

# Bladder-type accumulators

**RA 51350/04.13**  
Replaces: 05.12

1/30

## Model HAB

Component series 5X  
Nominal capacity 1 quart to 15 gallons  
Maximum operating pressure 6000 PSI



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## Features

- Hydraulic accumulator according to ASME Section VIII pressure vessel code or CRN/TSSA certification.
  - Bladder material for different applications
- Use:
- Energy storing in systems with intermittent operation
  - Energy reserve for emergencies
  - Compensation for leakage losses
  - Impact and vibration damping
  - Compensation of flow in the case of changes in pressure and temperature

For complete details on HAB-4X design, refer to data sheet RE 50170.

## Ordering Code

|            |           |          |            |          |           |           |            |          |          |          |          |          |          |          |              |
|------------|-----------|----------|------------|----------|-----------|-----------|------------|----------|----------|----------|----------|----------|----------|----------|--------------|
| <b>HAB</b> | <b>10</b> | <b>-</b> | <b>207</b> | <b>-</b> | <b>5X</b> | <b>/1</b> | <b>S09</b> | <b>F</b> | <b>-</b> | <b>6</b> | <b>N</b> | <b>1</b> | <b>1</b> | <b>1</b> | <b>-ASME</b> |
| 01         | 02        |          | 03         |          | 04        | 05        | 06         | 07       |          | 08       | 09       | 10       | 11       | 12       | 13           |

**Accumulator**

|    |                   |     |
|----|-------------------|-----|
| 01 | Model designation | HAB |
|----|-------------------|-----|

**Nominal volume (L)**

|    |                         |    |
|----|-------------------------|----|
| 02 | 1.0 liter = (1 quart)   | 1  |
|    | 4.0 liter = (1 gallon)  | 4  |
|    | 10 liter = (2.5 gallon) | 10 |
|    | 20 liter = (5 gallon)   | 20 |
|    | 35 liter = (10 gallon)  | 35 |
|    | 40 liter = (11 gallon)  | 40 |
|    | 50 liter = (15 gallon)  | 50 |

**Maximum pressure**

|    |  |      |
|----|--|------|
| 03 | 207 bar (3000 PSI)                               | -207 |
|    | 275 bar (4000 PSI)                               | -275 |
|    | 345 bar (5000 PSI, 10, 20, 35 and 50 liter only) | -345 |
|    | 414 bar (6000 PSI, 10, 20, 35 and 50 liter only) | -414 |

**Design series**

|    |           |    |
|----|-----------|----|
| 04 | 5X design | 5X |
|----|-----------|----|

**Pre-charge pressure**

|    |                                  |  |    |
|----|----------------------------------|--|----|
| 05 | Nitrogen gas pre-charge pressure | 1 bar (15 PSI) standard precharge. (Consult factory for customer specific pre-charges) | /1 |
|----|----------------------------------|--|----|

**Fluid port connection**

|    |   |     |
|----|---|-----|
| 06 | G2 BSPP (10 to 50 liter sizes)  | G09 |
|    | 1" NPT (only 1 liter size)  | N05 |
|    | 1-1/4" NPT (only 4 liter size)  | N06 |
|    | 2" NPT (10 to 50 liter sizes)   | N08 |
|    | 1-1/2" SAE 4 bolt flange, code 62 (only 5000/6000 PSI, 10 - 50 liter sizes) | S07 |
|    | 2" SAE 4 bolt flange, code 61 (only 3000 PSI, 10 - 50 liter sizes)          | S09 |
|    | 1-5/8"-12UN (#20 SAE, only 4 liter size)                                    | U08 |
|    | 1-7/8"-12UN (#24 SAE, 10 to 50 liter sizes)                                 | U09 |
|    | 1-5/16"-12UN (#16 SAE, only 1 liter size)                                   | U14 |

**Fluid port design**

|    |  |    |
|----|--|----|
| 07 | Bottom repairable threaded connection            | G  |
|    | Top repairable threaded connection               | GT |
|    | Bottom repairable threaded connection, high flow | HG |
|    | Bottom repairable flanged connection             | F  |
|    | Top repairable flanged connection                | FT |
|    | Bottom repairable flanged connection, high flow  | HF |

**Gas valve connection**

|    |   |   |
|----|---|---|
| 08 | 207/275 bar rated units (3000/4000 PSI) | 6 |
|    | 345/414 bar rated units (5000/6000 PSI) | 7 |

**Bladder material**

|    |  |   |
|----|--|---|
| 09 | Nitrile (Buna)   | N |
|    | Hydrin - Eco   | E |
|    | Fluoro-Elastomer (Viton®) <small>Note: Viton® is a trademark of DuPont</small> | F |
|    | Butyl  | I |
|    | Extreme low temp nitrile   | L |
|    | Cold weather nitrile   | T |

**Shell Material**

|    |       |   |
|----|-------|---|
| 10 | Steel | 1 |
|----|-------|---|

**Inside shell surface**

|    |                  |   |
|----|------------------|---|
| 11 | Plain steel      | 1 |
|    | Phenolic Coating | 3 |

**Inside fluid port surface**

|    |             |   |
|----|-------------|---|
| 12 | Plain steel | 1 |
|----|-------------|---|

**Certificate type**

|    |  |      |
|----|--|------|
| 13 | ASME certification   | ASME |
|    | CRN <sup>1</sup> (Canadian Registration No.) certification | CRN  |

<sup>1</sup> = not available on all configurations

## General Information

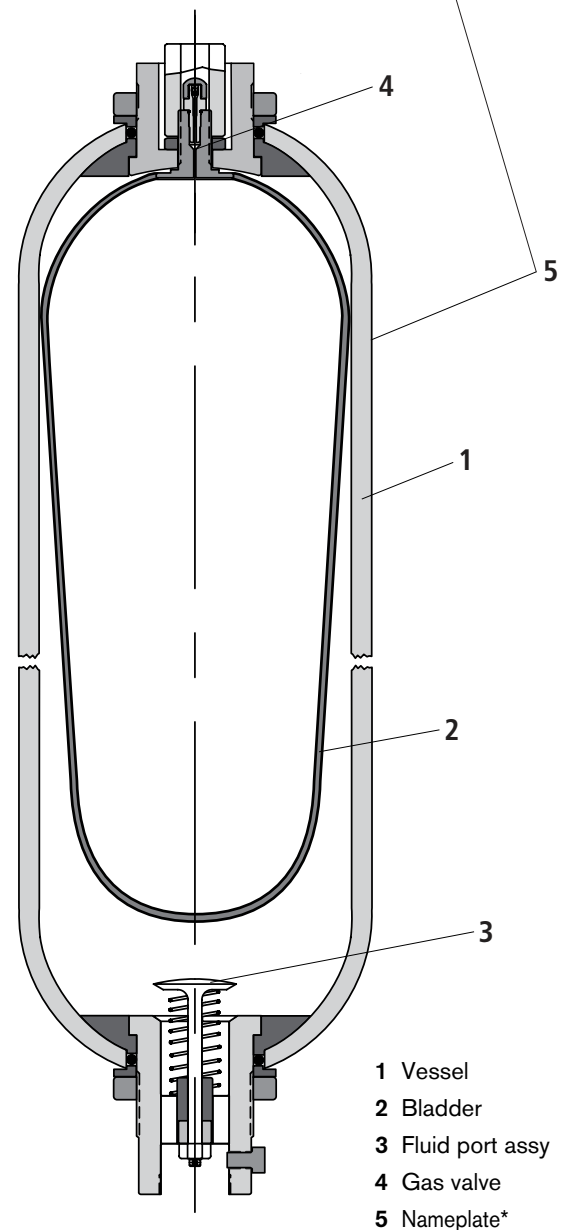
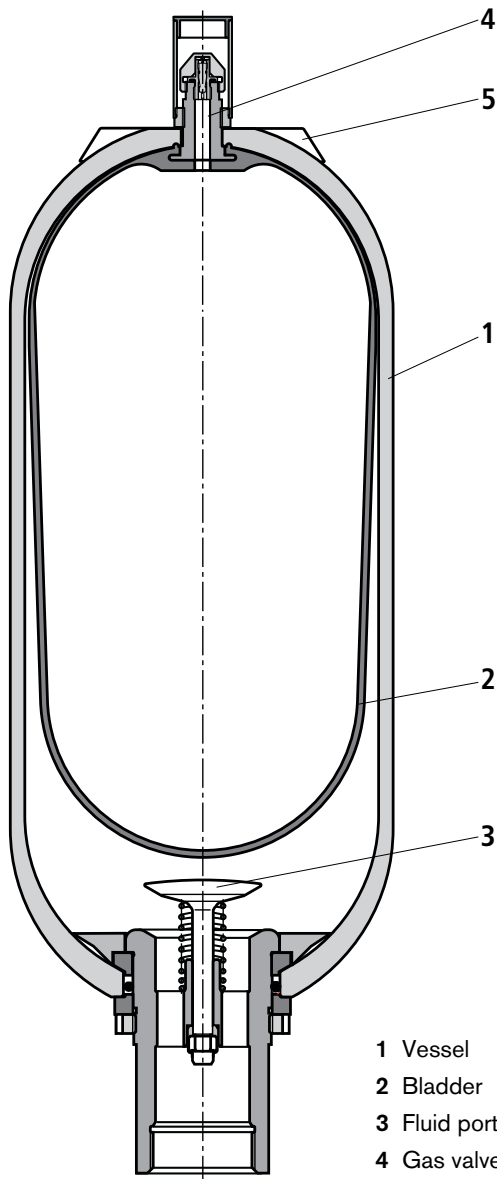
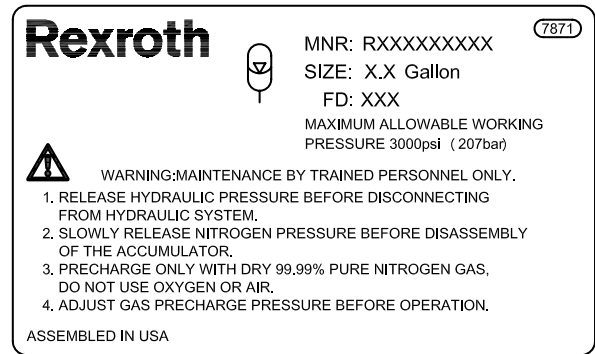
### 1. Applications

Hydro-pneumatic accumulators can be used for the following functions:

1. Store power for intermittent duty cycles thus economizing pump drive power.
2. Provide energy or standby power
3. Compensate for leakage loss
4. Suspension in vehicles
5. Dampen pulsations and shocks of a periodic nature.

### 2. Principals of Operation

Hydraulic accumulators are hydrostatic units, which can store a certain amount of energy and make it available to the hydraulic system when required.



\* Top repairable accumulators don't have metallic nameplates. TR units are identified by adhesive labels affixed to the vessel.

## Standard ASME models

Fluids are hardly compressible, whereas gases feature high compressibility. The operating principle of all gas-loaded hydraulic accumulators is based on this difference.

Hydraulic accumulators basically consist of a fluid and a gas section with a gas-tight separating element. The fluid section is connected to the hydraulic circuit.

When a certain amount of pressurized gas is pressurized to a higher fluid pressure, the gas volume decreases as the fluid pressure rises.

When the fluid pressure falls, the fluid is pressed back into the hydraulic system through expansion of the gas until the pressure is again balanced.

Bladder-type accumulators consist of a seamless cylindrical pressure vessel (1) made of high-tensile steel.

The accumulator is subdivided into a gas and a fluid side by an elastic bladder (2) mounted in the interior of the vessel.

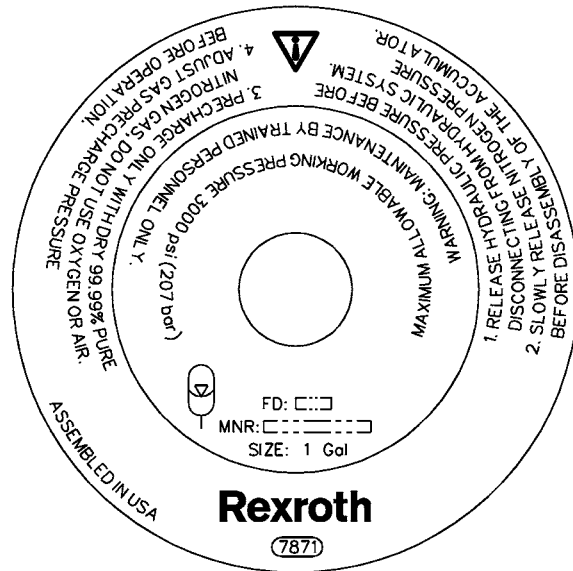
The bladder is charged with nitrogen to the specified gas charge pressure  $p_0$  by means of gas valve (4).

When the fluid is pressed into the accumulator, the gas in the bladder is compressed and hence the pressure increases. The gas volume reduces and on the fluid side, the fluid can flow into the accumulator. As soon as the pressure on the fluid side falls below the gas pressure, the accumulator is emptied.

Fluid port assembly (3) is provided in the oil port of the bladder-type accumulator and closes when the pressure on the gas side is higher than on the fluid side. This prevents draining of the bladder into the oil channel and thus the bladder from being destroyed.

When the minimum operating pressure is reached, a small oil volume is to be maintained between the bladder and the fluid volume (approx. 10 % of the nominal capacity of the hydraulic accumulator), in order that the bladder does not hit the valve during every expansion process.

An example accumulator nameplate is shown in the following figure:



## Standard ASME models

| Volume Size | Material Number | DCH Designation               |
|-------------|-----------------|-------------------------------|
| 1 Quart     | R978045718      | HAB1-207-5X/1N05G-6N111-ASME  |
| 1 Quart     | R978045719*     | HAB1-207-5X/1U14G-6N111-ASME  |
| 1 Gallon    | R978045720      | HAB4-207-5X/1N06G-6N111-ASME  |
| 1 Gallon    | R978045721*     | HAB4-207-5X/1U08G-6N111-ASME  |
| 2.5 Gallon  | R978045722      | HAB10-207-5X/1N08G-6N111-ASME |
| 2.5 Gallon  | R978045724*     | HAB10-207-5X/1U09G-6N111-ASME |
| 2.5 Gallon  | R978045726      | HAB10-207-5X/1S09F-6N111-ASME |
| 5 Gallon    | R978045734      | HAB20-207-5X/1N08G-6N111-ASME |
| 5 Gallon    | R978045736*     | HAB20-207-5X/1U09G-6N111-ASME |
| 5 Gallon    | R978045738      | HAB20-207-5X/1S09F-6N111-ASME |
| 10 Gallon   | R978045746      | HAB35-207-5X/1N08G-6N111-ASME |
| 10 Gallon   | R978045748*     | HAB35-207-5X/1U09G-6N111-ASME |
| 10 Gallon   | R978045750      | HAB35-207-5X/1S09F-6N111-ASME |
| 11 Gallon   | R978045758      | HAB40-207-5X/1N08G-6N111-ASME |
| 11 Gallon   | R978045759      | HAB40-207-5X/1U09G-6N111-ASME |
| 11 Gallon   | R978045760      | HAB40-207-5X/1S09F-6N111-ASME |
| 15 Gallon   | R978045764      | HAB50-207-5X/1N08G-6N111-ASME |
| 15 Gallon   | R978045766*     | HAB50-207-5X/1U09G-6N111-ASME |
| 15 Gallon   | R978045768      | HAB50-207-5X/1S09F-6N111-ASME |

