



Explore Kit - Enhanced prototype demonstrator of Cold Plasma technology

Piezoelectric Based Cold Plasma Generator

Series/Type: HF Series packaged component
Ordering code: Z63000Z2910Z 1Z72
Date: 2021-02-02
Version: 1

Preliminary data

Intended Use

- Demonstration unit for exploring disinfection processes by using CeraPlas™ technology
- For initial tests and application trials
- Unit is not designed for end customers, please do not use the device unattended
- TDK does not declare that this demonstrator conforms to CE standards. Risk assessments and EMI measurements are available to estimate the affords for a CE conformity. For further information contact the local sales manager.

Features

- Rechargeable Lithium-Ion battery (18650 default cell), for further information see the operation instruction
- Direct high voltage discharge unit for generation of plasma
 - No high voltage wiring
 - No high voltage plugs
 - Ready to use with CeraPlas driving stage
- High ionization rate and efficient ozone generation rate
- Ozone (O₃) neutralizer unit
- Android App for controlling the decontamination process and visualization

Application fields

- Non-thermal atmospheric pressure plasma generation
- Smell reduction
- Decontamination

Applications

- Implementation in handheld and plug connected devices
- Support product designers and developers for future plasma products
- Enhanced demonstrator of the CeraPlas technology using the evaluation kit as a base (P/N Z63000Z2910Z 1Z69)

Construction

- RoHS compatible PZT ceramic
- Control unit
- Filter extension
- Container
- Power cord (USB-C)

Preliminary data
Scope of delivery

- Control unit
- Container
- Filter extension
- USB-C charging cord
- QR Code for downloading the Android application
- Operating instructions

This document uses the term "ozone". Other respectively used terms are: O₃, active oxygen and reactive oxygen.

Specification

Parameter	Symbol	Value	Unit
Charging voltage (USB-C)	V _{dc}	5	V
Charging current	I _{dc}	1	A
Typical operating hours after battery charge	t _{op}	2	h
Max. ozone generation rate	GR _{max.}	80	mg/h
Typical ozone concentration (measured in empty container)	O ₃ typ.	200	ppm
Max. ozone concentration	O ₃ max.	500	ppm
Operating temperature range	T _{op}	+5 ... +45	°C
Max. operating humidity (non-condensing)	RH	60	%
Outer dimensions of the container	L/H/W	354/158/260	mm
Inner dimensions of usable volume inside the container	L/H/W	230/130/215	mm
Volume of container	Vol.	8	liters
Weight	m approx.	2	kg

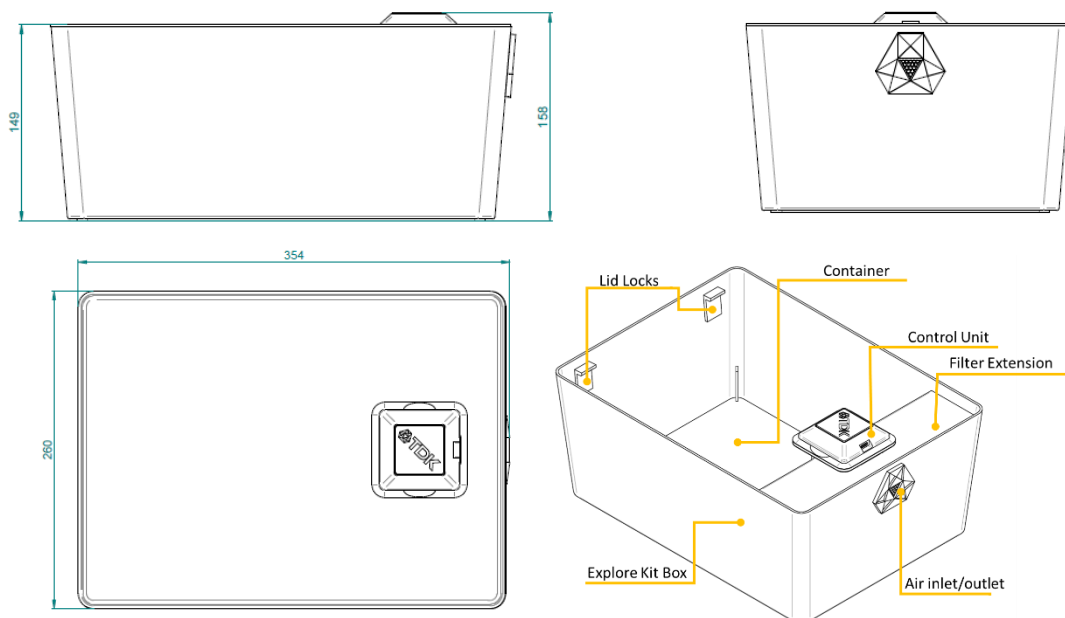
Material types and features

- CeraPlas element HF series (P/N Z63000Z2910Z 1Z60): Piezoelectric high coupling transformer for plasma generation out of ceramic material
- Driving stage of CeraPlas evaluation kit for driving CeraPlas element at most efficient way
- Control unit for operating the explore kit
- Filter extension including lock, filters and pumps for safety application and ozone reduction
- 3D printed explore kit box and housing for easy-to-use demonstration purpose of the explore kit

