

EN

OPERATING MANUAL
OZONE METER



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Notes regarding the operating manual

Symbols



Warning of electrical voltage

This symbol indicates dangers to the life and health of persons due to electrical voltage.



Warning

This signal word indicates a hazard with an average risk level which, if not avoided, can result in serious injury or death.



Caution

This signal word indicates a hazard with a low risk level which, if not avoided, can result in minor or moderate injury.

Note

This signal word indicates important information (e.g. material damage), but does not indicate hazards.



Info

Information marked with this symbol helps you to carry out your tasks quickly and safely.



Follow the manual

Information marked with this symbol indicates that the operating manual must be observed.

You can download the current version of the operating manual and the EU declaration of conformity via the following link:



OZ-ONE



<https://hub.trotec.com/?id=41860>

Safety

Read this manual carefully before starting or using the device. Always store the manual in the immediate vicinity of the device or its site of use!



Warning

Read all safety warnings and all instructions.

Failure to follow the warnings and instructions may result in electric shock, fire and / or serious injury.

Save all warnings and instructions for future reference.

This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved.

Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.

- Do not use the device in potentially explosive rooms.
- Do not use the device in aggressive atmosphere.
- Protect the device from permanent direct sunlight.
- Do not remove any safety signs, stickers or labels from the device. Keep all safety signs, stickers and labels in legible condition.
- Do not open the device.
- Observe the storage and operating conditions as given in the Technical data chapter.

Intended use

Only use the device for measurements of the ozone concentration in the air as well as for indoor temperature and humidity measurements within the measuring range specified in the technical data.

To use the device for its intended use, only use accessories and spare parts which have been approved by Trotec.

Improper use

Do not use the device in potentially explosive atmospheres, for measurements in liquids or at live parts. Trotec accepts no liability for damages resulting from improper use. In such a case, any warranty claims will be voided. Any unauthorised modifications, alterations or structural changes to the device are forbidden.

Personnel qualifications

People who use this device must:

- have read and understood the operating manual, especially the Safety chapter.

Residual risks



Warning

Risk of suffocation!

Do not leave the packaging lying around. Children may use it as a dangerous toy.



Warning

The device is not a toy and does not belong in the hands of children.



Warning

Dangers can occur at the device when it is used by untrained people in an unprofessional or improper way! Observe the personnel qualifications!



Caution

Keep a sufficient distance from heat sources.

Note

Never expose the sensor to hard shocks. Do not shake the sensor, e.g. to ventilate the sensor chamber after an oversaturation, since the reaction electrolyte in the sensor can be irreparably damaged.

Note

To prevent damages to the device, do not expose it to extreme temperatures, extreme humidity or moisture.

Note

Do not use abrasive cleaners or solvents to clean the device.

Information about the device

Device description

The device OZ-ONE is an ozone meter for measuring the ozone concentration in the air. It can also be used to determine the air, dew point and wet-bulb temperature as well as the humidity level of indoor areas.

For assessing the measurements, a Max/Min function (maximum and minimum value), the time-weighted average, the short-term exposure limit and a Hold function for freezing the currently measured value are also available.

When not in use, an automatic switch-off saves the batteries.

Formation, perception and distribution of ozone

The word ozone has become an integral part of our vocabulary and the colourless, toxic gas is part of our everyday life. The irritant effect ozone can have on our eyes and airways has been common knowledge for a few years now, especially since the increasing ozone volume can be attributed to the so-called summer smog. Ozone is further generated during certain industrial processes.

Ozone (chemical symbol: O₃) consists of three oxygen atoms. Ozone is created wherever oxygen molecules (O₂) in the air are turned into atoms (O) due to electrical energy or UV radiation. It is these atoms that can react with the oxygen molecules to form ozone (O₃).

In case of a high solar irradiation ozone forms involving other air pollutants. The nitrogen oxides (NO_x) from automobiles, domestic heating systems, power plants and the industry play a major role in this.

Depending on the concentration, ozone can have a very intense smell similar to chlorine, hay or carnations. By nature, the human nose is already vastly superior to most measuring devices: It detects the gas with a concentration of as little as 0.01 ml/m³. What this means when compared to other irritant gases is that we humans can already detect even minor quantities of ozone which gives us the opportunity to take corresponding precautions to avoid any hazard caused by the gas in due time. However, our nose also has a crucial disadvantage compared with measuring devices: the so-called *habituation effect*. After only a brief period of time spent in an ozone-polluted environment we become so acclimated to the smell that we go noseblind.

