

plasma cell P300

Operating instructions



Thank you for choosing a high-quality branded device from **relyon plasma** and for the trust you have placed in us.

Please read the operating instructions carefully to make optimum use of the device.



Important!

It is essential to read these instructions thoroughly prior to assembly, installation and commissioning.

The safety warnings must be observed. Non-observance of the safety warnings can lead to accidents and may cause serious injury to the person or damage to machinery.

Commissioning and operation of the device may only be performed by qualified trained specialists.

Ensure that the relevant specialists are suitably trained. The operator/user is responsible for ensuring that the relevant personnel have fully understood the operation of the device as well as the safety regulations.

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1 Safety

This device has been manufactured according to the relevant international standards. As with any technical product, hazards may be present if the system is used improperly or contrary to the intended use.

Operating this device can be dangerous and may lead to serious or even fatal injury. Therefore, please protect yourself and others.

In addition to the advice given in these operating instructions, please also observe the generally applicable safety regulations.



Caution – danger!

The system may only be operated by appropriately trained persons.

Please observe the safety advice in these operating instructions; non-observance can result in serious or even fatal injury when operating the device.

1.1 Residual risks

This device has been manufactured to the latest technology standards. Nevertheless, residual risks should never be ignored.

Observe the following safety warnings strictly:



Caution – high voltage!

- High voltage danger
 - Never reach into the plasma beam of the connected plasma generator.
 - Never touch the workpiece in contact with the plasma beam or the holder during operation.
 - Never touch the connected plasma generator during operation.
 - Never direct the plasma beam towards humans or animals.
 - Earth the plasma generator by mounting it into a holder.
- Beware of the risks associated with 230 V, especially if the electrical connections, power cords, monitor arm cables or the device itself are visibly damaged:
 - Do not operate the device in this case.
 - Damaged parts must either be repaired by a specialist or replaced.
 - This device should only be used in conjunction with earthed power outlets.
 - Ensure that the electrical information on the type plate corresponds to the data on the power supply.



Beware of danger to the person!

This device operates at high frequency (~ 40 to 65 kHz plasma generator).

- As a precaution, persons with a pacemaker, hearing aid or hearing implants should note the following:
 - Do not use this device if wearing a pacemaker, hearing aid or hearing implant.
 - Consult a physician prior to working in the vicinity of the system.
- Within a hospital environment or similar, the function of electromedical, information technology or other equipment (ECG, PC, ...) may be affected when the device is operated.
 - Ensure that operators of other equipment or systems are aware of this risk prior to commissioning this device.



Beware of hot surfaces!

Take care when opening the processing chamber, as the plasma generator nozzle may reach temperatures of up to 200°C during operation.

- Only touch the nozzle or the workpiece once they have cooled down after operation.
- If the nozzle or electrode needs to be exchanged, always wait until the plasma generator has cooled down.

Please note that heat may build up on the substrate during the plasma process. Be aware therefore of potential fire risks.



Beware of danger by crushing!

The processing unit may only be moved with the door closed and the housing intact, otherwise there is a danger of crushing.



Caution – nitrogen oxides and ozone (O₃)!

Nitrogen oxides or ozone above the recommended limits may be produced by the device.

- Ensure that the work area is well ventilated.
- Always use the optional P300 plasmacell integrated extraction module or install an extraction facility.



Tripping danger!

Lay the connecting cables and gas lines inside suitable cable runs.

Lay the cables and gas lines in such a way that any danger of tripping is excluded.



Beware of the risk of damage to the device!

The device can overheat. Do not cover the ventilation slots.

1.2 Operator obligations and information

- Emitted interference is to be expected.
The system has been tested in accordance with the EMC Directive 2004/108/EC.
 - The operator must check and ensure the electromagnetic compatibility with other electrical and electronic devices in the immediate vicinity.
- Ensure that:
 - the operating personnel have read and understood these operating instructions.
 - persons in the vicinity of the device are also made aware of the dangers and are equipped with the necessary protection.
 - maintenance is only be performed by a qualified specialist.
- Instruct the operating personnel in particular regarding the safety instructions in these operating instructions.
- Always keep the system in good working condition.
- Modifications to the device will render both the operating permit and warranty void.
This is unless the changes are expressly permitted by the manufacturer.

1.3 Intended use

The plasmacell P300 is exclusively designed for operation with integrated components from **relyon plasma** GmbH. The manufacturer should be contacted if operation is sought with components other than those supplied.

Operation with components and/or products from other manufacturers that have not been approved will render the warranty void.

The device with integrated plasma generator is intended exclusively for the plasma treatment of material surfaces (metals, textiles, glass and plastics) for activation, cleaning, coating or residue removal at atmospheric pressure or in a low vacuum (up to 1 mbar). Flammability of the substrates must be taken into account.

Under no circumstances may the device be operated by untrained personnel. Maintenance may only be performed by a qualified specialist.

The system is designed for operation with compressed air or nitrogen. Other gases are not permitted.

1.4 Unsuitable operating conditions

Operation of the device is not permitted under the following conditions:

- in areas with risk of explosion (EX)
- for heavy dust deposits
- if damage is visible or known
- if air humidity levels are too high (see the “Technical Data” chapter)
- for installations over 2,000 m above sea level
- in situations of high vibration
- with potentially flammable materials and liquids.

1.5 Emissions

The connected plasma generator emits the following:

- Small amounts of UV light.
- Small amounts of ozone (O₃) and nitrogen oxides (NO_x). The occupational exposure limit (OEL) may be exceeded. For example:

Plasma gas	Gas flow	Ozone	NO _x
Air	35 l/min	1.5 mg/m ³	3,500 mg/m ³
Nitrogen	35 l/min	0.4 mg/m ³	350 mg/m ³

Please note the information given in the operating instructions for the plasma generator.



Note:

As a precaution, an extraction unit with a capacity of at least 500 litres per minute should be connected to the device. If no extraction system is available on site, the system can optionally be supplied with an extraction system or retrofitted. Please contact **relyon plasma GmbH** for such requirements.

2 Device description

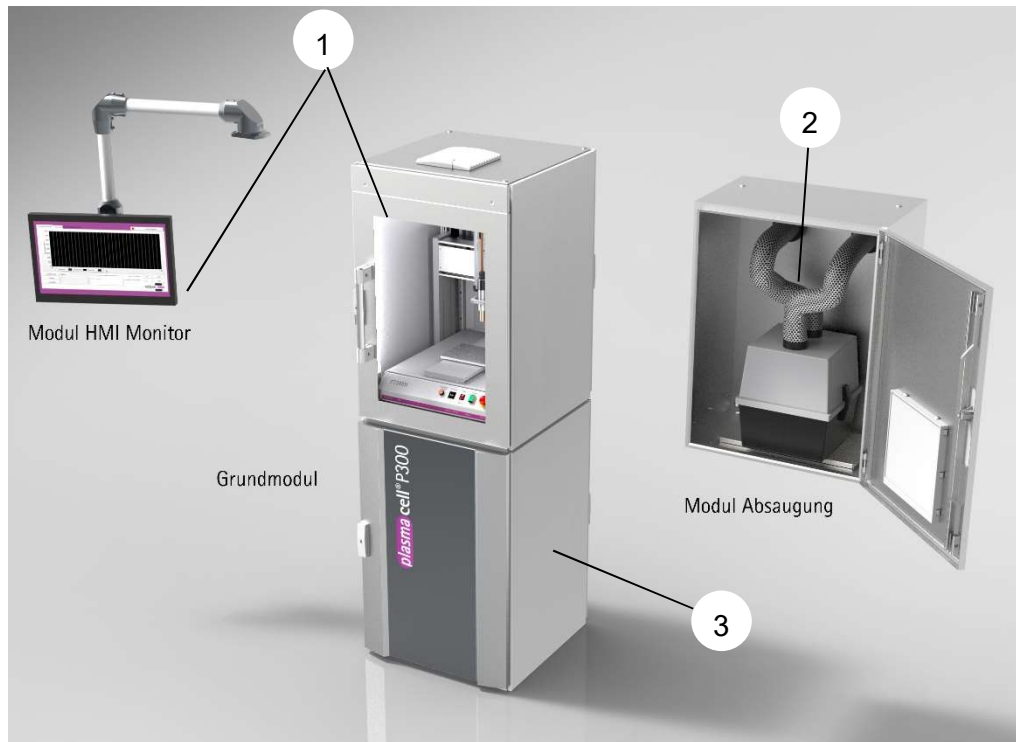
2.1 Function

The plasmacell P300 is a workstation for the surface treatment of conductive and non-conductive materials at atmospheric pressure. All the necessary components for operation and plasma treatment are already integrated into the system.

The system is intended for industrial and laboratory applications in which, for example, surfaces are activated and cleaned with plasma before printing, adhering or painting.

2.2 Device overview

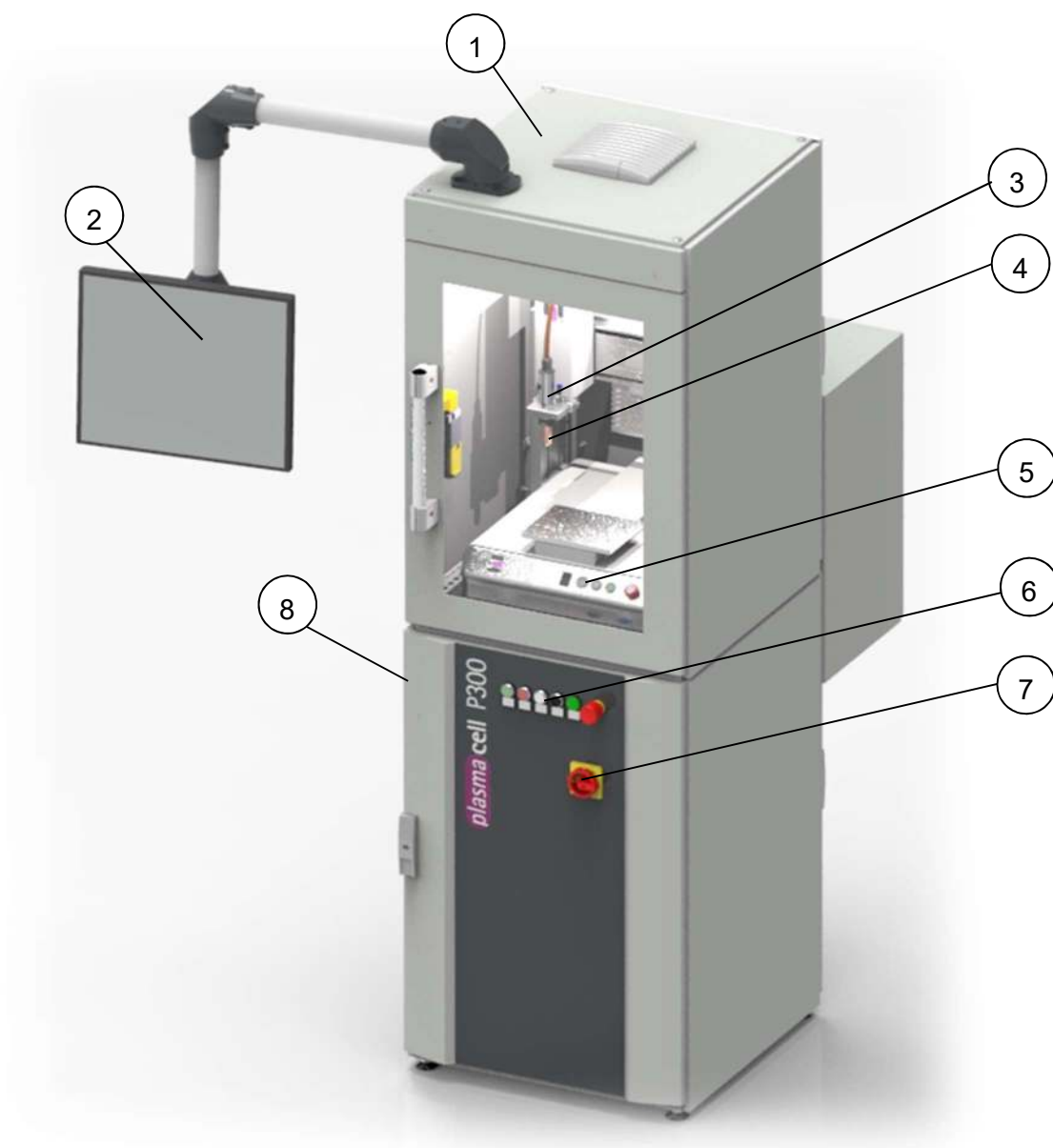
2.2.1 Module overview



No.	plasmacell P300 module
1	plasmacell P300 basic modul with human machine interface (HMI) (incl. PG31 plasma generator, nozzle, HVC, PS2000 power source and XYZ portal)
2	plasmacell P300 module integrated suction (extraction unit with exchangeable activated carbon filter without external piping)
3	plasmacell P300 module compressor (integrated, for compressed air supply; not shown)

All modules except the basic module are optional. Please note that an appropriate extraction system must always be available.

