

# Instruction Manual Differential Pressure Transducer for Top-hat Rail Mounting Type PS11, Type PK11 with Contact Point



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## Purpose of instruction manual

This instruction manual describes the features of the PS11/PK11 differential pressure transducer and provides guidelines for its use.

Improper use of this instrument or failure to follow these instructions may cause injury or equipment damage. Every person who uses the device must therefore read the manual and understand the possible risks. The instruction manual, and in particular the safety precautions contained therein, must be followed carefully. **Contact the manufacturer if you do not understand any part of this instruction manual.**

Handle this manual with care:

- It must be readily available throughout the lifecycle of the instrument.
- It must be provided to any individuals who assume responsibility for operating the instrument at a later date.
- It must include any supplementary materials provided by the manufacturer.

The manufacturer reserves the right to continue developing this instrument model without documenting such development in each individual case. The manufacturer will be happy to determine whether this manual is up-to-date.

## Conformity

This device is state of the art. It complies with the legal requirements of EC directives. This is shown by the CE mark.



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The manufacturer owns the copyright to this instruction manual. It contains technical data, instructions and drawings detailing the device's features and how to use it. It must not be copied either wholly or in part or made available to third parties.

# 1 Safety precautions

## 1.1 Appropriate use

In addition to differential pressure data, the PS11/PK11 differential pressure transducer also records positive and negative overpressures.

Always observe the operating requirements—particularly the permissible supply voltage—indicated on the rating plate and in the "Technical data" section of this manual.

The instrument may only be handled as indicated in this manual. Modifications to the instrument are prohibited. The manufacturer is not liable for damages caused by improper use or failure to follow these instructions. Violations of this type render all warranty claims null and void.

## 1.2 Shipping, assembly, electrical connections and start-up

Do not close the pressure inlets during shipping. Changes in barometric pressure may damage devices with low measuring ranges.

Assembly and the electrical connections should only be handled by professionals. They should be given proper training and be authorised by the operator of the facility.

The instrument may only be operated by appropriately trained individuals who have been authorized by the operator of the facility.

Do not carry out a function test with compressed or breathable air. This would damage instruments with low measuring ranges.

Measurement errors may occur if the instrument is not kept protected from sunlight.

Specific safety precautions are given in individual sections of this manual.

## 1.3 Troubleshooting, maintenance, repairs, disposal

The individual responsible for the electrical connections must be notified immediately if the instrument is damaged or if errors occur that cannot be corrected as indicated in section 6.

This individual must take the instrument out of service until the error has been corrected and ensure that it cannot be used unintentionally.

### **Always unplug the supply voltage before opening the instrument!**

This instrument requires no maintenance.

Only the manufacturer may perform repairs that require the housing to be opened.

The electronic components of the instrument contain environmentally hazardous materials and materials that can be reused. The instrument must therefore be sent to

a recycling plant when you no longer wish to use it. The environment codes of your particular country must be complied with.

#### 1.4 Symbols

The symbols given below are used throughout this manual to indicate instances when improper operation could result in the following hazards:



**WARNING!** This warns you of a potential hazard that could lead to bodily injury up to and including death if the corresponding instructions are not followed.



**WARNING:** This warns you of a potential hazard that could lead to significant property damage if corresponding instructions are not followed.



**INFORMATION:** This indicates that the corresponding information is important for operating the instrument properly.

## 2 Instrument description

The Type PS11/PK11 pressure transducer is a pneumatic, electronic sensor for measuring overpressures, vacuum pressures and differential pressures. As well as two output signals proportional to the pressure, it also offers the option of a floating contact point. Typical applications include, for instance, the monitoring of filters in air-conditioning and ventilation ducts. At the heart of the transducer is a pressure measurement capsule with a beryllium bronze membrane spring, which is displaced by the pressure difference between the two chambers of the measurement capsule. Inductive displacement transducers measure membrane deflection without contacting the membrane. The instrument has no frictional parts or parts subject to mechanical wear.

## 3 Start-up

### 3.1 Features

Although the PS11/PK11 pressure transducer is highly robust, it is nevertheless a precision instrument and should be handled with care. Avoid mounting the PS11/PK11 in the direct vicinity of any sources of heat or radiation. The instrument should be mounted vertically on a 35 mm DIN top hat rail not subject to vibration.

The smoothed supply voltage 24 VDC (+20% / -15 %) should be connected at the terminals indicated in the connection diagram (see below).

The pressure (+) and vacuum (-) ports should be connected to the installed pipes using short lengths of tubing.

When connecting pressure to the transducer, use the following table to ensure that the sign of the pressure (+ or -) is correct.

