testo 330i · Flue gas measuring instrument

testo 330i LX · Flue gas measuring instrument

Instruction manual

Register your Testo product and receive a one-year free warranty extension.

The product registration is valid for 30 days after purchase.

1 Contents

2 Safety and the environment

Please note the information in the document **Commissioning and Safety** (printed version supplied with the product). Make sure that all product users read and observe the safety information!

2.1. Product-specific safety instructions

CAUTION

Acid in the sensors.

May cause chemical burns.

> Do not open the sensors.
> 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

Acid 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.

3 Use

The **testo 330i** / **testo 330i LX** is a flue gas measuring instrument which in combination with a separate Android or iOS mobile device and the **testo 330i** App enables professional flue gas analysis of combustion systems:

- Small combustion systems (oil, gas, wood, coal)
- Low-temperature and condensing boilers
- Gas water heaters

These systems can be adjusted using the instrument and checked for compliance with the applicable limit values.

The instrument has been verified as a short-term measuring instrument and should not be used as a safety (alarm) instrument.

The following tasks can also be carried out using the instrument:

- Regulating the O_2, CO and CO_2, NO, NO_x values in furnaces for the purpose of ensuring optimal operation.
- Draught measurement.
- Measuring and regulating the gas flow pressure in gas water heaters.
- Measuring and optimising the flow and return temperatures of heating systems.
- Ambient measurement - CO and CO_2.
- Detection of CH_4 (methane) and C_3H_8 (propane).
- The instrument can be used for measurements on combined heat and power stations (CHP) in accordance with the first German Federal Immission Control Ordinance (BImSchV).
  - In principal, the CO sensor can also be used for measurements on CHP stations. If you should carry out more than 50 measurements on CHP stations per year, please contact your nearest Testo service centre or send the testo 330i to testo Service for inspection.

    A worn NO_x filter of the CO sensor can be ordered as a spare part (item no. 0554 4150) and replaced.

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 unauthorised third-party products. Competitor products are not authorised by Testo.
As is common practice, Testo generally excludes support, warranty or guarantee claims relating to functionality that has not been guaranteed by Testo as part of the product offered. Claims shall also be excluded in the event of improper use or handling of the products, e.g. in combination with unauthorised third-party products.

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 a country certification has been granted. The user and every owner has the obligation to adhere to these regulations and prerequisites for use, and acknowledges that the re-sale, export, import etc. in particular in countries without wireless permits, is his responsibility.

4 Product description

4.1. Measuring instrument

4.1.1. Overview

1 Retaining bracket: for attaching to the probe mount testofix®
2 Terminal panel left
3 Status LEDs:

LED	Display	Meaning
Blue	Off	Instrument off or not ready
	Flashes (0.05 s on/0.5 s off)	Instrument on, start up phase
	Flashes (0.5 s on/0.5 s off)	Instrument on, Bluetooth® Find Device activated
	Light is constant	Instrument on, Bluetooth® connection activated
Red	Flashes (0.05 s on/0.5 s off)	Device error
	Flashes (0.5 s on/0.5 s off)	Mains unit plugged in, battery charging
	Light is constant	Mains unit plugged in, battery fully charged

4 ON/OFF button
5 Condensate container, condensate outlet plug
6 Terminal panel right

7. Magnetic holder (on rear)

WARNING

Magnetic field

May be harmful to those with pacemakers.

> Keep a minimum distance of 15 cm between pacemaker and instrument.

ATTENTION

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. Terminal panel left/right

1 USB interface
2 Minus connection for differential pressure measurement
3 Mains unit socket
4 Flue gas socket
5 Probe socket

4.2. Modular flue gas probe

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

5 First steps

5.1. Commissioning

Please note the information in the document **Commissioning and Safety** (printed version supplied with the product).

5.2. Getting to know the product

5.2.1. Connecting probes

> Always connect the probes to the flue gas socket or probe socket before switching on the measuring instrument; switch the measuring instrument off and restart after replacing a probe.

Connecting flue gas probes/gas pressure adapters/temperature adapters

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

> There must be no more than one extension lead (0554 1201) between measuring instrument and flue gas probe.

Connecting other probes

> Insert the connector plug of the probe into the probe socket.

5.2.2. Mains unit/rechargeable battery

If the mains unit is connected, the measuring instrument is automatically powered from the unit.

5.2.2.1. 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.

1. Connect the instrument plug of the mains unit to the mains unit socket on the measuring instrument.

2. Plug the mains plug of the mains unit into a mains socket.
- The charging process starts (red LED flashes: 0.5 s on/0.5 s off).
- The charging process stops automatically when the battery is charged (red LED is constant).

Rechargeable battery care

- Do not fully exhaust rechargeable batteries.
- Store rechargeable batteries only if charged and at low temperatures, but not below 0 °C. The best storage conditions are with a charge level of 30-70% and an ambient temperature of 0-15 °C. Fully charge before using again.
- Optimal charging temperature at 20 °C ambient temperature.
- Trickle charging should not exceed 2 days.

5.2.2.2. Mains operation

1. Connect the instrument plug of the mains unit to the mains unit socket on the measuring instrument.
2. Plug the mains plug of the mains unit into a mains socket.
- The measuring instrument is powered via the mains unit.
- If the measuring 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.

5.2.3. Switching on and connecting with a mobile terminal device

✓ The **testo 330i** App must be installed on your mobile terminal device. Please note the information in the document **Commissioning and Safety** (printed version supplied with the product).

