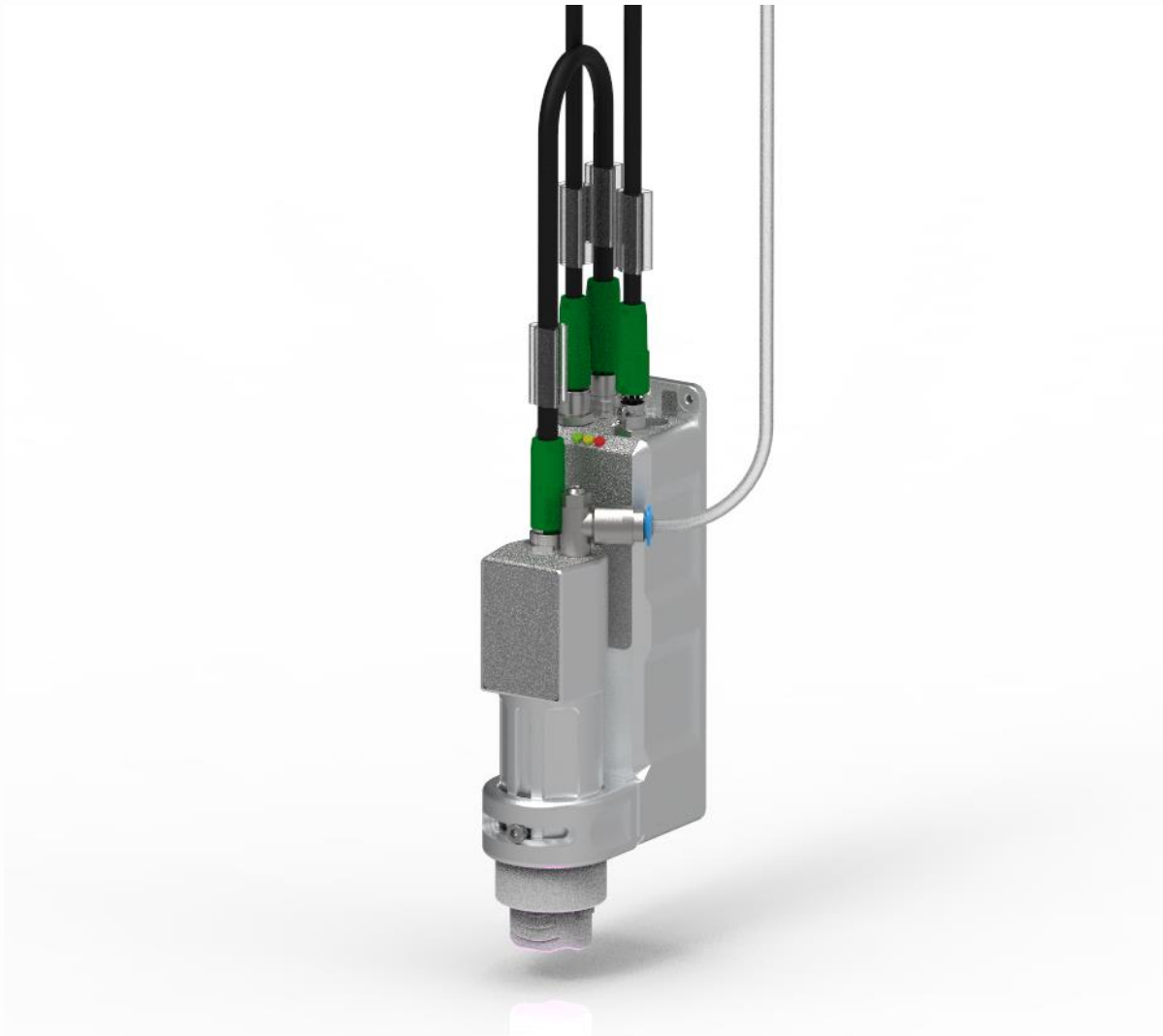


# **piezo** brush<sup>®</sup> PZ3-i

Operating instructions for:  
piezobrush<sup>®</sup> PZ3-i integration unit  
**BETA-TEST**



Thank you for purchasing a **relyon plasma GmbH** branded product. To get the best from your device, please read these instructions carefully.



### **Important!**

**Read these instructions carefully before assembling, installing and starting up the device!**

**Always follow the safety instructions!** Failure to follow the safety instructions may result in accidents, serious injury and serious damage to the device.

**Train your staff!** The operator / user is responsible for ensuring that personnel have fully understood the operation of the device and the safety requirements.

© Copyright **relyon plasma GmbH** 2021.  
All rights reserved.

Text, images and diagrams and their layout are protected by copyright and other laws. Unauthorized copying and distribution of this document and the utilization and communication of its contents are strictly prohibited unless expressly authorized. Offenders will be held liable for the payment of damages. All rights reserved in the event of a patent, utility model or ornamental design registration are granted.

<b>1</b>	<b>Safety</b>	<b>4</b>
1.1	Residual risks	4
1.2	Information and obligations for the operator	6
1.3	Impermissible operating conditions	6
1.4	Emissions	6
<b>2</b>	<b>Description of device</b>	<b>7</b>
2.1	Intended use	7
2.2	Scope of delivery	7
2.3	Description of device	8
2.4	Connecting lead assignment	9
<b>3</b>	<b>Technical data</b>	<b>11</b>
<b>4</b>	<b>Transport / storage</b>	<b>11</b>
<b>5</b>	<b>Installation</b>	<b>12</b>
5.1	Unpacking	12
5.2	Installation requirements	12
5.3	Positioning the components	12
5.4	Mounting the components	14
5.5	Connecting the gas supply	15
5.6	Connecting the connection cable Digital I/O	15
5.7	Adjusting the module carrier	16
<b>6</b>	<b>Special note on the operation of the plasma process</b>	<b>18</b>
6.1	General description	18
6.2	Carrying out surface treatment	19
6.3	Measures to take after the surface treatment	19
<b>7</b>	<b>Operation</b>	<b>20</b>
7.1	LED indicator on driver unit	20
7.2	Switching signals	20
7.3	Error acknowledgement	20
7.4	Inserting / removing the module	21
7.5	Commissioning a device with digital I/O communication	22
7.6	Working with module "Standard"	23
7.7	Working with module "Nearfield"	23
7.8	Working with other modules	23
<b>8</b>	<b>Taking out of service</b>	<b>24</b>
<b>9</b>	<b>Maintenance</b>	<b>24</b>
9.1	Cleaning	24
9.2	Replacing a module	24
<b>10</b>	<b>Troubleshooting</b>	<b>25</b>
<b>11</b>	<b>Environment</b>	<b>26</b>
11.1	Disposal	26
<b>12</b>	<b>Conformity / standards</b>	<b>26</b>
12.1	CE	26
12.2	FCC	26
12.3	Product standards	27
<b>13</b>	<b>Spare parts</b>	<b>27</b>

## Safety

This device is built according to corresponding international standards. Like with every technical product incorrect or not intended use can however be dangerous.

