testo 400 - Universal IAQ instrument

Instruction manual

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1 About this document

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

2 Safety and disposal

Take the **testo information** document into account (accompanies the product).

3 Product-specific approvals

You can find the current country approvals in the **Approval and Certification** document (enclosed with the product).

4 Product-specific safety instructions

⚠ DANGER

Integrated magnet
Danger to life for persons with pacemakers!

- Keep a distance of at least 20 cm between your pacemaker and the measuring instrument.

ATTENTION

Integrated magnet
Damage to other devices!

- Keep a safe distance from devices that may be damaged by magnetism (e.g. monitors, computers, credit cards, memory cards, etc.).

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5 Data protection

The testo 400 measuring instrument makes it possible to input and store personal data such as name, company, customer number, address, telephone number, e-mail address and homepage.

Please be aware that your use of the functions offered here is entirely your own responsibility. This applies in particular to use of the interactive functions (e.g. storing customer data or sharing readings). You are responsible for compliance with the data protection regulations and laws applicable in your country. Therefore it is your responsibility to ensure the legality of the processing of personal data for which you are responsible.

The personal data collected with the measuring instrument is never automatically transferred to Testo SE & Co. KGaA.

You can find the detailed **Privacy Policy – Measuring Instruments** in the testo 400 **Help & Information** main menu in the form of a PDF under **Exclusion of liability** -> **Data protection information**.

6 Use

The testo 400 is an instrument for measuring climate-related parameters. The testo 400 is particularly suitable for carrying out comfort level measurements for workplace evaluation and flow measurements in and on air conditioning systems.

The instrument is only to be used by qualified expert personnel. The product must not be used in potentially explosive atmospheres!

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7 Product description

7.1 Front view

1	On/Off and Standby button	**2**	User interface/Touchscreen (see Section 9.1)
3	Front camera	**4**	Connections for probes (see Section 7.3)

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7.2 Rear view

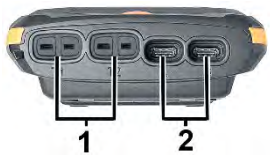
1	Camera	**2**	Differential pressure measurement connections (+/- marking)
3	Magnets	**4**	Attachment point for carrying strap
5	USB port/mains connection		

⚠ CAUTION

Make sure the pressure tube does not jump away from the connection socket.
Risk of injury!

- Ensure correct connection.

7.3 Probe connections



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1	Thermocouple probe type K connection (T1 and T2)	**2**	Connection for probes with TUC connector (A and B)

7.4 Probe overview

7.4.1 Compatible cable probes (digital)

Description	Order no.
Hot wire probe, fixed cable, including temperature sensor	0635 1032
Hot wire probe, fixed cable, including temperature and humidity sensor	0635 1572
Vane probe (Ø 16 mm), fixed cable	0635 9532
Vane probe (Ø 16 mm), fixed cable, including temperature sensor	0635 9572
Fume cupboard probe, fixed cable	0635 1052
Vane probe (Ø 100 mm), fixed cable, including temperature sensor	0635 9432
High-precision vane probe (Ø 100 mm), fixed cable, including temperature sensor	0635 9372
Humidity/temperature probe, fixed cable	0636 9732
High-precision humidity/temperature probe, fixed cable	0636 9772
Robust humidity/temperature probe for temperatures up to +180 °C, fixed cable	0636 9775
Turbulence probe, fixed cable	0628 0152
Lux probe, fixed cable	0635 0551
CO_2 probe including temperature and humidity sensor, fixed cable	0632 1552
CO probe, fixed cable	0632 1272

7.4.2 Compatible Bluetooth® probes (digital)

Description	Order no.
Hot wire probe with Bluetooth®, including temperature and humidity sensor	0635 1571
Vane probe (Ø 16 mm) with Bluetooth®, including temperature sensor	0635 9571
Vane probe (Ø 100 mm) with Bluetooth®, including temperature sensor	0635 9431
High-precision vane probe (Ø 100 mm) with Bluetooth®, including temperature sensor	0635 9371
Temperature/humidity probe with Bluetooth®	0636 9731

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Description	Order no.
High-precision temperature/humidity probe with Bluetooth®	0636 9771
CO_2 probe with Bluetooth®, including temperature and humidity sensor	0632 1552
CO probe with Bluetooth®	0632 1272

7.4.3 Compatible NTC probes (analog)

Description	Order no.
Waterproof immersion/penetration probe – with NTC temperature sensor	0615 1212
Robust air probe – with NTC temperature sensor	0615 1712
Temperature probe with Velcro and NTC temperature sensor	0615 4611
Clamp probe with NTC temperature sensor – for measurements on pipes (Ø 6-35 mm)	0615 5505
Pipe wrap probe with NTC temperature sensor – for measurements on pipes (Ø 5-65 mm)	0615 5605

7.4.4 Compatible Pt100 probes (digital)

Description	Order no.
High-precision immersion/penetration probe with Pt100 temperature sensor	0618 0275
Immersion/penetration probe with Pt100 temperature sensor	0618 0073
Air temperature probe with Pt100 temperature sensor	0618 0072
Flexible immersion probe with Pt100 temperature sensor and flexible PTFE probe tube	0618 0071
Laboratory probe with Pt100 temperature sensor in glass tube (Duran 50), resistant to aggressive media	0618 7072

7.4.5 Compatible Smart Probes (digital)

Description	Order no.
testo 115i - clamp thermometer operated by smartphone	0560 1115 0560 2115 02 0560 2115 03 (US)
testo 805i - infrared thermometer operated by smartphone	0560 1805

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Description	Order no.
testo 605i - thermohygrometer operated by smartphone	0560 1605 0560 2605 02 0560 2605 03 (US)
testo 405i - thermal anemometer operated by smartphone	0560 1405
testo 410i - vane anemometer operated by smartphone	0560 1410
testo 510i - differential pressure measuring instrument operated by smartphone	0560 1510
testo 549i - high-pressure measuring instrument operated by smartphone	0560 1549 0560 2549 02 0560 2549 03 (US)

7.4.6 Compatible type K thermocouples (analog)

Description	Order no.
Surface paddle probe	0602 0193
TC measuring tip for radio probes	0602 0293
Surface probe	0602 0393
TC surface tip for radio probes	0602 0394
Flexible immersion measuring tip, TC type K	0602 0493
Immersion probe	0602 0593
TE couple with TC plug TC type K	0602 0644
TE couple with TC plug TC type K	0602 0645
TE couple PTFE with TC plug TC type K	0602 0646
Surface probe	0602 0693
Globe probe Ø 150mm	0602 0743
Surface probe	0602 0993
Immersion/penetration probe, waterproof	0602 1293
Air probe, robust	0602 1793
Surface probe	0602 1993
Surface temperature probe TC type K	0602 2394
Immersion/penetration probe	0602 2693
Pipe wrap probe TC type K	0602 4592
Clamp probe with thermoelectric couple.	0602 4692
Magnetic probe	0602 4792
Magnetic probe Tmax 400°C	0602 4892
Plug-in immersion measuring tip, flexible	0602 5693
Measuring tip with TC plug TC type K	0602 5792
Measuring tip with TC plug Type K, class 3	0602 5793
Pipe wrap probe with Velcro strip	0628 0020

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Description	Order no.
Penetration probe type K	0628 0026
Penetration temperature probe	0628 1292
Surface probe	0628 9992

8 Commissioning

8.1 Mains unit/energy storage unit

The measuring instrument is supplied with an energy storage unit.

Fully charge the energy storage unit before using the measuring instrument.

Plug the mains unit USB cable into the USB port on the side.

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

Only charge the energy storage unit at an ambient temperature of 0 to 45 °C.

8.1.1 Charging the energy storage unit

1. Connect the USB mains unit to the USB interface/mains unit socket of the testo 400 (see Section 7.2).
2. Connect the mains plug of the mains unit to a mains socket.

▸ The charging process starts.

If the energy storage unit has completely discharged, the charging time at room temperature is approx. 5-6 hours. Only charge the instrument at an ambient temperature of 0 to 45 °C.

If the battery level is 6 – 10%, this message is displayed: “Once the battery level reaches 5%, the measuring instrument undergoes a controlled shut-down. Please charge up your measuring instrument in a timely manner.”

If the battery level is 5% or less, the following message is displayed: “The battery level is very low. The measuring instrument will now shut

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down.” The instrument should only be switched back on after a brief charging phase. The minimum battery level must be 6%.

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8.1.2 Rechargeable battery LED status

LED status	Description
Lit up green	Instrument is supplied with power (battery fully charged)
Flashing green (rapidly)	Instrument is on and being supplied with power (battery is charging)
Flashing green (slowly)	Ready for operation in battery mode
Flashing green/red	Instrument is off and being supplied with power (battery is charging)
Flashing red	Internal error, please restart. If the error has still not been rectified, please carry out a factory reset (see Section 10.3.7). If the problem persists, contact Testo Customer Service.

8.1.3 Mains operation

1. Connect the USB mains unit to the USB interface/mains unit socket of the testo 400 (see Section 7.2).
2. Connect the mains plug of the mains unit to a mains socket.

▸ The measuring instrument is powered via the mains unit. The battery charges.

8.2 Switching the testo 400 on and off

Current status	Action	Function
Instrument off	Press and hold down the button (> 3 sec)	Instrument is switched on

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Current status	Action	Function
When the measuring instrument is started for the first time, the setup wizard guides you through the following setting parameters step by step: - **Language** - **Country** - **Units** - **WLAN** - **Date and time** - **Own company address** - **E-mail account** After the setup wizard, a tutorial can be launched. The tutorial demonstrates the general operation and the most important functions of the measuring instrument using examples.		
Instrument on	Press the button briefly (< 1 sec)	Instrument is switched to standby mode. The instrument is re-activated when the button is pressed again.
Instrument on	Press and hold down the button (> 1 sec)	Choice: press **[OK]** to switch the instrument off or press **[Cancel]** to cancel switch-off of the instrument.

The tutorial can be executed again at any time in the main menu under **Help and Information**.

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

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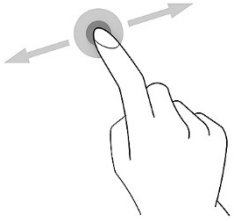
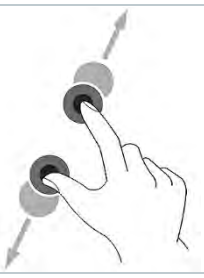
8.3 Touchscreen

You only need three touchscreen movements to use the testo 400:

Description	
Tapping To open applications, select menu icons, press buttons on the display or enter characters with the keypad, tap these with a finger in each case.	
Swiping Swipe to the right or left on the display to show further views, e.g. to switch from the list view to the graphic view.	
Zooming In order to make a section of the display larger or smaller, touch the display with two fingers and move them apart or together.	

8.4 Setup wizard

When the testo 400 is started up for the first time, the setup wizard is activated and guides you step-by-step through the following setting parameters.

The instrument setup that is implemented can be adapted at any time in the **Settings** menu.

8.4.1 Select language

The first step is to select the language for using the testo 400.

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8.4.2 Country settings and units

In this step, you have the option of selecting the country and of deciding whether you want to use the metric or imperial unit system. It is also possible to establish user-defined settings for the units. See Section 10.3.1 and 10.3.3.

8.4.3 WLAN

Click on the **WLAN** field to connect the testo 400 to the internet. Here, connection to a known WLAN must be established. The ⋮ icon at top right allows you to manually **add networks,** call up **saved networks** and **update** available networks. In addition, further adjustments can be made via **Advanced**.

For password-protected networks, you need to enter the password. On secured networks, various ports may be blocked, restricting the creation of e-mail accounts and the sending/receiving of e-mails.

The WLAN connection can be used for various functions:

- Automatic notification of information for updates
- Carrying out updates of the instrument firmware (see Section 10.1)
- Sending measurement reports as PDF files and measurement data as .json and .csv files via e-mail (see Section 9.6)
- Using the internet browser via the **Other applications** menu (see Section 10.4.5)

If the WLAN reception is not sufficient, the error message **Network disabled** appears. Try connecting the testo 400 to a better WLAN network.

8.4.4 Date and time

Click on the **Time** field to set the date and time. It is possible to automatically retrieve the date/time via network or GPS or to set it manually. The time zone can also be set automatically/manually and you can choose between 12-hour/24-hour mode.

We recommend that you select **Use network-provided time** as the setting.

Please also see Section 10.3.1.

8.4.5 Contact information/company details

On each line, personal details can be entered for the items Company / Technician name / Street, building number / Postcode, city / Country / Telephone / Fax / E-mail and Homepage. In principle, company details can also be inserted using the testo DataControl software. The company details will be displayed in all PDF reports at the top right of the document and also listed in the measurement data report. The company details stored in the testo 400 at the time of the measurement cannot be subsequently changed in the PDF report

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of the measurement. The new company details will only be stored in the PDF report once a new measurement is carried out. Please also see Section 10.3.4.

8.4.6 Setting up an e-mail account

Click on the **E-mail** field to connect an e-mail account to the testo 400 measuring instrument, so that you can send measurement data reports via e-mail. See also Section 10.2.

8.5 Tutorial

At the end of the Setup wizard, the tutorial can be launched.

The tutorial can be executed again at any time via the **Help and Information** menu.

The tutorial demonstrates the general operation and the most important functions of the measuring instrument, using brief examples. The detailed descriptions can be found in the relevant sections.

- Connect cable and Bluetooth® probes (see Section 8.6)
- Display - user interface (see Section 9.1)
- Application menus (see Section 9.4)
- General measurement information (see Section 9.3.1)
- Managing measurement data (see Section 9.6.1)
- Customer management (see Section 9.5)
- Sensor management (see Section 9.7)
- Setting up an e-mail account (see Section 10.2)

8.6 Connecting probes

All probes can be connected or changed while the instrument is switched on. However, the connection must not be interrupted during a probe update.

8.6.1 Connecting a cable probe to the testo 400

> Connect the testo 400 to the probe via the TUC slot.

▸ The cable probe is immediately displayed in the sensor management, in the basic view and in the relevant measurement menu.

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Disconnecting

> Pull the connector out of the instrument.

▸ The cable probe is listed in the sensor management in the **Recently connected probes** section.

8.6.2 Connecting a Bluetooth® probe to the testo 400

The Bluetooth® connection from the testo 400 for the probes is always activated and cannot be switched on and off manually. It is established automatically, and no special pairing is required.

1. Switch on the probe using the button on the Bluetooth® handle and make sure that the probe is located within a maximum distance of 1 m from the testo 400.

▸ The LED on the handle flashes yellow. As soon as the connection is established, the LED flashes green.

▸ The Bluetooth® probe is immediately displayed in the sensor management, in the basic view and in the relevant measurement menu.

2. Press the button on the probe handle for at least 3 seconds to switch the probe off.

▸ The Bluetooth® probe is listed in the sensor management in the **Recently connected probes** section.

Probe LED status	Description
Flashing red.	Low battery status
Flashing yellow.	The probe is switched on and searching for the Bluetooth® connection.
Flashing green	The probe is switched on and connected to the testo 400 via Bluetooth®.

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8.6.3 Probe update

If the probe does not have the latest firmware, an update notification appears (this requires activation of the relevant switch in the **Instrument information** menu (Section 10.1 / 10.4.1). This is only possible for cable probes, but you can also connect and update other probe heads with the cable handle.

The connection must NOT be interrupted during the probe update. The update must be carried out completely.

▸ Update notification appears.

> Click on **Start Update**.

▸ Update starts.

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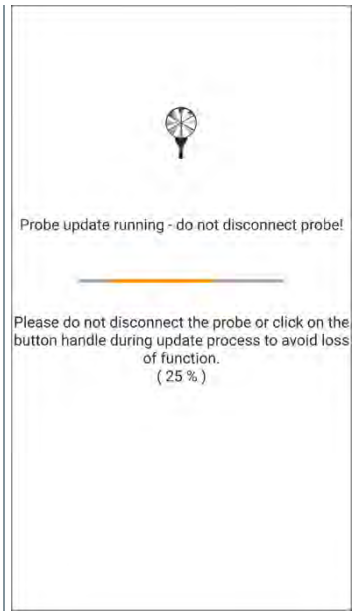
- Update status.



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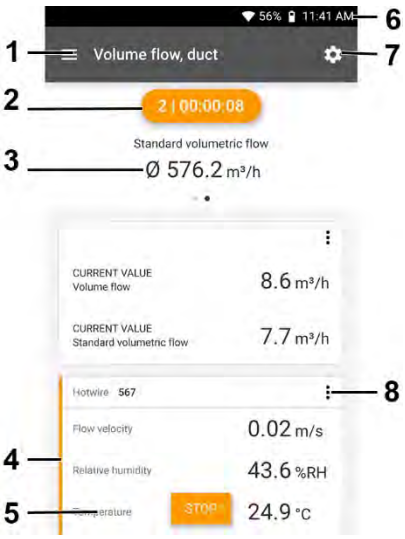
9 Operation

9.1 Display – user interface



1		Open main menu
2		Display of the measurement period
3		Display of calculated measurement results
4		Reading for each probe
5		Can be controlled with different function keys
6		Instrument status bar
7		Configuration
8		Edit reading display

Further symbols on the user interface (without numbering)

	One level back
	Exit view
	Share report
	Search
	Favourite
	Delete

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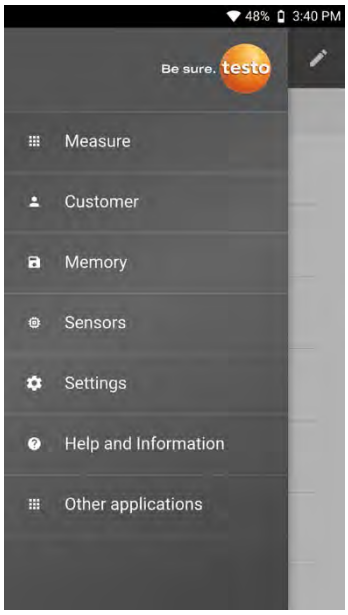
	Further information
	Display report
	Multiple selection

9.2 Main menu

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

	Measure (see Section 9.4)
	Customer (see Section 9.5)
	Memory (see Section 9.6)
	Sensors (see Section 9.7)
	Settings (see Section 10)
	Help and Information (see Section 10.4)
	Other applications (see Section 10.4.5)



Additional icons on the testo 400:

	One level back		Delete
	Exit view		Further information
	Share measurement data/reports		Display report
	Search		Edit
	Favourite		

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9.3 Preparing for measurement

9.3.1 General measurement information

All compatible probes are listed in Section 7.4.

- Depending on the parameter to be measured, certain probes need to be connected to the instrument (via Bluetooth®, TUC or TC plug).
- Some (thermal) probes require a warming-up phase until they are ready to measure.
- Before every measurement, wait until the adjustment phase is over. The adjustment phase ensures that the readings have stabilized.
- For some measurement parameters, additional calculation parameters need to be set in order to ensure that you get the correct measurement results, see details in the respective application menus.
- To enable reliable data handling, the quantity of measuring values to be saved for each measurement protocol must be restricted to 1 million individual values.

Depending on the measurement period, specific measuring cycles are feasible:

Duration:	Minimum measuring cycle:
1 min to 15 min	1 sec
16 min to 2 hours	10 sec
> 2 hours to 1 day	60 sec
> 1 day to 21 days	5 min

With the testo 400 (and the IAQ data logger), a maximum 1 million readings (with a maximum of 18 channels) can be recorded with one measurement.

Example 1: **Result: 9,216 readings**

Duration: 8 days

Measuring cycle: 5 minutes

Measurement channels: Temperature, humidity, CO2, flow (4 channels)

Example 2: **Result: 17,700 readings**

Duration: 59 minutes

Measuring cycle: 1 second

Measurement channels: Temperature, humidity, CO2, flow, pressure (5 channels)

Depending on the connected probe, prior to each measurement, individual parameters for the measurement can be set via the ⋮ icon (see Section 9.1 - Point 8), such as the visibility of individual measurement parameters or the units of the measured values.

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If a probe's individual readings are hidden, these settings are stored on the testo 400 specifically for each probe and applied to all application menus. Whereas the units set are only stored in the corresponding application menu, but are time-independent.

The measuring mode can be set via the configuration menu . Confirm the selection via **Apply configuration** (see Section 9.3.2).

