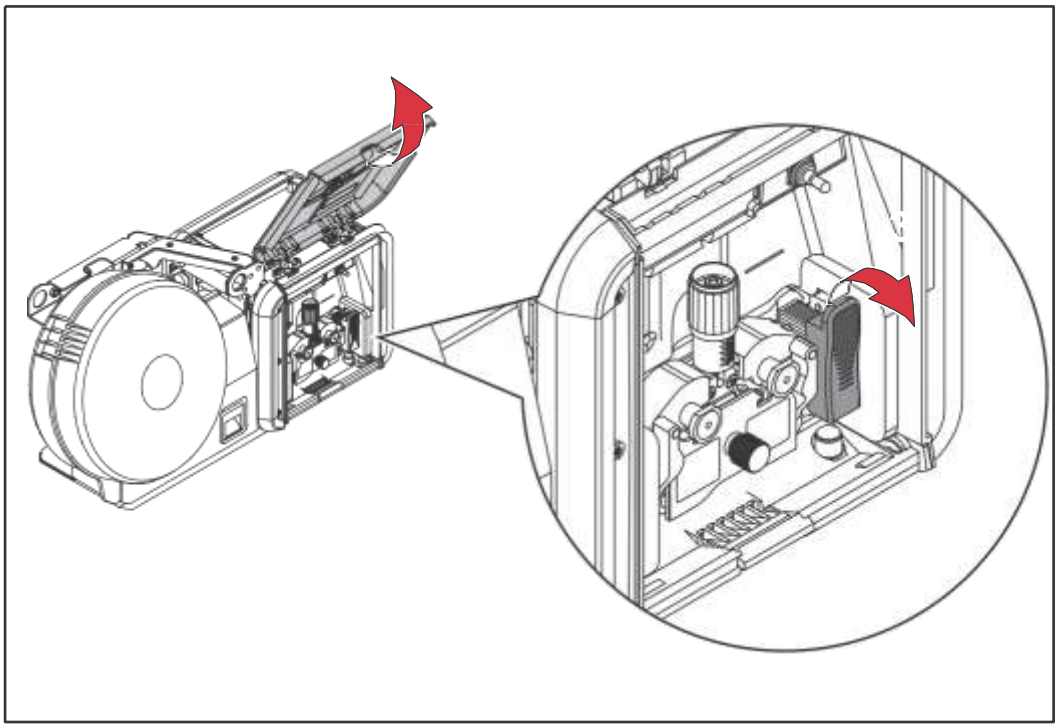
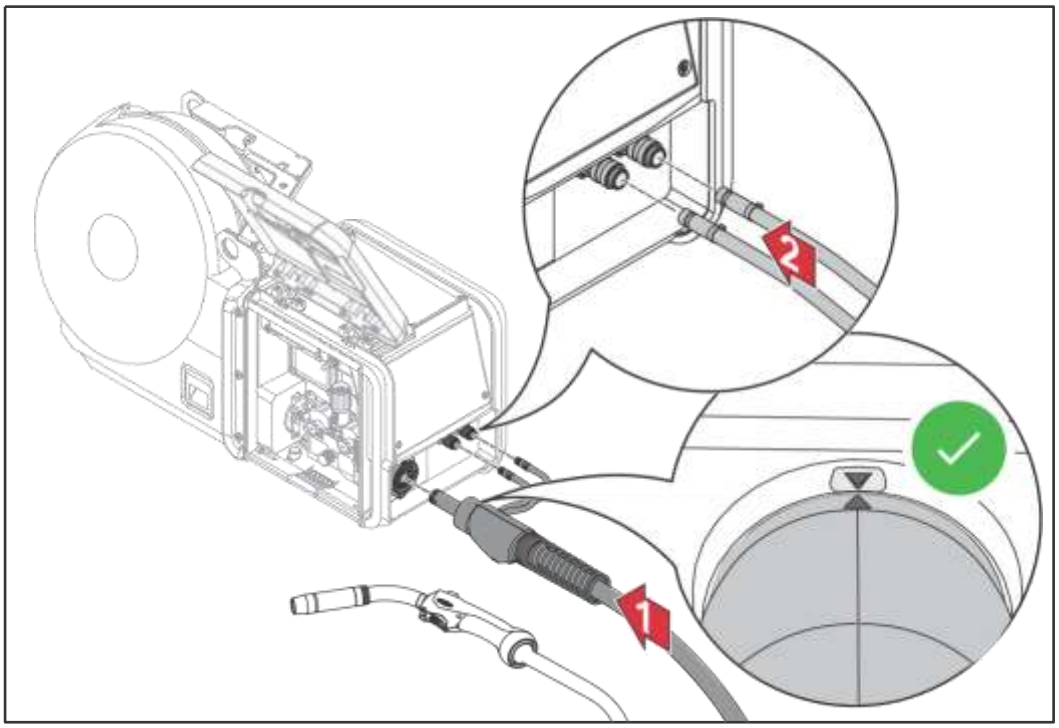
Connecting a MIG/MAG welding torch to the wirefeeder

1 Check that all cables, leads, and hosepacks are undamaged and correctly in- sulated



2 Open the wire drive cover

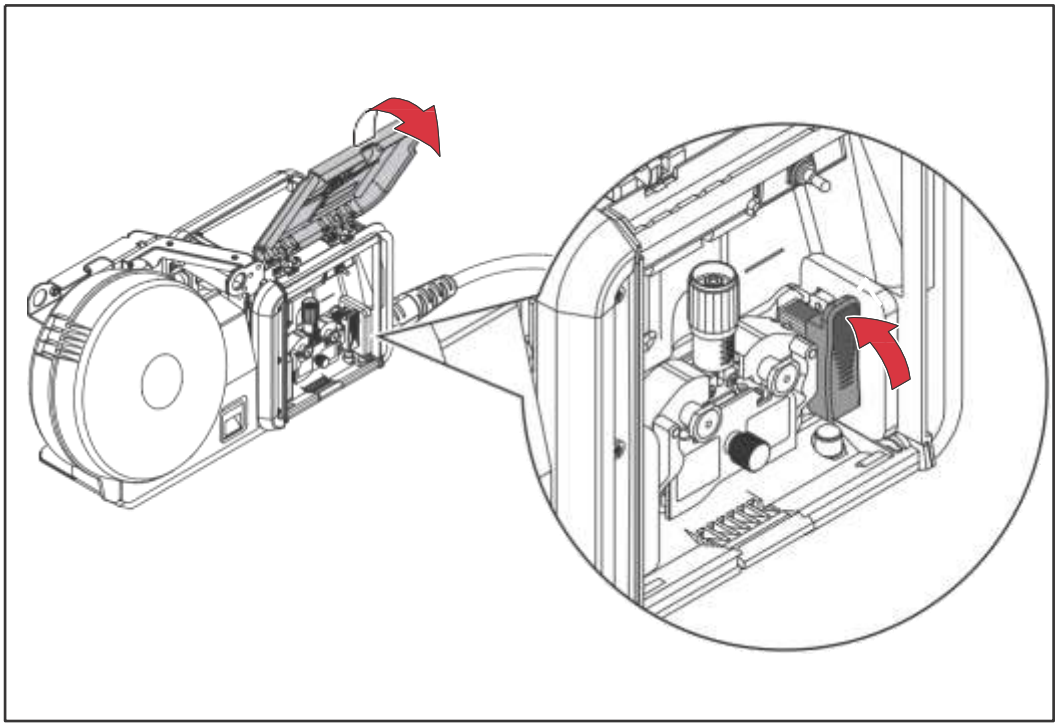
3 Open the clamping lever on the wire drive



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) Connect the

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



7 Close the clamping lever on the wire drive Close the

8 wire drive cover

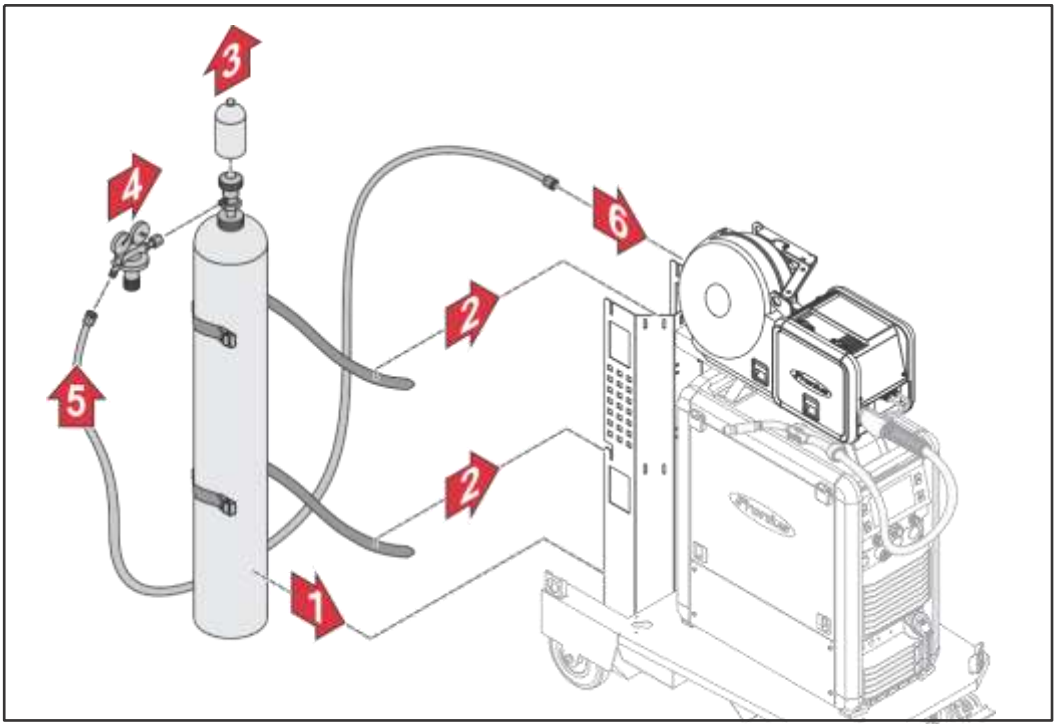
9 Check that all connections are secure

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. Se- cure 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

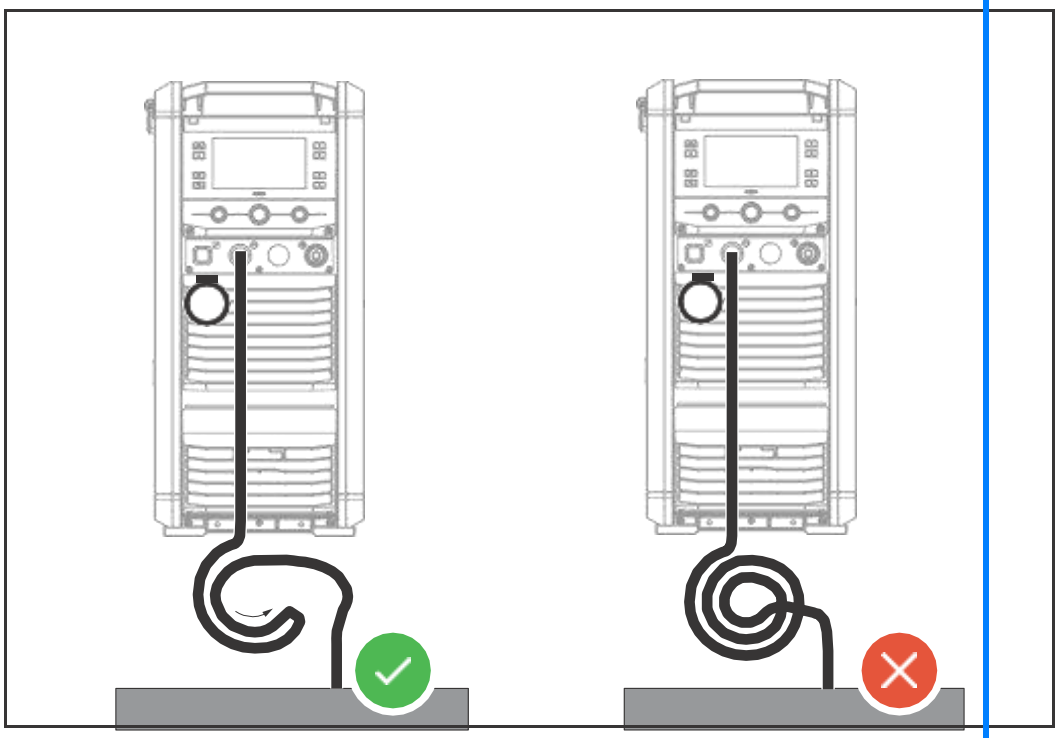
6 Connect the shielding gas hose from the interconnecting hosepack to the wirefeeder

Establishing a ground earth connection

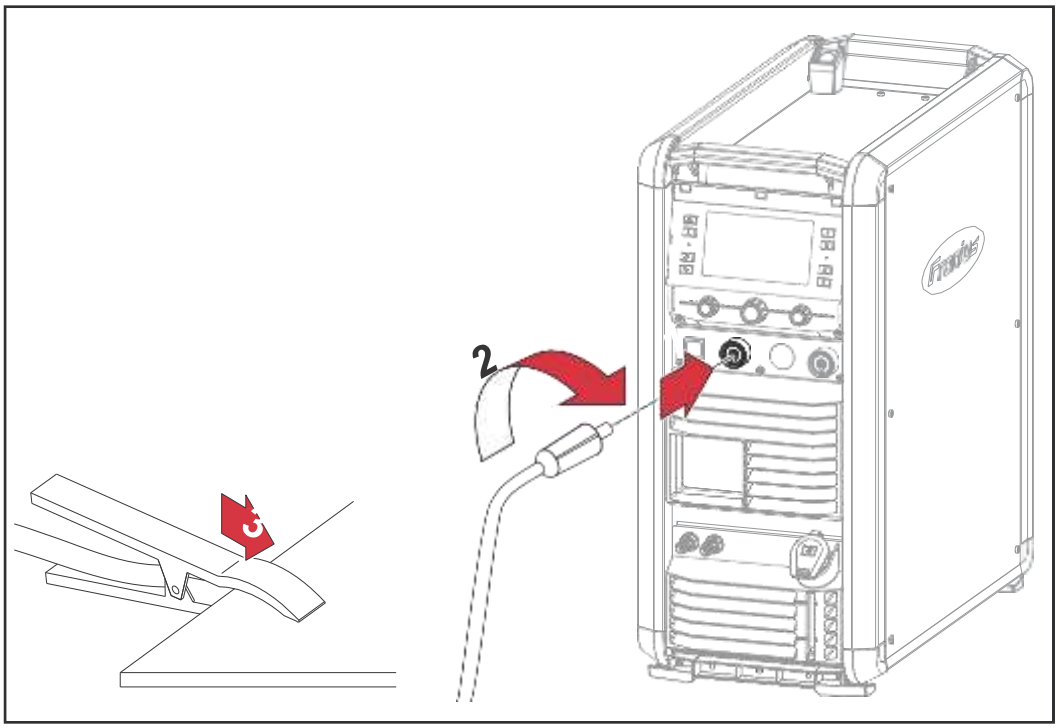
NOTE!

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 in- terconnecting 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 Lock return
2 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 Threading the
3 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 Adjust
5 the brake

IMPORTANT! For optimum welding results, the manufacturer recommends car- rying 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 align- ment can be found in the setup menu / MIG/MAG / R/L alignment as of page200.

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

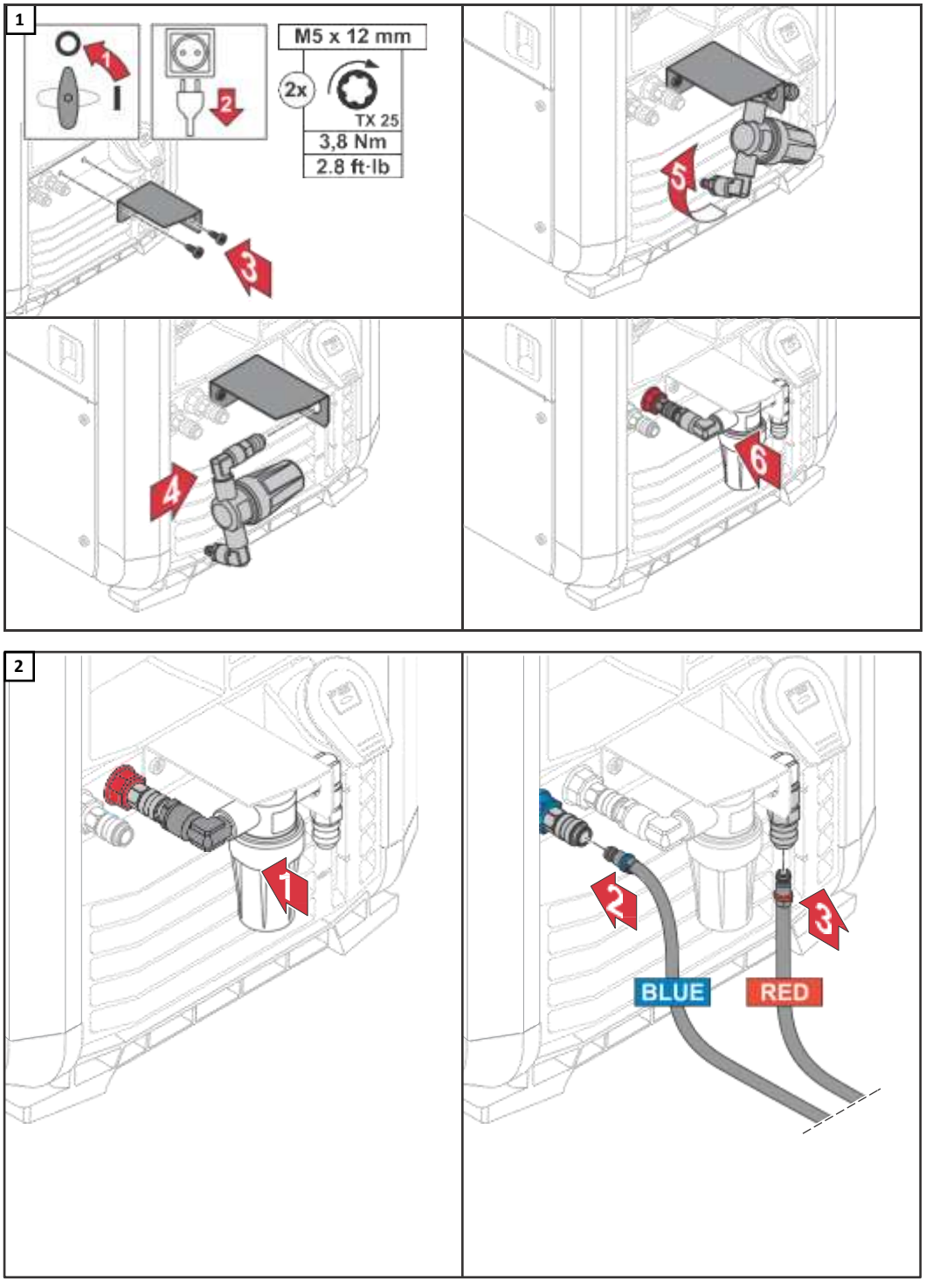
Installing the fil- ter and connect- ing the coolant hoses

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 cool- ing 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!

