



## testo 338 · Density gauge

Instruction manual



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# 1 Contents

<b>1</b>	<b>Contents</b> .....	<b>3</b>
<b>2</b>	<b>Safety and the environment</b> .....	<b>5</b>
	2.1. About this document.....	5
	2.2. Ensure safety.....	6
	2.3. Protecting the environment.....	7
<b>3</b>	<b>Specifications</b> .....	<b>8</b>
	3.1. Use .....	8
	3.2. Technical data .....	8
	3.3. Declaration of Conformity .....	10
	3.4. Measuring principle .....	11
	3.4.1. Sensors .....	11
	3.4.2. Paper blackening (PB).....	12
	3.4.3. Filter loading (FL).....	12
	3.5. Measurement units .....	13
	3.5.1. Soot concentration [mg/m <sup>3</sup> ].....	13
	3.5.2. Filter smoke number [FSN].....	13
	3.5.3. Bosch number [Bosch].....	14
<b>4</b>	<b>Product description</b> .....	<b>15</b>
<b>5</b>	<b>First steps</b> .....	<b>18</b>
	5.1. Charging the battery .....	18
	5.2. Connecting the mains unit .....	18
	5.3. Switching the instrument on/off.....	19
<b>6</b>	<b>Using the product</b> .....	<b>21</b>
	6.1. Performing the leakage test.....	21
	6.2. Performing settings.....	22
	6.2.1. Date/time .....	22
	6.2.2. Configuration menu.....	22
	6.3. Preparing measurements .....	23
	6.4. Measuring.....	24
	6.5. Viewing, printing and deleting saved measurement results .....	25
	6.6. Data transfer to testo easyEmission software.....	26

<b>7</b>	<b>Maintaining the product .....</b>	<b>27</b>
	7.1. Removing TopSafe from the testo 338 .....	27
	7.2. Emptying the condensate trap .....	28
	7.3. Changing the rechargeable battery .....	29
	7.4. Changing the filter paper .....	30
	7.5. Replacing the particle filter .....	33
	7.6. Cleaning the instrument and TopSafe .....	34
	7.7. Cleaning / replacing the gas sampling probe .....	34
	7.8. Calibration .....	35
<b>8</b>	<b>Tips and assistance .....</b>	<b>36</b>
	8.1. Questions and answers .....	36
	8.2. Accessories and spare parts .....	37

## 2 Safety and the environment

### 2.1. About this document

#### Use


- > Please read this documentation through carefully and familiarize yourself with the product before putting it to use. Pay particular attention to the safety instructions and warning advice in order to prevent injuries and damage to the products.
- > Keep this document to hand so that you can refer to it when necessary.
- > Hand this documentation on to any subsequent users of the product.

#### Symbols and writing standards

Symbol	Explanation
<b>i</b>	Note: Basic or further information.
1. ... 2. ...	Handling: several steps, the sequence must be followed.
> ...	Handling: one step or optional step.
- ...	Result of an action.
<b>Menu</b>	Elements of the instrument, the instrument display or the program interface.
<b>[OK]</b>	Control keys of the instrument or buttons of the program interface.
...   ...	Functions / paths within a menu.
“...”	Example entries
✓ ...	Handling prerequisite

### Warnings

Always pay attention to information that is marked by the following warnings with warning pictograms. Implement the specified precautionary measures.

Representation	Explanation
 <b>CAUTION</b>	indicates potential minor injuries
<b>NOTICE</b>	indicates circumstances that may lead to damage to the products

## 2.2. Ensure safety

- > Only operate the product properly, for its intended purpose and within the parameters specified in the technical data. Do not use any force.
- > Do not store the product together with solvents. Do not use any desiccants.
- > Carry out only the maintenance and repair work on this instrument that is described in the documentation. Follow the prescribed steps exactly. Use only original spare parts from Testo.
- > Improper use of rechargeable batteries can lead to destruction or injuries by means of current surges, fire or escaping chemicals. The following instructions must be observed to avoid such hazards:
  - Only use in accordance with the directions in the instruction manual.
  - Do not short, take apart or modify.
  - Do not expose to heavy impacts, water, fire or temperatures above 60 °C.
  - Do not store in the proximity of metal objects.
  - Do not use leaky or damaged rechargeable batteries. In the event of contact with battery acid: Thoroughly wash affected area with water and consult a doctor, if necessary.

- Only charge in the instrument or the recommended charging station.
- Immediately stop the charging process if this is not completed in the given time.
- In the event of improper function or signs of overheating, immediately remove the rechargeable battery from the measuring instrument/charging station. Caution: Rechargeable battery may be hot!

**For products with Bluetooth® (optional)**

Changes or modifications that have been made without the explicit consent of the responsible approval authority, may cause the retraction of the type approval. Data transfer may be disturbed by equipment that uses the same ISM-band, e.g. WLAN, microwave ovens, ZigBee.

The use of radio communication links is not permitted in aeroplanes and hospitals, among others. For this reason the following points must be ensured before entering:

The data transfer function must not be active.

## 2.3. Protecting the environment

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

## 3 Specifications

### 3.1. Use

#### Functions and use

The soot concentration meter is a hand-held measuring device for determining the soot concentration ( $\text{mg}/\text{m}^3$ ), as well as the Filter Smoke Number (FSN) or the Bosch number for diesel engines.

