



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-tight 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 a perforated disc or check valve.

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

Designation	Perm. pressure [bar] ²⁾	Volume [l]	Q ¹⁾ [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

¹⁾ Q = max. flow rate of pressure fluid

²⁾ 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 fluid valve must be at the bottom. For 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 mounting clamps or the HYDAC accumulator mounting set.

See catalogue sections:

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

¹⁾ See section 2.2. Model code, material code, accumulator bladder

²⁾ 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:

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

$$p_2 = \text{max. operating pressure}$$

$$p_0 = \text{pre-charge pressure}$$

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

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

$$\text{Type SB16/35A/AH: } p_{0 \text{ max}} = 10 \text{ bar}$$

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

* in model with perforated disc

The specified values are maximum values and must not be considered as referring to a permanent load. The tolerable pressure ratio is influenced by the geometry, temperature, fluid and flow rate as well as any gas losses due to physical properties.

2.1.10 Certificate codes

Country	Certificate code (CC)
EU member states	U
Australia	F ¹⁾
China	A9
Hong Kong	A9
Iceland	U
Canada	S1 ¹⁾
New Zealand	T
Norway	U
Russia	A6
Switzerland	U
South Africa	S2
Turkey	U
Ukraine	A10
USA	S
Belarus	A6

¹⁾ Registration required in the individual territories or provinces.

Others on request

2.1.11 Notice

All work on HYDAC bladder accumulators must only be carried out by suitably trained staff.

Incorrect installation or handling can lead to serious accidents.

The operating instructions must be observed!

No. 3.201.BA

Assembly and repair instructions are available for work which may be carried out on the bladder accumulator after installation and commissioning, e.g. repair work.

No. 3.201.M

Further information such as accumulator sizing, safety information and extracts from the acceptance specifications can be found in the following catalogue section:

- HYDAC Accumulator Technology No. 3.000

Relevant PDF documents can be accessed at:

www.hydac.com » Downloads » Documents » Accumulator Division

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-repairable

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

Combinations must be agreed with HYDAC

Nominal volume [l]

Fluid port

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 design

2 = back-up version

3 = gas valve 7/8-14UNF with M8 internal 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 (MC)

dependent on operating medium

standard design = 112/342 for mineral oils

others on request

Fluid port

1 = carbon steel

2 = high tensile steel

3 = stainless steel²⁾

6 = low temperature steel

Accumulator shell

0 = plastic coated (internally)

1 = carbon steel

2 = chemically nickel-plated (internal coating)

4 = stainless steel²⁾

6 = low temperature steel

Accumulator bladder^{1) 3) 4)}

2 = NBR⁵⁾

3 = ECO

4 = IIR

5 = NBR⁵⁾

6 = FKM

7 = other

9 = NBR⁵⁾

Certification code

U = European Pressure Equipment Directive (PED)

Permitted operating pressure [bar]

Connection

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

A = thread to ISO228 (BSP)

B = thread to DIN13 or ISO965/1 (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 port: 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!

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

²⁾ Dependent on type and pressure rating

³⁾ Standard materials, all other materials on request

⁴⁾ Elastomer types not available for all bladder sizes.

⁵⁾ Observe temperature ranges, see section 2.1.