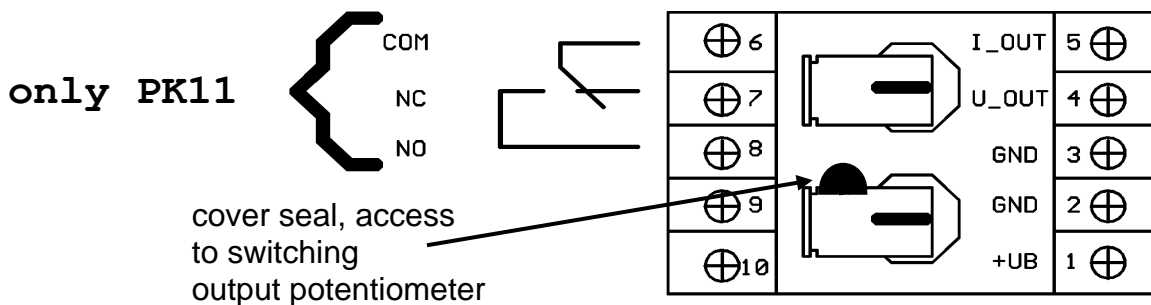
Measuring task	Connect pressure to	Example
overpressure / pos. differential pressure	+ input port	0...1 kPa
vacuum / neg. differential pressure	- input port	0...- 500 Pa
symmetrical overpressure / vacuum	+ input port	± 200 Pa

### 3.2 Supply voltage connections in the instrument:

The supply voltage should be connected at the terminals (1...2). The pressure transducer is protected against reverse polarity of the supply voltage.

The output signal is available on the signal terminal (3...5) as shown below. The output voltage is protected against short circuits for a short period.

The optional floating relay output is available on terminal (6...8).



**Observe the required supply voltage (see rating plate).**

## 4 Calibration of the output signals



**Please remember that it takes roughly 30 to 60 minutes for the pressure transducer to warm up after it is switched on. The output signal may not remain stable during this period.**

**It is recommended that the zero point after a long operating time (approximately 6 months) is checked and if necessary calibrate it again.**

The instruments are calibrated by the manufacturer before delivery. During assembly it should only be necessary to correct any positional errors.

However, the following tools are required if calibration is still necessary:

- ☞ power adapter with 24 V DC
- ☞ instrument for measuring voltage and current
- ☞ calibration device with pressure sensor (e.g. halstrup-walcher KAL 84)
- ☞ the accuracy should be four times greater than that of the instrument being calibrated

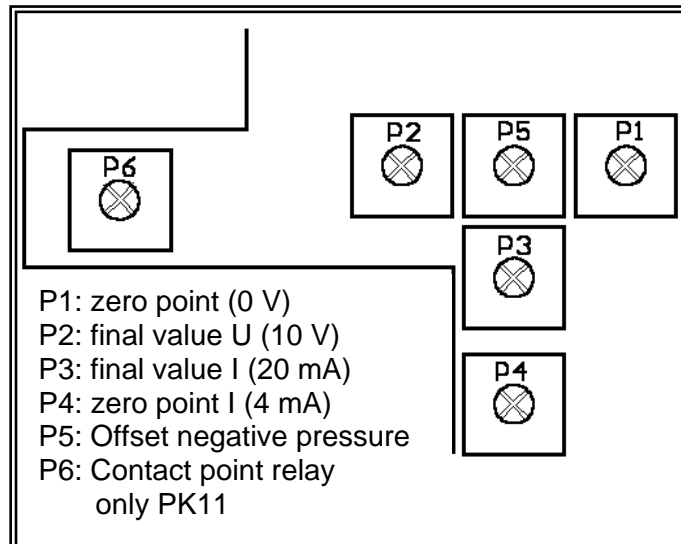
During calibration the instrument should be in the position in which it is later mounted. Unscrew the locking saddles to the left and right of the ports using a small screwdriver. You can now remove the front cover.

Now pull out the PCB assembly far enough that you can set the potentiometer. Connect the (+) supply voltage to terminal 1 and the (-) supply voltage to terminal 2. Connect the instrument for measuring voltage with PLUS to terminal 4, the instrument for measuring current with PLUS to terminal 5 and both instruments with MINUS (GND) to terminal 3.

The zero point can be calibrated after the pressure transducer has warmed up. The voltage should be set to 0V with open ports using P1, then the current should be set to 4mA using P4.

At the pressure input for the sensor (+) provide the correct nominal pressure (100% measurement range), and calibrate the output of the instrument to 10V using the P2 potentiometer. Parallel to this operation, set the current to 20mA using P3.

Repeat both these setting operations, if necessary.



## 5 Adjusting the switching threshold

The floating contact point functions as a changeover contact, i.e. it can be used as an NO contact or an NC contact. The following describes how to set the contact point with the NO contact function. The same instructions apply to setting the NC contact function, only the function is inverted.

You can access the P6 potentiometer through a bore in the front of the instrument. If the ports use elbow connectors, you may have to twist them out of the way.