2.2.2 Basic module



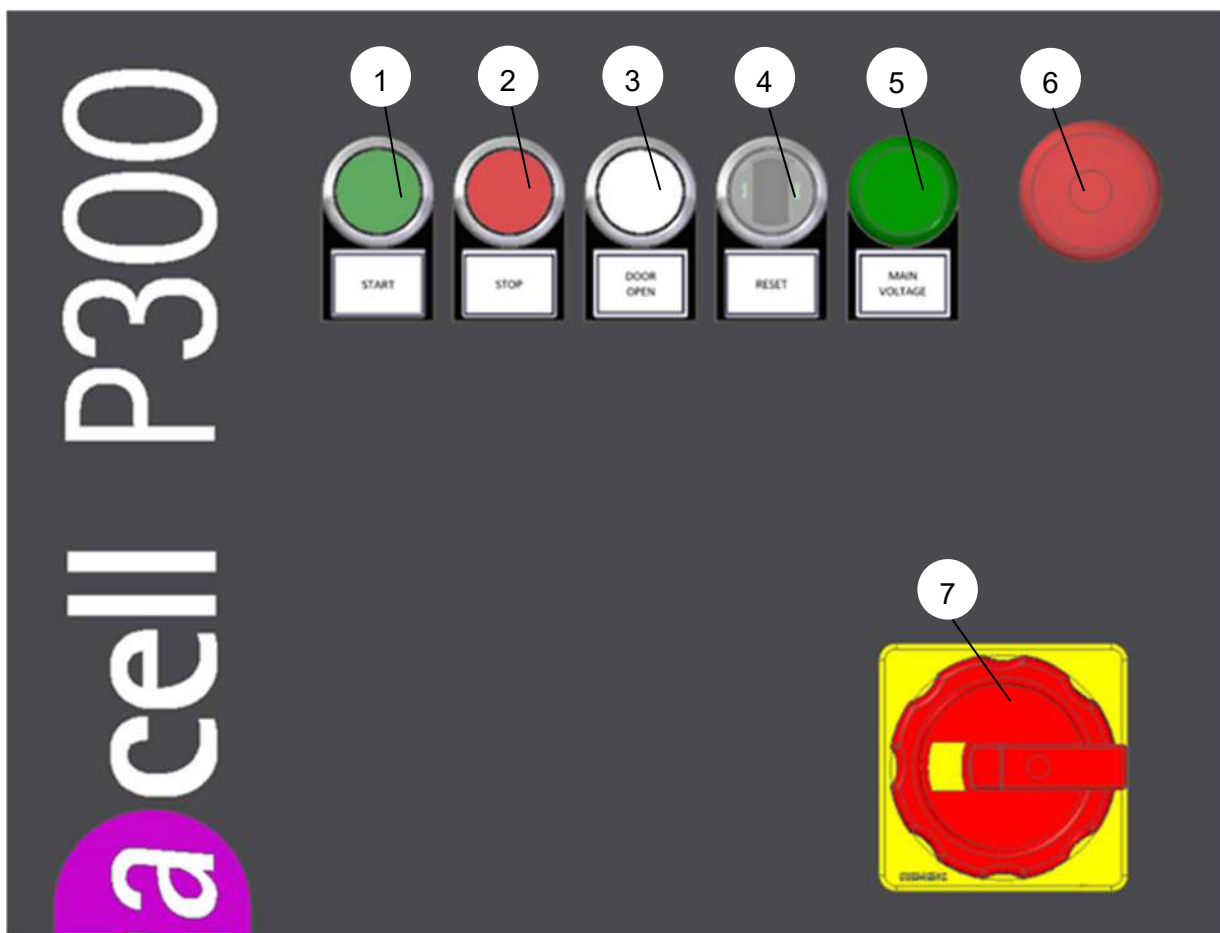
No.	Basic module
1	Housing upper cabinet incl. Processing chamber
2	Human Machine Interface (HMI; monitor as extended input and display option incl. the process unit software)
3	Plasma generator
4	Nozzle
5	Process unit control panel
6	Main control panel
7	Main switch
8	Housing lower cabinet incl. power supply

2.2.3 Process unit control panel



No.	Process unit control panel
1	Program selection 00-99
2	Operating mode settings: "Run" = normal mode or "Teach" = setup mode
3	Purge (illuminates if plasma active)
4	Manual start of the selected program (process unit only, i.e. without plasma generation)
5	EMERGENCY STOP
6	External PC interface connection
7	Teach pendant connection

2.2.4 Main control panel



No.	Main control panel
1	Start button
2	Stop button
3	Open door button (disabled during plasma operation)
4	Status display and acknowledgement button (turns red in the event of a fault)
5	Green light (confirms that mains voltage is applied to the system)
6	EMERGENCY STOP
7	Main switch

2.2.5 Teach pendant



The teach pendant is attached to the rear of the HMI. This can be used to program the process unit software (see example program in Chapter 7.3). Number assignment is performed directly on the process unit.

Once a program has been set up, the teach pendant is no longer required as the program can be called up and run via the process unit and HMI.

No.	Main control panel
1	Shift (LED illuminates when active)
2	Speed setup (first press Shift, release, then press Speed)
3	Jump

There is a number on the right of most of the buttons on the teach pendant. If the input requires a number, then this is automatically used when the corresponding button is pressed.

2.2.6 Description and connections

- **Power:**

The basic module has a 230 V black IP44 earthed plug on the back (bottom right).

- **Extractor:**

If you have opted for the version with extraction module then you do not need to connect anything else.

Otherwise, please connect your own extraction system to ensure that nitrogen oxides and ozone do not escape unintentionally. In addition there are two ventilation grilles on the rear of the basic module (see image below) with external dimensions of 9x9 cm and internal dimensions of 7x7 cm.



Caution – nitrogen oxides and ozone (O₃)!

Nitrogen oxides or ozone above the recommended limits may be produced by the device.

- Ensure that the work area is well ventilated.
- Always use the optional P300 plasmacell integrated extraction module or install an extraction facility.

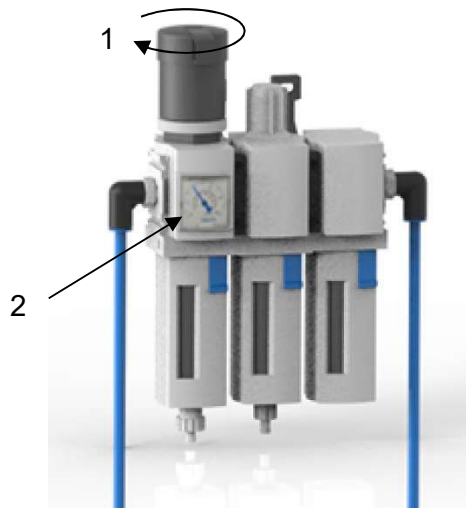
- **Compressed air:**

If you have opted for the version with compressor module then you do not need to connect anything.

Otherwise, please connect your own compressed air supply to the maintenance unit. This is located on the rear of the basic unit at the bottom right (see image).



Characteristic of the preadjusted throttle

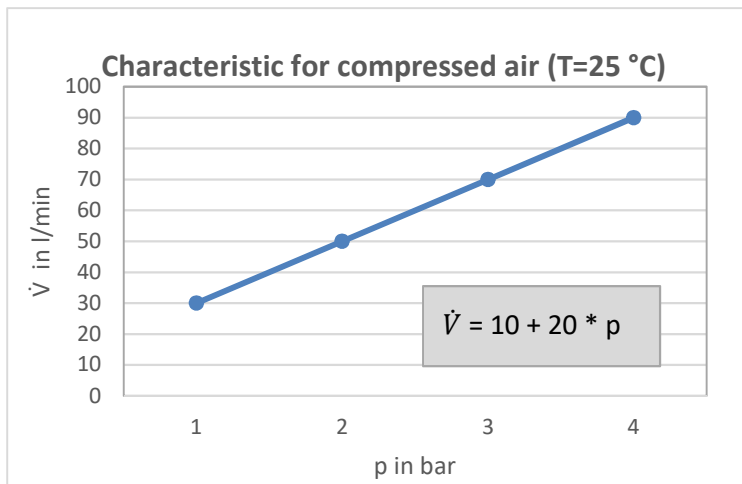


1. Adjust the gas pressure by turning the maintenance unit on the pressure reducer.
2. Read off the set value on the display.
3. The corresponding flow results from the following characteristics. Please refer to the operating instructions of the connected machines for the permissible operating parameters.



Characteristic validity range

The characteristic is only valid if the throttle is not moved and the hose length ($D_i=4$ mm) is 1 m. For a hose length that is 5m, the pressure must be increased by 10%. For a hose length that is 10 m, the pressure must be increased by 20%.



Compressed air characteristic at room temperature (1 m hose connection with $D_i=4$ mm)

Pressure		Gas flow \dot{V}	
1	bar	30	l/min
2	bar	50	l/min
3	bar	70	l/min
4	bar	90	l/min



Beware of the risk of damage to the device!

Operating the plasma generator with little or no gas may damage the unit.

- Ensure that the gas supply has been connected correctly and that a minimum pressure of 5 bar is present.

• Data:

A data connection is only required for remote maintenance (see Chapter 7.4.7).

2.3 Deconnectedry scope

The product is supplied with the following components:

- plasmacell P300 basic module plus selected additional options (see Chapter 2.2.1 Module Overview)
- plasmacell P300 operating instructions (available herewith)
- Operating instructions for PS2000OEM power source
- Operating instructions for PG31 plasma generator
- Operating instructions for HVC cable extension
- Operating instructions for PB3 nozzle exchange

3 Technical data

Description	Standard with HMI	Option level: HMI + extraction	Option level: HMI + compressor	Option level: HMI + extraction + compressor
Electrical connection				
Electrical connection	220 V – 240 V AC/50-60 Hz/max. 10 A			
Mains fuse	No mains fuse included			
Power consumption	≤ 2,000 W			
Power dissipation	P _{max} : 500 W			
Protection class	IP54 in accordance with EN 60529			
Protection class	Class I according to IEC 61140			
Plasma generator working voltage	• up to 20 kV U _{peak} (max. voltage during ignition (temporary)) • up to 2 kV RMS (medium operating voltage)			
Internal fuses F1, F2	6.3 A/500 VAC/time lag, SIBA type 189140.6,3 (PS2000)			
Gas supply				
Permissible gases	Compressed air; nitrogen	Compressed air; nitrogen	Gas supply from internal compressor	Gas supply from internal compressor
Connection	6 mm Festo hose connection	6 mm Festo hose connection		
Pre-pressure	5 bar	5 bar		
Min. flow rate	80 l/min	80 l/min		
Mass				
Weight	225 kg; 496 lbs	260 kg; 573 lbs	235 kg; 518 lbs	270 kg; 595 lbs
Minimum level	1,950 mm; 76.77"			
Width without HMI	600 mm; 23.62"	625 mm 24.61"	600 mm; 23.62"	625 mm 24.61"
Width with HMI/ maximum width	1,255 mm; 49.41"			
Standard depth	715 mm; 28.15"	1,060 mm; 41.73"	715 mm; 28.15"	1,060 mm; 41.73"
Maximum depth with HMI	1,500 mm; 59.06"	1,800 mm; 70.87"	1,500 mm; 59.06"	1,800 mm; 70.87"
Operating conditions				
Humidity	< 80% rel. (non-condensing)			
Temperature	5 – 40°C; 41 – 104°F			
Storage conditions				
Humidity	< 80% rel. (non-condensing)			
Temperature	-25 – 55°C; -13 – 131°F			
Noise emissions				
Sound pressure level	< 70 dB(A) at 1 meter distance			

4 Transportation and storage

- To transport the plasmacell P300, use the supplied transportation pallet and a lift truck, for example.
- There are four lifting lugs on the upper cabinet for transportation purposes.
- Store the plasmacell P300 in a dry place.
- Protect the plasmacell P300 from heavy soiling and foreign bodies.

5 Unpacking and installation



Caution – high voltage!

High voltage danger 230/400 V.

- The plasmacell P300 may only be connected to the mains voltage supply by a qualified electrician.

5.1 Unpacking and set up

- Open the plasmacell P300 packaging carefully. Observe the directional information on the packaging.
- A lifting device is required to lower the plasmacell P300 from the transportation pallet.
- The unit must be set up on a firm and level surface.
- Adjust the feet of the basic module until it stands straight.
Additional modules which have been ordered will already be attached to the basic module.
- For the integrated extraction module, ensure that the ventilation slots are not covered (clearance to wall > 150 mm).
- Before establishing media connections to the plasmacell P300, check the device for possible damage, especially to cables and hoses.

