



OPTIBAR PSM 2010 **Technical Datasheet**

Electronic pressure switch with flush welded diaphragm

- Wide variety thanks to modular design
- SIP/CIP compatible
- Hygienic process connections

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1.1 Universal pressure switch for general application

The **OPTIBAR PSM 2010** pressure switch is specifically designed with the requirements of both the food and pharmaceutical industries in mind.

With the fully welded front flush diaphragm it is perfectly suited for cavity-free instrumentation, providing a repeatable measuring signal that is stable over a long term, even with regular SIP/CIP cleaning, while simultaneously guaranteeing a high degree of chemical resistance to process and cleaning solutions. For process temperatures higher than 150°C / 302°F additional cooling fins for temperature decoupling are available.

The pressure switch features an IO-Link-interface by default to exchange process data, diagnosis and status reports to a subordinate control level and to enable remote adjustment of the pressure switch.

For higher comfort and adjustment probabilities the OPTIBAR PSM 2010 provides an integrated display module. Via the VDMA-conform menu-structure in combination with the two push buttons the device can be configured on site. Since the display module is almost continuously rotatable, a perfect readability is always guaranteed.

The OPTIBAR PSM 2010 comes with a M12 4-pole electrical plug and offers two output signals at the same time with multiple communications like 4...20 mA, 0...10V, NPN and PNP switches, as well as IO-Link. This enables the use as pressure switch and transmitter simultaneously.



Figure 1-1: OPTIBAR PSM 2010

- ① Display unit
- ② M12 x 1 4-pole electrical connection
- ③ Process connection with build-in pressure cell

Highlights

- Fully welded pressure measuring cell with 1.4435 / AISI 316L stainless steel diaphragm
- Diaphragm surface roughness of $R_a < 0.4 \mu\text{m}$
- Variety of front flush and hygienic process connections with 3A approval
- Measuring accuracy $\pm 0.35\%$
- Outstanding temperature stability at zero point
- SIP/CIP compatible
- Measuring range: 0.1...40 bar / 4...580 psi

- Modular construction
- Ingress protection up to IP67
- Multiple output signals: 4...20 mA, 0...10 V, NPN / PNP, IO-Link
- Integrated display module with VDMA conform menu-structure
- Two push buttons for quick parameter set up

Industries

- Food & Beverage
- Pharmaceutical industry
- Viscous and crystallising media
- General sterile process technology

Applications

- Absolute and gauge pressure measurement in gases and liquids
- Process automation
- Hydrostatic level measurement in containers
- Dry-run protection of delivery pumps
- Pressure monitoring of compressors

2.1 Technical data

- *The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local sales office.*
- *Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Downloadcenter).*

Measuring system

Measuring principle	Piezoresistive measuring cell
Application range	Measurement of gauge and absolute pressure in gases and liquids
Measuring range	0.1...40 bar / 1.5...580 psi; refer also to chapter "Measuring ranges" Adjustment (in relation to the nominal range): Zero: $\pm 5\%$ Span: 90...100%

Display and user interface

Display on signal converter	4-digit, 7-segment LED-Display 22.5 x 10.5 mm / 0.89 x 0.41" 4 LED's for indication of unit (bar, mbar, PSI, Mpa) Status LED for IO-Link and switching-outputs Display infinitely rotatable up to -210° and $+100^\circ$ Ambient temperatures below -20°C may affect the readability of the display
Display function	Display of measured value All parameters are accessible via the operating menu
Operating	Local operation via 2 softkeys on the display and adjustment module
Remote control	PACTware™ via IODD and USB IO-Link interface

Measuring accuracy

Reference conditions	Medium: air
	Temperature: ambient temperature
	Ambient pressure: 1013 mbar / 14.7 psi
	Nominal position: vertical, pressure port down
	Power supply: 24 VDC
Pressure type	Gauge pressure / absolute pressure
Measuring accuracy according to IEC 60770 (terminal based) (Hysteresis, non-linearity, non-repeatability)	Nominal pressure (P_N) < 0.4 bar / 5.8 psi: $\leq \pm 0.5\%$ of URL
	Nominal pressure (P_N) ≥ 0.4 bar / 5.8 psi: $\leq \pm 0.35\%$ of URL (URL = Upper Range Limit)
Ambient temperature effect on zero and span	$\leq \pm 0.3\%$ of URL per 10K in compensated range of $-25...85^\circ\text{C}$ / $-13...185^\circ\text{F}$
Long-term stability	$\leq \pm 0.3\%$ of URL within one year under reference conditions
Step response time	≤ 12 ms (T90)
Vacuum resistance	$P_N \geq 1$ bar / 14.5 psi: vacuum resistant $P_N < 1$ bar / 14.5 psi: on request

