BLADDER ACCUMULATOR

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Fluma Co., Ltd.

HYDRAULIC, PNEUMATIC AND ELECTRIC TECHNOLOGY

BLADDER ACCUMULATOR GENERAL
BLADDER 형 ACCUMULATOR 개요

Definition and operation

Bladder accumulator is a device designed specifically for the storage of liquids under pressure. As liquids are, for all practical purposes, incompressible, the objective is achieved by utilizing the compressibility of gases. (fig 1)

A) A flexible separator bladder is fitted into a pressure vessel(accumulator shell).

B) Through a special valve an inert gas(nitrogen) is introduced into the bladder with pressure P0. The bladder expands, filling the entire volume V0 of the accumulator shell.

C) When circuit pressure P1 is higher than the gas pre-charge pressure P0, the liquid valve opens. And the bladder is compressed reducing the gas volume to V1.

D) When the liquid pressure rise to P2, the volume of gas reduces to V2 with an attendant rise in pressure, thus balancing the liquid pressure.

This means that the accumulator has been pressurized ΔV=V1-V2 and a potential energy has been created to be utilized as desired.

정의 및 일반적인 작동

Bladder accumulator는 일정 압력하에 유체를 저장하기 위해 디자인된 장비이다.
실제로 유체는 비압축성이며, 가스의 압축성을 이용한다. (fig 1 참조)

A) 유연성 있는 bladder는 압력용기(accumulator shell)에 고정된다.

B) 특별히 제작된 밸브를 통해 비활성 기체(질소)를 P_0의 압력으로 bladder에 주입한다. Bladder는 팽창하고, accumulator shell에 V_0의 체적으로 주입된다.

C) 압력라인 P_1이 pre-charge된 압력 P_0보다 높아졌을 때, 유체밸브(오일밸브)는 열린다. Bladder는 가스 볼륨 V_1이 줄어들면서, 압축된다.

D) 유체압력이 P_2로 증가하면, 가스 볼륨 V^2는 줄어들면서 유체의 압력과 밸런스를 맞춘다.

Accumulator는 $\Delta V = V_1-V_2$와 같은 압력 유지를 하게 되면, 요구에 의해 이용 되어질 위치에너지가 발생된다.

