

## MONITORING SYSTEMS FOR HYDRAULIC ACCUMULATORS

### – p<sub>0</sub>-Guard –

#### GENERAL

The compressibility of the gas in the accumulator serves to store the fluid pressure and thus provide energy in hydraulic systems. This is achieved by introducing nitrogen (N<sub>2</sub>) on the gas side of the hydraulic accumulator. The amount of gas and thus the pre-charge pressure (p<sub>0</sub>) of the hydraulic accumulator is determined by the application and the accumulator type.

If the pre-charge pressure held in the hydraulic accumulator differs from the specified value, the accumulator will not work, or will no longer work optimally.

Monitoring and the option of an early correction of the pre-charge pressure is therefore essential for the correct functioning of the hydraulic accumulator.

HYDAC offers a cost-effective solution in the accessories range, which can be used on the fluid side of an individual hydraulic accumulator as well as on accumulator stations:

→ the p<sub>0</sub>-Guard: EDS 3446 F31-...-P00



#### DESCRIPTION



The EDS 3400 is a compact electronic pressure switch with integrated accumulator monitoring function.

The EDS 3400 allows for the monitoring of the hydraulic accumulator pre-charge pressure (p<sub>0</sub>) and the control of the accumulator charging function.

The pre-charge pressure at the accumulator is monitored on the fluid side during each shutdown process (fluid side discharge of the hydraulic accumulator).

A too-low pre-charge pressure (p<sub>0</sub>) is indicated. The pressure can be displayed in either bar, psi or MPa.

Stand / As of:  
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# HYDAC ACCUMULATORS

The device can be connected to the hydraulic system control via an IO-Link communication interface or in switching mode, the classic way.

For operation in IO-Link mode, an IO-Link master is required. It can communicate with the EDS 3400 to read out measured values and to store or load configuration parameters. Thus, time-consuming re-parameterisation (e.g. when replacing the EDS) will no longer be required.

If the IO-Link is not used, the EDS 3400 operates in switching mode (2 outputs). One switching output is intended to monitor  $p_0$ . The second output can either be used as a switching output for the accumulator charging function (N/C or N/O) or as an analogue output for pressure monitoring (4 ... 20 mA or 0 ... 10 V). An integrated LED display provides information about the operation mode and the switching status.

The configuration of the EDS 3400 is done either directly via the menu navigation on the device or conveniently via the following options:

- HYDAC programming device HPG P1-000
- HYDAC programming adapter ZBE P1-000
- HYDAC portable data recorder HMG 4000

## MEASUREMENT PRINCIPLE

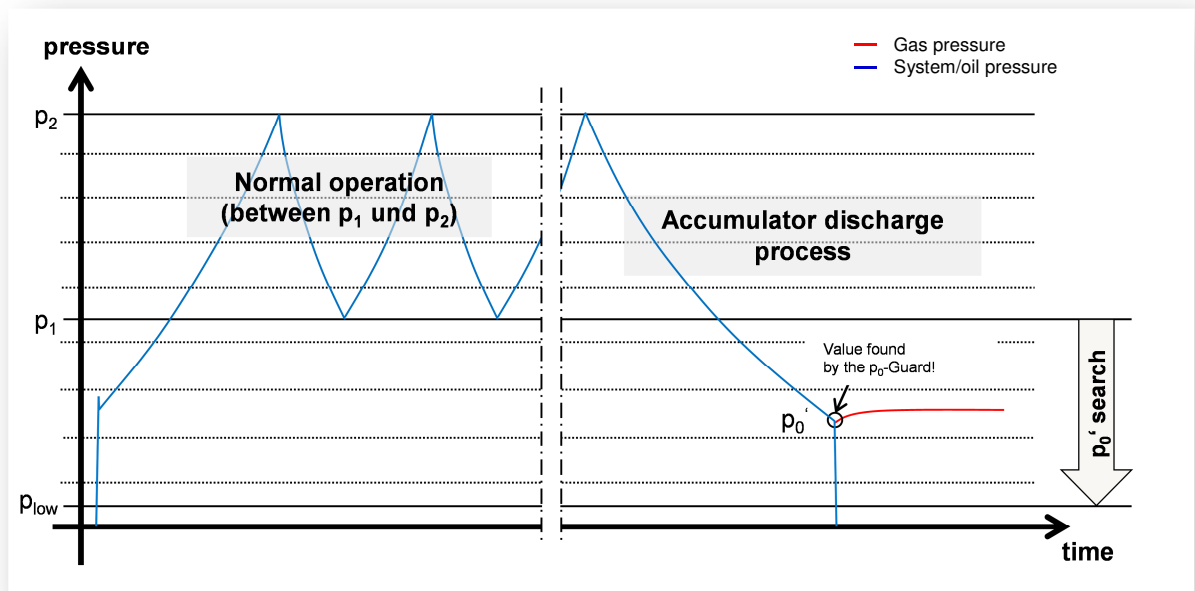
The  $p_0$ -Guard searches for the closing pressure  $p_0'$  during the discharge process of the hydraulic accumulator between  $p_1$  and a selectable minimum pressure  $p_{low}$ . While doing so, the closing pressure describes the pressure value at which the separation element sets down on the bottom of the accumulator.

