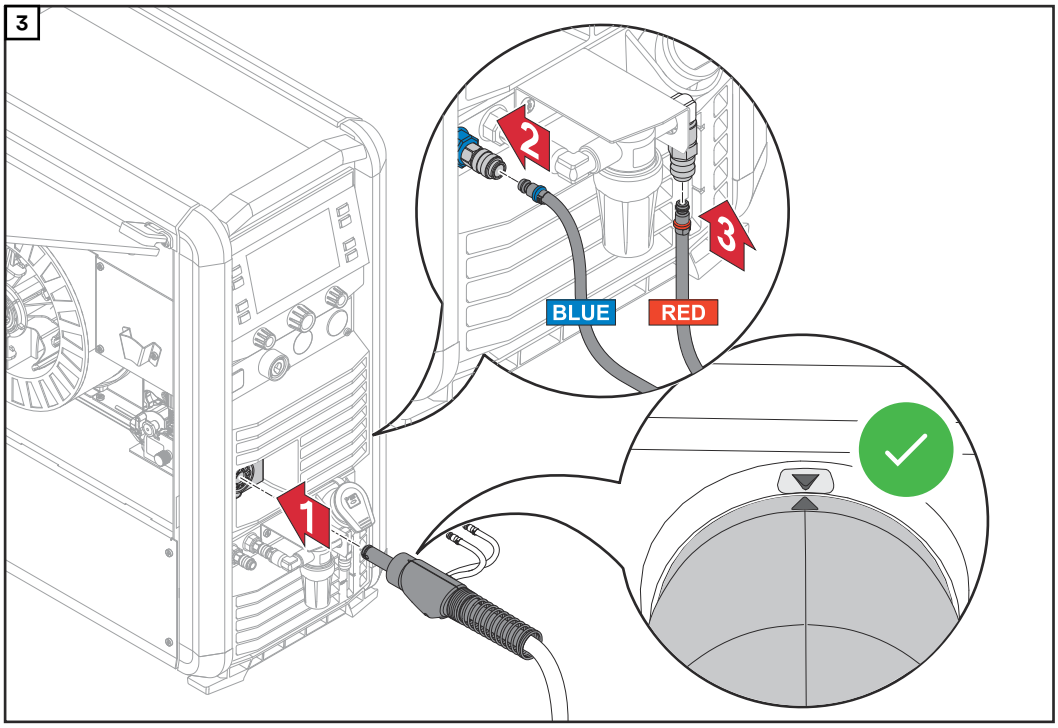

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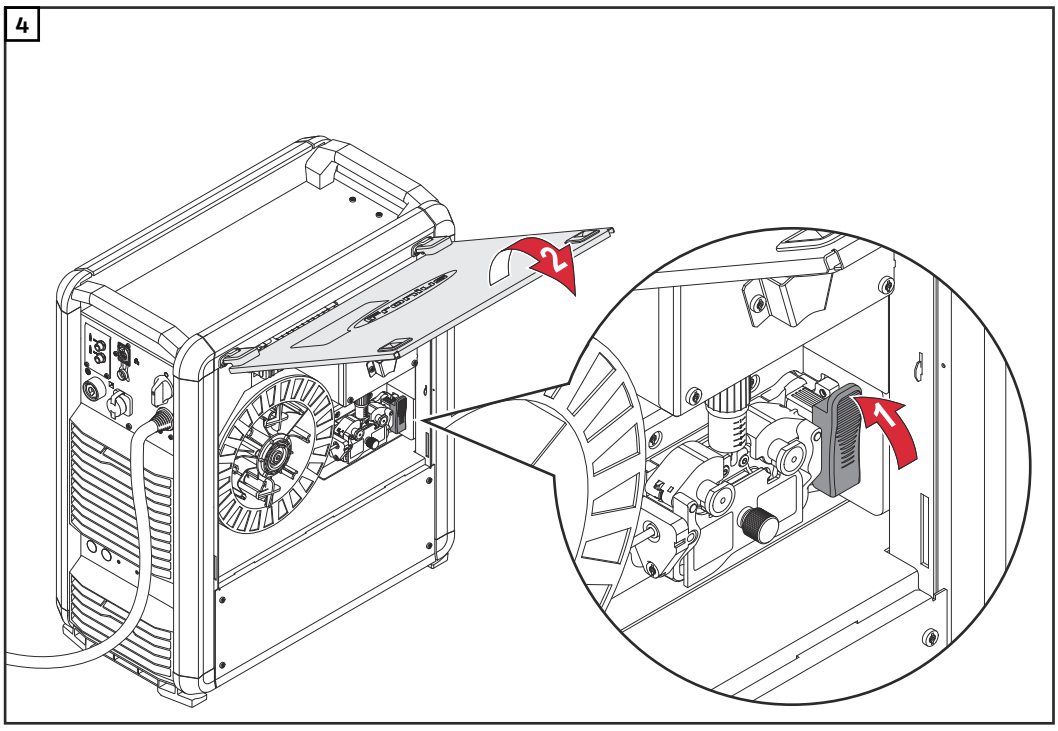
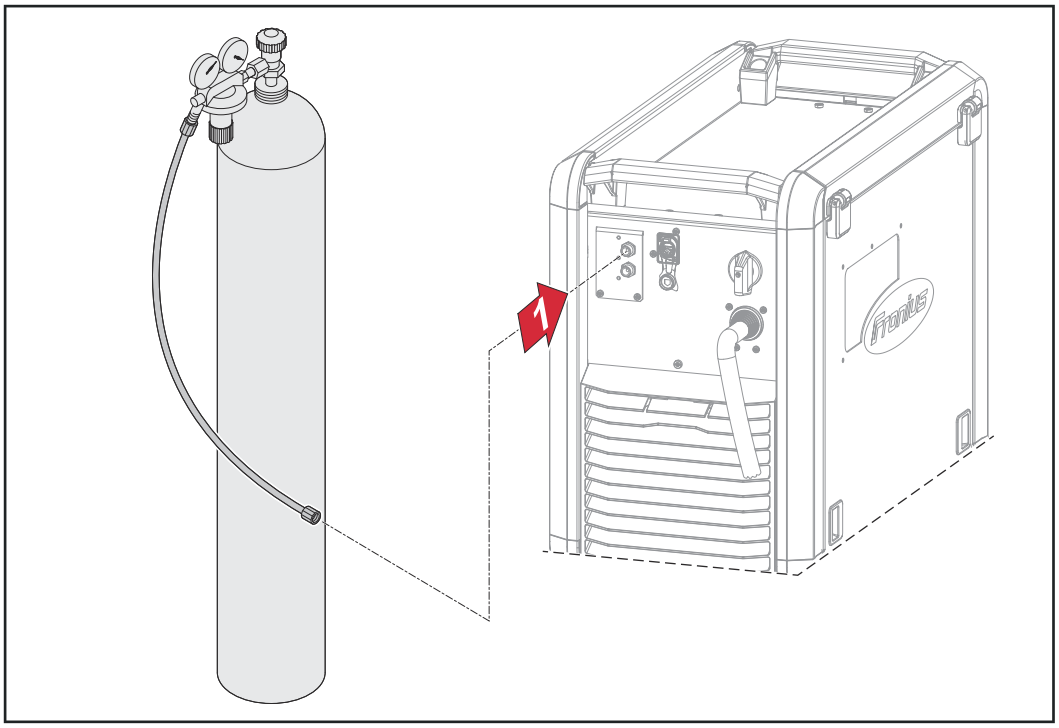


Connecting the gas cylinder

⚠ WARNING!

Danger from falling gas cylinders.
This can result in severe personal injury and damage to property.

- ▶ Place gas cylinders on a solid, level surface so that they remain stable. Secure gas cylinders to prevent them from falling over.
- ▶ Observe the safety rules of the gas cylinder manufacturer.



Connecting the gas hose

1 Place gas cylinder on a solid, level surface so that it remains stable

2 Secure gas cylinder against falling over, although not by the neck of the cylinder

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 gas pressure regulator onto the gas cylinder and tighten it

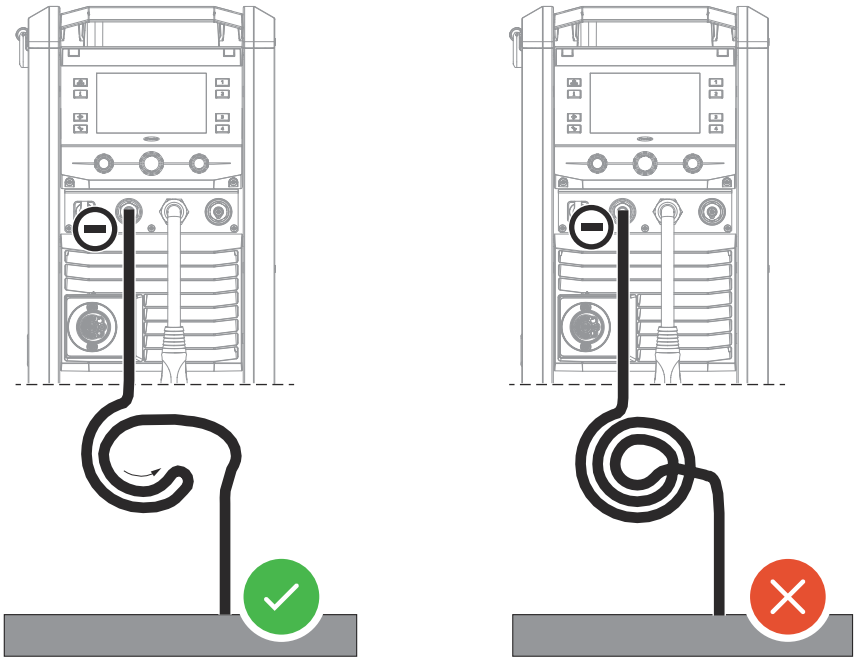
7 Connect the gas pressure regulator to the shielding gas connection on the welding machine using a gas hose

Establishing a ground earth connection

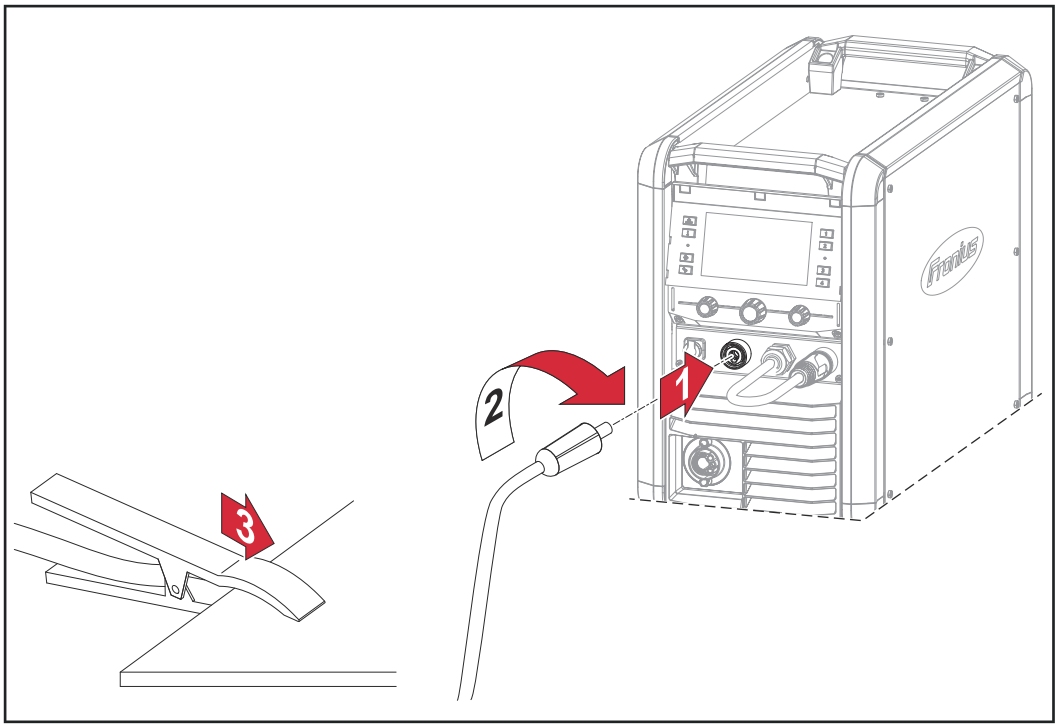
NOTE!

When establishing a ground earth connection, observe the following points:
Failure to do so may impair welding results and pulse welding.

- ▶ Use a separate return lead cable for each welding machine
- ▶ Keep positive cables and return lead cables together as long and as close as possible
- ▶ Physically separate the welding circuits of individual welding machines
- ▶ Do not route several return lead cables in parallel;
  if parallel routing cannot be avoided, keep a minimum distance of 30 cm between the welding circuits
- ▶ Keep the return lead cables as short as possible and use cables with a large cross-section
- ▶ Do not cross over return lead cables
- ▶ Avoid ferromagnetic materials between the return lead cables and the interconnecting hosepack
- ▶ Do not reel up long return lead cables—coil effect!
  Route long return lead cables in loops



- ▶ Do not route return lead cables in iron pipes, metal cable trays, or along steel beams, avoid cable ducts;
  (routing positive cables and return lead cables together in an iron pipe does not cause any problems)
- ▶ If several return lead cables are being used, separate the grounding points on the component as far as possible and do not allow crossed current paths between the individual arcs.



1 Insert the return lead cable into the (-) current socket

If there is a polarity reverser:
Insert the return lead cable into the free current socket

2 Lock return lead cable

3 Connect the other end of the return lead cable to the workpiece

⚠ CAUTION!

Impaired welding results due to a ground earth connection being shared by several welding machines!
If several welding machines are all welding one component, a common ground earth connection can have a significant effect on the welding results.

- ▶ Disconnect welding circuits!
- ▶ Provide a separate ground earth connection for each welding circuit!
- ▶ Do not use a common return lead cable!

Inserting the wire spool

⚠ CAUTION!

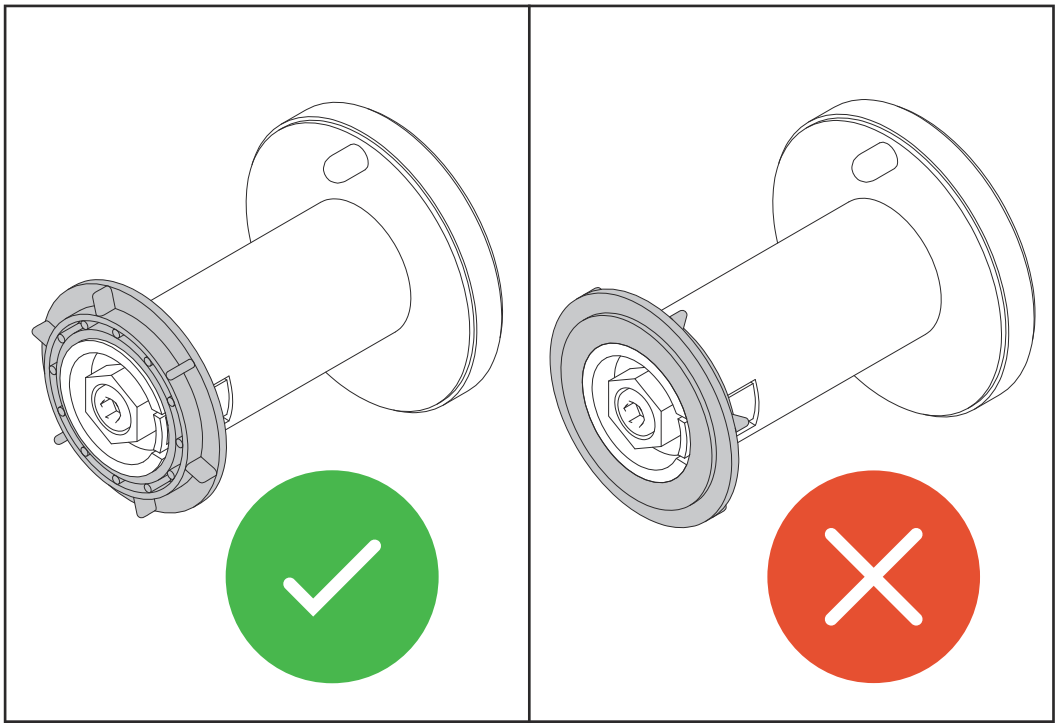
Danger from springiness of spooled wire electrode.
Could result in injury.
▶ When inserting the wire spool, hold the end of the wire electrode firmly to avoid injuries caused by the wire electrode springing back.

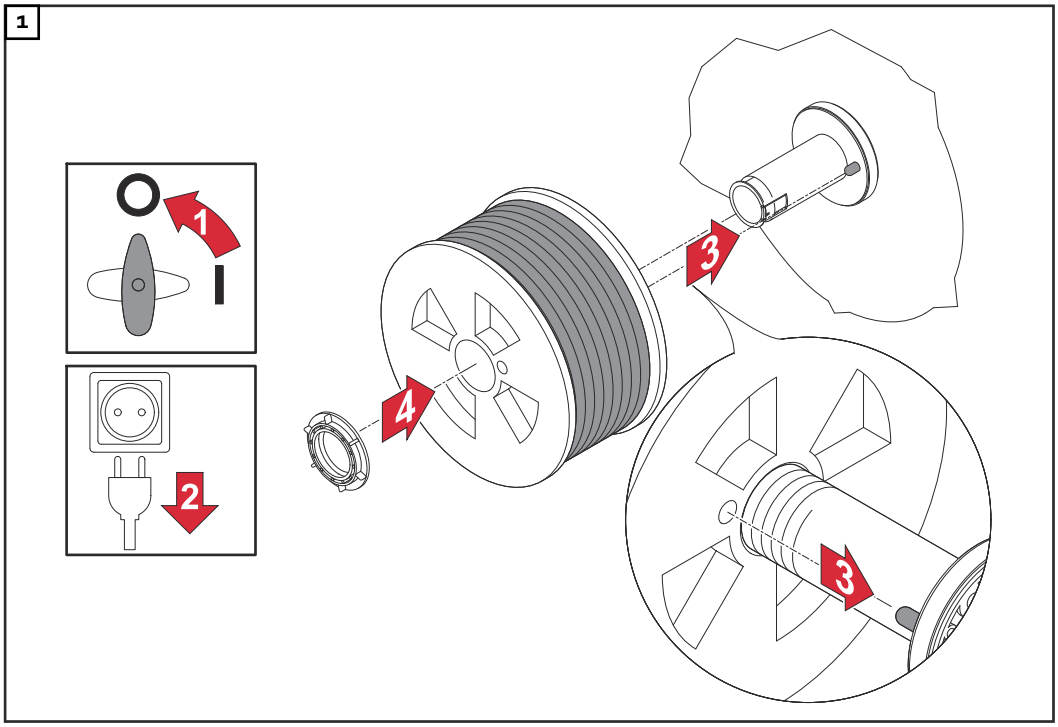
⚠ CAUTION!

Danger from falling wire spool.
Could result in injury.
▶ Ensure that the wire spool is fitted securely to the wire spool holder.

⚠ CAUTION!

Danger due to falling wire spool as a result of the locking ring being fitted the wrong way round.
Could result in personal injury and functional impairments.
▶ Always position the locking ring as shown in the image below.





Installing the basket-type spool

NOTE!

When working with basket-type spools, only use the basket-type spool adapter supplied with the device.

⚠ **CAUTION!**

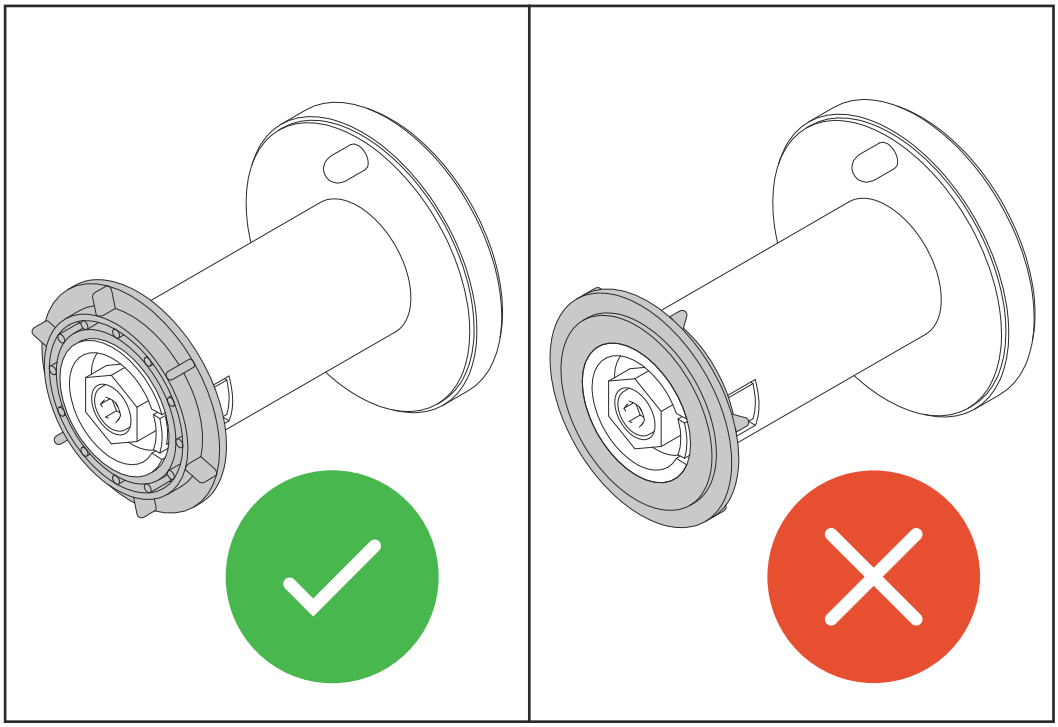
Danger from springiness of spooled wire electrode.
Personal injury may result.
- ▶ Wear safety goggles.
- ▶ When inserting the wirespool/basket-type spool, hold the end of the wire electrode firmly to avoid injuries caused by the wire electrode springing back.

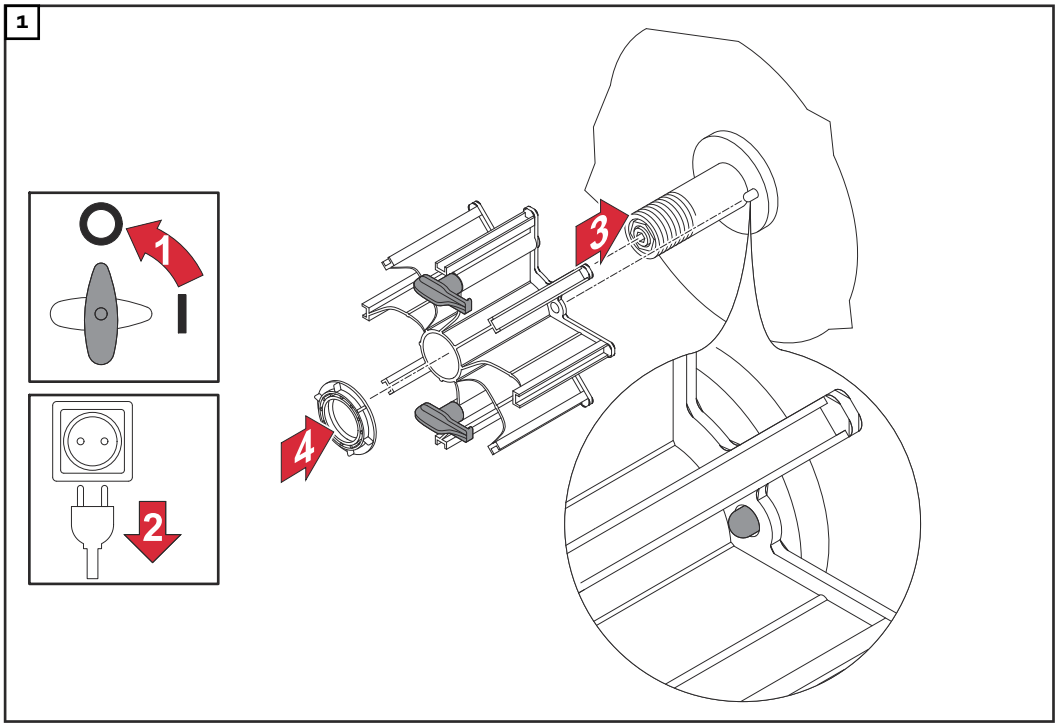
⚠ **CAUTION!**

Danger from falling basket-type spool.
Could result in injury.
- ▶ Make sure that the basket-type spool with basket-type spool adapter is fitted securely to the wire spool holder.
- ▶ Place the basket-type spool on the adapter provided in such a way that the bars on the spool are inside the adapter guideways.

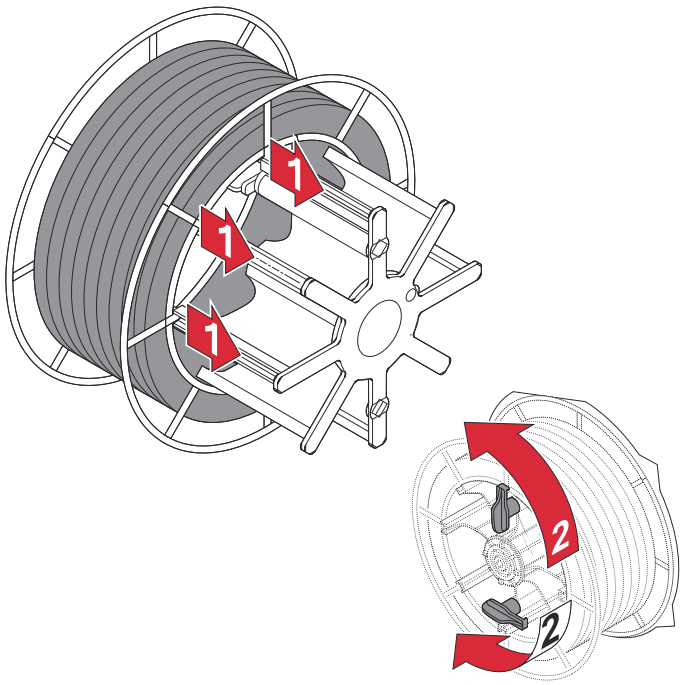
⚠ CAUTION!

Danger due to falling basket-type spool as a result of the locking ring being fitted the wrong way round.
Could result in personal injury and functional impairments.
▶ Always position the locking ring as shown in the image below.





2



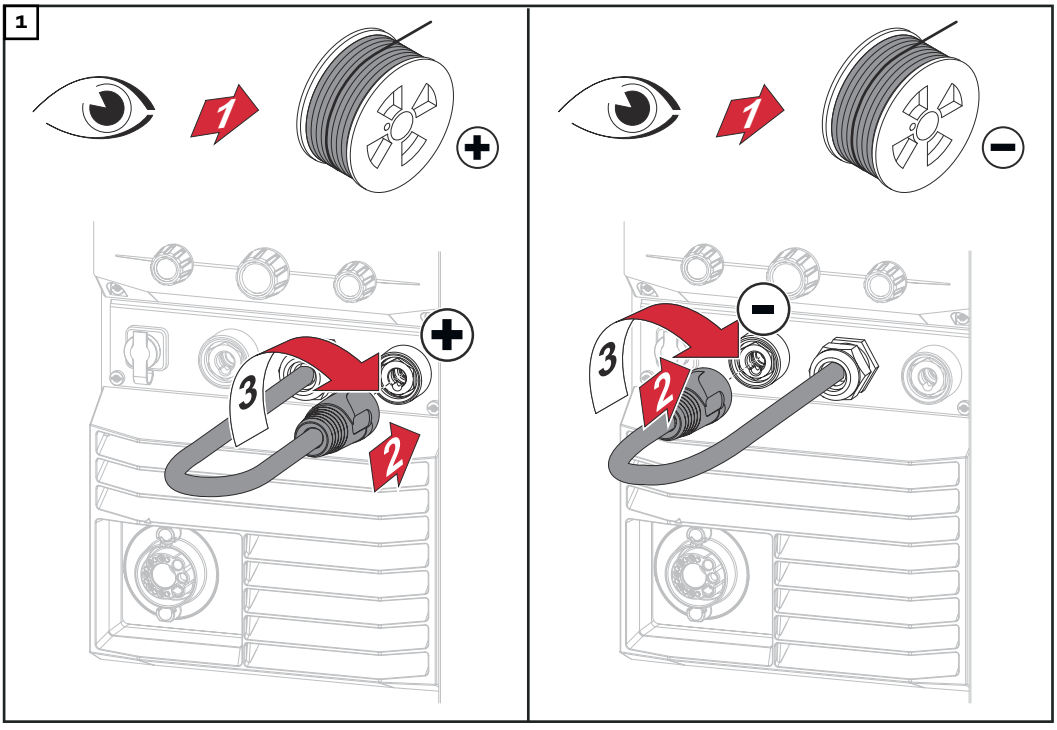
Connecting the polarity reverser

NOTE!

If the polarity reverser is incorrectly connected, it can result in poor-quality weld properties or damage to the device.

▶ Connect the polarity reverser according to the wire electrode used. Check the wire electrode packaging to determine whether the wire electrode is for (+) or (-) welding.

1



Feeding in the wire electrode

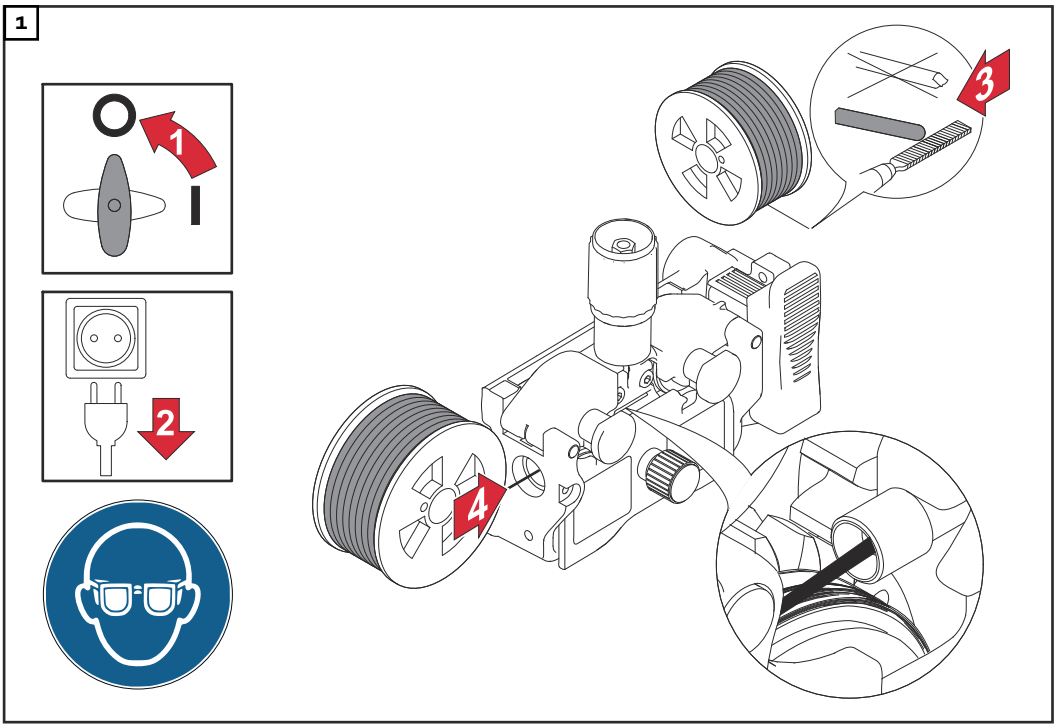
⚠ CAUTION!

Danger from springiness of spooled wire electrode.
Personal injury may result.
- ▶ Wear safety goggles.
- ▶ When inserting the wirespool/basket-type spool, hold the end of the wire electrode firmly to avoid injuries caused by the wire electrode springing back.

⚠ CAUTION!

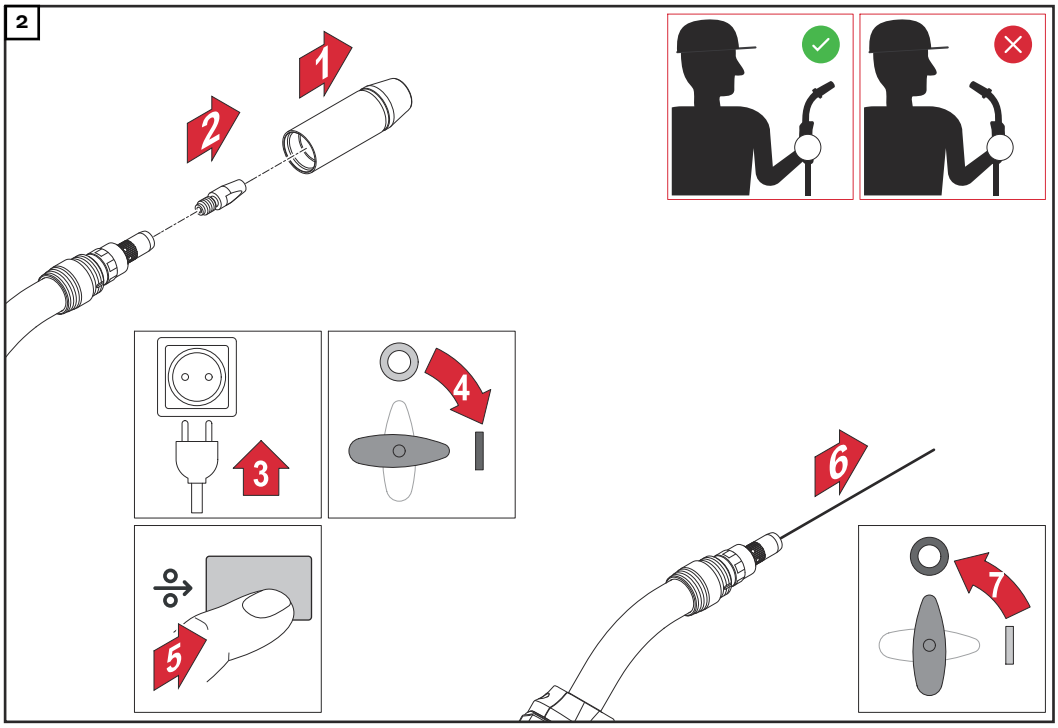
Danger due to sharp end of the wire electrode.
This can damage the welding torch.
- ▶ Deburr the end of the wire electrode well before threading in.
- ▶ Lay out the torch hosepack as straight as possible.

1



⚠ CAUTION!

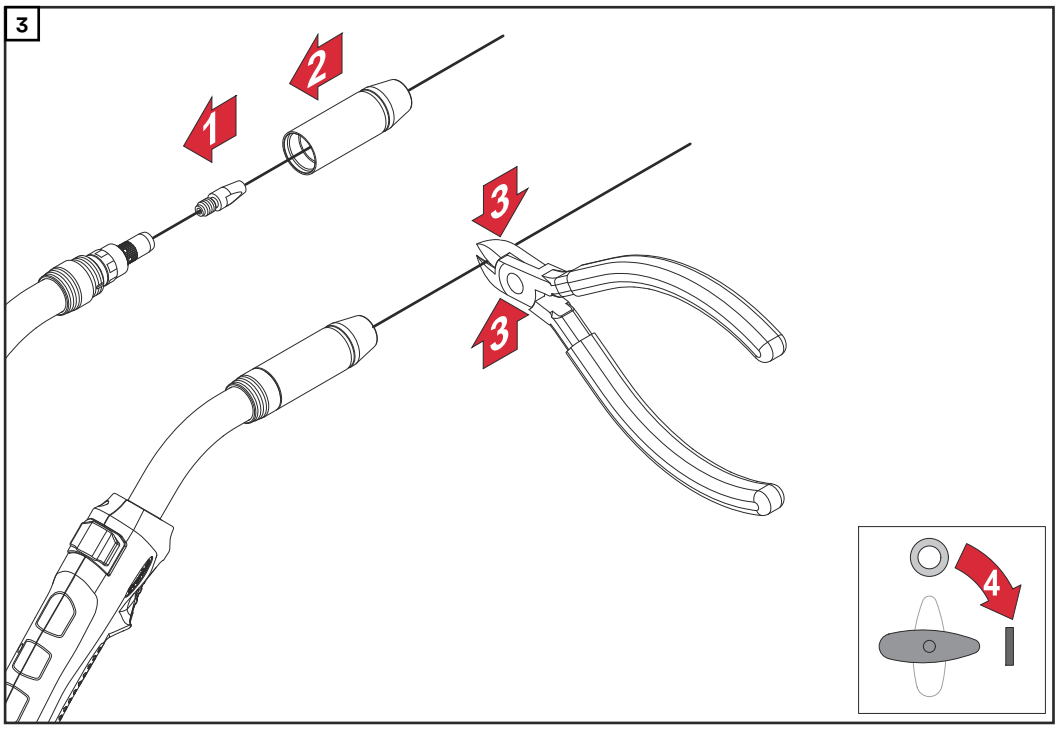
Danger due to emerging wire electrode.
Personal injury may result.
- ▶ Hold the welding torch so that the tip of the welding torch points away from the face and body.
- ▶ Wear suitable protective goggles.
- ▶ Do not point the welding torch at people.
- ▶ Ensure that the wire electrode can only intentionally make contact with electrically conductive objects.



NOTE!

The wire electrode can be threaded by pressing a wire threading button provided in the welding system or by pressing the torch trigger.

▶ The "Wire threading" dialog window is shown on the displays of the welding machine and wirefeeder.



Instructions for wire threading

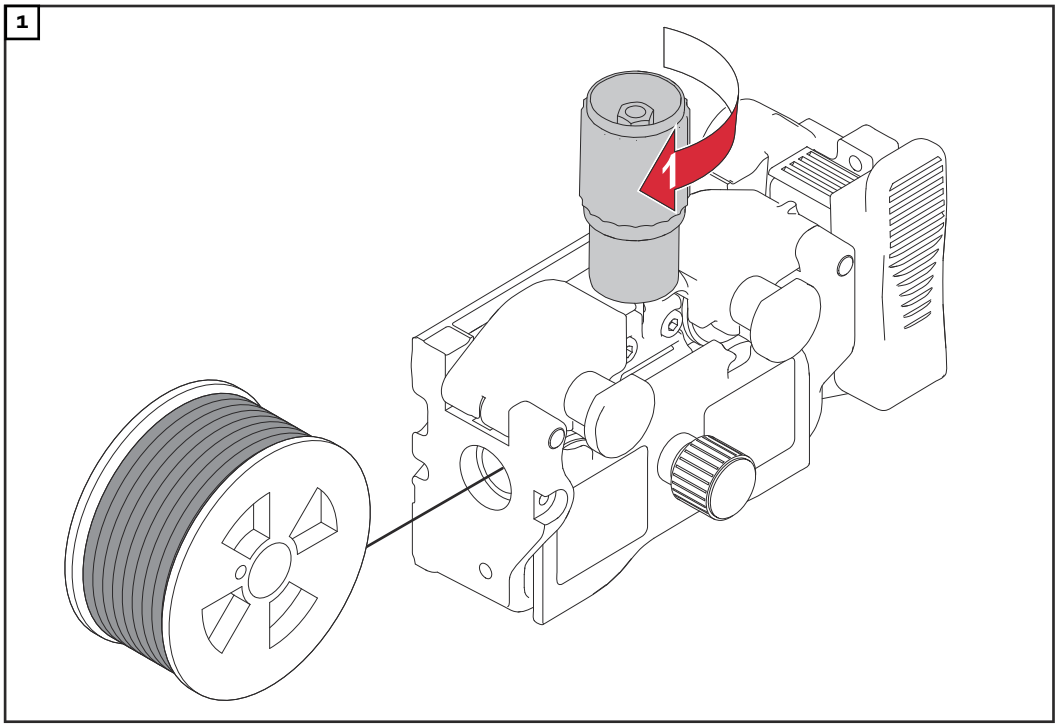
If contact is made with the ground during wire threading, the wire electrode is automatically stopped.

When the torch trigger is pressed once, the wire electrode moves forwards 1 mm.

Setting the contact pressure

NOTE!

Set the contact pressure in such a way that the wire electrode is not deformed but nevertheless ensures proper wirefeeding.

