

## 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 separation element. 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- 150 ... 450	16	150 - 450	15
SB35A- 150 ... 450	35		
SB16AH- 150 ... 450	16		
SB35AH- 150 ... 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 bladder material must be selected in accordance with the particular operating medium or operating temperature, see section 2.1.

If discharge conditions are unfavourable (high  $p_2/p_0$  pressure ratio, rapid discharge speed), the gas may cool to below the permitted temperature.

This can cause cold cracking. 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 hydraulic 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 support clamps or the HYDAC accumulator installation set.

See catalogue sections:

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

## 2. SPECIFICATIONS

### 2.1. EXPLANATIONS, NOTES

#### 2.1.1 Operating pressure

see section 3. for the particular series (may differ from nominal pressure for foreign test certificates)

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

-10 °C ... +80 °C  
standard design, others on request

#### 2.1.3 Nominal volume

see section 3. for the particular series

#### 2.1.4 Effective gas volume

see Section 3. for the particular series, based on nominal dimensions, this differs slightly from the nominal volume and must be used when calculating the effective fluid volume.

#### 2.1.5 Effective volume

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

#### 2.1.6 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 typical conditions and is not applicable in all operating conditions.

#### 2.1.7 Working temperature and operating medium

The permitted working temperature of a bladder accumulator is dependent on the application limits of the metal materials and the bladder. Outside this temperature range, special materials must be used. The operating medium must also be taken into account.

The following table displays a selection of elastomer materials including max. temperature range and a rough overview of resistant and non-resistant fluids. Please contact us for help in selecting a suitable elastomer.

Materials		Material code <sup>1)</sup>	Temperature range	Overview of the fluids <sup>2)</sup>	
				Resistant to	Not resistant to
NBR	Acrylonitrile butadiene rubber	2	-15 °C ... + 80 °C	<ul style="list-style-type: none"> <li>● Mineral oil (HL, HLP)</li> <li>● Flame-retardant fluids from the groups HFA, HFB, HFC</li> <li>● Synthetic esters (HEES)</li> <li>● Water</li> <li>● Sea water</li> </ul>	<ul style="list-style-type: none"> <li>● Aromatic hydrocarbons</li> <li>● Chlorinated hydrocarbons (HFD-S)</li> <li>● Amines and ketones</li> <li>● Operating fluids from the group HFD-R</li> <li>● Fuels</li> </ul>
		5	-50 °C ... + 50 °C		
		9	-30 °C ... + 80 °C		
ECO	Ethylene oxide epichlorohydrin rubber	3	-30 °C ... +120 °C	<ul style="list-style-type: none"> <li>● Mineral oil (HL, HLP)</li> <li>● Flame-resistant fluids from the group HFB</li> <li>● Synthetic esters (HEES)</li> <li>● Water</li> <li>● Sea water</li> </ul>	<ul style="list-style-type: none"> <li>● Aromatic hydrocarbons</li> <li>● Chlorinated hydrocarbons (HFD-S)</li> <li>● Amines and ketones</li> <li>● Operating fluids from the group HFD-R</li> <li>● Flame-resistant fluids from the groups HFA and HFC</li> <li>● Fuels</li> </ul>
IIR	Butyl rubber	4	-50 °C ... +100 °C	<ul style="list-style-type: none"> <li>● Operating fluids from the group HFD-R</li> <li>● Flame-resistant fluids from the group HFC</li> <li>● Water</li> </ul>	<ul style="list-style-type: none"> <li>● Mineral oils and mineral greases</li> <li>● Synthetic esters (HEES)</li> <li>● Aliphatic, chlorinated and aromatic hydrocarbons</li> <li>● Fuels</li> </ul>
FKM	Fluorine rubber	6	-10 °C ... +150 °C	<ul style="list-style-type: none"> <li>● Mineral oil (HL, HLP)</li> <li>● Hydraulic fluids from the group HFD</li> <li>● Synthetic esters (HEES)</li> <li>● Fuels</li> <li>● Aromatic hydrocarbons</li> <li>● Inorganic acids</li> </ul>	<ul style="list-style-type: none"> <li>● Amines and ketones</li> <li>● Ammonia</li> <li>● Skydrol and HyJet IV</li> <li>● Steam</li> </ul>

<sup>1)</sup> see section 2.2. Model code, material code, accumulator bladder

<sup>2)</sup> others on request

### 2.1.8 Gas charging

Hydraulic accumulators must only be charged with nitrogen.

Never use other gases.

