# **(HYDAC)** INTERNATIONAL



# Bladder accumulators Low pressure

**1. DESCRIPTION** 

### 1.1. FUNCTION

While fluids are practically incompressible, this does not apply to gases. Hydraulic accumulators use these basic laws of physics to store hydraulic energy. Nitrogen is normally used as the compressible medium.

The various types of hydraulic accumulator are categorised on the basis of the separation element that keeps the gas section separate from the fluid section in the pressure vessel. In the case of a bladder accumulator, the separation element is a closed elastomer bladder.

The fluid side of the bladder accumulator is connected to the hydraulic circuit so that the bladder accumulator draws in fluid when the system pressure increases and the trapped gas is compressed. When the system pressure drops, the compressed gas expands and forces the stored fluid back out into the hydraulic circuit.

HYDAC bladder accumulators are available in various designs, see catalogue sections:

 Bladder accumulators Standard design No. 3.201



 Bladder Accumulators High pressure No. 3.203



Bladder accumulators can also be used as dampers, for example – see catalogue section: Hydraulic dampers

#### No. 3.701



HYDAC 21

EN 3.202.8/05.24



## 1.2. DESIGN

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

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

#### SB35HB

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

#### SB40-70 ... 220 litres

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.

#### SB16/35A AND SB16/35AH

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.

### 2. GENERAL INFORMATION

### 2.1. MATERIALS, CORROSION PROTECTION

#### 2.1.1 Accumulator shell

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.

#### 2.1.2 Bladder

The bladder material must be selected in accordance with the particular operating medium or operating temperature, see section 2.1.3. If discharge conditions are unfavourable (high p<sub>2</sub>/p<sub>0</sub> 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**.

#### 2.1.3 Maximum temperature range of elastomer materials

The permitted working temperature of a bladder accumulator is dependent on the applications limits of the metal materials and the bladder. The operating medium must also be taken into account. The following table shows the main **elastomer materials with their maximum possible temperature ranges** with examples of operating fluids.

Materials	Material	Max. possible	Possible operating fluids, others on request					
	code 1)	temperature range 2)	Resistant to	Not resistant to				
NBR Acrylonitrile butadiene rubber	2	-15 °C + 80 °C	– Mineral oil (HL, HLP) – Flame-retardant fluids from the	– Aromatic hydrocarbons – Chlorinated hydrocarbons				
	5	-50 °C + 50 °C	Synthetic esters (HEES) – Water	(HFD-S) – Amines and ketones – Hydraulic fluids from the group HFD-R – Fuels				
	9	-30 °C + 80 °C						
ECO Ethylene oxide epichlorohydrin rubber	3	-30 °C +120 °C	– Mineral oil (HL, HLP) – Flame-retardant fluids from the HFB group – Synthetic esters (HEES) – Water – Sea water	<ul> <li>Aromatic hydrocarbons – Chlorinated hydrocarbons</li> <li>(HFD-S) – Amines and ketones – Hydraulic fluids from the group</li> <li>HFD-R – Flame-retardant fluids</li> <li>from the groups HFA and HFC – Fuels</li> </ul>				
IIR Butyl rubber	4	-50 °C +100 °C	– Hydraulic fluids from the group HFD-R – Flame-retardant fluids from the group HFC – Water	<ul> <li>Mineral oils and 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	– Mineral oil (HL, HLP) – Hydraulic fluids from the group HFD – Synthetic esters (HEES) – Fuels – Aromatic hydrocarbons – Inorganic acids	– Amines and ketones – Ammonia – Skydrol and HyJet IV – Steam				

1) The material code (MC) is described in more detail in the model code, see section 3.

2) The specified temperature range relates to the particular elastomer material, not to the operating range of the hydraulic accumulator, see section 4.1.1

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# 2.2. 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. 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.

### 2.3. TYPE OF INSTALLATION

For strong vibrations and volumes above 1 litre, we recommend HYDAC mounting elements – see catalogue section:

- Mounting elements for hydraulic accumulators No. 3.502
- ACCUSET SB
- No. 3.503

# 2.4. CHARGING GAS

- Charging gas: Nitrogen
- Specification: min. Class 2.8

If other gases are to be used or if these specifications are deviated from, please contact HYDAC.