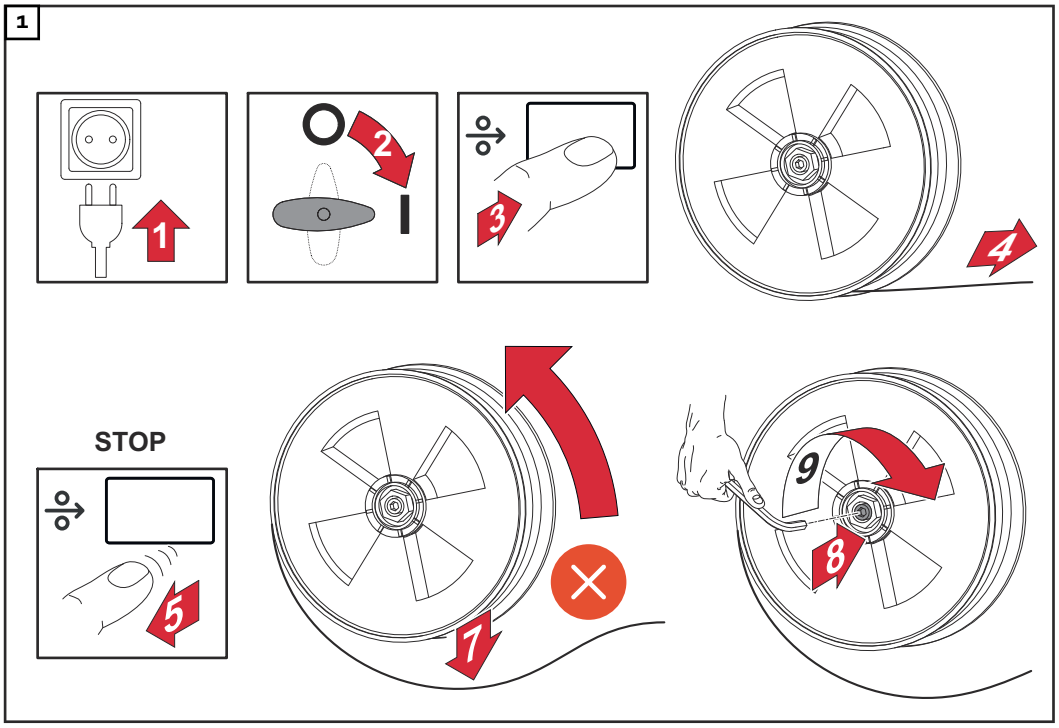


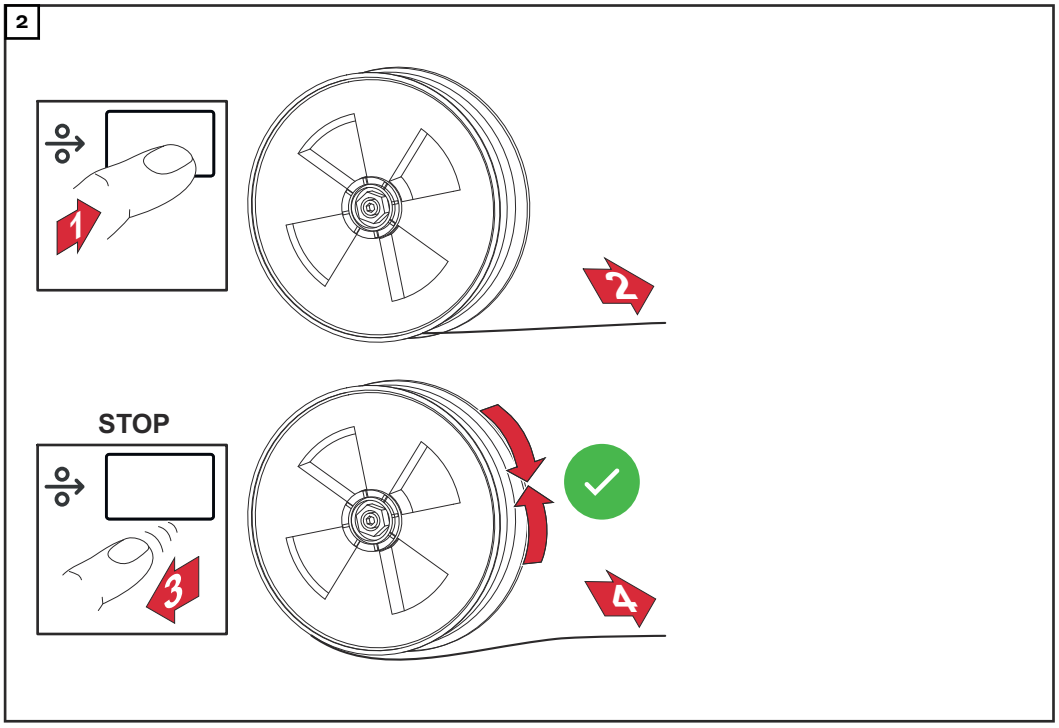
The standard values for the contact pressure can be found on the sticker on the 4-roller drive.

Adjusting the brake

NOTE!

After releasing the torch trigger, the wire spool must stop unreeling.
Adjust the brake if necessary.

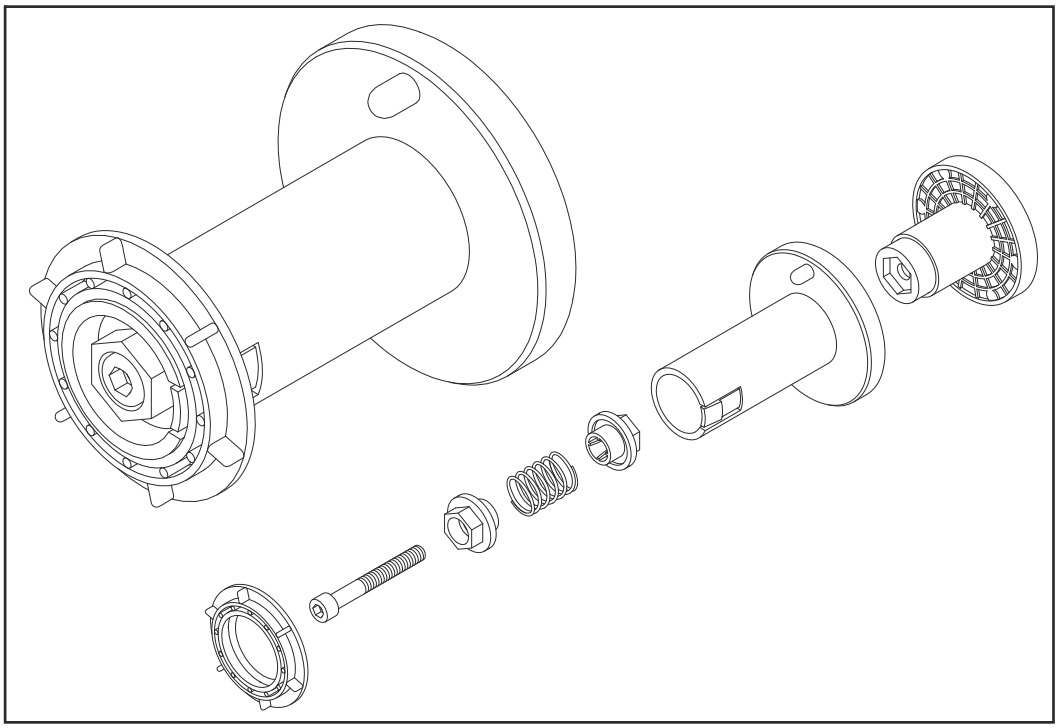




Design of the brake

⚠ CAUTION!

Danger from incorrect installation.
Personal injury and damage to property may result.
- ▶ Do not dismantle the brake.
- ▶ Maintenance and servicing of brakes is to be carried out by trained, qualified personnel only.



The brake is only available as a complete unit.
The illustration of the brake is for information purposes only.

Performing R/L alignment

IMPORTANT! For optimum welding results, the manufacturer recommends carrying out an R/L alignment whenever the device is commissioned and whenever changes are made to the welding system.
Further information on the R/L alignment can be found in the setup menu / MIG/MAG / R/L alignment as of page 202.

Commissioning Fortis with external wirefeeder

Danger from electrical current

⚠ WARNING!

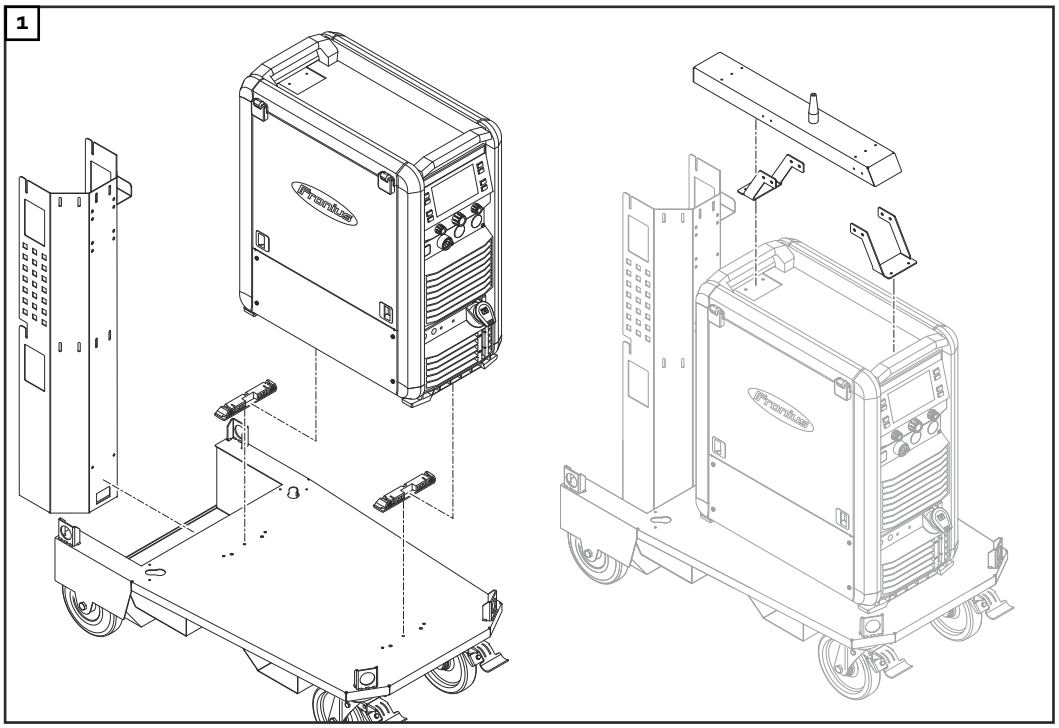
Danger from electrical current.
This may result in serious personal injury and damage to property.
- ▶ Before starting work, switch off all the devices and components involved and disconnect them from the grid.
- ▶ Secure all these devices and components so they cannot be switched back on.

⚠ WARNING!

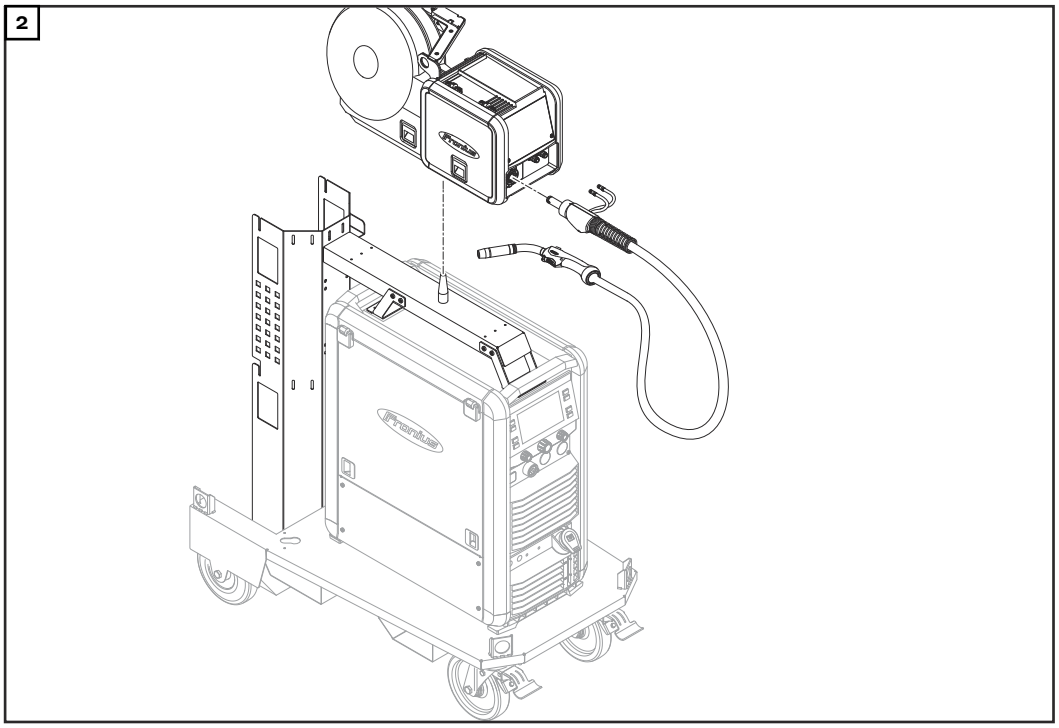
Danger of electrical current due to electrically conductive dust in the device.
This may result in serious personal injury and damage to property.
- ▶ Only operate the device if an air filter is fitted. The air filter is a very important safety device for achieving IP 23 protection.

Fortis: Assembling the system components (overview)

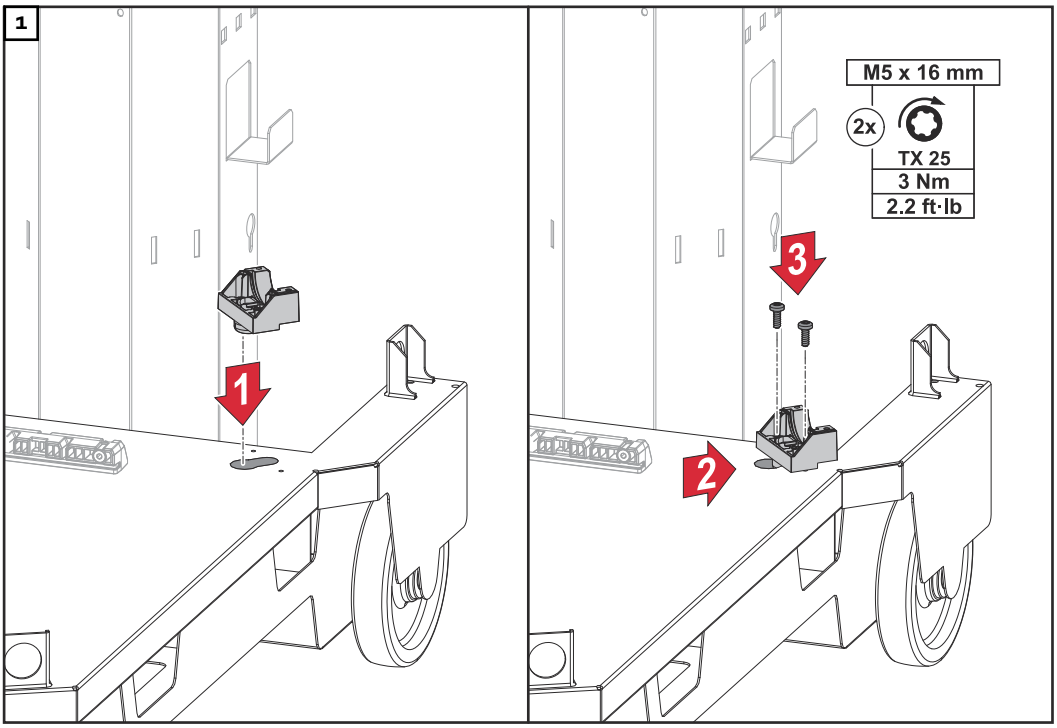
1



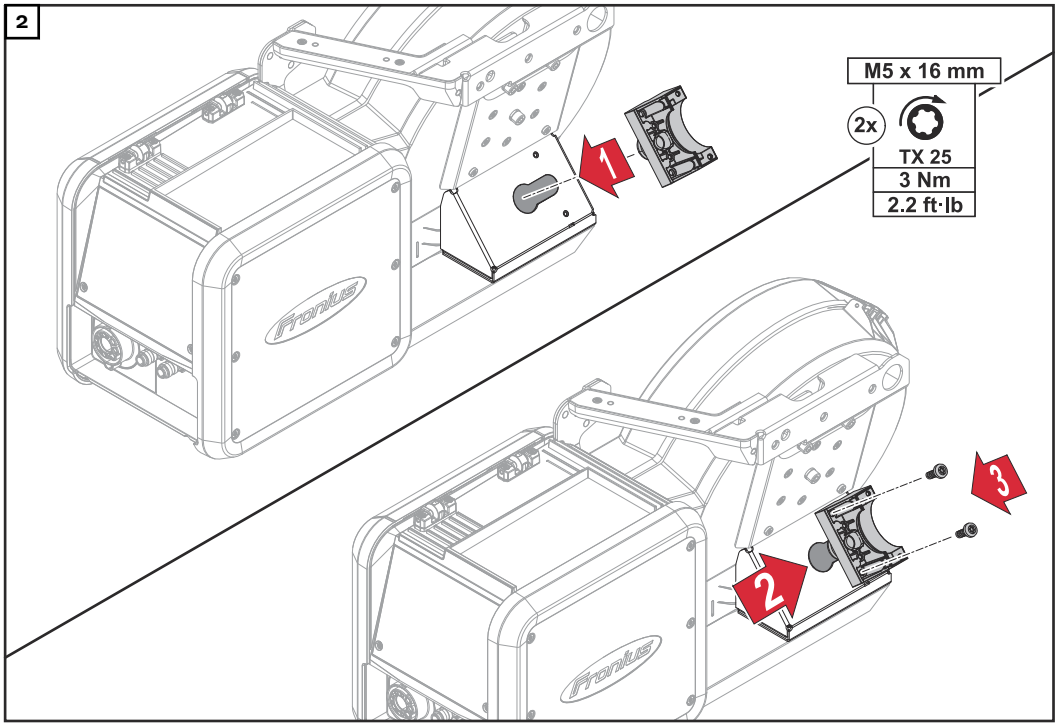
2



Attach the strain-relief device for the interconnecting hosepack

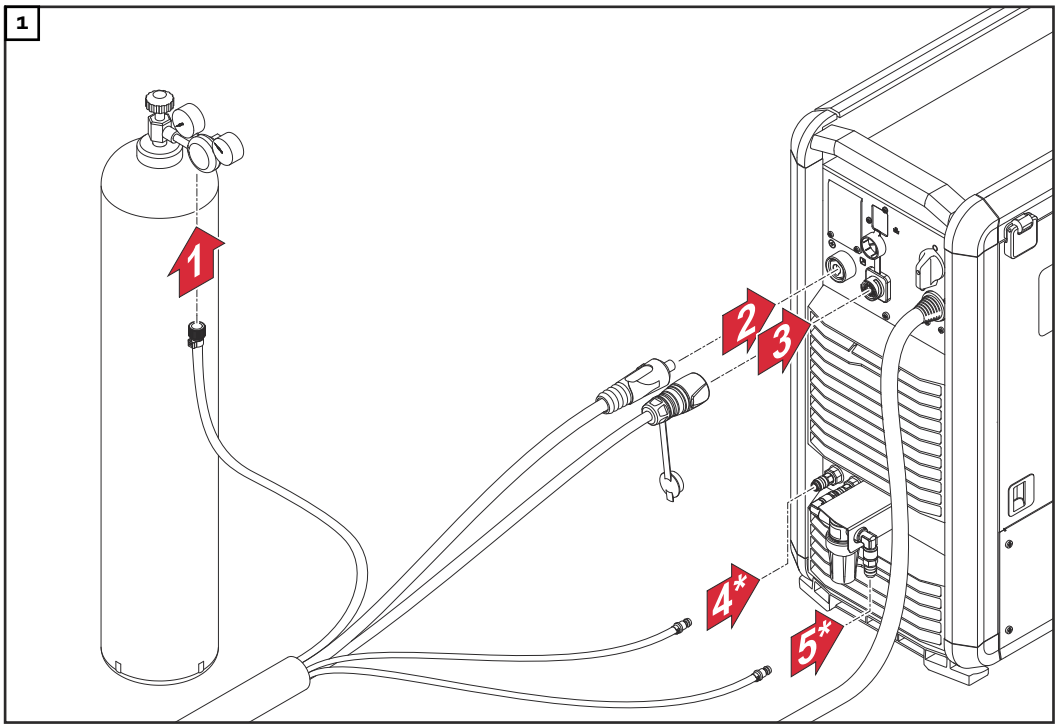


Attach the strain-relief device to the trolley

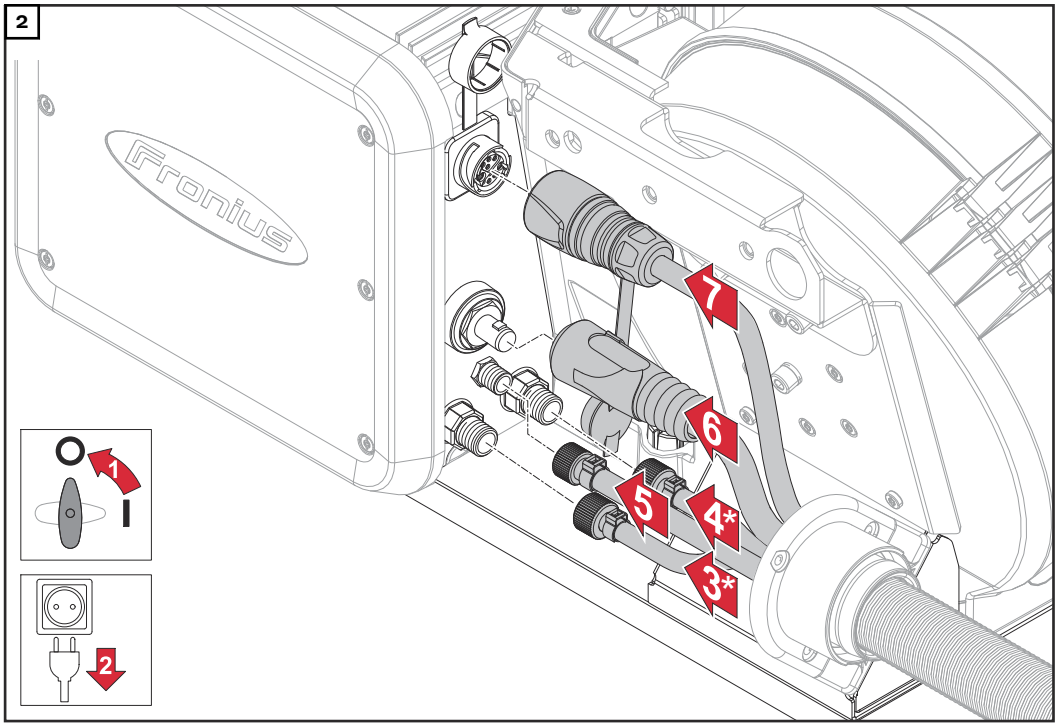


Attach the strain-relief device to the wirefeeder

Connecting the interconnecting hosepack



Connect interconnecting hosepack to the welding machine



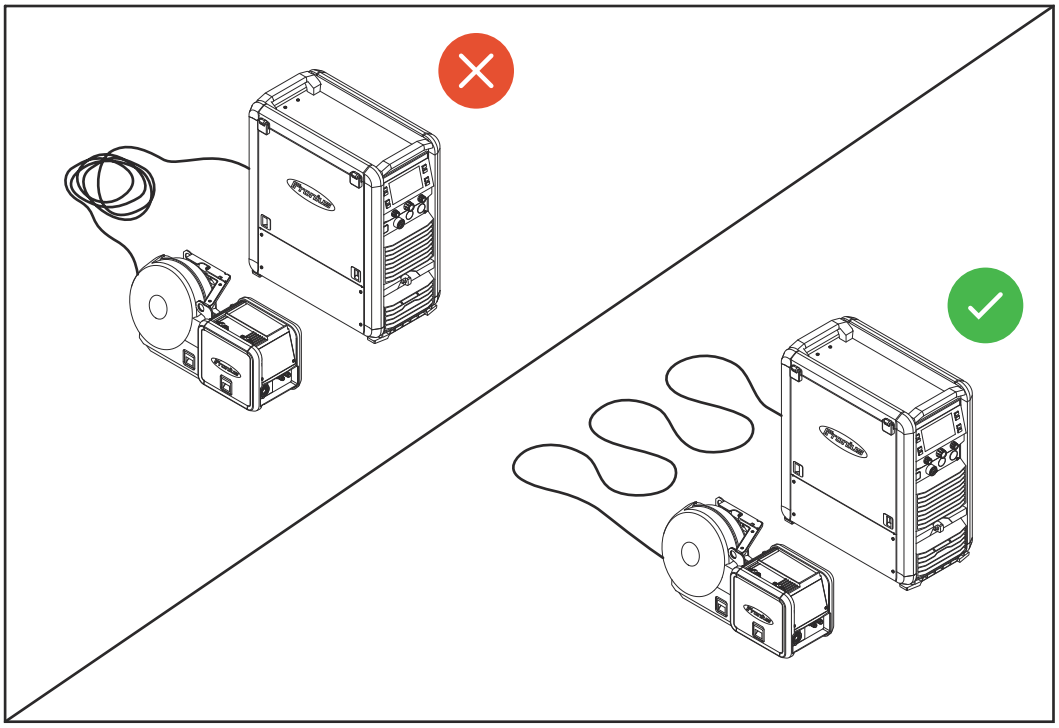
Connect interconnecting hosepack to the wirefeeder

* only if the coolant connections are installed in the wirefeeder and only if the interconnecting hosepack is water-cooled

Correct routing of the interconnecting hosepack

⚠ CAUTION!

Risk of overheating caused by an incorrectly routed interconnecting hosepack.
The welding system components may be damaged.
- ▶ Do not form any loops when routing the interconnecting hosepack
- ▶ Do not cover the interconnecting hosepack
- ▶ Do not wind the interconnecting hosepack as you get near the gas cylinder and do not wrap it around the gas cylinder

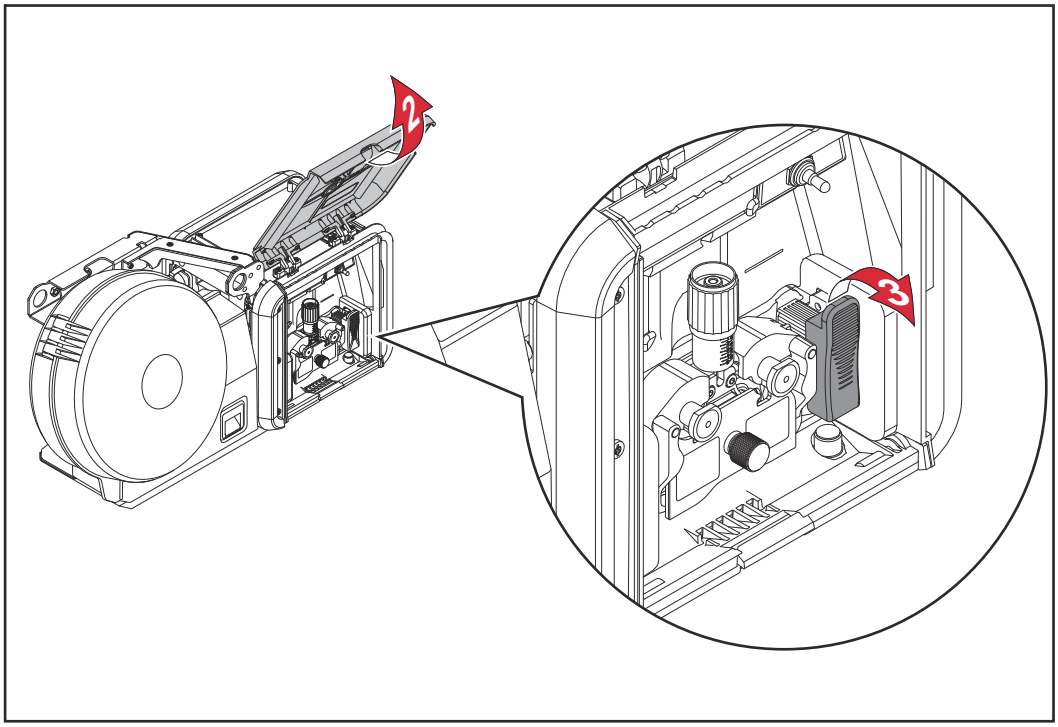


Correct routing of the interconnecting hosepack

IMPORTANT!
- The duty cycle values (ED) of the interconnecting hosepacks can only be achieved if the hosepacks are correctly routed.
- If the routing of an interconnecting hosepack changes, carry out an R/L alignment (see page 202)!

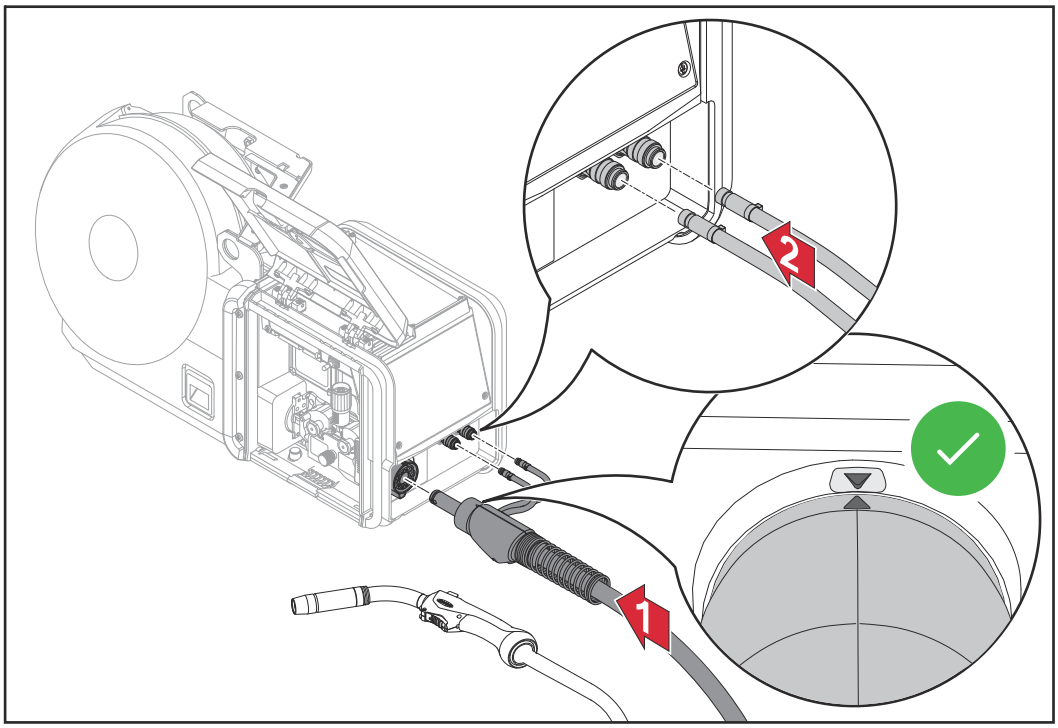
Connecting a MIG/MAG welding torch to the wirefeeder

1 Check that all cables, leads, and hosepacks are undamaged and correctly insulated



2 Open the wire drive cover

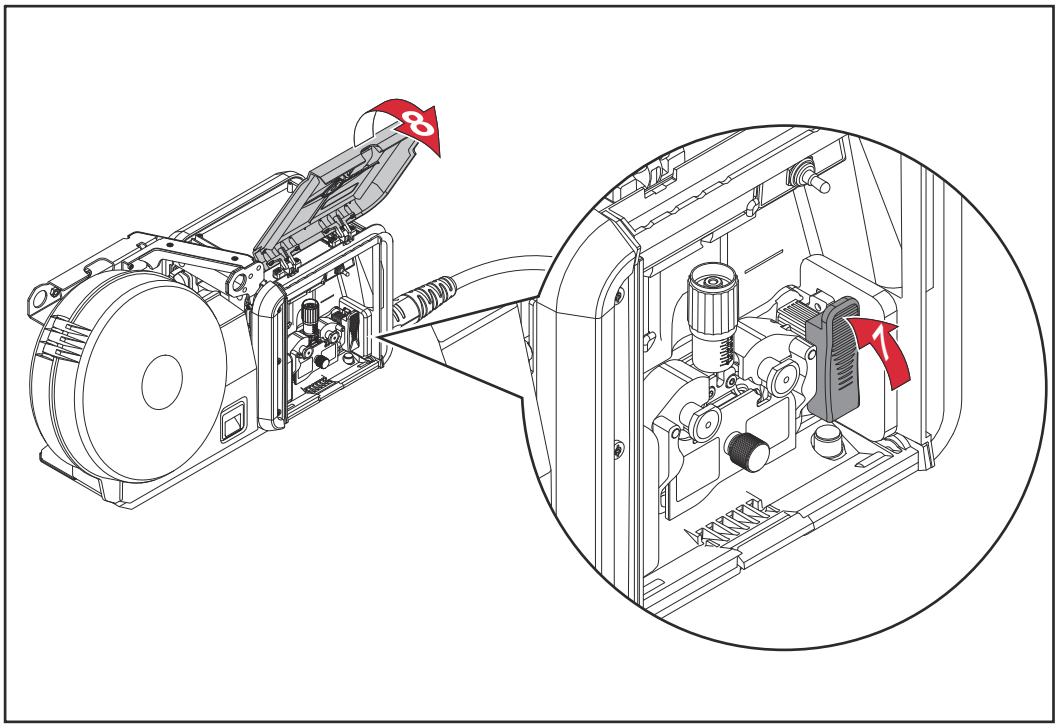
3 Open the clamping lever on the wire drive



4 Push the correctly equipped welding torch with the marking facing up from the front into the welding torch connection of the wirefeeder

5 For water-cooled welding torches:
Connect the coolant supply hose to the coolant supply connection (blue)

6 Connect the coolant return hose to the coolant return connection (red)

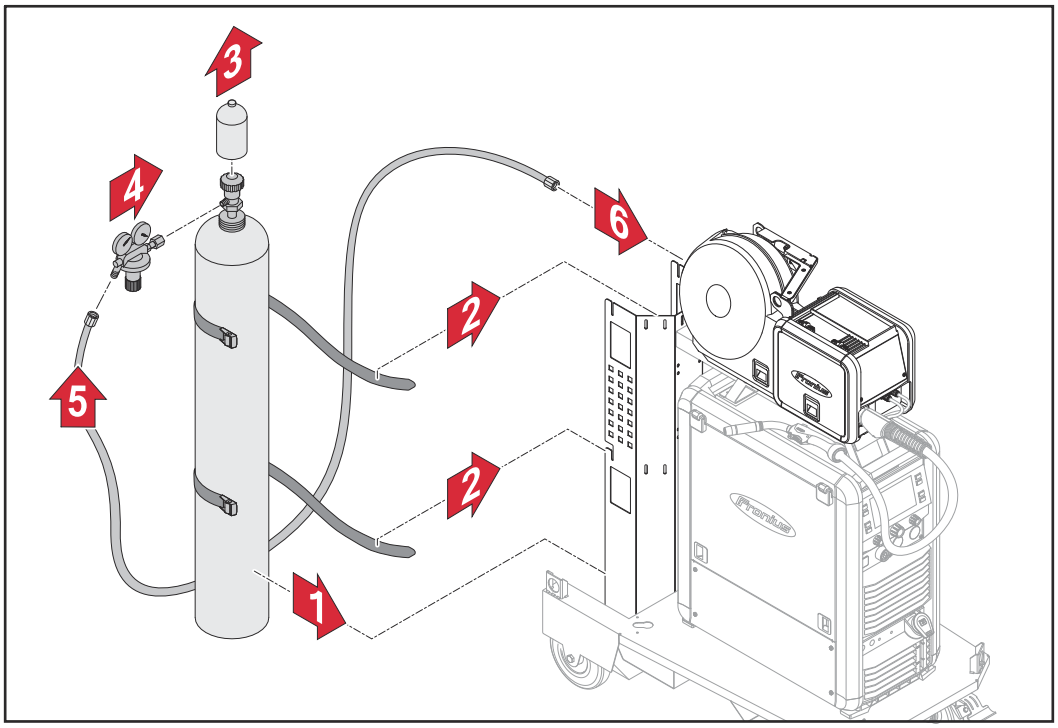


7 Close the clamping lever on the wire drive
8 Close the wire drive cover
9 Check that all connections are secure

Connecting the gas cylinder

⚠ WARNING!

Danger from falling gas cylinders.
This can result in serious injury and damage to property.
- ▶ Place gas cylinders on a solid, level surface so that they remain stable. Secure gas cylinders to prevent them from falling over.
- ▶ Observe the safety rules of the gas cylinder manufacturer.



1 Place the gas cylinder on the base of the trolley

2 Use cylinder straps to secure the gas cylinder against falling over, although not by the neck of the cylinder

3 Remove the protective cap from the gas cylinder
- Briefly open the gas cylinder valve to remove any dirt
- Inspect the seal on the gas pressure regulator

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

5 Connect the shielding gas hose from the interconnecting hosepack to the gas pressure regulator

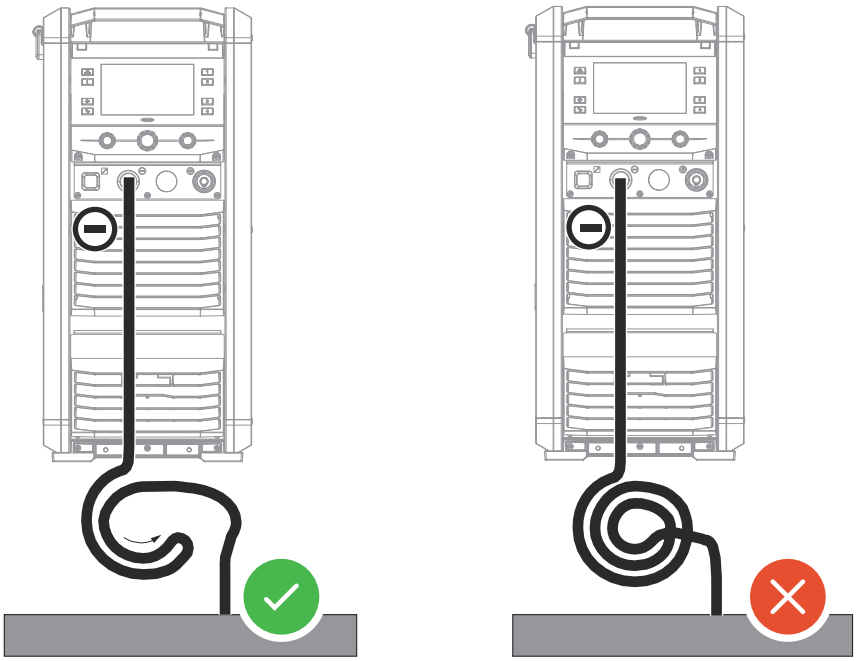
6 Connect the shielding gas hose from the interconnecting hosepack to the wirefeeder

Establishing a ground earth connection

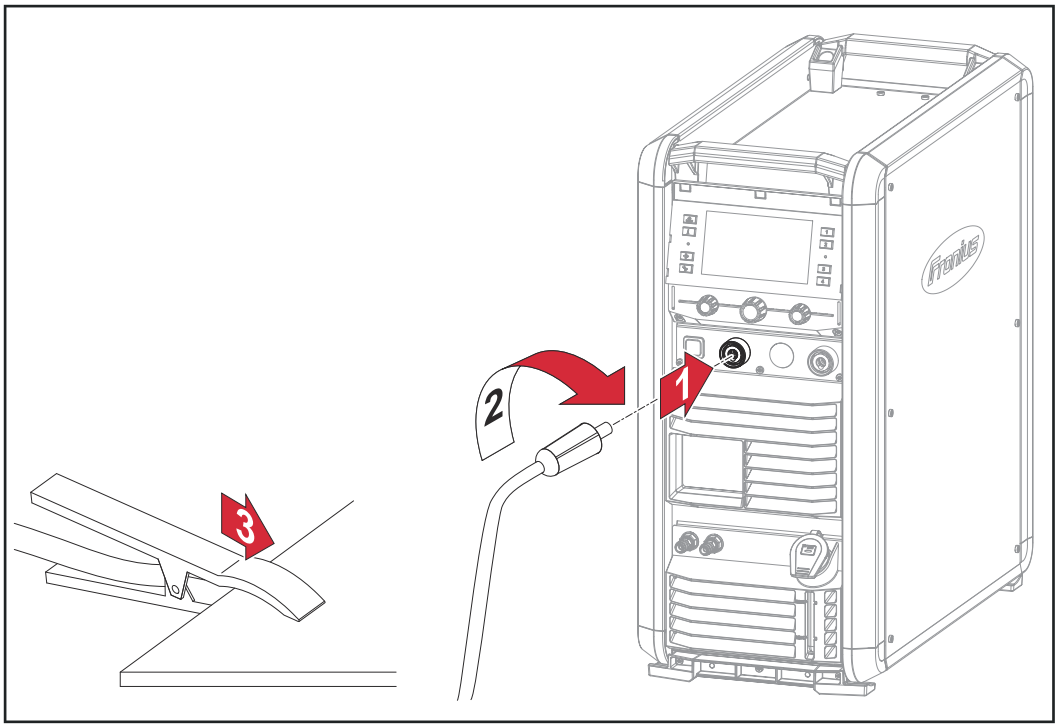
NOTE!