The impact of ozone on human beings

The sensitivity to ozone depends on its concentration and varies for each individual. Ozone is an oxidative irritant gas, affecting eyes, nose, pharynx and lungs even at low concentrations. The mucous membranes are unable to stop it seeing as ozone is hardly soluble in water. As a result, the gas can be carried deeper into the lungs than other irritant gases. Concentrations of 200 µg/mm³ and higher can cause the following symptoms:

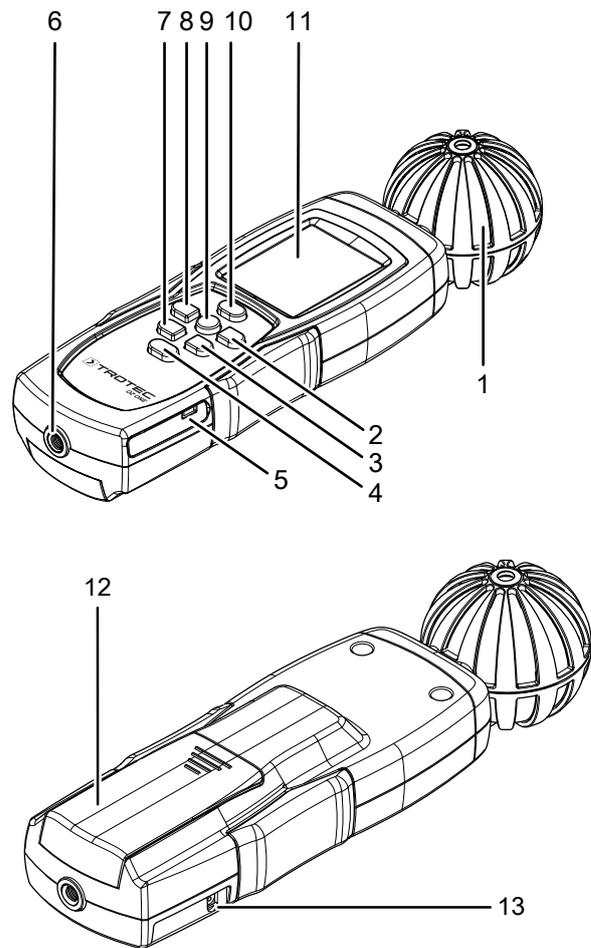
- irritations of the mucous membranes, eyes and the respiratory tract
- hoarseness, coughs and headaches
- feeling of constriction behind the sternum
- reduced physical performance

The main damage is caused in the respiratory tract which can lead to breathing difficulties and a reduced respiratory volume. Late complications can include nosebleeds, a bronchitis (or tracheitis) or a pulmonary oedema. But the transition from irritations without lasting consequences to long-term changes with pathological significance is very smooth.

Ozone threshold and target values

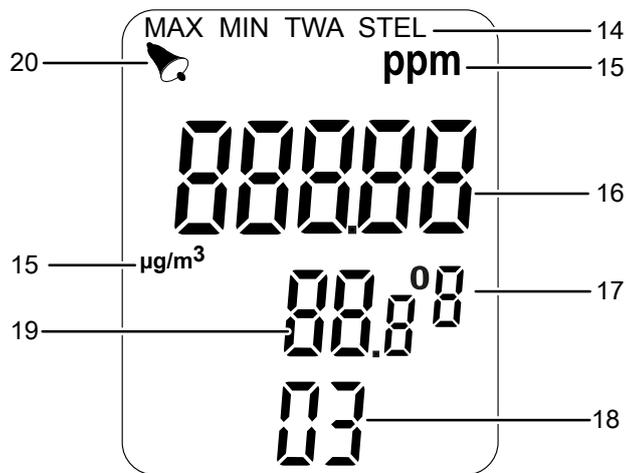
The information threshold for ozone concentrations amounts to 180 µg/m³ (1-hour value) and the alert threshold is 240 µg/m³ (1-hour value). From an ozone concentration of 180 µg/m³ the media starts to inform the public of the recommended behaviour. Furthermore, a target value has been specified to protect human health: Averaged over three years, the daily maximum 8-hour value of 120 µg/m³ must not be exceeded on more than 25 days per calendar year. In the long run, the maximum average values determined over an 8-hour period are not supposed to exceed 120 µg/m³ altogether. To protect the vegetation, a target value of 18,000 µg/m³ applies for a 5-year average. This is the summed up difference between the hourly average values above 80 µg/m³ measured during the daylight hours (8 a.m. to 8 p.m.) in the main growing season between May and July and 80 µg/m³.