# 2.5. CERTIFICATES

Hydraulic accumulators that are installed outside of Germany are supplied with the relevant test certificate documentation. The country of installation must be stated at the time of ordering. HYDAC pressure vessels can be supplied with almost any approval classification. The permitted operating pressure may differ from the nominal pressure.

The following table provides some examples of the code in the model code:

Country	Certificate
	10000 (00)
EU member states	U
Australia	F <sup>1)</sup>
Belarus	A6
Canada	S1 1)
China	A9
Great Britain	Υ
Hong Kong	A9
Iceland	U
Japan	Р
Korea (Republic of)	A11
New Zealand	Т
Norway	U
Russia	A6
South Africa	S2
Switzerland	U
Turkey	U
Ukraine	A10
USA	S

Registration required in the individual territories or provinces.
 Others on request

# 2.6. FURTHER INFORMATION

Operating and maintenance instructions for low pressure bladder accumulators are available on request.

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

 HYDAC Accumulator Technology No. 3.000

This document and others are available from our Download Center at www.hydac.com.

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rise       Juice - No. P.		SB16 A - 150 E 7 / 112 II - 40
pre code         c details = standard         = high flow         Bio-optimise du value (AI) =         Biodder (op-reparate)         A - bladder integrity system, industry version (others on request)         ombinations must be agreed with HYDAC.         owternal thread.         sealing surfaces on front interface (e.g. on thread MS0x1.5 – valve)         asside connection.         standard design 2         = back-up version         gas valve NS0x1.5 In accumulators smaller than 50 1         = MYA 104 Ky gas valve         MEX1.5 gas valve (with M14x1.5 bore in gas valve)         = Mindard design 12 or A2 for mineral olis         therad to constrain thread of the model of the standard design 12 or A2 for mineral olis         = binde (meer coaling)	ries	<u>3616A</u> - <u>136 - 77 1120</u> - 407
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= plastic (inner coating) = carbon steel = chem. nickel-plated (inner coating) = stainless steel 2) = low temperature steel ccumulator bladder 1:19 = low temperature steel ccumulator bladder 1:19 = low temperature steel ccumulator bladder 1:19 = low temperature steel = competities and the steel steel = thread to fluid port bladder steel ste	cumulator shell	
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- definit incode plated (inite coaling) = stainless steel a) = low temperature steel ccumulator bladder (1)(a) NBR (1)(3) = ECO IIR 5 = BR (1) = FKM = other = NBR (1) = thread to code = European Pressure Equipment Directive (PED) or others, see section 2.5. ermitted operating pressure [bar] onnection, fluid side mead, codes for fluid port: A, C, E, G = thread to ISO228 (BSP) = thread to IDIV13 or ISO965/1 (metric) = thread to IDIV13 or ISO965/1 (metric) = thread to ANSI B1.20.1 (UN-2B seal SAE J 514) = thread to ANSI B1.20.1 (UN-2B seal SAE J 514) = thread to ANSI B1.20.1 (NPT) = special thread, to customer specification ange, codes for fluid port: F = flange EN 1092-1 = flange ASME B16.5 = SAE flange 63000 psi = special flange, to customer specification equired gas pre-charge pressure must be stated separately!	= carbon side	
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When ordering a spare bladder, please state diameter of the smaller shell port ependent on type and pressure rating lastomer types not available for all bladder sizes bbserve temperature ranges, see section 2.1.	quired gas pre-charge pressure must be stated separately!	
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bserve temperature ranges, see section 2.1.	astomer types not available for all bladder sizes	
	serve temperature ranges, see section 2.1.	



# 4. STANDARD ITEMS

The bladder accumulators and spare parts described below are manufactured in carbon steel and stainless steel with an NBR accumulator bladder (MC = 112/342).

The tables provide the most important data and dimensions for the series depicted.

