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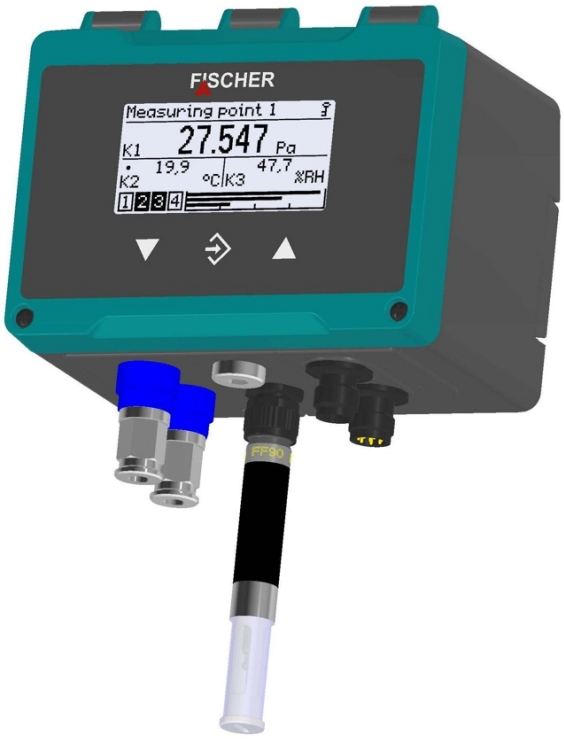
RoHS II COMPLIANT



Operating manual

FT90

Humidity and temperature measuring device
PRO-LINE®

with optional (differential) pressure measurement

09015247 • BA_EN_FT90 • Rev. ST4-B • 08/20

Masthead

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Version history

Rev. ST4-A 03/20	Version 1 (first edition)
Rev. ST4-B 08/20	Version 2 Ordering code changed

Table of contents

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:

Ⓔx II 3G Ex ec IIC T4 Gc

Dust explosion protection

Designation as per Directive 2014/34/EU:

Ⓔx II 3D Ex tc IIIB T125°C Dc

-20°C ≤ T_{amb} ≤ 60°C

2.3 Function diagram

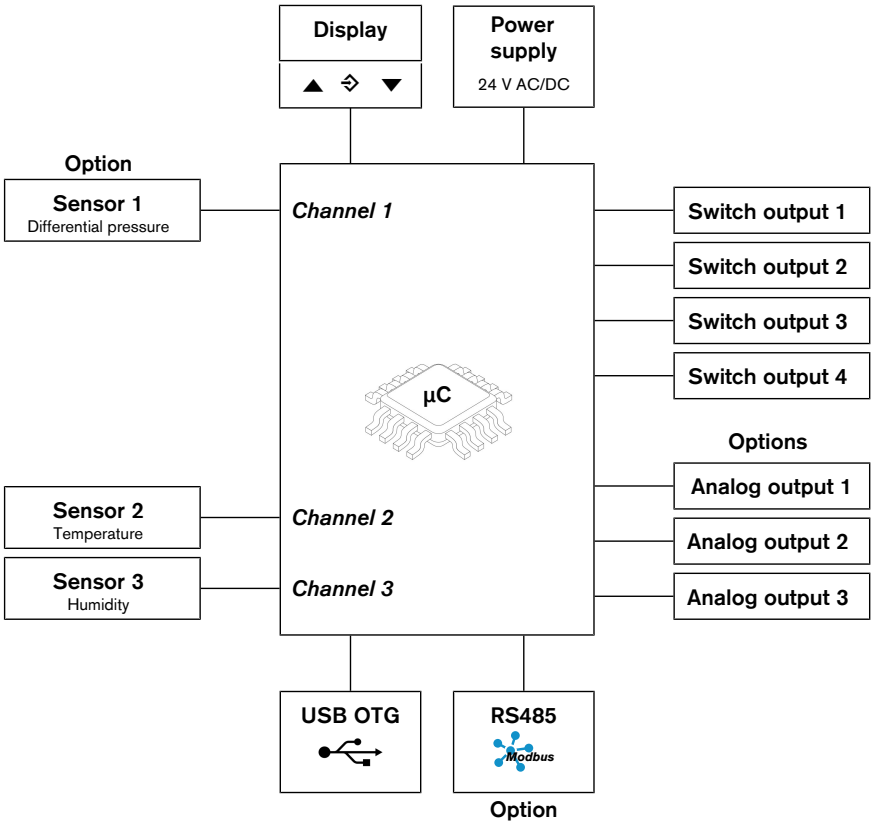


Fig. 1: Function diagram

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 Process connection

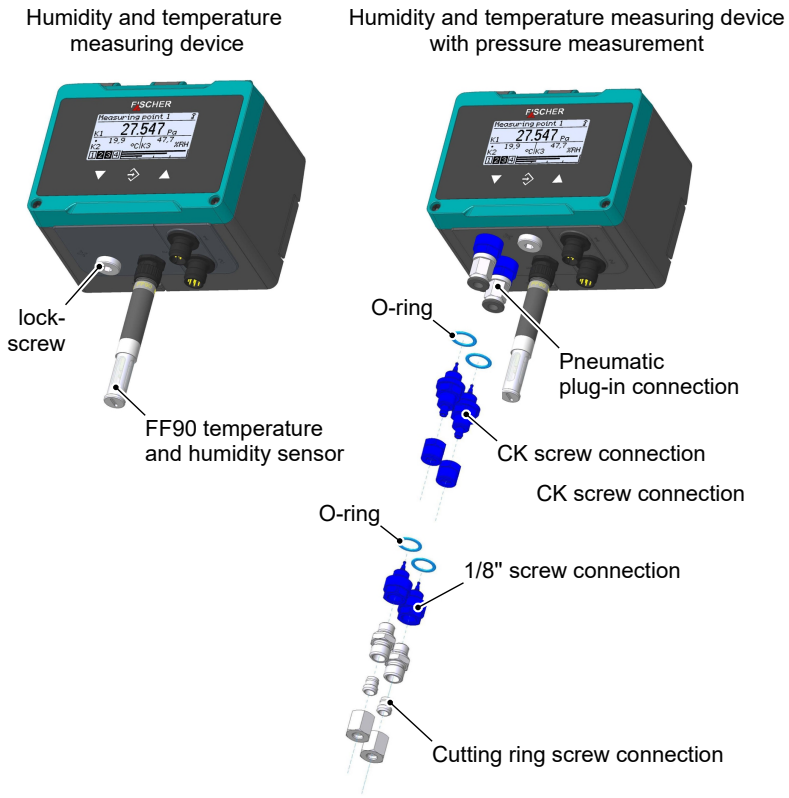


Fig. 2: Process connections

2.5.2 Electrical connection

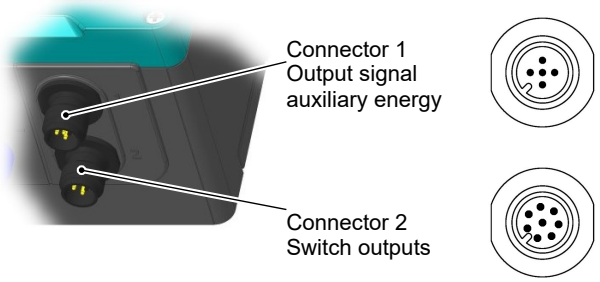


Fig. 3: Electric connections

2.5.3 ATEX model

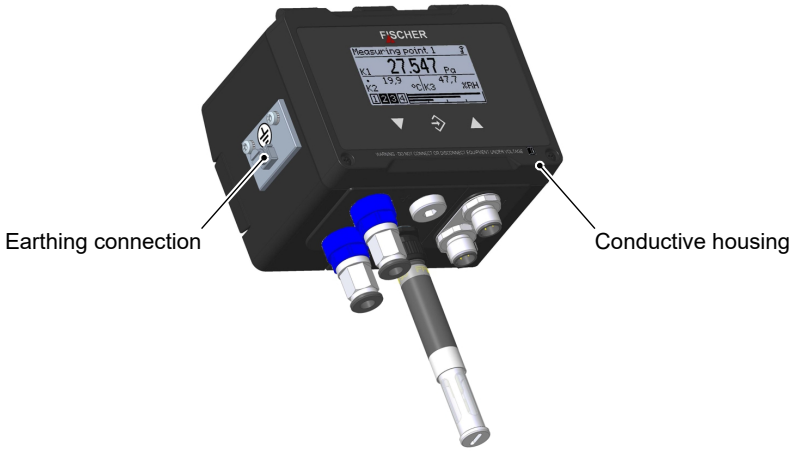


Fig. 4: ATEX model

2.5.4 Type plate

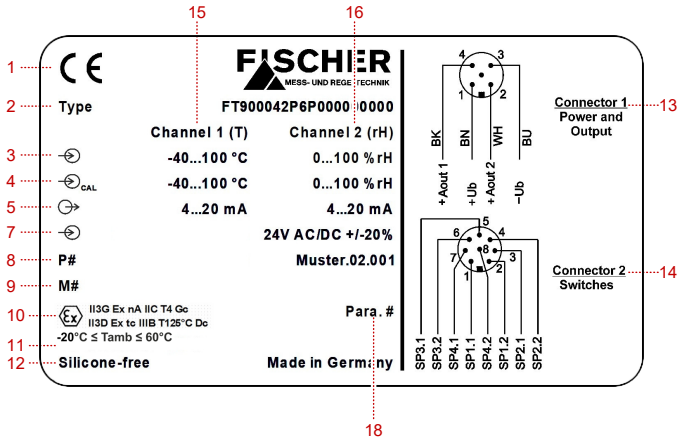


Fig. 5: Humidity/temperature type plate

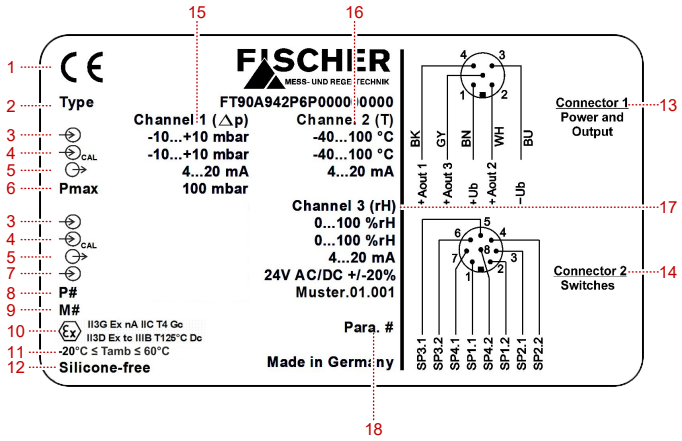


Fig. 6: Pressure/humidity/temperature type plate

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

CAL	Factory Setting
Pmax	Proof Pressure
P#	Production No.
M#	Customers Art.no.
Para. #	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.

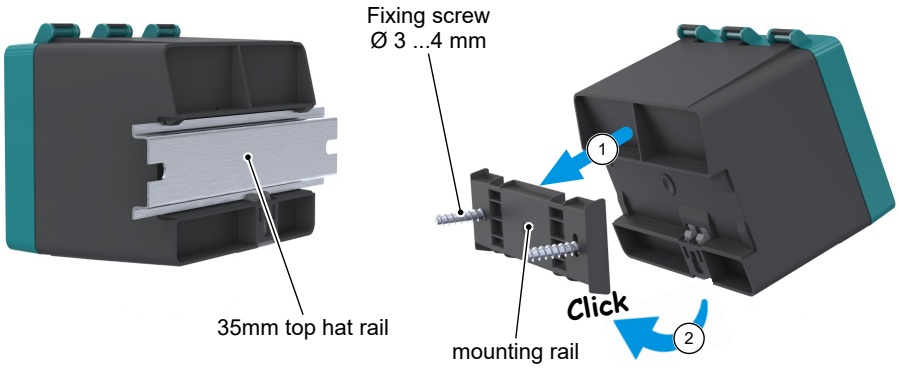


Fig. 7: Assembly

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).

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.

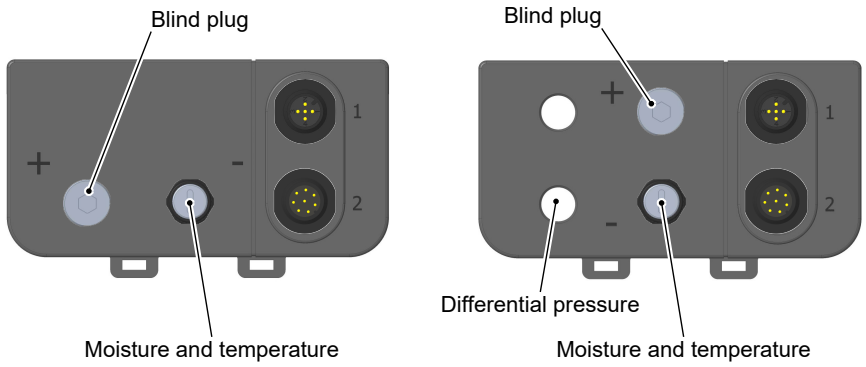


Fig. 8: Replacement plate

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 for hydraulic hoses	Polyamide hose	6 x 4 x 1 mm 8 x 6 x 1 mm
	CK quick-action screw connection for soft hoses	PVC hose TYGON®	6 x 4 x 1 mm 8 x 6 x 1 mm
	cutting ring screw connection for hydraulic tubes (stainless steel)	tube	6 mm outside 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 [1] 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.

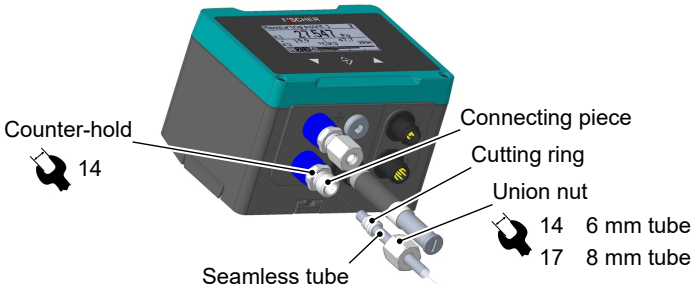


Fig. 10: Counter-hold for cutting ring screw connections

[1] 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

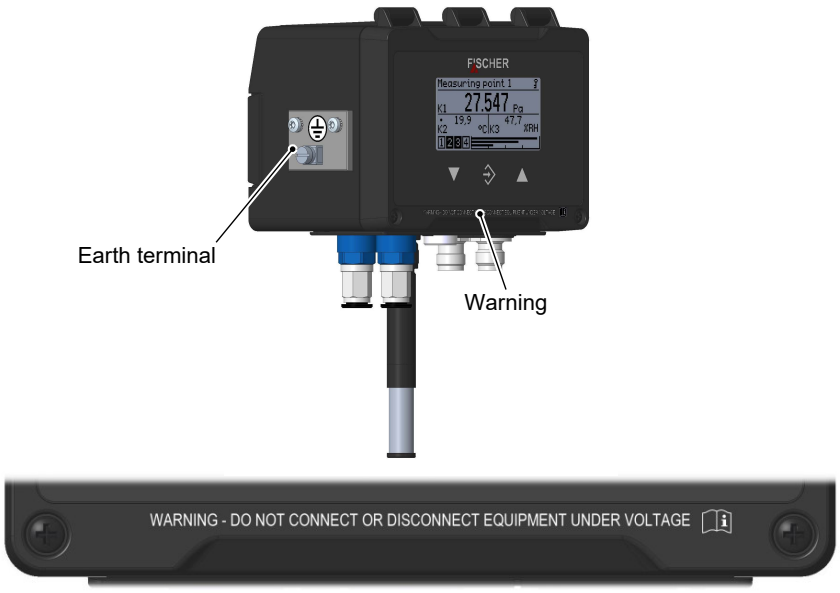
Sparks can be created, the plug is mounted under tension or replaced.

- 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^2 or single-wire conductors up to 6 mm^2.

