



Driving  
**TECHNOLOGICAL**  
EXCELLENCE

**ACCUMULATOR**

Bladder type Hydraulic Accumulator is an energy storage device, which is mainly used during instant high demand requirement of flow and pressure. It compensates for pressure when there is a power outage or during switch over between pumps, manage the minor leakages and pressure drop that takes place in the Hydraulic pipelines, fittings, and tubing's, etc. It also acts as a shock absorber.

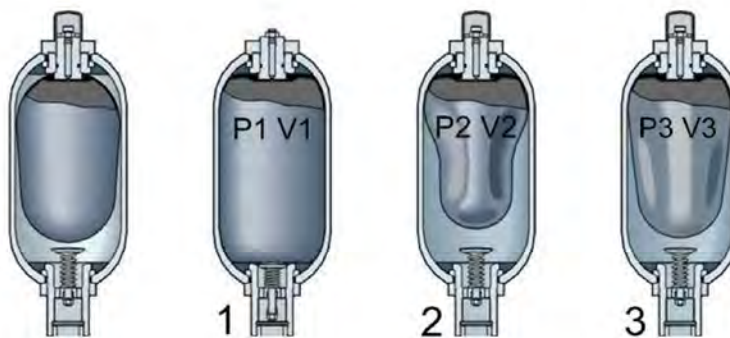
Accumulator uses the compressibility of the gas. In general, the accumulator comprises of two segments one is a dry side (containing compressed gas, usually nitrogen) and a wet side containing hydraulic liquid. The dry side of the accumulator is pre-charged with the gas as per the system's requirement. Bladder accumulators uses a synthetic rubber such as nitrile or Viton to contain the nitrogen gas as pre-charged. The bladder is installed inside a high-pressure-capacity sealed cylinder with hemispherical or elliptical caps at either end.

Ideally, Bladder Accumulator should be mounted with the liquid port on the bottom and the gas port on the top. During the pre-charge, the bladder fills most of the void inside the shell and a poppet valve at the fluid port prevents the bladder from extruding out the bottom. As the hydraulic fluid enters the sealed shell, it starts compressing the nitrogen gas stored inside the bladder, and the compressed gas is stored as hydraulic energy which is equal to the fluid volume taken in factored with the pressure of the pre-charge. As the downstream energy is dropped the compressed gas immediately starts expanding and pushes the hydraulic fluid instantly.



## WORKING PRINCIPLE

1. At the initial condition, the gas section shall be pre-charged with Nitrogen at pressure as per the requirement.
2. When the hydraulic oil is pumped into the accumulator, the oil pressure will compress the gas section into a certain volume and certain pressure.
3. When there is a hydraulic demand arises, the accumulator will release the hydraulic oil and makes the gas section expand. See the below drawing for accumulator working principle illustration.



## PRE-CHARGE CONDITIONS

$P1 = 0.9 P3$  for Bladder accumulators (90% of minimum system pressure to prevent bladder damage)

$P1 = P3$  for Piston accumulators

## CHARGED CONDITIONS

$P3$  = Minimum system operating pressure

$P2$  = Maximum system operating pressure

As per the above description, the objective of the sizing is to find the effective volume of the accumulator  $V1$ . To avoid any deficiency due to something that we don't know (un-accurate valve actuator swept volume etc) we need to put some margin (let's say 10% of  $V1$ ) so the accumulator volume will be  $1.1 \times V1$ .

The filling or compression process by the hydraulic pump (from  $P1$  to  $P2$ ) can be considered as isothermal process since there is no temperature change after compression. While the expansion process (from  $P2$  to  $P3$ ) can be considered as adiabatic process since the expansion process is fast due to the usage of the valve actuator. This fast expansion will make the change in heat doesn't have enough time to transfer outside the accumulator. From this assumption, we can develop the following equation to calculate the required effective volume  $V1$  of the accumulator.



From P1 to P2 is isothermal compression then, **Where:**

$$P_1 V_1 = P_2 V_2$$

$$V_1 = P_2 V_2 / P_1$$

From P2 to P3 is adiabatic compression then,

$$P_2 V_2^n = P_3 V_3^n$$

$$V_2 = (P_3 V_3^n / P_2)^{1/n}$$

$$V_2 = V_3 (P_3 / P_2)^{1/n}$$

The different between V2 and V3 is the delivered hydraulic oil to the valve actuator