1. Switch on the measuring instrument: Press the ⏻ key.
- Measuring instrument starts up: The blue LED flashes (0.05 s on/0.5 s off).
- Connecting mode is activated: The blue LED flashes (0.5 s on/0.5 s off).
2. Switch on the mobile terminal device.

3. Start up the **testo 330i** App on your mobile terminal device.

- The **Find device** function is activated: Any compatible devices within radio range are displayed (product name + last 4 digits of the device serial number).

> Tap instrument designation to select an instrument.

- It may take around 30 s to establish the connection.
- A Bluetooth® connection is established: The blue LED is constant.

If it is not possible to establish a connection, various corrective measures are displayed. If you are unable to implement these successfully, please refer to the section **Tips and assistance** and/ or contact your dealer or Testo Customer Service.

- Measurement type **Flue Gas** screen is displayed.

5.2.4. Switching off

Measuring values that have not been saved are lost when the measuring instrument is switched off.

> Switch off the measuring instrument: Press the key.

- This may happen: the pump starts and the sensors are rinsed until the switch-off thresholds (O_2 > 20%, other measurement parameters < 50 ppm) are reached. The maximum rinsing period is 3 minutes.
- The measuring instrument switches off.

5.2.5. Using the App

Make sure you are familiar with how your mobile terminal device works before using the App; observe the documentation for your mobile terminal device.

Actions are mainly carried out by touching an icon, a symbol, or a name.

User interface

1 : Open the **Measurement Types** selection list

2 : Open/close the **Menu** selection list

3 : Open the **Fuels** selection list

4 Select reading display type

5 : Open the **Options** selection list

6 Start/stop measurement

7 : Open the **Protocols** selection list

Please also take note of the tutorial in the App under | **Help** | **Tutorial**.

6 Using the product

6.1. Performing settings

6.1.1. Configuring measurements

The measurement parameters/units and the number and order of displayed measurement parameters in the reading display type can be set in the **List**.

Only those parameters and units that are enabled in the reading display appear in the measured value display, in the saved measurement records and on the record printouts.

The settings only apply to the measurement type currently activated.

Overview of measurement parameters (available selection depends on the chosen measurement type, set fuel, and the sensors available in the measuring instrument):

Display	Measurement parameter
FT	Flue gas temperature
AT	Combustion air temperature
Itemp	Instrument temperature
Pump	Pumping capacity
O_2	Oxygen
CO_2	Carbon dioxide
qAnet	Flue gas loss without due consideration of the calorific value range
Effn	Efficiency without consideration of the heat value range
qAgr.	Flue gas loss with due consideration of the calorific value range
Effg	Efficiency with due consideration of the calorific value range
Draught	Flue draught
ΔP	Differential pressure
CO	Carbon monoxide
uCO	Carbon monoxide undiluted
NO	Nitrogen monoxide

Display	Measurement parameter
NO_x	Nitrogen oxide
λ	Fuel-air ratio
AmbCO	Ambient carbon monoxide
O_2ref	Oxygen reference
Dew Pt	Flue gas dewpoint temperature

Performing actions

> To add a measurement parameter to the display list: Touch **Add** to open the selection list of measurement parameters.

> To delete a measurement parameter from the display list: Touch  .

> Change the unit of a measurement parameter: Touch the measurement parameter name to open the selection list of measurement units.

> To change the position of a measurement parameter in the display list:  press down and drag.

> To accept changes: Touch **Confirm**.

6.1.2. Graphics

In the graphics reading display type, the reading progress can be displayed as a line diagram.

A maximum of 4 measurement parameters can be set at any one time. Only those measurement parameters/units can be displayed that are available in the reading display type **List**.

> Touch  to open the selection list of measurement parameters/units.

The first four measurement parameters from the **List** reading display type are used as the default setting for the graphics too.

6.1.3.  | Instrument settings | Language

The user interface language can be set.

The number of available languages depends on the activated country version.

6.1.4. | Instrument settings | Country version

The Country version configuration affects the measurement parameters, fuels, fuel parameters, and the basis of and formulas for calculations activated in the measurement box.

The country version setting affects the user screen languages that can be enabled.

6.1.5. | Instrument settings | Sensor diagnosis

The instrument displays the current status of the sensors.
If a sensor is worn out, the display reads: **Faulty**

> Replace the sensor

6.1.6. | Instrument settings | Sensor protection

Threshold values can be set to protect the CO/NO sensors against overload. The sensor protection is activated if the threshold is exceeded:

- Fresh air dilution if exceeded
- Shutdown if exceeded again

When dilution is activated, the CO and CO undiluted values are displayed in a blue font. On the printout, a "*" is shown after the name of both values to indicate dilution.

To disable sensor protection the threshold values must be set to 0 ppm.

6.1.7. | Instrument settings | O_2 reference

The O_2 reference value of the current fuel can be set.

6.1.8. | Instrument settings | O_2 addition

The NO_2 addition value can be set.

6.1.9. | Instrument settings | Height compensation

Extremely low absolute pressure causes wrong calculation of the O_2 sensor service life. Therefore, when the measuring instrument is used at great heights, the factory set value should be adjusted so that an O_2 sensor is not displayed prematurely as "expended".

If using the measuring instrument at heights up to approx. 1800 m above mean sea level (MSL), the factory setting (922 hPa, equals approx. 800 m above MSL) can be retained.