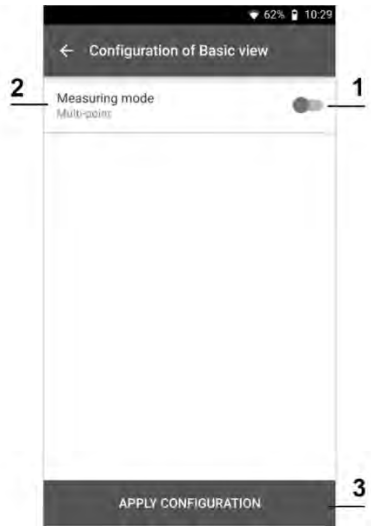
You can choose between the individual application menus:

Application menus	Continuous	Punctual	IAQ data logger
Basic view	X	X	X
Volume flow measurements	X	X	
Comfort level – PMV/PPD	X	X	X
Discomfort level measurements	X		X
Differential temperature	X	X	
Differential pressure	X	X	

9.3.2 Measuring mode

9.3.2.1 Punctual measurement

In the first line of the configuration menu, you can choose between **Punctual** and **Continuous** (1). The text under **Measuring Mode** changes depending on your selection (2). Click on **Apply Configuration** (3) to start the measurement.



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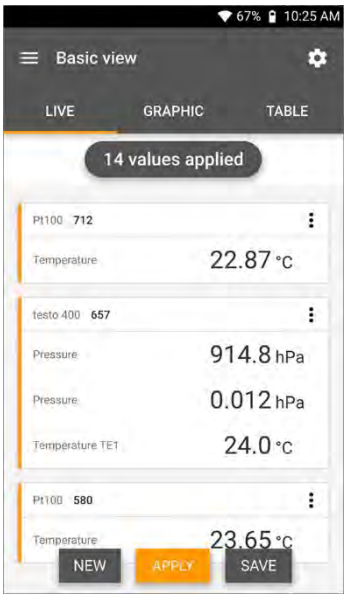
The counter in the upper section indicates the number of readings accepted. The measurement does not need to be started explicitly.

1 Press **Apply**.



▸ The first reading was saved. There are 3 options to continue.

2 **Apply**: save a second, third, fourth, etc., reading. The counter shows the number of values that have already been accepted.

Or:

New: launch a new measurement. The current measurement will be deleted along with all readings (a warning is displayed).

Or:

Save: exit the current measurement and save all readings on the testo 400 (see Section 9.6).

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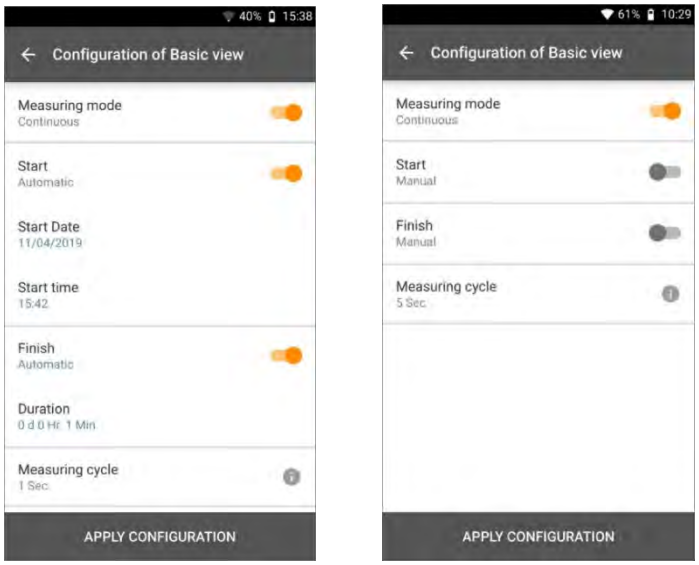
9.3.2.2 Continuous measurement

For the continuous measurement, a start time, a measurement duration and a measuring cycle can be defined or the measurement can be started and finished manually.



1 Click on **Apply Configuration** to start the measurement (with a scheduled start time).

2 Click on **Start** or the measurement starts automatically at the configured time.

▸ The measurement starts, all selected readings are recorded, the counter changes colour from grey to orange and starts running.

Option A: Once the settings have been accepted and the measurement has started, the counter in the upper section turns orange and runs backwards to 00:00:00.

Option B: Once the settings have been accepted and the measurement has started, the counter in the upper section turns orange and starts running from 00:00:00.

3 Click on **Stop** to pause or exit the measurement.

▸ The measurement pauses. The counter is grey. There are 3 options to continue.

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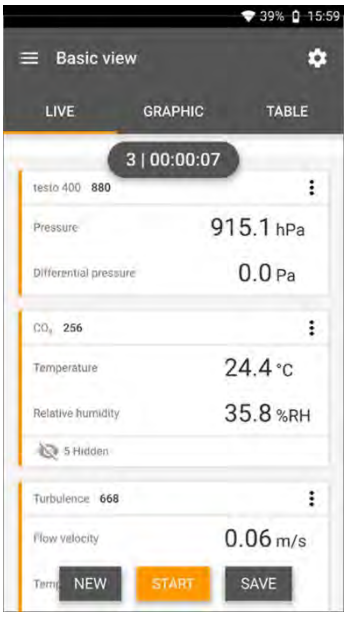
4	**Start**: start a second, third, fourth, etc., measurement. The counter changes colour again and displays the current measurement as the first number. Or: **New**: launch a new measurement. The current measurement will be deleted along with all readings (a warning is displayed). Or: **Save**: exit the current measurement and save all readings on the testo 400 (see section 9.6).	

The counter in the upper section turns orange and measures the time (after stopping, the counter turns grey again). To the left of the counter, the number of the current/last measurement is displayed (e.g. **3 | 00:00:07** – the third measurement ran for 7 seconds).

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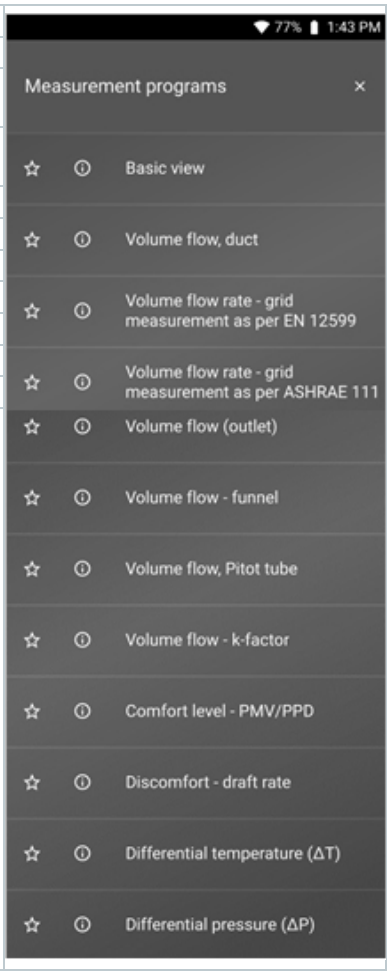
9.4 Application menus

The testo 400 has permanently installed measurement programs. These enable the user to carry out convenient configuration and implementation of specific measuring tasks.

The testo 400 offers the following **Measurement menus**:

Basic view
Volume flow, duct
Volume flow rate – grid measurement as per EN 12599
Volume flow rate – grid measurement as per ASHRAE 111
Volume flow (outlet)
Volume flow – funnel
Volume flow, Pitot tube
Volume flow – k-factor
Comfort level – PMV/PPD
Discomfort – draft rate
Differential temperature (ΔT)
Differential pressure (ΔP)



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9.4.1 Basic view

In the **Basic view** application menu, the current measuring values can be read, recorded and saved. The Basic view is particularly suitable for fast, uncomplicated measurements without the specific requirements of a standard-compliant measurement. The measuring mode can be selected via the **Configuration menu** (see Section 9.4.2).

All probes that can be connected to the testo 400 are also displayed in the **Basic view** application menu. As this is not an application menu where only specific probes can be used, all probes are highlighted in orange on the left-hand side.

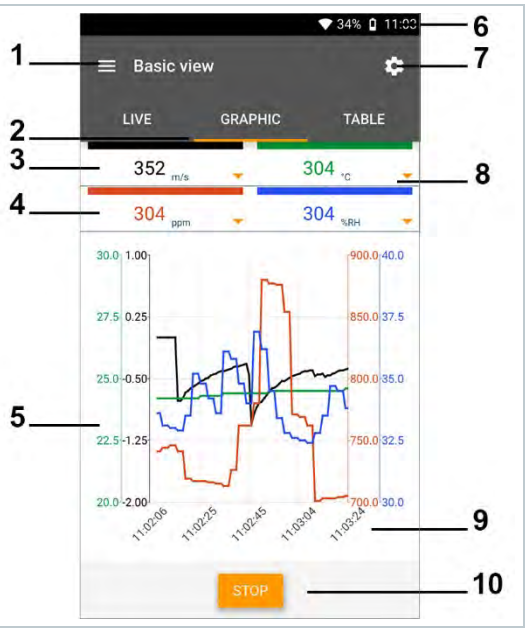
In all application menus, apart from the volume flow measurement, there are three different screens for the measurement - Live (or also Basic view), Graphic and Table.

9.4.1.1 Graphic view

In the Graphic view, the values for a maximum 4 channels can be displayed simultaneously in a chronological trend graph. All measured parameters can be displayed in the Graphic view via the channel selection (click on one of the four selection fields). Once a measurement parameter has been selected, the value is updated automatically.

The Zoom touch function allows individual parts of the graphic to be viewed in more detail or time progressions to be displayed compactly.

1	Open the main menu
2	Change of display
3	Reading for selected channel
4	Measurement parameter and measurement unit
5	Graphic with selected channels and 4 Y-axes
6	Status bar
7	Open the configuration menu
8	Selection of other channels
9	Time axis
10	New / Start / Stop / Save button



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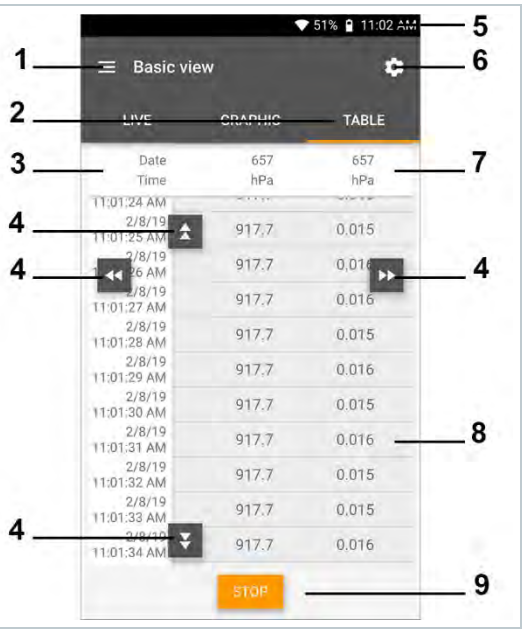
9.4.1.2 Table view

1	Open the main menu
2	Change of display
3	Column with date and time
4	Arrow keys to go directly to the end of the table
5	Status bar
6	Open the configuration menu
7	Probe ID - measurement unit
8	Measuring values
9	New / Start / Stop / Save button



9.4.2 Volume flow, duct

Use this application to measure the volume flow in a ventilation system duct. There are various options for this, which differ mainly in terms of the measuring range and the required probes:

- Thermal flow velocity probes for low flow velocities
- 16 mm vane probe for medium flow velocities
- Pitot tube for measurements at high velocities and in heavily contaminated flows with a high particle content

1 Click on .

▸ Main menu opens

2 Click on **Measure**.

3 Click on **Volume flow, duct**.

▸ The Volume flow, duct measurement menu opens.

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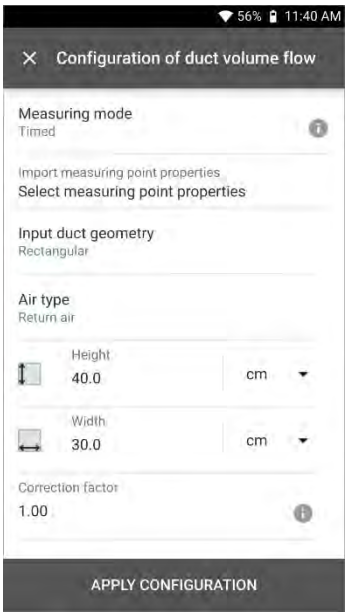
4 Click on ⚙.

▸ Configuration menu opens.

5 Make the required settings.



The measurement can be started even without customer data. This can be added following the measurement result.

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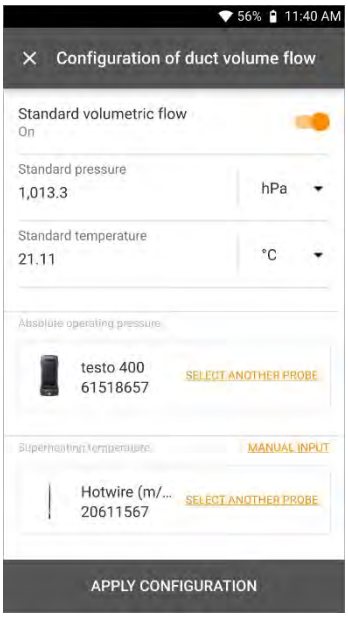
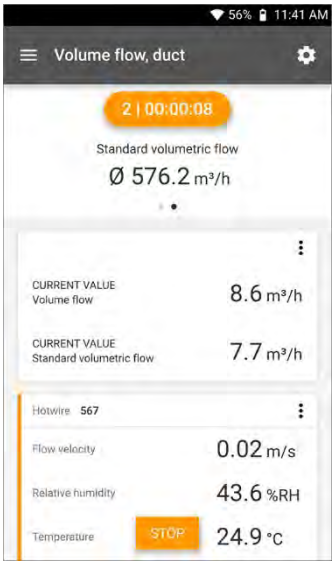
6 Make further settings accordingly.



7 Click on **Apply Configuration**.

▸ Values currently being measured are displayed.



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9.4.3 Volume flow rate - grid measurement as per DIN EN 12599

With this application, the volume flow in a ventilation system duct can be measured as per the DIN EN 12599 standard. There are various options for this, which differ mainly in terms of the measuring range and the required probes:

- Thermal probes (including temperature measurement and possibly humidity measurement) for low flow velocities
- 16 mm wheel measuring head (including temperature measurement) for average flow velocities
- Pitot tube for measurements at high velocities and in heavily contaminated flows with a high particle content

The main prerequisite for accurate measurement is the suitability of the measuring site. Minimum distances from points of discontinuity must be observed:

- From points of discontinuity upstream of the flow, observe a clearance of at least six times the hydraulic diameter Dh = 4A/U (A: duct cross-section, U: duct circumference).
- From points of discontinuity downstream of the flow, observe a clearance of at least twice the hydraulic diameter Dh = 4A/U (A: duct cross-section, U: duct circumference).

1. Click on ☰.

▸ Main menu opens

2. Click on **Measure**.

3. Click on **Volume flow rate - grid measurement as per DIN EN 12599**.

▸ The Volume flow rate - grid measurement as per DIN EN 12599 measurement menu opens.

4. Click on ⚙.

▸ Configuration menu opens.

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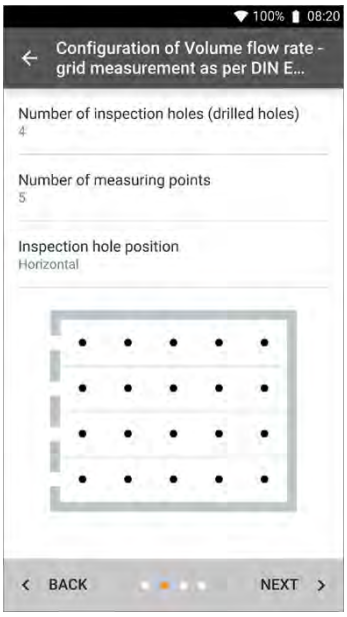
5 Make the required settings and click on **Next**.



For volume flow measurement as per the DIN EN 12599 standard, it is necessary for the measurement to be carried out at different measuring points. The number of measuring points depends on the distance from the point of discontinuity and irregularities in the profile.

6 Configure the measuring interval for each measuring point in the duct.

7 Click on **Start**.

The longer a measuring point is measured, the more accurate the result at the end of the volume flow measurement as per DIN EN 12599.

▸ During the measurement in the duct, the required immersion depth of the next measuring point is automatically shown on the display. The immersion depth of the probe can be found on the scale of the probe shaft.

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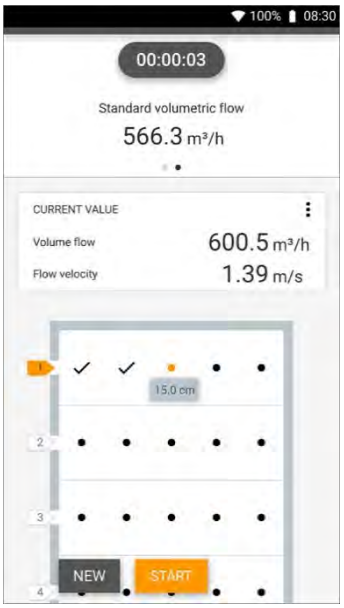
- Following successful measurement of a measuring point, the measurement assistant jumps straight to the next measuring point until all the measuring points are marked with a tick. You now have three options to proceed.



It is also possible to correct and overwrite individual measuring points by selecting the corresponding point on the display and starting a new measurement.

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8 **Start**: start another measurement.

Or:

New: launch a new measurement. The current measurement will be deleted along with all readings (a warning is displayed).

Or:

Save: exit the current measurement and save all readings on the testo 400 (see Section 9.6).

If large differences in flow velocities are ascertained over the cross-section, the number of measuring points must be increased. The number of measuring points is then adequate if the measurement value for each area is representative for its immediate surroundings, i.e. if it can be regarded as a genuine mean value for its portion of the area.

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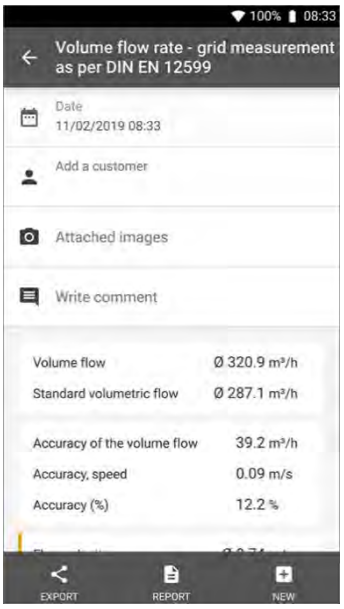
- At the end of a volume flow measurement in compliance with the standards, the average volume flows are shown on the results display, along with the information about measuring accuracy, which helps to better estimate the measurement result.



9.4.4 Volume flow rate - grid measurement as per ASHRAE 111

With this application, the volume flow in a ventilation system duct can be measured as per the ASHRAE 111 standard. There are various options for this, which differ mainly in terms of the measuring range and the required probes:

- Thermal probes (including temperature measurement and possibly humidity measurement) for low flow velocities
- 16 mm wheel measuring head (including temperature measurement) for average flow velocities
- Pitot tube for measurements at high velocities and in heavily contaminated flows with a high particle content

The main prerequisite for accurate measurement is the suitability of the measuring points. Minimum distances from points of discontinuity must be observed:

- From points of discontinuity upstream of the flow, observe a clearance of at least six times the hydraulic diameter Dh = 4A/U (A: duct cross-section, U: duct circumference).
- From points of discontinuity downstream of the flow, observe a clearance of at least twice the hydraulic diameter Dh = 4A/U (A: duct cross-section, U: duct circumference).

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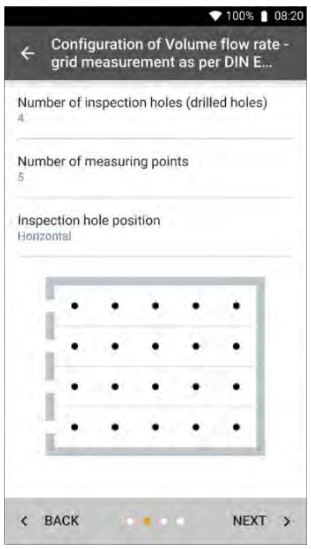
1. Click on ☰.
   - Main menu opens
2. ▦ Click on **Measure**.
3. Click on **Volume flow rate - grid measurement as per ASHRAE 111**.
   - The Volume flow rate - grid measurement as per ASHRAE 111 measurement menu opens.
4. Click on ⚙.
   - Configuration menu opens.
5. Make the required settings and click on **Next**.



