Pressure switches

Hydraulic-electric signal converter, optional with teach-in function, 2 switching outputs/ 1 analogue output (optional)

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1 Description

These pressure switches measure the pressure in hydraulic systems and convert it into electrical signals.
All devices are provided with 2 outputs. While output 1 is a freely programmable switching output, output 2 can be selected as analogue output, switching output or alarm output.

The switching and reset points, the output logic and time delays can be programmed through the membrane keyboard.
Display and analogue output are equipped with adjustable damping for dynamic measurements.

2 Validity of the documentation

This document applies to the following products:

Pressure switches of data sheet F9734. The following types or part numbers are concerned:

Pressure switch with classic parametrisation:
- 9740 049A

Pressure switch with teach-in function:
- 9740 050A

3 Target group of this document

- Specialists, fitters and set-up men of machines and installations with hydraulic expert knowledge.

- Specialists, fitters and set-up men of machines and installations with expert knowledge in electrical engineering.

Qualification of the personnel
Expert knowledge means that the personnel must
- be in the position to read and completely understand technical specifications such as circuit diagrams and product-specific drawing documents,
- have expert knowledge (electric, hydraulic, pneumatic knowledge, etc.) of function and design of the corresponding components.

An **expert** is somebody who has due to its professional education and experiences sufficient knowledge and is familiar with the relevant regulations so that he
- can judge the entrusted works,
- can recognize the possible dangers,
- can take the required measures to eliminate dangers,
- knows the acknowledged standards, rules and guidelines of the technology.
- has the required knowledge for repair and mounting.

4 Symbols and signal words

⚠ WARNING

Person damage

Stands for a possibly dangerous situation.
If it is not avoided, death or very severe injuries will result.

⚠ CAUTION

Easy injuries / property damage

Stands for a possibly dangerous situation.
If it is not avoided, minor injuries or material damages will result.

Hazardous to the environment

The symbol stands for important information for the proper handling with materials that are hazardous to the environment.
Ignoring these notes can lead to heavy damages to the environment.

Note

This symbol stands for tips for users or especially useful information. This is no signal word for a dangerous or harmful situation.

5 For your safety

5.1 Basic information

The operating instructions serve for information and avoidance of dangers when installing the products into the machine as well as information and references for transport, storage and maintenance.
Only in strict compliance with these operating instructions, accidents and property damages can be avoided as well as trouble-free operation of the products can be guaranteed.
Furthermore, the consideration of the operating instructions will:

- avoid injuries
- reduce down times and repair costs,
- increase the service life of the products.

5.2 Safety instructions

The product was manufactured in accordance with the generally accepted rules of the technology.
Observe the safety instructions and the operating instructions given in this manual, in order to avoid personal damage or material damage.

- Read these operating instructions thoroughly and completely, before you work with the product.
- Keep these operating instructions so that they are accessible to all users at any time.
- Pay attention to the current safety regulations, regulations for accident prevention and environmental protection of the country in which the product will be used.
- Use the ROEMHELD product only in perfect technical condition.
- Observe all notes on the product.
- Use only accessories and spare parts approved by the manufacturer in order to exclude danger to persons because of not suited spare parts.
- Respect the intended use.
- You only may start up the product, when it has been found that the incomplete machine or machine, in which the product shall be mounted, corresponds to the country-specific provisions, safety regulations and standards.
- Perform a risk analysis for the incomplete machine, or the machine.
  Due to the interactions between the product and the machine/fixture or the environment, risks may arise that only can be determined and minimized by the user, e.g. :
  - generated forces,
  - generated movements,
  - Influence of hydraulic and electrical control,
  - etc.

6 Application

6.1 Intended use

Pressure switches are used in industrial applications:

- to switch on and off motor pumps
- to switch to unpressurised mode
- for sequence control of solenoid valves
- for pressure-dependent machine tool interlock

Furthermore the following belongs to possible uses:

- Use within the capacity indicated in the technical characteristics (see data sheet).
- Use as per operating instructions.
- Compliance with service intervals.
- Qualified and trained personnel for the corresponding activities.
- Mounting of spare parts only with the same specifications as the original part.

6.2 Misapplication

⚠ WARNING

Injuries, material damages or malfunctions!

Modifications can lead to weakening of the components, reduction in strength or malfunctions.

- Do not modify the product!

The use of these products is not admitted:

- For domestic use.
- On pallets or machine tool tables in primary shaping and metal forming machine tools.
- In areas for which special guidelines apply, especially installations and machines:
  - For the use on fun fairs and in amusement parks.
  - In food processing or in areas with special hygiene regulations.
  - In mines.
  - In explosive and aggressive environments (e.g. ATEX).
- For other operating and environmental conditions.

In an environment with high risk of contamination, for example

- dust
- swarf
- coolants
- or the like

A protective housing is to be planned.

Special solutions are available on request!

7 Installation

⚠ WARNING

Injury by high-pressure injection (squirting out of hydraulic oil under high pressure)!

Improper connection can lead to escapes of oil under high pressure at the connections.

- Mounting or dismounting of the element must only be made in depressurised mode of the hydraulic system.
- Connection of the hydraulic line as per DIN 3852/ISO 1179.
- Unused connections have to be locked professionally.
- Use all mounting holes.

Injury by high-pressure injection (squirting out of hydraulic oil under high pressure)!

Wear, damage of the seals, ageing and incorrect mounting of the seal kit by the operator can lead to escapes of oil under high pressure.

- Before using them make a visual control.

Poisoning due to contact with hydraulic oil.

Wear, damage of the seals, aging and incorrect mounting of the seal kit by the operator can lead to escapes of oil.

Incorrect connection can lead to escapes of oil at the ports.

- For handling with hydraulic oil consider the material safety data sheet.
- Wear protection equipment.

⚠ CAUTION

Operation with inductive loads

For operation with inductive load, a protective circuit is to be planned.

7.1 Design

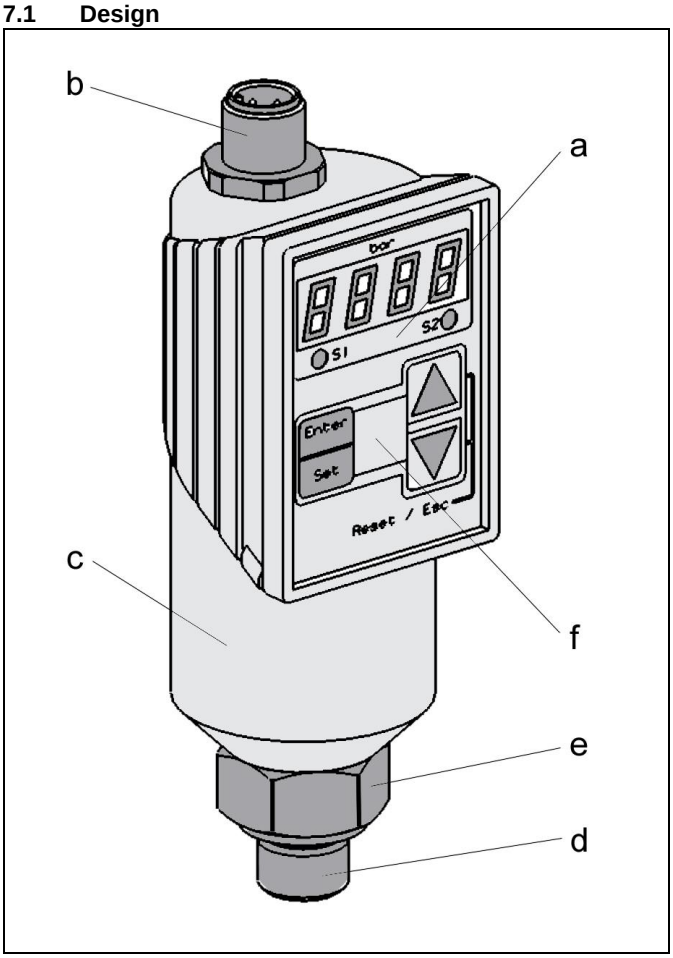

Figure 1: Components

a	Operating and display panel	d	Connection / connecting thread
b	Connection for 4-pole plug, M12	e	Spanner flat
c	Housing	F	Field for optical interface (accessory)

