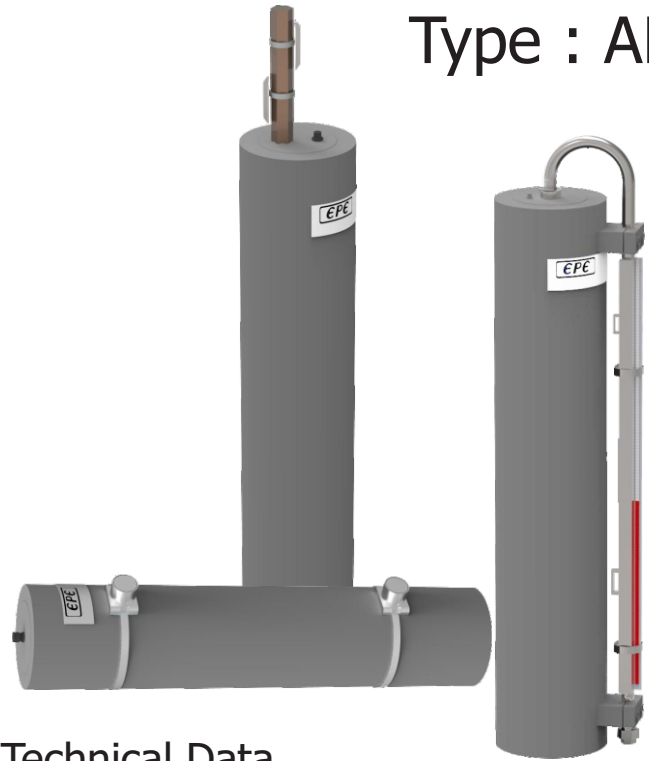
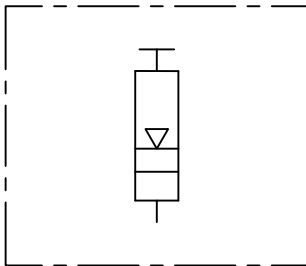


Piston Accumulator

Type : AP



Hydraulic Symbol



Specifications

Material of Construction	
Body	: Carbon Steel / Stainless Steel.
Piston	: Aluminium Alloy / SG Iron.
Piston Seals	: PU / PTFE / Viton / EPDM. Others on request.
Connections	
Gas Side	: 5/8" UNF / 1/4" BSP / 5/16" UNEF/Vg8. Others on request.
Fluid Side	: Female Threaded or Flanged. Others on request.
Paint-CS Accumulators	: Externally painted in RAL-5010. Others on request.

Description

A hydro-pneumatic piston accumulator is a device used specifically for storage of liquid under pressure. As liquids, for all practical purposes, are incompressible, this objective is achieved by utilizing the compressibility of gases.

A floating piston is fitted into the accumulator tube. An inert gas - nitrogen - is filled into the gas side through a pressure valve to a pressure P_0 . The piston moves to the bottom end, filling the entire volume V_0 of the accumulator. When the system pressure P_1 is higher than the gas precharge pressure P_0 , the liquid enters the accumulator and the piston is moved towards the gas side compressing and reducing the gas volume to V_1 . Should the liquid pressure rise to P_2 , the volume of gas reduces to V_2 with an attendant rise in pressure, thus balancing the Liquid pressure.

A potential energy is now stored in the accumulator to be utilised whenever needed.

Technical Data

Design	: Floating Piston, repairable
Max. Pressure (PS)	: 220 ~ 800 Bar.
Test Pressure (PT)	: 1.43 x PS
Temperature range	: -20°C to +80°C (Standard)
Allowable pre.ratio (P_2/P_0)	: 8:1
Nominal capacity	: 0.25 to 1500 Ltrs.
Fluid	
Fluid Viscosity range	: 10 to 400 cSt
Recommended viscosity	: 32 cSt
Fluid contamination degree:	Class 20/18/13 according to ISO 4406:1999 or better on request.

Certification

The EPE piston accumulators are generally designed & manufactured according to European directive. They can also be supplied as per ASME or others on request.

Materials

In standard version, the tube is made of seamless Carbon Steel, internally honed and externally painted; the end covers are made from Carbon Steel. The floating piston is in Aluminium Alloy & seals in PU/PTFE. This configuration is suitable for oils and non-corrosive liquids.

Options for tube in Stainless Steel / Aluminium alloy, piston in SG Iron and seals in Viton / EPDM are available on request.

Operation

Sequence of operations in the accumulator working cycle

- A) General appearance in assembled condition.
- B) Piston at bottom end of the tube occupying the entire space inside the tube after precharge.
- C&D) The accumulator in working condition between minimum pressure (C) & maximum pressure (D) delivers fluid and calculated between V_1 & V_2 i.e., $\Delta V = V_1 - V_2$.

Accumulator now has a potential energy to be utilised as desired.

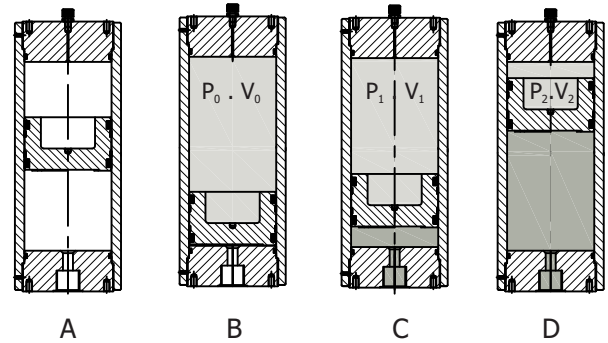


Fig. 1

Construction

The EPE piston accumulator, generally designed & manufactured according to European directive, comprises a seamless carbon steel tube in which is fitted a floating piston with gas side cover complete with a gas valve on the gas side and liquid side cover on the liquid side (Fig.2)

The accumulator tube is of seamless carbon steel - internally super-finished for low friction and externally painted - designed and manufactured to meet relevant international standards. Stainless steel construction is also available. For special applications various surface coatings are available.

The floating piston is made of light weight Aluminium Alloy with special sealing system for gas and oil application. The piston assembly is thus designed to enable quick response with low resistance at the same time ensuring sealing between the two chambers. The piston is also available with integral recovery valves to avoid build-up of pressure between seals.

The piston seals are normally of PU or PTFE construction while the end cover seals are in nitrile. For special applications seals in Viton, ethylene-propylene etc, are available.

The gas side & liquid side covers are made from Carbon Steel and are screwed into the tube at either ends.