5.2 Installation requirements

The following conditions must be met before installing the device:

- A suitable gas supply must be available when operating without a compressor.
- The device must not be damaged.
- In fixed installations or within buildings, a switch or circuit breaker suitable according to the specifications of the respective national safety regulations (within EN 60204) is to be provided as an upstream all-pole disconnecting device in order to be able to disconnect the device from the supply voltage. This disconnecting device must be placed close to the unit and should be easily accessible for the user. This switch must be clearly marked as a disconnecting device for the unit.
- For connections, see Chapter 2.2.6 Description and connections.

6 Essential information prior to plasma processing

6.1 General description

Treating surfaces with atmospheric plasma has several advantages. These include an increase in the surface energy in order to achieve superior surface wetting.

Optimal surface wetting is the first and often decisive step in obtaining a good imprint, a homogeneous coating, uniform painting or a material-locking adhesive application. The interface bond often determines the longevity and adhesive strength of the material pairing.

Atmospheric pressure plasma increases throughput in many industrial processes while at the same time saving solvents or chemical primers. We have successfully integrated our plasma products into the following fields of application:

- Cleaning of metal, glass and plastics
- Surface activation and functionalisation for optimised wetting
- Coating to achieve new surface properties
- Plasma-assisted laminating processes
- Plasma-assisted adhesive bonds
- Filling and sealing
- Plasma-induced reduction of metal surfaces
- Chemical-free bleaching of textiles
- Plasma-sterilisation of tissue
- Food treatment for quality and shelf life
- Sterilisation of thermally unstable plastics
- Multi-component injection moulding

Virtually all technical material classes can be processed efficiently under atmospheric pressure:

- Metals and metal alloys
- Plastics and composites
- Glass, ceramics, inorganic composites and natural stone
- Natural and imitation leather
- Natural fibres, wood and paper

Since plasma treatment is always only a part of the entire process, it is important that any further influencing variables are also known in order to achieve an optimum result.

Examples of typical influencing variables might be:

- Plasma process: depth to substrate, speed and nozzle geometry
- Substrate/workpiece: material composition, contamination, electrical conductivity, thermal conductivity and moisture content
- Workpiece handling: contamination before or after plasma processing, delay between plasma processing and subsequent processing

Treatment examples can be directly requested from **relyon plasma** GmbH.

Further information about applications and publications can be found on the website **www.relyon-plasma.com**.

6.2 Notes on the correct handling of the substrates to be treated



Caution – high voltage!

- High voltage danger
 - Never direct the plasma beam towards humans or animals.
 - Never touch the plasma nozzle or plasma stream during operation.
 - Never touch the workpiece being treated or its holder during plasma generation.
 - Electrically conductive materials in contact with the workpiece to be treated must be earthed.

Certain safety precautions must be taken since the device operates at high voltage. This applies not only to the direct handling of the device itself but also to the workpiece to be treated and its holder.

In principle, workpiece holders and any other objects in contact with the workpiece must be earthed. It must be ensured, for example, that any workpiece holder made of conductive material cannot be touched by the user or third party during plasma treatment. Electric shocks can also be transmitted from the workpiece via the workpiece holder to a third party. If an additional holder made of insulating material is employed, it must have a dielectric strength of at least 20 kV/mm.

If you are interested in this special application, please contact **relyon plasma** GmbH directly.

6.3 Performing surface treatment

Depending on the type and condition of your substrate, pre-cleaning prior to plasma processing may improve the overall result.

The effect of the treatment depends on the operating distance, duration of treatment, speed and uniformity of movement as well as on the material to be treated.

Ensure that the substrate does not become thermally damaged by excessively slow movement or too short an operating distance.

Treatment examples can be directly requested from **relyon plasma** GmbH.

6.4 Steps subsequent to surface treatment

In order to achieve an optimal result, it is important that as little time as possible elapses subsequent to plasma treatment and that the treated surface is not touched or soiled in any way. Surface cleaning AFTER plasma treatment is not recommended. Since the workpiece may heat up depending on the type and duration of the plasma process, it may be necessary to allow the workpiece to cool down before performing the next process stage. This is to ensure that processing is not negatively influenced by heat input (e.g. for certain adhesion processes).



Beware of hot surfaces!

The workpiece to be treated may heat up during plasma processing depending on the process parameters. If necessary, allow the workpiece to cool before touching it.

7 Operation

7.1 Controls/displays



Caution – high voltage!

Risk of electric shock.

- Never reach into the vicinity of the connected plasma generator (nozzle, workpiece or holder) while it is in operation or even when it has switched itself off.

The plasmacell P300 has an indicator light showing the current status (see Chapter 2.2.4 Control panel 4 status display).

7.2 Switch on device and operate



Beware of the risk of damage to the device!

Operating the plasma generator with little or no gas may damage the unit.

- Ensure that the gas supply has been connected correctly and that a minimum pressure of 5 bar is present.

Use the device only for the described purpose. Please use the plasma generator supplied together with the corresponding nozzles.

To start plasma treatment, perform the following steps in the order shown below:

1. Switch on the device using the main switch on the front of the basic module. The system will then start incl. HMI.
2. If there are any fault messages, the acknowledgement button on the main control panel will illuminate. Acknowledge this by pressing the acknowledge button there or that of the HMI in the “Error message” interface.
3. Open the processing chamber using the button to open the door on the main control panel and set the switch on the process unit control panel to the “Teach” operating mode.
4. Using the program selection button, select the program number you wish to use. The example programs are numbered 0-4.
5. Close the processing chamber.
6. Edit/write the set program to your requirements using the teach pendant. Follow the steps in Chapter 7.3 and the example program with comments.
7. Next, open the processing chamber again by pressing the door button.
8. Set the switch on the process unit control panel to “RUN” mode and close the processing chamber.
9. Press the start button on the control panel to launch the selected program.



Beware of the risk of damage!

The plasma generator starts automatically when the start button is pressed on the HMI or main control panel! This means that the plasma is always automatically switched on in RUN mode together with the process unit.

Beware of this when starting for the first time in order to avoid damage to any material which may be in the processing chamber.

- ✓ The device is switched on with the selected program running.

7.3 Example program with comments



Note:

The command “Dispense” activates the plasma in the process unit.

In order to write a program, the door on the upper cabinet should be opened and the process unit manually set to “Teach” mode by pressing the “Set operating mode” button on the process unit (see Chapter 2.2.3) so that the button is engaged in the pressed position, i.e. “Teach”. The door should then be closed and the teach pendant used to set the program.

A program consists of a series of commands, each of which is stored at a numbered address within the software itself.

An address contains either a location with X, Y and Z coordinates, the dot type, the instruction to set parameters such as speed, etc., or one to switch the plasma on and off, ...

Dot type: a “dot type” can be defined for each location. The corresponding stored command is then executed at that particular location. The most commonly used dot types are: **Dispense Dot**, **Line Start**, **Line Passing**, **Arc Point** and **Line End**.



Line Start



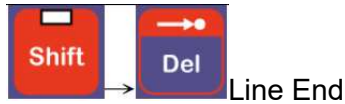
Dispense Dot



Line Passing



End Program



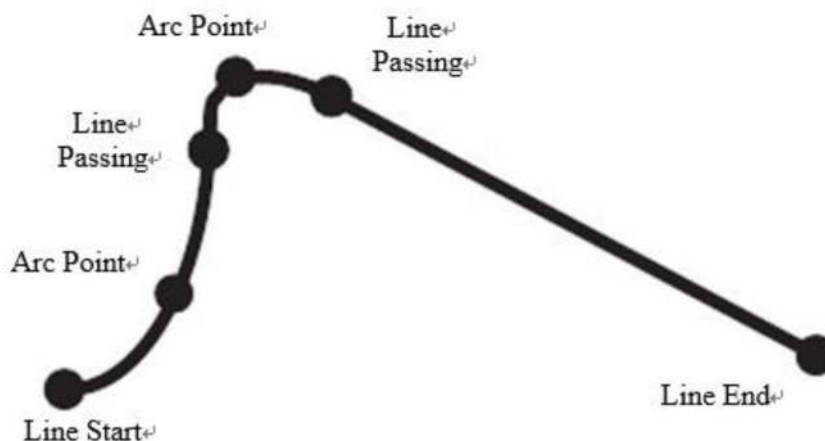
Line End



Arc Point

Dispense Dot means that the relevant dot type is stored at an X, Y, Z coordinate. When the process unit approaches this point the plasma is activated for the set time.

Arc Point is used to move the process unit in a circular arc. **Line Start**, **Arc Point** and **Line End** should be set in this case. The robot then moves over the three points in an arc of a circle with **Arc Point** at the apogee. **Arc Point** can be combined with **Line Passing** to incorporate straight sections and further arcs. However, **Arc Point** may not be repeated consecutively.

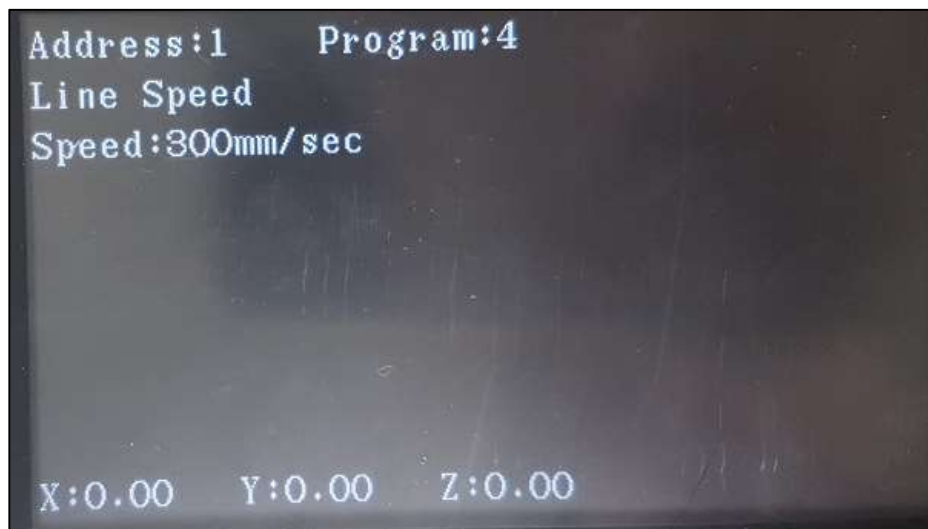


After setting the program, the process unit can be set to "Run". This means that the door can be opened in a safe state and the process unit can be manually set to "Run" mode by pressing the "Set operating mode" button on the process unit (see Chapter 2.2.3) so that the button remains in the up position, i.e. "Run". The door is then closed again. The selected program can now be started.

The teach pendant is no longer needed.

Example of "RP-Test4" program with images of the teach pendant:

- Address 1: set the robot speed to 300 mm/s.



A photograph of a teach pendant screen. The screen is dark with light blue text. At the top, it says 'Address:1' and 'Program:4'. Below that, it says 'Line Speed' and 'Speed:300mm/sec'. At the bottom, it shows 'X:0.00 Y:0.00 Z:0.00'.

```
Address:1    Program:4
Line Speed
Speed:300mm/sec

X:0.00    Y:0.00    Z:0.00
```

- Address 2: plasma on/off setting (dispensing in this example).



A photograph of a teach pendant screen. The screen is dark with light blue text. At the top, it says 'Address:2' and 'Program:4'. Below that, it says 'Line Dispense Setup', 'Head Time:0.00s', 'Tail Time:0.00s', 'Node Time:1.00s', and 'Tail Length:0.00mm'. At the bottom, it shows 'X:0.00 Y:0.00 Z:0.00'.

```
Address:2    Program:4
Line Dispense Setup
Head Time:0.00s
Tail Time:0.00s
Node Time:1.00s
Tail Length:0.00mm

X:0.00    Y:0.00    Z:0.00
```

- Address 3: start of route with first point at 60, 75, 30 (X, Y, Z).

