EPE
Filters . Accumulators

Piston type Accumulators
Type-AP

EPE Accumulators are widely used in Hydraulic Systems for following applications :

- Fluid Power Storage
- Counter Balance
- Hydraulic Semi-Shock Damper
- Emergency Energy Reserve
- Shock Absorber
- Volume Compensator
- Hydraulic Spring
- Pressure Compensator
- Fluid Separator

Technical Features

Design	:	Floating Piston, Repairable
Max. Working pressure	:	220 - 350 - 375 - 600 - 800 Bar.
Test pressure	:	1.43 times Max. Working Pressure
Temperature range	:	-10° C to +80° C
Allowable pre. Ratio (P2/P0)	:	8:1
Nominal capacity	:	0.5 to 1500 Ltrs.
Material of Construction		
Shell	:	Carbon Steel (Others on request)
Piston Seals	:	Nitrile / Viton (Others on request)
Connections - Gas Side	:	5/8" UNF (M)
Fluid Side	:	3/4" BSP(F) ~ 1-1/2" BSP(F)

Identification Code

AP	35	P	375	18	0	2	F	G	-

Accumulator Type	Nom. Capacity (ltrs)	Seal Material	Max. Pressure (bar)	Internal/Bore Diameter (mm)	Housing Material	Piston Material	Gas Fill Valve	Fluid Port Connection (1)	Others
AP = Piston Accumulator	**0.5** ~ **1500** (To Specify)	**P** = Nitrile **V** = Viton **S** = Special	**800** **600** **375** **350** **220**	**10** = 100 **12** = 125 **18** = 180 **25** = 250 **35** = 350 **52** = 520 **S** = Others	**C** = Carbon Steel **N** = Carbon Steel with Ext.Nickel Plating **X** = Stainless Steel **S** = Others	**1** = SG Iron **2** = Alu. Alloy **3** = Special	**N** = Not Fitted - 3/4" BSP(F) Threaded **F** = 5/8" UNF(M) **1** = 5/16" UNEF(M) **2** = 1/4" BSP(M) **S** = Special	**G** = Threaded **F** = Flanged (1) Connection **S** = Special (1)	- = N/A **ES** = Limit switching Device **SV** = Switch-Over Position Indicator **KME** = Position Transducer **U** = Liquid-side exit Rod **TU** = Ultrasonic Position Indicator **SC** = Ultrasonic Position Switch **S** = Special (to specify)

(1) To be specified in full besides the code.

Note : Technical specifications are subject to change.

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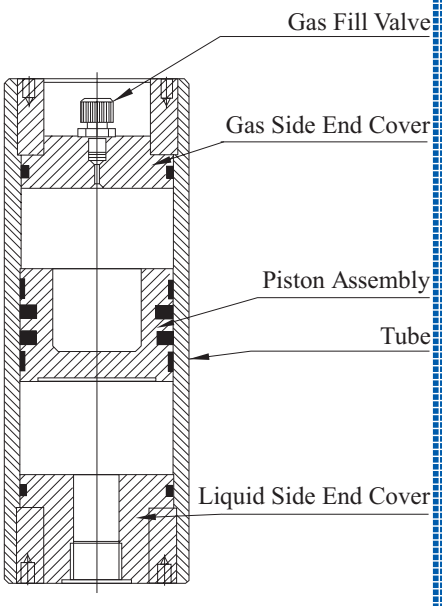


Definition:

A hydropneumatic 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 utilising the compressibility of gases.

