

Metal bellows accumulators



1. DESCRIPTION

1.1. FUNCTION

Fluids are practically incompressible and cannot therefore store pressure energy. The compressibility of a gas is utilised in hydraulic accumulators for storing fluids. HYDAC metal bellows accumulators are based on this principle, using nitrogen as the compressible medium.

They consist of a fluid section and a gas section with metal bellows acting as a gas-tight separation element.

The fluid section is connected to the hydraulic circuit so that the metal bellows accumulator draws in fluid when the pressure increases and the gas is compressed. When the pressure drops, the compressed gas expands and forces the stored fluid into the circuit.

1.2. ADVANTAGES

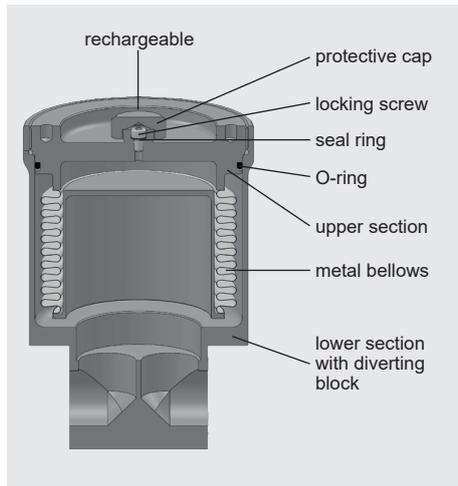
The special features of the metal bellows accumulator are:

- No frictional parts, low-maintenance, long service life
- Media-resistant in temperature ranges of -65 °C to over +160 °C
- Gas-tight

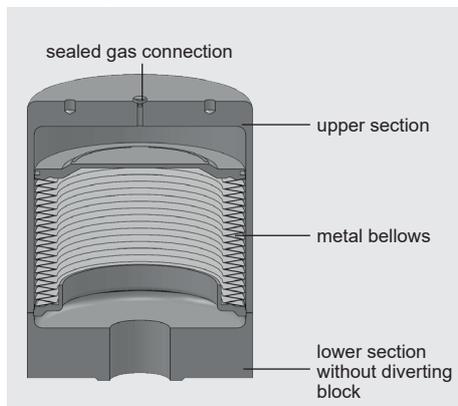
1.3. DESIGN

The design of the HYDAC metal bellows accumulator can vary considerably depending on the customer requirements or field of application.

Example design of a metal bellows accumulator with corrugated bellows



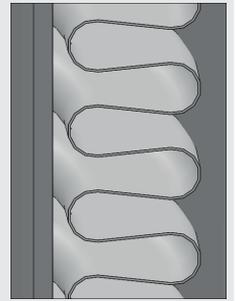
Example design of a metal bellows accumulator with diaphragm bellows



1.3.1 Bellows design

HYDAC supplies two types of bellows. The formed corrugated bellows and the welded diaphragm bellows.

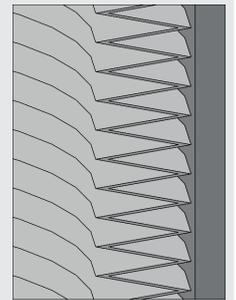
Corrugated bellows (formed)



Properties:

- Suitable for high differential pressures
- Unsusceptible to contamination
- Robust

Diaphragm bellows (welded)



Properties:

- High displacement volumes
- Very good energy saving properties
- Compact design

1.3.2 Pressure vessel design

The pressure vessel of the metal bellows accumulator fundamentally comprises of an upper section and a lower section. These can be connected in a wide variety of ways.

The most common variants are listed below, others are available on request.

Screw type



Weld type



Formed type



1.4. MATERIALS

The selection of materials for the pressure vessel, metal bellows and sealing systems must be coordinated to suit the particular operating medium, operating temperature and pre-charge pressure.

Pressure vessel: carbon steel,
stainless steel

Metal bellows: stainless steel

Sealing system: NBR, FKM, etc.

See material code or on request.

1.5. CORROSION PROTECTION

The pressure vessel is fabricated in carbon steel or in stainless steel.

Various coating systems are available to protect carbon steel versions.

1.6. INSTALLATION POSITION

Metal bellows accumulators are preferably to be installed vertically, with the gas charging connection at the top. Other installation positions must be agreed with HYDAC.

1.7. TYPE OF INSTALLATION

HYDAC mounting elements must be used to securely fasten metal bellows accumulators.

1.8. CLEANLINESS

Diaphragm bellows accumulators must only be operated with hydraulic fluids that contain no hard particles and that have a minimum cleanliness class of:

- NAS 1638 Class 6 or
- ISO 4406 Class 17/15/12

Furthermore, the fluid must not solidify at any time.

2. SPECIFICATIONS

2.1. EXPLANATIONS, NOTES

2.1.1 Explanatory notes

HYDAC metal bellows accumulators are made with tailor-made designs and material selections. Because of their special properties, they are an outstanding addition to the HYDAC hydraulic accumulator product range. We are always happy to provide detailed advice.

2.1.2 Notice

All work on HYDAC metal bellows accumulators must only be carried out by suitably trained staff.

Incorrect installation or handling can lead to serious accidents.

The operating instructions and the product-specific documents must be observed!

