

Contents

**Pressure switch, high adjustability of switch differential
For the process industry
Model PSM-700**

EN



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1. General information

- The mechanical pressure switch described in the operating instructions has been designed and manufactured using state-of-the-art technology. All components are subject to stringent quality and environmental criteria during production. Our management systems are certified to ISO 9001.
- These operating instructions contain important information on handling the instrument. Working safely requires that all safety instructions and work instructions are observed.
- Observe the relevant local accident prevention regulations and general safety regulations for the instrument's range of use.
- The operating instructions are part of the product and must be kept in the immediate vicinity of the pressure measuring instrument and readily accessible to skilled personnel at any time.
- Skilled personnel must have carefully read and understood the operating instructions prior to beginning any work.
- The manufacturer's liability is void in the case of any damage caused by using the product contrary to its intended use, non-compliance with these operating instructions, assignment of insufficiently qualified skilled personnel or unauthorised modifications to the instrument.
- The general terms and conditions contained in the sales documentation shall apply.
- Subject to technical modifications.
- Further information:

- Relevant data sheet: PV 35.05

Abbreviations, definitions

DPDT Double pole double throw

SPDT Single pole double throw

NC Normally closed contact type (NC = normally closed)

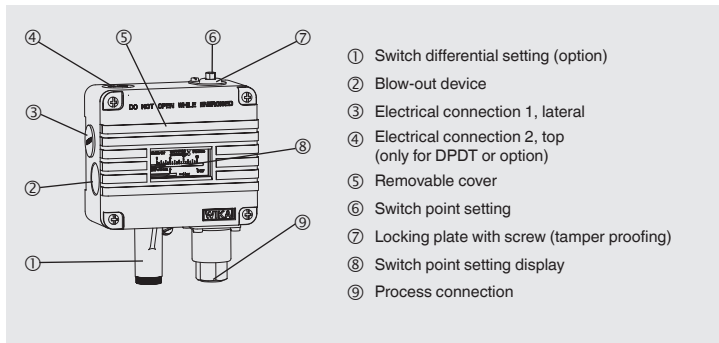
NO Normally open contact type (NO = normally open)

COM Common contact

GND Ground connection

2. Design and function

2.1 Overview



2.2 Description

The pressure element of the model PSM-700 is a resilient bellow from stainless steel which works against a spring mechanism with an adjustable pre-load force. On the spring mechanism there is a contact arm for actuating the switch contact. The switch is actuated as soon as the force generated by the pressure in the pressure element is greater than the set pre-load force.

2.3 Terms used

Maximum operating pressure

The maximum static pressure with which the instrument can be used without changing the assured performance data.

Reset point

The pressure value at which the switch returns to the starting position. Mathematically, the pressure value for the reset point is equal to the pressure value of the switch point minus the switch differential on rising pressure. On falling pressure, the pressure value for the reset point is equal to the pressure value of the switch point plus the switch differential.

Switch differential

The switch differential is the difference between the switch point and the reset point. This is also known as the switch hysteresis.

2.4 Scope of delivery

Pressure switch, operating instructions

Cross-check scope of delivery with delivery note.

3. Safety

3.1 Explanation of symbols



WARNING!

... indicates a potentially dangerous situation that can result in serious injury or death, if not avoided.



CAUTION!

... indicates a potentially dangerous situation that can result in light injuries or damage to property or the environment, if not avoided.



DANGER!

... identifies hazards caused by electrical power. Should the safety instructions not be observed, there is a risk of serious or fatal injury.



WARNING!

... indicates a potentially dangerous situation that can result in burns, caused by hot surfaces or liquids, if not avoided.



Information

... points out useful tips, recommendations and information for efficient and trouble-free operation.

3.2 Intended use

Depending on the version, the model PSM-700 mechanical pressure switch is fitted with an SPDT or DPDT switch contact and is used in industrial control, monitoring and alarm applications. The switch point can be specified by the customer on site. Depending on the version, the instrument can switch electrical loads of up to AC 250 V, 15 A.

The PSM-700 pressure switch offers many application possibilities for gaseous and liquid aggressive media that are not highly viscous or crystallising.



WARNING!

Use in the wrong application can lead to considerable personal injury and damage to equipment.

