



testo 316-2-EX gas leak detector
0560 3164

Instruction manual



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1 About this document

- The instruction manual is an integral part of the instrument.
- Please keep this documentation available for future reference.
- Always use the complete original instruction manual.
- Please read this instruction manual through carefully and familiarize yourself with the product before putting it to use.
- Hand this instruction manual on to any subsequent users of the product.
- Pay particular attention to the safety instructions and warning advice in order to prevent injury and damage to the product.

2 Safety and disposal

2.1 Security

General safety instructions

- Only operate the product properly, for its intended purpose, and within the parameters specified in the technical data.
- Do not apply any force.
- Do not operate the instrument if there are signs of damage on the housing, mains unit or connected cables.
- Dangers may also arise from objects to be measured or the measuring environment. Always comply with the locally valid safety regulations when carrying out measurements.
- Do not store the product together with solvents.
- Do not use any desiccants.
- Only perform maintenance and repair work on this instrument that is described in this documentation. Follow the prescribed steps exactly when doing the work.
- Use only original spare parts from Testo.
- Only use the original mains unit from Testo.
- The substantial safety and health requirements are fulfilled in accordance with the following norms:
 - EN IEC 60079-0:2018
 - EN 60079-11:2012
- The gas leak detector must not be exposed to the processes that generate significant electrostatic charges.

Batteries

- Improper use of batteries may cause the batteries to be destroyed, or lead to injury due to current surges, fire or escaping chemicals.
- Do not expose the batteries to heavy impacts, water, fire or temperatures in excess of 60 °C.
- In the event of contact with battery acid: rinse affected areas thoroughly with water, and if necessary consult a doctor.
- Only charge the battery using the original Testo mains unit supplied.
- Immediately stop the charging process if this is not completed in the given time.

Warnings

Always pay attention to any information denoted by the following warnings. Implement the precautionary measures specified!

 **DANGER**

Risk of death!

 **WARNING**

Indicates possible serious injury.

 **CAUTION**

Indicates possible minor injury.


CAUTION

Indicates possible damage to equipment.

2.2 Disposal

- Dispose of faulty rechargeable batteries and spent batteries in accordance with the valid legal specifications.
- At the end of its useful life, deliver the product to the separate collection point for electric and electronic devices (observe local regulations) or return the product to Testo for disposal.



-  WEEE Reg. No. DE 75334352

3 Product-specific information

- Do not carry out measurements on live components.
- Do not operate the instrument in environments above 80 %RH (condensing).
- Observe the permissible storage and transport temperatures and the permissible operating temperature (e.g. protect the measuring instrument from direct sunlight)!
- Always carry out a function test before searching for gas leaks.
- If the instrument is misused or subjected to force, all warranty claims will be voided!
- Do not allow the sensor to come into contact with moisture or acids, as it will react cross-sensitively.

4 Intended use

The testo 316-2-EX is a gas leak detector for the short-term detection of leaks in gas and refrigerant systems in potentially explosive atmospheres of the class **ATEX II 2 G Ex ib IIC T1Gb** according to Directive 2014/34/EU (ATEX).

The following substances can be detected:

- Methane CH₄
- Propane C₃H₈
- Butane C₄H₁₀
- Hydrogen H₂
- Refrigerants (R1234yf, R134A, R404A, R407C, R410A, R1234ze, R290, R417A, R513A, R32, R449A, R22)

The instrument is not suitable for precise measurement of the gas concentration.

ATTENTION

Explosive limits of flammable substances

A flammable substance in the air has a lower explosive limit (LEL) and an upper explosive limit (UEL).

The air/gas mixture is flammable anywhere between these two limits, potentially leading to an explosion (critical range).

Below the LEL, the mixture is too lean for an explosion, and above the UEL it is too rich (non-critical range).