$$H_{HYD} = V_3 - V_2$$

$$V_3 = V_{HYD} + V_2$$

By substituting the V3 in V2, we get

$$V_2 = (V_{HYD} + V_2 (P_3 / P_2)^{1/n})^{1/n}$$

$$V_2 = V_{HYD} (P_3 / P_2)^{1/n} / (1 - (P_3 / P_2)^{1/n})$$

By Substituting V2 in V1, we get

$$V_1 = P_2 (V_{HYD} (P_3 / P_2)^{1/n} / P_1 (1 - (P_3 / P_2)^{1/n}))$$

**P1** = 0.9 P3 for Bladder accumulators (90% of minimum system pressure to prevent bladder damage)

**P1** = P3 for Piston accumulators

**P2** = Maximum system operating pressure

**P3** = Minimum system operating pressure

**V1** = Effective gas volume of the accumulator

**V2** = Maximum gas volume compressed by the hydraulic oil

**V3** = Expanded volume of gas at the minimum pressure required (P2)

**VHYD** = Amount of oil to be supplied to valve actuator (swept volume of hydraulic valve actuator)

**n** = ratio of specific heat or **CP/CV** = 1.4 for nitrogen

## The Main Parts of the Bladder Accumulator are

1. Shell
2. Rubber bladder
3. Fluid port
4. Gas fill valve adaptor

### SHELL

- ▶ Bladder-type accumulators consist of a seamless steel cylinder or a fabricated shell which encloses a bladder.
- ▶ The Shells are designed in accordance Pressure Vessel and Boiler Code Section ASME VIII Division 1, and ALSO in other standards like BSEN with PED approval (Europe standard) and AD 2000 (German standards).

### RUBBER BLADDER

- ▶ The rubber bladder separates the nitrogen gas and the hydraulic fluid. It is made up of rubber elastomers like NBR, HNBR, FKM, EPDM, etc., based on the applications.
- ▶ The advantage of the bladder is high flexibility, low weight, the bladder has a rapid response time, allowing the accumulator to quickly compensate for pressure drops in the system.

### FLUID PORT

- ▶ The Fluid port is made up of Duplex SS to withstand high pressure and high force. It is also available in other materials such as 17-4 PH Steel and SS316L.
- ▶ The fluid port assembly equipped with a poppet valve which is supported and actuated by a steel spring. The purpose of this valve is to regulate the flow rate and to protect the bladder from damage.

### GAS FILL VALVE

- ▶ The bladder is moulded with steel stem made up of stainless steel and carbon steel material.
- ▶ The bladder stem is used to mount the bladder in the shell and firmly assembled with a lock nut. The gas fill valve adaptor is mounted on the Bladder stem.
- ▶ Since Accumulator is a pressure vessel considering the safety purpose pressure relief device is added to the Gas fill valve adaptor.
- ▶ The Burst Disc plays a role of pressure relief valve. It is designed in such way at a set differential pressure, the disc bursts on its own and releases the high pressure and safeguards the system from explosion.

## TECHNICAL SPECIFICATION

### DESIGN DATA

- ▶ Volume Range: 1 - 54 litres
- ▶ Pressure Range: 207 Bar. G, 280 Bar. G, 350 Bar. G, 455 Bar. G & 690 Bar. G
- ▶ Temperature Range: -10°C to +95°C

### MOC OF SHELL

- ▶ 34 CrMo4 (SA 372 Gr. E Cl. 70),
- ▶ SS 316L - on special request

### DESIGN CODES AND APPROVALS

- ▶ ASME Sec VIII Div. -1 with or without U stamp
- ▶ BSEN Standard with or without PED 2014/68/EU

### MOC OF RUBBER BLADDER

- ▶ NBR with SS 316L Stem. (standard Design)
- ▶ Viton with SS 316L stem on request

### FLUID PORT

- ▶ Sizes: 1/4", 3/8", 1/2", 3/4", 1" & 2"- NPT/BSP/UNF/Flanged
- ▶ other higher sizes on request
- ▶ MOC of Fluid port: DUPLEX SS, SS 316/L & SS 17-4 PH

### ACCESSORIES

#### GAS FILL VALVE

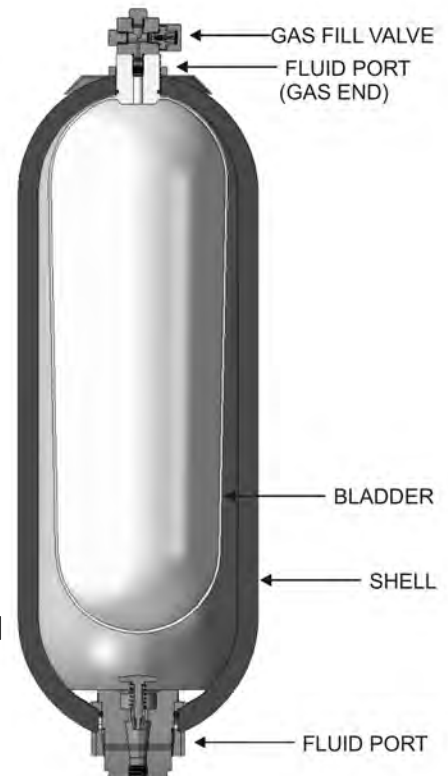
- ▶ 5/8" UNF / 7/8" UNF / 1/4" BSPP
- ▶ MOC of Gas fill valve: SS 316/L
- ▶ Burst Disc connection size 1/4" BSP / 1/4" NPT

#### BURST DISC

- ▶ Size: 1/4" (Default). Other size on request
- ▶ Set Pressure: As per customer requirement
- ▶ MOC: SS316/L with SS316L or Inconel disc

### CERTIFICATIONS

- ▶ 3.1 MTC as per EN 10204 for all pressurized parts
- ▶ Hydro test certificate
- ▶ PMI certificate (optional)
- ▶ NACE compliance as per MR 0175 / MR 0103 (optional)
- ▶ ASME certificate / PED Certificate / DOSH certificate (optional)
- ▶ Flushing certificate in compliance with NAS 6 Class (optional)



