



Ex II 3G Ex ec IIC T4 Gc

Ex II 3D Ex tc IIIB T125°C Dc



**IO-Link**



**Modbus**



RoHS III  
COMPLIANT

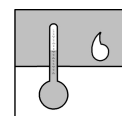


## Operating manual

### FT90

Humidity and temperature measuring device  
PRO-LINE®

with optional (differential) pressure measurement



## Masthead

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## Version history

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|------------------|---|
| Rev. ST4-A 03/20 | Version 1 (first edition)   |
| Rev. ST4-B 08/20 | Version 2 order code changed  |
| Rev. ST4-C 09/20 | Version 3: Passwords  |
| Rev. ST4-D 11/21 | Version 4 accessories (cable length for sensors changed)  |
| Rev. ST4-E 04/22 | Version 5 Techn. Data corrected for temperature sensor FF90   |
| Rev. ST4-F 10/22 | Version 6 UKCA conformity   |
| Rev. ST4-G 05/23 | Version 7 process connection G $\frac{1}{8}$ added, ATEX sensor connection changed, mounting flange changed |
| Rev. ST4-H 02/24 | Version 8 Change to sensor: FF12 added, introduction of firmware version >1.41                              |
| Rev. ST4-I 07/24 | Version 9 (measurement deviation edited and revised, IO-Link)   |
| Rev. ST4-K 11/24 | Version 10 (Outdoor application)  |

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# 1 Safety instructions

## 1.1 General

This operating manual contains basic instructions for the installation, operation and maintenance of the device that must be followed without fail. It must be read by the installer, the operator and the responsible specialist personnel before installing and commissioning the device.

This operating manual is an integral part of the product and therefore needs to be kept close to the instrument in a place that is accessible at all times to the responsible personnel.

The following sections, in particular instructions about the assembly, commissioning and maintenance, contain important information, non-observance of which could pose a threat to humans, animals, the environment and property.

The instrument described in these operating instructions is designed and manufactured in line with the state of the art and good engineering practice.

## 1.2 Personnel Qualification

The instrument may only be installed and commissioned by specialized personnel familiar with the installation, commissioning and operation of this product.

Specialized personnel are persons who can assess the work they have been assigned and recognize potential dangers by virtue of their specialized training, their skills and experience and their knowledge of the pertinent standards.

## 1.3 Personnel Qualification

The instrument may only be installed and commissioned by specialized personnel familiar with the installation, commissioning and operation of this product.

Specialized personnel are persons who can assess the work they have been assigned and recognize potential dangers by virtue of their specialized training, their skills and experience and their knowledge of the pertinent standards.

For explosion-proof models the specialized personnel must have received special training or instruction or be authorized to work with explosion-proof instruments in explosion hazard areas.

## 1.4 Risks due to Non-Observance of Safety Instructions

Non-observance of these safety instructions, the intended use of the device or the limit values given in the technical specifications can be hazardous or cause harm to persons, the environment or the plant itself.

The supplier of the equipment will not be liable for damage claims if this should happen.

## 1.5 Safety Instructions for the Operating Company and the Operator

The safety instructions governing correct operation of the instrument must be observed. The operating company must make them available to the installation, maintenance, inspection and operating personnel.

Dangers arising from electrical components, energy discharged by the medium, escaping medium and incorrect installation of the device must be eliminated. See the information in the applicable national and international regulations.

Please observe the information about certification and approvals in the Technical Data section.

## 1.6 Safety Instructions for the Operating Company and the Operator

The safety instructions governing correct operation of the instrument must be observed. The operating company must make them available to the installation, maintenance, inspection and operating personnel.

Dangers arising from electrical components, energy discharged by the medium, escaping medium and incorrect installation of the device must be eliminated. See the information in the applicable national and international regulations.

Please observe the information about certification and approvals in the Technical Data section.

The instrument must be decommissioned and secured against inadvertent re-operation if a situation arises in which it must be assumed that safe operation is no longer possible. Reasons for this assumption could be:

- evident damage to the instrument
- failure of the electrical circuits
- longer storage outside the approved temperature range.
- considerable strain due to transport

Repairs may be carried out by the manufacturer only.

A professional single conformity inspection as per DIN EN 61010, section 1, must be carried out before the instrument can be re-commissioned. This inspection must be performed at the manufacturer's location. Correct transport and storage of the instrument are required.

## 1.7 Unauthorised Modification

Modifications of or other technical alterations to the instrument by the customer are not permitted. This also applies to replacement parts. Only the manufacturer is authorised to make any modifications or changes.

## 1.8 Inadmissible Modes of Operation

The operational safety of this instrument can only be guaranteed if it is used as intended. The instrument model must be suitable for the medium used in the system. The limit values given in the technical data may not be exceeded.

The manufacturer is not liable for damage resulting from improper or incorrect use.

## 1.9 Safe working practices for maintenance and installation work

The safety instructions given in this operating manual, any nationally applicable regulations on accident prevention and any of the operating company's internal work, operating and safety guidelines must be observed.

The operating company is responsible for ensuring that all required maintenance, inspection and installation work is carried out by qualified specialized personnel.

## 1.10 Pictogram explanation



### **DANGER**

#### Type and source of danger

This indicates a **direct** dangerous situation that could lead to death or **serious injury** (highest danger level).

1. Avoid danger by observing the valid safety regulations.



### **WARNING**

#### Type and source of danger

This indicates a **potentially** dangerous situation that could lead to death or **serious injury** (medium danger level).

1. Avoid danger by observing the valid safety regulations.



### **CAUTION**

#### Type and source of danger

This indicates a **potentially** dangerous situation that could lead to slight or serious injury, damage or **environmental pollution** (low danger level).

1. Avoid danger by observing the valid safety regulations.



### **NOTICE**

#### Note / advice

This indicates useful information of advice for efficient and smooth operation.

## 2 Product and functional description

### 2.1 Delivery scope

- Differential pressure transmitter FT90 PRO-LINE®  
Version as stated on the type plate with an integrated assembly rail. Attachment screws are not included in the delivery.
- Operating manual

### 2.2 Intended use

The FT90 is suitable for the measurement of humidity and temperature in neutral gaseous media. Optionally, the device can be used to measure the pressure, negative pressure, or differential pressure of neutral gaseous media.

Note the specifications in the technical data with regard to media compatibility.


The device may only be used for the purpose stipulated by the manufacturer. The manufacturer will not be liable for damage arising from incorrect or improper use.

#### 2.2.1 Explosion hazard area classification

Devices with the order code **FT90 ## ## ## # 0 # 000 R1 # #** are classified as electrical equipment for use in potentially explosive areas zone 2 (gases and vapours) and/or zone 22 (dusts).

##### Gas explosion protection

Designation as per Directive 2014/34/EU:

 II 3G Ex ec IIC T4 Gc

##### Dust explosion protection

Designation as per Directive 2014/34/EU:

 II 3D Ex tc IIIB T125°C Dc

$-20^{\circ}\text{C} \leq T_{\text{amb}} \leq 60^{\circ}\text{C}$

#### 2.2.2 External application

If the device is intended for outdoor use, we recommend permanently protecting the membrane keypad against UV radiation and using a suitable enclosure or at least the erection of a sufficiently dimensioned canopy as a protection measure against constant rain or snow.

## 2.3 Function diagram

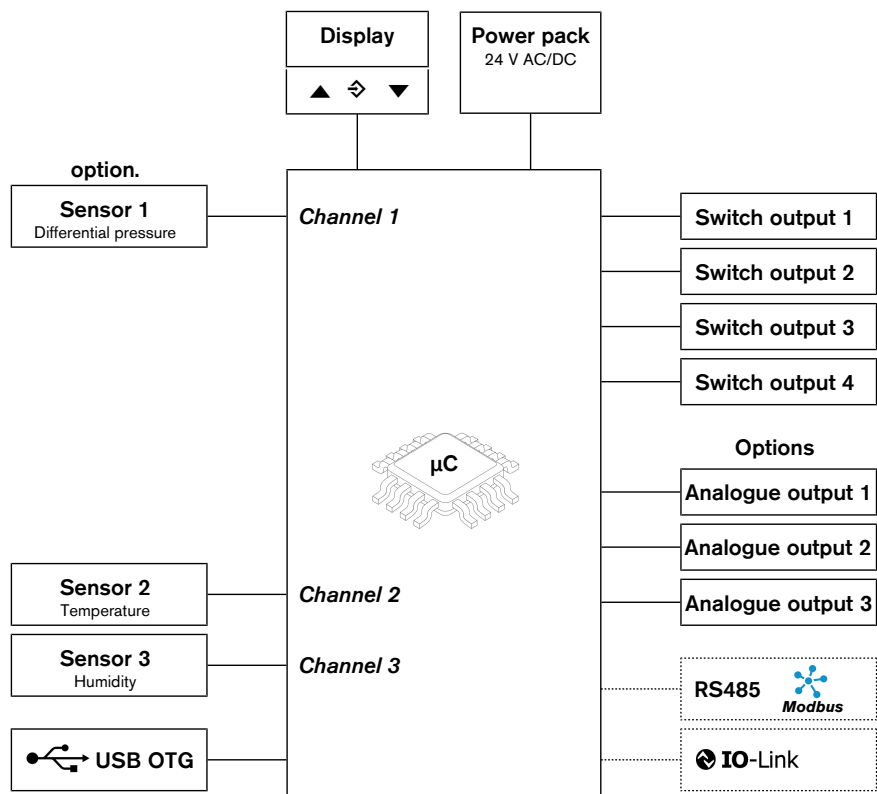


Fig. 1: Function diagram

## 2.4 Design and mode of operation

### Temperature and humidity measurement

The temperature and humidity measurement is based on a sensor chip with a digital I2C bus interface. The analog measurement data is digitally converted and linearised. The transmitted data is evaluated by the integrated electronics and is transformed into a display, analog output, and up to four switch outputs or output via the optional Modbus output.

### Pressure measurement

The pressure measurement is based on a piezo-resistive sensor element that is suitable for measuring overpressure, negative pressure, and differential pressure. The pressures to be compared have a direct effect on a silicon membrane equipped with a measuring bridge.

When the pressure is equal, the measuring membrane is in its idle state. If a pressure difference occurs, the membrane is deflected and a resistance change takes place on the attached measuring bridge. This change is evaluated by the electronics integrated into the device and is transformed into a display, analog output, and up to four switch outputs or is output via the optional Modbus output.

## 2.5 Device versions

### 2.5.1 Equipment

#### 2.5.1.1 Version dP/T/rH

| Inputs                | Channel 1 | Channel 2 | Channel 3 |
|-----------------------|-----------|-----------|-----------|
| Differential pressure | x         |           |           |
| Temperature           |           | x         |           |
| Humidity              |           |           | x         |

#### 2.5.1.2 Version T/rH

| Inputs                | Channel 1 | Channel 2 | Channel 3 |
|-----------------------|-----------|-----------|-----------|
| Differential pressure |           |           |           |
| Temperature           | x         |           |           |
| Humidity              |           | x         |           |

#### 2.5.1.3 Outlets and interfaces

| Standard          | dP/T/rH    | T/rH       | Modbus |        | IO-Link |
|-------------------|------------|------------|--------|--------|---------|
|                   | 3 channels | 2 channels | (Opt1) | (Opt2) |         |
| Switch output 1-4 | x          | x          |        | x      | x       |
| USB interface     | x          | x          | x      | x      | x       |
| <b>Options</b>    |            |            |        |        |         |
| Analogue output 1 | x          | x          |        |        |         |
| Analogue output 2 | x          | x          |        |        |         |
| Analogue output 3 | x          |            |        |        |         |
| RS 485 Modbus RTU |            |            | x      | x      |         |
| IO-Link           |            |            |        |        | x       |

### 2.5.2 Process connection

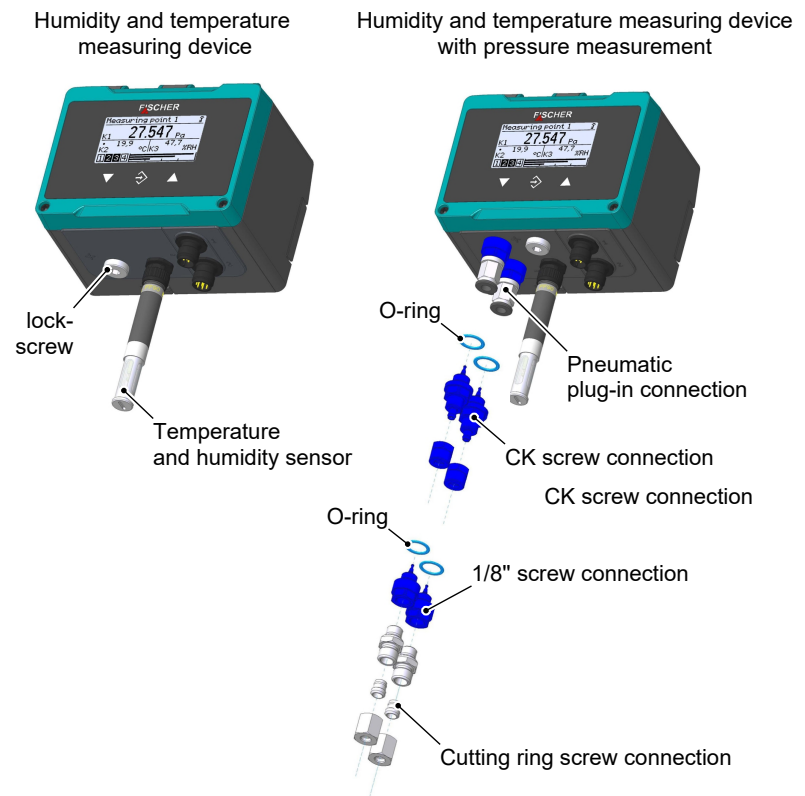


Fig. 2: Process connections

### 2.5.3 Electrical connection

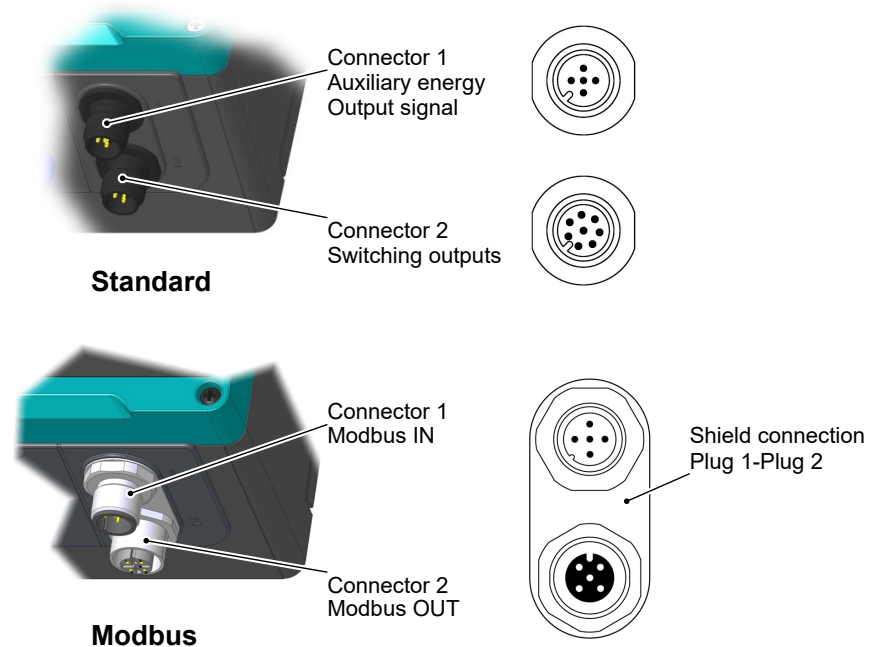


Fig. 3: Electric connections

### 2.5.4 ATEX model

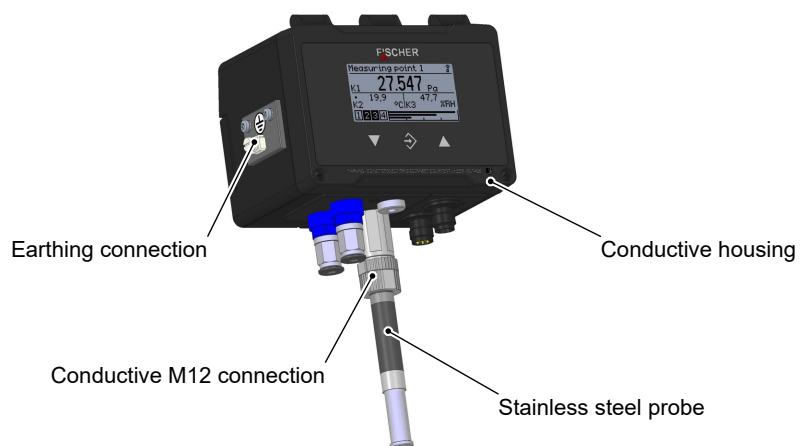


Fig. 4: ATEX model

## 2.5.5 Type plate

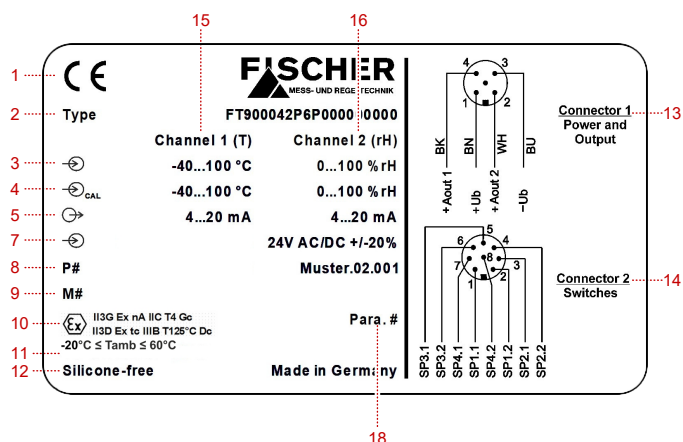


Fig. 5: Humidity/temperature type plate

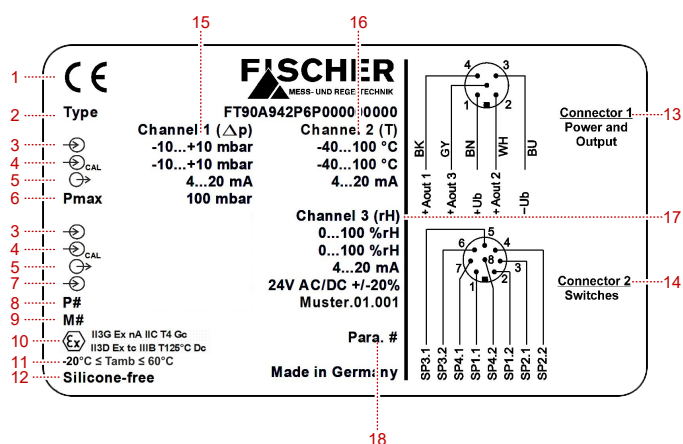


Fig. 6: Pressure/humidity/temperature type plate

|    |                                 |    |                                 |
|----|---------------------------------|----|---------------------------------|
| 1  | Conformity                      | 2  | Device type (order code)        |
| 3  | Basic measuring range           | 4  | Set measuring range             |
| 5  | Output signal                   | 6  | Overload capacity               |
| 7  | Auxiliary energy                | 8  | Production number               |
| 9  | Customer item number            | 10 | ATEX marking                    |
| 11 | Special properties              | 12 | Parameter number                |
| 13 | Circuit diagram for connector 1 | 14 | Circuit diagram for connector 2 |
| 15 | Data for channel 1              | 16 | Data for channel 2              |
| 17 | Data for channel 3              | 18 | Parameter number                |

### Explanations of the symbols

|                |                   |
|----------------|-------------------|
|                | Input             |
|                | Output            |
| <b>CAL</b>     | Factory Setting   |
| <b>Pmax</b>    | Proof Pressure    |
| <b>P#</b>      | Production No.    |
| <b>M#</b>      | Customers Art.no. |
| <b>Para. #</b> | Parameter No.     |

## 3 Assembly

### 3.1 General

The device is designed for installation on assembly plates or wall surfaces. A pre-mounted 35 mm plastic assembly rail is supplied for this purpose. The attachment screws are not included in the delivery.

Alternatively, the device can also be mounted to a 35 mm top-hat rail.

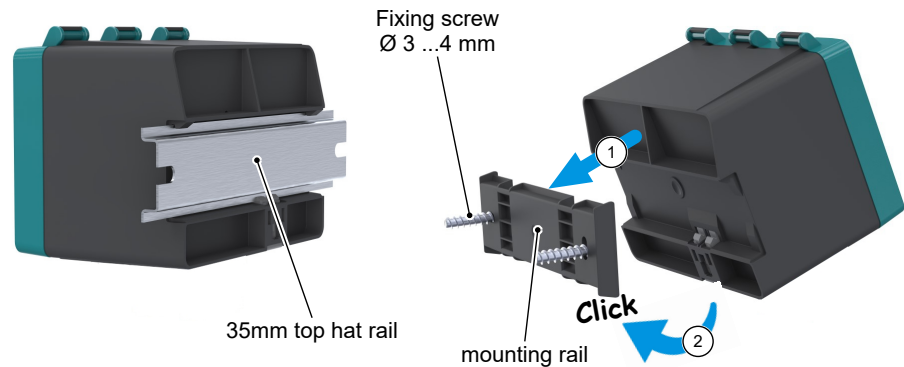


Fig. 7: Assembly

At the factory, the device is calibrated for vertical installation, but the installation position is arbitrary. For any installation positions that are not vertical, the zero-point signal can be corrected via the installed offset correction.

The enclosure protection type IP 65 is only guaranteed, if a suitable power supply cable is used (see accessories).

If the device is intended for outdoor use, we recommend permanently protecting the membrane keypad against UV radiation and using a suitable enclosure or at least the erection of a sufficiently dimensioned canopy as a protection measure against constant rain or snow.

### 3.2 Mounting in explosive areas

- If operated in explosive areas, the valid local regulations and guidelines for the installation and operation of electrical systems in explosive areas must be observed.
- If units are used in potentially explosive areas, the personnel must receive additional training or briefings or have a permit to work on explosion-protected units in potentially explosive systems.

**DANGER! The operator must ensure that any falling objects cannot collide with the installed unit.**

Steps must be taken to prevent the impact creating sparks so that the protection class of the casing is no longer guaranteed. This can be avoided by attaching protective cover, a protective housing or similar.

### 3.3 Process connection

- By authorized and qualified specialized personnel only.
- The pipes need to be depressurized when the instrument is being connected.
- Appropriate steps must be taken to protect the device from pressure surges.
- Check that the device is suitable for the medium being measured.
- Maximum pressures must be observed (cf. Tech. data)

The pressure lines must be kept as short as possible and installed without any tight bends to avoid delays.

The pressure lines must be installed at an inclination so that no water pockets are created. If the required gradient is not reached, water filters need to be installed at suitable points.

The process connections are marked with (+) and (-) symbols on the device. The pressure lines must be mounted according to these symbols.

#### 1. Differential pressure measurement

- ⊕ Higher pressure
- ⊖ lower pressure

#### 2. Pressure measurement

- ⊕ Pressure
- ⊖ open

#### 3.3.1 Replacement plates

The device is fitted with different replacement plates depending on the number of measuring channels.

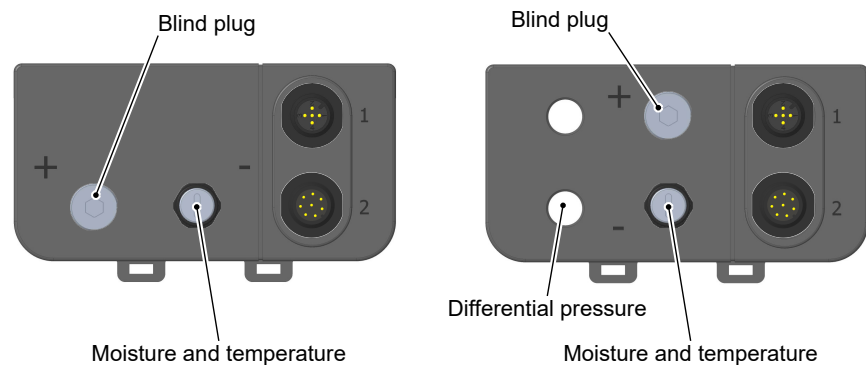


Fig. 8: Replacement plate

These replacement plates are equipped ex-works with the required process connections and the M12 flange connectors for the electrical connection. The user may not make any independent modifications.




| Process connection type   |  |                    | size                         |
|---|--|--------------------|------------------------------|
|  | Pneumatic plug connection<br>for hydraulic hoses                       | Polyamide hose     | 6 x 4 x 1 mm<br>8 x 6 x 1 mm |
|  | CK quick-action screw connection<br>for soft hoses                     | PVC hose<br>TYGON® | 6 x 4 x 1 mm<br>8 x 6 x 1 mm |
|  | cutting ring screw connection<br>for hydraulic tubes (stainless steel) | tube               | 6 mm outside<br>8 mm outside |

Fig. 9: Process connection table

### 3.3.2 Cutting ring screw connections

- ▷ In the case of cutting ring screw connections, incorrect installation of the pressure lines can lead to the destruction of the replacement plate due to the acting forces.
- ▷ The cutting ring screw connection may not be mounted to the device in one work step.
  1. Mount the cutting ring using a pre-assembly connecting piece.
  2. Always use a conventional assembly paste <sup>(1)</sup> to avoid cold welding of the stainless steel parts.
  3. Carry out the final assembly work on the device only with a counter-hold. Mount the cutting ring screw connection with a quarter or half-turn of the union nut.

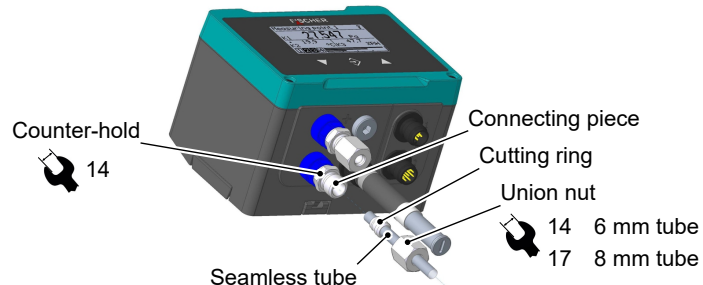


Fig. 10: Counter-hold for cutting ring screw connections

<sup>(1)</sup> The assembly paste is not part of the delivery scope nor is it included in the accessories.

### 3.4 Electrical connections

- By authorized and qualified specialized personnel only.
- When connecting the unit, the national and international electro-technical regulations must be observed.
- Disconnect the system from the mains, before electrically connecting the device.
- Install the consumer-adapted fuses.
- Do not connect the connector if strained.

#### 3.4.1 Operation in areas at risk of explosion



#### **WARNING**

##### **Do not connect the connector if strained**

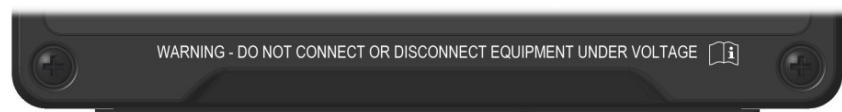
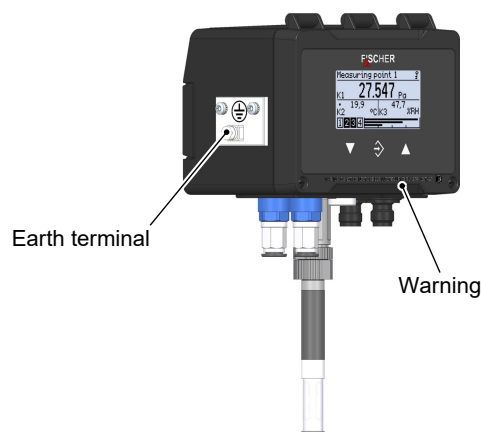
Sparks can be created, the plug is mounted under tension or replaced.

- If the device is operated in potentially explosive atmospheres, the electrical data of the unit and the valid local regulations and guidelines for the installation and operation of electrical systems in potentially explosive atmospheres must be observed (e.g. DIN EN 60079).
- If the device is used in a potentially explosive atmosphere, the personnel must have received additional training/instruction and/or have obtained a permit for working on explosion-proof devices in potentially explosive systems.
- A CE-conform mains adapter with a slow 200 mA fuse only may be used in the power supply circuit.

**NOTICE! The outer ground connection must always be connected to the protective potential equalisation or a similar local potential equalisation.**

The ground terminal is suitable for connecting fine-wire conductors up to 4 mm<sup>2</sup> or single-wire conductors up to 6 mm<sup>2</sup>.

The earthing connection serves to discharge static electricity.



**WARNING - DO NOT CONNECT OR DISCONNECT EQUIPMENT UNDER VOLTAGE**

Fig. 11: Earthing connection

### 3.4.2 Devices only with switch outputs

#### 3.4.2.1 Circuit

The device is connected as described below. The admissible load/impedance is stated in the technical data. The connection is performed using a prefabricated sensor connection cable (see the accessories). Alternatively, a prefabricated M12 connector can be used.

**NOTICE! The protection class of the housing can be guaranteed only if an IP65 connecting plug is used.**

##### Version dP/T/rH

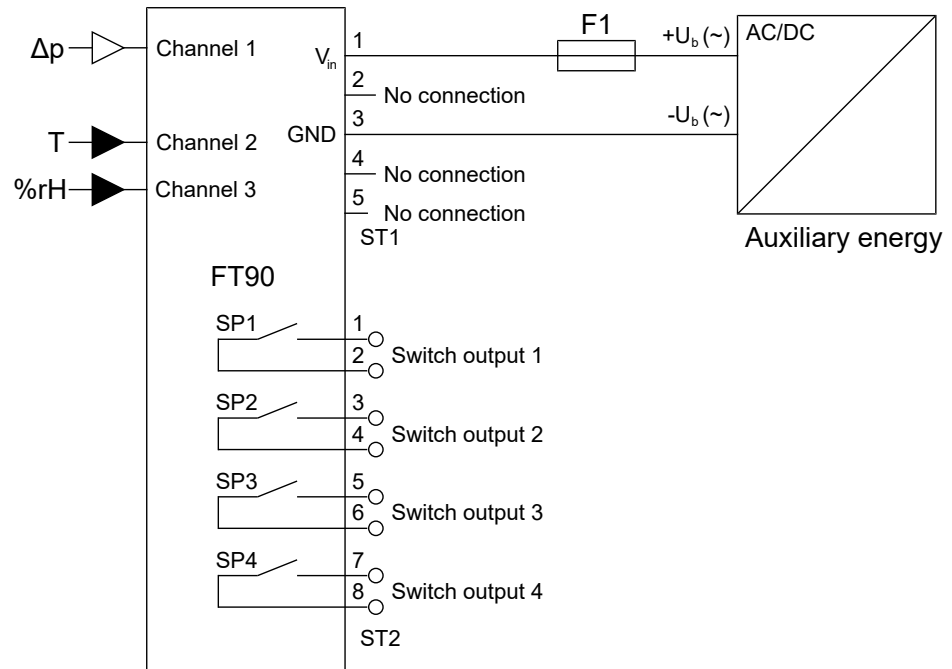


Fig. 12: 3-channel version

##### Version T/rH

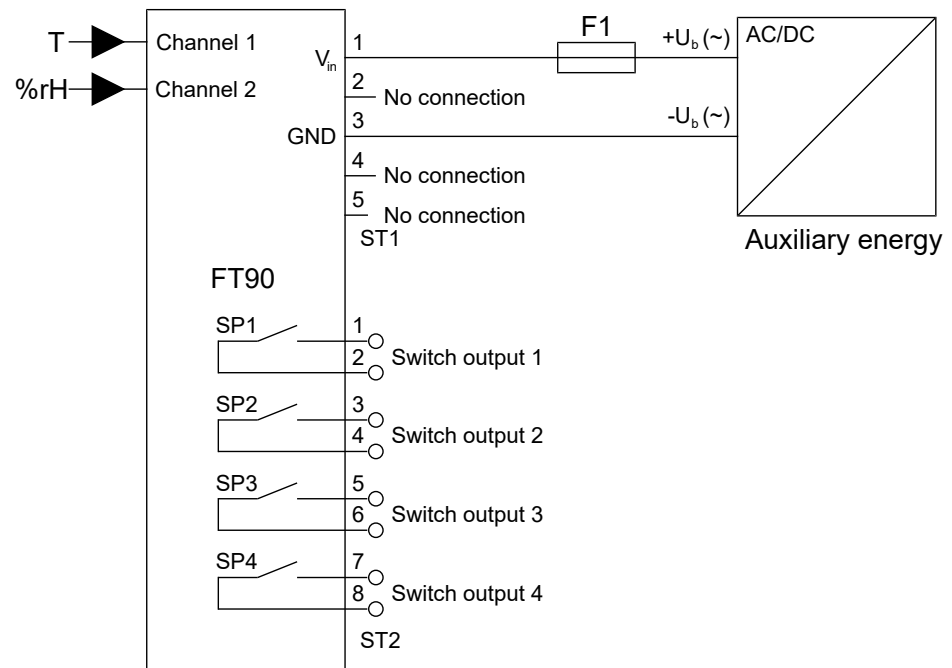


Fig. 13: 2-channel version

### 3.4.2.2 M12 connector 1: auxiliary energy and analogue output

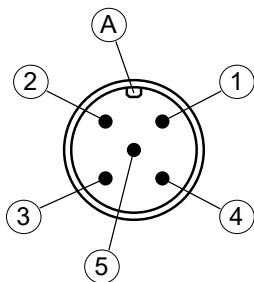


Fig. 14: 5-pin M12 connector

| Pin | Signal            |                  | Cable colour |
|-----|-------------------|------------------|--------------|
| 1   | Operating voltage | + U <sub>b</sub> | Brown        |
| 2   | Unused            |                  | White        |
| 3   | Operating voltage | - U <sub>b</sub> | Blue         |
| 4   | Unused            |                  | Black        |
| 5   | Unused            |                  | Grey         |
| A   | Coding            |                  |              |

### 3.4.2.3 M12 connector 2: switch outputs

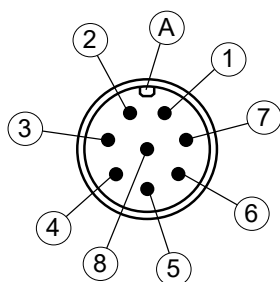


Fig. 15: 8-pin M12 connector

| Pin | Signal          |     | Cable colour |
|-----|-----------------|-----|--------------|
| 1   | Switch output 1 | SP1 | White        |
| 2   | Switch output 1 | SP1 | Brown        |
| 3   | Switch output 2 | SP2 | Green        |
| 4   | Switch output 2 | SP2 | Yellow       |
| 5   | Switch output 3 | SP3 | Grey         |
| 6   | Switch output 3 | SP3 | Pink         |
| 7   | Switch output 4 | SP4 | Blue         |
| 8   | Switch output 4 | SP4 | Red          |
| A   | Coding          |     |              |

### 3.4.2.4 M12 connector 3: Sensor input

**NOTICE!** The operating voltage U+ is generated by FT90.

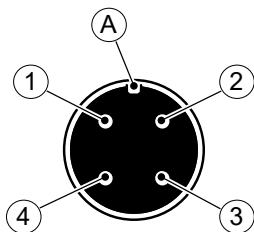


Fig. 16: 4-pin M12 bush

| Pin | Signal                       |     | Cable colour |
|-----|------------------------------|-----|--------------|
| 1   | Operating voltage (internal) | GND | Brown        |
| 2   | Operating voltage (internal) | U+  | White        |
| 3   | I2C bus                      | SDA | Blue         |
| 4   | I2C bus                      | SCL | Black        |
| A   | Coding                       |     |              |

### 3.4.3 Devices with switching and analog outputs

#### 3.4.3.1 Circuit

The device is connected in a 3-wire circuit as described below. The admissible load/impedance is stated in the technical data. The connection is performed using a prefabricated sensor connection cable (see the accessories). Alternatively, a prefabricated M12 connector can be used.

