

Bladder Accumulators

Standard

1. DESCRIPTION

1.1. FUNCTION

Fluids are practically incompressible and cannot therefore store pressure energy.

The compressibility of a gas is utilised in hydro-pneumatic accumulators for storing fluids. HYDAC bladder accumulators are based on this principle, using nitrogen as the compressible medium.

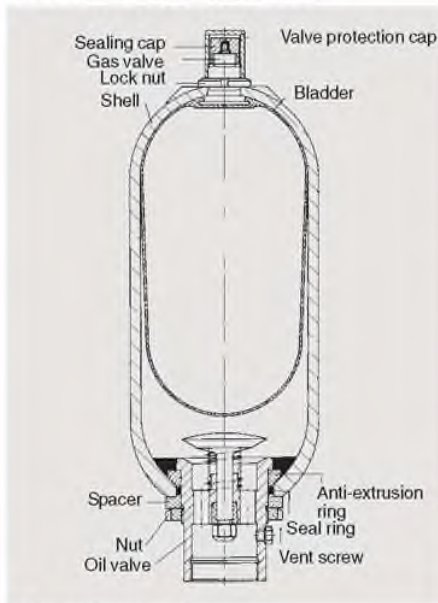
The bladder accumulator consists of a fluid section and a gas section with the bladder acting as a gas-proof screen. The fluid around the bladder is connected with the hydraulic circuit, so that the bladder accumulator draws in fluid when pressure increases and the gas is compressed. When the pressure drops, the compressed gas expands and forces the stored fluid into the circuit.

HYDAC bladder accumulators can be used in a wide variety of applications, some of which are listed below:

- energy storage
- emergency operation
- force equilibrium
- leakage compensation
- volume compensation
- shock absorption
- vehicle suspension
- pulsation damping
(see brochure on Hydraulic Dampers no. 3.701...)



1.2. CONSTRUCTION



1.2.1 Construction

● Standard bladder accumulators SB330/400/500/550

HYDAC standard bladder accumulators consist of the pressure vessel, the flexible bladder with gas valve and the hydraulic connection with check valve. The pressure vessel is seamless and manufactured from high tensile steel.

● Bladder accumulator SB330N

The flow optimised design of the standard oil valve enables the maximum possible operating fluid flow rate to increase to 25 l/s on this accumulator type.

● High Flow bladder accumulator SB330H

HYDAC high flow bladder accumulators, type SB330H, are high performance accumulators with a flow rate of up to 30 l/s. The fluid connection is enlarged to allow higher flow rates.

1.2.2 Bladder materials

The following elastomers are available as standard:

- NBR (acrylonitrile butadiene rubber, Perbunan),
- IIR (butyl rubber),
- FKM (fluoro rubber, Viton®),
- ECO (ethylene oxide epichlorohydrin rubber).

The material used depends on the respective operating medium and temperature.

1.2.3 Corrosion protection

For use with chemically aggressive media the accumulator shell can be supplied with corrosion protection, such as plastic coating on the inside or chemical nickel plating.

If this is insufficient, then stainless steel accumulators must be used.

1.3. MOUNTING POSITION

HYDAC bladder accumulators can be installed vertically, horizontally and at a slant.

When installing vertically or at a slant, the oil valve must be at the bottom. On certain applications listed below, particular positions are preferable:

- energy storage: vertical
 - pulsation damping: any position from horizontal to vertical
 - maintaining constant pressure: any position from horizontal to vertical
 - volume compensation: vertical
- If the mounting position is horizontal or at a slant the effective volume and the maximum permissible fluid flow rate are reduced.

1.4. TYPE OF MOUNTING

- By using an appropriate adaptor, HYDAC accumulators, up to size 1 l, can be mounted directly inline
- For strong vibrations and volumes above 1 l, we recommend the use of HYDAC accumulator supports or the HYDAC accumulator mounting set. (Brochure "Supports for Hydraulic Accumulators" no. 3.502. and ACCUSET SB, no. 3.503.)