Device depiction



No.	Designation
1	Measuring probe with protective cap
2	MAX/MIN button
3	UNIT button
4	Lamp button
5	Mini USB port
6	Tripod thread
7	SET button
8	MODE button
9	Power button
10	HOLD button
11	Display
12	Battery compartment with cover
13	Connector for the power adapter

Display



No.	Designation
14	Measuring mode indication
15	Indication of the unit for the ozone concentration: <ul style="list-style-type: none"> • ppm • $\mu\text{g}/\text{m}^3$
16	Measurement value display for ozone concentration
17	Indication of the unit for the ambient temperature / relative humidity
18	Indication of the ozone measuring mode
19	Measurement value display for: <ul style="list-style-type: none"> • Ambient temperature • Relative humidity • Dew point temperature • Wet-bulb temperature
20	Activated alarm indication

Technical data

Parameter	Value
Model	OZ-ONE
Article number	3,510,006,110
Weight	185 g
Dimensions (length x width x height)	210 mm x 60 mm x 40 mm
Ozone concentration	
Measuring principle	Electrochemical sensor
Measuring range	0 to 1,996 $\mu\text{g}/\text{m}^3$ (at 20 °C, 50 % RH and 1,013 hPa)
Accuracy	< 0.1 ppm (< 200 $\mu\text{g}/\text{m}^3$): ±0.02 ppm (±40 $\mu\text{g}/\text{m}^3$) at 25 °C and 1,013 hPa; otherwise ±10 %
Measuring range resolution	1 $\mu\text{g}/\text{m}^3$ or 0.01 ppm (10 ppb)
Drift	±2 % / month*
Relative humidity	
Measuring range	0.0 % RH to 99.9 % RH
Accuracy	± 3 % RH (at 10 % to 70 % and 25 °C) ± 5 % RH (0 % to 10 % and 70 % to 99.9 %)
Measuring range resolution	0.1 %
Reaction time	2 s
Operating conditions	0 °C to 50 °C, <80 % RH (non-condensing)
Storage conditions	-20 °C to 50 °C, <90 % RH (non-condensing)
Air temperature	
Measuring range	0 °C to 50 °C or 32 °F to 122 °F
Accuracy	± 0.6 °C
Measuring range resolution	0.1 °C
Automatic switch-off	after approx. 15 minutes
Power supply	4 AAA batteries

* This systematic measurement deviation is attributable to the characteristics of the required O₃ sensor technology. Electrochemical sensors are wear products and subject to a continuous aging process from the date of manufacture (see also chapter Errors and faults).

Scope of delivery

- 1 x Device OZ-ONE
- 1 x Calibration certificate
- 4 x AAA batteries
- 1 x Quick guide
- 1 x Transport bag

Transport and storage

Note

If you store or transport the device improperly, the device may be damaged.
 Note the information regarding transport and storage of the device.

Transport

For transporting the device, use the bag included in the scope of delivery in order to protect the device from external influences.

Storage

When the device is not being used, observe the following storage conditions:

- dry and protected from frost and heat
- protected from dust and direct sunlight
- with a cover to protect it from invasive dust if necessary
- Store the device in the resealable zip bag it has been supplied in.
- The storage temperature is the same as the range given in the Technical data chapter.
- Remove the batteries from the device.