**NOTICE! The protection class of the housing can be guaranteed only if an IP65 connecting plug is used.**

#### Version dP/T/rH

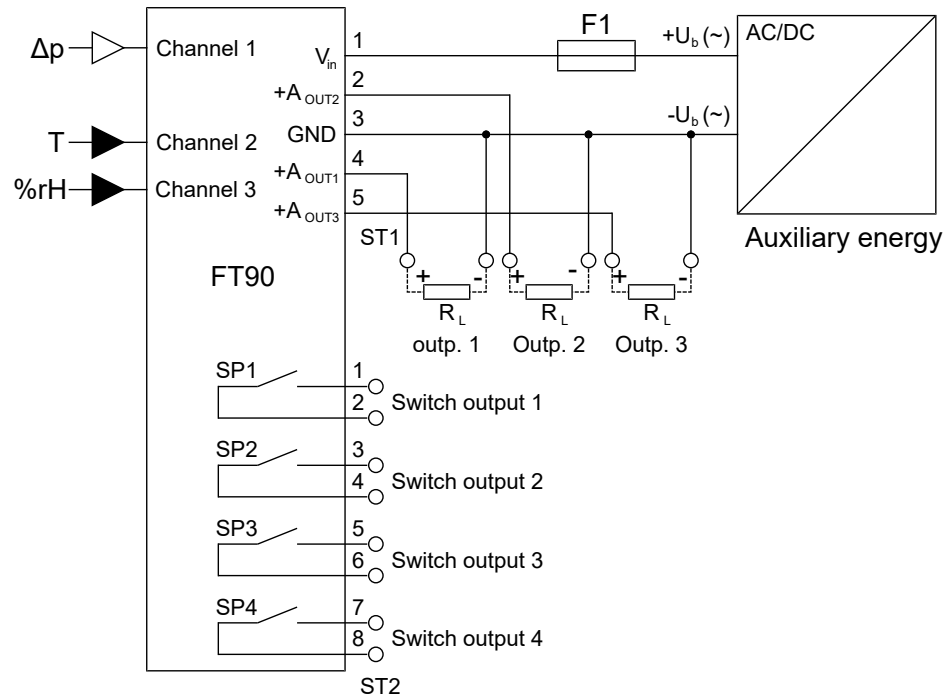


Fig. 17: 3-channel version

#### Version T/rH

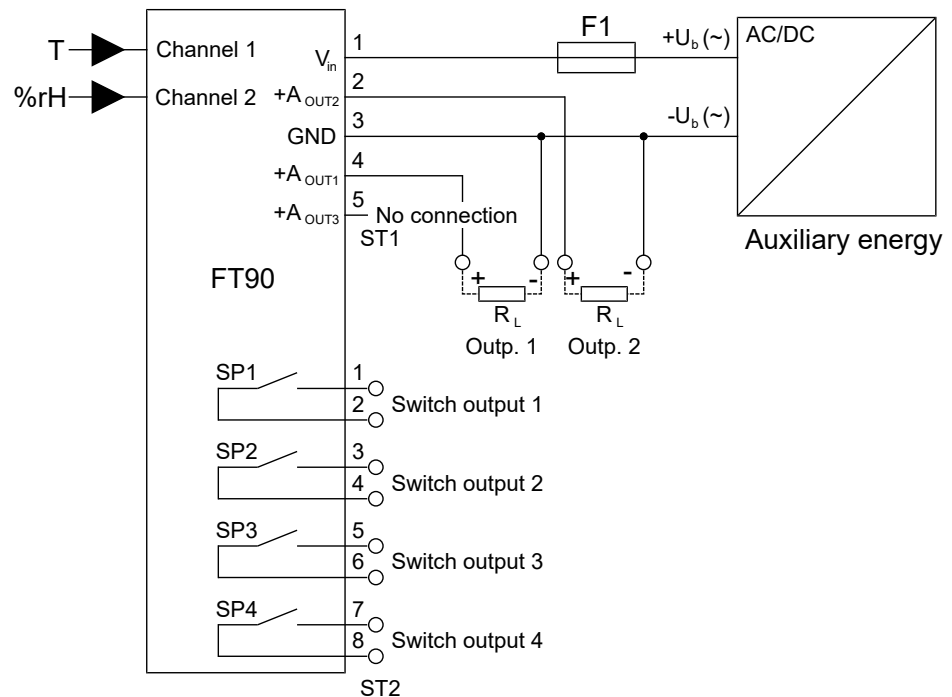


Fig. 18: 2-channel version

### 3.4.3.2 M12 connector 1: auxiliary energy and analogue output

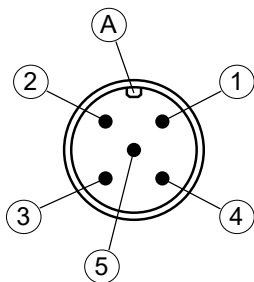


Fig. 19: 5-pin M12 connector

| Pin | Signal            |                  | Cable colour |
|-----|-------------------|------------------|--------------|
| 1   | Operating voltage | + U <sub>b</sub> | Brown        |
| 2   | Analog output 2   | AOut2            | White        |
| 3   | Operating voltage | - U <sub>b</sub> | Blue         |
| 4   | Analog output 1   | AOut1            | Black        |
| 5   | Analog output 3   | AOut3            | Grey         |
| A   | Coding            |                  |              |

### 3.4.3.3 M12 connector 2: switch outputs

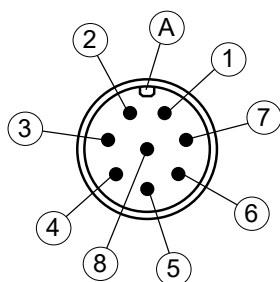


Fig. 20: 8-pin M12 connector

| Pin | Signal          |     | Cable colour |
|-----|-----------------|-----|--------------|
| 1   | Switch output 1 | SP1 | White        |
| 2   | Switch output 1 | SP1 | Brown        |
| 3   | Switch output 2 | SP2 | Green        |
| 4   | Switch output 2 | SP2 | Yellow       |
| 5   | Switch output 3 | SP3 | Grey         |
| 6   | Switch output 3 | SP3 | Pink         |
| 7   | Switch output 4 | SP4 | Blue         |
| 8   | Switch output 4 | SP4 | Red          |
| A   | Coding          |     |              |

### 3.4.3.4 M12 connector 3: Sensor input

**NOTICE!** The operating voltage U+ is generated by FT90.

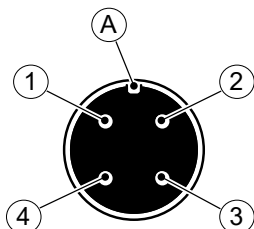


Fig. 21: 4-pin M12 bush

| Pin | Signal                       |     | Cable colour |
|-----|------------------------------|-----|--------------|
| 1   | Operating voltage (internal) | GND | Brown        |
| 2   | Operating voltage (internal) | U+  | White        |
| 3   | I2C bus                      | SDA | Blue         |
| 4   | I2C bus                      | SCL | Black        |
| A   | Coding                       |     |              |

### 3.4.4 Devices with Modbus (without switch outputs)



#### **⚠ DANGER**

##### **Auxiliary energy for ATEX devices**

When selecting the power supply, bear in mind that it may be a potential ignition source.

Take suitable safety precautions to prevent this risk.

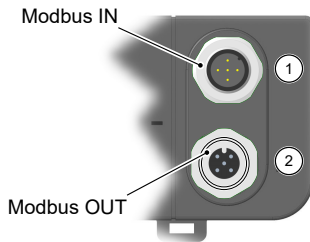


Fig. 22: Modbus replacement plate

The devices with a Modbus interface do not have analog and switch outputs. The replacement plate is equipped with a 5-pin M12 flange connector for the Modbus input and a 5-pin M12 flange socket for the Modbus output.

The FT90 can be connected to the Modbus RTU network as a slave. Up to 247 devices can be addressed in one line network.

**NOTICE! Star-shaped networks are not allowed.**

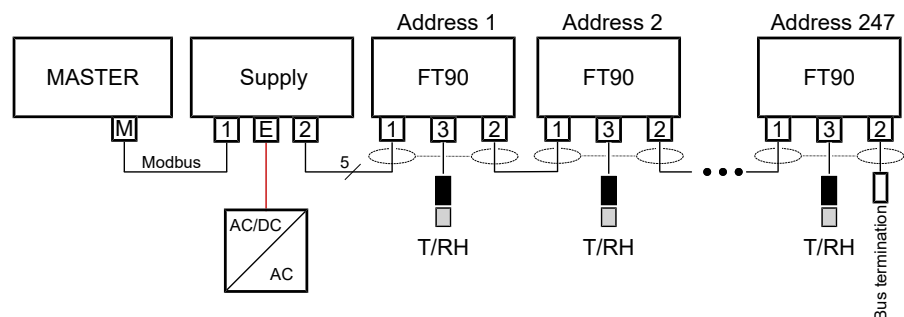


Fig. 23: Modbus RTU network

Communication is effected solely with the Modbus master. The connected slaves only react to direct commands from the master, so communication between the slaves is not possible.

To guarantee fault-free data transmission, we recommend terminating the end point of the Modbus RTU network with a 120  $\Omega$  resistor. This bus termination resistor is available as an accessory.

#### 3.4.4.1 Connection to an existing Modbus RTU network

It can be connected to an existing Modbus network via a conventional T-piece (passive TAP).

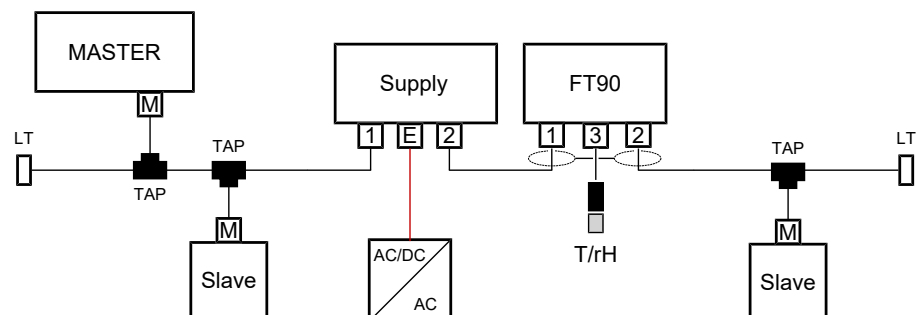


Fig. 24: Modbus connection

### 3.4.4.2 Auxiliary energy supply

The following illustrations explain the principle of the power supply of the FT90 in the Modbus network. However the feeder nodes are not part of the delivery scope and need to be installed by the operator.

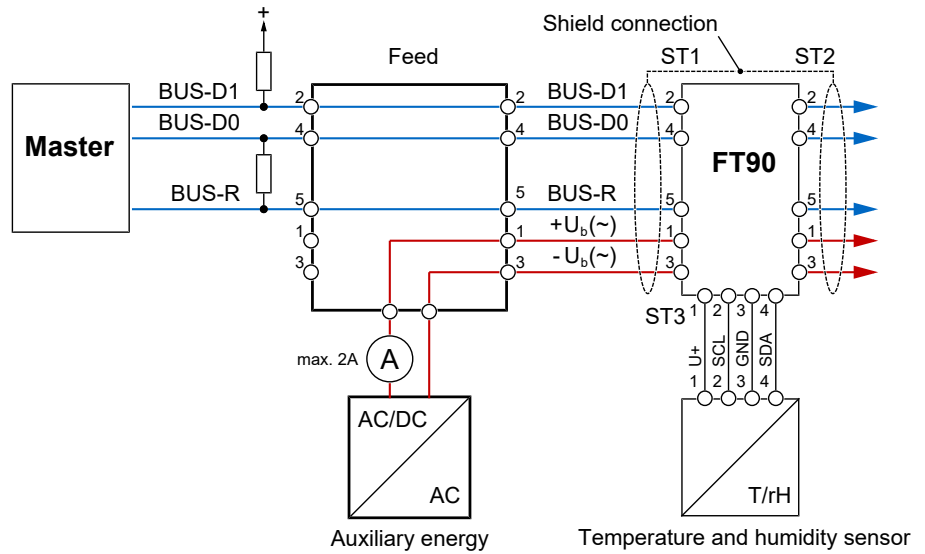


Fig. 25: Main supply

Please note that the M12 connectors are approved for max. 2A. This value can be exceeded with more than just 12 devices of the type FT90. In this case, an intermediate auxiliary energy feed should be provided at a suitable place.

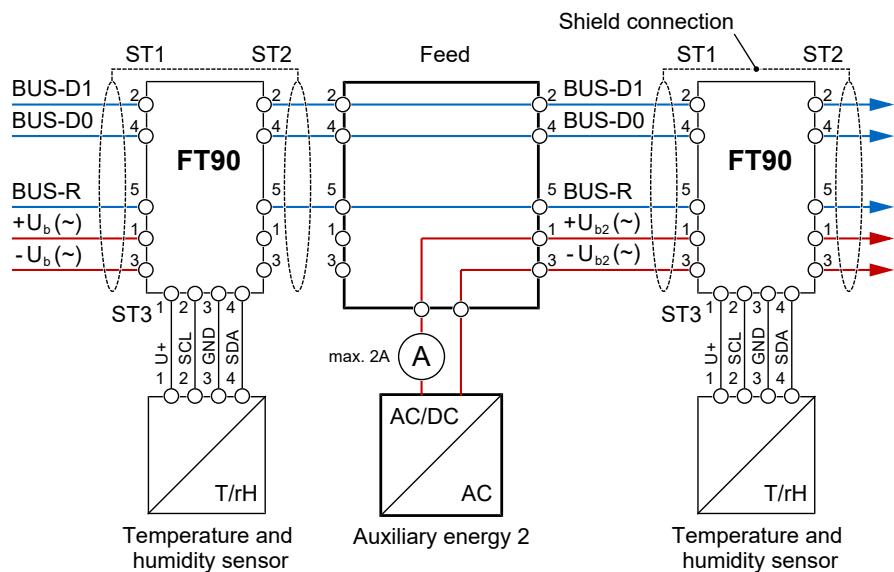


Fig. 26: Intermediate supply

### 3.4.4.3 M12 plug 1: Modbus IN

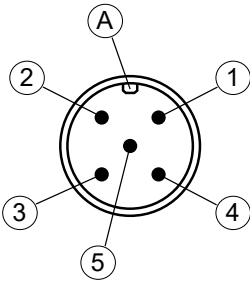


Fig. 27: M12 plug 5-pin

| PIN | Signal            |                  | Cable colour |
|-----|-------------------|------------------|--------------|
| 1   | Operating voltage | +U <sub>b</sub>  | Brown        |
| 2   | Modbus            | BUS-D1           | White        |
| 3   | Operating voltage | - U <sub>b</sub> | Blue         |
| 4   | Modbus            | BUS-D0           | Black        |
| 5   | Modbus            | BUS-R            | Grey         |
| A   | Coding            |                  |              |

### 3.4.4.4 M12 plug 2: Modbus OUT

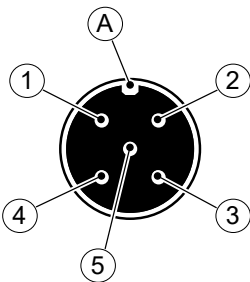


Fig. 28: M12 bush 5-pin

| PIN | Signal            |                  | Cable colour |
|-----|-------------------|------------------|--------------|
| 1   | Operating voltage | +U <sub>b</sub>  | Brown        |
| 2   | Modbus            | BUS-D1           | White        |
| 3   | Operating voltage | - U <sub>b</sub> | Blue         |
| 4   | Modbus            | BUS-D0           | Black        |
| 5   | Modbus            | BUS-R            | Grey         |
| A   | Coding            |                  |              |

### 3.4.4.5 M12 connector 3: Sensor input

**NOTICE!** The operating voltage U<sub>+</sub> is generated by FT90.

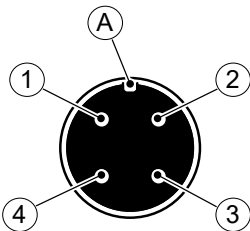


Fig. 29: 4-pin M12 bush

| Pin | Signal                       |                | Cable colour |
|-----|------------------------------|----------------|--------------|
| 1   | Operating voltage (internal) | GND            | Brown        |
| 2   | Operating voltage (internal) | U <sub>+</sub> | White        |
| 3   | I2C bus                      | SDA            | Blue         |
| 4   | I2C bus                      | SCL            | Black        |
| A   | Coding                       |                |              |

## 3.4.5 Devices with Modbus (and 4 switch outputs)



### **⚠ DANGER**

#### Auxiliary energy for ATEX devices

When selecting the power supply, bear in mind that it may be a potential ignition source.

Take suitable safety precautions to prevent this risk.

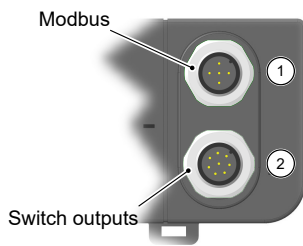


Fig. 30: Replacement plate Modbus with switch outputs

This version with a Modbus interface has 4 switch outputs. The replacement plate is equipped with a 5-pin M12 flange connector for the Modbus input and an 8-pin M12 flange connector for the switch outputs.

The FT90 can be connected to the Modbus RTU network as a slave. Up to 247 devices can be addressed in one line network. It is connected via a conventional T-piece (passive TAP).

**NOTICE! Star-shaped networks are not allowed.**

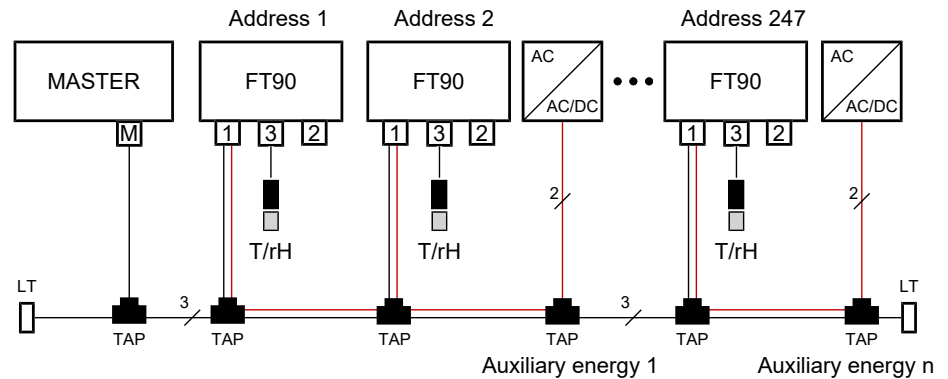


Fig. 31: Modbus RTU network

Communication takes place solely with the Modbus master. The connected slaves only react to direct commands from the master, so communication between the slaves is not possible.

To guarantee fault-free data transmission, we recommend terminating the end point of the Modbus RTU network with a 120 Ω resistor. This bus termination resistor is available as an accessory.

### 3.4.5.1 Connection to an existing Modbus RTU network

It can be connected to an existing Modbus network via a conventional T-piece (passive TAP).

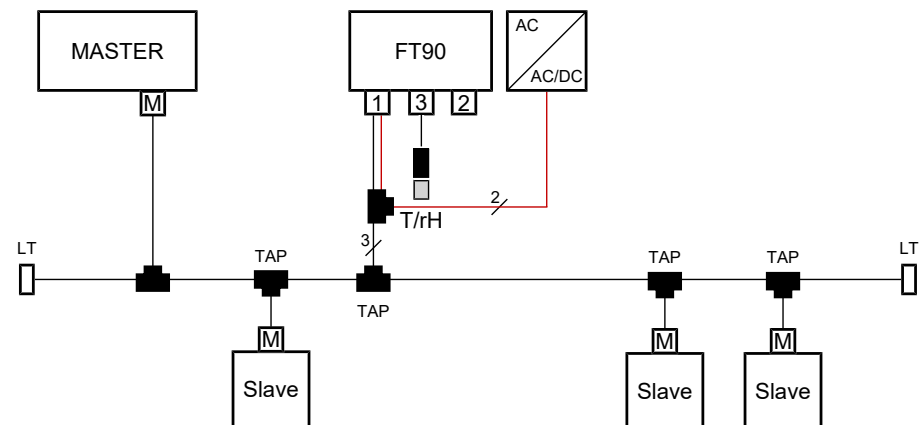


Fig. 32: Modbus connection

### 3.4.5.2 Auxiliary energy supply

The following illustrations explain the principle of the power supply of the FT90 in the Modbus network. However the feeder nodes are not part of the delivery scope and need to be installed by the operator.

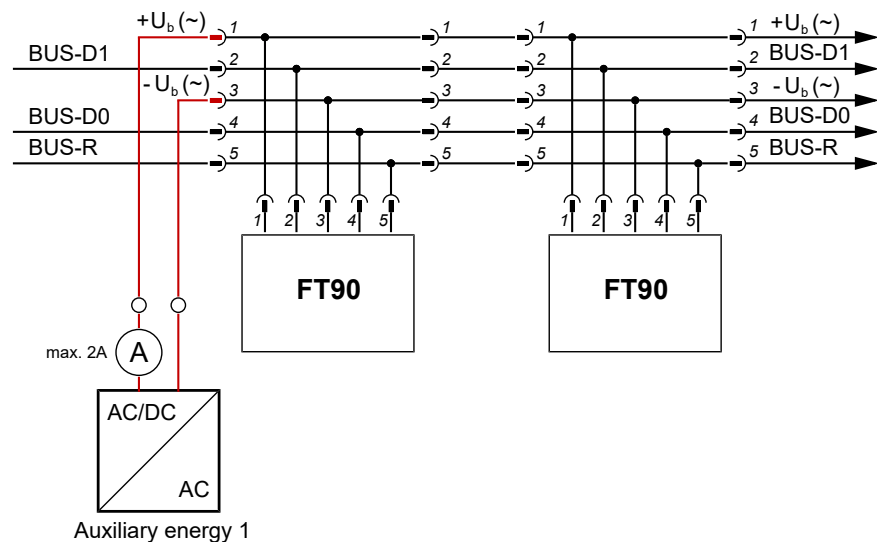


Fig. 33: Main supply

Please note that the M12 connectors are approved for max. 2A. This value can be exceeded with more than just 12 devices of the type FT90. In this case, an intermediate auxiliary energy feed should be provided at a suitable place.

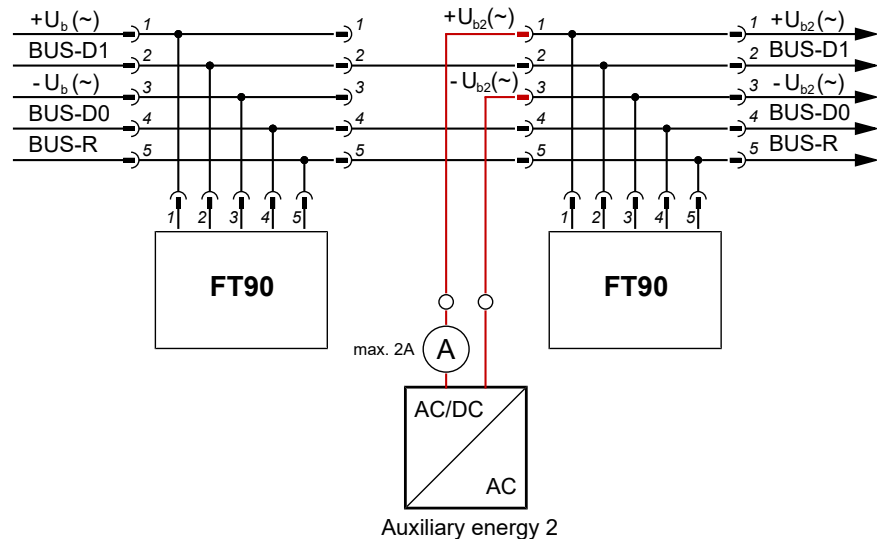


Fig. 34: Intermediate supply

### 3.4.5.3 M12 connector 1: Modbus

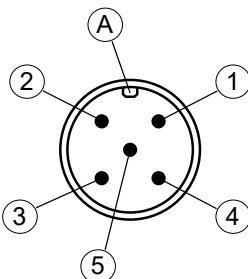


Fig. 35: M12 plug 5-pin

| PIN | Signal            |        | Cable colour |
|-----|-------------------|--------|--------------|
| 1   | Operating voltage | $+U_b$ | Brown        |
| 2   | Modbus            | BUS-D1 | White        |
| 3   | Operating voltage | $-U_b$ | Blue         |
| 4   | Modbus            | BUS-D0 | Black        |
| 5   | Modbus            | BUS-R  | Grey         |
| A   | Coding            |        |              |

3.4.5.4 M12 connector 2: Switch outputs

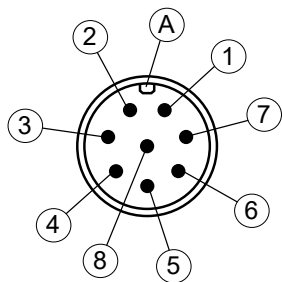


Fig. 36: 8-pin M12 connector

| PIN | Signal          |       | Cable colour |
|-----|-----------------|-------|--------------|
| 1   | Switch output 1 | ┌ SP1 | White        |
| 2   | Switch output 1 |       | Brown        |
| 3   | Switch output 2 | ┌ SP2 | Green        |
| 4   | Switch output 2 |       | Yellow       |
| 5   | Switch output 3 | ┌ SP3 | Grey         |
| 6   | Switch output 3 |       | Pink         |
| 7   | Switch output 4 | ┌ SP4 | Blue         |
| 8   | Switch output 4 |       | red          |
| A   | Coding          |       |              |

3.4.5.5 M12 connector 3: Sensor input

NOTICE! The operating voltage U+ is generated by FT90.

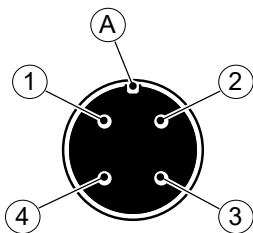


Fig. 37: 4-pin M12 bush

| Pin | Signal                       |     | Cable colour |
|-----|------------------------------|-----|--------------|
| 1   | Operating voltage (internal) | GND | Brown        |
| 2   | Operating voltage (internal) | U+  | White        |
| 3   | I2C bus                      | SDA | Blue         |
| 4   | I2C bus                      | SCL | Black        |
| A   | Coding                       |     |              |

## 4 Start-up

### 4.1 Installation control

**NOTICE! The check of the pressure lines is not necessary for devices without a pressure connection.**

Before starting the measuring device:

- ▷ Check that the pressure lines are mounted correctly.
  1. Is the measuring device undamaged?
  2. Does the measuring device fulfil the requirements of the measuring point specification?
  3. Are the pressure lines laid correctly?
  4. Are the attachment screws tightened correctly?
  5. Is the device adequately protected against precipitation and solar radiation?
  
- ▷ Check that all electrical supply and measuring lines are installed correctly.
  1. Are the connection lines undamaged?
  2. Do the cables used fulfil the requirements?
  3. Is there strain relief on the mounted cables?
  4. Are the connection plugs mounted correctly?
  5. Is the earthing connection connected correctly?

### 4.2 Switch on the measuring device

- ▷ The measuring device can be switched on after a successful installation check.
  1. The start screen is now shown on the display.

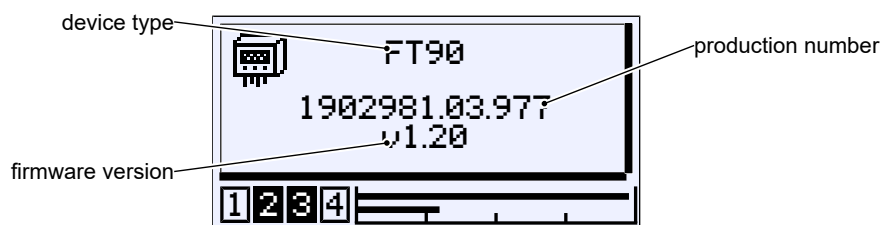


Fig. 38: Start screen

- ➔ After a successful start, the start screen switches to the measurement data display.

### 4.2.1 Measured value display

Depending on the unit model, there are different presentation variants for the measured value display.

#### 4.2.1.1 2-channel version T/rH

Assignment:

Channel 1: Temperature

Channel 2: Humidity

The display can be changed using the 'Meas.data display' menu. You can display the channels individually or at the same time. The bar graph display always shows both measuring channels.

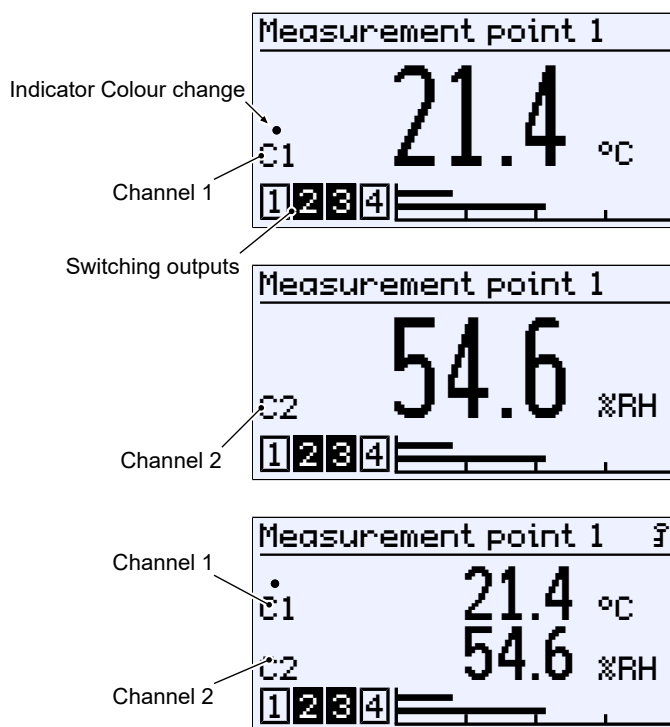


Fig. 39: Measuring data display (2 channels)

#### 4.2.1.2 3-channel version P/T/rH

Assignment:

Channel 1: Differential pressure

Channel 2: Temperature

Channel 3: Humidity

The display can be changed using the 'Meas.data display' menu. The three channels can be displayed individually or at the same time. The bar graph display always shows all three measuring channels.