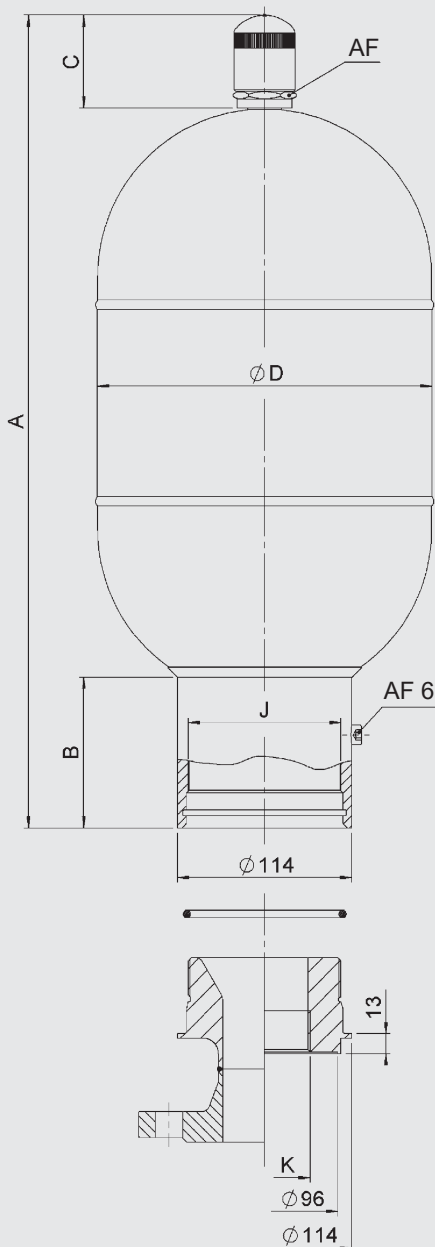
3. LOW PRESSURE ACCUMULATOR TYPES

3.1. SB40-2.5 ... 50

3.1.1 Design

HYDAC low pressure accumulators in the series SB40-2.5 ... 50 consist of a welded pressure vessel, an accumulator bladder with gas valve and a hydraulic connection with a perforated disc (check valve on request). In addition, we can offer suitable adapters for connection to the hydraulic system.

3.1.2 Dimensions SB40-2.5 ... 50



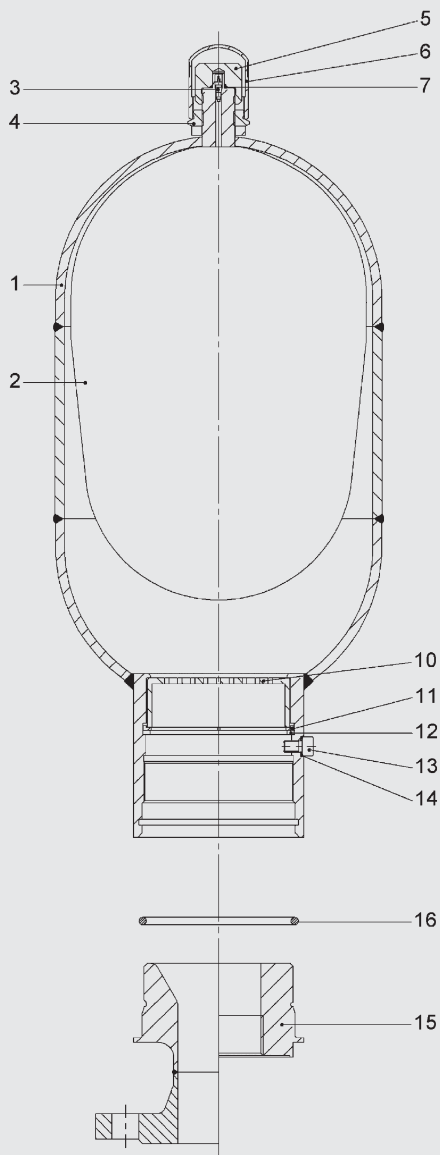
Standard versions: permitted operating pressure 40 bar (PED)

Nominal volume [l]	Eff. gas volume [l]	Part no.		A [mm]	B [mm]	C [mm]	Ø D [mm]	J thread ISO DIN 13	K thread ISO 228	AF [mm]	Q ¹⁾ [l/s]	Weight [kg]
		Carbon steel, NBR	Stainless steel, NBR									
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						68 ²⁾		52

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

²⁾ Use C-spanner

3.1.3 Spare parts
SB40-2.5 ... 50



Description	Item
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Bladder assembly ¹⁾

consisting of:

Bladder	2
Gas valve insert*	3
Lock nut	4
Seal cap	5
Protective cap	6
O-ring	7

Seal kit

consisting of:

O-ring	7
Vent screw	13
Seal ring	14
O-ring	16

Repair kit ¹⁾

consisting of:

Bladder assembly (see above)	
Seal kit (see above)	

Hydraulic connection assembly

consisting of:

Hydraulic connector	10
Anti-extrusion ring	11
Retaining ring	12
Vent screw	13
Seal ring	14

* Available separately

¹⁾ When ordering, please state diameter of the smaller shell port

Accumulator shell (item 1) not available as a spare part
Adapter (item 15) incl. O-ring (item 16) available as an accessory, please ask

