testo 435
Multifunction measuring instrument

Instruction manual en

Contents

General notes

This chapter provides important advice on using this documentation.

The documentation contains information that must be applied if the product is to be used safely and efficiently.

Please read this documentation through carefully and familiarise yourself with the operation of the product before putting it to use. Keep this document to hand so that you can refer to it when necessary.

Identification

Representation	Meaning	Comments
 Warning!	Warning advice: Warning!	Read warning advice carefully and take the precautionary measures indicated! Serious physical injury could occur if you do not take the precautionary measures indicated.
 Caution!	Warning advice: Caution!	Read warning advice carefully and take the precautionary measures indicated! Slight physical injury or damage to equipment could occur if you do not take the precautionary measures indicated.
	Note	Offers helpful tips and information.
➢, 1, 2	Objective	Denotes the objective that is to be achieved via the steps described. Where steps are numbered, you must always follow the order given!
✓	Condition	A condition that must be met if an action is to be carried out as described.
>, 1, 2, ...	Step	Carry out steps. Where steps are numbered, you must always follow the order given!
Text	Display text	Text appears on the instrument display.
Button	Control button	Press the button.
	Function button	Press the button.
-	Result	Denotes the result of a previous step.
	Cross-reference	Refers to more extensive or detailed information.

Short form

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

Example: Calling up the “Instrument data” function

Short form: **Device** → [OK] → **Inst.data** → [OK].
(1) (2) (3) (4)

Steps required:

1 Press [▲] / [▼] to select the **Device** function.
2 Confirm selection with [OK].
3 Press [▲] / [▼] to select the **Inst.data** function.
4 Confirm selection with [OK].

1. Safety instructions

This chapter gives general rules which must be followed and observed if the product is to be handled safely.

Avoid personal injury/damage to equipment

> Do not use the measuring instrument and probes to measure on or near live parts.

> Never store the measuring instrument/measuring cells together with solvents and do not use any desiccants.

Product safety/preserving warranty claims

> Operate the measuring instrument only within the parameters specified in the Technical data.

> Always use the measuring instrument properly and for its intended purpose. Do not use force.

> Do not expose handles and feed lines to temperatures in excess of 70 °C unless they are expressly permitted for higher temperatures. Temperatures given on probes relate only to the measuring range of the sensors.

> Open the instrument only when this is expressly described in the documentation for maintenance or repair purposes.
Carry out only the maintenance and repair work that is described in the documentation. Follow the prescribed steps when doing so. For safety reasons, use only original spare parts from Testo.

Ensure correct disposal

> Take faulty rechargeable batteries/spent batteries to the collection points provided for them.

> Send the product back to Testo at the end of its useful life. We will ensure that it is disposed of in an environmentally friendly manner.

Instruments with radio module 915.00 MHz FSK

Warning: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules.
These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.
However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
· Reorient or relocate the receiving antenna.
· Increase the separation between the equipment and receiver.
· Connect the equipment into an outlet on a circuit different from that to which the receiver is needed.
· Consult the dealer or an experienced radio/TV technician for help.
Operation is subject to the following two conditions:
· this device may not cause harmful interference, and
· this device must accept any interference received, including interference that may cause undesired operation.

2. Intended purpose

This chapter gives the areas of application for which the product is intended.

Use the product only for those applications for which it was designed. Ask Testo if you are in any doubt.

testo 435 is a compact, multifunction measuring instrument for measuring temperature, humidity and flow rate.

The product was designed for the following tasks/applications:

- Measuring room climate
- Regulating and inspecting ventilation and air-conditioning installations
- Measuring the pressure dew point in compressed air systems
- Assessing the quality of room air with the help of the IAQ probe

The product should not be used in the following areas:

- Areas at risk of explosion.
- Diagnostic measurements for medical purposes.

3. Product description

This chapter provides an overview of the components of the product and their functions.

3.1 Display and control elements

Overview

① Infrared, USB interface
② Display (light can be activated)
③ Control buttons
④ Rear: Battery and radio module compartment, holding magnets

Caution!

Magnetic field

May be harmful to those with pacemakers!

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

Magnetic field

Damage to other instruments!

> Keep a safe distance from products which could be damaged by magnetism (e.g. monitors, computers, credit cards).

⑤ Probe socket(s)

Button functions

Button	Functions	
		Function button (3x): The function depends on the button assignment at the time
		Change display of the 1st reading line In configuration mode: Increase value, select option
		Change display of the 2nd reading line In configuration mode: Decrease value, select option
		Print data 435-1 / -3 only: If the Cyclical Printing function is activated, the programmed measuring program is started.
		Switch instrument on, switch display light on/off; switch instrument off (press and hold)

Function buttons (Function dependant on profile and setting)