**i** The Bluetooth® option may only be operated in countries in which it is type approved.

### 3.2. Technical data

Feature	Values
Measuring principle	Filter loading
Measurement range	FSN/Bosch no. <sup>1</sup> : 0 to 2.5 Soot concentration: 0 to 70 $\text{mg}/\text{m}^3$
Resolution	FSN/Bosch no. <sup>1</sup> : 0.01 Soot concentration: 0.01 $\text{mg}/\text{m}^3$
Reproducibility	FSN/Bosch no. <sup>1</sup> : < 0,08 Soot concentration: < 1,5 $\text{mg}/\text{m}^3$ (0...5 $\text{mg}/\text{m}^3$ ) < 1,25 $\text{mg}/\text{m}^3$ + 5 % v. Mw. (5...70 $\text{mg}/\text{m}^3$ )
Measuring probe volume	<b>Hi</b> : 0.2 l (range: 0.2 to 2.5 FSN) <b>Lo</b> : 0.4 l (range: 0 to 0.3 FSN)
Storage/transportation temperature	-20 to 50°C
Operating temperature	5 to 45°C
Rech. batt.	Lithium-ion, 2600 mAh / 3.7 V
Rech. batt. life	approx. 4 h continuous operation
Protection class	IP 40



Feature	Values
Interfaces	Printer: IR, IRDA Software: Bluetooth (only 0632 3382)
Dimensions	270 x 92 x 127mm
Weight	770g (including battery)
Warranty	2 years, warranty conditions: see <a href="http://www.testo.com/warranty">www.testo.com/warranty</a>
EU Directive	2004/108/EC

<sup>1</sup> Under reference conditions of +25°C and 1000 hPa

### Bluetooth® module (option)



- Bluetooth® type: BlueNiceCom IV
- Bluetooth® product note: BNC4\_HW2x\_SW2xx
- Bluetooth® identification: B013784
- Bluetooth® company: 10274
- Coverage: < 10 m
- Certification: Belgium (BE), Bulgaria (BG), Denmark (DK), Germany (DE), Estonia (EE), Finland (FI), France (FR), Greece (GR), Ireland (IE), Italy (IT), Latvia (LV), Lithuania (LT), Luxembourg (LU), Malta (MT), Netherlands (NL), Austria (AT), Poland (PL), Portugal (PT), Romania (RO), Sweden (SE), Slovakia (SK), Slovenia (SI), Spain (ES), Czech Republic (CZ), Hungary (HU), United Kingdom (GB), Republic of Cyprus (CY), Iceland, Liechtenstein, Norway and Switzerland, Turkey, El Salvador, Columbia

### 3.3. Declaration of Conformity



**EG-Konformitätserklärung**

**EC declaration of conformity**

Für die nachfolgend bezeichneten Produkte:

We confirm that the following products:

**testo 338**

Best. Nr.: / Order No.: 0632 3382

wird bestätigt, daß sie den wesentlichen Schutzanforderungen entsprechen, die in der Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die **elektromagnetische Verträglichkeit** (2004/108/EG) festgelegt sind.

corresponds with the main protection requirements which are fixed in the EEC "Council Directive 2004/108 EC on the approximation of the laws of the member states relating to electromagnetic compatibility" The declaration applies to all samples of the above mentioned product.

Zur Beurteilung der Erzeugnisse hinsichtlich elektromagnetischer Verträglichkeit wurden folgende Normen herangezogen:

For assessment of the product following standards have been called upon:

**Störaussendung / Pertubing radiation:**  
**Störfestigkeit: / Pertubing resistance:**

DIN EN 50270:2006 Typ 1  
DIN EN 50270:2006 Typ 2

**R&TTE Richtlinie:**

EN 300 328 V1.7.1 (2006-10)  
EN 301 489-1 V1.6.1 (2005-09)  
EN 301 489-17 V1.2.1 (2002-08)  
EN 60950-1 (2006-11)

**Sicherheits-Richtlinie:**

Diese Erklärung wird für:

This declaration is given in responsibility for:

**Testo AG**  
Postfach / P.O. Box 1140  
79849 Lenzkirch / Germany  
www.testo.com



Der Hersteller betreibt ein zertifiziertes Qualitätssicherungssystem nach DIN ISO 9001  
The manufacturer operates a certified quality assurance system according to DIN ISO 9001

abgegeben durch / by:

Dr. Jörk Hebenstreit  
(Name / name)

Uwe Haurv  
(Name / name)

Managing Director  
(Stellung im Betrieb des Herstellers)  
(Position in the company of the manufacturer)

Head of Electrical Engineering  
(Stellung im Betrieb des Herstellers)  
(Position in the company of the manufacturer)

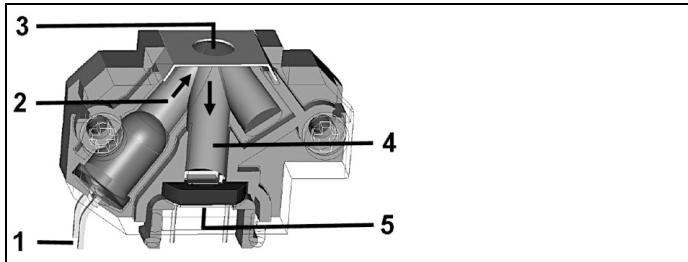
Lenzkirch, 26.02.2014  
(Ort, Datum / place, date)

[Signature]  
(Rechtsgültige Unterschrift)  
(Legally valid signature)

