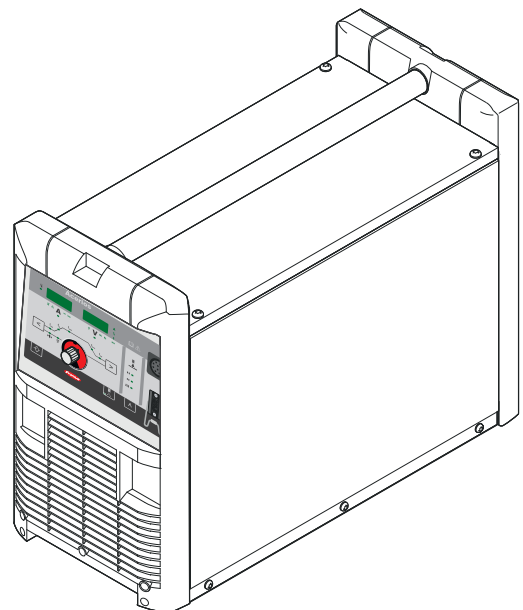


Operating Instructions

Acerios



EN-US | Operating instructions



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Safety Instructions

Explanation of Safety Instructions

DANGER!

Indicates an immediate danger.

- ▶ Death or serious injury may result if appropriate precautions are not taken.
-

WARNING!

Indicates a possibly dangerous situation.

- ▶ Death or serious injury may result if appropriate precautions are not taken.
-

CAUTION!

Indicates a situation where damage or injury could occur.

- ▶ Minor injury or damage to property may result if appropriate precautions are not taken.
-

NOTE!

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

General

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

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

All persons involved in the commissioning, operation, maintenance, and servicing of the device must

- be suitably qualified,
 - have knowledge of plasma surface treatment and
 - have completely read and followed these Operating Instructions.
-

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

All safety and danger notices on the device must

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

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

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

Your personal safety is at stake!

Intended Use	<p>The device is to be used exclusively for its intended purpose.</p> <hr/> <p>The device is intended exclusively for the process specified on the rating plate. Utilization for any other purpose, or in any other manner, shall be deemed to be "not in accordance with the intended purpose". The manufacturer accepts no liability for any damage resulting from improper use.</p> <hr/> <p>Intended use also means</p> <ul style="list-style-type: none"> - reading and adhering to all instructions in the Operating Instructions - reading and adhering to all safety instructions and danger notices - carrying out all the specified inspection and servicing work. <hr/> <p>Never use the device for the following applications:</p> <ul style="list-style-type: none"> - Thawing pipes - Charging batteries - Starting motors <hr/> <p>The device is designed for operation in industry and business. The manufacture shall not be liable for any damage resulting from use in a living area.</p> <hr/> <p>The manufacturer shall also not be liable for faulty or incorrect work results.</p>
Environmental Conditions	<p>Operation or storage of the device outside the stipulated area will be deemed as not in accordance with the intended purpose. The manufacturer accepts no liability for any damage resulting from improper use.</p> <hr/> <p>Temperature range of the ambient air:</p> <ul style="list-style-type: none"> - 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) <hr/> <p>Relative humidity:</p> <ul style="list-style-type: none"> - Up to 50% at 40°C (104°F) - Up to 90% at 20°C (68°F) <hr/> <p>Ambient air: free of dust, acids, corrosive gases or substances, etc. Altitude above sea level: up to 2000 m (6561 ft. 8.16 in.)</p>
Obligations of the Operating Company	<p>The operating company must only allow persons to work with the device if they</p> <ul style="list-style-type: none"> - Are familiar with the basic occupational safety and accident prevention regulations and are trained in handling the device - Have read and understood these Operating Instructions, especially the section "Safety Rules," and have confirmed this with their signature - Are trained according to the requirements for the work results <hr/> <p>The safety-conscious work of the personnel must be checked regularly.</p>
Obligations of Personnel	<p>All persons who are assigned to work with the device must do the following before beginning the work:</p> <ul style="list-style-type: none"> - Follow the basic regulations for occupational safety and accident prevention - Read these Operating Instructions, especially the section "Safety Rules," and confirm that they have understood and will follow them by signing <hr/> <p>Before leaving the workplace, ensure that no personal injury or property damage can occur in one's absence.</p>

Grid Connection	<p>Devices with a high output can influence the energy quality of the grid due to their current consumption.</p> <hr/> <p>This may affect a number of device types in terms of:</p> <ul style="list-style-type: none"> - connection restrictions - criteria regarding maximum permissible grid impedance ^{*)} - criteria regarding the minimum required short-circuit power ^{*)} <p>^{*)} both at the interface with the public grid See technical data</p> <hr/> <p>In this case, the operator or the person using the device should check whether or not the device is allowed to be connected, where appropriate through discussion with the power supply company.</p> <hr/> <p>IMPORTANT! Ensure secure grounding of the grid connection!</p>
------------------------	---

Personal Protection and Protection of Others	<p>You are exposed to numerous hazards while handling the device, for example:</p> <ul style="list-style-type: none"> - Flying sparks and pieces of hot metal - Arc radiation that poses a risk of injury to the eyes and skin - Hazardous electromagnetic fields that pose a risk of death for individuals with pacemakers - Electrical risks from grid current and welding current - Increased noise exposure - Harmful fumes and gases <hr/> <p>Wear suitable protective clothing when dealing with the device. The protective clothing must have the following properties:</p> <ul style="list-style-type: none"> - Flame resistant - Insulating and dry - Covering the entire body and in good condition with no damage - Safety helmet - Cuffless pants <hr/> <p>Protective clothing involves the following:</p> <ul style="list-style-type: none"> - Protecting the face and eyes from UV radiation, heat, and flying sparks with a face guard featuring a regulation-compliant filter. - Wearing regulation-compliant protective goggles with side protection behind the face guard. - Wearing rigid, wet-insulating footwear. - Protecting hands with appropriate gloves (featuring electrical insulation and thermal protection). - Wearing ear protection to reduce noise exposure and protect against injury. <hr/> <p>Keep persons, especially children, away during the operation of the devices and during the plasma surface treatment process. However, if persons are in the vicinity:</p> <ul style="list-style-type: none"> - Instruct them about all hazards (blinding hazard due to arcs, risk of injury from flying sparks, fumes hazardous to health, noise exposure, possible hazard due to grid current or process current, etc.), - Provide suitable protective equipment, or - Construct suitable protective walls and curtains.
---	---

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

A work station-specific emission value cannot be specified because this value depends on the process and the environmental conditions. It depends on differing parameters, such as the power range, the component geometry, the material, the resonance properties of the workpiece, the work station environment, and many other factors.

Danger from Toxic Gases and Vapors

The fumes produced during plasma surface treatment contain toxic gases and vapors.

The fumes produced contain substances that may cause birth defects and cancer in some circumstances.

Use at-source extraction source and a room extraction system.
If possible, use integrated extraction devices.

The operator of the plasma system is obliged to maintain the values for the maximum allowable concentrations (MAC).

- Ensure that there is sufficient fresh air!
- Arrange the extraction capacity so that at least 3 times the gas used can be extracted per plasma torch.

Keep your head out of the fumes and gases.

Take the following precautionary measures for fumes and harmful gases:

- Do not breathe them in
- Extract them from the work area using appropriate equipment.

Use breathing apparatus with air supply if there is insufficient ventilation.

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

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

The following components are factors that determine how toxic the fumes are:

- The materials used for the workpiece
- Electrodes
- Coatings
- Cleaning agents, degreasers, and the like
- The type and amount of component contamination

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

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

Danger from Fire

Flying sparks can cause fires and explosions.

Never perform the plasma surface treatment near flammable materials.

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

Keep suitable, tested fire extinguishers on hand.

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

Only ever perform the plasma surface treatment in areas at risk of fire and explosion, on sealed tanks, drums, or pipes if these have been prepared in accordance with corresponding national and international standards.

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

Do not perform plasma surface treatments on materials or contamination which could cause a fire when the plasma arc is operated.

**Hazards from
Grid Current and
Process Current**

An electric shock is life-threatening and may be deadly.

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

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

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

Before every use, check power connections for secure fit by hand.

In the case of power cables with bayonet connectors, turn the power cable by at least 180° around the longitudinal axis and pretension.

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

The electrode

- never immerse it in liquids to cool it
 - never touch it when the power source is switched on.
-

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

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

Only operate the device on a grid with a ground conductor and a socket with a ground conductor contact.

Operating the device on a grid without a ground conductor and on a socket without a ground conductor contact is considered gross negligence. The manufacturer accepts no liability for any damage resulting from improper use.

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

Switch off unused devices.

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

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

After opening the device:

- Discharge all electrically charged components
 - Ensure that all components are disconnected from the power supply.
-

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

Stray currents

If the following instructions are not observed, stray currents may occur, which pose a risk of the following:

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

Ensure a tight connection between the hosepack and the power source.

Ensure a tight connection between the plasma nozzle and the plasma welding torch.

If the floor is electrically conductive, ensure that there is sufficient insulation between the device and the floor.