Button	Functions
▶☰	Open (main) menu
OK	Enter confirmation
ESC	Cancel
Hold / ACT	Hold value/display current measurement value
Reset	Reset max./min. values to current measurement value
Mean	Open menu item “Multi-point mean calculation“
Measp	Open menu item “Measuring program“ (435-2/-4 only) 435>
Start	Start test series (435-2/-4 only)
End	End test series (435-2/-4 only), End Cyclical Print (435-1 / -3 only)
Save	Save values (435-2/-4 only)
Turb	Activate “Turb“ test series (435-2/-4 only with attached turbulence probe)
Area	Open menu item “Area”
P=0	Zero internal pressure sensor (435-3/-4 only)

Important displays

Display	Meaning
	Battery capacity (only for operation by battery/rechargeable battery): · 4 segments in the battery symbol are lit: Instrument battery is fully charged · No segments in the battery symbol are lit: Instrument battery is almost spent
(flashing)	Print function: Data are sent to the printer
	435-3 / -4 only: Measurement channel differential pressure (internal sensor)
①, ②	Measurement channel no.: Channel 1, channel 2. If a measurement channel is a radio channel, the radio symbol lights up as well as the measurement channel no.

3.2 Interfaces

Infrared interface

Measurement data can be sent to a Testo printer via the infrared interface on the head of the instrument.

USB interface

The mains unit (accessory part) can be connected to the head of the instrument via the USB interface to power the instrument.

Instruments with a memory: Measurement/instrument data can be exchanged with a PC via the USB interface.

Probe socket(s)

Plug-in measuring probes can be connected via the probe socket(s) on the base of the instrument. The instrument is a HighPower device, possibly an additional USB-Hub is required!

Radio module (accessory part)

ℹ Radio probes may only be used in countries in which they have been Type Approved (see application information of the radio probe).

Up to three radio probes can be connected via the radio module.

3.3 Voltage supply

Voltage is supplied via three mignon batteries (included in delivery) or rechargeable batteries or through a mains unit (accessory part). It is not possible to charge rechargeable batteries in the instrument.

ℹ When operating the instrument with the mains unit, insert batteries in order to avoid switching off the instrument in case of a power interruption.

4. Commissioning

This chapter describes the steps required to commission the product.

➢ Inserting batteries/rechargeable batteries and a radio module (accessory part):

1 Undo the two screws on the rear of the instrument and lift off the battery compartment cover.

2 Insert batteries/rechargeable batteries (3x mignon) into the battery compartment. Observe the polarity!

3 Push the radio module (accessory part) into the radio module compartment until it engages in place. Note the guide groove.

4 Replace the battery compartment cover, press down and secure by tightening the two screws.

5. Operation

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

5.1 Connecting a probe

Plug-in probes

Plug-in probes must be connected before the measuring instrument is switched on so that they are recognised by the instrument.

> Insert the connector of the probe into the probe socket of the measuring instrument.

Radio probes

Radio probes may only be used in countries in which they have been Type Approved (see application information of the radio probe).

A radio module (accessory part) is required for the use of radio probes. The radio module must be connected before the measuring instrument is switched on so that it is recognised by the measuring instrument.

Each radio probe has a probe ID (identification number) which must be set in configuration mode.
➥ See chapter PROBE, p. 15.

5.2 Switching on/off

➢ Switching the instrument on:

> Press ⏻.

- Measurement view is opened: The current reading is displayed, or ---- lights up if no reading is available.
  Instruments with a memory: The activated location is displayed (topmost line).

-or-

The instrument is switched on for the first time, a reset was carried out or the power supply was interrupted for a lengthy period of time:

- The **Language** function is opened.
  ➥ See the chapter LANGUAGE, p. 18.

➢ Switching the instrument off:

> Press and hold ⏻ (for approx. 2s) until the display goes out.

5.3 Display light

➢ Switching the display light on/off:

✓ The instrument is switched on.

> Press ⏻.

6. Setting the instrument

This chapter describes the steps that are required in order to adapt the measuring instrument for specific measuring tasks.

6.1 Configuration menu

The basic settings for the measuring instrument are performed in the configuration menu.

➢ Opening the configuration menu:

✓ The instrument is in measurement view.

> Press and hold [▶☰] (approx. 2s) until **config.** is displayed.

ℹ Press [ESC] to go one menu level back. To leave the configuration menu, press [ESC] several times until the instrument changes to measurement view.

6.1.1 Profile

The instrument has predefined measurement profiles that are tailored to specific areas of application.

The profile setting influences the following points in measurement mode:

- Assignment of the function buttons
- Number of predefined functions
- Structure of the main menu

All functions are available in the standard profile. In the application-specific measurement profiles, the available functions are reduced to only those that are needed to ensure speedier access.

➢ Setting a profile:

✓ The configuration menu is open, **config.** is displayed.

1 Profile → [OK].

2 Select the desired profile with [▲] / [▼] and confirm with [OK].

6.1.2 Units

Predefined systems and individual setting options:

Parameter	ISO system	US system	Individual setting options
Temperature	°C	°F	°C, °F
Pressure	hPa	inchH2O	mbar, Pa, hPa, kPa, inchH2O
Velocity	m/s	fpm	m/s, fpm
Volumetric flow rate	m³/h	ft³/min	m³/h, l/s, ft³/min
Length	mm	inch	mm, inch
Power	kW	BTU/h	kW, BTU/h, TONS

➢ Setting units:

✓ The configuration menu is open, **config.** is displayed.