The explosive limits depend on the substance:

- **Methane CH₄: LEL 4.4 vol.% / UEL 16.5 vol.%**
- **Propane C₃H₈: LEL 1.7 vol.% / UEL 10.9 vol.%**
- **Butane C₄H₁₀: LEL 1.4 vol.% / UEL 9.4 vol.%**
- **Hydrogen H₂: LEL 4.0 vol.% / UEL 77.0 vol.%**
- **Refrigerant: There are flammable and non-flammable refrigerants. R290, for example, is chemically identical to propane and therefore equally flammable.**

ATTENTION

Restrictions on the field of use

- **Do not use the instrument as a monitoring instrument for personal safety! The instrument is not protective equipment!**
- **Do not use the instrument as a gas analyzer! The sensor detects almost all combustible gases alike.**

4.1 Special conditions for the usage

- The gas leak detector must only be used in potentially explosive atmospheres of the IIC T1 class.
- The gas leak detector must only be used in the ambient temperature range from -5 °C to +50 °C.
- The gas leak detector must not be exposed to the processes that generate significant electrostatic charges.
- The gas leak detector must only be recharged using the corresponding charger outside of a potentially explosive atmosphere in the ambient temperature range from 0 °C...+45 °C.
- The charging voltage must not be higher than $U_m = 8.5 \text{ V}$. This voltage can be provided using one of the following measures in accordance with IEC 60079-14:
 - making sure that U_m in a SELV/PELV system can not be higher than 50 V AC or 120 V DC;
 - using a safety transformer that fulfils all requirements according to IEC 61558-2-6 or an equivalent technical standard;

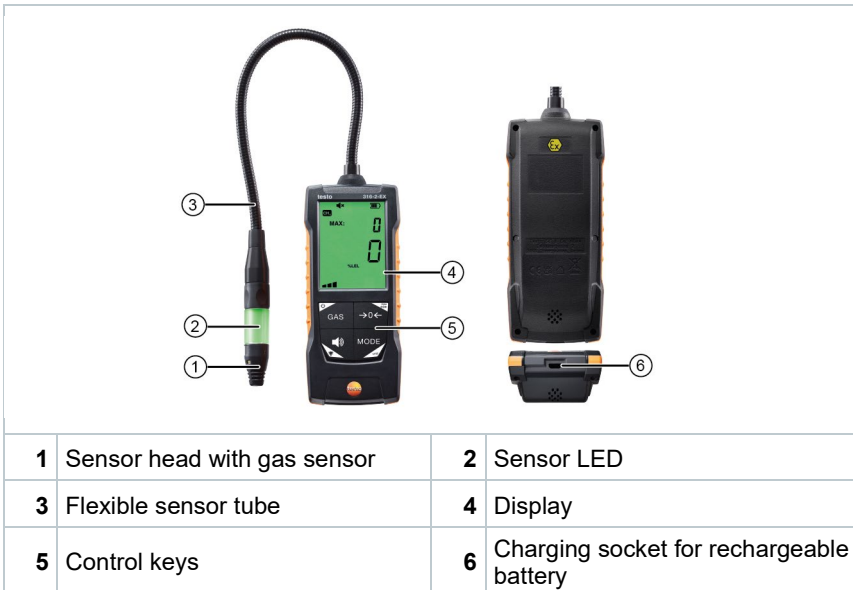
- connecting it directly to an instrument that fulfils all requirements according to IEC 60950 and its successors, IEC 61010-1 or an equivalent technical standard;
- using a direct power supply source, e.g cells or batteries.
- The expected short-circuit current during the charging process must not exceed 50 A.



Use only the supplied mains unit to fulfil all charging requirements.

5 Product description

5.1 Instrument overview



6 First steps

6.1 Getting to know the product

6.1.1 Switching the instrument on and off

Switching on

Only switch on the instrument in fresh air, since automatic zeroing is carried out when the instrument is switched on. The ambient temperature and ambient humidity during zeroing should correspond to the ambient conditions at the measuring location. If necessary, zero again manually at the measuring location (switch off and on again).



