INFORMATION

0.1.1 THE FACTORY

Epe italiana is the italian leader manufacturer of hydro-pneumatic accumulators for industrial and mobile applications.
With more than 35 years' experience in this field, can offer a wide range of products all around the world.
Epe italiana products are all certified and, thanks to its qualified technicians, is able to offer the best technical solution.
Its strengths are:

- quick delivery
- excellent price-quality ratio
- customized solutions
- special coatings and surface treatments
- accumulators and components for high pressure
- ability to carry out tests in the presence of the client or the certifying body

New site: EPE ITALIANA S.r.l.
Viale Spagna, 112
20093 - COLOGNO MONZESE (MI) - ITALY

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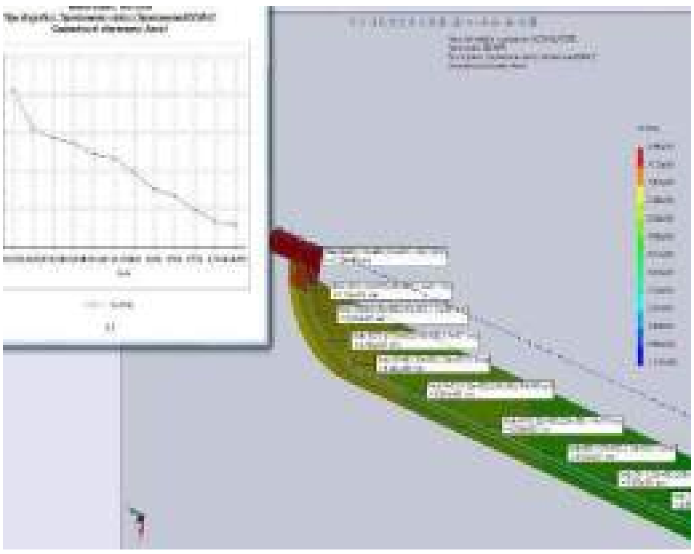
0.1.2 TECHNICAL OFFICE

New products are designed using the latest software technologies.



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0.1.3 PRODUCTION DEPARTMENT

Modern machining centers ensure highest quality accumulator parts.

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Large bore piston accumulators are machined on large capacity lathes.

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0.1.4 PAINTING ROOM

Painting room for sandblasting and special painting

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0.1.5 ASSEMBLY DEPARTMENT

Assembly department equipped for fast response to customer demands.

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0.1.6 QUALITY DEPARTMENT

ISO 9001 certified and CE audited manufacturing plant. Fig 0.1h

0.1h

0.1.7 TESTING DEPARTMENT

All accumulators are pre-charged with nitrogen and tested at four times the filling pressure or at the max pressure PS. Fig. 0.1i

0.1i

0.1.8 PACKING AND SHIPPING DEPARTMENT

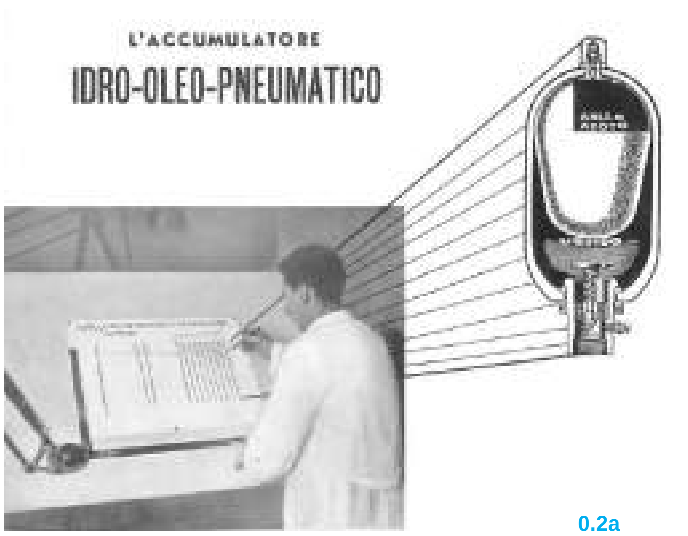
Standard and customized packaging for any special request. Fig 0.1l

0.1l

0.1m

0.2.1 COMPANY HYSTORY

The current Epoll finds its origins in 1974, when Mr. Natale Pollon was appointed by the German company Epe-Eppensteiner, a leading manufacturer of industrial filters, to activate a representation of the same in Italy in order to test the market.
Given the Italian potential, in 1975 was founded Epe Italiana, limited liability company, with offices and warehouse in Milan, but above all thanks to the intuition of Mr. Pollon that the company quickly turned into a production company participated by what originally was the house mother.
During his long experience in the purchasing department of Rexroth, in fact, Mr. Pollon accumulated an important know-how not only in filtering, but also in a technology at that time totally unknown in Italy, but valuable for the oil-hydraulic systems; the technology that gave rise to the design and production of oleo/hydro-pneumatic accumulators.
The first step towards the production was made in 1978 with the acquisition by Epe Italiana of C.I.P.I. owned by Mr. G. Coprani, a small company specialized in construction, with its own patent, of hydropneumatic bladder accumulators (gas valve separate from the bladder and bladder in one piece without joints).
Thanks to this operation is extended the production range, now consolidated in two separate production units: the German for the filters and the Italian for the accumulators.
The expansion of the production capacity and the development of the international market increased the need to create a sales network in the world for the distribution both of filters and accumulators. So, between 1986 and 1992 bore Epe France in the Paris suburbs, Epe UK Ltd., about 50 miles from London; Epe Schweiz AG, based in Dietlikon, Switzerland; Epe-Fluid Power in Barrington (USA), Epe Canada, based in Cambridge, Ontario.
In 1992 was founded Epe Process Filters & Accumulators Pvt in Hyderabad, India. This is the third production and commercial unit with representatives throughout whole India. In the same year the Dutch branch Epe Goldman, created in 1973 (it was the first branch of Eppensteiner), moves into new headquarters in Schiedam, Rotterdam with sales offices, maintenance workshop and warehouse.
The industrial and commercial enterprise of Epe Italiana lead in 1997 to the creation of a new headquarters that is for a company a sign of confirmation and development. Epe Italiana in fact moved in the establishment located in Milan, viale Rimembranze di Greco, with a production area of 1,000 sqm and 400 sqm of offices.
Is enlarged the range of products with the marketing of cylinders of the German company Haenchen Hydraulik and valves of the Polish company Fabryka Elementow "Ponar Wadowice" as well as started the production of piston accumulators and complete accumulator stations.
As a demonstration of its high construction quality, between 1999 and 2017 Epe italiana obtains ISO 9001 certification, PED, ML, ABS, AS1210, ATEX, EAC, CCS, etc...
The continuous increase in turnover, the need to hire new staff, the desire to provide customers, in all markets, a prompt and personalized service, but especially the huge commercial success of the original idea of construction of the oleo/hydro pneumatic accumulator lead Mr. Pollon to the historical decision, happened in 2003, to dissociate from the German Eppensteiner and to found a new company, the current Epoll - Epe Italiana S.r.l., building a new headquarters in Cologno Monzese (MI), with a production area of 1,500 sqm and 600 sqm of offices.
With the new plant, operative since 2007, Epoll intends to give greater impulse to its presence in Italy with continuous investment both on men and on the corporate structure through a further increase in staff in the commercial department and in the technical and assistance one.
The new headquarters represents a new milestone and is therefore crucial to strengthen the activity of the company that in the future intends to access to other related fields, without neglecting the simultaneous development of the workshop.
Today the company is set up on Italian and foreign markets as a producer of bladder, piston and diaphragm accumulators as well as accessories and certified accumulator stations; sells a wide range of industrial filters with advanced design. In addition, representing also the Polish Fabryka Elementow "Ponar Wadowice, places itself in a position to offer a complete service extremely useful for the optimization of costs and applications in industrial automation.
The sales organization and the competitiveness of products made it possible to reach an export quota of 65% compared to 35% in the national distribution, with a particular commercial success in Europe and the Far East.
With almost forty years of experience, thanks to its manufacturing quality, flexibility, prompt delivery permitted by independent production, Epoll - Epe Italiana S.r.l. was able to acquire market share increasingly important in Europe and in the world, determining the success of the company, now one of leader in the field.



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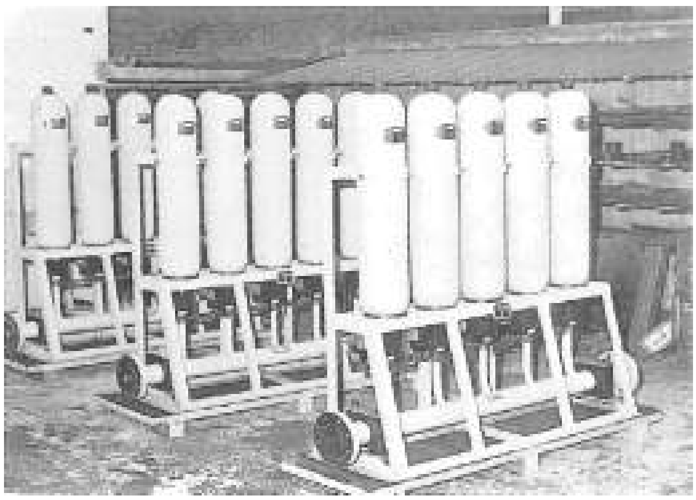
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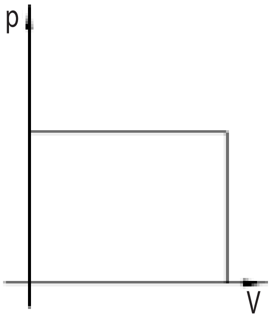
0.3.1 ACCUMULATOR HYSTORY

At the beginning of the industrial period, accumulator made his first appearance on the water systems. It was, in fact, used in presses, usually added between the pump and cylinder with the function of a Flywheel.
During the pressing phase, through a system of valves, the accumulator and the pump worked in parallel and powered the cylinder of the press.
During the discharge phase, those valves supplied the startup of the pump and consequently the functioning of the accumulator.
The use of accumulator, leading to the better functioning of installed power, lower cycle times and more power presses from a single pumping station. The accumulators commonly used at that time were the “raised weight Accumulator” and the “free hair Accumulator”.



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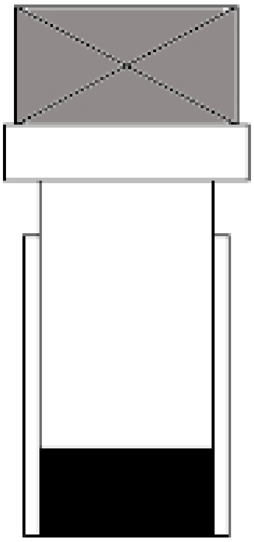

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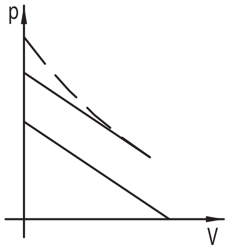
The raised weight Accumulator essentially consists in a vertical steel cylinder inside of which flowed a metal piston on which is placed a weight. The water is pumped into the cylinder so as to raise the piston and the weight; a check valve furthermore prevents the water flowing into the pump. So there is a reservoir of hydraulic energy equal to the product of the cylinder stroke by the weight above.
The weight accumulator is the only accumulator that can return a quantity of liquid at constant pressure.
An evolution of the raised weight accumulator is the spring-loaded accumulator.
The spring accumulator consists of a cylinder whose piston is charged by one or more springs. For constructional reasons could be built only in small dimensions. Moreover, this accumulator returned the fluid under pressure so inconstant and variable in time depending to the fatigue resistance of the spring.



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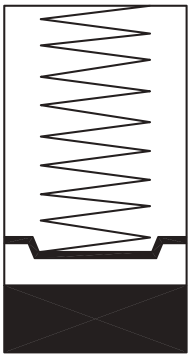

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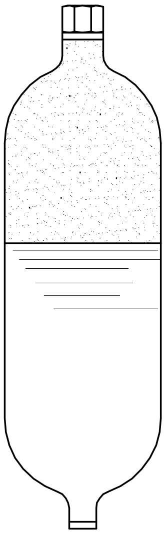
Another type of accumulators used in the past is called "free hair".
These accumulators were made of mainly of a steel shell filled with water and air. There were also a safety valve set at the working pressure (P max) and a valve of minimum pressure (P min). The first provide to discharge the water when the pressure exceeds the maximum working pressure, the second will allow the flow when the pressure was below the minimum value.



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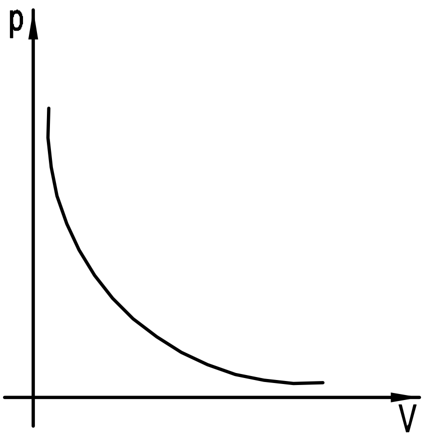
On these systems the minimum pressure of work was generally very close to maximum pressure.
P max – P min = 5% x P max
The shells were filled with liquid to approximately 50%.
It should be noted, however, that a third of the capacity of the shells was not used anyway, because the vortex that was formed during the

discharge swept away also the air.
So the shells were used for only about 20% of their total capacity.
The hydro-pneumatic accumulator had a delivery much greater than the raised weight accumulator and also, thanks to the use of air with water, or nitrogen with oil, allowed a variation of pressure contained.
This type of accumulator is still used today (though not in its original configuration) in plastic moldings, metal die casting and so on.
In 1936 a French engineer, Jean Mercier, was commissioned by a company of aircraft manufacturer to design a retractable landing gear.
Thus was born the hydropneumatic bladder accumulator.Its function on this aircraft were mainly two:
- provide hydropower to lower/raise the landing gear during takeoff and landing.
- ensure the hydro-pneumatic suspension of the aircraft during takeoff and landing on the track.

These systems built for Dewoitine (French fighter entered into the Armèe de l'Air shortly before World War II) were later adopted by Moran, Caproni, Fokker and other aviation pioneers.
The originality, simplicity and innovative performance has subsequently opened the doors to several markets, such as car manufacturing, machine tools, aviation, marine, aerospace, nuclear, petrochemical, food .... in all applications where the pressure of a liquid should be controlled or where are required high instantaneous flows.
In most of the existing hydraulic systems are increasingly used those gas accumulators with a separation between gas and liquid.
Depending on the type of item separation, the accumulators are distinguished:
- bladder accumulators
- piston accumulators
- diaphragm accumulators



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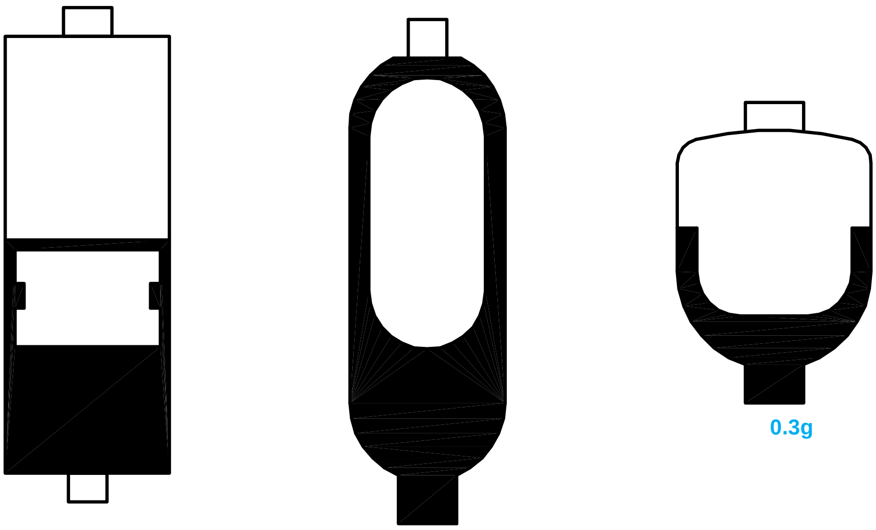

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0.4.1 NITROGEN

Nitrogen is a colorless and odourless gas. Its chemical symbol is N, its atomic number is 7, its atomic mass 14.0067, at room temperature it is gaseous, non-flammable; it's a dry gas that does not promote corrosion.

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Nitrogen was discovered in Scotland in 1772 by Daniel Rutherford, uncle of Sir Walter Scott and simultaneously, but independently by Joseph Priestley and Henry Cavendish in England and by Carl W. Scheele in Sweden. The French chemist Antoine L. Lavoisier proved that it was a chemical element and named it "azote", in fact the French have used until recently the symbol Az. The symbol N derived by nitrogen, compound word from the Greek words Nitron and genes, meaning generator of saltpeter, because one of the most important compounds, known to the ancient Greeks, was the saltpeter. From what, all the oxygenated nitrogen compounds are named with the common origin nitro. The name "azote" also comes from the Greek and means lifeless, indicating that does not support the combustion and therefore breathing, but it's not a very appropriate term in view of the fact that nitrogen is one of the fundamental constituents of the living organisms.

0.4.2 NATURAL SOURCES

Nitrogen is the most abundant element that occurs naturally in a free state, in the form of diatomic molecules. The air contains 78.06% by volume of nitrogen (75.5% by weight) and it is also found in gases emitted from volcanoes, hot springs and mines.
The most important nitrogen's mineral is nitrate of Sodium, also known as Chile saltpetre or Chile's nitre.
Nitrogen is also found in seawater in the form of ions, such as the ammonia, nitrites, and nitrates. The nitrogen used in industry is usually obtained from the fractional distillation of air liquid.

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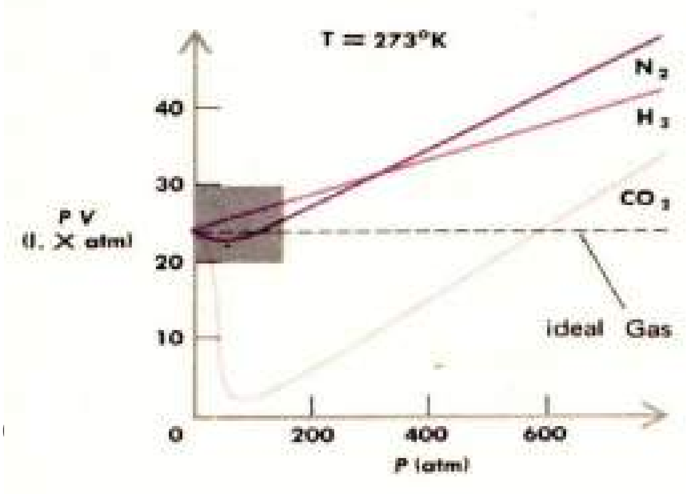
If, however, are required only small amounts of nitrogen, it can be prepared by decomposing the compounds.

0.4.3 USE

Gaseous nitrogen is an inert gas due to the high stability of the triple bond that joins the two nitrogen atoms forming the molecule.



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Nitrogen is mainly used for the synthesis of ammonia, used in turn to produce fertilizers, nitric acid, urea, hydrazine and amines. The liquid nitrogen is used as a super cooling in cryogenics, as its temperature is about -196°C. Because of its low reactivity, gaseous nitrogen is used to form an inert atmosphere within which the substances with high reactivity may be stored or processed in a controlled situation. You can remove water from organic solvents by bubbling nitrogen. Nitrogen is also used to block the oxidation reactions, for example, when the coffee is roasted.
Because of its characteristics, the gas mainly used for the pre-charge of the accumulators is nitrogen. The choice of nitrogen is dictated by its properties of inert gas, in fact, the combination air-oil at high pressure and high temperature can trigger spontaneous combustion (detonation), while nitrogen is not flammable and is stable at the variation of the temperature.
In addition, another advantage of using nitrogen is to reduce the phenomenon of aging of elastomers (bladders, seals, diaphragms), which in contact with air or other gases, could lose or reduce their elasticity in a short time . Nitrogen is easy to find on the market, it is in shells, pressurized to about 200 bar and it is quite cheap.
The pure nitrogen, commercially available, is produced by the fractional distillation of air liquid. Nitrogen, more volatile than oxygen, moves to the head of the distillation column.
For security reasons it is absolutely forbidden to use oxygen or other gases to pre-charge the accumulators.

0.4.4 TECHNICAL DATA

ATOMIC NUMBER: 7
CHEMICAL NAME: nitrogen
CHEMICAL FORMULA: N2
EC NUMBER: 231-783-9
HAZARDS IDENTIFICATION: not classified as dangerous according to Directive 67/548/EEC
COLOUR: colorless
ODOUR: none
PHYSICAL STATE: gas
PURITY: 99.6 ÷ 99,9 %

NITROGEN INFORMATIONS

BOILING POINT: -195,79 °C
MELTING/FREEZING POINT: -209,99 °C
VAPOUR DENSITY at 0 °C: 0,97 (air = 1)
CRITICAL TEMPERATURE: -146,9 °C
DENSITY: 1,25 Kg/m3
ATOMIC MASS: 14,0067

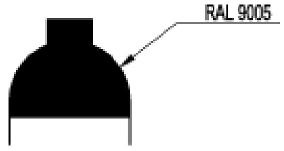
0.4.5 SAFETY

Name: Compressed Gas
Non-flammable, non-toxic gas
Classification of the substance: product not classified as hazardous under current regulations.
Classification according to Directive 67/548/EEC: not listed
Classification EC 1272/2008: H280 compressed gas.
UN n°: 1066
H.I. n°: 20
ADR classe: 2
Classification code ADR/RID: 1 A
CAS n°: 07727-37-9
CEE n°: 231-783-9

Note: for use and transport of the pressure vessel containing nitrogen follow all relevant national and international regulations.

0.4.6 HANDLING AND STORAGE

Use only specified equipment suitable on the product, to the pressure and temperature work.
Store the accumulators and/or the shells at a temperature below 50° C in a ventilated environment.
The UNI EN 1089-3 provides a system of identification of commercial compressed gas bottles with color codes of ogives; for nitrogen the ogive is colored in black RAL 9005



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0.4.7 ECOLOGICAL INFORMATION

Toxicity: does not create any ecological damage
Disposal: Dispose in the atmosphere in a well ventilate area.

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0.5.1 HYDRAULIC FLUIDS

The hydraulic fluids, also known as hydraulic liquids, are the means by which the forces and movements are transmitted in the oleodynamic systems; the most common are based on mineral oil or water. In fact, is used the incompressibility of hydraulic fluid to transmit pressure in all directions equally.

The main characteristics of a hydraulic fluids are:
- Low compressibility.
- Low variation in viscosity with temperature variations.
- Stability of chemical composition as the temperature changes.
- Good lubrication circuit (anti-adhesion, low coefficient of friction).
- Hydrolytic stability (ability to maintain the characteristics in presence of high humidity).
- Low pour point (minimum temperature at which the oil is still fluid).
- Ability to separate the water that can enter into the system for leakage from the outside or can be formed by condensation.
- Ability to quickly dispose of the heat produced by the plant.
- Filterability (ability to quickly separate from the dirt around).
- Protection against oxidation and rust.
- Low flammability.
- Resistance to cavitation (formation of air bubbles within the oil, due to sudden pressure changes, which then implode causing erosion in the metal of the pump).
- Low foam production.
- Compatibility with pipes and gaskets.
- Low toxicity and high biodegradability.
- Resistance to aging.

The hydraulic fluid for excellence since the ancient Egypt was the water, from which derived the name "Hydraulic". Since 1920 it has been mostly used mineral oil for its intrinsic lubricating properties and the ability to work even at temperatures where the water is boiling. Later they were also introduced vegetable oils derived from seeds of plants and, with the evolution of chemistry, synthetic oils.

0.5.2 MINERAL OILS

- **Unbound Oil: H or HH**
  Mineral oil without additives, with low capacity lubrication.

- **Hydraulic oil HL**
  Mineral oil resistant to oxidation and rust, but which lack the necessary additives to protect against the risk of wear.

- **Hydraulic oil: HM**
  Anti-wear and detergent mineral oil.

- **Hydraulic oil: HV**
  Mineral oil anti-wear and high viscosity index.

- **Hydraulic oil: HG**
  Anti-wear and detergent mineral oil with anti stick-slip.

- **Hydraulic oil: HS**
  Long-life synthetic oil.

- **Hydraulic oil: HLP**
  Mineral oil with additives to protect against corrosion, oxidation and wear. It's the most common hydraulic fluid.

- **Hydraulic oil: HVLP**
  Mineral oil with additives to protect against corrosion, oxidation and wear but with a viscosity higher than the HLP hydraulic oils. It is used in wider temperature range.

- **White oil USDA H1**
  Mineral oil without additives for use in systems where it might be contact with foodstuffs.

- **Mineral oil: MIL-H**
  Mineral oil usually based naphthenic with extended temperature range. It is mainly used in aeronautics.

- **Mineral oil: HD**
  Mineral oil developed for application in combustion engines.

0.5.3 COMPATIBLE LIQUID ENVIRONMENT

- **Natural oil: HETG**
  Liquid-based natural oil such as rapeseed oil or sunflower oil with additives. These fluids have low resistance to temperatures exceeding 60 ° C. Above this temperature tend to resinify, cake together and premature aging.

- **Polyethylene glycol HEPG**
  Polyethylene glycol-based liquid. Has properties similar to mineral oil.

- **Ester synthetic: HEES**
  Liquid-based carbonic acid ester, ester, polyester. Has properties similar to mineral oil.

- **Fluid: HEPR**
  Acceptable for the environment.

0.5.4 DIFFICULT FLAMMABLE LIQUIDS

- **Oil in water emulsion: HFA**
  Oil in water emulsion with water percentage greater than 80% and minimum percentage of mineral oil greater by 4%, which promotes the lubricity and prevents freezing in systems located outside.

- **Water in oil emulsion: HFB**
  The water in oil emulsion is characterized by a percentage of 50 - 60% of mineral oil. At the obtained emulsion, are normally added additives to improve the properties.

- **Aqueous glycolic solution: HFC**
  Glycolic solution or polyglycolic aqueous solution with water percentage less than 35%.
  Glycol, from English words glyc (Erin) and (Alch) ol, is chemically

defined as "bivalent aliphatic alcohol".
Water glycol has a viscosity slightly higher than the mixture of water and oil and it's less flammable, it has a poor lubricity and is incompatible with zinc plated parts and most of the varnish (with the exception of epoxidic and vinyl).

- **Liquid anhydrous: HFD**
  Anhydrous liquid with properties similar to mineral oil
  Derivatives: - phosphate acid ester: HFDR
  - chlorinated hydrocarbon: HFDS
  - Mixture of HFDR and HFDS: HFDT
  - other composition: HFDU

0.5.5 SPECIAL LIQUIDS

- **Brake fluid: AT**
  Glycol-based brake fluid.

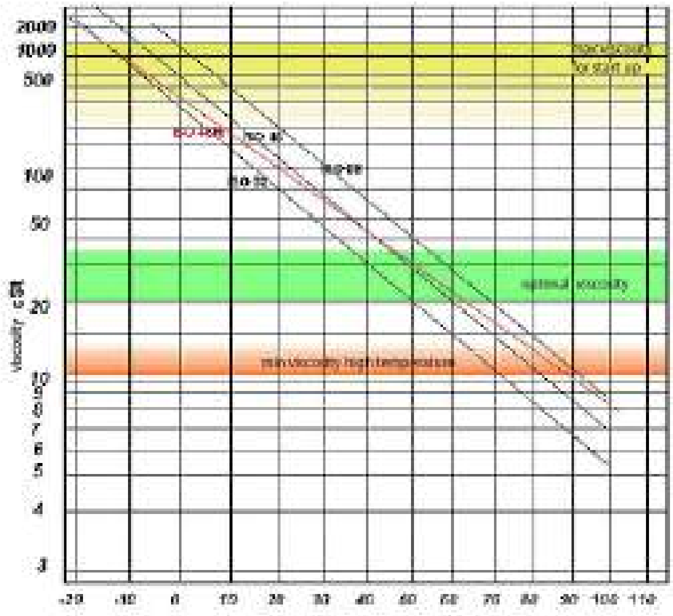
- **SKYDROL**
  Liquid for use in aeronautics

0.5.6 CLASSIFICATION OF HYDRAULIC OILS

The International Standardization Organization (ISO) has established with the rule 3448 (currently the most widely used in hydraulic oils) a classification of oils according to their viscosity grade (VG). Under this standard, the oils are labeled with letters VG followed by a number corresponding to viscosity of the oil measured in "centistokes" at a temperature of 40 ° C (eg, ISO VG 46). The scale ranges from ISO VG 2 to ISO VG 1500, but the most common grades in use are: 32, 46 and 68.
Viscosity is the resistance that a fluid opposes to the reciprocal flow of its particles. The viscosity of lubricating oil decreases with increasing temperature, so it's normally measured at a given temperature of 40°C.
The viscosity of the lubricant determines the thickness of oil film between metal surfaces in reciprocal movement.
The unit of measurement of viscosity that is generally used is centistokes (cSt) or "Engler" (E) degrees.

0.5.7 KINEMATIC VISCOSITY CHANGE DEPENDING ON THE TEMPERATURE

From the table showed below, you can see how temperature changes modify the viscosity of the oil.
The more horizontal is the characteristic oil curve, the better is the behavior of the oil at the temperature changes.



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ISO gradation	Kinematic viscosity cSt a 40 °C			Medium viscosity °E a 50°C
	min.value	max. value	med. value	
VG 2	1,98	2,42	**2,2**	1,10
VG 3	2,88	3,52	**3,2**	1,17
VG 5	4,14	5,06	**4,6**	1,29
VG 7	6,12	7,48	**6,8**	1,40
VG 10	9	11	**10**	1,60
VG 15	13,5	16,5	**15**	1,90
VG 22	19,8	24,2	**22**	2,30
VG 32	28,8	35,2	**32**	3
VG 46	41,4	50,6	**46**	4
VG 68	61,2	74,9	**68**	5,7
VG 100	90	110	**100**	8
VG 150	135	165	**150**	12
VG 220	198	242	**220**	16,5
VG 320	288	352	**320**	24
VG 460	414	506	**460**	32
VG 680	612	748	**680**	45
VG 1000	900	1100	**1000**	66
VG 1500	1350	1650	**1500**	100

0.5b

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0.6.1 PRESSURE EQUIPMENT DIRECTIVE

Pressure Equipment Directive is a directive (2014/68/EU) issued by the European Union and transposed in Italy by Legislative Decree No. 93/2000. Until May 30, 2002 it was possible to retain the existing Italian legislation and, from that date, the PED has become mandatory and replaced the previous provisions.
PED governing the design, construction, equipment and installation of pressure devices in safety.
In the field of application of the law are included, for example, pipes, hydraulic valves and vessels under a relative pressure greater than 0.5 bar.
Equipments under pressure with greater pressure of 0.5 bar must be subjected to a preliminary examination to assess whether they fall within the scope of PED and if they are subjected to the requirements of compliance, audit and attestation required by the Directive.
If the preliminary examination is successful, equipments under pressure must satisfy the essential requirements of Annex I of the Directive and then must recive the CE mark followed by the number of notification of the Notified Body.
The PED directive concerns exclusively the marketing of the pressure equipments, in the European Community, but gives no indication on the requirements relating to operation and maintenance of them, which are governed by national regulations.
In Italy all installations of pressure equipments subject to the PED directive must be communicated to the relevant offices of ISPESL or ASL (D.M. n. 329/04).
The Directive has introduced the concept of a Notified Body, which was absent in the field of pressure equipment, such as certifying body for the activities of construction of pressure equipments. The nomenclature has also been enriched by expressions such as "pressure equipment", meaning by this expression each part subject to an internal pressure (piping, pressure vessels, etc.), "pressure accessories" and "safety system", instruments that are aimed to limit the pressure in certain circumstances.
PED identifies the manufacturer as the solely responsible of the production process, assisted in some activities by the Notified Body. Last important innovation was the inclusion of a dedicated procedure for manufacturers operating in certified quality system ISO 9001/2008.
Fall within pressure equipments subjected to PED directive the following single equipment and their assemblies:

- containers: housing designed and built to contain fluids under pressure such as compressors, autoclaves, condensers, gas or steam vessels, reactors, heat exchangers, LPG spheres, etc.
- pipelines: understood as a pipe or system of pipes for the transport of pressurized fluids including any pressure-bearing components such as dismantling joints, expansion joints, flanges, fittings etc.. It does not include for example the water pipes for oil or gas (see paragraphs below);
- pressure accessories: hydraulic valves such as gate valves, butterfly valves, air valves, non-return valves, etc.
- safety controls: devices designed to protect pressure equipment against exceeding the allowable limits, and these include:
- devices for direct pressure limitation: safety valves, burst disk devices, folding bars, controlled safety devices used for the discharged pressure (CSPRS);
- limiting devices that activate control systems or that close and disable the equipment: switches, thermostats, fluid level sensors, security devices for measuring, control and regulation (SRMCR).
- sets: consisting of various pressure equipments assembled by a manufacturer to constitute an integrated and functional assembly.
  The PED requires manufacturers to identify the level of dangerousness of the equipment built. They are required to recognize the risks due to pressure and then to design and build the equipment taking into account this analysis. The threat level is linked to the concept of energy stored in the equipment.
  The stored energy is evaluated on the basis of the following parameters:
- size of equipment (volume V in liters in the case of vessels, diameter DN in millimeters in the case of pipes);
- maximum working pressure (PS): maximum pressure in bar, for which the equipment was designed, according to manufacturer's specifications.
- minimum/maximum working temperature (TS): minimum/maximum temperature for which the equipment was designed, according to manufacturer's specifications.
- fluid: pure gas, liquid, vapor or mixtures thereof. They are classified as
- fluids in Group 1: dangerous. Belong to this group the fluid
  - explosive
  - toxic
  - flammable
  - oxidizing
- fluids in Group 2: non-dangerous. Belong to this group all those who do not fall into Group 1.

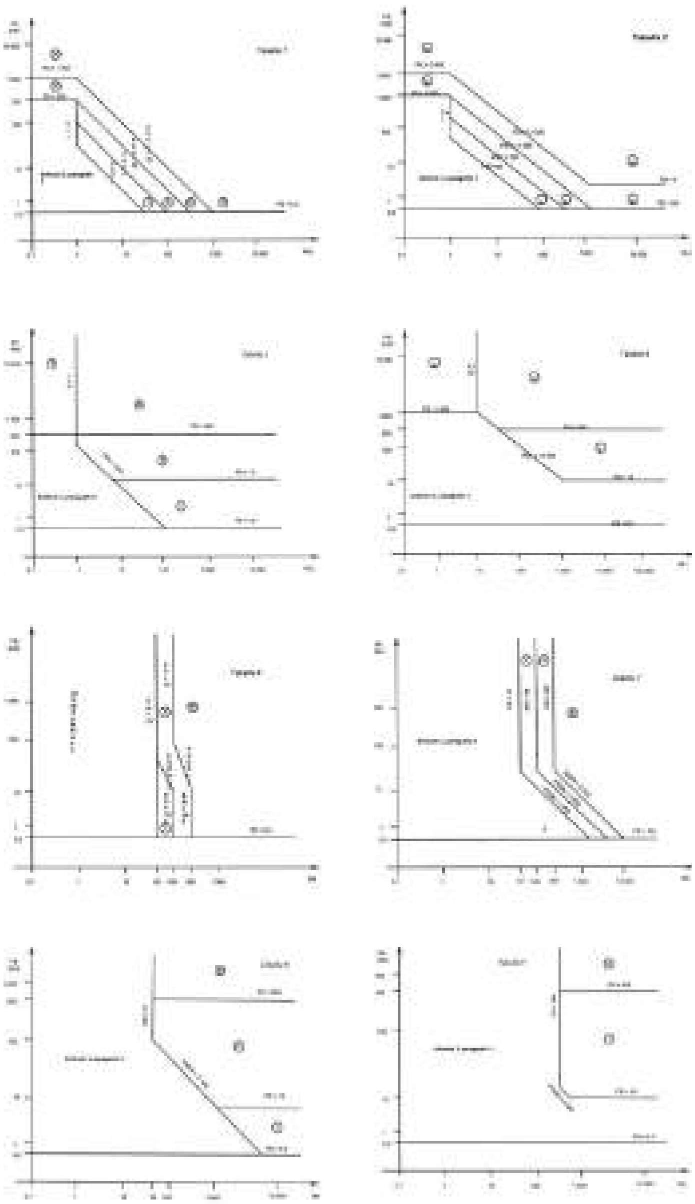
Operating conditions and installation.
According to Annex II of the Directive, depending on the type of equipment under pressure (pipe, vessel, accessories), the parent group of the fluid (dangerous or not dangerous), the physical state of the fluid (gas, liquid) and result of the calculation of PS x V, in the case of containers, PS x DN in the case of vessels, there are nine tables through which you can define the risk category (I, II, III, IV) of the component, equipment or assembly.
Equipment or assembly acquire the most severe category of risk between the risk categories of pressure equipment of which they belong, while safety accessories are automatically classified in category IV, which corresponds to that of maximum risk.
For the vessels and piping results:

Fluids	Containers	Pipes
gas group 1	table 1	table 6
gas group 2	table 2	table 7
liquid group 1	table 3	table 8
liquid group 2	table 4	table 9

0.6a

Depending on the risk category of pressure equipment, EC certification procedures vary according to the Pressure Equipment Directive.

- In the case of low limits of dangerous equipment (as provided in Article 3, paragraph 3 of the Directive), it will bear no EC marking, so you can place the product on the market accompanied by the necessary information to the purchaser for an appropriate use of the equipment. Up



0.6b

to 1,000 bar, the accumulators under a liter capacity are excluded (or better within article 3, par. 3).

- for classes I, II, III, IV is required to issue the Declaration of Conformity and stamp the EC mark, an operation that, for classes II, III and IV is authorized by the Notified Body. In order to stamp the mark, the manufacturer, in each construction phase, must follow the requirements more demanding with increasing risk class. These requirements vary according to the product supplied.

For class I, which covers less dangerous equipments, it is mandatory EC certification without the intervention of the Notified Body. In fact, the PED allows the “self-certification", that is EC marking of the equipment according to the preparation of a technical file able to demonstrate that are satisfied the essential requirements set out in Annex I of the Directive and also justifies the membership product to category I, accompanied by a declaration of conformity issued by the manufacturer and purchaser intended.
The requests are more heavy in higher classes, up to class IV, in fact:

- for Class II is mandatory EC certification issued by a Notified Body which, without considering the merits of the design, shall carry out the monitoring of production in the manner chosen by the manufacturer;
- for Class III is mandatory EC certification issued by a Notified Body. If the manufacturer has not certified its quality system including the design, there is also the execution of extensive tests on the prototype which will bear the EC mark;
- for the risk class IV is required the highest level of design and production control. We refer to the safety system (automatically) and sets consisting of vessels + pipelines that use dangerous fluids at high pressures. Class IV is never reached in the case of fluids in Group 2 with vapor pressure less than 0.5 bar (ie: water at temperatures below 110°) whatever the size of the equipment.

Directive 2014/68/EU applies only to the productive activities of the equipment under pressure and its sale. The use of the equipment does not fall directly into the European directive, but every State has adopted specific legislation for this purpose. In Italy the rule regarding the use of pressure equipment is the D.M. n° 329 of 01/12/2004.
The user of the component must still obtain the documents relating to the accumulator and should enclose them at the side of the machine.

0.6.2 RELEVANT LEGISLATION

- PED - Directive 2014/68/EU (published in Official Journal of the European Communities NL181 / 1 of 09.07.1997) certification of pressure equipment and assemblies placed on the European Community market.
- Legislative Decree No 02/25/2000 93 - Implementation of Directive 92/23/EEC concerning pressure equipment.
- Decree Law No. 329, 01/12/2004 (Published in the Official Journal of General Series No. 22, 28/01/2005) - Regulations for the commissioning and use of pressure equipment and assemblies referred to Article 19 Legislative Decree 25 February 2000, No 93. - certification of pressure equipment and assemblies placed on the European Community market
- T-PED Directive - Directive 99/36/EC (D. Lgs. No. 23 of February 2, 2000) - certification of transportable pressure equipment.

0.6.3 CERTIFIED PRESSURE EQUIPMENT

Gas Accumulators

The accumulators are to be regarded as vessels containing a liquid and a gas, according to Art. 8, paragraph 3, when a vessel is composed of several compartments, it must be classified according to the fluid results in the highest category, should then consider the case of a vessel with gas of group 2 (Nitrogen, gas not dangerous). The classification uses the diagram described in Table 2 of Annex II of the PED
Each accumulator, as it is a pressure vessel, must be provided with a safety valve.
The safety valve can be mounted on the nitrogen side or on the oil side.
When the installation location of the accumulator is provided for the fire risk, you must also install a safety device on the gas side (safety valve type VS214/VS215 or burst disk type DR / ....) calibrated at a pressure equal to or less than the PS, and / or a fusible disk DF / ... calibrated at a temperature equal to or less than the maximum TS max.
On the pipe that connects the accumulator to the system, you must mount a shut-off device, accompanied by the corresponding discharge.

Pressure relief valves

The pressure relief valves (or security valves) are special accessories directly limiting the pressure in the system. They are therefore part of the "safety system" (art. 1 par. 2.1.3) and must meet the requirements of Annex I of the Directive and be CE marked.

0.6c

0.6.4 DOCUMENTATION

Each product must be accompanied by:
- Declaration of CE Conformity
- operating and maintenance manual.

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0.7.1 REFERENCE LEGISLATION

On February 12, 2005 entered into force Decree 1 December 2004, n. 329 by the Ministry of Productive Activities, entitled: "Rules for the commissioning and use of pressure equipment and assemblies referred to Article 19 of Legislative Decree 25 February 2000, No 93" (PED).

SCOPE (article 1)

The DM 329 is applicable to:

- Pressure equipment and "assemblies" as defined by the Decree 93/2000, in particular:
- vessels of gas and liquids;
- generators of steam and hot water;
- piping intended to contain liquids and gases;
- equipment and facilities that existed prior to May 29, 2002 and approved by ISPESL (ANCC) according to the rules in force before April 19, 2000;
- simple pressure equipment regulated by legislative decree 27/09/1991 n ° 311;
- vessels and pipelines for liquids already in service before May 29, 2002 and never subjected to approval (and not falling into the conditions of exclusion provided for in Legislative Decree no. 93/2000).

Articles 4 and 6 of Ministerial Decree 329/2004 take care of the verification of first equipment (or supervision of commissioning) and the obligations of the commissioning with the declaration.

EXCLUSION FROM THE CONTROL OF THE COMMISSIONING

The following equipments and assemblies are excluded from the verification of commissioning:

- portable fire extinguishers and portable cylinders for breathing apparatus;
- simple vessels by Decree-Law No 311/1991 with pressure less than or equal to 12 bar and product pressure by volume lower than 8000 bar x liter;
- pressure vessels, including the simple equipment referred to Legislative Decree 27 September 1991, No 311, with a capacity <25 l and, if the pressure is <12 bar, with a capacity <50 liters.
- the assemblies for which from the relevant notified body or from a user inspectorate are made the verifications of the safety accessories or of the control devices.

COMMISSIONING

The current legislation provides that only for the pressure equipment or assemblies installed and assembled by the user should be done a verification of proper installation, known as first verification system or commissioning.

The test above mentioned must be requested by the user to the relevant ISPESL or ASL referred to art. 4 of the DM 329/2004.

Once the verification of first/new installation is done, the user is required, at the time of commissioning of the equipment/assembly, to send a statement of commissioning to the relevant ISPESL or ASL, which includes a numbered technical documents mentioned in Art. 6 of Decree 329/2004, including the report of the first verification system.

DECLARATION OF COMMISSIONING

The declaration of commissioning, to be sent to ISPESL and to USL or to ASL responsible, must contain:

- a list of the items, with respective values of pressure, temperature, capacity, and the working fluid;
- a technical report, with the plant diagram, containing the conditions of installation and operation, security measures, protection and control measures adopted;
- an explicit declaration, drawn up under Article 2 of Decree of the President of the Republic of 20 October 1998, no 403, stating that the installation was done according to the operating Manual;
- the report issued by the supervisor and provided to the company at the end of the verification, if required;
- a list of components operating under viscose sliding or subjected to few cycle fatigue.
- the timing of periodical re-testing equipment (article 10 and Tables "Annex A and B" of the DM 329/2004)
- exemption from periodic re-testing (Article 11).

The documentation of the new equipment and/or assembly, built according to the PED, is now made up of the Declaration of Conformity issued by the manufacturer and supplemented by the operation and maintenance manual, rather than the ISPELS booklet that accompanied pressure vessels built in accordance with the previous legislation.

VERIFICATION OF PERIODIC CHECKS:

The current law puts in the hands of the end users of pressure equipment/assembly a number of obligations related to periodical checks which they are subjected.

In particular, users are obliged to:

- Submit equipment/sets to regular checks.
- Exclude from operation the equipment/sets that are not subject to periodic checks on time.
- Encourage and provide the necessary assistance for the conduct of periodic inspections.
- Communicate the decommissioning and/or restart of equipment/assembly.

CLASSIFICATION

The Ministerial Decree 329/2004 provides that the pressure equipment falling within the scope of the decree, should be classified under the categories defined in Annex II of the Decree 93/2000 and, consequently, defined the frequency of checks for the requalification.

The classification must be made by the user even for the equipment in use before the entry into force of Legislative Decree no. 93/2000.

This technical specialist evaluation can be, if deemed necessary by the official ASL/ARPA responsible for periodic review, adequately supported by a specific document showing the appropriate arguments and technical considerations to support the classification made and signed by appropriate technical authority.

FREQUENCY

The Ministerial Decree 329/2004 regulates the frequency of checks according to the two tables annexed to the same Ministerial Decree (Table 0.7a and Table 0.7b).

The classification according to the fluid inside is approximately as follows:

a) fluids in group 1 include dangerous fluids (fluids are defined as hazardous substances or preparations as defined in Article 2, Section 2, of Legislative Decree no. 52/97, such as “explosive”, "extremely flammable", "highly flammable”, “flammable” when the maximum allowable temperature is above flashpoint, “highly toxic”, ”toxic” and “oxidizing”) for such cases, the frequency of the periodic examination is two years.

b) For all the fluids in Group 2 such as air, air/water, nitrogen, argon, carbon dioxide, etc.., the frequency may be three or four years depending

on the category.
Regarding to the discipline of the safety at the workplace, the law 81/2008, art. 71 provides that all equipments (including pressure vessels) are subjected to periodic inspections.
The first review is carried out by ISPESL which must execute the task within sixty days from the request. After that period the manufacturer can ask to the ASL to carry out this job to a public or private authorized entity.
Further checks are carried out by ASL, which provides within thirty days from the request after which the employer may make use of public or private entity authorized.

EXEMPTIONS FROM THE REGULAR REDEVELOPMENT
Are excluded from the requirement of periodic requalification:
a) vessels containing fluids in Group 2, excluding water vapor, which are not subjected to internal or external corrosion, provided the pressure PS is less than or equal to 12 bar and the product of PS and the volume V does not exceed 12,000 bar x l;
b) vessels with volume less than 1000 liters and pressure PS less than or equal to 30 bar belonging to cooling plants in which are not mounted vessels with volume and pressure greater than those indicated in letter a);
c) vessels of water vapor self-producers for which the product of pressure PS in bar to volume in liters does not exceed 300 and pressure PS does not exceed 10 bar;
d) vessels of water vapor does not self-producers for which the product of the pressure PS in bar to volume in liters does not exceed 400 and pressure PS does not exceed 10 bar;
e) acetylene generators;
f) the steam converters, traps, condensate separators, oil separators mounted along the pipelines of vapors or gases, filters, receivers and distributors barrels of vapor or gas and power machines belonging to category I and II for which do not occur the conditions laid down in Article 2, paragraph 1, letter o);
g) All vessels containing liquids of Group 2;
h) the tubes containing fluids of Group 2 and classified in category I and II;
i) portable fire extinguishers, powder, foam or water-based with a gas cartridge whose pressure is less than or equal to 18 bar.

PRESSURE EQUIPMENT	LIMITS AND FREQUENCY OF INSPECTIONS
EQUIPMENT/SETS CONTAINING FLUIDS OF GROUP 1 (Legislative Decree no. 93/2000 Art. 3)	
Vessels/Assemblies classified in category III and IV, vessels containing unstable gases belonging to category I to IV, furnaces for the chemical industries and similar, generators and vessels for overheated liquids different than water.	Frequency of inspections: - every 2 years: functional test - every 10 years: integrity test
Vessels/Assemblies classified in category I and II	Frequency of inspections: - every 4 years: functional test - every 10 years: integrity test
Pipelines for gas, vapor and overheated liquids classified in category I, II and III	Frequency of inspections: - every 5 years: functional test - every 10 years: integrity test
Pipelines for liquids classified in category I, II and III	Frequency of inspections: - every 5 years: functional test - every 10 years: integrity test
Vessels for liquids classified in category I, II and III	Frequency of inspections: - every 5 years: functional test - every 10 years: integrity test

0.7a

PRESSURE EQUIPMENT	LIMITS AND FREQUENCY OF INSPECTIONS
EQUIPMENT/SETS CONTAINING FLUIDS OF GROUP 2 (Legislative Decree no. 93/2000 Art. 3)	
Vessels/Assemblies containing compressed gases, liquefied or dissolved or vapor other than water vapor classified in category III and IV and vessels of water vapor and water overheated in category I to IV.	Frequency of inspections: - every 3 years: functional test - every 10 years: integrity test
Vessels/Assemblies containing compressed gases, liquefied or dissolved or vapor other than water vapor classified in category I and II.	Frequency of inspections: - every 4 years: functional test - every 10 years: integrity test
Water vapor generator	Frequency of inspections: - every 2 years: functional test and inside inspection - every 10 years: integrity test
Pipelines for gas, vapor and overheated liquids classified in category III	Frequency of inspections: for TS<= 350 °C - every 10 years: integrity test for TS> 350 °C - every 5 years: functional test; - every 10 years: integrity test
Pipelines for liquids	No test
Vessels for liquids	No test
Bottles for breathing apparatus	- for underwater use: initial review every 4 years; following every 2 - for no-underwater use: review every 10 years
Portable fire extinguishers	- No corrosive gas: review every 10 years - Corrosive gas: review every 3 years

0.7b

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0.8.1 GENERAL INFORMATION

The abbreviation ATEX (**AT**mosphere **EX**plosive) refers to two European Union directives on the risk of explosion in different areas.
The first ATEX directive (2014/34/EU) (ATEX 95) regards the requirements for equipment intended to use in areas at risk of explosion.
The second ATEX Directive (99/92/EC) (Atex 137) concerns the minimum safety and health requirements that areas at risk of explosion must satisfy.
These directives, which came into force from July 1, 2003, harmonize and align the different laws of the Member States relating to safety rules and equipment to use in potentially explosive areas.
In particular, the ATEX (2014/34/EU) identifies different groups and areas of risk, defining the technical/ construction features of the equipment suitable for operating in these groups/areas.
The new ATEX Directive 2014/34/EU, entered into force from 20 April 2016, is the alignment result of the previous Directive ATEX 94/9/EC for the “New Legislative Framework” (NLF), in particular with Decision 768/2008/EC, and with regard to provisions of the Treaty on the functioning of the EU (TFEU), after the Lisbon Treaty.
The new Directive appears quite different to the Directive it will replace but other than rewording, reformatting, reordering and clarifications, the actual changes and the impact on manufacturers is relatively slight.

The main changes are as follows:

- **Terminology changes, clarifications and additions**
  As with the other Directives which have been aligned with the NLF, a number of terms have been changed and even some new terms have been introduced
- **Scope**
  The types of products which are covered by the directive remains the same, however the scope has been modified to make it clear that components intended to be incorporated into equipment and protective systems, do fall within the scope of the ATEX Directive.
- **Obligations of Economic Operators**
  The Directive now specifically details the obligations of Manufacturers, Authorised Representatives, Importers and Distributors.
- **Essential health and safety requirements**
  The requirements of manufacturers contained within the Annex II of the Directive, concerning the Essential health and safety requirements remain largely the same as the previous Directive. The only potentially significant difference is contained within clause 1.5 which contains requirements with respect to safety-related-devices. The clause now states that the ‘fail-safe principle’ should be applied in general, as opposed to just the electrical circuits, as was the previous requirement. In reality the majority of manufactures have already been applying the fail-safe principle to all systems in their products where necessary as determined through the use of Ignition Hazard Assessment and Harmonised Standards.
- **Assessment modules**
  The assessment modules have been aligned with the NLF and Decision 768/2008/EC.
- **EU Declaration of Conformity**
  The EC Declaration of Conformity is now referred to as an EU Declaration of Conformity and should now include more detailed information.
- **Other changes**
  There are a number of other differences between the current and new ATEX Directives, but theses generally will only affect the operation of notified bodies and member states and will not require manufacturers and other economic operators to make changes in order for them to be accommodated.

0.8.2 CORRESPONDENCE BETWEEN RISK AREAS AND TYPES OF EQUIPMENT

Zone 0 / 20 Danger constant
Permanent presence of explosive gases (**G**): Zone **0**
Permanent presence of explosive gases and / or combustible dust (D) zone **20**.
Zone 1 / 21 Potential danger
Occasional presence of explosive gases (**G**): zone **1**
Occasional presence of explosive gases and/or combustible dust (D): Zone **21**, during normal operation.
Zone 2 / 22 Danger lower
Improbable or only for a short time the presence of explosive gases (**G**): Zone **2**
Improbable or only for a short time the presence of explosive gases and/or combustible dust (**D**) zone **22**.

0.8.3 MAIN DIFFERENCES BETWEEN AREAS WITH DUST AND GAS

A potentially explosive atmosphere is composed of a mixture of air and flammable substances in the form of gases, vapors, mists or dusts in which, after ignition, combustion spreads to the entire unburned mixture.
The main difference between a gas and a dusty atmosphere is the mass per unit volume; that of gas and vapor is about 1000 times smaller than that of powders.
Furthermore, the gases dispel into the air for convection and diffusion to form a homogeneous atmosphere. The powders are much heavier than air and settles more or less quickly.
The powder to be flammable should generally have a particle size less than 0.3 mm and a concentration greater than 50 g/m3.

0.8.4 CONSTRUCTION

All equipments intended for use in areas classified at risk of explosion must be designed and constructed in accordance with ATEX Directive 2014/34/EU and according to European standards EN 1127-1 (explosion prevention and protection) and EN 13464-1 (non-electrical equipment for potentially explosive atmospheres).
For example, the hydropneumatic accumulator from the perspective of the ATEX directive is a non-electrical appliance. However, all its components must be analyzed according to the procedures for assessing the compliance to the directive. In addition, the EN 13463-1 defines all the specific requirements of the materials admitted, impact tests, etc.

0.8.5 CLASSES OF TEMPERATURE IN THE ATMOSPHERE WITH GAS

Equipment suitable to operate in a potentially explosive gas atmosphere, have a further specification according to the maximum surface temperature reachable during the operation, which must be less than the ignition temperature of the explosive mixture.
The maximum surface temperature is the highest temperature reached during operation in normal conditions, at any point on the surface of the equipment.
Maximum values of surface temperature according to its class:
class **T1** ≤ 450 °C
class **T2** ≤ 300 °C
class **T3** ≤ 200 °C
class **T4** ≤ 135 °C
class **T5** ≤ 100 °C
class **T6** ≤ 85 °C
Of course, an equipment with the temperature class T4, for example, can also be used in areas with required temperature class T1, T2, T3.

0.8.6 SURFACE TEMPERATURE IN ATMOSPHERES WITH DUST FUEL

In atmospheres with combustible dust, can stir up:
dust layer
dust cloud
In general, the ignition temperatures of dust in the form of a cloud and in the form of a layer are different, so you must calculate the highest temperature between the two, called reference temperature, and use the equipment with surface temperatures lower than the reference.
Tcloud = 2/3 Tcl (Tcl = ignition temperature of dust)
Tlayer =T5mm -75°C (T5mm = ignition temperature of a 5 mm layer of dust)
Treference = the minor between Tcloud e Tlayer

0.8.7 MARKING ATEX

The CE marking shows certainty that the equipment has been constructed in accordance with the basic requirements and evaluation procedures applicable in the European Union.
The devices, systems and components shall bear the specific marking concerning the explosion protection (symbol "?x enclosed within a hexagon), already in use before the ATEX directive in compliance with the previous directives concerning explosive atmosphere.
This mark will be followed by the symbol of the group and category and, with regard to group II, the letter "G" (concerning explosive atmospheres caused by gases, vapors and mists) and/or the letter "D" (concerning explosive atmospheres caused by dust).
Example of marking:

II 2 GDc T4

0.8a

II = material destined for surface plants (not mine)
2 = high protection for zone 1
G = occasional presence of explosive gases
D = dust atmosphere
c = constructional safety
T4 = 135 ° C maximum surface temperature

0.8.4 DOCUMENTATION

Each product must be accompanied by:
- EC declaration of conformity
- operating and maintenance

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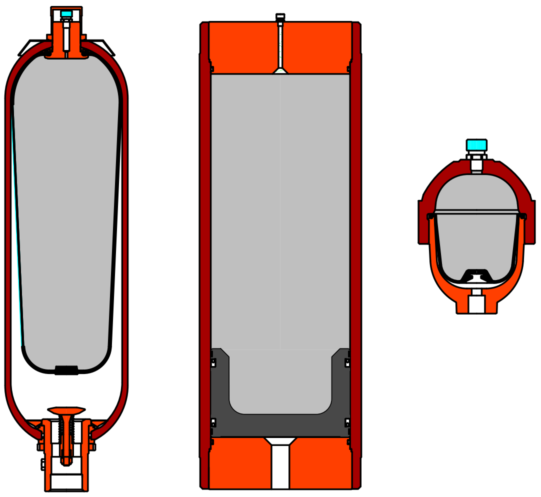
GENERAL APPLICATIONS

1.1.1 GENERAL

The main task of the hydraulic accumulator is to accumulate fluid under pressure and return it when necessary.
Since the accumulator contains a fluid under pressure, it is treated as a pressure tank and must therefore be sized for the maximum operating pressure according to test regulations in force in the country where it is installed.
To achieve the volume compensation and get the accumulation of energy, the fluid is pre-loaded by a weight, a spring or a compressed gas.



1.1a

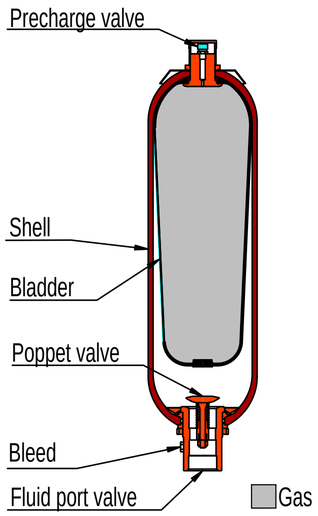
Between the pressure of fluid and the counter-pressure exerted by the weight, the spring or the compressed gas must be in a constant state of equilibrium. Weight and spring accumulators are used in industry only in special cases and thus have a relative importance.
Gas accumulators without a separating element are rarely used in hydraulics due to the absorption of gas by the fluid.
In most of the hydraulic systems are then used the gas accumulators provided with a separating element between gas and fluid.
Depending on the type of separating element, we can distinguish bladder, piston and diaphragm accumulators.

1.1.2 TYPES OF ACCUMULATORS WITH SEPARATING ELEMENT

These accumulators consist of a fluid zone, a gas zone and a separating gas-tight element.
The fluid area is in contact with the circuit. With the pressure increases, a certain volume of fluid enters into the accumulator and compresses the gases.
In the hydraulic systems, are used with the following accumulators with a separating element:
- bladder accumulators (Fig. 1.1b)
- piston accumulators (Fig. 1.1c)
- diaphragm accumulators (Fig. 1.1d)

1.1.2.1 BLADDER ACCUMULATORS

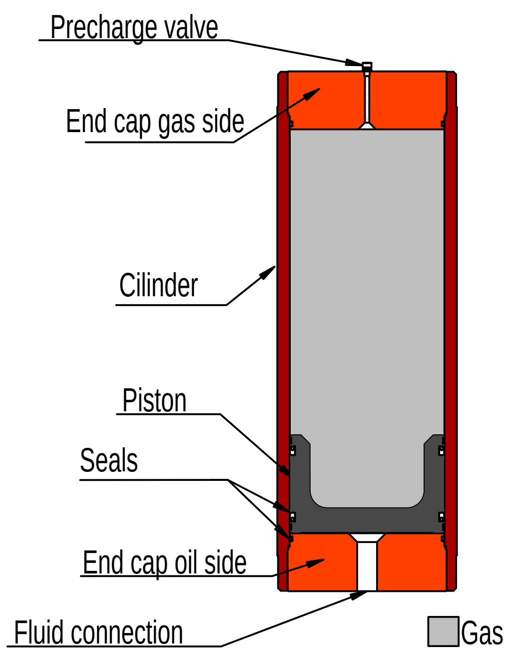
In the bladder accumulators, the fluid area is separated from the gas area by a flexible bladder. The fluid around the bladder is in contact with the circuit, so any increase in pressure causes the entry of the fluid into the accumulator and thereby compresses the gas. Vice versa, every drop of pressure in the circuit causes the expansion of the gas, resulting in delivery of the fluid from the accumulator to the circuit.
Bladder accumulators can be installed in vertical position (preferable), in horizontal one and, under certain operating conditions, also in an inclined one. In the inclined and vertical positions, the valve on the fluid side should face down. The bladder accumulators include a pressure welded or forged vessel, a flexible bladder and the fittings for gas and oil.