1 Units → [OK].

2 Press [▲] / [▼] ISO/US (to set the system) or a parameter (to set individually) and confirm with [OK].

3 Set the system of units or the desired unit with [▲] / [▼] and confirm with [OK].

6.1.3 Device

Instrument data

➢ Displaying instrument data:

✓ The configuration menu is open, **config.** is displayed.

1 Device → [OK] → Inst.data → [OK].

- The firmware version and the serial number of the instrument are displayed.

Date / Time

➢ Setting the date/time:

✓ The configuration menu is open, **config.** is displayed.

1 Device → [OK] → date/time → [OK].

2 Use [▲] / [▼] to set the value for **year** and confirm with [OK].

3 Set the other values as described in step 2.

Battery type

To ensure that the battery capacity is displayed correctly, the battery type used must be set.

➢ Setting the battery type:

✓ The configuration menu is open, config. is displayed.

1 Device → [OK] → Bat-type → [OK].

2 Press [▲] / [▼] Battery or ReBa and confirm with [OK].

Auto OFF

If Auto OFF is switched on, the instrument switches itself off automatically after 10min if no button is pressed. Exception: Cyclical printing (instruments without a memory) or a measuring program (instruments with a memory) is active.

➢ Switching Auto OFF on/off:

✓ The configuration menu is open, config. is displayed.

1 Device → [OK] → Auto OFF → [OK].

2 Press [▲] / [▼] to select On or Off and confirm with [OK].

Reset

When a reset is carried out, the instrument is reset to the default settings, all settings / data are deleted. Exception: Language, Date / Time.

➢ Resetting:

✓ The configuration menu is open, config. is displayed.

1 Device → [OK] → reset → [OK].

2 Reset with [OK] or cancel the reset with [ESC].

Setting min. / max. printing function

If pr MinMaxAuto is activated, minimum and maximum values are also printed with the measurement readings.

➢ Switching off pr MinMax:

✓ The configuration menu is open, Config. is displayed.

1 Device → [OK] → pr MinMax → [OK].

2 Choose On or Off with [▲] / [▼] and confirm with [OK].

K-factor

The querying of the K-factor (correction factor for areas) when entering the parameter „Area“.can be switched on/off.

➥ See chapter PARAMETER / AREA, p. 24.

➢ Switching K-factor on/off:

✓ The configuration menu is open, **config.** is displayed.

1 **Device** → [OK] → **K-factor** → [OK].

2 With [▲] / [▼], select **On** or **Off** and confirm with [OK] .

Num holes

The querying of the number of holes (number of measurement points) in the calculation of a multi-point mean value can be switched on/off. The number of holes is required to allocate the readings to the number of measurement points for later evaluation via the PC software.

➥ See Chapter MEAN, p. 22 and MEASURING, p. 26.

➢ Switching number of holes on/off:

✓ The configuration menu is open, **config.** is displayed.

1 **Device** → [OK] → **Num holes** → [OK].

2 With [▲] / [▼], select **On** or **Off** and confirm with [OK] .

6.1.4 Probe

RadioC

ℹ Radio probes may only be used in countries in which they have been Type Approved (see application information of the radio probe).

A radio module (accessory part) is required for the use of radio probes. The instrument can establish a connection with a maximum of three radio probes.

Each radio probe has a probe ID (RF ID). This consists of the last 3 digits of the serial no. and the position of the slide switch (**H** or **L**) in the radio probe.

➢ Setting up a radio probe:

✓ A radio module (accessory part) is inserted in the instrument.
➥ See chapter COMMISSIONING, p. 9.

✓ The configuration menu is open, **config.** is displayed.

✓ The radio probe is switched on and the transfer rate is set to 2 readings per second (see the advice on using the radio probe).

1 Probe → [OK] → RadioC → [OK].
2 Press [▲] / [▼] to select the desired channel no. for the radio probe (P.1, P.2 or P.3) and confirm with [OK].
   - The instrument searches for switched-on radio probes in the receiving range.
   - The probe IDs of the radio probes found are displayed.

   If no radio probes were found, this may be because of the following:
   · The radio probe is not switched on or the battery of the radio probe is spent.
   · The radio probe is outside the range of the measuring instrument.
   · Sources of interference are influencing the radio transmission (e.g. reinforced concrete, metal objects, walls or other barriers between transmitter and receiver, other transmitters of the same frequency, strong electromagnetic fields).
   ▯ If necessary, rectify the possible causes of the fault in radio transmission.

   Alternatively, the probe ID can also be entered manually.
   ▯ [MAN] → Press [▲] / [▼] to enter the probe ID.
3 Press [▲] / [▼] to select the probe that is to be assigned to the chosen channel no.
4 Assign the radio probe to the chosen channel no. with [OK] or exit the function with [ESC], without changing the probe configuration.

