



II 3D Ex tc III B T125°C Dc
II 3G Ex nA IIC T4 Gc



RoHS II
COMPLIANT



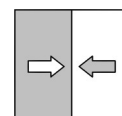
Operating manual

DE39 ... R/S

Digital differential pressure transmitter
with colour-change LCD

for explosive areas
Dust explosion protection zone 22, dry dusts
Gas explosion protection zone 2, gases and vapours

09005356 • BA_EN_DE39_LCD_ATEX • Rev. ST4-C • 11/19



Masthead

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Version history

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1 Safety guidelines

1.1 General

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).

- a) 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).

- a) 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).

- a) Avoid danger by observing the valid safety regulations.



NOTICE

Note / advice

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

2 Product and functional description

2.1 Delivery scope

- Differential pressure transmitter DE39
- User Manual

2.2 Intended use

The devices of the series DE39 can be used as display and switching device for measuring differential pressure of gaseous and fluid media. Its sturdy design also allows heavily contaminated media to be used. Always check the medium compatibility [▶ 31].

2.2.1 Explosion hazard area classification

Dust explosion protection

Devices with the order code DE39 ## V0 ### KWDL # S##### are suitable as 'Electrical equipment for use in areas with combustible dust', Zone 22 - dry dusts.

Designation as per guideline 2014/34/EU:

⊕ II 3D Ex tc IIIB T125°C Dc
-10 °C ≤ T_{amb} ≤ 60 °C



WARNING

Static electricity

The case must be equipped with an earth connection on the side to reduce the surface resistance.

Gas explosion protection

Devices with the order code DE39 ## V0 ### KWDM # R##### are suitable as 'Electrical equipment for use in potentially explosive areas, Zone 2 - Gases and vapours.

Designation as per guideline 2014/34/EU:

⊕ II 3G Ex nA IIC T4 Gc
-10 °C ≤ T_{amb} ≤ 60 °C

2.3 Function diagram

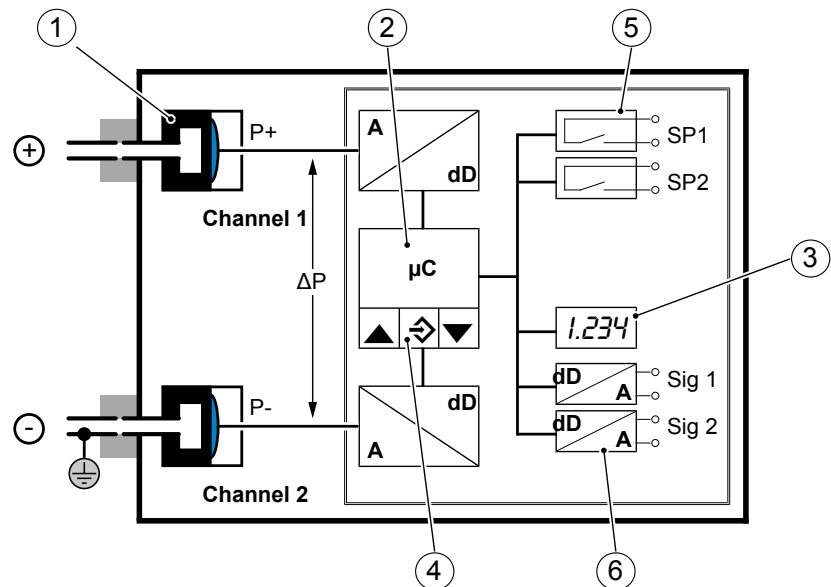


Fig. 1: Function diagram

1	Ceramic sensor element	2	Micro-controller
3	Advertisement	4	Keyboard
5	Switching outputs	6	Analogue outputs

2.4 Design and mode of operation

The pressure is measured by two integrated ceramic sensor elements whose measuring signals P+ and P- are analysed by a digital measuring transducer. The analysis allows two independent switch points to be set and makes two programmable output signals available. The measurements can be shown together, separately or alternately. The nominal pressures of the integrated sensors and the differential pressure measuring range are set permanently ex-works and stated on the type plate.

The unit works in two operating modes:

(a) Differential pressure measurement

The first output signal (Sig 1) is proportional to the differential pressure (ΔP) and can be influenced by means of rooting or a table. The second output signal (Sig 2) is proportional to the pressure and can be assigned optionally to the signal P+ or P-.

(b) 2-channel relative pressure measurement

The output signals are proportional to the pressure, in which the output (Sig1) is permanently assigned to the pressure (P+) and the output (Sig2) is permanently assigned to the pressure (P-). Both output signals can be rooted or influenced by means of a table.

2.5 Equipment versions

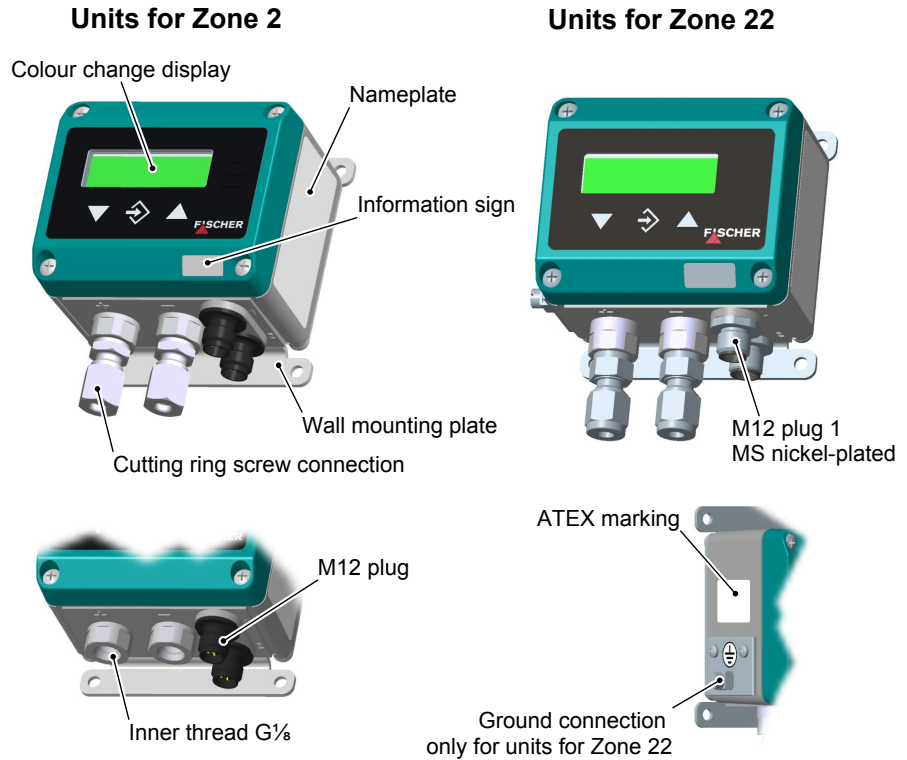


Fig. 2: Equipment versions

Nameplate

This type plate serves as an example of the information that is stated. The data shown is purely fictive, but does correspond to the actual conditions. For more information, please see the order code at the end of these instructions.