Follow the instructions in this operating manual in addition to the general safety regulations.



### Caution - Danger!

When working with the device, please note and observe the safety instructions and requirements in these operating instructions because non-compliance may result in serious or fatal injury.

### 1.1

#### Residual risks

This device has been manufactured in accordance with the current state of the art. However, it is impossible to eliminate residual risks.

Always adhere to the following safety instructions:



### Caution – Electrical voltage!

The IEC protection class of this device is class III.

- Only electricians may connect the electrical wiring
- Only use SELV/PELV power supplies
- Let a qualified person check, if the requirements of the basic protection and the error protection according DIN VDE 0100-410 are fulfilled.

Danger from electrical voltage. If the wiring is visibly damaged:

- Do not use the damaged part.
- Have the damaged parts repaired by a qualified person or replace them.

Danger from sparks on the piezo element and the substrate to be treated:

- Do not reach into the area of the plasma discharge.
- Electrically conductive substrates must be grounded or protected against touching.
- Use air or nitrogen as working gases only! Do not use flammable working gases!
- Flammable or thermal sensitive materials could be ignited or damaged. Check the compatibility of the plasma treatment before. Never treat flammable materials unattended.



### Trip hazard!

Lay the connection cables and gas pipes in suitable cable trays. Lay cables such that they do not present a trip hazard.



### Attention – Emissions!

Dangerous amounts of the reaction gas ozone (O<sub>3</sub>) may be produced during device operation.

- Volumes of ozone in excess of 0.2 mg/m<sup>3</sup> may be produced.
- Note that national health and safety measures must be observed when operating the device.
- Only use the device in well ventilated areas or in conjunction with a suitable extraction device.
- Do not leave the device running unattended.
- Do not point the device at people when in operation.
- In order to rule out the possibility of dangerous amounts of ozone being produced in the event of a failure of the extraction system, we recommend monitoring the extraction power in the process and only enabling plasma generation when the extraction system is active.
- Due to the corrosive effect of ozone we recommend to place a suitable gas extraction as close to the nozzle outlet as possible to avoid corrosion/damage of other devices/surfaces.



### Attention – Damage to device!

The plasma generator may be damaged if it is operated without gas flow. This would interrupt the supply of cooling medium required in operation.

Monitor the gas flow and stop the device immediately if insufficient gas flow is detected.

Never touch the piezo element at the front of the device with sharp-edged objects. This component may be damaged by improper handling.

Protect the device from falls or other hard impacts which may damage the electronics or piezo element.



### Attention! Device for use in industrial environment

Due to the presence of both conducted and radiated interference, this device may have difficulty in ensuring electromagnetic compatibility in other environments.



### Caution – hot surface!

The exchange modules can become hot during operation. Do not touch them until they have cooled down and take care not to damage thermally sensitive surfaces when working with the exchange modules.

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

## 1.2 Information and obligations for the operator

- The system may emit interference.
  - The system **will be tested** in accordance with EMC legislation.
  - The operator must verify and assure electromagnetic compatibility with other electrical and electronic equipment in the immediate vicinity of the system.
- Ensure that:
  - Operating personnel have read and understood these operating instructions.
  - Anyone working near the device is made aware of the dangers and is provided with the necessary protective equipment.
  - Repairs are only carried out by qualified persons.
- In particular, make operating personnel aware of the safety instructions in this document.
- Always keep the system in fully functional condition.
- Any modifications made to the device will invalidate the operating license and the warranty. Exception: Such modifications are expressly authorized by the manufacturer.

## 1.3 Impermissible operating conditions

The device must not be operated under the following conditions:

- In explosive (Ex) zones
- In areas with severe build-up of dust
- In environments where the humidity is too high (see chapter 3)
- At altitudes of more than 2.000 m above sea level
- Where there are strong vibrations

## 1.4 Emissions

The connected device produces the following emissions:

- Ozone (O<sub>3</sub>)
- Nitrous gases (NO<sub>x</sub>)

Process gas	Gas flow	Emission/production rate
Air (CDA)	10 l/min	Ozone < 0,1 g/h
Air (CDA)	10 l/min	NO <sub>2</sub> < 5 mg/h
Air (CDA)	10 l/min	N <sub>2</sub> O < 1 mg/h



### Note!

As a precautionary measure, we recommend an extraction system with about 10-times the flow rate of the entire gas flow through the device (or the devices) in the direct vicinity of the plasma outlet.

To avoid the possibility of dangerous amounts of ozone being produced in the event of a failure of the extraction system, we recommend monitoring the extraction power in the process and only releasing the plasma generation when the extraction system is active.

## 2 Description of device

### 2.1 Intended use

The piezobrush® PZ3-i is an integration unit for generating technical plasma. It is intended to be mounted in stationary machines or in positioning units and is used for pre-treating various material surfaces prior to process steps such as adhesive bonding or printing. The cleaning effect of the plasma can also be utilized.

Only use the device for the intended purposes. Failure to do so may restrict product liability.

### 2.2 Scope of delivery

#### **piezobrush®PZ3-I integration unit (1000 7000 00)**

The scope of delivery includes the following components:

- Plasma generator/Integration unit (consisting of driver unit and module carrier)
- Connection cable between driver unit and module carrier (length 0,3 m)
- Connection cable DC (length 10 m)
- Connection cable communication (length 10 m)
- Module "Standard"
- Module "Nearfield"
- Mounting screws (2 pcs M3x30; 1 pc M3x6)
- Operating instructions

