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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 of explosive substances
This symbol indicates dangers to the life and health of persons due to potentially explosive substances.

⚠️ Warning of laser radiation
This symbol indicates dangers to the health of persons due to laser radiation.

⚠️ 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.

⚠️ Notice
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.
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!

- Do not use the device in potentially explosive rooms.
- Do not use the device in aggressive atmosphere.
- Do not immerse the device in water. Do not allow liquids to penetrate into the device.
- The device may only be used in dry surroundings and must not be used in the rain or at a relative humidity exceeding the operating conditions.
- 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 with a tool.
- Only use the device if sufficient safety precautions were taken at the surveyed location (e.g. when performing measurements along public roads, on building sites etc.). Otherwise do not use the device.
- Observe the storage and operating conditions (see chapter Technical data).

Intended use

The device is intended for measuring the size and number as well as the mass concentration of particles in the air.

Improper use

The device may not be used for measurements in liquids.

The device may not be used in potentially explosive atmospheres, when wet or very humid.

Any unauthorised changes, modifications or alterations 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 of explosive substances**
  
  Do not expose the battery to temperatures above 45 °C! Do not let the battery come into contact with water or fire! Avoid direct sunlight and moisture. There is a risk of explosion!

- **Warning of laser radiation**
  
  **Laser class 1**
  
  The laser is encapsulated.
  
  Do not open the device to prevent direct contact with the laser and the emitted radiation!

- **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.

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

- **Notice**
  
  Do not use abrasive cleaners or solvents to clean the device.
Information about the device

Device description

The particle counter is designed to measure the size and number as well as the mass concentration of particles in the air. The detected data can be used for analysing cleanrooms or prove environmental burdens from particulates.

To detect the data, the particle counter sucks in air for a selectable duration and determines the size and number or mass concentration of particles contained in it.

Particles sized 2.5 μm and 10.0 μm are treated equally during this process.

The detected values for all active particle sizes are displayed on a colour display simultaneously. Additionally, the air contamination is indicated on a colour scale. As soon as the particle burden is no longer in the green area of this scale, a beep is emitted (see table Alarm limit values for particle burden).

The device is equipped with an integrated measuring cell with laser (class 3R laser, 780 nm, 1.5-3 mW). Owing to the tamper-proof enclosure it is classified as laser class 1 (DIN EN 60825-1) according to the Technical Regulations of the Occupational Health and Safety Ordinance on Artificial Optical Radiation (TROS) devised by the German Federal Institute for Occupational Health and Safety. Maintenance and repair work may only be carried out by trained expert staff observing the legal regulations.

<table>
<thead>
<tr>
<th>Channel</th>
<th>Green</th>
<th>Yellow</th>
<th>Orange</th>
<th>Red</th>
<th>Purple</th>
<th>Brown</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5 μm</td>
<td>0 to 545</td>
<td>546 to 1235</td>
<td>1236 to 2470</td>
<td>2471 to 3300</td>
<td>3301 to 4950</td>
<td>&gt; 4950</td>
</tr>
<tr>
<td>10 μm</td>
<td>0 to 68</td>
<td>69 to 170</td>
<td>171 to 340</td>
<td>341 to 454</td>
<td>455 to 680</td>
<td>&gt; 680</td>
</tr>
</tbody>
</table>

1) The alarm limit values specified here refer to an average PM2.5 particle concentration over a period of 24 hours and are derived from the global air quality guidelines of the WHO (World Health Organization). They are in no way legally binding and have a merely orientating function.