Benefits of Accumulator:

- Less installed power
- Less heat generation
- Better efficiency
- Lower cost of operation

The ***main components*** of Piston type Accumulator are***:***

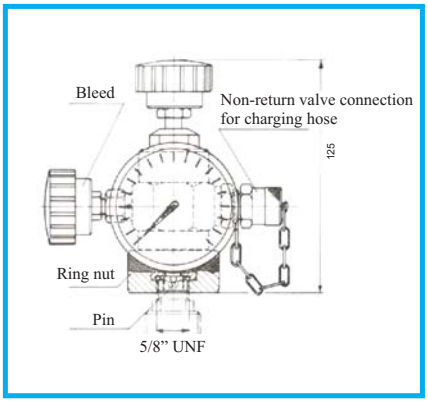
- Tube with internals worked for low friction.
- Floating Piston Assembly with Special Sealing System for gas and oil application.
- End Covers on both sides for fixing with a screw ring.
- Non-return Valve to charge Nitrogen in case of standard Accumulator.

Advantages of EPE Piston Accumulators:

- High degree of reliability.
- Low friction.
- Total discharge on full stroke. No sudden gas loss.
- Performs with low delta P.
- Less space.
- Additional gas bottles possible (Transfert).
- No Booster required if connected with charging block.
- Exact capacities of Accumulator for precise oil requirements.

Checking & Charging

Pre-Loading & Checking Set type-PC is to be used for checking / charging of welded Diaphragm 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.***

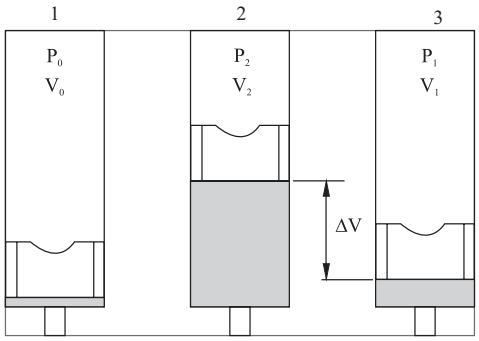
Proceed as follows:

- Fit the suitable pre-charging equipment to the gas 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.

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.

Calculations / 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.)	P_0	=	Precharge Pressure (Bar)
V_1	=	Volume at Min. Pressure (in Ltrs.)	P_1	=	Min. Working Pressure (Bar)
V_2	=	Volume at Max. Pressure (in Ltrs.)	P_2	=	Max. Working Pressure (Bar)
ΔV	=	Stored / Displacement Volume (Ltr) i.e., $V_1 - V_2$	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 Pre-charged pressure.

Accordingly the additional volume to be compensated is calculated as under.

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

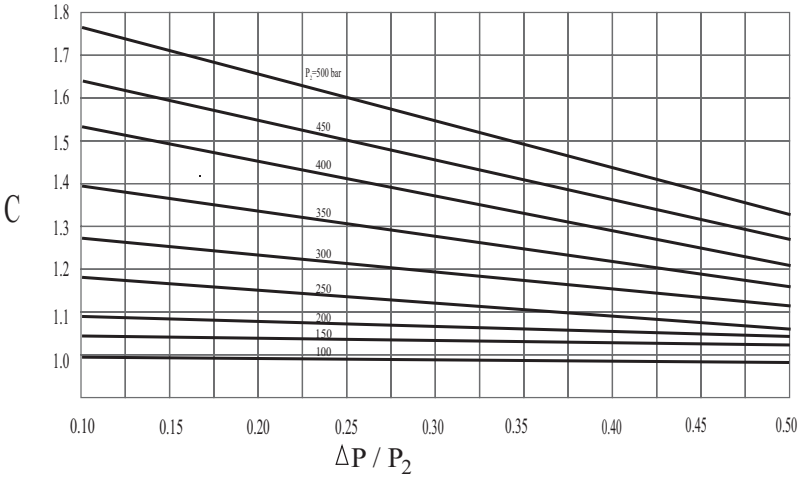
T = ambient temperature in Kelvin.