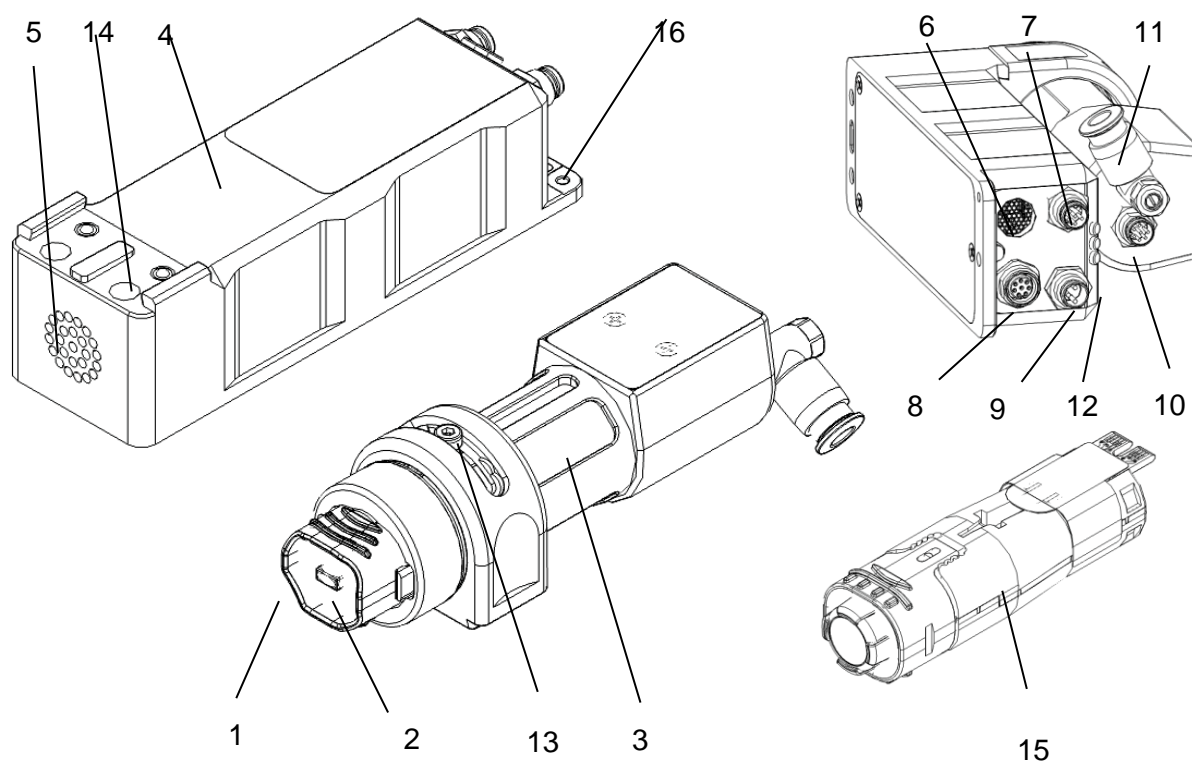
Not included:

- Power supply
- Gas hose (outer diameter of hose Ø 4 mm)



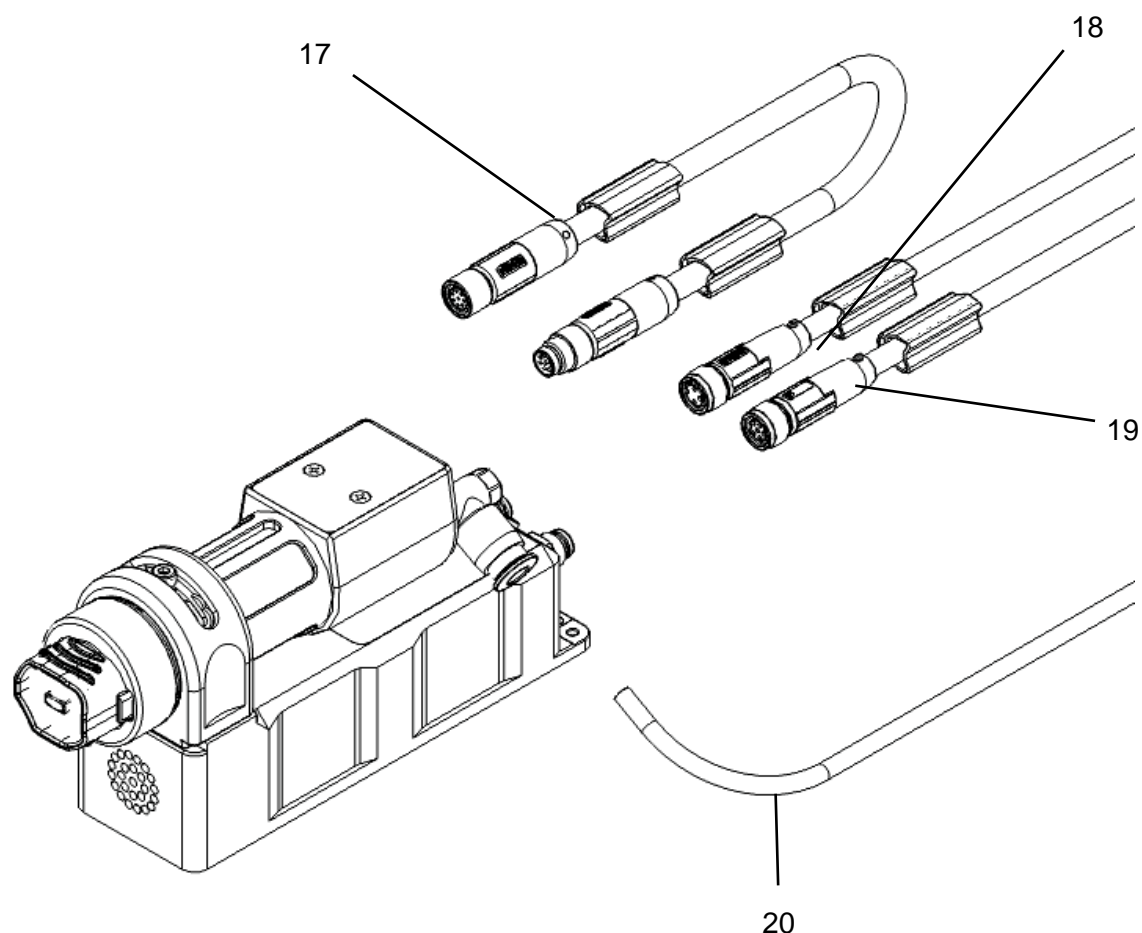
## 2.3 Description of device

The individual parts of the device are shown and named in the diagram below. These terms are used throughout the operating instructions.



No.	Component description
1	Module "Standard" (inserted)
2	Piezo element in module (embedded in module)
3	Integration unit (module carrier)
4	Integration unit (driver unit)
5	Fan outlet (cooling driver unit)
6	Fan inlet (cooling driver unit)
7	Interface "Digital I/O"
8	Interface "Module out"
9	Interface "DC in"
10	Interface "Module in"
11	Interface "Gas in"
12	LED status indicator (3 LEDs: Plasma / Warning / Error)
13	Alignment screw for module carrier
14	Mount for module carrier
15	Module "Nearfield" (not inserted)
16	Equipotential bonding terminal





No.	Component description
17	Connection cable module carrier (8-pin, length 0,3 m)
18	Connection cable DC (3-pin, length 10 m)
19	Connection cable communication (6-pin, length 10 m)
20	Gas hose Ø4 mm outer diameter (not included)



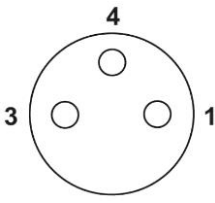
### Attention!

The piezo element is an oscillating component that vibrates mechanically at high frequency. Due to its design, this component cannot be fixed rigidly. For this reason, the component can lie off-center in the interchangeable modules within certain limits. This is not an error or quality defect.

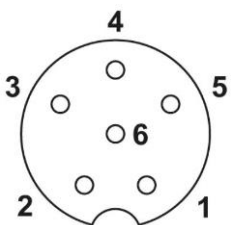
Due to the vibration, audible frequencies may also occur under certain circumstances. This is also normal and not a fault or quality defect.