### Prerequisite

$p_{low}$  must be undershot to complete the  $p_0'$  search.  $p_{low}$  is preset with a default value (3% of the pressure range).

Example: Pressure range 250 bar  $\rightarrow$  Default value = 7.5 bar

## Measurement of the closing pressure $p_0'$



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## FUNCTION

The closing pressure  $p_0'$  detected by the  $p_0$  guard is directly dependent on the gas pre-charge pressure  $p_0$ . In order to minimise the additional influencing factors on the closing pressure (removal flow rate, temperature boundary conditions and the installation position of the hydraulic accumulator), the  $p_0$ -Guard must be "taught" under **real** operating conditions.

Teaching means: The last detected closing pressure  $p_0'$  is saved

$$p_0' \rightarrow p_{0' \text{ teach}}$$

The taught closing pressure  $p_{0' \text{ teach}}$  is the reference for the permitted  $p_0$  loss ( $\Delta p_0'$ )

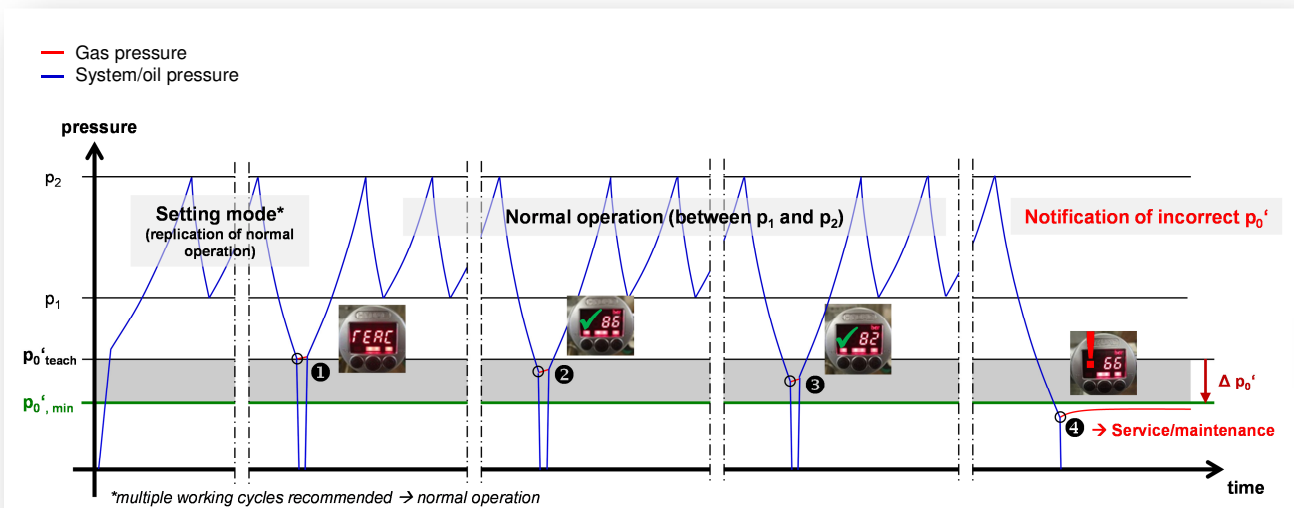
(alternatively, this reference can be set)

$$p_{0' \text{ min}} = p_{0' \text{ teach}} - \Delta p_0'$$

When this limit value is undershot, the guard transmits a signal.

## Function example of the $p_0$ -Guard

- ①  $p_0'$  measurement "after setting mode"  
→ the  $p_0$ -Guard is taught to this value =  $p_{0' \text{ teach}}$
- ② ③ System shutdown  
 $p_0'$  measurement →  $p_0'$  within the tolerance range ✓
- ④ System shutdown  
 $p_0'$  measurement → **Notification**,  $p_0'$  outside the tolerance range !



