



testo 340 Flue gas analyzer

Instruction manual



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1 About this document

- The instruction manual is an integral part of the instrument.
- Pay particular attention to the safety instructions and warning advice in order to prevent injury and damage to the product.
- Please read this instruction manual through carefully and familiarize yourself with the product before putting it to use.
- Keep this documentation at hand so that you can refer to it when necessary.

Symbols and writing standards

Display	Explanation
	Notice: basic or further information
	Warning advice, risk level according to the signal word: Danger! Risk of death! Warning! Serious physical injury may occur. Caution! Minor physical injury or damage to the equipment may occur. Important! Possible damage to equipment. > Take the specified precautionary measures.
Text	Text appears on the instrument's display
	Key
OK	Function key with the function OK . > Press the key.
 → xyz	Short form for operating steps

Short form

This document uses a short form for describing operating steps (e.g. calling up a function).

Example: Calling up the **Flue gas** function

Short form:  → **Measurement** → **OK** → **Flue gas** → **OK**

1 2 3 4 5

Steps required:

- 1 Open the Main menu: .
- 2 Select the **Measurements** menu: , .
- 3 Confirm selection: **OK**.
- 4 Select the **Flue gas** menu: , .
- 5 Confirm selection: **OK**.

Warning notices

Always pay attention to any information marked with the following warning notices along with warning pictograms. Implement the specified precautionary measures!

DANGER

Risk of death!

WARNING

Indicates possible serious injury.

CAUTION

Indicates possible minor injury.

ATTENTION

Indicates possible damage to equipment.

2 Safety and disposal

2.1 Security

CAUTION

Acid in the sensors!

May cause chemical burns!

Do not open the sensors.

Always wear gloves when changing a sensor.

Eye contact: Rinse the affected eye thoroughly under running water for 10 minutes, keeping the eyelids wide open and protecting the unaffected eye. Remove contact lenses wherever possible.

CAUTION

Powder in the sensor filters.

May cause irritation to the skin, eyes or respiratory tract.

- Do not open the sensor filters.

Eye contact: Rinse the affected eye thoroughly under running water for 10 minutes, keeping the eyelids wide open and protecting the unaffected eye. Remove contact lenses wherever possible.

Skin contact: Remove the injured person's contaminated clothing, ensuring self-protection. Rinse affected skin areas under running water for at least 10 minutes.

Inhalation: Move to fresh air and make sure that breathing is unrestricted.

Ingestion: Rinse mouth out and spit out liquid. If conscious, drink 1 glass of water (approx. 200 ml). Do not induce vomiting.

DANGER

Risk of death!

Electrical voltage.

Never use the measuring instrument and probes to carry out measurements on or near live parts.

- Do not store the product together with solvents.
- Do not use any desiccants.



For products with Bluetooth® (optional)

Changes or modifications that have been made without the explicit consent of the competent approval authority may lead to cancellation of the type approval.

Interference with data transfer can be caused by instruments which transmit on the same ISM band, e.g. WLAN, microwave ovens, ZigBee. Places where the use of radio links is not permitted include aeroplanes and hospitals. For this reason, the following point must be checked before entering:

- Deactivate **Bluetooth** function.
 -  → **Inst. settings** → **OK** → **Communication** → **OK** → Select **IrDA** → **OK**.
-
- Only operate the product properly, for its intended purpose, and within the parameters specified in the technical data.
 - Do not apply any force.
 - Temperature information given on probes/sensors relates only to the measuring range of the sensor technology. Do not expose handles and feed lines to temperatures in excess of 70 °C (158 °F), unless they are expressly authorized for use at higher temperatures.
 - Open the measuring instrument only when this is expressly described in the instruction manual for maintenance purposes.
 - Carry out only the maintenance and repair work that is described in the instruction manual. Follow the prescribed steps exactly when doing the work. For safety reasons, use only original spare parts from Testo. Any additional work must only be carried out by authorized personnel. Testo will otherwise refuse to accept responsibility for the proper functioning of the measuring instrument after repair and for the validity of certifications.

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.

3 Intended use

This chapter describes the areas of application for which the measuring instrument is intended.

The testo 340 is a hand-held measuring instrument used in professional flue gas analysis by:

- Engineers servicing/monitoring industrial combustion plants (process systems, power stations)
- Emissions inspectors
- Engine manufacturers and operators
- Service engineers/mechanics of burner/boiler manufacturers in the industrial sector

Typical measuring tasks and particular characteristics of the testo 340 include:

- Measurement on industrial engines (CO/NO dilution)
- Measurement on gas turbines (high-precision CO and NO plus optional dilution)
- Emissions measurement (integrated flow speed and differential pressure measurement)



testo guarantees the functionality of its products when used in accordance with their intended purpose. This guarantee does not apply to features of Testo products in combination with unauthorized third-party products. Competitor products are not authorized by Testo.

As is common practice, Testo generally excludes any claims relating to support, warranty or guarantees insofar as they concern functionality that has not been expressly assured by Testo as part of the product offered. Claims of this kind shall also be excluded in the event of improper use or handling of the products, e.g. in combination with unauthorized third-party products.

Further warranty terms: see website www.testo.com/warranty

The testo 340 should not be used:

- for continuous measurements > 2 h
- as a safety (alarm) device



testo 340 with the Bluetooth® option:

The use of the wireless module is subject to the regulations and stipulations of the respective country of use and the module may only be used in countries for which national certification has been obtained. Users and owners undertake to adhere to these regulations and prerequisites for use and acknowledge that the re-sale, export, import, etc., in particular in, to or from countries without radio authorization, is their responsibility.

4 Product description

This chapter provides an overview of the individual components of the product.

4.1 Measuring instrument

4.1.1 Overview



Element		Element	
1	Infrared interface	2	Interfaces: USB, PS2
3	On/Off switch	4	Condensate trap (on rear)
5	Attachment for carrying strap (on rear)	6	Magnetic holders (on rear)
7	Display	8	Service cover (on rear)

9	Keypad	10	Instrument connections: flue gas probe, sensor, pressure probe, mains unit, gas outlets
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⚠ CAUTION

Infrared radiation.

Risk of injury!

Do not point infrared beam at people's eyes.

⚠ WARNING

Magnetic field.

May be harmful to those with pacemakers!

Keep a minimum distance of 20 cm between pacemaker and instrument.

IMPORTANT

Magnetic field.

Damage to other devices!

Keep a safe distance away from products that could be damaged by the effects of magnetism (e.g. monitors, computers or credit cards).

4.1.2 Keypad

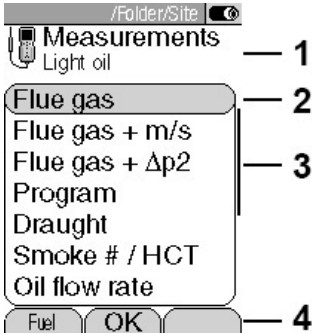
Key	Functions
	Switch measuring instrument on/off
	Function key (orange, 3x), relevant function is shown on the display
	Scroll up, increase value
	Scroll down, reduce value
	Back, cancel function
	Open Main menu : press briefly (changed settings are stored, measuring values are carried over into the Flue gas menu), open Measurements menu: press and hold down for 2 s (changed settings are stored, measuring values are carried over into the Flue gas menu)
	Open Inst. diagnosis menu
	Change display lighting: display light stays on permanently or display light is switched on for 10 s every time the key is pressed.

4.1.3 Display

Depending on the menu that is active, the display shows a variety of elements.
Header (active in all views)

	
Element	
1	Warning symbol (only if there is an instrument error, instrument errors are displayed in the Inst. diagnosis menu)
2	Active folder and measurement location
3	Power supply symbol:  - Mains operation  - Rechargeable battery operation, capacity: 76 to 100%  - Rechargeable battery operation, capacity: 51 to 75%  - Rechargeable battery operation, capacity: 26 to 50%  - Rechargeable battery operation, capacity: 6 to 25%  - Rechargeable battery operation, capacity: 0 to 5%

Function select view

1	Active menu, activated fuel	
2	Function selection field: Function selection field: The selected function is shown with a grey background.	
3	Scroll bar	
4	Function keys for entering commands	

Settings view

1	Active menu	
2	Function fields for entering commands	
3	Scroll bar	
4	Selection field for adjustable values: The selected value is shown with a grey background. Unavailable values are written in grey type.	
5	Function keys for entering commands	

Measuring view

1	Active menu, depending on the selected function: Additional information (e.g. activated fuel, date and time)	
2	Scroll bar	
3	Display field for readings, parameters	
4	Function keys for entering commands	

4.1.4 Instrument connections

Element	Element
1 Probe socket	2 Flue gas socket
3 Mains unit socket	4 Pressure socket p+
5 Pressure socket p-	6 Gas outlets

4.1.5 Interfaces



Element		Element	
1	USB interface: connection to PC	2	PS2 interface: adapter for automatic burner controls
3	IR/IrDA interface	4	Bluetooth® interface

4.1.6 Components



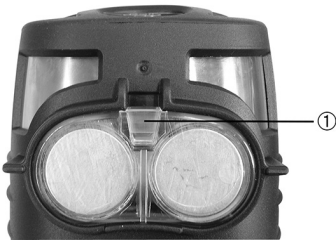
Element		Element	
1	Rechargeable battery	2	Measuring gas pump
3	Sensor slot 1: O ₂	4	Sensor slot 2: CO, COlow, NO, NOlow, SO ₂
5	Sensor slot 3: NO, NOlow, NO ₂	6	Sensor slot 4: CO, COlow, SO ₂ , NO ₂