Operating conditions

Temperature	
Nominal temperature	-20...+85°C / -4...+185°F
Ambient temperature	-40...+85°C / -40...+185°F
Process temperature	Silicone oil: -40...+125°C / -40...+257°F
	Food grade oil: -10...+125°C / +14...+257°F
	With cooling fins (optional):
	Silicone oil: $P_N > 0$ barg: -40...+300°C / -40...+572°F; $P_N < 0$ barg: -40...+150°C / -40...+302°F Food grade oil: $P_N > 0$ barg: -10...+250°C / +14...+482°F; $P_N < 0$ barg: -10...+150°C / +14...+301°F

Installation conditions

Mounting position	Any - factory calibration carried out with pressure port down.
Dimensions	For detailed information refer to chapter "Dimensions and weights".
Weight	Min. 230 g / 0.51 lb (depending on pressure port)

Materials

Housing	Stainless steel 1.4404 / AISI 316L
Fill fluid	Silicone oil
Wetted parts	
Pressure port	Stainless steel 1.4404 / AISI 316L
Separating diaphragm	Stainless steel 1.4435 / AISI 316L
Sealing	FKM, EPDM ($P_N \leq 160$ bar)

Process connections

Thread	Thread ISO 228 G1/2", DIN 3852 ($P_N \geq 1$ bar / 14.5 psi), Thread ISO 228 G3/4", DIN 3852 ($P_N \geq 600$ mbar / 8.7 psi), Thread ISO 228 G1", DIN 3852; Thread ISO 228 G1", cone Thread ISO228 G1/2" hygienic design; DIN3852 Thread ISO228 G1" hygienic design; DIN3852
Clamp	Clamp DN25 ISO 2852; clamp DN38 ISO 2852; clamp DN51 ISO 2852 Others on request.

Electrical connection

Output signal 1	IO-Link / SIO (PNP/NPN) switchable
Output signal 2	4...20 mA / 0...10 V (3-wire) / with PNP / NPN switchable
Power supply	$U_b = 18...30$ VDC
Load	4...20mA / 3-wire: $R_{lmax} \leq (U_b - U_{bmin}) / 0.036$ A [Ohm] 0...10 V / 3-wire: $R_{lmin} \geq U_b / 0.0012$ A [Ohm]
Short circuit protection	Continuously
Reverse polarity protection	In the event of reversed connections there is no damage but also no function.

Ripple	Supply: 0.05% URL Load: ≤ 0.1% URL
Electrical connection	Connector M12x1, 4-pin

Properties switching signal

Switch point accuracy	≤ +/- 0.5% URL
Repeatability	≤ +/- 0.1% URL
Max. switching current	150 mA
Switching frequency	max. 170 Hz
Delay	0...50 seconds

IO-Link

Interface	IO-Link 1.1; Slave
Data transmission	38.4 kbit/s (COM2)
Mode	SIO / IO-Link
Standard	IEC 61132-2, IEC 61161-9

Approvals and certificates

CE	The device fulfils the statutory requirements of the EU directives. The manufacturer certifies that these requirements have been met by applying the CE marking.
Electromagnetic compatibility (EMC) acc. to EN 61326-1:2013	EMC Directive: 2014/30/EU For more information consult the relevant declaration of conformity.
Pressure equipment directive	2014/68/EU
Other standards and approvals	
Vibration resistance acc. to EN 60068-2-6	10g RMS (25...2000 Hz)
Shock resistant (impact) according to EN 60068-2-27	500g / 11 ms ($P_N \geq 60$ bar / 870 psi)
Hygienic	3-A approved; FDA approved materials

