

# Operating Manual

## DE46 | Digital differential pressure switch / transmitter with 4-digit colour change LCD

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## 1 Safety guidelines

### 1.1 General Information



This operating manual contains instructions fundamental to the installation, operation and maintenance of the instrument that must be observed unconditionally. It must be read by the assembler, operator and the specialized personnel in charge of the instrument before it is installed and put into operation. This operating manual must be kept in an easily accessible place at the installation site.

The subsequent sections on general safety instructions (1.2 - 1.7) as well as the following special instructions about assembly in particular, commissioning and maintenance (2 to 10) contain important safety instructions, the non-observance of which can endanger persons, animals and physical objects.

### 1.2 Personnel Qualification

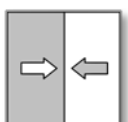
Staff assigned to assembly, operating, maintenance and inspection tasks shall be adequately qualified for this work and must be sufficiently instructed and trained to meet the requirements of assembly, operating, maintenance and inspection work.

### 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. Fischer Mess- und Regeltechnik GmbH 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 on 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 instrument must be eliminated. The particulars can be found in the respective regulations such as DIN, EN, accident prevention regulations (UVV) and - for industry-specific individual applications - also in the industry guidelines issued by the DVWG, Ex, GL, etc. as well as VDE and local EVUs.



## 1.5 Unauthorized Modification

Modifications of or other technical alterations to the instrument by the customer are not permitted. This also applies to replacement parts. Any modifications / alterations required must be carried out by Fischer Mess- und Regeltechnik GmbH only.

## 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.

## 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 Symbol explanation



### WARNING!

... indicates a potentially dangerous situation, non-observance of which could endanger persons, animals, the environment or objects.



### INFORMATION!

... highlights important information efficient and smooth operation.



### Tip!

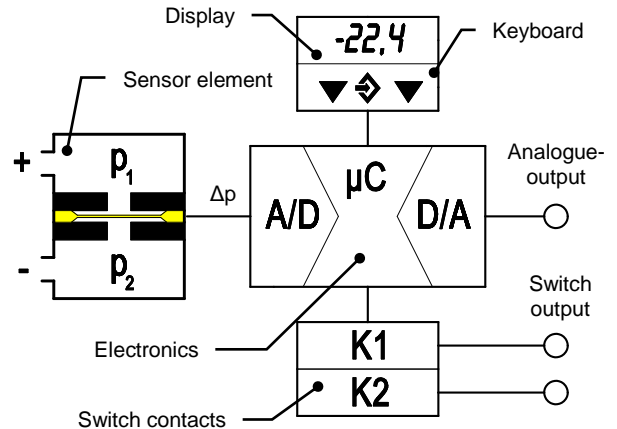
... indicates recommendations that are not specifically necessary in certain situations but which could be useful.

## 2 Application purpose

Display and switching device for differential pressure of gaseous media. The instrument is to be exclusively used for the applications agreed between the manufacturer and user.

## 3 Description of the Product

### 3.1 Function diagram



### 3.2 Design and mode of operation

This switching device is based on a capacitive sensor element that is suitable for measuring overpressure, underpressure and differential pressure.

The measured pressure acts on the sensor element with a micromechanically produced differential condenser in silicon-glass technology.

Changes in pressure generate changes in capacity, which is evaluated by the device's electronics and transformed into signals on the display, switch contacts and an output signal.

## 4 Installation and assembly

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

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

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.

## 4.1 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 instrument from pressure surges.
- Check the suitability of the instrument for the media to be measured.
- Maximum pressures must be observed.
- Do not blow into the pressure connections!

The pressure measuring lines must be installed on a gradient so that no air pockets e.g. for liquid measurements or water pockets e.g. for gas measurements can be created. If the required incline is not reached, water and/or air filters need to be installed at suitable points.

The pressure sensing lines need to be kept as short as possible and installed without sharp bends to avoid disruptive delay times.