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# HYDAC ACCUMULATORS

## INSTALLATION RECOMMENDATIONS FOR HYDRAULIC ACCUMULATORS

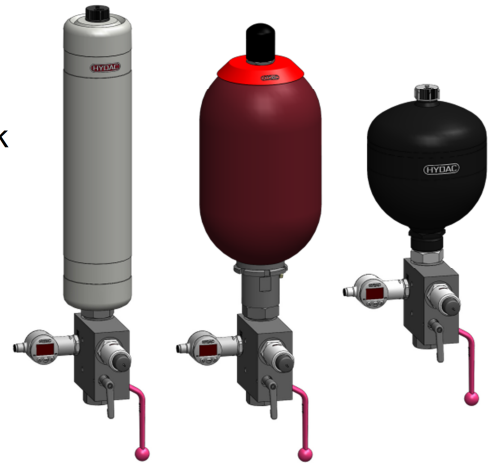
The p<sub>0</sub>-Guard (EDS 3400) can be used in combination with all accumulator designs, in open hydraulic systems. It should be installed on the system side as close to the hydraulic accumulator as possible.

- **Control block / power bar**

For accumulator stations, installation in a central location is recommended, e.g. on the control block on the system side of the hydraulic system.

- **Safety and shut-off block SAF**

The SAF is connected to the accumulator. The p<sub>0</sub>-Guard can be screwed into the M2 connection (ISO 228 - G 1/4), and therefore it is installed close to the hydraulic accumulator.



- **Special case: Bladder accumulator**

Generally, bladder accumulators have an air bleed screw at the oil valve. If available, the p<sub>0</sub>-Guard can be screwed onto this bore (please note thread size); see figure on the right: bladder accumulator (e.g. SB330) with EDS.



## MODEL CODE

EDS 3 4 4 6 - F31 - XXXX - P00

### Mechanical connection

4 = G1/4 A ISO 1179-2

### Electrical connection

6 = male M12x1, 4 pole (connector not supplied)

### Output

F31 = IO-Link interface

### Pressure range in bar

0040; 0100; 0250; 0400; 0690

### Modification number

**P00 = p<sub>0</sub>-Guard**

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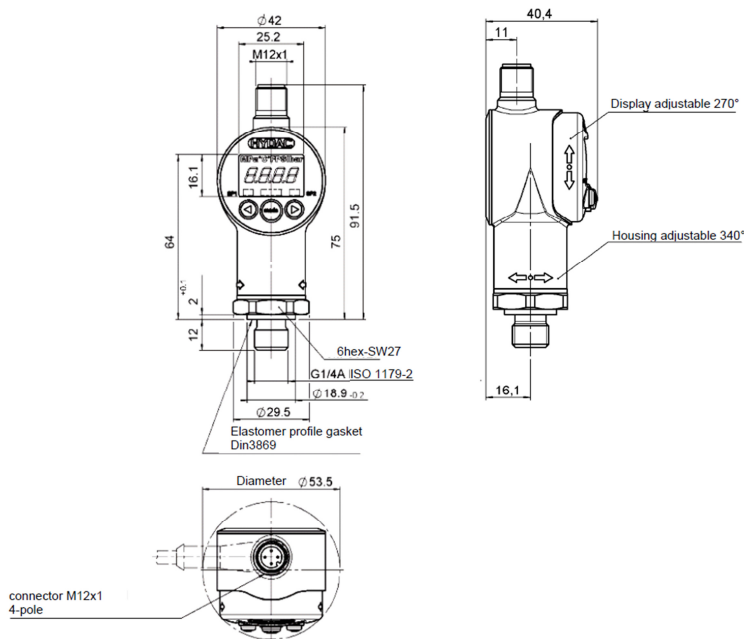
You can find suitable accessories, e.g. mating connectors for the electrical connection, mechanical connection adapters, splash guards, etc. in the following brochure:

- Accessories for Sensors  
No. 18.128

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PRODUCT INFORMATION

## DIMENSIONS



## PART NUMBERS

Designation	Part no.	Measuring range [bar]
EDS 3446-F31-0040-P00	926882	0 ... 40
EDS 3446-F31-0100-P00	926772	0 ... 100
EDS 3446-F31-0250-P00	926711	0 ... 250
EDS 3446-F31-0400-P00	926712	0 ... 400
EDS 3446-F31-0690-P00	926883	0 ... 690

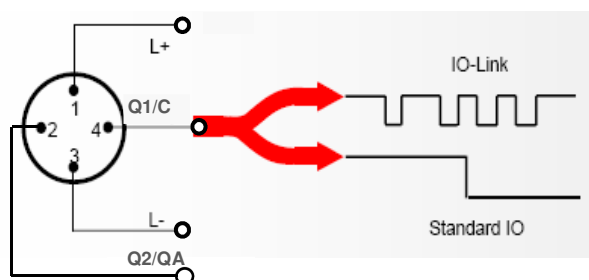
## PIN CONNECTIONS

M12x1, 4 pole

Pin	Signal	Designation
1	L+	+U <sub>B</sub>
2	Q2/QA	Switching output for accumulator charging function (SP2) / Analogue output
3	L-	0 V
4	Q1/C	Switching output for p <sub>0</sub> monitoring (SP1) / IO-Link communication

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