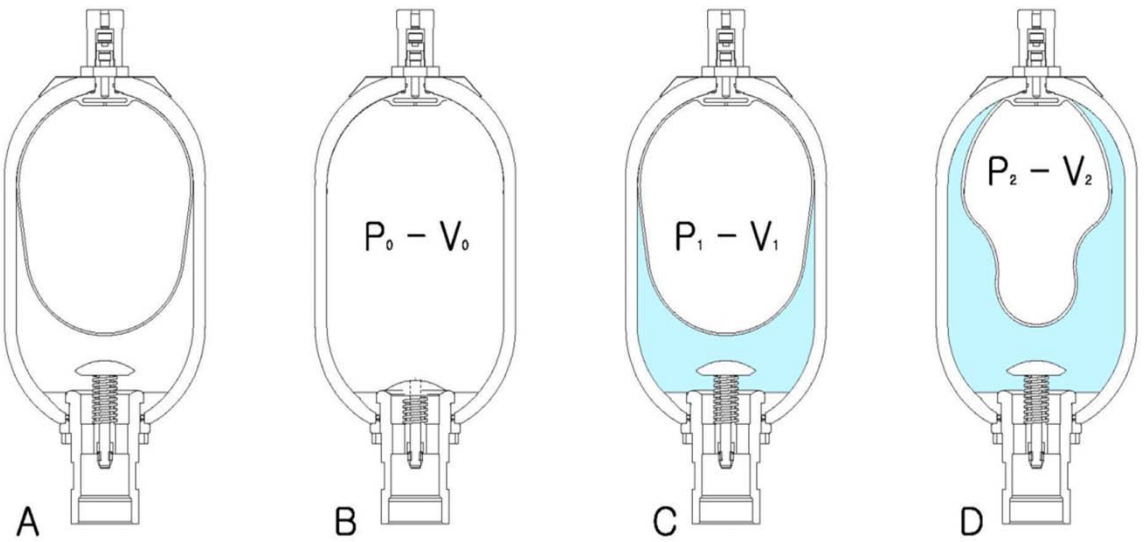


Fig. 1

BLADDER ACCUMULATOR CONSTRUCTION
BLADDER 형 ACCUMULATOR 구조

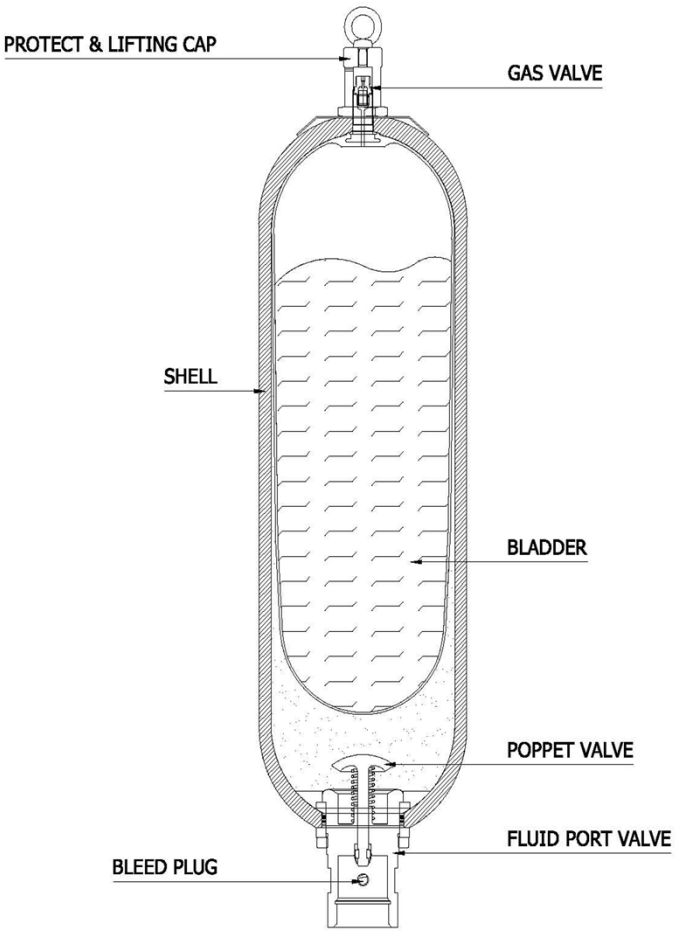


Fig. 2

FLUMA bladder accumulator comprises a steel shell in which is fitted a bladder complete with gas valve and fluid port with the poppet valve(fig.2) :

FLUMA bladder accumulator는 가스 밸브와 bladder가 장착된 steel shell과 유체방향에는 포핏밸브로 구성되어있다.

The shell is a pressure vessel forged or fabricated from high grade steel designed and manufactured to meet the relevant international standards.
For special applications various surface coatings are available as well as a stainless steel construction.

Shell은 다양한 국제적인 사양을 맞추기 위해 디자인되고, 생산된 높은 등급의 steel을 가공하거나 혹은 단조성형을 한 압력용기이다.
특수한 적용(application)에 대하여 다양한 표면처리 뿐만아니라 SUS로도 제작이 가능하다.

The bladder, which separated the gas from the liquid, is made in nitrile rubber in the standard version. Bladders in butyl, neoprene, ethylene-propylene etc. are available for special uses(Fluid).

Bladder는 유체로 부터 가스를 분리할 목적으로 사용되며, 일반적으로 NBR(nitrile rubber)로 제작되지만, 특수한 유체에 대하여 사용하기 위해 bladder를 부틸 합성고무, 네오프렌, 및 에틸렌-프로필렌 등으로도 제작 할 수도 있다..

Another advantage of the FLUMA bladder is the gas valve which, not being vulcanized to the bladder, can be fit to it and removed simply and safely. For this reason the same bladder can be supplied with gas valve in different versions, or the valve can be reused , thus reusing the cost of spare parts.

FLUMA bladder의 다른 장점으로는 장착 및 제거가 쉽고 안전한 가스밸브가 장착되어 있다는 것이다. 이러한 이유로, 동일한 bladder가 다양한 버전 및 재 사용되는 가스밸브와 함께 공급되며, spare parts의 가격 절감을 이루고 있다.