Operation

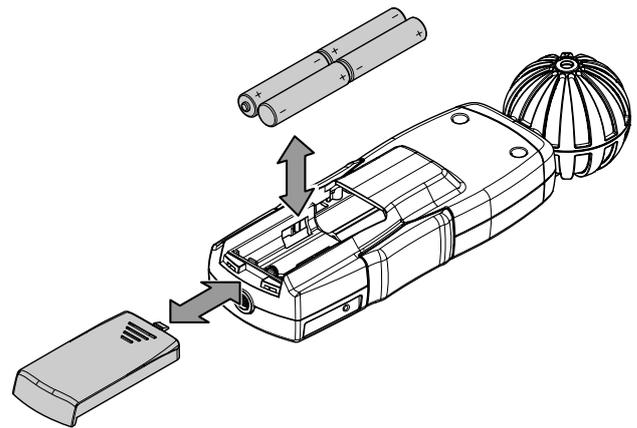
Inserting the batteries

Note

Make sure that the surface of the device is dry and the device is switched off.

1. Open the battery compartment by sliding open the cover (12) with your fingers.
2. Remove the battery compartment cover.
3. Insert the batteries (4 batteries of type AAA) into the battery compartment with correct polarity.

4. Slide the cover back onto the battery compartment.



Switch-on and ozone level measurements

Note

Never expose the sensor to hard shocks. Do not shake the sensor, e.g. to ventilate the sensor chamber after an oversaturation, since the reaction electrolyte in the sensor can be irreparably damaged.

Note

Do not blow into the sensor ball and do not actively warm it in your hand, e.g. by encompassing it, because temperature, changing humidity as well as air currents can influence and falsify the measurement result. Moreover, if the humidity level has been rapidly increased all of a sudden, interruptions of the sensor output can occur ("rEg", see chapter Errors and faults).

Note

Note that moving from a cold area to a warm area can lead to condensation forming on the device's circuit board. This physical and unavoidable effect can falsify the measurement. In this case, the display shows either no measured values or they are incorrect. Wait a few minutes until the device has become adjusted to the changed conditions before carrying out a measurement.

1. Briefly press the Power button (9).
 - ⇒ The display will be activated and the device will be in a warm-up phase for about three minutes.
 - ⇒ At the end of that phase the device is ready for operation and can be used for measurements.
 - ⇒ On the measurement value display the device indicates the ozone concentration (16) as well as the relative humidity and ambient temperature (19).



Info

If no ozone concentration is detected in the current measuring range, the measuring device indicates "0.00" on the measurement value display (16).

Cross sensitivities

Due to the construction of the electro chemical sensor, the device also reacts to other gases than ozone. Besides, a high humidity level (e.g. by blowing into the measuring probe) can falsify the result. For this reason, always make sure that no other gases influence the measurement and that the measuring probe is not exposed to sources of high humidity when you measure the ozone concentration.

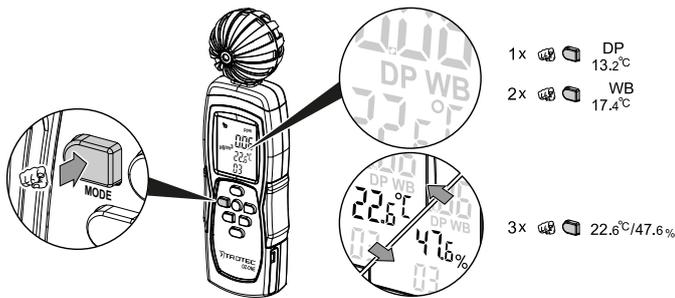
Displaying DP and WB values

The ozone concentration is always displayed by the measurement value display for ozone concentration (16) of the device.

Further measured values that can be indicated are the dew point temperature DP and the wet-bulb temperature WB.

Please proceed as follows to have these values displayed by the device:

1. Repeatedly press the *MODE* button (8) until the desired measured value is displayed.



Setting the HOLD function

1. Press the *HOLD* button (10).
 ⇒ The current values for the ozone concentration, relative humidity level and ambient temperature will be held.
2. Press the *HOLD* button (10) again.
 ⇒ The display again indicates the current measured values.

Setting the MAX / MIN function

You can view the highest or lowest value for the ozone concentration from the current measuring interval.

To do so, please proceed as follows:

1. Briefly press the *MAX/MIN* button (2).
 ⇒ The MAX indication appears on the display (11) in the measuring mode indication (14).
 ⇒ The display now indicates the highest ozone concentration measured since the device was switched on in the selected measuring mode.
2. Press the *MAX/MIN* button (2) again.
 ⇒ The MIN indication appears on the display (11) in the measuring mode indication (14).
 ⇒ The display now indicates the lowest ozone concentration measured since the device was switched on in the selected measuring mode.