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

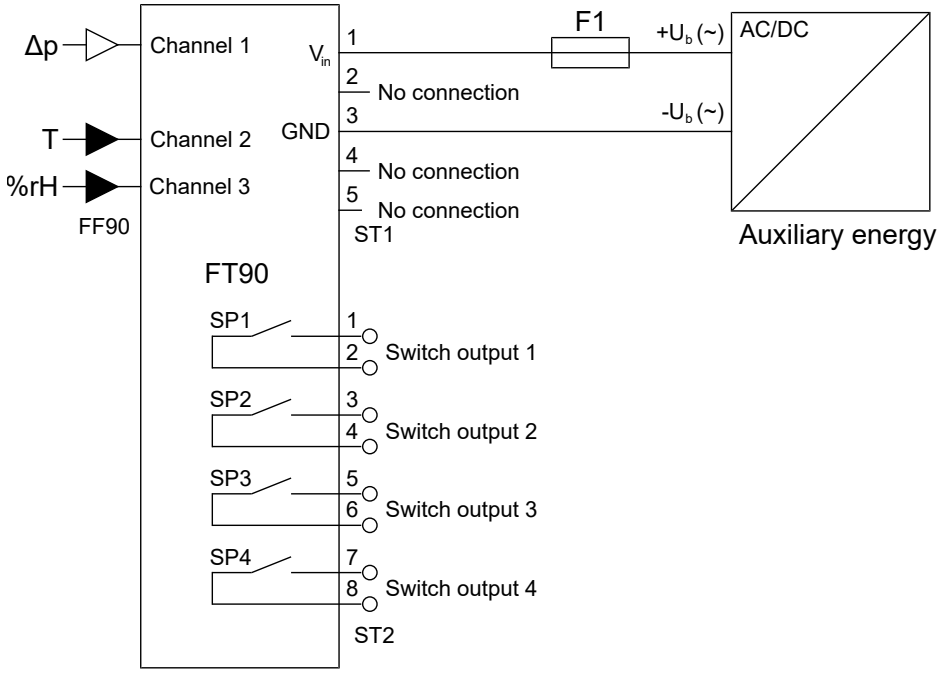


Fig. 12: 3-channel version

Version T/rH

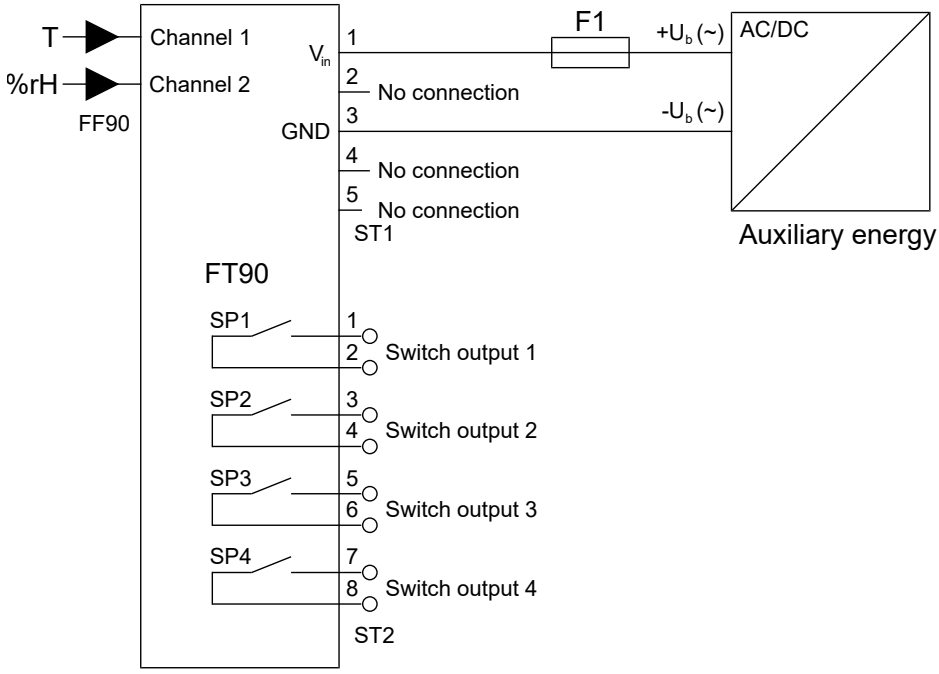


Fig. 13: 2-channel version

3.4.2.2 M12 connector 1: auxiliary energy and analogue output

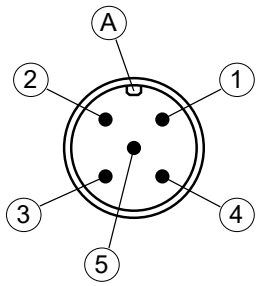


Fig. 14: 5-pin M12 connector

Pin	Signal		Cable colour
1	Operating voltage	+ U_b	Brown
2	Unused		White
3	Operating voltage	- U_b	Blue
4	Unused		Black
5	Unused		Grey
A	Coding		

3.4.2.3 M12 connector 2: switch outputs

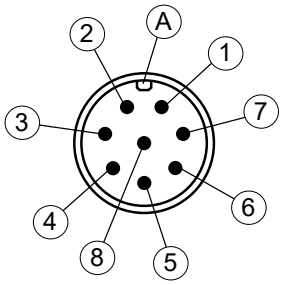


Fig. 15: 8-pin M12 connector

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.

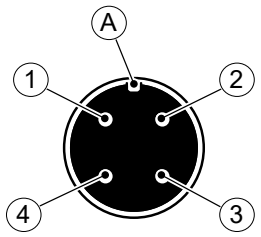


Fig. 16: 4-pin M12 bush

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

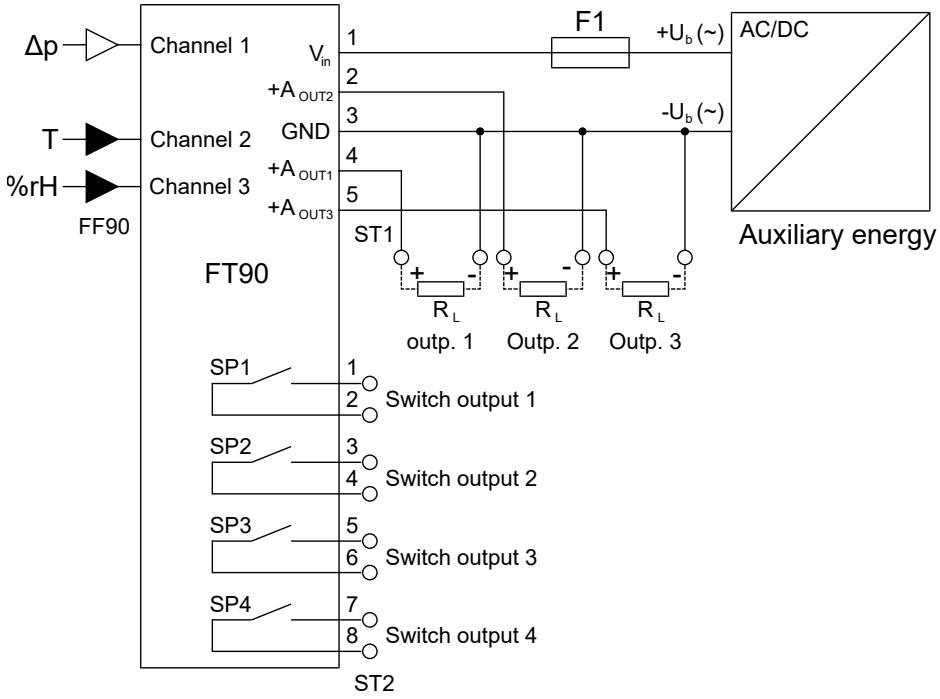


Fig. 17: 3-channel version

Version T/rH

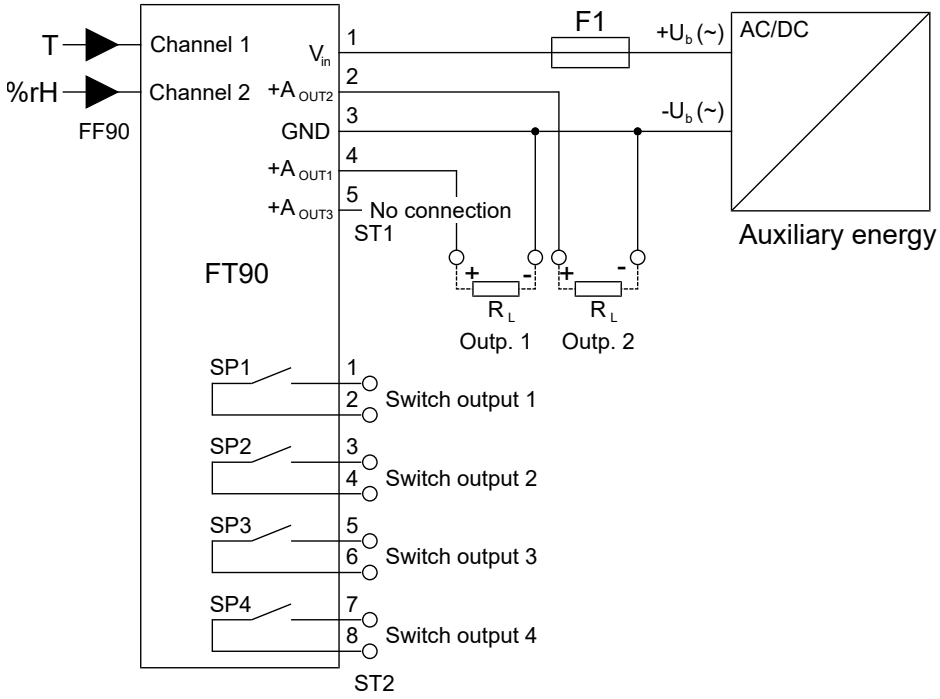


Fig. 18: 2-channel version

3.4.3.2 M12 connector 1: auxiliary energy and analogue output

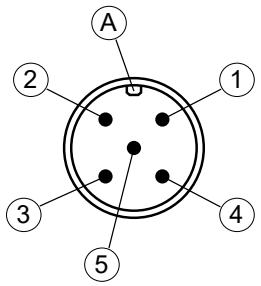


Fig. 19: 5-pin M12 connector

Pin	Signal		Cable colour
1	Operating voltage	+ U_b	Brown
2	Analog output 2	AOut2	White
3	Operating voltage	- U_b	Blue
4	Analog output 1	AOut1	Black
5	Analog output 3	AOut3	Grey
A	Coding		

3.4.3.3 M12 connector 2: switch outputs

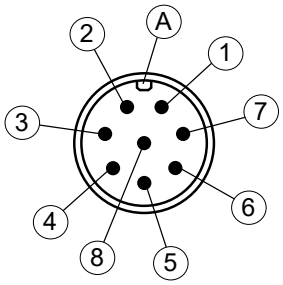


Fig. 20: 8-pin M12 connector

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.

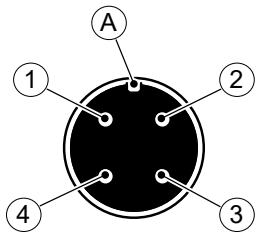


Fig. 21: 4-pin M12 bush

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

3.4.4 Device with Modbus

⚠ 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.

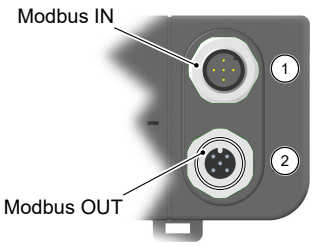


Fig. 22: Modbus replacement plate

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.

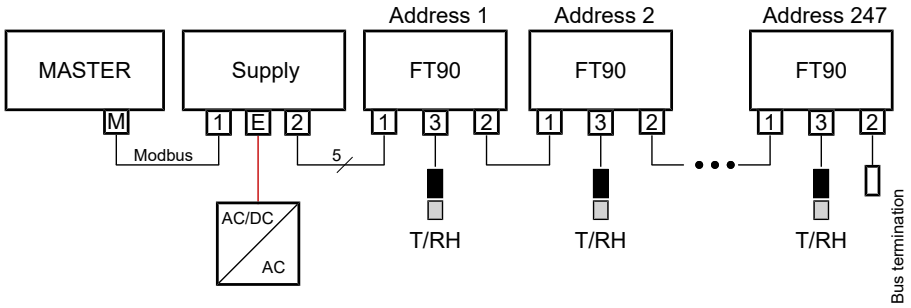


Fig. 23: Modbus RTU network

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 Ω 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).

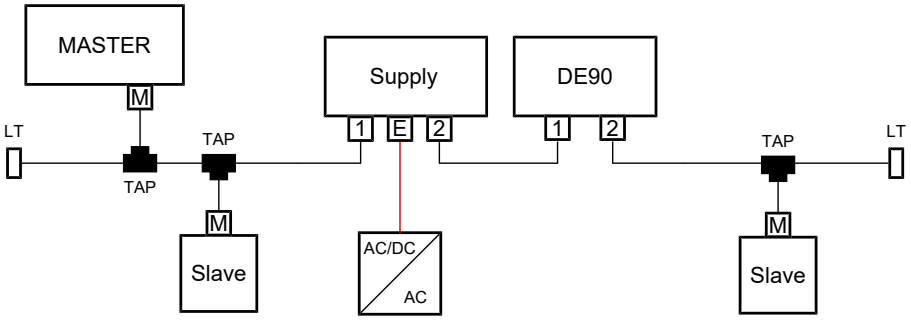


Fig. 24: Modbus connection

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.

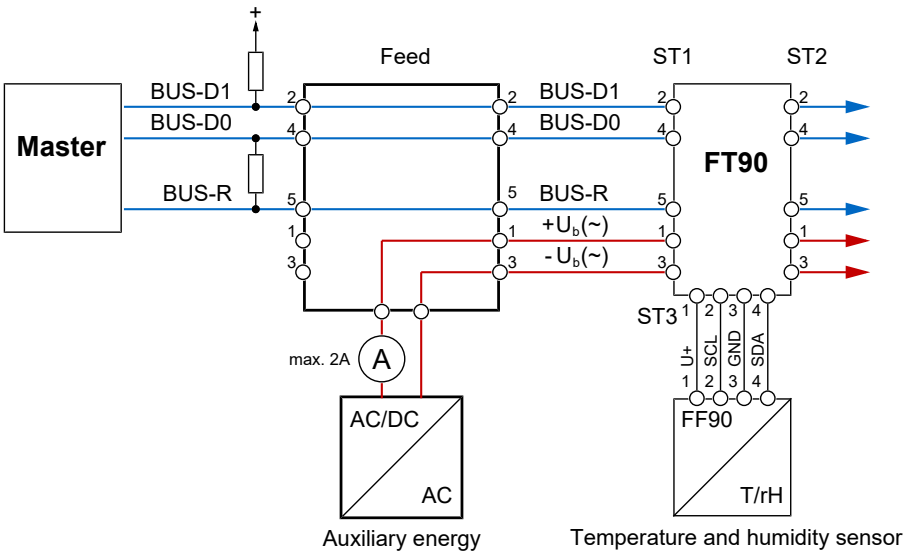


Fig. 25: Main supply

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.

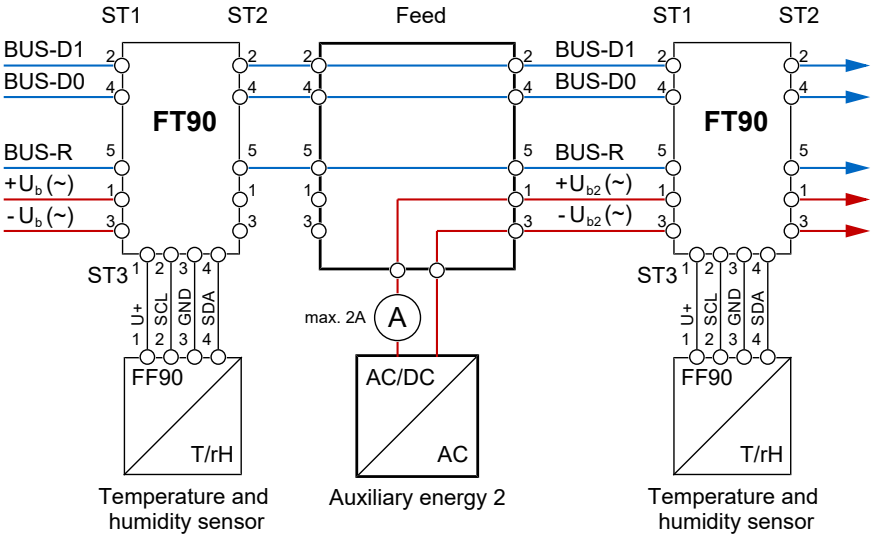


Fig. 26: Intermediate supply

3.4.4.3 M12 plug 1: Modbus IN

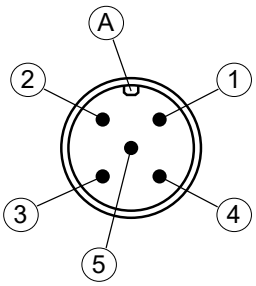


Fig. 27: M12 plug 5-pin

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

3.4.4.4 M12 plug 2: Modbus OUT

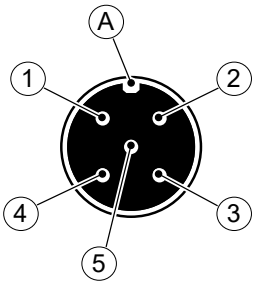


Fig. 28: M12 bush 5-pin

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		

3.4.4.5 M12 connector 3: Sensor input

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

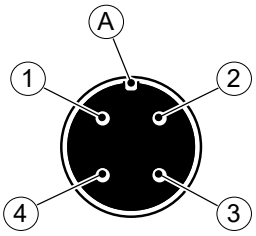


Fig. 29: 4-pin M12 bush

Pin	Signal		Cable colour
1	Operating voltage (internal)	U+	Brown
2	I2C bus	SCL	White
3	Operating voltage (internal)	GND	Blue
4	I2C bus	SDA	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.

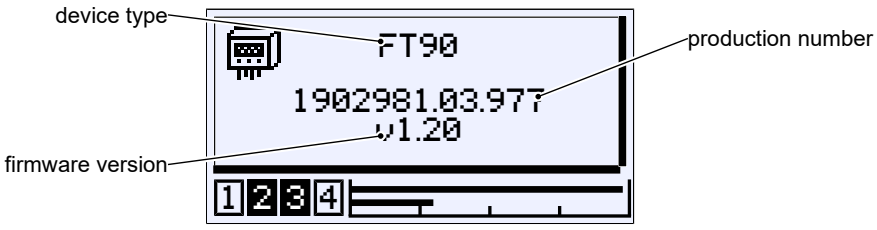


Fig. 30: Start screen

➥ 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.

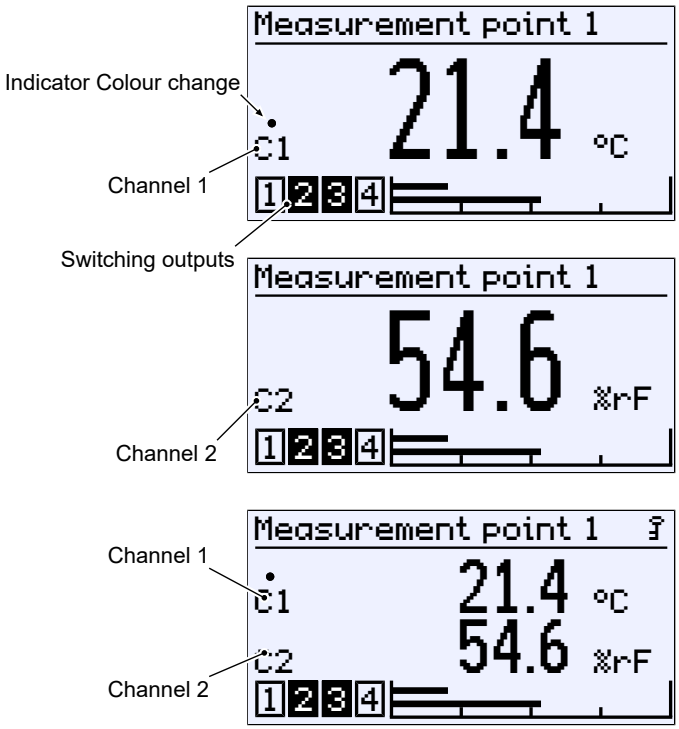


Fig. 31: Measuring data display (2 channels)

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.