EMC Device Classifications

Devices in emission class A:

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

Devices in emission class B:

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

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

EMC Measures

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

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

Test and assess the immunity of equipment in the vicinity of the device in accordance with national and international provisions. Examples of interference-prone equipment that could be affected by the device:

- Safety devices
 - Grid power lines, signal lines, and data transfer lines
 - IT and telecommunications equipment
 - Devices for measuring and calibrating
-

Supporting measures to avoid EMC problems:

1. Grid power supply
 - If electromagnetic interference occurs despite a grid connection that complies with regulations, take additional measures (e.g., use a suitable grid filter).
2. Route the hosepack far away from other lines
3. Equipotential bonding
4. Workpiece grounding
 - If necessary, establish grounding using suitable capacitors.
5. Shield, if necessary
 - Shield other devices in the vicinity
 - Shield the complete system

EMF Measures

Electromagnetic fields may cause health problems that are not yet known:

- Effects on the health of persons close by, e.g., those with pacemakers and hearing aids
 - Persons with pacemakers must seek advice from their doctor before staying in the immediate vicinity of the device and the plasma process
 - Keep distances between hosepacks and the head/torso of the operator as great as possible for safety reasons
 - Do not carry hosepacks over your shoulder or wrap them around your body or body parts
-

Particular Hazard Areas

Keep hands, hair, loose clothing, and tools away from moving parts, such as:

- fans
-

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

During operation:

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

Always keep the plasma torch away from your body and wear suitable protective goggles.

Do not touch the workpiece during or after the plasma surface treatment - burning hazard.

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

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

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

Power sources for work in areas where electrical hazards pose a greater risk (e.g. the boiler room) must be marked with a (Safety) sign. However, the power source may not be located in such areas.

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

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

Only use suitable load-carrying equipment from the manufacturer when transporting devices by crane.

- Attach chains or ropes to all designated suspension points on suitable load-carrying equipment.
 - Chains or ropes must be as close to perpendicular as possible.
 - Remove the gas cylinder.
-

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

All lifting equipment (belts, buckles, chains, etc.), which is used in association with the device or its components, must be checked regularly (e.g. for mechanic-

al damage, corrosion, or changes due to other environmental influences). The test interval and scope must at least comply with the respective valid national standards and guidelines.

There is a risk of colorless, odorless gas escaping unnoticed if an adapter is used for the gas connection. Use suitable Teflon tape to seal the thread of the gas connection adapter on the device side before installation.

Impaired Plasma Surface Treatment

The following specifications concerning gas quality must be met in order to ensure the safe and proper function of the plasma system:

- Solid particle size < 40 µm
- Pressure condensation point < -20 °C
- Max. oil content < 25 mg/m³

Use filters if necessary.

IMPORTANT! Ring lines in particular pose a risk of contamination.

Danger from Gas Cylinders

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

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

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

Keep gas cylinders away from electrical circuits.

Ensure that when handling a plasma torch, you never:

- Hang it on a gas cylinder
- Point it at or place it on a gas cylinder

Never touch a gas cylinder with an electrode.

Risk of explosion - never perform a plasma surface treatment on a compressed gas cylinder.

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

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

If no plasma surface treatment is being performed, close the valve of the gas cylinder.

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

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

Danger due to Escaping Gas

Risk of suffocation due to uncontrolled gas leakage

In the event of leaks, the escaping colorless and odorless gas may displace the oxygen in the ambient air.

- Ensure there is a sufficient supply of fresh air with a ventilation flow rate of at least 20 m³ per hour
- Observe the safety and maintenance information on the gas cylinder or the main gas supply
- When no plasma surface treatment is being performed, close the valve of the gas cylinder or the main gas supply.
- Check the gas cylinder or main gas supply for uncontrolled gas leakage before each start-up.

Safety Measures at the Setup Location and During Transport

A toppling device can be deadly! Set up the device securely on an even, solid surface

- A tilt angle of no more than 10° is permitted.

Special regulations apply in areas at risk of fire or explosion

- Follow the appropriate national and international regulations.

Use instructions and checks within the company to ensure that the area around the work station is always clean and organized.

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

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

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

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

Before transporting the device, completely drain the coolant and remove the gas cylinder.

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

Safety Measures in Normal Operation

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

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

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

Never bypass or disable safety devices.

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

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

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

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

Only use appropriate original coolant from the manufacturer.

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

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

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

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

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

When the system is cool, always check the coolant level before starting a plasma surface treatment.

Maintenance and repair

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

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

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

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

Safety Inspection

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

A safety inspection by a certified electrician is recommended

- after changes
- after alterations
- after repair, care, and maintenance
- at least every 12 months.

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

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

Disposal

Do not dispose of this device with normal domestic waste! To comply with the European Directive on Waste Electrical and Electronic Equipment and its implementation as national law, electrical equipment that has reached the end of its

life must be collected separately and returned to an approved recycling facility. Any device that you no longer require must be returned to your dealer, or you must locate the approved collection and recycling facilities in your area. Ignoring this European Directive may have potentially adverse effects on the environment and your health!

Safety symbols

Devices with the CE label satisfy the essential requirements of the low-voltage and electromagnetic compatibility directive (e.g., relevant product standards of the EN 60974 series).

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

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

Data backup

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

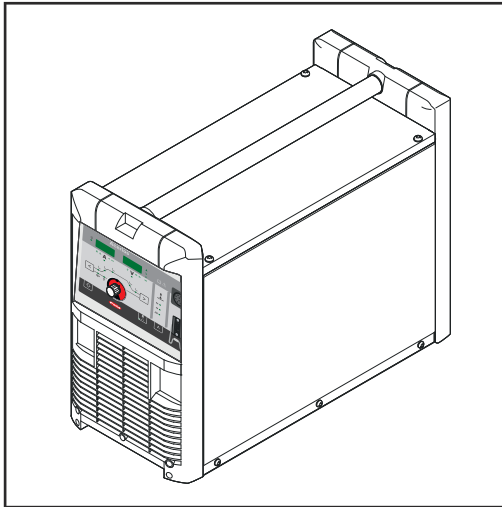
Copyright

Copyright of these Operating Instructions remains with the manufacturer.

Text and illustrations were accurate at the time of printing. Fronius reserves the right to make changes. The contents of the Operating Instructions shall not provide the basis for any claims whatsoever on the part of the purchaser. If you have any suggestions for improvement, or can point out any mistakes that you have found in the Operating Instructions, we will be most grateful for your comments.

General information

Device Concept



The fully digitized and microprocessor-controlled Acerios plasma power source is used for Hot Active Plasma (HAP) surface treatments on metallic materials.

The modular design makes it easy to upgrade the system and allows great flexibility. The devices can be adapted to practically any conditions.

The plasma power source has a Local-Net interface to make it easy to connect digital system add-ons. The extensive robot and system interfaces simplify networking and control.

All key functions can be quickly viewed and adjusted.

Job Mode allows differing process parameters to be saved and retrieved and can be used for pre-setting.

The plasma pulsed arc function with a wide frequency range provides additional process-stabilizing options.

The Acerios plasma power source has an optimized high-frequency ignition process for short cycle times and high repeatability.

NOTE!

The plasma surface treatment process will simply be referred to as the plasma process in the rest of these instructions.

Operating Principle

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

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

This results in:

- a precise plasma process,
- an exact degree of reproducibility for all process parameters,
- excellent surface treatment properties.

The energy yield can be individually tailored by distance and speed.

It is possible to achieve high plasma process speeds, thanks to stable and precise arc control and the regulated supply of process gas (argon).

Another gas can be introduced via an additional gas connection, e.g. as a shielding gas or as a reactive gas.

Application Areas

The devices are used commercially in automated applications with various metals, non-ferrous metals, and various heat-resistant materials.

The devices achieve excellent results, for example in cleaning applications involving:

- Dry lubricant on aluminum
 - Oil on steel
-

System Configurations

Plasma power source and cooling unit installed on an upright console

(1) Acerios plasma power source

+
Robot interface

(2) FK 9000 R cooling unit

(3) TU Podium upright console

(4) Gas control 5 - 30 l
digital, external gas regulator

(5) PCT 2000 plasma torch

(6) Robot

(7) Robot control system

Plasma power source and gas cylinder on trolley, separate cooling unit

(1) Acerios plasma power source

+
Robot interface

(2) CU 1800 or CU 4700 cooling unit

+
OPT/i CU 1800 / 4700 Interface FC

(3) TU Car 4 Pro trolley

(4) Gas control 5 - 30 l
digital, external gas regulator

(5) PCT 2000 plasma torch

(6) Robot

(7) Robot control system

Operating controls and connections

Control Panel

General

The key feature of the control panel is the logical arrangement of the controls. All parameters essential for day-to-day work can be easily

- selected with buttons
- changed using the selection dial
- shown on the digital display during the plasma process.

NOTE!

Because of software updates, certain functions may be available for your device but not described in these Operating Instructions or vice versa.

In addition, individual figures may also differ slightly from the operating elements of your device. However, the function of these operating elements is identical.