2. TECHNICAL SPECIFICATIONS

2.1. EXPLANATORY NOTES

- 2.1.1 **Working pressure**
see tables
(In some countries this can differ from the nominal pressure)
- 2.1.2 **Nominal volume**
see tables
- 2.1.3 **Effective gas volume**
see tables, based on nominal dimensions; this differs slightly from the nominal volume and must be used when calculating the effective volume.
- 2.1.4 **Effective volume**
The fluid volume available between the working pressures p_2 and p_1 .
- 2.1.5 **Max. pressure fluid flow rate**
In order to achieve the max. flow rate given in the tables, the accumulator must be mounted vertically. It has to be taken into account that a residual fluid volume of approx. 10% of the effective gas volume remains in the accumulator.
- 2.1.6 **Fluids**
The various seal and bladder materials are compatible with the following fluids:

| Material | Fluid |
|------------------------|--|
| NBR LOW TEMP NBR | Mineral oils (HL, HLP, HFA, HFB, HFC), water |
| ECO | Mineral oil |
| IIR | Phosphate ester |
| FKM | Chlorinated hydrocarbons, petrol |

2.1.7 Permissible operating temperature

The permissible operating temperatures are dependent on the application limits of the metallic materials and the bladders.

The standard valve bodies, gas valves and accumulator shells are suitable for temperatures -10 °C to +80 °C.

Outside these temperatures, special material combinations must be used.

The following table shows the correlation between bladder material and application temperature.

| Material | Temperature ranges |
|-----------------|---------------------|
| NBR | - 15 °C to + 80 °C |
| LOW TEMP NBR | - 50 °C to + 80 °C |
| ECO | - 30 °C to + 120 °C |
| FKM | - 10 °C to + 150 °C |

2.1.8 Gas charging

Always charge with 99.995% nitrogen only, filtered to < 3 µm.

If other gases are to be used, please contact HYDAC for advice.

NEVER USE OXYGEN OR COMPRESSED AIR.

RISK OF EXPLOSION.

- 2.1.9 **Critical values for gas pre-charge pressure**
 $p_0 \leq 0.9 \times p_1$
 with a permissible pressure ratio of: $p_2 : p_0 \leq 4:1$
 $p_2 = \text{max. operating pressure}$
 $p_0 = \text{gas pre-charge pressure}$

2.1.10 **Certificate codes**

| | |
|------------------|------|
| Australia | F* |
| Brazil | U*** |
| Canada | S1** |
| China | A9 |
| CIS | A6 |
| EU member states | U*** |
| Hungary | U*** |
| India | U*** |
| Japan | P |
| New Zealand | T |
| Poland | A4 |
| Romania | U |
| Slovakia | A8 |
| South Africa | U*** |
| Switzerland | U |
| USA | S |

others on request

- * = approval required in the individual territories
- ** = approval required in the individual provinces
- *** = 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 with accumulators (repairs, connecting pressure gauges etc) must only be carried out once the pressure and fluid have been released.

Please observe operating instructions!

Note:

Application examples, accumulator sizing and extracts from approvals regulations on hydraulic accumulators can be found in the accumulator overview brochure no. 3.000./...

2.2. **MODEL CODE**
 (also order example)

SB 330 H - 32 A 1 / 112 U - 330 A

Series

Type

- H = High Flow
 - N = increased flow, standard oil valve dimensions
 - A = shock absorber
 - P = pulsation damper
 - S = suction flow stabiliser
 - B = bladder top-repairable
- Combinations possible: e.g.
 HB = High Flow with a top-repairable bladder or
 PH = pulsation damper with high flow rate.
 No details = standard

Nominal volume in l

Fluid connection

- A = standard connection, thread with internal seal face
- F = flange connection
- C = valve mounting with screws on underside
- E = sealing surfaces on the front interface (e.g. on thread M50 x 1.5)
- G = male thread
- S = special connection according to customer specification