4.1.7 Carrying strap

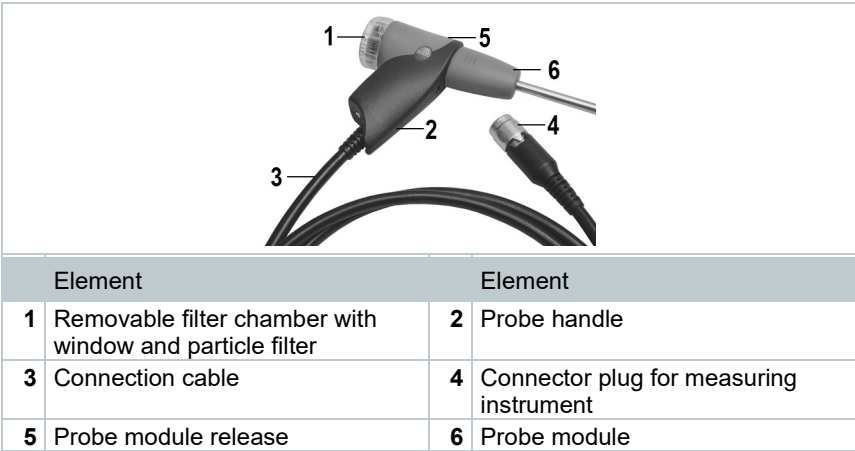
Securing the carrying strap

- 1 Place the measuring instrument face down.

- 2 | Secure the carrying strap in the holder (1).



4.2 Modular flue gas probe



Element		Element	
1	Removable filter chamber with window and particle filter	2	Probe handle
3	Connection cable	4	Connector plug for measuring instrument
5	Probe module release	6	Probe module

5 Commissioning

This chapter describes the steps required to commission the product.

- ✓ The measuring instrument is supplied with a rechargeable battery already fitted.
- 1 | Remove the protective film from the display.
- 2 | Charge the battery up fully before using the measuring instrument. (see Charging the rechargeable battery)

6 Operation

This chapter describes the operating steps that are frequently required when using the product.



Please read this chapter carefully. The information in this chapter is assumed to be known in the subsequent chapters of this document.

6.1 Mains unit/rechargeable battery

If the mains unit is connected, the measuring instrument is automatically powered via the mains unit. It is not possible to charge the rechargeable battery in the measuring instrument during operation.

6.1.1 Charging the rechargeable battery

The rechargeable battery can only be charged at an ambient temperature of ± 0 to $+35$ °C. If the rechargeable battery pack has discharged completely, the charging time at room temperature is approx. 5-6 hrs.

Charging in the measuring instrument



The measuring instrument must be switched off.

- 1 | Connect the instrument plug of the mains unit to the mains unit socket on the measuring instrument.
 - 2 | Connect the mains plug of the mains unit to a mains socket.
- The charging process starts. The charge status is shown on the display. The charging process will stop automatically when the rechargeable battery is fully charged.

Charging in the charging station (0554 1103)

- Refer to the documentation that comes with the charger.

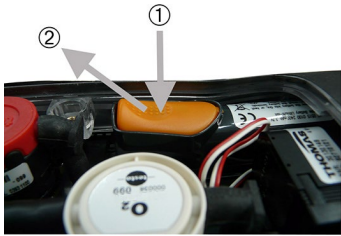
Rechargeable battery care

- If possible, always discharge the rechargeable battery and recharge it fully.
- Do not store the rechargeable battery for long periods when discharged. (The best storage conditions are at 50-80 % charge level and 10-20 °C ambient temperature; charge fully before further use).

6.1.2 Changing the rechargeable battery



The measuring instrument must not be connected to a mains socket via the mains unit. The measuring instrument must be switched off. Change the rechargeable battery within 60 minutes, otherwise instrument settings (e.g. date/time) will be lost.

- 1 Place the measuring instrument face down.
 - 2 Loosen screws using a Phillips screwdriver, release clip in the direction of the arrow and remove the service cover.
 - 3 Open the battery lock: Press the orange key (1) and push in the direction of the arrow (2).
- 
- 4 Remove the battery and insert a new rechargeable battery. Only use the Testo rechargeable battery 0515 0100!
 - 5 Close the battery lock: Press the orange key and push against the direction of the arrow until the battery engages.
 - 6 Replace and close service cover (clip must click into place), fasten with screws.

6.1.3 Operation with the mains unit

- 1 Connect the instrument plug of the mains unit to the mains unit socket on the measuring instrument.
 - 2 Connect the mains plug of the mains unit to a mains socket.
- ▶ The measuring instrument is powered via the mains unit.
 - ▶ If the instrument is switched off and a rechargeable battery is inserted, the charging process will start automatically. Switching the measuring instrument on has the effect of stopping the battery charging and the measuring instrument is then powered via the mains unit.

6.2 Probes/sensors

6.2.1 Connecting probes/sensors



Probe socket:

Probe detection is carried out at the probe socket during the activation process: Always connect the probes you need to the measuring instrument before switching it on or switch the instrument off and then on again after a change of probe so that the correct probe data can be read into the measuring instrument.

Flue gas socket:

Probe/sensor detection at the flue gas socket is carried out continuously. It is possible to change the probe/sensor even while the measuring instrument is switched on.

Connecting flue gas probes

- > Insert the connector into the flue gas socket and lock it by turning it slightly clockwise (bayonet fitting).



There must be no more than two extension leads (0554 1202) between the measuring instrument and the flue gas probe.



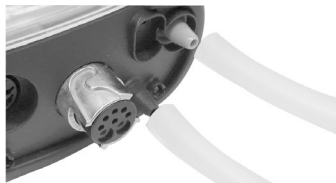
Connecting other probes

- > Insert the probe's connector into the probe socket.



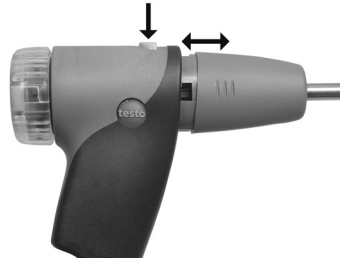
Connecting the pressure tube

- > Connect the pressure hose(s) to the connecting nipple(s) of the pressure socket(s).



6.2.2 Replacing the probe module

- 1 Press the key on the top of the probe handle and remove the probe module.



- 2 Fit new probe module and click into place.

6.3 Regular care

6.3.1 Condensate trap

The fill level of the condensate trap can be read from the markings on the condensate trap. A warning message (⚠, red flashing light) is displayed if the fill level in the condensate trap reaches 90%.

Emptying the condensate trap



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.

⚠ CAUTION

Damage to sensors and flue gas pump!

Condensate entering the gas path.

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

- 1 Keep measuring instrument in an upright position (condensate outlet pointing upwards).



- 2 Open the condensate outlet on the condensate trap. Pull out the plug as far as it will go.

- 3 Let the condensate run out into a sink.
- 4 Dab off any remaining drops on the condensate outlet with a cloth.
- 5 Close the condensate outlet.



The condensate outlet must be completely closed, otherwise incorrect measurements could occur due to infiltration of external air.

6.3.2 Checking/replacing the particle filter

Checking the particle filter

- > Check the particle filter of the modular flue gas probe for contamination at regular intervals: check visually by looking through the window of the filter chamber. Replace the filter if there are signs of contamination.

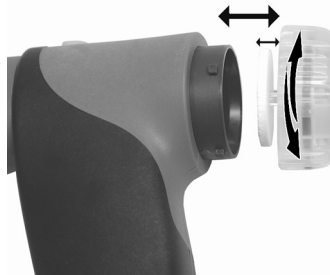


Replacing the particle filter



The filter chamber may contain condensate.

- 1 Open filter chamber: turn slightly anti-clockwise.
- 2 Remove filter plate and replace it with a new one (0554 3385).
- 3 Attach the filter chamber and lock it: turn slightly clockwise.



6.4 Basic operating steps

6.4.1 Switching the measuring instrument on

- > Press .
- ▶ - The start screen is displayed (for about 5 s).
- ▶ - Display light is switched on for 10 s.

Option:

To go directly to a measurement while the start screen is being displayed: press the function key for the required measurement. See also "Start keys edit".

- The **Measurements** menu is opened.

or

- If the power supply was interrupted for a longer period: the **Date / Time** menu is opened.

or

- There is an instrument error: The **Error diagnosis** is displayed.

6.4.2 Calling up the function



Functions which cannot be selected because the required sensor/probe is not connected are shown in grey type.

1 Select function: ▲, ▼.

- ▶ The selected function is shown with a grey background.

2 Confirm selection: **OK**.

- ▶ The selected function is opened.

6.4.3 Entering values

Some functions require values (numbers, units, characters) to be entered. Depending on the selected function, the values are entered either via a list field or an input editor.

List field

- 1 Select the values to be changed (number, unit): , .



- 2 Adjust the value: , .
- 3 Repeat steps 1 and 2 as required.
- 4 Confirm entry: **OK**.
- 5 Save the entry: **OK Save input** → **OK**.

Input editor

- 1 Select value (character): , , , .