7.2 Operating and display panel

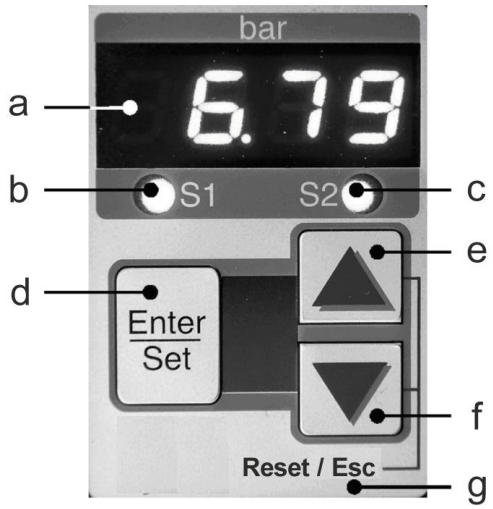

Figure 2: Operating and display panel

Description / Function	Symbol
a four-digit display to display the system pressure → Parameters, parameter values	265.4
b LED red S1 → Display of the switching state of output 1 Is lit if the switching output is switched	-
c LED red S2 → Display of the switching state of output 2 Is lit if the switching output is switched	-
d Program key Enter / Set → Selection of the menus and parameters Confirm and save the parameters	Enter / Set
e Arrow key up → Setting of the parameter values - increase of the value (continuously and quickly with continuous pressure, gradually with individual pressure)	▲
f Arrow key down → Setting of the parameter values - decrease of the value (continuously and quickly with continuous pressure, gradually with individual pressure)	▼
g Key Reset / Esc → Finish programming without saving / keyboard lock Press arrow key up and arrow key down at the same time	▲ ▼ Reset / Esc

7.2.1 Display

4-digit LED display.
Symbolic description:

Description / Function	Symbol
Indicates the current system pressure (RUN mode), menu names, parameters and parameter values.	265.4
Blinking display in the RUN mode: Error report (Error). 3 x blinking in programming mode: Value will be saved by pressing Enter/Set key.	265.4
The indication on the display depends on the programmed functions. Only if one of these functions is selected in the expanded menu, the indication will be shown in the base menu on the display	SP2

7.2.2 Program key Enter / Set

Description / Function	Symbol
Selection of menus and submenus as well as confirmation and saving of parameter values. **Short** pressing in the RUN mode: Starting the base menu.	Enter / Set

7.2.3 Arrow keys

Description / Function	Symbol
Increase and decrease of the parameter values as well as scrolling in the menus. Continuous pressing of the keys increases or decreases the value in "fast-forward" mode. With single key press, the value changes gradually.	▼ and ▲

7.2.4 Reset / Esc key

Description / Function	Symbol
Simultaneous pressing both arrow keys results in the key function Esc. With this function you can step backwards inside the menus and parameters without saving the settings. In order to quit all menus and submenus, please press the keys again and again until you are back in the RUN mode.	▲ ▼ Reset / Esc **at the same time** ▼ + ▲

7.2.5 Keyboard lock

Description / Function	Symbol
Simultaneous pressing of both arrow keys for at least 5 seconds to activate the keyboard lock. Device must be in the RUN mode. On the display, the writing "sLOC" blinks 3 times. Now the adjusted settings in the menus can be read but not changed. The keyboard lock is deactivated by renewed simultaneous pressing of both keys for at least 5 seconds.	**at the same time** ▼ + ▲ **min. 5 sec.**