Alarm limit values for particle burden

<table>
<thead>
<tr>
<th>Air quality grade</th>
<th>Value in μg/m³</th>
<th>Indicator scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>0 to 10 μg/m³</td>
<td>Green</td>
</tr>
<tr>
<td>Good</td>
<td>10 to 35 μg/m³</td>
<td>Yellow</td>
</tr>
<tr>
<td>Low contamination</td>
<td>35 to 75 μg/m³</td>
<td>Orange</td>
</tr>
<tr>
<td>Moderate contamination</td>
<td>75 to 150 μg/m³</td>
<td>Red</td>
</tr>
<tr>
<td>High contamination</td>
<td>150 to 250 μg/m³</td>
<td>Purple</td>
</tr>
<tr>
<td>Severe contamination</td>
<td>&gt; 250 μg/m³</td>
<td>Brown</td>
</tr>
</tbody>
</table>
Device depiction

1. Measuring funnel
2. USB port
3. Tripod thread
4. ESC / button
5. MEM button
6. START / ENTER button
7. Power button
8. SET / button
9. Colour display
10. Protective cap

Display

No. | Designation
---|---
11 | Battery indicator
12 | Start delay
13 | Measurement duration
14 | Measuring interval
15 | Unit (number or µg/m³)
16 | Indicator scale for particle burden
17 | Relative humidity
18 | Ambient temperature
19 | Size and number or mass concentration of particles
20 | Measurement status
21 | Date and time

AT 33.4 °C RH 45.2 %

2019-09-19 10:20
counting wait size
2.5 um 0
1.0 um 0
## Technical data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model</strong></td>
<td>BQ20</td>
</tr>
<tr>
<td><strong>Dimensions</strong> (length x width x height)</td>
<td>188 mm x 52 mm x 35 mm</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>175 g</td>
</tr>
<tr>
<td><strong>Interfaces</strong></td>
<td>USB port for charger</td>
</tr>
<tr>
<td><strong>Tripod thread</strong></td>
<td>1/4 inch – 20 UNC</td>
</tr>
<tr>
<td><strong>Operating conditions</strong></td>
<td>0 °C to +40 °C with 20 to 80 % RH</td>
</tr>
<tr>
<td><strong>Storage conditions</strong></td>
<td>-10 °C to +50 °C with 10 to 90 % RH</td>
</tr>
<tr>
<td><strong>Display</strong></td>
<td>2 inch colour LCD with background illumination</td>
</tr>
<tr>
<td><strong>Functions</strong></td>
<td>Alarm function, °C/°F switching</td>
</tr>
<tr>
<td><strong>Data storage</strong></td>
<td>5,000 data records on internal memory</td>
</tr>
</tbody>
</table>

### Energy

| Battery | Li-ion |
| Nominal voltage | 3.7 V |
| Capacity | 1500 mAh |
| Operating time | approx. 5 hours of continuous operation |
| Charging time | approx. 3.5 hours with an alternating current adapter |
| Automatic switch-off | 3 min, 15 min or 30 min |

### Temperature measurement

| Temperature range | 0 °C to 50 °C (32 °F to 122 °F) |
| Temperature accuracy | ±1 °C (2 °F) |

### Humidity measurement

| Humidity level measuring range | 0 % RH to 100 % RH |
| Humidity level accuracy | ±3.5 % RH at 20 % to 80 % RH |
|                           | ±5 % RH at 0 % to 20 % RH and 80 % to 100 % RH |

### Particle counter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channels (detectable particle sizes)</td>
<td>2.5 μm, 10.0 μm</td>
</tr>
<tr>
<td>Flow rate</td>
<td>0.9 l/min controlled by internal pump</td>
</tr>
<tr>
<td>Counter mode</td>
<td>Concentration</td>
</tr>
<tr>
<td>Counting efficiency</td>
<td>100 % for particles &gt; 0.45 μm (according to ISO 21501)</td>
</tr>
<tr>
<td>Zero check</td>
<td>1 check / 5 minutes (according to JIS B9921)</td>
</tr>
<tr>
<td>Start delay</td>
<td>5 seconds</td>
</tr>
<tr>
<td>Sample inlet</td>
<td>Isokinetic probe</td>
</tr>
<tr>
<td>Calibration</td>
<td>Using monodisperse latex particles (PSL particles; compliant with NIST)</td>
</tr>
<tr>
<td>Light source of the measuring cell</td>
<td>Laser class 1 (class 3R laser enclosed in a way to prevent tampering, 780 nm, 1.5-3 mW, classified according to DIN EN 60825-1 and the Technical Regulations of the Occupational Health and Safety Ordinance on Artificial Optical Radiation (TROS))</td>
</tr>
</tbody>
</table>

### Mass concentration

| Channels | PM 2.5 / PM 10 |
| Measuring range | 0 to 2000 μg/m³ |
| Resolution | 1 μg/m³ |

### Scope of delivery

- 1 x Particle counter BQ20
- 1 x USB connecting cable
- 1 x Charger
- 1 x Stand with screw
- 1 x Quick guide
Transport and storage

Notice
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 a suitable bag to protect it from external influences.