- 2 | Accept the value: **OK**.
Options:
 - Switch between uppercase/lowercase letters: **A <=> a** (not always available).
 - Delete character: **<=**.
 - To position the cursor in the text: Select the text input field: , 
and position the cursor: , .
 - To delete the character in front of the cursor: **Del**.
- 3 | Repeat steps 1 and 2 as required.
- 4 | Save the entry: **OK Save input** → **OK**.

6.4.4 Printing data

Data is printed out via the function key **Print**. The function is only available if a printout is possible.

To be able to transmit data to a report printer via the infrared interface, the printer to be used must be activated, see **Printer**.

6.4.5 Saving data

Data is saved either via the function key **Save** or the function field **OK Save input**. The functions are only available if saving is possible. See also **Memory**.

6.4.6 Confirming an error message

If an error occurs, an error message is shown on the display.

- To confirm an error message: **OK**.

Errors that have occurred but have not yet been rectified are indicated by a warning symbol () in the header.

Messages for errors which have not yet been rectified can be displayed in the Error diagnosis menu, see **Instrument diagnosis**.

6.4.7 Switching the measuring instrument off



Unsaved readings are lost when the measuring instrument is switched off.

- > Press .
- ▶ - The following may happen: the pump starts and the sensors are rinsed/purged until the switch-off thresholds (O2 > 20%, other measurement parameters < 50 ppm) are reached. Purging lasts no more than 2 minutes.
- The measuring instrument switches off.

6.5 Memory

All readings are allocated to the location that is activated at the time and can be saved in the Flue gas menus. Unsaved readings are lost when the measuring instrument is switched off!

Folders and locations can be created (max. 100 folders, max. 10 locations per folder), edited and activated and measurement reports can be printed.

The special function **Extras memory** can be used to display the remaining free memory space. All reports can be printed or deleted. The entire memory (folders and locations including reports) can also be deleted.

Calling up the function

- > • → Memory **OK**.

6.5.1 Folders

Creating a new folder

Folders are given a unique identification via the folder number. A folder number can only be allocated once. The folder number cannot be changed afterwards.

- 1 **New Folder** → **OK**.
- 2 Select **Folder Number** → **Change**.
- 3 Enter values → **OK**, **Save input** → **OK**.
- 4 Repeat steps 2 and 3 for the other criteria as required.
- 5 **OK**.

Sorting the folders list

- 1 **Folders list**.
- 2 Select the order criterion: **Folder**, **Name**, **Addr..**

Restoring the folders list

- > To arrange the list in the order in which the folders were created:
Restore list → **OK**.

Editing folders

- > Select the folder.
Options:

- Delete the folder: → **Del**.
- Edit the folder: → **Edit**.

6.5.2 Location

Creating a new location

A location is always created in a folder.

- 1 Select the folder → **OK** → **New location** → **OK**.
- 2 Select the **Location name** → **Change**.
- 3 Enter values → **OK Save input** → **OK**.
- 4 Repeat steps 2 and 3 for the other criteria as required.
- 5 **OK Go to measurement** or **OK To location** → **OK**.

Sorting the locations list

- 1 Select the folder → **OK**.
- 2 **Locations list** → **OK**.

Activating a location

- > Select the folder → **OK** → Select location → **OK**.
- ▶ The location is activated and the **Measurements** menu is opened.

Restoring the locations list

- > To arrange the list in the order in which the folders were created: Select the folder → **OK** → **Restore list** → **OK**.

Delete a location

- 1 Select the folder → **OK**.
- 2 Select the location → **Edit**.
- 3 Select **Delete site with data** → **OK**.

Performing location settings

For flow speed, air flow and mass flow to be measured correctly, the shape and surface area of the cross-section must be set.

The parameters **Pitot factor** and **Offset factor** (correction factor) influence the measurement of flow speed, air flow and mass flow. The Pitot factor depends on the type of Pitot tube used:

- Straight Pitot tubes (0635 2042): Pitot tube factor 0.67
- Prandtl (bent) Pitot tubes (0635 2145, 0635 2345): Pitot tube factor 1.00

The correction factor refers to the stated areas. If parts of the area are covered (e.g. by grille bars), this can be compensated via the correction factor. The free portion of the area should be given (e.g. 20% covered and 80% free: correction factor 0.8). The correction factor should be set at 1.00 for all standard applications.

The parameters **Temp./amb.** (ambient air temperature), **Hum/amb.** (ambient air humidity) and **Dew p./amb.** (ambient air dew point) influence calculation of the qA (Flue gas loss) and DP (Flue gas dewpoint temperature). The parameters should be set to the factory settings for all standard applications (Temp./amb.: 20.0 °C, Hum/amb.: 80.0%, Dew p./amb.: 16.4 °C). To achieve greater accuracy, the values can be adjusted to the actual ambient conditions.

If the ambient air temperature probe/sensor is plugged in, the value for Temp./amb. is accepted automatically. The parameter **Dew p./amb.** can be calculated from the values of **Temp./amb.** and **Hum/amb.** via the function key **calc.**

- 1 Select the folder → **OK**.
- 2 Select the location → **Edit**.
Options:
 - To set the shape of the cross-section:
Cross section → **Change** → Select the cross-section → ☒.
 - **Cross section** → **Change** → Select the cross-section → **Change** → Set the values → **OK**.
 - To set parameters:
Select the parameter → **Change** → Set the values → **OK**.
- 3 **OK To location** → **OK**.

6.5.3 Protocols/Reports

Printing/deleting all reports

- > Select the folder → **OK** → Select a location → **Data**.

- ▶ The saved reports are displayed. Measurement program reports are marked with a vertical line and the number of individual measurements (e.g. |245), for more than 999 measurements, dots are used (|...). Options:
 - To print all data: Print all → **OK**.
 - To delete all data: Delete all → **OK**.

Displaying/printing/deleting an individual report

- 1 Select the folder → **OK** → Select a location → **Data**.
 - ▶ The saved reports are displayed. Measurement program reports are marked with a vertical line and the number of individual measurements (e.g. |245), for more than 999 measurements, dots are used (|...).
- 2 Select the report → **Value**. Options:
 - To print the data: **Print**.
 - To delete the data: **Del**.

6.5.4 Extras Memory

Calling up the functions

- >  → **Memory** → **Extra**.
 - ▶ The available memory space is displayed. Options:
 - **Print all data** → **OK**.
 - **Delete all data** → **OK**.
 - **Delete memory** → **OK**.

6.6 Instrument diagnosis

Important operating values and instrument data are displayed. A gas path check can be carried out. The status of the sensors and any instrument errors not yet rectified can be displayed.

Calling up the functions

- >  → **Inst. diagnosis**.
or
.

Performing a gas path check

- 1 Gas path check → **OK**.
- 2 Place the black sealing cap on the tip of the flue gas probe.
 - ▶ The pump flow is displayed. If the flow rate is ≤ 0.02 l/min, the gas paths are not leaking.
- 3 End the check: **OK**.

Viewing instrument errors

- > **Error diagnosis** → **OK**.
- ▶ Unrectified errors are displayed.
- > View next/previous error: , .

Viewing the sensor diagnosis

- 1 **Sensor check** → **OK**.
 - ▶ Possibly: Gas zeroing (30 s).
- 2 Select sensor: , .
- ▶ The status of the sensor is displayed.

7 Configuration

This chapter describes the possible steps for adapting the product to the particular measurement task or the requirements of the user.



Familiarity with the contents of the "Operation" chapter is assumed.

7.1 Instrument settings

7.1.1 Display edit

The parameters/units and the display format (number of measured values shown per display page) can be set.

Selectable parameters and units (may vary depending on the instrument):

Display	Parameter	Units
FT	Flue gas temperature	°C, °F
AT	Ambient (combustion) temperature	°C, °F
CO2	Carbon dioxide	%
qA	Flue gas loss	%
λ	Air ratio	-
O2	Oxygen	%
CO	Carbon monoxide	ppm, %, g /GJ
uCO	Undiluted carbon monoxide	ppm
Effn	Efficiency	%
NO	Nitrogen monoxide	ppm, %, g /GJ,
NOx	Nitrogen oxides	ppm, %, g /GJ, mg/m³, mg/kW
AT	Ambient temperature (combustion air temperature)	°C, °F
Drgh	Flue draught	mbar, hPa, mmWS, inW, Pa, psi, inHG
SO2	Sulphur dioxide	ppm, %, g /GJ, mg/m³, mg/kW
NO2	Nitrogen dioxide	ppm, %, g /GJ, mg/m³, mg/kW
Itemp	Instrument temperature	°C, °F
DP	Flue gas dewpoint temperature	°C, °F
ΔP2	Differential pressure (200 hPa)	mbar, hPa, Pa
GasFI	Gas flow rate	m³/h, l/min
GasP	Gas burner output	kW
OilFI	Oil flow rate	kg/h
Oil p	Oil pressure	bar
OilP	Oil burner output	kW
Pabs	Absolute pressure	hPa, mbar, Pa, mmWS, inW, psi, inHG
Pump	Pump output	l/min
ΔP1	Differential pressure (40 hPa)	mbar, hPa, Pa, mmWS, inW, psi, inHG
Speed	Flow speed	m/s, fpm
Flow	Airflow	m³/s, m³/m, m³/h, m³/T, m³/J, f³/s, f³/m, f³/h, f³/d, f³/y, l/min

Display	Parameter	Units
MCO, MNOx, MSO2	Mass flow	kg/h, kg/T, t/T, t/J, lb/h
H2	Hydrogen	ppm

Calling up the function

>  → **Inst. settings** → **OK** → **Display edit** → **OK**.