2.2 Dimensions

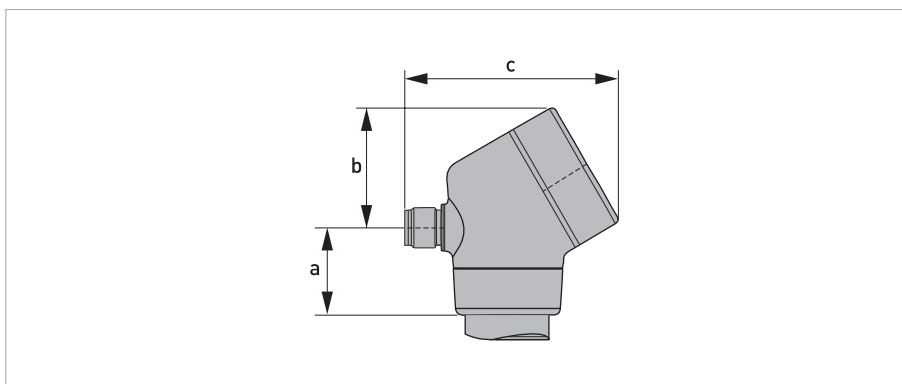


Figure 2-1: Dimensions

Dimensions					
a		b		c	
[mm]	["]	[mm]	["]	[mm]	["]
26	1.02	35.5	1.40	64	2.52

Pressure transmitter with threaded connection

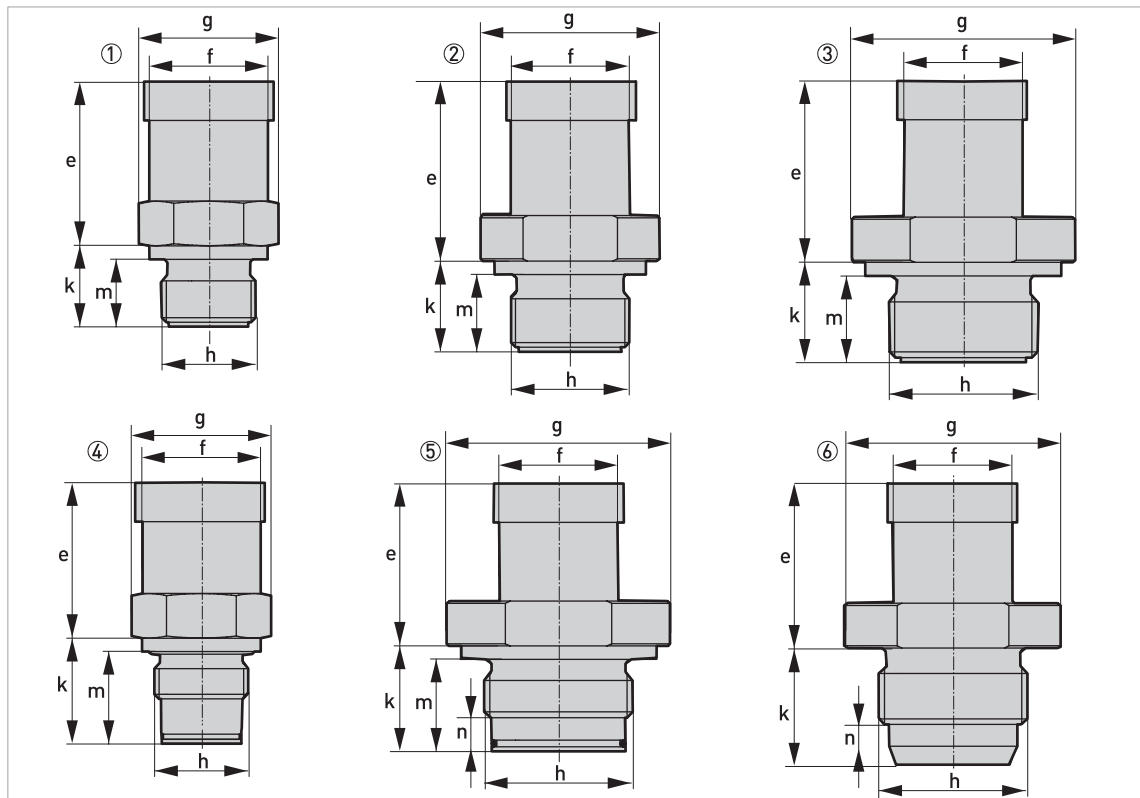


Figure 2-2: Dimensions for pressure transmitter with threaded connection

- ① G1/2" DIN 3852 flush
- ② G3/4" DIN 3852 flush
- ③ G1" DIN 3852 flush
- ④ G1/2" DIN 3852 flush hygienic design
- ⑤ G1" DIN 3852 flush hygienic design
- ⑥ G1" cone

	Dimensions											
	①		②		③		④		⑤		⑥	
	[mm]	[""]	[mm]	[""]	[mm]	[""]	[mm]	[""]	[mm]	[""]	[mm]	[""]
e	60	2.36	60	2.36	60	2.36	60	2.36	60	2.36	60	2.36
f	Ø26.5	Ø1.04	Ø26.5	Ø1.04	Ø26.5	Ø1.04	Ø26.5	Ø1.04	Ø26.5	Ø1.04	Ø26.5	Ø1.04
g	WS27		WS34		WS41		WS27		WS41		WS34	
h	G½"		G¾"		G1"		G½"		G1"		G1"	
k	18	0.71	20	0.79	22	0.87	23.5	0.93	23.5	0.93	26	1.02
m	15	0.59	17	0.67	19	0.75	20.5	0.81	20.5	0.81	-	-
n	-	-	-	-	-	-	-	-	7.5	0.3	9	0.35

The entire length of the device is made up of the electrical connection (a), the transmitter housing (e) and the process connection (k).