When establishing a ground earth connection, observe the following points:
Failure to do so may impair welding results and pulse welding.

- ▶ Use a separate return lead cable for each welding machine
- ▶ Keep positive cables and return lead cables together as long and as close as possible
- ▶ Physically separate the welding circuits of individual welding machines
- ▶ Do not route several return lead cables in parallel;
  if parallel routing cannot be avoided, keep a minimum distance of 30 cm between the welding circuits
- ▶ Keep the return lead cables as short as possible and use cables with a large cross-section
- ▶ Do not cross over return lead cables
- ▶ Avoid ferromagnetic materials between the return lead cables and the interconnecting hosepack
- ▶ Do not reel up long return lead cables - coil effect!
  Route long return lead cables in loops



- ▶ Do not route return lead cables in iron pipes, metal cable trays, or along steel beams, avoid cable ducts;
  (routing positive cables and return lead cables together in an iron pipe does not cause any problems)
- ▶ If several return lead cables are being used, separate the grounding points on the component as far as possible and do not allow crossed current paths between the individual arcs.



1 Plug the return lead cable into the (-) current socket
2 Lock return lead cable
3 Connect the other end of the return lead cable to the workpiece

IMPORTANT! For optimum weld properties, route the return lead cable as close as possible to the interconnecting hosepack.

⚠ CAUTION!

Impaired welding results due to a ground earth connection being shared by several welding machines!
If several welding machines are all welding one component, a common ground earth connection can have a significant effect on the welding results.
- ▶ Disconnect welding circuits!
- ▶ Provide a separate ground earth connection for each welding circuit!
- ▶ Do not use a common return lead cable!

Other activities

Carry out the following steps according to the Operating Instructions for the wirefeeder:

1 Insert feed rollers into the wirefeeder
2 Insert wirespool or basket-type spool and its adapter into the wirefeeder
3 Threading the wire electrode

The wire electrode can be threaded by pressing a wire threading button in the welding system or by pressing the torch trigger.
The dialog window "Wire threading" is shown on the display.

4 Set the contact pressure
5 Adjust the brake

IMPORTANT! For optimum welding results, the manufacturer recommends carrying out an R/L alignment whenever the device is commissioned and whenever changes are made to the welding system. Further information on the R/L alignment can be found in the setup menu / MIG/MAG / R/L alignment as of page202.

Instructions for wire threading

If contact is made with the ground during wire threading, the wire electrode is automatically stopped.

When the torch trigger is pressed once, the wire electrode moves forwards 1 mm.

Commissioning the cooling unit

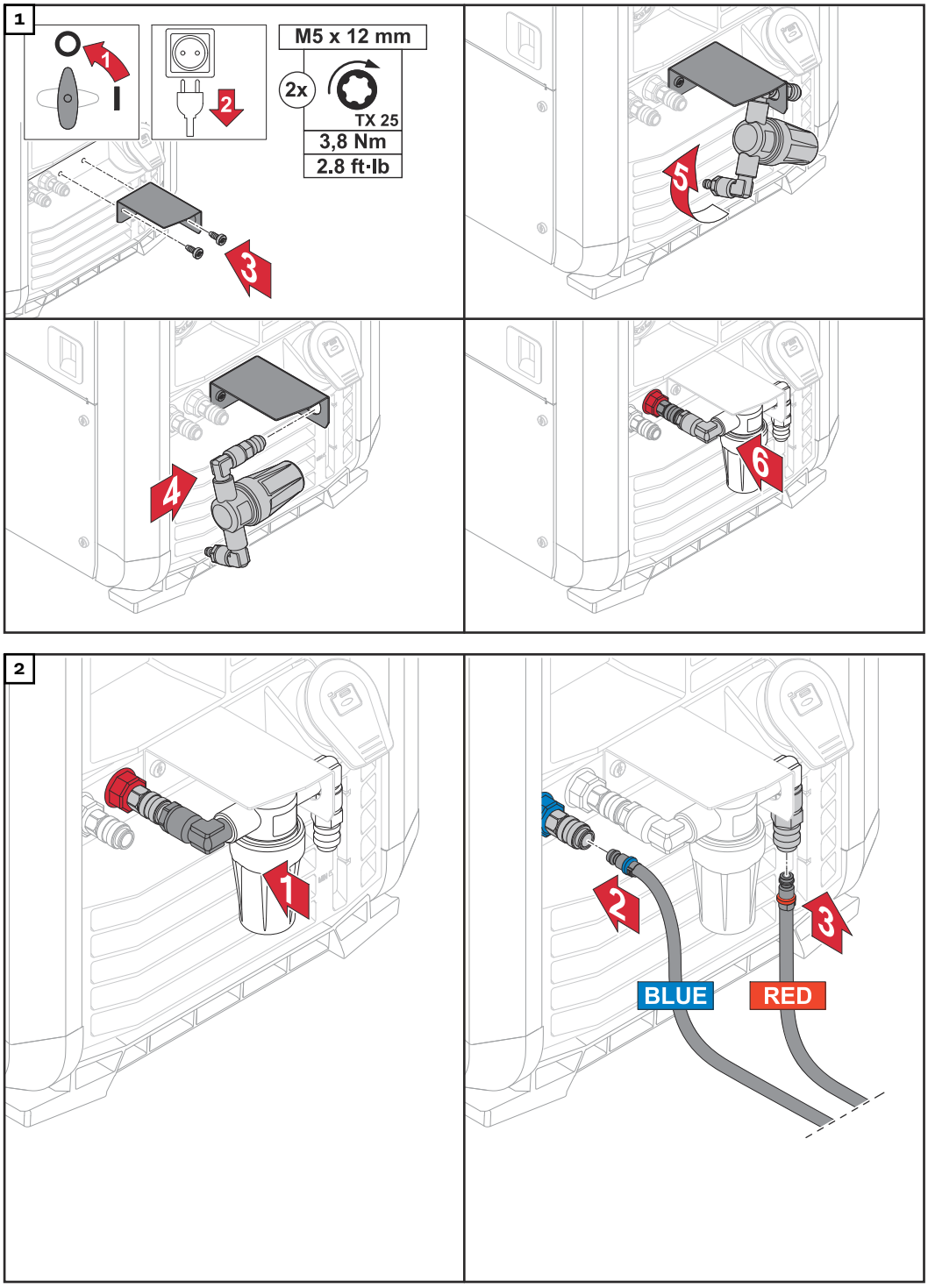
Installing the filter and connecting the coolant hoses

The filter and mounting plate are included in the scope of supply of the optional cooling unit.

NOTE!

The filter must be installed before commissioning the cooling unit!

▶ The cooling unit must not be operated without a filter.



Connect coolant hoses from the welding torch or from the interconnecting hosepack to the cooling unit of the welding machine according to their color coding

Filling the cooling unit

When the optional cooling unit is installed in the factory, a 5 l canister containing coolant is included in the scope of supply.

⚠ CAUTION!

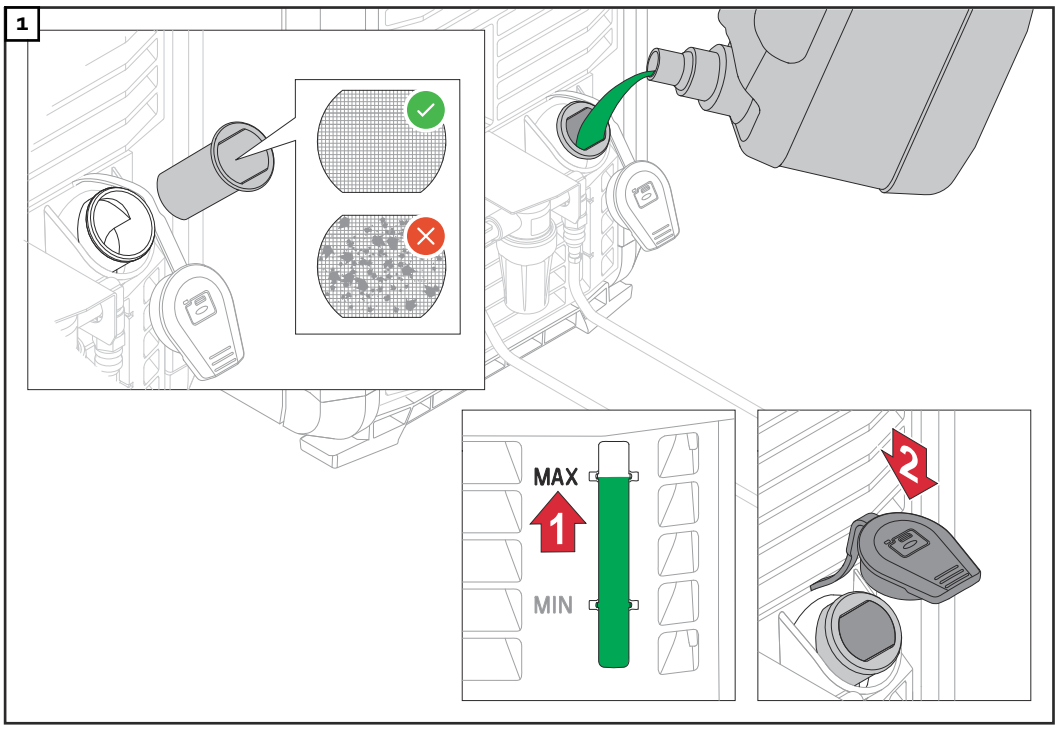
Danger from using prohibited coolant.
This can result in damage to property.

- ▶ The cooling unit must only be operated using Cooling Liquid FCL10/20. Other coolants are not suitable due to their electrical conductivity and insufficient material compatibility.
- ▶ Do not mix different coolants.
- ▶ When changing the coolant, make sure all the coolant is replaced.

⚠ CAUTION!

Danger due to coolant escaping.
Personal injury and damage to property may result.

- ▶ If coolant ends up on the outside of the device, this should be removed immediately.
- ▶ Make sure that no coolant ends up on the inside of the cooling unit.



IMPORTANT! The filter insert in the filler pipe must be checked before each filling or refilling of the coolant tank to ensure that:

- It is present
- It is correctly positioned (flat side at the top)
- It is not contaminated (clean if necessary)

Commissioning the cooling unit

NOTE!

Before commissioning the cooling unit, make sure that:

- ▶ There is sufficient coolant in the cooling unit
- ▶ The coolant is free of contamination
- ▶ The welding torch is connected

The cooling unit is supplied with power and controlled via the welding machine. When the power switch on the welding machine is turned to the - I - position, the cooling unit begins to operate as follows:

- The fan runs for approx. 5 seconds
- The coolant pump runs for approx. 3 minutes. If welding does not start after approx. 3 minutes, the coolant pump switches off again

In the component menu of the welding machine, the following operating modes can be set for the cooling unit:

- eco
- auto
- off

For details on the cooling unit settings, see from page 212 onwards.

After the end of welding, the pump continues to operate for 2 minutes, after which the pump switches off.

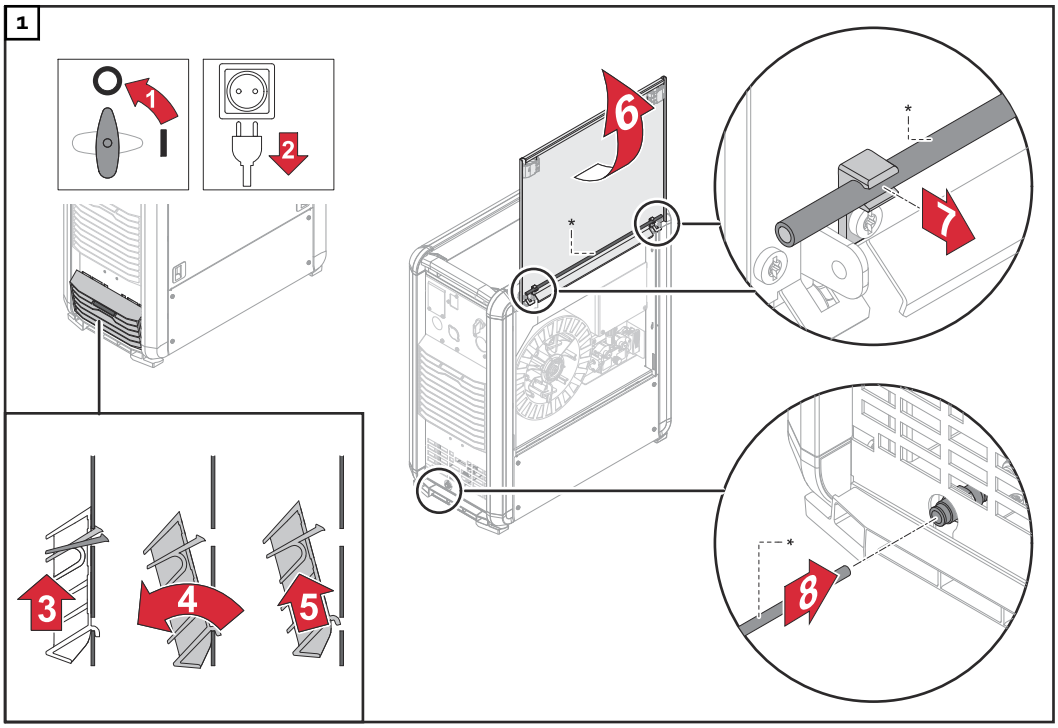
Replacing the coolant

Draining the coolant

⚠ CAUTION!

Danger due to hot coolant.
This can result in burns or scalding.

- ▶ Allow the coolant to cool down to +25 °C / +77 °F before starting work.
- ▶ Switch off the cooling unit before disconnecting coolant hoses.

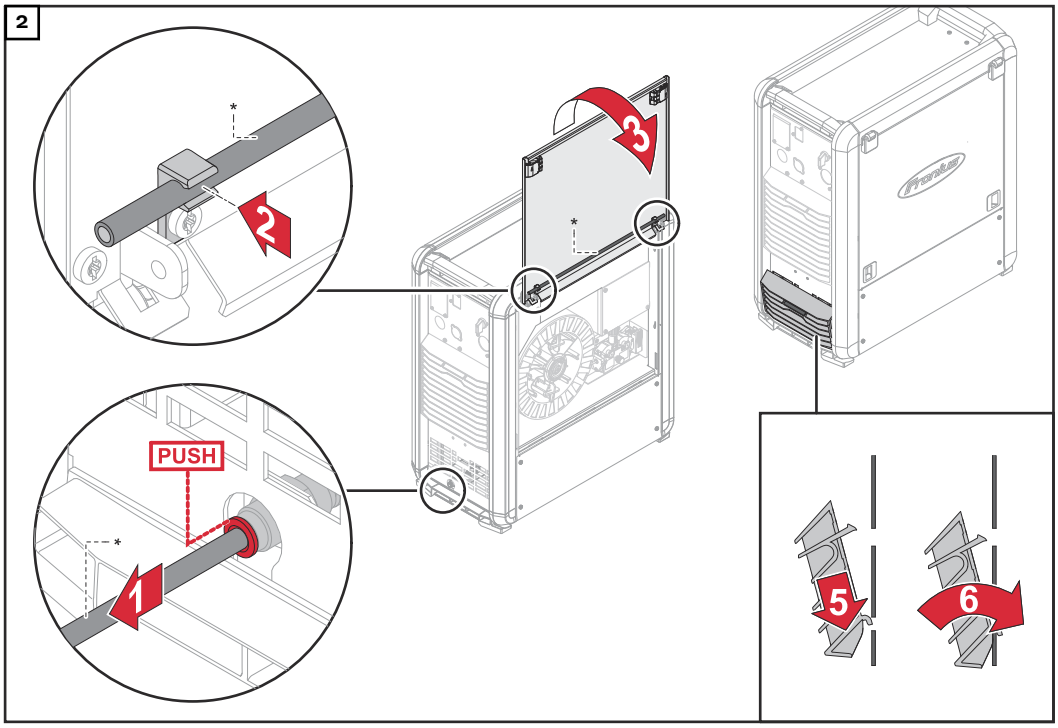


* *Hose for draining the coolant*

NOTE!

As soon as the hose for draining the coolant is plugged in at the coolant drainage point, the coolant will run out.

- ▶ Lifting the welding machine on the front side facilitates complete emptying of the cooling unit.
- ▶ Do not dispose of coolant in the sewage system.
- ▶ Coolants should be disposed of according to applicable national and local regulations.
- ▶ When changing the coolant, make sure all the coolant is replaced.



** Hose for draining the coolant – press in the ring at the coolant drainage point to unplug*

3 Fill the cooling unit
(See from page 117 onwards)

Commissioning Fortis Duo

General

In Duo operation, a welding machine with integrated wire drive is operated with an additional external wirefeeder.
Duo operation enables the joint use of two welding process lines with one welding machine. The welding process lines can be changed using the torch trigger, on the welding machine, via the operating controls on the wirefeeder, or on a remote control.

With Multiprocess devices, it is also possible to switch to a TIG welding process line in addition to the two MIG/MAG welding process lines.
The TIG welding torch is connected to the welding machine; the welding process lines can also be switched over via the TIG welding torch.
For the TIG welding process line, the polarity reverser on the welding machine must be reconnected manually.

⚠ CAUTION!

Danger due to unused welding torches or electrodes.
In Duo operation, the welding potential is applied to electrodes of unused welding torches or electrode holders.
Personal injury and damage to property as a result of unexpected voltages or arcs may result.
- ▶ Only put aside unused welding torches when they are insulated against ground.
- ▶ Do not place unused welding torches on the workpiece.

Duo operation is possible with gas and water-cooled welding systems.

Components required for Duo operation

- **TU Move 4 Pro trolley**
  + OPT/TU gas cylinder holder Duo
  + OPT/TU swivel pin holder
- **Fortis C /GW**
  + OPT/s Duo
  + software activation Duo
  + OPT/s CU 1200 MC (for water-cooled welding systems)
- **WF 25s wirefeeder**
  + OPT/s WF control unit
  + OPT/s WF water cooling (for water-cooled welding systems)
- **Interconnecting hosepack HP xx /s**
- **2 gas cylinders**
- **2 MIG/MAG welding torches**

Danger from electrical current

⚠ WARNING!

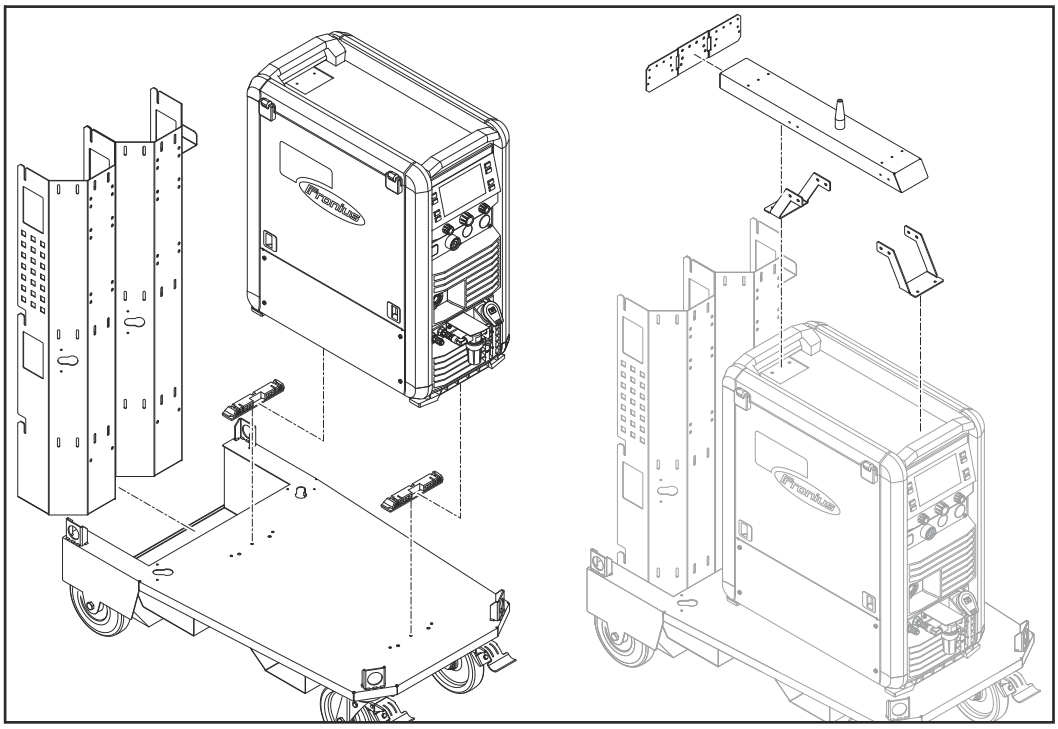
Danger from electrical current.
This may result in serious personal injury and damage to property.
- ▶ Before starting work, switch off all the devices and components involved and disconnect them from the grid.
- ▶ Secure all these devices and components so they cannot be switched back on.

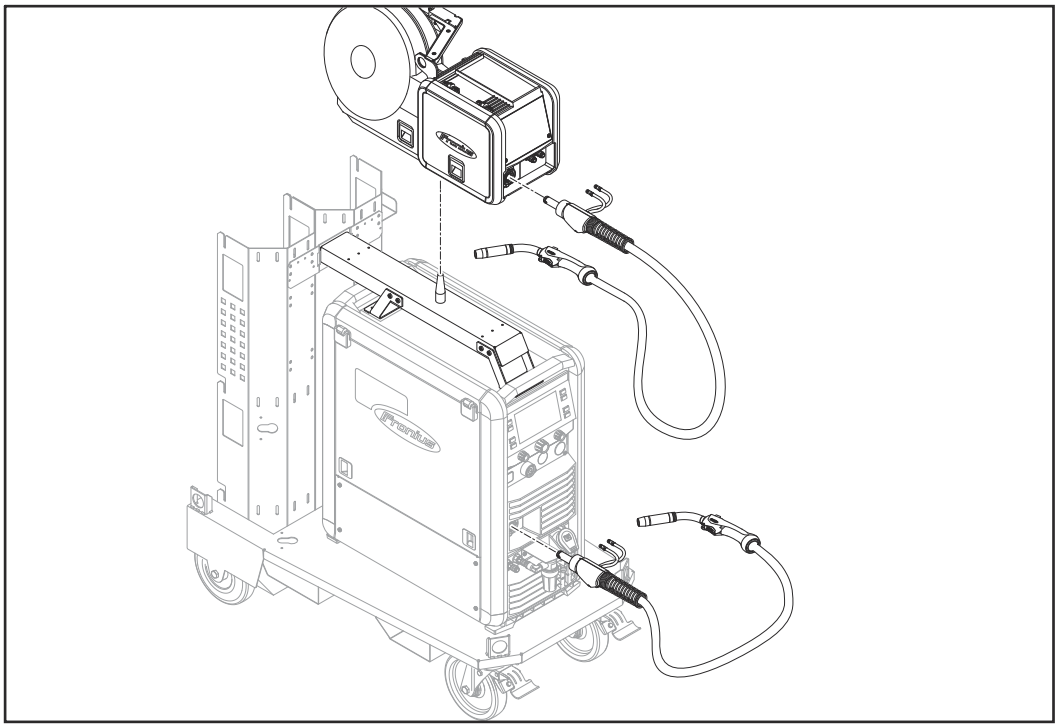
⚠ WARNING!

Danger of electrical current due to electrically conductive dust in the device.
This may result in serious 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.

Fortis Duo: Assembling the system components (overview)





Installation sequence:

1. Mount gas cylinder holders on the trolley
2. Set up the welding machine on the trolley
3. Fit the swivel pin holder on the trolley and on the welding machine
4. Place the wirefeeder on the swivel pin holder
5. Connect the interconnecting hosepack to the welding machine and wirefeeder
6. Connect the welding torches to the welding machine and wirefeeder

Locking and unlocking the welding machine

General

The welding machine can be locked by pressing a key combination or by means of an external NFC key reader, e.g., to prevent unauthorized access or the modification of welding parameters.

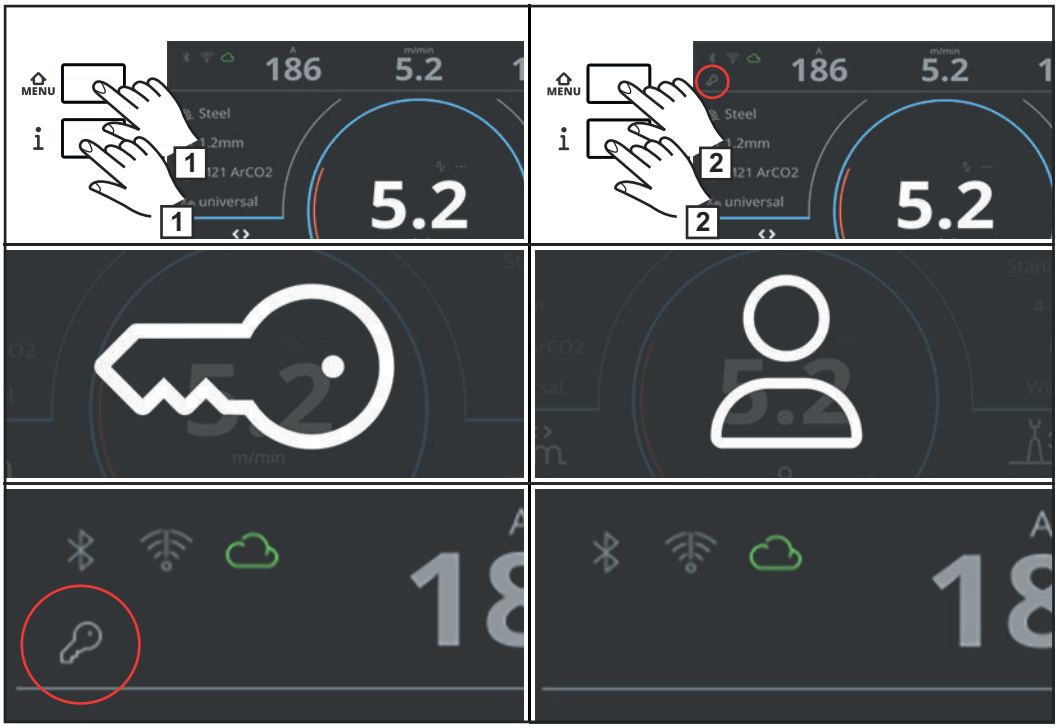
To lock and unlock the welding machine, the welding machine must be turned on.

NFC key = NFC card or NFC key fob

User Management on the welding machine or SmartManager offers further locking and unlocking functions as well as functions for different people logging in and out.

For details, see
- from page 219 onwards ... User Management on the welding machine
- from page 248 onwards ... User Management on the SmartManager

Locking and unlocking the welding machine by pressing a key combination



1 Press the Menu button and the Information button at the same time

The key symbol appears briefly on the display.
The key symbol is then displayed in the status bar.

The welding machine is now locked; the role "locked" that has been predefined in User Management is activated.
Only the welding parameters can be viewed and set.

If a locked function is called up, a corresponding message is displayed.

Unlocking the welding machine

2 Press the Menu button and the Information button at the same time

The user symbol appears briefly on the display.
The key symbol is no longer displayed in the status bar.

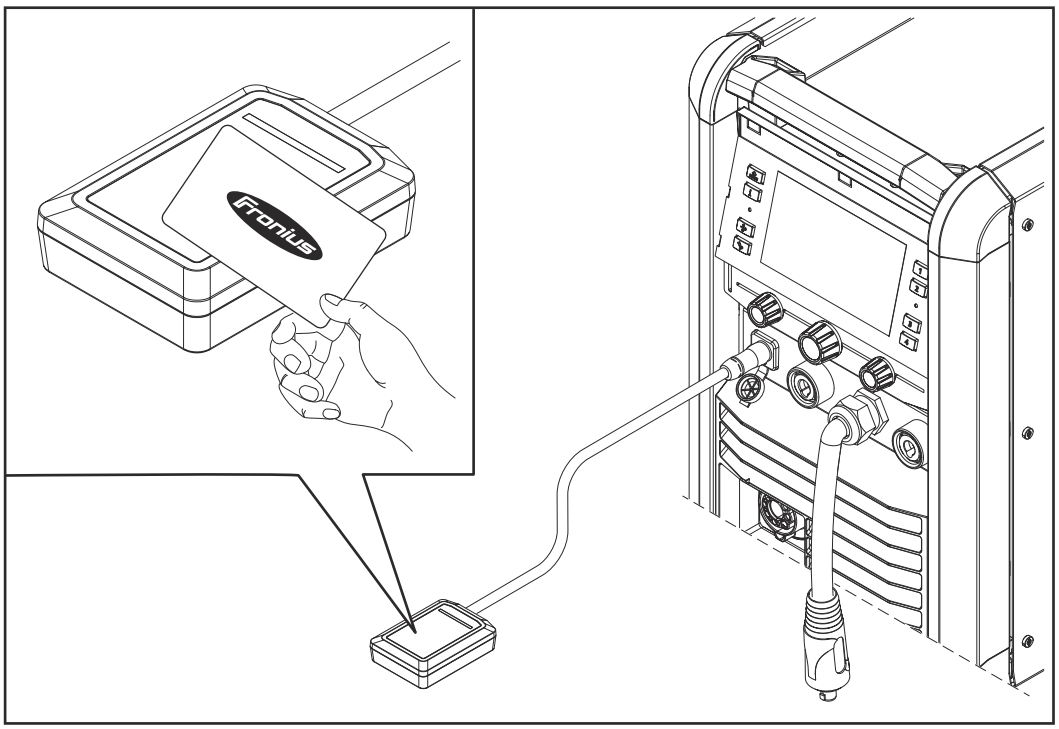
All welding machine functions are available again without restriction.

For details on the predefined role "locked", see User Management from page 219 onwards.

Locking and unlocking the welding machine using an NFC key

To lock and unlock the welding machine using an NFC key, the OPT/s NFC Reader /TMC option must be connected to the welding machine.

Locking the welding machine



1 Hold the NFC key on the NFC key reader

The key symbol appears briefly on the display.
The key symbol is then displayed in the status bar.

The welding machine is now locked; the role "locked" that has been predefined in User Management is activated.

Only the welding parameters can be viewed and set.

If a locked function is called up, a corresponding message is displayed.

Unlocking the welding machine

2 Hold the NFC key on the NFC key reader

The user symbol appears briefly on the display.
The key symbol is no longer displayed in the status bar.

All welding machine functions are available again without restriction.

For details on the predefined role "locked", see User Management from page 219 onwards.

If the OPT/s NFC Reader /TMC option is connected, User Management is also available in the welding machine Setup menu.
For details on User Management, see from page 219 onwards.

Status indicators on the NFC key reader

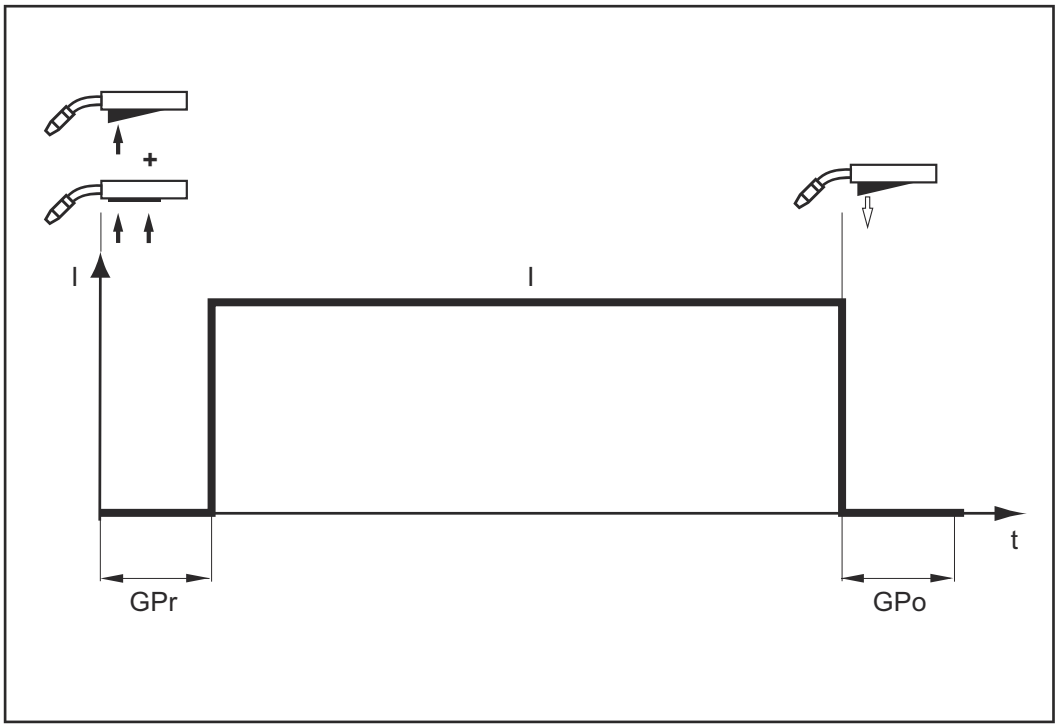
With the OPT/s NFC Reader /TMC option connected, the following status indicators can be displayed on the NFC key reader:

- Green chaser light:
  The system is starting up after plugging in the NFC key reader.
- Lights up green:
  The NFC key reader is ready.
- The status indicator fills green from left to right:
  An NFC key is detected.
- The status indicator fills red from left to right:
  An NFC key is not detected.

MIG/MAG welding

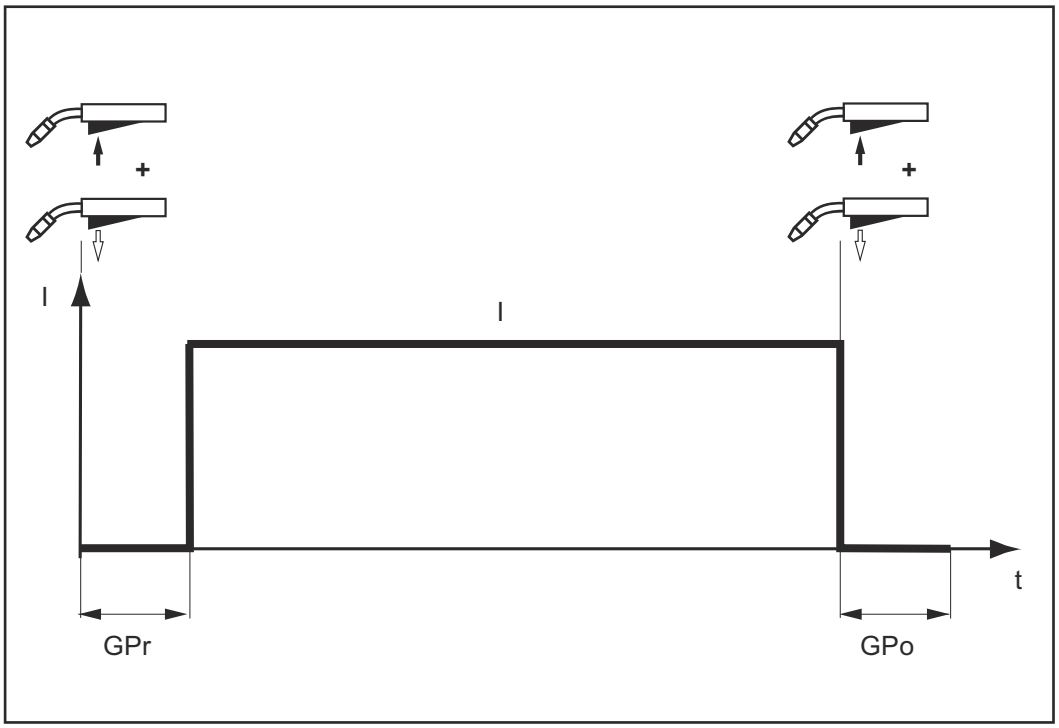
MIG/MAG operating modes and interval

2-step mode



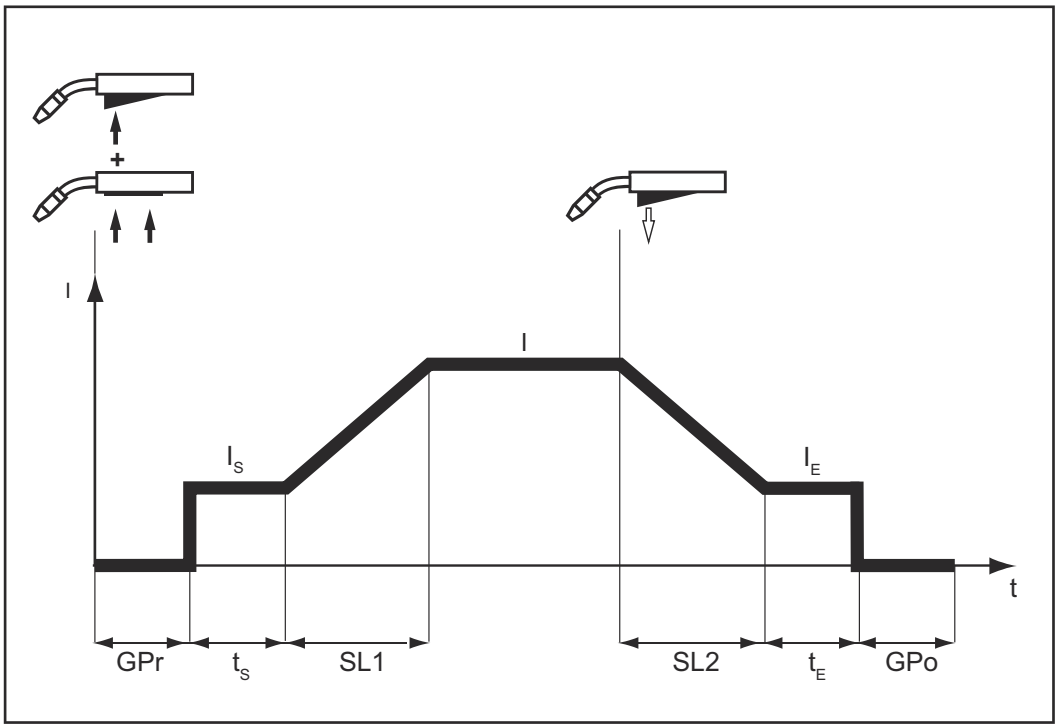
"2-step mode" is suitable for
- Tacking work
- Short weld seams
- Automatic and robot operation

4-step mode



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

Special 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.

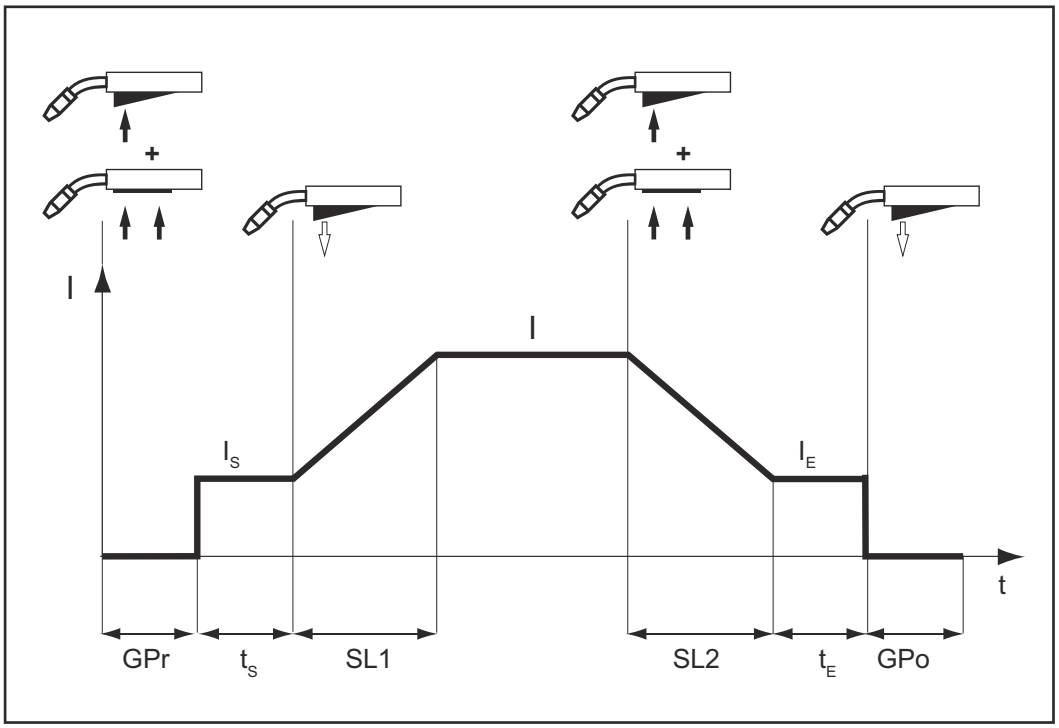
To activate special 2-step mode:

1. Select special 2-step operating mode
2. In the setup menu, set the t-$_S$ (starting current duration) and t-$_E$ (final current duration) parameters to a value > 0

   Special 2-step mode is activated.