\* Indicates **GoTo** Products

## Specifications

| Function & performance data  |   |                |      |       |      |      |      |      |
|--|---|----------------|------|-------|------|------|------|------|
| Bottom Repairable, 3000/4000 PSI   | Nominal volume (GAL)  | 1 QT           | 1 G  | 2.5 G | 5 G  | 10 G | 11 G | 15 G |
|  | Effective gas volume (L)  | 1.2            | 3.8  | 9.8   | 19.7 | 37.0 | 41.5 | 56.4 |
|  | Max operating pressure (PSI)  | 4000           | 4000 | 4000  | 4000 | 4000 | 4000 | 4000 |
| Bottom Repairable, 5000/6000 PSI   | Nominal volume (GAL)  |                |      | 2.5 G | 5 G  | 10 G |      | 15 G |
|  | Effective gas volume (L)  |                |      | 9.8   | 19.7 | 37.0 |      | 56.4 |
|  | Max operating pressure (PSI)  |                |      | 6000  | 6000 | 6000 |      | 6000 |
| Top Repairable, 3000/4000 PSI  | Nominal volume (GAL)  |                |      | 2.5 G | 5 G  | 10 G | 11 G | 15 G |
|  | Effective gas volume (L)  |                |      | 9.8   | 19.7 | 37.0 | 41.5 | 56.4 |
|  | Max operating pressure (PSI)  |                |      | 4000  | 4000 | 4000 | 4000 | 4000 |
| Top Repairable, 5000/6000 PSI  | Nominal volume (GAL)  |                |      | 2.5 G | 5 G  | 10 G |      | 15 G |
|  | Effective gas volume (L)  |                |      | 9.8   | 19.7 | 37.0 |      | 56.4 |
|  | Max operating pressure (PSI)  |                |      | 6000  | 6000 | 6000 |      | 6000 |
| Operating Temperature Range  | Nitrile, Buna-n (NBR)   | 5°F to 212°F   |      |       |      |      |      |      |
|  | Hydrin epichlorohydrin (ECO)  | -26°F to 239°F |      |       |      |      |      |      |
|  | Viton® fluoroelastomer (FKM)  | -4°F to 284°F  |      |       |      |      |      |      |
|  | Butyl (IIR)   | 5°F to 248°F   |      |       |      |      |      |      |
|  | Extreme low temp nitrile  | -40°F to 200°F |      |       |      |      |      |      |
|  | Cold weather nitrile  | -50°F to 158°F |      |       |      |      |      |      |
| Flow Output<br>(Standard SAE fluid port, max flow rate dependant on fluid viscosity and accumulator orientation) |   |                |      |       |      |      |      |      |
|  | Nominal volume (GAL)  | 1 QT           | 1 G  | 2.5 G | 5 G  | 10 G | 11 G | 15 G |
|  | Max flow rate (GPM)   | 30             | 80   | 160   | 160  | 160  | 160  | 160  |
| Pre-Charge Ratio Limitation  | Maximum ratio of system pressure to pre-charge pressure, 4:1  |                |      |       |      |      |      |      |
| Mounting Position  | <p>Bosch Rexroth bladder accumulators in the 1Qt to 15 gallon design can be installed in either vertical or non-vertical orientations. When mounted vertically or at an angle, the fluid port must be at the bottom of the installation. Installation recommendations change based on application types as follows:</p> <p><b>Energy Storage</b><br/>Vertical installation is preferred. Non-vertical installations can result in performance reduction.</p> <p><b>Pulsation Dampening</b><br/>Any installation from vertical to horizontal.</p> <p><b>Leakage Compensation</b><br/>Any installation from vertical to horizontal.</p> <p><b>Volume and Pressure Compensation</b><br/>Any installation from vertical to horizontal.</p> <p>Please consult factory if further review of your specific application type is needed.</p> |                |      |       |      |      |      |      |
| Fluid  | Mineral oils to DIN 51524, HFC to ISO 12922, other fluids compatible with bladder compounds listed.   |                |      |       |      |      |      |      |
| Gas  | Nitrogen gas with typical purity 99.99%   |                |      |       |      |      |      |      |

Note: Viton® is a trademark of DuPont

## Sizing calculations

The majority of applications use accumulators to store energy for intermittent duty cycles or to provide a source of emergency power. In either case, the problem is determining the optimum size and precharge of the accumulator.

Accumulator sizing is based on the gas charge. The change in gas volume and pressure determines the amount of liquid that can be added or withdrawn. However, unlike mechanical springs, compressing a gas tends to heat it, raising the pressure above what would be expected from compression alone. Expanding a gas tends to cool it, reducing the pressure below that caused by expansion alone. Either of these effects can substantially affect accumulator sizing. Expansion (or compression) of a gas resulting in a change of gas temperature produces adiabatic expansion. When an accumulator is discharged rapidly, there is not enough time for sufficient heat transfer through the accumulator walls and adiabatic expansion occurs.

If the expansion (or compression) occurs slowly, there is sufficient time for heat to be added (or subtracted) by the accumulator wall to maintain a constant gas temperature and isothermal expansion occurs. The median of these two states of expansion can be partially "adiabatic".

When carrying out the calculations for an accumulator, the following pressures are of primary importance:

$p_0$  = Gas pre-charge pressure at room temperature and with liquid chamber drained

$p_1$  = Minimum operating pressure

$p_2$  = Maximum operating pressure

## Oil volumes

The gas volumes  $V_0 \dots V_2$  correspond to the pressures  $p_0 \dots p_2$ . Here,  $V_0$  is the rated volume of the accumulator.

The available oil volume  $\Delta V$  corresponds to the difference between the oil volume  $V_1$  and  $V_2$ .

$$\Delta V = V_2 - V_1 \quad (3)$$

The variable gas volume for a given pressure difference is determined according to the following equations:

a) For isothermal change of state of gases, the following equation applies:

$$p_0 \cdot V_0 = p_1 \cdot V_1 = p_2 \cdot V_2 \quad (4.1)$$

The isothermal equation is used when the change in the gas volume takes place so slowly that there is sufficient time for the complete exchange of heat to take place between the nitrogen and its surroundings. The result is a constant temperature.

The following relationships apply: the gas pre-charge pressure is to be slightly lower than the minimum hydraulic pressure so that the bladder does not continually contact the oil valve (wear).

$$p_0 \approx 0.9 \cdot p_1 \quad (1)$$

The maximum hydraulic pressure is not to exceed 4 times the pre-charge pressure; otherwise, the elasticity of the bladder or diaphragm will be adversely affected. Also, excessive changes in pressure result in considerable heating of the gas. Reducing the pressure differential between  $p_1$  and  $p_2$  increases bladder service life. On the other hand, it must be taken into account that a lower pressure differential also reduces the utilization of available storage capacity.

Bladder-type accumulators

$$p_2 \leq 4 \cdot p_0 \quad (2)$$

b) For adiabatic change of state of gases, the following formula applies:

$$p_0 \cdot V_{n0} = p_1 \cdot V_{n1} = p_2 \cdot V_{n2} \quad (4.2)$$

$n$  = relationship of the specific heats of the gas (adiabatic component);  $n = 1.4$  for nitrogen. The equation for adiabatic change of state is used when the change in the gas volume takes place so rapidly that the temperature of the nitrogen also changes.

In most cases the changes of state tend to follow the adiabatic rather than the isothermal laws. It is often the case that the charge takes place isothermally and the discharge adiabatically. Considering the equations (1) and (2),  $\Delta V$  is about 50 to 70% of the rated accumulator volume. The following formula can act as a guideline for sizing accumulators:

$$V_0 = 1.5 \dots 3x \Delta V \quad (5)$$

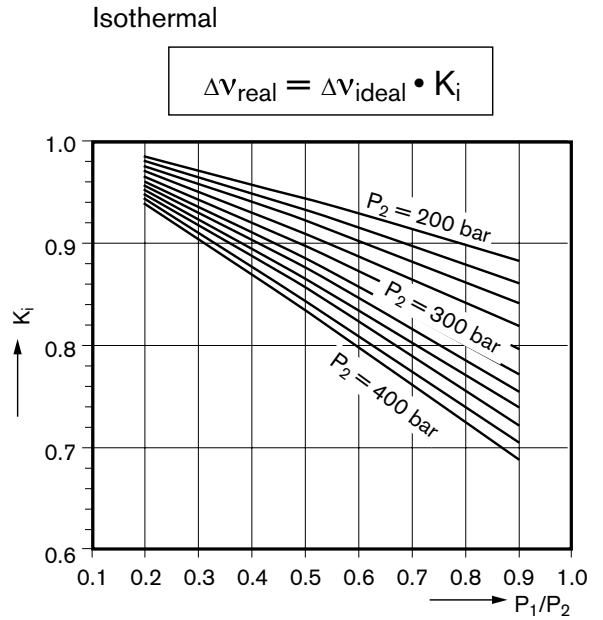
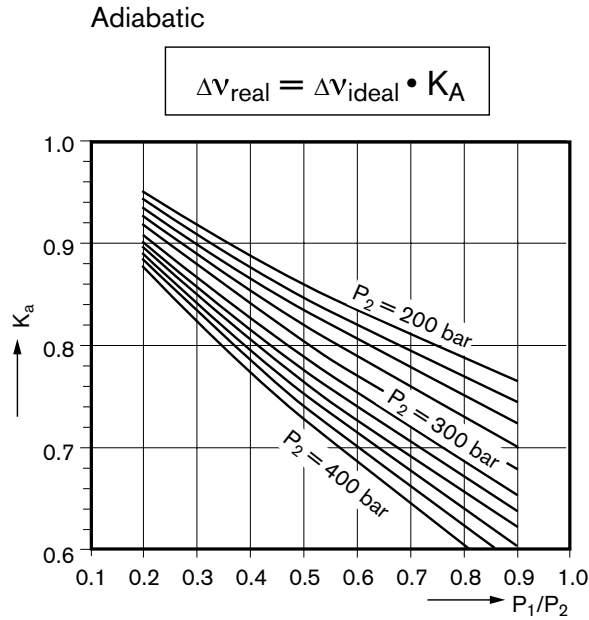
## Sizing calculations

### Calculation diagrams

The formula (4.1) and (4.2) are converted into diagrams on page 8 for graphic calculation purposes. Depending on the type of problem, the available oil volume, the accumulator size or the pressures can be determined.

### Correction factors $K_i$ and $K_a$

The formula (4.1) and (4.2) apply to ideal gases only. In practice, at pressures above 200 bar (2900 PSI), the behavior of real gases deviates markedly from that of the ideal gases. This makes it necessary to use correction factors. These are to be taken from the following diagrams. The correction factors, with which the ideal discharge volume  $\Delta V$  must be multiplied, are in the range of 0.6 ... 1.

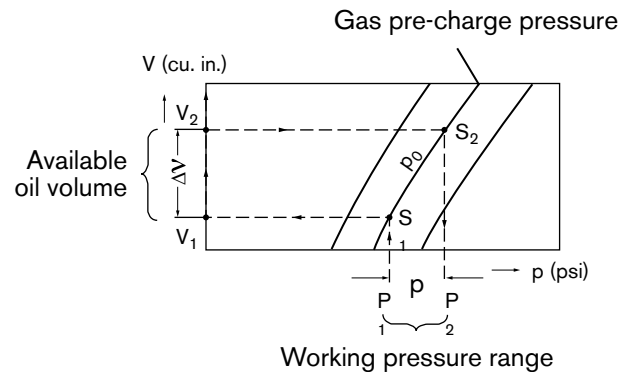


### Using the diagrams

With the pre-charge pressure ( $p_0$ ) and the minimum and maximum system pressures ( $p_1$  and  $p_2$ ) known, the available volume can be determined from the charts. Vertical lines are drawn from  $p_1$  and  $p_2$  to intersect the appropriate pre-charge curve. From the points of intersection, horizontal lines are then drawn to the left axis. Here  $V_1$  and  $V_2$  can be determined for the various sizes of accumulators. The difference between these values is the available volume.

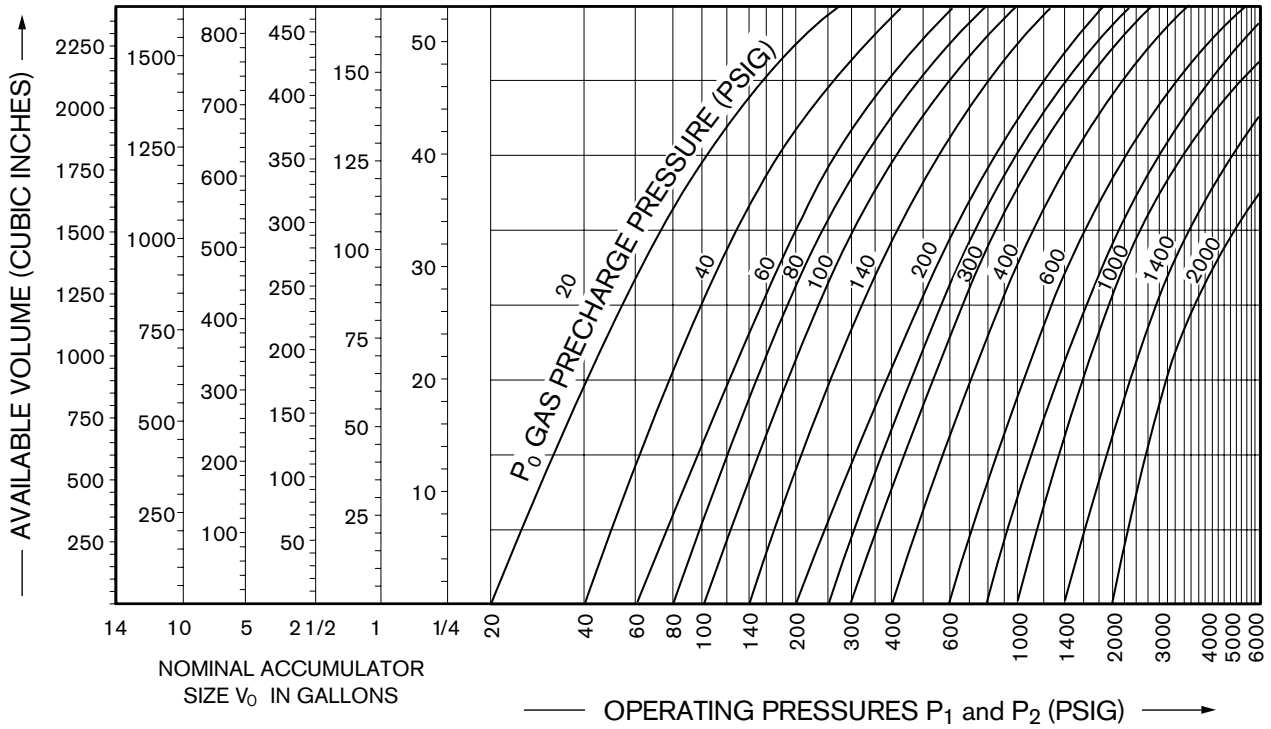
Similarly, pressures can be determined if the volume is known.

