developing solutions

FISCHER
MESS- UND REGELTECHNIK

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

IO-Link Modbus

Operating manual

DD90

Differential pressure transmitter
PRO-LINE ®

09015484 • BA_EN_DD90 • Rev. ST4-A • 10/25

Impressum

Manufacturer: **FISCHER Mess- und Regeltechnik GmbH**

Bielefelderstr. 37a
D-32107 Bad Salzuflen

Telephone: +49 5222 974 0
Telefax: +49 5222 7170

eMail: info@fischermesstechnik.de
web: www.fischermesstechnik.de

Technical editorial team: Technical editor: R. Kleemann

Version history

Rev. ST4-A 09/25	Version 1 (first edition)

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.

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.

1.3 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.

1.4 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.

1.5 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.

1.6 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.

1.7 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.

1.8 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.

Other symbols

This table explains how the different objects (menu, parameters, etc.) are shown in these operating instructions.

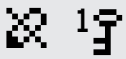
Symbol	Description
	This symbol indicates that the switch output contact is open.
	This symbol indicates that the switch output contact is closed.
Meas.data display	This presentation is selected for parameter or menu names.
	This symbol indicates that the administrator is still logged in.
	This symbol indicates that one of the users is still logged in. The number corresponds to the number of the user.
	This symbol indicates that user 1 only has one set of read rights. The respective user number (see above) is used for another user. There is no symbol for writing/read rights.
	This symbol indicates that there is a submenu
	This symbol indicates that there is a blocked submenu or parameter.
	This symbol is an indicator for the menu output at the next highest level.
	This symbol stands for an option that was not selected in a list.
	This symbol stands for a selected option from a list.
	This symbol stands for an activated property.
	This symbol stands for a deactivated property.
	This symbol stands for a short press of a button
	This symbol stands for a permanent push of a button hereinafter call 'repeat' or 'button repeat'.
	The guide stands for a collection of links that indicate the path to certain topics.

Table 1: Pictogram explanation

2 Product and functional description

2.1 Delivery scope

- Differential pressure transmitter DD90 PRO-LINE®
- Operating Manual

2.2 Intended use

The DD90 is a differential pressure transmitter with an optional additional pressure measurement channel for system pressure measurement. It is suitable for measuring overpressure, underpressure and differential pressure for the following media:

- Air
- Water
- Exhaust air, acidic
- Steam
- Heated drinking water
- Hot water
- Cold water
- Cooling water
- Brine (max. 2.5% salt content)
- Water-glycol mixture

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

Eurasian Economic Union (EAC):

The device does not have ATEX approval for this market. It may only be used there as an industrial device.

2.2.1.1 Gas explosion protection

Ex Zone 2

Devices with the order code **DD90** ## ## ## # 00 000 **R1** # # are suitable as ‘Electrical equipment for use in potentially explosive atmospheres’, Zone 2 – Gases and vapours.

Designation as per Directive 2014/34/EU:

Ex II 3G Ex ec IIC T4 Gc

2.2.1.2 Dust explosion protection

Ex Zone 22

Devices with the order code **DD90** ## ## ## # 00 # 000 **R1** # # are suitable as ‘Electrical equipment for use in areas with combustible dust’, Zone 22 – Dry dusts.

Designation as per Directive 2014/34/EU:

Ex II 3D Ex tc IIIB T125°C Dc

-20°C ≤ T_{amb} ≤ 60°C

2.2.2 External application

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

You can find a suitable protective cover in the Accessories [▷ 129].

2.3 Function diagram

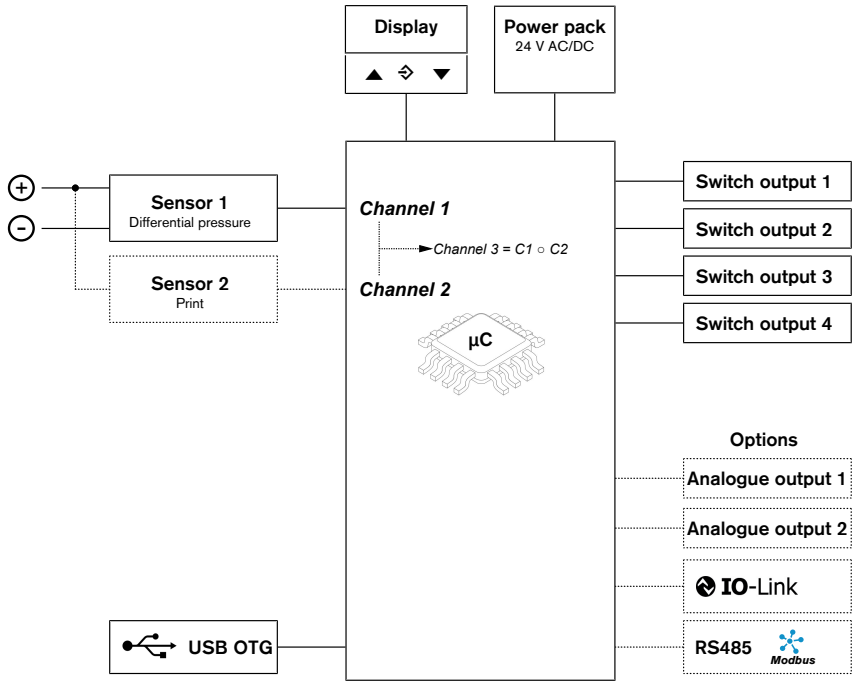


Fig. 1: Function diagram

2.4 Design and mode of operation

The device is based on a piezoresistive sensor element with a stainless steel diaphragm and is suitable for measuring overpressure, underpressure and differential pressure (channel 1).

The pressures to be compared act directly on a diaphragm equipped with a measuring bridge. When the pressure is equal, the measuring diaphragm is in its idle state. If a pressure difference occurs, the diaphragm is deflected, causing a change in resistance. This change is evaluated and displayed by the electronics integrated in the device and converted into up to four switching contacts.

Optionally, the device can be equipped with a second piezoresistive sensor element with a stainless steel diaphragm for measuring static pressure (channel 2 for system pressure measurement). With these devices, it is possible to mathematically combine the two input channels into one virtual channel (channel 3).

Overall, the device can be delivered with the following equipment.

	1-channel	2-channel	Modbus RTU*)		IO-Link
			(Opt1)	(Opt2)	
Switch output 1	x	x		x	x
Switch output 2	x	x		x	x
Switch output 3		x		x	x
Switch output 4		x		x	x
USB interface	x	x	x	x	x
Options:					
RS485 Modbus RTU			x	x	
IO-Link					x
Analogue output 1	x	x			
Analogue output 2		x			

*) Opt1: without switch outputs; Opt2: with switch outputs

2.5 Device versions

In the standard version, the device is equipped with a green lid and an anthracite-coloured lower housing section.

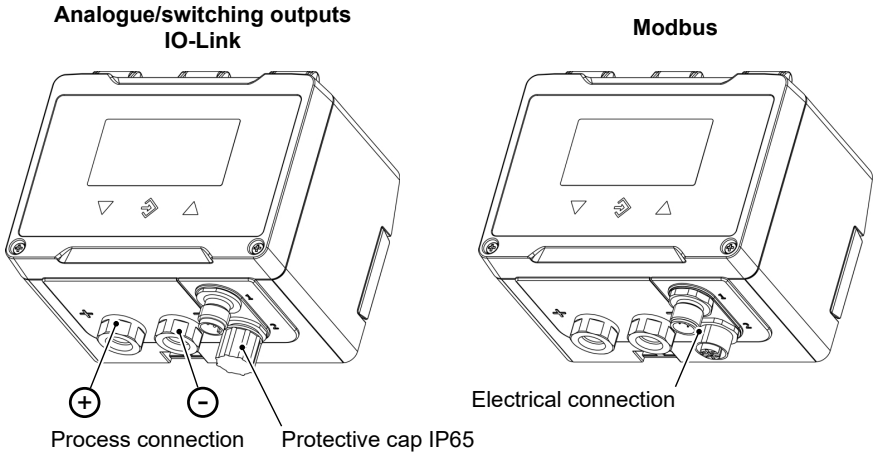


Fig. 2: Basic versions

2.5.1 Process connections

NOTICE! Pneumatic push-in fittings may only be used up to a maximum of 10 bar.

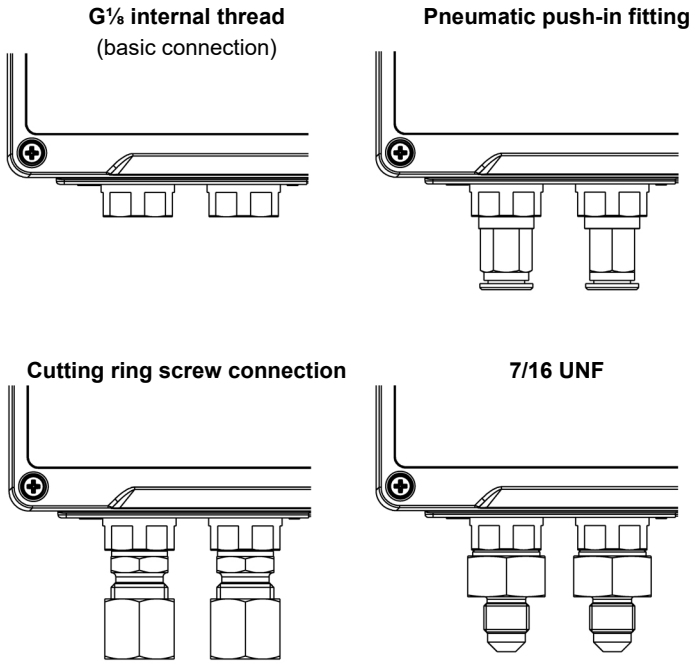


Fig. 3: Process connections

2.5.2 Electric connections

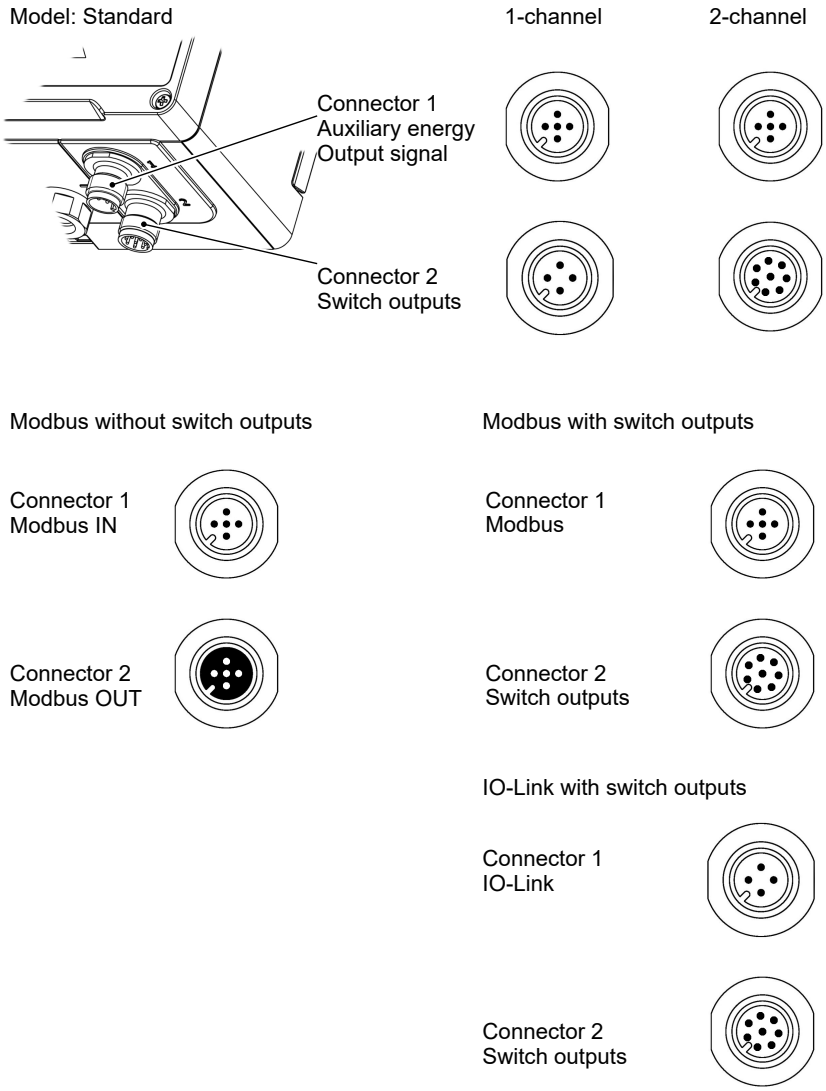


Fig. 4: Electric connections

2.5.3 ATEX model

In the ATEX version, the device is equipped with a black conductive housing.

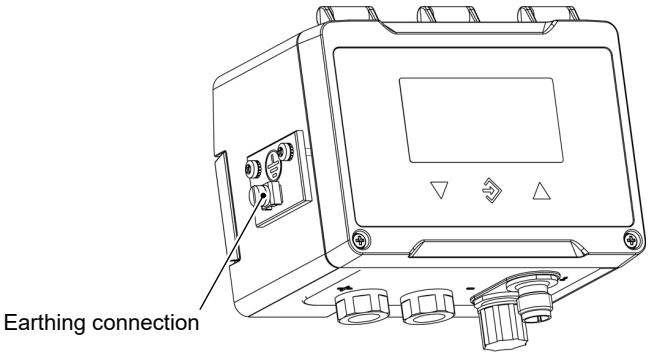


Fig. 5: ATEX model

2.5.4 Type plate

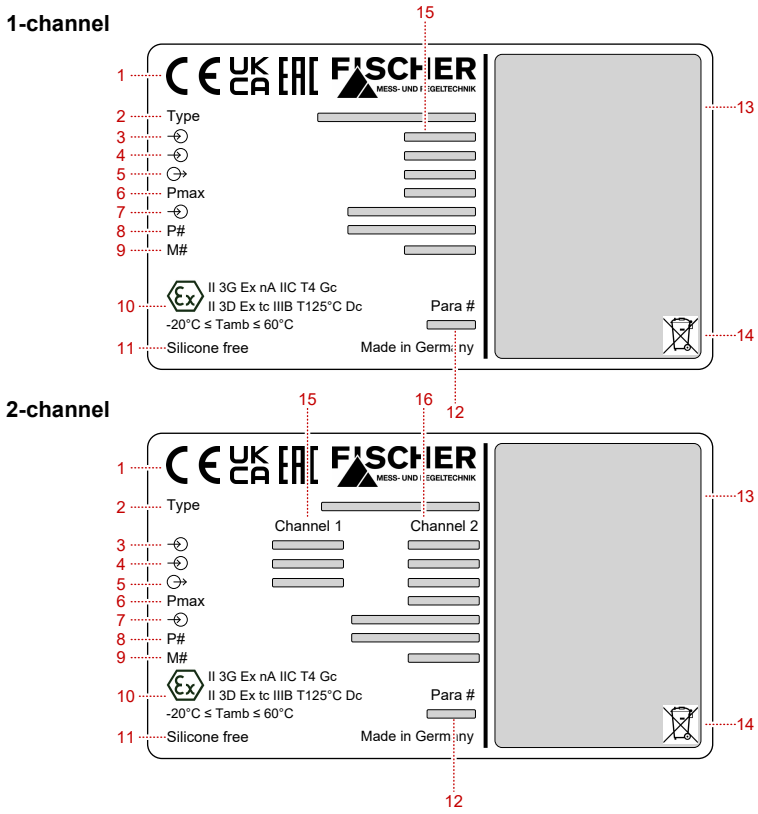


Fig. 6: Type plate

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	**14**	WEEE marking
15	Data for channel 1	**16**	Data for channel 2

Explanations of the symbols

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

Fig. 7: Key

3 Installation

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.

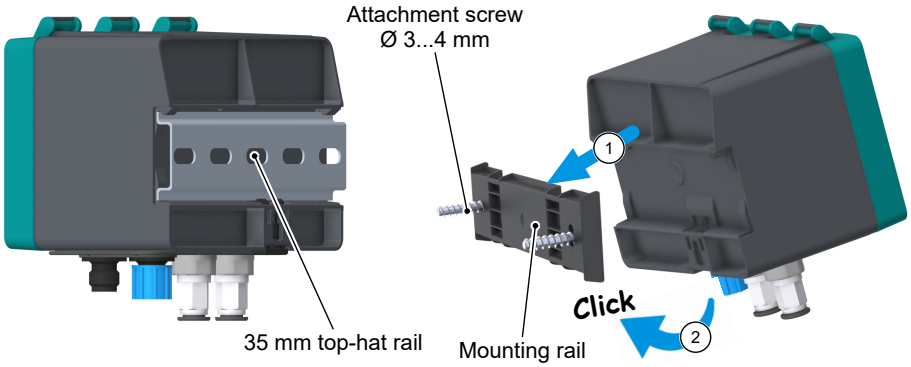


Fig. 8: Installation

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

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

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

3.2 Mounting in explosive areas

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

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

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

3.3 Process connection

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

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

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

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

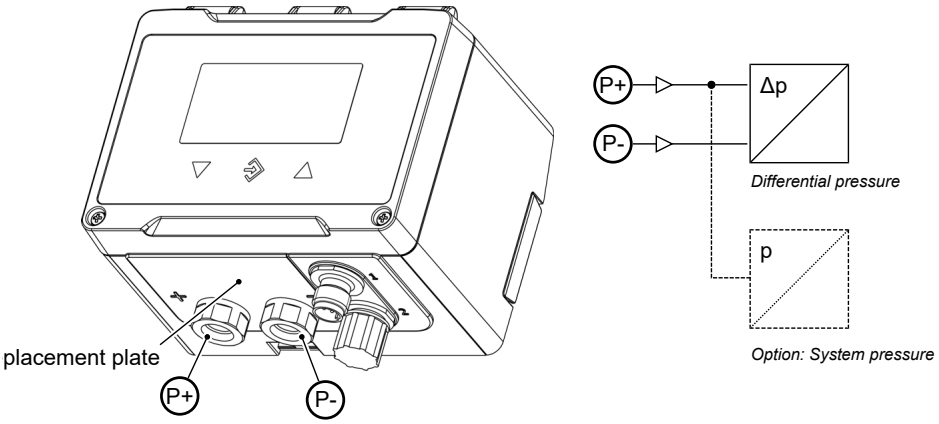


Fig. 9: Process connection G1/8″ internal

3.3.1 Replacement plates

The pressure transmitter can be supplied with different pressure connections (see order code).

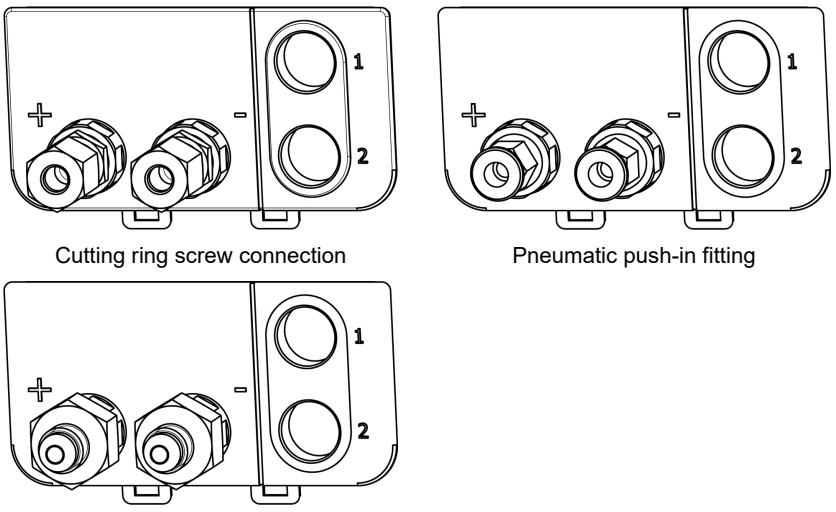


Fig. 10: Options for pressure connections

3.3.2 Cutting ring screw connections

▷ In the case of cutting ring screw connections, incorrect installation of the pressure lines can lead to a 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 with just one counter-hold. Mount the cutting ring screw connection with a quarter or half-turn of the union nut.

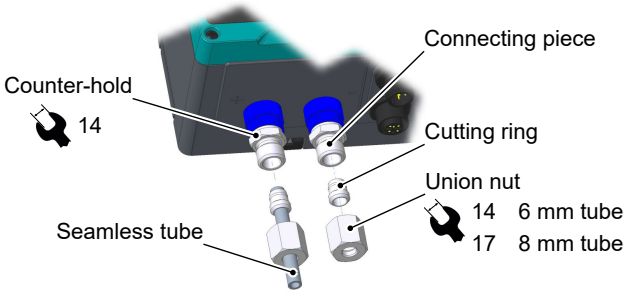


Fig. 11: Counter-hold for cutting ring screw connections

[1] The assembly past is not part of the delivery scope nor is it a part of 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.

Translation:

WARNING – DO NOT CONNECT OR DISCONNECT DEVICES UNDER VOLTAGE

Fig. 12: Earthing connection

3.4.2 Devices only with switching 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 pre-assembled sensor connection cable (see the accessories). Alternatively, a field-attachable M12 socket can be used.

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

1-channel version

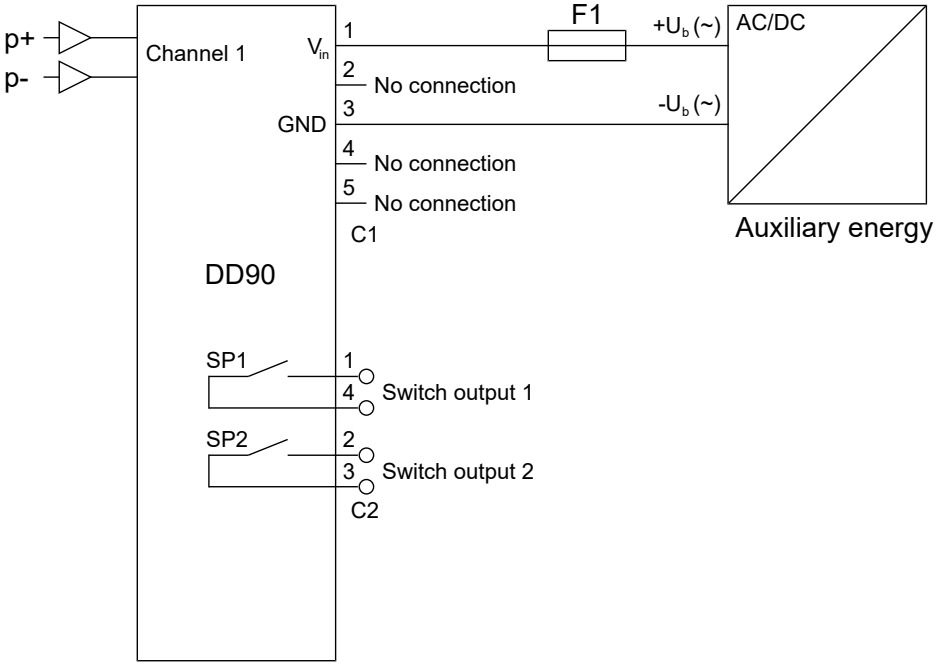


Fig. 13: 1-channel version (without analogue output)

2-channel version

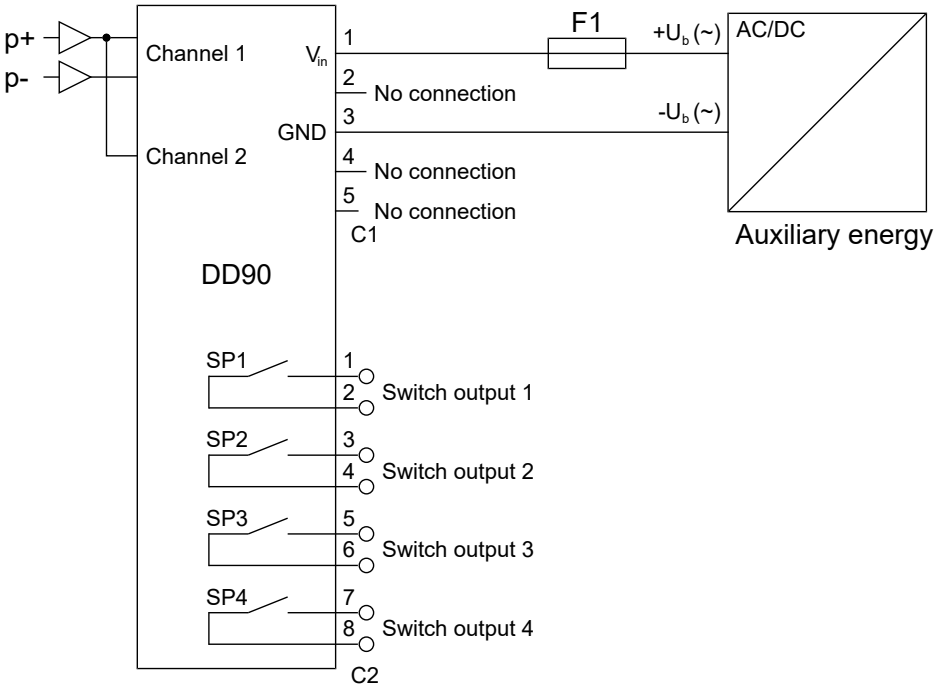


Fig. 14: 2-channel version (without analogue output)

3.4.2.2 M12 connector 1: auxiliary energy

1 channel version

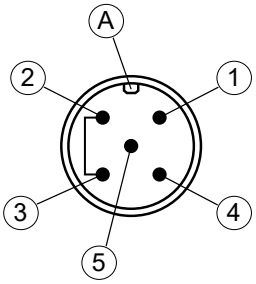


Fig. 15: M12 plug 5pin + bridge

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		

2 channel version

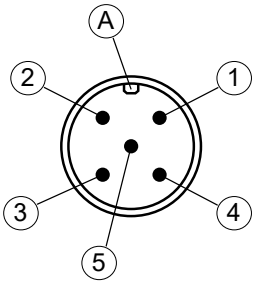


Fig. 16: M12 plug 5pin

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

The number of switch outputs depends on the number of measuring ducts.