## 2.4 Connecting lead assignment

The connections of the connection cable DC are to be assigned as followed:

	#	Colour	Signal
	1	brown	24V DC
	3	blue	GND
	4		-not connected-

The connections of the connection cable communication are to be assigned as followed:

	#	Colour	Signal
	1	brown	Plasma on (Input 0 to 10 V analog, up to 24V)
	2	white	Plasma OK (Outlet 0V / 24V at max. 20mA)
	3	blue	Error (Outlet 0V / 24V at max. 20mA)
	4		-not connected-
	5	grey	GND
	6		-not connected-



### Caution – electrical voltage!

The wires may only be connected to the power supply unit or control system by authorised electrically skilled persons!

Danger due to line voltage. If the power supply unit is visibly damaged:

- Do not start up the machine.
- Replace the damaged parts or have them repaired by a qualified person.

### 3 Technical data

Electrical data			
• Supply voltage	24 V DC		
• Power consumption	max. 18 W		
• Model	Integration unit with gas connection		
Dimensions			
• Weight	350 g (with module, without connection cables)		
• Dimensions	40 x 157 x 71 mm (BxHxT)		
• Cable length	10 m (connection cables)		
Typical application parameters (exemplary for module “Standard”)*			
Application	Fine cleaning	Bonding	Printing
• Plasma temperature	< 50 °C		
• Treatment distance	2 – 10 mm		
• Width of treatment	Air/CDA 5 - 29 mm, Nitrogen 5 to 50 mm		
• Treatment speed	1-15 mm/s	10-150 mm/s	100-1500 mm/s
Operating conditions			
• Air humidity	< 80 % rel. (non-condensing)		
• Temperature	10 – 40 °C; 50 – 104 °F		
Storage conditions			
• Air humidity	< 80% rel. (non-condensing)		
• Temperature	0 – 60 °C; 32 – 140 °F		
Gas connection			
• Gas types	Compressed air (purified, oil- and lubricant-free) Nitrogen (particle- and oil-free technical gases) Additional gas types only after approval from <b>relyon plasma</b> .		
• Gas flow rate	10 – 25 l/min		
• Quality	Compressed air 1.4.1 in accordance with ISO 8573.1 Nitrogen 2.8 (N2) in accordance with DIN EN ISO 14175:N1		
• Connection	Hose outer diameter Ø 4 mm (quick coupling)		

\* These values are only a course guideline. Depending on treated material, process parameters, following processes and process requirements the actual results can vary significantly from the typical parameters in both directions (see chapter 6). Due to the low plasma temperature of lower than 50 °C a slower treatment is not considered critically.

### 4 Transport / storage

- Store the device in a dry place. This will prevent corrosion of the electrical contacts.
- Protect the device from dirt and foreign objects.
- Protect the device from falls or other hard impacts.

## 5 Installation



### Attention - Damage to device!

In order to prevent damage to the device, please ensure that you follow the advice in chapter 7.

### 5.1 Unpacking

- Carefully open the packaging. Note the information about directions provided on the packaging.
- Remove the device from the packaging.

### 5.2 Installation requirements

Before installing the machine, the following must be true:

- The machine must be fully intact.
- Provide a power supply (SELV/PELV) that meets the following requirements
  - Output Voltage: 24V +/- 5%
  - Output Ripple: <1%
  - Power supply: min. 18 W per device
- There must be an appropriate gas supply (see chapter 3).
- If installing as a permanent installation or in a building, a suitable switch or circuit breaker that satisfies national safety requirements (in Germany: VDE 0100) must be fitted as an upstream all-pole cut-off device that will disconnect the machine from the power supply. This cut-off device should be fitted near the machine and must be easily accessible to the user. The switch must also be labelled as the cut-off device for the machine.

### 5.3 Positioning the components

The following points must be observed when positioning the device:

- The distance between the piezo elements must be at least 40 mm from center to center.

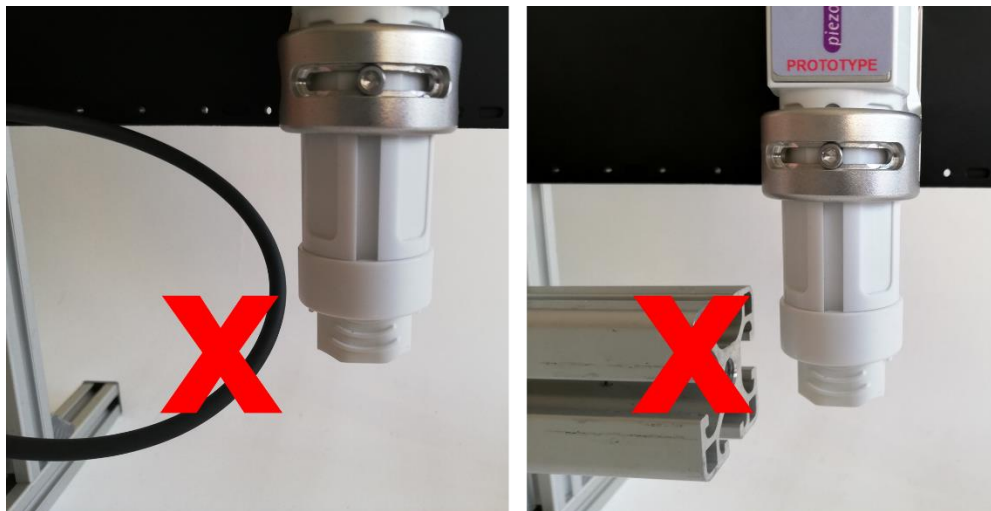
- In the area of the foremost quarter of the piezo element, no electrically conductive objects may be positioned laterally closer than 40 mm.

- position a gas extraction close to the plasma discharge. Note that ozone is a corrosive gas and the extracted gas stream can also corrode varnished surfaces. Also note point 1.4 for the extraction quantity.

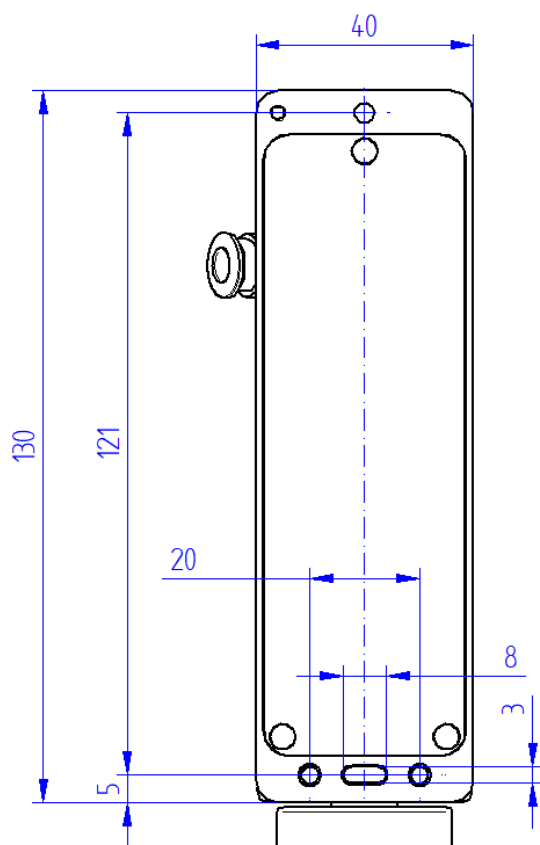
- Make sure that the fan openings on the top and bottom of the unit are not covered.

