

# Bedienanleitung / Manual

## XA1000 / XP400 / XP201 / XP200



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## Notes regarding the operating manual

### Preface

The operating manual only describes the multifunction measuring meter and its intended use. Detailed descriptions of the sensors and optional accessories as well as tips for proper and practical use of the multifunction measuring meter are not included in this operating manual.

The current version of the operating manual and the general catalogue can be found at: [www.lufft.de](http://www.lufft.de)

## Symbols



### Hazardous electric current!

Warns of hazards from electric current which can lead to injuries or even death.



### Danger!

Warns of a hazard which can lead to personal injury.



### Caution!

Warns of a hazard which can lead to damage to property.

## Definitions

Concept	Meaning
SDI connection	Serial Digital Interface; digital serial interface for connecting sensors
SmartGraph3	PC software for analysis and visualisation of measured values
Calibration	Detection of the measurement deviation of a sensor, see also calibration certificate
Adjustment	Setting of a sensor, approximation of a measured value to the real value

## Legal notice

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Changes to construction in the interests of constant improvements to the product, as well as changes to the shape and colour are reserved.

The scope of delivery may vary from product images. This document was created with all due care. Lufft® accepts no liability whatsoever for possible mistakes or omissions.

The only party responsible for determining measured results to be valid, drawing conclusions and deriving actions is the user! Lufft® accepts no claims of warranty for correctness of detected measured values or measured results. Further, Lufft® accepts no liability whatsoever for possible mistakes or damage which have been caused by utilising the detected measured results. © Lufft®

## Warranty

The warranty is for 12 months. Damages caused by incorrect use by untrained people or startup by unauthorised people are excluded from the warranty. The device complies with the fundamental health and safety requirements of the applicable EU regulations and was tested at the factory for perfect functionality multiple times. However, if faults in the functionality occur and cannot be remedied with the measures in the chapter "Errors and faults", please get in touch with your dealer or distributor. When making a warranty claim, supply the device number (see the rear of the device). The invoice acts as warranty certificate. When manufacturer's instructions or legal regulations have not been followed, or after unauthorised changes to the device are made, the manufacturer is not responsible for the resulting damages. Changes to the device or unauthorised replacement of individual parts can drastically impact the electrical safety of this product and leads to the forfeit of the warranty. Liability does not extend to damages to people or property caused by the device being used other than as described in the instructions in this operating manual. Subject to changes to technical design and model changes as part of constant development and product improvement without prior notice.

No liability is accepted for damages resulting from improper use. In such cases, entitlements to a warranty are then also forfeited.

## Information about the device

### Description of the device

The multifunction measuring meter XA1000 / XP400 / XP201 / XP200 is used for carrying out accurate measured value detection. Several sensors can be connected to the digital interface of the device for this purpose.

The operating elements are located on the front and sides of the robust housing. A scratch proof colour display with touch function (1) allows entering and selecting values and functions and also displaying detected results. You can also navigate the device software by using the cross control (3) and the "OK" key (5) and select measuring functions.

By pressing the "Back" key (2) you return to the previous screen of the device software. Pressing the "Main menu" key (6) directly opens the main menu.

Pressing the "Illumination on/off" key (4) either switches the background illumination for the colour display and the keys on or dims them.

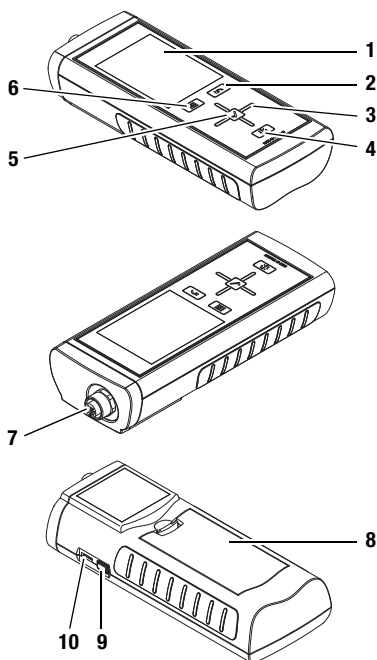
Located above the colour display (1) is the connection for the digital sensors (7). Here connect the appropriate digital sensor for the corresponding situation. The universal interface of the digital sensors allows the multifunction measuring meter to automatically detect the sensor construction, so that after switching the device on the corresponding measuring mode is displayed automatically. If no sensor is connected, an error code (see chapter "Status and error codes") is shown in the colour display (1). Depending on the sensor construction, it is calibrated to the prevailing ambient conditions after connection. On the basis of the various basic measured values, such as temperature and humidity, the multifunction measuring meter calculates the desired derived measured values like the dew point temperature, partial vapour pressure etc.

The measured results of the connected sensor are shown in the device's colour display (1).

The "On/Off" key (9) and a USB port (10) can be found on the sides of the device.

You can connect the device to a computer by using the supplied USB connection cable. Then you can extract and analyse your measured results with the SmartGraph3 software.

### Device depiction



No.	Operating element
1	scratch proof colour display with touch function
2	"Back" key
3	cross control with "Up", "Down", "Left", "Right" keys
4	"Illumination on/off" key
5	"OK" key
6	"Main menu" key
7	port for digital sensors (5-pin)
8	battery compartment with battery cover
9	"On/Off" key
10	micro USB port

## Technical data

Parameters	Values		
Multifunction measuring meter, model	XA1000	XP200	XP400
Sensors *	Temperature / humidity (digital sensor)	Temperature / humidity (digital sensor)	-
	Air flow / temperature (digital sensor)	-	Air flow / temperature (digital sensor)
	Air pressure (integrated air pressure sensor)	Air pressure (integrated air pressure sensor)	Air pressure (integrated air pressure sensor)
	CO <sub>2</sub> sensor (digital sensor)	-	-
Integrated air pressure sensor			
Air pressure measuring range	800 to 1100 mbar (complete accuracy)		
Air pressure accuracy at 25 °C, 1013.25 mbar	max. ± 0.5 mbar		
Air pressure long term stability	type -1 mbar/year		
Air pressure measurement resolution	0.024 mbar		
Operating range			
Operating temperature	0 °C to +50 °C		
Relative air humidity	< 90 % or < 20 g/m <sup>3</sup> (non-condensing)		
Height above sea level (NN)	max. 4000 m		
Storage			
Relative air humidity	< 90% (non-condensing)		
Ambient temperature	-20 °C to +60 °C		
Energy			
Battery	4 x Alkaline LR6 AA, 1.5 V		
Optional power supply	5 V USB		
Power consumption, active	approx. 400 mW		
Battery lifespan, passive	approx. 1 year		
Battery lifespan, active	at least 24 h		
Sensor supply	5.5 V ±10 % DC, max. 200 mA		
Further information			
Measured value storage	for approx. 200 measuring projects consisting of up to 3 x 3600 (=10,800) measuring points, that is a total of 200 x 10,800 = 2,160,000 measuring points		
Dimensions (L x W x H)	approx. 170 x 62 x 34 mm		
Weight	approx. 205 g		
Real time clock with calender programmed to 2099			

\* Data are subject to change (e.g. new sensors for additional measurements). As the case may be, using new sensors requires an update of the device software.

## Scope of delivery

The scope of delivery includes:

- 1 x Multifunction measuring meter
- 1 x USB connection cable
- 4 x Alkaline LR6 AA, 1.5 V batteries
- 1 x Getting started guide
- 1 x Factory test certificate

Additionally available free of charge is the SmartGraph3 PC software ([www.smartgraph3.de/download](http://www.smartgraph3.de/download)) for archiving and analysing data.

## XP201 (sold separately, order no. 5810.20)

The XP201 set consists of the following components:

- 1 x Multifunction measuring meter XP200
- 1 x Probe 8130.TFF (temperature/humidity highly accurate)
- 1 x DAkkS calibration certificate

## Safety

**Carefully read the operating manual before using the device and keep it within reach!**

- Do not use the device in atmospheres containing oil, sulphur, chlorine or salt.
- Ensure that all connection cables are protected from damages (e.g. from kinks or crushing).
- Protect the device from permanent direct sunlight.
- Observe the storage and operating conditions (see chapter "Technical data").