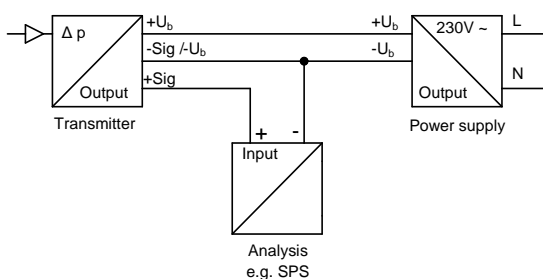
The pressure connections are marked with (+) and (-) symbols on the device. For differential pressure measurements, the higher pressure is connected to the (+) side and the lower pressure to the (-) side of the device.

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

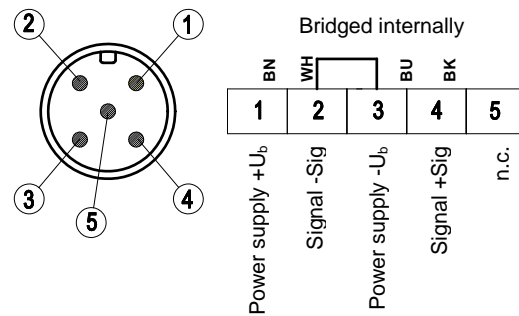
## 4.2 Electronic connection

- By authorized and qualified specialized personnel only.
- The electrical connection of the instrument shall be performed according to relevant VDE and local electricity board regulations.
- Disconnect the system from the mains before connecting the instrument.
- Add a fuse adapted to the energy requirements.

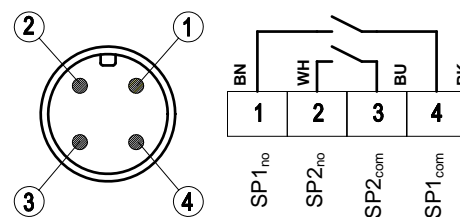
### 3-conductor circuit



## Connector 1: Power supply and output signal



## Connector 2: Switching outputs

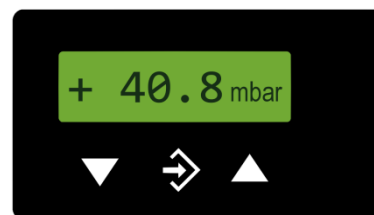


## 5 Commissioning

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 instrument.

Check the leak-tightness of the pressure connections.

### 5.1 Display



The 4-digit LCD display represents the current differential pressure in normal mode. The unit is shown on the right of the display. If the device is equipped with contacts, a closed contact is always symbolised by an inverted text "SP1" or "SP2".

The colour of the background lighting can change to indicate a good / poor measured value. Alternatively, a fixed colour can be defined for the background colour. The background lighting can also be switched off.

During the programming process, 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 is the change of switching times - in this case, the previously valid time must have run down first.

## 5.2 Configuration

For commissioning there is a multitude of setting options for optimum adaptation of the device to the measuring point and task at hand. To make the input easier, the individual parameters are summarised into groups in the menu.

Depending on the device model (power output / voltage output / contacts), some menu items may not be available.

## 5.3 Operation

It is operated via the buttons ▼ ◆ and ▲.

In normal mode, press the button ◆ to enter the menu. (After pressing the button ◆ it may be necessary to enter a password via the buttons ▲ and ▼ and to confirm this password with the button ◆.)

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 "Quit" and press ◆.

### Example: Setting the switch points

In normal mode, press the button ũ to enter the menu. **Menu level Switch points** appears in the display; to change the switch points press the ◆ button again and the parameter **Switch point 1 on** is shown.

Select other parameters with the buttons ▲ or ▼. If the parameter that is to be changed is displayed, press the button ◆ again.

The device jumps to the input:

- The parameter is stated in the first line.
- The value that is to be changed is shown in the second 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 ◆.