- Avoid permanent movement of the cables.

In the beta test status, the robot and drag chain suitability has not yet been conclusively tested. To avoid damage, we currently recommend avoiding permanent cable movement. A corresponding specification is planned for the series production status.



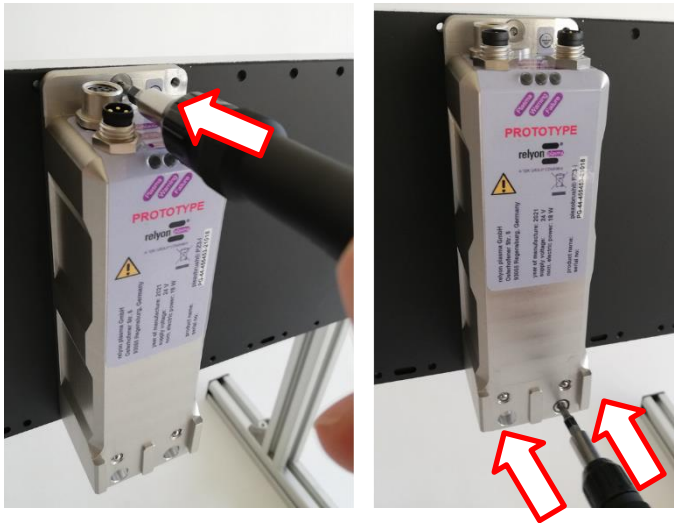
- The device must either be positioned in such a way that the exchange module can be pulled out of the module carrier during maintenance or, alternatively, in such a way that the module carrier can be removed as described in 7.4.
- Three M4 holes as shown in the drawing below are required for mounting the device. The keyway (DIN 6885-A1, 3x3x8) is optional (for high demands on the repeatability of the positioning; e.g. for multi device solutions).



## 5.4

### Mounting the components

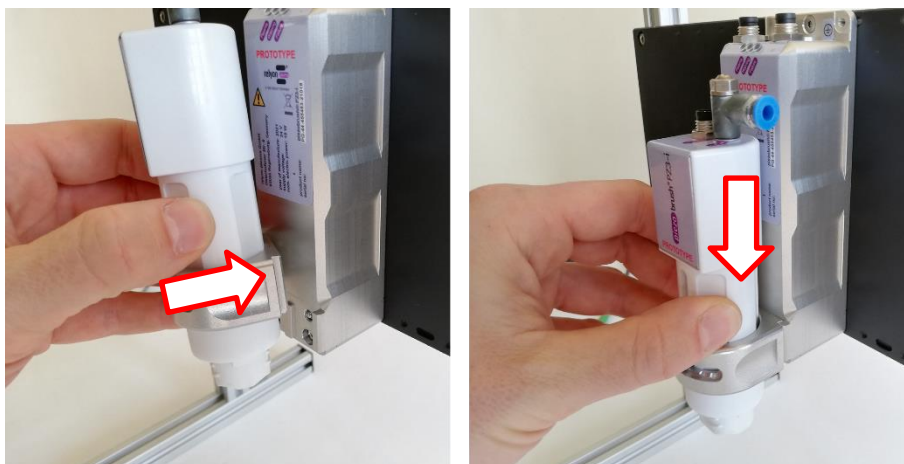
Fasten the driver unit to your mounting surface first at the top with the enclosed countersunk screw (M3x6, SW 2) and then at the bottom with the two cap screws (M3x30, SW 2.5)



Insert the desired module into the module carrier. To do this, hold it from the outside in the front area as shown in the picture without touching the piezo element. With the sticker pointing upwards, the module can simply be inserted into the module carrier. Make sure that the module is inserted as far into the carrier as shown in the picture.

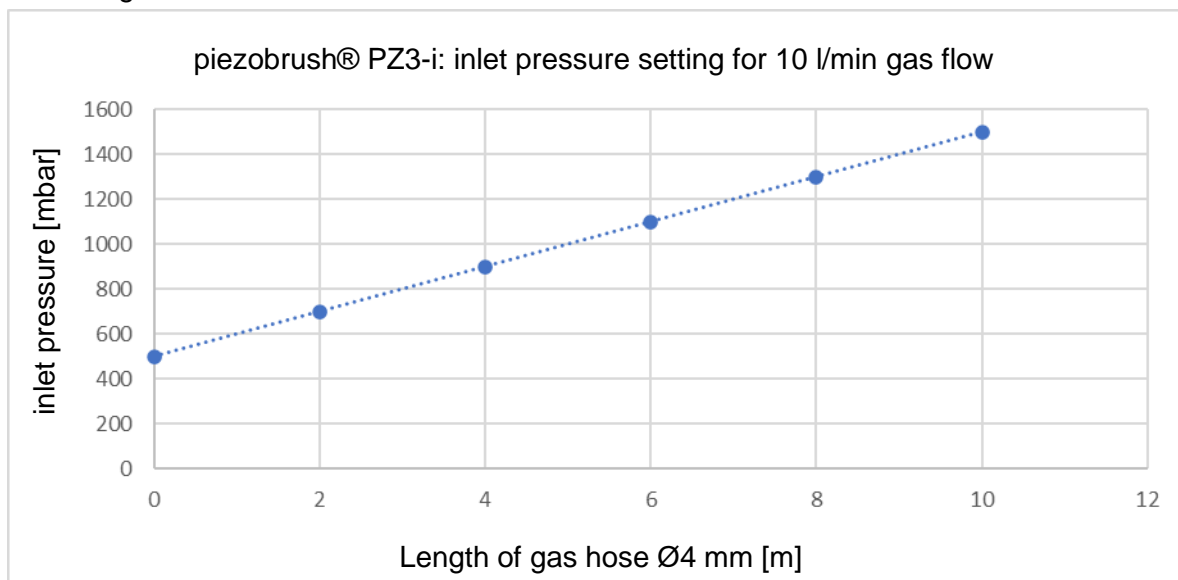


Place the module carrier onto the driver unit by positioning it flat above the interface and then sliding it down until the stop.