3. Press the *MAX/MIN* button (2) three times in total to return to the normal measuring mode.
 ⇒ The display (11) again indicates the current measured value for the ozone concentration.

Resetting the MAX/MIN values

The MAX/MIN values of the current measuring interval can be reset. To do so, please proceed as follows:

1. When MAX or MIN indication appears on the display, press and hold the *HOLD* button (10) for approx. 3 seconds.
 ⇒ "CLR" will be displayed. The MAX/MIN values of the current measuring interval will be reset and the device automatically returns to the normal measuring mode.

Displaying the time-weighted average of the ozone concentration

The time-weighted average TWA indicates the average value of the ozone concentration measured over a period of eight hours. If the device was in operation for less than eight hours, the average value will be calculated based on the time span since the last switch-on.

Please proceed as follows to have the time-weighted average value TWA displayed by the device:

1. Repeatedly press the *MAX/MIN* button (2) until TWA is indicated in the measuring mode indication (14) of the display (11).
 ⇒ The device indicates the time-weighted average TWA for the measured ozone concentration.

Displaying the short-term exposure limit for the ozone concentration

The short-term exposure limit STEL indicates the average value of the ozone concentration measured over a period of 15 minutes. If the device was in operation for less than 15 minutes, the short-term exposure limit STEL will be calculated based on the time span since the last switch-on.

Please proceed as follows to have the short-term exposure limit STEL displayed by the device:

1. Repeatedly press the *MAX/MIN* button (2) until STEL is indicated in the measuring mode indication (14) of the display (11).
 ⇒ The device indicates the short-term exposure limit STEL for the measured ozone concentration.

Changing the unit for the ozone concentration ppm / µg/m³

The device can display the ozone concentration in either ppm or µg/m³. To change the units at the device, please proceed as follows:

1. Press and hold the *UNIT* button (3) for approx. 3 seconds to change the unit.
 ⇒ The currently selected unit ppm or µg/m³ will be indicated in the unit indication for the ozone concentration (15) of the display (11).

Changing the unit °C / °F

The default setting for the temperature unit is °C.

Please proceed as follows to change the temperature unit at the device:

1. Press the *UNIT* button (3) to change the unit.
⇒ The currently selected unit °C or °F will be indicated in the unit indication for the ambient temperature / relative humidity (17) of the display (11).

Switching on the background illumination

1. Briefly press the Lamp button (4).
⇒ The background illumination is activated.
2. Briefly press the Lamp button (4) again to deactivate the background illumination.

Configuring the alarm for the ozone limit value

The ozone limit alarm has been preconfigured in the factory for a value of 0.06 ppm. If a measurement exceeds this value and the alarm function is activated, an acoustic signal will be emitted by the device.

The device allows you to manually configure the ozone limit value in a range between 0.00 ppm and 1.00 ppm.

Please proceed as follows to manually configure the ozone limit value at the device:

1. Press and hold the *SET* button (7) for approx. 3 seconds.
⇒ "SET" will appear on the display (11) and the measurement value display for the ozone concentration (16) flashes.
2. Now you can adjust the value as desired by use of the *HOLD* button (10) and the Lamp button (4).
3. Press the *HOLD* button (10) to increase the value.
4. Press the Lamp button (4) to reduce the value.
5. Use the buttons *MAX/MIN* (2) and *MODE* (8) to switch between the different positions in the measurement value display for the ozone concentration (16).
6. Press the *MAX/MIN* button (2) to move one position to the right in the measurement value display for the ozone concentration (16).
7. Press the *MODE* button (8) to move one position to the left in the measurement value display for the ozone concentration (16).
8. Press and hold the *SET* button (7) to save the changes.
⇒ "SAVE" appears on the display (11) and the device switches to the air pressure setting screen.

Adjusting the air pressure value

The air pressure has a significant impact on the measures ozone level. In order to achieve better measurement results, you can manually adjust the air pressure value at the device. You can adjust the air pressure in a range from 300 hPa to 1100 hPa.