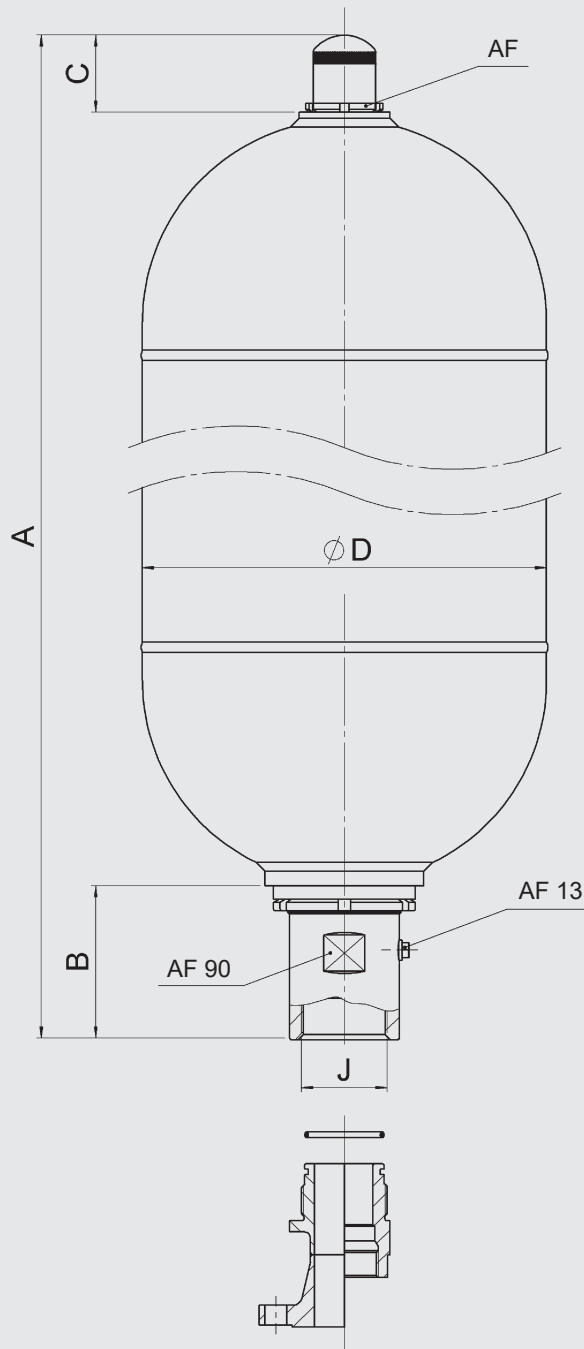
3.2. SB40-70 ... 220

3.2.1 Design

HYDAC low pressure accumulators in the series SB40-70 ... 220 consist of a welded pressure vessel, an accumulator bladder with gas valve and a hydraulic connection with a check valve.

In addition, we can offer suitable adapters for connection to the hydraulic system.

3.2.2 Dimensions SB40-70 ... 220



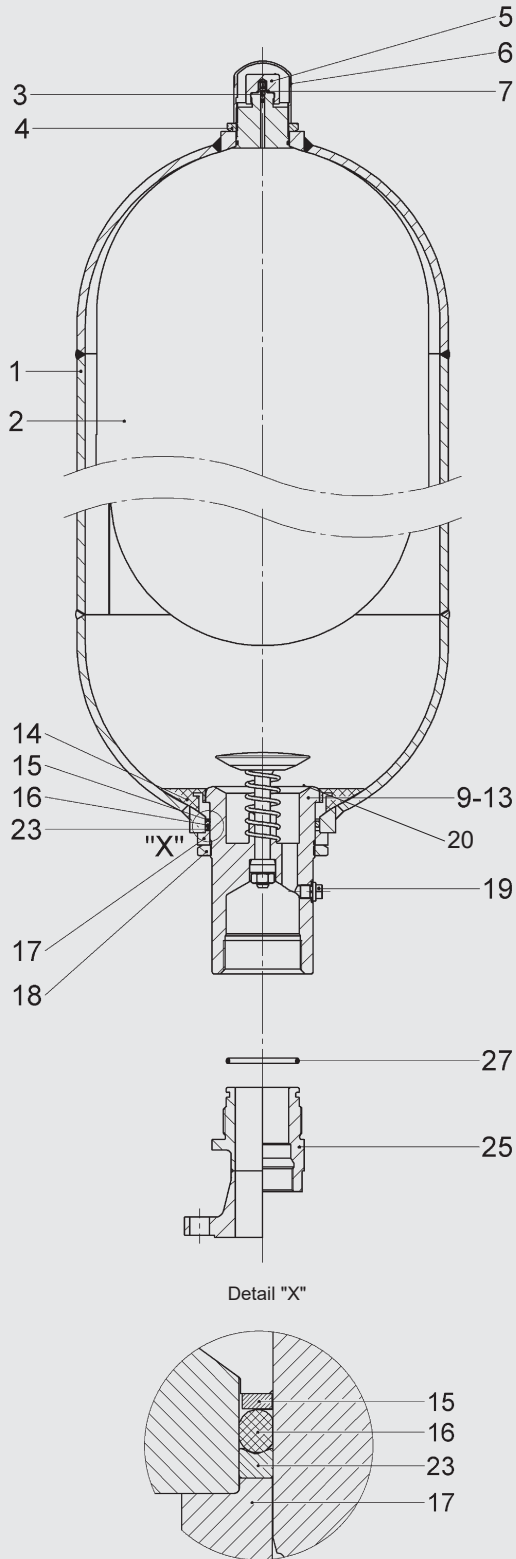
Standard versions: permitted operating pressure 40 bar (PED)

