

## Bladder Accumulators Low Pressure



### 1. DESCRIPTION

#### 1.1. FUNCTION

Fluids are practically incompressible and cannot therefore store pressure energy.

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

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

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

- energy storage
- emergency operation
- force equilibrium
- leakage compensation
- volume compensation
- shock absorption
- vehicle suspension
- pulsation damping

See catalogue section:

- Hydraulic Dampers  
No. 3.701

#### 1.2. DESIGN

HYDAC low pressure bladder accumulators consist of a welded pressure vessel, a flexible bladder with gas valve and a hydraulic connection with check valve or a perforated disc.

The table shows the different models which are described in greater detail in the pages that follow:

Designation	Perm. pressure [bar] <sup>2)</sup>	Volume [l]	Q <sup>1)</sup> [l/s]
SB40- 2.5 ... 50	40	2.5 - 50	7
SB40- 70 ... 220		70 - 220	30
SB35HB- 20 ... 50	35	20 - 50	20
SB16A- 100 ... 450	16	100 - 450	15
SB35A- 100 ... 450	35		
SB16AH- 100 ... 450	16		
SB35AH- 100 ... 450	35		20

<sup>1)</sup> Q = max. flow rate of pressure fluid

<sup>2)</sup> Higher pressures on request

#### 1.3. BLADDER MATERIAL

The following elastomers are available as standard:

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

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

#### 1.4. CORROSION PROTECTION

For operation with chemically aggressive media, the accumulator shell can be supplied with corrosion protection, such as plastic coating on the inside or chemical nickel-plating. If this is insufficient, then stainless steel accumulators must be used.

#### 1.5. INSTALLATION POSITION

HYDAC bladder accumulators can be installed vertically, horizontally and at a slant. When installing vertically or at a slant, the oil valve must be at the bottom. On certain applications listed below, particular positions are preferable:

- Energy storage: vertical,
- Pulsation damping: any position from horizontal to vertical,
- Maintaining constant pressure: any position from horizontal to vertical,
- Pressure surge damping: vertical,
- Volume compensation: vertical.

If the installation position is horizontal or at a slant, the effective fluid volume and the maximum permitted flow rate of the operating fluid are reduced.

Bladder accumulators SB16A / SB35A and SB16AH / SB35AH must only be installed vertically with the gas side uppermost.

#### 1.6. TYPE OF INSTALLATION

For strong vibrations and volumes above 1 litre, we recommend the use of HYDAC accumulator supports or the HYDAC accumulator installation set.

See catalogue sections:

- Supports for Hydraulic Accumulators  
No. 3.502
- ACCUSET SB  
No. 3.503

## 2. TECHNICAL SPECIFICATIONS

### 2.1. EXPLANATORY NOTES

#### 2.1.1 Operating pressure

see tables  
Based on nominal pressure for foreign test certificates)

#### 2.1.2 Nominal volume

see tables

#### 2.1.3 Effective gas volume

see tables  
Based on nominal dimensions, this differs slightly from the nominal volume and must be used when calculating the effective fluid volume.

#### 2.1.4 Effective fluid volume

Volume of fluid which is available between the operating pressures  $p_2$  and  $p_1$ .

#### 2.1.5 Max. flow rate of the operating fluid

In order to achieve the max. flow rate given in the tables, the accumulator must be installed vertically. It must be noted that a residual fluid volume of approx. 10% of the effective gas volume remains in the accumulator.

The maximum fluid flow rate was determined under specific conditions and is not applicable in all operating conditions.

#### 2.1.6 Fluids

The following sealing and bladder materials are suitable for the fluids listed below.

Material	Fluids
NBR	Mineral oils (HL, HLP, HFA, HFB, HFC), water
ECO	Mineral oil
IIR	Phosphate ester, water
FKM	Chlorinated hydro-carbons, petrol

#### 2.1.7 Permitted operating temperature

The permitted operating temperature of a bladder accumulator is dependent on the application limits of the metal materials and the bladder.