Please proceed as follows to adjust the air pressure value at the device:

1. Press and hold the *SET* button (7) for approx. 3 seconds.
⇒ "SET" will appear on the display (11) and the measurement value display for the ozone concentration (16) flashes.
2. Press and hold the *SET* button (7).
⇒ "SAVE" appears on the display (11) and the device switches to the air pressure setting screen.
3. Press the *HOLD* button (10) to increase the air pressure value.
4. Press the Lamp button (4) to reduce the air pressure value.
5. Use the buttons *MAX/MIN* (2) and *MODE* (8) to switch between the different positions in the display for the reference air pressure.
6. Press the *MAX/MIN* button (2) to move one position to the right in the display for the reference air pressure.
7. Press the *MODE* button (8) to move one position to the left in the display for the reference air pressure.
8. Press and hold the *SET* button (7) to save the changes.
⇒ The selected air pressure value will be saved and the device automatically returns to the normal measuring mode.

Setting the temperature/ humidity value deviation

The device comes with a maintenance-free precision sensor for air temperature and humidity. When in long-term use or in use for special precision measurements, the sensors for temperature and humidity can be adjusted if the surrounding conditions are known. To do so, please proceed as follows:

- ✓ The device is switched off.
1. With the fingers of your left hand, press and hold the *Mode* (8) button and the Lamp button (4).
 2. With the fingers of your right hand, press and hold the *MAX/MIN* (2) button and the Power button (9).
⇒ "SET" will appear on the display (11) and the measurement value display (19) indicates "0.0 °C".
 3. Let go of all buttons again.
 4. Press the *UNIT* button (3) to switch between °C and °F.
 5. Set the temperature value deviation with regard to the temperature displayed before. Press the *HOLD* button (10) to increase the value. Press the Lamp button (4) to reduce the value. You can set a temperature value deviation of up to ±9.9 °C/ F.
 6. Press the *SET* button (7) to exit this mode and to change to the adjustment options for the value of the relative humidity.

7. Press the *HOLD* button (10) to increase the value deviation. Press the *Lamp* button (4) to reduce the value. You can set a value deviation of up to ± 9.9 % RH.
8. Press the *SET* button (7) to save the values.
 - ⇒ "SAVE" will appear on the display (11) for approx. 2 seconds.
9. Press and hold the *Power* button (9) for approx. 3 seconds.
 - ⇒ The device will be switched off. The values are adjusted.

Ozone zero adjustment

To calibrate the device, an ozone zero adjustment can be made in an ozone-free environment. To do so, please proceed as follows:

1. Simultaneously press and hold the *UNIT* (3) button and the *SET* (7) button.
 - ⇒ "CAL" will appear on the display (11).
2. Simultaneously press the *UNIT* (3) button and *SET* (7) button again.
 - ⇒ The calibration is started. The device counts backwards from 120.
 - ⇒ Upon successful calibration, "End" appears on the display (11).



Info

Ensure to carry out the calibration in surroundings that are free of other gases the sensor reacts to, e.g. nitrogen dioxide. For more detailed information about cross-sensitivities please refer to the chapter *Errors and faults*.

De-/Activating the alarm function for the ozone limit value

Once the ozone limit value has been configured, the alarm function can be activated or deactivated by hand.

Please proceed as follows to configure the alarm function at the device:

1. Press the *Power* button (9) for approx. 1 s.
 - ⇒ The activated alarm indication (20) will be displayed and the alarm function is activated.
2. Press the *Power* button (9) again for approx. 1 s to deactivate the alarm function.
 - ⇒ The activated alarm indication (20) will no longer be displayed and the alarm function is deactivated.

Automatic switch-off

In default setting, the automatic switch-off function is activated. The device switches off when not in use for 15 minutes.

To deactivate automatic switch-off at the device, please proceed as follows:

1. Switch the device off by pressing the *Power* button (9) and holding it for approx. 3 s.
2. Simultaneously press the *Power* button (9) and the *HOLD* button (10) until the message "n" is displayed.
 - ⇒ Automatic switch-off is permanently deactivated.



Info

If you switch off the device manually, the automatic switch-off setting is reset, i.e. automatic switch-off is activated again when the device is switched back on.