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(Rechtsgültige Unterschrift)  
(Legally valid signature)

## 3.4. Measuring principle

### 3.4.1. Sensors



- 1 White LED
- 2 Light
- 3 Loaded filter paper
- 4 Reflected light
- 5 Optical sensor (photodiode)

Component	Process
Optical sensor (photodiode and white LED)	The white LED radiates light with a defined intensity on to the blackening mark. The photodiode calculates the paper blackening based on the reflected light intensity. The more soot is deposited on the filter paper, the less light is reflected.
Differential pressure sensor/temperature sensor	<p>The sensor for differential pressure determines the sample volume under ambient conditions.</p> <p>The ambient pressure depends on the height above sea level and weather (high/low-pressure region). In the case of the testo 338, the current height above sea level (with an accuracy of <math>\pm 200</math> m) must be entered manually. The sample volume determined by the differential pressure sensor is used to calculate the sample volume under reference conditions, with the input height and the temperature measured by the instrument.</p>

This sample volume and the measured paper blackening are used to determine the soot concentration ( $\text{mg}/\text{m}^3$ ) and also the FSN (Filter Smoke Number) or the Bosch number.

**i** Measurements are assessed optically and are therefore dependent on the optical property of the soot. The optical properties of the soot vary depending on the engine and fuel, which can lead to inaccuracies during the calculation of the mass.

### 3.4.2. Paper blackening (PB)

The optical sensor detects the reflection capacity of filter paper blackened by flue gas. This means that 100% reflection corresponds to PB = 0 (white paper) and complete absorption = 0% reflection (completely blackened paper) corresponds to PB = 10.

$$PB = 10 \cdot \left(1 - \frac{R_B}{R_W}\right)$$

PB: Paper blackening

$R_B$ : Measuring value

$R_W$ : Reflection of the white filter paper

### 3.4.3. Filter loading (FL)

Filter loading describes the level of soot on the paper and is specified in milligrams per square metre. The filter loading increases exponentially with the paper blackening.

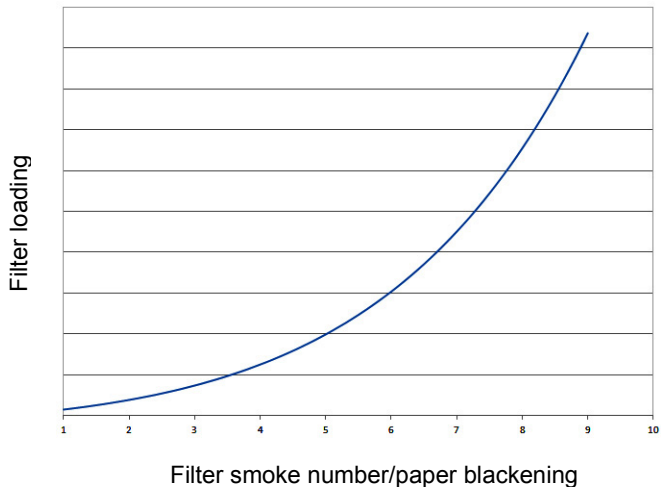
$$FL = \alpha \cdot PB \cdot e^{\beta \cdot PB}$$

FL = filter loading

$\alpha$ : empirical, fixed value

PB: Paper blackening

$\beta$ : empirical, fixed value



## 3.5. Measurement units

### 3.5.1. Soot concentration [mg/m<sup>3</sup>]

With the filter loading, via the volume that causes the blackening, it is possible to infer the soot concentration (SC = soot concentration) of the flue gas. This unit is calculated via the measured filter loading and the effective length. The effective length corresponds to the flue gas column which is actually drawn through the filter paper. The filter loading and the effective length are understood in the following context:

$$SC = \frac{FL_{eff}}{L_{eff}}$$

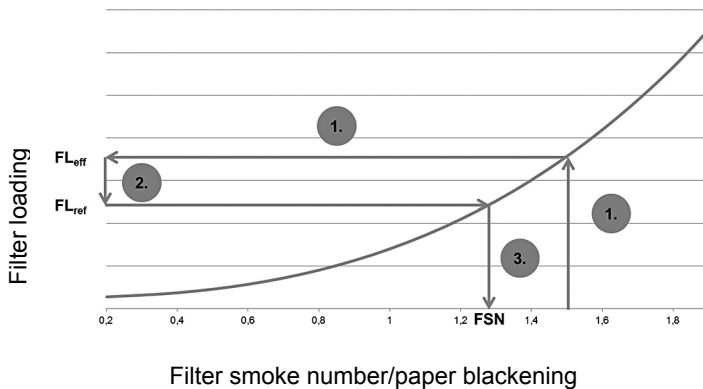
SC: Soot concentration

FL<sub>eff</sub>: effective filter loading

L<sub>eff</sub>: effective length

### 3.5.2. Filter smoke number [FSN]

The filter smoke number (FSN) is a standardised unit. It corresponds to the paper blackening caused by the intake of a flue gas column with a reference length of 405 mm (under reference conditions: 1000 mbar, +25 °C) on the filter paper. In the case of the testo 338, a longer flue gas column is drawn through the filter paper to increase sensitivity. This is converted to a reference length after the measurement. During the measurement, the flue gas volume taken in by the testo 338 is adjusted to the current ambient conditions (pressure, temperature) so that it corresponds to the volume under reference conditions. This gives a measuring value irrespective of local conditions.