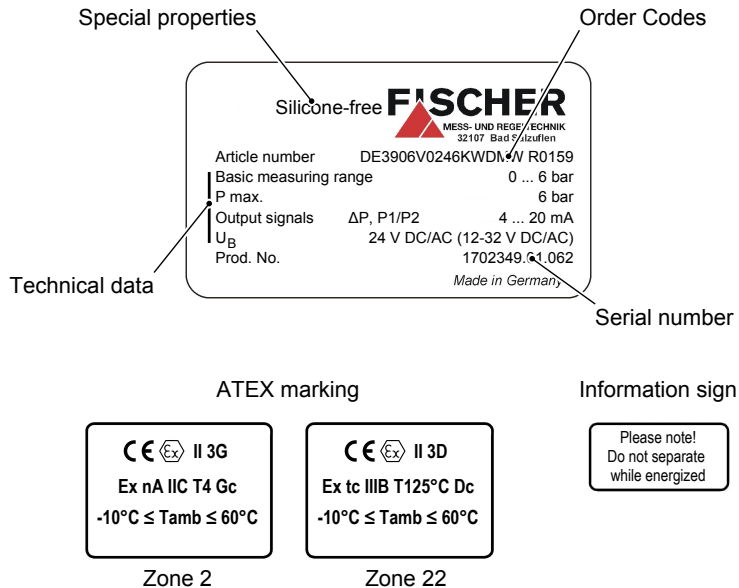


Fig. 3: Nameplate

3 Assembly

3.1 General

The device is designed for installation onto flat assembly plates. For screw connection to the assembly plate, the device features four assembly bores on its back, which can be used for \varnothing 3.5 mm tapping screws.

Optionally, the device can be delivered with a wall-mounting plate. This is also available as accessory.

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.



⚠ WARNING

Falling objects

The operator must ensure that any falling objects cannot collide with the installed unit. Steps must be taken to prevent

- ⇒ sparks being generated on impact.
- ⇒ the protection class of the casing is no longer guaranteed.
 - a) This can be avoided by attaching protective cover,
 - b) a protective casing or
 - c) a similar element.

3.2 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 process connection may only be realised by authorised and qualified specialists that have undergone additional training or briefings or have a permit to work on explosion-protected units in potentially explosive systems.

Risks emanating from pressure on the instrument should be prevented by means of suitable action.



⚠ WARNING

Earth connection via the system earth

During assembly, ensure that the earth connection between the unit and the system earth is ensured. The connection to the system earth is realised via the process connection.

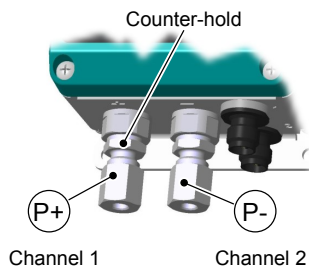


Fig. 4: Process connection

The pressure lines must be installed at an inclination so that when fluids are measured no air pockets are created or when measuring gases, no water pockets are created. If the required inclination is not reached, water or air filters must be installed at suitable places.

If water is used as a measuring medium, the unit must be protected against frost.

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

Pulsating pressure on the system side can lead to wear and functional problems. To safeguard this, we recommend installing absorption elements in the pressure line.

If the pressure sensing lines are already pressurised at the time of commissioning, zero-point control and adjustment cannot be performed. In such cases, the device should be only connected to the mains without the pressure sensing lines.

The pressure connections are marked with (+) and (-) symbols on the device. When the differential pressure is measured, the higher pressure is connected to the (+) side and the lower pressure to the (-) side. In the 2-channel operating mode, the (+) connection is channel 1 and the (-) connection is channel 2.



NOTICE

When mounting and dismantling pressurised lines, ensure that the screw socket does not also turn.

If screw sockets also turn, this can lead to leaks on the unit. To prevent this, a wrench is used to hold the hex of the screw socket tight.

3.3 Electrical connection

The electrical connection may only be realised by authorised and qualified specialists that have undergone additional training or briefings or have a permit to work on explosion-protected units in potentially explosive systems.

Risks emanating from electrical current or voltage should be prevented by means of suitable action.

- 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.
- Do not connect the connector if strained.
- A CE-conform mains adapter with a slow 200 mA fuse only may be used in the power supply circuit.



Fig. 5: Ground connection

The nominal supply voltage and the permissible range can be found in the technical data.

The admissible load / resistance is stated in the technical data.



WARNING

Static electricity

The case must be equipped with an earth connection on the side to reduce the surface resistance.

Only devices for operation in potentially explosive areas with combustible, Zone 22 – Dry dusts have an earth connection on the left-hand side.

The housing is made of a non-conductive plastic. To reduce its surface resistance, a metal layer has been applied in an evaporation process. To discharge any static charging (e.g. caused by wiping), the housing must be earthed.

The ground terminal is suitable for connecting fine-wire conductors up to 4 mm² or single-wire conductors up to 6 mm².

3-wire connection

The device is connected as follows in a 3-wire switch:

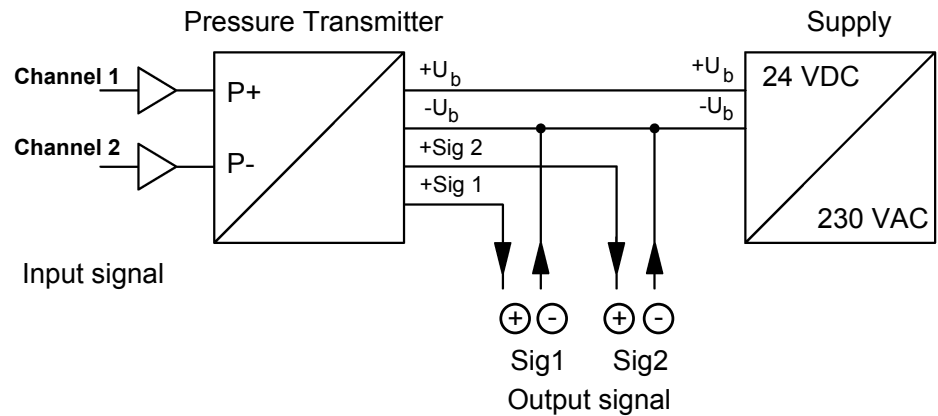


Fig. 6: 3L connection

Connector 1: Supply and output signal

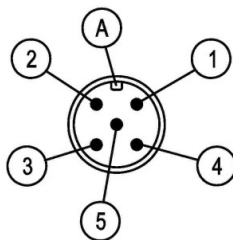


Fig. 7: M12 connector 5-pin

Position	Description	Cable colour
1	+U _b Supply (+)	brown
2	+Sig2 Output signal 2	white
3	-U _b Supply (-)	blue
4	+Sig1 Output signal 1	black
5	n.c.	
A	Coding	

Connector 2: Switching outputs

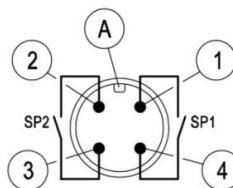


Fig. 8: M12 connector 4-pin

Position	Description	Cable colour
1	SP1 Switching output 1	brown
2	SP2 Switching output 2	white
3	SP2 Switching output 2	blue
4	SP1 Switching output 1	black

4 Commissioning

4.1 General

All electrical supply, operating and measuring lines, and the pressure connections must have been correctly installed before commissioning. All supply lines are arranged so that there are no mechanical forces acting on the device.

Check that the pressure connections do not leak before commissioning.

4.2 LC display

In normal mode, the current measured value of an input channel is shown on a 4-digit LC display. To show very large values, it is possible to switch to a 5 or 6-digit presentation (see Parameter MB decimal place).

In the one-line presentation of the measured value, the display can be 'switched' to the respective other channel using the arrow ▲. As soon as the key is released, the originally display channel is shown again.

The unit is shown to the right of the measured value. If the device is equipped with contacts, a closed contact is always symbolised by an inverted text "**SP1**" or "**SP2**". One exception is the 1-channel bar chart diagram. Here, the switching points are symbolised with simple numbers "**12**".

Various colours can be selected for the back lighting. Depending on the measured value, the colour of the back lighting can be automatically changed. This can be used e.g. to depict good/poor differences. The back lighting can also be deactivated.

The measured value can also be shown in a bar chart. The measured value is also shown in smaller pictures as a number.