For volume flow measurement as per the ASHRAE 111 standard, it is necessary for the measurement to be carried out at different measuring points. The number of measuring points depends on the distance from the point of discontinuity and irregularities in the profile. In contrast to standard EN 12599, the measurement must be carried out on at least 5 inspection holes (drilled holes) and at 5 measuring points in each case.

6. Configure the measuring interval for each measuring point in the duct.

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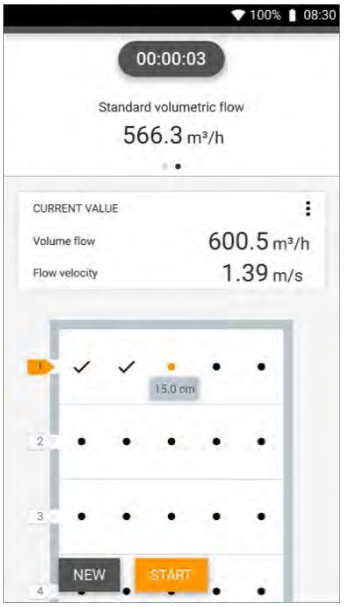
7 Click on **Start**.

The longer a measuring point is measured, the more accurate the result at the end of the volume flow measurement as per DIN EN 12599.

- During the measurement in the duct, the required immersion depth of the next measuring point is automatically shown on the display. (The calculation of the immersion depth varies between the two standards ASHRAE and EN 12599). The immersion depth of the probe can be found on the scale of the probe shaft.
- Following successful measurement of a measuring point, the measurement assistant jumps straight to the next measuring point until all the measuring points are marked with a tick. You now have three options to proceed.



It is also possible to correct and overwrite individual measuring points by selecting the corresponding point on the display and starting a new measurement.

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8 **Start**: start another measurement.

Or:

New: launch a new measurement. The current measurement will be deleted along with all readings (a warning is displayed).

Or:

Save: exit the current measurement and save all readings on the testo 400 (see Section 9.6).

If large differences in flow velocities are ascertained over the cross-section, the number of measuring points must be increased. The number of measuring points is then adequate if the measurement value for each area is representative for its immediate surroundings, i.e. if it can be regarded as a genuine mean value for its portion of the area.

▸ At the end of a volume flow measurement as per ASHRAE 111, the average volume flows are shown on the results display.

9.4.5 Volume flow, outlet

Use this application to measure the volume flow at outlets of ventilation systems. The 100 mm vane probes (including temperature measurement) are best suited for measuring the volume flow at outlets.

1 Click on ☰.

▸ Main menu opens

2 ⊞ Click on **Measure**.

3 Click on **Volume flow, outlet**.

▸ The Volume flow, outlet measurement menu opens.

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4 Click on ⚙.

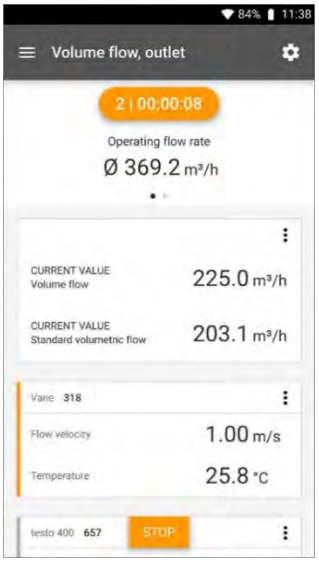
▸ Configuration menu opens.

5 Make the required settings.

When measuring the volume flow at outlets, it is possible to enter the free area of the outlet as a percentage in order to take possible sources of interference into account.

6 Click on **Apply Configuration**.

▸ The measurement screen is displayed. The probe relevant to the measurement is marked in orange.



9.4.6 Volume flow - funnel

Use this application to measure the volume flow of ventilation systems with a funnel.

A volume flow rate funnel is required to determine the flow rate on ventilation systems. The measurement can be carried out with a compatible 100 mm vane probe in conjunction with a funnel set. The funnels differ in size. When selecting the funnel, make sure that the opening of the funnel covers the outlet grille completely and tightly.

1 Click on ☰.

▸ Main menu opens

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2 Click on **Measure**.

3 Click on **Volume flow - funnel**.

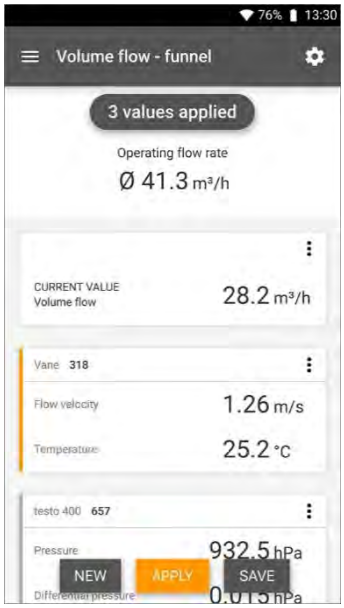
▸ The Volume flow - funnel measurement menu opens.

4 Click on ⚙.

▸ Configuration menu opens.

5 Make the required settings.

▸ The measurement screen is displayed. The probe relevant to the measurement is marked in orange. You now have three options to proceed.



6 **Apply**: the current reading is applied.

Or:

New: launch a new measurement. The current measurement will be deleted along with all readings (a warning is displayed).

Or:

Save: exit the current measurement and save all readings on the testo 400 (see Section 9.6).

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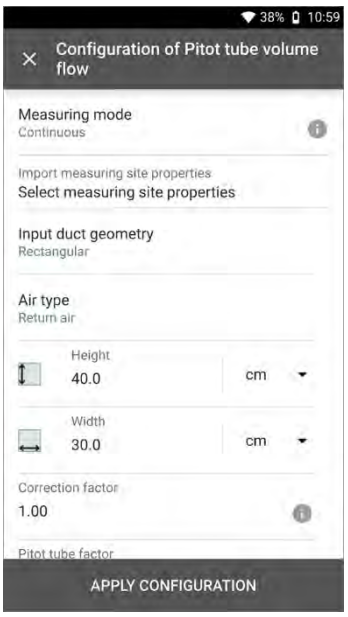
9.4.7 Volume flow, Pitot tube

Use this application to measure the volume flow in a ventilation system duct. The Pitot volume flow measurement is suitable for high velocities and flows with a high particle content.

1. Click on ☰.
   - Main menu opens
2. ▦ Click on **Measure**.
3. Click on **Volume flow, Pitot tube**.
   - The Volume flow, Pitot tube measurement menu opens.
4. Click on ⚙.
   - Configuration menu opens.
5. Make the required settings.



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7 Make further settings accordingly.

Prandtl Pitot tubes (order no.: 0635 2045, 0635 2145, 0635 2345):
Pitot tube factor: 1.00.
Straight Pitot tubes (order no.: 0635 2043, 0635 2143, 0635 2243):
Pitot tube factor: 0.67.
For Pitot tubes from other manufacturers, please refer to the instruction manual for the Pitot tube factor or ask your supplier.

8 Click on **Apply Configuration**.

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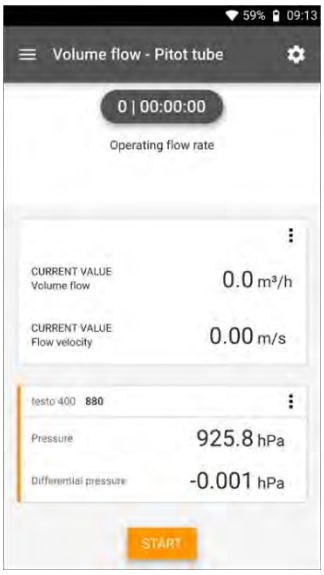
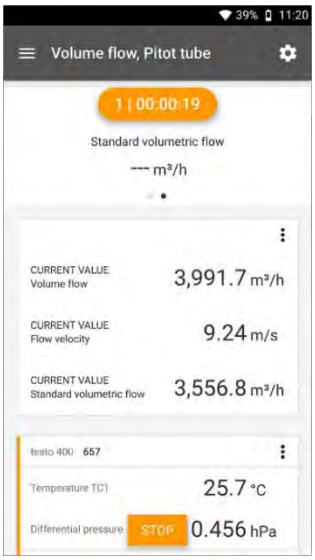
9 Click on ⋮ to zero the differential pressure sensor.



▶ A message is displayed, the pressure is zeroed.

10 Click on **Start**.

▶ The measurement starts.



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11 Click on **Stop**.

▸ Values currently being measured are displayed. You now have three options to proceed.

12 **Start**: start another measurement.

Or:

New: launch a new measurement. The current measurement will be deleted along with all readings (a warning is displayed).

Or:

Save: exit the current measurement and save all readings on the testo 400 (see Section 9.6).

9.4.8 Volume flow - k-factor

The testo 400 can determine the volume flow by measuring the reference resistance and input of the K-factor. This allows the testo 400 to remain connected to the air outlet during adjustment work and the changes in volume flow can be read directly on the display.

This process for determining volume flow can always be used when there are appropriate specifications available from the component manufacturer. In line with these specifications, the differential pressure is measured at a position specified by the manufacturer or supplier. The volume flow is determined from the differential pressure via a component-specific k-factor using the following mathematical equation:

$$v = k * \sqrt{\Delta P}$$

v	Volume flow
ΔP	Measured differential pressure in Pa
k	System-specific conversion factor

1 Click on ☰.

▸ Main menu opens

2 ▦ Click on **Measure**.

3 Click on **Volume flow - k-factor**.

▸ The Volume flow - k-factor measurement menu opens.

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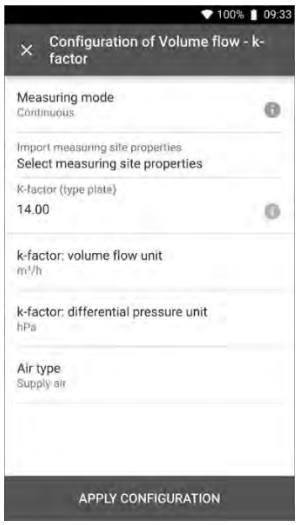
4 Click on ⚙.

▸ Configuration menu opens.

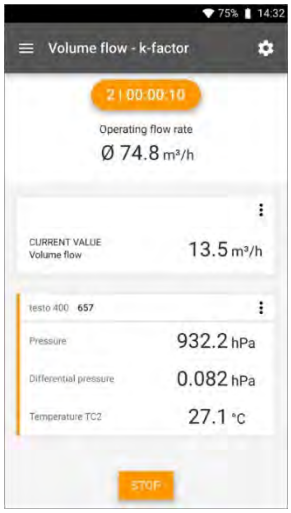
5 Make the required settings.



6 Click on **Apply Configuration**.

7 Click on **Start**.

▸ The measurement starts.



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8 Click on **Stop**.

▸ Values currently being measured are displayed. You now have three options to proceed

9 **Start**: start another measurement.

Or:

New: launch a new measurement. The current measurement will be deleted along with all readings (a warning is displayed).

Or:

Save: exit the current measurement and save all readings on the testo 400 (see Section 9.6).

9.4.9 Comfort level – PMV / PPD (EN 7730 / ASHRAE 55)

The PMV/PPD measurement determines the comfort level (PMV = Predicted Mean Vote) and the relative discomfort (PPD = Predicted Percentage Dissatisfied) e.g. at workstations (described in the standard ISO 7730).

The mean radiation temperature required for determining PMV/PPD is calculated in the testo 400 from the measurement parameters of globe temperature, ambient temperature and air velocity. The formula is based on forced convection and applies to standard bulbs 150 mm in diameter in accordance with DIN EN ISO 7726.

Necessary measurement parameters

- Mean radiation temperature in °C = t_r
- Globe temperature in °C = t_g
- Ambient temperature in °C = t_a
- Air velocity in m/s = v_a

$$t_r = [(t_g+273)^4+2.5*10^8*v_a^{0.6}*(t_g-t_a)]^{1/4}-273$$

For the PMV/PPD calculation, we use the measured temperature of the humidity probe for the ambient temperature. At low flow velocities < 0.2 m/s, the temperature of the turbulence probe cannot be used because a slightly increased temperature is indicated due to the thermal effect of the hot wire.

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1 Click on ☰.

▸ Main menu opens

2 ▦ Click on **Measure**.

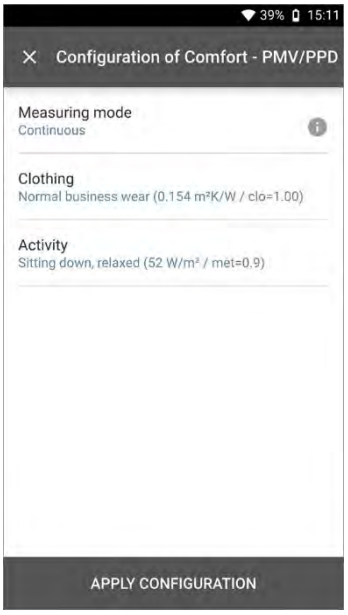
3 Click on **Comfort level – PMV/PPD**.

▸ The Comfort level – PMV/PPD measurement menu opens.

4 Click on ⚙.

▸ Configuration menu opens.

5 Make the required settings.



6 Determine **Clothing** and **Activity**.

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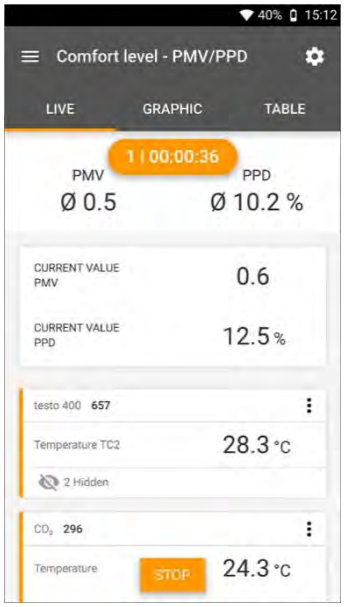
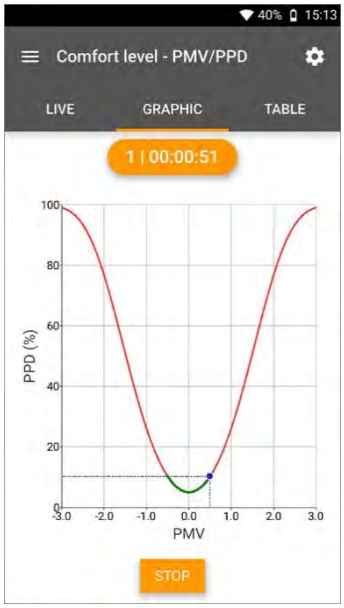
7 Click on **Apply Configuration**.

- Values currently being measured are displayed.



- Values currently being measured are displayed graphically.



Factors to be entered

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Clothing

Clothing reduces body heat losses and is therefore classified based on its insulating value. The insulating effect of clothing is given in the unit clo or m² K/W (1 clo = 0.155 m² K/W). The clo value can be calculated by adding together the values of the individual items of clothing. Insulating values for individual items of clothing can be found in ISO 7730. Alternatively, a range can be selected.

Parameter in clo	Parameter in m^2 K/W	Description
0 to 0.02		No clothing
0.03 to 0.29	0.005 to 0.045	Underwear
0.30 to 0.49	0.046 to 0.077	Shorts and T-shirt
0.50 to 0.79	0.078 to 0.122	Trousers and T-shirt
0.80 to 1.29	0.123 to 0.200	Light business wear
1.30 to 1.79	0.201 to 0.277	Warm business wear
1.80 to 2.29	0.278 to 0.355	Jacket or coat
2.30 to 2.79	0.356 to 0.432	Warm winter clothing
2.80 to 3.00	0.433 to 0.465	Extremely warm winter clothing

Activity

The metabolic rate specifies the energy released by oxidation processes in the human body, and depends on muscle activity. The metabolic rate is given in met or W/m^2 (1 met = 58.2 W/m² body surface area). The average adult has a body surface area of 1.7 m². In a state of thermal comfort, a person with a metabolic rate of 1 met has heat loss of approx. 100 W. When calculating the metabolic rate, a mean value of the activity of the relevant person within the past hour must be used. Met values for various activities can also be found in ISO 7730.

Parameter in met	Parameter in W/m^2	Description
0.1 to 0.7	6 to 45	Lying down, relaxed
0.8 to 0.9	46 to 57	Sitting down, relaxed
1.0 to 1.1	58 to 59	Seated activity
1.2 to 1.5	70 to 92	Standing
1.6 to 1.7	93 to 104	Standing up, light activity
1.8 to 1.9	105 to 115	Standing up, moderate activity
2.0 to 2.3	116 to 139	Slow walking
2.4 to 2.9	140 to 174	Quick walking
3.0 to 3.4	175 to 203	Strenuous activity
3.5 to 4.0	204 - 233	Extremely strenuous activity

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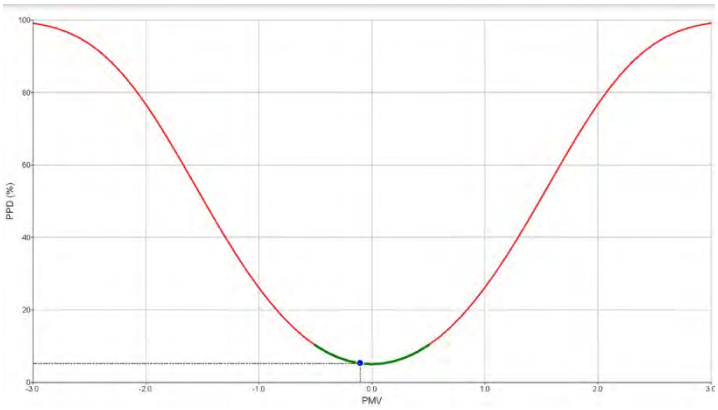
The factors to be entered refer to ISO 7730 Appendix B and C.

We recommend using the following probes:

- Globe thermometer (0602 0743)
- IAQ probe (0632 1551 Bluetooth® / 0632 1552 cable / 0632 1550 probe head)
- Turbulence probe (0628 0152)
- Tripod (0554 1591)

Graphical representation



	Element		Element
1	PPD axis, scaling from 0 – 100%	**1**	Calculated point from PPD and PMV
3	PMV axis scaling from -3 to +3	**4**	Green section of the curve from -0.5 to 0.5 PMV
5	Critical section of the curve		

Formula for the display:

PPD = 100-95*exp (-0.03353*PMV^4 – 0.2179*PMV^2)

9.4.10 Discomfort - draught rate

With the turbulence probe 0628 0152 connected, the turbulence calculation for the flow value is made possible on the basis of DIN EN 13779 and DIN EN 7730, as well as ASHRAE 55. The draught rate measures the air temperature, fluctuation and standard deviation of the air velocity. From these three values, the testo 400 calculates the percentage of dissatisfaction due to draughts.

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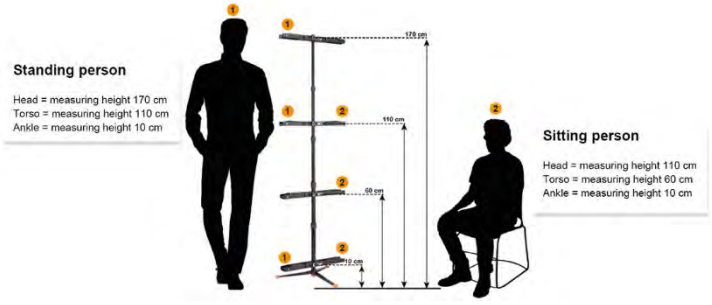
The turbulence probe requires a warm-up period of around 3 seconds after connection to the testo 400. Carry out the measurement after this.

For unimpaired measurement, we recommend attaching the probe(s) to a tripod. In combination with the testo tripod and the IAQ data logger, up to 3 probes can be positioned at the relevant heights in accordance with the standards.

The draught is measured at the level of thermally exposed areas such as the head and ankles, as well as at the level of thermal centre of gravity, at abdominal height. The measurement heights refer to the relevant measuring points in accordance with the standards (EN 7726 and ASHRAE Standard 55), depending on whether the person is standing or sitting.



1 Click on ☰.

▸ Main menu opens

2 ▦ Click on **Measure**.

3 Click on **Discomfort - draught rate**.

▸ The Discomfort - draught rate measurement menu opens.

4 Click on ⚙.

▸ Configuration menu opens.