The gas fill valve is a non return valve mounted on the gas side cover and used for filling the accumulator with Nitrogen gas to the desired pressure.

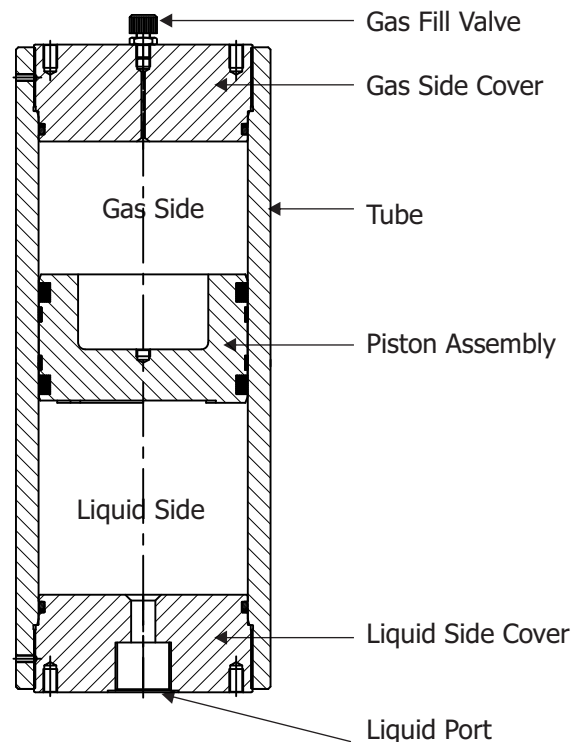


Fig. 2

Standard accumulators are with female threading at the liquid side to enable connect to the hydraulic system. On request the same can also be provided with flanged connections based on the requirement.

Sizing | Formulae

$$V_1 = \frac{C \cdot \Delta V \cdot P_2}{\Delta P}; \quad V_0 = \frac{P_1 \cdot V_1}{P_0}; \quad V_2 = V_1 - \Delta V$$

$V_0 - V_2$ is the minimum required Accumulator capacity.

Where:

C = Correction Factor

C_{Iso} = "C" for Isothermal Change of state

C_{Adia} = "C" for Adiabatic Change of state

V_0 = Total Volume (in Ltrs.)

V_1 = Volume at Min. Pressure (in Ltrs.)

V_2 = Volume at Max. Pressure (in Ltrs.)

ΔV = Stored / Displacement Volume (Ltr) i.e., $V_1 - V_2$

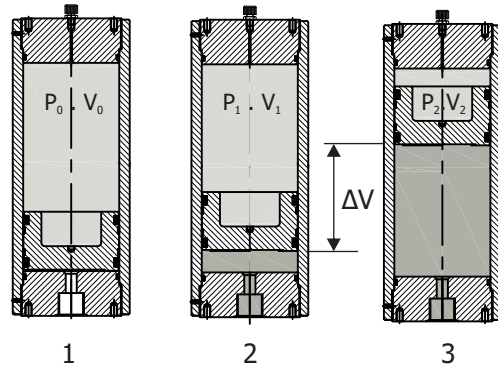


Fig. 3

P_0 = Precharge Pressure (Bar)

P_1 = Min. Working Pressure (Bar)

P_2 = Max. Working Pressure (Bar)

ΔP = $P_2 - P_1$

For applications with back-up bottles

Minimum Accumulator volume, $V_{Acc} = V_0 - V_2$ and Back-up Bottle Volume, $V_{Bot} = V_0 - V_{Acc}$

Correction Factor "C"

The values of C_{Iso} and C_{Adia} are the deciding factors for determining the required Accumulator capacity. In case the Piston Accumulator is used for an emergency application (energy reserve) Correction Factor C_{Iso} must be used. However during quick discharge applications Correction Factor C_{Adia} must be considered.

Temperature Influence

The ambient temperature must be considered only when there is a big variation in temperatures which influences the Nitrogen Temperature. This in turn influences the precharge pressure. Accordingly the additional volume to be compensated is calculated as under.

$$V_{Addl} = V_1 \cdot \left(\frac{T_{max}}{T_{min}} - 1 \right)$$

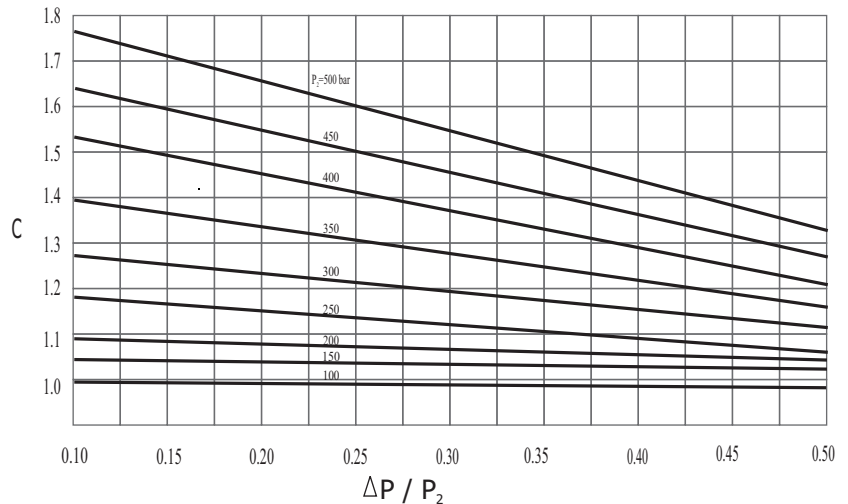
T_{max} & T_{min} are in Kelvin.