### How to use the calculation diagrams

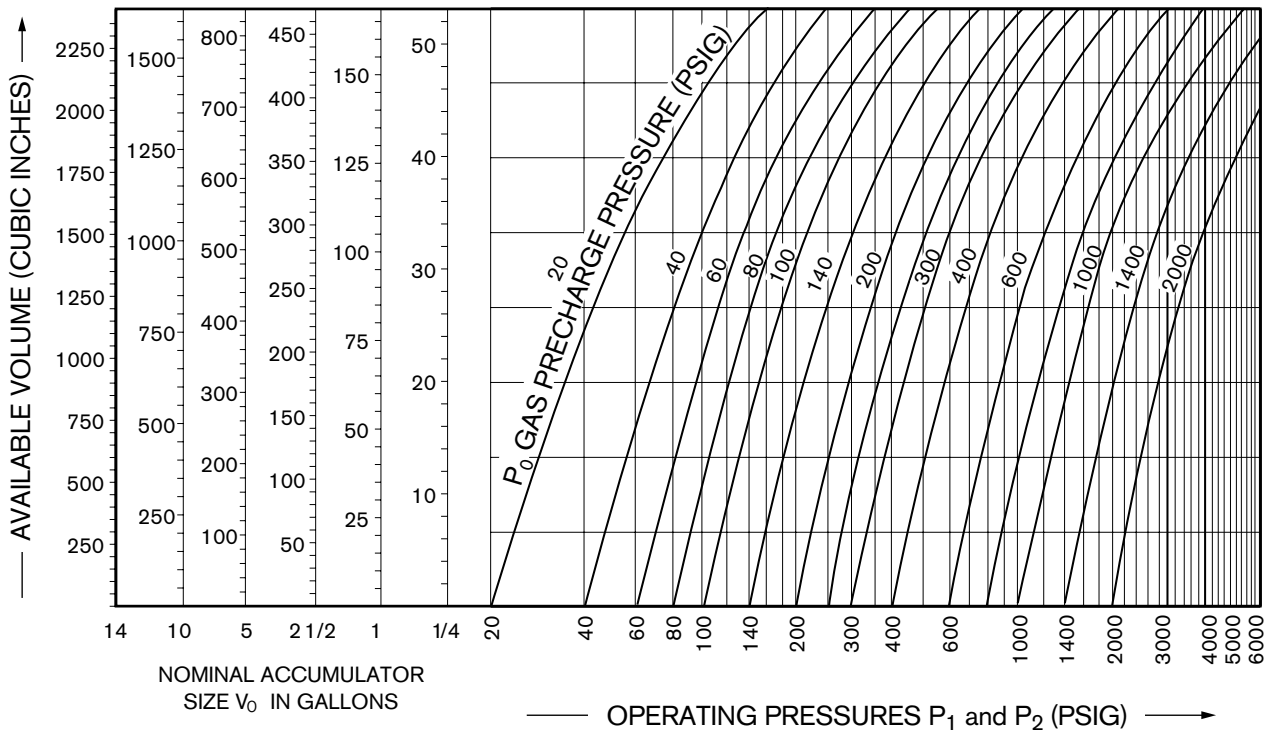


Sizing calculations

Pressure-Volume Curve, Adiabatic Relationship; Bladder Type Accumulator



Pressure-Volume Curve, Isothermal Relationship; Bladder Type Accumulator

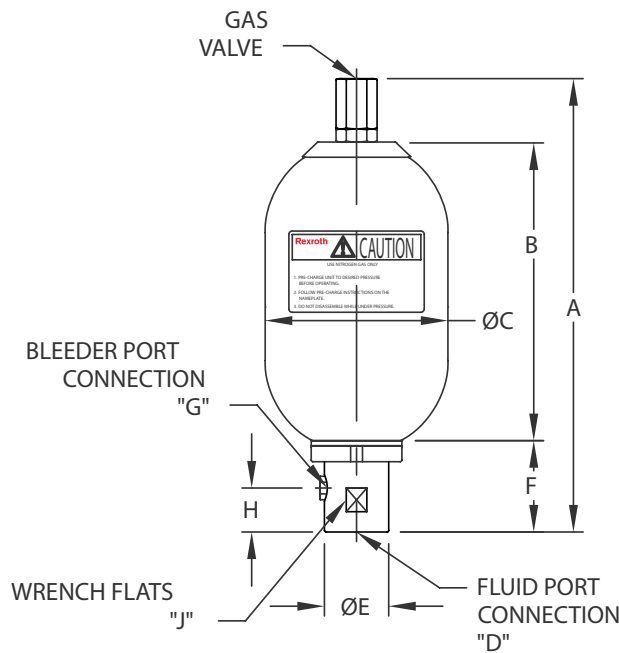




**Unit dimensions, 1 quart and 1 gallon accumulators, HAB-5X ASME**

| Nominal Size       | Max allow work pres                      | Overall Length A | Shell           |                 | Fluid Port |                |                | Bleeder Port |                | Wrench Flats J | Approx Weight   |
|--------------------|--|------------------|-----------------|-----------------|------------|----------------|----------------|--------------|----------------|----------------|-----------------|
|                    |  |                  | Length B        | Ø C             | Con. D     | Ø E            | Length F       | Con. G       | Loc. H         |                |                 |
| 1 Quart (1 Liter)  | 3000 PSI (207 bar) or 4000 PSI (275 bar) | 11-1/2" (292 mm) | 7-5/8" (194 mm) | 4-1/2" (114 mm) | 1" NPT     | 1-5/8" (41 mm) | 2" (51 mm)     | 1/8" NPT     | 15/16" (24 mm) | 1-1/2" (38 mm) | 10 lbs (4.5 kg) |
|                    |  |                  |                 |                 | #16 SAE    |                |                |              |                |                |                 |
| 1 Gallon (4 Liter) | 3000 PSI (207 bar) or 4000 PSI (275 bar) | 16-7/8" (425 mm) | 11" (279 mm)    | 6-3/4" (171 mm) | 1 1/4" NPT | 2-3/8" (60 mm) | 3-3/8" (86 mm) | 1/4" NPT     | 1-1/2" (38 mm) | 2-1/4" (57 mm) | 34 lbs (15 kg)  |
|                    |  |                  |                 |                 | #20 SAE    |                |                | #6 SAE       | 1-5/8" (38 mm) |                |                 |

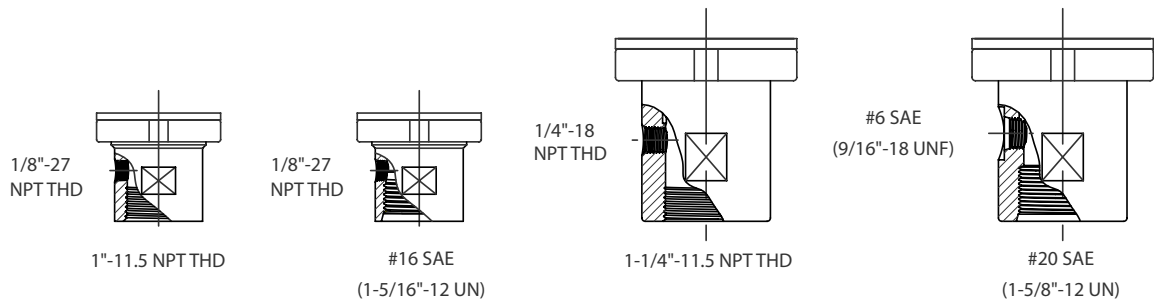
**Unit drawings, 1 quart and 1 gallon accumulators**



**Notes:**

1. All dimensions are nominal
2. Tolerance on overall length "A" is  $\pm 1/2"$  ( $\pm 12.7$  mm)
3. No dimensional changes are necessary when units are dual rated for ASME and CRN

**Fluid Port and Bleeder Port Connections with Thread Types**



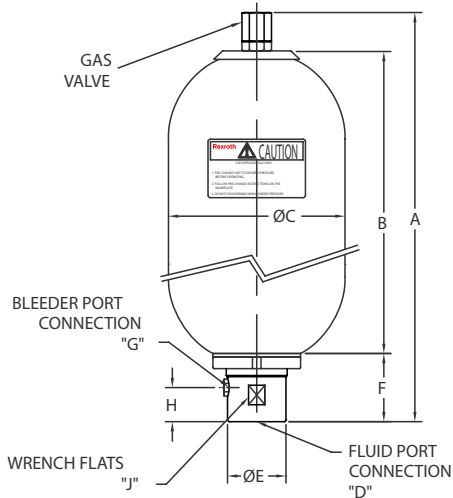
1 Quart Fluid Ports

1 Gallon Fluid Ports

**Unit dimensions, 2.5 to 15 gallon accumulators (3000/4000 PSI), HAB-5X ASME (Bottom Repairable)**

| Nominal Size                             | Max allow work pres | Overall Length A  | Shell             |                  | Fluid Port    |                  |                | Bleeder Port   |                | Wrench Flats J | Approx Weight    |
|--|---------------------|-------------------|-------------------|------------------|---------------|------------------|----------------|----------------|----------------|----------------|------------------|
|  |                     |                   | Length B          | Ø C              | Con. D        | Ø E              | Length F       | Con. G         | Loc. H         |                |                  |
| 2.5 Gallon (10 Liter)                    | 3000 PSI (207 bar)  | 21-3/8" (543 mm)  | 15-5/8" (397 mm)  | 9-1/16" (230 mm) | 2" SAE Flange | 2-13/16" (71 mm) | 3-1/2" (89 mm) | NA             |                | NA             | 80 lbs (36 kg)   |
|  | 2" NPT              |                   |                   |                  | 3" (76 mm)    |                  |                | 1/4" NPT       | 1-3/4" (44 mm) | 2-7/8" (73 mm) |                  |
|  | #24 SAE             | G2 - ISO 228      |                   |                  |               | NA               |                | 2-3/4" (70 mm) |                |                |                  |
| 3000 PSI (207 bar) or 4000 PSI (275 bar) | 21-7/8" (556 mm)    |                   |                   |                  |               | 4" (102 mm)      |                |                |                |                |                  |
| 5 Gallon (20 Liter)                      | 3000 PSI (207 bar)  | 33-5/8" (854 mm)  | 27-7/8" (708 mm)  | 9-1/16" (230 mm) | 2" SAE Flange | 2-13/16" (71 mm) | 3-1/2" (89 mm) | NA             |                | NA             | 120 lbs (54 kg)  |
|  | 2" NPT              |                   |                   |                  | 3" (76 mm)    |                  |                | 1/4" NPT       | 1-3/4" (44 mm) | 2-7/8" (73 mm) |                  |
|  | #24 SAE             | G2 - ISO 228      |                   |                  |               | NA               |                | 2-3/4" (70 mm) |                |                |                  |
| 3000 PSI (207 bar) or 4000 PSI (275 bar) | 34-1/8" (867 mm)    |                   |                   |                  |               | 4" (102 mm)      |                |                |                |                |                  |
| 10 Gallon (35 Liter)                     | 3000 PSI (207 bar)  | 54-3/4" (1391 mm) | 49" (1245 mm)     | 9-1/16" (230 mm) | 2" SAE Flange | 2-13/16" (71 mm) | 3-1/2" (89 mm) | NA             |                | NA             | 220 lbs (100 kg) |
|  | 2" NPT              |                   |                   |                  | 3" (76 mm)    |                  |                | 1/4" NPT       | 1-3/4" (44 mm) | 2-7/8" (73 mm) |                  |
|  | #24 SAE             | G2 - ISO 228      |                   |                  |               | NA               |                | 2-3/4" (70 mm) |                |                |                  |
| 3000 PSI (207 bar) or 4000 PSI (275 bar) | 55-1/4" (1403 mm)   |                   |                   |                  |               | 4" (102 mm)      |                |                |                |                |                  |
| 11 Gallon (40 Liter)                     | 3000 PSI (207 bar)  | 59-7/8" (1521 mm) | 54-1/8" (1375 mm) | 9-1/16" (230 mm) | 2" SAE Flange | 2-13/16" (71 mm) | 3-1/2" (89 mm) | NA             |                | NA             | 240 lbs (109 kg) |
|  | 2" NPT              |                   |                   |                  | 3" (76 mm)    |                  |                | 1/4" NPT       | 1-3/4" (44 mm) | 2-7/8" (73 mm) |                  |
|  | #24 SAE             | G2 - ISO 228      |                   |                  |               | NA               |                | 2-3/4" (70 mm) |                |                |                  |
| 3000 PSI (207 bar) or 4000 PSI (275 bar) | 60-3/8" (1534 mm)   |                   |                   |                  |               | 4" (102 mm)      |                |                |                |                |                  |
| 15 Gallon (50 Liter)                     | 3000 PSI (207 bar)  | 77-3/4" (1975 mm) | 72" (1829 mm)     | 9-1/16" (230 mm) | 2" SAE Flange | 2-13/16" (71 mm) | 3-1/2" (89 mm) | NA             |                | NA             | 305 lbs (138 kg) |
|  | 2" NPT              |                   |                   |                  | 3" (76 mm)    |                  |                | 1/4" NPT       | 1-3/4" (44 mm) | 2-7/8" (73 mm) |                  |
|  | #24 SAE             | G2 - ISO 228      |                   |                  |               | NA               |                | 2-3/4" (70 mm) |                |                |                  |
| 3000 PSI (207 bar) or 4000 PSI (275 bar) | 78-1/4" (1988 mm)   |                   |                   |                  |               | 4" (102 mm)      |                |                |                |                |                  |

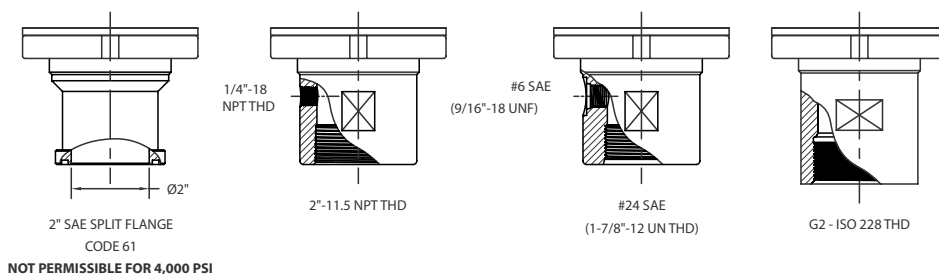
**Unit drawings, 2.5 to 15 gallon accumulators (Bottom Repairable, 3000/4000 PSI)**



**Notes:**

1. All dimensions are nominal
2. Tolerance on overall length "A" is  $\pm 1/2"$  ( $\pm 12.7$  mm)
3. No dimensional changes are necessary when units are dual rated for ASME and CRN

**Fluid Port and Bleeder Port Connections with Thread Types or Flange Types**

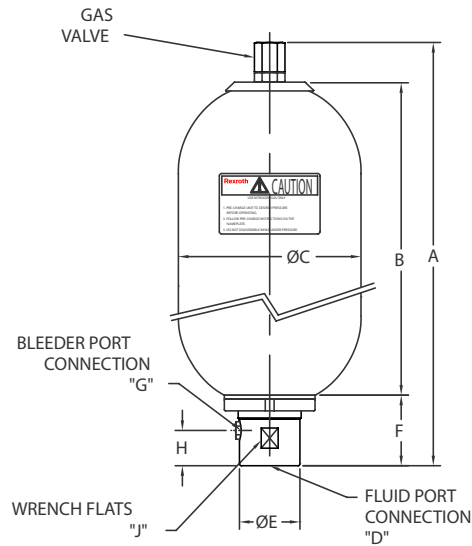


NOT PERMISSIBLE FOR 4,000 PSI

**Unit dimensions, 2.5 to 15 gallon accumulators (5000/6000 PSI), HAB-5X ASME (Bottom Repairable)**

| Nominal Size             | Max allow work pres                                  | Overall Length A  | Shell             |                  | Fluid Port        |                |                | Bleeder Port    |                | Wrench Flats J | Approx Weight    |
|--------------------------|--|-------------------|-------------------|------------------|-------------------|----------------|----------------|-----------------|----------------|----------------|------------------|
|                          |  |                   | Length B          | Ø C              | Con. D            | Ø E            | Length F       | Con. G          | Loc. H         |                |                  |
| 2.5 Gallon<br>(10 Liter) | 5000 PSI<br>(345 bar)<br>or<br>6000 PSI<br>(414 bar) | 22-3/4" (578 mm)  | 16" (406 mm)      | 9-9/16" (243 mm) | 2" NPT            | 3" (76 mm)     | 3-1/2" (89 mm) | 1/4" NPT        | 1-3/4" (44 mm) | 2-7/8" (73 mm) | 120 lbs (54 kg)  |
|                          |  | #24 SAE           |                   |                  | #6 SAE            |                |                |                 |                |                |                  |
|                          |  | 23-1/4" (591 mm)  |                   |                  | G2 - ISO 228      | 4" (102 mm)    | NA             | 2-3/4" (70 mm)  |                |                |                  |
|                          |  | 23-3/4" (603 mm)  |                   |                  | 1-1/2" SAE Flange | 2-1/2" (64 mm) |                | 4-1/2" (114 mm) | NA             |                |                  |
| 5 Gallon<br>(20 Liter)   | 5000 PSI<br>(345 bar)<br>or<br>6000 PSI<br>(414 bar) | 35" (889 mm)      | 28-1/4" (718 mm)  | 9-9/16" (243 mm) | 2" NPT            | 3" (76 mm)     | 3-1/2" (89 mm) | 1/4" NPT        | 1-3/4" (44 mm) | 2-7/8" (73 mm) | 220 lbs (100 kg) |
|                          |  | #24 SAE           |                   |                  | #6 SAE            |                |                |                 |                |                |                  |
|                          |  | 35-1/2" (902 mm)  |                   |                  | G2 - ISO 228      | 4" (102 mm)    | NA             | 2-3/4" (70 mm)  |                |                |                  |
|                          |  | 36" (914 mm)      |                   |                  | 1-1/2" SAE Flange | 2-1/2" (64 mm) |                | 4-1/2" (114 mm) | NA             |                |                  |
| 10 Gallon<br>(35 Liter)  | 5000 PSI<br>(345 bar)<br>or<br>6000 PSI<br>(414 bar) | 55-3/4" (1416 mm) | 49" (1245 mm)     | 9-9/16" (243 mm) | 2" NPT            | 3" (76 mm)     | 3-1/2" (89 mm) | 1/4" NPT        | 1-3/4" (44 mm) | 2-7/8" (73 mm) | 335 lbs (152 kg) |
|                          |  | #24 SAE           |                   |                  | #6 SAE            |                |                |                 |                |                |                  |
|                          |  | 56-1/4" (1429 mm) |                   |                  | G2 - ISO 228      | 4" (102 mm)    | NA             | 2-3/4" (70 mm)  |                |                |                  |
|                          |  | 56-3/4" (1441 mm) |                   |                  | 1-1/2" SAE Flange | 2-1/2" (64 mm) |                | 4-1/2" (114 mm) | NA             |                |                  |
| 15 Gallon<br>(50 Liter)  | 5000 PSI<br>(345 bar)<br>or<br>6000 PSI<br>(414 bar) | 79-1/4" (2013 mm) | 72-1/2" (1842 mm) | 9-9/16" (243 mm) | 2" NPT            | 3" (76 mm)     | 3-1/2" (89 mm) | 1/4" NPT        | 1-3/4" (44 mm) | 2-7/8" (73 mm) | 485 lbs (220 kg) |
|                          |  | #24 SAE           |                   |                  | #6 SAE            |                |                |                 |                |                |                  |
|                          |  | 79-3/4" (2026 mm) |                   |                  | G2 - ISO 228      | 4" (102 mm)    | NA             | 2-3/4" (70 mm)  |                |                |                  |
|                          |  | 80-1/4" (2038 mm) |                   |                  | 1-1/2" SAE Flange | 2-1/2" (64 mm) |                | 4-1/2" (114 mm) | NA             |                |                  |