## ORDERING INFORMATION AND MODEL DE-CODIFICATION

<b>ACB</b>	<b>A</b>	<b>10</b>	<b>CS</b>	<b>N</b>	<b>S15</b>	<b>P450</b>
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DESCRIPTION	DESIGN CODE	VOLUME	SHELL MOC	BLADDER MATERIAL	FLUID PORT SIZE	PRESSURE RATING		
BLADDER ACCUMULATOR	A-ASME SEC VIII-DIV1 without U stamp	1- 1 LITRE	CS - 34CrMO4	N - NBR	S5 - 1/4"	P200 - 207 Bar		
		2- 2 LITRE			S10 - 3/8"			
		4- 4 LITRE				V - FKM	S15 - 1/2"	P242 - 242 Bar
	A1-ASME SEC VIII-DIV1 with U stamp	6- 6 LITRE		SS1 - SS316L	E- EPDM			S25- 1"
		10-10 LITRE						
	P-BSEN standard	20 - 20 LITRE		SS1 - SS316L	E- EPDM	S20 - 3/4"	P350 - 350 Bar	
		25 - 25 LITRE						
		35-35 LITRE	S50 - 2"			P690 - 690 Bar		
	P1-BSEN with PED	54 - 54 LITRE						
		XX-Other volume						
	UP-U stamp+ PED			HN-HNBR	XX-Others			
	UA-U stamp+ AS1210			LN-Low temp NBR				
	UD-U stamp+ DOSH							
	XX-Others							

## DIMENSION DETAILS

BLADDER ACCUMULATOR 200 / 242 / 280 BAR. G								
NOMINAL VOLUME IN LITRES	FLUID PORT CONNECTION	WEIGHT IN KG	A	B	C	D	E	F
1	1/2" NPTF	5	114	315	47	68	68	40
2	1/2" NPTF	10	114	440	66	68	68	40
4	1/2" NPTF	20	168	420	66	68	80	56
10	1/2" NPTF	50	229	550	77	68	105	74
20	1/2" NPTF	90	229	852	77	68	105	74
25	1/2" NPTF	65	229	1025	77	68	105	74
35	1/2" NPTF	151	229	1380	77	68	105	74
50	1/2" NPTF	213	229	1895	77	68	105	74

BLADDER ACCUMULATOR 350 / 450 BAR. G								
NOMINAL VOLUME IN LITRES	FLUID PORT CONNECTION	WEIGHT IN KG	A	B	C	D	E	F
1	1/2" NPTF	6	116	315	47	68	68	40
2	1/2" NPTF	12	116	440	66	68	68	40
4	1/2" NPTF	23	168	436	66	68	80	56
10	1/2" NPTF	55	245	560	77	68	105	74
20	1/2" NPTF	95	245	865	77	68	105	74
25	1/2" NPTF	65	245	1035	77	68	105	74
35	1/2" NPTF	158	245	1385	77	68	105	74
50	1/2" NPTF	225	245	1900	77	68	105	74

BLADDER ACCUMULATOR 690 BAR. G								
NOMINAL VOLUME IN LITRES	FLUID PORT CONNECTION	WEIGHT IN KG	A	B	C	D	E	F
10	1/2" NPTF	100	267	565	65	68	105	74
20	1/2" NPTF	160	267	875	65	68	105	74
35	1/2" NPTF	265	267	1385	65	68	105	74
50	1/2" NPTF	345	267	1910	65	68	105	74



All linear dimensions are in mm & Weight is specified in Kg. The above dimensions are for reference only and are subject to change without any prior notice.



## BLADDER ACCUMULATOR (TOP REPAIRABLE)

“Top repairable design” makes it possible to inspect the inside and replace bladders without having to remove the accumulator from its installation position. This type of Accumulator will greatly reduce the maintenance time and the cost involved.

The accumulator does not disperse the hydraulic fluid that happens to the bottom loading type accumulators during maintenance jobs, it is good also for the environment.

### TECHNICAL SPECIFICATIONS

#### DESIGN DATA

- Volume Range: 10 - 54 litres
- Pressure Range: 200 Bar. G & 450 Bar. G
- Temperature Range: -10°C to + 95°C

#### MOC OF SHELL

- 34 CrMo4 (SA 372 Gr. E Cl. 70)
- SS 316L - on special request

#### DESIGN CODES AND APPROVALS

- ASME Sec VIII Div. -1 with or without U stamp
- BSEN Standard with or without PED 2014/68/EU

### ACCESSORIES

#### GAS FILL VALVE

- 5/8" UNF / 7/8" UNF / 1/4" BSPP
- MOC of Gas fill valve: SS 316/L
- Burst Disc connection size 1/4" BSP/ 1/4" NPT

#### BURST DISC

- Size: 1/4" BSP (Default). Other sizes on request
- Set Pressure: As per customer requirement
- MOC: SS316/L with SS316L or Inconel disc