1 channel version

2 switch outputs

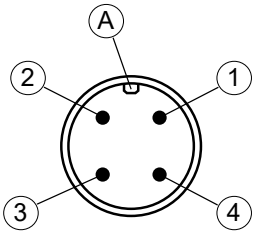


Fig. 17: M12 plug 4-pin

PIN	Signal		Cable colour
1	Switch output 1	SP1	Brown
2	Switch output 2	SP2	White
3	Switch output 2	SP2	Blue
4	Switch output 1	SP1	Black
A	Coding		

2 channel version

4 switch outputs

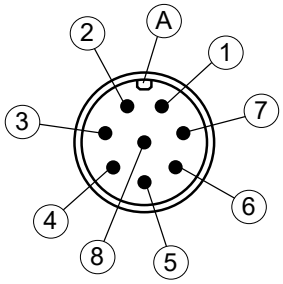


Fig. 18: M12 plug 8-pin

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 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 pre-assembled sensor connection cable (see the accessories). Alternatively, a field-attachable M12 socket can be used.

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

1-channel version

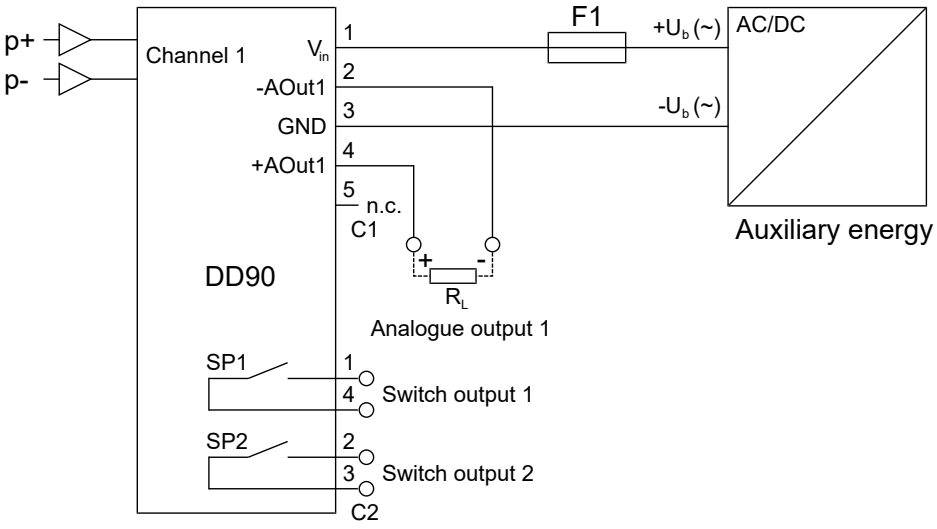


Fig. 19: 1-channel version (with analogue output)

2-channel version

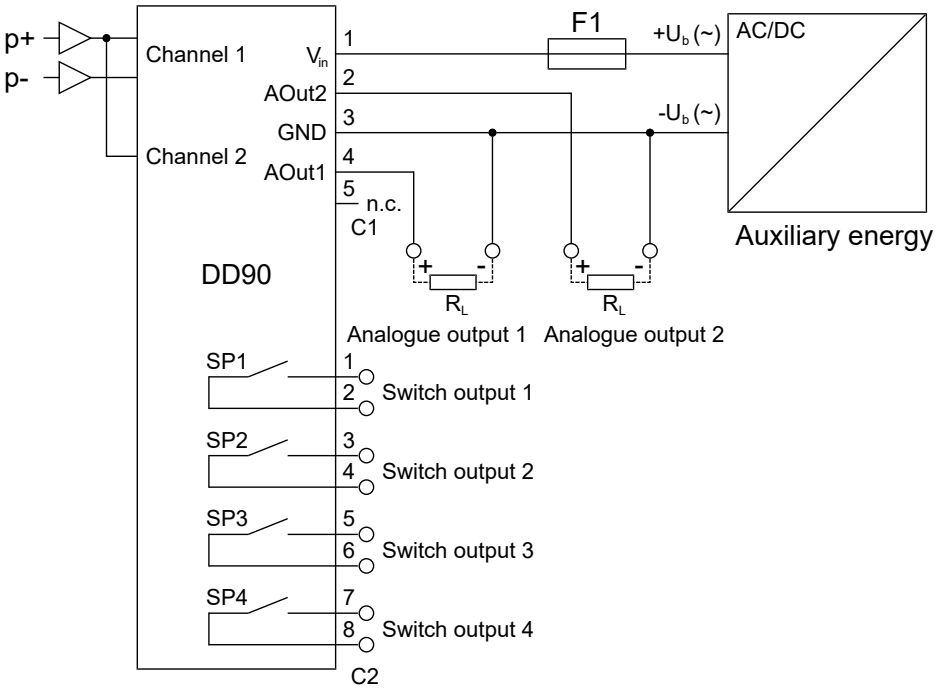


Fig. 20: 2-channel version (with analogue output)

3.4.3.2 M12 connector 1: auxiliary energy and analogue output

1 channel version

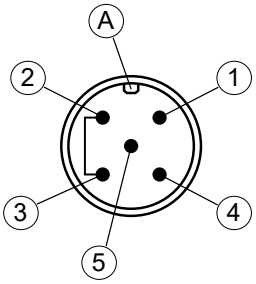


Fig. 21: M12 plug 5-pin+bridge

PIN	Signal		Cable colour
1	Operating voltage	$+U_b$	Brown
2	Analog output 1	-AOut1	White
3	Operating voltage	$- U_b$	Blue
4	Analog output 1	+AOut1	Black
5	Unused		Grey
A	Coding		

2 channel version

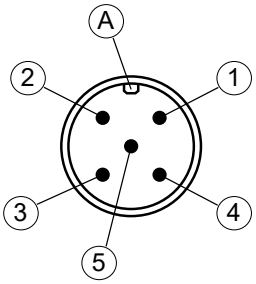


Fig. 22: M12 plug 5-pin

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	Unused		Grey
A	Coding		

3.4.3.3 M12 connector 2: switch outputs

The number of switch outputs depends on the number of measuring ducts.

1 channel version

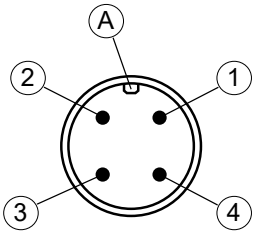


Fig. 23: M12 plug 4-pin

2 switch outputs

PIN	Signal		Cable colour
1	Switch output 1	SP1	Brown
2	Switch output 2	SP2	White
3	Switch output 2	SP2	Blue
4	Switch output 1	SP1	Black
A	Coding		

2 channel version

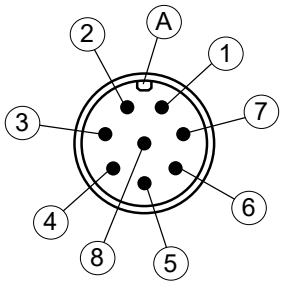


Fig. 24: M12 plug 8-pin

4 switch outputs

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		

3.4.4 Devices with Modbus (without switch outputs)

⚠ DANGER

Auxiliary energy for ATEX devices

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

Take suitable safety precautions to prevent this risk.

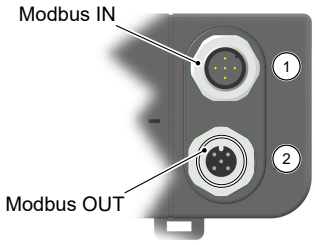


Fig. 25: Modbus replacement plate

These devices with a Modbus interface do not have analogue or switching outputs. The replacement plate is equipped with a 5-pin M12 flange plug for the Modbus input and a 5-pin M12 flange socket for the Modbus output.

The DD90 can be connected to a Modbus RTU network as a so-called slave. Up to 247 devices can be addressed in one line network.

NOTICE! Star-shaped networks are not allowed.

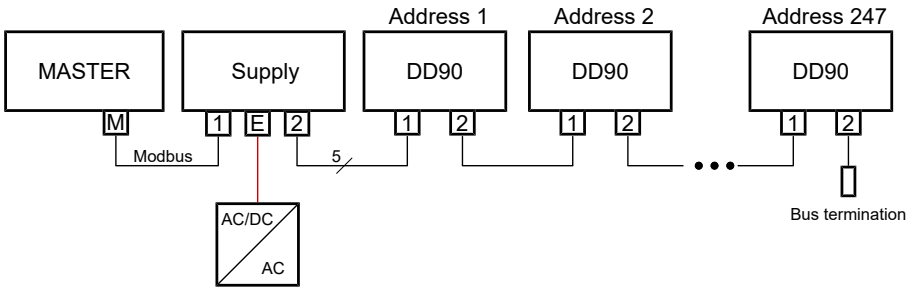


Fig. 26: Modbus RTU network

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

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

3.4.4.1 Connection to an existing Modbus RTU network

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

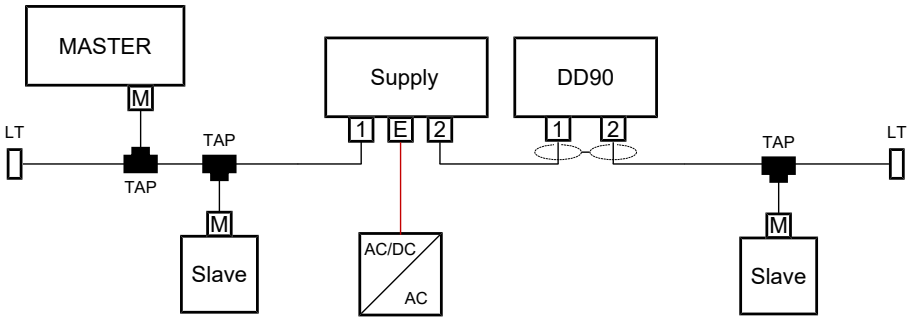


Fig. 27: Modbus connection

3.4.4.2 Auxiliary energy supply

The following illustrations explain the principle of the power supply of the DD90 in the Modbus network. However the feeder nodes are not part of the delivery scope and need to be installed by the operator.

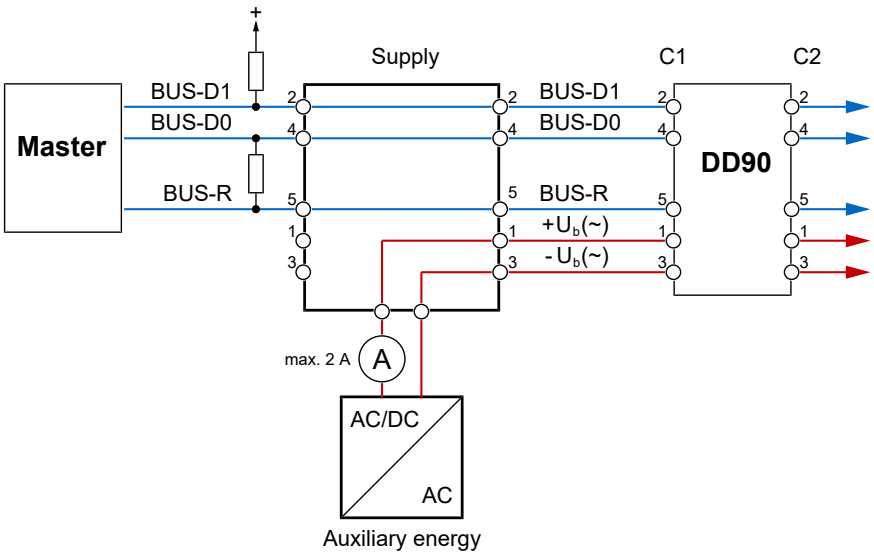


Fig. 28: Main supply

Please note that the M12 plugs are approved for max. 2 A. This value may already be exceeded if there are more than 12 devices of type DD90. In this case, an intermediate auxiliary energy feed should be provided at a suitable place.

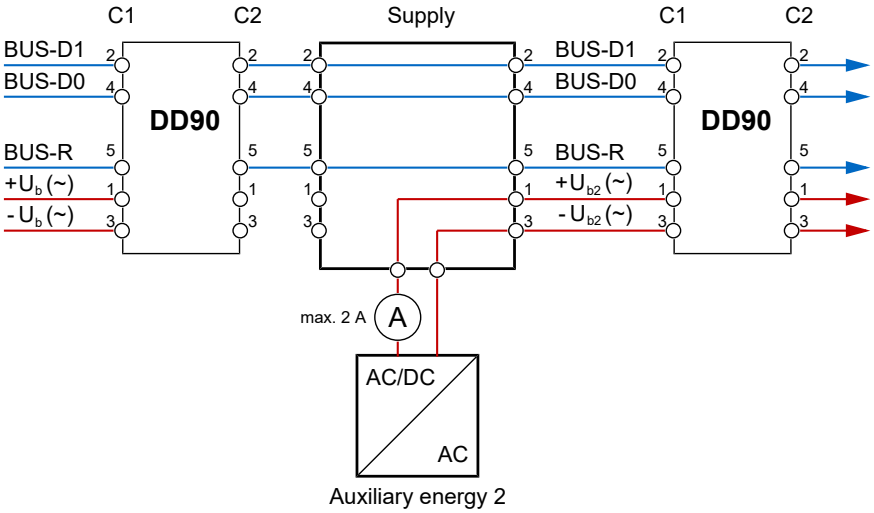


Fig. 29: Intermediate supply

3.4.4.3 M12 plug 1: Modbus IN

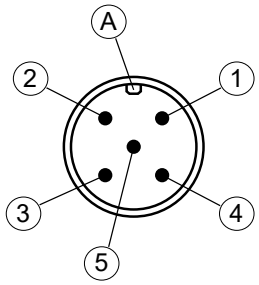


Fig. 30: M12 plug 5-pin

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

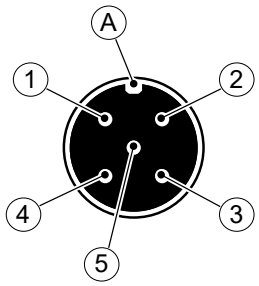


Fig. 31: M12 bush 5-pin

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		

3.4.5 Devices with Modbus (and 4 switch outputs)

⚠ DANGER

Auxiliary energy for ATEX devices

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

Take suitable safety precautions to prevent this risk.

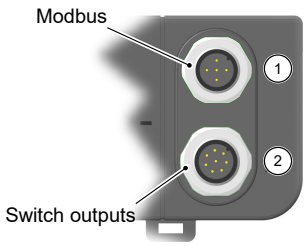


Fig. 32: Replacement plate Modbus with switch outputs

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

The DD90 can be connected to a Modbus RTU network as a so-called slave. Up to 247 devices can be addressed in one line network. It is connected via a conventional T-piece (passive TAP).

NOTICE! Star-shaped networks are not allowed.

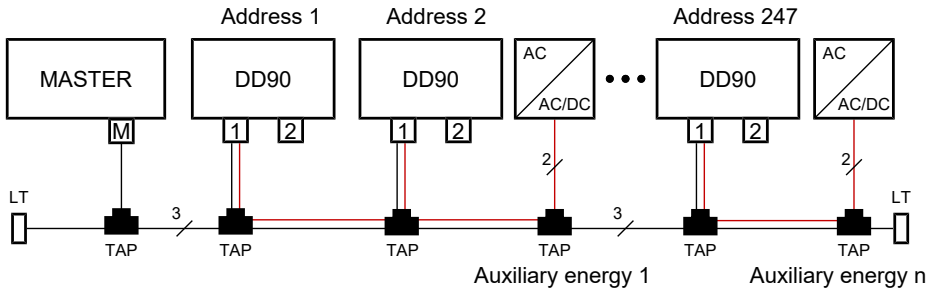


Fig. 33: Modbus RTU network

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

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

3.4.5.1 Connection to an existing Modbus RTU network

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

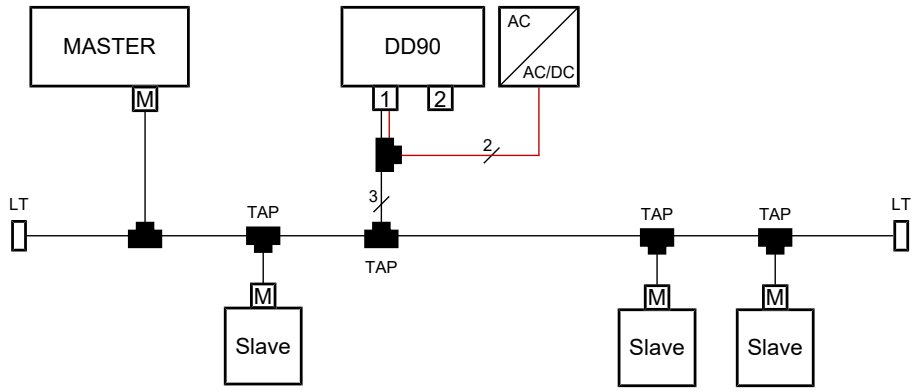


Fig. 34: Modbus connection

3.4.5.2 Auxiliary energy supply

The following illustrations explain the principle of the power supply of the DD90 in the Modbus network. However the feeder nodes are not part of the delivery scope and need to be installed by the operator.

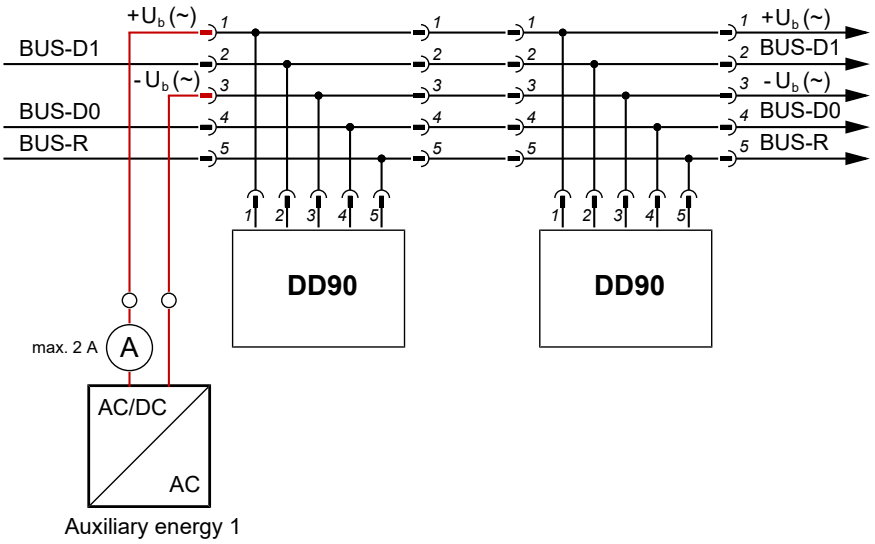


Fig. 35: Main supply

Please note that the M12 plugs are approved for max. 2 A. This value may already be exceeded if there are more than 12 devices of type DD90. In this case, an intermediate auxiliary energy feed should be provided at a suitable place.

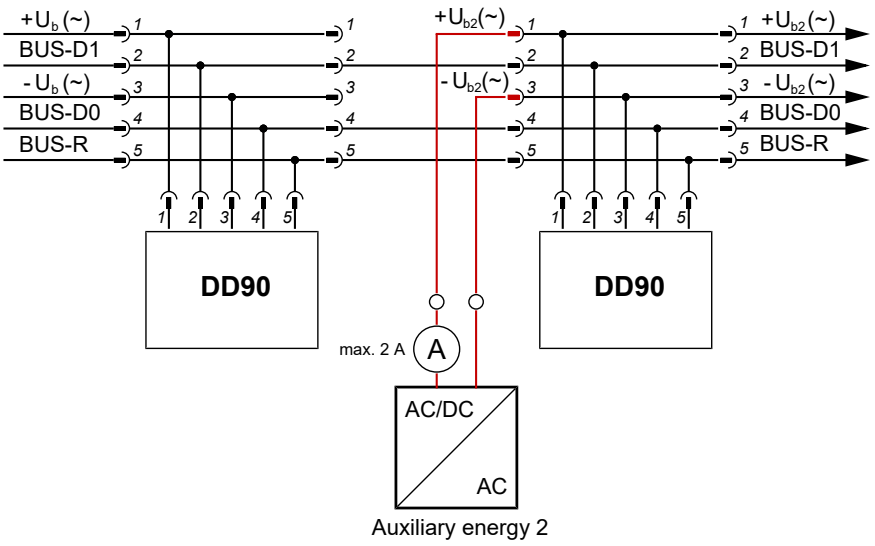


Fig. 36: Intermediate supply

3.4.5.3 M12 connector 1: Modbus

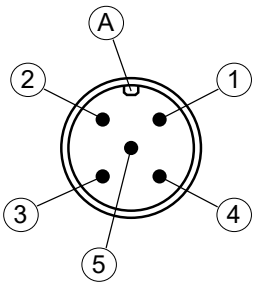


Fig. 37: M12 plug 5-pin

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

3.4.5.4 M12 connector 2: Switch outputs

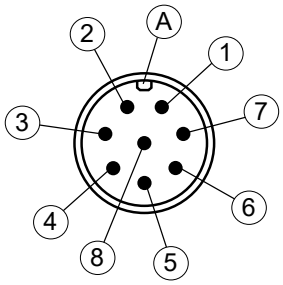


Fig. 38: 8-pin M12 connector

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		

3.4.6 Devices with IO-Link

3.4.6.1 M12 connector 1: IO-Link

Supply via the IO-Link (Class A) is limited to 200 mA.

Pin assignment M12-4 Class A

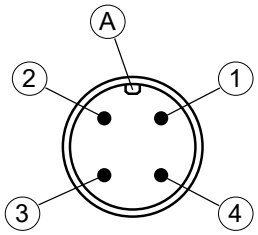


Fig. 39: M12 connector 4-pin

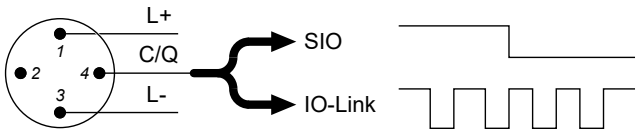


Fig. 40: IO-Link

Position	Description		Cable colour
1	L+	24 V supply (U_s+)	Brown
2	n.c.	Not connected	White
3	L-	24 V supply (U_s-)	Blue
4	C/Q	Standard input/output (SIO) or communication line (I/O Link)	Black
A		Coding	

3.4.6.2 M12 connector 2: Switch outputs

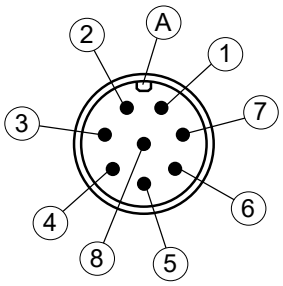


Fig. 41: 8-pin M12 connector

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		

3.4.7 USB port

⚠ DANGER

Opening the housing on ATEX devices

ATEX devices must never be opened inside potentially explosive areas.

There is a micro USB connection for a USB stick inside the housing. The parameters can be secured and loaded or the firmware can be updated via this USB interface. The device can be configured via this interface using the PC software '**inTouch**'[(2)] .

▷ Access to the USB socket:

1. Remove the two cover screws.
2. Open the housing
3. Lift the rear circuit board slightly.
4. This makes the USB socket easily accessible.

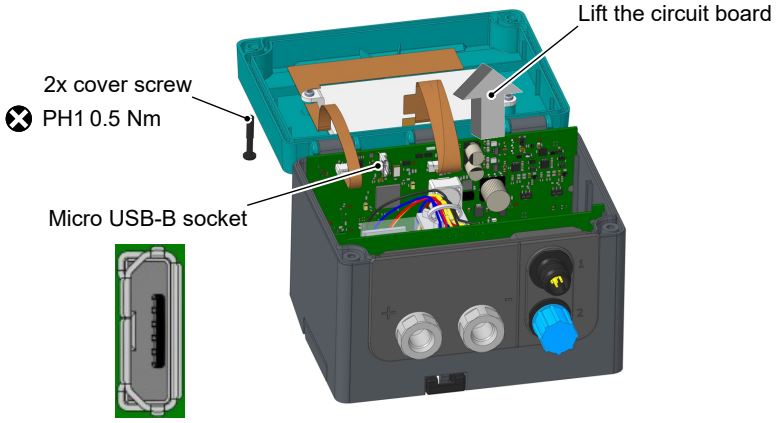


Fig. 42: USB port (example)

[(2)] see accessories

4 Start-up

⚠ WARNING

Operation in areas at risk of explosion

When operating in potentially explosive atmospheres, inspections must be carried out in accordance with the applicable national and international regulations and directives for the installation and operation of electrical equipment in potentially explosive atmospheres.

4.1 Installation control

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?

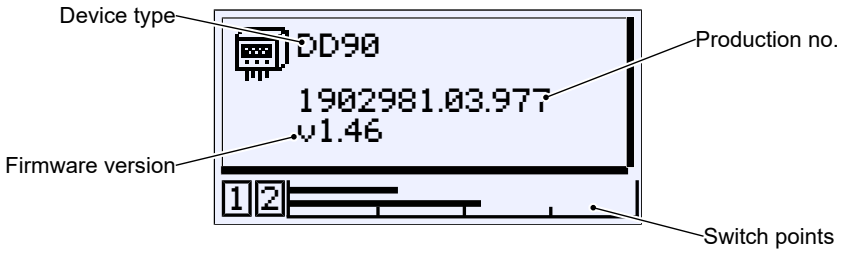
▷ Check that all electrical supply and measuring lines are installed correctly.