Gas side

- 1 = standard model ⁴⁾
- 2 = back-up model
- 3 = gas valve 7/8-14UNF with M8 female thread
- 4 = 5/8" gas valve
- 5 = gas valve M50 x 1.5 in accumulators smaller than 50 l
- 6 = 7/8-14UNF gas valve
- 7 = M28 x 1.5 gas valve
- 8 = M16 x 1.5 gas valve
- 9 = special gas valve according to customer specification

Material code ¹⁾

- 112 = standard for mineral oil
- depending on operating medium
- others on request

Fluid connection

- 1 = carbon steel
- 2 = high-strength steel
- 3 = stainless steel (Niro) ³⁾
- 6 = low temperature steel

Accumulator shell

- 0 = plastic coated (internally)
- 1 = carbon steel
- 2 = chemically nickel plated (internally)
- 4 = stainless steel (Niro) ³⁾
- 6 = low temperature steel

Accumulator bladder ²⁾

- 2 = NBR
- 3 = ECO
- 4 = IIR (Butyl)
- 5 = TT-NBR (low temperature)
- 6 = FPM
- 7 = others

Certificate code

- U = PED 97/23/EC

Permissible operating pressure (bar)

Connection

- Thread, codes for fluid connections: A, C, E, G
- A = thread to ISO 228 (BSP)
- B = thread to DIN 13 or ISO 965/1 (metric)
- C = thread to ANSI B1.1 (UN..-2B seal to SAE J 514)
- D = thread to ANSI B1.20.1 (NPT)
- S = special thread according to customer specification

Flange, codes for fluid connection: F

- A = DIN flange
- B = flange ANSI B 16.5
- C = SAE flange 3000 psi
- D = SAE flange 6000 psi
- S = special flange according to customer specification

Required gas pre-charge pressure must be stated separately!

1) Not all combinations are possible.
 2) When ordering spare bladders, please state bladder connection port size.
 3) Depending on type and pressure rating.
 4) Gas valve type in SB < 50 l = 7/8 - 14 UNF, in SB ≥ 50 l = M50 x 1.5