The final values will be

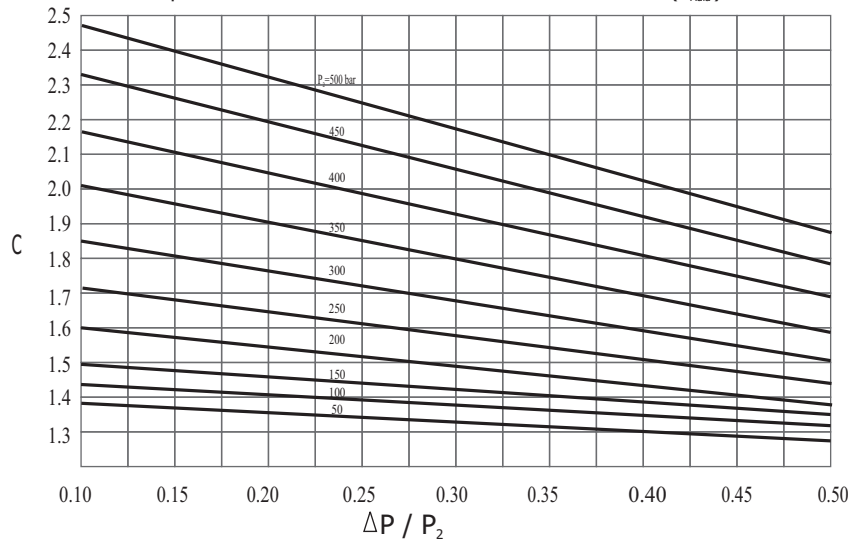
$$V_0 = V_0 + V_{Addl}; \quad V_{Acc} = V_{Acc} + V_{Addl}$$

Graphs for Correction Factor

Graph for determination of Correction Factor - Isothermal (C_{Iso})



Graph for determination of Correction Factor - Adiabatic (C_{Adia})



Ordering Code - Accumulators

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
AP - 35 - 375 - 180 - C - 2 - PPU - P - 0 - 0 - 0 - FV - 0 - G07F - 0 / P0:10 / - - -

↑ indicate only if applicable ↗

1	Series	Piston Accumulator	= AP
2	Nominal Capacity (Ltrs)	Piston dia 50mm Piston dia 80mm Piston dia 100mm Piston dia 125mm Piston dia 180mm Piston dia 250mm Piston dia 350mm Piston dia 520mm	= 0.25-1.5 = 0.5-10 = 0.5-15 = 2-25 = 6-100 = 15-200 = 100-400 = 200-1000
3	Max working pressure (Bar)	Piston dia 50mm Piston dia 80mm Piston dia 100mm Piston dia 125mm Piston dia 180mm Piston dia 250mm Piston dia 350mm Piston dia 520mm	= 250 = 300 = 375 = 330 = 220 / 375 = 220 / 350 = 220 / 350 = 220 / 285
4	Piston Diameter	Piston dia 50mm Piston dia 80mm Piston dia 100mm Piston dia 125mm Piston dia 180mm Piston dia 250mm Piston dia 350mm Piston dia 520mm	= 050 = 080 = 100 = 125 = 180 = 250 = 350 = 520
5	Tube & End Cover material	Carbon Steel Carbon Steel - Externally Nickel Coated Stainless Steel Aluminium	= C (standard) = N = X = A
6	Piston material	SG Iron Aluminium Alloy Stainless Steel	= 1 = 2 (standard) = X
7	Piston speed & Piston Seal material	Speed 3 m/s Polyurethane (PU) Seals Speed 3 m/s PTFE + Nitrile Seals Speed 3 m/s PTFE + Viton Seals Speed 3 m/s PTFE + EPDM Seals Speed 3 m/s Viton Seals Speed 3 m/s EPDM Seals Speed 0.5 m/s PU + PTFE Seals Speed 2 m/s PTFE + Nitrile Seals Speed 2 m/s PTFE + Viton Seals	= PPU (upto 180dia)-std = PTN (> 180dia) -std = PTV (> 180dia) = PTE (> 180dia) = PVV (> 180dia) = PEE (> 180dia) = FPT (upto 180dia) = TTN (upto 350dia) = TTV (upto 350dia)
8	End Cap Seals	Nitrile (NBR) Viton (FKM) Ethylene-Propylene (EPDM)	= P (standard) = V = E
9	Piston Design	Without Recovery Valve With Recovery Valve Special	= 0 (standard) = V = S

* Before ordering, check for availability

Ordering Code - Accumulators

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
AP - 35 - 375 - 180 - C - 2 - PPU - P - 0 - 0 - 0 - FV - 0 - G07F - 0 / P0:10 / - - -

↑ indicate only if applicable ↗

10	Inner Surface	Standard Others	= 0 (standard) = S
11	Gas Side - design	Standard Others	= 0 (standard) = S
12	Gas Side - connections	Gas Fill Valve - 5/8" UNF Gas Fill Valve - 5/8" UNF in SS Gas Fill Valve - 5/16" UNEF/Vg8 Gas Fill Valve - 1/4" BSP Gas Fill Valve - M16x2.0 Gas Fill Valve - Double Lock Military Valve Gas Fill Valve - M28x1.5 W/o Gas Fill Valve - With 3/4" BSP(F) port W/o Gas Fill Valve - With 1" BSP(F) port Others (xx - Design No. specified by EPE)	= FV (standard) = FX = F1 = F2 = F3 = F8 = FM = G05F = G06F = SGxx
13	Liquid Side - design	Standard Others	= 0 (standard) = S
14	Liquid Side - connections (Refer page 8 & 9 for standard connections)	1/2" BSP(F) 3/4" BSP(F) 1" BSP(F) 1-1/4" BSP(F) 1-1/2" BSP(F) 2" BSP(F) Others (yy - Design No. specified by EPE)	= G04F = G05F = G06F = G07F = G08F = G09F = SLyy
15	Test certification	Factory Testing CE/PED Design as per ASME - w/o U Stamp Design as per ASME - with U Stamp	= 0 = 8 = 7W = 7U
16	Precharge Pressure	Uncharged Condition Precharge Pressure in bar	= - = XX
17	Piston Position Monitoring Devices	Refer page 6	= -
18	Other Variants	Refer page 7	= -

* Before ordering, check for availability

Ordering Code - Accumulators

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
AP - **35** - **375** - **180** - **C** - **2** - **PPU** - **P** - **0** - **0** - **0** - **FV** - **0** - **G07F** - **0** / **P0:10** / - - -