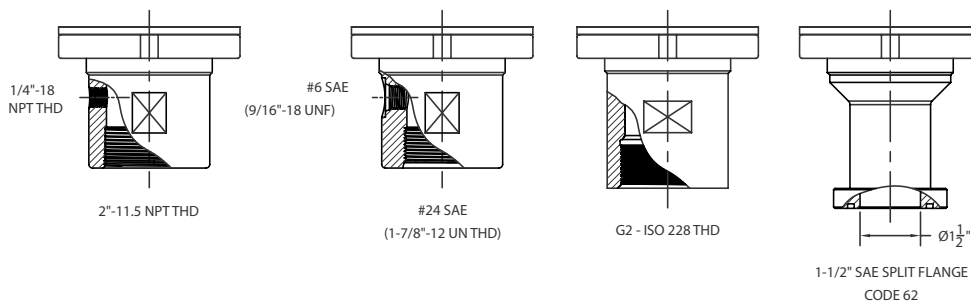
**Unit drawings, 2.5 to 15 gallon accumulators (Bottom Repairable, 5000/6000 PSI)**



**Notes:**

1. All dimensions are nominal
2. Tolerance on overall length "A" is ± 1/2" (± 12.7 mm)
3. No dimensional changes are necessary when units are dual rated for ASME and CRN

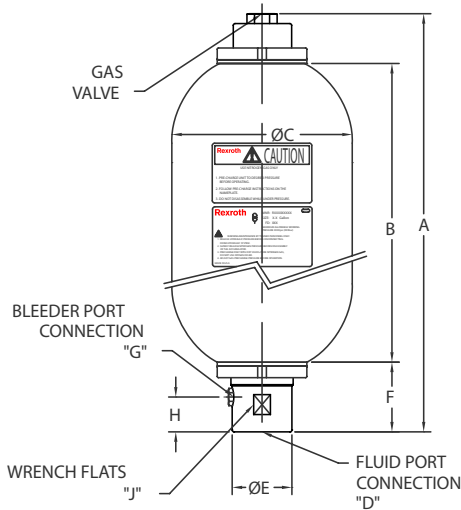
**Fluid Port and Bleeder Port Connections with Thread Types or Flange Types**



**Unit dimensions, 2.5 to 15 gallon accumulators (3000/4000 PSI), HAB-5X ASME (Top Repairable)**

| Nominal Size          | Max allow work pres | Overall Length A  | Shell             |                  | Fluid Port    |                  |                | Bleeder Port   |                | Wrench Flats J | Approx Weight    |
|-----------------------|---------------------|-------------------|-------------------|------------------|---------------|------------------|----------------|----------------|----------------|----------------|------------------|
|                       |                     |                   | Length B          | Ø C              | Con. D        | Ø E              | Length F       | Con. G         | Loc. H         |                |                  |
| 2.5 Gallon (10 Liter) | 3000 PSI (207 bar)  | 21" (533 mm)      | 15-1/2" (394 mm)  | 9-1/16" (230 mm) | 2" SAE Flange | 2-13/16" (71 mm) | 3-1/2" (89 mm) | NA             |                | NA             | 80 lbs (36 kg)   |
|                       | 2" NPT              |                   |                   |                  | 3" (76 mm)    |                  |                | 1/4" NPT       | 1-3/4" (44 mm) |                |                  |
|                       | #24 SAE             | 4" (102 mm)       |                   |                  |               | NA               |                | 2-3/4" (70 mm) |                |                |                  |
| or 4000 PSI (275 bar) | 21-1/2" (546 mm)    |                   | G2 - ISO 228      |                  |               |                  |                |                |                |                |                  |
| 5 Gallon (20 Liter)   | 3000 PSI (207 bar)  | 33" (838 mm)      | 27-1/2" (699 mm)  | 9-1/16" (230 mm) | 2" SAE Flange | 2-13/16" (71 mm) | 3-1/2" (89 mm) | NA             |                | NA             | 120 lbs (54 kg)  |
|                       | 2" NPT              |                   |                   |                  | 3" (76 mm)    |                  |                | 1/4" NPT       | 1-3/4" (44 mm) |                |                  |
|                       | #24 SAE             | 4" (102 mm)       |                   |                  |               | NA               |                | 2-3/4" (70 mm) |                |                |                  |
| or 4000 PSI (275 bar) | 33-1/2" (851 mm)    |                   | G2 - ISO 228      |                  |               |                  |                |                |                |                |                  |
| 10 Gallon (35 Liter)  | 3000 PSI (207 bar)  | 53-3/4" (1365 mm) | 48-1/4" (1226 mm) | 9-1/16" (230 mm) | 2" SAE Flange | 2-13/16" (71 mm) | 3-1/2" (89 mm) | NA             |                | NA             | 220 lbs (100 kg) |
|                       | 2" NPT              |                   |                   |                  | 3" (76 mm)    |                  |                | 1/4" NPT       | 1-3/4" (44 mm) |                |                  |
|                       | #24 SAE             | 4" (102 mm)       |                   |                  |               | NA               |                | 2-3/4" (70 mm) |                |                |                  |
| or 4000 PSI (275 bar) | 54-1/4" (1378 mm)   |                   | G2 - ISO 228      |                  |               |                  |                |                |                |                |                  |
| 11 Gallon (40 Liter)  | 3000 PSI (207 bar)  | 59-5/8" (1514 mm) | 54-1/8" (1375 mm) | 9-1/16" (230 mm) | 2" SAE Flange | 2-13/16" (71 mm) | 3-1/2" (89 mm) | NA             |                | NA             | 240 lbs (109 kg) |
|                       | 2" NPT              |                   |                   |                  | 3" (76 mm)    |                  |                | 1/4" NPT       | 1-3/4" (44 mm) |                |                  |
|                       | #24 SAE             | 4" (102 mm)       |                   |                  |               | NA               |                | 2-3/4" (70 mm) |                |                |                  |
| or 4000 PSI (275 bar) | 60-1/8" (1527 mm)   |                   | G2 - ISO 228      |                  |               |                  |                |                |                |                |                  |
| 15 Gallon (50 Liter)  | 3000 PSI (207 bar)  | 77-1/2" (1969 mm) | 72" (1829 mm)     | 9-1/16" (230 mm) | 2" SAE Flange | 2-13/16" (71 mm) | 3-1/2" (89 mm) | NA             |                | NA             | 305 lbs (138 kg) |
|                       | 2" NPT              |                   |                   |                  | 3" (76 mm)    |                  |                | 1/4" NPT       | 1-3/4" (44 mm) |                |                  |
|                       | #24 SAE             | 4" (102 mm)       |                   |                  |               | NA               |                | 2-3/4" (70 mm) |                |                |                  |
| or 4000 PSI (275 bar) | 78" (1981 mm)       |                   | G2 - ISO 228      |                  |               |                  |                |                |                |                |                  |

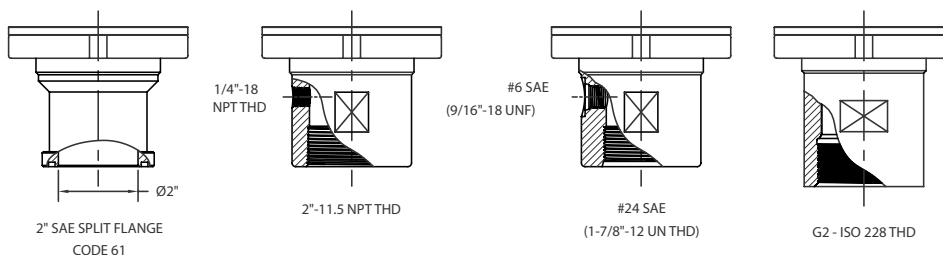
**Unit drawings, 2.5 to 15 gallon accumulators (Top Repairable, 3000/4000 PSI)**



**Notes:**

1. All dimensions are nominal
2. Tolerance on overall length "A" is ± 1/2" (± 12.7 mm)
3. No dimensional changes are necessary when units are dual rated for ASME and CRN

**Fluid Port and Bleeder Port Connections with Thread Types or Flange Types**

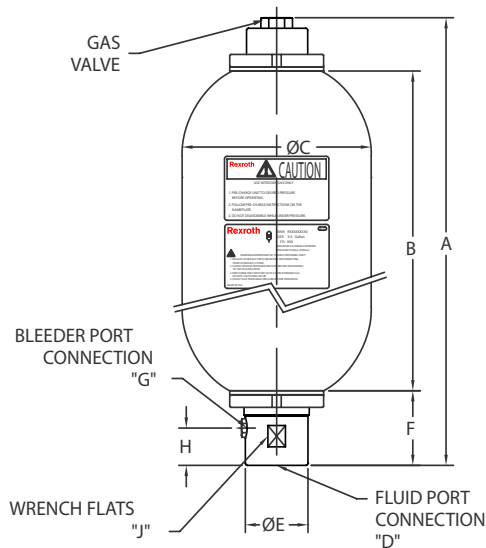


NOT PERMISSIBLE FOR 4,000 PSI

**Unit dimensions, 2.5 to 15 gallon accumulators (5000/6000 PSI), HAB-5X ASME (Top Repairable)**

| Nominal Size             | Max allow work pres                                  | Overall Length A  | Shell             |                  | Fluid Port        |                |                | Bleeder Port    |                | Wrench Flats J | Approx Weight    |
|--------------------------|--|-------------------|-------------------|------------------|-------------------|----------------|----------------|-----------------|----------------|----------------|------------------|
|                          |  |                   | Length B          | Ø C              | Con. D            | Ø E            | Length F       | Con. G          | Loc. H         |                |                  |
| 2.5 Gallon<br>(10 Liter) | 5000 PSI<br>(345 bar)<br>or<br>6000 PSI<br>(414 bar) | 22-1/2" (572 mm)  | 16" (406 mm)      | 9-9/16" (243 mm) | 2" NPT            | 3" (76 mm)     | 3-1/2" (89 mm) | 1/4" NPT        | 1-3/4" (44 mm) | 2-7/8" (73 mm) | 120 lbs (54 kg)  |
|                          |  | #24 SAE           |                   |                  | #6 SAE            |                |                |                 |                |                |                  |
|                          |  | 23" (584 mm)      |                   |                  | G2 - ISO 228      | 4" (102 mm)    | NA             | 2-3/4" (70 mm)  |                |                |                  |
|                          |  | 23-1/2" (597 mm)  |                   |                  | 1-1/2" SAE Flange | 2-1/2" (64 mm) |                | 4-1/2" (114 mm) | NA             |                |                  |
| 5 Gallon<br>(20 Liter)   | 5000 PSI<br>(345 bar)<br>or<br>6000 PSI<br>(414 bar) | 34-3/4" (883 mm)  | 28-1/4" (718 mm)  | 9-9/16" (243 mm) | 2" NPT            | 3" (76 mm)     | 3-1/2" (89 mm) | 1/4" NPT        | 1-3/4" (44 mm) | 2-7/8" (73 mm) | 220 lbs (100 kg) |
|                          |  | #24 SAE           |                   |                  | #6 SAE            |                |                |                 |                |                |                  |
|                          |  | 35-1/2" (895 mm)  |                   |                  | G2 - ISO 228      | 4" (102 mm)    | NA             | 2-3/4" (70 mm)  |                |                |                  |
|                          |  | 35-3/4" (908 mm)  |                   |                  | 1-1/2" SAE Flange | 2-1/2" (64 mm) |                | 4-1/2" (114 mm) | NA             |                |                  |
| 10 Gallon<br>(35 Liter)  | 5000 PSI<br>(345 bar)<br>or<br>6000 PSI<br>(414 bar) | 55-1/2" (1416 mm) | 49" (1245 mm)     | 9-9/16" (243 mm) | 2" NPT            | 3" (76 mm)     | 3-1/2" (89 mm) | 1/4" NPT        | 1-3/4" (44 mm) | 2-7/8" (73 mm) | 335 lbs (152 kg) |
|                          |  | #24 SAE           |                   |                  | #6 SAE            |                |                |                 |                |                |                  |
|                          |  | 56" (1422 mm)     |                   |                  | G2 - ISO 228      | 4" (102 mm)    | NA             | 2-3/4" (70 mm)  |                |                |                  |
|                          |  | 56-1/2" (1435 mm) |                   |                  | 1-1/2" SAE Flange | 2-1/2" (64 mm) |                | 4-1/2" (114 mm) | NA             |                |                  |
| 15 Gallon<br>(50 Liter)  | 5000 PSI<br>(345 bar)<br>or<br>6000 PSI<br>(414 bar) | 79" (2007 mm)     | 72-1/2" (1842 mm) | 9-9/16" (243 mm) | 2" NPT            | 3" (76 mm)     | 3-1/2" (89 mm) | 1/4" NPT        | 1-3/4" (44 mm) | 2-7/8" (73 mm) | 485 lbs (220 kg) |
|                          |  | #24 SAE           |                   |                  | #6 SAE            |                |                |                 |                |                |                  |
|                          |  | 79-1/2" (2019 mm) |                   |                  | G2 - ISO 228      | 4" (102 mm)    | NA             | 2-3/4" (70 mm)  |                |                |                  |
|                          |  | 80" (2032 mm)     |                   |                  | 1-1/2" SAE Flange | 2-1/2" (64 mm) |                | 4-1/2" (114 mm) | NA             |                |                  |

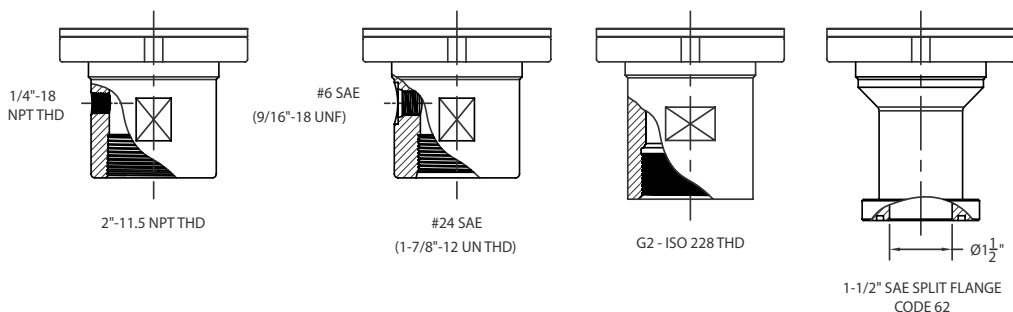
**Unit drawings, 2.5 to 15 gallon accumulators (Top Repairable, 5000/6000 PSI)**



**Notes:**

1. All dimensions are nominal
2. Tolerance on overall length "A" is ± 1/2" (± 12.7 mm)
3. No dimensional changes are necessary when units are dual rated for ASME and CRN

**Fluid Port and Bleeder Port Connections with Thread Types or Flange Types**



**Accessories for HAB accumulators with BSPP fluid ports**

**Adapters and flanges (rated pressure 350 bar)**

The M33 threaded adapters on this page are designed to be used with ABZSS model safety blocks <sup>3)</sup> and are not compatible with VAW model safety blocks.