## 5.5 Connecting the gas supply

Connect a suitable gas hose with an outer diameter of  $\varnothing$  4mm. Press it as far into the push-in fitting until it is locked. Check the tight fit of the hose before applying pressure to it. If you are using the device without gas flow monitoring, you can achieve a flow rate of 10 l/min using the following characteristic curve by adjusting the inlet pressure and your hose length:



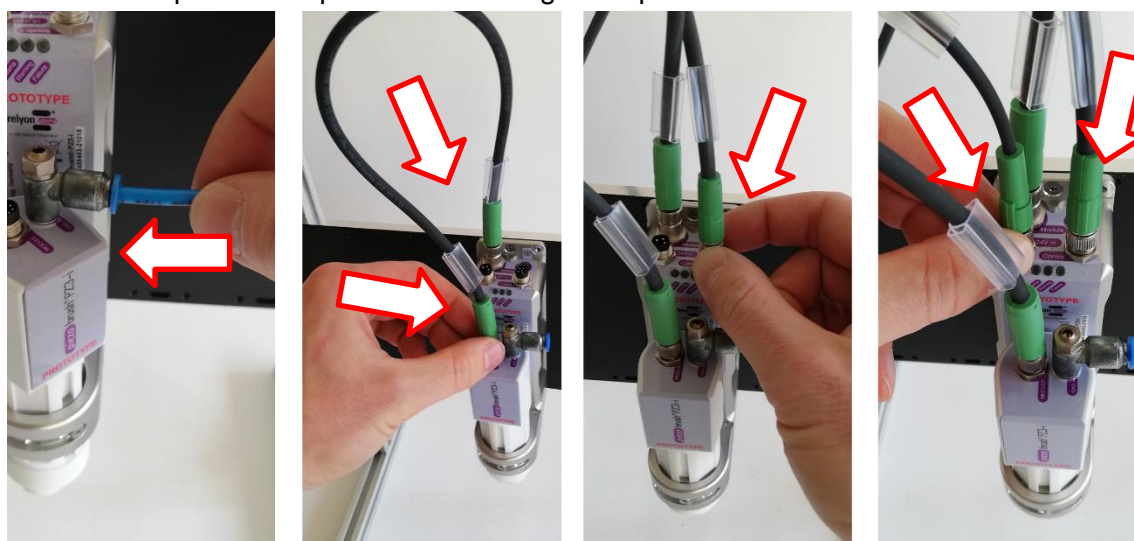
## 5.6 Connecting the connection cable Digital I/O

Connect the connecting cable between module and driver unit. In the following, tighten all union nuts hand tight.

Connect the communication connection cable to the driver housing.

Connect the DC connecting cable to the driver housing.

Connect the potential equalization to the ground potential.





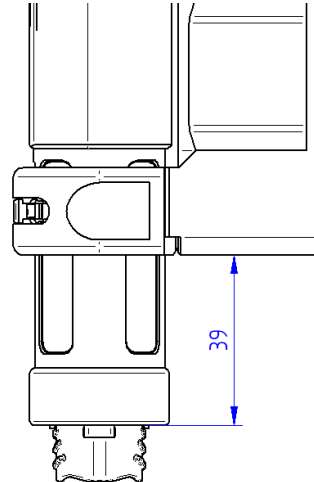
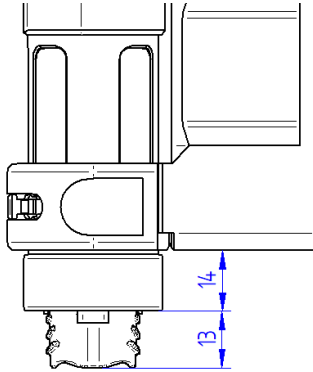
## 5.7

## Adjusting the module carrier

- Height adjustment

The module carrier can be adjusted in height via the adjustment screw.

Loosen it and move the module carrier to the desired height. Tighten the screw again in this position.



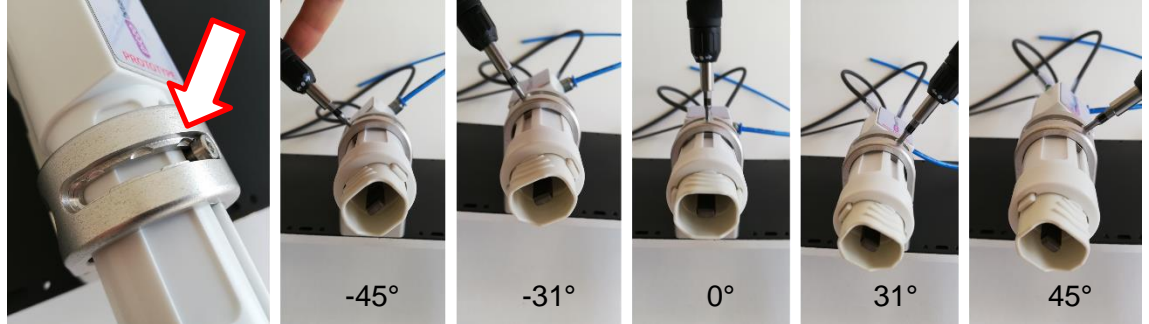


- **Angle adjustment**

In the vertical axis, the module carrier can be rotated by  $\pm 45^\circ$  relative to the driver housing.

To do this, loosen the adjustment screw so far that the screw head can be moved over the countersinks in the cut-out.

The predefined angles are  $-45^\circ$ ,  $-31^\circ$ ,  $0^\circ$ ,  $+31^\circ$  and  $+45^\circ$ .



Due to its design, the piezo element does not have a circularly symmetrical cross-section. The discharge shape results in optimum angles for activation results that are as homogeneous as possible.

Depending on the direction of movement of the device relative to the substrate to be treated, the angle adjustment can thus be optimized for high homogeneity requirements.

- **Sealing sticker**

To prevent accidental change of these settings, the adjustment screw can be covered with the enclosed sealing sticker. A module change can be made without tools and without changes to the positioning of the module carrier.



## 6 Special note on the operation of the plasma process

### 6.1 General description

Treating surfaces with atmospheric pressure plasma has several advantages. These are e.g. the increase of surface energy to improve the wettability of the surface. An optimal surface wetting is the first and often decisive step to achieve excellent print quality, homogeneous coating, uniform varnishing or an integrally bonded application of adhesives. The bond at this interface often determines the durability and adhesive strength of this material pairing.

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

- Ultra-fine cleaning of metal, glass and plastics
- Surface activation and surface functionalization for optimized wettability
- Plasma-assisted laminating process
- Plasma-assisted adhesive bonded joints
- Plugging and sealing
- Plasma induced reduction of metal surfaces
- Chemical-free bleaching of textiles
- Handling of food products for quality and shelf life
- Multi-component injection molding

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

- Metals and metal alloys
- Plastics and composite materials
- Glass, ceramics, inorganic composites and natural stone
- Real leather and imitation leather
- Natural fibers, wood and paper

Since the plasma treatment is always just one part of the entire process, it is important to know the overall influences on the surface properties in order to achieve an optimal result.

Typical influencing factors are:

- Plasma process: Distance to the substrate, speed, power setting, gas type (CDA/Nitrogen), gas flow, module design
- Substrate / workpiece: Material composition, contamination, electrical conductivity, thermal conductivity, moisture content
- Workpiece treatment: Contamination before or after the plasma process, the time between the plasma process and the follow-up process

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

Please note that the selected plasma system is suitable for the desired application. Additional information on applications, as well as publications, can be found on the website [www.relyon-plasma.com](http://www.relyon-plasma.com).