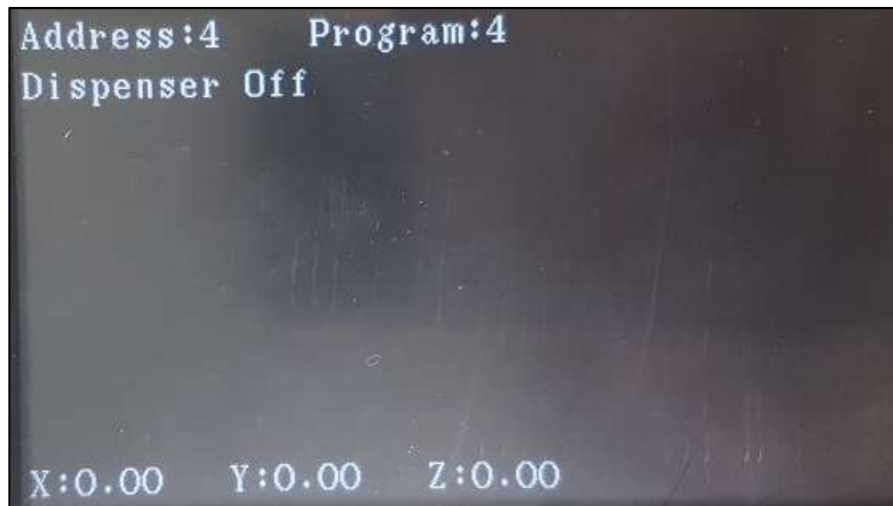


A photograph of a teach pendant screen. The screen is dark with light blue text. At the top, it says 'Address:3' and 'Program:4'. Below that, it says 'Line Start', 'X:60.00', 'Y:75.00', and 'Z:30.00'. At the bottom, it shows 'X:0.00 Y:0.00 Z:0.00'.

```
Address:3    Program:4
Line Start
X:60.00
Y:75.00
Z:30.00

X:0.00    Y:0.00    Z:0.00
```

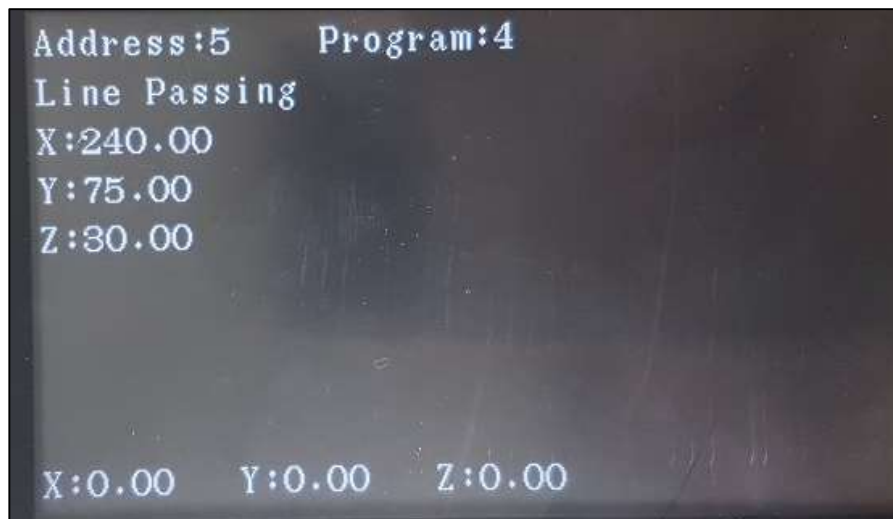
- Address 4: plasma off (dispensing closed in this example).



Address:4 Program:4
Dispenser Off

X:0.00 Y:0.00 Z:0.00

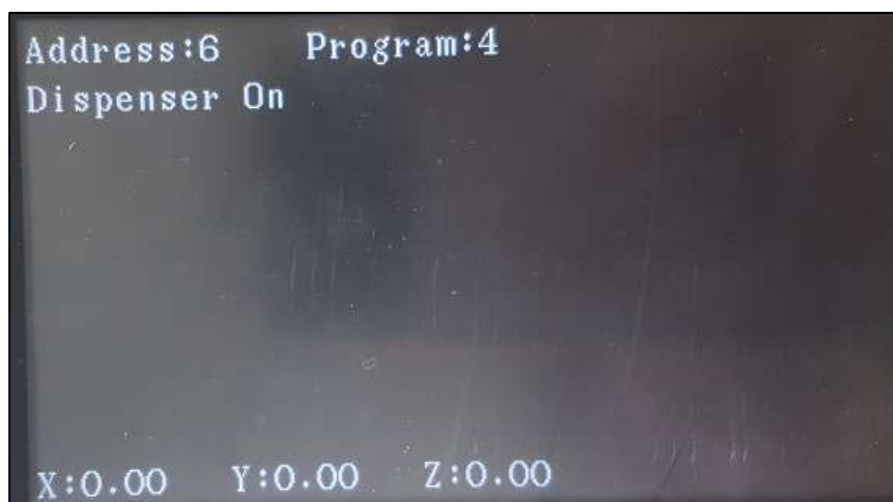
- Address 5: continuation of the line to point 240, 75, 30 (X, Y, Z).



Address:5 Program:4
Line Passing
X:240.00
Y:75.00
Z:30.00

X:0.00 Y:0.00 Z:0.00

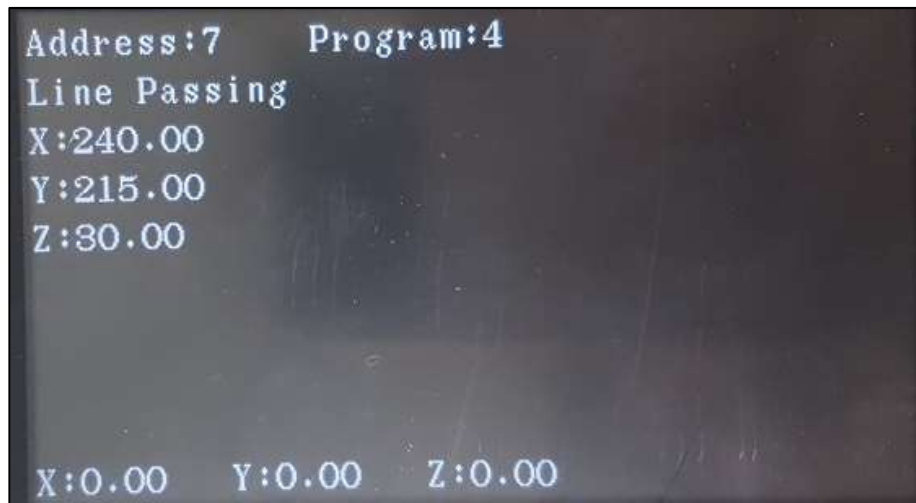
- Address 6: the plasma is switched on as soon as point 240, 75, 30 (X, Y, Z) is reached.



Address:6 Program:4
Dispenser On

X:0.00 Y:0.00 Z:0.00

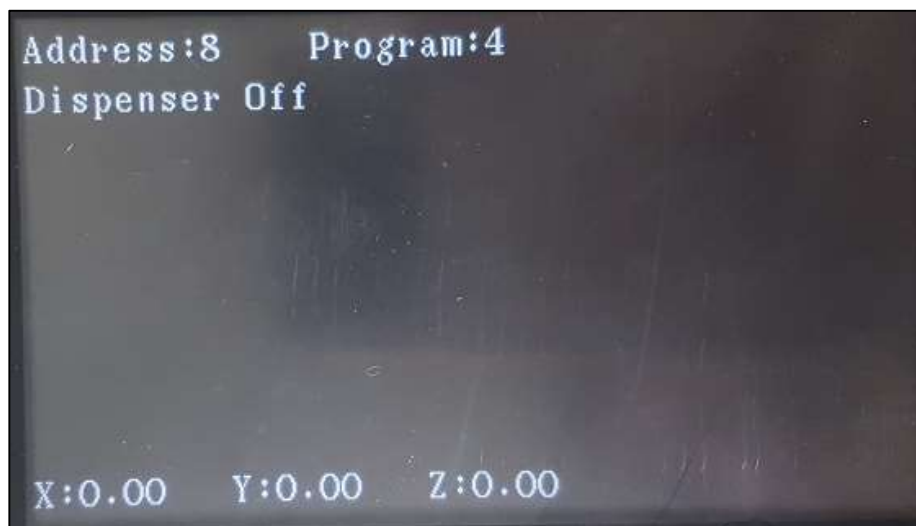
- Address 7: continuation of the line to point 240, 215, 30 (X, Y, Z).



```
Address:7      Program:4
Line Passing
X:240.00
Y:215.00
Z:30.00

X:0.00   Y:0.00   Z:0.00
```

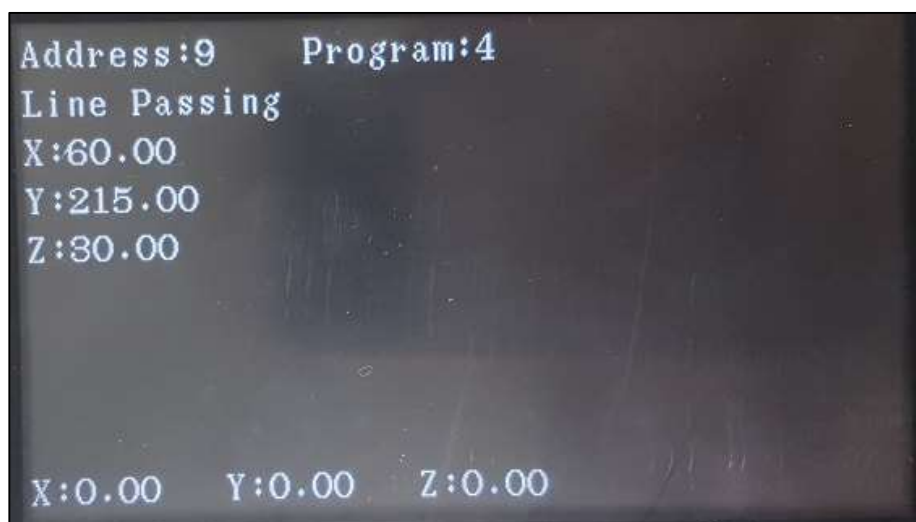
- Address 8: the plasma is switched off as soon as point 240, 215, 30 (X, Y, Z) is reached.



```
Address:8      Program:4
Dispenser Off

X:0.00   Y:0.00   Z:0.00
```

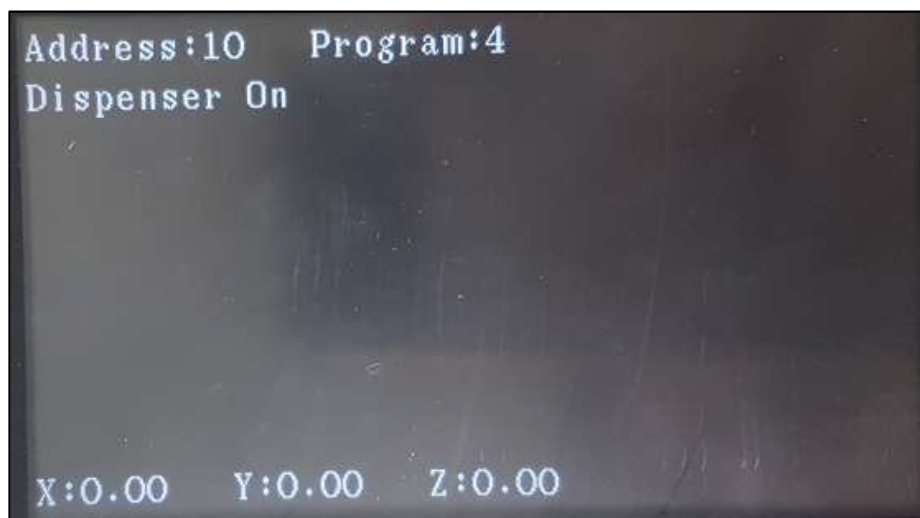
- Address 9: continuation of the line to point 60, 215, 30 (X, Y, Z).



```
Address:9      Program:4
Line Passing
X:60.00
Y:215.00
Z:30.00

X:0.00   Y:0.00   Z:0.00
```

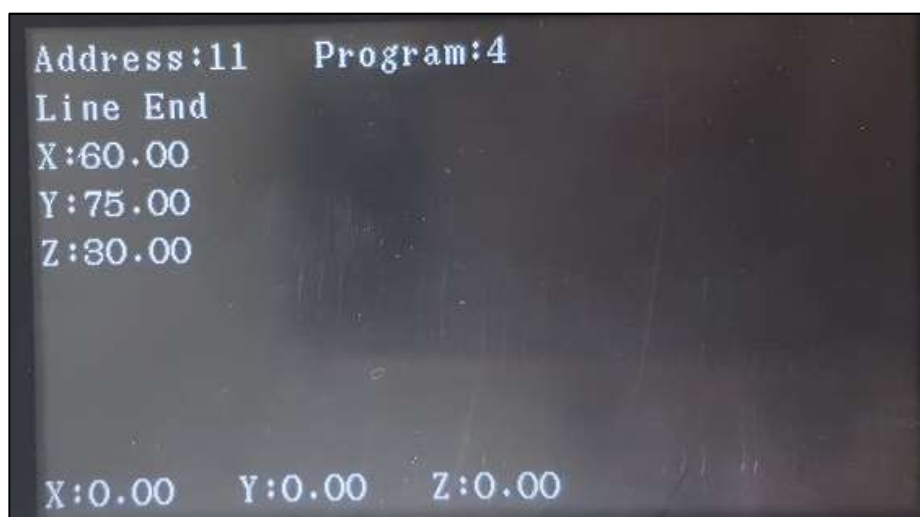
- Address 10: the plasma is switched on as soon as point 60, 215, 30 (X, Y, Z) is reached.



```
Address:10  Program:4
Dispenser On

X:0.00  Y:0.00  Z:0.00
```