The final values will be

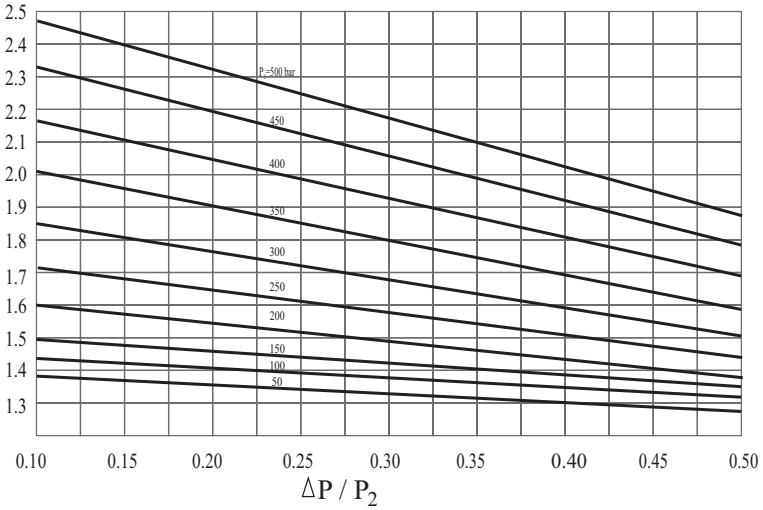
$$V_0 = V_0 + V_{Addl}; \quad V_{Acc} = V_{Acc} + V_{Addl}$$

Graphs for Correction Factor

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



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



Operation & Maintenance

The EPE Piston Accumulator is designed, manufactured and tested in accordance with current standards. The maximum working pressure, model, precharge pressure, serial number and year of manufacture are marked on the Accumulator name plate.

Instructions.

- 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.

For system & personnel safety, ensure that all the necessary precautions for pressure vessels are taken.

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.

***Before installation*,** it is essential to check that

- The working pressure marked on the Accumulator is higher that the maximum operating pressure of the system and
- The Accumulator is precharged to the required pressure.

Installation.

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

- Leave sufficient space to allow use of the precharging equipment.
- Leave the name plate clearly visible.
- Ensure space for easy removal of Accumulator from the system.

Connection to the fluid port requires

- An isolation and unloading valve.
- A relief valve.
- A pressure gauge connection.

This can easily be obtained by using standard EPE Accumulator safety blocks.

Mounting:

There must be no additional forces or moments acting on the Accumulator other than those due to the fluid power system. The Accumulator mounting (brackets, clamps etc.) must ensure that the mechanical movements and vibrations are safely absorbed so that liquid and gas connections do not become additionally loaded. No machining or welding should be carried out on the Accumulator for the purpose of mounting.

Putting into service.

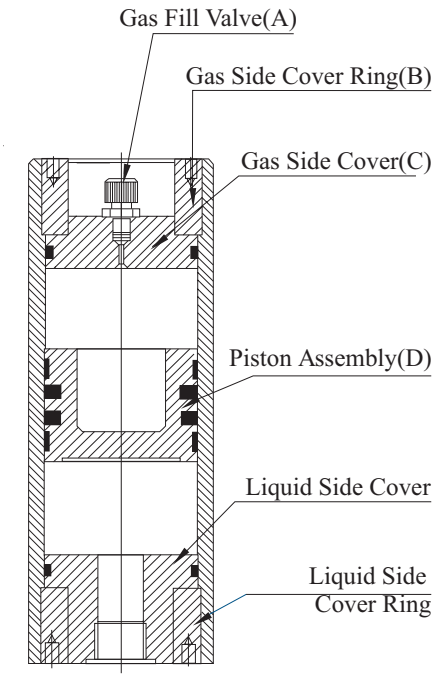
Before the system is pressurised, check that

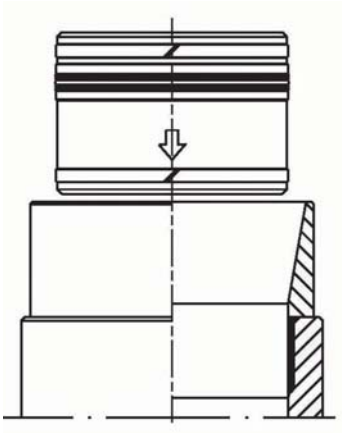
- The precharge gas is at the required pressure.
- The setting of the safety valve or relief valve is lower than the maximum working pressure of the Accumulator, and
- Air is vented from the piping.

