

# Electronic pressure switches type DG 5 E

With two signal outputs, DESINA compatible  
4-pin socket M12



Operation pressure  $p_{max} = 600 \text{ bar}$

For piston type pressure switches type DG, see D 5440

## 1. General

### 1.1 Application

The electronic pressure switches type DG 5E... widen the product range, complementing the well approved piston type pressure switches acc. to D 5440. They are intended for high-end applications where e.g. two switch points, high switch operation accuracy, repeatability, programmable hysteresis, high switching frequency and acceleration resistance are a must. Additional feature is the DESINA compatibility and the pressure gauge functionality.

### 1.2 Brief description

The electronic pressure switches type DG 5E... work according to the capacitive principle. They are equipped with high-quality electronics, feature easy handling and are very reliable.

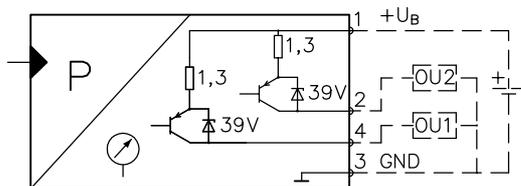
#### Essential functional parts:

- The pressure sensor, ceramic discs manufactured with thick-film technology (capacitive principle)
- Microprocessor controlled evaluation system
- 4-digit LED indication
- 2 yellow LED's indicating the operational state, three green LED's indicating the measuring units
- Two programming buttons
- 2 fully electronic outlets (adjustable PNP or NPN)
- Electrical connection by means of M12 socket
- Housing: Stainless / plastic
- Hydraulic connection: Tapped port G 1/4 (BSPP)
- Watchdog integriert
- 400 bar and 600 bar devices come with restrictor

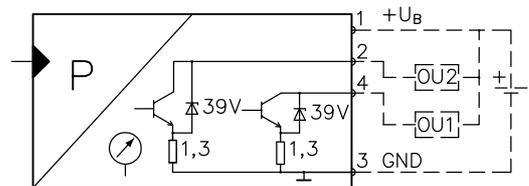
#### Features and benefits:

- Integrated visual function display
- Pressure indication (adjustable bar, PSI or MPa) can be read in standing or hanging position
- Refresh interval for the indication can be selected (50 to 600 ms)
- Indication function can be cut-off
- Easy, straight forward operation and programming
- Both signal outputs are overload resistant and short-cut proof
- High adjustment accuracy and repeatability
- Very high mechanical and electrical service life
- Rugged industrial design
- High IP protection class (IP 67)
- Electronics partly molded
- Provision for a lead seal (optional "protection cap")
- The following may be programmed independently for both switching outputs:
  - Operation as PNP/NPN NO- or NC-contact
  - Switching function as hysteresis or window,
  - Delay times for switch-on and switch-off point
  - Rise time (damping of the analog signal)
- Optional Japan version (indication only in MPa)
- Special interface (EPS) for programming via PC
- Adjustment and transfer of the parameters to other devices via a EPS-programming device (optional)

#### Circuitry

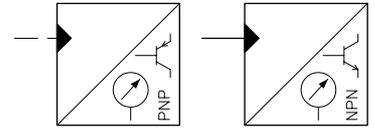


Outputs PNP (switching plus)



Outputs NPN (switching minus)

Symbol  
(simplified illustration for wiring diagrams etc.)



Outputs PNP

Outputs NPN

Pressure switch type DG 5 E...



Accessories

Protecting cap



Hydraulic connectors



## 2. Available versions

### 2.1 Type coding key, accessories

#### 2.1.1 Pressure switch

Order coding:	<b>DG 5 E -</b>	<b>100</b>	<b>Part No.:</b>	6217 8114
		<b>250</b>		6217 8115
		<b>400</b>		6217 8116
		<b>600</b>		6217 8117
Basic type	Pressure ranges			
		0 ... 100 bar		
		0 ... 250 bar		
		0 ... 400 bar		
		0 ... 600 bar		