Nominal volume [l]	Eff. gas volume [l]	Part no.		A max. [mm]	B [mm]	C [mm]	Ø D [mm]	J thread ISO 228	AF [mm]	Q ¹⁾ [l/s]	Weight [kg]
		Carbon steel, NBR	Stainless steel, NBR								
70	65	2127513	2127533	1128	136	69	356	G 2 1/2	68 ²⁾	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				

¹⁾ Q = max. flow rate of operating fluid

²⁾ Use C-spanner

3.2.3 Spare parts
SB40-70 ... 220



Description	Item
Bladder assembly¹⁾	
consisting of:	
Bladder	2
Gas valve insert*	3
Lock nut	4
Seal cap	5
Protective cap	6
O-ring	7
Seal kit	
consisting of:	
O-ring	7
Washer	15
O-ring	16
Vent screw	19
Support ring	23
O-ring	27
Repair kit¹⁾	
consisting of:	
Bladder assembly (see above)	
Seal kit (see above)	
Oil valve assembly	
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

¹⁾ 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

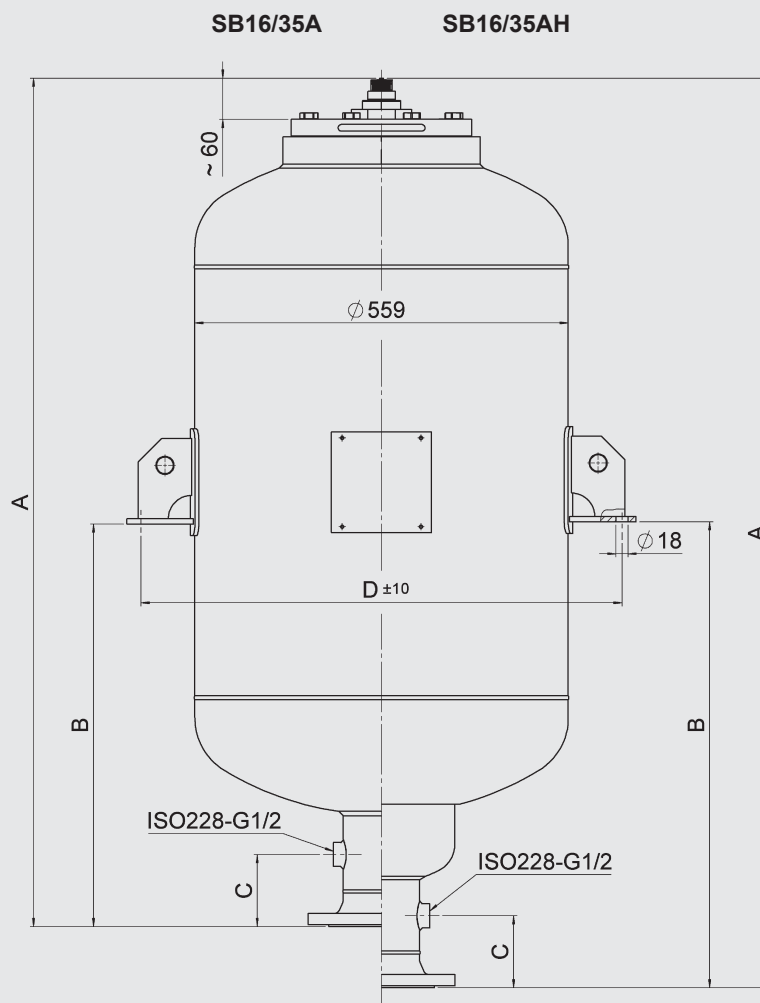
Adapter (item 25) incl. O-ring (item 27) available as an accessory, please ask

3.3. 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



Standard versions: permitted operating pressure 16/35 bar (PED)