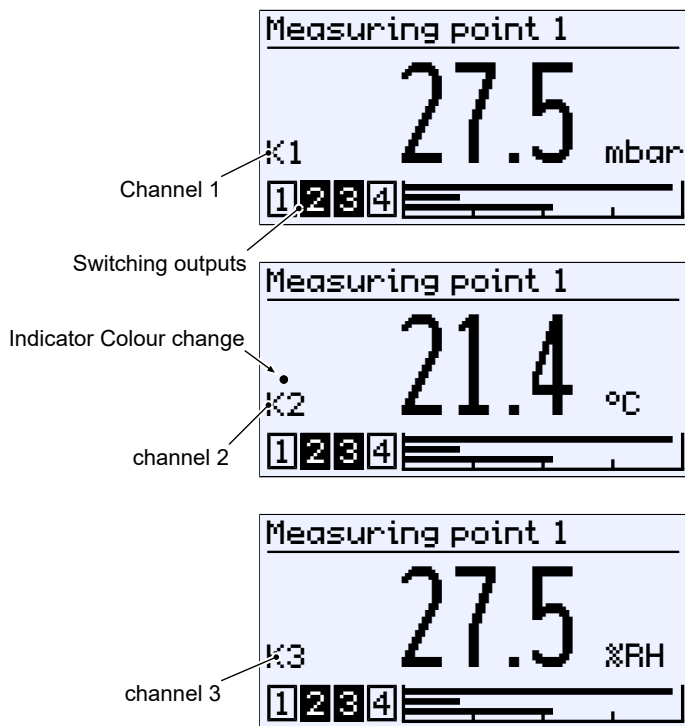


Fig. 40: Measuring data display (individual channels)

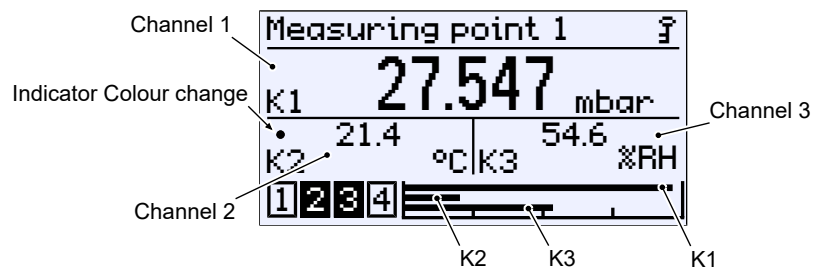


Fig. 41: Measuring data display (3 channels)

### 4.2.1.3 Back lighting

The LC display is equipped with RGB back lighting. This allows it to create various coloured backgrounds for the measuring data display.

Also, the so-called colour changes can be configured that serve to indicate when limits have been overstepped.

For more information, please go to menu display and/or colour change.

### 4.2.2 Keyboard

The basic functions of the keyboard are explained in this section. For more information about the operating concept, please see the section 'First steps'.

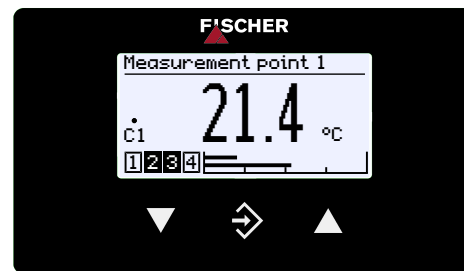


Fig. 42: Operating keys

|   |              |                |         |
|---|--------------|----------------|---------|
| ▼ | Page down    | Decrease value |         |
| ↻ | Call up menu | Save value     | Go back |
| ▲ | Page up      | Increase value |         |

The buttons are always pressed individually. Combinations such as pressing two buttons at the same time are not used.

A button can be actuated in two ways. Below, the adjacent symbols indicate the actuation type.



1. Pressing a button briefly triggers an immediate reaction.
2. Pressing a button for longer than 250 ms triggers a 'Repeat' reaction. Holding a button down, triggers a continuous sequence of 'Repeat' reactions. However, there is no acceleration.
3. Automatic stop at the menu item '**Back**': Holding the button ▼ or ▲ down returns the user to the menu item '**Back**' very quickly. The stop is automatic there.
4. Return to the operating display: Holding the button ↻ down takes the user from the menu item '**Back**' to the operating screen.

## 4.3 Setup

The measuring device is completely configured in the factory before delivery. Nevertheless, all parameters can be adjusted directly on site using the keypad. Optionally, a configuration can also be created on the PC using the inTouch© software and transferred to the device via the USB interface.

### 4.3.1 Set menu language

Works setting: German or ordered national language

- ▷ The menu language can be changed as follows.
  1. You have the right to change the configuration.
  2. Log in to the device and go to the menu **Configuration** and then to the menu **Display**.
  3. There, open the menu **Language** and change the menu language.

### 4.3.2 Measuring point designation

- ▷ A designation for the measuring point can be filed to identify the device within a system.
  1. You have the right to change the configuration.
  2. Log in to the device and go to the menu **Configuration** and then to the menu **Display**.
  3. Change the **Designation** parameter.

### 4.3.3 Configuration

The measuring device is delivered in the configuration stated in the Order code.

- ▷ Do you want to adjust the parameters on the device on site?
  1. You have the right to change the configuration.
  2. Log in to the device and call up the menu **Configuration**.
  3. Carry out the required changes.
- ▷ The PC software **inTouch®** can be used for making more comprehensive changes to the configuration.
  1. Carry out the changes on the PC using the inTouch software.
  2. Transfer the configuration to the device via the USB interface.

## 4.4 Modbus RTU interface

The FT90 can also be supplied with a Modbus interface. This communication interface is set in the menu 'Modbus RTU [▶ 104]'.

## 4.5 IO-Link Interface

The FT90 can also be delivered with an IO-Link interface. Default settings for this interface are completed at the factory. The associated IODD and a description of the interface are available in the download area of the FISCHER website ([www.fischermesstechnik.de](http://www.fischermesstechnik.de)).

## 5 Operation

### 5.1 First steps

#### 5.1.1 Passwörter



#### NOTICE

##### Publicly accessible passwords

By publishing the passwords in these operating instructions, the parameterisation is accessible to everyone. Within the scope of security, it is absolutely necessary for the operator of the plant to issue new passwords for all user types.

The manufacturer is not liable for damages resulting from changes to a parameterisation.

The following passwords are assigned when the unit is delivered.

| User          | Password |
|---------------|----------|
| User 1        | 000      |
| User 2        | 000      |
| User 3        | 000      |
| Administrator | 000      |

Users 1, 2, and 3 are disabled at delivery and must be explicitly enabled by the user. The administrator user can change all passwords in the respective menu *Login > Manage users > User # > User # password*.

If the same passwords are assigned, priority is given when logging in:

Administrator > User 1 > User 2 > User 3

Using the *Login > Reset passwords* function, the administrator user can reset all passwords to the factory setting 000.

##### See also

Manage users [► 54]

Reset passwords [► 57]

#### 5.1.2 Operating modes

##### Operating mode

After activation, the device automatically starts. The device works according to its configuration.

##### Configuration mode

Pressing the button takes the user from the operating mode to the configuration mode. The device is still operational and works according to its configuration. All parameter changes have a direct effect on how the device operates.

If the device is configured via the USB interface, operation is interrupted when transmission starts. Operation starts with the new configuration after transmission. The transfer lasts just a few milliseconds.

### 5.1.3 Menu tree



Fig. 43: Main menu

#### 5.1.3.1 Login

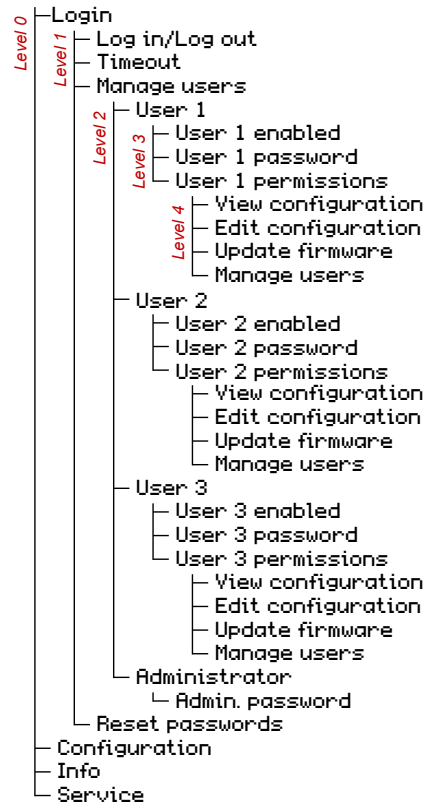
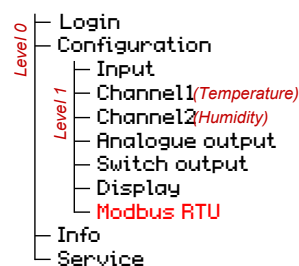
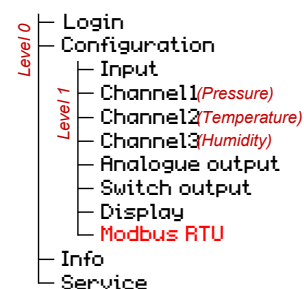


Fig. 44: 'Login' submenu

#### 5.1.3.2 Configuration



2-channel version



3-channel version



The Modbus menu only appears for devices with a Modbus RTU interface. For this reason, the Modbus menu is not shown in the 2-channel version diagram.

Fig. 45: 'Configuration' submenu

### 5.1.3.2.1 Configuration -> Channel

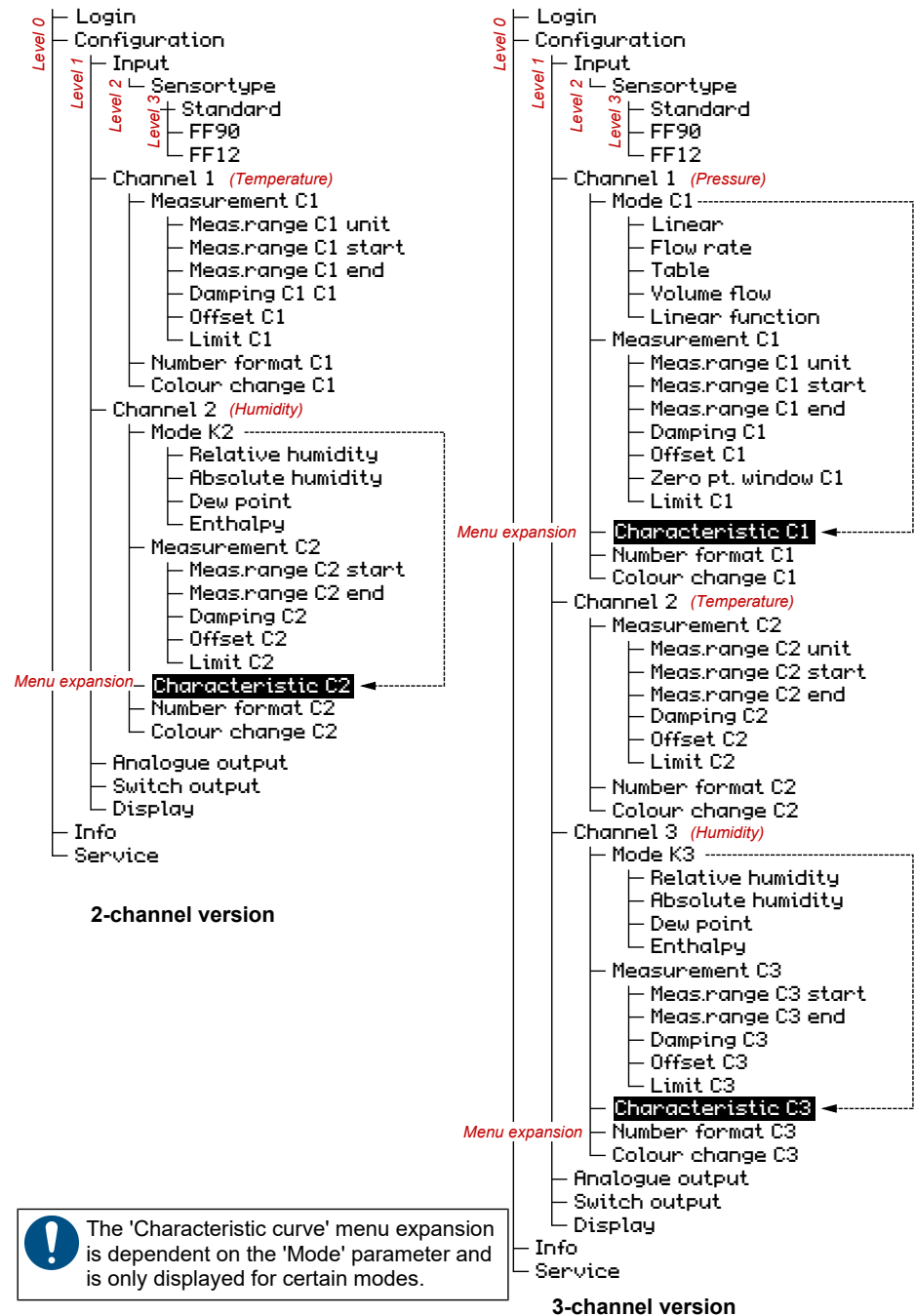


Fig. 46: 'Configuration/Channel' submenu

### Configuration channel1/mode = Linear

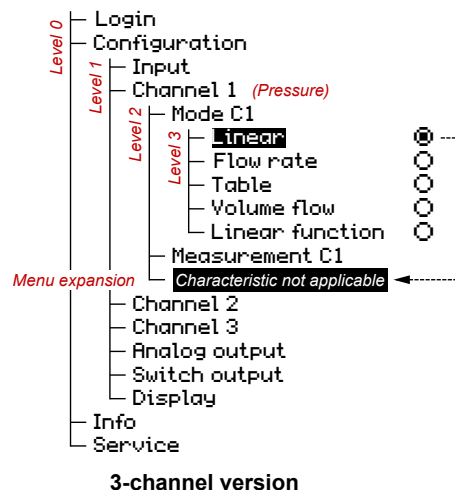


Fig. 47: Configuration/channel1/menu extension Linear

### Configuration channel1/mode = Flow rate

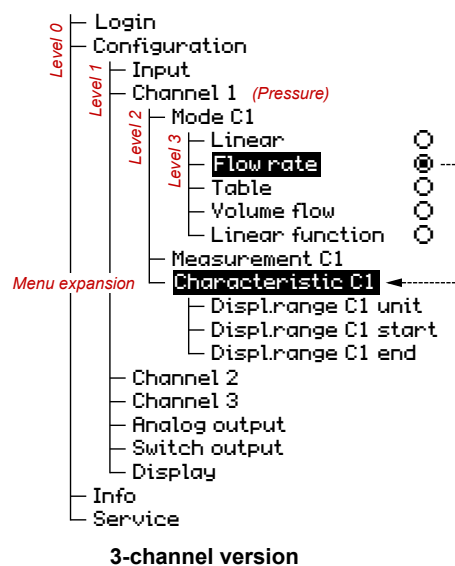


Fig. 48: Configuration/channel1/menu expansion Flow rate

### Configuration channel1/mode = Table

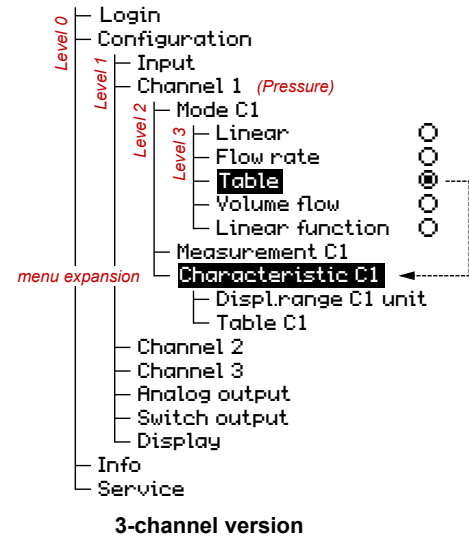


Fig. 49: Configuration/channel1/menu expansion Table

### Configuration channel1/mode = Volume flow

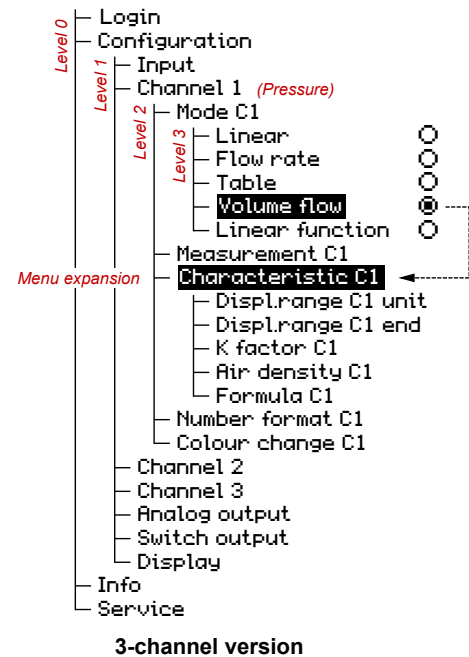
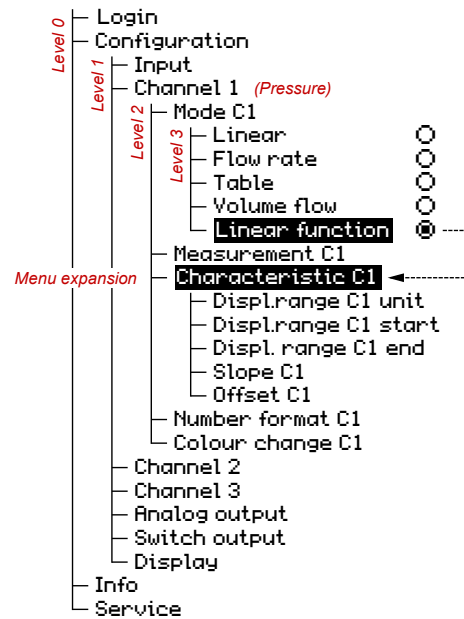


Fig. 50: Configuration/channel1/menu expansion Volume flow

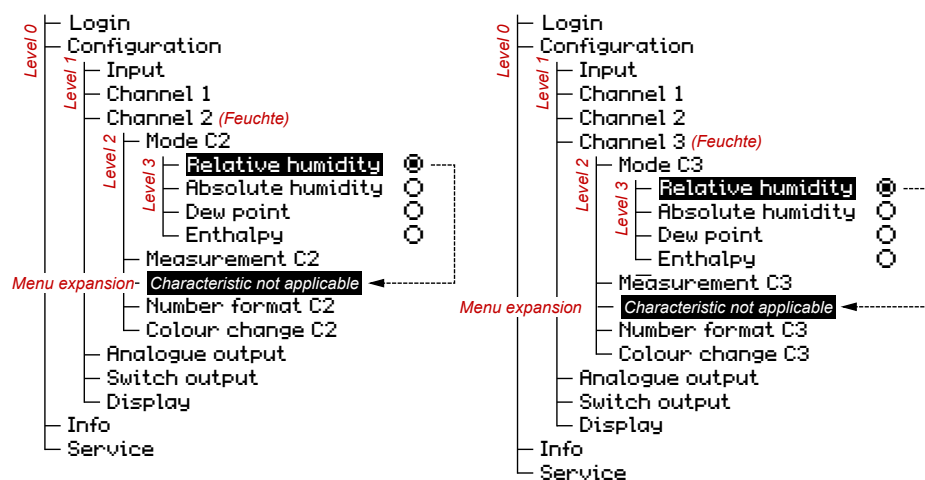
### Configuration channel1/mode = Linear function



3-channel version

Fig. 51: Configuration/channel1/menu expansion Linear function

### 5.1.3.2.1.1 Configuration channel2/3 mode = Relative humidity



2-channel version

3-channel version

Fig. 52: Configuration/channel2(3)/menu expansion Relative humidity

### 5.1.3.2.1.2 Configuration channel 2/3 mode = Absolute humidity

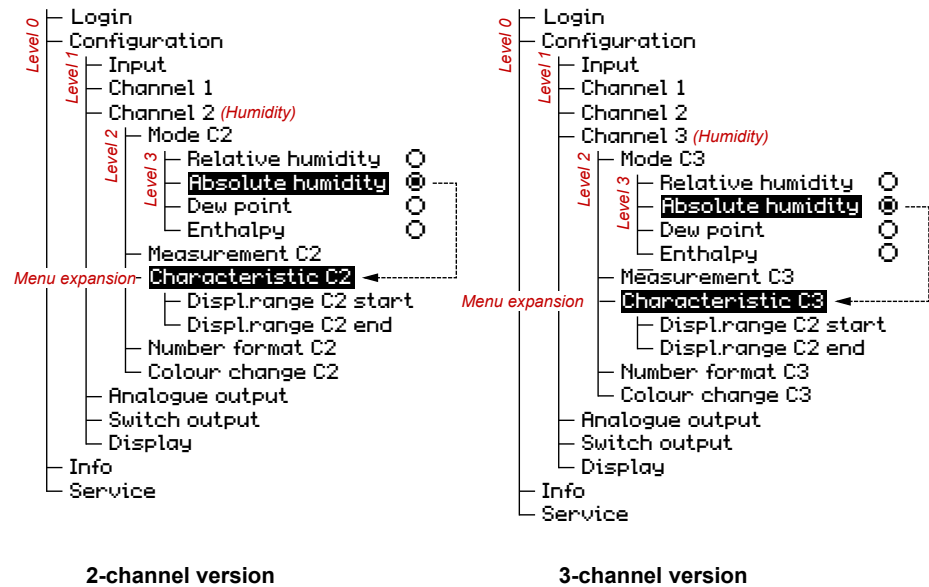


Fig. 53: Configuration/channel2(3)/menu expansion Absolute humidity

### 5.1.3.2.1.3 Configuration channel2/3 mode = Dew point

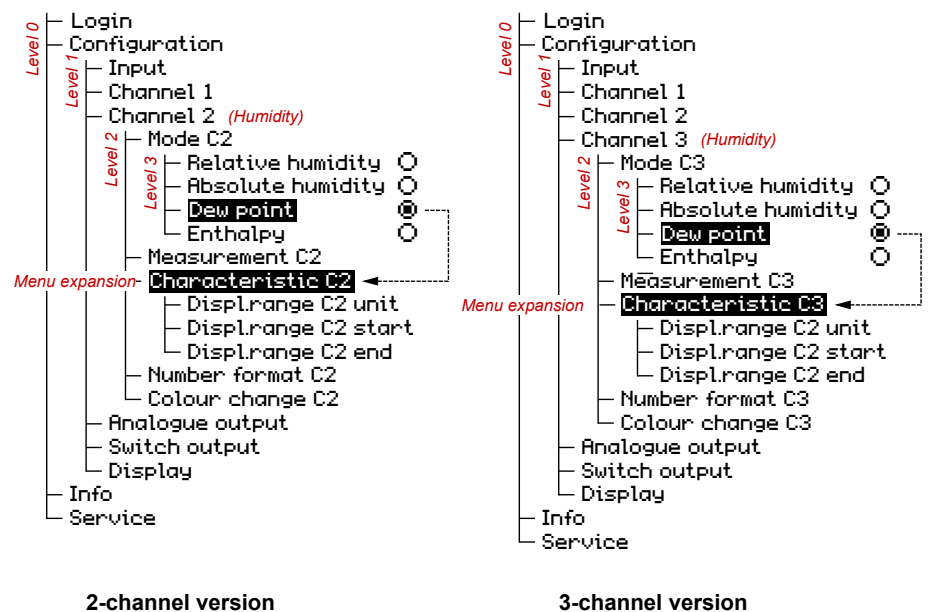
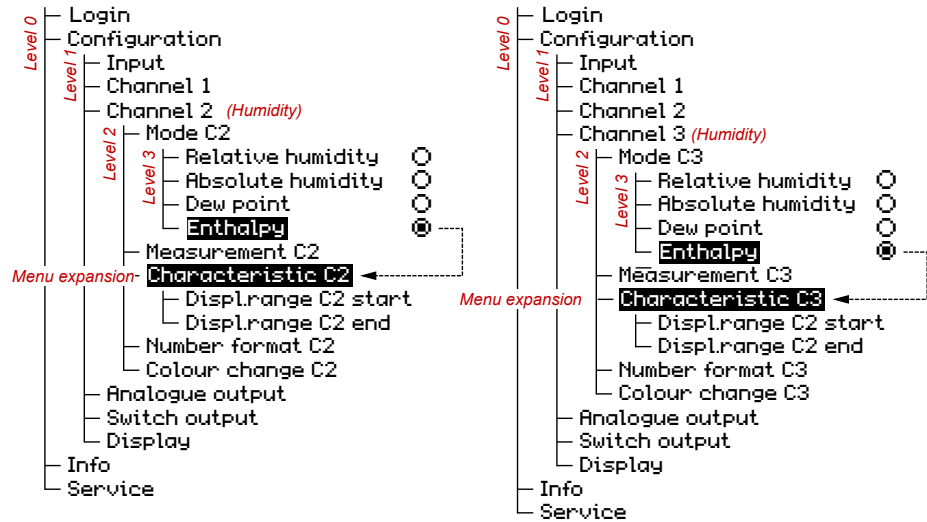


Fig. 54: Configuration/channel2(3)/menu expansion Dew point

#### 5.1.3.2.1.4 Configuration channel 2/3 mode = Enthalpy

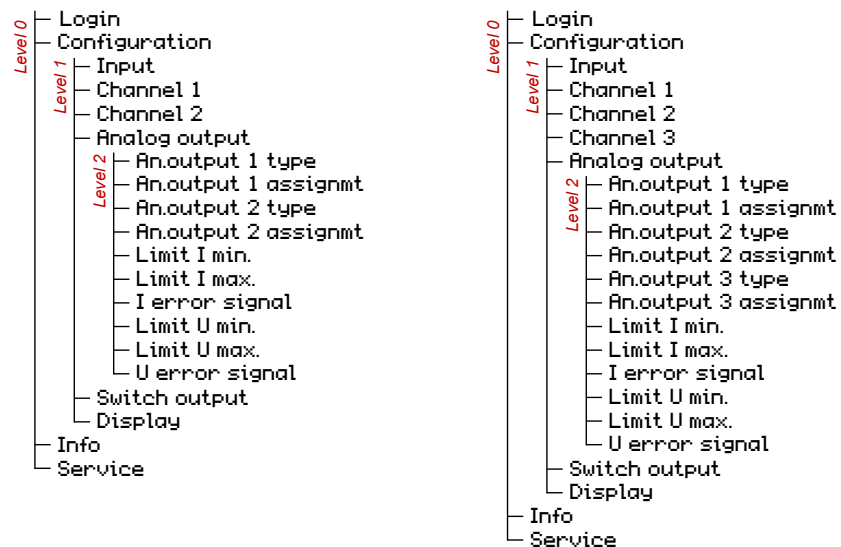


2-channel version

3-channel version

Fig. 55: Configuration/channel2(3) submenu/enthalpy menu expansion

#### 5.1.3.2.2 Configuration -> Analog output



2-channel version

3-channel version

Fig. 56: Configuration/analogue output submenu

### 5.1.3.2.3 Configuration -> Switch output

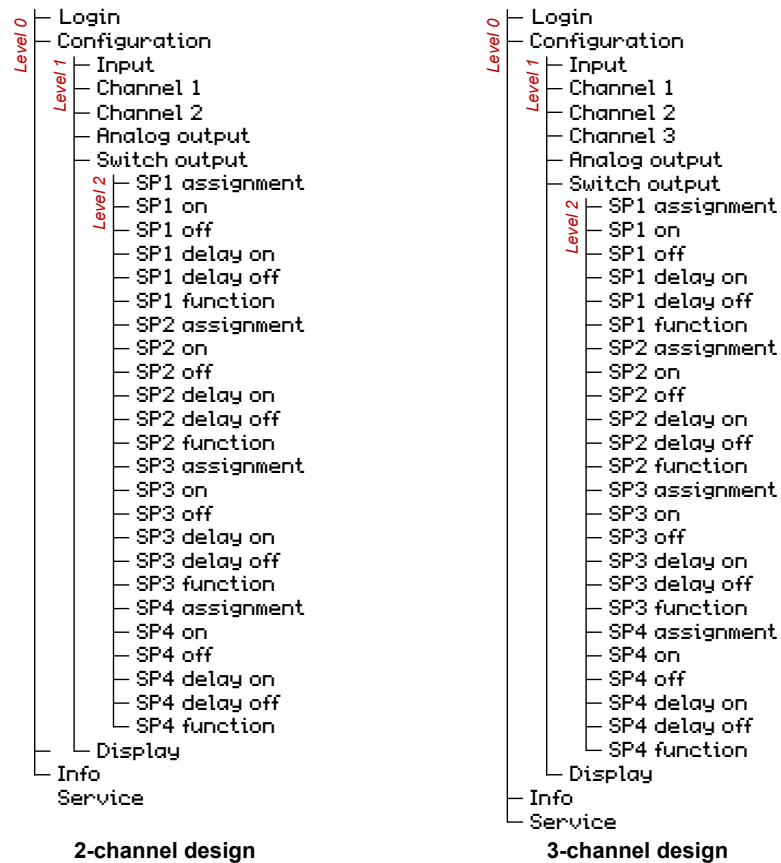


Fig. 57: 'Configuration/Switch output' submenu

### 5.1.3.2.4 Configuration -> Display

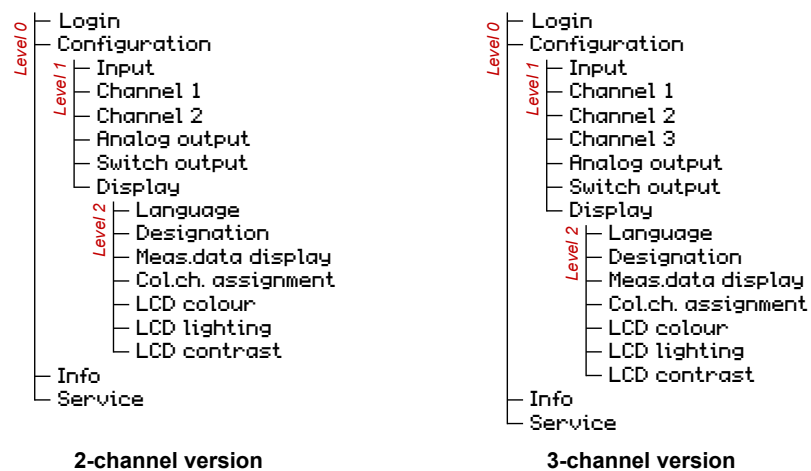


Fig. 58: 'Configuration/Display' submenu

### 5.1.3.3 Info

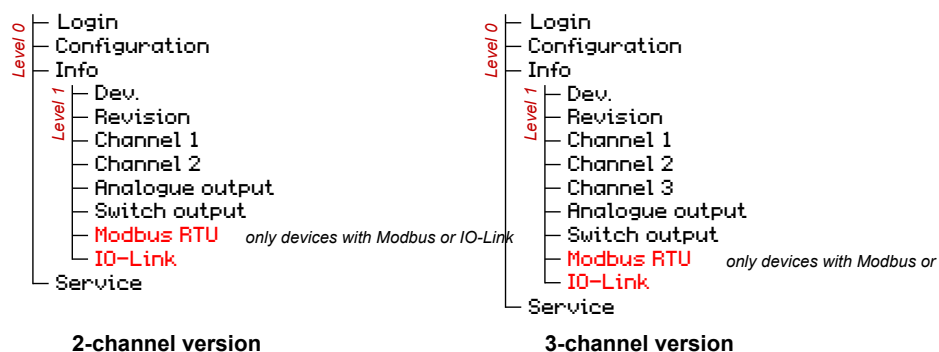


Fig. 59: 'Info' submenu

### 5.1.3.4 Service

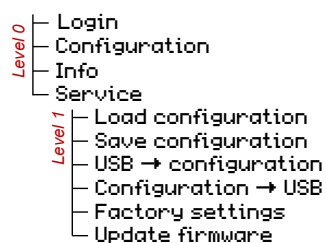



Fig. 60: 'Service' submenu

### 5.1.4 Navigation in the menu tree

Pressing the button  takes the user from the 'Meas.data display' screen to the main menu.

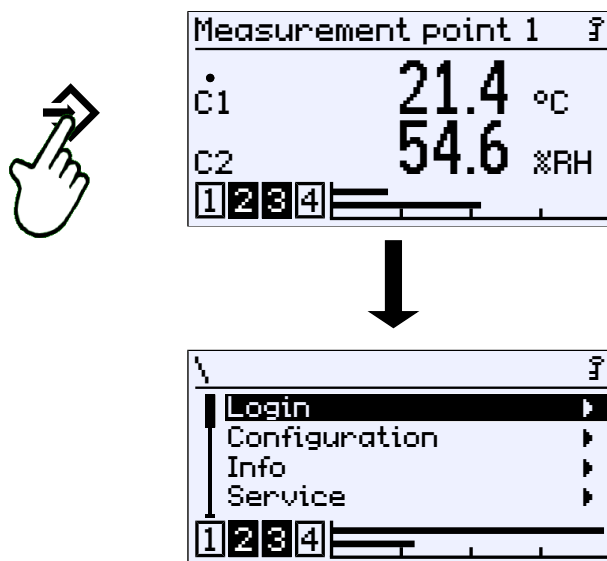



Fig. 61: Accessing the main menu (level 0)

The menu has up to five levels. The levels are numbered from 0 to 4. Level 0 is the main menu. No distinction is made between menus and parameters in the display. However, a menu can be recognised by the indicator .