1.1b

1.1.2.2 PISTON ACCUMULATORS

In the piston accumulators, the fluid area is separated from the gas area from a metal piston fitted with gas tight seals. The gas area is filled with nitrogen.
The fluid zone is connected to the hydraulic system, so any increase

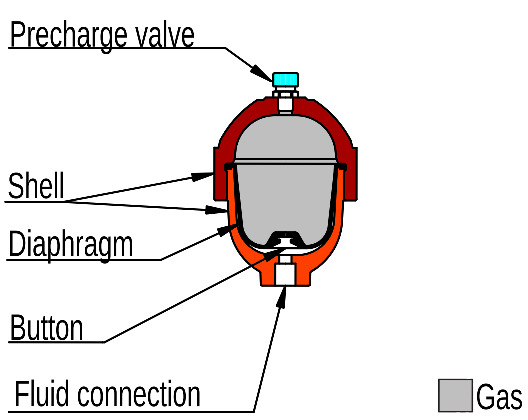


1.1c

in pressure in the circuit causes the entry of fluid in the accumulator resulting in compression of the gas.
Vice versa, at every drop of pressure in the circuit, the compressed gas contained in the accumulator expands and the accumulator delivers the fluid to circuit.
The piston accumulators can operate in any position, but it is preferable to mount them with the gas area upwards in order to prevent that solid contaminants contained in the fluid settle by gravity on the piston seals.
The typical structure of the piston accumulator, represented schematically in Figure 1.1c, includes a cylindrical pipe, a piston with seals, end caps in which there are the fluid side and gas side connections.
The pipe serves to resist to the internal pressure and to drive the piston.
To ensure that the pressures of the two chambers are as balanced as possible, during the movement, it's necessary that the friction between the piston and the pipe is minimized.
For this reason, the inner surface of the pipe must be honed. In practice, however, the friction between the piston seals and the pipe creates, between gas area and fluid one, a pressure difference that, however, can be limited to 1 bar with appropriate selection of seals.
The position of the piston can be shown continuously through a passing rod. By fixing a cam to the rod, you can also take advantage of the movement of the piston in order to control through limit switches the switching on or switching off of the pump.
For other types of monitoring of the piston position, see Section 4.1.

1.1.2.3 DIAPHRAGM ACCUMULATORS

Diaphragm accumulators are made of a steel pressure-resistant vessel, usually cylindrical or spherical in shape, inside which is mounted a flexible material diaphragm as separating element.
Diaphragm accumulators are manufactured in three versions:
- screwed execution (see Section 5.1.)
- forged execution (see Section 5.2.)
- welded execution (see Section 5.3.)



1.1d

In the screwed version, the diaphragm is blocked by a metal ring fitted between the lower shell and upper shell of the body.
In the welded accumulators, the diaphragm is pressed into the bottom before the welding of two steel shells.
Thanks to appropriate processes such as electron beam welding and also thanks to the special provision of the diaphragm, it's possible to prevent its damage and forging.

1.1.2.4 DERIVATION CONNECTION OF THE GAS BOTTLES

When for a given volume of fluid to provide/absorb the difference between the maximum and minimum pressure in the hydraulic circuit must be of limited size, the volume of the accumulator, obtainable with the calculation, may be very large. Under these conditions, it is preferable to connect the gas side of the accumulator with one or more additional gas bottles (Fig. 1.1l). For the sizing of the accumulator, you should take into account the following parameters:
- the useful volume to provide/absorb
- allowable ratios of pressures and volumes P2/Po = V0/V2
- the expansion of gas volume due to changes in operating temperature.

1.1.3 OPERATING CONDITIONS

Stage A
The accumulator is empty and neither gas nor hydraulic sides are pressurized Po = P = 0 bar

Stage B
The accumulator is pre-charged Po

Stage C
The hydraulic system is pressurized. System pressure exceeds the precharge one and the fluid flows into the accumulator Po→P1

Stage D
System pressure peaks. The accumulator is filled with fluid according to its design capacity.
Any further increase in hydraulic pressure would be prevented by a relief valve fitted on the system P1→P2

Stage E
System pressure falls. Pre-charge pressure forces the fluid from the accumulator into the system P2→P1

Stage F
Minimum system pressure is reached. The accumulator has discharged its maximum design volume of fluid back into the system min ΔP (P1min)

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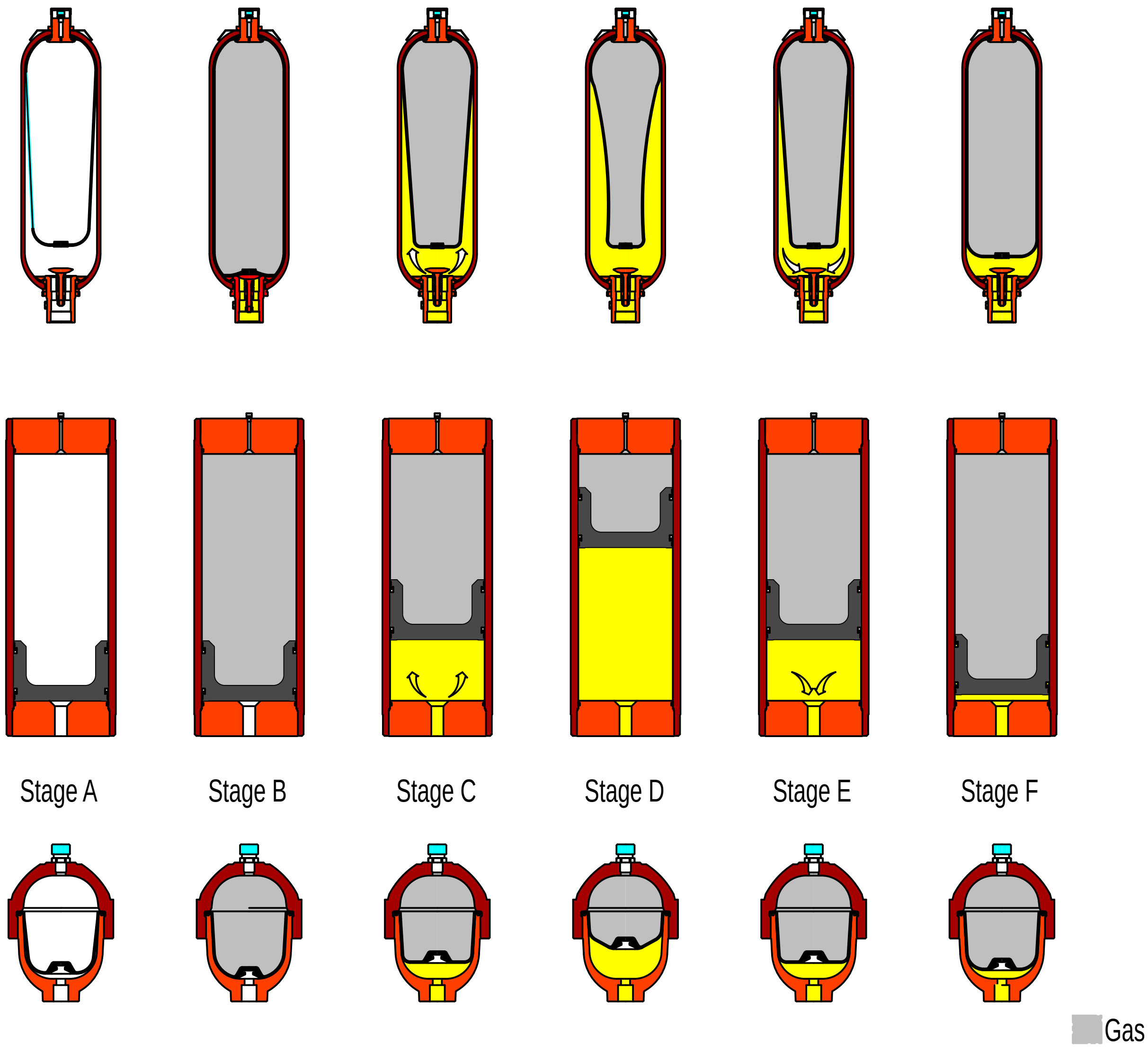


1.1e

1.1.4 ACCUMULATOR SELECTIONS

When selecting an accumulator for a particular application, both system and performance criteria should be taken into account.
To ensure long and satisfactory service life, the following factors should be taken into account.

- failure modes
- flow rate
- response time
- high frequency cycling
- external forces
- output volume
- fluid type
- shock suppression
- sizing information
- temperature effect
- safety
- certification

1.1.4.1 FAILURE MODES

In certain applications, a sudden failure may be preferable than a gradual failure. A high-speed machine, for example, where product quality is a function of hydraulic system pressure.
As sudden failure is detected immediately, scrap is minimized, whereas a gradual failure might mean that production of a large quantity of sub-standard product could occur before the failure becomes apparent.
A bladder/diaphragm accumulator would be most suitable for this application. Vice versa, where continuous operation is paramount and sudden failure could be detrimental as, for example, in a braking or steering circuit on mobile equipment, a progressive failure mode is desirable. In this application, a piston accumulator would be appropriate.

1.1.4.2 FLOW RATE

The larger standard bladder designs are limited to 1000 LPM, although this may be increased to 2000 LPM using a high-flow port.
The poppet valve controls the flow rate, with excessive flow causing the poppet to close prematurely.

Flow rates greater than 2000 LPM may be achieved by mounting several accumulators on a common manifold - see Accumulators station, Section 10.
For a given system pressure, flow rates for piston accumulators generally exceed those of the bladder designs.
Flow is limited by piston velocity, which should not exceed 3 m/sec. to avoid piston seal damage.
In high-speed applications, high seal contact temperatures and rapid decompression of nitrogen, which has permeated the seal itself, can cause blisters, cracks and pits in the seal surface. In this type of application, a bladder style accumulator would be better suited.

1.1.4.3 RESPONSE TIME

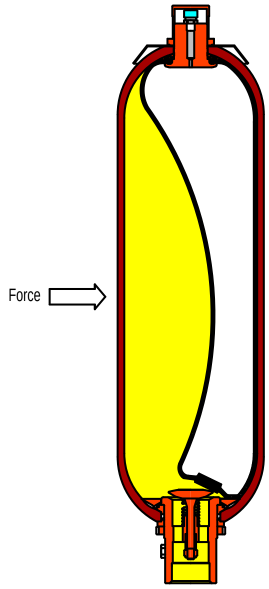
In theory, bladder and diaphragm accumulators should respond more quickly to system pressure variations than piston types.
There is no static friction to be overcome as occurs with a piston seal, and there is no piston mass to be accelerated and decelerated.
In practice, however, the difference in response is not great, and is probably insignificant in most applications.
This applies equally in servo applications, as only a small percentage of servos requires response times of 25 ms or less.
This is the point where the difference in response between piston and bladder accumulators becomes significant.
Generally, a bladder accumulator should be used for applications requiring less than 25 ms response time, and either accumulator type for a response of 25 ms or greater.

1.1.4.4 HIGH FREQUENCY CYCLING

High-frequency system pressure cycling can cause a piston accumulator to “dither”, with the piston cycling rapidly back and forth so covering a distance less than its seal width.
Over an extended period, this condition may cause heat build-up under the seal due to lack of lubrication, resulting in seal and bore wear.
For high frequency dampening applications, therefore, a bladder/diaphragm accumulator is generally more suitable.

1.1.4.5 EXTERNAL FORCES

Any application subjecting an accumulator to acceleration, deceleration or centrifugal force may have a detrimental effect on its operation, and could cause damage to the bladder.
Forces along the axis of the pipe or shell normally have little effect on a bladder accumulator but may cause a variation in gas pressure in a piston type accumulator because of the mass of the piston.
Forces perpendicular to an accumulator’s axis should not affect a piston model, but fluid in a bladder accumulator may be thrown to one side of the shell (Fig. 1.1f), displacing the bladder and flattening and lengthening it. In this condition, fluid discharge could cause the poppet valve to pinch and cut the bladder.



1.1f

Fig. 1.1f: Perpendicular force causes the mass of the fluid to displace the bladder. Higher pre-charge pressures increase the resistance of the bladder according to the effects of the perpendicular forces.

1.1.4.6 OUTPUT VOLUME

The maximum sizes available of each type of accumulator determine the limits of suitability where large output volumes are required. There are, however, several methods to achieve higher output volumes than standard accumulator capacities suggest - see Accumulators station, Section 10.

Compres-sion ratio	System pressure bar		Recommended Precharge bar		Fluid Output LPM	
	max	min	Bladder	Piston	Bladder	Piston
1,5	210	140	125	130	10,5	11,5
2	210	105	95	98	16	16,5
3	210	70	60	60	21,5	21,5
6	210	35	*	28	*	24

* *Below required minimum operating ratio of 4:1*

1.1g

Fig. 1.1g compares typical fluid outputs for Epe’s 35 litres piston and bladder accumulators operating isothermally as auxiliary power sources over a range of minimum system pressures.
The higher pre-charge pressures recommended for piston accumulators result in higher outputs than as occurred in comparable bladder accumulators.

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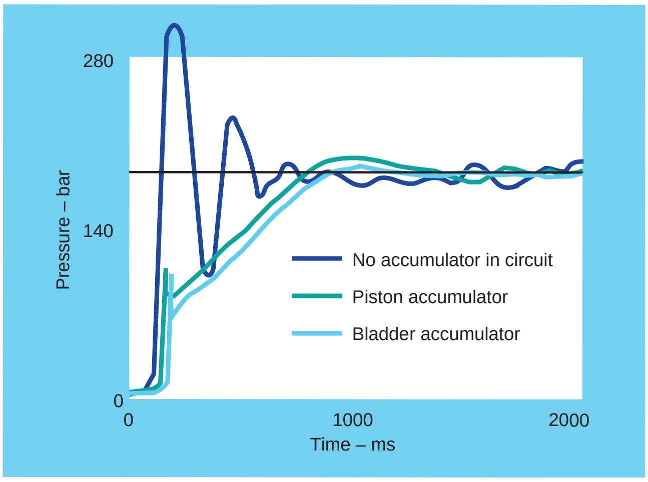
In addition, bladder accumulators are not generally suitable for compression ratios greater than 1:4, as these could result in excessive bladder deformation.
Piston accumulators have an inherently higher output relative to their overall dimensions, which may be critical in locations where space is limited.
Piston accumulators are available in a choice of diameters and lengths for a given capacity, whereas bladder and diaphragm accumulators are frequently offered in only one size per capacity, and fewer sizes are available.
Piston accumulators can also be built to custom lengths for applications in which the available space is critical

1.1.4.7 FLUID TYPE

Bladder/Diaphragm accumulators are more resistant to damage caused by contamination of the hydraulic fluid than piston types.
While some risks exist from contaminants trapped between the bladder and the shell, a higher risk of failure exists from the same contaminants acting on the piston seal.
Bladder accumulators are usually preferred to piston type accumulators for water service applications.
Water systems tend to carry more solid contaminants and lubrication is poor.
Both the piston and bladder type units require some type of preparation to resist to corrosion on the wetted surfaces (example nickel coated) Piston accumulators are preferred for systems using special fluids or where extreme temperatures are experienced as compared to bladders.
Piston seals are more easily moulded in the required special compounds and may be less expensive.

1.1.4.8 SHOCK SUPPRESSION

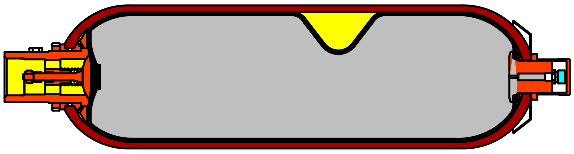
Shock control does not necessarily demand a bladder/diaphragm accumulator, it is possible to use also a piston accumulator, see example Fig. 1.1h



1.1h

1.1.4.9 MOUNTING POSITION

The optimum mounting position for any accumulator is vertical, with the hydraulic port downwards. Piston models can be mounted horizontally if the fluid is kept clean but, if solid contaminants are present or expected in significant amount; horizontal mounting can result in uneven or accelerated seal wear.
A bladder accumulator may also be mounted horizontally, but uneven wear on the top of the bladder as it rubs against the shell while floating one the fluid can reduce its service life and even cause permanent distortion.
The extent of the damage will depend on the fluid cleanliness, cycle rate, and compression ratio. In extreme cases, fluid can be trapped away from the hydraulic port (Fig. 1.1i),



1.1i

Fig. 1.1i *A horizontally-mounted bladder accumulator can trap fluid away from the hydraulic valve reducing output, or the bladder may become elongated, forcing the poppet valve to close prematurely.*

1.1.4.10 SIZING INFORMATION

Accurate sizing of an accumulator is critical if it has to deliver a long and reliable service life. Information and worked examples are shown in Section 2 or accumulator size can be calculated automatically by entering application details into Epe's Sizing software selection program.
Please contact your local Epe distributor for details or contact us at **www.epeitaliana.it**

1.1.4.11 TEMPERATURE EFFECT

Temperature variation can seriously affect the pre-charge pressure of an accumulator. As the temperature increases, the pre-charge pressure increases; Vice versa, decreasing temperature will decrease the precharge pressure. In order to assure the accuracy of your accumulator pre-charge pressure, you need to factor in the temperature variation.
The temperature variation is determined by the temperature encountered during the pre-charge versus the operating temperature expected in the system, (see Section 2.2.)

1.1.4.12 SAFETY

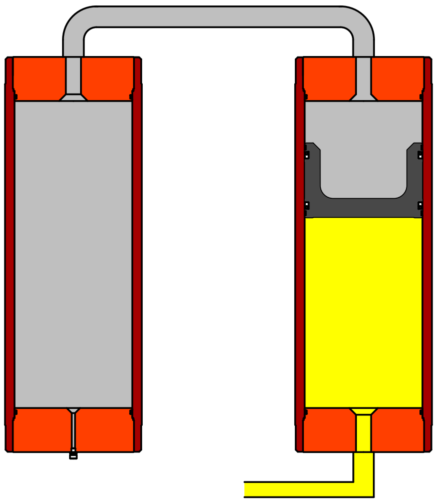
Hydro-pneumatic accumulators should always be used in conjunction with a safety block, to enable the accumulator to be isolated from the circuit in an emergency or for maintenance purposes, (see Section8 e 9).

1.1.4.13 CERTIFICATION

Accumulators are frequently required to conform to national or international certification. These requirements range from simple design factors to elaborate materials testing and inspection procedures carried out by an external agency. Most of the accumulators within Epe's piston, bladder or diaphragm ranges are available with certification PED97/23EC or other on request (see Section 1.4)

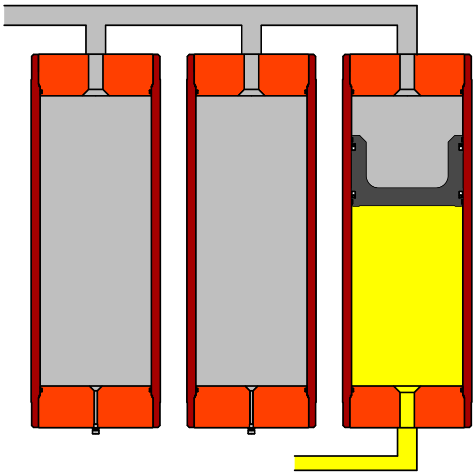
1.1.5 GAS BOTTLES INSTALLATION

Remote gas storage offers installation flexibility where the available space or position cannot accommodate an accumulator of the required size. A smaller accumulator may be used in conjunction with an Epe additional gas bottle, which can be located elsewhere (Fig. 1.1l)



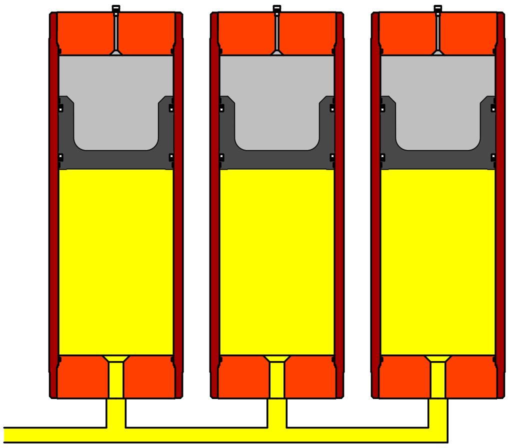
1.1l

Fig. 1.1l Piston accumulator with additional bottles type AB.



1.1m

Fig. 1.1m (above) Several gas bottles can supply pre-charge pressure to a single accumulator



1.1n

Fig. 1.1n (above) Multiple accumulators connected together offer high system flow rates

The gas cylinder and the accumulator must be sized by Section 2:
Gas bottle installations may use either bladder or piston accumulators, subject to the following considerations.

- Any accumulator used with remote gas storage should generally have the same size port of the gas end as at the hydraulic end, to allow an unimpeded flow of gas to and from the gas bottle. The gas bottle will have an equivalent port in one end and a gas charging valve at the other.
- A piston accumulator should be carefully sized to prevent the piston bottoming at the end of the cycle. Bladder designs should be sized to prevent filling of more than 75% full.
- Bladder installations require a special device called transfer barrier at the gas end, to prevent extrusion of the bladder into the gas bottle piping. The flow rate between the bladder transfer barrier and its gas bottle will be restricted by the neck of the transfer barrier tube.
- Because of the above limitations, piston accumulators are generally preferred to bladder types for use in gas bottle installations.
- Diaphragm style accumulators are normally not used in conjunction with gas bottles.

The requirement for an accumulator with an output of more than 200 litres cannot usually be met by a single accumulator, because larger piston designs are relatively rare and expensive, and bladder designs are not generally available in these sizes. The requirement can, however, be met using one of the multiple-component installations shown in Figs. 1.1m and 1.1n.

The installation in Fig. 1.1m consists of several gas bottles serving a single piston accumulator through a gas manifold. The accumulator portion may be sized outside of the limitations of the sizing formula on Section 2.2, but should not allow the piston to strike the caps repeatedly while cycling. The larger gas volume available with this configuration allows a relatively greater piston movement – and hence fluid output – than with a conventionally sized single accumulator. A further advantage is that, because of the large pre-charge “reservoir”, gas pressure is relatively constant over the full discharge cycle of the accumulator. The major disadvantage of this arrangement is that a single seal failure could drain the whole gas system.
The installation in Fig. 1.1n uses several accumulators, of piston or bladder design, mounted on a hydraulic manifold. Two advantages of multiple accumulators over multiple gas bottles are that higher unit fluid flow rates are permissible, and a single leak will not drain pre-charge pressure from the entire system.
A potential disadvantage is that, where piston accumulators are used, the piston with the least friction will move first and could occasionally bottom on the hydraulic end cap. However, in a slow ore infrequently used system, this would be of little significance.

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1.1.6 FAILURE PREVENTION

Accumulator failure is generally defined as inability to accept and exhaust a specified amount of fluid when operating over a specific system pressure range.
Failure often results from an unwanted loss or gain of pre-charge pressure.
It cannot be too highly stressed that the correct pre-charge pressure is the most important factor in prolonging accumulator life.
If maintenance of the pre-charge pressure and relief valve settings are neglected, and if system pressures are adjusted without making corresponding adjustments to pre-charge pressures, shortened service life will result.

1.1.6.1 FAILURE

Bladder/diaphragm accumulator failure occurs rapidly due to bladder/diaphragm rupture (Fig. 1.1o). Rupture cannot be predicted because the intact bladder or diaphragm is essentially impervious to gas of fluid seepage; no measurable gas or fluid leakage through the bladder or diaphragm precedes failure.

1.1.6.2 PISTON ACCUMULATOR FAILURE

Piston Accumulator failure generally occurs in one of the following gradual modes.

- FLUID LEAKS TO THE GAS SIDE

This failure, sometimes called dynamic transfer, normally takes place during rapid cycling operations after considerable time in service. The worn piston seal carries a small amount of fluid into the gas side during each stroke.
As the gas side slowly fills with fluid, pre-charge pressure rises and the accumulator stores and exhausts decreasing the amounts of fluid. The accumulator will totally fail when pre-charge pressure equals the maximum hydraulic system pressure. At that point, the accumulator will accept no further fluid. As the increase in pre-charge pressure can be measured (Fig. 1.1oa), failure can be predicted and repairs can be carried out before total failure occurs.

- GAS LEAKAGE

Pre-charge may be lost as gas slowly bypasses the damaged piston seals. Seal deterioration occurs due to excessively long service, fluid contamination or a combination of the two. Gas can also vent directly through a defective gas core or an end cap O-ring.
The reducing pre-charge pressure then forces progressively less fluid into the system. As this gradual decrease in pre-charge pressure can be measured (Fig. 1.1ob), repairs can again be carried out before total failure occurs.

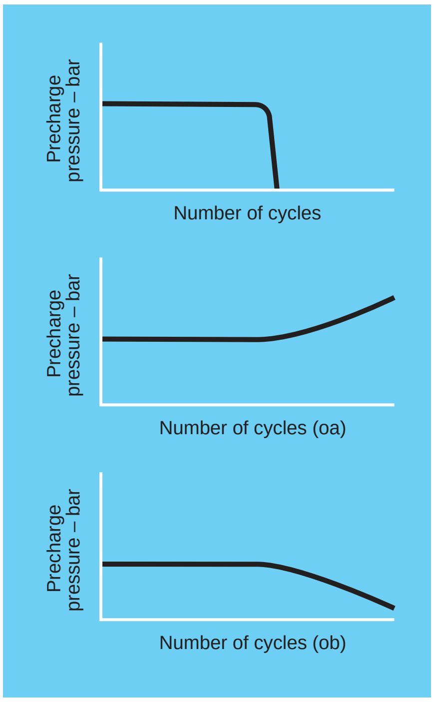


Fig.1.1.o When an accumulator bladder ruptures, precharge pressure immediately falls to zero

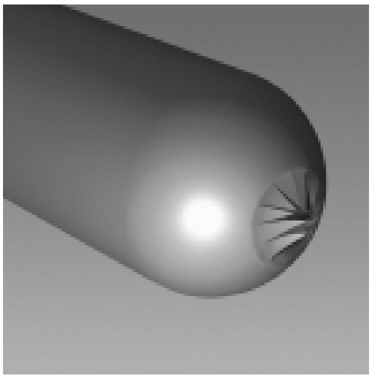
As fluid leaks past an accumulator piston, precharge pressure rises (oa).

Gas leaking past the piston or valve causes precharge pressure to fall (ob)

1.1o

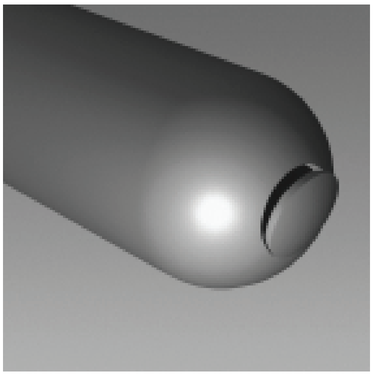
1.1.7 PRE-CHARGING PROCESS

Correct pre-charging involves accurately filling of the gas side of an accumulator with a dry, inert gas such as nitrogen, before admitting fluid to the hydraulic side.
It is important to pre-charge an accumulator under the correct specified pressure. Pre-charge pressure determines the volume of fluid retained in the accumulator at minimum system pressure. In an energy storage application, a bladder/ diaphragm accumulator is typically pre-charged to 90% of the minimum system pressure, and a piston accumulator to 97% of the minimum system pressure at the system operating temperature.
The ability to correctly carry out and maintain pre-charging is an important factor when choosing the type of accumulator for an application.
Bladder accumulators are more susceptible to damage during pre-charging than piston types. Before pre-charging and entering in service, the inside of the shell should be lubricated with system fluid.
This fluid acts as a cushion and lubricates and protects the bladder as it expands. When pre-charging, the first 10 bar of nitrogen should be introduced slowly. Failure to follow this precaution could result in immediate bladder failure: high pressure nitrogen, expanding rapidly and thus cold, could form a channel in the folded bladder, concentrating at the bottom. The chilled expanding rapidly brittle rubber would then inevitably cause the rupture (Fig. 1.1p).
The bladder could also be forced under the poppet, resulting in a cut. (Fig. 1.1q).
Close attention should be paid to operating temperature during pre-charging, as an increase in temperature will cause a corresponding increase in pressure which could then exceed the pre-charge limit.
Little damage can occur when pre-charging or checking the pre-charge on a piston accumulator, but care should be taken to make sure the accumulator is void of all fluid to prevent getting an incorrect reading on the pre-charge.



1.1p

Fig. 1.1p Starburst rupture caused by loss of bladder elasticity



1.1q

Fig. 1.1q C-shaped cut shows that bladder has been trapped under poppet

EXCESSIVELY HIGH PRE-CHARGE

Excessive pre-charge pressure or a decrease in the minimum system pressure without a corresponding reduction in pre-charge pressure may cause operating problems or damage to accumulators.

With excessive pre-charge pressure, a piston accumulator will cycle between stages (e) and (b) of Fig. 1.1e), and the piston will travel too close to the hydraulic end cap. The piston could bottom at minimum system pressure, thus reducing the output and eventually damaging the piston and the piston seal. The piston can often be heard bottoming, warning of impending problems.

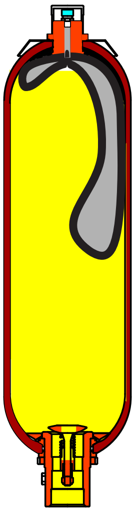
An excessive pre-charge in a bladder accumulator can drive the bladder into the poppet assembly when cycling between stages (e) and (b).This could cause fatigue failure of the poppet spring assembly, or even a pinched and cut bladder, should it become trapped beneath the poppet as it is forced closed (Fig. 1.1q). Excessive pre-charge pressure is the most common cause of bladder failure.

EXCESSIVELY LOW PRE-CHARGE

Excessively low pre-charge pressure or an increase in system pressure without a corresponding increase in pre-charge pressure can also cause operating problems and subsequent accumulator damage. With no pre-charge in a piston accumulator, the piston will be driven into the gas end cap and will often remain there. Usually, a single contact will not cause any damage, but repeated impacts will eventually damage the piston and seal.

Vice versa, for a bladder accumulator, too low or no pre-charge can have rapid and severe consequences. The bladder will be crushed into the top of the shell and can extrude into the gas stem and be punctured (Fig 1.1r). This condition is known as “pick out”. One cycle as the one mentioned above is sufficient to destroy a bladder.

Overall, piston accumulators are generally more tolerant with respect to careless pre-charging.



1.1r

1.2.1 DESCRIPTION

The main sectors and areas of application are industrial hydraulics, process technology and mobile sistems

1.2.2 ENERGY POWER PLANTS

Energy is the topic of the future. Global energy demand is rapidly rising. Oil supply for lubrication and/or emergency.

1.2a

1.2b

1.2.3 DIE CASTING MACHINERY

High pressure and flows in a short time period.

1.2c

1.2.4 PLASTIC MACHINERY

Quick response.

1.2d

1.2e

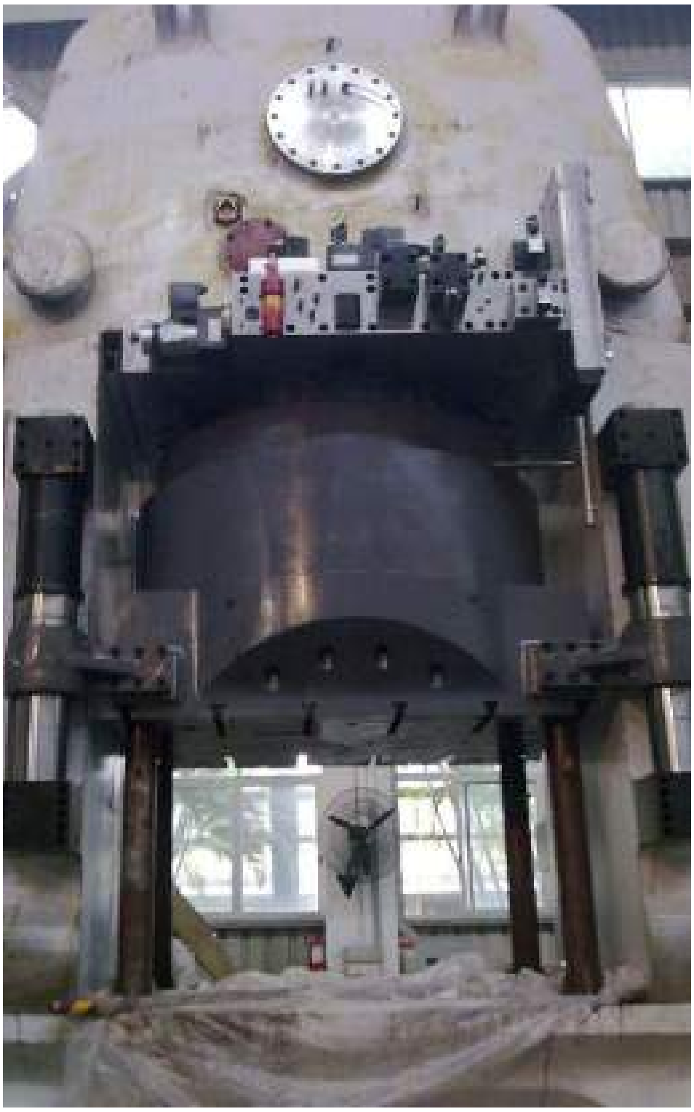
1.2.5 STEEL INDUSTRY

High pressure and fast movements.

1.2f

1.2.6 MACHINE TOOLS

Maintains pressure, reduces pump size.



1.2g

1.2.8 CHEMICAL INDUSTRY

Reduce pump pulsations.

1.2i

1.2.7 CRANES VEHICLES

High demands and load stabilizer.

1.2h

1.2.9 CONSTRUCTION MOBILE MACHINERY

Constant power.

1.2l

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1.2.10 OIL & GAS / OFFSHORE

Emergency and shock damper.

1.2m

1.2o

1.2n

1.2.11 INDUSTRIAL APPLICATIONS

Energy reserve.

1.2o

1.2.12 AUTOMOTIVE

Braking system.

1.2p

1.2.13 LOADING STATION

Shock absorber.

1.2q

1.2.14 AGRICULTURY MACHINERY

Stabilizer system.

1.2r

1.2.15 COMPENSATOR

Liquid separator and pressure compensator for subsea applications.

1.2s

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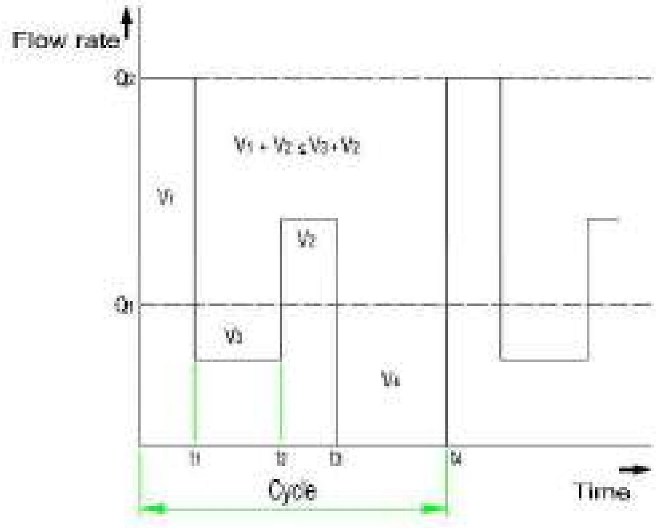
1.3.1 GENERAL

It is not possible to design an optimum hydraulic system in economic and technical point of view that does not involve the use of hydropneumatic accumulators. From an economic point of view, the use of hydropneumatic accumulators usually leads to a reduction in equipment and operating costs (energy savings) and dimensions of the plant. From a technical point of view, the use of an accumulator may become relevant or appropriate to carry out certain functions, such as increase reliability, improve overall efficiency, extend the lives of the plant components and eliminate secondary phenomena (noise, development of heat).
The hydropneumatic accumulators used in order to: save on the pump power to be installed in the case of variable demand for oil, supply power in emergency situations or during working stages requiring a high power even for short periods, shorter the working cycles, drive the secondary circuits as volume compensators when there are variations of pressure and temperature, maintain the pressure in the closed circuits, compensate for the losses, recover the braking energy, as a tank of fluid under pressure, separate the fluids, such as replacement of springs and damper for shocks and pulsations absorbing. Here below, we describe some applications in more detail.

1.3.2 ACCUMULATION OF ENERGY

The graph (cyclograph) of the power required by a plastic injection machine shown in Chart 1.3a shows that, with a high rate of injection into the mould, the maximum power is required only for a short time. Without a compensation system, the pump should be sized for peak power, even if requested for a few moments.
Once used an accumulator, the power (and thus the flow rate) of the pump can be instead fixed according to the average absorption.
In the early stages of the working cycle when the needs of system flow rate is less than the pump one, this fills the accumulator. When you need the maximum flow rate, the difference in comparison with the pump supply is taken from the accumulator.

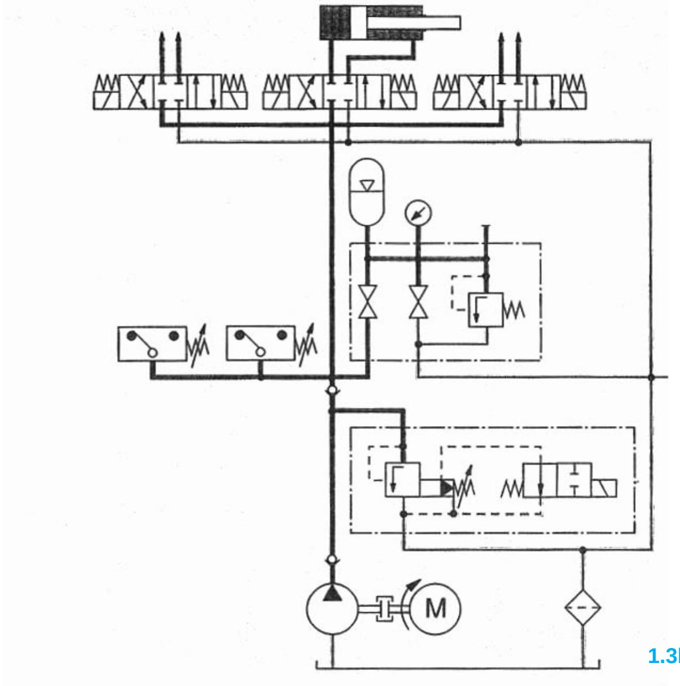


1.3a

Advantages:
- use of lower capacity pumps
- lower installed power
- less heat generation
- easy maintenance and installation
- for certain applications: damping the peaks and pressure pulses, with consequent longer life time of the components.

The installation of hydropneumatic accumulators allows substantially saving energy.
For the systems with very strong instantaneous or short-term absorptions or short operating cycles, the only economic solution is represented by the hydropneumatic accumulators.

1.3.2.1 MORE USERS WITH DIFFERENT ABSORPTION

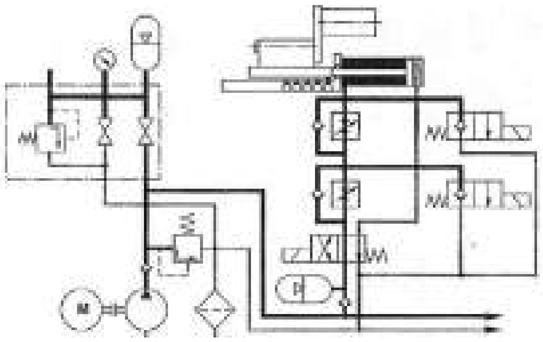


1.3b

Fig. 1.3b: circuit diagram for the accumulation of energy of a plastic injection machine

1.3.2.2 REDUCTION OF THE TIMES OF THE WORKING CYCLES (EXAMPLE, TOOL MACHINES)

Thanks to the hydropneumatic mounting directly next to the user, the inertia of the fluid column is exceeded more quickly than if all the fluid must be set in motion by the pump.
So you get a faster start-up and also the accumulators compensate the instantaneous differential absorptions of the single users.

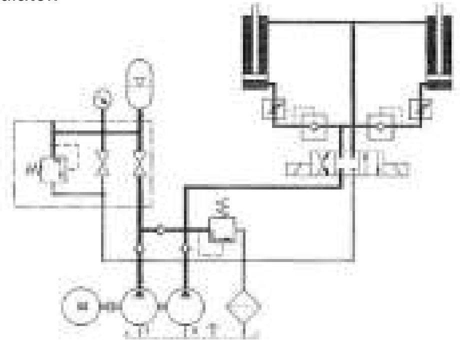


1.3c

Fig. 1.3c: circuit diagram for the accumulation of energy of a tool machine.

1.3.2.3 REDUCTION OF THE APPROACH TIMES

The rational performance of the pressing and printing cycles demands for rapid empty strokes in order to make more time available for the phase of work under high pressure.
During progressing under empty, the fluid is simultaneously delivered by the low pressure pump, the high pressure pump and the accumulator, so as to achieve high speed.
At the end of the approach stroke, the pressure increases, the check valve closes and only the high pressure pump delivers to the activator a reduced flow rate but at high pressure, while the low pressure pump charges the accumulator.



1.3d

Fig. 1.3d: circuit diagram for the reduction of the approach time of a press.

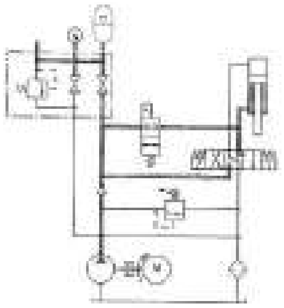
1.3.3 RESERVE OF FLUID (SAFETY)

Using the accumulator as a safety device in normal operation of the system, it does not act as an energy source, although it is always connected to the pump.
If the accumulator is equipped with a high quality separating element, the accumulated energy can be stored almost indefinitely and is always available when needed.
Safety devices on the accumulators are used for emergency operation on the hydraulic plants, to ensure the performance of certain functions in the event of failure, such as:

- closure of bulkheads, valves, exchanges
- switching on of gate valves
- switching on of power switches
- start-up of rapid switching off systems

1.3.3.1 EMERGENCY DRIVE

In an emergency, for example due to power failure, the presence of an accumulator allows carrying out one or more output and/or return strokes.
Fig. 1.3e shows the circuit diagram of an emergency drive: in case of power failure, the spring returns the valve to its resting position, making the connection between the accumulator and rod side chamber with a consequent return of the cylinder.



1.3e

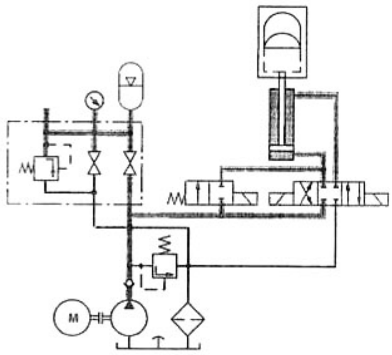
Fig. 1.3e: circuit diagram of an emergency drive.

Another case of emergency drive based on the accumulator is the completion of a working cycle already begun, despite the failure of a pump or a valve.
Advantages of the emergency drive with accumulator:

- immediate availability of stored energy
- indefinite energy conservation
- no operator fatigue
- immediate response
- maximum security with low maintenance.

High short-term oil absorption during failure

With the circuit of Figure 1.3f, the output of the cylinder, in case of pump failure, is guaranteed by the accumulator.

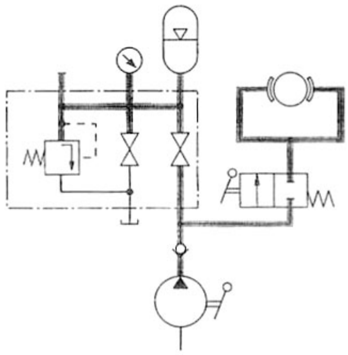


1.3f

Fig 1.3f: output of the cylinder in case of damage to the pump.

1.3.3.2 EMERGENCY BRAKING

The hydraulic accumulator is used to operate the emergency drive of the brake and the doors of funicular railways, cableways, special vehicles etc.
The accumulators charge (closed circuit) is performed with a motor pump in proper workshop or with a pump.
Often the emergency brake circuit is passive: in case of failure, the braking is automatic by effect of a spring, while in normal conditions the brake cylinders are kept open by the pressure of the accumulator that operates contrary to the spring.



1.3g

Fig.1.3g: emergency brake for cableway

1.3.3.3 EMERGENCY LUBRICATION

To maintain intact the lubricating film in the bearings, they must be constantly fed with oil, so the lubrication points should always be under pressure. In case of failure of the lubricant pump, the presence of an accumulator keeps the pressure up until the stop of the machine or until any auxiliary lubrication pump restore the required pressure.

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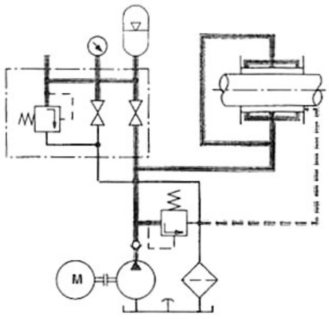
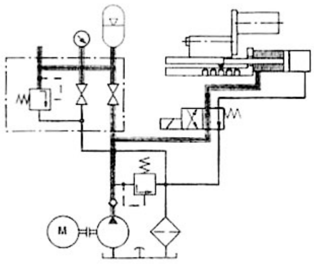


1.3h

Fig. 1.3h: emergency lubrication for bearings.

1.3.3.4 OPERATING SECURITY

The lack of voltage during the operation of a machine may cause costly business interruptions. The accumulators allow the completing of the production cycle started.



1.3i

Fig. 1.3i: operational safety circuit.

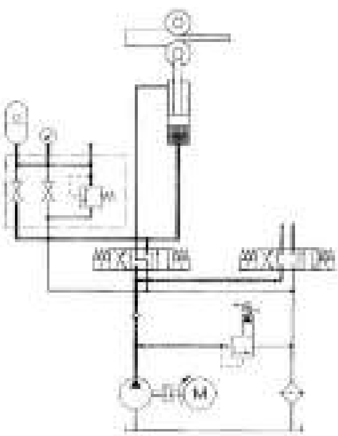
1.3.4 FORCES COMPENSATOR

With the accumulators forces or movements can be compensated. This need arises when, during a continuous working process, i.e. rolling, may occur obliquely positioning of the forming rolls as a result of variables resistances by the material to be laminated. Thanks to the balance of the rolls, you get a uniform thickness.

Fig. 1.3l shows the circuit diagram for the balance of the rolls of a rolling mill, comprising an accumulator with its safety block.

Advantages:

- mild compensation of the forces and, therefore, less load on the foundation and frame
- savings of counter weights and thus reduction in weight and dimensions of the plant



1.3l

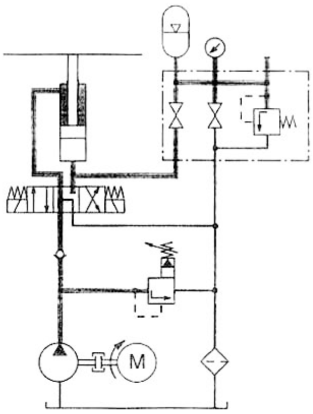
Fig. 1.3l: balance of the rollers of a rolls mill

1.3.5 COMPENSATION OF LEAKAGES

The compression force exerted by a hydraulic cylinder can only be maintained by compensating the inevitable losses due to system leakage. The accumulators are particularly suitable for this purpose. Fig. 1.3m shows a scheme of a system of compensation for a leak, through which, when the pump is stopped, the leakage losses are replenished by dispensing oil from the accumulator to the piston side chamber of the cylinder. The pump starts only when the pressure falls below a predetermined value and charges the accumulator.

Advantages:

- intermittent pump operation
- less heat generation, resulting in lower operating costs
- longer life of the plant.



1.3m

Fig. 1.3m: leak compensation

1.3.6 CUSHIONING

In the hydraulic systems, pressure oscillations can occur when the flow conditions vary for reasons related to the operation of the system; i.e.

- uneven distribution of the pump
- presence of systems including masses and resilience (i.e. valves pressure balancing device) or instantaneous connection of circuit branches at different pressures
- switching on of regulation and interception valves with short opening and closing
- switching on or off of pumps.

These phenomena can cause variations in flow rate or pressure, which may have adverse effects on the life of components.

According to the conditions of formation, the pressure oscillations can be divided into impulsive (pressure peaks) and periodic (pulses).

To prevent that the functioning of the system is compromised, you should evaluate, already during the design phase, the amplitude of these oscillations and provide appropriate measures of damping.

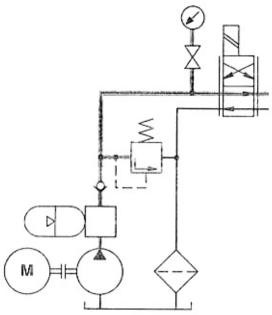
While there are several options to reduce the pressure fluctuations, in hydraulic systems are particularly suitable certain types of accumulators.

To meet the requirements of the machines in terms of performance and speed of the cycles, while ensuring a limited noise, it is advisable to install an accumulator with appropriate features as ahock absorber in order to:

- reduce the flow rate fluctuations caused by the operation of the machine and their transmission to the mechanical structures that act as resonant bodies and convert them to noise
- extend the life of the machine.

1.3.6.1 FLOW RATE FLUCTUATIONS OF PUMPS

The volumetric pumps produce more or less pronounced flow rate pulsations, causing noise and vibrations, with danger of damage to the plant. An accumulator mounted near the pump reduces this phenomenon.

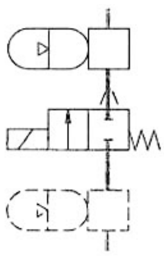


1.3n

Fig 1.3n Damping pulsations caused by the volumetric pumps.

1.3.6.2 DAMPING OF PRESSURE WAVES

In most of the hydraulic plants, pressure waves are generated by various components or by the effect of load changes in the system, for example when using the bucket of an excavator.
The installation of an accumulator protects the sensitive components from pressure waves and, in particular, the pumps.

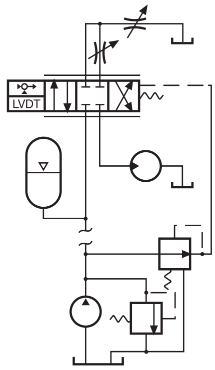


1.3o

Fig. 1.3o: dampening the pulsations downwards the pump

1.3.6.3 FAST OPENING AND CLOSING OF THE VALVES

By discharging instantly a strong flow rate in the return line generate water hammer, which can damage the heat exchangers and the filters on the return lines.
But even when the fluid in motion is stopped suddenly (i.e. due to an emergency stop), the water hammer can damage the valves, pipes and fittings.



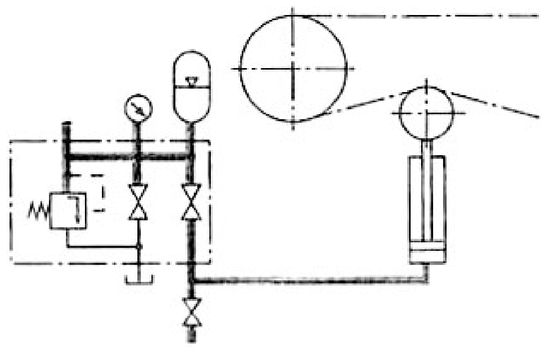
1.3p

Fig. 1.3p: damping the water hammer.

1.3.6.4 HYDRAULIC SPRING

For the damping of shock waves and pressure fluctuations, the accumulator acts as a hydraulic spring thanks to the compressible gas it contains.

The first example below for the application of the "hydraulic spring" is the hydraulic tensioning device of a chain (Fig. 1.3q).

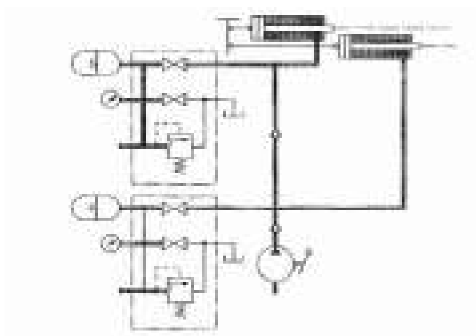


1.3q

Fig. 1.3q: tensioning of a chain for a tool machine.

By installing an accumulator to stretch the chain of a tool machine or a vehicle, you avoid tearing chain transmission to the system.

The second application example of the "hydraulic spring" is the tensioning of the hauling cables and main ones (Fig. 1.3r).



1.3r

Fig. 1.3r: tensioning of the supporting cables of a cableway.

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The third application example of the "hydraulic spring" is the cushioning system for vehicles (fig. 1.3s).

It's known that for the smooth operation of the cableways and elevators, small tolerances are required on cable lengths.

The differences in length of the cables caused, in case of cableways, by the strokes up and down and in the case of elevators by the temperature variations or by the inequalities of the loads are compensated by inserting one or more accumulators in the hydraulic circuit.

1.3s

Fig. 1.3s: suspension system for vehicles

Marching on irregular road surfaces, a vehicle is affected by mechanical stresses, potentially harmful for the body and the chassis.

By installing a hydropneumatic suspension system comprising some cylinders connected to an accumulator, the mechanical stresses are first converted into hydraulic stresses in the cylinders and then are absorbed by the accumulator.

The use of in-vehicle hydropneumatic suspensions:

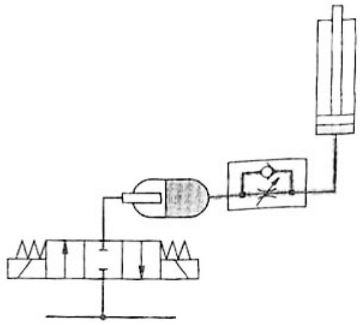
- reduces the risk of accidents
- extends the life of the vehicle
- allows faster cornering
- keeps the load in the desired position
- reduces stress on material
- reduces the operating costs

1.3.7 SEPARATION OF FLUIDS

In fluid power systems in which there are two fluids that must interact while remaining strictly separated, as separating element, it is used a bladder or a diaphragm accumulator.

1.3.7.1 SEPARATION BETWEEN AIR AND OIL

In some pneumatic systems, it can be useful to add a hydraulic component when it is required the generation of a high force.
The separation between the pneumatic circuit and hydraulic one is obtained with an accumulator. As in this application the fluid power comes from the pneumatic circuit, the hydraulic circuit does not require a power unit.

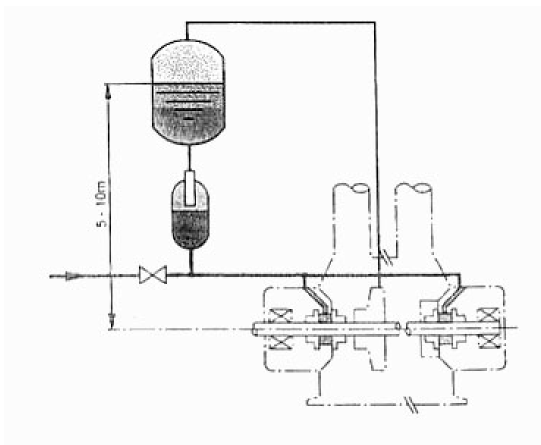


1.3t

Fig. 1.3t: accumulator used for the separation of a pneumatic circuit from a hydraulic one.

1.3.7.2 SEPARATION OF TWO FLUIDS

In compressors for petrochemical use with floating ring seals, for operational and pollution reasons, the process gas pumped by the compressor should not come into contact with the flushing fluid of the seals.
On the other hand, the operation of this type of seal requires a flushing pressure greater than 0.5 – 1.0 bar with respect to the process gas.
To ensure the overpressure, a tank containing a liquid is installed in an elevated position with respect to the compressor (Fig. 1.3u,) on the surface of which acts the same process gas supplied by the compressor.
To avoid contamination of the process gas, the fluid should have a neutral behaviour with regard to the gas. But, as normally it does not have the lubricity that the floating seals and shaft bearings require, to the seals must be sent a different fluid than the one contained in the tank. The separation between the two fluids is achieved with an accumulator.



1.3u

Fig. 1.3u: accumulator for the separation of the fluids.

1.3.7.2 SEPARATION OF TWO GASES

In systems that can be damaged by the infiltration of moisture through the tank breather filter, or in the case of pressurized tanks with nitrogen to prevent condensation due to temperature changes, compensation in volume changes is provided by an accumulator (Fig. 1.3v).

1.3v

Fig. 1.3v: accumulator for the volume compensation.

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1.4 DESCRIPTION

Accumulators are pressure vessels subjected to the specific current regulations or accepted ones of the Countries where they will be installed.
For all the European Countries, design, construction and accumulator testing must be carried out according to the Directive 2014/68/EU on Pressure Equipment.
EPE ITALIANA, also in virtue of the quality system using EN ISO 9001:2008, works according to forms H and H1 of total quality guarantee and design control issued by the Notify Body.
The above mentioned Directive includes the pressure equipment that exceeds 0.5 bar. So all the accumulators are involved in this Directive even if it provides different procedures of testing and certification.
Please keep in mind that accumulators up to 1 litre of volume, even if manufactured according to the Directive 2014/68/EU, are not marked EC and are not provided with the conformity declaration.
For volumes higher than 1 litre, after the testing, each accumulator is stamped with the mark CE followed by the number that identifies the Notify Body.
For these high pressure and low pressure accumulators, the documentation necessary includes the conformity declaration and the operator's manual.
It is also possible to supply accumulators in accordance with Directive ATEX 2014/34/EU (enclosure VIII) and with harmonized regulations EN 13463-1 related to non-electrical equipment to be used in environment with potentially explosive atmosphere and to be included into the classification ATEX EX II2GDcT4 and IM2c.
EPE ITALIANA provides also other tests and certifications for those Countries in which EC regulations are not accepted:
- ASME-U.S. for USA, Canada, South Africa, etc..
- ML (ex SQL) for China.
- Australian Pressure Vessel Standard AS1210-1997 for Australia.
- EAC for Russia.
- DDP passport for Algeria
- RINA, BS-L Lloyd's Register, ABS, DNV, CCS for naval applications.
- For other Countries, which require a specific test, accumulators are in any case manufactured according to the European Directive but are supplied without EC marking and with factory test only.

The documentation related to each regulation is normally provided in a proper envelope along with the goods. If it's not available, it will be sent by post or in another way as soon as possible.
In order to define correctly both the price and the availability, it is necessary that in the inquiry it is mentioned the required certification.

1.4.0 REPORT TEST

All EPE components are completely tested and, upon request, you can receive the certificate of inspection by the factory.

1.4.1 EAC PASSPORT

In order to import products into the Russian Federation and former Soviet republics (Belarus, Ukraine, Kazakhstan), you must have the EAC passport. This certificate confirms to the end user that the product complies with the local regulations on safety of pressure vessels and safety devices. Without the passport, the goods cannot be cleared and the end user (importer) cannot start-up or use the product because it is classified not safe.

1.4a

1.4.2 AUSTRALIAN PRESSURE VESSEL STANDARD

In Australia, it is necessary to define the level of risk that a vessel under pressure represents.
The level of risk is a ok of: volume to pressure, type of contente fickle/unstable, its compressibility, operating conditions (static, movable, proximity to public, etc.).
The degree of risk level is expressed in the Australian Standard with some letters according to "AS4343-1999 - Equipment under pressure - Level of risk".
Any pressure vessel that has a level of risk higher than the level "E" should belong to a registered drawing.
The registration of the drawings is issued by a Government agency in every State of Australia called "Work Safe Australia".
The "Work Safe" will issue the registrations only for vessels under pressure showing to be in accordance with Australian standards: AS1210-1997 - pressure vessels - and, normally, this registration is accepted by the other Australian States.

1.4.3 ML (EX SQL) - CHINA

With the entry of China into the WTO (World Trade Organization), the Chinese State Council has officially issued (02/19/2003) the new regulations on safety supervision of special equipment to be entered in the Chinese market.
The organization "General Administration of Quality Supervision Inspection and Quarantine" (AQSIQ) was authorized to take care of the direct control and management of this special equipment used in China.
To this control system must therefore be subject even the special equipment that are imported into China from all over the world.
In place of Safety Quality License Office (SQLO), the offices of SELO (Special Equipment Licensing Office) directly under AQSIQ, become the new operational reference.
SELO is solely responsible for the management of documentation and for the evaluation of the manufacturer in order to obtain of the license (Manufacture License ML).
EPE ITALIANA was authorized by SELO to export its products in China with License ML No. TS2200710-2020.

1.4.4 RINA

RINA certification for the marine industry. RINA is a third party that, in accordance with its rules, tests and certifies various pressure equipment that will be used in the marine industry.
RINA is an associate member of IACS and is authorized to act on behalf of the Italian administration in accordance with EU Directive 94/57 and about 70 other flag administrations.

1.4.7 ASME-U.S.

ASME (American Society of Mechanical Engineers) is an organization that regulates the design and manufacture of pressure vessels. Accumulators are categorized as unfired pressure vessels and fall under the jurisdiction of ASME Code when required by State law.
Accumulators specifically fall under the section of the code referred to Section VIII, Division 1. This section requires certification on vessels with internal diameters of 6" or greater and with the "U" symbol as evidence that they were designed and manufactured in accordance with the Code. The "U" symbol is an internationally recognized symbol of design and quality manufacturing.
The essential criteria of ASME Certification is a requirement of strength and material traceability. Accumulators must be manufactured with materials that meet ASME specifications and require a design factor of 4:1 in the ratio of burst pressure to rated pressure.
This 4:1 requirement is mandatory for all accumulators with ASME Certification with the exception of those that comply with a specific rule within the Code called "Appendix 22".
Appendix 22 permits that accumulators manufactured with "forged" shells, with connections of a specified maximum size, may be certified with a design factor of 3:1 in the ratio of burst pressure to rated pressure.
ASME requires that each vessel is marked with the design pressure at the Minimum Design Metal Temperature (MDMT) for the vessel.
ASME Certification requires third party surveillance of an approved quality system and requires witness by a third party of all hydrostatic testing.
Currently, unlike many other standards around the world, there is no ASME national requirement for periodic inspection of accumulators after installation. However, local laws would dictate such inspections.