SB16/35A

Nominal volume	Eff. gas volume	SB16A							SB35A						
		Part no.		A (approx.)	B (approx.)	C (approx.)	D ±10	Weight	Part no.		A (approx.)	B (approx.)	C (approx.)	D ±10	Weight
[l]	[l]	Carbon steel, NBR	Stainless steel, NBR	[mm]	[mm]	[mm]	[mm]	[kg]	Carbon steel, NBR	Stainless steel, NBR	[mm]	[mm]	[mm]	[mm]	[kg]
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

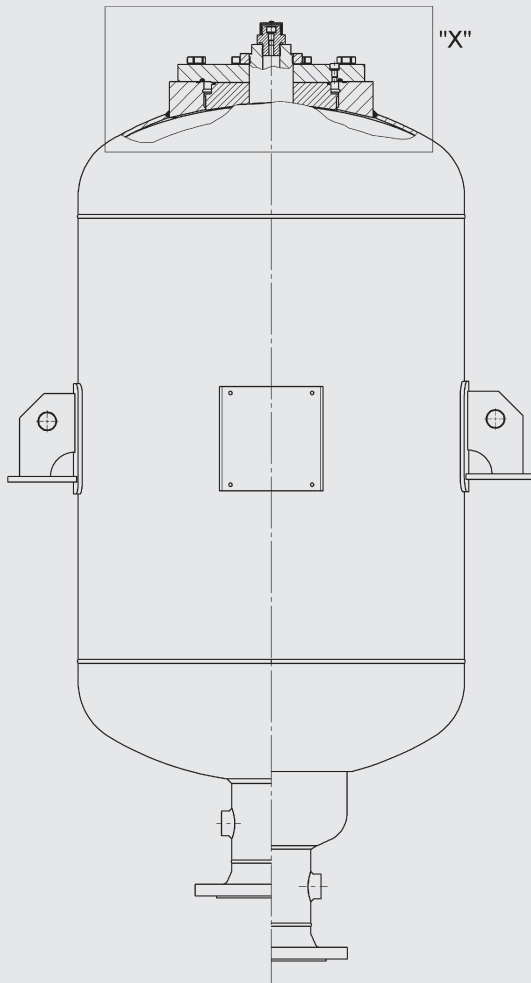
Nominal volume	Eff. gas volume	SB16AH							SB35AH						
		Part no.		A (approx.)	B (approx.)	C (approx.)	D ±10	Weight	Part no.		A (approx.)	B (approx.)	C (approx.)	D ±10	Weight
[l]	[l]	Carbon steel, NBR	Stainless steel, NBR	[mm]	[mm]	[mm]	[mm]	[kg]	Carbon steel, NBR	Stainless steel, NBR	[mm]	[mm]	[mm]	[mm]	[kg]
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

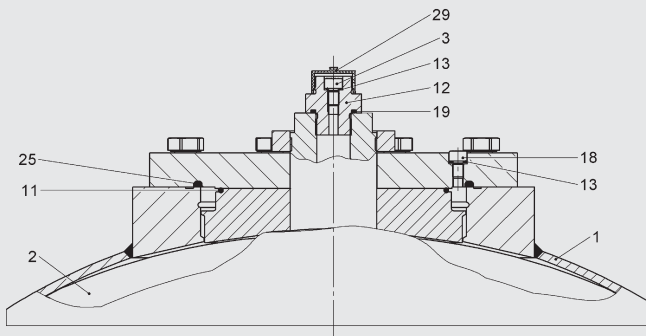
3.3.3 Spare parts SB16/35A, SB16/35AH

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

For low-pressure bladder accumulators SB16/35A and SB16/35AH with construction year < 2016, spare parts are available on request.



Detail "X"



Description	Item
Bladder	2
Gas valve assembly	
consisting of:	
Locking screw	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