## 6.2 Carrying out surface treatment

Depending on the type and condition of your substrate, pre-cleaning before the plasma process can improve the overall outcome.

The effect of the treatment depends on the **working distance, treatment time, speed and consistency of movement as well as the material** to be treated.

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

## 6.3 Measures to take after the surface treatment

To achieve an optimal result, it is important that as little time as possible elapses after the plasma treatment and that the treated surface is not touched or contaminated.

Cleaning the surface **AFTER** the plasma treatment is not recommended.

Since the workpiece can heat up depending on the type and duration of the plasma process, it may be necessary to allow the workpiece to cool down first before the next process step is executed in order to not negatively affect the follow-up process through the introduction of heat (e.g. certain bonding processes).



### Caution – Hot surface!

The workpiece to be treated can become heated up by the plasma process depending on the process parameters. If necessary, allow the workpiece to cool down before handling it.

## 7

## Operation

## 7.1

## LED indicator on driver unit

In the event that the "Error" signal is present due to an error condition, the cause of the error can be limited via the LED display on the driver housing using the following error codes:

	Device not powered
	Device ready
	Device powered; no module detected
	Plasma process running
	Warning: plasma process running, plasma critical
	Warning: plasma process running, temperature critical
	Failure: plasma
	Failure: temperature

Legend:

	off
	permanent light
	flashing (quantity)

## 7.2

## Switching signals

- Plasma on

Analog input to start the plasma generation. By signal voltage between 3 V and 10 V the power can be controlled as follows.

The voltage value for the desired power must be permanently present for the duration of the plasma generation.

Voltage	Power setting
0 V	plasma off
3 V	30 %
4 V	40 %
...	...
10 V	100%
>10 V (up to 24 V)	100%

- Plasma OK

Output with feedback about the plasma state.

In a permissible operating state, 24 V are present at this output. In a switched-off state or in the event of a fault, 0 V are present. Maximum load 20 mA.

- Error

Output with feedback on the error status. In the event of an error, 24 V are present at this output. In permissible operating states, 0 V are present. Maximum load 20 mA.

## 7.3

## Error acknowledgement

The error status remains active even after deactivation of the "Plasma on" signal. Acknowledgement of the error after removal of the problem, can only be done by removing the 24 V voltage supply on the DC connection line.

To restart plasma generation, the "Plasma on" switching signal must be switched on again.

## 7.4 Inserting / removing the module

The modules are provided with labels in different colors for easy identification. Please do not remove these labels.



### Caution – electrical voltage!

Make sure that the power supply is disconnected when changing the module. Do not reach into the inside of the device when the exchange module is removed.

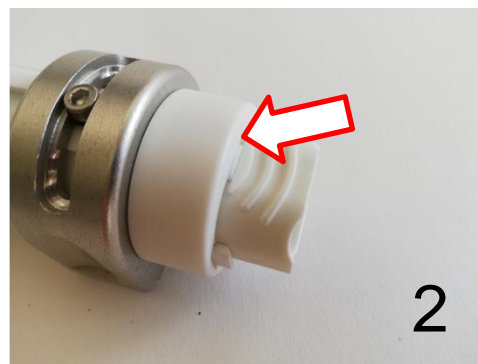
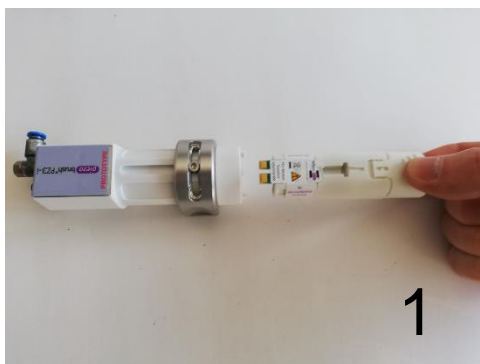
To insert a module, take it out of the packaging and hold it in the area of the nozzle outlet without touching the piezo element (picture 1).

Please note that the contact board of the module must be on the same side as the label of the module carrier allow insertion.

Carefully insert the module into the device as shown in the picture without using force until the module locks into place (picture 2). Make sure that the exchange module is inserted as deep as shown in the picture.

To remove a module, wait until it has cooled down. Depending on the type of module, operation can lead to a significant increase in temperature.

Hold the module carrier in one hand and with the other hand, hold the module in the area of the nozzle outlet without touching the piezo element and carefully pull the module out of the device.



### Caution – hot surface!

The exchange modules can become hot during operation. Do not touch them until they have cooled down and take care not to damage thermally sensitive surfaces when working with the exchange modules.

If, due to your installation situation, the exchangeable module cannot be removed downwards when mounted, the module carrier including the module can be removed without any tools. To avoid damaging the module cable, we recommend unplugging it before removing the module carrier.

Pull the module carrier upwards and then carry out the removal of the exchange module as described above.

The module carrier can also be plugged back onto the driver housing without tools.



### Attention – Damage to device!

Do not reach into the interior of the unit if no module is inserted and do not insert any objects into the opening of the unit other than the modules provided for this purpose.

Hold the modules only in the front area as described above and avoid touching the contact board and the piezo element.

Insert and remove the modules carefully.

## 7.5 Commissioning a device with digital I/O communication

- Make sure that a module is inserted in the device.
- Make sure that the air inlet and outlet and the nozzle outlet are not covered.
- please observe the instructions below regarding electrically conductive objects (picture 5 to 8).
- Ensure that the extraction of the working area is sufficient.
- Make sure that the gas supply of the module holder is available.
- Make sure that the supply voltage of 24 V is applied.
- Apply the desired voltage to the "Plasma on" switching input



Do not reach into the work area during plasma generation. This can disturb the plasma discharge and can also cause skin irritation or be perceived as slightly painful.



### Attention - Damage to device!

The device can be damaged if it is operated without air supply.

This would interrupt the supply of the cooling medium required during operation.

Never cover the air inlet/outlet and/or the nozzle outlet during operation.

Monitor the gas flow to the module carrier and interrupt plasma generation immediately if the gas supply is interrupted. We recommend monitoring the suction power in the process and only enabling plasma generation when the extraction system is active.

The device can be damaged if electrically conductive objects are closer than 40 mm to the front third of the device during operation.

**Exception:** Substrates in front of the module when using modules designed for this purpose, e.g. the Module "Nearfield".



### Note!

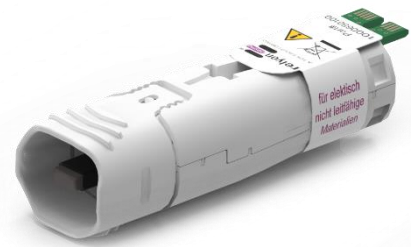
Under certain circumstances, the electric fields generated by the device can damage sensitive electronic components. Make sure that the components of your application are not affected by the plasma process.

## 7.6 Working with module “Standard”

This module is used for various applications on non-electrically conductive substrates / materials such as plastics, ceramics, glass, natural fibers, leather, textiles etc. The range of the permissible working distance is approx. 2 to 10 mm.