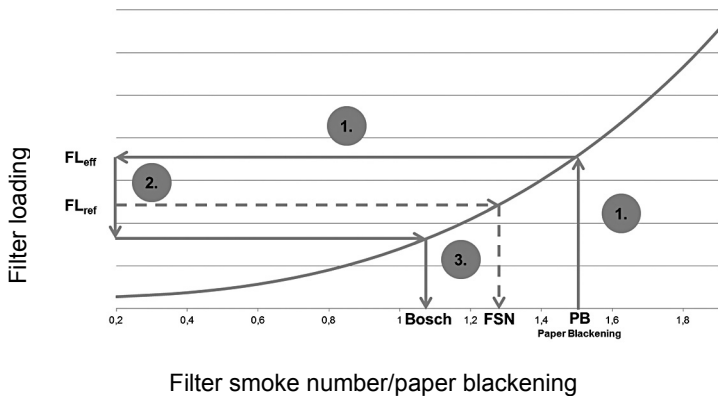
The calculation of the FSN from the directly measured filter blackening PB is carried out in three steps:

- 1 With the measured paper blackening (at reference pressure and temperature), the effective filter loading ( $FL_{eff}$ ) is calculated.
- 2 The filter loading at the reference length ( $FL_{ref}$ ) is determined by the relationship between the actual length and the reference length of the flue gas column.
- 3 The FSN is determined according to the calculated reference filter loading.

The reference conditions (pressure, temperature) for calculating the volume are 1000 mbar and 25 °C. This means that, irrespective of where and under what conditions a measurement is carried out, the measurement results remain comparable.

### 3.5.3. Bosch number [Bosch]

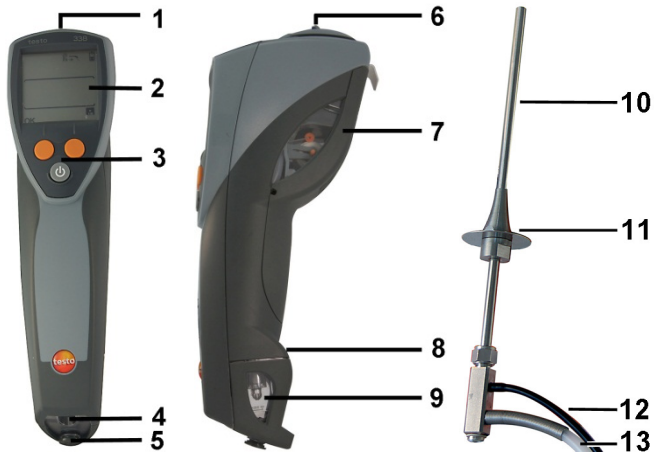
The main difference between the Bosch number and the FSN is its dependency on the current ambient pressure and the current ambient temperature.











The Bosch number is calculated in the testo 338 as follows:




- 1 With the measured paper blackening (at reference pressure and temperature), the effective filter loading ( $FL_{eff}$ ) is calculated.
- 2 The filter loading at the reference length ( $FL_{ref}$ ) is determined by the relationship between the actual length and the reference length under operating conditions.
- 3 The Bosch number is determined according to the calculated reference filter loading (under current ambient conditions).

## 4 Product description







- 1 IR- / IrDA interface
- 2 Display:  
Instrument status icons:





Icon	Meaning
	Error message
	Pump running
	Printing
	Memory menu open
	Query: Clear data?
	Data transfer (printer or memory)
	Note: Feed probe into flue gas duct
	Note: Remove probe from flue gas duct.
<b>set</b>	Configuration menu opened

Icon	Meaning
 + percentage	Engine operating point
	Battery capacity: >75% / >50% / >25% / <10%
 + two-digit number	Engine number
<b>Hi, Lo</b>	Probe volume mode (set automatically by the instrument irrespective of the FSN value of the last measurement): <ul style="list-style-type: none"> <li>• <b>Hi</b>: high soot concentration – measurement period 20 s</li> <li>• <b>Lo</b>: low soot concentration – measurement period 40 s</li> </ul>
<b>Test</b>	Leakage test running

3 Control keys:

Button	Function
	Switch the instrument on/off Cancel (takes the display back one operating step)
Left function key:	Function changes depending on the instrument status:
<b>[Start]</b>	Begin smoke measurement
<b>[OK]</b>	Apply setting/measuring value
	Toggle position display
	Open date/time menu
	Start printout



Button	Function
Right function key:	Function changes depending on the instrument status:
[test 	Begin leakage test
[set]	Open configuration menu
	Change selection
	Save measuring values
	Delete measuring values
[NO]	Apply setting/measuring value

- 4 Mains socket
- 5 Condensate outlet
- 6 Gas inlet
- 7 Service lid: access to filter paper, battery
- 8 Eyelet for wrist strap
- 9 Condensate trap
- 10 Probe shaft
- 11 Cone
- 12 Connecting hose to the gas inlet
- 13 Bypass with hose clamps (not shown)

## 5 First steps


### 5.1. Charging the battery

Fully charge the rechargeable battery before using the instrument. The rechargeable battery can only be charged at an ambient temperature of 0 to 35°C / 32 to 95°F. If the rechargeable battery pack has discharged completely, the charging time at room temperature is approx. 8-9 hrs.