With cooling fins (optional) additional 32 mm / 1.26".

Pressure transmitter with cooling fins and hygienic process connections

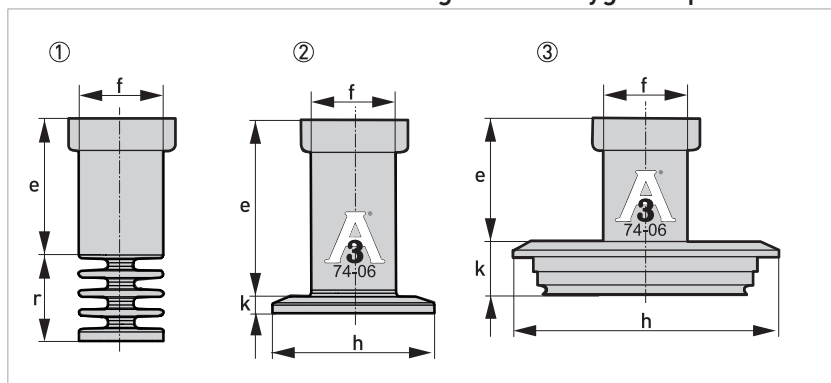


Figure 2-3: Dimensions for pressure transmitter with cooling fins and hygienic process connections

- ① Cooling fins (optional)
- ② Clamp DIN 32678 / ISO 2852, 3-A approved
- ③ Varivent® DN40/50, 3-A approved

	Dimensions					
	①		②		③	
	[mm]	[""]	[mm]	[""]	[mm]	[""]
e	50	1.97	50	1.97	48	1.89
f	Ø26.5	Ø1.04	Ø26.5	Ø1.04	Ø26.5	Ø1.04
h	-	-	DN25: 50.5 DN38: 50.5 DN51: 64	DN25: 2.0 DN38: 2.0 DN51: 2.5	Ø84	Ø3.3
k	-	-	5	0.2	17	0.67
r	32	1.26	-	-	-	-

The entire length of the device is made up of the electrical connection (a), the transmitter housing (e) and the process connection (k).

Other hygienic connections are available on request.

2.3 Measuring ranges

Pressure in bar

Nominal pressure (gauge/abs.)	0.10	0.16	0.25	0.40	0.50	0.60	1	1.6
Max. working pressure (MWP)	0.5	1	1	2	2	5	5	10
Burst pressure (OPL)	1.5	1.5	1.5	3	3	7.5	7.5	15

Nominal pressure (gauge/abs.)	2	2.5	4	5	6	10	16	25	40
Max. working pressure (MWP)	10	10	20	20	40	40	80	80	105
Burst pressure (OPL)	15	15	25	25	50	50	120	120	210

Pressure in psi

Nominal pressure (gauge/abs.)	1.45	2.32	3.63	5.80	7.5	8.70	14.5	23.2
Max. working pressure (MWP)	7.3	14.5	14.5	29	29	72.5	72.5	145
Burst pressure (OPL)	21.8	21.8	21.8	43.5	43.5	108.8	108.8	217.6

Nominal pressure (gauge/abs.)	29	36.3	58.0	72.5	87.0	145	232.1	362.6	580
Max. working pressure (MWP)	145	145	290	290	580	580	1160	1160	1523
Burst pressure (OPL)	217.6	217.6	362.6	362.6	725	725	1740	1740	3046

3.1 General notes on installation

Inspect the packaging carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

Do a check of the packing list to make sure that you have all the elements given in the order.

*Look at the device nameplate to ensure that the device is delivered according to your order.
Check for the correct supply voltage printed on the nameplate.*

3.2 Installation specifications

Install the device only when depressurised and without power!

For installation the respective regulations for explosion protection have to be fulfilled.

