

MONITORING SYSTEMS FOR HYDRAULIC ACCUMULATORS

– p₀-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 (N₂) on the gas side of the accumulator. The amount of gas and thus the pre-charge pressure (p₀) of the accumulator is determined by the application and the accumulator type.

If the pre-charge pressure held in the 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 accumulator.

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

→ the p₀-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 accumulator pre-charge pressure (p₀) 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. A too-low pre-charge pressure (p₀) is indicated. The pressure can be displayed in either bar, psi or MPa.

Stand / As of:
07/08/2018

HYDAC
TECHNOLOGY GMBH
Industriegebiet
D-66280 Sulzbach/Saar
Tel. +49 (0)6897 509-01
Fax +49 (0)6897 509-464
E-mail:
speichertechnik@hydac.com
Internet:
www.hydac.com

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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

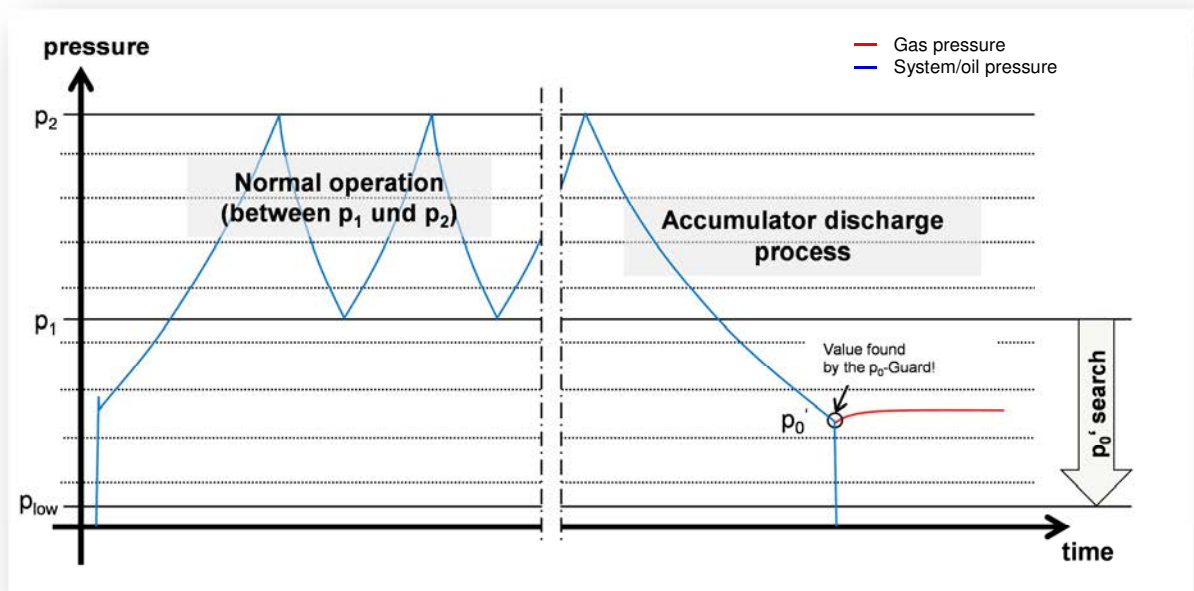
The p_0 -Guard searches for the closing pressure p_0' during the discharge process of the accumulator between p_1 and a selectable minimum pressure p_{low} . While doing so, the closing pressure describes the pressure value at which the separation element sets down on the bottom of the accumulator.

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 → 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 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 ($\Delta p_0'$)