#### Risk of explosion!

In principle, only use nitrogen of at least Class 4.0 (filtration < 3 µm).

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

### 2.1.9 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
Australia	F <sup>1)</sup>
Belarus	A6
Canada	S1 <sup>1)</sup>
China	A9
Hong Kong	A9
Iceland	U
Japan	P
Korea (Republic)	A11
New Zealand	T
Norway	U
Russia	A6
South Africa	S2
Switzerland	U
Turkey	U
Ukraine	A10
USA	S

<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.

#### The operating instruction must be observed!

#### No. 3.201.BA

#### Notice:

Application examples, accumulator dimensioning 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.

SB16 A - 150 F 7 / 112 U - 40 A

#### Series

#### Type code

no details = standard

H = high flow

N = flow-optimised oil valve

A = shock absorber

B = bladder top-removable

DA = bladder integrity system, industry model (others on request)

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 = external 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 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 = NBR <sup>5)</sup>

3 = ECO

4 = IIR

5 = NBR <sup>5)</sup>

6 = FKM

7 = other

9 = NBR <sup>5)</sup>

#### Certification code

U = European Pressure Equipment Directive (PED)

#### Permitted operating pressure [bar]

#### Connection

Thread, codes for fluid connections: A, C, E, G

A = thread to ISO 228 (BSP)

B = thread to DIN13 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

#### Required gas pre-charge pressure must be stated separately!

<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.

<sup>5)</sup> observe temperature ranges, see section 2.1.

### 3. LOW PRESSURE ACCUMULATOR TYPES

#### 3.1. STANDARD BLADDER ACCUMULATORS

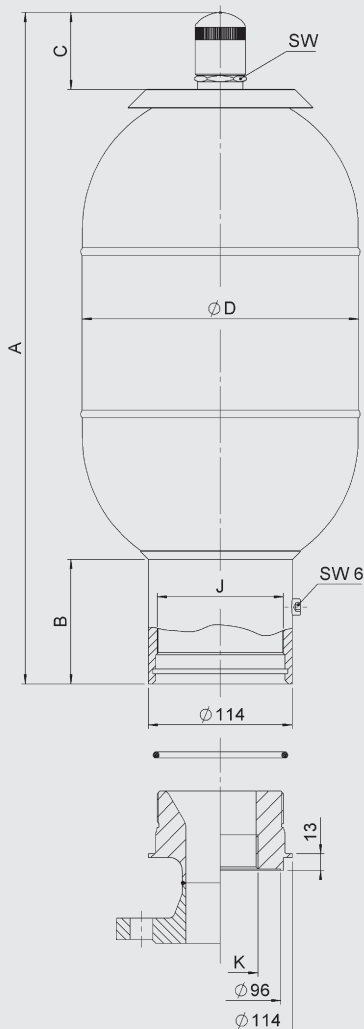
##### SB40-2.5 ... 50

##### 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 section 2.1.
- a hydraulic connection with a perforated disc which is held in place with a 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

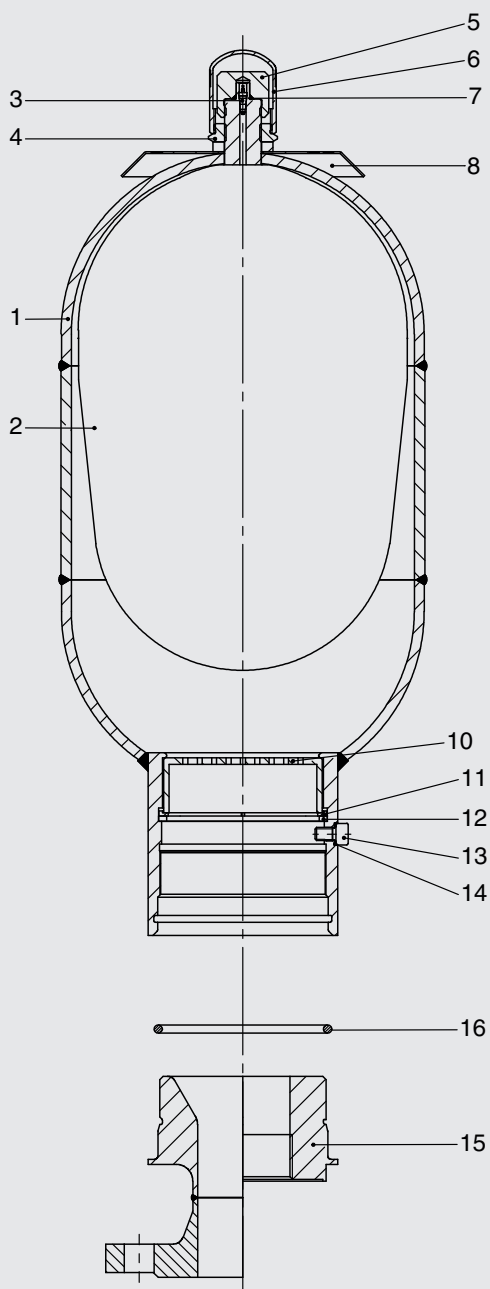
Permitted operating pressure 40 bar (PED)

