Instruction and Operations Manual

Bladder Accumulator SHBS/HBS

GB

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CONTENT

1.General remarks

These instructions apply for all SERVI bladder accumulator type SHBS+HBS. The standard bladder accumulator SHBS/HBS are designed, manufactured and tested in accordance with European Directive PED 2014/68/EU (Pressure Equipment Directive). International regulations or special applications may possibly require special acceptances and / or further instructions (e.g. ATEX accumulator acc. to RL2014 / 34 / EU).

Strict compliance with the instructions and recommendations that are issued in this document and all other relevant documents, are absolutely necessary for the operation of this accumulator. The supplier accepts no responsibility for direct or indirect damage to property or any personal injury and consequential damages, such as business interruption arising out of non-compliance with the following instructions.

Before commissioning and during operation it is necessary to follow all directions and the valid, national regulations of the place of installation must be observed. Compliance with the current instructions is the responsibility of the operator. The documents that have been supplied with the hydro accumulator are kept in a safe and accessible place. These can also be useful for the operation, testing and inspection.

2. Intended Use 

The SERVI bladder accumulator SHBS/HBS is exclusively used for the hydraulic fluid in a hydraulic system to absorb and to give off. The nitrogen filling in a bladder serves as working medium.

SERVI bladder accumulator is intended as a component which will be installed in a machine or system, or assembled with other components to form a machine or a system. It may only be put into operation when it has been built into the system, for which it is intended and ensures that the system meets the requirements of the Machinery Directive and/ or other local regulations of the place of installation.

For commissioning and for the operation the requirements of the Pressure Equipment Directive 2014/68/EU and the Machinery Directive 2006/42 EC or other country-specific regulations outside the EU are to be observed within the EU.

The fluid group indication 1 or 2 (EU- regulation- no. 1272/2008) on the name plate refers to the suitable pressure fluid.

Service on hydro pneumatic accumulators may be carried out only by qualified personnel. Mishandling can result severe or fatal accidents.

If repair is carried out by one‘s own hand without informing the producer, the guarantee will expire. The intended use also includes that the operator has read and understood these instructions completely.

The SERVI standard accumulator (fluid group 2) is designed exclusively for the use with non-corrosive systems and may not to be operated in its supplied standard paint in corrosive atmosphere. The outside of the accumulator body is in RAL 5015 (blue) primed and can be painted for a specific corrosion protection by the operator, or Servi.

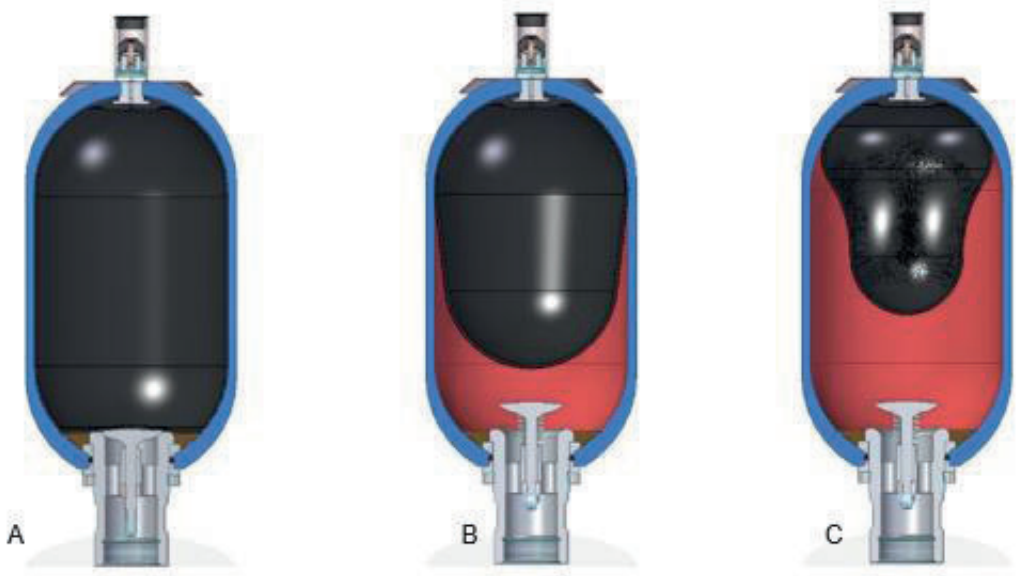
For use in corrosive atmosphere/ medium SERVI offers a special interior and exterior coated accumulator as special design.