7.2.6 Overview of the menu levels

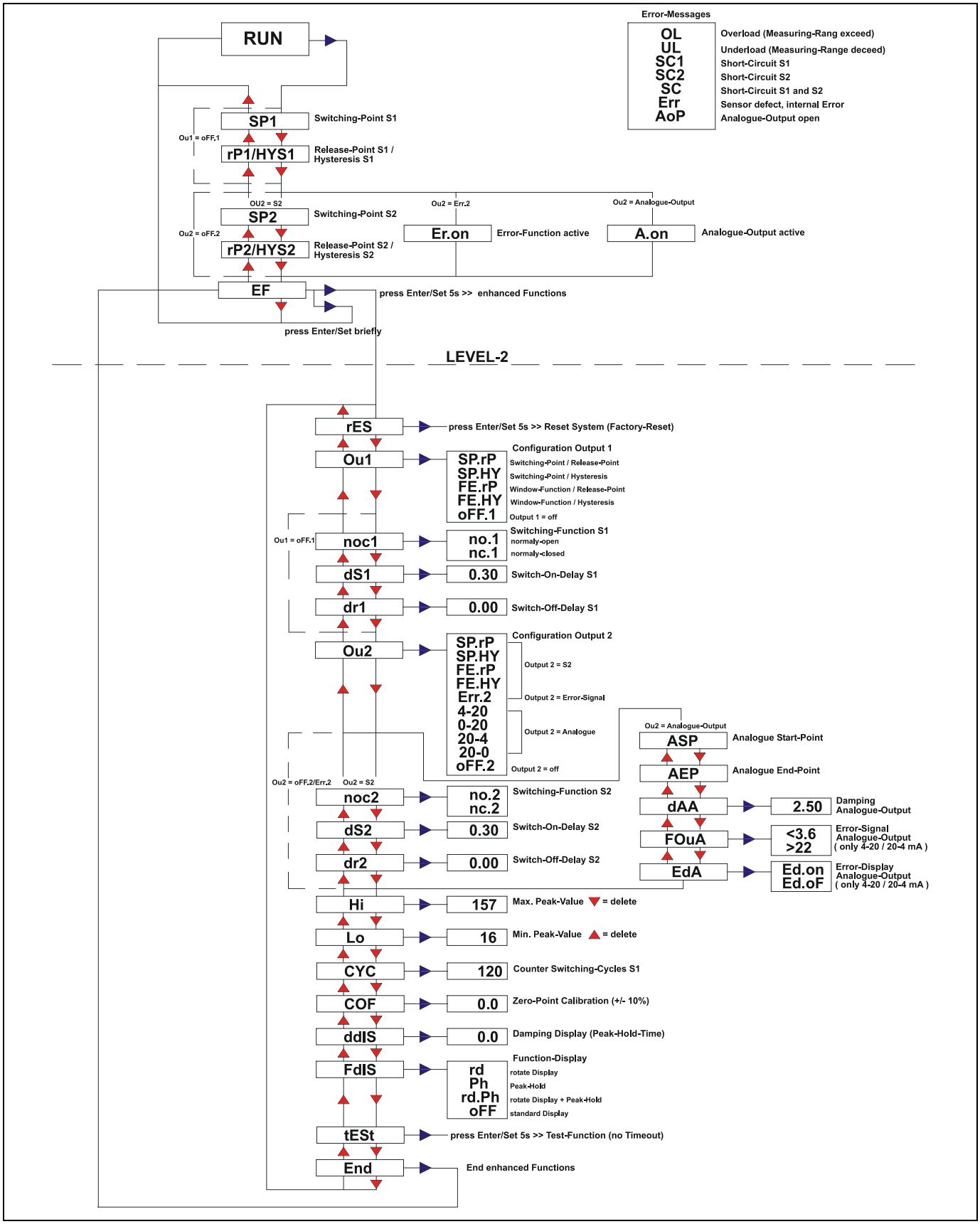

Figure 3: Menu levels 1 and 2

7.3 Operating and display panel

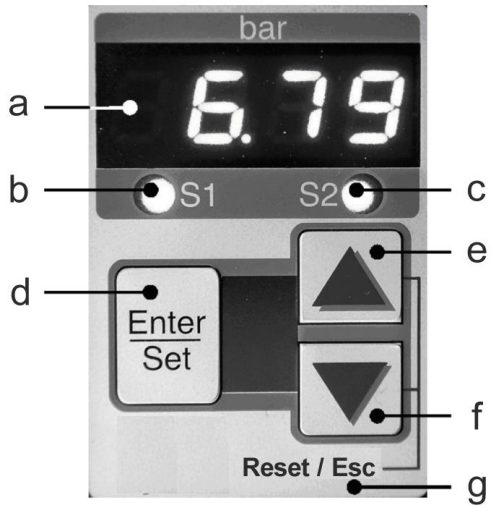

Figure 4: Operating and display panel

Description / Function	Symbol
a four-digit display to display the system pressure → Parameters, parameter values	265.4
b LED red S1 → Display of the switching state of output 1 Is lit if the switching output is switched	-
c LED red S2 → Display of the switching state of output 2 Is lit if the switching output is switched	-
d Program key Enter / Set → Teach current pressure value → Selection of the menus and parameters Confirm and save the parameters	Enter / Set
e Arrow key up → Setting of the parameter values - increase of the value (continuously and quickly with continuous pressure, gradually with individual pressure)	▲
f Arrow key down → Setting of the parameter values - decrease of the value (continuously and quickly with continuous pressure, gradually with individual pressure)	▼
g Key Reset / Esc → Activation of the TEACH mode → Finish programming without saving / keyboard lock Press arrow key up and arrow key down at the same time	▲ ▼ Reset / Esc

7.3.1 Display

4-digit LED display.
Symbolic description:

Description / Function	Symbol
Indicates the current system pressure (RUN mode), menu names, parameters and parameter values.	265.4
Blinking display in the RUN mode: Error report (Error). 3 x blinking in programming mode: Value will be saved by pressing Enter/Set key. Cyclic extinguishing display: TEACH mode is activated	265.4
The indication on the display depends on the programmed functions. If one of these functions is selected in the expanded menu, the indication will be shown in the base menu on the display.	SP2

7.3.2 Program key Enter / Set

Description / Function	Symbol
Operation in the TEACH mode: Teach (set) the current pressure value and return to RUN mode. **Short** pressing in the RUN mode: Starting the base menu. On the display the writing "EF" appears. Selection of menus and submenus as well as confirmation and saving of parameter values.	Enter / Set

7.3.3 Arrow keys

Description / Function	Symbol
Increase and decrease of the parameter values as well as scrolling in the menus. Continuous pressing of the keys increases or decreases the value in "fast-forward" mode. With single key press, the value changes gradually.	▼ and ▲

7.3.4 Reset / Esc key

Description / Function	Symbol
Simultaneous pressing of both arrow keys for at least 3 s in the RUN mode results in the function TEACH mode (Reset). Note: Only in TEACH mode the Teach-in function can be effected with the program key Enter/Set. **Simultaneous pressing of both arrow keys** outside the RUN mode results in the key function "Esc"(Escape) With this function you can step backwards inside the menus and parameters without saving the settings. In order to quit all menus and submenus, please press the keys again and again until you are back in the RUN mode.	▲ ▼ Reset / Esc at the same time ▼ + ▲

7.3.5 Keyboard lock

Description / Function	Symbol
The keyboard lock can be activated by **simultaneous pressing of both keys for at least 5 seconds**. This can only be made in the base menu (obvious on the display by the writing "EF"). On the display, the writing "sLOC" blinks 3 times. Now the adjusted settings in the menus can be read but not changed. The keyboard lock is deactivated by re-newed simultaneous pressing of both keys for at least 5 seconds.	at the same time  min. 5 sec.