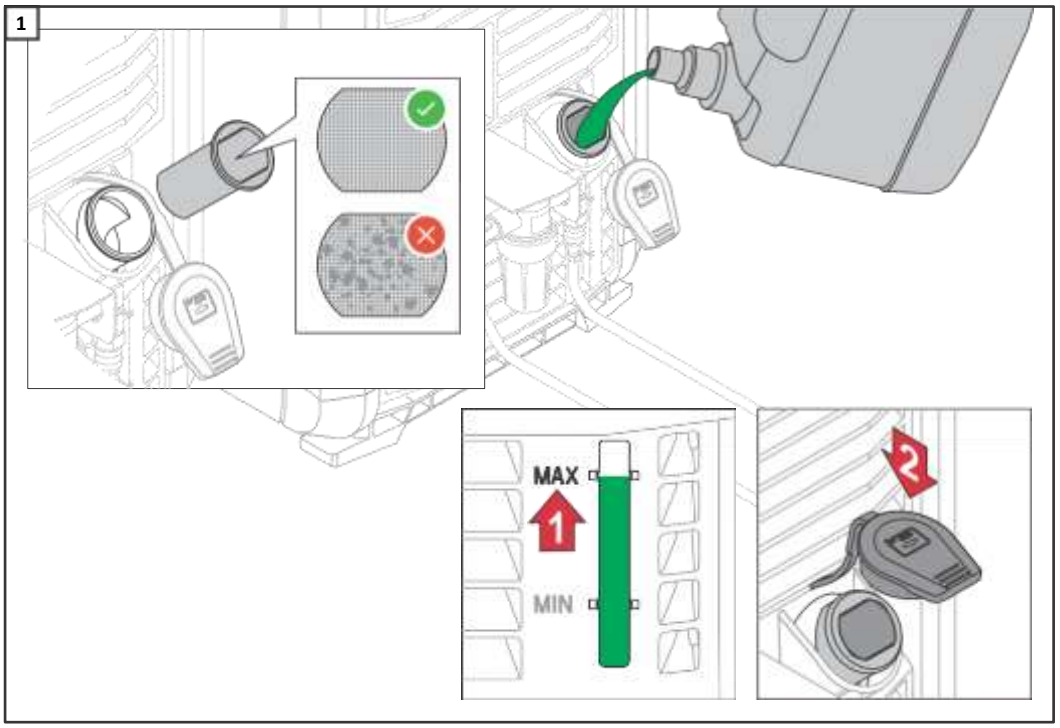
Danger from using prohibited coolant.
This can result in damage to property.

- ▶ The cooling unit must only be operated using Cooling Liquid FCL10/20. Other coolants are not suitable due to their electrical conductivity and in- sufficient 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:

- auto
- off

For details on the cooling unit settings, see from page 210 onwards.

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

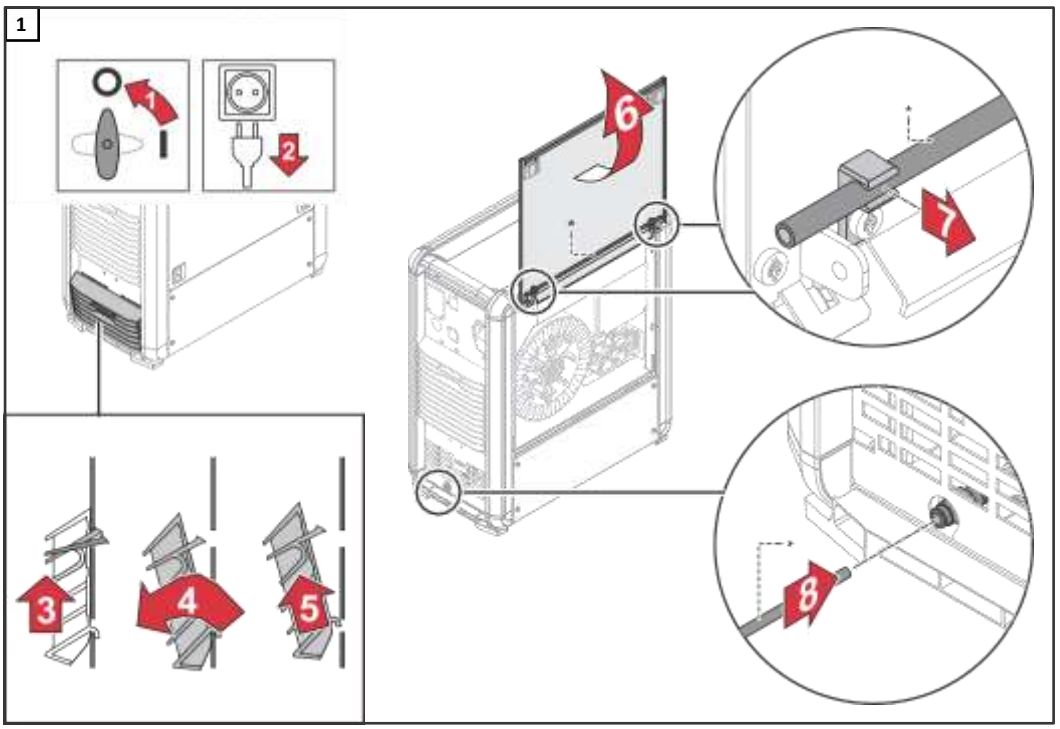
Replacing the coolant

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.



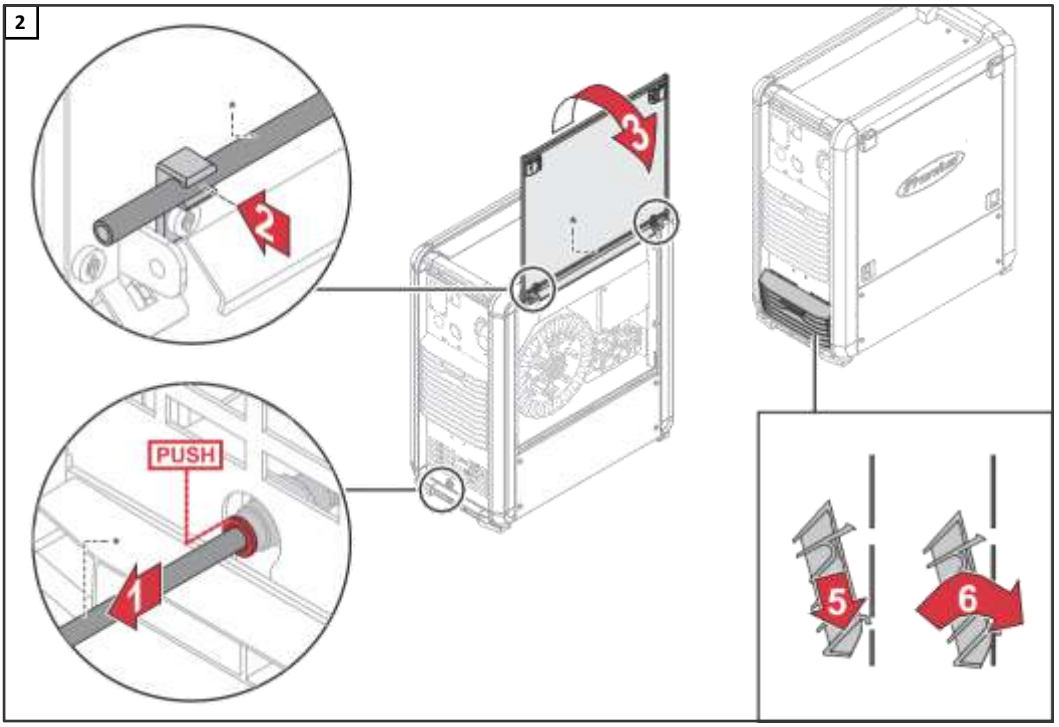
** Hose for draining the coolant*

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 empty- ing 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.

2



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

3 Fill the cooling unit
(See from page 119 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**

Safety

⚠ WARNING!

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

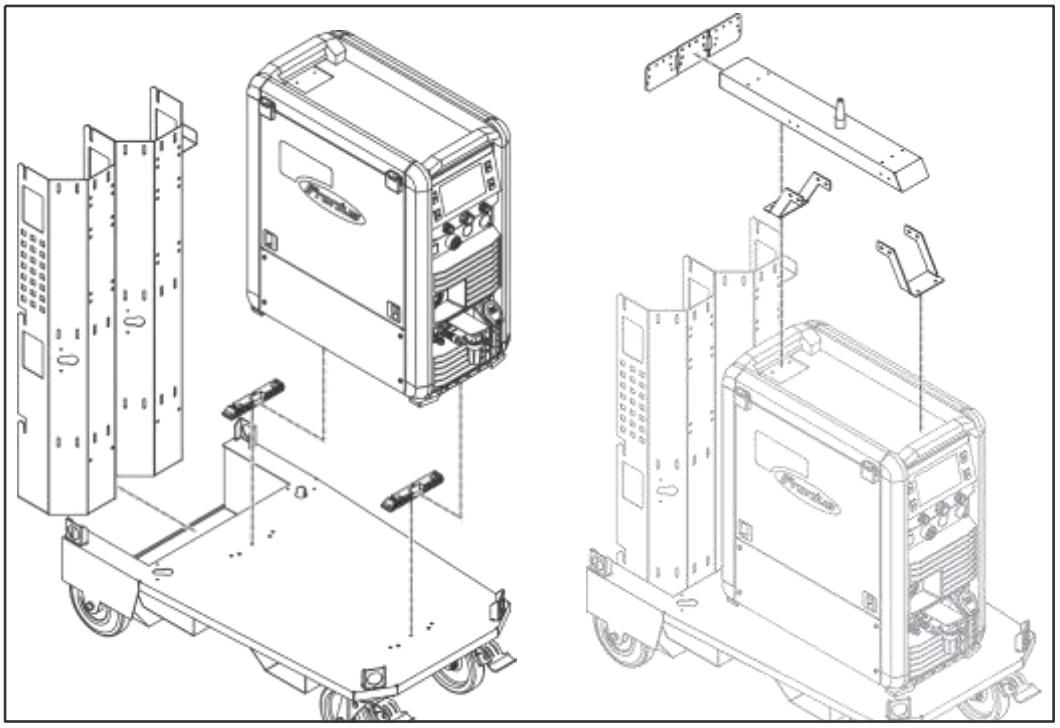
- ▶ Before starting work, switch off all the devices and components involved and disconnect them from the grid.
- ▶ Secure all devices and components involved so they cannot be switched back on.

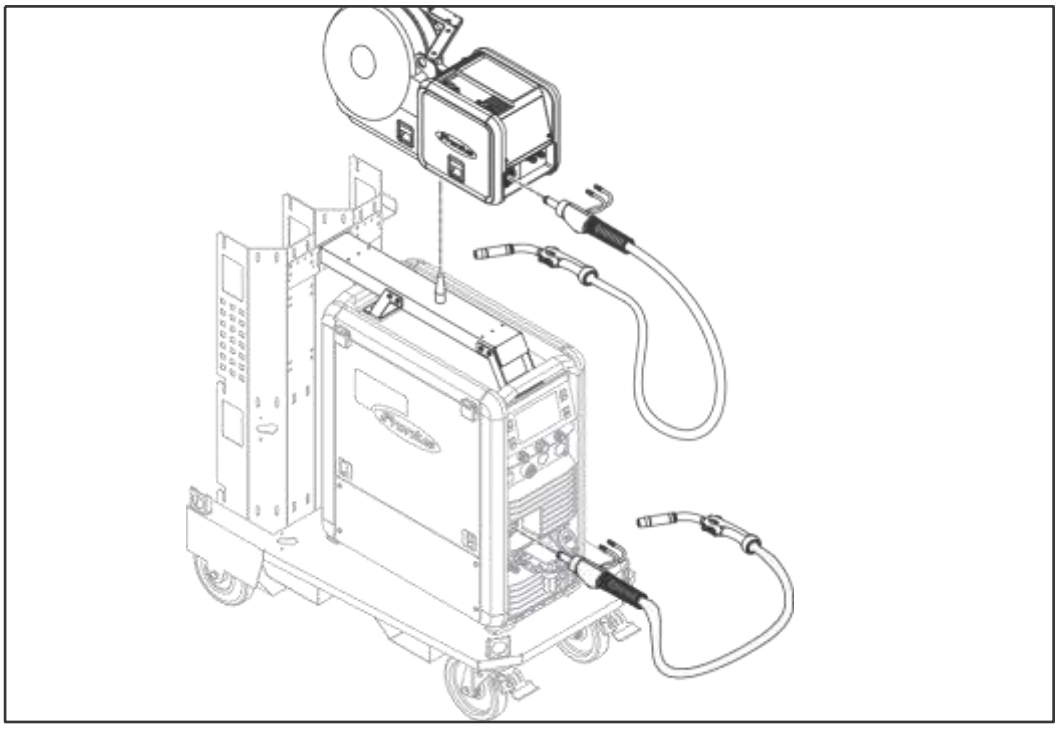
⚠ WARNING!

Danger of electrical current due to electrically conductive dust in the device.
Serious personal injury and damage to property may result.

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

Fortis Duo: Assembling the system components (overview)





Installation sequence:

1. Mount gas cylinder holders on the trolley Set up
2. the welding machine on the trolley
3. Fit the swivel pin holder on the trolley and on the welding machine Place the
4. wirefeeder on the swivel pin holder
5. Connect the interconnecting hosepack to the welding machine and wirefeed- er
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 modifica- tion 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 lock- ing and unlocking functions as well as functions for different people logging in and out.

For details, see
- from page 217 onwards ... User Management on the welding machine
- from page 245 onwards ... User Management on the SmartManager

Locking and un- locking the weld- ing 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 pre- defined 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.

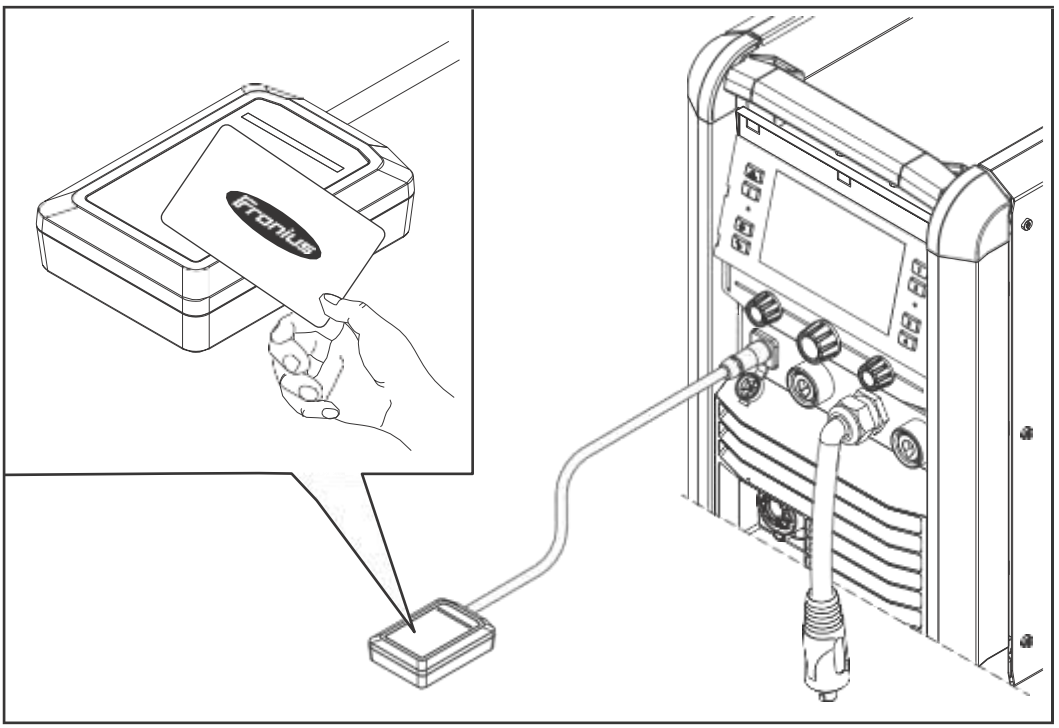
All welding machine functions are available again without restriction.

For details on the predefined role "locked", see User Management from page 217 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 Read- er /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 pre- defined 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 217 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 217 onwards.