Danger of slipping! ⚠
Leaks or oil spills cause puddles, soil contamination can cause serious injury and environmental damage. When removing connections, residual oil can escape without pressure. Immediately pick up the escaping residual oil and dispose it properly.

Danger of poisoning and injury due to escaping hydraulic medium! ⚠
Contact with hydraulic fluids may cause health issues (e.g. eye injuries, skin damage, poisoning) Always check the lines for wear or damage before each use. Wearing of protective gloves, goggles and appropriate work clothing is recommended.
The safety data sheets of the medium must be observed.

3. Functionality

The rubber blader separates the nitrogen gas from the system fluid.



Picture A

The accumulator bladder is in pre charge position (P_0), without operating pressure fluid, the fluid port is closed

Picture B

Bladder compression at minimum working pressure P_1 / V_1. The nitrogen is compressed in the bladder, include pressure medium r**est filling at least 10% of the nominal volume of the accumulator. The accumulator may never be completely emptied!**

Picture C

Bladder compression at maximum working pressure P_2 / V_2.
The change of volume $\triangle V$ between V_1 and V_2 comply with the exchanged voulme.

4. Configuration

The SERVI standard bladder accumulators are configured as a forged carbon steel pressure vessels and with NBR-bladder. Other materials are available on request.
The used materials are to be matched to the respective medium and the application data.

5. Safety notes ⚠

The current commissioning rules and regulations for a safe operation of hydraulic accumulators require the observance of all safety-related measures, e.g.:

- appropriate safeguards against excessive pressure
- safety regulations when handling with nitrogen as a filling gas
- use proper and calibrated pressure gauge
- correct connection of the gauge
- shut-off and relief devices, etc.

The operator must ensure that all relevant regulations are observed. SERVI accessories for example safety and shut-off blocks include the legal requirements (e.g. acc. to TRB 403) in Germany.

6. Transport – Storage

6.1 Transport

Handle with care!

Use for transport only approved hoists and equipment by which the hydraulic accumulator can be handled safely. Steel chains or -ropes are to be avoid. The protective cap of the gas side may not be removed. The gas valve of the accumulator may not be used as a transport means and ensure that in no case no damage occurs.

Danger of property damage and personal injury! ⚠

The standard accumulator can weigh up to approx. 130 kg. Uncontrolled movements or

falling to the bottom of the hydro accumulator, can lead to serious property damage and personal injury.

6.2 Storage ⚠

Accumulators must be stored in cool and dry places away from heat. If hydraulic accumulator is stored for more than five years, all elastomer parts must be replaced before commissioning (contact SERVI). The storage of a bladder accumulator over a longer period with a nitrogen pre charge P_0 is not recommended.

Note: In case of storage of a accumulator for more than 2 years as part of the commissioning requires possibly a renewed internal examination.

7. Marking of the hydro accumulator

Data, markings und further labelling may not be altered without the prior written permission of SERVI.
In case of discrepancy regarding the information displayed on the name plate and those specified on other parts of the accumulator (body, fluid port, etc.) the data indicated on the name plate must be observed for operation.

The following information is displayed on the accumulator:

- accumulator-type
- item number of the accumulator

<u>Permissible operating data:</u>

- temperature range TS in ° C
- maximum allowable pressure PS in bar
- fluid group
- manufacturing date mm / yy
- nominal volume
- test pressure PT in bar
- weight in kg
- CE logo and identification number of the notified body (for volume > 1 liter / fluid group 2)

<u>Warnings on the nameplates and on the accumulator body:</u>

- warnings and safety instructions („Danger“, „only nitrogen use“, etc. or any similar indication)
- pre-charging pressure P_0

Damaged or lost name plates must be replaced! The operation of a hydraulic accumulator without type plate is not allowed!

8. Operating ⚠

The operating of accumulators and equipment may only be carried out by qualified personnel. Systems with hydro accumulators have a supervisory duty and they are subject of special commissioning regulations.