Outside these temperatures, special material combinations must be used. The following table shows the correlation between bladder material and application temperature.

Material	Temperature ranges
NBR20	-15 °C ... +80 °C
NBR21	-50 °C ... +80 °C
NBR22	-30 °C ... +80 °C
ECO	-30 °C ... +120 °C
IIR	-55 °C ... +100 °C
FKM	-10 °C ... +150 °C

#### 2.1.8 Gas charging

Hydraulic accumulators must only be charged with nitrogen.  
Never use other gases.

#### Risk of explosion!

In principle, the accumulator may only be charged with nitrogen class 4.0, filtered to < 3 µm.

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

#### 2.1.9 Limits for gas pre-charge pressure

$$p_0 \leq 0.9 \cdot p_1$$

with a permitted pressure ratio of:

$$p_2 : p_0 \leq 4 : 1$$

$p_2$  = max. operating pressure

$p_0$  = pre-charge pressure

For HYDAC low pressure accumulators, the following must also be taken into account:

Type SB40:  $p_{0 \max} = 20 \text{ bar}^*$

Type SB35A/AH:  $p_{0 \max} = 10 \text{ bar}$

Type SB35HB:  $p_{0 \max} = 10 \text{ bar}$

\* in model with perforated disc

#### 2.1.10 Certificate codes

Country	Certificate code (AKZ)
EU member states	U
AU Australia	F <sup>1)</sup>
BY Belarus	A12
CE Canada	S1 <sup>1)</sup>
CH Switzerland	U
CN China	A9
HK Hong Kong	A9
IS Iceland	U
JP Japan	P
KR Korea (Republic)	A11
NO Norway	U
NZ New Zealand	T
RU Russia	A6
TR Turkey	U
UA Ukraine	A10
US USA	S
ZA South Africa	S2

<sup>1)</sup> Registration required in the individual territories or provinces  
others on request

On no account must any welding, soldering or mechanical work be carried out on the accumulator shell. After the hydraulic line has been connected it must be completely vented.

Work on systems with hydraulic accumulators (repairs, connecting pressure gauges etc) must only be carried out once the pressure and the fluid have been released.

**Please read the Operating Manual! No. 3.201.CE**

**When replacing seals and/or bladder, please read the Instructions for assembly and repair (No. 3.201.M).**

#### Note:

Application examples, accumulator sizing and extracts from approvals regulations relating to hydraulic accumulators can be found in the following catalogue section:

- HYDAC Accumulator Technology No. 3.000

## 2.2. MODEL CODE

Not all combinations are possible.

Order example. For further information, please contact HYDAC.

**SB40 A - 100 F 7 / 112 U - 40 A**

**Series** \_\_\_\_\_

**Type code** \_\_\_\_\_  
no details = standard  
H = high flow  
N = increased flow, standard oil valve dimensions  
A = shock absorber  
B = bladder top-repairable  
Combinations must be agreed with HYDAC

**Nominal volume [l]** \_\_\_\_\_

**Fluid connection** \_\_\_\_\_  
A = standard connection, thread with internal seal face  
F = flange connection  
C = valve mounting with screws on underside  
E = sealing surfaces on front interface (e.g. on thread M50x1.5 - valve)  
G = male thread  
S = special connection, to customer specification

**Gas side** \_\_\_\_\_  
1 = standard model  
2 = back-up model  
3 = gas valve 7/8-14UNF with M8 female thread  
4 = gas valve 7/8-14UNF with gas valve connection 5/8-18UNF  
5 = gas valve M50x1.5 in accumulators smaller than 50 l  
6 = 7/8-14UNF gas valve  
7 = M28x1.5 gas valve  
8 = M16x1.5 gas valve (with M14x1.5 bore in gas valve)  
9 = special gas valve, to customer specification

**Material code** \_\_\_\_\_  
dependent on operating medium  
standard model = 112 for mineral oils  
others on request

**Fluid connection** \_\_\_\_\_  
1 = carbon steel  
2 = high tensile steel  
3 = stainless steel <sup>2)</sup>  
6 = low temperature steel