1.4.8 2014/68/EU EUROPE

The Pressure Equipment Directive is one of the series of technical harmonization directives covering subjects such as machinery, simple pressure vessels, gas appliances, etc., which were identified by the European Community's program for the elimination of technical barriers to trade.
The purpose of the PED is to harmonize national laws of Member States regarding the design, manufacture, testing and conformity assessment of pressure equipment and assemblies of pressure equipment.
The program aims to ensure the free placing on the market and putting into service of relevant equipment within the European Union and the European Economic Area.
The Directive requires that all pressure equipment and assemblies within its scope must be safe when placed on the market and put into service.
The Pressure Equipment Directive applies to the design, manufacture and conformity assessment of pressure equipment and assemblies of pressure equipment with maximum allowable pressure greater than 0.5 bar above atmospheric pressure (i.e.:1.5 bar of absolute pressure).
The PED Conformity Assessment Forms apply to all accumulators using fluids of Group 2 (i.e.: non-hazardous), with a volume greater than 1 litre and a product of service pressure (PS) and volume (V) greater than 50 bar x litre or for any pressure vessel where PS exceeds 1000 bar.
PED applies in the member States of the European Union (EU) and the European Economic Area (EEA). Similar requirements to PED have been adopted by many other countries, which joined the European Union.
The EU member States are: Austria, Belgium, Bulgaria, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Czech Republic, Romania, Slovakia, Slovenia, Spain, Sweden, Hungary, and United Kingdom.
The European Economic Area (EEA) includes the 27 EU countries listed above, plus Iceland, Liechtenstein, Norway and Switzerland.

1.4.9 ATEX (2014/34/EU)

Fall within the scope of the Directive 2014/34/EU also non-electrical equipment that have to be used in potentially explosive atmospheres so they must be certified Atex according to the customer's risk area. See section 0.8.
As required by the regulation 2014/34/EU, in addition to the deposit of the technical dossier, EPE ITALIANA monitors its internal production and constantly checks that the production cycle is consistent with the risk analysis performed on the equipment and it carries out a self-certification.

1.4.10 DNV

«Det Norske Veritas» (DNV) Certification, section «Maritime».
DNV certifies all materials, components and systems that are relevant to the operation of ships in terms of safety and quality. The Classification is a particular type of certification, which is used to confirm that the ships and all structures that exist within it conform to the requirements.
These requirements are specified in the regulations of DNV. The classification, in fact, provides that the same company that performs the classification, namely the institution of the third party, establishes the requirements.

1.4.12 ALGERIAN PASSPORT

EPE Italiana is able to supply its components with the Algerian passport for all applications that it's required.
After the approval of the preliminary dossier from the Algerian Ministry of Energy and Certification with endorsement by the Algerian Consulate in Italy and the Italian Chamber of Commerce, will be issued the final dossier in French language and carried out, by third party, the pressure test on the equipment subjected to this certification.

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1.5.1 DETAILS OF THE BLADDERS AND/OR SEALS MATERIAL

The bladders can be made of various types of elastomers. To obtain the thermal and chemical compatibility with the fluid used, you must select the proper elastomer, depending on the fluid used and the working temperature. For more precise information than the specifications outlined below, please contact our technical service.

1.5.2 "P" NITRILE RUBBER (NBR)

Nitrile rubber NBR is the generic name of the acryl-nitrile butadiene compound. The content of nitrile-acrylate is greater than 33%, so you have the right balance between a good compatibility with oils and fuels, while maintaining good flexibility at low temperatures. The NBR rubber is highly resistant to ozone and weathering. Heat resistance up to 80°C and for short periods up to 90°C (at higher temperatures, the aging is accelerated). Resistance to low temperatures down to -20°C, for short periods up to -25° C.

Chemical compatibility:
- aliphatic hydrocarbons (propane, butane, gasoline, oils, mineral greases, diesel fuel, fuel oil, kerosene)
- mineral greases and oils
- HFA, HFB, HFC fluids
- many dilute acids, alkalis, salt solutions
- water
- water glycol

Not compatible with:
- fuels with high aromatic content (i.e. premium gasoline)
- aromatic hydrocarbons (benzene)
- chlorinated hydrocarbons (trichloroethylene)
- polar solvents (ketone, acetone, ethylene esters of acetic acid)
- strong acids
- brake fluids based on glycol
- water glycol
- poor resistance to ozone, weathering and aging.

1.5.3 "F" NITRILE RUBBER FOR LOW TEMPERATURES

The same as with standard nitrile and most types of freon. It has lower content of acrylic nitrile with respect to the standard, so it is best suitable to work at low temperatures but the chemical resistance to various liquids is slightly lower. Working temperature –40°C +70°C.

1.5.4 "H" NITRILE RUBBER FOR HYDROCARBONS

Compatible with normal gasoline, super low-aromatic ones, combined heavy oil and all fluids of standard nitrile. Working temperature –10°C +90°C

1.5.5 "K" HYDROGENATED NITRILE (HNBR)

The hydrogenated nitrile rubber is obtained by adding hydrogen to the compound of the NBR rubber, which imparts superior mechanical properties, outstanding abrasion resistance, high tensile strength, excellent resistance to high temperatures, low gas permeability. Heat resistance up to 130°C, with higher peaks for short periods of up to 150°C. Resistance to low temperatures up to -30°C.
Chemical compatibility greater than the NBR rubber.

1.5.6 "B" BUTYL (IIR)

The butyl rubber has low gas permeability and good electric insulation capacity. Heat resistance up to 100°C, with higher peaks for short periods of up to 120°C. Resistance to low temperatures up to -30°C.

Chemical Compatibility:
- hot water up to 100°C
- brake fluids based on glycol
- many acids and bases
- salt solutions
- polar solvents such as alcohols, ketones and esters
- polyglycol-based hydraulic fluids (HFC fluids) and bases of phosphoric acid esters (HFD-R fluids)
- silicone oils and greases
- Skydrol 500 e 7000
- resistance to ozone, weathering and aging

Not compatible with:
- mineral oils and greases
- fuels
- chlorinated hydrocarbons

1.5.7 "E" ETHYLENE-PROPYLENE (EPDM)

EPDM is a rubber derived from the copolymerization of ethylene with propylene and diene, so it has features particularly suitable to contact with hydraulic fluids based on phosphate esters; it can be also used with fluids of the glycol-based brake systems. Heat resistance up to 100°, with higher peaks for short periods of up to 120°C . Resistance to low temperatures up to -30°C.

Chemical Compatibility:
- hot water up to 100°C
- brake fluids based on glycol
- many organic and inorganic acids
- detergents, sodium and potassium solutions
- hydraulic fluids based on phosphate esters (HFD-R)
- silicone oils and greases
- many polar solvents (alcohol, ketones, esters)
- Skydrol 500 and 7000
- resistance to ozone, weathering and aging

Not compatible with:
- mineral oils and greases
- fuels

1.5.8 "N" CHLOROPRENE (CR)

Trade name NEOPRENE.
Chloroprene rubber is one of the first rubbers created synthetically. Given the high content of chlorine, vulcanizing items have good flammability. They burn under direct action of the flame, but go out when it goes away. The compatibility to the oil is medium, good mechanical properties in the wide temperature range of use. Heat resistance up to 100°C , with higher peaks for short periods of up to 110°C . Resistance to low temperatures up to -30°C.

Chemical Compatibility:
- mineral paraffin oils

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- silicone oils and greases
- water and aqueous solutions
- refrigerants (ammonia, carbon dioxide, Freon)
- naphthenic mineral oils
- low molecular aliphatic hydrocarbons (propane, butane, gasoline)
- brake fluids based on glycol
- better resistance to ozone, weathering and aging than in NBR rubber.

Not compatible with:
- aromatic hydrocarbons (benzene)
- chlorinated hydrocarbons (trichloroethylene)
- polar solvents (ketones, esters, ethers, acetone).

1.5.9 "Y" EPICHLOROHYDIN (ECO)
The epichlorohydrin rubber is a copolymer which has good compatibility with mineral oils, fuels and ozone. The high temperature resistance is good; it still has a good elasticity at low temperature, while the gas permeability is not excellent. Heat resistance up to 110°C, with higher peaks for short periods of up to 120°C. Resistance to low temperatures up to -30°C.

Chemical Compatibility:
- mineral oils and greases
- aliphatic hydrocarbons (propane, butane and gasoline)
- silicone oils and greases
- water at ambient temperature
- resistance to ozone, weathering and aging

Not compatible with:
- aromatic hydrocarbons and chlorinated solutions
- ketones and esters
- non-flammable hydraulic fluids of HFD-R and HFD-S groups
- brake fluids based on glycol

1.5.10 "V" FLUOROCARBON (FPM)
The trade name ("DuPont") is VITON®. The fluorocarbon rubber has excellent resistance to high temperatures, ozone, oxygen, mineral oils, synthetic hydraulic fluids, fuels and many chemicals and organic solutions. In the field of low temperatures, its behaviour is not optimal. The permeability to gases is very low, similar to that of butyl. Heat resistance up to 180°C, for short periods of up to 200°C. Resistance to low temperatures up to -10°C.

Chemical Compatibility:
- mineral oils and greases
- non-flammable fluids of HFD group
- silicone oils and greases
- animal and vegetable oils and greases
- aliphatic hydrocarbons (gasoline, butane, propane, natural gas)
- aromatic hydrocarbons (benzene, toluene)
- chlorinated hydrocarbons (tetrachloroethylene, carbon tetrachloride)
- fuels (normal, premium and containing methanol)
- good resistance to ozone, weathering and aging.

Not compatible:
- polar solvents (acetone, methyl ethyl ketone, ethyl acetate, diethyl ether, dioxane)
- Skydrol 500 and 7000
- brake fluids based on glycol
- ammonia gas, amines, alkali
- superheated steam
- low molecular organic acids (formic and acetic acid).

1.5.11 POLYURETHANE (HPU)
The H-PU polyurethane is a copolymer, based on aromatic isocynate and diols.
Compared to all other elastomers, it has excellent wear resistance, excellent resistance to extrusion and high elasticity. The gas permeability is good compared to that of IIR. Heat resistance: up to approx. +80°C; resistance to low temperatures: up to approx. –20°C.

Chemical Compatibility:
- pure hydrocarbons
- natural oils and greases
- silicone oils and greases
- water up to +50°C
- resistance to ozone and aging

Not compatible with:
- ketones, esters, ethers, alcohols, glycols
- hot water, steam, alkalis, amines, acids

Resistant to:
- oil, petrol, hot water, hot air, ozone, synthetic and native esters

Not resistant to:
- conc. Acids, conc. lyes, conc. alcohols and aromatic solvents.

1.5.12 SILICON-FLUORINE (MFQ)
The rubber MFQ contains in its molecule, as well as methyl groups, even trifluoropropyl groups. The physical and mechanical properties are comparable to those of silicone rubber (MVQ). In comparison to silicone (MVQ), the silicon fluoride (MQF) shows a significantly higher compatibility to fuels and mineral oils, while resistance to the hot air is slightly lower.
Heat resistance: up to approx. 150°C. (max. 180°C)
Resistance to low temperatures: up to approx. +50°C

Chemical Compatibility:
- mineral aromatic oils (i.e. ASTM Oil No. 3)
- fuels
- aromatic low molecular hydrocarbons (i.e. benzene, toluene)
- engine oils and aliphatic type transmissions
- animal and vegetable oils and greases
- brake fluids based on glycol
- non-flammable hydraulic fluids, HFD-R and HFD-S fluids
- chlorinated aromatic hydrocarbons with high molecular content (i.e. Chlophen), chlorinated diphenyl
- water up to +70°C
- dilute salt solutions
- resistance to ozone, aging and weathering

Not compatible with:
- superheated steam over 100°C
- acids and alkalis

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- silicone oils and greases
- low molecular chlorinated hydrocarbons (i.e. trichloroethylene)

1.5.12 TEFLON (PTFE)

Normally it is better known by its trade name Teflon®, in which other stabilizers and plasticizers are added to the polymer to improve the characteristics depending on the application. It's a plastic smoother to the touch and resistant to high temperatures (up to 200°C).
The main features are:

- the complete chemical inertia, so it's not attacked by almost all chemical compounds (with the exception of molten alkali metals, fluorine at high pressure and some fluorine compounds under particular conditions of temperature) and especially it does not change the fluids with which is placed in contact, such as high purity fluids for the electronics industry
- the complete insolubility in water and in any organic solvent
- good electric quality (65 kV / mm of dielectric strength)
- excellent resistance to fire: it does not propagate the flame
- Excellent flow properties on the surface: the coefficient of friction is the lowest among the industrial sealing products
- Non-stick: the surface cannot be glued (contact angle is of 127°)

These characteristics take on added importance when you take into account that remain virtually unchanged in a range of temperatures from -50°C and 150°C (max. 200°C).

Chemical Compatibility:

- Teflon has a high chemical compatibility with most fluids and chemicals used.

Not compatible with:

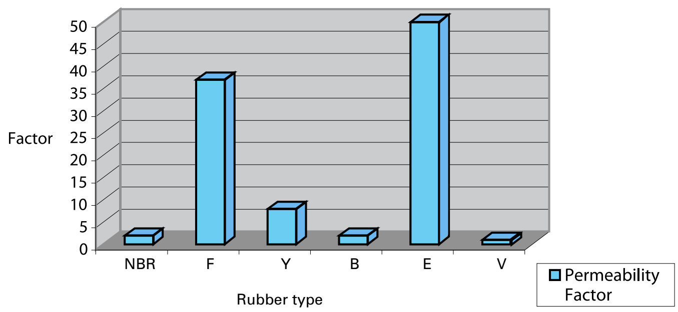
- hardly compatible with fuel oils in general

1.5.13 THE GAS PERMEABILITY ISSUE SIMPLIFIED

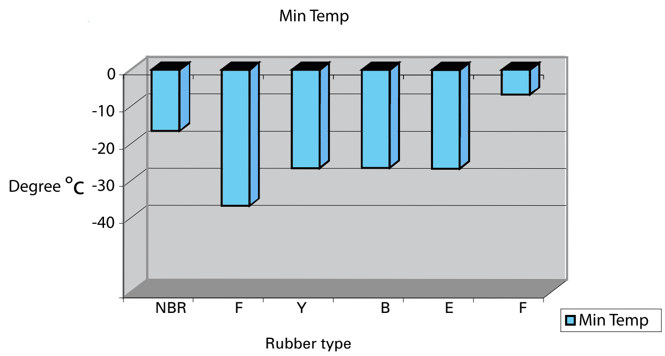
As you gain low temperature capability in a bladder compound, permeability of the bladder increases, and hence greater pre-charge loss due to gas permeation at working temperature.
To show the direct correlation, the potential permeability of each bladder compound was tested to define the relationship between the bladder compound permeability and temperature.
The Gas Permeability Factor was determined by rating the permeability (potential loss of gas pre-charge through the bladder or through the seal) of each compound on a scale of 0 to 50 at 70°F. The higher the Permeability Factor of the faster gas pre-charge would be lost in a low-temperature application using that bladder compound.
Specifically:

Rubber type	TSmin °C	Permeability Factor
"**P**" Nitrile (NBR)	- 20	3
"**F**" Nitrile (NBR–LT)	- 40	30
"**Y**" Epichlorohydrin ECO)	- 30	8
"**B**" Butyl (IIR)	- 30	2
"**E**" Ethylene-propylene(EPDM)	- 30	50
"**V**" Fluorocarbon (FKM)	- 10	1

The Permeability Factor increases or decreases with temperature, setting up a trade-off situation for having to use a low temperature bladder compound. If the application requires a – 40°C bladder material because the equipment needs to be left out the cold overnight, the upside is that the bladder won't shatter at low temperature.
The downside is that the pre-charge in the bladder will have to be checked more often because of the higher working temperature when the oil warms up.
The following charts will assist bladder accumulator users when they have a low temperature application. Figure 1.5a Permeability Factor & Bladder Compounds shows the permeability of each compound within a 0 to 50 Permeability Factor scale.



1.5a



1.5b

Figure 1.5b– Minimum Use Temperature & Bladder Compounds shows the lowest temperature at which each bladder compound can be used. With reference to both charts, it is graphically easy to see that the nitrile low temperature compound, for example, has excellent low temperature capability at – 40°C, but the trade-off for that low temperature performance is a relatively high Permeability Factor of 30. This is a solid confirmation that using this bladder compound will require more frequent maintenance checks for the loss of pre-charge due to gas permeation.

2.1.1 DEFINITIONS

Po = nitrogen pre-charge pressure (relative to the atmospheric pressure, namely the "relative pressure"). Measure to be performed when the accumulator is completely oil-free and at a temperature of 20 ± 2°C.

P1 = minimum working pressure of the hydraulic circuit (relative to the atmospheric pressure, namely the "relative pressure"). The minimum pressure must be higher than the pre-charge pressure.

P2 = maximum working pressure of the hydraulic circuit (relative to the atmospheric pressure, namely the "relative pressure").

P3 = calibration pressure of the safety valve (relative to the atmospheric pressure, namely the "relative pressure"). The pressure calibration of the safety valve must be greater than P2 at least of the hysteresis of the safety valve but equal or lower than the PS value.

PS = maximum working pressure of the accumulator (relative to the atmospheric pressure, namely the "relative pressure").

PT = testing pressure of the accumulator (relative to the atmospheric pressure, namely the "relative pressure"). Usually PT = PS x 1.43.

ΔP = is the difference between the maximum and minimum working pressure (P2-P1).

Po/P2 = compression ratio.

Vo = volume of gas under Po pressure

V = volume of fluid when the accumulator is completely full.

VoA = gas volume of the accumulator in case of a transfer bladder or piston accumulator.

V1 = volume of gas under P1 pressure.

V2 = volume of gas under P2 pressure.

V3 = volume of gas under P3 pressure.

ΔV = useful volume. It indicates the difference in volume of the working fluid between V1 and V2. Volume made by the accumulator during the working phase.

TSmin = minimum working temperature.

TSmax = maximum working temperature.

T20 = reference temperature at 20°C.

ts = discharge time of ΔV of the fluid.

tr = recharge time of ΔV of the fluid.

tc = plant cycle time. On a cyclical machine, it's the time between the start of a discharge of ΔV and the start of the next discharge.

N = number of cycles in a time unit.

η = polytrophic exponent.

Q = flow rate by volume.

2.1.2 UNIT OF MEASUREMENT

Pressure - Force/Surface

Pascal	**Pa**	1 Pa = 1 N/m² 1 kPa = 0.01 bar = 0.1 N/cm² = 0.10 mH2O = 7.5 mmHg = 0.0099 atm =0.145 psi = 0.02088 lbf/ft² = 0.334 ftH2O
bar	**bar**	1 bar = 100'000 Pa = 100 kPa = 0.1MPa = 1.0197 kg/cm² = 10.198 mH2O = 750 mmHg = 0.987 atm = 14.5 psi = 33.455 ftH2O
millibar	**mbar**	1 mbar = 100 Pa = 0.010 mH2O = 0.750 mmHg = 0.00102 kg/cm² = 0.0145 psi = 2.088 ldf/ft² = 0.033 ftH2O
millimetres of mercury	**mmHg**	1 mmHg = 133.322 Pa = 0.133 kPa = 0.00133 bar = 0.0136 mH2O = 0.00131 atm = 0.00136 kg/cm² = 0.01934 psi = 2.78 ldf/ft² = 0.045 ftH2O
technical atmosphere = kgf/cm²	**at Kg/cm²**	1 at = 1 kg/cm² = 735.56 mmHg = 10 mH2O = 98066.50 Pa = 98.067 kPa = 0.981 bar = 0.968 atm = 14.22 psi = 2048.16 lbf/ft² = 32.81 ftH2O
metric atmosphere	**atm**	1 atm = 101'325 Pa = 760 mmHg = 1.033 at = 10.33 mH2O = 1.01 bar = 14.696 psi = 2116.22 lbf/ft² = 33.9 ftH2O
water column metres	**m_{H2O}**	1 mH2O = 9806 Pa = 0.09806 bar = 73.55 mmHg = 0.9806 N/cm² = 0.09678 atm = 0.0999 at = 1.4224 psi = 204.8 lbf/ft² = 3.28 ftH2O
foot of water	**ft_{H2O}**	1 ftH2O = 2988.87 Pa = 0.0299 kPa = 0.3048 mH2O= 22.419 mmHg = 0.0295 atm = 0.03048 kg/cm² = 0.4335 psi = 62.42 ldf/ft²

pounds per square inch	**psi**	1 psi = 6.894.76 Pa = 6.894 kPa = 0.069 bar = 0.703 mH2O = 51.715 mmHg = 0.689 N/cm² = 0.068 atm = 0.0703 kg/cm² = 144 lbf/ft² = 2.31 ftH2O
pounds per square foot	**lbf/ft²**	1 lbf/ft² = 2'988.87 Pa = 2.99 kPa = 0.0299 bar = 0.3048 mH2O = 22.418 mmHg = 0.299 N/cm² = 0.0295 atm = 0.0305 at = 0.433 psi = 62.424 lbf/ft²

Volume

cubic meter	**m³**	1 m³ = 1'000 dm³ = 35.3146 ft³ = 61'023.744 in³ = 1.308 yd³ = 264.20 galUS = 219.97 galUK
cubic decimetre; litre	**dm³**	1 dm³ = 1 l = 0.001 m³ = 61.024 in³ = 0.0353 ft³ = 0.00131 yd³ = 0.26417 galUS = 0.21997 galUK
cubic centimetre	**cm³, cc**	1 cm³ = 0.001 dm³ = 0.001 l = 0.061 in³ = 0.000264 galUS = 0.00022gal UK
cubic inch	**in³**	1 in³ = 0.0000164 m³ = 0.0164 dm³ = 0.0005787 ft³ = 0.0043 galUS = 0.0036 galUK
cubic foot	**ft³**	1 ft³ = 0.02832 m³ = 28.32 dm³ = 1'728 in³ = 0.037 yd³ = 7.48 galUS = 6.23 galUK
cubic yard	**yd³**	1 yd³ = 0.764 m³ = 764.55 dm³ = 46.656 in³ = 27 ft³ = 201.97 galUS = 168.18 galUK
gallon US	**galUS**	1 galUS= 0.00378 m³ = 3.785 dm³ = 231 in³ = 0.134 ft³ = 0.0049 yd³ = 0.833 galUK
gallon UK	**galUK**	1 galUK = 0.00455 m³ = 4.546 dm³ = 277.42 in³ = 0.16 ft³ = 0.0059 yd³ = 1.2 galUS

Temperature

kelvin	**K**	K = °C + 273.15 K = 1.8 · °R K = [5/9 · °F] + (459.67/1.8)
degree Centigrade	**°C**	°C = (°F - 32) · 5/9 °C = K - 273.15 °C = (5/9) · °F - (32/1.8)
degree Fahrenheit	**°F**	°F = 9/5 · °C + 32 °F = °R - 459.67 °F = (9/5) · K - 459.67
degree Rankine	**°R**	°R = (5/9) K °R = 491.67 + (9/5) · °C °R = 459.67 + °F

Time

seconds	**s**	s = 0.01666667 min s = 0.00027778 h s = 0.00001157 days
minutes	**min.**	min = 60 s min = 0.01666667 h min = 0.00071428 days
hours	**h**	h = 60 min h = 0.041666667 days h = 3600 s
days	**days**	day = 86400 s day= 1440 min day= 24 h

Flow rate by volume

cubic meters per second	**m³/s**	1 m³/s = 60 m³/min = 3'600 m³/hour = 1'000 l/s = 60'000 l/min = 6'102'374.42 in³/s = 2'118.88 ft³/min = 15'850.32 gpm = 13'198.13 I gpm
cubic meters per minute	m³/min	1 m³/min = 0.0167 m³/s = 60 m³/h = 16.67 l/s = 1'000 l/min = 35.31 ft³/min = 264.17 gpm = 219.97 I gpm
cubic meters per hour	**m³/h**	1 m³/h = 0.000278 m³/s = 0.0167 m³/min = 0.28 l/s = 16.67 l/min = 1017.06 in³/s = 0.588 ft³/min = 4.40 gpm = 3.66 I gpm
litres per second	**l/s**	1 l/s = 0.001 m³/s = 0.06 m³/min = 3.6 m³/h = 60 l/min = 3661.42 in³/min = 2.12 ft³/min = 15.85 gpm = 13.198 I gpm
litres per minute	**l/min**	1 l/min = 0.001 m³/min = 0.06 m³/h = 0.0167 l/s = 61.024 in³/min = 0.035 ft³/min = 0.264 gpm = 0.22 Igpm
cubic inch per minute	**in³/min**	1 in³/min = 0.00027 l/s = 0.016 l/min = 0.00058 ft³/min = 0.0043 gpm = 0.0036 I gpm
cubic foot per minute	**ft³/min**	1 ft³/min = 0.00047 m³/s = 0.028 m³/min = 1.7 m³/h = 0.472 l/s = 28.32 l/min = 1'728 in³/min = 7.48 gpm = 6.23 I gpm
gallon per minute	**gpm**	1 gpm = 0.0038 m³/min = 0.227 m³/h = 0.063 l/s = 3.785 l/min = 231 in³/min = 0.134 ft³/min = 0.833 I gpm
imperial gallon per minute	**I gpm**	1 I gpm = 0.000076 m³/s = 0.00454 m³/min = 0.273 m³/h = 0.076 l/s = 4.55 l/min = 277.42 in³/min = 0.16 ft³/min = 1.2 gpm

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2.2.1 PRINCIPLE OF OPERATION

Gas compression

In hydropneumatic accumulators, oil or other liquids are maintained under pressure by a pre-compressed gas, usually nitrogen. Therefore, we show some principles on the compression of gases, useful then in the calculation of the accumulators. The fundamental characteristics of a gas are: volume, temperature and pressure.

The law governing these functions is the one on the ideal gases of Boyle and Mariotte, which states that in every condition under which we place a certain amount of gas, the product between its pressure (relative to vacuum) and its volume is constant. The law adds that this remains constant even if the passage from one state to another occurs with equal heat exchange with the external environment.

This means that, for a given quantity of gas, if the volume available is halved, the pressure is twice; the product of the volume for the absolute pressure is constant.

$P_1 * V_1 = P_2 * V_2 = P_3 * V_3 = \ldots\ldots\ldots\ldots\ldots\ldots = \text{constant}$

According to the law of Gay-Lussac: at constant volume, in an ideal gas, the absolute pressure and the temperature are directly proportional. Maintaining a constant pressure in an ideal gas, its volume V varies directly with temperature T:

V1:V2=T1:T2

And maintaining a constant volume, the pressure varies in proportion to temperature changes:

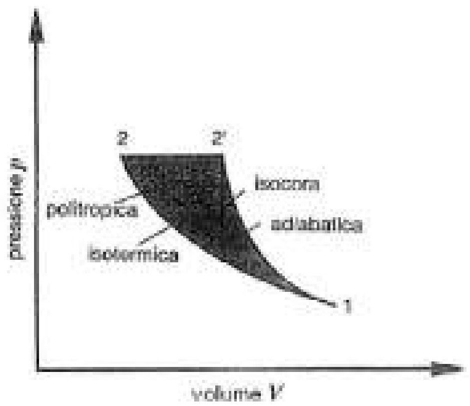
P1:P2=T1:T2

From this it follows that an increase in pressure leads to an increase in temperature and, conversely, a decrease in pressure causes a decrease in temperature. The laws of Boyle and Mariotte and Gay-Lussac are valid exactly only for ideal gases; the nitrogen, being a real gas, is bound to small and influential changes than the laws of the compression of ideal gases. Another crucial factor concerns the change of the aeriform state.

Change in gas state

The state change of the gas may be:
- isochore
- isothermal
- adiabatic
- polytrophic

Diagram 2.2a : change of state in the diagram P - V



2.2a

Changes in isochore

This change of state is characterized by a constant volume of gas. It occurs when the gas area of the accumulator is pre-charged at low temperature and then subjected to a pressure increase at constant volume due to heat exchange with the environment.

Equation of state: **$P/T = P_1/T_1 = \text{constant}$**

Isothermal change

This variation, characterized by the constant temperature of the gas, occurs when the charging or discharging of the fluid to / from the accumulator occurs in long times, allowing for the complete heat exchange between the gas and the environment (more than 180 seconds).

Equation of state: **$P \times V = P_1 \times V_1 = \text{constant}$**

Adiabatic change

The adiabatic change occurs when the discharge and charge of the fluid to / from the accumulator is so fast as to prevent any heat exchange between the gas and the environment (less than 60 seconds).

Equation of state: **$P \times V^{k} = P_1 \times V^{1k} = \text{constant}$**

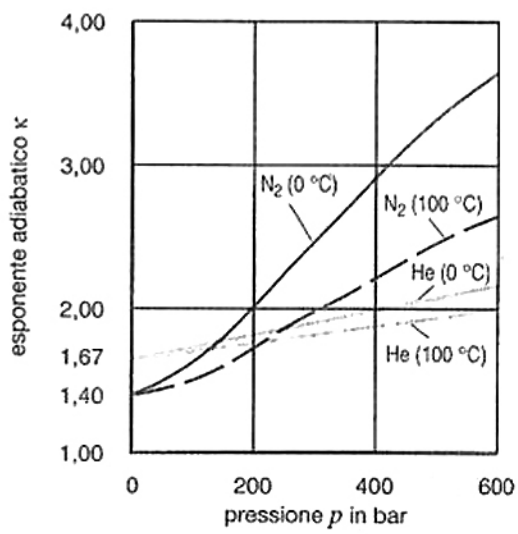
The relationships between temperature and volume and between temperature and pressure are expressed by the thermal equations of state:

$T \times V^{k-1} = T_1 \times V_1^{\,k-1}$

$T \times P^{(1-k)/k} = T_1 \times P_1^{\,(1-k)/k}$

In these equations, “k” is the adiabatic exponent, which for a diatomic gas such as nitrogen under normal conditions, is equal to 1,4.

Diagram 3: evolution of the adiabatic nitrogen exponent depending on the pressure at temperatures of 0°C and 100°C.



2.2b

Polytrophic change

The operation of an accumulator never occur under the theoretical assumptions, namely without heat exchange. In practice, there is an intermediate change of state between the isothermal and adiabatic ones, which takes the name of polytrophic.

The valid relations are similar to those of the adiabatic change, but it has to substitute the adiabatic change adiabatic exponent with the polytrophic exponent N.

2.2.2 SIZING OF THE ACCUMULATOR

With the sizing of the accumulator, we want to establish the geometric capacity according to the pressures within which it works, the amount of fluid that it has to store and return and the time required.
In light of the above, it follows that the equations to be used for the calculation of an accumulator depends on the actual duration of the process of absorption/delivery of the fluid.
As empiric rule for choosing the appropriate equations, apply the following criteria:
- cycle duration < 1 minute: adiabatic change
- cycle duration > 3 minutes: isothermal change
- cycle duration between 1 and 3 minutes: polytrophic change.

The equations to be used for the calculation of the accumulator are shown in Table 3. It should also be noted that the calculation of the accumulator involves some experimental values, which, on one hand, ensure the optimal exploitation of the accumulator volume and, on the other, allow not to endanger the duration. Table 2 shows the experimental values for the various types of accumulators.

Deviations of the real gases

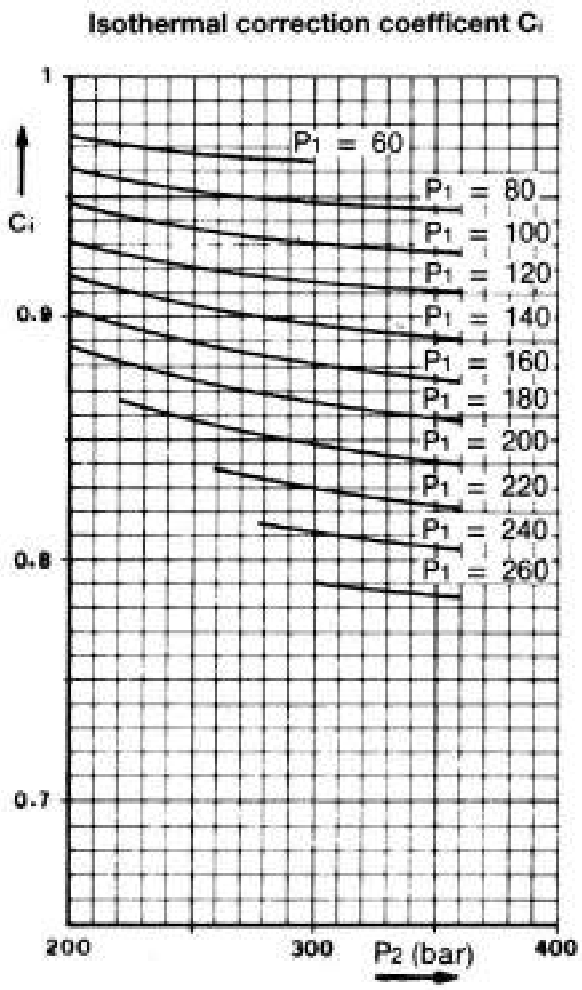
The equations of state shown in the preceding paragraphs apply only if the gas follows the ideal behaviour. In fact, various gases such as nitrogen, differ (especially at other pressures) by the laws of the ideal gas. This behaviour is called "real".
For real gases, relations between the parameters of state (P, T, and V) can be represented only by approximate equations, whose sufficiently precise use is very laborious and long. We prefer, therefore, to take into account the behaviour of the real gases by introducing appropriate correction factors.
In this case, the real volume for an isothermal change of state is expressed by

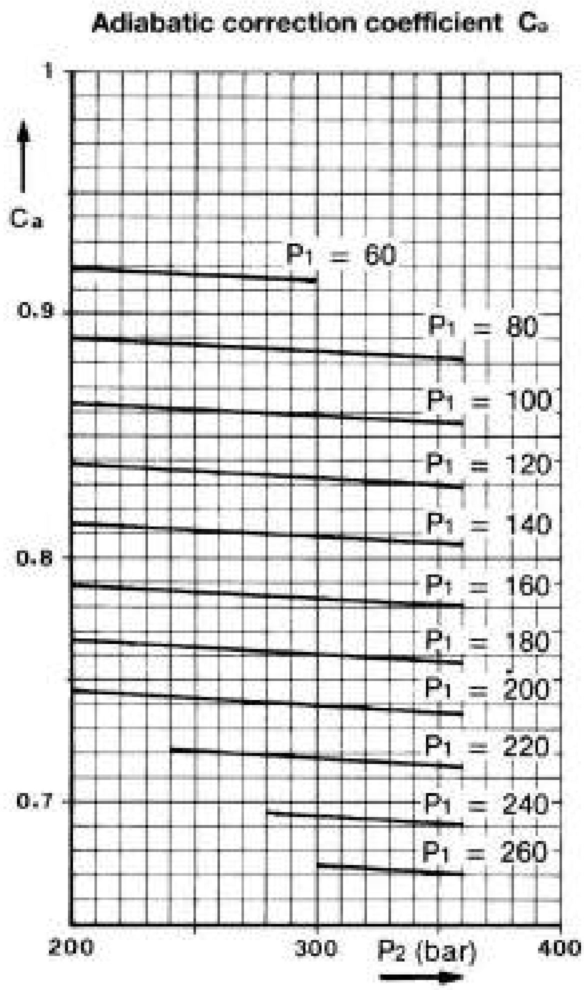
$\mathbf{V_{0\ real} = C_i \times V_{0\ ideal}}$

and for an adiabatic change of state is expressed by

$\mathbf{V_{0\ real} = C_a \times V_{0\ ideal}}$

The correction factors C_i and C_a in the equations can be obtained from the following diagrams





2.2c

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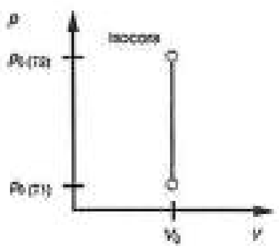
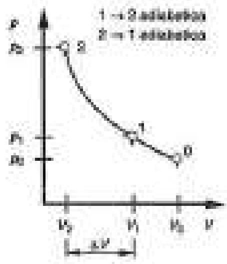
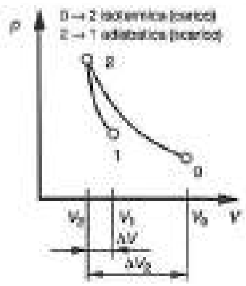
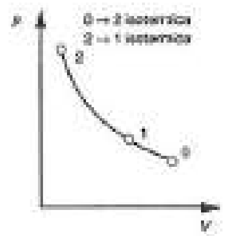
Accumulator	Bladder accumulator High pressure	Bladder accumulator Low pressure	Diaphragm accumulator welded -	Diaphragm accumulator screwed	Piston accumulator with reduced friction
Gas pre-charge pressure P_0 (T_b) (at max. working temperature)	≤ 0.9 •p_1 (accumulation of energy) = (0.6-0.9) • p_m (shock absorption)		≤ 0.9 •p_1 (accumulation of energy) 0.6 • p_m (pulsations damping)		≤ p_1 - 5 bar < 2 bar (piston with reduced friction) < 10 bar (normal piston)

2.2d

Cycle (state change)	Equation	Notes
	$P_{0\,(T1)} = P_{0\,(T2)}$ • **Ts min/ Ts max**	$P_{0\,(T1)}$ = pre-charge pressure at minimum temperature Ts min (degrees Kelvin) $P_{0\,(T2)}$ = pre-charge pressure at maximum temperature Ts max (degrees Kelvin) **Use** Calculation of the pre-charge pressure when the operating temperature is different from the pre-charge temperature.
	$\Delta V = V_0\,[(p_0/p_1)^{1/n} - (p_0/p_2)^{1/n}]$ $V_0 = \Delta V/\ (p_0/p_1)^{1/n} - (p_0/p_2)^{1/n}$	η = K = 1.4 for nitrogen (p_0 at temperature Ts min) **Use** Accumulation of energy
	$\Delta V_2 = V_0\ p_0/p_2\ [(p_0/p_1)^n - 1]$ $V_0 = \Delta V \cdot p_2/\ p_0\ /\ (p_2/p_1)^{1/n} - 1$	**Use** Emergency, safety (p_0 at temperature Ts min)
	$\Delta V = V_0\ (p_0/p_1 - p_0/p_2)$ $V_0 = \Delta V\ /\ p_0/p_1 - p_0/p_2$	**Use** Leak and volume compensation (p_0 at temperature Ts min)

2.2e

CALCULATION OF THE ACCUMULATORS

Temperature variation

Temperature variation can seriously affect the pre-charge pressure of an accumulator. As the temperature increases, the pre-charge pressure increases; conversely, decreasing temperature will decrease the pre-charge pressure. In order to assure the accuracy of your accumulator pre-charge pressure, you need to factor in the temperature variation.
The temperature change is determined by the temperature encountered during the pre-charge versus the operating temperature expected in the system.
NOTE: it is important to wait for the thermal exchange caused by pressure shifts to be stabilized in order to check or adjust the pre-filling pressure. As a safety measure, isolate the nitrogen source during the stabilization period.

Equation used

This equation is used for correction of nitrogen filling pressure Po in relation to the operating temperature.

$$P0\ (Ts) = P0\ (T_{20})\ \times\ \frac{Ts + 273}{T_{20} + 273}$$

P0 (Ts) = filling pressure at checking temperature
P0 (T_{20}) = nitrogen pressure P0 at 20°C

NITROGEN FILLING PRESSURE															
200	173	183	186	193	200	207	214	221	227	234	241	248	255	261	268
190	164	171	177	184	190	197	203	210	216	222	229	235	246	248	255
180	155	162	168	174	180	186	192	198	205	211	217	223	229	235	241
170	147	153	158	164	170	176	182	187	193	199	205	211	216	222	228
160	138	144	149	155	160	166	171	176	182	187	193	198	204	209	215
150	130	135	140	145	150	155	160	165	171	176	181	186	191	196	201
140	121	126	130	135	140	145	150	154	159	164	169	173	178	183	188
130	112	117	121	126	130	134	139	143	148	152	157	161	166	170	174
120	104	108	112	116	120	124	128	132	136	141	145	149	153	157	161
110	95	99	103	106	110	114	118	121	125	129	133	136	140	144	148
105	91	94	98	101	105	109	112	116	119	123	127	130	134	137	141
100	**86**	**90**	**93**	**97**	**100**	**103**	**107**	**110**	114	117	120	124	127	131	134
95	82	85	89	92	95	98	102	**105**	108	111	115	118	121	124	127
90	78	81	84	87	90	93	96	**99**	102	105	108	112	115	118	121
85	73	76	79	82	85	88	91	**94**	97	100	102	105	108	111	114
80	69	72	75	77	80	83	86	**88**	91	94	96	99	102	105	107
75	65	67	70	72	75	78	80	**83**	85	88	90	93	96	98	101
70	60	63	65	68	70	72	75	**77**	80	82	84	87	89	92	94
65	56	58	61	63	65	67	69	**72**	74	76	78	81	83	85	87
60	52	54	56	58	60	62	64	**66**	68	70	72	74	76	78	81
55	48	49	51	53	55	57	59	**61**	63	64	66	68	70	72	74
50	43	45	47	48	50	52	53	**55**	57	59	60	62	64	65	67
45	39	40	42	43	45	47	48	**50**	51	53	54	56	57	59	60
40	35	36	37	39	40	41	43	**44**	45	47	48	50	51	52	54
35	30	31	33	34	35	36	37	**39**	40	41	42	43	45	46	47
30	26	27	28	29	30	31	32	**33**	34	35	36	37	38	39	40
25	22	22	23	24	25	26	27	**28**	28	29	30	31	32	33	34
20	17	18	19	19	20	21	21	**22**	23	23	24	25	26	26	27
15	13	14	14	15	15	16	16	**17**	17	18	18	19	19	20	20
10	8.6	9	9.3	9.7	10	10.4	10.8	**11.1**	11.4	11.8	12.2	12.6	13	13.4	13.8
5	4.3	4.5	4.7	4.8	5	5.2	5.3	**55.5**	5.7	5.9	6	6.2	6.4	6.5	6.7
	-20	**-10**	**0**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**

REFERENCE TEMPERATURE °C

2.2f

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2.2.3 EMERGENCY ENERGY RESERVE WITH BLADDER ACCUMULATOR

Typical occasion when storage is slow (isothermal) and discharge is quick (adiabatic).

Volume will be given by:
$V_o = \Delta V / (P_0/P_2)^{1/n} \cdot [(P_2/P_1)^{1/n} - 1]$

And stored volume by:
$\Delta V = V_o\ (P_0/P_2)^{1/n} \cdot [(P_2/P_1)^{1/n} - 1]$

Where:
$n = 1.4$ adiabatic coefficient (quick discharge phase)
$n_c = 1 \div 1.4$ polytrophic coefficient (slow storage phase)

$V_o = \Delta V\ P_2/P_0 / (P_2/P_1)^{0,7143} - 1$; $\Delta V = V_o\ P_0\ (P_2/P_0)^{0,7143} - 1/ P_2$

Example:
An accumulator must discharge 4.6 litres of oil in 3 seconds with a change of pressure from P_2 = 280 bar to P_1 = 220 bar.
The loading time is 4 minutes. Define the capacity keeping in mind that ambient temperature will change from 20°C to 50°C.

$V_0 = \Delta V/ (P_0/P_2)^{1/1.1} - [(P_2/P_1)^{1/1.4} - 1]$

$= 4.6 / (199/281)^{0.09091} \cdot [(281/221)^{0.7143} -1] = 33.63$ l

P_1 = 221 abs. bar
P_2 = 281 abs. bar
P_0 = 0.9x220 = 198 = 199 bar abs.

n_c = 1.1 (from Fig.2.2a)
T_1 = (273+20) = 293 °K
T_2 = (273+50) = 323 °K

Considering the correction coefficient for high pressure and the temperature change, we have:

$V_{ot} = V_o/C_m \times T_2/T_1$ = 33.63/0.777 x 323/293 = 47.7 l

Where:
C_a = 0.72
C_i = 0.834
$C_m = C_a + C_i / 2$ = 0.777

The pre-charge pressure at 20°C will be:

$P_{0(20°C)}$ = 199 x 293/323 = 180.5 bar = 179.5 rel. bar

The accumulator type is **AS55P360**…..

2.2.4 PULSATION COMPENSATOR Q WITH BLADDER ACCUMULATOR

A typical calculation in adiabatic conditions due to high speed storage and discharge.
The fluid amount ΔV to be considered in the calculation depends on the type and capacity of the pump:

$\Delta V = K \cdot q$

Volume becomes:
$V0 = K \cdot q / (P_0/P_1)^{0.7143} - (P_0/P_2)^{0.7143}$

Where:
q = pump displacement (litres)
= A x C (piston surface x stroke)
= Q/n = flow rate (l/min) / strokes/min.
P = average working pressure (bar)
P_1= P-X (bar)
P_2= P+X (bar)
X = α • P/100 (bar) deviation from average pressure
α = remaining pulsation ± (%)
K = coefficient taking into account the number of pistons and if pump is single or double acting.

Pump type	K
1 piston, single acting	0.69
1 piston, double acting	0.29
2 pistons, single acting	0.29
2 pistons, double acting	0.17
3 pistons, single acting	0.12
3 pistons, double acting	0.07
4 pistons, single acting	0.13
4 pistons, double acting	0.07
5 pistons, single acting	0.07
5 pistons, double acting	0.023
6 pistons, double acting	0.07
7 pistons, double acting	0.023

2.2g

Example:
Assume a 3-piston pump, single acting, with a flow rate Q = 8 m3/h and operating pressure of 20 bar. Calculate the volume necessary to limit the remaining pulsation to α = ± 2.5%. Pump RPM 148. Working pressure 40°C.

P = 20 bar
P_2 = (20 - 0.5) = 19.5 bar
P_2 = (20 + 0.5) = 20.5 bar
P_0 = (0.7 • 20) = 14 bar

q = 8000/60x148x3 = 0.3 l
K = 0.12
X = 2.5x20/100 = 0.5 bar

$V_0 = 0.12 \times 0.3 / (15/20.5)^{0.7143} - (15/21.5)^{0.7143} = 1.345$ l
$P_{0(20°C)}$ = 15 x 293/313 = 14 abs. Bar = 13 bar rel.

The most suitable accumulators is the low pressure type: **AS1.5P80**…

2.2.5 HYDRAULIC LINE SHOCK DAMPER WITH BLADDER ACCUMULATOR

A rapid increase in pressure caused by a high acceleration or deceleration in flow is commonly known as water hammer. The overpressure, **ΔP max**, that takes place in piping, the flow rate, the density of the liquid and the valve shut down time.
This is given by:

ΔP max (bar) = 2 У L v / t x 10^5

The volume of the accumulator, required to reduce shock pressure within predetermined limits AP, is obtained by:

V_0 = Q/7.2 (**2 У L v / C_0** x 10^5 – t) / $(P_0/P_1)^{0.7143}$ – $(P_0/P_2)^{0.7143}$

Where:
V_0 = accumulator gas capacity (litres)
Q = flow rate in the piping (m^3/h)
L = total length of piping (m)
У = specific gravity of the fluid (kg/m^3)
V = Q/S x 103/3.6 = flow velocity (m/s)
S = Лd 2 / 4 = internal pipe section (mm^2)
d = internal pipe diameter (mm)
ΔP = allowable overpressure (bar)
P_1 = operating pressure by free flow (absolute bar)
P_2 = P + ΔP = max allowable pressure (absolute bar)
t = deceleration time (s) (valve shut down, etc.)

Example:
Assume a water pipe (У = 1000 kg/m^3) with internal diameter d = 80 mm, length L = 450 m, flow rate Q = 17 m^3/h, operating pressure P_1 = 5 bar, allowable overpressure ΔP = 2 bar, valve closure time t = 0.8 s.

ΔP max = 2 x 1000 x 450 x 0.94 / 0.8 • 10^5 = 10.57 bar

The accumulator volume necessary to reduce the ΔP max to 2 bar is:

V_0 = 17/7.2 (2 x 1000 x 450 x 0.94 / 2 x 10^5 - 0.8)/$(5.5/6)^{0.7143}$ - $(5.5/8)^{0.7143}$ = 46.4 l

Where:
S = Л x 80^2 / 4 = 5026.5 mm^2
V = 17 x 103 / 5026.5 x 3.6 = 0.94 m/s
P_0 = 5 x 0.9 = 4.5 = 5.5 abs. bar
P_1 = 6 abs. bar
P_2 = 5 + 2 = 7 bar = 8 abs. bar

An accumulator of 55 litres low pressure range will be chosen, type **AS55P30**…

2.2.6 PISTON ACCUMULATOR + ADDITIONAL GAS BOTTLES (TRANSFER)

In all case where a considerable amount of fluid must be obtained with a small difference between P1 and P2, the resultant volume V0 is large compared to ΔV.
In these cases, it could be convenient to get the required nitrogen volume by additional bottles. Volume calculation is performed, according to the application, both in isothermal as well as in adiabatic conditions, using the formulas given above always taking temperature into account. To get the maximum of efficiency, it is convenient to fix a quite high pre-charge value. In case of **energy reserve**, it is possible to use:

P_0 = 0.97 P_1 or P_0 = P_1 - 5

Once the required gas volume is calculated, the volume must be allocated between the minimum indispensable portion VA, which represents the volume of additional bottles.

V_{oT} = V_{oA} + V_{oB}

Where:

$V_{oA} \geq \Delta V + (V_{oT} - V_o) / 0.75$

This means that the sum of the required fluid volume plus the volume change due to temperature must be **lower than ¾ of the accumulator capacity**. The bottles volume is given by the difference.

$V_{oB} = V_{oT} - V_{oA}$

Example:
Suppose ΔV = 30 l. to be obtained in 2 seconds, from a pressure P2 = 180 bar to P1 = 160 bar.
Temperature: **q**1 = 20°C; **q**2 = 45°C

$P_{0(45°C)}$ = 0.97 x 160 = 155 bar

V_0 = ΔV / $(P_0/P_1)^{0.7143}$ – $(P_2/P_1)^{0.7143}$

= 30 / $(156/161)^{0.7143}$ – $(156/181)^{0.7143}$ = 382.4 l

V_{oT} = 382.4 x 318 / 293 = 415 l

V_{oA} = 30 + (415 – 382.4) / 0.75 = 83.5 l

One accumulator **AP100**… is used with the total V0 = 100 l. plus **6 bottles of 50** l. type **B52P360**… or 4 additional bottles type **B75P360**… of 75 l.

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3.1.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS): 360 bar

PRESSURE TEST (PT): 1.43 x PS

NOMINAL CAPACITIES:
0.2 - 0.7 - 1 - 1.5 - 3 - 5 - 10 - 15 - 20 - 25 - 35 - 55 litres

WORKING TEMPERATURE: -40 ÷ +150 °C

COMPRESSION RATIO (Po : P2): max. 1 : 4

FLUID VISCOSITY RANGE: 10 ÷ 400 cSt

RECOMMENDED VISCOSITY: 36 cSt

FLUID CONTAMINATION DEGREE:
class 21/19/16 according to ISO 4406/99

BODY MATERIAL:
- carbon steel shell painted with rust inhibitor RAL 8012
- nickel coating 25 - 40 μ
- stainless steel AISI 316L
- internal and external coating with RILSAN th. 0.6 mm

VALVES MATERIAL:
- phosphated or galvanized carbon steel in compliance with Directive 2002/95/EC (RoHS) to resist to corrosion
- stainless steel AISI 316L
- nickel coating 25-40 μ

BLADDER MATERIAL:
- P = Nitrile rubber (NBR)
- F = Low temp. nitrile rubber
- H = Nitrile for hydrocarbons
- K = Hydrogenated nitrile (HNBR)
- B = Butyl (IIR)
- E = Ethylene-propylene (EPDM)
- N = Chloroprene (Neoprene)
- Y = Epichlorohydrin (ECO)
- V = Fluorocarbon (FPM)

See Table 3.1c and/or Chapter 1.5

FILLING VALVE CONNECTION:
- 5/8”-UNF std
- 7/8” UNF
- ¼” BSP

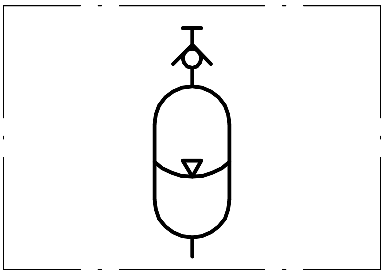
FLUID PORT CONNECTION: see 3.1dc - 3.1df - 3.1eb - 3.1ec - 3.1fb - 3.1fd

FLOW RATE: see Table 3.1db

WEIGHT: see Table 3.1db - 3.1df

3.1a

3.1.2 HYDRAULIC SYMBOL



3.1b

3.1.3 “AS and ASP” BLADDER ADVANTAGES
- dirt tolerant
- light weight
- compact
- simple construction
- quick response
- works well on water, low lubricity fluids
- quick, easy installation
- low cost

3.1.4 DESCRIPTION
Bladder-type accumulators consist of a seamless cylindrical pressure vessel made of high-tensile steel.
The accumulator is subdivided into a gas and fluid side by an elastic bladder mounted in the interior of the vessel.
The bladder is charged with nitrogen to the specified gas charge pressure P0 by means of gas valve.
When the fluid is pressed into the accumulator, the gas in the bladder is compressed and hence the pressure increased.
The gas volume reduces and on the fluid side, the fluid can flow into the accumulator. As soon as the pressure on the fluid side falls below the gas pressure, the accumulator is emptied.
Oil valve is provided in the oil port of the bladder-type accumulator and closes when the pressure on the gas side is higher than the one on the fluid side.
This prevents draining of the bladder into the oil channel and thus the bladder from being destroyed.
When the minimum operating pressure is reached, a small oil volume is to be maintained between the bladder and the fluid volume (approx. 10% of the nominal capacity of the hydraulic accumulator), in order that the bladder does not hit the valve during every expansion process.
Gas valve consists of external caps, sealing cap, filling valve, gas valve body and rubber coated washer. These parts can be replaced separately.
The nameplate shows the technical data and features of the hydraulic accumulator.

3.1.5 EUROPE MARKET
All hydraulic accumulators are pressure vessels and are subject to the national regulations and directives valid at the place of installation.
Bladder accumulator type AS, up to and including 1 litre, must not be CE marked.
Bladder accumulator type ASP, up to and including 1 litre and max. pressure less than 200 bar, must not be CE marked.
For bladder accumulator type AS, greater than 1 litre and, in the case of ASP, greater than 1 litre or 1 litre but with max. pressure higher than 200 bar every shipping batch is complete of a conformity declaration and instruction of use and maintenance and/or all documents requested.
All vessel categories (see Table 3.1e) must be protected by means of a pressure relief valve in accordance with Directive 2014/68/EU.

3.1.6 ACCESSORIES
For support equipment, see Cap. 7
For gas side’s safety equipment, see Cap. 8
For fluid side’s safety equipment, see Cap. 9
For pre-loading and charging set, see Cap. 11
For other components, see Cap. 12

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3.1.7 BLADDER-TEMPERATURE-LIQUID COMPATIBILITY

When selecting the accumulator variant, pay attention to the following non-binding notes with regard to hydraulic fluid, bladder material and the permissive temperature range. (see Section 1.5)

Code letter	Polymer	ISO	Temperature range (°C)	Some of the liquids compatible with the polymer
P	Standard nitrile (Perburan)	NBR	-20 ÷ +80	Aliphatic hydrocarbons (propane, butane, gasoline, oils, mineral greases, diesel fuel, fuel oil, kerosene), mineral greases and oils, HFA - HFB - HFC fluids, many dilute acids, alkalis, saline solutions, water, water glycol.
F	Low temperature nitrile	NBR	-40 ÷ +70	The same as with standard nitrile + a number of different types of Freon. (This contains less acrylonitrile than the standard and is therefore more suitable for low temperatures, but its chemical resistance is slightly lower).
H	Nitrile for hydrocarbons	NBR	-10 ÷ +90	Regular and premium grade slightly aromatic gasoline (and all the liquids for standard nitrile).
K	Hydrogenated nitrile	HNBR	-30 ÷ +130	The same as with standard nitrile but with excellent performance at high and low temperatures.
B	Butyl	IIR	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many acids and bases, salt solutions, polar solvents such as alcohols, ketones and esters, polyglycol-based hydraulic fluids (HFC fluids) and bases of esters of phosphoric acid (HFD-R fluids), silicone oils and greases, resistance to ozone, aging and weathering.
E	Ethylene-Propylene	EPDM	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many organic and inorganic acids, detergents, solutions of sodium and potassium, phosphate ester-based hydraulic fluids, (HFD-R), silicone oils and greases, many polar solvents (alcohol, ketones, esters), Skydrol LD4 and 500B-4, resistance to ozone, aging and weathering.
N	Chloroprene (Neoprene)	CR	-30 ÷ +100	Mineral oils of paraffin, silicone oils and greases, water and aqueous solutions, refrigerants (ammonia, carbon dioxide, Freon), naphthenic mineral oils, low molecular aliphatic hydrocarbons (propane, butane, fuel), brake fluids based on glycol, better resistance to ozone, weathering and aging compared to NBR rubber.
Y	Epichloridrin	ECO	-30 ÷ +110	Mineral oils and greases, aliphatic hydrocarbons (propane, butane and gasoline), silicone oils and greases, water at room temperature, resistance to ozone, aging and weathering.
V	Fluorocarbon	FKM	-10 ÷ +150	Mineral oils and greases, non-flammable fluids of HFD group, silicone oils and greases, animal and vegetable oils and greases, aliphatic hydrocarbons (gasoline, butane, propane, natural gas), aromatics hydrocarbons (benzene, toluene), chlorinated hydrocarbons (Tetrachloroethylene, carbon tetrachloride), fuel (regular, super and containing methanol), excellent resistance to ozone, weathering and aging.

For other hydraulic fluid and/or temperatures, please consult us.