Before the commissioning, a visual inspection is necessary regarding any external damage to the pressure equipment. Before work of any kind to be carried out on the hydraulic system, it must be ensured that the plant is pressureless.

Improper installation can lead to serious accidents!

⚠ **Strictly forbidden are:**

- **welding on hydraulic accumulators, soldering, drilling or carry out of work, which can change the mechanical properties of the pressure device.**
- **change of the hydraulic accumulator or its components.**

8.1 Works before commissioning

8.1.1 Charging gas

Use only nitrogen with at least class 3.5 (at least 99.8% pure)
Using of oxygen or compressed air for filling is strictly forbidden. Risk of explosion!

8.1.2 Pre-charge pressure P_0

By default, the SERVI bladder accumulator is delivered with a stock fill (max 2 bar). Before commissioning, the pre-filling must be carried out by the user, otherwise the bladder might be destroyed!

If the accumulator has been pre-filled by the factory to a certain pre-charge pressure P_0, the pre-charge pressure will be displayed on the hydro accumulator (type plate, sticker).

The correct setting of the pre-charge pressure P_0 depends on the function, the min. working pressure P_1, and max. working pressure P_2 and is calculated by the operator from the operating data of the system.
The influence of temperature must also be considered.
The SERVI bladder accumulator offers a volume utilization of up to 75% of the effective gas volume.

⚠ **The gas pre-filling pressure may not exceed the max. System pressure (P_2) and operating pressure (PS).**

Limit values: $P_0 <= 0{,}9 \times P_1$, max. permissible pressure ratio $P_0:P_2 = 1:4$

8.1.3 Maximum allowable operating pressure (PS) ⚠

The maximum allowable operating pressure (PS) for the hydo bladder accumulator is stamped on the type plate and on the accumulator body. Is the system pressure greater than the max. operating pressure of the accumulator, the accumulator may **not** be used.

8.1.4 Permitted temperature range (TS) ⚠

The temperature range (TS) is indicated on the name plate. The design temperature of the body is stamped on the steel body.
The bladder material normally limits the temperature range. Make sure to check information on the name plate.

8.1.5 Hydraulic fluids ⚠

The materials, especially those of the bladder and of the seals of the hydro accumulator, must be compatible with the used hydraulic fluid.

Group 1-fluids may not be used in a hydro accumulator, which is determined for Group 2 fluids (standard SHBS/HBS). The type plate indicates the allowed fluid group of hydro accumulator.

It is strictly forbidden to use the accumulator with liquid for which it is not determined or suitable.

If using fluid of the fluid group 1, all possible safety precautions must be observed strictly, in accordance with the laws and currently regulations in force. If using other media as hydraulic fluids (e.g. HLP 46), these are to be marked by the operator at the store!

8.1.6 Installation ⚠

Make sure that the labels and markings are clearly visible and legible. Keep a distance at least 200 mm above the gas valve for the mounting of a testing and filling device.
Please consider climate conditions in order to protect the accumulator from sources of heat, electric and magnetic fields, against lightning, moisture and other adverse environmental conditions.

For an optimal performance, place the accumulator as close as possible to the consumer.
Preferred mounting position is vertical, gas valve on top.

8.1.7 Installation (B) ⚠

During assembly of the hydraulic accumulator is to be observed:

- make sure that the connected pipe system is assembled free of tension and safely
- make sure that the hydraulic accumulator is properly secured and no uncontrolled movements can be executed even in the cas of a line break
  SERVI - clamps and brackets are suitable for this purpose and deliverable as accessory
- the accumulator must be mounted so that no external tensions acting on it

8.1.8 Final checks before commissioning

The final review before commissioning must be performed in the accordance with the current commissioning and operational safety regulations and in line with the laws in the country of set-up (e. g. use of appropriate safety devices or acceptance test by a recognized test center, etc.)

8.2 Filling with nitrogen ⚠

Secure the hydraulic accumulator. Position yourself during filling so that you cannot be hurt by a possible leak or rupture of the equipment.

Especially do not stand in the longitudinal axis in front or behind of the accumulator. Use for the filling process the SERVI - filling and test device and therefore the valid instructions for use have to be noted.