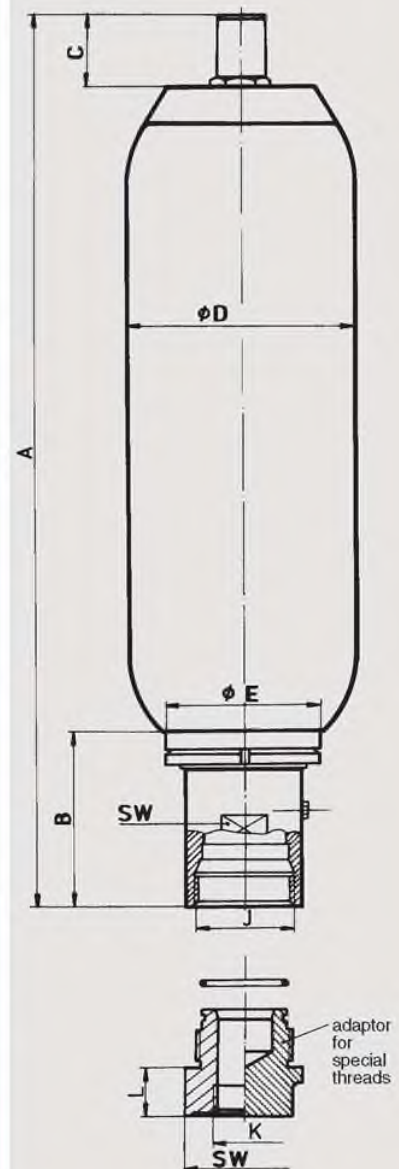
3. DIMENSIONS AND SPARE PARTS

3.1. DIMENSIONS

| Nominal volume Litres | Valve | max. working pressure (PED 97/23/EC) bar | Eff. gas volume litres | Weight kg | A | B | C | Ø D | J | Ø E | SW | Q ¹⁾ | | | | |
|--------------------------|----------|--|---------------------------|--------------|-------|-------|-------|------|--------|-------|-------|-----------------|------|-----|----|----|
| | | | | | mm | mm | mm | mm | thread | mm | mm | mm | l/s | | | |
| 0.5 | standard | 400 | 0.5 | 2.8 | 270 | 57 | 33.5 | 95.5 | G 3/4 | 50 | 32 | 4 | | | | |
| 1 | | 330 | 1.0 | 4.5 | 302 | 58 | 68 | 229 | 118 | G 1 | 67 | 45 | 4 | | | |
| | | 550 | | 8.5 | 334 | | | | 121 | | | | | | | |
| 2.5 | | 330 | 2.4 | 10 | 532 | | | | 63 | 118 | G 1 ¼ | 50 | 10 | | | |
| | | 550 | 2.5 | 13.5 | 539 | | | | 68 | 121 | G 1 | 45 | 4 | | | |
| 4 | | 330 | 3.7 | 11.5 | 410 | | | | 63 | 173 | G 1 ¼ | 50 | 10 | | | |
| | | 400 | | 15.5 | 410 | | | | 63 | 172 | G 1 ¼ | 50 | 10 | | | |
| 5 | | 550 | 4.9 | 23 | 867 | | | | 68 | 121 | G 1 | 45 | 4 | | | |
| 6 | | 330 | 5.7 | 15 | 540 | | | | 63 | 173 | G 1 ¼ | 50 | 10 | | | |
| 10 ²⁾ | | 330 | 9.3 | 25 | 728 | | | | | | G 1 ¼ | 50 | 10 | | | |
| 10 | | standard | 330 | 9.3 | 31.5 | | | | 568 | 103 | 58 | 229 | G 2 | 100 | 70 | 15 |
| | | N | | | 25 | | | | | | | | | | | |
| | H | 9 | | 34.5 | 603 | | | | 138 | G 2 ½ | 125 | 90 | 30 | | | |
| | standard | 400 | | 9.3 | 37.5 | 572 | 103 | G 2 | 100 | 70 | 15 | | | | | |
| 13 | standard | 330 | 12 | 43 | 660 | 103 | 58 | 229 | G 2 | 100 | 70 | 15 | | | | |
| | N | | | 25 | | | | | | | | | | | | |
| | H | | 46 | 695 | 138 | G 2 ½ | 125 | 90 | 30 | | | | | | | |
| | standard | | 400 | 49 | 666 | 103 | G 2 | 100 | 70 | 15 | | | | | | |
| 20 | standard | 330 | 18.4 | 50.5 | 896 | 103 | 58 | 229 | G 2 | 100 | 70 | 15 | | | | |
| | N | | | 25 | | | | | | | | | | | | |
| | H | | 17.5 | 53.5 | 931 | 138 | G 2 ½ | 125 | 90 | 30 | | | | | | |
| | standard | | 400 | 18.4 | 63.5 | 896 | 103 | 233 | G 2 | 100 | 70 | 15 | | | | |
| 24 | standard | 330 | 23.6 | 69.0 | 1062 | 103 | 79 | 229 | G 2 | 100 | 70 | 15 | | | | |
| | N | | | 25 | | | | | | | | | | | | |
| | H | | 24 | 72 | 1097 | 138 | G 2 ½ | 125 | 90 | 30 | | | | | | |
| | standard | | 400 | 49 | 666 | 103 | G 2 | 100 | 70 | 15 | | | | | | |
| 32 | standard | 330 | 33.9 | 87 | 1411 | 103 | 79 | 229 | G 2 | 100 | 70 | 15 | | | | |
| | N | | | 25 | | | | | | | | | | | | |
| | H | | 32.5 | 90 | 1446 | 138 | G 2 ½ | 125 | 90 | 30 | | | | | | |
| | standard | | 400 | 33.9 | 104.5 | 1411 | 103 | 233 | G 2 | 100 | 70 | 15 | | | | |
| 50 | standard | 330 | 47.5 | 117.5 | 1931 | 103 | 68 | 229 | G 2 | 100 | 70 | 15 | | | | |
| | N | | | 25 | | | | | | | | | | | | |
| | H | | 120.5 | 1966 | 138 | G 2 ½ | 125 | 90 | 30 | | | | | | | |
| | standard | | 400 | 142 | 1931 | 103 | 233 | G 2 | 100 | 70 | 15 | | | | | |
| 60 | standard | 330 | 60 | 182 | 1156 | 138 | 68 | 356 | G 2 ½ | 125 | 90 | 30 | | | | |
| | 80 | | | 221 | 1406 | | | | | | | | | | | |
| | 100 | | 105 | 255 | 1656 | | | | | | | | | | | |
| | 130 | | 133 | 305 | 1976 | | | | | | | | | | | |
| 160 | standard | 330 | 170 | 396 | 2006 | 68 | 68 | 406 | G 2 ½ | 125 | 90 | 30 | | | | |
| | 200 | | | 201 | 485 | | | | | | | | 2306 | | | |

