# Piston Accumulators
## High pressure

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

A piston accumulator consists of a fluid section and a gas section with the piston acting as a gas-proof separation element. The gas section is pre-charged with nitrogen.
The fluid section is connected to the hydraulic circuit so that the piston 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.

HYDAC piston accumulators can be used in a wide variety of applications and are also available in different pressure ranges, see also catalogue sections:

- Piston Accumulators
  Standard
  No. 3.301
- Piston Accumulators
  Series SK280
  No. 3.303

### 1.2. DESIGN

The high pressure piston accumulator consists of:

- a cylinder with very finely machined internal surface.
- covers on the gas side and the oil side.
- O-ring seals.
- floating metal piston.
- high pressure sealing system.

The piston floats on guide rings which prevent metal-to-metal contact between the piston and the accumulator wall.
For use with certain aggressive or corrosive fluids, the parts coming into contact with the fluid can be nickel plated for protection or made entirely from corrosion-resistant material.
Suitable materials are also available for low temperature applications.

Piston accumulators are supplied with short-term preservative.

Long-term preservative is available on request.

### 1.3. SEALING SYSTEMS

Precise information about the intended operating conditions is required in order to select the most appropriate sealing system for the field of application. Important criteria for this selection are, for example:

- design pressure,
- actual pressure differential,
- switching frequency or cycles,
- piston velocity,
- operating temperature,
- operating fluid,
- cleanliness of fluid (filtration rating),
- maintenance requirements.

For high-pressure piston accumulators, an advanced piston of type 2 is used which has been modified for applications up to 1000 bar.
Hydraulic accumulators must only be operated with operating fluids with a minimum cleanliness class of:

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

### 1.4. INSTALLATION POSITION AND TYPE OF INSTALLATION

HYDAC piston accumulators operate in any position. Vertical installation with the gas side uppermost is preferable, to prevent contamination from the fluid settling on the piston seals.

Information on secure installation and mounting elements can be found in the following catalogue sections:

- Piston Accumulators
  Standard
  No. 3.301
- Supports for Hydraulic Accumulators
  No. 3.502

**The operating instruction must be observed!**
**No. 3.301.BA**

# 2. SPECIFIVATIONS

## 2.1. EXPLANATIONS, NOTES

### 2.1.1 **Operating pressure**

690 bar / 800 bar / 1000 bar
others on request

### 2.1.2 **Permitted operating temperature of the hydraulic accumulator**

-20 °C ... +50 °C
standard design, others on request

### 2.1.3 **Working temperature and operating medium**

The permitted working temperature of a piston accumulator is dependent on the application limits of the metal materials and the piston seal. Outside this temperature range, special materials must be used. The operating medium must also be taken into account.
The following table displays a selection of elastomer materials including max. temperature range and a rough overview of resistant and non-resistant fluids. Please contact us for help in selecting a suitable elastomer.

| Materials | | Material code [1] | Temperature range | Overview of the fluids [2] | |
|---|---|---|---|---|---|
| | | | | Resistant to | Not resistant to |
| NBR | Acrylonitrile butadiene rubber | 2 | -20 °C ... + 80 °C | ● Mineral oil (HL, HLP)<br>● Flame-retardant fluids from the groups HFA, HFB, HFC<br>● Synthetic esters (HEES)<br>● Water<br>● Sea water | ● Aromatic hydrocarbons<br>● Chlorinated hydrocarbons (HFD-S)<br>● Amines and ketones<br>● Operating fluids from the group HFD-R<br>● Fuels |
| | | 5 | -40 °C ... + 80 °C | | |
| FKM | Fluorine rubber | 6 | -15 °C ... +160 °C | ● Mineral oil (HL, HLP)<br>● Operating fluids from the group HFD<br>● Synthetic esters (HEES)<br>● Fuels<br>● Aromatic hydrocarbons<br>● Inorganic acids | ● Amines and ketones<br>● Ammonia<br>● Skydrol and HyJet IV<br>● Steam |

[1] see section 2.2. Model code, material code and piston code, material of seals incl. piston
[2] others on request

### 2.1.4 **Gas charging**

Hydraulic accumulators must only be charged with nitrogen.
Never use other gases.
**Risk of explosion!**

In principle, only use nitrogen of at least Class 4.0 (filtration < 3 µm).
If other gases are to be used, please contact HYDAC for advice.