- ▶ Only use the instrument in applications that lie within its technical performance limits (e.g. max. ambient temperature, material compatibility, ...).
- ▶ For performance limits see chapter 9 "Specifications".
- ▶ This instrument is not permitted to be used in hazardous areas!

The instrument has been designed and built solely for the intended use described here, and may only be used accordingly.

The manufacturer shall not be liable for claims of any type based on operation contrary to the intended use.

3.3 Improper use



WARNING!

Injuries through improper use

Improper use of the instrument can lead to hazardous situations and injuries.

- ▶ Refrain from unauthorised modifications to the instrument.
- ▶ Do not use the instrument within hazardous areas.
- ▶ Do not use the instrument with abrasive or highly viscous media.

Any use beyond or different to the intended use is considered as improper use.

3.4 Personal qualification



WARNING!

Risk of injury should qualification be insufficient!

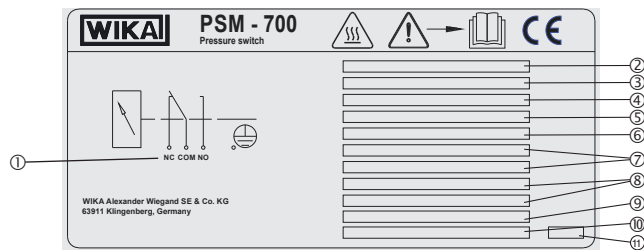
- ▶ Improper handling can result in considerable injury and damage to equipment.
- ▶ The activities described in these operating instructions may only be carried out by skilled personnel who have the qualifications described below.

Skilled electrical personnel

Skilled electrical personnel are understood to be personnel who, based on their technical training, know-how and experience as well as their knowledge of country-specific regulations, current standards and directives, are capable of carrying out work on electrical systems and independently recognising and avoiding potential hazards. The skilled electrical personnel have been specifically trained for the work environment they are working in and know the relevant standards and regulations. The skilled electrical personnel must comply with current legal accident prevention regulations.

3.5 Labelling, safety marks

Product label (example)



- ① Switching function and pin assignment
- ② Article number
- ③ Serial number
- ④ Setting range
- ⑤ P_{max} = Maximum operating pressure
- ⑥ Permissible switching voltage
- ⑦ Electrical rating
- ⑧ Permissible ambient and medium temperature ranges
- ⑨ Ingress protection
- ⑩ TAG number
- ⑪ Coded date of manufacture



Before mounting and commissioning the instrument, ensure you read the operating instructions!

4. Transport, packaging and storage

4.1 Transport

Check the instrument for any damage that may have been caused by transport. Obvious damage must be reported immediately.



CAUTION!

Damage through improper transport

With improper transport, a high level of damage to property can occur.

- ▶ When unloading packed goods upon delivery as well as during internal transport, proceed carefully and observe the symbols on the packaging.
- ▶ With internal transport, observe the instructions in chapter 4.2 "Packaging and storage".

If the instrument is transported from a cold into a warm environment, the formation of condensation may result in instrument malfunction. Before putting it back into operation, wait for the instrument temperature and the room temperature to equalise.

4.2 Packaging and storage

Do not remove packaging until just before mounting.

Keep the packaging as it will provide optimum protection during transport (e.g. change in installation site, sending for repair).

Permissible conditions at the place of storage:

- Storage temperature: -50 ... +60 °C [-58 ... +140 °F]
- Humidity: 35 ... 85 % relative humidity (no condensation)

Avoid exposure to the following factors:

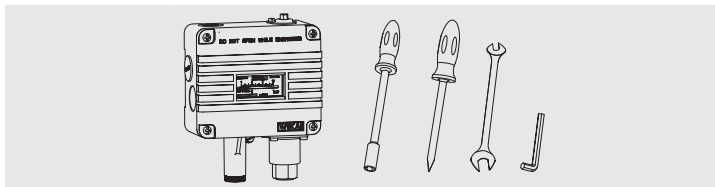
- Direct sunlight or proximity to hot objects
- Mechanical vibration and mechanical shock (putting it down hard)
- Soot, vapour, dust and corrosive gases
- Hazardous environments, flammable atmospheres

Store the instrument in its original packaging in a location that fulfils the conditions listed above.

5. Commissioning, operation

Before installation, commissioning and operation, ensure that the appropriate instrument has been selected in terms of design and specific measuring conditions.