Status indicators on the NFC key reader

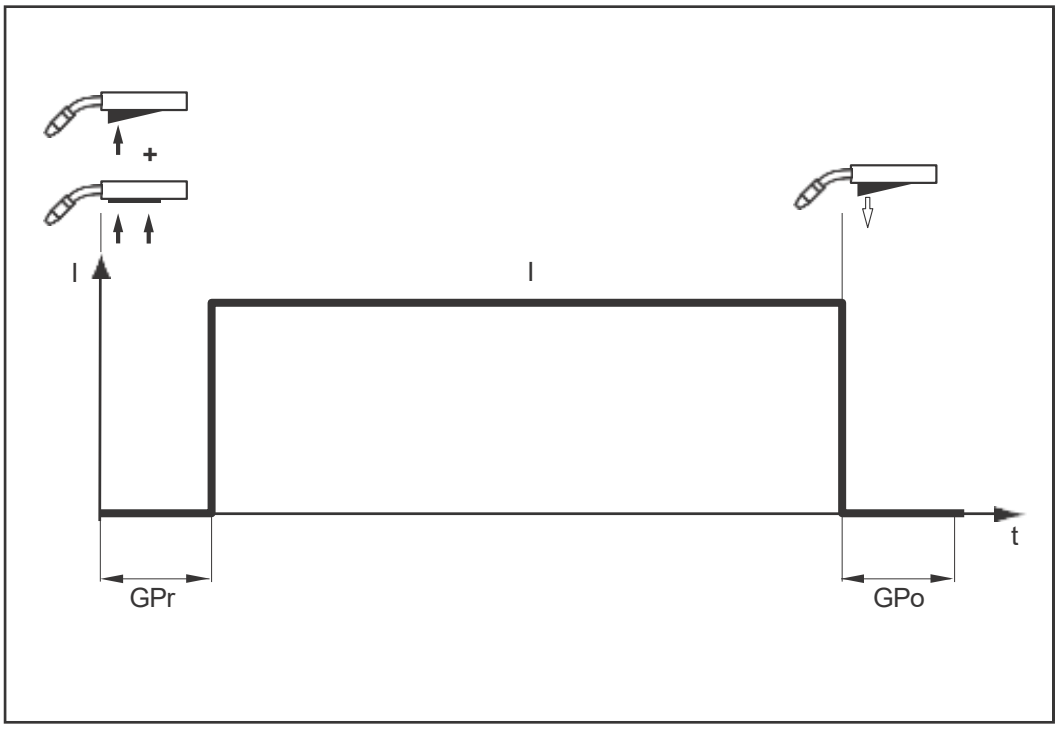
With the OPT/s NFC Reader /TMC option connected, the following status indic- ators can be displayed on the NFC key reader:

- 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

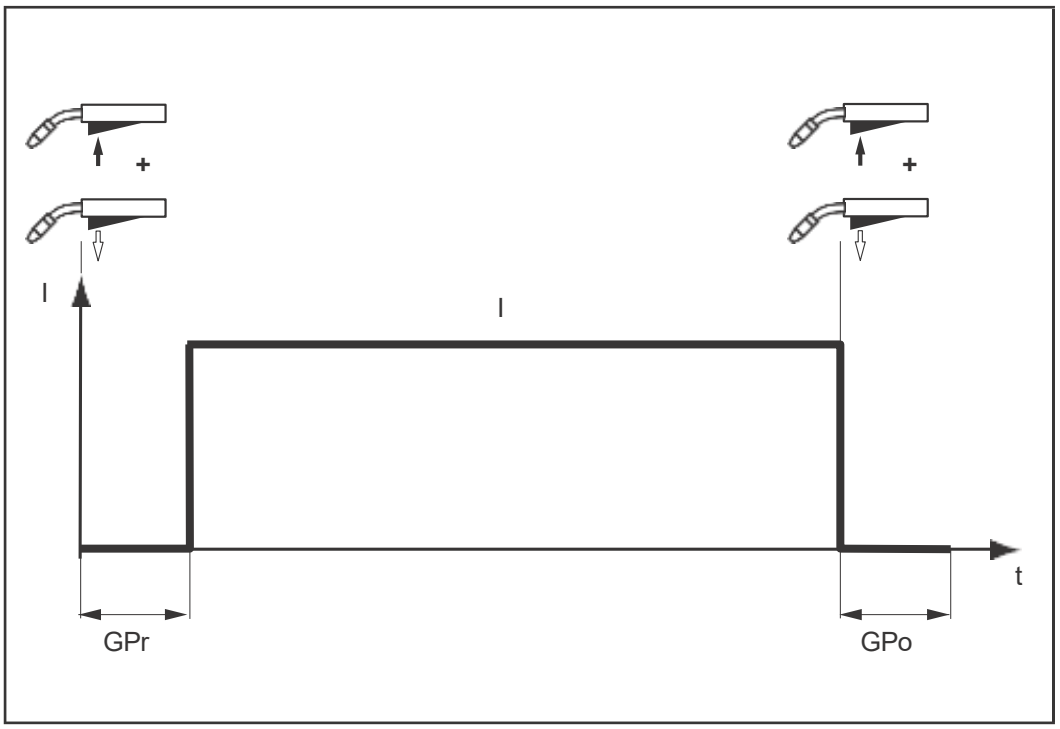
MIG/MAG operating modes and interval

2- step mode



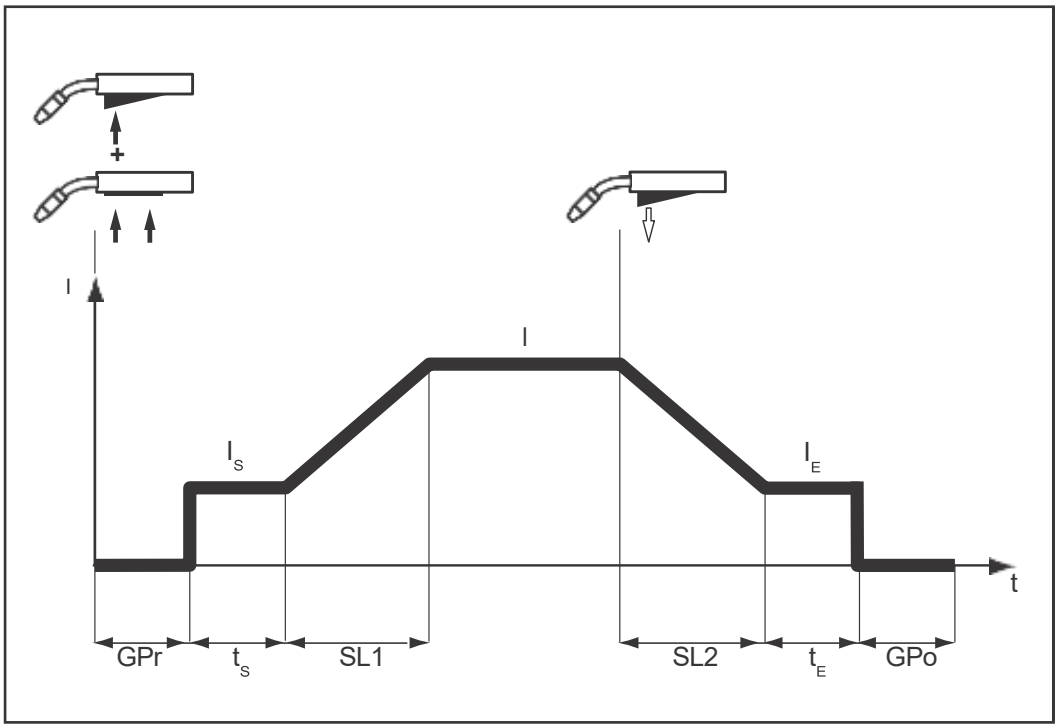
"2-step mode" is suitable for
- Tacking work
- Short weld seams
- Automatic and robot operation

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.

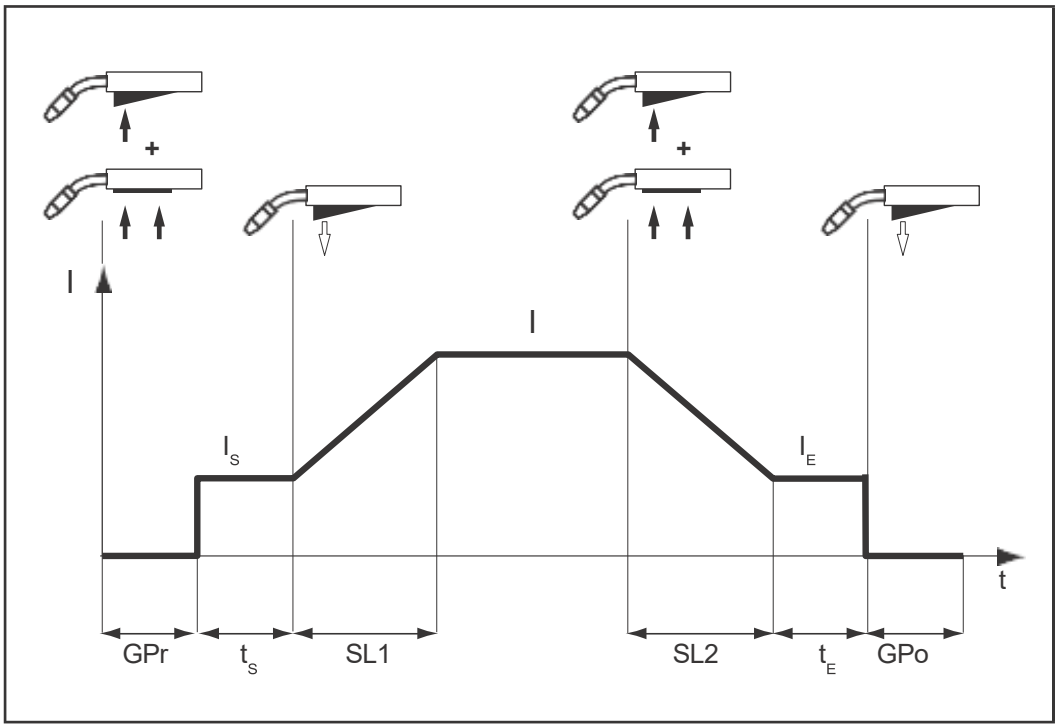
To activate special 2-step mode:

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

   Special 2-step mode is activated.

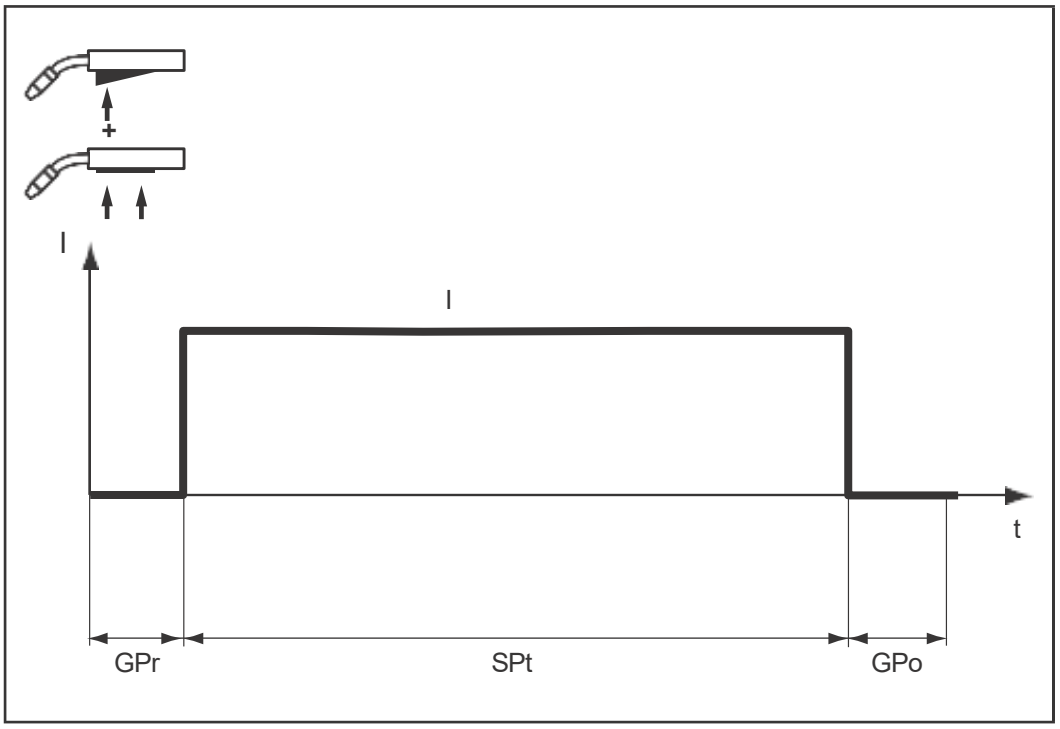
3. In the setup menu, set the SL1/2 (slope 1 and 2) and I_S (starting current) parameters

Special 4-step mode



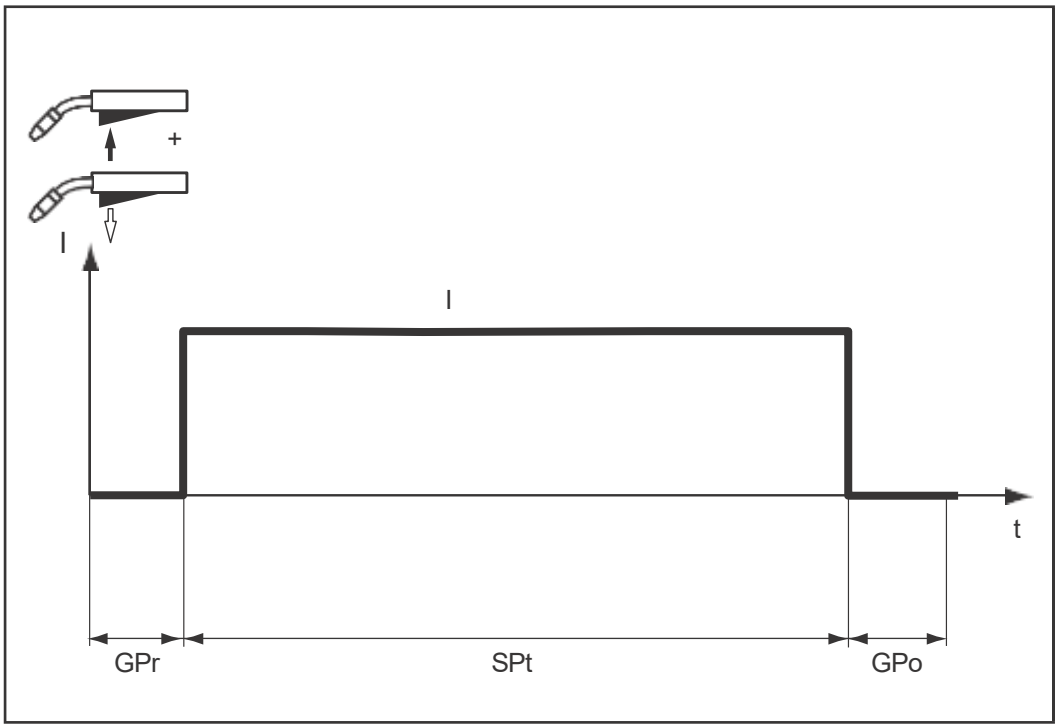
Special 4-step mode allows the starting and final current to be configured in ad- dition to the advantages of 4-step mode.

Spot welding in 2-step mode



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

Spot welding in 4-step mode

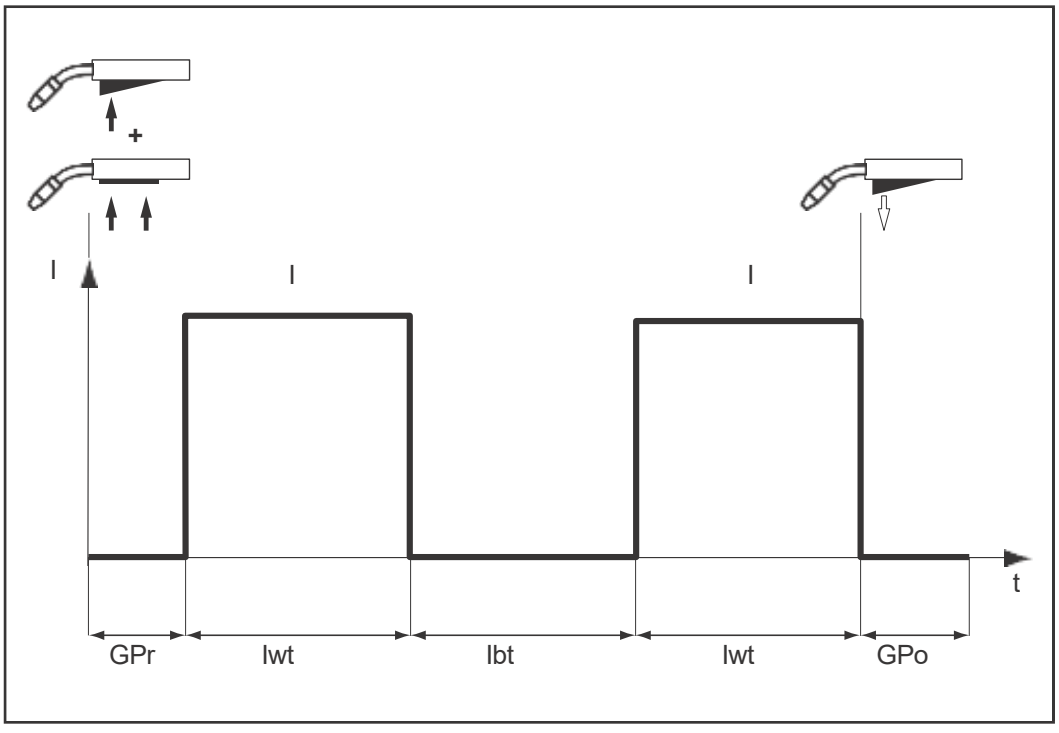


The "Spot welding" mode is suitable for welded joints on overlapped sheets.

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.

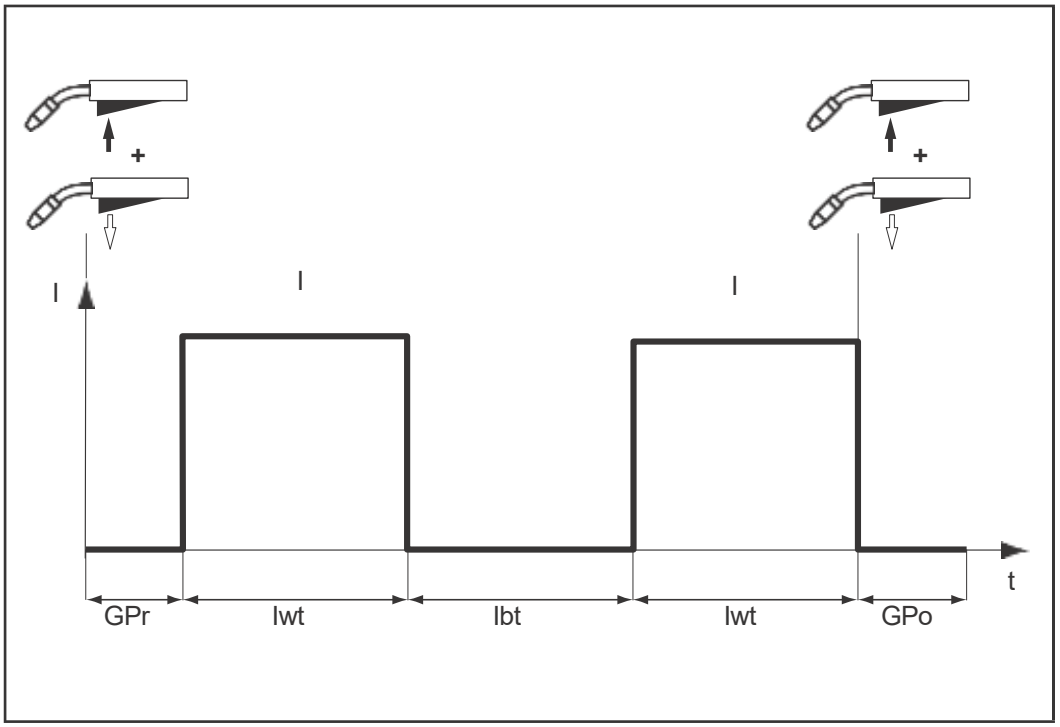
Stitch welding in 2-step mode



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.