## 5.4 Menu

### Switch points

Switch point 1 On  
Switch point 1 Off  
Switch point 1 Delay  
Switch point 1 Function  
Switch point 2 On  
Switch point 2 Off  
Switch point 2 Delay  
Switch point 2 Function

### Input

Damping  
Offset correction  
Zero-point window

### Measurement

Start of measuring range  
End of measuring range  
Unit  
Limitation

### Output

min. output  
max. output  
error signal

### Function

Function  
free unit "Decimal places"  
free unit "Start of measuring range"  
free unit "End of measuring range"  
free unit "Unit"  
Table: Number of value pairs  
Table: Value pair 1  
...  
Table: Value pair n

### Display

Colour Auto1:  
red-green switchover  
green-red switchover  
Colour Auto2:  
red-yellow switchover  
yellow-green switchover  
green-yellow switchover  
yellow-red switchover  
Hysteresis (for colour change)  
Delay (for colour change)  
Colour  
Illumination time  
Contrast  
Bargraph

## System

- Software-Info
- Config.-Info
- Statistics
- Password
- Config. load
- Config. save

### 5.5 Menu level Switch points

The two switch outputs are configured by four parameters respectively.

For switch point 1 these are: **SP1 On, SP1 Off, SP1 Delay, SP1 Function.**

For switch point 2 accordingly: **SP2 On, SP2 Off, SP2 Delay, SP2 Function.**

**SP1 On** specifies the activation point, **SP1 Off** the deactivation point of switch output 1. The values are displayed and set in the valid unit.

Together, the two parameters determine the switch function of switch output 1:

If **SP1 Off < SP1 On**, 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 **SP1 Off**.

If **SP1 Off > SP1 On**, the output switches on, if **SP1 On < Measured value < SP1 Off** applies (window function).

Both parameters can be set independently over the entire range.

**SP1 Delay** allows the reaction of the switch output 1 to be delayed by between 0 and 100 s. This value applies equally for switching on and off.



**The following applies for instruments with firmware 2.16 and later:**

The reaction of the switch output is delayed by 0...1800 s.

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

### 5.6 Menu level Input

If there are unsteady pressure readings during operation, you can use the parameters **Damping** and **Zero-point window** to stabilise the reading (and the output signal).

The effect of parameter **Damping** (on the reading, output signal and switching points, if available, but not on the measuring cell!) corresponds to that of a capillary throttle. You can set the response time to pressure jumps in the range 0.0 to 100 s. But with maximum damping, it will take more than 2 minutes for the reading to also reach zero after a pressure jump from nominal pressure (100 %) to zero!

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 zero (differential) pressure is expected. In such situations, the parameter **Zero-point window** can be applied. Its value defines a range of measurement values around zero, for which the measuring value is set to zero. The reading will not indicate zero any more, only if the pressure exceeds these limits. When reaching double the value, the measuring pressure and reading match again. This avoids jumps in the reading.

It makes sense to set the **Offset** (zero-point displacement) if, without differential pressure (remove measuring line), the display shows a value that is not zero. Before the offset correction, the zero-point window should be set to zero.

Select the **Offset correction** parameter and correct the reading using the buttons ▲ and ▼ until zero is shown.



**The following applies for instruments with firmware V2.15 and later:**

The currently measured value is shown when setting the offset. The zero point window is not active when the offset is being set.

### 5.7 Measurement

The transmitter output signal initially depends on the sensed pressure. However, you have the option of adjusting the output signal to a large extent to suit your requirements.

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

The parameters **Start of measuring range** and **End of measuring range** initially define the two pressures 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 pressure (in the respective unit). However, the signal values (current / voltage) for **Start of measuring range** and **End of measuring range** are fixed.

If **Start of measuring range** is smaller than **End of measuring range**, this is called an increasing characteristic curve; the output signal increases due to the increasing pressure. If **End of measuring range** is smaller than **Start of measuring range**, this is a decreasing characteristic curve and the output signal decreases due to decreasing pressure.

The difference between the values **Start of measuring range** and **End of measuring range** must be at least 25 % 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.

