piezobrush PZ2

Operating Instructions for Handheld Device

Series/Type: PZ2 - Prototypes
Ordering code: Z63000Z2910Z1Z62
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Please read Cautions and warnings and Important notes at the end of this document.
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 (O₃) may be produced during device operation.
- Volumes of ozone in excess of 0.2 mg/m³ 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.
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 component 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 component.

### 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 authorized 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
2.4 Emissions
The connected plasma generator produces certain amounts of ozone (O₃), which may exceed the workplace limits.

<table>
<thead>
<tr>
<th>Plasma Gas</th>
<th>Gas flow</th>
<th>Ozone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>Ca 20 l/min</td>
<td>&lt; 0.12 g/h</td>
</tr>
</tbody>
</table>

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: Z63000Z2910Z1Z62.

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)
- Changeable plugs for EU, US and UK
- Operating instruction
Not included:
- Multigas nozzle (see chapter 14)

Additional information can be found on the website www.relyon-plasma.com.
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.

<table>
<thead>
<tr>
<th>No.</th>
<th>Component description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Piezo component (internal)</td>
</tr>
<tr>
<td>2</td>
<td>Nozzle insert</td>
</tr>
<tr>
<td>3</td>
<td>Catch button for nozzle insert (on both sides)</td>
</tr>
<tr>
<td>4</td>
<td>On/Off button</td>
</tr>
<tr>
<td>5</td>
<td>Nameplate</td>
</tr>
<tr>
<td>6</td>
<td>Fan grille</td>
</tr>
<tr>
<td>7</td>
<td>Socket for external power plug</td>
</tr>
<tr>
<td>No.</td>
<td>Component description</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------------------------------------</td>
</tr>
<tr>
<td>8</td>
<td>External power plug (with changeable plugs for EU, US and UK)</td>
</tr>
<tr>
<td>9</td>
<td>Nearfield nozzle in socket for spare nozzle-inserts</td>
</tr>
<tr>
<td>10</td>
<td>Foam inlay</td>
</tr>
</tbody>
</table>
4 Technical data

Electrical data
- Supply voltage: 15 V DC
- Power consumption: max. 30 W
- Model: Handheld device with external power plug

Dimensions
- Weight: 170 g (not including external power plug)
- Length: 215 mm
- Diameter max.: 36 mm
- Diameter min.: 27 mm
- Cable length: 1500 mm

Typical application parameters
- 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

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

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.

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 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
- Plasma decontamination of fabric
- Handling of food products for quality and shelf life
- Decontamination of thermally-unstable plastics
- Air purification and odour 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
- 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.
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.
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.
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 component on the front side of the device with sharp-edged objects. This component may be damaged by improper handling.

<table>
<thead>
<tr>
<th>Nozzle type</th>
<th>Item number</th>
<th>Working distance [mm]</th>
<th>Activation width [mm]</th>
<th>For non-conductive material</th>
<th>For conductive material</th>
<th>see picture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>1000269202</td>
<td>2 - 10</td>
<td>approx. 10</td>
<td>x</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Nearfield</td>
<td>1000606802</td>
<td>0.5 - 2</td>
<td>approx. 10</td>
<td>x</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

Please read Cautions and warnings and Important notes at the end of this document.
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!

Attention – Damage to device!

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

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

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.
13.2 Product standards
The device satisfies the following requirements and standards:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMC</td>
<td>EN 55011:2009+A1:2010 Group 1 Class A</td>
</tr>
<tr>
<td></td>
<td>EN 61000-6-2:2005+AC:2005</td>
</tr>
<tr>
<td>LVD</td>
<td>EN 61010-1:2010</td>
</tr>
<tr>
<td>RoHS</td>
<td>EN 50581:2012</td>
</tr>
<tr>
<td>Protection class IP20</td>
<td>IEC 60529</td>
</tr>
</tbody>
</table>

14 Spare parts and optional accessory
Spare parts can be ordered directly at Relyon Plasma:

<table>
<thead>
<tr>
<th>Item number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000269202</td>
<td>Standard Nozzle</td>
</tr>
<tr>
<td>1000606802</td>
<td>Nearfield Nozzle</td>
</tr>
<tr>
<td>1000606701</td>
<td>Multigas Nozzle</td>
</tr>
<tr>
<td>1000617300</td>
<td>POWER ADAPTOR 15V DC</td>
</tr>
<tr>
<td>1000602100</td>
<td>POWER ADAPTOR 15V DC (US)</td>
</tr>
<tr>
<td>1000625100</td>
<td>POWER ADAPTOR 15V DC (UK)</td>
</tr>
</tbody>
</table>

Display of ordering codes for TDK Electronics products
The ordering code for one and the same product can be represented differently in data sheets, data books, other publications, on the company website, or in order-related documents such as shipping notes, order confirmations and product labels. The varying representations of the ordering codes are due to different processes employed and do not affect the specifications of the respective products. Detailed information can be found on the Internet under www.tdk-electronics.tdk.com/orderingcodes.
The following applies to all products named in this publication:

1. Some parts of this publication contain statements about the suitability of our products for certain areas of application. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application. As a rule we are either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether a product with the properties described in the product specification is suitable for use in a particular customer application.

2. We also point out that in individual cases, a malfunction of electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified. In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health (e.g. in accident prevention or life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of an electronic component.

3. The warnings, cautions and product-specific notes must be observed.

4. In order to satisfy certain technical requirements, some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as hazardous). Useful information on this will be found in our Material Data Sheets on the Internet (www.tdk-electronics.tdk.com/material). Should you have any more detailed questions, please contact our sales offices.

5. We constantly strive to improve our products. Consequently, the products described in this publication may change from time to time. The same is true of the corresponding product specifications. Please check therefore to what extent product descriptions and specifications contained in this publication are still applicable before or when you place an order.

   We also reserve the right to discontinue production and delivery of products. Consequently, we cannot guarantee that all products named in this publication will always be available. The aforementioned does not apply in the case of individual agreements deviating from the foregoing for customer-specific products.

6. Unless otherwise agreed in individual contracts, all orders are subject to our General Terms and Conditions of Supply.

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