## Intended use

Use the Multifunction measuring meter XA1000 / XP400 / XP201 / XP200 only in the field of climate diagnostics, while adhering to and following the technical data.

To use the device for its intended use, only connect and use accessories and spare parts which have been approved by Lufft®.

## Intended use includes e. g.

- the analyses of
  - supply and exhaust air flows,
  - fluctuations in relative humidity,
  - condensate formation,
  - heat build-ups and temperature fluctuations and
- the utilization as reference device according to DIN EN ISO 9001.

## Improper use

Do not use the device in potentially explosive atmospheres, or for measurements in liquids. Lufft® accepts no liability for damages resulting from improper use. In such a case, entitlements to a warranty are forfeited. Any unauthorised modifications, alterations or structural changes to the device are forbidden.

## Personnel qualifications

People who use this device must:

- know and understand the dangers of working near live parts.
- take measures to protect themselves from direct contact with live parts.
- have read and understood the operating manual, especially the "Safety" chapter.

**For maintenance or repair work which requires the housing to be opened, contact Lufft® customer service. Devices which have been opened unlawfully are void of any warranty and warranty claims.**

## Residual risks



### **Hazardous electric current!**

Work on the electrical components must only be carried out by an authorised specialist company.



### **Hazardous electric current!**

Never measure live parts.



### **Danger!**

Do not leave the packaging lying around. Children may use it as a dangerous toy.



### **Danger!**

The device is not a toy and does not belong in the hands of children.



### **Danger!**

Dangers can occur at the device when it is used by untrained people in an unprofessional or improper way. Observe the personnel qualifications.



### **Caution!**

To prevent damages to the device, do not expose it to extreme temperatures, extreme humidity or moisture.



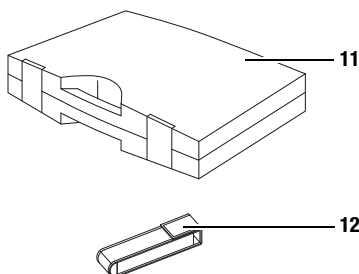
### **Caution!**

To prevent damages to the device or to a connected sensor due to overheating, observe the permissible operating and measuring ranges of the device and the connected sensor. The corresponding specifications are provided in the general catalogue for industrial measuring devices or on [www.lufft.de](http://www.lufft.de) under the "Information material – Industrial measuring devices" menu.

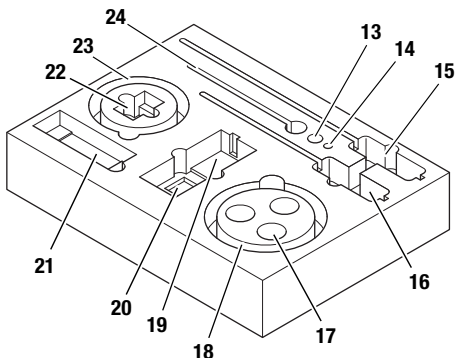
## Transport and storage

### Transport

To safely transport the multifunction measuring meter and accessories, use the transport case (11) recommended by Lufft®. Otherwise, protect the device during use and transport with an optional device bag (12). Contact Lufft® customer service if you want this alternative version.



The transport case is equipped with special compartments where the multifunction measuring meter and accessories can be kept as follows:



No.	Operating element
13	CO <sub>2</sub> sensor
14	TFF sensor
15	TFF sensor with handle
16	Flow sensor with handle
17	3x calibration solution
18	Sensor/actuator cable (connection cable)
19	Multifunction measuring meter XA1000
20	Batteries
21	Abridged operating instructions
22	USB power plug
23	USB cable
24	Temperature/humidity sensor



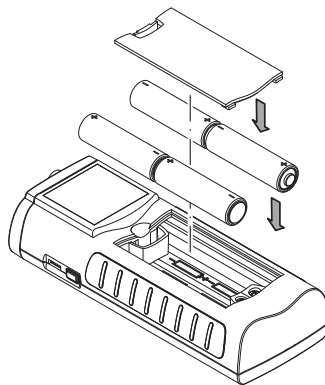
## Storage

When the device is not being used, observe the following storage conditions:

- dry,
- protected from dust and direct sunlight,
- with a plastic cover to protect it from invasive dust, if necessary.
- The storage temperature is the same as the range given in the chapter "Technical data".
- When storing the device for a long time, remove the batteries.
- To store the device, use the transport case (see chapter "Transport") wherever possible.

## Operation

### Inserting the batteries



### Switching on

1. Press and hold the "On/Off" key for approx. 3 seconds until the device beeps.
2. Release the "On/Off" key.
  - The colour display is switched on. The device is ready for operation as soon as the screen of the particular measuring mode is displayed (depends on the connected sensor).

### Switching off

1. Press and hold the "On/Off" key for approx. 3 seconds until the device beeps.
2. Release the "On/Off" key.
  - The colour display is switched off.

## Description of screen elements

When using the device, take special note of the following important operating elements and displays:

- The "Back" key (2) opens the previous menu.
- The "Main menu" key (6) opens the main menu.
- Name of the current screen (26)
- Indication of the current time (27)
- The "padlock" symbol (28) appears when you press and hold the "On/Off" key for approx. 1 second during a measurement. The touch function of the colour display is locked. To release the lock, press and hold the "On/Off" key for approx. 1 second.
- The "lightbulb" symbol (29) appears when you have used the "Illumination on/off" key to switch on background illumination (see chapter "Information about the device").
- Indication of the battery loading status (30); a plug symbol is shown when power is supplied via a USB connection.

All options which can be selected via touch function can also be selected by using the cross control and the "OK" key.

For safety reasons, some options can only be selected and configured by using the cross control and the "OK" key (e.g. date and time in the "Settings" screen).

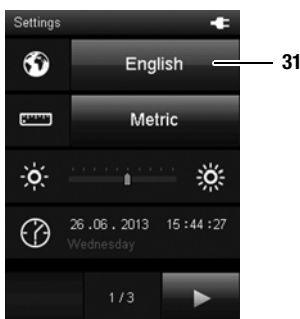


## Setting the language

1. Press the "Main menu" key (6) to open the main menu.



2. Press the "Settings" key in the main menu.
3. Press the language selection key (31) in the "Settings" screen.



4. Press the key with the desired language from the following screen.
  - The selected screen language is activated immediately.

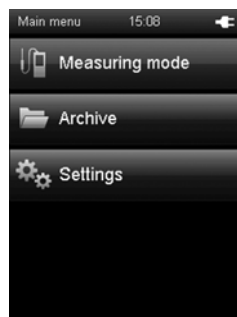


5. Press the "Back" key (2) to return to the desired measuring mode. Alternatively press the "Main menu" key and then the "Measuring mode" key.



## Main menu

You can open the following menus from the main menu:

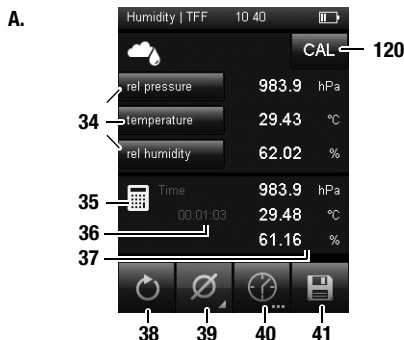


- |                 |   |
|-----------------|---|
| Measuring mode: | Perform measurements in compliance with the connected sensor. If no sensor is connected, only the values from the integrated air pressure sensor are available. |
| Archive:        | Open archived measured values.  |
| Settings:       | Make any device settings.   |

## "Measuring mode – Air pressure" screen (integrated sensor)

### Note!

This measuring mode is only displayed when no digital sensor is connected.



34 When using the integrated air pressure sensor, only select the measured values for air pressure (see fig. B.). The latest measured value is displayed next to the corresponding key on the right (also see chapter "Explanation of the measured values", page 19).

The remaining selection options are disabled. Should you select one of the disabled entries, "E55" is displayed. If applicable, deactivate the display by pressing one of the keys marked with 34 and actuating the selection "Off" at the end of the list in the pop-up window (see fig. B.).

35 This symbol indicates that the measured values displayed under 37 are calculated (e.g. minimum/maximum measured value).

