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 diaphragm accumulators are based on this principle, using nitrogen as the compressible medium.

A diaphragm accumulator consists of a fluid section and a gas section with the diaphragm acting as the gas-proof screen. The fluid section is connected to the hydraulic circuit so that the diaphragm 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.

At the base of the diaphragm is a valve poppet. This shuts off the hydraulic outlet when the accumulator is completely empty and thus prevents damage to the diaphragm.

NOTE:
HYDAC diaphragm accumulators when fitted with a HYDAC Safety and Shut-off Block comply with the regulations of the Pressure Equipment Directive PED 97/23/EC and the German regulations on health & safety at work (Betr.Sich.V.).

See catalogue section:
- Safety and shut-off block SAF/DSV No. 3.551

1.2. DESIGN

HYDAC diaphragm accumulators are available in two versions.

1.2.1 Weld type

This consists of:
- Welded pressure vessel, rechargeable on the gas side or, alternatively, completely sealed. Fluid connection available in various types.
- Flexible diaphragm to separate the fluid and gas sections.
- Valve poppet set into the base of the diaphragm.

1.2.2 Screw type

This consists of:
- Forged upper section with gas charging connection.
- Forged lower section with fluid connection.
- Exchangeable flexible diaphragm to separate the gas and fluid.
- Vulcanized valve poppet set into the base of the diaphragm.
- Lock nut to hold the upper and lower sections of the accumulator together.

1.2.3 Diaphragm materials

The diaphragms are available in the following elastomers:
- NBR (acrylonitrile butadiene rubber, perbunan),
- IIR (butyl rubber),
- FKM (fluoro rubber, Viton®),
- ECO (ethylene oxide epichlorohydrin rubber).

The material must be selected according to the particular operating fluid and temperature.

When choosing the elastomer, allowances must be made for the fact that the gas can cool down to below the permitted elastomer temperature if there are adverse discharge conditions (high pressure ratio $p_2/p_0$, high discharging velocity). This can cause cold cracking in the elastomer. The gas temperature can be calculated using the HYDAC Accumulator Simulation Program ASP.

1.2.4 Corrosion protection

For use with chemically aggressive fluids the accumulator can be supplied with corrosion protection, such as plastic coating or a galvanic or chemical surface protection. If this is insufficient, then almost all types can be supplied in stainless steel.

1.3. MOUNTING POSITION

Optional. However, if there is a risk of contamination collecting, a vertical position is preferable (fluid connection at the bottom).
1.4. TYPE OF MOUNTING
Accumulators up to 2 l can be screwed directly inline.
Where strong vibrations are expected, the accumulator must be secured to prevent it working loose. For weld type accumulators we recommend HYDAC support clamps. For screw type accumulators with lock nut, a suitable support console can be ordered. Additional male threads on the hydraulic connection are available for screwing into mounting holes - see table 3.1.
See catalogue section:
● Supports for Hydraulic Accumulators No. 3.502

1.5. GENERAL
1.5.1 Permitted operating pressure
See tables 3.1. and 3.2.
The permitted operating pressure can differ from the nominal pressure for foreign test certificates.
1.5.2 Nominal volume
See tables 3.1. and 3.2.
1.5.3 Effective gas volume
Corresponds to the nominal volume of the diaphragm accumulator.
1.5.4 Effective volume
Volume of fluid which is available between the operating pressures $p_2$ and $p_1$.
1.5.5 Fluids
Mineral oils, hydraulic oils. Other fluids on request.
1.5.6 Gas charging
All accumulators are supplied with a protective pre-charge. Higher gas pre-charge pressures are available on request (gas charging screw or sealed gas connection). Hydraulic accumulators must only be charged with nitrogen. Never use other gases. RISK OF EXPLOSION!

1.5.7 Permitted operating temperature
-10 °C ... +80 °C
263 K ... 353 K for material code 112.
Others on request
1.5.8 Permitted pressure ratio
Ratio of maximum operating pressure $p_2$ to gas pre-charge pressure $p_0$.
1.5.9 Max. flow rate of operating fluid
In order to achieve the max. flow rate given in the tables, a residual fluid volume of approx. 10 % of the effective gas volume must remain in the accumulator.