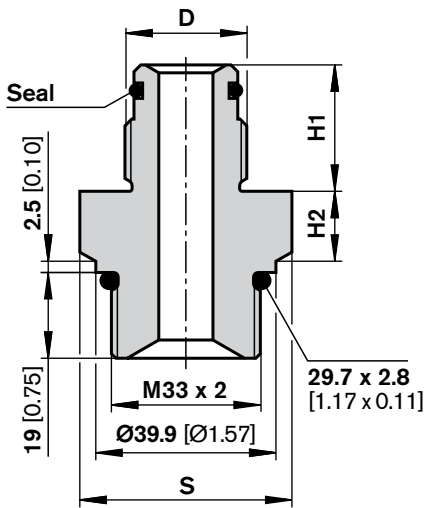


Figure A

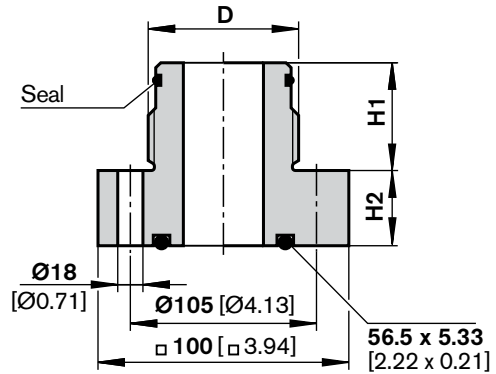


Figure B

| Accumulator safety block <sup>3)</sup> | Accumulator size         | Accum adapter | Figure | S                    | H1           | H2             | D    | Seal                    |
|--|--------------------------|---------------|--------|----------------------|--------------|----------------|------|-------------------------|
| ABZSS 10<br>ABZSS 20                   | 2.5 Gallon<br>(10 Liter) | S13           | A      | 65A/F<br>(2.56" A/F) | 43<br>(1.69) | 20.5<br>(0.81) | G2 A | 48 x 3<br>(1.89 x 0.12) |
|  | 5 Gallon<br>(20 Liter)   |               |        |                      |              |                |      |                         |
|  | 10 Gallon<br>(35 Liter)  |               |        |                      |              |                |      |                         |
|  | 11 Gallon<br>(40 Liter)  |               |        |                      |              |                |      |                         |
|  | 15 Gallon<br>(50 Liter)  |               |        |                      |              |                |      |                         |
| ABZSS 30                               | 2.5 Gallon<br>(10 Liter) | S309          | B      | -                    | 43<br>(1.69) | 30<br>(1.18)   | G2 A | 48 x 3<br>(1.89 x 0.12) |
|  | 5 Gallon<br>(20 Liter)   |               |        |                      |              |                |      |                         |
|  | 10 Gallon<br>(35 Liter)  |               |        |                      |              |                |      |                         |
|  | 11 Gallon<br>(40 Liter)  |               |        |                      |              |                |      |                         |
|  | 15 Gallon<br>(50 Liter)  |               |        |                      |              |                |      |                         |

**Ordering code**

| Short code | Accumulator Adapter         | Material number FKM | Accumulator Adapter         | Material number NBR <sup>2)</sup> |
|------------|-----------------------------|---------------------|-----------------------------|-----------------------------------|
| S13        | S13V/G2-M33 x 2             | R900545256          | S13 M/G2-M33 x 2            | R900862701                        |
| S309       | S309V/G2-DN32 <sup>1)</sup> | R900545858          | S309M/G2-DN32 <sup>1)</sup> | R900862702                        |

1) 4 off ISO 4762-M16 x 45-10.9 hexagon socket head cap screws are included in the scope of supply.

2) Special version

3) Further details on the Rexroth ABZSS safety block can be found in datasheet RE 50131.

Accessories for HAB accumulators with SAE fluid ports

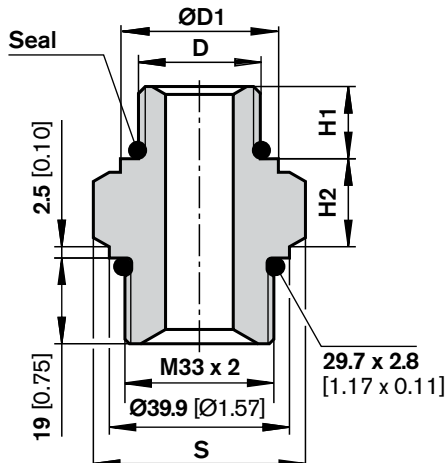


Figure A

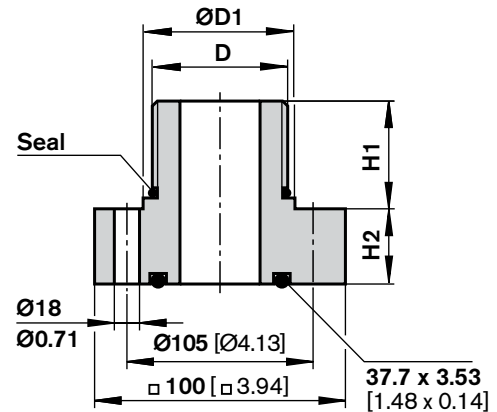


Figure B

| Accumulator safety block <sup>3)</sup> | Accumulator size         | Accum adapter | Fig. | S                    | H1             | H2             | D                           | ØD1          | Seal                        |
|--|--------------------------|---------------|------|----------------------|----------------|----------------|-----------------------------|--------------|-----------------------------|
| ABZSS 10<br>ABZSS 20                   | 1 Quart<br>(1 Liter)     | S60           | A    | 65A/F<br>(1.61" A/F) | 15.2<br>(0.60) | 20.3<br>(0.80) | 1 1/16-12UN-2A              | 32<br>(1.26) | 23.0 x 3.0<br>(0.91 x 0.12) |
|  | 1 Gallon<br>(4 Liter)    | S62           |      |                      |                |                | 1 5/8-12UN-2A               | 48<br>(1.89) | 38.0 x 3.0<br>(1.50 x 0.12) |
|  | 2.5 Gallon<br>(10 Liter) | S63           |      |                      |                |                | 1 7/8-12UN-2A               | 54<br>(2.13) | 44.0 x 3.0<br>(1.73 x 0.12) |
|  | 5 Gallon<br>(20 Liter)   |               |      |                      |                |                |                             |              |                             |
|  | 10 Gallon<br>(35 Liter)  |               |      |                      |                |                |                             |              |                             |
|  | 11 Gallon<br>(40 Liter)  |               |      |                      |                |                |                             |              |                             |
|  | 15 Gallon<br>(50 Liter)  |               |      |                      |                |                |                             |              |                             |
| ABZSS 30                               | 1 Gallon<br>(4 Liter)    | S620          | B    | -                    | 15.2<br>(0.60) | 33.8<br>(1.33) | 1 5/8-12UN-2A               | 48<br>(1.89) | 38.0 x 3.0<br>(1.50 x 0.12) |
|  | 2.5 Gallon<br>(10 Liter) | S630          |      |                      |                |                |                             |              |                             |
|  | 5 Gallon<br>(20 Liter)   |               |      |                      | 1 7/8-12UN-2A  | 54<br>(2.13)   | 44.0 x 3.0<br>(1.73 x 0.12) |              |                             |
|  | 10 Gallon<br>(35 Liter)  |               |      |                      |                |                |                             |              |                             |
|  | 11 Gallon<br>(40 Liter)  |               |      |                      |                |                |                             |              |                             |
|  | 15 Gallon<br>(50 Liter)  |               |      |                      |                |                |                             |              |                             |

The M33 threaded adapters on this page are designed to be used with ABZSS model safety blocks <sup>3)</sup> and are not compatible with VAW model safety blocks.

Ordering code

| Short code | Accumulator Adapter                  | Material number FKM | Accumulator Adapter                  | Material number NBR <sup>2)</sup> |
|------------|--------------------------------------|---------------------|--------------------------------------|-----------------------------------|
| S60        | S60V/1 1/16-12UN-M33 x 2             | R900618788          | S60M/ 1 1/16-12UN-M33 x 2            | R900618799                        |
| S62        | S62V/1 5/8-12UN-M33 x 2              | R900618800          | S60M/ 1 5/8-12UN-M33 x 2             | R900618801                        |
| S63        | S63V/ 1 7/8-12UN-M33 x 2             | R900618803          | S63M/ 1 7/8-12UN-M33 x 2             | R900618804                        |
| S620       | S620V/ 1 5/8-12UN-DN32 <sup>1)</sup> | R900618813          | S620M/ 1 5/8-12UN-DN32 <sup>1)</sup> | R900618814                        |
| S630       | S630V/ 1 7/8-12UN-DN32 <sup>1)</sup> | R900618817          | S630M/ 1 7/8-12UN-DN32 <sup>1)</sup> | R900618815                        |

1) 4 off ISO 4762-M16 x 45-10.9 hexagon socket head cap screws are included in the scope of supply.

2) Special version

3) Further details on the Rexroth ABZSS safety block can be found in datasheet RE 50131.

## Clamps and brackets

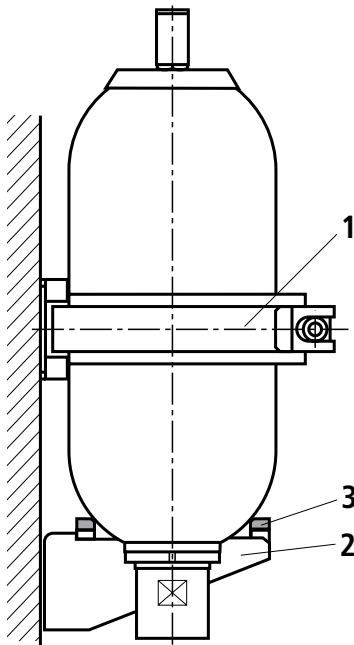
### Features:

- Allows secure yet easy installation of accumulator in vertical position.
- Clamps can be bolted or welded to support structure.
- Rubber cushioning on straps help prevent noises from being transmitted through metal to metal contact.
- Mounting bracket available for support of vertical mounting of large sizes.

## HAB-5X 3000/4000 PSI ASME/CRN

**Important note:** Mounting bracket and clamps shown on page 16 and 17 are to be used with the following units:  
 207 bar (3000 PSI) ASME/CRN units  
 275 bar (4000 PSI) ASME/CRN units

Please refer to page 18 for 345 bar (5000 PSI) and 414 bar (6000 PSI) ASME/CRN mounting bracket and clamp.

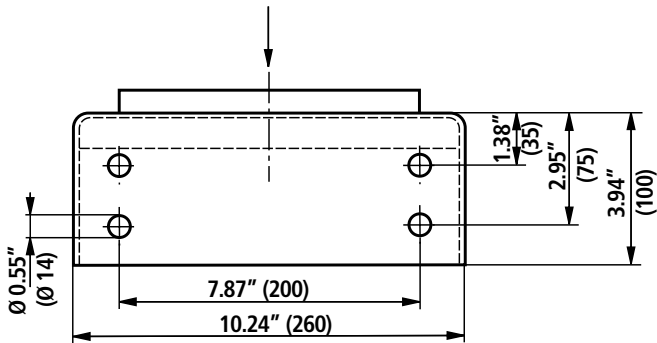


| Accessory           | Material no. | Accumulator size |       |         |        |        |
|---------------------|--------------|------------------|-------|---------|--------|--------|
|                     |              | 1 quart          | 1 gal | 2.5 gal | 5 gal  | 11 gal |
|                     |              |                  |       |         | 10 gal | 15 gal |
| Clamp 110-120       | 1531316021   | 1                |       |         |        |        |
| Clamp 160-170       | 1531316022   |                  | 2     |         |        |        |
| Clamp 2.5-15        | R978044766   |                  |       | 1       | 2      | 2      |
| Mounting bracket    | 1531334008   |                  |       | 1       | 1      | 1      |
| Rubber back-up ring | 1530221042   |                  |       | 1       | 1      | 1      |

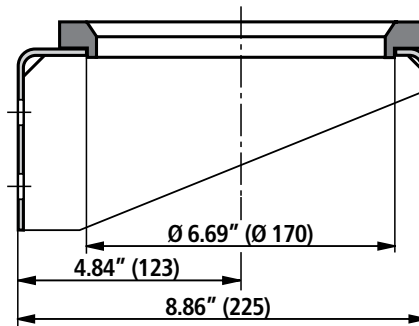
- 1 Clamp
- 2 Mounting bracket
- 3 Rubber back-up ring

### Mounting bracket and rubber back-up ring

(only used on 2.5 gallon and larger units, 3000/4000 PSI ASME/CRN)



**Mounting bracket**  
 Material no. 1531334008



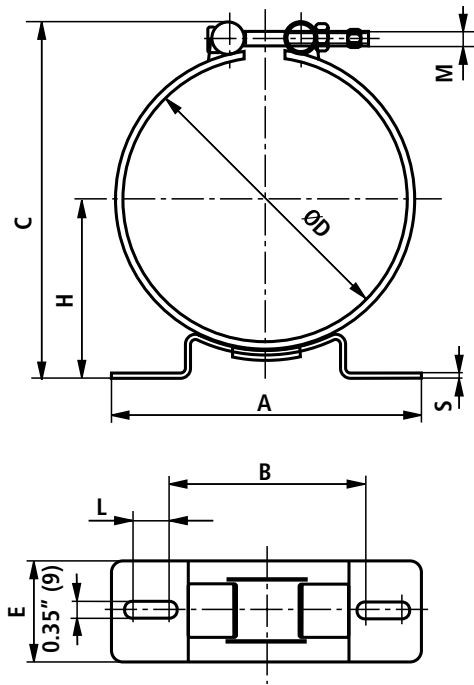
**Rubber back-up ring**  
 Material no. 1530221042



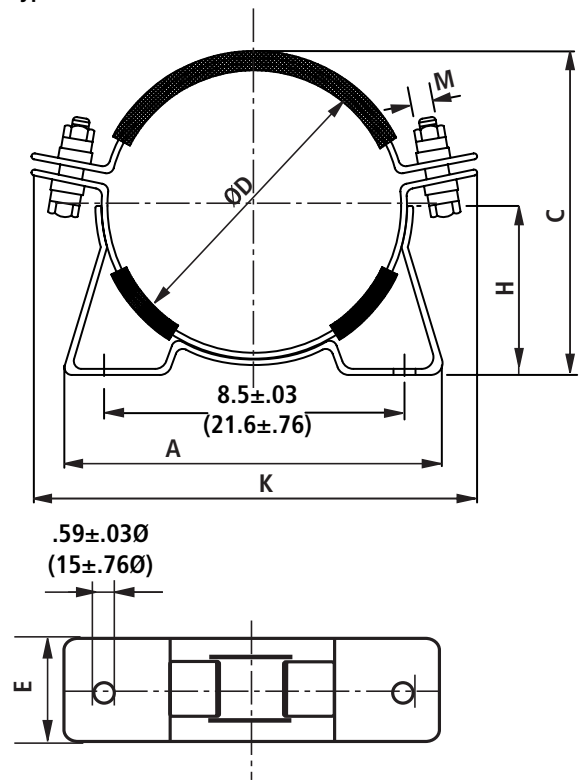
**HAB-5X 3000/4000 PSI ASME/CRN**

**Mounting clamps**

**Type F1**

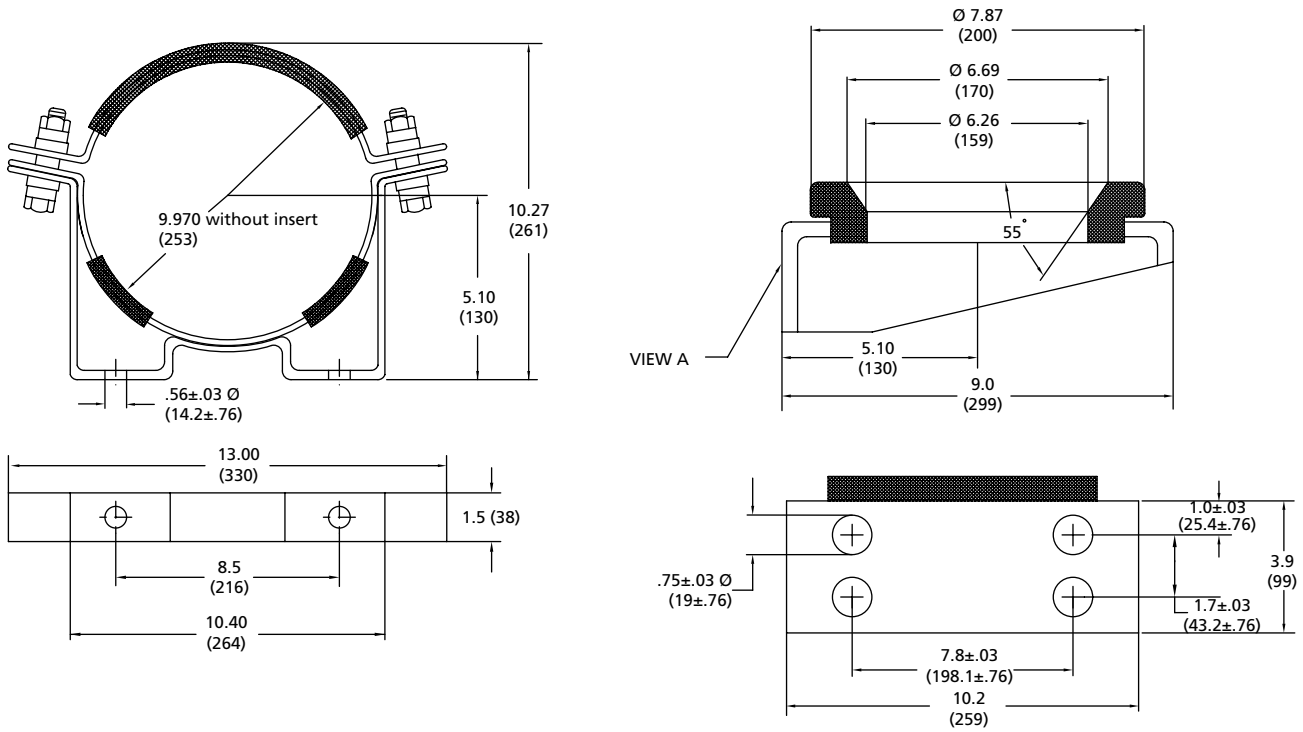


**Type F2**



| Clamp type          |    | Dimensions     |               |                |                        |              |                      |                |              |               |            | Material No. |
|---------------------|----|----------------|---------------|----------------|------------------------|--------------|----------------------|----------------|--------------|---------------|------------|--------------|
|                     |    | A              | B             | C              | ØD                     | E            | H                    | K              | L            | M             | S          |              |
| Clamp 1 Qt.         | F1 | 5.32<br>(135)  | 3.78<br>(96)  | 5.91<br>(150)  | 4.33-4.72<br>(110-120) | 1.97<br>(50) | 2.52-2.62<br>(64-69) | -              | .24<br>(6)   | M8            | .12<br>(3) | 1531316021   |
| Clamp 1 Gal.        | F1 | 9.33<br>(237)  | 5.79<br>(147) | 7.87<br>(200)  | 6.30-6.69<br>(160-170) | 1.97<br>(50) | 3.54-3.74<br>(90-95) | -              | 1.38<br>(35) | M8            | .16<br>(4) | 1531316022   |
| Clamp 2.5 - 15 Gal. | F2 | 10.00<br>(254) | -             | 10.03<br>(255) | 9.25<br>(235)          | 1.50<br>(38) | 4.84<br>(123)        | 12.50<br>(318) | -            | 1/2-13<br>UNC | -          | R978044766   |

