



## **piezobrush®PZ2**

### Operating instructions for piezobrush®PZ2 handheld device

**Series/Type:** piezobrush®PZ2 - prototypes

**Ordering code:** Z63000Z2910Z1Z62

**Date:** 2018-01-18

**Version:** 1.1

## Preliminary data

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**Preliminary data****2 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.

**2.1 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!**

Only use the external power plug provided.

Danger from mains voltage. If the external power plug is visibly damaged:

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

**Attention – Emissions!**

Dangerous amounts of the reaction gas ozone ( $O_3$ ) 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 vented areas or in conjunction with a suitable extraction device

## Preliminary data

**Attention – Damage to device!**

Under no circumstances may the fan cover on the rear side of the device be closed. This would interrupt the supply of cooling medium required in operation.

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

Protect the plasma generator from falls or other hard impacts which may damage the electronics or piezo crystal.

## 2.2 Information and obligations for the operator

- The system may emit interference.
  - The system has been 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. The only exceptions are modifications which are expressly authorised by the manufacturer.

## 2.3 Interpermissible 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 technical data)
- At altitudes of more than 2000 m above sea level
- In areas with strong vibrations

**Preliminary data****2.4 Emissions**

The connected plasma generator produces certain amounts of ozone ( $O_3$ ), which may exceed the workplace limits

Plasma Gas	Gas flow	Ozone
Air	Ca 20 l/min	< 0.12 g/h

**Note!**

As a precautionary measure, we recommend an extraction system with about 10 times the amount of gas flow through the device in the direct vicinity of the plasma outlet.

### 3 Description of device

#### 3.1 Ordering Code

The piezobrush®PZ2 handheld device can be ordered by using ordering code: **Z63000Z2910Z 1 Z62**.

#### 3.2 Correct use

The piezobrush® PZ2 is a handheld device for generating technical plasma. It is used to pretreat a wide range of material surfaces before processes such as gluing or printing. It is also possible to use the cleaning effect of the plasma.

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

#### 3.3 Scope of delivery

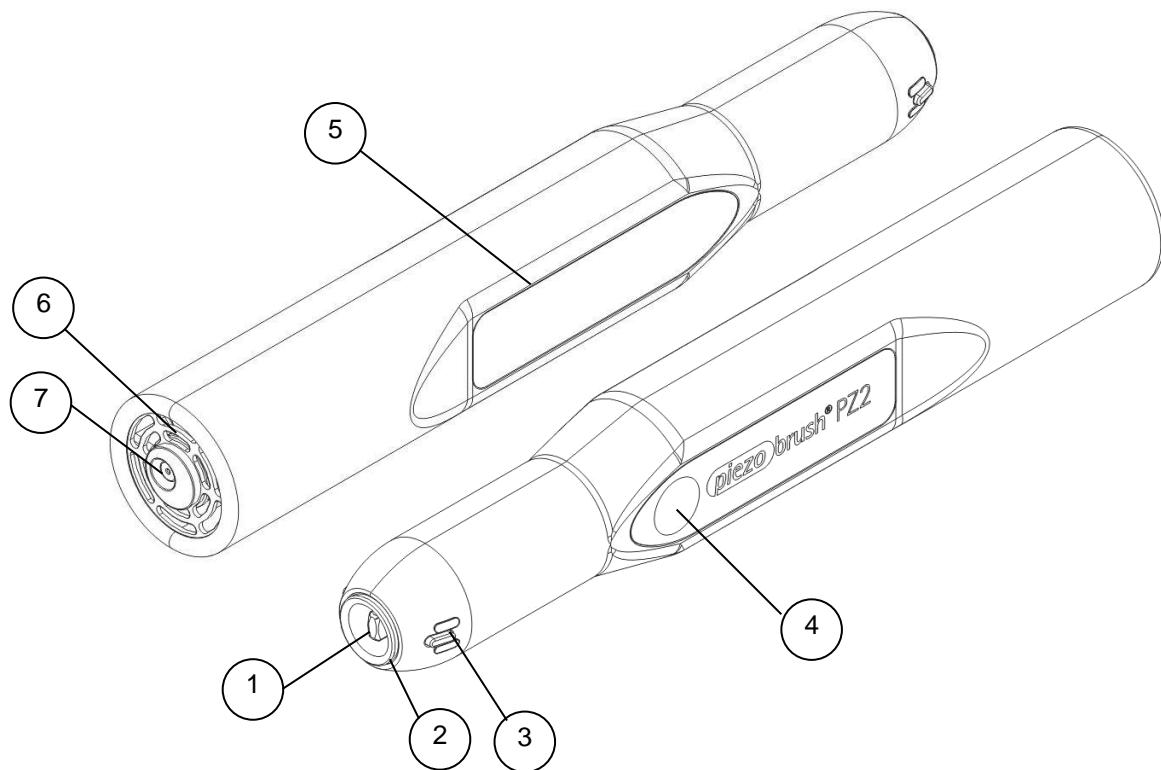
The scope of delivery includes the following components:

- Plasma generator
- Standard nozzle (already mounted)
- Nearfield nozzle
- Power plug (length 1.5m)
- Operating instruction

## Preliminary data

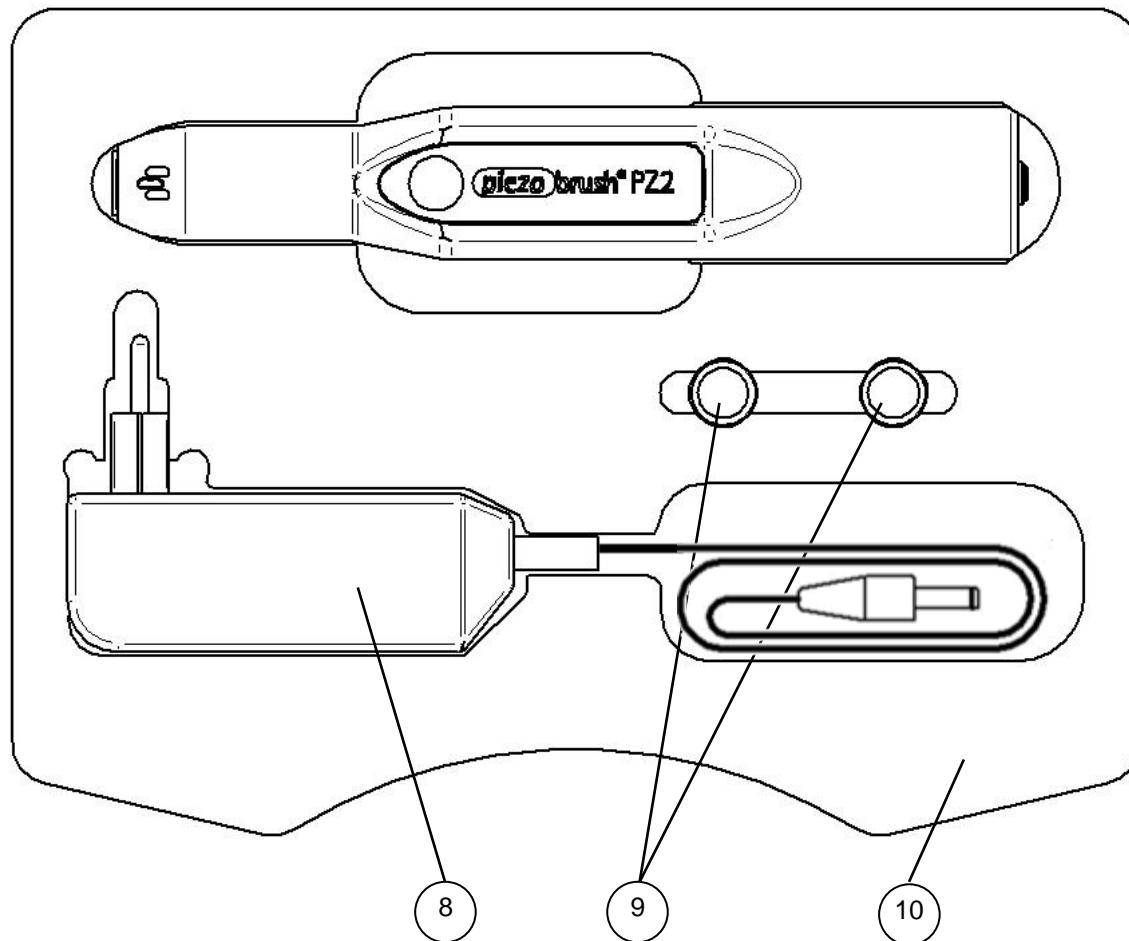
## 3.4 Description of device

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



No.	Component description
1	Piezo crystal (internal)
2	Nozzle insert
3	Catch button for nozzle insert (on both sides)
4	On/Off button
5	Nameplate
6	Fan grille
7	Socket for external power plug

## Preliminary data



No.	Component description
8	External power plug
9	Nearfield nozzle in socket for spare nozzle-inserts
10	Foam inlay

**Preliminary data**

## 4 Technical Data

<b>Electrical data</b>	
• Supply voltage	15 V DC
• Power consumption	max. 30 W
• Model	Handheld device with external power plug
<b>Dimensions</b>	
• Weight	170 g (not including external power plug)
• Length	215 mm
• Diameter max.	36 mm
• Diameter min.	27 mm
• Cable length	1500 mm
<b>Typical application parameters</b>	
• Plasma temperature	< 50 °C
• Distance for treatment	5 – 10 mm
• Width of treatment	5 - 20 mm depending on process parameters (see chapter 7)
• Treatment speed	10 – 20 mm/s
<b>Operating conditions</b>	
• Air humidity	< 80% rel. (non-condensing)
• Temperature	10 – 40 °C; 50 – 104 °F
<b>Storage conditions</b>	
• Air humidity	< 80% rel. (non-condensing)
• Temperature	0 – 60 °C; 32 – 140 °F

## 5 Transport /storage

- Store the plasma generator in a dry place. This will prevent corrosion of the electrical contacts. It is best to use the provided case for storage and transport.
- Protect the plasma generator from dirt and foreign bodies.
- Protect the plasma generator from falls or other hard impacts.

## 6 Installation

- Remove the plasma generator from the packaging.
- Use the external power plug to establish the power supply.
- Ensure that the workplace is well vented.

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**Attention - Damage to device**