For installations outdoor and in damp areas, the following points must be observed:

- *To ensure that no moisture can get into the connector, the device should be connected electrically immediately after installation. Otherwise a moisture admission has to be prevented e.g. by using a suitable protection cap.*
- *Select an installation if possible, where a mounting position allows draining of spray and condensate. Sealing surfaces should not be submerged!*
- *When using devices with cable glands or output, the cable should be looped facing down so that any liquid that collects on the cable can drip off.*
- *Install the device so it is protected from direct sunlight. In the worst case scenario, the permissible operating temperature will be exceeded in the presence of direct sunlight. This can negatively affect or damage the functionality of the device. In addition, it can lead to temporary measuring errors if the internal pressure of the device increases due to the sunlight.*
- *When installing outside where the risk of lightning or overvoltage may exist and damage the device, we recommend installing suitable overvoltage protection between the supply device or control cabinet and the device.*

- *Handle this highly sensitive electronic measuring device with care, both in and out of the packaging!*
- *Only remove the packaging and any protection cap from the device immediately before installing to prevent damage to the diaphragm! Keep the supplied protection cap! Remove the protection cap slowly and carefully to avoid any negative pressure on the diaphragm.*
- *Handle the unprotected diaphragm with extreme care; it is very easily damaged.*
- *A device with a gauge reference in the housing (small hole next to the electrical connection) must be installed so that the gauge reference necessary for measurement is protected from dirt and moisture. Should the pressure transmitter be exposed to fluid admission, the air pressure compensation is blocked by the gauge reference. Accurate measurement in this state is not possible. It can also result in damage to the pressure transmitter.*
- *Ensure that no mechanical stress is applied to the pressure port during installation as this may result in a shift in the characteristic curve. This applies in particular to very small pressure ranges as well as to devices with plastic pressure ports.*
- *With hydraulic systems, arrange the device so that the pressure port faces up (venting).*

3.3 Mounting

Do not screw in using the housing! Tightening this way can cause damage to the rotary mechanism on the housing.

- *Prior to installing the transmitter, it is essential to verify whether the version of the device on hand completely fulfils the technical and safety requirements of the measuring point. This applies in particular to the measuring range, overpressure resistance, temperature, explosion protection and operating voltage.*
- *Check the materials used for the wetted parts (e.g. gasket, process connection, separating diaphragm etc.) for suitability as regards process compatibility.*
- *The device must not be heated by radiated heat (e.g. exposure to the sun) to an electronics housing surface temperature above the maximum permissible ambient temperature. If it is necessary to prevent damage from heat sources, a heat protection (e.g. sun shade) has to be installed.*

3.3.1 Installation steps for connections acc. to DIN 3852

- Make sure that the O-ring fits properly in the intended groove.
- Ensure that the raised face of the receiving part has a smooth surface.
- Screw the device into the thread by hand.
- Devices with wrench flats must be tightened with a wrench. For information on tightening torque refer to the following table.

Wrench size	Tightening torque [Nm]
Wrench size of steel	
G1/4	approx. 5
G1/2	approx. 10
G3/4	approx. 15
G1	approx. 20
G1 1/2	approx. 25
Wrench size of plastic	
All sizes	max. 3

3.3.2 Installation steps for connections acc. to EN 837

- When sealing, use a suitable gasket that corresponds to the product and pressure to be measured (e.g. a copper gasket).
- Ensure that the raised face of the receiving part has a smooth surface.
- Screw the device into the thread by hand.
- Then tighten the device with the wrench.

Wrench size	Tightening torque [Nm]
G1/4	approx. 20
G1/2	approx. 50

3.3.3 Installation steps for NPT connections

- When sealing, use a suitable sealing agent that is compatible with the product (e.g. PTFE tape).
- Screw the device into the thread by hand.
- Then tighten the device with the wrench.

Wrench size	Tightening torque [Nm]
1/4 NPT	approx. 30
1/2 NPT	approx. 70

4.1 Safety instructions

*All work on the electrical connections may only be carried out with the power disconnected.
Take note of the voltage data on the nameplate!*

Observe the national regulations for electrical installations!

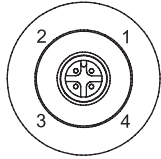
For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

*Observe without fail the local occupational health and safety regulations.
Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.*

*Look at the device nameplate to ensure that the device is delivered according to your order.
Check for the correct supply voltage printed on the nameplate.*

4.2 Terminal assignment

Install the device only when depressurised and without power!