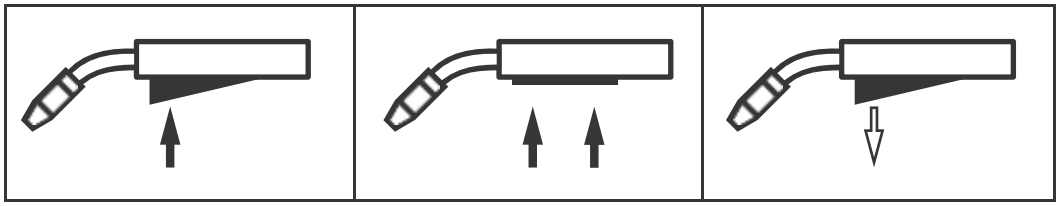
Stitch welding in 4-step mode



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 ex-planations



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 dis- sipation 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 temperat- ure 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 from incorrect operation and work that is not carried out properly.
This can result in serious personal injury and damage to property.

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

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 car- rying 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 200.

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 diamet- er		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 Press the
2 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 pro- cess: 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 139)

Selecting the filler metal and shielding gas

1 Turn the left-hand dial and select the desired filler metal Press the left-
2 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 Press the left-
6 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 Press the left-
10 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 Press the left-
14 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 Press the left or
16 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 correc- tion.

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 dur- ing 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 weld- ing 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 weld- ing time
- For the right-hand dial: welding voltage, ignition current (manual), wire re- traction (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 195 onwards.

Adjusting the quantity of shielding gas

1 Open the gas cylinder valve Press the

2 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 weld- ing

⚠ 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 195 onwards. Press the torch

2 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 para- meters 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 ma- chine.

The welding parameter wizard

General

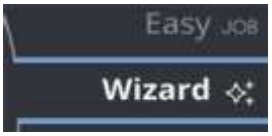
The welding parameter wizard supports the welder in selecting the welding para- meters. The parameter recommendation can be accepted or saved as a job.

Running the welding para- meter wizard

1 Select the filler metal and shielding gas see page 139

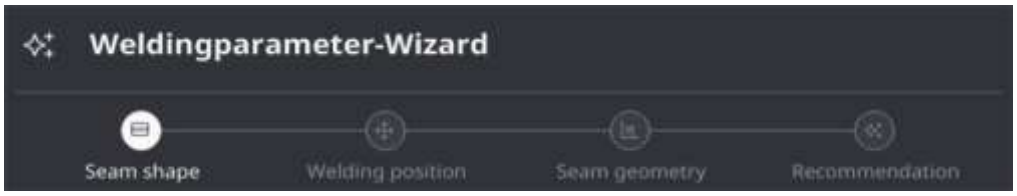
2 Select the Pulse or Standard welding process see page 139

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 selec- tion 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)

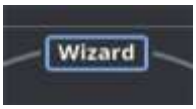
The recommended welding parameters are displayed:

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 weld- ing 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 access- ible 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 Open the Setup

3 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 Press the

6 Menu button and exit the Setup menu

NOTE!

Once spot welding mode has been selected, the spot welding time para- meter 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 Open the

8 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 Press and
2. release the torch trigger
3. Maintain the position of the welding torch Wait for
4. 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" Enter the desired
5. value for the stitch cycles
6. Enter the desired value for the stitch welding time Enter the
7. 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 para- meter 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 Select filler
9. metal, wire diameter, and shielding gas Open the gas cylinder
10. 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 Depending on the
2 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 Wait for
4 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) Wait for the
7 gas post-flow time
8 Raise the welding torch

Job Mode

Saving and retrieving jobs

General

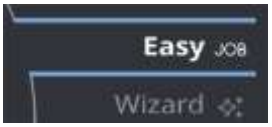
If the OPT/s Job option is available, up to 1000 jobs can be stored and repro- duced on the welding machine.

Jobs can only be saved when you are not welding. In addition to the current weld- ing 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 223, 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 Press the right-
2 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": Press the right-
4 hand or middle selection dial

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

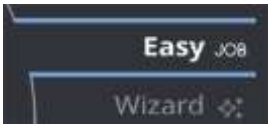
5 Turn the middle selection dial and select the desired job Press the
6 selection dial and accept the selected job Initiate welding process
7

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.

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 Press the right-
4 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

Optimizing a job

1 Activate Job Mode
(see page 152, 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" Press the right-
4 hand or middle selection dial

The list of jobs is displayed.

5 Turn a selection dial and select the job to be optimized Press the
6 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 152, 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" Press the right-

4 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 152, 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" Press the right-
4 hand or middle selection dial

The list of jobs is displayed.

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

The selected job is displayed individually.

7 Turn a selection dial and select the desired storage location for the duplicate Press the
8 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 223, step 2

Deleting a job

1 Activate Job Mode
(see page 152, 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" Press the right-
4 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 - Unplug
2. the mains plug
3. Remove the MIG/MAG welding torch
4. Disconnect the return lead cable from the (-) current socket Insert the return
5. lead cable into the (+) current socket and lock Connect the other end of the
6. return lead cable to the workpiece
7. Insert the bayonet plug of the TIG gas-valve welding torch into the (-) cur- rent 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 from incorrect operation and work that is not carried out properly.
This can result in serious personal injury and damage to property.

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

⚠ 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 electric- ally 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 139 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 para- meters 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 ma- chine.

3 Set TIG welding parameters

The setting of the MIG/MAG welding parameters is described from page 140 onwards.
The TIG welding torches 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 202 on- wards.

5 Perform R/L adjustment
For details, see from page 204 onwards.

6 Open the gas check valve on the TIG gas-valve welding torch

7 Set the desired amount of shielding gas on the gas pressure regulator Commence the

8 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)

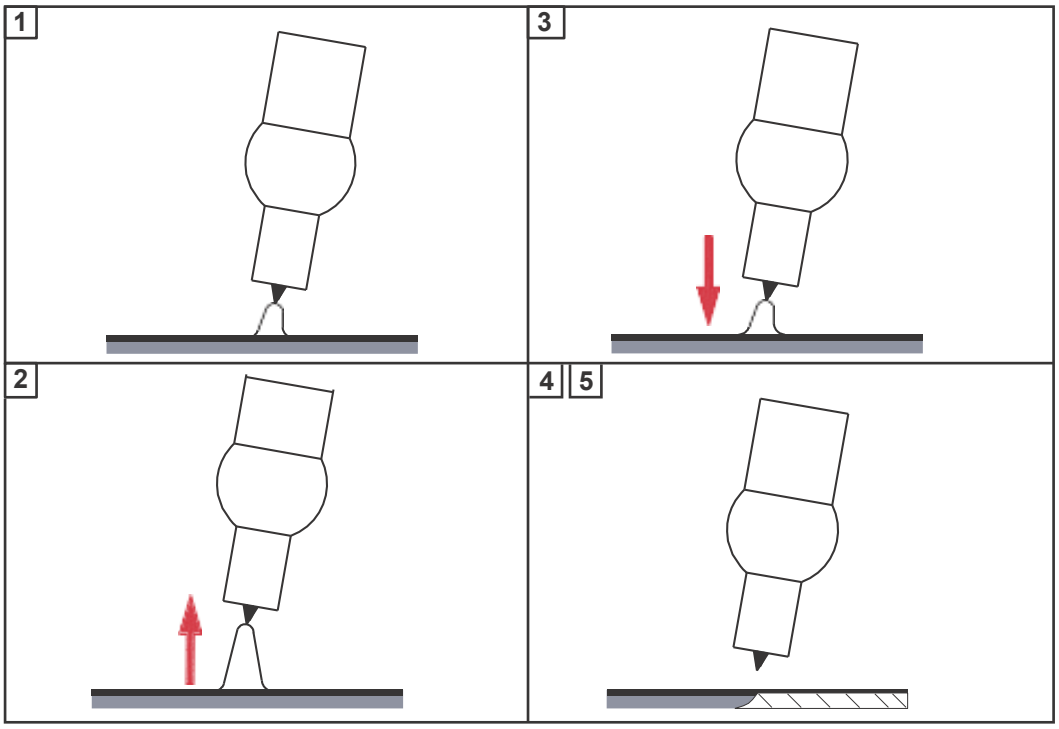
3-270 A ... Fortis 270 C
3-320 A ... Fortis 320 C / Fortis 320
3-400 A ... Fortis 400 C / Fortis 400
3-500 A ... Fortis 500 C / Fortis 500 Factory setting:
50 A

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

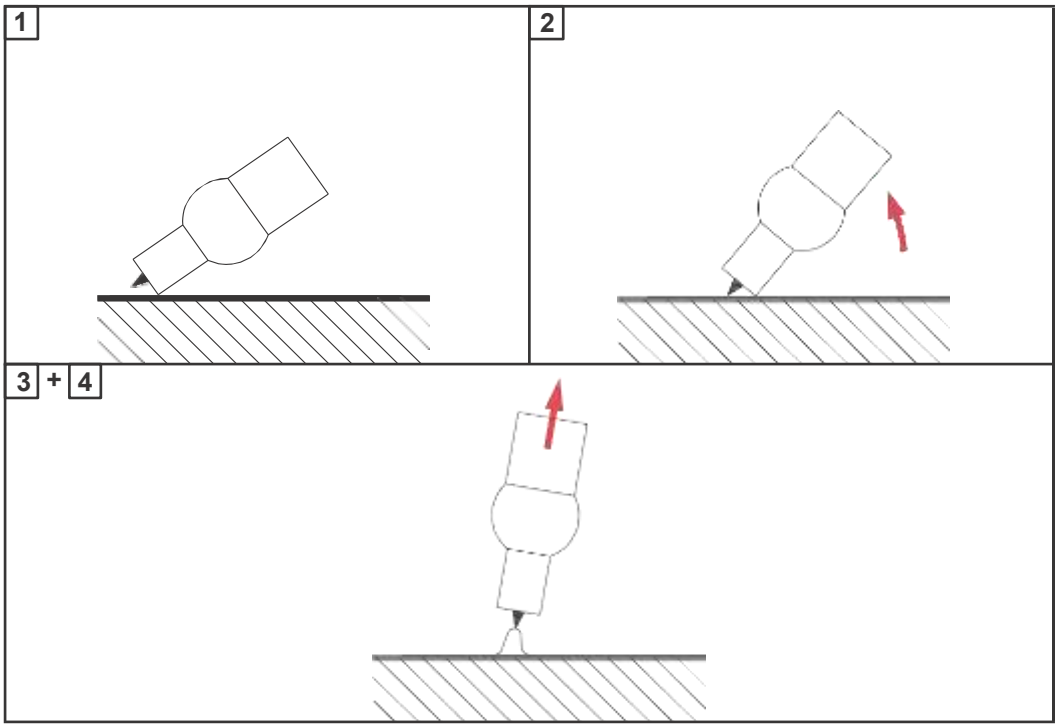
4 Maintain height of the welding torch
- The welding current ramps down continuously (DownSlope).
- The arc goes out.

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 Carry out welding

4

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 elec- trode to cool sufficiently.

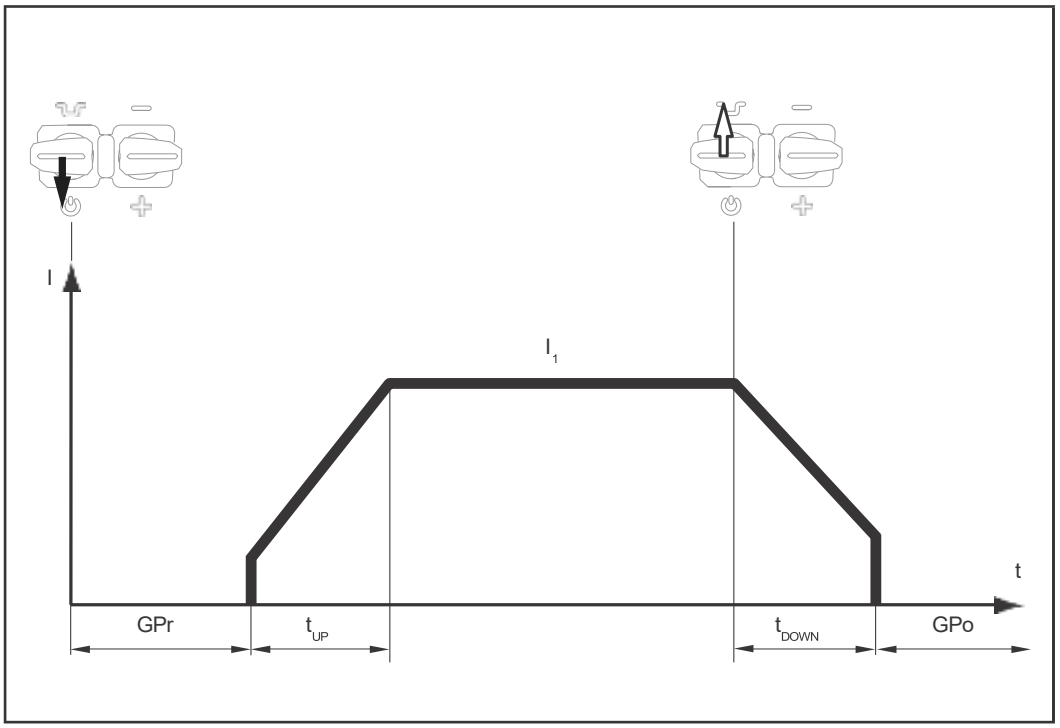
2 Close the gas stop valve on the TIG gas-valve torch

TIG welding with Multiprocess

TIG Operating Modes

2- step mode

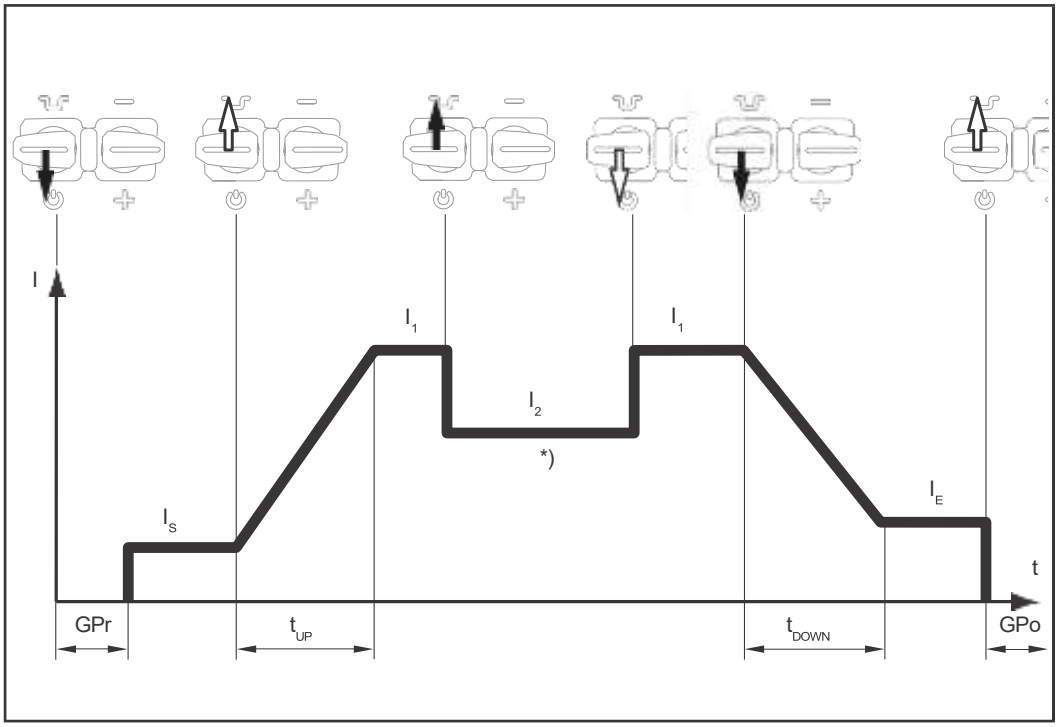
- Welding: Pull back the torch trigger and hold it in this position
- End of welding: Release the torch trigger



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 po- sition
- End of welding: Release the torch trigger



4- step mode

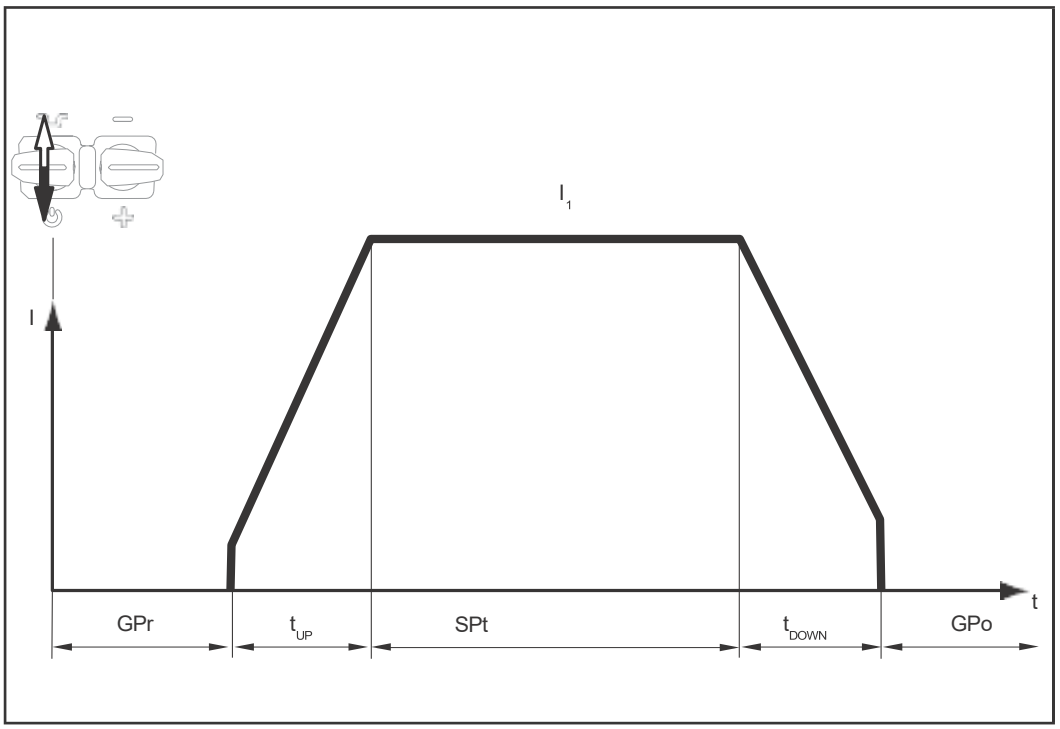
*) Intermediate lowering

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

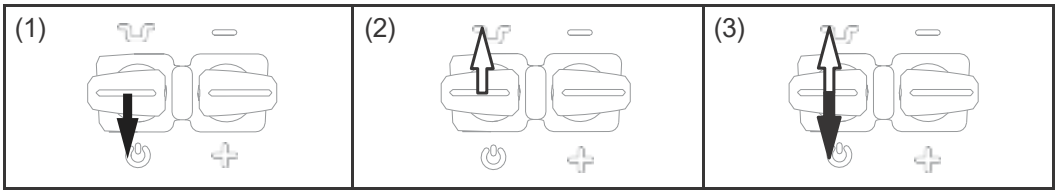
- To activate intermediate lowering, push the torch trigger forward and hold it in this position
- Release the torch trigger to resume the main current

Spot welding

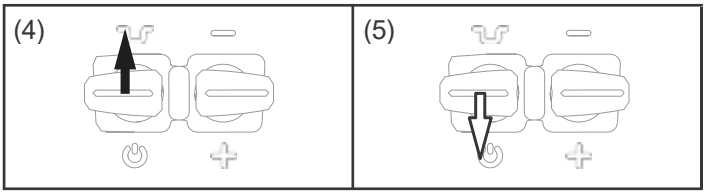
- Welding: Briefly pull back and hold the torch trigger
  The welding time (SPt) corresponds to the value of how long the torch trig- ger is held.
- Ending the welding process: Release the torch trigger



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 avail- able.