The part numbers provided refer to bladder accumulators in accordance with PED (CC = U).

Designs that differ from the standard types described below can be requested from HYDAC.

### 4.1. TECHNICAL DATA

### 4.1.1 Permitted operating temperature

As standard, the products listed in the tables may be operated in the following temperature range:

-10 °C ... +80 °C

Other operating temperatures on request.

#### 4.1.2 Permitted operating pressure

The permitted operating pressure may differ from the nominal pressure in the case of other certifications. The table in section 4.2. shows the permitted operating pressure in accordance with the European Pressure Equipment Directive.

#### 4.1.3 Nominal volume

HYDAC bladder accumulators are available with set nominal volumes, see tables in section 4.2.

#### 4.1.4 Effective gas volume

The effective gas volume is based on nominal dimensions. It differs slightly from the nominal volume and must be used when calculating the effective fluid volume, see table in section 4.2.

#### 4.1.5 Effective volume

Volume of fluid which is available between the operating pressures p2 and p1.

#### 4.1.6 Maximum 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 ensured 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.

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

 $p_0 \le 0.9 \cdot p_1$ with a permitted pressure ratio of:  $p_2 : p_0 \le 4:1$ 

 $p_2 = max.$  operating pressure  $p_0 = pre-charge pressure$ 

For HYDAC low pressure accumulators, the following must also be taken into account: Type SB40: p<sub>0 max</sub> = 20 bar (in model with perforated disc) Type SB16/35A/AH: p<sub>0 max</sub> = 10 bar Type SB35HB: p<sub>0 max</sub> = 10 bar

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.

For more information, see catalogue section:

HYDAC Accumulator Technology

No. 3.000



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4.2. TABLES AND DRAWINGS

4.2.1 Series SB40-2.5 ... 50



Nominal volume	Perm. operating pressure (PED)	Part no.		Eff. gas volume	A	В	С	ØD	J thread	K thread	AF	Qmax 1)	Veight
[1]	[bar]	Carbon steel, NBR	Stainless steel, NBR	] [[]	[mm] [	mm] [n	im]	[mm]	ISO DIN 13	ISO 228	[mm] [	]/s]	[kg]
2.5		3114684	3130528	2.5	541	122		100	ĺ			-	9
5	]	3113791	3118722	5	891	]		100					13
10	10	3111110	3125662	9.3	533 8	343	68		M100x2	<b>C</b> 2	36	7	14
20	40	3125719	3130529	18	106	]		210	IVI 100X2	G Z		l '	23
32	]	3130487	3130530	33.5	1363	]		219					38
50		3119445	3130531	48.6	1875	]	78	]			<b>68</b> 2)	]	52

1) Approx. 0.5 bar pressure drop via connection

2) Use C-spanner

EN 3.202.8/05.24

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4.2.2 SB35HB



Nominal volume	Perm. operating pressure (PED)	Part no.		Eff. gas volume	A max.	С	ØD	AF	Q <sub>max</sub>	DN 1)	Weight
[I]	[bar]	Carbon steel, NBR	Stainless steel, NBR	[1]	[mm]	[mm]	[mm]	[mm]	[l/s]		[kg]
20		3130682	3130683	19.8	1081	62		26			43
32	35	3130684	3130685	35	1591	03	219	30	20	50	56
50		3130686	3130687	50	2091	78		Ø 68 2)			69

 $_{1)}$  To EN 1092-1/11 / PN40, others on request  $_{2)}$  Groove nut

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4.2.3 SB40-70 ... 220 AF C ∢ ØD AF 13 AF 90 × ш Ш Nominal Perm Δ Woight Dort no Eff. goo D 

volume	operating pressure (PED)	Part no.		volume	max.	Б	C	טש	thread	AF	Qmax	weight
		Carbon steel,	Stainless steel,									
[1]	[[bar]	NBR	NBR	[I] [mm] [m	m] [mm	] 65 11	28	[[mm]	ISO 228	[[mm]	[[l/s]	[kg]
70		2127513	2127533									73
100		2127514	2127534	111	1655			356				99
130	40	2127515	2127535	133	1905	136	69		G 2 1/2	<b>68</b> 1)	30	130
190		3182579	3182581	192	2101			106				175
220		3182582	3182583	221	2348			400				197