36 Indicates the measurement duration.

37 Displays the calculated measured values according to the specifications under 34 and 39. The calculation starts when switching the multifunction measuring meter on. Actuating key 38 restarts the calculation of measured values.

38 Sets the measured values displayed under 37 and the duration shown under 36 back to zero.

39 **Specifies how the measured values under 37 are shown (see fig. C.):**

Minimum: Always shows the smallest detected measured value from a measuring period.

Maximum: Always shows the largest detected measured value from a measuring period.

Average: Shows the average value of all detected measured values from a measuring period.

Hold: Holds the current detected measured value and shows it continually (when this option is selected).

Off: Switches off the measured values indication under 37.

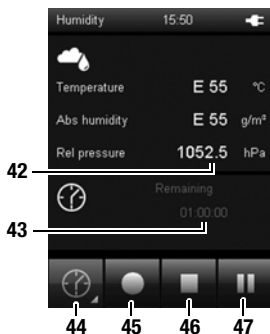
40 Carries out an automatic measurement for the duration of a predefined recording interval. The recording interval can be specified in the following screen (see fig. D. and fig. E., page 12).

41 Saves the currently displayed measured value as single measurement in the archive with date and time stamp.

120 Calls up the calibration menu for the integrated air pressure sensor (see Calibration chapter).

## "Measuring mode – Automatic measurement" screen (integrated sensor)

D.

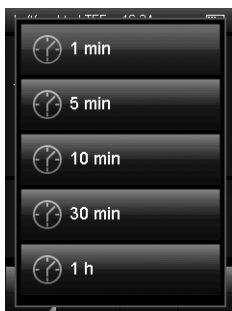


- 42 mmHg: Displays the measured value according to the specifications under 34 (e.g. in the measuring unit millimetres of mercury) and under 39 (e.g. as average value) (see fig. A., page 11).
- 43 Indicates the remaining recording duration for the automatic measurement.
- 44 Opens a screen for selecting the recording duration for measuring over a long period (see fig. E.).
- 45 Starts recording.  
The key turns red once recording has started.

### Note!

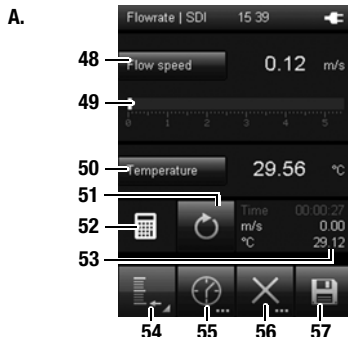
During an active recording it is not possible to switch off the multifunction measuring meter with the "On/Off" key. Automatic switch-off is also deactivated. First stop the recording by pressing key 46 and then turn off the device.

E.



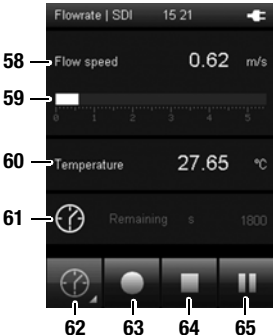

- 46 Stops the current recording. The detected values are automatically saved to the current measuring project.
- 47 Pauses the current recording.  
Key 45 flashes.  
Press this key again to continue recording.

## "Measuring mode – Flowrate" screen

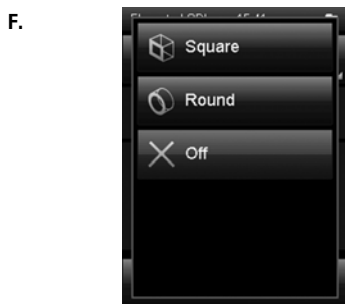
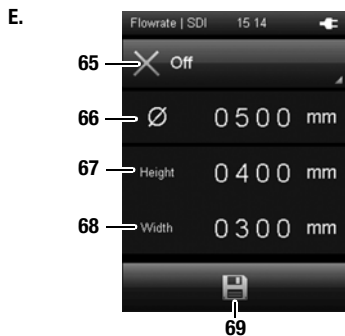


- 48 Shows the measured flow rate as a numerical value in the selected unit (e.g. m/s).  
In order to display and select the available units, touch "Flow speed" (see chapter "Explanation of the measured values", page 19).
- 49 Shows the measured flow rate as visual bars.
- 50 In order to display and select the available measured values, touch "Temperature" (see chapter "Explanation of the measured values", page 19).  
Select "Off" to switch the display off.
- 51 Sets the measured values displayed under 53 and the duration back to zero.
- 52 This symbol indicates that the displayed measured values under 53 are calculated (e.g. minimum/maximum measured value).
- 53 **Displays the calculated measured values according to the specifications under 48, 50 and 54:**  
Time: Duration of the interval  
m/s: Shows the flow rate as a numerical value in the selected unit (e.g. m/s).  
°C: Displays the temperature value (e.g. in °C).
- 54 **Specifies how the measured values under 53 are shown (see fig. B.):**  
Minimum: Always shows the smallest detected measured value from a measuring period.  
Maximum: Always shows the largest detected measured value from a measuring period.  
Average: Shows the average value of all measured values which have been detected so far from a measuring period.  
Hold: Holds the current detected measured value and shows it continually (when this option is selected).  
Off: Switches 53 display off.
- 55 Carries out an automatic measurement for the duration of a predefined recording interval. The recording interval can be specified in the following screen (see fig. C. and fig. D., page 14).
- 56 Opens fig. E., page 15, where you can specify parameters for the volumetric flow measurement (e.g. the form of the object to be measured).
- 57 Saves the currently displayed measured value as single measurement in the archive with date and time stamp.

## "Measuring mode – Flowrate – Automatic measurement" screen

- C.**
- 
- 58 Shows the measured flow rate as a numerical value in the selected unit (e.g. m/s). You can select the unit under 48 in fig. A., page 13.
- 59 Shows the measured flow rate as visual bars.
- Note!**  
This display is only available when measuring flow values. The representations in fig. C. can slightly deviate depending on the previous setting.
- 60 Shows the measured temperature value.
- 61 Shows the remaining time until the automatic measurement finishes.
- 62 Opens a screen for selecting the recording duration (see fig. D.).
- 63 Starts recording.  
The key turns red once recording has started.
- Note!**  
During an active recording it is not possible to switch off the multifunction measuring meter with the "On/Off" key. Automatic switch-off is also deactivated. First stop the recording by pressing key 64 and then turn off the device.
- 64 Stops the current recording. The detected values are automatically saved to the current measuring project.
- 65 Pauses the current recording.  
Key 63 flashes.  
Press this key again to continue recording.
- D.**
- 

## "Measuring mode – Flowrate – Measuring range" screen



- 65 Selects the form of the object to be measured. The following options are available (see fig. F):
1. Square (volumetric flow measurement)
  2. Round (volumetric flow measurement)
  3. Off (no volumetric flow measurement)

Depending on the selected form, a different equation is used to calculate the measured values.

The presentation of measured values under 48 in fig. A., page 13 depends on the settings selected here.

- 66 Determines the diameter of the object to be measured (with selection "Round" under 65).
- 67 Determines the height of the object to be measured (with selection "Square" under 65).
- 68 Determines the width of the object to be measured (with selection "Square" under 65).
- 69 Saves the settings and returns to fig. A., page 13.

The measured values for the volumetric flow can only be displayed under 48 in fig. A., page 13.

During volumetric flow measurement, further measured values, such as the flow rate, can be displayed under 50 in fig. A., page 13.

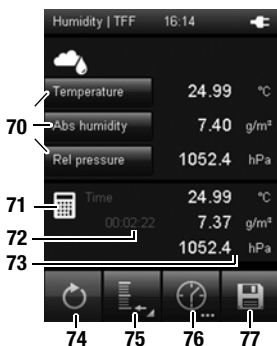
### **Note!**

The settings saved here are also used for all following measurements, unless they are deactivated (in the corresponding menu item)!



## "Measuring mode – Humidity" screen

A.



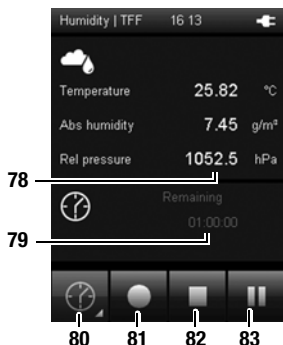
B.