↑ indicate only if applicable ↗

17	<p align="center">Piston Position Monitoring Devices (Refer page 14 Fig.10)</p>	<p align="center"><u>Standard Accumulator - Without any variants</u></p> <p>Electrical Limit Switching Device - Screw-in Electrical Limit Switching Device - Flanged 'xxxx' Max. Stroke Length (in mm) One Switch - type NO One Switch - type NC Two Switches - NO near Accumulator & NC far end Two Switches - NC near Accumulator & NO far end 'n' no. of Bistable Switches</p> <p>Walking Stick Design Magnetic Flapper Arrangement - for use with WS Position Transducer - for use with WS One Switch - type NO One Switch - type NC Two Switches - NO near Accumulator & NC far end Two Switches - NC near Accumulator & NO far end 'n' no. of Bistable Switches</p> <p>Exit Rod - Gas Side Exit Rod - Liquid Side One Switch - type NO One Switch - type NC Two Switches - NO near Accumulator & NC far end Two Switches - NC near Accumulator & NO far end 'n' no. of Bistable Switches</p> <p>Ultrasonic Position Switch Arrangement - External 'n' no. of Ultrasonic Position Switch</p> <p>Ultrasonic Position Switch Arrangement - Internal</p> <p>Wire Position Monitoring Device with Transducer & Display</p>	<p>= --</p> <p>= ES = EF = -xxxx = -1NO = -1NC = -2OC = -2CO = -nBS</p> <p>= WS = -MF = -PT = -1NO = -1NC = -2OC = -2CO = -nBS</p> <p>= XG = XL = -1NO = -1NC = -2OC = -2CO = -nBS</p> <p>= UE = -nUS</p> <p>= UI</p> <p>= WP</p>
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* Before ordering, check for availability

Ordering Code - Accumulators

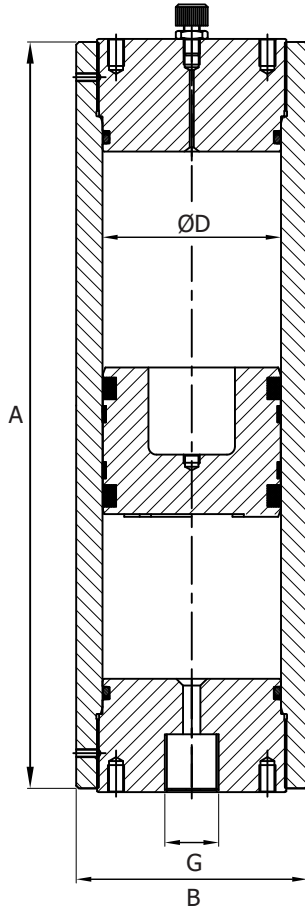
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
AP - 35 - 375 - 180 - C - 2 - PPU - P - 0 - 0 - 0 - FV - 0 - G07F - 0 / P0:10 / - - -

↑ indicate only if applicable ↓

18	Other variants	<p><u>Standard Accumulator - Without any variants</u></p> <p><u>Gas Side Variants</u> Lifting Hooks - 2 Nos. Adapter for connecting 1/4" Gauge (without gauge) Adapter with xxx bar 63mm Pressure Gauge Adapter with xxx bar rupture disc Adapter with xxx bar rupture disc + 1/4" BSPF Port Adapter with xxx bar rupture disc + yyy bar 63mm Gauge Adapter with xxx bar rupture disc + 1/4" NPTF Port Adapter with xxx bar rupture disc + 3/8" NPTF Port Adapter with xxx bar rupture disc + 1/2" NPTF Port Adapter with VS214 Gas Safety Valve set at xxx bar Adapter with VS224X Gas Safety Valve set at xxx bar Adapter with 1/4" BSP Needle Valve Adapter with 1/4" BSP Needle Valve in SS Adapter with PGSV (Pressure Gauge Shut-off Valve) Adapter with PGSV + xxx bar 63mm pressure gauge</p> <p><u>External Variants</u> Finish Paint - RAL-5003</p> <p><u>Internal Variants</u> Flushing to NAS-10 Flushing to NAS-9 Flushing to NAS-8 Flushing to NAS-7 Flushing to NAS-6 Flushing to NAS-5</p>	<p>= --</p> <p>= G07/2 = G11 = G12(XXX) = G13(XXX) = G14(XXX) = G15(XXX/YYY) = G16(XXX) = G17(XXX) = G18(XXX) = G19(XXX) = G20(XXX) = G21 = G22 = G23 = G24(XXX)</p> <p>= E01</p> <p>= F10 = F09 = F08 = F07 = F06 = F05</p>
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* Before ordering, check for availability

Dimensions - AP (upto 125 dia) | Piston Seal Kits



Type	Nominal Diameter ØD (mm)	Max. Pressure (bar)/ External Dia B (mm)		Oil Capacity (Ltrs)	Length A (mm)	Fluid Port G (BSP)	Weight Mid. Pre. (kgs)	Weight High Pre. (kgs)
		Mid Pre	High Pre					
AP-0.25	50	250	Ø60	0.25	260	1/2"	3	
AP-0.5				0.5	380		4	
AP-0.75				0.75	504		5	
AP-1				1	632		6	
AP-1.5				1.5	886		7	
AP-2				2	1141		9	
AP-2.5				2.5	1396		11	
AP-3				3	1651		12	
AP-4				4	2160		16	
AP-5				5	2670		19	
AP-0.75	80	300	Ø92	0.75	310	3/4"	8	
AP-1				1	360		9	
AP-1.5				1.5	460		10	
AP-2				2	559		11	
AP-2.5				2.5	659		13	
AP-3				3	758		14	
AP-4				4	957		16	
AP-5				5	1156		19	
AP-6				6	1355		21	
AP-8				8	1753		26	
AP-10	10	2151	32					
AP-0.75	100	375	Ø125	0.75	299	1"	19	
AP-1				1	330		20	
AP-1.5				1.5	394		22	
AP-2				2	458		24	
AP-2.5				2.5	521		27	
AP-3				3	585		29	
AP-4				4	713		33	
AP-5				5	840		38	
AP-6				6	967		42	
AP-8				8	1222		51	
AP-10				10	1477		60	
AP-12				12	1732		69	
AP-2	125	330	Ø150	2	381	1"	30	
AP-3				3	463		34	
AP-4				4	544		37	
AP-5				5	626		41	
AP-6				6	707		44	
AP-7				7	789		48	
AP-8				8	870		51	
AP-9				9	952		55	
AP-10				10	1033		58	
AP-11				11	1115		61	
AP-12				12	1196		65	
AP-13				13	1278		68	
AP-14				14	1359		72	
AP-15				15	1441		75	