Tools: 6.5 mm socket wrench, cross-head screwdriver, 20 mm open-ended spanner, 6 mm Allen key



5.1 Requirements at the measuring point

- The process pressure must never exceed the specified maximum operating pressure.
- The ambient and medium temperatures must never be outside the permissible operating conditions (see chapter 9 "Specifications"). The temperature at the instrument case must not exceed the value of 100 °C. The limit values at the instrument must be fulfilled by taking appropriate measures, e.g. by mounting with a distance from large hot surfaces or vessels; if required, by extending the connection with a pipeline or by providing it with thermal insulation.
- Protected from weather influences.
- Any vibrations or shocks which occur must not exceed accelerations of 1 g (9.81 m/s²) within a frequency range of 10 ... 150 Hz.
- The measuring line and the process connection must be designed such that no mechanical loads can occur on the instrument in the entire permissible ambient and medium temperature ranges.
- Sealing faces are clean and undamaged.
- Maintain clearance for blow-out device of > 20 mm.
- Sufficient space for a safe electrical installation.

→ For performance limits see chapter 9 "Specifications"

5.2 Mechanical mounting

- After unpacking the instrument, a visual inspection for damage must be carried out.
- Mounting is only permitted in the depressurised state. Reliably depressurise the instrument using the available valves and protective devices.
- Use seals suitable for the process connection provided.
- When screwing the instruments in, the force required for sealing must not be applied through the case, but only through the spanner flats provided for this purpose on the process connection, and using a suitable tool. The tightening torque is dependent on the selected process connection.
- After screwing in, make sure that no damage or cracks have occurred at the process connection.

5.3 Electrical mounting and integration into the installation

The connection cable must provide basic insulation for external circuits of protection class I. The instrument must be able to be switched off completely by means of a switch or a control unit. Depending on the load, additional protective measures, e.g. for motor protection, may be required.



DANGER!

Danger to life caused by electric current

Upon contact with live parts, there is a direct danger to life.

- ▶ The instrument may only be installed and mounted by skilled personnel.
- ▶ Switch off the load circuit before starting work and secure against being switched on unauthorised.

Cable preparation

Provide strain relief for the installed cables (e.g. integrated in cable gland). The cable gland(s) used must be suitable for achieving an IP66 ingress protection. Size the connecting cables for the largest current strength in the circuits and ensure sufficient UV resistance and mechanical stability.

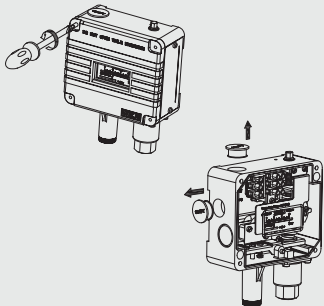
Recommendation: 4-wire cable with conductor cross-section of 0.5 ... 2.5 mm² (AWG 20 ... 14). Fit wire ends with end splices. Conductor cross-section for end splices with plastic sleeve ≤ 1.0 mm² and for end splices without plastic sleeve ≤ 1.5 mm².

Grounding

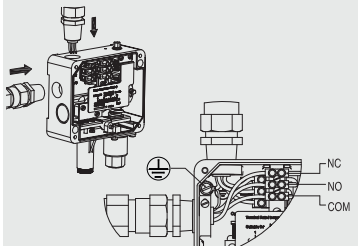
Include the ground connection in the inside of the instrument into the grounding concept of the installation. Maximum conductor cross-section 4 mm².

Clamping the cable

1. Remove 4 screws and open cover
2. Remove the cover(s) of the electrical connection(s)



3. Fit suitable cable gland(s) and feed in the cable
4. Carry out the terminal assignment according to the switching function, tightening torque: Approx. 0.4 ... 0.5 Nm



5. Close the cover again and fix it with the 4 supplied screws.

5.4 Switch point setting

For an exact setting of the switch point, a test assembly with pressure generation and pressure reference is needed. This test assembly can, for example, be realised with a model CPG1500 precision digital pressure gauge and a model CPP30 hand test pump (not shown).