The supplied Li-ion batteries are subjects to the requirements of dangerous goods legislation.

Observe the following when transporting or shipping Li-ion batteries:
- The user may transport the batteries by road without any additional requirements.
- If transport is carried out by third parties (e.g. air transport or forwarding company), special requirements as to packaging and labelling must be observed. This includes consulting a dangerous goods specialist when preparing the package.
  - Only ship batteries if their housing is undamaged.
  - Mask open terminals with tape and pack the battery in a way that it cannot move inside the packaging.
  - Please also observe any other national regulations.

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
- The storage temperature is the same as the range given in the Technical data chapter
- Remove the batteries from the device

Operation

Charging the battery
The battery is partially charged upon delivery to avoid damage to the battery caused by a deep discharge.

Warning of electrical voltage
Before each use of the charger or power cable, check for damages. If you notice damages, stop using the charger or power cable!

Notice
The battery can be damaged in case of improper charging.

Remove the charger’s mains plug before inserting or removing the battery.

Never charge the battery at ambient temperatures below 10 °C or above 40 °C.

The battery should be charged prior to initial start-up and when the battery is low (battery indicator (11) flashes). To do so, please proceed as follows:
1. Plug the charger into a properly fused mains socket.
2. Connect the charging cable to the device’s USB connection.

⇒ A charging indicator appears on the display.
Mounting the stand (optional)
If required, you can fasten the stand to the tripod thread using the screw included in the scope of delivery.

Switch-on
1. Press and hold the Power button until the colour display turns on.
   - An acoustic signal is emitted.
   - The device is ready for operation as soon as the start screen is shown.

Carrying out a measurement
Info
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. Remove the protective cap (10) from the measuring funnel (1).

2. Point the device at the area to be measured.

3. Press the START button (6).
   - The device counts down for approx. 5 seconds before starting the measurement.
   - The measurement will run for the measuring interval set.
   - The measurement results are displayed for each measurement channel.
System settings

1. Press the SET button (8) for approx. 2 s to open the system settings.
   ⇒ The following menu is displayed:

   2019-09-19 10:20
   System Set
   • Date/Time
   ○ Alarm Set
   ○ Sample Time
   ○ Unit (°C/°F)
   ○ Memory View
   ○ Mass/Particle
   ○ Auto Power off

2. Press the SET / ▲ (8) or ESC / ▼ button (4) to select a submenu.
3. Press the START button (6) to confirm the selection.
4. Press the SET (8) or ESC button (4) to make the desired setting in the submenu.
5. Afterwards press the ESC button (4) for approx. 2 s to leave the submenu or the system settings menu.

The following submenus offering further setting options can be accessed from the main menu:

<table>
<thead>
<tr>
<th>Submenu</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date/Time</td>
<td>Setting the date and time</td>
</tr>
<tr>
<td>Alarm Set</td>
<td>Enabling/disabling the alarm</td>
</tr>
<tr>
<td>Sample Time</td>
<td>Setting the measurement duration</td>
</tr>
<tr>
<td>Unit (°C/°F)</td>
<td>Changing the temperature unit</td>
</tr>
<tr>
<td>Memory View</td>
<td>Displaying the memory use</td>
</tr>
<tr>
<td>Mass/Particle</td>
<td>Selecting the measuring mode</td>
</tr>
<tr>
<td></td>
<td>Particle (Particle) or mass concentration (Mass)</td>
</tr>
<tr>
<td>Auto Power Off</td>
<td>Setting the automatic switch-off</td>
</tr>
</tbody>
</table>

Setting the date and time

You can set the date and time and select whether to display the time in 24 h or 12 h format.