In order to prevent damage to the device, please ensure that you follow the advice in chapter 8 Operation.

## 7 Special Note on the operation of the plasma process

### 7.1 General description

Treating surfaces with atmospheric plasma has several advantages. Examples include the increase of surface energy resulting in improved surface wetting.

Optimal surface wetting is the first and often decisive step to get a good imprint, a uniform coating, a consistent coat of varnish or an integrally-bonded application of adhesive. The bond at this boundary layer often determines the longevity 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 application fields:

- Cleaning of metal, glass and plastics
- Surface activation and surface functionalisation for optimised wettability
- Plasma-assisted laminating process
- Plasma-assisted adhesive bonded joints
- Plugging and sealing
- Plasma induced reduction of metal surfaces
- Chemical-free bleaching of textiles
- Plasma sterilisation of fabric
- Handling of food products for quality and shelf life
- Sterilisation of thermally-unstable plastics
- Air purification, odour and germ reduction
- Multi-component injection moulding

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

- Metals, metal alloys
- Plastics and composite materials
- Glass, ceramics, inorganic composites, natural stone
- Real leather, imitation leather
- Natural fibres, wood, 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 could be:

- Plasma process: Distance to the substrate, speed, nozzle geometry
- Substrate/ workpiece: Material composition, contamination, electrical conductivity, thermal conductivity, moisture content

**Preliminary data**

- Workpiece treatment: Contamination before or after the plasma process, the time duration between the plasma process and the follow-up process

Treatment examples can be requested directly from Relyon Plasma GmbH.