If the unit is not used for a prolonged period of time, the sensor will become contaminated. Particularly if the instrument has not been in operation for a prolonged period of time (> 2 weeks), it should be left switched on for a while before being used. The longer it has not been in operation, the longer this additional warming-up phase should be. Please note that the instrument switches itself off by default after 10 min of inactivity.

- 1 Press and hold down (1 sec) the **On/Off** key.

Warm-up phase (HEAT)

- ▶ The instrument starts up. With regular use, the warm-up period takes approx. 30 sec and is symbolized by the text "HEAT" and a countdown.
As long as the sensor LED is flashing orange, the instrument is not ready for use.
- ▶ Following the warm-up period, the measurement view is displayed.

Self-cleaning (CLN)

- ▶ If the sensor is dirty, the warm-up phase is followed by the sensor cleaning phase. This usually happens when the instrument has not been used for several days. The self-cleaning is symbolized by the text "CLN" and a countdown.

Switching off

CAUTION

Caution! Risk of burns due to hot sensor head after prolonged operation.

- **Before touching the sensor head or packing the instrument: switch instrument off and let the sensor head cool down.**
-

- 1 Press and hold down (1 sec) the **On/Off** key.
- ▶ The instrument is switched off.

Auto OFF

After 10 minutes of inactivity (no user input, no gas concentration above the warning threshold), the instrument switches itself off. The switch-off is signalled beforehand by an alarm sound, red flashing of the sensor LED and a 10 sec countdown.

You can prevent the instrument from switching off by pressing any key within 10 seconds.

Enabling/disabling the Auto-OFF function:

- 1 Press the **Sound** and **UNIT** keys simultaneously for 1 sec.
- ▶ Enabling/disabling is confirmed by "AOFF ON" or "AOFF OFF".

6.2 Establishing a Bluetooth® connection



The instrument can be connected to the **testo Smart App** via Bluetooth® connection.

- ✓ The gas leak detector is switched on.

6.2.1 Establishing a Bluetooth® connection to the testo Smart App



To establish a connection via Bluetooth®, you need a tablet or smartphone with the Testo Smart App already installed on it.

You can get the App for iOS instruments in the App Store or for Android instruments in the Play Store.

Compatibility:

Requires iOS 13.0 or later/Android 8.0 or later, requires Bluetooth® 4.2.



- 1 Open the **testo Smart App**.
- ▶ The app automatically searches for Bluetooth® devices in the vicinity.
- 2 In the **Bluetooth** menu, check whether the required instrument is connected.

- ▶ If necessary, switch the instrument to be connected off and on again to restart the connection mode.

7 Using the product

The gas leak detector can be used in conjunction with the **testo Smart App**.

7.1 Controls










- ✓ The instrument is switched on.
- ✓ The app is installed on the smartphone and connected to the instrument via Bluetooth®.
- ▶ Settings and controls are primarily carried out on the instrument and are transferred to the app. To a lesser extent, control via app is also possible (selection of gas type).





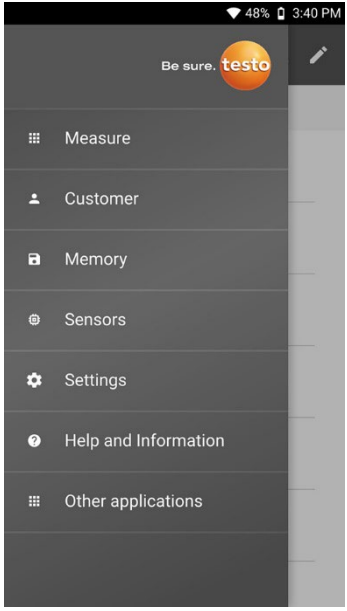






1	Sound / Illumination key
2	On/Off / GAS key
3	Bar display
4	Mode
5	Measurement parameter
6	Display for alarm signal, Bluetooth®, charge level
7	Maximum measured value
8	Current measured value
9	Unit of value

10	->0<- / max ->0<- key
11	MODE / unit key

Additional symbols on the user interface of the app (not numbered)

	One level back
	Exit view
	Share measurement data/report
	Searching
	Favourite
	Deleting
	Further information
	Display report
	Multiple selection

The **Main menu** can be accessed via the  icon at top left. To exit the main menu, select a menu or right-click on the guided menus. The last screen displayed is shown.