Periodic Checks

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.

A second check should be carried out approximately 3 months later and subsequent checks after every 3 to 6 months.





Sleeve Assembly

Maintenance

Before removing the Accumulator for servicing, isolate it from the hydraulic circuit and reduce pressure to zero by draining the fluid from Accumulator to 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.

- Firmly fasten the Accumulator in a vice.
- Completely depressurise the Accumulator.
- Charge, the accumulator with fluid under pressure in a way to bring the piston and the end of the stroke at the gas side.
- Completely discharge fluid pressure.
- Remove the Gas Fill Valve (A).
- Before removing the Cover Rings 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 Ring (B).
- Remove the Gas Side Cover (C) carefully to avoid damage to Accumulator threads.
- Push out the Piston (D) 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.

- 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 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.
- Replace the Gas Fill Valve.

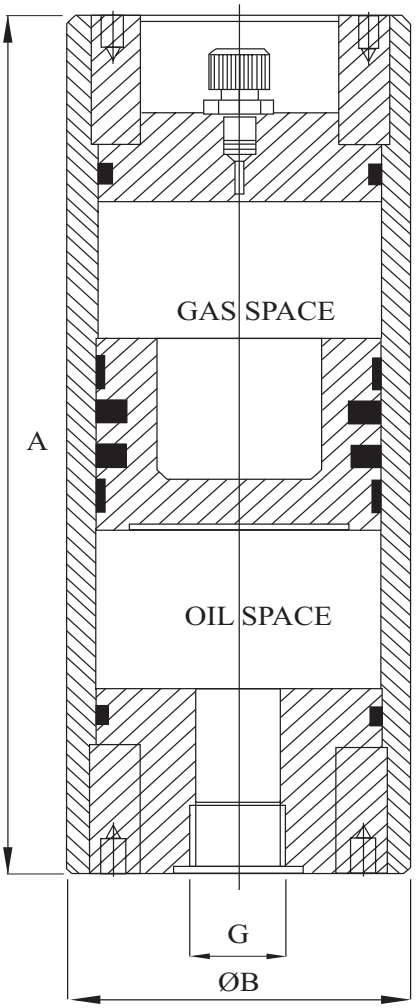
Precharge.

- 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-2.

Assembly equipment.

The sleeve equipment to re-assemble the piston accumulators is necessary every time an accumulator needs to be stripped for maintenance (For example, when replacing piston seals) and then re-fitting the piston to the accumulator.



Dimensions

Technical Features:

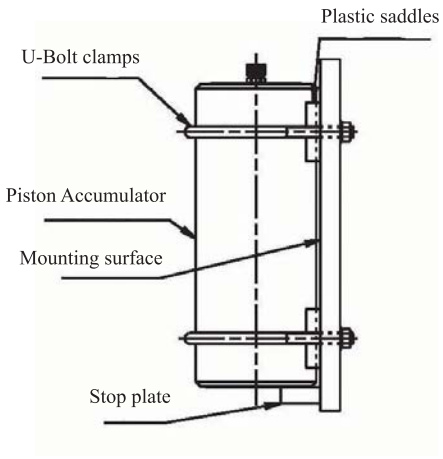
Max. working pressures : 220-350-375-600-800 bar
Test Pressure : Max. working pressure x 1.43
Piston Speed : < 2.0 m/s
Temperature range : -10º to + 80º C