- Address 11: end of the route at point 60, 75, 30 (X, Y, Z).



```
Address:11  Program:4
Line End
X:60.00
Y:75.00
Z:30.00

X:0.00  Y:0.00  Z:0.00
```

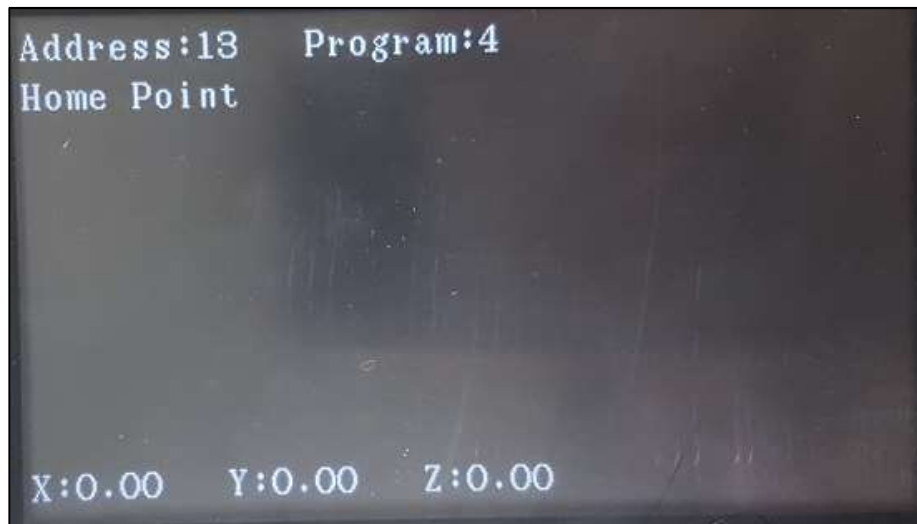
- Address 12: the plasma is switched off as soon as point 60, 75, 30 (X, Y, Z) is reached.



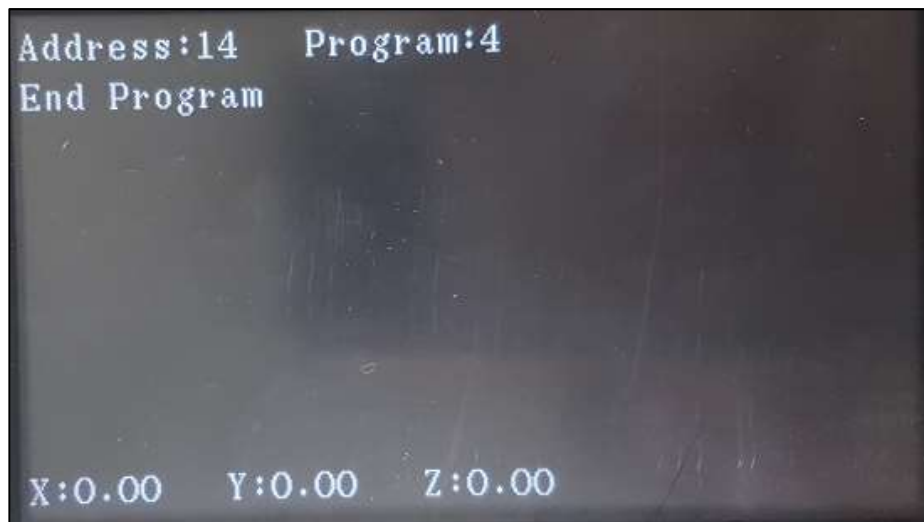
```
Address:12  Program:4
Dispenser Off

X:0.00  Y:0.00  Z:0.00
```

- Address 13: robot moves to home position.




- Address 14: end of program.



For more information on programming contact relyon plasma GmbH technical support.

7.4 HMI interfaces

7.4.1 Home screen/main page

This interface appears when the HMI is launched or upon clicking on the link to the main page .



No.	Home screen
1	Product logo
2	Status display
3	Time
4	Remaining operating hours before nozzle exchange
5	Remaining operating hours before electrode exchange
6	Process control
7	Performance chart
8	Link to main page
9	Link to settings
10	Link to system status
11	Link to error messages
12	Link to help pages
13	Link to shutdown

1) The company logo is displayed on every screen.

2) Status display:

Green: the system is ready for operation

Yellow: door is open

Red: a fault is present

3) The time is obtained from the Windows operating system

4) Remaining operating hours before nozzle exchange. Operating hours until recommended nozzle exchange. This value is stored under "Settings".

5) Remaining operating hours before nozzle exchange indicates the remaining operating hours until the recommended electrode exchange. This value is stored under "Settings".

6) The process control consists of three functions represented by these symbols:



Start: runs the selected programs on the process unit.

The plasma is ignited and remains active until the program is finished.

If the button is greyed out then the process unit has already been issued a command to move.



Stop: stops the current program at any time. The process unit then stops and the plasma extinguishes.



Home: allows the process unit to move to the home position, i.e. the starting position.

The following message is displayed above the process control field if the process unit has not reached the starting position:


Traversing unit not in the starting position. Please wait.

If the button is greyed out then the process unit has already been issued a command to move.

7) The performance chart shows current, voltage and power output from the PS2000 power source via the CAN bus plotted over time.

8) – 13) The links in each menu to the other menu interfaces of the HMI
(see Chapter 7.4.2 – 7.4.8)

7.4.2 Settings

This field appears when selecting the “Settings”  link.

plasma cell P300

16:33:43

PS2000

1

PS2000 power (70..100) [%]:

70

2

PS2000 frequency (40000..65000) [Hz]:

60000

GAS

3

GAS-preflow time (1..10) [s]:

2

4

GAS-flowstop delay (1..10) [s]:

2

5


PlasmaCell with compressor module:

☒

General

6

Show manual:



7

Show performance chart in main menu:

☐


8


Start data recording:


☐

9

Activate remote support?







18

Nozzle and electrode

ACTIVE

10

Change nozzle in (1..5000) [h]:


500

☒

11

Nozzle operating hours:
(Reset only after replacing the nozzle)

0 [h]



12

Alarm for changing nozzle (1..5000) [h]:

450

☒

13

Change electrode in (1..5000) [h]:


1000

☒

14

Electrode operating hours:
(Reset only after replacing the electrode)

0 [h]



15

Alarm for changing electrode (1..5000) [h]:

950

☒

Traversing unit

ACTIVE

16


Traversing unit - stop


☒


17


Traversing unit - send to home position


☒














MAIN

SETTINGS

SYSTEM STATUS

ERROR MESSAGES

HELP

SHUTDOWN

No.	Home screen
1	PS2000 power
2	PS2000 frequency
3	GAS-preflow time
4	GAS-flowstop delay
5	Compressor module
6	Link to manual
7	Performance chart activation
8	Start data recording
9	Link to remote access
10	Input time until nozzle exchange
11	Display of nozzle operating hours
12	Set alarm before nozzle exchange
13	Enter time until electrode exchange
14	Display of electrode operating hours

15	Set alarm before electrode exchange
16	Stop traversing unit
17	Move traversing unit to home position
18	Language setting German or English

- 1) Under “PS2000 Power”, the output of the PS2000 power source can be set between 70% and 100%.
The default setting is 100%.
- 2) Under “PS2000 Frequency” the frequency of the PS2000 power source can be set between 40 kHz and 65 kHz.
The default setting is 54 kHz.
- 3) Under “Gas lead time”, the gas lead time can be set between 2 and 10 seconds **on any existing additional compressor module**. The default setting is 2 seconds. The appropriate reaction time can be set depending on the system lead time.
- 4) Under “Gas overrun time”, the gas overrun time can be set between 2 and 10 seconds **on any existing additional compressor module**. The default setting is 2 seconds. Ensure that there is no damage due to overheating. The appropriate reaction time can be set depending on the system overrun time.



Beware of the risk of damage to the device!

The gas lead and overrun times can only be controlled with the additional gas module. If you did not opt for this module, you will need to take care of the appropriate lead and overrun times yourself.

Operating the plasma generator with little or no gas may damage the unit.

- Ensure that the gas supply has been connected correctly and that a minimum pressure of 5 bar is present.

- 5) Here the checkbox on the right should only be active if the optional compressor module is available. The circuit activates the pre- and post-run time and must be selected if the module is connected. If the compressor module has been selected but is not present, this can lead to errors.
- 6) Link to the “Help” menu and thus to these operating instructions.
- 7) Under “Activate performance diagram”, the performance chart can either be displayed or hidden from the main menu.
- 8) Data recording begins when “Start data recording” is activated.
- 9) “Remote access” serves to activate the technical service remote access (see Chapter 10.2 Customer service).
- 10) “Enter time until nozzle exchange” allows the time until nozzle exchange to be set between 1 and 5,000 hours.

The default setting is 500 hours. Depending on usage levels, it may be recommended to exchange the nozzle earlier or be possible to operate the nozzle for longer without deterioration (see Chapter 9 Cleaning and maintenance).

11) Display of current operating hours. The button is used to reset the time to zero when exchanging the nozzle.

12) Setting the nozzle exchange alarm displays the appropriate message in the main menu.



13) “Enter time until electrode exchange” allows the time until electrode exchange to be set between 1 and 5,000 hours.

The default setting is 1,000 hours (see Chapter 9 Cleaning and maintenance).

14) Display of current operating hours. The button is used to reset the time to zero when exchanging the electrode.

15) Setting the alarm until the electrode is exchanged displays the appropriate message in the main menu.




16) “Traversing unit - stop” brings the process unit to a stop at any time. The process unit then stops and the plasma extinguishes.

17) With “Traversing unit- send to home position” the process unit can be moved to the home position, i.e. the starting position.

18) The respective national flags can be used to distinguish between German and English.

7.4.3 System status

This field appears when the “System status”  link is clicked.



11:03:47

1

Status code :	4
Error code :	0000 [hex]
Frequency :	60 [kHz]
Power :	16 [W]
Voltage (RMS) :	6 [V]
Current (RMS) :	0 [mA]
System uptime :	5 [h]
Temperature 1 :	22 [°C]
Temperature 2 :	28 [°C]
Temperature 3 :	32 [°C]
Temperature 4 :	34 [°C]

2

Bus Load :	1
Cycle counter :	0
Open error :	0
Actual cycle time :	0
Diag. flag :	0
Cycle failed counter :	0

3







Nozzle operating hours :	0 [h]
Electrode operating hours :	0 [h]

4

Input: Userbutton "START"	
Input: Userbutton "STOP"	
Input: Userbutton "DOOR"	
Input: Userbutton "RESET"	
Input: Userbutton "EMG. STOP"	
Output: Plasma on	
Output: Reset	
Output: GAS (optional)	
Door Status:	

5

Beckhoff FI 1008 - 1 :	8	
Beckhoff EL1008 - 2 :	8	
Beckhoff EL2008 :	8	
Beckhoff EL6002 :	8	

MAIN SETTINGS SYSTEM STATUS ERROR MESSAGES HELP SHUTDOWN

No.	Home screen
1	PS2000 data
2	CAN bus data
3	Display of nozzle and electrode operating hours
4	Digital input and output feedback
5	Beckhoff terminal status

- Under “PS2000 data” you will find the data that are reported back from the PS2000 power source (see operating instructions for the PS2000OEM power source). Frequency, power, voltage and current represent the current PS2000 values shown. The power and frequency can be set under “Settings”.
The operating hours solely represent the operating hours of the power source. However, these can be related to the “operating hours of the nozzle and the electrode”.

The four temperatures shown are purely for PS2000 internal monitoring purposes to protect against overheating. The temperatures have no influence on the process and should be below 40°C.

- 2) "Data to CAN bus" displays the data that the CAN bus reports back. The bus load is always represented between 0 and 100%. All other values are 0 by default.
- 3) Display of the nozzle and the electrode operating hours analogous to the display in the main menu and under "Settings", where these can be reset.
- 4) Here you see the inputs and output data reported back to the system.