1) Use C-spanner



### 4.2.4 SB16/35A, SB16/35AH



Series	Nominal volume	Perm. operating pressure (PED)	Part no.		Eff. gas volume	A B (appro (approx.)	ox.) (appro	x0)	D ±10	Weight
	[I]	[bar]	Carbon steel, NBR	Stainless steel, NBR	] [I]	[mm]	[mm]	[mm]	[mm]	[kg]
	150		4108288	4108241	149	1044	493			127
	200		4108290	4093557	203	1275	691	1		149
SB16A	300	16	4108291	4108242	288	1644	920	108	720	178
	375		4108292	4108243	374	2020	1063	1		214
	450		4108294	4108244	453	2361	1234	1		244
	150		4108339	4108306	149	1076	578			171
	200		4108341	4108307	203	1318	699	1		208
SB35A	300	35	4108342	4108308	288	1701	937	121	728	261
	375		4108355	4108312	374	2086	1083	1		315
	450	1	4108357	4108314	453	2436	1258		364	
	150		4108720	4108702	149	1135	638			135
	200	1	4108721	4108703	203	1366	754	1		157
SB16AH	300	16	4108724	4108715 288 98	8 108 374	1735		1	720	186
	375	1	4108725	4108717		2111	1127	1		222
	450	1	4108726	4108718	453	2452	1298	1		252
	150		4108773	4108729	149	1166	641			180
	200	1	4108775	4108730	203	1408	762	1		217
SB35AH	300	35	4108774	4108734	288	1791	1000	121	728	270
	375	1	4108776	4108758	374	2176	1146	1		324
	450	1	4108778	4108762	453	2526	1321	1		373

# 4.3. SPARE PARTS

4.3.1 SB40-2.5 ... 50



Description	Item
Bladder assembly 1) consisting of:	
Bladder	2
Gas valve insert 2)	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
Hydraulic connection assembly consisting of:	
Hydraulic connector	10
Anti-extrusion ring	11
Retaining ring	12
Vent screw	13
Seal ring	14

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

Carbon steel, NBR									
Nominal volume [l]	Bladder assembly	Seal kit	Hydraulic connector assembly	Gas valve insert					
2.5	236171								
5	240917								
10	236088	2051615	2106751	622965					
20	236089	3951015		032000					
32	235335								
50	235290								

Stainless steel, NBR									
Nominal volume [I]	Bladder assembly	Seal kit	Hydraulic connector assembly	Gas valve insert					
2.5	356019								
5	2123155								
10	356022	4102701	2115039	632865					
20	4611049	4102701							
32	3259250								
50	356025								

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Item

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Item

4.3.3 SB40-70 ... 220





Bladder assembly 1) consisting of:	
Bladder	2
Gas valve insert 2)	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
Oil valve assembly consisting of:	
Valve	9-13
Anti-extrusion ring 2)	14
Washer	15
O-ring	16
Spacer	17
Groove nut	18
Vent screw	19
Support ring	23

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

2) Available separately

Description

Accumulator shell (item 1) not available as 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 accessory, please ask

Carbon st	Carbon steel, NBR									
Nominal volume	Bladder assembly	Seal kit	Oil valve assembly	Anti-extrus ring	i <b>Gia</b> s valve insert					
[I]										
70	3364274									
100	3127313									
130	4583554	4126907	3273734	3102326	632865					
190	3640698									
220	3461300									

Stainless steel, NBR							
Nominal volume	Bladder assembly	Seal kit	Oil valve assembly	Anti-extrus ring	si <b>Gia</b> s valve		
[I]					Insen		
70	3143382						
100	3176772						
130	3143388	3102124	3891165	3099934	632865		
190	3143389						
220	3143390						

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### 4.3.4 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.







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 spare part

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

# 5. 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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