	Measure	
	Customer	
	Memory	
	Sensors	
	Settings	
	Help and Information	
	Other applications	

7.1.1 Implementing settings

Selecting, opening and setting functions

- 1 Press the relevant key to select the functions.




Secondary assignment (long press)






All keys with a white corner have a secondary assignment, which can be selected by pressing and holding the key (1 sec).

Adjustable functions



Ensure correct settings: all settings are transferred immediately. There is no Cancel function.

Function	Setting options/comments
On/Off (long press) 	Switches the instrument on or off
Measurement parameter 	Cycle through CH ₄ (methane), C ₃ H ₈ (propane), C ₄ H ₁₀ (butane), H ₂ (hydrogen) or refrigerant
Display illumination / sensor LED (long press) 	OFF (display illumination and sensor LED not active) or ON (display illumination and sensor LED active)

Function	Setting options/comments
<p>Alarm sound</p> 	<p>ON (acoustic alarm on) or OFF (acoustic alarm off). The frequency of the alarm sound increases as the concentration increases.</p>
<p>Unit (long press)</p> 	<p>Switch between g/a (refrigerant only), PPM and %LEL</p>
<p>Measuring mode</p> 	<p>MODE 1 for gas detection MODE 2 for locating leaks</p>
<p>Max. zeroing (long press)</p> 	<p>Zero maximum reading</p>
<p>Zeroing</p> 	<p>Zero current reading, up to 250 ppm can be suppressed. Symbolized by an arrow pointing downwards on the display.</p>

7.2 Carrying out a function test

- 1 Apply low-concentration gas to the sensor (max. 10 sec).
- ▶ If the sensor does not respond (no alarm), the instrument is defective and must no longer be used. The instrument must be taken to the service centre for repair.



Due to the selectivity of the sensor, gas equivalents are not suitable for checking the function and especially not for calibrating the sensor.

7.3 Carrying out gas detection

This section deals with the detection of fuel gases. For the detection of refrigerants, please see the following section.

ATTENTION

Destruction of the sensor due to external influences!

- **Do not expose the sensor to high concentrations of H₂S (hydrogen sulphide), SO_x (sulphur dioxides), Cl₂ (chlorine), or HCl (hydrogen chloride).**
- **> Prevent alkaline materials or water from coming into contact with the sensor.**
- **> Do not expose the sensor to moisture or frost.**



Have the instrument serviced annually by the manufacturer.



Testing natural gas lines or hydrogen lines:

Methane (main component of natural gas) or hydrogen are lighter than air, detection should be carried out above the pipe / suspected leak.

Testing propane and butane gas lines: Propane and butane are heavier than air, detection should be carried out below the pipe / suspected leak, starting from the bottom and working upwards.

Selecting the gas to be detected

- 1 Select the gas types via the **GAS** key or the **testo Smart App** using the 3-point menu in the top right corner of the output field
- ▶ After switching on the instrument, the process of cycling through starts with methane (CH₄).

Automatic identification of common gas types

The gas is automatically detected and indicated by a flashing gas icon on the display if a gas concentration currently applied to the sensor has characteristics of a different gas type than is currently selected.

For technical reasons, this is subject to uncertainty and is intended as a support for users, and must therefore always be checked by the user.

Forming gas

When pressure testing with forming gas (95% N₂, 5% H₂), the instrument can detect leaks based on the hydrogen content.