The user button fields to the right of the list of I/O signals **Input: user button "START", "STOP", "DOOR", "RESET" and "EMERGENCY STOP"** turn green when the relevant buttons are pressed. Furthermore:

- **Output: plasma ON** turns green as long as the plasma is switched on, i.e. the appropriate voltage is applied to the power source, otherwise the field is grey.
- **Output: reset** turns red when the STOP button on the HMI home screen or main control panel is pressed.
- **Output: reset** turns grey again if the acknowledgement button on the "Error message" interface of the HMI or on the main control panel has been pressed.
- **Output GAS (optional)** turns green when the compressor is running.

i

Note:

Output: GAS (optional) refers to the optional module of the integrated compressor. If this is not available then this field has no function and you must independently set and monitored the gas flow.

- **Door contact status** turns red when the door is open.

The door contact turns green when the door is closed.

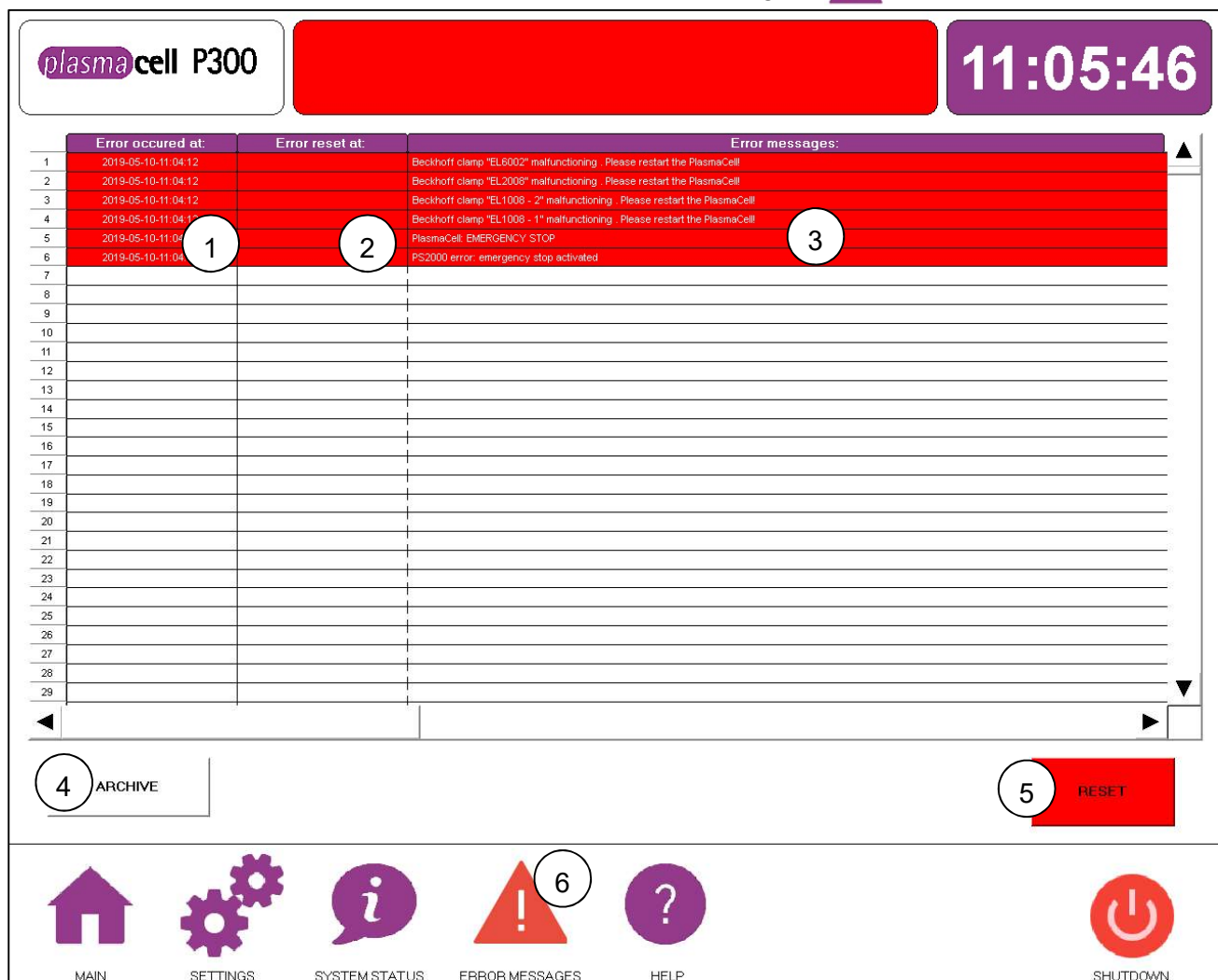
- 5) The "Beckhoff terminal status" has the following states:

```
1 = Slave in 'INIT' state -Initialise status
2 = Slave in 'PREOP' state -PreOperational status
3 = Slave in 'BOOT' state -Bootup status
4 = Slave in 'SAFEOP' state -SafeOperational status
8 = Slave in 'OP' state -Operational status
257=clamp malfunction
```

A terminal malfunction 257 can, for example, be induced by a power failure (see Chapter 10.1).

7.4.4 Error message

This interface can be accessed via the “Error message” icon.



No.	Home screen
1	Date and time of error occurrence
2	Date and time of error acknowledgement
3	Plain text description of the error
4	Link to error archive
5	Acknowledgement button
6	Link to error message

- 1) Here you can see when the error occurred.
- 2) Here you can see when the error was acknowledged.
- 3) Plain text description of the error. In this example: power interruption for 1-12 sec.
- 4) Here, the error history (described below) is shown and the already acknowledged errors are listed traceably in an archive.
- 5) If errors are present, the acknowledge button turns red and the existing faults can be acknowledged by pressing it.
- 6) The link to the displayed “Error Message” page also turns red when an error occurs.

7.4.5 Error history

You can access this interface via “Archive” as the link to the “Error archive” in the “Error message” menu.

13:00:41

Error occurred at:	Error reset at:	Operational at:	Error messages:
2019-01-31-12:59:20	2019-01-31-12:59:44	2019-01-31-12:59:45	PS2000 error: emergency stop activated
2019-01-31-12:59:20	2019-01-31-12:59:44	2019-01-31-12:59:44	PlasmaCell: EMERGENCY STOP
2019-01-31-12:53:53	2019-01-31-12:55:14	2019-01-31-12:55:14	PlasmaCell: EMERGENCY STOP
2019-01-31-12:47:47	2019-01-31-12:48:54	2019-01-31-12:48:54	PlasmaCell: EMERGENCY STOP
2019-01-31-09:19:56	2019-01-31-09:20:18	2019-01-31-09:20:18	PlasmaCell: EMERGENCY STOP
2019-01-31-09:01:29	2019-01-31-09:02:54	2019-01-31-09:02:54	PS2000 error: emergency stop activated
2019-01-30-17:00:35	2019-01-31-09:02:54	2019-01-31-09:02:54	PlasmaCell: EMERGENCY STOP
2019-01-30-14:55:04	2019-01-30-14:55:48	2019-01-30-14:55:48	PS2000 error: emergency stop activated
2019-01-30-14:51:06	2019-01-30-14:55:48	2019-01-30-14:55:48	PlasmaCell: EMERGENCY STOP
2019-01-30-14:45:44	2019-01-30-14:46:40	2019-01-30-14:46:40	PS2000 error: emergency stop activated
2019-01-30-14:42:14	2019-01-30-14:46:40	2019-01-30-14:46:40	PlasmaCell: EMERGENCY STOP
2019-01-30-14:39:54	2019-01-30-14:39:58	2019-01-30-14:39:59	PS2000 error: emergency stop activated
2019-01-30-14:19:56	2019-01-30-14:19:56	2019-01-30-14:20:03	PS2000 error: emergency stop activated
2019-01-30-14:19:52	2019-01-30-14:19:55	2019-01-30-14:20:02	PlasmaCell: EMERGENCY STOP
2019-01-30-14:19:52	2019-01-30-14:19:55	2019-01-30-14:19:55	PS2000 error: emergency stop activated
2019-01-30-14:05:07	2019-01-30-14:05:07	2019-01-30-14:05:37	Bus error: PS2000 offline
2019-01-30-14:05:00	2019-01-30-14:05:02	2019-01-30-14:05:31	PS2000 error: emergency stop activated
2019-01-30-14:03:00	2019-01-30-14:03:41	2019-01-30-14:03:41	PlasmaCell: EMERGENCY STOP
2019-01-30-13:45:50	2019-01-30-13:45:53	2019-01-30-13:45:53	PS2000 error: emergency stop activated
2019-01-30-13:45:50	2019-01-30-13:45:53	2019-01-30-13:45:53	PlasmaCell: EMERGENCY STOP
2019-01-30-13:42:29	2019-01-30-13:42:31	2019-01-30-13:42:31	PS2000 error: emergency stop activated
2019-01-30-13:42:29	2019-01-30-13:42:31	2019-01-30-13:42:31	PlasmaCell: EMERGENCY STOP
2019-01-30-13:39:49	2019-01-30-13:39:51	2019-01-30-13:39:52	PS2000 error: emergency stop activated
2019-01-30-13:39:49	2019-01-30-13:39:51	2019-01-30-13:39:52	PlasmaCell: EMERGENCY STOP
2019-01-30-13:38:10	2019-01-30-13:38:48	2019-01-30-13:38:48	PlasmaCell: EMERGENCY STOP
2019-01-30-13:34:39	2019-01-30-13:34:46	2019-01-30-13:34:47	PS2000 error: emergency stop activated
2019-01-30-13:34:39	2019-01-30-13:34:46	2019-01-30-13:34:46	PlasmaCell: EMERGENCY STOP
2019-01-30-13:33:43	2019-01-30-13:34:24	2019-01-30-13:34:24	PlasmaCell: EMERGENCY STOP
2019-01-30-13:19:45	2019-01-30-13:19:53	2019-01-30-13:19:53	PlasmaCell: EMERGENCY STOP


BACK

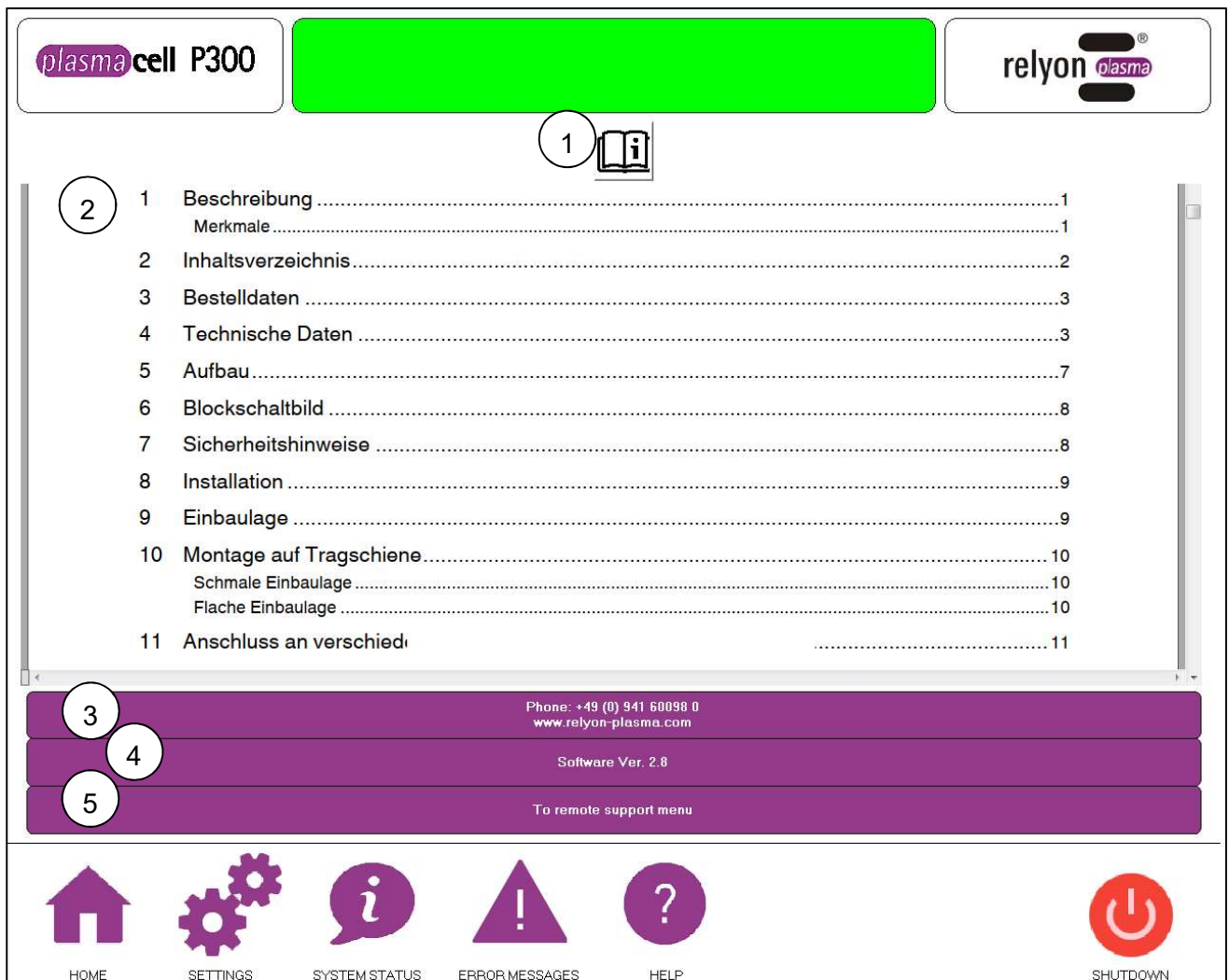
MAIN
SETTINGS
SYSTEM STATUS
ERROR MESSAGES
HELP
SHUTDOWN

No.	Home screen
1	Error history
2	Back button

- 1) The “Error History” contains a list of the errors that have already been acknowledged at the relevant point in time.
- 2) This takes you back to the “Error message” menu.