## 5.8 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 pressure. The limit values take priority over the range defined by the **Start of measuring range** and **End of measuring range**!

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** values 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.

## 5.9 Menu level Function

The reading and the output signal can be modified in the **Function** menu to meet the special requirements.

The following functions are available:

**LINEAR:** Linear implementation of the input on 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.

**Square rooted:** Here, the input signal is square rooted before being sent to the display and the output. This is necessary e.g. for flow measurements with differential pressure. A "free unit" can be defined for the display. To this end, the start and end of the display range and the number of decimal points is defined. It is also possible to define the unit with 4 characters.

**TABLE:** This function allows the input in the display and output to be freely adjusted via a table which has up to 30 support points. Pairs of values comprising the measured value and display value are issued for the support points.



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

The display range is defined with the parameters **Measuring range decimal points**, **Start of measuring range** and **End of measuring range**. The user can select the configuration freely.



The following applies for instruments with firmware V2.15 and later:

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

The parameter **Measuring range unit** gives the user the possibility of using a completely independent unit. Letters (large, small), digits and some special characters are available. The unit may be max. 4 characters long.

If the function TABLE is selected, the number of pairs needs to be stated. The number of value pairs (support points) that make up a table is defined here. At least 3, maximum 30 support points are allowed.



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

The individual value pairs can be viewed and changed using **Value pair 1** to **Value pair 30**(maximum). A value pair comprises a measured value (left side) and a display value (right side). The measured value must lie within the measuring range, the display value must lie within the freely defined "free unit". The respective limits are displayed during the input process. The table must contain the increasing values.

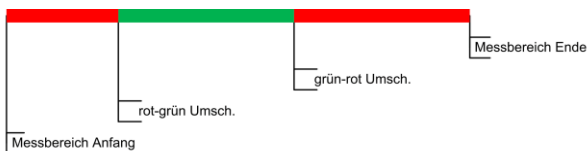
## 5.10 Display

The parameters for influencing the display are summarised in this menu.

The most important parameter is **Colour**. A fixed background colour (red, green, yellow, blue, pink, turquoise, white) can be selected here. There are also two auto-functions with colour switching available. One possible colour switch is red-green, the second colour switch is red-yellow-green. Alternatively, the background illumination can be permanently deactivated.

In the automatic colour switch mode it is possible to enter the required switching thresholds "red-yellow switching", "yellow-green switching", "green-yellow switching", "yellow-red switching" or "red-green switching" and "green-red switching".

The switching thresholds can be moved within the measuring range. The series of switch points cannot be altered.



**Note:** If a range cannot be used, the associated switch thresholds can be set to the same value. An example is shown in the sketch:

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.



Fast and unwanted changing of the colour can be prevented via the **Hysteresis** value. The hysteresis can be set between the range 0.1... Can be set 10 ...



**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. Here the colour change can be delayed in the range between 0...100s.



**The following applies for instruments with firmware 2.16 and later:**

Here the colour change can be delayed in the range between 0...1800s.

If the lighting should not shine constantly, the parameter **Lighting period** can be used to define when it should turn off after the last button is pressed. In addition to the permanent lighting, the automatic shutdown is possible after 10...600 s. The set time is only valid if the background 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, this 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.

The display can be switched via the parameter **Bargraph** yes/no: the measured value is either shown in large digits or the display shows small digits and an additional bargraph to display the measured value more clearly.

## 5.11 System

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

The **Software - Info** shows the device type, controller ID and the firmware version. The **Config - Info** states the basic measuring range, the defined output signal and the existing contacts.

The statistics provide information about the operating time and the relay operations since delivery. The operating time is shown in days (d) and hours (h)

In the **Password** menu, the menu can be protected against unauthorised access. The password is a number between 1 and 999. 0 means that no password is active.



**Caution:** The user is not able to delete a forgotten password!

A configuration saved by the user can be loaded via the menu item **Load config**. For instance, a functional set of parameters can be restored after configuration attempts.