Setting the display format

> Select **values on disp large** or **values on disp small** → **OK**.

Changing parameters and units

- 1 Select the display position.
Options:
 - To insert a space: **Space**.
 - To delete a parameter: **Del**.
- 2 **Change** → Select parameter → **OK** → Select unit → **OK**.

Saving settings

> **OK Save input** → **OK**.

7.1.2 Printer

Configure the headers (lines 1-3) and the footer for the printout. To be able to transfer data to a report printer via the infrared interface, the selected printer must be enabled.

The following printers can be used with the testo 340:

- Infrared fast printer (order no.: 0554 0549)

Calling up the function

>  → **Inst. settings** → **OK** → **Printer** → **OK**.

Setting the printed text

- 1 **Print text** → **OK**.
- 2 Select **Line 1**, **Line 2**, **Line 3** or **Footnote** → **Change**.
- 3 Enter values → **OK Save input** → **OK**.
- 4 Repeat steps 2 and 3 for the other lines in the same way.

5 | **OK Save input** → **OK**.

Printer selection

> | **Select Printer** → **OK** → Select Printer → **OK**.

7.1.3 Start keys edit

Assignment of the function keys depends on the selected function. Only the function keys on the start screen (shown when the measuring instrument is switched on) can be assigned any function from the **Measurements** menu.

The function keys are only active if the required sensors are connected.

Calling up the function

> |  → **Inst. settings** → **OK** → **Start keys edit** → **OK**.

Assigning functions to the start keys

1 | Select function → Press the function key that is to be assigned the selected function.

2 | Repeat step 1 for the other function keys as required.

Saving settings

> | **OK Save input** → **OK**.

7.1.4 AutoOff

With the AutoOff function active, the instrument switches itself off automatically if no key is pressed after the set period of time.

Calling up the function

> |  → **Inst. settings** → **OK** → **AutoOff** → **OK**.

Switching AutoOff on and off

> | Select **Auto Off** → **Change** → select **On** or **Off** → **OK**.

Setting the AutoOff time

> | Select **Time** → **Change** → Set the value → **OK**.

7.1.5 Communication

Select interface IR/IrDA interface/Bluetooth®.

Calling up the function

>  → **Inst. settings** → **OK** → **Communication** → **OK**.

Set interface IR/IrDA interface/Bluetooth®:

> Select **IrDA** or **Bluetooth®** → **OK**.

7.1.6 Date/Time

The date and the time can be set.

Calling up the function

>  → **Inst. settings** → **OK** → **Date / Time** → **OK**.

Setting the date / time

> Select **Time** or **Date** → **Change** → Set the values → **OK**.

Saving settings

> **OK Save input** → **OK**.

7.1.7 Language

The menu language can be set.

Calling up the function

>  → **Geräteeinst.** → **OK** → **Sprache** → **OK**.

-or-

>  → **Inst. settings** → **OK** → **Language** → **OK**.

Setting the language

> Select **Deutsch** or **Englisch** → **OK**.

-or-

> Select **German** or **English** → **OK**.

7.1.8 Dilution settings

The dilution of the measurement gas can be set.

Calling up the function

>  → **Inst. settings** → **OK** → **Dilution settings** → **OK**.

Setting automatic dilution

Automatic dilution is enabled to protect the sensors against overload if threshold values are exceeded. Threshold values can be set for the available sensors. See the section Sensor settings.



When the instrument is switched on (without the mains plug connected), **Automatic dilution** is always selected as the default setting.

When the instrument is switched on with the mains plug connected, the preset dilution setting is retained.

Functionality with automatic dilution

Automatic measuring range extension	Slot 3 or slot 4	Slot 2
testo 340 without the option for dilution of all sensors (only applicable to instruments with firmware versions prior to 1.14)	If a threshold value of a sensor in slot 3 or slot 4 is exceeded, the system is shut down.	If the reading of the sensor in slot 2 exceeds the threshold value set for it, the gas to sensor 2 is diluted by a factor of x5. (Single slot dilution)
testo 340 with the option for dilution of all sensors (all instruments with firmware version 1.14 and later*)	If a threshold value of a sensor in slot 3 or 4 is exceeded, the gas to all sensors, i.e. slots 1-4, is diluted by a factor of x2. (Dilution across all sensors)	
*) With firmware version 1.14, all testo 340 instruments can use dilution for all sensors (slots 1-4, factor x2) in addition to single slot dilution (slot 2, factor x5).		



If a threshold value is exceeded despite dilution, the gas pump switches off.

Select > **Automatic** → **OK**.



If **Manual 2x**, **5x** or **Dilution Off** is selected, the dilution value is fixed, there is no switching between the dilution factors.

Behaviour with fixed dilutions

Manual measuring range extension	Slot 3 or slot 4	Slot 2
Manual 5x (Permanent single slot dilution)	The gas to sensors 1, 3 and 4 remains undiluted.	The gas to sensor 2 is permanently diluted by a factor of 5x.
Manual 2x (Permanent dilution across all sensors)	The gas to sensors 1, 2, 3 and 4 is permanently diluted by a factor of 2x.	
Dilution Off (Permanent switch-off of dilution)	The gas to sensors 1, 2, 3 and 4 remains permanently undiluted.	



If a sensor threshold value is exceeded, the gas pump is switched off.

Setting permanent dilution across all sensors

- > Select **Manual 2x All** → **OK**.

Setting permanent single slot dilution

- > Select **Manual 5x (Slot 2)** → **OK**.

Switching dilution off

- > Select **Dilution Off** → **OK**.

Viewing measuring range information

The measuring range information depends on the available sensors.

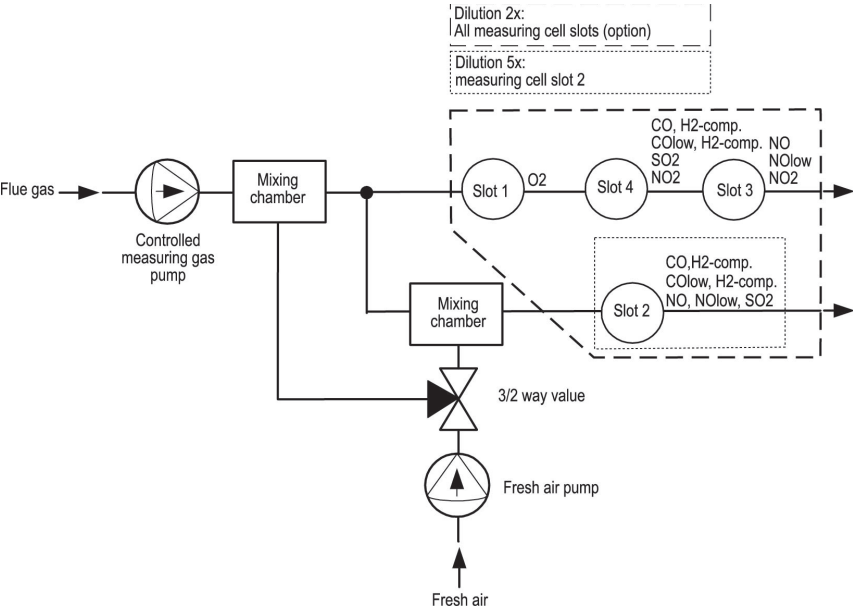
- > Select **Measuring ranges** → **OK**.



When dilution is enabled, the measurement value resolution and measuring accuracies change, see technical data.

The set dilution factor is shown on the analyzer display. Diluted values are represented inversely.

Gas path schematic of the testo 340:



Slot 1	Slot 2	Slot 3	Slot 4
O ₂	CO, H ₂ -comp.	NO	CO, H ₂ -comp.
	CO _{low} , H ₂ -comp.	NO _{low}	CO _{low} , H ₂ -comp.
	NO	NO ₂	SO ₂
	NO _{low}		NO ₂
	SO ₂		

7.2 Sensor settings

It is possible to set an NO₂ addition and thresholds for activating sensor protection (dilution/disconnect). The actual calibration data and the status of the sensors can be displayed. Recalibration can be carried out.

Calling up the function

>  → **Sensor settings** → **OK**.

Setting the NO₂ addition (as long as no NO₂ sensor is plugged in):

- 1 NO₂ addition.
Option:

1.1 | Reset NO2 addition to default value: **Deflt.**

2 | **Change** → Set the value → **OK**.

Setting sensor protection

To extend the measuring range and protect the sensors against overloads, you can set thresholds which, when exceeded, activate sensor protection. Thresholds for a variety of parameters can be set, depending on the sensors that are connected.

1 | **Sensor protection** → **OK**.

2 | Select the parameter.

2.1 | Reset selected parameter to default value:
Deflt.

3 | **Change** → Set the value → **OK**.

4 | Repeat steps 2 and 3 for the other parameters accordingly.

5 | **OK Save input** → **OK**.

Measurements with the CO (H₂-compensated) sensor



In order to protect the sensor and for a longer sensor life, we recommend that in the case of measurements with unexpectedly high CO concentrations (more than 1,000 ppm), the CO sensor is installed in slot 2, and that the threshold of the CO sensor protection is set to 1,000 ppm. From a CO concentration of 1,000 ppm, dilution with a factor of 5 is automatically activated. This setting can also be made if H₂ concentrations of more than 1,000 ppm are to be expected.