The value can be input directly (**Abs. pressure**), or is automatically calculated when entering the barometric pressure (**Barom. pressure**) and **Altitude**.

6.1.10. | Instrument settings | Switching the testo 330i off

It is possible to switch the testo 330i off via the mobile terminal device.

Measuring values that have not been saved are lost when the measuring instrument is switched off.

> Switch off the measuring instrument: tap **OK**.

- The following may happen: the pump starts and the sensors are rinsed until the switch-off thresholds (O_2 > 20%, other measurement parameters < 50 ppm) are reached. The maximum rinsing period is 3 minutes.

- The measuring instrument switches off.

6.2. Measuring

6.2.1. Preparing for measurement

6.2.1.1. Checking the condensate container fill level

Regularly check the fill level of the condensate container and empty it in good time; see Draining the condensate container, page **28**.

6.2.1.2. Checking the particle filter

Regularly check the particle filter of the flue gas probe for contamination and replace in good time; see Checking/replacing the particle filter, page **35**.

6.2.1.3. Zeroing phases

Measuring the combustion air temperature (AT)

If no combustion air temperature probe is connected, the temperature measured by the thermocouple of the flue gas probe during the zeroing phase is used as the combustion air temperature. All dependent parameters are calculated using this value. This method of measuring combustion air temperature is sufficient for systems dependent on ambient air. However, ensure that the flue gas probe is near the intake duct of the burner during the zeroing phase!

If a combustion air temperature probe is connected, the combustion air temperature is measured continuously via this probe.

Gas zeroing

The gas sensors are automatically zeroed when the instrument is switched on.

> To manually start zeroing of the gas sensors: | **Zeroing Gas Sensors**.

Draught/pressure zeroing

The pressure sensors are continuously zeroed.

The flue gas probe can be in the flue gas duct during the zeroing phase, if there is no overpressure in the duct and a separate AT probe is plugged in. The minus connection for differential pressure measurements must be clear (ambient pressure, not closed).

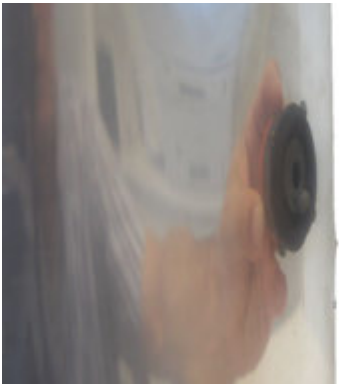
6.2.1.4. Performing a gas path check

Regularly check the measurement system (measuring instrument + flue gas probe) for leaks.

A high O_2 value, in particular, may be an indicator of a leaking measurement system.

> | **Gas path check**.

6.2.1.5. Installing the probe mount testofix®



1. Insert the probe mount in the measurement aperture of the flue gas duct, making sure the attachment pin is pointing downwards.

2. Attach the probe mount to the flue gas duct by turning the fixing ring clockwise.

3. Slide the measuring instrument onto the probe mount up to the stop.
4. Check if the locking mechanism has latched into the probe mount.

5. Insert the flue gas probe through the probe mount into the flue gas duct.

> When using the testofix® probe mount, the measuring instrument is exposed to heat radiating from the flue gas duct during the measurement. In order to prevent consequently affecting the combustion air temperature a AT probe with cable must be used for the measurement!

6.2.1.6. Using the modular flue gas probe

Checking the thermocouple

The thermocouple of the flue gas probe must not lie against the probe cage.

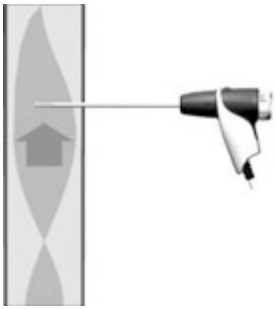
> Check before use. Bend the thermocouple back if necessary.

Aligning the flue gas probe

The flue gas must be able to flow freely past the thermocouple.

> Align the probe by turning it as required.

Searching for the centre of flow



The tip of the probe must be in the core current of the flue gas flow.

1. **Corestream** | .
2. Align the flue gas probe in the flue gas duct so that the tip is in the core current (area of the highest flue gas temperature **Max FT**).

- Grey value/grey pointer: Display of current flue gas temperature
- Orange value/orange pointer: Display of maximum flue gas temperature

> Reset values/pointer: .

6.2.2. | Flue gas

In order to obtain the correct readings, the fuel used must be set before taking the readings

▼ Fuels

> Select fuel

To achieve usable measurement results, the measurement period of a flue gas measurement should be a minimum of 3 minutes and the measuring instrument should display stable measured values.

If a separate measurement of **CO undiluted** has not yet been carried out, this value is calculated using the readings from the flue gas probe and is updated continuously.

1. .

- Readings are displayed.

If the **Draught** measurement parameter is activated in the reading display, a draught measurement is automatically initiated in parallel to the flue gas measurement. In the **List** measurement data screen, the parallel draught measurement can be

stopped/restarted. This draught measurement is performed separately to a measurement of the **Draught** measurement type.

> For the draught measurement, the minus connection for differential pressure measurements must be clear (ambient pressure, not closed).

> Tap the draught reading display or next to it.

2. .

6.2.3. | Draught

> The minus connection for differential pressure measurements must be clear (ambient pressure, not closed).

1. .

- The reading is displayed.

The pressure sensor is continuously zeroed (every 10 s) to prevent a drift during long measurements. The switching sound of the valve can be heard during zeroing.

2. .