2019-09-19 10:20
Date Set
Date 2016-09-19
24 Hour 16:24

Please proceed as follows to set the date and time:

1. Press the SET (8) or ESC button (4) to set the year.
2. Press the START button (6) to confirm the selection.
3. Press the SET (8) or ESC button (4) to set the month.
4. Press the START button (6) to confirm the selection.
5. Press the SET (8) or ESC button (4) to set the day.
6. Press the START button (6) to confirm the selection.
7. Press the SET (8) or ESC button (4) to select either 24 h or A.M./P.M. format.
8. Press the START button (6) to confirm the selection.
9. Press the SET (8) or ESC button (4) to set the hours.
10. Press the START button (6) to confirm the selection.
11. Press the SET (8) or ESC button (4) to set the minutes.
12. Press the START button (6) to confirm the selection.
13. Press the ESC button (4) for approx. 2 s to return to the system settings menu.
   ⇒ The date and time settings are saved.
Enabling / disabling the alarm

Please proceed as follows to enable or disable the alarm:
1. Press the SET (8) or ESC button (4) to select the ON (alarm enabled) or OFF (alarm disabled) setting.
2. Press the ESC button (4) for approx. 2 s to return to the system settings menu.

Setting the measurement duration

Please proceed as follows to set the measurement duration:
1. Press the SET (8) or ESC button (4) to select the desired measurement duration.
2. Press the ESC button (4) for approx. 2 s to return to the system settings menu.

Changing the temperature unit

You can select whether the temperature is to be displayed in °C or °F.

Please proceed as follows to change the temperature unit:
1. Press the SET (8) or ESC button (4) to switch between °C and °F.
2. Press the ESC button (4) for approx. 2 s to return to the system settings menu.
Displaying the memory use
Up to 5,000 data records can be stored on the device’s internal memory.

Please proceed as follows to display the memory use:
1. Press the SET (8) or ESC button (4) to select the desired measurement. Alternatively, you can use the MEM button (5) in the measurement screen for quick access.
2. Press the START button (6) to confirm the selection.
   ⇒ The measurement values are shown on the display (9).
   ⇒ Alternatively, you can also select the different measurements from this screen using the SET (8) and ESC (4) buttons. The upper left-hand corner of the display shows the corresponding number of the respective measurement.
3. Press the ESC button (4) for approx. 2 s to return to the overview of measurements.
4. Press the ESC button (4) for approx. 2 s to return to the system settings menu.

Info
You can delete the memory by first pressing the ESC button (4) in the measurement screen and then simultaneously pressing the MEM button (5) until a longer acoustic signal is emitted.

Selecting the measuring mode
You can select whether particles (Particle) are counted or the mass concentration (Mass) of the particles is displayed.

Please proceed as follows to select the measuring mode:
1. Press the SET (8) or ESC button (4) to select either Particle or Mass concentration measuring mode.
2. Press the ESC button (4) for approx. 2 s to return to the system settings menu.
Setting the automatic switch-off
You can select whether the device switches off automatically after 3, 10 or 30 min. You can also Disable automatic switch-off.

Please proceed as follows to set the automatic switch-off:
1. Press the SET (8) or ESC button (4) to select the desired switch-off time.
2. Press the ESC button (4) for approx. 2 s to return to the system settings menu.

Switch-off
1. Press and hold the Power button  until the colour display turns off.
   ⇒ An acoustic signal is emitted.
   ⇒ The device has switched itself off.
2. Put the protective cap (10) on the measuring funnel (1).

![Image of the device showing the automatic switch-off settings]
Maintenance and repair

Warning of laser radiation
Laser class 1
The laser is encapsulated.
Do not open the device to prevent direct contact with the laser and the emitted radiation!

Cleaning
Clean the device with a soft, damp and lint-free cloth. Ensure 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.

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.

You are responsible for deleting any personal data stored on the waste equipment to be disposed of.

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.