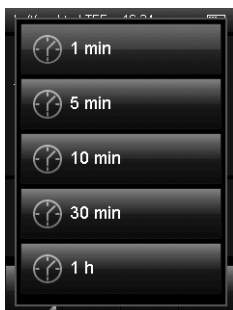
- 70 Specifies how measured values and the corresponding units are shown (see chapter "Explanation of the measured values", page 19). The latest measured value is displayed next to the corresponding key on the right.  
Select "Off" to switch the respective display off.
- 71 This symbol indicates that the displayed measured values under 73 are calculated (e.g. minimum/maximum measured value).
- 72 Indicates the measurement duration.
- 73 **Displays the measured values according to the specifications under 70 and 75:**
  - °C: Displays the temperature according to the specifications under 70 (e.g. in degrees Celsius) and under 75 (e.g. as average value):
  - $\text{g/m}^3$ : Displays the humidity according to the specifications under 70 (e.g. in gram per cubic metre) and under 75 (e.g. as average value):
  - mmHg: Displays the air pressure according to the specifications under 70 (e.g. in the measuring unit millimetres of mercury) and under 75 (e.g. as average value):
- 74 Sets the measured values shown under 73 back to zero.
- 75 **Specifies how the measured values under 73 are shown (see fig. B.):**
  - Minimum: Always shows the smallest detected measured value from a measuring period.
  - Maximum: Always shows the largest detected measured value from a measuring period.
  - Average: Shows the average value of all detected measured values from a measuring period.
  - Hold: Holds the current detected measured value and shows it continually (when this option is selected).
  - Off: Switches off the measured values indication under 73.
- 76 Carries out an automatic measurement for the duration of a predefined recording interval. The recording interval can be specified in the following screen (see fig. C. and fig. D., page 17).
- 77 Saves the currently displayed measured value as single measurement in the archive with date and time stamp.

## "Measuring mode – Humidity – Automatic measurement" screen

C.



D.



78 **Displays the measured values according to the specifications under 70 and 75 in fig. A.:**

- °C: Displays the temperature according to the specifications under 70 (e.g. in degrees Celsius) and under 75 (e.g. as average value):
- g/m<sup>3</sup>: Displays the humidity according to the specifications under 70 (e.g. in gram per cubic metre) and under 75 (e.g. as average value):
- mmHg: Displays the air pressure according to the specifications under 70 (e.g. in the measuring unit millimetres of mercury) and under 75 (e.g. as average value):

79 Indicates the remaining recording duration for the automatic measurement.

80 Opens a screen for selecting the recording duration for measuring over a long period (see fig. D.).

81 Starts recording.  
The key turns red once recording has started.

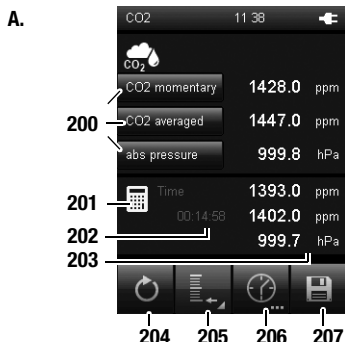
### **Note!**

During an active recording it is not possible to switch off the multifunction measuring meter with the "On/Off" key. Automatic switch-off is also deactivated. First stop the recording by pressing key 82 and then turn off the device.

82 Stops the current recording. The detected values are automatically saved to the current measuring project.

83 Pauses the current recording.  
Key 81 flashes.  
Press this key again to continue recording.

## "Measuring mode – CO<sub>2</sub> sensor" screen



- 200 Specifies how measured values and the corresponding units are shown (see chapter "Explanation of the measured values", page 19). The latest measured value is displayed next to the corresponding key on the right.  
Select "Off" to switch the respective display off.
- 201 This symbol indicates that the displayed measured values under 203 are calculated (e.g. minimum/maximum measured value).
- 202 Indicates the measurement duration.
- 203 **Shows the measured values according to the specifications under 200:**
- ppm (non-averaged): Displays the current CO<sub>2</sub> measured value in ppm (parts per million).
- ppm (averaged): Displays the median of the last 11 CO<sub>2</sub> measured values in ppm (parts per million).
- hPa: Displays the air pressure according to the specifications under 200 (e.g. in the measuring unit hectopascal) and under 205 (e.g. as average value).
- 204 Sets the measured values shown under 203 back to zero.
- 205 **Specifies how the measured values under 203 are shown:**
- Minimum: Always shows the smallest detected measured value from a measuring period.
- Maximum: Always shows the largest detected measured value from a measuring period.
- Average: Shows the average value of all detected measured values from a measuring period.
- Hold: Holds the current detected measured value and shows it continually (when this option is selected).
- Off: Switches off the measured values indication under 203.
- 206 Carries out an automatic measurement for the duration of a predefined recording interval.
- 207 Saves the currently displayed measured value as single measurement in the archive with date and time stamp.

## Explanation of the measured values

Depending on the measuring mode and used sensor, the following measured values can be selected to be displayed in the corresponding measurement units:

[Unit] Measured value		Meaning
[g/m <sup>3</sup> ]	Abs humidity	Indicates the mass of water vapour in relation to the volume, in which the humid gas is contained, in: • grams per cubic metre • grains per cubic foot
[gr/ft <sup>3</sup> ]		
[hPa]	Abs pressure	Indicates the barometric air pressure. This is the currently present pressure, based on an absolute vacuum of "0" and thus termed absolute pressure. Possible units are: • hectopascal • millimetres of mercury • pounds per square inch
[mmHg]		
[psi]		
[°C]	Ice bulb temp	Indicates the temperature setting in at the interface of an icy surface and a gas gushing past in: • degrees Celsius • degrees Fahrenheit
[°F]		
[°C]	Wet bulb temp	Indicates the temperature setting in at the interface of a wet surface and a gas gushing past in: • degrees Celsius • degrees Fahrenheit
[°F]		
[°C]	Frost point temp	Indicates the temperature at which the current partial water vapour pressure equals the saturated vapour pressure and ice starts to form in: • degrees Celsius • degrees Fahrenheit
[°F]		
[kg/m <sup>3</sup> ]	Air density	Indicates the mass of air in proportion to a certain volume in: • kilograms per cubic metre • pounds per cubic foot
[lb/ft <sup>3</sup> ]		
[g/kg]	Saturation ratio	Indicates the relative mass ratio of ambient air saturated with humidity in the total mass in: • grams per kilogram • grains per pound • parts per million
[gr/lb]		
[ppm]		

[Unit] Measured value		Meaning
[g/kg]	Mixing ratio	Indicates the mass of water vapour in proportion to the mass of dry gas in: • grams per kilogram • grains per pound • parts per million
[gr/lb]		
[ppm]		
[g/kg]	Mass frac w-vapour	Indicates the mass of water vapour in proportion to the mass of humid gas in: • grams per kilogram • grains per pound • parts per million
[gr/lb]		
[ppm]		
[ft <sup>3</sup> /h]	Norm vol flow	Converts the measured volumetric flow employing the ideal gas law to standard conditions (temperature and pressure). The following standard conditions can be set: • DIN 1343: 0 °C/1013.25 mbar • DIN ISO 2533: 25 °C/1013.25 mbar • DIN 1945-1: 20 °C/1013.25 mbar
[ft <sup>3</sup> /min]		
[ft <sup>3</sup> /s]		
[in <sup>3</sup> /h]		
[in <sup>3</sup> /min]		The following units can be selected: • cubic feet per hour • cubic feet per minute • cubic feet per second • cubic inches per hour • cubic inches per minute • cubic inches per second • litres per minute • cubic metres per hour • cubic metres per minute • cubic metres per second
[in <sup>3</sup> /s]		
[l/min]		
[m <sup>3</sup> /h]		
[m <sup>3</sup> /min]		
[m <sup>3</sup> /s]		
[hPa]	Partial vap pressure	Indicates the partial pressure of water in its gaseous phase in a given volume of a gas or gas mixture in: • hectopascal • pounds per square inch
[psi]		
[%]	Rel humidity	Indicates the relative humidity as the ratio of the partial water vapour pressure to the saturated vapour pressure under saturation conditions above water in per cent.
[%]	Rel humidity techn.	Indicates the relative humidity as the ratio of the partial water vapour pressure to the saturated vapour pressure under saturation conditions above ice in per cent (only with temperatures below 0 °C).