6.2.4. | COundiluted

✓ A multi-hole probe (0554 5762) must be connected.

1. .

- The reading is displayed.

2. .

6.2.5. | Smoke number

The values calculated by a smoke pump tester can be entered.

The parameters **Smoke** and **Oil depos.** are only available for oil fuels.

6.2.6. | Differential pressure

WARNING

Dangerous mixture of gases

Danger of explosion!

> Make sure there are no leaks between the sampling point and the measuring instrument.

> Do not smoke or use naked flames during measurement.

✓ The gas pressure set (0554 1203) must be connected.

✓ The minus connection for differential pressure measurement must be depressurised at the beginning of measurement (ambient pressure; the instrument not connected to the system being checked), as the pressure sensor is zeroed.

1. .

- Zeroing the pressure sensor.
- The reading is displayed.

2. Connect the instrument to the system being checked.

Do not measure for longer than 5 minutes, as the drift of the pressure sensor could mean that the measured values are outside the tolerance limits. Re-zero the pressure sensor for longer measurements.

3. .

6.2.7. | Differential temp.

✓ The differential temperature set (0554 1208) must be connected.

1. .

- The measured values and the calculated differential temperature **Δt** (T1 - T2) are displayed.

2. .

6.2.8. | O_2 supply air

1. .

- The reading is displayed.

2. .

6.2.9. | Gas flow rate

The function is only available if the chosen fuel is a gas.

The gas burner capacity is calculated by means of the volume of gas consumed. To this end, a volume of gas is input into the app and its consumption read out at the gas meter.

1. Set the volume of gas to watch for at the gas meter.
2. Set the calorific value of the burnt gas.
3. .

- The measurement period is displayed.

4. When the set gas volume is reached: .
- The calculated gas flow rate and the gas burner capacity (in kW) are displayed.

6.2.10. | Oil flow rate

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

This function is used to calculate the capacity of the burner from the set oil pressure and the oil flow rate of the oil nozzle.

> Set the oil flow rate of the oil nozzle and the oil pressure
- The calculated oil burner capacity (in kW) is displayed.

6.3. Printing readings

The current readings can be printed using a report printer (accessories: Testo printer 0554 0621).

Making print text settings

The reading printout can be supplemented with individual information (header: company address; footer: name of technician).

1. | **Protocols** | **Own Company Data**.
2. Make the settings.

A logo cannot be included in the reading printout. This is only used for a report issued in PDF format.

Printing current readings

✓ The printer is switched on and within wireless range.

> | **Print values**.

6.4. Report

A report can be created of saved measurement data (readings) and other information about the measurement.

Reports can be printed using a report printer (accessories: Testo printer 0554 0621) or sent as a file attachment in an email. The email application installed on the mobile terminal device is used for this.

6.4.1. Add to protocol (save measurement)

The measurement data from the last measurement type carried out are stored temporarily on the measuring instrument.

> The clipboard is deleted when the measuring instrument is switched off.

Measurements carried out can be saved to back up measurement data and be used for a subsequent report:

>  | **Add to protocol**.

> The measurements are stored in the measuring instrument. This memory is not suitable for use as a long-term memory/archive! Generate a report of significant measurements and save this in a suitable place.

6.4.2. Finish protocol

1.  | **Finish protocol**.
   or
    | **Protocols**.
2. Open the input category: 
3. Enter/select log data:

Category	Description
Own Company Data	Reports can be supplemented with individual information (company address; name of the technician). A logo can only be included when issued in PDF format.

Category	Description
Format and print	Select version format(s): • **CSV** (comma separated text file, e.g. for Microsoft® Excel), • **PDF** • **Print values** (Testo printer 0554 0621 required (accessories)) • **ZIV** (XML file, complying with the regulations of the 'Federal Association of Chimney Sweeps Germany').
Customer data	Enter contact details or **Import Contact Data** (opens the application installed for contacts on the mobile terminal device).
Comments and pictures	Enter comments (file name of log, comment, measuring location name) and **Add pictures** (opens the application installed for photos and videos on the mobile terminal device). Pictures are only included when issued in PDF format.
Select measurements	All saved measurements are displayed in one of the following time categories, depending on the creation date: **Today**, **Yesterday** or **Older**. The measurements selected to create the report are identified with ✓. New, saved measurements are automatically identified. To display saved readings to check them: > 🔍. To delete individual measurement: > 🗑. To delete all measurements of a time category: > Touch 🗑 next to the time category name. To select/deselect a measurement for the report: > ✓.

ℹ All selected pictures and measurements are included in the report. This means the report may reach a file size of several megabytes. Before sending the report, check what your mobile provider may charge for this!

4. **Send**.

7 Maintaining the product

7.1. Checking instrument status

7.1.1. | Instrument settings | Sensor diagnosis

The current status of the sensors can be displayed.

To change expended sensors, see Replacing sensors , page **33**.

7.1.2. | Error list

Instrument errors that have not yet been rectified can be displayed.

7.2. Cleaning the measuring instrument

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

Use distilled water, or alternatively mild solvents such as isopropanol to clean the flue gas analyzer. If using isopropanol, please refer to the instruction leaflet for the product. Isopropanol fumes have a slight narcotic effect, and typically cause irritation of the eyes and sensitive mucous membranes. When using it, please ensure that there is adequate ventilation.

Do not store any objects that have come into contact with solvents and/or degreasers (e.g. isopropanol) in the case. Evaporating or leaking solvents and/or degreasers may cause damage to the instrument and to the sensors.