#### 2.1.2 Accessories

Order coding:	<b>Protecting cap</b>	6217 8047
Transparent protecting cap made of plastic (PU), provision for a lead seal		
Order coding:	<b>MSD-T7</b>	6217 8048
Plug M12, 4-pin, angled		
Order coding:	<b>ERMETO EGE 8-SR-ED</b>	6030 7411
Straight male stud fitting with taper 1/4"-1/4" (BSPP)		
Order coding:	<b>Y1E</b>	6951 3863
Flange adapter (similar hole pattern like DG 3.. acc. to D 5440)		

## 2.2 Technical data

### 2.2.1 General data

Nomenclature	<b>Electronic pressure switch</b>
Pressure connection	G 1/4 conforming DIN ISO 228 (BSPP) (female thread)
Materials in contact with the pressure fluid	V2A (1.4305), ceramic, FKM
Housing materials	V2A (1.4305), V4A (1.4404), PBTP, PC, EPDM/X, FPM,
Electrical port	Via plug M12, 4-pin (industrial standard). Available from HAWE as option, see sect. 2.1.2
Installed position	Any
Mass (weight)	approx. 0.25 kg
Shock resistance acc. to DIN IEC 68-2-27	50 g, 11 ms
Vibration resistance acc. to DIN IEC 68-2-6	20 g, 10-2000 Hz
Protection class EN 60529 or IEC 60529 in properly installed state	IP 67
Ambient temperature	-25° ... + 80°C (at $U_B < 32$ V) -25° ... + 60°C (at $36$ V $\geq U_B \geq 32$ V)
Fluid temperature	-25° ... + 80°C (storage -40° ... +100°C)
Electro-magnetic compatibility (EMC)	Interference emission acc. to EN 50081-1, interference immunity acc. to EN 61000-4-2 ESD 4/8 kV EN 61000-4-3 HF radiation 10 V/m EN 61000-4-4 Burst 2 kV EN 61000-4-5 Surge 0,5/1 kV EN 61000-4-6 HF wire bound 10 V Conforming EC regulation 89/336 EWG

UL-CSA approval: UL-Listing Mark apparent for pressure range 100, 250, and 400 bar



**Attention:** It is mandatory that the device is supplied via a fuse from a galvanically separated source to fulfill the "limited Voltage" requirements acc. to UL 508!

**2.2.2 Hydraulic data**

		DG 5E-100	DG 5E-250	DG 5E-400	DG 5E-600
Measuring range	$p_{\text{range}}$ [bar]	0 ... 100	0 ... 250	0 ... 400	0 ... 600
	[PSI]	0 ... 1450	0 ... 3625	0 ... 5822	0 ... 8700
	[MPa]	0 ... 10	0 ... 25	0 ... 40	0 ... 60
Perm. overload pressure	$p_{\text{max}}$ [bar]	300	400	600	800
	[PSI]	4350	5800	8700	11600
	[MPa]	30	40	60	80
Burst pressure	$p_{\text{burst}}$ [bar]	650	850	1000	1200
	[PSI]	9400	12300	14500	17400
	[MPa]	65	85	100	120
Adjustment ranges:					
Switch-on point, SP1+SP2	[bar]	1 ... 100	2 ... 250	4 ... 400	6 ... 600
	[PSI]	20 ... 1450	40 ... 3620	60 ... 5790	100 ... 8700
	[MPa]	0.1 ... 10	0.2 ... 25	0.4 ... 40	0.6 ... 60
Switch-off point, rP1+rP2	[bar]	0,5 ... 99,5	1 ... 249	2 ... 398	3 ... 597
	[PSI]	10 ... 1440	20 ... 3600	30 ... 5760	50 ... 8650
	[MPa]	0.05 ... 9.95	0.1 ... 24.9	0.2 ... 39.8	0.3 ... 59.7
by steps of	[bar]	0,5	1	2	3
	[PSI]	10	20	30	50
	[MPa]	0.05	0.1	0.2	0.3

**Note:**

The evaluation system can be damaged within the range between  $p_{\text{max}}$  and  $p_{\text{burst}}$  but the equipment remains tight to the outside.