The gas valve is connected to the bladder by a rubber coated washer to ensure a gas tight joint and non return valve is incorporated for bladder inflation. The bladder, complete with the gas valve, is fixed to the accumulator shell by a lock nut and the assembly is protected by a cover.

가스밸브는 누기 현상을 막기 위해 고무로 코팅된 washer로 bladder와 연결되어 있고, non return valve는 bladder의 팽창을 위해 합해져 있다. 가스밸브와 완전히 조립된 bladder는 lock nut로 accumulator shell과 조립되어지며, 이러한 조립상태는 커버로 보호된다.

The fluid port valve prevents the bladder from extruding into the fluid port and, at the same time, allows the liquid to flow. In the high pressure range is used a poppet valve, while in the low pressure range is used a drilled disc. In the latter case the pre-charge pressure should not exceed 15bar.

유체포트 밸브는 bladder가 유체포트 쪽으로 방출되는 것을 예방함과 동시에 유체의 흐르도록 한다. 압력이 높은 범위의 경우에는 포핏 밸브를 사용하고 낮은 압력범위의 경우에는 drilled disc를 사용한다. 후자의 경우에는 pre-charge압력이 15bar를 넘어서는 안 된다.

BLADDER ACCUMULATOR MATERIAL
BLADDER 형 ACCUMULATOR 재질

Bladder material
Bladder 재질

NO	Code letter	Polymer	ISO	Temperature range(℃)
1	P	Standard nitrile (Perbunan)	NBR	-20 ℃ ~ 85 ℃
2	F	Low temperature nitrile	NBR	-40 ℃ ~ 70 ℃
3	H	Nitrile for hydrocarbons	NBR	-10 ℃ ~ 90 ℃
4	K	Hydrogenated nitrile	HNBR	-30 ℃ ~ 130 ℃
5	A	For food stuff	NBR	-20 ℃ ~ 85 ℃
6	B	Butyl	IIR	-30 ℃ ~ 90 ℃
7	E	Ethylene-Propylene	EPDM	-20 ℃ ~ 90 ℃
8	N	Chloroprene (Neoprene)	CR	-20 ℃ ~ 85 ℃
9	Y	Epichloridrin	ECO	-30 ℃ ~ 110 ℃

Material of accumulator shell and valve
Accumulator shell and valve 재질

In standard version, the shell is made of carbon steel and painted on the outside with a coat of rust inhibitor; the valves are made of phosphated carbon steel.
This configuration is suitable for fluids of group2 and the whole assembly is indicated in the identification code by the letter C.
For special applications, shell and vales, usually in carbon steel, can be nickel coated.
Minimal thickness 25micron. Identification code letter N (specify different thickness separately).
In some cases the execution is completely in stainless steel(indicated by letter X)
If specifically requested, the fluid port and/or the gas valve can be supplied in a different material to the one used for the accumulator shell. Only in this case, it is necessary to add to the identification code the letter indicating each valve. (See order designation)

일반적으로 shell은 carbon steel로 제작되면 도장을 한뒤에 방청제를 외부에 바른다. Valve는 피막처리된 carbon steel로 제작된다.
이 구성은 group 2의 유체에 적당하며, 전체 조립품은 식별코드 C로 표기한다.
shell과 valve의 일반적인 사양은 carbon steel이지만, 특별한 적용 사양에 대해서는 니켈 코팅도 할 수 있다. 최도 두께는 25micron이다. 식별코드는 N이다.
(다른 두께는 명시 바랍니다)
다른 특별한 경우에는 완전히 stainless steel로 제작한다.(식별코드는 X)
만약에 특별하게 요구된다면, 유체/가스 방향 밸브는 accumulator shell에 사용된 재질과 다른 재질로 공급이 가능하다. 일부 경우에는, 각각의 밸브에 식별코드를 추가 할 필요가 있다.
(주문코드 확인바랍니다.)