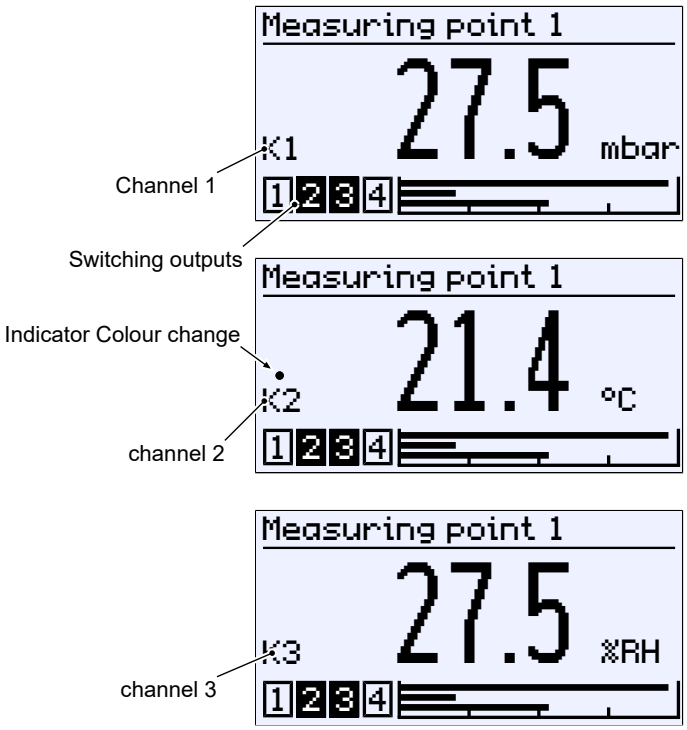


Fig. 32: Measuring data display (individual channels)

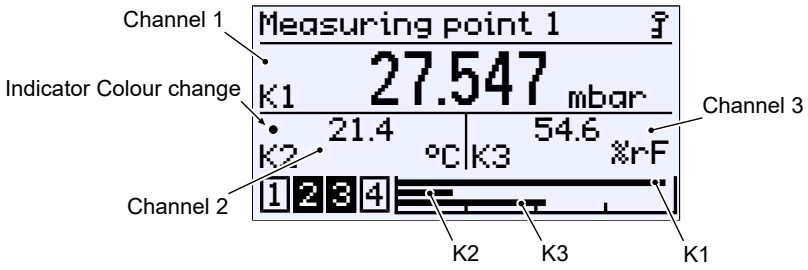


Fig. 33: Measuring data display (3 channels)

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'.

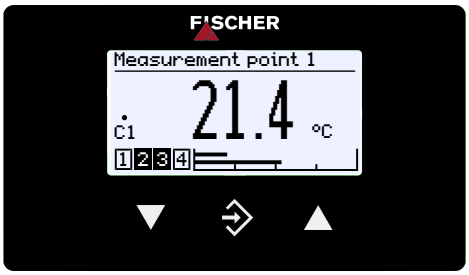


Fig. 34: Operating keys

▼	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 delivered in the configuration stated in the Order code. However, some parameters can be modified quickly and easily via the menu Quick access.

- Menu language
- Measuring point designation
- Configuration

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 onto the device and go to the quick access.
3. 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 onto the device and go to the quick access.
3. Change the Designation parameter.

4.3.3 Configuration

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

▷ However, some parameters can be modified quickly and easily via the quick access: unit, start of measuring range, end of measuring range and damping.

1. You have the right to change the configuration.
2. Log onto the device and call up the Quick access.
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.

NOTICE! The configuration can also be changed using the keyboard in the configuration menu.

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 [▶ 86]'.

5 Operation

5.1 First steps

5.1.1 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.

5.1.2 Menu tree

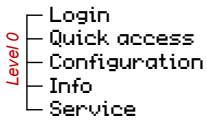


Fig. 35: Main menu

5.1.2.1 Login

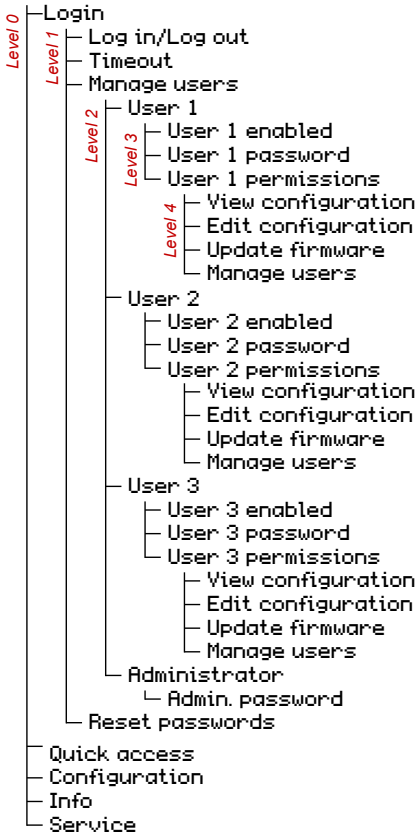
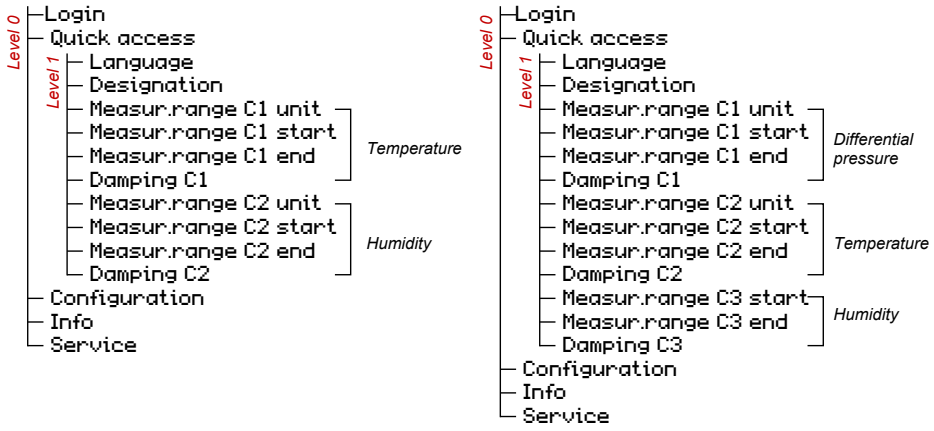


Fig. 36: 'Login' submenu

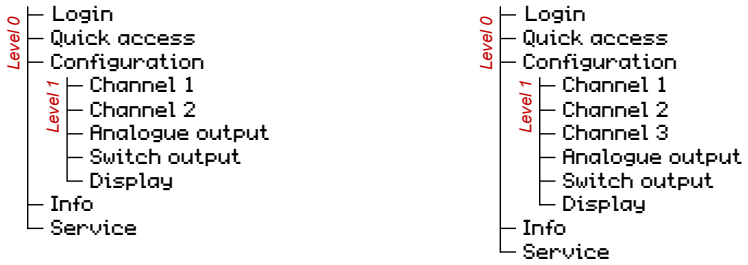
5.1.2.2 Quick access



2-channel version **3-channel version**

Fig. 37: 'Quick access' submenu

5.1.2.3 Configuration



2-channel version **3-channel version**

Fig. 38: 'Configuration' submenu

5.1.2.3.1 Configuration -> Channel

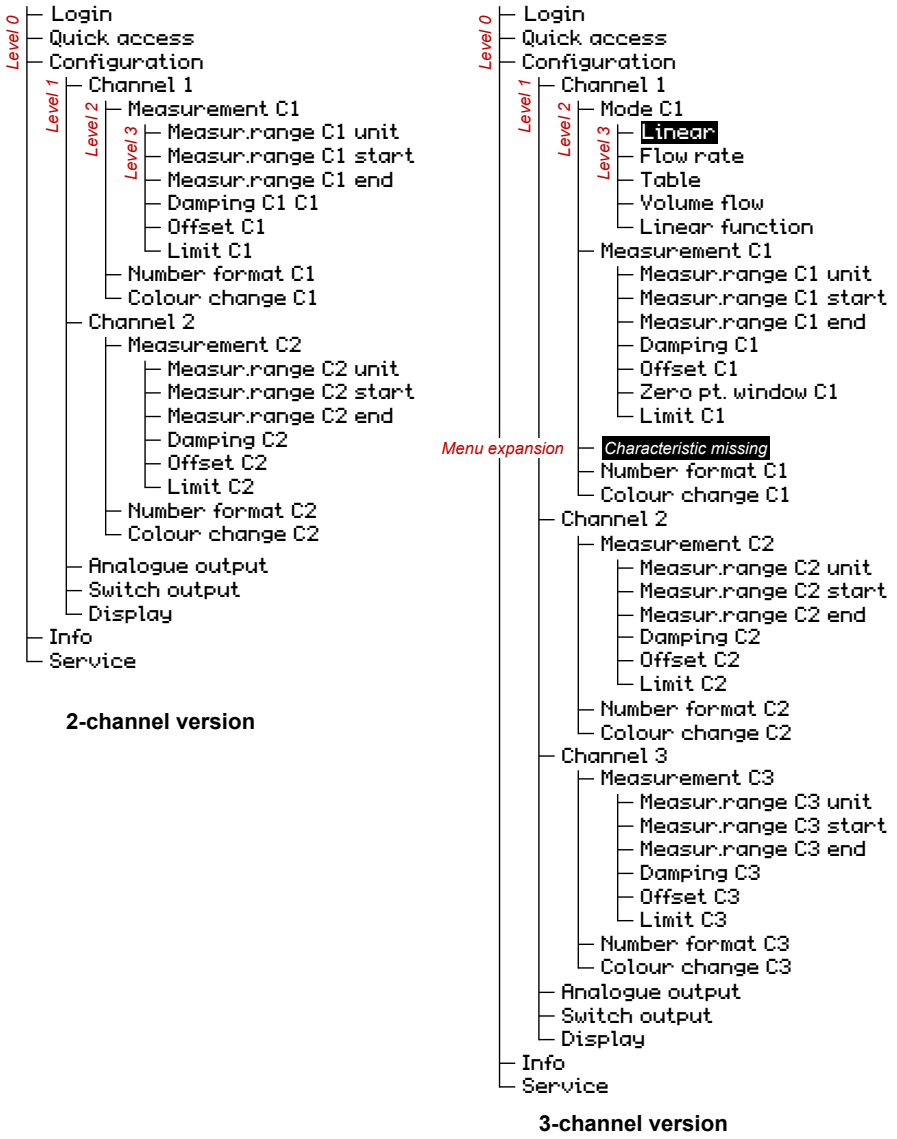
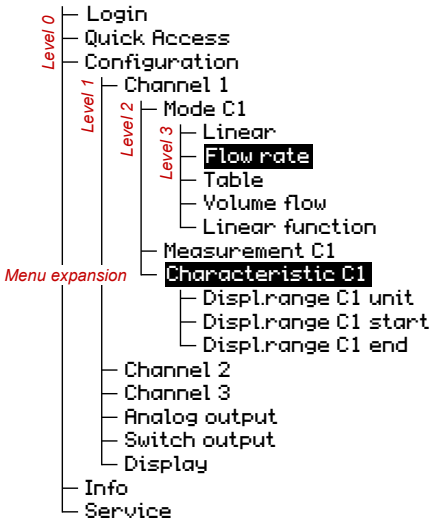


Fig. 39: 'Configuration/Channel' submenu

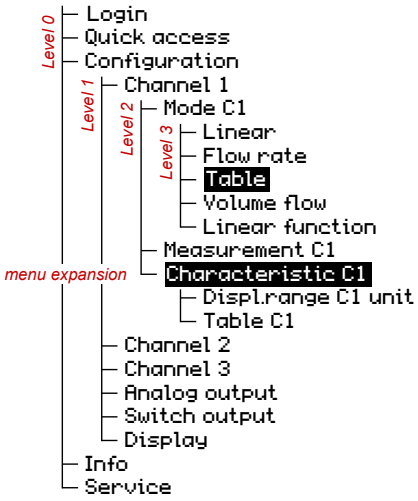
Configuration -> Channel -> Flow rate mode



3-channel version

Fig. 40: 'Configuration/Channel/Flow rate/Characteristic' submenu

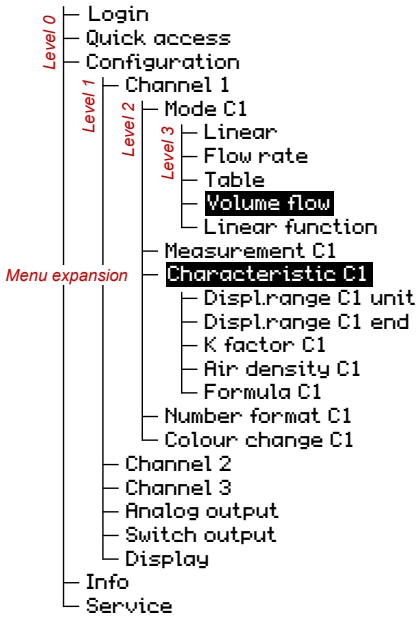
Configuration -> Channel -> Table mode



3-channel version

Fig. 41: Configuration/Channel/Table menu expansion

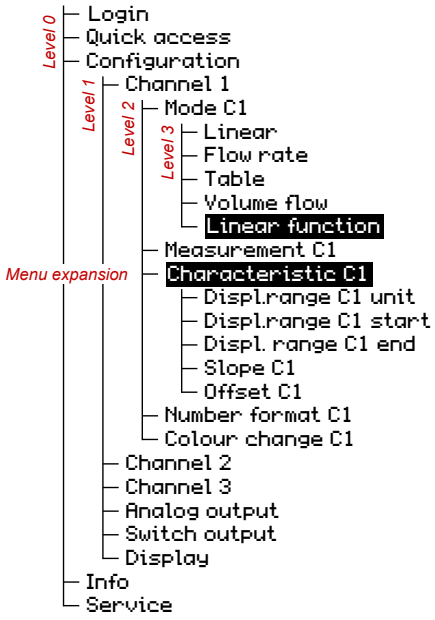
Configuration -> Channel -> Volume flow mode



3-channel version

Fig. 42: 'Configuration/Channel/Volume flow/Characteristic' submenu

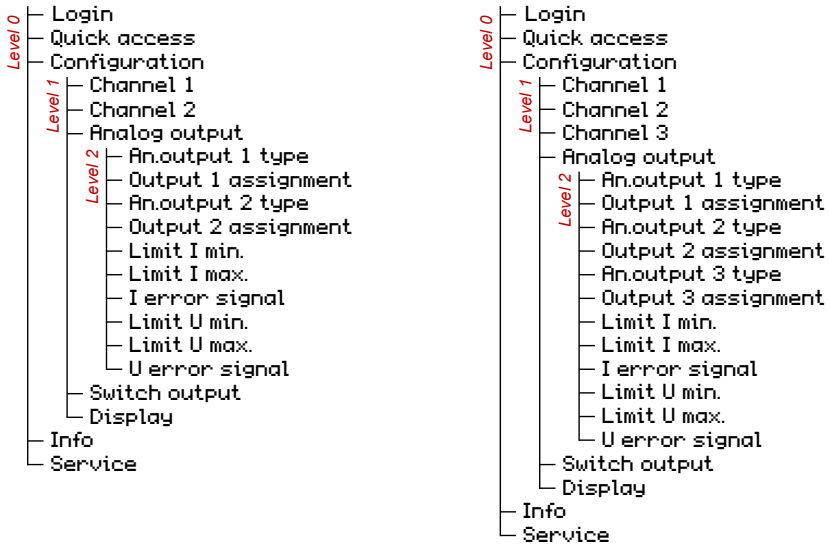
Configuration -> Channel -> Linear function mode



3-channel version

Fig. 43: 'Configuration/Channel/Linear function/Characteristic' submenu

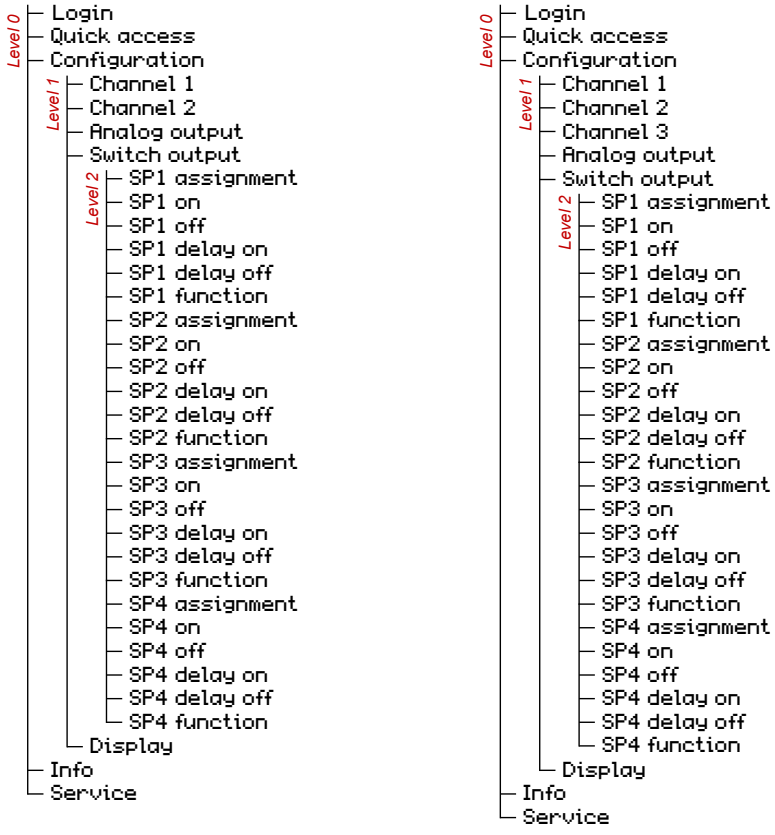
5.1.2.3.2 Configuration -> Analog output