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? (Only for ATEX devices)

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.



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

4.2.1 Meas.data display

Depending on the device version, there are different display options for the measurement data display.

4.2.1.1 1-channel version

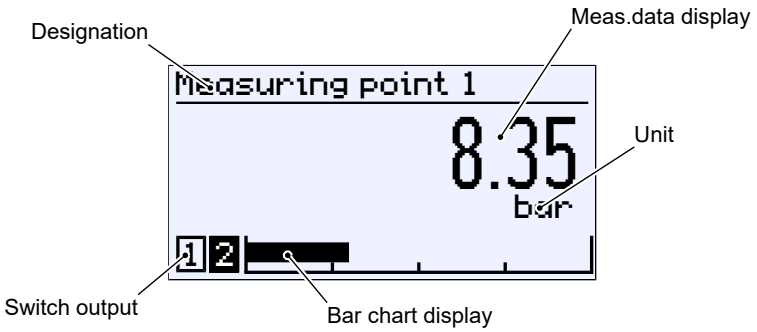


Fig. 43: Meas.data display (1-channel)

4.2.1.2 2-channel version

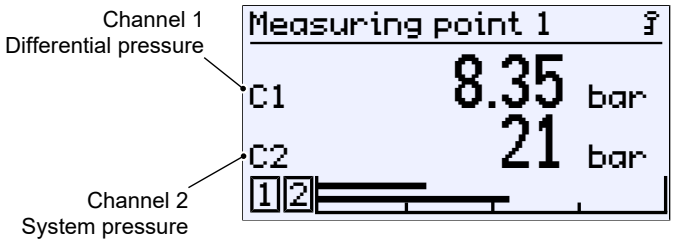


Fig. 44: Meas.data display (2-channel)

4.2.1.3 3 channel version

Channel 3 is a so-called *virtual channel* . The displayed value is calculated from the measured values of channels 1 and 2. You can define the corresponding formula in the menu `Measurement C3/Formula C3` . If the second channel is not available, this display mode is not used.

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.

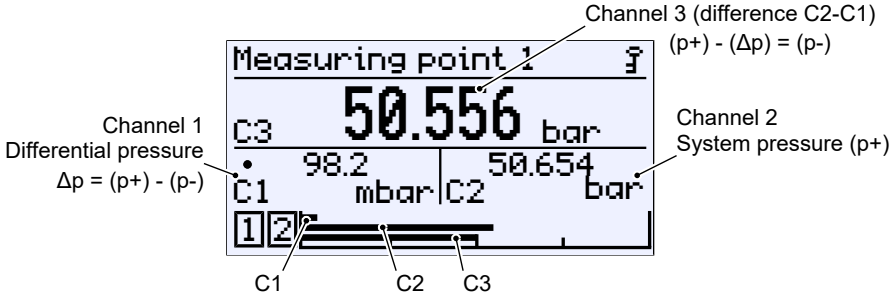


Fig. 45: Meas.data display (3-channel)

4.2.1.4 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’.

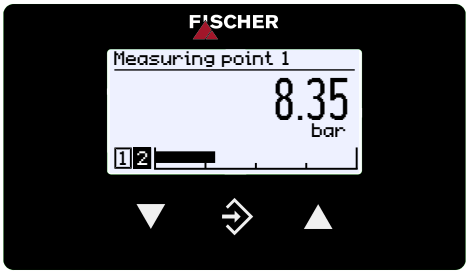


Fig. 46: Operating keys

▼	Page down	Decrease value	
⇳	Call up menu	Save value	Go back
▲	Page up	Increase value	

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

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

1. Pressing a button briefly triggers an immediate reaction.

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

4.3 Setup

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

4.3.1 Set menu language

Works setting: English

▷ The menu language can be changed as follows.

1. You have the right to change the configuration.
2. Log in to the device and go to the menu `Configuration` and then to the menu `Display` .
3. There, open the menu `Language` and change the menu language.

4.3.2 Measuring point designation

▷ A designation for the measuring point can be filed to identify the device within a system.

1. You have the right to change the configuration.
2. Log in to the device and go to the menu `Configuration` and then to the menu `Display` .
3. Change the `Designation` parameter.

4.3.3 Configuration

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

▷ Do you want to adjust the parameters on the device on site?

1. You have the right to change the configuration.
2. Log in to the device and call up the menu `Configuration` .
3. Carry out the required changes.

▷ The PC software **inTouch**® can be used for making more comprehensive changes to the configuration.

1. Carry out the changes on the PC using the inTouch software.
2. Transfer the configuration to the device via the USB interface.

5 Operation

5.1 First steps

5.1.1 Passwords

NOTICE

Publicly accessible passwords

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

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

The following passwords are assigned when the unit is delivered.

User	Password
User 1	000
User 2	000
User 3	000
Administrator	000

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

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

Administrator > User 1 > User 2 > User 3

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

5.1.2 Operating modes

Operating mode

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

Configuration mode

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

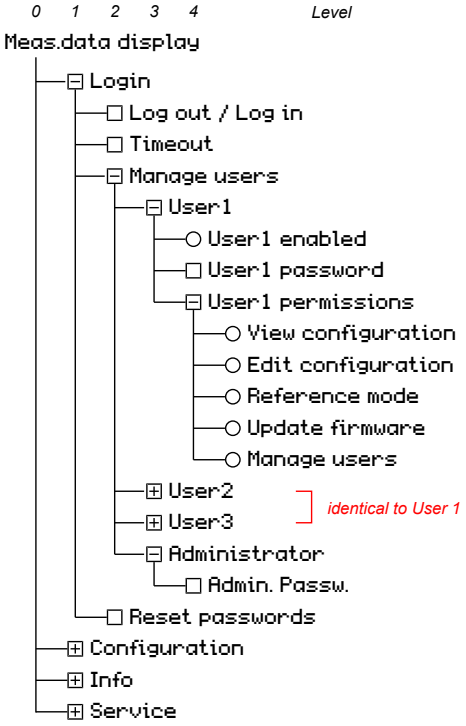
If the device is configured via the USB interface, operation is interrupted when transmission starts. Operation starts with the new configuration after transmission. The transfer lasts just a few milliseconds.

5.1.3 Menu tree

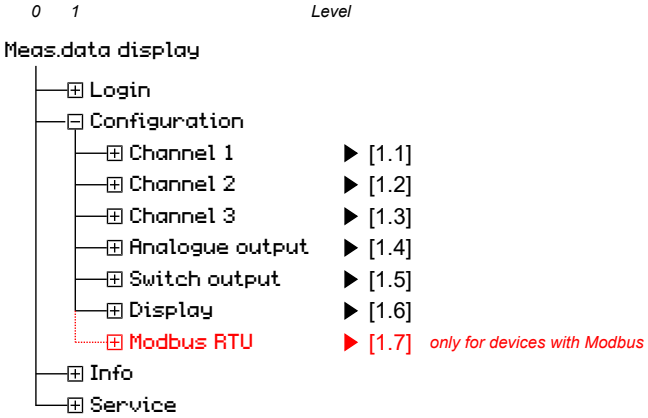
NOTICE! The menu tree is shown for devices with two channels and two switch points. For devices with only one channel, the parameters for the second and third channels are omitted.

[0] Main menu

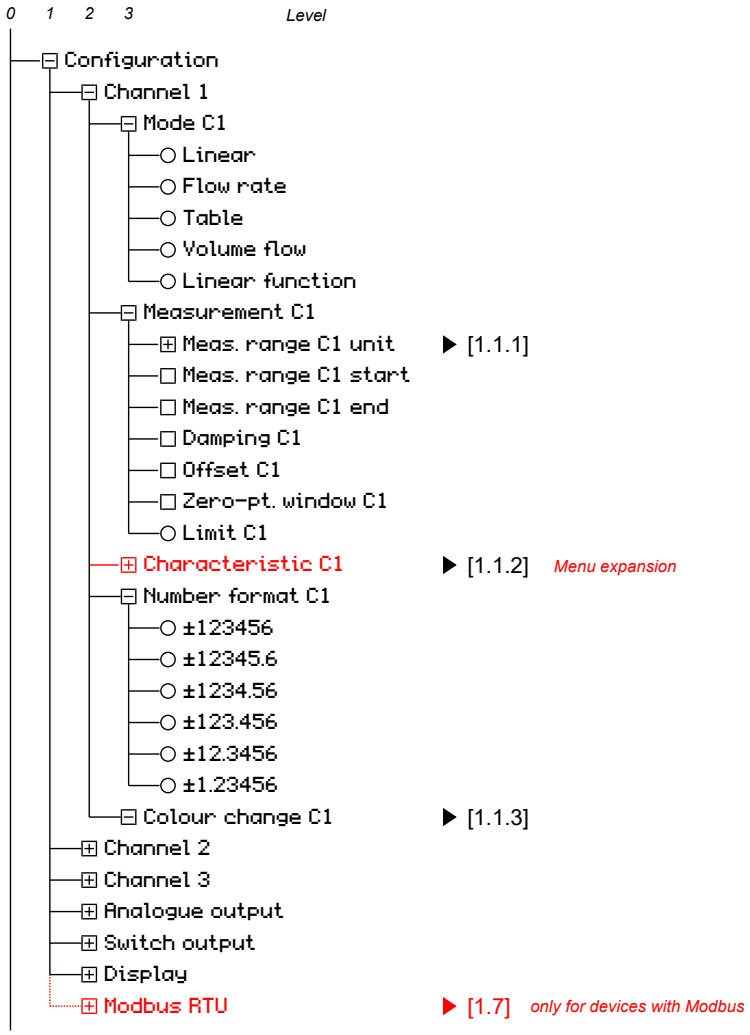
[1] Login



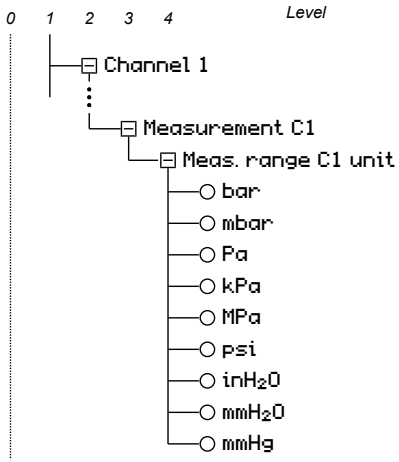
[2] Configuration



[1.1] Channel 1 (differential pressure)



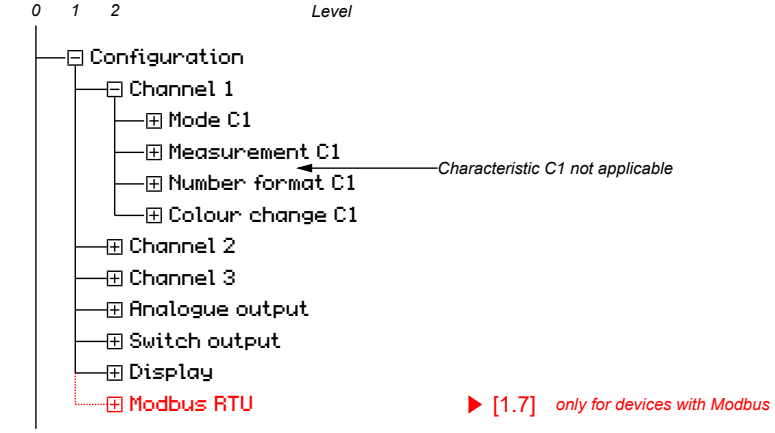
[1.1.1] Measur. range C1 unit



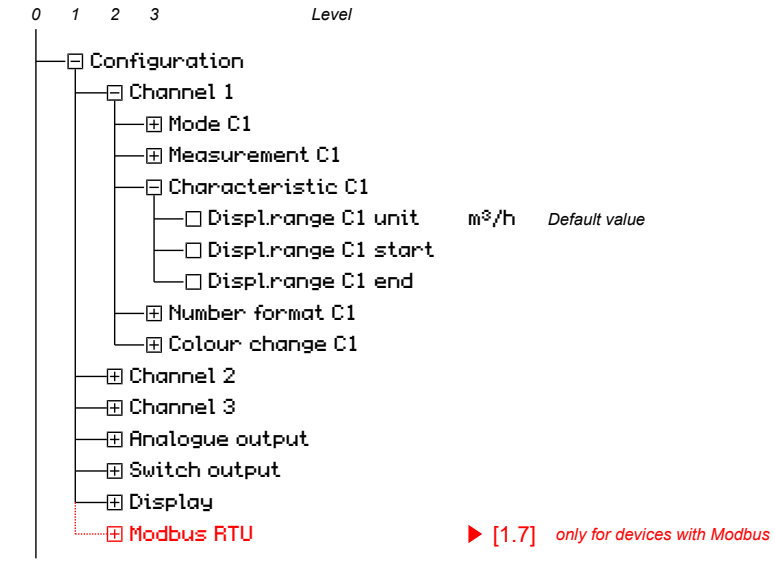
[1.1.2] Characteristic C1

NOTICE! The parameter list for the menu extension (Characteristic C1) depends on the value of the Mode C1 parameter.

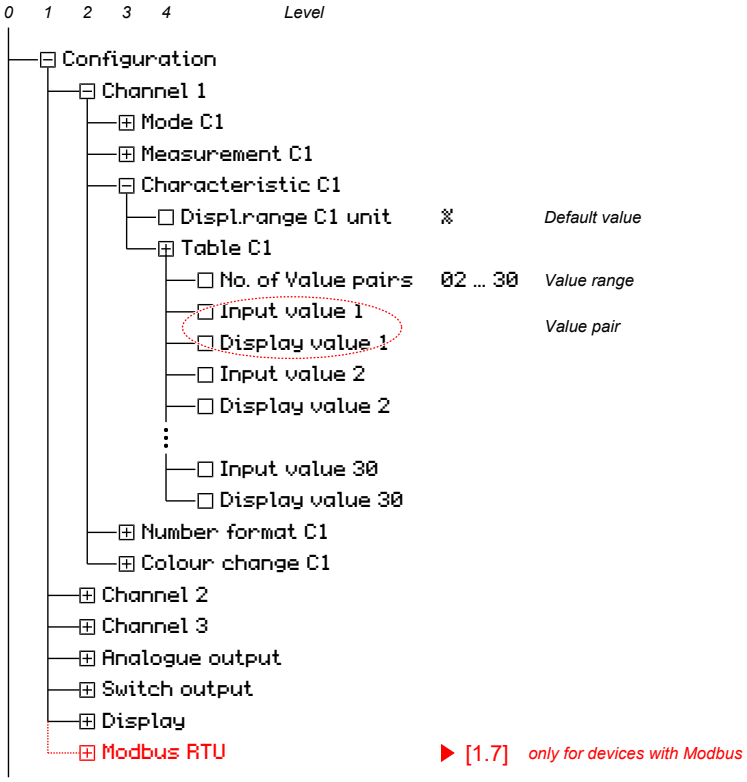
(1) Mode C1 = Linear



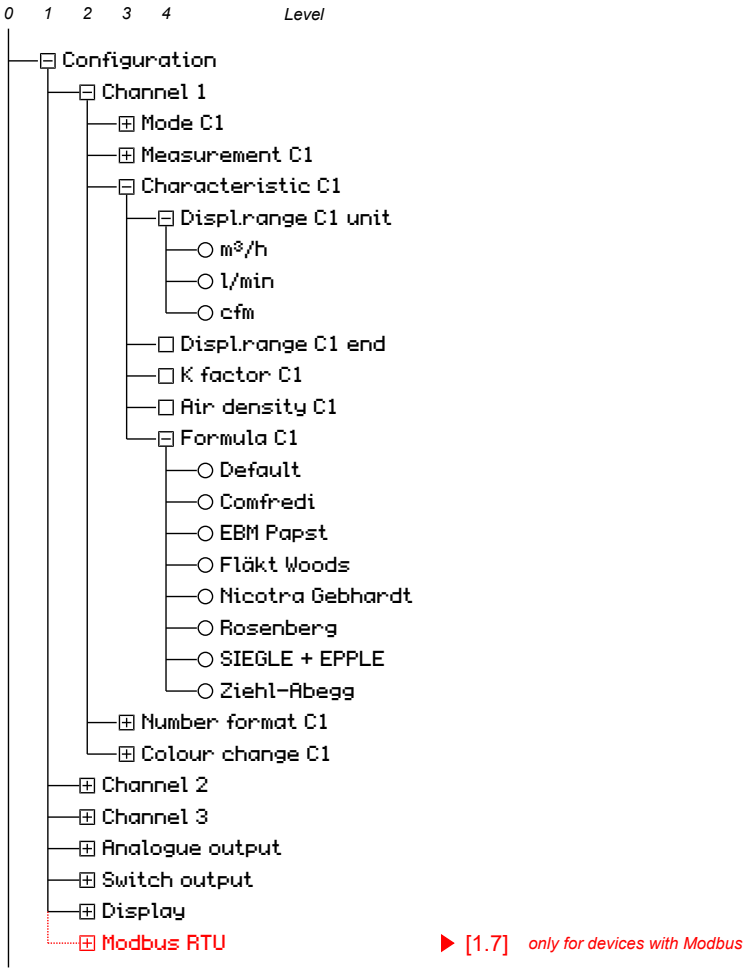
(2) Mode C1 = Flow rate

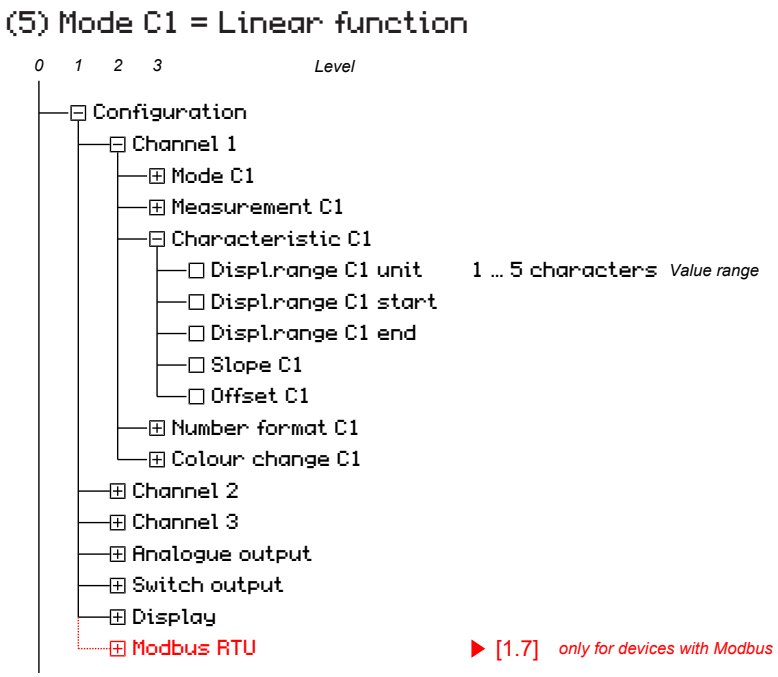


(3) Mode C1 = Table

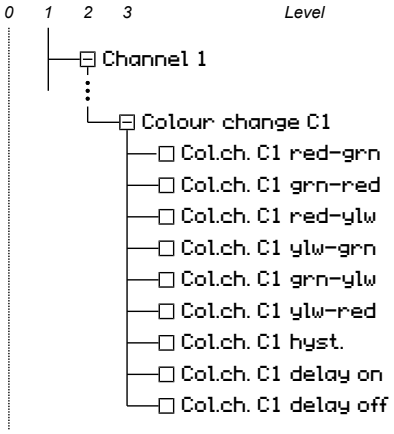


(4) Mode C1 = Volume flow

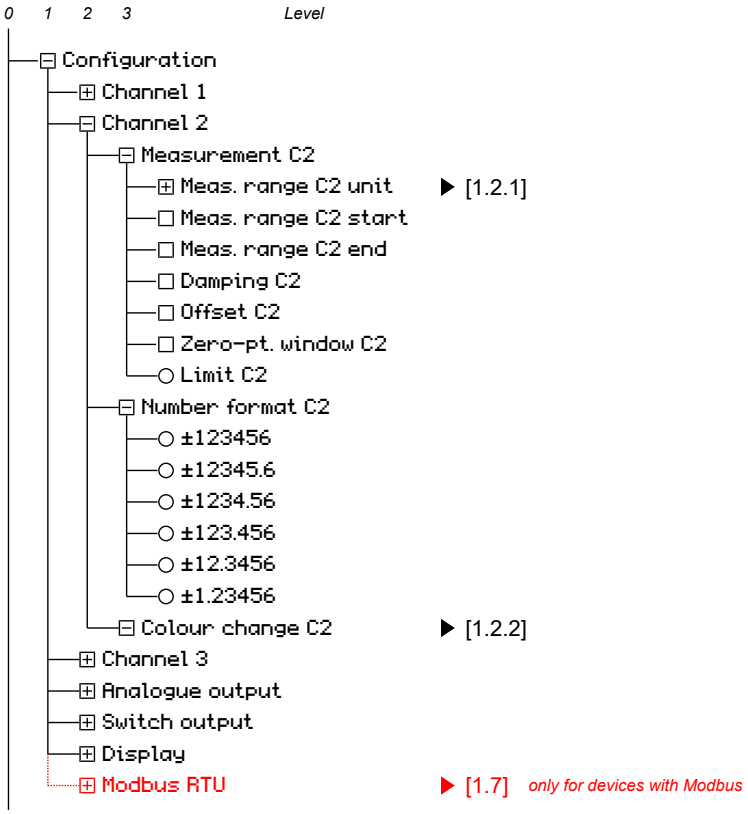




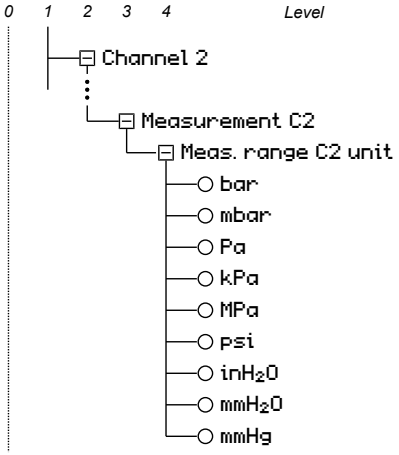
[1.1.3] Colour change C1



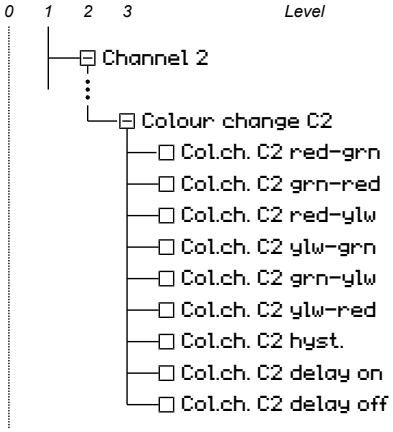
[1.2] Channel 2 (system pressure)



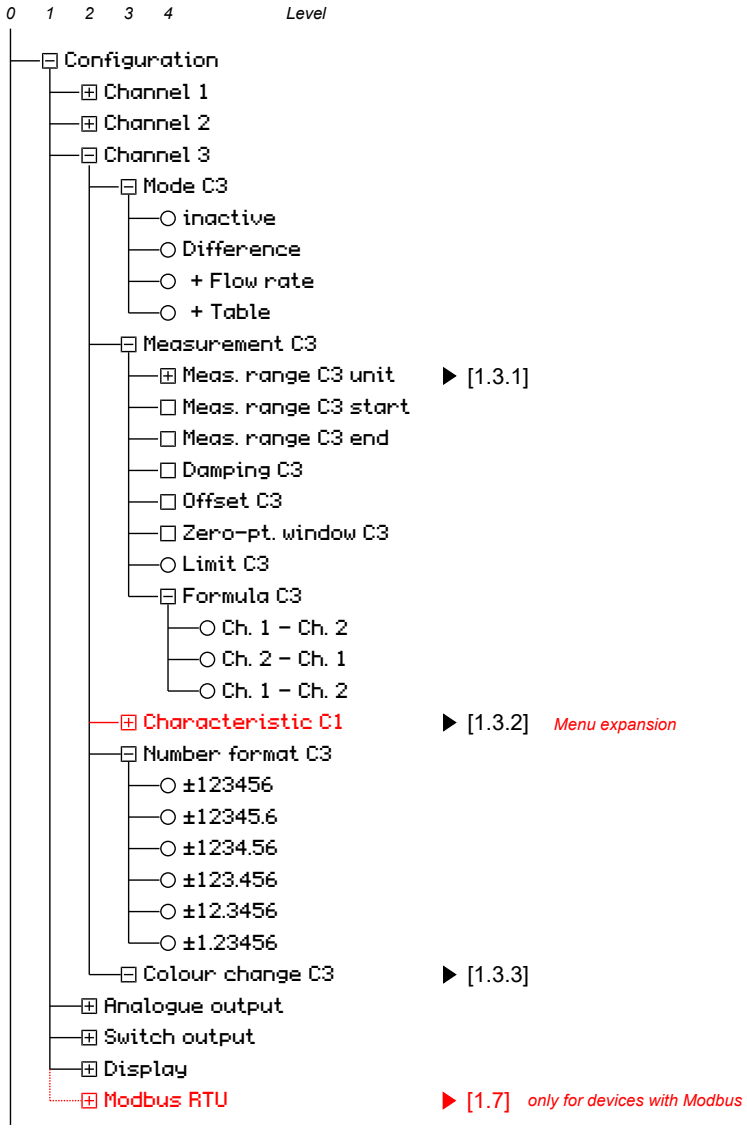
[1.2.1] Measur. range C2 unit



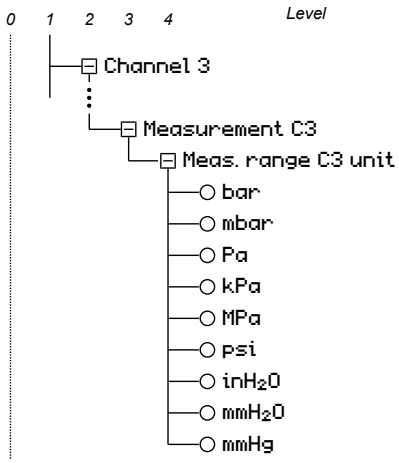
[1.2.2] Colour change C2



[1.3] Channel 3 (virtual channel)



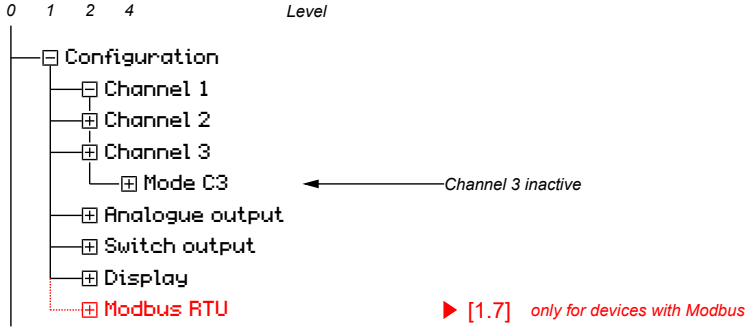
[1.3.1] Measur. range C3 unit



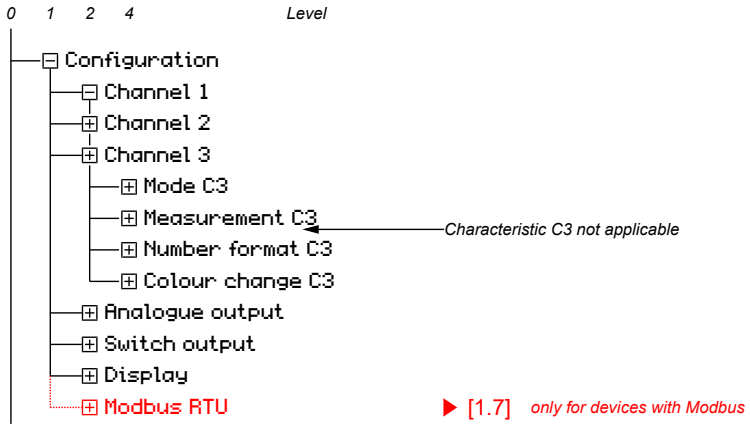
[1.3.2] Characteristic C3

NOTICE! The parameter list for the menu extension (Characteristic C3) depends on the value of the Mode C3 parameter.