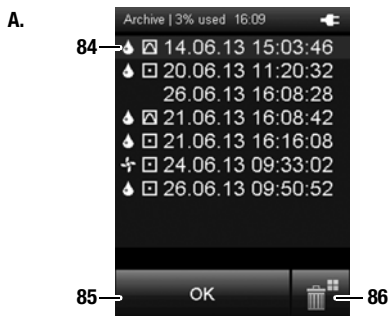
[Unit] Measured value		Meaning
[hPa]	Rel pressure	Indicates the air pressure corrected to sea level employing the international barometric height formula in: <ul style="list-style-type: none"> <li>• hectopascal</li> <li>• millimetres of mercury</li> <li>• pounds per square inch</li> </ul>
[mmHg]		
[psi]		
[hPa]	Sat vap pres a. ice	Indicates the partial water vapour pressure under saturation conditions above ice in: <ul style="list-style-type: none"> <li>• hectopascal</li> <li>• pounds per square inch</li> </ul>
[psi]		
[hPa]	Sat vap pres a. water	Indicates the partial water vapour pressure under saturation conditions above water in: <ul style="list-style-type: none"> <li>• hectopascal</li> <li>• pounds per square inch</li> </ul>
[psi]		
[BTU/lb]	Specific enthalpy	Indicates the state variable of the humid gas, which is composed of the specific enthalpies of the mixture components and based on the mass fraction of the dry gas, in: <ul style="list-style-type: none"> <li>• British Thermal Unit per pound</li> <li>• Kilojoule per kilogram</li> </ul>
[kJ/kg]		
[fpm]	Flow speed	Indicates the movement of fluids or gases as proportion of length to a certain time in: <ul style="list-style-type: none"> <li>• feet per minute</li> <li>• metres per second</li> </ul>
[m/s]		
[°C]	Dewpoint temp	Indicates the temperature at which the current partial water vapour pressure equals the saturated vapour pressure and condensation starts in: <ul style="list-style-type: none"> <li>• degrees Celsius</li> <li>• degrees Fahrenheit</li> </ul>
[°F]		
[°C]	Temperature	Indicates the measured air temperature in: <ul style="list-style-type: none"> <li>• degrees Celsius</li> <li>• degrees Fahrenheit</li> </ul>
[°F]		
[%]	Vol frac w-vapour	Indicates the volume fraction of water vapour in proportion to the total volume of humid gas in: <ul style="list-style-type: none"> <li>• per cent</li> <li>• parts per million</li> </ul>
[ppm]		

[Unit] Measured value		Meaning
[ft <sup>3</sup> /h]	Flow rate	Indicates the volume calculated from the measured flow rate and the set area in: <ul style="list-style-type: none"> <li>• cubic feet per hour</li> <li>• cubic feet per minute</li> <li>• cubic feet per second</li> <li>• cubic inches per hour</li> <li>• cubic inches per minute</li> <li>• cubic inches per second</li> <li>• litres per minute</li> <li>• cubic metres per hour</li> <li>• cubic metres per minute</li> <li>• cubic metres per second</li> </ul>
[ft <sup>3</sup> /min]		
[ft <sup>3</sup> /s]		
[in <sup>3</sup> /h]		
[in <sup>3</sup> /min]		
[in <sup>3</sup> /s]		
[l/min]		
[m <sup>3</sup> /h]		
[m <sup>3</sup> /min]		
[m <sup>3</sup> /s]		

## "Archive" screen

In the "Archive" screen, you can view archived measuring projects or open them for further processing:

### Archive, fig. A:



84 Shows the measuring projects which are saved in the archive. The currently selected archive entry is highlighted.

Navigate in the archive as follows:

1. Press the "Down" key on the cross control until the desired archive entry is selected.
2. You may need to turn the page by pressing the "Left" or "Right" keys on the cross control.
3. Press the "OK" key on the cross control to confirm the selected archive entry. You can also press "OK" (85) on the screen. ⇒ Fig. B., page 22 opens.


85 Selects the currently selected archive entry. ⇒ Fig. B., page 22 opens.


86 Deletes all entries from the archive. ⇒ A safety prompt opens. Confirm it by pressing the "OK" key if you want to delete all entries. Otherwise, touch the "Cancel" key.

The icons beside the saved measuring projects show each measuring mode (see examples in fig.A.). The meaning is as follows:

 Flowrate measurement

 Measurement of humidity, temperature or air pressure

 Spot measurement

 Time measurement

## Archive, fig. B.:

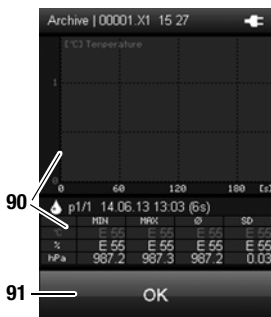
B.



- 87 Opens the selected archive entry (see fig. C.).
- 88 Deletes the selected archive entry. ⇒ A safety prompt opens. Confirm it by pressing the "OK" key if you want to delete the entry. Otherwise, touch the "Cancel" key.
- 89 Closes fig. B. and returns to fig. A. ("Archive" screen, page 21).

## Archive, fig. C.:

C.



- 90 Charts (top of fig. C.) and tabulates (bottom of fig. C.) the measured values. You can select one of the three different measurement channels using the "Up" and "Down" keys on the cross control until. The selected measurement channel will be highlighted in the table. Displayed in the table are the minimum value (MIN), the maximum value (MAX), the arithmetic average (Ø) and the standard deviation (SD).
- In case the data won't fit onto one table page after a longer recording session, you can browse through the timeline ([s], on the right in fig. C.) by using the "Left" and "Right" keys on the cross control unit.
- 91 Closes the selected archive entry and returns to fig. A. ("Archive" screen, page 21).

## "Settings" screen

You can configure the device as follows in the "Settings" screen:

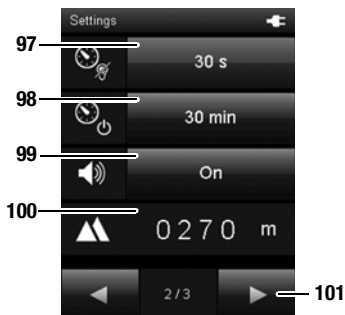
### Settings 1/3:



- 92 Selects the screen language (see chapter "Setting the language").
- 93 **Selects the unit system:**
  - Metric: Activates the metric unit system for all available measured values (e.g. for use in continental Europe).
  - Imperial: Activates the imperial unit system for all available measured values (e.g. for use in the USA).
- 94 Sets the screen brightness.  
This option can only be selected by using the cross control below the colour display.
  1. Press the "Down" key on the cross control until the scale is selected.
  2. Press the "Left" or "Right" keys on the cross control to reduce (left) or increase (right) the screen brightness.
- 95 Sets the date and time.  
This option can only be selected by using the cross control below the colour display.
  1. Press the "Down" key on the cross control until the date is selected.
  2. Press the "OK" key on the cross control.  
⇒ The entire row is selected.
  3. Press the "Left" or "Right" keys on the cross control to select the value to be configured.
  4. Press the "Up" or "Down" keys on the cross control to increase or reduce the value to be configured.
  5. Press the "OK" key on the cross control.  
⇒ The row is deselected.
- 96 Opens the next screen.



## Settings 2/3:



97 Either specifies the period for automatic dimming of the colour display or deactivates the function:  
30 seconds, 1 minute, 5 minutes, off

98 Either specifies the period for automatic switch-off of the colour display or deactivates the function:  
10 minutes, 30 minutes, 1 hour, off

### **Note!**

This function is deactivated during an automatic measurement.

99 Switches signal tones/key tones on or off.

100 Sets the height above sea level (SL).  
This value is i.a. required for the calculation of the relative air pressure and other values.