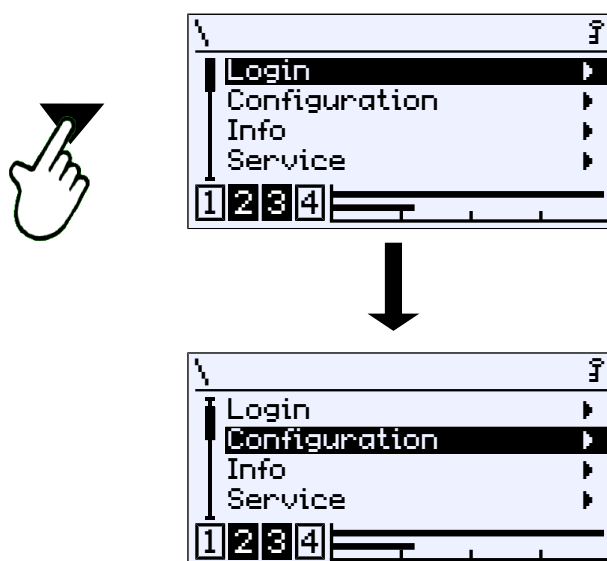





Fig. 62: Moving down in the menu (level 0)

Buttons  and  are used to move the cursor through the menu. The button  opens the menu and the submenu of the next level appears on the display.

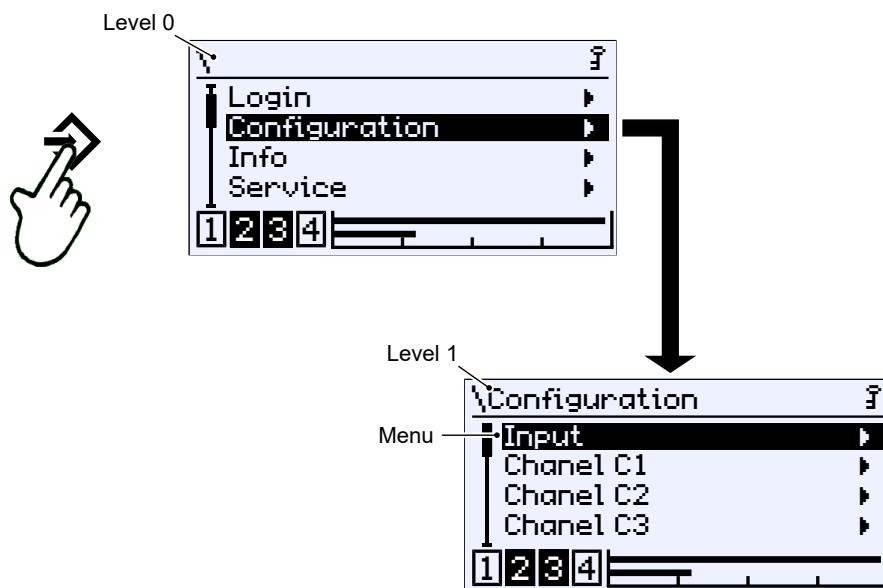


Fig. 63: Sideways in submenu (level 1)

To leave the menu, move the cursor to the 'Back' menu item. Press the ↵ button to return to the next highest level.

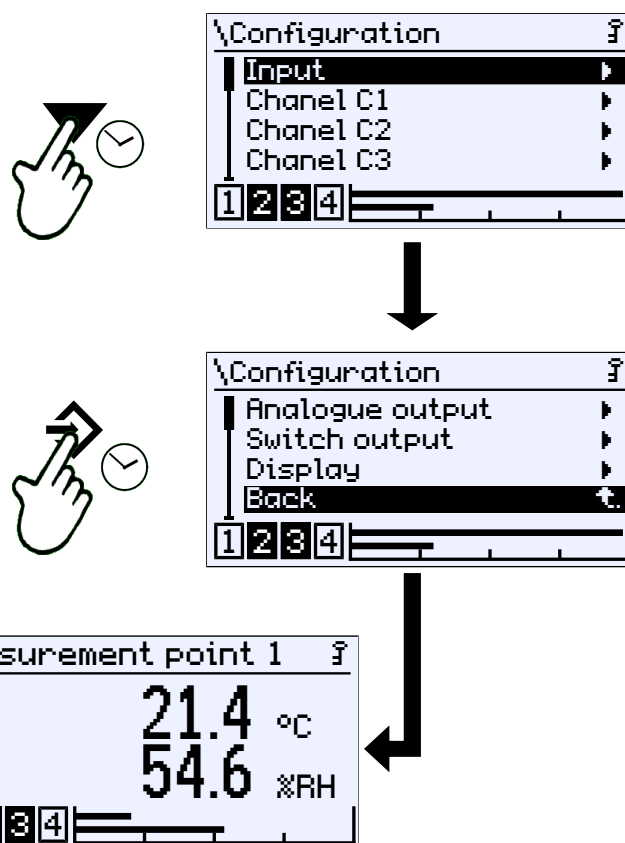


Fig. 64: Page down to exit

It is of course possible to move down the menu to the 'Back' menu item.

### 5.1.5 Path details

The path information appears in the first line of the display. For space reasons, the paths cannot be shown in full. The menu level is indicated by the number of backslash symbols ('\'). Where this is not possible, only the menu name is shown.

*Path: \Configuration\Channel 2\Measurement C2\Measur.range C2 unit*

↑Level 0      ↑Level 1    ↑Level 2      ↑Level 3

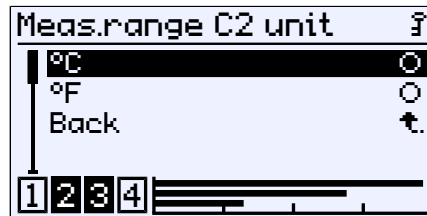


Fig. 65: Path

### 5.1.6 Input

The following softkeys are used whenever text or values are entered:

- **Edit**  
This softkey is used to switch into the editing window for entering text or values.
- **OK**  
The input is completed with this softkey. The entered text or value is saved.
- **Cancel**  
The input is cancelled with this softkey. The originally saved text or value is retained.

A softkey is pressed by first being selected with the buttons ▼ and ▲. The softkey is shown inverted. It is realised with the button ⇨.

#### 5.1.6.1 Text input

For example:

*Path: \Quick access\Designation*



Fig. 66: Action selection

Select the softkey **Edit** with the button ▼ or ▲. The selection is confirmed with the button ⇨. The following window opens for editing.

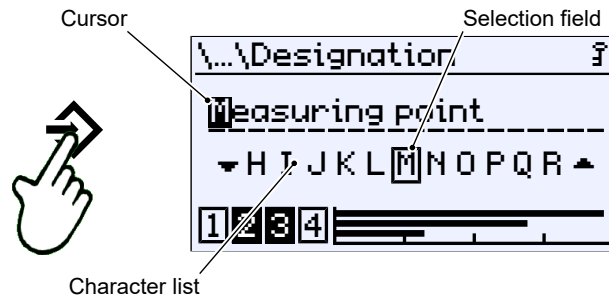


Fig. 67: Editing text

In this display, the cursor is controlled with the button  $\rightleftarrows$ . The cursor can only be moved to the right. It is not possible to move back. If the cursor is moved past the edge, the display for selecting the action (see above) is displayed again.

Text is edited with the selection field in conjunction with the current cursor position. The button  $\blacktriangledown$  moves the list of characters<sup>(2)</sup> to the left and the button  $\blacktriangle$  moves it to the right. Once the correct character is shown in the selection field, it can be accepted with the button  $\rightleftarrows$  at the cursor position. The cursor moves one character to the right and the next character position can be edited.

### 5.1.6.2 Value input

For example:

Path: \Configuration\Channel 1\Measurement C1\Meas.range C1 start

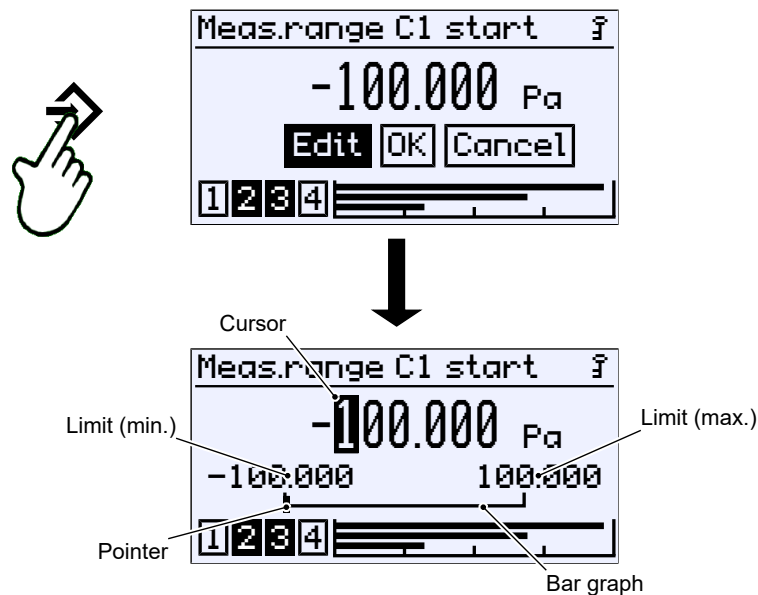


Fig. 68: Entry of numerical values, 1st position

#### Entry of digits one by one

Numerical values can be entered digit by digit from left to right. The buttons  $\blacktriangledown$  and  $\blacktriangle$  are used to set the digits 0 to 9. The plus/minus sign changes automatically in accordance with the selected movement direction. The limit values determined from the device configuration cannot be undercut or exceeded. A set digit is accepted using the button  $\rightleftarrows$ . The cursor then moves one position to the right. The movement direction of the cursor is defined and cannot be changed.

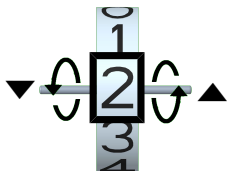


Fig. 69: Setting a figure

<sup>(2)</sup> The list of characters comprises the characters of the character set Windows 1252 (Latin 1 and Latin 9)

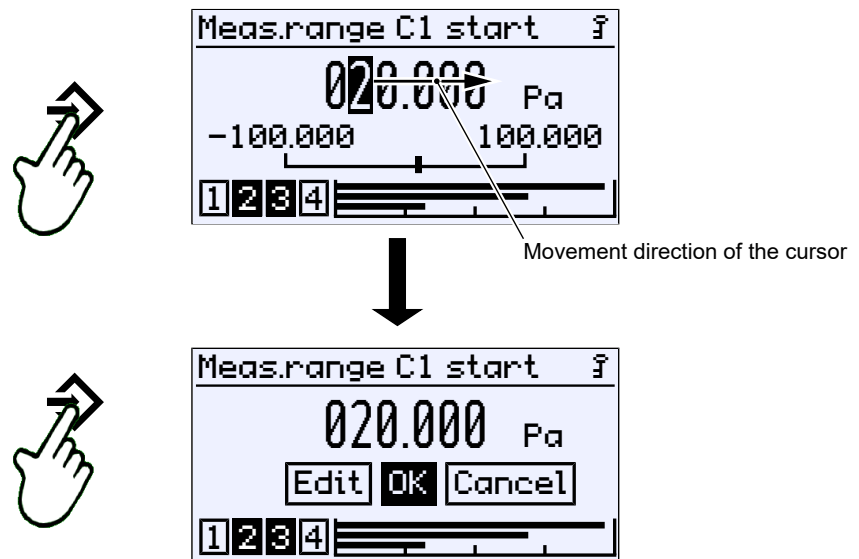


Fig. 70: Entry of numerical values, 2nd position

A ⇨ button repeat automatically returns the user to the action selection. Pressing the button again saves the value.

### Number overflow

If the number 9 is set for one position and the button ▲ is pressed again, a number overflow occurs. In this example, the value is incremented from 29 to 30. Holding the button ▲ down (repeat) causes the value to increase gradually like a counter.

Counting takes place in the opposite direction if you press the button ▼. The value becomes negative after the zero point is reached.

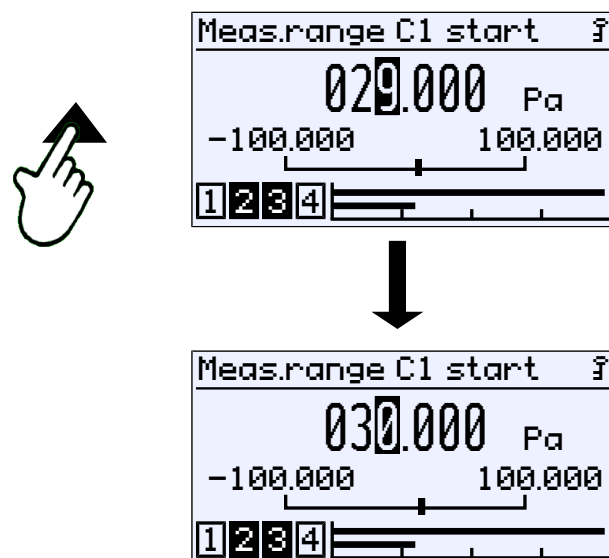


Fig. 71: Number overflow

The value is always incremented from the cursor position. If, for example, the cursor is on the first decimal place, the digit in that decimal place is incremented:

29.0 → 29.1 → 29.2 ...

However, if the cursor is in the final position, that digit is incremented as follows:  
29.000 → 29.001 → 29.002 up to the overflow 29.999 → 30.000 etc.

### 5.1.6.3 Selection of options

For example:

Path: \Configuration\Channel 2\Measurement C2\Meas.range C2 unit

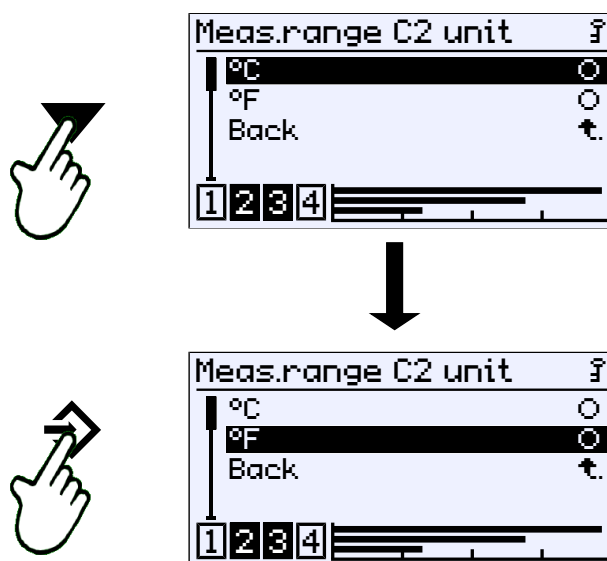


Fig. 72: Entry of options

The cursor is moved with the buttons ▼ and ▲. Only one of the offered options can be selected. The button ⇄ is used to select the option marked by the cursor.

You can use the 'Back' exit button to return to the calling menu. The selected option is saved.

## 5.2 Main menu

Path: \  
Level: 0

Pressing the ⇨ button takes the user from operating mode to configuration mode. The main menu is displayed. The bar graph display and display of the switch outputs still remain visible.

**NOTICE! The device also remains operational during configuration. All parameter changes have a direct effect.**

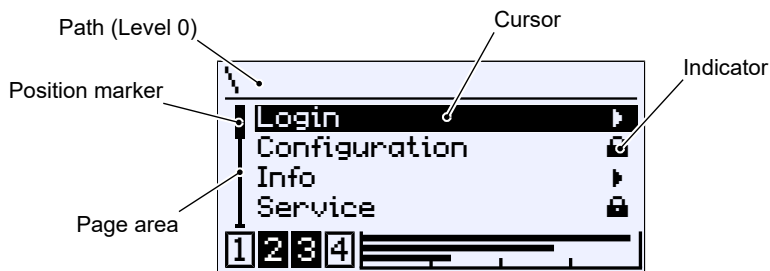
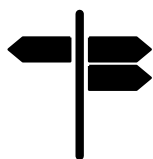


Fig. 73: Main menu

The indicator ▶ shows that there is a submenu on the following level. The main menu comprises the following menus:

| Menu name     | Description   |
|---------------|---|
| Login         | ▶ In this menu, users can log in and out as well as manage passwords.                                 |
| Configuration | ▶ The device is configured using this menu. There are up to four menu levels.                         |
| Info          | ▶ This menu contains information about the hardware and software of the device and its configuration. |
| Service       | ▶ The firmware of the device can be updated and parameters can be loaded and saved with this menu.    |
| Back          | ⬅ This is the exit level of the main menu. It takes you 'Back' to the 'Meas.data display' screen.     |



### Signposts [▶ Page]

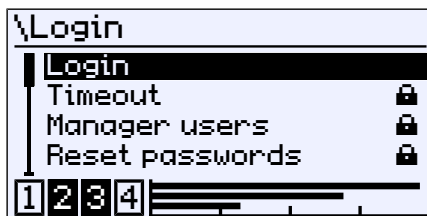
- Login [▶ 52]
- Configuration [▶ 58]
- Info
- Service

### 5.3 Login

*Path: \Login*

*Level: 1*

Users that are not logged in only have access to the information menu. Users must log in to gain access to the configuration.



*Fig. 74: Login*

The login menu consists of the following parameters and submenus:

| Menu name        | Description  |
|------------------|--|
| Log in / log out | Users can log in and out with this menu item.                            |
| Timeout          | The timeout function is defined with this parameter.                     |
| Manager users    | ▶ This submenu is for managing users and passwords.                      |
| Reset passwords  | This menu item is used to reset all passwords to 000 .                   |
| Back             | ⬅ This is the login menu exit point. It takes you back to the main menu. |

### 5.3.1 Log in / log out

Path: \Login\Log in

Level: 2

Users log in by entering a numerical value. Once the correct password has been entered, the menus for which the user in question has access rights are unlocked.

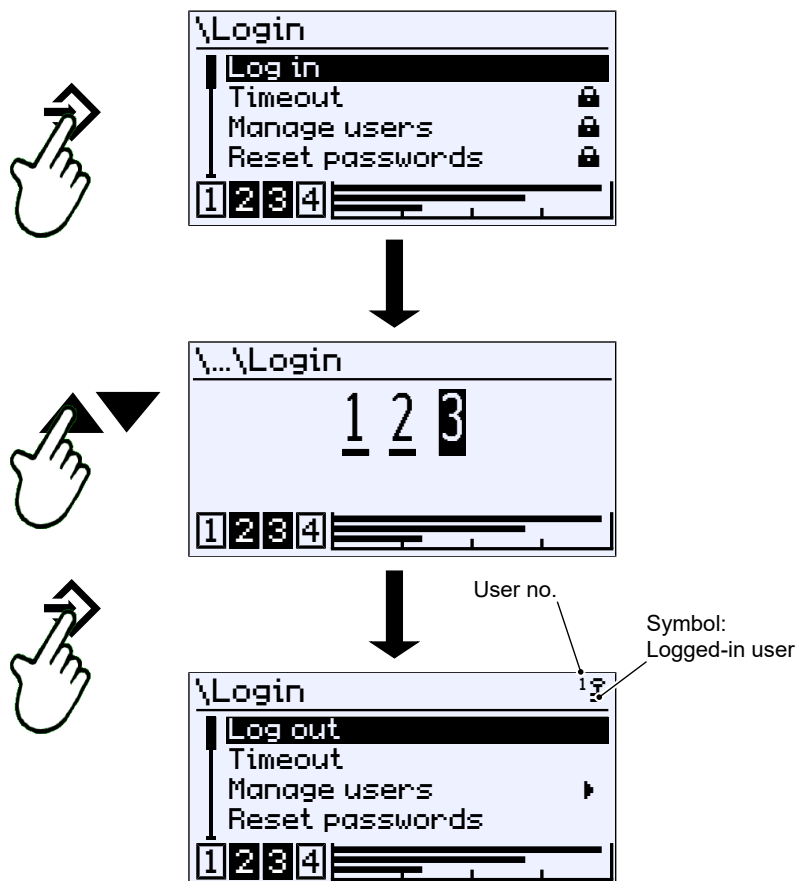



Fig. 75: Log in

Users log out by selecting the menu item in question and confirming with the button . A key in the top right corner of the display indicates the logged-in user.

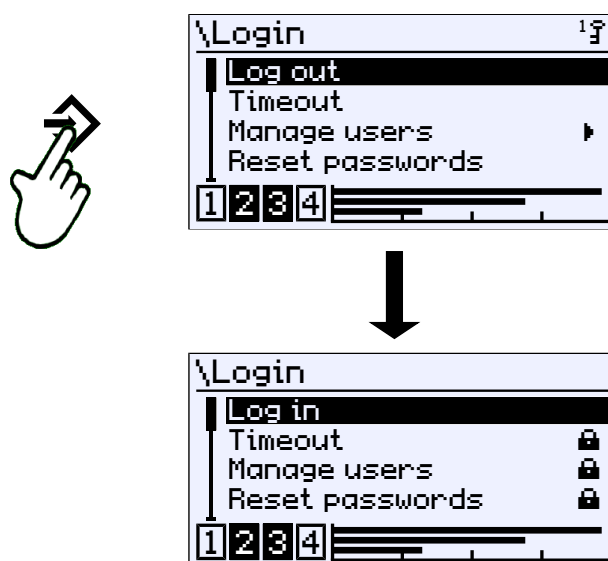


Fig. 76: Log out

### 5.3.2 Timeout

*Path: \Login\Timeout*

*Level: 2*

If the device is switched to configuration mode and no button is pressed, the device returns to the operating mode after the expiry of a defined time period. This time range is set with the parameter **Timeout**.

Values entered in minutes. The value range covers 0 ... 60 min. When the value 0 is entered, the timeout function is switched off.

After the set timeout time has expired, a logged in user is logged off whilst the device switches to the operating mode.

If, however, the timeout function is deactivated, the user remains permanently logged in. Users must log off manually.

The key symbol should indicate this possibly undesirable status.



### 5.3.3 Manage users

*Path: \Login\Manage users*

*Level: 2*

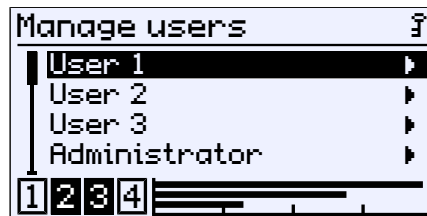


Fig. 77: Manage users

The login menu consists of the following parameters and submenus:

| Menu name     |   | Description  |
|---------------|---|--|
| User 1        | ▶ | This menu item is used to manage the rights of the user in question.                   |
| User 2        | ▶ |  |
| User 3        | ▶ |  |
| Administrator | ▶ | The password for the administrator is defined in this menu.                            |
| Back          | ⬅ | This is the exit point of the 'Manage users' menu. It takes you back to the main menu. |

The menus for the users are identical, so only the menu for user 1 is described here as an example for all.

### 5.3.3.1 User 1

Path: \Login\Manage users\User 1

Level: 3

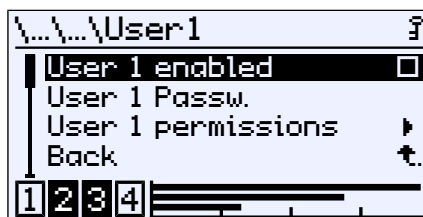


Fig. 78: User 1

| Menu name          |                          | Description   |
|--------------------|--------------------------|---|
| User 1 enabled     | <input type="checkbox"/> | The user can be enabled with this parameter.  |
| User 1 password    |                          | The password for user 1 is defined with this parameter.                                       |
| User 1 permissions | <input type="right"/>    | The permissions for user 1 are defined with this parameter.                                   |
| Back               | <input type="up"/>       | This is the exit point of the 'User 1' menu. It is used to return to the 'Manage users' menu. |

The parameter **User 1 enabled** activates user 1:

- ☐ User disabled
- ☒ User enabled

The password for the user is assigned with the parameter **User 1 password**. The password 000 is assigned with the default setting. Only numerical passwords from 000 to 999 can be used.

5.3.3.1.1 User 1 permissions

Path: \Login\Manage users\User 1\User 1 permissions  
Level: 4

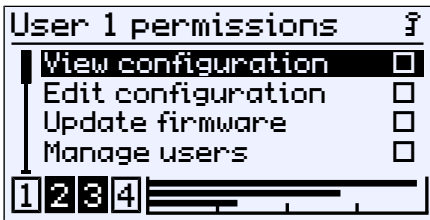


Fig. 79: User 1 permissions

| Menu name          | Description              |  |
|--------------------|--------------------------|--|
| View configuration | <input type="checkbox"/> | This parameter assigns read permission.  |
| Edit configuration | <input type="checkbox"/> | This parameter assigns read and write permission.  |
| Update firmware    | <input type="checkbox"/> | This parameter assigns permission to perform an update.  |
| Manage users       | <input type="checkbox"/> | This parameter assigns user management permission.   |
| Back               |                          | This is the exit point of the 'User 1 permissions' menu. It takes you back to the 'User 1' menu. |



The parameter 'View configuration' is used to define whether the user may read the configuration. The activation of read permission is indicated by the crossed-out pencil symbol. This indicates that the user does not have write permission.



Read and write permission is assigned with the parameter 'Edit configuration'. This permission allows the user to change the configuration. Access to the service menu is allowed. However, the user does not have permission to manage users or perform a firmware update.

Permission to update the firmware is assigned with the parameter 'Update firmware'.

Permission to change user permissions is assigned with the parameter 'Manage users'.

A user with all permissions does **not** have access to the administrator menu and is not allowed to reset the passwords to the factory settings.

### 5.3.3.2 Administrator

Path: \Login\Manage users\Administrator

Level: 3



Fig. 80: Administrator

The password for the administrator is assigned with the parameter 'Admin. password'. The administrator has unlimited access to all menus and parameters.

### 5.3.4 Reset passwords

Path: \Login\Reset passwords

Level: 2

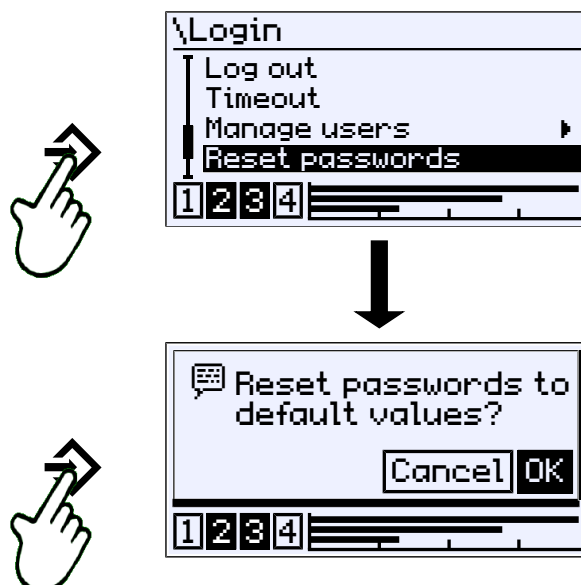


Fig. 81: Reset passwords

All passwords are set to the default value 000. Only the administrator can carry out this action. Set permissions of users are retained.

## 5.4 Configuration

The device can also be configured with the **inTouch®** software on a PC. The finished parameter set is then transferred to the FT90 via the USB interface.



### WARNING

#### Configuration in potentially explosive areas

The housing may not be opened within the ATEX area. This means that configuration and firmware updates via the USB interface are only possible outside the potentially explosive area.

Path: \Configuration

Level: 1

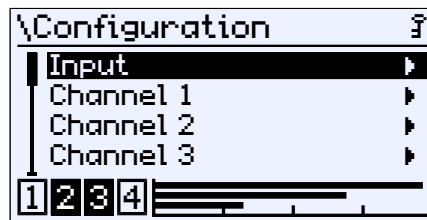
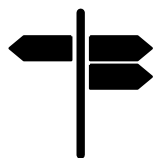


Fig. 82: Configuration

The parameters and menus are described for a device with three channels. The displays and descriptions may vary in the case of a device with two channels.

| Menu name       | Description  |
|-----------------|--|
| Input           | ▶ This menu can be used to configure the input.  |
| Channel 1       | ▶ This menu is used to configure the 1st measuring channel.                                      |
| Channel 2       | ▶ This menu is used to configure the 2nd measuring channel.                                      |
| Channel 3       | ▶ This menu is used to configure the 3rd measuring channel.                                      |
| Analogue output | ▶ The analogue outputs are configured with this menu.  |
| Switch output   | ▶ The switch outputs are configured with this menu.  |
| Display         | ▶ This display is configured with this menu.   |
| Modbus RTU      | ▶ This menu is available for Modbus devices only. It enables the configuration of the interface. |
| Back            | ⬅. This is the exit point of the configuration menu. It takes you 'Back' to the main menu.       |

**Signpost [► Page]**

- Input [► 60]
- Channel 1 [► 62]
- Channel 2 [► 85]
- Channel 3 [► 91]
- Analogue output [► 93]
- Switch output [► 96]
- Display [► 99]
- Modbus RTU [► 104]

### 5.4.1 Input

The introduction of software 1.41 includes the replacement of the FF90 by the FF12 sensor, which will also be delivered as a spare part in the future. To ensure the compatibility of older devices during a firmware update, there is now the option of choosing between the two sensor types.

*Path: \Configuration\Input*

*Level: 2*

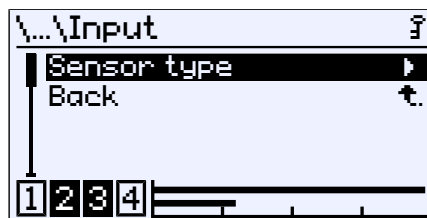


Fig. 83: Input

| Menu name   | Description  |
|-------------|--|
| Sensor type | ► The sensor type can be selected in this menu.  |
| Back        | ◄ This is the exit point of the channel 1 menu. It takes you 'Back' to the configuration menu. |

### 5.4.1.1 Sensor type

Path: \Configuration\Input\Sensor type

Level: 3

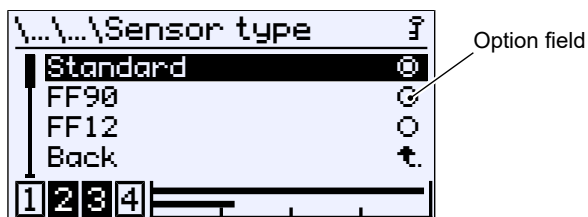


Fig. 84: Sensor type

| Menu name |   | Description  |
|-----------|---|--|
| Standard  | ⊙ | Automatic detection of the connected sensor type.                                    |
| FF90      | ○ | Manual selection of the old sensor type.   |
| FF12      | ○ | Manual selection of the successor type (from firmware 1.41).                         |
| Back      | ← | This is the exit point of the channel 1 menu. It takes you 'Back' to the input menu. |



## NOTICE

### Automatic detection

If the **Standard** option is selected, sensors of type FF90 and FF12 are automatically recognised after installation (replacement). If the sensor is not recognised, select the sensor type manually.

▷ The sensors can be categorised as follows:

1. All FF12 sensors are labelled on the cap.
2. This labelling is missing on the FF90 sensors.



FF12



FF90

### 5.4.2 Channel 1

The parameterisation of the channels is largely the same for all versions. However, the following should be noted:

| 2 channel version |             | 3 channel version |                       |
|-------------------|-------------|-------------------|-----------------------|
| Channel 1         | Temperature | Channel 1         | Differential pressure |
| Channel 2         | Humidity    | Channel 2         | Temperature           |
|                   |             | Channel 3         | Humidity              |

#### 5.4.2.1 2 channel version [temperature]

Path: \Configuration \ Channel 1

Level: 2

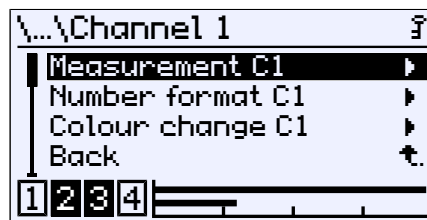
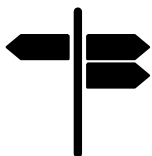


Fig. 85: Channel 1

| Menu name        | Description  |
|------------------|--|
| Measurement C1   | ▶ Parametrise the input of the measuring channel in this menu.                                     |
| Number format C1 | ▶ The decimal places for the measured value display of the measuring channel are set in this menu. |
| Colour change C1 | ▶ Parameterise the colour changes for the measuring channel in this menu.                          |
| Back             | ⏮. This is the exit point of the channel 1 menu. It takes you 'Back' to the configuration menu.    |



#### Signpost [▶ Page]

- Measurement C1 [▶ 65]
- Number format C1 [▶ 79]
- Colour change C1 [▶ 80]

5.4.2.2 3 channel version [differential pressure]

Path: \Configuration \ Channel 1  
Level: 2

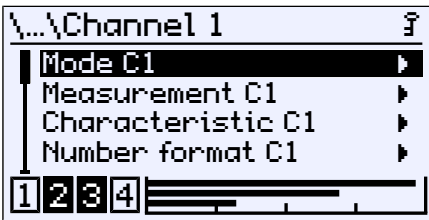
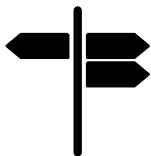


Fig. 86: Channel 1

Menu extension

| Menu name         | Description  |
|-------------------|--|
| Mode C1           | This menu can be used to select defined functions for the measuring channel.                     |
| Measurement C1    | The input of the measuring channel is parameterised in this menu.                                |
| Characteristic C1 | This menu is hidden depending on the selected mode.  |
| Number format C1  | The decimal places for the measured value display of the measuring channel are set in this menu. |
| Colour change C1  | The colour changes for the measuring channel are parameterised in this menu.                     |
| Back              | This is the exit point of the channel 1 menu. It takes you 'Back' to the configuration menu.     |



Signpost [► Page]

- Mode C1 [► 64]
- Measurement C1 [► 65]
- Characteristic curve C1 (menu extension) [► 72]
- Number format C1 [► 79]
- Colour change C1 [► 80]

### 5.4.2.2.1 Mode C1

Path: \Configuration\Channel 1\Mode C1  
Level: 3

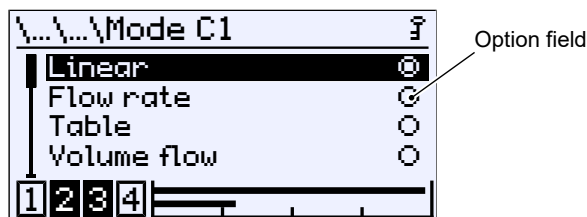


Fig. 87: Mode C1

In this menu, different operating modes can be selected for the 1st measuring channel (C1). The currently selected mode is shown by the option field.

| Parameter value | Description   |
|-----------------|---|
| Linear          | Linear input characteristic   |
| Flow rate       | Flow rate measurements on a measuring orifice                           |
| Table           | Fill level measurements on tanks  |
| Volume flow     | Volume flow measurements in ventilation systems                         |
| Linear function | Mathematic function<br>$f(x) = mx + b$                                  |
| Back            | This is the menu exit point. It takes you back to the 'Channel 1' menu. |

Each of these operating modes requires a different configuration of the characteristic. Consequently, the calling menu after the exit has the menu expansion 'Characteristic C1', which enables the configuration of the characteristic for the selected mode.