Safety



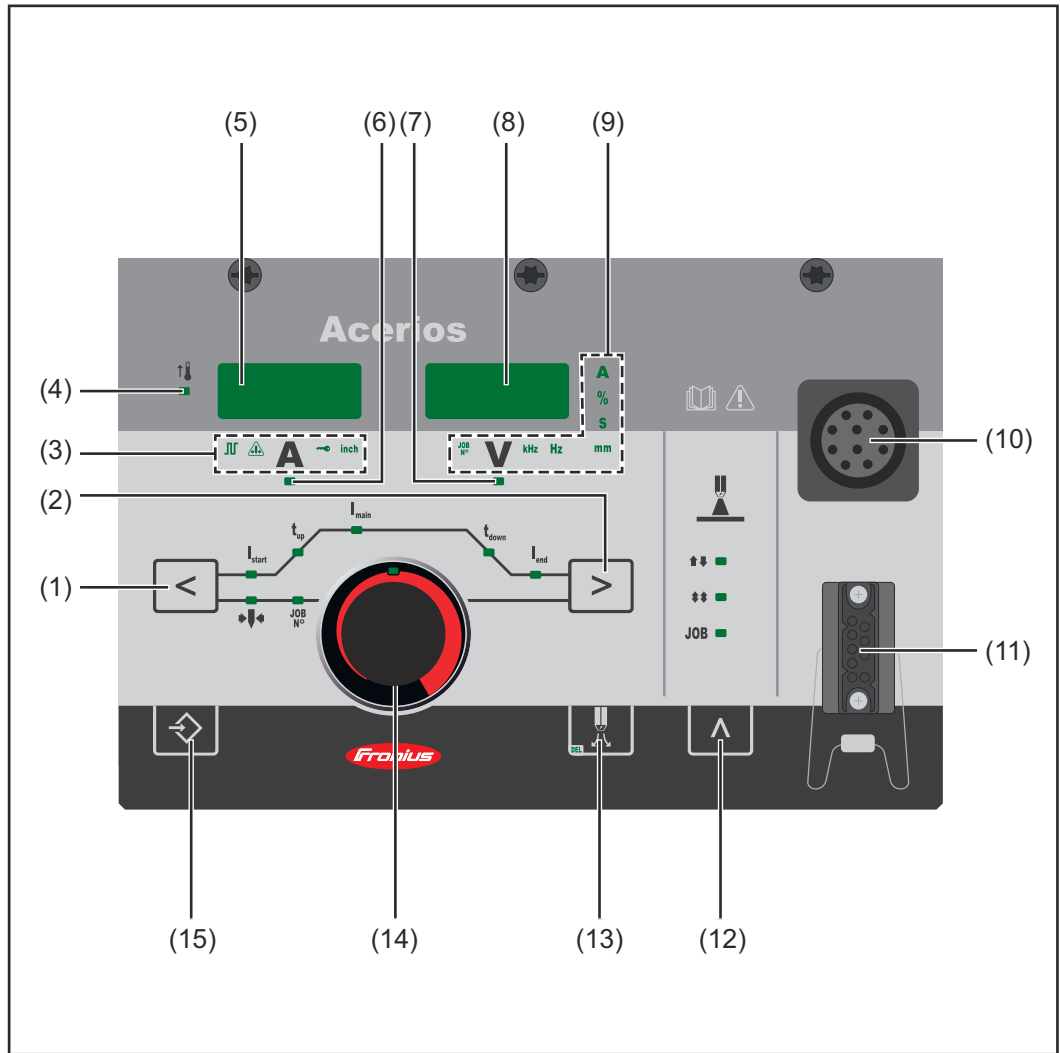
WARNING!

Danger from incorrect operation and work that is not carried out properly.

This can result in serious personal injury and damage to property.

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

Control Panel



No. Function

(1) Left parameter selection button

(2) Right parameter selection button

Buttons (1) and (2) are used to select the following process parameters:

I_{start} Starting current for the plasma process

t_{up} UpSlope

Period of time it takes to rise from the starting current I_{start} to the specified main current I_{main} during the plasma process.

I_{main} Main current for the plasma process

t_{down} DownSlope

Period of time it takes to fall from the specified main current I_{main} to the final current I_{end} during the plasma process.

I_{end} Final current for the plasma process

JOB Job number

In job mode, for retrieving saved parameter sets by job numbers.

$\blacktriangleright\blacktriangleleft$ Diameter of electrode

For entering the diameter of the tungsten electrode for the plasma process

When a parameter is selected, the LED at the corresponding parameter symbol illuminates.

(3) Special indicators

 **Pulsing indicator**

Illuminates when the F-P setup parameter has been set to a pulse frequency

 **Electrode overloaded indicator**

Illuminates when the tungsten electrode is overloaded

Further information on the electrode overloaded indicator can be found in the section headed "Overloaded Electrode" on page 41 of the "Plasma Surface Treatment" chapter.

 **Key lock indicator**

Illuminates when the key lock is activated

 **Inch indicator**

Illuminates when the SEt setup parameter is set to US

(4) Overtemperature indicator

Illuminates when the power source heats up excessively
Refer to the "Troubleshooting" section for further information.

(5) Left digital display

(6) Process current display

For displaying the current value for the parameters starting current I_{start} , main current I_{main} , and final current I_{end} .

The left digital display shows the set value before the start of the plasma process. For I_{start} and I_{end} , the right digital display also shows the % amount of the main current I_{main} .

The parameter I_{main} is automatically selected after the start of the plasma process. The left digital display shows the current actual value of the main current.


The corresponding position in the plasma process is shown for the process parameters by illuminated LEDs.

(7) Voltage indicator


Illuminates when the selected parameter is I_{main}
During the plasma process, the current actual voltage value is indicated on the right digital display.

(8) Right digital display

(9) Unit indicators

 Job no. indicator

Illuminates in Job Mode

 kHz indicator

Illuminates if the F-P setup parameter is selected when the value entered for the pulse frequency is ≥ 1000 Hz

 Hz indicator

Illuminates if the F-P setup parameter is selected when the value entered for pulse frequency is < 1000 Hz

mm mm indicator

Illuminates when the electrode diameter setup parameter has been selected

s s indicator

Illuminates when parameters t_{up} and t_{down} have been selected, along with the following setup parameters:

GPr / G-L / G-H / t-S / t-E / C-t / HFt / Ito / Arc

% % indicator

Illuminates when parameters I_{start} and I_{end} have been selected, along with setup parameters dcY and I-G

A A indicator

(10) LocalNet connection

Standardized connection socket for system add-ons

(11) Torch control connection

Input for the collision protection signal if connecting a robot interface or fieldbus coupler

(12) Operating mode button

For selecting the operating mode

↕ 2-step mode

↕↕ 4-step mode

JOB Job Mode

When a mode is selected, the LED illuminates at the corresponding symbol.

(13) Gas-test button

For setting the required gas volume on the pressure regulator

After pressing the gas-test button, process gas is released for 30 s.

Press the button again to stop the gas flow prematurely.

(14) Selection dial

for changing parameters. When the indicator on the selection dial illuminates, the selected parameter can be changed.

(15) Store button

For saving jobs and accessing the Setup menu

Shortcut Keys - Special Functions


General


Pressing buttons on the control panel simultaneously or repeatedly can access the functions described below.

Key Lock

+ **Activate key lock:**

Keeping the store button pressed, press the right parameter selection button.

 The lock message "CLo|SEd" appears briefly on the digital displays.

 The key lock special indicator illuminates on the control panel


Now if a button is pressed, the lock message "CLo|SEd" will appear on the control panel. The selection dial can only be used to change the parameter selected when the keys were locked.

NOTE!

The key lock also remains activated after the power source has been switched off and back on again.

+ **Deactivate key lock:**

Keeping the store button pressed, press the right parameter selection button

 The unlock message "-OP|En-" appears briefly on the digital displays. The key lock special indicator turns off



Show Software Version, Runtime, and Coolant Flow

 +  **Show software version:**

Keeping the store button pressed, press the left parameter selection button. The software version appears on the digital displays.

 **Show runtime:**

Press the left parameter selection button again

  The runtime records the actual plasma time since starting for the first time.



Example: "654 | 32.1" = 65,432.1 hours = 65,432 hours 6 mins

NOTE!

The runtime indicator is not suitable as a basis for calculating hiring fees, warranty services, etc.

 **Show coolant flow:**

(Only in conjunction with a cooling unit with the optional flow sensor fitted): Press the left parameter selection button again

  The current coolant flow of the cooling unit is shown in l/min (CFL = **Coolant Flow**)

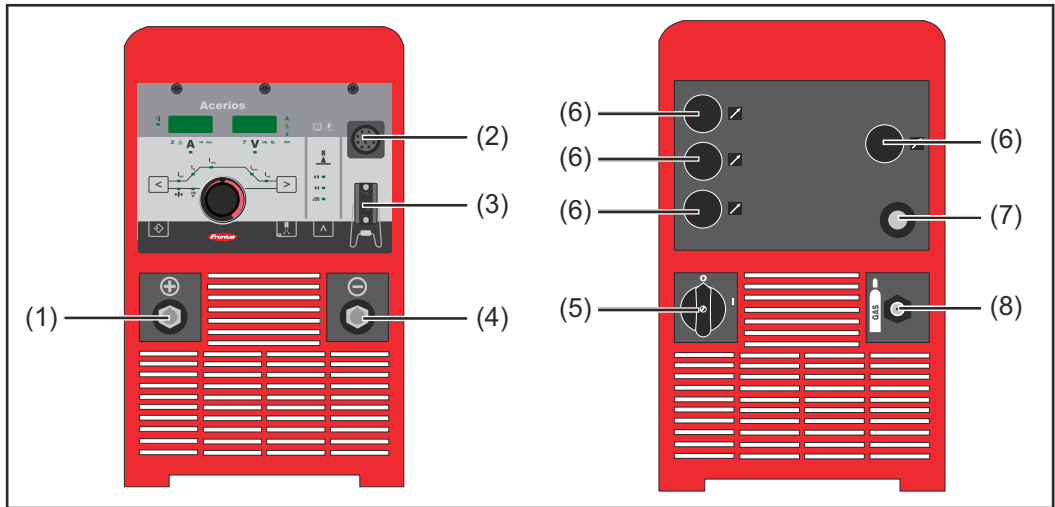
If the coolant flow is < 0.7 l/min, the power source switches off after the period of time set in parameter C-t, the error message "no | H2O" is output.

 **Exit:**

by pressing the store button.

Connections, Switches, and Mechanical Components

Acerios Connections



No.	Function
(1)	(+) Current socket with bayonet latch Connect the plasma torch here
(2)	LocalNet connection Standardized connection socket for system add-ons
(3)	Torch control connection Input for the collision protection signal if connecting a robot interface or fieldbus coupler
(4)	(-) Current socket with bayonet latch and gas outlet Connect the plasma torch here
(5)	Power switch For switching the power source on and off
(6)	Dummy cover
(7)	Mains cable with strain relief
(8)	Gas connection For using an additional shielding gas

Depending on the configuration, a robot interface is fitted to the plasma power source.