Display ppm/hour counter (active only when sensors with replaceable filters are used)

For sensors that use a replaceable chemical filter to neutralize interfering gases, a ppm hour counter is available.

This applies to:

- CO, H₂-comp. sensor (filter life approx. 170,000 ppmh)
- NO sensor (filter life approx. 120,000 ppmh)

1 | **ppm/hour counter** → **OK**.

2 Select sensors.

Options:

- Switch between the individual sensors: , .
- Display of max. filter life and current hour counter value.
- When maximum filter life is reached, information is displayed: **Filter material spent. Please exchange filter.**
- Reset hour counter of a sensor: **back**.

Displaying current calibration data/sensor status

> **Calibration data** → **OK**.

Options:

- To switch between the current calibration data of the individual sensors: , .
- To print out the current calibration data of all sensors: **Print**.
- To display the status of the sensor as a graphic: **Graphic**. - The status of the sensor is checked with every recalibration. Any deviation from the condition on delivery is indicated as a percentage. 70%-threshold: "Gas cell reading unstable, replace item recommended.", 50%-threshold: "Replacement sensor." The last 25 recalibrations are shown.
- To return to the display of the current calibration data: **Value**.

Recalibration

CO, H₂-comp., SO₂, NO₂, NO sensors and the O₂ reference value can be recalibrated. Measurement gas dilution in slot 2 can be recalibrated. If obviously unrealistic readings are displayed, the sensors should be checked and recalibrated as required.

WARNING

Dangerous gases!

Risk of poisoning!

- **Observe safety regulations/accident prevention regulations when handling test gases.**
- **Use test gases in well ventilated rooms only.**



Recalibration with low gas concentrations can lead to deviations in accuracy in the upper measuring ranges. Sensor protection is deactivated during recalibration. For this reason, the test gas concentration should be lower than the maximum value of the sensors. Recalibrating the sensor in slot 2 has an effect on the dilution: Always carry out a recalibration of measurement parameters before a recalibration of dilution.

The following conditions must be met when recalibrating:

- Use absorption-free tube material
- Switch the measuring instrument on at least 20 min before recalibration (warming-up)
- Use clean air for gas zeroing
- Charge the test gas via calibration adapter (0554 1205, recommended) or the tip of the probe
- Maximum overpressure of the test gas: 30 hPa (recommended: pressure-free via bypass)
- Charge the test gas for at least 3 min

Recommended test gas concentrations and compositions are given in Testo's field guide to test gases.

- 1 **Recalibration** → **OK**.
Possibly: Gas zeroing (30 s).
- 2 Select the parameter → **Change** → Enter the test gas concentration (nominal value).
- 3 Charge the analyzer with test gas.
- 4 Start the calibration: **Start**.

If the parameter of the sensor inserted in slot 2 has been selected:
- You will receive a query as to whether dilution should be initialized.
 - 4.1 Start recalibration of parameter: **No** → **Start**.
 - 4.2 Start recalibration of dilution: **Yes** → **Start**.
- 5 Accept the nominal value once the actual value is stable: **OK**.

7.3 Fuels

The fuel can be selected. The fuel-specific coefficients and ten fuels can be configured according to customer requirements.

Calling up the function

- >  → **Fuels** → **OK**.

Activating fuel

- > Select the fuel → **OK**.

Setting coefficients

- 1 **Coeff.**
Option:
 - 1.1 To reset all coefficients to default values: **Default values** → **OK**.
 - 1.2 To change the name of the fuel (only possible with customer-specific fuel): **Name** → **Change** → Set the values → **OK**.
- 2 Select the coefficient.
Option:
 - 2.1 To reset the selected coefficient to its default value: **Deflt.**
- 3 **Change** → **Set the value** → **OK**.
- 4 **OK Save input** → **OK**.



The calculation of the fuel factors is carried out via the testo easyEmission software.

8 Measuring

This chapter describes the measuring tasks that can be carried out with the product.



Familiarity with the contents of the **Operation** chapter is assumed.

8.1 Preparing measurements

8.1.1 Zeroing phases

Measuring the ambient air / combustion air temperature (AT)

If no combustion air temperature probe is connected, the temperature measured by the thermocouple of the flue gas probe or the connected external thermocouple at the probe socket during the zeroing phase is used as the ambient air / combustion air temperature. All dependent parameters are calculated using this value.



If an external thermocouple is connected at the probe socket, the flue gas probe or the external thermocouple should not be in the flue gas duct during the zeroing phase!

This method of measuring ambient air / combustion air temperature is sufficient for systems dependent on ambient air. However, the flue gas probe must be near the intake duct of the burner during the zeroing phase! Following the zeroing phase, the currently measured temperature is displayed as the flue gas temperature (FT). If an ambient air / combustion air temperature probe is connected, the ambient air / combustion air temperature is measured continuously via this probe.

Gas zeroing

The first time a gas measuring function is called up after the instrument has been switched on, the sensors are zeroed.



The flue gas probe can be in the flue gas duct even during the zeroing phase, if a separate combustion air temperature probe is plugged in.

Draught/pressure zeroing

The pressure sensors are zeroed when a pressure measuring function is called up.

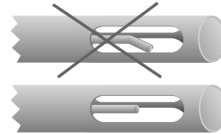


The pressure sockets must be free (i.e. depressurized, not closed) during the zeroing phase.

8.1.2 Using the modular flue gas probe

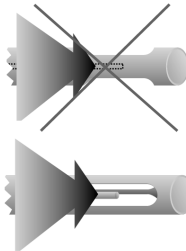
Checking the thermocouple

- ✓ The thermocouple of the flue gas probe must not be touching the probe cage.
- > Check before use. Bend the thermocouple back if necessary.

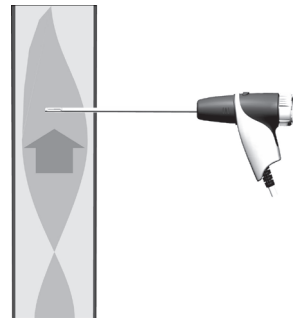


Align flue gas probe

- ✓ The thermocouple must be freely exposed to the flue gas flow.
- 1 Align the probe by turning it as required. The tip of the probe must be in the centre of the flue gas flow.



- 2 Align the flue gas probe in the flue gas duct so that the tip is situated in the centre of the flow (area of the highest flue gas temperature).



8.1.3 Configuring the reading display

Only those measurement parameters and units that are enabled in the reading display appear in the reading display, in the saved measurement reports and on the report printouts.

- > Before performing measurements, configure the reading display so that the required parameters and units are activated, see , **Display edit**.

8.1.4 Setting the location/fuel

- > Before carrying out measurements, the measurement location and the fuel must be correctly selected, see the sections **Location** and **Fuel**.

8.2 Measurements



Before starting the measurement, remove and set aside the fitted sealing cap on the probe tip of the flue gas sampling probe. The sealing cap is required for the gas path check (see section **Instrument diagnosis**).

8.2.1 Flue gas, Flue gas + m/s, Flue gas + Δp_2

The flue gas menus are the central measurement menus in which - in addition to the readings measured with this function - the readings of all measurements carried out are displayed (if this is selected in the **Display edit** menu). All readings can also be saved in or printed out from these menus.

The flue gas menus are always available, regardless of which probes/sensors are connected. Measuring functions of the three flue gas menus:

- The **Flue gas** function enables flue gas to be measured.
- The **Flue gas + m/s** function enables flue gas to be measured in addition to flow speed (+ air/mass flow calculation) by means of a Pitot tube (the connection cable for the straight Pitot tube thermocouple should not be connected to the instrument probe socket).
- The **Flue gas + Δp_2** function enables flue gas to be measured in addition to differential pressure.



After measurements with high concentrations and longer measurements, the instrument should be purged with fresh air in order to enable the sensors to regenerate, see the section **Recommended rinsing times**.



For flow speed measurement: Before beginning measurement, configure the location settings (Pitot tube factor and correction factor), see the section **Location**. Do not measure for longer than 5 min, as the drift of the pressure sensor means that the readings could be outside the tolerance limits.

Calling up the function

- > → **Measurements** → **OK** → **Flue gas** → **OK**.

or

- > → **Measurements** → **OK** → **Flue gas + m/s** → **OK**.

or

>  → **Measurements** → **OK** → **Flue gas + Δp_2** → **OK**.



Possibly: gas zeroing.

For the functions **Flue gas + m/s** and **Flue gas + Δp_2** : Depressurize the pressure sensor and carry out pressure zeroing with **V = 0**.

If no fuel has yet been selected:

> Select the fuel → **OK**.

Measuring

- 1 Start measuring: **Start**.
- ▶ The readings are displayed.
- 1.1 Option: Interrupt measurement and purge sensors: **Air**
Continue measurement: **Gas**.
- 2 Stop measuring: **Stop**.
- 3 To print readings: **Print**.
- 3.1 To save readings: **Save**.



The readings from the flue gas measurement, as well as any readings taken over into the Flue Gas menu from other measurement functions are stored and/or printed in a measurement report (automatic burner control data is not printed).

8.2.2 Program

Five flue gas measuring programs can be set, saved and run.

Calling up the function

>  → **Measurements** → **OK** → **Program** → **OK**.

Changing a measuring program

- 1 Select the program → **Change**.
- 2 **Meas rate** → **Change** → Enter the values → **OK**.
- 3 Repeat step 2 for the other criteria accordingly.