The 'Linear' operating mode is an exception. There is no menu expansion because configuration takes place only in the menu 'Measurement C1'.

#### See also

Characteristic curve C1 (menu expansion) [► 72]

### 5.4.2.2.2 Measurement C1

Path: \Configuration\Channel 1\Measurement C1  
Level: 3

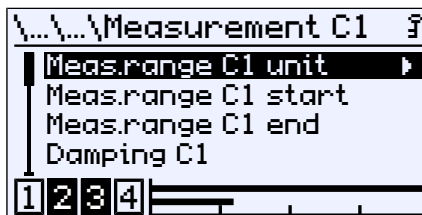


Fig. 88: Measurement C1

In this menu, the linear starting range is configured independent of the set operating mode.

| Menu name           |                          | Description   |
|---------------------|--------------------------|---|
| Meas.range C1 unit  | ▶                        | In this menu, the measurement unit of the physical variable that is to be measured must be defined.   |
| Meas.range C1 start |                          | The start of the measuring range is defined with this parameter.  |
| Meas.range C1 end   |                          | The end of the measuring range is defined with this parameter.  |
| Damping C1          |                          | The damping parameter serves to dampen the display.   |
| Offset C1           |                          | The characteristic is displaced with the parameter offset.  |
| Zero-pt. window C1  |                          | <b>Only for devices with differential pressure measurement.</b><br>The zero point window parameter defines a range around zero in which the display value is set to zero. |
| Limits              | <input type="checkbox"/> | This property determines whether or not the set measuring range limits also act on the meas.data display.   |
| Back                | ⬅                        | This represents the output (exit) of the menu. Press 'back' to return to the channel 1 menu   |



## NOTICE

### Unit of the measuring range

The above menu is structured in the same way for channels 2 and 3. For the measured variable 'Humidity', however, the menu for the unit is omitted, as the humidity is measured in the unit [%RH] and therefore the selection of a unit is omitted.

#### 5.4.2.2.1 Measuring range C1 unit

##### Differential pressure

Path: \Configuration\Channel 1\Measurement C1\Meas.range C1 unit  
Level: 4

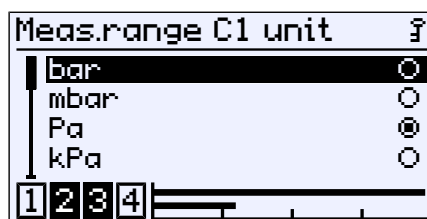


Fig. 89: Measuring range C1 unit

##### Implemented pressure units:

| Unit               |                             | Description                           |
|--------------------|-----------------------------|---------------------------------------|
| bar                | bar                         | Metric and SI units                   |
| mbar               | milli bar                   |                                       |
| Pa                 | Pascal                      |                                       |
| kPa                | kilo Pascal                 |                                       |
| MPa                | Mega Pascal                 |                                       |
| psi                | pound-force per square inch | Anglo-American units (Imperial Units) |
| inH <sub>2</sub> O | inch water column           |                                       |
| mmH <sub>2</sub> O | mm Water column             | Historical units                      |
| mmHg               | mm Mercury column           |                                       |

If the pressure unit changes, all parameters are automatically converted.

##### Temperature

Path: \Configuration\Channel 1\Measurement C1\Meas.range C1 unit  
Level: 4

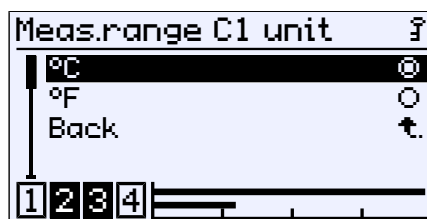


Fig. 90: Measuring range C1 unit

##### Implemented temperature units:

| Unit |            | Description                           |
|------|------------|---------------------------------------|
| °C   | Celsius    | Metric and SI units                   |
| °F   | Fahrenheit | Anglo-American units (imperial units) |

##### Humidity

The unit for humidity is fixed as %rH .

#### 5.4.2.2.2 Measuring range C1 start

Path: \Configuration\Channel 1\Measurement C1\Measur. range C1 start  
Level:4



Fig. 91: Measuring range C1 start

The start value of the measuring range is entered here. This input acts directly on the output signal. The display is not directly affected.

The unit, value range, and value range limits are displayed automatically.

In the factory configuration, a basic measuring range is defined for each device. This basic measuring range is defined by the order code and is stated as the measuring range on the type plate.

The parameters 'Meas.range C1 start' and 'Meas.range C1 end' are for configuring the input range of measuring channel C1.

#### Spread (turn down)

The characteristic can be spread within the basic measuring range. The spread is the ratio between the basic measuring range and the set measuring range and may be a maximum of 4:1. This means that the difference between the two values 'Meas.range C1 start' and 'Meas.range C1 end' must be at least 25% of the basic measuring range.

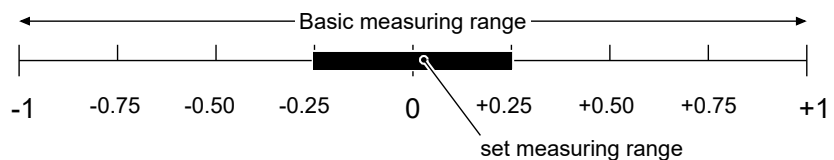


Fig. 92: Turn down

The spread of the characteristic only acts directly on the output signal. The activation of the parameter 'Limit' limits the display area to the set measuring range, too.

#### Characteristic slope

If 'Meas.range C1 start' < 'Meas.range C1 end', this gives a rising characteristic. The output signal increases with increasing pressure.

If 'Meas.range C1 start' > 'Meas.range C1 end', this gives a falling characteristic. The output signal drops with increasing pressure.

#### 5.4.2.2.2.3 Measuring range C1 end

Path: \Configuration\Channel 1\Measurement C1\Meas.range C1 end  
Level: 4

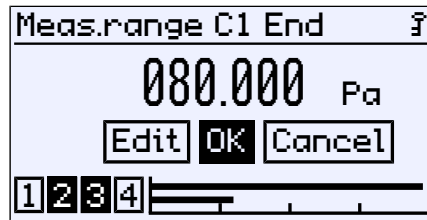


Fig. 93: Measuring range C1 end

At this point, the end value of the measuring range is entered. The value range and its limits are displayed automatically.

#### 5.4.2.2.2.4 Damping C1

Path: \Configuration\Channel 1\Measurement C1\Damping C1  
Level: 4



Fig. 94: Damping C1

If there are unsteady measurement readings during operation, you can use the parameter **Damping C1** to stabilise the reading.

The value range is from 0 s to 30 s.

The parameter functions like a capillary throttle. Please note that the damping only affects the signal input. The measuring cell itself is not influenced. The parameter value states the time period until the amplitude reaches 90 %. A value of 0s means that no damping is carried out.

#### 5.4.2.2.5 Offset C1

Path: \Configuration\Channel 1\Measurement C1\Offset C1  
Level: 4

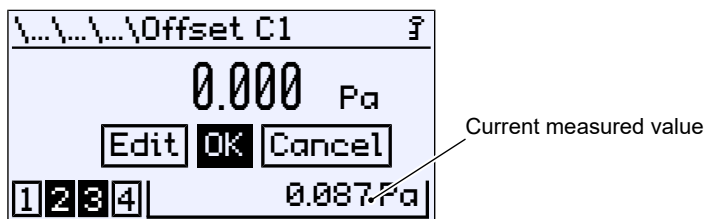


Fig. 95: Offset C1

If the measuring data display in the zero-point shows a different value, this can be corrected with the parameter **Offset C1**.

The value range is one third of the basic measuring range.

The current measurement is shown at the bottom right. During the input, the set offset parameters act immediately on the measured value. Please note that this zero-point window and the damping are not active during the offset setting.

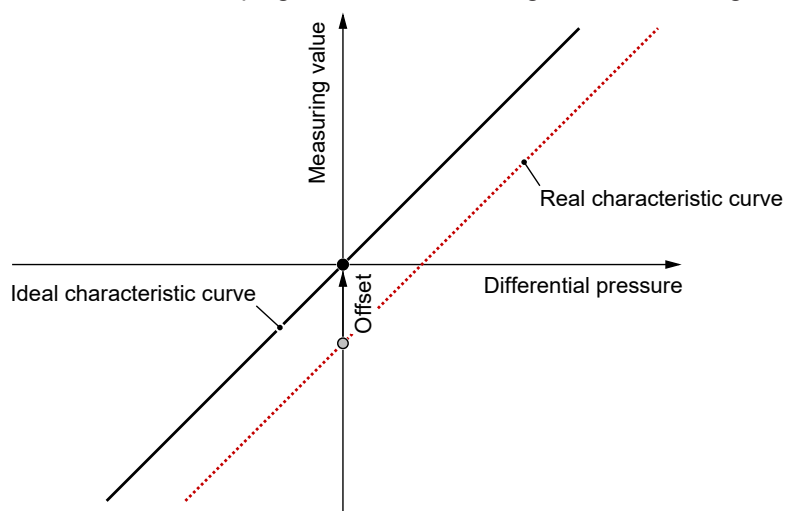


Fig. 96: Offset error

The parameter causes a shift of the entire characteristic toward the ideal characteristic.

#### 5.4.2.2.2.6 Zero-point window C1

**NOTICE!** This menu is only available for devices with differential pressure channel.

Path: \Configuration\Channel 1\Measurement C1\Zero-pt. window C1

Level: 4



Fig. 97: Zero-point window C1

Unsteady readings are not usually a problem during normal operating mode, but this is not true for the idle state, if a measured value of zero is expected. The parameter **Zero-pt. window C1** is designed to solve this.

The value range is one third of the basic measuring range.

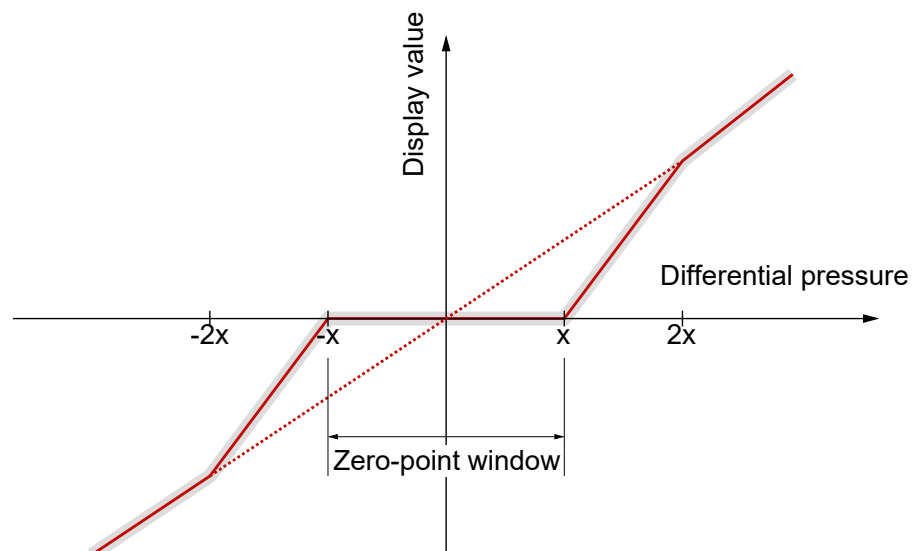


Fig. 98: Zero-point window

The parameter value ( $x$ ) defines a range around zero, the so-called zero-point window. All measured values within this window are displayed as a zero value. The reading will only no longer show zero, if the pressure lies outside the set window.

In this area, approximation is linear up to twice the parameter value ( $2x$ ). Only when twice the pressure is reached for the zero-point window, the measured value and the reading match again. This avoids jumps in the display.

#### 5.4.2.2.7 Limits

Path: \Configuration\Channel 1\Measurement C1

Level: 3

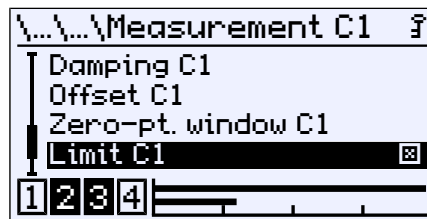


Fig. 99: Limit C1

With this property, the measuring data display can be limited to the **Meas.range C1 start** and **Meas.range C1 end** measuring range defined with the parameters. The button ⇄ is used to activate and deactivate.

### 5.4.2.2.3 Characteristic curve C1 (menu expansion)

**NOTICE!** This menu is available only for devices with a differential pressure channel.

The menu changes depending on the set operating mode of the measuring channel.

The menu expansion is not present for devices for which the parameter 'Mode' has been set to the value 'Linear'.

#### 5.4.2.2.3.1 Characteristic C1 (flow rate)

Path: \Configuration\Channel 1\Characteristic C1

Level: 3

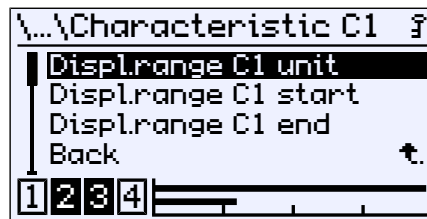


Fig. 100: Characteristic C1 (flow rate)

| Menu name            | Description  |
|----------------------|--|
| Displ.range C1 unit  | This parameter is used to define the flow rate unit. It must have a length of at least 5 characters. |
| Displ.range C1 start | The start of the display range is defined with this parameter.                                       |
| Displ.range C1 end   | The end of the display range is defined with this parameter.   |
| Back                 | This represents the output (exit) of the menu. Press 'back' to return to the Channel 1 menu.         |

This function allow the flow rate to be measured by means of an effective pressure procedure on a measuring panel. The differential pressure is a measure for the flow rate:

$$q = \sqrt{\Delta p}$$

$q$ : Flow rate

$\Delta p$ : Differential pressure

The root extracted input signal is shown as a signal from 0 ... 100 %. The display value can be furnished with a different unit with the parameter **Displ.range C1 unit**. The display range can be scaled to this unit with the parameters **Displ. C1 start** and **Displ.range C1 end**.

5.4.2.2.3.2 Characteristic C1 (Table)

Path: \Configuration\Channel 1\Characteristic C1  
Level: 3

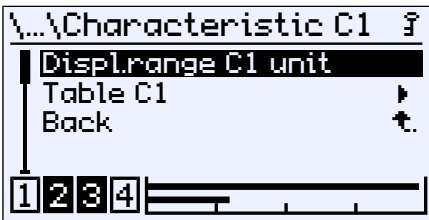


Fig. 101: Characteristic C1 (table)

| Menu name           | Description  |
|---------------------|--|
| Displ.range C1 unit | A unit for the display value is defined with this parameter. It must have a length of at least 5 characters. |
| Table C1            | The table is defined in this menu.   |
| Back                | This represents the output (exit) of the menu. It is used to return to the Channel 1 menu.                   |

The table function can be used to correct the input characteristic of the sensor at any point. The changes impact on the display value and the output signal.

5.4.2.2.3.2.1 Table C1

Path: \Configuration\Channel 1\Characteristic C1\Table C1  
Level: 4

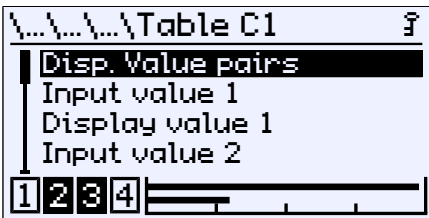


Fig. 102: Table C1

| Menu name        | Description  |
|------------------|--|
| No. Value pairs  | This parameter is used to define the number of value pairs.<br>Value range: ... 2 ... 30         |
| Input value 1    | Value pair 1   |
| Display value 1  |  |
| Input value 2    | Value pair 2   |
| Display value 2  |  |
| ⋮                |  |
| Input value 30   | Value pair 30  |
| Display value 30 |  |
| Back             | This is the exit point of the channel 1 menu. It takes you 'Back' to the Characteristic C1 menu. |

Each support point is stated by a value pair comprising the **Input value**  $\times$  and **Display value**  $\times$ . The index  $\times$  states the number of the value pair. At least two value pairs always need to be stated. The maximum number of value pairs is 30.

The first value pair is assigned to the start of the measuring range and the last value pair to the end of the measuring range. There is a linear interpolation of the characteristic between two values. The input values must either be continuously rising or falling. This is not mandatory for the assigned display values.

#### For example:

The table should have 7 value pairs <sup>(3)</sup>. Of the input signal, the range 20 ... 80 Pa should be used. The basic measuring range is 0 ... 100 Pa. The display should display in the start of the measuring range 20 Pa and at the end of the measuring range 80 Pa.

Basic measuring range 0...100 Pa  
 Measuring range 20 ... 80 Pa  
 Display range 10 ... 70 Pa  
 Output signal 0...20 mA

The value point 5 should be displayed so that the output delivers 12 mA. The following values are then entered in the menu **Table C1**:

| Input       | E1 | O2   | O3   | O4 | O5    | O5 | O6    | O7 |
|-------------|----|------|------|----|-------|----|-------|----|
| Value [Pa]  | 20 | 30   | 40   | 50 | 60    | 56 | 70    | 80 |
| Display     | A1 | A2   | A3   | A4 | A5    | A5 | A6    | A7 |
| Value [Pa]  | 10 | 20   | 30   | 40 | 50    | 46 | 60    | 70 |
| Output [mA] | 0  | 3.33 | 6.66 | 10 | 13.33 | 12 | 16.66 | 20 |

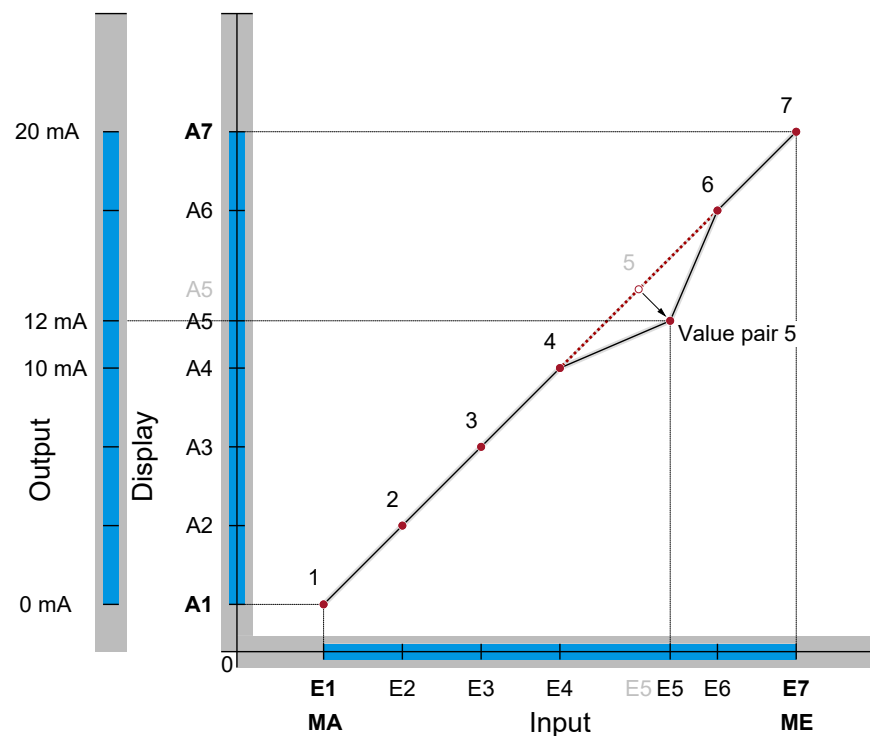


Fig. 103: Table function

<sup>(3)</sup> input values are abbreviated with E1...E7 and display values with A1...A7

### 5.4.2.2.3.3 Characteristic C1 (volume flow)

Path: \Configuration\Channel 1\Characteristic C1  
Level: 3

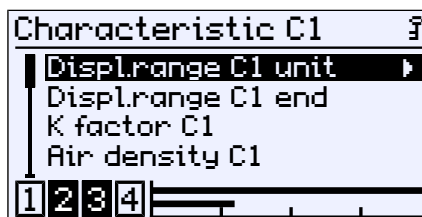


Fig. 104: Characteristic C1 (volume flow)

| Menu name           |   | Description  |
|---------------------|---|--|
| Displ.range C1 unit | ▶ | This parameter can be used to set a unit for the display.                                  |
| Displ.range C1 end  |   | The end of the display range is defined with this parameter.                               |
| K factor C1         |   | This parameter is used to enter the specific calibration factor for the panel type.        |
| Air density C1      |   | This parameter can be used to enter the air density at operating temperature.              |
| Formula C1          | ▶ | The calculation formula is selected in this menu.  |
| Back                | ⬅ | This represents the output (exit) of the menu. It is used to return to the Channel 1 menu. |

This function allow the volume flow to be measured by means of an effective pressure procedure.

$q$ : Volume flow  
 $k$ : K factor  
 $\Delta p$ : Differential pressure

$$q = k \cdot \sqrt{\Delta p}$$

Fig. 105: Volume flow basic formula

The ventilator is equipped with a measuring device to measure the volume flow. Each manufacturer states a K factor for his ventilator. This is filed with the parameter **K factor C1**.

The calculation formula of the manufacturer can deviate from the basic formula. Therefore the manufacturer of the ventilator used in the menu **Formula C1** must be selected.

Due to the fact that the volume of a gas changes with the pressure and the temperature, the air pressure at operating temperature is taken into account in the calculation. The value can be entered with the parameter **Air density C1**. As standard, the density is preset with 1.2040 kg/m<sup>3</sup>.<sup>(4)</sup>

<sup>(4)</sup> This value corresponds to the air density at 20 °C as sea level at an atmospheric pressure of 1013.25 hPa and dry air

#### 5.4.2.2.3.3.1 Display range C1 unit

Path: \Configuration\Channel 1\Characteristic C1\Displ.range C1 unit  
Level: 4

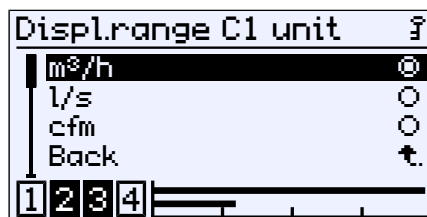


Fig. 106: Display range C1 unit

The following units are available for selection:

|      |                       |               |
|------|-----------------------|---------------|
| m³/h | Cubic metre per hour  | Default value |
| l/s  | Litre per second      |               |
| cfm  | Cubic feet per minute |               |

### 5.4.2.2.3.3.2 Formula C1

Path: \Configuration\Channel 1\Characteristic C1\Formula C1  
Level: 4

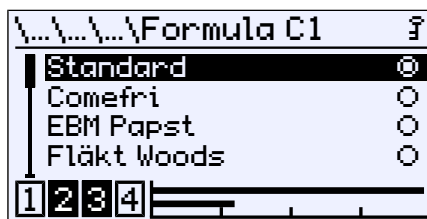


Fig. 107: Formula C1

The following table lists the formulas specified by the respective manufacturer for calculating the volume flow.

|   |  |
|---|--|
| <b>Standard</b><br><b>EBM Pabst</b><br><b>Goal Abegg</b><br><b>SIEGLE+EPPLÉ</b> | $q = k \cdot \sqrt{\Delta p}$                      |
| <b>Comefri</b><br><b>Nicotra Gebhardt</b><br><b>Rosenberg</b>                   | $q = k \cdot \sqrt{\frac{2}{\rho} \cdot \Delta p}$ |
| <b>Fläkt Woods</b>  | $q = \frac{1}{k} \cdot \sqrt{\Delta p}$            |

Fig. 108: Volumetric flow measurement Manufacturer's formulas

### Volume flow measurement at the inlet cone

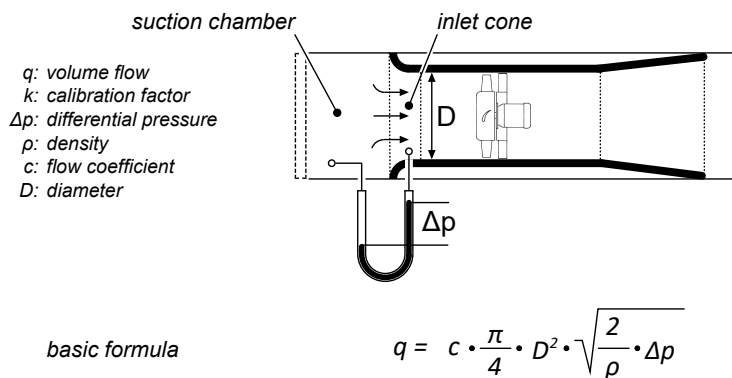


Fig. 109: Volume flow measurement

Fans are usually equipped with an inlet cone. The volume flow measurement consists of one or more measuring points in the inlet cone and one measuring point in the suction chamber of the ventilation unit. The differential pressure between the measuring points is used to calculate the volume flow.

The basic formula given applies to a frictionless and loss-free flow with constant density. In reality, therefore, a correction value caused by the design and other factors must be taken into account.

The fan manufacturers have determined the correction value for each inlet nozzle. In general, these values are called calibration factor or K-factor and can be found in the data sheet or operating instructions of the volume flow measuring device.

#### 5.4.2.2.3.4 Characteristic C1 (linear function)

Path: \Configuration\Channel 1\Characteristic C1  
Level: 3

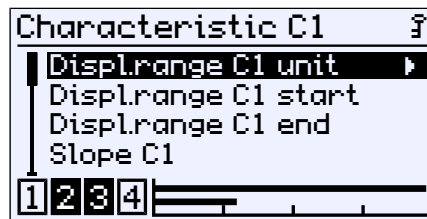


Fig. 110: Characteristic curve C1 (linear function)

| Menu name            | Description   |
|----------------------|---|
| Displ.range C1 unit  | This parameter defines the unit of the flow measurement. A maximum of 5 characters can be used. |
| Displ.range C1 start | This parameter defines the beginning of the display range.                                      |
| Displ.range C1 end   | This parameter defines the end of the display range.  |
| Slope C1             | This parameter determines the slope (m) of the linear characteristic.                           |
| Offset C1            | This parameter defines the axis section (b) of the linear characteristic.                       |
| Back                 | This represents the output (exit) of the menu. This takes you back to the Channel 1 menu.       |

With this menu, the output characteristic can be parameterized as a linear function.

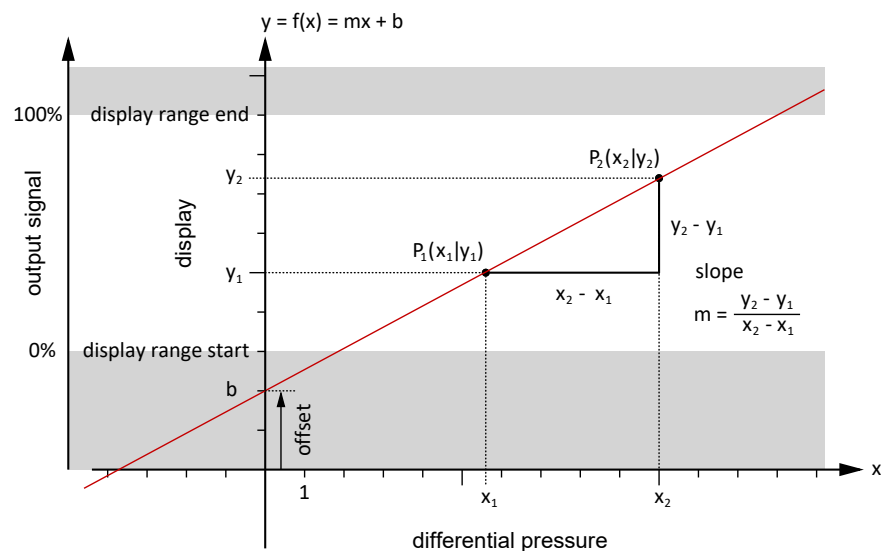


Fig. 111: Linear function

#### 5.4.2.2.4 Number format C1

Path: \Configuration\Channel 1\Number format C1  
Level: 3

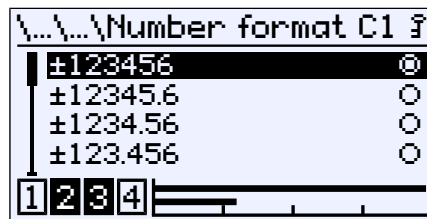


Fig. 112: Number format C1

The number of decimal places can be determined with this menu. All theoretically possible variants are made available for selection.

The decimal places are limited by the measuring range. There are 8 characters available with signs, decimal points and number value. The measuring data display can have less decimal points than set in the number format.

**For example:**

|                            |                  |
|----------------------------|------------------|
| Set number format:         | <b>±123.456</b>  |
| Current measuring value:   | <b>-1234.567</b> |
| Displayed measuring value: | <b>-1234.57</b>  |

Only two decimal points are shown, as otherwise the maximum number of 8 characters would be exceeded. The last decimal place is rounded.

### 5.4.2.2.5 Colour change C1

Path: \Configuration\Channel 1\Colour change C1  
Level: 3



Fig. 113: Colour change C1

This menu is used to set the switch threshold for the colour change of the back lighting. A pre-requisite for the efficiency of the switch thresholds is the activation of the colour change in the menu LCD colour and its assignment to measuring channel K1 in the menu Col.ch. assignment.

| Menu name            | Description   |
|----------------------|---|
| Col.ch. C1 red-grn   | Switching thresholds for the named colour change  |
| Col.ch. C1 grn-red   |   |
| Col.ch. C1 red-ylw   |   |
| Col.ch. C1 ylw-grn   |   |
| Col.ch. C1 grn-ylw   |   |
| Col.ch. C1 ylw-red   |   |
| Col.ch. C1 hyst..    | This parameter can be used to set an hysteresis for all switch thresholds.                      |
| Col.ch. C1 delay on  | This parameter can be used to set an activation delay for all switch thresholds.                |
| Col.ch. C1 delay off | This parameter can be used to set a deactivation hysteresis for all switch thresholds.          |
| Back                 | ↑. This represents the output (exit) of the menu. Press 'back' to return to the Channel 1 menu. |

There are precisely two types of colour change that can be set in the menu LCD colour. Depending on this, certain thresholds are ignored. So, for instance, the switching threshold Col.ch. C1 ylw-grn is not relevant for the colour change type red/green.

By means of colour changes, it is possible to signalise certain operating states by the colour of the back lighting.

5.4.2.2.5.1 Colour change C1 type: red/green

The following switching thresholds are relevant for this colour change:

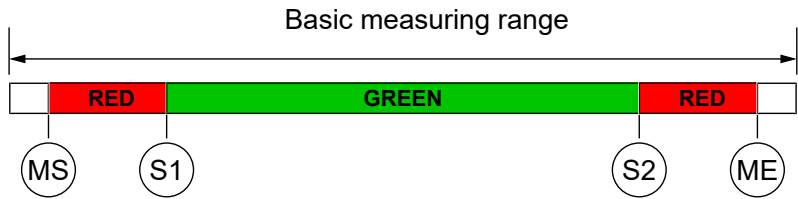


Fig. 114: Colour change red/green

|    |                     |                                  |
|----|---------------------|----------------------------------|
| MS | Meas.range C1 start | See menu Measurement C1 : [▶ 65] |
| S1 | Col.ch. C1 red-grn  |                                  |
| S2 | Col.ch. C1 grn-red  |                                  |
| ME | Meas.range C1 end   | See menu Measurement C1 : [▶ 65] |

For example:

Input of the threshold red/green

Path: \Configuration\Channel 1\Colour change C1\Col.ch. C1 red-grn  
Level: 4

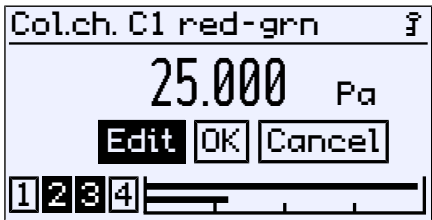


Fig. 115: Colour change C1 red-green

The other switch thresholds are entered in the same way.