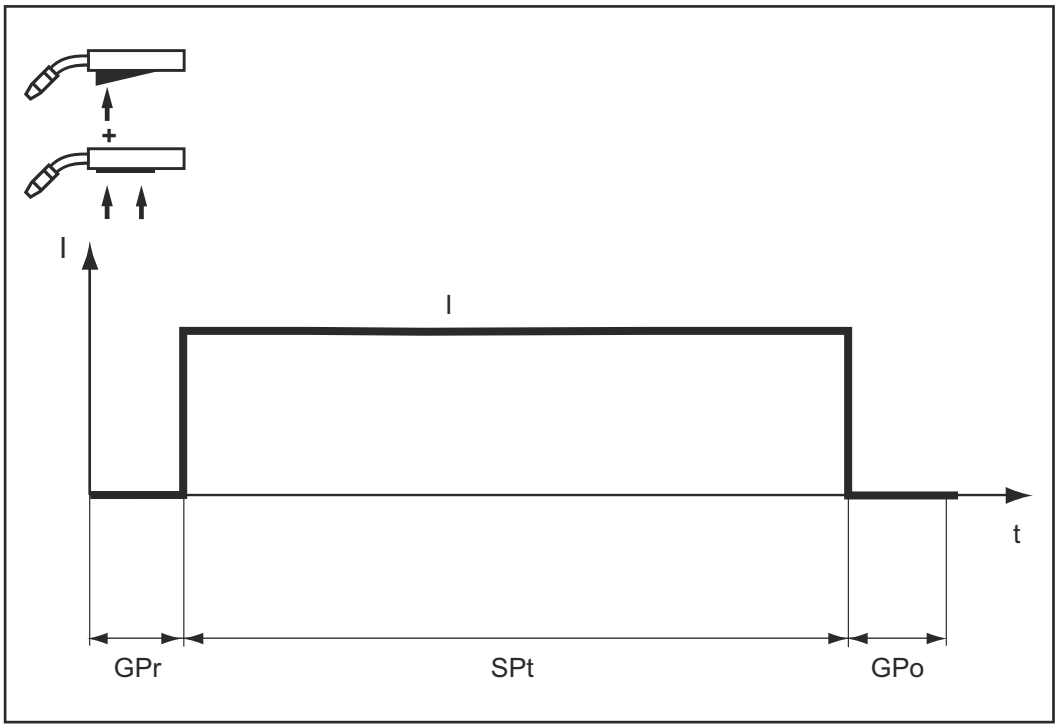
3. In the setup menu, set the SL1/2 (slope 1 and 2) and I_S (starting current) parameters

Special 4-step mode



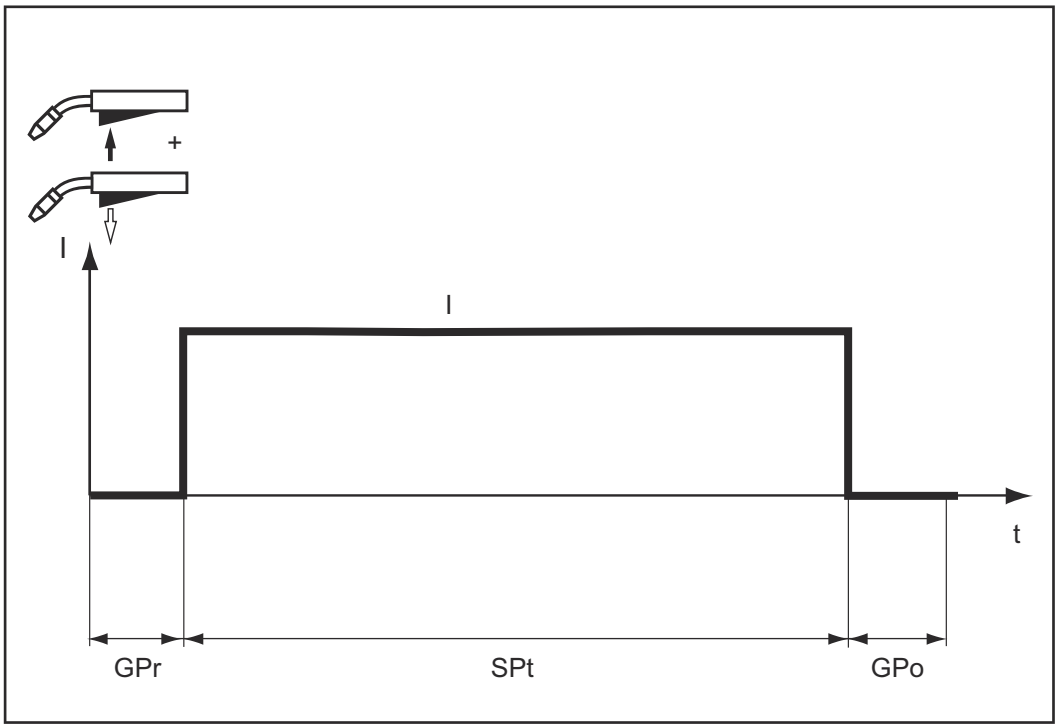
Special 4-step mode allows the starting and final current to be configured in addition to the advantages of 4-step mode.

Spot welding in 2-step mode



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

Spot welding in 4-step mode

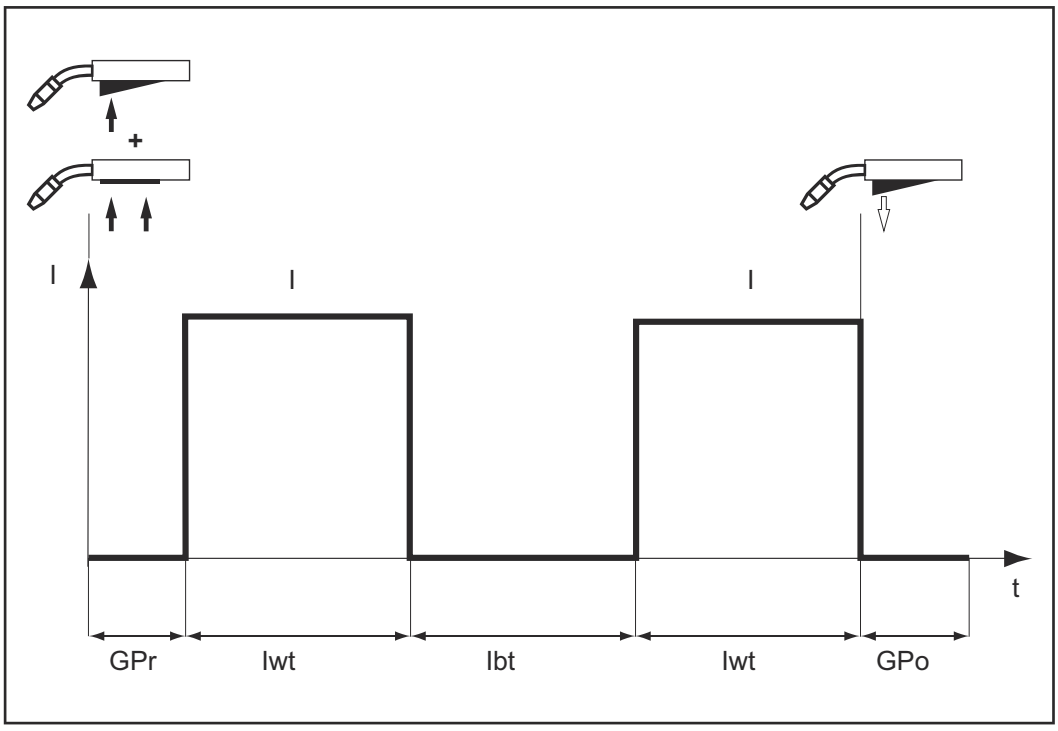


The "Spot welding" mode is suitable for welded joints on overlapped sheets.

Start by pressing and releasing the torch trigger – GPr gas pre-flow – welding current phase over the SPt spot welding time duration – GPo gas post-flow.

If the torch trigger is pressed again before the end of the spot welding time (< SPt), the process is canceled immediately.

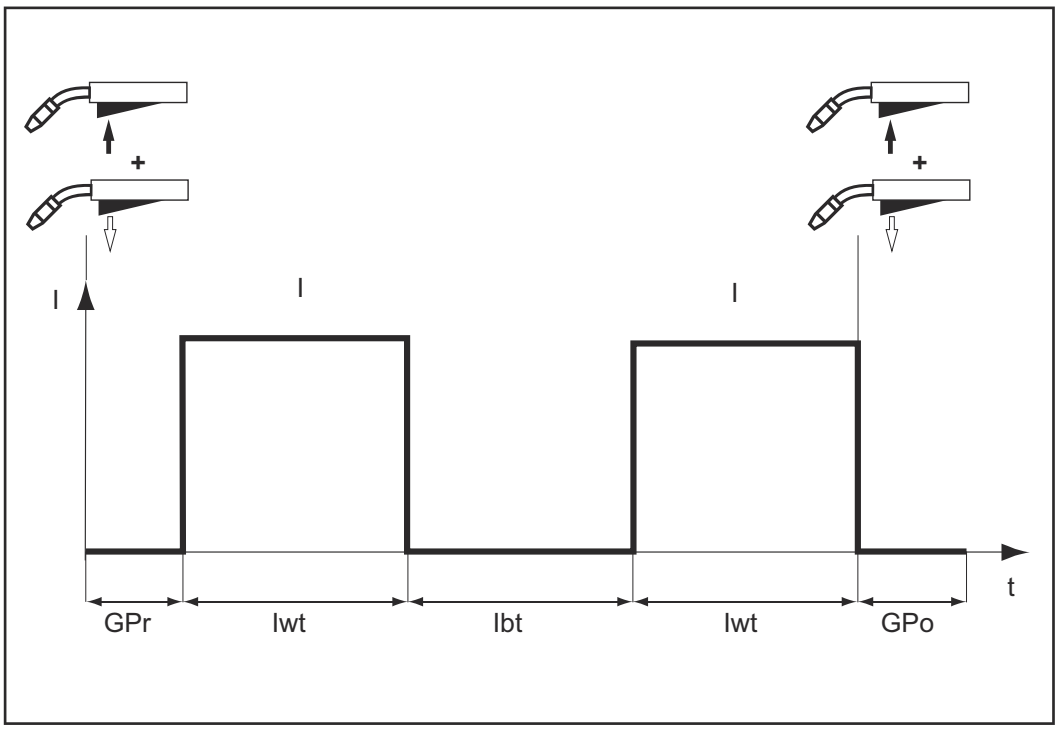
Stitch welding in 2-step mode



2-step stitch welding

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

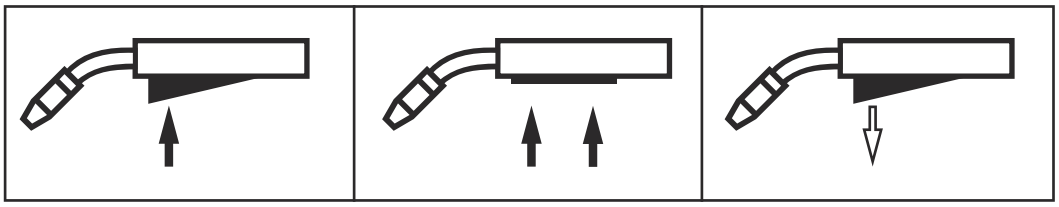
Stitch welding in 4-step mode



4-step stitch welding

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

Symbols and explanations



Press the torch trigger | Hold the torch trigger | Release the torch trigger

GPr
Gas pre-flow time

I_S
Starting-current phase: rapid heating of the base material despite high heat dissipation at the start of welding

t_S
Starting current duration

SL1
Slope 1: continuous reduction of the starting current to the welding current

I
Welding current phase: even heat input into the base material whose temperature is raised by the advancing heat

I_E
Final current phase:
- To fill in the end-crater
- To avoid local overheating of the base material caused by heat accumulation at the end of welding. This prevents possible sagging of the weld.

t_E
Final current duration

SL2
Slope 2: continuous reduction of the welding current to the final current

GPo
Gas post-flow

SPt
Spot welding time

Iwt
Stitch welding time

Ibt
Stitch pause time

MIG/MAG welding

Switch on the welding machine

⚠ WARNING!

Danger due to incorrect operation and work not carried out correctly.
This may result in serious personal injury and damage to property.

- ▶ All the work and functions described in this document must be carried out by technically trained and qualified personnel only.
- ▶ Read and understand this document in full.
- ▶ Read and understand all safety rules and user documentation for this equipment and all system components.

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 whenever the device is commissioned and whenever changes are made to the welding system.
Further information on the R/L alignment can be found in the setup menu / MIG/MAG / R/L alignment as of page 202.

MIG/MAG welding – overview

Control panel with welding screen for MIG/MAG

Left-hand selection dial	Middle selection dial	Right-hand selection dial
Filler metal	Wire speed [1) 4)] Welding current [1)] Sheet thickness [1)]	Welding process - Pulse - Standard - Manual - Electrode - TIG - CEL [7)]
Wire electrode diameter		Operating mode [5)]
Shielding gas		Easy JOB
Characteristic property		Wizard
Pulse correction [2) 6)] or dynamic correction [3) 6)] or dynamic [4) 6)]		Arc length correction [2) 3) 6)] or welding voltage [4) 6)]

1) If one of these parameters is changed for the Pulse and Standard welding processes, the remaining parameters are also adjusted.
2) For Pulse welding process
3) For Standard welding process
4) For Manual welding process
5) Depends on the welding process
6) The parameters displayed on the welding screen can be set depending on the selected welding process.
For details, see from page 43 onwards.
7) Only for /XT devices

Selecting the welding process

1 Turn the right-hand dial and select the welding process
2 Press the right-hand dial

The available welding processes are displayed in the central display section.

3 Turn the right or middle dial and select the desired MIG/MAG welding process:
pulsed, standard or manual

4 Press the right or middle dial

The selected welding process is applied and the available welding parameters are displayed.

5 Select filler metal (see as of page 137)

Selecting the filler metal and shielding gas

1 Turn the left-hand dial and select the desired filler metal
2 Press the left-hand dial

The available filler metals are displayed in the central display section.

3 Turn the left or middle dial and select the desired filler metal
4 Press the left or middle dial to confirm the selection

5 Turn the left-hand dial and select the wire electrode diameter
6 Press the left-hand dial

The available wire electrode diameters are displayed in the central display section.

7 Turn the left or middle dial and select the desired wire electrode diameter
8 Press the left or middle dial to confirm the selection

9 Turn the left-hand dial and select the desired shielding gas
10 Press the left-hand dial

The available shielding gases are displayed in the central display section.

11 Turn the left or middle dial and select the desired shielding gas
12 Press the left or middle dial to confirm the selection

13 Turn the left-hand dial and select the characteristic property
14 Press the left-hand dial

The available characteristic properties are displayed in the central display section.

15 Turn the left or middle dial and select the desired characteristic property
16 Press the left or middle dial to confirm the selection

Setting the welding parameters

1 Turn the middle dial and select the desired welding parameter.

For details on selected and adjustable parameters, see page 38.

2 Press the middle dial

The value of the welding parameter can now be changed.

3 Turn the middle dial and change the value of the welding parameter

A corresponding graphic is displayed with the value change.

If one of the welding parameters is changed in the pulsed and standard welding processes, the remaining parameters are also adjusted.

4 **If necessary:**
Turn the left-hand dial and select the pulse or dynamic correction

5 Press the left-hand dial to adjust the value of the pulse or dynamic correction.

6 Press the left-hand dial to apply the value

MIG/MAG welding parameters

Welding parameters for Pulse and Standard

Wire speed *

1.0-25 m/min / 39.4-984.3 ipm (depending on characteristic)

Current [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.

Sheet thickness [mm/inch] *

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

Pulse correction
For correcting the pulse energy in pulsed welding

Pulse correction is set using the left-hand dial.

-10-+10
Factory setting: 0

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

Dynamic correction
For setting the short circuit current and the current to short circuit breakup during standard welding

The dynamic correction is set using the left-hand dial.

-10-+10
Factory setting: 0

-10 harder arc (higher current in case of short circuit breakup, increased welding spatter)
+10 softer arc (lower current in case of short circuit breakup, reduced welding spatter formation)

Arc length correction
For correcting the arc length

The arc length correction is set using the right-hand dial.

-10-+10
Factory setting: 0

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

* If one of these three parameters is changed, the remaining parameters are also adjusted.

The following parameters can be set for Pulse and Standard for display on the welding screen:
- For the left-hand selection dial: pulse/dynamic correction, gas pre-flow, stitch welding time, frequency
- For the right-hand dial: arc length correction, gas post-flow, stitch pause time, stitch cycles, delta wire feed, duty cycle (high)

For details on setting the parameter displayed on the welding screen, see from page 43 onwards.

Welding parameters for Manual

Wire speed
For setting a harder and more stable arc

1.0-25 m/min / 39.4-984.3 ipm

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

The arc-force dynamic is set using the left-hand dial.

0-10
Factory setting: 1.5

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

Voltage [V]

The voltage is set using the right-hand dial.

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.

The following parameters can be set for Manual for display on the welding screen:

- For the left-hand selection dial: arc-force dynamic, gas pre-flow, stitch welding time
- For the right-hand dial: welding voltage, ignition current (manual), wire retraction (manual), gas post-flow, stitch pause time, stitch cycles

For details on setting the parameter displayed on the welding screen, see from page 43 onwards.

For details on the setup parameters, see from page 197 onwards.

Adjusting the quantity of shielding gas

1 Open the gas cylinder valve

2 Press the Gas-test button

Gas flows out.
The "Gas purging" dialog box appears on the display, indicating the remaining gas purging duration.

3 Turn the adjusting screw on the bottom of the gas pressure regulator until the manometer displays the desired quantity of shielding gas

4 Press the Gas-test button

The gas flow stops.

MIG/MAG welding

⚠ CAUTION!

Danger due to emerging wire electrode.
Personal injury may result.

- ▶ Hold the welding torch so that the tip of the welding torch points away from the face and body.
- ▶ Wear suitable protective goggles.
- ▶ Do not point the welding torch at people.
- ▶ Ensure that the wire electrode can only intentionally make contact with electrically conductive objects.

1 If necessary, set process parameters or other setup parameters for user- or application-specific settings on the welding system
For process parameters and setup parameters, see from page 197 onwards.

2 Press the torch trigger and start welding

At the end of each welding operation, the welding data is stored as an average value and shown on the display.

NOTE!

Under certain circumstances, it may not be possible to change welding parameters that have been set on the control panel of a system component – such as wirefeeder or remote control – on the control panel of the welding machine.

The welding parameter wizard

General

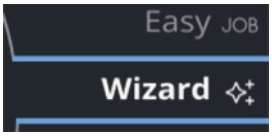
The welding parameter wizard supports the welder in selecting the welding parameters. The parameter recommendation can be accepted or saved as a job.

Running the welding parameter wizard

1 Select the filler metal and shielding gas
see page 137

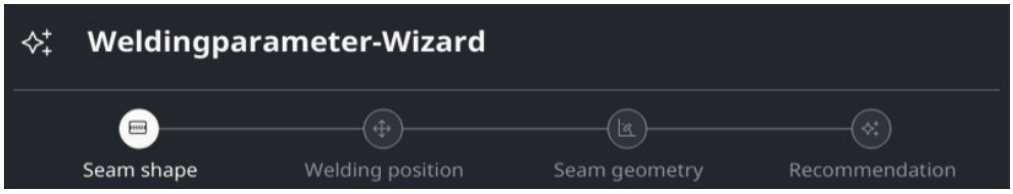
2 Select the Pulse or Standard welding process
see page 137

3 Turn the right-hand selection dial and select "Wizard"



4 Press the right-hand selection dial

The welding parameter wizard is started.



5 Select the appropriate weld shape by turning and pressing the middle selection dial.

6 Press the right-hand selection dial (Next)

The welding positions are displayed.

7 Select the appropriate welding position by turning and pressing the middle selection dial.

8 Press the right-hand selection dial (Next)

The weld geometry is displayed.

9 Select and set the geometry parameters sheet thickness, a-dimension, and air gap by turning and pressing the middle selection dial

10 Press the right-hand selection dial (Next)

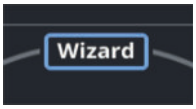
The recommended welding parameters are displayed:

on page 1
- Welding speed [cm/min]
  The welding speed is also animated.
- Welding process - Characteristic property - Number of weld layers
- Welding current [A] - Welding voltage [V] - Wire speed [m/min]
  Parameters can be changed by turning the middle selection dial. When the parameters are changed, the welding speed and the displayed welding power value also change.
- Welding power [kW] - Gas flow volume [l/min] - a-dimension [mm]

on page 2
- Graphical overview of the weld layers
- Welding current, welding voltage, and wire speed for the weld layers
- Tilt angle
- Stick out

11 Press the right-hand selection dial (Next)

The proposed welding parameters are adopted, the MIG/MAG welding screen is displayed.
The wizard is displayed in the middle of the display.



The welding parameters can now be welded or saved as an EasyJob.

Spot welding and stitch welding

Spot welding

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

1 Use the right-hand selection dial to select the desired welding process: Pulse, Standard, or Manual

2 Use the right-hand selection dial to select the spot welding mode

3 Open the Setup menu and select MIG/MAG

4 Under Setup mode, select an operating mode for spot welding: 2-step or 4-step

4-step (factory setting):
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.

2-step:
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.

NOTE!

Stitch welding must be switched off for spot welding.

▶ Setup menu - MIG/MAG - Mode Setup - Interval = off

5 Enter the desired value for the spot welding time

6 Press the Menu button and exit the Setup menu

NOTE!

Once spot welding mode has been selected, the spot welding time parameter is available in the left-hand additional menu.

▶ The spot welding time can also be set in the additional menu.

▶ For details on the additional menu, see from page 43 onwards.

7 Select filler metal, wire diameter, and shielding gas

8 Open the gas cylinder valve

9 Adjust the shielding gas volume

⚠ **CAUTION!**

Danger due to emerging wire electrode.
Personal injury may result.

▶ Hold the welding torch so that the tip of the welding torch points away from the face and body.

▶ Wear suitable protective goggles.

▶ Do not point the welding torch at people.

▶ Ensure that the wire electrode can only intentionally make contact with electrically conductive objects.

10 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

NOTE!

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

- ▶ The start/end of welding treatment for spot welding can thus be stored in the Setup menu under MIG/MAG / Start/End.
- ▶ 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.

Stitch welding

1. Use the right-hand selection dial to select the desired welding process: Pulse, Standard, or Manual
2. Use the right-hand selection dial to select the operating mode for stitch welding
3. Open the Setup menu and select MIG/MAG
4. Under the Setup operating mode, set the stitch parameter to "on"
5. Enter the desired value for the stitch cycles
6. Enter the desired value for the stitch welding time
7. Enter the desired value for the stitch pause time

NOTE!

Alternative way to activate stitch welding:

- ▶ Press the middle selection dial for more than two seconds
  The function menu opens.
- ▶ Select and activate stitch welding
  Once stitch welding has been activated, the stitch welding time parameter is available in the left-hand additional menu and the stitch pause time and stitch cycles parameters are available in the right-hand additional menu.

8. Press the Menu button and exit the Setup menu
9. Select filler metal, wire diameter, and shielding gas
10. Open the gas cylinder valve
11. Adjust the shielding gas volume

⚠ CAUTION!

Danger due to emerging wire electrode.
Personal injury may result.
- ▶ Hold the welding torch so that the tip of the welding torch points away from the face and body.
- ▶ Wear suitable protective goggles.
- ▶ Do not point the welding torch at people.
- ▶ Ensure that the wire electrode can only intentionally make contact with electrically conductive objects.

12 Stitch welding

Procedure for stitch welding:

1 Keep the welding torch vertical

2 Depending on the set operating mode:
Press and hold the torch trigger (2-step mode)
Press and release the torch trigger (4-step mode)

3 Maintain the position of the welding torch

4 Wait for the welding interval

5 Position the welding torch at the next point

6 To stop stitch welding, depending on the set operating mode:
Release the torch trigger (2-step mode)
Press and release the torch trigger (4-step mode)

7 Wait for the gas post-flow time

8 Raise the welding torch

Job Mode

EasyJobs

Saving an Easy-Job

EasyJob = saving current welding settings

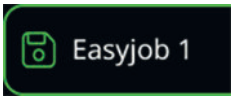
The saved EasyJob can be accessed at any time by pressing a button.

NOTE!

Up to four EasyJobs can be saved using the existing multifunctional buttons.
The EasyJobs are saved under job numbers 1 - 4.
▶ Saving an EasyJob overwrites an EasyJob saved under the same number!

1 Press one of the multifunctional buttons for approx. 3 seconds to store the current welding settings

After approx. 3 seconds, a symbolized button with a green frame and the Save symbol is shown on the display.



The settings have been saved. The last saved settings are activated.

Saving and retrieving jobs

General

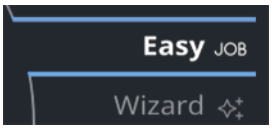
If the OPT/s Job option is available, up to 1000 jobs can be stored and reproduced on the welding machine.

Jobs can only be saved when you are not welding. 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 process
- Material, wire diameter, shielding gas, characteristic property
- Welding parameters, correction parameters
- Setup parameters

2 Turn the right-hand selection dial and select Easy JOB



3 Press the right-hand selection dial

The list of jobs is displayed.

4 Turn a selection dial and select a corresponding storage space

Existing job selected:
"Overwrite job" is displayed above the middle selection dial.

Free storage space selected:
"Save job" is displayed above the middle selection dial.

5 Press the middle selection dial

A confirmation prompt is displayed when overwriting a job.
Press the right-hand selection dial to confirm - the text input* is displayed.

When saving the job, the text input* is displayed.

6 Enter the desired job name in the text input* by turning and pressing the middle selection dial (max. 30 characters)

7 Press the right-hand selection dial (Save)

The welding screen is displayed.
The job name is displayed in the middle of the display.

* Explanation of text input on page 225, step 2

Welding job – retrieving jobs

NOTE!

Before retrieving a job, ensure that the welding system is set up and installed according to the job in question.

1 Turn the right-hand selection dial and select the welding process
2 Press the right-hand selection dial

The available welding processes are displayed in the central display section.

3 Turn the right-hand or middle selection dial and select "Job Mode":
4 Press the right-hand or middle selection dial

Job Mode is activated and the data for the last job retrieved are displayed.

5 Turn the middle selection dial and select the desired job
6 Press the selection dial and accept the selected job
7 Initiate welding process

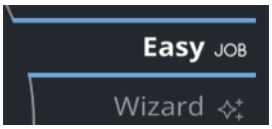
IMPORTANT! In Job Mode, only the "JOB" welding parameter can be changed; the remaining welding parameters can only be viewed or changed as part of the job correction limits.

Optimizing a job

Loading a job as an EasyJob

Use the Load EasyJob function to load the data for a stored job or EasyJob onto the welding screen. The corresponding welding parameters are displayed and can be welded, modified, or saved as a new job or EasyJob.

1. Turn the right-hand selection dial and select Easy JOB



2. Press the right-hand selection dial

   The list of jobs is displayed.

3. Turn a selection dial and select the job to be loaded as an EasyJob
4. Press the right-hand selection dial (Load EasyJob)

   The welding screen is displayed.
   The job name is displayed in the middle of the display.

   The data for the loaded job can now be welded (no job mode), modified, or saved as a new job or EasyJob.

Optimizing a job

1. Activate Job Mode
   (see page 151, steps 1 - 4)
2. Turn the right-hand selection dial and select "Edit JOB"

3. Turn the right-hand or middle selection dial and select "Optimize"
4. Press the right-hand or middle selection dial

   The list of jobs is displayed.

5. Turn a selection dial and select the job to be optimized

6 Press the middle selection dial

The job parameters are displayed.
- Job Name
- Working parameters
- Welding process parameters
- Stitch settings
- Special 2-step/4-step parameters
- Wire retraction
- Spot welding
- SynchroPulse
- Gas default settings
- Components
- Job slope
- Documentation

7 Turn the middle selection dial:
Select parameter group / parameter

Press the middle selection dial:
Edit parameter group / parameter

Turn the middle selection dial:
Change the value of a parameter

Press the middle selection dial:
Accept value change

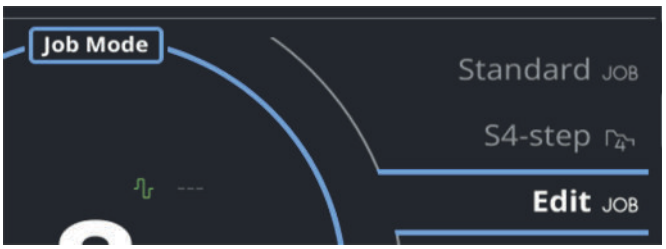
8 Then press the right-hand selection dial (OK)

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 Activate Job Mode
(see page 151, steps 1 - 4)

2 Turn the right-hand selection dial and select "Edit JOB"



3 Turn the right-hand or middle selection dial and select "Correction limits"

4 Press the right-hand or middle selection dial

The list of jobs is displayed.

5 Turn a selection dial and select the job for which the correction limits are to be set.

6 Press the middle selection dial

The correction limit parameters are displayed.
- Welding power
- Arc length correction

7 Turn the middle selection dial:
Select parameter group / parameter

Press the middle selection dial:
Edit parameter group / parameter

Turn the middle selection dial:
Change the value of a parameter

Press the middle selection dial:
Accept value change

8 Then press the right-hand selection dial (OK)

Duplicating a job

1 Activate Job Mode
(see page 151, steps 1 - 4)

2 Turn the right-hand selection dial and select "Edit JOB"

3 Turn the right-hand or middle selection dial and select "Duplicate"

4 Press the right-hand or middle selection dial

The list of jobs is displayed.

5 Turn a selection dial and select the job to be duplicated

6 Press the middle selection dial

The selected job is displayed individually.

7 Turn a selection dial and select the desired storage location for the duplicate

8 Press the middle selection dial
The text input* is displayed.

9 Enter the desired job name in the text input* by turning and pressing the middle selection dial (max. 30 characters)

10 Press the right-hand selection dial (Save)

The welding screen is displayed.
The job name is displayed in the middle of the display.

* Explanation of text input on page 225, step 2

Deleting a job

1 Activate Job Mode
(see page 151, steps 1 - 4)

2 Turn the right-hand selection dial and select "Edit JOB"

3 Turn the right-hand or middle selection dial and select "Delete"

4 Press the right-hand or middle selection dial

The list of jobs is displayed.

5 Turn a selection dial and select the job to be deleted

6 Press the right-hand selection dial (Delete)

A confirmation prompt is displayed.

7 Press the right-hand selection dial (Delete)

The job is deleted, the welding screen is displayed.

TIG welding without Multiprocess

TIG welding without Multiprocess

Devices concerned

The following devices offer TIG welding without multiprocess:
Fortis 400 C /GW*
Fortis 500 C /GW*
Fortis 320 /GW
Fortis 400 /GW
Fortis 500 /GW

* The Fortis 400 C /GW and Fortis 500 C /GW devices are delivered as standard without the multiprocess function.

Preparation

1. Set the power switch to - O -
2. Unplug the mains plug
3. Remove the MIG/MAG welding torch
4. Disconnect the return lead cable from the (-) current socket
5. Insert the return lead cable into the (+) current socket and lock
6. Connect the other end of the return lead cable to the workpiece
7. Insert the bayonet plug of the TIG gas-valve welding torch into the (-) current socket and turn it clockwise to lock
8. Screw the gas pressure regulator onto the gas cylinder (argon) and tighten it
9. Connect the gas hose of the TIG gas-valve welding torch to the gas pressure regulator
10. Insert the mains plug

TIG welding

⚠ WARNING!

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

⚠ 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 any people or electrically conductive or grounded parts (housing, etc.).

1. Set the power switch to - I -

2 Select the TIG welding process

The available TIG welding parameters are displayed.
The welding voltage is applied to the welding socket with a three-second time lag.

Selection of the welding process for MIG/MAG is described from page 137 onwards.
The welding process for TIG is selected in the same way.

NOTE!

Under certain circumstances, it may not be possible to change welding parameters that have been set on a control panel of a system component—such as a wirefeeder or remote control—on the control panel of the welding machine.

3 Set the TIG welding parameters

Setting the MIG/MAG welding parameters is described from page 138 onwards.
The TIG welding torches are set in the same way.

4 If necessary, set process parameters or other setup parameters for user- or application-specific settings on the welding system
For TIG process parameters and setup parameters, see from page 204 onwards.

5 Carry out an R/L comparison
See from page 206 onwards.

6 Open the gas shut-off valve on the TIG gas-valve welding torch

7 Set the desired shielding gas volume on the gas pressure regulator

8 Commence the welding process (ignite arc)

TIG welding parameters

Break voltage
For setting a voltage value at which the welding process may be ended by a slight raise of the TIG welding torch. 10.0-30.0 V
Factory setting: 14 V

Main current (I_1)

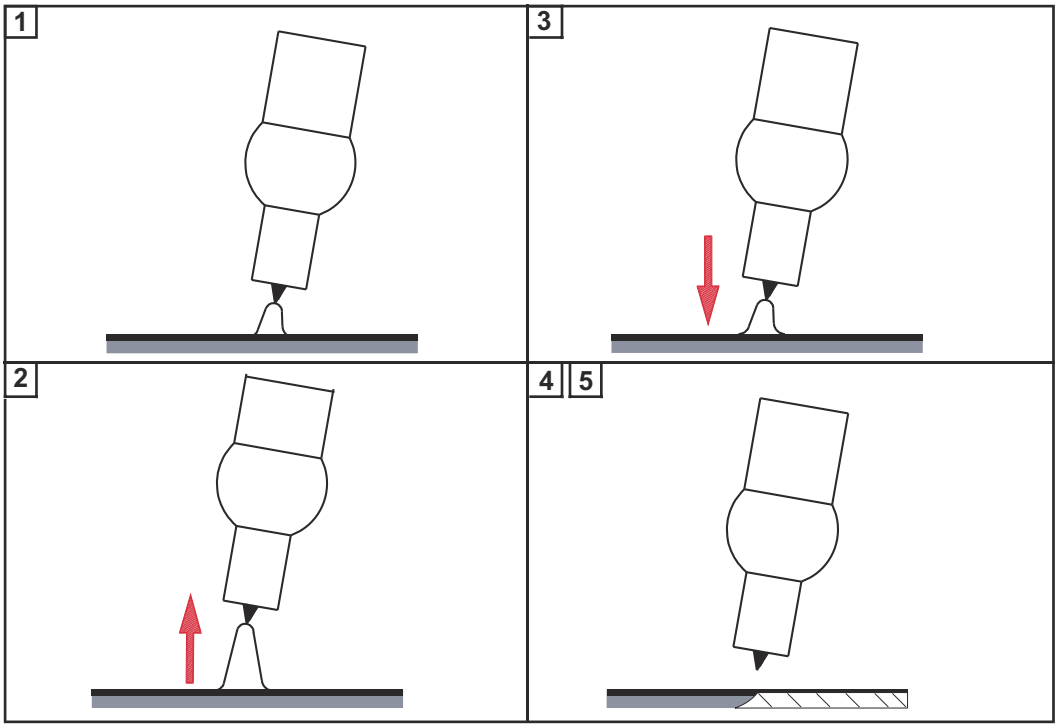
3-270 A ... Fortis 270 C
3-320 A ... Fortis 320 C / Fortis 320
3-400 A ... Fortis 400 C / Fortis 400
3-500 A ... Fortis 500 C / Fortis 500
Factory setting: 50 A

Comfort Stop sensitivity
For activating/deactivating the TIG Comfort Stop function

off / 0.1-1.0 V
Factory setting: 0.8 V

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 gas-valve 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 TIG Comfort Stop function has triggered

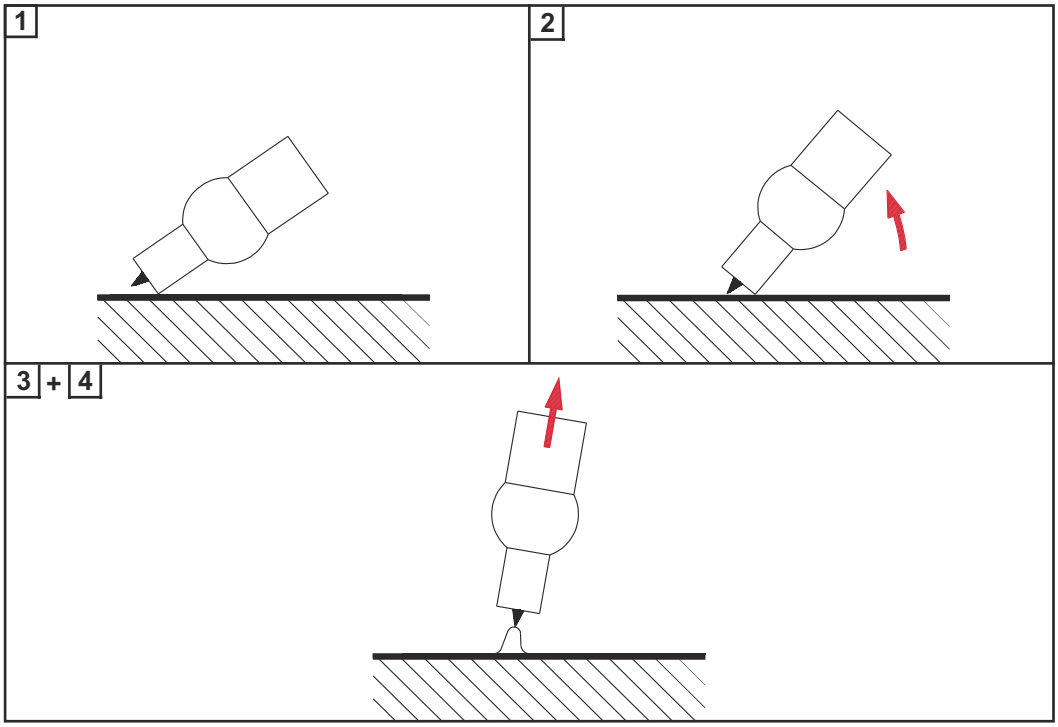
4 Maintain height of the welding torch
- The welding current ramps down continuously (DownSlope).
- The arc goes out.

IMPORTANT! The DownSlope is fixed and cannot be adjusted.

5 Lift the welding torch from the workpiece

Igniting the arc

The arc ignites when the workpiece makes contact with the tungsten electrode.



1 Place the gas nozzle on the ignition point so that there is a distance of 2 - 3 mm or 0.08 - 0.12 in. between the tip of the tungsten electrode and the workpiece

2 Gradually tilt the welding torch up until the tungsten electrode touches the workpiece

3 Raise the welding torch and tilt it into the normal position, the arc ignites

4 Carry out welding

Finishing welding

1 Lift the TIG gas-valve torch away from the workpiece until the arc goes out.

IMPORTANT! To protect the tungsten electrode, ensure that the shielding gas at the end of welding flows for long enough to allow the tungsten electrode to cool sufficiently.