Nominal volume [l]	Eff. gas volume [l]	Part no.		A [mm]	W [mm]	C [mm]	Ø D [mm]	J Thread ISO DIN 13	K Thread ISO 228	SW [mm]	Q <sup>1)</sup> [l/s]	Weight [kg]
		Carbon steel	Stainless steel									
2.5	2.5	3114684	3130528	541	122	68	108	M100x2	G 2	36	7	9
5	5	3113791	3118722	891								13
10	9.3	3111110	3125662	533	106	78	219	M100x2	G 2	36	7	14
20	18	3125719	3130529	843								23
32	33.5	3130487	3130530	1363								38
50	48.6	3119445	3130531	1875								52

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

<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
Protective cap	6
O-ring	7
<b>Seal kit</b>	
consisting of:	
O-ring	7
Vent screw	13
Seal ring	14
O-ring	16
<b>Repair kit <sup>1)</sup></b>	
consisting of:	
Bladder assembly (see above)	
Seal kit (see above)	
<b>Hydraulic connection assembly</b>	
consisting of:	
Hydraulic connector	10
Anti-extrusion ring	11
Retaining ring	12
Vent screw	13
Seal ring	14

\* available separately

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

Accumulator shell (item 1) and company label (item 8) not available as a spare part

Adapter (item 15) incl. O-ring (item 16) available as an accessory, please ask

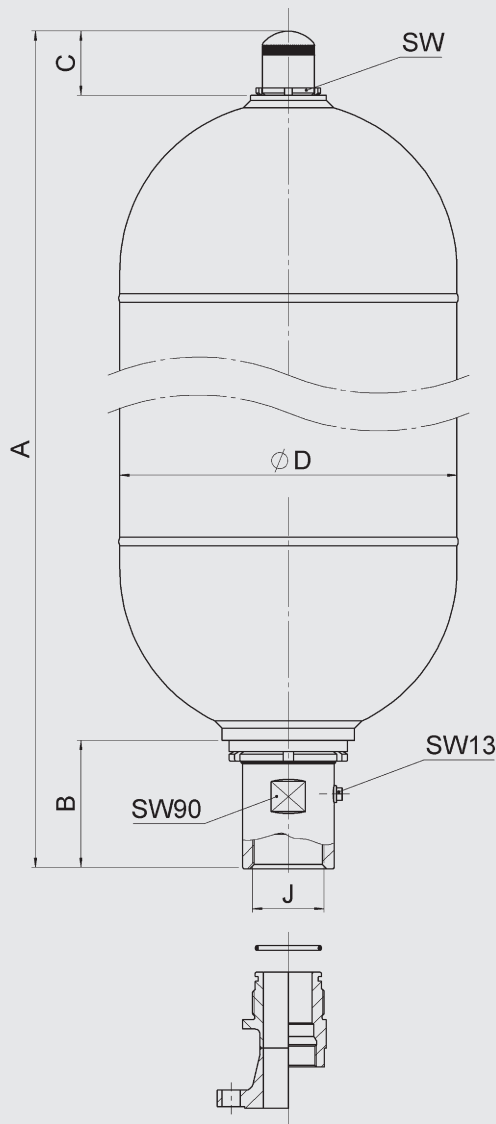
## 3.2. BLADDER ACCUMULATOR SB40-70 ... 220