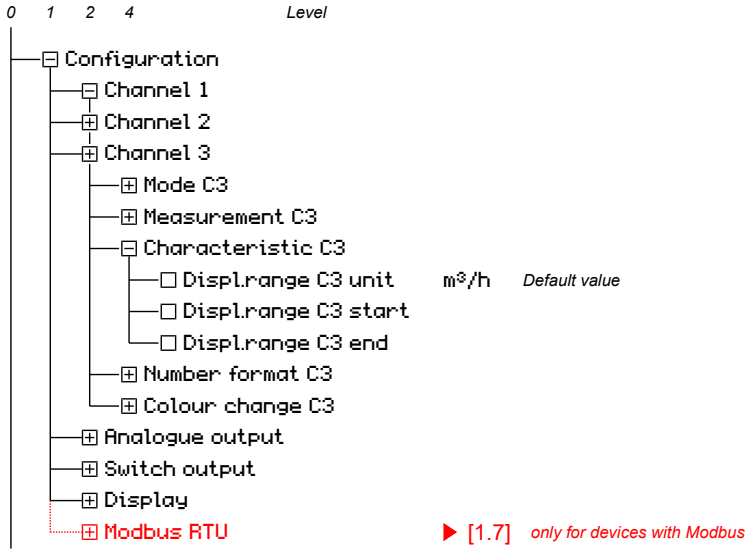
(1) Mode C3 = Inactive

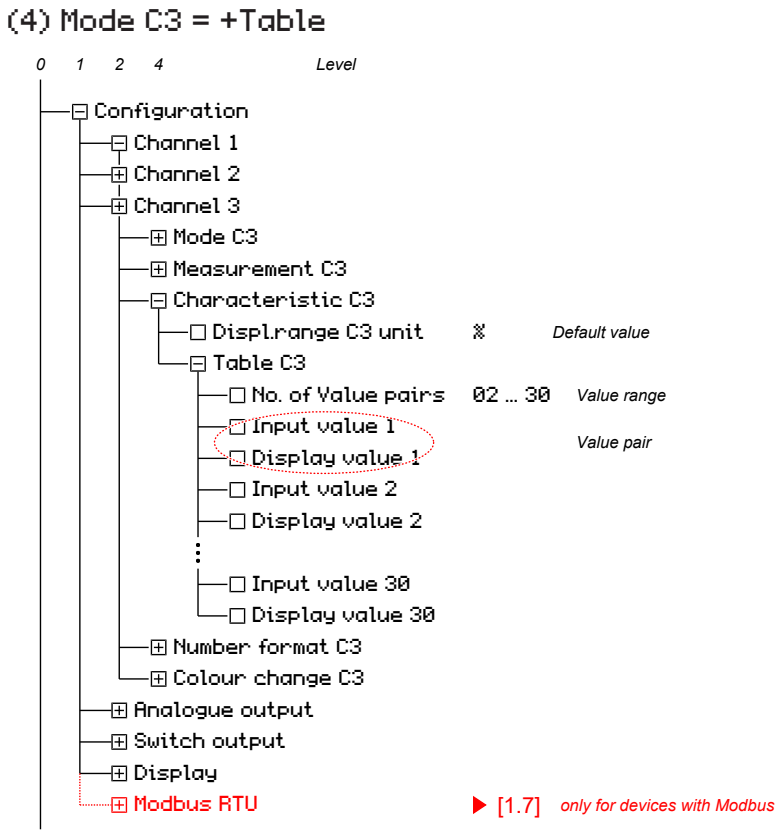


(2) Mode C3 = Difference

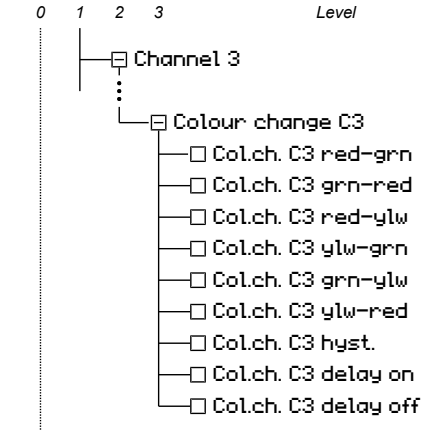


(3) Mode C3 = +Flow rate

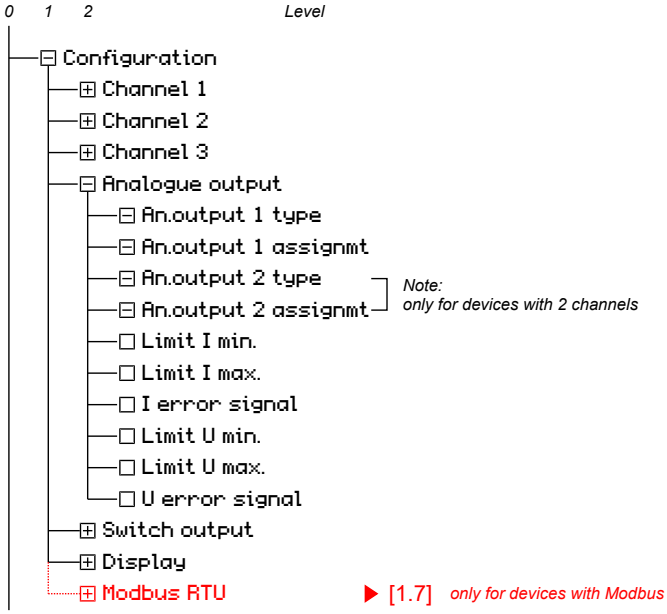




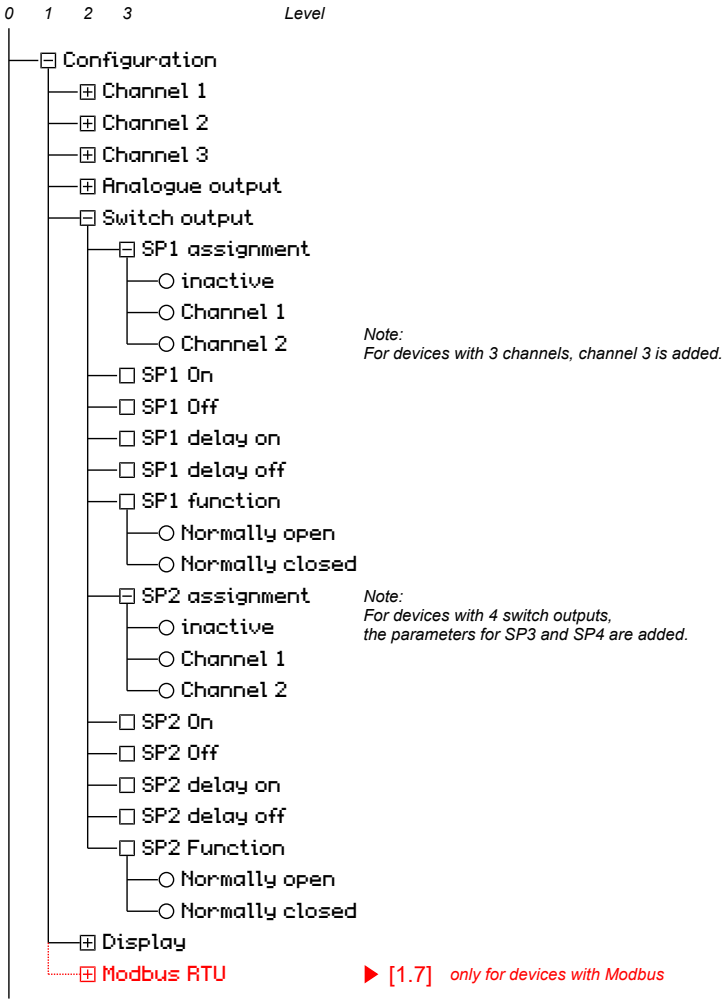
[1.3.3] Colour change C3



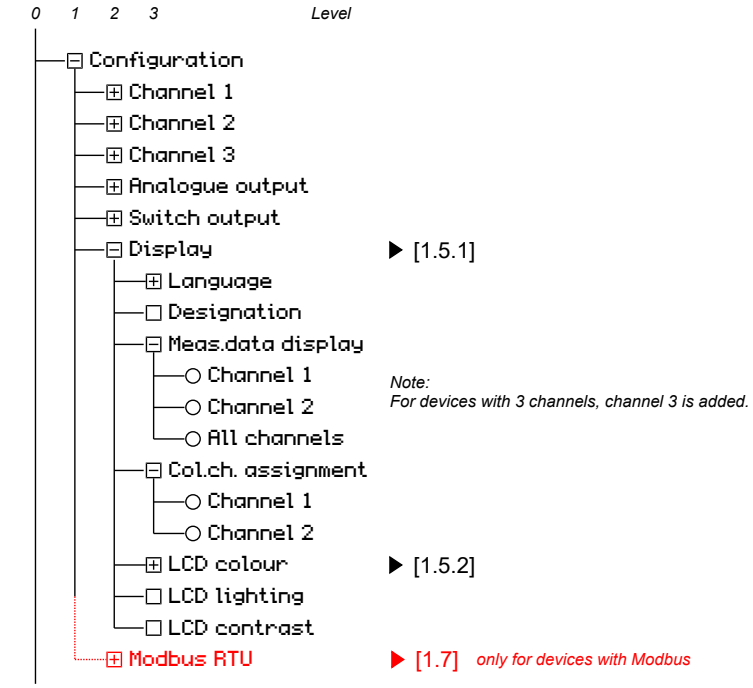
[1.4] Analogue output



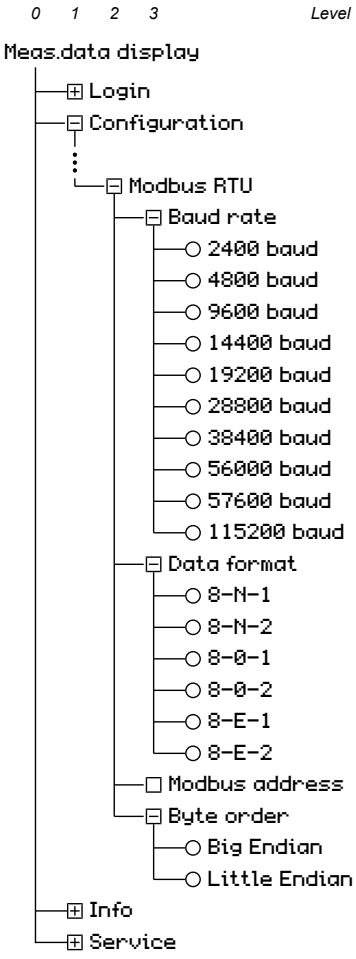
[1.5] Switch output



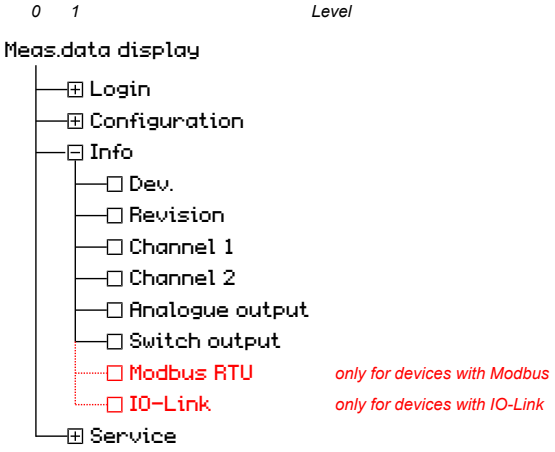
[1.6] Display



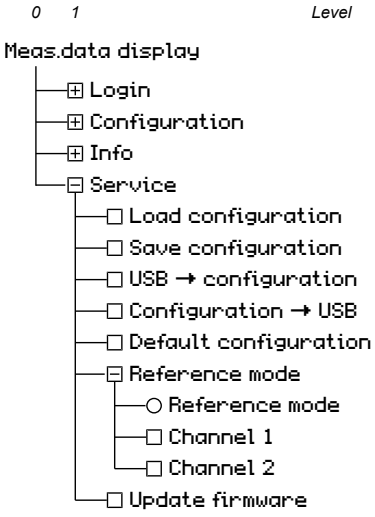
[1.7] Modbus



[3] Info



[4] Service



5.1.4 Navigation in the menu tree

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

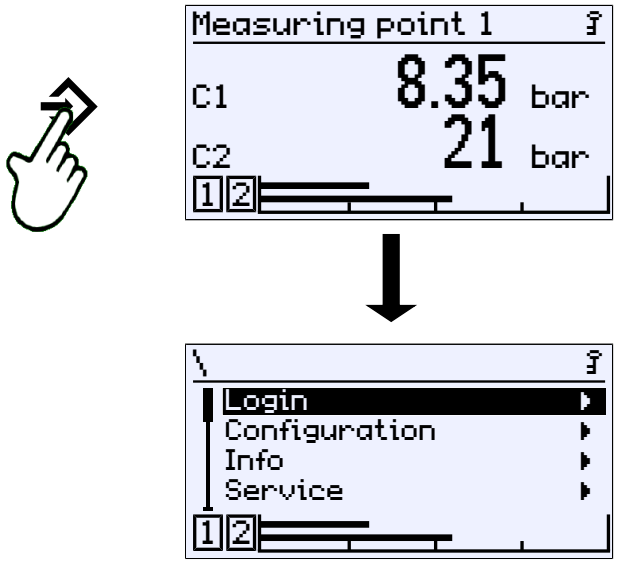


Fig. 47: Accessing the main menu (level 0)

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

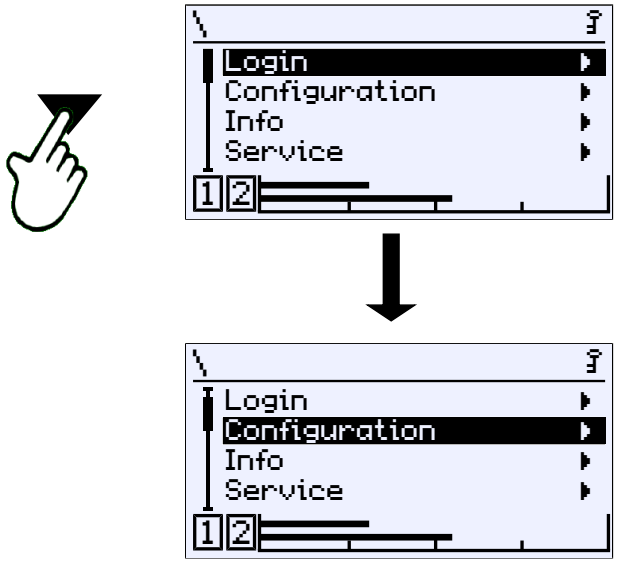


Fig. 48: Moving down in the menu (level 0)

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

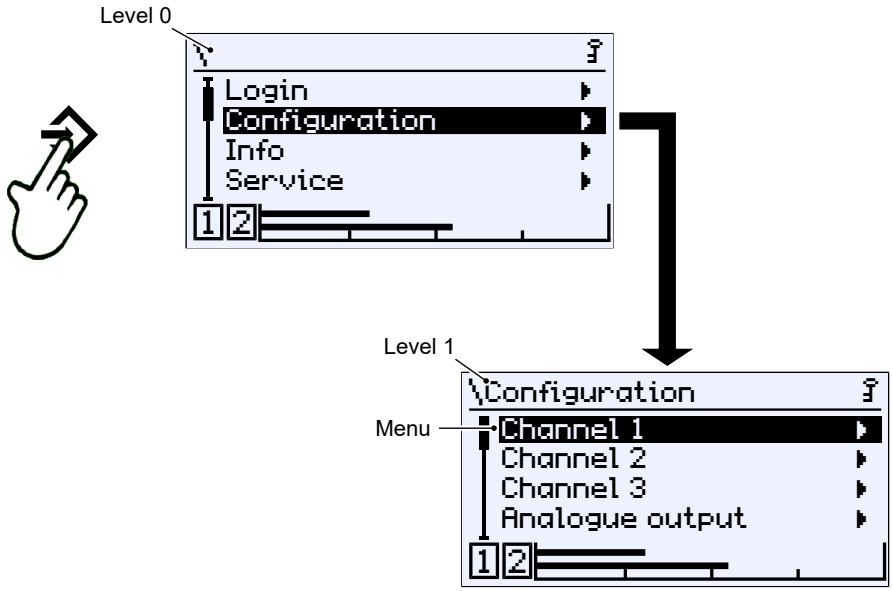


Fig. 49: Sideways in submenu (level 1)

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

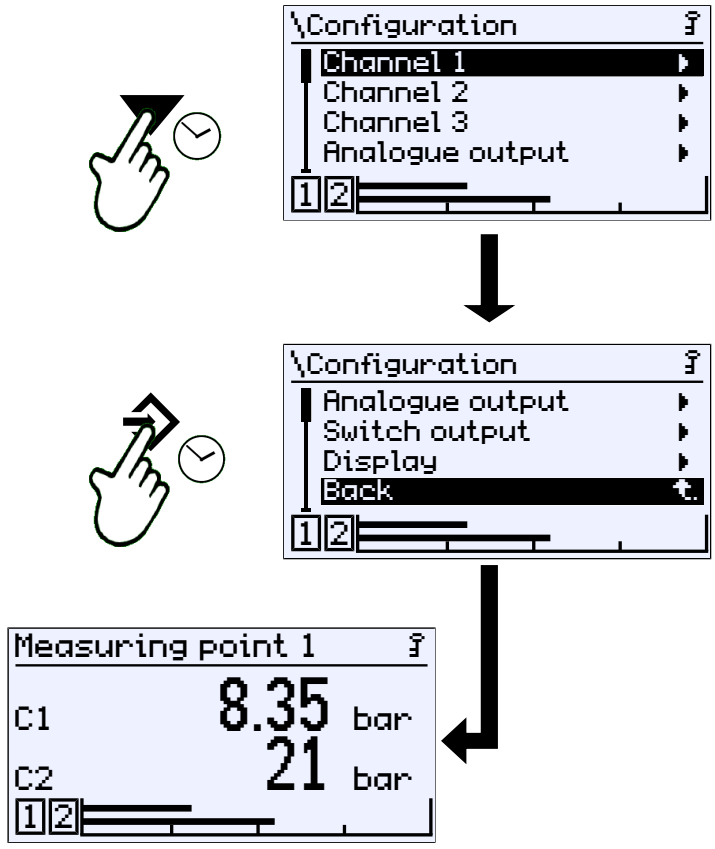


Fig. 50: Page down to exit

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

5.1.5 Path details

The path information appears in the first line of the display. For space reasons, the path 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.

Pfad: \Configuration\Chanel 1\Measurement C1\Meas.range C1 unit
Level 0 Level 1 Level 2 Level 3

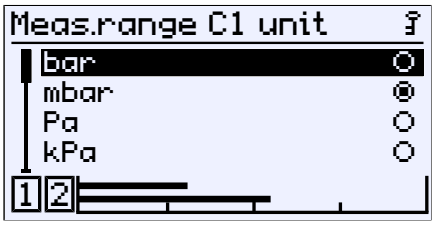


Fig. 51: Path

5.1.6 Input

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

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

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

5.1.6.1 Text input

For example: *Path: \Configuration\Display\Designation*

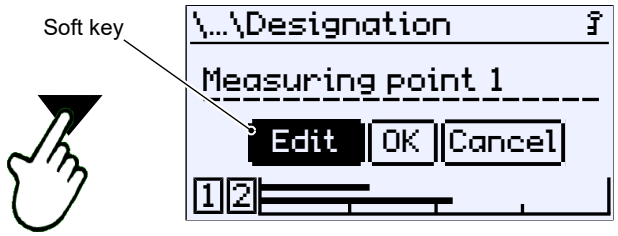


Fig. 52: Action selection

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

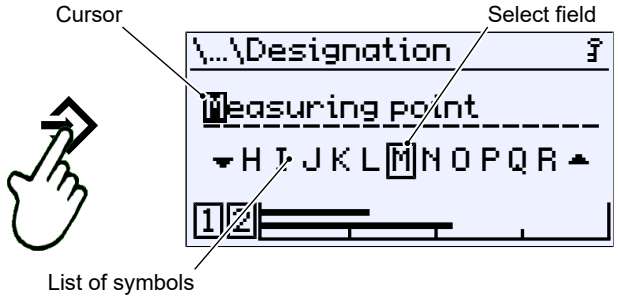


Fig. 53: Editing text

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[3] 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.

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

5.1.6.2 Value input

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

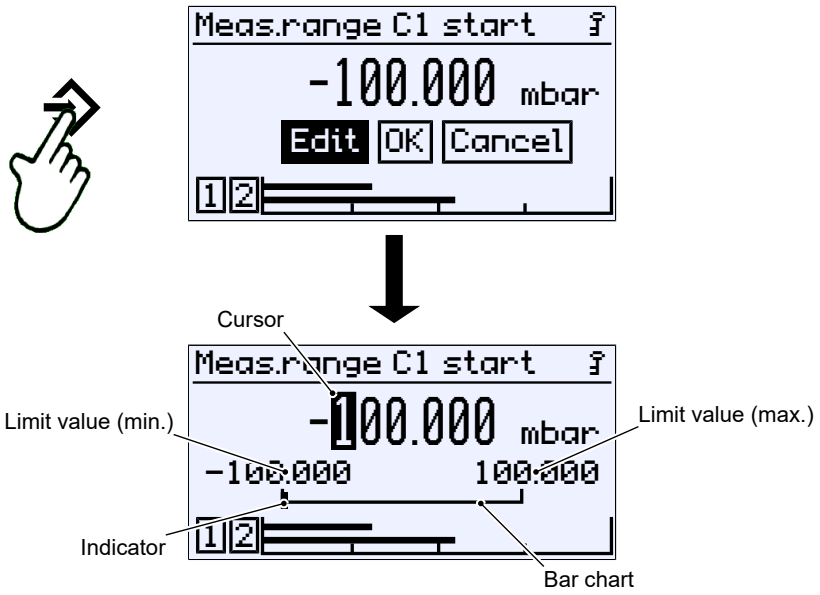


Fig. 54: Entry of numerical values, 1st position

Entry of digits one by one

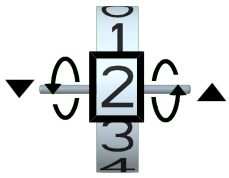


Fig. 55: Setting a figure

Numerical values can be entered digit by digit from left to right. The buttons ▼ and ▲ are used to set the digits 0 … 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.