BLADDER ACCUMULATOR ORDER DESIGNATION
BLADDER 형 ACCUMULATOR 주문코드

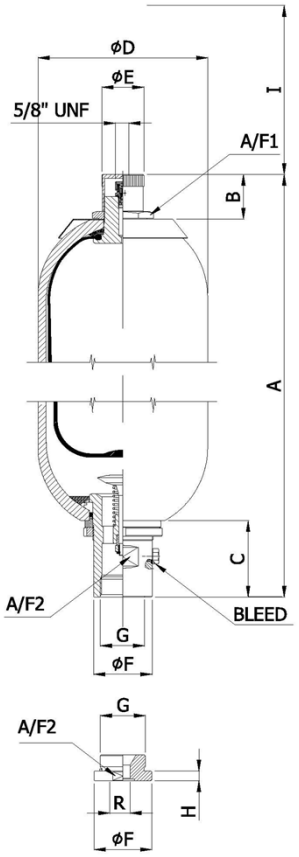
BA	1.4	P	360	C	G	8	-	□	□
1	2	3	4	5	6	7		8	9

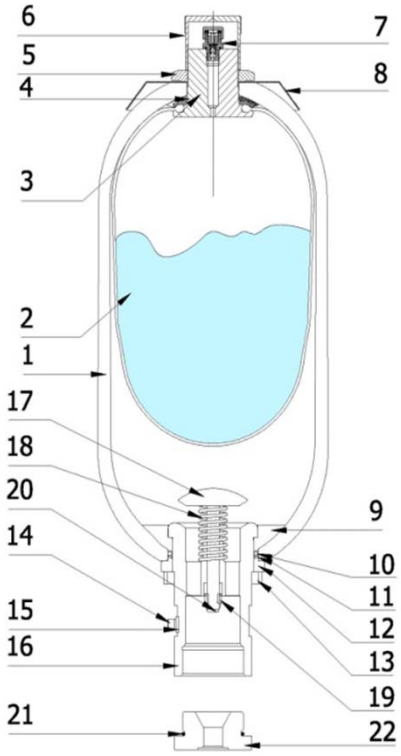
1	Accumulator type Accumulator 타입	◀	BA = High pressure/Low capacity(0.2~5L) Bladder accumulator BA = High pressure/High capacity(10~60L) Bladder accumulator BA = Low pressure(30~80bar) Bladder accumulator
2	Nominal capacity 용 량	◀	Normal accumulator : 0.2 ~ 60 L ASME accumulator : 1/4 ~ 15 gallons
3	Bladder material Bladder 재질	◀	P = Standard nitrile(Perbunan) F = Nitrile for low temperatures H = Nitrile for Hydrocarbons K = Hydrogenated Nitrile A = For food-stuffs B = Butyl E = Ethylene-propylene N = Chloroprene (Neoprene) Y = Epichlorohydrin
4	Max working pressure 2) 최대 작동 압력	◀	High pressure/Low capacity carbon steel : 360 bar High pressure/High capacity carbon steel : 330bar High pressure stainless steel : 30 ~ 200 bar Low pressure carbon steel : 30 & 80 bar Low pressure stainless steel : 25 & 40 bar
5	Shell and valves material Shell & valve 재질	◀	C = Shell painted carbon steel (Valve : phosphated carbon steel) N = Nickel coated carbon steel X = Stainless steel V = Carbon steel with coating of Rilsan
6	Fluid port connection 유체 방향 연결	◀	G = Female ISO 228 L = For flange SAE3000 H = For flange SAE6000 M = Metric thread P = NPT thread S = SAE thread 3) R = With adapter 3) F = With flange 3)
7	Tests and certifications 검사 및 인증	◀	0 = Factory testing 1 = GOST(Russia)-(For 0.5~5L) 2 = Australian pressure vessel standard(Australia) – For 0.5~5L 3 = ML (ex SQL) (China) – For 0.5~5L 4 = RINA 5 = BS-LLOYD'S Register 6 = Germanischer lloyd 7 = ASME-U.S.(USA) 8 = 97/23/EC(Europe) 9 = ATEX(94/9/EC) 10 = Other to be specified (DNV, ABS 등)
8	Fluid port material 1) 유체 방향 재질	◀	- = The same to material shell C = Phosphated carbon steel N = Nickel coated X = Stainless steel
9	Gas valve material 1) 가스 방향 재질	◀	- = The same to material shell C = Phosphated carbon steel N = Nickel coated X = Stainless steel

1) Specify both when at least one is made of different material from the accumulator(Refer item. 8,9)
2) Use the proper value among those indicated
3) To be specified separately

1) 적어도 Accumulator shell과 다른 재질로 만들때 두 사양 모두 명시 할 것. (주문코드 8, 9 참조)
2) 명기된 값 중 적당한 것을 사용 할 것
3) 단독으로 표기 할 것.