3.1c

3.1.8 ORDER CODE

1	2	3	4	5	6	7 - 8	9		10		11	12	13	14	15		16
AS	25	P	360	C	R	G4	V	-	8	-	C	0	C	0	R250	/	30

1 Series

Bladder accumulator	= **AS**
Bladder accumulator for fluid gr. 1 (dangerous)	= **ASP**

2 Nominal capacity

0.2 lt	= **0.2**
0.7 lt	= **0.7**
1 lt	= **1**
1.5 lt	= **1.5**
3 lt	= **3**
5 lt	= **5**
10 lt	= **10**
15 lt	= **15**
20 lt	= **20**
25 lt	= **25**
35 lt	= **35**
55 lt	= **55**

3 Bladder material

Nitrile rubber (NBR)	= **P**
Nitrile for low temp.	= **F**
Nitril for hydrocarbons	= **H**
Hydrogenated nitrile (HNBR)	= **K**
Butyl (IIR)	= **B**
Ethylene-propylene (EPDM)	= **E**
Chloroprene (Neoprene)	= **N**
Epichlorohydrin (ECO)	= **Y**
Fluorocarbon (FKM)	= **V**

4 Max working pressure (PS)

See the table on front page

5 Body material

Carbon steel	= **C**
Nickel coated carbon steel 25 μ	= **N**
Nickel coated carbon steel 40 μ	= **M**
Stainless steel	= **X**
Rilsan coating	= **V**

6 Fluid port connection

See the table on front page

7 - 8 Dimension of the connection fluid or 7+8 table

See the table on front page

Special variants upon request

16 Precharge pressure (bar)

Standard 30 bar = **0 ÷ 300** (< PS)

15 Other variants

See the table on front page

14 Variants of gas side

Standard	= **0**
Only cap in stainless steel	= **1**
Brass nameplate	= **2**
Other numbers/variants to be requested EPE	

13 Gas valve material

Carbon steel	= **C**
Nickel coated carbon steel 25 μ	= **N**
Nickel coated carbon steel 40 μ	= **M**
Stainless steel	= **X**

12 Variants of fluid side

Standard	= **0**
Adapter in stainless steel (R)	= **1**
Button and spring in stainless steel	= **2**
Other numbers/variants to be requested EPE	

11 Fluid valve material

Carbon steel	= **C**
Nickel coated carbon steel 25 μ	= **N**
Nickel coated carbon steel 40 μ	= **M**
Stainless steel	= **X**

10 Test and certification

Factory testing	= **0**
Australian Standard	= **2**
ML (China)	= **3**
RINA	= **4**
Lloyd's Register	= **5**
PED 2014/68/EU (for capacities greater than 1 l)	= **8**
ATEX 2014/34/EU (for surface)	= **9**
ATEX 2014/34/EU (for mine)	= **9M**
DNV	= **10**
EAC (Russia)	= **11**
Algeria passport	= **12**
Standard regulation (NR13) (Brazil)	= **13**
Tunisian passport	= **14**
Bureau Veritas	= **15**
ABS	= **16**
CCS	= **17**
Dosh	= **20**
CRN	= **21**

9 Type of filling valve

Standard filling valve 5/8" UNF thread	= **V**
Standard filling valve with 5/8" UNF thread in stainless steel	= **VX**
Without filling valve (thread hole M12x1.5)	= **V0**
Brass filling valve ¼" BSP	= **V2**
Filling valve 7/8" UNF	= **V4**

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4 Max working pressure (PS)		
Capacity litres	Carbon steel	Stainless steel
0,2 ÷ 3	**360** (100 only for ASP type)	**150 - 210**
5 ÷ 55	**360** (100 only for ASP type: 210 only for the version with connection L or other pressure related to connections B or U)	**30 - 40 - 60 80 - 150 - 210**
1 ÷ 55	**343** (for Certification RINA [4])	**-**

6 Fluid port connection			
For AS0.7÷55	BSP ISO 228 with chamfer for OR (std)	=	**A**
For AS0.2	BSP ISO 228 (std)	=	**G**
For AS3÷55	Metric	=	**M**
For AS0.7÷55	NPT-F	=	**P**
For AS3÷55	internal thread SAE	=	**S**
For AS3÷55	adapter for flange SAE 3000 Psi	=	**L**
For AS3÷55	adapter for flange SAE 6000 Psi	=	**H**
For AS0.7÷55	flange ANSI	=	**B**
For AS0.7÷55	flange UNI - DIN	=	**U**
For AS0.7÷55	square flange	=	**Q**
For AS0.7÷55	adapter *	=	**R**

* assembled on the fluid valve connection type A

7 Dimension of the fluid connection			
For the type of connection:			
A	(0.7÷1.5 l) ¾"	=	**5**
	(3÷5 l) 1" ¼	=	**7**
	(10÷55 l) 2"	=	**9**
G	(0.2 l) ½"	=	**4**
M	(3÷5 l) 40x1.5	=	**40/1.5**
	(10÷55 l) 50x1.5	=	**50/1.5**
P	(0.7÷1.5 l) ¾"	=	**5**
	(3÷5 l) 1" ¼	=	**7**
	(10÷55 l) 2"	=	**9**
S	(0.7÷1.5 l) 1" 1/16 12UN	=	**1 1/16-12**
	(3÷5 l) 1" 5/8 12UN	=	**1 5/8-12**
	(10÷55 l) 1" 7/8 12UN	=	**1 7/8-12**
L	(3÷5 l) 1" ¼ SAE3000	=	**7**
	(10÷55 l)1" ½ SAE 3000	=	**8**
	2" SAE 3000	=	**9**
H	(3÷5 l) 1" ¼ SAE6000	=	**7**
	(10÷55 l)1" ½ SAE 6000	=	**8**
	2" SAE 6000	=	**9**
B	(0.7÷55 l)		**DIMENSION/RATING**
	Former. 1" ANSI 1500 = 1/1500 (Pmax = 250 bar)		
U	(0.7÷55 l)		**DN/PN**
	Former. DN50 PN100 = 50/100 (Pmax = 100 bar)		
Q	(3÷5 l) 1" ¼	=	**7**
	(10÷55 l) 2"	=	**9**
R	(0.7÷55 l) Blind	=	**0**
R	(0.7÷55 l) internal thread BSP ISO 228	=	**G***
	NPT-F	=	**P***
	BSPT	=	**N***
	SAE	=	**S***
	Metric	=	**M***

*Variant in table 8

G*, P*, N* → **Dimension in inch - No.of pitch for inch**

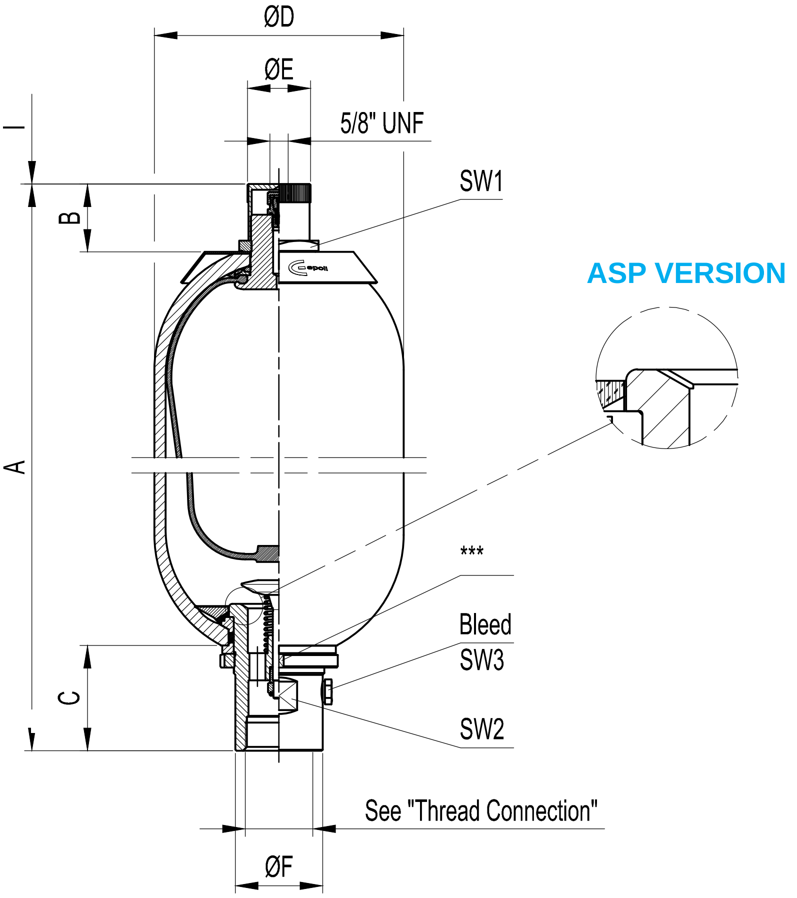
S*, M* → **Diameter/pitch**

15 Other variants	
Adapter + rupture disc set at xxx bar	= **Rxxx**
(see Section 8.2)	
Adapter with connection for pressure gauge + rupture disk	= **RxxxM**
Adapter + Safety valve type VS224X set at xxx bar	= **Vxxx**
Adapter + Needle Valve of ¼" BSP	= **EG2**
Adapter + Stainless steel needle Valve of ¼ BSP	= **EG2X**
Adapter + excluding device with with full scale pressure gauge of xxx bar	= **EMxxx**
Adapter + excluding device of 90° with full scale pressure gauge of xxx bar	= **ELMxxx**
Adapter + safety valve VS11	= **T11**
Adapter + safety valve VS16	= **T16**
Adapter + shut off 2-way valve	= **S2**
Adapter + shut off 3-way valve	= **S3**
Adapter with minimess	= **MIN**
Flushing with degree of contamination ≤ ...class	= **Fx**
75-80 μ thick polyurethane paint with colour to be specified	= **Wxxx**
Off-shore paint with colour to be specified	= **Zxxx**
NORSOK System 1 paint with colour to be specified	= **K1**
NORSOK System 7B paint with colour to be specified	= **K7B**
other variants upon request	
Gas side adapter with minimess	= **MIN**

8 Dimension					
1/8"	= **1**		3/4"	= **5**
1/4"	= **2**		1"	= **6**
3/8"	= **3**		1" ¼	= **7**
1/2"	= **4**		1" ½	= **8**

Special variants on request

3.1.9 DIMENSIONS



3.1d

Acc. type AS-ASP in carbon steel	Nominal gas volume litres	Effective gas volume litres	Working pressure *bar*	Ped cat. fluids of group 2 AS	Ped cat. fluids of group 1 ASP	Max.diff. pressure P2-P1 *bar*	Flow rate *l/min*	Max.comp. ratio P0/P2	A *mm*	B *mm*	C *mm*	ØD *mm*	ØE *mm*	ØF *mm*	I *mm*	SW 1 *mm*	SW 2 *mm*	SW 3 *mm*	Bleed	Acc. dry weight *kg*
AS/ASP 0,2	0,2	0,2	360	Art.3 (3)	III	100	160	1:4	252 ± 2	23	40	53	20	26	140	24	23	4*	M5	1,7
AS/ASP 0,7	0,7	0,65	360	Art.3 (3)	III	100	300	1:4	280 ±1,5	47	52	90	25	36	140	32	32	4*	M5	4,2
AS/ASP 1	1	1	360	Art.3 (3)	III	100	300	1:4	296 ± 5	47	52	114	25	36	140	32	32	4*	M5	5,2
AS/ASP 1,5	1,5	1,5	360	II	III	100	300	1:4	355 ±5	47	52	114	25	36	140	32	32	4*	M5	6,3
AS/ASP 3	3	2,95	360	III	IV	100	600	1:4	554 ± 8	47	65	114	25	53	140	32	50	4*	M5	11
AS/ASP 5	5	5	360	III	IV	100	600	1:4	458 ± 10	47	65	168	25	53	140	32	50	4*	M5	15
AS/ASP 10	10	9,1	360	IV	IV	100	1000	1:4	569 ± 10	60	93	220	60	77	140	70	70	19**	1/4" BSP	33
AS/ASP 15	15	14,5	360	IV	IV	100	1000	1:4	719 ± 10	60	93	220	60	77	140	70	70	19**	1/4" BSP	43
AS/ASP 20	20	18,2	360	IV	IV	100	1000	1:4	879 ± 10	60	93	220	60	77	140	70	70	19**	1/4" BSP	48
AS/ASP 25	25	23,5	360	IV	IV	100	1000	1:4	1044 ±15	60	93	220	60	77	140	70	70	19**	1/4" BSP	59
AS/ASP 35	35	33,5	360	IV	IV	100	1000	1:4	1393 ±15	60	93	220	60	77	140	70	70	19**	1/4" BSP	78
AS/ASP 55	55	50	360	IV	IV	100	1000	1:4	1904 ±15	60	93	220	60	77	140	70	70	19**	1/4" BSP	108

* Allen wrench ** Ex. wrench *** see chapter 3.1.12.2 table 3.1ab

3.1db

- The maximum differential pressure is the maximum allowable difference between the maximum pressure and the minimum working pressure (P2-P1) to have an infinite life cycle of the accumulator (greater than 2,000,000 cycles).
- Flow rate measured using mineral oil with viscosity of 36 cSt at 50°C and ΔP = 5 bar

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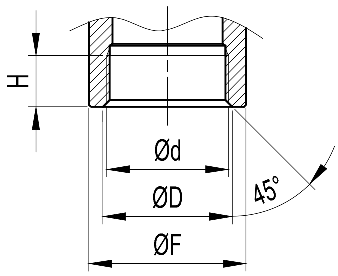
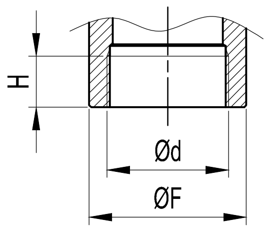
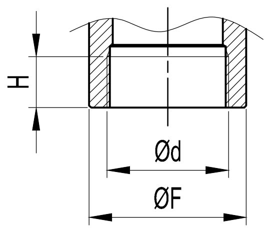
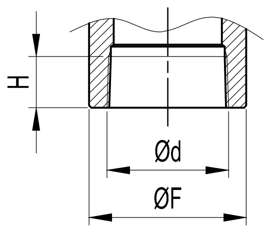
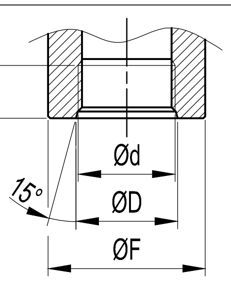
3.1.9.1 STANDARD THREAD CONNECTIONS

Dimensions	Connection Type	Accumulator type	Complete spare valve order code	Ød	ØD mm	ØF mm	H mm
	A BSP ISO 228 with chamfer for OR	AS/ASP 0,2	-	-	-	-	-
		AS/ASP 0,7	V 2023-A5-**/*	3/4" BSP	28,8	36	19
		AS/ASP 1	V 2024-A5-**/*				
		AS/ASP 1,5					
		AS/ASP 3	V 2025-A7-**/*	1" 1/4 BSP	46	53	25
		AS/ASP 5	V 2044-A7-**/*				
		AS/ASP 10 ÷ 55	V 2064-A9- **/*	2" BSP	63,35	77	28
	G BSP ISO 228	AS/ASP 0,2	V 2004-G4-**/*	1/2" BSP	-	26	15
		AS/ASP 0,7	-	-	-	-	-
		AS/ASP 1	-	-	-	-	-
		AS/ASP 1,5	-	-	-	-	-
		AS/ASP 3	-	-	-	-	-
		AS/ASP 5	-	-	-	-	-
		AS/ASP 10 ÷ 55	-	-	-	-	-
	M Metric	AS/ASP 0,2	-	-	-	-	-
		AS/ASP 0,7					
		AS/ASP 1					
		AS/ASP 1,5					
		AS/ASP 3	V 2025-M40x1.5-**/*	M40x1,5	-	53	25
		AS/ASP 5	V 2044-M40/1.5-**/*				
		AS/ASP 10 ÷ 55	V 2064-M50/1.5-**/*	M50x1,5	-	77	28
	P NPT-F	AS/ASP 0,2	-	-	-	-	-
		AS/ASP 0,7	V 2023-P5-**/*	3/4" NPT-F	-	36	Thread plug gage
		AS/ASP 1	V 2024-P5-**/*				
		AS/ASP 1,5					
		AS/ASP 3	V 2025-P7-**/*	1" 1/4 NPT-F	-	53	
		AS/ASP 5	V 2044-P7-**/*				
		AS/ASP 10 ÷ 55	V 2064-A9- **/*	2" NPT-F	-	77	
	S SAE thread	AS/ASP 0,2	-	-	-	-	-
		AS/ASP 0,7	V 2023-S1 /16-12-**/-*	1" 1/16 12 UN	29,16	36	19
		AS/ASP 1	V 2024-S1 /16-12-**/-*				
		AS/ASP 1,5					
		AS/ASP 3	V 2025-S1 5/8-12-**/-*	1" 5/8 12 UN	43,5	53	23
		AS/ASP 5	V 2044-S1 5/8-12-**/-*				
		AS/ASP 10 ÷ 55	V 2064-S1 7/8-12-**/-*	1" 7/8 12 UN	49,84	77	26

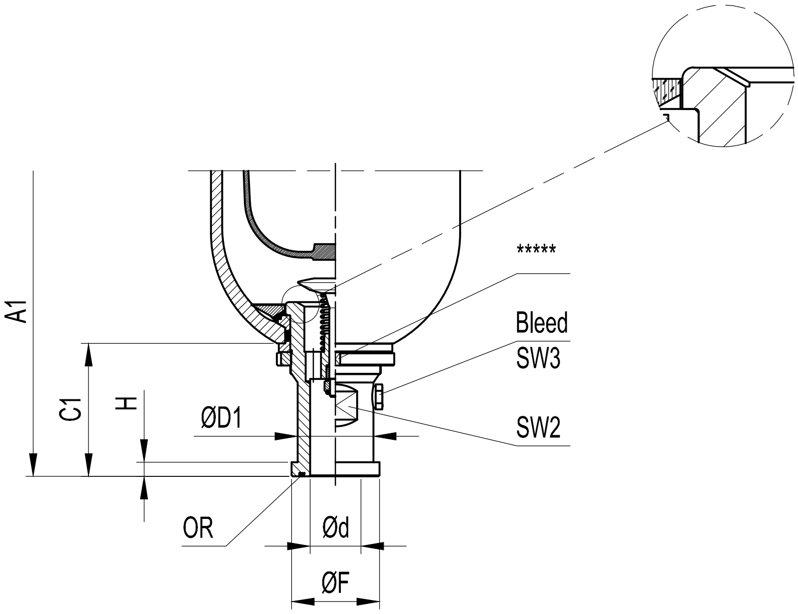
* Gasket material ** Component material

For "ASP" version valve order code become V xxxxP - thread version

3.1dc

3.1.9.2 ADAPTER FOR FLANGE SAE 3000/6000 PSI (L/H)

ASP VERSION



3.1de

Acc. type AS-ASP in carbon steel	Dim.	A1 mm	C1 mm	SW2 mm	SW3 mm	Bleed	Ød mm	SAE 3000 (L) Spare valve order code	ØD1 mm	ØF mm	H mm	SAE6000 (H) Spare valve order code	ØD1 mm	ØF mm	H mm	OR (Included)	Acc. dry weight kg
AS / ASP 0,2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AS / ASP 0,7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AS / ASP 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AS / ASP 1,5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AS / ASP 3	1"	589 ± 8	100	38	4***	M5	-	-	-	-	-	V 2025-H6-**/*	38	47,6	9,5	0010R4131-*	11
	1"1/4	578 ± 8	89				31	V 2025-L7-**/*	43	50,8	8	V 2025-H7-**/*	44	53,3	10,3	0010R4150-*	
AS / ASP 5	1"	493 ± 10	100	38	4***	M5	-	-	-	-	-	V 2044-H6-**/*	38	47,6	9,5	0010R4131-*	15
	1"1/4	482 ± 10	89				31	V 2044-L7-**/*	43	50,8	8	V 2044-H7-**/*	44	53,3	10,3	0010R4150-*	
AS / ASP 10	1"1/2	583 ± 10	115	42	19****	1/4"	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	33
	2"			55		BSP	45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	
AS / ASP 15	1"1/2	733 ± 10	115	42	19****	1/4"	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	43
	2"			55		BSP	45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	
AS / ASP 20	1"1/2	893 ± 10	115	42	19****	1/4"	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	48
	2"			55		BSP	45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	
AS / ASP 25	1"1/2	1058 ± 15	115	42	19****	1/4"	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	59
	2"			55		BSP	45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	
AS / ASP 35	1"1/2	1408 ± 15	115	42	19****	1/4"	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	78
	2"			55		BSP	45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	
AS / ASP 55	1"1/2	1918 ± 15	115	42	19****	1/4"	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	108
	2"			55		BSP	45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	

* Gasket material ** Component material *** Allen wrench **** Ex. Wrench ***** see chapter 3.1.12.2 table 3.1ab

3.1df

For "ASP" version valve order code become V xxxxP - thread version

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3.1.9.3 FLANGE CONNECTION TYPE ANSI / UNI DIN (B/U)

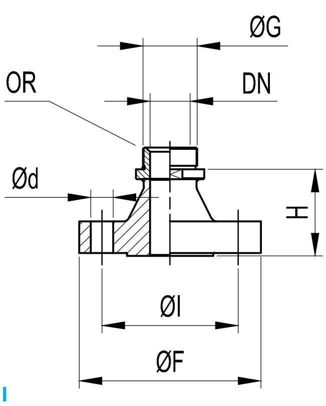
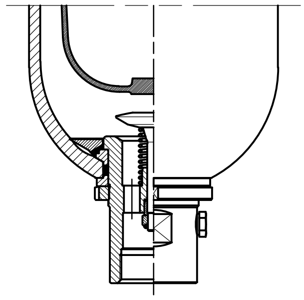


Fig. I



STD. CONNECTION (G)

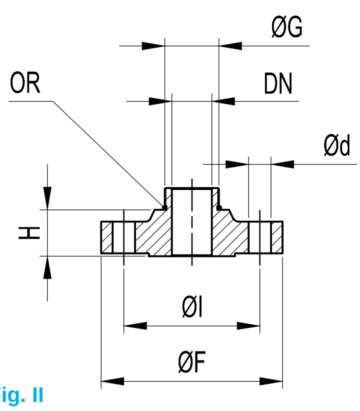


Fig. II

3.1ea

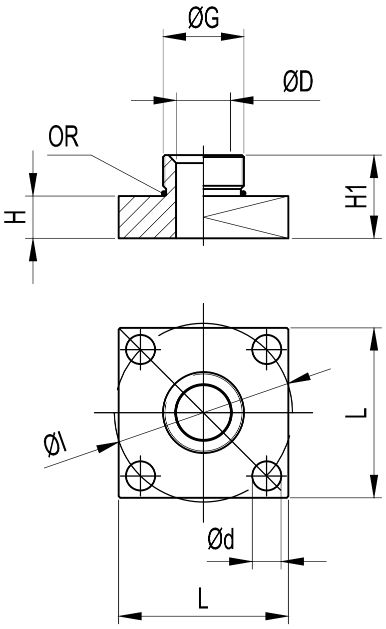
	Accumulator type	Spare flange order code	Ref. Directive		DN mm	PN bar	Fig.	Ø F mm	Ø I mm	Ød mm	N° Holes	H mm	G BSP	OR (Included)
			UNI	DIN										
U (UNI-DIN)	AS / ASP 0,7 - 1 - 1,5	F 2205 - ** / *	2284	2635	20	40	II	105	75	14	4	23	3/4"	0010R2093-*
		F 2206 - ** / *	6086	2628		250		135	95	18	4	45		
	AS / ASP 3 - 5	F 2211 - ** / *	2284	2635	25	40	I	115	85	14	4	51	1"1/4	0010R3150-*
		F 2212 - ** / *	6086	2628		250		150	105	22	4	76		
		F 2215 - ** / *	2284	2635	32	40	II	140	100	18	4	22		
		F 2216 - ** / *	6086	2628		250		165	120	22	4	55		
	AS / ASP 10 ÷ 55	F 2221 - ** / *	2282	2633	25	16	I	115	85	14	4	49	2"	0010R3218-*
		F 2222 - ** / *	2284	2635		40		115	85	14	4	51		
		F 2223 - ** / *	6086	2628		250		150	105	22	4	76		
		F 2227 - ** / *	2284	2635	40	40	I	150	110	18	4	56		
		F 2228 - ** / *	6086	2628		250		185	135	25	4	91		
		F 2231 - ** / *	2282	2633	50	16	II	165	125	18	4	23		
		F 2232 - ** / *	2285	2636		64		185	135	22	4	40		
		F 2233 - ** / *	6086	2628		250		200	150	25	8	61		

* Gasket material ** Flange material Others size on request 3.1eb

	Accumulator type	Spare flange order code	Ref. Directive	DN inch	PN lbs	Fig.	Ø F mm	Ø I mm	Ød mm	N° Holes	H mm	G BSP	OR (Included)
B (ANSI)	AS / ASP 0,7 - 1 - 1,5	F 2207 - ** / *	B16.5	3/4"	300	II	117,5	82,5	19	4	40	3/4"	0010R2093-*
		F 2208 - ** / *	B16.5		1500		130	88,9	22,5	4	59		
	AS / ASP 3 - 5	F 2213 - ** / *	B16.5	1"	300	I	123,5	88,9	22,5	4	73	1"1/4	0010R3150-*
		F 2214 - ** / *	B16.5		1500		149,5	101,6	25,4	4	90		
		F 2217 - ** / *	B16.5	1" 1/4	300	II	133,3	98,4	19	4	44		
		F 2218 - ** / *	B16.5		1500		159	111,1	25,4	4	58		
	AS / ASP 10 ÷ 55	F 2225 - ** / *	B16.5	1"	300	I	123,5	88,9	19	4	73	2"	0010R3218-*
		F 2226 - ** / *	B16.5		1500		149,5	101,6	25,4	4	90		
		F 2229 - ** / *	B16.5	1" 1/2	300	I	155,6	114,3	22,2	4	79		
		F 2230 - ** / *	B16.5		1500		178	123,8	28,5	4	100		
		F 2235 - ** / *	B16.5	2"	400	II	165	127	19	8	55		
		F 2236 - ** / *	B16.5		1500		216	165,1	25,4	8	83		

* Gasket material ** Flange material Others size on request 3.1ec

3.1.9.4 SQUARE FLANGE CONNECTION



3.1fa

Accumulator type	Spare square flange order code	Ø G BSP	Ø D *mm*	L *mm*	Ø I *mm*	H *mm*	Ø d *mm*	H 1 *mm*	Weight *Kg*	OR (Included)
AS / ASP 3 - 5	F 2454 A7 - ** / *	1" 1/4 BSP	26	100	105	25	17.5	49	0,8	0010R3150 - *
AS / ASP 10 ÷ 55	F 2455 A9 - ** / *	2" BSP	32						0,9	0010R3218 - *

* Gasket material ** Square flange material Weigth indicated only for blind version

3.1fb

3.1.9.5 ADAPTERS

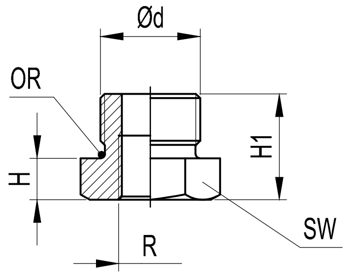


Fig. I

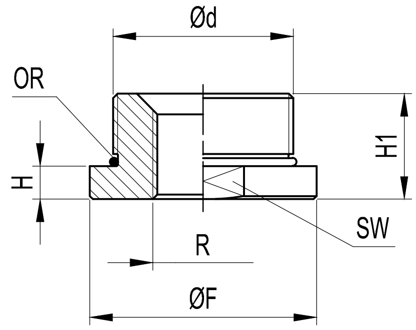


Fig. II

3.1fc

Accumulator type	Order code	Ød Acc. connection	R**** Out connections (0 = blind)	Fig.	SW *mm*	Ø F *mm*	H *mm*	H1 *mm*	OR (Included)	Weight *Kg*
AS / ASP 0,7 - 1 - 1,5	R - A5*** - ** / *	3/4" BSP	1/8" ÷ 3/8" BSP - NPT - BSPT	I	32	-	11	28	0010R2093 - *	0,14
			1/2" BSP - NPT - BSPT	I			28	45		0,27
AS / ASP 3 - 5	R - A7*** - ** / *	1" 1/4 BSP	1/8 ÷ 3/4" BSP - NPT - BSPT	II	48	53	11	32	0010R3150 - *	0,41
AS / ASP 10 ÷ 55	R - A9*** - ** / *	2" BSP	1/8" ÷ 1" 1/2 BSP - NPT - BSPT	II	70	75	11	35	0010R3218 - *	0,86

* Gasket material ** Adapter material *** See chapter 3.1.8 table 7 - 8 Weigth indicated only for blind version

3.1fd

**** R Out connections type "S" and "M" thread on request

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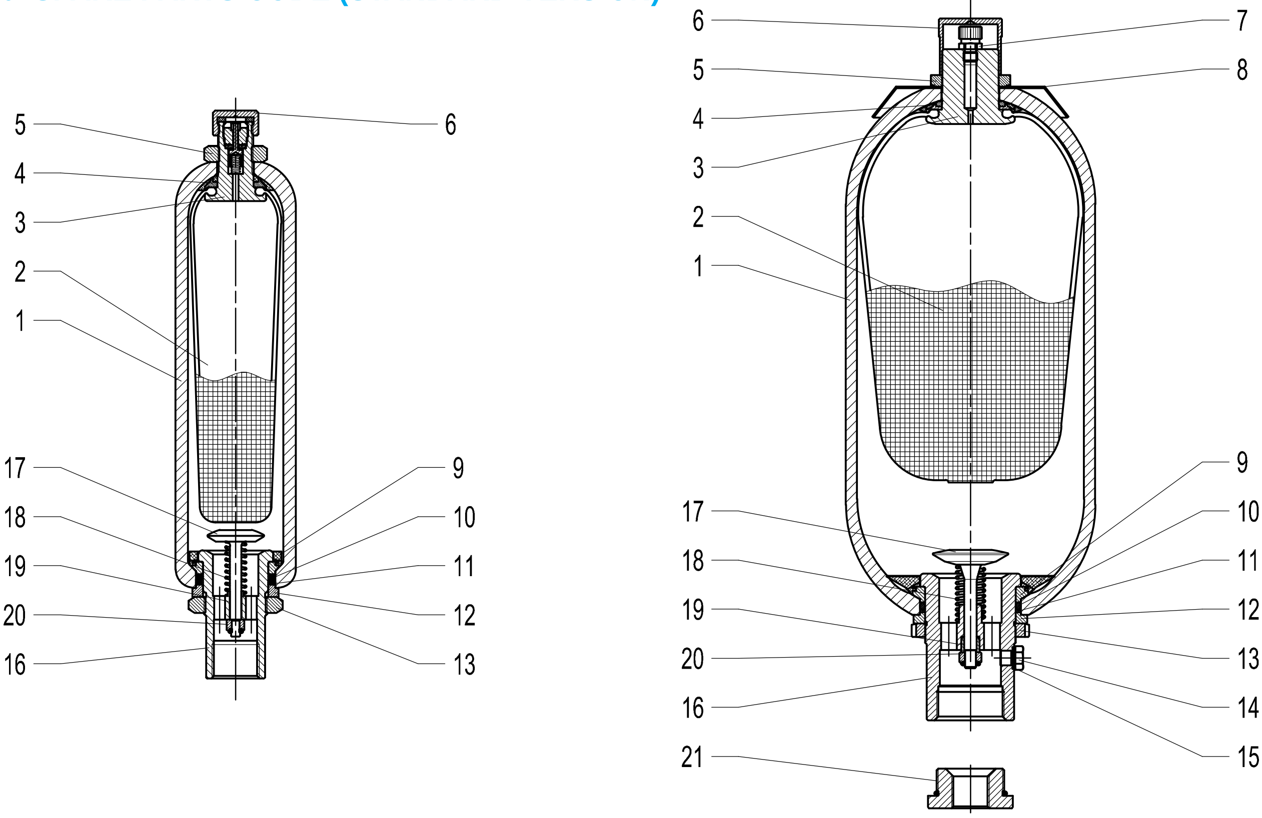
3.1.10. SPARE PARTS CODE (STANDARD VERSION)



3.1ga

<table>
<tr><th rowspan="2">Item</th><th rowspan="2">Description</th><th rowspan="2">Q.ty</th><th colspan="6">Type</th></tr>
<tr><th>AS / ASP 0,2</th><th>AS / ASP 0,7</th><th>AS / ASP 1 - 1,5</th><th>AS / ASP 3</th><th>AS / ASP 5</th><th>AS / ASP 10 ÷ 55</th></tr>
<tr><td>1</td><td>Accumulator shell</td><td>1</td><td colspan="6">Not supplied as spare part</td></tr>
<tr><td>2</td><td>Bladder</td><td>1</td><td>S 0.2 * - 0</td><td>S0.7 * - 0</td><td>S1*- 0 / S1.5*- 0</td><td>S3 * - 0</td><td>S5 * - 0</td><td>S10 ÷ 55 * - 0</td></tr>
<tr><td>3</td><td>Gas valve body</td><td>1</td><td>B10026 - **</td><td colspan="3">B10107 - **</td><td>B10202- **</td><td>B10333 - **</td></tr>
<tr><td>4</td><td>Rubber-coated washer</td><td>1</td><td>B10024 - ** / *</td><td>B10104 - ** / *</td><td colspan="2">B10106 - ** / *</td><td>B10205 - ** / *</td><td>B10334 - ** / *</td></tr>
<tr><td>5</td><td>Gas valve looknut</td><td>1</td><td>B10023 - **</td><td colspan="4">B10109 - **</td><td>B10302 - **</td></tr>
<tr><td>6</td><td>Protection cap</td><td>1</td><td>B10337 / 00 - ** - *</td><td colspan="4">B10103 - **</td><td>B10301 - **</td></tr>
<tr><td>7</td><td>Gas-fill valve</td><td>1</td><td>V 2001 - ** / *</td><td colspan="5">V 2072 - ** - *</td></tr>
<tr><td>8</td><td>Name plate</td><td>1</td><td>-</td><td colspan="3">D10300A-A</td><td>D10300C-A</td><td>D10300E-A</td></tr>
<tr><td>9</td><td>Retaining ring</td><td>1</td><td>B10035 - ** / *</td><td>B10123 - ** / *</td><td>B10127 - ** / *</td><td>B10146 - ** / *</td><td>B10222 - ** / *</td><td>B10317 - ** / *</td></tr>
<tr><td>10</td><td>"O" ring</td><td>1</td><td>0010R4112 - *</td><td colspan="2">0010R4150 - *</td><td>0010R0159 - *</td><td>0010R6212 - *</td><td>0010R0181 - *</td></tr>
<tr><td>11</td><td>Supporting ring</td><td>1</td><td>B10038-T</td><td colspan="2">B10133-T</td><td>B10150-T</td><td>B10227-T</td><td>B10320-T</td></tr>
<tr><td>12</td><td>Space ring</td><td>1</td><td>B10037 - **</td><td colspan="2">B10120 - **</td><td colspan="2">B10223 - **</td><td>B10319 - **</td></tr>
<tr><td>13</td><td>Fluid port ring nut</td><td>1</td><td>B10039 - **</td><td colspan="2">B10122 - **</td><td colspan="2">B10217 - **</td><td>B10321 - **</td></tr>
<tr><td>14</td><td>Bleed screw</td><td>1</td><td>-</td><td colspan="4">B10128 - **</td><td>B10316A - **</td></tr>
<tr><td>15</td><td>Seal ring</td><td>1</td><td>-</td><td colspan="4">B10129 - R</td><td>0010T14-1/4 - *</td></tr>
<tr><td rowspan="2">16</td><td>Fluid port body std. version</td><td rowspan="2">1</td><td>B10031 - *** - **</td><td colspan="2">B10115 - *** - **</td><td colspan="2">B10144 - *** - **</td><td>B10311 - *** - **</td></tr>
<tr><td>Fluid port body "P" version</td><td>B10031P - *** - **</td><td colspan="2">B10115P - *** - **</td><td colspan="2">B10144P - *** - **</td><td>B10311P - *** - **</td></tr>
<tr><td>17</td><td>Poppet</td><td>1</td><td>B10028 - **</td><td colspan="2">B10111 - **</td><td colspan="2">B10221 - **</td><td>B10310 - **</td></tr>
<tr><td>18</td><td>Spring</td><td>1</td><td>B10029 - **</td><td colspan="2">B10112 - **</td><td colspan="2">B10149 - **</td><td>B10322 - **</td></tr>
<tr><td>19</td><td>Brake bushing</td><td>1</td><td>-</td><td colspan="2">B10113 - **</td><td colspan="2">B10226 - **</td><td>B10314 - **</td></tr>
<tr><td>20</td><td>Selflocking nut</td><td>1</td><td>B10033 - **</td><td colspan="2">B10116 - **</td><td colspan="2">B10211 - **</td><td>B10315 - **</td></tr>
<tr><td>21</td><td>Adapter</td><td>1</td><td colspan="6">See chapter 3.1.9.5 ADAPTER</td></tr>
<tr><td colspan="2">Standard gas valve ass. (parts 3 ÷ 7)</td><td>1</td><td>V 2002 - ** / *</td><td>V 2021 - ** / *</td><td colspan="2">V 2022 - ** / *</td><td>V 2042 - ** / *</td><td>V 2062 - ** / *</td></tr>
<tr><td colspan="2">Standard fluid port ass. (parts 9 ÷ 20)****</td><td>1</td><td>V 2004 - *** - ** / *</td><td>V 2023 - *** - ** / *</td><td>V 2024 - *** - ** / *</td><td>V 2025 - *** - ** / *</td><td>V 2044 - *** - ** / *</td><td>V 2064 - *** - ** / *</td></tr>
<tr><td colspan="2">Gasket sets</td><td>1</td><td>B2010-* { 0010R2050-*
B10341-P
B10342-P
0010R4112-*
B10038-T }</td><td colspan="2">B2030-* { 0010R2050-*
B10341-P
B10342-P
0010R4150-*
B10133-T
B10129-R
0010R2093-* }</td><td>B2031-* { 0010R2050-*
B10341-P
B10342-P
0010R0159-*
B10150-T
B10129-R
0010R3150-* }</td><td>B2050-* { 0010R2050-*
B10341-P
B10342-P
0010R6212-*
B10227-T
B10129-R
0010R3150-* }</td><td>B2080-* { 0010R2050-*
B10341-P
B10342-P
0010R0181-*
B10320-T
0010T14-1/4-*
0010R3218-* }</td></tr>
</table>

* Gasket material   ** Component material   *** See chapter 3.2.8 table 6 - 7   **** For "ASP" version valve order code become V xxxxP - thread version

3.1gb

3.1.11 COMMISSIONING AND MAINTENANCE

Delivery conditions

Bladder accumulators are delivered pre-charged with nitrogen at a pressure of 30 bar or at value of pressure required at time of order. The pre-charge value is also on the nameplate of the accumulator.
Depending on the size and quantity ordered, the bladder accumulators are shipped in boxes, in cartons, on pallets or wooden boxes on request. Unless otherwise required, certificates and documentation are provided together with the accumulators.

Handling

The original packaging is suitable for handling and storage. Where necessary, you should use suitable lifting equipment to support the weight of the accumulators.
However protect from impact the packaging and handle it with care.

Storage

During storage in the warehouse, leave the product in its original packaging, keeping it away from heat sources and naked flames. The storage temperature should be between +10 and +40°C.
In addition to six months of storage, the precharge pressure must be to two bar and make sure that inside there is lubrication fluid compatible with bladder polymer.
After six years of storage, it is essential to proceed with the replacement of all elastomeric parts before the commissioning.

Marking on the nameplate of the accumulator

With reference to the PED 2014/68/EU classification, Article 3, Paragraph 3 and / or risk categories I or II depending to the volume and maximum working pressure, the accumulator indicates the following data:

- Logo, name and country of the manufacturer
- Mounth/year of production
- Product code
- Serial number
- Maximum PS pressure and PT test pressure in bar
- Min. and max. TS working temperature in Celsius
- Volume V in litres
- Group of fluids allowed (II)
- CE marking (for volumes exceding 1 litre) with the identification number of the notified body
- Pre-charge pressure in bar

It is strictly forbidden to:

- weld, rivet or screw any item of 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 (dangerous) fluid of Group 1 with equipment designed and manufactured for fluids of Group 2.

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 security valve (see Chapter 8) or a security block type BS (see Chapter 9). This device provides user and equipment protection against possible damage caused by pressure surges and also makes the maintenance of the accumulator easier, facilitating the interception and the discharge.
Provide for a space of 200 mm above the gas pre-charge valve to allow access to and control of the pre-charge equipment (see Chap.11.1).
The accumulators type AS may be installed in any position from horizontal to vertical (preferably with the pre-charge valve at the top), and the nameplate 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 (please see Chapter 7) to avoid the transmission of vibrations.
If are not used EPE safety blocks, make sure that the accumulator is connected to the hydraulic circuit by suitable connection devices.
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.

Pre-charge of nitrogen

Normally, the bladder accumulators are delivered pre-charged with pressurized gas. The pre-charge of gas can be controlled and / or adjusted before or after installation of the accumulator in the hydraulic circuit.
For the pre-charge, use only industrial dry nitrogen with a purity of min. 99%. It is important to use the nitrogen from a bottle equipped with a pressure reducing valve (see Chap.11.3). Use the EPE pre-charge and charging set type PC to check the charging pressure requires, and adjust if necessary. If the pre-charge pressure is lower than required, connect the charging hose on one side and the other side connect it to the nitrogen bottle or to the pressure reducer. Slowly fill the nitrogen in the accumulator until reaching a pressure slightly higher than that set value (+ 10 ÷ 15%). Close the bottle and remove the charging hose pipe from the pre-loading set; wait until the gas temperature has stabilized (2 hours) and calibrate the pressure, discharging the excess gas.
Make sure that the gas valve is not subject to losses and, if necessary, use soap and water.
Tighten the protective caps manually.

Hydraulic pressurization

- Check that the pre-charge pressure is adequate for the application.
- Ensure that the hydraulic pressure never exceeds the max allowed pressure (PS) shown on the accumulator shell.
  To avoid this risk, use a safety item (see Chap. 9).

Maintenance

- Periodically check the pre-charge pressure of the gas: after the commissioning, check after 2-3 weeks of operation and if there were no leaks, repeat the operation after 3 months; if the pressure at the same temperature was stable, repeat the test yearly. For heavy-duty applications, check the pre-charge every 6 months.
- Periodically (yearly) carry out a visual inspection of the accumulator in order to detect any early signs of deterioration such as corrosion, deformation, etc.
- Comply with the requirements of the regulations concerning the verification of the functionality of the equipment according to the country of installation of the accumulator.

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Repair

If for failure, scheduled check or retest it is necessary to remove the accumulator from the system, prior to removal, isolate the accumulator from the installation and discharge pressure of the liquid.
All bladder EPE accumulators of the AS and ASP series may be repaired. It may consist in replacing the bladder, the seals, the pre-charge valve and/or the parts of the gas and fluid valve.
For reasons of functionality and security, it is recommended to use only original spare parts.

Disassembly

- Fasten the accumulator firmly in a vice or on a bench in a horizontal position, taking care not to damage the outer surface.

3.1h

- If you have not already carried out, unscrew the cap nut first and then the valve cap of the gas valve.

3.1i

- Allow gas escapes from the bladder with the help of the check valve until a pressure of 0 is displayed. Check if the bladder is now de-pressurizing an open valve.

3.1j

- Remove gas valve, unscrew the nut on the gas valve and remove the nameplate.

3.1k

- Undo slotted round nut for hook wrench by using the hook wrench.

3.1l

- Remove the slotted nut and the retaining ring.

3.1m

- Push enough oil valve into the housing until the sealing ring and the washer can be removed.

3.1n

- Remove the sealing ring and the washer.

3.1o

- Remove the retaining ring, take it out, by carefully pushing the ring together.

3.1p

- Remove the oil valve from the shell.

3.1q

- Fold bladder somewhat and withdraw by turning it slightly.

Refitting

Tightening torques in Nm				
	0.2 l	0.7-1.5 l	3 - 5 l	10-55 l
Fluid port ring nut	60 +10	100 +20	200 +50	450 +50
Bleed screw	3 +1	5 +1	5 +1	30 +10
Gas valve locknut	50 +10	80 +20	100 +20	150 +30
Filling valve V - VX - V2	-	30 +5	30 +5	30 +5
Valve insert V4	-	0.3 +0.2	0.3 +0.2	0.3 +0.2

- Cleaning and testing: clean all metallic parts on accumulator using an organic degraser - visual inspection of oil valve parts (valve poppet, spring, nut, breake bushing)
  - check valve for sluggishness
  - Clean bladder, i.e. using isopropanol. Visual inspection of bladder for faults - inner inspection of shell for signs of corrosion. In event of coated shell, check the condition of the coating.
  Replace the parts deemed to be bad; the o-rings must always be replaced (see spare parts Section 3.1.10).

3.1s

- Drain air from bladder by pressing together.

3.1t

- Carefully moisten the inside of the bladder and the shell with the same medium operation. That will be used during operation.

3.1u

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- Reinstall according to this sequence: o-ring, support ring and space ring.

3.1v

- Screw the slotted nut and centre the parts on the oil valve by using a plastic hammer.

3.1w

- Bleed screw with sealing ring.

3.1x

- Mount the bleed screw with its sealing ring.

3.1y

- Tighten the hexagon nut SW1 on the gas valve.

3.1z

- Mount the filling valve.

Pre-charge

3.1zz

- Screw the pre-charge PC equipment on the gas valve.
- Connect the equipment to the cylinder of nitrogen or to the pressure reducer with the inflation tube.
- Slowly enter the nitrogen in the accumulator until reaching a pressure slightly higher than the set value (+ 10 ÷ 15%).
- Close the cylinder and remove the connecting pipe from the equipment.
- Wait until the gas temperature has stabilized (2 hours).
- Calibrate the pressure discharging the excess gas.

Make sure that the gas valve is not subject to losses and, if necessary, use soap and water.
Tighten the protective caps manually.

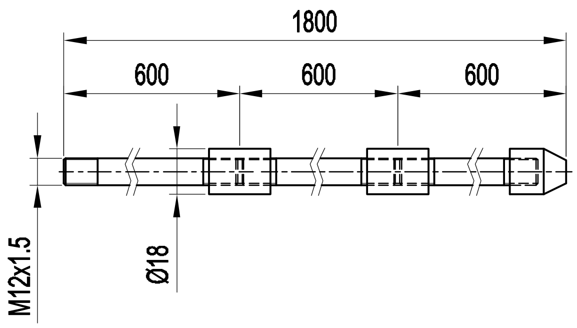
Demolition and recycling of the accumulator
Before accumulator demolition or recycling, you should always discharge completely the pre-charge pressure and remove the gas valve.
If needed, proceed decontaminating in relation to the fluid used prior to demolition.

3.1.12 REPAIR TOOLS

3.1.12.1 BLADDER PULL ROD

The pull rod screwed to the gas valve of the bladder for easy assembly into shell during reassembly. Pull rod is complete with fitting for EPE gas valve and 3 extension segments to accommodate all size of accumulators.
Code for complete kit: **B2505**

Dimension

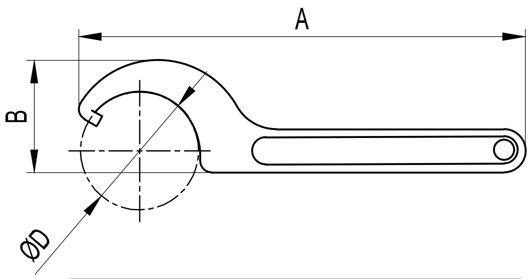


3.1aa

3.1.12.2 SPANNER WRENCH

Fits all standard size bladder accumulator. It is used to remove or install lock nut on fluid port assembly.
0,7÷1,5 lt code **2506/58**
3÷5 lt code **2506/68**
10÷55 lt code **2506/105**

Dimension



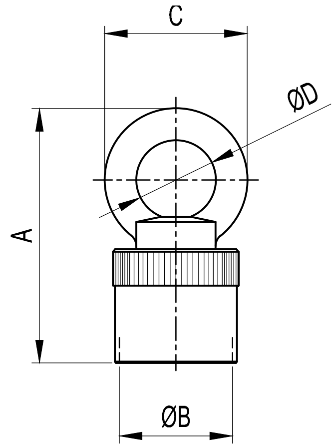
CODE	A	B	ØD	For Accumulator
B2506/58	241	45	58	0.7 ÷ 1.5
B2506/68	241	43	68	3 ÷ 5
B2506/105	336	82	105	10 ÷ 55

3.1ab

3.1.12.3 LIFTING HOOK

To be used for the safe lifting of mounted accumulators:
For accumulators 0,7÷5 lt (M22x1,5) code **B2507/2**
For accumulators 10÷55 lt (M50x1,5) code **B2507/5**
For accumulators V4 (7/8" UNF) code **B2507/7**

Dimension



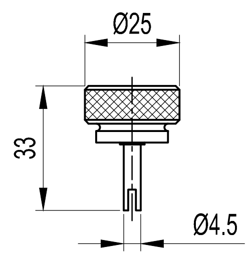
CODE	A	ØB	C	ØD	For Accumulator
B2507/2	100	M22x1.5	63	35	0,7 ÷ 5
B2507/5	112	M50x1.5	63	35	10 ÷ 55
B2507/7	100	7/8" UNF	63	35	10 ÷ 55

3.1ac

3.1.12.4 CORE TOOL

The core tool is used to remove and reinstall the valve core type V4.
Code **B2508**

Dimension



3.1ad

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3.2.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS): 360 bar

PRESSURE TEST (PT): 1.43 x PS

NOMINAL CAPACITIES:
ASL: 0.2 - 0.7 - 1 - 1.5 - 3 - 5 – 10 – 15 – 20 – 25 – 35 - 55 litres
AST: 1 - 1.5 - 3 - 5 – 10 – 15 – 20 – 25 – 35 - 55 litres

WORKING TEMPERATURE: -40 ÷ +150 °C

FLUID VISCOSITY RANGE: 10 ÷ 400 cSt

RECOMMENDED VISCOSITY: 36 cSt

FLUID CONTAMINATION DEGREE:
class 21/19/16 according to ISO 4406/99

BODY MATERIAL:
- carbon steel shell painted with rust inhibitor RAL 8012
- nickel coating 25 - 40 μ
- stainless steel AISI 316L
- internal and external coating with RILSAN th. 0.6 mm

VALVES MATERIAL:
- phosphated or galvanized carbon steel in compliance with Directive 2002/95/EC (RoHS) to resist to corrosion
- stainless steel AISI 316L
- nickel coating 25-40 μ

BLADDER MATERIAL:
- **P** = Nitrile rubber (NBR)
- **F** = Low temp. nitrile rubber
- **H** = Nitril for hydrocarbons
- **K** = Hydrogenated nitrile (HNBR)
- **B** = Butyl (IIR)
- **E** = Ethylene-propylene (EPDM)
- **N** = Chloroprene (Neoprene)
- **Y** = Epichlorohydrin (ECO)
- **V** = Fluorocarbon (FPM)

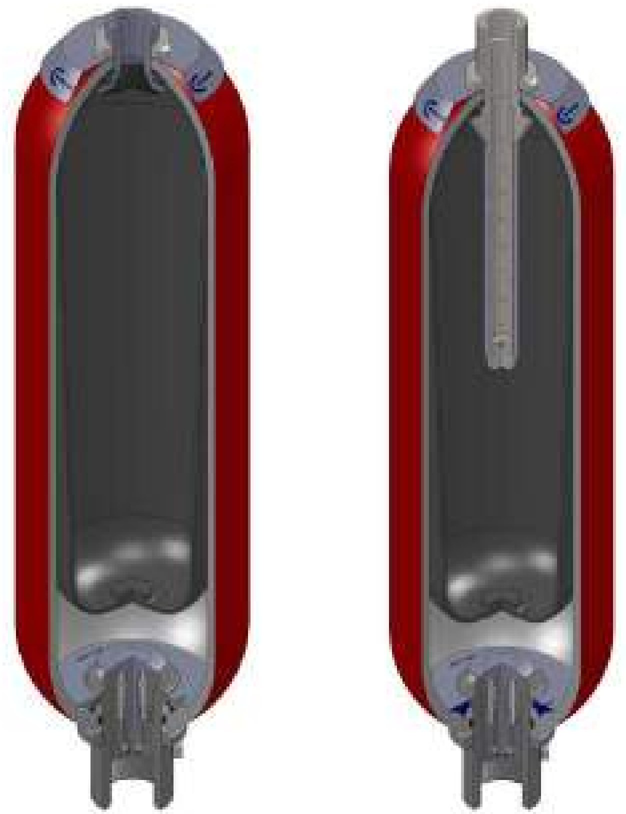
See Table 3.2c and/or Chapter 1.5

GAS VALVE CONNECTION: see 3.2db - 3.2dd

FLUID PORT CONNECTION: see 3.2de - 3.2dg - 3.2eb - 3.2ec
3.2fb - 3.2fd

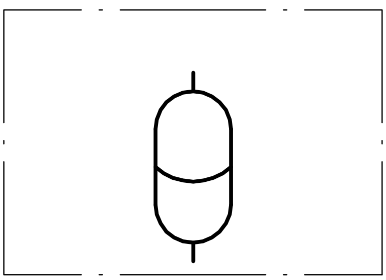
FLOW RATE: see Table 3.2db - 3.2dd

WEIGHT: see Table 3.2db - 3.2dd



3.2a

3.2.2 HYDRAULIC SYMBOL



3.2b

3.2.3 "ASL and AST" BLADDER ADVANTAGES

- dirt tolerant
- light weight
- compact
- simple construction
- quick response
- works well on water, low lubricity fluids
- quick, easy installation
- low cost

3.2.4 DESCRIPTION

Bladder accumulators' type ASL and AST consist of a seamless cylindrical pressure vessel made of high-tensile steel.
The accumulators are subdivided into a gas and fluid side by an elastic bladder mounted in the interior of the vessel.
In the ASL type, the liquid is also inside the bladder.
The transfer accumulator AST type is designed especially for connecting to nitrogen cylinders. A diffuser rod prevents damage to the bladder when the accumulator works.
Nitrogen cylinders used as back-ups increase the gas volume in the accumulator. This means that smaller accumulators can be used for the same gas volume and costs can be reduced.
When the fluid is pressed into the accumulator, the gas in the bladder is compressed and hence the pressure increased. The gas volume reduces and on the fluid side, the fluid can flow into the accumulator. As soon as the pressure on the fluid side falls below the gas pressure, the accumulator is emptied.
Oil valve is provided in the oil port of the bladder-type accumulator and closes when the pressure on the gas side is higher than the one on the fluid side. This prevents draining of the bladder into the oil channel and thus the bladder from being destroyed.
When the minimum operating pressure is reached, a small oil volume is to be maintained between the bladder and the fluid volume (approx. 10% of the nominal capacity of the hydraulic accumulator), in order that the bladder does not hit the valve during every expansion process.
The gas valve body of ASL type accumulator is complete with anti-extrusion in addition to the rubber washer and locknut.
The gas valve body of AST type accumulator is complete with diffuser rod in addition to the rubber washer and locknut.
These parts can be replaced separately.
The nameplate shows the technical data and features of the hydraulic accumulator.

3.2.5 EUROPE MARKET

All hydraulic accumulators are pressure vessels and are subject to the national regulations and directives valid at the place of installation.
Bladder accumulator type ASL and AST, up to and including 1 litre, must not be CE marked.
For bladder accumulator type ASL and AST, greater than 1 litre, every shipping batch is complete of a conformity declaration and instruction of use and maintenance and/or all documents requested.
All vessel categories (see Table 3.2db, 3.2dd) must be protected by means of a pressure relief valve in accordance with Directive 2014/68/EU.

3.2.6 ACCESSORIES

For additional cylinders, see Section 6
For support equipment, see Cap. 7
For gas side's safety equipment, see Cap. 8
For fluid side's safety equipment, see Cap. 9
For pre-loading and charging set, see Cap. 11
For other components, see Cap. 12

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3.2.7 BLADDER-TEMPERATURE-LIQUID COMPATIBILITY

When selecting the accumulator variant, pay attention to the following non-binding notes with regard to hydraulic fluid, bladder material and the permissive temperature range. (see Section 1.5)

Code letter	Polymer	ISO	Temperature range (°C)	Some of the liquids compatible with the polymer
P	Standard nitrile (Perburan)	NBR	-20 ÷ +80	Aliphatic hydrocarbons (propane, butane, gasoline, oils, mineral greases, diesel fuel, fuel oil, kerosene), mineral greases and oils, HFA - HFB - HFC fluids, many dilute acids, alkalis, saline solutions, water, water glycol.
F	Low temperature nitrile	NBR	-40 ÷ +70	The same as with standard nitrile + a number of different types of Freon. (This contains less acrylonitrile than the standard and is therefore more suitable for low temperatures, but its chemical resistance is slightly lower).
H	Nitrile for hydrocarbons	NBR	-10 ÷ +90	Regular and premium grade slightly aromatic gasoline (and all the liquids for standard nitrile).
K	Hydrogenated nitrile	HNBR	-30 ÷ +130	The same as with standard nitrile but with excellent performance at high and low temperatures.
B	Butyl	IIR	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many acids and bases, salt solutions, polar solvents such as alcohols, ketones and esters, polyglycol-based hydraulic fluids (HFC fluids) and bases of esters of phosphoric acid (HFD-R fluids), silicone oils and greases, resistance to ozone, aging and weathering.
E	Ethylene-Propylene	EPDM	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many organic and inorganic acids, detergents, solutions of sodium and potassium, phosphate ester-based hydraulic fluids, (HFD-R), silicone oils and greases, many polar solvents (alcohol, ketones, esters), Skydrol LD4 and 500B-4, resistance to ozone, aging and weathering.
N	Chloroprene (Neoprene)	CR	-30 ÷ +100	Mineral oils of paraffin, silicone oils and greases, water and aqueous solutions, refrigerants (ammonia, carbon dioxide, Freon), naphthenic mineral oils, low molecular aliphatic hydrocarbons (propane, butane, fuel), brake fluids based on glycol, better resistance to ozone, weathering and aging compared to NBR rubber.
Y	Epichloridrin	ECO	-30 ÷ +110	Mineral oils and greases, aliphatic hydrocarbons (propane, butane and gasoline), silicone oils and greases, water at room temperature, resistance to ozone, aging and weathering.
V	Fluorocarbon	FKM	-10 ÷ +150	Mineral oils and greases, non-flammable fluids of HFD group, silicone oils and greases, animal and vegetable oils and greases, aliphatic hydrocarbons (gasoline, butane, propane, natural gas), aromatics hydrocarbons (benzene, toluene), chlorinated hydrocarbons (Tetrachloroethylene, carbon tetrachloride), fuel (regular, super and containing methanol), excellent resistance to ozone, weathering and aging.