1) Q = max. operating fluid flow rate
2) slimline version for confined spaces

Dimensions



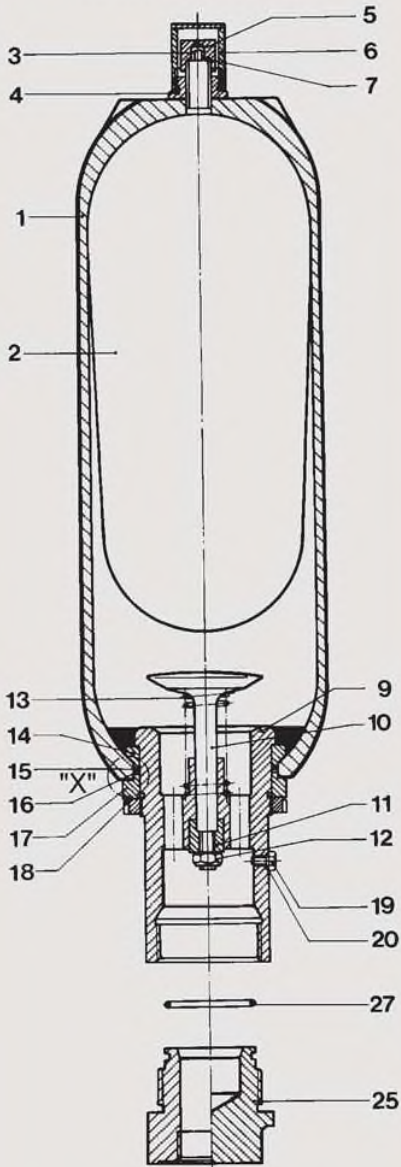
3.2. ADAPTORS¹⁾

| Series | Nominal volume | J | K | L | SW |
|---------------------|------------------------|---------|---------|----|-----|
| | | ISO 228 | ISO 228 | mm | mm |
| SB330/40 SB330 N | 0.6 - 1 | G ¾ | G 3/8 | 27 | 32 |
| | 2.5 - 10 ²⁾ | G 1¼ | G ¾ | 13 | 46 |
| | 10 ²⁾ - 50 | G 2 | G 1½ | 36 | 65 |
| SB550 | 1 - 5 | G 1 | G ¾ | 31 | 46 |
| SB330 | 60 - 200 | G 2½ | G 2 | 40 | 100 |
| SB330 H | 10 - 50 | G 2½ | | | |

1) order separately
2) 10 l standard model
*) slimline version for confined spaces

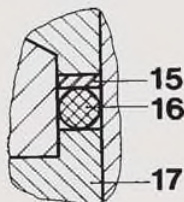
3.3. SPARE PARTS

SB 330/400/440/500/550
SB 330 H / SB 330 N

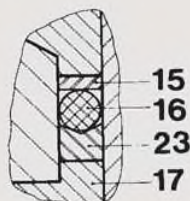


Detail "X"