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

7.3. Draining the condensate container

The fill level of the condensate container can be read from the markings. Hold the instrument horizontally or vertically to check the fill level.

The condensate consists of a weak mix of acids. Avoid skin contact. Make sure that the condensate does not run over the housing.

CAUTION

Condensate entering the gas path.

Damage to sensors and flue gas pump!

> Do not empty the condensate container while the flue gas pump is in operation.

1. Open the condensate outlet on the condensate container.
2. Let the condensate run out into a sink.
3. Wipe off any drops still on the condensate outlet with a cloth and close the condensate outlet.

The condensate outlet must be completely closed, otherwise measuring errors could occur if external air gets in.

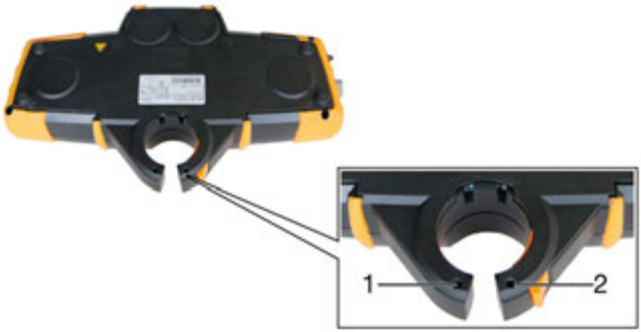
7.4. Opening the measuring instrument

Open the measuring instrument only when this is required for measuring purposes (gas sensors/replacing battery).

✓ The measuring instrument must not be connected to a mains socket via the mains unit. The measuring instrument must be switched off.

When opening/assembling the instrument, take care not to lose any removed screws. Placing a cloth on the work top is recommended.

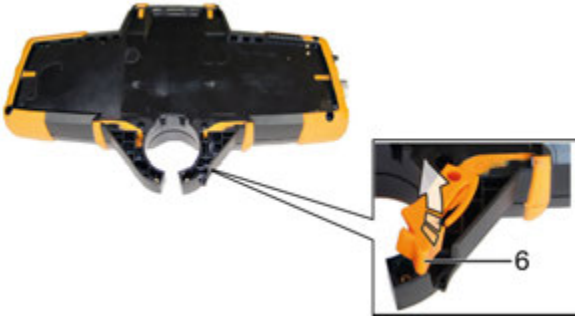
1. Lay the instrument face down so that the rear of the instrument faces upwards and the side with the retaining bracket faces you.



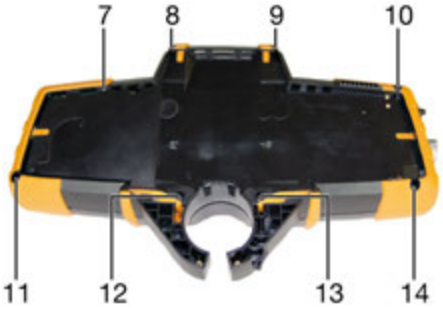
2. Use a cross-head screwdriver to remove the two (short) screws (**1** and **2**) from the retaining bracket.

3. Move the catch hook outwards (**3**) and push the back of the instrument up and lift off.

> If the back of the instrument cannot be removed by hand, this can easily be levered out by applying a screwdriver to both of the recesses **4** and **5**.



4. Remove the orange locking clips upwards out of the instrument casing (**6**).



5. Use a cross-head screwdriver to loosen and remove the 4 screws **7** to **10** (short screws) and the 4 screws **11** to **14** (long screws).
6. Turn the instrument over and place on its back so that the front is facing upwards.

7. Remove the condensate trap sealing plug from the condensate outlet (**15**).

8. Fold up/back the upper instrument casing and place next to the lower casing (**16**). Do this carefully to prevent damaging hoses and lines.

Assembly

Perform in reverse order to assemble. Please note:

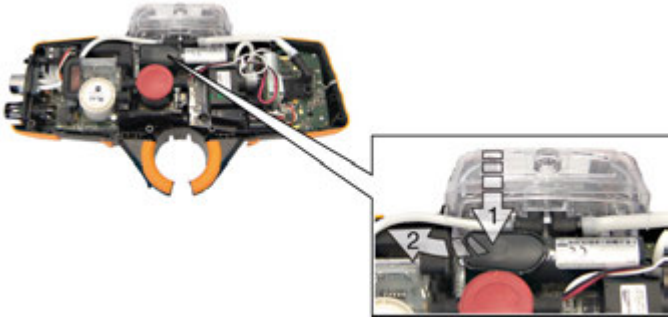
> Lay hoses and lines in the designated ducts.

> Make sure that hoses and lines do not get stuck.

> Insert the teeth on the lower edge of the back of the housing into the lower instrument casing and push at the height of the symbols CE (**17**) and ⚠ (**18**) to lock into place in the housing.

7.5. Replacing the rechargeable battery

✓ Measuring instrument is open; see Opening the measuring instrument, page **29**.