For other hydraulic fluid and/or temperatures, please consult us. 3.2c

3.2.8 ORDER CODE

1	2	3	4	5	6	7 - 8	9		10		11	12	13	14	15
AST	25	P	360	C	R	G8	G6	-	8	-	C	0	C	1	R250

1 Series

Bladder accumulator liquid separator	=	**ASL**
Bladder accumulator transfer	=	**AST**

2 Nominal capacity

0.2 lt	=	**0.2**
0.7 lt	=	**0.7**
1 lt	=	**1**
1.5 lt	=	**1.5**
3 lt	=	**3**
5 lt	=	**5**
10 lt	=	**10**
15 lt	=	**15**
20 lt	=	**20**
25 lt	=	**25**
35 lt	=	**35**
55 lt	=	**55**

3 Bladder material

Nitrile rubber (NBR)	=	**P**
Nitrile for low temp.	=	**F**
Nitril for hydrocarbons	=	**H**
Hydrogenated nitrile (HNBR)	=	**K**
Butyl (IIR)	=	**B**
Ethylene-propylene (EPDM)	=	**E**
Chloroprene (Neoprene)	=	**N**
Epichlorohydrin (ECO)	=	**Y**
Fluorocarbon (FKM)	=	**V**

4 Max working pressure (PS)

See the table on front page

5 Body material

Carbon steel	=	**C**
Nickel coated carbon steel 25 μ	=	**N**
Nickel coated carbon steel 40 μ	=	**M**
Stainless steel	=	**X**
Rilsan coating	=	**V**

6 Fluid port connection

See the table on front page

7 - 8 Dimension of the connection fluid or 7+8 table

See the table on front page

15 Other variants

See the table on front page

14 Variants of gas side

Standard	=	**0**
Only cap in stainless steel	=	**1**
Brass nameplate	=	**2**

Other numbers/variants to be requested EPE

13 Gas valve material

Carbon steel	=	**C**
Nickel coated carbon steel 25 μ	=	**N**
Nickel coated carbon steel 40 μ	=	**M**
Stainless steel	=	**X**

12 Variants of fluid side

Standard	=	**0**
Adapter in stainless steel (R)	=	**1**
Button and spring in stainless steel	=	**2**

Other numbers/variants to be requested EPE

11 Fluid valve material

Carbon steel	=	**C**
Nickel coated carbon steel 25 μ	=	**N**
Nickel coated carbon steel 40 μ	=	**M**
Stainless steel	=	**X**

10 Test and certification

Factory testing	=	**0**
Australian Standard	=	**2**
ML (China)	=	**3**
RINA	=	**4**
Lloyd's Register	=	**5**
PED 2014/68/EU (for capacities greater than 1 l)	=	**8**
ATEX 2014/34/EU (for surface)	=	**9**
ATEX 2014/34/EU (for mine)	=	**9M**
DNV	=	**10**
EAC (Russia)	=	**11**
Algeria passport	=	**12**
Standard regulation (NR13) (Brazil)	=	**13**
Tunisian passport	=	**14**
Bureau Veritas	=	**15**
ABS	=	**16**
CCS	=	**17**
Dosh	=	**20**
CRN	=	**21**

9 Connection gas side

Capacity 0.2 l	=	**G1**
Capacity 0.7 ÷ 5 l	=	**G2**
Capacity 10 ÷ 55 l	=	**G6**

Special variants upon request

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4 Max working pressure (PS)		
Capacity litres	Carbon steel	Stainless steel
AST 0,7 ÷ 55 ASL 0,2 ÷ 55	**360** (210 only for the version with connection L or other pressure related to connections B or U)	**30 - 40 - 60 - 80 - 150 - 210**

6 Fluid port connection

For ASx 0.7÷55	BSP ISO 228 with chamfer for OR (std)	=	**A**
For ASx 0.2	BSP ISO 228 (std)	=	**G**
For ASx 3÷55	Metric	=	**M**
For ASx 0.7÷55	NPT-F	=	**P**
For ASx 3÷55	internal thread SAE	=	**S**
For ASx 3÷55	adapter for flange SAE 3000 Psi	=	**L**
For ASx 3÷55	adapter for flange SAE 6000 Psi	=	**H**
For ASx 0.7÷55	flange ANSI	=	**B**
For ASx 0.7÷55	flange UNI	=	**U**
For ASx 0.7÷55	square flange	=	**Q**
For ASx 0.7÷55	adapter *	=	**R**

* assembled on the fluid valve connection type A

7 Dimension of the fluid connection

For the type of connection:

A	(0.7÷1.5 l) 3/4”	=	**5**
	(3÷5 l) 1” 1/4	=	**7**
	(10÷55 l) 2”	=	**9**
G	(0.2 l) 1/2”	=	**4**
M	(3÷5 l) 40x1.5	=	**40/1.5**
	(10÷55 l) 50x1.5	=	**50/1.5**
P	(0.7÷1.5 l) 3/4”	=	**5**
	(3÷5 l) 1” 1/4	=	**7**
	(10÷55 l) 2”	=	**9**
S	(0.7÷1.5 l) 1” 1/16 12UN	=	**1 1/16-12**
	(3÷5 l) 1” 5/8 12UN	=	**1 5/8-12**
	(10÷55 l) 1” 7/8 12UN	=	**1 7/8-12**
L	(3÷5 l) 1” 1/4 SAE3000	=	**7**
	(10÷55 l)1” 1/2 SAE 3000	=	**8**
	2” SAE 3000	=	**9**
H	(3÷5 l) 1” 1/4 SAE6000	=	**7**
	(10÷55 l)1” 1/2 SAE 6000	=	**8**
	2” SAE 6000	=	**9**
B	(0.7÷55 l)		**DIMENSION/RATING**

Former. 1” ANSI 1500 = 1/1500 (Pmax = 250 bar)

U	(0.7÷55 l)		**DN/PN**

Former. DN50 PN100 = 50/100 (Pmax = 100 bar)

Q	(3÷5 l) 1” 1/4	=	**7**
	(10÷55 l) 2”	=	**9**
R	(0.7÷55 l) Blind	=	**0**
R	(0.7÷55 l) internal thread		
	BSP ISO 228	=	**G***
	NPT-F	=	**P***
	BSPT	=	**N***
	SAE	=	**S***
	Metric	=	**M***

*Variant in table 8

15 Other variants

Burst disc set at xxx bar, laterally on AST (see Section 8.2)	= **Rxxx**
Needle Valve of ¼” BSP, laterally on AST	= **EG2**
Flushing with degree of contamination ≤ ...class	= **Fx**
75-80 µ thick polyurethane paint with colour to be specified	= **Wxxx**
Off-shore paint with colour to be specified	= **Zxxx**
NORSOK System 1 paint with colour to be specified	= **K1**
NORSOK System 7B paint with colour to be specified	= **K7B**

other variants upon request

8

Dimension

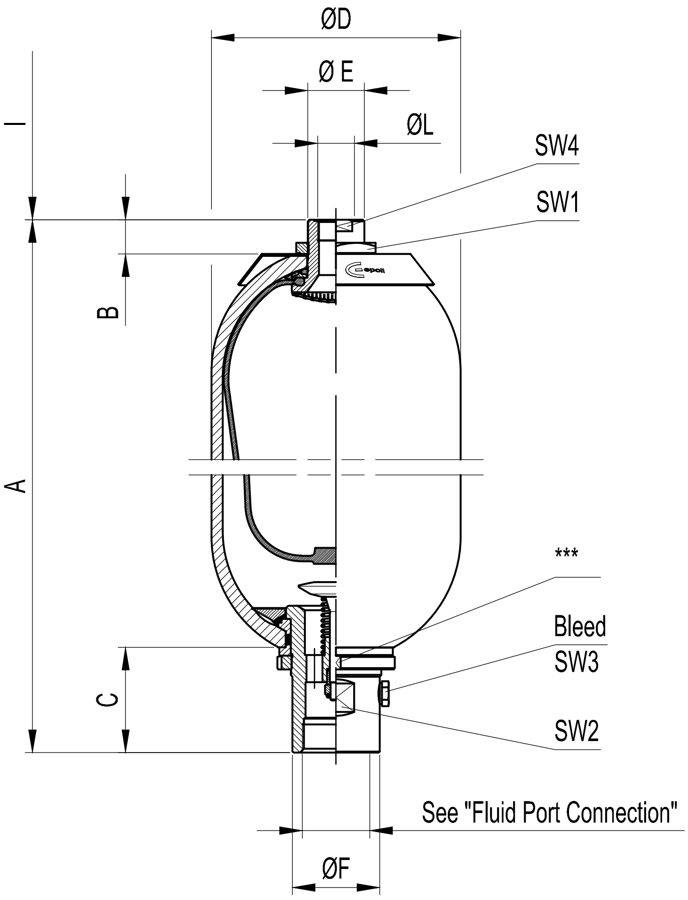
1/8“	=	**1**	3/4“	=	**5**
1/4“	=	**2**	1“	=	**6**
3/8“	=	**3**	1“ 1/4“	=	**7**
1/2“	=	**4**	1“ 1/2“	=	**8**

Dimension in inch - No.of pitch for inch

Diameter/pitch

Special variants upon request

3.2.9 ASL VERSION DIMENSIONS



3.2da

Acc. type ASL in carbon steel	Nominal gas volume litres	Effective gas volume litres	Working pressure *bar*	Ped category liquids of group 2	Max.diff. pressure P2-P1 *bar*	Flow rate *l/min*	Max.comp. ratio P0/P2	A *mm*	B *mm*	C *mm*	Ø D *mm*	Ø E *mm*	Ø L *mm*	ØF *mm*	I *mm*	SW 1 *mm*	SW 2 *mm*	SW 3 *mm*	SW 4 *mm*	Bleed	Acc. dry weight *kg*
ASL 0,2	0,2	0,2	360	Art.3 (3)	100	160	1:4	247 ± 2	18	40	53	5/8" UNF	1/8" BSP	26	140	24	23	4*	18	M5	1,7
ASL 0,7	0,7	0,65	360	Art.3 (3)	100	300	1:4	253 ± 1,5	20	52	90	M22x1,5	1/4" BSP	36	140	32	32	4*	18	M5	4,2
ASL 1	1	1	360	Art.3 (3)	100	300	1:4	268 ± 5	20	52	114	M22x1,5	1/4" BSP	36	140	32	32	4*	18	M5	5,2
ASL 1,5	1,5	1,5	360	II	100	300	1:4	328 ±5	20	52	114	M22x1,5	1/4" BSP	36	140	32	32	4*	18	M5	6,3
ASL 3	3	2,95	360	III	100	600	1:4	526 ± 8	20	65	114	M22x1,5	1/4" BSP	53	140	32	50	4*	18	M5	11
ASL 5	5	5	360	III	100	600	1:4	434 ± 10	23	65	168	M22x1,5	1/4" BSP	53	140	32	50	4*	18	M5	15
ASL 10	10	9,1	360	IV	100	1000	1:4	535 ± 10	28	93	220	M50x1,5	1" BSP	77	140	70	70	19**	41	1/4" BSP	33
ASL 15	15	14,5	360	IV	100	1000	1:4	685 ± 10	28	93	220	M50x1,5	1" BSP	77	140	70	70	19**	41	1/4" BSP	43
ASL 20	20	18,2	360	IV	100	1000	1:4	845 ± 10	28	93	220	M50x1,5	1" BSP	77	140	70	70	19**	41	1/4" BSP	48
ASL 25	25	23,5	360	IV	100	1000	1:4	1010 ± 15	28	93	220	M50x1,5	1" BSP	77	140	70	70	19**	41	1/4" BSP	59
ASL 35	35	33,5	360	IV	100	1000	1:4	1360 ± 15	28	93	220	M50x1,5	1" BSP	77	140	70	70	19**	41	1/4" BSP	78
ASL 55	55	50	360	IV	100	1000	1:4	1870 ± 15	28	93	220	M50x1,5	1" BSP	77	140	70	70	19**	41	1/4" BSP	108

* Allen wrench ** Ex. wrench *** see chapter 3.2.12.2 table 3.2ab

3.2db

- The maximum differential pressure is the maximum allowable difference between the maximum pressure and the minimum working pressure (P2-P1) to have an infinite life cycle of the accumulator (greater than 2,000,000 cycles).
- Flow rate measured using mineral oil with viscosity of 36 cSt at 50°C and ΔP = 5 bar

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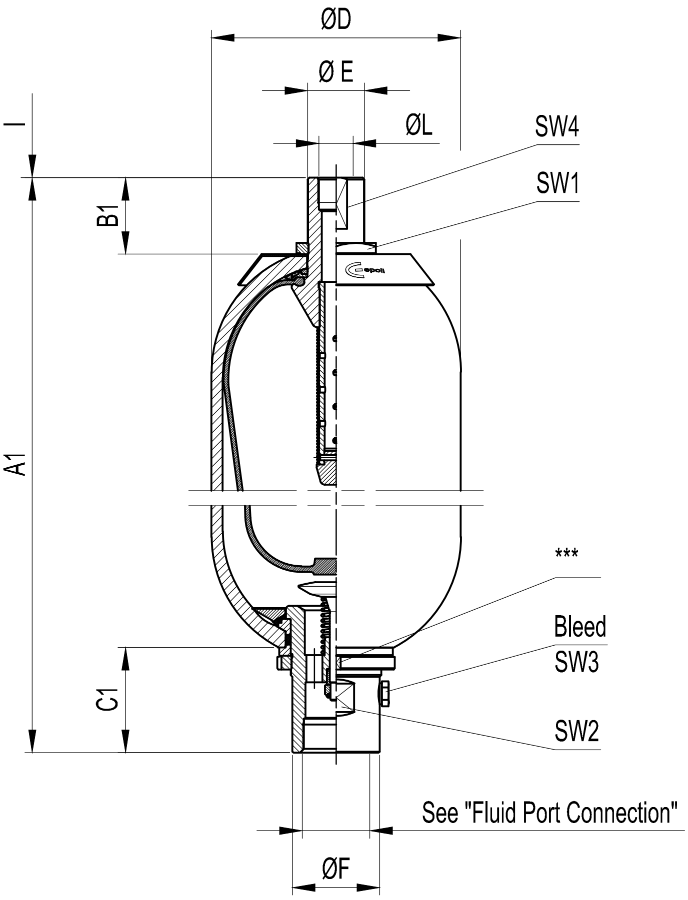
3.2.9 AST VERSION DIMENSIONS



3.2dc

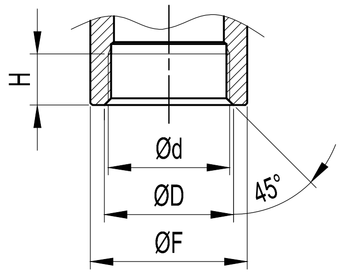
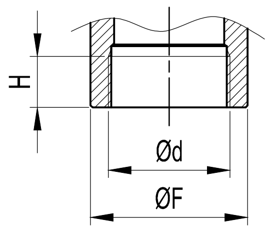
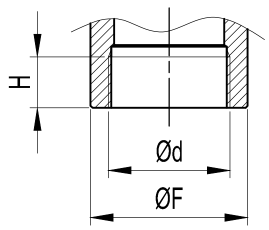
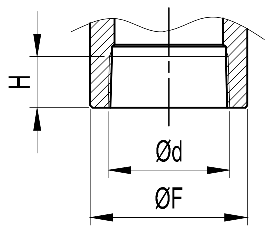
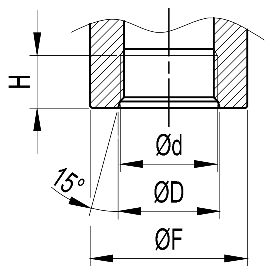
Acc. type AST in carbon steel	Nominal gas volume litres	Effective gas volume litres	Working pressure *bar*	Ped category liquids of group 2	Max.diff. pressure P2-P1 *bar*	Flow rate *l/min*	Max.comp. ratio P0/P2	A 1 *mm*	B 1 *mm*	C 1 *mm*	Ø D *mm*	Ø E *mm*	Ø L *mm*	ØF *mm*	I *mm*	SW 1 *mm*	SW 2 *mm*	SW 3 *mm*	SW 4 *mm*	Bleed	Acc. dry weight *kg*
AST 0,2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AST 0,7	0,7	0,7	360	Art.3 (3)	100	300	1:4	269 ± 5	28	52	90	M22x1,5	1/4" BSP	36	140	32	32	4*	18	M5	3,7
AST 1	1	1	360	Art.3 (3)	100	300	1:4	276 ± 5	28	52	114	M22x1,5	1/4" BSP	36	140	32	32	4*	18	M5	5,2
AST 1,5	1,5	1,5	360	II	100	300	1:4	336 ±5	28	52	114	M22x1,5	1/4" BSP	36	140	32	32	4*	18	M5	6,3
AST 3	3	2,95	360	III	100	600	1:4	534 ± 8	28	65	114	M22x1,5	1/4" BSP	53	140	32	50	4*	18	M5	11
AST 5	5	5	360	III	100	600	1:4	439 ± 10	28	65	168	M22x1,5	1/4" BSP	53	140	32	50	4*	18	M5	15
AST 10	10	9,1	360	IV	100	1000	1:4	573 ± 10	66	101	220	M50x1,5	1" BSP	77	140	70	70	19**	46	1/4" BSP	33
AST 15	15	14,5	360	IV	100	1000	1:4	723 ± 10	66	101	220	M50x1,5	1" BSP	77	140	70	70	19**	46	1/4" BSP	43
AST 20	20	18,2	360	IV	100	1000	1:4	883 ± 10	66	101	220	M50x1,5	1" BSP	77	140	70	70	19**	46	1/4" BSP	48
AST 25	25	23,5	360	IV	100	1000	1:4	1048 ± 15	66	101	220	M50x1,5	1" BSP	77	140	70	70	19**	46	1/4" BSP	59
AST 35	35	33,5	360	IV	100	1000	1:4	1398 ± 15	66	101	220	M50x1,5	1" BSP	77	140	70	70	19**	46	1/4" BSP	78
AST 55	55	50	360	IV	100	1000	1:4	1908 ± 15	66	101	220	M50x1,5	1" BSP	77	140	70	70	19**	46	1/4" BSP	108

* Allen wrench   ** Ex. wrench   *** see chapter 3.2.12.2 table 3.2ab

3.2dd

- The maximum differential pressure is the maximum allowable difference between the maximum pressure and the minimum working pressure (P2-P1) to have an infinite life cycle of the accumulator (greater than 2,000,000 cycles).
- Flow rate measured using mineral oil with viscosity of 36 cSt at 50°C and ΔP = 5 bar

3.2.9.1 STANDARD THREAD CONNECTIONS

Dimensions	Connection Type	Accumulator type	Complete spare valve order code	Ød	ØD *mm*	ØF *mm*	H *mm*
	A BSP ISO 228 with chamfer for OR	ASL/AST 0,2	-	-	-	-	-
		ASL/AST 0,7	V 2023-A5-**/*	3/4" BSP	28,8	36	19
		ASL/AST 1	V 2024-A5-**/*				
		ASL/AST 1,5					
		ASL/AST 3	V 2025-A7-**/*	1" 1/4 BSP	46	53	25
		ASL/AST 5	V 2044-A7-**/*				
		ASL/AST 10 ÷ 55	V 2064-A9- **/*	2" BSP	63,35	77	28
	G BSP ISO 228	ASL/AST 0,2	V 2004-G4-**/*	1/2" BSP	-	26	15
		ASL/AST 0,7	-	-	-	-	-
		ASL/AST 1	-	-	-	-	-
		ASL/AST 1,5	-	-	-	-	-
		ASL/AST 3	-	-	-	-	-
		ASL/AST 5	-	-	-	-	-
		ASL/AST 10 ÷ 55	-	-	-	-	-
	M Metric	ASL/AST 0,2	-	-	-	-	-
		ASL/AST 0,7					
		ASL/AST 1					
		ASL/AST 1,5					
		ASL/AST 3	V 2025-M40x1.5-**/*	M40x1,5	-	53	25
		ASL/AST 5	V 2044-M40/1.5-**/*				
		ASL/AST 10 ÷ 55	V 2064-M50/1.5-**/*	M50x1,5	-	77	28
	P NPT-F	ASL/AST 0,2	-	-	-	-	-
		ASL/AST 0,7	V 2023-P5-**/*	3/4" NPT-F	-	36	Thread plug gage
		ASL/AST 1	V 2024-P5-**/*				
		ASL/AST 1,5					
		ASL/AST 3	V 2025-P7-**/*	1" 1/4 NPT-F	-	53	
		ASL/AST 5	V 2044-P7-**/*				
		ASL/AST 10 ÷ 55	V 2064-A9- **/*	2" NPT-F	-	77	
	S SAE thread	ASL/AST 0,2	-	-	-	-	-
		ASL/AST 0,7	V 2023-S1 /16-12-**/-*	1" 1/16 12 UN	29,16	36	19
		ASL/AST 1	V 2024-S1 /16-12-**/-*				
		ASL/AST 1,5					
		ASL/AST 3	V 2025-S1 5/8-12-**/-*	1" 5/8 12 UN	43,5	53	23
		ASL/AST 5	V 2044-S1 5/8-12-**/-*				
		ASL/AST 10 ÷ 55	V 2064-S1 7/8-12-**/-*	1" 7/8 12 UN	49,84	77	26

* Gasket material ** Component material

3.1de

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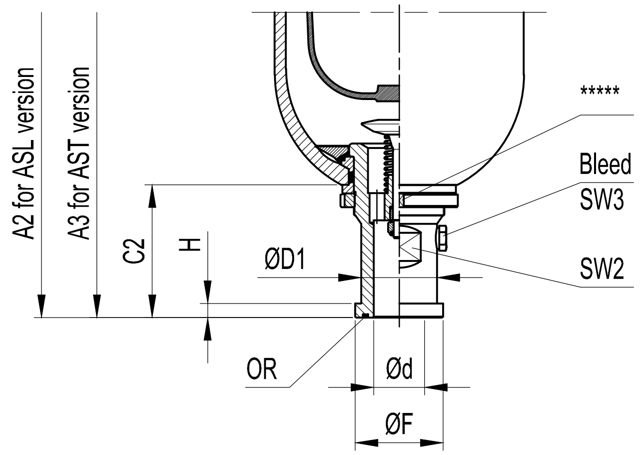
3.1.9.2 ADAPTER FOR FLANGE SAE 3000/6000 PSI (L/H)



3.1df

Acc. type ASL / AST in carbon steel	Dim.	A2 - ASL mm	A3 - AST mm	C2 mm	SW2 mm	SW3 mm	Bleed	Ød mm	SAE 3000 (L) Spare valve order code	SAE 3000 (L) ØD1 mm	SAE 3000 (L) ØF mm	SAE 3000 (L) H mm	SAE6000 (H) Spare valve order code	SAE6000 (H) ØD1 mm	SAE6000 (H) ØF mm	SAE6000 (H) H mm	OR (Included)	Acc. dry weight kg
ASL / AST 0,2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ASL / AST 0,7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ASL / AST 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ASL / AST 1,5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ASL / AST 3	1"	562± 8	570± 8	100	38	4***	M5	-	-	-	-	-	V 2025-H6-**/*	38	47,6	9,5	0010R4131-*	11
	1"1/4	551 ± 8	559 ± 8	89				31	V 2025-L7-**/*	43	50,8	8	V 2025-H7-**/*	44	53,3	10,3	0010R4150-*	
ASL / AST 5	1"	469 ± 10	474 ± 10	100	38	4***	M5	-	-	-	-	-	V 2044-H6-**/*	38	47,6	9,5	0010R4131-*	15
	1"1/4	458 ± 10	463 ± 10	89				31	V 2044-L7-**/*	43	50,8	8	V 2044-H7-**/*	44	53,3	10,3	0010R4150-*	
ASL / AST 10	1"1/2	550 ± 10	588 ± 10	115	42	19****	1/4"	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	33
	2"				55		BSP	45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	
ASL / AST 15	1"1/2	700 ± 10	738 ± 10	115	42	19****	1/4"	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	43
	2"				55		BSP	45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	
ASL / AST 20	1"1/2	860 ± 10	898 ± 10	115	42	19****	1/4"	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	48
	2"				55		BSP	45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	
ASL / AST 25	1"1/2	1025 ± 15	1063 ± 15	115	42	19****	1/4"	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	59
	2"				55		BSP	45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	
ASL / AST 35	1"1/2	1375 ± 15	1413 ± 15	115	42	19****	1/4"	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	78
	2"				55		BSP	45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	
ASL / AST 55	1"1/2	1885 ± 15	1923 ± 15	115	42	19****	1/4"	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	108
	2"				55		BSP	45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	

* Gasket material ** Component material *** Allen wrench **** Ex. Wrench ***** see chapter 3.2.12.2 table 3.1ab

3.1dg

3.2.9.3 FLANGE CONNECTION TYPE ANSI / UNI DIN (B/U)

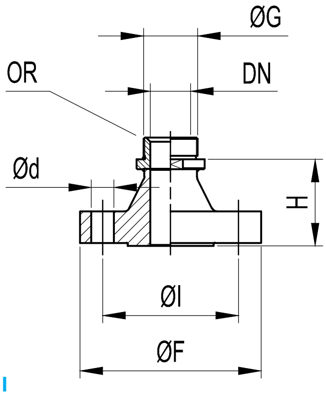
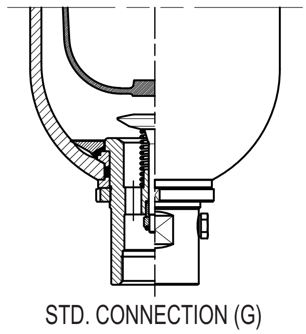


Fig. I



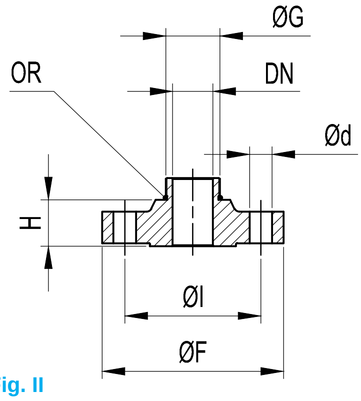


Fig. II

3.2ea

	Accumulator type	Spare flange order code	Ref. Directive		DN mm	PN bar	Fig.	Ø F mm	Ø I mm	Ød mm	N° Holes	H mm	G BSP	OR (Included)
			UNI	DIN										
U (UNI-DIN)	ASL / AST 0,7 - 1 - 1,5	F 2205 - ** / *	2284	2635	20	40	II	105	75	14	4	23	3/4"	0010R2093-*
		F 2206 - ** / *	6086	2628		250		135	95	18	4	45		
	ASL / AST 3 - 5	F 2211 - ** / *	2284	2635	25	40	I	115	85	14	4	51	1"1/4	0010R3150-*
		F 2212 - ** / *	6086	2628		250		150	105	22	4	76		
		F 2215 - ** / *	2284	2635	32	40	II	140	100	18	4	22		
		F 2216 - ** / *	6086	2628		250		165	120	22	4	55		
	ASL / AST 10 ÷ 55	F 2221 - ** / *	2282	2633	25	16	I	115	85	14	4	49	2"	0010R3218-*
		F 2222 - ** / *	2284	2635		40		115	85	14	4	51		
		F 2223 - ** / *	6086	2628		250		150	105	22	4	76		
		F 2227 - ** / *	2284	2635	40	40	I	150	110	18	4	56		
		F 2228 - ** / *	6086	2628		250		185	135	25	4	91		
		F 2231 - ** / *	2282	2633	50	16	II	165	125	18	4	23		
		F 2232 - ** / *	2285	2636		64		185	135	22	4	40		
		F 2233 - ** / *	6086	2628		250		200	150	25	8	61		

* Gasket material ** Flange material Others size on request

3.2eb

	Accumulator type	Spare flange order code	Ref. Directive	DN inch	PN lbs	Fig.	Ø F mm	Ø I mm	Ød mm	N° Holes	H mm	G BSP	OR (Included)
B (ANSI)	ASL / AST 0,7 - 1 - 1,5	F 2207 - ** / *	B16.5	3/4"	300	II	117,5	82,5	19	4	40	3/4"	0010R2093-*
		F 2208 - ** / *	B16.5		1500		130	88,9	22,5	4	59		
	ASL / AST 3 - 5	F 2213 - ** / *	B16.5	1"	300	I	123,5	88,9	22,5	4	73	1"1/4	0010R3150-*
		F 2214 - ** / *	B16.5		1500		149,5	101,6	25,4	4	90		
		F 2217 - ** / *	B16.5	1" 1/4	300	II	133,3	98,4	19	4	44		
		F 2218 - ** / *	B16.5		1500		159	111,1	25,4	4	58		
	ASL / AST 10 ÷ 55	F 2225 - ** / *	B16.5	1"	300	I	123,5	88,9	19	4	73	2"	0010R3218-*
		F 2226 - ** / *	B16.5		1500		149,5	101,6	25,4	4	90		
		F 2229 - ** / *	B16.5	1" 1/2	300	I	155,6	114,3	22,2	4	79		
		F 2230 - ** / *	B16.5		1500		178	123,8	28,5	4	100		
		F 2235 - ** / *	B16.5	2"	400	II	165	127	19	8	55		
		F 2236 - ** / *	B16.5		1500		216	165,1	25,4	8	83		

* Gasket material ** Flange material Others size on request

3.2ec

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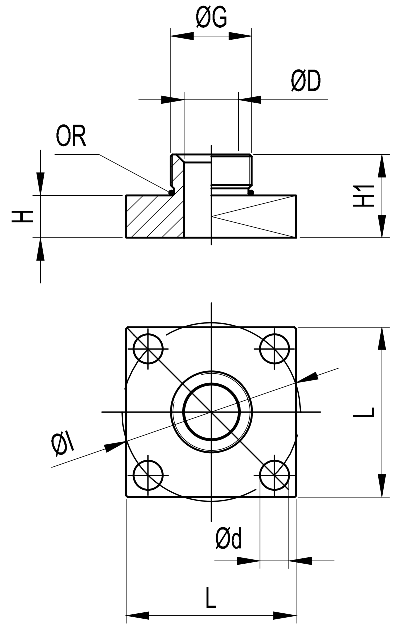
3.2.9.4 SQUARE FLANGE CONNECTION



3.2fa

Accumulator type	Spare square flange order code	Ø G BSP	Ø D *mm*	L *mm*	Ø I *mm*	H *mm*	Ø d *mm*	H 1 *mm*	Weight *Kg*	OR (Included)
ASL / AST 3 - 5	F 2454 A7 - ** / *	1" 1/4 BSP	26	100	105	25	17.5	49	0,8	0010R3150 - *
ASL / AST 10 ÷ 55	F 2455 A9 - ** / *	2" BSP	32						0,9	0010R3218 - *

* Gasket material ** Square flange material Weigth indicated only for blind version

3.2 fb

3.1.9.5 ADAPTER

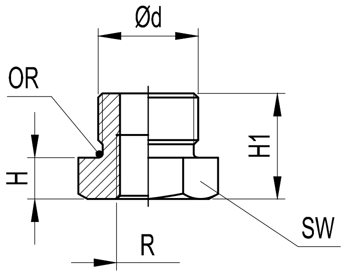


Fig. I

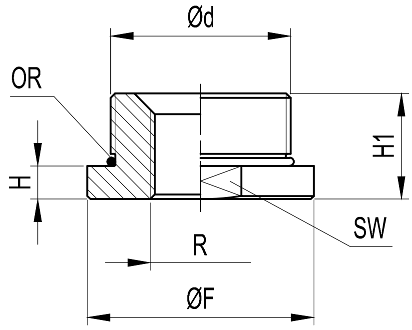


Fig. II

3.2fc

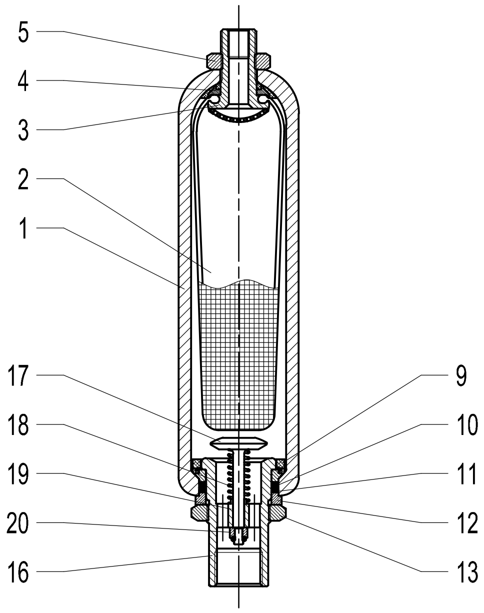
Accumulator type	Order code	Ød Acc. connection	R**** Out connections (0 = blind)	Fig.	SW *mm*	Ø F *mm*	H *mm*	H1 *mm*	OR (Included)	Weight *Kg*
ASL / AST 0,7 - 1 - 1,5	R - A5*** - ** / *	3/4" BSP	1/8" ÷ 3/8" BSP - NPT - BSPT	I	32	-	11	28	0010R2093 - *	0,14
			1/2" BSP - NPT - BSPT	I			28	45		0,27
ASL / AST 3 - 5	R - A7*** - ** / *	1" 1/4 BSP	1/8 ÷ 3/4" BSP - NPT - BSPT	II	48	53	11	32	0010R3150 - *	0,41
ASL / AST 10 ÷ 55	R - A9*** - ** / *	2" BSP	1/8" ÷ 1" 1/2 BSP - NPT - BSPT	II	70	75	11	35	0010R3218 - *	0,86

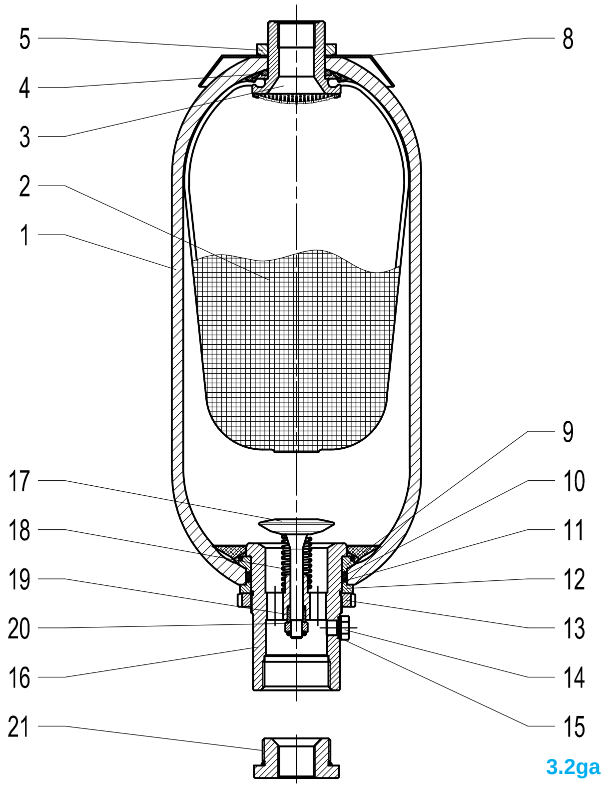
* Gasket material ** Adapter material *** See chapter 3.2.8 table 7 - 8 Weigth indicated only for blind version

3.2fd

**** R Out connections type "S" and "M" thread on request

3.2.10. ASL VERSION SPARE PARTS CODE





3.2ga

Item	Description	Q.ty	Type					
			ASL 0,2	ASL 0,7	ASL 1 - 1,5	ASL 3	ASL 5	ASL 10 ÷ 55
1	Accumulator shell	1	Not supplied as spare part					
2	Bladder	1	S0.2 * - 0	S0.7 * - 0	S1*- 0 / S1.5*- 0	S3 * - 0	S5 * - 0	S10 ÷ 55 * - 0
3	Gas valve body	1	B10022A - **	B10132A - **			B10229A - **	B10431A - **
4	Rubber-coated washer	1	B10024 - ** / *	B10104 - ** / *	B10106 - ** / *		B10205 - ** / *	B10334 - ** / *
5	Gas valve looknut	1	B10023 - **	B10109 - **				B10302 - **
6	-	1	-	-				-
7	-	1	-	-				
8	Name plate	1	-	D10300A-A			D10300C-A	D10300E-A
9	Retaining ring	1	B10035 - ** / *	B10123 - ** / *	B10127 - ** / *	B10146 - ** / *	B10222 - ** / *	B10317 - ** / *
10	"O" ring	1	0010R4112 - *	0010R4150 - *		0010R0159 - *	0010R6212 - *	0010R0181 - *
11	Supporting ring	1	B10038-T	B10133-T		B10150-T	B10227-T	B10320-T
12	Space ring	1	B10037 - **	B10120 - **		B10223 - **		B10319 - **
13	Fluid port ring nut	1	B10039 - **	B10122 - **		B10217 - **		B10321 - **
14	Bleed screw	1	-	B10128 - **				B10316A - **
15	Seal ring	1	-	B10129 - R				0010T14-1/4 - *
16	Fluid port body std. version	1	B10031 - *** - **	B10115 - *** - **		B10144 - *** - **		B10311 - *** - **
17	Poppet	1	B10028 - **	B10111 - **		B10221 - **		B10310 - **
18	Spring	1	B10029 - **	B10112 - **		B10149 - **		B10322 - **
19	Brake bushing	1	-	B10113 - **		B10226 - **		B10314 - **
20	Selflocking nut	1	B10033 - **	B10116 - **		B10211 - **		B10315 - **
21	Adapter	1	See chapter 3.2.9.5 ADAPTER					
Standard gas valve ass. (parts 3 ÷ 7)		1	V 2003 - ** / *	V 2027 - 1 - ** / *	V 2027 - ** / *		V 2048 - ** / *	V 2073 - ** / *
Standard fluid port ass. (parts 9 ÷ 20)		1	V 2004 - *** - ** / *	V 2023 - *** - ** / *	V 2024 - *** - ** / *	V 2025 - *** - ** / *	V 2044 - *** - ** / *	V 2064 - *** - ** / *
Gasket sets		1	B2010-1-* { 0010R4112-*, B10038-T }	B2030-1-* { 0010R4150-*, B10133-T, B10129-R, 0010R2093-* }		B2031-1-* { 0010R0159-*, B10150-T, B10129-R, 0010R3150-* }	B2050-1-* { 0010R6212-*, B10227-T, B10129-R, 0010R3150-* }	B2080-1-* { 0010R0181-*, B10320-T, 0010T14-1/4-*, 0010R3218-* }

* Gasket material ** Component material *** See chapter 3.2.8 table 6 - 7

3.2gb

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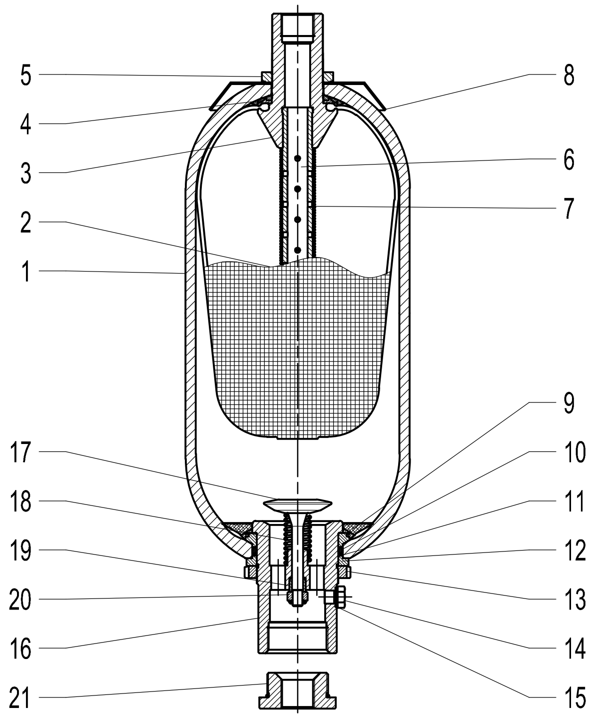
3.2.10. AST VERSION SPARE PARTS CODE



3.2gc

Item	Description	Q.ty	Type					
			AST 0,2	AST 0,7	AST 1 - 1,5	AST 3	AST 5	AST 10 ÷ 55
1	Accumulator shell	1		Not supplied as spare part				
2	Bladder	1	-	S0.7 *- 0	S1*- 0 / S1.5*- 0	S3* - 0	S5* - 0	S10 ÷ 55* - 0
3	Gas valve body	1	-	B10107T - **			B10219 - **	B10420 - **
4	Rubber-coated washer	1	-	B10104 - ** / *	B10106 - ** / *		B10205 - ** / *	B10334 - ** / *
5	Gas valve looknut	1	-	B10109 - **				B10302 - ** / *
6	Holed pipe	1	-	B10141 - **		B10142 - **	B10220 - **	AST 10-15 = B10409 - 3 - ** AST 20-25 = B10409 - 4 - ** AST 35-55 = B10409 - 5 - **
7	Spring	1	-	B10218-1 - **		B10218-2 - **	B10218 - **	AST 10-15 = B10411- 1 - ** AST 20-25 = B10411 - 2 - ** AST 35-55 = B10411 - **
8	Name plate	1	-	D10300A-A			D10300C-A	D10300E-A
9	Retaining ring	1	-	B10127 - ** / *		B10146 - ** / *	B10222 - ** / *	B10317 - ** / *
10	"O" ring	1	-	0010R4150 - *		0010R0159 - *	0010R6212 - *	0010R0181 - *
11	Supporting ring	1	-	B10133-T		B10150-T	B10227-T	B10320-T
12	Space ring	1	-	B10120 - **		B10223 - **		B10319 - **
13	Fluid port ring nut	1	-	B10122 - **		B10217 - **		B10321 - **
14	Bleed screw	1	-	B10128 - **				B10316A - **
15	Seal ring	1	-	B10129-R				0010T14-1/4 - *
16	Fluid port body std. version	1	-	B10115 - *** - **		B10144 - *** - **		B10311 - *** - **
17	Poppet	1	-	B10111 - **		B10221 - **		B10310 - **
18	Spring	1	-	B10112 - **		B10149 - **		B10322 - **
19	Brake bushing	1	-	B10113 - **		B10226 - **		B10314 - **
20	Selflocking nut	1	-	B10116 - **		B10211 - **		B10315 - **
21	Adapter	1	-	See chapter 3.2.9.5 ADAPTER				
Standard gas valve ass. (parts 3 ÷ 7)		1	-	V 2456 - ** / *	V 2026 - ** / *	V 2029 - ** / *	V 2043 - ** / *	AST 10-15 = V 2065 - ** / * AST 20-25 = V 2066 - ** / * AST 35-55 = V 2067 - ** / *
Standard fluid port ass. (parts 9 ÷ 20)		1	-	V 2024 - *** - ** / *		V 2025 - *** - ** / *	V 2044 - *** - ** / *	V 2064 - *** - ** / *
Gasket sets		1	-	B2030-1-* { 0010R4150-* B10133-T B10129-R 0010R2093-* }		B2031-1-* { 0010R0159-* B10150-T B10129-R 0010R3150-* }	B2050-1-* { 0010R6212-* B10227-T B10129-R 0010R3150-* }	B2080-1-* { 0010R0181-* B10320-T 0010T14-1/4-* 0010R3218-* }

* Gasket material ** Component material *** See chapter 3.2.8 table 6 - 7

3.2gd

3.2.11 COMMISSIONING AND MAINTENANCE

Delivery conditions

The bladder accumulators' type ASL and AST cannot be delivered with the pre-charge.
Depending on the size and quantity ordered, the accumulators are shipped in boxes or in cartons or on pallets, or wooden boxes on request.
Unless otherwise required, certificates and documentation are provided together with the accumulators.

Handling

The original packaging is suitable for handling and general storage.
Where necessary, you should use suitable lifting equipment to support the weight of the accumulators.
However protect from impact the packaging and handle it with care.

Storage

During storage in the warehouse, leave the product in its original packaging, keeping it away from heat sources and naked flames. The storage temperature should be between +10 and +40°C.
In addition to six months of storage, the precharge pressure must be to two bar and make sure that inside there is lubrication fluid compatible with bladder polymer.
After six years of storage, it is essential to proceed with the replacement of all elastomeric parts before the commissioning.

Marking on the nameplate of the accumulator

With reference to the PED 2014/68/EU classification, Article 3, Paragraph 3 and / or risk categories I or II depending on the volume and maximum working pressure, the accumulator indicates the following data:

- Logo, name and country of the manufacturer
- Mounth/year of production
- Product code
- Serial number
- Maximum PS pressure and PT test pressure in bar
- Min. and max. TS working temperature in Celsius
- Volume V in litres
- Group of fluids allowed (II)
- CE marking (for volumes exceding 1 litre) with the identification number of the notified body

It is strictly forbidden to:

- weld, rivet or screw any item of 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 (dangerous) fluid of Group 1 with equipment designed and manufactured for fluids of Group 2.

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 lock-off and security block type BS (see Chap. 9). This device provides the user protection and equipment against damage caused by pressure peaks, and also males easy and safe the maintenance of the accumulator, so simplifying the interception and discharging. The accumulators type AS may be installed in any position from horizontal to vertical (preferably with the gas valve at the top), and the nameplate 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 (please see Chapter 7) to avoid the transmission of vibrations. If are not used EPE safety blocks, make sure that the accumulator is connected to the hydraulic circuit by suitable connection devices. 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.

Pre-charge of nitrogen (type AST)

The pre-charge of gas should be performed after the connection to the additional bottles and after the installation of the accumulator in the hydraulic circuit. For the pre-charge, use only industrial dry nitrogen with a purity of min. 99%. It is important to use the nitrogen from a bottle equipped with a pressure reducing valve (see Chap.11.3). Use the EPE pre-charge and charging set type PC to check the charging pressure required, and adjust if necessary. If the pre-charge pressure is lower than required, connect the charging hose on one side and the other side connect it to the nitrogen bottle or to the pressure reducer. Slowly fill enter the nitrogen in the accumulator until reaching a pressure slightly higher than that set value (+ 10 ÷ 15%). Close the bottle and remove the charging hose from the pre-loading set; wait until the gas temperature has stabilized (2 hours) and calibrate the pressure, discharging the excess gas.
Make sure that the pre-charge valve, fittings, pipes and anything else are not subject to losses, by using, if necessary, soap and water.
Tighten the protective caps manually.

Hydraulic pressurization

- Check that the pre-charge pressure is adequate for the application
- Ensure that the hydraulic pressure never exceeds the max allowed pressure (PS) shown on the accumulator shell.

To avoid this risk, use a safety device (see Chap. 9).

Maintenance

- Periodically check the pre-charge pressure of the gas: after the commissioning, check after 2-3 weeks of operation and if there were no leaks, repeat the operation after 3 months; if the pressure at the same temperature was stable, repeat the test yearly. For heavy-duty applications, check the pre-charge every 6 months.
- Periodically (yearly) carry out a visual inspection of the accumulator in order to detect any early signs of deterioration such as corrosion, deformation, etc.
- Comply with the requirements of the regulations concerning the verification of the functionality of the equipment according to the country of installation of the accumulator.

Repair

If for failure, scheduled check or retest it is necessary to remove the accumulator from the system, prior to removal, isolate the accumulator from the installation and discharge pressure of the liquid. All bladder EPE accumulators of the ASL and AST series may be repaired.

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It may consist in replacing the bladder, the seals, the pre-charge valve (AST) and/or the parts of the gas and fluid valve.
For reasons of functionality and security, it is recommended to use only original spare parts.

Disassembly

- Fasten the accumulator firmly in a vice or on a bench in a horizontal position, taking care not to damage the outer surface.

3.2h

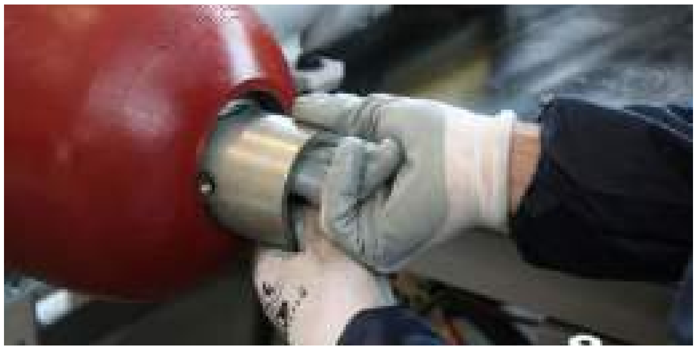
- Remove gas valve, fastening the nut on the gas valve and remove the nameplate

3.2i

- Undo slotted round nut for hook wrench by using the hook wrench.

3.2j

- Remove the slotted nut and the retaining ring



3.2k

- Push enough oil valve into the housing until the sealing ring and the washer can be removed.

3.2l

- Remove the sealing ring and the washer

3.2m

- Remove the retaining ring, take it out, by carefully pushing the ring together.

3.2n

- Remove the oil valve from the container

3.2o

- Fold bladder somewhat and withdraw by turning it slightly

Refitting

Tightening torques in Nm				
	0.2 l	0.7-1.5 l	3 - 5 l	10-55 l
Fluid port ring nut	60 +10	100 +20	200 +50	450 +50
Bleed screw	3 +1	5 +1	5 +1	30 +10
Gas valve locknut	50 +10	80 +20	100 +20	150 +30
Filling valve V - VX - V2	-	-	-	30 +5

3.2p

- Cleaning and testing : clean all metallic parts on accumulator using an organic reducer – visual inspection of oil valve parts (valve tappet, spring, nut, damping screw) – check valve for sluggishness – Clean bladder, i.e. using isopropanol. Visual inspection of bladder for faults – inner inspection of container for signs of corrosion. In event of coated containers, check the condition of the coating. Replace the parts deemed to be bad; the o-rings must always be replaced (see spare parts Section 3.2.10).

3.2s

- Drain air from bladder by pressing together

3.2t

- Carefully moisten the inside of the bladder and the container with used medium (roll container)

3.2u

- Reinstall according to this sequence: o-ring, washer and spacer sleeve.

3.2v

- Screw the slotted nut and centre the parts on the oil valve by using a plastic hammer

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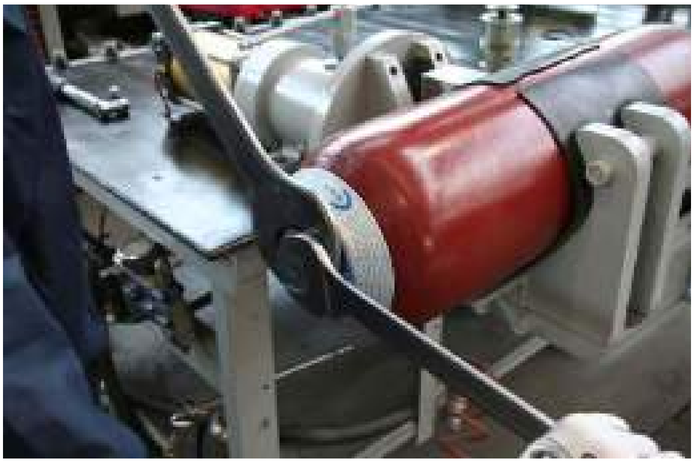
3.2w

- Bleed screw with sealing ring

3.2x

- Mount the bleed screw with its sealing ring



3.2y

- Tighten the hexagon nut SW1 on the gas valve

3.2z

- Mount the filling valve (AST)

Pre-charge (AST) after having fitted the accumulator on the system and having connected it to the additional cylinders.

- Screw the pre-charge PC equipment on the gas valve.
- Connect the equipment to the cylinder of nitrogen or to the pressure reducer with the inflation tube.
- Slowly enter the nitrogen in the accumulator until reaching a pressure slightly higher than the set value (+ 10 ÷ 15%).
- Close the cylinder and remove the connecting pipe from the equipment.
- Wait until the gas temperature has stabilized (2 hours).
- Calibrate the pressure discharging the excess gas.

Make sure that the gas valve, the fittings and the pipes are not subject to losses and, if necessary, use soap and water.
Tighten the protective caps manually.

Demolition and recycling of the accumulator

Before accumulator demolition or recycling, you should always discharge completely the pre-charge pressure and remove the gas valve (AST).
If needed, proceed decontaminating in relation to the fluid used prior to demolition.

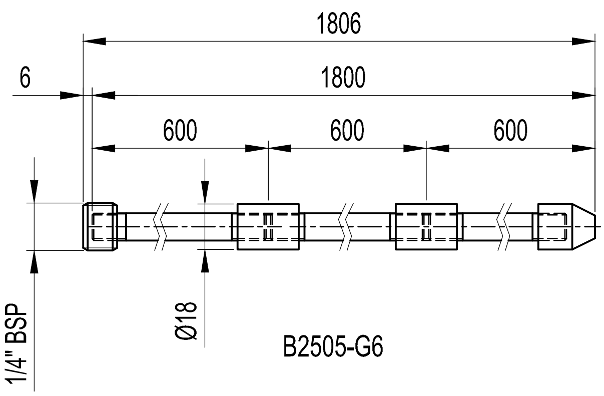
3.2.12 REPAIR TOOLS

3.2.12.1 BLADDER PULL ROD

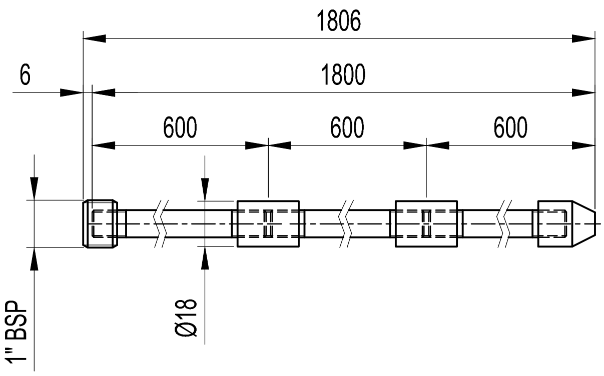
The pull rod screwed to the gas valve of the bladder for easy assembly into shell during reassembly. Pull rod is complete with fitting for EPE gas valve and 3 extension segments to accommodate all size of accumulators.
Code for complete kit: **B2505-G2 / B2505-G6**

Dimension

B2505-G2



B2505-G6

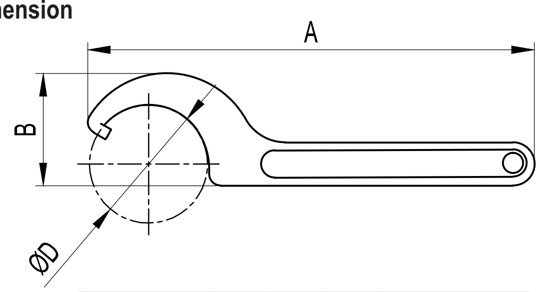


3.2aa

3.2.12.2 SPANNER WRENCH

Fits all standard size bladder accumulator, it is used to remove or install lock nut on fluid port assembly.
0,7÷1,5 lt code **2506/58**
3÷5 lt code **2506/68**
10÷55 lt code **2506/105**

Dimension



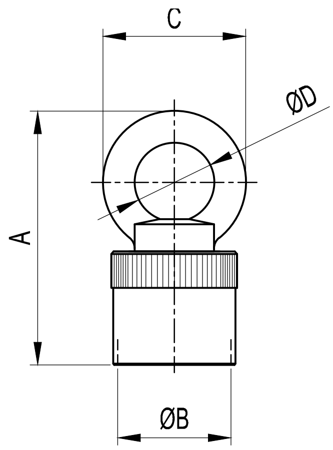
CODE	A	B	ØD	For Accumulator
B2506/58	241	45	58	0.7 ÷ 1.5
B2506/68	241	43	68	3 ÷ 5
B2506/105	336	82	105	10 ÷ 55

3.2ab

3.2.12.3 LIFTING HOOK

To be used for the safe lifting of mounted accumulators:
For accumulators 0,7÷5 lt (M22x1,5) code **B2507/2**
For accumulators 10÷55 lt (M50x1,5) code **B2507/5**
For accumulators V4 (7/8" UNF) code **B2507/7**

Dimension



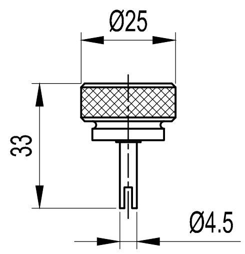
3.2ac

CODE	A	ØB	C	ØD	For Accumulator
B2507/2	100	M22x1.5	63	35	0,7 ÷ 5
B2507/5	112	M50x1.5	63	35	10 ÷ 55
B2507/7	100	7/8" UNF	63	35	10 ÷ 55

3.2.12.4 CORE TOOL

The core tool is used to remove and reinstall the valve core type V4.
Code **B2508**

Dimension



3.2ad

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3.3.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS): 60 bar

PRESSURE TEST (PT): 1.43 x PS

NOMINAL CAPACITIES:
0.7 - 1 - 1.5 - 3 - 5 - 10 - 15 - 20 - 25 - 35 - 55 litres

WORKING TEMPERATURE: -40 ÷ +150 °C

COMPRESSION RATIO (Po : P2): max. 1 : 4

FLUID VISCOSITY RANGE: 10 ÷ 400 cSt

RECOMMENDED VISCOSITY: 36 cSt

FLUID CONTAMINATION DEGREE:
class 21/19/16 according to ISO 4406/99

BODY MATERIAL:
- carbon steel shell painted with rust inhibitor RAL 8012
- nickel coating 25 - 40 µ
- stainless steel AISI 316L

VALVES MATERIAL:
- phosphated or galvanized carbon steel in compliance with Directive 2002/95/EC (RoHS) to resist to corrosion
- stainless steel AISI 316L
- nickel coating 25-40 µ

BLADDER MATERIAL:
- **P** = Nitrile rubber (NBR)
- **F** = Low temp. nitrile rubber
- **H** = Nitrile for hydrocarbons
- **K** = Hydrogenated nitrile (HNBR)
- **B** = Butyl (IIR)
- **E** = Ethylene-propylene (EPDM)
- **N** = Chloroprene (Neoprene)
- **Y** = Epichlorohydrin (ECO)
- **V** = Fluorocarbon (FPM)

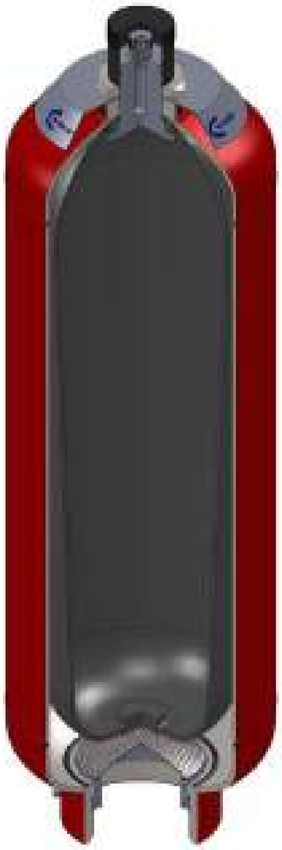
See Table 3.3c and/or Chapter 1.5

FILLING VALVE CONNECTION:
- 5/8"-UNF std
- 7/8" UNF
- ¼" BSP

FLUID PORT CONNECTION: see 3.3db - 3.3eb - 3.3ec - 3.3fb

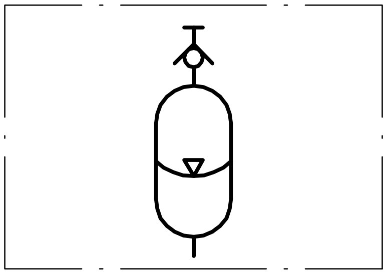
FLOW RATE: see Table 3.3db

WEIGHT: see Table 3.3db



3.3a

3.3.2 HYDRAULIC SYMBOL



3.3b

3.3.3 “ASB” BLADDER ADVANTAGES

- dirt tolerant
- light weight
- compact
- simple construction
- quick response
- works well on water, low lubricity fluids
- quick, easy installation
- low cost

3.3.4 DESCRIPTION

Bladder low pressure type accumulators consist of a welded cylindrical pressure vessel made of steel.
The accumulator is subdivided into a gas and fluid side by an elastic bladder mounted in the interior of the vessel.
The bladder is charged with nitrogen to the specified gas charge pressure P0 by means of gas valve.
When the fluid is pressed into the accumulator, the gas in the bladder is compressed and hence the pressure increased. The gas volume reduces and on the fluid side, the fluid can flow into the accumulator. As soon as the pressure on the fluid side falls below the gas pressure, the accumulator is emptied.
The special oil valve (anti-extrusion plate) prevents draining of the bladder into the oil channel and thus the bladder from being destroyed.
When the minimum operating pressure is reached, a small oil volume is to be maintained between the bladder and the fluid volume (approx. 10% of the nominal capacity of the hydraulic accumulator), in order that the bladder does not hit the valve during every expansion process.
Gas valve consists of external caps, sealing cap, filling valve, gas valve body and rubber coated washer. These parts can be replaced separately.
The nameplate shows the technical data and features of the hydraulic accumulator.

3.3.5 EUROPE MARKET

All hydraulic accumulators are pressure vessels and are subject to the national regulations and directives, valid at the place of installation.
Bladder accumulator type ASB, up to and including 1 litre, must not be CE marked.
For bladder accumulator type ASB, greater than 1 litre, every shipping batch is complete of a conformity declaration and instruction of use and maintenance and/or all documents requested.
All vessel categories (see Table 3.3db) must be protected by means of a pressure relief valve in accordance with Directive 2014/68/EU.

3.3.6 ACCESSORIES

For support equipment, see Cap. 7
For gas side’s safety equipment, see Cap. 8
For fluid side’s safety equipment, see Cap. 9
For pre-loading and charging set, see Cap. 11
For other components, see Cap. 12

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3.3.7 BLADDER-TEMPERATURE-LIQUID COMPATIBILITY

When selecting the accumulator variant, pay attention to the following non-binding notes with regard to hydraulic fluid, bladder material and the permissive temperature range. (see Section 1.5)

Code letter	Polymer	ISO	Temperature range (°C)	Some of the liquids compatible with the polymer
P	Standard nitrile (Perburan)	NBR	-20 ÷ +80	Aliphatic hydrocarbons (propane, butane, gasoline, oils, mineral greases, diesel fuel, fuel oil, kerosene), mineral greases and oils, HFA - HFB - HFC fluids, many dilute acids, alkalis, saline solutions, water, water glycol.
F	Low temperature nitrile	NBR	-40 ÷ +70	The same as with standard nitrile + a number of different types of Freon. (This contains less acrylonitrile than the standard and is therefore more suitable for low temperatures, but its chemical resistance is slightly lower).
H	Nitrile for hydrocarbons	NBR	-10 ÷ +90	Regular and premium grade slightly aromatic gasoline (and all the liquids for standard nitrile).
K	Hydrogenated nitrile	HNBR	-30 ÷ +130	The same as with standard nitrile but with excellent performance at high and low temperatures.
B	Butyl	IIR	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many acids and bases, salt solutions, polar solvents such as alcohols, ketones and esters, polyglycol-based hydraulic fluids (HFC fluids) and bases of esters of phosphoric acid (HFD-R fluids), silicone oils and greases, resistance to ozone, aging and weathering.
E	Ethylene-Propylene	EPDM	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many organic and inorganic acids, detergents, solutions of sodium and potassium, phosphate ester-based hydraulic fluids, (HFD-R), silicone oils and greases, many polar solvents (alcohol, ketones, esters), Skydrol LD4 and 500B-4, resistance to ozone, aging and weathering.
N	Chloroprene (Neoprene)	CR	-30 ÷ +100	Mineral oils of paraffin, silicone oils and greases, water and aqueous solutions, refrigerants (ammonia, carbon dioxide, Freon), naphthenic mineral oils, low molecular aliphatic hydrocarbons (propane, butane, fuel), brake fluids based on glycol, better resistance to ozone, weathering and aging compared to NBR rubber.
Y	Epichloridrin	ECO	-30 ÷ +110	Mineral oils and greases, aliphatic hydrocarbons (propane, butane and gasoline), silicone oils and greases, water at room temperature, resistance to ozone, aging and weathering.
V	Fluorocarbon	FKM	-10 ÷ +150	Mineral oils and greases, non-flammable fluids of HFD group, silicone oils and greases, animal and vegetable oils and greases, aliphatic hydrocarbons (gasoline, butane, propane, natural gas), aromatics hydrocarbons (benzene, toluene), chlorinated hydrocarbons (Tetrachloroethylene, carbon tetrachloride), fuel (regular, super and containing methanol), excellent resistance to ozone, weathering and aging.

3.3c

For other hydraulic fluid and/or temperatures, please consult us.