Additional information on applications, as well as publications, can be found on the website [www.relyon-plasma.com](http://www.relyon-plasma.com).

## 7.2 Notes on the correct handling of the substrates to be treated

**Caution – electrical voltage!**

- Danger from electrical voltage
  - Never direct the plasma beam at people or animals.
  - Never touch the plasma nozzle or the plasma jet when the device is in operation.
  - Never touch the workpiece to be treated or its holder during plasma generation.
  - Make sure that no third party comes into contact with the workpiece to be treated or its holder.
  - If electrically conductive materials touch the workpiece to be worked on, these materials must be grounded.

This applies not only to direct handling of the device, but also to the workpiece to be handled and its holder.

A functional grounding connection is provided on the device for a special form of plasma treatment involving transferred electric arcs. If you want to use this special application, please contact Relyon Plasma GmbH directly.

## 7.3 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.

Ensure that the substrate is not thermally damaged due to movement that is too slow or a working distance that is too low.

Treatment examples can be requested directly from Relyon Plasma GmbH.

## 7.4 Measured to take the surface treatment

To achieve an optimal result, it is important that as little time as possible elapse 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 first 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).

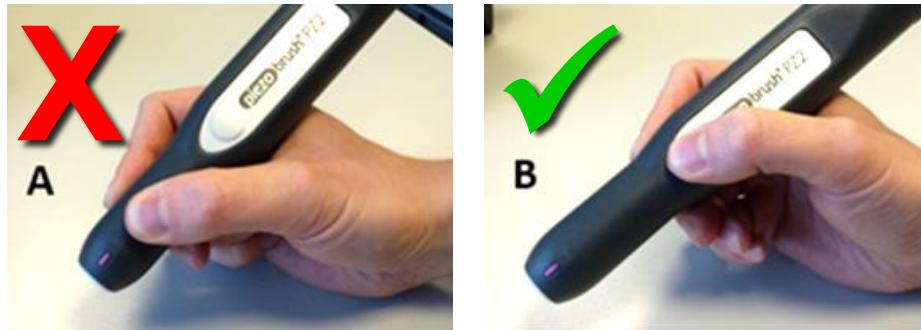
**Caution – Hot surface!**

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.

## Preliminary data

**8 Operation****8.1 General Operating Instructions**

- Ensure that the fan grille is not covered so that the device can draw in enough ambient air.
- Always hold the device in the middle area where the button and the logo plate are located and not in the area closer to the tip (see picture).
- When mounting the device, follow the advice below concerning electrical conductive devices.
- Press the On/Off button to start generating plasma.



While plasma is being generated, do not put your hand into the working area. This may disturb the plasma discharge and cause skin irritations and might be slightly painful.

**Attention - Damage to device!!**

**The plasma generator may be damaged, if used without gas flow resulting in a lack of the cooling medium needed in the process. Ensure that the fan grille and the nozzle outlet are not covered while in use.**

**The plasma generator may be damaged if electrically conductive objects are closer than 60 mm (~2.4 inches) to the front third of the plasma generator.**

**Exception: Substrates in front of the nozzle when using the nearfield-nozzle.**

**8.2 Changing the nozzle**

Proceed as follows:

- Ensure that the plasma generator is disconnected from the power supply.
- Press the catch buttons on both sides of the nozzle insert.
- Pull the nozzle insert out of the housing.
- Put the new nozzle insert in the housing. If necessary, press the catch buttons initially and do not angle the insert.
- Apply a little pressure and slide the nozzle insert in until it engages in the lock position.

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**8.3 Standard-Nozzle**

The standard-nozzle is inserted by default into the device. This nozzle is used for various applications for non-conductive substrates. Conductive Substrates such as metals or conductive polymers cannot be treated reliably with this nozzle.

**8.4 Nearfield-Nozzle**

The nearfield-nozzle has been specially developed for the treatment of conductive substrates.