#### CERTIFICATIONS

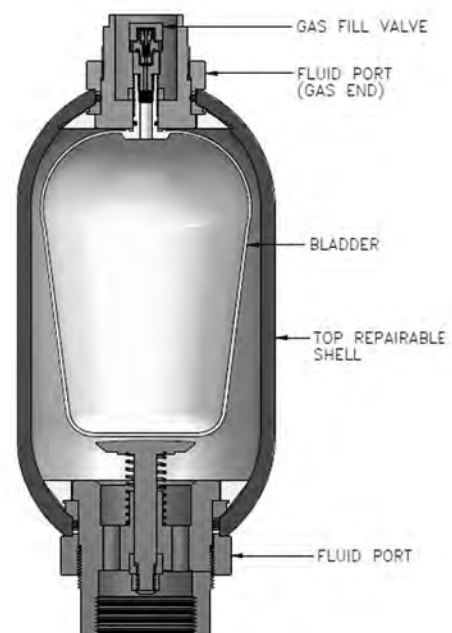
- 3.1 MTC as per EN 10204 for all pressurized parts
- Hydro test certificate
- PMI certificate (optional)
- NACE compliance as per MR 0175 / MR 0103 (optional)
- ASME certificate / PED Certificate (optional)
- Flushing certificate in compliance with NAS 6 Class (optional)

#### MOC OF RUBBER BLADDER

- NBR with SS 316L Stem. (Standard Design)
- Viton with SS 316L stem on request

#### FLUID PORT

- Sizes: 1/4", 3/8", 1/2", 3/4", 1" & 2"- NPT/ BSP/UNF/Flanged
- Other higher sizes on request
- MOC of Fluid Port: DUPLEX SS, SS 316/L & SS 17-4 PH



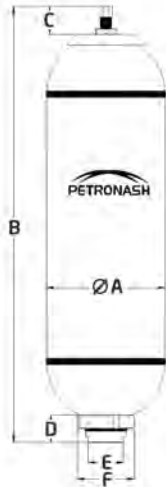
## ORDERING INFORMATION AND MODEL DE-CODIFICATION

<b>ACB</b>	<b>TRP</b>	<b>A</b>	<b>10</b>	<b>CS</b>	<b>N</b>	<b>S15</b>	<b>P200</b>
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DESCRIPTION	TYPE	DESIGN CODE	VOLUME	SHELL MOC	BLADDER MATERIAL	FLUID PORT SIZE	PRESSURE RATING	
BLADDER ACCUMULATOR	TPR - TOP REPAIRABLE	A - ASME SEC VIII-DIV1 without U STAMP	10 - 10 LITRE	CS - 34CrMO4	N - NBR	S5 - 1/4"	P200 - 200 bar	
		A1-ASME SEC VIII-DIV1 with U STAMP	20 - 20 LITRE		V - FKM	S10 - 3/8"		
		P - BSEN standard	25 - 25 LITRE	SS1 - SS316L	E- EPDM	S15 - 1/2"	P450 - 450 bar	
		P - BSEN with PED	35 - 35 LITRE			S20 - 3/4"		
	HF - HIGH FLOW	UP - U STAMP + PED	54 - 54 LITRE	SS2 - DUPLEX SS	HN - HNBR	S25- 1"		PXX - Other Pressure Rating
		UA - U STAMP + AS1210						
		UD - U STAMP + DOSH	XX - Other Volume	SS3 - SS316/SS316L (Dual Certified)	LN - Low temp NBR	S50 - 2"		
		XX - Others						

## DIMENSION DETAILS

WELDED BLADDER ACCUMULATOR, 83 BAR							
NOMINAL VOLUME IN LITRES	WEIGHT IN KG	A	B	C	D	E	F
1	6	116	315	47	68	68	40
2	12	116	440	66	68	68	40
4	18	168	465	65	90	74	80
10	30	219	630	65	90	74	105
20	55	219	920	65	90	74	105
25	60	219	1080	65	90	74	105
35	65	219	1370	65	90	74	105
50	98	219	1840	65	90	74	105



WELDED BLADDER ACCUMULATOR, 120 BAR							
NOMINAL VOLUME IN LITRES	WEIGHT IN KG	A	B	C	D	E	F
1	8	116	330	47	68	68	40
2	14	116	455	66	68	68	40
4	20	168	485	65	90	74	80
10	33	219	650	65	90	74	105
20	60	219	940	65	90	74	105
25	68	219	1130	65	90	74	105
35	88	219	1480	65	90	74	105
50	110	219	1970	65	90	74	105

## BLADDER ACCUMULATOR (WELDED TYPE)

Welded type bladder Accumulator is used mainly in low-pressure applications. The accumulator is fabricated with pipe and dish ends instead of seamless forming. The openings for the gas and fluid ends are precisely machined with high-precision CNC machines. Welding quality is validated using Radiography inspection to maintain the quality and integrity. The volumes are available in various ranges to meet the wide range of applications. The welded accumulators are available in Stainless steel material of any grade as well as in carbon steel material.