7.3.6 Overview of the menu levels

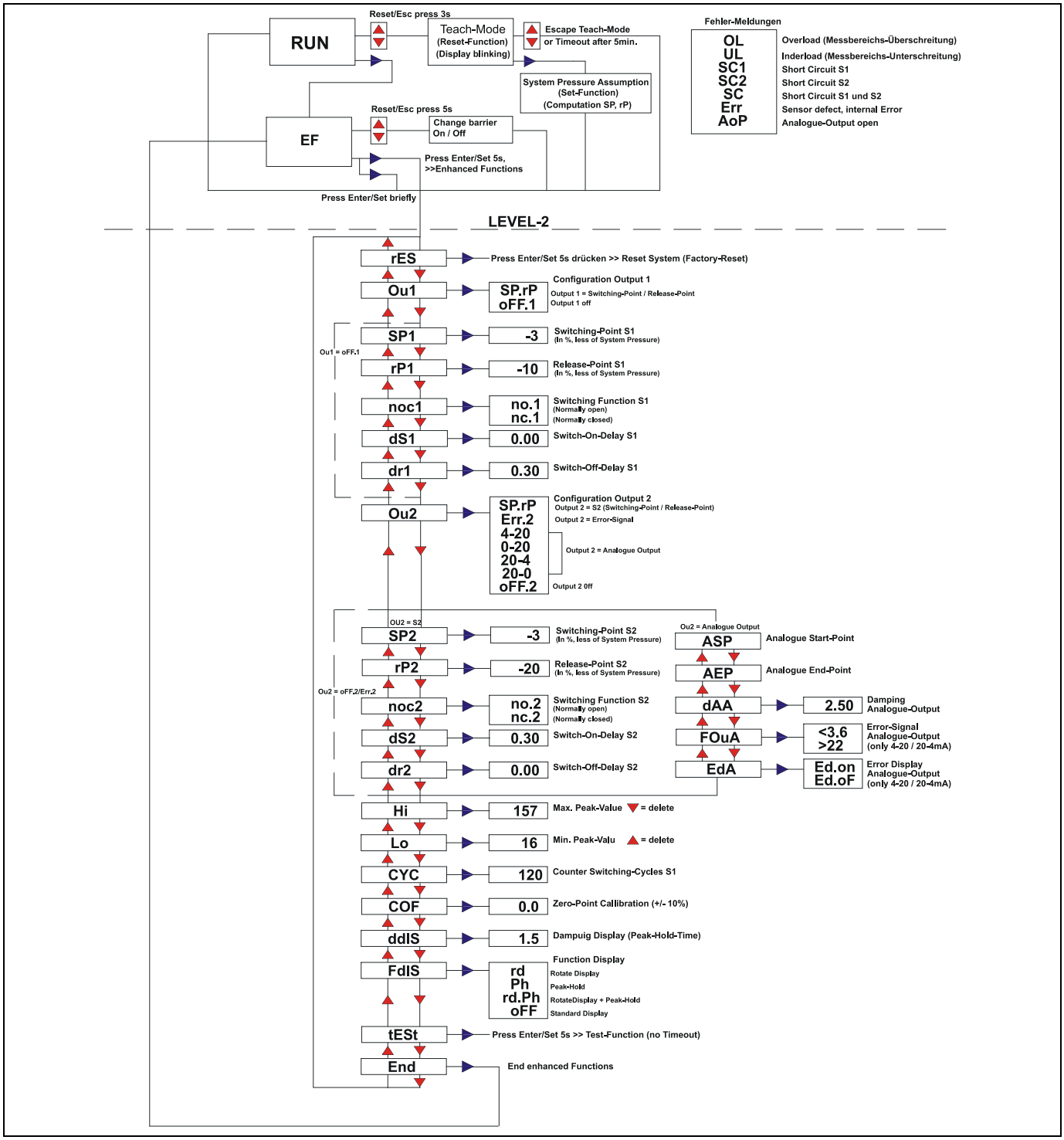

Figure 5: Menu levels 1 and 2

7.4 Mounting - installation

⚠ CAUTION

Product installed in accordance with the specified protection

The product is designed in accordance with the indicated code class (see technical characteristics).

- Plan protection cover or protection housing, if necessary.

NOTE

Accessories

Accessories, available on request.

7.5 Connection of the hydraulic equipment

⚠ CAUTION

Damage of components!

Irreparable damage of the pressure diaphragm!

- Do **not** touch the opening of the pressure connection with a pointed object.

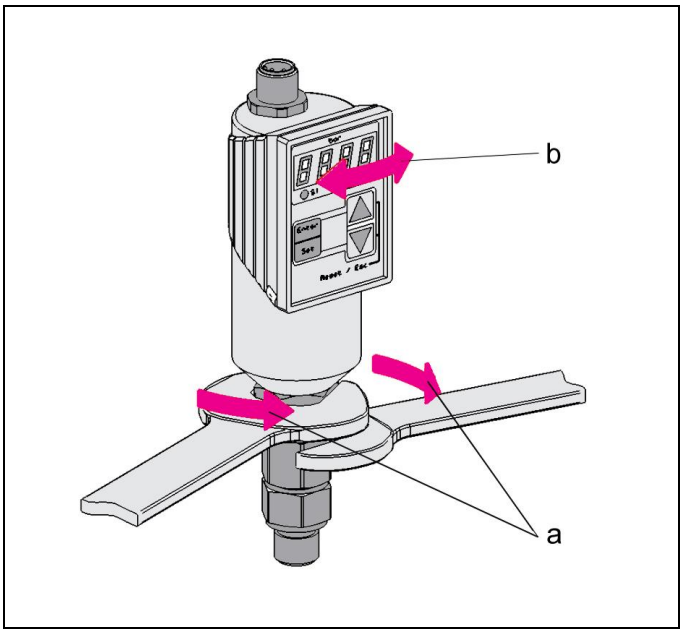

Figure 6: Hold for mounting

a Hold for mounting	b Display panel ►**Note:** Rotatable by max. 350°

1. Connect hydraulic lines to qualifying standards and pay attention to scrupulous cleanness!

⚠ CAUTION

Material damage due to blockade!

If the housing cannot rotate freely or hits a component, the internal electronic will be damaged.

- Hold the pressure switch as shown.

2. Hold for mounting.
   Max. seating torque 55 Nm

NOTE

More details

- See ROEMHELD data sheets A 0.100, F 9.300, F 9.310 and F 9.360.

Screwed Plug

- Use only fittings "screwed plug B and E" as per DIN 3852 (ISO 1179).

Hydraulic connection

- Do not use sealing tape, copper rings or coned fittings.

Pressure fluids

- Use hydraulic oil as per ROEMHELD data sheet A 0.100.

7.6 Electric connection

⚠ CAUTION

Work by qualified personnel

- Works only to be effected by authorised personnel.

Mounting components of the customer!

- When mounting components of the customer no damages may occur at the product .

NOTE

- Power supply as per EN 50178.
- Use shielded cable box to avoid possible interference coupling.

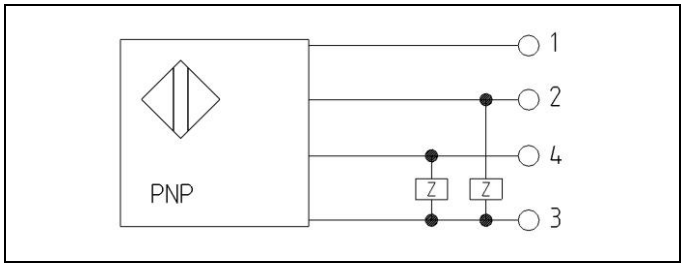

Figure 7: Circuit diagram of the pressure switch

Pin	Function	Wire colour
1	**+U_B**	Brown
2	**Output 2** • Switching output e.g. machine tool interlock (switch-back point 80%) • Analogue output • Alarm output	White
3	**0 V**	Blue
4	**Output 1** • Switching output e.g. system pressure (switch-back point 90%)	black

8 Start up

8.1 Functioning of the switching outputs

Note:

- The represented examples and descriptions of the switching outputs (SP-1) refer to the switching function "normally open" (no). With the programmed switching function "normally closed" (nc) the states are reversed.
- The minimum distance between the switching point and the reverse switching point is set by the system to 1 bar.

- The smallest adjustable hysteresis is set by the system to 1 bar.
- All examples can also be used for output 2, if this output is programmed as switching output (SP-2).

8.1.1 Switching point with reverse switching point (example)

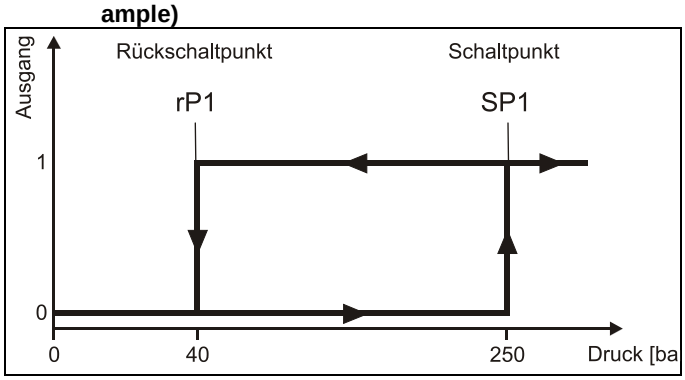

Figure 8: Diagram - switching point with reverse switching point

Programmed parameters:
SP.1: 250.0 bar
rP.1: 40.0 bar

A pressure increase to SP.1 (e.g. 250 bar) reverses the output according to the set switching function (no or nc). The switching state remains the same for higher pressure.
With decreasing pressure the switching state of the output changes with the pressure value rP.1. If SP.1 will be changed, rP.1 remains the same.
The minimum distance between SP1 and rP.1 is set by the system to 1 bar.