#### 5.4.2.2.5.2 Colour-change C1 type: red/yellow/green

The following switching thresholds are relevant for this colour change:

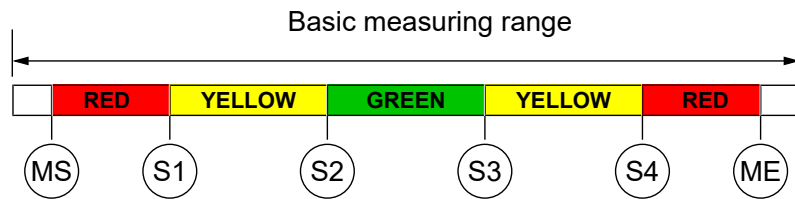


Fig. 116: Colour change red/yellow/green

|    |                     |                                 |
|----|---------------------|---------------------------------|
| MS | Meas.range C1 start | See menu Measurement C1 : [ 65] |
| S1 | Col.ch. C1 red-ylw  |                                 |
| S2 | Col.ch. C1 ylw-grn  |                                 |
| S3 | Col.ch. C1 grn/ylw  |                                 |
| S4 | Col.ch. C1 ylw/red  |                                 |
| ME | Meas.range C1 end   | See menu Measurement C1 : [ 65] |

For example:

#### Channel 1: Basic measuring range: 0 ... 100 Pa

The measuring range is defined as 10 ... 90 Pa. The green range should be 0 ... 60 Pa. Then the critical range (yellow) up to 70 Pa starts. This is where the red range that ranges up to the measuring range end at 90 Pa starts. The lower colour changes red-yellow and yellow-green are switched off.

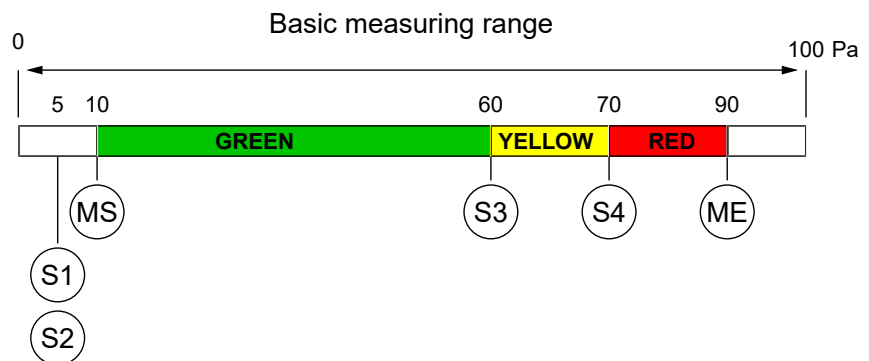


Fig. 117: Example colour-change red/yellow/green

|    |                     |       |      |
|----|---------------------|-------|------|
| MS | Meas.range C1 start | 10 Pa |      |
| S1 | Col.ch. C1 red-ylw  | 5 Pa  | < MS |
| S2 | Col.ch. C1 ylw-grn  | 5 Pa  | < MS |
| S3 | Col.ch. C1 grn/ylw  | 60 Pa |      |
| S4 | Col.ch. C1 ylw/red  | 70 Pa |      |
| ME | Ms.range C1 end     | 90 Pa |      |

The lower colour changes S1 and S2 are 'switched off' by placing thresholds outside the measuring range. If the threshold values were to be laid precisely at the start of the measuring range, the display would shine red in the zero-point,

**Red > Yellow > Green**

The cause for this lies in the priority of the colours. The red colour has priority over the yellow colour and this has priority over the green colour.

### 5.4.2.2.5.3 Colour change C1 hysteresis

Path: \Configuration\Channel 1\Colour change C1\Col.ch. C1 hyst.  
Level: 4



Fig. 118: Colour change C1 hyst.

This parameter can be used to define an hysteresis for the switch thresholds of the colour change. The set hysteresis applies to all switch thresholds at the same time. The input is a pressure value in the current unit. The allowed value range is stated automatically.

#### Functional principle:

The colour symbolises the following risk levels:

| Colour | Risk level | Operating mode |
|--------|------------|----------------|
| Green  | 0          | Normal         |
| yellow | 1          | Warning        |
| rot    | 2          | Danger         |

The following colour change red/yellow/green is examined as an example for all colour changes. There are a total of four switch thresholds (S1...S4) in which a colour change is realised. This leads to the following image without hysteresis.

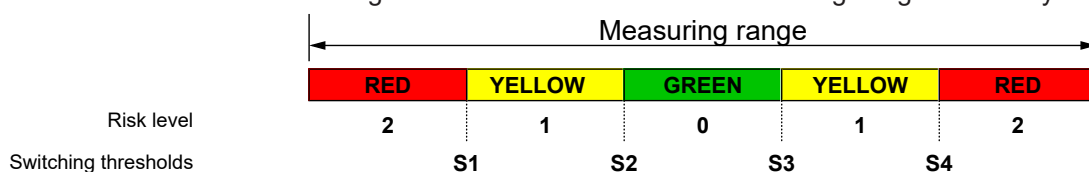


Fig. 119: Colour change (without hysteresis)

The parameter **Col.ch. C1 hyst.** defines a distance to the switch threshold. The colour change with hysteresis is then realised as follows:

#### (i) Lower switching thresholds S1 and S2

In case of a colour change from a higher to a lower risk level, the hysteresis acts with an increasing signal.

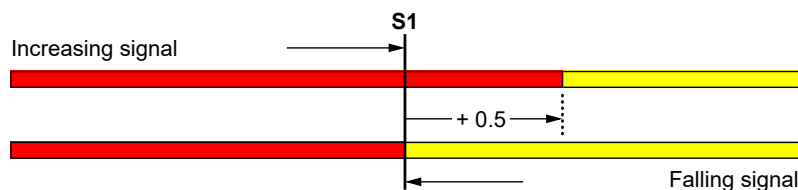


Fig. 120: Example: Hysteresis S1

#### (ii) Upper switching thresholds S3 and S4

In case of a colour change from a lower to a higher risk level, the hysteresis acts with an decreasing signal.

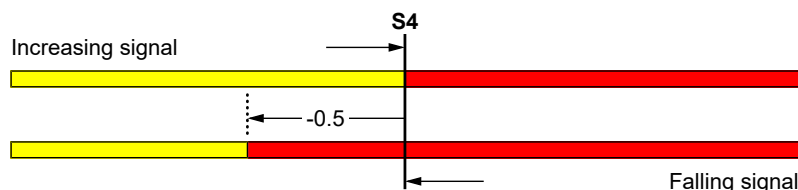


Fig. 121: Example: Hysteresis S4

#### 5.4.2.2.5.4 Colour change C1 delay on

Path: \Configuration\Channel 1\Colour change C1\Col.ch. C1 delay on  
Level: 4:

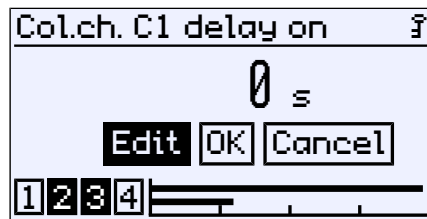


Fig. 122: Colour change C1 delay on

The activation delay acts when changing from a lower risk level to a higher risk level.

#### 5.4.2.2.5.5 Colour change C1 delay off

Path: \Configuration\Channel 1\Colour change C1\Col.ch. C1 delay off  
Level: 4

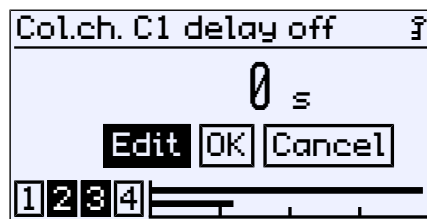


Fig. 123: Colour change C1 delay off

The deactivation delay acts when changing from a higher risk level to a lower risk level.

This results in the following connection between the delay and the colour change:

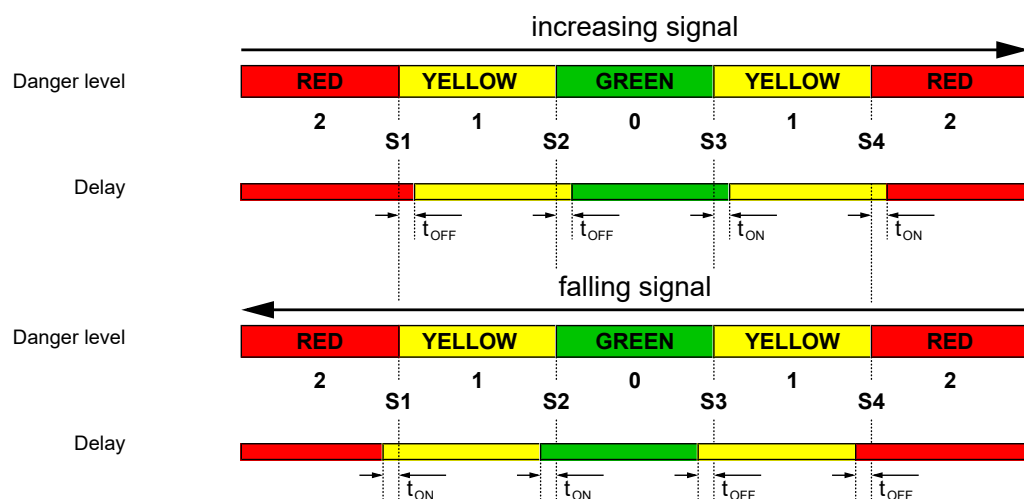


Fig. 124: Colour change delay

5.4.3 Channel 2

The parameterisation of the channels is largely the same for all versions. However, the following should be noted:

| 2 channel version |             | 3 channel version |                       |
|-------------------|-------------|-------------------|-----------------------|
| Channel 1         | Temperature | Channel 1         | Differential pressure |
| Channel 2         | Humidity    | Channel 2         | Temperature           |
|                   |             | Channel 3         | Humidity              |

5.4.3.1 2 channel version [humidity]

Path: \Configuration \ Channel 2  
Level: 2

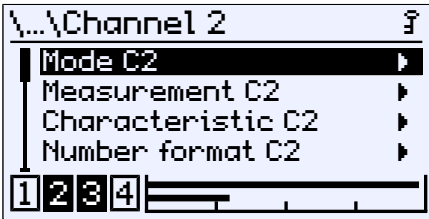
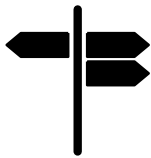


Fig. 125: Channel 2

Menu extension

| Menu name         | Description  |
|-------------------|--|
| Mode C2           | The physical measured variable for the humidity sensor is defined in this menu.                  |
| Measurement C2    | The input of the measuring channel is parameterised in this menu.                                |
| Characteristic C2 | This menu is hidden depending on the selected mode.  |
| Number format C2  | The decimal places for the measured value display of the measuring channel are set in this menu. |
| Colour change C2  | The colour changes for the measuring channel are parameterised in this menu.                     |
| Back              | This represents the exit of the menu. This takes you 'Back' to the parameterisation menu.        |



Signpost [► Page]

- Modus C2 [► 86]
- Characteristic curve C2 [► 87]

The further explanations of the menus are identical to those for channel 1.

- Measurement C2 [► 65]
- Number format C2 [► 79]
- Colour change C2 [► 80]

### 5.4.3.1.1 Mode C2

Path: \Configuration\Channel 2\Mode C2

Level: 3

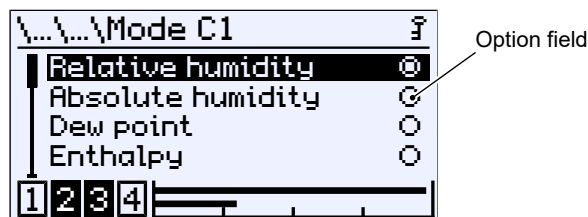


Fig. 126: Mode C2

| Parameter value   |                                  | Description   |
|-------------------|----------------------------------|---|
| Relative humidity | <input checked="" type="radio"/> | This option measures the relative humidity indicated in [%RH].<br><br>The relative humidity depends on the temperature and pressure of the thermodynamic system.                              |
| Absolute humidity | <input type="radio"/>            | This option calculates the absolute humidity from the ambient temperature and the relative humidity. It is indicated in [g/m³].<br><br>Exceeding the absolute humidity leads to condensation. |
| Dew point         | <input type="radio"/>            | This option calculates the dew point temperature indicated in [°C] or [°F].<br><br>The dew point is the maximum water vapour content of the air.  |
| Enthalpy          | <input type="radio"/>            | This option calculates the <b>specific enthalpy</b> . It states the enthalpy per kilogram and is indicated in [kJ/kg].<br><br>Enthalpy is a measure of the energy of a thermodynamic system.  |
| Back              | <input type="radio"/>            | This is the menu exit point. It takes you 'Back' to the Channel 2 menu.   |


5.4.3.1.2 Characteristic C2 (menu expansion)

5.4.3.1.2.1 Characteristic C2 (absolute humidity)

Path: \Configuration\Channel 2\Characteristic C2  
Level: 3



Fig. 127: Characteristic C2 (absolute humidity)

| Menu name            | Description  |
|----------------------|--|
| Displ.range C2 start | The start of the display range is defined with this parameter.   |
| Displ.range C2 end   | The end of the display range is defined with this parameter.   |
| Back                 |  This is the menu exit point. Press 'Back' to return to the Channel 2 menu. |

#### 5.4.3.1.2.2 Characteristic C2 (dew point)

Path: \Configuration\Channel 2\Characteristic C2

Level: 3

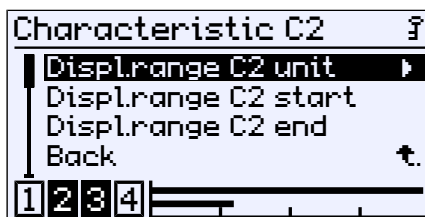


Fig. 128: Characteristic C2 (dew point)

| Menu name            | Description  |
|----------------------|--|
| Displ.range C2 unit  | This menu is used to define the display range unit.                        |
| Displ.range C1 start | The start of the display range is defined with this parameter.             |
| Displ.range C1 end   | The end of the display range is defined with this parameter.               |
| Back                 | This is the menu exit point. Press 'Back' to return to the Channel 2 menu. |

##### 5.4.3.1.2.2.1 Displ.range C2 unit

Path: \Configuration\Channel 2\Characteristic C2\Displ.range C2 unit

Level: 3

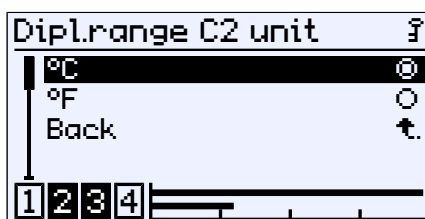


Fig. 129: Display range C2 unit

| Menu name | Description  |
|-----------|--|
| °C        | Default value  |
| °F        |  |
| Back      | This is the menu exit point. Press 'back' to return to the Characteristic C2 menu. |

### 5.4.3.1.2.3 Characteristic C2 (enthalpy)

Path: \Configuration\Channel 2\Characteristic C2  
Level: 3

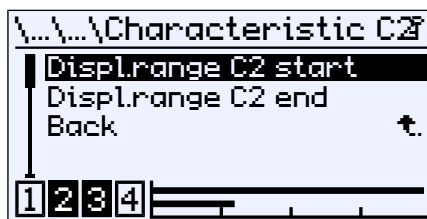



Fig. 130: Characteristic C2 (enthalpy)

| Menu name            | Description  |
|----------------------|--|
| Displ.range C2 start | The start of the display range is defined with this parameter.   |
| Displ.range C2 end   | The end of the display range is defined with this parameter.   |
| Back                 |  This is the menu exit point. Press 'Back' to return to the Channel 2 menu. |

### 5.4.3.2 3 channel version [temperature]

Path: \Configuration\Channel 2

Level: 2

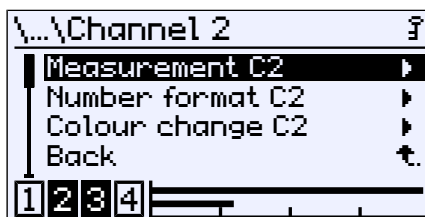


Fig. 131: Channel 2

| Menu name        | Description  |
|------------------|--|
| Measurement K2   | ▶ The input of the measuring channel is parameterised in this menu.                                |
| Number format K2 | ▶ The decimal places for the measured value display of the measuring channel are set in this menu. |
| Colour change K2 | ▶ The colour changes for the measuring channel are parameterised in this menu.                     |
| Back             | ⬅ This represents the exit of the menu. This takes you 'Back' to the parameterisation menu.        |



#### Signpost [▶ Page]

The explanations for the menus are identical to those for channel 1.

- Measurement K2 [▶ 65]
- Number format K2 [▶ 79]
- Colour change K2 [▶ 80]

5.4.4 Channel 3

The configuration of the channels is largely the same for all versions. However, note the following:

| 2-channel version |             | 3-channel version |                       |
|-------------------|-------------|-------------------|-----------------------|
| Channel 1         | Temperature | Channel 1         | Differential pressure |
| Channel 2         | Humidity    | Channel 2         | Temperature           |
|                   |             | Channel 3         | Humidity              |

5.4.4.1 3 channel version [Humidity]

Path: \Configuration\Channel 3  
Level: 2

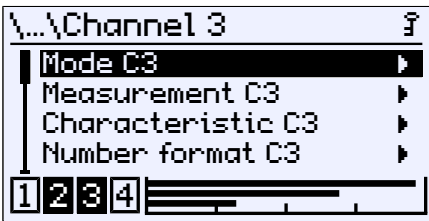
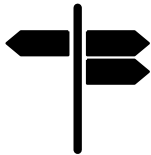


Fig. 132: Channel 3

Menu extension

| Menu name         | Description  |
|-------------------|--|
| Mode K3           | The physical measured variable for the humidity sensor is defined in this menu.                    |
| Measurement K3    | ▶ The input of the measuring channel is parameterised in this menu.                                |
| Characteristic C3 | ▶ This menu is hidden depending on the selected mode.  |
| Number format K3  | ▶ The decimal places for the measured value display of the measuring channel are set in this menu. |
| Colour change K3  | ▶ The colour changes for the measuring channel are parameterised in this menu.                     |
| Back              | ⬅ This represents the exit of the menu. This takes you 'Back' to the parameterisation menu.        |



Signpost [▶ Page]

- Mode K3 [▶ 92]
- Characteristic curve K3 [▶ 92]

The explanations for the menus are identical to those for channel 1.

- Measurement K3 [▶ 65]
- Number format K3 [▶ 79]
- Colour change K3 [▶ 80]

### 5.4.4.1.1 Mode C3

Path: \Configuration\Channel 3\Mode C3  
Level: 3

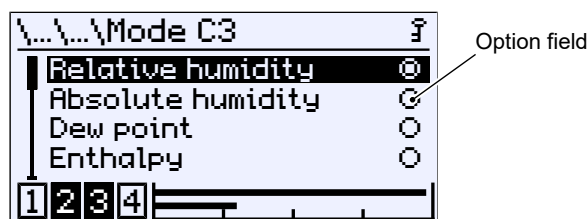


Fig. 133: Mode C3

| Parameter value   |                                  | Description   |
|-------------------|----------------------------------|---|
| Relative humidity | <input checked="" type="radio"/> | This option measures the relative humidity indicated in [%RH].<br><br>The relative humidity depends on the temperature and pressure of the thermodynamic system.                              |
| Absolute humidity | <input type="radio"/>            | This option calculates the absolute humidity from the ambient temperature and the relative humidity. It is indicated in [g/m³].<br><br>Exceeding the absolute humidity leads to condensation. |
| Dew point         | <input type="radio"/>            | This option calculates the dew point temperature indicated in [°C].<br><br>The dew point is the maximum water vapour content of the air.  |
| Enthalpy          | <input type="radio"/>            | This option calculates the <b>specific enthalpy</b> . It states the enthalpy per kilogram and is indicated in [kJ/kg].<br><br>Enthalpy is a measure of the energy of a thermodynamic system.  |
| Back              |                                  | This is the menu exit point. It takes you 'Back' to the Channel 3 menu.   |

### 5.4.4.1.2 Characteristic C3 menu expansion

The menu expansion for characteristic C3 depends on the selected mode C3. Just like for channel 2, the display ranges are defined for various physical measured variables of humidity.

#### See also

Characteristic C2 (menu expansion) [► 87]

### 5.4.5 Analog output

The number of analog outputs depends on the version.

|                   |                  |
|-------------------|------------------|
| 2-channel version | 2 analog outputs |
| 3-channel version | 3 analog outputs |

Path: \Configuration\Analog output

Level: 2

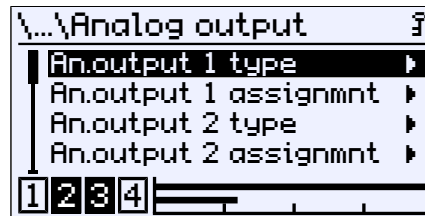


Fig. 134: Analog output

#### 2 channel version

| Menu name             | Description  |
|-----------------------|--|
| An.output 1 type      | This menu is used to define the output signal for output 1.                  |
| An.output 1 assignmnt | The measuring channel to which output 1 is assigned is defined in this menu. |
| An.output 2 type      | This menu is used to define the output signal for output 2.                  |
| An.output 2 assignmnt | The measuring channel to which output 2 is assigned is defined in this menu. |

#### 3 channel version

|                       |  |
|-----------------------|--|
| An.output 3 type      | This menu is used to define the output signal for output 3.                  |
| An.output 3 assignmnt | The measuring channel to which output 3 is assigned is defined in this menu. |
| Limit I min.          | Parameter for the lower limit of the current output                          |
| Limit I max.          | Parameter for the upper limit of the current output                          |
| I error signal        | Parameter for the error signal of the current output                         |
| Limit U min.          | Parameter for the lower limit of the voltage output                          |
| Limit U max.          | Parameter for the upper limit of the voltage output                          |
| U error signal        | Parameter for the error signal of the voltage output                         |
| Back                  | This is the menu exit point. It takes you back to the configuration menu.    |

The parameters for the type and assignment work in the same way for all channels. Consequently, the parameters are explained below using channel 1 as an example.

This also applies for limit parameters, which are explained using the current signal as an example. If the signal type is changed, the entered parameters for the previous signal are retained.

### 5.4.5.1 Analog output 1 type

Path: \...\An.output 1 type

Level: 3

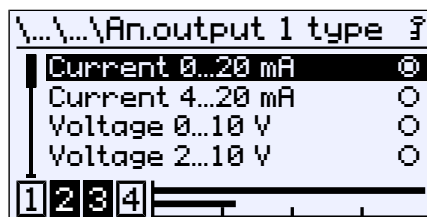


Fig. 135: Analog output 1 type

The signals can be set for output 1:

| Current signals | Voltage signals |
|-----------------|-----------------|
| 0 ... 20 mA     | 0 ... 10 V      |
| 4 ... 20 mA     | 2 ... 10 V      |
|                 | 1 ... 5 V       |

### 5.4.5.2 Analog output 1 assignment

Path: \Configuration\Analog output\An.output 1 assignmnt

Level: 3



Fig. 136: An.output 1 assignment

The assignment of the analog outputs to the channels can be set freely. In the case of a device with two channels, the third channel is hidden.

### 5.4.5.3 Signal limits

**NOTICE! The limit parameters apply for both output signals.**

The output signal can be limited by the limit parameters. This primarily serves to prevent error messages in downstream systems caused by brief overstepping of measuring ranges. Due to the fact that the limit parameters for both signal types work the same way, they are only explained for the current signal at this point.

The parameters **limit I min.**, **limit I max.** and **I error signal** define the limits of the output signal that may not be undercut or exceeded regardless of the measured variable. These limit values take precedence over the **Meas.range C1 start** and **Meas.range C1 end** range defined by the parameter <sup>(5)</sup>.

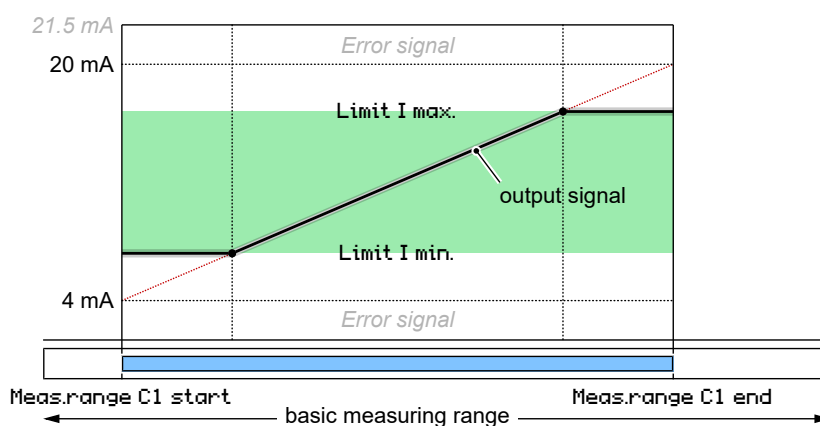


Fig. 137: Limitation of the output signal

The value defined via the parameter **I error signal** is issued if the device detects an internal error and can no longer work correctly. It should be noted here that not all potential errors and faults can be detected by the device itself.

#### Signal range

|                |               |
|----------------|---------------|
| Current signal | 0 ... 21.5 mA |
| Voltage signal | 0 ... 10.5 V  |

<sup>(5)</sup> For the second channel, the channel number changes to C2.

### 5.4.6 Switch output

Path: \Configuration\Switch output

Level: 2

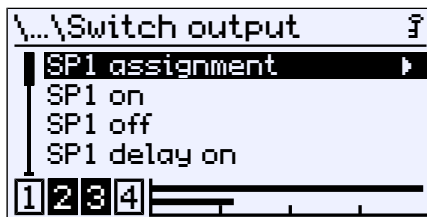


Fig. 138: Switch output

**NOTICE!** As the configuration for each switch output is the same, only the parameters for the first switch output are shown here.

| Menu name      |   | Description   |
|----------------|---|---|
| SP1 assignment | ▶ | This menu is used to assign switch output 1 to a channel or to switch it off. |
| SP1 on         |   | The activation point is set with this parameter.                              |
| SP1 off        |   | The deactivation point is defined with this parameter.                        |
| SP1 delay on   |   | The activation delay is defined with this parameter.                          |
| SP1 delay off  |   | The deactivation delay is defined with this parameter.                        |
| SP1 function   | ▶ | The contact point is defined with this menu.                                  |
|                | ⋮ |   |
| Back           | ⬅ | This is the menu exit point. It takes you back to the configuration menu.     |

#### 5.4.6.1 SP1 assignment

Path: \Configuration\Switch output\SP1 assignment

Level: 3

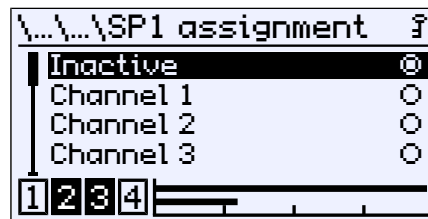


Fig. 139: SP1 assignment

This menu can be used to assign or deactivate the switch point of a channel.

#### 5.4.6.2 SP1 function

Path: \Configuration\Switch output\SP1 function

Level: 3

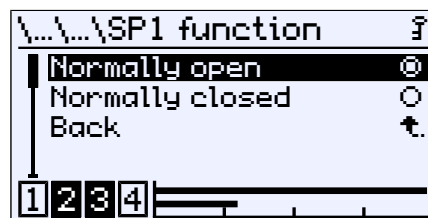


Fig. 140: SP1 function

The function of this contact is defined with this parameter.

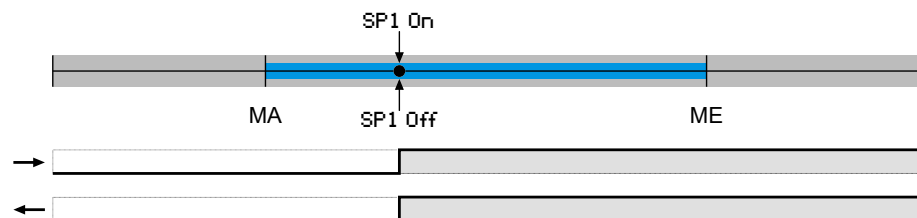
### 5.4.6.3 Switching function

The function of the individual parameters is explained for all switch points using Switch point 1 as an example.

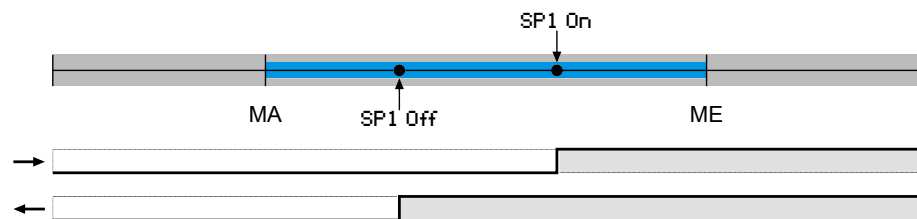
**SP1 On** defines the activation point, **SP1 Off** the deactivation point of switch output 1. The values are shown in the valid unit and set accordingly. The values are shown in the valid unit and set accordingly. Both parameters can be set independently over the entire value range.

If the parameter **SP1 on = SP1 off**, the contact pulls, if the measured value exceeds the parameter value. If the measured value undercuts the parameter value, the contact drops.

→ Increasing input signal  
← dropping input signal



If the parameter **SP1 on > SP1 off**, the contact pulls, if the measured value exceeds the SP1 on. The contact only drops again if SP1 Off is undercut.



If the parameter **SP1 on < SP1 off**, the contact pulls, if the measured value lies between the parameter values:

$SP1\ on < \text{Measured value} < SP1\ off$ . Otherwise the contact will drop.

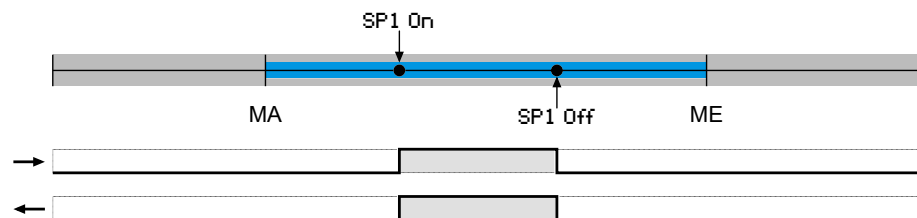


Fig. 141: Switch point setting

### Delay

The switching behaviour of the contact can be delayed with the two parameters **SP1 delay on** and **SP1 delay off**.

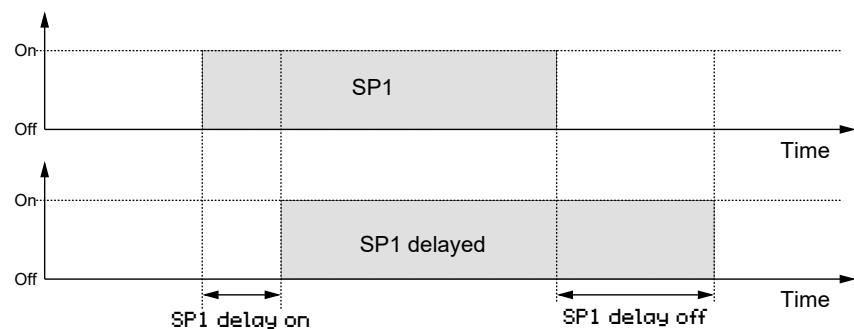


Fig. 142: Delay

### 5.4.7 Display

Path: \Configuration\Display

Level: 2

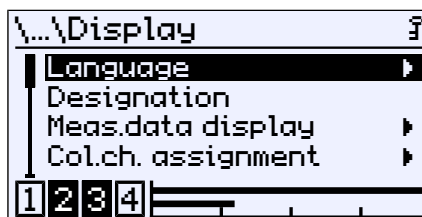


Fig. 143: Display

| Menu name         |   | Description  |
|-------------------|---|--|
| Language          | ▶ | The menu language can be selected in this menu.  |
| Designation       |   | This parameter can be used to file the designation for the device.                               |
| Meas.data display | ▶ | This menu can be used to define which measuring value channel should be displayed.               |
| Col.ch. assignmt  | ▶ | This menu can be used to determine which measuring channel controls the colour change.           |
| LCD col.          | ▶ | This menu is used to determine the colour of the backlighting and/or their colour change.        |
| LCD lighting      |   | This parameter can be used to switch off the lighting based on a timer.                          |
| LCD contr.        |   | This parameter is used to set the contrast for the LC display.                                   |
| Back              | ⬅ | This represents the output (exit) of the menu. Press 'back' to return to the configuration menu. |

### 5.4.7.1 Language

Path: \Configuration\Display\Language

Level: 3



Fig. 144: Language

| Parameter name | Language |                    |
|----------------|----------|--------------------|
| German         | DE       | German language    |
| English        | EN       | English language   |
| Español        | ES       | Spanish language   |
| Français       | FR       | French language    |
| Italiano       | IT       | Italian language   |
| Magyar         | HU       | Hungarian language |

### 5.4.7.2 Designation

Path: \Configuration\Display\Designation

Level: 3

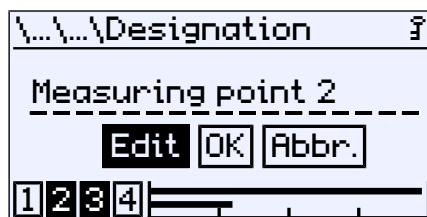


Fig. 145: Designation

At this point, a designation for the differential pressure transmitter can be issued. There are 20 digits available. The designation appears on the measured value display.