**Accumulator shell** \_\_\_\_\_  
0 = plastic coated (internally)  
1 = carbon steel  
2 = chemically nickel-plated (internal coating)  
4 = stainless steel <sup>2)</sup>  
6 = low temperature steel

**Accumulator bladder** <sup>1) 3) 4)</sup> \_\_\_\_\_  
2 = NBR20  
3 = ECO  
4 = IIR (butyl)  
5 = NBR21 (low temperature)  
6 = FKM  
7 = Others  
9 = NBR22

**Certificate code** \_\_\_\_\_  
U = PED 97/23/EC

**Permitted operating pressure (bar)** \_\_\_\_\_

**Connection** \_\_\_\_\_  
Thread, codes for fluid connections: A, C, E, G  
A = thread to ISO 228 (BSP)  
B = thread to DIN 13 or ISO 965/1 (metric)  
C = thread to ANSI B1.1 (UN.-2B seal SAE J 514)  
D = thread to ANSI B1.20.1 (NPT)  
S = special thread, to customer specification  
Flange, codes for fluid connection: F  
A = EN 1092-1 welding neck flange  
B = flange ASME B16.5  
C = SAE flange 3000 psi  
D = SAE flange 6000 psi  
S = special flange, to customer specification

<sup>1)</sup> When ordering a spare bladder, please state diameter of the smaller shell port

<sup>2)</sup> Dependent on type and pressure rating

<sup>3)</sup> Standard materials, all other materials on request

<sup>4)</sup> Elastomer types not available for all bladder sizes.

### 3. LOW PRESSURE ACCUMULATORS

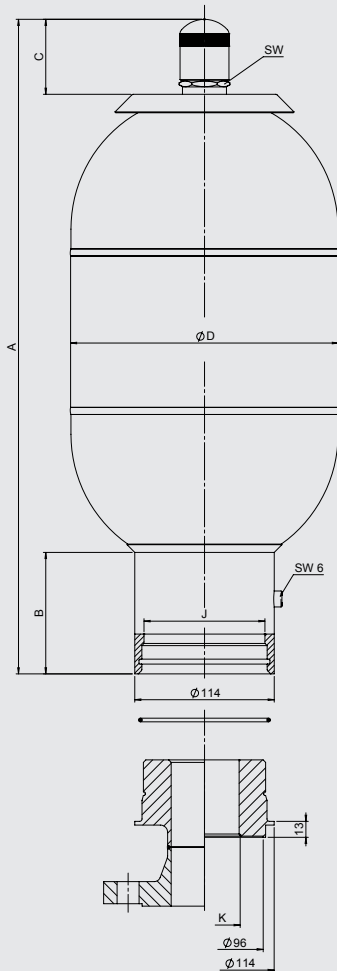
#### 3.1. STANDARD BLADDER ACCUMULATORS SB40-2.5 ... 50

##### 3.1.1 Design

HYDAC standard low pressure accumulators consist of:

- A welded pressure vessel which can be treated with various types of corrosion protection for chemically aggressive fluids, or can be supplied in stainless steel.
- A bladder with gas valve. The bladders are available in the elastomers listed under point 2.1.
- A hydraulic connection with a perforated disc which is held in place with retaining ring.
- In addition, we can offer suitable adapters for connection to the hydraulic system.