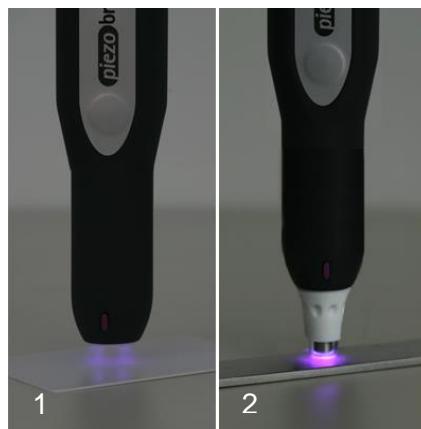


Caution! In operation, the nozzle insert can become hot. Do not touch the nozzle insert immediately after operation. Do not touch the substrate with the nozzle insert.

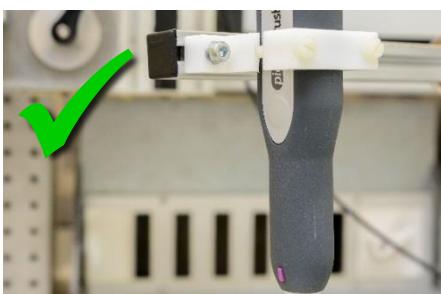
**Attention – Damage to device!**

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

Nozzle type	Item number	Working distance [mm]	Activation width [mm]	For non-conductive material	For conductive material	see picture
Standard	1000269202	2 - 10	approx. 10	x		1
Nearfield	1000606802	0,5 - 2	approx. 10		x	2



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**Note!**

The plasma generator with standard nozzle is not fit for the use on metal or electrically conductive substrate

Such substrate may result in negative affect on the process and damage to the device.

The treating of electrically conductive substrate is only allowed with a specially designed nozzle (e.g. the nearfield nozzle).

Do not use the plasma generator on sensitive electrical components for it may damage these components.

## 9 Decommissioning

- Press the On/Off button again.
- Disconnect the power supply once work is complete.

## 10 Maintenance

### 10.1 Cleaning

Only clean the outside of the plasma generator.

- Ensure that the plasma generator is disconnected from the power supply.
- Only clean the plasma generator with a cloth dampened in water. Do not use solvents to clean the plasma generator!

## Preliminary data

**Attention – Damage to device!**

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

**11 Troubleshooting**

Fault / error	Cause	Rectification
Device cannot be started or plasma stops during operation	Mains failure.	Check electrical power supply.
	Mains fuse triggered.	Check mains fuse.
	Mains plug not making contact correctly.	Check seat of mains plug.
	Mains plug is defective.	Replace mains plug.
	There is an internal error.	De-energise device. Switch on again.
	Piezo crystal broken, the plasma generator is defective.	Contact customer service.
	Shutdown due to overheating.	Allow the plasma generator to cool down. Ensure that the fan grille is not covered so that enough ambient air can be drawn in.

If these actions do not remedy the problem, please contact customer service.

**12 Environment****12.1 Disposal****Consider the environment.**

Used electrical and electronic equipment should not be disposed of along with normal waste.

- The device contains valuable materials that can be recycled. Take the device to a suitable collection point.

**13 Conformity / standards****13.1 CE****We declare that this product conforms to CE standards.**

The product name can be found on the device's nameplate.

**Preliminary data****13.2 Product standards**

The device satisfies the following requirements and standards:

EMC	EN 55011:2009+A1:2010 Group 1 Class A
	EN 61000-6-2:2005+AC:2005
	EN 61000-3-2:2006+A1:2009+A2:2009
	EN 61000-3-3:1995+ A1:2001
LVD	EN 61010-1:2010
RoHS	EN 50581:2012
Protection class IP20	IEC 60529

**14 Spareparts**

Spare parts can be ordered directly at Relyon Plasma:

Item number	Description
1000269202	Standard Nozzle
1000606802	Nearfield Nozzle
1000617300	POWER ADAPTOR 15V DC
1000602100	POWER ADAPTOR 15V DC (US)
1000625100	POWER ADAPTOR 15V DC (UK)

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## Important notes

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