During the programming, the menu items and the associated parameters are shown on the display. The device continues to function whilst the parameters are being set; apart from one exception, the changes come into effect instantly. The exception here is a change of switching times - here the previously valid time must have run down.

(a) Operating mode differential pressure:

In this operating mode, the first channel is assigned to the differential pressure measurement. The second channel of the pressure measurement P+. According to this assignment, the measured values are shown (see Fig.). There is also an option for displaying all values, however it is then not possible to show a bar chart.

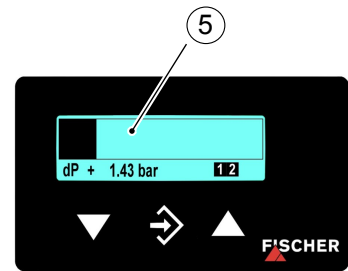
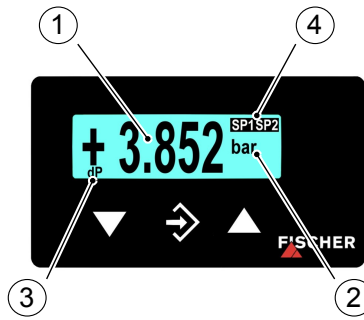
(b) Operating mode 2-channel

In this operating mode, the first channel is assigned to the differential pressure (P+). The second channel of the pressure measurement (P-). According to this assignment, the measured values and the channel numbers (ch1) and (ch2) are shown.

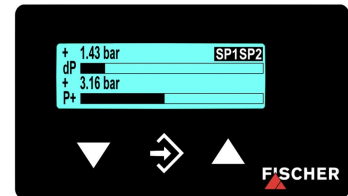
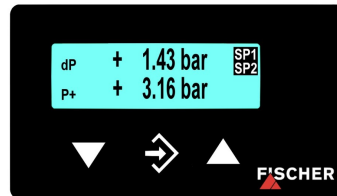
SP1SP2

Fig. 9: LC display 2SP

1 input channel

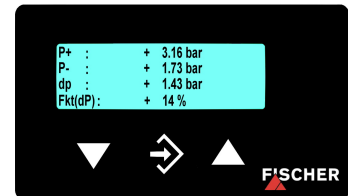
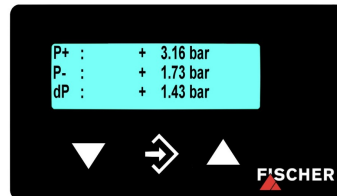


2 input channels



All values

(only differential pressure)



Function: linear

Function: square root / table

Fig. 10: LC display

1	Measured value	2	Unit
3	Input signal assignment	4	Status display of the switch points
5	Bar chart		

4.3 Keyboard

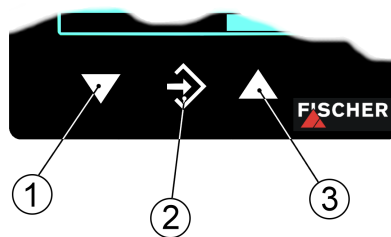


Fig. 11: Operating keys [LC display]

1	Page down menu	Reduce value
2	Call up menu	Save value
3	Page up menu	Increase value

The individual menu items and parameters can be displayed using the buttons ▲ and ▼. The respective menu item is selected or the parameters for making changes are called up via the button ⇄.

If a parameter can be changed, the display flashes. The change is made via the buttons ▲ and ▼. The value is saved with the button ⇄.

To leave a menu level or the entire menu, select the parameter "Menu level Quit" and press ⇄.

Example:

Switch-on point set switchpoint 1

In normal mode, press the button ↵ to enter the menu. The **menu level Switch points** appears. Press the enter key ↵ again to call up the display parameter.

The first parameter **SP 1 On** is displayed. To change this parameter, press the button ↵ again.

The device jumps to the input:

- The parameter is stated in the 1st line.
- The value that is to be changed is shown in the 2nd line, the display flashes.
- The input limits are displayed in the 3rd line (if there is one).

The required value is set with the buttons ▲ and ▼ and then confirmed with ↵

4.4 Menu levels

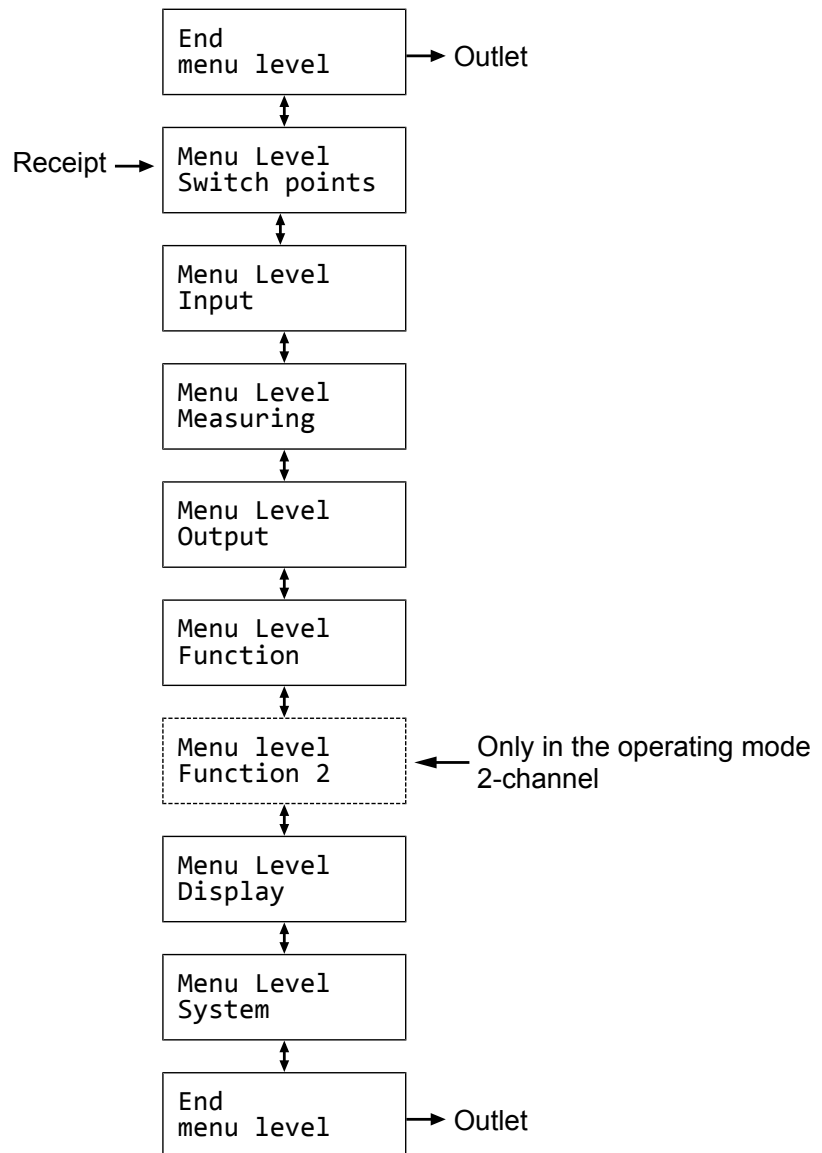


Fig. 12: Menu levels

4.4.1 Menu Level Switch points (2SP)

NOTICE! This menu only appears on models with two switching outputs.