SB 330/400 – 0.5 to 6 l



SB 330/400/500 – 10 to 200 l and
SB 330 H-10 to 200 l
SB 550-1 to 5 l



| Description | Item |
|---------------------------------------|------|
| Anti-extrusion ring | 14 |
| Oil valve complete, consisting of: | |
| Oil valve body | 9 |
| Valve | 10 |
| Damping sleeve | 11 |
| Safety nut | 12 |
| Valve spring | 13 |
| Anti-extrusion ring | 14 |
| Protection ring | 15 |
| O-ring (see above) | 16 |
| Spacer | 17 |
| Lock nut | 18 |
| Vent screw | 19 |
| Seal ring | 20 |
| Back-up ring | 23 |

| | |
|--------------------|----|
| Seal kit * | |
| consisting of: | |
| O-ring (see above) | 7 |
| Protection ring | 15 |
| O-ring (see above) | 16 |
| Seal ring | 20 |
| Back-up ring | 23 |
| O-ring (see above) | 27 |

| Description | Item |
|--------------------------------|------|
| Gas valve insert * | 3 |
| Repair kit * ²⁾ | |
| consisting of: | |
| Bladder | 2 |
| Gas valve insert | 3 |
| Lock nut | 4 |
| Cap nut | 5 |
| Valve protection cap | 6 |
| O-ring 7.5 x 2.0 ¹⁾ | 7 |
| Protection ring | 15 |
| O-ring | 16 |
| Seal ring | 20 |
| Back-up ring | 23 |
| O-ring | 27 |

* Recommended spare parts

¹⁾ For code 663 and 665
different dimensions.

²⁾ When ordering please state smallest
bladder connection port size.
Item 1 not available as spare part,
Item 25 has to be ordered separately
(see page 4)

3.4 REPAIR KITS

NBR, carbon steel
Nom. volume: 0.5 to 200 litres
Standard gas valve

| Nom. volume [L] | Stock no. |
|-----------------|-----------|
| 1 | 02106261 |
| 2.5 | 02106200 |
| 4 | 02106204 |
| 5 | 02106208 |
| 6 | 02112100 |
| 10 * | 03117512 |
| 10 | 02106212 |
| 13 | 02106216 |
| 20 | 02106220 |
| 24 | 02106224 |
| 32 | 02106228 |
| 50 | 02106252 |
| 60 | 03117513 |
| 80 | 03117514 |
| 100 | 03117515 |
| 130 | 03117516 |
| 160 | 03117517 |
| 200 | 03117558 |

*) slimline version for confined spaces
others on request

4. BLADDER ACCUMULATORS BACK-UP TYPE SB 330-...A2

4.1. CONSTRUCTION

Based on the bladder accumulators 20 - 50 l, the gas side of these accumulators is designed especially for connecting to nitrogen bottles.

A perforated anti-extrusion rod prevents damage to the bladder when the accumulator is charged.

This construction can also be used for the separation of fluids (taking into account the volume ratios valid for bladder accumulators).

4.2. DIMENSIONS

| Nom. volume litres | Effect. gas volume litres | Weight kg | A max. mm |
|--------------------|---------------------------|-----------|-----------|
| 20 | 17.5 | 53.5 | 905 |
| 24 | 24 | 72 | 1070 |
| 32 | 32.5 | 89 | 1420 |
| 50 | 47.5 | 119.5 | 1930 |

4.3. SPARE PARTS

| Description | Item |
|--------------------------------|------|
| Repair kit * consisting of: | |
| Bladder | 2 |
| Lock nut | 4 |
| O-ring 7.5 x 2.0 ¹⁾ | 7 |
| Protection ring | 15 |
| O-ring 80 x 5 ¹⁾ | 16 |
| Seal ring | 20 |
| Back-up ring | 23 |
| O-ring 48 x 3 ¹⁾ | 27 |
| O-ring 22 x 2.5 ¹⁾ | 31 |
| O-ring 11 x 2 ¹⁾ | 33 |
| Anti-extrusion ring | 14 |
| Rod | 30 |

* Recommended spares

¹⁾ For code 663 and 665 different dimensions.