* Other sizes on request

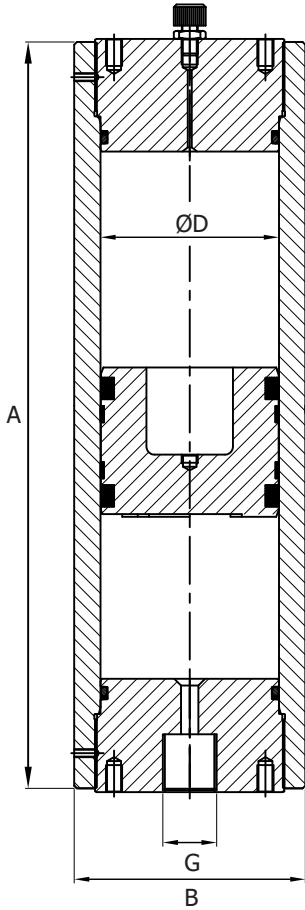
All dimensions in mm

Piston Seal Kit part numbers for re-ordering

Piston Speed	Piston Seal Material	Piston Dia 50mm	Piston Dia 80mm	Piston Dia 100mm	Piston Dia 125mm
3 m/s	Polyurethane (PU) Seals	PSK-050-PPU	PSK-080-PPU	PSK-100-PPU	PSK-125-PPU
3 m/s	PTFE + Nitrile Seals	n/a	n/a	n/a	n/a
3 m/s	PTFE + Viton Seals	n/a	n/a	n/a	n/a
3 m/s	PTFE + EPDM Seals	n/a	n/a	n/a	n/a
3 m/s	Viton Seals	n/a	n/a	n/a	n/a
3 m/s	EPDM Seals	n/a	n/a	n/a	n/a
0.5 m/s	PU + PTFE Seals	PSK-050-FPT	PSK-080-FPT	PSK-100-FPT	PSK-125-FPT
2 m/s	PTFE + Nitrile Seals	PSK-050-TTN	PSK-080-TTN	PSK-100-TTN	PSK-125-TTN
2 m/s	PTFE + Viton Seals	PSK-050-TTV	PSK-080-TTV	PSK-100-TTV	PSK-125-TTV

Note : In case End Cap Seals are also required along with Piston Seals append the End cap seal code to the above codes. Eg.. PSK-180-PPU-N

Dimensions - AP (180 dia & above) | Piston Seal Kits



Type	Nominal Diameter ØD (mm)	Max. Pressure (bar)/ External Dia B (mm)		Oil Capacity (Ltrs)	Length A (mm)	Fluid Port G (BSP)	Weight Mid. Pre. (kgs)	Weight High Pre. (kgs)				
		Mid Pre	High Pre									
AP-6	180	220 Ø207	375 Ø219	6	529	1-1/2"	74	91				
AP-8				8	608		79	98				
AP-10				10	686		84	106				
AP-15				15	883		97	125				
AP-20				20	1079		109	143				
AP-25				25	1276		122	162				
AP-30				30	1473		135	181				
AP-35				35	1669		147	200				
AP-40				40	1866		160	219				
AP-45				45	2062		173	238				
AP-50				50	2259		185	256				
AP-60				60	2652		211	294				
AP-70				70	3045		236	332				
AP-80				80	3438		261	370				
AP-90	90	3831	286	408								
AP-100	100	4224	311	446								
AP-30	250	250 Ø290	350 Ø310	30	993	1-1/2"	226	299				
AP-40				40	1197		253	341				
AP-50				50	1401		280	384				
AP-60				60	1605		307	426				
AP-70				70	1809		334	468				
AP-80				80	2013		361	510				
AP-90				90	2216		388	552				
AP-100				100	2420		416	595				
AP-110				110	2624		443	637				
AP-120				120	2828		470	679				
AP-130				130	3032		497	721				
AP-140				140	3236		524	763				
AP-150				150	3439		551	806				
AP-180				180	4051		633	932				
AP-200	200	4458	687	1017								
AP-100	350	220 Ø406	350 Ø419	100	1548	1-1/2"	639	741				
AP-120				120	1756		693	809				
AP-130				130	1860		720	843				
AP-150				150	2068		775	911				
AP-180				180	2380		856	1013				
AP-200				200	2588		910	1081				
AP-250				250	3108		1046	1251				
AP-280				280	3420		1127	1353				
AP-300				300	3628		1182	1421				
AP-350				350	4148		1317	1591				
AP-400				400	4668		1453	1761				
AP-200				520	220 Ø584		285 Ø605	200	1640	2"	1372	1624
AP-250								250	1876		1474	1763
AP-300								300	2111		1577	1902
AP-400	400	2582	1782			2179						
AP-500	500	3054	1987			2457						
AP-600	600	3525	2192			2735						
AP-700	700	3996	2397			3013						
AP-800	800	4467	2603			3290						
AP-900	900	4938	2808			3568						
AP-1000	1000	5409	3013			3845						

Note : We reserve the right to supply high pressure accumulators in place of mid pressure accumulators. If required, GA drawing may be requested for approval.

* Other sizes on request

All dimensions in mm

Piston Seal Kit part numbers for re-ordering

Piston Speed	Piston Seal Material	Piston Dia 180mm	Piston Dia 250mm	Piston Dia 350mm	Piston Dia 520mm
3 m/s	Polyurethane (PU) Seals	PSK-180-PPU	n/a	n/a	n/a
3 m/s	PTFE + Nitrile Seals	n/a	PSK-250-PTN	PSK-350-PTN	PSK-520-PTN
3 m/s	PTFE + Viton Seals	n/a	PSK-250-PTV	PSK-350-PTV	PSN-520-PTV
3 m/s	PTFE + EPDM Seals	n/a	PSK-250-PTE	PSK-350-PTE	PSK-520-PTE
3 m/s	Viton Seals	n/a	PSK-250-PVV	PSK-350-PVV	PSK-520-PVV
3 m/s	EPDM Seals	n/a	PSK-250-PEE	PSK-350-PEE	PSK-520-PEE
0.5 m/s	PU + PTFE Seals	PSK-180-FPT	n/a	n/a	n/a
2 m/s	PTFE + Nitrile Seals	PSK-180-TTN	PSK-250-FPT	PSK-350-TTN	n/a
2 m/s	PTFE + Viton Seals	PSK-180-TTV	PSK-250-TTN	PSK-350-TTV	n/a

Note : In case End Cap Seals are also required along with Piston Seals append the End cap seal code to the above codes. Eg.. PSK-180-PPU-N

General

EPE Piston Accumulators are designed, manufactured and tested in accordance with the current standards. All accumulators are carefully inspected and tested at the factory and are exactly as designated by the model code printed on the name plate. The name plate is also marked with the maximum working pressure, precharge pressure, serial number and year of manufacture.

Accumulators are normally supplied empty (uncharged). Nitrogen precharged units can be supplied on request. Test certificates if required are supplied with the accumulator, or forwarded by mail.