### TECHNICAL SPECIFICATION

#### DESIGN DATA

- ▶ Volume Range: 1 - 100 litres
- ▶ Pressure Range: 40 Bar.g to 280 Bar.g (Other pressure Rating on request)
- ▶ Temperature Range:  
For shell: -45 Deg.C to +525 Deg.C  
For Bladder: -45 Deg.C to 121 Deg.C

#### MOC OF SHELL

- ▶ CS, SS316, SS316L, Duplex SS, etc.,

#### DESIGN CODES

- ▶ ASME Sec VIII Div. -1 & Div.-2
- ▶ BSEN Standard

#### SPECIAL REQUIREMENT & CERTIFICATIONS

- ▶ PED 2014/68/EU + CE MARKING
- ▶ U STAMP + NB , DOSH, NR-13 COMPLIANCE, AS-1210

#### MOC OF RUBBER BLADDER

- ▶ NBR, EPDM FKM (Viton), Low Temperature Nitrile and HNBR
- ▶ Other materials on request

#### FLUID PORT

- ▶ Size: 1/4", 3/8", 1/2" , 3/4", 1" & 2"- SW ADAPTOR / NPT/BSP/UNF/Flanged
- ▶ Other sizes on request

#### MOC OF FLUID PORT

- ▶ CS, DUPLEX SS, SS304/L & SS 316/L

### ACCESSORIES

#### GAS FILL VALVE

- ▶ 5/8" UNF / 7/8" UNF / 1/4" BSPP
- ▶ MOC of Gas fill valve: SS 316/L

#### GAS CHARGING BLOCK

- ▶ Design as per customer requirement
- ▶ MOC of Charing block: CS, SS304/L & SS 316/L

#### MOUNTING BRACKET & CLAMP

- ▶ Design suitable for the accumulator

#### CERTIFICATIONS

- ▶ 3.1 MTC as per EN 10204 for all pressurized parts
- ▶ NACE compliance as per MR 0175 / MR 0103 (optional)
- ▶ Hydro test certificate
- ▶ PMI certificate (optional)

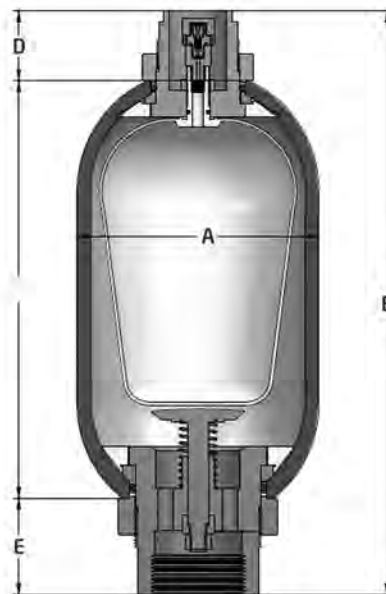
## ORDERING INFORMATION AND MODEL DE-CODIFICATION

<b>ACBW</b>	<b>A</b>	<b>10</b>	<b>CS</b>	<b>N</b>	<b>S15</b>	<b>P81</b>
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DESCRIPTION	DESIGN CODE	VOLUME	SHELL MOC	BLADDER MATERIAL	FLUID PORT SIZE	PRESSURE RATING
ACBW-WELDED ACCUMULATOR	A-ASME SEC VIII-DIV1 without U stamp	1 - 1 LITRE	CS - CS	N - NBR	S10 - 3/8"	P81 - 81 Bar
		2 - 2 LITRE			S15 - 1/2"	
		4 - 4 LITRE				
	A1-ASME SEC VIII-DIV1 with U stamp	10 - 10 LITRE	SS1 - SS316L	V - FKM	S20 - 3/4"	
		20 - 20 LITRE				
	P-BSEN standard	25 - 25 LITRE	SS2 - DUPLEX SS	E- EPDM	S25 - 1"	
		35 - 35 LITRE				
	P1-BSEN with PED	50 - 50 LITRE	SS2 - DUPLEX SS	E- EPDM	S50 - 2"	
		XX-Other volume				
	UP-U stamp+ PED		SS3 - SS316/316L (dual certified)	HN-HNBR	PXX-Other pressure rating	
	UA-U stamp+ AS1210			LN-Low temp NBR		
	UD-U stamp+ DOSH					
	XX-Others					

## DIMENSION DETAILS

BLADDER ACCUMULATOR - TOP REPAIRABLE 200 BAR. G							
NOMINAL VOLUME IN LITRES	FLUID PORT CONNECTION	WEIGHT IN KG	A	B	C	D	E
10	1/2" NPTF	28	219	557	389	76	92
20	1/2" NPTF	44	219	867	699	76	92
35	1/2" NPTF	71	219	1387	1219	76	92
40	1/2" NPTF	80	219	1522	1354	76	92
50	1/2" NPTF	100	219	1912	1744	76	92



BLADDER ACCUMULATOR - TOP REPAIRABLE 450 BAR. G							
NOMINAL VOLUME IN LITRES	FLUID PORT CONNECTION	WEIGHT IN KG	A	B	C	D	E
10	1/2" NPTF	41	228	550	393	65	90
20	1/2" NPTF	62	228	857	700	65	90
35	1/2" NPTF	98	228	1387	1230	65	90
40	1/2" NPTF	107	228	1527	1370	65	90
50	1/2" NPTF	138	228	1987	1830	65	90

Piston accumulators work similar to bladder accumulators but are completely different in terms of construction. The Piston accumulator comprises of a seamless cylinder, a floating piston with gas-tight seals and enclosed with top & bottom covers. The piston moves freely between the lower end cap and its upper position, ensuring that pressure on the gas side and the hydraulic fluid side is always equal.