Figure 1

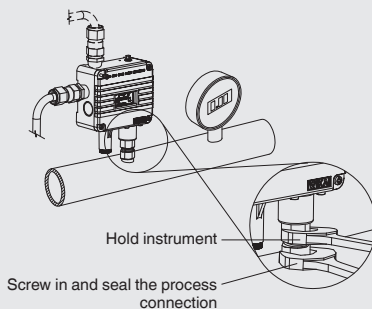


Figure 2

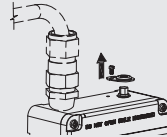


Figure 3

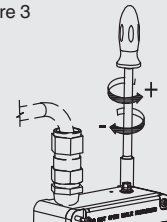


Figure 1: Instrument mounting at the test assembly (also see 5.2 "Mechanical mounting")

Figure 2: Screwing out the locking plate

Figure 3: Switch point setting

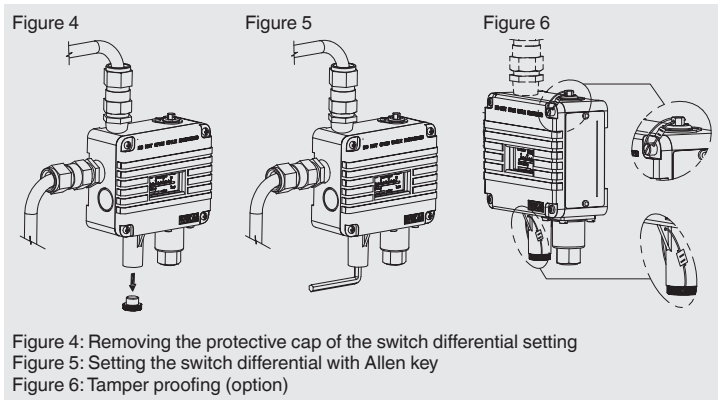
1. Connect the model PSM-700 pressure switch, pressure reference and pressure generation to a common pressure system.
2. Ensure that the switch point setting does not switch any loads on or off by mistake. For visualisation of the switching function, an equivalent circuit, e.g. with a light bulb, is recommended.
3. Drive slowly towards the required switch point pressure with the pressure generation and pressure reference. Depending on the definition of the switch point, this must be carried out on rising/falling pressure.
 - If the instrument switches **before** the required switch point is reached, the switch point setting must be turned anticlockwise (+) with the socket wrench.
 - If the instrument switches **after** the required switch point is reached, the switch point setting must be turned clockwise (-) with the socket wrench.After each correction, release/build up the pressure and repeat this procedure until the switch point is set correctly.

For instruments with adjustable switch differential directly in the connection, follow the instructions in the next chapter.

5.5 Setting of the switch differential (option)

The handling instructions described here cannot be carried out on instrument versions with fixed switch differential.

Before setting the switch differential, the handling steps in chapter 5.2 "Switch point setting" must be carried out.



- Release/build up the pressure slowly and check the reset point.
 - If the pressure value of the reset point is **too high**, the adjustment screw for the switch differential must be turned clockwise with the Allen key.
 - If the pressure value of the reset point is **too low**, the adjustment screw for the switch differential must be turned anticlockwise with the Allen key.
 After correcting the switch differential, the switch point must be re-checked.
- If the switch point and the reset point coincide with the required pressure values, the switch point and switch differential setting is complete.
- Close the cover again and fix it with the 4 supplied screws, see chapter 2.1 "Overview".

5.6 Commissioning

- Check that the following torques for screw connections are maintained:
 - Clamping screws and screw for locking plate: Approx. 0.6 Nm
 - Case screws: Approx. 1.25 ... 1.5 Nm
- Check the sealing at the process connection over the entire operating pressure range before commissioning.
- Pressure surges must be avoided at all costs, open the shut-off valves slowly.
- The instrument must not be subjected to any external loading (e.g. use as a climbing aid, support for objects).

6. Faults



CAUTION!

Physical injuries and damage to property and the environment

If faults cannot be eliminated by means of the listed measures, the instrument must be taken out of operation immediately.

- ▶ Ensure that there is no pressure in the instrument and that the load circuit is switched off. Protect against being put into operation accidentally.
- ▶ Contact the manufacturer.
- ▶ If a return is needed, please follow the instructions given in chapter 8.2 "Return".



WARNING!