2-channel version **3-channel version**

Fig. 44: 'Configuration/Channel/Analog output' submenu

5.1.2.3.3 Configuration -> Switch output



2-channel design **3-channel design**

Fig. 45: 'Configuration/Switch output' submenu

5.1.2.3.4 Configuration -> Display

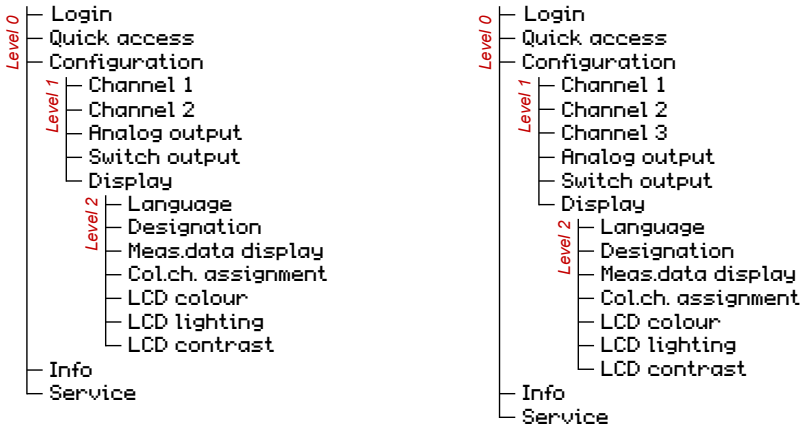


Fig. 46: 'Configuration/Display' submenu

5.1.2.4 Info

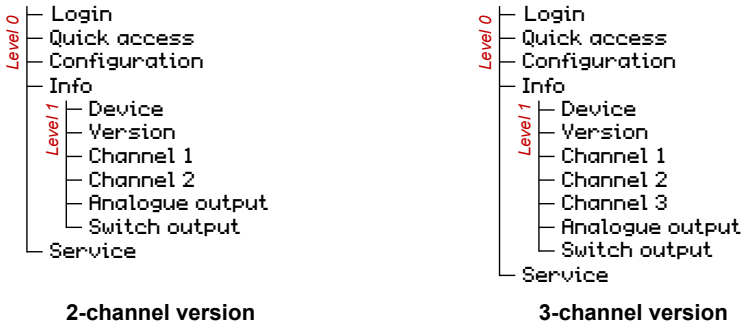


Fig. 47: 'Info' submenu

5.1.2.5 Service

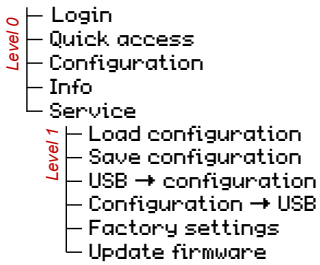


Fig. 48: 'Service' submenu

5.1.3 Navigation in the menu tree

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

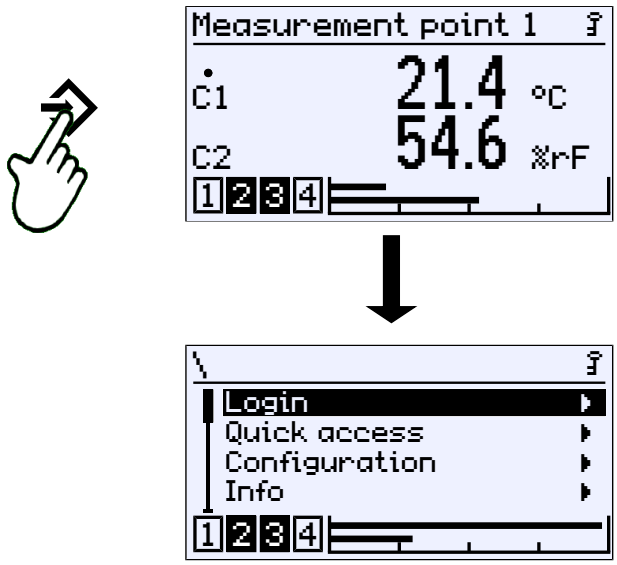


Fig. 49: Call of main menu (level 0)

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 ▸ .

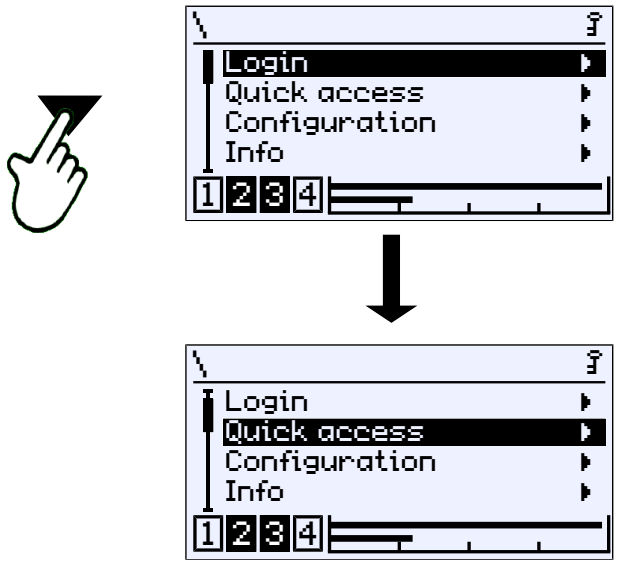


Fig. 50: Moving down in the menu (level 0)

The 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.

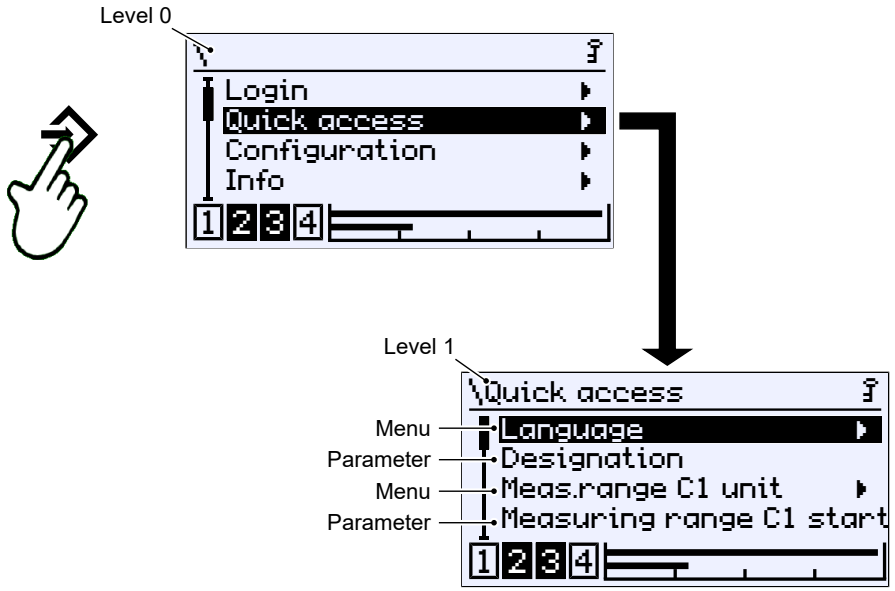


Fig. 51: Sidewards in submenu (level 1)

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

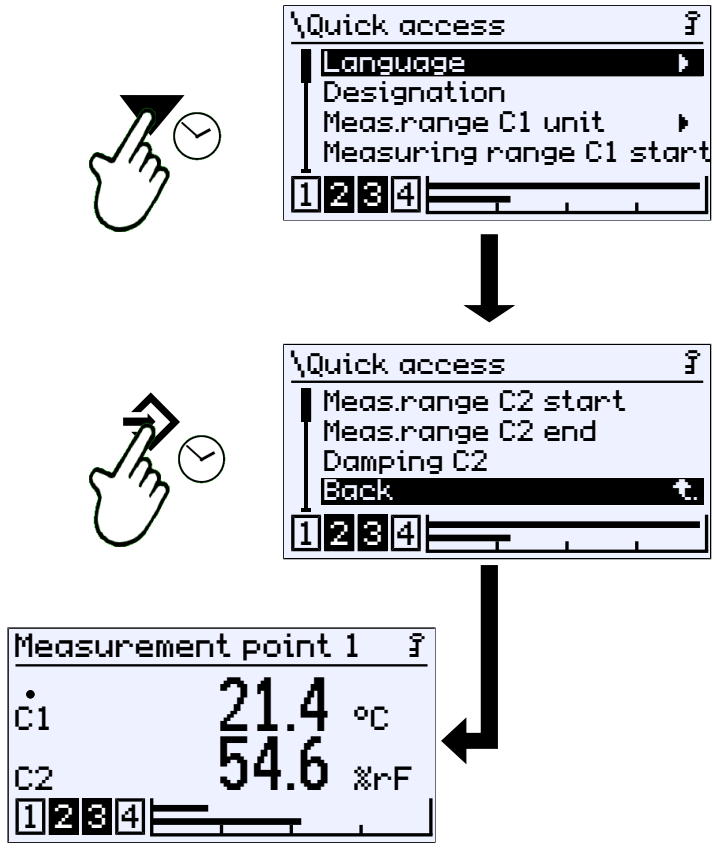


Fig. 52: Page down to exit

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

5.1.4 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

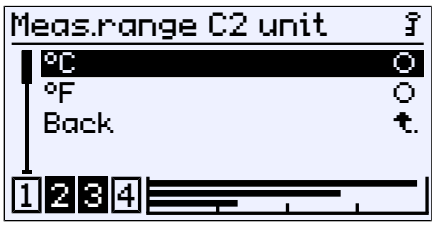


Fig. 53: Path

5.1.5 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 ⇳ .

5.1.5.1 Text input

For example: *Path: \Quick access\Designation*

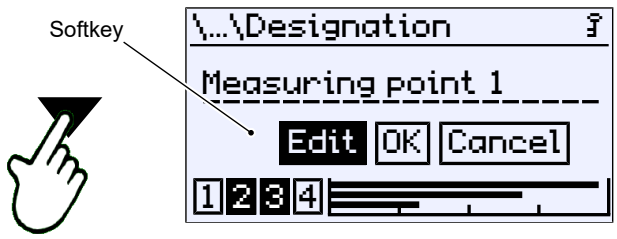


Fig. 54: Action selection

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

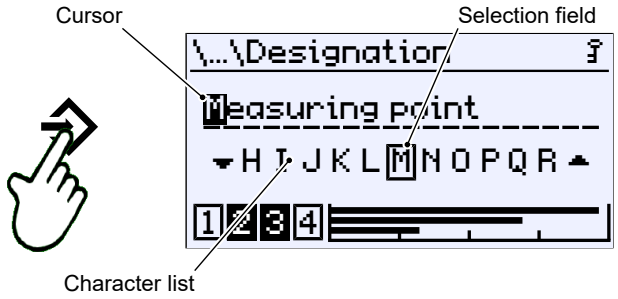


Fig. 55: Editing text

In this display, the cursor is controlled with the button ⇳ . 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 ▼ moves the list of characters[2] to the left and the button ▲ moves it to the right. Once the correct character is shown in the selection field, it can be accepted with the button ⇳ at the cursor position. The cursor moves one character to the right and the next character position can be edited.

5.1.5.2 Value input

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

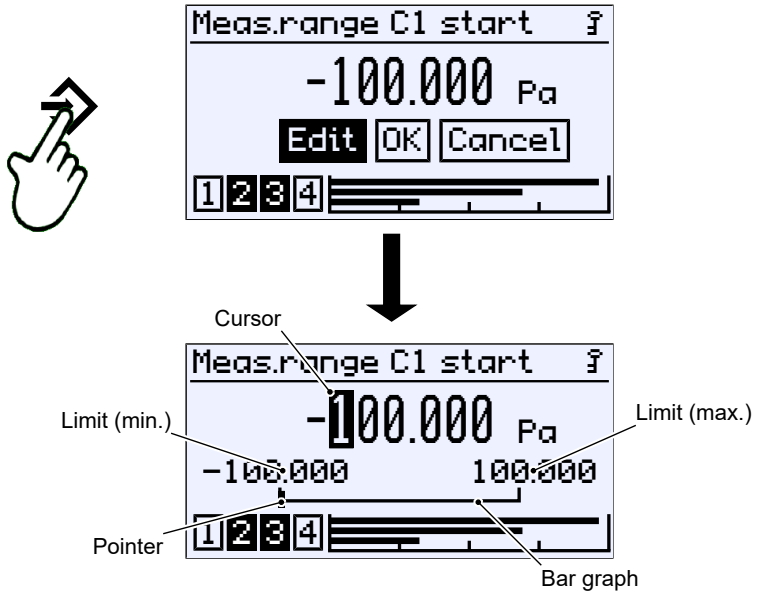
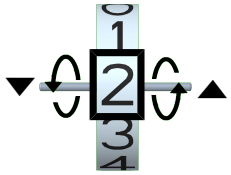


Fig. 56: Entry of numerical values, 1st position

Entry of digits one by one



Numerical values can be entered digit by digit from left to right. The buttons ▼ and ▲ 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 ⇳ . The cursor then moves one position to the right. The movement direction of the cursor is defined and cannot be changed.

Fig. 57: Setting a figure

[2] The list of characters comprises the characters of the character set Windows 1252 (Latin 1 and Latin 9)

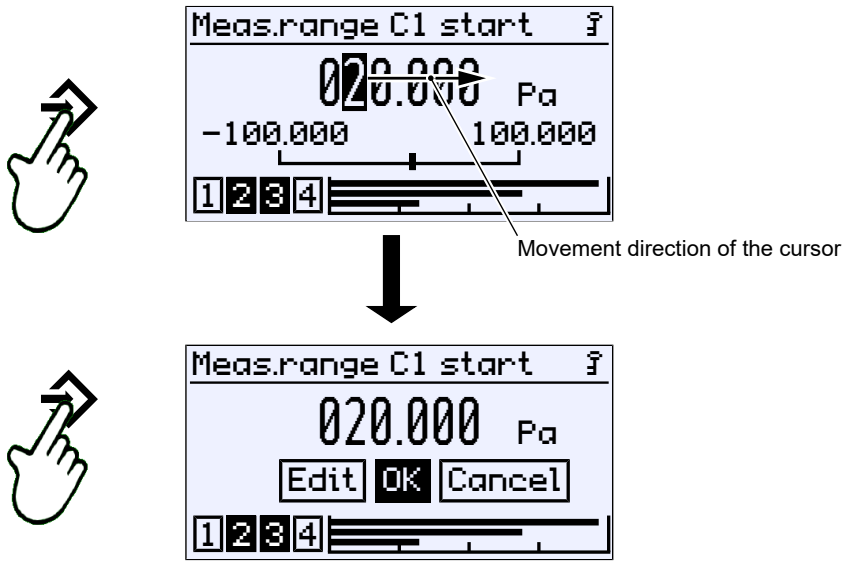


Fig. 58: Entry of numerical values, 2nd position

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.

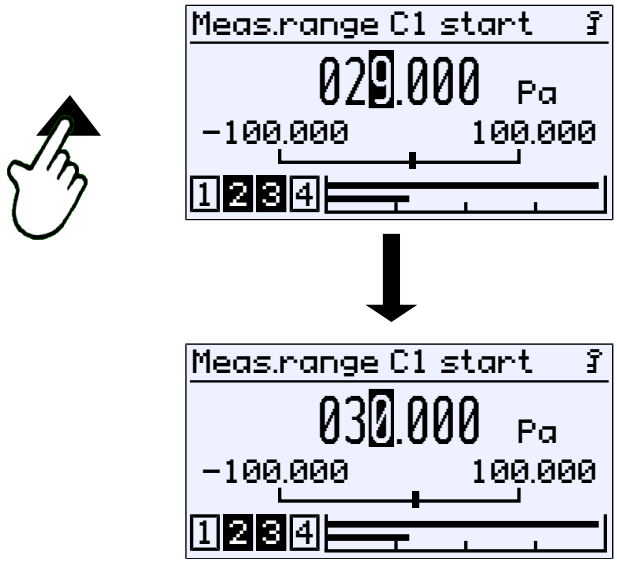


Fig. 59: Number overflow

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.

5.1.5.3 Selection of options

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

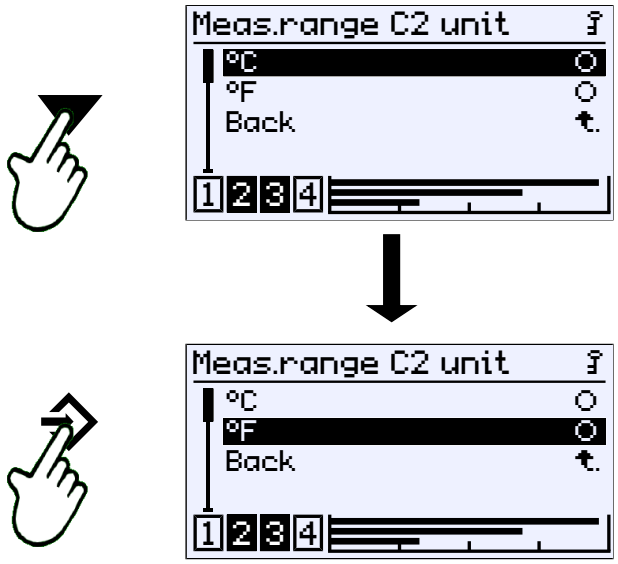


Fig. 60: Entry of options

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 even during configuration. All parameter changes have a direct effect.

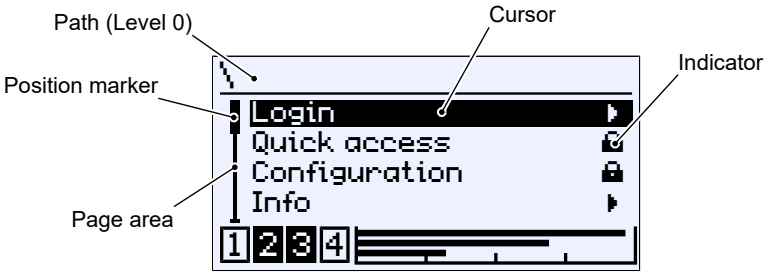
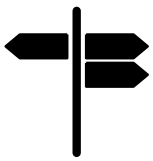


Fig. 61: Main menu

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.
Quick access	▸	This menu contains important parameters and menus that can be reached and changed in quick access mode.
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 undated 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 [▸ 44]
- Quick access [▸ 50]
- Configuration [▸ 52]
- Info [▸ 89]
- 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. 62: 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.
Manage 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.

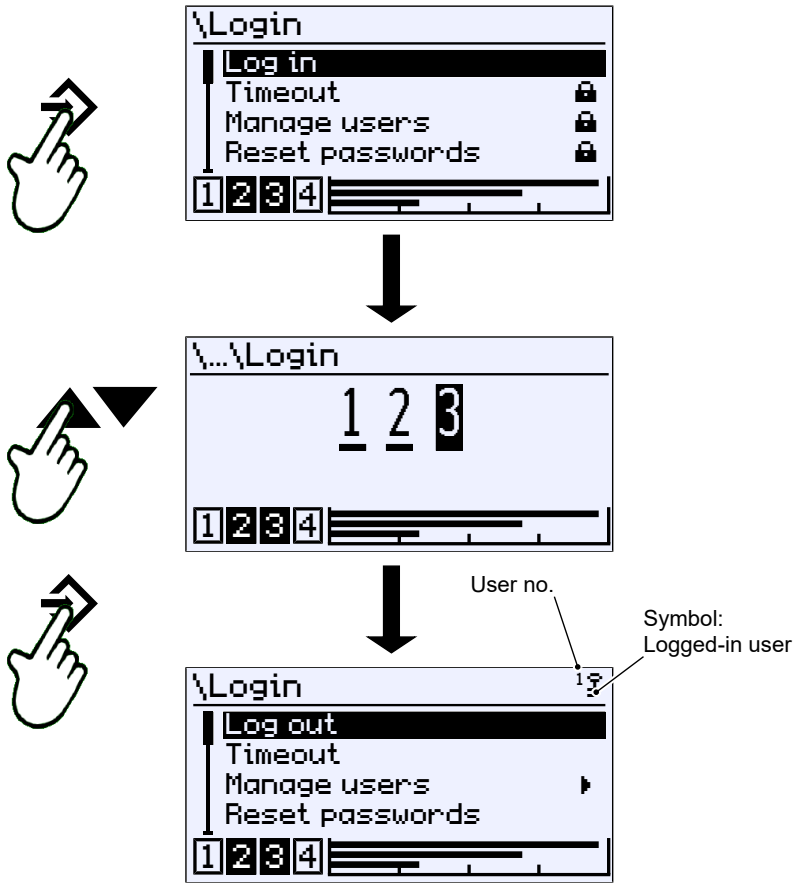


Fig. 63: Log in

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.