### The piston accumulator consists of

- ▶ cylinder with very finely machined internal surface
- ▶ Piston seals & O-rings
- ▶ high-pressure sealing system
- ▶ end caps on the gas side and the oil side
- ▶ floating metal piston

### Cylindrical Shell

Piston accumulator is made up of high-strength seamless pipes or round bars. To enable a smooth movement of the piston the inner surface of the cylinder is machined to high degree surface finish with RA value between 0.4 microns to 0.8 microns.

The shell is designed as per ASME SEC VIII DIV.1 & BS EN 14359: 2017 standards.

### End caps

The End caps were rigidly designed with suitable threads and machined with the latest cutting-edge technology to attain an even surface finish which enables easy handling during the assembly process and field services. The end caps are equipped with O-rings with backup rings to achieve leak-free system. Provision for the gas filling, pressure gauge, and other safety devices are provided at the gas end.

### Piston

The Floated piston is made of metal for freely moving inside the shell on guide rings, which prevent metal to metal contact between the piston and the shell. It seals the operating medium from the gas chamber via the custom sealing system. The piston's special profile enables it to be lightweight, yet strong enough to respond quickly to pressure acts on it.

### Seals

The Primary function of the piston seals is to keep the gas and hydraulic fluid separation, and to provide a long last leak-free service, the primary seal and secondary seal are supported with guide rings. The seals are selected in various materials like PU/POM/PTFE/NBR/FKM. The materials are selected to withstand extreme temperature and high pressure. Also, piston seals reduce friction between moving parts, improving the lifespan of the accumulator.

## ADVANTAGES

- ▶ Extremely high flow rates
- ▶ High compression ratios
- ▶ Ability to work with gas bottl
- ▶ Can Be Mounted in any Posit
- ▶ Failure Mode Is Gradual, Prec
- ▶ Unlimited sizes/mounting

## APPLICATIONS

- ▶ Hydraulic Cranes & power ur
- ▶ Wind Turbines & Press tools
- ▶ Tooling Machines
- ▶ Construction/Mobile Vehicle
- ▶ Machine Tools



## TECHNICAL SPECIFICATIONS

### DESIGN PARAMETERS

- ▶ Volume Range: 1 - 54 litres
- ▶ Pressure Ranges 200 Bar.g, 350 Bar.g, 450 Bar.g, 690 Bar.g
- ▶ Temperature Ranges: -10°C - 95°C

### MOC of Shell

- ▶ 34 CrMo4 (SA 372 Gr. E Cl. 70)
- ▶ SS316L
- ▶ 17-4 PH
- ▶ SS 316L - on special request

### MOC OF PISTON

- ▶ 34 CrMo4 (SA 372 Gr. E Cl. 70)
- ▶ SS 316L
- ▶ Aluminium
- ▶ 17-4 PH
- ▶ DUPLEX - Others on special request

### DESIGN CODES

- ▶ ASME Sec VIII Div. -1
- ▶ BS EN 14359: 2017

### MOC OF SEALS

- ▶ PUR, POM
- ▶ PTFE
- ▶ NBR, FKM

### PROCESS CONNECTION

- ▶ 1/4", 3/8", 1/2", 3/4" and 1" - SW/NPT/BSP/ Flanged
- ▶ other higher sizes on request.



## ACCESSORIES

### GAS FILL VALVE

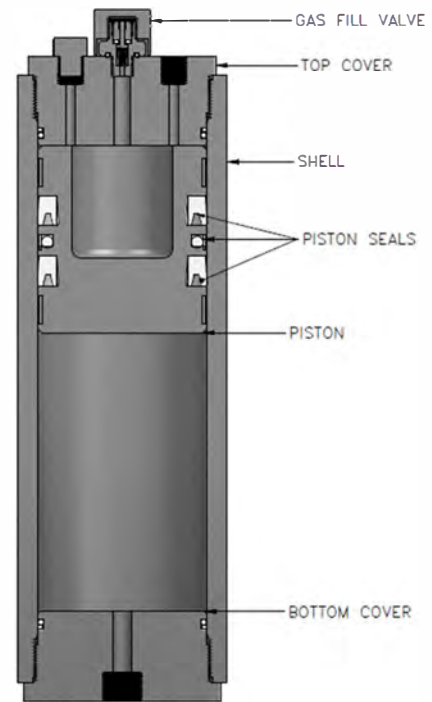
- 5/8" UNF / 7/8" UNF / 1/4" BSPP
- MOC of Gas fill valve: SS 316/L
- Burst Disc connection size 1/4" BSP

### BURST DISC

- Size: 1/4" BSP (Default). Other size on request
- Set Pressure: As per customer requirement
- MOC: SS316/L with SS316L or Inconel disc

### CERTIFICATIONS

- 3.1 MTC as per EN 10204 for all pressurized parts
- Hydro test certificate
- PMI certificate (optional)
- ASME certificate / PED certificate (optional)