**Note:** 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.

**Save config** is used to save the existing parameters in a protected part of the memory. This is helpful if the settings of a functional device are to be optimised. **Save config** and **Load config** can be used to restore the original status quickly.

## 6 Maintenance

The instrument is maintenance-free.

We recommend the following regular inspection to guarantee reliable operation and a long service life:

- Check the reading.
- 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 shall be adapted to the operating and ambient conditions. If various instrument components interact, the operating instructions of all the other instruments also need to be observed.

## 7 Transport

The instrument must not be exposed to mechanical shocks. It may only be transported in packaging specifically intended for transport.

## 8 Service

All damaged or faulty instruments must be sent directly to our repair department. Please coordinate all shipments with our sales department.



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 instruments must be cleaned thoroughly.

## 9 Accessories

- Connection cable with M12 connector
- Assembly set for wall mounting
- Adapter for parameterisation via PC software

## 10 Disposal

For the sake of the environment ....



Please help to protect our environment and dispose of or recycle used instruments as required by the applicable regulations.



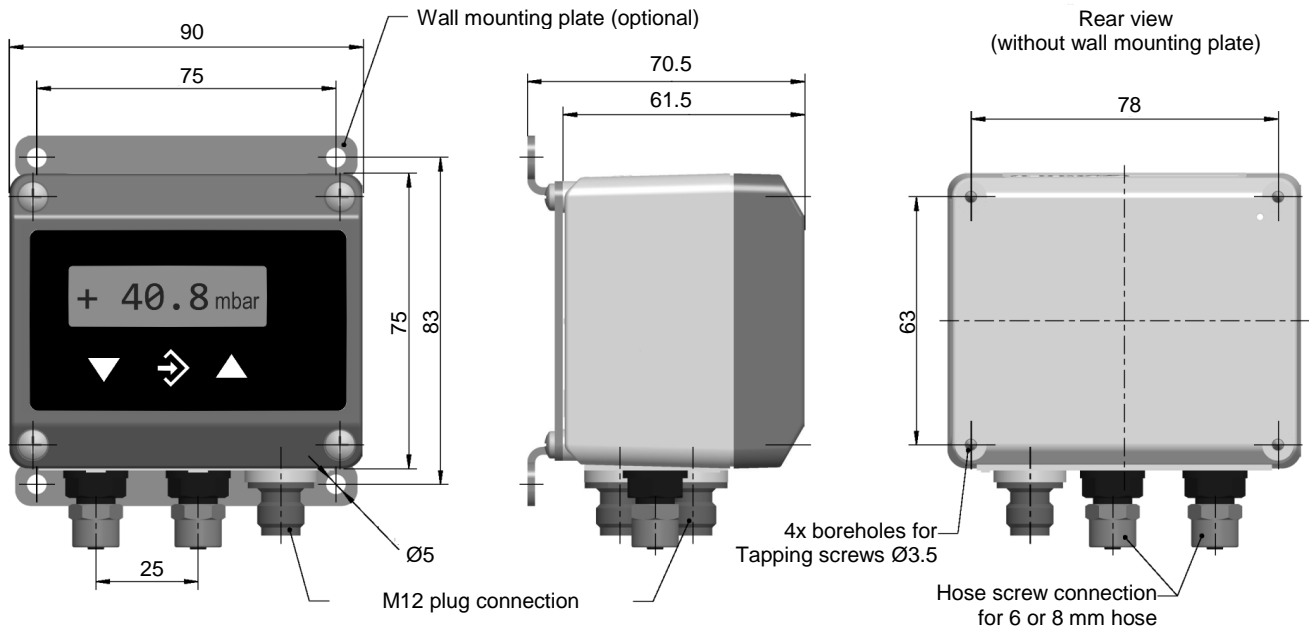
## 11 Technical data

Basic measuring range	Pa	0-25	0-50	0-100	0-250	0-500	0-1000	- 25...+ 25	- 50...+ 50	- 20...+ 80	- 100...+ 100
Max. stat. operating pressure	bar	1.0									
Bursting pressure	bar	1.7									
Max. deviation from the characteristic curve	%FS	1.0									
Reproducibility	%FS	0.1									
Max. TK spread and zero point °°	%FS/10K	0.6									

