

**Differential pressure switch
with adjustability of switch differential
For process industry
Model DPS-300**



Smart in sensing

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Prior to starting any work, read the operating instructions!
Keep for later use!

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1. General information

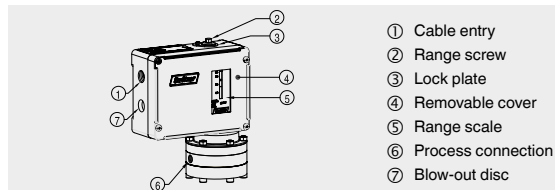
- The mechanical differential pressure switch described in the operating instructions has been designed and manufactured using state-of-the-art technology. All components are subject to stringent quality and environmental criteria during production. Our management systems are certified to ISO 9001.
- 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:
 - Internet address: www.wika.co.in
 - Relevant data sheet: PV 35.59 . 01/2022

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

DPS-300 differential pressure switch is a simple electro mechanical device operating on basic principles of Levers and opposing forces. Three essential elements, various combinations of which form the basics for presenting hundreds of variants to suit a variety of industrial applications. They are :

1. Sensing element metallic diaphragm
2. Stable spring to determine the range setpoint
3. Snap-acting microswitch available in a wide variety.

When pressures from two different sources in a process are connected across the sensing diaphragm, metallic or elastomeric, the pressure difference creates force which when overcomes that of a pre-tensioned spring, moves a balancing arm to effect the minimal movement required to actuate a microswitch(es).

High and low pressures are applied on either side of the specially contoured diaphragm and this design feature straight away eliminates the errors due to the difference in area, a common problem present in twin element pressure differential switches. A unique motion transfer assembly is used, which is sensitive to minute movements of the diaphragm but immune to the application of very high static pressure.

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

- Differential 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

The model DPS-300 mechanical differential 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 DPS-300 differential 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. pressure, current rating, 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 Personnel qualification



WARNING!

Risk of injury should qualification be insufficient!

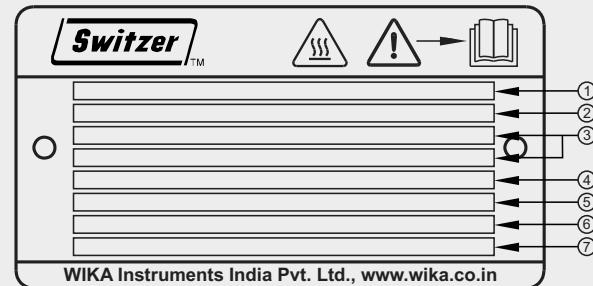
- Improper handling can result in considerable injury and damage to equipment.
- ▶ The activities described in these operating instructions may only be carried out by skilled personnel who have the qualifications described below.

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 - Model | ⑤ - Ingress Protection & Date / year of Manufacture |
| ② - Range & Pmax | ⑥ - Article No. |
| ③ - Elec. Rating | ⑦ - Serial No. |
| ④ - Ambient Temp. | |



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: -10 ... +60°C (14 ... +140°F)
- Humidity: 35 ... 85 % relative humidity (no condensation)

Avoid exposure to the following factors:

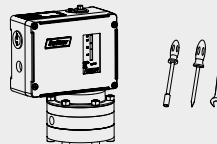
- Direct sunlight or proximity to hot objects
- Mechanical vibration, mechanical shock (putting it down hard)
- Soot, vapour, dust and corrosive gases
- Hazardous environments, flammable atmospheres

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: Star screw driver, socket wrench 6.5 mm, open-ended spanner suitably.



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 60 °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.

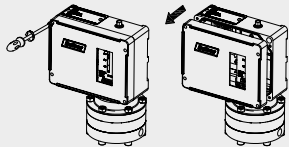
Carry out the terminal assignment according to the switching function tightening torque: 0.7 ... 0.5 N/m approx.