**Mounting bracket and clamp, 5000/6000 PSI HAB-5X ASME/CRN**



| Accessory        | Material no.      | Accumulator size |       |        |        |
|------------------|-------------------|------------------|-------|--------|--------|
|                  |                   | 2.5 gal          | 5 gal | 10 gal | 15 gal |
| Clamp            | <b>R978041967</b> | 1                | 2     | 2      | 2      |
| Mounting bracket | <b>R978041968</b> | 1                | 1     | 1      | 1      |

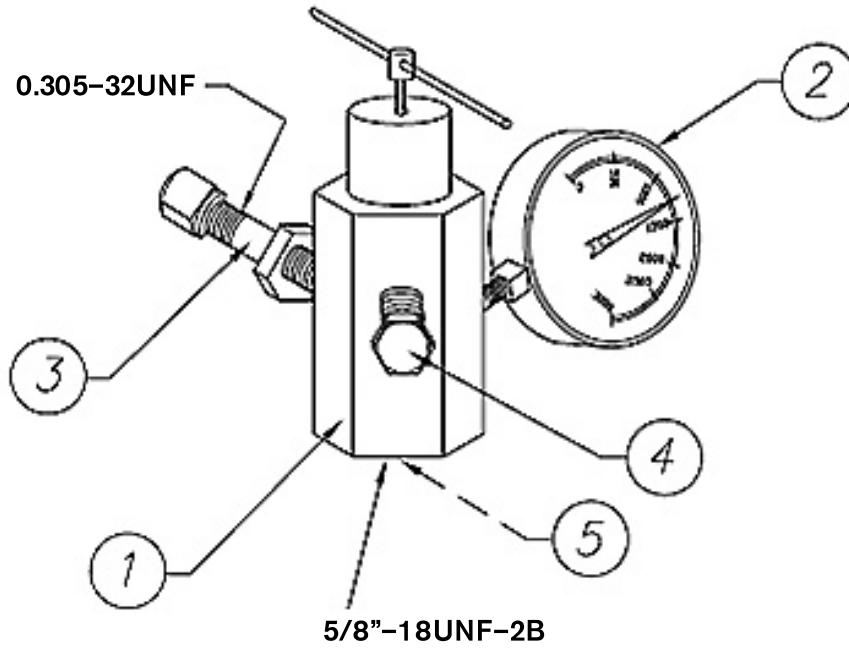
**Note:** Mounting bracket is supplied with a dampening insert.

**Permanent gauge block assemblies**

---

HAB-5X 3000 PSI, 1 Qt size

Assembly Part Number: R978053669



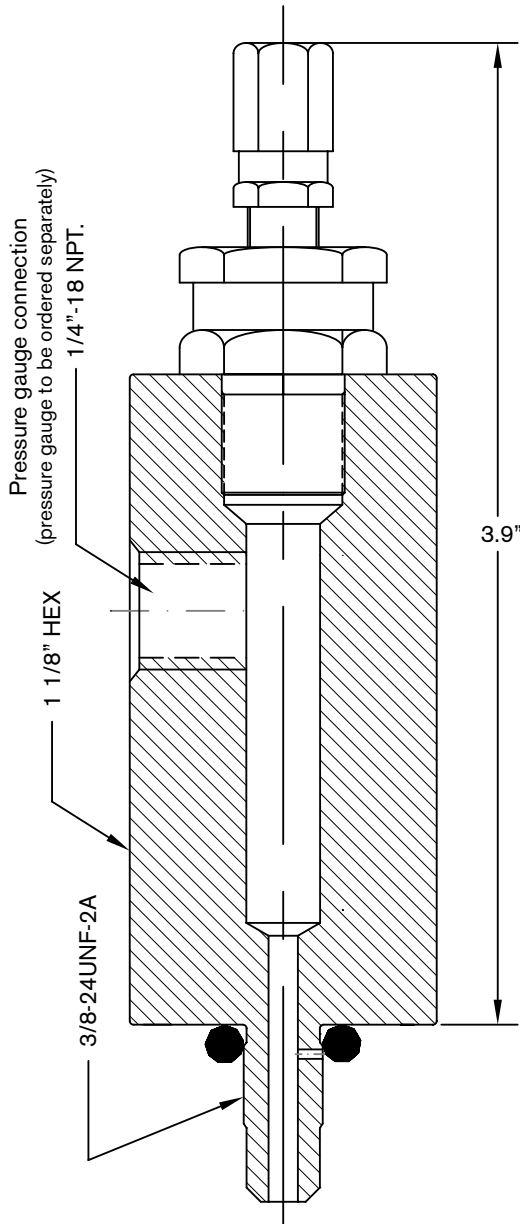
| Item # | Description      |
|--------|------------------|
| 1      | Adaptor Manifold |
| 2      | 3000 PSI Gauge   |
| 3      | Tank Valve       |
| 4      | Bleeder Valve    |
| 5      | Air Valve Washer |

**Permanent gauge block assemblies**

**HAB-5X 3000/4000 PSI**

Assembly Part Number: R978048584

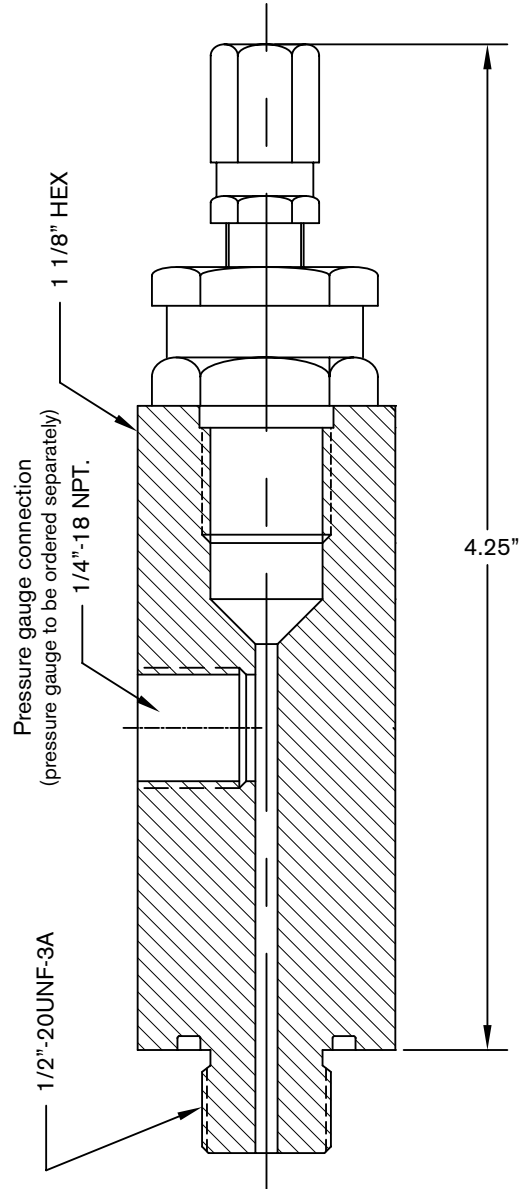
Assembly torque value to install gauge block on accumulator: 55 in-lbs



**HAB-5X 5000/6000 PSI**

Assembly Part Number: R978048583

Assembly torque value to install gauge block on accumulator: 50 in-lbs



**Important Notes:**

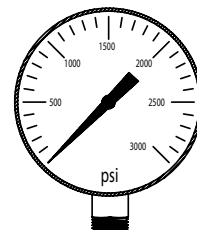
These assemblies can be used on both bottom and top repairable accumulators ASME/CRN version only.

These gauge block adapters are only compatible with 2.5 gallon and larger sizes. Refer to page 19 for gauge blocks for the 1 Qt size. Please contact the factory for gauge blocks for the 1Gal size.

**Pressure Gauge Part Numbers:**

3000 PSI pressure gauge  
1/4" NPT male  
Part number: **R901283946**

5000 PSI pressure gauge  
1/4" NPT male  
Part number: **R901281084**



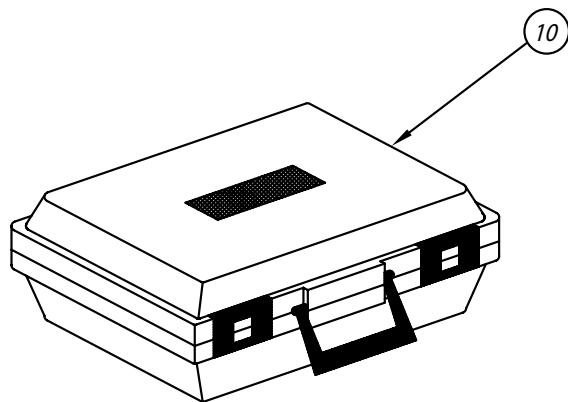
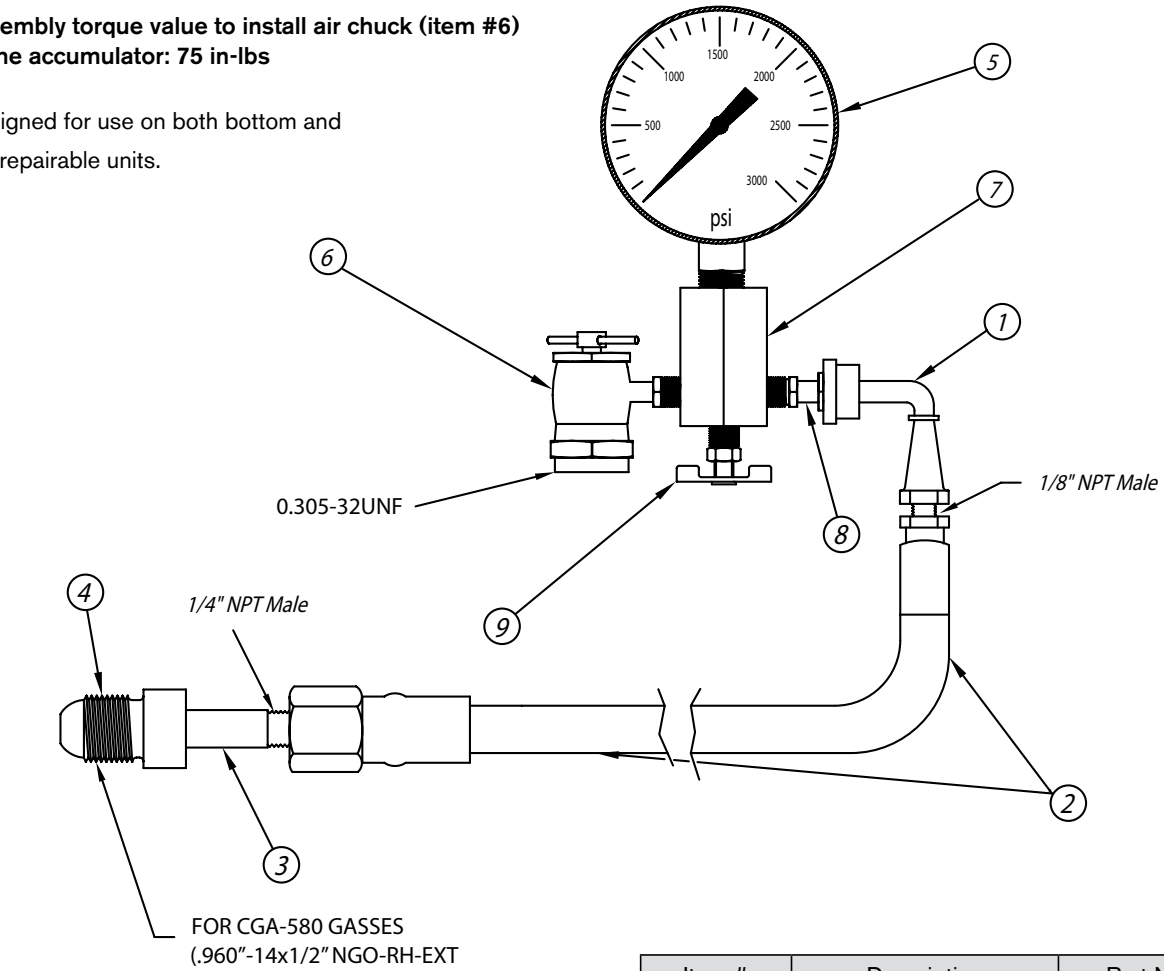
**Charging and test kit for ASME units** (gas valve types 6 and 7)

Part number: R978046091

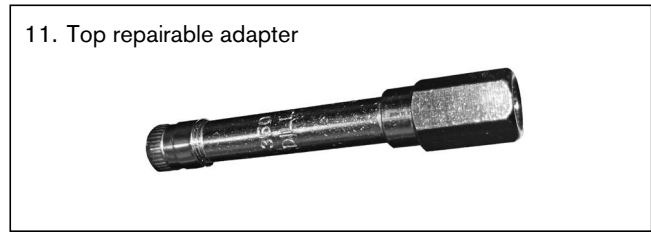
Rated to 6000 PSI

Assembly torque value to install air chuck (item #6) to the accumulator: 75 in-lbs

Designed for use on both bottom and top repairable units.



| Item # | Description              | Part Number |
|--------|--------------------------|-------------|
| 1      | Swivel connector         |             |
| 2      | Hose (length = 10 ft.)   |             |
| 3      | Gland                    |             |
| 4      | Nut                      |             |
| 5*     | Gauge                    |             |
| 6      | Air chuck                | R978016988  |
| 7      | Adaptor                  |             |
| 8      | Tank valve               |             |
| 9      | Bleeder valve            |             |
| 10     | Protective carrying case |             |
| 11     | Top repairable adaptor   |             |



\* R978046091 kit is supplied with two pressure gauges, 2000 PSI and 5000 PSI. Please use the appropriate gauge depending on pre-charge pressure.

HAB-5X charge kit is supplied with a CGA-580 gas bottle connection which is rated up to 3000 psi. If high pressure nitrogen bottles will be used, a CGA-680 connection is required which is rated for 3001 – 5500 psi. Two additional parts must be ordered separately for this CGA-680 connection, gland nut (R978053670) and gland (R978053671).

## Accumulator installation & operating instructions

### General

Hydraulic circuits incorporating accumulators may store hydraulic oil under pressure depending on the function of the accumulator in the system. Therefore, the system may remain pressurized after the pump is turned off.