Humidity probe calibration (435-2/-4 only)

This function is only available if a humidity probe is plugged in.

The calibration values can be reset to the default settings (Reset). A 2-point calibration can be performed.

➢ Resetting the calibration values:

✓ The configuration menu is open, config. is displayed.
1 Probe → [OK] → Calibr. → [OK].
2 Press [▲] / [▼] to select Reset and confirm by pressing [OK] twice.
   - The calibration values are reset to the default settings.

➢ Calibrating:

✓ The configuration menu is open, config. is displayed.

1 Probe → [OK] → Calibr. → [OK].

2 Press [▲] / [▼] to select calibration point P1 or P2 and confirm by pressing [OK] twice.

3 Put the humidity probe into the reference medium and wait for the equalisation period to elapse.

- The current humidity reading and the calibration point (nominal value) are displayed.

4 Start the calibration menu with [OK].

5 Save calibration with [OK] or cancel calibration with [ESC].

P internal (435-3/-4 only)

The internal pressure sensor can be switched on/off.

➢ Switching the internal pressure sensor on/off:

✓ The configuration menu is open, config. is displayed.

1 Probe → [OK] → P intern → [OK].

2 Press [▲] / [▼] On or Off and confirm with [OK].

Te-Type

The probe characteristic curves stored in the instrument can be set for the probe type used.

➢ Setting probe type:

✓ The configuration menu is open, Config. is displayed.

1 Probe → [OK] → Te-Type → [OK].

2 Select the desired probe type with [▲] / [▼] and confirm with [OK] .

Adjustment

The function is only available when an absolute pressure probe is attached.

The display value for the measurement of abolute pressure.

➢ Carrying out adjustment:

✓ The configuration menu is open, config. is displayed.

1 Probe → [OK] → Adjustm. → [OK].

2 With [▲] / [▼], set the adjusted value and confirm with [OK] .

Pressure

The function is only available when an absolute pressure probe is attached.

You can set whether the absolute air pressure (measured with an absolute pressure probe) or the barometric air pressure (calculated from the measured absolute pressure and the input of the altitude above sea level).

⇨ For the input of **abs alt.** for the calculation of the barometric air pressure, see chapter PARAMETER / AREA, p. 24.

➢ Setting measurement parameter:

✓ The configuration menu is open, **config.** is displayed.

1 Probe → OK → Pres. → OK.

2 With ▲ / ▼, select the desired measurement parameter and confirm with OK .

6.1.5 Language

➢ Setting the language:

✓ The configuration menu is open, **config.** is displayed.

1 Language → OK.

2 Select the desired language with ▲ / ▼ and confirm with OK.

6.2 Main menu

Settings by which the measuring instrument can be adapted to the particular measuring task are performed in the main menu.

ℹ The instrument has predefined measurement profiles that are tailored to specific areas of application.

⇨ See the chapter PROFILE, p. 12.

The profile setting influences the number of available functions and the structure of the main menu.

The method described in this chapter for calling up the functions in the main menu relates to the **Standard** profile setting. If a different profile is set, the method for calling up individual functions may change or the function may not be available in that particular profile. Some functions are only available when a probe is connected or a wireless probe is switched on and registered.

Menu overview testo 435-1/-3

Profile	menu items	Function
Standard	P = 0 (nur 435-3)	Zero internal pressure sensor
	Area	Set form, cross-section area, K-factor
	Calc.	De/activate volume flow, differential temperature, dewpoint temperature, psychrometric temperature calculation; 435-3 additionally; De/activate flow calculation
	Parameter	Set reference pressure, abs. altitude; 435-3 additionally; Set reference temperature/humidity.
	cyc. Print	De/activate cycle printing
Ductm.	P = 0 (nur 435-3)	Zero internal pressure sensor
	Velocity (nur 435-3)	De/activate flow calculation
	Vol.	De/activate volume flow calculation
	Parameter (nur 435-3)	Set reference pressure, abs. altitude, P-factor, Set reference temperature/humidity.
	Pres. (nur 435-1)	Set reference pressure
	cyc. Print	De/activate cycle printing

Menu overview testo 435-2/-4

Profile	menu items	Function
Standard	Memory	Info, Activate/set measurement locality, print report, delete store
	Meas. Prog	Set/ de/activate measurement program
	Mean	Time/point mean calculation
	Calc.	De/activate volume flow, differential temperature, dewpoint temperature, psychrometric temperature, Enthalpy calculation; Set heat transfer coefficient alpha 435-3 additionally; De/activate flow calculation
	P = 0 (nur 435-4)	Zero internal pressure sensor
	Parameter	Set reference pressure, abs. altitude, Set area form/cross-section; 435-4 additionally: Set reference temperature/humidity.
Ductm.	P = 0 (nur 435-4)	Zero internal pressure sensor
	Memory	Info, Activate/set measurement locality, print report, delete store
	Velocity (nur 435-4)	De/activate flow calculation
	Vol.	De/activate volume flow calculation
	Parameter	Set reference pressure, abs. altitude 435-4 additionally: Set reference temperature/humidity.
IAQ	Mean	Time mean calculation
	Pres.	Set reference pressure
	Memory	Info, Activate/set measurement locality, print report, delete store
	abs alt.	Set abs. altitude
	P = 0 (nur 435-4)	Zero internal pressure sensor

➢ Opening the main menu:

✓ The instrument is in measurement view.