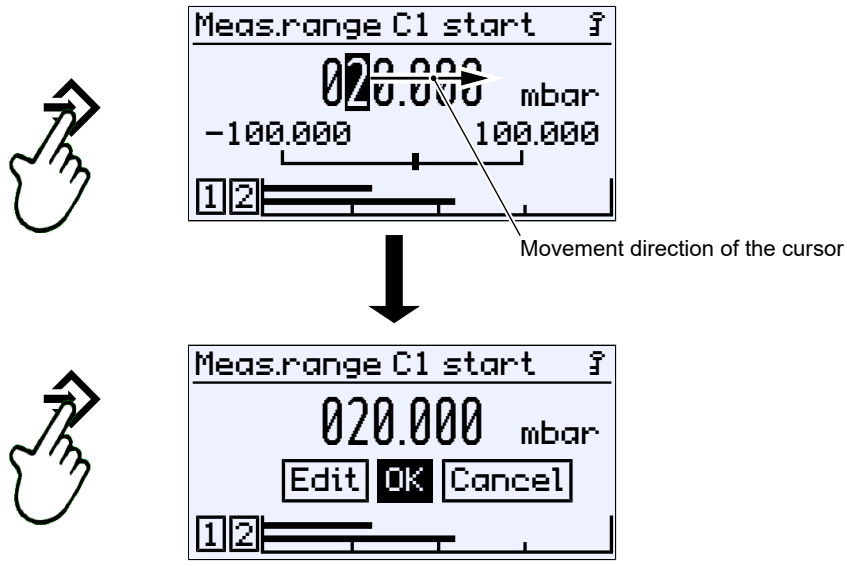


Fig. 56: Entry of numerical values, 2nd position

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.

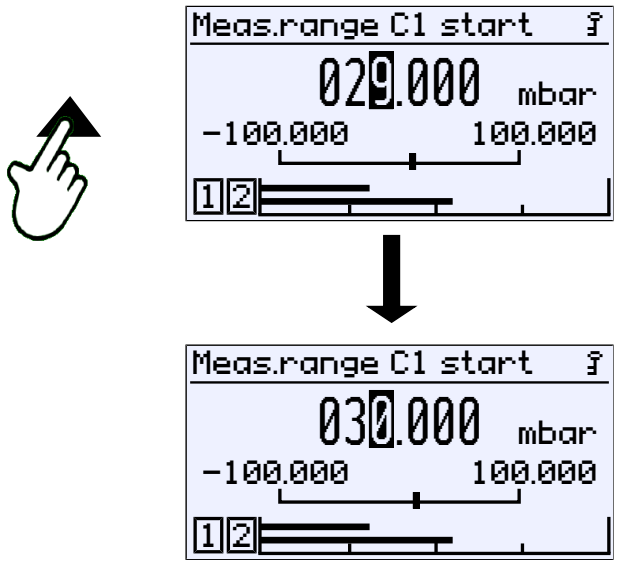


Fig. 57: Number overflow

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 …

5.1.6.3 Selection of options

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

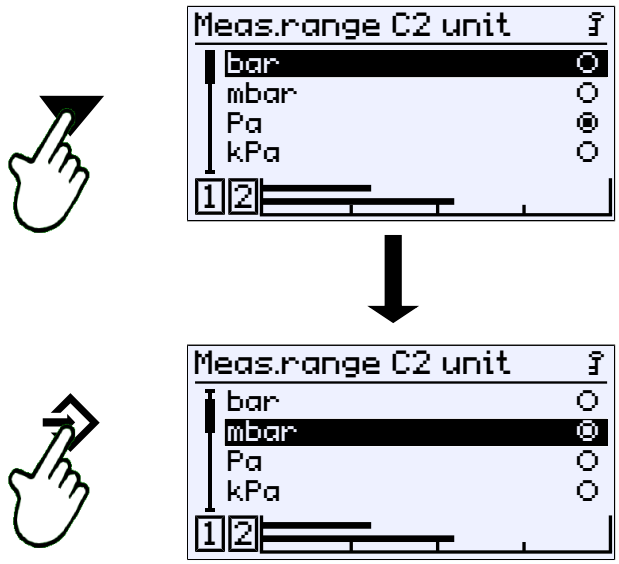


Fig. 58: Entry of options

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

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

5.2 Main menu

*Path: *
Level: 0

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

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

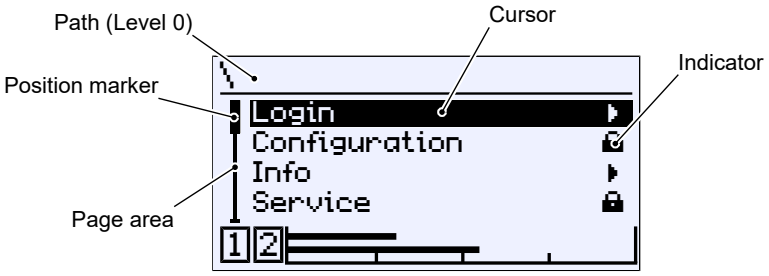
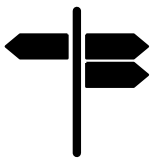


Fig. 59: Main menu

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

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



Signpost [►Page]

- Login
- Configuration
- Info
- Service

5.2.1 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. 60: 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.

5.2.1.1 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.

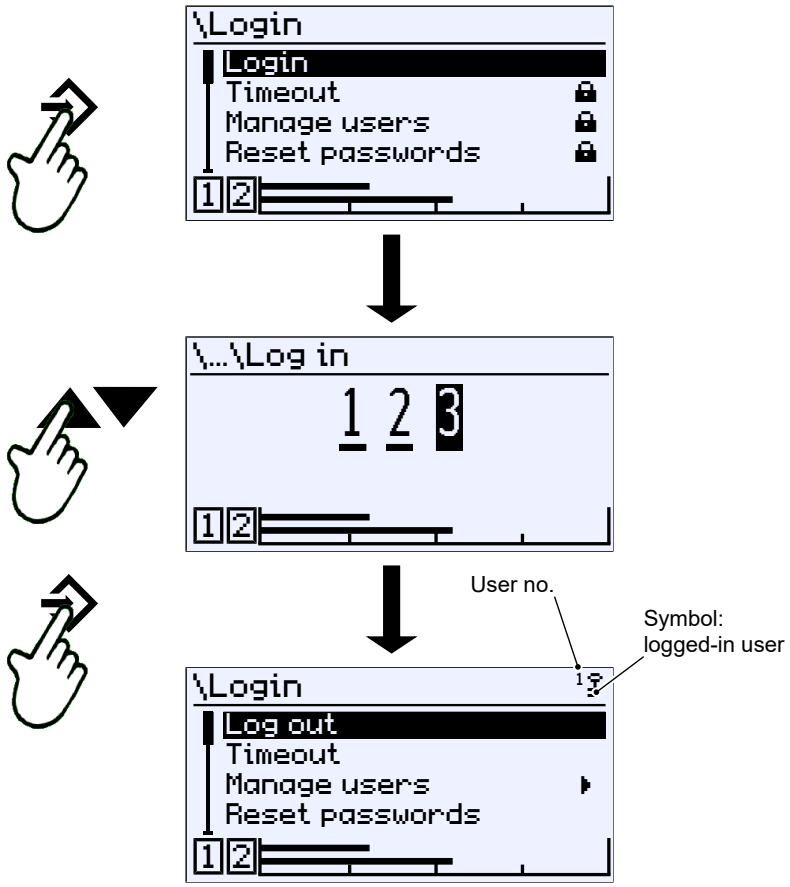


Fig. 61: Log in

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.

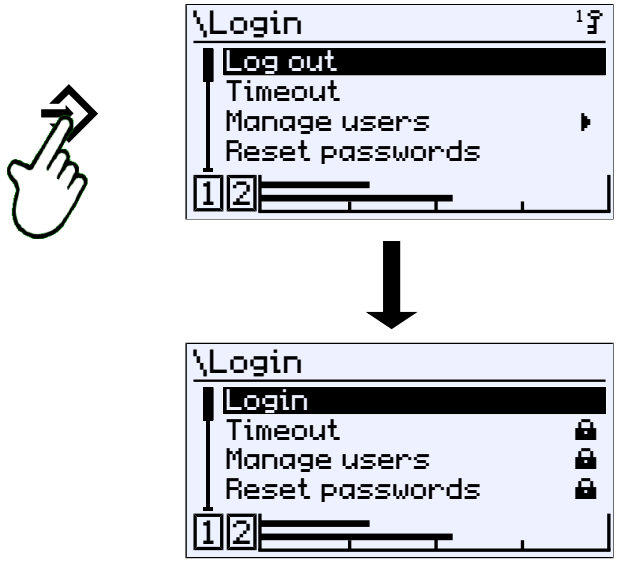


Fig. 62: Log out

5.2.1.2 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.

1 The key symbol should indicate this possibly undesirable status.

5.2.1.3 Manage users

Path: \Login\Manage users
Level: 2

Fig. 63: 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.

5.2.1.3.1 User 1

Path: \Login\Manage users\User 1
Level: 3

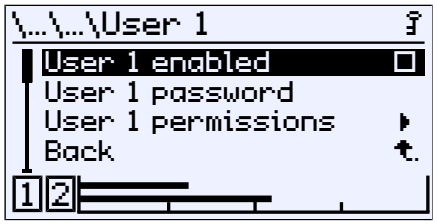


Fig. 64: User 1

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.

5.2.1.3.1.1 User 1 permissions

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

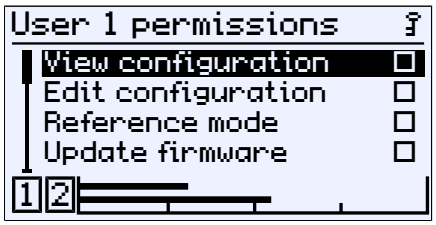


Fig. 65: User 1 permissions

Menu name		Description
View configuration	☐	This parameter assigns read permission.
Edit configuration	☐	This parameter assigns read and write permission.
Reference mode	☐	This parameter assigns the permission to use reference mode.
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.

The parameter Reference mode gives the user the right to use the reference mode in the Service menu.

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.

5.2.1.3.2 Administrator

Path: \Login\Manage users\Administrator
Level: 3

Fig. 66: Administrator

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

5.2.1.4 Reset passwords

Path: \Login\Reset passwords
Level: 2

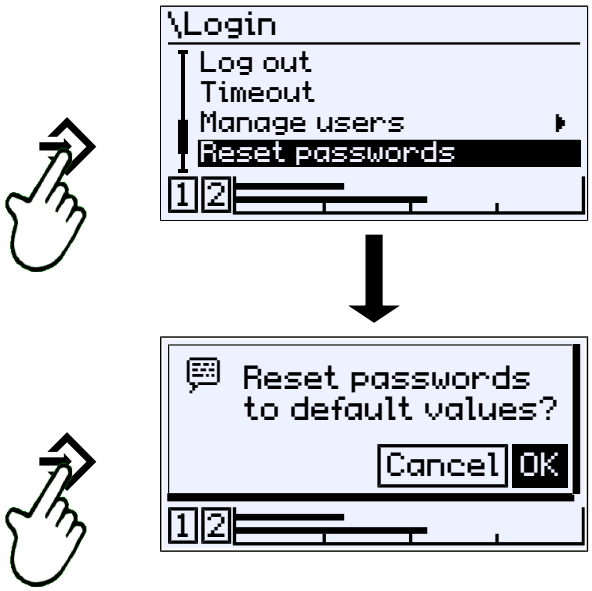


Fig. 67: Reset passwords

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

5.2.2 Configuration

The device can also be configured on a PC with the **inTouch®** software. The finished parameter set is then transferred to the device 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. 68: Configuration

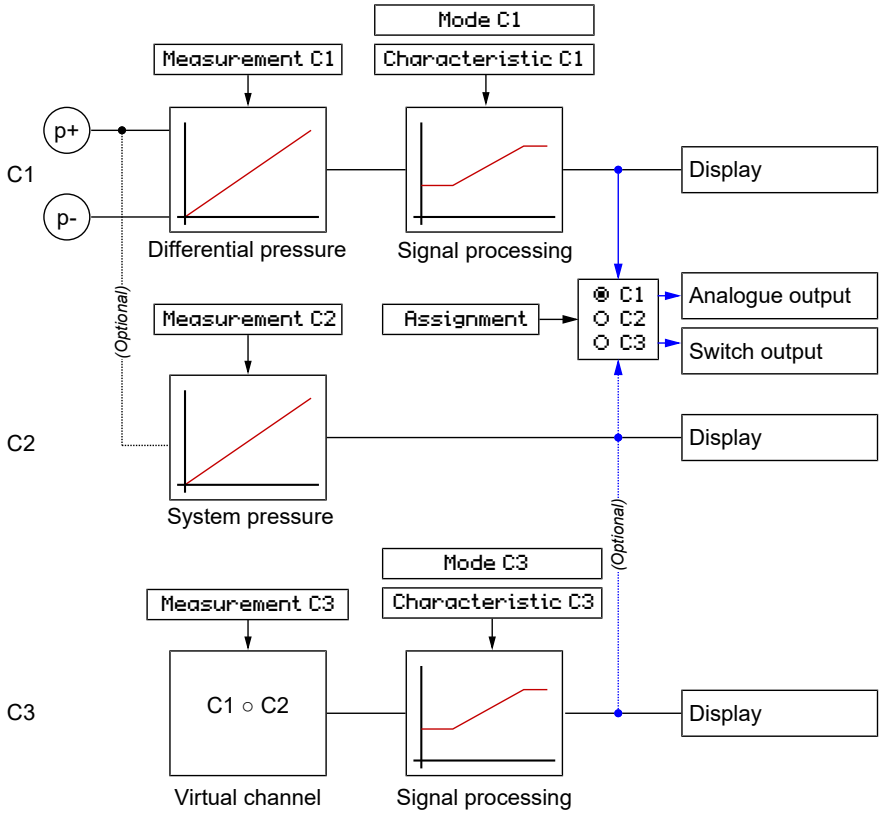
The device has a connection for differential pressure measurement (channel 1). In this version, the menus for the other channels (2 and 3) are hidden.

Optionally, a variant for simultaneous measurement of the system pressure (channel 2) via the pressure connection (+) can be supplied. The menus and parameters are described in more detail for these devices.

Menu name		Description
Channel 1	▸	This menu is used to configure the differential pressure measurement (channel 1).
Channel 2	▸	This menu is used to configure the system pressure measurement (channel 2).
Channel 3	▸	This menu is used to configure the virtual channel (channel 3). The calculation is performed using a mathematical function.
Analogue output	▸	The analogue outputs are configured with this menu.
Switch output	▸	The switch outputs are configured with this menu.
Display	▸	This display is configured with this menu.
Modbus RTU	▸	This menu is available for Modbus devices only. It enables the configuration of the interface.
Back	↰	This is the exit point of the configuration menu. It takes you ‘Back’ to the main menu.

Option

The following diagram provides an overview of the various parameters and how they interact. Digital interfaces are not included.



○: *mathematical operator*

Fig. 69: Configuration

Signpost [▶ Page]

- Channel 1 [▶ 66]
- Channel 2 [▶ 90]
- Channel 3 [▶ 91]
- Analogue output [▶ 98]
- Switch output [▶ 101]
- Display [▶ 104]
- Modbus RTU [▶ 110]

5.2.2.1 Channel 1

Path: \Configuration\Channel 1
Level: 2

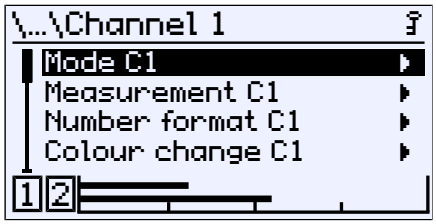
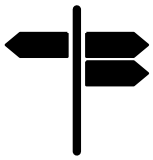


Fig. 70: Channel 1

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 in this menu.
Menu expansion		
Characteristic C1	▸	This menu is hidden depending on the selected mode.
Number format C1	▸	The decimal places for the measurement data display 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.



Signpost [▶ Page]

- Mode C1 [▸ 67]
- Measurement C1 [▸ 68]
- Characteristic C1 (menu expansion) [▸ 75]
- Number format C1 [▸ 83]
- Colour change C1 [▸ 84]

5.2.2.1.1 Mode C1

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

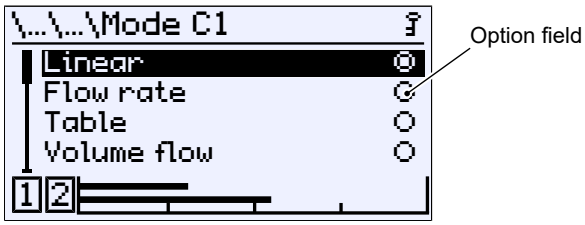


Fig. 71: Mode C1

In this menu, various operating modes for differential pressure measurement (channel 1) can be selected. 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	Correction table for input characteristics
Volume flow	Volume flow measurements in ventilation systems
Linear function	Mathematical function f(x) = mx + b
Back	This is the menu exit point. Press ‘Back’ to return to the channel 1 menu.

Each of these operating modes allows a different configuration of the characteristic. Therefore, after exiting, the calling menu (channel 1) is supplemented by the menu extension Characteristic C1 , which is used to configure the characteristic curve 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) [▶ 75]

5.2.2.1.2 Measurement C1

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

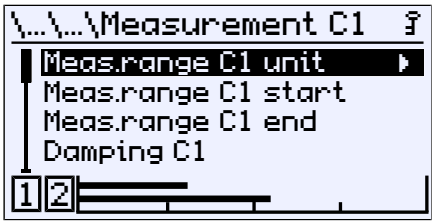


Fig. 72: Measurement C1

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 (pressure) 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 curve is displaced with the parameter offset.
Zero-pt. window C1		The zero-point window parameter defines a range around zero in which the display value is set to zero.
Limit C1	☐	This property determines whether or not the set measuring range limits also act on the measurement data display.
Back	↰	This is the menu exit point. Press ‘Back’ to return to the channel 1 menu

5.2.2.1.2.1 Measuring range C1 unit

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

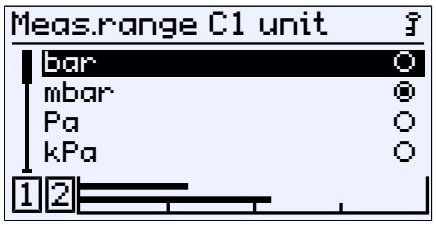


Fig. 73: Meas.range C1 unit

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$_2$O	inch water column	
mmH$_2$O	mm Water column	Historical units
mmHg	mm Mercury column	

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

5.2.2.1.2.2 Measuring range C1 start

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

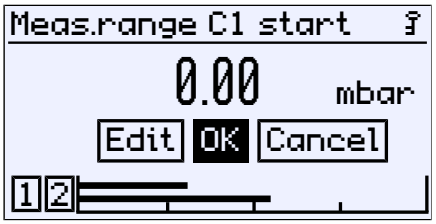


Fig. 74: Meas.range C1 start

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 value range and its 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 curve 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.

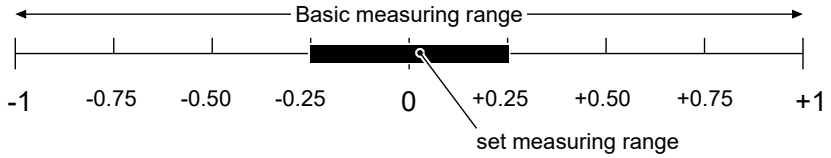


Fig. 75: Turn down

The spread of the characteristic curve only acts directly on the output signal. The activation of the parameter Limit C1 limits the display range to the set measuring range, too.

Characteristic slope

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

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

5.2.2.1.2.3 Measuring range C1 end

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

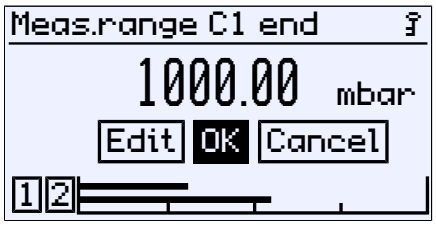


Fig. 76: Measur. range C1 end

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

5.2.2.1.2.4 Damping C1

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

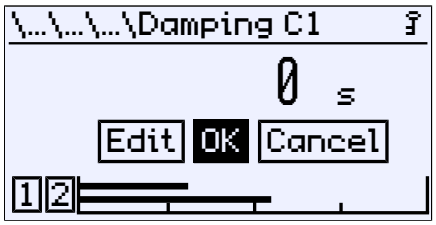


Fig. 77: Damping C1

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 to 600 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 0 s means that no damping is carried out.

5.2.2.1.2.5 Offset C1

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

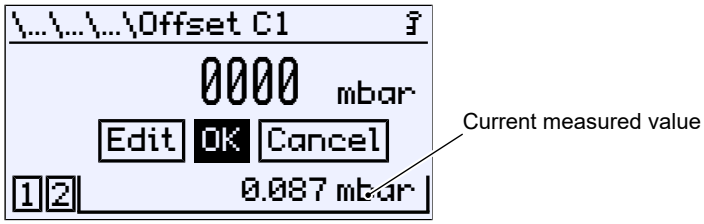


Fig. 78: Offset C1

If the measurement data display shows a different value for the zero point, 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.

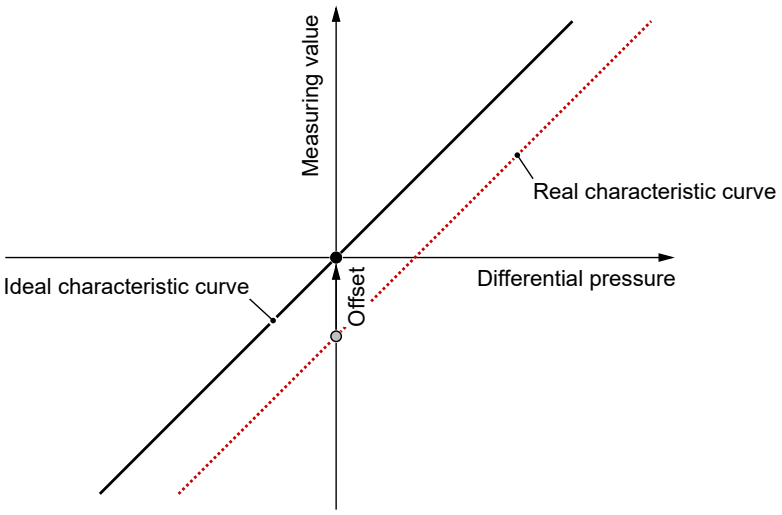


Fig. 79: Offset error

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

5.2.2.1.2.6 Zero-point window C1

Path: \Path: \Configuration\Channel 1\Measurement C1\Zero-pt. window C1
Level: 4

Fig. 80: Zero-pt. 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.

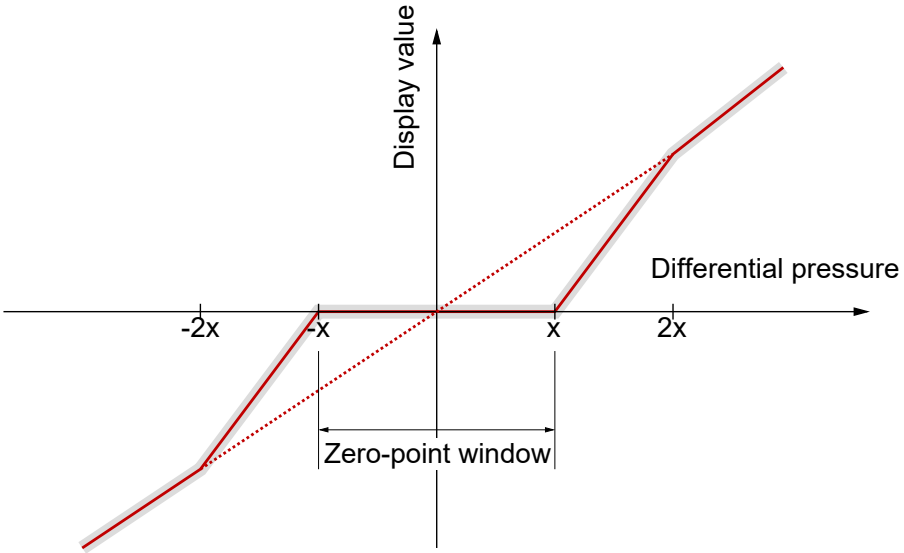


Fig. 81: Zero-point window

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.

5.2.2.1.2.7 Limits

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

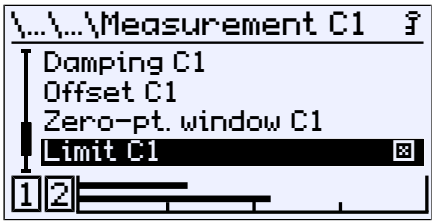


Fig. 82: Limit C1

With this characteristic, the measurement data display can be limited to the measuring range defined with the parameters `Meas.range C1 start` and `Meas.range C1 end` . The button ⇳ is used to activate and deactivate.

5.2.2.1.3 Characteristic curve C1 (menu expansion)

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

NOTICE! The menu extension does not apply to devices for which the Mode parameter has been set to the linear value.

5.2.2.1.3.1 Characteristic C1 (flow rate)

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

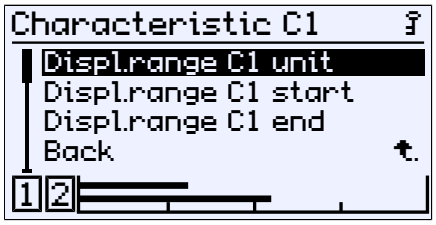


Fig. 83: Characteristic C1 (flow rate)

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. Default value: m^3/h
Displ.range C1 start	The start of the display range is defined with this parameter.
Displ.range C1 end	The end of the display range is defined with this parameter.
Back	This is the menu exit point. Press 'Back' to return to the Channel 1 menu.

This function allows 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.range C1 start and Displ.range C1 end .

5.2.2.1.3.2 Characteristic C1 (Table)

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

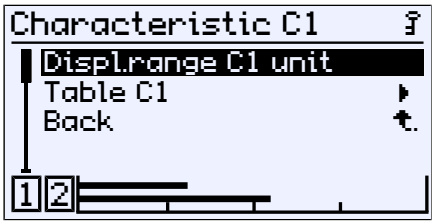


Fig. 84: Characteristic C1 (table)

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. Default value: %
Table C1	The table is defined in this menu.
Back	This is the menu exit point. It is used to return to the Channel 1 menu.