		
Electrical connections	Description	M12x1 (4-pin)
Supply +		1
Supply -		3
Signal 1	IO-Link / PNP / NPN switchable (SIO)	4
Signal 2	PNP / NPN / mA / V switchable	2
Shielding		Pressure-port

4.3 Electrical connection diagram

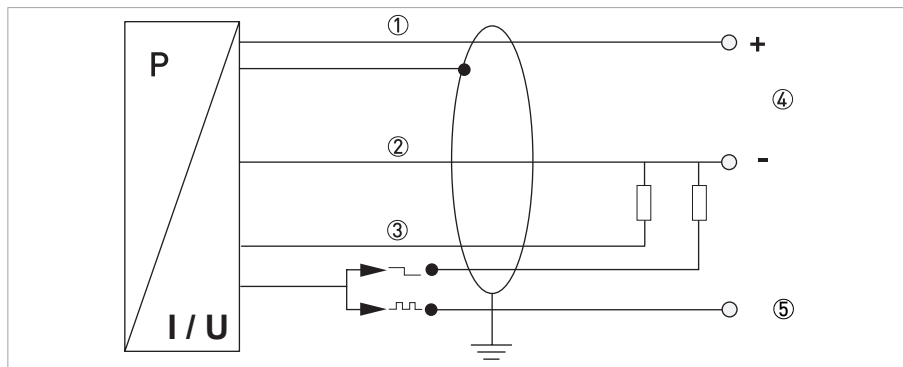


Figure 4-1: Electrical connection diagram 2-wire 4...20 mA

- ① Supply +
- ② Supply -
- ③ Signal 2
- ④ Power supply
- ⑤ IO-Link Master

4.4 Switching output signals

The output for the switching signals can be configured with two different function, both for normally open and normally closed actuators.

Window function

When the window function is activated, the output signal is set when the applied pressure is within the upper (FH) and lower (FL) pressure threshold:

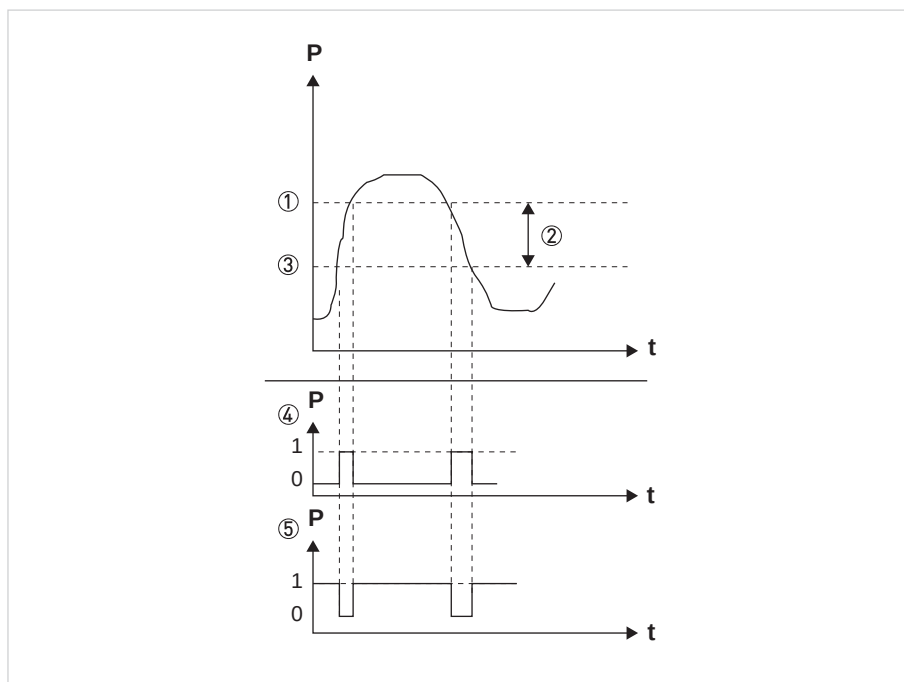


Figure 4-2: Switching output signals (window function)

- ① FH
- ② Pressure range
- ③ FL
- ④ Hno (normally open)
- ⑤ Hnc (normally closed)

Hysteresis-function

When the hysteresis-function is activated, the output signal is activated when the pressure reaches the switching pressure (SP) and deactivated when the release pressure (rP) is applied:

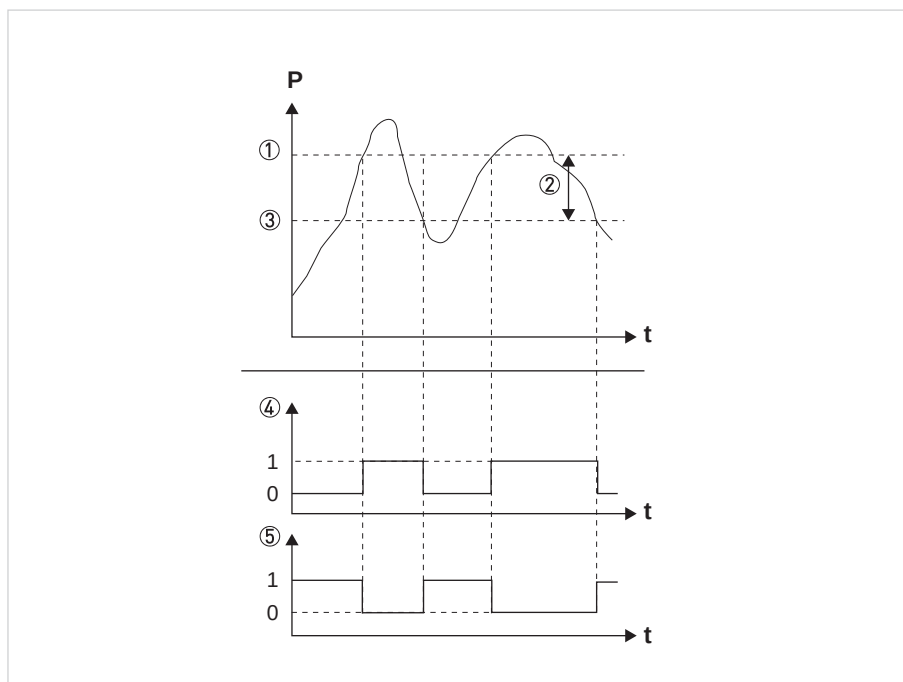


Figure 4-3: Switching output signals (hysteresis-function)

- ① SP
- ② Hysteresis
- ③ rP
- ④ Hno (normally open)
- ⑤ Hnc (normally closed)

Hysteresis-function

To eliminate an unintended switching signal caused by pressure spikes, a damping-constant (dr, dS) can be configured for both switching-functions:

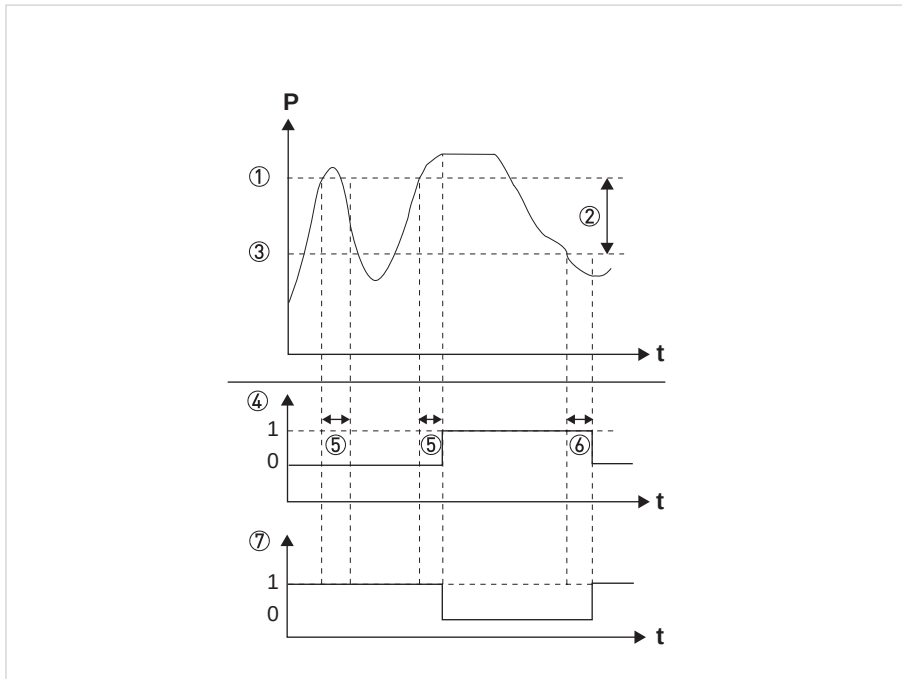


Figure 4-4: Switching output signals (hysteresis-function with damping)

- ① SP
- ② Hysteresis
- ③ rP
- ④ Hnc (normally closed)
- ⑤ dS
- ⑥ dr
- ⑦ Hno (normally open)

The characters of the order code highlighted in light grey describe the standard.