3.3.8 ORDER CODE

1	2	3	4	5	6	7 - 8	9		10		11	12	13	14	15		16
ASB	55	P	30	C	R	G9	V	-	8	-	X	1	X	0	G30	/	10

1 Series

Bladder accumulator low pressure = **ASB**

2 Nominal capacity

1 lt	= **1**
1.5 lt	= **1.5**
3 lt	= **3**
5 lt	= **5**
10 lt	= **10**
15 lt	= **15**
20 lt	= **20**
25 lt	= **25**
35 lt	= **35**
55 lt	= **55**

3 Bladder material

Nitrile rubber (NBR)	= **P**
Nitrile for low temp.	= **F**
Nitril for hydrocarbons	= **H**
Hydrogenated nitrile (HNBR)	= **K**
Butyl (IIR)	= **B**
Ethylene-propylene (EPDM)	= **E**
Chloroprene (Neoprene)	= **N**
Epichlorohydrin (ECO)	= **Y**
Fluorocarbon (FKM)	= **V**

4 Max working pressure (PS)

See the table on front page

5 Body material

Carbon steel	= **C**
Nickel coated carbon steel 25 μ	= **N**
Nickel coated carbon steel 40 μ	= **M**
Stainless steel	= **X**

6 Fluid port connection

1÷55 l BSP ISO 228 with chamfer for OR (std)	= **A**
1÷55 l adapter *	= **R**

* assembled on the fluid valve connection type A

7 - 8 Dimension of the connection fluid or 7+8 table

See the table on front page

16 Precharge pressure (bar)

Standard 10 bar = **0 ÷ 15** (< PS)

15 Other variants

See the table on front page

14 Variants of gas side

Standard	= **0**
Only cap in stainless steel	= **1**
Brass nameplate	= **2**

Other numbers/variants to be requested EPE

13 Gas valve material

Carbon steel	= **C**
Nickel coated carbon steel 25 μ	= **N**
Nickel coated carbon steel 40 μ	= **M**
Stainless steel	= **X**

12 Variants of fluid side

Standard	= **0**
Adapter in stainless steel (R)	= **1**
Button and spring in stainless steel	= **2**

Other numbers/variants to be requested EPE

11 Fluid valve material

Carbon steel	= **C**
Nickel coated carbon steel 25 μ	= **N**
Nickel coated carbon steel 40 μ	= **M**
Stainless steel	= **X**

10 Test and certification

Factory testing	= **0**
PED 2014/68/EU (for capacities greater than 1 l)	= **8**
EAC (Russia)	= **11**
Algeria passport	= **12**
Standard regulation (NR13) (Brazil)	= **13**
Tunisian passport	= **14**

9 Connection gas side

Standard filling valve 5/8" UNF thread	= **V**
Standard filling valve with 5/8" UNF thread in stainless steel	= **VX**
Without filling valve (thread hole M12x1.5)	= **V0**
Brass filling valve 1/4" BSP	= **V2**
Filling valve 7/8" UNF	= **V4**

Special variants upon request

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4 Max working pressure (PS)		
Capacity litres	Carbon steel	Stainless steel
1 ÷ 3	**60**	**60**
5	**40**	**40**
10 ÷ 55	**30 - 60** (other pressure related to connections B or U)	**30 - 60**

15 Other variants	
Adapter + Burst disc set at xxx bar (see Section 8.2)	= **Rxxx**
Adapter + Safety valve, type VS214 set at xxx bar	= **Gxxx**
Adapter + Needle Valve of 1/4” BSP	= **EG2**
Adapter + Stainless steel needle Valve of 1/4 BSP	= **EG2X**
Adapter + Excluding device with with full scale pressure gauge of xxx bar	= **EMxxx**
Adapter + Excluding device of 90° with full scale pressure gauge of xxx bar	= **ELMxxx**
Flushing with degree of contamination ≤ ...class	= **Fx**
75-80 μ thick. polyurethane paint with colour to be specified	= **Wxxx**
Off-shore paint with colour to be specified	= **Zxxx**
NORSOK System 1 paint with colour to be specified	= **K1**
NORSOK System 7B paint with colour to be specified	= **K7B**
other variants upon request	

7 Dimension of the fluid connection

For the type of connection:

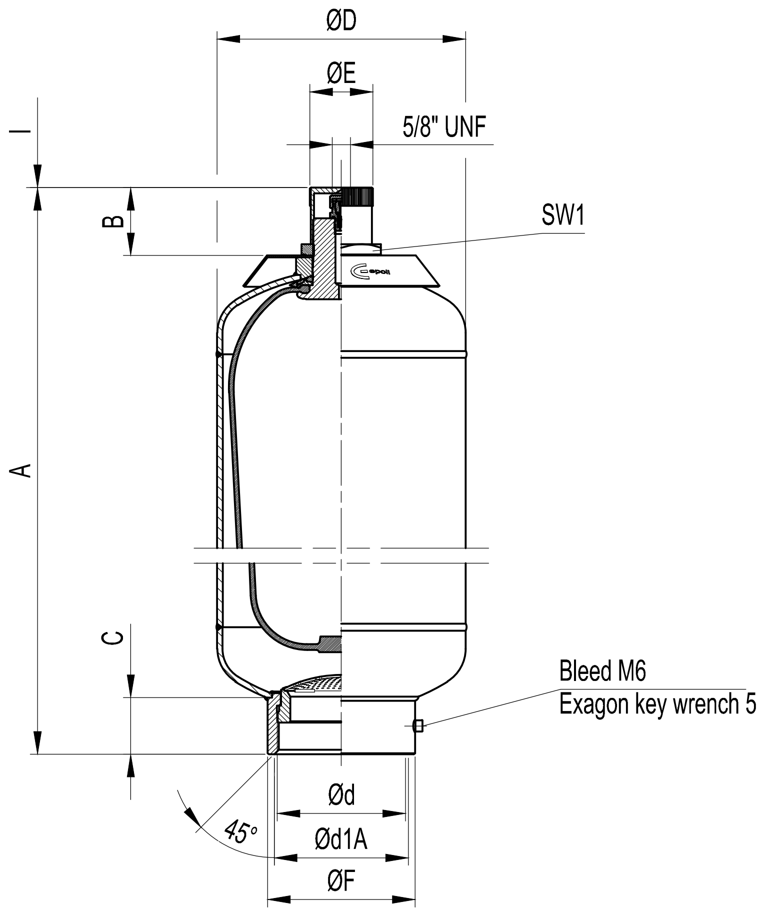
(1 ÷ 3 l) 2”	= **9**
(5 l) 2” 1/2	= **10**
(10 ÷ 55 l) 4”	= **13**
B (1÷ 55 l)	**DIMENSION/RATING**
Former. 1” ANSI 150 = 1/150 (Pmax = 20 bar)	
U (0.7÷55 l)	**DN/PN**
Former. DN50 PN16 = 50/16 (Pmax = 16 bar)	
R (0.7÷55 l) Blind	= **0**
R (0.7÷55 l) internal thread	
BSP ISO 228	= **G***
NPT-F	= **P***
BSPT	= **N***

*Variant in table 8

8 Dimension								
1/8”	=	**1**	3/4”	=	**5**	2”	=	**9**
1/4”	=	**2**	1”	=	**6**	2” 1/2	=	**10**
3/8”	=	**3**	1” 1/4	=	**7**	3”	=	**11**
1/2”	=	**4**	1” 1/2	=	**8**	3” 1/2	=	**12**

Special variants upon request

3.3.9 DIMENSIONS



3.3da

Acc. type ASB in carbon steel	Nominal gas volume litres	Effective gas volume litres	Working pressure bar	Ped category liquids of group 2	Max.diff. pressure P2-P1 bar	Flow rate l/min	Max. comp. ratio P0/P2	A mm	B mm	C mm	Ø D mm	Ø d BSP	Ø d1 mm	Ø E mm	ØF mm	I mm	SW 1 mm	Acc. dry weight kg
ASB 1	1	1	60(60)	art.3 (3)	60 (25)	100	1:4	253 ±3	45	41	114	2"	54	25	60	140	32**	4.2
ASB 1,5	1,5	1,5	60 (60)	II	60 (25)	100	1:4	330 ±3	47	45	114	2"	63.35	25	75	140	32**	4.8
ASB 3	3	2,95	60 (60)	II	60 (25)	100	1:4	510 ± 5	47	45	114	2"	63.35	25	75	140	32**	5.5
ASB 5	5	5	40 (40)	II	22 (17)	150	1:4	420 ± 10	47	46	168	2" 1/2	79	25	88	140	32**	11
ASB 10	10	9,1	60 (30÷60)	II÷III	40 (13÷34)	300	1:4	475 ± 10	60	50	219	4"	118.4	55	130	140	70**	18
ASB 15	15	14,5	60 (30÷60)	II÷III	40 (13÷34)	300	1:4	615 ± 10	60	50	219	4"	118.4	55	130	140	70**	23
ASB 20	20	18,2	60 (30÷60)	II÷III	40 (13÷34)	300	1:4	755 ± 10	60	50	219	4"	118.4	55	130	140	70**	28
ASB 25	25	23,5	60 (30÷60)	II÷III	40 (13÷34)	300	1:4	900 ± 15	60	50	219	4"	118.4	55	130	140	70**	33
ASB 35	35	33,5	60 (30÷60)	II÷III	40 (13÷34)	300	1:4	1285 ± 15	60	50	219	4"	118.4	55	130	140	70**	47
ASB 55	55	50	60 (30÷60)	II÷III	40 (13÷34)	300	1:4	1765 ± 15	60	50	219	4"	118.4	55	130	140	70**	65

** Open end wrench

3.3db

3.3db

- The maximum differential pressure is the maximum allowable difference between the maximum pressure and the minimum working pressure (P2-P1) to have an infinite life cycle of the accumulator (greater than 2,000,000 cycles).
- Flow rate measured using mineral oil with viscosity of 36 cSt at 50°C and ΔP = 5 bar

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3.3.9.1 FLANGE CONNECTION TYPE ANSI / UNI DIN (B/U)

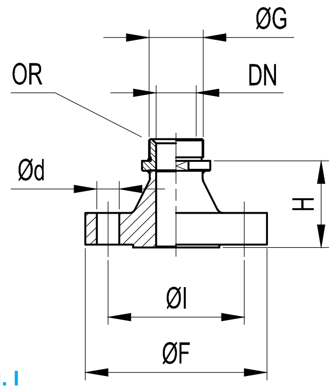
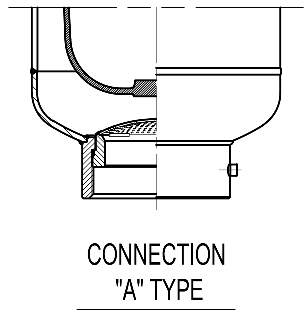


Fig. I



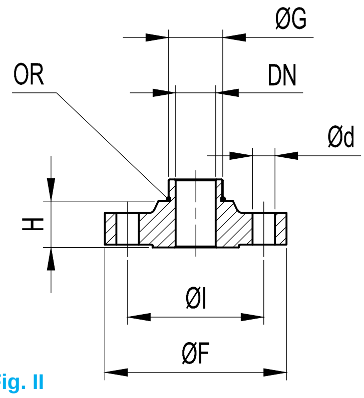


Fig. II

3.3ea

	Accumulator type	Spare flange order code	Ref. Directive UNI	Ref. Directive DIN	DN mm	PN bar	Fig.	Ø F mm	Ø I mm	Ød mm	N° Holes	H mm	G BSP	OR (Included)
U (UNI-DIN)	ASB 1	-	-	-				On request					-	-
	ASB 1.5 - 3	F 2222 - ** / *	2284	2635	25	40	I	115	85	14	4	51	2"	0010R3218-*
		F 2227 - ** / *	2284	2635	40	40	I	150	110	18	4	56		
		F 2231 - ** / *	2282	2633	50	16	II	165	125	18	4	23		
		F 2232 - ** / *	2285	2636		64		185	135	22	4	40		
	ASB 5	F 2241 - ** / *	2282	2633	65	16	II	185	145	18	4	23	2" 1/2	0010R3281-*
		F 2242 - ** / *	2284	2635		40		185	145	18	8	30		
	ASB 10 ÷ 55	F 2255 - ** / *	2282	2633	50	16	I	165	125	18	4	65	4"	0010R4425-*
		F 2256 - ** / *	2284	2635		40		165	125	18	4	68		
		F 2259 - ** / *	2282	2633	80	16		200	160	18	8	70		
		F 2261- ** / *	2282	2633	100	16	II	220	180	18	8	31		
		F 2262 - ** / *	2284	2635		40		235	190	22	8	44		

* Gasket material ** Flange material Others size on request

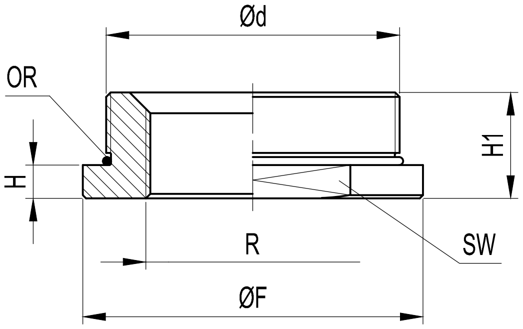
3.3eb

	Accumulator type	Spare flange order code	Ref. Directive	DN inch	PN lbs	Fig.	Ø F mm	Ø I mm	Ød mm	N° Holes	H mm	G BSP	OR (Included)
B (ANSI)	ASB 1	-	-				On request					-	-
	ASB 1.5 - 3	F 2225 - ** / *	B16.5	1"	300	I	123,5	88,9	19	4	73	2"	0010R3218-*
		F 2229 - ** / *	B16.5	1" 1/2	300	I	155,6	114,3	22,2	4	79		
		F 2235 - ** / *	B16.5	2"	400	II	165	127	19	8	55		
	ASB 5	F 2243 - ** / *	B16.5	2" 1/2	150	II	177,8	139,7	19	4	45	2" 1/2	0010R3281-*
		F 2244 - ** / *	B16.5		300		190,5	149,2	22,2	8	52		
	ASB 10 ÷ 55	F 2257 - ** / *	B16.5	2"	150	I	152,4	120,6	19	4	84	4"	0010R4425-*
		F 2258 - ** / *	B16.5		300		165,1	127	19	8	90		
		F 2263 - ** / *	B16.5	4"	150	II	228,6	190,5	19	8	46		
		F 2264 - ** / *	B16.5		300		254	200	22,2	8	60		

* Gasket material ** Flange material Others size on request

3.3ec

3.3.9.2 ADAPTERS



3.3fa

Accumulator type	Order code	Ød Acc. connection	R**** Out connections (0 = blind)	SW *mm*	Ø F *mm*	H *mm*	H 1 *mm*	OR (Included)	Weight *Kg*
ASB 1 - 3	R - A9*** - ** / *	2" BSP	1/8" ÷ 1" 1/2 BSP - NPT - BSPT	70	75	11	35	0010R3218 - *	0,86
ASB 5	R - A10*** - ** / *	2" 1/2 BSP	1/8" ÷ 2" BSP - NPT - BSPT	80	88	20	44	0010R3281 - *	1,3
ASB 10 ÷ 55	R - A13*** - ** / *	4" BSP	1/8" ÷ 3" 1/2 BSP - NPT - BSPT	120	130	14	35	0010R4425 - *	3

* Gasket material ** Adapter material *** See chapter 3.3.8 table 7 – 8 Weigth indicated only for blind version

**** R Out connections type "S" and "M" thread on request

3.3fb

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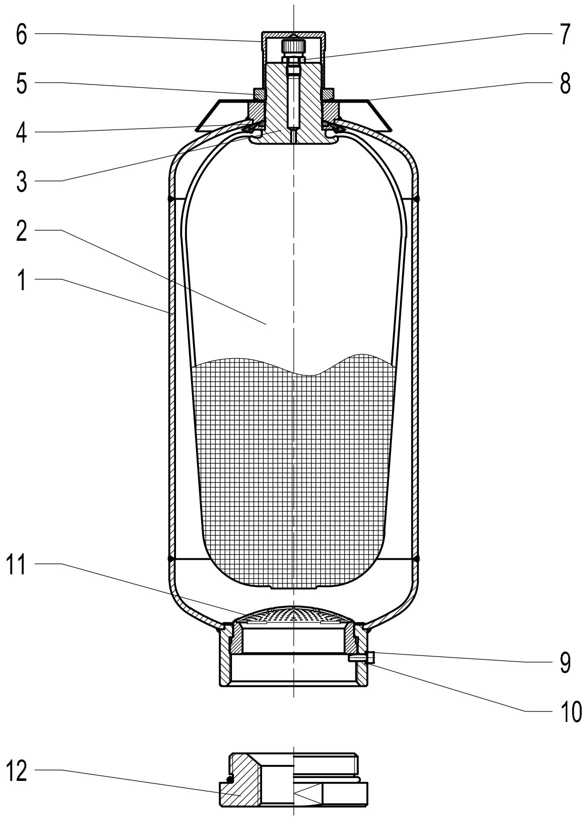
3.3.10. SPARE PARTS CODE



3.3ga

Item	Description	Q.ty	Type		
			ASB 1-1,5 - 3	ASB 5	ASB 10 ÷ 55
1	Accumulator shell	1	Not supplied as spare part		
2	Bladder	1	S1*- 0 / S1.5* - 0 / S3* - 0	S5* - 0	S10 ÷ 55* - 0
3	Gas valve body	1	B10107 - **	B10202 - **	B10333 - **
4	Rubber-coated washer	1	B10106 - ** / *	B10205 - ** / *	B10334 - ** / *
5	Gas valve looknut	1	B10109 - **		B10302 - **
6	Protection cap	1	B10103 - **		B10301 - **
7	Gas fill valve	1	V 2072 - ** - *		
8	Name plate	1	D10300A-A	D10300C-A	D10300E-A
9	Bleed screw	1	B10316 - **		
10	Seal ring	1	B10336 - R		
11	Anti-extrusion plate	1	B10159-1 - **	B10241-1 - **	B10421A - **
12	Adapter	1	See chapter 3.3.9.2 ADAPTER		
Standard gas valve ass. (parts 3 ÷ 7)		1	V 2022 - ** / *	V 2042 - ** / *	V 2062 - ** / *
Gasket sets		1	B2032 - * { 0010R2050-* B10341-P B10342-P 0010R3218-* B10336 - R }	B2052-* { 0010R2050-* B10341-P B10342-P 0010R3281-* B10336 - R }	B2082-* { 0010R2050-* B10341-P B10342-P 0010R4425-* B10336-R }

* Gasket material ** Component material

3.3gb

3.3.11 COMMISSIONING AND MAINTENANCE

Delivery conditions

Bladder accumulators type ASB are delivered pre-charged with nitrogen at a pressure of 10 bar or at value of pressure required at time of order. The pre-charge value is also on the nameplate of the accumulator.

Depending on the size and quantity ordered, the bladder accumulators are shipped in boxes, in cartons, on pallets or wooden boxes on request. Unless otherwise required, certificates and documentation are provided together with the accumulators.

Handling

The original packaging is suitable for handling and general storage. Where necessary, you should use suitable lifting equipment to support the weight of the accumulators.

However protect from impact the packaging and handle it with care.

Storage

During storage in the warehouse, leave the product in its original packaging, keeping it away from heat sources and naked flames. The storage temperature should be between +10 and +40°C.

In addition to six months of storage, the precharge pressure must be to two bar and make sure that inside there is lubrication fluid compatible with bladder polymer.

After six years of storage, it is essential to proceed with the replacement of all elastomeric parts before the commissioning.

Marking on the nameplate of the accumulator

With reference to the PED 2014/68/EU classification, Article 3, Paragraph 3 and / or risk categories I or II depending on the volume and maximum working pressure, the accumulator indicates the following data:

- Logo, name and country of the manufacturer
- Mounth/year of production
- Product code
- Serial number
- Maximum PS pressure and PT test pressure in bar
- Min. and max. TS working temperature in Celsius
- Volume V in litres
- Group of fluids allowed (II)
- CE marking (for volumes exceding 1 litre) with the identification number of the notified body
- Pre-charge pressure in bar

It is strictly forbidden to:

- weld, rivet or screw any item of 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 (dangerous) fluid of Group 1 with equipment designed and manufactured for fluids of Group 2.

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 security valve (see Chapter 8) or a security block type BS (see Chapter 9). This device provides user and equipment protection against possible damage caused by pressure surges and also makes the maintenance of the accumulator easier, facilitating the interception and the discharge. Provide for a space of 200 mm above the gas pre-charge valve to allow access to and control of the pre-charge equipment (see Chap.11.1). The accumulators type ASB may be installed in any position from horizontal to vertical (preferably with the pre-charge valve at the top), and the nameplate 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 (please see Chapter 7) to avoid the transmission of vibrations. If are not used EPE safety blocks, make sure that the accumulator is connected to the hydraulic circuit by suitable connection devices. 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.

Pre-charge of nitrogen

Normally, the bladder accumulators are delivered pre-charged with pressurized gas. The pre-charge of gas can be controlled and / or adjusted before or after installation of the accumulator in the hydraulic circuit.

For the pre-charge, use only industrial dry nitrogen with a purity of min. 99%. It is important to use the nitrogen from a bottle equipped with a pressure reducing valve (see Chap.11.3). Use the EPE pre-charge and charging set type PC to check the charging pressure required, and adjust if necessary. If the pre-charge pressure is lower than required, connect the harging hose on one side and the other side connect it to the nitrogen bottle or to the pressure reducer. Slowly fill the nitrogen in the accumulator until reaching a pressure slightly higher than that set value (+ 10 ÷ 15%). Close the bottle and remove the charging hose from the pre-loading set; wait until the gas temperature has stabilized (2 hours) and calibrate the pressure, discharging the excess gas. Make sure that the gas valve is not subject to losses and, if necessary, use soap and water. Tighten the protective caps manually.

Hydraulic pressurization

- Check that the pre-charge pressure is adequate for the application
- Ensure that the hydraulic pressure never exceeds the max pressure allowed (PS) shown on the accumulator shell.

To avoid this risk, use a safety device (see Chap. 9).

Maintenance

- Periodically check the pre-charge pressure of the gas: after the commissioning, check after 2-3 weeks of operation and if there were no leaks, repeat the operation after 3 months; if the pressure at the same temperature was stable, repeat the test yearly. For heavy-duty applications, check the pre-charge every 6 months.
- Periodically (yearly) carry out a visual inspection of the accumulator in order to detect any early signs of deterioration such as corrosion, deformation, etc.
- Comply with the requirements of the regulations concerning the verification of the functionality of the equipment according to the country of installation of the accumulator.

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Repair

If for failure, scheduled check or retest it is necessary to remove the accumulator from the system, prior to removal, isolate the accumulator from the installation and discharge pressure of the liquid.
All bladder EPE accumulators of the ASB series may be repaired.
It may consist in replacing the bladder, the seals, the pre-charge valve and/or the parts of the gas and fluid valve.
For reasons of functionality and security, it is recommended to use only original spare parts.

Disassembly

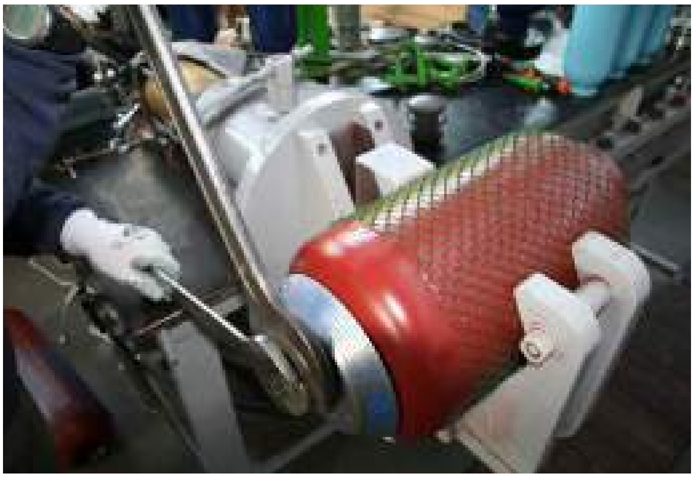
- Fasten the accumulator firmly in a vice or on a bench in a horizontal position, taking care not to damage the outer surface.

3.3h

- If you have not already carried out, unscrew the cap nut first and then the valve cap of the gas valve.

3.3i

- Allow gas escapes from the bladder with the help of the check valve until a pressure of 0 is displayed. Check if the bladder is now de-pressurizing an open valve.



3.3l

- Remove gas valve, fastening the nut on the gas valve and remove the nameplate

3.3m

- Unscrew the vent screw

3.3n

- Using a suitable wrench, unscrew the fluid valve (anti-extrusion plate)

3.3o

- Remove the oil valve

3.3q

- Drain air from bladder by pressing together

3.3p

- Fold bladder somewhat and withdraw by turning it slightly

3.3r

- Carefully moisten the inside of the bladder and the container with used medium (roll container)

Refitting

Tightening torques in Nm			
	0.7-1.5 l	**3 - 5 l**	**10-55 l**
Bleed screw	5 +1	5 +1	30 +10
Gas valve locknut	80 +20	100 +20	150 +30
Filling valve V - VX - V2	30 +5	30 +5	30 +5
Valve insert V4	0.3 +0.,2	0.3 +0.2	0.3 +0.2

- Cleaning and testing: clean all metallic parts on accumulator using an organic reducer – visual inspection of valves– Clean bladder, i.e. using isopropanol. Visual inspection of bladder for faults – inner inspection of container for signs of corrosion. In event of coated containers, check the condition of the coating. Replace the parts deemed to be bad; the o-rings must always be replaced (see spare parts Section 3.3.9).

3.3s

- Install the anti extrusion plate.

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3.3t

- Mount the bleed screw with its sealing ring

3.3u

- Tighten the hexagon nut SW1 on the gas valve

3.3v

- Mount the filling valve

Pre-charge

3.3z

- Screw the pre-charge PC equipment on the gas valve.
- Connect the equipment to the cylinder of nitrogen or to the pressure reducer with the inflation tube.
- Slowly enter the nitrogen in the accumulator until reaching a pressure slightly higher than the set value (+ 10 ÷ 15%).
- Close the cylinder and remove the connecting pipe from the equipment.
- Wait until the gas temperature has stabilized (2 hours).
- Calibrate the pressure discharging the excess gas.

Make sure that the gas valve is not subject to losses and, if necessary, use soap and water.
Tighten the protective caps manually.

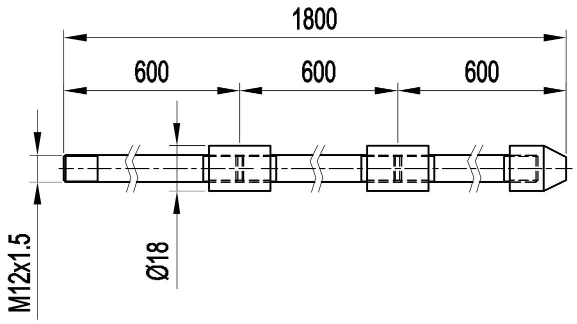
Demolition and recycling of the accumulator
Before accumulator demolition or recycling, you should always discharge completely the pre-charge pressure and remove the gas valve.
If needed, proceed decontaminating in relation to the fluid used prior to demolition.

3.3.12 REPAIR TOOLS

3.3.12.1 BLADDER PULL ROD

The pull rod screwed to the gas valve of the bladder for easy assembly into shell during reassembly. Pull rod is complete with fitting for EPE gas valve and 3 extension segments to accommodate all size of accumulators.
Code for complete kit: **B2505**

Dimension

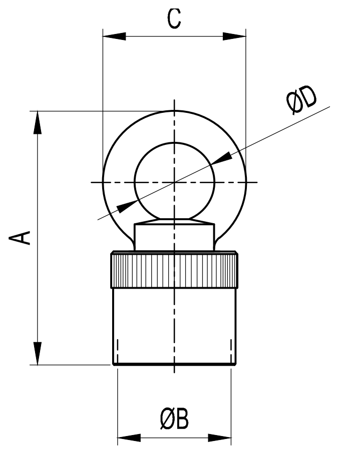


3.3aa

3.3.12.2 LIFTING HOOK

To be used for the safe lifting of mounted accumulators:
For accumulators 0,7÷5 lt (M22x1,5) code **B2507/2**
For accumulators 10÷55 lt (M50x1,5) code **B2507/5**
For accumulators type V4 (7/8" UNF) code **B2507/7**

Dimension



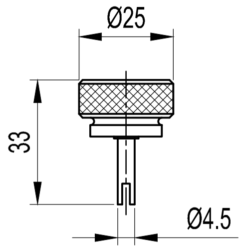
3.3ab

CODE	A	ØB	C	ØD	For Accumulator
B2507/2	100	M22x1.5	63	35	0,7 ÷ 5
B2507/5	112	M50x1.5	63	35	10 ÷ 55
B2507/7	100	7/8" UNF	63	35	10 ÷ 55

3.3.12.3 CORE TOOL

The core tool is used to remove and reinstall the valve core type V4.
Code **B2508**

Dimension



3.3ac

3.4.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS): 60 bar

PRESSURE TEST (PT): 1.43 x PS

NOMINAL CAPACITIES:
ASBL: 0.7 - 1 - 1.5 - 3 - 5 – 10 – 15 – 20 – 25 – 35 - 55 litres
ASBT: 1 - 1.5 - 3 - 5 – 10 – 15 – 20 – 25 – 35 - 55 litres

WORKING TEMPERATURE: -40 ÷ +150 °C

FLUID VISCOSITY RANGE: 10 ÷ 400 cSt

RECOMMENDED VISCOSITY: 36 cSt

FLUID CONTAMINATION DEGREE:
class 21/19/16 according to ISO 4406/99

BODY MATERIAL:
- carbon steel shell painted with rust inhibitor RAL 8012
- nickel coating 25 - 40 µ
- stainless steel AISI 316L

VALVES MATERIAL:
- phosphated or galvanized carbon steel in compliance with Directive 2002/95/EC (RoHS) to resist to corrosion
- stainless steel AISI 316L
- nickel coating 25-40 µ

BLADDER MATERIAL:
- **P** = Nitrile rubber (NBR)
- **F** = Low temp. nitrile rubber
- **H** = Nitril for hydrocarbons
- **K** = Hydrogenated nitrile (HNBR)
- **B** = Butyl (IIR)
- **E** = Ethylene-propylene (EPDM)
- **N** = Chloroprene (Neoprene)
- **Y** = Epichlorohydrin (ECO)
- **V** = Fluorocarbon (FPM)

See Table 3.4c and/or Chapter 1.5

GAS VALVE CONNECTION: see Table 3.4db - 3.4dd

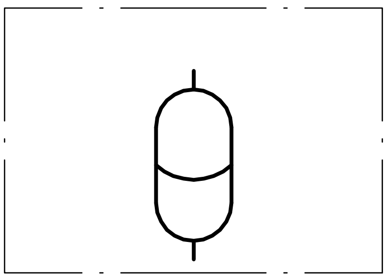
FLUID PORT CONNECTION: - see Table 3.4db - 3.4dd - 3.4eb 3.4ec - 3.4fb

FLOW RATE: see Table 3.4db - 3.4dd

WEIGHT: see Table 3.4db - 3.4dd

3.4a

3.4.2 HYDRAULIC SYMBOL



3.4b

3.4.3 "ASBL and ASBT" BLADDER ADVANTAGES

- dirt tolerant
- light weight
- compact
- simple construction
- quick response
- works well on water, low lubricity fluids
- quick, easy installation
- low cost

3.4.4 DESCRIPTION

Bladder low pressure ASBL and ASBT type accumulators consist of a welded cylindrical pressure vessel made of steel.
The accumulators are subdivided into a gas and fluid side by an elastic bladder mounted in the interior of the vessel.
In the ASBL type, the liquid is also inside the bladder.
The transfer accumulator ASBT type is designed especially for connecting to nitrogen bottle. A diffuser rod prevents damages to the bladder when the accumulator works.
Nitrogen bottle used as back-ups increase the gas volume in the accumulator. This means that smaller accumulators can be used for the same gas volume and costs can be reduced.
When the fluid is pressed into the accumulator, the gas in the bladder is compressed and hence the pressure increased. The gas volume reduces and on the fluid side, the fluid can flow into the accumulator. As soon as the pressure on the fluid side falls below the gas pressure, the accumulator is emptied.
Oil valve is provided in the oil port of the bladder-type accumulator and closes when the pressure on the gas side is higher than the one on the fluid side. This prevents draining of the bladder into the oil channel and thus the bladder from being destroyed.
When the minimum operating pressure is reached, a small oil volume is to be maintained between the bladder and the fluid volume (approx. 10% of the nominal capacity of the hydraulic accumulator), in order that the bladder does not hit the valve during every expansion process.
The gas valve body of ASBL type accumulator is complete with anti-extrusion in addition to the rubber washer and locknut.
The gas valve body of ASBT type accumulator is complete with diffuser rod in addition to the rubber washer and locknut.
These parts can be replaced separately.
The nameplate shows the technical data and features of the hydraulic accumulator.

3.4.5 EUROPE MARKET

All hydraulic accumulators are pressure vessels and are subject to the national regulations and directives, valid at the place of installation.
Bladder accumulator type ASBL e ASBT, up to and including 1 liter must not be CE marked.
For bladder accumulator type ASBL e ASBT, greater than 1 liter, every shipping batch is complete of a conformity declaration and instruction of use and maintenance and/or all documents requested.
All vessel categories (see Table 3.4db, 3.4dd) must be protected by means of a pressure relief valve in accordance with Directive 2014/68/EU.

3.4.6 ACCESSORIES

For additional cylinders, see Section 6
For support equipment, see Cap. 7
For gas side's safety equipment, see Cap. 8
For fluid side's safety equipment, see Cap. 9
For pre-loading and charging set, see Cap. 11
For other components, see Cap. 12

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3.4.7 BLADDER-TEMPERATURE-LIQUID COMPATIBILITY

When selecting the accumulator variant, pay attention to the following non-binding notes with regard to hydraulic fluid, bladder material and the permissive temperature range. (see Section 1.5)

Code letter	Polymer	ISO	Temperature range (°C)	Some of the liquids compatible with the polymer
P	Standard nitrile (Perburan)	NBR	-20 ÷ +80	Aliphatic hydrocarbons (propane, butane, gasoline, oils, mineral greases, diesel fuel, fuel oil, kerosene), mineral greases and oils, HFA - HFB - HFC fluids, many dilute acids, alkalis, saline solutions, water, water glycol.
F	Low temperature nitrile	NBR	-40 ÷ +70	The same as with standard nitrile + a number of different types of Freon. (This contains less acrylonitrile than the standard and is therefore more suitable for low temperatures, but its chemical resistance is slightly lower).
H	Nitrile for hydrocarbons	NBR	-10 ÷ +90	Regular and premium grade slightly aromatic gasoline (and all the liquids for standard nitrile).
K	Hydrogenated nitrile	HNBR	-30 ÷ +130	The same as with standard nitrile but with excellent performance at high and low temperatures.
B	Butyl	IIR	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many acids and bases, salt solutions, polar solvents such as alcohols, ketones and esters, polyglycol-based hydraulic fluids (HFC fluids) and bases of esters of phosphoric acid (HFD-R fluids), silicone oils and greases, resistance to ozone, aging and weathering.
E	Ethylene-Propylene	EPDM	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many organic and inorganic acids, detergents, solutions of sodium and potassium, phosphate ester-based hydraulic fluids, (HFD-R), silicone oils and greases, many polar solvents (alcohol, ketones, esters), Skydrol LD4 and 500B-4, resistance to ozone, aging and weathering.
N	Chloroprene (Neoprene)	CR	-30 ÷ +100	Mineral oils of paraffin, silicone oils and greases, water and aqueous solutions, refrigerants (ammonia, carbon dioxide, Freon), naphthenic mineral oils, low molecular aliphatic hydrocarbons (propane, butane, fuel), brake fluids based on glycol, better resistance to ozone, weathering and aging compared to NBR rubber.
Y	Epichloridrin	ECO	-30 ÷ +110	Mineral oils and greases, aliphatic hydrocarbons (propane, butane and gasoline), silicone oils and greases, water at room temperature, resistance to ozone, aging and weathering.
V	Fluorocarbon	FKM	-10 ÷ +150	Mineral oils and greases, non-flammable fluids of HFD group, silicone oils and greases, animal and vegetable oils and greases, aliphatic hydrocarbons (gasoline, butane, propane, natural gas), aromatics hydrocarbons (benzene, toluene), chlorinated hydrocarbons (Tetrachloroethylene, carbon tetrachloride), fuel (regular, super and containing methanol), excellent resistance to ozone, weathering and aging.

3.4c

For other hydraulic fluid and/or temperatures, please consult us.

3.4.8 ORDER CODE

1	2	3	4	5	6	7 - 8	9		10		11	12	13	14	15
ASBL	25	P	25	X	R	G10	G6	-	8	-	X	1	X	0	F6

1 Series

Bladder accumulator low pressure liquid separator	= ASBL
Bladder accumulator low pressure transfer	= ASBT

2 Nominal capacity

1 lt	= **1**
1.5 lt	= **1.5**
3 lt	= **3**
5 lt	= **5**
10 lt	= **10**
15 lt	= **15**
20 lt	= **20**
25 lt	= **25**
35 lt	= **35**
55 lt	= **55**

3 Bladder material

Nitrile rubber (NBR)	= **P**
Nitrile for low temp.	= **F**
Nitril for hydrocarbons	= **H**
Hydrogenated nitrile (HNBR)	= **K**
Butyl (IIR)	= **B**
Ethylene-propylene (EPDM)	= **E**
Chloroprene (Neoprene)	= **N**
Epichlorohydrin (ECO)	= **Y**
Fluorocarbon (FKM)	= **V**

4 Max working pressure (PS)

See the table on front page

5 Body material

Carbon steel	= **C**
Nickel coated carbon steel 25 μ	= **N**
Nickel coated carbon steel 40 μ	= **M**
Stainless steel	= **X**

6 Fluid port connection

1÷55 l BSP ISO 228 with chamfer for OR (std)	= **A**
1÷55 l adapter *	= **R**

* assembled on the fluid valve connection type A

7 - 8 Dimension of the connection fluid or 7+8 table

See the table on front page

9 Connection gas side

Capacity 0.7 ÷ 5 l	= **G2**
Capacity 10 ÷ 55 l	= **G6**

10 Test and certification

Factory testing	= **0**
PED 2014/68/EU (for capacities greater than 1 l)	= **8**
EAC (Russia)	= **11**
Algeria passport	= **12**
Standard regulation (NR13) (Brazil)	= **13**
Tunisian passport	= **14**

11 Fluid valve material

Carbon steel	= **C**
Nickel coated carbon steel 25 μ	= **N**
Nickel coated carbon steel 40 μ	= **M**
Stainless steel	= **X**

12 Variants of fluid side

Standard	= **0**
Adapter in stainless steel (R)	= **1**

Other numbers/variants to be requested EPE

13 Gas valve material

Carbon steel	= **C**
Nickel coated carbon steel 25 μ	= **N**
Nickel coated carbon steel 40 μ	= **M**
Stainless steel	= **X**

14 Variants of gas side

Standard	= **0**
Only cap in stainless steel	= **1**
Brass nameplate	= **2**

Other numbers/variants to be requested EPE

15 Other variants

See the table on front page

Special variants upon requestVersioni speciali su richiesta

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4 Max working pressure (PS)		
Capacity litres	Carbon steel	Stainless steel
1 ÷ 3	**60**	**60**
5	**40**	**40**
10 ÷ 55	**30 - 60** (other pressure related to connections B or U)	**30 - 60**

15 Other variants	
Adapter + Burst disc set at xxx bar (see Section 8.2)	= **Rxxx**
Adapter + Safety valve, type VS214 set at xxx bar	= **Gxxx**
Adapter + Needle Valve of 1/4” BSP	= **EG2**
Adapter + Stainless steel needle Valve of 1/4 BSP	= **EG2X**
Adapter + Excluding device with with full scale pressure gauge of xxx bar	= **EMxxx**
Adapter + Excluding device of 90° with full scale pressure gauge of xxx bar	= **ELMxxx**
Flushing with degree of contamination ≤ ...class	= **Fx**
75-80 μ thick. polyurethane paint with colour to be specified	= **Wxxx**
Off-shore paint with colour to be specified	= **Zxxx**
NORSOK System 1 paint with colour to be specified	= **K1**
NORSOK System 7B paint with colour to be specified	= **K7B**
other variants upon request	

7 Dimension of the fluid connection

For the type of connection:

(1 ÷ 3 l) 2” = **9**
(5 l) 2” 1/2 = **10**
(10 ÷ 55 l) 4” = **13**
B (1÷ 55 l) **DIMENSION/RATING**
Former. 1” ANSI 150 = 1/150 (Pmax = 20 bar)
U (0.7÷55 l) **DN/PN**
Former. DN50 PN16 = 50/16 (Pmax = 16 bar)

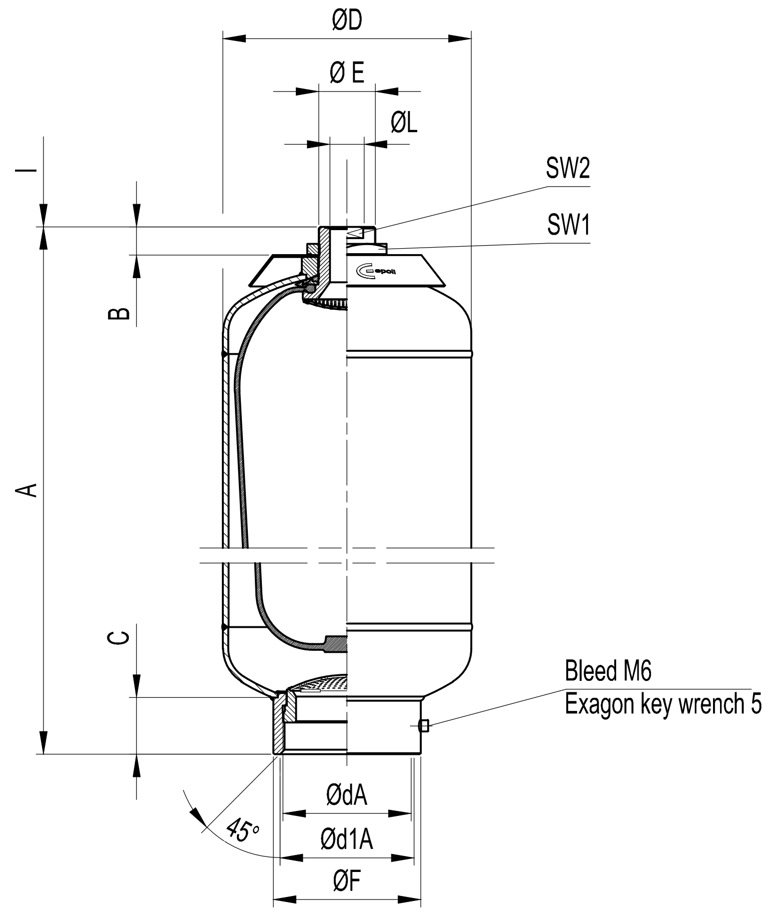
R (0.7÷55 l) Blind = **0**
R (0.7÷55 l) internal thread
BSP ISO 228 = **G***
NPT-F = **P***
BSPT = **N***

*Variant in table 8

8 Dimension								
1/8”	=	**1**	3/4”	=	**5**	2”	=	**9**
1/4”	=	**2**	1”	=	**6**	2” 1/2	=	**10**
3/8”	=	**3**	1” 1/4	=	**7**	3”	=	**11**
1/2”	=	**4**	1” 1/2	=	**8**	3” 1/2	=	**12**

Special variants upon request

3.4.9 DIMENSIONS
ASBL VERSION



3.4da

Acc. type ASBL in carbon steel	Nominal gas volume litres	Effective gas volume litres	Working pressure *bar*	Ped category liquids of group 2	Max.diff. pressure P2-P1 *bar*	Flow rate *l/min*	Max. comp. ratio P0/P2	A *mm*	B *mm*	C *mm*	Ø D *mm*	Ø d *BSP*	Ø d1 *mm*	Ø E *M*	ØF *mm*	ØL BSP	I *mm*	SW 1 *mm*	SW 2 *mm*	Acc. dry weight *kg*
ASBL 1	1	1	60(60)	art.3 (3)	60 (25)	100	1:4	228 ±3	21	41	114	2"	63.35	22x1.5	60	1/4"	140	32**	18	4
ASBL 1,5	1,5	1,5	60 (60)	II	60 (25)	100	1:4	297 ± 3	20	45	114	2"	63.35	22x1.5	75	1/4"	140	32**	18	4.8
ASBL 3	3	2,95	60 (60)	II	60 (25)	100	1:4	477 ± 3	20	45	114	2"	63.35	22x1.5	75	1/4"	140	32**	18	5.5
ASBL 5	5	5	40 (40)	II	22 (17)	150	1:4	392 ± 10	19	46	168	2" 1/2	79	22x1.5	88	1/4"	140	32**	18	11
ASBL 10	10	9,1	60 (30÷60)	II÷III	40 (13÷34)	300	1:4	443 ± 10	28	50	219	4"	118.4	50x1.5	130	1"	140	70**	41	18
ASBL 15	15	14,5	60 (30÷60)	II÷III	40 (13÷34)	300	1:4	583± 10	28	50	219	4"	118.4	50x1.5	130	1"	140	70**	41	23
ASBL 20	20	18,2	60 (30÷60)	II÷III	40 (13÷34)	300	1:4	723 ± 10	28	50	219	4"	118.4	50x1.5	130	1"	140	70**	41	28
ASBL 25	25	23,5	60 (30÷60)	II÷III	40 (13÷34)	300	1:4	868 ± 15	28	50	219	4"	118.4	50x1.5	130	1"	140	70**	41	33
ASBL 35	35	33,5	60 (30÷60)	II÷III	40 (13÷34)	300	1:4	1253 ± 15	28	50	219	4"	118.4	50x1.5	130	1"	140	70**	41	47
ASBL 55	55	50	60 (30÷60)	II÷III	40 (13÷34)	300	1:4	1733 ± 15	28	50	219	4"	118.4	50x1.5	130	1"	140	70**	41	65

** Open end wrench

3.4db

- The maximum differential pressure is the maximum allowable difference between the maximum pressure and the minimum working pressure (P2-P1) to have an infinite life cycle of the accumulator (greater than 2,000,000 cycles).
- Flow rate measured using mineral oil with viscosity of 36 cSt at 50°C and ΔP = 5 bar

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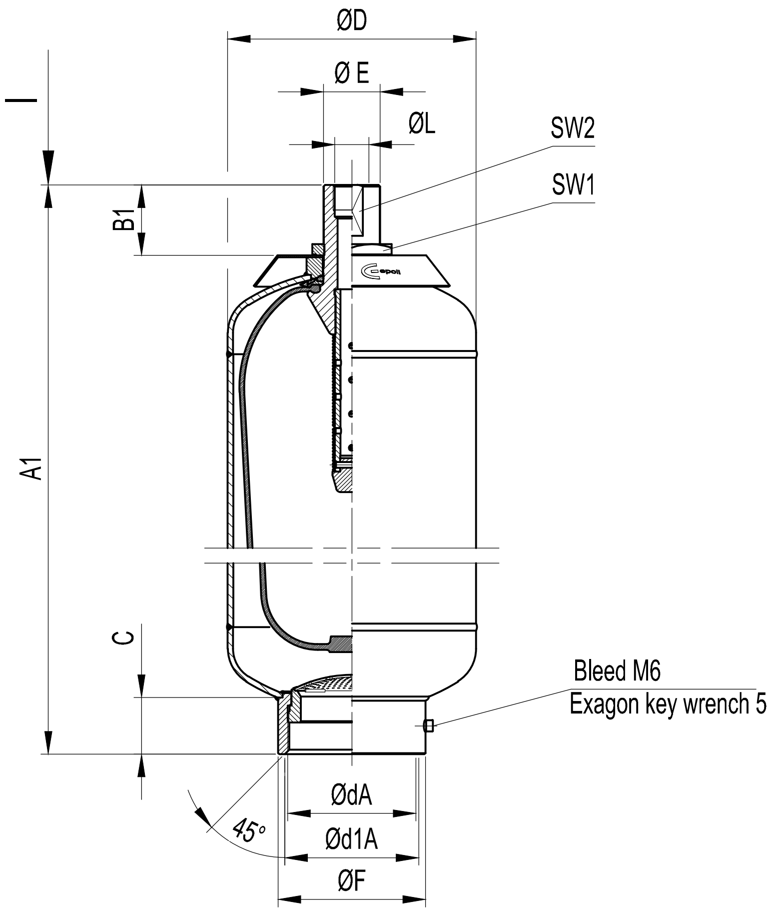
ASBT VERSION



3.4dc

Acc. type ASBT in carbon steel	Nominal gas volume litres	Effective gas volume litres	Working pressure *bar*	Ped category liquids of group 2	Max.diff. pressure P2-P1 *bar*	Flow rate *l/min*	Max. comp. ratio P0/P2	A *mm*	B *mm*	C *mm*	Ø D *mm*	Ø d *BSP*	Ø d1 *mm*	Ø E *M*	ØF *mm*	ØL BSP	I *mm*	SW 1 *mm*	SW 2 *mm*	Acc. dry weight *kg*
ASBT 1,5	1,5	1,5	60 (60)	II	60 (25)	100	1:4	305 ± 3	28	45	114	2"	63.35	22x1.5	75	1/4"	140	32**	18	4.8
ASBT 3	3	2,95	60 (60)	II	60 (25)	100	1:4	485 ± 3	28	45	114	2"	63.35	22x1.5	75	1/4"	140	32**	18	5.5
ASBT 5	5	5	40 (40)	II	22 (17)	150	1:4	396 ± 10	23	46	168	2" 1/2	79	22x1.5	88	1/4"	140	32**	18	11.2
ASBT 10	10	9,1	60 (30÷60)	II÷III	40 (13÷34)	300	1:4	464 ± 10	49	50	219	4"	118.4	50x1.5	130	1"	140	70**	46	18
ASBT 15	15	14,5	60 (30÷60)	II÷III	40 (13÷34)	300	1:4	604 ± 10	49	50	219	4"	118.4	50x1.5	130	1"	140	70**	46	23
ASBT 20	20	18,2	60 (30÷60)	II÷III	40 (13÷34)	300	1:4	744 ± 10	49	50	219	4"	118.4	50x1.5	130	1"	140	70**	46	28
ASBT 25	25	23,5	60 (30÷60)	II÷III	40 (13÷34)	300	1:4	889 ± 15	49	50	219	4"	118.4	50x1.5	130	1"	140	70**	46	33
ASBT 35	35	33,5	60 (30÷60)	II÷III	40 (13÷34)	300	1:4	1274 ± 15	49	50	219	4"	118.4	50x1.5	130	1"	140	70**	46	47
ASBT 55	55	50	60 (30÷60)	II÷III	40 (13÷34)	300	1:4	1754 ± 15	49	50	219	4"	118.4	50x1.5	130	1"	140	70**	46	65

** Open end wrench

3.4dd

* The maximum differential pressure is the maximum allowable difference between the maximum pressure and the minimum working pressure (P2-P1) to have an infinite life cycle of the accumulator (greater than 2,000,000 cycles).
** Flow rate measured using mineral oil with viscosity of 36 cSt at 50°C and ΔP = 5 bar

3.4.9.1 FLANGE CONNECTION TYPE ANSI / UNI DIN (B/U)

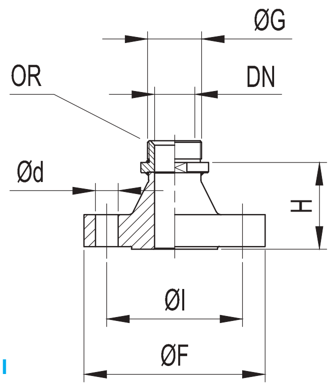
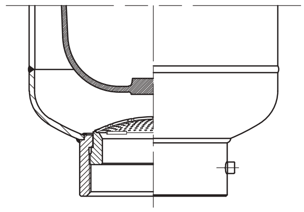


Fig. I



STD. CONNECTION (G)

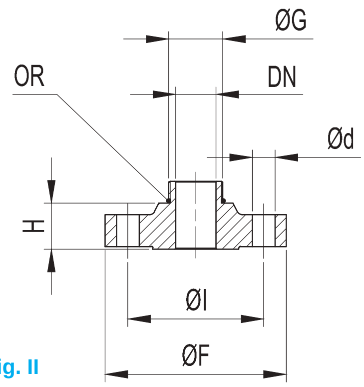


Fig. II

3.4ea

	Accumulator type	Spare flange order code	Ref. Directive UNI	Ref. Directive DIN	DN mm	PN bar	Fig.	Ø F mm	Ø I mm	Ød mm	N° Holes	H mm	G BSP	OR (Included)
U (UNI-DIN)	ASBL / ASBT 1.5 - 3	F 2221 - ** / *	2284	2635	25	16	I	115	85	14	4	49	2"	0010R3218-*
		F 2222 - ** / *	2284	2635		40		115	85	14	4	51		
		F 2223 - ** / *	6086	2628		250		150	105	22	4	76		
		F 2227 - ** / *	2284	2635	40	40	I	150	110	18	4	56		
		F 2228 - ** / *	6086	2628		250		185	135	25	4	91		
		F 2231 - ** / *	2282	2633	50	16	II	165	125	18	4	23		
		F 2232 - ** / *	2285	2636		64		185	135	22	4	40		
		F 2233 - ** / *	6086	2628		250		200	150	25	8	61		
	ASBL / ASBT 5	F 2241 - ** / *	2282	2633	65	16	II	185	145	18	4	23	2" 1/2	0010R3218-*
		F 2242 - ** / *	2284	2635		40		185	145	18	8	30		
	ASBL / ASBT 10 ÷ 55	F 2251 - ** / *	2282	2633	25	16	I	115	85	18	4	52	4"	0010R4425-*
		F 2255 - ** / *	2282	2633	50	16		165	125	18	4	65		
		F 2256 - ** / *	2284	2635		40		165	125	18	4	68		
		F 2259 - ** / *	2282	2633	80	16		200	160	18	8	70		
		F 2261- ** / *	2282	2633	100	16	II	220	180	18	8	31		
		F 2262 - ** / *	2284	2635		40		235	190	22	8	44		

* Gasket material ** Flange material Others size on request 3.4eb

	Accumulator type	Spare flange order code	Ref. Directive	DN inch	PN lbs	Fig.	Ø F mm	Ø I mm	Ød mm	N° Holes	H mm	G BSP	OR
B (ANSI)	ASBL / ASBT 1.5 - 3	F 2224 - ** / *	B16.5	1"	150	I	107,9	79,4	15,9	4	67	2"	0010R3218-*
		F 2225 - ** / *	B16.5		300		123,5	88,9	19	4	73		
		F 2226 - ** / *	B16.5		1500		149,5	101,6	25,4	4	90		
		F 2229 - ** / *	B16.5	1" 1/2	300	I	155,6	114,3	22,2	4	79		
		F 2230 - ** / *	B16.5		1500		178	123,8	28,5	4	100		
		F 2235 - ** / *	B16.5	2"	400	II	165	127	19	8	55		
		F 2236 - ** / *	B16.5		1500		216	165,1	25,4	8	83		
	ASBL / ASBT 5	F 2243 - ** / *	B16.5	2" 1/2	150	II	177,8	139,7	19	4	45	2" 1/2	0010R3281-*
		F 2244 - ** / *	B16.5		300		190,5	149,2	22,2	8	52		
	ASBL / ASBT 10 ÷ 55	F 2252 - ** / *	B16.5	2"	150	I	107,9	79,4	15,9	4	70	4"	0010R4425-*
		F 2257 - ** / *	B16.5				152,4	120,6	19	4	84		
		F 2258 - ** / *	B16.5		300		165,1	127	19	8	90		
		F 2263 - ** / *	B16.5	4"	150	II	228,6	190,5	19	8	46		
		F 2264 - ** / *	B16.5		300		254	200	22,2	8	60		

* Gasket material ** Flange material Others size on request 3.4ec

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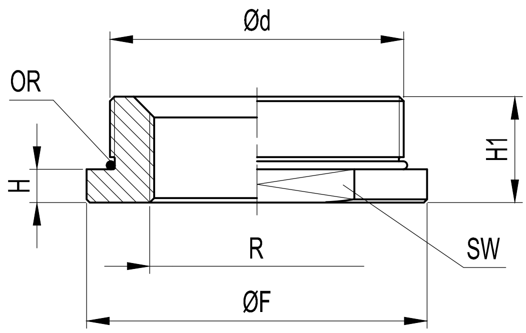
3.4.9.2 ADAPTERS



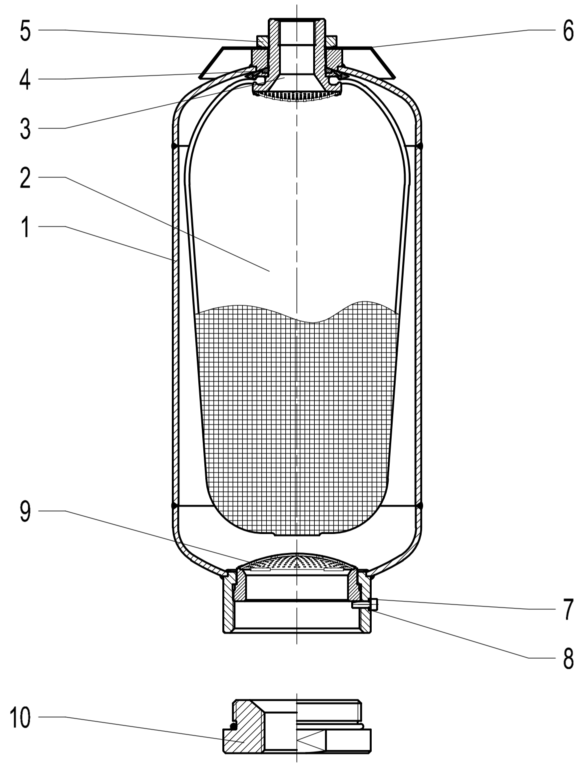
3.4fa

Accumulator type	Order code	Ød Acc. connection	R**** Out connections (0 = blind)	SW *mm*	Ø F *mm*	H *mm*	H 1 *mm*	OR (Included)	Weight *Kg*
ASBL \ ASBT 1- 3	R - A9*** - ** / *	2" BSP	1/8" ÷ 1" 1/2 BSP - NPT - BSPT	70	75	11	11	0010R3218 - *	0,86
ASBL \ ASBT 5	R - A10*** - ** / *	2" 1/2 BSP	1/8" ÷ 2" BSP - NPT - BSPT	80	88	11	11	0010R3281 - *	1,3
ASBL \ ASBT 10 ÷ 55	R - A13*** - ** / *	4" BSP	1/8" ÷ 3" 1/2 BSP - NPT - BSPT	120	130	14	14	0010R4425 - *	3

* Gasket material   ** Adapter material   *** See chapter 3.4.8 table 7 - 8   Weigth indicated only for blind version   3.4fb

**** R Out connections type "S" and "M" thread on request

3.4.10. SPARE PARTS CODE
ASBL VERSION



3.3ga

Item	Description	Q.ty	Type		
			ASBL 1 - 1,5 - 3	ASBL 5	ASBL 10 ÷ 55
1	Accumulator shell	1	Not supplied as spare part		
2	Bladder	1	S1*- 0 / S1.5*- 0 / S3* - 0	S5* - 0	S10 ÷ 55* - 0
3	Gas valve body	1	B10132A - **	B10229A - **	B10431A - **
4	Rubber-coated washer	1	B10106 - ** / *	B10205 - ** / *	B10334 - ** / *
5	Gas valve looknut	1	B10109 - **		B10302 - **
6	Name plate	1	D10300B-A	D10300C-A	D10300D-A
7	Bleed screw	1	B10316 - **		
8	Seal ring	1	B10336 - R		
9	Anti-extrusion plate	1	B10159 - 1 - **	B10241 - 1 - **	B10421 - 1 - **
10	Adapter	1	See chapter 3.4.9.2 ADAPTER		
Standard gas valve ass. (parts 3 ÷ 7)****		1	V 2027 - ** / *	V 2048 - ** / *	V 2073 - ** / *
Gasket sets		1	B2032-1-* { B10336-R 0010R3218-*	B2052-1-* { B10336-R 0010R3281-*	B2082-1-* { B10336-R 0010R4425-*

* Gasket material ** Component material

3.3gb

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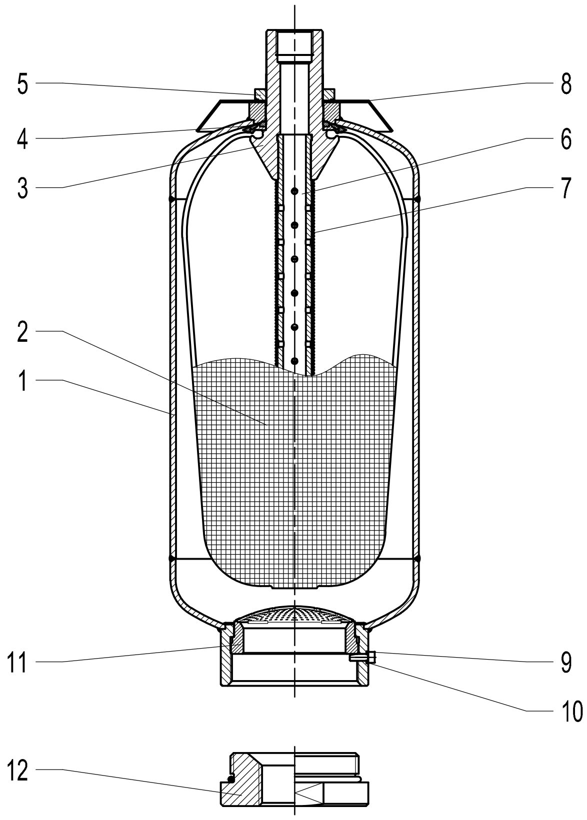
ASBT VERSION



3.4gc

Item	Description	Q.ty	Type			
			ASBT 1,5	ASBT 3	ASBT 5	ASBT 10 ÷ 55
1	Accumulator shell	1	Not supplied as spare part			
2	Bladder	1	S1,5* - 0	S3* - 0	S5* - 0	S10 ÷ 55* - 0
3	Gas valve body	1	B10107T - **		B10219 - **	B10420 - **
4	Rubber-coated washer	1	B10106 - ** / *		B10205 - ** / *	B10334 - ** / *
5	Gas valve looknut	1	B10109 - **			B10302 - **
6	Holed pipe	1	B10141 - **	B10142 - **	B10220 - **	ASBT 10-15 = B10409 - 3 - ** ASBT 20-25 = B10409 - 4 - ** ASBT 35-55 = B10409 - 5 - **
7	Spring	1	B10218-1 - **	B10218-2 - **	B10218 - **	ASBT 10-15 = B10411- 1 - ** ASBT 20-25 = B10411 - 2 - ** ASBT 35-55 = B10411 - **
8	Name plate	1	D10300B-A		D10300C-A	D10300D-A
9	Bleed screw	1	B10316 - **			
10	Seal ring	1	B10336 - R			
11	Anti-extrusion plate	1	B10159 - 1 - **		B10241 - 1 - **	B10421A - **
12	Adapter	1	See chapter 3.4.9.2 ADAPTER			
Standard gas valve ass. (parts 3 ÷ 7)		1	V 2026 - ** / *	V 2029 - ** / *	V 2043 - ** / *	AST 10-15 = V 2065 - ** / * AST 20-25 = V 2066 - ** / * AST 35-55 = V 2067 - ** / *
Gasket sets		1	B2032-1-* { B10336-R, 0010R3218-* }		B2052-1-* { B10336-R, 0010R3281-* }	B2082-1-* { B10336-R, 0010R4425-* }

* Gasket material ** Component material

3.3gd

3.4.11 COMMISSIONING AND MAINTENANCE

Delivery conditions

The bladder accumulators' type ASL and AST cannot be delivered with the pre-charge.
Depending on the size and quantity ordered, the bladder are shipped in boxes, in cartons, on pallets or wooden boxes on request.
Unless otherwise required, certificates and documentation are provided together with the accumulators.

Handling

The original packaging is suitable for handling and storage.
Where necessary, you should use suitable lifting equipment to support the weight of the accumulators.
However protect from impact the packaging and handle it with care.

Storage

During storage in the warehouse, leave the product in its original packaging, keeping it away from heat sources and naked flames. The storage temperature should be between +10 and +40°C.
In addition to six months of storage, the precharge pressure must be to two bar and make sure that inside there is lubrication fluid compatible with bladder polymer.
After six years of storage, it is essential to proceed with the replacement of all elastomeric parts before the commissioning.

Marking on the nameplate of the accumulator

With reference to the PED 2014/68/EU classification, Article 3, Paragraph 3 and / or risk categories I or II depending on the volume and maximum working pressure, the accumulator indicates the following data:

- Logo, name and country of the manufacturer
- Mounth/year of production
- Product code
- Serial number
- Maximum PS pressure and PT test pressure in bar
- Min. and max. TS working temperature in Celsius
- Volume V in litres
- Group of fluids allowed (II)
- CE marking (for volumes exceding 1 litre) with the identification number of the notified body

It is strictly forbidden to:

- weld, rivet or screw any item of 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 (dangerous) fluid of Group 1 with equipment designed and manufactured for fluids of Group 2.