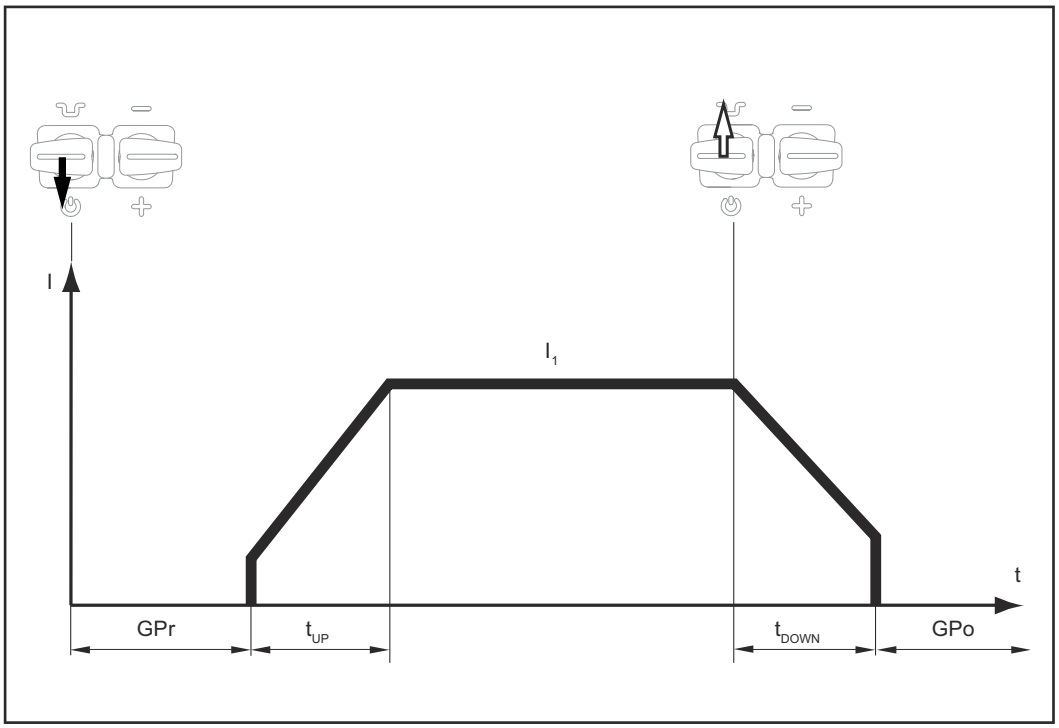
2 Close the gas stop valve on the TIG gas-valve torch

TIG welding with Multiprocess

TIG Operating Modes

2-step mode

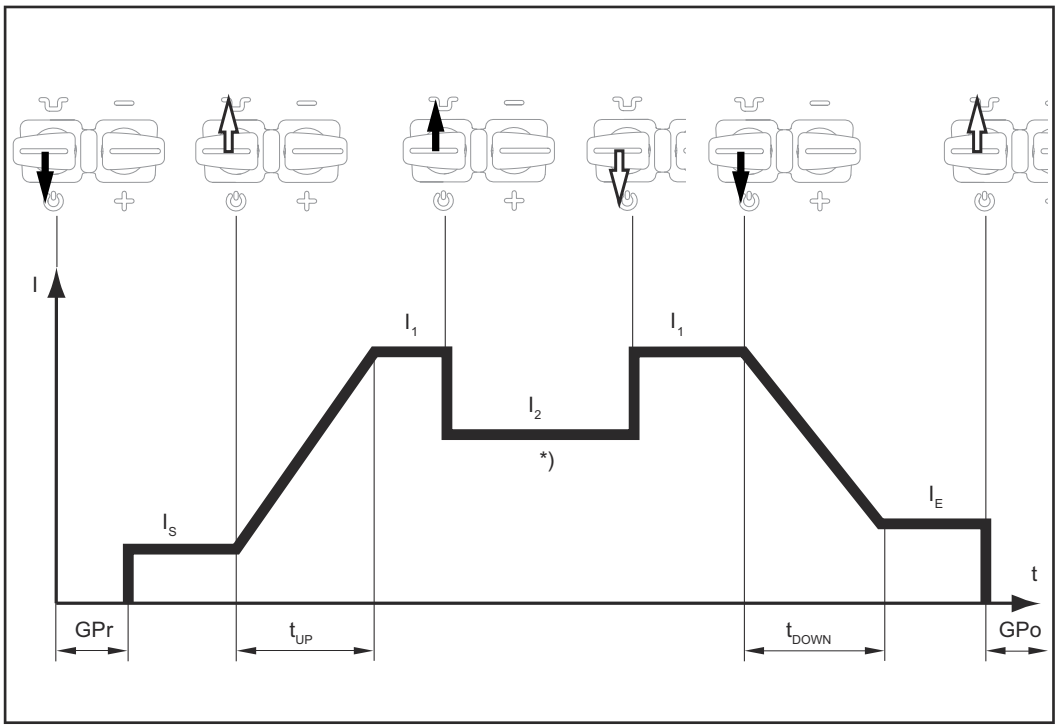
- Welding: Pull back the torch trigger and hold it in this position
- End of welding: Release the torch trigger



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

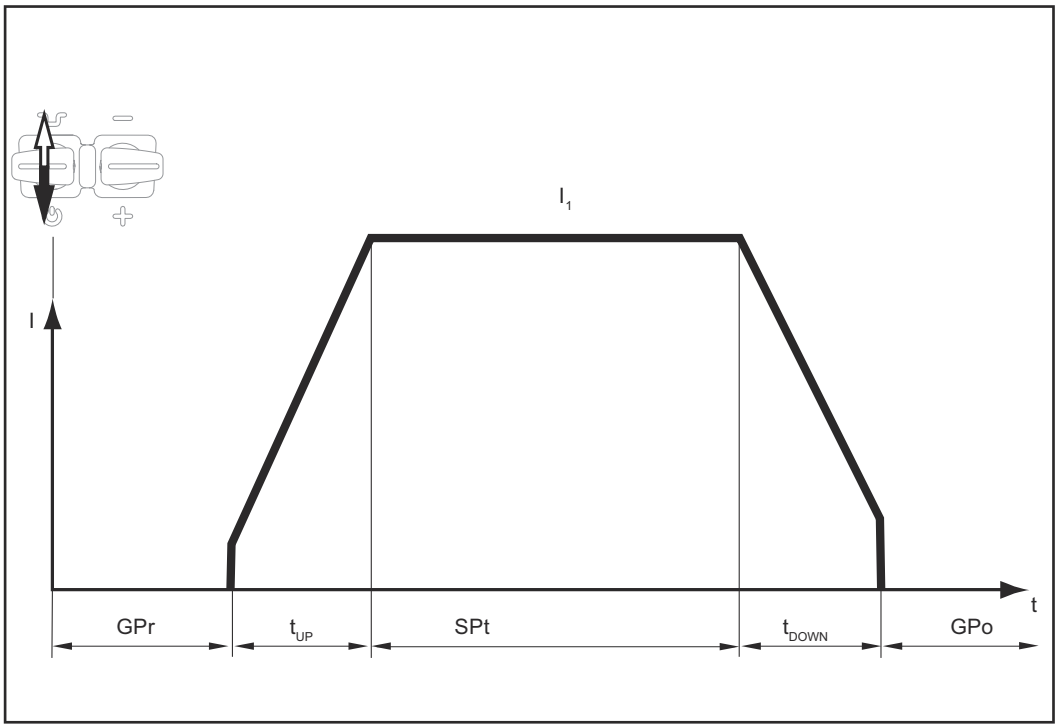
*) Intermediate lowering

With intermediate lowering, the welding current is lowered to the set lowering current I_2 during the main current phase.

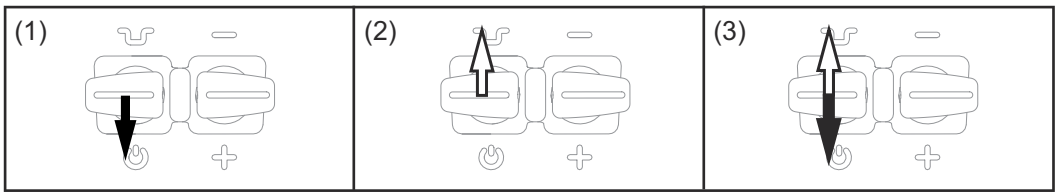
- To activate intermediate lowering, push the torch trigger forward and hold it in this position
- Release the torch trigger to resume the main current

Spot welding

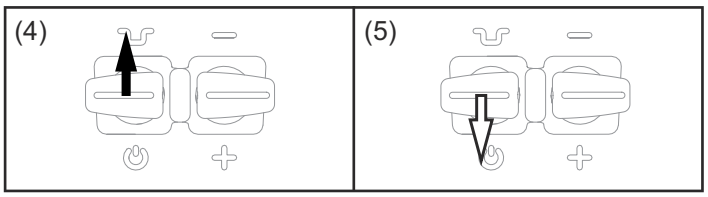
- Welding: Briefly pull back and hold the torch trigger
  The welding time (SPt) corresponds to the value of how long the torch trigger is held.
- Ending the welding process: Release the torch trigger



Symbols and explanations



(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 accumu-

	lation 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

TIG welding with Multiprocess

Preparation for Multiprocess

If the OPT/s MP 400/500 or OPT/s MP 400/500 XT /600V Multiprocessoption is available on the welding machine, the following connections are also available on the welding machine:

- Additional TIG socket (gas flow socket)
- Integrated gas solenoid valve
- Polarity reverser
- TIG Multi Connector port

If a Multiprocess option is available, more TIG welding parameters are also available.

Preparation for TIG welding if there is a Multiprocess option for the welding machine:

1. Set the power switch to - O -
2. Unplug the mains plug
3. Remove the MIG/MAG welding torch
4. Disconnect the polarity reverser from the welding machine
5. Unplug the return lead cable from the welding machine
6. Insert the return lead cable into the (+) current socket and lock
7. Connect the other end of the return lead cable to the workpiece
8. Insert the bayonet connector of the TIG welding torch into the (-) current socket and twist it clockwise to lock
9. Connect the TMC plug of the TIG welding torch to the welding machine
10. Screw the gas pressure regulator onto the gas cylinder (argon) and tighten it
11. Connect the gas hose to the gas pressure regulator and the gas solenoid valve of the welding machine
12. Insert the mains plug

TIG welding with Multiprocess

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- ▶ Read and understand this document in full.
- ▶ Read and understand all safety rules and user documentation for this equipment and all system components.

⚠ CAUTION!

Danger of injury and damage to property 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 TIG welding process

The available TIG welding parameters are displayed.
The welding voltage is applied to the welding socket with a three-second delay.

The selection of the welding process for MIG/MAG is described from page 137 onwards.
The selection of the welding process for TIG is performed in the same way.

NOTE!

Under certain circumstances, it may not be possible to change welding parameters that have been set on the control panel of a system component – such as wirefeeder or remote control – on the control panel of the welding machine.

3 Set TIG welding parameters

The setting of the MIG/MAG welding parameters is described from page 138 onwards.
The TIG welding parameters are configured in the same way.

4 If necessary, set process parameters or other setup parameters for user- or application-specific settings on the welding system
For TIG process parameters and setup parameters, see from page 204 onwards.

5 Perform R/L adjustment
For details, see from page 202 onwards.

6 Set the desired amount of shielding gas on the gas pressure regulator

7 Commence the welding process (ignite arc)

TIG welding parameters with Multiprocess

For the welding machines Fortis 270 C and Fortis 320 C or if the OPT/s MP 400/500 or OPT/s MP 400/500 XT /600V Multiprocess option is available on the welding machine, the following TIG welding parameters are available:

Starting current I_S

0 – 200% (of the main current)
Factory setting: 50%

UpSlope

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

3 – 270 A ... Fortis 270 C
3 – 320 A ... Fortis 320 C
3 – 400 A ... Fortis 400 C
3 – 500 A ... Fortis 500 C
Factory setting: -

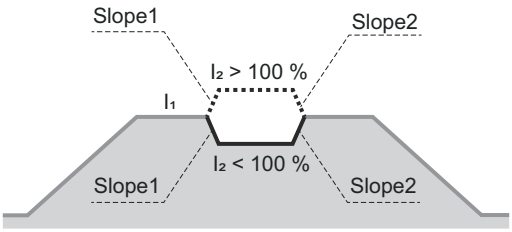
IMPORTANT! For welding torches with Up/Down function, the full setting range can be selected while the device is on standby.

Lowering current I_2
only in 4-step mode

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 for the TIG welding parameters.

DownSlope

off; 0.1 – 30.0 s
Factory setting: 1.0 s

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

Final current I_E

0 – 100% (of the main current)
Factory setting: 30%

The following parameters can be set for TIG for display on the welding screen:
- For the left-hand dial: Tacking, gas pre-flow, starting current time t_S
- For the right-hand dial: Pulse frequency, gas post-flow, final current time

For details on setting the parameter displayed on the welding screen, see from page 43 onwards.

For details on the setup parameters, see as of page 204.

Igniting the arc

General

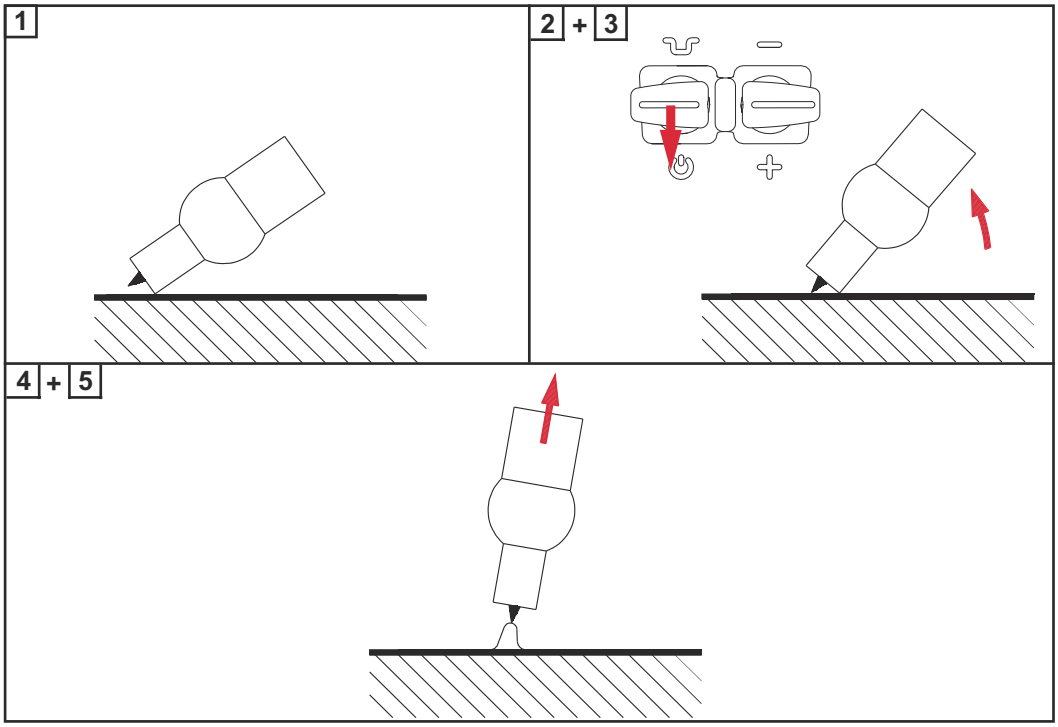
To ensure an optimal ignition sequence during TIG welding, the following must be taken into account for the welding machine:

- The diameter of the tungsten electrode
- The current temperature of the tungsten electrode, taking into account the previous welding time and break

Contact ignition

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 distance of approximately 2 to 3 mm (0.08 to 0.12 in.) between the tungsten electrode and the workpiece

2 Press 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 tilt it into the normal position

The arc now ignites.

5 Carry out welding

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 in the central display section (for details, see from page 40 onwards).

The "electrode overloaded" indicator depends on the set electrode diameter and the set welding current.

End of welding

1 Depending on the set operating mode, end welding by releasing the torch trigger

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

Additional TIG functions

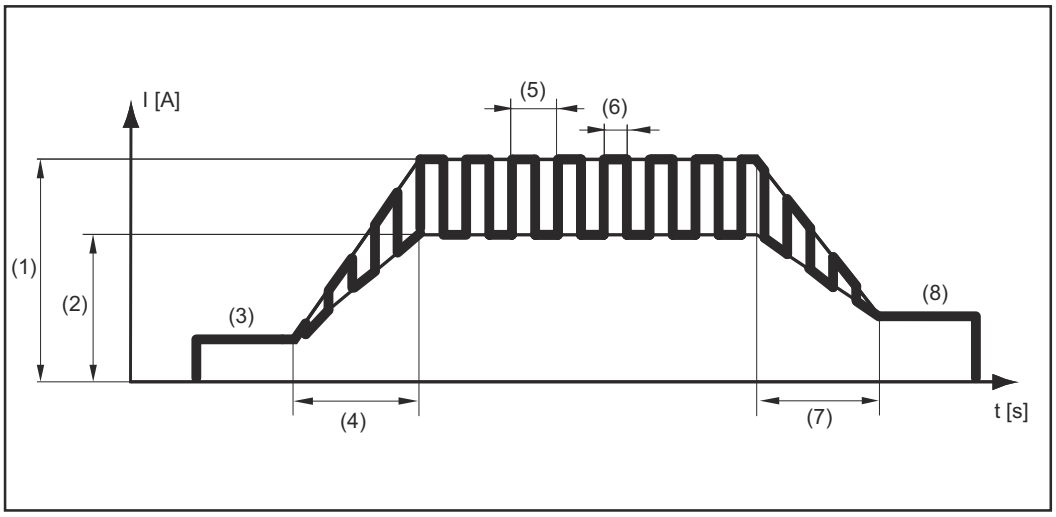
TIG pulsing

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 base 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 a 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).

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

TIG pulsing in operation:



TIG pulsing – welding current progression 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)

Base current and duty cycle are specified by the welding machine.

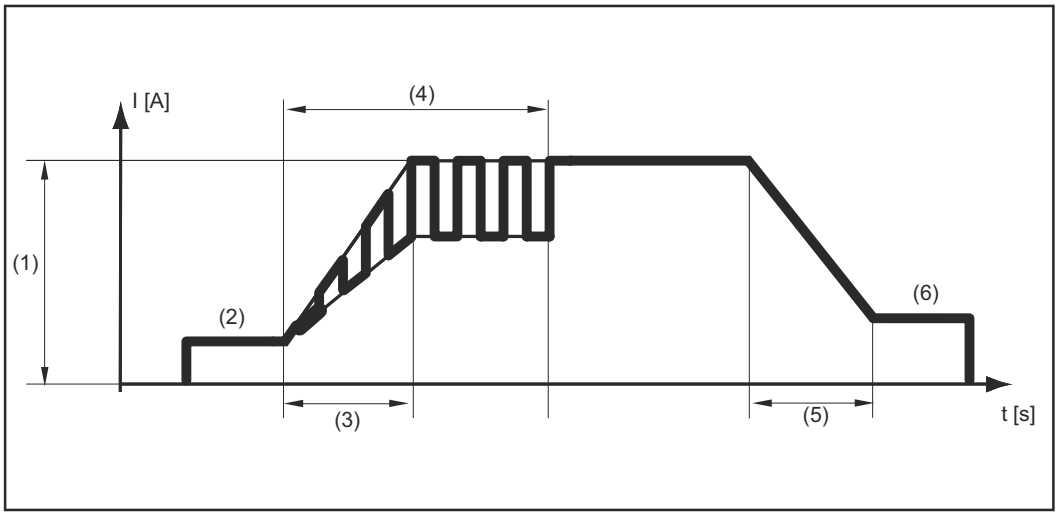
Tacking function

The tacking function is available for TIG welding.

When a period of time is set for the setup parameter Tacking (4), 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 in the central display section.

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 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 welding machine 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).

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

Manual metal arc welding, CEL welding, arc air gouging

Manual metal arc welding, CEL welding

Preparation

1. Set the power switch to - O -
2. Unplug the mains plug
3. Remove the MIG/MAG welding torch
4. If present, disconnect the polarity reverser

NOTE!

Check the packaging or labeling on the stick electrode to determine whether the stick electrodes are to be welded on the positive pole (+) or the negative pole (-).

5. Depending on the type of electrode, insert the return lead cable into the (-) current socket or into the (+) current socket and lock
6. Use the other end of the return lead cable to establish a connection to the workpiece
7. 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
8. Insert the mains plug

Manual metal arc welding, CEL welding

⚠ **WARNING!**

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- ▶ Read and understand this document in full.
- ▶ Read and understand all safety rules and user documentation for this equipment and all system components.

⚠ **CAUTION!**

Danger of injury and damage to property 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 any people or electrically conductive or grounded parts (housing, etc.).

NOTE!

CEL welding is only possible with /XT welding machines.

1. Set the power switch to - I -

2 Select the electrode or CEL welding process

The available welding parameters are displayed.
The welding voltage is applied to the welding socket with a three-second delay.

The selection of the welding process for MIG/MAG is described from page 137 onwards.
The selection of the welding process for MMA or CEL welding is done in the same way.

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

3 Set welding parameters

Setting the MIG/MAG welding parameters is described from page 138 onwards.
The welding parameters for MMA and CEL welding are set in the same way.

4 If necessary, set the process parameters or other setup parameters for user- or application-specific settings on the welding system
- For process parameters for manual metal arc welding and setup parameters, see from page 208 onwards.
- For process parameters for CEL welding and setup parameters, see from page 211 onwards.

5 Initiate welding process

Welding parameters for manual metal arc welding

For manual metal arc welding, the following welding parameters can be set and displayed:

Starting current
For setting a starting current value in the range 0 - 200% of the set welding current in order to avoid slag inclusions or incomplete fusion.
The starting current depends on the electrode type.

0 - 200%
Factory setting: 150%

Starting current > 100%:
- Improved ignition properties, even when using electrodes with poor ignition properties
- Better fusion of base material in the start phase, therefore less neutralization
- Slag inclusions largely avoided

Starting current < 100%:
- Improvement of ignition properties with electrodes that ignite at a low welding current, e.g., basic electrodes
- Slag inclusions largely avoided
- Reduction of welding spatter

The starting current is active for the starting current time set in the Setup menu.

Main current [A]

Setting range: depends on the welding machine used

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 - 100
Factory setting: 20

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

For manual metal arc welding, the following setup parameters can be defined as the last welding parameter:
- For the left-hand selection dial: starting current time, break voltage
- For the right-hand selection dial: characteristic

For details on setting the parameter displayed on the welding screen, see from page 43 onwards.

For details on the setup parameters, see from page 208 onwards.

Welding parameters for CEL welding

For CEL welding, the following welding parameters can be set and displayed under "Welding":

Starting current
For setting a starting current value in the range 0-200% of the set welding current in order to avoid slag inclusions or incomplete fusion.
The starting current depends on the electrode type.

0-200%
Factory setting: 150%

The starting current is active for the starting current time set under the process parameters.

Main current [A]

Setting range: depends on the welding machine used

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

0-100
Factory setting: 20

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

For manual metal arc welding, the following setup parameters can be defined as the last welding parameter:
- For the left-hand selection dial: starting current time, break voltage
- For the right-hand selection dial: anti-stick

For details on setting the parameter displayed on the welding screen, see from page 43 onwards.

For details on the setup parameters, see from page 208 onwards.

Additional stick electrode functions

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 welding machine 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 in the stick electrode menu.

Electrode pulsing

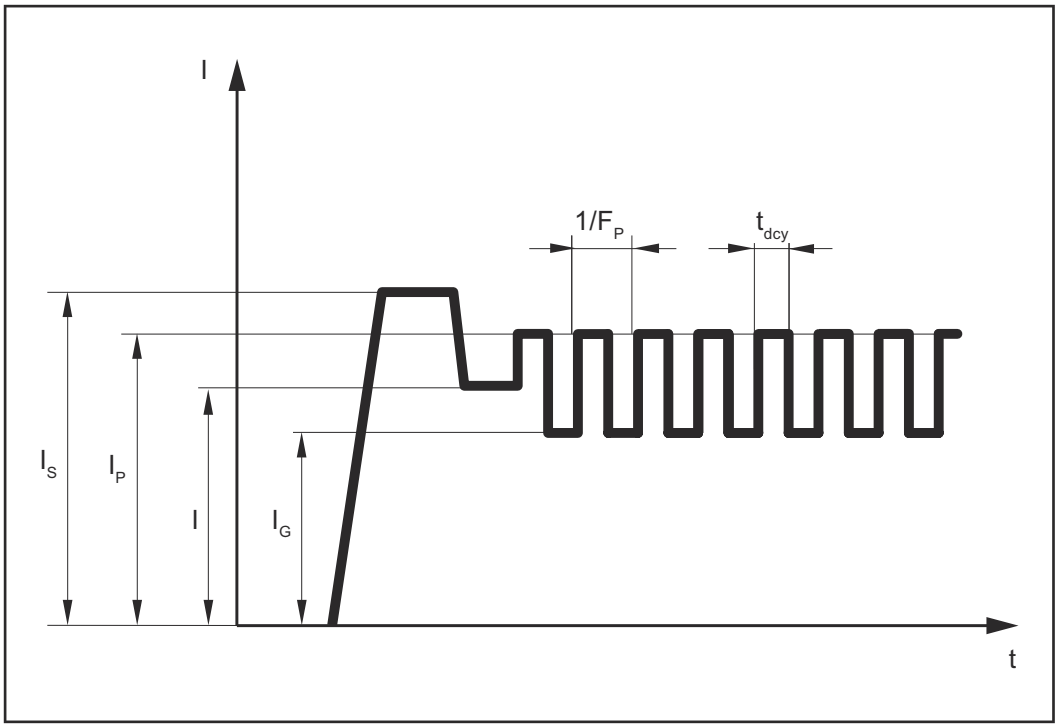
Electrode pulsing is a stick electrode welding process with a pulsing welding current, e.g., for welding steel pipes when welding out of position or for welding thin sheet metal.

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 base material will not be sufficiently melted.
- If overheating occurs, there is a danger that the liquid weld pool may drip.

During electrode pulsing, a low base current I_G rises steeply to the significantly higher pulse current I_P and then drops back to the base current I_G after a certain time t_{dcy}.
The base current, pulse current, and time are specified by the welding machine according to the set pulse frequency F_P.

During electrode pulsing, small sections of the welding location melt quickly and then rapidly re-solidify.

Welding current curve during electrode pulsing:



I_S = starting current, I_P = pulse current, I = welding current, I_G = base current, F_P = pulse frequency, t_{dcy} = time

NOTE!

For electrode pulsing, the electrode characteristic must be set to "I-constant".

Arc Air Gouging

Danger due to incorrect operation and electric current

⚠ WARNING!

Danger due to incorrect operation and work not carried out correctly.
This may result in serious personal injury and damage to property.
- ▶ All the work and functions described in this document must be carried out by technically trained and qualified personnel only.
- ▶ 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 may result in serious personal injury and damage to property.
- ▶ Before starting any maintenance or servicing work, switch off all the devices and components involved and disconnect them from the grid.
- ▶ Secure all these devices and components 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 return lead cable with a cable cross-section of 120 mm² is required for arc air gouging.

1. Set the power switch to - O -
2. Unplug the mains plug
3. Remove the MIG/MAG welding torch
4. Insert the return lead cable into the (-) current socket and lock
5. Connect the other end of the return lead cable to the workpiece
6. Insert the bayonet connector of the arc air gouging torch into the (+) current socket and twist it clockwise to lock
7. Connect the compressed air connection of the arc air gouging torch to the compressed air supply
   Working pressure: 5-7 bar (constant)
8. 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
9. Insert the mains plug

Arc air gouging

⚠ CAUTION!

Danger of injury and damage to property 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 any people or electrically conductive or grounded parts (housing, etc.).

⚠ CAUTION!

Danger due to loud operating noise.
This may result in personal injury.
▶ Use suitable hearing protection during arc air gouging!

1 Set the power switch to - I -
2 Select the electrode welding process

The available welding parameters are displayed.
The welding voltage is applied to the welding socket with a three-second delay.

The selection of the welding process for MIG/MAG is described from page 137 onwards.
The selection of the welding process for MMA welding is done in the same way.

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

NOTE!

Under certain circumstances, it may not be possible to change welding parameters that have been set on the control panel of a system component – such as wirefeeder or remote control – on the control panel of the welding machine.

3 Under electrode, select "Characteristic" in the Setup menu
4 Set the "Characteristic" parameter to "Arc air gouging" (last entry)

NOTE!

The settings for break voltage and starting current time are ignored.

5 Exit the Setup menu for MMA welding
6 Use the middle dial to set the main current depending on the electrode diameter and in accordance with the specifications 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 208.

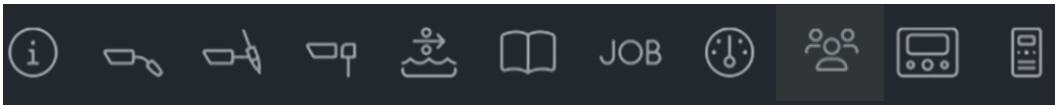
Setup Menu

Overview

Accessing the Setup menu

1 Press the Menu button

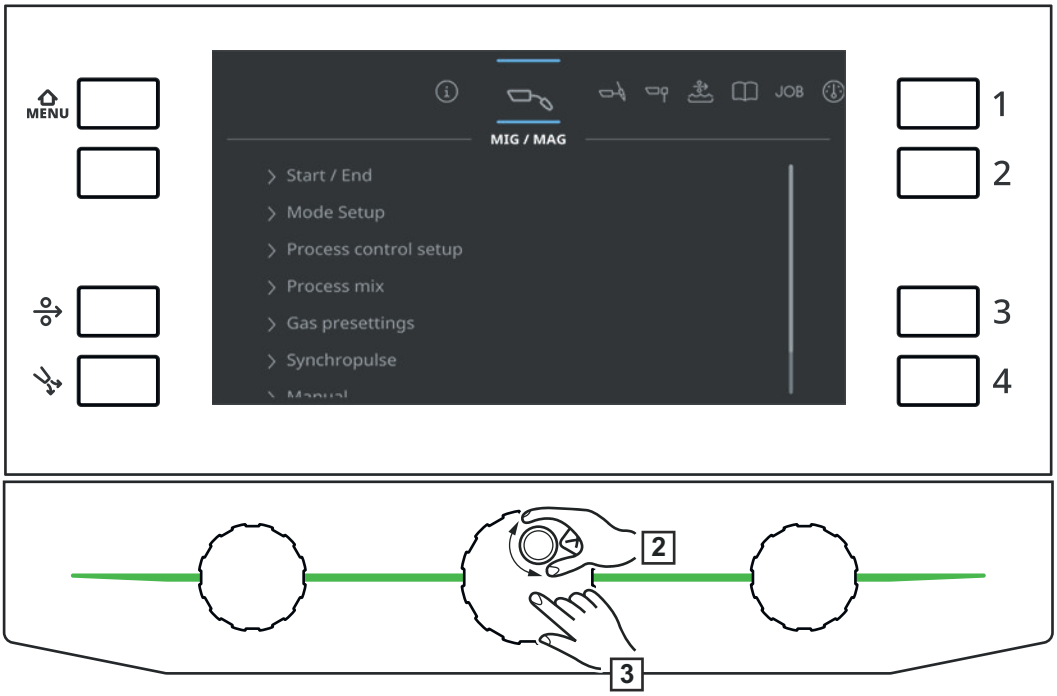
The available menus are displayed:



(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11)

(1)	Device information	(7)	Job pre-settings
(2)	MIG/MAG	(8)	Monitoring
(3)	TIG	(9)	User Management
(4)	Electrode *	(10)	Display
(5)	Components	(11)	System
(6)	Logbook		

* The CEL menu is also displayed on /XT welding machines.



MIG/MAG menu selected

2 Turn the middle selection dial to select the desired menu

A selected menu is highlighted, enlarged, and shown between two blue lines on the display.

3 Press the middle selection dial to display or adjust the parameters of the selected menu

The first parameter or the first parameter group of the menu is selected and can be edited.
A selected parameter or group of parameters are also shown brightly on the display between two blue lines.

MIG/MAG menu, parameter group Start / End selected

Opening parameter groups, setting parameters

Opening the parameter group

1 Turn the middle dial to select the desired parameter group
2 Press the middle dial

The parameters in the group are displayed and can be modified.

Setting parameters

3 Turn middle the dial to select the desired parameter
4 Press the middle dial

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

5 Turn the middle dial and adjust the value of the parameter
6 Press the middle dial and set other parameters

or

press the menu button to exit the setup menu.
The welding screen is displayed.

Switching menus

1 Within a parameter group, turn the middle selection dial and move the selection up until the parent menu is selected.
Example:

2 Press the middle selection dial

The menu symbol is highlighted in white.

3 Turn the middle selection dial to select a different menu
4 Press the middle selection dial and open the new menu

Exiting the setup menu

1 Press the "Menu" key

No matter where you are in the setup menu, the welding screen is displayed upon pressing the menu button.

If you press the menu button again, the last menu accessed is displayed.

Grayed-out parameters

NOTE!

In the setup menu, certain parameters are grayed out because they have no function with the currently selected settings.

- ▶ Grayed-out parameters can be selected but not amended.
- ▶ Grayed-out welding parameters have no influence on the current welding process or the welding result.

Device information

Retrieving system data

The current system data are displayed.

	Welding current in A
	Welding voltage in V
	Wire speed in m/min or ipm
	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 per unit length can be calculated: E = IP / vs E Electrical energy per unit length in kJ/cm IP Arc power in kW vs Welding speed in cm/s
	Duration of current weld in 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 per unit length 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 per unit length.
	Total operating hours of the welding machine in h
	Arc time in h

	Current weld
INT	Wire drive in the welding machine
EXT	External wirefeeder

MIG/MAG

Start / 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)

0-400% (of the welding current)
Factory setting: 135%

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
For setting 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
For setting 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
For setting the final current in order to
a) Prevent a build-up of heat at the end of welding
b) Fill the end-crater in the case of aluminum

0-400% (of the welding current)
Factory setting: 50%

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

off / 0.1-10.0 s
Factory setting: off

Wire retraction
For setting the wire retraction value (= combined value from wire retraction and a time) during MIG/MAG manual welding
The wire retraction depends on the equipment on the welding torch.

0.0-10.0
Factory setting: 0.0

Setup mode

Spot welding

2-step /4-step
Factory setting: 4-step

Spot welding time

0.1 – 10.0 s
Factory setting: 1.0 s

Stitch
To activate/deactivate stitch welding

off/on
Factory setting: off

Stitch cycles

constant / 1 – 99
Factory setting: constant

Stitch welding time

0.01 – 9.9 s
Factory setting: 0.3 s

Stitch pause time

off / 0.01 – 9.9 s
Factory setting: 0.3 s

Process Mix

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

Upper power time correction
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 pulse process phase becomes longer.

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

Lower power time correction
To set the duration of the cold process phase in a mixed process

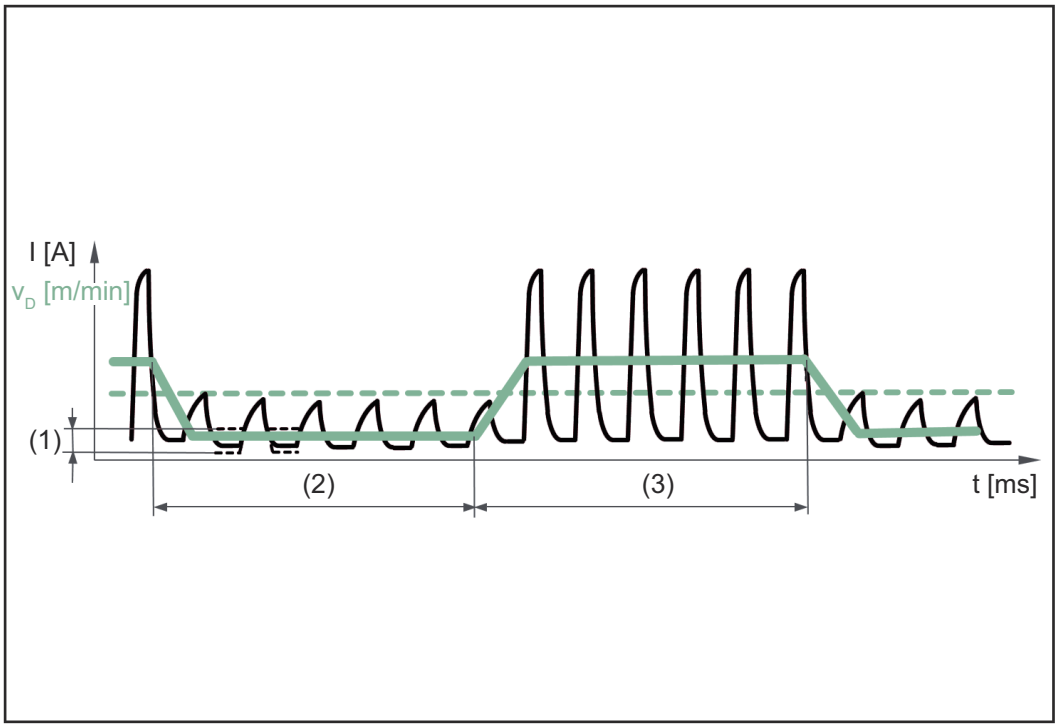
-10.0 – +10.0
Factory setting: 0

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

Lower power correction
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 therefore a higher energy yield in the cold standard process phase.



Mixed process between pulsed and standard welding process. A cold standard process phase follows a hot pulsed process phase as part of a cycle.

(1) Lower power correction
(2) Lower power time correction
(3) Upper power time correction
v_D Wire speed

Gas default settings

The following process parameters can be set and displayed for the gas default settings:

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

0 – 9.9 s
Factory setting: 0.1 s

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

0 – 60 s
Factory setting: 0.5 s

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 - 3.0 m/min / 5 - 115 ipm
Factory setting: 2.0 m/min

(4) Frequency
To set the SynchroPulse frequency

off / 0.5 - 5.0 Hz
Factory setting: off

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

10 - 90%
Factory setting: 50%

(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

NOTE!

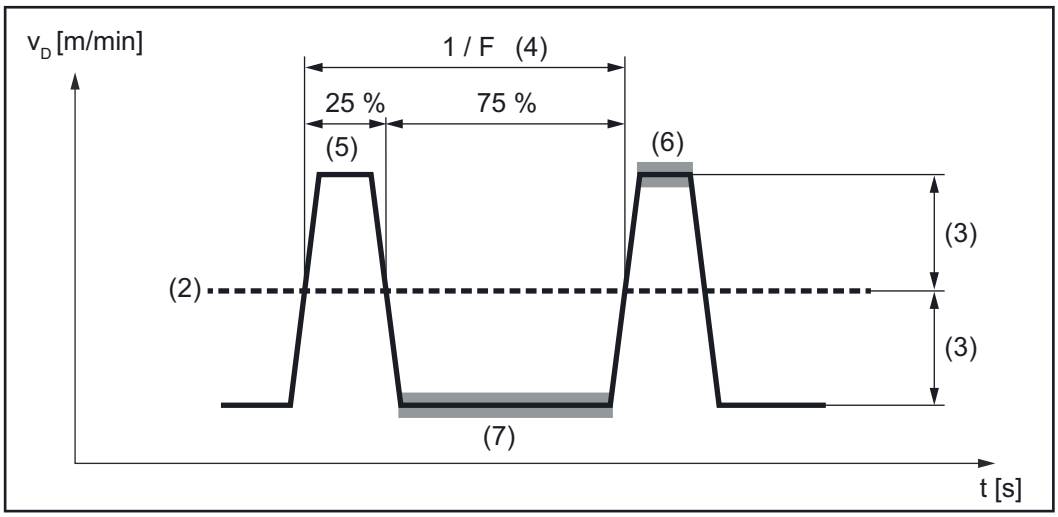
If SynchroPulse is activated, the normal arc length correction has no effect on the welding process.

▶ The arc length correction is then no longer displayed in the welding parameters.

(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
o ... uncorrected arc length
+ ... longer arc



Example: SynchroPulse, duty cycle (high) = 25% (2) = wire speed

Manual

Ignition current (manual)
For setting the ignition current for MIG/MAG manual welding

100-500 A (Fortis 270 C)
100-550 A (Fortis 320 C, Fortis 320)
100-600 A (Fortis 400 C, Fortis 400)
100-600 A (Fortis 500 C, Fortis 500)
Factory setting: 500 A

Wire retraction (manual)
For setting the wire retraction value (= combined value from wire retraction and a time) during MIG/MAG manual welding
The wire retraction depends on the equipment on the welding torch.

0.0-10.0
Factory setting: 0.0

Slope characteristics

auto / U constant / 1,000-8 A/V
Factory setting: auto

auto:
A fixed characteristic slope is stored.

U constant:
The welding machine immediately regulates a change in the arc length.

8 A/V:
The welding device does not regulate a change in the arc length or only does this to a minimal extent.

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
- Return lead cables, welding power-leads
- Wirefeeders
- Welding torches, electrode holders

Prerequisites for R/L alignment:

The welding system must be complete: closed welding circuit with welding torch and torch hosepack, wirefeeders, return lead cables, interconnecting hosepacks.

Performing R/L alignment:

1 Select R/L alignment in the Setup menu

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

2 Select "Next" (press right-hand dial) or 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 right-hand dial) or press torch trigger

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

5 Follow the on-screen instructions
6 Select "Next" (press right-hand dial) or press torch trigger

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

7 Follow the on-screen instructions
8 Select "Next" (press right-hand dial) or press torch trigger

The current values are displayed when the measurement is complete.

9 Select "End" (press the right-hand dial)

Welding circuit inductance limit values	
Fortis 270	15 µH
Fortis 400 / 500	25 µH

Larger inductance values may impair welding results. This can be remedied by optimizing the routing of hosepacks and return lead cables (see also from page 93 or 113 onwards).