- 4 | **OK Save input** → **OK**.

Running a measurement program

- 1 | Select the program → **Start**.
- 2 | Select **Start without zeroing** (only available if gas zeroing has already been carried out) or **Start with zeroing** and start the program with **OK**.
 - ▶ If selected: Gas zeroing (32 s).
 - ▶ Stabilization phase (60 s).
 - ▶ The program will run and then stop after the programmed time.
- 3 | To print readings: **Print**.
- 3.1 | To save readings: **Save**.

8.2.3 Draught

The **Draught** function is only available when a flue gas probe is connected.



Do not measure for longer than 5 min, as the drift of the pressure sensor means that the readings could be outside the tolerance limits.

Calling up the function

- >  → **Measurements** → **OK** → **Draught** → **OK**.

Measuring

- 1 | Start measuring: **Start**.
 - ▶ Draught zeroing (5 s).
- 2 | Position the flue gas probe in the centre of the flow (area of the highest flue gas temperature). The display showing the maximum measured flue gas temperature (FT) helps when positioning the probe.
 - ▶ The reading is displayed.
- 3 | Stop measuring: **Stop**.
 - ▶ The reading is recorded.

- 3.1 | To print readings: **Print**.
- 4 | To copy the reading to the **Flue gas** menu: **OK**.
- ▶ The **Measurements** menu is opened.

8.2.4 Smoke# / HCT

Calling up the function

- >  → **Measurements** → **OK** → **Smoke#/HCT** → **OK**.

Recording smoke tester no. / smoke numbers / oil derivative with the smoke pump and manual input

The function is only available if the chosen fuel is an oil.

- 1 | **Sm. tester no.** → **Change** → Enter the tester number → **OK**.
- 2 | **Smoke # 1** → **Change** → Enter the value → **OK**.
- 3 | Repeat step 2 for the other smoke # and the oil derivative accordingly.

Entering the heat carrier temperature

- > **Heat carrier** → **Change** → Enter the value → **OK**.

Copying values to the Flue gas menu



The values are not shown on the instrument's display. In the **Flue gas** menu, they can be stored and/or printed in a measurement report together with the readings from a flue gas measurement, or transferred to a PC.

- > **OK Copy readings** → **OK**.
- ▶ The **Measurements** menu is opened.

8.2.5 Gas flow rate

The **Gas flow rate** function is only available if the activated fuel is a gas.

Calling up the function

- >  → **Measurements** → **OK** → **Gas flow rate** → **OK**.

Measuring

- 1 Enter the measurement period: **Sample time** → **Change** → Enter the value (**18**, **36** or **180** seconds) → **OK**.
- 2 Start measuring: **Start**. Note the counter status of the gas counter.
 - ▶ The remaining measurement period is displayed.
 - ▶ The last 5 seconds are indicated by a short beep. The end of the measurement period is indicated by a long beep.
- 3 Enter the flow rate: **Gasflow** → Enter the value → **OK**.
 - ▶ The calculated gas burner output is displayed.
- 4 Copy the values to the **Flue gas** menu: **OK Copy readings** → **OK**.
 - ▶ The **Measurements** menu is opened.

8.2.6 Oil flow rate

The **Oil flow rate** function is only available if the activated fuel is an oil.

Calling up the function

-  → **Measurements** → **OK** → **Oil flow rate** → **OK**.

Measuring

- 1 Enter the flow rate: **Flowrate** → **Change** → Enter the value → **OK**.
- 2 Enter the oil pressure: **Oil pressure** → **Change** → Enter the value → **OK**.
 - ▶ The calculated oil burner output is displayed.
- 3 Copy the values to the **Flue gas** menu: **OK Copy readings** → **OK**.
 - ▶ The **Measurements** menu is opened.

8.2.7 m/s



A Pitot tube must be connected, the connection cable for the Pitot tube thermocouple must be connected to the instrument probe socket.

To measure flow speed, air flow and mass flow, the parameters cross-section shape, cross-section surface area, Pitot factor and offset/correction factor must be set, see **Location**.



Do not measure for longer than 5 min, as the drift of the pressure sensor means that the readings could be outside the tolerance limits.

Calling up the function

>  → **Measurements** → **OK** → **m/s** → **OK**.

Measuring

- 1 | Start measuring: **Start**.
 - ▶ Pressure zeroing (5 s).
- 2 | Position the Pitot tube in the duct. The display showing the measured flow velocity (Speed) helps when positioning the probe.
 - ▶ The reading is displayed.
- 3 | Stop measuring: **Stop**.
 - ▶ The reading is recorded.
- 3.1 | To print readings: **Print**.
 - 4 | Accept the reading: **OK**.
 - ▶ The **Measurements** menu is opened.

8.2.8 Δp_2



Do not measure for longer than 5 min, as the drift of the pressure sensor means that the readings could be outside the tolerance limits.

When measuring the gas flow pressure of gas heaters:



Dangerous mixture of gases.

Risk of explosion!

- Make sure there are no leaks between the sampling point and the measuring instrument.
 - Do not smoke or use naked flames during the measurement.
-

Calling up the function

>  → **Measurements** → **OK** → **Δp2** → **OK**.

Measuring

- 1 | Start measuring: **Start**.
 - ▶ Pressure zeroing (5 s).
- 2 | Position the Pitot tube in the duct.
- 3 | Stop measuring: **Stop**.
 - ▶ The reading is recorded.
- 3.1 | To print readings: **Print**.
 - 4 | Accept the reading: **OK**.
 - ▶ The **Measurements** menu is opened.

9 Transferring data

9.1 Report printer

To be able to transmit data to a Testo report printer via the infrared interface, the printer to be used must be activated, see **Printer**.

Data is printed out via the function key . The function is only available if a printout is possible.

10 Maintenance and care

This chapter describes the steps and action required in order to keep the product functioning properly. See also **Regular care**.

10.1 Cleaning the measuring instrument

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



Use distilled water or a weak solvent to clean the flue gas analyzer.

IMPORTANT

Leaking solvents and degreasers!

Damage to the instrument and sensors!

The following substances can damage the instrument or the sensors:

- Solvent-containing vapours such as those contained in cleaning agents, degreasers, wax polishes and adhesives
- Formaldehyde

Do not store cleaning cloths, solvents and degreasers in the case.



The use of strong or harsh alcohol or brake cleaner can result in damage to the instrument.

10.2 Replacing sensors



Acid in the sensors!

May cause chemical burns!

Do not open the sensors.

Always wear gloves when changing a sensor.

Eye contact: Rinse the affected eye thoroughly under running water for 10 minutes, keeping the eyelids wide open and protecting the unaffected eye.

Remove contact lenses wherever possible.



A slot bridge (0192 1552) must be inserted in slots which are not equipped with a sensor. Used sensors must be disposed of as hazardous waste!

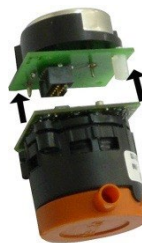
- ✓ The latest instrument software must be installed on the measuring instrument, see the section **Updating the instrument software**.
- ✓ The measuring instrument must be switched off and the mains unit disconnected from the mains supply.
- 1 Place the measuring instrument face down.
- 2 Loosen screws using a Phillips screwdriver, release clip in the direction of the arrow and remove the service cover.
- 3 Pull the hose connections off the faulty sensor/bridge.
- 4 Remove the faulty sensor/bridge from the slot.



Do not remove auxiliary circuit boards of the new sensors until immediately before installation. Do not leave the sensors without auxiliary circuit boards for longer than 15 min.

- 4.1 O₂ LL / NO / NOlow sensors: Remove auxiliary circuit board.

- 5 Install new sensor/bridge in the slot.



- 6 Attach the hose connections to the sensor / bridge.
- 7 Replace and close service cover (clip must click into place), fasten with screws.
- 8 Switch the instrument on.



After replacing an O₂ sensor, wait 15 minutes for acclimatization before using the instrument (establishment of the supply voltage and initial stabilization phase for new sensors).

When retrofitting a sensor, the associated measurement parameter and unit of measurement must be activated, see **Display edit**.

When replacing an O₂ sensor and when there is an interruption of the power supply for more than 10 hours, we recommend an acclimatization time of 1 hour for compliance with measuring accuracy.

10.3 Replacing the filter for CO, H₂-comp. and NO sensors

The measuring instrument must be switched off and the mains unit disconnected from the mains supply.

- 1 Place the measuring instrument face down.
- 2 Loosen screws using a Phillips screwdriver, release clip in the direction of the arrow and remove the service cover.
- 3 Pull the hose connections off the sensor.
- 4 Remove the sensor from the slot.
- 5 Remove the used filter from the sensor.

- 6 Plug the new filter on the sensor.



Avoid touching the sensor electronics. Follow the marking on the filter and the sensor.



- 7 Insert the sensor in the slot.
- 8 Attach the hose connections to the sensor.
- 9 Replace and close service cover (clip must click into place), fasten with screws.
- 10 Reset ppm hour counter, see **Display ppm/hour counter**.

10.4 Recalibrating sensors

See **Sensor settings**.

10.5 Cleaning the modular flue gas probe



Detach the flue gas probe from the measuring instrument before cleaning.