Installation and Startup

Before installation and initial operation

Safety

WARNING!

Danger from incorrect operation and work that is not carried out properly.

This can result in serious personal injury and damage to property.

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

Minimum Equipment

- Acerios plasma power source
- Robot interface or fieldbus coupler
- Plasma torch
- Cooling unit
- Process gas connection (process gas supply of 5 - 6 bar)
- Digital, external gas regulator

Intended Use

The plasma power source is intended exclusively for automated plasma surface treatment in conjunction with Fronius components.

Any other use does not constitute proper use.

The manufacturer accepts no responsibility for any damage resulting from improper use.

Intended use also means:

- Following all instructions in these Operating Instructions
- Reading the Operating Instructions of all the other system components, especially the safety rules in the aforementioned documents
- Carrying out all the specified inspection and servicing work

Setup Regulations

The device has been tested according to degree of protection IP 23. This means:

- Protection against penetration by solid foreign bodies with diameters > 12.5 mm (0.49 in.)
- Protection against spraywater at any angle up to 60° from the vertical

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

Direct moisture (e.g., from rain) must be avoided.

WARNING!

Danger from machines toppling over or falling.

This can result in serious personal injury and damage to property.

- ▶ Set up the device securely on an even, solid surface.
- ▶ Check all screw connections are tightly fastened after installation.

The ventilation channel is a very important safety device. When selecting the setup location, ensure that the cooling air can enter or exit unhindered through

the vents on the front and back. Any electrically conductive dust (e.g. from grinding work) must not be allowed to be sucked directly into the device.

Grid Connection The devices are designed for the grid voltage stated on the rating plate. If the mains cable or mains plug has not been attached to your version of the appliance, these must be installed according to national standards. Fuse protection for the grid lead can be found in the technical data.



CAUTION!

Danger due inadequately dimensioned electrical installations.

This can lead to serious damage

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

Safety

WARNING!

Danger from electrical current.

This can result in serious personal injury and damage to property.

- ▶ Before starting work, switch off all devices and components involved, and disconnect them from the grid.
- ▶ Secure all devices and components involved so they cannot be switched back on.
- ▶ After opening the device, use a suitable measuring instrument to check that electrically charged components (such as capacitors) have been discharged.

WARNING!

Danger of electrical current due to electrically conductive dust in the device.

This can result in severe personal injury and damage to property.

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

General

A standard configuration is used to describe the installation and start-up of the plasma system.

The standard configuration consists of the following system components:

- Acerios plasma power source (including robot interface)
- FK 9000 R cooling unit
- PCT 2000 plasma torch
- Gas pressure regulator
- Gas cylinder with process gas
- Upright console
- Gas control 5 - 30 l

The following steps should provide an overview of plasma system installation and start-up.

For detailed information about the individual steps, please refer to the corresponding Operating Instructions for the system components.

Installation

WARNING!

Danger due to incorrect operation.

Serious personal injury and damage to property may result.

- ▶ All the functions described may only be used by trained specialist personnel.
- ▶ Read and understand this document in full.
- ▶ Read and understand all the Operating Instructions for the system components, especially the safety rules, in full.

Requirement:

- The components for an automated application (e.g. robot, robot control system, longitudinal chassis, rotary tables, etc.) must be present and ready for use.

- 1 Anchor the upright console to the surface
- 2 Fit the cooling unit on the upright console

IMPORTANT! To mount the cooling unit, follow the "FK 9000 R in Conjunction with a Power Source" chapter in the Operating Instructions for the cooling unit.

- 3 Connect and secure the plasma power source to the cooling unit
- 4 Set up the plasma torch (on the robot, for example)
- 5 Connect the plasma torch to the plasma power source and the cooling unit
- 6 Connect the plasma torch to the external gas regulator
- 7 Use a LocalNet cable to join the external gas regulator to the plasma power source
- 8 Connect the process gas supply to the external gas regulator

IMPORTANT! A flow controller must not be fitted upstream of the external gas regulator.

- 9 Connect the robot interface to the robot control system
- 10 Equip the plasma torch with the correct wearing parts

NOTE!

Do not use pure tungsten electrodes for the Acerios plasma power source (color code: green).

Connecting the Gas Cylinder

 **WARNING!**

Danger of severe injury and damage to property if gas cylinders fall over.

- ▶ Place gas cylinders on a solid, level surface in such a way that they remain stable.
- ▶ Secure the gas cylinders to prevent them from falling over: the retaining strap must be attached at the height of the upper part of the gas cylinder.
- ▶ Never secure a retaining strap to the neck of the cylinder!
- ▶ Observe the safety rules of the gas cylinder manufacturer!

- 1 Secure the gas cylinder
- 2 Remove the safety cap from the gas cylinder
- 3 Briefly open the gas cylinder valve to remove surrounding dirt
- 4 Inspect the seal on the gas pressure regulator
- 5 Screw the gas pressure regulator to the gas cylinder and tighten the connection
- 6 Use a gas hose to join the gas pressure regulator and the GAS IN connection at the external gas regulator
- 7 Tighten the gas hose union nut

Connecting the Plasma Torch

- 1 Set the power switch to - O -
- 2 Insert the power cable from the plasma torch hose pack into the current sockets of the plasma power source and twist clockwise to lock in place

IMPORTANT! (-) = current socket / power cable with gas through-hole!

- 3 Connect the plasma torch gas hose to the GAS OUT connection on the external gas regulator
- 4 Fit parts to the plasma torch according to the plasma torch's Operating Instructions
- 5 Connect the plasma torch coolant connections to the cooling unit according to the color markings for coolant supply and coolant return (red)

Plasma Surface Treatment

Overloaded Electrode

Overloaded Electrode

If the electrode is overloaded, there is a risk that an oversized cap could form on the tungsten electrode. An oversized cap has a negative effect on the ignition properties.

If the electrode is overloaded, the "electrode overloaded" indicator illuminates on the control panel.



Possible causes of an overloaded electrode:

- Diameter of the tungsten electrode is too small
- Main current I_{main} value is set too high

Remedy:

- Use a tungsten electrode with a larger diameter
- Reduce the main current

NOTE!

The "electrode overloaded" indicator is tailored for use with ceriated tungsten electrodes.

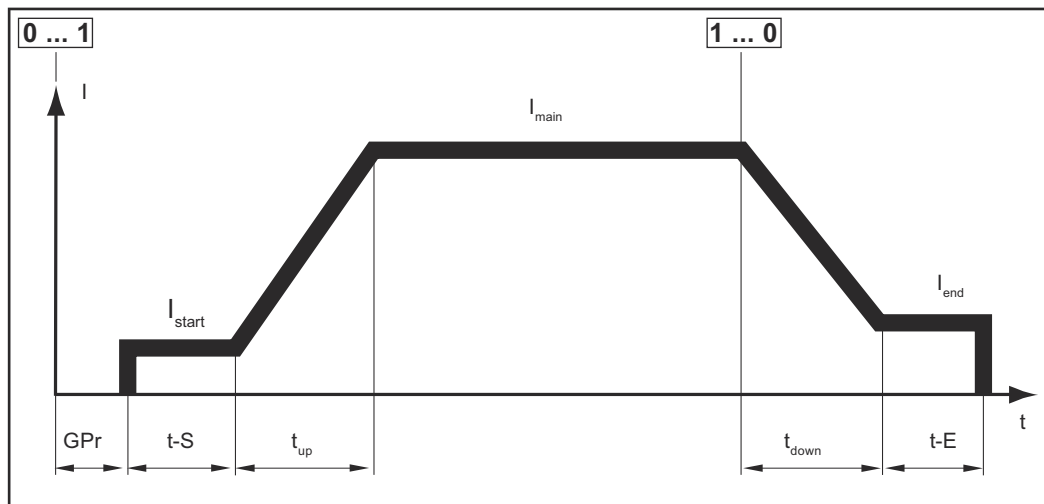
For all other electrodes, the "electrode overloaded" indicator can be used as a guide.

Description of operating modes

2-Step Mode

$0 \dots 1$ Trigger signal (from the robot control system)

$1 \dots 0$ Reset trigger signal



GPr = gas pre-flow time, I_{start} = starting current, $t-S$ = starting current time, t_{up} = UpSlope, I_{main} = main current, t_{down} = DownSlope, I_{end} = final current, $t-E$ = final current time

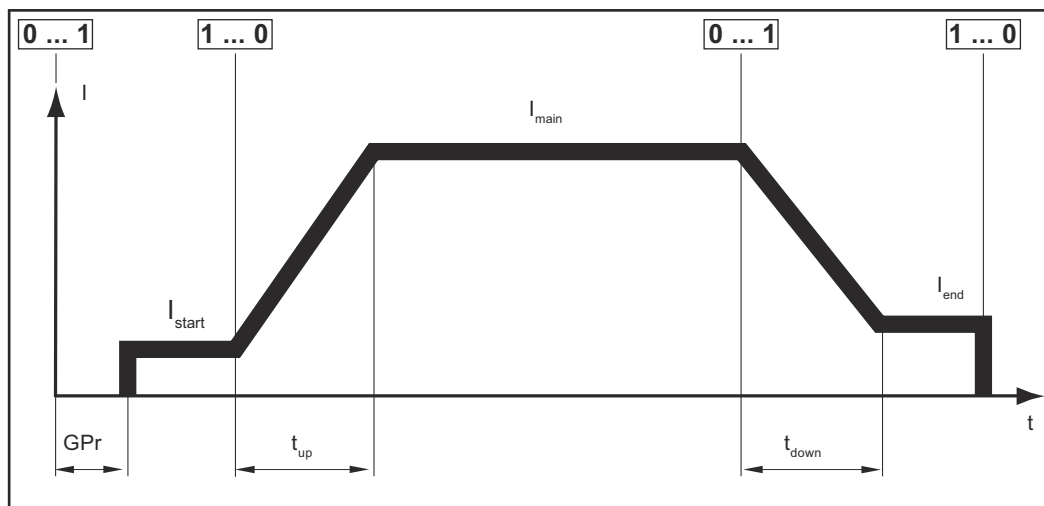
4-Step Mode

$0 \dots 1$ Trigger signal (from the robot control system)

$1 \dots 0$ Reset trigger signal

- Start with starting current I_{start} (trigger signal active)
- UpSlope and working with main current I_{main} (trigger signal not active)
- Lowering to final current I_{end} (trigger signal active)
- End (trigger signal not active)

In 4-step mode, the starting current time and the final current time are defined by the length of time for which the trigger signal is active.