- 
- i** Rechargeable battery care:
- Do not store a discharged battery for an extended period, fully charge before renewed use.
  - Best storage conditions: 50-80 % residual capacity, 10 to 20°C / 50 to 68°F ambient temperature.
- 

**i** Due to the high energy requirement of the testo 338, it is not possible to charge the battery while the instrument is switched on.

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- > Switch the instrument off before charging the battery.
1. Insert the instrument plug of the mains unit into the mains socket on the instrument.
  2. Insert the mains plug of the mains unit into a mains socket.
    - The charging process will start. The battery symbol illuminates with a variable number of segments. The charging process stops automatically and  illuminates when the battery is charged.

### 5.2. Connecting the mains unit




1. Insert the instrument plug of the mains unit 0554 1096 into the mains socket on the instrument.
2. Insert the mains plug of the mains unit into a mains socket.

## 5.3. Switching the instrument on/off


### Switching the instrument on

- 
- i** If the service lid is not secured, incorrect measurements will result:
    - > Check that the service lid is secured before switching on the instrument.
- 

Testo recommends performing a leakage test before every series of measurements:

- > Seal off the probe shaft before switching on the instrument and close the hose clamp on the bypass.
- 1. Press and hold down  until something appears on the display.
- A segment test is carried out: all display segments light up for 2 s.
- The firmware version is then displayed for 2 s.  is assigned to the right function key and  is assigned to the left function key.



During this time, you have the following options:

- > Set date/time: press .
  - The date/time menu is opened, see Date/time, page 22.


---

**i** During first commissioning, this menu is opened automatically.

---

- > Start leakage test: press .
  - The leakage test is started, see Performing the leakage test, page 21.
  -  is then assigned to the right function key for 2 s.

During this time, you have the following option:

- > Open configuration menu: press .
  - The configuration menu is opened, see Configuration menu, page 22.

---

**i** During first commissioning, this menu is opened automatically.

---

- > Carry out the basic settings, see Performing settings, page 22.
- If no function key is pressed, the instrument switches to the measurement view, see Measuring, page 24.

- The stability time is started:  lights up and a 60 s countdown runs down.

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**i** During the stability time, the ambient temperature is measured, which is required for calculating the Bosch number. To ensure correct Bosch number calculation:


- > Only start the Bosch number measurement once the stability time has elapsed.

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**i** For the Filter Smoke Number (FSN) measurement, the stability time does not necessarily need to have elapsed.

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### **Switching the instrument off**

- > Press and hold down  until the display goes out.
- Rinse phase begins (pump running, duration 10 s).
- The instrument switches itself off.

## 6 Using the product

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- i** While the instrument is switched on, filter paper heating is activated automatically. This reduces the operating time of the rechargeable battery.
- 

### 6.1. Performing the leakage test

---

- i** Um den Dichtigkeitstest durchführen zu können müssen die Geräteeinstellungen definiert sein.
- 

1. Connect the hose clamp to the bypass to carry out the tightness test. When opening, make sure that the hose is not sticking.
- 

- i** The tightness test must be carried out with filter paper in place.
- 

- The leakage test has been started, see Switching the instrument on/off, page **19**.
- **Test** lights up and the flue gas pump runs. Air is sucked in for max. 20 seconds. During this time, the probe shaft must remain sealed off and the hose clamp on the bypass hose must be closed.
- If the instrument is leak-tight, **Test OK** lights up before 20 seconds have elapsed.
  - > Press **[OK]** to switch to the measurement view.
- If the instrument leaks, **⚠** lights up:
  - > Check whether the service lid is secured correctly.
  - > Check whether the condensate trap is inserted and closed correctly.
  - > Repeat the leakage test: press **[Start]**.
  - > Contact your dealer or Testo Customer Service if you receive another error message.
- 2. After the test, open the clamp on the bypass again and ensure that the hose is not squashed. If necessary, move the hose clamp slightly.

## 6.2. Performing settings

### 6.2.1. Date/time

- ✓ The date/time menu has been opened, see Switching the instrument on/off, page 19.
- The date and time are displayed alternately.
- 1. Press **[set]** while the date is displayed.
- 2. Set the date with **[↑]** (increase value) and **[→]** (switch to the next value).
- 3. Press **[OK]**.
- 4. Press **[set]** while the time is displayed.
- 5. Set the time with **[↑]** (increase value) and **[→]** (switch to the next value).
- 6. Press **[OK]** twice.
- The instrument switches to the measurement view.

### 6.2.2. Configuration menu

- ✓ The configuration menu has been opened, see Switching the instrument on/off, page 19.
- **C** lights up and the engine operating point value flashes.
- 1. Switch to the next engine operating point: press **[↑]**.



There are twenty operating points (01 to 20) that can be assigned to an engine.

---




- 2. Press **[OK]**.
- **ENR** lights up and the engine number flashes.
- 3. Set the engine number: press **[↑]**.




Ten engine numbers between 01 and 10 can be set.

---

- 4. Press **[OK]**.
- **PRN** lights up and the printer number flashes.

5. Select the printer used: press [].
  - **0545**: Testo report printer (IR) 0554 0545
  - **0547**: Testo report printer (IrDA) 0554 0547
  - **0549**: Testo report printer (IrDA) 0544 0549
6. Press **[OK]**.
  - **Bosch** or **FSN** flashes.
7. Set measurement unit: press [].
8. Press **[OK]**.
  - **Alt** lights up and the height value flashes.
9. Set height above sea level: press [].