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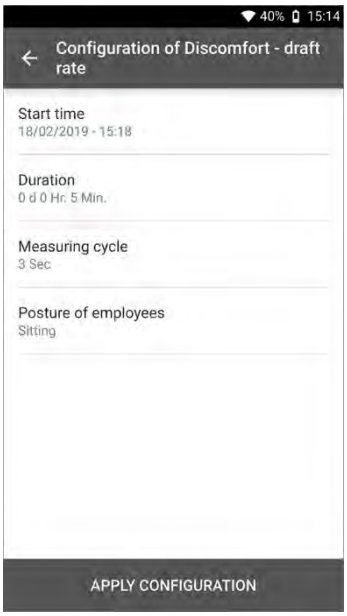
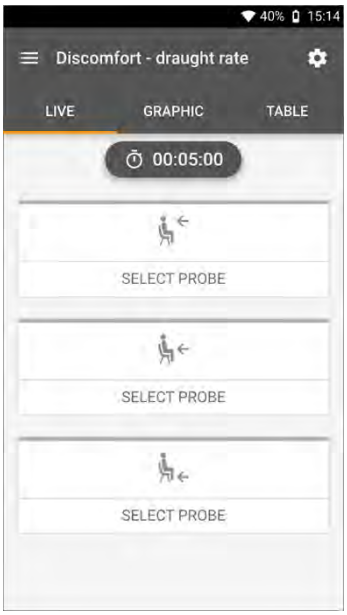
5 Make the required settings.



6 Click on **Apply Configuration**.

7 Using the 3-digit probe ID, assign the probes to the respective measuring position. It is possible to connect up to three probes simultaneously (with IAQ data loggers), but also to measure with one probe at three heights in succession.



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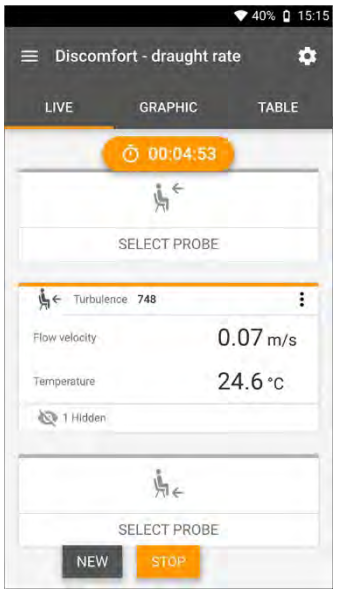
- Values currently being measured are displayed. The measuring values can also be called up in the **Graphic** and **Table** views.



If the heights are being measured one after the other, you can click directly on the second height following successful measurement of the first height, and only after completion of the third height can the measurement be saved. This means that all the measurement results are saved in one report and not in three different reports.

The two calculated measurement parameters Turbulence (Tu) and Draught rate (DR) are only calculated on the basis of all measured values. This means that these two values are displayed at the end of the measurement and are not calculated for each time point of the measurement.

9.4.11 Differential temperature (ΔT)

In this application, the temperature span can be measured with two temperature probes. This can be used, for example, to determine whether the temperature span of a HVAC system corresponds to the set values.

Two temperature probes are required for the differential temperature application. If more than two probes are connected to measure the temperature, the selection of the relevant probes can only be influenced by disconnecting and reconnecting them. The two temperature probes connected first are selected for the calculation.

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1 Click on ☰.

▸ Main menu opens

2 ▦ Click on **Measure**.

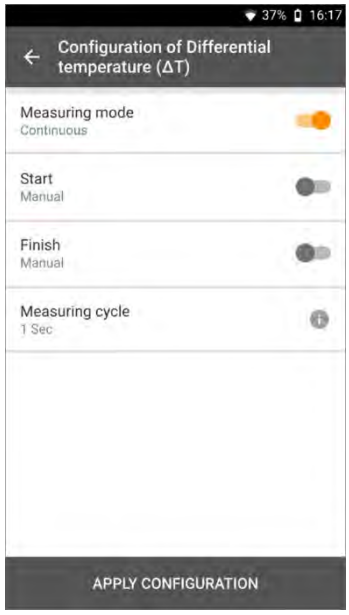
3 Click on **Differential temperature (ΔT)**.

▸ The **Differential temperature (ΔT)** measurement menu opens.

4 Click on ⚙.

▸ Configuration menu opens.

5 Make the required settings.



6 Click on **Apply Configuration**.

7 Click on **Start**.

▸ The measurement starts.

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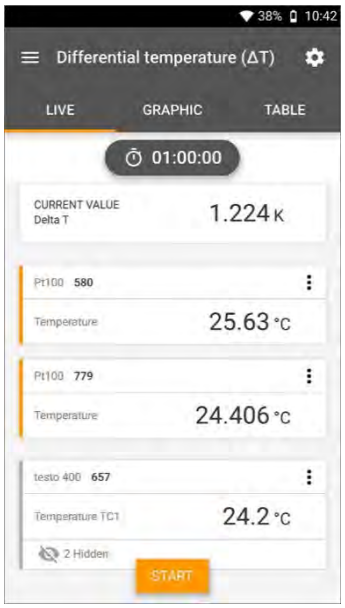
▸ Values currently being measured are displayed.



9.4.12 Differential pressure (ΔP)

The testo 400 has an internal absolute and differential pressure sensor. This sensor can be used, for example, to investigate the differential pressure of two rooms.

1 Connect the pressure tubes to the **+** and **-** connection sockets.

⚠ CAUTION

Make sure the pressure tube does not jump away from the connection socket.
Risk of injury!

- Ensure correct connection.

2 Click on ☰.

▸ Main menu opens

3 ▦ Click on **Measure**.

4 Click on **Differential pressure (ΔP)**.

▸ The Differential pressure (ΔP) measurement menu opens.

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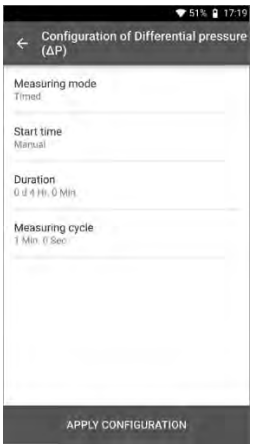
5 Click on ⚙.

▸ Configuration menu opens.

6 Make the required settings.



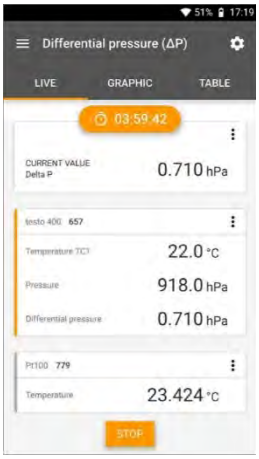
7 Click on **Apply Configuration**.

8 Click on ⋮ to zero the differential pressure sensor.

9 Click on **Start**.

▸ The measurement starts.

▸ Values currently being measured are displayed.



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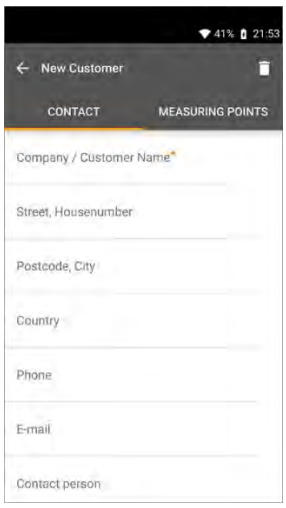
If the readings fluctuate wildly, it is advisable to damp the readings (see Section 9.7.5).

9.5 Customer management

In the **Customer** menu, all customer and measuring site information can be created, edited and deleted. Fields marked with * are mandatory. Without any information in this field, no customers or measuring sites can be stored.

9.5.1 Creating and editing a customer

1. Click on ☰.
   - Main menu opens
2. Click on **Customer**.
   - The Customer menu opens.
3. Click on **+ New customer**.
   - A new customer can be created.
4. Store all relevant customer data.



5. Click on **Save**.
   - The new customer was saved.

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9.5.2 Creating and editing measuring sites

1 Click on ☰.

▸ Main menu opens

2 Click on 👤 Click on **Customer**.

▸ The Customer menu opens.

3 Click on **+ New customer**.

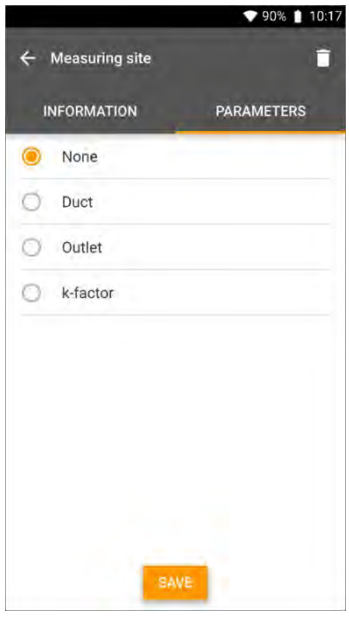
Click on right tab **Measuring site**.

5 Click on **+ New measuring site**.

▸ A new measuring site can be created.

6 Store all relevant measuring site information.

7 Click on right tab **Parameters**.



8 Select further parameters.

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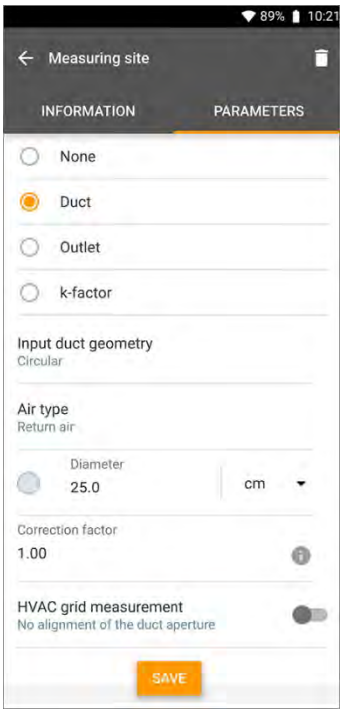
For the duct, outlet or duct with k-factor measuring sites, further parameter settings can be implemented.

9 Click on **Save**.

▸ The new measuring site has been saved.

9.5.2.1 Duct measuring site

1 Click on **Duct**.



▸ Other characteristics are displayed.

2 Input the characteristics accordingly: Duct geometry, air type, duct dimensions (different measurement units can be selected) and correction factor.

The correction factor is preset to 1.0 by default. The setting can be between 0.01 and 9.99.

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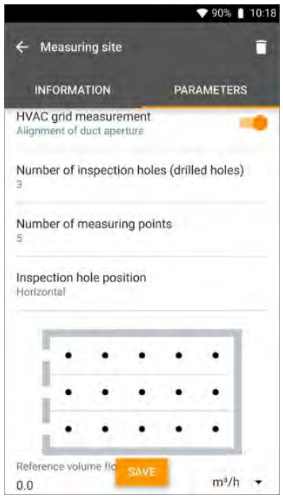
Due to pressure drops in the system, the measured volume flow may be smaller than the actual volume flow. The measured volume flow can be corrected via the flow rate correction factor. The flow rate correction factor has a directly proportional effect on the measurement result and is usually set at 1.00. Once the factor is changed, the result is multiplied by the flow rate correction factor.

3 Click on **Save**.

▸ Settings have been saved.

HVAC grid measurement

1 Activate **HVAC grid measurement** using the slider.



▸ Detailed information about a standard-compliant measurement can be stored in order to have the measurement assistant determine the optimum immersion depth of the probe in the duct.

2 Determine the **Number of inspection holes (drilled holes)**.

3 Determine the **Number of measuring points**.

4 Determine the **Inspection hole position**.

▸ A graphic with the number of inspection holes and measuring points is displayed.

5 Click on **Save**.

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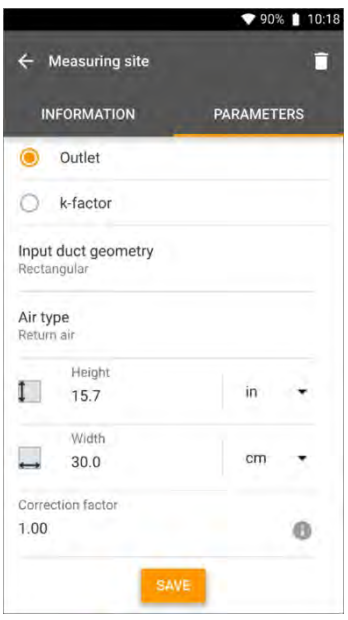
9.5.2.2 Outlet measuring site

1 Click on **Outlet**.



▸ Other characteristics are displayed.

2 Input the characteristics accordingly: Duct geometry, air type, duct dimensions (different measurement units can be selected) and correction factor.

> The correction factor is preset to 1.0 by default. The setting can be between 0.01 and 9.99.

3 Click on **Save**.

▸ Settings have been saved.

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9.5.2.3 k-factor measuring site

1 Click on **k-factor**.

▸ Other characteristics are displayed.

2 Enter the relevant characteristics: specific k-factor, volume flow, differential pressure and air type.

3 Click on **Save**.

▸ Settings have been saved.

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9.5.3 Searching for and managing customers and measuring sites

Searching for a customer

1. Click on .
   - Main menu opens.
2. Click on **Customer**.
   - The Customer menu opens.
3. Click on .
   - The input window appears.
4. Enter the name.
   - The selected customer appears in the overview.

Deleting a customer

1. Click on the required customer.
   - is displayed at top right.
2. Click on .
3. Acknowledge the warning.

Searching for a customer's measuring site

1. Click on .
   - Main menu opens.
2. Click on **Customer**.
   - The Customer menu opens.

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3 Click on .

▸ The input window appears.

4 Enter the name.

▸ The selected customer appears in the overview.

5 Click on the Measuring site tab.

▸ The Measuring site menu opens.

6 Click on .

▸ The input window appears.

7 Enter the name.

▸ The selected measuring site appears in the overview.

Deleting a customer's measuring site

1 Click on the required measuring site.

▸ is displayed at top right.

2 Click on .

3 Acknowledge the warning.

If you are in the Measuring site tab (and no measuring site has been selected) and you click on the icon at top right, you will not delete the measuring site(s) but the customer with all the data. Therefore please always pay heed to the warnings.

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9.6 Measurement data management

All measurements stored on the testo 400 can be found in the Memory. You can store customer and measuring site information, add images and comments, create PDF reports, CSV and JSON data, and export via Bluetooth or e-mail.

	Element		Element
1	Search	2	Edit
3	Stored measurement with date/time, customer/measuring site information, application description		

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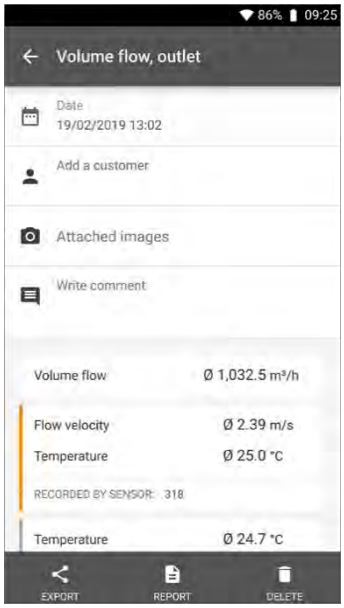
9.6.1 Managing measurement data

After clicking on a saved measurement, the corresponding results screen is displayed. All properties for the measurement are listed there. Customer and measuring site information can be stored, images and comments can be added and PDF reports, CSV and JSON data can be created and exported via Bluetooth or e-mail.

1. Click on ☰.
   - Main menu opens.
2. Click on **Memory**.
   - The Memory menu opens.
3. Click on the required measurement.
   - The measurement opens.



4. If required, click on **Add a customer** (see Section 9.5).
5. If required, click on **Attached images**.
   - Image can be added from the **Directory** or taken with the **Camera**.

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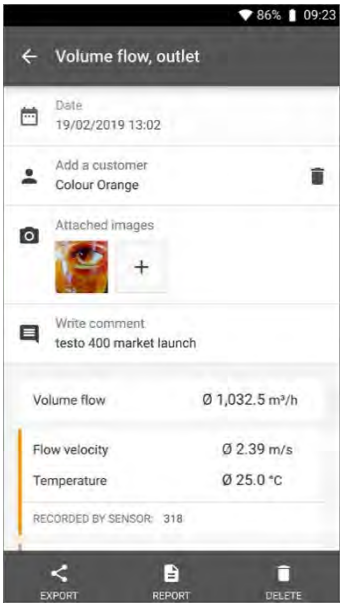
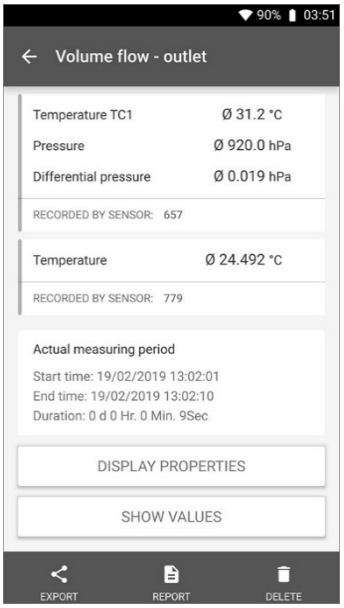
6 If required, **Write comment**, up to 1000 characters.

- The customer, the attached images and the comments are displayed in the results view.



- The calculated result of the measurement is displayed under the Customer data, Images and Comments.



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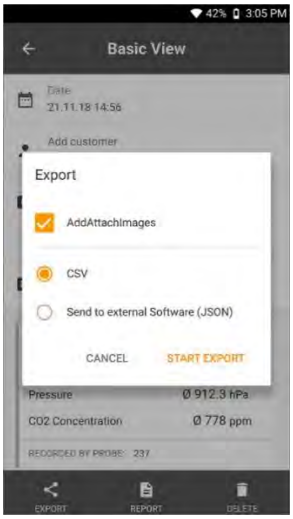
The other measuring values are assigned to the corresponding probes. The probes relevant to the application menu are highlighted in orange, while the other probes, which have stored additional measuring values during the measurement, are highlighted in grey. After the probes, the **Actual measuring period** is displayed. This always starts at the time of the first recorded measuring value and ends with the last recorded measuring value. If, for example, a 60-minute measurement were terminated prematurely, the measurement properties would indicate that the measurement period is 60 minutes, but in the case of the **Actual measuring period**, the correct measurement period will be calculated and displayed.
At the bottom of the screen, following all the listed measuring values, the **Display Properties** and **Show Values** tabs are listed, in all the measurement menus. In addition, the **Graphic** tab is displayed for PMV/PPD measurements. The graphic progression of the individual measurements can be called up at any time in the testo DataControl software (see Section 13.8.2). For HVAC grid measurements in accordance with EN 12599 or ASHRAE, the gauged **Measuring Points** and not the measuring values are listed generally.
Properties lists the settings that the measurement was carried out with, along with all the individual elements (measuring mode, duct dimensions, correction factor, etc.). In the second menu item, all measuring values of the various measurement parameters are listed with a time allocation.

Sending a report

1. Click on **Export**.

▸ A selection window is displayed, and the measurement report can be exported as a CSV or JSON file.



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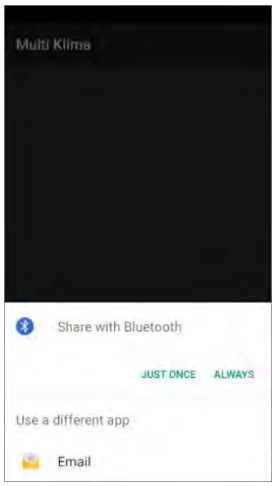
2 Select **CSV file** or **JSON file** and click on **Start export**. If necessary, activate the **Add Attach Images** button.

▸ Export options are displayed.



3 Click on **Bluetooth** or **E-mail**.

An e-mail account must be set up before this option can be used (see Section 10.2).

Converting a report to a PDF file

1 Click on **Report**.

▸ A selection window is displayed

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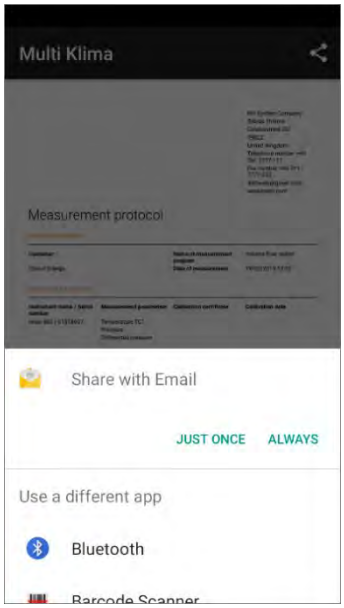
2 If required, activate the **Create PDF with all readings** button.

3 Click on **Create**.

For measurements, please be aware that the option **Create PDF with all readings** is only possible up to 30 pages in the testo 400, due to the resulting file size and number of pages. In the testo DataControl software, however, PDF reports can be created for all measurements without any restrictions.