GPr = gas pre-flow time, I_{start} = starting current, t_{up} = UpSlope, I_{main} = main current, t_{down} = DownSlope, I_{end} = final current,

Plasma Surface Treatment

Safety

 **WARNING!**

Danger from incorrect operation and work that is not carried out properly.

This can result in serious personal injury and damage to property.

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

 **WARNING!**

Danger from electrical current.

This can result in serious personal injury and damage to property.

- ▶ Before starting work, switch off all the devices and components involved and disconnect them from the grid.
- ▶ Secure all devices and components involved so they cannot be switched back on.
- ▶ After opening the device, use a suitable measuring instrument to check that electrically charged components (such as capacitors) have been discharged.

Process Parameters


I_{start} **Starting current**
0 - 200% (of main current I_{main})
Factory setting: 50%

t_{up} **UpSlope**
0.0 - 9.9 s
Factory setting: 0.5 s

I_{main} **Main current**
35 - 200 A
Factory setting: -

t_{down} **DownSlope**
0.0 - 9.9 s
Factory setting: 1.0 s

I_{end} **Final current**
0 - 100% (of main current I_{main})
Factory setting: 30%

 **Electrode diameter**
OFF - max. mm / in.
Factory setting: 4.8 mm/0.189 in.

Plasma Surface Treatment

- 1 Insert mains plug

 **CAUTION!**

Danger of injury and damage from electric shock.

When the power switch is set to position - I -, the tungsten electrode of the plasma torch is live.

- ▶ Ensure that the tungsten electrode is not touching any people or electrically conductive or grounded parts (housing, etc.).

-
- 2 Set the power switch to position - I -

All indicators on the control panel briefly illuminate.

- 3 Press the operating mode button to select the desired operating mode:

 2-step mode

 4-step mode

- 4 Use the left or right parameter selection button to select the corresponding process parameters

- 5 Set the selected parameters to the desired value with the selection dial

All parameter set values that are set using the selection dial are saved until their next alteration. This is still true if the power source has been turned off and back on again in the meantime.

- 6 Check whether the "CO_r" parameter in the 2nd level Setup menu is set to "Aut"

- 7 Set the process gas cylinder pressure regulator to 5 - 6 bar or open the valve of the main gas supply

- 8 If hosepacks are long and condensate has built up after longer periods of downtime in the cold:

Pre-purge the gas - set a time for setup parameter GPU

The plasma power source is now ready.

Plasma surface treatment is triggered by a corresponding signal from the robot control system.

Special Functions and Options

Arc Break Monitoring Function

If the arc breaks and no current flow takes place during the time set in the Setup menu, the plasma power source automatically switches off. The control panel displays the service code "no | Arc".

Press any button on the control panel to resume the plasma process.

The "2nd Level Setup Menu" section describing how to set the arc break monitoring (Arc) setup parameters begins on page [58](#).

Ignition Time-Out Function

The plasma power source has an ignition time-out function.

If the plasma process is started, gas pre-flow begins immediately. Then the ignition procedure is initiated. If no plasma arc emerges during the period of time set in the Setup menu, the plasma power source automatically switches off. The control panel displays the service code "no | IGn".

The "2nd Level Setup Menu" section describes how to set the ignition time-out function (ito) parameter.

Plasma Pulsing

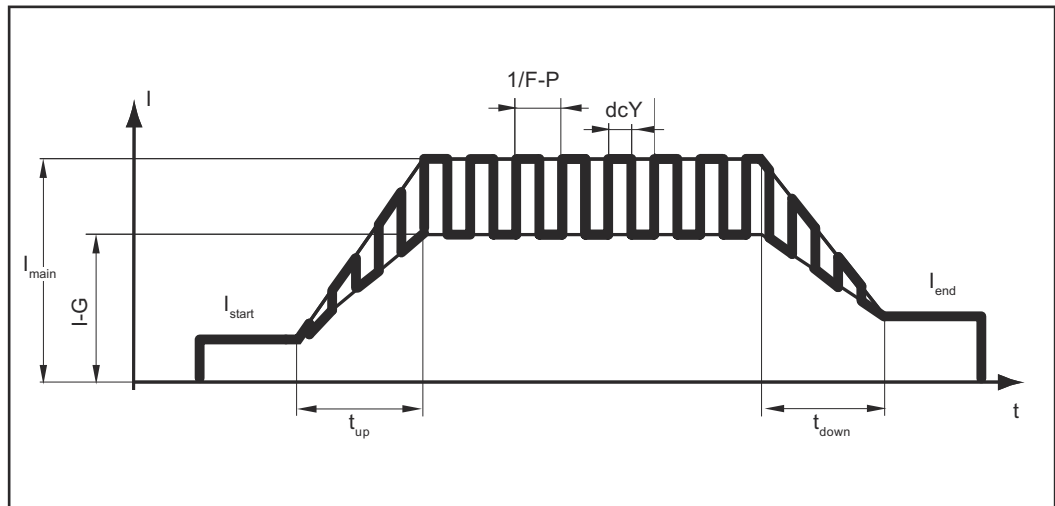
The current set at the start of a plasma surface treatment may not always be optimum for the entire plasma process.

If the amperage is too low, this can reduce the effect of the plasma arc. If the amperage is too high, this can cause distortion in thin-walled components. Low treatment distances and treatment speeds can cause thermal damage to components.

With plasma pulsing (plasma process with a pulse current), a low base current I-G rises steeply to the significantly higher pulse current I_{main} and drops back to the base current I-G after the set dcY (duty cycle) time. Higher pulse frequencies are generally used in automated applications and mainly serve to stabilize the plasma arc.

Plasma pulsing allows the heat input to be tailored to each component and restricted, if necessary, to achieve the best-possible results.

Current flow during plasma pulsing



I_{start} = starting current, I_{end} = final current, t_{up} = UpSlope, t_{down} = DownSlope, $F-P$ = pulse frequency, dcY = duty cycle, IG = base current, I_{main} = main current

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

Hold-Function

The current actual process current and process voltage values are saved each time a process ends.

The hold-function relates to the last main current I_{main} to be reached.

If other parameters are selected, the set values will be displayed again.

If the I_{main} parameter is selected again, the hold values will still be available.

The hold values are cleared when:

- a process starts again
- the process current I_{main} is set
- the operating mode is changed

NOTE!

No hold values are output if the main current phase has never been reached.

Job Mode

General

Job Mode raises quality and simplifies operation in automated plasma applications.

Up to 100 proven jobs (operating points) can be reproduced in Job Mode, with no need to manually document the parameters.

Different jobs are preprogrammed, depending on the configuration.

Another advantage is that because jobs are preprogrammed, the plasma power source is ready for use immediately. The jobs can be grouped or lined up in accordance with the production process.

The result is minimal downtime at fully reproducible quality, as well as easy operation and adjustment.

Abbreviations

The following messages can be displayed when working with jobs:

- - No job assigned to the program location (job retrieval)

-

nPG ... No job assigned to the program location (saving a job)

.

PrG Job assigned to the program location

Pro Briefly displayed while saving

dEL Briefly displayed while deleting

Saving a Job

NOTE!

Jobs cannot be created in Job Mode.

Creating a new job:

- 1 Set the desired process parameters to be saved as a job



NOTE!

Apart from specific settings in the 2nd level Setup menu, all the currently made settings are saved.

- 2 Briefly press the store button to switch to the Job menu.

The first free program location for the job is displayed.



- 3 Use the selection dial to select the desired program location, or leave the suggested program location.



- 4 Press and hold the store button

NOTE!

If the selected program location already has a job assigned to it, the existing job will be overwritten by the new job.

This action cannot be undone.

"Pro" shows on the left digital display - the job is saved to the preset program location.

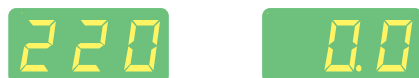


If "PrG" appears on the left digital display, saving has finished.



- 5 Release the store button
- 6 Briefly press the store button to exit the Job menu.

The power source switches to the setting requested before the job was saved.



NOTE!

Before retrieving a job, make sure that the plasma power source is set up and installed in accordance with the job.

- 1 Press the operating mode button to select Job Mode

JOB

The last used job is displayed.



- 2 Use the selection dial to select the desired job



Use the left and right parameter selection buttons to view the settings programmed in the job. It is not possible to change these settings.

It is not possible to select unassigned program locations (indicated by "--") either, when retrieving a job on the plasma power source.

- 3 Start the plasma process

The plasma surface treatment is performed with the parameters saved in the job. During the plasma process, it is possible to switch to a different job without interruption.

Switching to a different operating mode ends Job Mode.

Copying/Overwriting a Job

In Job Mode, it is possible to copy a job already saved to a program location to any other program location:

- 1 Press the operating mode button to select Job Mode

JOB

The last used job is displayed.