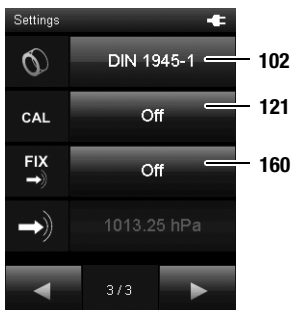
This option can only be selected by using the cross control below the colour display.

1. Press the "Down" key on the cross control until the numerical value is selected.
2. Press the "OK" key on the cross control.  
⇒ The first number is selected.
3. Press the "Left" or "Right" keys on the cross control to select the number to be configured.
4. Press the "Up" or "Down" keys on the cross control to increase or reduce the value to be configured.
5. Press the "OK" key on the cross control.  
⇒ The single number is deselected.

101 Opens the next screen.

## Settings 3/3:

A.



B.



- 102 Determines the setting for the amount of gas or the volumetric flow to be measured (also see chapter "Explanation of the measured values");  
DIN 1343, DIN ISO 2533, DIN 1945-1

### **Note!**

Before using the multifunction measuring meter, make sure that you are aware of the device's intended purpose and the respective standard in effect as well as the contents of this standard.

- 121 Activates or deactivates the calibration function.  
Further information on the calibration function can be found in the Calibration chapter.

### **Note!**

After switch-off of the device, the calibration function is switched to "Off".

- 160 Activates or deactivates the fixed reference value pressure for the calculation/measurement of pressure-dependent values.

**FIX Off:** The pressure value is provided by the internal pressure sensor

**FIX On:** The pressure value is the value set under 161 (see fig. B.)

- 161 Determines the pressure value for the calculation of pressure-dependent values (e. g. flow rate).

### **Note!**

This value can only be changed if FIX is set to "On".

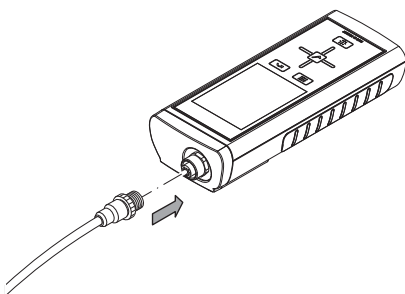
## Performing a measurement (exemplary using sensor for temperature and air flow measuring)

### Note:

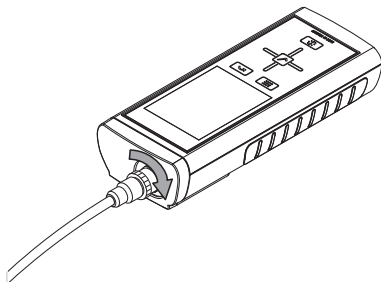
Note that moving from a cold area to a warm area can lead to condensation forming on the device's circuit board. This physical and unavoidable effect can falsify the measurement. In this case, the colour display shows either no measured values or they are incorrect. Wait a few minutes until the device has become adjusted to the changed conditions before carrying out a measurement.

After connecting a sensor, the multifunction measuring meter automatically selects the appropriate measuring mode. The corresponding screen is displayed and the measurement begins.

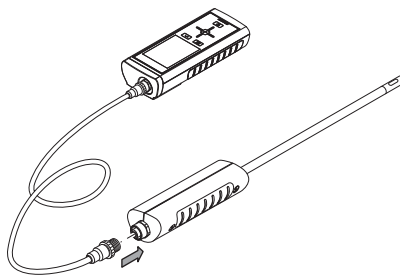
A.



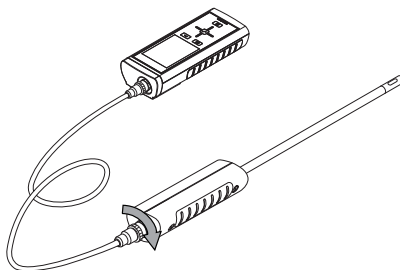
B.



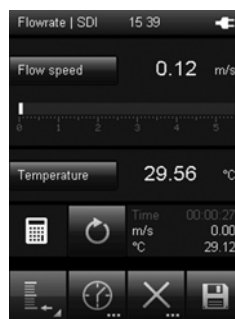
C.



D.



E.



## Shut down procedure

1. Switch off the device by pressing the "On/Off" key (see chapter "Switching off").
2. Detach connecting cables and sensors.
3. Clean the device according to the chapter "Maintenance".
4. Store the device according to the chapter "Storage".

## Calibration

The different sensors can be adjusted manually to compensate any measurement deviations.

### Note!

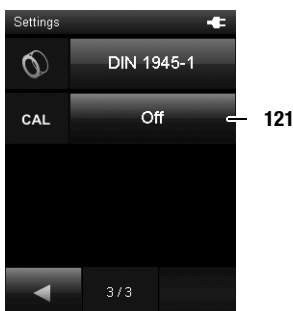
Calibration should only be carried out by trained personnel working with suitable means!

### Definitions

Concept	Meaning
Calibration	Detection of the measurement deviation of a sensor, see also calibration certificate
Adjustment	Setting of a sensor, approximation of a measured value to the real value

### Activating the calibration function

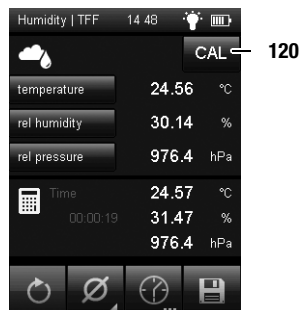
1. In the Settings 3/3 menu, set the button (121) next to CAL to "On" (see page 25).



2. Press button 122 to activate the additional visualisation of measured values.
  - You can, for example, select the average.



- In the advance measuring mode, the "CAL" button (120) is displayed.



3. Press the "CAL" button (120) to call up the calibration function of the respective sensor.

### Note!

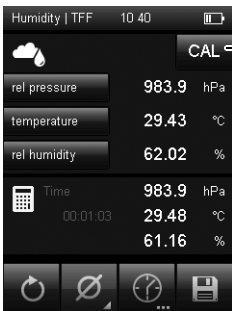
The "CAL" button is only available for the primary measured values which are directly measured by the sensor.  
Please note that the calibration menu indicated is always that of the top measurement channel.

## Calibration internal air pressure sensor


### Note!

Please note that the calibration menu indicated is always that of the top measurement channel.

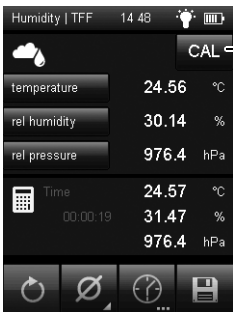
Example figure A: The calibration refers to the air pressure.

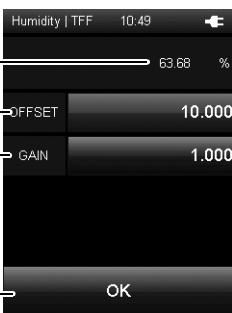
- A.**
- 
- 120 CAL opens the calibration menu (see fig. B.).
- 130 Current measured value indication
- 131 CAL (offset):  
Actuate this button to enter an offset value (see fig. C.).  
Please observe the limit values.
- 132 Returns to the "Measuring mode" screen.

- B.**
- 
- 130
- 131 CAL 0.0
- 132 OK

- C.**
- 
- +0.000
- 7 8 9
- 4 5 6
- 1 2 3
- 0 +/- <
- OK Cancel

## Calibration humidity and temperature sensor 8120.TFF (XA1000, XP200 only)

- A.**
- 
- 120 Opens the calibration menu (see fig. B.).  
Please note that the calibration menu indicated is always that of the top measurement channel, in this case the temperature (see fig. A.).
- 133 Current measured value indication
- 134 Offset:  
Use this button to enter an offset value (see fig. C.).  
Please observe the limit values.
- 135 Gain:  
Use this button to enter a multiplying factor. The measured values are adjusted according to the following formula:  
 $y = \text{offset} + x * \text{gain}$   
where y is the indicated and x the measured value.
- 136 Returns to the "Measuring mode" screen.

- B.**
- 
- 133
- 134 OFFSET 10.000
- 135 GAIN 1.000
- 136 OK

### Note:

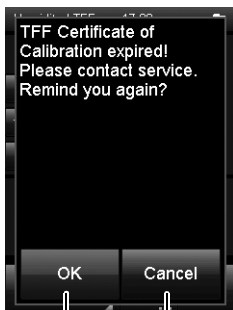
All values are stored in the sensor and are retained even if the device is exchanged.