ATTENTION

- The max working pressure marked on the accumulator must be \geq that the calibrated pressure of the relief valve.
- Do not machine or weld the Accumulator body.
- Precharge gas must be nitrogen unless otherwise agreed between manufacturer & user.
- Do not use liquids incompatible with the material of construction.
- Before undertaking any work on the hydraulic circuit for mounting an accumulator, it is required to release the pressure completely.
- For system and personnel safety, ensure that all the necessary precautions for pressure vessels are taken.

Installation

EPE Piston Accumulator may be installed in any position. However, the vertical position (fluid port down) is preferred.

To achieve a high degree of efficiency, the accumulator should be fitted as close as possible to the installation it serves.

Leave sufficient space to allow use of the precharging equipment. The space necessary for charging & gauging kit is at least 150mm above the gas fill valve.

Leave the name plate clearly visible.

Ensure space for easy removal of Accumulator from the system.

To guarantee trouble free operation, the following points should be observed:

- A non-return valve to be fitted between pump and accumulator to prevent flow reversal.
- A relief valve must be fitted close to the accumulator and set at lower than the max. working pressure marked on the accumulator.
- A shut-off valve and a dump valve are recommended to enable periodic checks or isolating during normal operation. EPE safety blocks **Type B** incorporate all the essential functions.

Mounting Instructions

The accumulator should be properly fitted / clamped (Fig.4) on the system to ensure that the mechanical movements and vibrations are safely absorbed and that liquid and gas connections do not become additionally loaded or stressed due to over tightening.

There must be no additional forces or moments acting on the Accumulator other than those due to the fluid power system.

CONNECTION adopters and flanges are available on request. When fitting screws, reducers or the safety block, care must be taken that the accumulator is held firmly.

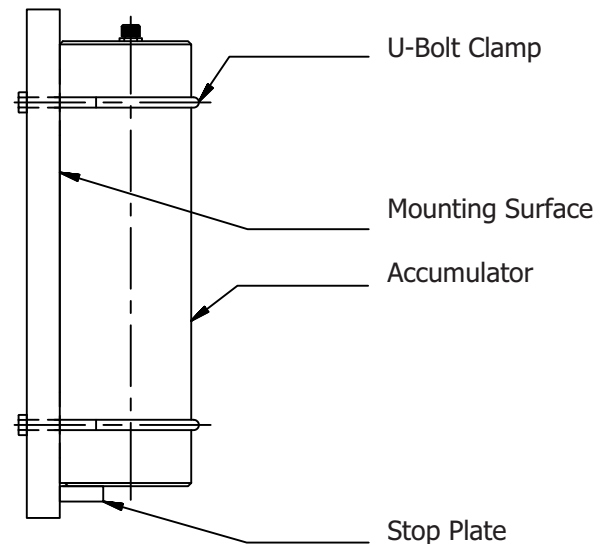


Fig.4

Position

It is suggested that the accumulators are installed vertically with gas side on top. The manufacturers name plate stating the initial pressure must be visible.

The mounting must be such that, should a rupture occur on the pipe system at the liquid connection, or should the gas fill valve break, the accumulator cannot be pulled from its mounting by the forces involved.

Preliminary Checking

On receipt of the Accumulator, check to ascertain that

- The Accumulator is not damaged in transit.
- The identification code is as per the order.
- The Accumulator is precharged to the required pressure. In general piston accumulators are precharged to 5 bar lower than the minimum working pressure. Gas precharge pressure is of crucial importance to the correct functioning of the accumulator. The gas pressure, when the accumulator is supplied pre-charged is related to the temperature of 20°C.

In case of accumulators supplied without pre-loading pressure, or after repair work, it is necessary to precharge the accumulator with nitrogen using equipment type-PC following procedure Checking & Charging - page-11.

Initial Operation

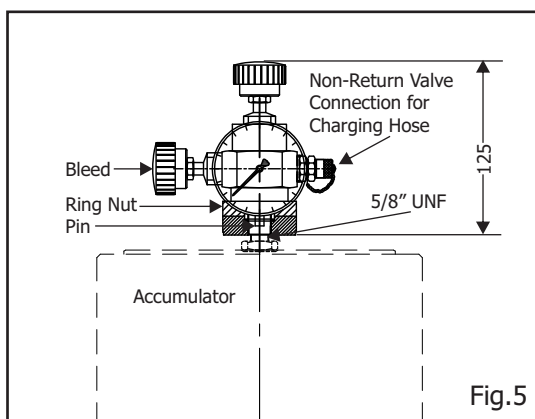
Before the system is pressurised, check that The precharge pressure in the accumulator is as required. The setting of the safety valve or relief valve is lower than the maximum working pressure of the Accumulator, and Air is vented from the piping.

Periodic Checking

After the installation of a new unit, or following repairs, the accumulator should be checked to ensure that the gas pressure has not reduced. Before checking, the Accumulator must be isolated from the system and the fluid drained. An initial check is required during the first week of installation so that any gas losses can be immediately observed and remedied.

If no gas losses are observed during the first check, a second check should be carried out approximately 3 months later and subsequent checks after every 3 to 6 months.

It is however recommend that heavy duty applications be checked every month.



Checking & Charging

Pre-Loading & Checking Set type-PC (refer Fig.6) is to be used for checking / charging of piston accumulators. When charging, the nitrogen bottles must be capable of delivering pressure higher than the desired accumulator gas pressure.

Use dry industrial nitrogen. NEVER USE OXYGEN OR AIR.

Proceed as follows:

- Fit the suitable pre-charging equipment to the gas fill valve;
- Connect it to the nitrogen cylinder with the charging hose;
- Slowly introduce nitrogen into the accumulator until reaching a pressure slightly above the required level;
- Close the valve of nitrogen cylinder and disconnect the charging hose from the equipment;
- Wait for the gas temperature stabilization;
- Set the pressure by venting off the excess of gas.

It is important that the gas pressure be kept constant and should therefore be checked periodically by means of the filling and checking equipment PC/...

The same equipment is used for charging the accumulator after repair work or change of use.

Connection is made by the special hose to the dry nitrogen bottle.

ONLY NITROGEN MUST BE USED. AIR OR OXYGEN COULD CAUSE AN EXPLOSION.

Pressure Checks

This is simple operation, the correct procedure is as follows:

- Isolate the accumulator from the system and reduce the liquid pressure to zero.
- Remove the protection cap from the gas fill valve.
- Prior to the mounting PC/ - equipment ensure that the valve A is unscrewed, that bleed valve B is closed and that non-return valve C is screwed tight. (refer Fig.6)
- Attach the unit to the gas-fill valve by means of the knurled nut D.
- Screw valve A to a point where pressure is registered.