220 1

- 2 Use the selection dial to select the desired job

897 2

- 3 Briefly press the store button to switch to the Job menu.

The first free program location is suggested for the job being copied

nPG 0

- 4 Use the selection dial to select the desired program location, or leave the suggested program location.

nPG 3

- 5 Press and hold the store button

NOTE!

If the selected program location already has a job assigned to it, the existing job will be overwritten by the new job.

This action cannot be undone.

"Pro" shows on the left digital display - the job is copied to the preset program location.

Pro 3

When "PrG" appears on the left digital display, copying has finished.

PrG 3

- 6 Release the store button

- 7 Briefly press the store button to exit the Job menu

The power source switches to the setting requested before the job was copied.

A green rectangular digital display showing the number 89.7 in yellow.A green rectangular digital display showing the number 3 in yellow.

Deleting a Job

- 1 In Job Mode, briefly press the store button to switch to the Job menu.

The first free program location is displayed.

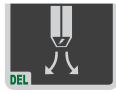


- 2 Use the selection dial to select the job to delete



The "DEL" symbol illuminates on the gas-test button.

- 3 Press and hold the gas-test button



"dEL" shows on the left digital display - the job is deleted.



When "nPG" appears on the left digital display, deleting has finished.



- 4 Release the gas-test button
- 5 Briefly press the store button to exit the Job menu.

The power source switches to the setting requested before the job was deleted



Setup Settings

The Setup Menu

General

The Setup menu offers easy access to expert knowledge related to the plasma power source, as well as additional functions. The Setup menu makes it possible to easily adjust the parameters for various tasks.

- All setup parameters that directly affect the plasma process are located in the Setup menu.
- All setup parameters for presetting the plasma system are located in the 2nd level Setup menu.

The parameters are arranged in logical groups. The individual groups can be accessed through their own shortcut keys.

Accessing the Setup Menu

- 1 Press the operating mode button to select 2-step mode



- 2 Press and hold the store button





- 3 Press the operating mode button



The power source is now located in the Setup menu. The last selected parameter is displayed.

Accessing the 2nd Level Setup Menu



- 1 Accessing the Setup Menu
- 2 Select the "2nd" parameter **2nd**
- 3 Press and hold the store button 
- 4 Press the operating mode button 

The power source is now located in the 2nd level Setup menu. The last selected parameter is displayed

Adjusting Parameters

- 1 Use the left or right parameter selection button to select the parameter to adjust
- 2 Use the selection dial to change the parameter value

Parameters in the Setup Menu

F-P	Pulse frequency OFF / 0, 20 Hz - 2.00 kHz) Factory setting: OFF IMPORTANT! If F-P is set to "OFF", Setup parameters dcY and I-G cannot be selected. The pulsing special display illuminates on the control panel if a value for the pulse frequency has been entered.  Selecting pulse frequency F-P: 0.2 Hz to 5 Hz ... Thermal pulsing 1 kHz to 2 kHz ... Arc-stabilizing pulsing (stabilizing the arc at a low process current)
dcY	Duty cycle Relationship between pulse duration and base current duration at the set pulse frequency 10 - 90% Factory setting: 50%
I-G	Base current 0 - 100% (of main current I_{main}) Factory setting: 50%
t-S	Starting current time (for 2-step mode) OFF / 0.01 - 9.9 s Factory setting: OFF The starting current time t-S indicates the duration of the starting-current phase I_{start} .
t-E	Final current time (for 2-step mode) OFF / 0.01 - 9.9 s Factory setting: OFF The final current time t-E indicates the duration of the final current phase I_{end} . 2-step mode: Starting current and final current time  GPr = gas pre-flow time, I_{start} = starting current, t-S = starting current time, t_{up} = UpSlope, I_{main} = main current, t_{down} = DownSlope, I_{end} = final current, t-E = final current time 0 ... 1 = trigger signal (from the robot control system) 1 ... 0 = trigger signal reset
FAC	Factory Resetting the plasma power source to the factory setting Keep the store button pressed for 2 s, to restore the factory setting. If "PrG" shows on the digital display, the plasma power source is reset.

IMPORTANT! If the plasma power source is reset, all the personal settings in the Setup menu are lost.

The jobs and parameter settings in the 2nd level Setup menu are not deleted when the plasma power source is reset.

2nd **2nd level Setup menu**

Parameters in the 2nd Level Setup Menu

C-C **Cooling unit controls**

Aut / ON / OFF
 Factory setting: Aut

Aut ... The cooling unit cuts out 2 minutes after the end of the plasma process

ON ... The cooling unit remains permanently ON

OFF ... The cooling unit remains permanently OFF

IMPORTANT! If the cooling unit has the "Thermostat" option fitted, the return-flow temperature of the coolant is constantly checked. If the return-flow temperature is less than 50 °C, the cooling unit cuts out automatically.

C-t **Cooling time**

Time from when the flow sensor is triggered until the "no | H2O" service code is output

For example, if there are air bubbles in the cooling system, the cooling unit will not cut out until the end of this preset time.

5 - 25 s
 Factory setting: 10 s

IMPORTANT! Every time the plasma power source is switched on, the cooling unit carries out a test run for 180 seconds.

HFt **High frequency time**

High frequency ignition: Time between HF impulses

0.01 - 0.4 s / EHF (starting with external ignition tool)
 Factory setting: 0.01 s

IMPORTANT! If there are problems with sensitive equipment in the immediate vicinity, increase the HFt parameter up to as much as 0.4 s.

PrI **Delayed ignition for immediate high frequency start**

OFF / 0.1 - 1 s
 Factory setting; OFF

If a time is entered for the PrI parameter, arc ignition is delayed by this amount of time: trigger signal - high frequency applied for the period of time - arc ignition

r **Plasma system resistance**
 mOhm

See the "Displaying Plasma System Resistance r" section starting on page [61](#).

L Plasma system inductance

Microhenry

See the "Displaying Plasma System Inductance L" section starting on page [62](#).

Ito Ignition time-out

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

0.1 - 9.9 s

Factory setting: 5 s

IMPORTANT! The ignition time-out function is a safety function and cannot be deactivated. The ignition time-out function is described on page [45](#).

Arc Arc break monitoring

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

0.1 - 9.9 s

Factory setting: 2 s

IMPORTANT! Arc break monitoring is a safety function and cannot be deactivated. The arc break monitoring function is described on page [45](#).

SEt Country-specific setting

Std/US (Standard/USA)

Factory setting: Std (metric units)

E-P External parameter

A freely selectable parameter for the robot interface

A freely selectable parameter is available for the robot interface. If "E-P" is selected, use the selection dial to choose between the following for this freely definable parameter:

OFF ... The freely definable parameter is not assigned (factory setting)

ELd ... Diameter of electrode

I-S ... Starting current

UPS ... UpSlope

dsl ... DownSlope

I-E ... Final current

F-P ... Pulse frequency

dcY ... Duty cycle

I-G ... Base current

The number of freely selectable parameters depends on the configuration and the set operating mode.

ACS Automatic changeover to main current

ON/OFF

Factory setting: ON

ON

After the plasma process has started, the parameter I_{main} (main current)

is automatically selected.

The main current I_{main} can be adjusted immediately.

OFF

The last selected parameter remains selected during the plasma process.

The last selected parameter can be adjusted immediately. The main current I_{main} is not automatically selected.

COr **Gas correction**


For entering a gas correction factor for the process gas (only in conjunction with the "digital gas control" or "external gas regulator" options)

Aut / 1.0 - 10.0


Factory setting: Aut

IMPORTANT! More detailed explanations of the "COr" parameter can be found in the "Digital Gas Control" Operating Instructions.


**Exiting the 2nd
Level Setup
Menu**

1 Press the store button 

The power source is now located in the Setup menu

2 Press the store button again to exit the Setup menu 

**Exiting the
Setup Menu**

1 Press the store button 

Displaying Plasma System Resistance r

General

Measuring the plasma system resistance provides information on the total resistance of the plasma torch hosepack and the plasma torch.

For example, if the plasma system resistance increases after the plasma torch is replaced, the following components may be faulty:

- Plasma torch hosepack
- Plasma torch
- Plasma torch wearing parts
- Current sockets

The plasma system resistance is displayed on the right digital display after measuring.

r ... Plasma system resistance (in mOhm)

Measuring Plasma System Resistance r

- 1 In Gas Setup, set the GAS parameter to "OFF"
- 2 Establish contact between the electrode and the plasma nozzle
- 3 Access the 2nd level Setup menu
- 4 Use the left or right parameter selection button to select the "r" parameter



NOTE!

Ensure that there is contact between the electrode and the plasma nozzle with new wearing parts.

The cooling unit is deactivated during the measurement.

- 5 Briefly press the gas-test button

The plasma system resistance is calculated, the right digital display shows "run" during the measurement



The measurement is finished when the right digital display shows the plasma system resistance (e.g. 11.4 milliohm)

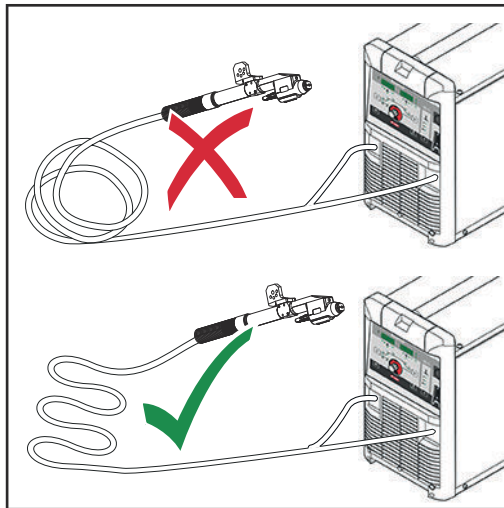


- 6 In the gas setup menu, set the GAS parameter to the desired value

Displaying Plasma System Inductance L

General Information on Plasma System Inductance L

The way that the hosepack is arranged has a significant effect on the properties of the plasma arc. Depending on the length and arrangement of the hosepack, a high plasma system inductance can be produced, especially during pulsing. The increase in current is limited.