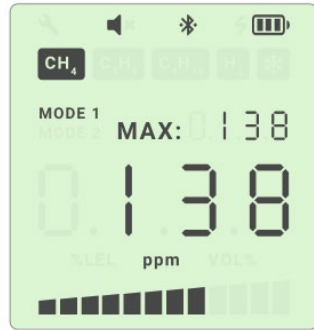
- 1 Use the **GAS** key to set the instrument to H₂.

Selecting the mode

- 1 Press the MODE key to switch between modes.

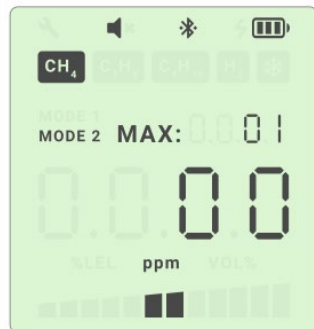
MODE 1 is suitable for measuring the general gas concentration in indoor areas.

- ▶ The gas concentration is indicated by the increasing bar display.



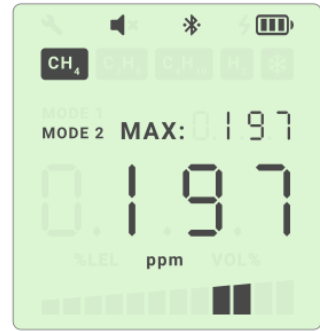
MODE 2 is suitable for locating a leak. In this mode, rising or falling concentration values are output.

- ▶ At the beginning, two bar segments are displayed in the middle. At the same time, the sensor LED flashes in a colour corresponding to the concentration value and an audio signal is emitted at the same frequency.



- ▶ As the concentration increases, a deflection to the right is displayed. The frequency of the flashing/audio signal increases.

As the concentration decreases, a deflection to the left is displayed. The frequency of the flashing/audio signal decreases.



- ▶ If the concentration remains unchanged, the deflection moves back to the centre. The deflection is reset manually using the [-> 0 <--] key

Carrying out the measurement

- 1 Move the sensor head as close as possible and at low speed (approx. < 2 cm per second) over the components that are to be checked for leaks.
The surface of the sensor must not be covered.
- ▶
 - Concentration < 100 ppm: The sensor LED and the display illumination light up green. In addition, the bar display increases.
 - Concentration > 100 and < 999 ppm: The sensor LED and the display illumination light up yellow. In addition, the bar display increases.
 - Concentration > 999 ppm: The unit changes to VOL% and the bar display increases.
 - Concentration > 9999 ppm / > 0.99 VOL%: The sensor LED and the display light up red (alarm threshold).
 - ▶ When the lower explosive limit is reached, ">LEL" is displayed. Higher values are not displayed.



To locate the leak, it is advisable, in the case of these larger leaks, to switch to **MODE 2** in order to receive feedback via audio and flashing signals.

- ▶ If the warning threshold (100 ppm) is exceeded, the sensor LED and display illumination light up yellow. If the acoustic alarm is enabled, an additional warning sound is emitted when the warning threshold is exceeded, the frequency of which increases as the concentration increases, and changes to a continuous tone when the second alarm threshold (10,000 ppm) is exceeded.

Changing units

By default, the display shows ppm (concentration in parts per million). From a concentration of >999 ppm, the display changes to vol% (1000 ppm=0.1 vol%). Higher concentrations in ppm are also displayed in the app.

In addition, %LEL (the percentage of the lower explosive limit that has been reached) can be selected (not for refrigerants due to the smaller measuring range).

- 1 Press the **unit** key to change the unit.

Carrying out manual zeroing

The zero point can only be set manually if the currently detected gas concentration is below the max. 250 ppm (max. 250 ppm can be suppressed).

For example:

- 150 ppm (\leq 250 ppm): are completely suppressed (display: 0 ppm)
- 1000 ppm ($>$ 250 ppm): 250 ppm are suppressed (display: 750 ppm)



Gas concentrations present at the time of zeroing are suppressed by zeroing. As a result, the displayed reading no longer corresponds to the real gas concentration.