Parameter name	Description	Value range
SP1 On	Switch point 1 On	MBA-50% ... MBE+50%
SP1 Off	Switching point 1 off	MBA-50% ... MBE+50%
SP1 Delay	Switching point 1 delay	0...1800 s
SP1 Function	Switching point 1 function	NO, NC
Assignment SP	Channel assignment	Channel 1, 2 and 1+2
SP2 On	Switch point 2 On	MBA-50% ... MBE+50%
SP2 Off	Switching point 2 off	MBA-50% ... MBE+50%
SP2 Delay	Switching point 2 delay	0...1800 s
SP2 Function	Switching point 2 function	NO, NC

The two switching outputs are configured by four parameters respectively. For the switch point 1 these are

- **SP1 On**
- **SP1 Off**
- **SP1 Delay**
- **SP1 Function**

Accordingly for switch point 2:

- **SP2 On**
- **SP2 Off**
- **SP2 Delay**
- **SP2 Function**

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

SP1 On defines the activation point, **SP1 Off** the deactivation point of switching 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.

The value range ranges from MBA – 50% to MBE + 50%. MBA stands for start of measuring range and MBE for the end of the measuring range.

Example:

Measuring range = 0 ... 100 %

The value range for this measuring range is -50 % ... +150 %.

Function of the switch points

Together, the two parameters **SP1 On** and **SP1 Off** determine the switch function of switching output 1:

- If **SP1 On** > **SP1 Off**, the output switches on, if the measured value exceeds SP1 On. It is only switched off again if the measured value SP1 Off is undercut (hysteresis function).
- If **SP1 On** = **SP1 Off**, the output switches on if the measured value exceeds SP1 On and off if the measured value undercuts the same value (SP1 Off).
- If **SP1 On** < **SP1 Off**, the output switches on, if the measured value lies within these switch points: i.e:
SP1 On < Measured value < **SP1 Off** (window function).

SP1 Delay allows the reaction of the switching output to be delayed by between 0 and 1800 s. This parameter applies equally for switching on and off.

SP1 Function changes the function of the switching output 1. It is possible here to define whether the contact should work as a open contact (NO) or a break contact (NC).

Assignment SP is used to define the input to which the contacts are assigned. The following options are available:

- Channel 1
Both contacts are assigned to channel 1.
- Channel 1, channel 2
A contact is assigned to every channel.
Channel 1: SP1
Channel 2: SP2
- Channel 2
Both contacts are assigned to channel 2.

The unit and the input range are adapted accordingly when entering the switch points.

4.4.2 Menu Level Input

Operating mode	Channel 1	Channel 2
Differential pressure	Differential pressure (dP)	Pressure (P+)
2-channel	Pressure (P+)	Pressure (P-)

Channel 1:

Parameter name	Description	Value range
Absorption	Damping	0...100 s
Offset corr.	Offset correction	1/3 basic measuring range
Zero-pt. wind.	Zero-point window	1/3 basic measuring range

Channel 2:

Parameter name	Description	Value range
Absorption 2	Damping	0...100 s
Offset corr. 2	Offset correction	1/3 basic measuring range
Zero-pt. wind.2	Zero-point window	1/3 basic measuring range

The parameters for both channels are set in the same way. The following explains the parameters for the first channel as an example for both channels.

If there are unsteady measurement readings during operation, you can use the parameters **Absorption** and **Zero-pt. wind.** to stabilize the reading (and the output signal).

The parameter **Absorption** functions like a capillary throttle. However, it only acts on the display, output signal and switch points (if these exist) but not on the measuring cell itself.

You can set the response time to measuring value jumps in the range 0.0 to 100 s.



NOTICE

Response time

At maximum damping, it can take over 2 minutes until after a measurement jump from 100% to 0% is also shown as zero in the display.

In many cases, unsteady readings are not a problem during normal operating mode, but this is not true for the idle state, i.e. if a measured value of zero is expected. The parameter **Zero-pt. wind.** is designed to solve this. Its value defines a range around zero at which the measured value is set to zero (see fig.).

The display only stops showing zero when the measurement leaves the set window. When reaching double the value, the measured value and the reading match again. This avoids jumps in the display.

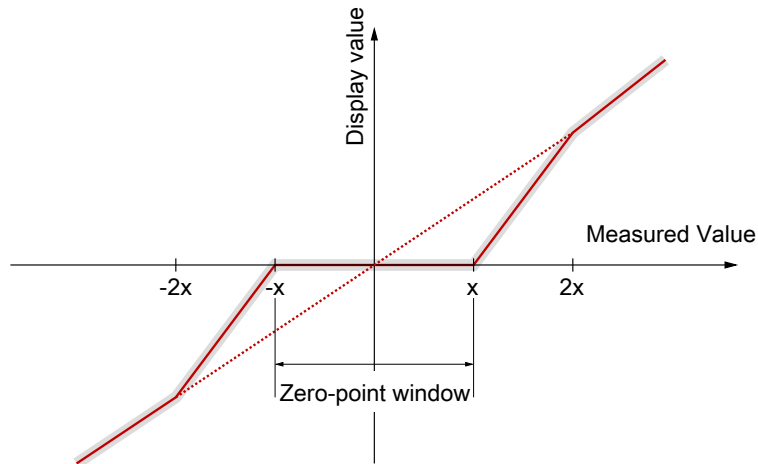


Fig. 13: Zero-point window

It may be necessary to set the offset to correct the impact of the installation position.

Select the **Offset corr.** parameter and correct the reading using the buttons ▲ or ▼ until zero is shown in the display.

When setting the offset, the current measured value is displayed. The zero-point window is not active during the offset setting.

4.4.3 Menu Level Measurement

Depending on the selected operating mode, the 'Measuring' menu is shown differently.

Differential pressure:

Parameter name	Description	Value range
MB start	Measuring range start	Basic measuring range
MB end	Measuring range end	Basic measuring range
Unit	Measuring range unit	
Limit	Measuring range limit	yes, no
Mode	Operating mode	Differential pressure 2-channel

2-channel:

Parameter name	Description	Value range
MB start	Measuring range start channel1	Basic measuring range
MB end	Measuring range end channel1	Basic measuring range
Unit	Measuring range unit channel1	
Limit	Measuring range limit channel1+2	yes, no
Mode	Operating mode	Differential pressure 2-channel
MB start 2	Measuring range start channel2	Basic measuring range
MB end 2	Measuring range end channel2	Basic measuring range
Unit 2	Measuring range unit channel2	

The output signals of the transmitter primarily depend on the measured input variables (channel 1 or channel 2). However, you have the option of adjusting the output signals to a large extent to suit your requirements.

The operating mode parameter can be used to switch between the differential pressure measuring and two-channel relative pressure measuring.



NOTICE

Change of the operating mode

After changing the operating type, some values (unit, spread, table function) are reset to the default values.

These values need to be checked by the user and corrected if necessary, or define the operating mode at the beginning of the configuration process.

The measuring range of channel 1 is configured by three parameters. In the 2nd channel operating mode, channel 2 is configured analogue to the first channel. The settings are more or less identical for both channels and are explained in the following using channel 1 as an example.



NOTICE

Adjustment of the output signal

The basic measuring range (indicated on the type label) and the type of output signal (voltage / current) are not variable.

The parameters **MB start** and **MB end** initially define the two measurements between which the output signal will change at all. Both values are adjustable across the entire basic measuring range. The set values also refer to the measurement in the respective unit. However, the signal values (current / voltage) for Start of measuring range and End of measuring range are fixed.

If **MB start** is smaller than **MB end**, this is called an increasing characteristic curve; the output signal increases as the measurement increases.

If **MB end** is smaller than **MB start**, this is a decreasing characteristic curve and the output signal decreases as the measurement increases.

The difference between the values **MB start** and **MB end** must be at least 10 % of the basic measuring range.

You can select a unit other than the unit of the basic measuring range with the parameter **Unit**. The user should remember however that not every unit is suitable. The conversion is automatic.