Physical injuries and damage to property and the environment caused by media

Upon contact with hazardous media, harmful media (e.g. corrosive, toxic, carcinogenic), and also with refrigeration plants and compressors, there is a danger of physical injuries and damage to property and the environment. Should a failure occur, aggressive media with extremely high temperature and under high pressure or vacuum may be present at the instrument.

- ▶ For these media, in addition to all standard regulations, the appropriate existing codes or regulations must also be followed.



For further information see chapter 1 "General information".

Faults	Causes	Measures
Contact is not switching in accordance with the specification at the set switch point/reset point	Electrical connection is interrupted.	Carry out a continuity test on the electrical connection lines.
	Wiring error, e.g. short-circuit	Check the pin assignment and correct it if necessary
	Electrical load unsuitable.	Maintain the permissible electrical loads.
	Contact contaminated.	Replace instrument
	Switch differential greater than the switch point. Vibrations	Carry out switch point setting with matching test assembly, see chapter 5.2. Decouple the instrument mechanically.
Short-circuit	Moisture in the instrument.	Only use in ambient conditions for which the ingress protection is suitable.
Contact chatter (repeated, short-duration opening and closing).	Vibrations	Decouple the instrument mechanically.

Faults	Causes	Measures
Switching status remains unchanged despite reaching the switch point/reset point.	Error with switch point setting.	Carry out switch point setting with matching test assembly.
	Contacts defective (e.g. fused contact zone).	Replace instrument. Before recommissioning the new instrument, provide a protective circuit for the contact.
	Pressure port blocked.	Replace instrument.
	Leakage	Carry out a leak test. Seal the process connection or replace the instrument.

For the exchange of the instrument chapters 8 "Dismounting, return and disposal" and 5 "Commissioning, operation" must be observed.

7. Maintenance and cleaning

7.1 Maintenance

The instruments are maintenance-free.

The switch point setting must be checked after 6 months. Carry out switch point setting with matching test assembly, see chapter 5.2.

Carry out the check with slow rate of change of pressure in the desired pressure direction 3 times with identical initial pressure values.

Repairs must only be carried out by the manufacturer.

7.2 Cleaning



WARNING! **Risk of burns**

With cleaning there is a risk through hot surfaces.

- ▶ Before cleaning the instrument, allow it to cool sufficiently or use protective equipment!



CAUTION! **Physical injuries and damage to property and the environment**

Improper cleaning may lead to physical injuries and damage to property and the environment. Residual media in the dismantled instrument can result in a risk to persons, the environment and equipment.

- ▶ Carry out the cleaning process as described below.

1. Before cleaning, correctly disconnect the instrument from the pressure supply and switch the load circuit off.
2. Use the requisite protective equipment.
3. Clean the instrument with a moist cloth.
Electrical connections must not come into contact with moisture!



CAUTION! **Damage to the instrument**

Improper cleaning may lead to damage to the instrument!

- ▶ Do not use any aggressive cleaning agents.
- ▶ Do not use any hard or pointed objects for cleaning.

4. Wash or clean the dismantled instrument, in order to protect persons and the environment from exposure to residual media.

8. Dismounting, return and disposal



WARNING! **Physical injuries and damage to property and the environment through residual media**

Residual media in the dismantled instrument can result in a risk to persons, the environment and equipment.

- ▶ Observe the information in the material safety data sheet for the corresponding medium.
- ▶ Wash or clean the dismantled instrument, in order to protect persons and the environment from exposure to residual media.

8.1 Dismounting



WARNING! **Risk of burns**

During dismantling there is a risk of dangerously hot media escaping.

- ▶ Let the instrument cool down sufficiently before dismantling it!



DANGER! **Danger to life caused by electric current**

Upon contact with live parts, there is a direct danger to life.

- ▶ The dismantling of the instrument may only be carried out by skilled personnel.
- ▶ Remove the instrument once the system has been isolated from power sources.



WARNING! **Physical injury**

When dismantling, there is a danger from aggressive media and high pressures.

- ▶ Observe the information in the material safety data sheet for the corresponding medium.
- ▶ Dismount the instrument when there is no pressure.

8.2 Return

Strictly observe the following when shipping the instrument:

All instruments delivered to WIKA must be free from any kind of hazardous substances (acids, bases, solutions, etc.) and must therefore be cleaned before being returned.

**WARNING!****Physical injuries and damage to property and the environment through residual media**

Residual media in the dismantled instrument can result in a risk to persons, the environment and equipment.