Sensor	Type	
VGKY	4	A Absolute Pressure
		R Gauge Pressure
		N Gauge Pressure with neg. nominal measuring range [-x...+x]
		Measuring Range
		MWP (Max. Working Pressure)
		1 100 mbar / 10 kPa / 1.5 psi 500 mbar / 50 kPa / 7.5 psi (only type N, R)
		2 160 mbar / 16 kPa / 2.3 psi 1 bar / 100 kPa / 14.5 psi (only type N, R)
		4 250 mbar / 25 kPa / 3.6 psi 1 bar / 100 kPa / 14.5 psi (only type N, R)
		5 400 mbar / 40 kPa / 5.8 psi 2 bar / 200 kPa / 29 psi
		6 500 mbar / 50 kPa / 7.5 psi 2 bar / 200 kPa / 29 psi
		7 600 mbar / 60 kPa / 8.7 psi 5 bar / 500 kPa / 72.5 psi
		A 1.0 bar / 100 kPa / 14.5 psi 5 bar / 500 kPa / 72.5 psi
		B 1.6 bar / 160 kPa / 23 psi 10 bar / 1 MPa / 145 psi
		C 2.0 bar / 200 kPa / 29 psi 10 bar / 1 MPa / 145 psi
		D 2.5 bar / 250 kPa / 36 psi 10 bar / 1 MPa / 145 psi
		E 4.0 bar / 400 kPa / 58 psi 20 bar / 2 MPa / 290 psi
		F 5.0 bar / 500 kPa / 72.5 psi 20 bar / 2 MPa / 290 psi
		G 6.0 bar / 600 kPa / 87 psi 40 bar / 4 MPa / 580 psi
		H 10 bar / 1 MPa / 145 psi 40 bar / 4 MPa / 580 psi
		K 16 bar / 1.6 MPa / 232 psi 80 bar / 8 MPa / 1160 psi
		M 25 bar / 2.5 MPa / 363 psi 80 bar / 8 MPa / 1160 psi
		N 40 bar / 4 MPa / 580 psi 100 bar / 10 MPa / 1450 psi
		Z Custom measuring range
		Process Connection / Material
		0 Thread ISO228 G1/2"; DIN 3852; 316L (Pn ≥ 1 bar)
		1 Thread ISO228 G3/4"; DIN 3852; 316L (Pn ≥ 600 mbar)
		2 Thread ISO228 G1"; DIN 3852; 316L
		7 Thread ISO228 G1/2"; hygienic design; DIN3852; 316L (Pn ≥ 1 bar)
		8 Thread ISO228 G1"; hygienic design; DIN3852; 316L
		B Clamp DN25 (1") PN16; DIN 32676 / ISO2852; 316L; 3-A (Pn ≥ 250 mbar)
		C Clamp DN38 (1 1/2") PN16; DIN 32676 / ISO2852; 316L; 3-A
		D Clamp DN51 (2") PN16; DIN 32676 / ISO2852; 316L; 3-A
		K Thread ISO228 G1"; Cone; 316L (Pn ≥ 600 mbar)
		V Varivent®N; DN40 - 162; PN25; 316L; 3-A
		Z Custom process connection
		Diaphragm / Fill Fluid
		S 316L (1.4435); Silicon oil (standard for process connection 0...2)
		T 316L (1.4435); FDA listed food grade oil (standard for process connection 7...V)

										Accuracy Class	
										3	0.35%
										5	0.5% (Pn < 400mbar; measuring range: 1, 2, 4)
										Special	
										0	None
										C	Cooling Fins (Tprocess ≤ 300°C / 572°F)
										Sealing / Temperature	
										0	None (standard for process connection B...V)
										V	FKM; -40 125°C / -40 257°F (standard for process connection 0...8)
										E	EPDM; -40..125°C / -40...257°F (standard for process connection 0...8)
										Approval	
										0	None
										SIL	
										0	None
										Output	
										S	IO-Link, 4..20 mA, 0..10 V, PNP/NPN configurable
										Electrical Connection	
										M	Plug M12x1; 4-pole; IP67
										Language Manual	
										Other languages available upon request.	
										1	EN - English
										2	DE - German
										F	FR - French
										Certificates	
										0	without
										M	see additional VZPA/B code
										Marking	
										0	without
										T	Tag Plate (30 x 19 mm)
										Accessories	
										0	without
										1	Weld-in socket G1/2" DIN3852; 316L
										2	Weld-in socket G1" DIN3852; 316L
										7	Weld-in socket G1/2" DIN3852 hygienic design; 316L
										8	Weld-in socket G1" DIN3852 hygienic design; 316L
										K	Weld-in socket G1" Cone; 316L
VGKU	4					0	0	0	S	M	0





KROHNE – Process instrumentation and measurement solutions

- Flow
- Level
- Temperature
- Pressure
- Process Analysis
- Services

Head Office KROHNE Messtechnik GmbH
Ludwig-Krohne-Str. 5
47058 Duisburg (Germany)
Tel.: +49 203 301 0
Fax: +49 203 301 10389
info@krohne.com

The current list of all KROHNE contacts and addresses can be found at:
www.krohne.com