TIG

Start / End

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

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

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.

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.

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

0.02 - 120 s
Factory setting: 5.0 s

Break voltage
For setting a voltage value at which the welding process may be ended by a slight raise of the TIG welding torch.

10.0 - 30.0 V
Factory setting: 14 V

Torch trigger

on / off
Factory setting: on

on
Welding is started using the torch trigger

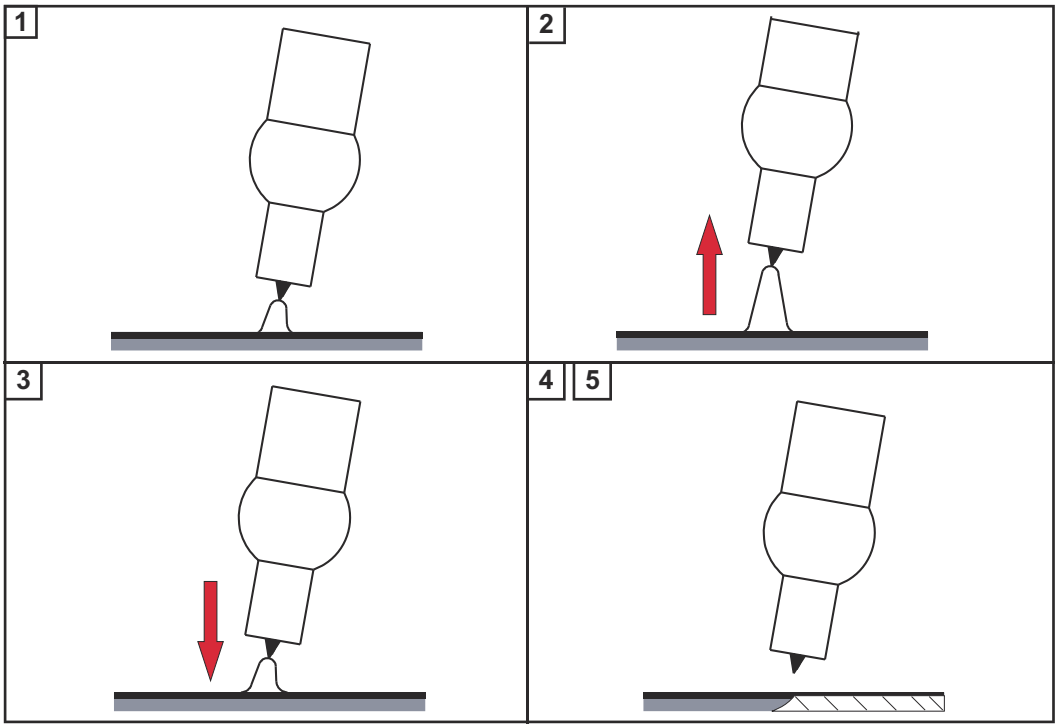
on
Welding is started by touching the workpiece with the tungsten electrode; especially suitable for welding torches without torch triggers, ignition sequence depends on ignition parameters

Comfort Stop sensitivity
For activating/deactivating the TIG Comfort Stop function

off / 0.1 - 10.0 V
Factory setting: 0.8 V

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 gas-valve 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 TIG Comfort Stop function has triggered

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

Electrode diameter, tacking

Electrode diameter

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

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 set time has passed, further welding is carried out at a constant welding current. 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 central display section if a value has been set.

Pulsed

Pulse frequency

off / 0.20 – 990 Hz
Factory setting: off

The set pulse frequency is also applied for the lowering current I_2.

The Pulsing indicator lights up in the central display section if a value for the pulse frequency has been entered.

Gas default settings

The following process parameters can be set and displayed for the gas default 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 welding machine calculates and automatically adjusts the optimal gas post-flow time.

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
- Return lead cables, welding power-leads
- Wirefeeders
- Welding torches, electrode holders

Prerequisites for R/L alignment:

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

Perform R/L alignment:

1 Select R/L alignment in the setup menu

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

2 Select "Next" (press right-hand dial) or 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 right-hand dial) or press torch trigger

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

5 Follow the on-screen instructions

6 Select "Next" (press right-hand dial) or press torch trigger

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

7 Follow the on-screen instructions

8 Select "Next" (press right-hand dial) or press torch trigger

The actual values are displayed when the measurement is complete.

9 Select "End" (press the right-hand dial)

Electrode

Start / End

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

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

0.0 – 2.0 s
Factory setting: 0.5 s

Break voltage
For setting a voltage value at which the welding process may be ended by a slight raise of the stick electrode.

20 – 90 V
Factory setting: 90 V

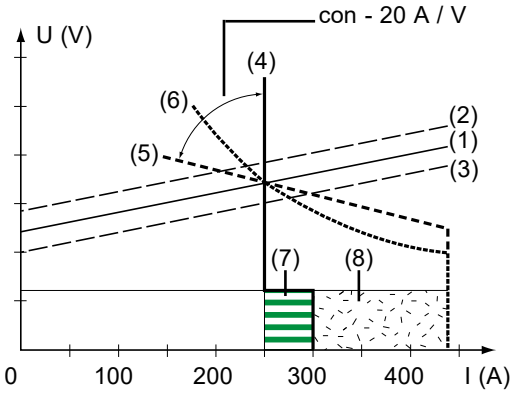
The arc length depends on the welding voltage. To end the welding process, a significant lifting of the stick electrode is usually required. The break voltage parameter allows the welding voltage to be limited to a value, which permits the welding process to be ended by only slightly lifting the stick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

IMPORTANT! If the welding process regularly comes to an unintentional end, set the break voltage to a higher value.

Characteristic

Characteristic
For selecting the electrode characteristic

I-constant / 0.1 - 20.0 A/V / P-constant / Gouging
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 slope)
(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)

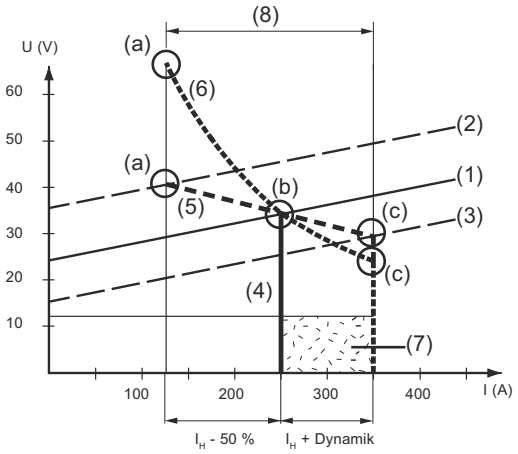
I-constant (constant welding current)

- 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.
- "I-constant" must be set for electrode pulsing.

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 gouging with a carbon electrode



(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 slope)
(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)

(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) intersects 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

Anti-stick
To activate/deactivate the anti-stick function

off / on
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 the anti-stick function. If the stick electrode begins to stick, the welding machine switches the welding current off after 1.5 seconds. The welding process can be resumed without problems once the stick electrode has been lifted from the workpiece.

Electrode pulsing

Electrode pulsing
For activating or deactivating the pulse frequency

off / 0.20 - 100 Hz
Factory setting: off

For details on electrode pulsing, see from page 183 onwards.

CEL

For /XT devices only

This CEL menu is only available for /XT devices.

Start / End

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

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

0.0 – 2.0 s
Factory setting: 0.5 s

Break voltage
For setting a voltage value at which the welding process may be ended by a slight raise of the stick electrode.

20 – 90 V
Factory setting: 90 V

The arc length depends on the welding voltage. To end the welding process, a significant lifting of the stick electrode is usually required. The break voltage 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.

IMPORTANT! If the welding process regularly comes to an unintentional end, set the break voltage to a higher value.

Anti-stick

Anti-stick
To activate/deactivate the anti-stick function

off / on
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 the anti-stick function. If the stick electrode begins to stick, the welding machine switches the welding current off after 1.5 seconds. The welding process can be resumed without problems once the stick electrode has been lifted from the workpiece.

Components

Interior lighting

Interior lighting
For activating/deactivating the interior lighting

off / 1 - 60 s / on
Factory setting: 5 s

off
The interior lighting is switched off.

1 - 60 s
The interior lighting lights up for the set period of time.

on
The interior lighting lights up permanently.

Cooling unit

The following process parameters can be set and displayed for an optional cooling unit:

Cooling unit operating mode
For setting whether the cooling unit is to be switched off or operated automatically

auto / off
Factory setting: auto

auto:
The cooling unit starts to operate when welding starts. The fan starts to operate from a coolant return temperature of 40 °C (104 °F). The coolant flow starts at approx. 1 l/min (0.26 gal./min [US]) and increases as the coolant return temperature increases to up to 1.5 l/min (0.40 gal./min [US]).
In the event of faults in the cooling circuit, a corresponding error message is displayed.
After the end of welding, the cooling unit continues to operate for the set cooling unit run-on time. When the cooling unit run-on time has elapsed, the cooling unit switches off.

off:
The cooling unit is deactivated.
No operation, even when welding starts

IMPORTANT! If a gas-cooled welding torch is operated on a welding machine with a cooling unit, set the cooling unit operating mode parameter to "**off**".

Cooling unit shut-off delay
Run-on time of the cooling unit after the end of welding

2-20 minutes
Factory setting: 2 minutes

Delay time flow sensor
Only in conjunction with the OPT/s CU Flow Sensor cooling unit option.
The flow sensor option is integrated into the OPT/s CU1200 MC cooling unit model.

For setting the time between the flow sensor tripping and the output of a warning message

5-25 s
Factory setting: 5 s

Cooler flow warning limit
Only in conjunction with the OPT/s CU flow sensor cooling unit option.
The flow sensor option is integrated into the OPT/s CU1200 MC cooling unit model.

If the parameter is activated, a warning is generated if the actual value falls below the entered value.

off / 0.75-0.95 l/min
Factory setting: off

Wirefeeder

The following process parameters can be set and displayed for the integrated wire drive and for a separate wirefeeder of a welding system:

Feeder inching speed
To set the wire speed at which the wire electrode or welding wire is fed into the torch hosepack

2 - 25 m/min / 78 - 984 ipm
Factory setting: 10 m/min

NOTE!

The feeder inching speed can also be set in the window that opens when the wire threading button is pressed:
- ▶ Press the wire threading button
- ▶ Turn the middle selection dial to adjust the value of the feeder inching speed

Welding machine

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

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. Wirefeeding 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.

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

0.1 – 9.9 s
Factory setting: 5.0 s

Welding torch

Torch trigger job selection
Switch to the next job using the torch trigger

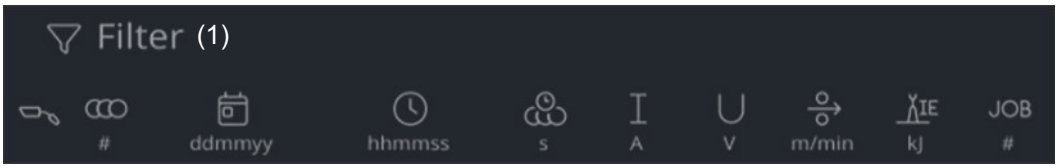
Switching can take place when idle or during welding.

on / off
Factory setting: off

Logbook

Viewing the logbook

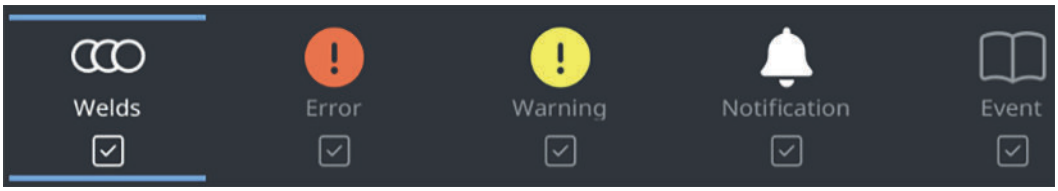
The following data are displayed in the logbook:



(2) (3) (4) (5) (6) (7) (8) (9) (10) (11)

(1) Filter
(2) Logged in user
(3) Number of the weld
(4) Date (ddmmyy)
(5) Time (hhmmss)
(6) Duration of welding in s
(7) Welding current in A (average)
(8) Welding voltage in V (average)
(9) Wire speed in m/min
(10) Arc energy in kJ (for details see page 195)
(11) Job No.

The following data can be displayed with the filter function (1):



a) b) c) d) e)

a) Welds
b) Error
c) Warning
d) Notification
e) Event

Turn a selection dial to scroll through the list.
Press the selection dial to display details of a logbook entry.

Job pre-settings

Job slope

Job slope
Defines the time between the currently selected job and the next job

0.0 - 10.0 s
Factory setting: 0 s

Job-Correction-Limit MIG/MAG

Upper power correction limit
For setting the upper power correction limit for a job

0 - 20%
Factory setting: 0%

Lower power correction limit
For setting the lower power correction limit for a job

-20 - 0%
Factory setting: 0%

Upper arc length correction limit
For setting the upper arc length correction limit for a job

0.0 - 10.0
Factory setting: 0

Lower arc length correction limit
For setting the lower arc length correction limit for a job

-10.0 - 0.0
Factory setting: 0

For more information on the job correction limits, see the chapter Job Mode on page 154.

Job-Correction-Limit TIG

Upper main current limit
For setting the upper main current limit for a job

0 - 20%
Factory setting: 0%

Lower main current limit
For setting the lower main current limit for a job

-20 - 0%
Factory setting: 0%

Monitoring

Arc break monitoring

Arc break monitoring

Ignore/Error
Factory setting = ignorieren

Ignore:
Arc break monitoring is deactivated.
The welding machine remains active and no error message appears on the display.

Error:
Arc break monitoring is activated.
If the arc breaks off and there is no current flow within a set arc break time period, the system switches off automatically and an error message appears on the display.

Arc break filter time
An error is output if the set time period is exceeded.

0.1 – 9.9 s
Factory setting = 0.2 s

Motor force monitoring

Wirefeeding force monitoring

ignore / warning / error
Factory setting: Ignore

Ignore ... no reaction
Warning ... a warning is displayed
Error ... Welding process is interrupted, an error message is displayed

Maximum force

0 – 999 N
Factory setting: 100 N

Maximum force deviation time

0.1 – 10.0 s
Factory setting: 3 s

Single Phase Mode Settings

The parameters can be set when the device is in single-phase mode.

Fuse current value

Fortis 270 /XT: off / 10 - 35 A
Fortis 320 /XT: off / 10 - 63 A
Fortis 400 /XT: off / 10 - 63 A
Fortis 500 /XT: off / 10 - 63 A
Factory setting: off

Reaction

off / power limitation / warning
Factory setting: off

off:
No reaction

Power limitation:
The output welding power is limited depending on the welding characteristic and the fuse current value.

Warning:
Is automatically set when a fuse current value > off has been set.
If a limit is exceeded, the symbol for single-phase mode changes to red, but there is no restriction of the output welding power.

Documentation

Sampling rate
For activating/deactivating the sampling rate for the logbook

off / 0.1 - 100.0 s
Factory setting: off

off
Sampling rate is deactivated, only mean values are saved.

0.1 - 100 s
Documentation is saved at the set sampling rate.

User management

General

User management is useful if multiple users are working with the same welding machine.
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 welding machine 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 welding machine. Users are assigned different roles depending on their level of training or qualification.

NFC key
An NFC card or and NFC key fob is assigned to a specific user who is registered on the welding machine.
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 in 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 role "locked"
- cannot be deleted or renamed
- can be edited in order to activate various functions as required

The role "locked" cannot be assigned NFC keys.

If no NFC key is assigned to the predefined "Admin" user, each NFC key functions to lock and unlock the welding machine (no user management, see also section "Locking and unlocking the welding machine using an NFC key", page 125).

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 welding machine can no longer be operated without administrator rights.

Procedure

NOTE!

The loss of an administrator NFC key may affect welding machine 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

NOTE!

If an NFC key is assigned to the predefined "Admin" user in User Management, then User Management is activated.

1 Select User Management in the Setup menu

2 Turn a selection dial and select Activate User Management

3 Press a selection dial

The instructions for assigning an NFC key are displayed.

4 Hold a new NFC key on the external NFC key reader and wait for confirmation of recognition.

The NFC key is assigned to the predefined "Admin" user, and User Management is activated.
New users and roles can now be created in User Management.

Create a second administrator key:

1. Turn a selection dial in User Management and select User
2. Press a selection dial
3. Turn the middle selection dial and select new user
4. Press the selection dial

   The text input* is displayed.

5. Enter the desired name in the text input* by turning and pressing the middle selection dial (max. 30 characters)
6. Press the right-hand selection dial (Save)

   The properties of the new user are displayed.

   IMPORTANT! The "Administrator" role must be retained.

7. Turn the middle selection dial and select "NFC card"
8. Press the middle selection dial

   The note for assigning an NFC key is displayed.

9. Hold a new NFC key on the external NFC key reader and wait for confirmation that it has been recognized.

   The NFC key will be assigned to the new user.

* Explanation of text input on page 225, step 2

Creating roles

1. Once User Management is activated, turn a selection dial and select **Role**
2. Press a selection dial

   The list of available roles is displayed.

3. Turn the middle selection dial and select **+ new role**
4. Press the middle selection dial

   The text input* is displayed.

5. Enter the desired name in the text input* by turning and pressing the middle selection dial (max. 30 characters)
6. Press the right-hand selection dial (**Save**)

   The functions that can be executed by a role are displayed.

   Symbols:

   ✕ ... not possible

   ✓ ... possible

... hidden

... read only

... read and write

7 Specify functions that a user can execute with this role
- Select functions by turning the middle selection dial
- Press the middle selection dial
- Select settings from the list by turning the middle selection dial
- Press the middle selection dial

8 Press the right-hand selection dial (**Save**)

* Explanation of text input on page 225, step 2

Creating users

NOTE!

For data privacy reasons, only personal ID numbers and no full names should be entered when creating users.

1 Once User Management is activated, turn a selection dial and select **User**

2 Press a selection dial

The list of available users is displayed.

3 Turn the middle selection dial and select **+ new user**

4 Press the middle selection dial

The text input* is displayed.

5 Enter the desired name in the text input* by turning and pressing the middle selection dial (max. 30 characters)

6 Press the right-hand selection dial (**Save**)

The user properties are displayed.

7 Assign a role to the user and 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 text input*

8 Turn the middle selection dial and select **NFC card**

9 Press the selection dial

The note for assigning an NFC key is displayed.

10 Hold a new NFC key on the external NFC key reader and wait for confirmation that it has been recognized.

The NFC key will be assigned to the new user.

* Explanation of text input on page 225, step 2

Editing roles or users

1. Once User Management is activated, turn a selection dial and select the following:
   User ... to change an existing user
   Role ... to change an existing role
2. Press a selection dial

   The list of available users or roles is displayed.

3. Turn the middle selection dial and select the user to be changed or the role to be changed
4. Press the middle selection dial

   The user properties or the functions that can be executed by the role are displayed.

5. Turn the middle selection dial and select the data to be changed
6. Press the middle selection dial to change the data
7. Then press the right-hand selection dial (**Save**)

Deleting roles or users

1. Once User Management is activated, turn a selection dial and select the following:
   User ... to delete an existing user
   Role ... to delete an existing role
2. Press a selection dial

   The list of available users or roles is displayed.

3. Turn the middle selection dial and select the user or role to be deleted
4. Press the right-hand selection dial (**Delete user**/**Delete role**)

   A confirmation prompt is displayed.

5. Press the right-hand selection dial (**Yes**)

Deactivating User Management

1 Once User Management is activated, turn a selection dial and select **Deactivate User Management**

2 Press a selection dial

The confirmation prompt for deactivating User Management and for deleting the NFC card is displayed.

3 Press the right-hand selection dial (**Yes**)

User Management is deactivated, the welding machine is locked.
The welding machine can be unlocked and locked again with any NFC key (see also page 125).

Lost administrator NFC key?

Procedure if
- User Management is activated
- The welding machine is locked
  and
- The administrator NFC key has been lost:

1 Press the Information button for 5 seconds

The information regarding the loss of the administrator card is displayed.

2 Note down the IP address of the welding machine

3 Open the SmartManager for the welding machine (enter the IP address of the welding machine in a browser)

4 Inform the Fronius service team

Display

Background lighting

For setting the background lighting

0-10
Factory setting: 10 (brightest)

Status LED

For activating / deactivating setting of the status indicator

off/on
Factory setting: on

Mean display

For activating / deactivating the Mean display (large display of the average values after the end of welding over the entire display area)

Mean = average value

off / on
Factory setting: off

The following values are displayed in the Mean display:
- Welding parameter set values
- Average welding parameter values after the end of welding
- Welding power [kW], welding duration [s], welding energy [kJ]
- Welding process, operating mode, process functions used

Selecting the language

1 Turn the middle dial and select the desired language
2 Press the middle dial
3 Press the right-hand dial to select the language

The welding screen is displayed.

Setting the date and time

The date and time can be assigned automatically or set manually.

1 Select **Set date & time automatically** (press the middle selection dial)

The date and time are assigned automatically.

2 Select **Time server** and press the middle selection dial

The text input is displayed.

Aa ... Uppercase and lowercase
!#1 ... Numbers and special characters
x ... Delete text to the right of the cursor
x ... Delete text to the left of the cursor
> ... Move cursor to the right
< ... Move cursor to the left

3 Enter the address of the local time server:
- Turn the middle selection dial – select characters
- Press the middle selection dial – confirm characters
- Finally, press the right-hand selection dial to confirm the input

The address of the local time server can be obtained from your IT administrator or via the Internet (e.g., pool.ntb.org).

4 Select **Time zone** and press the middle selection dial

5 Turn the middle selection dial and select the desired time zone

The time zone must match the location of the welding machine.

6 Press the right-hand selection dial to confirm the time zone

7 Turn the middle selection dial and select **Test**

8 Press the middle selection dial to start the time synchronization

9 Press the right-hand selection dial

Setting the date and time manually
To set the date and time manually, **Set date & time automatically** must not be selected.

1 Turn the middle selection dial and select the desired parameter:
Time zone / **Year** / **Month** / **Day** / **Hour** / **Minute**

2 Press the middle selection dial to change the parameter

3 Turn the middle selection dial to select the desired value

4 Press the middle selection dial and confirm the set value

5 Press the right-hand selection dial (**Save**) to confirm the settings

---

Units / Standards

Units

Metric / **Imperial**
Factory setting: **Metric**

Standards

EN / **AWS**
Factory setting: EN

EN
Name of filler metal according to European standards
(e.g., AlMg 5, CuSi3, steel, etc.)

AWS
Name of filler metal according to the American Welding Standard (e.g., ER 5356, ER CuSi-A, ER 70 S-6, etc.)

System

System data

The following data are displayed:
- Device name
- Serial number of the welding machine
- Image version
- Software version
- Open source licenses
- Regulatory certification

Restoring the website password

1 In the system menu, select "Restore the website password"

The confirmation prompt for resetting the website password appears.

2 Press the right-hand dial to reset the website password

The website password is reset to the factory setting:
User name = admin
Password = admin

Network settings

Bluetooth

on / off
Factory setting: on

NOTE!

The wordmark Bluetooth® and the Bluetooth® logos are registered trademarks and property of Bluetooth SIG, Inc. and are used by the manufacturer under license.

WLAN

on / off
Factory setting: off

Activating WLAN:

1 Select WLAN in the system menu
2 Press the middle dial (tick in the checkbox)

WLAN is activated, the available networks are displayed.

3 Turn the middle dial and select the desired network
4 Press the middle dial
5 Select a password and enter it using text input
6 Press the right-hand dial
7 Activate or deactivate DHCP

8 If DHCP is deactivated:
IP address, network mask, default gateway, DNS server 1 and DNS server 2 are displayed

9 Press the right-hand dial (OK)

WLAN is deactivated (no tick in the checkbox):

1 Select country code setting
2 Select country code
3 Press the right-hand dial (save)

Ethernet IP
For manually setting the network parameters

If DHCP is activated, the network parameters IP address, network mask, default gateway, DNS server 1 and DNS server 2 are grayed out and cannot be set.

1 Deactivate DHCP (no tick in the checkbox)
2 Turn the middle dial and select the desired network parameter
3 Press the middle dial

The numeric keypad for the selected network parameter is displayed.

4 Enter a value for the network parameter
5 Press the right-hand dial (save) and confirm the value for the network parameter
6 Press right-hand dial (save) to confirm the network parameters

Welding machine configuration

1 Turn the middle selection dial and select a configuration item
2 Press the middle selection dial
3 Enter the desired text using the text input (max. 30 characters)
4 Press the right-hand selection dial (**OK**) to confirm the text
5 Press the right-hand selection dial (**Save**)

Restoring factory settings

1 In the System menu, select **Restore factory settings**

The confirmation prompt for the factory settings appears.

2 Press the right-hand selection dial (**Yes**) to reset the values to the factory settings

SmartManager – the welding machine website

SmartManager – the welding machine website

General

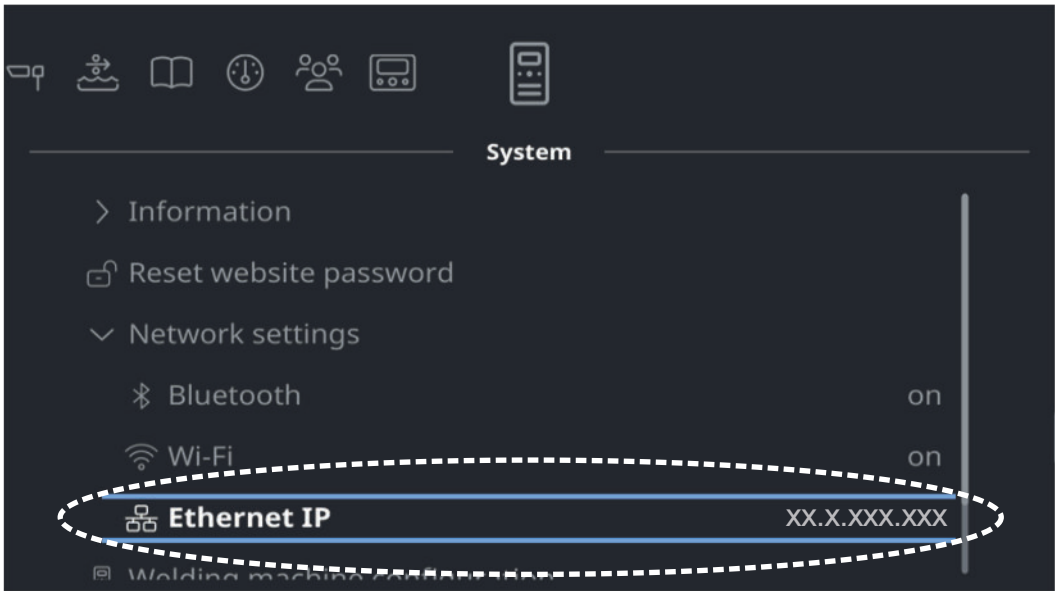
With the SmartManager, the welding machines have their own website.
Once the OPT/s Ethernet option is installed on the welding machine, the welding machine can be connected to a computer via WLAN or a network cable, or integrated into a network.
The SmartManager of the welding machine can be accessed via the IP address of the welding machine.
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:

- Actual system data
- Documentation Logbook
- Job Data
- Power source settings
- Backup & Restore
- Overview
- Update
- Function Packages
- Synergic lines overview
- Screenshot

Opening and logging into the SmartManager for the welding machine



1 In the Setup menu under System / Network settings, note the IP address of the welding machine

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 (up to firmware version < V1.1.1)

IMPORTANT! From firmware version V1.1.1 and higher, the password for the SmartManager corresponds to the Unique Password.
This Unique Password is a 20-digit number printed on the rating plate of the welding machine.

4 Confirm the displayed message

The unique password does not have to be changed when logging in to the SmartManager for the first time.

The SmartManager for the welding machine is displayed.

Help functions if logging in does not work

There are two help functions when logging into the SmartManager:
- Start unlock function?
- Forgot your password?

Start unlock function?

This feature allows you to unlock an unintentionally locked welding machine 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

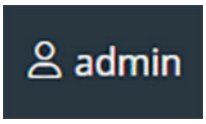
4 Save the unlock file to the computer
5 Click on "Find unlock file"
6 Save the unlock file
7 Click on "Load unlock file"

The welding machine is temporarily unlocked.

Forgot your password?

After clicking on "Forgot your password?", a note appears indicating that the password can be reset on the welding machine (see also "Restoring the website password", page 228).

Changing the password/ logging out



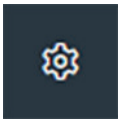
Click on this symbol to
- change the user password
- log out of the SmartManager

Changing the SmartManager password:

1 Enter the old password
2 Enter a new password *
3 Repeat the new password
4 Click on "Save"

* A password must satisfy the following criteria:
- The password must be between 10 and 16 characters in length.
- It must contain three of the following four features:
  uppercase letters A - Z
  lowercase letters a - z
  digits 0 - 9
  special characters , . @ = + - * / ~ " ° _ # ( ) ! ? & % : ;

Settings

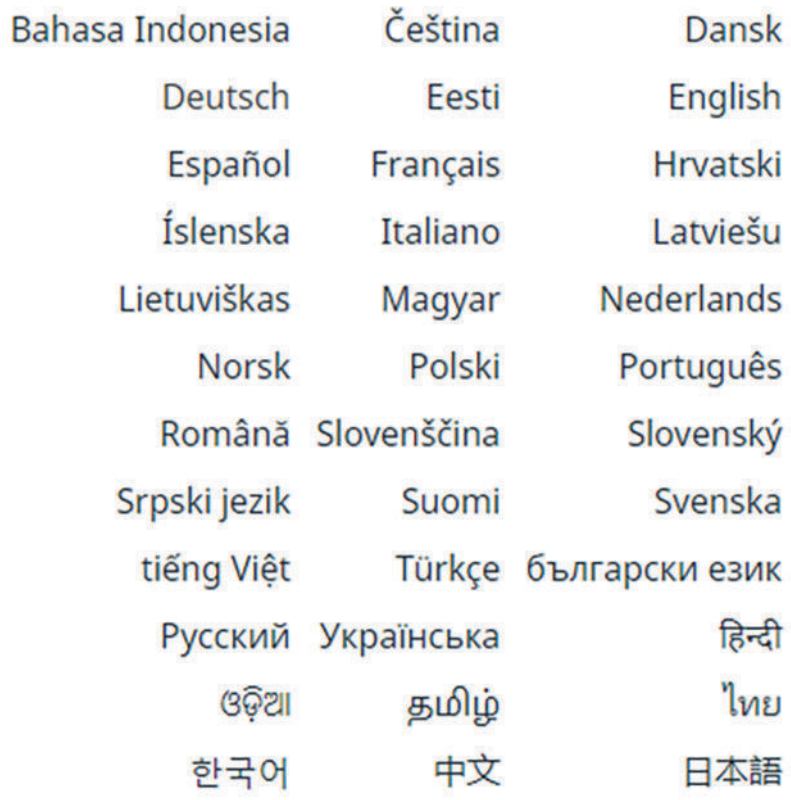


Click on this symbol to expand the display of characteristics, material specifications and certain welding parameters on the SmartManager for the welding machine.

The settings depend on the user who is logged in.

Language selection

Click on the language abbreviation to display the languages available for the SmartManager.



To change the language, click on the desired language.

Status indicator

The current status of the welding machine is displayed between the Fronius logo and the selected welding machine.

Caution/warning

Error on the welding machine *

Welding machine is welding

Welding machine is ready for use (online)

Welding machine 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

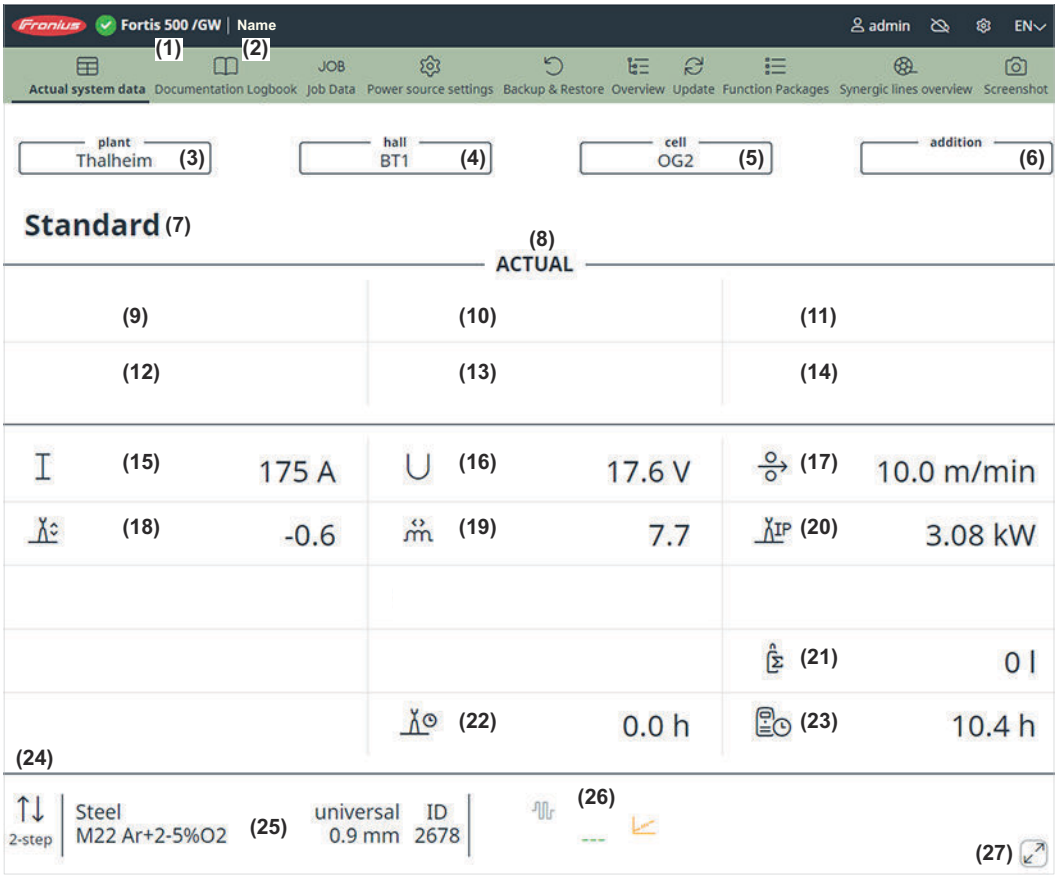
Current system data

Current welding system data is displayed.

NOTE!

Depending on the welding process, equipment, and existing WeldingPackages, the system data displayed will vary.

▶ e.g. system data for MIG/MAG:



(1) Device type
(2) Device name
(3) Factory
(4) Hall
(5) Cell
(6) Addition
(7) Welding process
(8) Actual values / average values
(9) Welding current
(10) Welding voltage
(11) Wire speed
(12) Arc time
(13) Arc energy
(14) Arc power
(15) Welding current command value
(16) Welding voltage set value
(17) Wire speed set value
(18) Arc length correction
(19) Pulse/dynamic correction
(20) Arc power
(21) Total shielding gas consumption
(22) Total arc time
(23) Total operating hours of the welding machine
(24) Operating mode
(25) Filler metal, shielding gas, characteristic, diameter, ID
(26) Process functions
(27) Full screen mode

Documentation logbook

Logbook

The documentation entry in the logbook shows the last 100 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 with date (yyyy MM dd) and time (hh mm), each from – to.
An empty filter reloads the most recent welding operations.
The display of welding operations, errors, warnings, notifications, 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) Protection class – 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)

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 real-time values in W
(15) Arc energy in kJ
(16) Job No.
(17) Process

Additional values can be also displayed by clicking on the "Paste column" button:

- I max / I min: maximum/minimum welding current in A
- Power max / Power min: maximum/minimum arc power in W
- Start time (welding machine 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/s documentation option is present on the welding machine, 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/s documentation option must be present on the welding machine.

Basic settings

The sampling rate for documentation can be activated and set in the basic settings.
In addition, the motor force M1 – M3, gas flow actual value and welding speed can be activated for documentation.

Job data

Job data

If the OPT/s Jobs option is available on the welding machine, 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/s Jobs option is not available on the welding machine.

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 column" button.

All added jobs are compared with the selected job.

Editing a job

Existing jobs in the welding machine can be optimized, provided the OPT/s Jobs option is available on the welding machine.

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/s Jobs option is available on the welding machine.

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 welding machine to store jobs externally, provided the OPT/s Jobs option is available on the welding machine.

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 machine can be exported as PDF or CSV files.
For CSV export, the OPT/s Jobs option must be available on the welding machine.

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.

Welding machine settings

Process parameters

Under Process parameters, you can view and modify general process parameters and process parameters for components & monitoring of a welding machine.

Changing process parameters

1 Click on Parameter Group/Parameters
2 Change the value of the parameter directly in the display field
3 Save changes

Designation & location

The welding machine configuration can be viewed and modified under Designation & location.

Parameter display

Welding parameters and special functions for the welding machine can be set under Parameter display.

1 Select parameter/function (tick)
2 Save changes

The selected parameters/functions are displayed in the welding parameters on the welding machine display.

Date & time

The date & time can be set automatically or manually.

Network settings

The following parameters can be set under Network settings:

Management
- MAC address and current IP address are displayed.
- If DHCP is not selected, the IP address, network mask, default gateway, DNS server 1 and 2 can be set manually.

WLAN
- MAC address and current IP address are displayed.
- The WLAN country code can be set.
- Configured networks are displayed
- Available networks are displayed

WeldCube Air
Connect welding machine to WeldCubeAir
(alternatively click on the cloud icon at the top right)

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 machine data as a backup

By default, the data is saved in the format
Backup_SN00001831_2024_01_11_100039.fbc
at the selected location.

YYYY = year
MM = month
DD = day
HH = hour
mm = minute

Date and time information according to the settings on the welding machine.

Finding a recovery file

1 Click on "Find recovery file" to transfer an existing backup to the welding machine

2 Select the file and click on "Open"

The selected backup file appears in the SmartManager for the welding machine 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 welding machine. During import, existing user management data on the welding machine is overwritten.
- A CENTRUM server can be activated.

User management is created on one welding machine and can then be saved with the export/import function and transferred to other welding machines.

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 welding machine

1 Click on "export"

User management for the welding machine 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 welding machine

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 welding machine.

CENTRUM Server

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 welding machine network settings.

3 Click on the "Verify server" button.

   The availability of the specified server is checked.

4 Save 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 welding machine: - ACU1: Item number, version, serial number, production date Bootloader: Version Image: Version Licenses: WP Standard, WP Pulse, etc. - SC2: Item number Firmware: Version Click on the "Collapse all groups" button to hide the details of the system components.
Export component overview as ...	Click on the "Export component overview as" 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 welding machine can be updated.

The welding machine's current firmware version is displayed.

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 welding machine may need to be re-started.

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 welding machine under Update.

3 Click on "Update"

The progress of the update process is displayed.
Once this reaches 100%, the prompt to restart the welding machine 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 welding machine, click on "Yes"

The welding machine restarts, the display goes dark for a short time.
During the restart, the welding machine 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.

Information on open source licensing

Click on the link to view information on open source licensing.

Fronius WeldConnect

Under the Update entry, the Fronius WeldConnect mobile application can also be called up.
WeldConnect is an app for wireless interaction with the welding system.

WeldConnect can be used to perform the following functions:
- Current device configuration at a glance
- Mobile access to the SmartManager of the welding machine
- Automatic determination of output parameters for MIG/MAG and TIG
- Cloud storage and wireless transmission to the welding machine
- Component identification
- Log on and off the welding machine without NFC card
- Save and share parameters and jobs
- Data transfer from one welding machine to another by means of backup, restore
- Firmware update

Fronius WeldConnect is available as follows:
- As an app for Android
- As an app for Apple/IOS

For more information on Fronius WeldConnect, visit:

https://www.fronius.com/en/welding-technology/innovative-solutions/weldconnect

Function packages

Function packages

The following data can be displayed under function packages:
- Welding Packages available on the welding machine (e.g. WP STANDARD, WP PULSE)
- Options available on the welding machine (OPT/s ...)

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 welding machine Function package.

5 Click on "Load function package"

Once the function package has been successfully loaded, a confirmation is displayed.

Synergic lines overview

Overview of characteristics

In the Characteristics overview entry

- available characteristics in the welding system can be displayed: Available characteristics button
- possible characteristics in the welding system can be displayed: Possible characteristics button
- characteristics for the welding system can be preselected: Characteristic preselection button
- saved characteristic preselections can be exported and imported: Export & import button

You can search for, sort and filter the displayed characteristics at any time.

The following information is displayed for the characteristics:
- Status
- Material
- Diameter
- Gas
- Property
- Process
- ID

To sort the characteristics in ascending or descending order, click on the arrow next to the corresponding information.