- 1 Release probe catch by pressing the key on the probe handle and remove probe module.
- 1.1 Probe shafts with pre-filter: unscrew the pre-filter.
- 2 Blow compressed air through flue gas ducts of the probe module and probe handle (see illustration). Do not use a brush!



- 2.1 | Probe shafts with pre-filter: blow compressed air through the pre-filter. For thorough cleaning, use an ultrasonic bath or a cleaner for dentures. Screw the pre-filter back on to the probe shaft after cleaning.
- 3 | Fit probe module onto the probe handle and click into place.

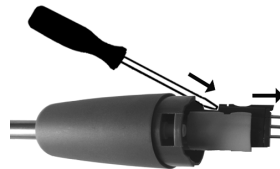
10.6 Replacing the probe pre-filter

On probe modules with pre-filter the pre-filter can be replaced.

- > | Unscrew the pre-filter from the probe shaft and screw on a new filter.

10.7 Replacing the thermocouple

- 1 | Release probe catch by pressing the key on the probe handle and remove probe module.
- 2 | Remove thermocouple plug-in head from the socket using a screwdriver and pull thermocouple out of the probe shaft.
- 3 | Insert new thermocouple into the probe shaft until the plug-in head clicks into place.
- 4 | Fit probe module onto the probe handle and click into place.



11 Questions and answers

This chapter gives answers to frequently asked questions.

Question	Possible causes	Remedy
Measuring instrument keeps switching itself off or will not switch on.	AutoOff function is switched on.	Switch AutoOff function off, see AutoOff .
	Battery spent.	Charge the battery or connect the mains unit, see Operation .
Measuring instrument will not switch on.	Battery spent.	Charge the battery or connect the mains unit, see Operation .
Displayed battery capacity seems to be faulty	Battery was repeatedly not fully discharged/charged.	Fully discharge the battery (until measuring instrument switches off automatically) and then charge fully.
Error message: Pump flow rate too high	Gas outlet is blocked.	Make sure that the gas outlet is clear.
Error message: Sensor protection active	The switch-off threshold of a sensor has been exceeded	Remove the probe from the flue.
Error message: Printing not possible	Wrong printer activated.	Activate the correct printer, see Printer .
	Printer is switched off.	Switch printer on.
	Printer is out of wireless range.	Move printer into wireless range.

If we could not answer your question, please contact your dealer or Testo Customer Service. See the back of this document or the www.testo.com/service-contact web page for contact details.

12 Technical data

12.1 Standards and tests

- As declared in the certificate of conformity, this product complies with the requirements of Directive 2014/30/EU
- This product has been TÜV-tested in accordance with EN 50379 Part 2, with the following exceptions: The measurement parameters SO₂ and NO₂ have not been tested; recalibration is not blocked.

12.2 Measuring ranges and accuracies

Parameter	Measuring range	Accuracy	Resolution	t ₉₀ ¹
O ₂	0 to 25 vol. %	± 0.2 vol. %	0.01 vol. %	< 20 s
CO, H ₂ -comp.	0 to 10000 ppm	±10 ppm or ±10% of reading ¹ at 0 to 200 ppm ±20 ppm or ±5% of reading ¹ at 201 to 2000 ppm ±10% of reading at 2001 to 10000 ppm	1 ppm	< 40 s
CO _{low} , H ₂ -comp.	0 to 500 ppm	±2 ppm at 0.0 to 39.9 ppm ±5% of reading at 40.0 to 500 ppm	0.1 ppm	< 40 s
NO ₂	0 to 500 ppm	±10 ppm at 0 to 199 ppm ±5% of reading in rest of range	0.1 ppm	< 40 s
SO ₂	0 to 5000 ppm	±10 ppm at 0 to 99 ppm ±10% of reading in rest of range	1 ppm	< 40 s
NO _{low}	0 to 300 ppm	±2 ppm at 0.0 to 39.9 ppm ±5% of reading at 40.0 to 300.0 ppm	0.1 ppm	< 30 s

¹ Response time 90%, recommended minimum measurement duration to guarantee correct readings: 3 min.

Parameter	Measuring range	Accuracy	Resolution	t ₉₀ ¹
NO	0 to 4000 ppm	±5 ppm at 0 to 99 ppm ±5% of reading at 100 to 1999 ppm ±10% of m.v. at 2000 to 4000 ppm	1 ppm	< 30 s
Draught, Δp1	-40 to 40 hPa	+0.03 hPa (-2.99 to +2.99 hPa) +1.5 % of reading (remaining measuring range)	0.01 hPa	-
Δp2	-200 to 200 hPa	±0.5 hPa (-49,9 to +49,9 hPa) ±1.5% of m.v. (remaining measuring range)	0.1 hPa	-
P abs	600 to 1150 hPa	±10 hPa	1 hPa	
Temperature (NiCrNi)	-40 to 1200 °C	±0.5 °C at 0.0 to 99 °C ±0.5% of reading in rest of range	0.1 °C at -40.0 to 999.9 °C 0.1 °C at 1000 to 1200 °C	Probe-dependent
Efficiency	0 to 120%	-	0.1%	-
Flue gas loss	0 to 99.9%	-	0.1%	-
Flue gas dew point	0 to 99.9 °C	-	0.1%	-
CO ₂ determination (Calculation from O ₂)	0 to CO ₂ max.	±0.2 vol.%	0.1 vol%	<40 s

For activated single dilution slot 2 (factor 5)

Parameter	Measuring range	Accuracy	Resolution
CO, H ₂ -comp.	700 to 50000 ppm	+10% of reading (additional error)	1 ppm
CO _{low} , H ₂ -comp.	300 to 2500 ppm	+10% of reading (additional error)	0.1 ppm
SO ₂	500 to 25000 ppm	+10% of reading (additional error)	1 ppm
NO	500 to 20000 ppm	+10% of reading (additional error)	1 ppm
NO _{low}	150 to 1500 ppm	+10% of reading (additional error)	0.1 ppm

With activated dilution of all sensors (factor 2)

Parameter	Measuring range	Accuracy	Resolution	t90 ²
O ₂	0 to 25 vol. %	±1 vol. % additional error (0 to 4.99 vol. %) ±0.5 vol. % additional error (5 to 25 vol. %)	0.01 vol. %	< 20 s
CO, H ₂ -comp.	700 to 20000 ppm	+10% of reading (additional error)	1 ppm	-
CO _{low} , H ₂ -comp.	300 to 1000 ppm	+10% of reading (additional error)	0.1 ppm	-
NO ₂	200 to 1000 ppm	+10% of reading (additional error)	0.1 ppm	-
SO ₂	500 to 10000 ppm	+10% of reading (additional error)	1 ppm	-
NO	500 to 8,000 ppm	+10% of reading (additional error)	1 ppm	-
NO _{low}	150 to 600 ppm	+10% of reading (additional error)	0.1 ppm	-

Filter lifetime

Parameter	Measuring range
CO, H ₂ -comp.	170000 ppmh
NO	120000 ppmh

12.3 Other instrument data

Feature	Values
Temperature measurement range	-40 to 1200 °C
Operating temperature	-5 to 45 °C
Storage/transport temperature	-20 to 50 °C
Ambient humidity	0 to 90 %RH, non-condensing
Power supply	Battery pack: 3.7 V/2.4 Ah Mains unit: 6.3 V / 2 A
Dimensions (L x W x H)	283 x 103 x 65 mm
Weight	960 g
Memory	max. 100 folders, max. 10 locations per folder
Display	Monochrome, 4 grey levels, 160 x 240 pixels

² Response time 90%, recommended minimum measurement duration to guarantee correct readings: 3 min.

Feature	Values
Rechargeable battery storage temperature	± 0 to 35 °C
Rechargeable battery life	> 6 h (pump on, display light off, 20 °C ambient temperature)
Pump performance against x hPa	Max. positive pressure at probe tip: +50 mbar Max. negative pressure at probe tip: -200 mbar
Initialization and zeroing time	30 sec
Battery charge time	approx. 5-6 h
Battery charging temperature	± 0 to 35 °C
Protection class	IP 40, for indoor use
Level of contamination	PD2
Operating altitude	≤ 2000 m
EU Directive	2014/30/EU, 2014/53/EU

12.4 EU declaration of conformity, authorizations and certification

Testo SE & Co. KGaA hereby declares that the testo 340 (0632 3340) complies with Directive 2014/53/EU.

The full text of the EU Declaration of Conformity can be found on the following website: <https://www.testo.com/eu-conformity>.