8.1.2 Switching point with hysteresis (example)

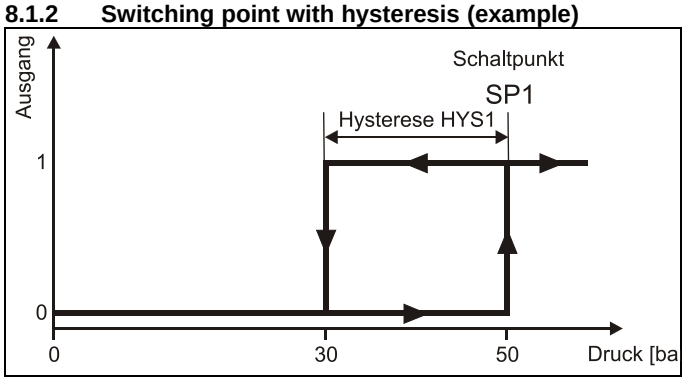

Figure 9: Diagram - switching point with hysteresis

Programmed parameters:
SP.1: 50.0 bar
HYS.1: 20.0 bar

A pressure increase to SP.1 (e.g. 50 bar) reverses the output according the set switching function (no or nc). The switching state remains the same for higher pressure.
With decreasing pressure the switching state of the output reverses only after passing the hysteresis (e.g. 20 bar). If SP.1 will be changed, the hysteresis remains the same, i.e. the reverse switching point is (SP.1 – 20) bar.

8.1.3 Window function with reverse switching point (example)

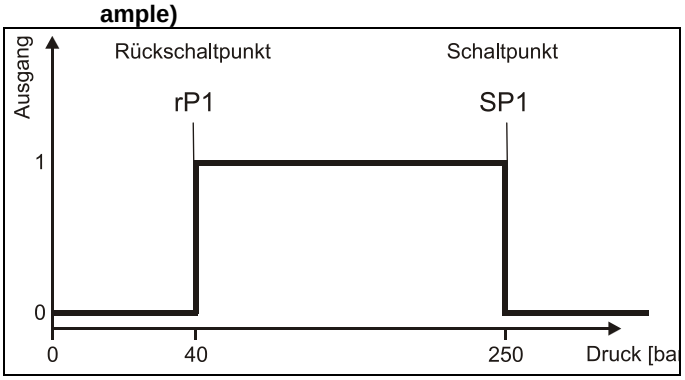

Figure 10: Diagram - switching point with reverse switching point

Programmed parameters:
SP.1: 250.0 bar
rP.1: 40.0 bar

The window function allows the monitoring of a defined pressure range.
As soon as the pressure reaches the set switching window between rP.1 (40 bar) and SP.1 (250 bar), the output reverses as per the set switching function (no or nc). The switching state changes again when leaving the window. The entry direction and/or exit direction is insignificant. The values for switching point and reverse switching point must be changed separately. If only SP.1 will be changed, rP.1 remains the same.

8.1.4 Window function with hysteresis (example)

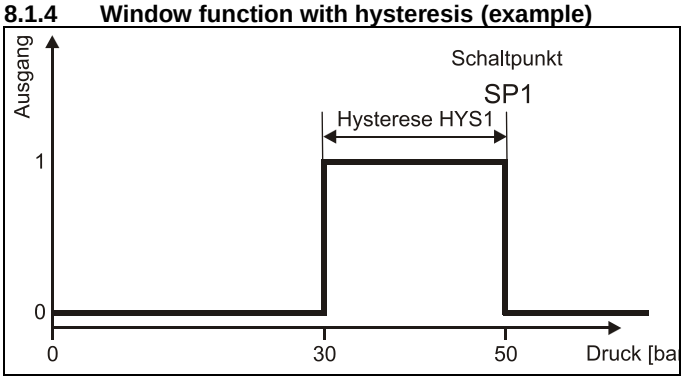

Figure 11: Diagram - switching point with hysteresis

Programmed parameters:
SP.1: 50.0 bar
HYS.1: 20.0 bar
If the pressure reaches the set switching window between (SP.1-HYS.1) and SP.1 (50bar), the output reverses as per the set switching function (no or nc). The switching state changes again when leaving the window. The entry direction and/or exit direction is insignificant. If SP1 will be changed, the hysteresis remains the same.

8.2 Brief instruction - Pressure switch with Teach-In function

1. Connect operating voltage. The device is now automatically in RUN mode
2.

Press the key Reset / Esc for at least 3 s. - Activation of the TEACH mode. (Press arrow key up and arrow key down at the same time)	

The device is now in TEACH mode (display extinguishes cyclically).

3. Now the pressure can be adjusted at the pressure generator and can be checked at the display of the pressure switch.
4.

Shortly press Enter/Set key.	Enter / Set

The device is now again automatically in RUN mode, the switching points were newly calculated and saved.

8.3 Functioning of the switching outputs

Note:

- The represented examples and descriptions of the output 1 (SP.rP1) refer to the switching function "normally closed" (nc). With the programmed switching function "normally open" (no) the states are reversed.
- The minimum distance between the switching point and the reverse switching point is set by the system to 1 bar.
- The smallest adjustable hysteresis is set by the system to 1 bar.
- The represented examples and descriptions of the output 2 refer to the switching function "normally open" (no), if this output is programmed as switching output (SP.rP2). With the programmed switching function "normally closed" (nc) the states are reversed.

8.3.1 Teach function (set) realized at 100 bar Output 1 with function normally closed (factory setting)

Switching point with reverse switching point

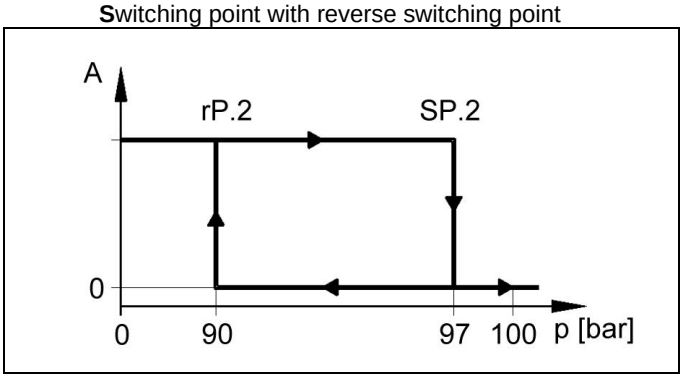

Figure 12: Diagram - switching point with reverse switching point

A Output p Pressure in bar	rP.1 Reverse switching point SP.1 Switching point

Programmed parameters:

SP.1: -3 % (factory setting)

rP.1: -10 % (factory setting)

A pressure increase to SP.1 (e.g. 97 bar) reverses the output according the set switching function (no or nc).
With decreasing pressure the switching state of the output changes with the pressure value rP.1.