> Press [▶☰].

- Menu is displayed.

ℹ Press [ESC] to go one menu level back. To leave the main menu, press [ESC] several times until the instrument changes to measurement view.

6.2.1 Memory (435-2 / -4 only)

Info

The free memory space is displayed

Location

The active location can be changed. Up to 99 locations can be created. The numerical location designations (01-99) can be changed into any text (max. 10 characters) using the PC software.

➢ Changing an active location:

✓ The main menu is open, Menu is displayed.

1 Memory → [OK] → Location → [OK].

2 Press [▲] / [▼] to select the location to be activated and confirm with [OK].

Protocol

Saved measurement protocols can be printed out on a Testo printer (accessory part) via the infrared interface.

➢ Printing a measurement protocol:

✓ The main menu is open, Menu is displayed.

1 Memory → [OK] → Protocol → [OK].

2 Press [▲] / [▼] to select the measurement protocol that is to be printed.

3 Press [🖶] to start printing out the measurement protocol.

Delete

The entire memory with all measurement protocols can be cleared.

➢ Clearing the memory:

✓ The main menu is open, **Menu** is displayed.

1 **Memory** → [OK] → **Delete** → [OK].

2 Press [OK] to clear the entire memory.

6.2.2 Measuring program (435-2 / -4 only)

A measuring program can be programmed and activated/deactivated:

Designation	Description
Off	Measuring program switched off: Readings can be stored manually
AUTO	Automatic measuring program: The measuring cycle (min. 1s) and the number of readings can be set freely.
Turb	Automatic measuring program for measuring turbulence (only if a turbulence probe is available and plugged in): The measuring cycle (1/5s) and duration (180s) are preset.

➢ Deactivating a measuring program:

✓ The main menu is open, **Menu** is displayed.

1 **Meas.Prog** → [OK].

2 Press [▲] / [▼] to select **Off** and confirm with [OK].

- The instrument returns to measurement view.

➢ Programming and activating the AUTO measuring program:

✓ The main menu is open, **Menu** is displayed.

1 **Meas.Prog** → [OK].

2 Press [▲] / [▼] to select **AUTO** and confirm with [OK].

The measuring cycle is set in the order: hours / minutes / seconds.

3 Press [▲] / [▼] to set the measuring cycle in hours and confirm with [OK].

4 Perform the setting for minutes and seconds as described in step 3.

5 Press [▲] / [▼] to set the number of readings and confirm with [OK].

- The instrument returns to measurement view.

➢ Activating the TURB measuring program:

The measuring program for measuring turbulence is only available if a turbulence probe is plugged in.

✓ The main menu is open, **Menu** is displayed.

1 Meas-Prog → [OK].

2 Press [▲] / [▼] to select **Turb** and confirm with [OK].

- The instrument returns to measurement view.

6.2.3 Mean

ℹ The menu item Mean value calculation is only available in the instrument testo 435-2/-4. In the instrument testo 435-1/-3, the function Mean value calculation is called up with the function button [Mean].
For carrying out Mean value calculation see chapter Measuring, p. 26.

6.2.4 P = 0 (435-3 / -4 only)

The internal pressure sensor can be zeroed.

ℹ The measurement values can be falsified by a change in the position of the measuring instrument. After zeroing, the position of the measuring instrument must not be changed. Carry out zeroing before every measurement in order to compensate faulty positioning or long-term zero-point drift. Zeroing is only possible in a range of 0...25% of the measuring range.

➢ Zeroing the internal pressure sensor:

✓ The main menu is open, **Menu** is displayed.

P = 0 → [OK].

6.2.5 Calculation

If calculation is switched on, additional parameters with calculated values can be displayed from the readings of one probe. These are then displayed as additional measurement channels in measurement view.

Particular measurement channels must be available in order to perform the calculation.
Additional calculation parameters need to be set for some calculated variables.
➥ See the chapter PARAMETER / AREA, p. 24.

The following variables can be calculated:

- Flow velocity (435-3/-4 only)
- Volumetric flow rate
- Dew point (below 0°Ctd / 32°Ftd frost point temperatures are displayed)
- Psychrometric temperature
- Enthalpy (Heating/cooling performance of assemblies)

The heat transfer coeffiient (**alpha**) required for the calculation of the U-value can be set.

It is also possible to calculate the difference between two measurement channels (**Delta**). This is only possible if the selected measurement channels have the same unit.

➢ Activating/deactivating reading calculation:

✓ The main menu is open, **Menu** is displayed.

1 **Calc.** → [OK].
2 Press [▲] / [▼] to select the variable that is to be activated/deactivated and confirm with [OK].
3 Press [▲] / [▼] to select **On** (= activated) or **Off** (= deactivated) and confirm with [OK].