Grounding

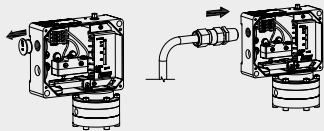
Include the ground connection in the inside of the instrument into the grounding concept of the installation. Maximum conductor cross-section 4 mm²

Clamping the cable

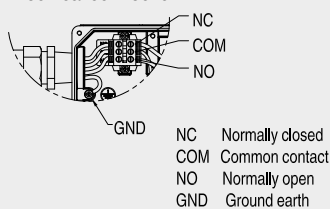
Remove cover screw for electrical connection



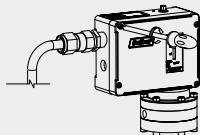
Remove dummy cap and fix cable gland



Electrical connection

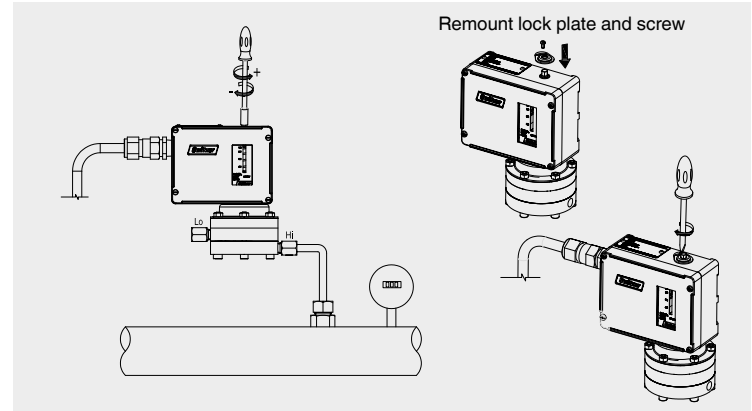


Close cover and fix again with screw



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).



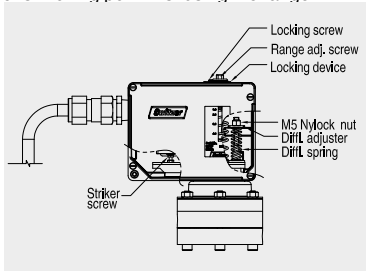
1. Connect the model DPS-300 differential pressure switch, for calibration apply pressure at high pressure port keeping low pressure port vented to atmosphere. Pressure reference and pressure generation to a common pressure system.
2. Ensure that the switch point setting does not switch any loads on 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.
4. After setting, refix the locking device back in position to prevent unauthorised adjustment of the setpoint.
5. In instruments with two SPDT switches for DPDT action, the synchronization of actuation is done within practical limits. The switches are synchronized as per customer preference, either on "falling" or on "rising" pressure. If no preference is indicated, synchronization is done for **fall** in pressure at factory.

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

5.5 Setting of the switch differential (model 303 & 363)

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 5.4 “Switch point setting” must be carried out.

- 6. In adjustable differential model set the lower switching point first using the range adjuster and then adjust the differential adjust knob inside the enclosure to set upper switching point.
- 7. Adjusting the differential adjuster will shift only the upper switching point i.e. the switching pressure difference (on-off differential) alone changes. A clockwise rotation will increase upper switching point and anti-clockwise rotation will decrease it. The upper switching point should not exceed maximum range.
- 8. After setting the differential, tighten the Nylock nut to lock the differential adjuster to prevent loosening.
- 9. Close the cover again and fix it with the 4 supplied screws,
- 10. see chapter 2.1 “Overview”.



PRECAUTION

The switching actuating screw on the balancing arm is critically adjusted. Disturbance of this would result in not achieving the desired result while ON-OFF differential adjustments are made. If accidentally disturbed, to reset the microswitch for correct operation adjust the height of the striker screw such that the balancing arm is not in contact with the Differential spring seat at the time of switch de-actuation. This alone will ensure unloaded condition of the auxiliary spring during de-actuation.