Item 1 not available as spare part.

Item 25 to be ordered separately (see page 4).

Item 32 type 1 Standard.

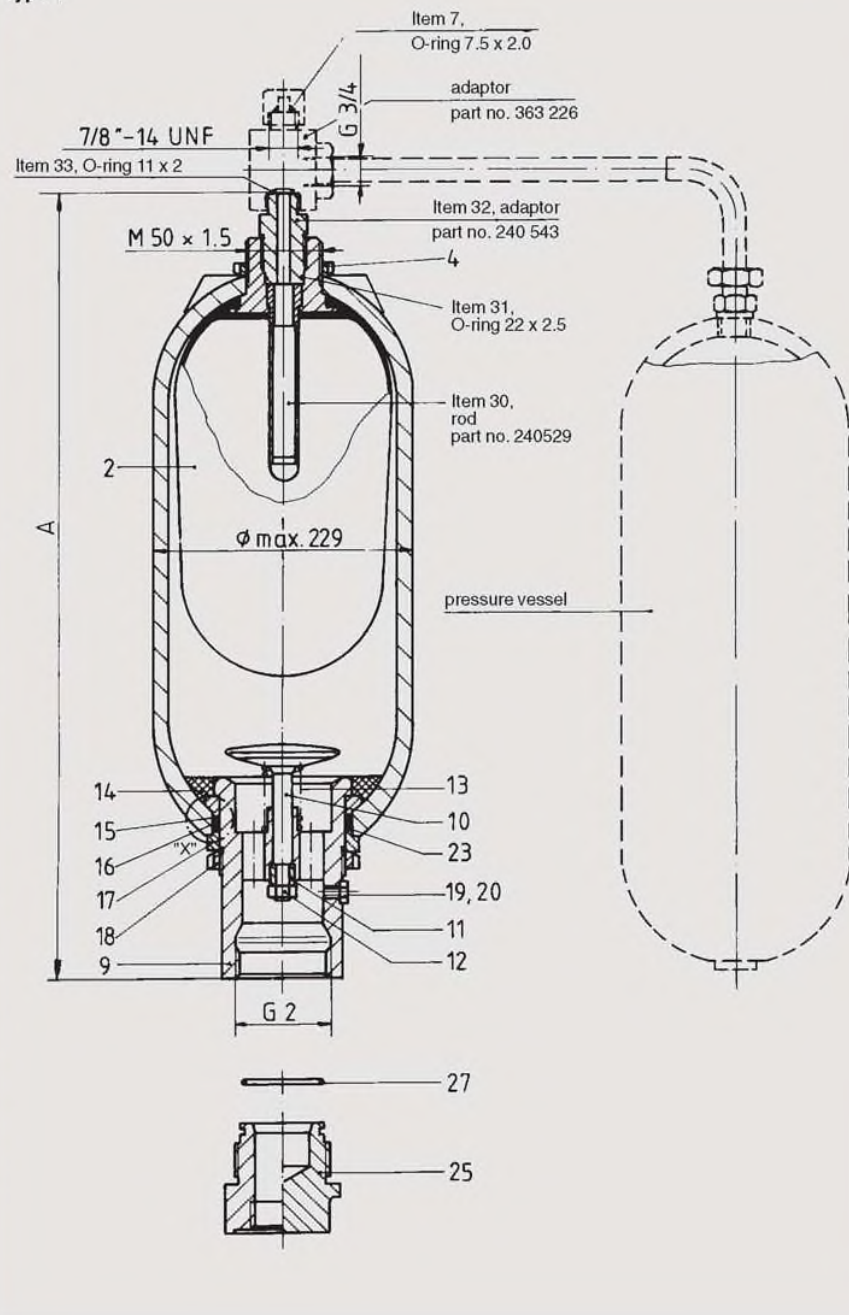
Other spare parts – see point 3.