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 lock-off and security block type BS (see Chap. 9). This device provides the user protection and equipment against damage caused by pressure peaks and also males easy and safe the maintenance of the accumulator, simplifying the interception and discharging. The accumulators type AS may be installed in any position from horizontal to vertical (preferably with the gas valve at the top), and the nameplate 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 (please see Chapter 7) to avoid the transmission of vibrations. If there are not used EPE safety blocks, make sure that the accumulator is connected to the hydraulic circuit by suitable connection devices. 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.

Pre-charge of nitrogen (type AST)

The pre-charge of gas should be performed after the connection to the additional cylinders and after the installation of the accumulator in the hydraulic circuit. For the pre-charge, use only industrial dry nitrogen with a purity of min. 99%. It is important to use the nitrogen from a bottle equipped with a pressure reducing valve (see Chap.11.3). Use the EPE precharge and charging set type PC to check the charging pressure required, and adjust if necessary. If the pre-charge pressure is lower than required, connect the charging hose on one side and the other side connect it to the nitrogen bottle or to the pressure reducer. Slowly fill the nitrogen in the accumulator until reaching a pressure slightly higher than that set value (+ 10 ÷ 15%). Close the bottle and remove the charging hose from the preloading set; wait until the gas temperature has stabilized (2 hours) and calibrate the pressure, discharging the excess gas.
Make sure that the pre-charge valve, fittings, pipes and anything else are not subject to losses, by using, if necessary, soap and water.
Tighten the protective caps manually.

Hydraulic pressurization

- Check that the pre-charge pressure is adequate for the application
- Ensure that the hydraulic pressure never exceeds the max pressure allowed (PS) shown on the accumulator shell.

To avoid this risk, use a safety device (see Chap. 9).

Maintenance

- Periodically check the pre-charge pressure of the gas: after the commissioning, check after 2-3 weeks of operation and if there were no leaks, repeat the operation after 3 months; if the pressure at the same temperature was stable, repeat the test yearly. For heavy-duty applications, check the pre-charge every 6 months.
- Periodically (yearly) carry out a visual inspection of the accumulator in order to detect any early signs of deterioration such as corrosion, deformation, etc.
- Comply with the requirements of the regulations concerning the verification of the functionality of the equipment according to the country of installation of the accumulator.

Repair

If for failure, scheduled check or retest it is necessary to remove the accumulator from the system, prior to removal, isolate the accumulator from the installation and discharge pressure of the liquid. All bladder EPE accumulators of the ASL and AST series may e repaired.

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It may consist in replacing the bladder, the seals, the pre-charge valve (AST) and/or the parts of the gas and fluid valve.
For reasons of functionality and security, it is recommended to use only original spare parts.

Disassembly

- Fasten the accumulator firmly in a vice or on a bench in a horizontal position, taking care not to damage the outer surface.

3.4h

- Remove gas valve, fastening the nut on the gas valve and remove the nameplate

3.4i

- Unscrew the vent screw

3.4l

- Using a suitable wrench, unscrew the fluid valve (anti-extrusion plate)

3.4m

- Remove the anti-extrusion plate

3.4n

- Fold bladder somewhat and withdraw by turning it slightly

Refitting

Tightening torques in Nm			
	0.7-1.5 l	**3 - 5 l**	**10-55 l**
Fluid port anti-extrusion plate	50 + 5	60 + 60	100 +10
Bleed screw	10 +2	10 +2	10 +2
Gas valve locknut	80 +20	100 +20	150 +30
Filling valve (AST)	-	-	30 +5

- Cleaning and testing : clean all metallic parts on accumulator using an organic reducer – visual inspection of valves– Clean bladder, i.e. using isopropanol. Visual inspection of bladder for faults – inner inspection of container for signs of corrosion. In event of coated containers, check the condition of the coating. Replace the parts deemed to be bad: the o-rings must always be replaced (see spare parts Section 3.4.10).

3.4o

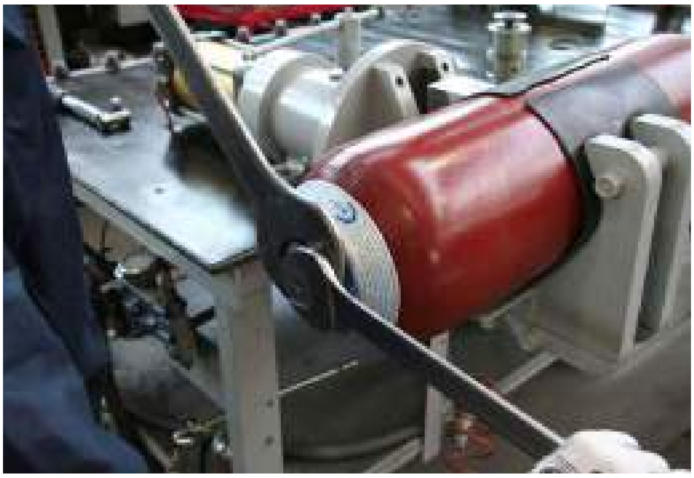
- Drain air from bladder by pressing together

3.4r

- Bleed screw with sealing ring
- Mount the bleed screw with its sealing ring

3.4p

- Carefully moisten the inside of the bladder and the container with used medium (roll container)



3.4s

- Tighten the hexagon nut SW1 on the gas valve
- Mount the filling valve (ASBT)

3.4q

- Install the anti extrusion plate.

Pre-charge (ASBT) after having fitted the accumulator on the system and having connected it to the additional cylinders.

- Screw the pre-charge PC equipment on the gas valve.
- Connect the equipment to the cylinder of nitrogen or to the pressure reducer with the inflation tube.
- Slowly enter the nitrogen in the accumulator until reaching a pressure slightly higher than the set value (+ 10 ÷ 15%).
- Close the cylinder and remove the connecting pipe from the equipment.
- Wait until the gas temperature has stabilized (2 hours).
- Calibrate the pressure discharging the excess gas.

Make sure that the gas valve, the fittings and the pipes are not subject to losses and, if necessary, use soap and water.
Tighten the protective caps manually.

Demolition and recycling of the accumulator

Before accumulator demolition or recycling, you should always discharge completely the pre-charge pressure and remove the gas valve (ASBT). If you need, proceed decontaminating in relation to the fluid used prior to demolition.

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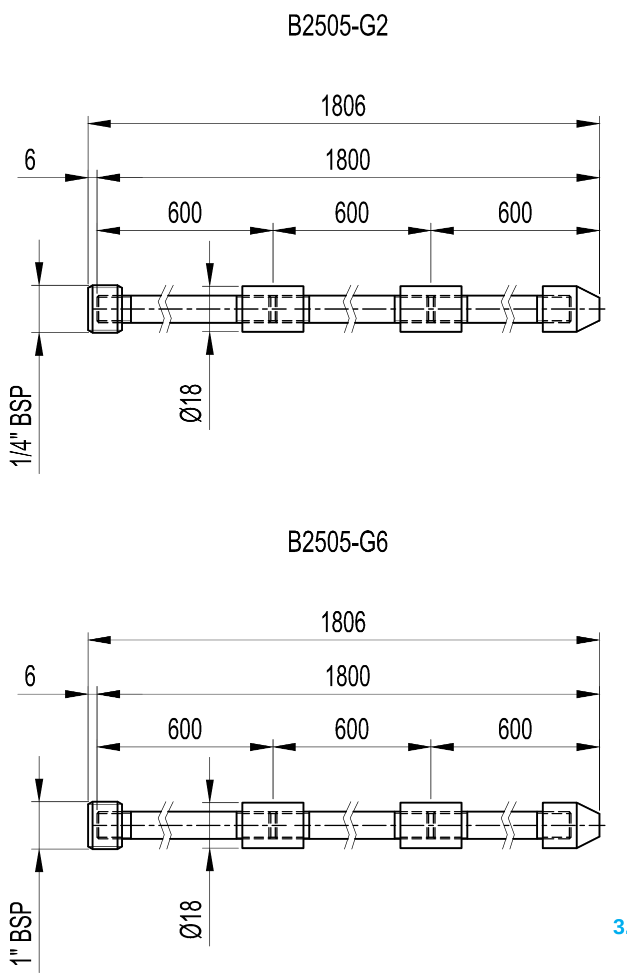
3.4.12 REPAIR TOOLS

3.4.12.1 BLADDER PULL ROD

The pull rod screwed to the gas valve of the bladder for easy assembly into shell during reassembly. Pull rod is complete with fitting for EPE gas valve and 3 extension segments to accommodate all size of accumulators.
Code for complete kit: **B2505-G2 / B2505-G6**

Dimension

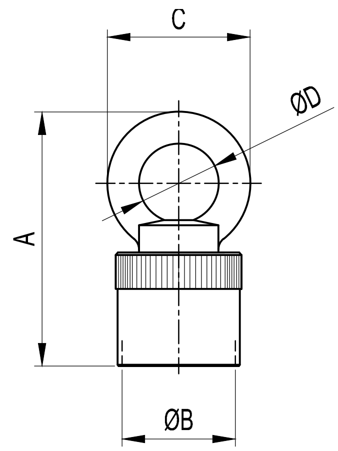


3.4aa

3.4.12.2 LIFTING HOOK

To be used for the safe lifting of mounted accumulators:
For accumulators 0,7÷5 lt (M22x1,5) code **B2507/2**
For accumulators 10÷55 lt (M50x1,5) code **B2507/5**
For accumulators V4 (7/8" UNF) code **B2507/7**

Dimension



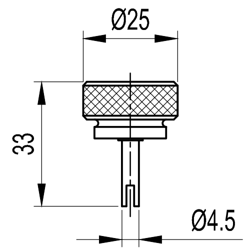
CODE	A	ØB	C	ØD	For Accumulator
B2507/2	100	M22x1.5	63	35	0,7 ÷ 5
B2507/5	112	M50x1.5	63	35	10 ÷ 55
B2507/7	100	7/8" UNF	63	35	10 ÷ 55

3.4ab

3.4.12.3 CORE TOOL

The core tool is used to remove and reinstall the valve core type V4.
Code **B2508**

Dimension



3.4ac

3.5.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS): 4000 PSI

PRESSURE TEST (PT): 1.3 x PS

NOMINAL CAPACITIES: 1/4 - 1 - 2.5 - 5 - 10 - 15 gallons

WORKING TEMPERATURE: -40 ÷ +200 °F (-40 ÷ +93 °C)

COMPRESSION RATIO (Po : P2): max. 1 : 4

FLUID VISCOSITY RANGE: 10 ÷ 400 cSt

RECOMMENDED VISCOSITY: 36 cSt

FLUID CONTAMINATION DEGREE:
class 21/19/16 according to ISO 4406/99

BODY MATERIAL:
- carbon steel shell (SA 372 grade E class 70) painted with rust inhibitor RAL 8012
- nickel coating 25 - 40 µ
- internal and external coating with RILSAN th. 0.6 mm

VALVES MATERIAL:
- phosphated or galvanized carbon steel in compliance with Directive 2002/95/EC (RoHS) to resist to corrosion
- stainless steel AISI 316L
- nickel coating 25-40 µ

BLADDER MATERIAL:
- **P** = Nitrile rubber (NBR)
- **F** = Low temp. nitrile rubber
- **H** = Nitrile for hydrocarbons
- **K** = Hydrogenated nitrile (HNBR)
- **B** = Butyl (IIR)
- **E** = Ethylene-propylene (EPDM)
- **N** = Chloroprene (Neoprene)
- **Y** = Epichlorohydrin (ECO)
- **V** = Fluorocarbon (FPM)

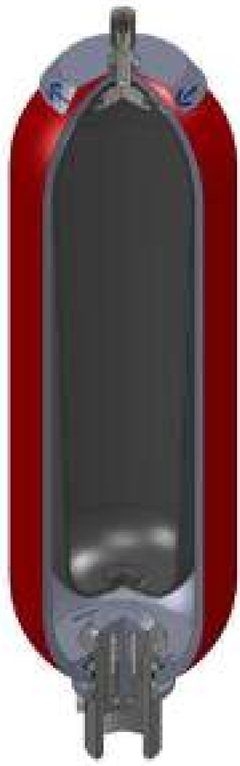
See Table 3.5c and/or Chapter 1.5

FILLING VALVE CONNECTION:
- 5/8"-UNF std
- 7/8" UNF
- ¼" BSP

FLUID PORT CONNECTION: see Table 3.5dc - 3.5df - 3.5eb - 3.5ec

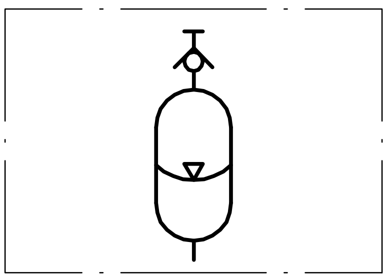
FLOW RATE: see Table 3.5db

WEIGHT: see Table 3.5db - 3.5df



3.5a

3.5.2 HYDRAULIC SYMBOL



3.5b

3.5.3 “ASA” BLADDER ADVANTAGES

- dirt tolerant
- light weight
- compact
- simple construction
- quick response
- works well on water, low lubricity fluids
- quick, easy installation
- low cost

3.5.4 DESCRIPTION

ASA Bladder-type accumulators consist of a seamless cylindrical pressure vessel made of high-tensile steel.
The accumulator is subdivided into a gas and fluid side by an elastic bladder mounted in the interior of the vessel.
The bladder is charged with nitrogen to the specified gas charge pressure P0 by means of gas valve.
When the fluid is pressed into the accumulator, the gas in the bladder is compressed and hence the pressure increased. The gas volume reduces and on the fluid side, the fluid can flow into the accumulator. As soon as the pressure on the fluid side falls below the gas pressure, the accumulator is emptied.
Oil valve is provided in the oil port of the bladder-type accumulator and closes when the pressure on the gas side is higher than the one on the fluid side. This prevents draining of the bladder into the oil channel and thus the bladder from being destroyed.
When the minimum operating pressure is reached, a small oil volume is to be maintained between the bladder and the fluid volume (approx. 10% of the nominal capacity of the hydraulic accumulator), in order that the bladder does not hit the valve during every expansion process.
Gas valve consists of external caps, sealing cap, filling valve, gas valve body and rubber coated washer. These parts can be replaced separately.
The nameplate shows the technical data and features of the hydraulic accumulator.

3.5.5 ACCESSORIES

For support equipment, see Cap. 7
For gas side’s safety equipment, see Cap. 8
For fluid side’s safety equipment, see Cap. 9
For pre-loading and charging set, see Cap. 11
For other components, see Cap. 12

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3.5.6 BLADDER-TEMPERATURE-LIQUID COMPATIBILITY

When selecting the accumulator variant, pay attention to the following non-binding notes with regard to hydraulic fluid, bladder material and the permissive temperature range. (see Section 1.5)

Code letter	Polymer	ISO	Temperature range (°C)	Some of the liquids compatible with the polymer
P	Standard nitrile (Perburan)	NBR	-20 ÷ +80	Aliphatic hydrocarbons (propane, butane, gasoline, oils, mineral greases, diesel fuel, fuel oil, kerosene), mineral greases and oils, HFA - HFB - HFC fluids, many dilute acids, alkalis, saline solutions, water, water glycol.
F	Low temperature nitrile	NBR	-40 ÷ +70	The same as with standard nitrile + a number of different types of Freon. (This contains less acrylonitrile than the standard and is therefore more suitable for low temperatures, but its chemical resistance is slightly lower).
H	Nitrile for hydrocarbons	NBR	-10 ÷ +90	Regular and premium grade slightly aromatic gasoline (and all the liquids for standard nitrile).
K	Hydrogenated nitrile	HNBR	-30 ÷ +130	The same as with standard nitrile but with excellent performance at high and low temperatures.
B	Butyl	IIR	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many acids and bases, salt solutions, polar solvents such as alcohols, ketones and esters, polyglycol-based hydraulic fluids (HFC fluids) and bases of esters of phosphoric acid (HFD-R fluids), silicone oils and greases, resistance to ozone, aging and weathering.
E	Ethylene-Propylene	EPDM	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many organic and inorganic acids, detergents, solutions of sodium and potassium, phosphate ester-based hydraulic fluids, (HFD-R), silicone oils and greases, many polar solvents (alcohol, ketones, esters), Skydrol LD4 and 500B-4, resistance to ozone, aging and weathering.
N	Chloroprene (Neoprene)	CR	-30 ÷ +100	Mineral oils of paraffin, silicone oils and greases, water and aqueous solutions, refrigerants (ammonia, carbon dioxide, Freon), naphthenic mineral oils, low molecular aliphatic hydrocarbons (propane, butane, fuel), brake fluids based on glycol, better resistance to ozone, weathering and aging compared to NBR rubber.
Y	Epichloridrin	ECO	-30 ÷ +110	Mineral oils and greases, aliphatic hydrocarbons (propane, butane and gasoline), silicone oils and greases, water at room temperature, resistance to ozone, aging and weathering.
V	Fluorocarbon	FKM	-10 ÷ +150	Mineral oils and greases, non-flammable fluids of HFD group, silicone oils and greases, animal and vegetable oils and greases, aliphatic hydrocarbons (gasoline, butane, propane, natural gas), aromatics hydrocarbons (benzene, toluene), chlorinated hydrocarbons (Tetrachloroethylene, carbon tetrachloride), fuel (regular, super and containing methanol), excellent resistance to ozone, weathering and aging.

3.5c

For other hydraulic fluid and/or temperatures, please consult us.

3.5.7 ORDER CODE

1	2	3	4	5	6	7 - 8	9		10		11	12	13	14	15		16
ASA	15	P	4000	C	R	P5	V4	-	7	-	C	0	C	0	R250	/	435

1 Series

Bladde accumulator with ASME U-STAMP = **ASA**

2 Nominal capacity (gallons)

1/4 gal (0.95 lt)	= **1/4**
1 gal (3.78 lt)	= **1**
2.5 gal (9.46 lt)	= **2.5**
5 gal (18.93 lt)	= **5**
10 gal (37.85 lt)	= **10**
15 gal (56.78 lt)	= **15**

3 Bladder material

Nitrile rubber (NBR)	= **P**
Nitrile for low temp.	= **F**
Nitril for hydrocarbons	= **H**
Hydrogenated nitrile (HNBR)	= **K**
Butyl (IIR)	= **B**
Ethylene-propylene (EPDM)	= **E**
Chloroprene (Neoprene)	= **N**
Epichlorohydrin (ECO)	= **Y**
Fluorocarbon (FKM)	= **V**

4 Max working pressure (PS)

4000 PSI (275 bar) = **4000**
(**3000** only for the version with connection L or other pressure related to connections B or U)

5 Body material

Carbon steel	= **C**
Nickel coated carbon steel 25 μ	= **N**
Nickel coated carbon steel 40 μ	= **M**
Stainless steel	= **X**
Rilsan coating	= **V**

6 Fluid port connection

See the table on front page

7 - 8 Dimension of the connection fluid or 7+8 table

See the table on front page

Special variants upon request

16 Precharge pressure (bar)

Standard 435 PSI = **0 ÷ 3600** PSI (30 bar)

15 Other variants

See the table on front page

14 Variants of gas side

Standard	= **0**
Only cap in stainless steel	= **1**
Brass nameplate	= **2**

Other numbers/variants to be requested EPE

13 Gas valve material

Carbon steel	= **C**
Nickel coated carbon steel 25 μ	= **N**
Nickel coated carbon steel 40 μ	= **M**
Stainless steel	= **X**

12 Variants of fluid side

Standard	= **0**
Adapter in stainless steel (R)	= **1**
Button and spring in stainless steel	= **2**

Other numbers/variants to be requested EPE

11 Fluid valve material

Carbon steel	= **C**
Nickel coated carbon steel 25 μ	= **N**
Nickel coated carbon steel 40 μ	= **M**
Stainless steel	= **X**

10 Testing and certification

ASME U-STAMP (ASME VIII div.1 appendix 22)	= **7**
Australian standard	= **2**
Dosh	= **20**

9 Connection gas side

Standard filling valve 5/8" UNF thread	= **V**
Standard filling valve with 5/8" UNF thread in stainless steel	= **VX**
Without filling valve (thread hole M12x1.5)	= **V0**
Brass filling valve ¼" BSP	= **V2**
Filling valve 7/8" UNF	= **V4**

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6 Fluid port connection

For ASA 1/4÷15 gallons BSP ISO 228 with chamfer for OR (std)	= **A**
For ASA 1÷15 gallons Metric	= **M**
For ASA 1÷15 gallons NPT-F	= **P**
For ASA 1÷15 gallons internal thread SAE	= **S**
For ASA 1÷15 gallons adapter for flange SAE 3000 Psi	= **L**
For ASA 1÷15 gallons adapter for flange SAE 6000 Psi	= **H**
For ASA 1÷15 gallons flange ANSI	= **B**
For ASA 1÷15 gallons flange UNI	= **U**
For ASA 1÷15 gallons square flange	= **Q**
For ASA 1/4÷15 gallons adapter *	= **R**

* assembled on the fluid valve connection type A

15 Other variants

Adapter + Burst disc set at xxx bar (see Section 8.2)	= **Rxxx**
Adapter + Safety valve, type VS224TX set at xxx bar	= **Gxxx**
Adapter + Needle Valve of ¼” BSP	= **EG2**
Adapter + Stainless steel needle Valve of ¼” BSP	= **EG2X**
Adapter + Excluding device with with full scale pressure gauge of xxx bar	= **EMxxx**
Adapter + Excluding device of 90° with full scale pressure gauge of xxx bar	= **ELMxxx**
Flushing with degree of contamination ≤ ...class	= **Fx**
75-80 μ thick. polyurethane paint with colour to be specified	= **Wxxx**
Off-shore paint with colour to be specified	= **Zxxx**
NORSOK System 1 paint with colour to be specified	= **K1**
NORSOK System 7B paint with colour to be specified	= **K7B**

other variants upon request

7 Dimension of the fluid connection

For the type of connection:

A	(1/4 gallon) 3/4”	= **5**
	(1 gallon) 1” ¼	= **7**
	(2.5 ÷15 gallons) 2”	= **9**
M	(1 gallon) 40x1.5	= **40/1.5**
	(2.5 ÷15 gallons) 50x1.5	= **50/1.5**
P	(1 gallon) 1” ¼	= **7**
	(2.5 ÷15 gallons) 2”	= **9**
S	(1/4 gallon) 1” 1/16 12UN	= **1 1/16-12**
	(1 gallon) 1” 5/8 12UN	= **1 5/8-12**
	(2.5 ÷15 gallons) 1” 7/8 12UN	= **1 7/8-12**
L	(1 gallon) 1” ¼ SAE3000	= **7** (Pmax = 3000)
	(2.5 ÷15 gallons) 1” ½ SAE 3000	= **8** (Pmax = 3000)
	2” SAE 3000	= **9**
H	1” SAE6000	= **6**
	(1 gallon) 1” ¼ SAE6000	= **7**
	(2,5 ÷15 gallons) 1” ½ SAE 6000	= **8**
	2” SAE 6000	= **9**
B		= **DIMENSION/RATING**
	Former. 1” ANSI 600 = 1/600 (Pmax =600)	
U		= **DN/PN**
	Former. DN50 PN100 = 50/1450 (Pmax =1450)	
Q	(1 gallon) 1” ¼	= **7**
	(2.5 ÷15 gallons) 2”	= **9**

R Blind	= **0**
R internal thread	
BSP ISO 228	= **G***
NPT-F	= **P***
BSPT	= **N***
SAE	= **S***
Metric	= **M***

*Variant in table 8

8 Dimension

1/8“	=	**1**	3/4“	=	**5**
1/4“	=	**2**	1“	=	**6**
3/8“	=	**3**	1“ ¼“	=	**7**
1/2“	=	**4**	1“ ½“	=	**8**

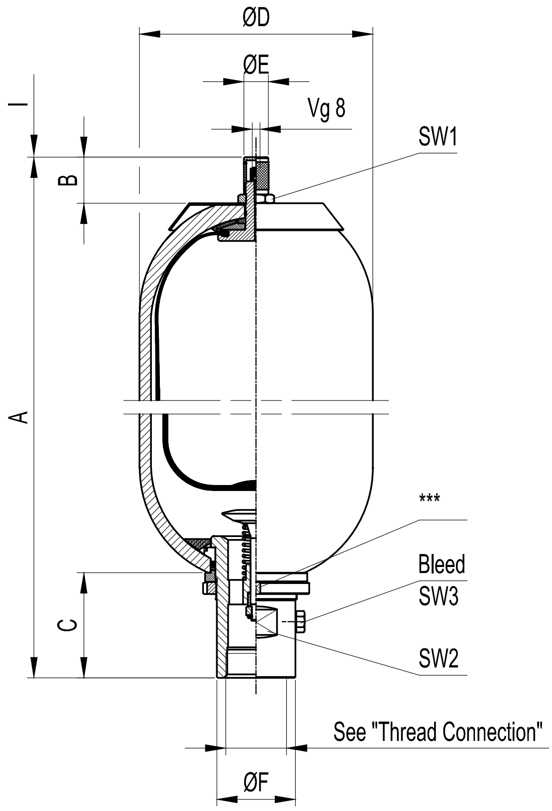
Dimension in inch - No.of pitch for inch

Diameter/pitch

Special variants upon request

epoll®

3.5.9 DIMENSIONS



3.5da

Acc. type ASA in carbon steel	Nominal gas volume gallons	Effective gas volume litres	Working pressure psi	Max.diff. pressure P2-P1 psi	Flow rate l/min	Max.comp. ratio P0/P2	A mm	B mm	C mm	Ø D mm	Ø E mm	ØF mm	I mm	SW 1 mm	SW 2 mm	SW 3 mm	Bleed	Acc. dry weight kg
ASA 1/4	1/4	1	4000	1450	300	1:4	272 ± 5	26	52	114	20	36	140	24	32	4*	M5	5.2
ASA 1	1	3,5	4000	1450	600	1:4	391 ± 10	47	65	168	25	53	140	32	50	4*	M5	13
ASA 2,5	2,5	9,1	4000	1450	1000	1:4	544 ± 10	47	93	229	25	77	140	32	70	19**	1/4" BSP	37
ASA 5	5	18,2	4000	1450	1000	1:4	848 ± 10	47	93	229	25	77	140	32	70	19**	1/4" BSP	58
ASA 10	10	33,5	4000	1450	1000	1:4	1382 ± 10	47	93	229	25	77	140	32	70	19**	1/4" BSP	96
ASA 15	15	50	4000	1450	1000	1:4	1903 ± 10	47	93	229	25	77	140	32	70	19**	1/4" BSP	133

* Allen wrench   ** Ex. wrench   *** see chapter 3.5.12.2 table 3.5ab

3.5db

- The maximum differential pressure is the maximum allowable difference between the maximum pressure and the minimum working pressure (P2-P1) to have an infinite life cycle of the accumulator (greater than 2,000,000 cycles).
- Flow rate measured using mineral oil with viscosity of 36 cSt at 50°C and ΔP = 5 bar

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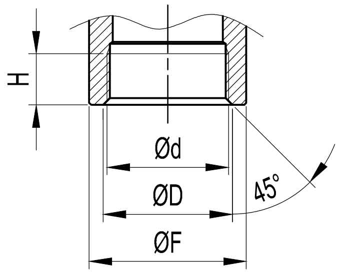
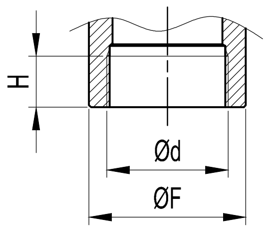
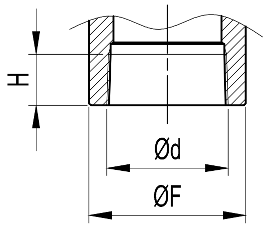
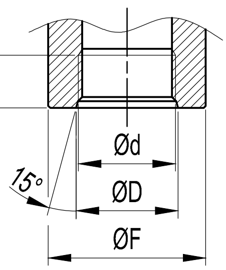
3.5.9.1 STANDARD THREAD CONNECTIONS

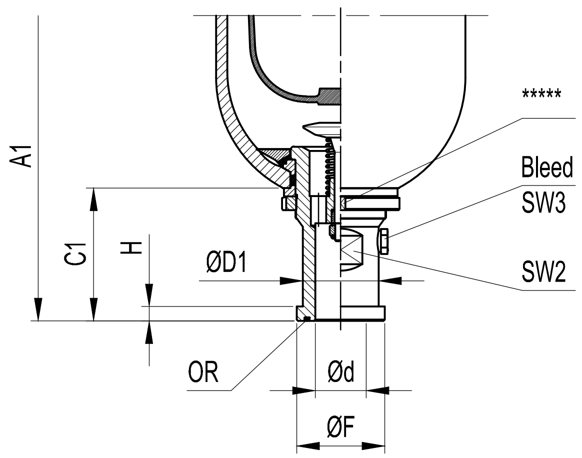
Dimensions	Connection Type	Accumulator type	Complete spare valve order code	Ød	ØD mm	ØF mm	H mm
	A BSP ISO 228 with chamfer for OR	ASA 1/4	V 2024-A5-**/*	3/4" BSP	28,8	36	19
		ASA 1	V 2044-A7-**/*	1" 1/4 BSP	46	53	25
		ASA 2,5 ÷ 15	V 2064-A9- **/*	2" BSP	63,35	77	28
	M Metric	ASA 1	V 2044-M40/1.5-**/*	M40x1,5	-	53	25
		ASA 2,5 ÷ 15	V 2064-M50/1.5-**/*	M50x1,5	-	77	28
	P NPT-F	ASA 1/4	V 2024-P5-**/*	3/4" NPT-F	-	36	Thread plug gauge
		ASA 1	V 2044-P7-**/*	1" 1/4 NPT-F	-	53	
		ASA 2,5 ÷ 15	V 2064-P9- **/*	2" NPT-F	-	77	
	S SAE thread	ASA1/4	V 2024-S1 /16-12-**/-*	1" 1/16 12 UN	29,16	36	19
		ASA 1	V 2044-S1 5/8-12-**/-*	1" 5/8 12 UN	43,5	53	23
		ASA 2,5 ÷ 15	V 2064-S1 7/8-12-**/-*	1" 7/8 12 UN	49,84	77	26

* Gasket material ** Component material

3.5dc

3.5dc

3.5.9.2 ADAPTER FOR FLANGE SAE 3000/6000 PSI (L/H)



3.5de

Acc. type ASA in carbon steel	Dim.	A1 mm	C1 mm	SW2 mm	SW3 mm	Bleed	Ød mm	SAE 3000 (L)				SAE6000 (H)				OR (Included)	Acc. dry weight kg
								Spare valve order code	ØD1 mm	ØF mm	H mm	Spare valve order code	ØD1 mm	ØF mm	H mm		
ASA 1/4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ASA 1	1"	493 ± 10	100	38	4***	M5	-	-	-	-	-	V 2044-H6-**/*	38	47,6	9,5	0010R4131-*	13
	1"1/4	482 ± 10	89				31	V 2044-L7-**/*	43	50,8	8	V 2044-H7-**/*	44	53,3	10,3	0010R4150-*	
ASA 2.5	1"1/2	583 ± 10	115	42	19****	1/4"	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	37
	2"			55		BSP	45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	
ASA 5	1"1/2	733 ± 10	115	42	19****	1/4"	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	58
	2"			55		BSP	45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	
ASA 10	1"1/2	893 ± 10	115	42	19****	1/4"	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	96
	2"			55		BSP	45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	
ASA 15	1"1/2	1058 ± 15	115	42	19****	1/4"	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	133
	2"			55		BSP	45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	

* Gasket material ** Component material *** Allen wrench **** Ex. Wrench ***** see chapter 3.5.12.2 table 3.5ab

3.5df

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3.5.9.3 FLANGE CONNECTION TYPE ANSI / UNI DIN (B/U)

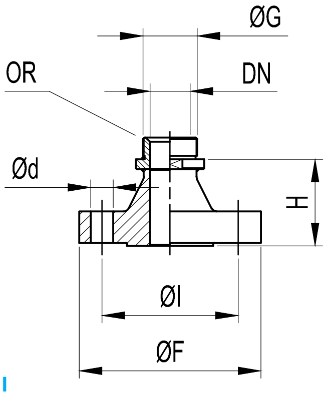
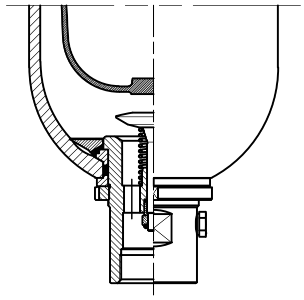


Fig. I



STD. CONNECTION (G)

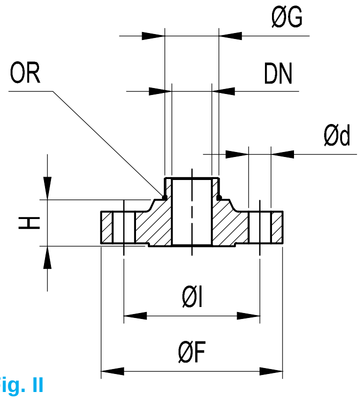


Fig. II

3.5ea

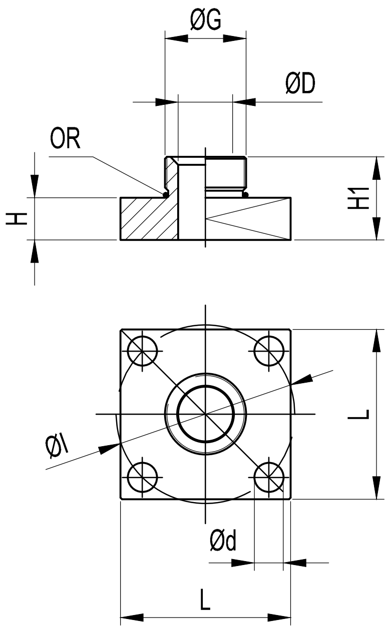
	Accumulator type	Spare flange order code	Ref. Directive UNI	Ref. Directive DIN	DN mm	PN bar	Fig.	Ø F mm	Ø I mm	Ød mm	N° Holes	H mm	G BSP	OR (Included)
U (UNI-DIN)	ASA 1/4	F 2205 - ** / *	2284	2635	20	40	II	105	75	14	4	23	3/4"	0010R2093-*
		F 2206 - ** / *	6086	2628		250		135	95	18	4	45		
	ASA 1	F 2211 - ** / *	2284	2635	25	40	I	115	85	14	4	51	1"1/4	0010R3150-*
		F 2212 - ** / *	6086	2628		250		150	105	22	4	76		
		F 2215 - ** / *	2284	2635	32	40	II	140	100	18	4	22		
		F 2216 - ** / *	6086	2628		250		165	120	22	4	55		
	ASA 2.5 ÷ 15	F 2221 - ** / *	2282	2633	25	16	I	115	85	14	4	49	2"	0010R3218-*
		F 2222 - ** / *	2284	2635		40		115	85	14	4	51		
		F 2223 - ** / *	6086	2628		250		150	105	22	4	76		
		F 2227 - ** / *	2284	2635	40	40	I	150	110	18	4	56		
		F 2228 - ** / *	6086	2628		250		185	135	25	4	91		
		F 2231 - ** / *	2282	2633	50	16	II	165	125	18	4	23		
		F 2232 - ** / *	2285	2636		64		185	135	22	4	40		
		F 2233 - ** / *	6086	2628		250		200	150	25	8	61		

* Gasket material ** Flange material Others size on request 3.5eb

	Accumulator type	Spare flange order code	Ref. Directive	DN inch	PN lbs	Fig.	Ø F mm	Ø I mm	Ød mm	N° Holes	H mm	G BSP	OR (Included)
B (ANSI)	ASA 1/4	F 2207 - ** / *	B16.5	3/4"	300	II	117,5	82,5	19	4	40	3/4"	0010R2093-*
		F 2208 - ** / *	B16.5		1500		130	88,9	22,5	4	59		
	ASA 1	F 2213 - ** / *	B16.5	1"	300	I	123,5	88,9	22,5	4	73	1"1/4	0010R3150-*
		F 2214 - ** / *	B16.5		1500		149,5	101,6	25,4	4	90		
		F 2217 - ** / *	B16.5	1" 1/4	300	II	133,3	98,4	19	4	44		
		F 2218 - ** / *	B16.5		1500		159	111,1	25,4	4	58		
	ASA 2.5 ÷ 15	F 2225 - ** / *	B16.5	1"	300	I	123,5	88,9	19	4	73	2"	0010R3218-*
		F 2226 - ** / *	B16.5		1500		149,5	101,6	25,4	4	90		
		F 2229 - ** / *	B16.5	1" 1/2	300	I	155,6	114,3	22,2	4	79		
		F 2230 - ** / *	B16.5		1500		178	123,8	28,5	4	100		
		F 2235 - ** / *	B16.5	2"	400	II	165	127	19	8	55		
		F 2236 - ** / *	B16.5		1500		216	165,1	25,4	8	83		

* Gasket material ** Flange material Others size on request 3.5ec

3.5.9.4 SQUARE FLANGE CONNECTION



3.5fa

Accumulator type	Spare square flange order code	Ø G BSP	Ø D *mm*	L *mm*	Ø I *mm*	H *mm*	Ø d *mm*	H 1 *mm*	Weight *Kg*	OR (Included)
ASA 1	F 2454 A7 - ** / *	1" 1/4 BSP	26	100	105	25	17.5	49	0,8	0010R3150 - *
ASA 2.5 ÷ 15	F 2455 A9 - ** / *	2" BSP	32						0,9	0010R3218 - *

* Gasket material ** Square flange material Weigth indicated only for blind version

3.5fb

3.5.9.5 ADAPTERS

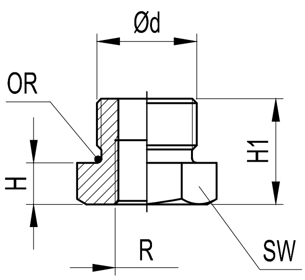
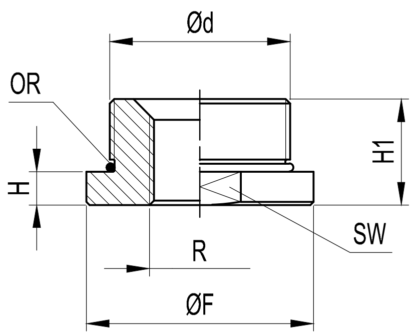


Fig. I



3.5fc

Fig. II

Accumulator type	Order code	Ød Acc. connection	R**** Out connections (0 = blind)	Fig.	SW *mm*	Ø F *mm*	H *mm*	H1 *mm*	OR (Included)	Weight *Kg*
ASA 1/4	R - A5*** - ** / *	3/4" BSP	1/8" ÷ 3/8" BSP - NPT	I	32	-	11	28	0010R2093 - *	0,14
			1/2" BSP - NPT	I			28	45		0,27
ASA 1	R - A7*** - ** / *	1" 1/4 BSP	1/8" ÷ 1" BSP - NPT	II	48	53	11	32	0010R3150 - *	0,41
ASA 2.5 ÷ 15	R - A9*** - ** / *	2" BSP	1/8" ÷ 1" 1/2 BSP - NPT	II	70	75	11	35	0010R3218 - *	0,86

* Gasket material ** Adapter material *** See chapter 3.5.7 table 7 - 8 Weigth indicated only for blind version

3.5fd

**** R Out connections type "S" and "M" thread on request

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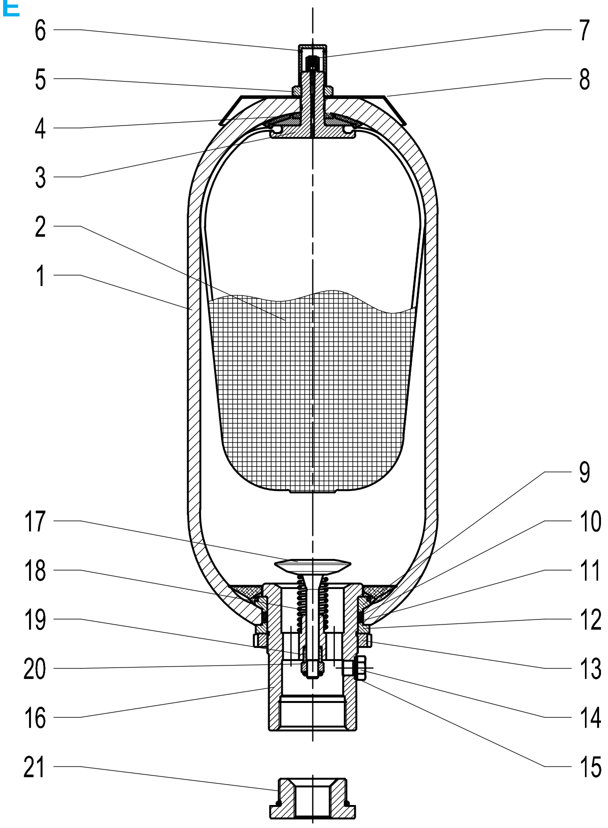
3.5.10. SPARE PARTS CODE



3.5ga

Item	Description	Q.ty	Type		
			ASA 1/4	ASA 1	ASA 2.5 ÷ 15
1	Accumulator shell	1	Not supplied as spare part		
2	Bladder	1	S1* - 0	S4* - 0	S10 ÷ 55* - 0
3	Gas valve body	1	B10110 - **	B10259 - **	B10330 - **
4	Rubber-coated washer	1	B10106 - ** / *	B10205 - ** / *	B10331 - ** / *
5	Gas valve looknut	1	B10023 - **	B10108 - **	
6	Protection cap	1	B10337/00 - ** / *	B10135 - **	
7	Valve mechanism	1	V 2070 - ** / *	V 2069 - ** / *	
8	Name plate	1	D10300B-A	D10300C-A	D10300U-A
9	Retaining ring	1	B10127 - ** / *	B10222 - ** / *	B10317 - ** / *
10	"O" ring	1	0010R4150 - *	0010R6212 - *	0010R0181 - *
11	Supporting ring	1	B10133-T	B10227-T	B10320-T
12	Space ring	1	B10120 - **	B10223 - **	B10319 - **
13	Fluid port ring nut	1	B10122 - **	B10217 - **	B10321 - **
14	Bleed screw	1	B10128 - **		B10316A - **
15	Seal ring	1	B10129-R		0010T14-1/4 - *
16	Fluid port body std. version	1	B10115 - *** - **	B10144 - *** - **	B10311 - *** - **
17	Poppet	1	B10111 - **	B10221 - **	B10310 - **
18	Spring	1	B10112 - **	B10149 - **	B10322 - **
19	Brake bushing	1	B10113 - **	B10226 - **	B10314 - **
20	Selflocking nut	1	B10116 - **	B10211 - **	B10315 - **
21	Adapter	1	See chapter 3.5.9.5 ADAPTER		
Standard gas valve ass. (parts 3 ÷ 7)		1	V 2020 - ** / *	V 2046 - ** / *	V 2085 - ** / *
Standard fluid port ass. (parts 9 ÷ 20)		1	V 2024 - *** - ** / *	V 2044 - *** - ** / *	V 2064 - *** - ** / *
Gasket sets		1	B2380-* { 0010R2015-* 0010R4150-* B10133-T B10129-R 0010R2093-*	B2381-* { 0010R2015-* 0010R6212-* B10227-T B10129-R 0010R3150-*	B2382-* { 0010R2015-* 0010R0181-* B10320-T 0010T14-1/4 -* 0010R3218-*

* Gasket material ** Component material *** See chapter 3.5.8 table 6 - 7

3.5gb

3.5.11 COMMISSIONING AND MAINTENANCE

Delivery condition

Bladder accumulators type ASA are delivered pre-charged with nitrogen at a pressure of 435 PSI or at value of pressure required at time of order. The pre-charge value is still on the nameplate of the accumulator.

Depending on the size and quantity ordered, the diaphragm accumulators are shipped in boxes or in cartons or on pallets, or wooden boxes on request. Unless otherwise required, certificates and documentation are provided together with the accumulators.

Handling

The original packaging is suitable for handling and general storage. Where necessary, you should use suitable lifting equipment to support the weight of the accumulators.

Protect from impact, however, the packaging and handle it with care.

Storage

During storage in the warehouse, leave the product in its original packaging, keeping it away from heat sources and naked flames. The storage temperature should be between +10 and +40°C.

In addition to six months of storage, the precharge pressure must be to two bar and make sure that inside there is lubrication fluid compatible with bladder polymer.

After six years of storage, it is essential to proceed with the replacement of all elastomeric parts before the commissioning.

Marking on the nameplate of the accumulator

The accumulator will be supplied with th following data stamped on the nameplate:

- Logo, name and country of the manufacturer
- Month/year of production
- Product code
- Serial number
- Maximum PS pressure and PT test pressure in Psi
- Min. and max. TS working temperature in Fahrenheit
- Volume V in gallons
- ASME U-stamp
- Pre-charge pressure in Psi

It is strictly forbidden to:

- weld, rivet or screw any item of 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 (dangerous) fluid of Group 1 with equipment designed and manufactured for fluids of Group 2.

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 security valve (see Chapter 8) or a security lock-off BS type (see Chapter 9).

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 (see Chap.11.1). The accumulators type ASA may be installed in any position from horizontal to vertical (preferably with the pre-charge valve at the top), and the nameplate 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 (please see Chapter 7) to avoid the transmission of vibrations. If there are not used safety EPE blocks, make sure that the accumulator is connected to the hydraulic circuit by suitable connection devices. 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.

Pre-charge of nitrogen

Normally, the bladder accumulators are delivered pre-charged with pressurized gas. The pre-charge of gas can be controlled and / or adjusted before or after installation of the accumulator in the hydraulic circuit.

For the pre-charge, use only industrial dry nitrogen with a purity of min. 99%. It is important to use the nitrogen from a cylinder equipped with a pressure reducing valve (see Chap.11.3).

Use the EPE pre-charge and charging set type PC to check the charging pressure Calculated Against the pressure, and adjust if necessary. If the pre-charge pressure is lower than required, connect the inflation tube on one side and the other of the equipment.

Connect it to the cylinder of nitrogen or to the pressure reducer. Slowly enter the nitrogen in the accumulator until reaching a pressure slightly higher than that set (+ 10 ÷ 15%).

Close the cylinder and remove the connecting pipe from the equipment; wait until the gas temperature has stabilized (2 hours) and calibrate the pressure, discharging the excess gas.

Make sure that the gas valve is not subject to losses and, if necessary, use soap and water.

Tighten the protective caps manually.

Hydraulic pressurization

- Check that the pre-charge pressure is adequate for the application
- Ensure that the hydraulic pressure never exceeds the max. (PS) allowed and shown on the accumulator shell.

To avoid this risk, use a safety item (see Chap. 9).

Maintenance

- Periodically check the pre-charge pressure of the gas: after the commissioning, check after 2-3 weeks of operation and if there were no leaks, repeat the operation after 3 months; if the pressure at the same temperature was stable, repeat the test at annual intervals.
  For heavy-duty applications, check the pre-charge every 6 months.
- Periodically (annually) carry out a visual inspection of the accumulator in order to detect any early signs of deterioration such as corrosion, deformation, etc.
- Comply with the requirements of the regulations concerning the verification of the functionality of the equipment according to the country of installation of the accumulator.

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Repair
If for failure, scheduled check or retest it is necessary to remove the accumulator from the system, prior to removal, isolate the accumulator from the installation and discharge pressure of the liquid.
All bladder EPE accumulators of the AS and ASP series may be repaired. It may consist in replacing the bladder, the seals, the pre-charge valve and/or the parts of the gas and fluid valve.
For reasons of functionality and security, it is recommended to use only original spare parts.

Disassembly
- Fasten the accumulator firmly in a vice or on a bench in a horizontal position, taking care not to damage the outer surface.
- If you have not already carried out, unscrew the cap nut first and then the valve cap of the gas valve.
- Allow gas escapes from the bladder with the help of the check valve until a pressure of 0 is displayed. Check if the bladder is now de-pressurizing an open valve.
- Remove gas valve, fastening the nut on the gas valve and remove the nameplate
- Unscrew the vent screw
- Using a suitable wrench, unscrew the fluid valve (anti-extrusion plate)
- Push enough oil valve into the housing until the sealing ring and the washer can be removed.
- Remove the sealing ring and the washer
- Remove the retaining ring; take it out, by carefully pushing the ring together.
- Remove the oil valve from the container
- Fold bladder somewhat and withdraw by turning it slightly

Refitting

Tightening torques in Nm		
	1/4 gallon	2.5÷15 gallons
Fluid port ring nut	200 +50	450 +50
Bleed screw	5 +1	30 +10
Gas valve locknut	100 +20	150 +30
Filling valve V - VX - V2	30 +5	30 +5
Valve insert V4	0.3 +0.2	0.3 +0.2

3.5gd

- Cleaning and testing: clean all metallic parts on accumulator using an organic reducer – visual inspection of oil valve parts (valve tappet, spring, nut, damping screw) – check valve for sluggishness – Clean bladder, i.e. using isopropanol. Visual inspection of bladder for faults – inner inspection of container for signs of corrosion. In event of coated containers, check the condition of the coating. Replace the parts deemed to be bad; the o-rings must always be replaced (see spare parts Section 3.5.8).
- Drain air from bladder by pressing together
- Carefully moisten the inside of the bladder and the container with used medium (roll container)
- Reinstall according to this sequence: o-ring, washer and spacer sleeve.
- Screw the slotted nut and centre the parts on the oil valve by using a plastic hammer
- Bleed screw with sealing ring
- Mount the bleed screw with its sealing ring
- Tighten the hexagon nut SW1 on the gas valve
- Mount the filling valve with tightening torques, see Table 3.5gd.

Pre-charge
- Screw the pre-charge PC equipment on the gas valve.
- Connect the equipment to the cylinder of nitrogen or to the pressure reducer with the inflation tube.
- Slowly enter the nitrogen in the accumulator until reaching a pressure slightly higher than the set value (+ 10 ÷ 15%).
- Close the cylinder and remove the connecting pipe from the equipment.
- Wait until the gas temperature has stabilized (2 hours).
- Calibrate the pressure discharging the excess gas.
- Make sure that the gas valve is not subject to losses and, if necessary, use soap and water.
- Tighten the protective caps manually.

Demolition and recycling of the accumulator
Before accumulator demolition or recycling, you should always discharge completely the pre-charge pressure and remove the gas valve.
If needed, proceed decontaminating in relation to the fluid used prior to demolition.

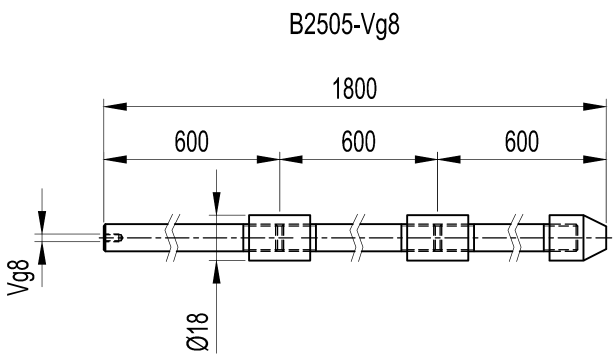
3.5.12 REPAIR TOOLS

3.5.12.1 BLADDER PULL ROD

The pull rod screwed to the gas valve of the bladder for easy assembly into shell during reassembly. Pull rod is complete with fitting for EPE gas valve and 3 extension segments to accommodate all size of accumulators.

Code for complete kit: **B2505-Vg8**

Dimension

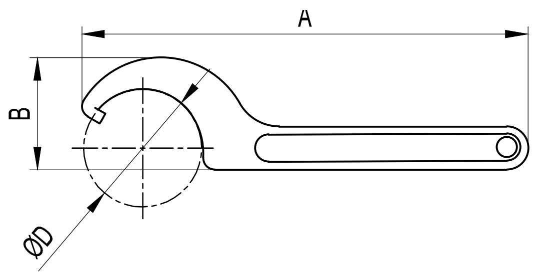


3.5.12.2 SPANNER WRENCH

Fits all standard size bladder accumulator. It is used to remove or install lock nut on fluid port assembly.

1/4 gal code **2506/58**
1 gal code **2506/68**
2,5÷15 gal code **2506/105**

Dimension



CODE	A	B	ØD	For Accumulator
B2506/58	241	45	58	1/4 gal
B2506/68	241	43	68	1 gal
B2506/105	336	82	105	2.5 ÷ 15 gal

3.5ab

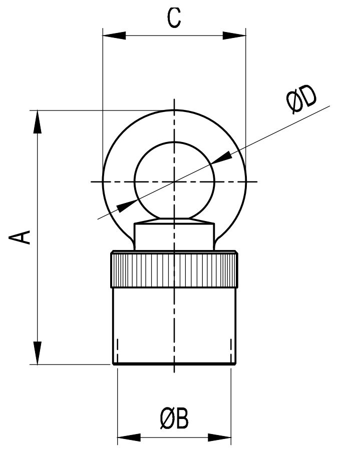
3.5.12.3 LIFTING HOOK

To be used for the safe lifting of mounted accumulators:

For accumulators V (M22x1,5) code **B2507/2**

For accumulators V4 (7/8" UNF) code **B2507/7**

Dimension



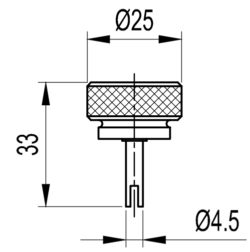
CODE	A	ØB	Gas valve	C	ØD	For Accumulator
B2507/2	100	M22x1,5	5/8" UNF	63	35	1 ÷ 15 gal
B2507/7	100	7/8" UNF	7/8" UNF	63	35	1 ÷ 15 gal

3.5.12.4 CORE TOOL

The core tool is used to remove and reinstall the valve core type V4.

Code **B2508**

Dimension



3.5ad

3.6.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS): 16 bar

PRESSURE TEST (PT): 1.43 x PS

NOMINAL CAPACITIES: 100 - 150 - 200 - 300 - 500 - 750 - 1000 - 1500 - 2000 - 3000 - 4000 - 5000 litres

WORKING TEMPERATURE: -30 ÷ +100 °C

COMPRESSION RATIO (Po : P2): max. 1 : 4

FLUID VISCOSITY RANGE: 10 ÷ 400 cSt

RECOMMENDED VISCOSITY: 36 cSt

FLUID CONTAMINATION DEGREE:
class 21/19/16 according to ISO 4406/99

BODY MATERIAL:
- carbon steel shell painted with rust inhibitor RAL 5015 up to 1500 lt; RAL 9010 for capacities from 2000 lt to 5000 lt
- stainless steel AISI 316L

VALVES MATERIAL:
- phosphated or galvanized carbon steel in compliance with Directive 2002/95/EC (RoHS) to resist to corrosion
- stainless steel AISI 316L

BLADDER MATERIAL:
- **P** = Nitrile rubber (NBR)
- **B** = Butyl (IIR)
- **E** = Ethylene-propylene (EPDM)

See Table 3.6c and/or Chapter 1.5

FILLING VALVE CONNECTION:
- 5/8”-UNF std
- 7/8” UNF
- ¼” BSP

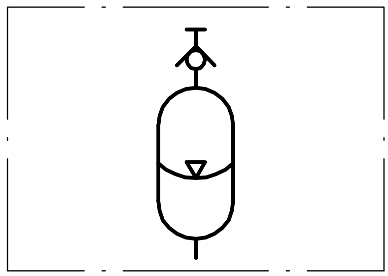
FLUID PORT CONNECTION: see Table 3.6e

FLOW RATE: see Table 3.6e

WEIGHT: see Table 3.6e

3.6a

3.6.2 HYDRAULIC SYMBOL



3.6b

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3.6.3 "ASE" BLADDER ADVANTAGES

- dirt tolerant
- light weight
- compact
- simple construction
- quick response
- works well on water, low lubricity fluids
- quick, easy installation
- low cost

3.6.4 DESCRIPTION

ASE Bladder-type accumulators consist of a cylindrical pressure vessel made of high-tensile steel.
The accumulator is subdivided into a gas and fluid side by an elastic bladder mounted in the interior of the vessel.
The nitrogen is charged to the specified gas charge pressure P0 by means of gas valve at the external of the bladder.
When the fluid is pressed into the bladder, the gas in the accumulator is compressed and hence the pressure increased. The gas volume reduces and on the fluid side, the fluid can flow into the bladder. As soon as the pressure on the fluid side falls below the gas pressure, the accumulator is emptied.
A special oil valve (anti-extrusion plate) is provided in the oil port in order to prevent draining of the bladder into the oil channel and thus the bladder from being destroyed.
When the minimum operating pressure is reached, a small oil volume is to be maintained between the bladder and the fluid volume (approx. 10% of the nominal capacity of the hydraulic accumulator), in order that the bladder does not hit the valve during every expansion process.
Gas valve consists of a sealing cap, a filling valve and an adapter.
The nameplate shows the technical data and features of the hydraulic accumulator.

3.6.5 EUROPE MARKET

All hydraulic accumulators are pressure vessels and are subject to the national regulations and directives, valid at the place of installation.
Every shipping batch is complete of a conformity declaration and instruction of use and maintenance and/or all documents requested.
All vessel categories (see Table 3.6e) must be protected by means of a pressure relief valve in accordance with Directive 2014/68/EU.

3.6.6 ACCESSORIES

For gas side's safety equipment, see Cap. 8
For fluid side's safety equipment, see Cap. 9
For pre-loading and charging set, see Cap. 11
For other components, see Cap. 12

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3.6.7 BLADDER-TEMPERATURE-LIQUID COMPATIBILITY

When selecting the accumulator variant, pay attention to the following non-binding notes with regard to hydraulic fluid, bladder material and the permissive temperature range. (see Section 1.5)

Code letter	Polymer	ISO	Temperature range (°C)	Some of the liquids compatible with the polymer
P	Standard nitrile (Perburan)	NBR	-20 ÷ +80	Aliphatic hydrocarbons (propane, butane, gasoline, oils, mineral greases, diesel fuel, fuel oil, kerosene), mineral greases and oils, HFA - HFB - HFC fluids, many dilute acids, alkalis, saline solutions, water, water glycol.
E	Ethylene-Propylene	EPDM	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many organic and inorganic acids, detergents, solutions of sodium and potassium, phosphate ester-based hydraulic fluids, (HFD-R), silicone oils and greases, many polar solvents (alcohol, ketones, esters), Skydrol LD4 and 500B-4, resistance to ozone, aging and weathering.