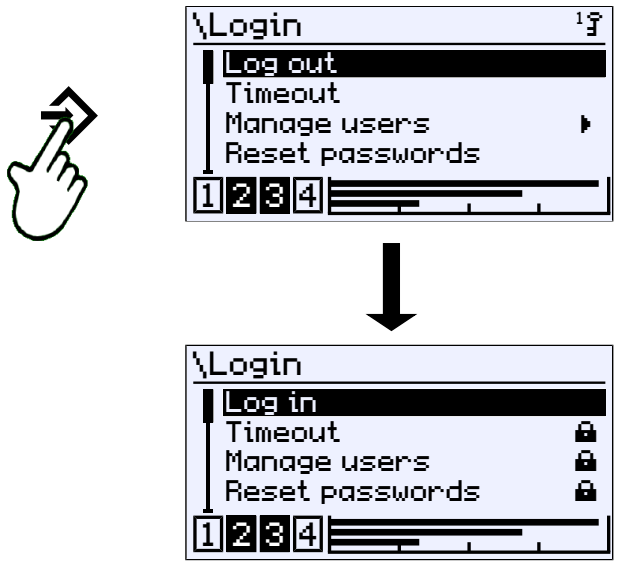


Fig. 64: Log out

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 whist 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. 65: 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

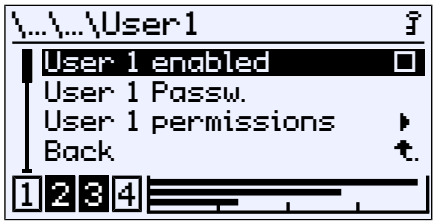


Fig. 66: User 1

Menu name		Description
User 1 enabled	☐	The user can be enabled with this parameter.
User 1 password		The password for user 1 is defined with this parameter.
User 1 permissions	▸	The permissions for user 1 are defined with this parameter.
Back	↰	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. 67: User 1 permissions

Menu name		Description
View configuration	☐	This parameter assigns read permission.
Edit configuration	☐	This parameter assigns read and write permission.
Update firmware	☐	This parameter assigns permission to perform an update.
Manage users	☐	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. 68: 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

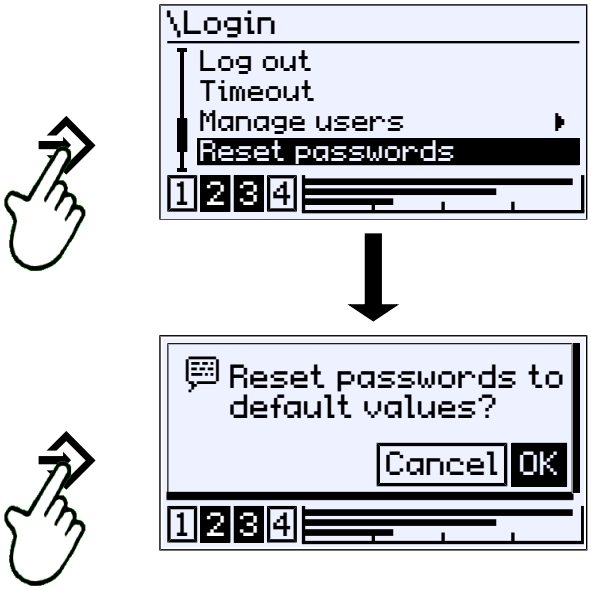


Fig. 69: Reset passwords

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 Quick access

Path: \Quick access
Level: 1

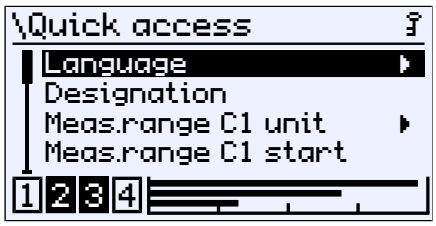
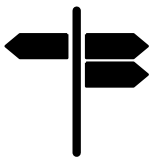


Fig. 70: Quick access

This menu allows quick access to some of the most important parameters of the measuring channels. The menu for devices with three measuring channels (C1, C2, C3) is displayed. In versions with two measuring channels, the parameters of the third channel (C3) are hidden.

Menu name		Description
Language	▸	This menu can be used to select a defined language as the menu language.
Designation		A designation for the measuring point is entered in this menu item.
Meas.range C1 unit	▸	A defined unit for the 1st measuring channel can be selected in this submenu.
Meas.range C1 start		The start of the measuring range of the 1st measuring channel is defined with this parameter.
Meas.range C1 end		The end of the measuring range of the 1st measuring channel is defined with this parameter.
Damping C1		This parameter can be used to set damping for the 1st measuring channel.
Meas.range C2 unit	▸	A defined unit for the 2nd measuring channel can be selected in this submenu.
Meas.range C2 start		The start of the measuring range of the 2nd measuring channel is defined with this parameter.
Meas.range C2 end		The end of the measuring range of the 2nd measuring channel is defined with this parameter.
Damping C2		This parameter can be used to set damping for the 2nd measuring channel.
Meas.range C3 unit	▸	A defined unit for the 2nd measuring channel can be selected in this submenu.
Meas.range C3 start		The start of the measuring range of the 3rd measuring channel is defined with this parameter.
Meas.range C3 end		The end of the measuring range of the 3rd measuring channel is defined with this parameter.

Menu name		Description
Damping C3		This parameter can be used to set damping for the 3rd measuring channel.
Back	↰	This is the exit point of the 'Quick access' menu. It takes you back to the main menu.



Signposts [►Page]

- Language [▷ 83]
- Designation [▷ 83]
- Meas.range C1 unit [▷ 57]
- Meas.range C1 start [▷ 58]
- Meas.range C1 end [▷ 59]
- Damping C1 [▷ 59]

Since the configuration of all of the channels is identical, only the first channel is described. The links for the other channels are therefore missing.

5.5 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

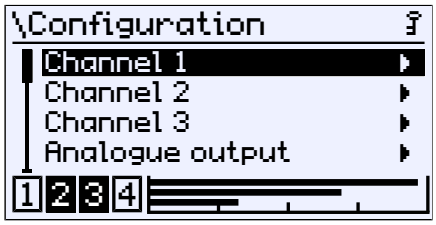
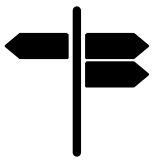


Fig. 71: Configuration

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
Channel 1	▸	The 1st measuring channel is configured with this menu.
Channel 2	▸	The 2nd measuring channel is configured with this menu.
Channel 3	▸	The 3rd measuring channel is configured with this menu.
Analogue output	▸	The analog 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.



Signposts [► Page]

- Channels 1-3 [▸ 53]
- Analogue output [▸ 77]
- Switch output [▸ 80]
- Display [▸ 82]
- Modbus RTU [▸ 86]

5.5.1 Channels 1 to 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 N/A	Channel 3 Humidity

Temperature/humidity

2-channel version

The configuration of the channels for the temperature and humidity takes place in the same way. Here, only the parameters for the first channel are shown.

Path: \Configuration\Channel 1
Level: 2

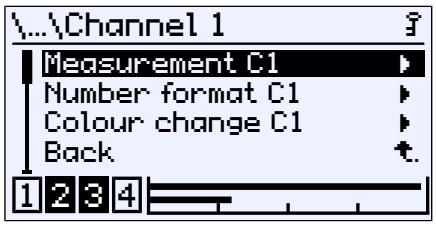


Fig. 72: Channel 1

Menu name		Description
Measurement C1	▸	The input of the measuring channel is configured with this menu.
Number format C1	▸	The decimal places for the display of the measured values for the measuring channel are set in this menu.
Colour change C1	▸	The colour change for the measuring channel is defined in this menu.
Back	↰	This is the menu exit point. It takes you back to the configuration menu.

Differential pressure Temperature/humidity

3-channel version

The configuration of channel 1 (differential pressure) differs from the configuration of channels 2 and 3 for temperature and humidity.

For channel 1, there are the additional configuration submenus 'Mode' and 'Characteristic' . Channels 2 and 3 are configured in the same way as for the 2-channel version.

Path: \Configuration\Channel 1
Level: 2

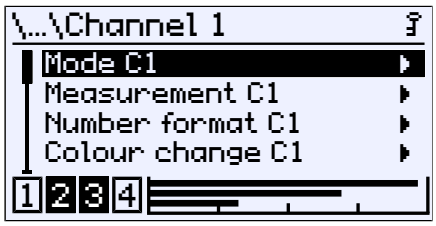


Fig. 73: Channel 1

Menu expansion

Menu name		Description
Mode C1	▸	Defined functions can be selected for the measuring channel with this menu.
Measurement C1	▸	The input of the measuring channel is configured with this menu.
Characteristic C1	▸	This menu is hidden depending on the selected mode.
Number format C1	▸	The decimal places for the display of the measured values for the measuring channel are set in this menu.
Colour change C1	▸	The colour change for the measuring channel is defined in this menu.
Back	↰	This is the menu exit point. It takes you back to the configuration menu.

The graphic below clarifies the interaction between the various parameters.

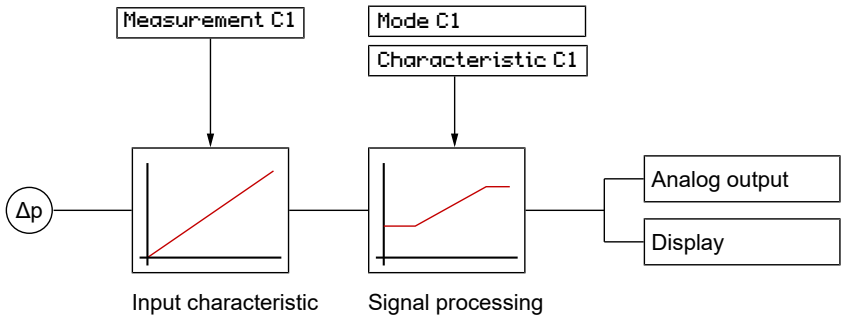
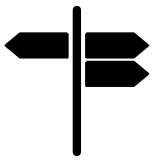


Fig. 74: Configuration of characteristic C1



Signposts [▶ Page]

- Mode C1 [▸ 55]
- Measurement C1 [▸ 56]
- Characteristic C1 (menu expansion) [▸ 63]
- Number format C1 [▸ 70]
- Colour change C1 [▸ 71]

5.5.1.1 Mode C1

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

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

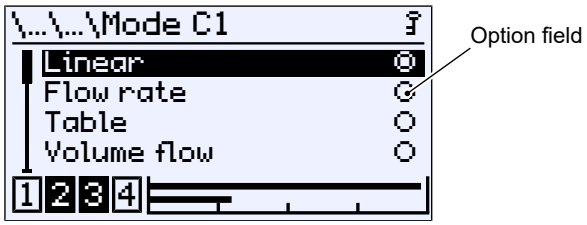


Fig. 75: Mode C1

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 f(x) = mx + b
Back	This is the menu exit point. It takes you back to the 'Channel 3' 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) [▶ 63]

5.5.1.2 Measurement C1

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

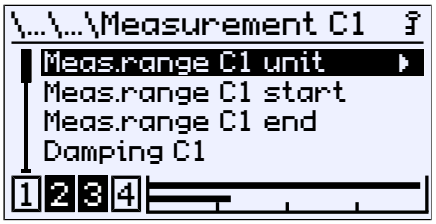


Fig. 76: Measurement C1

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		**Only for devices with differential pressure measurement.** The zero point window parameter defines a range around zero in which the display value is set to zero.
Limits	☐	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

5.5.1.2.1 Measuring range C1 unit

Differential pressure

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

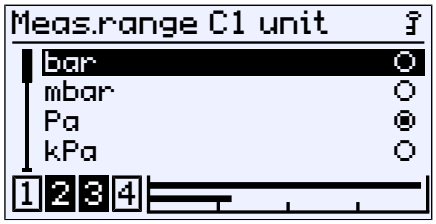


Fig. 77: Measuring range C1 unit

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_2O	inch water column	
mmH_2O	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

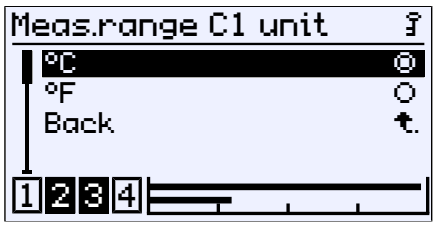


Fig. 78: Measuring range C1 unit

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 .

5.5.1.2.2 Measuring range C1 start

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

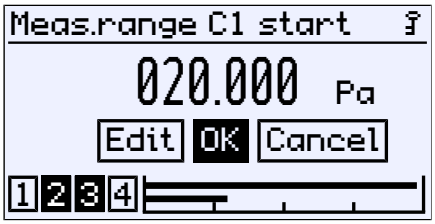


Fig. 79: Measuring range C1 start

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.

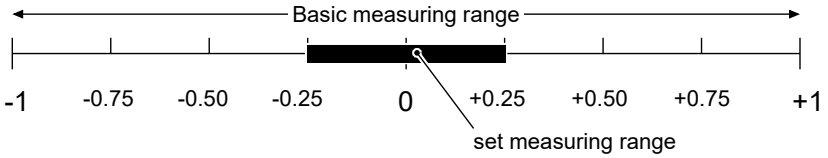


Fig. 80: Turn down

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.

5.5.1.2.3 Measuring range C1 end

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

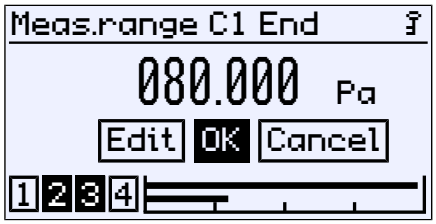


Fig. 81: Measuring range C1 end

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

5.5.1.2.4 Damping C1

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

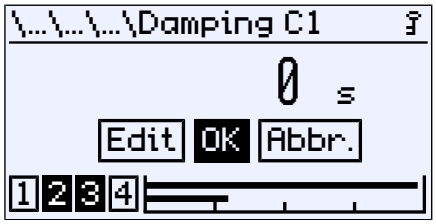


Fig. 82: Damping C1

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 uninfluenced. The parameter value states the time period until the amplitude reaches 90 %. A value of 0s means that no damping is carried out.

5.5.1.2.5 Offset C1

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

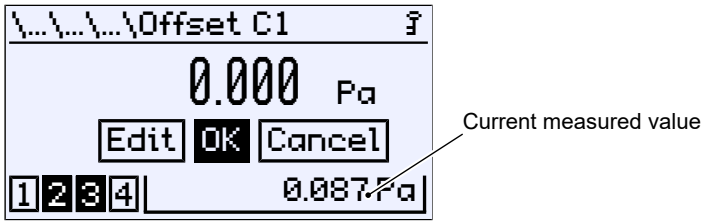


Fig. 83: Offset C1

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.

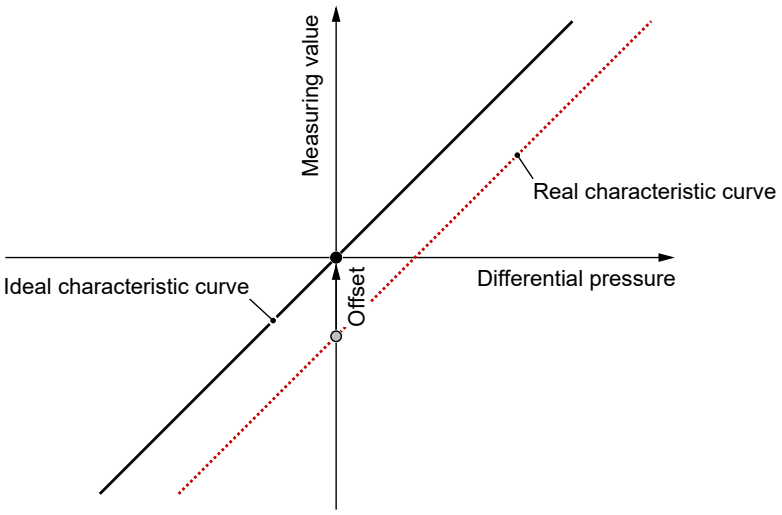


Fig. 84: Offset error

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

5.5.1.2.6 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

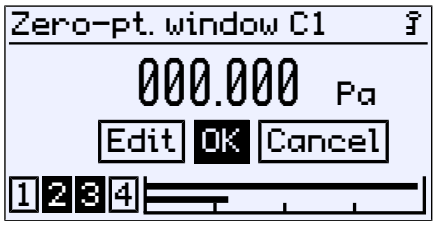


Fig. 85: Zero-point window C1

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.

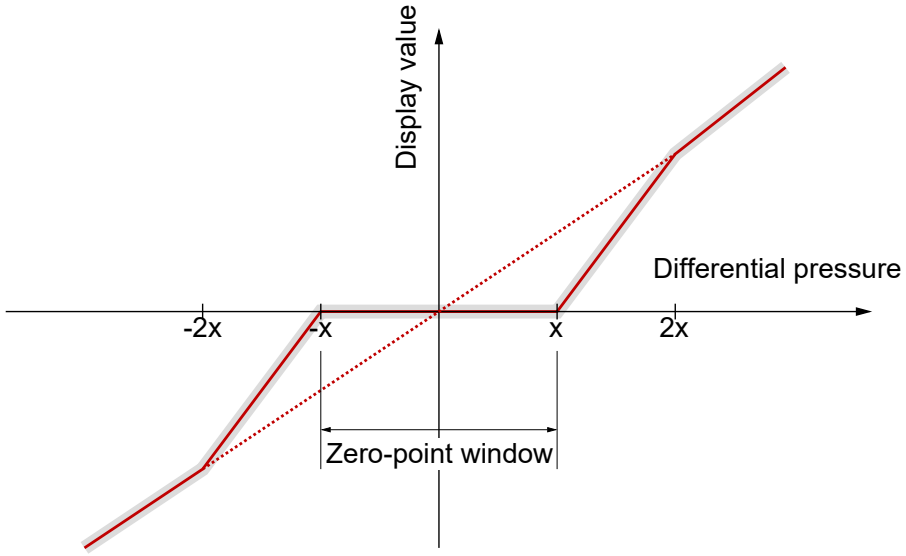


Fig. 86: Zero-point window

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.