▸ A report containing all the information is created.

▸ A selection window is displayed. The report can be sent via e-mail or Bluetooth®.



4 Click on e-mail or Bluetooth®.

▸ The report will be sent.

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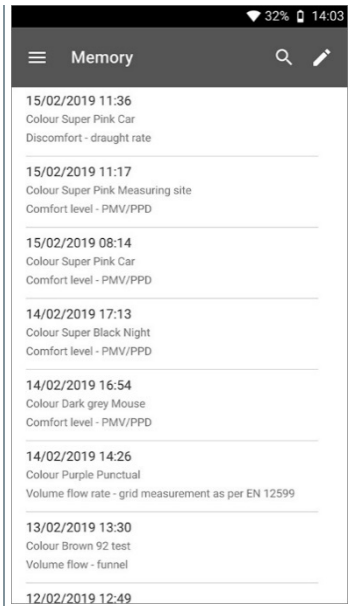
9.6.2 Editing measurement data

1. Click on ☰.
   - Main menu opens.
2. Click on **Memory**.
   - The Memory menu opens.



3. Click on ✎.
   - Selection fields appear next to each stored measurement.

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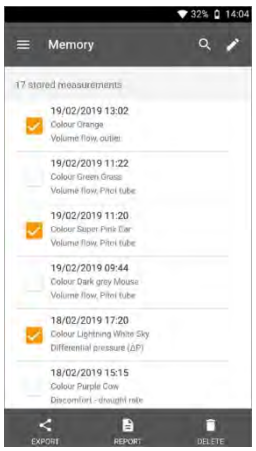
4 Click on the selection fields for the required measurements.

▸ The measurements are marked with a tick.

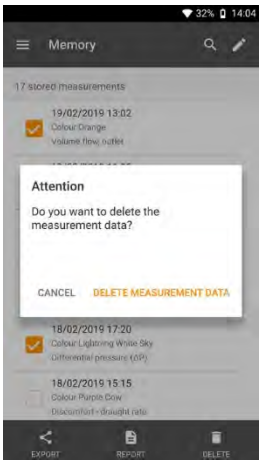


5 Click on **Export** or **Report**.

▸ All marked measurements are sent as CSV or JSON files or as PDF reports via Bluetooth® or e-mail.

or6 Click on **Delete**.

▸ A selection window is displayed and the selected measurement reports can be deleted.



7 Click on **Delete Measurement Data** or **Cancel**.

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9.6.3 Searching for measurement data

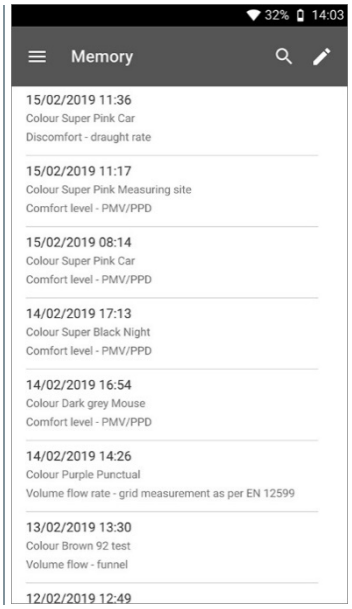
The search function allows you to quickly and easily filter the measurements you are searching for according to certain search terms. Both the customer and measuring site names as well as the descriptions of the applications are included in the search. This makes it possible, for example, to filter by customer name or the term PMV or draught rate.

1. Click on ☰.

▸ Main menu opens.

2. Click on **Memory**.

▸ The Memory menu opens.



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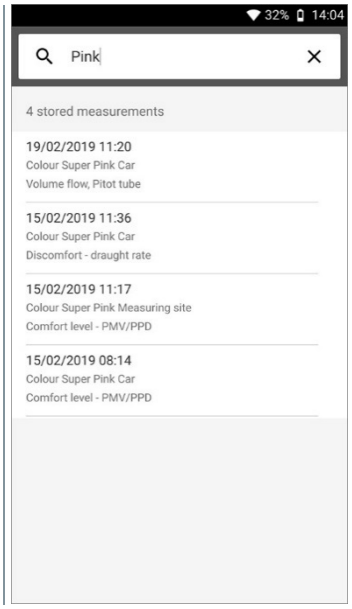
3 Click on .

The text box for the search is displayed.



4 The search term can be entered.

Upper and lower case letters do not have to be taken into account when entering text.

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9.7 Sensor management

All sensors that the testo 400 uses can be found in the Sensors menu. There, you can view general information about currently connected probes as well as recently connected probes. In addition, you can enter and call up calibration information, activate damping and carry out adjustment and humidity calibration.

9.7.1 General information about the probes

Information is stored for each probe.

✓ The probe is connected to the testo 400.

1 Click on ☰.

▸ Main menu opens.

2 Click on Sensors.

▸ The Sensors menu opens.

3 Click on one of the displayed probes.

▸ Information is displayed about the model, order number, serial number and firmware version.

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9.7.2 Calibration

For all sensors, calibration data can be stored under the **Measurement parameter** tab for individual measurement parameters.

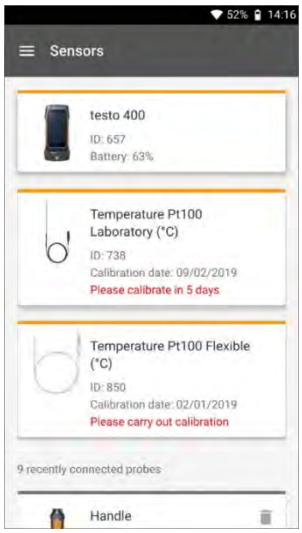
✓ The probe is connected to the testo 400.

1 Click on ☰.

▸ Main menu opens.

2 Click on **Sensors**.

▸ The Sensors menu opens.



From 14 days preceding expiry of the calibration reminder, a notice is displayed in the sensor management for the relevant probe – **Please calibrate in x day**. In addition, an orange dot is displayed in the **Sensors** main menu as an indicator.

If the calibration reminder has already expired, the notice changes to **Please carry out calibration**.

3 Click on one of the displayed probes.

▸ Information is displayed about the model, order number, serial number and firmware version.

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4 Click on the **Measurement parameters** tab.

5 Click on the required measurement parameter.

6 Store or edit the relevant data.

▸ All changes are automatically stored in the respective probe.

9.7.3 Surface increment

Surface probes withdraw heat from the measured surface immediately after the initial contact. This makes the measurement result lower than the true surface temperature without the probe (or the reverse if the surface is colder than the environment). This effect can be corrected by an increment in % of the reading.

✓ The probe is connected to the testo 400.

1 Click on ☰.

▸ Main menu opens.

2 Click on **Sensors**.

▸ The Sensors menu opens.

3 Click on the testo 400.

The TC type K probes are not displayed as separate probes, but always on the instrument itself.

▸ Information is displayed about the model, order number, serial number and firmware version.

4 Click on the **Measurement parameters** tab.

▸ Window with measurement parameters opens.

5 Click on the required **Temperature TE1** or **Temperature TE2**.

▸ Window for surface increment opens.

6 Click on **Activate surface increment**.

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7 Click on **Set surface increment**.

▸ Window for Use surface increment opens.

8 Enter the percentage.

9 Click on **Save**.

The surface increment, related to a measuring problem, is a probe constant and must therefore be determined anew for each design.

9.7.4 Adjustment

The digital probes allow direct measurement and signal conversion in the probe. This technology means that measurement uncertainty caused by the instrument is no longer an issue. The probe can be calibrated without a handheld instrument. Entering the adjustment/calibration data generates a zero-error display.

✓ The probe is connected to the testo 400.

1 Click on ☰.

▸ Main menu opens.

2 Click on **Sensors**.

▸ The Sensors menu opens.

3 Click on the required sensor.

▸ Information is displayed about the model, order number, serial number and firmware version.

4 Click on the **Measurement parameters** tab.

▸ Window with measurement parameters opens.

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5 Click on the required measurement parameters.

▶ The measurement parameter opens.

6 Click on **Adjustment**.

A total of six different adjustment values can be stored.

7 Input **Current**, **Target SH** and the **Unit**.

8 Click on **Adjust**.

The adjustment data entered can be deleted at any time in the sensor management via the icon.

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9.7.5 Damping

If the readings fluctuate wildly, it is advisable to damp the readings.

✓ The probe is connected to the testo 400.

1 Click on ☰.

▸ Main menu opens.

2 Click on **Sensors**.

▸ The Sensors menu opens.

3 Click on the required sensor.

▸ Information is displayed about the model, order number, serial number and firmware version.

4 Click on the **Measurement parameters** tab.

▸ Window with measurement parameters opens.

5 Enable **Activate damping** using the slider.

6 Click on **Average of the measured values**.

▸ Window for Average of the measured values opens.

7 Enter a value between 2 and 20 seconds.

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9.7.6 Humidity calibration

For humidity calibration, the measurement parameter of the connected probe is adjusted to the reference value at the two standard adjustment points 11.3 %RH and 75.3 %RH; any measuring value deviations from the nominal value are minimized across the entire measuring range. The Testo calibration set provides a reference value to calculate the offset for a humidity calibration.

Humidity calibration is possible with the following probes:

Order no.	Designation
0636 9771	High-precision temperature/humidity probe with Bluetooth®
0636 9772	High-precision temperature-humidity probe, fixed cable
0636 9731	Temperature/humidity probe with Bluetooth®
0636 9732	Temperature/humidity probe, fixed cable
0636 9775	Robust temperature/humidity probe for temperatures up to +180 °C, fixed cable

✓ The probe is connected to the testo 400.

1 Click on ☰.

▸ Main menu opens.

2 Click on **Sensors**.

▸ The Sensors menu opens.

3 Click on the required sensor.

▸ Information is displayed about the model, order number, serial number and firmware version.

4 Click on the **Measurement parameters** tab.

▸ Window with measurement parameters opens.

5 Click on **Relative humidity**.

▸ The Relative humidity window opens.

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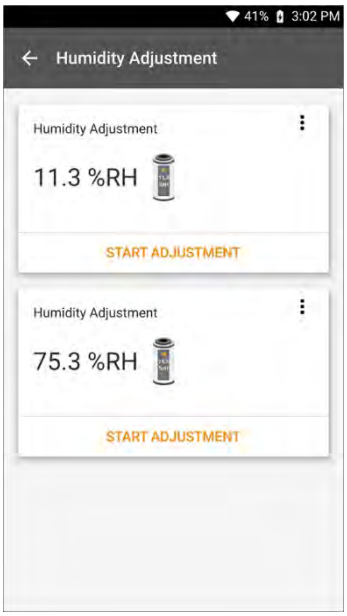
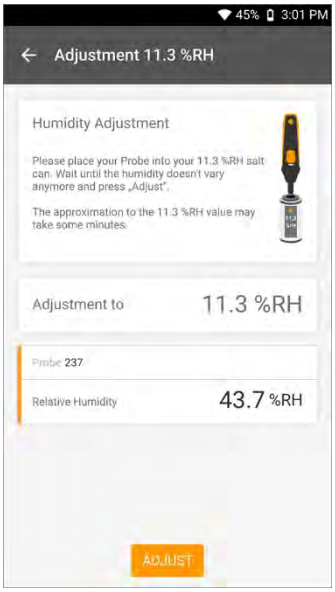
6 Click on **Start Adjustment**.



▸ Humidity calibration is started.



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10 Settings

10.1 Carrying out a testo 400 update

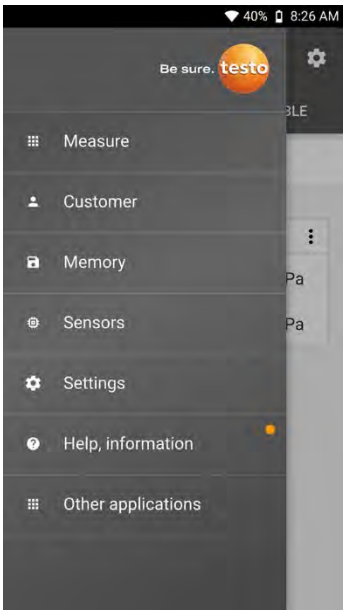
If a new update is available, an orange dot appears in the main menu at **Help, information**.

This notification only appears if there is a WLAN connection. Otherwise, it is not possible to check whether updates are available.

1 Click on .

▸ Main menu opens.

2 Click on **Help, information**.



▸ The **Help and Information** menu opens.

3 Click on **Instrument information**. If updates are available, the field is also marked with an orange dot.

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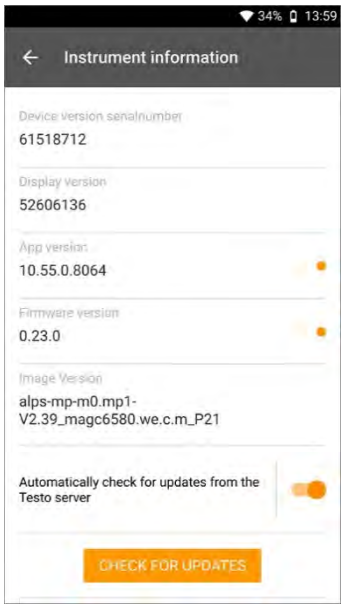
▸ Information about Serial number, Display number, App version and Firmware version is displayed.



4 If required, activate **Automatic probe update** with the slider.

5 If required, activate **Automatically check for updates** with the slider.

6 Click on **Check for updates**.

▸ A dialogue box opens.

7 Click on **Install update** if an update is available.

or

Click on **Later** to do this at a later date.

If a cable probe with older firmware is connected to the testo 400, the probe can be updated or removed (see Section 8.6.3).

We always recommend carrying out the probe update, since the introduction of new firmware always serves a purpose or solves an existing problem on the market.

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10.2 Setting up an e-mail account

An e-mail account has to be set up in order to be able to send reports as e-mails. A Wireless LAN connection must be available to set the account up.

10.2.1 Setup via the wizard

You can use the Setup wizard in Section 8.4 to set up your e-mail account.

10.2.2 Manual set-up

1. Click on ☰.
   - Main menu opens.
2. ⚙ Click on **Settings**.
   - The **Settings** menu opens.
3. Click on **WLAN & e-mail**.
4. Click on **E-mail**
   - Account setup appears. E-mail account can be set up.

or

1. Click on ☰.
   - Main menu opens.
2. ⓘ Click on **Other applications**.
3. Click on **E-mail**
   - Account setup appears. E-mail account can be set up.

If an Exchange e-mail account is set up, a request for the PIN code entry or a password will be made for security reasons.
From now on, this PIN code or the password will be required **each time** you unlock the screen.

For security reasons, resetting is only possible via testo Service.

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10.2.3 Deleting an e-mail account

1 Click on .

▸ Main menu opens.

2 Click on **Settings**.

▸ The **Settings** menu opens.

3 Click on **WLAN & e-mail**.

▸ The WLAN & e-mail menu opens.

4 Click on E-mail accounts.

▸ Window with warning opens.

5 Click on **Remove accounts** or **Cancel**.

10.2.4 General information about the e-mail account

Many e-mail providers have security systems that prohibit signing up to the e-mail app on the testo 400. This is why setting up an e-mail account generally works best via the IMAP and SMTP incoming and outgoing servers.

To make the correct server settings, please check the recommendations from your e-mail provider. You can usually find suitable instructions on the e-mail provider's homepage.

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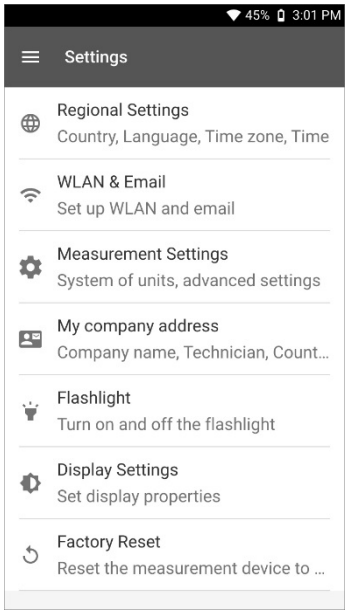
10.3 Making basic settings

Basic settings contains all the general settings for the testo 400. Configurations implemented in the Setup wizard can be changed here.



10.3.1 Regional settings

1. Click on ☰.
   - Main menu opens.
2. ⚙ Click on **Settings**.
   - The **Settings** menu opens.
3. Click on **Regional settings**.
   - The **Regional settings** menu opens.
4. Click on **Language**.
   - The **Language** window opens.

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5 Click on **Country**.

▸ Information window is displayed.

6 Click on **OK**.

7 Select **Country**.

8 Click on **Time**.

▸ Information window is displayed.

9 Click on **OK**.

10 Set the **Date & Time**.

10.3.2 WLAN & e-mail

1 Click on ☰.

▸ Main menu opens.

2 ⚙ Click on **Settings**.

▸ The **Settings** menu opens.

3 Click on **WLAN & e-mail**.

▸ The **WLAN & e-mail** menu opens.

4 Click on **WLAN**.

▸ Information window is displayed.

5 Click on **OK**.

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6 Select **WLAN** network.

7 Click on **E-mail**.

▸ Account setup appears.

You can set up your account in just a few steps. Follow the instructions.

8 Click on **E-mail accounts**.

▸ Window with warning opens.

9 Click on **Remove accounts** or **Cancel**.

10.3.3 Measurement settings

1 Click on ☰.

▸ Main menu opens.

2 ⚙ Click on **Settings**.

▸ The **Settings** menu opens.

3 Click on **Measurement settings**.

▸ The **Measurement settings** menu opens.

4 Click on required unit.

▸ Window with corresponding units opens.

5 Click on unit.

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10.3.4 Company details

1 Click on ☰.

▸ Main menu opens.

2 ⚙ Click on **Settings**.

▸ The **Settings** menu opens.

3 Click on **Company details**.

▸ The **Company details** menu opens.

4 Click on required fields.

5 Enter information.

10.3.5 Torch

1 Click on ☰.

▸ Main menu opens.

2 ⚙ Click on **Settings**.

▸ The **Settings** menu opens.

3 Click on **Torch**.

▸ The torch switches on.

4 Click on **Torch** again.

▸ The torch switches off.

ℹ Please note that constant activation of the torch will result in higher battery consumption.

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10.3.6 Display settings

1 Click on ☰.

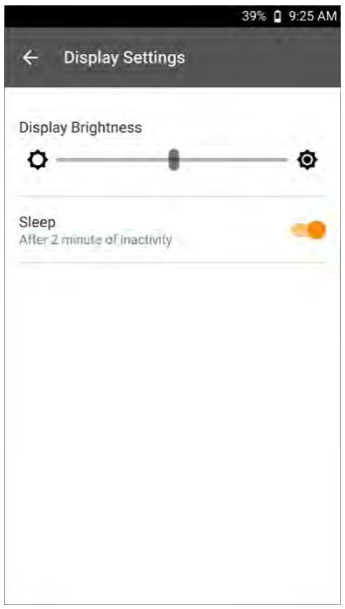
▸ Main menu opens.

2 ⚙ Click on **Settings**.

▸ The **Settings** menu opens.

3 Click on **Display Settings**.

▸ The **Display Settings** menu opens.



4 For the **Display Brightness**, move the controller to the left or right.

▸ The display becomes brighter or darker.

5 Enable **Sleep** using the slider.

▸ **Sleep** is enabled (or disabled).

When clicking on **Sleep**, you can select whether the display switches to sleep mode after 2 minutes and becomes inactive. The display is activated again by briefly pressing the On/Off switch.

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10.3.7 Resetting the testo 400 to factory settings

1 Click on ☰.

▸ Main menu opens.

2 ⚙ Click on **Settings**.

▸ The **Settings** menu opens.

3 Click on **Restore factory settings**.

▸ Information window opens.

ℹ After clicking on the **Restore factory settings** field, you will be asked whether you are sure that you want to carry out a reset. All relevant measurement data should be stored on an external instrument. The testo 400 must then be reconfigured and all collected measurement data deleted.

4 Click **OK** or **Cancel**.

10.4 General information

Under General Information, you will find information about the testo 400, and the tutorial can once again be called up and implemented. There you will also find the Quick Start Guide, the detailed instructions and the legal information.

10.4.1 General instrument information

1 Click on ☰.

▸ Main menu opens.

2 ? Click on **Help and Information**.

▸ The **Help and Information** menu opens.

3 Click on **Instrument information**.

▸ The current serial and display numbers are displayed. The current app and firmware version is also displayed.

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It is possible to check manually whether updates for the app or firmware are currently available.