**2.2.3 Electrical data**

Supply voltage	$U_B$	18 .. 36 VDC (protected against reverse polarity and overload resistant up to 40 VDC) Applies only to UL-applications: It is mandatory that the device is supplied via a fuse from a galvanically separated source to fulfill the "limited Voltage" requirements acc. to UL 508!
Stand-by delay	tB	approx. 0,3 s
Idle current consumption	$I_L$	max. 50 mA (self-consumption)
Max. perm. ripple factor	w	10% (ripple)

**Outputs**

(Short-circuit and overload protected):

Current rating	$I_A$	max. 250 mA
Voltage drop	$\Delta U_A$	max. 2 VDC

**Adjustable delay time**

dS1, dr1, and dS2, dr2

0-0.2-0.4- ... 10-11- ... 50 s

Note: dS2 and dr2 are **not active** with OU2 = dESI (DESINA- setting)

**Table of values** for the adjustable response time for the outputs and the max. resulting switching frequency when the pressure signal is square wave (switch-on point SP = 70%, switch-off point rP1 = 30%)

Set response time = dAp	[ms]	3	6	10	17	30	60	125	250	500
Max. switching frequency	[Hz]	170	80	50	30	16	8	4	2	1

**Visual function displays**

Switching states	2 yellow LED's
System pressure, functions	via 4-digit LED indication Indicated pressure unit: via 3 green LED's

**Precision :**

Repeatability	$\pm 0,1\%$ of the value of measuring range
Curve deviation	$\pm 0,5\%$ of the value of measuring range
Hysteresis	$\pm 0,25\%$ of the value of measuring range ( $\pm 0,5\%$ at 600 bar)
Temperature drift over the complete temperature range 0 ... 80°C	$\pm 0,2\%$ of the value of measuring range / 10 K
Long term drift	$\pm 0,05\%$ of the value of measuring range per 6 month
Switching cycles N	> 100 million
Switch point setting	Via programming buttons
Leak resistance at 500 VDC	> 100 M $\Omega$

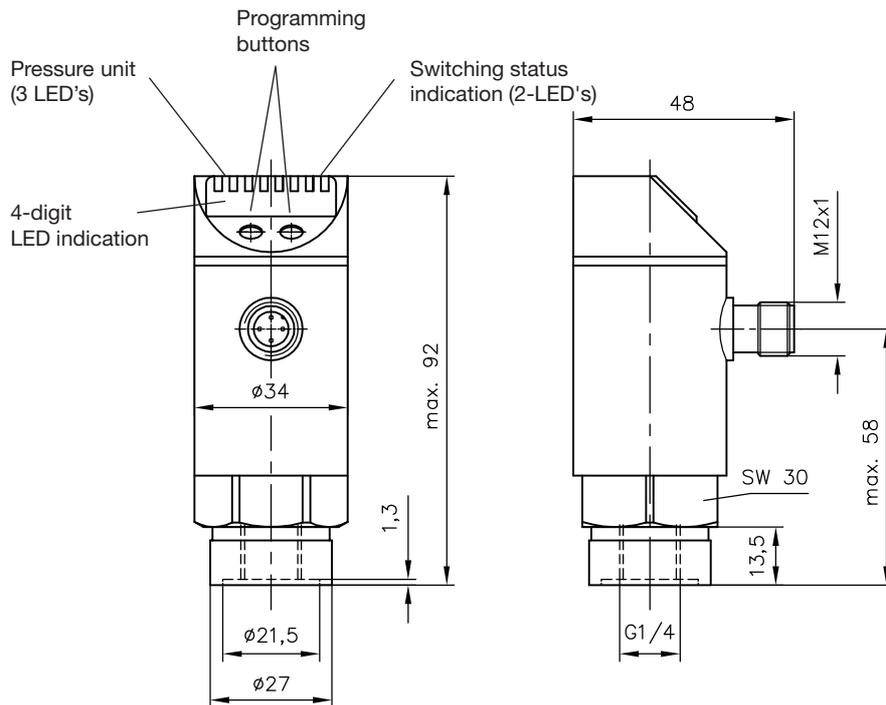
**2.2.4 Elektro-magnetic compatibility (EMC)**

The EMC of the device was checked by an accredited approval institute (interference immunity acc. to EN 50081-1 and interference emission acc. to EN 61000-4-++). This EMC test doesn't relieve the user from the proper execution of a specified EMC test for his complete system, since these test assemblies represent only a typical application (conforming the EC-guideline 89/336/EWG).