5.5.1.2.7 Limits

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

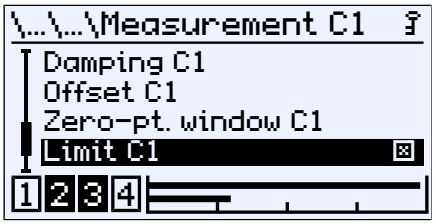


Fig. 87: Limit C1

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.

5.5.1.3 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'.

5.5.1.3.1 Characteristic C1 (flow rate)

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

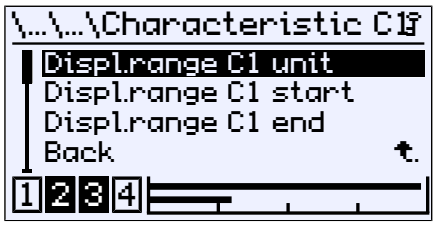


Fig. 88: Characteristic C1 (flow rate)

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
Δp: 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 .

5.5.1.3.2 Characteristic C1 (Table)

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

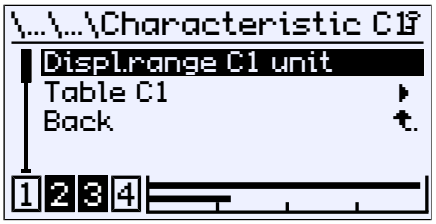


Fig. 89: Characteristic C1 (table)

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.

5.5.1.3.2.1 Table C1

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

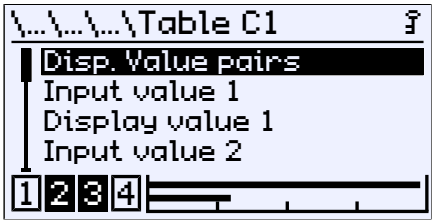


Fig. 90: Table C1

Menu name	Description
No. Value pairs	This parameter is used to define the number of value pairs. 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	

Each support point is stated by a value pair comprising the `Input value x` and `Display value x`. The index `x` 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 [3]. 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

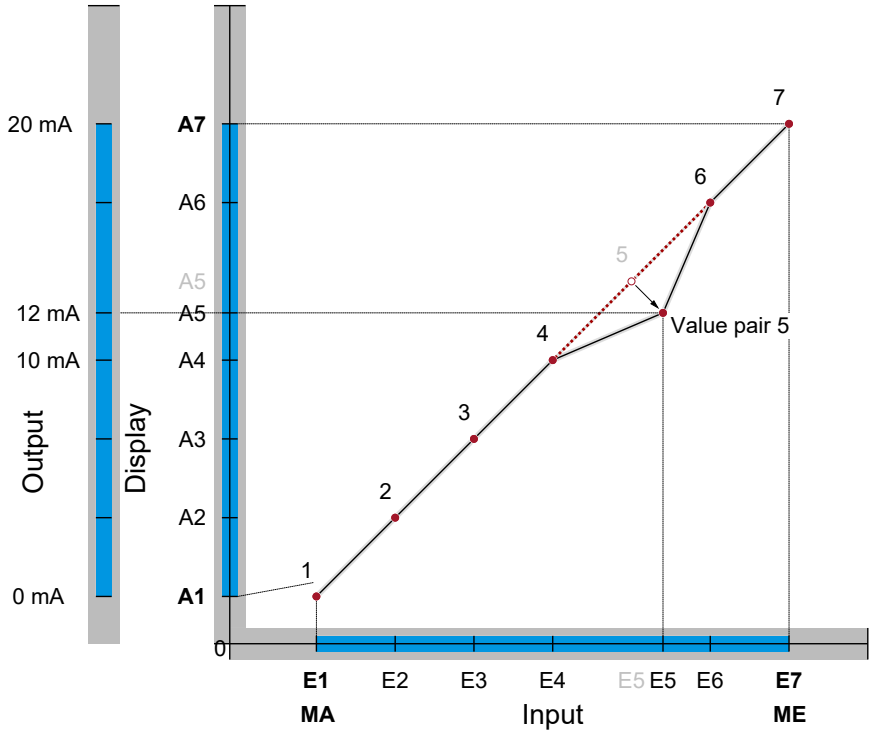


Fig. 91: Table function

[3] input values are abbreviated with E1…E7 and display values with A1…A7

5.5.1.3.3 Characteristic C1 (volume flow)

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

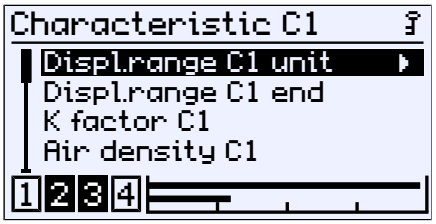


Fig. 92: Characteristic C1 (volume flow)

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
Δp: Differential pressure

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

Fig. 93: 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^3. [4]

[4] This value corresponds to the air density at 20 °C as sea level at an atmospheric pressure of 1013.25 hPa and dry air

5.5.1.3.3.1 Display range C1 unit

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

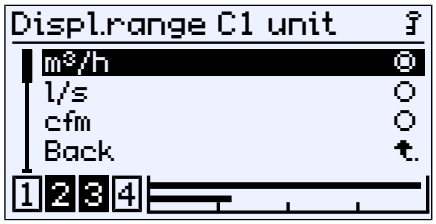


Fig. 94: Display range C1 unit

The following units are available for selection:

m^3/h	Cubic metre per hour	Default value
l/s	Litre per second	
cfm	Cubic feet per minute	

5.5.1.3.3.2 Formula C1

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

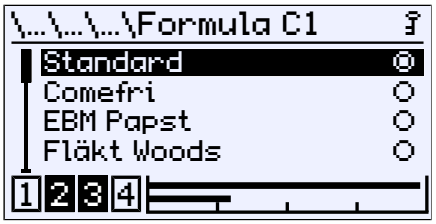


Fig. 95: Formula C1

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

Standard **EBM Pabst** **Ziel-Abegg**	$q = k \cdot \sqrt{\Delta p}$
Comefri **Nicotra Gebhardt** **Rosenberg**	$q = k \cdot \sqrt{\frac{2}{\rho} \cdot \Delta p}$
Fläkt Woods	$q = \frac{1}{k} \cdot \sqrt{\Delta p}$

Fig. 96: Volumetric flow measurement Manufacturer's formulas

Volume flow measurement at the inlet cone

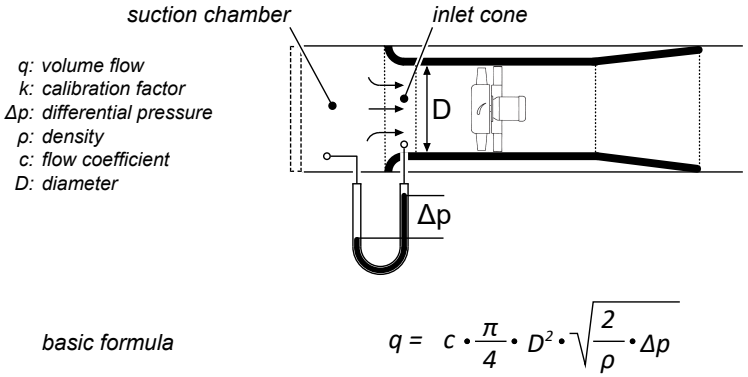


Fig. 97: Volume flow measurement

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.

5.5.1.3.4 Characteristic C1 (linear function)

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

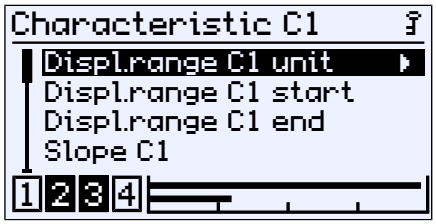


Fig. 98: Characteristic curve C1 (linear function)

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.

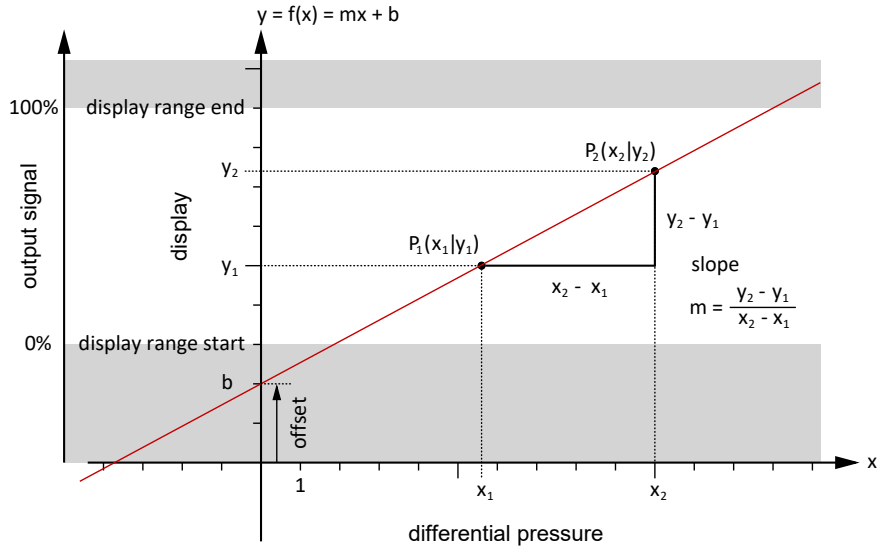


Fig. 99: Linear function

5.5.1.4 Number format C1

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

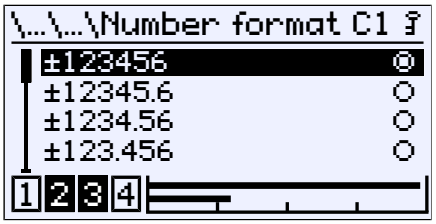


Fig. 100: Number format C1

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:	±123.456
Current measuring value:	−1234.567
Displayed measuring value:	−1234.57

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

5.5.1.5 Colour change C1

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

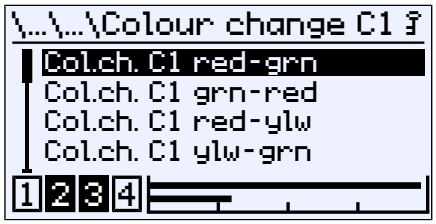


Fig. 101: Colour change C1

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.

5.5.1.5.1 Colour change C1 type: red/green

The following switching thresholds are relevant for this colour change:

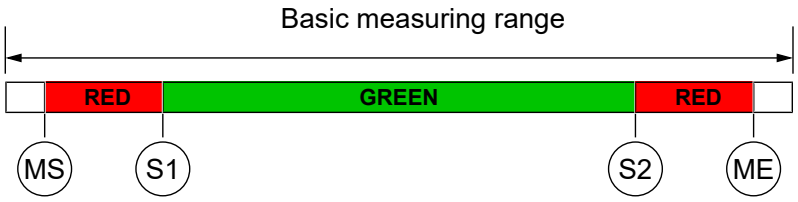


Fig. 102: Colour change red/green

MS	Meas.range C1 start	See menu Measurement C1 : [56]
S1	Col.ch. C1 red-grn	
S2	Col.ch. C1 grn-red	
ME	Meas.range C1 end	See menu Measurement C1 : [56]

For example:

Input of the threshold red/green

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

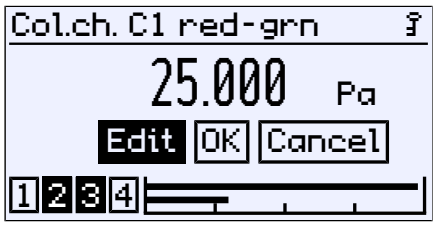


Fig. 103: Colour change C1 red-green

The other switch thresholds are entered in the same way.

5.5.1.5.2 Colour-change C1 type: red/yellow/green

The following switching thresholds are relevant for this colour change:

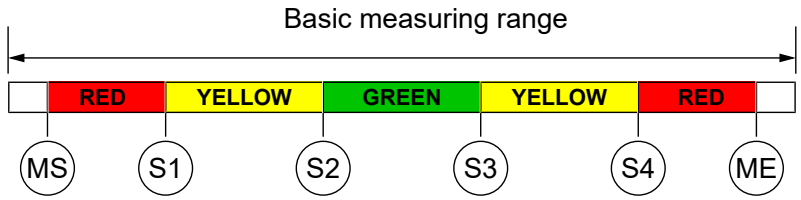


Fig. 104: Colour change red/yellow/green

MS	Meas.range C1 start	See menu Measurement C1 : [56]
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	Meass.range C1 end	See menu Measurement C1 : [56]

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.

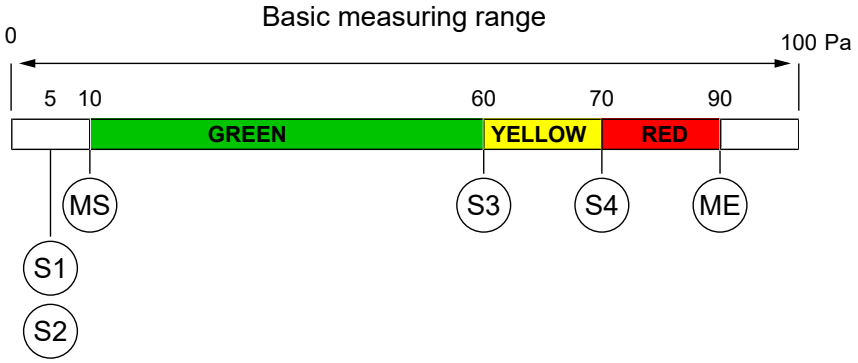


Fig. 105: Example colour-change red/yellow/green

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.

5.5.1.5.3 Colour change C1 hysteresis

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

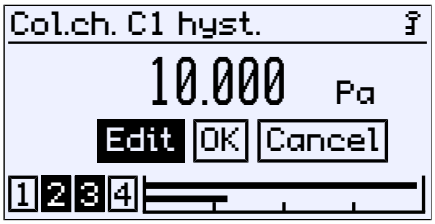


Fig. 106: Colour change C1 hyst.

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.

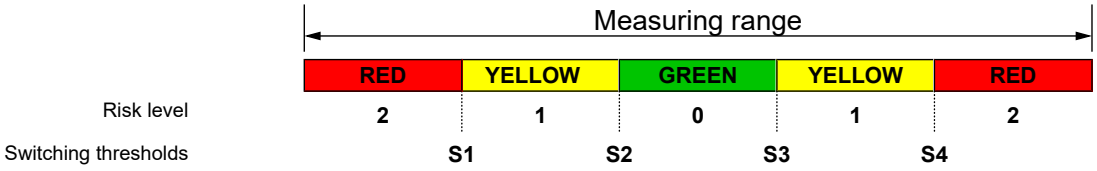


Fig. 107: Colour change (without hysteresis)

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.

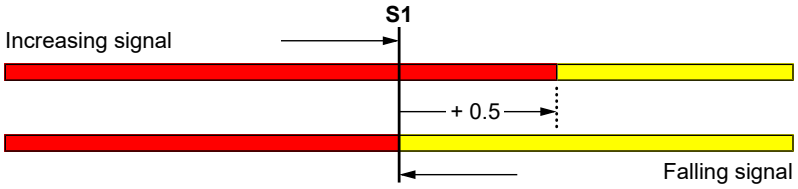


Fig. 108: Example: Hysteresis S1

(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.

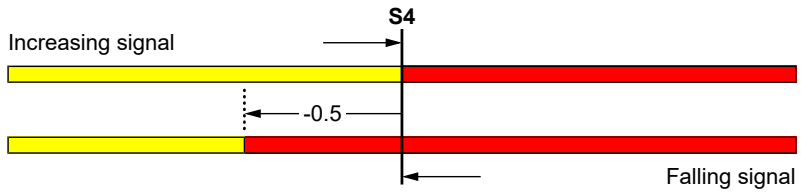


Fig. 109: Example: Hysteresis S4

5.5.1.5.4 Colour change C1 delay on

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

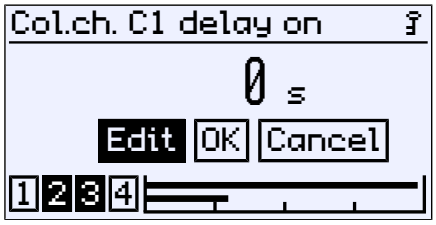


Fig. 110: Colour change C1 delay on

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

5.5.1.5.5 Colour change C1 delay off

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

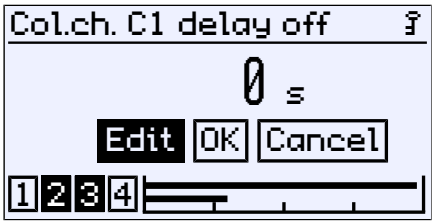


Fig. 111: Colour change C1 delay off

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:

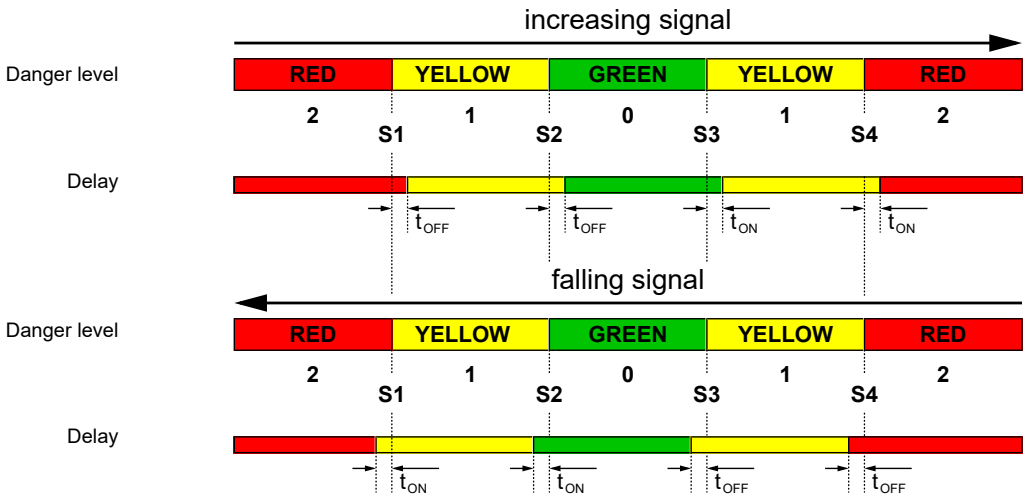


Fig. 112: Colour change delay

5.5.2 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

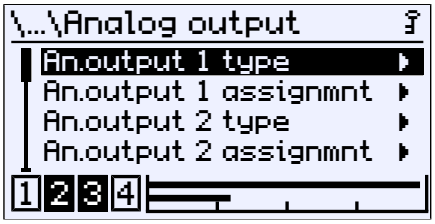


Fig. 113: Analog output

Menu name		Description
An.output 1 type	▸	This menu is used to define the output signal for output 1.
An.output 1 assignment	▸	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 assignment	▸	The measuring channel to which output 2 is assigned is defined in this menu.
An.output 3 type	▸	This menu is used to define the output signal for output 3.
An.output 3 assignment	▸	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.