➢ Activating differential calculation (delta):

✓ The instrument is in measurement view.

Differential calculation is performed with the parameters that are shown on the display.

1 Press [▲] and [▼] to select the measurement channels from which the difference is to be calculated.
2 Press [▶☰] to open the main menu.
3 **calc.** → [OK].
4 Press [▲] / [▼] to select **Delta** and confirm with [OK].

6.2.6 Parameter / Area

Some calculated variables relate to particular reference values (ambient conditions or factors for certain probes). These can be entered by means of calculation parameters.

Parameters used for calculating variables:

Parameters	Calculated measuring variables
Temp. (reference temperature) (435-3/-4 only)	Flow velocity, volumetric flow rate (for measurement with a pitot tube)
Humid. (reference humidity) with a (435-3/-4 only)	Flow velocity, volumetric flow rate (for measurement pitot tube)
Pres. (reference pressure)	Flow velocity, volumetric flow rate (for measurement with a pitot tube or hot wire probe), heating/cooling performance (enthalpy)
Area (cross-section area)	Volumetric flow rate
P-factor (pitot tube factor) (435-3/-4 only)	Flow velocity and volumetric flow rate (for measurement with a pitot tube)
abs alt.	Barometric air pressure

➢ Setting parameters (not the “Area” parameter):

✓ The main menu is open, **Menu** is displayed.

1 Parameter → [OK].

2 Press [▲] / [▼] to select the parameter that is to be set and confirm with [OK].

3 Press [▲] / [▼] to set the value and confirm with [OK].

➢ Setting the “Area” parameter / Activating shape:

Five areas can be stored for the “Area” parameter. Three shapes are defined in the default setting (one rectangles: edge length a and b, one circle: diameter d, any shaped area: cross-section area A). The dimensions of the areas can be adapted in the instrument. It is possible to reassign the shapes using the PC software (435-2/-4 only).

When K-factor activated (see chapter DEVICE, p. 13): An offset factor is stored for each area. If parts of an area are covered (e.g. grilles on ventilation openings), this can be calculated out using the offset factor. What must be indicated is the free part of the area (20% covered --> 80% free area --> offset factor 0.8).

For measurements made at outlets and volume flow regulators with defined differential pressure measurement points, a component-specific correction factor (**k-Vol**) prescribed by the manufacturer can be entered instead of the area input.

For measurements at ventilation outlets with a funnel the parameter **Funnel**

must be activated. The funnel set (order no. 0563 4170) consists of a funnel for measurements at plate outlets (200 x 200mm) and a funnel for measurements at ventilation outlets (330 x 330mm) in combination with the testo 435 and with the 100mm vane probe 0635 9435.

✓ The main menu is open, **Menu** is displayed.

1 testo 435-2/-4 only: **Parameter** → [OK].

2 Press [▲] / [▼] to select **Area** and confirm with [OK].

3 Press [▲] / [▼] to select the shape by which the area is to be described and confirm the input with [OK].

4 Press [▲] / [▼] to set the parameter(s) and confirm each one with [OK].
   - The settings are applied and the last shape to be set is activated.

6.2.7 Cyclical Print (435-1/-3 only)

The Cyclical Print function can be activated/deactivated. A measuring program for cyclical printing can be programmed. This enables readings (up to 999) to be printed in a defined measuring cycle (min. 1min). The readings are sent to a Testo printer.

➢ Activating cyclical printing/programming a measuring program:

✓ The main menu is open, **Menu** is displayed.

1 **cyc.Print** → [OK].

2 Press [▲] / [▼] to select **Off** (deactivated) or **On** (activated) and confirm with [OK]. The measuring cycle is set in the order: minutes/hours.

3 Press [▲] / [▼] to set the measuring cycle in minutes and confirm with [OK].

4 Perform the setting for hours as described in step 3.

5 Press [▲] / [▼] to set the number of readings and confirm with [OK].
   - The instrument returns to measurement view.
   - The measurement series is programmed and cyclical print can be started with [🖶] .

7. Measuring

This chapter describes the steps that are required to perform measurements with the product.

Particular probes must be plugged in or switched on and registered (radio probes) according to the variable that is to be measured.

Some probes require a warming-up phase until they are ready to measure.

For some variables additional calculation parameters have to be set if correct measurements are to be obtained.
➥ See PARAMETER / AREA, p. 24.

For the calculation of the U-value, please refer to the documentation included with the U-value temperature probe (0614 1635).

Required for the calculation of the heating/cooling performance of assemblies:

- A vane probe (for determining the volume flow) must be connected.
- 2 wireless humidity probes (for determining enthalpy at the input and output of the assembly and for calculating tightness).
- The parameter pressure (for the calculation of tightness) must be entered.
- The calculation factor enthalpy must be activated. The enthalpy is integrated in the calculation of performance, an enthalpy value cannot be displayed..
- The wireless humidity probe allocated to radio channel 1 must be positioned next to the vane probe, as its readings are automatically used to calculate the mass flow.