1 Enable **Automatically check for updates** with the slider.

2 Click on **Check for updates**.

▸ The system searches for updates.

3 Follow the instructions.

Automatic probe update can be enabled or disabled.

> Enable or disable **Automatic probe update** with the slider (see Section 8.6.3).

10.4.2 Calling up the tutorial

1 Click on ☰.

▸ Main menu opens.

2 Click on **Help and Information**.

▸ The **Help and Information** menu opens.

3 Click on **Tutorial**.

▸ The tutorial shows you the most important steps prior to commissioning.

10.4.3 Calling up the Quickstart Guide/detailed instructions

1 Click on ☰.

▸ Main menu opens.

2 Click on **Help and Information**.

▸ The **Help and Information** menu opens.

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3 Click on **Quickstart Guide** or **Instruction Manual**.

▸ The Quickstart Guide for the testo 400 including IAQ data logger and the testo DataControl software are displayed in pdf format.

10.4.4 Calling up legal information

1 Click on .

▸ Main menu opens.

2 Click on **Help and Information**.

▸ The **Help and Information** menu opens.

3 Click on **Exclusion of liability**.

▸ The data protection information and licence usage information is displayed.

10.4.5 Other applications

1 Click on .

▸ Main menu opens.

2 Click on **Other applications**.

▸ The **Other applications** menu opens.

In the **Other applications** menu, you will find the following applications:

	Camera		Calendar
	Clock		Computer
	E-mail		Quick Support
	Gallery		File manager
	Browser		Bluetooth®

1 Click on .

▸ Information window opens.

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2 Click **Next** or **Cancel**.

▸ Individual apps and additionally installed apps can be closed manually. E-mail and Bluetooth® settings can be reset.

If **always** has been selected for the data export, the setting can be undone in this menu. This means that both export options will be available again in the future.

11 Maintenance

11.1 Rechargeable battery care

Battery replacement may only be carried out by Testo Service.

- At low ambient temperatures, rechargeable battery performance decreases. This reduces the available useful life.
- Do not store the rechargeable battery for long periods when discharged. (Best storage conditions at 50-80% battery level, 10-20 °C ambient temperature.) Fully charge before using again.
- The available useful life of the rechargeable battery reduces more and more with frequent use. If the useful life is significantly shortened, the rechargeable battery should be replaced.

11.2 Notifications

In the main menu, notifications are marked with an orange dot next to the menu entry. Depending on the menu entry, these notifications contain different information.

Menu entry	Information
Sensors	Calibration reminder: The reminder date of a stored calibration certificate has been exceeded (see Section 9.7.2).
Help and Information, Instrument information	Update information: A software update is available on the Testo server. This can be downloaded with an existing WLAN connection (see Section 10.1).

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12 Technical data

General

Feature	Value
Probe connections	- 2x type K thermocouple - 2x Testo Universal Connector (TUC) for connecting cable probes to the corresponding plug - 1x differential pressure - 1x absolute pressure (integrated) - 4x Bluetooth® probe or testo Smart Probe
Interfaces	- Micro USB for connection to PC or for battery charging with mains unit - WLAN 802.11 b/g/n - Bluetooth® 4.0
Internal memory capacity	2 GB (corresponds to 1,000,000 readings)
Rechargeable battery life	10 hours of continuous operation / 3200 mAh
Measuring cycle	0.5 sec / display update 1 sec
Operating temperature	-5 to +45 °C
Storage temperature	-20 to +60 °C
Charging temperature	0 to +45 °C
Dimensions in mm	186 x 89 x 41 (L x W x H)
Housing material	PC, ABS, TPE
Weight	500 g
Protection class	IP 40 (with probe connected)
Display	5.0 inch HD display (1280*720 pixels)
Camera	- Front camera 5.0 MP - Rear camera 8.0 MP

Integrated sensors (at 22 °C, ±1 digit)

Characteristics	Measuring range	Accuracy	Resolution
Temperature (TC type K)[1]	-200 to +1370 °C	±(0.3 °C + 0.1% of m.v.) Internal cold junction measurement: ±0.5 °C	0.1 °C
Temperature (NTC)	-40 to +150 °C	±0.2 °C (-25.0 to +74.9 °C) ±0.4 °C (-40.0 to -25.1 °C) ±0.4 °C (+75.0 to +99.9 °C) ±0.5% of m.v. (rest)	0.1 °C

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Characteristics	Measuring range	Accuracy	Resolution
Differential pressure[2]	-100 to +200 hPa	±(0.3 Pa + 1% of m.v.) (0 to 25 hPa) ±(0.1 hPa + 1.5 % of m.v.) (25.001 to 200 hPa)	0.001 hPa
Absolute pressure	+700 to +1100 hPa	±3 hPa	0.1 hPa

[1] The accuracy information applies in an adjusted, stable temperature state. Plugging in the mains unit, charging the battery or adding digital probes can distort this temporarily, and additional errors may occur.

[2] The accuracy specification applies immediately after zeroing of the sensor. For long-term measurements, mains operation with fully-charged battery is recommended.

13 testo DataControl PC software

13.1 General information

The testo 400 has a USB port, via which the measuring instrument can be connected to the PC.

Knowledge of Windows® operating systems is required to work with the software.

13.2 Purpose

The testo DataControl measurement data management and analysis software enhances the functionality of the testo 400 measuring instrument by adding lots of useful functions:

- Manage and archive customer data and measuring site information
- Read out, evaluate and archive measurement data
- Presenting readings in graphic form
- Create professional measurement reports from the existing measurement data
- Conveniently add pictures and comments to measurement reports
- Data import from and data export to the measuring instrument

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13.3 System requirements

Administrator rights are required for installation.

Operating system

The software can be run on the following operating systems:

- Windows® 7
- Windows® 8
- Windows® 10

Computer

The computer must meet the requirements of the operating system in each case. The following requirements must also be met:

- Interface USB 2 or higher
- DualCore processor with minimum 1 GHz
- Minimum 2 GB RAM
- Minimum 5 GB available hard disk space
- Screen with a resolution of at least 800 x 600 pixels

13.4 Installing drivers and software

1. Insert the program CD into the CD-ROM drive of the computer.

   or

   Download testo DataControl software (
)
2. Launch the **DataControl.exe** file.
3. Follow the instructions of the installation wizard.
4. Click on **Finish** to complete the software installation.
5. Use the USB cable to connect the testo 400 to the PC.

▸ The connection will be established.

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13.5 Launching testo DataControl

The user interface of the software is opened in the language of the operating system, if it is supported. If the operating system language is not supported, the user interface will be in English.

Windows® 7:

> Click on [Start] | All Programs | Testo | testo DataControl (double-click on left mouse button).

▸ testo DataControl launches automatically.

Windows® 8:

> Click on Start | right mouse button | Search (Enter the application name in the search field | testo DataControl (double-click on left mouse button).

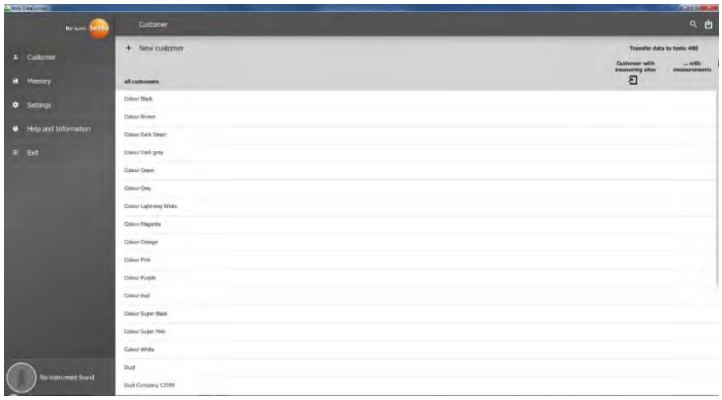
▸ testo DataControl launches automatically.

Windows® 10:

> Click on [Start] | All Apps | Testo | testo DataControl (double-click on left mouse button).

▸ testo DataControl launches automatically.

13.6 Connecting the testo 400



As long as the testo 400 is not connected to the computer, No Instrument found is displayed at bottom left.
All customers are listed in all customers.

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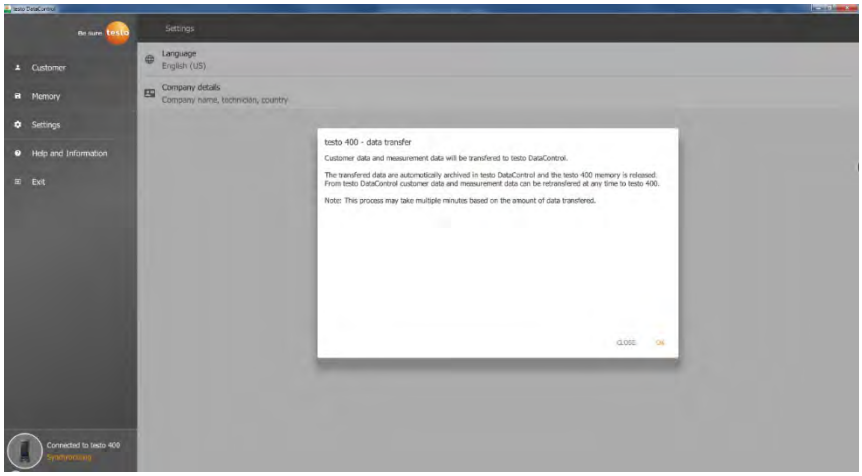

As soon as the testo 400 is connected via a USB cable to a computer, **Connected to testo 400 – Synchronizing** is displayed at bottom left.
A message about data transfer is displayed. Confirm by pressing **OK** to transfer all customer and measurement data from the testo 400 to the software. The testo 400 memory is then empty. Depending on requirements, customer and measurement data as well as measuring site information can be transmitted back.

Click on **Close** to use the software normally, however no data will be transferred from the software to the testo 400. To start the data transfer manually, click on **Synchronizing** at bottom left. No message about the data transfer from the instrument is displayed, and the synchronization starts immediately.

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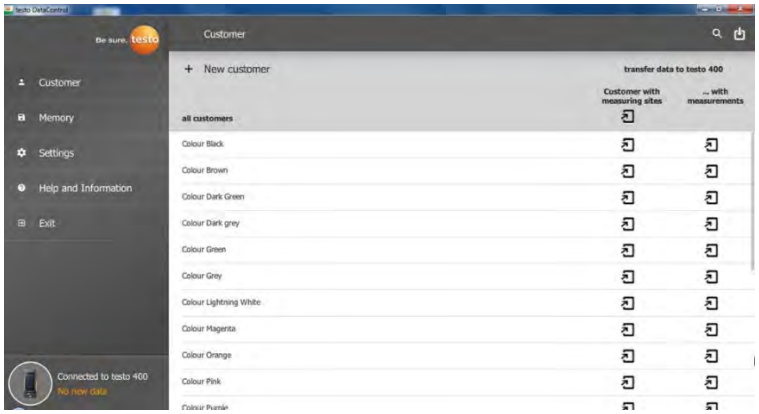
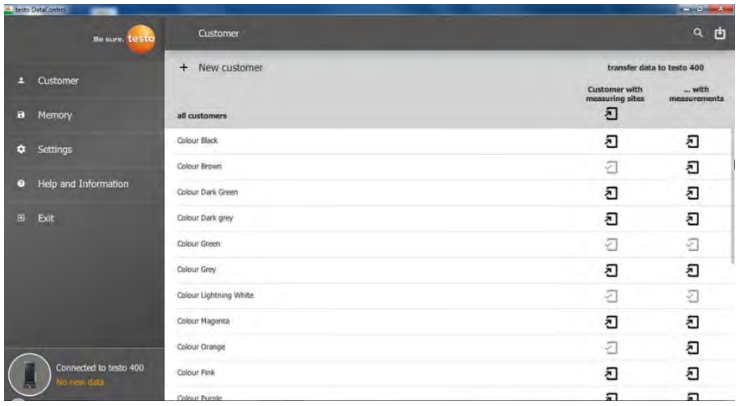


Following successful synchronization, for each customer two icons are displayed relating to the data transfer.
In order to have the relevant customer data available in the instrument for measurements on site and to assign new measurements on site to measuring sites, all customer data and measuring site information is transferred to these customers by clicking the left .
In order to be able to view the customer's already recorded measurement results on site for comparison purposes, all data belonging to the customer is transferred to the testo 400 by clicking the right .
Moreover, there is the option of transferring customer data and measuring site information from all customers by simply clicking on **Customer with measuring sites**.



If the data transfer to the testo 400 was successful, the icon changes to .

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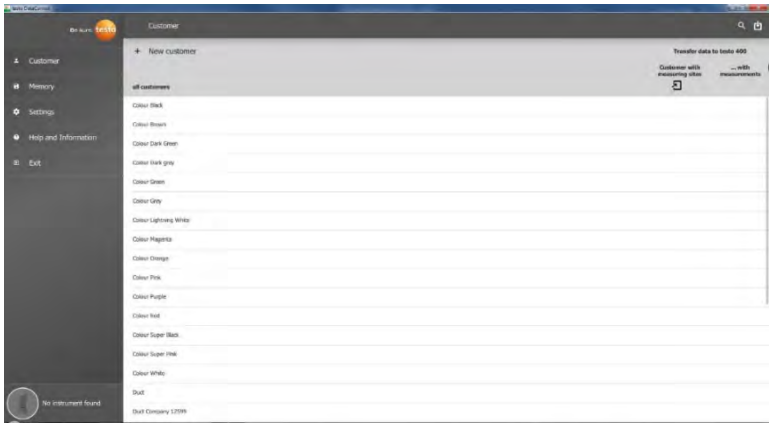
13.7 Customer management

In the **Customer** menu, all customer and measuring site information can be created, edited, deleted and transferred to the testo 400. All customer and measuring site information created on the testo 400 is also displayed following successful transfer to the software.

13.7.1 Creating and editing customers and measuring sites

13.7.1.1 Customer

✓ The **Customer** menu is open.



> Click on **+ New customer**.

▸ A new customer can be created in testo DataControl.

Editing existing customer data

> Click on existing customer name.

▸ Separate customer view is opened.

▸ The customer can be edited.

The following customer information can be saved and/or changed:

Company/customer name	Street, building number
Postcode, city	Country
Telephone	E-mail
Contact person	Customer number

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Only the field **Company/customer name** is mandatory. Other fields may remain blank.

13.7.1.2 Measuring site

Search for customer's measuring site

✓ Several measuring sites are stored.

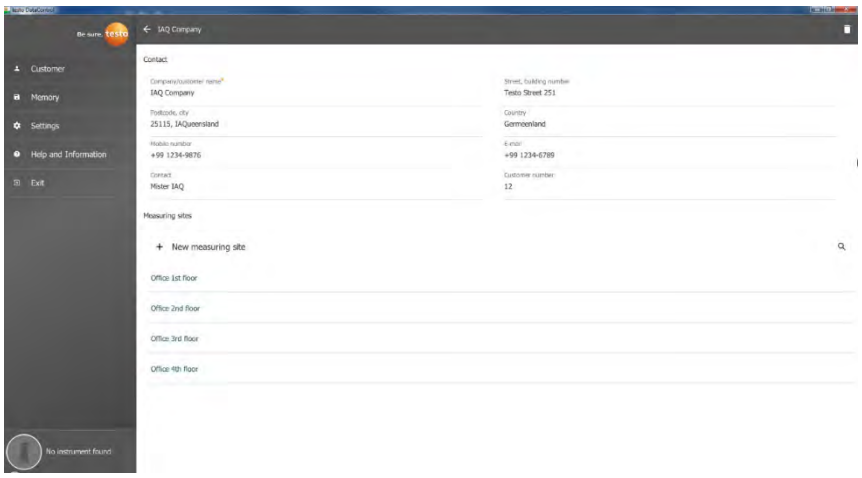
> Click on 🔍.

▸ Search field opens.

Create new measuring site

Any number of measuring sites can be created for the selected customer.

✓ Required customer is open.



1 Click on **+ New measuring site**.

▸ Measuring site can be added.

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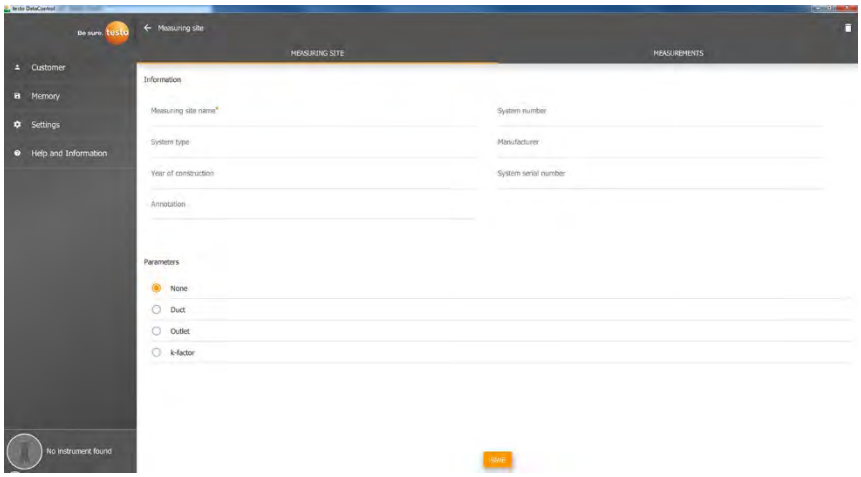

The following measuring site information can be saved and/or changed:

Measuring site name	System number
System type	Manufacturer
Year of construction	System serial number
Annotation	

The following characteristics can be assigned to the respective measuring site:

None	Duct
Outlet	k-factor

Only the field **Measuring site name** is mandatory. Other fields may remain blank.

2 Click on **Save**.

If duct, outlet or k-factor was selected as a measuring site feature, the specific information for the measuring sites must be inserted.
In addition, for the Channel feature there is the option to configure HVAC grid measurement.

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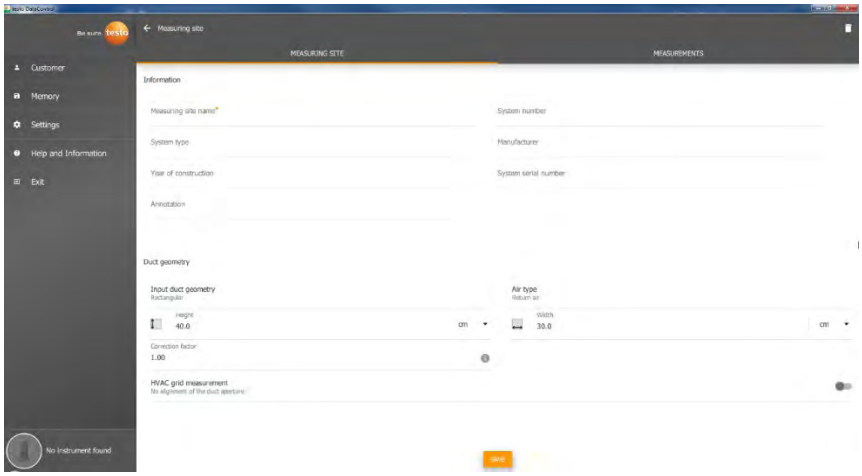
HVAC grid measurement (optional)

1 Activate **HVAC grid measurement** using the slider.



▸ Additional fields expand.

▸ The following data can be stored: Duct geometry, air type, duct dimensions and the correction factor, number of inspection holes and measuring points as well as the inspection hole position and the reference volume flow for the respective measuring site.

2 Click on **Save**.

Calling up stored measurements of a selected measuring site

> Click on the **Measurements** tab.

▸ Measurements assigned to the selected measuring sites are displayed.