8.3.1.1 Output 2 with function normally open (factory setting) Switching point with reverse switching point

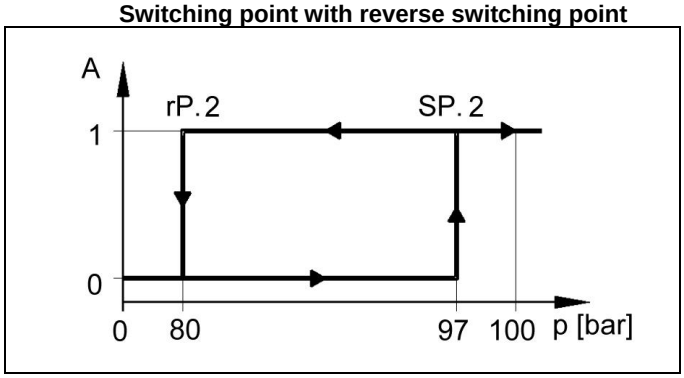

Figure 13: Diagram - switching point with reverse switching point

A Output p Ppressure in bar	rP.2 Reverse switching point SP.2 Switching point

Programmed parameters:

SP.2: -3 % (factory setting)

rP.2: -20 % (factory setting)

A pressure increase to SP.2 (e.g. 97 bar) reverses the output according to the set switching function (no or nc).
With decreasing pressure the switching state of the output changes with the pressure value rP.2.

8.4 Operating modes for pressure switch with classic parametrisation

8.4.1 RUN mode

Normal operating mode.
After connecting the operating voltage the device is in RUN mode. The pressure switch carries out its monitoring function as per the set parameters and switches the outputs or gives an analogous signal. On the display, the current system pressure appears and the red LED signals the switching states of the outputs.

8.4.2 Base menu

Display and adjustment of the switching points, reverse switching points or the hysteresis.
By short pressing on the key **Enter/Set**, the base menu can be called. The operating mode is internally maintained. The parameter values can be read and adjusted.
Short pressing on the key arrow down scrolls through the adjustable parameters.
Short pressing on the key **Enter/Set** indicates the set parameter value.
Short pressing on the key arrow up or arrow down gradually changes the value and long pressing quickly changes the value. By pressing on the key **Enter/Set**, the display blinks three times and the changed value is saved.
The device works now with the newly set value.

Return to RUN mode:
Press the key **Reset/Esc**.

8.4.3 Expanded menu / programming mode

Setting of the parameters and programming of the base functions.
The device changes to the programming mode, if in the base menu the item "EF" is set and the **Enter/Set** key is pressed for more than 5s.
The operating mode is internally maintained.

Short pressing on the keys **arrow up** or **arrow down** scrolls through the adjustable parameters.
Short pressing on the key **Enter/Set** indicates the set parameter value.
Short pressing on the keys **arrow up** or **arrow down** gradually changes the value and long pressing quickly changes the value. By pressing on the key **Enter/Set**, the display blinks three times and the changed value is saved.
The device works now with the newly set value.

Return to RUN mode: repeated pressing of the key **Reset/Esc**.

8.4.4 Programming

8.4.4.1 Programming

Key	Display	Description
Enter / Set 1x	SP1	Shortly press the key Enter/Set to enter the base menu. Press the key Enter/Set again The current value for the switching point S1 is indicated. *) Set the desired value with the arrow keys. Confirm the value with Enter/Set.
▼ 1x	rP1 / HYS1	Press the key Enter/Set The current value for the reverse switching point S1 or the hysteresis is indicated. *) Set the desired value with the arrow keys. Confirm the value with Enter/Set.
▼ 1x		Output 2 is switching output SP2 / rP2 and/or HYS2. Changes can be made as described above. Or output 2 is an error signal: Er.On As soon as the outputs become inactive, EF will be displayed immediately.
▼ 1x	EF	Shortly press Enter/Set or arrow down in order to get to the run mode. Press the key Enter/Set for at least 5s to call the expanded functions. As long as the key is pressed, a point is flashing at the right side of the display. Changes inside the menu items can be made as described above. The possible menu items can be seen in the parameter list.

*) A flashing point at the right side of the display indicates that the value can be changed.
After confirmation of the set value the display value will blink three times.

8.4.5 Parameter list

Param.	Description
SP1	Switching point S1
HYS1 / rP1	Hysteresis S1 / reverse switching point S1
SP2	Switching point S2
HYS2 / rP2	Hysteresis S2 / reverse switching point S2
EF	This menu item encloses a submenu which contains further parameters. Press the key Enter/Set for at least 5s to get access to these parameters.
rES	Reset (getting back to the factory settings) Press the Enter/Set key for at least 5s to reset the system. Thereafter the unit automatically returns to the RUN mode.
0u 1	Configuration of output 1: Four switching functions are possible: **SP.HY** switching point / hysteresis **SP.rP** switching point / reverse switching point **FE.HY** window function / hysteresis **FE. rP** window function / reverse switching point **oFF.1** output 1 "off"
noc 1	Function of the switching output S1: **no.1** (normally open) **nc.1** (normally closed) Note: noc 1 is only active, if a switching function was set for Ou 1.
dS 1	**Function:** Switch-on delay s1 Note: dS 1 is only active, if a switching function was set for Ou 1.
dr 1	**Function:** Switch-off delay S1 Note: dr 1 is only active, if a switching function was set for Ou 1.
Ou 2	Configuration of output 2: Four switching functions, the error signal or four analogue functions are possible: **SP.HY** switching point / hysteresis **SP.rP** switching point / reverse switching point **FE.HY** window function / hysteresis **FE. rP** window function / reverse switching point **ERR. 2** error signal **4-20** analogue signal 4-20mA **0-20** analogue signal 0-20mA **20-4** analogue signal 20-4mA **20-0** analogue signal 20-0mA **oFF.2** output 2 "off"
ASP	**Function:** Analogue starting point:

Pa-ram.	Description
	The lower pressure value (low pressure), where the analogue signal starts. Note: ASP is only active, if an analogue signal was set for Ou 2.
AEP	**Function:** Analogue end point The upper pressure value (high pressure), where the analogue signal ends. Note: The minimum range between analogue starting and end point is 20% of the measuring range.
dAA	**Function:** Damping the analogue output This function filters peak values of short duration or high frequency. dAA-value = response time. Period of time between the pressure change and the change of the analogue signal in seconds. Note: dAA is only active, if an analogue signal was set for Ou 2.
FOUA	**Function:** Error display of the analogue output. The analogue output gives a signal <3.6mA or >22mA (only for 4-20/ 20-4) Note: Is only active, if an analogue signal was set for Ou 2.
EdA	Error display of the analogue output (only for 4-20mA/ 20-4mA)
noc 2	Function of the switching output S2: **no.2** (normally open) **nc.2** (normally closed) Note: noc 2 is only active, if a switching function was set for Ou 2.
dS 2	**Function:** Switch-on delay S2 Note: dS 2 is only active, if a switching function was set for Ou 2.
dr 2	**Function:** Switch-off delay s2 Note: dr 2 is only active, if a switching function was set for Ou 2.
HI	Saving the max. pressure value of the system. Display of the highest measured pressure value.  = delete memory

Pa-ram.	Description
LO	Saving the min. pressure value of the system. Display of the lowest measured pressure value.  = delete memory
CYC	Cycle meter Display of switching cycles of S1. The total number of switching cycles is written every 5 min. into the permanent memory and cannot be deleted.
COF	Zero point calibration The internal reading (operating value of the sensor) is offset against the real measured value. Range of adjustment: -10% of the measuring range.
ddIS	Damping of the display (peak-hold time)
FdIS	Display functions: **rd** rotate display **Ph** peak hold. Temporary display of peek values **Rd. Ph** rotate display + peak hold **oFF** standard display
tESt	Press Enter/Set for 5s, then test function (no time out) With the test function all set parameters can be checked without changing the pressure. The display starts with the current pressure. By actuating the arrow keys, the displayed value can be increased or decreased. All parameters react as if the actual pressure would increase or decrease. Quit the test mode with ESC.
END	End of expanded function Press the Enter/Set key twice to get to the RUN mode.