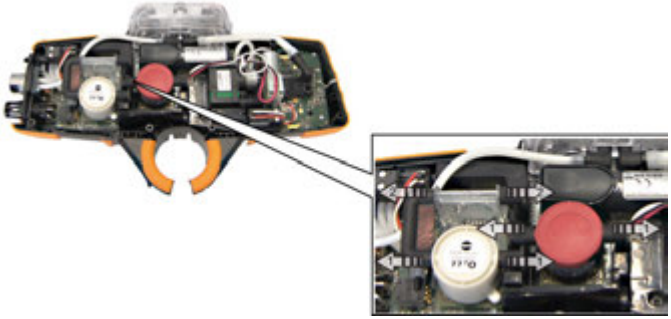


1. Open the battery lock: Press the grey button (1) and push to the left keeping the button pressed (2).
2. Remove the battery and insert a new rechargeable battery. Use only Testo rechargeable battery 0515 0107!
3. Close the battery lock: Press the grey button and push to the right keeping the button pressed until the battery engages.

7.6. Replacing sensors

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!

✓ Measuring instrument is open; see Opening the measuring instrument, page **29**.



1. Disconnect the hose connections from the faulty sensor (**1**)/bridge (**2**).

2. Remove the faulty sensor/bridge from the slot.

> For NO sensor: Remove the auxiliary circuit board.

Do not remove the auxiliary circuit board for the NO sensor until immediately before installation. Do not leave the sensor without auxiliary circuit board for longer than 15 minutes.

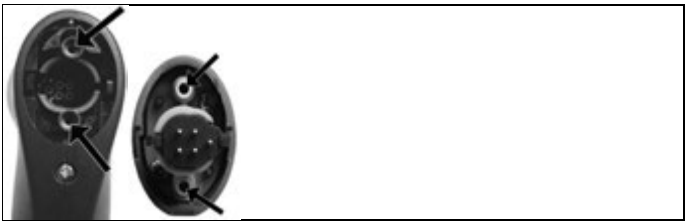
3. Install new sensor/new bridge in the slot:
   - Slot 1: O_2 sensor
   - Slot 2: CO sensor or CO_{low} sensor
   - Slot 3: NO sensor or NO_{low} sensor
4. Push the hose connections onto the sensor/bridge.
5. Close the measuring instrument.

When retrofitting a sensor, the associated measurement parameter/unit must be enabled in the reading display.

7.7. Cleaning the modular flue gas probe

✓ Disconnect the flue gas probe from the measuring instrument prior to cleaning.

1. Release the probe catch by pressing the key on the probe handle and remove the probe module.



2. Blow compressed air through the flue gas ducts in probe module and probe handle (see illustration). Do not use a brush!
3. Fit a new probe module on the probe handle and engage it in place.

7.8. Replacing the probe module

✓ Disconnect the flue gas probe from the measuring instrument.

1. Press the button on the top of the probe handle (**1**) and remove the probe module (**2**).
2. Plug in the new probe module and lock it in place (**3**).

7.9. Checking/replacing the particle filter

Checking the particle filter:

Check the particle filter of the modular flue gas probe periodically for contamination: check visually by looking through the window of the filter chamber.

> If there is visible contamination or inadequate pump flow, replace the filter.

Replacing the particle filter:

The filter chamber may contain condensate. This is not a malfunction and will not cause wrong readings.

1. Open the filter chamber: turn slightly anti-clockwise (**1**). Remove the filter chamber (**2**).
2. Remove the filter plate (**3**) and replace it with a new one (**4** [0554 3385]).
3. Attach the filter chamber and lock it: turn slightly clockwise.

7.10. Changing the thermocouple

1. Release the probe catch by pressing the key on the probe handle and remove the probe module.

2. Remove the thermocouple plug-in head from the socket using a screwdriver and pull the thermocouple out of the probe shaft.
3. Keep inserting the new thermocouple into the probe shaft until the connection head clicks into place.
4. Fit a new probe module on the handle and engage in place.

7.11. Updating the instrument software

The current instrument software (firmware) you can find on the Testo homepage under the product-specific downloads.

✓ The measuring instrument must be switched off.

1. Plug the measuring instrument mains unit into a mains socket.
2. Press and hold down for 10 s.

- Both status LEDs (blue/red) slowly flash alternately.

3. Insert the connecting cable (0449 0047) into the USB port on the measuring instrument, then connect it to the PC.

- Your PC identifies the measuring instrument as a removable medium.

4. Copy the new instrument software file (ap330ir.bin) to the identified removable medium.

- Both status LEDs (blue/red) quickly flash alternately. This process may take a few minutes.

5. Disconnect the connecting cable from the measuring instrument.

- Once the instrument software has been updated, the measuring instrument will automatically reboot and is ready for use again.

8 Technical data

8.1.1. Examinations and licenses

As declared in the Certificate of Conformity, this product complies with Directive 2014/30/EU.

testo 330i / testo 330i LX with gas sensors O_2/CO, H_2-compensated/NO, combustion air temperature sensor, flue gas temperature sensor and differential pressure sensor (draught) is TüV-tested in accordance with VDI 4206.

The CO sensor 0393 0101 (CO, H_2-compensated) is TÜV-tested in accordance with EN 50379 part 2.

The CO sensor 0393 0051 (CO, not H_2-compensated) is TÜV-tested in accordance with EN 50379 part 3.

For official measurements in accordance with the 1st BImSchV (chimney sweeps), the measuring instrument must be checked every six months by a technical testing body of the Guild of Master Chimney Sweeps or another testing body recognised by the authorities.