### 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

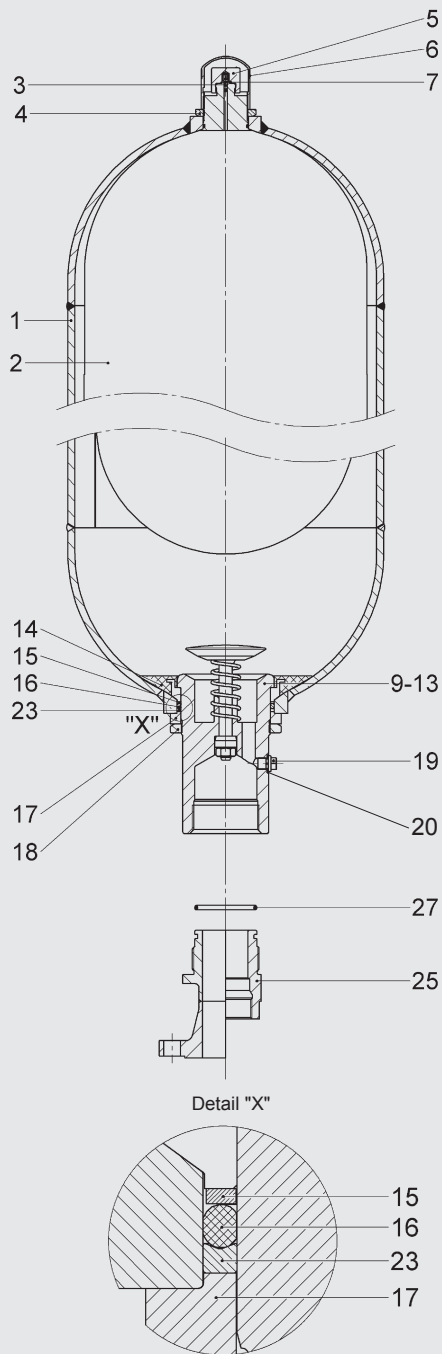
Permitted operating pressure 40 bar (PED)

Nominal volume [l]	Eff. gas volume [l]	Part no.		A max. [mm]	W [mm]	C [mm]	Ø D [mm]	J Thread ISO 228	SW [mm]	Q <sup>1)</sup> [l/s]	Weight [kg]
		Carbon steel	Stainless steel								
70	65	2127513	2127533	1128	136	69	356	G 2 1/2	68 <sup>2)</sup>	30	73
100	111	2127514	2127534	1655							99
130	133	2127515	2127535	1905							130
190	192	3182579	3182581	2101			175				
220	221	3182582	3182583	2348			197				

<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
Protective cap	6
O-ring	7
<b>Seal kit</b>	
consisting of:	
O-ring	7
Washer	15
O-ring	16
Vent screw	19
Support ring	23
O-ring	27
<b>Repair kit<sup>1)</sup></b>	
consisting of:	
Bladder assembly (see above)	
Seal kit (see above)	
<b>Oil valve assembly</b>	
consisting of:	
Valve	9-13
Anti-extrusion ring*	14
Washer	15
O-ring	16
Spacer	17
Lock nut	18
Vent screw	19
Support ring	23

\* available separately

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

Accumulator shell (item 1) not available as a spare part

Vent screw (item 19) for NBR/carbon steel:

seal ring (item 20) included

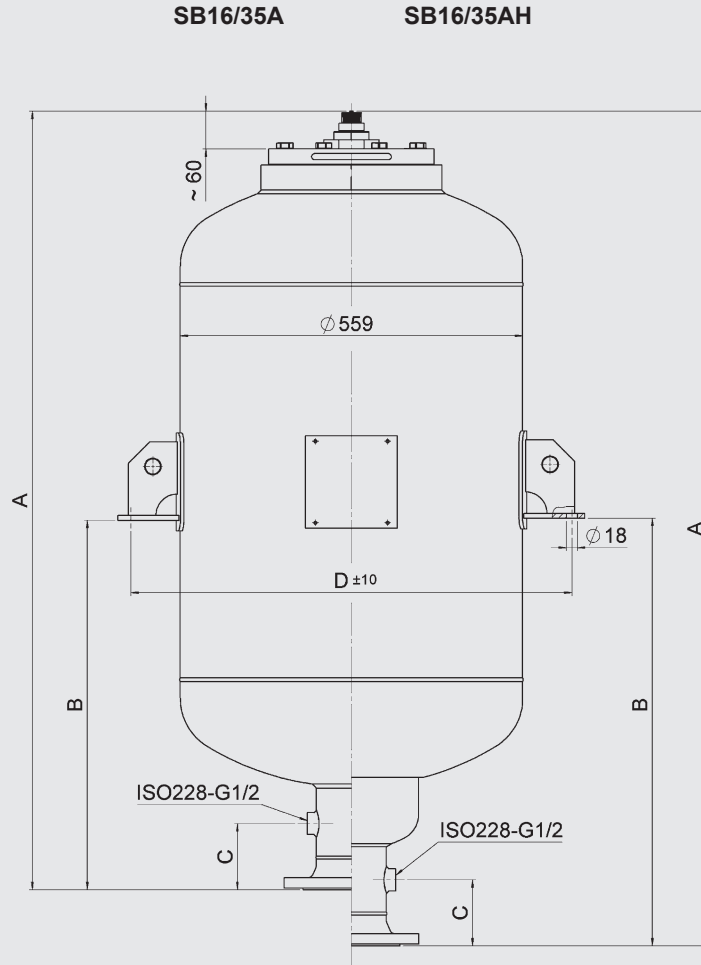
Adapter (item 25) incl. O-ring (item 27) available as an accessory, please ask