Preparation for TIG welding if there is a Multiprocess option for the welding ma- chine:

1. Set the power switch to - O - Unplug the
2. mains plug
3. Remove the MIG/MAG welding torch
4. Disconnect the polarity reverser from the welding machine Unplug the
5. return lead cable from the welding machine
6. Insert the return lead cable into the (+) current socket and lock Connect the other
7. 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 Screw the gas
10. 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

⚠ WARNING!

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- ▶ All the work and functions described in this document must only be car- ried out by technically trained and qualified personnel.
- ▶ Read and understand this document in full.
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⚠ CAUTION!

Danger of injury and damage to property from electric shock.
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- ▶ Ensure that the tungsten electrode is not touching anyone or any electric- ally 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 139 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 para- meters 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 ma- chine.

3 Set TIG welding parameters

The setting of the MIG/MAG welding parameters is described from page 140 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 202 on- wards.

5 Perform R/L adjustment
For details, see from page 200 onwards.

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

7 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: -

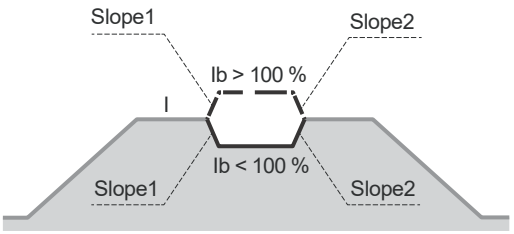
IMPORTANT! For welding torches with Up/Down function, the full setting range can be selected while the device is on standby.

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 op- erating 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 202.

Igniting the arc

General

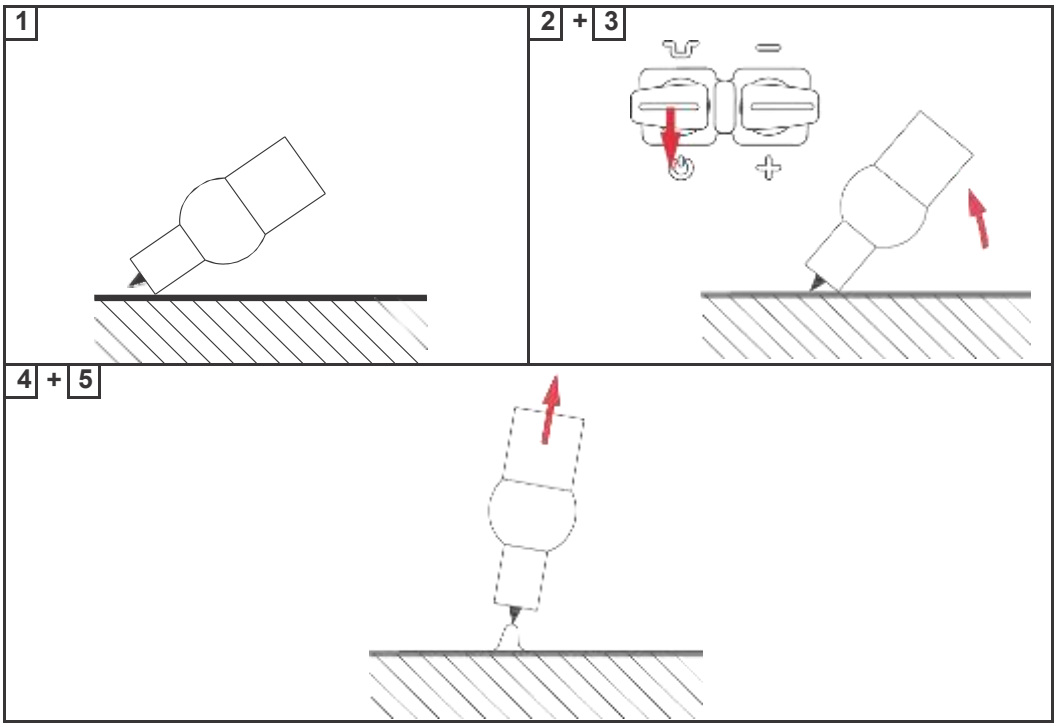
To ensure an optimal ignition sequence during TIG welding, the following must be taken into account for the welding machine:

- 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 ap- proximately 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

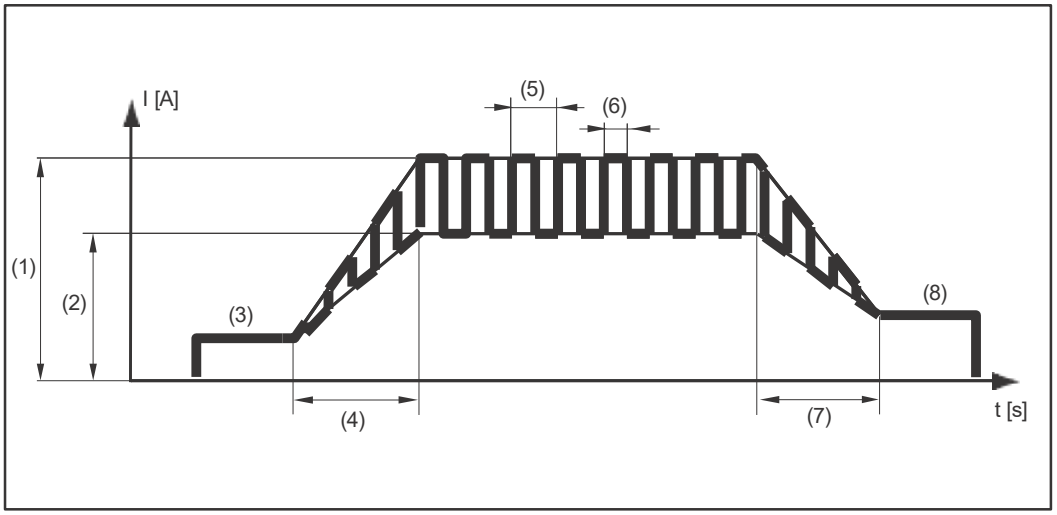
The welding current set at the start of welding may not always be ideal for the entire welding process:

- 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 fre- quency *
(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.

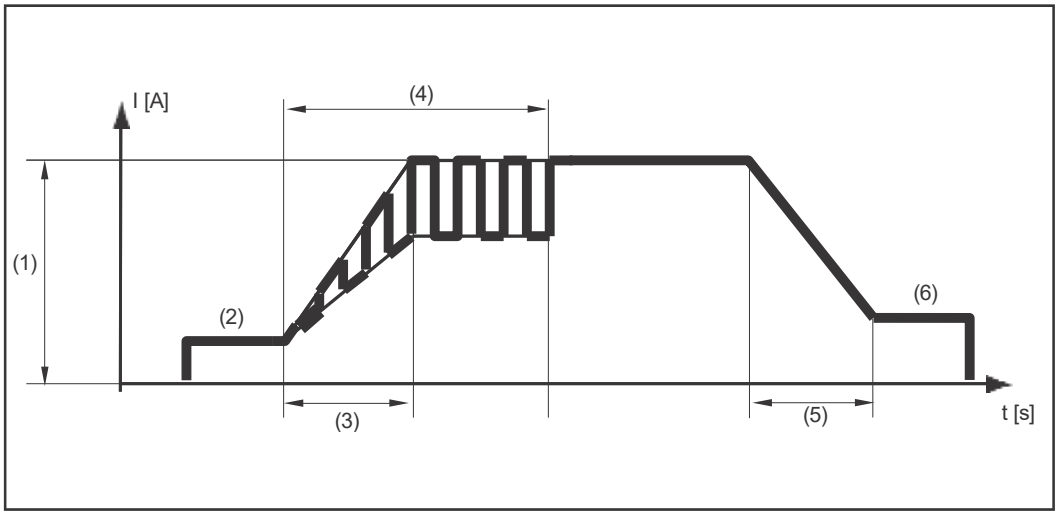
Tacking function

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 mer- ging 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 - Unplug
2. 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!**

Danger from incorrect operation and work that is not carried out properly.
This can result in serious personal injury and damage to property.

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

⚠ **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 139 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 automatic- ally 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 140 on- wards.
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 para- meters, see from page 206 onwards.
- For process parameters for CEL welding and setup parameters, see from page 209 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 cur- rent 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 neutraliza- tion
- Slag inclusions largely avoided

Starting current < 100%:
- Improvement of ignition properties with electrodes that ignite at a low weld- ing 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 206 onwards.

Welding parameters for CEL welding

For CEL welding, the following welding parameters can be set and displayed un- der "Welding":

Starting current
For setting a starting current value in the range 0-200% of the set welding cur- rent 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 206 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 cur- rent, e.g., for welding steel pipes when welding out of position or for welding thin sheet metal.

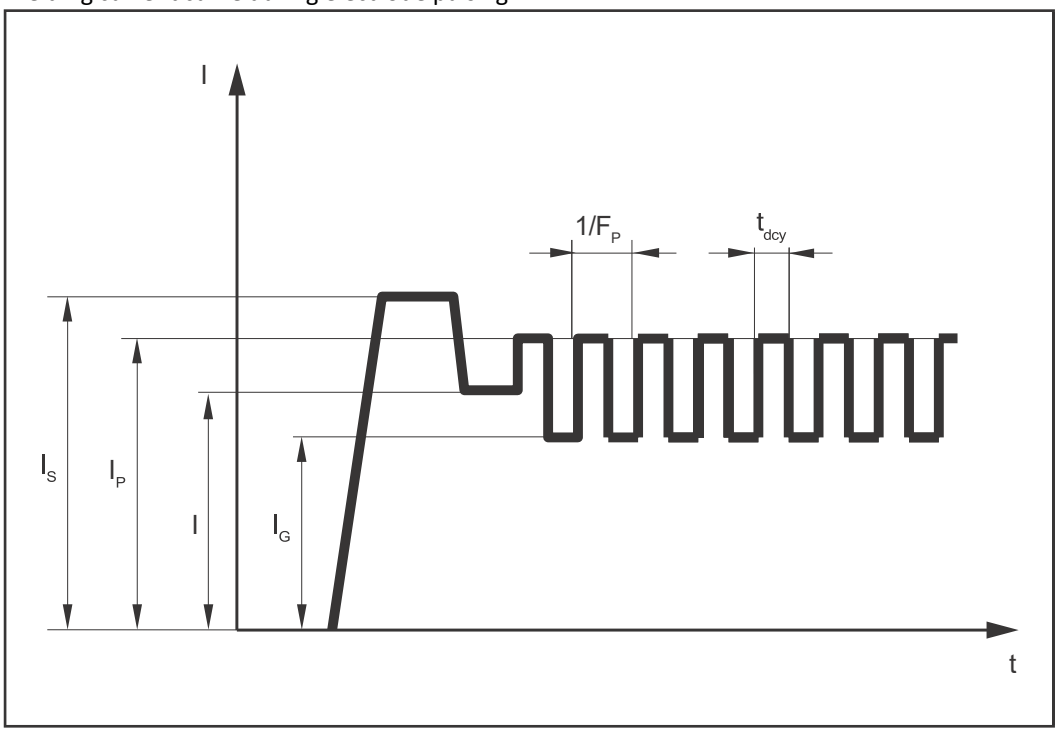
The welding current set at the start of welding may not always be ideal for the entire welding process:

- 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 fre- quency, t_{dcy} = time

NOTE!

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

Arc Air Gouging

Safety

⚠ WARNING!

Danger from incorrect operation and work that is not carried out properly.
This can result in serious personal injury and damage to property.

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

⚠ WARNING!

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

- ▶ Before carrying out maintenance or service work, switch off all devices and components involved and disconnect them from the power supply.
- ▶ Secure all devices and components involved against being switched on again.
- ▶ After opening the appliance, use a suitable measuring device to ensure that electrically charged components (e.g. capacitors) are discharged.

Preparation

IMPORTANT! A return lead cable with a cable cross-section of 120 mm² is re- quired for arc air gouging.

1. Set the power switch to - O - Unplug the
2. mains plug
3. Remove the MIG/MAG welding torch
4. Insert the return lead cable into the (-) current socket and lock Connect the other
5. 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 Insert the mains
9. 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 con- ductive or grounded parts (housing, etc.).

CAUTION!

Risk of personal injury due to loud operating noise.

▶ Use suitable hearing protection during arc air gouging!

1 Set the power switch to - I -

2 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 139 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 de- activated if present. It is not possible to turn it on.

NOTE!

Under certain circumstances, it may not be possible to change welding para- meters 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 ma- chine.

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 dia- meter 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 Initiate the

8 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 206.

Setup Menu

Overview

Accessing the Setup menu

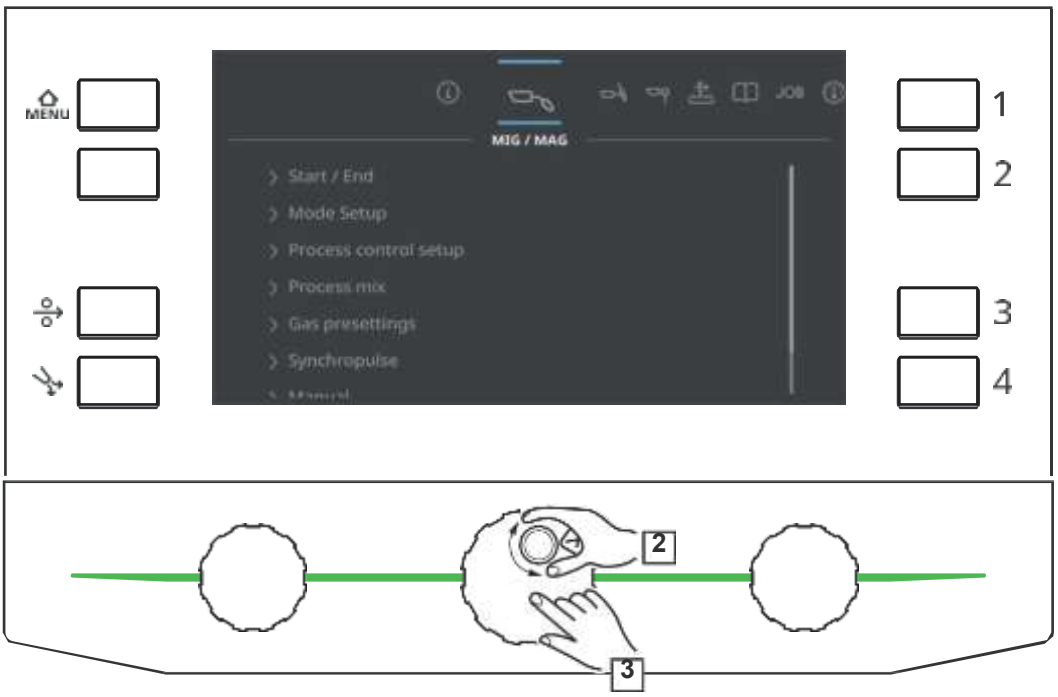
1 Press the Menu button

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 se- lected 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 dis- play between two blue lines.

MIG/MAG menu, parameter group Start / End selected

Opening parameter groups, setting paramet- ers

Opening the parameter group

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

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

Setting parameters

3 Turn middle the dial to select the desired parameter Press the
4 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 Press the middle
6 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 selec- tion 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 Press the
4 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 pro- cesses. 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 pro- cesses. 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 alu- minum)

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

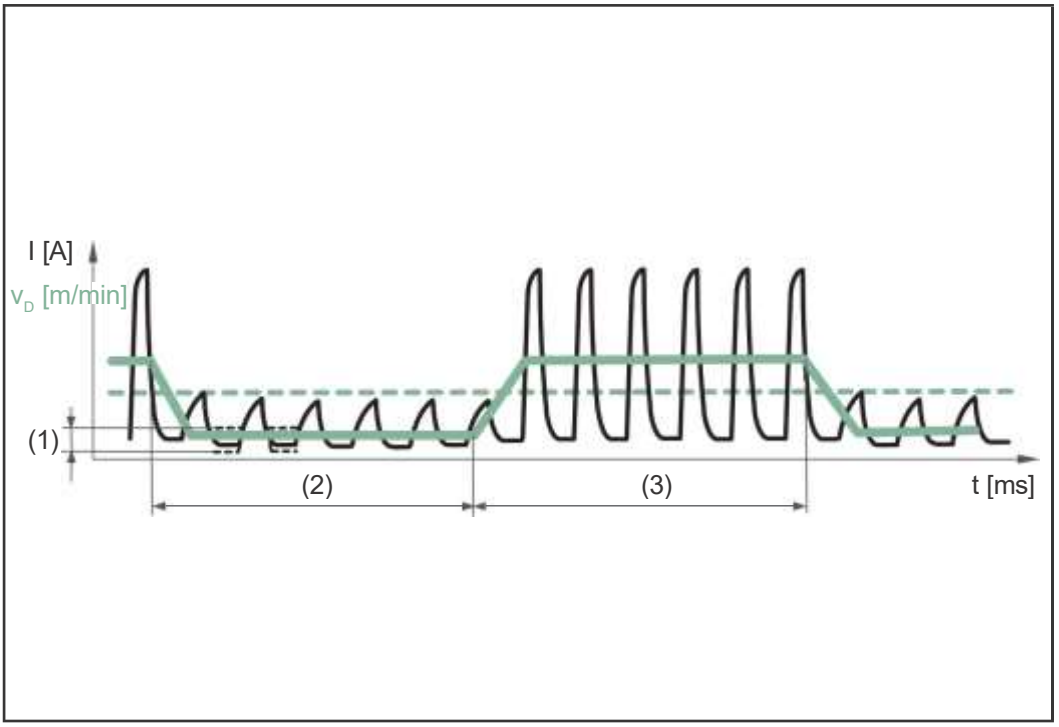
-10.0 – +10.0
Factory setting: 0

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.