Preliminary data

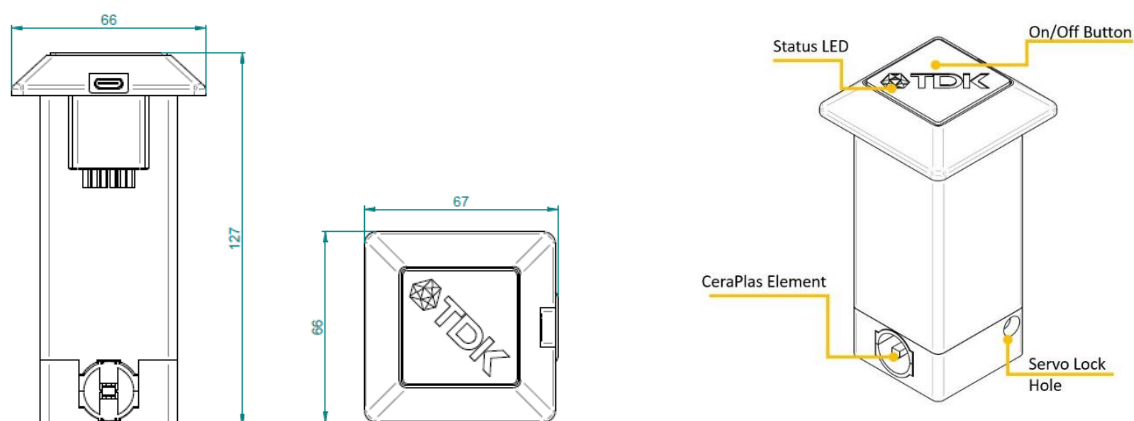
Dimensional drawings

Explore kit



Control unit

Material: PLA



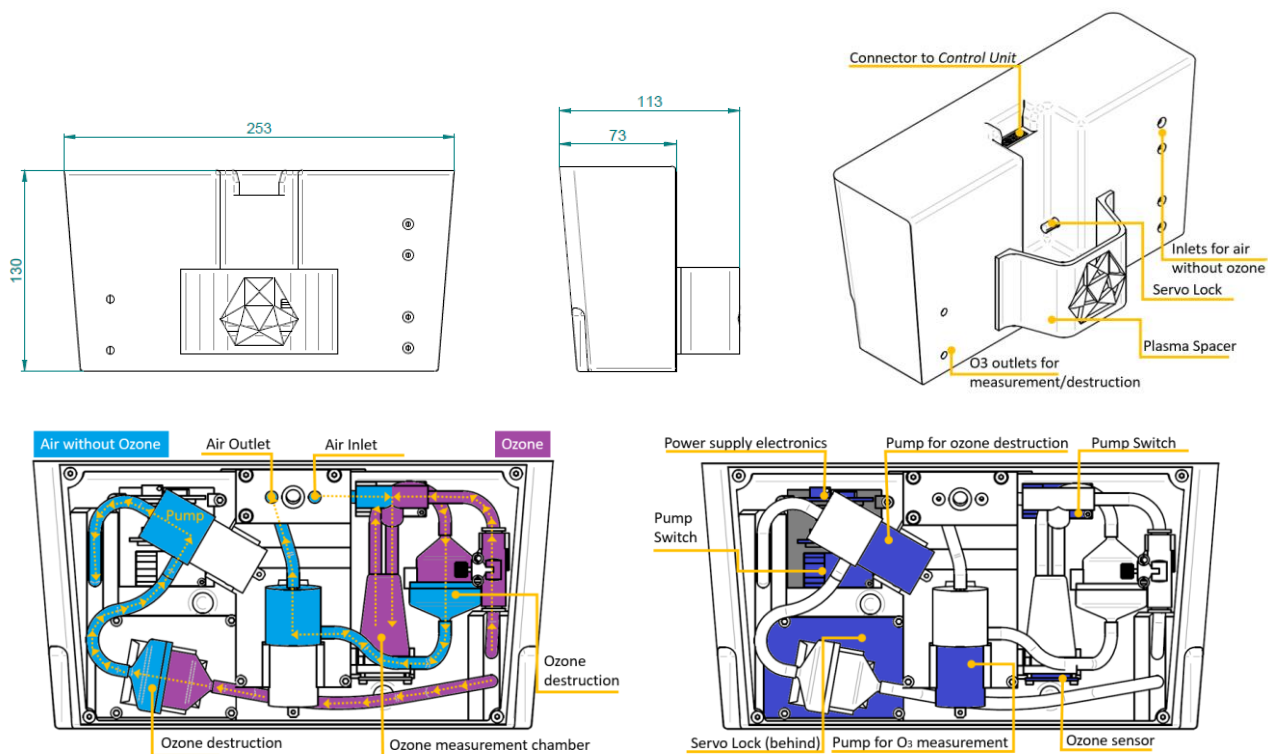
Piezoelectric Based Cold Plasma Generator