Electrically conductive substrates such as metals or conductive polymers cannot be reliably treated with this nozzle.

When treating electrically conductive substrates / materials, arcing can occur if the distance is too small. In this case the unit will stop plasma generation after approx. 0.5 seconds.

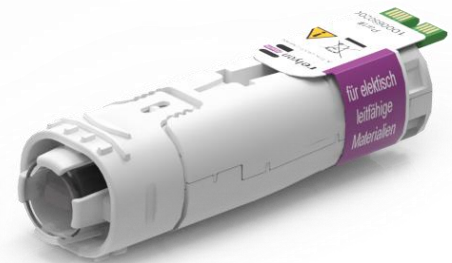


## 7.7 Working with module “Nearfield”

The module "Nearfield" was especially designed for the treatment of electrically conductive substrates / materials such as metals or conductive polymers. Even partially conductive materials such as carbon fiber reinforced plastics (CFRP) should be treated with this module.

The device can only generate a surface activation if an electrically conductive substrate is in front of the device within the range of the permissible working distance. This is approx. 0.5 to 2.0 mm. If the distance is greater, plasma generation may not be possible under certain circumstances, depending on the material and geometry of your substrate.

If too great a distance is selected, the unit automatically stops plasma generation after 5 seconds.



### Caution - hot surface!

The module can become hot during operation. Do not touch the module immediately after operation. Do not touch the substrate with the module during operation.

## 7.8 Working with other modules

It is planned to develop further modules for this device. Please refer to the corresponding operating instructions enclosed with these modules.

## 8 Taking out of service

- Apply a voltage of 0 V to the "Plasma on" switching input.
- To reduce unnecessary power consumption, it is recommended to deactivate the 24 V voltage supply in case of longer interruptions.

## 9 Maintenance

### 9.1 Cleaning

- Clean the device only on the outside.
- Make sure that the device is disconnected from the power supply.
- Clean the device only with a cloth moistened with water. Do not use solvents to clean the device!
- Do not clean the piezo element.

### 9.2 Replacing a module

The modules can be subject to wear depending on the application and should be exchanged for consistent treatment results. Proceed as described in section 7.4.

You can obtain replacement modules directly from relyon plasma GmbH. To optimize our modules, we evaluate returned modules. Please contact us and send us back your defective or replaced modules for analysis.



#### **Attention – Damage to device!**

Never touch the piezo element at the front end of the device with sharp objects. This component can be damaged by improper handling.



Fault / error	Cause	Rectification
Device cannot be started or plasma extinguishes during operation.	Mains failure.	Check electrical power supply.
	Mains fuse triggered.	Check mains fuse.
	Plug connection of the connection lines do not contact	Check that all plug connections are correctly connected and that the union nuts are hand-tightened.
	There is an internal error.	De-energize device. Switch on again.
	Piezo element broken. The exchange module must be replaced.	Piezo element broken. Remove the defective module and insert a new one.
Device cannot be switched on or plasma extinguishes during operation and a level of 24V is present on pin "Error"	The device has detected an error and is in error state.	Check the status of the LED display on the device itself and proceed according to the following points.
Plasma extinguishes during operation and device displays LED error code "Error plasma" (see chap. 7.1)	Device does not find a permissible operating frequency.	Piezo element broken. Remove the defective module and insert a new one. Reset the error as described in section 7.2.
	Arcing on conductive substrate with e.g. module "Standard".	Use a module suitable for the substrate, e.g. module "Nearfield". Reset the error as described in section 7.2.
	No conductive substrate in sufficient proximity to e.g. module "Nearfield".	Reduce the distance to the substrate or use a module suitable for the substrate, e.g. module "Standard". Reset the error as described in section 7.2.
As above, display device displays LED error code: "Fan error" (see chap. 7.1)	Fan is defective.	Contact customer service.
As above, display device displays LED error code: "Temperature error" (see chap. 7.1)	The device reached an impermissible inner temperature.	Allow the device to cool down. Check whether the air inlet and the nozzle outlet are not covered. Reset the error as described in section 7.2.
As above, display device displays LED error code: "No module inserted" (see chap. 7.1)	Module was not detected.	Check whether the module is inserted deep enough in the device. If necessary, remove the module and reinsert it. If necessary, insert a new module.

Should these actions not remedy the problem, please contact relyon plasma GmbH.

## 11 Environment

### 11.1 Disposal



#### Consider the environment.

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

- The device contains valuable materials that can be recycled. Take the device to a suitable collection point.
- Please return defective or replaced modules to relyon plasma GmbH for analysis. Please contact us in advance.

## 12 Conformity / standards



### Attention! Device in beta test stage

The device is not yet in the final production stage.

You have been selected as a beta tester for this test series in consultation with our sales department.

Please note that the device has been developed to the best of our knowledge and belief, but has not yet to undergo all CE/EMV/FCC clearance tests at this stage.

Thank you for your participation in the beta test phase!

### 12.1 CE



We do **not** declare CE conformity.

In the current beta test stage, the tests for CE/EMV are not yet completed.

### 12.2 FCC



We do **not** declare FCC conformity.

In the current beta test stage, the tests for FCC are not yet completed.

### 12.3 Product standards

In the later series state, the device will meet the following standards:

EMC	EN 55011:2018 + A1:2017 Group 2 Class A
	EN 61000-6-2:2019
	EN 61000-3-2:2019
	EN 61000-3-3:2014
LVD	EN 61010-1:2011
RoHS	EN 50581:2013-02
Protection grade IP20	EN 60529:2014-09
FCC	Part 15 und Part 18

## 13 Spare parts

Order number	Description
1000650100	Module "Standard" (wear part)
1000650200	Module "Nearfield" (wear part)

**relyon plasma GmbH**  
**A TDK Group Company**

Osterhofener Straße 6  
93055 Regensburg  
Germany

Phone: +49-941-60098-0  
Fax: +49-941-60098-100  
E-Mail: [info@relyon-plasma.com](mailto:info@relyon-plasma.com)  
<http://www.relyon-plasma.com>



## Do you already know our other products?

### piezo brush® PZ3



The piezobrush® PZ3 has been developed as a compact handheld plasma device for use in laboratories, pre-development and small series assembly. With a maximum power consumption of 18 W, cold-active plasma with a temperature of less than 50°C is generated using Piezoelectric Direct Discharge (PDD®) technology.

### plasma brush® PB3



The plasmabrush® PB3 is the high-performance plasma system for fast inline processes that require the highest performance. The plasmabrush® PB3 is widely used in the automotive, packaging and printing industry.

### plasma tool



The plasmatool is designed as a high-performance hand tool for the plasma treatment of workpieces that cannot be machined due to their size or mobility. With the plasmatool pre-treatment with plasma is possible almost anywhere.

### plasma cell P300



The plasmacell is a compact stand-alone plasma system, for the simple and efficient plasma treatment of small to medium sized components. The integrated software system enables process monitoring.