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 The height is adjustable in 100 m steps, between - 1500 m (e.g. mining) and 3500 m. In order to achieve results that are as accurate as possible, the height must be specified with an accuracy of  $\pm 200$  m.

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10. Press **[OK]**.
  - The measurement view is opened (duration approx. 5 s).

## 6.3. Preparing measurements

### Safety

 <b>CAUTION</b>
<p><b>Hot probe shaft may cause burns!</b></p> <ul style="list-style-type: none"> <li>&gt; Wear safety gloves.</li> <li>&gt; Allow the probe shaft to cool down after a measurement.</li> </ul>

### Preventing product damage

- > Check the fill level of the condensate trap. Empty it if the level is past the **max.** mark, see Emptying the condensate trap, page **28**.
- > Check and clean the gas sampling probe at the very latest after 50 measurements, see Cleaning / replacing the gas sampling probe, page **34**.
- > Check the particle filter for signs of contamination. Change the filter if it is contaminated, see Replacing the particle filter, page **33**.
- > Check that there is enough filter paper in the instrument (service lid window). Replace the filter paper when it has been used up, see Changing the filter paper, page **30**.

### Ensuring measuring accuracy

- > Recommendation: Carry out a leakage test prior to every series of measurements, see Switching the instrument on/off, page 19.
- > Adjust the height entry after changing the measuring location, see Configuration menu, page 22.
- > Ensure that the hose clamp on the bypass is used correctly:
  - Measurements when there is overpressure in the flue gas duct (normal): hose clamp open.
  - Measurements when there is underpressure in the flue gas duct: hose clamp closed.



If an overpressure cannot be clearly ascertained, close the hose clamp so as not to distort the measurement result.

---

## 6.4. Measuring

- ✓ The flue gas probe is located outside the flue gas duct.
- 1. Press **[OK]**.
  - Rinse phase (pump running, duration 10 s).
  - A 20 s countdown runs down. During this time, the probe shaft must be fed into the flue gas duct and the measurement must be started. If this is not done, the rinse phase must be started again.
- 2. Position the probe shaft in the flue gas duct.
- 3. Press **[Start]**.
  - The measurement begins (pump running).
  - The measurement is stopped automatically after 20 s (**Hi**) or 40 s (**Lo**).
- 4. Remove probe from flue gas duct.

### CAUTION

#### The instrument may become damaged due to condensate!

- > Only leave the probe shaft in the flue gas duct for the duration of the measurement.
- The evaluation of the blackening mark created on the filter paper is performed as soon as the instrument is unpressurised. The determined soot concentration, as well as the Bosch number or FSN (depending on the setting), is displayed after a few seconds.






5. Press **[OK]** to apply the value or **[NO]** to delete the value.
- > To remove the output filter paper strip: Hold the paper just above the paper outlet and pull sideways.

#### CAUTION



##### The instrument may become damaged!

- > While the service lid is closed, do not pull the filter paper out of the instrument.
- > Only pull the filter paper sideways to remove it.





- > Press .
  - The data is transferred to the report printer (  flashes).
6. Press .
  - The data is stored.
  - **[set]** is shown for approx. 2 s. You can call up the configuration menu to select another operating point or another engine number.
  - The measurement view is opened.

## 6.5. Viewing, printing and deleting saved measurement results



- ✓ The measurement view is open and the measurement data has been saved.

1. Press .
2. Select engine number (only possible if measuring values have been stored under multiple engine numbers): press  and confirm with **[OK]**.


### Viewing measurement results

3. Press  and then **[OK]**.
4. Select engine operating point (only possible if measuring values have been stored under multiple engine operating points): press  and confirm with **[OK]**.
  - Measurement results are displayed.
- > Display date/time of measurement: press . Back to the soot concentration display: .

### Deleting measurement results



5. Press  and then .
6. Delete a measurement result: **[OK]**.

### Printing measurement results

3. Press  and then **[OK]**.
- The data is transferred to the report printer (↵ flashes).

## 6.6. Data transfer to testo easyEmission software

A data transfer to the testo easyEmission software is only possible for instruments with Bluetooth® (article no. 0632 3382). Please read the instruction manual for the testo easyEmission software (0970 0360).

- ✓ The measurement view is open and the measurement data has been confirmed.
1. Press .
  2. Select engine number (only possible if measuring values have been stored under multiple engine numbers): Press  and confirm with **[OK]**.
- Transfer begins automatically (↵).



Data transfer stops automatically as soon as the measuring menu is exited.

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## 7 Maintaining the product

### 7.1. Removing TopSafe from the testo 338

1. Unplug the instrument from the mains and switch it off before opening the TopSafe.
2. Push down the locking clip (1) to release the guard.
3. Open guard (2).



4. Open the TopSafe cover (3).



5. Remove the testo 338 from the TopSafe (4).



## 7.2. Emptying the condensate trap

### CAUTION

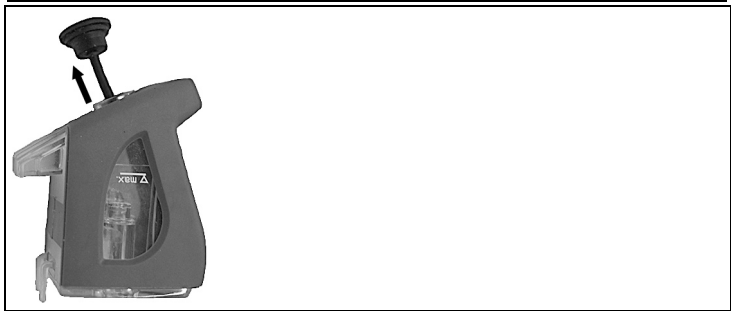
**The flue gas pump may become damaged as a result of condensate entering the gas path!**

- > Do not empty the condensate trap while the flue gas pump is running.