- C.**
- 
- 136 OK

## Calibration humidity and temperature sensor 8120.TFF – calibration certificate

The following reminder appears 1 year after the first use of the probe:

D.

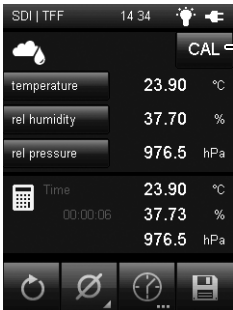
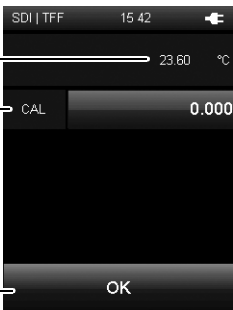
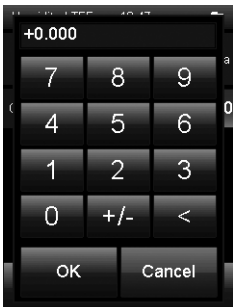


137

138

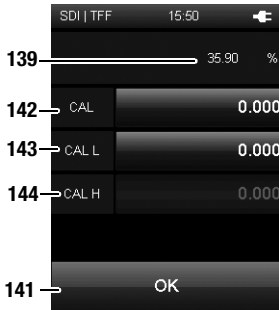
- 137 Press the OK key to confirm the reminder.  
The reminder will appear again after 28 days.
- 138 Press the Cancel key to switch the reminder off.  
The reminder will only appear again when the entire archive is deleted.

## Calibration temperature/humidity probe SDI 9130.540 and 9130.520 (XA1000, XP200 only)

- A.**
- 
- 120 Opens the calibration menu (see fig. **B.**).  
Please note that the calibration menu indicated is always that of the top measurement channel, in this case the temperature (see fig. **A.**).  
For humidity calibration, see fig. **D.** on the following page.
- 139 Current measured value indication
- 140 CAL (offset/single-point calibration):  
Use this button to enter an offset value (see fig. **C.**).  
Please observe the limit values.
- 141 Returns to the "Measuring mode" screen.
- B.**
- 
- 139
- 140
- 141
- C.**
- 

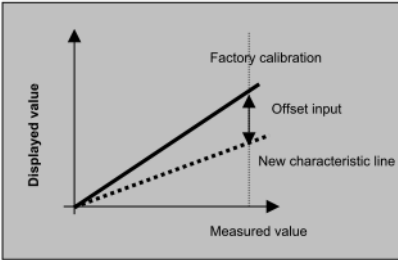


D.



E.

#### Offset input for relative humidity



- 139 Current measured value indication
- 142 CAL (offset/single-point calibration) for humidity values from 30 %:  
Use this button to enter an offset value (see fig. C.). Please note that the input of this offset causes the characteristic curve to rotate around zero, see fig. E.
- 143 CAL L:  
lower calibration value for the two-point calibration. The range of values is between 10 % and 40 % RH (preferably 33 % RH). The offset values can be entered in steps of 0.1.
- 144 CAL H:  
upper calibration value for the two-point calibration. The range of values is between 60 % and 90 % RH (preferably 76 % RH). The offset values can be entered in steps of 0.1.
- 141 Returns to the "Measuring mode" screen.

#### Notes regarding two-point calibration:

Beyond the ranges indicated for CAL L and CAL H two-point calibration is not possible! The maximum offset per point is  $\pm 10$  % RH.

The factory settings can be restored by setting all three offset values to 0.0.

#### Note:

All values are stored in the sensor and are retained even if the device is exchanged.

## Calibration CO<sub>2</sub> sensor

A.  120

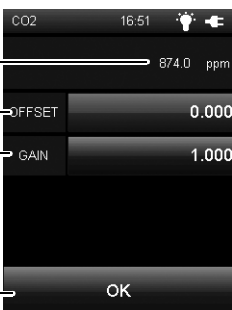
120 Opens the calibration menu (see fig. B.).  
Please note that the calibration menu indicated is always that of the top measurement channel, in this case CO<sub>2</sub> non-averaged (see fig. A.).  
CO<sub>2</sub> averaged cannot be calibrated.

145 Current measured value indication

146 Offset:  
Use this button to enter an offset value (see fig. C.).  
Please observe the limit values.

147 Gain:  
Use this button to enter a multiplying factor. The measured values are adjusted according to the following formula:  
 $y = \text{offset} + x * \text{gain}$   
where y is the indicated and x the measured value.

148 Returns to the "Measuring mode" screen.

B. 

145 → 874.0 ppm

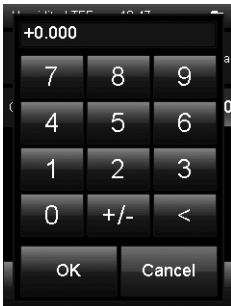
146 → OFFSET 0.000

147 → GAIN 1.000

148 → OK

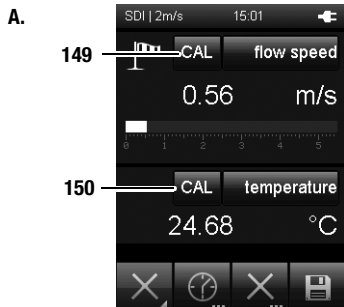
### Note:

All values are stored in the sensor and are retained even if the device is exchanged.

C. 

148 → OK

## Calibration SDI sensor flow speed and temperature (XA1000, XP400 only)



149 Opens the calibration menu for the flow speed (see fig. B.).

150 Opens the calibration menu for the flow speed.  
An offset can be entered here (see fig. C.).  
Please observe the limit values.

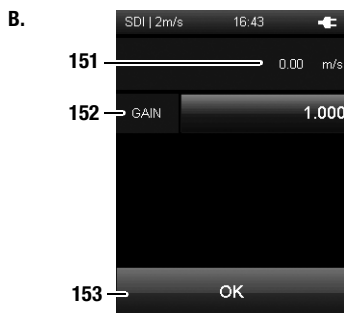
151 Current measured value indication

152 Gain:  
Use this button to enter a multiplying factor. The measured values are adjusted according to the following formula:  
 $y = x * \text{gain}$   
where y is the indicated and x the measured value.

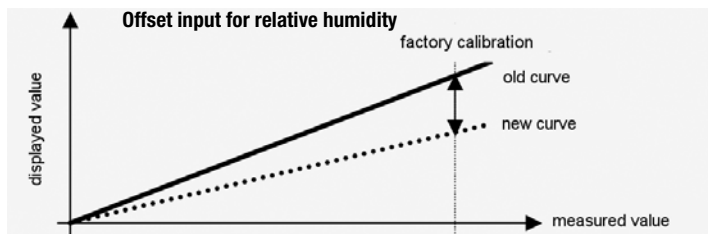
153 Returns to the "Measuring mode" screen.

### Note:

All values are stored in the sensor and are retained even if the device is exchanged.



**D.**



### **Calibration humidity and temperature sensor 8130.TFF (XA1000 and XP200 only)**

Due to the high precision of the sensor, calibration is possible only when using a special software with a suitable USB adapter. For the relative humidity, a 5-point calibration of the humidity levels 11 %, 33 %, 53 %, 75 % and 90 % is recommended.

## PC software

Use the SmartGraph3 PC software to carry out a detailed analysis and visualisation of your measured results. Only by employing this PC software can all options of the multifunction measuring meter for visualization and functioning be utilized (e.g. data export into an Excel/PDF file or data output in form of a printout).

You can open a basic display of your measured values at any time in the device (see chapter "Description of screen elements").