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.
- Flush the pipe system before fitting. Ensure that no stress is produced and are sealed without leak.
- Mount the instrument firmly and rigidly either directly on the pressure piping or on a vibration free wall, panel or pipe stanchion. The instruments are for vertical mounting. Any tilt may lead to set point shift.
- For outdoor installation, provide protection against aggressiveness of very high or low temperature, air, dust, solar radiation, water penetration etc.
- If process temperature is higher than the following permissible maximum temperature it can be brought down by using longer pressure piping.
 - 70°C for Nitrile / SS
- For steam application use condenser coil or a syphon

- For air and gas application, use proper filters (dust collectors) to ensure that the process line is not clogged with accumulation of dust / foreign particles.
- Ensure that suitable dampener / snubber is used in rapidly fluctuating pressure to avoid chattering.
- Bleed the system before putting into operation.
- **Ensure that low pressure side does not exceed high pressure side.**
- Use a 3 or 5 way manifold for differential pressure switch. Keep the equaliser valve open at startup.
- 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 contact details see chapter 1 “General information”.

Faults	Causes	Measures
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.
	Process pressure fluctuation	Fit the pulsation dampener and adjust the damping screw as required

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 for the switch contact model.	Maintain the permissible electrical loads for the switch contact model.
	Contact contaminated.	Replace instrument
	Switch differential greater than the switch point.	Carry out switch point setting with matching test assembly, see chapter 5.4.
Switching status remains unchanged despite reaching the switch point/reset point.	Vibrations	Decouple the instrument mechanically.
	Error with switch point setting.	Carry out switch point setting with matching test assembly, see chapter 5.4.
	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.
	Insufficient pressure	Check the process line pressure with pressure gauge.

For the exchange of the instrument chapters 8 "Dismounting, return and disposal" and 5.6 "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.

Repairs must only be carried out by the manufacturer.

Do not attempt dismantling the sensing diaphragm as it would permanently disturb the factory settings. Special jigs are needed for reassembly, hence not recommended at the user end. However, cleaning of the diaphragm chamber can be performed by flushing with compatible cleaning fluid, Vent / Drain periodically.

7.2 Cleaning



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**Permissible ambient temperature**

-10 ... +60 °C (14 ... 140 °F)

Ingress protection

IP66 per IS/IEC 60529

Setpoint repeatability

±1% of FSR

Scale accuracy

±5% of FSR

Switching function

- 1 × SPDT (single pole double throw)
- 2 × SPDT (single pole double throw),
for DPDT action synchronising error within 2% of FSR

Setting range

Code	Range ^{(1), (4)}	Maximum working pressure ⁽³⁾	Switching differential for contact versions ^{(2), (5)}			
			3, D	5	9, G	W
Unit : mbar						
M042	5 ... 120	110 bar	5	10	12	55 ... 70
		40 bar	5	10	12	55 ... 70
		15 bar	12	12	-	65 ... 70
M048	50 ... 350	110 bar	12	20	30	80 ... 200
		40 bar	12	20	30	80 ... 201
		15 bar	20	25	60	95 ... 200
Unit : bar or Kg/Cm²						
B023	0.1 ... 1.5	110	0.06	0.085	0.12	0.35 ... 0.90
		40	0.06	0.085	0.12	0.35 ... 0.90
		15	0.07	0.09	0.25	0.40 ... 0.90
B028 / K051 ⁽⁶⁾	0.2 ... 4	110	0.175	0.35	0.5	-
		40	0.175	0.35	0.5	-
		15	0.3	0.6	0.7	-
B032 / K102 ⁽⁶⁾	0.7 ... 7	110	0.3	0.5	-	-
		40	0.3	0.5	-	-
B034 / K103 ⁽⁶⁾	1.5 ... 15	110	0.8	1.35	-	-
		40	0.8	1.35	-	-

- ⁽¹⁾ In the absence of customer specification, the switch point will be preset on falling pressure to the mid point of the range [i.e. 50% of span + minimum range value]
- ⁽²⁾ The values indicate the maximum achievable limits of switch differential.
- ⁽³⁾ Maximum working pressure that the sensor element can withstand without suffering any permanent damage. The instrument might have to be calibrated afterwards.
- ⁽⁴⁾ Set and reset point of the switch should not exceed the upper and lower range limits.
- ⁽⁵⁾ 1.3 multiplication factor shall be considered for arriving minimum differentials of 2 × SPDT contact version. Maximum differential remains same as SPDT contact version.
- ⁽⁶⁾ Not applicable in model DPS-303