The devices are equipped with an optical interface that allows the connection to a PC. The required interface cable and the windows software are available on request.
By means of this software, all adjustments described in these instructions can be made via the PC.

8.5 Operating modes for pressure switch with teach-in function

8.5.1 RUN mode

Normal operating mode.
After connecting the operating voltage the device is in RUN mode. The pressure switch carries out its monitoring function as per the set parameters and switches the ouputs or gives an analogue signal. On the display, the current system pressure appears and the red LED signals the switching states of the outputs.

8.5.2 Base menu

Open the menu "EF" to adjust all parameters.
By short pressing on the key **Enter/Set**, the base menu can be called. Indication "EF" on the display.

Return to RUN mode:
Renewed pressing of the key **Enter/Set**.

8.5.3 Expanded menu (EF) / programming mode

Setting of the parameters and programming of the main functions.
The device changes to the programming mode, if in the base menu the item "EF" is set and the **Enter/Set** key is pressed for more than 5 s.
The operating mode is internally maintained.

Short pressing on the keys **arrow up** or **arrow down** scrolls through the adjustable parameters.
Short pressing on the key **Enter/Set** indicates the set parameter value.
Short pressing on the keys **arrow up** or **arrow down** gradually changes the value and long pressing quickly changes the value. By pressing on the key **Enter/Set**, the display blinks three times and the changed value is saved.
The device works now with the newly set value.

Return to RUN mode (base menu):
Repeated pressing of the key **Reset/Esc** until "EF" is displayed,
then shortly press **Enter/Set**.

8.5.4 Programming

8.5.4.1 Programming

Key	Display	Description
Enter / Set 1x	SP1	Shortly press the key Enter/Set to enter the base menu.
Enter / Set 1x	EF	Press the key Enter/Set for at least 5s to call the expanded functions. As long as the key is pressed, a point is flashing at the right side of the display. Changes inside the menu items can be made as described above (chapter: expanded menu). The possible menu items can be seen in the parameter list.

*) A flashing point at the right side of the display indicates that the value can be changed.
After confirmation of the set value the display value will blink three times.

8.5.5 Parameter list

Param.	Description
EF	This menu item encloses a submenu with the parameters. Press the key Enter/Set for at least 5s to get access to the parameters.
rES	Reset (getting back to the factory settings) Press the Enter/Set key for at least 5s to reset the system. Thereafter the unit automatically returns to the RUN mode.
0u 1	Configuration of output 1: **SP.rP** switching point / reverse switching point **oFF.1** output 1 "off"
SP1	Parameter SP1 in "%" of the "nominal value" (nominal value = indication on the display when actuating the Teach-In function with the Set key) Example: 200bar -6bar (SPp1=-3%) = 194bar (actual switching point)
rP1	Parameter rP1 in "%" of the "nominal value" (nominal value = indication on the display when actuating the teach-in function with the set key) Example: 200bar -20bar (rP1=-10%) = 180bar (actual reverse switching point)
noc 1	Function of the switching output S1: **no.1** (normally open) **nc.1** (normally closed) Note: noc 1 is only active, if a switching function was set for Ou 1.
dS 1	**Function:** Switch-on delay S1 Note: dS 1 is only active, if a switching function was set for Ou 1.
dr 1	**Function:** Switch-off delay S1 Note: dr 1 is only active, if a switching function was set for Ou 1.
Ou 2	Configuration of output 2: Switching function, error signal or four analogue functions can be selected: **SP.rP** switching point / reverse switching point **Err. 2** error signal **4-20** analogue signal 4 - 20 mA **0-20** analogue signal 0 - 20 mA **20-4** analogue signal 20 - 4 mA **20-0** analogue signal 20 - 0 mA **oFF.2** output 2 "off"
ASP	**Function:** Analogue starting point: The lower pressure value (low pressure), where the analogue signal starts. Note: ASP is only active, if an analogue signal was set for Ou 2.
AEP	**Function:** Analogue end point The upper pressure value (high pressure), where the analogue signal ends. Note: The minimum range between analogue starting and end point is 20% of the measuring range.

Pa-ram.	Description
dAA	**Function:** Damping the analogue output This function filters peak values of short duration or high frequency. dAA-value = response time. Period of time between the pressure change and the change of the analogue signal in seconds. Note: dAA is only active, if an analogue signal was set for Ou 2.
FOUA	**Function:** Error display of the analogue output. The analogue output gives a signal <3.6mA or >22mA (only for 4-20/ 20-4) Note: Is only active, if an analogue signal was set for Ou 2.
EdA	Error display of the analogue output (only for 4-20mA/ 20-4mA)
SP2	Parameter SP2 in "%" of the "nominal value" (nominal value = indication on the display when actuating the Teach-In function with the Set key) Example: 200bar -6bar (SP2=-3%) = 194bar (actual switching point)
rP2	Parameter rP2 in "%" of the "nominal value" (nominal value = indication on the display when actuating the teach-in function with the set key) Example: 200bar -40bar (rP2= -20%) = 160bar (actual reverse switching point)
noc 2	Function of the switching output S2: **no.2** (normally open) **nc.2** (normally closed) Note: noc 2 is only active, if a switching function was set for Ou 2.
dS 2	**Function:** Switch-on delay S2 Note: dS 2 is only active, if a switching function was set for Ou 2.
dr 2	**Function:** Switch-off delay S2 Note: dr 2 is only active, if a switching function was set for Ou 2.
HI	Saving the max. pressure value of the system. Display of the highest measured pressure value.
	 = delete memory
LO	Saving the min. pressure value of the system. Display of the lowest measured pressure value.  = delete memory
CYC	Cycle meter Display of switching cycles of S1. The total number of switching cycles is written every 5 min. into the permanent memory and cannot be deleted.
COF	Zero point calibration The internal reading (operating value of the sensor) is offset against the real measured value. Range of adjustment: -10% of the measuring range.
ddIS	Damping of the display (peak-hold time)
FdIS	Display functions: **rd** rotate display (180 °) **Ph** peak hold. temporary display of peek values **Rd. Ph** rotate display (180 °) + peak hold **oFF** standard display
tESt	Press Enter/Set for 5s, then test function (no time out) With the test function all set parameters can be checked without changing the pressure. The display starts with the current pressure. By actuating the arrow keys, the displayed value can be increased or decreased. All parameters react as if the actual pressure would increase or decrease. Quit the test mode with Esc.
END	End of expanded function Press the Enter/Set key twice to get to the RUN mode.