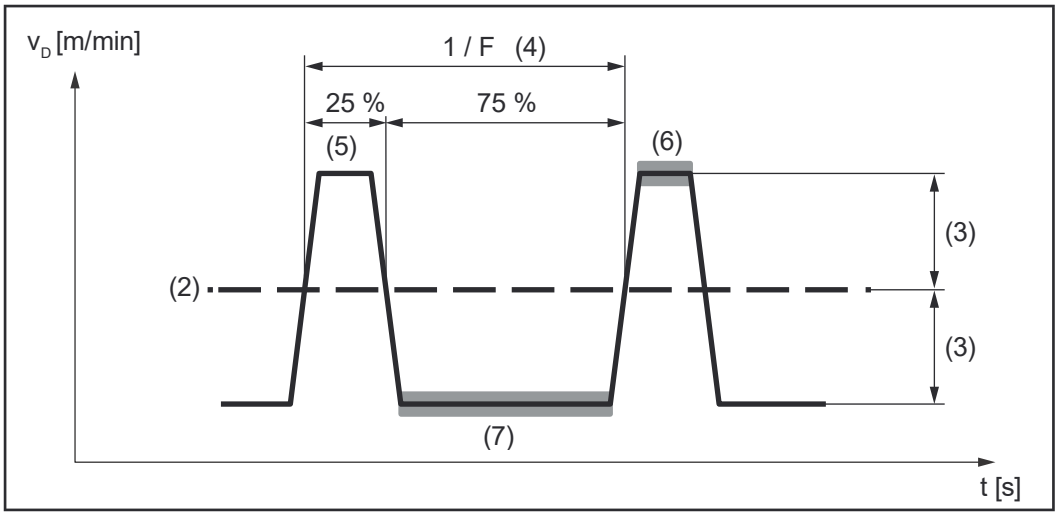
▶ The arc length correction is then no longer displayed in the welding para- meters.

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

-10.0 - +10.0

Factory setting: 0.0

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



Example: SynchroPulse, duty cycle (high) = 25% (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 95 or 115 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 determ- ined 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 weld- ing. 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

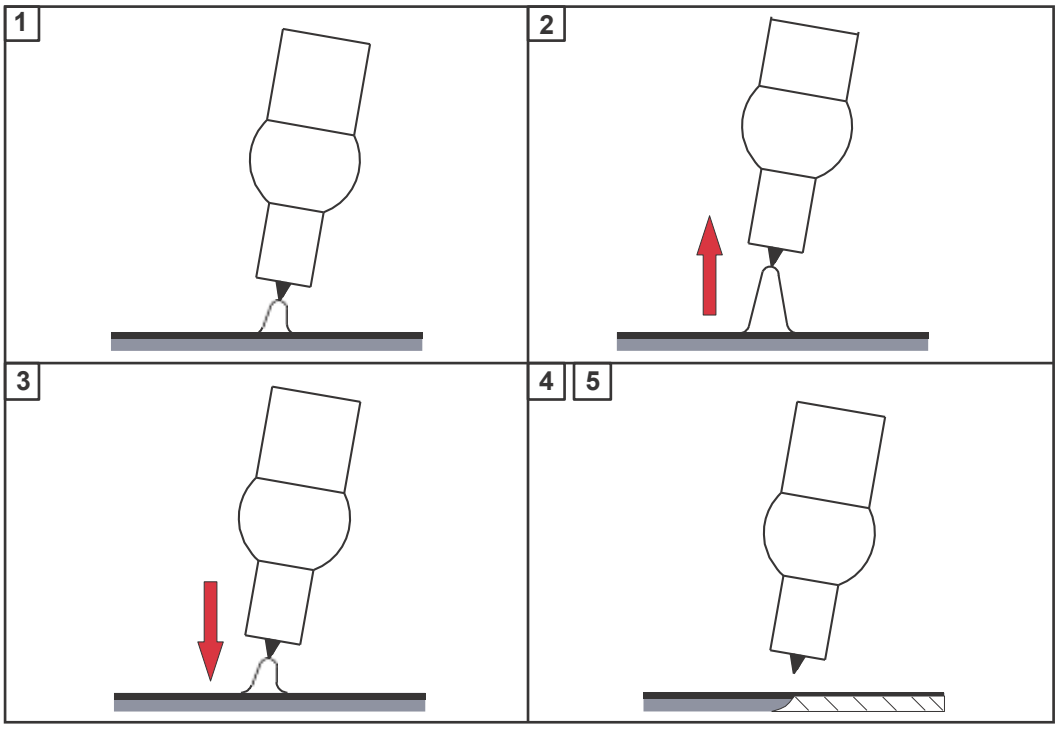
on
Welding is started by touching the workpiece with the tungsten electrode; especially suitable for welding torches without torch triggers, ignition sequence depends on ignition parameters

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 paramet- ers 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 set-tings

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

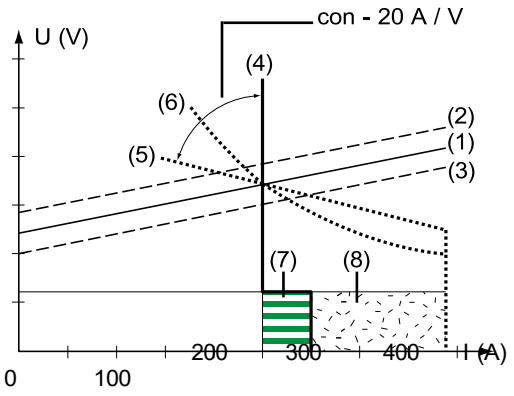
The arc length depends on the welding voltage. To end the welding process, a sig- nificant lifting of the stick electrode is usually required. The break voltage para- meter allows the welding voltage to be limited to a value, which permits the weld- ing process to be ended by only slightly lifting the 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" (con- stant welding current)
(5) Characteristic for selected parameter "0.1 - 20" (drooping characteristic with adjustable slope)
(6) Characteristic for selected parameter "P-constant" (con- stant 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

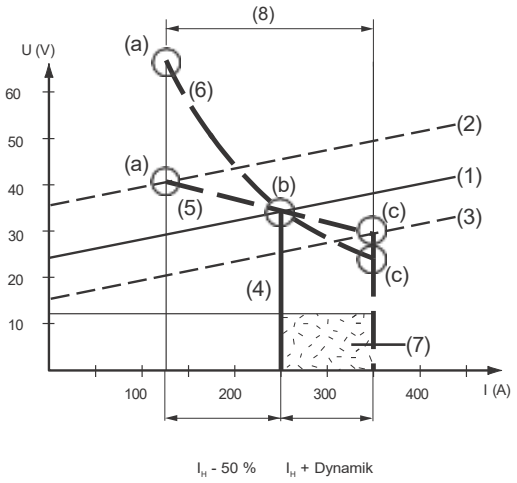
(constant welding current)

- If the "I-constant" parameter is set, the welding current is kept constant re- gardless 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 set- ting 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 elec- trodes.

P-constant (constant welding power)
- If the "P-constant" parameter is set, the welding power is kept constant re- gardless of the welding voltage and current. The result is a hyperbolic char- acteristic (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" (con- stant welding current)
(5) Characteristic for selected parameter "0.1 - 20" (drooping characteristic with adjustable slope)
(6) Characteristic for selected parameter "P-constant" (con- stant 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 weld- ing current.

With a fixed welding current (I_H), the operating point can travel along the charac- teristics (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 sig- nificant lifting of the stick electrode is usually required. The break voltage para- meter allows the welding voltage to be limited to a value, which permits the weld- ing 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 cool- ing unit:

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

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 temper- ature 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 dis- played.
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 warn- ing 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 be- low 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 ma- chine:

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 spe- cified 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

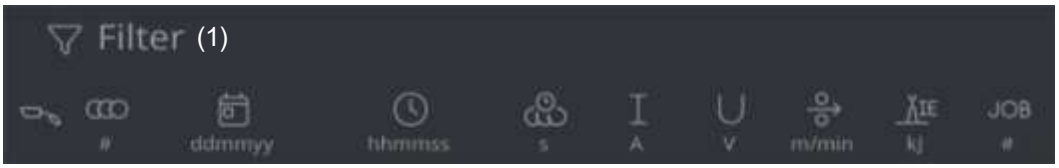
take place when idle or during welding.

on / off
Factory setting: off

Logbook

Viewing the logbook

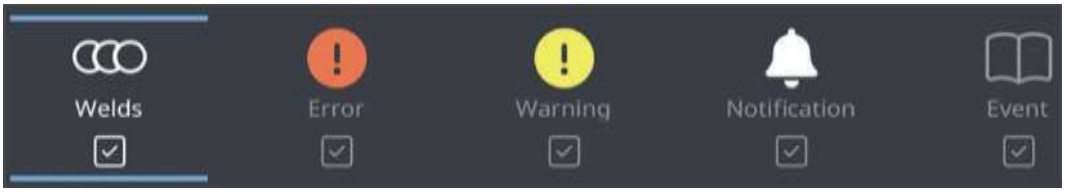
The following data are displayed in the logbook:



(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 193)
(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 dis- play.

Error:
Arc break monitoring is activated.
If the arc breaks off and there is no current flow within a set arc break time peri- od, 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 qualific- ation.

Explanation of terms

Administrator
An administrator has full access to all welding machine functions. An adminis- trator'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 func- tions to lock and unlock the welding machine (no user management, see also sec- tion "Locking and unlocking the welding machine using an NFC key", page 127).

Recommenda- tion 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 administrat- or 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 ad- ministrator key

NOTE!

If an NFC key is assigned to the predefined "Admin" user in User Manage- ment, then User Management is activated.

1 Select User Management in the Setup menu

2 Turn a selection dial and select Activate User Management Press a selection

3 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 confirma- tion of recognition.

The NFC key is assigned to the predefined "Admin" user, and User Manage- ment 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 Press a
2 selection dial
3 Turn the middle selection dial and select new user Press the
4 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" Press the
8 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 confirma- tion that it has been recognized.

The NFC key will be assigned to the new user.

* Explanation of text input on page 223, 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 223, 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* Turn the

8 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 confirma- tion that it has been recognized.

The NFC key will be assigned to the new user.

* Explanation of text input on page 223, step 2

Editing roles or users

1 Once User Management is activated, turn a selection dial and select the fol- lowing:
User ... to change an existing user
Role ... to change an existing role Press a

2 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 dis- played.

5 Turn the middle selection dial and select the data to be changed Press the middle

6 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 fol- lowing:
User ... to delete an existing user
Role ... to delete an existing role Press

2 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 Press the right-

4 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 **Deactiv- ate 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 127).

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 Press the
2 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
... Delete text to the right of the cursor ...
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 adminis- trator 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 Turn the middle

7 selection dial and select **Test**

8 Press the middle selection dial to start the time synchronization Press the right-

9 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 Turn the

3 middle selection dial to select the desired value Press the middle

4 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 trade- marks 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 Press the
4 middle dial
5 Select a password and enter it using text input Press the
6 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 Press the
3 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 para- meter
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 Press the
2 middle selection dial
3 Enter the desired text using the text input (max. 30 characters) Press the
4 right-hand selection dial (**OK**) to confirm the text Press the right-hand
5 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 set- tings

SmartManager – the welding ma- chine website

SmartManager – the welding machine website

General

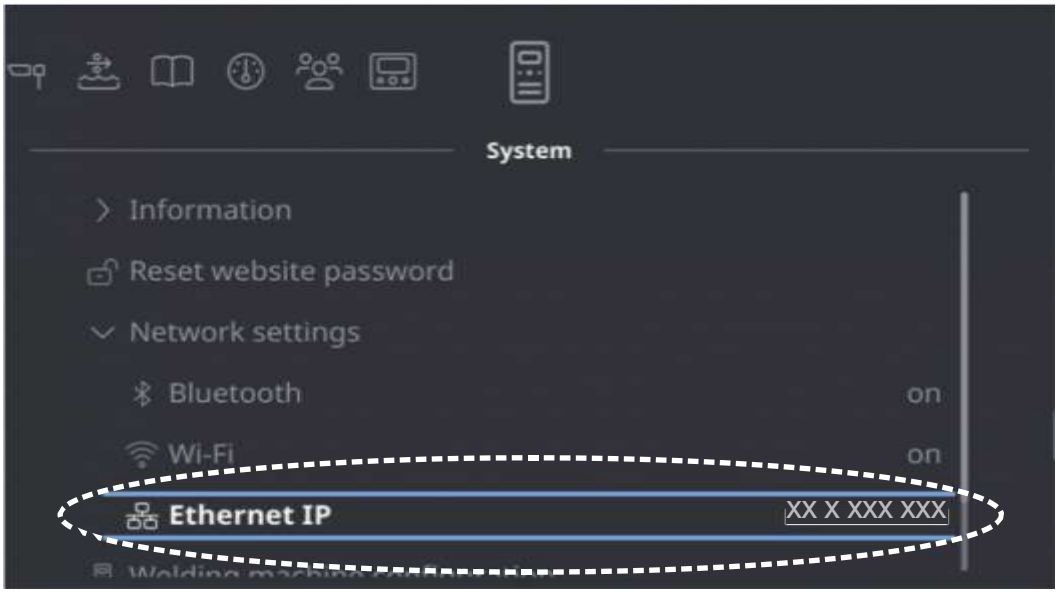
With the SmartManager, the welding machines have their own website.
Once the OPT/s Ethernet option is installed on the welding machine, the welding machine can be connected to a computer via WLAN or a network cable, or integ- rated into a network.
The SmartManager of the welding machine can be accessed 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 log- ging 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 Enter user

3 name and password

Factory setting: User
name = admin Password
= admin

4 Confirm the displayed message

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?" Create a
2 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

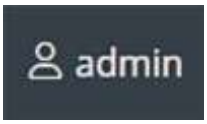
4 Save the unlock file to the computer Click
5 on "Find unlock file"
6 Save the unlock file
7 Click on "Load unlock file"

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 226).

Changing the password/ logging out



Click on this symbol to
- change the user password
- log out of the SmartManager

Changing the password for the SmartManager:

1 Enter the old password Enter a
2 new password Repeat the new
3 password Click on "Store"
4

Settings

Click on this symbol to expand the display of characteristics, material specifica- tions and certain welding parameters on the SmartManager for the welding ma- chine.

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.

Bahasa Indonesia	Čeština	Dansk
Deutsch	Eesti	English
Español	Français	Hrvatski
Íslenska	Italiano	Latviešu
Lietuviškas	Magyar	Nederlands
Norsk	Polski	Português
Română	Slovenščina	Slovenský
Srpski jezik	Suomi	Svenska
tiếng Việt	Türkçe	български език
Русский	Українська	हिन्दी
ଓଡ଼ିଆ	தமிழ்	ไทย
한국어	中文	日本語

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

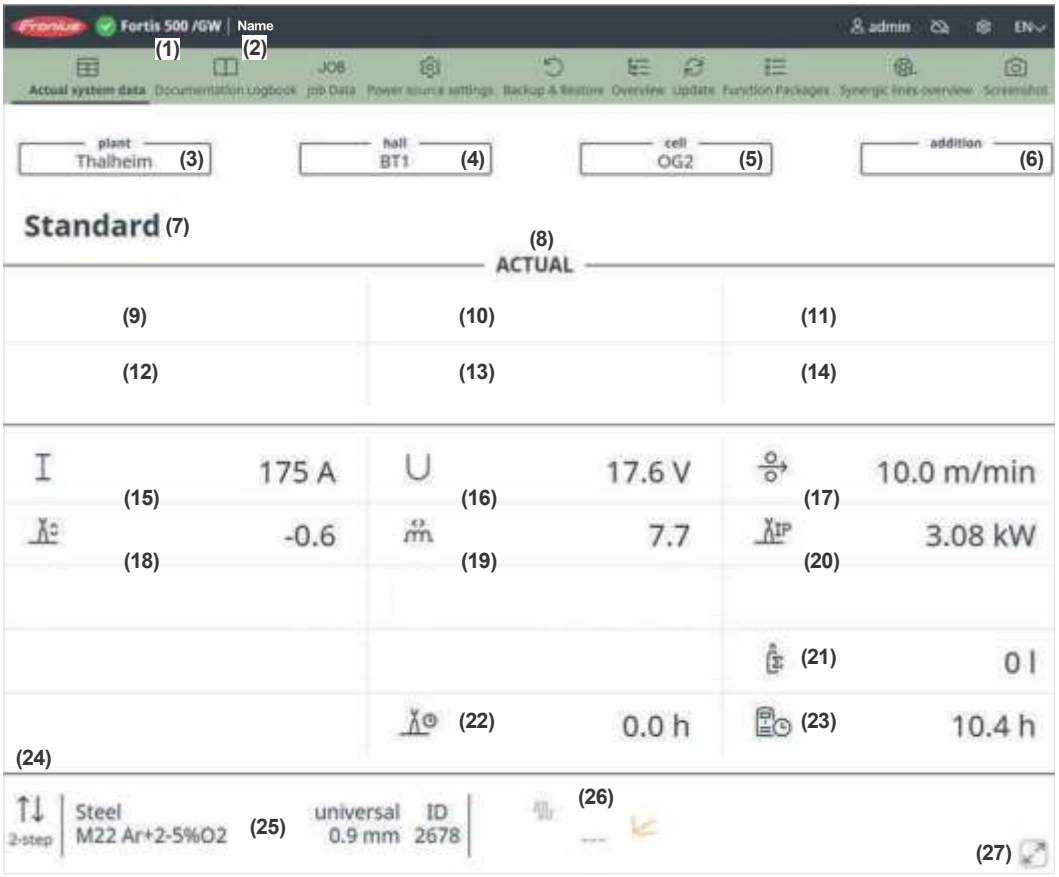
Current system data

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 consump- tion
(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 log- book 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 weld- ing machine.

Basic settings

The sampling rate for documentation can be activated and set in the basic set- tings.
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 sys- tem, provided the OPT/s Jobs option is available on the welding machine.

1 Click on "Find job file" Select the

2 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 Click on

2 "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 ex- ported as PDF or CSV files.
For CSV export, the OPT/s Jobs option must be available on the welding ma- chine.

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 Save changes
3

Designation & location

The welding machine configuration can be viewed and modified under Designa- tion & location.

Parameter display

Welding parameters and special functions for the welding machine can be set un- der Parameter display.

1 Select parameter/function (tick) Save
2 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 set- tings, 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 ma- chine

2 Select the file and click on "Open"

The selected backup file appears in the SmartManager for the welding ma- chine 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 set- tings:
- Server
- Port
- User
- Password

5 Save changes

6 Activate automatic backup

If you have any questions about configuration, contact your network administrat- or.

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 Save the
3 changes

Deleting a user:

1 Select a user
2 Click on the "Delete user" button Confirm
3 the prompt with "OK"

Creating a user:

1 Click on the "Create new user" button Enter user
2 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 Save the
3 changes

The "Administrator" role cannot be changed.

Deleting a user role:

1 Select a user role
2 Click on the "Delete user role" button Confirm the
3 prompt with "OK"

The "Administrator" and "locked" roles cannot be deleted.