### 5.4.7.3 Measuring data display

Path: \Configuration\Display\Meas.data display

Level: 3



Fig. 146: Measuring data display

In this menu the channel, whose measured value is displayed, is defined. This menu item is not shown for 1-channel devices.

#### 5.4.7.4 Colour change assignment

Path: \Configuration\Display\Col.ch. assignment

Level: 3

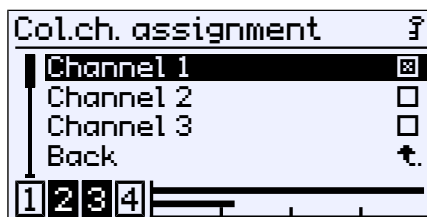


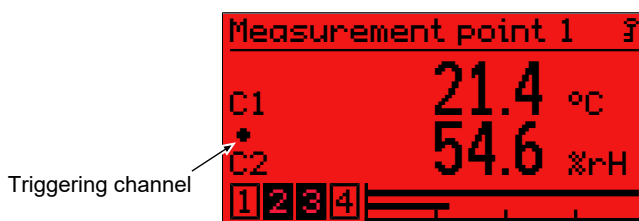
Fig. 147: Colour change assignment

This menu is used to define the channel that controls the colour change. If multiple channels are selected, the colour change takes place once one of the channels triggers a colour change. The triggering channel is marked with a dot. The indicators are deleted once the green range is entered again.

#### Example

Two channels are displayed on the operating display. First, channel 2 triggers a green-red colour change. Shortly after, the same colour change is triggered by channel 1.

##### Event 1: Green-red colour change on channel 2



##### Event 2: Green-red colour change on channel 1

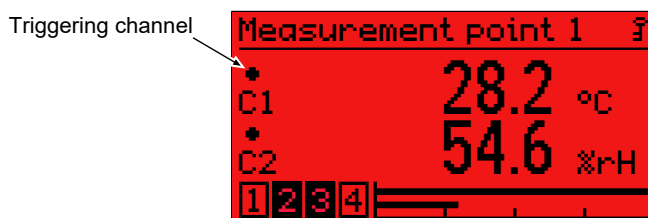


Fig. 148: Display of measured values (colour change)

### 5.4.7.5 LCD colour

Path: \Configuration\Display\LCD colour

Level: 3



Fig. 149: LCD colour

The following colours can be selected for the back lighting.

|                  |  |
|------------------|--|
| Off              |  |
| Red              |  |
| Green            |  |
| Yellow           |  |
| Blue             |  |
| Magenta          |  |
| Cyan             |  |
| White            |  |
| Red/green        | Activation of the colour change red/green        |
| Red/yellow/green | Activation of the colour change red/yellow/green |

The setting for the switch thresholds of the respective colour change are in the menu item Colour change in the menu for the configuration of the channels.

### 5.4.7.6 LCD lighting

Path: \Configuration\Display\LCD lighting

Level: 3

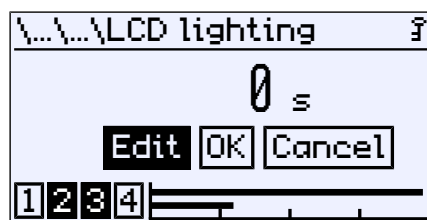


Fig. 150: LCD lighting

This parameter is used to define a time period after which the back lighting is switched off once no more input has been entered via the keyboard. The lighting can be switched on again by pressing any button.

**NOTICE! The parameter also impacts in the same way on the colour change. When the lighting is switched off, a colour change is only display when a button is pressed.**

Values of 0 to 600 s can be entered. The lighting can be switched on permanently with the parameter value 0s.

#### 5.4.7.7 LCD contrast

Path: \Configuration\Display\LCD contrast

Level: 3



Fig. 151: LCD contrast

This parameter can be used to set the contrast for the LC display.

### 5.4.8 Modbus RTU

**NOTICE!** This menu is only available for devices with a Modbus interface.

Path: \Configuration\Modbus RTU

Level: 2

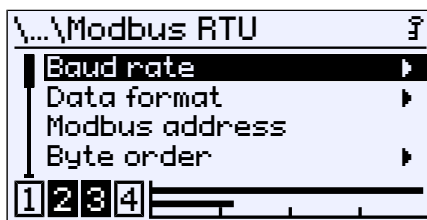


Fig. 152: Modbus RTU

| Menu name      | Description  |
|----------------|--|
| Baud rate      | ▶ The baud rate is set with this menu.   |
| Data format    | ▶ The data format (data, parity, stop-bit) is defined for the transmission with this menu.         |
| Modbus address | The device address is entered with this parameter.   |
| Byte sequence  | ▶ The byte order for the floating point figure is defined with this menu.                          |
| Back           | ⬅ This represents the output (exit) of the menu. Press 'back' to return to the configuration menu. |

5.4.8.1 Baud rate

Path: \Configuration\Modbus RTU\Baud rate  
Level: 3

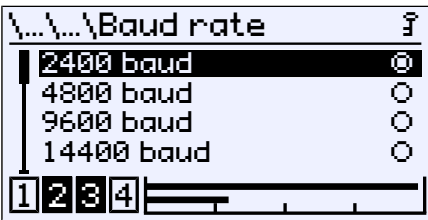


Fig. 153: Baud rate

| Baud rates  | Description  |
|-------------|--|
| 2400 Baud   | Options for data transmission.   |
| 4800 Baud   |  |
| 9600 Baud   |  |
| 14400 Baud  |  |
| 19200 Baud  |  |
| 28800 Baud  |  |
| 38400 Baud  |  |
| 56000 Baud  |  |
| 57600 Baud  |  |
| 115200 Baud |  |
| Back        | ⬅. This represents the output (exit) of the menu. Press 'back' to return to the Modbus RTU menu. |

5.4.8.2 Data format

Path: \Configuration\Modbus RTU\Data format  
Level: 3

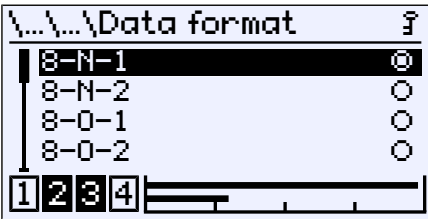


Fig. 154: Data format

| Data format | Description  |
|-------------|--|
| 8-N-1       | 8 data-bit – No parity – 1 stop-bit  |
| 8-N-2       | 8 data-bit – No parity – 2 stop-bit  |
| 8-O-1       | 8 data-bit – Odd parity – 1 stop-bit   |
| 8-O-2       | 8 data-bit – Odd parity – 2 stop-bit   |
| 8-E-1       | 8 data-bit – Even parity – 1 stop-bit  |
| 8-E-2       | 8 data-bit – Even parity – 2 stop-bit  |
| Back        | ⬅. This represents the output (exit) of the menu. Press 'back' to return to the Modbus RTU menu. |

### 5.4.8.3 Modbus address

Path: \Configuration\Modbus RTU\Modbus address  
Level: 3

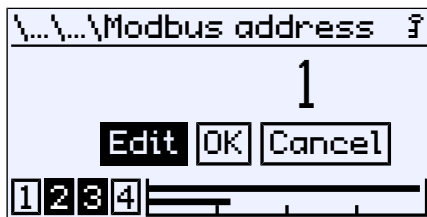


Fig. 155: Modbus address

Addresses from 1 to 247 can be used.

### 5.4.8.4 Byte order

Path: \Configuration\Modbus RTU\Byte order  
Level: 3

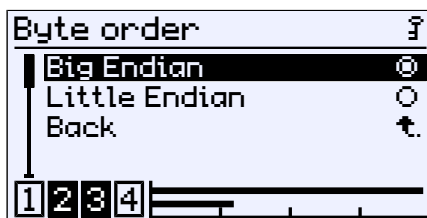


Fig. 156: Byte order

| Menu name     | Description   |
|---------------|---|
| Big Endian    | The highest value byte first (MSB-LSB).   |
| Little Endian | The lowest value byte first (LSB-MSB).  |
| Back          | This represents the output (exit) of the menu. Press 'back' to return to the Modbus RTU menu. |

The order for the bytes of the floating point figures is defined with this menu.

5.5 Info

Path: \Info  
Level: 1

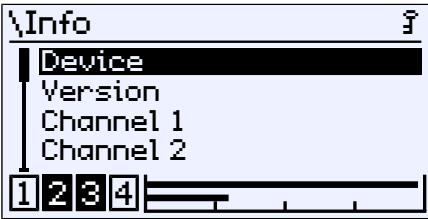


Fig. 157: Info  
Various information for configuration and setting of the device is provided in this menu.

| Menu name              |                 | Description   |
|------------------------|-----------------|---|
| 3 channel version only | Dev.            | Device type, serial number  |
|                        | Revision        | Firmware version  |
|                        | Channel 1       | Basic measurement range, spread   |
|                        | Channel 2       | Basic measurement range, spread   |
|                        | Channel 3       | Basic measurement range, spread   |
|                        | Analogue output | Output signal   |
|                        | Switch output   | Assignment, contact type  |
| Modbus version only    | Modbus RTU      | Baud rate, data format, address   |
| IO-Link version only   | IO-Link         | Version, vendor ID, device ID   |
| Back                   |                 | ⬆. This represents the output (exit) of the information menu. It takes you back to the main menu. |

Information about the device and the configuration are provided in this menu.

## 5.6 Service

Path: \Service

Level: 1

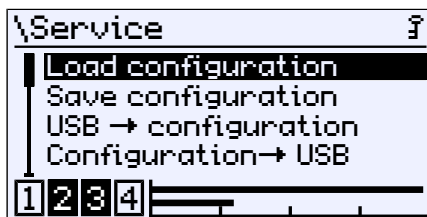


Fig. 158: Service

| Menu name           | Description  |
|---------------------|--|
| Load configuration  | The configuration saved in the flash memory of the device is loaded.                 |
| Save config.        | The configuration is saved in the flash memory of the device.                        |
| USB → Config.       | The configuration saved on a USB drive is loaded.                                    |
| Configuration → USB | The configuration is saved to a USB drive.   |
| Factory settings    | The configuration is reset to the default setting.                                   |
| Firmware update     | The firmware update saved on a USB drive is performed.                               |
| Back                | ⬅. This is the exit point of the service menu. It takes you 'Back' to the main menu. |

### 5.6.1 Firmware update

For an update, you will need a USB stick with micro-USB connection or, alternatively, a suitable adapter. The internal USB port is accessible after opening the housing.



#### **DANGER**

#### **Opening the housing on ATEX devices**

ATEX devices must never be opened inside potentially explosive areas.

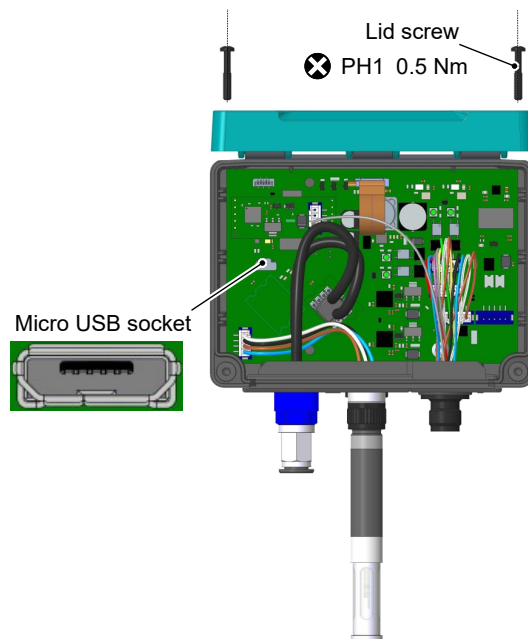


Fig. 159: USB port (example)

If you received the firmware on a FISCHER USB stick, you can immediately start the update. If the update has been supplied as a ZIP archive, unzip the archive to the USB stick's root directory. This creates the right directory structure and you can start the update. If an update is not possible, check whether the "fw" directory exists and the firmware (\*.bin) is saved there. Additional files on the stick normally do not disrupt the process and do not need to be deleted.

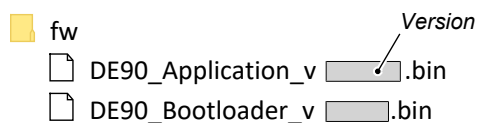


Fig. 160: Example folder structure

## Execution

▷ Perform the update as follows:

1. Open the housing
2. Insert the USB stick with the new firmware into the USB port.
3. Log in as the user with the right to update firmware.
4. Navigate to the Service menu.
5. Select the Update firmware menu item and start the update. The update takes place automatically.

**NOTICE! Sometimes the USB stick is not correctly recognised. In this case, remove the stick and re-insert it during the update.**

➡ The new software is now installed. The device restarts once the new firmware has been installed.

6. Remove the USB stick and close the housing.

▶ The update is now complete.

### 5.6.2 Replace the humidity and temperature sensors

The FT90 with the FF12 sensor is supplied with firmware version 1.41. All devices with an older firmware version are still fitted with an FF90 sensor. The FF12 sensor only works with the new software.

The current firmware version of a device can be checked via the Info menu. The new software (from 1.41) allows the connected sensor type [▷ 61] to be set and queried.

If a sensor is defective, the FF12 is delivered as a spare part.

**NOTICE! FF90 sensors can no longer be delivered.**

▷ To make the replacement, proceed as follows:

1. You have the rights to update firmware and change the parameters.
2. Update firmware with the current firmware if the firmware version is <1.41.
3. Then disconnect the device.
4. Remove the old sensor and fit the delivered replacement FF12 sensor.
5. Re-connect the power supply.
6. Log back in to the device
7. Follow the path: `\Configuration\Input\Sensor type` .
8. Select sensor type FF12. <sup>(6)</sup>
9. Exit the configuration and access the operating display again.

▶ The sensor replacement is now complete.

<sup>(6)</sup> From software 1.43, the sensor type (FF90 or FF12) is recognised automatically if the sensor type parameter is set to Standard.

## 6 Servicing

### 6.1 Maintenance

The instrument is maintenance-free. We recommend the following regular inspection to guarantee reliable operation and a long service life:

- Check the function in combination with downstream components.
- Check the leak-tightness of the pressure connection lines.
- Check the electrical connections.

The exact test cycles need to be adapted to the operating and environmental conditions. In combination with other devices, the operating instructions for the other devices also need to be observed.

### 6.2 Transport

The measuring device must be protected against impacts. It should be transported in the original packaging or a suitable transport container.

### 6.3 Service

All defective or faulty devices should be sent directly to our repair department. Please coordinate all shipments with our sales department.



#### **WARNING**

##### **Process media residues**

Process media residues in and on dismantled devices can be a hazard to people, animals and the environment. Take adequate preventive measures. If required, the devices must be cleaned thoroughly.

Return the device in the original packaging or a suitable transport container.

### 6.4 Disposal


#### **WEEE-Reg.-No. DE 31751293**

Please help to protect our environment and dispose of the workpieces and packaging materials used in an environmentally friendly manner. Observe the country-specific waste treatment and disposal regulations.

The year of production can be found in the production number (serial number):



**P#** 23 03618.03.123

Production year 2023 

Further information on disposal can be found on our website  
[[www.fischermesstechnik.de](http://www.fischermesstechnik.de)]

## 7 Technical data

### 7.1 General

|                       |                       |                 |
|-----------------------|-----------------------|-----------------|
| Type designation      | FT90                  |                 |
| Measuring variable    | Temperature           |                 |
|                       | Humidity              |                 |
|                       | Differential pressure |                 |
| Measurement principle | Temperature           | Band gap        |
|                       | Humidity              | Capacitive      |
|                       | Print                 | Piezo-resistive |

### 7.2 Input variables

#### 7.2.1 Temperature and humidity

|                          | Sensor assembly | Temperature measuring range |
|--------------------------|-----------------|-----------------------------|
| Possible range           | On device       | -20 to +70°C                |
|                          | Offset          | -40 to +100°C               |
| Humidity measuring range |                 |                             |
| Possible range           |                 | 0 to +100 %rH               |

#### 7.2.2 Differential pressure

Asymmetric measuring ranges:

| Measuring range |               | Overload | Bursting pressure | Sensor type |
|-----------------|---------------|----------|-------------------|-------------|
|                 | -20 to +80 Pa | 750 mbar | 1 bar             | A           |
|                 | 0 to 25 Pa    | 750 mbar | 1 bar             | A           |
|                 | 0 to 40 Pa    | 750 mbar | 1 bar             | A           |
|                 | 0 to 60 Pa    | 750 mbar | 1 bar             | A           |
| 0 to 1 mbar     | 0 to 100 Pa   | 750 mbar | 1 bar             | A           |
| 0 to 1.6 mbar   | 0 to 160 Pa   | 750 mbar | 1 bar             | A           |
| 0 to 2.5 mbar   | 0 to 250 Pa   | 750 mbar | 1 bar             | A           |
| 0 to 4 mbar     | 0 to 400 Pa   | 100 mbar | 200 mbar          | B           |
| 0 to 4 mbar     | 0 to 400 Pa   | 750 mbar | 1 bar             | A *         |
| 0 to 6 mbar     | 0 to 600 Pa   | 100 mbar | 200 mbar          | B           |
| 0 to 6 mbar     | 0 to 600 Pa   | 750 mbar | 1 bar             | A *         |
| 0 to 10 mbar    | 0 to 1 kPa    | 100 mbar | 200 mbar          | B           |
| 0 to 10 mbar    | 0 to 1 kPa    | 750 mbar | 1 bar             | A *         |
| 0 to 16 mbar    | 0 to 1.6 kPa  | 400 mbar | 800 mbar          | B           |
| 0 to 25 mbar    | 0 to 2.5 kPa  | 400 mbar | 800 mbar          | B           |
| 0 to 40 mbar    | 0 to 4 kPa    | 400 mbar | 800 mbar          | B           |
| 0 to 60 mbar    | 0 to 6 kPa    | 1 bar    | 2 bar             | B           |
| 0 to 100 mbar   | 0 to 10 kPa   | 1 bar    | 2 bar             | B           |
| 0 to 160 mbar   | 0 to 16 kPa   | 2.5 bar  | 5 bar             | B           |
| 0 to 250 mbar   | 0 to 25 kPa   | 2.5 bar  | 5 bar             | B           |

\*) Measuring range with increased overload and bursting pressure capability (see 'Order codes/Special aspects')

**Symmetric measuring ranges:**

| Measuring range   |                    | Overload | Bursting pressure | Sensor |
|-------------------|--------------------|----------|-------------------|--------|
|                   | -12,5 ... +12,5 Pa | 750 mbar | 1 bar             | A      |
|                   | -25 to +25 Pa      | 750 mbar | 1 bar             | A      |
|                   | -40 to +40 Pa      | 750 mbar | 1 bar             | A      |
|                   | -60 to +60 Pa      | 750 mbar | 1 bar             | A      |
| -1 to +1 mbar     | -100 to +100 Pa    | 750 mbar | 1 bar             | A      |
| -1.6 to +1.6 mbar | -160 to +160 Pa    | 750 mbar | 1 bar             | A      |
| -2.5 to +2.5 mbar | -250 to +250 Pa    | 100 mbar | 200 mbar          | B      |
| -2.5 to +2.5 mbar | -250 to +250 Pa    | 750 mbar | 1 bar             | A *    |
| -4 to +4 mbar     | -400 to +400 Pa    | 100 mbar | 200 mbar          | B      |
| -4 to +4 mbar     | -400 to +400 Pa    | 750 mbar | 1 bar             | A *    |
| -6 to +6 mbar     | -600 to +600 Pa    | 100 mbar | 200 mbar          | B      |
| -6 to +6 mbar     | -600 to +600 Pa    | 750 mbar | 1 bar             | A *    |
| -10 to +10 mbar   | -1 to +1 kPa       | 100 mbar | 200 mbar          | B      |
| -10 to +10 mbar   | -1 to +1 kPa       | 750 mbar | 1 bar             | A *    |
| -16 to +16 mbar   | -1.6 to +1.6 kPa   | 400 mbar | 800 mbar          | B      |
| -25 to +25 mbar   | -2.5 to +2.5 kPa   | 400 mbar | 800 mbar          | B      |
| -40 to +40 mbar   | -4 to +4 kPa       | 400 mbar | 800 mbar          | B      |
| -60 to +60 mbar   | -6 to +6 kPa       | 1 bar    | 2 bar             | B      |
| -100 to +100 mbar | -10 to +10 kPa     | 1 bar    | 2 bar             | B      |
| -160 to +160 mbar | -16 to +16 kPa     | 2.5 bar  | 5 bar             | B      |
| -250 to +250 mbar | -25 to +25 kPa     | 2.5 bar  | 5 bar             | B      |

\*) Measuring range with increased overload and bursting pressure capability (see 'Order codes/Special aspects')

## 7.3 Output sizes

### Analog outputs

The number of analogue outputs depends on the device version.

| Device version           | Temperature<br>Humidity | Temperature<br>Humidity<br>Differential pres-<br>sure |
|--------------------------|-------------------------|---|
| Number of analog outputs | 2                       | 3   |

The output signal can be set in the configuration. Upon delivery, all of the analog outputs are set to the same signal (see the type plate).

| Output signal        | 0 to 20 mA<br>4 to 20 mA | 0 to 10 V<br>2 to 10 V<br>1 to 5 V |
|----------------------|--------------------------|------------------------------------|
| Signal range         | 0.0 to 21.5 mA           | 0.0 to 10.5 V                      |
| Load impedance $R_L$ | $\leq 600 \Omega$        | $\geq 2 \text{ k}\Omega$           |
| Turn down            | 4:1                      | 4:1                                |

### Switch outputs

The assignment of the switch outputs to the channels can be configured freely.

|                           |   |
|---------------------------|---|
| Number of switch outputs  | 4   |
| Type                      | Potential-free semiconductor switch (MOS-FET)         |
| Progr. switching function | 1-pole open contact (NO)<br>1-pole break contact (NC) |
| Max. switching voltage    | 3 to 32 V AC/DC                                       |
| Max. switching current    | 0.25 A  |
| Max. switching output     | 8 W / 8 VA<br>$R_{ON} \leq 4 \Omega$                  |

## 7.4 Measuring accuracy

### 7.4.1 Humidity

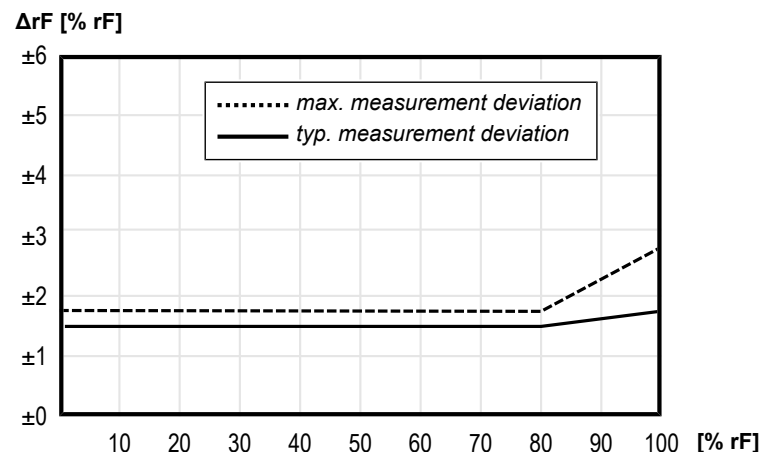


Fig. 161: Measurement deviation over the entire temperature range

|                       |                 |
|-----------------------|-----------------|
| Measurement deviation | see diagram     |
| Hysteresis            | ± 1.0 %rH       |
| Typical repeatability | ± 0.21 %rH      |
| Long-term stability   | ≤ 0.25 %rH/year |

If the sensor is operated continuously at a humidity of over 80 % rH, the measurement error can still exceed the specified maximum value for some time after the humidity has been quickly reduced.

### 7.4.2 Temperature

The limit values apply to plastic and all remote mounted sensors.

In order for stainless steel sensors mounted directly on the unit to maintain the specified measuring accuracy, an air flow of min. 0.1 m/s must be ensured.

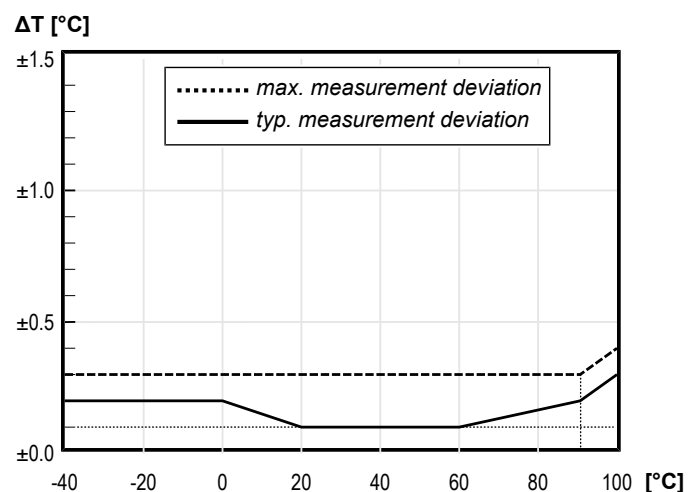


Fig. 162: Typical measurement deviation of the temperature

|                       |               |
|-----------------------|---------------|
| Measurement deviation | see diagram   |
| Typical repeatability | ± 0.15 °C     |
| Long-term drift       | < 0.3 °C/Year |

### 7.4.3 Differential pressure

- The specifications for the measurement error include linearity and hysteresis.
- All specifications relate to the basic measuring range (see the type plate) and a compensation range of -20 to +70°C.

#### Sensor type A

| Measuring range   |                    | Measurement error [%] |      | Tc-zero [%/10K] |      | Tc span [%/10K] |      |
|-------------------|--------------------|-----------------------|------|-----------------|------|-----------------|------|
|                   |                    | Typ.                  | Max. | Typ.            | Max. | Typ.            | Max. |
|                   | 0 to 25 Pa         | 1.5                   | 2.5  | 0.5             | 1.0  | 0.3             | 0.6  |
|                   | 0 to 40 Pa         | 1.0                   | 2.0  | 0.5             | 1.0  | 0.2             | 0.4  |
|                   | 0 to 60 Pa         | 0.75                  | 1.5  | 0.3             | 0.6  | 0.2             | 0.4  |
| 0 to 1 mbar       | 0 to 100 Pa        | 0.5                   | 1.0  | 0.3             | 0.6  | 0.2             | 0.4  |
| 0 to 1.6 mbar     | 0 to 160 Pa        | 0.5                   | 1.0  | 0.3             | 0.6  | 0.2             | 0.4  |
| 0 to 2.5 mbar     | 0 to 250 Pa        | 0.5                   | 1.0  | 0.3             | 0.6  | 0.2             | 0.4  |
| 0 to 4 mbar       | 0 to 400 Pa        | 0.5                   | 1.0  | 0.15            | 0.3  | 0.05            | 0.1  |
| 0 to 6 mbar       | 0 to 600 Pa        | 0.5                   | 0.75 | 0.15            | 0.25 | 0.05            | 0.1  |
| 0 to 10 mbar      | 0 to 1 kPa         | 0.25                  | 0.5  | 0.1             | 0.2  | 0.05            | 0.1  |
|                   | -20 ... +80 Pa     | 0,5                   | 1,0  | 0,3             | 0,6  | 0,2             | 0,4  |
|                   | -12,5 ... +12,5 Pa | 1,5                   | 2,5  | 0,5             | 1,0  | 0,3             | 0,6  |
|                   | -25 ... +25 Pa     | 1,0                   | 2,0  | 0,4             | 0,8  | 0,2             | 0,4  |
|                   | -40 to +40 Pa      | 0.75                  | 1.5  | 0.3             | 0.6  | 0.2             | 0.4  |
|                   | -60 to +60 Pa      | 0.5                   | 1.0  | 0.3             | 0.6  | 0.2             | 0.4  |
| -1 to +1 mbar     | -100 to +100 Pa    | 0.5                   | 1.0  | 0.3             | 0.6  | 0.2             | 0.4  |
| -1.6 to +1.6 mbar | -160 to +160 Pa    | 0.5                   | 1.0  | 0.3             | 0.6  | 0.2             | 0.4  |
| -2.5 to +2.5 mbar | -250 to +250 Pa    | 0.5                   | 1.0  | 0.15            | 0.3  | 0.05            | 0.1  |
| -4 to +4 mbar     | -400 to +400 Pa    | 0.5                   | 1.0  | 0.1             | 0.2  | 0.05            | 0.1  |
| -6 to +6 mbar     | -600 to +600 Pa    | 0.5                   | 0.75 | 0.1             | 0.15 | 0.05            | 0.1  |
| -10 to +10 mbar   | -1 to +1 kPa       | 0.25                  | 0.5  | 0.05            | 0.1  | 0.05            | 0.1  |

**Sensor type B**

| Measuring range   |                  | Measurement error<br>[%] |      | Tc-zero<br>[%/10K] |      | Tc span<br>[%/10K] |      |
|-------------------|------------------|--------------------------|------|--------------------|------|--------------------|------|
|                   |                  | Typ.                     | Max. | Typ.               | Max. | Typ.               | Max. |
| 0 to 4 mbar       | 0 to 400 Pa      | 0.5                      | 1.0  | 0.15               | 0.3  | 0.05               | 0.1  |
| 0 to 6 mbar       | 0 to 600 Pa      | 0.5                      | 0.75 | 0.15               | 0.25 | 0.05               | 0.1  |
| 0 to 10 mbar      | 0 to 1 kPa       | 0.25                     | 0.5  | 0.1                | 0.2  | 0.05               | 0.1  |
| 0 to 16 mbar      | 0 to 1.6 kPa     | 0.25                     | 0.5  | 0.15               | 0.3  | 0.05               | 0.1  |
| 0 to 25 mbar      | 0 to 2.5 kPa     | 0.25                     | 0.5  | 0.15               | 0.25 | 0.05               | 0.1  |
| 0 to 40 mbar      | 0 to 4 kPa       | 0.25                     | 0.5  | 0.1                | 0.2  | 0.05               | 0.1  |
| 0 to 60 mbar      | 0 to 6 kPa       | 0.25                     | 0.5  | 0.1                | 0.2  | 0.05               | 0.1  |
| 0 to 100 mbar     | 0 to 10 kPa      | 0.25                     | 0.5  | 0.1                | 0.15 | 0.05               | 0.1  |
| 0 to 160 mbar     | 0 to 16 kPa      | 0.25                     | 0.5  | 0.05               | 0.1  | 0.05               | 0.1  |
| 0 to 250 mbar     | 0 to 25 kPa      | 0.25                     | 0.5  | 0.05               | 0.1  | 0.05               | 0.1  |
| -2.5 to +2.5 mbar | -250 to +250 Pa  | 0.5                      | 1.0  | 0.15               | 0.3  | 0.05               | 0.1  |
| -4 to +4 mbar     | -400 to +400 Pa  | 0.5                      | 1.0  | 0.1                | 0.2  | 0.05               | 0.1  |
| -6 to +6 mbar     | -600 to +600 Pa  | 0.5                      | 0.75 | 0.1                | 0.15 | 0.05               | 0.1  |
| -10 to +10 mbar   | -1 to +1 kPa     | 0.25                     | 0.5  | 0.05               | 0.1  | 0.05               | 0.1  |
| -16 to +16 mbar   | -1.6 to +1.6 kPa | 0.25                     | 0.5  | 0.1                | 0.2  | 0.05               | 0.1  |
| -25 to +25 mbar   | -2.5 to +2.5 kPa | 0.25                     | 0.5  | 0.1                | 0.15 | 0.05               | 0.1  |
| -40 to +40 mbar   | -4 to +4 kPa     | 0.25                     | 0.5  | 0.05               | 0.1  | 0.05               | 0.1  |
| -60 to +60 mbar   | -6 to +6 kPa     | 0.25                     | 0.5  | 0.05               | 0.1  | 0.05               | 0.1  |
| -100 to +100 mbar | -10 to +10 kPa   | 0.25                     | 0.5  | 0.05               | 0.1  | 0.05               | 0.1  |
| -160 to +160 mbar | -16 to +16 kPa   | 0.25                     | 0.5  | 0.05               | 0.1  | 0.05               | 0.1  |
| -250 to +250 mbar | -25 to +25 kPa   | 0.25                     | 0.5  | 0.05               | 0.1  | 0.05               | 0.1  |

## 7.5 Digital interfaces

### USB interface

|               |                        |
|---------------|------------------------|
| USB On The Go | 2.0                    |
| Data rate     | 12 Mbit/s (Full Speed) |
| Connection    | Micro USB type B       |
| Communication | Host/Device mode       |

### Modbus RTU interface

|                      |   |
|----------------------|---|
| interface            | RS 485  |
| Report               | Modbus RTU  |
| Modbus specification | Application Protocol Specification V1.1b3 (26 April 2012) |
| Address              | 1 ... 247   |
| Baud rate            | 2400 ... 115200 baud                                      |
| Parity               | Even, uneven, parity                                      |
| Stop bits            | 1...2   |

### IO-Link Interface

|                         |                      |
|-------------------------|----------------------|
| Connection              | M12-4 Class A        |
| IO-Link specification   | V1.1                 |
| Pin assignment          | as per IEC 60974-5-2 |
| Device energy supply    | max. 200 mA          |
| Data transmission rates | COM 2 = 38.4 kBd     |

## 7.6 Auxiliary energy

**NOTICE! Only a CE-compliant mains adapter with a slow 200 mA fuse may be used in the power supply circuit for ATEX devices.**

|                                    |                              |
|------------------------------------|------------------------------|
| Nominal voltage                    | 24 V AC/DC                   |
| Admissible operating voltage $U_b$ | 19.2 to 28.8 V AC/DC         |
| Power consumption                  | Typ. 2W (VA)<br>Max. 3W (VA) |

## 7.7 Operating conditions

|                           | Standard   | ATEX          |
|---------------------------|--|---------------|
| Ambient temperature range | -20 to +70 °C  | -20 to +60 °C |
| Medium temperature range  | -20 to +70 °C  | -20 to +60 °C |
| Storage temperature range | -20 to +70 °C  | -20 to +70 °C |
| Ingress Protection Code   | IP65   | IP65          |
| EMC                       | EN 61326-1:2013<br>EN 61326-2-3:2013                   |               |
| ATEX                      | EN IEC 60079-0:2018<br>EN 60079-15:2010<br>EN 60079-31 |               |
| RoHS                      | EN IEC 63000:2018                                      |               |

**CAUTION! Avoid contact between the temperature/humidity sensor and the following chemicals and substances:**

- Contaminated air/air that is not oil-free (e.g. jets of air from an air gun)
- Volatile chemicals such as solvents and organic (carbonated) compounds

- Ketene, acetone, ethanol, isopropyl alcohol, toluene and so on are known for causing a drift in the measured humidity value. In most cases, this is not reversible. Please note that these chemicals are integral parts of epoxides, adhesives, glues etc. and can degas during baking/curing.
- Acids and bases such as HCl, H<sub>2</sub>SO<sub>4</sub>, HNO<sub>3</sub>, and NH<sub>3</sub> can affect the sensor irreversibly, and should be avoided. Ozone in high concentrations or H<sub>2</sub>O<sub>2</sub> has the same effect and should also be avoided.
- The sensor must not be allowed to come into contact with cleaning agents (e.g. alcohol and detergents). The application of cleaning agents to the sensor can cause the measured value to drift or the sensor to fail completely.