##### 3.1.2 Dimensions SB40-2.5 ... 50



##### SB40-2.5 ... 50

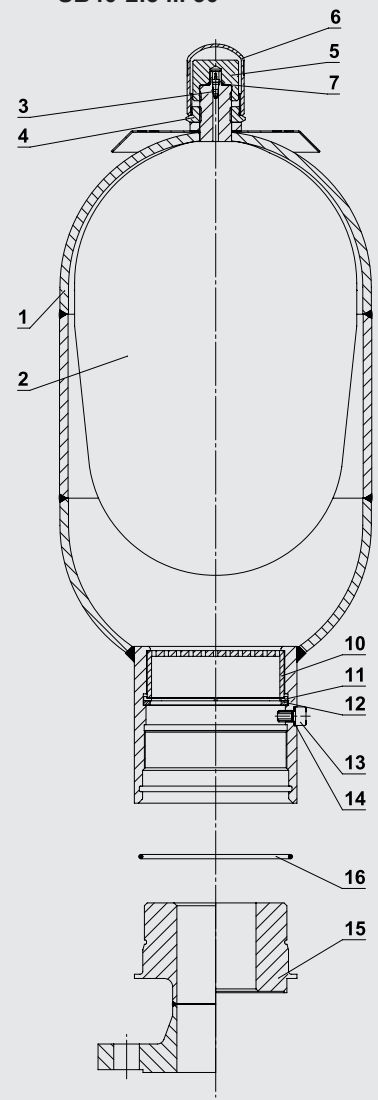
Permitted operating pressure 40 bar (PED 97/23/EC)

Nominal volume [l]	Eff. gas volume [l]	Weight [kg]	A [mm]	B [mm]	C [mm]	Ø D [mm]	J thread ISO DIN 13	K* thread ISO 228	SW [mm]	Q <sup>1)</sup> [l/s]
2.5	2.5	9	541							
5	5	13	891	122		108				
10	8.7	14	533		68		M100x2	G 2	36	7
20	18	23	843			219				
32	33.5	38	1363	106						
50	48.6	52	1875		78					

<sup>1)</sup> Q = max. flow rate of operating fluid (at approx. 0.5 bar pressure drop via adapter)

<sup>2)</sup> Use C-spanner

##### 3.1.3 Spare parts SB40-2.5 ... 50



Description	Item
<b>Bladder assembly<sup>1)</sup></b> consisting of:	
Bladder	2
Gas valve insert*	3
Retaining nut	4
Seal cap	5
Valve protection cap	6
O-ring	7
<b>Seal kit</b> consisting of:	
O-ring	7
Bleed screw	13
Seal ring	14
O-ring	15
<b>Repair kit,<sup>1)</sup></b> consisting of:	
Bladder assembly (see above)	
Seal kit (see above)	
<b>Hydraulic connection assembly</b> consisting of:	
Perforated disc	10
Anti-extrusion ring	11
Retaining ring	12
Bleed screw	13
Seal ring	14
O-ring	15

\* available separately

<sup>1)</sup> When ordering, please state diameter of the smaller shell port).

Item 1 not available as a spare part.

Item 16 available as an accessory, please ask

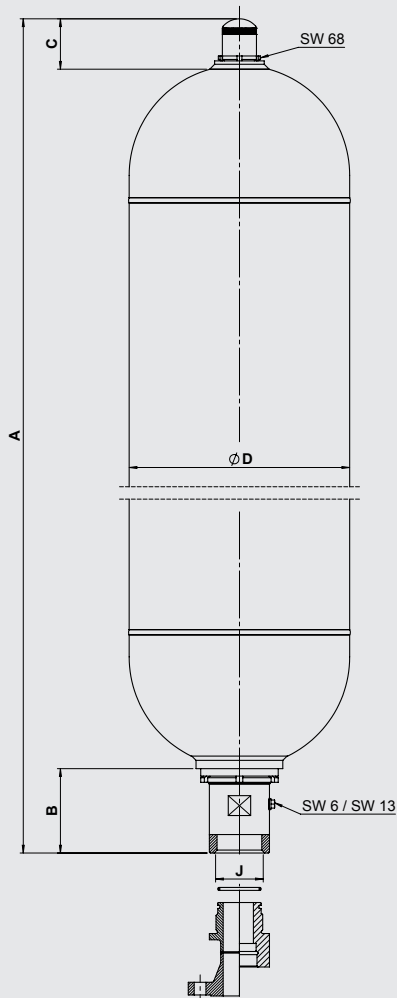
## 3.2. BLADDER ACCUMULATOR SB40-70 ... 220

### 3.2.1 Design

HYDAC low pressure accumulators, type SB40-70 ... 220 consist of:

- A welded pressure vessel which is compact and yet suitable for high flow rates and large volumes. The pressure vessel is manufactured in carbon steel or in stainless steel.
- A bladder with gas valve.
- A hydraulic connection with check valve.