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

5.2.2.1.3.2.1 Table C1

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

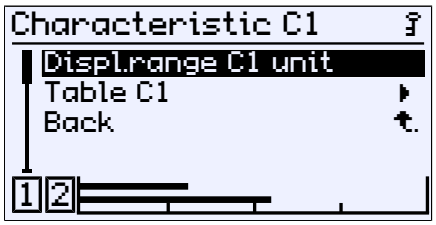


Fig. 85: Table C1

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	
Back ↰	This is the menu exit point. This takes you ‘Back’ to the Characteristic C1 menu.

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 curve 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 [4]. The range 20 … 80 mbar of the input signal should be used. The basic measuring range is 0 … 100 mbar. The display should show 20 mbar at the start of the measuring range and 80 mbar at the end of the measuring range.

Basic measuring range	0…100 mbar
Measuring range	20…80 mbar
Display range	10…70 mbar
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	**O1**	**E2**	**E3**	**E4**	**E5**	**E5**	**E6**	**E7**
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

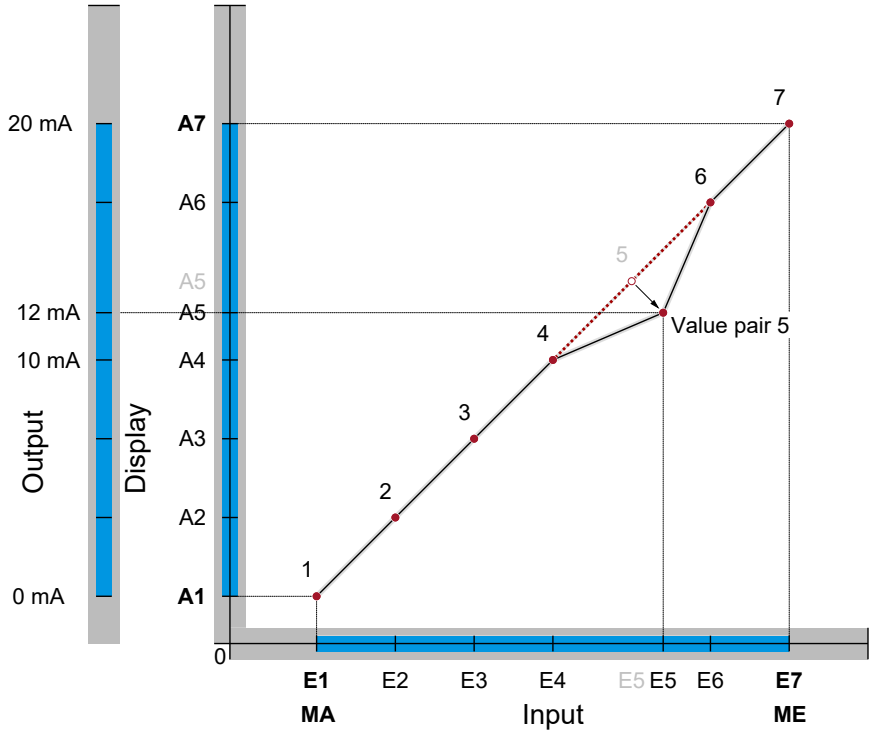


Fig. 86: Table function

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

5.2.2.1.3.3 Characteristic C1 (volume flow)

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

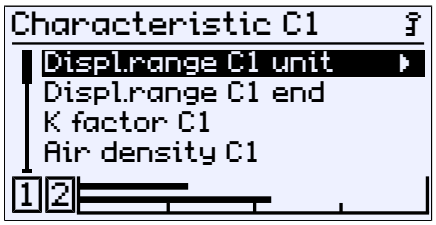


Fig. 87: Characteristic C1 (volume flow)

Menu name	Description
Displ.range C1 unit ▸	This parameter can be used to set a unit for the display.
Displ.range C1 end	The display end 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. Default value: 1.204 kg/m^3
Formula C1 ▸	The calculation formula is selected in this menu.
Back ↰	This is the menu exit point. 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. 88: Volume flow basic formula

The fan is equipped with a measuring device to measure the volume flow. Each manufacturer states a K factor for its fan. 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 fan 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 . The density is preset with the default value of 1.204 kg/m^3. [(5)]

[(5)] Density of dry air at 20°C at sea level and an atmospheric pressure of 1013.25 hPa (1.01325 bar)

5.2.2.1.3.3.1 Display range C1 unit

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

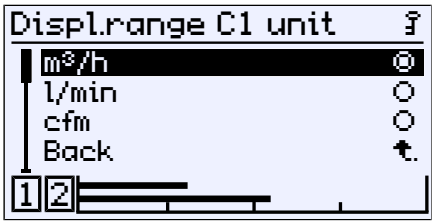


Fig. 89: Displ.range C1 unit

The following units are available for selection:

m^3/h	Cubic metre per hour	Default value
l/min	Litres per minute	
cfm	Cubic feet per minute	

5.2.2.1.3.3.2 Formula C1

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

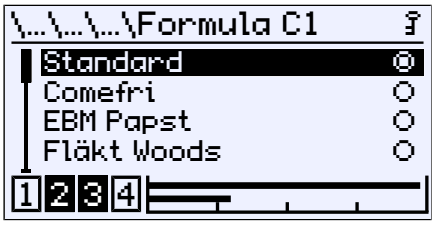


Fig. 90: Formula C1

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

Standard **EBM Pabst** **Goal Abegg** **SIEGLE+EPPLE**	$q = k \cdot \sqrt{\Delta p}$
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. 91: Volume flow measurement – manufacturer formulas

Volume flow measurement at the inlet nozzle

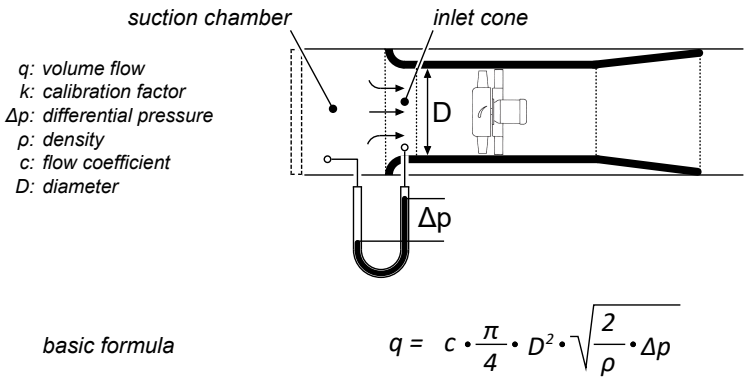


Fig. 92: Volume flow measurement

Fans are usually equipped with an inlet nozzle. The volume flow measurement consists of one or more measuring points in the inlet nozzle and one measuring point in the suction-side 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 frictionless and loss-free flow with constant density. In reality, a correction value determined by the design and other factors must therefore be taken into account.

The fan manufacturers have determined the correction value for each inlet nozzle. These values are generally referred to as calibration factors or K factors and can be found in the data sheet or operating manual for the volume flow measuring device.

NOTICE

The device always calculates the volume flow in the unit Pa.

If the formulae are recalculated, the following must be taken into account:

1. If the device has been calibrated in the unit Pa, the measured value can simply be inserted into the relevant formula.
2. If the device is working in a different unit, the measured value must first be converted into the unit Pa before the formula can be used.

Example

The measured value is 0.8 mbar and the K factor of the fan is specified as 70. First, the measured value is converted into the unit Pa.

1. Δp = 0.8 mbar = 80 Pa
2. *Inserted into the standard formula, this results in a volume flow of:*
   $q = k \cdot \sqrt{\Delta p} = 70 \cdot \sqrt{80} = 626.099\ [m^3/h]$
3. *Depending on the selected display unit, the result is:*
   626.099 [m³/h] = 10435.0 l/min
   626.099 [m³/h] = 368.508 cfm

NOTICE! Use the formula applicable to the respective fan to calculate the volume flow.

5.2.2.1.3.4 Characteristic C1 (linear function)

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

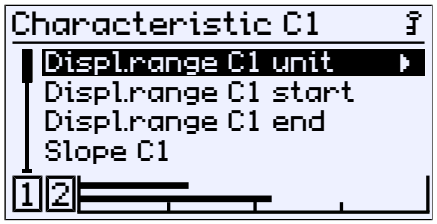


Fig. 93: Characteristic C1 (linear function)

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	This parameter defines the start of the display range in the selected unit.
Displ.range C1 end	This parameter defines the end of the display range in the selected unit.
Slope C1	This parameter defines the slope (m) of the linear characteristic curve.
Offset C1	This parameter defines the intercept (b) of the linear characteristic curve.
Back	This is the menu exit point. It is used to return to the Channel 1 menu.

This menu can be used to configure the output characteristic curve as a linear function. The measuring range defined in the ‘Measurement’ menu is mapped to the display range.

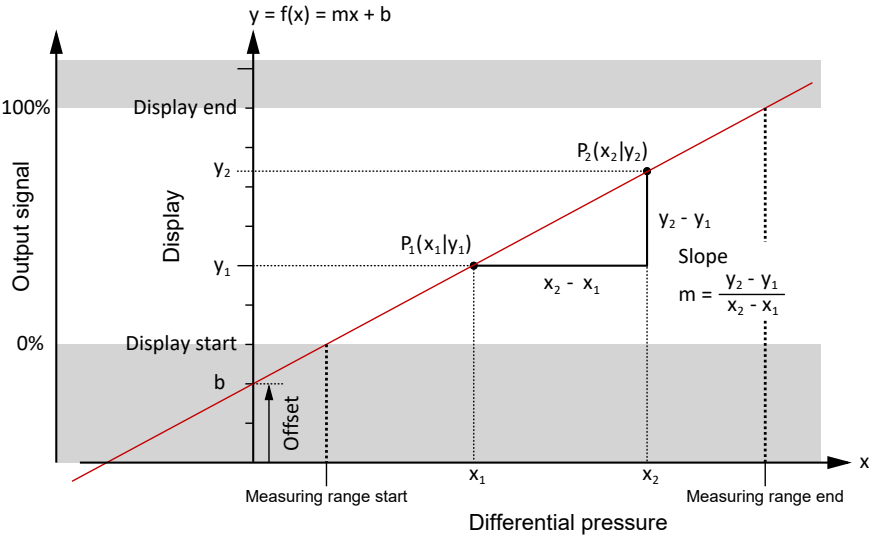


Fig. 94: Linear function

5.2.2.1.4 Number format C1

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

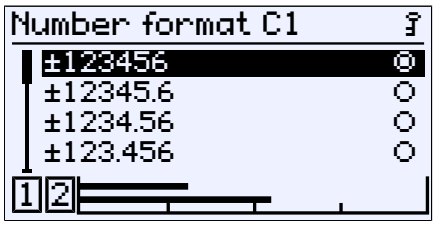


Fig. 95: Number format C1

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 measurement 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.

5.2.2.1.5 Colour change C1

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

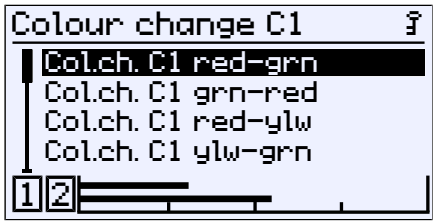


Fig. 96: Colour change C1

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 [▶ 108] and its assignment to measuring channel C1 in the menu Col.ch. assignment [▶ 107].

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 is the menu exit point. 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.

5.2.2.1.5.1 Colour change C1 type: red/green

The following switching thresholds are relevant for this colour change:

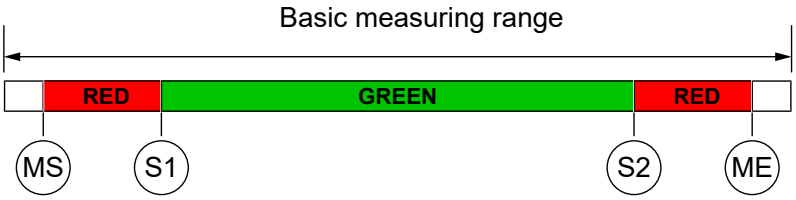


Fig. 97: Colour change red/green

MS	Meas.range C1 start	See menu Measurement C1 : [▸ 68]
S1	Col.ch. C1 red-grn	
S2	Col.ch. C1 green-red	
ME	Meas.range C1 end	See menu Measurement C1 : [▸ 68]

For example:

Input of the threshold red/green

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

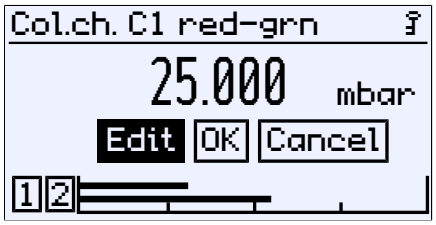


Fig. 98: Colour change C1 red-green

The other switch thresholds are entered in the same way.

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

The following switching thresholds are relevant for this colour change:

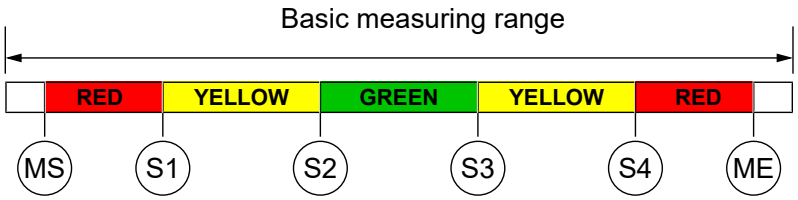


Fig. 99: Colour change red/yellow/green

MS	Meas.range C1 start	See menu Measurement C1 : [▷ 68]
S1	Col.ch. C1 red-ylw	
S2	Col.ch. C1 ylw-grn	
S3	Col.ch. C1 grn-ylw	
S4	Col.ch. C1 ylw-red	
ME	Meas.range C1 end	See menu Measurement C1 : [▷ 68]

For example:

Channel 1: Basic measuring range: 0 … 100 mbar

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

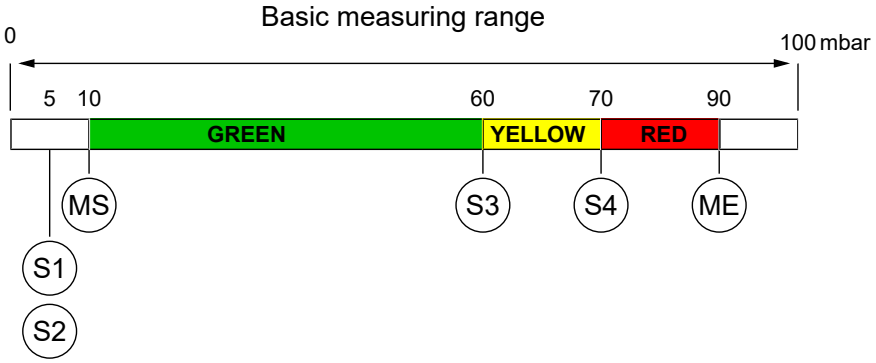


Fig. 100: Example colour-change red/yellow/green

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

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.

5.2.2.1.5.3 Colour change C1 hysteresis

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

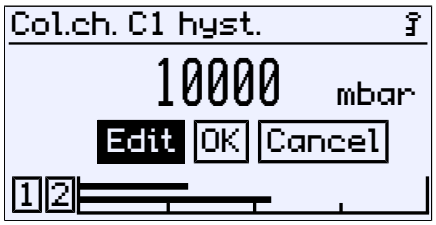


Fig. 101: Colour change C1 hysteresis

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
Red	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.

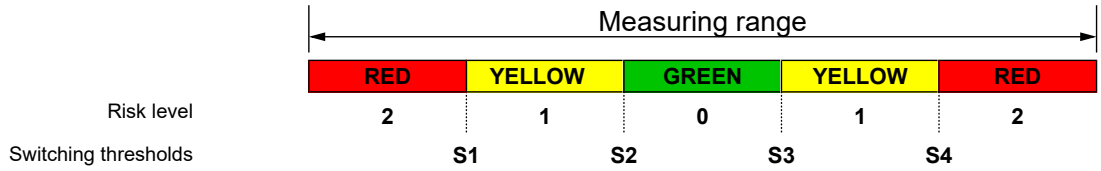


Fig. 102: Colour change (without hysteresis)

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.

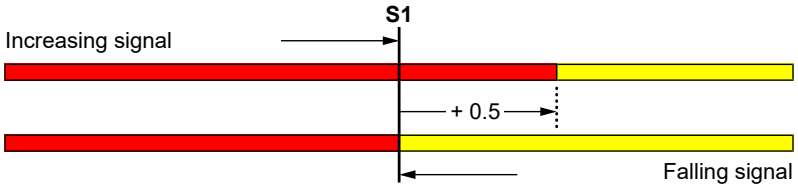


Fig. 103: Example: Hysteresis S1

(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.

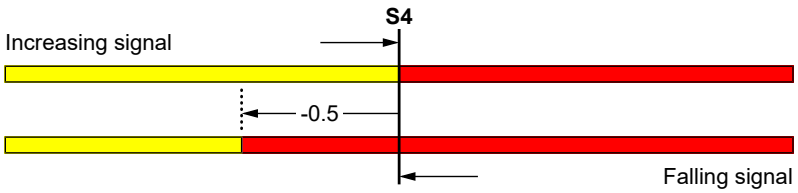


Fig. 104: Example: Hysteresis S4

5.2.2.1.5.4 Colour change C1 delay on

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

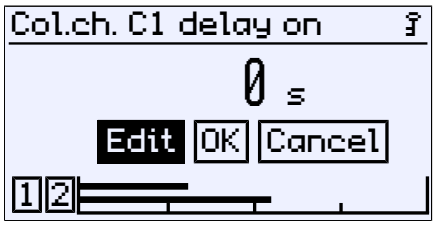


Fig. 105: Colour change C1 delay on

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

5.2.2.1.5.5 Colour change C1 delay off

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

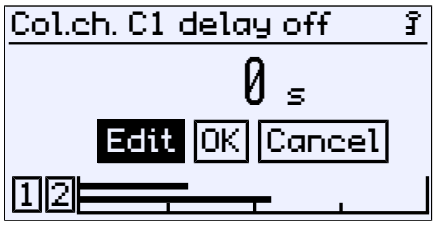


Fig. 106: Colour change C1 delay off

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:

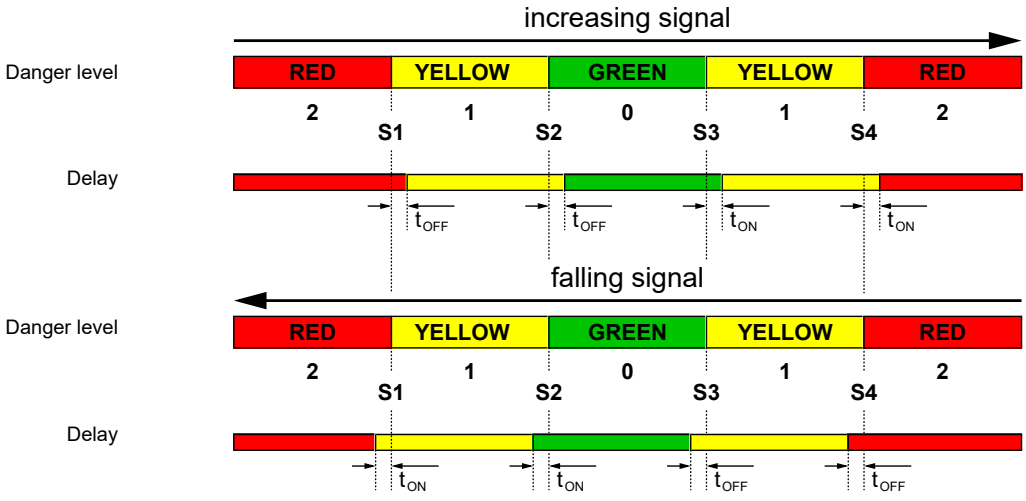


Fig. 107: Colour change delay

5.2.2.2 Channel 2

Path: \Configuration\Channel 2
Level: 2

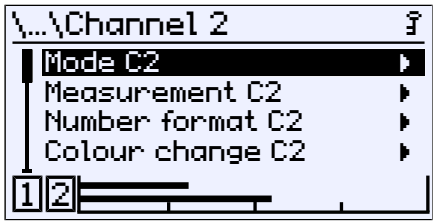


Fig. 108: Channel 2

The 2nd measuring channel is configured identically to the 1st measuring channel [▷ 66]. No explanation is provided at this point.

5.2.2.3 Channel 3

Path: \Configuration\Channel 3
Level: 2

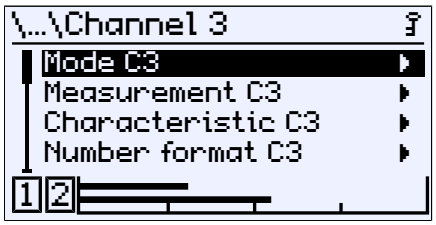


Fig. 109: Channel 3

NOTICE! The third channel is a so-called 'virtual' channel that is calculated from the two input channels 1 and 2 using a mathematical function.

Menu expansion

Menu name		Description
Mode C3	▸	Defined functions can be selected for the measuring channel with this menu.
Measurement C3	▸	The input of the measuring channel is configured in this menu.
Characteristic C3	▸	This menu is hidden depending on the selected mode.
Number format C3	▸	The decimal places for the measurement data display for the measuring channel are set in this menu.
Colour change C3	▸	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.

Signpost [▶Page]

- Mode C3 [▸ 92]
- Measurement C3 [▸ 93]
- Characteristic C3 [▸ 95]
- Number format C3 [▸ 97]
- Colour change C3 [▸ 97]

5.2.2.3.1 Mode C3

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

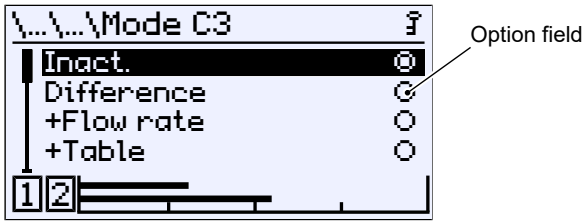


Fig. 110: Mode C3

Parameter value		Description
Inact.	◉	Activates/deactivates Channel 3
Difference	○	Difference between the input channels
+Flow rate	○	Difference between the input channels with subsequent root extraction for flow measurement.
+Table	○	Difference between the input channels with subsequent characteristic curve correction using a breakpoint table.
Back	↰	This is the menu exit point. It takes you 'Back' to the Channel 3 menu.

The operating modes +Flow rate and +Table require different configurations of the characteristic curve. Consequently, the calling menu after the exit has the menu expansion Characteristic C3 , which enables the configuration of the characteristic curve for the selected mode. The difference is determined by the selected formula.

See also

- Characteristic C3 (menu expansion) [▶ 95]
- Formula C3 [▶ 94]

5.2.2.3.2 Measurement C3

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

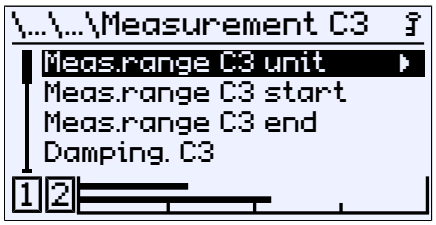


Fig. 111: Measurement C3 (difference, +Flow rate and +Table)

Menu name		Description
Meas.range C3 unit	▸	This parameter is used to define the measuring range unit.
Meas.range C3 start		The start of the measuring range is defined with this parameter.
Meas.range C3 end		The end of the measuring range is defined with this parameter.
Damping C3		This parameter serves to dampen the display.
Offset C3		The characteristic curve is displaced with the parameter offset.
Zero-pt. window C3		The zero-point window parameter defines a range around zero in which the display value is set to zero.
Limit C3	☐	This property determines whether or not the set measuring range limits act on the meas.data display.
Formula C3	▸	A formula for calculating the difference between the input channels is defined in this menu.
Back	↰	This is the menu exit point. Press ‘Back’ to return to the Channel 3 menu

An explanation of the parameters can be found in the description of the first channel (see Measurement C1 [▸ 68]).

5.2.2.3.2.1 Meas.range C3 unit

Path: \Configuration\Channel 3\Measurement C3\Meas.range C3 unit
Level: 4

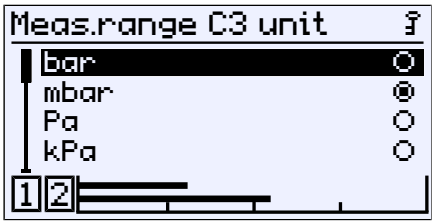


Fig. 112: Meas.range C3 unit

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.

5.2.2.3.2.2 Formula C3

Path: \Configuration\Channel 3\Measurement C3\Formula C3
Level: 4

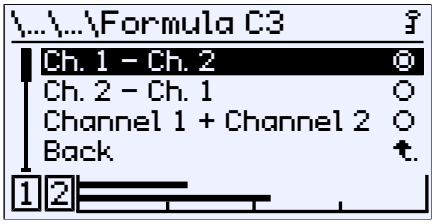


Fig. 113: Formula C3

Menu name		Description
Channel 1 - Channel 2	○	Formula for calculating the difference or sum.
Channel 2 - Channel 1	○	
Channel 1 + Channel 2	○	
Back	↵	This is the menu exit point. Press ‘Back’ to return to the Channel 3 menu

The setting made affects to the operating modes Difference, +Flow rate and +Table.

5.2.2.3.3 Characteristic C3 (menu expansion)

The menu changes depending on the parameter Mode C3 . For the parameter values Inactive and Difference , the menu extension does not apply.