7.4.6 Help

This interface is accessed via the “Help”  link.



No.	Home screen
1	Operating manual
2	Operating manual display field
3	Manufacturer contact information
4	Software version
5	Link to remote access

- 1) Here you can access the operating instructions from the field below.
- 2) The operating instructions are displayed here.
- 3) If you have any questions, please contact us on this number.
- 4) The software version is displayed here.
- 5) This takes you to the “Remote Access” interface (see next chapter).

7.4.7 Remote maintenance guide

This interface is accessed via the “Remote access” link in the “Settings” menu or in the “Help” menu.



No.	Home screen
1	Text: Insert the network cable
2	Text: Press button below
3	Button initialises remote access
4	Text: Wait for remote access program to start (can take up to 30 seconds)

For a description of the procedure, see Chapter 7.7 Remote Maintenance.

7.4.8 Shutdown

This interface is accessed from any menu by clicking on the “Shutdown” link.



No.	Home screen
1	Confirmation of complete system shutdown
2	Cancel complete system shutdown

7.5 Switch off device



Beware of the risk of damage to the device!


The connected plasma generator may overheat if the system is shut down during the gas overrun period.

- Do not switch off the system during gas overrun (2 seconds by default).

To switch off, perform the following steps in the order shown below:

1. If there is a workpiece inside the processing chamber, open the processing chamber with the open door button on the main control panel and remove the workpiece once it has cooled down. Close the processing chamber.
 2. If the process unit is not in its starting position, use the “Home” button on the start screen to move it to the starting position (see Chapter 7.4.1).
 3. Shut down the system via the “Shutdown” interface on the HMI (see Chapter 7.4.8).
 4. Switch off the device using the main switch on the lower cabinet of the basic module.
- ✓ The device is switched off

7.6 Error acknowledgement

If there is an error originating from the plasmacell P300, this is indicated by a red light in the status message. In the event of an error, both the “Error message” symbol  on the HMI and the “Status display” button on the main control panel illuminate. Please correct the cause of the error. Once the cause of the fault has been eliminated, the fault can be acknowledged by pressing the “Status display” button on the front of the system or using the “Acknowledge” button in the “Error message” view on the HMI (see Chapter 7.4.4).



Note:

Please note that after successful acknowledgement, the process unit automatically moves first upwards and then to the start position. If for any reason an obstacle is in the path of the process unit, please remove it before acknowledging the previous error, otherwise damage may occur.

For error analysis see Chapter 10.1. If you have any questions please contact customer services at **relyon plasma** GmbH (see Chapter 10.2).

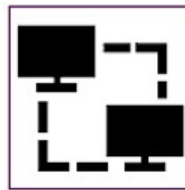
7.7 Remote maintenance

Remote maintenance is designed to offer you timely support service anywhere. For remote maintenance, navigate to the “Remote access” link in the HMI, either via the “Settings” menu or via the “Help” menu. This takes you to the “Remote maintenance guide” interface (see Chapter 7.4.7). Follow the instructions listed below:

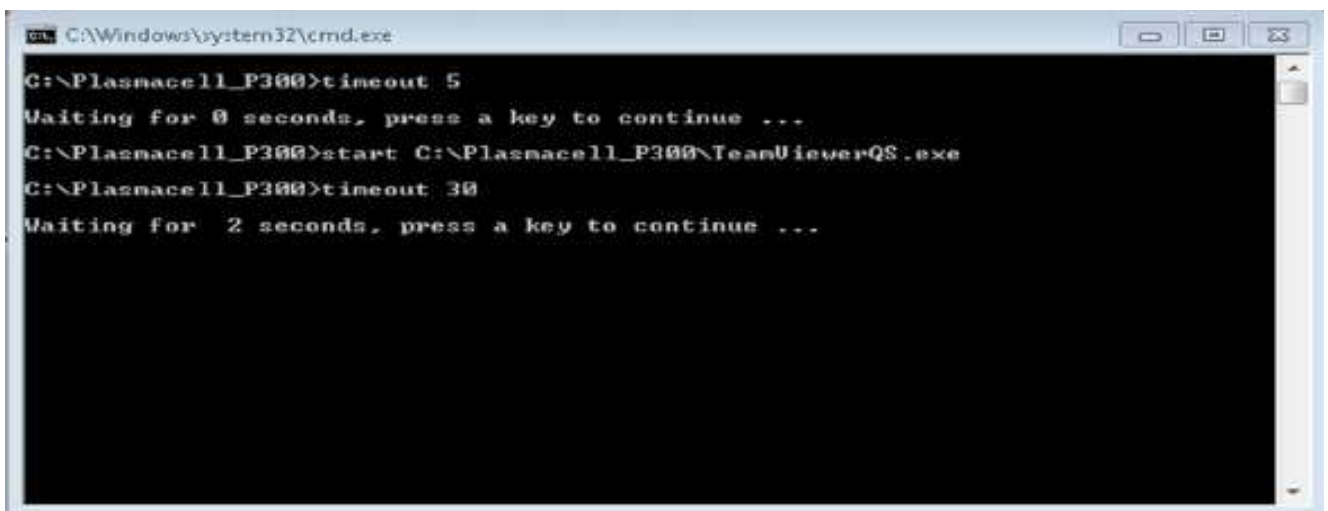
1. Plug the network cable with internet connection into the plasmacell.
Open the lower cabinet of the basic module. There is a Beckhoff unit inside.
Connect your network cable with internet access here (see image below).



2. After attaching the network connector, press the button on the HMI to initialise remote access.



3. Wait until the system has started up. This can take up to 30 seconds. Firstly a script opens on the HMI.



```
C:\Windows\system32\cmd.exe
G:\Plasmacell_P300>timeout 5
Waiting for 0 seconds, press a key to continue ...
G:\Plasmacell_P300>start C:\Plasmacell_P300\TeamViewerQS.exe
G:\Plasmacell_P300>timeout 30
Waiting for 2 seconds, press a key to continue ...
```

TeamViewer then starts up.



Please provide the ID and password (see red marking in the above image) to our service agent so they can connect to your system.

✓ Remote access is then established.

7.8 Compressor module

You have the option of purchasing a compressor or compressed air supply as part of the installation. The compressor is part of the system and no external gas supply is required. Please note that the maintenance unit and pneumatic connections are not required when the unit is supplied with a compressor. The integrated compressor starts and stops automatically with the selected program and does not need to be controlled separately. The “Settings” menu can be used to set the gas lead and overrun times (see Chapter 7.4.2).



Beware of the risk of damage to the device!

The gas lead and overrun times can only be controlled with the additional gas module. If you did not opt for this module, you will need to take care of the appropriate lead and overrun times yourself.

Operating the plasma generator with little or no gas may damage the unit.

- Ensure that the gas supply has been connected correctly and that a minimum pressure of 5 bar is present.

7.9 Extractor module

If no suitable extraction system is available at the factory or on site then the plasmacell P300 must be equipped with an extractor module. The components are fitted to the rear of the plasmacell P300 in the form of a small cabinet and shipped ready for use (see Chapter 2.2.1). The extraction unit contains a filter cassette with activated carbon filter and outlet filter for particulates. The extraction unit starts up automatically with the system and provides a compact and quiet solution for minimising nitrogen oxides and ozone.



Caution – nitrogen oxides and ozone (O₃)!

Nitrogen oxides or ozone above the recommended limits may be produced by the device.

- Ensure that the work area is well ventilated.
- Always use the optional P300 plasmacell integrated extraction module or install an extraction facility.

8 Decommissioning



Caution – high voltage!

High voltage danger 230/400 V.

- Separation of the power supply and the plasma generator or the HVC cable extension from the PS2000OEM power supply may only be carried out by a qualified electrician.

High voltage danger at the output.

- After switching off the high voltage/supply voltage, high voltage may still be present at the output for up to one additional second. Please observe this delay for all works on the PS2000OEM, high voltage cable or plasma generator.

To decommission the device, perform the following steps in the order shown below:

1. If there is a workpiece inside the processing chamber, open the processing chamber with the Open door button on the main control panel and remove the workpiece once it has cooled down. Close the processing chamber.
2. If the process unit is not in its starting position, use the “Home” button on the start screen to move it to the starting position (see Chapter 7.4.1).
3. Shut down the system via the “Shutdown” interface on the HMI (see Chapter 7.4.8).
4. Switch off the device using the main switch on the lower cabinet of the basic module.
5. Disconnect the plasmacell P300 from the mains power supply by removing the power plug.

- ✓ The device is no longer in service.

9 Cleaning and maintenance



Beware of high voltages! Danger of death!

High voltage is generated inside the device.

- Always disconnect the power supply to the device for cleaning, maintenance and repair work.

9.1 Cleaning

Clean the device externally using only a dry cloth or a gentle acid-free cleaner. Ensure that no electronic components are damaged.



Beware of hot surfaces!

Temperatures of up to 200°C arise on the plasma generator housing.

- Wear protective gloves when touching the device.
- Wait until the unit has cooled down.

Only clean the plasma generator externally.

- Only clean the plasma generator dry.
- The power supply must be switched off.
- The plasma generator must have cooled down.

Detailed information can be found in the “Plasma generator PG31” operating manual.

Clean the HMI monitor regularly in the interests of hygiene, paying particular regard to the touchscreen.

9.2 Maintenance of the basic module housing lower cabinet

9.2.1 PS2000OEM filter exchange



Beware of high voltages! Danger of death!

High voltage is generated in the PS2000OEM power supply unit. This is still present after the unit is switched off.

- The unit must not be opened!
- Always disconnect the power supply to the PS2000OEM for cleaning, maintenance and repair work on the PS2000OEM or any connected components.



Beware of the risk of damage to the device!

Opening the unit may damage it.

- The unit must not be opened!

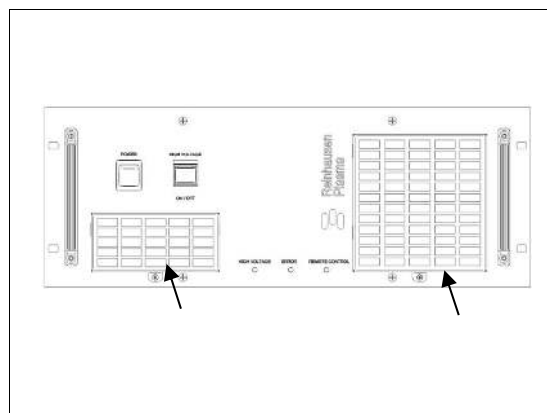
The PS2000OEM is maintenance-free except for the dust protection filters used.

For information regarding commissioning, etc., please refer to the operating instructions for the “PS2000OEM power source”.