BLADDER ACCUMULATOR – HIGH PRESSURE/LOW CAPACITY SPECIFICATION
BLADDER 형 ACCUMULATOR - 고압 / 저용량 사양





Dimension 2)

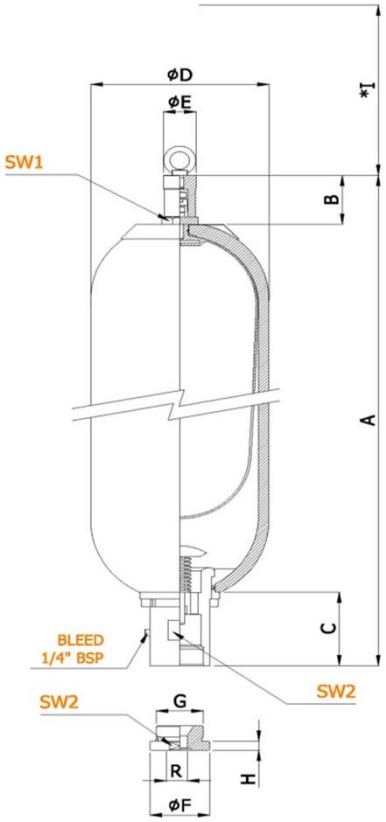
Type	Max work pressure (bar)	Gas volume (liter)	Dry weight (Kg)	Fluid port connection		A	B	C	ΦD	ΦE	ΦF	H	I*	SW1	SW2
				G BSP ISO 228	R BSP ISO 228										
BA 0.2	360	0.2	1.7	1/2"	-	250 ± 2	22	40	53 +1	20	26	-		24	23
BA 0.7	360	0.65	4.2	3/4"	0=blind 3/8" 1/2"	280 ± 3	47	52	90 ± 1	25	36	11	14	32	32
BA 1	360	1	5.2			295 ± 5			114 ± 1						
BA 1.5	360	1.5	6.3			355 ± 5									
BA 3	360	2.95	11	1 1/4"	0=blind 3/8"-1/2"-3/4"	553 ± 8		65			53				50
BA 5	360	5	15			458 ± 10			168 ± 1.5						

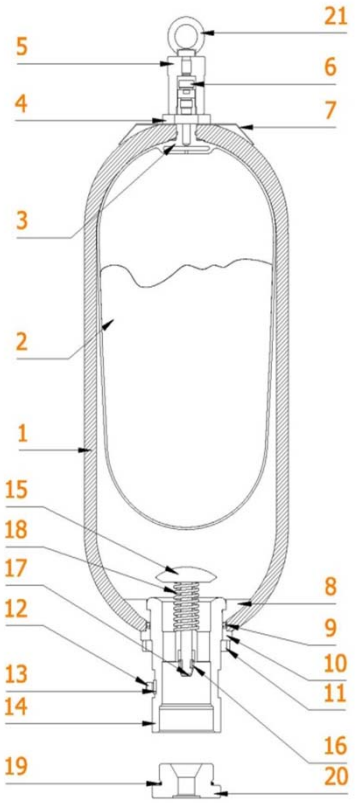
I* = Overall dimensions of pre-loading unit.
2) = Data related to standard version in carbon steel PS=360 bar

Part list

Item	Description	Item	Description	Item	Description	Item	Description
1	Accumulator shell	7	Gas fill valve	13	Fluid port ring nut	19	Brake bushing
2	Bladder	8	Name plate	14	Bleed screw	20	Self locking nut
3	Gas valve body	9	Retaining ring	15	Seal ring	21	Adapter O ring
4	Rubber-coated washer	10	"O" ring	16	Fluid port	22	Adapter
5	Gas valve locknut	11	Supporting ring	17	Poppet		
6	Protection cap	12	Space ring	18	Spring		