## ORDERING INFORMATION AND MODEL DE-CODIFICATION

<b>ACP</b>	<b>P</b>	<b>2</b>	<b>S15</b>	<b>SS1</b>	<b>P250</b>
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DESCRIPTION	DESIGN CODE	VOLUME	FLUID PORT SIZE	SHELL MOC	PRESSURE RATING
PISTON ACCUMULATOR	A - ASME SEC VIII-DIV1 (Without U Stamp)	1.5 - 1.5 LITRE	S8 - 1/4"	CS- 34CrMO4	P200 - 200 bar
		2 - 2 LITRE			P250 - 250 bar
	A1 - ASME SEC VIII-DIV1 (With U Stamp)	2.5 - 2.5 LITRE	S10 - 3/8"	SS1 - SS 316L	P350 - 350 bar
		5 - 5 LITRE			P450 - 450 bar
	P - BS EN standard (With PED)	10 - 10 LITRE	S15 - 1/2"	SS2 - DUPLEX	P450 - 450 bar
		20 - 20 LITRE			S20 - 3/4"
	P1 - BS EN standard	35 - 35 LITRE	S25- 1"	SS3 - 17-4 PH	
		54 - 54 LITRE			

Diaphragm accumulator working principle is same as other two accumulators which is storing of fluid energy by means of compressibility of gas (nitrogen). It is usually in cylindrical or spherical shape in terms of construction. A flexible rubber diaphragm is used as the separation element for nitrogen and fluid side. The fluid side is connected to the hydraulic circuit which draws in fluid when the nitrogen is compressed, when the pressure expands, it returns the fluid energy into the circuit. An insert is incorporated into the bottom of the diaphragm to prevent extrusion through the fluid portion of the accumulator.

The diaphragm accumulator consists of

- Top and bottom shell welded with each other
- Flexible rubber diaphragm fitted inside
- Clamping ring and insert

## ADVANTAGES

- Light weight & compact design
- Low cost & small volumes
- Mounting at any position
- Good for shock absorptions

## TECHNICAL SPECIFICATIONS

### DESIGN DATA

- Volume Range: 0.16 - 2.0 litres
- Pressure Ranges 100 Bar. G, 130 Bar. G, 140 Bar. G, 210 Bar. G & 250 Bar. G
- Temperature Ranges: -10°C - 120°C

### MOC OF SHELL

- 34 CrMo4 (SA 372 Gr. E Cl. 70)
- Carbon steel with painting
- SS 316L

### MOC OF DIAPHRAGM

- Nitrile (NBR)
- Viton



### PROCESS CONNECTION

- 1/4", 3/8" 1/2", 3/4" and 1"
- other higher sizes on request.

## ORDERING INFORMATION AND MODEL DECODIFICATION

<b>ACD</b>	<b>0.16</b>	<b>S15</b>	<b>CS</b>	<b>N</b>	<b>P250</b>
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DESCRIPTION	VOLUME	PROCESS CONNECTION	SHELL MOC	BLADDER MOC	PRESSURE RATING
DIAPHRAGM ACCUMULATOR	0.16 - 0.16 LITRE	S8 - 1/4"	CS - 34CrM04	N - NITRILE (NBR)	P100 - 100 bar
	0.32 - 0.32 LITRE				P130 - 130 bar
	0.5 - 0.5 LITRE	S10 - 3/8"	SS - SS 316L		P140 - 140 bar
	0.75 - 0.75 LITRE			V - VITON	P210 - 210 bar
	1 - 1 LITRE	S15 - 1/2"	CS1 - CARBON STEEL WITH PAINTED		
	1.4 - 1.4 LITRE	S20 - 3/4"			
	2.0 - 2.0 LITRE	S25 - 1"			

## ACCUMULATOR BLADDERS

The Accumulator bladders are available in various range and the significant properties are shown below.

RUBBER PROPERTIES FOR SELECTION BASED ON	
<b>Nitrile (NBR)</b>	Good aliphatic hydrocarbon oil/fuel resistance and resilience. Limited weathering resistance and only modest temperature resistance. Typical temperature range: -20°C to +85°C (-4°F to +185°F).
<b>Butyl (IIR)</b>	Low permeability to gases and hence used for inner tubes. High damping at ambient temperatures. Good ozone, weathering, heat and chemical resistance but not oil resistant. Other uses include wire and cable applications, pharmaceutical closures and vibration isolation. Typical temperature range -20 °C to +90 °C(-4°F to 194°F)
<b>Fluorocarbon (FKM)</b>	Excellent ozone/weathering resistance; good heat resistance. Limited resistance to steam, hot water and other polar fluids (except Tetra-) although new peroxide cured grades with no metal oxides are better. Attacked by amines, limited low-temperature capabilities (except specialised grades). Typical temperature range: -20°C to +120°C (-4°F to +185°F). Properties vary significantly with type.
<b>Ethylene propylene (EPM/EPDM)</b>	Excellent ozone/weathering resistance; excellent hot water and steam resistance. Good resistance to inorganic and polar organic chemicals. Low resistance to hydrocarbons. Typical temperature range: -20°C to +90°C (-4°F to 194°F). Mineral oil/grease lubricants should not be used to aid assembly.
<b>Hydrogenated Nitrile (HNBR)</b>	Excellent Performance at both low and high temperatures. Good aliphatic hydrocarbon oil/fuel resistance and resilience same as the standard Nitrile. Typical temperature range: -50°C to +130°C (-58°F to +266°F)
<b>Low Temperature Nitrile</b>	Less amount of acrylonitrile provides low temperature resistance. Chemical resistance is slightly lower than the standard Nitrile. Typical temperature range: -40°C to 70°C (-40°F to +158°F)



## SPARES AND ACCESSORIES

### THE BLADDER ASSEMBLY KIT

The bladder assembly kit can be ordered with the following De-codification ACB-BLD-10-V. The bladder comes with stem O-ring, lock nut. On special request charging block shall be included, it is comprised with Charging block and ports for pressure gauges, burst plug. The bladders are available in wide range of materials like NBR, FKM, EPDM and butyl rubber supplied based on the requirement. The bladder stem is generally comes with SS 304/316 material, and we shall supply carbon steel on special request.