- ✓ The instrument is in measurement view.

- 1 Briefly press [**--> 0 <--**].

- ▶ The zero point for the current reading is reset or the current suppression is cancelled.
- ▶ On instruments with a display, the suppression of the reading is symbolized by an arrow pointing downwards on the display.



The maximum reading can be zeroed using [**max --> 0 <--**].

After the measurement

- 1 Ventilate the sensor thoroughly after each use. To do this, place the instrument in fresh air for approx. 2 minutes before using it again.

7.4 Carrying out refrigerant detection

The refrigerant loss can be output in grams/year (g/a), but the instrument only measures the concentration as an input quantity. A conversion is carried out in the instrument. For this, the leak must be scanned at a defined speed of 2 cm/sec at a distance of 1 cm.

Selecting the refrigerant to be detected

- 1 Select the refrigerant via the **GAS** key or the **testo Smart App** using the 3-point menu in the top right corner of the output field.

- ▶ After switching on the instrument, the process of cycling through starts with methane (CH₄).



It is advisable, especially with refrigerants, to select the refrigerant via the app, as otherwise you may have to press the **GAS** key very frequently to cycle through.

Carrying out the measurement

- 1 Move the sensor head as close as possible and at low speed (2 cm per second) over the components that are to be checked for leaks.
 - ▶
 - Concentration < 20 ppm: The sensor LED and the display illumination light up green
 - Concentration > 20 and < 35 ppm: The sensor LED and the display illumination light up yellow
 - Concentration > 35 ppm: The sensor LED and the display illumination light up red.
 - ▶ For the output in %LEL, you can switch to the corresponding chemically identical gas type as the measured value for the following refrigerants:
 - R290 - Propane
 - R50 - Methane
 - R702 - Hydrogen
 - R600a - Butane
 - ▶ When the upper display range is reached, ">-" is displayed. Higher values are not displayed.



To locate the leak, it is advisable, in the case of these larger leaks, to switch to **MODE 2** in order to receive feedback via audio and flashing signals.

- ▶ If the warning threshold (20 ppm) is exceeded, the sensor LED and display illumination light up yellow. If the acoustic alarm is enabled, an additional warning sound is emitted when the warning threshold is exceeded, the frequency of which increases as the concentration increases, and changes to a continuous tone when the second alarm threshold (35 ppm) is exceeded.

Changing units

By default, the display shows ppm (concentration in parts per million). From a concentration of >999 ppm, the display changes to vol% (1000 ppm=0.1 vol%). Higher concentrations in ppm are also displayed in the app.

In addition, %LEL (the percentage of the lower explosive limit that has been reached) can be selected (not for refrigerants due to the smaller measuring range). For refrigerants, g/a can be selected in addition to ppm.

- 1 Press the **unit** key to change the unit.

After the measurement

- 1 Ventilate the sensor thoroughly after each use. To do this, place the instrument in fresh air for approx. 2 minutes before using it again.

8 Maintaining the product

8.1 Charging the rechargeable battery

 **DANGER**

-  **Do not charge the rechargeable battery in potentially explosive atmospheres!**



Only charge the battery using the original Testo mains unit supplied.

The instrument indicates that the battery needs to be charged via a flashing battery symbol.

- 1 Connect the instrument to the mains via the mains unit. To do this, insert the plug of the mains unit into the charging socket on the underside of the instrument.



When the mains unit is plugged in during operation, the instrument switches off due to ATEX regulations.



The instrument can become very warm during charging and should not be held in your hand.

8.2 Cleaning the instrument

- 1 If the housing of the instrument is dirty, clean it with a damp cloth.



Do not use any aggressive cleaning agents or solvents! Mild household cleaning agents and soap suds may be used.