**CAUTION** - Prior to performing any maintenance or system modifications, bleed off any stored system pressure.

Completely release all hydraulic fluid pressure in a safe controlled manner using appropriate valving. Installation of an automatic accumulator discharge valve in the hydraulic circuit is recommended.

Accumulator repairs must be performed by trained hydraulic service personnel experienced in servicing accumulators. Contact your local authorized distributor for application or repair assistance.

### Bladder accumulators

Bladder accumulators will ship from the factory with a primer coating on the shell and with a rust preventative applied to other surfaces. The exception to this policy would be if Bosch Rexroth supplies a complete power unit assembly or accumulator stand and the customer specifies a particular finish coating on the entire unit.

It is the user's responsibility to provide sufficient corrosion protection corresponding to the ambient conditions that the accumulator will be exposed to over the life time of the equipment. If a finish coat is desired, it is strongly recommended to mask the accumulator nameplate and all caution / warning labels prior to painting. Nameplate information is required for warranty evaluation and replacement purposes, therefore proper masking should preserve the condition of the nameplate for future use!

Bladder type accumulators are generally delivered with a nitrogen precharge pressure of approximately 15 PSI (1 bar) for shipping purposes unless a higher pressure is specified in the accumulator model code. After installation and prior to initial start-up, the precharge pressure must be set to the application requirements, or machine manufacturer's specifications.

### Mounting & installation

For mounting orientation recommendations, please refer to the table on page 5.

All accumulators must be rigidly installed using clamps and support brackets specifically designed for accumulator mounting. The fluid port assembly must not be used to support the weight of the accumulator.

**CAUTION** – DO NOT use gas valve or fluid port assembly as lifting points. The accumulator shell must not be altered. DO NOT weld or machine pressure vessel.

Improper installation may result in damage to the gas valve or fluid port assembly, accumulator shell, or seals. Exercise care not to paint over rating nameplate or the warning label.

### Checking the gas pre-charge pressure

Bleed off hydraulic system pressure. After the accumulator has been put in service, the precharge pressure should be checked with an accumulator charging and testing device at least once in the first week. If this check reveals no loss in pressure, the precharge should be checked on the following schedule:

|                   |          |
|-------------------|----------|
| 1st Check -       | 1 week   |
| 2nd Check -       | 3 months |
| 3rd Check -       | 1 year   |
| 4th & Continued - | yearly   |

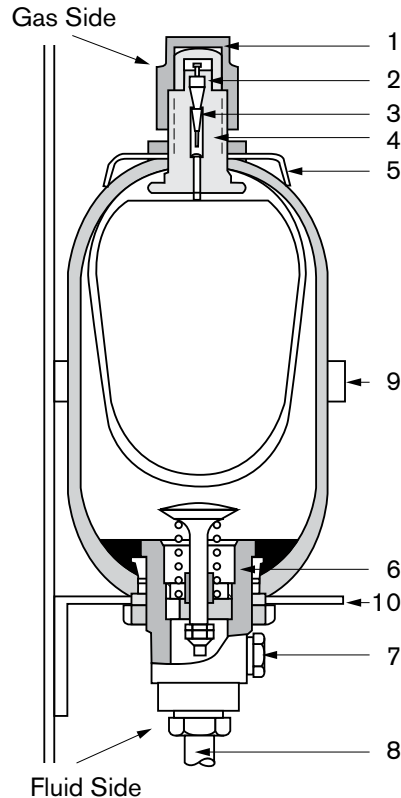


Fig.1 – Typical Bladder Accumulator Installation

- |                   |                     |
|-------------------|---------------------|
| 1. Valve guard    | 6. Fluid port assy  |
| 2. Valve cap      | 7. Bleed port       |
| 3. Gas valve core | 8. Hydraulic line   |
| 4. Gas valve body | 9. Clamp            |
| 5. Name plate     | 10. Support bracket |

## Accumulator installation & operating instructions

If the gas precharge is low, investigate cause and correct. Possible causes of lost precharge pressure includes leaking or damaged gas valve, or damaged bladder.

### Testing pre-charge pressure

Completely release accumulator hydraulic system pressure in a safe controlled manner. Install the charging and testing device onto the gas valve. Measure the pre-charge pressure using the gauge supplied in the charge kit.

### Charging the accumulator

**CAUTION - USE only dry 99.99% pure nitrogen for charging accumulators. NEVER USE OXYGEN OR AIR, due to the risk of explosion.**

Close the drain valve on the charging and testing device and connect the hose to the nitrogen bottle.

Remove the valve guard and valve cap and screw the charging and testing device onto the gas valve. More detail information is provided in the instruction sheet furnished with the charging and testing device. Open the gas shut-off valve on the nitrogen bottle and allow the gas to flow slowly into the accumulator. Close the shut-off valve frequently and check the value of the precharge pressure on the gauge.

If the precharge pressure is too high, it may be reduced by opening the drain valve and allowing some nitrogen to escape.

Note: The precharge pressure will vary depending on the gas temperature. Once the desired precharge is reached, it is necessary to wait 2 minutes until the gas temperature has equalized.

Once again the precharge pressure needs to be checked and adjusted if necessary.

Unscrew the charging and testing device and replace the valve guard and cap (see Fig. 1, Item #1 & #2) A check for leaks with a soapy solution should follow. If a leak is found, it should be repaired following recommended repair procedures. If the gas valve core is replaced, use only valve cores approved for accumulator service, **NEVER USE AN AUTOMOTIVE TYPE VALVE CORE.**

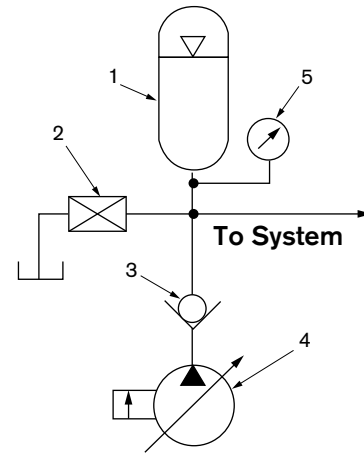


Fig. 2 – Typical Circuit

- |   |                                 |   |                    |
|---|---------------------------------|---|--------------------|
| 1 | Accumulator                     | 3 | Check valve        |
| 2 | Bleed automatic discharge valve | 4 | Pump               |
|   |                                 | 5 | Oil pressure gauge |

## Intended use

Rexroth bladder type accumulators HAB..-5X are intended for the setup of hydraulic drive systems in the field of stationary machine-building and plant construction.

In mobile applications or applications, in which acceleration forces act on the bladder-type accumulator during operation according to the intended purpose, the use is subject to approval by the responsible Bosch Rexroth product manager. Please contact the technical sales organization.

Rexroth HAB..-5X bladder-type accumulators are not intended for private use. They must not be used in potentially explosive atmospheres in accordance with Directive 94/9/EC (ATEX).

## Safety notes on hydraulic accumulators

Before commissioning and during operation of hydraulic accumulators, observe the regulations valid at the place of installation.

The operator is solely responsible for observing applicable regulations.

Documents included in the scope of supply must be properly kept; they are required by the surveyor for recurring inspections.

**The operator should never attempt to adjust, loosen, or remove the bleeder port plug (page 21, figure 1, item #7) without completely depressurizing the system. Installing replacement bleeder plugs not approved or supplied from the manufacturer is strictly forbidden.**

### ⚠ Warning

**Never carry out any welding, soldering or mechanical work on the accumulator vessel!**



- Risk of explosion during welding and soldering!
  - Risk of bursting and loss of the operating permission in the case of mechanical working!
- Never charge hydraulic accumulators with oxygen or air. Risk of explosion!

Before carrying out any work on hydraulic systems, depressurize the system and secure it against restarting! Improper mounting can lead to severe accidents!

**Commissioning must exclusively be carried out by qualified personnel.**

## Legal stipulations

Hydraulic accumulators are pressure vessels and are subject to the national regulations and ordinances valid at the place of installation.

Special rules must be observed in the fields of shipbuilding, aircraft construction, mining, etc.

## Safety equipment

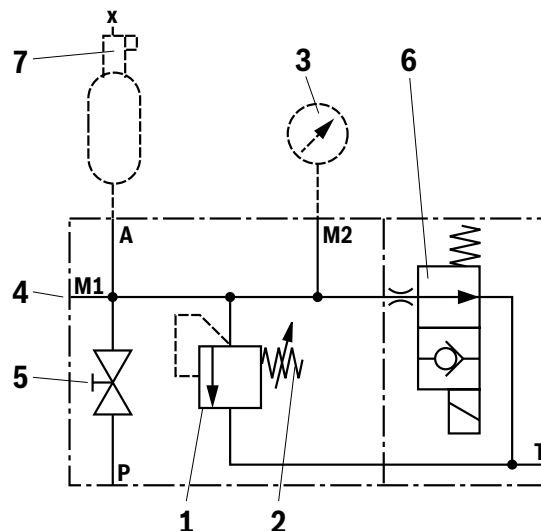
The following safety equipment is recommended:

1. Relief valve
2. Manual discharge valve
3. Pressure gauge
4. Gauge pressure connection
5. Isolation valve

Option:

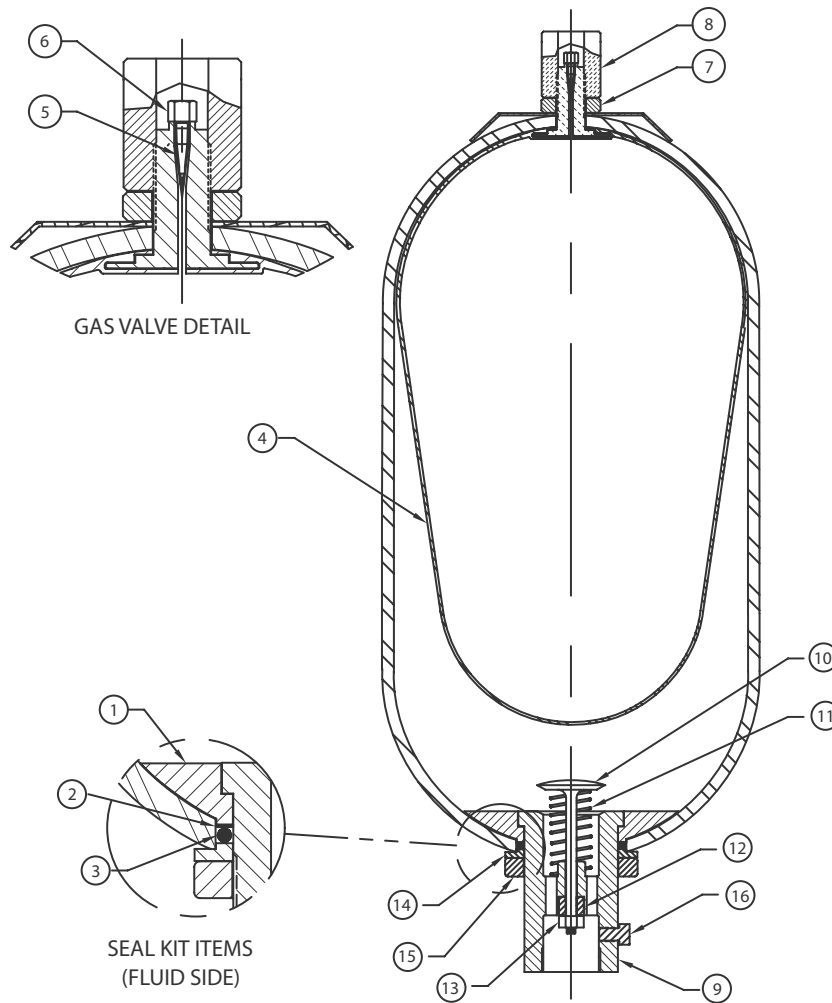
6. Solenoid operated unloading valve
7. Thermal fuse plug

Many of these safety devices are combined in a compact Bosch Rexroth safety and shut-off block (see RE 50131).





**Spare parts for ASME/CRN design only** (1 Quart & 1 Gallon, 3000/4000 PSI)



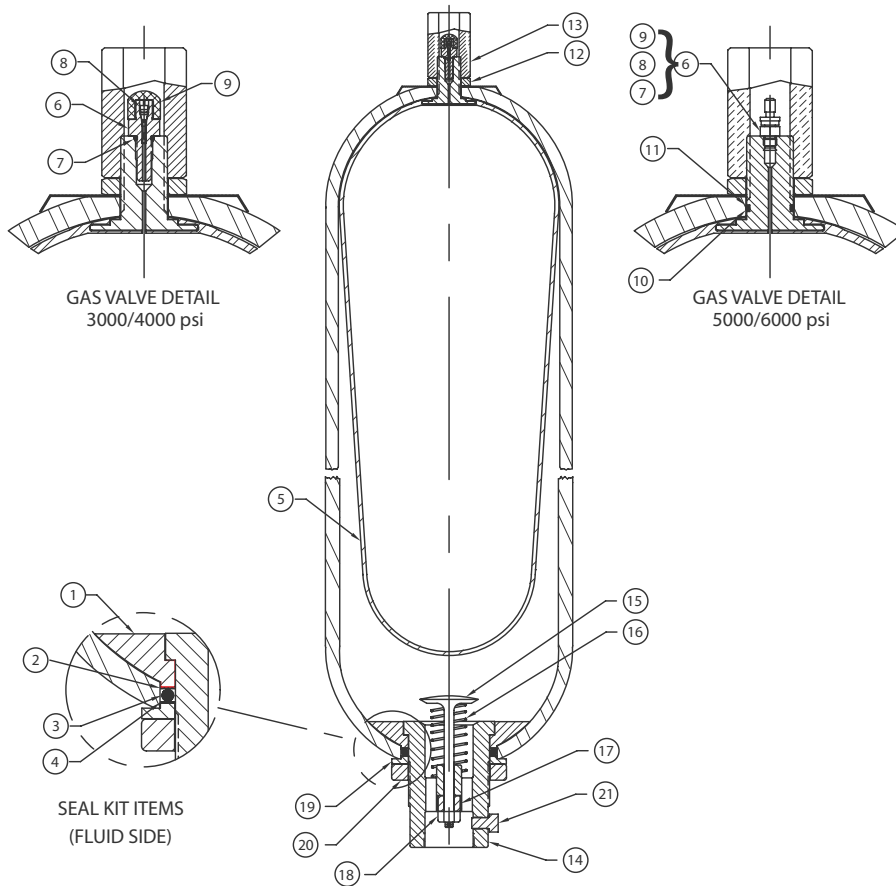
| Seal Kit Items |          |                             |
|----------------|----------|-----------------------------|
| Item           | Quantity | Description                 |
| 1              | 1        | Bladder anti-extrusion ring |
| 2              | 1        | Metal back-up ring          |
| 3              | 1        | O-ring                      |

| Bladder Kit Items |          |                             |
|-------------------|----------|-----------------------------|
| Item              | Quantity | Description                 |
| 1                 | 1        | Bladder anti-extrusion ring |
| 2                 | 1        | Metal back-up ring          |
| 3                 | 1        | O-ring                      |
| 4                 | 1        | Bladder with stem           |
| 5                 | 1        | Gas valve core              |
| 6                 | 1        | Gas valve cap               |
| 7                 | 1        | Jam nut                     |
| 8                 | 1        | Protective cap              |

| Fluid Port Kit Items |          |                             |
|----------------------|----------|-----------------------------|
| Item                 | Quantity | Description                 |
| 1                    | 1        | Bladder anti-extrusion ring |
| 2                    | 1        | Metal back-up ring          |
| 3                    | 1        | O-ring                      |
| 9                    | 1        | Fluid port                  |
| 10                   | 1        | Poppet                      |
| 11                   | 1        | Poppet spring               |
| 12                   | 1        | Poppet piston               |
| 13                   | 1        | Poppet locknut              |
| 14                   | 1        | Spacer                      |
| 15                   | 1        | Locknut                     |
| 16                   | 1        | Bleeder plug                |

For kit part numbers, see page 29.