The parameter **Limit** allows the display, output and switching points to be limited to the range between Start of measuring range and End of measuring range. If Limit is set to "no", those measured values that are greater or smaller than the end values are shown. In the 2-channel operating mode, the limitation impacted on both channels.

4.4.4 Menu Level Output

The type of output signal (0/4...20 mA, 0...10V) must be stated on the order and cannot be changed.

(a) Operating mode differential pressure:

There are two output signals available. Output 1 (Sig1) is permanently assigned to the differential pressure signal (dP). An assignment can be defined for output 2 (Sig2) using the parameter **Assignment out 2**. This parameter only appears in this operating mode,

(b) Operating mode 2-channel

There are two output signals available. Output 1 (Sig1) is permanently assigned to the pressure at input (P+) and output 2 (Sig2) is permanently assigned to the pressure at input (P-).

Output 1 (Sig1)

Parameter name	Description	Value range
min. output	min. output 1	
max. output	max. output 1	0.0 ... 21.0 mA or 0.0 ... 11.0 V
Error signal	Error signal 1	

Output 2 (Sig2)

Parameter name	Description	Value range
min. output 2	min. output 2	
max. output 2	max. output 2	0.0 ... 21.0 mA or 0.0 ... 11.0 V
Error signal 2	Error signal 2	

Only operating mode differential pressure:

Parameter name	Description	Value range
Assignment Out 2	Assignment output 2	dP, P+, P-, function

The parameter **Assignment out 2** can define which signal is to be issued on the 2nd analogue output. In the case of the latter 'Function' assignment, the settings in the function menu for the 2nd analogue output are used.

Both outputs are configured in the same way, which is why this is only explained for the first output.

The parameters **min. output**, **max. output** and **error signal** define the limits of the output signal that may not be undercut or exceeded regardless of the measured variable. The limit values take priority over the range defined by the **MB start** and **MB end** parameters! These parameters primarily serve to prevent error messages in downstream systems caused by brief overstepping of measuring ranges.

The parameter **Min. output** is usually only used for devices with an output signal 4...20 mA because frequently values of below 3.8 mA are evaluated as error signals.

The **Max. output** value can be used for the voltage and current to limit the maximum value.

The value defined via the parameter **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.

4.4.5 Menu Level Function

The Function menu level is a variable menu whose appearance depends on the value of the Function parameter. There are linear, square rooted and table functions



NOTICE

Operating mode

In the differential pressure operating mode, only the Function menu level appears whilst in the 2-channel operating mode a further Function 2 menu level appears.

Linear function

The input signal is linear before being sent to the display and the output. The range defined in the menu "Measuring" serves as the measuring range. If the function LINEAR is active, the other menu items are cancelled.

Parameter name	Description	Value range
Function	Function	Value = linear

Square rooted function

Here, the input signal is square rooted before being sent to the display and the output. A free unit can be defined for the display. To do this, the start and end of the display range and the number of decimal points are defined. It is also possible to define the unit with 4 characters.

Parameter name	Description	Value range
Function	Function	Value = square rooted
MB decimal pl.	Measuring range decimal places	1234, 123.4, 12.34, 1,234, 12345, 123456
MB start	Measuring range start	-9999 ... +9999
MB end	Measuring range end	-9999 ... +9999
MB unit	Measuring range unit	4 characters

The following section contains descriptions of the parameters **MB decimal pl.**, **MB start**, **MB end** and **MB unit** to describe the table function.

Tables function

This function allows free adjustment of the input variable to the display and output via a table with up to 30 support points. A value pair comprising a measured value and display value is issued for every support point.



NOTICE

Change of parameter

When switching from TABLE to another function, the table is initialised again and the existing values are lost.

Parameter name	Description	Value range
Function	Function	Value = Table
MB decimal pl.	Measuring range decimal places	1234, 123.4, 12.34, 1,234, 12345, 123456
MB start	Measuring range start	-9999 ... +9999
MB end	Measuring range end	-9999 ... +9999
MB unit	Measuring range unit	4 characters
No. of pairs	Number of pairs	n = 3...30
Value pair1	Value pair 1	MB-start ... MB-end
Value pair2	Value pair 2	
Value pair3	Value pair 3	
	...	
Value pair30	Value pair 30	

The display range is defined with the parameters **MB decimal pl.**, **MB start** and **MB end**. The user can select the configuration freely.

Using the parameter **MB decimal pl.**, it is possible to select between a 5 or 6-digit presentation. The resolution is not increased. Only an extra zero or two zeros are added. This serves the correct display of larger values. The measuring range must be positive for the 6 digit presentation.

The **MB unit** gives the user the option of defining a completely independent unit. Letters, numbers or special characters can be used. The unit can be max. 4 characters long.

If the function TABLE is selected, then it is also necessary to state the **No. of pairs**. It is defined here how many pairs of values (support points) are used in the table. A table is made up of at least 3, max. 30 support points.



NOTICE

Number of value pairs

If the number of value pairs is changed, the table is initialised again and the existing values are deleted.

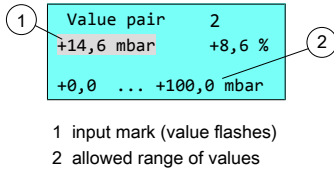


Fig. 14: Value pair

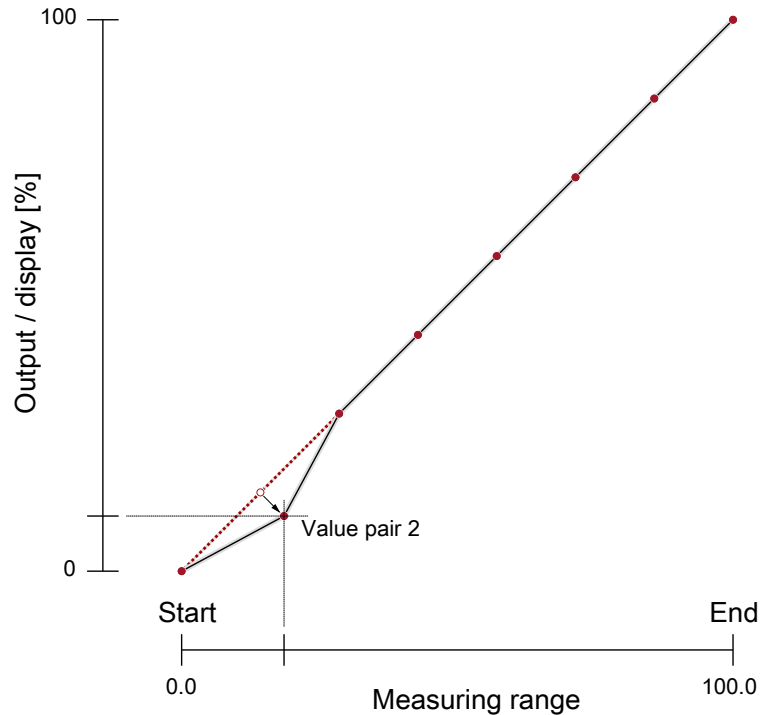


Fig. 15: Table function (example)

The individual value pairs can be seen and changed with the **Value pair1** to **Value pair30** parameters. A value pair comprises a measured value (left side) and a display value (right side). The measured value must lie within the measuring range and the display value must lie within the defined "free unit". The respective limits are shown during input. The table must contain either increasing or decreasing values. the table must contain either continuously increasing or continuously failing values. A change from an increasing to a decreasing characteristic curve within a support point table is not allowed.

4.4.6 Menu level function 2

This menu level only appears, if the 2-channel operating mode has been set. The parameters on this menu level are identical to the parameters on the function menu level. Therefore the parameters are not described again here.