12.5 Principles of calculation

12.5.1 Fuel parameters

Fuel	A2 ¹	B ¹	CO ₂ max ²	O ₂ ref ²	V _{AGtrMin} ¹	V _{LMin} ¹
Natural gas	0.6600	0.0090	11.9 vol. %	3 vol. %	8.36	9.12
Light oil	0.6800	0.0070	15.4 vol. %	3 vol. %	10.53	11.26
Heavy oil	0.8060	0.0000	15.9 vol. %	3 vol. %	10.09	10.73
LPG	0.6300	0.0080	13.7 vol. %	3 vol. %	23.80	25.95
Coke	0.7650	0.0000	20.3 vol. %	13 vol. %	7.64	7.66
Pellets	0.6200	0.0081	20.3 vol. %	13 vol. %	4.07	4.13
Briquettes	0.8330	0.0000	18.9 vol. %	8 vol. %	5.08	5.20
Lignite	0.9550	0.0000	19.8 vol. %	8 vol. %	4.01	4.09
Hard coal	0.7580	0.0000	20.5 vol. %	8 vol. %	7.81	7.82
Coke oven gas	0.6000	0.0110	10.3 vol. %	3 vol. %	3.86	4.28
Town gas	0.6300	0.0110	13.6 vol. %	3 vol. %	3.61	3.90
Diesel	0.6790	0.0069	15.5 vol. %	3 vol. %	10.35	11.17
Petrol	0.6530	0.0072	15.0 vol. %	3 vol. %	9.99	10.86

Fuel	A2 ¹	B ¹	CO ₂ max ²	O ₂ ref ²	V _{AGtrMin} ¹	V _{LMin} ¹
Test gas (span gas)	0.0000	0.000	0.00 vol. %	0 vol. %	0.00	0.00
Wood 15%	0.6860	0.0096	20.3 vol. %	13 vol. %	3.87	3.93
Wood 30%	0.6640	0.0118	20.3 vol. %	13 vol. %	3.19	3.24
Wood 45%	0.6340	0.0150	20.3 vol. %	13 vol. %	2.50	2.54
Wood 60%	0.5860	0.0199	20.3 vol. %	13 vol. %	1.82	1.85

¹ Fuel-specific factor

² Factory setting

12.5.2 Calculation formulae

Carbon dioxide:
$$CO_2 = \frac{CO_{2max} \times (O_{2ref} - O_2)}{O_{2ref}}$$

CO₂max: Fuel-specific carbon dioxide value

O₂ref: O₂ reference value (general)

O₂: Measured oxygen concentration in %

Flue gas loss:
$$q_A = ((FT - AT) \times \frac{A2}{O_{2ref} - O_2} + B) - K_k$$

AT: Ambient temperature (combustion air temperature)

A2 / B: Fuel-specific parameters

O₂ref: O₂ reference value (general)

O₂: Measured oxygen concentration in %

K_k: calculated value taking into account the recovered condensation heat when operating below the dewpoint (for condensing systems).

Efficiency:
$$\eta = 100 - q_A$$

q_A: calculated flue gas loss

Air ratio:
$$\lambda = 1 + \frac{V_{AGtrMin}}{V_{LMin}} \times \frac{O_2 - CO/2}{O_{2ref} - O_2 + CO/2}$$

V_{AGtrMin}: dry flue gas volume at stoichiometric combustion

V_{LMin}: air requirement for stoichiometric combustion of the fuel

O₂ref: O₂ reference value (general)

O₂: Measured oxygen concentration in %

Nitrogen oxides: No NO₂ sensor connected:

$$NO_x = NO + (NO_{2Add} \times NO)$$

NO₂ sensor connected:

$$NO_x = NO + NO_2$$

NO: Measured nitric oxide value

NO_{2Add}: Nitrogen dioxide addition factor

**Carbon monoxide
undiluted:**

$$u_{CO} = CO \times \lambda$$

CO: Measured carbon monoxide concentration

λ : Calculated excess air ratio

Flue gas dew point:
$$DP = \frac{\ln(F_{H2O} \times P_{Abs} / 610.78) \times 234.175}{\ln(F_{H2O} \times P_{Abs} / 610.78) - 17.08085}$$

F_{H2O} : Flue gas-specific water vapour content in vol. %

P_{Abs} : Absolute pressure in mbar/hPa

Flow speed:
$$v = \sqrt{\frac{575 \times \Delta P \times (FT + 273.15)}{P_{Abs}}} \times \alpha$$

P_{Abs} : Absolute pressure

ΔP : Differential pressure

FT : Flue gas temperature

α : Pitot tube factor

Air flow:
$$V = v \times a$$

v : Flow velocity

a : Cross-sectional area

Mass flow:

Mass flow CO:
$$MCO = CO \text{ [kg/h]} \text{ [ppm]} \times F_{Gas} \times 1.25 \text{ [kg/m}^3\text{]} \times Z$$

Mass flow NO_x:
$$MNO_x = NO_x \text{ [kg/h]} \text{ [ppm]} \times F_{Gas} \times 2.05 \text{ [kg/m}^3\text{]} \times Z$$

Mass flow SO₂:
$$MSO_2 = SO_2 \text{ [kg/h]} \text{ [ppm]} \times F_{Gas} \times 2.86 \text{ [kg/m}^3\text{]} \times Z$$

F_{Gas} : Fuel-specific humidity value

T : Dewpoint

Z : Calculation term (see below)

Calculation term Z:
$$Z = \frac{273.15 \times P_{Abs} \text{ [mbar]}}{273.15 + T \text{ [}^\circ\text{C]} \times 1013} \times V \text{ [m}^3\text{/s]} \times 10^{-6} \text{ [1/ppm]} \times 3600$$

Conversion from ppm to mg/Nm³



The numerical factor used in the formulas (e.g. 1.25 for CO) corresponds to the standard density of the respective gas in mg/m³. Please note:

- For SO₂, standard density values in the range of 2.86 to 2.93 are stated in the literature (difference between ideal and real gas behaviour of SO₂)
- For NO_x, the standard density of NO₂ (2.05) is used, since only this compound is stable (NO rapidly combines with oxygen after formation to produce NO₂)

Carbon monoxide:
$$CO \text{ [mg/Nm}^3\text{]} = \frac{O_{2ref} - O_{2Bez}}{O_{2ref} - O_2} \times CO \text{ [ppm]} \times 1.25$$

Nitrogen oxides:
$$\text{NO}_x [\text{mg}/\text{Nm}^3] = \frac{O_{2\text{ref}} - O_{2\text{Bez}}}{O_{2\text{ref}} - O_2} \times \text{NO}_x [\text{ppm}] \times 2.05$$

Sulphur dioxide:
$$\text{SO}_2 [\text{mg}/\text{Nm}^3] = \frac{O_{2\text{ref}} - O_{2\text{Bez}}}{O_{2\text{ref}} - O_2} \times \text{SO}_2 [\text{ppm}] \times 2.86$$

$O_{2\text{ref}}$: O_2 reference value (general)

O_2 : Measured oxygen concentration in %

$O_{2\text{Bez}}$: Fuel-specific oxygen reference index in %

13 Accessories

Description	Order no.
Modular flue gas probes	
Modular flue gas probe 335 mm, 500 °C, thermocouple 0.8 mm	0600 9766
Modular flue gas probe 700 mm, 500 °C, thermocouple 0.8 mm	0600 9767
Modular flue gas probe 335 mm, 1000 °C, thermocouple 0.8 mm	0600 8764
Modular flue gas probe 700 mm, 1000 °C, thermocouple 0.8 mm	0600 8765
Modular flue gas probe with pre-filter 335 mm, 1000 °C, thermocouple 0.8 mm	0600 8766
Modular flue gas probe with pre-filter 700 mm, 1000 °C, thermocouple 0.8 mm	0600 8767
Probe modules/accessories for modular flue gas probes	
Probe shaft module 700 mm, 500 °C, thermocouple 0.8 mm	On request
Probe shaft module 335 mm, 1000 °C, thermocouple 0.8 mm	0554 8764
Probe shaft module 700 mm, 1000 °C, thermocouple 0.8 mm	0554 8765
Probe shaft module with pre-filter 335 mm, 1000 °C, thermocouple 0.8 mm	On request
Probe shaft module with pre-filter 700 mm, 1000 °C, thermocouple 0.8 mm	On request
Extension lead 2.8 m	0554 1202
Particle filter, 10 pcs.	0554 3385
Replacement pre-filter for modular flue gas probe with pre-filter (2 pcs.)	0554 3372
Industry engine probe	
Engine probe without pre-filter	0600 7555
Engine probe with pre-filter	0600 7556
Spare probe shaft for engine probe with pre-filter	On request
Thermocouple, Tmax. 1000 °C	0600 8898
Other probes	
Pitot tube, 350 mm	0635 2145
Pitot tube, 1000 mm	0635 2345
Pitot tube, 750 mm, including temperature measurement and heat protection plate	0635 2042

Description	Order no.
Connection hose, silicone, length 5 m, maximum load capacity 700 hPa (mbar)	0554 0440
Combustion air temperature (AT) probe, 60 mm	0600 9797
Retrofit sensors	
NO _{low} retrofit sensor	0554 2152
NO retrofit sensor	0554 2150
CO _{low} , H ₂ -comp. retrofit sensor	0554 2102
CO, H ₂ -comp. retrofit sensor	0554 2100
NO ₂ retrofit sensor	0554 2200
SO ₂ retrofit sensor	0554 2250
Replacement sensors	
O ₂ LL	0393 0012
O ₂ sensor	0393 0000
CO, H ₂ -comp. sensor	0393 0100
NO _{low} sensor	0393 0152
NO sensor	0393 0150
NO ₂ sensor	0393 0200
SO ₂ sensor	0393 0250
CO _{low} , H ₂ -comp. sensor	0393 0102
Replacement filters	
CO, H ₂ -comp. sensor	0554 4100
NO sensor	0554 4150
Other retrofits	
Bluetooth	only retrofittable by testo Service
Other accessories	
Infrared fast printer	0554 0549
Spare thermal paper for printer (6 rolls)	0554 0568
Mains unit for testo 340	0554 1096
Charger with spare rechargeable battery	0554 1103
Spare rechargeable battery	0515 0100
testo EasyEmission PC configuration software	0554 3334
Transport case	0516 3340
External sample gas conditioner	0554 3501



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