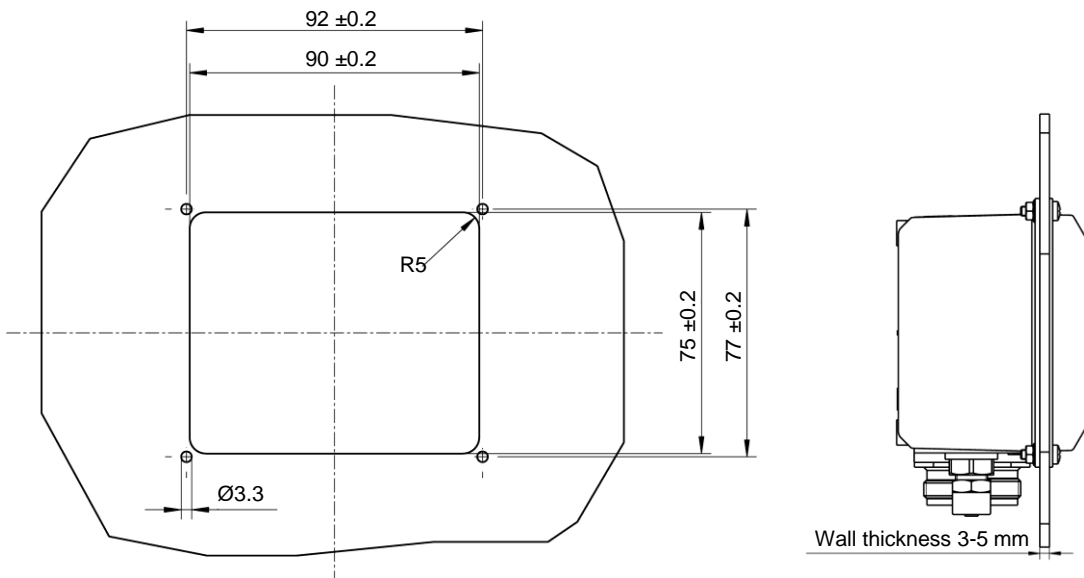
°: Characteristic curve deviation (non-linearity and hysteresis) at 25°C, basic measuring range (linear characteristic curve, not spread)  
 °°: with reference to the basic measuring range (not spread), Compensation range 4...50°C.

<b>General data</b>	
Admissible ambient temperature	-10 ... 70°C
Admissible media temperature	-10 ... 70°C
Admissible storage temperature	-20 ... 70°C
Enclosure protection class	IP 65 acc. to DIN EN 60529
<b>Electrical data</b>	
Rated Voltage	24 V DC/AC
Admissible operating voltage $U_b$	20 ... 32 V DC/AC
Connection type	Three-wire
Output signal	0 ... 20 mA 4 ... 20 mA
Apparent ohmic resistance	$U_b \leq 26V : R_L \leq (U_b - 4V)/0,02A$ $U_b > 26V : R_L \leq 1100\Omega$
Power consumption	approx. 2 W / VA
Measured Value Display	4-digit LCD, full graphic, colour backlighting
<b>Switch contacts</b>	
Progr. switching function	2 potential-free relay contacts Open contact (NO) / break contact (NC)
Switching voltage	max. 32 V DC/AC
Max. switching current	2A
max. switching output	64 W/VA
<b>Connections, materials, assembly</b>	
Electrical connections	Round plug connector M12 for supply and analogue output signal (5-pole, male) for switch contacts (4-pole, male)
Pressure Connections	Hose screw connections made of Al, 6/4 mm or 8/6 mm
Casing material	Polyamide PA 6.6
Media-contacting material	Silicon, PVC, aluminium, brass
Assembly	Wall mounting Panel mounting set Assembly of the mounting rails