### 3.2.2 Dimensions SB40-70 ... 220



### SB40-70 ... 220

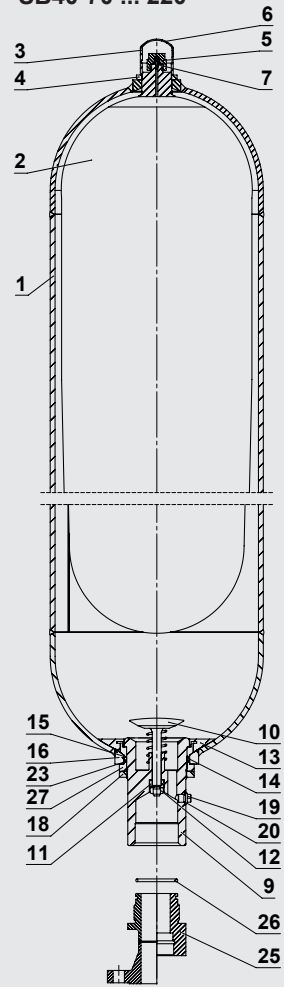
Permitted operating pressure 40 bar (PED 97/23/EC)

Nominal volume [l]	Eff. gas volume [l]	Weight [kg]	A max. [mm]	B [mm]	C [mm]	Ø D [mm]	J Thread ISO 228	SW	Q <sup>1)</sup> [l/s]
70	65	73	898	136	68	356	G 2 1/2	68 <sup>2)</sup>	30
100	111	99	1423						
130	133	130	1675						
190	192	175	1871						
220	221	197	2119			406			

<sup>1)</sup> Q = max. flow rate of operating fluid

<sup>2)</sup> Use C-spanner

### 3.2.3 Spare parts SB40-70 ... 220



Description	Item
<b>Bladder assembly <sup>1)</sup></b> consisting of:	
Bladder	2
Gas valve insert*	3
Retaining nut	4
Seal cap	5
Valve protection cap	6
O-ring	7
<b>Seal kit</b> consisting of:	
O-ring	7
Washer	15
O-ring	16
Bleed screw	19
Support ring	23
O-ring	27
<b>Repair kit, <sup>1)</sup></b> consisting of:	
Seal kit (see above)	
Bladder assembly (see above)	
<b>Anti-extrusion ring</b>	14
<b>Oil valve assembly</b> consisting of:	
Valve assembly (items 9-13)	9
Anti-extrusion ring	14
Washer	15
O-ring	16
Spacer	17
Lock nut	18
Bleed screw	19
Support ring	23

\* available separately

<sup>1)</sup> When ordering, please state diameter of the smaller shell port).

Item 1 not available as a spare part.