## 2.2. MODEL CODE

**Not all combinations are possible.**
**Order example. For further information, please contact HYDAC.**

**SK690 – 1 / 2212 U – 690 ADE – VB – 08 UP2 – 1 – 300**

**Series**

**Nominal volume [l]**

**Material and piston code**

**Piston design**

High pressure piston 2

**Piston material**

2 = carbon steel
3 = stainless steel [1)]

**Material of cylinder and end cap**

1 = carbon steel
3 = stainless steel [1)]

**Material of seals including piston seals**

2 = NBR [2)] / PTFE
6 = FKM / PTFE

**Certification code**

U = European Pressure Equipment Directive (PED)

**Perm. operating pressure [bar]**

**Fluid port**

Type of connection (see Table 1)
Standard or specification of the type of connection (see Table 2)
Size of connection (see Table 3)

**Gas side connection or gas valve**

Type of connection (see Table 1)
Standard or specification of the type of connection (see Table 2)
Size of connection (see Table 3)

**Piston diameter**

08 = 80 mm
12 = 125 mm
15 = 150 mm
18 = 180 mm

**Supplementary equipment***

Detailed technical data on request
M = magnetic flapper indication
UP.. = piston position switch
(e.g. UP2 = 2 position switches, UPEX = ATEX version)

**Safety equipment***

1 = burst disc (please give nominal pressure and temperature)

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

* if required, please state at time of ordering!
[1)] dependent on type and pressure range
[2)] observe temperate ranges, see section 2.1.3

**Table 1, Connection type**

| Code letter | Description |
|---|---|
| A | Threaded connection (internal) → Table 2 and then 3 |
| K | High pressure port → Table 4 |
| V | Gas valve port → Table 5 |
| S | Special port on request |

**Table 2, Standard or specification, Threaded connection**

| Code letter | Description |
|---|---|
| A | Thread to ISO 228 (BSP) |
| W | Thread to DIN 13 or ISO 965/1 (metric) |
| C | Thread to ANSI B1.1 (UN..-2B, seal SAE J 514) |
| D | Thread to ANSI B1.20.3 (NPTF) |

**Table 3, Threaded connection sizes**

| Type Table 2 | Code letter, size | | | | | | |
|---|---|---|---|---|---|---|---|
| | A | W | C | D | E | F | G |
| A | G 1/8 | G 1/4 | G 3/8 | G 1/2 | G 3/4 | G 1 | G 1 1/4 |
| W | M10x1 | M12x1.5 | M14x1.5 | M16x1.5 | M18x1.5 | M22x1.5 | M27x2 |
| C | 5/16-24UNF | 3/8-24UNF | 7/16-20UNF | 1/2-20UNF | 9/16-18UNF | 3/4-16UNF | 7/8-14UNF |
| D | 1/16-27 NPTF | 1/8-27 NPTF | 1/4-18 NPTF | 3/8-18 NPTF | 1/2-14 NPTF | 3/4-14 NPTF | 1-11 1/2 NPTF |

**Table 4, Connection size for preferred high pressure ports (e.g. Maximator)**

| | Code letter, size | | | | | | |
|---|---|---|---|---|---|---|---|
| | KCQ | KCR | KCT | KUR | KUY | KWB | KWP |
| 1. Connection | 13/16-16UNF (9MF) | 13/16-16UNF (9MF) | 9/16-18UNF (6MF) | 9/16-18UNF (6MF) | 1 3/8-12UNF (16MF) | 9/16-18UNF (6MF) | 3/4-16UNF (6HF) |
| 2. Connection | 13/16-16UNF (9MF) | - | - | 9/16-18UNF (6MF) | - | G 3/4-ISO228 | - |