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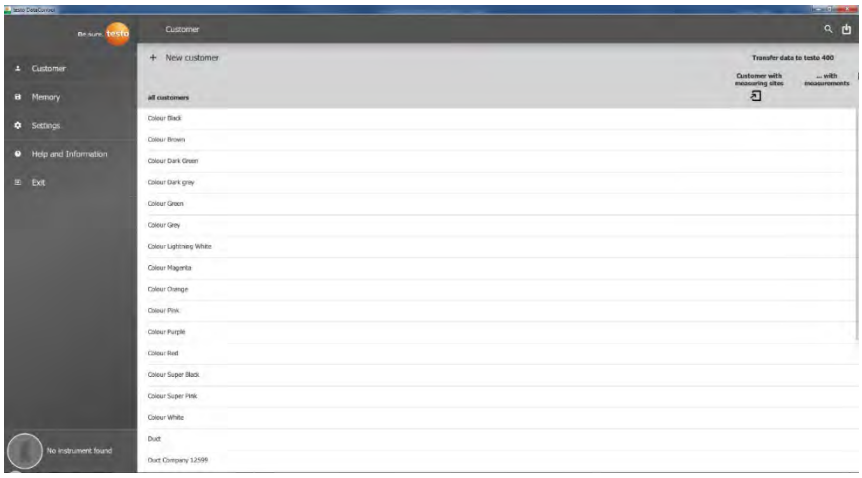
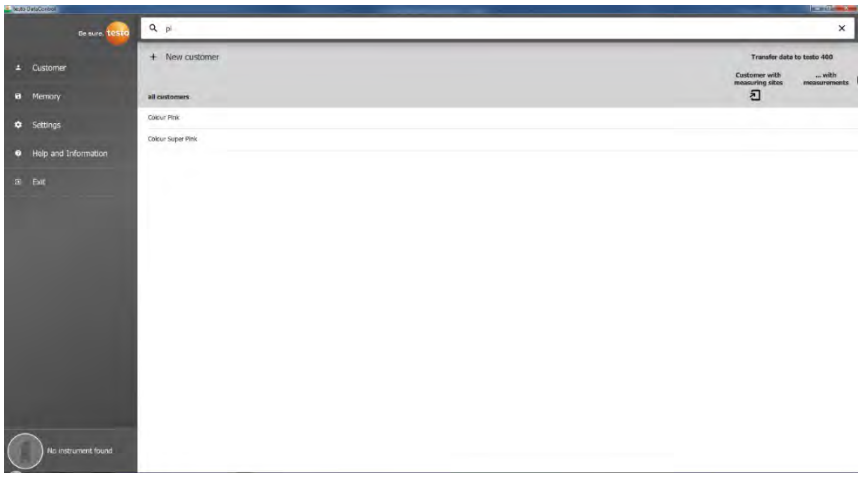
13.7.2 Search function

✓ The **Customer** menu is open.



1 Click on .

▸ Search field with customer list opens.



2 Enter customer name in the search field.

▸ Customer is displayed.

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13.7.3 Delete function

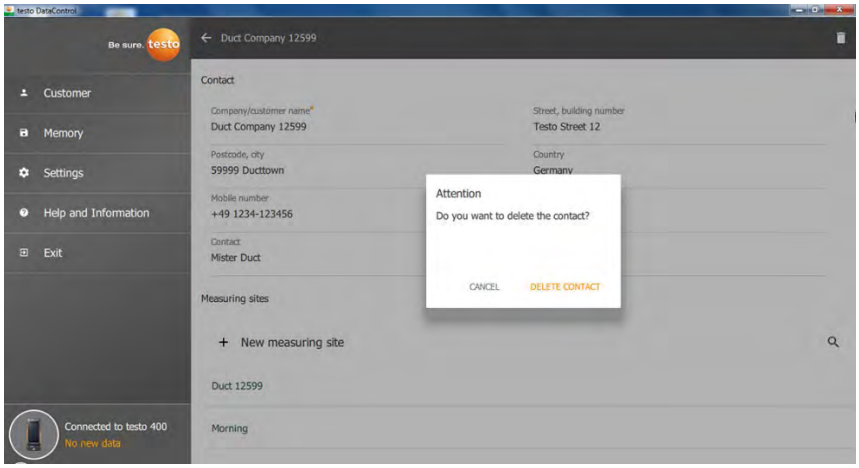
✓ The **Customer** menu is open.

1 Click on the required customer (or measuring site).

The stored customer plus all measuring site information are deleted. All measurements carried out must be deleted separately in the Memory menu.

2 Click on .

▶ Information window is displayed.



3 Click on **Delete Contact** (or measuring site).

▶ The customer (or measuring site) was deleted.

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13.8 Memory management

In the **Memory** menu, you can call up all the measurement results stored with the testo 400 and transferred to the software, analyze them in detail and also create and save csv data and PDF reports.

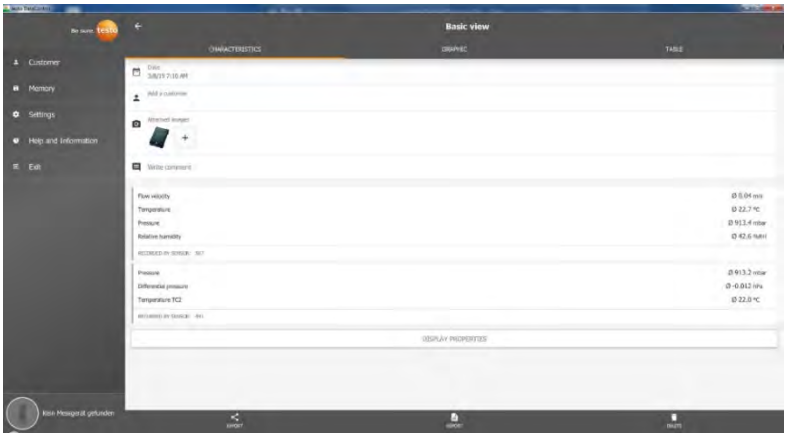
In principle, stored measurements **CANNOT** be edited. The stored measurement data recorded with the testo 400 cannot be changed. (The only exceptions are the clo and met values for PMV/PPD measurement).

When clicking on a measurement, an overview of the measurement results is displayed. For all measurements, except for HVAC grid measurements as per EN 12599 and ASHRAE 111, three windows are displayed under the name of the measurement.

- Characteristics
- Graphic
- Table

13.8.1 Characteristics view

In the first tab **Characteristics**, the date and time of the measurement are displayed. In addition, the measurement's customer and measuring site data, images and comments can be viewed and added. The measurement settings are listed under **Display Properties** (Measuring mode, Measuring cycle, Measurement period, Duct geometry, Reference volume flow, etc.).



The measurement results listed are divided into three areas. • Display of the calculated results of the application menu

- Probes relevant to the measurement, shown in orange
- All connected probes with the average measuring values in each case, shown in grey.

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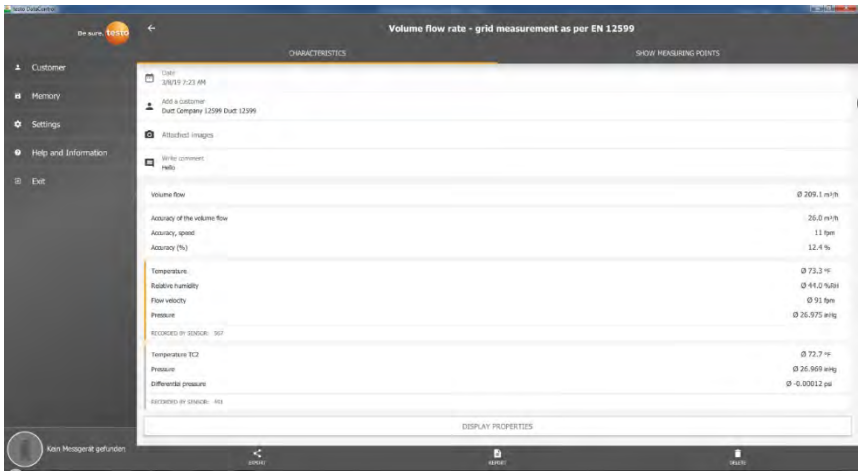

Via the three icons in the footer, the measurement results can be saved as a .csv /.json file or as a PDF report on the computer or permanently deleted .

When creating a PDF report, there is the option, as on the testo 400, to include only the average measuring values or to integrate all measured values in the report.

Creating large PDF reports (with over 100,000 readings) can take a few minutes. The time may vary depending on PC performance.

13.8.2 Graphic view

In the **Graphic** tab, corresponding values are located along the chronological trend graph of the measurement for up to four selected measurement parameters. Each of the four channels contains the three-digit probe ID and the unit of the selected measurement parameter. The colour of the individual channels is reflected in the corresponding Y-axes and trend graphs in each case. If you move the mouse pointer along the graphic, the exact time and measuring values of all channels will be displayed for the corresponding time point.

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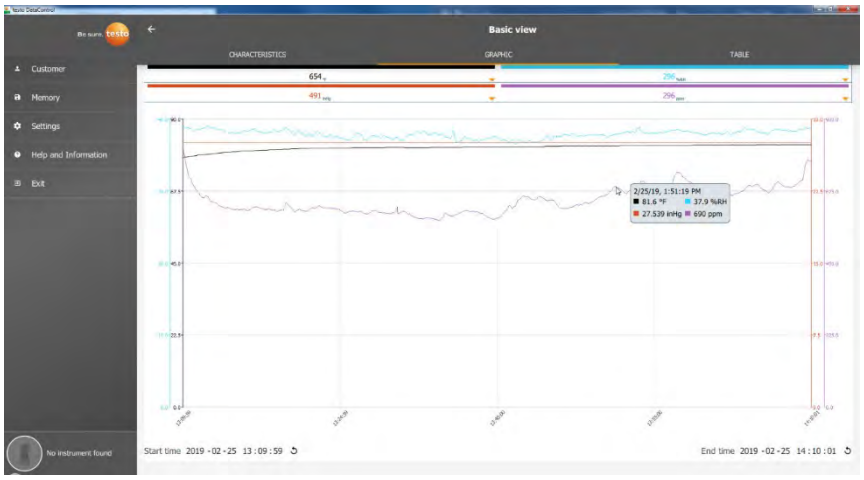
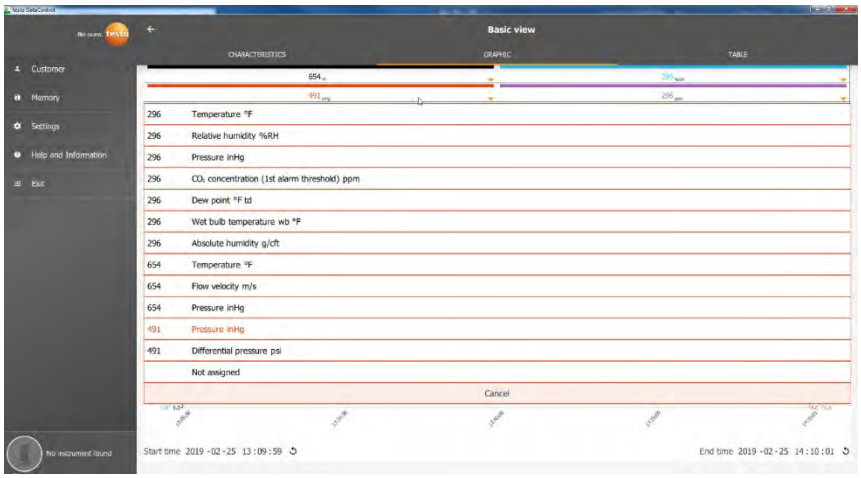


Clicking on one of the four channels opens the selection of measurement parameters recorded during the measurement. The measuring parameters can easily be assigned to the individual channels via the probe ID and measuring unit or selected as **not assigned**.



Below the graphic, both the start and end time of the measurement are listed. The information can be changed by clicking on the individual fields with the mouse. The trend graph immediately adapts to the new time selection.

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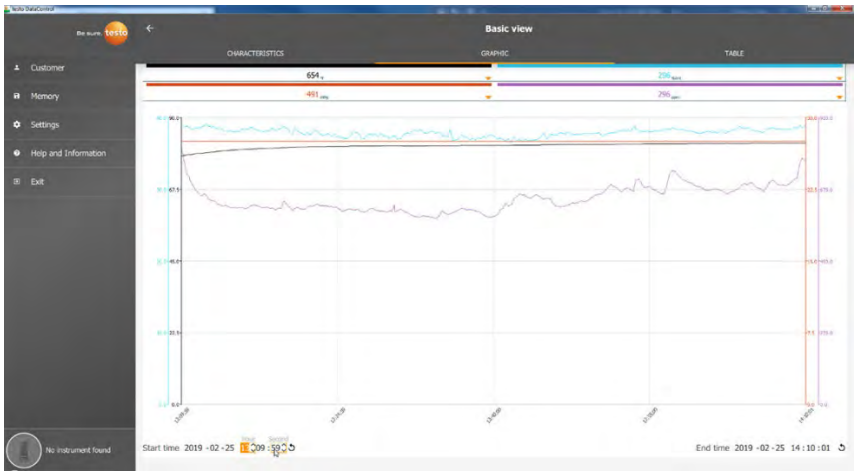

The total measurement period in the example in the figure above is 60 minutes. After changing the start time, only the last 10 minutes of the measurement are displayed in the graphic in accordance with the selection. Adjusting the time enables the measuring values to be analyzed in detail.
To display the complete measurement period in the graphic once again, click on the icon ↻ next to the start and end time.

You can use the mouse wheel to zoom in and out within the graphic in order to have a closer look at individual measuring values.

No graphic is displayed for HVAC grid measurements in accordance with the standards. There are only two tabs to choose from. In the Comfort level - PMV/PPD measurement menu, the PMV/PPD graphic is displayed instead of the chronological trend graph.

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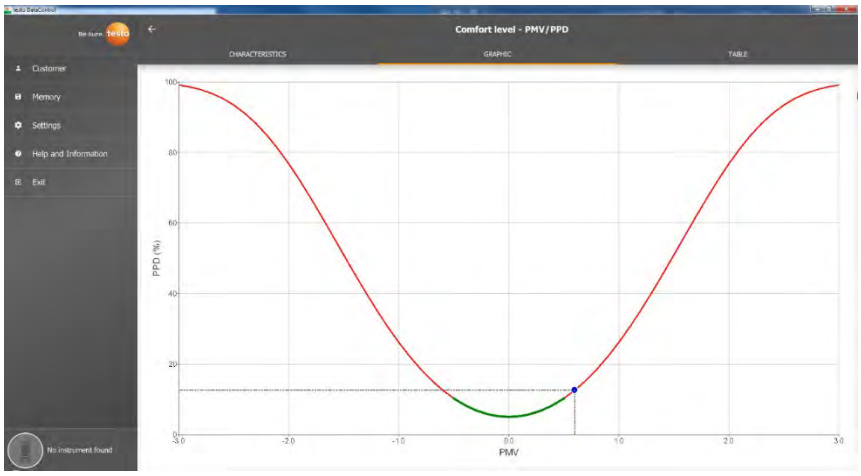

Via the first tab **Characteristics** and the field **Display properties**, you can change the clothing and activity parameters in the next window. This recalculates the PMV/PPD values and also the graphic. In order to be able to compare different calculations/graphics with each other, you need to save the respective CSV and PDF files. The calculations are overwritten in each case - it is therefore not possible to view different results of a measurement at the same time.

13.8.3 Table view

In the **Table** tab, all the measurement parameters and the corresponding measuring values for each point in time of the measurement, depending on the measuring cycle, are displayed. All measuring values can be viewed using the mouse wheel, the arrow keys on the keyboard or the scroll bars in the footer or at the right-hand margin.

At the bottom of the table are the average and min/max values of the measurement for all measurement parameters. The individual measurement parameters to be displayed in the table can be selected via the icon . This choice also has an effect on the ducts available for selection in the Graphic view (see Section 13.8.2). Only the measurement parameters visible in the table can be selected there.

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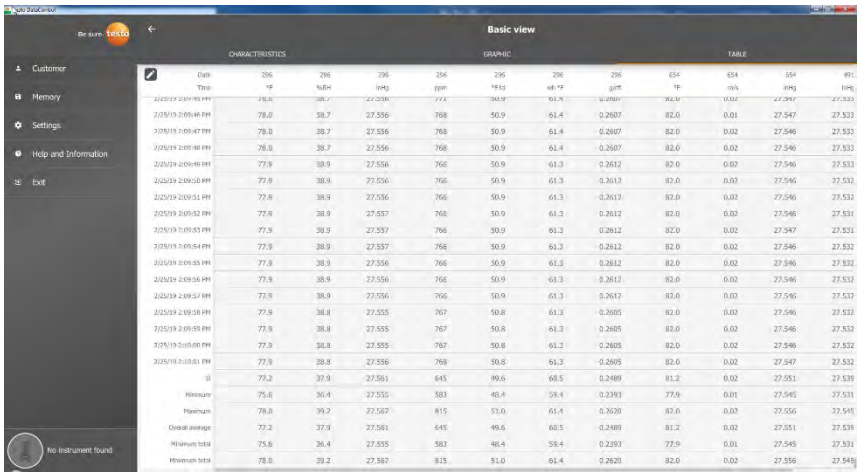
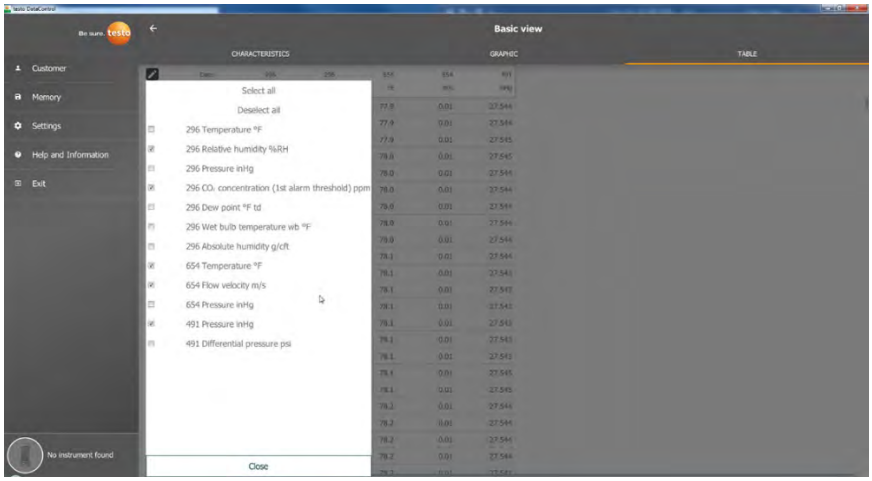


All measurement parameters can either be selected, deselected or selectively selected using a check mark in the box, to obtain a clear view of the measurement.



For future measurements, the required measurement parameters can be selected in the testo 400 prior to the measurement.

(see Section 9.1 - point 8 Edit reading display).

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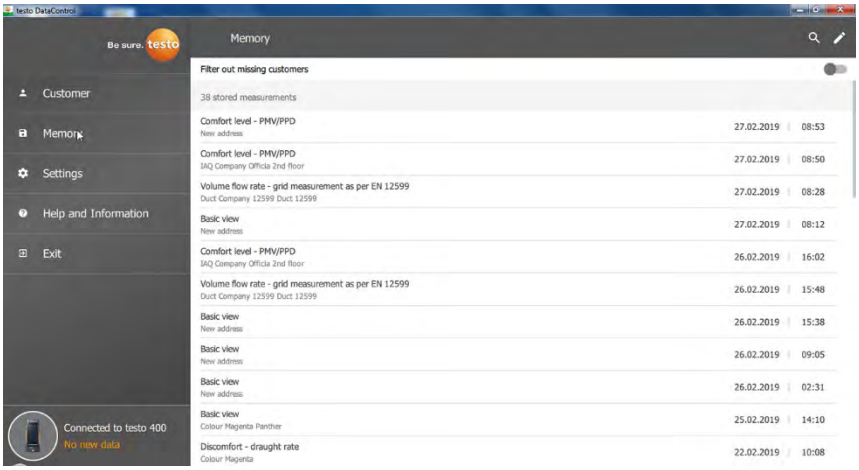
13.8.4 Searching for and deleting measurement results

In the **Memory** menu, all stored measurements are sorted by date and time.



✓ The **Memory** menu is open.

1 Click on 🔍.

▸ Search field with measurements opens.

2 Enter the customer name or measuring site or date/time in the search field.

▸ The result is displayed.

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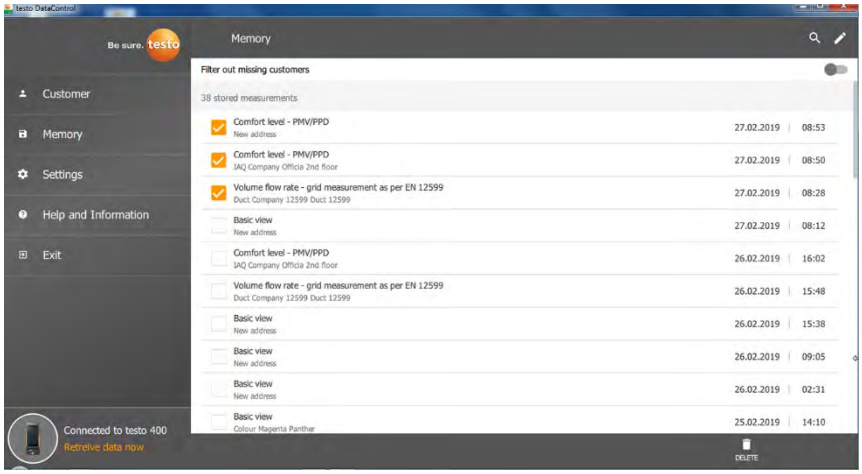
Deleting

1. Click on .

▸ A check box is displayed in front of each measurement.