Creating a user role:

1 Click on the "Create new user role" button Enter a
2 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" Select the
2 file and click on "open" Click on "import"
3
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 num- ber, production date, etc.
Expanding all groups/ collapsing all groups	Click on the "Expand all groups" button to see further details about the individu- al 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 com- ponents.
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 Select the
3 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
2 After clicking on "Find update file", select the desired firmware (*.ffw) Click on "Open"

The selected update file appears in the SmartManager for the welding ma- chine 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 sys- tem.

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, re- store
- 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 Click on
2. "Find function package file"
3. Select the desired function package file (*.xml) Click on
4. "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 in- formation.

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 sav- ing 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.

Safety

⚠ WARNING!

Danger from electric current.
This can result in serious personal injury and damage to property.
- ▶ Before carrying out maintenance or service work, switch off all devices and components involved and disconnect them from the power supply.
- ▶ Secure all devices and components involved against being switched on again.
- ▶ After opening the appliance, use a suitable measuring device to ensure that electrically charged components (e.g. capacitors) are 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 oth- er 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 ex- tinguished. 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 Check
Remedy: mains lead, if necessary insert mains plug

Cause: Mains socket or mains plug faulty Replace
Remedy: 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 Observe the
Remedy: 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 Contact
Remedy: 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 Replace the
Remedy: welding torch

No function after pressing torch trigger

Power switch switched on; displays and indicators light up

Cause:	Control plug not plugged in Plug in
Remedy:	control plug
Cause:	Welding torch or welding torch control line faulty Replace the
Remedy:	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 Change gas
Remedy:	cylinder
Cause:	Gas pressure regulator faulty
Remedy:	Replace gas pressure reducer
Cause:	Gas hose not attached, or damaged Attach or
Remedy:	replace gas hose
Cause:	Welding torch faulty Change
Remedy:	welding torch
Cause:	Gas solenoid valve faulty Inform
Remedy:	the service team

Poor-quality weld properties

Cause: Wrong welding parameters, wrong correction parameters Check settings

Remedy:

Poor ground earth connection Establish good

Cause: contact with workpiece

Remedy:

Several welding machines welding one part

Cause: Increase distance between hosepacks and return lead cables; Do not use a common ground.

Remedy:

Too little or no shielding gas

Cause: Check pressure regulator, gas hose, gas solenoid valve, welding torch gas connection, etc.

Remedy:

Welding torch leaks Change

Cause: welding torch

Remedy:

Incorrect or heavily worn contact tip Change

Cause: contact tip

Remedy:

Incorrect wire alloy or incorrect wire diameter Check wire

Cause: electrode in use

Remedy:

Incorrect wire alloy or incorrect wire diameter Check the

Cause: weldability of the base material

Remedy:

Shielding gas not suitable for wire alloy Use

Cause: correct shielding gas

Remedy:

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: Remedy:

Remedy:

Cause:

Remedy:

Cause:

Remedy:

Cause:

Remedy:

Cause:

Braking force has been set too high Loosen the b	rake

Contact tip hole too narrow Use suitable contact tip

Faulty inner liner in welding torch
Check the inner liner for kinks, dirt, etc. and replace if necessary

Feed rollers not suitable for wire electrode used Use suitable feed rollers

Incorrect contact pressure of feed rollers 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 Observe

Remedy: 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 259.

Troubleshooting the cooling unit

Coolant flow too low / no coolant flow

Cause: Coolant level too low Top up

Remedy: coolant

Cause: Constriction or foreign body in the cooling circuit Remove

Remedy: 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 Clean coolant

Remedy: filter using clean tap water or change filter insert

Cause: Coolant pump defective Contact

Remedy: After-Sales Service

Coolant flow too low / no coolant flow

Cause: Coolant pump jammed Contact

Remedy: After-Sales Service

Cooling capacity too low

Cause: Cooler or air filter dirty

Remedy: Purge cooler with dry compressed air (see from page 268 onwards) Clean air filter (see from page 265 onwards)

Cause: Fan faulty

Remedy: Contact After-Sales Service

Cause: Coolant pump defective Contact

Remedy: 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 nor- mal operating conditions. However, some important points must be noted to en- sure that the welding system remains in a usable condition for many years.

Safety

⚠ WARNING!

Danger from electric current.
This can result in serious personal injury and damage to property.
- ▶ Before carrying out maintenance or service work, switch off all devices and components involved and disconnect them from the power supply.
- ▶ Secure all devices and components involved against being switched on again.
- ▶ After opening the appliance, use a suitable measuring device to ensure that electrically charged components (e.g. capacitors) are 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 oth- er screws without a reliable ground conductor connection.

⚠ CAUTION!

Danger due to hot components and parts.
This can result in burns.
- ▶ Leave hot components and parts such as welding torches to cool before working on them.

Original spare and wear parts

It is impossible to guarantee that third-party parts are designed and manufac- tured to meet the demands made on them, or that they satisfy safety require- ments.
- 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, intercon- necting 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 weld- ing system are tightened
- Check if all welding system coolant connections are leak-tight

---

Once a week

- The device must be examined for externally detectable damage and func- tionality 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 insuffi- cient material compatibility.

Every 2 months

- Clean air filter
- Clean the coolant return filter on the outside of the unit and replace the fil- ter 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 dis- tance.

- 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 121 onwards.

Every 24 months

- Change the coolant (in 1-shift operation with FCL 10/20 coolant)

If necessary: changing the display protector

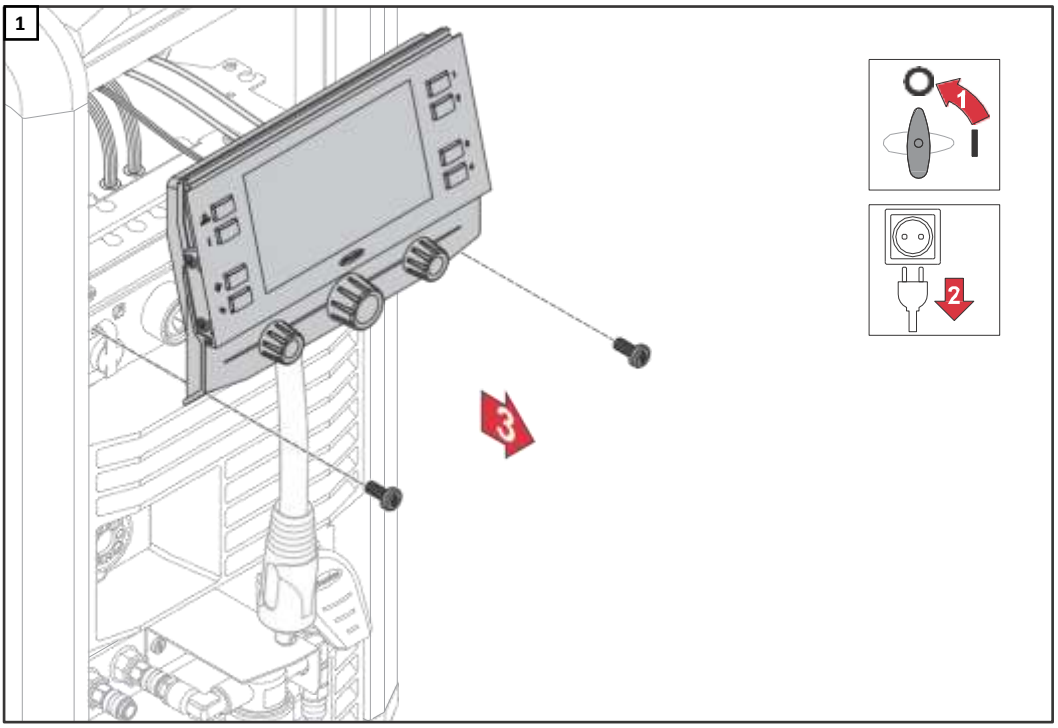
In the event of heavy soiling, the display protector can be changed as follows:

⚠ WARNING!

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

- ▶ Before carrying out maintenance or service work, switch off all devices and components involved and disconnect them from the power supply.
- ▶ Secure all devices and components involved against being switched on again.
- ▶ After opening the appliance, use a suitable measuring device to ensure that electrically charged components (e.g. capacitors) are discharged.

1



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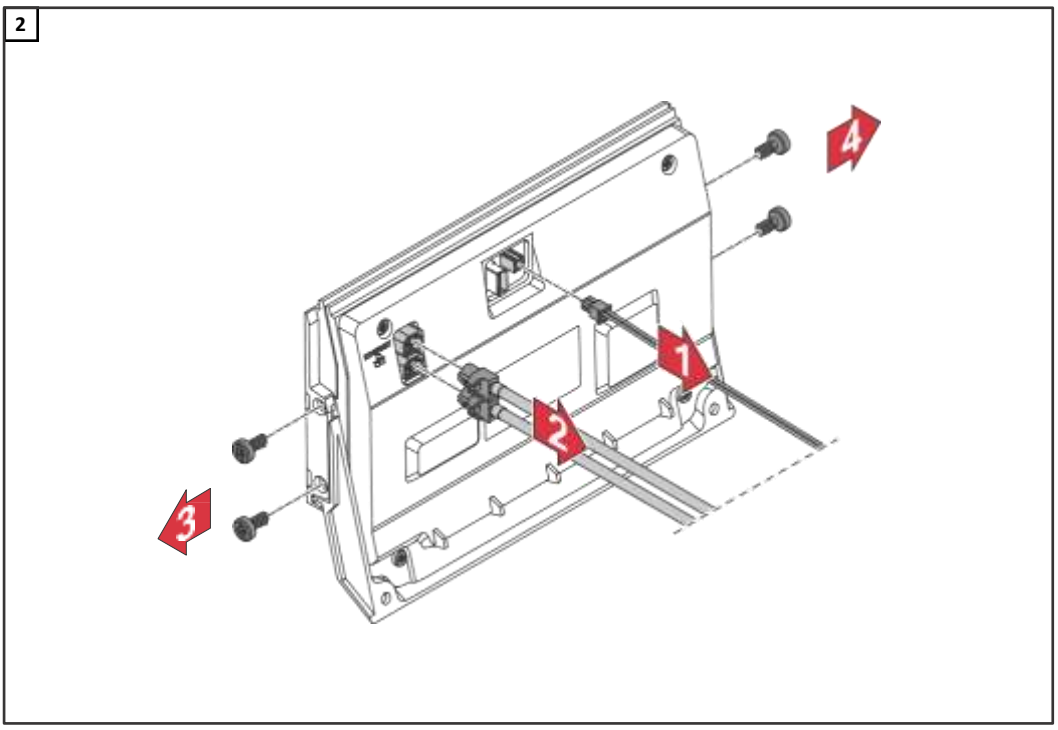

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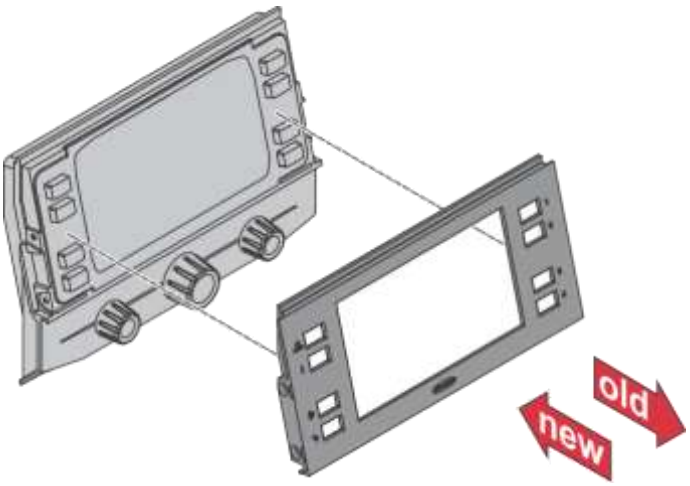

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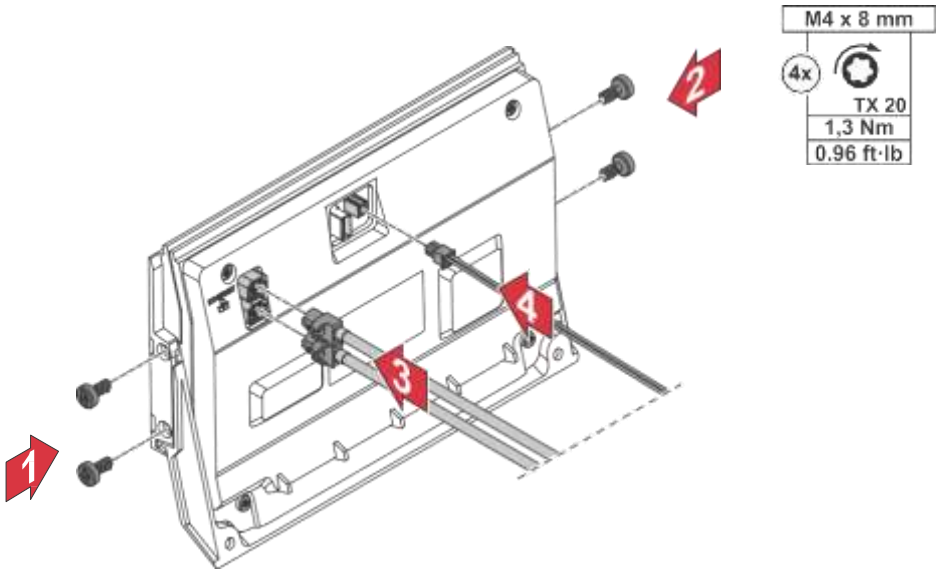
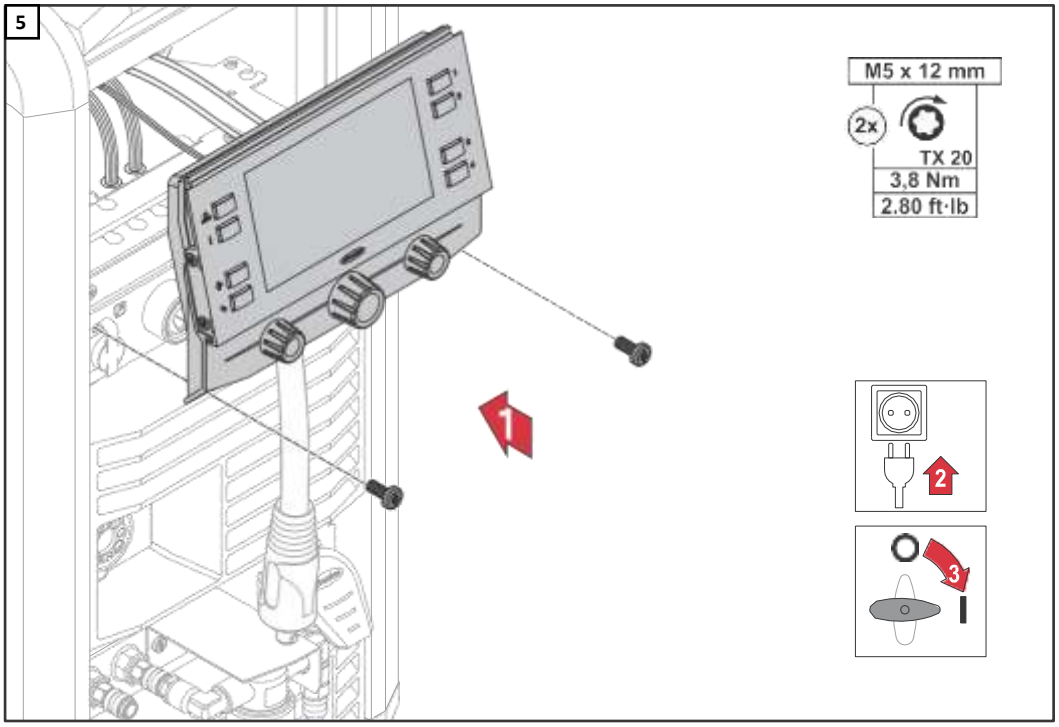
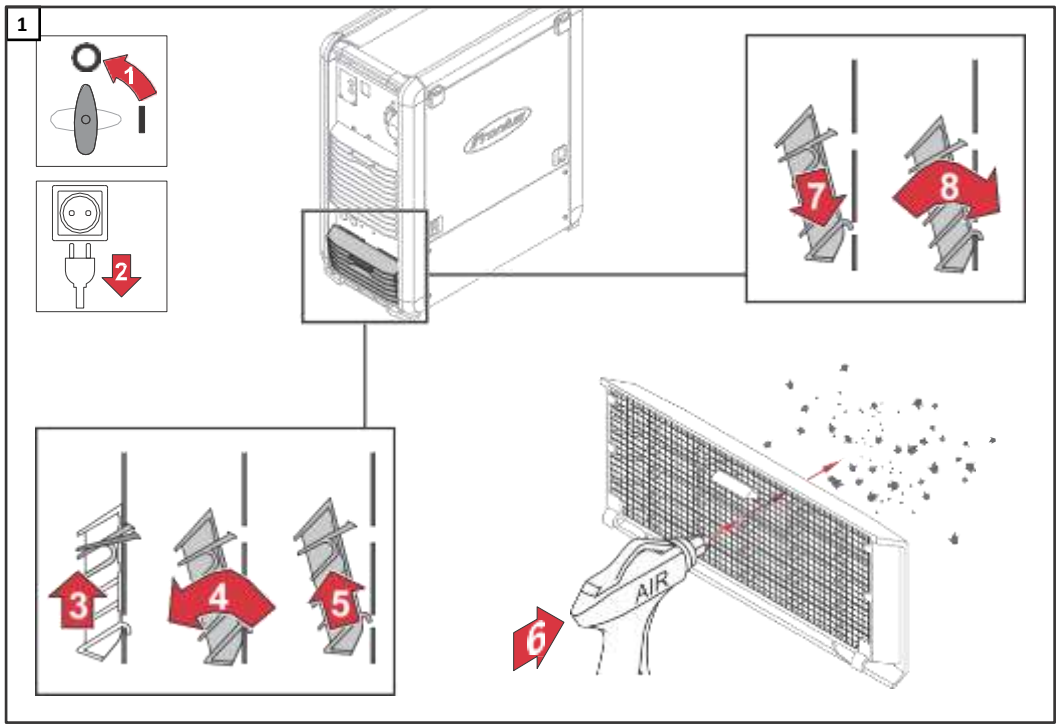




Cleaning the air filter

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!