Series		Max. Pressure / Ext. Diameter (mm)		Oil Capacity	Length	Fluid Connection	Weight
Type	Nominal Diameter (mm)	Mid Pressure (bar)	High Pressure (bar)	Fluid Volume (liters)	A (mm)	G (mm)	Dry Weight (kgs)
AP-0.75	100	220 Ø207	375 Ø125	0.75	336	3/4"	22
AP-1				1	368		23
AP-1.5				1.5	431		25
AP-2				2	495		28
AP-2.5				2.5	559		30
AP-3				3	622		32
AP-4				4	750		36
AP-5				5	877	1"	41
AP-6				6	1004		45
AP-8				8	1259	1-1/4"	54
AP-10				10	1514		63
AP-12				12	1768		72
AP-2	125	220 Ø207	350 Ø150	2	413	1"	33
AP-3				3	495		37
AP-4				4	576		40
AP-5				5	658		43
AP-6				6	739		47
AP-7				7	821		50
AP-8				8	902		54
AP-9				9	984		57
AP-10				10	1065		61
AP-11				11	1147		64
AP-12				12	1228		68
AP-13				13	1310		71
AP-14				14	1391		74
AP-15				15	1473		78
AP-6	180	220 Ø207	375 Ø217	6	560	1-1/2"	82
AP-8				8	640		89
AP-10				10	720		97
AP-15				15	915		115
AP-20				20	1110		132
AP-25				25	1310		150
AP-30				30	1505		168
AP-35				35	1700		186
AP-40				40	1895		203
AP-45				45	2095		221
AP-50				50	2290		239
AP-60				60	2685		275
AP-70				70	3075		310
AP-80				80	3470		346
AP-30	250	220 Ø290	350 Ø310	30	982	1-1/2"	303
AP-40				40	1185		346
AP-50				50	1390		390
AP-60				60	1592		434
AP-70				70	1796		478
AP-80				80	2000		521
AP-90				90	2204		565
AP-100				100	2407		609
AP-110				110	2611		653
AP-120				120	2815		696
AP-130				130	3018		740
AP-140				140	3222		784
AP-150				150	3426		828
AP-180				180	4037		959
AP-200				200	4444		1047
AP-100	350	220 Ø406	350 Ø419	100	1523	1-1/2"	730
AP-120				120	1731		798
AP-130				130	1835		832
AP-150				150	2043		900
AP-180				180	2355		1002
AP-200				200	2563		1070
AP-250				250	3082		1240
AP-280				280	3394		1342
AP-300				300	3602		1410
AP-350				350	4122		1580
AP-400				400	4642		1750
AP-200	520	220 Ø580	350 Ø605	200	1542	1-1/2"	1436
AP-250				250	1777		1575
AP-300				300	2013		1714
AP-400				400	2483		1991
AP-500				500	2954		2270
AP-600				600	3425		2547
AP-800				800	4367		3102
AP-1000				1,000	5309		3657

Other sizes on request

Subject to change

Mounting Arrangement



Mounting Instructions

The accumulators should be properly fitted / clamped on the system. Clamping should not cause the shell or the accumulator connection to be stressed due to over tightening. It is necessary, especially with larger capacities / lengths, horizontal mounting or with heavy units, to use fasteners (clamps, brackets etc) that support the accumulator and prevent dangerous vibrations.

To achieve a high degree of efficiency, the accumulator should be fitted as close as possible to the installation it serves. The space necessary for charging & gauging kit is atleast 150mm above the gas fill valve.

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. Moreover access to the vent screw, if any, must be kept unobstructed.

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. No welding or other mechanical process must be carried out on the accumulator shell for the purpose of attaching fasteners.

Construction

The mounting "U" Bolt Clamps for piston accumulators are manufactured from carbon steel duly surface protected. They are supplied along with 2 Nos. Nuts and flat washers.