The devices are equipped with an optical interface that allows the connection to a PC. The required interface cable and the windows software are available on request.
By means of this software, all adjustments described in these instructions can be made via the PC.

9 Maintenance

9.1 Maintenance

Check if the hydraulic ports are tight (visual control). The pressure switch itself is maintenance free.

9.2 Cleaning

⚠ CAUTION

Material damage, damage or functional failure

Aggressive cleaning agents can cause damage, especially to seals.
The product must not be cleaned with:

- corrosive or caustic substances or
- organic, solvents such as halogenated or aromatic hydrocarbons and ketones (cellulose thinner, acetone, etc.).

The product must be cleaned from dirt, swarf and liquids at regular intervals.

10 Trouble shooting

In case of troubles check the connections, the electrical characteristics, the operating pressure and the correct mounting.

Fault indication during operation

Display	Cause	Effect on the outputs	Elimination
OL	Overload system pressure exceeds the measuring range (sensor limit)> 120% Pnominal		limit the system pressure to Pnominal If necessary use a device with higher measuring range.
UL	Underload system pressure is below the measuring range		
SC1	Short circuit S1	Analogue output = error signal*	check wiring. check load S1.
SC2	Short circuit S2	Analogue output = error signal*	check wiring. check load S2.
SC	Short circuit S1 and S2	Analogue output = error signal*	check wiring. check load.
ERR	Sensor defect, internal error	S1 and S2 are switched off Analogue output = error signal*	contact manufacturer.
AOP	Analogue output open		check wiring. check burden resistance.
	NOTE If this indication is not desired, the menu item EdA can be set to Ed.oF.		

*) The error signal of the analogue output appears only if for OU2 an analogue signal was set (4-20mA or 20-4mA).
The error signal (< 3.6mA or >22mA) is adjustable in menu item FOuA.

11 Technical characteristics

General characteristics

Port	M12 connector 4-pin
Operating fluid:	Hydraulic oil HLP22, 32 and 46 (other media - please contact us)
Pressure ranges [bar]	5...600
Excess pressure [bar]	50% of the nominal pressure (P_n)
Pressure pick-up	Peak value memory every 2 ms (display via PC)
Operating voltage	12 to 32 V DC (residual ripple < 10 %), protected against short circuits, protected against reverse polarity,
Voltage drop (max. load)	< 2 V
Current consumption (without load)	< 60 mA
Switching outputs	2 x pnp switching, no/nc each 250 mA
Delay time	0 to 20 s, switch on and off delay separately adjustable
Range of adjustment switching point	1 to 100% of PN
Reset point	0 to 99 % of PN
Switching frequency	max. 125 Hz
Reproducibility	< ±0,1 % of the final value
Analogue output	0/4 to 20 mA, 20 to 0/4 mA, starting point and final point selectable
Load	max. RL [W]=(Ub-8V) / 20 mA
Error detection	Analogue output in case of line break
Rise time	5ms (10 % to 90 % of PN)
Damping	0 to 20 s, adjustable
Linearity deviation	max. ±0.25 %of PN
System pressure display	4 x 7 segment LED display
Display damping	0 to 20 s, adjustable
Switching function display	2x LED red
Operating temperature	–20 °C to +80 °C
Temperature drift	< ±0.2 %/ 10 K (-10° C bis +70° C)
Pressure port	G1/4A, SW 19, rotatable
Sensor head material	stainless steel 1.4435
Housing material	Polyamide
Code class	IP65 as per EN 60529
MTTFd	280 years
Switching cycles	10 million
Weight	0.350 kg
Optical interface	9600 Baud, via optical adapter at USB port (on request)

Pressure switch with classic parametrisation

Factory settings level 1

SP 1	100% of the nominal pressure
HYS1	10% of the nominal pressure

SP 2	100% of the nominal pressure
HYS 2	10% of the nominal pressure

Factory settings Level 2

Ou1	SP.HY
noc1	no.1
dS1	0.30
dr1	0.00

Ou2	SP.HY
noc2	no.2
dS2	0.30
dr2	0.00

Hi	0
Lo	0
CYC	0
COF	0.0
ddIS	0
FdIS	oFF

sLoc	not active

Pressure switch with teach-in function

Factory settings Level 1

SP 1	485 bar
rP1	450 bar
SP 2	485 bar
rP2	400 bar

Factory settings Level 2

Ou1	SP.rP
SP1	-3 %
rP1	-10 %
noc1	nc.1
dS1	0.00
dr1	0.00

Ou2	SP.rP
SP2	-3 %
rP2	-20 %
noc2	no.2
dS2	0.00
dr2	0.00

Hi	0
Lo	0
CYC	0
COF	0.0
ddIS	0
FdIS	oFF

sLoc	active

12 Accessory

NOTE

Accessories
Accessories, available on request.

13 Storage

⚠ CAUTION

Damage due to incorrect storage of components
In case of improper storage, the seals can embrittle and resinification of the anti-corrosive oil or corrosion on/in the element can occur.

- Storage in the packaging and moderate environmental conditions.
- The product must not be exposed to direct sunlight, since UV light may cause serious damage to the seals.

ROEMHELD elements are tested with mineral oil. The exterior of the elements is protected against corrosion.
The residual oil film after the test procedure provides for a six-month interior protection against corrosion when stored in dry and tempered rooms.

14 Disposal

Hazardous to the environment
Due to possible environmental pollution, the individual components must be disposed only by an authorised expert company.

The individual materials have to be disposed as per the existing regulations and directives as well as the environmental conditions.
Special attention has to be drawn to the disposal of components with residual portions of hydraulic fluids. The instructions for the disposal at the material safety data sheet have to be considered.
For the disposal of electrical and electronic components (e.g. stroke measuring systems, proximity switches, etc.) country-specific legal regulations and specifications have to be kept.

15 Declaration of conformity

15.1 Manufacturer

Manufacturer
Römheld GmbH Friedrichshütte
Römheldstraße 1-5
35321 Laubach, Germany
Tel.: +49 (0) 64 05 / 89-0
Fax: +49 (0) 64 05 / 89-211
E-mail: info@roemheld.de
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Responsible person for the documentation:
Dipl.-Ing. (FH) Jürgen Niesner, Tel.: +49(0)6405 89-0.

This declaration of conformity applies to the following products:
Pressure switches of data sheet F9734. The following types or part numbers are concerned:

Pressure switch with classic parametrisation:
- 9740 049A

Pressure switch with teach-in function:
- 9740 050A

We herewith declare that the products described comply with the basic safety and health requirements of the aforementioned EU directives in their design and construction, as well as in the version marketed by us.

The following additional EU directives were applied:

2014/30/EU EMC - Electromagnetic compatibility [www.eur-lex.europa.eu]

- **2011/65/EU,** RoHS

The following harmonised standards have been applied:

DIN EN 61000-4-2; 2009-12, Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test

DIN EN 61000-4-4; 2009-10, Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test

i.V. Ralph Ludwig

Ralph Ludwig
Head of Research and Development

Römheld GmbH
Friedrichshütte

Laubach, 16.8.2023