Switch-off

If automatic switch-off is activated, the device switches off after 15 minutes of non-use.

1. Press and hold the *Power* button (9) for approx. 3 seconds.
 - ⇒ The device will be switched off.

Maintenance and repair

Battery change

A battery change is required when a battery indication lights up on the display (11), when erratic values are indicated on the display or when the device can no longer be switched on. See chapter Operation.

Cleaning

Clean the device with a soft, damp and lint-free cloth. Make sure that no moisture enters the housing. Do not use any sprays, solvents, alcohol-based cleaning agents or abrasive cleaners, but only clean water to moisten the cloth.

Repair

Do not modify the device or install any spare parts. For repairs or device testing, contact the manufacturer.

Errors and faults

The device has been checked for proper functioning several times during production. If malfunctions occur nonetheless, check the device according to the following list.

If the measurement value display is flickering or only partly visible, the batteries have to be changed. See chapter Operation, section "Inserting the batteries".

The following error messages can be displayed in the measurement value display for the ozone concentration (16):

Error message	Cause	Remedy
rEg	High measured values - sensor regenerates	Wait until the regeneration phase is over. This process may take up to one minute. Once the device returns to the normal measuring mode, you can proceed with the next measurement. If this is not the case, please contact the customer service.
Er1	Defective sensor	Please contact the customer service.
oL2	Message appears in measurement value display Ozone concentration (16): Measured ozone value is outside the device's measuring range.	At first, wait for the measured value to drop and check whether the measurement value display returns back to normal.
	Message appears in measurement value display Humidity (19): Measured humidity value is outside the device's measuring range, temperature is displayed correctly and alternating with the error message.	If this is not the case, please contact the customer service.
	Message appears in measurement value display Temperature (19): Measured temperature value is outside the device's measuring range, humidity is displayed correctly and alternating with the error message.	

Design-related, the electrochemical sensor deployed in the device offers various advantages, e.g.:

- short warm-up phase
- linear response
- good repeatability and accuracy
- fast response time (1–2 s)
- low energy intake
- only limited cross-sensitivity to other VOCs

Due to its functional principle, though, one ought to observe the following:

- A high humidity level as well as temperature changes can influence the measurement and may lead to increased measured values.
- Based on the ongoing oxidation the sensor lifetime is limited. We therefore recommend to put the device back into the resealable plastic zip bag it has been delivered in to prevent it from being continuously exposed to the oxygen in the air during storage.

There is a risk of cross-sensitivity to other gases and to combinations of other gases. These include:

- Nitrogen dioxide
- Chlorine
- Hydrogen sulphide
- Sulphur dioxide
- Nitric oxide
- Carbon monoxide
- Carbon dioxide
- ammonia
- Hydrogen
- Water vapour



Info

The cross-sensitivities are not restricted to this list. In addition, the sensitivity of the sensor changes with the conditions of the tested surroundings (air pressure, humidity level, temperature etc.)

Disposal



The icon with the crossed-out waste bin on waste electrical or electronic equipment stipulates that this equipment must not be disposed of with the household waste at the end of its life. You will find collection points for free return of waste electrical and electronic equipment in your vicinity. The addresses can be obtained from your municipality or local administration. For further return options provided by us please refer to our website www.trotec24.com.

The separate collection of waste electrical and electronic equipment aims to enable the re-use, recycling and other forms of recovery of waste equipment as well as to prevent negative effects for the environment and human health caused by the disposal of hazardous substances potentially contained in the equipment.



In the European Union, batteries and accumulators must not be treated as domestic waste, but must be disposed of professionally in accordance with Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators. Please dispose of batteries and accumulators according to the relevant legal requirements.

Warranty

As a result of its construction and functional principle the integrated O₃ sensor is a wear product.

For the O₃ sensor itself we provide a pan-European one-year warranty from the date of purchase. The guarantee is issued by: Trotec GmbH & Co. KG, Grebbener Straße 7, D-52525 Heinsberg.

Statutory warranty rights (liability for defects) shall not be limited by this warranty in any way. The warranty covers any repair and shipment charges in case of defects or damages at the O₃ sensor within the warranty period and not resulting from improper handling. In the case of a warranty claim, please contact Trotec GmbH & Co. KG at the address indicated above.

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