### 3. Unit dimensions

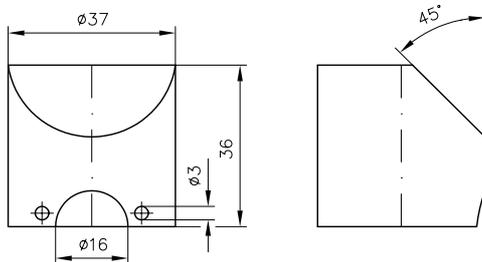
All dimensions in mm, subject to change without notice!

#### 3.1 Electronic pressure switch

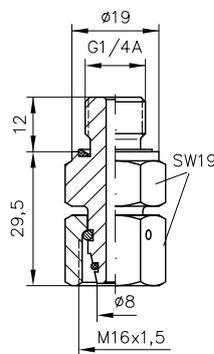


#### 3.2 Accessories

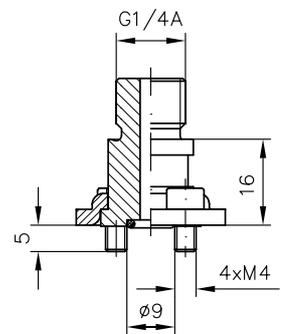
**Protecting cap**  
Transparent (material PU)



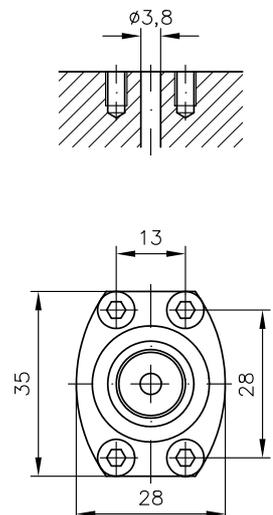
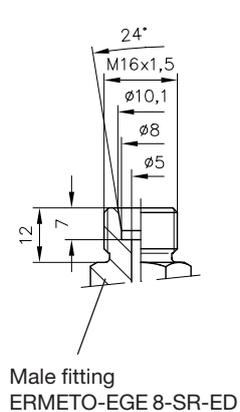
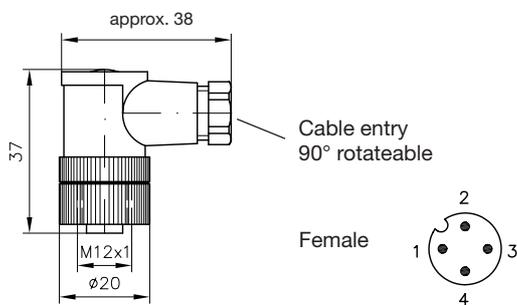
**ERMETO-EGE 8-SR-ED**  
Straight male stud fitting with taper



**Y1E**  
Flange adapter



**MSD-T7 M12**  
Plug



## 4. Mounting and adjustment manual

### 4.1 Mounting

Mount the electronic pressure switch at a suitable test port (see accessories).

Switch your system in unstressed mode and attach the equipment electrically via plug M12 (see assembly accessories in sect. 2.1.2). Please take into account, that any assembly accessories is not scope of delivery with the pressure switch, therefore it must be ordered separately if required

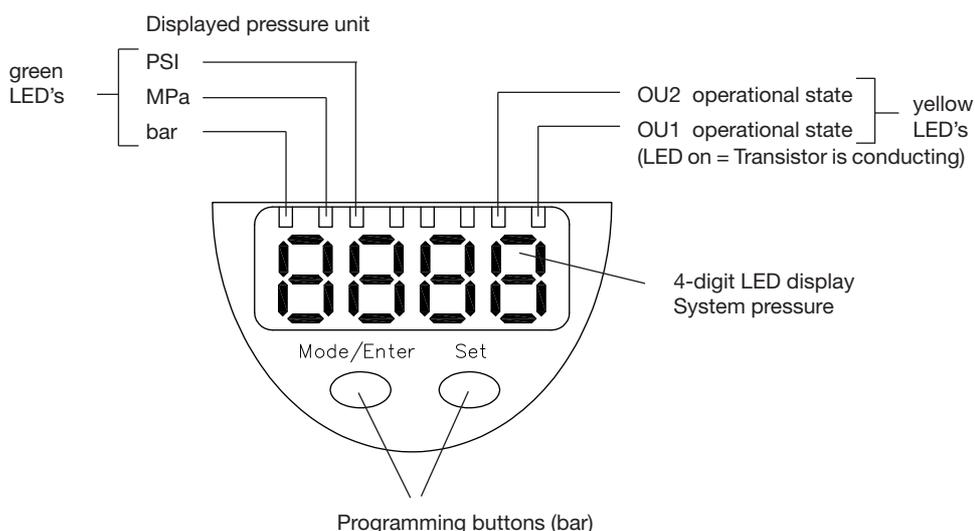
The protecting cap (see sect. 2.1.2) is another option which protects the programming buttons / display against paint, dust etc. It also gives provision for a lead seal preventing unauthorized adjustment after the final setting procedure.