### Installation conditions

Ensure that the following minimum requirements for installing the SmartGraph3 PC software are fulfilled:

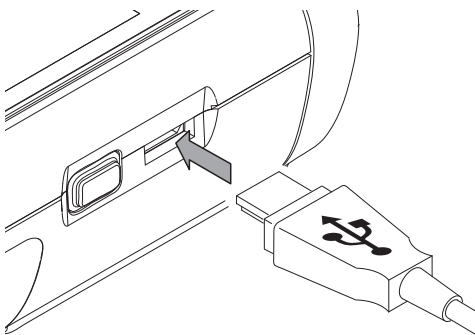
- Supported operating systems (32 or 64 bit version):
  - Windows Vista
  - Windows 7
  - Windows 8
  - Windows 10
- Software requirements:
  - Microsoft .NET Framework (is automatically installed during the software installation, where applicable)
- Hardware requirements:
  - Processor speed: 1.6 GHz, minimum
  - USB connection
  - 2 GB RAM, minimum
  - 1 GB hard disk space, minimum

### Installing the PC software

1. Download the current PC software from the Internet. To do so, visit the website [www.smartgraph3.de/download](http://www.smartgraph3.de/download).
2. Double-click the downloaded file.
3. Follow the instructions of the installation wizard.

### Starting the PC software

1. Start the SmartGraph3 software.
2. Switch on the multifunction measuring meter (see chapter "Switching on") if necessary.
3. Connect the multifunction measuring meter to your PC via the USB connection cable provided in the scope of delivery. After a few seconds (up to one minute) the multifunction measuring meter is automatically detected and added to the device list in the SmartGraph3 software.



Information about using the PC software is provided in the online help.

## Errors and faults

The accurate functionality of the device was tested during production a number of times. However, if functionality faults do occur, then check the device according to the following list.

### The device does not switch on:

- Check the loading status of the batteries. Replace the batteries when the battery symbol in the colour display only shows one bar. If the battery symbol is red, then the battery voltage is insufficient.
- Check that the batteries are properly positioned. Check the polarity is correct.
- Never carry out an electrical check yourself; instead, contact your Lufft® customer service.

### The device is switched on, but no measured values are displayed:

- Check whether the multifunction measuring meter is in the correct sensor mode.
- Check the connected connection cable for correct fit.
- Check the used connection cable and its connections as well as the connections to the multifunction measuring meter for damages (e.g. broken cable, damaged contacts etc.). Use a different connection cable of the same type to rule out possible faults.
- Ensure that the appropriate sensor for the measurement is being used. Here, also observe the general catalogue or the product catalogue for measuring devices.
- Ensure that the colour display is switched on. If necessary, actuate the "Illumination on/off" key (see chapter "Device depiction").

- Check the room temperature and the relative humidity. Check the device's permissible operating range complies with the technical data.
- Check whether the multifunction measuring meter responds to touching the colour display. If it shows no reaction despite an enabled colour display and sufficient battery power, remove the batteries for approx. 1 minute. Subsequently refit the batteries (see chapter "Inserting the batteries") and restart the multifunction measuring meter.

### Does your device still not operate correctly after these checks?

Contact Lufft® customer service.

## Status and error codes

Status/error code	Meaning
E 27	Faulty factory setting
E 2C	Failed initialization of a component
E 50	Measured value above the specified range
E 51	Measured value below the specified range
E 52	Measured value physically supersaturated (upper limit)
E 53	Measured value physically supersaturated (lower limit)
E 54	Receipt of invalid data
E 55	Sensor missing or defective
E FF	Unknown fault

## Maintenance

### Maintenance and care intervals

Maintenance and care interval	before every start	when necessary	at least every 4 weeks	at least annually
check connections for digital sensors and micro USB for dirt and foreign objects and clean if necessary	X			
clean housing		X		X
visually check whether the device is dirty		X	X	
replace batteries		X		
check for damages	X			
carry out a test run				X

## Activities for before the start of maintenance

1. Switch off the device (see chapter "Switching off").
2. Detach connecting cables and sensors.



**For maintenance or repair work which requires the housing to be opened, contact Lufft® customer service. Devices which have been opened unlawfully are void of any warranty and warranty claims.**

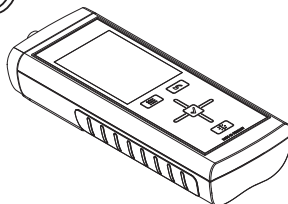
## Visual inspection of the device

1. Check the device for dirt and damages.
2. Check the connection for digital sensors and the micro USB connection for dirt and damages.
3. Check the colour display for dirt and damages.
4. Check that the batteries and battery cover sit properly.

Damaged connections can falsify measurements and measurement results. A damaged colour display can influence how measured results are shown. In this case, contact your Lufft® customer service or replace the device.

## Cleaning the device

1. Use a soft, lint-free cloth for cleaning.
2. Dampen the cloth with clean water. Do not use sprays, solvents, alcohol-based or abrasive cleaners to dampen the cloth.
3. Clear dirt from the housing, the connections and the colour display.

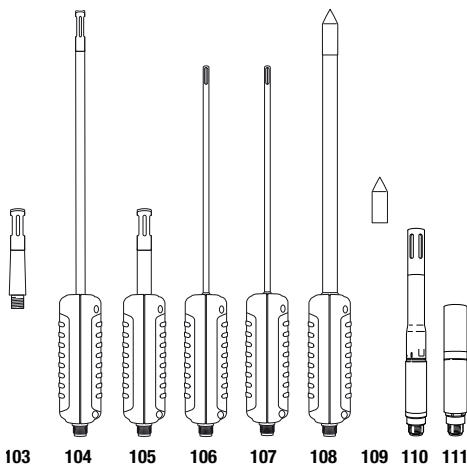




## Available digital sensors

An overview of the currently available digital sensors is provided below.

Further details about digital sensors and their use is provided in the separate general catalogue.



No.	Digital sensor	Article number	Compatible with		
			XA1000	XP200	XP400
108	SDI sensor for high temperature and humidity measurements with Teflon probe inside a stainless steel sinter cap	9130.530	X	X	
109	Stainless steel sinter cap	5120.212	for sensor (108)		
110	TFF I sensor for XA1000 and XP200	8130.TFF	X	X	
111	CO <sub>2</sub> sensor for XA1000	7120.CO2	X		

### Note!

Lufft® continually improves and broadens the range of available sensors. Information on additional, new sensors can be found on the website [www.lufft.de](http://www.lufft.de).

## Further accessories (optional)

The following accessories are optionally available. Contact Lufft® customer service if you want this alternative version:

No.	Digital sensor	Article number	Compatible with		
			XA1000	XP200	XP400
103	TFF20 Sensor for temperature and humidity measurements for comparative measurements in the maintenance service	8120.TFF	X	X	
104	SDI sensor for temperature and humidity measurements with slim probe tube (Ø 4 mm) for measuring at poorly accessible places	9130.520	X	X	
105	SDI sensor for temperature and humidity measurements	9130.540	X	X	
106	SDI sensor as reference device for temperature and air flow measurements in the maintenance service	6120.510	X		X
107	SDI sensor for temperature and air flow measurements in the climate metrology	6120.520	X		X

Accessories	Article number
Case for portable measuring instruments	5900.CAS
Holster	5900.HOL
USB power supply	8120.NT
Humidity standard 11%	5560.FS11
Humidity standard 33%	5560.FS33
Humidity standard 53%	5560.FS53
Humidity standard 75%	5560.FS75
Humidity standard 90%	5560.FS90
Adapter for a diameter of 13 mm	5900.AD13
Extension cable 2 m	8120.KAB2
Stainless steel sinter filter	5120.212
Batteries	8120.SV1

## Disposal

In the European Union, electronic equipment must not be treated as domestic waste, but must be disposed of professionally in accordance with Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 concerning old electrical and electronic equipment. After the end of its use, please dispose of this device in a manner appropriate to the relevant legal requirements.

In the European Union, batteries must not be treated as domestic waste, but must be disposed of professionally in accordance with Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 concerning batteries and accumulators. Please dispose of batteries in a manner appropriate to the relevant legal requirements.

## Declaration of conformity

in accordance with the EC Low Voltage Directive 2006/95/EC and the EC Directive 2004/108/EC about electromagnetic compatibility.

Herewith, we declare that the multifunction measuring meter XA1000 / XP400 / XP201 / XP200 was developed, constructed and produced in compliance with the named EC directives.

Applied harmonised standards:

EN 61326-1:2006,  
EN 61326-2-1:2006,  
IEC 61326-1:2005,  
IEC 61326-2-1:2005

The **CE** marking is located on the rear of the device.

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Fellbach, 2 September 2013



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