When measuring ambient CO, observe:

- The ambient CO probe must be situated in fresh air (CO-free) during the zeroing phase.
- Cigarette smoke influences the measurement by more than 50ppm. The breathed air of a smoker influences the reading by approx. 5ppm.
- The flow impact of the gas influences the measurement accuracy. Frontal impact on the sensor leads to higher measurement values. The best measurement results are acheived with a slight movement of the probe back and forth.

➢ Taking a measurement:

✓ The instrument is in measurement view.

✓ The measuring program AUTO or TURB is not activated (435-2/-4 only).

> Put the probe in position and take the readings.

➢ Changing the upper measurement channel line display:

> Press [▲].

➢ Changing the lower measurement channel line display, showing the max./ min. value of the variable in the upper measurement channel line:

> Press [▼].

- The following are displayed in consecutive order:
  - · Available measurement channels
  - · Maximum value of the variable in the upper display line
  - · Minimum value of the variable in the upper display line
  - · Lower measurement line not shown

➢ Resetting max./min. values:

The minimum or maximum values of all measurement channels are reset.

1 Press [▼] several times until the maximum or minimum value is displayed.

2 Reset the max./min. values with [Reset].

➢ Holding readings:

> Press [Hold].

> Press [Act] to change back to displaying the actual reading.

➢ Saving readings (435-2/-4 only):

> Press [Save].

- A measurement protocol with the readings of all available measurement channels is created for the active location.

➢ Timed mean calculation:

The mean is formed as a moving mean value and individual values are not displayed.

1 435-1/-3: Press [MEAN], 435-2/-4: [▶目] → **Mean** → [OK].

2 **Timed** → [OK].

3 Press [Start] to start mean calculation.
Press [End] to stop mean calculation.

➢ Multi-point mean calculation:

The mean is formed as a moving mean value.

1 435-1/-3: Press [MEAN], 435-2/-4: [▶目] → **Mean** → [OK].

2 **Multi-poi** → [OK].

3 Press [Pick] to include readings.
Press [End] to stop mean calculation.

Only testo 435-2 / -4 in the profile Duct measurement and with hole query activated (see chapter DEVICE, p. 13):

4 With ▲ / ▼, enter number of holes and confirm with OK .

➢ Running the AUTO or TURB measuring program (435-2/-4 only):

✓ The instrument is in measurement view and the AUTO or TURB measuring program is activated.

1 Start the measuring program with Start.

- The measuring program starts. The readings are recorded.
- The measuring program continues to run until cancelled with End or until the end criterion is met (number of readings is reached or time has expired when measuring turbulence).
- The readings are saved in a protocol.

➢ Cyclical printing (435-1/-3 only):

✓ The instrument is in measurement view and Cyclical Print is activated.

> Start cyclical printing with 🖶.

- The measuring program starts. The readings are transmitted to the Testo printer.
- Measurement continues to run until cancelled with End or until the end criterion is met (number of readings is reached).

8. Care and maintenance

This chapter describes the steps that help to maintain the functionality of the product and extend its service life.

➢ Cleaning the housing:

> Clean the housing with a moist cloth (soap suds) if it is dirty. Do not use aggressive cleaning agents or solvents!

➢ Changing the battery/rechargeable battery:

i To prevent the loss of data (deletion of data stored in the instrument) when changing the battery:

- switch instrument off before changing the battery.
  Recommendation: Supply the instrument with power via the mains unit (accessory)..
- Make sure that the ⏻ key is not pressed when changing the battery.

✓ Instrument is switched off.

1 Undo the two screws on the rear of the instrument and lift off the battery compartment cover.

2 Remove spent batteries/rechargeable batteries and insert new batteries/ rechargeable batteries (3x mignon) into the battery compartment. Observe the polarity!

3 Replace the battery compartment cover and tighten the two screws.

9. Questions and answers

This chapter gives answers to frequently asked questions.

Question	Possible causes	Possible solution
▭ lights up	· Instrument battery is almost spent.	· Replace instrument battery.
Instrument switches off automatically.	· Auto Off function is switched on. · Residual capacity of the battery is too low.	· Switch function off. · Replace battery.
Display: -----	· Probe is not plugged in. · Radio contact with radio probe is interrupted. · Probe break.	· Switch instrument off, connect probe and switch instrument back on again. · Switch radio probe on, if necessary register radio probe again. · Please contact your dealer or Testo Customer Service.
Display: uuuuu	· Permitted measuring range was undershot.	· Keep to permitted measuring range.
Display: ooooo	· Permitted measuring range was exceeded.	· Keep to permitted measuring range.
Instrument settings are no longer correct	· Power supply was interrupted for a long time.	· Re-enter instrument settings.