Item 20 (seal ring) not required for carbon steel accumulators

### 3.3. LOW PRESSURE ACCUMULATORS SB16/35A AND SB16/35AH

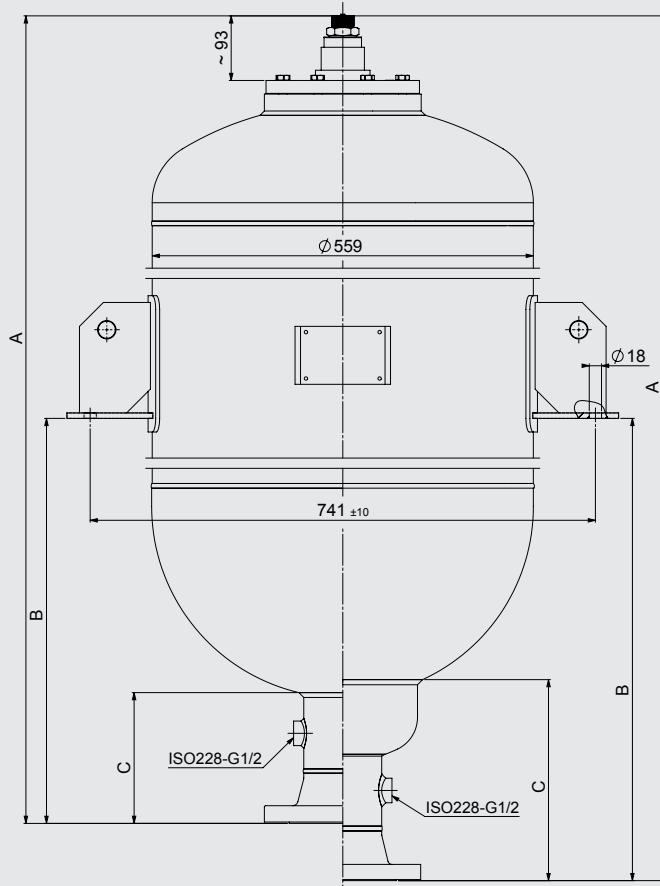
#### 3.3.1 Design

HYDAC low pressure bladder accumulators for large volumes, type SB35A and SB16A are in a weld construction in carbon steel or stainless steel.

The hydraulic outlet is covered by a perforated disc which prevents the flexible bladder extruding from the shell. The bladder is top-repairable.

#### 3.3.2 Dimensions SB16/35A

SB16/35AH



#### SB16/35A

Permitted operating pressure 16/35 [bar] (PED 97/23/EC)

Nominal volume [l]	Eff. gas volume [l]	Weight [kg]		A (approx.) [mm]		B (approx.) [mm]		C (approx.) [mm]		DN*
		SB16A	SB35A	SB16A	SB35A	SB16A	SB35A	SB16A	SB35A	
100	99	84	144	880	890	400	400	185	198	100
150	143	101	161	1070	1080	500	500			
200	187	122	223	1310	1320	685	685			
300	278	155	288	1710	1720	985	985			
375	392	191	326	2230	2240	1250	1250			
450	480	237	386	2325	2635	1465	1465			

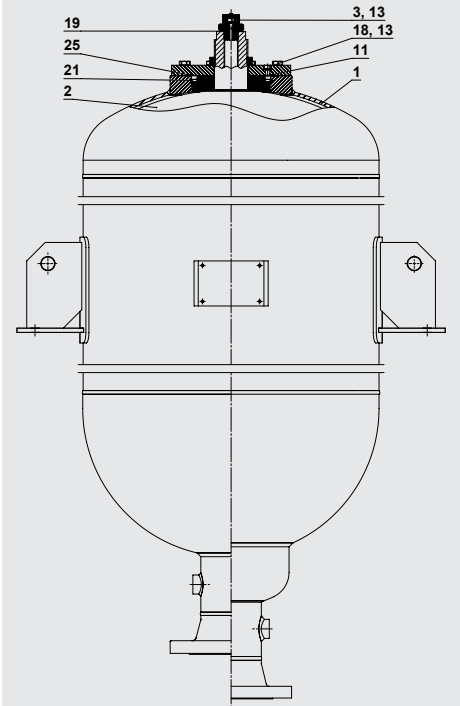
#### SB16/35AH

Permitted operating pressure 16/35 [bar] (PED 97/23/EC)

Nominal volume [l]	Eff. gas volume [l]	Weight [kg]		A (approx.) [mm]		B (approx.) [mm]		C (approx.) [mm]		DN*
		SB16AH	SB35AH	SB16AH	SB35AH	SB16AH	SB35AH	SB16AH	SB35AH	
100	99	93	153	910	920	450	450	245	254	100
150	143	110	170	1120	1130	560	560			
200	187	131	230	1340	1350	760	760			
300	278	164	297	1755	1765	1040	1040			
375	392	200	335	2285	2295	1330	1330			
450	480	246	395	2670	2680	1530	1530			

\* to EN1092-1/11 / PN16 or PN40 others on request

#### 3.3.3 Spare parts SB16/35A, SB16/35AH



Description	Item
Bladder	2
Lock nut	3
O-ring	11
Seal ring	13
Vent screw	18
O-ring	19
Retaining ring	21
O-ring	25

Item 1 not available as a spare part.