Correct hosepack arrangement

Plasma stability can be optimized by modifying the hosepack arrangement. The hosepack must always be arranged as shown in the diagram.

Displaying Plasma System Inductance L

- 1 Measure plasma system resistance r
- 2 Use the left or right parameter selection button to select setup parameter "L"



The right digital display shows the plasma system inductance (e.g. 5 microhenry).

The Gas Menu

General

The gas menu gives easy access to the gas settings.

Accessing the Gas Menu

- 1 Press and hold the store button 
- 2 Press the gas-test button 

The power source is now located in the gas menu; the last selected parameter is displayed.

Adjusting Parameters

- 1 Use the left or right parameter selection button to select the parameter to adjust
- 2 Use the selection dial to change the parameter value

Parameters in the Gas Menu

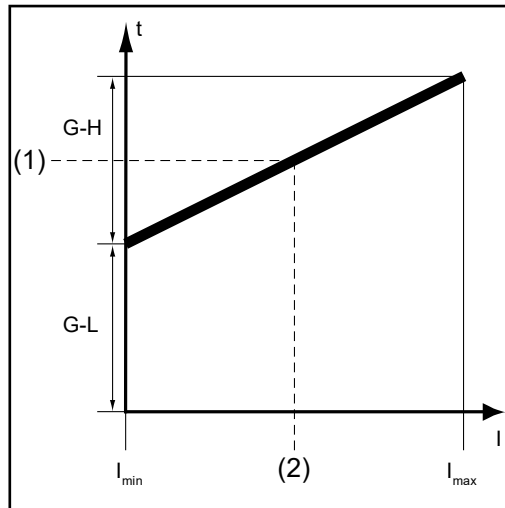
GPr	Gas pre-flow time 0.0 - 9.9 s Factory setting: 0.4 s
G-L	Gas post-flow time increase at minimum process current 0 - 25 s Factory setting: 5 s
G-H	Gas post-flow time increase at maximum process current 0 - 40 s / Aut Factory setting: Aut

The setting for G-H only applies if the maximum process current is actually set. The actual value results from the process current at that moment. With a medium process current, the actual value is half the setting for G-H, for example.

IMPORTANT! The settings for setup parameters G-L and G-H are added together. For example, if both parameters are at their maximum (25 s / 40 s), the gas post-flow time lasts for
25 s at minimum process current
65 s at maximum process current
45 s if the process current is exactly halfway between the minimum and maximum current values.

In the Aut setting, the gas post-flow time G-H is calculated automatically.

Gas post-flow time subject to the process current:



(1) = present gas post-flow time, (2) = present process current,
 G-H = post-flow at I_{max} , G-L = post-flow at I_{min}

GAS Set value for the flow of process gas
 ("Digital Gas Control" option)

OFF / 5.0 - max l/min (OFF / 10.71 - max. cfh)
 Factory setting: 15 l/min (32.14 cfh)

IMPORTANT! More detailed explanations of the "GAS" parameter can be found in the "Digital Gas Control" Operating Instructions.


GPU Gas pre-purging

OFF / 0.1 - 10.0 min
 Factory setting: OFF

Gas pre-purging starts as soon as a value is set for GPU.
 For safety reasons, it is necessary to re-enter a value for GPU in order to re-start gas pre-purging.

IMPORTANT! Gas pre-purging is mainly required if condensate has built up after longer periods of downtime in the cold. Long hosepacks in particular may be affected by this.

Exiting the Setup Menu



- 1 Press the store button 

The Job Correction Menu

General

Setup parameters can be adapted to meet the specific requirements of individual jobs in the job correction menu.

Accessing the Job Correction Menu

- 1 Press the operating mode button to select "Job Mode" **JOB**
- 2 Press and hold the store button 
- 3 Press the operating mode button 

The power source is now located in the job correction menu. The first "Job" parameter is displayed. The "Job" parameter is used to select the job for which the parameters are to be adapted.

Adjusting Parameters

- 1 Use the selection dial to select the job with parameters to be adjusted
- 2 Use the left or right parameter selection button to select the parameter to be corrected
- 3 Use the selection dial to change the parameter value

IMPORTANT! The adjusted parameters are immediately saved and applied to the plasma process.

Correctable Parameters in the Job Correction Menu

NOTE!

Some parameters are specific to the job correction menu and relate, for example, to changing settings that were affected the first time the job was saved on the control panel.

The list below contains the corresponding explanation and details of the adjustment ranges for these parameters.

The following parameters can be adjusted for each saved job:

Eld **Electrode diameter**
 OFF - max. mm (OFF - max. in.)
 Factory setting: 4.8 mm (0.189 in.)

I-S **Starting current I_{start}**
 0 - 200% (of main current I_{main})
 Factory setting: 35%

UPS **UpSlope t_{up}**
 Transition time from starting current I_{start} to main current I_{main}
 OFF / 0.01 - 9.9 s
 Factory setting: 0.5 s

I-1 **Main current I_{main}**
 35 - 200 A
 Factory setting: -

dSL	<p>DownSlope t_{down} Transition time from main current I_{main} to final current I_{end} OFF / 0.01 - 9.9 s Factory setting: 1.0 s</p>
-----	---

I-E	<p>Final current I_{end} 0 - 100% (of main current I_{main}) Factory setting: 30%</p>
-----	--

GAS	<p>Set value for the flow of process gas ("Digital Gas Control" option) OFF / 5.0 - max l/min (OFF / 10.71 - max. cfh) Factory setting: 15 l/min (32.14 cfh)</p>
-----	--

Cor	<p>Gas correction For entering a gas correction factor for the process gas (only in conjunction with the "digital gas control" or "external gas regulator" options) Aut / 1.0 - 10.0 Factory setting: Aut</p>
-----	--

JSL	<p>Job slope Time for a smooth transition of the process current from the job in question to the job next in line</p> <p>OFF / 0.1 - 9.9 s Factory setting: OFF</p> <p>IMPORTANT! "JSL" job slope can be adjusted separately for each saved job.</p> <p>It is only possible to progress from one job to the next without interrupting the plasma process with a robot interface or a fieldbus.</p>
-----	--

GPr	<p>Gas pre-flow time 0.0 - 9.9 s Factory setting: 0.4 s</p>
-----	--


G-L	<p>Gas post-flow time increase at minimum process current 0 - 25 s Factory setting: 5 s</p>
-----	--

G-H	<p>Gas post-flow time increase at maximum process current 0 - 40 s / Aut Factory setting: Aut</p> <p>More information about the G-H parameter can be found on page 63.</p>
-----	---

F-P	<p>Pulse frequency OFF / 0, 20 Hz - 2.00 kHz Factory setting: OFF</p> <p>More information about the F-P parameter can be found on page 45.</p>
-----	---

dCY	<p>Duty cycle Relationship between pulse duration and base current duration at the set pulse frequency 10 - 90% Factory setting: 50%</p>
<hr/>	
I-G	<p>Base current 0 - 100% (of main current I_{main}) Factory setting: 50%</p>
<hr/>	
tri	<p>Operating mode selection 2t / 4t</p> <p>2t = operating mode is 2-step mode 4t = operating mode is 4-step mode</p>
<hr/>	
t-S	<p>Starting current time OFF / 0.01 - 9.9 s Factory setting: OFF</p> <p>More information about the t-S parameter can be found on page 56.</p>
<hr/>	
t-E	<p>Final current time OFF / 0.01 - 9.9 s Factory setting: OFF</p> <p>More information on the t-E parameter can be found on page 56.</p>
<hr/>	
I-c	<p>I_{main} correction range for job retrieval OFF / 1 - 100% Factory setting: OFF</p> <p>All the settings in the jobs are fixed and saved. Parameter I-c, however, allows the main current I_{main} to be subsequently corrected.</p> <p>Example Setup parameter I-c was set to 30%. Main current I_{main} can be reduced or increased by up to 30%.</p> <p>IMPORTANT! Each subsequent correction to the main current I_{main} is reset when the plasma power source is switched off.</p>

Exiting the Job Correction Menu

- 1 Press the store button 

Troubleshooting and Maintenance

Troubleshooting

General

Digital power sources are equipped with an intelligent safety system, which completely negates the need for fuses (except for the coolant pump fuse). After correcting a possible error, the power source can be properly operated again without having to change any fuses.

Safety

WARNING!

Danger from incorrect operation and work that is not carried out properly.

This can result in serious personal injury and damage to property.

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

WARNING!

Danger from electrical current.

This can result in serious personal injury and damage to property.

- ▶ Before starting work, switch off all devices and components involved, and disconnect them from the grid.
 - ▶ Secure all devices and components involved so they cannot be switched back on.
 - ▶ After opening the device, use a suitable measuring instrument to check that electrically charged components (such as capacitors) have been discharged.
-

WARNING!

Danger due to insufficient ground conductor connection.

This can result in serious personal injury and damage to property.