5.5.2.1 Analog output 1 type

Path: \...\...\An.output 1 type
Level: 3

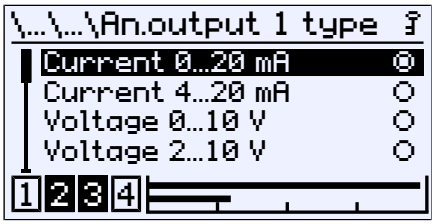


Fig. 114: Analog output 1 type

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

5.5.2.2 Analog output 1 assignment

Path: \Configuration\Analog output\An.output 1 assignment
Level: 3

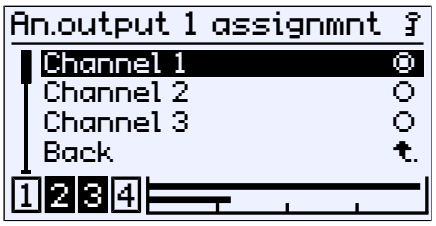


Fig. 115: An.output 1 assignment

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.

5.5.2.3 Signal limits

NOTICE! The limit parameters apply for both output signals.

The output signal can by 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 working the same way, they are only explained for the current signal as 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 .[5]

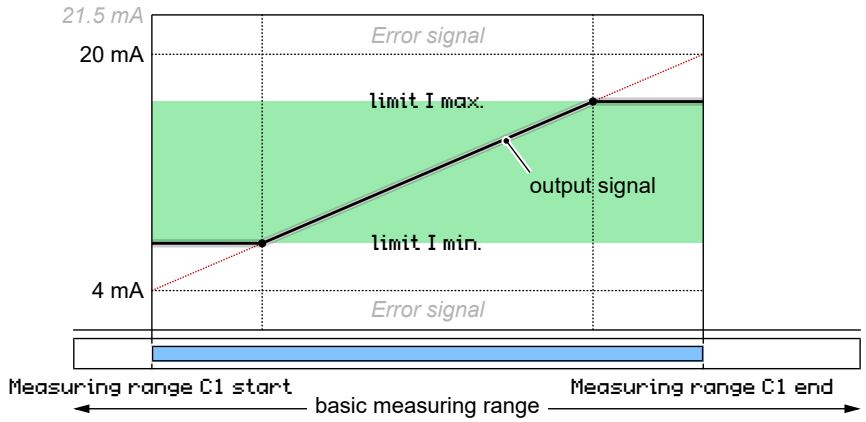


Fig. 116: Limitation of the output signal

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

[5] For the second channel, the channel number changes to C2.

5.5.3 Switch output

Path: \Configuration\Switch output
Level: 2

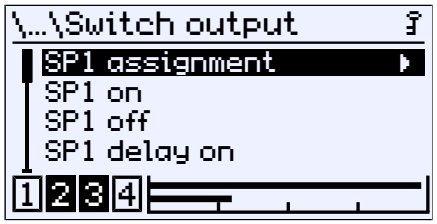


Fig. 117: Switch output

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.

5.5.3.1 SP1 assignment

Path: \Configuration\Switch output\SP1 assignment
Level: 3

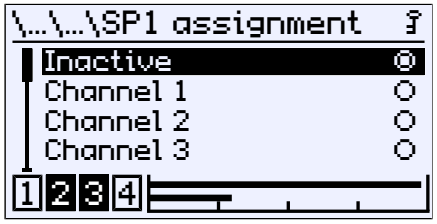


Fig. 118: SP1 assignment

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

5.5.3.2 SP1 function

Path: \Configuration\Switch output\SP1 function
Level: 3

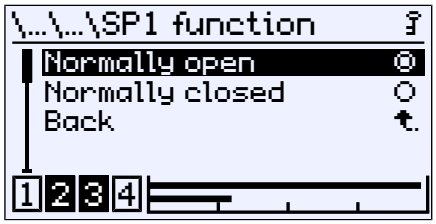


Fig. 119: SP1 function

The function of this contact is defined with this parameter.

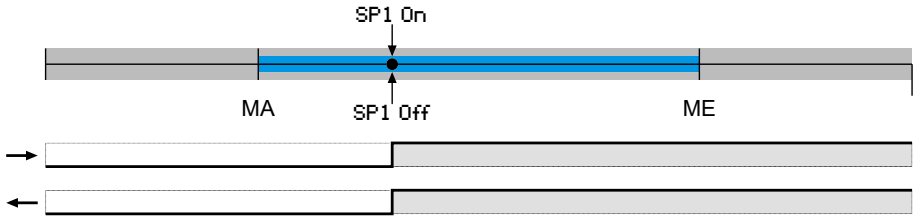
5.5.3.3 Switching function

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

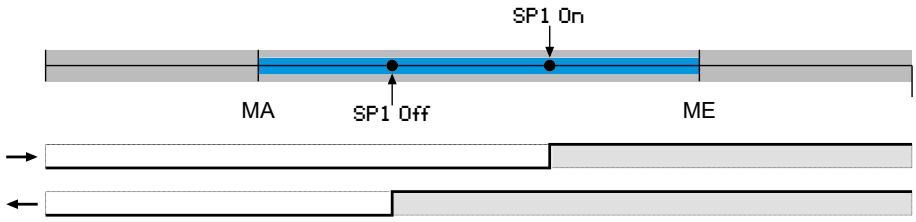
SP1 On defines the activation point, SP1 Off the deactivation point of switch output 1. The values are shown in the valid unit and set accordingly. The values are shown in the valid unit and set accordingly. Both parameters can be set independently over the entire value range.

→ Increasing input signal
← dropping input signal

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.



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 < Measured value < SP1 off. Otherwise the contact will drop.

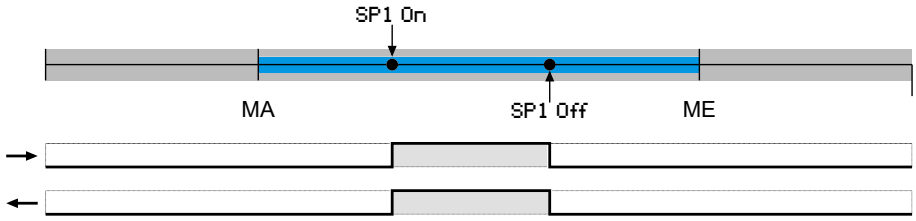


Fig. 120: Switch point setting

Delay

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

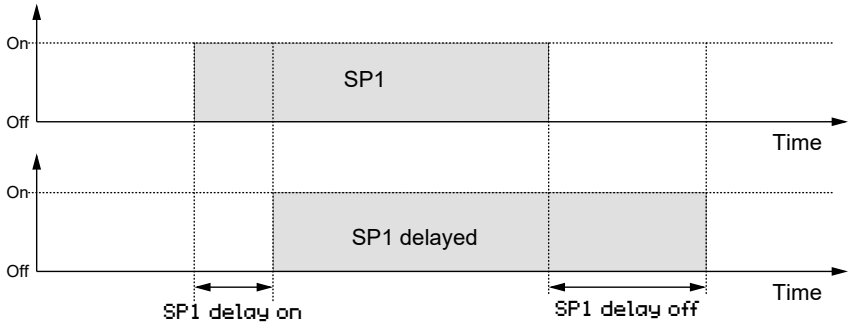


Fig. 121: Delay

5.5.4 Display

Path: \Configuration\Display
Level: 2

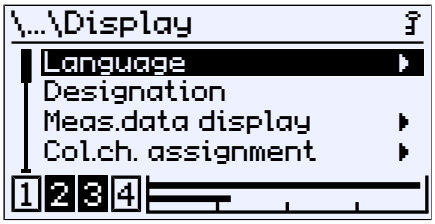


Fig. 122: Display

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.

5.5.4.1 Language

Path: \Configuration\Display\Language
Level: 3

Fig. 123: 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

5.5.4.2 Designation

Path: \Configuration\Display\Designation
Level: 3

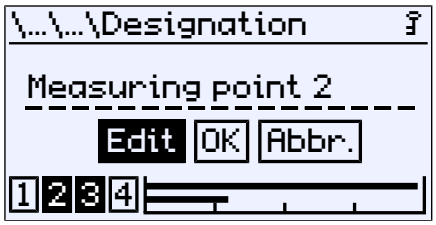


Fig. 124: Designation

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.

5.5.4.3 Measuring data display

Path: \Configuration\Display\Meas.data display
Level: 3

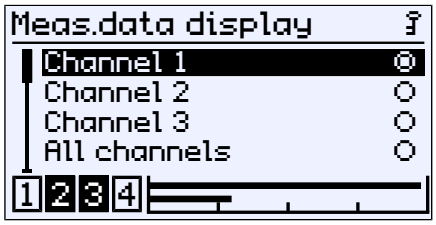


Fig. 125: Measuring data display

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

5.5.4.4 Colour change assignment

Path: \Configuration\Display\Col.ch. assignment
Level: 3

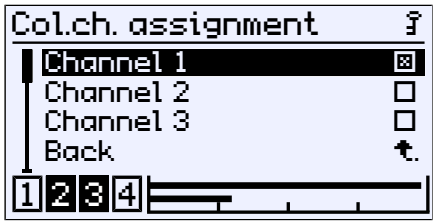


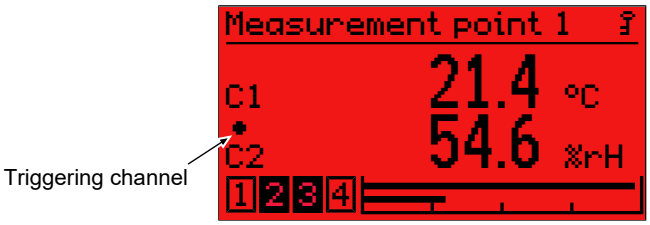
Fig. 126: Colour change assignment

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

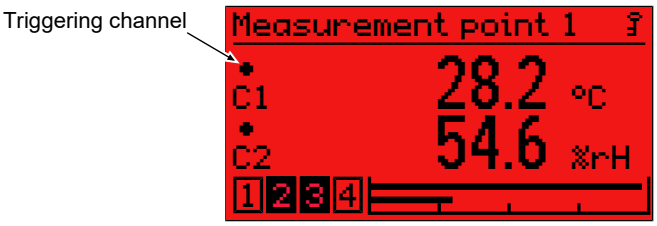


Fig. 127: Display of measured values (colour change)

5.5.4.5 LCD colour

Path: \Configuration\Display\LCD colour
Level: 3

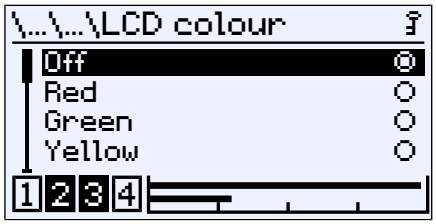


Fig. 128: LCD colour

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.

5.5.4.6 LCD lighting

Path: \Configuration\Display\LCD lighting
Level: 3

Fig. 129: 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.

5.5.4.7 LCD contrast

Path: \Configuration\Display\LCD contrast
Level: 3

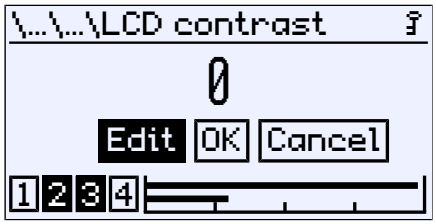


Fig. 130: LCD contrast

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

5.5.5 Modbus RTU

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

Path: \Configuration\Modbus RTU
Level: 2

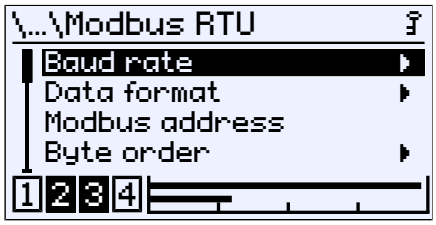


Fig. 131: Modbus RTU

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 DE90 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.

5.5.5.1 Baud rate

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

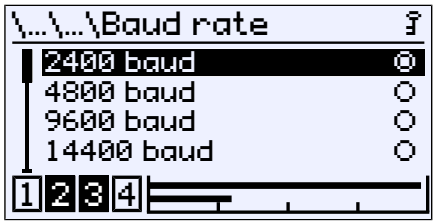


Fig. 132: Baud rate

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.

5.5.5.2 Data format

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

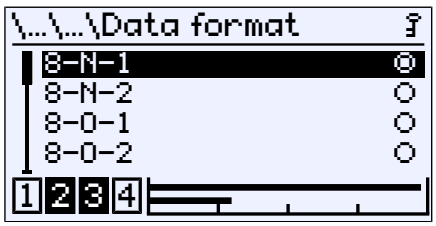


Fig. 133: Data format

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.

5.5.5.3 Modbus address

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

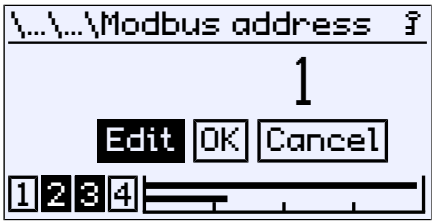


Fig. 134: Modbus address

Addresses from 1 to 247 can be used.

5.5.5.4 Byte order

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

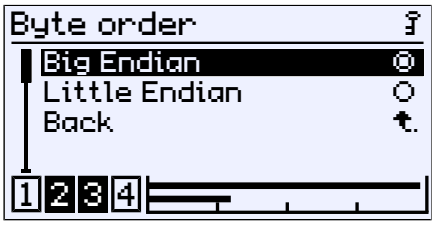


Fig. 135: Byte order

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.

5.6 Info

Path: \Info
Level: 1

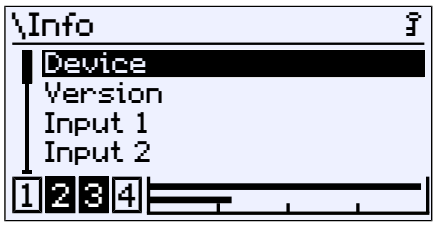


Fig. 136: Info

Various information for configuration and setting of the device is provided in this menu.

Menu name	Description
Dev.	Device type, serial number
Revision	Firmware version
Input 1	Basic measurement range, spread
Input 2	Basic measurement range, spread
Analog output	Output signal
Switch output	Assignment, contact type
Back ↰.	This represents the output (exit) of the information menu. Press 'back' to return to the main menu.

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

5.7 Service

Path: \Service
Level: 1

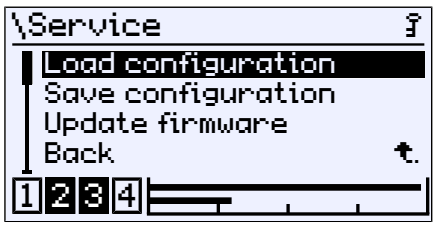


Fig. 137: Service

Menu name	Description
Load configuration	The configuration saved in the flash memory of the device is loaded.
Save configuration	The configuration is saved in the flash memory of the device.
USB → configuration	The configuration saved on a USB drive is loaded.
Configuration → USB	The configuration is saved to a USB drive.
Update firmware	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.

To be able to use a USB drive, you must open the housing first.

⚠ DANGER

Opening the housing on ATEX devices

ATEX devices may never be opened inside potentially explosive areas.

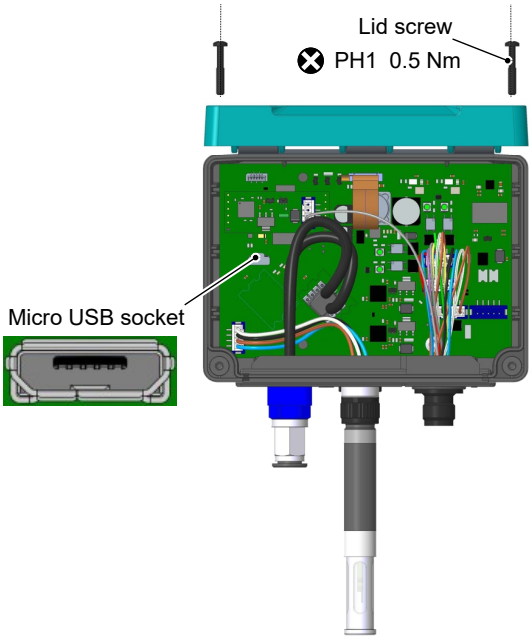


Fig. 138: USB port (example)

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

Please help to protect the environment by always disposing of the work pieces and packaging materials in compliance with the valid national waste and recycling guidelines or reuse them.