⚠ **Before testing, the hydraulic accumulator must be relieved on the liquid side!**

The nitrogen pressure varies according to the operating or room temperature. Too rapid filling causes a rapid pressure increase.
After filling or after the release process, the temperature compensation must be done in the hydraulic accumulator, before the checking of the pre-charge pressure.

The maximum precharging pressure must not exceed the maximum operating pressure of the hydraulic accumulator.

Check the fill valve for leaks (e.g. with foaming agents). Always use the protective caps to protect the fill valve.

8.3 Hydraulic pressure systems ⚠

First, the precharging pressure P_0 must be checked. Check the hydraulic pressure system regarding leaks.
Make sure that the hydrostatic pressure displayed on the accumulator, the maximum PS is not exceed.

The pressure system can be vented on the fluid port of the accumulator on some models. After venting, the vent screw must be closed and to be checked for tightness and leaks.

Caution! Never open the bleed screw when the hydraulic system is under pressure.

9. Maintenance / Repair ⚠

The maintenance and repair of the bladder accumulator requires basic mechanical and hydraulic knowledge. The maintenance and repair of the hydro accumulator may only be carried out by qualified staffs.

Before the hydraulic accumulator is dismantled by the system, it must be ensured that the hydraulic accumulator is completely depressurized on the liquid- and system side.

Disassembly, assembly and repair of the hydro accumulator may only be carried out by the manufacturer or authorized persons. For self-made repairs no guarantee is assumed!
For transport, close all openings with suitable protective caps so that dirt or moisture can not penetrate into the bladder accumulator.
Make sure that all connecting parts, in particular pressurized connecting parts, are sufficiently fixed. Self-loosing parts can lead to property damage and personal injury.

Before the dismantling of the hydraulic accumulator, please ensure that the accumulator on the liquid side is fully pressureless and released.

Before the dismantling of the accumulator all externally mounted components must be removed on liquid side without

⚠ **If the accumulator is completely relieved (gas and liquid side) the fluid port poppet valve must be open. If this can not be determined, further work is not permitted! Contact SERVI!**

The SHBS/HBS - repair instructions must be observed!
To keep the equipment in good working condition and to ensure a long service life we recommend the following maintenance:

9.1 Filling pressure P_0 check

After commissioning, check the filling pressure P_0 once a week in the first month.
Then repeat the exam monthly, twice a year, annually, depending on the detected pressure drop.

9.2. Other maintenance

SERVI - recommend to carry out the following checks
(depending on the test distances and the operating conditions):

- verification of the safety instructions and the connections
- models with vent screw have to be regularly checked for strength and tightness
- checking of the fixings
- visual inspection of the accumulator with regard to possible signs of wear, such as corrosion or deformation
- if you use an abrasive or corrosive liquid, an internal checking for wear is required, in dependence from aggressiveness of the liquid
- the hydraulic accumulator is subject of regular internal and external audits in accordance with legal regulations

Repair work must be performed in accordance with the underlying maintenance manuals.
For repair or maintenance, only use original spare parts of the manufacturer.

10. List of possible faults

Incident/ type of disturbance	Supposed cause	Effects/ danger	Action to remedy the disturbance/ preventive measures
change of pre-charge pressure (P_0)/ incorrect pre-charge pressure P_0	system specific change of P_0, depending on the temperature	limited functionality/ destruction of the bladder	temperature spcific selected P_0, depending on the min. and max. working pressure
	gas filling valve/ damaged sealing ring	loss of pre-charge pressure (P_0), limited functionality/ destruction of the bladder	regular check of the gas filling valve/ use of the corresponding protective caps.
	insufficiently fixed gas filling valve		regular check of the gas filling valve, considering the tightening torque
	reduction of P_0 due to permeation	loss of pre-charge pressure (P_0), destruction of the bladder	regular check of the P_0, the gas valve seals, if necessary change of the bladder
leakage	damaged connection parts - liquid side	oil loss	regular check of the valves, considering the tightening torque
	damaged connection parts - gas side	nitrogen loss, functionality problems, destruction of the bladder	
	insufficiently fixed connecting parts	separation of the connection parts	
cracks / deformations in the accumulator body	cracks in the accumulator body	bursting	immediate decommissioning of the system. The accumulator must be sorted out.
	Overload of the hydro accumulator Operating of the accumulator outside predetermined limits		decommissioning, exchange, compliance and control of permissible operating parameters (see type plate, declaration of conformity, instruction manual). Protecting the accumulator against overpressure using appropriate safety valves.
reduction of the wall thickness of the accumulator body	Abrasion due to excessive frictional forces / by using unsuitable fluids / Contamination of the fluid		immediate decommissioning of the system. replacement of the accumulator/ use of suitable fluids. Avoiding contamination in the operating system, filtration
corrosion of the accumulator inside	by using unsuitable fluids (e.g., corrosive fluids). incorrect storage / transport	corrosion/ bursting	immediate decommissioning of the system. replacement of the accumulator/ use of suitable fluids./ use of suitable hydro accumulators (e.g. coated hydro accumulators or stainless steel accumulators). For storage and transport: close openings with suitable protective caps.
corrosion of the accumulator outside	due to insufficient surface coating (e.g. operation of the accumulator in the outside area) incorrect storage / transport		immediate decommissioning of the system. replacement of the accumulator/ use of suitable surface protection/ material accumulator