If the pressure is OK remove the PC/unit as follows:

- Unscrew the valve A.
- Open the bleed valve B and unscrew the nut D.

Pressure Reduction

If the pressure has to be reduced this is done by opening the bleed valve B slowly until the correct pressure is registered on the gauge.

Increase or reset precharge pressure

If it is necessary to fill, or to increase the gas pressure, proceed as follows:

- Fit the PC/ unit as described above.
- Fit the connection to nitrogen cylinder. (refer Fig.6 & Fig.7)
- Connect the hose between the cylinder and the non-return valve C.
- Slowly open the valve on the cylinder till the gauge registers a pressure slightly higher than the one desired, then shut.
- Unscrew A and reduce the pressure PC/ unit to zero by means of the bleed valve B.
- Disconnect the hose from the non-return valve C. and replace cap.
- Close the bleed valve and wait approximately 5 mins. for the temperature to adjust.
- Screw valve A until the pressure can be read. This should be slightly higher than the desired pressure.
- Adjust by means of bleed valve, remove the filling unit.
- Use soapy water test for leaks.
- Replace the valve cover and protection cap.

The accumulator is ready for use.

Standard equipment PC-280/70 is supplied with two pressure gauges: the high pressure gauge (0-280 bar) is used for pre-loading values higher than 50 bar and low pressure gauge (0-70 bar) for values lower than 50 bar.

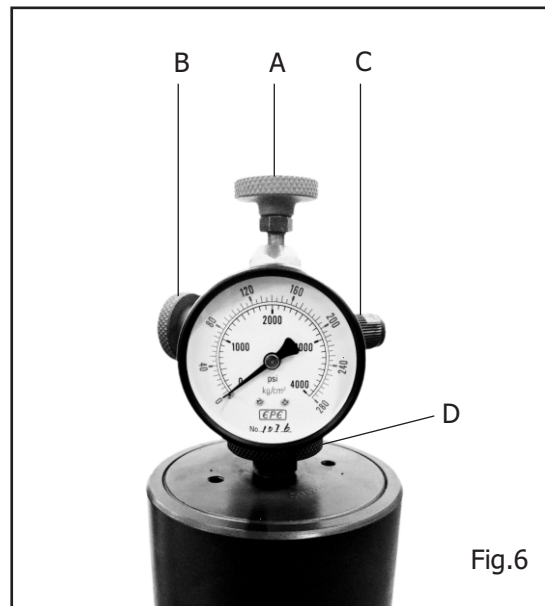


Fig.6



Fig.7

A PRESSURE REDUCING VALVE MUST BE INSTALLED BETWEEN THE NITROGEN GAS CYLINDER AND THE ACCUMULATOR WHEN THE GAS CYLINDER PRESSURE IS HIGHER THAN MAX PERMISSIBLE PRESSURE OF ACCUMULATOR.

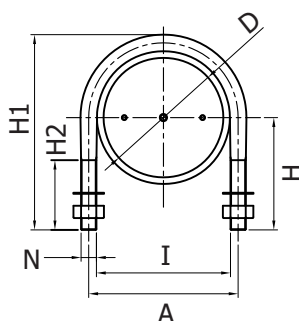


Fig.8

U-Clamp Assembly - Order code & dimensions

Accumulator Ext. Dia.	U-Clamp Assy. Code	A	D	H	H1	H2	I	N
130	11545	164	133	123	217	105	148	M16
210/220	11546	248	219	176	311	125	228	M20
292/312	11547	352	316	229	418	125	332	M20
405/419	11548	452	419	287	526	145	428	M24

Other sizes on request

Maintenance

If the Accumulator has to be stripped for any reason, the following procedure must be followed in the sequence shown below.

Before removing Accumulators for servicing, the fluid pressure must be reduced to zero by exhausting the fluid through the system and back to the reservoir.

When this is not possible the Accumulator shut-off valve must be closed and the dump valve opened to exhaust the Accumulator directly to the reservoir.

Repair

Repair work can involve replacing the Piston, Piston Seals or Gas Fill Valve.

For safety and functionality, use only parts supplied by EPE. Before any repair work is undertaken both the liquid and the gas chambers have to be completely depressurised.

Disassembly (Refer Fig.2)

- Firmly fasten the Accumulator in a vise.
- Completely depressurise the Accumulator.
- Charge the accumulator gradually with fluid under pressure in a way to bring the piston to the end of the stroke at the gas side.
- Completely discharge fluid pressure.
- Remove the Gas Fill Valve.
- Before removing the Covers tap them with aluminum hammer in order to release tension on the side of the thread.
- Screw two screws into the threaded holes and using a bar as a lever, unscrew the Gas Side Cover.
- Remove the Gas Side Cover carefully to avoid damage to Accumulator threads.
- Push out the Piston if you have access at the sides or else pull the Piston out using an eyebolt carefully to avoid damage to the Piston, Piston Seals & Accumulator threads.
- Check the internal surface of the cylinder body which should be bright and free from scratches.

Reassembly (Refer Fig.2)

- Check the internal surface of the cylinder body which should be bright and free from scratches.
- Remove all gaskets from pistons and cover rings taking precaution not to scratch or damage the faces.
- Clean the faces.
- Lubricate all the seals, gaskets and guide strips in the piston, taking care not to damage during assembly. Fit to respective faces.
- Position the assembly sleeve (Fig.9) from the end where the piston is to be inserted, and after having lubricated push the piston in towards the internal of the accumulator body.
- With the accumulator vertically positioned, with gas side towards the top, pour approximately 100 ml of mineral oil on the internal surface of the accumulator, in order to keep the gaskets lubricated in the nitrogen chamber and to avoid oxidation as a result of eventual humid residue of gas.
- Reassemble the Gas Side Cover and Gas Side Cover Ring and tighten firmly.
- Reassemble the Gas Fill Valve.

Precharge

Carry out precharging using EPE pre-loading and checking equipment, Type-PC. Only dry industrial nitrogen should be used.

Follow procedure as explained in "Checking & Charging" on page-11.

Assembly equipment

The sleeve equipment (Fig.9) is necessary to insert the piston into the accumulator after it has been stripped for maintenance (For example, when replacing piston seals) and then re-fitting the piston to the accumulator.