**Attention:** It is mandatory that the device is supplied via a fuse from a galvanically separated source to fulfill the "limited Voltage" requirements acc. to UL 508!

400 bar and 600 bar devices come with restrictor to prevent excessive pressure. The plug M12x1 cannot be rotated! Any forced rotation will harm the device - corresponding defects are not covered by guaranty.

### 4.2 Program and control of the preset values

#### Operating devices and display elements



The electronic pressure switch type DG 5E.. is programmed by means of the two programming buttons "MODE/ENTER" and "SET". The current system pressure is indicated on the 4-digit LED indication while in operation mode.

The program will return automatically to operation mode if both programming buttons weren't actuated for at least 15 sec.

You can achieve and move within the first programming level (level 1) via the programming button "MODE/ENTER". The table (page 6 and 7) lists its sequential steps starting from operation mode but it will return automatically to it, if the button wasn't actuated for at least 15 sec.

You can check or reset parameters within the second programming level (level 2) which is achieved via the programming button "SET".

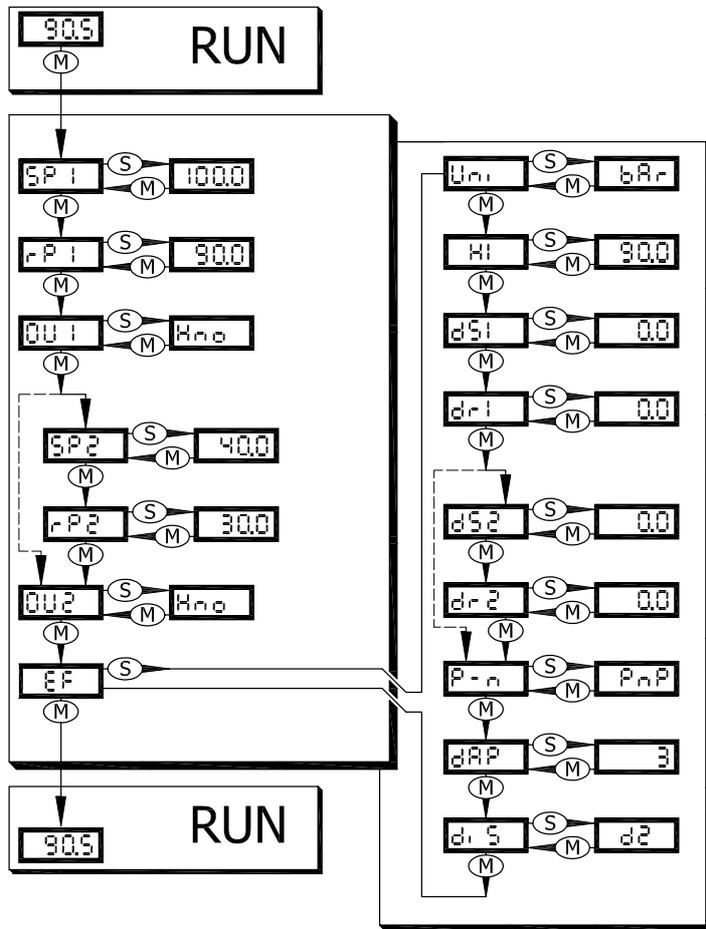
Set the displayed units (**Uni**) before adjusting the parameters **SPx** and **rPx**. This will eliminate rounding errors during internal conversion from one to another unit and makes sure you'll receive exactly the desired results.