### O-RING AND GASKET ASSEMBLY

The Seal kit can be ordered with the following De-codification ACB-ORG-10-V. As a standard material in order to have an excellent chemical resistance and to withstand higher temperature resistance, FKM is used as a standard material. A set of 3 (Fluid port, bladder stem and charging block) nos. O-rings will be supplied with a Backup ring. The O-ring material shall be customized based on the requirement.



## GAS CHARGING KIT

The gas charging kit is an important equipment used for Charging, discharging any gas such as air, nitrogen, etc., and to check the pressure of the gas inside the Accumulators or any other pressure equipment. This charging kit is a firm and rigid in design which can work up to the maximum pressure of 690 Bar.G. Generally, the charging kit comes with a ring nut have 1/4" BSP which is considered as a universal gas charging thread connection size. The body consist of s of ports suitable for gauge mounting and hose connection.

### THE CHARGING KIT WILL CONSIST OF,

- ▶ Valve body with ring nut
- ▶ Pressure gauges
- ▶ Charging Hose
- ▶ Carrying case
- ▶ Seals spares kit



### VALVE BODY WITH RING NUT

The Valve body is capable of charging Maximum pressure of 690 Bar.G. Material can be either carbon steel with blackening or Duplex SS selected to enhance high strength to weight ratio. The threads are machined to high accuracy using the latest cutting-edge technology to achieve the utmost quality.

### PRESSURE GAUGES

In order to measure the charging pressure, each charging kit is comprised of a pressure gauge. Pressure gauges are available in wide ranges as per the pressure requirement. These pressure gauges come with standard connections (i.e.) 1/4" NPT connections. Other connections are supplied on special request.

### CHARGING HOSE

The high-pressure microbore hoses with antileak ends are supplied along with the charging kit. These hoses are attached with suitable leak-proof end connections. These hoses are highly flexible and have long durability in life. The hose provides safety and a controlled charging process. The length of the hose will be 2.0 M as standard. Other lengths will be available as an option.

### MINIMIZE COUPLING

The minimize coupling acts as a non-return valve. It allows the gas to pass through in one direction and retains the gas from entering back. The minimize coupling is made up of CS / SS316L material.

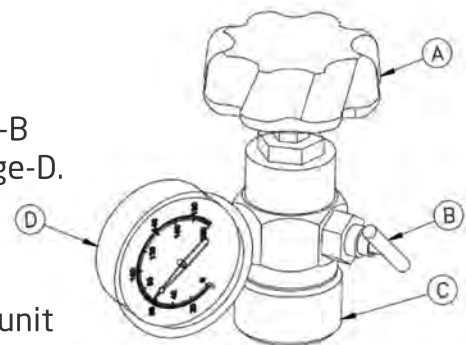
## OPERATING PROCEDURE OF CHARGING KIT

### CHARGING PROCEDURE

- Mount the valve body of the charging kit on the gas fill valve using the ring nut-C as shown below. Keep the control knobs-A at appropriate positions before starting the operation.
- Ensure the bleed valve-B is fully closed and the control knob-A on the top of the valve body is fully retracted by turning it on the counter-clockwise direction.
- Then connect the one end of the nitrogen charging kit hose with the nitrogen cylinder and another end with the valve body.
- Open the knob of the nitrogen cylinder gently and slowly.
- Allow the gas to flow at a slow rate.
- Monitor the pressure gauge-D in the valve body which will indicate the pressure at which the nitrogen gas is entering the shell.
- Close the control knob on the nitrogen gas cylinder once the pre-charge pressure is attained.
- Wait for five minutes, apply a snoop on the top side fittings to check for leakage of the nitrogen gas.

### DISCHARGING PROCEDURE

- Fit the pre-charge unit by rotating the ring nut-D.
- Screw-in valve knob-A.
- Reduce the nitrogen pressure by opening the bleed Valve-B slowly, until the required pressure is on the Pressure gauge-D.
- Close the bleed valve-B.
- Unscrew the knob -A.
- Remove the nitrogen charging unit from the accumulator unit



	CKT	450 B	S18	SS	H
DESCRIPTION	PRESSURE	SIZE	MATERIAL	HOSE LENGTH	
AIR / NITROGEN CHARGING KIT	200 B	S18 -5/8" UNF	SS- SS316L	2 m	
	400 B	S22-7/8" UNF	CS- carbon steel	6 m	
	690 B	S8-1/4" BSP	SSD- Duplex 32205	XX-Other Length Upon required	

**Note:** Customised models and materials are available based on requirements.

Above data are only for reference purpose and subject to change without any prior notice due to constant efforts on product improvement.



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