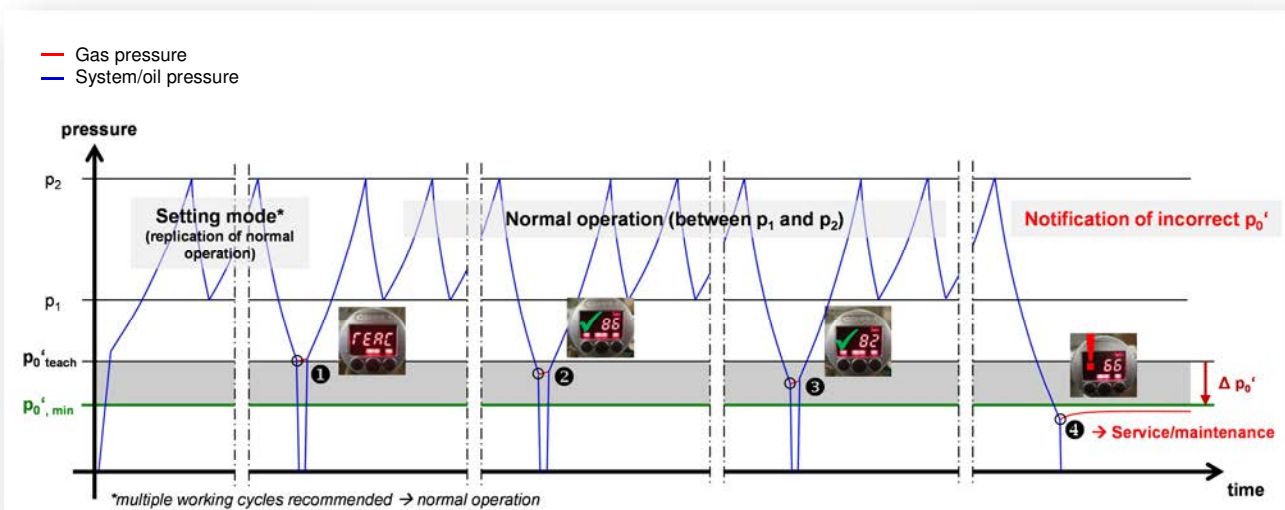
(alternatively, this reference can be set)

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

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

Function example of the p_0 -Guard

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



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HYDAC ACCUMULATORS

PRODUCT INFORMATION

INSTALLATION RECOMMENDATIONS FOR HYDRAULIC ACCUMULATORS

The p₀-Guard (EDS 3400) can be used in combination with all accumulator designs, in open and, depending on the application, also in closed hydraulic systems. However, on the system side, it should be installed as close to the 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 p₀-Guard can be screwed into the M2 connection (ISO 228 - G 1/4), and therefore it is installed close to the accumulator.



- **Special case: Bladder accumulator**

Generally, bladder accumulators have an air bleed screw at the oil valve. If available, the p₀-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 = p₀-Guard

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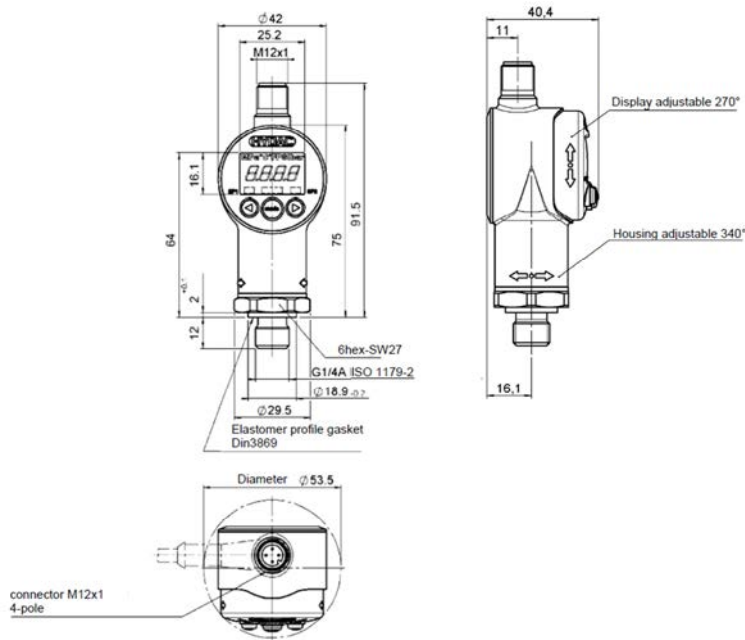
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You can find suitable accessories, e.g. mating connectors for the electrical connection, mechanical connection adapters, splash guards, etc. in the following brochure:

- Accessories for Sensors
No. 18.128

DIMENSIONS



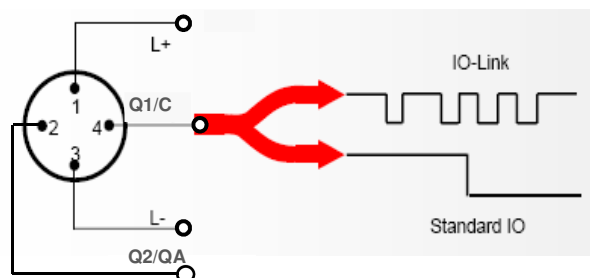
PART NUMBERS

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 _B
2	Q2/QA	Switching output for accumulator charging function (SP2) / Analogue output
3	L-	0 V
4	Q1/C	Switching output for p ₀ monitoring (SP1) / IO-Link communication



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