Characteristic C3 (+flow rate)

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

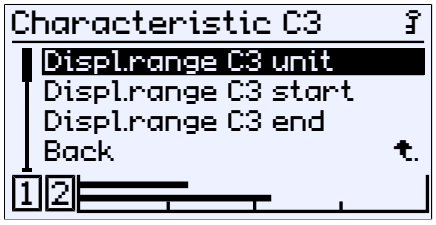


Fig. 114: Characteristic C3 (+Flow rate)

Menu name	Description
Displ.range C3 unit	This parameter is used to define the display range unit.
Displ.range C3 start	The start of the display range is defined with this parameter.
Displ.range C3 end	The end of the display range is defined with this parameter.
Back	This is the menu exit point. It is used to return to the Channel 3 menu.

Characteristic C3 (+table)

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

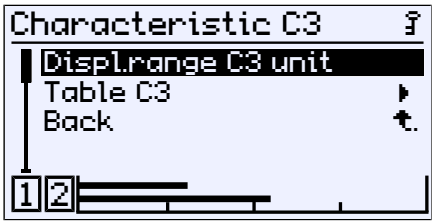


Fig. 115: Characteristic C3 (+Table)

Menu name	Description
Displ.range C3 unit	This parameter is used to define the unit for channel 3.
Table C3	This menu is used to define a support point table for Characteristic C3.
Back	This is the menu exit point. It is used to return to the Channel 3 menu.

A description of how to create such a support point table can be found in the section Table C1.

5.2.2.3.4 Number format C3

Path: \Configuration\Channel 3\Number format C3
Level: 3

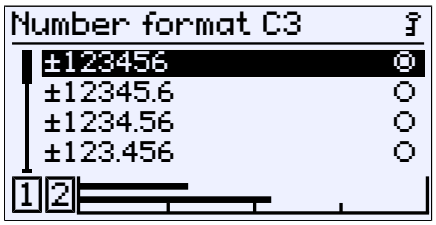


Fig. 116: Number format C3

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 measurement 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.

5.2.2.3.5 Colour change C3

Path: \Configuration\Channel 3\Colour change C3
Level: 3

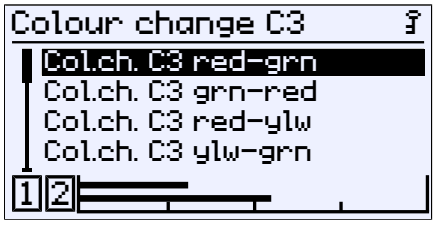


Fig. 117: Colour change C3

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 C3 in the menu `Col.ch. assignment` .

A detailed explanation of the colour changes can be found in the description for channel 1.

See also

- LCD colour [▶ 108]
- Colour change assignment [▶ 107]
- Colour change C1 [▶ 84]

5.2.2.4 Analog output

NOTICE! Devices with Modbus do not have an analogue output. This menu is therefore not available on these devices.

Path: \Configuration\Analogue output
Level: 2

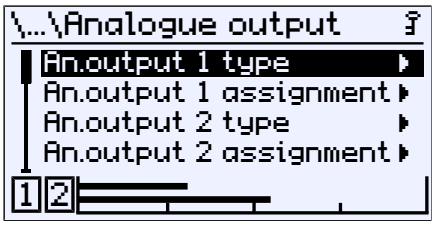


Fig. 118: Analogue output

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 of output 2 is assigned 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 represents the output (exit) of the menu. It takes you ‘Back’ to the configuration menu.

The parameters for the type and assignment work for both channels identically. 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.

5.2.2.4.1 Analog output 1 type

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

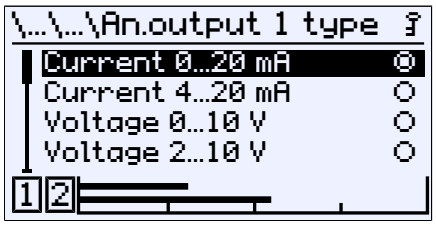


Fig. 119: An.output 1 type

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

5.2.2.4.2 Analog output 1 assignment

Path: \Configuration\Analogue output\Output 1 assignment
Level: 3

Fig. 120: An.output 1 assignment

The assignment of the analogue outputs to the channels can be set freely. The number of available channels depends on the device version. This menu item is not available on devices with only one channel.

See also

- Design and mode of operation [▶ 11]

5.2.2.4.3 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 .[6]

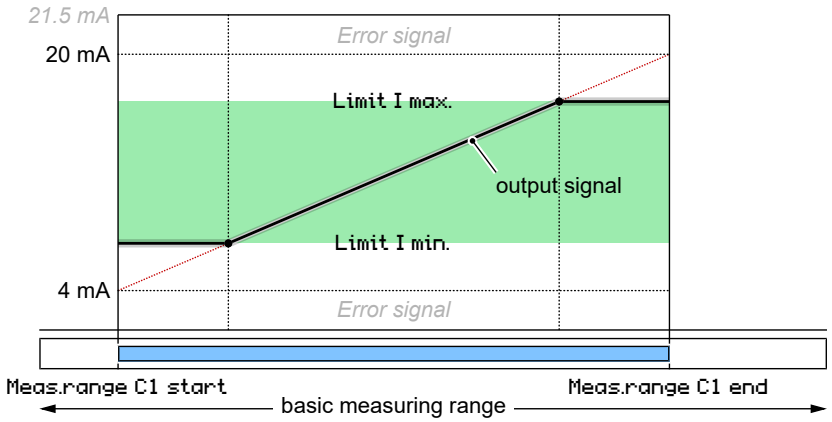


Fig. 121: Limitation of the output signal

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

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

5.2.2.5 Switch output

NOTICE! This menu is not available for Modbus devices without switch outputs.

Path: \Configuration\Switch output
Level: 2

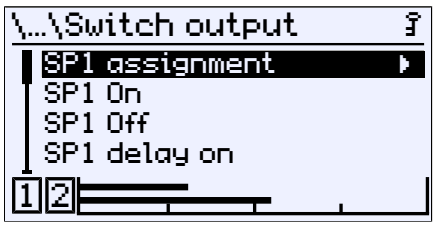


Fig. 122: Switch output

NOTICE! Depending on the version, the device has 2 or 4 switch outputs. 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.

5.2.2.5.1 SP1 assignment

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

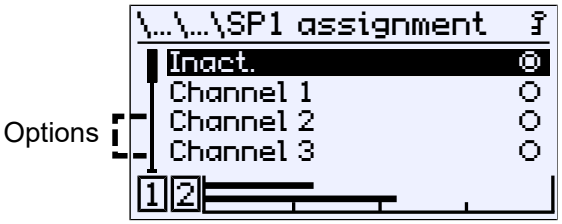


Fig. 123: SP1 assignment

This menu can be used to assign or deactivate the switch point of a channel. The number of available channels depends on the device version.

See also

- Design and mode of operation [▶ 11]

5.2.2.5.2 SP1 function

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

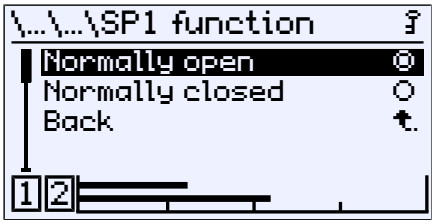


Fig. 124: SP1 function

The function of this contact is defined with this parameter.

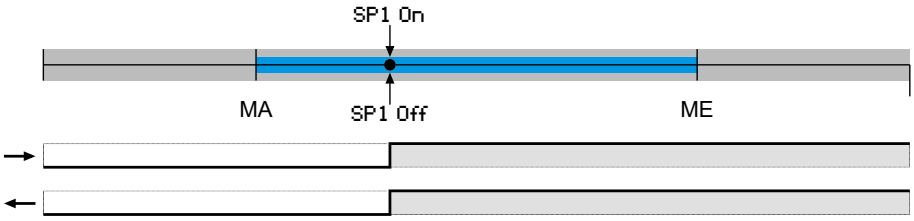
5.2.2.5.3 Switching function

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

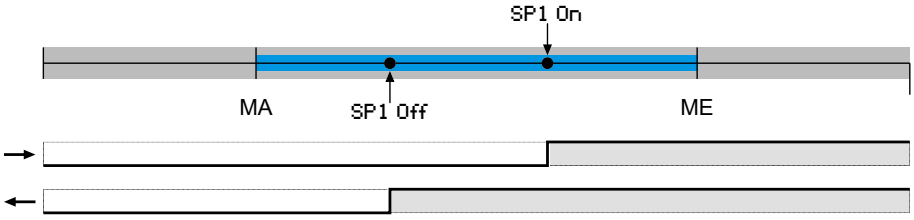
SP1 On defines the activation point, SP1 Off the deactivation point of switch output 1. The values are shown in the valid unit and set accordingly. The values are shown in the valid unit and set accordingly. Both parameters can be set independently over the entire value range.

→ 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.

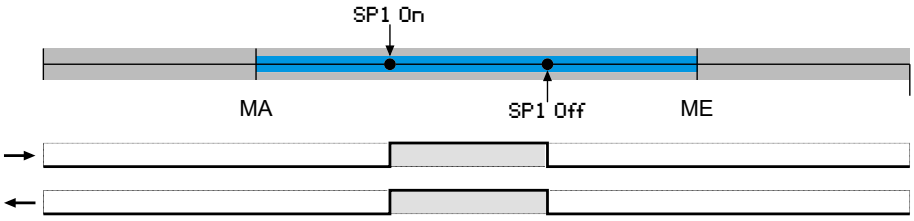


Fig. 125: Switch point setting

Delay

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

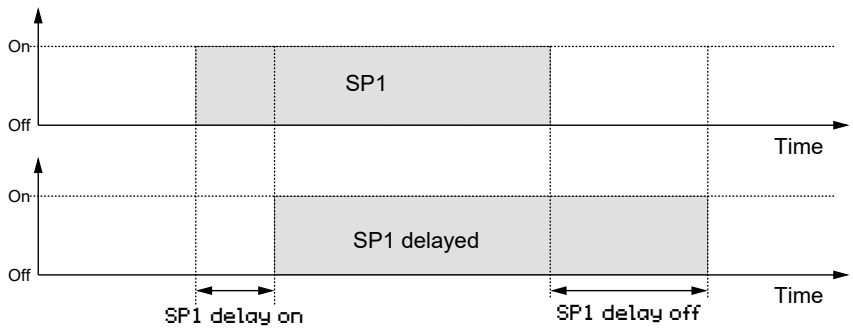


Fig. 126: Delay

5.2.2.6 Display

Path: \Configuration\Display
Level: 2

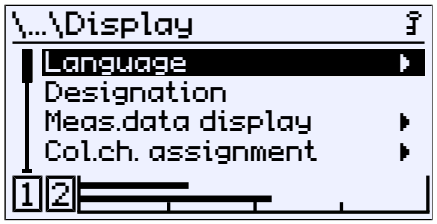


Fig. 127: Display

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. assignment	▸	This menu can be used to determine which measuring channel controls the colour change.
LCD colour	▸	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 contrast		This parameter is used to set the contrast for the LC display.
Back	↰	This is the menu exit point. It takes you ‘Back’ to the configuration menu.

5.2.2.6.1 Language

Path: \Configuration\Display\Language
Level: 3

Fig. 128: 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

5.2.2.6.2 Designation

Path: \Configuration\Display\Designation
Level: 3

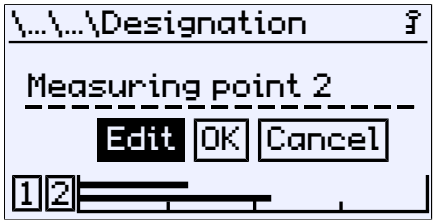


Fig. 129: Designation

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

5.2.2.6.3 Measuring data display

Path: \Configuration\Display\Measurement data display
Level: 3

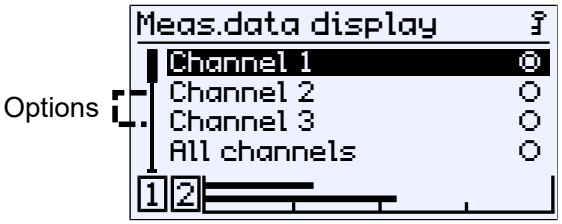


Fig. 130: Meas.data display

In this menu the channel, whose measured value is displayed, is defined. Only one channel can be selected at a time.

The number of channels depends on the device version. This menu item is not shown for 1-channel devices.

5.2.2.6.4 Colour change assignment

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

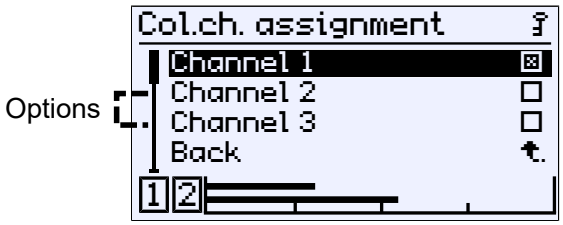


Fig. 131: Colour change assignment

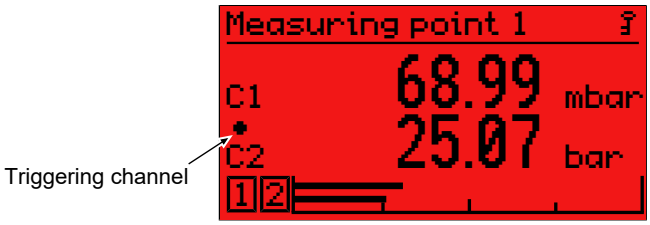
This menu is used to define the channel that controls the colour change. This menu item is not shown for 1-channel devices.

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 (system pressure) triggers a green-red colour change. Shortly after, the same colour change is triggered by channel 1 (differential pressure).

Event 1: Colour change green-red on channel 2



Event 2: Colour change green-red on channel 1

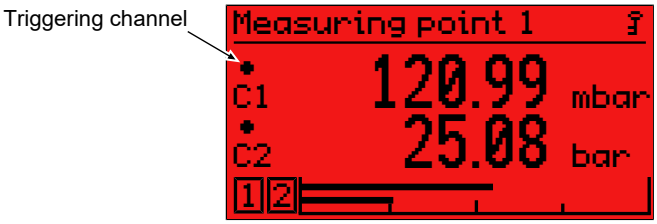


Fig. 132: Measurement data display (colour change)

5.2.2.6.5 LCD colour

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

Fig. 133: 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 [▶ 84] in the menu for the configuration of the channels.

5.2.2.6.6 LCD lighting

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

Fig. 134: 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 affects the colour change in the same way. When the lighting is switched off, a colour change is only displayed 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 0 s.

5.2.2.6.7 LCD contrast

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

Fig. 135: LCD contrast

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

5.2.2.7 Modbus RTU

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

Path: \Configuration\Modbus RTU
Level: 2

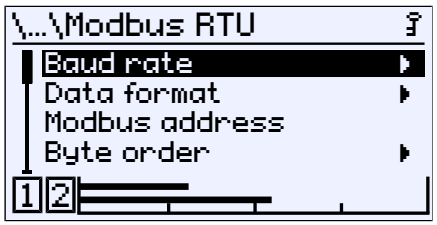


Fig. 136: Modbus RTU

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		This parameter is used to enter the address of the device.
Byte order	▸	The byte order for the floating point figure is defined with this menu.
Back	↰	This is the menu exit point. It takes you ‘Back’ to the configuration menu.

5.2.2.7.1 Baud rate

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

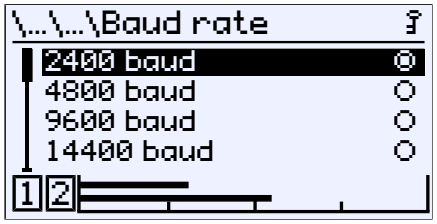


Fig. 137: Baud rate

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 is the menu exit point. Press ‘Back’ to return to the Modbus RTU menu.

5.2.2.7.2 Data format

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

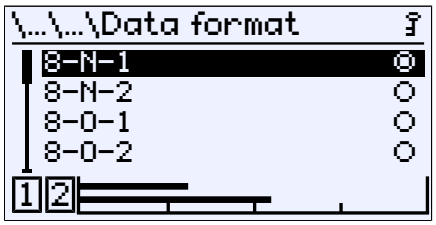


Fig. 138: Data format

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 is the menu exit point. Press ‘Back’ to return to the Modbus RTU menu.

5.2.2.7.3 Modbus address

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

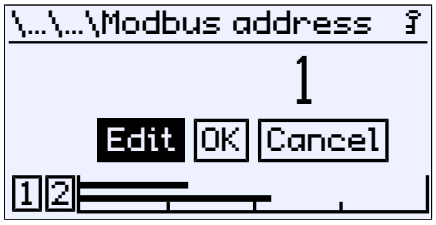


Fig. 139: Modbus address

Addresses from 1 to 247 can be used.

5.2.2.7.4 Byte order

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

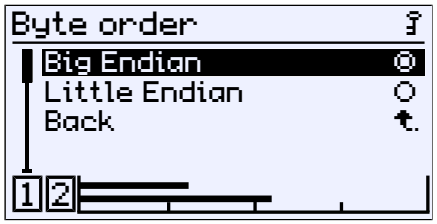


Fig. 140: Byte order

Menu name	Description
Big Endian	The highest value byte first (MSB-LSB).
Little Endian	The lowest value byte first (LSB-MSB).
Back	This is the menu exit point. Press ‘Back’ to return to the Modbus RTU menu.

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

5.2.3 Info

Path: \Info
Level: 1

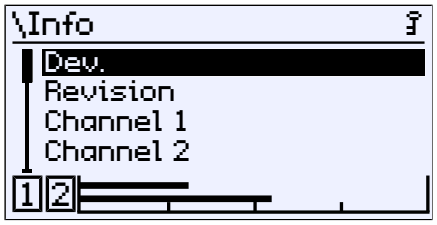


Fig. 141: Info

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
Channel 1	Basic measurement range, spread
Channel 2	Basic measurement range, spread
Analogue output	Output signal
Switch output	Assignment, contact type
Back	This represents the output (exit) of the information menu. It takes you ‘Back’ to the main menu.

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

5.2.4 Service

Path: \Service
Level: 1

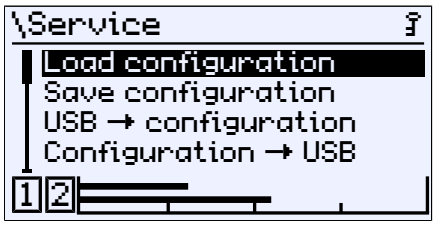


Fig. 142: Service

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.
Default configuration		The configuration is reset to the default values. *)
Reference mode	▸	Entry to the reference mode menu
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.

*) The default values are values that are stored in the flash memory and set the device to a default state. The default configuration is not the same as the customer-specific factory setting. The customer-specific factory setting can only be restored using the inTouch configuration software.

5.2.4.1 Reference mode

[Reference mode is available from firmware version 1.45 onwards.]

Path: \Service\Reference Mode
Level: 2

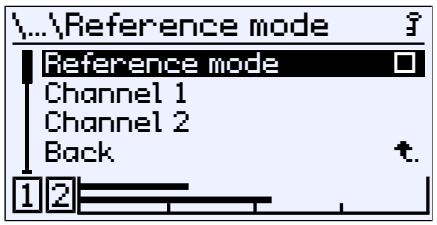


Fig. 143: Reference mode

Menu name		Description
Reference mode	☐	This parameter switches the reference mode on/off.
Channel 1		Enter the value for the first channel
Channel 2		Enter the value for the second channel
Back	↰	This is the exit from reference mode. This takes you 'Back' to the service menu.

Reference mode allows the sensor readings to be overwritten with fixed values. This enables the entire measuring chain to be checked. While reference mode is active, all other functions of the device behave as in normal operation. In particular, analogue outputs, switching outputs and colour changes assume the states corresponding to the reference value.

Reference mode is activated via the Reference mode parameter. It is always activated for all inputs simultaneously. For each channel, the value to be set is determined via the respective menu item (Channel 1 , Channel 2). The linear measuring ranges and units set for the channels apply here. No reference value can be specified for virtual channel 3, as this is calculated from the other channels as in normal operation.

When reference mode is active, the text
– Reference mode – is displayed in the title bar of the measurement data display.

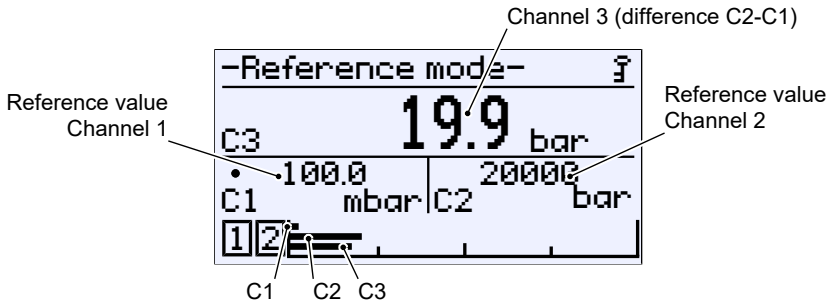


Fig. 144: Measurement data display – Reference mode

Reference mode is disabled once again using the parameter Reference mode . Reference mode is automatically disabled when the user logs out; this also applies to automatic logout. Reference mode is not active after the device is started.

The reference mode is initially only available to the Admin user. Other users can be granted access via the rights management in the Login menu.

5.2.4.2 Firmware update

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

⚠ DANGER

Opening the housing on ATEX devices

ATEX devices must never be opened inside potentially explosive areas.

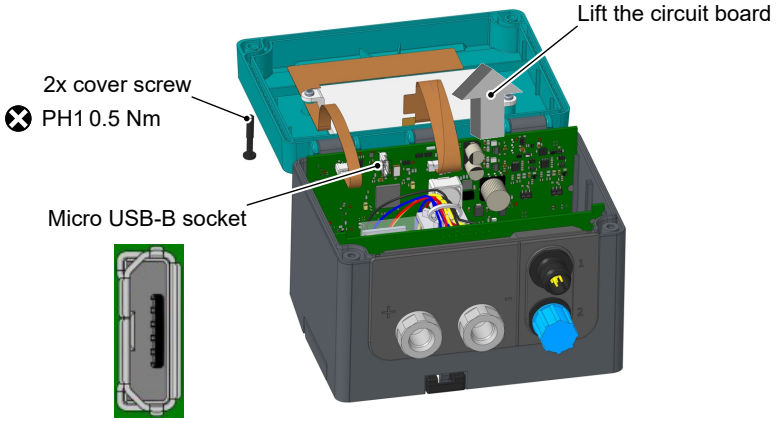


Fig. 145: USB port (example)

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

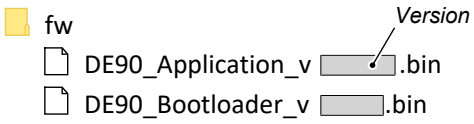


Fig. 146: Example folder structure

▷ Perform the update as follows:

1. Open the housing
2. Insert the USB stick with the new firmware into the USB port.
3. Log in as the user with the right to update firmware.
4. Navigate to the Service menu.
5. Select the Update firmware menu item and start the update. The update takes place automatically.
   NOTICE! Sometimes the USB stick is not correctly recognised. In this case, remove the stick and re-insert it during the update.
   ↪ The new software is now installed. The device restarts once the new firmware has been installed.
6. Remove the USB stick and close the housing.

▶ The update is now complete.

6 Servicing

6.1 Maintenance

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

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

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

6.2 Transport

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

6.3 Service

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

⚠ WARNING

Process media residues

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

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

6.4 Disposal

WEEE-Reg.-No. DE 31751293

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

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

P# **23** 03618.03.123

Production year 2023

Further information on disposal can be found on our website [www.fischermesstechnik.de]

7 Technical data

7.1 General

General information		
Type designation	DD90	
Channel 1		
Pressure type	Differential pressure	
Measurement principle	Piezoelectric	
Channel 2		
Pressure type	Relative pressure	
Measurement principle	Piezoelectric	
interface	Modbus RTU	
	IO-Link	

Reference conditions (acc. to IEC 61298-1)		
Temperature	+15 … +25 °C	
Relative humidity	45 … 75 %	
Air pressure	86 … 106 kPa	860 … 1060 mbar
Installation position	User-defined	

7.2 Input variables

Channel 1

[mbar]	Max. overload	Max. system pressure	Bursting pressure
	on one side	on both sides	on both sides
0 … +60	6 bar	40 bar	> 70 bar
0 … +100			
0 … +160			
0 … +250			
0 … +400			
-60 … +60			
-100 … +100			
-160 … +160			
-250 … +250			
-400 … +400			

[bar]	Max. overload	Max. system pressure	Bursting pressure
	on one side	on both sides	on both sides
0 … +0.6	6 bar	40 bar	> 70 bar
0 … +1	6 bar		
0 … +1.6	16 bar		
0 … +2.5	16 bar		
0 … +4	16 bar		
0 … +6	20 bar		
0 … +10	20 bar		
0 … +16	40 bar		
0 … +25	40 bar		
-0.6 … +0.6	6 bar		
-1.6 … +1.6	16 bar		
-2.5 … +2.5	16 bar		
-4 … +4	16 bar		
-6 … +6	20 bar		
-1 … 0	6 bar		
-1 … 0.6	6 bar		
-1 … +1	6 bar		
-1 … +1.5	16 bar		
-1 … +3	16 bar		
-1 … +5	20 bar		

Channel 2

[bar]	Max. overload	Max. system pressure	Bursting pressure
	on both sides	on both sides	on both sides
0 … +40	70 bar	40 bar	> 70 bar

7.3 Output variables

Analogue outputs

The number of analogue outputs depends on the device version.

Device version	1-channel	2-channel
Number of analogue outputs	1	2

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

Output signal	0 … 20 mA 4 … 20 mA	0 … 10 V 2 … 10 V 1 … 5 V
Signal range	0.0 ... 21.5 mA	0.0 ... 10.5 V
Load impedance	≤ 600 Ω	≥ 2 kΩ
Turn down	4:1	
Step response (T90)	< 100 ms	

Switch outputs

The number of switch outputs depends on the device version. The assignment of the switch outputs to the channels can be configured freely.