U-Bolt Clamps

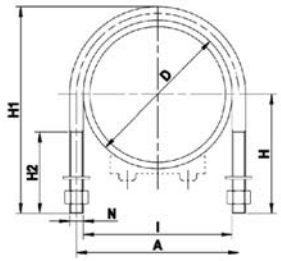


Fig.1

Plastic Pipe Saddles

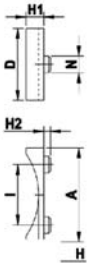


Fig.2

Dimensions & Order codes

External Diameter	Order Code	Fig.	A	D	H	H1	H2	I	N
130	11545	1	164	133	123	217	105	148	M 16
	11549	2	75	70	8	26	10	40	15
210 220	11546	1	248	219	176	311	125	228	M 20
	11550	2	140	75	8	26	10	90	25
292 312	11547	1	352	316	229	418	125	332	M 20
	11551	2	220	75	8	32	10	150	30
405 419	11548	1	452	419	287	526	145	428	M 24
	11552	2	220	75	8	32	10	150	30

Piston Position Monitoring Devices

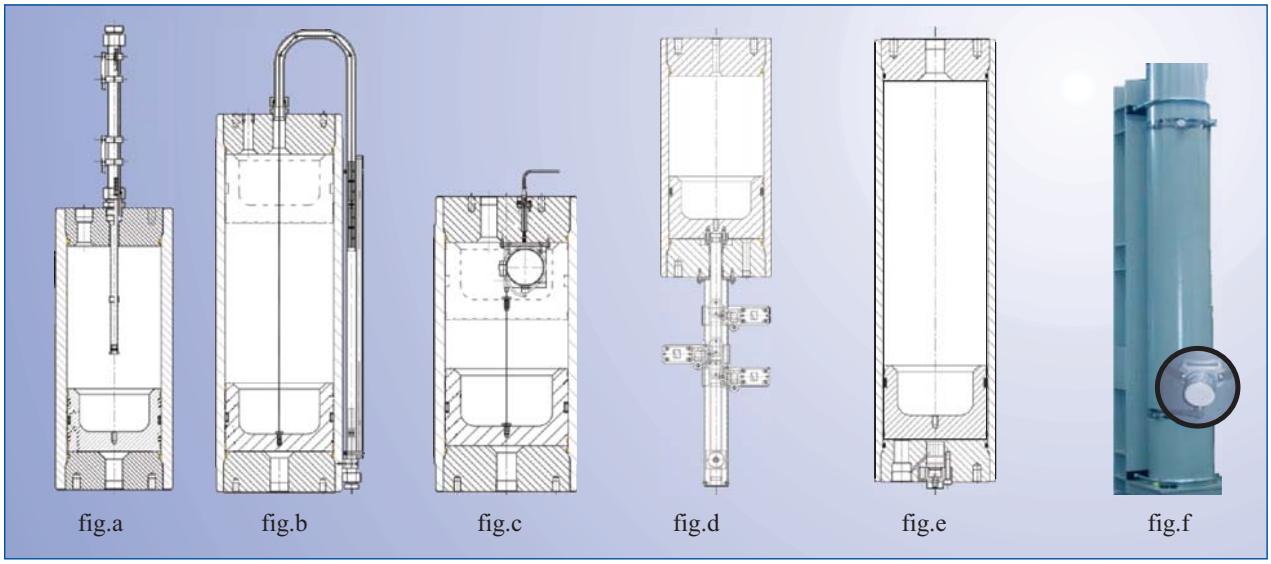


Fig.a : Limit Switching device, ***type - ES***, with 2 adjustable switch points. Stroke length - 75mm standard (others on request)
Fig.b : Flip-Over Position Indicator, ***type - SV***. Switches on request.
Fig.c : Position Monitoring Transducer, ***type - KME***, Output : 4-20 mA (others on request), with optional switches and display unit.
Fig.d : Liquid side Exit rod with Indicator Switches, ***type - U***. Gas side installation also possible.
Fig.e : Ultrasonic Position Indicator, ***type - TU***.
Fig.f : Ultrasonic Position Switch, ***type - SC***.

EPE

Filters . Accumulators

Other Products of Interest

Bladder type Accumulators
Type-AS

Welded Diaphragm Accumulators
Type-AMW

Repairable Diaphragm Accumulators
Type-AM

Safety cum Shut-Off Blocks
Type-B/BS

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