1.5.10 Certificate codes
Hydraulic accumulators which are installed in countries outside Germany are supplied with the test certificates required in that country. The country of installation must be stated at the time of ordering. HYDAC pressure vessels can be supplied with virtually any test certificate. Please note that the operating pressure can differ from the nominal pressure.
The following table contains a few examples of the codes used in the model code for different countries of installation:

| Australia | F 1) |
| Brazil | U 3) |
| Canada | S1 2) |
| China | A9 |
| CIS | A6 |
| EU member states | U |
| India | U 3) |
| Japan | P |
| New Zealand | T |
| South Africa | U 3) |
| Switzerland | U 3) |
| Ukraine | A10 |
| USA | S |
| others on request |

1) approval required in the individual territories
2) approval required in the individual provinces
3) alternative certificates possible

On no account must any welding, soldering or mechanical work be carried out on the accumulator shell. After the hydraulic line has been connected it must be completely vented. Work on systems incorporating hydraulic accumulators (repairs, connecting pressure gauges etc.) must only be carried out once the pressure and the fluid have been released.

Please read the Operating Manual!
No. 3.100 CE

Note:
Application examples, accumulator sizing and extracts from approvals regulations on hydraulic accumulators can be found in the catalogue section:
● Accumulators No. 3.000
## TECHNICAL SPECIFICATIONS

### 2.1. MODEL CODE

(Also order example)

| SBO210 | 2 | E1 | 112 | U | 210 | AK | 050 |

#### Series

- 2 = Standard model = 112 for mineral oils
- 0 = Plastic coated
- 1 = Carbon steel
- 2 = Carbon steel with protective coating
- 4 = Stainless steel 1.4571
- 6 = Low temperature steel

#### Nominal volume [l]

- 1 = Carbon steel
- 3 = Stainless steel 1.4571
- 4 = Carbon steel with protective coating
- 6 = Low temperature steel

#### Type

- 1) only for screw type
- 2) not all combinations are possible
- 3) only parts in contact with the medium
- 4) only for type E1 or E2, for scheduled orders

#### Weld type:

- E1 = rechargeable M28x1.5
- E2 = sealed gas connection, with gas pre-charge as requested
- E3 = rechargeable, gas valve M16x1.5 / M14x1.5

#### Screw type:

- A6 = rechargeable M28x1.5, exchangeable diaphragm
- A3 = gas valve M16x1.5 / M14x1.5, exchangeable diaphragm

#### Material code:

- 1) only for screw type
- 2) not all combinations are possible
- 3) only parts in contact with the medium

#### Fluid connection

1 = Carbon steel
3 = Stainless steel 1.4571
4 = Carbon steel with protective coating
6 = Low temperature steel

#### Accumulator shell

0 = Plastic coated
1 = Carbon steel
2 = Carbon steel with protective coating
4 = Stainless steel 1.4571
6 = Low temperature steel

#### Diaphragm

2 = NBR20 (acrylonitrile butadiene)
3 = ECO (ethylene oxide epichlorohydrin)
4 = IIR (butyl)
5 = NBR21 (low temperature NBR)
6 = FKM (fluoro rubber)
7 = Other (e.g. PTFE, EPDM ... on request)

#### Certificate code

U = PED 97/23/EC
For other countries see table

#### Permitted operating pressure [bar]

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<th>Fluid connection</th>
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<td>2) form</td>
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<tr>
<td>Standard connection = AK or AB</td>
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<tr>
<td>e.g. Form AK = G 3/4</td>
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<tr>
<td>for SBO210-2 see Point 3</td>
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</tr>
</tbody>
</table>

#### Pre-charge pressure $p_0$ [bar] at 20 °C, must be stated clearly, if required!

1) only for screw type
2) not all combinations are possible
3) only parts in contact with the medium
4) only for type E1 or E2, for scheduled orders
### 3. TECHNICAL SPECIFICATIONS

#### 3.1. WELD TYPE ACCUMULATORS

– non-exchangeable diaphragms –

#### 3.1.1 Drawings

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<th>Type</th>
<th>Gas side connection</th>
<th>Fluid side connection*</th>
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* = alternative fluid connections on request

**Diagrams:**
- **Diagram 1:**
  - Gas side connection: M28x1.5
  - Fluid side connection: hex.

- **Diagram 2:**
  - Gas side connection: on request
  - Fluid side connection: hex.

- **Diagram 3:**
  - Gas side connection: on request
  - Fluid side connection: hex.

- **Diagram 4:**
  - Gas side connection: M28x1.5
  - Fluid side connection: hex.
### Dimensions

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<td>[mm]</td>
<td>[kg]</td>
<td>[l/min]</td>
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| 1 | not available |

1) Others on request
2) Max. flow rate of operating fluid

E 3.100.24/03.12
### 3.2. SCREW TYPE

- exchangeable diaphragm -

#### 3.2.1 Drawings

![Diagram of SCREW TYPE with dimensions and drawings](image)

#### 3.2.2 Dimensions

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1) Others on request
2) Max. flow rate of operating fluid

#### 4. NOTE

The information in this brochure relates to the operating conditions and applications described. For applications and operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

---

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