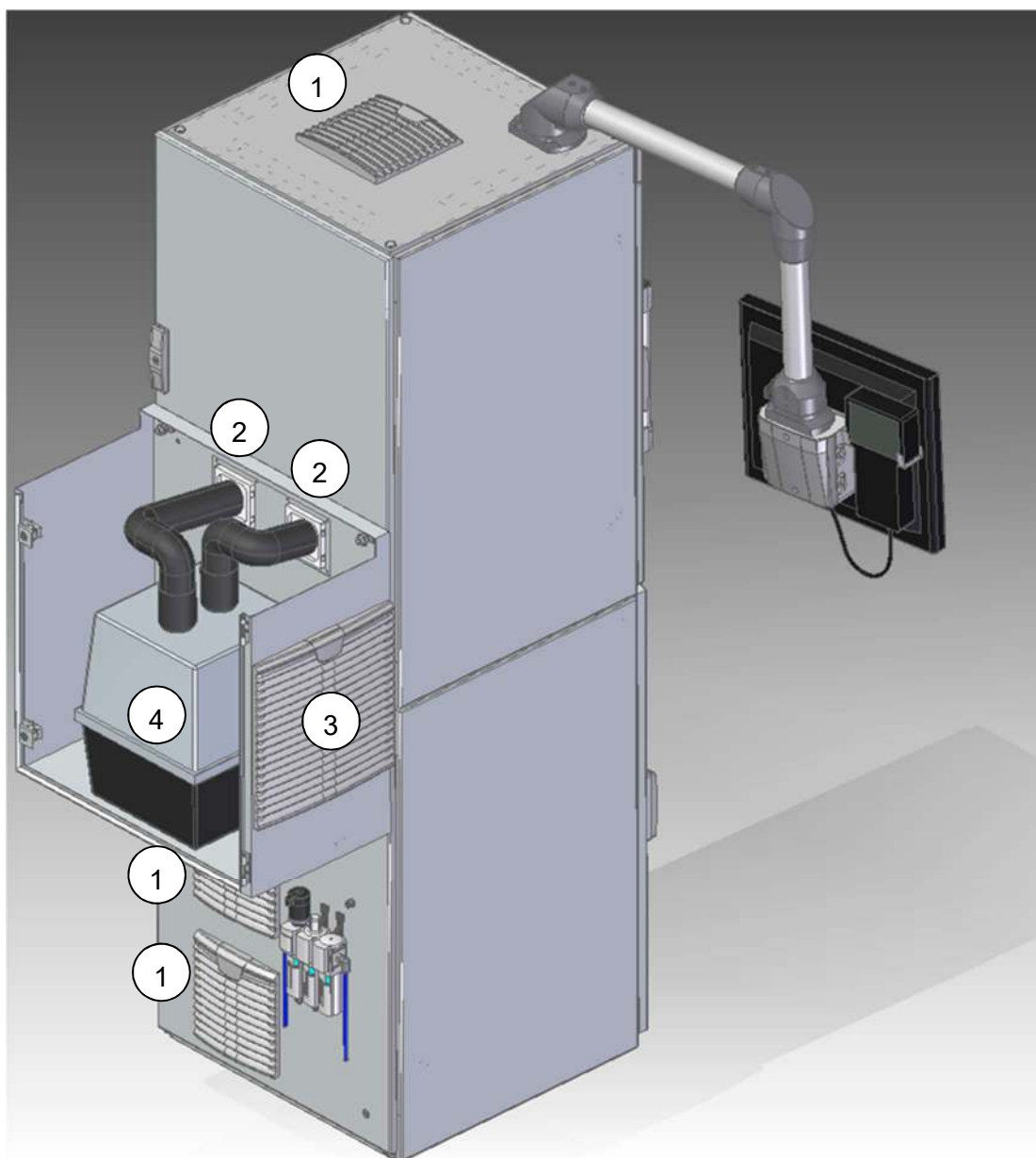
Change the filter mats every 5,000 operating hours at the very minimum. If the ambient conditions are very dusty then they may need to be changed earlier. The necessary filter mats can be ordered as replacement parts from **relyon plasma** GmbH.

Proceed as follows to replace the dust filters:

- 1) Disconnect the power supply from the PS2000OEM.
- 2) Open the ventilation grilles by loosening the screws marked on the right.
- 3) Remove the old dust filter and insert a new one (coarse dust filter class G2).
- 4) Attach the ventilation grille with new filter to the PS2000OEM.



9.2.2 Filter exchange



Nr.	Description	Item number
1	Filter mat 89x89mm	1000639300
2	Filter mat 173x173mm	1000639400
3	Filter mat 289x289mm	1000609900
4	Compact filter	1000610000

Filters 3 and 4 are only available if the plasmacell is equipped with the module integrated suction

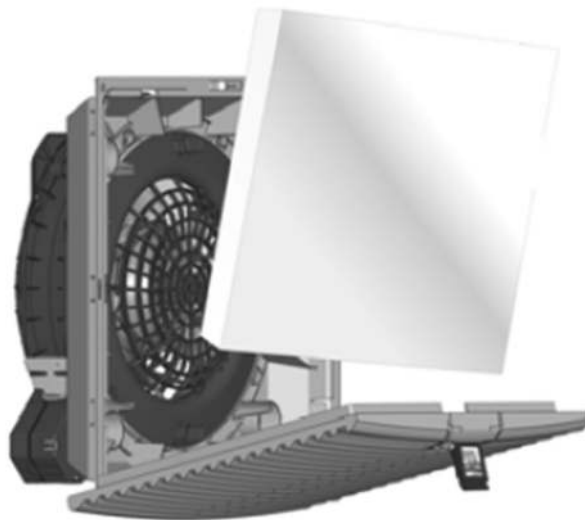
The plasmacell external filters must be replaced depending on the ambient conditions, or at least every 2,000 hours. A visual inspection for heavy soiling is recommended once per month. The necessary filter mats can be ordered as replacement parts from **relyon plasma GmbH**.

Filters 1-3 can be changed as follows:

- 1) Disconnect the power supply from the unit.
- 2) Open the filter holder on the basic module on the tab with the logo.

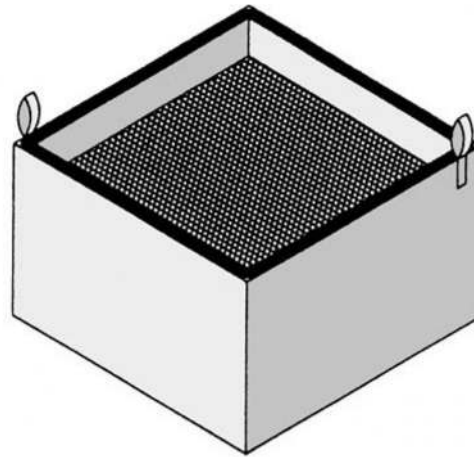


- 3) Insert a new filter mat.



- 4) Close the filter holder by pressing the tab until it clicks into place.

There is a filter cassette integrated in the compact filter unit, which must be replaced depending on the ambient conditions (see chapter 7.9). To change filter 4, open the door on the integrated suction module and open the plastic container using the lateral clamping catches (see picture on the left). Replace the filter cassette (see picture on the right) with a new one. If necessary, only the filter mat in the cassette can be replaced.



Caution – nitrogen oxides and ozone (O₃)!

Nitrogen oxides or ozone above the recommended limits may be produced by the device.

- Ensure that the working area is well ventilated at all times during operation.

9.3 Maintenance of basic module upper cabinet housing

9.3.1 Plasma generator



Beware of high voltages! Danger of death!

The plasma generator operates at high voltage. High voltage is still present after switching the unit off.

- The unit must not be opened.
- Always disconnect the power supply from the unit prior to cleaning, maintenance and repair work and before opening the plasma generator.
- Please wait at least 2 seconds after switching off and disconnecting the power supply before touching the plasma generator (only when door monitoring bypassed).



Beware of the risk of damage to the device!

The PG31 plasma generator can be damaged if opened.

- The unit must not be opened.

9.3.2 Nozzle and electrode exchange



Note:

The plasma nozzle and the electrode are wear parts. The ignition properties deteriorate and the plasma flame temperature increases due to possible oxidation layering on the plasma nozzle or burn-in cratering on the electrode. The wear parts must then be replaced.

Depending on the application, the plasma generator electrode and nozzle must be exchanged within a certain interval.

In order to exchange the electrode and the nozzle as well as the actual interval of exchange, please refer to the appropriate datasheet.

Please remember to reset the operating hours in the “Settings” menu of the HMI.

10 Resolving faults

10.1 Overview of faults/errors

For information on error acknowledgement, see Chapter 7.6.

Fault/error	Cause	Resolution
No function despite turning the main switch	No/incorrect voltage supply	Check the power supply unit connection and the mains voltage supply.
Status indicator on the control panel turns red	The device is not ready for operation due to the presence of an error.	Open the "Error message" menu via the HMI to view the plain text error message. If possible, resolve the error and acknowledge it by pressing the status display/acknowledge button or alternatively via the HMI in the "Error message" menu.
		If the emergency stop is pressed down: pull the emergency stop button out again and acknowledge the error by pressing the status display/acknowledge button or alternatively via the HMI in the "Error message" menu.
		Switch off the unit and switch off the power, wait a few seconds, check the unit for visible damage.
		If no damage is visible, switch the plasmacell back on again
		Problem cannot be resolved: take the device out of operation and contact customer service
No plasma is generated/plasma goes out during operation/no plasma is formed at the nozzle outlet System running, status indicator does not illuminate, program running correctly	Plasma not ignited, system otherwise running normally, no error message present.	Check whether the gas supply to the plasma generator has been established (pre-pressure 1-3 bar at the maintenance unit). Check whether there is sufficient gas flow through the plasma generator (gas flow: $\geq 35 - \leq 80$ NI/min).
		Check the PS2000 power and PS2000 frequency parameters from the "Settings" menu of the HMI. If necessary, reset them to factory settings: Power 100% Frequency 54,000 Hz
		Check the wear parts for damage.
		Check whether the HVC cable extension and/or gas supply are damaged. Check whether the HVC cable extension and/or gas supply are bent.

Parasitic discharges (discharges at unwanted positions, e.g. anywhere on the plasma generator cable connection)	Damage to the device or high-voltage cable	Take the device out of operation and contact customer service
Activation performance decreases/ignition properties deteriorate	Nozzle has formed an oxide layer/electrode exhibits burn-in cratering	Exchange nozzle and/or electrode
Despite pressing the start button, plasma is not igniting at the plasma generator or the program does not run.	Program incorrect	Check the selected program is correct. Refer to the supplied example program no. 0-4.
	"Status" LED turns red	"Error message" and "LED Error" illuminate.
		Check that the correct pressure is set on the maintenance unit (1-3 bar).
Plasma extinguishes, DT300-FN process unit stops and its controller turns off, PS 2000 turns off, emergency stop	Power interruption < 1 sec	All faults can be corrected after approx. 40 sec when the DT300-FN has started up its software
Plasma extinguishes, DT300-FN process unit stops and its controller turns off, PS 2000 turns off, emergency stop, Beckhoff terminals go into fault mode	1 sec < power interruption < 12 sec:	All faults can only be acknowledged after restarting the plasmacell.
Plasma extinguishes, DT300-FN process unit stops and its controller turns off, PS 2000 turns off, emergency stop, plasmacell starts up again	Power interruption > 12 sec	Faults can be acknowledged after restarting.

10.2 Customer service

If the unit does not function correctly, please contact **relyon plasma** GmbH technical support.

Technical support **relyon plasma** GmbH: +49 (941) 600 98 120

Please indicate the device involved. Ensure that you have the serial number from the type plate ready. In the interests of more rapid troubleshooting, please indicate how the device was being operated and a detailed description of the issue.

In order to enable remote access, see Chapter 7.7.

11 Environmental considerations and disposal



Be mindful of the environment.

Used electrical and electronic equipment should not be disposed of as household waste.

- The unit contains valuable raw materials that can be reused. The unit should be taken to an appropriate collection point.

12 Conformity/standards

12.1 CE



We declare CE conformity.

The CE mark is located on the type plate on the unit housing.

12.2 Product standards

The device complies with the following regulations and standards:

2004/108/EC EC EMC Directive

European Council Directive on the coordination of the laws of the member states relating to electromagnetic compatibility.

2006/42/EC EC Machinery Directive

Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery and amending Directive 95/16/EC (new version) (Machinery Directive for short) regulates a uniform level of protection against accidents for machinery and partly complete machinery when placed on the market within the European Economic Area (EEA) as well as Switzerland and Turkey.

- DIN EN ISO 12100-1 :2003
Safety of machinery: terminology and methodology
- DIN EN ISO 12100-2 :2003
Safety of machinery: technical principles
- DIN EN ISO 13849-1
Safety-related parts of control systems: general design principles
- DIN EN 60204-1
Electrical equipment of machines: general requirements

EN 55011 (2007 + A2:2007) Interference emissions, limit value class/group 2, class A

EN 61000-6-2 (2005) Noise immunity

Protection class IP54

IEC 60529

13 Replacement- and wear parts

Item number	Description	Type
1000639400	Filter mat 89x89mm	Wear part
1000639300	Filter mat 173x173mm	Wear part
1000609900	Filter mat 289x289mm	Wear part
1000610000	Compact filter	Wear part
76849401	PB3 electrode with O-ring	Wear part
1000242500	A250 nozzle	Wear part
1000600700	A350 nozzle	Wear part
78707200	A450 nozzle	Wear part
78879101	PB3 Plasma generator PG-31 (1m)	Replacement part
77071600	Ceramic sleeve spacer	Replacement part
74532300	PB3 ceramic sleeve spacer	Replacement part
77071500	PB3 union nut VA	Replacement part
1000609300	Outlet filter "Integrated extraction module"	Wear part

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