If we are unable to answer your question, please contact your dealer or Testo Customer Service. For contact data, see back of this document or web page www.testo.com/service-contact

10. Technical data

Measuring ranges and accuracies

Parameter/Probe type	Measuring range	Accuracy (± 1 Digit)	Resolution
Temperature / NTC	-50...+150°C	±0.2°C (-25.0...+74.9°C) ±0.4°C (-50.0...-25.1°C) ±0.4°C (+75.0...+99.9°C) ±0.5% of reading (rest of range)	0.1°C
	-58...+302°F	±0.4°F (-13.0...+166.9°F) ±0.8°F (-58.0...-13.1°F) ±0.8°F (+167.0...+211.9°F) ±0.5% of reading (rest of range)	0.1°F
Temperature / Type K / T	-200...+1370°C (Type K) -200...+400°C (Type T)	±0.3°C (-60.0...+60.0 °C) ±0.2°C+0.5% of reading (rest of range)	0.1°C
	-328...+2498°F (Type K) -328...+752°F (Type T)	±0.6°F (-76.0...+140.0°F) ±0.4°F+0.5% of reading (rest of range)	0.1°F
Relative humidity / humidity probe	0...+100%RH	Depends on probe	0.1%RH
Flow velocity / vane	Vane 16mm: 0.6...+40m/s	Depends on probe	0.1m/s
	Vane 60mm: 0.25...+20m/s	Depends on probe	0.01m/s
	Vane 100mm: 0.3...+20m/s	Depends on probe	0.01m/s
Flow velocity / hot wire probe	0...+20m/s	Depends on probe	0.01m/s
Pressure/absolute pressure probe	0...+2000hPa	Depends on probe	0.1hPa
CO2 / IAQ probe	0...+10000ppm	Depends on probe	1ppm
Lux/Lux probe (testo 435-2 / -4 only)	0...100000Lux	Depends on probe	1Lux
Pressure/internal differential pressure probe (testo 435-3 / -4 only)	0...+25hPa (Overload: 200hPa)	±0.02hPa (0...+2hPa) ±1% of reading (rest of range)	0.01hPa
CO/Ambient CO probe	0...500ppm	±5ppm (0...100ppm) [1] ±5% of reading (101...500ppm) [1]	1ppm

[1] at 10...30°C, outside this range additionally ±0.2% of reading / °C

Further instrument data

Characteristic	Value
Probe connections	1x Omega TC socket, 1x Mini-DIN socket, radio module (accessory), 435-3/-4 only: 2x pressure nipple
Memory	435-2/-4 only: max. 99 locations, up to 10000 readings (depending on number of locations, protocols, channels)
Battery life	160h (typical for vane measurement)
Power supply	3x mignon battery (included in delivery)/rechargeable battery or mains unit (accessory part)
Housing material	ABS/TPE/metal
Protection class	IP54
Dimensions	225 x 74 x 46mm
Operating temperature range	-20...+50°C
Storage temperature	-30...+70°C
Measuring rate	2/s
EC Directive	2014/30/EC

11. Accessories / spare parts

This chapter gives important accessory and spare parts for the product.

Name	Part no.
Probes	
Water-proof immersion/penetration probe, TC type K	0602 1293
Water-proof surface probe with widened measurement tip for smooth surfaces, TC type K	0602 1993
Robust affordable air probe, TC type K	0602 1793
Vane probe, 1000mm diameter	0635 9435
Vane probe, 60mm diameter, telescopic to max. 910mm	0635 9335
Vane probe, 16mm diameter, telescopic to max. 890mm	0635 9535
Humidity/temperature probe, 12mm diameter (testo 435-2/-4 only)	0636 9735
Handle for humidity/temperature probe, for connection to the measuring instrument, including probe cable, for measures/calibrates of humidity probehead (testo 435-2/-4 only)	0430 9735
Absolute pressure probe 2000hPa	0638 1835
Pressure dew point probe for measurements in compressed air systems (testo 435-2/-4 only)	0636 9835
Hot wire probe for m/s and °C, probehead 7.5mm diameter, telescopic to max. 820mm	0635 1025
IAQ probe to assess Indoor air quality, CO“, humidity, temperature and absolute pressure measurement	0632 1535
Thermal flow probe with integrated temperature and humidity measurment, 12mm diameter, with telescope max. 745mm	0635 1535
Comfort probe for degree of turbulence measurement, with telescopic handle and stand, fulfills DIN EN 13779 requirements (testo 435-2/-4 only)	0628 0109
Lux probe, probe for measuring luminous intensity (testo 435-2/-4 only)	0635 0545
Ambient CO probe	0632 1235
Miscellaneous	
Plug-in mains unit, 5VDC, 500mA with European plug	0554 0447
Funnel set sonsisting of funnel for plate outlets and funnel for vents.	0563 4170
External recharger incl. 4 Ni-MH rechargeable batteries with built-in, international plug, 100-240V, 300mA, 50/60Hz, 12VA/instrument	0554 0610

For a complete list of all accessories and spare parts, please refer to the product catalogues and brochures or look up our website: www.testo.com

testo SE & Co KGaA

Postfach 11 40, 79849 Lenzkirch
Testo-Straße 1, 79853 Lenzkirch

Telefon: (07653) 681-0
Fax: (07653) 681-100

E-Mail: info@testo.de
Internet: http://www.testo.com

www.testo.com

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