4.4.7 Menu Level Display

The Display menu level is a variable menu whose appearance depends on the value of the colour parameter. In addition to the various colours for the background lighting, there are also two auto-functions with colour switching available.

Parameter name	Description	Value range
Assignm. switch.	Assignment of the colour switch	Channel 1, channel 2
Colour	Colour	Off, red, green, yellow, blue, pink, turquoise, white, Auto1: Red-green Auto2: Red-yellow-green
Lighting	Lighting time	0 s, 10 ... 600 s
Contrast	Contrast	15 ... 45
Bar chart	Bar chart display	yes, no
Channel select.	Channel selection	Channel 1, channel 2, both channels alternating 3s, 6s, 9s

The parameter **Assignm. switch.** is used to define an input channel to which the colour change refers.⁽¹⁾ The most important parameter however is **Colour**. A fixed colour can be defined for the background colour here. There are also two auto-functions with colour switching available. Alternatively, the background illumination can be permanently deactivated.

If permanent lighting is not required, the parameter **Lighting** can be used to define when the lighting should be switched off after the last time a button is pressed. In addition to permanent lighting (0 s), automatic shut-down after 10... 600 s is also possible. The set time is only valid if the parameter **Colour** is not set to "off".

Amongst other things, the legibility of the display depends on the temperature and the reading angle. To ensure optimised legibility, the display can be adjusted using the parameter **Contrast**. When the contrast is changed, it is possible that the display appears empty or almost completely black. In this case, the contrast must be turned up or down.

Via the parameter **Bar chart**, the display can be switched between a display where the measured value is either shown in large digits or the display shows small digits and an additional bar chart.

The **Channel select.** parameter offers the user the option of deciding which of the measured values need to be shown on the display. The following values can be entered for the parameter:

- Channel 1
- Channel 2
- Both channels
- alternating 3s, 6s or 9s

The time that a measurement is shown on the display can be set with the value 'alternating'. The channel is changed after this time.

⁽¹⁾ This parameter only appears if a colour change function has been selected.

Auto1: Colour-change red to green

If parameter **Colour** is set to Auto 1: red-green, the menu changes as follows:

Parameter name	Description	Value range
Assignm. switch.	Assignment switching	Channel 1, channel 2
Red-Gr. switch.	Red-green switching	MB-start - 50% ...
Gr-Red switch.	Green-red switching	MB-end + 50%
Hysteresis	Hysteresis	0.1 ... 10.0 %
Delay	Delay	0 ... 1800 s
Colour	Colour	Off, red, green, yellow, blue, pink, turquoise, white, Auto1: Red-green Auto2: Red-yellow-green
Lighting	Lighting time	0 s, 10 ... 600 s
Contrast	Kontrast (contrast)	15 ... 45
Bar chart	Barchart display	yes, no
Channel select.	Channel selection	Channel 1, channel 2

The parameter **Assignm. switch.** is used to define an input channel to which the colour change refers.

In the Auto 1 mode with the automatic colour switchover, the parameters **Red-Gr. switch.** or **Gr-Red switch.** serve to enter the required thresholds. The colour change F1 and F2 can be moved anywhere within the measuring range. The series of colour changes however cannot be altered.

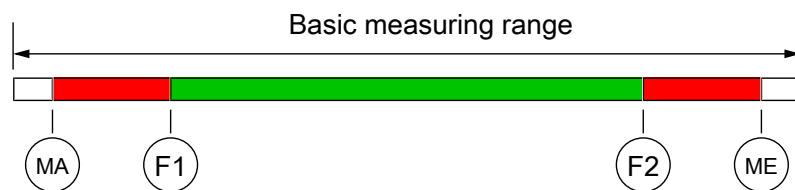


Fig. 16: Function Auto1

MA	MB-start	Measuring range start
F1	Red-Gr. switch.	Red-green switching
F2	Gr-Red switch.	Green-red switching
ME	MB-end	Measuring range end

The parameter **Hysteresis** can be used to prevent fast and unwanted colour changes. The hysteresis is set in the range 0.1... 10 %.



NOTICE

Overlapping colour areas

Note: In the case of large hysteresis values, steps must be taken to ensure that the ranges of the individual colours do not overlap. Otherwise it is possible that the colour change may not function in the desired way.

The parameter **Delay** offers a further option to prevent unwanted colour changes. The colour change here can be delayed between 0...1800 s.

The parameters **Lighting**, **Contrast**, **Bar chart** and **Channel select.** are explained in the previous section.

Auto2: Colour-change red-yellow-green

If the parameter Colour is set to Auto 2: red-yellow-green, the menu changes as follows:

Parameter name	Description	Value range
Assignm. switch.	Assignment switching	Channel 1, channel 2
Red-Yell.switch.	Red-yellow switchover	MB-start - 50% ... MB-end + 50%
Yell.-Gr.switch.	Yellow-green switchover	
Gr.-Yell. switch	Green-yellow switchover	
Yell.-Red switch	Yellow-red switchover	
Hysteresis	Hysteresis	0.1 ... 10.0 %
Delay	Delay	0 ... 1800 s
Colour	Colour	Off, red, green, yellow, blue, pink, turquoise, white, Auto1: Red-green Auto2: Red-yellow-green
Lighting	Lighting time	0 s, 10 ... 600 s
Contrast	Kontrast (contrast)	15 ... 45
Bar chart	Barchart display	yes, no
Channel select.	Channel selection	Channel 1, channel 2

In the Auto 2 mode with the automatic colour switchover, it is possible to enter the required switch thresholds via the parameters **Red-Yell.switch.**, **Yell.-Gr.switch.**, **Gr.-Yell. switch**, **Yell.-Red switch**. The colour change F1, F2, F3 and F4 can be moved anywhere within the measuring range. The series of colour changes however cannot be altered.

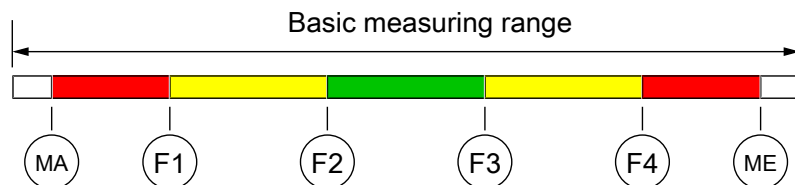


Fig. 17: Function Auto2

MA	MB-start	Measuring range start
F1	Red-Yell.switch.	Colour-change red to yellow
F2	Yell.-Gr.switch.	Colour-change yellow to green
F3	Gr.-Yell. switch	Colour-change green to yellow
F4	Yell.-Red switch	Colour-change yellow to red
ME	MB-end	Measuring range end



NOTICE

Unused range

If a range is not to be used, the associated switch thresholds (F1...F4) can be set to the same value.

Example

The parameter Colour is set to Auto2. Only the green, yellow and red ranges are required here. To fade out the lower ranges red and yellow, the switch thresholds "red-yellow switching" and "yellow-green switching" are set to the start of the measuring range.

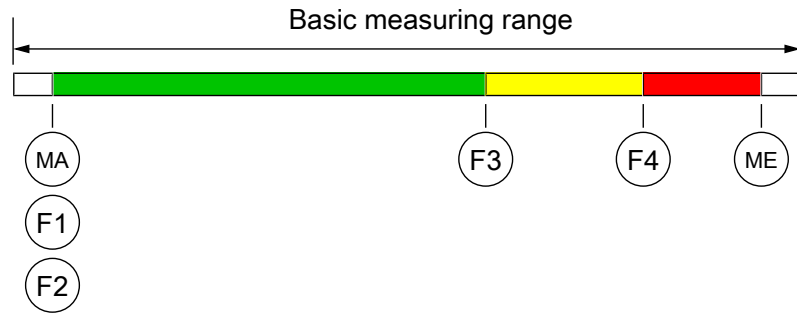


Fig. 18: Example Auto2

The parameters **Hysteresis**, **Delay**, **Lighting**, **Contrast**, **Bar chart** and **Channel select** are explained in the previous sections.