**12 Dimensional drawings** (all dimensions in mm unless otherwise specified)



**Cutout for panel mounting**



## 13 Order Codes

### Digital differential pressure switch / transmitter, with 4-digit colour change LCD

Type DE46			0	0			N	W		M	
<b>Measuring range</b>											
0... 25 Pa.....	> D 1										
0... 50 Pa.....	> J 6										
0... 100 Pa.....	> D 4										
0... 250 Pa.....	> D 6										
0... 500 Pa.....	> J 7										
0... 1000 Pa.....	> D 9										
- 25.0... +25.0 Pa.....	> L 5										
- 50.0... +50.0 Pa.....	> L 2										
- 20.0... +80.0 Pa.....	> L 0										
-100.0.. +100.0 Pa.....	> L 7										
<b>Pressure connection</b>											
Aluminium screw connection for 6 / 4 mm hose.....	4 0										
Aluminium screw connection for 8 / 6 mm hose.....	4 1										
<b>Electrical output signal</b>											
without analogue electrical output signal .....	> 0										
0 – 20 mA 3-wire (STANDARD) .....	> A										
0 – 10 V DC 3-wire (STANDARD) .....	> C										
4 – 20 mA 3-wire (STANDARD) .....	> P										
<b>Operating voltage</b>											
24 V DC/AC (20 - 32 V DC/AC) .....	> N										
<b>Measuring unit</b>											
Selectable pressure units .....	> W										
<b>Measured value display / contact elements</b>											
4-digit colour change LCD - 2 relay contacts .....	> C										
4-digit colour change LCD - 2 semiconductor switch .....	> D										
<b>Electrical connection</b>											
M12 plug connection .....	> M										
<b>Assembly option</b>											
Standard (attachment boreholes on rear side).....	> 0										
Assembly of the mounting rails.....	> S										
Panel mounting set.....	> D										
Wall mounting .....	> W										

### 13.1 Accessories

Order No.	Designation	No. of Poles	Usage	Length
06401993	Connection cable with M12 connector	4-pole	for switching outputs	2 m
06401994	Connection cable with M12 connector	4-pole	for switching outputs	5 m
06401995	Connection cable with M12 connector	5-pole	for supply / signal	2 m
06401996	Connection cable with M12 connector	5-pole	for supply / signal	5 m
04005144	Wall mounting set			

## 14 Declaration of conformity

### EG-Konformitätserklärung

Wir erklären in alleiniger Verantwortung, dass nachstehend genannte Produkte

**Digitaler 2-Kanal Differenzdruckschalter /  
Transmitter mit 4-stelliger Farbwechsel-  
LCD**

### EC Declaration of Conformity

We declare under our sole responsibility that the products mentioned below

**Digital 2-channel Differential Pressure  
Switch / Transmitter with 4-digit color  
changing LCD**

DE46##00###NW#M#

gemäß gültigem Datenblatt übereinstimmen mit den

as specified by the current data sheet complies with

### EG-Richtlinien

2004/108/EG (EMV)

### EC-directives

2004/108/EC (EMC)

Die Produkte wurden entsprechend der folgenden Normen geprüft (Störfestigkeit für Industriebereich, Störaussendung für Wohnbereich):

DIN EN 61326-1:2006-10  
DIN EN 61326-2-3:2007-05  
DIN EN 61010-1:2002-08

The products were tested in compliance with the following standard (Interference immunity for industrial environments, interface emission for residential environments)

DIN EN 61326-1:2006-10  
DIN EN 61326-2-3:2007-05  
DIN EN 61010-1:2002-08

Die Geräte werden gekennzeichnet mit:

The devices bear the following marking:

CE

Bad Salzuffen, 22.12.10  
(Ort, Datum / place, date)

  
(rechtsverb. Unterschrift / legally authorized signature)