4.4 REPAIR KITS

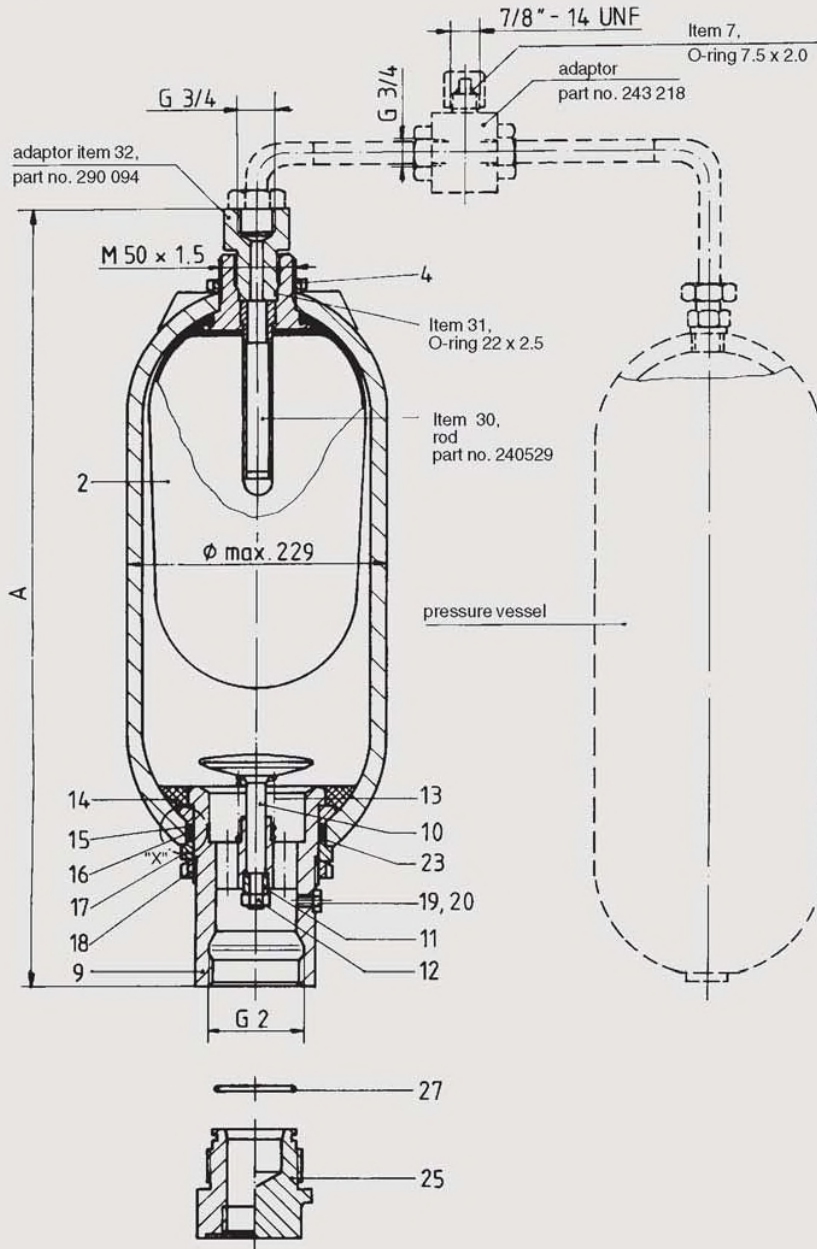
| Designation | Stock no. |
|--------------------|-----------|
| SB330/400A2-20 NBR | 03119500 |
| SB330/400A2-24 NBR | 03119502 |
| SB330/400A2-32 NBR | 03119498 |
| SB330/400A2-52 NBR | 03119499 |

others on request

Type 1



Type 2



5. NOTE

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