4.4.8 Menu Level System

Parameter name	Description	Value range
Language	Language change	DE, EN, FR, ES, IT,PT,HU
Software Info	Information about the software	Device type, serial number, firmware version
Config. Info	Information about the configuration	Basic measuring range, output signal, contacts
Statistics	Statistics	Operating time, switch cycles of the contacts
Password	Password	0/1...999
Load config.	Load configuration	
Save config.	Save configuration	

The user menu can be switched to German, English, French, Spanish, Italian, Portuguese or Hungarian using the parameter **Language**.

The menu items **Software Info** and **Config. Info** provide information about the device. This information helps to answer questions about the device quickly.

- The serial number and the firmware version is shown in **Software info**. If a 'designation' has been assigned, this is also issued. Please note that a 'designation' can only be entered with the PC software by remote configuration.
- The basic measuring range, the defined output signal and existing contacts are stated in the **Config. Info**.

The **Statistics** provide information about the operating time and the relay switching cycles from the time of delivery. The operating time is shown in days (d) and hours (h)

A **Password** can be used to protect the menu against unauthorised access. The password is a figure from 1 to 999. The input 0 means that no password is active.

The password needs to be set if the user presses the button in normal mode to enter the menu. If a wrong password is entered, the system automatically jumps back to normal mode again. If no password is active, the display immediately jumps to the menu.



NOTICE

Forgotten password

The user cannot restore a forgotten password. Please contact the manufacturer in this case.

The user can load a saved configuration via the menu item **Load config**. This means that a functional set of parameters can be loaded after trying out various settings.

The menu item **Save config** serves to save the existing parameters in a protected memory area. This is helpful if the settings of a functional device needs to be optimised. **Save config** and **Load config** can be used to quickly restore the initial status again.



NOTICE

Delivery condition

If the user has not yet saved a configuration, the default values (status on delivery) are loaded. In this case, any measuring range spreads or switch points are reset and the device needs to be newly configured.

5 Servicing

5.1 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.

5.2 Maintenance

To ensure reliable operation and a long service life, we recommend carrying out the following test on a regular basis:

- Check the reading.
- Checking the switch function in connection with the downstream components.
- Checking the differential pressure lines for leaks.
- Checking the electrical connections (terminal connection of the cable).

The precise test cycles and operating and ambient conditions need to be adjusted. If several components of the unit interact, all operating instructions of the other units also need to be observed.



WARNING

Dust deposits

The device must be cleaned with a damp cloth at regular intervals to prevent heat build-up. Cleaning intervals depend on the amount of local dust.

5.3 Transport

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

5.4 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.

5.5 accessories

- M12 connection cable
- Transmitter PC Interface

For precise information about this, please see the order code/accessories [▶ 34].

5.6 Disposal

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

6 Technical data

6.1 Input variables

Measuring variable

Differential and relative pressure

Measuring range

Measuring range		Stat. operating pressure max.	Overpressure	Bursting pressure
bar	MPa	bar	bar	bar
0...6	0...0.6	6	20	35
0...10	0...1.0	10	40	70
0...16	0...1.6	16	40	70
0...25	0...2.5	25	100	150
0...40	0...4.0	40	100	150

6.2 Output sizes

Analogue output signal

Connection type: Three-wire

Max. Spread: 10:1

Outlet	Signal range	Apparent ohmic resistance
0 ... 20 mA	0.0 ... 21.0 mA	$U_b \leq 26 \text{ V} : R_L \leq (U_b - 4 \text{ V})/0.02 \text{ A}$
4 ... 20 mA		$U_b > 26 \text{ V} : R_L \leq 1100 \ \Omega$
0 ... 10 V	0.0 ... 11.0 V	$R_L \geq 2 \text{ k}\Omega$

Switching outputs

2 potential-free semiconductor switches (MOSFET)

MOSFET	
Progr. switching function	One-pin activator (NO) One-pin deactivator (NC)
Max. switching voltage	3...32 V AC/DC
Max. switching current	0.25 A
Max. switching output	8 W / 8 VA $R_{ON} \leq 4 \ \Omega$

6.3 Measurement accuracy

Non-linearity	Max	0.5 % FS
	Typical	0.2 % FS
Hysteresis	Max	0.5 % FS
	Typical	0.2 % FS
Characteristic curve deviation ¹⁾	Max	1.0 %
Temperature drift	Zero point	0.07 % FS/K
	Measuring range	0.05 % FS/K

¹⁾ incl. non-linearity and hysteresis

6.4 Auxiliary energy

Rated Voltage	24 V AC/DC
Allowed operating voltage	12 ... 32 V AC/DC
Power input	approx. 2 W (VA)

A CE-compliant power supply unit with a 200 mA fuse only may be used as a power supply.

6.5 Operating conditions

Increase ambient temperature	-10 ... +60 °C
Media temperature	-10 ... +60 °C
Storage temperature	-20 ... +70 °C
Enclosure protection class	IP65 as per EN 60529
ATEX	EN 60079-0:2012 + A11:2013 EN 60079-15:2010 EN 60079-31:2014
EMC	EN 61326-1:2013 EN 61326-2-3:2013
RoHS	EN 50581:2012

6.6 Display and operating interface

Advertisement

4...6-digit LCD, full graphic, colour backlighting

Programming

Attenuation	0.0 ... 100.0 s (jump response time 10 / 90 %)
Switch output	Switch-off point, switch-on point, response time (0...1800s), function (NC / NO contact), channel assignment
Measuring range unit	bar, mbar, Pa, kPa, MPa, psi, InWc, mmWs, mmHg, 'free unit', starting value, end value and decimal point for 'free unit'
Output signal	User-definable within the basic measuring range ⁽¹⁾
Zero-point window	0... $\frac{1}{3}$ of the basic measuring range ⁽²⁾
Offset correction	$\pm\frac{1}{3}$ of the basic measuring range ⁽³⁾
Implementation of characteristic curve	linear, square rooted, table with 3...30 support points
Password	001 ... 999 (000 = no password protection)
Language (can be switched)	DE, EN, FR, ES, IT, PT, and HU

(1) Max. effective spread 10:1

(2) measured values around zero are set to zero.

(3) To compensate different installation positions.

6.7 Construction design

Process connection

Type	the material.	Size
Inner thread	1.4404	G $\frac{1}{8}$
Cutting ring screw connection	1.4571	6 mm tube
Cutting ring screw connection	1.4571	8 mm tube
Cutting ring screw connection	Nickel-plated brass	6 mm tube
Cutting ring screw connection	Nickel-plated brass	8 mm tube

Materials

Housing	Polyamide (PA) 6.6
Media-contacting material	CrNi steel 1.4404, FKM, Rubalit® 708 + Process connection (see above)

Assembly

Attachment boreholes on the rear side for attachment to mounting plates.
Wall mounting using wall mounting plate
Panel mounting set for installing the panel
Assembly of the mounting rails using an adapter