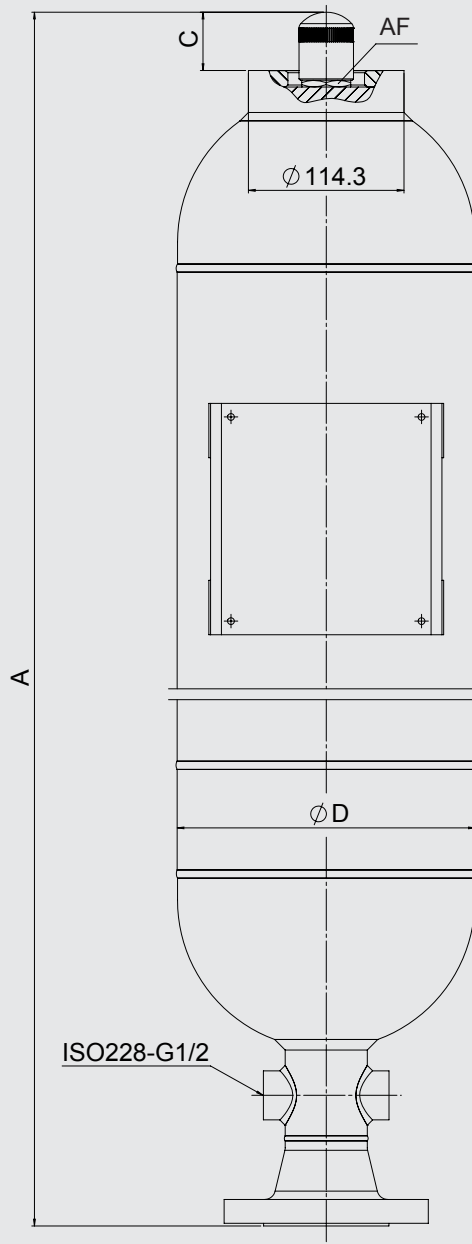
Nominal volume	Bladder	Seal kit	
		Carbon steel, NBR	Stainless steel, NBR
[l]			
150	4241264		
200	4241263		
300	4113771	4241465	4197141
375	4113731		
450	4241435		

3.4. SB35HB

3.4.1 Design

HYDAC high flow bladder accumulators in the series SB35HB are high performance accumulators for flow rates of up to 20 l/s at 2 bar Δp . They consist of a welded pressure vessel and an accumulator bladder with gas valve. The pressure vessel contains a fixed perforated disc which permits a high flow rate through its large free cross section. In addition, we can offer suitable adapters for connection to the hydraulic system.

3.4.2 Dimensions SB35HB



Standard versions: permitted operating pressure 35 bar (PED)

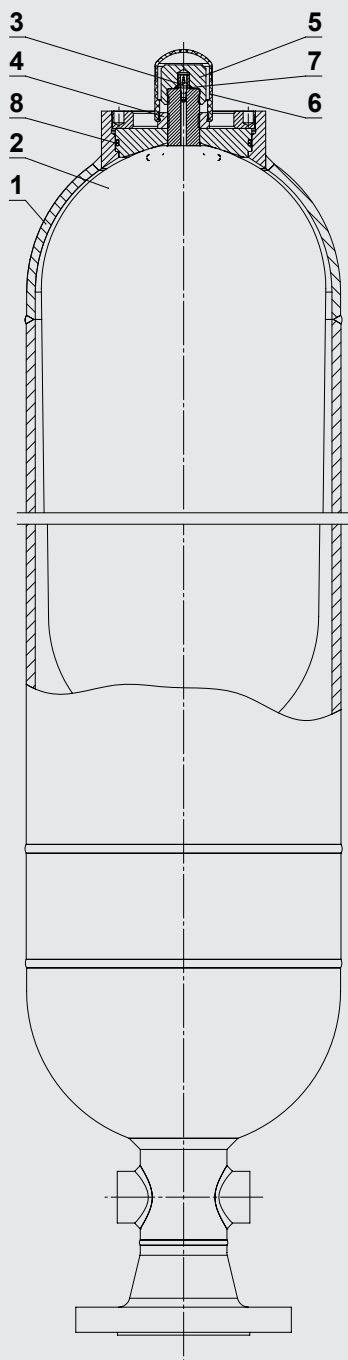
Nominal volume [l]	Eff. gas volume [l]	Part no.		A max. [mm]	C [mm]	Ø D [mm]	AF [mm]	Q ¹⁾ [l/s]	DN*	Weight [kg]
		Carbon steel, NBR	Stainless steel, NBR							
20	19.8	3130682	3130683	1081	63	219	36	20	50	43
32	35	3130684	3130685	1591			56			
50	50	3130686	3130687	2091	78	Ø 68 ²⁾				69

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

¹⁾ Q = max. flow rate of operating fluid

²⁾ Groove nut

3.4.3 Spare parts SB35HB



Description	Item
Bladder assembly ¹⁾	
consisting of:	
Bladder	2
Gas valve insert*	3
Lock nut	4
Seal cap	5
Protective cap	6
O-ring	7
Seal kit	
consisting of:	
Gas valve insert*	3
O-ring	7
O-ring	8
Repair kit ¹⁾	
consisting of:	
Bladder assembly (see above)	
Seal kit (see above)	

* Available separately

¹⁾ 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 applications and/or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

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