The condensate consists of a weak mix of acids:

- > Avoid contact with the skin.
- > Make sure that the condensate does not run over the housing.



1. Hold the instrument in such a way that the condensate outlet points upwards.
2. Pull the sealing plug out of the condensate outlet up to the stop.



3. Turn the instrument so that the condensate outlet points downwards.  
Dispose of the condensate correctly.

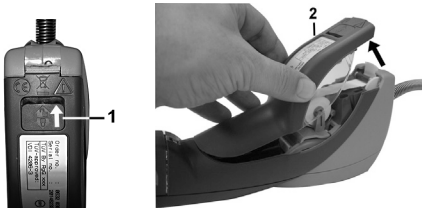
4. Wipe off any remaining drops at the condensate outlet using a cloth.
5. Close the condensate outlet with the sealing plug.



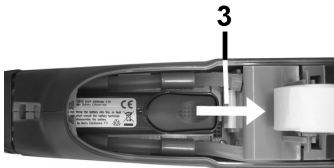
> Ensure that the condensate outlet is fully closed, otherwise incorrect measurements may occur due to external air entering.

### 7.3. Changing the rechargeable battery

1. Unplug the instrument from the mains and switch it off before changing the rechargeable battery.
2. Remove TopSafe from the instrument, see Removing TopSafe from the testo 338, page 27.
3. Open the lock of the service lid (1).
4. Open the service lid and remove it from the instrument (2).



5. Open the battery lock by pressing the grey button and simultaneously pushing in the direction of the arrow (3).



6. Remove the rechargeable battery from the instrument and insert a new battery. Only use the Testo rechargeable battery 0515 0107!
7. Close the battery lock by pressing the grey button and simultaneously pushing opposite the direction of the arrow until the battery engages.
8. Insert the service lid in the retaining hinge and close it.
9. Close the lock of the service lid.



After changing the battery, you have to set the date and time again.

## 7.4. Changing the filter paper

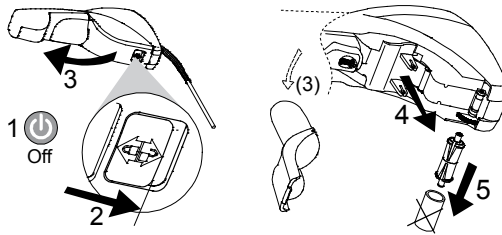
### CAUTION

**The measuring lens may become damaged or contaminated!**

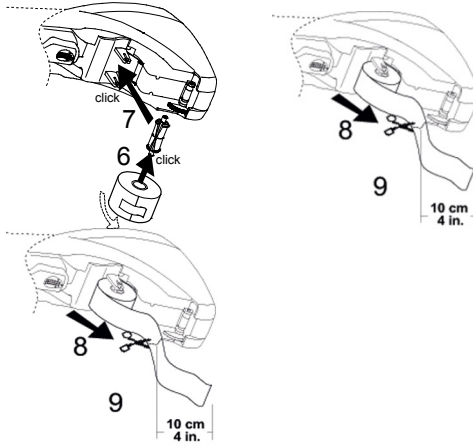
- > Keep the paper rolls free of contamination, as this could potentially be transmitted to the measuring lens.
- > Do not touch the protective glass of the measuring lens.

**i** Do not crinkle the filter paper to ensure that the paper is fed through smoothly.

1. Isolate the instrument from the mains and switch it off before changing the filter paper (1).
2. Remove TopSafe, see Removing TopSafe from the testo 338, page 27.
3. Open the lock of the service lid (2).
4. Open the service lid (3) and remove it from the instrument.
5. Pull the winder out of the bracket (4).
6. Remove the plastic sleeve of the spent paper roll from the winder and dispose of this (5).



7. Slide a new paper roll onto the winder (6).
8. Align the paper roll as shown (6) and fasten the winder in the bracket (7).
9. Unwind approx. 10 cm of paper from the roll (8).
10. Cut off the unwound paper and dispose of this (9). Then cut the start of the paper roll into a point.

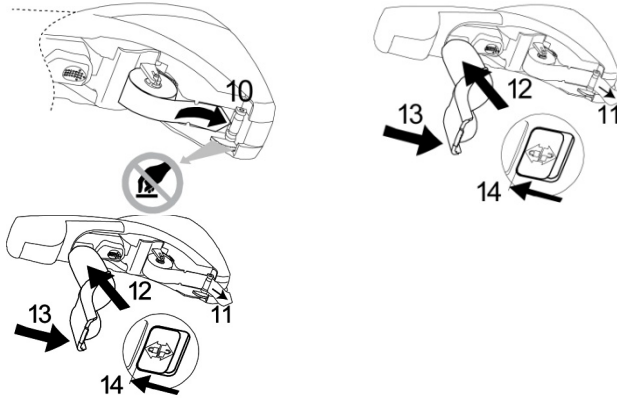


### CAUTION

**The gear wheel and the draw roll for paper transport may become damaged!**

- > Do not turn the gear wheel and the draw roll for paper transport.