Standard version	1-channel	2-channel
Number of switch outputs	2	4
Assignment on delivery	SP1-> channel 1 SP2-> channel 1	SP1-> channel 1 SP2-> channel 1 SP3-> channel 2 SP4-> channel 2

Modbus (Opt1)	1-channel	2-channel
Number of switch outputs	0	0
Assignment on delivery	---	--

Modbus (Opt2)	1-channel	2-channel
Number of switch outputs	4	4
Assignment on delivery	SP1-> channel 1 SP2-> channel 1 SP3-> channel 1 SP4-> channel 1	SP1-> channel 1 SP2-> channel 1 SP3-> channel 2 SP4-> channel 2

IO-Link	1-channel	2-channel
Number of switch outputs	4	4
Assignment on delivery	SP1-> channel 1 SP2-> channel 1 SP3-> channel 1 SP4-> channel 1	SP1-> channel 1 SP2-> channel 1 SP3-> channel 2 SP4-> channel 2

Type	Potential-free semiconductor switch (MOSFET)
Progr. switching function	1-pole normally open (NO) 1-pole normally closed (NC)
Max. switching voltage	3...32 V AC/DC
Max. switching current	0.25 A
Max. switching output	8 W / 8 VA R_{ON} ≤ 4 Ω

7.4 Measuring accuracy

- The specifications for the measurement error incl. linearity and hysteresis.
- All specifications refer to the basic measuring range (see type plate).

Measurement deviation	< 0.5%
Repeatability at 20°C	< 0.05% FS
Long-term stability	≤ 0.5% FS / year

7.4.1 Impact of the static pressure

Channel 1	
[mbar]	[%FS/bar]
0 … +60	< 0.12
0 … +100	< 0.07
0 … +160	< 0.05
0 … +250	< 0.03
0 … +400	< 0.02
-60 … +60	< 0.06
-100 … +100	< 0.04
-160 … +160	< 0.03
-250 … +250	< 0.02
-400 … +400	< 0.02

[bar]	
0 … +0.6	< 0.04
0 … +1	< 0.02
0 … +1.6	< 0.05
0 … +2.5	< 0.03
0 … +4	< 0.02
0 … +6	< 0.04
0 … +10	< 0.02
0 … +16	< 0.05
0 … +25	< 0.03
-0.6 … +0.6	< 0.02
-1.6 … +1.6	< 0.03
-2.5 … +2.5	< 0.02
-4 … +4	< 0.02
-6 … +6	< 0.02
-1 … 0	< 0.02
-1 … 0.6	< 0.02
-1 … +1	< 0.02
-1 … +1.5	< 0.03
-1 … +3	< 0.02
-1 … +5	< 0.04

7.4.2 Impact of ambient temperature

Channel 1	Zero point	Span
[mbar]	%FS/10 K	%FS/10 K
0 … +60	< 1.7	< 0.5
0 … +100	< 1.1	
0 … +160	< 0.7	
0 … +250	< 0.5	
0 … +400	< 0.5	
-60 … +60	< 0.9	
-100 … +100	< 0.6	
-160 … +160	< 0.5	
-250 … +250	< 0.5	
-400 … +400	< 0.5	
[bar]	%FS/10 K	%FS/10 K
0 … +0.6	< 0.5	< 0.5
0 … +1		
0 … +1.6		
0 … +2.5		
0 … +4		
0 … +6		
0 … +10		
0 … +16		
0 … +25		
-0.6 … +0.6		
-1.6 … +1.6		
-2.5 … +2.5		
-4 … +4		
-6 … +6		
-1 … 0		
-1 … 0.6		
-1 … +1		
-1 … +1.5		
-1 … +3		
-1 … +5		

Channel 2	Zero point	Span
[bar]	%FS/10 K	%FS/10 K
0 … 40	< 0.1	< 0.5

7.5 Digital interfaces

USB interface

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

Modbus RTU interface

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

IO-Link Interface

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

7.6 Auxiliary energy

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

Rated voltage	24 V AC/DC	
Admissible operating voltage U_b	19.2 to 28.8 V AC/DC	Default Modbus RTU
	18 to 30 V DC	IO-Link
Power consumption	Typ. 2W (VA) Max. 3W (VA)	

7.7 Operating conditions

	Standard	**ATEX**
Ambient temperature range	-20 … +70 °C	-20 … +60 °C
Media temperature range	-20 … +70 °C	-20 … +60 °C
Storage temperature range	-20 … +70 °C	-20 … +70 °C
Protection class	IP65	IP65
EMC	EN 61326-1:2013 EN 61326-2-3:2013	
ATEX	EN IEC 60079-0:2018 EN IEC 60079-7:2015/A1:2018 EN 60079-31:2014	
RoHS	EN IEC 63000:2018	

7.8 Display

Display	Full graphic LC display
Resolution	128 x 64 Pixel
Back lighting	RGB
Meas.data display	6 digits

7.9 Construction design

Process connection

NOTICE! Pneumatic push-in fittings may only be used up to a maximum of 10 bar.

G ⅛ internal thread made of stainless steel (1.4404)			
7/16-20 UNF brass connection spigot			
		Outer Ø	**Inner Ø**
Pneumatic push-in fitting made of nickel-plated brass	Hose	6 mm	4 mm
	Hose	8 mm	6 mm
Cutting ring screw connection made of stainless steel (1.4404)	Pipe	6 mm	
	Pipe	8 mm	

Electrical connection

Standard version	**1-channel**	**2-channel**
Plug 1: Auxiliary energy, output	5-pin male	5-pin male
Plug 2: Switch outputs	4-pin male	8-pin male

Modbus without switch outputs	**1-channel**	**2-channel**
Plug 1: Modbus IN	5-pin male	5-pin male
Plug 2: Modbus OUT	5-pin female	5-pin female

Modbus with switch outputs	**1-channel**	**2-channel**
Plug 1: Modbus	5-pin male	5-pin male
Plug 2: Switch outputs	8-pin male	8-pin male

IO-Link with switch outputs	**1-channel**	**2-channel**
Plug 1: IO-Link	4-pin male	4-pin male
Plug 2: Switch outputs	8-pin male	8-pin male

General activities

Installation position	User-defined
Dimensions (without connections)	120 x 81.5 x 95 mm
Weight	Max. 920 g

7.9.1 Materials

The device is silicone-free, i.e. we declare that there is no silicone on any surfaces or on any components or assemblies installed in the device.

NOTICE! We accept no liability for contamination caused by damage to the transport packaging or improper handling after unpacking!

Materials of parts in contact with medium	
Pressure chamber, sensor, screw connections	Stainless steel 1.4404
O-rings	FKM (fluorine rubber)
Process connections *)	Nickel-plated brass, stainless steel

*) depending on the version (see order code)

Materials of parts in contact with surroundings
Polyester, PET, polyamide 6.6, aluminium, nickel-plated brass, stainless steel

7.9.2 Dimensional drawings

All dimensions in mm unless otherwise stated

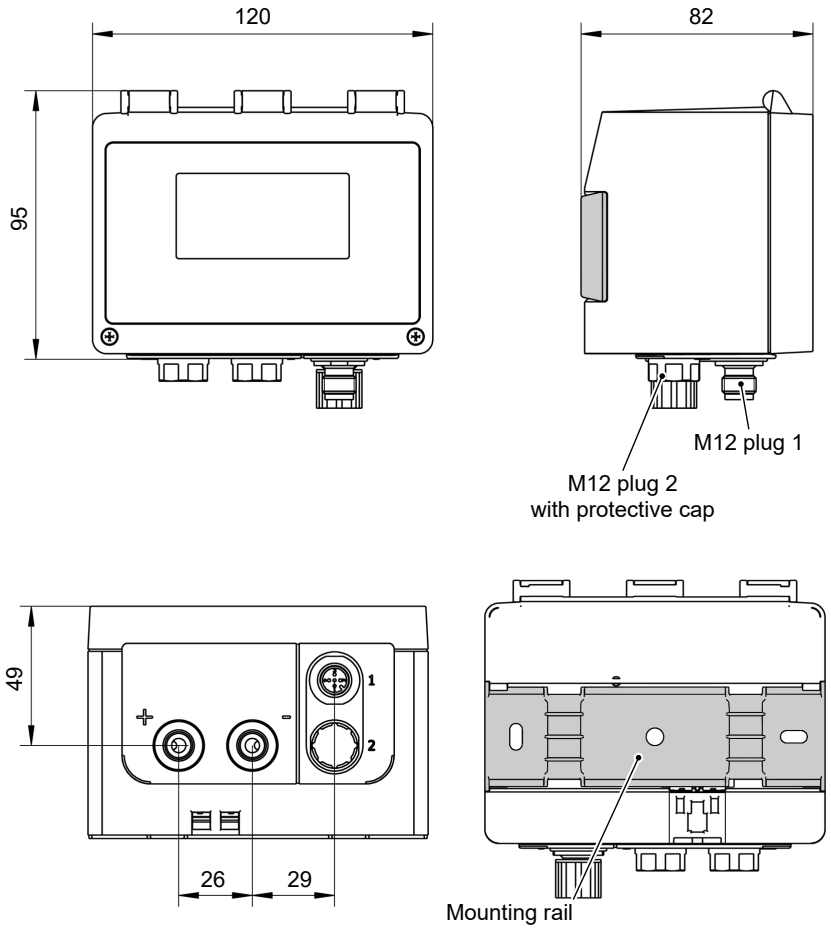


Fig. 147: Dimension drawing (standard)

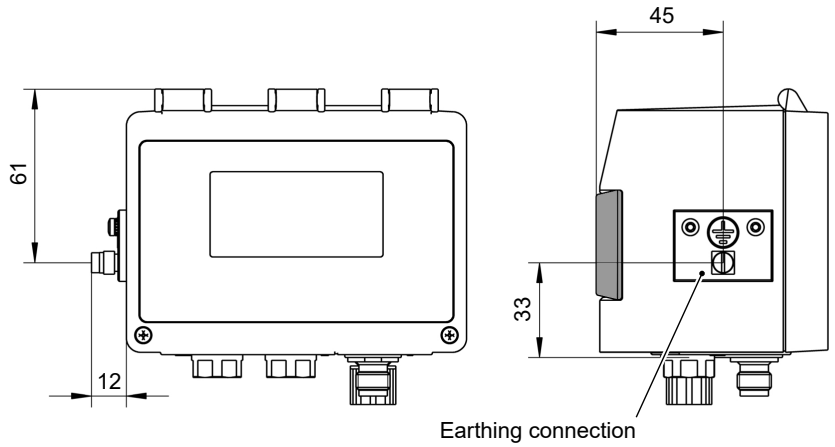


Fig. 148: Dimension drawing (ATEX)

Mounting rail

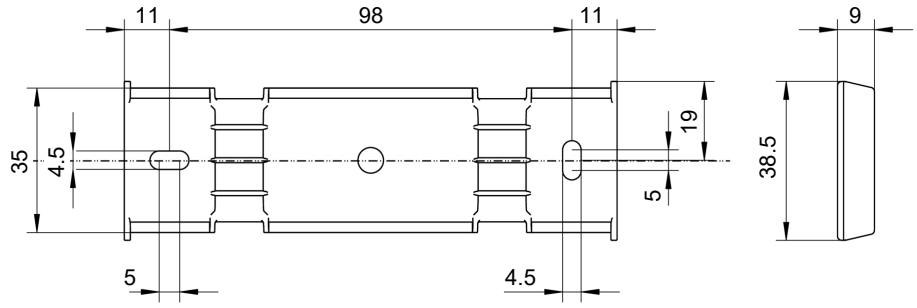
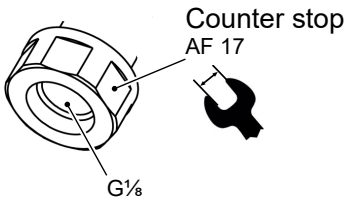
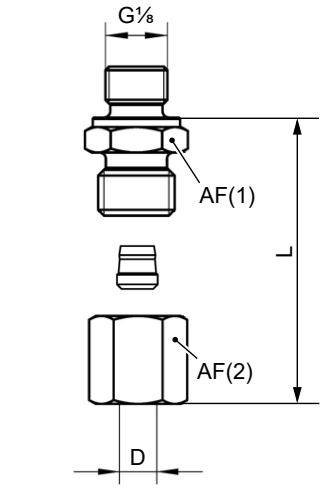


Fig. 149: Mounting rail

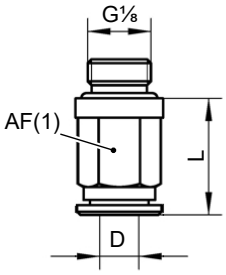
Process connections



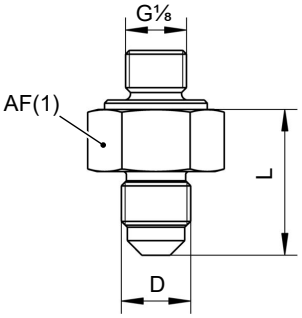
Basic connection
G⅛ internal thread



Cutting ring screw connection



Pneumatic push-in fitting



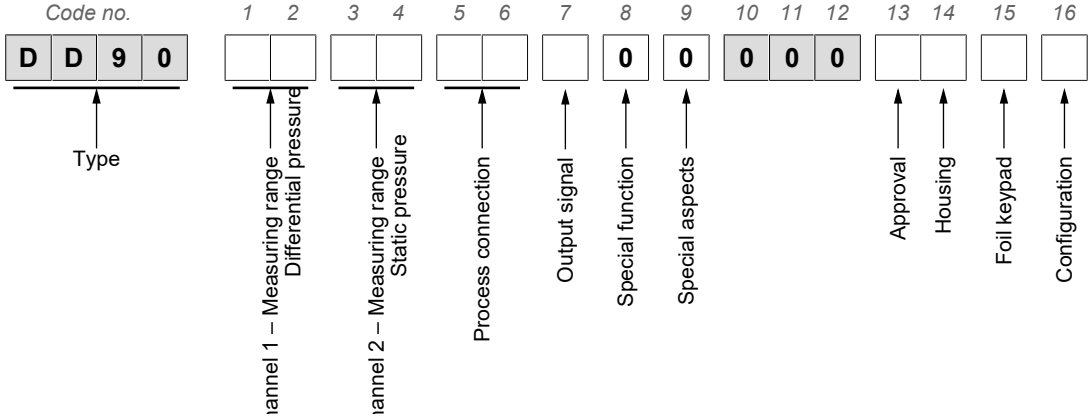
Connection spigot UNF

Fig. 150: Process connections

Process connection		D	L	AF(1)	AF(2)
G⅛ internal thread (basic connection)					
Cutting ring screw connection	Pipe	6	25	14	14
		8	27	17	14
Pneumatic push-in fitting	Hose	6	18	11	---
		8	20.5	13	---
Connection spigot UNF		7/16	23.5	19	---

NOTICE! Pneumatic push-in fittings may only be used up to a maximum of 10 bar.

8 Order codes



[1.2]	Channel 1: Differential pressure measuring range	
58	0 … 60	mbar
59	0 … 100	mbar
60	0 … 160	mbar
82	0 … 250	mbar
83	0 … 400	mbar
B3	-60 … 60	mbar
B4	-100 … 100	mbar
R5	-160 … 160	mbar
B6	-250 … 250	mbar
B7	-400 … 400	mbar
01	0 … 0.6	bar
02	0 … 1	bar
03	0 … 1.6	bar
04	0 … 2.5	bar
05	0 … 4	bar
06	0 … 6	bar
07	0 … 10	bar
08	0 … 16	bar
09	0 … 25	bar
E9	-0.6 … 0.6	bar
G9	-1.6 … 1.6	bar
K9	-2.5 … 2.5	bar
M9	-4 … 4	bar
N9	-6 … 6	bar
31	-1 … 0	bar
32	-1 … 0.6	bar
27	-1 … 1	bar
33	-1 … 1.5	bar
34	-1 … 3	bar
35	-1 … 5	bar

[3.4]	Channel 2: Static pressure measuring range	
00	None	
10	0 … 40	bar

[5.6]	Process connection
00	G1/8 internal, stainless steel 1.4404
24	6 mm cutting ring screw connection, stainless steel
25	8 mm cutting ring screw connection, stainless steel
P6	Pneumatic push-in fitting for 6/4 mm hose, nickel-plated brass
P8	Pneumatic push-in fitting for 8/6 mm hose, nickel-plated brass
33	Connection spigot 7/16-20 UNF, brass

NOTICE! Pneumatic push-in fittings may only be used up to a maximum of 10 bar.

[7]	Analogue output	
0	None	
	Switchable, preset at the factory:	
C	0 ... 10 V	3-wire
A	0 ... 20 mA	3-wire
P	4 ... 20 mA	3-wire
	Digital interface	
M	MODBUS RTU	(without switch output)
N	MODBUS RTU	(with 4 switch outputs)
I	IO-Link	(with 4 switch outputs)

[8]	Special function
0	None

[9]	Special aspects
0	None

[13.14]	Approval	Housing	Cover
00	None	Anthracite	Green
R1	ATEX (Zones 2 and 22)	Black (conductive)	Black (conductive)

[15]	Foil keypad
0	FISCHER
1	neutral

[16]	Configuration
0	Default
1	Linear characteristic curve
2	Flow rate
3	Table
5	Formula
S	Customer-specific

9 Accessories

9.1 M12 connection cables

Designation	No. of pins	Length	Order No.
PUR connection cable (**unshielded**)			
M12 socket (straight) on cable end (stripped and tinned)	4 pins	2 m	06401993
		5 m	06401994
		10 m	06401572
	5-pin	2 m	06401995
		5 m	06401996
		10 m	06401573
	8-pin	2 m	09001844
		5 m	09011146
		10 m	09011016

9.2 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

9.3 Modbus

Designation		Order No.
Modbus terminating resistor	120 ohm socket	06411280
	120 ohm connector	06411279
Y-distributor (shielded)		04451217

Designation	No. of pins	Length	Order No.
PUR connection cable (**shielded**)			
M12 plug to M12 socket straight plug	5-pin	1 m	09011277
		2 m	09011278
		5 m	09011299
		10 m	09011315
		20 m	09011295
M12 socket (straight) on cable end (stripped and tinned)	5-pin	2 m	09011316
		5 m	09011317
		10 m	09011318
M12 plug (straight) to cable end (stripped and tinned)	5-pin	2 m	09011495
		5 m	09011496
		10 m	09011497

9.4 IO-Link

Designation	No. of pins	Length	Order No.
PUR connection cable (**unshielded**)			
M12 plug to M12 socket straight plug	4 pins	2 m	09011363
		5 m	09011364
		10 m	09011365
		15 m	09011366

9.5 Measuring device accessories

MZ1###	Siphons
MZ400#	Capillary throttle coil
MZ410#	Settable damping reactor

The MZ data sheet is available for download on our website (fischermesstechnik.de).

9.6 Shut-off valves

DZ2300H###	Three-spindle equalising and shut-off valve
DZ2400H###	Four-spindle equalising and shut-off valve with vent valve

The DZ23-24 data sheet is available for download on our website (fischermesstechnik.de).

9.7 Accessories for outdoor use

Designation	Material	Order No.
Canopy	Stainless steel	02006130

9.8 Software

The inTouch configuration software is available for download on our website (fischermesstechnik.de).

10 Annex

FISCHER MESS- UND REGELTECHNIK

(Original) CE

EU Konformitätserklärung

Für das nachfolgend bezeichnete Erzeugnis

Produktbezeichnung **Differenzdrucktransmitter**

Typenbezeichnung **DD90**

wird hiermit erklärt, dass es den grundlegenden Anforderungen entspricht,
die in den nachfolgend bezeichneten EU Richtlinien festgelegt sind:

2014/30/EU	*EMV Richtlinie*
2011/65/EU	*RoHS Richtlinie*
(EU) 2015/863	*Delegierte Richtlinie zur Änderung von Anhang II der Richtlinie 2011/65/EU*

Die Produkte wurden entsprechend der nachfolgenden harmonisierten Normen geprüft.

Elektromagnetische Verträglichkeit (EMV)

DIN EN IEC 61326-1:2022-11 *EN IEC 61326-1:2021*	*Elektrische Mess-, Steuer-, Regel- und Laborgeräte - EMV-Anforderungen - Teil 1: Allgemeine Anforderungen*
DIN EN IEC 61326-2-3:2022-11 *EN IEC 61326-2-3:2021*	*Elektrische Mess-, Steuer-, Regel- und Laborgeräte - EMV-Anforderungen - Teil 2-3: Besondere Anforderungen - Prüfanordnung, Betriebsbedingungen und Leistungsmerkmale für Messgrößenumformer mit integrierter oder abgesetzter Signalaufbereitung*

RoHS Richtlinie (RoHS 3)

DIN EN IEC 63000:2019-05 *EN IEC 63000:2018*	*Technische Dokumentation zur Beurteilung von Elektro- und Elektronikgeräten hinsichtlich der Beschränkung gefährlicher Stoffe*

Das Erzeugnis wurde dem Konformitätsbewertungsverfahren „**Interne Fertigungskontrolle**“ unterzogen.

Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung in Bezug auf die Erfüllung der grundlegenden Anforderungen und die Anfertigung der technischen Unterlagen trägt der Hersteller.

Hersteller

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

Die Geräte werden gekennzeichnet mit: CE

Bad Salzuflen
26.08.2025

T. Malischewski
Geschäftsführer

09010984 • CE_EN_DD90 • Rev. ST4-A • 08/25 1 / 1

Fig. 151: CE_EN_DD90

FISCHER MESS- UND REGELTECHNIK

(Translation) CE

EU Declaration of Conformity

For the product described as follows

Product designation **Differential Pressure Transmitter**

Type designation **DD90 ## ## ## # 0 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*
(EU) 2015/863	*Delegated Directive amending Annex II to Directive 2011/65/EU*

The products were tested in compliance with the following standards.

Electromagnetic compatibility (EMC)

DIN EN IEC 61326-1:2022-11 *EN IEC 61326-1:2021*	*Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirement*
DIN EN IEC 61326-2-3:2022-11 *EN IEC 61326-2-3:2021*	*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* *Correction1* *IEC 60079-0:2017/COR1:2020*	*Explosive atmospheres - Part 0: Equipment - General requirements*
DIN EN IEC 60079-7/A1:2018-07 *EN IEC 60079-7:2015/A1:2018*	*Explosive atmospheres - Part 7: Equipment protection by increased safety "e" (IEC 60079-7:2015/A1:2017)*
DIN EN 60079-31:2014-12 *EN 60079-31:2014*	*Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosure "t"*

RoHS Directive (RoHS 3)

DIN EN IEC 63000:2019-05 *EN IEC 63000:2018*	*Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances*

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

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

Manufacturer

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

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
26 Aug 2025

T. Malischewski
Managing Director

09010988 • CE_EN_DD90_ATEX • Rev. ST4-A • 08/25

1 / 1

Fig. 152: CE_EN_DD90_ATEX

FISCHER MESS- UND REGELTECHNIK

(Translation) UK CA

UKCA Declaration of Conformity

For the product described as follows

Product designation **Differential Pressure Transmitter**

Type designation **DD90 ## ## ## # 0 0 000 R1 # #**

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

Statutory regulation No.	*Description*
2016 No. 1107	*The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016*
2016 No. 1101	*The Electrical Equipment (Safety) Regulations 2016*
2016 No. 1091	*The Electromagnetic Compatibility Regulations 2016*
2021 No. 422	*The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (Amendment) Regulations 2021*
2022 No. 1647	*The Hazardous Substances and Packaging (Legislative Functions and Amendment) (EU Exit) Regulations 2020*

The products have been tested according to the following standards.

Explosive atmospheres (ATEX):

BS EN IEC 60079-0+A11:2018-07-09	*Explosive atmospheres. Equipment. General requirements*
BS EN IEC 60079-7+A11:2015-12-31	*Explosive atmospheres. Equipment protection by increased safety "e"*
BS EN IEC 60079-31:2024-03-04	*Explosive atmospheres. Equipment dust ignition protection by enclosure "t"*

Electromagnetic compatibility (EMC):

BS EN IEC 61326-2-3:2021-06-10	*Electrical equipment for measurement, control and laboratory use. EMC requirements. Particular requirements. Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning*

Restriction of Hazardous Substances (RoHS):

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

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

Manufacturer

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

The devices bear the following marking:

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

Bad Salzuflen
26 Aug 2025

T. Malischewski
Managing Director

09010992 • UKCA_EN_DD90_ATEX • Rev. ST4-A • 08/25 1 / 1

Fig. 153: UKCA_EN_DD90

FISCHER MESS- UND REGELTECHNIK

(Translation) UK CA

UKCA Declaration of Conformity

For the product described as follows

Product designation **Differential Pressure Transmitter**

Type designation **DD90**

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

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

The products have been tested according to the following standards.

Electromagnetic compatibility (EMC):

BS EN IEC 61326-1:2021-06-07	*Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements*
BS EN IEC 61326-2-3:2021-06-10	*Electrical equipment for measurement, control and laboratory use. EMC requirements. Particular requirements. Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning*

Restriction of Hazardous Substances (RoHS):

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

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

Manufacturer

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

The devices bear the following marking: CE

Bad Salzuflen
26 Aug 2025

T. Malischewski
Managing Director

09010990 • UKCA_EN_DD90 • Rev. ST4-A • 08/25

1 / 1

Fig. 154: UKCA_EN_DD90_ATEX

Notes

FISCHER Mess- und Regeltechnik GmbH
Bielefelder Str. 37a
D-32107 Bad Salzuflen

Tel. +49 5222 974-0
Fax +49 5222 7170
www.fischermesstechnik.de
info@fischermesstechnik.de