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	
	-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 Humidity	Temperature Humidity Differential pressure
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 4 to 20 mA	0 to 10 V 2 to 10 V 1 to 5 V
Signal range	0.0 to 21.5 mA	0.0 to 10.5 V
Load impedance R_L	≤ 600 Ω	≥ 2 kΩ
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) 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 $R_{ON} \leq 4\ \Omega$

7.4 Measuring accuracy

7.4.1 Humidity

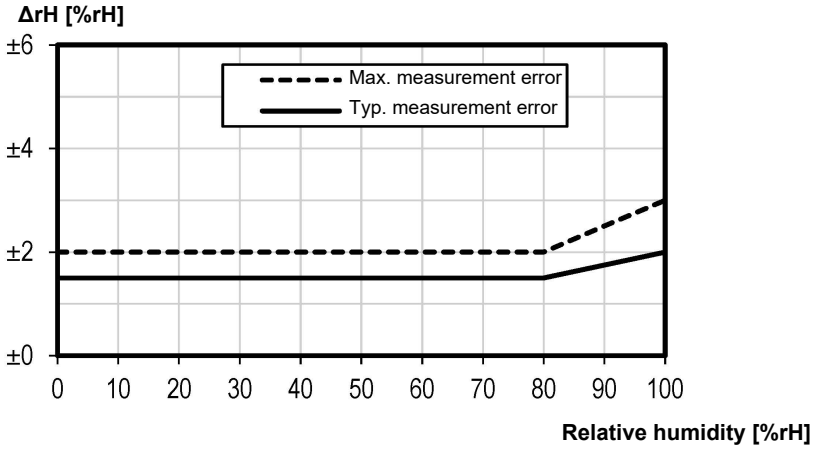


Fig. 139: Relative humidity measurement error in relation to relative humidity

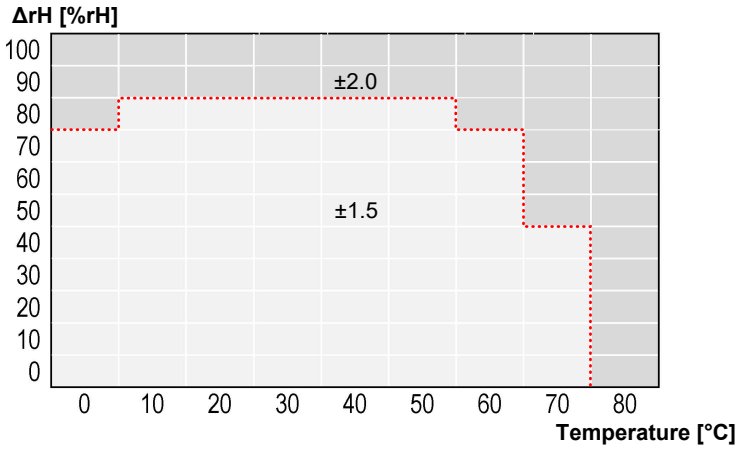


Fig. 140: Relative humidity measurement error in relation to temperature

Typical measurement error	1.5 to 2%rH
Maximum measurement error	2 to 3%rH

If the sensor is operated continuously with a humidity of over 80%rH, the measurement error can exceed the specified maximum value after a certain period of time.

Once the relative humidity drops below 80%rH, the sensor returns to its initial state and the measurement error is again within the specified limits.

7.4.2 Temperature

The limit values apply for plastic and all sensors mounted at an offset.

To ensure that the specified measurement error is upheld for stainless steel sensors mounted directly on the device, an air flow of at least 0.1 m/s must be guaranteed.

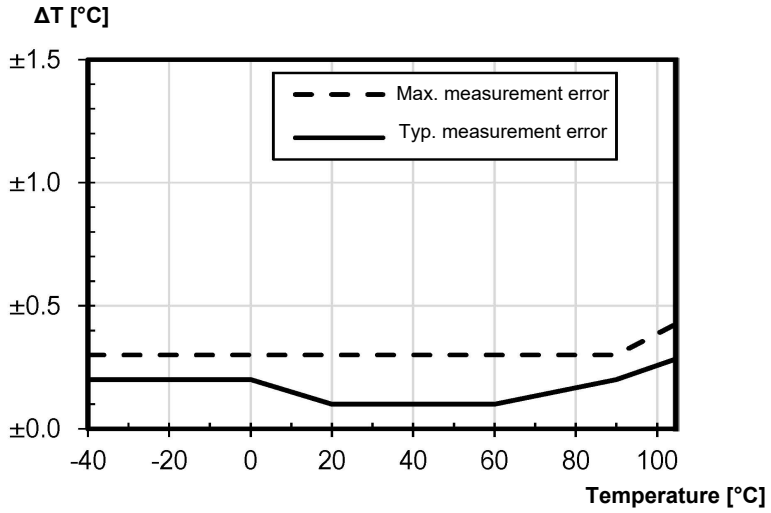


Fig. 141: Temperature measurement error in relation to temperature

Typical measurement error	0.1 to 0.3°C
Maximum measurement error	0.3 to 0.4°C

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.
	-20 to +80 Pa	0.5	1.0	0.3	0.6	0.2	0.4
	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
	-25 to +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

Measuring range		Measurement error [%]		Tc-zero [%/10K]		Tc span [%/10K]	
		Typ.	Max.	Typ.	Max.	Typ.	Max.
-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 [%]		Tc-zero [%/10K]		Tc span [%/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)
Port	Micro USB type B
Communication	Host/Device mode

Modbus RTU interface

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

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) 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 EN 61326-2-3:2013
ATEX	EN IEC 60079-0:2018 EN 60079-15:2010 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, H2SO4, HNO3, and NH3 can affect the sensor irreversibly, and should be avoided. Ozone in high concentrations or H2O2 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 that come into contact with the medium	
Pressure sensor	Silicon, PVC, FKM, aluminium, brass, stainless steel
Temperature and humidity sensor FF90FK	FR4, polyoxymethylene, solder resist, silicon, tin, copper, nickel, silver, ceramic
Humidity and temperature sensor FF90FV	FR4, stainless steel, solder resist, silicon, tin, copper, nickel, silver, ceramic

Materials of the parts that come into contact with the surroundings	
All versions	Polyester, PET, polyamide 6.6, aluminium, nickel-plated brass, stainless steel
Humidity and temperature sensor FF90FK	Polyoxymethylene
Humidity and temperature sensor FF90FV	Stainless steel

7.9.2 Dimensional drawings

All dimensions in mm unless otherwise stated

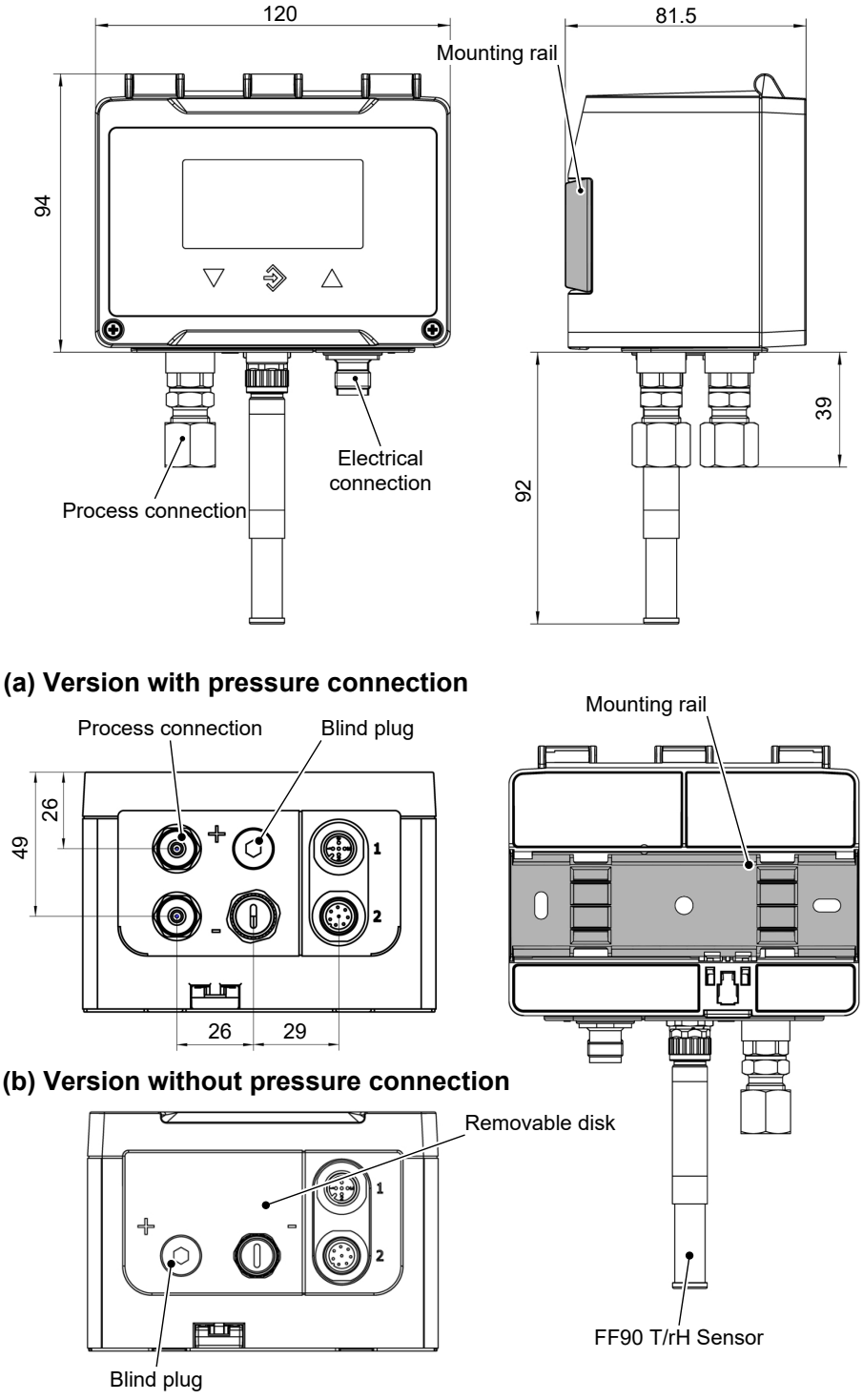


Fig. 142: Dimensional drawing

Mounting rail

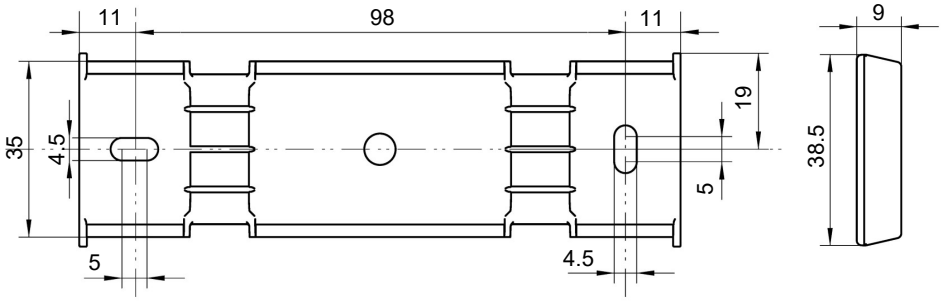


Fig. 143: Mounting rail

Process connection

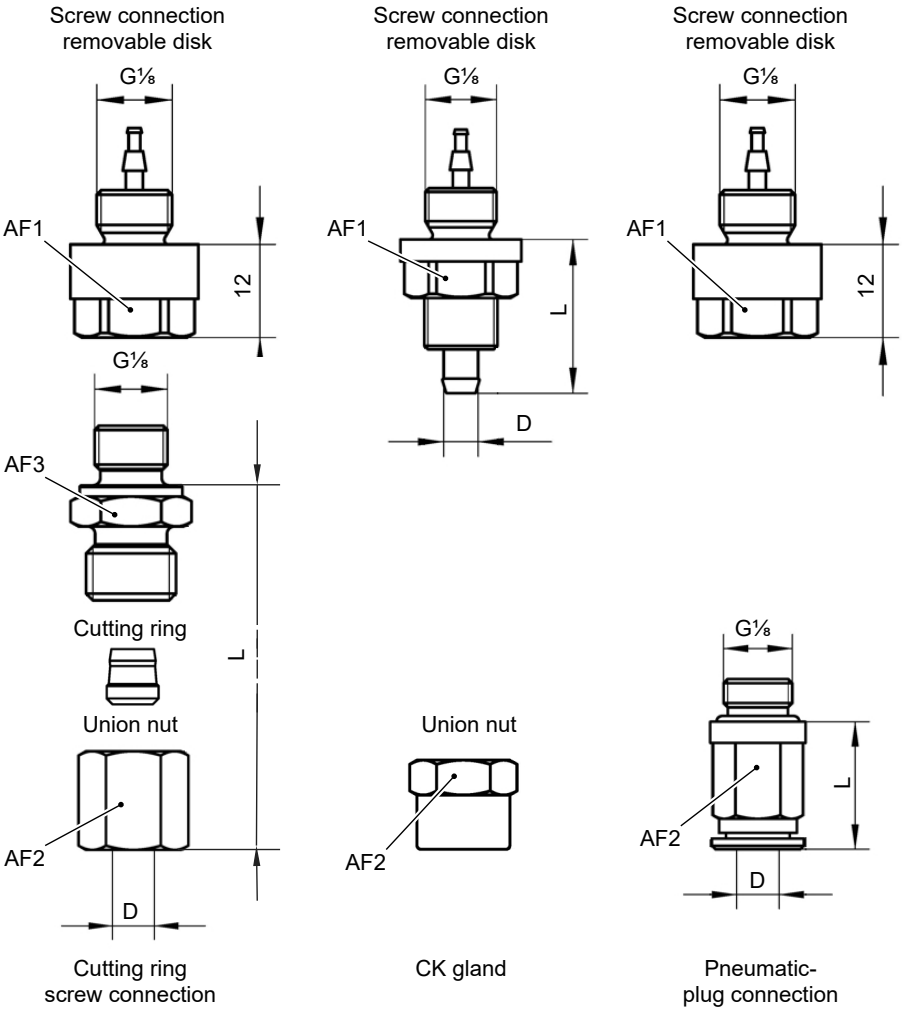
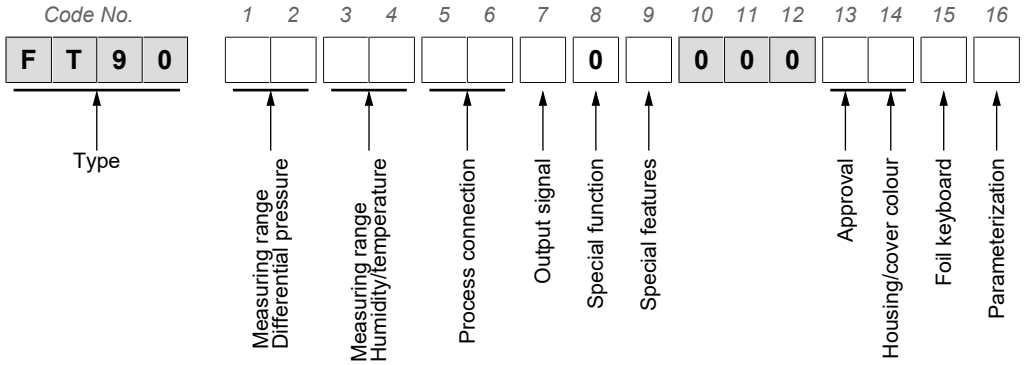


Fig. 144: Options for the process connection

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				
		L0	-20 … +80 Pa		
		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		
60	0 … 160 mbar	**E6**	0 … 16 kPa		
82	0 … 250 mbar	**E7**	0 … 25 kPa		
		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		
B6	-250 … +250 mbar	**T1**	-25 … +25 kPa		

Humidity and temperature measuring range:

[3,4]	Measuring range	Sensor material
10	Humidity 0 to 100% rH Temperature -40 to 100°C	Plastic (POM)
20	Humidity 0 to 100% rH Temperature -40 to 100°C	Stainless steel

Process connection:

[5,6]	
40	Aluminium CK screw connection for 6/4 mm hose
41	Aluminium CK screw connection for 8/6 mm hose
P6	Nickel-plated brass pneumatic plug-in connector for 6/4 mm hose
P8	Nickel-plated brass pneumatic plug-in connector for 8/6 mm hose
24	Stainless steel cutting ring connection for 6 mm pipe
25	Stainless steel cutting ring connection for 8 mm pipe

Output signal:

[7]	
0	without
Switchable, factory pre-set:	
C	0 … 10 V
A	0 … 20 mA
P	4 … 20 mA
Digital interface:	
M	RS485 Modbus RTU

Special functions:

[8]	
0	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
	A8	-6 to +6 mbar	**R2**	-600 to +600 Pa
	A9	-10 to +10 mbar	**L8**	-1 to +1 kPa

Approval and housing/lid colour:

[13,14]	Approval	Housing colour	Lid colour
00	None	Anthracite	Green
R1	ATEX zones 2 and 22	Black (conductive housing)	Black

Membrane keypad:

[15]	
0	FISCHER
1	Neutral

Configuration:

[16]	**Preset at the factory** *)
0	'Standard' configuration
Z	'Customer-specific' configuration

*) 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 FF90 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
		7 m	09011365
		10 m	09011366
Mounting flange for temperature sensor			06402713

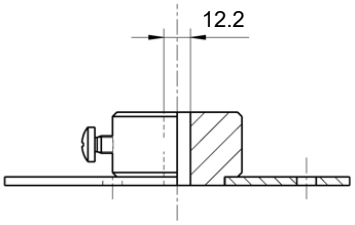


Fig. 145: Mounting flange for FF90 humidity and temperature sensor

Spare parts

FF90 humidity and temperature sensor	Order no.
Smooth sensor made from plastic	FF90 FK
Smooth sensor made from stainless steel	FF90 FV

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 as a download.

9 Attachments

9.1 EU Declaration of Conformity

FISCHER MESS- UND REGELTECHNIK

(Translation) CE

EU Declaration of Conformity

For the product described as follows

Product designation **Humidity and temperature measuring device**

Type designation **FT90**

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

2014/30/EU	*EMC Directive*
2011/65/EU	*RoHS Directive*

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*

RoHS Directive (RoHS 2)

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
Mr. Torsten Malischewski
B.Sc.
Development department

The devices bear the following marking: CE

Bad Salzuflen
10 June 2020

G. Gödde
Managing director

09010422 • CE_EN_FT90 • Rev. ST4-A • 06/20 1 / 1

Fig. 146: CE_DE_FT90

FISCHER MESS- UND REGELTECHNIK

(Translation) CE

EU Declaration of Conformity

For the product described as follows

Product designation **Humidity and temperature measuring device**

Type designation **FT90 ## ## ## # 0 # 000 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*

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 2)

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*

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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.

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Documentation representative

Mr. Torsten Malischewski
B.Sc.
Development department

The devices bear the following marking:

CE
Ex II 3G Ex ec IIC T4 Gc
Ex II 3D Ex tc IIIB T125°C Dc

Bad Salzuflen
10 June 2020

G. Gödde
Managing director

09010424 • CE_EN_FT90_ATEX • Rev. ST4-A • 06/20 1 / 1

Fig. 147: CE_DE_FT90_ATEX

Notes

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