Storage & transportation

To prevent contamination of the sensor, please do not store or transport the instrument in an environment where any tobacco smoke, foul air, oils, greases, silicones, evaporating liquids or gases are present. Any sensor that is

contaminated as a result of storage or transportation must be cleaned before use, see [Cleaning the sensor](#).

Regular inspection

Testo recommends having the gas leak detector inspected by an authorized service centre every year.

8.3 Cleaning the sensor

Tobacco smoke, dirty air, oils, greases, silicones and evaporating liquids or gases can leave deposits on the sensor surface. Possible consequences are reduced sensitivity, distorted displays of gas concentration or display of a background concentration. Clean the sensor if necessary

- 1 Switch on the instrument, allow it to initialize and then switch it off. Repeat this procedure several times.
- 2 If it is dirty, clean the sensor head with a soft, dry cloth.

Switching on regularly

If the instrument is used infrequently, deposits may build up on the sensor. Switching the instrument on prevents these deposits from building up on the sensor. Testo recommends switching the instrument on regularly to avoid deposits building up on the sensor.

Changing the sensor head

- 1 The sensor head can be unscrewed and replaced without tools. The interchangeable sensor is pre-calibrated and can be used straight away.



9 Technical data for testo 316-2-EX

Feature	Value
Measurement parameters	ppm Vol% %LEL g/a
Detectable gases	Methane, propane, hydrogen, butane, forming gas (H ₂)
Refrigerant	R1234yf, R134A, R404A, R407C, R410A, R1234ze, R290, R417A, R513A, R32, R449A, R22
Lower response threshold / Measuring range	Methane (CH ₄): 1 ppm to 4.0 vol.% Propane (C ₃ H ₈): 1 ppm to 1.9 vol.% Hydrogen (H ₂): 1 ppm to 4.0 vol.% Butane (C ₄ H ₁₀): 1 ppm to 1.5 vol.% Refrigerant: lower response threshold (detection limit): 3 g/year
Resolution (via app)	1 ppm 0.01 vol.% 1%LEL
Response time	Response time < 2 sec
Exposure recovery time for g/year	61 s
Leak alarm	3-colour LED on sensor head 3-colour display backlighting Acoustic App
Operating temperature	-5 to +50 °C
Operating humidity	0 to 80 %RH
Operating altitude	≤ 2,000 m
Storage temperature	-20 to +50 °C
Charging temperature	0 to +45 °C
Battery type	Rechargeable battery pack 5x NiMH AA USB charger (original mains unit from Testo) with a USB 2 Micro-B connection
Maximum power consumption	5 W @ 5 V DC

Feature	Value
Battery life	>10 h
Level of contamination	PD2
IP class	IP40
Dimensions	150 x 66.5 x 37.5 mm (L x W x H) Length with gooseneck arm 545 mm
Weight	425 g
EX-protection	ATEX II 2 G Ex ib IIC T1 Gb, U _m = 8.5 V

10 Tips and assistance

10.1 Questions and answers

Question	Possible cause	Possible solution
Zero point is unstable	Contamination of the sensor after a prolonged period of non-use	Leave the instrument switched on until the zero point has stabilized.
Instrument does not switch to measuring mode (remains in warm-up phase)	Battery voltage too low	Charge the instrument.

10.2 Error codes

Error code	Error
E001	Memory error
E002	Sensor error
E003	Sensorhead error

The error code is shown on the display.

10.2.1 Hard Reset

- 1 If you encounter any problems with the firmware, press and hold the **ON/OFF** key for a long time (4 sec.) to perform a reset.

10.3 Accessories and spare parts

Description	Order no.
Transport bag	0590 0018
Interchangeable sensor head	0393 3164

Description	Order no.
Mains unit from Testo	0664 1107

11 Support

You can find up-to-date information on products, downloads and links to contact addresses for support queries on the Testo website at: www.testo.com.

If you have any questions please contact your local dealer or the Testo Customer Service. You can find contact details on the back of this document or online at www.testo.com/service-contact.



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