## 7.8 Display

|                        |                         |
|------------------------|-------------------------|
| Display                | Full graphic LC display |
| Resolution             | 128 x 64 Pixel          |
| Backlight              | RGB                     |
| Measured value display | 6 digits                |

## 7.9 Construction design

| Process connection                                |      | Outer Ø | Inner Ø |
|---|------|---------|---------|
| CK screw connections made of aluminium            | Hose | 6 mm    | 4 mm    |
|   | Hose | 8 mm    | 6 mm    |
| Pneumatic connector socket in nickel-plated brass | Hose | 6 mm    | 4 mm    |
|   | Hose | 8 mm    | 6 mm    |
| Cutting ring connection in stainless steel        | Pipe | 6 mm    |         |
|   | Pipe | 8 mm    |         |

### Electrical connection

#### *Devices with analog and switch outputs*

|  |              |
|--|--------------|
| Connector 1 : Auxiliary energy, output   | 5-pin male   |
| Connector 2 : Switch outputs             | 8-pin male   |
| Connector 3: Temperature/humidity sensor | 4-pin female |

#### *Device with Modbus*

|  |              |
|--|--------------|
| Connector 1: Modbus IN                   | 5-pin male   |
| Connector 2: Modbus OUT                  | 5-pin female |
| Connector 3: Temperature/humidity sensor | 4-pin female |

|                                  |                    |
|----------------------------------|--------------------|
| Installation position            | User-defined       |
| Dimensions (without connections) | 120 x 81.5 x 95 mm |
| Weight                           | Max. 380 g         |

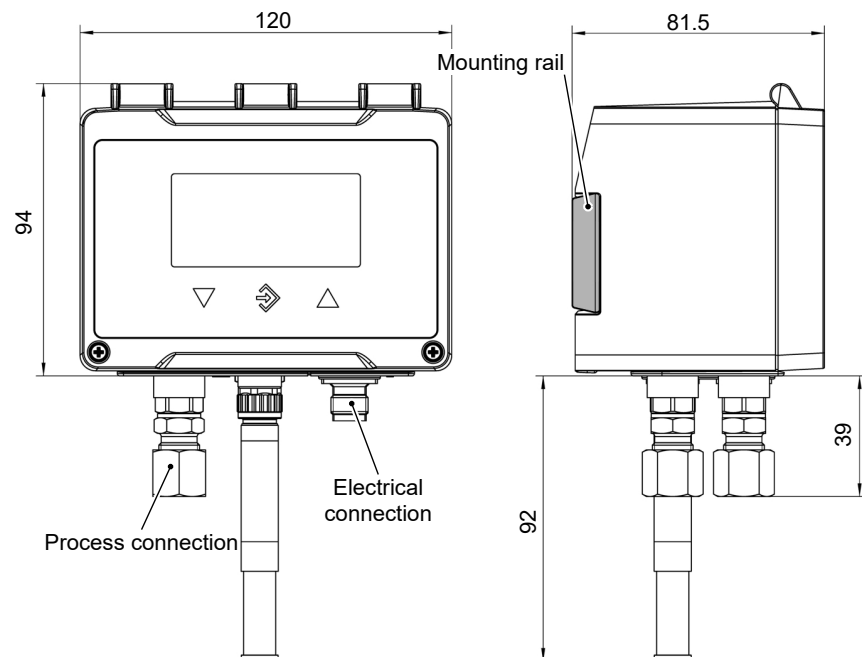
### 7.9.1 Materials

| Materials of the parts in contact with the medium |  |
|---|--|
| Pressure sensor                                   | Silicon, PVC, FKM, aluminium, brass, stainless steel   |
| FF12FK  | PBT (20% GF), stainless steel, FR4, solder resist, silicon, tin, copper, nickel, silver, ceramic       |
| FF12FE  | PBT (20% GF), stainless steel, PTFE, FR4, solder resist, silicon, tin, copper, nickel, silver, ceramic |
| FF12FV  | Stainless steel, FR4, solder resist, silicon, tin, copper, nickel, silver, ceramic                     |
| FF12FP  | Stainless steel, PTFE, FR4, solder resist, silicon, tin, copper, nickel, silver, ceramic               |

| Materials of the parts in contact with the environment |  |
|--|--|
| All versions   | Polyester, PET, polyamide 6.6, aluminium, nickel-plated brass, stainless steel |
| Sensor connection ATEX                                 | Zinc alloy, nickel-plated  |

### 7.9.2 Dimensional drawings

All dimensions in mm unless otherwise stated



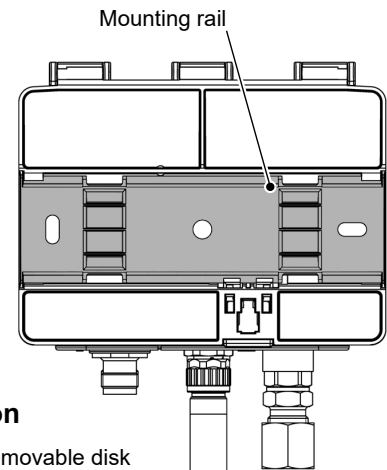
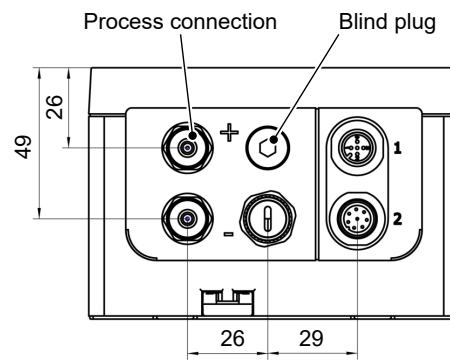
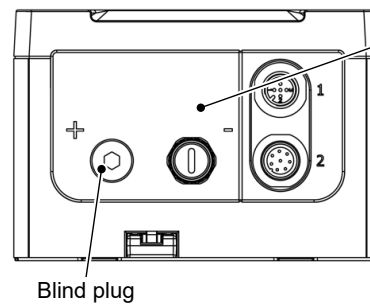
**(a) Version with pressure connection****(b) Version without pressure connection**

Fig. 163: Dimensional drawing

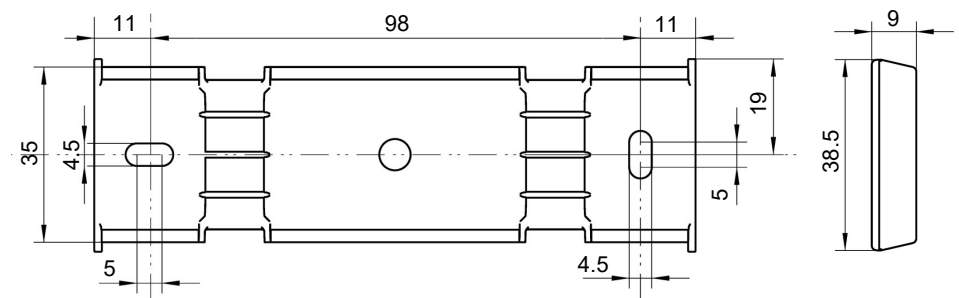
**Mounting rail**

Fig. 164: Mounting rail

## Process connection

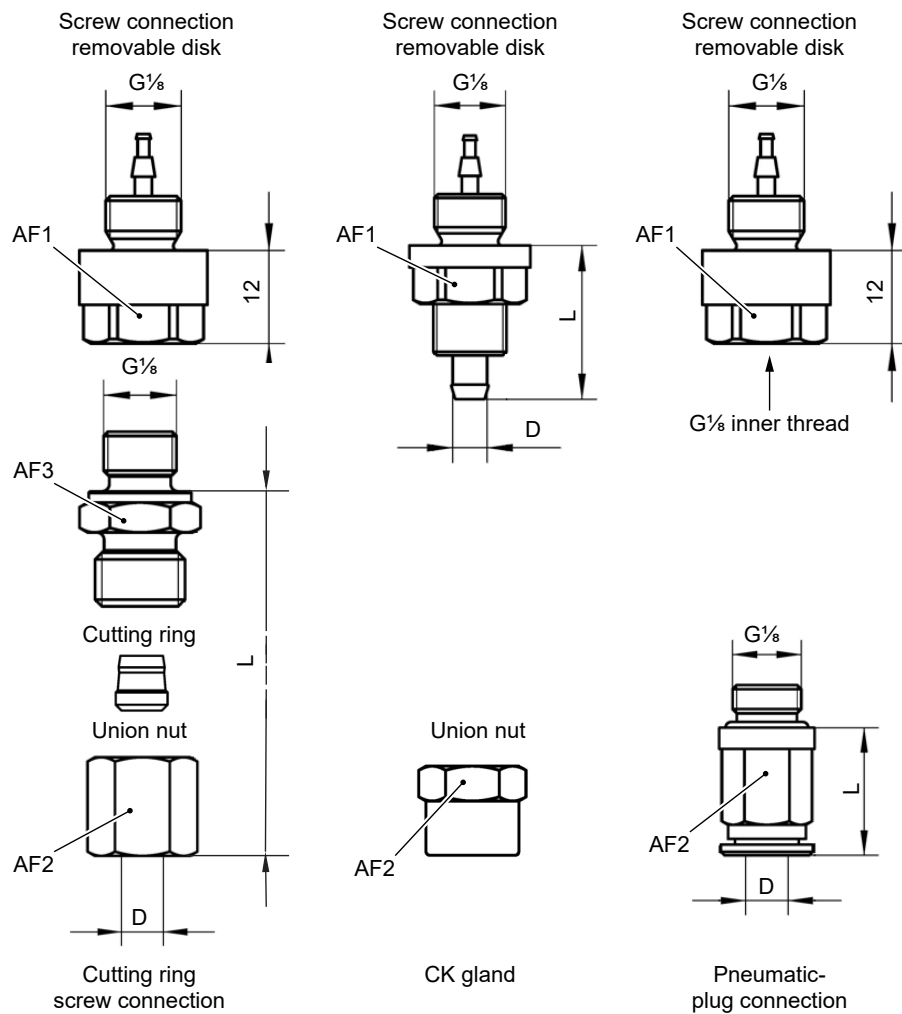
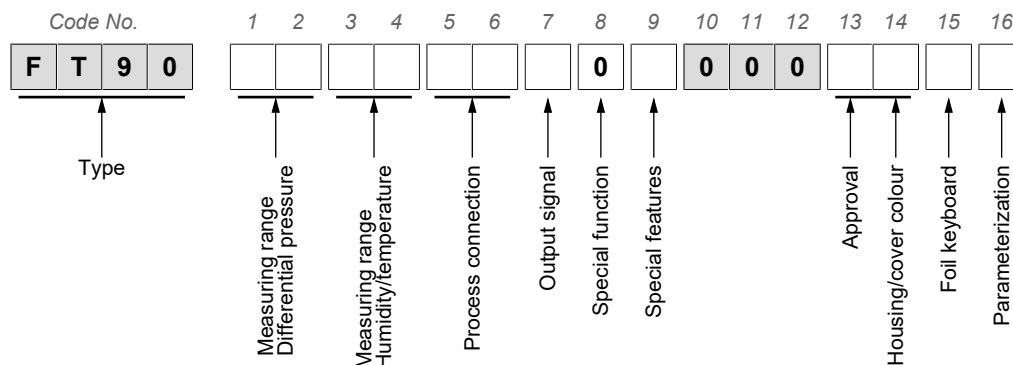


Fig. 165: Options for the process connection

| Process connection            |                | D | d   | L    | SW1 | SW2 | SW3 |
|-------------------------------|----------------|---|-----|------|-----|-----|-----|
| Cutting ring screw connection | Pipe           | 6 | --- | 23.5 | 14  | 14  | 14  |
|                               |                | 8 | --- | 24.5 | 14  | 17  | 14  |
| CK screw connection           | Hose           | 6 | 4   | 21   | 14  | 12  | --- |
|                               |                | 8 | 6   | 21   | 14  | 14  | --- |
| Pneumatic plug-in connection  | Pneumatic hose | 6 | 4   | 18   | 14  | 11  | --- |
|                               |                | 8 | 6   | 20.5 | 14  | 13  | --- |

D: Outer diameter; d: Inner diameter

## 8 Order code



### Differential pressure measuring range:

| [1,2] |   | [1,2] |                    | [1,2] |                |
|-------|---|-------|--------------------|-------|----------------|
| 00    | Without differential pressure measuring |       |                    |       |                |
|       |   | D1    | 0 ... 25 Pa        |       |                |
|       |   | D2    | 0 ... 40 Pa        |       |                |
|       |   | D3    | 0 ... 60 Pa        |       |                |
| 51    | 0 ... 1 mbar                            | D4    | 0 ... 100 Pa       |       |                |
| 97    | 0 ... 1,6 mbar                          | D5    | 0 ... 160 Pa       |       |                |
| 98    | 0 ... 2,5 mbar                          | D6    | 0 ... 250 Pa       |       |                |
| 52    | 0 ... 4 mbar                            | D7    | 0 ... 400 Pa       |       |                |
| 53    | 0 ... 6 mbar                            | D8    | 0 ... 600 Pa       |       |                |
| 54    | 0 ... 10 mbar                           | N1    | 0 ... 1 kPa        | D9    | 0 ... 1000 Pa  |
| 55    | 0 ... 16 mbar                           | N2    | 0 ... 1,6 kPa      | E1    | 0 ... 1600 Pa  |
| 56    | 0 ... 25 mbar                           | N3    | 0 ... 2,5 kPa      | E2    | 0 ... 2500 Pa  |
| 57    | 0 ... 40 mbar                           | N4    | 0 ... 4 kPa        | E3    | 0 ... 4000 Pa  |
| 58    | 0 ... 60 mbar                           | N5    | 0 ... 6 kPa        | E4    | 0 ... 6000 Pa  |
| 59    | 0 ... 100 mbar                          | E5    | 0 ... 10 kPa       | 1P    | 0 ... 10000 Pa |
| 60    | 0 ... 160 mbar                          | E6    | 0 ... 16 kPa       | 2P    | 0 ... 16000 Pa |
| 82    | 0 ... 250 mbar                          | E7    | 0 ... 25 kPa       | 3P    | 0 ... 25000 Pa |
|       |   | L0    | -20 ... +80 Pa     |       |                |
|       |   | L4    | -12,5 ... +12,5 Pa |       |                |
|       |   | L5    | -25 ... +25 Pa     |       |                |
|       |   | R6    | -40 ... +40 Pa     |       |                |
|       |   | 2L    | -60 ... +60 Pa     |       |                |
| A4    | -1 ... +1 mbar                          | L7    | -100 ... +100 Pa   |       |                |
| A5    | -1,6 ... +16 mbar                       | R7    | -160 ... +160 Pa   |       |                |
| A6    | -2,5 ... +2,5 mbar                      | L6    | -250 ... +250 Pa   |       |                |
| A7    | -4 ... +4 mbar                          | R1    | -400 ... +400 Pa   |       |                |
| A8    | -6 ... +6 mbar                          | R2    | -600 ... +600 Pa   |       |                |
| A9    | -10 ... +10 mbar                        | L8    | -1 ... +1 kPa      |       |                |
| B1    | -16 ... +16 mbar                        | L9    | -1,6 ... +1,6 kPa  |       |                |
| B2    | -25 ... +25 mbar                        | M6    | -2,5 ... +2,5 kPa  |       |                |
| C5    | -40 ... +40 mbar                        | M7    | -4 ... +4 kPa      |       |                |
| B3    | -60 ... +60 mbar                        | M8    | -6 ... +6 kPa      |       |                |
| B4    | -100 ... +100 mbar                      | R8    | -10 ... +10 kPa    |       |                |
| R5    | -160 ... +160 mbar                      | R9    | -16 ... +16 kPa    |       |                |

| [1,2]     | [1,2]              | [1,2]                     |
|-----------|--------------------|---------------------------|
| <b>B6</b> | -250 ... +250 mbar | <b>T1</b> -25 ... +25 kPa |

**Humidity and temperature measuring range:**

| [3,4]     | Measuring range                                   | Sensor material                             |
|-----------|---|---|
| <b>10</b> | Humidity 0 to 100% rH<br>Temperature -40 to 100°C | Plastic with stainless steel filter         |
| <b>20</b> | Humidity 0 to 100% rH<br>Temperature -40 to 100°C | Stainless steel with stainless steel filter |
| <b>30</b> | Humidity 0 to 100% rH<br>Temperature -40 to 100°C | Stainless steel with PTFE Filter            |
| <b>40</b> | Humidity 0 to 100% rH<br>Temperature -40 to 100°C | Plastic with PTFE Filter                    |

**Process connection:**

| [5,6]   |
|---|
| <b>00</b> without   |
| <b>18</b> G½ female thread (aluminium)                                    |
| <b>40</b> Aluminium CK screw connection for 6/4 mm hose                   |
| <b>41</b> Aluminium CK screw connection for 8/6 mm hose                   |
| <b>P6</b> Nickel-plated brass pneumatic plug-in connector for 6/4 mm hose |
| <b>P8</b> Nickel-plated brass pneumatic plug-in connector for 8/6 mm hose |
| <b>24</b> Stainless steel cutting ring connection for 6 mm pipe           |
| <b>25</b> Stainless steel cutting ring connection for 8 mm pipe           |

**Output signal:**

| [7]   |
|---|
| <b>0</b> without                                      |
| <i>Switchable, factory pre-set:</i>                   |
| <b>C</b> 0 ... 10 V                                   |
| <b>A</b> 0 ... 20 mA                                  |
| <b>P</b> 4 ... 20 mA                                  |
| <i>Digital interface:</i>                             |
| <b>M</b> RS485 Modbus RTU (without switching outputs) |
| <b>N</b> RS485 Modbus RTU (with 4 switching outputs)  |
| <b>I</b> IO-Link (with 4 switching outputs)           |

**Special functions:**

| [8]           |
|---------------|
| <b>0</b> None |

**Special aspects:**

| [9] |  |
|-----|--|
| 0   | None   |
| 1   | Sensor with increased overload and bursting pressure strength of 1 bar only for the following pressure ranges: |
| 52  | 0 to 4 mbar  |
| D7  | 0 to 400 Pa  |
| 53  | 0 to 6 mbar  |
| D8  | 0 to 600 Pa  |
| 54  | 0 to 10 mbar   |
| N1  | 0 to 1 kPa   |
| A6  | -2.5 to +2.5 mbar  |
| L6  | -250 to +250 Pa  |
| A7  | -4 to +4 mbar  |
| R1  | -400 to +400 Pa  |

| [9]       |                 |           |                 |
|-----------|-----------------|-----------|-----------------|
| <b>A8</b> | -6 to +6 mbar   | <b>R2</b> | -600 to +600 Pa |
| <b>A9</b> | -10 to +10 mbar | <b>L8</b> | -1 to +1 kPa    |

**Approval and housing/lid colour:**

| [13,14]   | Approval            | Housing colour                | Lid colour |
|-----------|---------------------|-------------------------------|------------|
| <b>00</b> | None                | Anthracite                    | Green      |
| <b>R1</b> | ATEX zones 2 and 22 | Black<br>(conductive housing) | Black      |

**Membrane keypad:**

| [15]     |         |
|----------|---------|
| <b>0</b> | FISCHER |
| <b>1</b> | Neutral |

**Configuration:**

| [16]     | Preset at the factory <sup>*)</sup> |
|----------|-------------------------------------|
| <b>0</b> | 'Standard' configuration            |
| <b>Z</b> | 'Customer-specific' configuration   |

<sup>\*)</sup> The configuration can be changed on the device at any time. The delivery state is defined by the order code. For details, see the operating instructions.

**8.1 Accessories****M12 connection cables**

| Designation                                     | No. of poles | Length | Order no. |
|---|--------------|--------|-----------|
| PUR connection cable with M12 coupling, A-coded | 4 poles      | 2 m    | 06401993  |
|   |              | 5 m    | 06401994  |
|   |              | 7 m    | 06401563  |
|   |              | 10 m   | 06401572  |
|   | 5 poles      | 2 m    | 06401995  |
|   |              | 5 m    | 06401996  |
|   |              | 7 m    | 06401564  |
|   |              | 10 m   | 06401573  |
|   | 8 poles      | 2 m    | 09001844  |
|   |              | 5 m    | 09011146  |
|   |              | 10 m   | 09011016  |

**Connection cables for humidity and temperature sensor**

| Designation                                  | No. of poles | Length | Order no. |
|--|--------------|--------|-----------|
| M12 coupling/M12 straight connector, A-coded | 4 poles      | 2 m    | 09011363  |
|  |              | 5 m    | 09011364  |
|  |              | 10 m   | 09011365  |
|  |              | 15 m   | 09011366  |

**Mounting flange for ventilation ducts**

|   |          |
|---|----------|
| Universal flange for square and round pipes | 06411826 |
|---|----------|

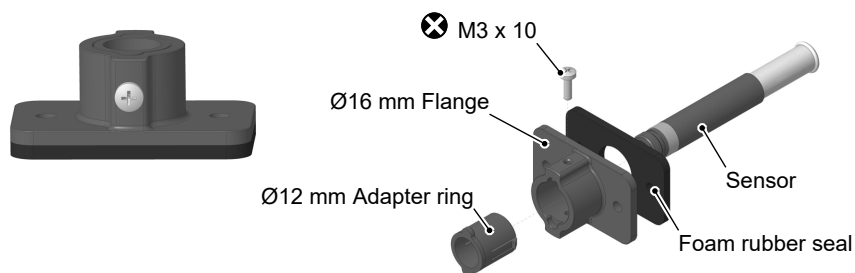


Fig. 166: Universal mounting flange for humidity and temperature sensors

### Spare parts

| FF12 humidity and temperature sensor                                |  | Order no. |
|---|--|-----------|
| Smooth sensor made from plastic with stainless steel filter         |  | FF12 FK   |
| Smooth sensor made from stainless steel with stainless steel filter |  | FF12 FV   |
| Smooth sensor made from stainless steel with PTFE Filter            |  | FF12 FP   |
| Smooth sensor made from plastic with PTFE Filter                    |  | FF12 FE   |

### USB interface

| Designation                                      |       | Order no. |
|--|-------|-----------|
| Connection cable, USB-A on USB micro-B connector | 2 m   | 09007340  |
| Stick USB 2.0, USB-A/micro-B connector           | 16 GB | 09007316  |

### Modbus

| Designation                 |                   | Order no. |
|-----------------------------|-------------------|-----------|
| Modbus terminating resistor | 120 ohm socket    | 06411280  |
|                             | 120 ohm connector | 06411279  |

### Software

The configuration software inTouch is available at [fischermesstechnik.de](http://fischermesstechnik.de) as a download.

### Accessories for outdoor use

| Designation | Material        | Order No. |
|-------------|-----------------|-----------|
| Canopy      | Stainless steel | 02006130  |

### Software

The inTouch configuration software is available for download on our website ([fischermesstechnik.de](http://fischermesstechnik.de)).

## 9 Attachments

### 9.1 EU Declaration of Conformity



(Translation) **CE**

#### EU Declaration of Conformity

For the product described as follows

**Product designation** Humidity and temperature measuring device  
**Type designation** FT90 ... 00##

it is hereby declared that it corresponds with the basic requirements specified in the following designated directives:

2014/30/EU  
 2011/65/EU  
 (EU) 2015/863

EMC Directive  
 RoHS Directive  
 Delegated Directive amending Annex II to Directive 2011/65/EU

The products were tested in compliance with the following standards.

#### Electromagnetic compatibility (EMC)

DIN EN 61326-1:2013-07  
 EN 61326-1:2013  
 DIN EN 61326-2-3:2013-07  
 EN 61326-2-3:2013

Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements  
 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-3: Particular requirements - Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning

#### RoHS Directive (RoHS3)

DIN EN IEC 63000:2019-05  
 EN IEC 63000:2018

Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Also they were subjected to the conformity assessment procedure „Internal production control“.

Sole responsibility for the issue of this declaration of conformity in relation to fulfilment of the fundamental requirements and the production of the technical documents is with the manufacturer.

**Manufacturer** FISCHER Mess- und Regeltechnik GmbH  
 Bielefelder Str. 37a  
 32107 Bad Salzuflen, Germany  
 Tel. +49 (0)5222 974 0

**Documentation representative** Torsten Malischewski  
 General Manager R&D

The devices bear the following marking:



Bad Salzuflen  
 25 Okt 2022

T. Malischewski  
 General manager R&D

09010422 • CE\_EN\_FT90 • Rev. ST4-B • 10/22



1 / 1

Fig. 167: CE\_DE\_FT90



(Translation)

## EU Declaration of Conformity

For the product described as follows

**Product designation**

**Humidity and temperature measuring device**

**Type designation**

**FT90 ... R1##**

it is hereby declared that it corresponds with the basic requirements specified in the following designated directives:

2014/30/EU

EMC Directive

2014/34/EU

ATEX Directive

2011/65/EU

RoHS Directive

(EU) 2015/863

Delegated Directive amending Annex II to Directive 2011/65/EU

The products were tested in compliance with the following standards.

### Electromagnetic compatibility (EMC)

DIN EN 61326-1:2013-07  
EN 61326-1:2013

Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

DIN EN 61326-2-3:2013-07  
EN 61326-2-3:2013

Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-3: Particular requirements - Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning

### Explosive atmospheres (ATEX)

DIN EN IEC 60079-0:2019-09  
EN IEC 60079-0:2018

Explosive atmospheres - Part 0: Equipment - General requirements

DIN EN IEC 60079-7/A1:2018-07  
EN IEC 60079-7:2015/A1:2018

Explosive atmospheres - Part 7: Equipment protection by increased safety "e" (IEC 60079-7:2015/A1:2017)

DIN EN 60079-31:2014-12  
EN 60079-31:2014

Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosure "t"

### RoHS Directive (RoHS 3)

DIN EN IEC 63000:2019-05  
EN IEC 63000:2018

Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Also they were subjected to the conformity assessment procedure „Internal production control“.

Sole responsibility for the issue of this declaration of conformity in relation to fulfilment of the fundamental requirements and the production of the technical documents is with the manufacturer.

**Manufacturer**

**FISCHER Mess- und Regeltechnik GmbH**

Bielefelder Str. 37a  
32107 Bad Salzuflen, Germany  
Tel. +49 (0)5222 974 0

**Documentation representative**

Torsten Malischewski  
General Manager R&D

**The devices bear the following marking:**



Zone 2

Ex II 3G Ex ec IIC T4 Gc

Zone 22

Ex II 3D Ex tc IIIB T125°C Dc

*ppa. T. Malischewski*

Bad Salzuflen  
25 Okt 2022

T. Malischewski  
General manager R&D

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Fig. 168: CE\_DE\_FT90\_ATEX

## 9.2 UKCA Declaration of Conformity



(Translation) **UK  
CA**

### UKCA Declaration of Conformity

For the product described as follows

**Product designation** Humidity and temperature measuring device

**Type designation** FT90 ... 00##

is hereby declared to comply with the essential requirements, specified in the following UK regulations:

| <b>Statutory regulation No.</b> | <b>Description</b>   |
|---------------------------------|--|
| 2016 No. 1091                   | The Electromagnetic Compatibility Regulations 2016   |
| 2021 No. 422                    | The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (Amendment) Regulations 2021 |
| 2022 No. 1647                   | The Hazardous Substances and Packaging (Legislative Functions and Amendment) (EU Exit) Regulations 2020                        |

The products have been tested according to the following standards.

#### Electromagnetic compatibility (EMC):

|                            |   |
|----------------------------|---|
| BS EN 61326-1:2013-02-28   | Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements  |
| BS EN 61326-2-3:2013-02-28 | Electrical equipment for measurement, control and laboratory use. EMC requirements. Particular requirements. Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning. |

#### Restriction of Hazardous Substances (RoHS):

|                            |  |
|----------------------------|--|
| BS EN IEC 63000:2018-12-10 | Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances |
|----------------------------|--|

The sole responsibility for drawing up this declaration of conformity in relation to the fulfilment of the essential requirements and the preparation of the technical documentation lies with the manufacturer.

**Manufacturer** FISCHER Mess- und Regeltechnik GmbH  
Bielefelder Str. 37a  
32107 Bad Salzuflen, Germany  
Tel. +49 (0)5222 974 0

The devices bear the following marking:



Bad Salzuflen  
25 Okt 2022

*ppa. T. Malischewski*

T. Malischewski  
General manager R&D



Fig. 169: UKCA\_EN\_FT90



(Translation) **UK  
CA**

## UKCA Declaration of Conformity

For the product described as follows

**Product designation**

**Humidity and temperature measuring device**

**Type designation**

**FT90 ... R1##**

is hereby declared to comply with the essential requirements, specified in the following UK regulations:

| <b>Statutory regulation No.</b> | <b>Description</b>  |
|---------------------------------|---|
| 2016 No. 1107                   | <i>The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016</i>                    |
| 2016 No. 1091                   | <i>The Electromagnetic Compatibility Regulations 2016</i>   |
| 2021 No. 422                    | <i>The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (Amendment) Regulations 2021</i> |
| 2022 No. 1647                   | <i>The Hazardous Substances and Packaging (Legislative Functions and Amendment) (EU Exit) Regulations 2020</i>                        |

The products have been tested according to the following standards.

### Explosive atmospheres (ATEX):

|                                      |   |
|--------------------------------------|---|
| <i>BS EN IEC 60079-0:2018-07-09</i>  | <i>Explosive atmospheres. Equipment. General requirements</i>                     |
| <i>BS EN IEC 60079-15:2019-05-03</i> | <i>Explosive atmospheres. Equipment protection by type of protection "n"</i>      |
| <i>BS EN 60079-31:2014-07-31</i>     | <i>Explosive atmospheres. Equipment dust ignition protection by enclosure "t"</i> |

### Electromagnetic compatibility (EMC):

|                                   |  |
|-----------------------------------|--|
| <i>BS EN 61326-1:2013-02-28</i>   | <i>Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements</i>  |
| <i>BS EN 61326-2-3:2013-02-28</i> | <i>Electrical equipment for measurement, control and laboratory use. EMC requirements. Particular requirements. Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning.</i> |

### Restriction of Hazardous Substances (RoHS):

|                                   |   |
|-----------------------------------|---|
| <i>BS EN IEC 63000:2018-12-10</i> | <i>Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances</i> |
|-----------------------------------|---|

The sole responsibility for drawing up this declaration of conformity in relation to the fulfilment of the essential requirements and the preparation of the technical documentation lies with the manufacturer.

**Manufacturer**

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**The devices bear the following marking:**

**UK  
CA**

Zone 2 II 3G Ex ec IIC T4 Gc  
Zone 22 II 3D Ex tc IIIB T125°C Dc

**Bad Salzuflen  
25 Okt 2022**

T. Malischewski  
General manager R&D

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Fig. 170: UKCA\_EN\_FT90\_ATEX

**Notes**



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