The column widths can be easily adjusted by dragging with the mouse cursor.

Show filter

Click on the "Show filter" symbol to display the possible filter criteria. With the exception of "ID" and "Replaced by", the characteristics can be filtered by all information.

First selection box = select all

To hide the filter criteria, click on the "Hide filter" symbol.

Screenshot

Screenshot

Under the Screenshot entry, a digital image of the welding machine 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 welding machines are equipped with an intelligent safety system, making it possible to dispense with nearly all fuses. After correcting any errors, the welding machine can be operated properly again.

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

Danger from electric current and insufficient ground conductor connection

⚠ WARNING!

Danger from electrical current.
This may result in serious personal injury and damage to property.
- ▶ Before starting any maintenance or servicing work, switch off all the devices and components involved and disconnect them from the grid.
- ▶ Secure all these devices and components 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.

⚠ CAUTION!

Danger due to insufficient ground conductor connection.
This can result in personal injury and damage to property.
- ▶ The housing screws provide a suitable ground conductor connection for grounding the housing.
- ▶ The housing screws must not under any circumstances be replaced by other screws without a reliable ground conductor connection.

MIG/MAG welding – Current limit

"Current limit" is a safety function for MIG/MAG welding, whereby
- It is possible to operate the welding machine at the power limit
- Process reliability is ensured

If the welding power is too high, the arc gets continuously smaller and may be extinguished. To stop the arc from being extinguished, the welding machine reduces the wire speed and therefore the welding power.
A corresponding warning is shown on the welding machine display.

Remedial measures
- Reduce one of the following welding power parameters:
  Wire speed
  Welding current
  Welding voltage
  Material thickness
- Increase the distance between the contact tip and workpiece

Troubleshooting the welding machine

Welding machine not working

Power switch is 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
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

Power switch is on, overtemperature is displayed

Cause: Overload, duty cycle exceeded
Remedy: Observe the duty cycle

Cause: Thermal automatic circuit breaker has tripped
Remedy: Wait until the welding machine 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: Fan in the welding machine defective
Remedy: Contact After-Sales Service

No welding current

Power switch of the welding machine switched on, indicators light up

Cause: Incorrect ground connection
Remedy: Check ground connection for polarity

Cause: Power cable in welding torch damaged or broken
Remedy: Replace the welding torch

No function after pressing torch trigger

Power switch 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 welding machines with integrated wire drive)
Remedy: Check interconnecting hosepack

no shielding gas

all other functions present

Cause: Gas cylinder empty
Remedy: Change gas cylinder

Cause: Gas pressure regulator faulty
Remedy: Replace gas pressure reducer

Cause: Gas hose not attached, or damaged
Remedy: Attach or replace gas hose

Cause: Welding torch faulty
Remedy: Change welding torch

Cause: Gas solenoid valve faulty
Remedy: Inform the service team

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 welding machines welding one part
Remedy: Increase distance between hosepacks and return lead 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 base 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

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: Faulty inner liner in welding torch
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: Incorrect contact pressure of feed rollers
Remedy: Optimize contact pressure

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

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.

Further information can be found in the "Troubleshooting the cooling unit" section below as of page 263.

Troubleshooting the cooling unit

Coolant flow too low / no coolant flow

Cause: Coolant level too low

Remedy: Top up coolant

Cause: Constriction or foreign body in the cooling circuit

Remedy: Remove constriction or foreign body

Cause: Coolant contaminated

Remedy: Change the coolant and then vent the cooling unit

Cause: Coolant return filter and/or coolant pre-filter installed incorrectly

Remedy: Clean coolant filter using clean tap water or change filter insert

Cause: Coolant pump defective

Remedy: Contact After-Sales Service

Coolant flow too low / no coolant flow

Cause: Coolant pump jammed

Remedy: Contact After-Sales Service

Cooling capacity too low

Cause: Cooler or air filter dirty

Remedy: Purge cooler with dry compressed air (see from page 272 onwards)
Clean air filter (see from page 269 onwards)

Cause: Fan faulty

Remedy: Contact After-Sales Service

Cause: Coolant pump defective

Remedy: Contact After-Sales Service

Welding torch gets very hot	
Cause:	Welding torch is inadequately sized
Remedy:	Observe duty cycle and load limits
Cause:	Coolant flow too low
Remedy:	Check coolant level. If necessary, top up coolant. Check coolant for pollution. Replace coolant if necessary
Cause:	Coolant pump jammed – coolant flow too low
Remedy:	Contact After-Sales Service

Service, maintenance and disposal

General

The welding machine only requires minimal service and maintenance under normal operating conditions. However, some important points must be noted to ensure that the welding system remains in a usable condition for many years.

Safety - maintenance

⚠ WARNING!

Danger from electrical current.
This may result in serious personal injury and damage to property.
- ▶ Before starting any maintenance or servicing work, switch off all the devices and components involved and disconnect them from the grid.
- ▶ Secure all these devices and components 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.

⚠ CAUTION!

Danger due to insufficient ground conductor connection.
This can result in personal injury and damage to property.
- ▶ The housing screws provide a suitable ground conductor connection for grounding the housing.
- ▶ The housing screws must not under any circumstances be replaced by other screws without a reliable ground conductor connection.

⚠ CAUTION!

Danger due to hot components and parts.
These can cause burns.
- ▶ Leave hot components and parts such as welding torches to cool before working with them.

Original spare and wear parts

It is impossible to guarantee that third-party parts are designed and manufactured to meet the demands made on them, or that they satisfy safety requirements.
- Use only original spare and wear parts (also applies to standard parts).
- Do not carry out any alterations, installations, or modifications to the device without first obtaining the manufacturer's permission.
- Components that are not in perfect condition must be changed immediately.
- When ordering, specify the exact name and part number according to the spare parts list, as well as the serial number of your device.

At every start-up

- Check mains plug and mains cable, as well as the welding torch, interconnecting hosepack, and ground earth connection for damage
- Check if the all-round clearance of the device is 0.5 m (1 ft. 8 in.) around the welding machine so that cooling air can circulate unimpeded

NOTE!

Air inlet and outlet openings must not be blocked or even partially covered.

- Check if the screw connections between all system components of the welding system are tightened
- Check if all welding system coolant connections are leak-tight

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Once a week

- The device must be examined for externally detectable damage and functionality of the safety devices.
- Check the coolant level. If the coolant level is below the "min" mark, top up with coolant.
- Check the purity of the coolant. Replace coolant if necessary

NOTE!

Only use the coolant Cooling Liquid FCL10/20 when filling the cooling unit.
Other coolants are not suitable due to their electrical conductivity and insufficient material compatibility.

Every 2 months

- Clean air filter
- Clean the coolant return filter on the outside of the unit and replace the filter insert if necessary

---

Every 6 months

⚠ **CAUTION!**

Danger due to the effect of compressed air.
This can result in damage to property.
▶ Do not clean electronic components with compressed air from a short distance.

- Open the welding machine and purge 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
- Purge the cooler in the cooling unit
- Change coolant (in 3-shift operation with ethanol-based coolant)

Every 12 months

- Change the coolant (in 3-shift operation with FCL 10/20 coolant)

For details on the coolant, see from page 119 onwards.

Every 24 months

- Change the coolant (in 1-shift operation with FCL 10/20 coolant)

For details on the coolant, see from page 119 onwards.

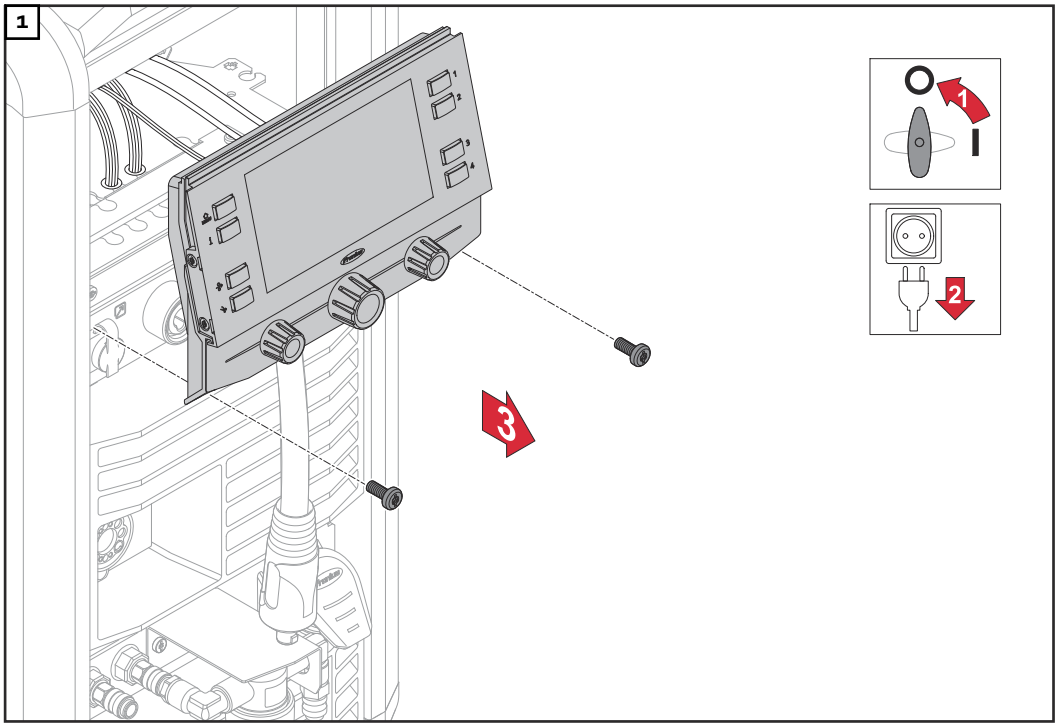
If necessary: changing the display protector

In the event of heavy soiling, the display protector can be changed as follows:

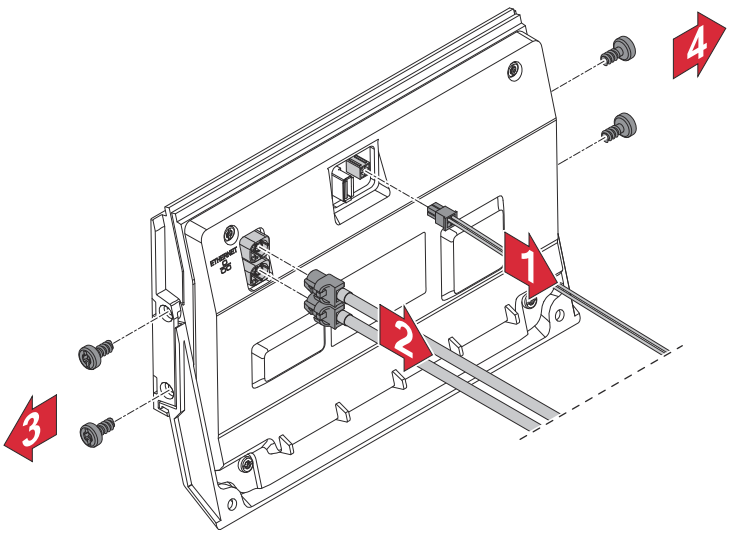
⚠ WARNING!

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

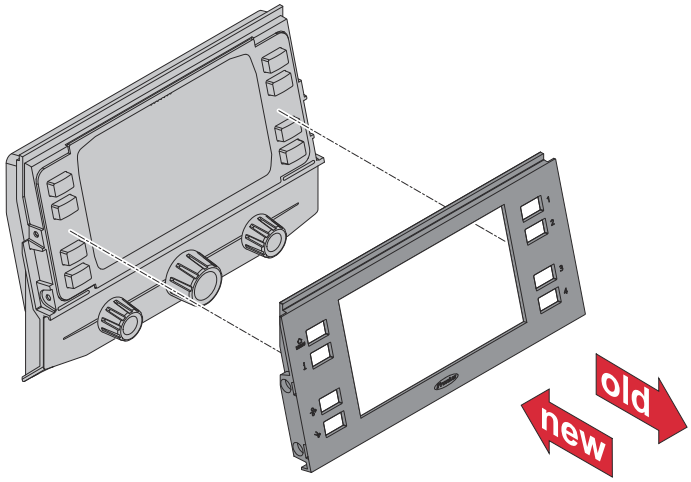
- ▶ Before starting any maintenance or servicing work, switch off all the devices and components involved and disconnect them from the grid.
- ▶ Secure all these devices and components so they cannot be switched back on.
- ▶ After opening the device, use a suitable measuring instrument to check that electrically charged components (such as capacitors) have been discharged.

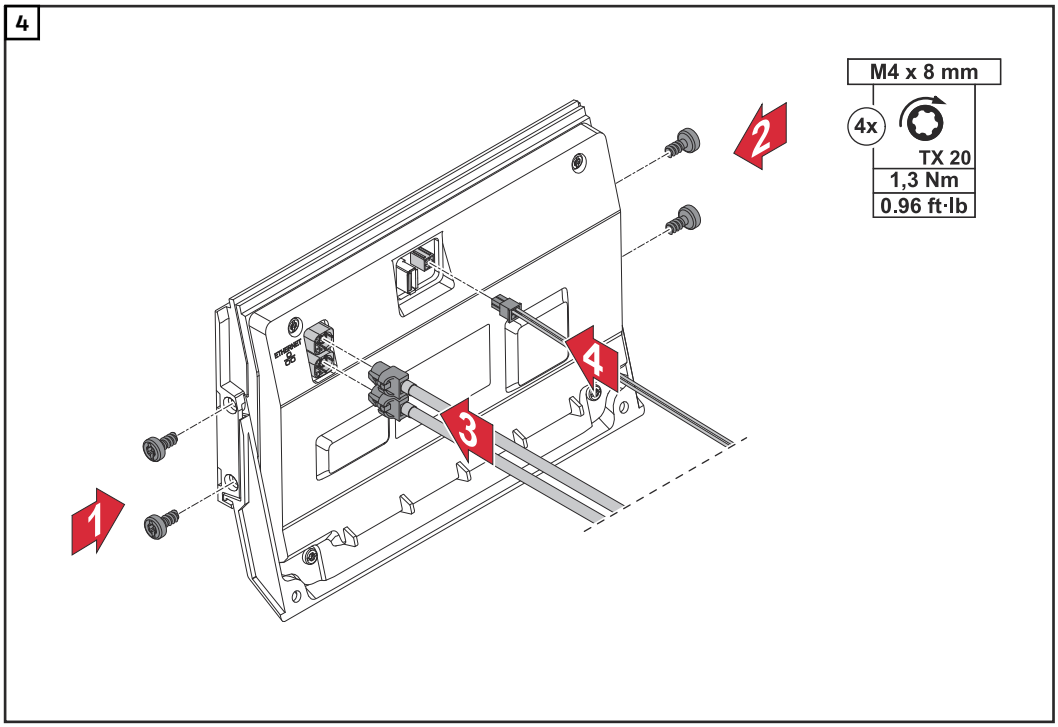


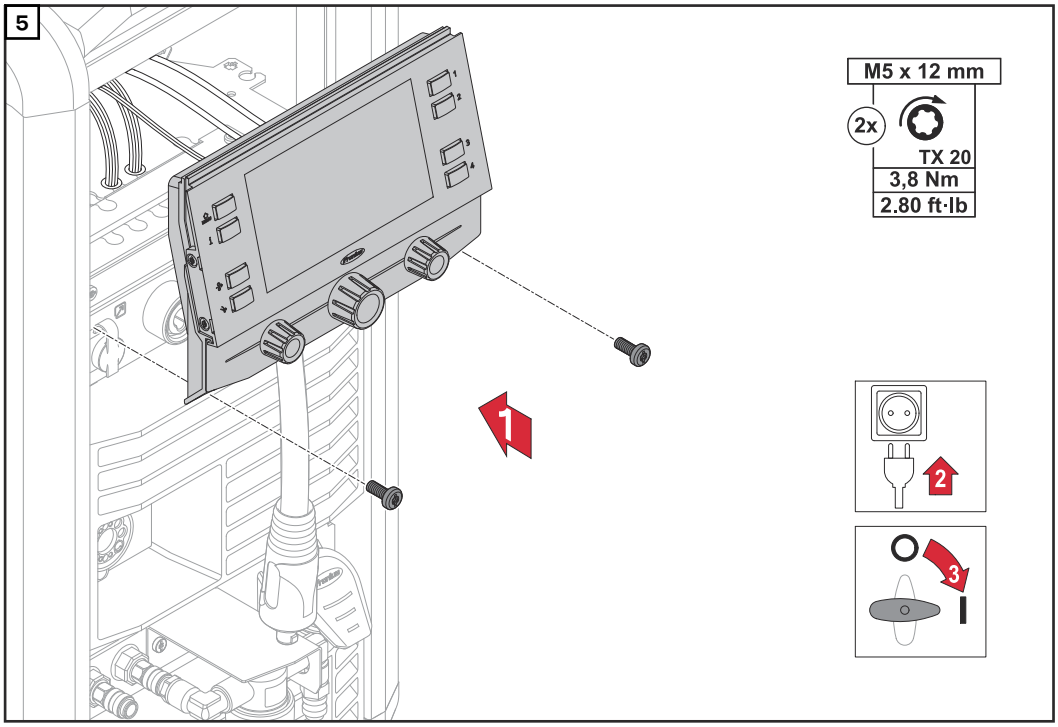
2



3



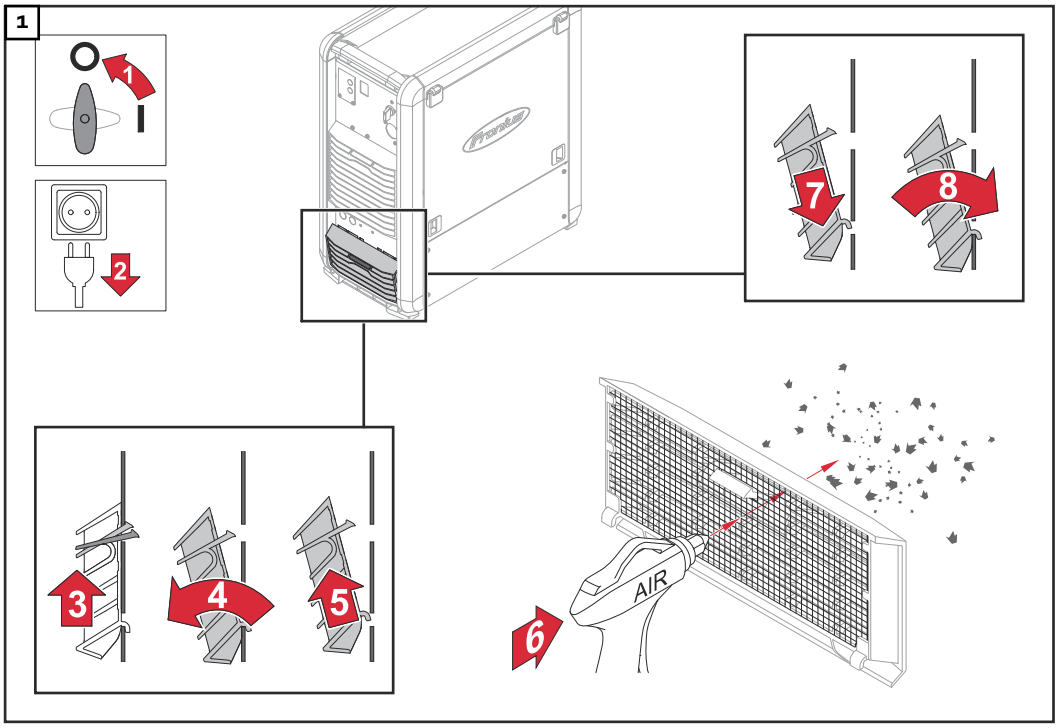




Cleaning the air filter

Cleaning the air filter is described using the example of the cooling unit air filter. The welding machine air filter is cleaned in the same way.

IMPORTANT! If there is a cooling unit in the welding system, always clean both air filters!



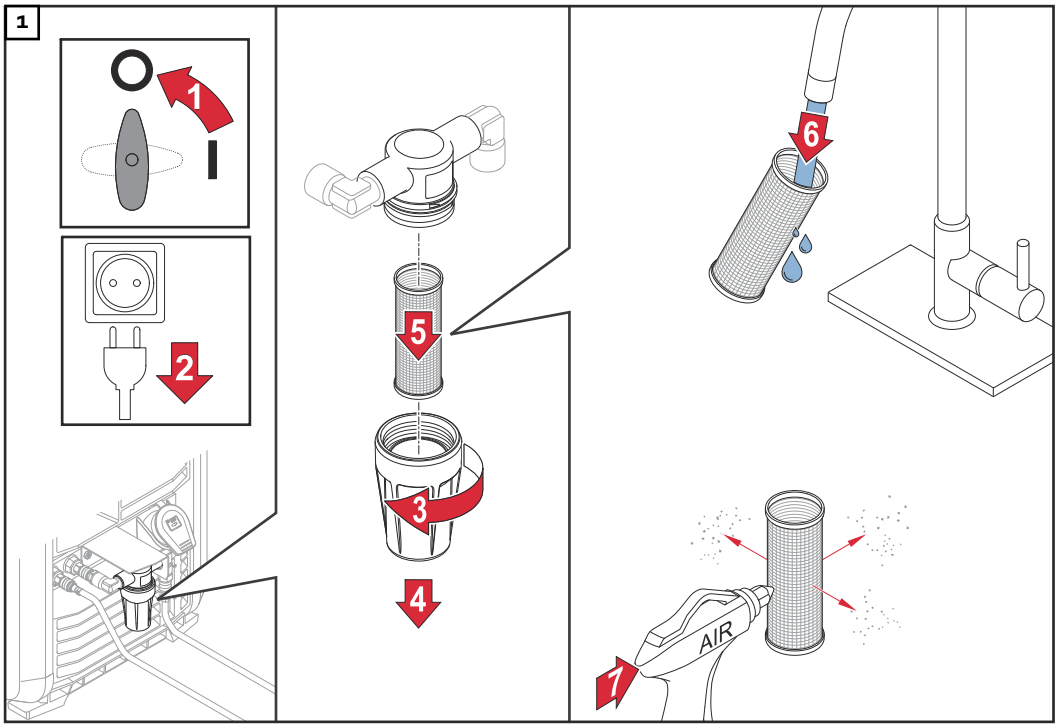
Cleaning the cooling unit filter

⚠ CAUTION!

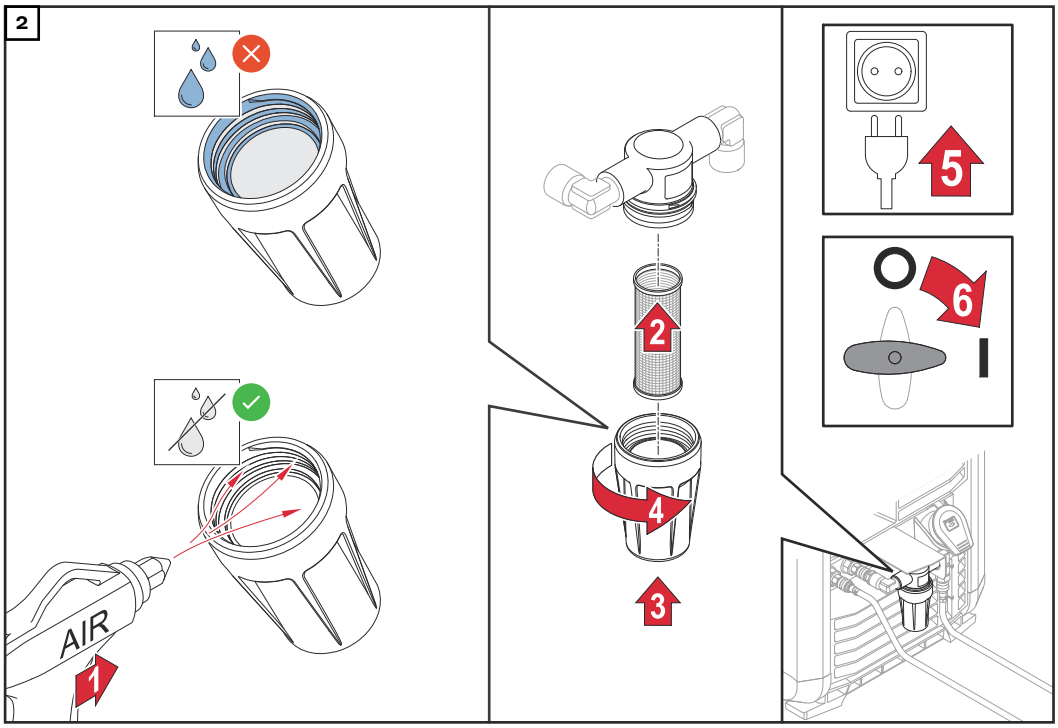
Danger from coolant escaping.
Personal injury and damage to property may result.
- ▶ If coolant ends up on the outside of the device, this should be removed immediately.
- ▶ Make sure that no coolant ends up inside the cooling unit.

⚠ CAUTION!

Danger due to hot coolant.
This can result in burns or scalding.
- ▶ Allow the coolant to cool down to +25 °C / +77 °F before commencing.
- ▶ Switch off the cooling unit before disconnecting coolant hoses.



IMPORTANT! If the filter insert can no longer be cleaned without tools, replace the filter insert.



3 Ensure that there is no coolant on the outside of the device

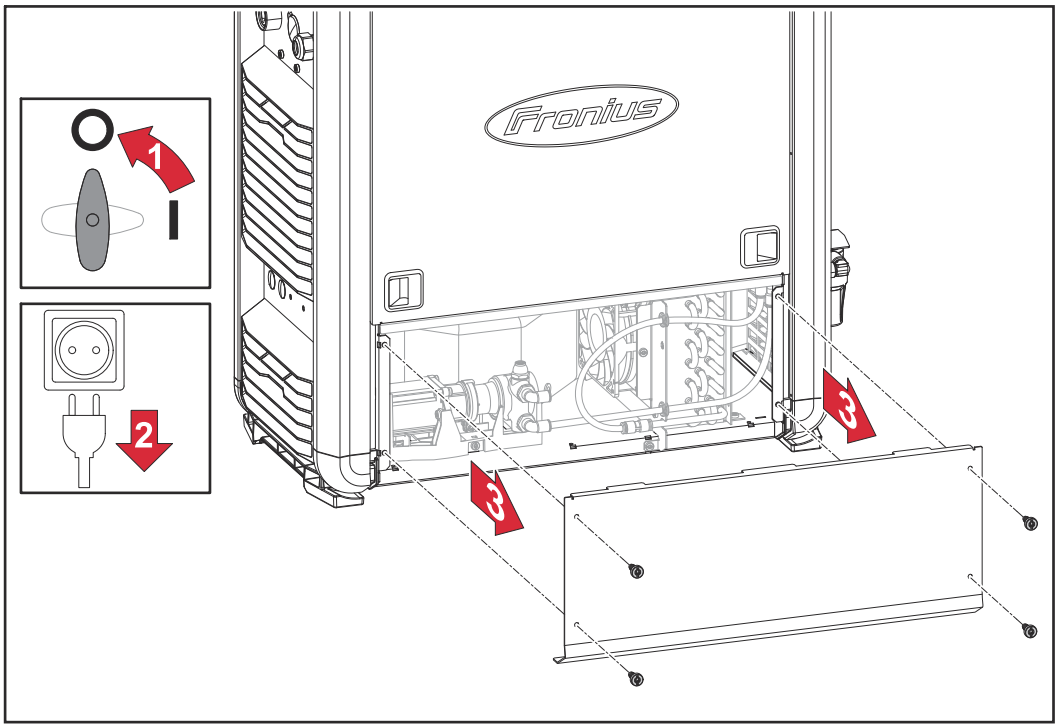
Gas purging of the cooling unit

⚠ CAUTION!

Danger from compressed air.
This may result in damage to electronic components.
▶ Do not bring the air nozzle too close to electronic components.

⚠ CAUTION!

Danger due to hot coolant.
This can result in burns or scalding.
▶ Allow the coolant to cool down to +25 °C / +77 °F before commencing.
▶ Switch off the cooling unit before disconnecting coolant hoses.

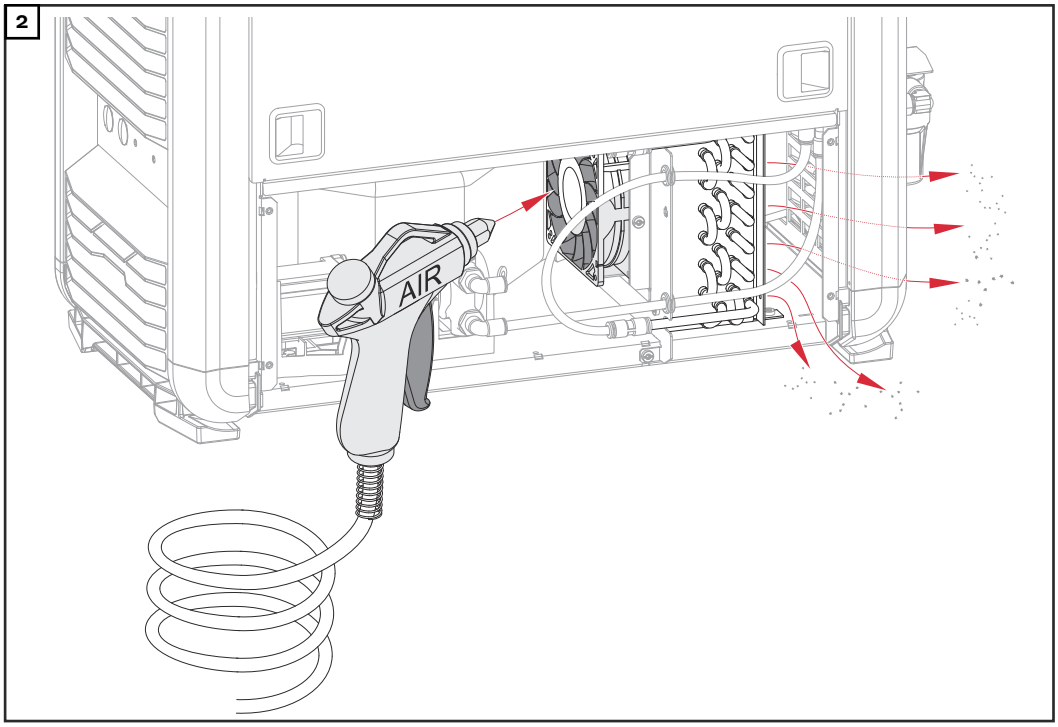


1

NOTE!

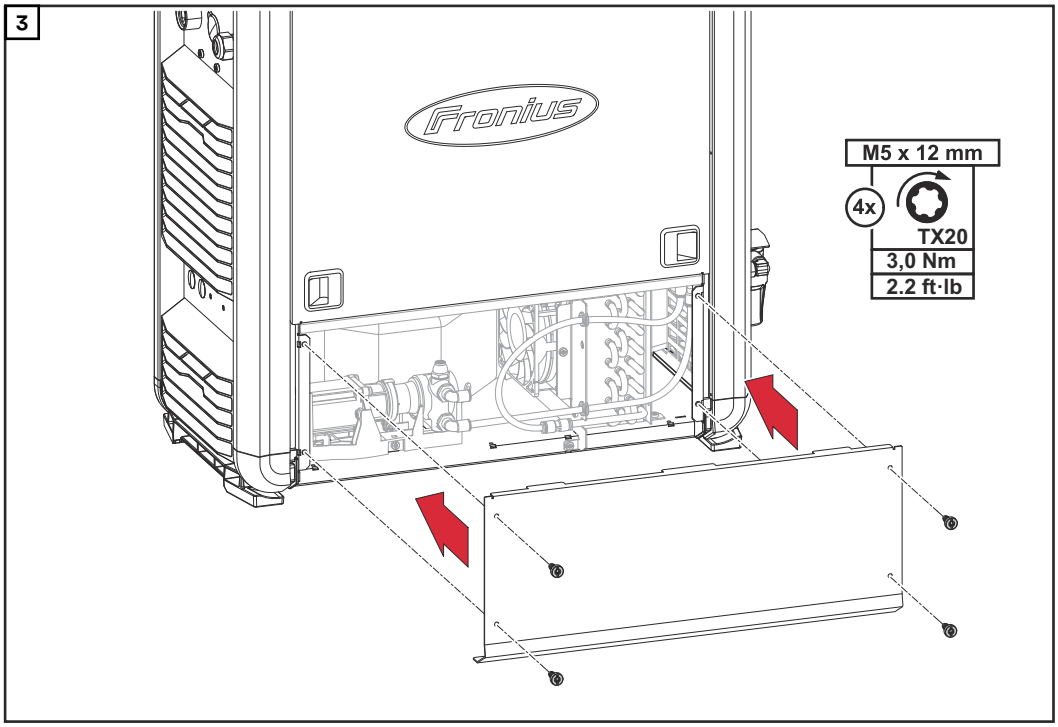
When gas purging the cooling unit, hold the fan impeller firmly to prevent damage to the fan.

2



Blow the cooling unit clean with dry, reduced compressed air.
If there is a lot of dust, also blow the inside of the device clean with dry, reduced compressed air

3



Updating the firmware

IMPORTANT! To update the firmware, you need a PC or laptop that is connected to the welding machine via an Ethernet network.

1 Get the latest firmware (e.g. from the Fronius DownloadCenter)
File format: Fortis_xxxxx.ffw

2 Establish an Ethernet connection between the PC/laptop and welding machine

3 Open the welding machine SmartManager (see page233)

4 Transfer the firmware to the welding machine (see page251)

Safety inspection

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

The manufacturer recommends calibrating welding machines within the same 12-month interval.

A safety inspection by a qualified electrician is recommended
- After alterations
- After repair, service, and maintenance

When performing 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 Fronius branch or your Fronius partner, who will provide the necessary documents upon request.

Disposal

Waste electrical and electronic equipment must be collected separately and recycled in an environmentally sound manner in accordance with the European Directive and national law. Used equipment must be returned to the distributor or through a local authorized collection and disposal system. Proper disposal of the used device promotes sustainable recycling of resources and prevents negative effects on health and the environment.

Packaging materials
- Collect separately
- Observe local regulations
- Crush cardboard boxes

Appendix

Average consumption values during welding

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

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 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

Technical data

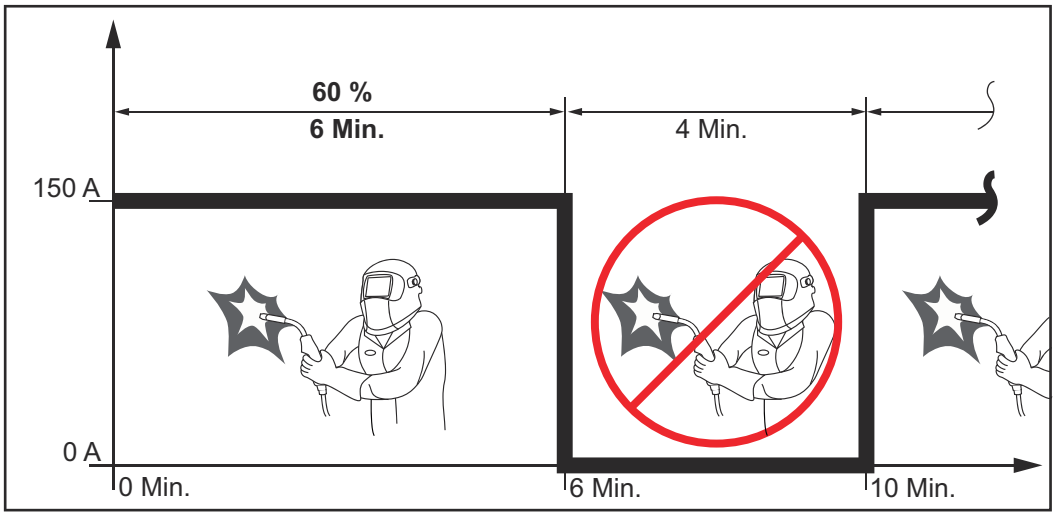
Explanation of the term duty cycle

The duty cycle (ED) is the period of a ten minute cycle in which the device may be operated at the stated power without overheating.

NOTE!

The ED values cited on the rating plate relate to an ambient temperature of 40 °C.
If the ambient temperature is higher, the ED or power must be lowered accordingly.

Example: Welding with 150 A at 60% ED
- 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% ED 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.

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:
https://www.fronius.com/welding-technology/downloads
Find downloads: critical

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

Environmental conditions

Temperature range of 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 of ambient air:

at 40 °C / 104 °F	max. 50%
at 20 °C / 68 °F	max. 90%

Fortis 270 C /G

Mains voltage (U_1)	3 x 400 V
Max. effective primary current (I_{1eff})	10.8 A
Max. primary current (I_{1max})	17.3 A
Mains fuse	16 A slow-blow
Mains voltage tolerance	-10 / +10%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 270 A
TIG	3 - 270 A
MMA	10 - 270 A
Welding current at 10 min / 40 °C (104 °F)	40% / 270 A 60% / 250 A 100% / 210 A
Output voltage range according to standard characteristic (U_2)	
MIG/MAG	14.2 - 27.5 V
TIG	10.1 - 20.8 V
MMA	20.4 - 30.8 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	104.1 V
Protection class	IP 23
EMC emission class	A [2)]
Dimensions l x w x h	681 / 368 / 555 mm 26.8 / 14.5 / 21.0 in.
Weight	37.0 kg / 81.57 lb.
Max. noise emission (LWA)	< 80 dB (A)
Max. shielding gas pressure	7 bar/101 psi
Wire speed	1 - 25 m/min / 40 - 980 ipm
Wire drive	4-roller drive
Wire diameter	0.6 - 1.6 mm/0.02 - 0.06 in.
Wire spool diameter	max. 300 mm / max. 11.8 in.
Wire spool weight	max. 20.0 kg / max. 44.1 lb.
Idle state power consumption at 400 V	23.5 W
Welding machine efficiency at 270 A / 30.8 V	88 %

The wire drive of the Fortis 270 C is integrated in the welding machine.

1) Interface to a 230/400-V and 50-Hz public grid
2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 270 C /G /nc

Mains voltage (U_1)	3 x 380 / 400 V
Max. effective primary current (I_{1eff})	10.6/10.8 A
Max. primary current (I_{1max})	16.8/17.3 A
Mains fuse	16 A slow-blow
Mains voltage tolerance	-10 / +10%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 270 A
TIG	3 - 270 A
MMA	10 - 270 A
Welding current at 10 min / 40 °C (104 °F)	40% / 270 A 60% / 250 A 100% / 210 A
Output voltage range according to standard characteristic (U_2)	
MIG/MAG	14.2 - 27.5 V
TIG	10.1 - 20.8 V
MMA	20.4 - 30.8 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	104.1 V
Protection class	IP 23
EMC emission class	A [2)]
Dimensions l x w x h	681 / 368 / 555 mm 26.8 / 14.5 / 21.0 in.
Weight	35.7 kg / 78.71 lb.
Max. noise emission (LWA)	< 80 dB (A)
Max. shielding gas pressure	7 bar/101 psi
Wire speed	1 - 25 m/min / 40 - 980 ipm
Wire drive	4-roller drive
Wire diameter	0.6 - 1.6 mm/0.02 - 0.06 in.
Wire spool diameter	max. 300 mm / max. 11.8 in.
Wire spool weight	max. 20.0 kg / max. 44.1 lb.
Idle state power consumption at 400 V	23.5 W
Welding machine efficiency at 270 A / 30.8 V	88 %

The wire drive of the Fortis 270 C /nc is integrated in the welding machine.

1) Interface to a 230/400-V and 50-Hz public grid
2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 270 C /G /XT/nc

Mains voltage (U_1)	3 x 200/230/380/400/460/600 V 1 x 230 V
Max. effective primary current (I_{1eff})	
3 x 200 V	18.0 A
3 x 230 V	15.6 A
3 x 380 V	9.4 A
3 x 400 V	8.9 A
3 x 460 V	7.8 A
3 x 600 V	8.0 A
1 x 230 V	36.1 A
Max. primary current (I_{1max})	
3 x 200 V	28.5 A
3 x 230 V	24.6 A
3 x 380 V	14.8 A
3 x 400 V	8.9 A
3 x 460 V	7.8 A
3 x 600 V	8.0 A
1 x 230 V	30.1 A
Mains fuse	
3 x 200 / 230 / 380 V	35 A slow-blow
3 x 400 / 460 / 600 V	16 A slow-blow
1 x 230 V	35 A slow-blow
Mains voltage tolerance	-10 / +6%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 270 A
TIG	3 - 270 A
MMA	10 - 270 A
Welding current at 10 min / 40 °C (104 °F)	
U_1 = 3 x 200 - 600 V	40% / 270 A 60% / 250 A 100% / 210 A
U_1 = 1 x 230 V	40% / 240 A 60% / 230 A 100% / 210 A

Output voltage range according to standard characteristic (U_2)	
MIG/MAG	14.2 - 27.5 V
TIG	10.1 - 20.8 V
MMA	20.4 - 30.8 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	70.5 V
Protection class	IP 23
EMC emission class	A [2)]
Dimensions l x w x h	681 / 368 / 555 mm 26.8 / 14.5 / 21.0 in.
Weight	37.4 kg / 82.45 lb.
Max. noise emission (LWA)	< 80 dB (A)
Max. shielding gas pressure	7 bar/101 psi
Wire speed	1 - 25 m/min / 40 - 980 ipm
Wire drive	4-roller drive
Wire diameter	0.6 - 1.6 mm/0.02 - 0.06 in.
Wire spool diameter	max. 300 mm / max. 11.8 in.
Wire spool weight	max. 20.0 kg / max. 44.1 lb.
Idle state power consumption at 400 V	25.2 W
Welding machine efficiency at 270 A / 30.8 V	87 %

The wire drive of the Fortis 270 C /XT/nc is integrated in the welding machine.