HF Series packaged component

Preliminary data

Filter extension

Material: PLA & Carbon fibre



**Notes: Material and dimensions under development.
Changes without notification!**

Preliminary data
List of electrical components
Control unit

Part	Pcs	Details
Accumulator	1	LiPo 2200 mAh (3.7 V, 2 mm JST)
Lithium Ion charger	1	USB-C Lipo charger Snone MT3608 adjustable DC/DC Boost
DC/DC converter	2	Converter
RGB LED	1	AZDelivery KY-016 RGB LED parent
Push-button	1	AZDelivery KY-004 Switch module parent
Buzzer	1	AZDelivery KY-012 Active piezo buzzer
Arduino	1	Arduino nano 33 IoT
Evaluation kit 2	1	Driver for CeraPlas element CeraPlas element HF series (P/N Z63000Z2910Z 1Z60)

Filter Extension

Part	Pcs	Details
DC/DC converter	2	Snone MT3608 Adjustable DC/DC Boost converter)
MOSFET switch	2	ICQUANZX DC 5 V to 36 V 15 A (Max.3 0 A) 400 W dual
Logic level converter	1	KeeYeas 4 channel IIC I2C Logic level converter
Servo motor	1	SG90 9G Micro servo motor
Pump	2	Micro vacuum pump - Mini motor for air pump DC 12 V
O3 sensor	1	Winsen ZE14-O3
Fuse	1	Baytronic standard

Functionality

The plasma generation is based on the CeraPlas evaluation kit including driving stage for CeraPlas element and shows one of the possible ways to use the CeraPlas technology, in this case for disinfection application.

Enhanced functionality of the explore kit can be set by using of the recommended Android application (see additional operating instructions).

The default functions of the state machine of the explore kit is based on following steps:

Phase 1: Start-up – Generation

1. Starting procedure and self-check
2. For safety reason locking of the lid to prevent opening during the operation

Preliminary data

3. Plasma generation with ozone creation for the utilisation in the container
Phase 2: Treatment
4. Maximised reaction between ozone and items in the container
Phase 3: Finishing phase – Ozone neutralisation
5. For safety reason ozone reduction process by filters and pumps units
6. Ending procedure of the decontamination and finishing the process

Cautions and warnings

General

This device uses plasma generator to produce ozone for interacting with the items in the container. Ozone is a gaseous disinfectant that breaks down to oxygen (O₂) after it is generated. It is the main part of the gas for odour reduction and disinfection. For effective application, a higher ozone concentration is necessary to take effect. The safety features of the demonstrator ensure to get the ozone contacting only the items and not the user during the operation cycle.

The filter extension uses active filter material (Cerulite 200) to reduce the ozone concentration and convert it back to oxygen after the application. The filter extension is designed to contain ozone within the container by preventing any opening during operation and reducing the ozone concentration before opening.

The smell of ozone is noticeable at low concentrations (< 0,2 mg/m³) and you may smell it briefly after the disinfection process.

Discontinue use of the explore kit if strong ozone odour is detected or, in rare cases, if those with respiratory sensitivities experience irritation.

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.

Storage

The control unit uses a Lithium-Ion battery for the base functionality. Rechargeable Lithium-Ion batteries are potentially hazardous and can present a serious FIRE HAZARD if damaged, defective or improperly used. Exposure to liquids can cause internal corrosion or damage to the cells or to the Battery Management System.

Please take care about to store the device as it is recommended for Lithium-Ion based devices. All batteries are affected by self-discharge. Self-discharge is not a manufacturing defect but a battery characteristic. Lithium-Ion based systems have a lower self-discharge. Li-ion self-discharges about 5 percent in the first 24 hours and then loses 1 to 2 percent per month; the protection circuit adds another 3 percent per month.

Please recharge the battery after longer storage before use.

Handling

This device is intended to be used indoor only.

Never use the control unit including the CeraPlas plasma generator outside of any closed and sealed volume.

The explore kit is made of plastic and electronics and is not made for use under hard conditions. Please use the demonstrator with care.

Preliminary data

This device can't be used by children's and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge. Children shall not play with the appliance.

Never use any fluids for cleaning the box, or inside of the container before or during the operation.

Do only place dry items inside the container.

Prevent any drop formation and condensation.

Do not place any explosive items inside of the container.

Do not put the explore kit in water or use any chemical cleaners on or in the container. Keep away from water sources including rain, bathtubs, sinks, and pools.

Do not place any flammable or ignitable items on or inside the explore kit.

Do not use the device in explosive environments, near gas vapours, or other flammables, etc.

Inspect the explore kit before each use and do not use it if there is any change to initial state or damage.

Do not disassemble the explore kit.

Operation

The explore kit shall be used only on tables or flat clean surfaces to avoid damage of the device and prevent wrong operation.

The explore kit is not designed for use in vehicles or any moving objects.

The explore kit can be used only for small items, which find a place inside of the container. Do not fill the container without space between the items or do not overload it. Do not use any pressure to close the lid or press the items inside the container.

The explore kit can be used for different items as e.g. everyday items like glasses, credit cards, visitor cards, masks, mobile devices, keyboards, mouse and so on.

Do not place any living thing inside the explore kit!

TDK is not responsible for any harm or defects of objects during operating and testing of the explore kit!

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Important notes

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