11. Slide the end of the paper strip through under the guide tabs on the side and under the draw roll (10). Carefully pull the paper strip approx. 3 cm out of the guide (11).
12. Insert the service lid in the retaining hinge (12) and close it (13).
13. Close the lock of the service lid (14).



#### CAUTION

##### **The instrument may become damaged!**

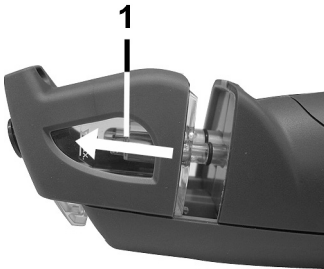
- > While the service lid is closed, do not pull the filter paper out of the instrument.
- > Only pull the filter paper sideways to remove it.



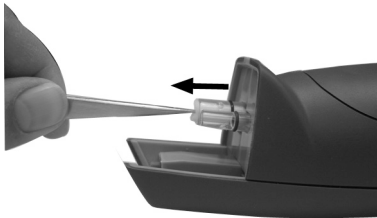
## 7.5. Replacing the particle filter

Check the particle filter regularly for filter saturation: visual inspection

- > If there are any signs of contamination, however, change the particle filter at the very latest after 50 measurements.
- 1. Unplug the instrument from the mains and switch it off before changing the particle filter.
- 2. Remove TopSafe from the testo 338, see Removing TopSafe from the testo 338, page 27.
- 3. Remove the condensate trap from the instrument (1).



- 4. Remove the spent particle filter from the plastic sleeve (2) and insert a new filter.



- 5. Place the condensate trap on the instrument again (3).



## 7.6. Cleaning the instrument and TopSafe

### Housing and TopSafe

- > If the instrument housing and TopSafe is contaminated, 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.

### Protecting glass of the measuring lens

#### CAUTION

**There is a risk of the protective glass of the measuring lens breaking!**

- > When cleaning, only exert light pressure on the protective glass.

- > If contaminated, clean the protective glass of the measuring lens with a damp cloth that is not too wet.

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

## 7.7. Cleaning / replacing the gas sampling probe

Check the gas sampling probe regularly for contamination: visual inspection.

- > If there are any signs of contamination, clean the gas sampling probe tube at the very latest after 50 measurements.

### Cleaning the probe shaft

- > Brush off soot or particle deposits on the probe shaft using a wire brush.
- > Blow compressed air through the probe shaft. Remove the probe shaft from the gas sampling probe, see Cleaning the probe shaft.

### **Replacing the probe shaft**

1. Fix the gas sampling probe securely in place.
2. Use a spanner to loosen the threaded ring (SWAGELOK® connector) from the probe handle by turning it anticlockwise and remove the probe shaft.
3. Fit the new probe shaft onto the probe handle, use a spanner to tighten the threaded ring (SWAGELOK® connector) by turning it clockwise until it is fighter-tight and check that it is gripped securely.




## **7.8. Calibration**

In order to guarantee measurement accuracy, we recommend having the instrument checked once a year. Please contact your dealer or Testo customer service.

For contact data, see back of this document or web page [www.testo.com/service-contact](http://www.testo.com/service-contact)

## 8 Tips and assistance

### 8.1. Questions and answers

Question	Possible causes/solutions
<b>E02</b> lights up	The drawn volume is too low after the end of the max. permissible measuring period. > Instrument may be blocked. > Clean the gas sampling probe, see Cleaning / replacing the gas sampling probe, page <b>34</b> .
<b>E04</b> lights up	Instrument temperature is outside the specified range > (Allow it to) cool down or warm up.
<b>E07</b> lights up	Basic position was not reached, gas path leaks. > Press <b>End</b> to carry out positioning again.
<b>OPEn b.P.</b> , <b>E30</b> lights up	The overpressure is too high > Open the hose clamp.
<b>E31</b> lights up	The evaluated smoke number does not correspond to the set measuring range, the measuring range is changed automatically > Repeat measurement
<b>E41</b> lights up <b>E42</b> lights up	System error > Contact Testo Service.
<b>E43</b> lights up	The optical (smoke number) evaluation is outside the permissible range. > Clean the protective glass of the measuring lens, see Cleaning the instrument and TopSafe, page <b>34</b> > Measuring lens is defective: contact Testo Service.
<b>E49</b> lights up	Unknown error > Contact Testo Service.
 and  flash	Battery charging not possible. > Plug in battery
 flashes	Battery charging <10% > Connect mains unit

If we could not answer your question or the solutions given during troubleshooting did not help: please contact your dealer or Testo Customer Service. Contact data see back of this document or website [www.testo.com/service-contact](http://www.testo.com/service-contact).

## 8.2. Accessories and spare parts

<b>Description</b>	<b>Article no.</b>
Gas sampling probe, immersion depth 240-285 mm, hose 1.6 m	0600 7570
TopSafe	0440 2330
Heat shield for probe handle (optional)	0054 0208
Heat protection plate for mounting on the probe shaft (optional)	0173 0147
Mains unit	0554 1096
Spare rech. battery	0515 0107
Spare filter paper (8 rolls)	0554 0146
Spare particle filter	0554 1101
Instrument bag	0516 0002
Testo fast printer IrDA	0554 0549
Spare thermal paper for printer	0554 0568
Easy Emission software	0554 3334