Default unit setting: **Uni = bAr**

When it is pressed only briefly the indication will show the current parameter setting (value) for 5 sec and return automatically to level 1 and then to operation mode. But if "SET" is pressed longer than 5 sec the current parameter setting will count up with increasing speed (for steps see table), alternatively you can achieve the desired value by frequent hitting of "SET" after the initial 5 sec.

Via "MODE/ENTER" you can save your new setting and return automatically to operation mode otherwise your setting won't be saved (old setting will be retained) and it returns automatically back to operation mode after 15 sec.

Menue overview



Adjustable parameter

<p>SP 1 SP 2</p>	<p><b>Switch-on point 1 / 2</b> Upper limit, when the output will change its switching state Adjustment range → sect. 2.2.2 SP2 is only active, when OU2 = Hno, Hnc, Fno or Fnc</p>
<p>rP 1 rP 2</p>	<p><b>Switch-off point 1 / 2</b> Lower limit, when the output will change its switching state. rPx is always smaller than SPx. Only figures smaller than SPx can be entered. The switch-off point is tracked i.e. it will move whenever the switch-on point is altered (constant distance between SPx and rPx). In case the distance is higher than the new switch-on point it will be reduced automatically i.e. rPx is set on minimum. Adjustment range → sect. 2.2.2 rP2 is only active, when OU2 = Hno, Hnc, Fno or Fnc</p>
<p>OU 1</p>	<p><b>Configuration for output 1</b> 4 switching functions can be adjusted Hno = Hysteresis/NO-contact Hnc = Hysteresis/NC-contact Fno = Window function/NO-contact Fnc = Window function/NC-contact</p>
<p>OU 2</p>	<p><b>Configuration for output 2</b> 4 switching functions can be adjusted Hno = Hysteresis/NO-contact Hnc = Hysteresis/NC-contact Fno = Window function/NO-contact Fnc = Window function/NC-contact dES1 = Output 2 serves a diagnosis output (DESINA)</p>
<p>EF</p>	<p><b>Extended functions</b> This menu item contains a submenu with further parameters. The submenu is opened by briefly pressing the “Set”-button. When safeguarded with a access code, “Cod1” will be flashing on the indication. - Press the “Set”-button and keep it pressed until the valid Code-No. is displayed. - Press briefly the “Mode/Enter”-button. Default setting when delivered by HAWE: No access restriction!</p>

## Submenu in EF - (extended functions)

Uni	<p><b>Displayed units</b></p> <p>The measurement and the parameter for SPx and rPx can be displayed in the following units: <b>bar, PSI, (M)Pa</b></p> <p>Set the displayed units (Uni) <b>before</b> adjusting the parameters SPx and rPx. This will eliminate rounding errors during internal conversion from one to another unit and makes sure you'll receive exactly the desired results.</p> <p>Default unit setting: <b>Uni = bar</b></p>
HI	<p><b>Min-Max-memory for the system pressure</b> (can be read only)</p> <ul style="list-style-type: none"> <li>● HI: Indicated the highest pressure measured</li> </ul> <p>Deleting the memory:</p> <ul style="list-style-type: none"> <li>- Press the "Mode/Enter"-button, until "HI" is displayed.</li> <li>- Press the "Set"-button and keep it pressed until "---" is displayed.</li> <li>- Press briefly the "Mode/Enter"-button.</li> </ul>
dS1 dS2 dr1 dr2	<p><b>Delay time for the outputs</b></p> <p>dSx = Switch-on delay; drx = Switch-off delay.</p> <p>The output's switching state will not change immediately after the switching process, but first after the delay time, i.e. when a switching state is not maintained over this delay time it will not be displayed.</p> <p>Adjustment range: 0 (=delay time isn't active) - 0.2 ... 50 s, in steps of 0.2 s.</p> <p>dS2 / dr2 is <b>not</b> active, when <b>OU2 = DESI</b> (DESINA).</p>
P - n	<p><b>Circuitry of the outputs</b></p> <p>Two different settings are possible:</p> <p>PnP = switching plus / rPn = switching minus</p> <p>The setting applies on both outputs</p>
dAP	<p><b>Dampening of the outputs</b></p> <p>This function minimizes the effects of pressure peaks or high frequency.</p> <p>dAP-value = Response time between pressure change and alternation of the switching state in milliseconds (ms).</p> <p>For the table, see sect. 2.2.3</p>
d1 S	<p><b>Adjusting the indication</b></p> <p>The following 7 settings are possible:</p> <ul style="list-style-type: none"> <li>d1 = Indication refresh every 50 ms.</li> <li>d2 = Indication refresh every 200 ms.</li> <li>d3 = Indication refresh every 600 ms.</li> </ul> <p>The indication refresh applies only to the indication and not the output.</p> <p>rd1, rd2, rd3 = Indication like d1, d2, d3; but turned-over by 180°.</p> <p>OFF = The indication is cut-off while in "Run-State". The current pressure will be displayed after one of the buttons is pressed for more than 15 sec. When the "Mode/Enter"-button pressed one again the "Indication-State" is started. The LED's remain active even when the indication is cut-off.</p>