- ▶ The housing screws provide a suitable ground conductor connection for grounding the housing.
 - ▶ The housing screws must not under any circumstances be replaced by other screws without a reliable ground conductor connection.
-

Displayed Service Codes

If an error message that is not listed here appears on the displays, the error can only be corrected by service personnel. Please note the displayed error message, as well as the serial number and configuration of the power source, and contact the After-Sales Service team with a detailed description of the error.

no | Prg

Cause: No preconfigured program has been selected

Remedy: Select a configured program

tP1 | xxx

Note: xxx stands for a temperature value

Cause: Overtemperature in the primary circuit of the power source

Remedy: Leave power source to cool

tP2 | xxx

Note: xxx stands for a temperature value

Cause: Overtemperature in the primary circuit of the power source

Remedy: Leave power source to cool

tP3 | xxx

Note: xxx stands for a temperature value

Cause: Overtemperature in the primary circuit of the power source

Remedy: Leave power source to cool

tP4 | xxx

Note: xxx stands for a temperature value

Cause: Overtemperature in the primary circuit of the power source

Remedy: Leave power source to cool

tP5 | xxx

Note: xxx stands for a temperature value

Cause: Overtemperature in the primary circuit of the power source

Remedy: Leave power source to cool

tP6 | xxx

Note: xxx stands for a temperature value

Cause: Overtemperature in the primary circuit of the power source

Remedy: Leave power source to cool

tS1 | xxx

Note: xxx stands for a temperature value

Cause: Overtemperature in the secondary circuit of the power source

Remedy: Leave power source to cool

tS2 | xxx

Note: xxx stands for a temperature value

Cause: Overtemperature in the secondary circuit of the power source

Remedy: Leave power source to cool

tS3 | xxx

Note: xxx stands for a temperature value

Cause: Overtemperature in the secondary circuit of the power source

Remedy: Leave power source to cool

tSt | xxx

Note: xxx stands for a temperature value

Cause: Overtemperature in the control circuit of the power source

Remedy: Leave power source to cool

Err | 049

Cause: Phase error in the power supply

Remedy: Check the mains fuse, the grid lead and the mains plug

Err | 050

Cause: Indirect symmetry error

Remedy: Contact After-Sales Service

Err | 051

Cause: Mains undervoltage: Mains voltage has fallen below the tolerance range (see "Technical Data" section)

Remedy: Check the mains voltage

Err | 052

Cause: Mains overvoltage: Mains voltage has exceeded the tolerance range (see "Technical Data" section)

Remedy: Check the mains voltage

no | IGn

Cause: The ignition time-out function is active; current did not start flowing within the time specified in the Setup menu. The power source safety cut-out has tripped

Remedy: Check the plasma torch wearing parts; if necessary, increase the period of time in the "2nd Level Setup Menu" to the safety cut-out

Err | PE

Cause: The earth current watchdog has triggered the safety cut-out of the power source.

Remedy: Switch off the power source, wait for 10 seconds and then switch it back on again; if the error occurs again despite numerous attempts to eliminate it - contact After-Sales Service

Err | IP

Cause: Primary overcurrent

Remedy: Contact After-Sales Service

Err | bPS

Cause: Power module error

Remedy: Contact After-Sales Service

dSP | Axx

Cause: Error in the central control and regulation unit

Remedy: Contact After-Sales Service

dSP | Cxx

Cause: Error in the central control and regulation unit

Remedy: Contact After-Sales Service

dSP | Exx

Cause: Error in the central control and regulation unit

Remedy: Contact After-Sales Service

dSP | Sy

Cause: Error in the central control and regulation unit

Remedy: Contact After-Sales Service

dSP | nSy

Cause: Error in the central control and regulation unit

Remedy: Contact After-Sales Service

r | E30

Cause: r adjustment: There is no contact between the electrode and the plasma nozzle

Remedy: Establish a proper connection between the electrode and the plasma nozzle

r | E31

Cause: r adjustment: Process was interrupted by repeatedly pressing the gas-test button

Remedy: Establish a proper connection between the electrode and the plasma nozzle
Press the gas-test button once

r | E33

Cause: r adjustment: Poor contact between the electrode and the plasma nozzle

Remedy: Check the plasma torch wearing parts

r | E34

Cause: r adjustment: Poor contact between the electrode and the plasma nozzle

Remedy: Check the plasma torch wearing parts

no | Arc

Cause: Plasma arc break

Remedy: Check plasma torch wearing parts, check process parameters and gas flow rate

no | H2O

Cause: Cooling unit flow sensor trips

Remedy: Check the cooling unit; if necessary, top-up with coolant or vent the coolant supply, as per the "Starting up the Cooling Unit" section

hot | H2O

Cause: Cooling unit thermostat trips

Remedy: Wait until the end of the cooling phase, when "Hot | H2O" is no longer displayed.
ROB 5000 or fieldbus coupler for robot control: Before resuming the plasma process, set the "Source error reset" signal.

-St | oP-

When operating the power source with a robot interface or field coupler

Cause: Robot not ready

Remedy: Set the "Robot ready" signal, set the "Source error reset" signal ("Source error reset" only for ROB 5000 and fieldbus coupler for robot control)

**Power Source
Troubleshooting**

Power source not working

Power source switched on; displays and indicators do not illuminate

Cause: Grid lead damaged or broken, mains plug not inserted

Remedy: Check grid lead, insert mains plug if necessary

Cause: Grid socket or mains plug faulty

Remedy: Replace faulty parts

Cause: Mains fuse protection

Remedy: Replace mains fuse

No plasma arc

Power switch ON, overtemperature indicator illuminates

Cause: Overloading

Remedy: Take duty cycle into account

Cause: Automatic thermal circuit breaker has tripped

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

Cause: Fan in the power source is faulty

Remedy: Contact After-Sales Service

No gas

All other functions are OK

Cause: Gas cylinder empty

Remedy: Replace gas cylinder

Cause: Faulty gas pressure regulator

Remedy: Replace the gas pressure regulator

Cause: Gas hose is not fitted or is damaged

Remedy: Fit or replace gas hose

Cause: Faulty plasma torch

Remedy: Replace the plasma torch

Cause: Faulty gas solenoid valve

Remedy: Contact After-Sales Service

Poor plasma qualities

Cause: Incorrect process parameters

Remedy: Check settings

Plasma torch gets very hot

Cause: Plasma torch is under-dimensioned

Remedy: Observe duty cycle and load limits

Cause: Coolant flow too low

Remedy: Check coolant level, coolant flow rate, water contamination, etc. If coolant pump blocked: use a screwdriver to turn on the shaft of the coolant pump at the gland

Cause: Parameter C-C is set to "OFF".

Remedy: In the Setup menu, set parameter C-C to "Aut" or "ON".

Service, maintenance and disposal

General

The plasma power source only requires minimal care and maintenance under normal operating conditions. However, several points must be observed in order for the plasma power source to remain operational for years to come.

Safety

WARNING!

Danger from incorrect operation and work that is not carried out properly.

This can result in serious personal injury and damage to property.

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

WARNING!

Danger from electrical current.

This can result in serious personal injury and damage to property.

- ▶ Before starting work, switch off all devices and components involved, and disconnect them from the grid.
- ▶ Secure all devices and components involved so they cannot be switched back on.
- ▶ After opening the device, use a suitable measuring instrument to check that electrically charged components (such as capacitors) have been discharged.

WARNING!

Danger due to insufficient ground conductor connection.

This can result in serious personal injury and damage to property.

- ▶ The housing screws provide a suitable ground conductor connection for grounding the housing.
- ▶ The housing screws must not under any circumstances be replaced by other screws without a reliable ground conductor connection.

At every start-up

- Check for damage to the mains plug and mains cable, as well as the plasma torch and hosepack
- Check if the all-round clearance of the device is 0.5 m (1 ft. 8 in.) so that cooling air can circulate unimpeded

NOTE!

Air intake and exhaust openings must also not be blocked or even partially covered.

Every 2 Months

- If present: clean air filter

Every 6 Months

 **CAUTION!**

Danger due to the effect of compressed air.

This can result in damage to property.

- ▶ Do not bring the air nozzle too close to electronic parts.

-
- 1 Dismantle device side panels and blow the inside of the device clean with dry, reduced compressed air
 - 2 Also clean the cooling air ducts if there is a large accumulation of dust

 **WARNING!**

Danger of electric shock due to grounding cable and device grounding points not being connected properly.

An electric shock can be fatal.

- ▶ When refitting the side panels, ensure that the grounding cable and device grounding points are properly connected.

Disposal

Materials should be disposed of according to valid local and national regulations.

Appendix

Technical data

Special Voltage

 **CAUTION!**

An inadequately dimensioned electrical installation can lead to serious damage.

- ▶ The grid lead and its fuse protection should be designed accordingly.
- ▶ The technical data on the rating plate should be followed.

Acerios

Mains voltage	3 x 400 V
Mains voltage tolerance	±15%
Grid frequency	50 / 60 Hz
Slow-blow mains fuse protection	35 A
Max. permitted grid impedance Z_{max} on PCC ¹⁾	Possible connection restrictions ²⁾
Primary continuous power (100% D.C. ³⁾)	10.8 kVA
Cos phi	0.99
Process current range	35 - 200 A
Process current at 10 min/40°C (104°F) 100% D.C. ³⁾	200 A
Open circuit voltage	97 V
Working voltage	11.4 - 33.0 V
Striking voltage (U_p)	9.5 kV
Protection class	IP 23
Type of cooling	AF
Insulation class	F
EMC device class (according to EN/IEC 60974-10)	A ⁴⁾
Dimensions l/w/h (with handle)	625/290/475 mm 24.6/11.4/18.7 in.
Weight	40.3 kg 88.85 lb.
Marks of conformity	S, CE

Explanation of Footnotes

- 1) PCC = interface to a 230/400 V, 50 Hz public grid
- 2) Consult the grid operator before connecting the device to the public grid!
- 3) D.C. = duty cycle
- 4) A device in emissions class A is not intended for use in residential areas in which the power is supplied via a public low-voltage grid. The electromagnetic compatibility may be influenced by conducted or radiated radio frequencies.



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