Set the switching point as follows:


- ☞ Connect a continuity tester to terminals 6 and 8.
- ☞ Provide the correct supply voltage.
- ☞ Provide the correct pressure at which the relay should shut off.
- ☞ Now turn P6 until the continuity tester hums.
- ☞ If the continuity tester is humming before you set the contact, turn P6 in the opposite direction until it stops humming.
- ☞ Now change the pressure in order to test whether the switching point has been set correctly (correct if necessary).



## 6 Troubleshooting

Error description	Potential cause	Corrective action
no output signal	<ul style="list-style-type: none"> <li>• supply voltage is not connected</li> <li>• incorrect supply voltage</li> <li>• defective reverse polarity protection diode</li> <li>• defective input protection diode</li> </ul>	<ul style="list-style-type: none"> <li>• connect correct supply voltage</li> <li>• connect the correct supply voltage (see rating plate).</li> <li>• send the instrument to the manufacturer for repair</li> <li>• send the instrument to the manufacturer for repair</li> </ul>
output signal is constant, despite change in pressure	<ul style="list-style-type: none"> <li>• defective output protection diode</li> <li>• pressure ports reversed</li> </ul>	<ul style="list-style-type: none"> <li>• send the instrument to the manufacturer for repair</li> <li>• connect the pressure as described in Section 3.1</li> </ul>
output signal incorrect	<ul style="list-style-type: none"> <li>• defective output protection diode</li> <li>• defective pressure measurement cell</li> </ul>	<ul style="list-style-type: none"> <li>• send the instrument to the manufacturer for repair</li> <li>• send the instrument to the manufacturer for repair</li> </ul>
zero point cannot be adjusted using P1	<ul style="list-style-type: none"> <li>• defective pressure measurement cell</li> </ul>	<ul style="list-style-type: none"> <li>• send the instrument to the manufacturer for repair</li> </ul>

## 7 Technical data

<b>Measurement data</b>	
measurement ranges	±300 Pa to 200 kPa
overload capacity	10 x the final value of the measurement range (for measurement ranges ≤ 20 kPa) 20 x the final value of the measurement range (for measurement ranges > 20 kPa)
hysteresis	0.1 %
warm-up period	approx. 30 min.
time required for adjustment	approx. 20 ms (up to 5 s available upon request)
deviation from characteristic curve (setting limiting value)	2 %
temperature-dependent drift in zero point	0.1%/ K (within the +10°C...+50 °C range)
temperature-dependent drift in measurement range	0.1%/ K (within the + 10°C...+50 °C range)
dead volume	approx. 2000 mm <sup>3</sup> (for measurement ranges ≥ 250 Pa)
control volume	max. 200mm <sup>3</sup>
max. system pressure	100 kPa
<b>Ambient conditions</b>	
medium	air, all non-aggressive gases
nominal temperature	+10° C to +50° C
operating temperature	0° C to +70° C
storage temperature	-10° C to +70° C
relative humidity	0...80 %
EMC standards	corresponds to EN 50 081 part 1 and EN 50 082 part 1
conformity	 declaration of conformity available upon request

<b>Electrical data</b>	
power consumption	max. 1.4 W
supply voltage	24 VDC +20% / -15% (smoothed, permissible peak-to-valley ratio = 1000 mV)
load resistance $R_L$	$R_L \geq 2 \text{ k}\Omega$ at output voltage 0...10 V effect of change from the minimal resistance to $\infty$ : max. 0.2 %
working resistance $R_B$	$R_B = 500 \Omega$ effect of change from 500 $\Omega$ to 0 $\Omega$ : max. 0.2%
output signal	0 to 10 V and 4 to 20 mA (voltage limited to 10 V)
contact points	single-pole switching relay max. load capability 230 VAC, 5 A can be adjusted over the complete measurement range using the potentiometer
<b>Physical data</b>	
pressure port	FESTO elbow (AN) quick connector for PVC tubing (external $\varnothing$ 6mm)
electrical connection	screw terminals for cables up to 2.5 mm <sup>2</sup>
mounting orientation	mounted vertically on 35mm DIN top hat rails
dimensions (w x l x h)	45 x 111 x 73 mm
protection class	IP40
weight	0.25 kg

#### Appendix A: Parts in contact with measurement medium

- Beryllium bronze CuBe2
- Mu metal (nickel alloy)
- Brass CuZn39Pb3
- Aluminium AlCuMgPb / AlMg3
- Silicon (tubing), optional: Viton
- Crastin (PTBP)
- Araldite CY236 / HY988
- Loctite 242e
- Carbonyl iron
- KEL (FPM: fluorinated rubber)
- Vepuran Vu 4457/51
- UHU-Plus endfest 300 binder

## 8 Dimension drawings