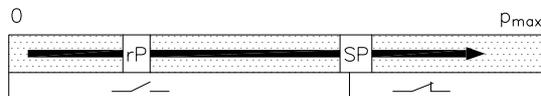
### 4.3 Lock / Unlock of the programming buttons

Press both buttons "MODE/ENTER" and "SET" for 10 sec to lock the programming buttons **LOC** is displayed as confirmation. Press both buttons "MODE/ENTER" and "SET" to unlock the programming buttons until **uLOC** is displayed. Adjustment will fail when tried while the device is locked (display "LOC") **LOC**

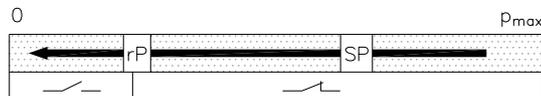
### 4.4 Notes for some switching functions

For nom. pressure range  $p_{range}$  and permissible pressure range  $p_{max}$ , see sect. 2.2.2.

#### 4.4.1 Hysteresis NO-contact

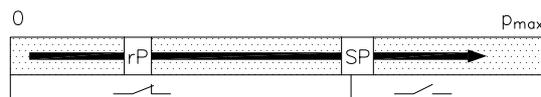


Output = ON if switch point "SP" is achieved

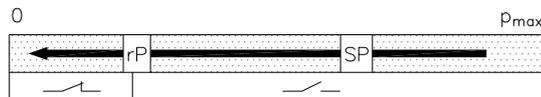


Output = OFF if switch point "rP" is achieved

#### 4.4.2 Hysteresis NC-contact

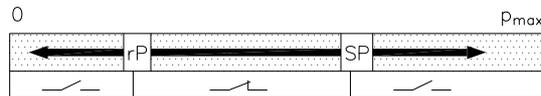


Output = OFF if switch point "SP" is achieved



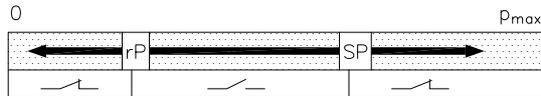
Outlet = ON if switch point "rP" is achieved

#### 4.4.3 Window function NO-contact



Output = ON if the system pressure is between switch point "SP" and switch-off point "rP"

#### 4.4.4 Window function NC-contact



Output = OFF if the system pressure is between switch point "SP" and switch-off point "rP"

#### 4.4.5 Rise time (damping)

This is the time which the pressure sensor requires to supply an analogous response signal (from 10 to 90%) after a step change of the system pressure (see also table of values in sect. 2.2.3).

### 4.5 Indications

#### 4.5.1 Fault indications during operation

OL	Pressure overload (measuring range exceeded)
SC 1	Flashing: Short-cut at output 1*
SC 2	Flashing: Short-cut at output 2*
SC	Flashing: Short-cut at both outputs*
Err	Flashing: Internal error

\* The respective output is cut-off, as long as the short-cut is existing. Indications SC1, SC2, SC, Err are also displayed when the indication is cut-off.

#### 4.5.2 Diagnosis function similar to DESINA specifications

Output 2 serves as diagnosis output, when  $OU2 = DESI$

- When there is no error, the output is connected through and  $U_B +$  (with  $P - n = P_n P$ ) or GND (with  $P - n = n P_n$ ) is apparent.
- The output is not active when there is an error.

The following errors are detected:

Ceramic disc (sensor) faulty; short-cut at output 1; measuring range exceeded; EEPROM-error; RAM-error; processor-error.