other connections on request

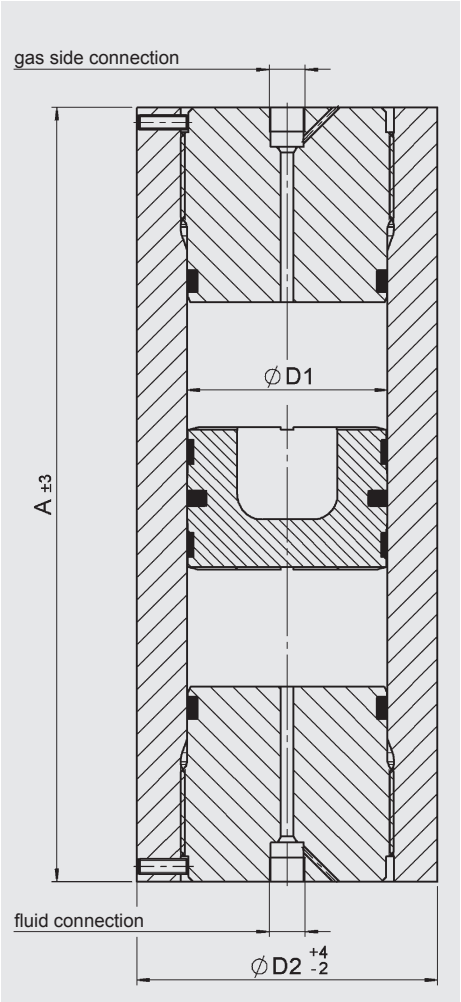
**Table 5, Gas valve port**

| Code letter | Description |
|---|---|
| W | Gas valve end connection M28x1.5/M8 (max. pre-charge pressure 800 bar with FPU-2) |
| M | Gas valve, male, for high pressure port 9/16-18UNF (6MF) (no limit for pre-charge pressure) |

**Notice:**
Application examples, accumulator dimensioning and extracts from approvals regulations on hydraulic accumulators can be found in the following catalogue section:

- HYDAC Accumulator Technology
  No. 3.000

## 3. DIMENSIONS




### 3.1. SERIES: SK690

max. permitted operating pressure: 690 bar (PED)

| Volume [l] | Ø D1 [mm] | Ø D2 Carbon steel [mm] | Ø D2 Stainless steel [mm] | A [mm] | Approx. weight Carbon steel [kg] | Approx. weight Stainless steel [kg] |
|---|---|---|---|---|---|---|
| 0.5 - 10 | 80 | 107 | 110 | 280 - 2170 | 15 - 74 | 16 - 83 |
| 1 - 20 | 125 | 160 | 160 | 295 - 1845 | 37 - 133 | 37 - 133 |
| 5 - 30 | 150 | 190 | 200 | 535 - 1950 | 75 - 194 | 88 - 241 |
| 5 - 50 | 180 | 246 | 220 | 480 - 2250 | 136 - 443 | 94 - 269 |

### 3.2. SERIES: SK800

max. permitted operating pressure: 800 bar (PED)

| Volume [l] | Ø D1 [mm] | Ø D2 Carbon steel [mm] | Ø D2 Stainless steel [mm] | A [mm] | Approx. weight Carbon steel [kg] | Approx. weight Stainless steel [kg] |
|---|---|---|---|---|---|---|
| 0.5 - 10 | 80 | 107 | 110 | 280 - 2170 | 15 - 74 | 16 - 83 |
| 1 - 20 | 125 | 162 | 160 | 295 - 1845 | 38 - 140 | 37 - 133 |
| 5 - 30 | 150 | 185 | 200 | 535 - 1990 | 80 - 182 | 87 - 240 |
| 5 - 50 | 180 | 246 | 224 | 480 - 2250 | 136 - 443 | 100 - 293 |

### 3.3. SERIES: SK1000

max. permitted operating pressure: 1000 bar (PED)

| Volume [l] | Ø D1 [mm] | Ø D2 Carbon steel [mm] | Ø D2 Stainless steel [mm] | A [mm] | Approx. weight Carbon steel [kg] | Approx. weight Stainless steel [kg] |
|---|---|---|---|---|---|---|
| 0.5 - 10 | 80 | 120 | 119 | 310 - 2200 | 23 - 117 | 22 - 113 |
| 1 - 20 | 125 | 172 | 164 | 295 - 1840 | 44 - 178 | 40 - 148 |
| 5 - 30 | 150 | 200 | 250 | 575 - 1990 | 100 - 253 | 179 - 529 |
| 5 - 50 | 180 | 246 | 280 | 555 - 2325 | 168 - 475 | 229 - 732 |

## 4. NOTE

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

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