2. Click on the required measurement.

▸ A tick is displayed in the respective box.



3. Click on .

▸ Information window is displayed.

4. Acknowledge the information.

▸ Selected measurements were deleted.

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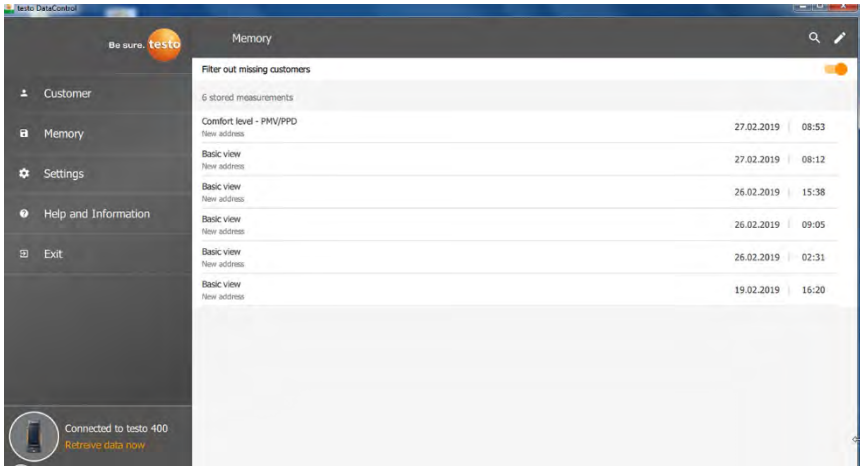
Assigning measurements

Measurements that have not been assigned to a customer/measuring site can be subsequently assigned.

> Activate **Filter out missing customers** slider.

All measurements are displayed without customer or measuring site information.



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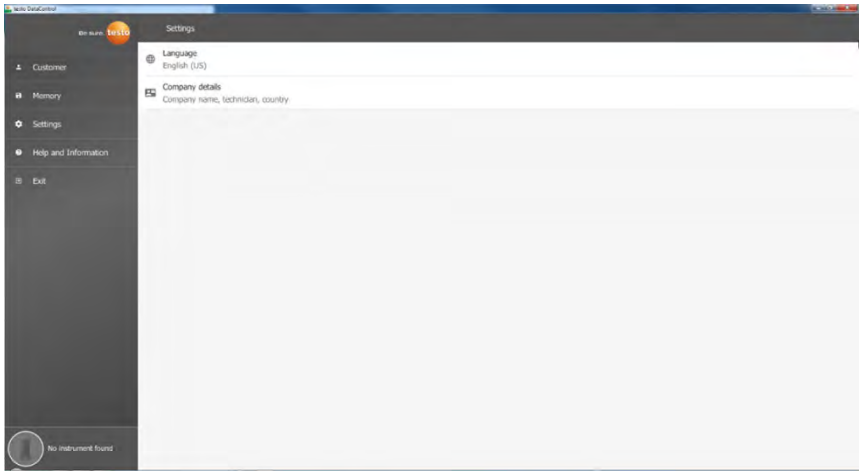
13.9 Settings

Under Settings, the company details can be saved and the language selected.

✓ The **Settings** menu is open.



1 Click on **Language**.

▸ Selection window opens.

2 Select language.

3 Click on **Company details**.

4 Fill in the following fields:

Company	Telephone
Technician	Fax
Street, building number	E-mail
Postcode, city	Website
Country	

5 If necessary, upload logo

By default, the company logo and company details are displayed below the measurement results in all csv files (without company logo) and in the PDF reports on the letterhead.

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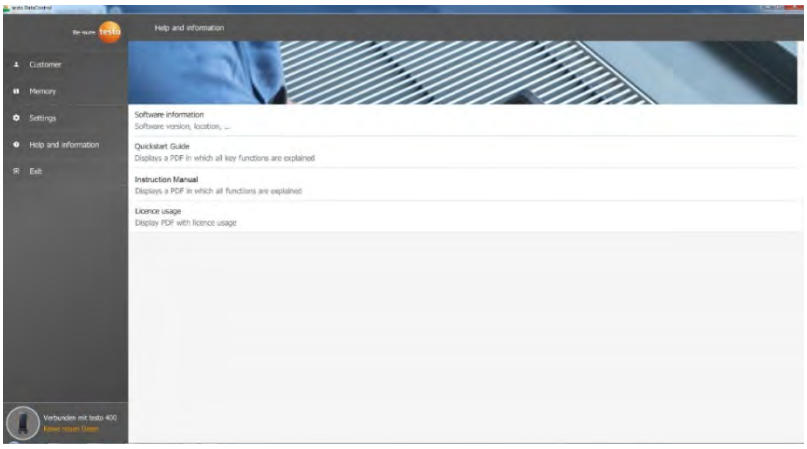
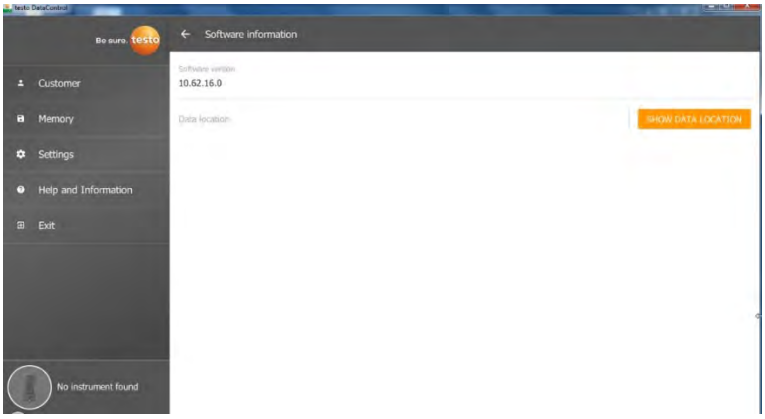
13.9.1 Help and Information



In the **Help and Information** menu, the current testo DataControl version is displayed under **Software information**.

In the **Software information** tab, click on **Show Data Location** to open an Explorer window for the data directory.



To copy the saved data on another computer or to save it externally, copy the **DataControl** folder.

Click on the **Quickstart Guide** or **Instruction Manual** button to call up the brief instructions or complete instruction manual for the testo 400 including IAQ data logger and testo DataControl software as a PDF file.

The software licences used by the testo DataControl software are listed under **Licence usage**.

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14 IAQ data logger

The IAQ data logger is used in conjunction with the testo 400 universal IAQ instrument to carry out long-term measurements of climatic and comfort level conditions independently of the measuring instrument.

The IAQ data logger with connected cable probes is configured with the aid of the testo 400 universal IAQ instrument. The measurement period and measurement interval can be set in this way. The IAQ data logger then records all the measurement parameters of the connected probes in accordance with the preset configuration, independently of the testo 400 measuring instrument. The IAQ data logger and the connected probes can be positioned directly on the testo measuring stand.

14.1 IAQ data logger front view

	Element		Element
1	Connection for type K thermocouples (2 off)	**2**	Connection for cable probes with TUC connector (4 off)
3	Status LED	**4**	Connection for USB plug

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14.2 IAQ data logger rear view

	Element		Element
1	USB connection cable for connecting to the testo 400	**2**	Bracket for measuring stand
3	Cable storage		

14.3 Mains unit cable

The IAQ data logger is supplied with a USB mains unit. No recording of measurement data occurs without power supply via the mains unit cable. The Testo USB mains unit has the specification 5V / 2A.

⚠ CAUTION

Power supply via a mains unit cable!
Tripping hazard!

- Take care when routing the mains unit cable.
- Remove any trailing mains unit cable.

Do not use any other mains unit cable for the IAQ data logger. It may only be used with the supplied original mains unit or a comparable 5V / 2A USB mains unit, since the charging electronics in the battery and the mains unit are coordinated with each other.

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14.4 Switching the IAQ data logger on and off

As soon as the IAQ data logger is supplied with power, it can be used. Separate activation is not necessary. To ensure reliable instrument detection on the testo 400, first connect the IAQ data logger to the power via the USB port and then connect it to the testo 400 using the cable attached to the rear.

It will automatically check whether a firmware update is available and if so, this will be installed straight away.

If the power supply is interrupted while a measurement is ongoing, there will be a gap in the measurement data recording process. As soon as the power supply is restored, the IAQ data logger will continue to record measurement data.

14.5 IAQ data loggers – General information

Depending on the measurement period, specific measuring cycles are feasible:

Duration	Minimum measuring cycle
1 min to 15 min	1 sec
16 min to 2 hours	10 sec
> 2 hours to 1 day	60 sec
> 1 day to 21 days	5 min

With the testo 400 (and the IAQ data logger), a maximum 1 million readings (with a maximum of 18 channels) can be recorded with one measurement.

Example 1 (timed measurement):
Result: 9,216 readings
Duration: 8 days
Measuring cycle: 5 minutes
Measurement channels: Temperature, humidity, CO2, flow (4 channels)

Example 2 (manually launched measurement):
Result: 17,700 readings
Duration: 59 minutes
Measuring cycle: 1 second
Measurement channels: Temperature, humidity, CO2, flow, pressure (5 channels)

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14.6 Measuring with the IAQ data logger

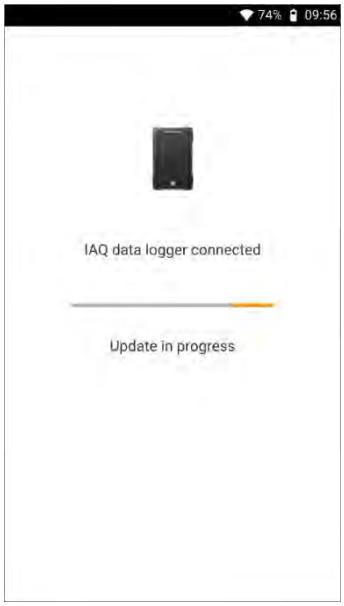
14.6.1 General

The IAQ data logger can be used in two ways. There is the option of selecting **Stand-alone** in the configuration of the measurement. In this variant, you set up the IAQ data logger, which carries out the planned measurement with the connected probes. The testo 400 is only required for the pre-settings and can be used elsewhere following successful configuration.

However, the IAQ data logger can also be used as a probe hub and can carry out measurements with the testo 400 with up to five connected cable probes. To do this, select **Measure with testo 400** in the configuration. In this variant, the IAQ data logger no longer records measurement data, but simply transmits it to the testo 400, which records the entire measurement.

1. Connect the IAQ data logger to the power supply.
2. Connect the IAQ data logger to the testo 400 via the TUC connector.

- Checks are made to ascertain whether a firmware update is available for the IAQ data logger. If so, the update will be implemented automatically.



- The Basic view shows the probes connected to the testo 400. Where the probes are connected via the IAQ data logger, the abbreviation IAQ appears in front of the measurement parameter and the three-digit probe ID. Example: IAQ: Pt100 738.

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14.6.2 Carrying out a measurement with the IAQ data logger

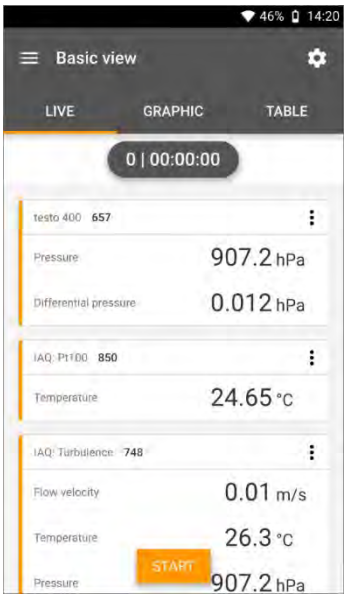
1 Click on **Measure**.

▸ Measurement programs are displayed.

2 Select the measurement program in conjunction with the IAQ data logger. (Basic view, Comfort level – PMV/PPD or Discomfort - draught rate)

▸ The measurement menu opens.

3 Click on .



▸ Configuration menu opens.

4 Make the required settings.

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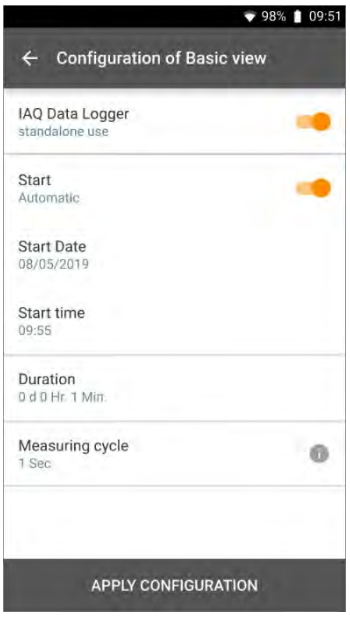
5 Enable **IAQ Data Logger** using the slider.

6 Configure measurement for standalone use.



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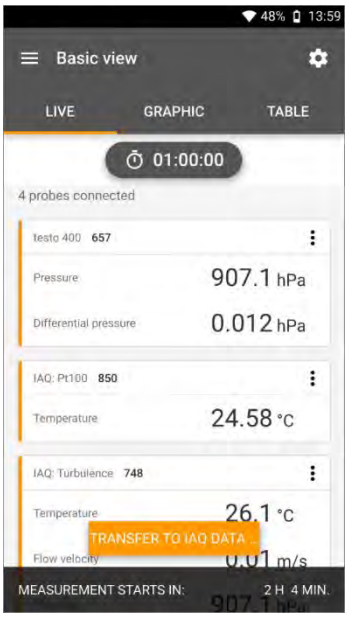
7 Click on **Apply Configuration**.

▸ The selected measurement program is displayed.

8 Click on **Transfer to IAQ Data logger**.



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- IAQ data logger is configured.

- Following successful configuration, the testo 400 can be disconnected from the IAQ data logger. The measurement starts at the defined time or as soon as the setup has been completed (if the start time has been set to manual). The green LED on the IAQ data logger flashes rapidly at short intervals.

14.7 Reading the IAQ data logger

Since the IAQ data logger is a standalone instrument, the testo 400 can be used for other measuring tasks following configuration of the IAQ data logger, while the measurement is ongoing.

The time for storing the measurement data can easily be delayed if the measurement involves a huge amount of data.

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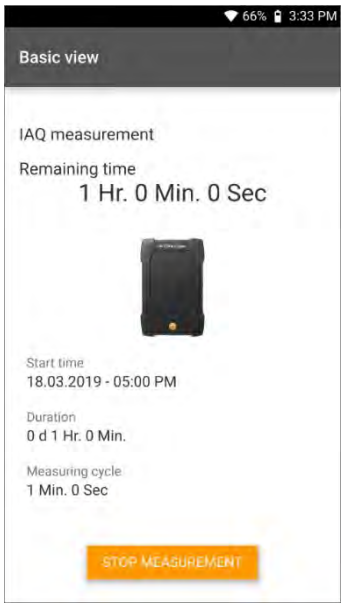
14.7.1 With testo 400 connected

✓ testo 400 and the IAQ data logger are connected to each other. The testo 400 displays an overview of the current measurement with the configured settings.



1 Click on **Stop Measurement**.

▸ Measurement results are saved automatically.

2 Disconnect the testo 400 from the IAQ data logger.

▸ testo 400 can be used for other measurements.

If the testo 400 was connected to the IAQ data logger for the measurement procedure, then the measurement is automatically stored on the measuring instrument.

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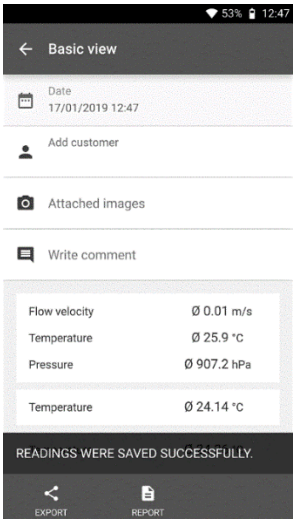
14.7.2 With the testo 400 disconnected

1 Connect the testo 400 to the IAQ data logger via the TUC connector.

- Once connected successfully, a message appears on the screen. The measurement data is transmitted. Data transmission may take some time.

- Following successful transmission of data, the measurement results are displayed. A confirmation to save appears.



2 The measurement can be managed accordingly (see Section 14.5).

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It is not possible to display the measuring values of an ongoing measurement in the graphic/table. Only the current measuring values of the probes can be viewed in the Basic view.

14.8 LED status

LED status	Description
Permanently red	Insufficient power supply or no compliant USB mains unit (PC or very old mains unit instead of the USB mains unit).
Flashing green/red (rapidly)	Measurement in progress. Power failure or probe missing/not responding. After a power failure, the IAQ data logger flashes red until the end of the measurement. If a probe is missing, it flashes for as long as it is missing. The measurement is still saved.
Flashing green/green (slowly)	IAQ box connected, ready to measure, no measurement is in progress.
Flashing green/green (rapidly)	Measurement in progress.
Flashing red	Internal error. Disconnect the mains unit from the power supply and reconnect it after a brief waiting period. If the problem persists, contact Testo Customer Service.

14.9 Technical data for IAQ data loggers

Feature	Value
Probe connections	2 x thermocouple type K 4 x Testo Universal Connector (TUC) for connecting cable probes to the corresponding plug
Interfaces	Micro USB for connection to a mains unit
USB mains unit	Recommended power supply 5 V, 2 A, 230 V
Internal memory capacity	1.5 GB = 1 million readings
Operating temperature	-5 to 45 °C
Storage temperature	-20 to +60 °C
Dimensions	89 x 136 x 39 mm
Housing material	PC, ABS, TPE
Weight	160 g
Protection class	IP 20

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Integrated sensors (at 22 °C, ±1 digit)

Characteristics	Measuring range	Accuracy	Resolution
Temperature (TC type K)[1]	-200 to +1370 °C	± (0.3 °C + 0.1% of m.v.) Internal cold junction measurement: ±0.5°C	0.1 °C
Temperature (NTC)	-40 to +150 °C	±0.2 °C (-25.0 to +74.9 °C) ±0.4 °C (-40.0 to -25.1 °C) ±0.4 °C (+75.0 to +99.9 °C) ±0.5% of m.v. (rest)	0.1 °C

15 Questions and answers

Error	Description
WLAN connection – error message.	If the WLAN reception is not sufficient, the error message **Network disabled** appears. Connect the testo 400 to a better WLAN network. When updating, make sure that there is a stable WLAN connection so that the update process does not abort.
Export option cannot be selected.	If **always** is selected for the data export, the settings can be undone via the icon (see Section 10.4.5). This means that both export options will be available again in the future.

[1] The accuracy information is valid in adjusted, stable temperature conditions. Plugging in the mains unit, charging the battery or adding digital probes can distort this temporarily, and additional errors may occur.

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<table>
<tr><th>Error</th><th colspan="2">Description</th></tr>
<tr><td>Rechargeable battery life.</td><td colspan="2">The information about the battery life relates to a measurement with the testo 400 and connected probes when the display is switched off.</td></tr>
<tr><td></td><td>testo 400 + 1x hot wire probe</td><td>approx. 8 hours</td></tr>
<tr><td></td><td>testo 400 + 1x hot wire probe + 2x TC</td><td>approx. 8 hours</td></tr>
<tr><td></td><td>testo 400 + 1x turbulence probe + 1x CO2 probe + 1x TC</td><td>approx. 8 hours</td></tr>
<tr><td></td><td>testo 400 + 1x turbulence probe + 1x humidity probe + 1x TC</td><td>approx. 8 hours</td></tr>
<tr><td></td><td>testo 400 + 1x humidity probe + 1x TC</td><td>approx. 10 hours</td></tr>
<tr><td></td><td>testo 400 + 1x CO2 + 2x TC</td><td>approx. 9 hours</td></tr>
<tr><td>testo 400 is not responding.</td><td colspan="2">If the testo 400 is not responding to any gestures, press the On/Off button for about 10 seconds to restart the instrument.</td></tr>
</table>

15.1 Contact and support

If you have any questions or need further information, please contact your dealer or Testo Customer Service.

Contact details can be found on the internet at:

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