8.1.2. Measuring ranges and resolution

Measurement parameter	Measuring range	Resolution
O_2	0 to 21 vol.%	0.1 vol.%
CO	0 to 4,000 ppm	1 ppm
CO (H_2-compensated)	0 to 8,000 ppm	1 ppm
CO (H_2-compensated) with fresh air dilution	0 to 30,000 ppm	1 ppm
CO_{low}	0 to 500 ppm	0.1 ppm
NO	0 to 3,000 ppm	1 ppm
CO environment (via flue gas probe)	0 to 2,000 ppm	1 ppm
Draught	-9.99 to 40 hPa	0.01 hPa
ΔP	0 to 300 hPa	0.1 hPa
Temperature	-40 to 1,200 °C	0.1 °C (-40.0 to 999.9 °C) 1 °C (rest of range)
Efficiency	0 to 120%	0.1%
Flue gas loss	0 to 99.9%	0.1%
CO_2 determination (calculation from O_2)	Display range 0 to CO_2max	1 ppm

8.1.3. Accuracy and response time

Measurement parameter	Accuracy	Response time
O_2	± 0.2 vol.%	< 20 s (t90)
CO	± 20 ppm (0 to 400 ppm) ± 5% of m.v. (401 to 2,000 ppm) ± 10% of m.v. (2,001 to 4,000 ppm)	< 60 s (t90)

Measurement parameter	Accuracy	Response time
CO H_2-compensated	± 10 ppm or ± 10% of m.v.[1] (0 to 200 ppm) ± 20 ppm or ± 5% of m.v.[1] (201 to 2,000 ppm) ± 10% of m.v. (2,001 to 8,000 ppm)	< 60 s (t90)
CO (H_2-compensated) with fresh air dilution	± 200 ppm or ± 20% of m.v.[1] (0 to 30,000 ppm)	< 60 s (t90)
CO_{low}	± 2 ppm (0 to 39.9 ppm) ± 5% of m.v. (rest of range)	< 40 s (t90)
NO	± 5 ppm (0 to 100 ppm) ± 5% of m.v. (101 to 2,000 ppm) ± 10% of m.v. (2,001 to 3,000 ppm)	< 30 s (t90)
Draught	± 0.02 ppm or ± 5% of m.v.[1] (-0.50 to 0.60 hPa) ± 0.03 hPa (0.61 to 3.00 hPa) ± 1.5% of m.v. (3.01 to 40.00 hPa)	-
ΔP	± 0.5 hPa (0.0 to 50.0 hPa) ± 1% of m.v. (50.1 to 100.0 hPa) ± 1.5% of m.v. (rest of range)	-
Temperature	± 0.5 °C (0.0 to 100.0 °C) ± 0.5% of m.v. (rest of range)	depending on the probe
Efficiency	-	-
Flue gas loss	-	-
CO_2 determination (calculation from O_2)	± 0.2 vol.%	-

[1] higher value is valid

8.1.4. Other instrument data

Flue gas analyzer

Feature	Values
Storage and transport temperature	-20 to 50 °C
Operating temperature	-5 to 45 °C
Max. surface temperature at the measurement aperture (with probe mount)	140 °C
Ambient humidity	0 to 90% RH, non-condensing
Operating positions	No restriction
Fill level of condensate trap	9 ml Corresponds with a service life of approx. 5 h (EL heating oil)/approx. 2.5 h (natural gas) at 20 °C ambient temperature)
Power supply	Li Ion battery: 3.7 V/2.6 Ah Mains unit: 6 V/2.0 A
Protection class	IP 40
Weight	720 g (excluding battery)
Dimensions	270 x 160 x 57 mm
Memory	500,000 individual readings
Flue gas overpressure	max. 50 mbar
Negative pressure	max. 80 mbar
Rechargeable battery charging temperature	± 0 to 35 °C
Rechargeable battery charge time	approx. 5-6 h
Rechargeable battery life	6 h (pump on, 20 °C ambient temperature)

Feature	Values
Warranty	**testo 330i** Measuring instrument: 48 months Sensors O2, CO: 48 months Other sensors: 24 months Flue gas probe: 48 months Thermocouple: 12 months Rechargeable battery: 12 months Further warranty terms: see website
	testo 330i LX Measuring instrument: 48 months Sensors O2, CO: 60 months Other sensors: 24 months Flue gas probe: 48 months Thermocouple: 12 months Rechargeable battery: 12 months Further warranty terms: see website

8.1.5. Declaration of conformity

Testo SE & Co. KGaA hereby declares that the testo 330i (0632 3000) comply with Directive 2014/53/EU.

The full text of the EU Declaration of Conformity can be found on the following website.

9 Tips and assistance

9.1. Questions and answers

Question	Possible causes/solution
Rechargeable battery low	> Switch to mains operation.
Measuring instrument switches off automatically or cannot be switched on	Rechargeable battery has run out: > Charge rechargeable batteries or switch to mains operation.
Displayed battery capacity seems to be faulty	Rechargeable battery was repeatedly not fully discharged/charged: > Discharge rechargeable battery (until measuring instrument switches off automatically) and then charge fully.
Error message: **Main pump flow is too high**	Gas outlet blocked: > Make sure that the gas outlet is clear. Overpressure in flue gas duct too high (> 50 mbar): > Perform draught measurement.
Error message: **Sensor protection is active**	The switch-off threshold of the CO sensor was exceeded: > Remove probe from flue gas duct.
Error message: **Printing not possible**	> Switch on printer. > Move printer into wireless range.
Three acoustic signals after switching on the measuring instrument	Device error: > Consult Testo Service or your dealer.
App no longer responds to command inputs	> Open the overview of active applications (refer to your smartphone operating system instructions) and close the App.
Instrument no longer responds to command inputs	> Keep the button pressed down for 10 s to reset and reboot the measuring instrument.