- ▶ With hazardous substances, include the material safety data sheet for the corresponding medium.
- ▶ Clean the instrument, see chapter 7.2 "Cleaning".

When returning the instrument, use the original packaging or a suitable transport packaging.

8.3 Disposal

Incorrect disposal can put the environment at risk.

Dispose of instrument components and packaging materials in an environmentally compatible way and in accordance with the country-specific waste disposal regulations.

9. Specifications**Operating conditions**

Ambient: -10 ... +60 °C [+14 ... +140 °F]
 Medium: ■ -30 ... +115 °C [-22 ... +239 °F]
 ■ -30 ... +150 °C [-22 ... +302 °F] ¹⁾
 Storage: -50 ... +60 °C [-58 ... +140 °F]

Reference conditions

Relative humidity per BS 6134
 < 50 % r. h. at 40 °C (104 °F)
 < 90 % r. h. at 20 °C (68 °F)

Ingress protection per IEC/EN 60529

IP66

Switch point repeatability

≤ 0.5 % of span

Switching function

1 x SPDT (single pole double throw) or 1 x DPDT (double pole double throw)
 1 or 2 micro switches, contacts silver-plated

Electrical safety

Safety class I per IEC 61010-1:2010 (case grounded with protective conductor), overvoltage category II, pollution degree 2

¹⁾ only selectable for contact version: F2, A1, A2

Contact version

Code	Switch type	Electrical rating AC				Electrical rating DC				
		Resistive load		Inductive load		Resistive load			Inductive load	
		125 V	250 V	125 V	250 V	30 V	125 V	250 V	30 V	125 V

Switch differential: Fixed

F1	SPDT	10 A	10 A	10 A	10 A	2 A	0.4 A	0.2 A	1 A	0.03 A	0.02 A
F2	DPDT	-	15 A	-	10 A	10 A	0.6 A	0.3 A	10 A	0.6 A	0.3 A

Switch differential: Adjustable

A1	SPDT	-	15 A	-	10 A	10 A	0.6 A	0.3 A	10 A	0.6 A	0.3 A
A2	DPDT	-	15 A	-	10 A	10 A	0.6 A	0.3 A	10 A	0.6 A	0.3 A

Setting range

Unit	Setting range	SP ¹⁾ factory set	P _{max} ²⁾	Fixed switch differential ³⁾ SPDT	Fixed switch differential ³⁾ DPDT	Adjustable switch differential ³⁾
bar	-1 ... 1.5	0.25	5	≤ 0.1	≤ 0.23	0.23 ... 0.9
	0.2 ... 1.6	0.9	2.5	≤ 0.06	≤ 0.24	0.24 ... 0.95
	0.4 ... 4	2.2	9	≤ 0.16	≤ 0.6	0.6 ... 2.4
	0.7 ... 7	3.85	18	≤ 0.28	≤ 1.1	1.1 ... 4
	1 ... 10	5.5	18	≤ 0.4	≤ 1.5	1.5 ... 6
	1.6 ... 16	8.8	25	≤ 0.64	≤ 2.4	2.5 ... 9.5
	4 ... 25	14.5	36	≤ 1	≤ 3.75	3.8 ... 15
psi	7 ... 35	21	50	≤ 1.4	≤ 5.25	5.5 ... 20
	-15 ... 21	3	72	≤ 1.45	≤ 3.3	3.3 ... 13
	3 ... 23	13	36	≤ 0.95	≤ 3.5	3.5 ... 13.5
	5.8 ... 58	32	130	≤ 2.4	≤ 8.7	8.7 ... 34
	10 ... 100	55	260	≤ 4.1	≤ 15.5	15.5 ... 60
	15 ... 145	80	260	≤ 5.1	≤ 22	22 ... 85
	23 ... 230	126.5	360	≤ 9.5	≤ 35	35 ... 139
60 ... 360	210	520	≤ 14.5	≤ 54.5	55 ... 215	
100 ... 500	300	720	≤ 20.5	≤ 76.5	76.5 ... 300	

¹⁾ In the absence of customer specification, the switch point "SP" will be preset on falling pressure to the specified value

²⁾ P_{max} = Maximum operating pressure

³⁾ The difference between the switch point and the reset point is also known as switch hysteresis