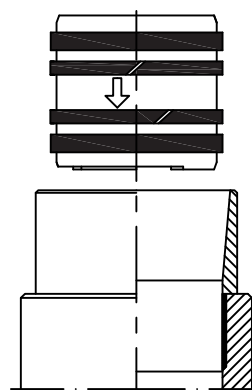


Fig.9

WARNING : Before any work is undertaken the gas pressure must be fully relieved.

Piston Position Monitoring Devices

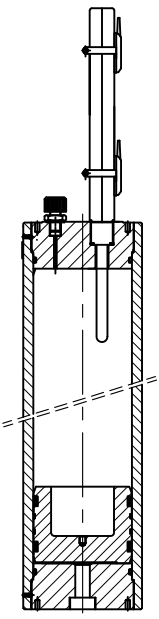
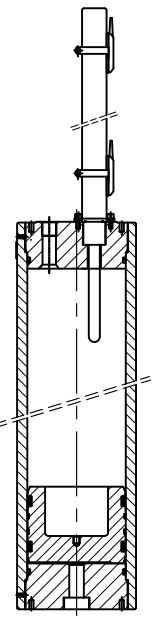
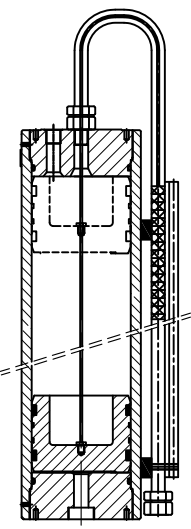
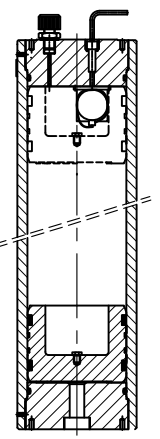
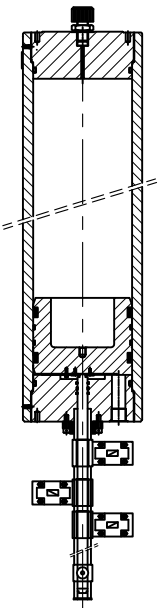
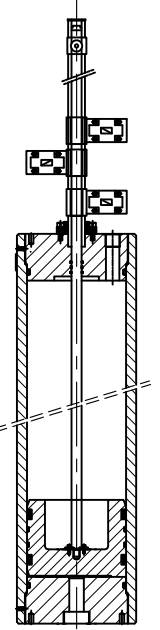
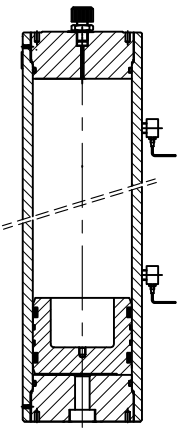
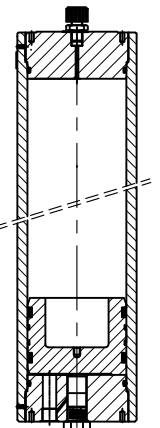
 <p>Type : ES Electrical Limit Switching Device - Screw-in</p>	 <p>Type : EF Electrical Limit Switching Device - Flanged</p>	 <p>Type : WS-MF Walking Stick Design with Magnetic Flapper Arrangement</p>	 <p>Type : WP Wire Rope Monitoring Device With transducer</p>
<p>Type : XL Exit Rod - Liquid Side</p> 	<p>Type : XG Exit Rod - Gas Side</p> 	<p>Type : UE Ultrasonic Position Switch - External</p> 	<p>Type : UI Ultrasonic Switch - Internal</p> 

Fig. 10

Special Instructions

Certification

All hydraulic accumulators are pressure vessels and are subject to the national regulations and directives, valid at the place of installation.

Piston accumulators type AP are generally designed and manufactured according to European Directive.

As per the provisions of the European Directive all accumulators with $V \leq 1$ ltr and $PS \leq 1000$ bar ($PS = \text{max. working pressure in bar}$) are not allowed to be CE marked [Articles 3; 1.1 and 1.4 (3)].

Accumulators of capacity greater than 1 ltr are eligible to be supplied with CE marking. When specified every shipping batch is provided with a conformity declaration and use and maintenance instructions.

Safety

All pressure vessels must be protected by means of a pressure relief valve in accordance with European Directive. Safety Blocks are used for this purpose.

The most important elements of the safety-related equipment are the pressure measuring device (pressure gauge), device for the preventing excess pressure (safety valves), non-return valves and shut-off valves and devices for de-pressurising (bleed valves). These functions can be performed with individual components or integrated in the form of a safety block.

Special Instructions

It is strictly forbidden to:

- weld or solder or carry out any mechanical operations on the accumulator.
- engrave or permanently stamp the surfaces of the accumulator shell and / or carry out other operations that could affect or change the mechanical properties of the accumulator
- use the accumulator as a structural element: it should not be subjected to stresses or loads.
- change the data of the nameplate and / or accumulator without the permission of the manufacturer.
- use a different fluid than those designed for.

Installation

Before installation, you must perform a visual check to verify that the accumulator has not suffered any damage during shipping / handling. Verify that the requested type matches with what stamped on the nameplate.

We recommend using the accumulator with a suitable safety valve or a security safety block. This device provides user and equipment protection against possible damage caused by pressure surges, and also makes the maintenance of the accumulator easier, so facilitating the interception and the discharge.

Provide for a clearance of 200 mm above the gas pre-charge valve to allow access to and control of the pre-charge equipment.

These accumulators may be installed in any position from horizontal to vertical (preferably with the pre-charge valve at the top), and the identification details must be visible.

Proceed to the assembly so that no abnormal force affects the pipes connected directly or indirectly to the accumulator, so we recommend the use of supporting components and also fastening to avoid the transmission of vibrations.

Make sure the fluid is compatible with the elastomer of the bladder.

Check that the max. allowed accumulator pressure is equal to or greater than that of the hydraulic circuit and that the temperature during operation is maintained within the range expected.

Make sure the fluid does not contain contaminants and/or abrasive.

Disposal

Before the accumulator is sent for disposal or recycling, it should always be discharged completely of the pre-charge pressure and the gas valve unscrewed. Pre-loading and checking kits are suited for this task.

Environmental Protection

Careless disposal of the accumulator and the residual fluid contained therein can cause environmental pollution.

Dispose the Accumulator in accordance with provisions applicable in the country of use.

Fluid residues are to be disposed according to the respective safety data sheets valid for the specific hydraulic fluids.