6.7.1 Dimensional drawings

Wall mounting

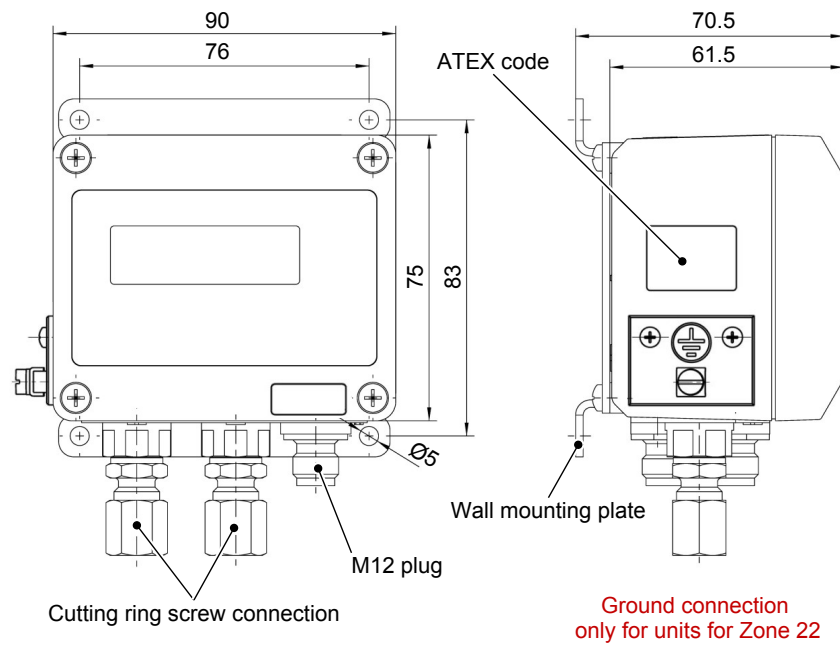


Fig. 19: Dimensional picture

Attachment boreholes on rear side

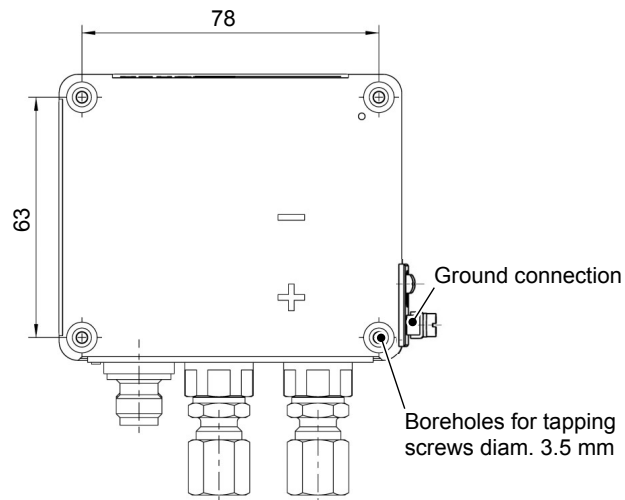
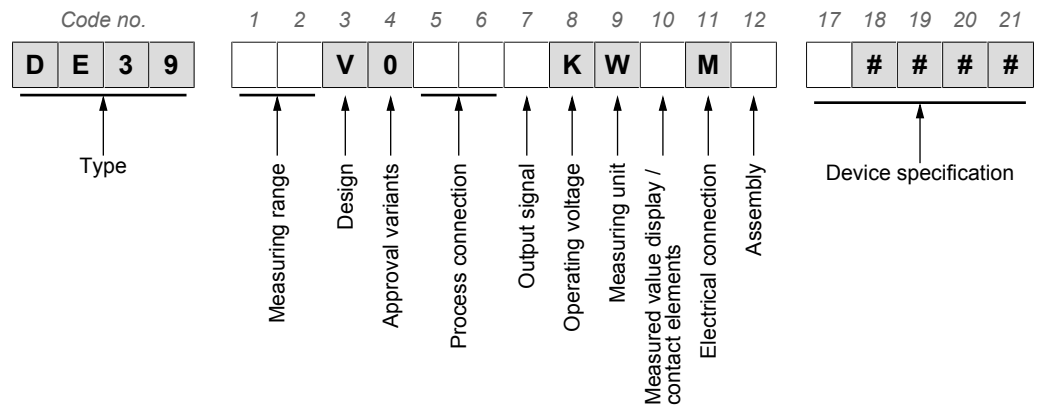


Fig. 20: Rear view of dimensional picture

7 Order Codes



Measuring range:

[1.2] (Code no.)	
06	0...6 bar
07	0...10 bar
08	0...16 bar
09	0...25 bar
10	0...40 bar

Design:

[3] (Code no.)	
R	CrNi Steel 1.4404

Approval variants:

[4] (Code no.)	
0	Default

Process connection:

[5.6] (Code no.)	
00	Inner thread G $\frac{1}{8}$
24	Cutting ring screw connection made of 1.4571 for 6 mm tube
25	Cutting ring screw connection made of 1.4571 for 8 mm tube
28	Cutting ring connection made of brass galvanised for 6 mm tube
29	Cutting ring connection made of brass galvanised for 8 mm tube

Output signal:

[7] (Code no.)	
0	without output signal
4	0 ... 20 mA
5	0 ... 10 V
6	4 ... 20 mA

Operating voltage:

[8] (Code no.)	
K	24 V AC/DC

Measuring unit:

[9]	(Code no.)
W	Selectable pressure units

Measured value display / contact elements:

[10]	(Code no.)
dD	4-digit colour change LCD 2 semiconductor switches

Electrical connection

[11]	(Code no.)
M	M12 plug connection Zone 2
L	M12 connector socket Ms-nickel-plated Zone 22

Assembly:

[12]	(Code no.)
0	Attachment boreholes on rear side (standard)
W	Wall mounting

Device specification:

[17]	(Code no.)
R	Gas explosion protection zone 2, gases and vapours
S	Dust explosion protection zone 22, dry dusts

[18...21]	(Code no.)
####	Ser. No.

7.1 Accessories

Order no.	Designation	No. of Poles	length
06401993	M12 Connection cable for switching outputs	4-pin	2m
06401994	M12 Connection cable for switching outputs	4-pin	5m
06401563	M12 Connection cable for switching outputs	4-pin	7m
06401572	M12 Connection cable for switching outputs	4-pin	10m
06401995	M12 Connection cable for supply/signal	5-pin	2m
06401996	M12 Connection cable for supply/signal	5-pin	5m
06401564	M12 Connection cable for supply/signal	5-pin	7m
06401573	M12 Connection cable for supply/signal	5-pin	10m

Remote configuration

Order no.	
EU05 0000	Transmitter PC interface incl. PC software without battery
EU05 0001	Transmitter PC interface incl. PC software With battery
EU03 F300	Transmitter PC interface incl. PC software

A data sheet is available on our website www.fischermesstechnik.de or on request.

8 Attachments



EU Declaration of Conformity

(Translation)

For the product described as follows

Product designation **Digital Differential Pressure Transmitter
with colour changing LCD**

Type designation **DE39 ... R/S**

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

- 2014/30/EU EMC Directive
- 2014/34/EU ATEX Directive
- 2011/65/EU RoHS Directive

The products were tested in compliance with the following standards.

- Electromagnetic compatibility (EMC)**
- EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements
- EN 61326-2-3:2013 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-3: Particular requirements - Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning

- Explosive atmospheres (ATEX)**
- EN 60079-0:2012 + A11:2013 Explosive atmospheres - Part 0: Equipment - General requirements
- EN 60079-15:2010 Explosive atmospheres - Part 15: Equipment protection by type of protection "n"
- EN 60079-31:2014 Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosure "t"

- RoHS**
- EN 50581:2012 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“.

The object of the declaration described above is in conformity with Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

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 Salzufflen, Germany
Tel. +49 5222 974 0

Documentation representative Mr. Torsten Malischewski
B.Sc.
Development department

The devices bear the following marking: **CE** **Ex** II 3D Ex tc IIIB T125°C Dc

CE **Ex** II 3G Ex nA IIC T4 Gc

**Bad Salzufflen,
06 June 2018** G. Gödde
General Manager



Fig. 21: CE_EN_DE39_LCD_ATEX