Incident/ type of disturbance	Supposed cause	Effects/ danger	Action to remedy the disturbance/ preventive measures
destruction bladder	due to incorrect nitrogen pre-filling P_0	destruction of the bladder	temperature spcific selected P_0, depending on the min. and max. working pressure/ regular check of the P_0.
	damaged/ insufficiently fixed gas filling valve		regular check of the gas filling valve, considering the tightening torque
	by using unsuitable fluids		use of suitable fluids / use of fluid-specific bladder material.
assembly problems	contaminated or damaged or connecting thread	no or insufficient screw possibility	clean affected parts or replace them.
	non-compliant mounting accessories	no or insufficient fixing possibility	
		generation of external forces and voltages	Use of suitable fixing equipment (e.g., clamps, brackets, back panels).
self-loosening parts	defective attachment	function problems, personal injury and property damage	Make sure there is sufficient fixation, in particular check fixations of pressurized parts regularly (e.g. gas valve, bleed screw, fittings)
commissioning problems	storing time timeout of subject to monitoring systems	commissioning-refusal of the notified body when the storage time is exceeded (> 2 years)	Additional internal test acc. to § 14 BetrSichV by the notified body.

11. Fatique life

For CE-approved standard SHBS/HBS bladder accumulators 1L - 57L.
For other approvals, please have a look on the fatique life-data in confirmation of accumulator.

Fatique Life Bladder accumulator HBS_1_2,5_5L_350 bar (Calculation according to EN 13445-Fluidgruppe 2)							
Bladder accumulator_HBS_1-350 bar / HBS_2,5-350 bar / HBS_5-350 bar							
▵P (bar)	0-120	0-150	0-186	0-200	0-250	0-280	0-350
load change (N) *	N > 1.000E8	N ≤ 1.000E8	N ≤ 1,99E6	N = 829300	N = 135400	N = 62540	N = 19417

Fatique Life Bladder accumulator HBS 4_6_10L_350 bar (Calculation according to EN 13445-Fluidgruppe 2) cicyles by using adaptors							
Bladder accumulator_HBS_4-350 bar / HBS_6-350 bar / HBS_10-350 bar							
▵P (bar)	0-120	0-150	0-169	0-200	0-250	0-280	0-350
load change (N) *	N > 1.000E8	N ≤ 4.031E7	N ≤ 2.082E6	N = 578400	N = 86600	N = 43345	N = 14783
load change (N)	N > 1.000E8	N ≤ 3.292E6	N = 709700	N = 176850	N = 58444	N = 39343	N = 14783
* = number of load cycles in applying of **HENNLICH** adaptors (**HENNLICH** accessories with inside placed sealings)							

Fatique Life Bladder accumulator HBS 10-50L_350 bar (Calculation according to EN 13445-Fluidgruppe 2)							
Bladder accumulator_HBS 10-330 bar / HBS_12_330 bar / HBS_20-330bar / HBS_24,5-330 bar /HBS 32-330 bar / HBS_50-330 bar							
▵P (bar)	0-122	0-145	0-161	0-200	0-250	0-280	0-330
load change (N)	N > 1.000E8	N ≤ 9.968E6	N ≤ 2.041E6	N = 196330	N = 43250	N = 24137	N = 11806