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

#### 3.3.1 Design

HYDAC low pressure bladder accumulators for large volumes have a welded design. The pressure vessel is fabricated in carbon steel or in stainless steel. The hydraulic outlet is covered by a perforated disc which prevents the flexible bladder from extruding from the shell. The bladder is top-removable.

#### 3.3.2 Dimensions



#### SB16/35A

Perm. operating pressure 16/35 bar (PED)

Nominal volume [l]	Eff. gas volume [l]	SB16A							SB35A						
		Part no.		A (approx.) [mm]	B (approx.) [mm]	C (approx.) [mm]	D ±10 [mm]	Weight [kg]	Part no.		A (approx.) [mm]	B (approx.) [mm]	C (approx.) [mm]	D ±10 [mm]	Weight [kg]
		Carbon steel	Stainless steel						Carbon steel	Stainless steel					
150	149	4108288	4108241	1044	493	108	720	127	4108339	4108306	1076	578	121	728	171
200	203	4108290	4093557	1275	691			149	4108341	4108307	1318	699			208
300	288	4108291	4108242	1644	920			178	4108342	4108308	1701	937			261
375	374	4108292	4108243	2020	1063			214	4108355	4108312	2086	1083			315
450	453	4108294	4108244	2361	1234			244	4108357	4108314	2436	1258			364

Flange to EN1092-1/11 / DN100 / PN16 or PN40  
others on request

#### SB16/35AH

Perm. operating pressure 16/35 bar (PED)

Nominal volume [l]	Eff. gas volume [l]	SB16AH							SB35AH						
		Part no.		A (approx.) [mm]	B (approx.) [mm]	C (approx.) [mm]	D ±10 [mm]	Weight [kg]	Part no.		A (approx.) [mm]	B (approx.) [mm]	C (approx.) [mm]	D ±10 [mm]	Weight [kg]
		Carbon steel	Stainless steel						Carbon steel	Stainless steel					
150	149	4108720	4108702	1135	638	108	720	135	4108773	4108729	1166	641	121	728	180
200	203	4108721	4108703	1366	754			157	4108775	4108730	1408	762			217
300	288	4108724	4108715	1735	988			186	4108774	4108734	1791	1000			270
375	374	4108725	4108717	2111	1127			222	4108776	4108758	2176	1146			324
450	453	4108726	4108718	2452	1298			252	4108778	4108762	2526	1321			373

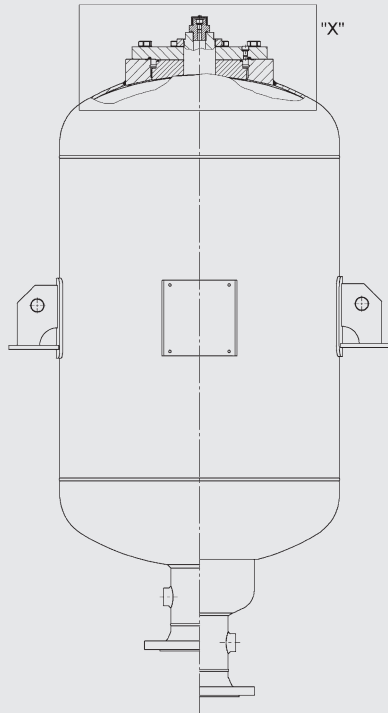
Flange to EN1092-1/11 / DN100 / PN16 or PN40  
others on request



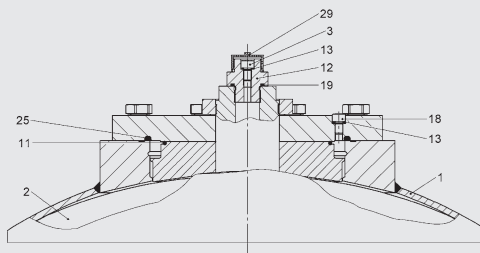
### 3.3.3 Spare parts SB16/35A, SB16/35AH

The following spare parts relate exclusively to hydraulic accumulators from construction year 2016 and later.