**Spare parts for ASME design only** (2.5 to 15 gallon, 3000/4000/5000/6000 PSI, bottom repairable)



| Seal Kit Items |          |                             |
|----------------|----------|-----------------------------|
| Item           | Quantity | Description                 |
| 1              | 1        | Bladder anti-extrusion ring |
| 2              | 1        | Metal back-up ring          |
| 3              | 1        | O-ring                      |
| 4              | 1        | Rubber back-up ring         |

| Gas Valve Kit Items |          |                          |
|---------------------|----------|--------------------------|
| Item                | Quantity | Description              |
| 6                   | 1        | Gas valve adaptor        |
| 7                   | 1        | Gas valve adaptor O-ring |
| 8                   | 1        | Gas valve core           |
| 9                   | 1        | Gas valve cap            |

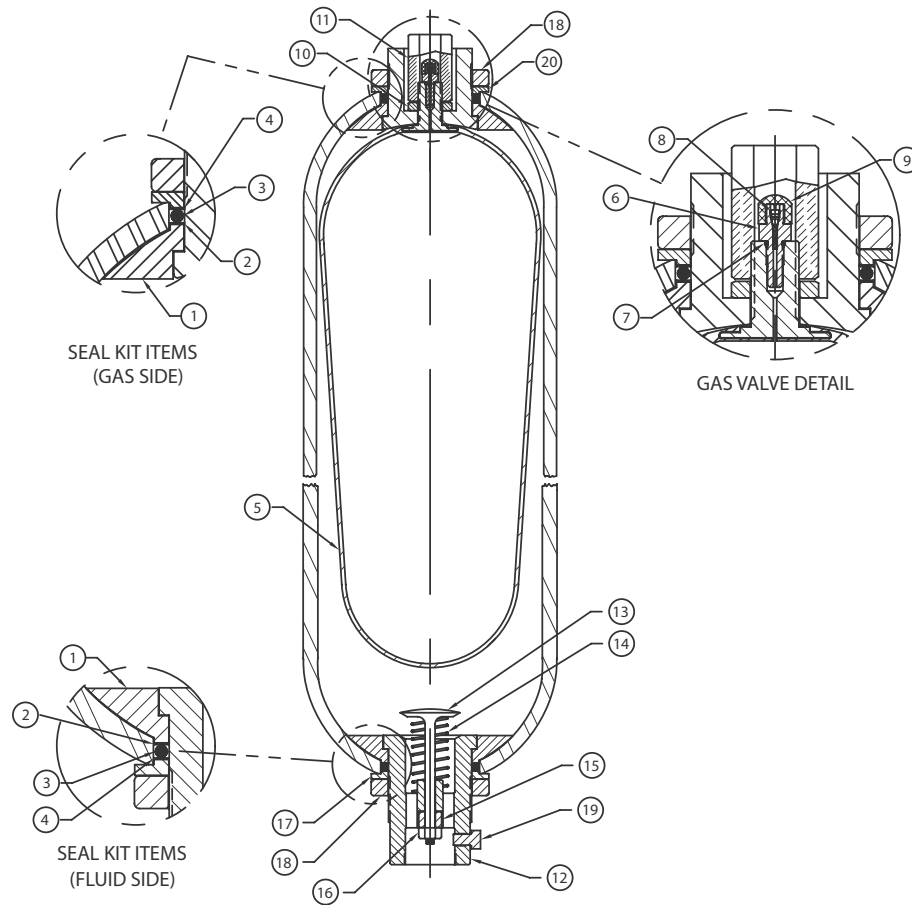
| Bladder Kit Items |          |                             |
|-------------------|----------|-----------------------------|
| Item              | Quantity | Description                 |
| 1                 | 1        | Bladder anti-extrusion ring |
| 2                 | 1        | Metal back-up ring          |
| 3                 | 1        | O-ring                      |
| 4                 | 1        | Rubber back-up ring         |
| 5                 | 1        | Bladder with stem           |
| 6                 | 1        | Gas valve adaptor           |
| 7                 | 1        | Gas valve adaptor o-ring    |
| 8                 | 1        | Gas valve core              |
| 9                 | 1        | Gas valve cap               |
| 10                | 1        | O-ring                      |
| 11                | 1        | O-ring back-up              |
| 12                | 1        | Jam nut                     |
| 13                | 1        | Protective cap              |

| Fluid Port Kit Items |          |                             |
|----------------------|----------|-----------------------------|
| Item                 | Quantity | Description                 |
| 1                    | 1        | Bladder anti-extrusion ring |
| 2                    | 1        | Metal back-up ring          |
| 3                    | 1        | O-ring                      |
| 4                    | 1        | Rubber back-up ring         |
| 14                   | 1        | Fluid port                  |
| 15                   | 1        | Poppet                      |
| 16                   | 1        | Poppet spring               |
| 17                   | 1        | Poppet piston               |
| 18                   | 1        | Poppet locknut              |
| 19                   | 1        | Spacer                      |
| 20                   | 1        | Locknut                     |
| 21                   | 1        | Bleeder plug                |

A. Item 6 includes items 7, 8, and 9 for 5000/6000 PSI bladder kits.  
 B. Items 10 and 11 are only used for 5000/6000 PSI bladder kits.

C. Item 21 is not included or used for fluid ports with SAE 4-Bolt Split Flange connection.  
 For kit part numbers, see page 29.

**Spare parts for ASME design only (2.5 to 15 gallon, 3000/4000 PSI, top repairable)**



| Seal Kit Items |          |                             |
|----------------|----------|-----------------------------|
| Item           | Quantity | Description                 |
| 1              | 1        | Bladder anti-extrusion ring |
| 2              | 1        | Metal back-up ring          |
| 3              | 1        | O-ring                      |
| 4              | 1        | Rubber back-up ring         |

| Gas Valve Kit Items |          |                          |
|---------------------|----------|--------------------------|
| Item                | Quantity | Description              |
| 6                   | 1        | Gas valve adaptor        |
| 7                   | 1        | Gas valve adaptor O-ring |
| 8                   | 1        | Gas valve core           |
| 9                   | 1        | Gas valve cap            |

A. Seal Kit items can be used on Gas Side or Fluid Side.

| Bladder Kit Items |          |                             |
|-------------------|----------|-----------------------------|
| Item              | Quantity | Description                 |
| 1                 | 1        | Bladder anti-extrusion ring |
| 2                 | 1        | Metal back-up ring          |
| 3                 | 1        | O-ring                      |
| 4                 | 1        | Rubber back-up ring         |
| 5                 | 1        | Bladder with stem           |
| 6                 | 1        | Gas valve adaptor           |
| 7                 | 1        | Gas valve adaptor o-ring    |
| 8                 | 1        | Gas valve core              |
| 9                 | 1        | Gas valve cap               |
| 10                | 1        | Jam nut                     |
| 11                | 1        | Protective cap              |

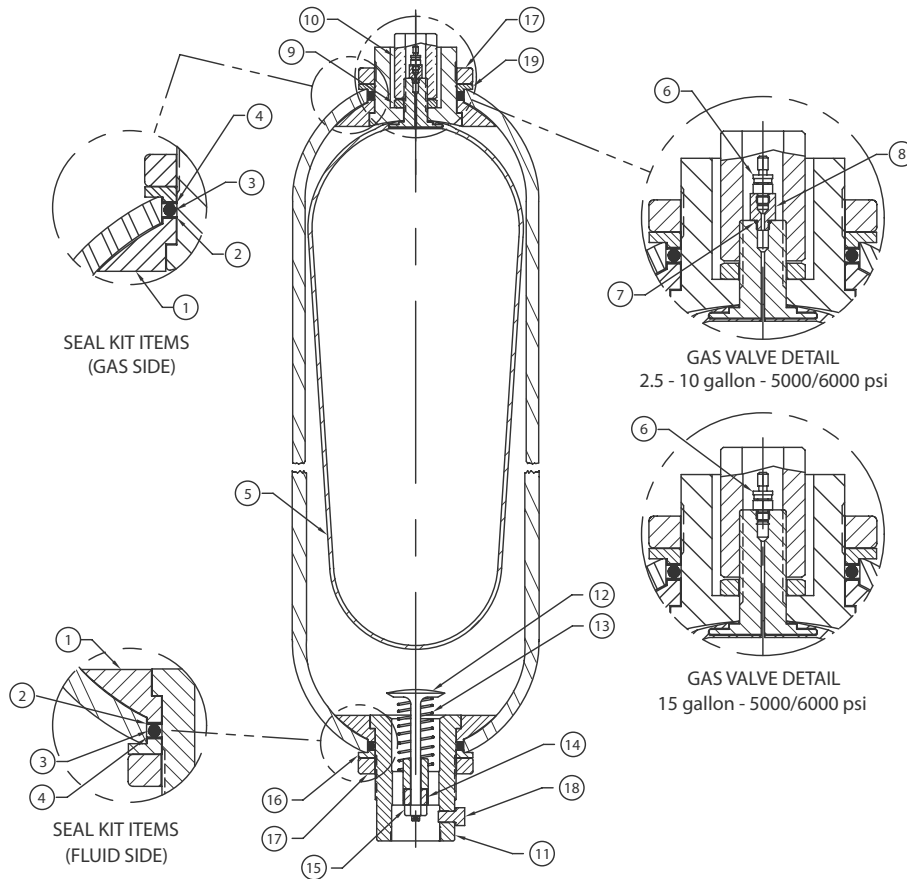
| Fluid Port Kit Items |          |                             |
|----------------------|----------|-----------------------------|
| Item                 | Quantity | Description                 |
| 1                    | 1        | Bladder anti-extrusion ring |
| 2                    | 1        | Metal back-up ring          |
| 3                    | 1        | O-ring                      |
| 4                    | 1        | Rubber back-up ring         |
| 12                   | 1        | Fluid port                  |
| 13                   | 1        | Poppet                      |
| 14                   | 1        | Poppet spring               |
| 15                   | 1        | Poppet piston               |
| 16                   | 1        | Poppet locknut              |
| 17                   | 1        | Spacer                      |
| 18                   | 1        | Locknut                     |
| 19                   | 1        | Bleeder plug                |

- B. Seals for Fluid Side are not included in Bladder Kit.
- C. Order Seal Kit separately for Fluid Side Repair.
- D. Items 18 (Locknut) & 20 (Spacer) are not included in any parts kit and must be ordered separately for Gas Side.

E. Item 19 is not included or used for fluid ports with SAE 4-Bolt Split Flange connection.

For kit part numbers, see page 29.

**Spare parts for ASME design only** (2.5 to 15 gallon, 5000/6000 PSI, top repairable)



| Seal Kit Items |          |                             |
|----------------|----------|-----------------------------|
| Item           | Quantity | Description                 |
| 1              | 1        | Bladder anti-extrusion ring |
| 2              | 1        | Metal back-up ring          |
| 3              | 1        | O-ring                      |
| 4              | 1        | Rubber back-up ring         |

A. Seal Kit items can be used on Gas Side or Fluid Side.

| Bladder Kit Items |          |                             |
|-------------------|----------|-----------------------------|
| Item              | Quantity | Description                 |
| 1                 | 1        | Bladder anti-extrusion ring |
| 2                 | 1        | Metal back-up ring          |
| 3                 | 1        | O-ring                      |
| 4                 | 1        | Rubber back-up ring         |
| 5                 | 1        | Bladder with stem           |
| 6                 | 1        | Gas valve adaptor           |
| 7                 | 1        | O-ring                      |
| 8                 | 1        | Stem extension              |
| 9                 | 1        | Jam nut                     |
| 10                | 1        | Protective cap              |

- B. Seals for Fluid Side are not included in Bladder Kit.
- C. Order Seal Kit separately for Fluid Side repair.
- D. Items 7 & 8 are not required for 15 Gallon Bladder Kit.
- E. Items 17 (Locknut) & 19 (Spacer) are not included in any parts kit and must be ordered separately for Gas Side.

| Gas Valve Kit Items |          |                   |
|---------------------|----------|-------------------|
| Item                | Quantity | Description       |
| 6                   | 1        | Gas valve adaptor |

| Fluid Port Kit Items |          |                             |
|----------------------|----------|-----------------------------|
| Item                 | Quantity | Description                 |
| 1                    | 1        | Bladder anti-extrusion ring |
| 2                    | 1        | Metal back-up ring          |
| 3                    | 1        | O-ring                      |
| 4                    | 1        | Rubber back-up ring         |
| 11                   | 1        | Fluid port                  |
| 12                   | 1        | Poppet                      |
| 13                   | 1        | Poppet spring               |
| 14                   | 1        | Poppet piston               |
| 15                   | 1        | Poppet locknut              |
| 16                   | 1        | Spacer                      |
| 17                   | 1        | Locknut                     |
| 18                   | 1        | Bleeder plug                |

F. Item 18 is not included or used for fluid ports with SAE 4-Bolt Split Flange connection.

For kit part numbers, see page 29.

## Seal kits and bladder repair kits HAB-5X ASME Design

| Seal Kits   |  |
|-------------|--|
| Part Number | Description                                      |
| R978046055  | Accum Seal Kit HAB-5X 10-50L NBR 3000 – 6000 PSI |
| R978046056  | Accum Seal Kit HAB-5X 1L NBR 3000/4000 PSI       |
| R978046057  | Accum Seal Kit HAB-5X 4L NBR 3000/4000 PSI       |

| Bladder Repair Kits                                  |   |
|--|---|
| 3000/4000 PSI bottom and top repairable bladder kits |   |
| R978046058   | Bladder repair kit – Nitrile (1 quart)    |
| R978904899   | Bladder repair kit – Nitrile (1 gallon)   |
| R978046059   | Bladder repair kit – Nitrile (2.5 gallon) |
| R978046063   | Bladder repair kit – Nitrile (5 gallon)   |
| R978889450   | Bladder repair kit – Nitrile (10 gallon)  |
| R978046066   | Bladder repair kit – Nitrile (11 gallon)  |
| R978046068   | Bladder repair kit – Nitrile (15 gallon)  |
| 5000 PSI bottom repairable bladder kits              |   |
| R978046060   | Bladder repair kit – Nitrile (2.5 gallon) |
| R978046065   | Bladder repair kit – Nitrile (5 gallon)   |
| R978046062   | Bladder repair kit – Nitrile (10 gallon)  |
| R978046069   | Bladder repair kit – Nitrile (15 gallon)  |
| 5000 PSI top repairable bladder kits                 |   |
| R978046061   | Bladder repair kit – Nitrile (2.5 gallon) |
| R978046067   | Bladder repair kit – Nitrile (5 gallon)   |
| R978046064   | Bladder repair kit – Nitrile (10 gallon)  |
| R978046070   | Bladder repair kit – Nitrile (15 gallon)  |

Note: Consult factory for 6000 PSI bladder kit information.

| Gas Valve Kit                           |  |
|---|--|
| 3000/4000 PSI bottom and top repairable |  |
| R978049846                              | Accum valve stem kit HAB-5X 10-50L 3000/4000 PSI |
| 5000 PSI bottom and top repairable      |  |
| R978049851                              | Accum valve stem kit HAB-5X 10-50L 5000 PSI      |
| 6000 PSI bottom and top repairable      |  |
| R978051788                              | Accum valve stem kit HAB-5X 10-50L 6000 PSI      |

## Fluid port assemblies HAB-5X ASME Design

| Fluid Port Assemblies        |  |                     |
|------------------------------|--|---------------------|
| Threaded fluid port assembly |  |                     |
| R978046071                   | Fluid port assembly (1 quart) – NPT – 3000/4000 PSI          | 1" - 11 1/2 NPT     |
| R978040023                   | Fluid port assembly (1 quart) – SAE – 3000/4000 PSI          | 1-5/16" - 12 SAE    |
| R978046072                   | Fluid port assembly (1 gallon) – NPT – 3000/4000 PSI         | 1-1/4" - 11 1/2 NPT |
| R978040024                   | Fluid port assembly (1 gallon) – SAE – 3000/4000 PSI         | 1-5/8" - 12 SAE     |
| R978046074                   | Fluid port assembly (2.5 gal –15 gal) – NPT – 3000/4000 PSI  | 2" - 11 1/2 NPT     |
| R978040022                   | Fluid port assembly (2.5 gal –15 gal) – SAE – 3000/4000 PSI  | 1-7/8" - 12 SAE     |
| R978053888                   | Fluid port assembly (2.5 gal –15 gal) – BSPP – 3000/4000 PSI | G2"-BSPP ISO228     |
| R978046090                   | Fluid port assembly (2.5 gal –15 gal) – NPT – 5000/6000 PSI  | 2" - 11 1/2 NPT     |
| R978046092                   | Fluid port assembly (2.5 gal –15 gal) – SAE – 5000/6000 PSI  | 1-7/8" - 12 SAE     |
| Flanged fluid port assembly  |  |                     |
| R978040009                   | Fluid port assembly (2.5 gal –15 gal, 3000 PSI)              | 2" code 61          |
| R978046073                   | Fluid port assembly (2.5 gal –15 gal, 5000/6000 PSI)         | 1-1/2" code 62      |

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## Notes

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