### 3.4. HIGH FLOW BLADDER ACCUMULATOR SB35HB

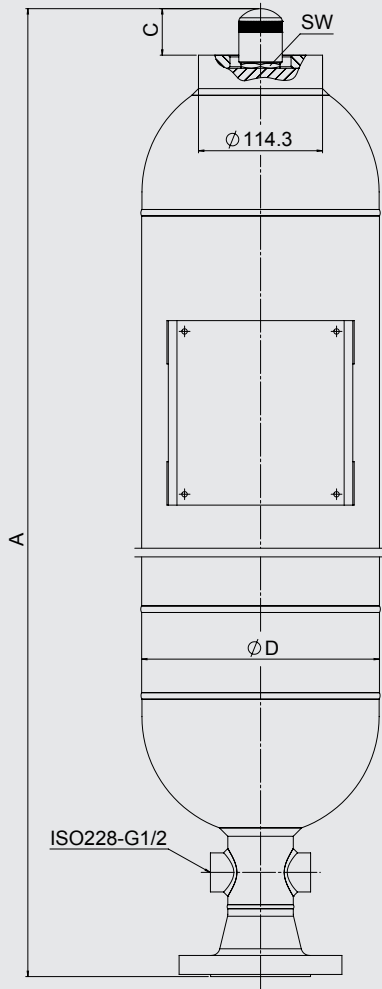
#### 3.4.1 Design

HYDAC high flow bladder accumulators type SB35HB are high performance accumulators for flow rates of up to 20 l/s at 2 bar  $\Delta p$ .

They consist of a pressure vessel in a weld construction and a flexible bladder with gas valve.

The pressure vessel contains a fixed perforated disc, permitting a high flow rate through its large free cross-section. For use with chemically aggressive fluids, the shell can be manufactured in stainless steel. See point 2.1 for bladder materials.

#### 3.4.2 Dimensions SB35HB



#### SB35HB

Permitted operating pressure 35 bar (PED 97/23/EC)

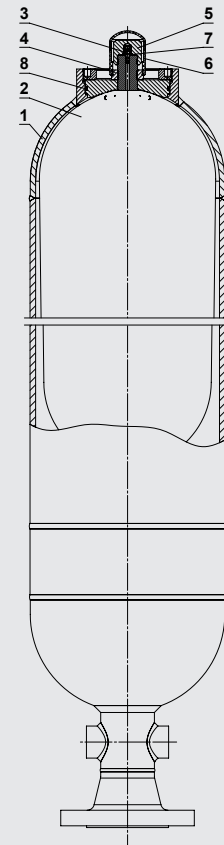
Nominal volume [l]	Eff. gas volume [l]	Weight [kg]	A max. [mm]	C [mm]	Ø D [mm]	SW [mm]	Q <sup>1)</sup> [l/s]	DN*
20	19.8	43	1081	63	219	36	20	50
32	35	56	1591					
50	50	69	2091	78		Ø68 <sup>2)</sup>		

\* to EN 1092-1/11 / PN40, others on request

<sup>1)</sup> Q = max. flow rate of operating fluid

<sup>2)</sup> Lock nut

#### 3.4.3 Spare parts SB35HB



Description	Item
<b>Bladder assembly <sup>1)</sup></b>	
consisting of:	
Bladder	2
Gas valve insert*	3
Retaining nut	4
Seal cap	5
Valve protection cap	6
O-ring	7
<b>Seal kit</b>	
consisting of:	
Gas valve insert*	3
O-ring	7
O-ring	8

#### Repair kit <sup>1)</sup>

consisting of:

Bladder assembly (see above)

Seal kit (see above)

\* available separately

<sup>1)</sup> When ordering, please state diameter of the smaller shell port.

Item 1 not available as a spare part.

### 4. NOTE

The information in this brochure relates to the operating conditions and applications described.

For applications and/or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

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