BLADDER ACCUMULATOR – HIGH PRESSURE/HIGH CAPACITY SPECIFICATION
BLADDER 형 ACCUMULATOR - 고압 / 대용량 사양





Dimension [2)]

Type	Max work pressure (bar)	Gas volume (liter)	Dry weight (Kg)	Fluid port connection		A	B	C	ΦD	ΦE	ΦF	H	I*	SW1	SW2
				G BSP ISO 228	R BSP ISO 228										
BA 10	330	10	41	2"	1/2"	583±15	70	105	223±3	41±1	76	13	500	46	70
BA 20	330	20	60	2"	1/2"	893±15	70	105	223±3	41±1	76	13	500	46	70
BA 37	330	37	87	2"	1/2"	1413±15	70	105	223±3	41±1	76	13	500	46	70
BA 42	330	42	95	2"	1"	1543±20	70	105	223±3	41±1	76	13	500	46	70
BA 54	330	54	115	2"	1 1/4"	1938±20	70	105	223±3	41±1	76	13	500	46	70
BA 60	330	60	130	2"	1 1/4"	2018±20	70	105	223±3	41±1	76	13	500	46	70

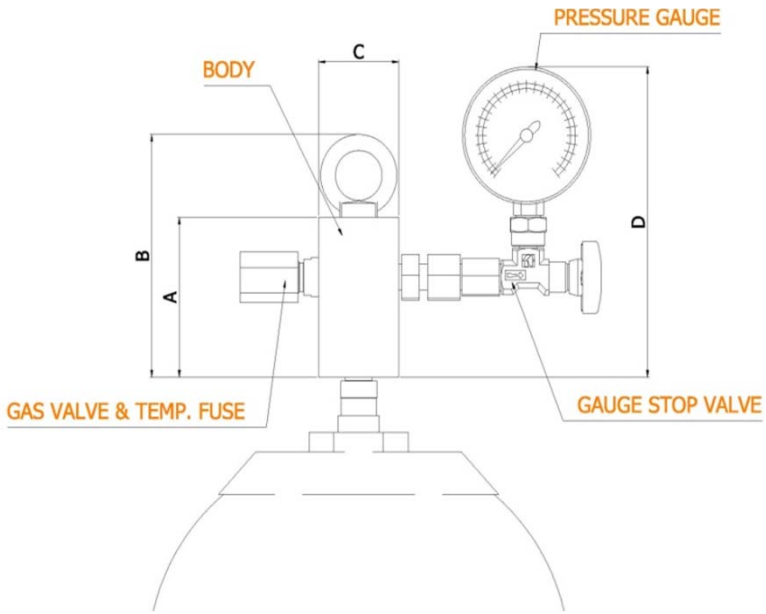
I* = Overall dimensions of pre-loading unit.
2) = Data related to standard version in carbon steel PS=330 bar

Part list

Item	Description	Item	Description	Item	Description	Item	Description
1	Accumulator shell	7	Name plate	13	Bleed screw	19	Adapter O ring
2	Bladder	8	Retaining ring	14	Fluid port body	20	Adapter
3	Gas valve body	9	"O" ring	15	Poppet		
4	Gas valve locknut	10	Supporting ring	16	Brake bushing		
5	Protection cap	11	Space ring	17	Self locking nut		
6	Gas valve	12	Fluid port ring nut	18	Spring		

PERMANENT GAUGE ASSEMBLY - ACCUMULATORS
ACCUMULATOR - 게이지 조립 ASSEMBLY

Permanent gauge assembly for bladder accumulator



Construction

Standard version includes :
- Gauge body
- Pressure gauge
- Gauge stop valve

On request :
- Gas valve & temp. Fuse

구 조

표준품 포함 내역 :
- Gauge body
- 압력계이지
- 게이지 stop valve

옵션사양 내역 :
- Gas valve & 온도 퓨즈

Ordering code permanent gauge assembly for bladder accumulator
주문 코드 - permanent gauge assembly for bladder accumulator

PG – 330 – TF

1 2 3

NO	Description	Specification
1	Type	PG(Permanent gauge)
2	Operating pressure	According to specification of accumulators
3	Temperature Fuse	N : Without temperature fuse TF : With temperature fuse(Option specification)

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