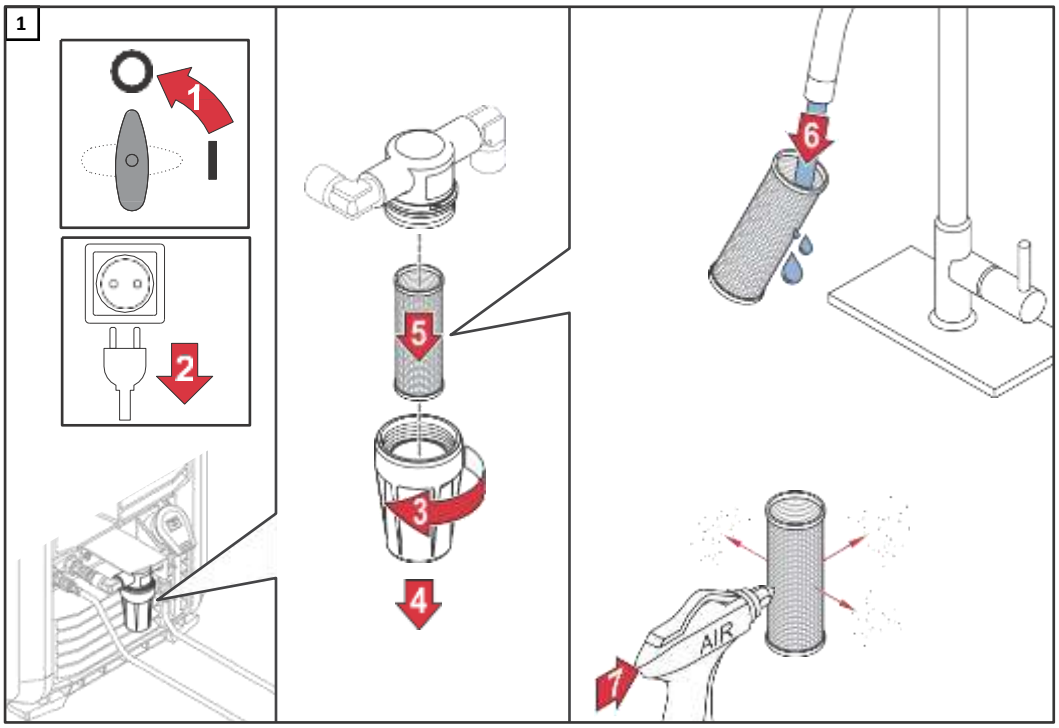
Cleaning the cooling unit fil- ter

⚠ CAUTION!

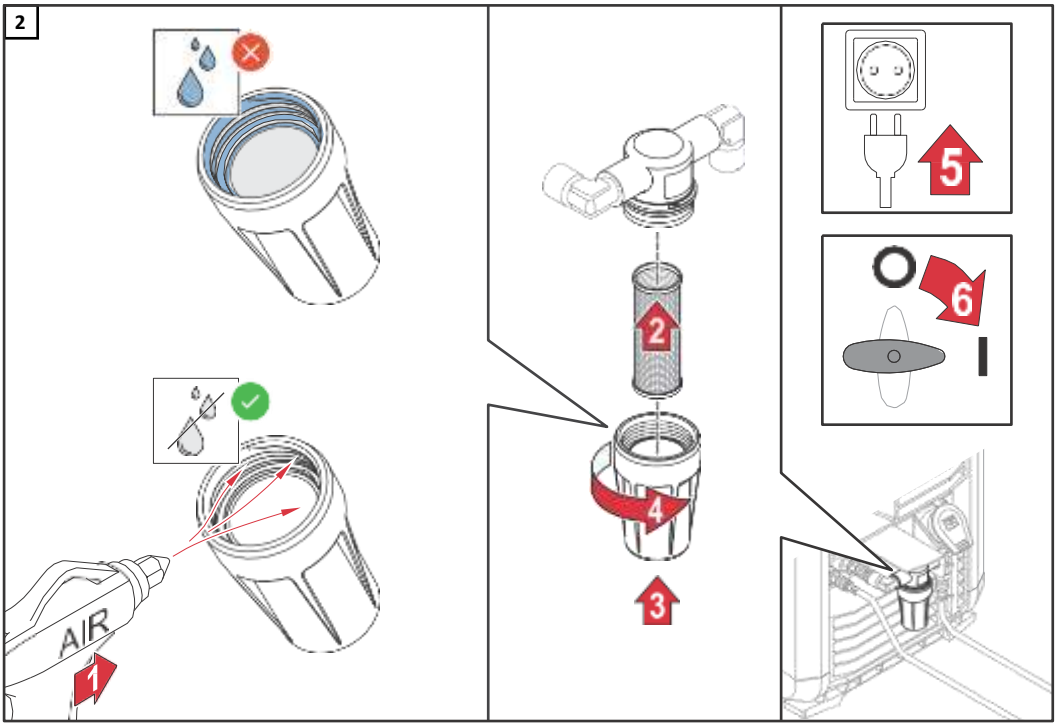
Danger due to coolant escaping.
Personal injury and damage to property may result.
- ▶ If coolant ends up on the outside of the device, this should be removed immediately. Make sure that no coolant ends up on the inside of the cooling unit.
- ▶

⚠ 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.



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

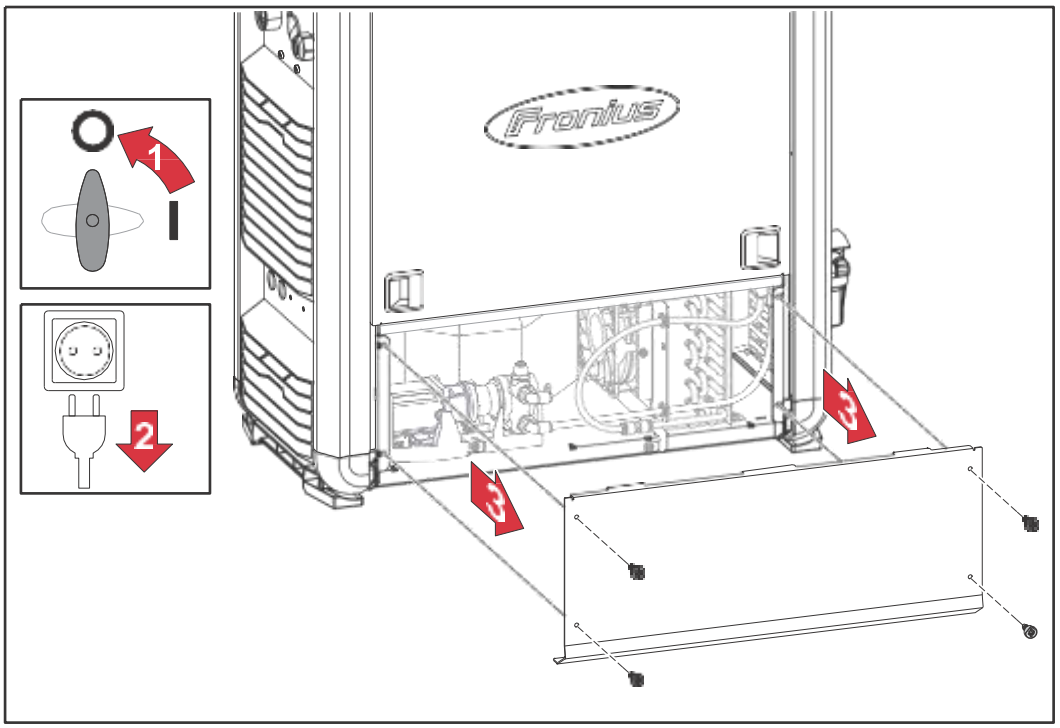
Purging the cooler

⚠ CAUTION!

Danger from compressed air.
Damage to electronic components may result.
▶ 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.

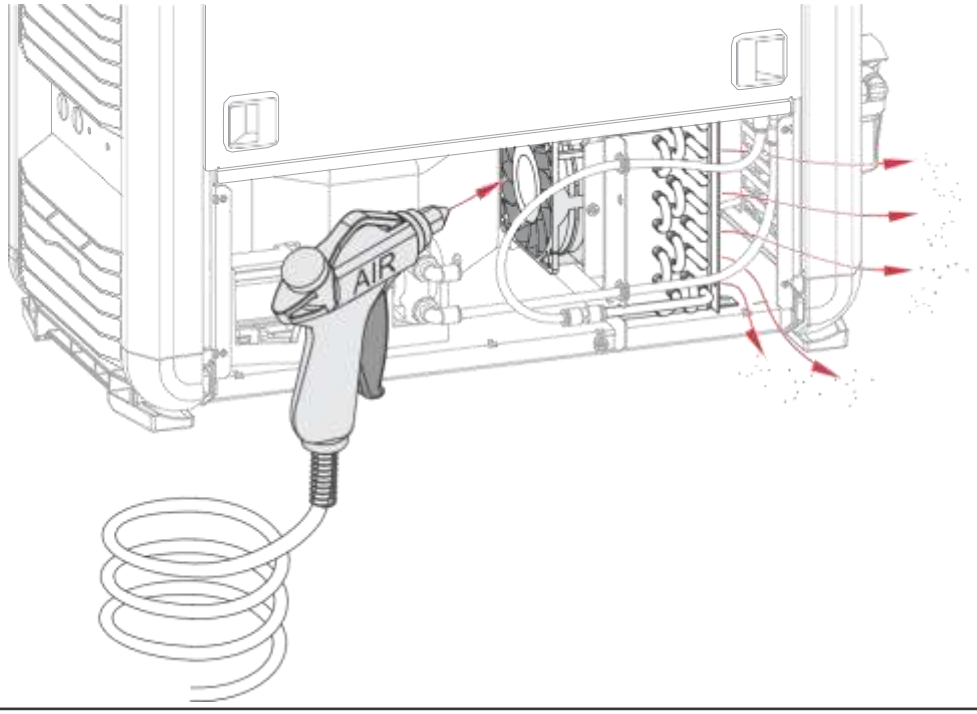


1

NOTE!

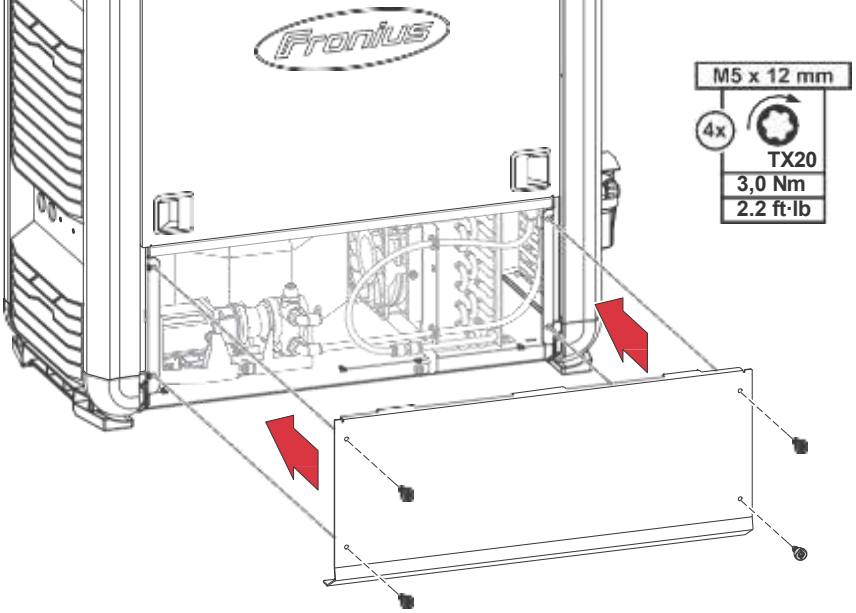
When purging the cooler, hold the fan impeller firmly to avoid damaging the fan.

2



Blow dry, reduced compressed air through the cooler to clean it.
If there is a large accumulation of dust, also blow dry, reduced compressed air through the inside of the device

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 ma- chine

3 Open the welding machine SmartManager (see page231) Transfer the

4 firmware to the welding machine (see page248)

Safety inspection

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

The manufacturer recommends calibrating welding systems within the same 12- month interval.

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

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

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

Disposal

Waste electrical and electronic equipment must be collected separately and re- cycled in an environmentally sound manner in accordance with the European Dir- ective 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

Saving an EasyJob

EasyJob = saving current welding settings

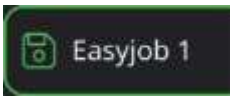
The saved EasyJob can be accessed at any time by pressing a button.

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 set- tings

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.

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 shield- ing gas con- sumption during MIG/MAG weld- ing

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 shield- ing gas con- sumption 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

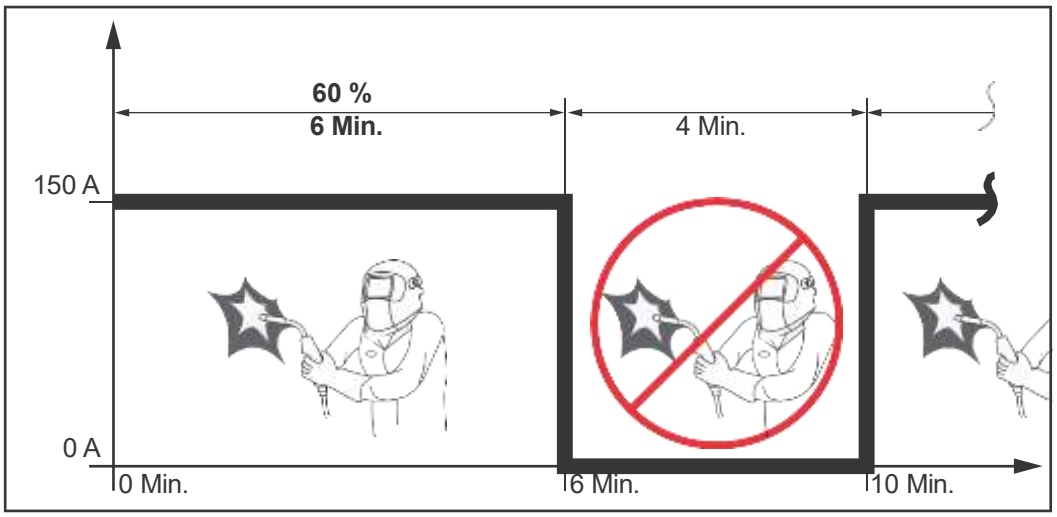
Explanation of the term duty cycle

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 ac- cordingly.

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 pro- duction = **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 cir- cuit 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	50 W
Welding machine efficiency at 320 A / 32.8 V	85%

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 ra- diated 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 cir- cuit 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	50 W
Welding machine efficiency at 320 A / 32.8 V	85%

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 ra- diated 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 cir- cuit 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

1)	Interface to a 230/400-V and 50-Hz public grid	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	23.5 W
Welding machine efficiency at 320 A / 32.8 V	88%

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 ra- diated 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 cir- cuit 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	50 W
Welding machine efficiency at 320 A / 32.8 V	85%

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 ra- diated 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 cir- cuit 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	50 W
Welding machine efficiency at 320 A / 32.8 V	85%

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 ra- diated 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 cir- cuit 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

1)	Interface to a 230/400-V and 50-Hz public grid	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	50 W
Welding machine efficiency at 320 A / 32.8 V	85%

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 ra- diated 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 cir- cuit 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.

Welding machine efficiency at 320 A / 32.8 V	85%
Idle state power consumption at 400 V	50 W

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 ra- diated 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 cir- cuit 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.

Welding machine efficiency at 320 A / 32.8 V	85%
Idle state power consumption at 400 V	50 W

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 ra- diated radio frequencies.

Fortis 320 C /GW/XT/nc

Welding machine efficiency at 320 A / 32.8 V	85%
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 cir- cuit 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	50 W
Welding machine efficiency at 320 A / 32.8 V	85%

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 ra- diated 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 cir- cuit 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.

Welding machine efficiency at 320 A / 32.8 V	89%
Idle state power consumption at 400 V	26.9 W

Welding machine efficiency at 320 A / 32.8 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 ra- diated 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 cir- cuit 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.

Welding machine efficiency at 320 A / 32.8 V	89%
Idle state power consumption at 400 V	26.9 W

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 ra- diated radio frequencies.

Fortis 400
C /GW /XT /nc

Welding machine efficiency at 320 A / 32.8 V	89%
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 cir- cuit 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	26.9 W
Welding machine efficiency at 320 A / 32.8 V	89%

The wire drive of the Fortis 400 C /GW/XT/nc is integrated in the welding ma- chine.

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 ra- diated 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
Max. permitted grid impedance Z_{max} on PCC[1)]	-
Recommended residual-current cir- cuit 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 [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	41.3 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.

Welding machine efficiency at 320 A / 32.8 V	89%
Idle state power consumption at 400 V	26.9 W

Welding machine efficiency at 320 A / 32.8 V	89%

The wire drive of the Fortis 400 C /GW/600/nc is integrated in the welding ma- chine.

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 ra- diated 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 cir- cuit 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 360 A / 34.4 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 ra- diated 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 cir- cuit 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.

Welding machine efficiency at 360 A / 34.4 V	89%
Idle state power consumption at 400 V	27.8 W

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 ra- diated radio frequencies.

Fortis 500 C /GW /XT /nc

Welding machine efficiency at 360 A / 34.4 V	89%
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 cir- cuit 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 360 A / 34.4 V	89%

The wire drive of the Fortis 500 C /GW/XT/nc is integrated in the welding ma- chine.

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 ra- diated 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
Max. permitted grid impedance Z_{max} on PCC[1)]	-
Recommended residual-current cir- cuit 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 [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	41.3 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.

Idle state power consumption at 400 V	27.8 W

Welding machine efficiency at 360 A / 34.4 V	89%

The wire drive of the Fortis 500 C /GW/600/nc is integrated in the welding ma- chine.

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 ra- diated 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 cir- cuit 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 240 A / 19.6 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 ra- diated 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 cir- cuit 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 240 A / 19.6 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 ra- diated 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 cir- cuit 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 210 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 ra- diated 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 cir- cuit 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 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 ra- diated 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 cir- cuit 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 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 ra- diated 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 cir- cuit 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 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 ra- diated 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
Max. permitted grid impedance Z_{max} on PCC[1)]	-
Recommended residual-current cir- cuit 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 [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	38.7 kg / 85.32 lb. 42.6 kg / 93.92 lb. 44.7 kg / 98.55 lb.
Max. noise emission (LWA)	< 80 dB (A)
Idle state power consumption at 400 V	26.9 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 ra- diated 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 cir- cuit 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 360 A / 34.4 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 ra- diated 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 cir- cuit 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 360 A / 34.4 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 ra- diated 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 cir- cuit 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 360 A / 34.4 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 ra- diated 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
Max. permitted grid impedance Z_{max} on PCC[1)]	-
Recommended residual-current cir- cuit 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 [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	38.7 kg / 85.32 lb. 42.6 kg / 93.92 lb. 44.7 kg / 98.55 lb.
Max. noise emission (LWA)	< 80 dB (A)
Idle state power consumption at 400 V	27.8 W
Welding machine efficiency at 360 A / 34.4 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 ra- diated 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 lb.)
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

CE

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

FCC/ ISED

FCC ID: QKWACU1
IC: 12270A-ACU1

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s).
Operation is subject to the following two conditions:
1 . This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada
applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :
1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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At www.fronius.com/contact you will find the contact details of all Fronius subsidiaries and Sales & Service Partners.