For low-pressure bladder accumulators SB16/35A and SB16/35AH up to construction year <2015 spare parts are available on request.



Detail "X"



Description	Item
<b>Bladder</b>	<b>2</b>

#### Gas valve assembly consisting of:

Screw plug	3
Gas valve body	12
Seal ring	13
O-ring	19
Protective cap	29

#### Seal kit consisting of:

O-ring	11
Seal ring	13
Vent screw	18
O-ring	19
O-ring	25

Accumulator shell (item 1) not available as a spare part

#### NBR

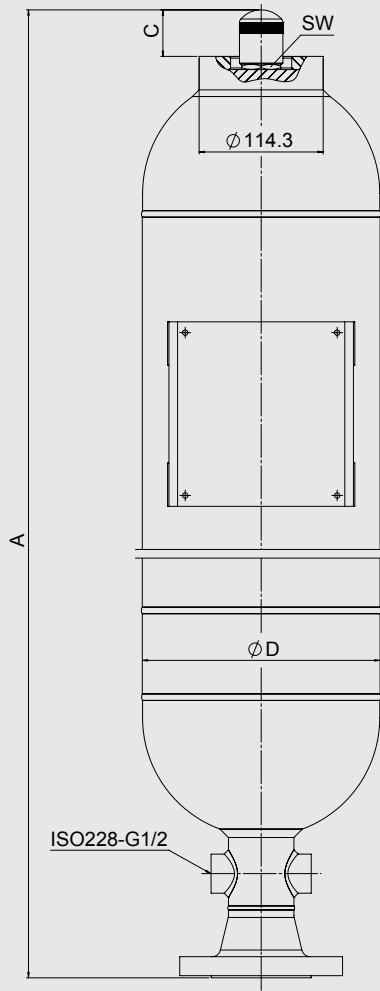
Nominal volume	Bladder	Seal kit	
		Carbon steel	Stainless steel
[l]			
150	4241264		
200	4241263		
300	4113771	4241465	4197141
375	4113731		
450	4241435		

### 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 with a welded 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 section 2.1 for bladder materials.

#### 3.4.2 Dimensions SB35HB



#### SB35HB

Perm. operating pressure 35 bar (PED)

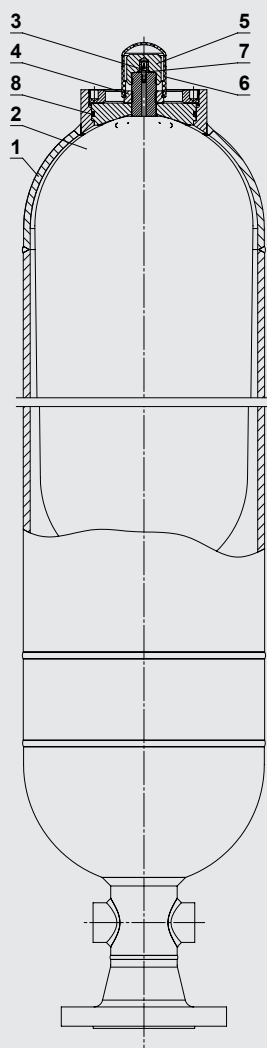
Nominal volume [l]	Eff. gas volume [l]	Part no.		A max. [mm]	C [mm]	Ø D [mm]	SW [mm]	Q <sup>1)</sup> [l/s]	DN*	Weight [kg]
		Carbon steel	Stainless steel							
20	19.8	3130682	3130683	1081	63	219	36	20	50	43
32	35	3130684	3130685	1591						56
50	50	3130686	3130687	2091	78		Ø 68 <sup>2)</sup>			69

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

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

<sup>2)</sup> retaining 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
Protective cap	6
O-ring	7
<b>Seal kit</b>	
consisting of:	
Gas valve insert*	3
O-ring	7
O-ring	8
<b>Repair kit <sup>1)</sup></b>	
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

Accumulator shell (item 1) not available as a spare part

## 4. NOTE

The information in this brochure relates to the operating conditions and fields of application described.

For fields of application and operating conditions not described, please contact the relevant technical department. Subject to technical modifications.

### HYDAC Technology GmbH

Industriegebiet

66280 Sulzbach/Saar, Germany

Tel.: +49 (0) 68 97 / 509 - 01

Fax: +49 (0) 68 97 / 509 - 464

Internet: www.hydac.com

E-mail: speichertechnik@hydac.com