1) Interface to a 230/400-V and 50-Hz public grid
2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
   The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 320 C /G

Mains voltage (U_1)	3 x 400 V
Max. effective primary current (I_{1eff})	12.7 A
Max. primary current (I_{1max})	20.0 A
Mains fuse	16 A slow-blow
Mains voltage tolerance	-10 / +10%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 320 A
TIG	3 - 320 A
MMA	10 - 320 A
Welding current at 10 min / 40 °C (104 °F)	40% / 320 A 60% / 260 A 100% / 240 A
Output voltage range according to standard characteristic (U_2)	
MIG/MAG	14.2 - 30.0 V
TIG	10.1 - 22.8 V
MMA	20.4 - 32.8 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	64.4 V 93.0 V on Multiprocess devices
Protection class	IP 23
EMC emission class	A [2)]
Dimensions l x w x h	681 / 368 / 555 mm 26.8 / 14.5 / 21.0 in.
Weight	38.0 kg / 83.78 lb.
Max. noise emission (LWA)	< 80 dB (A)
Max. shielding gas pressure	7 bar/101 psi
Wire speed	1 - 25 m/min / 40 - 980 ipm
Wire drive	4-roller drive
Wire diameter	0.6 - 1.6 mm/0.02 - 0.06 in.
Wire spool diameter	max. 300 mm / max. 11.8 in.
Wire spool weight	max. 20.0 kg / max. 44.1 lb.
Idle state power consumption at 400 V	27.3 W
Welding machine efficiency at 320 A / 32.8 V	89 %

The wire drive of the Fortis 320 C is integrated in the welding machine.

1) Interface to a 230/400-V and 50-Hz public grid
2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 320 C /G /nc

Mains voltage (U_1)	3 x 380 / 400 V
Max. effective primary current (I_{1eff})	13.1/12.7 A
Max. primary current (I_{1max})	20.7/20.0 A
Mains fuse	16 A slow-blow
Mains voltage tolerance	-10 / +10%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 320 A
TIG	3 - 320 A
MMA	10 - 320 A
Welding current at 10 min / 40 °C (104 °F)	40% / 320 A 60% / 260 A 100% / 240 A
Output voltage range according to standard characteristic (U_2)	
MIG/MAG	14.2 - 30.0 V
TIG	10.1 - 22.8 V
MMA	20.4 - 32.8 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	64.4 V 93.0 V on Multiprocess devices
Protection class	IP 23
EMC emission class	A [2)]
Dimensions l x w x h	681 / 368 / 555 mm 26.8 / 14.5 / 21.0 in.
Weight	36.7 kg / 80.91 lb.
Max. noise emission (LWA)	< 80 dB (A)
Max. shielding gas pressure	7 bar/101 psi
Wire speed	1 - 25 m/min / 40 - 980 ipm
Wire drive	4-roller drive
Wire diameter	0.6 - 1.6 mm/0.02 - 0.06 in.
Wire spool diameter	max. 300 mm / max. 11.8 in.
Wire spool weight	max. 20.0 kg / max. 44.1 lb.
Idle state power consumption at 400 V	27.3 W
Welding machine efficiency at 320 A / 32.8 V	89 %

The wire drive of the Fortis 320 C /nc is integrated in the welding machine.

1) Interface to a 230/400-V and 50-Hz public grid
2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 320 C /G /XT/nc

Mains voltage (U_1)	3 x 200/230/380/400/460/600 V 1 x 230 V
Max. effective primary current (I_{1eff})	
3 x 200 V	22.7 A
3 x 230 V	19.6 A
3 x 380 V	11.0 A
3 x 400 V	11.2 A
3 x 460 V	9.8 A
3 x 600 V	9.7 A
1 x 230 V	32.6 A
Max. primary current (I_{1max})	
3 x 200 V	35.9 A
3 x 230 V	31.0 A
3 x 380 V	18.5 A
3 x 400 V	11.2 A
3 x 460 V	9.8 A
3 x 600 V	9.7 A
1 x 230 V	43.1 A
Mains fuse	
3 x 200 / 230 / 380 V	35 A slow-blow
3 x 400 / 460 / 600 V	16 A slow-blow
1 x 230 V	35 A slow-blow
Mains voltage tolerance	-10 / +6%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 320 A
TIG	3 - 320 A
MMA	10 - 320 A
Welding current at 10 min / 40 °C (104 °F)	
U_1 = 3 x 200 - 600 V	40% / 320 A 60% / 260 A 100% / 240 A
U_1 = 1 x 230 V	40% / 270 A 60% / 250 A 100% / 210 A

Output voltage range according to standard characteristic (U_2)	
MIG/MAG	14.2 - 30.0 V
TIG	10.4 - 22.8 V
MMA	20.1 - 32.8 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	79.8 V
Protection class	IP 23
EMC emission class	A [2]
Dimensions l x w x h	681 / 368 / 555 mm 26.8 / 14.5 / 21.0 in.
Weight	38.5 kg / 84.88 lb.
Max. noise emission (LWA)	< 80 dB (A)
Max. shielding gas pressure	7 bar/101 psi
Wire speed	1 - 25 m/min / 40 - 980 ipm
Wire drive	4-roller drive
Wire diameter	0.6 - 1.6 mm/0.02 - 0.06 in.
Wire spool diameter	max. 300 mm / max. 11.8 in.
Wire spool weight	max. 20.0 kg / max. 44.1 lb.
Idle state power consumption at 400 V	29.4 W
Welding machine efficiency at 320 A / 32.8 V	89 %

The wire drive of the Fortis 320 C /XT/nc is integrated in the welding machine.

1) Interface to a 230/400-V and 50-Hz public grid
2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
   The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 320 C /GW

Mains voltage (U_1)	3 x 400 V
Max. effective primary current (I_{1eff})	12.7 A
Max. primary current (I_{1max})	20.0 A
Mains fuse	16 A slow-blow
Mains voltage tolerance	-10 / +10%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 320 A
TIG	3 - 320 A
MMA	10 - 320 A
Welding current at 10 min / 40 °C (104 °F)	40% / 320 A 60% / 260 A 100% / 240 A
Output voltage range according to standard characteristic (U_2)	
MIG/MAG	14.2 - 30.0 V
TIG	10.1 - 22.8 V
MMA	20.4 - 32.8 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	64.4 V 93.0 V on Multiprocess devices
Protection class	IP 23
EMC emission class	A [2)]
Dimensions l x w x h	681 / 368 / 763 mm 26.8 / 14.5 / 30.0 in.
Weight with toolbox option with cooling unit option	42.3 kg / 93.26 lb. 46.2 kg / 101.85 lb. 48.3 kg / 106.45 lb.
Max. noise emission (LWA)	< 80 dB (A)
Max. shielding gas pressure	7 bar/101 psi
Wire speed	1 - 25 m/min / 40 - 980 ipm
Wire drive	4-roller drive
Wire diameter	0.6 - 1.6 mm/0.02 - 0.06 in.
Wire spool diameter	max. 300 mm / max. 11.8 in.
Wire spool weight	max. 20.0 kg / max. 44.1 lb.
Idle state power consumption at 400 V	27.3 W

Welding machine efficiency at 320 A / 32.8 V	89 %

The wire drive of the Fortis 320 C /GW is integrated in the welding machine.

1) Interface to a 230/400-V and 50-Hz public grid
2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
   The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 320 C /GW /nc

Mains voltage (U_1)	3 x 380 / 400 V
Max. effective primary current (I_{1eff})	13.1/12.7 A
Max. primary current (I_{1max})	20.7/20.0 A
Mains fuse	16 A slow-blow
Mains voltage tolerance	-10 / +10%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 320 A
TIG	3 - 320 A
MMA	10 - 320 A
Welding current at 10 min / 40 °C (104 °F)	40% / 320 A 60% / 260 A 100% / 240 A
Output voltage range according to standard characteristic (U_2)	
MIG/MAG	14.2 - 30.0 V
TIG	10.1 - 22.8 V
MMA	20.4 - 32.8 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	64.4 V 93.0 V on Multiprocess devices
Protection class	IP 23
EMC emission class	A [2)]
Dimensions l x w x h	681 / 368 / 763 mm 26.8 / 14.5 / 30.0 in.
Weight with toolbox option with cooling unit option	41.0 kg / 9.39 lb. 44.9 kg / 98.99 lb. 47.0 kg / 103.62 lb.
Max. noise emission (LWA)	< 80 dB (A)
Max. shielding gas pressure	7 bar/101 psi
Wire speed	1 - 25 m/min / 40 - 980 ipm
Wire drive	4-roller drive
Wire diameter	0.6 - 1.6 mm/0.02 - 0.06 in.
Wire spool diameter	max. 300 mm / max. 11.8 in.
Wire spool weight	max. 20.0 kg / max. 44.1 lb.
Idle state power consumption at 400 V	27.3 W

Welding machine efficiency at 320 A / 32.8 V	89 %

The wire drive of the Fortis 320 C /GW/nc is integrated in the welding machine.

1) Interface to a 230/400-V and 50-Hz public grid
2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
   The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 320 C /GW/XT/nc

Mains voltage (U_1)	3 x 200/230/380/400/460/600 V 1 x 230 V
Max. effective primary current (I_{1eff})	
3 x 200 V	22.7 A
3 x 230 V	19.6 A
3 x 380 V	11.0 A
3 x 400 V	11.2 A
3 x 460 V	9.8 A
3 x 600 V	9.7 A
1 x 230 V	32.6 A
Max. primary current (I_{1max})	
3 x 200 V	35.9 A
3 x 230 V	31.0 A
3 x 380 V	18.5 A
3 x 400 V	17.7 A
3 x 460 V	15.4 A
3 x 600 V	15.3 A
1 x 230 V	43.1 A
Mains fuse	
3 x 200 / 230 / 380 V	35 A slow-blow
3 x 400 / 460 / 600 V	16 A slow-blow
1 x 230 V	35 A slow-blow
Mains voltage tolerance	-10 / +6%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 320 A
TIG	3 - 320 A
MMA	10 - 320 A
Welding current at 10 min / 40 °C (104 °F)	
U_1 = 1 x 230 V	40% / 270 A 60% / 250 A 100% / 210 A
U_1 = 3 x 200 - 600 V	40% / 320 A 60% / 260 A 100% / 240 A

Output voltage range according to standard characteristic (U_2)	
MIG/MAG	14.2 - 30.0 V
TIG	10.4 - 22.8 V
MMA	20.1 - 32.8 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	79.8 V
Protection class	IP 23
EMC emission class	A [2]
Dimensions l x w x h	681 / 368 / 763 mm 26.8 / 14.5 / 30.0 in.
Weight with toolbox option with cooling unit option	42.7 kg / 94.14 lb. 46.6 kg / 102.74 lb. 48.7 kg / 107.37 lb.
Max. noise emission (LWA)	< 80 dB (A)
Max. shielding gas pressure	7 bar/101 psi
Wire speed	1 - 25 m/min / 40 - 980 ipm
Wire drive	4-roller drive
Wire diameter	0.6 - 1.6 mm/0.02 - 0.06 in.
Wire spool diameter	max. 300 mm / max. 11.8 in.
Wire spool weight	max. 20.0 kg / max. 44.1 lb.
Idle state power consumption at 400 V	29.4 W
Welding machine efficiency at 320 A / 32.8 V	89 %

The wire drive of the Fortis 320 C GW/XT/nc is integrated in the welding machine.

1) Interface to a 230/400-V and 50-Hz public grid
2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
   The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 400 C /GW

Mains voltage (U_1)	3 x 400 V
Max. effective primary current (I_{1eff})	21.8 A
Max. primary current (I_{1max})	28.1 A
Mains fuse	35 A slow-blow
Mains voltage tolerance	-10 / +10%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 400 A
TIG	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)	
MIG/MAG	14.2 - 34.0 V
TIG	10.1 - 26.0 V
MMA	20.4 - 36.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	64.4 V 93.0 V on Multiprocess devices
Protection class	IP 23
EMC emission class	A [2)]
Dimensions l x w x h	681 / 368 / 763 mm 26.8 / 14.5 / 30.0 in.
Weight with toolbox option with cooling unit option	42.0 kg / 92.59 lb. 45.9 kg / 101.192 lb. 48.0 kg / 105.82 lb.
Max. noise emission (LWA)	< 80 dB (A)
Max. shielding gas pressure	7 bar/101 psi
Wire speed	1 - 25 m/min / 40 - 980 ipm
Wire drive	4-roller drive
Wire diameter	0.6 - 1.6 mm/0.02 - 0.06 in.
Wire spool diameter	max. 300 mm / max. 11.8 in.
Wire spool weight	max. 20.0 kg / max. 44.1 lb.
Idle state power consumption at 400 V	26.9 W

Welding machine efficiency at 400 A / 36 V	89%

The wire drive of the Fortis 400 C /GW is integrated in the welding machine.

1) Interface to a 230/400-V and 50-Hz public grid
2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
   The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 400 C /GW /nc

Mains voltage (U_1)	3 x 380 / 400 V
Max. effective primary current (I_{1eff})	22.7/21.8 A
Max. primary current (I_{1max})	28.9/28.1 A
Mains fuse	35 A slow-blow
Mains voltage tolerance	-10 / +10%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 400 A
TIG	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)	
MIG/MAG	14.2 - 34.0 V
TIG	10.1 - 26.0 V
MMA	20.4 - 36.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	64.4 V 93.0 V on Multiprocess devices
Protection class	IP 23
EMC emission class	A [2)]
Dimensions l x w x h	681 / 368 / 763 mm 26.8 / 14.5 / 30.0 in.
Weight with toolbox option with cooling unit option	40.1 kg / 88.41 lb. 44.0 kg / 97.00 lb. 46.1 kg / 101.63 lb.
Max. noise emission (LWA)	< 80 dB (A)
Max. shielding gas pressure	7 bar/101 psi
Wire speed	1 - 25 m/min / 40 - 980 ipm
Wire drive	4-roller drive
Wire diameter	0.6 - 1.6 mm/0.02 - 0.06 in.
Wire spool diameter	max. 300 mm / max. 11.8 in.
Wire spool weight	max. 20.0 kg / max. 44.1 lb.
Idle state power consumption at 400 V	26.9 W

Welding machine efficiency at 400 A / 36 V	89%

The wire drive of the Fortis 400 C /GW/nc is integrated in the welding machine.

1) Interface to a 230/400-V and 50-Hz public grid
2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
   The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 400 C /GW /XT /nc

Mains voltage (U_1)	3 x 200/230/380/400/460/600 V 1 x 230 V
Max. effective primary current (I_{1eff})	
3 x 200 V	35.8 A
3 x 230 V	31.0 A
3 x 380 V	18.6 A
3 x 400 V	17.7 A
3 x 460 V	15.5 A
3 x 600 V	15.2 A
1 x 230 V	36.3 A
Max. primary current (I_{1max})	
3 x 200 V	49.0 A
3 x 230 V	42.4 A
3 x 380 V	25.5 A
3 x 400 V	24.2 A
3 x 460 V	21.1 A
3 x 600 V	19.5 A
1 x 230 V	53.7 A
Mains fuse	
3 x 200 / 230 / 380 V	63 A slow-blow
3 x 400 / 460 / 600 V	35 A slow-blow
1 x 208 / 240 V	50 A slow-blow
Mains voltage tolerance	-10 / +6%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 400 A
TIG	3 - 400 A
MMA	10 - 400 A
Welding current at 10 min / 40 °C (104 °F)	
U_1 = 1 x 230 V	40% / 320 A 60% / 280 A 100% / 240 A
U_1 = 3 x 200 - 600 V	40% / 400 A 60% / 360 A 100% / 320 A

Output voltage range according to standard characteristic (U_2)	
MIG/MAG	14.2 - 34.0 V
TIG	10.1 - 26.0 V
MMA	20.4 - 36.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	79.8 V
Protection class	IP 23
EMC emission class	A [2]
Dimensions l x w x h	681 / 368 / 763 mm 26.8 / 14.5 / 30.0 in.
Weight with toolbox option with cooling unit option	43.6 kg / 96.12 lb. 47.5 kg / 104.72 lb. 49.6 kg / 109.35 lb.
Max. noise emission (LWA)	< 80 dB (A)
Max. shielding gas pressure	7 bar/101 psi
Wire speed	1 - 25 m/min / 40 - 980 ipm
Wire drive	4-roller drive
Wire diameter	0.6 - 1.6 mm/0.02 - 0.06 in.
Wire spool diameter	max. 300 mm / max. 11.8 in.
Wire spool weight	max. 20.0 kg / max. 44.1 lb.
Idle state power consumption at 400 V	30,5 W
Welding machine efficiency at 400 A / 36 V	89 %

The wire drive of the Fortis 400 C /GW/XT/nc is integrated in the welding machine.

1) Interface to a 230/400-V and 50-Hz public grid
2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
   The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 400 C /GW / 600V /nc

Mains voltage (U_1)	3 x 600 V
Max. effective primary current (I_{1eff})	16.7 A
Max. primary current (I_{1max})	22.0 A
Mains fuse	35 A slow-blow
Mains voltage tolerance	-10 / +6%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 400 A
TIG	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)	
MIG/MAG	14.2 - 34.0 V
TIG	10.1 - 26.0 V
MMA	20.4 - 36.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	77.6 V
Protection class	IP 23
EMC emission class	A [1)]
Dimensions l x w x h	681 / 368 / 763 mm 26.8 / 14.5 / 30.0 in.
Weight with toolbox option with cooling unit option	41.3 kg / 91.05 lb. 45.2 kg / 99.65 lb. 47.3 kg / 104.28 lb.
Max. noise emission (LWA)	< 80 dB (A)
Max. shielding gas pressure	7 bar/101 psi
Wire speed	1 - 25 m/min / 40 - 980 ipm
Wire drive	4-roller drive
Wire diameter	0.6 - 1.6 mm/0.02 - 0.06 in.
Wire spool diameter	max. 300 mm / max. 11.8 in.
Wire spool weight	max. 20.0 kg / max. 44.1 lb.

The wire drive of the Fortis 400 C /GW/600/nc is integrated in the welding machine.

1) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.

The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 500 C /GW

Mains voltage (U_1)	3 x 400 V
Max. effective primary current (I_{1eff})	25.0 A
Max. primary current (I_{1max})	36.7 A
Mains fuse	35 A slow-blow
Mains voltage tolerance	-10 / +10%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 500 A
TIG	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)	
MIG/MAG	14.2 - 39.0 V
TIG	10.1 - 30.0 V
MMA	20.4 - 40.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	64.4 V 93.0 V on Multiprocess devices
Protection class	IP 23
EMC emission class	A [2)]
Dimensions l x w x h	681 / 368 / 763 mm 26.8 / 14.5 / 30.0 in.
Weight with toolbox option with cooling unit option	42.7 kg / 94.14 lb. 46.6 kg / 102.74 lb. 48.7 kg / 107.37 lb.
Max. noise emission (LWA)	< 80 dB (A)
Max. shielding gas pressure	7 bar/101 psi
Wire speed	1 - 25 m/min / 40 - 980 ipm
Wire drive	4-roller drive
Wire diameter	0.6 - 1.6 mm/0.02 - 0.06 in.
Wire spool diameter	max. 300 mm / max. 11.8 in.
Wire spool weight	max. 200 kg / max. 44.1 lb.
Idle state power consumption at 400 V	27.8 W

Welding machine efficiency at 500 A / 40 V	89%

The wire drive of the Fortis 500 C /GW is integrated in the welding machine.

1) Interface to a 230/400-V and 50-Hz public grid
2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
   The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 500 C /GW /nc

Mains voltage (U_1)	3 x 380 / 400 V
Max. effective primary current (I_{1eff})	25.6/25.0 A
Max. primary current (I_{1max})	38.1/36.7 A
Mains fuse	35 A slow-blow
Mains voltage tolerance	-10 / +10%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 500 A
TIG	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)	
MIG/MAG	14.2 - 39.0 V
TIG	10.1 - 30.0 V
MMA	20.4 - 40.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	64.4 V 93.0 V on Multiprocess devices
Protection class	IP 23
EMC emission class	A [2)]
Dimensions l x w x h	681 / 368 / 763 mm 26.8 / 14.5 / 30.0 in.
Weight with toolbox option with cooling unit option	40.2 kg / 88.63 lb. 50.5 kg / 11.33 lb. 46.2 kg / 101.85 lb.
Max. noise emission (LWA)	< 80 dB (A)
Max. shielding gas pressure	7 bar/101 psi
Wire speed	1 - 25 m/min / 40 - 980 ipm
Wire drive	4-roller drive
Wire diameter	0.6 - 1.6 mm/0.02 - 0.06 in.
Wire spool diameter	max. 300 mm / max. 11.8 in.
Wire spool weight	max. 200 kg / max. 44.1 lb.
Idle state power consumption at 400 V	27.8 W

Welding machine efficiency at 500 A / 40 V	89%

The wire drive of the Fortis 500 C /GW/nc is integrated in the welding machine.

1) Interface to a 230/400-V and 50-Hz public grid
2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
   The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 500 C /GW /XT /nc

Mains voltage (U_1)	3 x 200/230/380/400/460/600 V 1 x 230 V
Max. effective primary current (I_{1eff})	
3 x 200 V	43.2 A
3 x 230 V	37.4 A
3 x 380 V	22.3 A
3 x 400 V	21.2 A
3 x 460 V	18.5 A
3 x 600 V	17.8 A
1 x 230 V	36.5 A
Max. primary current (I_{1max})	
3 x 200 V	68.3 A
3 x 230 V	59.2 A
3 x 380 V	35.3 A
3 x 400 V	33.5 A
3 x 460 V	29.2 A
3 x 600 V	23.7 A
1 x 230 V	53.6 A
Mains fuse	
3 x 200 / 230 / 380 V	63 A slow-blow
3 x 400 / 460 / 600 V	35 A slow-blow
1 x 230 V	50 A slow-blow
Mains voltage tolerance	-10 / +6%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 500 A
TIG	3 - 500 A
MMA	10 - 500 A
Welding current at 10 min / 40 °C (104 °F)	
U_1 = 1 x 230 V	40% / 320 A 60% / 290 A 100% / 260 A
U_1 = 3 x 200 - 600 V	40% / 500 A 60% / 430 A 100% / 360 A

Output voltage range according to standard characteristic (U_2)	
MIG/MAG	14.2 - 39.0 V
TIG	10.1 - 30.0 V
MMA	20.4 - 40.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	79.8 V
Protection class	IP 23
EMC emission class	A [2]
Dimensions l x w x h	681 / 368 / 763 mm 26.8 / 14.5 / 30.0 in.
Weight with toolbox option with cooling unit option	43.7 kg / 96.34 lb. 47.6 kg / 104.94 lb. 49.7 kg / 109.57 lb.
Max. noise emission (LWA)	< 80 dB (A)
Max. shielding gas pressure	7 bar/101 psi
Wire speed	1 - 25 m/min / 40 - 980 ipm
Wire drive	4-roller drive
Wire diameter	0.6 - 1.6 mm/0.02 - 0.06 in.
Wire spool diameter	max. 300 mm / max. 11.8 in.
Wire spool weight	max. 20.0 kg / max. 44.1 lb.
Idle state power consumption at 400 V	30.2 W
Welding machine efficiency at 500 A / 40 V	89%

The wire drive of the Fortis 500 C /GW/XT/nc is integrated in the welding machine.

1) Interface to a 230/400-V and 50-Hz public grid
2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
   The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 500 C /GW / 600V /nc

Mains voltage (U_1)	3 x 600 V
Max. effective primary current (I_{1eff})	19.2 A
Max. primary current (I_{1max})	29.1 A
Mains fuse	35 A slow-blow
Mains voltage tolerance	-10 / +6%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 500 A
TIG	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)	
MIG/MAG	14.2 - 39.0 V
TIG	10.1 - 30.0 V
MMA	20.4 - 40.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	77.6 V
Protection class	IP 23
EMC emission class	A [1)]
Dimensions l x w x h	681 / 368 / 763 mm 26.8 / 14.5 / 30.0 in.
Weight with toolbox option with cooling unit option	41.3 kg / 91.05 lb. 45.2 kg / 99.65 lb. 47.3 kg / 104.28 lb.
Max. noise emission (LWA)	< 80 dB (A)
Max. shielding gas pressure	7 bar/101 psi
Wire speed	1 - 25 m/min / 40 - 980 ipm
Wire drive	4-roller drive
Wire diameter	0.6 - 1.6 mm/0.02 - 0.06 in.
Wire spool diameter	max. 300 mm / max. 11.8 in.
Wire spool weight	max. 20.0 kg / max. 44.1 lb.

The wire drive of the Fortis 500 C /GW/600/nc is integrated in the welding machine.

1) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.

The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 320 /GW

Mains voltage (U_1)	3 x 400 V
Max. effective primary current (I_{1eff})	12.7 A
Max. primary current (I_{1max})	20.0 A
Mains fuse	16 A slow-blow
Mains voltage tolerance	-10 / +10%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 320 A
TIG	3 - 320 A
MMA	10 - 320 A
Welding current at 10 min / 40 °C (104 °F)	40% / 320 A 60% / 260 A 100% / 240 A
Output voltage range according to standard characteristic (U_2)	
MIG/MAG	14.2 - 30.0 V
TIG	10.1 - 22.8 V
MMA	20.4 - 32.8 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	64.4 V
Protection class	IP 23
EMC emission class	A [2)]
Dimensions l x w x h	681 / 368 / 763 mm 26.8 / 14.5 / 30.0 in.
Weight with toolbox option with cooling unit option	39.7 kg / 87.52 lb. 43.6 kg / 96.12 lb. 45.7 kg / 100.75 lb.
Max. noise emission (LWA)	< 80 dB (A)
Idle state power consumption at 400 V	27.3 W
Welding machine efficiency at 320 A / 32,8 V	89%

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

2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 320 /GW /nc

Mains voltage (U_1)	3 x 380 / 400 V
Max. effective primary current (I_{1eff})	13.1/12.7 A
Max. primary current (I_{1max})	20.7/20.0 A
Mains fuse	16 A slow-blow
Mains voltage tolerance	-10 / +10%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 320 A
TIG	3 - 320 A
MMA	10 - 320 A
Welding current at 10 min / 40 °C (104 °F)	40% / 320 A 60% / 260 A 100% / 240 A
Output voltage range according to standard characteristic (U_2)	
MIG/MAG	14.2 - 30.0 V
TIG	10.1 - 22.8 V
MMA	20.4 - 32.8 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	64.4 V
Protection class	IP 23
EMC emission class	A [2)]
Dimensions l x w x h	681 / 368 / 763 mm 26.8 / 14.5 / 30.0 in.
Weight with toolbox option with cooling unit option	38.4 kg / 84.66 lb. 42.3 kg / 93.26 lb. 44.4 kg / 97.89 lb.
Max. noise emission (LWA)	< 80 dB (A)
Idle state power consumption at 400 V	27.3 W
Welding machine efficiency at 320 A / 32.8 V	89%

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

2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 320 /GW /XT /nc

Mains voltage (U_1)	3 x 200/230/380/400/460/600 V 1 x 230 V
Max. effective primary current (I_{1eff})	
3 x 200 V	22.7 A
3 x 230 V	19.6 A
3 x 380 V	11.0 A
3 x 400 V	11.2 A
3 x 460 V	9.8 A
3 x 600 V	9.7 A
1 x 230 V	32.6 A
Max. primary current (I_{1max})	
3 x 200 V	35.9 A
3 x 230 V	31.0 A
3 x 380 V	18.5 A
3 x 400 V	17.7 A
3 x 460 V	15.4 A
3 x 600 V	15.3 A
1 x 230 V	43.1 A
Mains fuse	
3 x 200 / 230 / 380 V	35 A slow-blow
3 x 400 / 460 / 600 V	16 A slow-blow
1 x 208 / 240 V	35 A slow-blow
Mains voltage tolerance	-10 / +6%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 320 A
TIG	3 - 320 A
MMA	10 - 320 A
Welding current at 10 min / 40 °C (104 °F)	
U_1 = 1 x 230 V	40% / 270 A 60% / 250 A 100% / 210 A
U_1 = 3 x 200 - 600 V	40% / 320 A 60% / 260 A 100% / 240 A

Output voltage range according to standard characteristic (U_2)	
MIG/MAG	14.2 - 30.0 V
TIG	10.4 - 22.8 V
MMA	20.1 - 32.8 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	79.8 V
Protection class	IP 23
EMC emission class	A [2]
Dimensions l x w x h	681 / 368 / 763 mm 26.8 / 14.5 / 30.0 in.
Weight with toolbox option with cooling unit option	40.1 kg / 88.41 lb. 44.0 kg / 97.00 lb. 46.1 kg /101.63 lb.
Max. noise emission (LWA)	< 80 dB (A)
Idle state power consumption at 400 V	29.4 W
Welding machine efficiency at 320 A / 32,8 V	89%

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

2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 400 /GW

Mains voltage (U_1)	3 x 400 V
Max. effective primary current (I_{1eff})	21.8 A
Max. primary current (I_{1max})	28.1 A
Mains fuse	35 A slow-blow
Mains voltage tolerance	-10 / +10%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 400 A
TIG	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)	
MIG/MAG	14.2 - 34.0 V
TIG	10.1 - 26.0 V
MMA	20.4 - 36.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	64.4 V
Protection class	IP 23
EMC emission class	A [2)]
Dimensions l x w x h	681 / 368 / 763 mm 26.8 / 14.5 / 30.0 in.
Weight with toolbox option with cooling unit option	39.4 kg / 86.86 lb. 43.3 kg / 95.46 lb. 45.4 kg / 100.09 lb.
Max. noise emission (LWA)	< 80 dB (A)
Idle state power consumption at 400 V	26.9 W
Welding machine efficiency at 400 A / 36 V	89%

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

2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 400 /GW/nc

Mains voltage (U_1)	3 x 380 / 400 V
Max. effective primary current (I_{1eff})	22.7/21.8 A
Max. primary current (I_{1max})	28.9/28.1 A
Mains fuse	35 A slow-blow
Mains voltage tolerance	-10 / +10%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 400 A
TIG	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)	
MIG/MAG	14.2 - 34.0 V
TIG	10.1 - 26.0 V
MMA	20.4 - 36.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	64.4 V
Protection class	IP 23
EMC emission class	A [2)]
Dimensions l x w x h	681 / 368 / 763 mm 26.8 / 14.5 / 30.0 in.
Weight with toolbox option with cooling unit option	37.5 kg / 88.4 lb. 41.1 kg / 90.61 lb. 43.5 kg / 95.90 lb.
Max. noise emission (LWA)	< 80 dB (A)
Idle state power consumption at 400 V	26.9 W
Welding machine efficiency at 400 A / 36 V	89%

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

2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 400 /GW /XT /nc

Mains voltage (U_1)	3 x 200/230/380/400/460/600 V 1 x 230 V
Max. effective primary current (I_{1eff})	
3 x 200 V	35.8 A
3 x 230 V	31.0 A
3 x 380 V	18.6 A
3 x 400 V	17.7 A
3 x 460 V	15.5 A
3 x 600 V	15.2 A
1 x 230 V	36.3 A
Max. primary current (I_{1max})	
3 x 200 V	49.0 A
3 x 230 V	42.4 A
3 x 380 V	25.5 A
3 x 400 V	24.2 A
3 x 460 V	21.1 A
3 x 600 V	19.5 A
1 x 230 V	53.7 A
Mains fuse	
3 x 200 / 230 / 380 V	63 A slow-blow
3 x 400 / 460 / 600 V	35 A slow-blow
1 x 230 V	50 A slow-blow
Mains voltage tolerance	-10 / +6%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 400 A
TIG	3 - 400 A
MMA	10 - 400 A
Welding current at 10 min / 40 °C (104 °F)	
U_1 = 1 x 230 V	40% / 320 A 60% / 280 A 100% / 240 A
U_1 = 3 x 200 - 600 V	40% / 400 A 60% / 360 A 100% / 320 A

Output voltage range according to standard characteristic (U_2)	
MIG/MAG	14.2 - 34.0 V
TIG	10.1 - 26.0 V
MMA	20.4 - 36.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	79.8 V
Protection class	IP 23
EMC emission class	A [2]
Dimensions l x w x h	681 / 368 / 763 mm 26.8 / 14.5 / 30.0 in.
Weight with toolbox option with cooling unit option	41.0 kg / 90.39 lb. 44.9 kg / 98.99 lb. 47.0 kg / 103.62 lb.
Max. noise emission (LWA)	< 80 dB (A)
Idle state power consumption at 400 V	30.5 W
Welding machine efficiency at 400 A / 36 V	89%

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

2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 400 /GW/600/nc

Mains voltage (U_1)	3 x 600 V
Max. effective primary current (I_{1eff})	16.7 A
Max. primary current (I_{1max})	22.0 A
Mains fuse	35 A slow-blow
Mains voltage tolerance	-10 / +6%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 400 A
TIG	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)	
MIG/MAG	14.2 - 34.0 V
TIG	10.1 - 26.0 V
MMA	20.4 - 36.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	77.6 V
Protection class	IP 23
EMC emission class	A [1)]
Dimensions l x w x h	681 / 368 / 763 mm 26.8 / 14.5 / 30.0 in.
Weight with toolbox option with cooling unit option	38.7 kg / 85.32 lb. 42.6 kg / 93.92 lb. 44.7 kg / 98.55 lb.
Max. noise emission (LWA)	< 80 dB (A)

1) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 500 /GW

Mains voltage (U_1)	3 x 400 V
Max. effective primary current (I_{1eff})	25.0 A
Max. primary current (I_{1max})	36.7 A
Mains fuse	35 A slow-blow
Mains voltage tolerance	-10 / +10%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 500 A
TIG	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)	
MIG/MAG	14.2 - 39.0 V
TIG	10.1 - 30.0 V
MMA	20.4 - 40.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	64.4 V
Protection class	IP 23
EMC emission class	A [2)]
Dimensions l x w x h	681 / 368 / 763 mm 26.8 / 14.5 / 30.0 in.
Weight with toolbox option with cooling unit option	40.1 kg / 88.4 lb. 44.0 kg / 97.00 lb. 46.1 kg / 101.63 lb.
Max. noise emission (LWA)	< 80 dB (A)
Idle state power consumption at 400 V	27.8 W
Welding machine efficiency at 500 A / 40 V	89%

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

2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 500 /GW /nc

Mains voltage (U_1)	3 x 380 / 400 V
Max. effective primary current (I_{1eff})	25.6/25.0 A
Max. primary current (I_{1max})	38.1/36.7 A
Mains fuse	35 A slow-blow
Mains voltage tolerance	-10 / +10%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 500 A
TIG	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)	
MIG/MAG	14.2 - 39.0 V
TIG	10.1 - 30.0 V
MMA	20.4 - 40.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	64.4 V
Protection class	IP 23
EMC emission class	A [2)]
Dimensions l x w x h	681 / 368 / 763 mm 26.8 / 14.5 / 30.0 in.
Weight with toolbox option with cooling unit option	37.6 kg / 82.89 lb. 41.5 kg / 91.49 lb. 46.6 kg / 102.74 lb.
Max. noise emission (LWA)	< 80 dB (A)
Idle state power consumption at 400 V	27.8 W
Welding machine efficiency at 500 A / 40 V	89%

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

2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 500 /GW /XT /nc

Mains voltage (U_1)	3 x 200/230/380/400/460/600 V 1 x 230 V
Max. effective primary current (I_{1eff})	
3 x 200 V	43.2 A
3 x 230 V	37.4 A
3 x 380 V	22.3 A
3 x 400 V	21.2 A
3 x 460 V	18.5 A
3 x 600 V	17.8 A
1 x 230 V	36.5 A
Max. primary current (I_{1max})	
3 x 200 V	68.3 A
3 x 230 V	59.2 A
3 x 380 V	35.3 A
3 x 400 V	33.5 A
3 x 460 V	29.2 A
3 x 600 V	23.7 A
1 x 230 V	53.6 A
Mains fuse	
3 x 200 / 230 / 380 V	63 A slow-blow
3 x 400 / 460 / 600 V	35 A slow-blow
1 x 230 V	50 A slow-blow
Mains voltage tolerance	-10 / +6%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Max. permitted grid impedance Z_{max} on PCC[1)]	75 mOhm
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 500 A
TIG	3 - 500 A
MMA	10 - 500 A
Welding current at 10 min / 40 °C (104 °F)	
U_1 = 1 x 230 V	40% / 320 A 60% / 290 A 100% / 260 A
U_1 = 3 x 200 - 600 V	40% / 500 A 60% / 430 A 100% / 360 A

Output voltage range according to standard characteristic (U_2)	
MIG/MAG	14.2 - 39.0 V
TIG	10.1 - 30.0 V
MMA	20.4 - 40.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	79.8 V
Protection class	IP 23
EMC emission class	A [2]
Dimensions l x w x h	681 / 368 / 763 mm 26.8 / 14.5 / 30.0 in.
Weight with toolbox option with cooling unit option	41.1 kg / 90.6 lb. 45.0 kg / 99.21 lb. 47.1 kg / 103.84 lb.
Max. noise emission (LWA)	< 80 dB (A)
Idle state power consumption at 400 V	30.2 W
Welding machine efficiency at 500 A / 40 V	89%

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

2) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Fortis 500 /GW / 600V /nc

Mains voltage (U_1)	3 x 600 V
Max. effective primary current (I_{1eff})	19.2 A
Max. primary current (I_{1max})	29.1 A
Mains fuse	35 A slow-blow
Mains voltage tolerance	-10 / +6%
Mains frequency	50/60 Hz
Cos phi (1)	0.99
Recommended residual-current circuit breaker	Type B
Welding current range (I_2)	
MIG/MAG	3 - 500 A
TIG	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)	
MIG/MAG	14.2 - 39.0 V
TIG	10.1 - 30.0 V
MMA	20.4 - 40.0 V
Open circuit voltage (U_0 peak / U_0 r.m.s)	77.6 V
Protection class	IP 23
EMC emission class	A [1)]
Dimensions l x w x h	681 / 368 / 763 mm 26.8 / 14.5 / 30.0 in.
Weight with toolbox option with cooling unit option	38.7 kg / 85.32 lb. 42.6 kg / 93.92 lb. 44.7 kg / 98.55 lb.
Max. noise emission (LWA)	< 80 dB (A)

1) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid.
The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.

Cooling unit option (OPT/s CU 1200)

Supply voltage Fan Pump	 24 V DC 42 V DC
Current consumption	2.1 A

Cooling capacity at Q = 1 l/min. + 25 °C (77 °F) Q = 1 l/min. + 40 °C (104 °F) Q = max. + 25 °C (77 °F) Q = max. + 40 °C (104 °F)	 1,200 W 800 W 1,400 W 1,100 W
Max. delivery head	50 m (164 ft. 0.5 in)
Max. delivery rate	1.5 l/min (0.40 gal./min [US])
Max. pump pressure	5 bar (72.51 psi)
Pump service life	up to 15,000 hrs
Coolant content	5 l (1.32 gal. [US])
Protection class	IP 23
Dimensions l/w/h	740/340/230 mm (29.1/13.4/9.1 in.)
Weight (without coolant)	6 kg (13.23 Ib.)
Coolant temperature monitoring	Warning above 68 °C (154.4 °F) Error message above 70 °C (158 °F)
Flow monitoring sensor (option, standard on the OPT/s CU 1200 MC)	Warning at 1-0.7 l/min (0.26-0.18 gal./min [US]) Error message below 0.7 l/min (0.18 gal./min [US])

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)
2402 - 2482 MHz 0 - 39 < 4 dBm	GFSK

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At www.fronius.com/contact you will find the contact details of all Fronius subsidiaries and Sales & Service Partners.