Question	Possible causes/solution
It cannot establish a Bluetooth connection! or Required instrument is not in the Find Device display.	> Keep the button pressed down for 10 s to reset and reboot the measuring instrument.
No instruments are shown in the Find Device display.	> Check the Bluetooth settings on the mobile terminal device. > Switch Bluetooth off and on again on the mobile terminal device.
Connection fails repeatedly with a Bluetooth® error message.	1. Keep the button pressed down for 10 s to reset and reboot the measuring instrument. 2. Switch Bluetooth off and on again on the mobile terminal device. If necessary: switch the mobile terminal device off and on again.
When using two printers: The required printer not found!	The mobile terminal device may be connected to the other printer and this connection is saved in the App. > Close the App and restart it to establish a new connection.
In Excel® the CSV format is not displayed properly.	Open Excel® and create a new template. Click on the **Data** tab and activate the **From Text** menu. Select the CSV file and adopt in the Excel template.

9.2. Contact and Support

If we have not been able to answer your question, please contact your dealer or Testo Customer Service.
You can also send Testo an error report via e-mail. In the Help menu, select **Send error report**. Your e-mail app will be launched automatically and an error report created. The report contains information about your smart device and the operating system used. Send the report to the automatically generated e-mail address **developmentsupport@testo.de**. We will get back to you as soon as possible with information for troubleshooting.

9.3. Accessories and spare parts

Printer

Description	Article no.
Bluetooth®/IRDA printer, incl. mains unit 5 V/1.0 A with micro USB cable	0554 0621
Mains unit 5 V/1.0 A with micro USB cable	0554 1105
Spare thermal paper for printer (6 rolls)	0554 0568

Modular flue gas probes

Description	Article no.
Modular flue gas probe 180 mm, 500 °C, probe shaft diameter: 8 mm, hose 0.6 m	0600 9780
Modular flue gas probe 300 mm, 500 °C, probe shaft diameter: 8 mm, hose 0.6 m	0600 9781
Modular flue gas probe 180 mm, 500 °C, probe shaft diameter: 6 mm, hose 0.6 m	0600 9782
Modular flue gas probe 300 mm, 500 °C, probe shaft diameter: 6 mm, hose 0.6 m	0600 9783
Modular flue gas probe 180 mm, 500 °C, probe shaft diameter: 8 mm, hose 2.2 m	0600 9760
Modular flue gas probe 300 mm, 500 °C, probe shaft diameter: 8 mm, hose 2.2 m	0600 9761
Flexible flue gas probe 330 mm, $T_{max.}$ 180 °C, short-term 200 °C, bending radius max. 90° for measurements in difficult to access locations	0600 9770

Probe modules/accessories for modular flue gas probes

Description	Article no.
Probe shaft module 180 mm, 500 °C, thermocouple 0.5 mm, probe shaft diameter: 8 mm	0554 9760
Probe shaft module 300 mm, 500 °C, thermocouple 0.5 mm, probe shaft diameter: 8 mm	0554 9761
Spare thermocouple for module 0554 9760, 0554 9762	0430 9760
Spare thermocouple for module 0554 9761, 0554 9763	0430 9761
Probe mount testofix®, 8 mm	0554 3006
Cone, 8 mm, steel	0554 3330
Multi-hole probe shaft, length 300 mm, Ø 8 mm, for CO mean value calculation	0554 5762
Multi-hole probe shaft, length 180 mm, Ø 8 mm, for CO mean value calculation	0554 5763
Flexible probe shaft module	0554 9770
Hose extension; 2.8 m; extension line probe-instrument	0554 1202
Particle filter, 10 pcs.	0554 3385

Temperature probe

Description	Article no.
Combustion air temperature (AT) probe, 300 mm	0600 9791
Combustion air temperature (AT) probe, 190 mm	0600 9787
Combustion air temperature (AT) probe, 60 mm	0600 9797
Fast reaction surface probe	0604 0194
Mini ambient air probe	0600 3692

Other probes

Description	Article no.
O_2 dual wall clearance probe	0632 1260
Gas leak probe	0632 3330
Differential temperature set, 2 pipe wrap probes, adapter	0554 1208

Description	Article no.
Smoke pump tester, incl. oil, soot plates, for measuring soot in flue gas	0554 0307

Retrofit/spare sensors

Description	Article no.
O_2 sensor	0393 0002
CO sensor	0393 0051
CO sensor H_2-compensated	0393 0101
CO_{low} sensor	0393 0103
NO sensor	0393 0151
NO_{low} sensor	on request

Cases

System case with double floor (height:180 mm) for instrument, probes and accessories	0516 3302
System case (height: 130 mm) for instrument, probes and accessories	0516 3303

Other accessories

Description	Article no.
Mains unit	0554 1096
Spare rechargeable battery	0515 0107
Instrument/PC connecting cable	0449 0047
Additional filter	0133 0010
Flue draught set	0554 3150
Fine pressure probe	0638 0330
Set of capillary hoses	0554 1215
Solid fuel measurement module with adapter and probe shaft with sintered filter	0600 9765
Sintered filter for solid fuel measurement probe shaft	0133 0035
Filter material for condensate trap on solid fuel measurement adapter	0133 0012
NO_x filter	0554 4150

Description	Article no.
Pressure test set for gas pipe testing	0554 1213
ISO calibration certificate for flue gas	0520 0003

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