No. 3.304.BA

Detailed assembly and repair instructions are available for work which may be carried out on the metal bellows accumulator after installation and commissioning, e.g. repair work. No. 3.304.M

Further information such as accumulator dimensioning, safety information and extracts from the acceptance specifications can be found in the following catalogue section:

- HYDAC Accumulator Technology No. 3.000

Relevant PDF documents can be accessed at:
www.hydac.com » Downloads » Documents » Accumulator Division

2.2. MODEL CODE

Not all combinations are possible.

Order example. For further information, please contact HYDAC.

SM50 P - 0.5 W E 1/ 116 U - 50 AAJ - 2.5

Series

Type code

No details = without diverting block

P = with diverting block

L = light-weight

Nominal volume [l]

Version

W = corrugated bellows

M = diaphragm bellows

Type of shell

A = screw type

E = weld type

G = formed type

Type of gas side connection

1 = gas pressure adjustable (M28x1.5)

2 = gas pressure pre-set, non-adjustable gas locking screw

3 = gas pressure adjustable (M16x1.5)

Material code

Fluid port

1 = carbon steel

2 = carbon steel with corrosion protection

3 = stainless steel ¹⁾

Accumulator shell

1 = carbon steel

2 = carbon steel with corrosion protection

4 = stainless steel ¹⁾

Seal material

0 = no seal

2 = NBR

6 = FKM

7 = other materials

9 = FFKM

Certification code

U = PED 97/23/EC ²⁾

Permitted operating pressure [bar]

Fluid port

See tables in catalogue section Piston accumulators, No. 3.301

Pre-charge pressure p_0 [bar] at 20 °C

If required, please state at time of ordering!

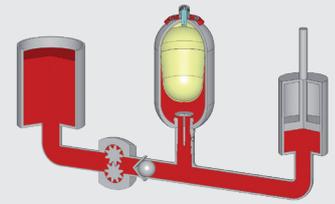
¹⁾ Dependent on type and pressure rating

²⁾ Other approvals possible, see catalogue section HYDAC Accumulator Technology, No. 3.000

3. FUNCTION AND APPLICATION EXAMPLES

3.1. ENERGY STORAGE

The stored hydraulic energy is available from the accumulator for the following purposes: reserve pump capacity (emergency function, pump support) and leakage compensation.



Application examples in the aviation industry



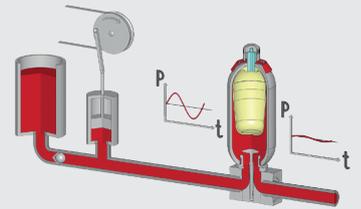
Application:
Supporting the working hydraulics for flight control



Accumulator type:
SM209
Nominal volume:
Up to 0.4 litres
Material:
Stainless steel
Version:
Diaphragm bellows

3.2. PULSATION DAMPING

Pressure pulsations are smoothed by the compressible gas inside the accumulator, e.g. suction flow stabilisation, reduction in noise level and vibrations.



Application examples in large diesel engines



Application:
Pulsation damping
Fuel system
Large diesel engines



Accumulator type:
SM50P and SM50
Nominal volume:
3.8 and 1.6 litres
Material:
Carbon steel, coated
Version:
Corrugated bellows

Application examples in the aviation industry

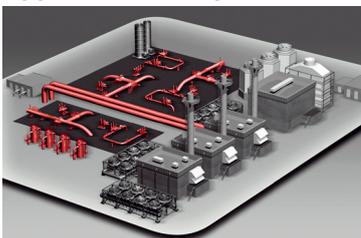


Application:
Suction flow stabiliser
Hydraulic line
Engine supply



Accumulator type:
SM16
Nominal volume:
1 litre
Material:
Stainless steel
Version:
Diaphragm bellows
Special feature:
Visual condition check

Application examples in the chemical industry/process technology



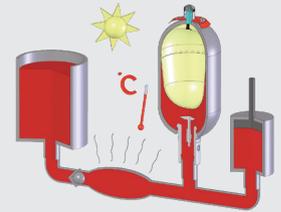
Application:
Suction flow stabiliser
3-piston pump



Accumulator type:
SM210
Nominal volume:
2 litres
Material:
Stainless steel
Version:
Diaphragm bellows
Special feature:
Flange connection

3.3. VOLUME COMPENSATION

The hydraulic accumulator compensates for surplus volume, for instance when the volume of the fluid increases due to an increase in temperature.



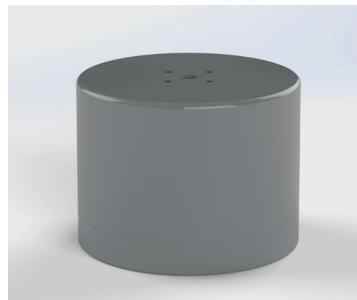
Application examples in the chemical industry/process technology



Application:
Volume compensation when temperature fluctuates



Accumulator type:
SM16
Nominal volume:
1 litre
Material:
Stainless steel
Version:
Diaphragm bellows



Accumulator type:
SM16
Nominal volume:
9.4 litres
Material:
Stainless steel
Version:
Diaphragm bellows
Special feature:

- High displacement volume
- Compact bellows design

4. NOTE

The information in this brochure relates to the operating conditions and fields of application described.
For applications and/or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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