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 hydraulic accumulator. The amount of gas and thus the pre-charge pressure (p_0) 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:

 \rightarrow 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 hydraulic accumulator pre-charge pressure (p_0) 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_0) is indicated. The pressure can be displayed in either bar, psi or MPa.

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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

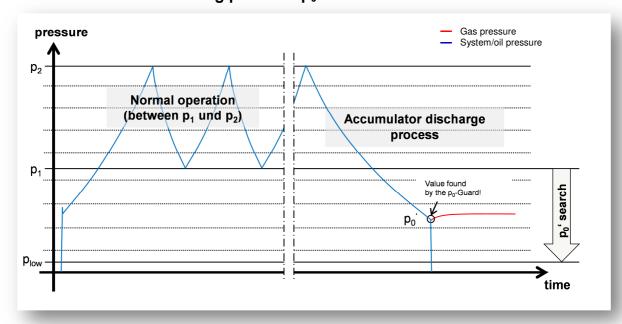
The p_0 -Guard searches for the closing pressure p_0 during the discharge process of the hydraulic accumulator between p_1 and a selectable minimum pressure p_{low} . While doing so, the closing pressure describes the pressure value at which the separation element sets down on the bottom of the accumulator.

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 → Default value = 7.5 bar

Measurement of the closing pressure pof



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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 $p_0 \rightarrow p_0$ teach

The taught closing pressure p_0 '_{teach} is the reference for the permitted p_0 loss (Δp_0 ')

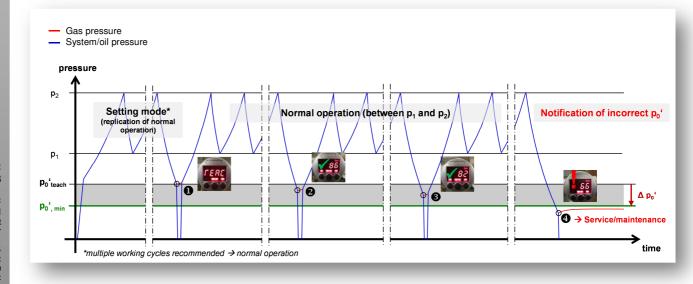
(alternatively, this reference can be set)

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

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

Function example of the po-Guard

- p₀' measurement "after setting mode"
 → the p₀-Guard is taught to this value = p₀'teach
- System shutdown p_0 'measurement $\rightarrow p_0$ ' within the tolerance range \checkmark
- System shutdown p₀ 'measurement → Notification, p₀ 'outside the tolerance range



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INSTALLATION RECOMMENDATIONS FOR HYDRAULIC ACCUMULATORS

The p₀-Guard (EDS 3400) can be used in combination with all accumulator designs. in open hydraulic systems. It should be installed of 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 p₀-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 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 = G1/4 A ISO 1179-2 Electrical connection = male M12x1, 4 pole (connector not supplied)

F31 = IO-Link interface

Pressure range in bar

0040; 0100; 0250; 0400; 0690

Modification number

 $P00 = p_0$ -Guard

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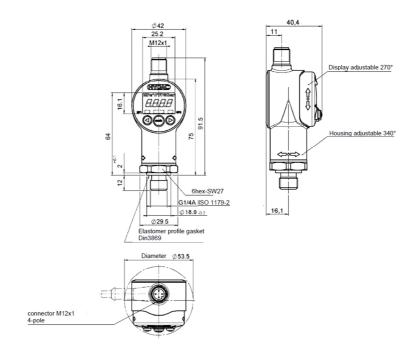
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You can find suitable accessories, e.g. mating connectors for the electrical connection, mechanical connection adapters, splash guards, etc. in the following brochure:

 Accessories for Sensors No. 18.128

DIMENSIONS



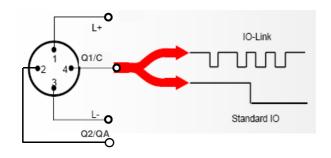
PART NUMBERS

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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JAP ACCUMULATORS

TECHNICAL DATA

Input data								
Measuring ranges	bar	40	100	250	400	690		
Overload pressures	bar	80	200	500	800	1000		
Burst pressure	bar	200	500	1000	2000	2000		
Mechanical connection	G1/4 A ISO 1179-2							
Tightening torque, recommended	20 Nm							
Parts in contact with fluid	Mech. connection: Stainless steel							
	Sensor cell: Stainless steel							
	Seal:	FPM						
Output data								
Switching outputs	PNP trans	stor outputs						
C.M.O.I.I.I.g coupate		current: 1.2 A	PIN	12				
	· ·	250 r		14				
Analogue output, permitted load resistance	Selectable	: 4 20 mA	res	istance max	κ. 500 Ω			
		0 10 V	res	istance min	. 1 kΩ			
Accuracy acc. to DIN 16086,	≤ ± 0.5% F	S type						
Limit point adjustment		≤ ± 1 % FS max.						
Temperature compensation, offset		% FS / ℃ type						
		% FS / ℃ max						
Temperature compensation, over range		% FS / ℃ type						
	≤ ± 0.025 °	% FS / ℃ max	ζ.					
Repeatability	≤ ± 0.25 %	FS max.						
Reaction time	< 10 ms							
Long-term drift	≤ ± 0.3 % l	S / year type						
Ambient conditions								
Compensated temperature range	-10 +70							
Operating temperature range	-25 +80	∞						
Storage temperature range	-40 +80							
Fluid temperature range	-25 +80	℃						
C € mark	EN 61000-6-1 / 2 / 3 / 4							
• N us-mark 1)	Certificate	no.: E318391						
Vibration resistance acc. to	≤ 10 g							
DIN EN 60068-2-6 at 0 500 Hz								
Shock resistance acc. to	≤ 50 g							
DIN EN 60068-2-27 (11 ms)								
Protection class to DIN EN 60529 2)	IP 67							
IO-Link specific data								
IO-Link revision	V1.1 / sup							
Transmission rate, baud rate 3)	38.4 kBau	d (COM2)						
Minimum cycle time	5 ms							
Process data width	32 bit							
SIO Mode Supported	Yes							
M-Sequence Capability		RATE = TYPE						
	OPERATE = TYPE_2_2							
	ISDU supp							
IO Device Description (IODD) download at:	https://iodo	dfinder.io-link.	com/#/					
Other data								
Supply voltage	9 35 V	DC, if PIN 2 =	: SP2					
	18 35 V DC, if PIN 2 = analogue output							
When applied acc. to UL specifications		nergy - accord		UL 61010; (Class 2;			
	UL 1310/1585; LPS UL 60950							
Residual ripple of supply voltage	≤5%							
Current consumption		ithout outputs						
Display		D, 7-segment	, red,					
		ligits 7 mm						
Weight	~ 120 g							

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Note: Excess voltage, override and short circuit protection are provided.

FS (Full Scale) = relative to complete measuring range

1) Environmental conditions according to 1.4.2 UL 61010-1; C22.2 No. 61010-1

2) With mounted female connector having the corresponding protection class

³⁾ Connection with unscreened standard sensor line possible up to a max. line length of 20 m.