For other hydraulic fluid and/or temperatures, please consult us. 3.6c

3.6.8 ORDER CODE

1	2	3	4	5	6	7	8		9		10	11	12	13	14		15
ASE	500	P	16	C	B	4/150	V	-	0	-	C	0	C	0	ELM25	/	1,5

1 Series

Bladder accumulator = **ASE**

2 Nominal capacity

100 lt	=	**100**
150 lt	=	**150**
200 lt	=	**200**
300 lt	=	**300**
500 lt	=	**500**
750 lt	=	**750**
1000 lt	=	**1000**
1500 lt	=	**1500**
2000 lt	=	**2000**
3000 lt	=	**3000**
4000 lt	=	**4000**
5000 lt	=	**5000**

3 Bladder material

Nitrile rubber (NBR) = **P**
Ethylene-propylene (EPDM) = **E**

4 Max working pressure (PS)

See the table on front page

5 Body material

Carbon steel = **C**
Stainless steel = **X**

6 Fluid port connection

Flange ANSI = **B**
Flange UNI = **U**

7 Dimension of the connection fluid

For the type of connection:
B = **DIMENSION/RATING**
Former. 4” ANSI 150 = 4/150
U = **DN/PN**
Former. DN100 PN10 = 100/10
Special variants upon request

8 Type of filling valve

Standard filling valve 5/8” UNF thread = **V**
Standard filling valve with 5/8” UNF thread in stainless steel = **VX**
Without filling valve (thread hole M12x1.5) = **V0**
Brass filling valve 1/4” BSP = **V2**
Filling valve 7/8” UNF = **V4**

9 Testing and certification

Factory testing = **0**

10 Fluid valve material

Carbon steel = **C**
Stainless steel = **X**

11 Variants of fluid side

Standard = **0**
Other numbers/variants to be requested EPE

12 Gas valve material

Carbon steel = **C**
Stainless steel = **X**

13 Variants of gas side

Standard = **0**
Other numbers/variants to be requested EPE

14 Other variants

See the table on front page

15 Precharge pressure (bar)

Standard 1.5 bar = **0 ÷ 6** (< PS)

Special variants upon request

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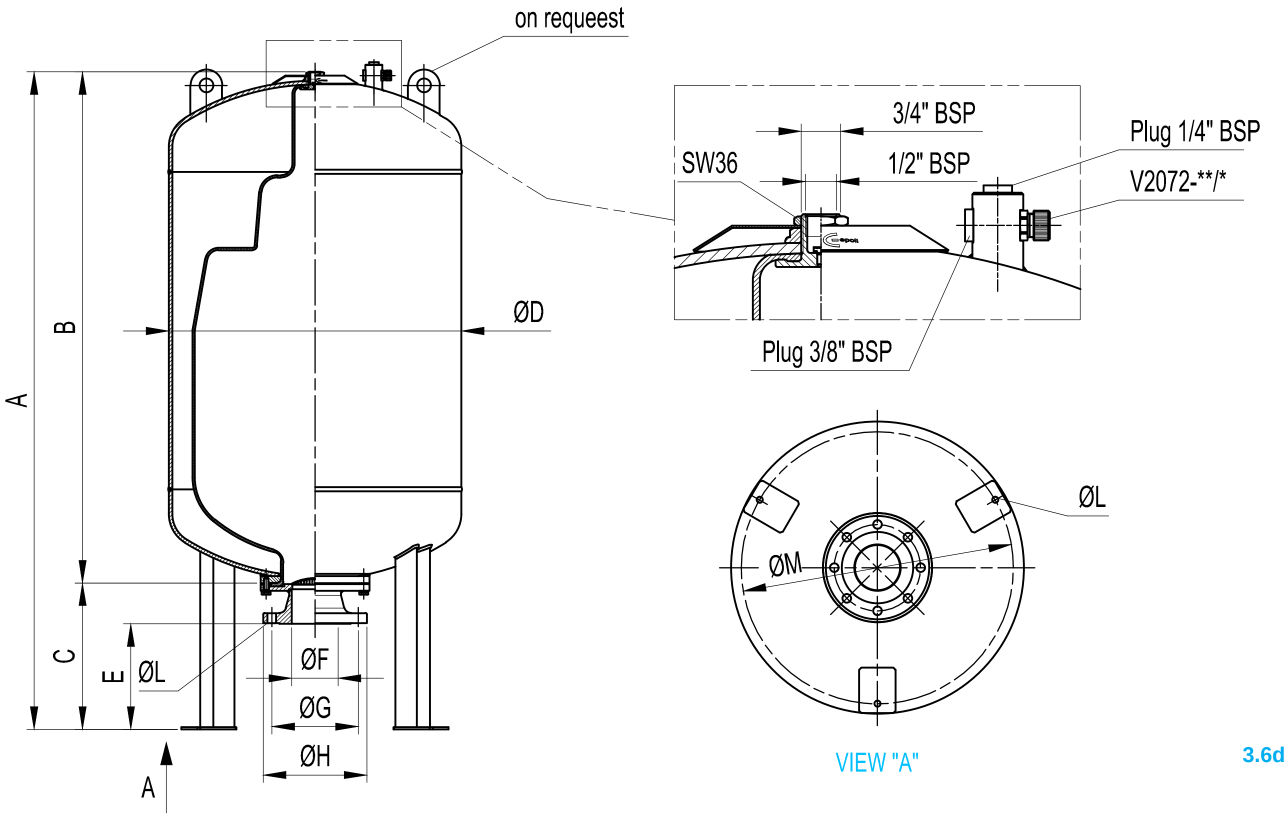
4 Max working pressure (PS)		
Capacity litres	Carbon steel	Stainless steel
100 ÷ 500	**10 - 16**	**10 - 16**
750 ÷ 5000	**10**	**10**

14 Other variants	
Dumper + Safety valve, type VS2470-11 set at 11 bar	= **F11**
Dumper + Needle Valve of 1/4” BSP	= **EG2**
Dumper + Stainless steel needle Valve of 1/4” BSP	= **EG2X**
Dumper + excluding device with with full scale pressure gauge of xxx bar (see Section…)	= **EMxxx**
Dumper + excluding device of 90° with full scale pressure gauge of xxx bar	= **ELMxxx**
Flushing with degree of contamination ≤ ...class	= **Fx**
75-80 μ thick polyurethane paint with colour to be specified	= **Wxxx**
Off-shore paint with colour to be specified	= **Zxxx**
NORSOK System 1 paint with colour to be specified	= **K1**
NORSOK System 7B paint with colour to be specified	= **K7B**
other variants upon request	

3.6.9 DIMENSIONS



3.6d

Acc. type ASE in carbon steel and stainless steel	Nominal gas volume liters	Working pressure *bar*	Ped category liquids of group 2	Max.diff. pressure P2-P1 *bar*	Flow rate *l/min*	Max.comp. ratio P0/P2	A ± 50 *mm*	B±30 *mm*	C *mm*	Ø D ± 10 *mm*	E ±50 *mm*	ØF *mm*	ØG *mm*	ØH *mm*	ØL *mm*	N° fixing holes	ØM mm	Acc. dry weight *kg*
ASE 100	100	10 ÷ 16	II ÷ III	4	300	1:4	880	720	160	460	85	102,4	190,5	233	19	8	390	18
ASE 150	150	10 ÷ 16	III	4	300	1:4	1030	870	160	510	85	102,4	190,5	233	19	8	440	22
ASE 200	200	10 ÷ 16	III ÷ IV	4	300	1:4	1070	885	185	590	110	102,4	190,5	233	19	8	440	35
ASE 300	300	10 ÷ 16	III ÷ IV	4	300	1:4	1250	1085	165	650	90	102,4	190,5	233	19	8	440	45
ASE 500	500	10 ÷ 16	III ÷ IV	4	300	1:4	1600	1360	240	750	165	102,4	190,5	233	19	8	550	60
ASE 750	750	10	IV	4	300	1:4	1820	1520	300	800	225	102,4	190,5	233	19	8	648	75
ASE 1000	1000	10	IV	4	300	1:4	2130	1820	310	800	235	102,4	190,5	233	19	8	-	85
ASE 1500	1500	10	IV	4	300	1:4	2130	1850	280	1000	205	102,4	190,5	233	19	8	790	105
ASE 2000	2000	10	IV	4	300	1:4	2550	2140	410	1100	335	102,4	190,5	233	19	8	930	140
ASE 3000	3000	10	IV	4	300	1:4	2930	2580	350	1250	275	102,4	190,5	233	19	8	1090	205
ASE 4000	4000	10	IV	4	300	1:4	3030	2600	430	1450	355	102,4	190,5	233	19	8	1250	250
ASE 5000	5000	10	IV	4	300	1:4	3800	3410	390	1450	315	102,4	190,5	233	19	8	1155	310

3.6e

- The maximum differential pressure is the maximum allowable difference between the maximum pressure and the minimum working pressure (P2-P1) to have an infinite life cycle of the accumulator (greater than 2,000,000 cycles).
- Flow rate measured using mineral oil with viscosity of 36 cSt at 50°C and ΔP = 5 bar

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3.6.10 SPARE PARTS CODE

Item	Description	Q.ty	Type					
			ASE 100	ASE 150	ASE 200	ASE 300	ASE 500	ASE 750
1	Bladder	1	S100*** - 0	S150*** - 0	S200*** - 0	S300*** - 0	S500*** - 0	S750*** - 0
2	Gas-fill valve	1	V 2072 - ** / *					
Item	Description	Q.ty	Type					
			ASE 1000	ASE 1500	ASE 2000	ASE 3000	ASE 4000	ASE 5000
1	Bladder	1	S1000*** - 0	S1500*** - 0	S2000*** - 0	S3000*** - 0	S4000*** - 0	S5000*** - 0
2	Gas-fill valve	1	V 2072 - ** / *					

* Gasket material   ** Component material   *** Bladder material

3.6f

03.6.11 COMMISSIONING AND MAINTENANCE

Delivery conditions

Bladder accumulators are delivered pre-charged with nitrogen at a pressure of 1.5 bar or at value of pressure required at time of order. The pre-charge value is also on the nameplate of the accumulator. The bladder accumulators type ASE are shipped in cartons on pallets or, upon request, in wooden crates. Unless otherwise required, certificates and documentation are provided together with the accumulators.

Handling

The original packaging is suitable for handling and general storage. Where necessary, you should use suitable lifting equipment to support the weight of the accumulators.
However protect from impact the packaging and handle it with care.

Storage

During storage in the warehouse, leave the product in its original packaging, keeping it away from heat sources and naked flames. The storage temperature should be between +10 and +40°C.
After six years of storage, it is essential to proceed with the replacement of all elastomeric parts before the commissioning.

Marking on the nameplate of the accumulator

With reference to the PED 2014/68/EU classification, Article 3, Paragraph 3 and / or risk categories I or II depending on the volume and maximum working pressure, the accumulator indicates the following data:

- Logo, name and country of the manufacturer
- Mounth/year of production
- Product code
- Serial number
- Maximum PS pressure and PT test pressure in bar
- Min. and max. TS working temperature in Celsius
- Volume V in litres
- Group of fluids allowed
- CE marking (for volumes exceding 1 litre) with the identification number of the notified body
- Pre-charge pressure in bar

It is strictly forbidden to:

- weld, rivet or screw any item of 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 (dangerous) fluid of Group 1 with equipment designed and manufactured for fluids of Group 2.

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 security valve (see Chapter 8) or a security block type BS (see Chapter 9).
This device provides user and equipment protection against possible damage caused by pressure surges and also makes the maintenance of the accumulator easier, facilitating the interception and the discharge.
Provide for a space of 200 mm above the gas pre-charge valve to allow access to and control of the pre-charge equipment (see Chap.11.1).
The accumulators type ASE may be installed with the pre-charge valve at the top, and the nameplate must be visible. Proceed to the assembly so that no abnormal force affects the pipes connected directly or indirectly to the accumulator. 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.

Pre-charge of nitrogen

Normally, the bladder accumulators are delivered pre-charged with pressurized gas. The pre-charge of gas can be controlled and / or adjusted before or after installation of the accumulator in the hydraulic circuit.
For the pre-charge, use only industrial dry nitrogen with a purity of min. 99%. It is important to use the nitrogen from a bottle equipped with a pressure reducing valve (see Chap.11.3). Use the EPE pre-charge and charging set type PC to check the charging pressure required, and adjust if necessary. If the pre-charge pressure is lower than required, connect thecharging hose on one side and the other side connect it to the nitrogen bottle or to the pressure reducer. Slowly fill the nitrogen in the accumulator until reaching a pressure slightly higher than that set value (+ 10 ÷ 15%). Close the bottle and remove the charging hose from the pre-loading set; wait until the gas temperature has stabilized (2 hours) and calibrate the pressure, discharging the excess gas. Make sure that the gas valve is not subject to losses and, if necessary, use soap and water.
Tighten the protective caps manually.

Hydraulic pressurization

- Check that the pre-charge pressure is adequate for the application
- Ensure that the hydraulic pressure never exceeds the max pressure allowed (PS) shown on the accumulator shell.

To avoid this risk, use a safety device (see Chap. 9).

Maintenance

- Periodically check the pre-charge pressure of the gas: after the commissioning, check after 2-3 weeks of operation and if there were no leaks, repeat the operation after 3 months; if the pressure at the same temperature was stable, repeat the test yearly.
  For heavy-duty applications, check the pre-charge every 6 months.
- Periodically (yearly) carry out a visual inspection of the accumulator in order to detect any early signs of deterioration such as corrosion, deformation, etc.
- Comply with the requirements of the regulations concerning the verification of the functionality of the equipment according to the country of installation of the accumulator.

Repair

If for failure, scheduled check or retest it is necessary to remove the accumulator from the system, prior to removal, isolate the accumulator from the installation and discharge pressure of the liquid. It may consist in replacing the bladder, the seals, the pre-charge valve and/or the parts of the gas and fluid valve. For reasons of functionality and security, it is recommended to use only original spare parts.

Demolition and recycling of the accumulator

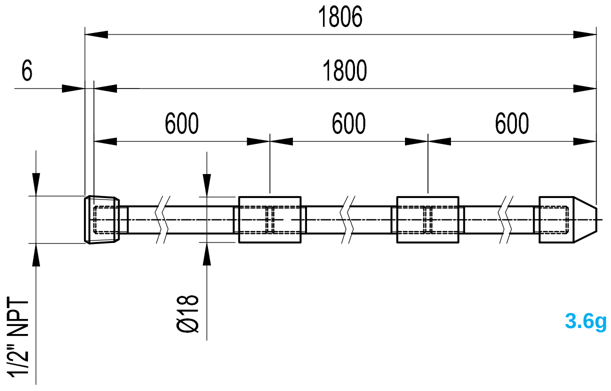
Before accumulator demolition or recycling, you should always discharge completely the pre-charge pressure and remove the gas valve. If needed, proceed decontaminating in relation to the fluid used prior to demolition.

3.6.12 REPAIR TOOLS

3.6.12.1 BLADDER PULL ROD

The pull rod screwed for the gas valve of the bladder for easy assembly into shell during rassembly. Pull rod is complete with fitting for EPE gas valve and 3 extension segments to accomodate all size of accumulators. Code for complete kit: **B2505-P4.**

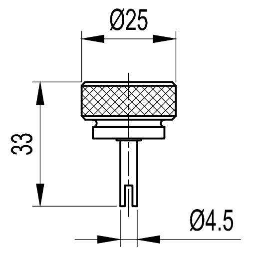
Dimension



3.6g

3.6.12.2 CORE TOOL

The core tool is used to remove and reinstall the valve core type V4.
Code **B2508**



3.6h

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3.7.1 TECHNICAL DATA

THE BLADDER, used in the standard version of the accumulators of all the series offered by EPE, is made in butadiene-acrilnitrile rubber (NBR) with medium-high ACN content which we have denoted “standard nitrile” and distinguished with the letter P. The “P” bladder is above all suitable for use with mineral oils but gives also excellent results with many other liquids. The operating temperature range is between –20 and +80°C. For special requirements, temperatures exceeding the above limits, special liquids, etc. the bladder can be supplied in the following materials: Nitrile for low temperatures (F), Nitrile for hydrocarbons (H), Hydrogenated Nitrile (K), Butyl (B), Ethylene-propylene (E), Neoprene (N), Epichlorohydrin (Y), Viton (V). See section 1,5.
N.B. Not all the sizes of bladders are available in all the materials.
Please consult our Technical Service Department before ordering.
of gas valve assembly.
The two parts, bladder and gas valve assembly, can be ordered separately so when is necessary the replacement of the bladder, it is possible to use again the gas valve assembly saving in this way money on the purchasing price of the spare baldder.

THE GAS VALVE used in the EPE accumulators is made of phosphated carbon steel, in the following three versions:

S = STANDARD. For capacities from 0,2 to 55 litres with inflating valve 5/8” UNF.
This valve can be supplied with Ø B and special inflation connections.

ST = TRANSFER. Suitable for use with the accumulator connected to one or more additional nitrogen bottles. For capacities from 5 to 55 litres.

SL = LIQUID SEPARATOR. It is used when a liquid is also inside the bladder. For capacities from 0,2 to 55 litres.

UPON REQUEST, all the valves can be supplied with chemical nickel coating 25 μm or 40 μm. (other thickness to be specified) or in stainless steel.

3.7a

3.7.2 DESCRIPTION

The EPE bladder is made by two different and separable parts.
One is the rubber bladder of which the main feature lies in an original and well developed process that allows the construction in a single piece. The second part is the gas valve assembly that is seal connected on the bladder mechanically. This unique method allows to seal connect on the same bladder different types.

3.7.3 SPECIAL GAS VALVE: NON EPOLL ACCUMULATORS

EPE bladders, in addition to their use in EPE accumulators, are perfectly interchangeable with many others brands available in the market.
In order to do that, gas valves (see below) are available with nonstandard stem diameters (ØB) and charge-connections.

3.7.4 BLADDER-TEMPERATURE-LIQUID COMPATIBILITY

When selecting the accumulator variant, pay attention to the following non-binding notes with regard to hydraulic fluid, bladder material and the permissive temperature range. (see Section 1.5)

Code letter	Polymer	ISO	Temperature range (°C)	Some of the liquids compatible with the polymer
P	Standard nitrile (Perburan)	NBR	-20 ÷ +80	Aliphatic hydrocarbons (propane, butane, gasoline, oils, mineral greases, diesel fuel, fuel oil, kerosene), mineral greases and oils, HFA - HFB - HFC fluids, many dilute acids, alkalis, saline solutions, water, water glycol.
F	Low temperature nitrile	NBR	-40 ÷ +70	The same as with standard nitrile + a number of different types of Freon. (This contains less acrylonitrile than the standard and is therefore more suitable for low temperatures, but its chemical resistance is slightly lower).
H	Nitrile for hydrocarbons	NBR	-10 ÷ +90	Regular and premium grade slightly aromatic gasoline (and all the liquids for standard nitrile).
K	Hydrogenated nitrile	HNBR	-30 ÷ +130	The same as with standard nitrile but with excellent performance at high and low temperatures.
B	Butyl	IIR	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many acids and bases, salt solutions, polar solvents such as alcohols, ketones and esters, polyglycol-based hydraulic fluids (HFC fluids) and bases of esters of phosphoric acid (HFD-R fluids), silicone oils and greases, resistance to ozone, aging and weathering.
E	Ethylene-Propylene	EPDM	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many organic and inorganic acids, detergents, solutions of sodium and potassium, phosphate ester-based hydraulic fluids, (HFD-R), silicone oils and greases, many polar solvents (alcohol, ketones, esters), Skydrol LD4 and 500B-4, resistance to ozone, aging and weathering.
N	Chloroprene (Neoprene)	CR	-30 ÷ +100	Mineral oils of paraffin, silicone oils and greases, water and aqueous solutions, refrigerants (ammonia, carbon dioxide, Freon), naphthenic mineral oils, low molecular aliphatic hydrocarbons (propane, butane, fuel), brake fluids based on glycol, better resistance to ozone, weathering and aging compared to NBR rubber.
Y	Epichloridrin	ECO	-30 ÷ +110	Mineral oils and greases, aliphatic hydrocarbons (propane, butane and gasoline), silicone oils and greases, water at room temperature, resistance to ozone, aging and weathering.
V	Fluorocarbon	FKM	-10 ÷ +150	Mineral oils and greases, non-flammable fluids of HFD group, silicone oils and greases, animal and vegetable oils and greases, aliphatic hydrocarbons (gasoline, butane, propane, natural gas), aromatics hydrocarbons (benzene, toluene), chlorinated hydrocarbons (Tetrachloroethylene, carbon tetrachloride), fuel (regular, super and containing methanol), excellent resistance to ozone, weathering and aging.

For other hydraulic fluid and/or temperatures, please consult us.

3.1c

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3.7.5 ORDER CODE

1	2	3		4	5	6
S	25	P	-	C	50	V

1 Series

Standard	= **S**
Transfer	= **ST**
Liquid separator	= **SL**

2 Nominal capacity

0.2 lt	= **0.2**
0.7 lt	= **0.7**
1 lt	= **1**
1.5 lt	= **1.5**
2.5 lt	= **2,5**
3 lt	= **3**
4 lt	= **4**
5 lt	= **5**
10 lt	= **10**
12 lt	= **12**
15 lt	= **15**
20 lt	= **20**
25 lt	= **25**
35 lt	= **35**
55 lt	= **55**

for ASE range
100 -:- 5000

3 Bladder material

Nitrile rubber (NBR)	= **P**
Nitrile for low temp.	= **F**
Nitril for hydrocarbons	= **H**
Hydrogenated nitrile (HNBR)	= **K**
Butyl (IIR)	= **B**
Ethylene-propylene (EPDM)	= **E**
Chloroprene (Neoprene)	= **N**
Epichlorohydrin (ECO)	= **Y**
Fluorocarbon (FKM)	= **V**

6 Type of filling valve*

Standard filling valve 5/8” UNF thread	= **V**
Standard filling valve with 5/8” UNF thread in stainless steel	= **VX**
Without filling valve (thread hole M12x1.5)	= **V0**
Brass filling valve 1/4” BSP	= **V2**
Filling valve 7/8” UNF	= **V4**
For ASE Type	= **-**

* Only for S and ST series

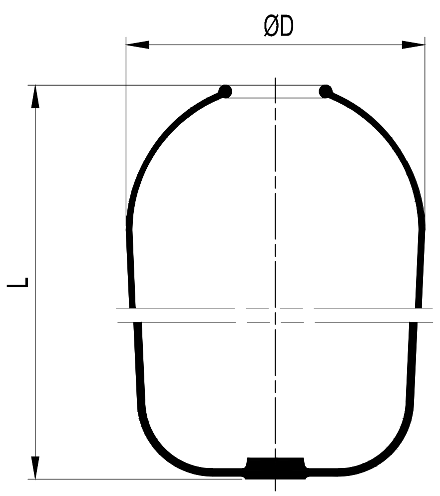
5 Gas valve dimension

M50X1.5	= **50**
M22X1.5	= **22**
7/8” UNF	= **7/8**
5/8” UNF	= **5/8**
For ASE 3/4 BSP	= **3/4**

4 Gas valve material

Whitout valve	= **0**
Carbon steel	= **C**
Nickel coated carbon steel 25 µ	= **N**
Nickel coated carbon steel 40 µ	= **M**
Stainless steel	= **X**

3.7.6 BLADDER DIMENSIONS AND SPARE PARTS CODES



3.7c

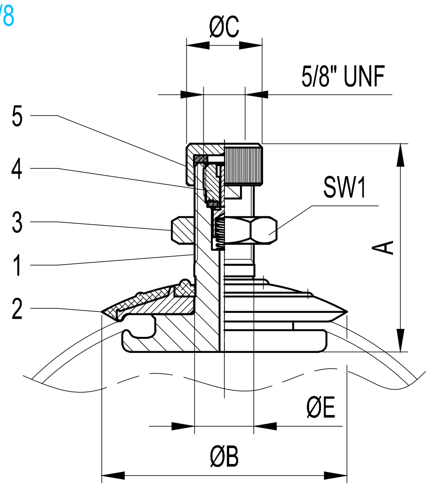
Bladder type S	Nominal gas volume litres	ØD *mm*	L *mm*	Bladder order code	Wheight *Kg*
S 0,2	0,2	38.5	148 ± 1,5	S 0,2* - 0	0,031
S 0,7	0,7	74	120 ± 2	S0,7* - 0	0,060
S 1	1	95	140 ± 2	S1* - 0	0,130
S 1,5	1,5	95	192 ± 2	S1,5* - 0	0,165
S 2,5	2,5	95	320 ± 2	S2,5* - 0	0,295
S 3	3	95	365 ± 2	S3* - 0	0,348
S 4	4	144	201 ± 2	S4* - 0	0,394
S 5	5	144	275 ± 2	S5* - 0	0,415
S 10	10	198	305 ± 3	S10* - 0	0,92
S 12	12	198	393 ± 3	S12* - 0	1,09
S 15	15	198	440 ± 4	S15* - 0	1,30
S 20	20	198	580 ± 5	S20* - 0	1,73
S 25	25	198	725 ± 5	S25* - 0	2,15
S 35	35	198	1105 ± 5	S35* - 0	3,3
S 55	55	198	1550 ± 5	S55* - 0	4,6

* Bladder material

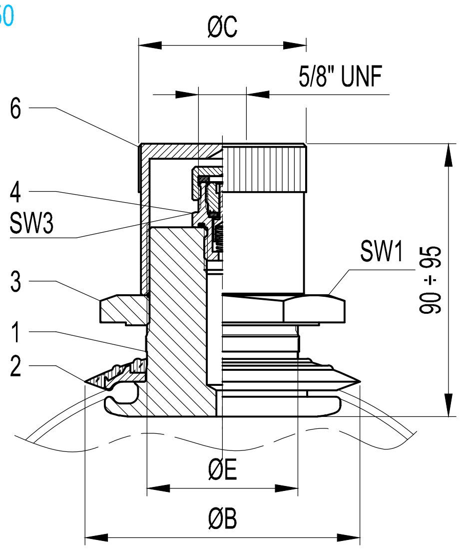
3.7d

3.7.7 VALVE DIMENSIONS AND SPARE PARTS CODE

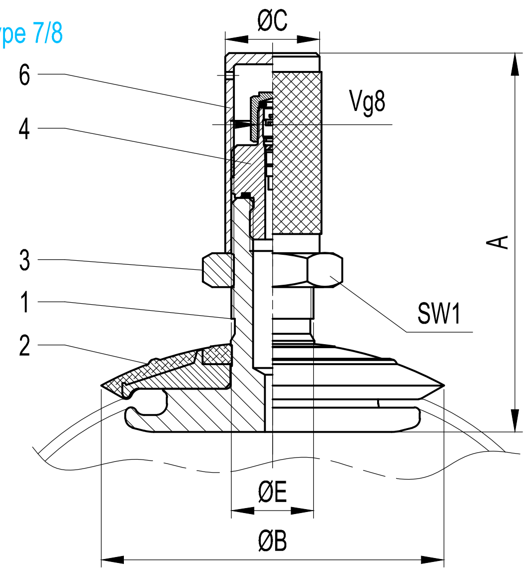
Type 5/8



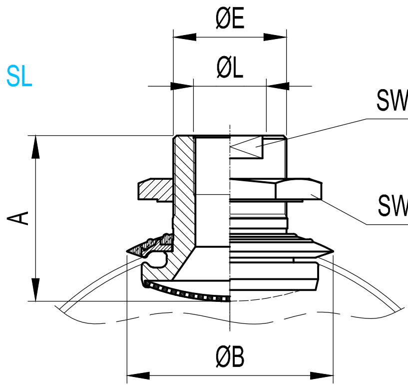
Type 50



Type 7/8

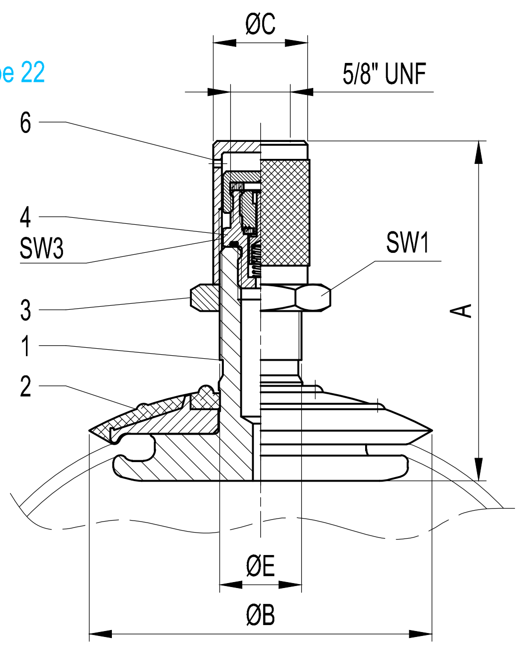


Type SL

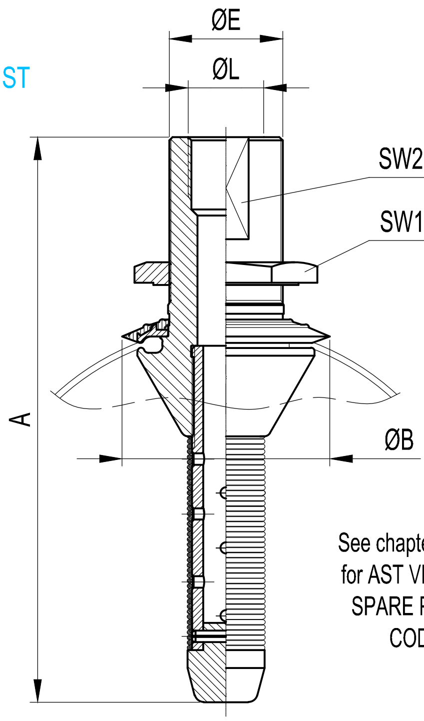


See chapter 3.2.10
for ASL VERSION
SPARE PARTS
CODE

Type 22



Type ST



See chapter 3.2.10
for AST VERSION
SPARE PARTS
CODE

3.7e

DIMENSIONS										
Nominal capacities (lt)	Valve type	Gas valve assembly	A mm	Ø B mm	Ø C mm	Ø E	Ø L	SW 1 mm	SW 2 mm	SW 3 mm
0,2	5/8	V 2002 - ** / *	40	34	20	5/8" UNF	-	24	-	-
	SL	V 2003 - ** / *	41	35	-	5/8" UNF	1/8" BSP	24	13	-
0,7	5/8	V 2015 - ** / *	45	48	20	5/8" UNF	-	24	-	-
	7/8	V 2020 - ** / *	65 ÷ 70	45	25	7/8" UNF	-	32	-	-
	22	V 2021 - ** / *	68 ÷ 73	45.5	25	M22x1.5	-	32	-	18
	SL	V 2027 - 1 - ** / *	48	45.5	-	M22x1.5	1/4" BSP	32	18	-
	ST	V 2456 - ** / *	236	45.5	-	M22x1.5	1/4" BSP	32	18	-
1 - 1,5 - 2,5 - 3	5/8	V 2015 - ** / *	45	48	20	5/8" UNF	-	24	-	-
	7/8	V 2020 - ** / *	65 ÷ 70	45	25	7/8" UNF	-	32	-	-
	22	V 2022 - ** / *	68 ÷ 73	45	25	M22x1.5	-	32	-	18
	SL	V 2027 - ** / *	48	45.5	-	M22x1.5	1/4" BSP	32	18	-
	ST	1-1,5-2,5 lt V 2026 - ** / *	121	45	-	M22x1.5	1/4" BSP	32	18	-
		3 lt V 2029 - ** / *	236	45	-	M22x1.5	1/4" BSP	32	18	-
4 - 5	5/8	V 2041 - ** / *	55	65	20	5/8" UNF	-	24	-	-
	7/8	V 2046 - ** / *	75 ÷ 80	61.5	25	7/8" UNF	-	32	-	-
	22	V 2042 - ** / *	73 ÷ 78	61.5	25	M22x1.5	-	32	-	18
	ST	V 2043 - ** / *	201	61.5	-	M22x1.5	1/4" BSP	32	18	-
	SL	V 2048 - ** / *	57	61.5	-	M22x1.5	1/4" BSP	32	18	-
10 ÷ 55	7/8	V 2085 - ** / *	90 ÷ 100	91	25	7/8" UNF	-	32	-	-
	22	V 2061 - ** / *	80 ÷ 85	91	25	M22x1.5	-	32	-	18
	50	V 2062 - ** / *	90 ÷ 95	91	56	M50x1.5	-	70	-	18
	ST	AST 10-15 = V 2065 - ** / *	272	91	-	M50x1.5	1" BSP	70	46	-
		AST 20-25 = V 2066 - ** / *	395							
		AST 35-55 = V 2067 - ** / *	495							
	SL	V 2073 - ** / *	73	91	-	M50x1.5	1" BSP	70	41	-

* Gasket material ** Component material

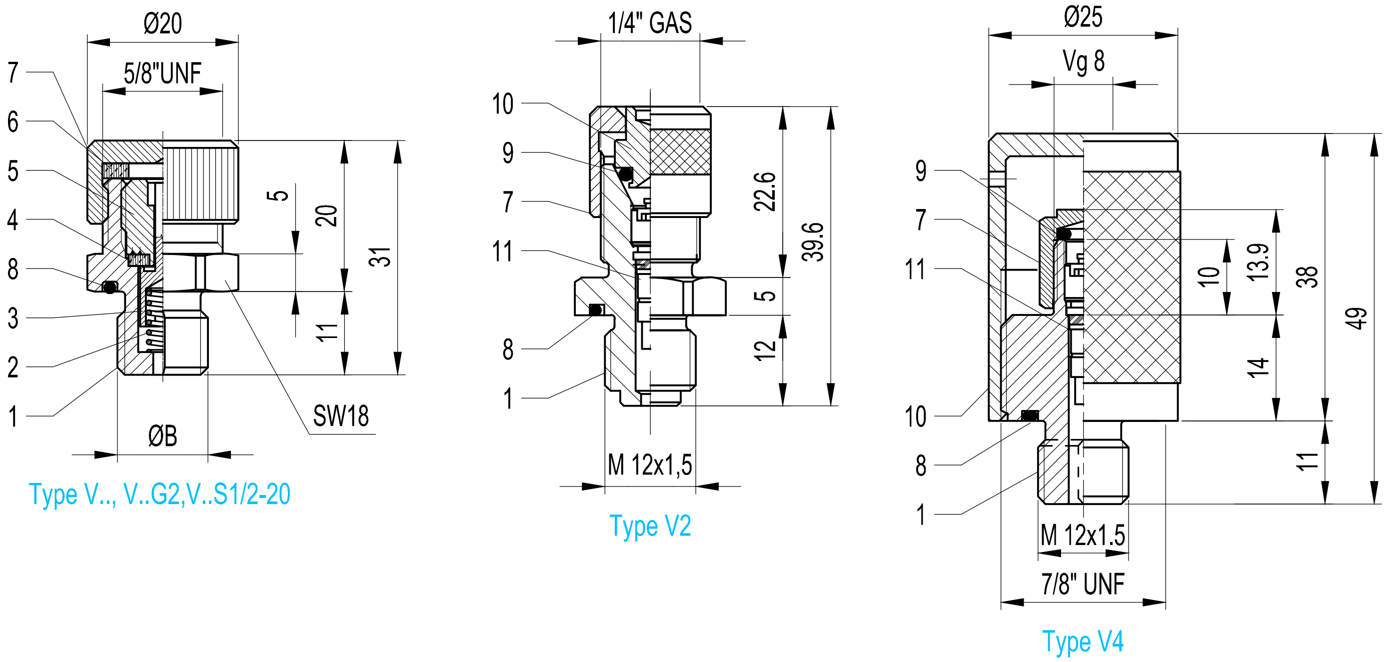
3.7f

Spare order codes										
Nominal capacities (lt)	Valve type	Ø E mm	Gas valve assembly	Pos. 1 valve body	Pos. 2 Rubber-coated washer	Pos. 3 locknut	Pos. 4 fill valve	Pos. 5 valve cap	Pos. 6 protect. cap	Weight kg
0,2	5/8	5/8" UNF	V 2002 - ** / *	B10026 - **	B10024 - ** / *	B10023 - **	V 2001 - ** / *	B10337/00 - ** - *	-	0,01
0,7	5/8	5/8" UNF	V 2015 - ** / *	B10110 - **	B10105 - ** / *	B10023 - **	V 2001 - ** / *	B10337/00 - ** - *	-	0,15
	7/8	7/8" UNF	V 2020 - ** / *	B10119 - **	B10104 - ** / *	B10108 - **	V 2069 - ** / *	B10134/00 - ** - *	B10135 - **	0,3
	22	M22x1.5	V 2021 - ** / *	B10107 - **	B10104 - ** / *	B10109 - **	V 2072 - ** / *	-	B10103 - **	0,28
1 - 1,5 - 2,5 - 3	5/8	5/8" UNF	V 2015 - ** / *	B10110 - **	B10105 - ** / *	B10023 - **	V 2001 - ** / *	B10337/00 - ** - *	-	0,15
	7/8	7/8" UNF	V 2020 - ** / *	B10119 - **	B10106 - ** / *	B10108 - **	V 2069 - ** / *	B10134/00 - ** - *	B10135 - **	0,3
	22	M22x1.5	V 2022 - ** / *	B10107 - **	B10106- ** / *	B10109 - **	V 2072 - ** / *	-	B10103 - **	0,28
4 - 5	5/8	5/8" UNF	V 2041 - ** / *	B10255 - **	B10257 - ** / *	B10023 - **	V 2001 - ** / *	B10337/00 - ** - *	-	0,27
	7/8	7/8" UNF	V 2046 - ** / *	B10259 - **	B10205 - ** / *	B10108 - **	V 2069 - ** / *	B10134/00 - ** - *	B10135 - **	0,4
	22	M22x1.5	V 2042 - ** / *	B10202 - **	B10205 - ** / *	B10109 - **	V 2072 - ** / *	-	B10103 - **	0,4
10 ÷ 55	7/8	7/8" UNF	V 2085 - ** / *	B10330 - **	B10331 - ** / *	B10108 - **	V 2069 - ** / *	B10134/00 - ** - *	B10135 - **	0,75
	22	M22x1.5	V 2061 - ** / *	B10332 - **	B10331 - ** / *	B10109 - **	V 2072 - ** / *	-	B10103 - **	0,75
	50	M50x1.5	V 2062 - ** / *	B10333 - **	B10334 - ** / *	B10302 - **	V 2072 - ** / *	-	B10301 - **	1,54

* Gasket material ** Component material For ASL and AST type order code see chapter 3.2.10

3.7g

3.7.8 FILLING VALVES DIMENSIONS AND SPARE PARTS CODE



3.7h

Item	Description	Q.ty	Valve type				
			V..	V..G2	V..S1/2-20	V2	V4
1	Valve body	1	B10335 - **	B10335 - 1 - **	B10335 -2 - **	B11605 - O	B10343 - 4 - **
2	Spring	1	B10339 - **			-	-
3	Pin	1	B10338 - **			-	-
4	Gasket pin	1	B10341 - *			-	-
5	Pin holder	1	B10340 - **			-	-
6	Gasket cap	1	B10342 - *			-	-
7	Valve cap	1	B10337 - **			B11603 - O	B10134 - O
8	Valve "O" ring	1	0010R2050 - *				
9	Valve cap "O" ring	1	-			0010R2018 - *	0010R0102 - *
10	Cap	1	-			B11604 - O	B10135 - **
11	Valve	1	-			V 2069-XP	
Cap assembly (parts 7-9-10)			-			B11604A-0	-
Valve assembly			V 2072 - ** / *	V 2072 - G2 - ** / *	V 2072 - S1/2-20-**/ *	V 2396 - O / *	V 2077 - 4 - **/ *
Ø B			M12x1.5	1/4" BSP	1/2" UNF	-	-
Weight			0,042			0,04	0,094

** Component material
* Gasket material

3.7i

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3.7.9 MAINTENANCE

Handling
The original packaging is suitable for handling and storage. Where necessary, you should use suitable lifting equipment to support the weight of the accumulators.
However protect from impact the packaging and handle it with care.

Storage
During storage in the warehouse, leave the product in its original packaging, keeping it away from heat sources and naked flames. The storage temperature should be between +10 and +40°C. The maximum time of storage is two years. After time is no longer usable.

Disassembly bladder from gas valve

- First time remove the assembly bladder plus gas valve from accumulator shell

3.7l

- Remove the rubber-coated washer, if is necessary use a small tool for to leverage.

3.7m

- Remove the rubber-coated washer, and slip-off

- Remove the rubber-coated washer. 3.7n

- Remove the gas valve, tilting slightly 3.7o

- Remove the gas valve,by pulling the bladder. 3.7p

- Remove the gas valve,by pulling the bladder whit hand 3.7p

SPARE BLADDERS AND VALVES type S

Assembly the new bladder with the gas valve

3.7r

- Put the gas body valve on the mouth of bladder an push.

3.7u

- Slip-on the rubber-coated washer.

3.7s

- Position the body gas valve.

3.7v

- Press the body gas valve and the rubber-coated washer forward the bladder .

3.7t

- Insert the rubber-coated washer.

3.7z

- Body gas valve correctly assembled.

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4.1.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS): (carbon steel) 220 - 250 - 350 - 375 bar;
(stainless steel) upon request

PRESSURE TEST (PT): 1.43 x PS

NOMINAL CAPACITIES: 0.1 ÷ 1000 litres

WORKING TEMPERATURE: - 60 ÷ +150 °C

COMPRESSION RATIO (Po : P2): $(V_0\text{-}V)\cdot P_2 / V_0 \cdot P_0$

FLUID VISCOSITY RANGE: 10 ÷ 400 cSt

RECOMMENDED VISCOSITY: 36 cSt

FLUID CONTAMINATION DEGREE: class 20/18/15 according to ISO 4406/99

BODY MATERIAL:- carbon steel pipe painted with a coat of rust inhibitor (70µ) RAL 8012
- nickel coating 25 - 40 µ
- stainless steel AISI 316L

FILLING VALVE MATERIAL:
- galvanized carbon steel in compliance with Directive 2002/95/EC (RoHS) to resist to corrosion.
- stainless steel AISI 316L

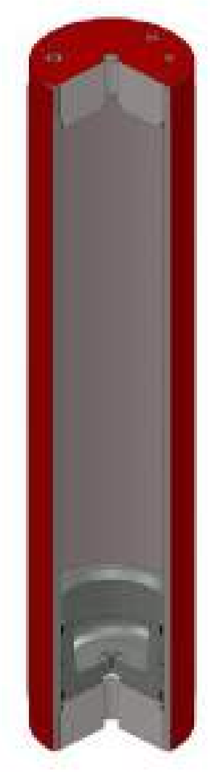
SEALS MATERIAL:
- **P** = Nitrile rubber (NBR)
- **U** = Polyurethane (HPU)
- **K** = Hydrogenated nitrile (HNBR)
- **L** = Hydrogenated nitrile for low temp. (HNBR)
- **V** = Fluorocarbon (FKM)
- **T** = Teflon (PTFE)
- **F** = Low temperature nitrile (NBR)

See Table 4.1c and/or Chapter 1.5

FILLING VALVE CONNECTION:
- 5/8” UNF - M28x1.5

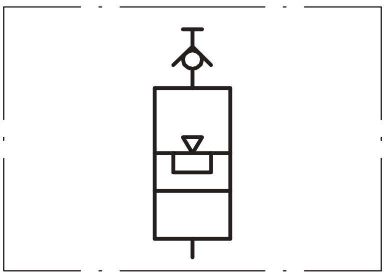
FLUID PORT CONNECTION: upon request, see Table 4.1e.

WEIGHT: see Table 4.1e



4.1a

4.1.2 HYDRAULIC SYMBOL



4.1b

4.1.3 PISTON ACCUMULATOR ADVANTAGES

- application solution for versatile choice of diameter and length
- ability to monitor the position of the piston and find out the amount of fluid inside the accumulator
- any mounting position
- various types of profile and material of the seals for every type of application and compatibility with the fluid
- performance greater than the other types of accumulator
- very low permeability of the seals
- aluminium piston for high dynamics
- connections up to 4"
- possibility to plan an intervention in case of loss of the seals as the seals can wear out slowly, not suddenly as could happen with a bladder accumulators.

4.1.4 DESCRIPTION

Definition and Functionality

The hydropneumatic piston accumulator is a device used to exchange energy using the hydraulic system to which it is connected.
At given moments, it lets energy escaping, the it accumulates it as pressure gas energy and, finally, it readily and integrally replenishes the system on demand, returning to the conditions of receiving again.
The piston accumulator consists particularly of two chambers, one of which is filled with gas under opportune pressure and the second one is connected to the hydraulic circuit.
The gas pressure must be chosen in relation to the conditions of the accumulator work and represents the pre-charge pressure.

Constructional features

The piston accumulator consists of a steel cylinder, closed at both ends, in which slides an airtight aluminium piston.
This divides the internal of the cylinder in two chambers, one filled with pre-charge gas and the other with oil or, generally speaking, with fluid from the system (Fig 1).

• **The piston** is made of aluminium in order to have rapid response time and not to generate pressure peaks during rapid cycles. For lighting purposes, it's also provided with cavity, visible in Fig 1. facing the gas chamber in order to increase the accumulation volume. Even the surface in contact with the oil has a concave cavity. The purpose of this cavity is so that the oil pressure acts on almost the entire surface of the piston and not only on one spot when the piston is against the bottom end cover in the oil chamber.

• **Seal between piston and cylinder** is guaranteed by a special multi-ring seals, which constitute the key characteristic elements for the efficiency of the accumulator. This type of seal has allowed the piston accumulator to have essential characteristics regarding air lightness, component longevity and stroking. In fact, the differential pressure necessary to move the piston, which relates directly on the response speed of the accumulator, is contained in moderate values, contrary as occurs in most seals for standard pistons.
The maximum operating temperature with polyurethane seals is 80ºC.
It is possible to operate at temperatures up to 150ºC, using Viton® seals and reduced piston, as the expansion factors of aluminium and steel are different; it is therefore necessary to compensate the thermal effect. It is also possible to use Teflon® gaskets for low temperatures (lower than -60°C) or for low friction applications.
In piston accumulators, the duration and number of operations carried out without evidence of changes in pressure exceeding 5% of the pre-charge value overcome, without penetration, certain quantities of oil in the gas chamber.
It is usually preferable to assume the change of pre-charge as a parameter for evaluating the longevity of the accumulator as long as this check is carried out rapidly and simply.
Through practical results, obtained by application experience, as well as laboratory tests, it was proved that 1,000,000 operations can be achieved without maintenance or recharge intervention.

• **The cylinder body of the accumulator** is made of low carbon steel, according to the mechanical characteristics of 2014/68/EU.
The internal surface of the cylinder is honed to 0.2 micron of roughness.
For special reasons, the cylinder and end covers can either be superficially treated or made of stainless steel.

• **The gas side** end cover is screwed to the cylinder body; the seal is guaranteed by a toroidal gasket, complete with anti-extrusion ring.
In the standard version, this end cap has a threaded seat in which the pre-charged valve is placed.

• **The oil side** end cover is also screwed to the cylinder body and is complete with relative seal.
This end cap has a coupling to connect it to the system, either threaded or flanged, in accordance to the customer requirements. Fig. 1
• All the accumulators manufactured by EPE are tested according to PED standards.
The accumulators are tested at PT pressure which is equal to the maximum working pressure PS, multiplied by 1.43, which allows to verify the absence of defects, which could cause flaws and deformities in the cylinder and in the piston or gas or oil leak from the seals, threaded sections or valve.
The relieve pressure exceeds 1150 bar for model types, designed to work at a maximum pressure of 375 bar.

4.1.5 EUROPE MARKET

All hydraulic accumulators are pressure vessels and are subject to the national regulations and directives valid at the place of installation.
Piston accumulator, up to and including 1 litre, must not be CE marked.
For piston accumulator type AP, greater than 1 litre, every shipping batch is complete of a conformity declaration and instruction of use and maintenance and/or all documents requested.
All vessel categories (see Table 4.1e) must be protected by means of a pressure relief valve in accordance with Directive 2014/68/EU.

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4.1.6 SEALS-TEMPERATURE-LIQUID COMPATIBILITY

When selecting the accumulator variant, pay attention to the following non-binding notes with regard to hydraulic fluid, seal material and the permissive temperature range.

Code letter	Polymer	ISO	Temperature range (°C)	Some of the liquids compatible with the polymer
P	Standard nitrile (Perburan)	NBR	-20 ÷ +80	Aliphatic hydrocarbons (propane, butane, gasoline, oils, mineral greases, diesel fuel, fuel oil, kerosene), mineral greases and oils, HFA - HFB - HFC fluids, many dilute acids, alkalis, saline solutions, water, water glycol.
U	Poliuretane	PU	-20 ÷ +115	The same as with standard nitrile + a number of different types of Freon. (This contains less acrylonitrile than the standard and is therefore more suitable for low temperatures but its chemical resistance is slightly lower).
K	Hydrogenated nitrile	HNBR	-30 ÷ +130	The same as with standard nitrile but with excellent performance at high and low temperatures.
L	Hydrogenated nitrile	HNBR	-60 ÷ +130	The same as with standard nitrile but with excellent performance at high and very low temperatures.
V	Fluorocarbon	FKM	-10 ÷ +150	Mineral oils and greases, non-flammable fluids of HFD group, silicone oils and greases, animal and vegetable oils and greases, aliphatic hydrocarbons (gasoline, butane, propane, natural gas), aromatics hydrocarbons (benzene, toluene), chlorinated hydrocarbons (Tetrachloroethylene, carbon tetrachloride), fuel (regular, super and containing methanol), excellent resistance to ozone, weathering and aging.
T	Teflon		-150 ÷ +250	Hot water up to 100°C, glycol-based brake fluids, many acids and bases, salt solutions, polar solvents such as alcohols, ketones and esters, polyglycol-based hydraulic fluids (HFC fluids) and bases of esters of phosphoric acid (HFD-R fluids), silicone oils and greases, Skydrol LD4 and 500B-4, resistance to ozone, aging and weathering.
F	Low temperature nitrile	NBR	-40 ÷ +70	The same as with standard nitrile + a number of different types of Freon. (This contains less acrylonitrile than the standard and is therefore more suitable for low temperatures, but its chemical resistance is slightly lower).

For other hydraulic fluid and/or temperatures, please consult us.

4.1c

4.1.7 ORDER CODE

1	2	3	4	5	6	7	8	9	10	9		11		12		13
AP	100	P	Q	250	C	250	G	4	V		-	8	-		/	30

1 Series

Piston accumulator = **AP**

2 Nominal capacity (litres)

Ø 60mm = **0.1 ÷ 2**
Ø 100mm = **1 ÷ 10**
Ø 180mm = **6 ÷ 100**
Ø 250mm = **30 ÷ 200**
Ø 350mm = **80 ÷ 400**
Ø 520mm = **200 ÷ 1000**

3 Caps seal material

Nitrile rubber (NBR) = **P**
Fluorocarbon (FKM) = **V**
Hydrogenated nitrile for low temp. = **L**
Low temperature nitrile = **F**

4 Piston seals material

Fluorocarbon (FKM) = **V**
Teflon (PTFE) = **T**
Hydrogenated nitrile = **K**
Poliuretane (HPU) = **U**
Hydrogenated nitrile for low temp. = **L**
Nitrile rubber (NBR) = **Q**

5 Max working pressure (bar)

Ø 60mm =**375**
Ø 100mm =**375**
Ø 180mm =**250 - 375**
Ø 250mm =**250 - 350**
Ø 350mm =**220 - 350**
Ø 520mm =**220 - 350**
(210 only for the version with L connection other pressure related to connections B or U)

6 Body and caps material

Carbon steel = **C**
Nickel coated carbon steel 25 μ = **N**
Nickel coated carbon steel 40 μ = **M**
Stainless steel = **X**

7 Nominal internal diameter

Ø 60mm =**60**
Ø 100mm =**100**
Ø 180mm =**180**
Ø 250mm =**250**
Ø 350mm =**350**
Ø 520mm =**520**

13 Precharge pressure (bar)

Standard 30 bar = **0 ÷ 280** (< PS)

12 Variants and accessories

See the table on front page

11 Test and certification

Factory testing = **0**
ML (China) = **3**
PED 2014/68/EU (for capacity greater than 1 l) = **8**
EAC Passport (Russia) = **11**
Algeria passport = **12**
Standard regulation (NR13) (Brazil) = **13**
Tunisian passport = **14**

9 Dimensions of gas side connection

See the table on front page

10 Gas side connection

See the table on front page

9 Dimensions of fluid port connection

See the table on front page

8 Fluid port side connection

Without connection = **0**
Female thread BSP UNI228 (standard) = **G**
Female thread BSP with chamfer for = **A**
Female thread NPT-F) = **P**
Female thread SAE = **S**
Female thread metric = **M**
Holes for flange SAE-3000, metric threads = **L**
Holes for flange SAE-6000, metric threads = **H**
Holes for flange ANSI, metric threads = **B**
Holes for flange UNI, metric threads = **U**
Holes for flange CETOP - 400, metric threads = **C**
Special flange = **F**

Special variants upon request

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9	Dimensions of fluid port connection Dimensions of gas side connection
Without connection	= **0**
For the type of connection:	
G-A-P-L-H 1/8”	= **1**
1/4”	= **2**
3/8”	= **3**
1/2”	= **4** (std. DN 60)
3/4”	= **5**
1”	= **6** (std. DN 100)
1” 1/4	= **7**
1”1/2	= **8** (std. DN 180-250-350)
2”	= **9** (std. DN 520)
2”1/2	= **10**
3”	= **11**
3”1/2	= **12**
4”	= **13**
S	= **Diameter “inch”-Pitch “inch”**
Former. 9/16-18 = 9/16-18	
M	= **Diameter/pitch**
Former. M 22x1.5 = 22/1.5	
B	= **Dimension/Rating**
Former. 4” ANSI 300 = 4/300	
U	= **DN/PN**
Former. DN100 PN16 = 100/16	
C	= **Diameter “inch”/max pressure “bar”**
Former. 3”Cetop 400 = 3/400	
F = to specify and EPE will assign a number	

10	Gas side connection
Without connection	= **0**
Pre-charge valve 5/8”UNF (std)	= **V**
Pre-charge valve 5/8”UNF (stainless steel)	= **VX**
Pre-charge valve of M28x1.5	= **VM**
Pre-charge valve of 7/8”UNF	= **V4**
Pre-charge valve of ¼”BSP	= **V2**
Female thread BSP UNI228 (standard)	= **G**
Female thread BSP with chamfer for	= **A**
Female thread NPT-F)	= **P**
Female thread SAE	= **S**
Female thread metric	= **M**
Holes for flange SAE-3000, metric threads	= **L**
Holes for flange SAE-6000,metric threads	= **H**
Holes for flange ANSI, metric threads	= **B**
Holes for flange UNI, metric threads	= **U**
Holes for flange CETOP - 400, metric threads	= **C**
Special flange	= **F**

12	Variants and accessories
Adapter + Burst disk set at xxx bar	= **Rxxx**
Adapter + Safety valve, type VS224/TX set at xxx bar	= **Gxxx**
Adapter + Needle Valve of 1/4” BSP	= **EG2**
Adapter + Stainless steel needle valve of 1/4 BSP	= **EG2X**
Adapter + Excluding device with full scale pressure gauge of xxx bar	= **EMxxx**
Adapter + Excluding device of 90° with full scale pressure gauge of xxx bar	= **ELMxxx**
Flushing with degree of contamination ≤ x	= **Fx**
75-80 μ thick polyurethane paint with colour to be specified	= **Wxxx**
Off-shore paint with colour to be specified	= **Zxxx**
NORSOK System 1 paint with colour to be specified	= **K1**
NORSOK System 7B paint with colour to be specified	= **K7B**
Piston in anodized aluminium	= **P1**
Piston in carbon steel	= **P2**
Piston in carbon steel with nitreg treatment	= **P4**
Piston in stainless steel	= **PX**
Piston with low friction seal	= **PB**
Checking piston displacement:	
Last 150 mm gas side add no. of magnetic switches	= **Bx**
(i.e. No.2 magnetic switch = B2; if they are bistable, use code B2B)	
Last 300mm gas side add no. of magnetic switches	= **Cx**
(i.e. No.2 magnetic switch = C2; if they are bistable, use code C2B)	
Last 700mm gas side add no. of magnetic switch	= **Dx**
(i.e. No.2 magnetic switch = D2; if they are bistable, use code D2B)	
Gas side exit rod with indicator add no. of micro switch	= **Ux**
(i.e. No. 3 micro switch = U3)	
Fluid side exit rod with indicator add no. of micro switch	= **Sx**
(i.e. No. 3 micro switch = S3)	
Potentiometric internal transducer	= **TP**
Magnetostrictive transducer with output 4-20 mA	= **T4** o **T20**
4 mA with piston pre-charged with nitrogen and without oil	= **T4**
20 mA with piston pre-charged with nitrogen and without oil	= **T20**
This transducer must be coupled with the outer stainless steel pipe, therefore you should add the letter A (i.e. AT4)	= **A**
It can be also coupled with other control devices (See Chapter 4.1.9) as: **WT**… **UT**… **ST**…	
Magnetic switches mounted on SS pipe	= **A...**
Ultrasonic sensor	= **TU**
Magnetic flag indicator	= **W**
other variants upon request	

4.1.8 DIMENSIONS

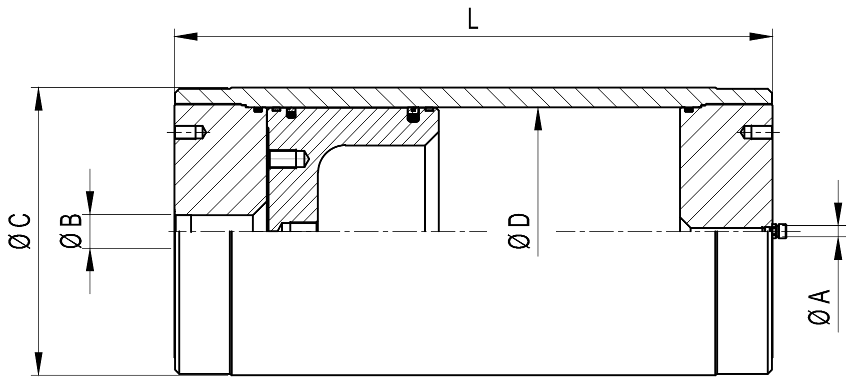

Fig. I

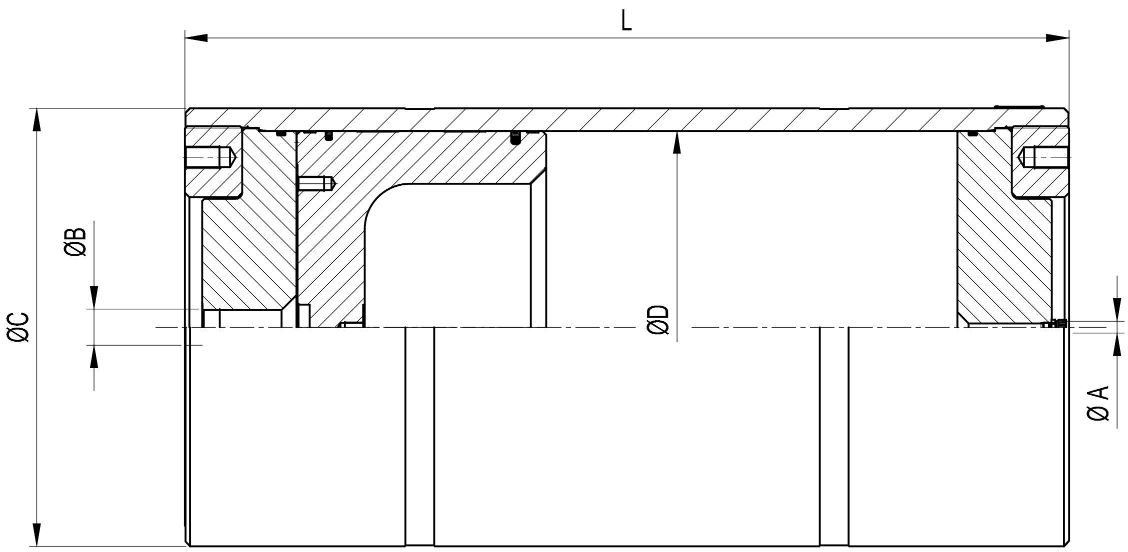

Fig. II

4.1d

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Accumulator type APXXX Ø bore (ØD)	Fig	Effective fluid volume liters	Gas capacity liters	Working pressure bar	Ped category for the liquids of group 2	Maximum differential pressure bar*	ØA	ØB	ØC mm	ØD mm	L mm	Weight Kg 220 bar	250 bar	350 bar	375 bar
		0,25	0,3		Art III (III)						219				5,9
60	I	0,5	0,55	375		300			80	60	307				7,8
		1	1,05		II		Pre-charge Valve 5/8" UNF	1/2" BSP			484				10,4
		1,5	1,55								669				13,5
		2	2,05								837				17
		1	1,1								308				21,1
		1,5	1,6		II						372				23,8
		2	2,1								435				26,5
		2,5	2,6								500				29,5
100	I	3	3,1	375			Pre-charge Valve 5/8" UNF	1"BSP	130	100	562				31,9
		4	4,1		III						690				37,3
		5	5,1								818				42,7
		6	6,1								945				48,2
		8	8,1								1200				59
		10	10,1		IV						1455				69
		6	7								542		83		97,3
		8	9		II	180,5			210		620		93,6		105,0
		10	11	250							698		94,2		112,7
		15	16								895		108,1		132,1
180	I	20	21					1" 1/2 BSP		180	1092		112,6		151,5
		25	26				Pre-charge Valve 5/8" UNF				1288		136,7		170,8
		30	31		IV	240			220		1485		150,9		190,2
		40	41	375							1878		179,2		228,9
		50	51								2270		207,4		267,5
		60	61								2665		235,8		306,5
		80	81								3450		294,4		383,6
		30	33								983		229,6	302,3	
		40	43	250		180,5			298		1188		258,3	346,2	
		50	53								1388		283,3	389,0	
		60	63				Pre-charge Valve 5/8" UNF	1" 1/2 BSP		250	1593		315,0	432,9	
250	I	80	83		IV						1998		397,7	519,5	
		100	103	350		220			324		2408		429,1	607,3	
		120	123								2818		486,5	695,5	
		150	153								3428		571,9	825,5	
		180	183								4038		657,3	966,1	
		100	108,5								1552	643,1		772,5	
		120	128,5	220		165					1762	698,4		841,5	
		150	158,5					1" 1/2 BSP	406	350	2072	780,0		942,6	
350	I	180	188,5		IV		Pre-charge Valve 5/8" UNF				2382	861,4		1036	
		200	208,5	350		220					2592	916,6		1212,6	
		250	258,5						419		3112	1053,4		1282,7	
		300	308,5								3632	1190,2		1452,7	
		400	408,5								4682	1463,8		1806,7	
		200	226,5								1618	1291,1		1914,3	
		250	276,5	220		165			584		1854	1393,6		2082,7	
		300	326,5		IV						2089	1495,6		2550,4	
520	II	350	376,5				Pre-charge Valve 5/8" UNF	2" BSP		520	2324	1597,7		2418,1	
		400	426,5								2559	1700,1		2585,8	
		500	526,5	350***		220					3030	1904,3		2921,9	
		600	626,5						635		3501	2108,8		3257,9	
		800	826,5								4443	2518,5		3930,2	
		1000	1026,5								5385	2926,9		4602,1	

4.1e

*** For dimension "L" for accumulators 350 bar, add +86 mm at dimension "L" of accumulator 220 bar.

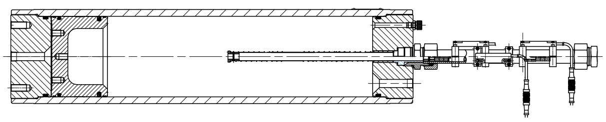
* The maximum differential pressure is the maximum allowable difference between the maximum pressure and the minimum working pressure (P2-P1) to have an infinite life cycle of the accumulator (greater than 2,000,000 cycles).

** Flow rate measured using mineral oil with viscosity of 36 cSt at 50°C and ΔP = 5 bar.

4.1.9 PISTON POSITION INDICATOR

4.1.9.1 LAST PISTON POSITION SWITCH

"B…" (No. OF MAGNETIC SWITCH)
"C…" (No. OF MAGNETIC SWITCH)
"D…" (No. OF MAGNETIC SWITCH)



4.1f

The electrical magnetic switch usually monitors the max. charged condition of the piston accumulator.
It can, however, also permit the control of the piston position of the last 150 mm (B), or 300 mm (C) or 700 mm (D) when the accumulator is full of oil.
The limit switch consists of the switching rod with a permanent solenoid, which is not connected to the piston and can only achieve a limited stroke, and an anti-magnetic housing and two or more switches.
The switch is reset by a spring or the force of gravity.
Vertical mounting is preferable due to the friction and possible wear and tear in the rod guide.
The maximum piston velocity must not exceed 0.5 m/s over the stroke range of the limit switch.

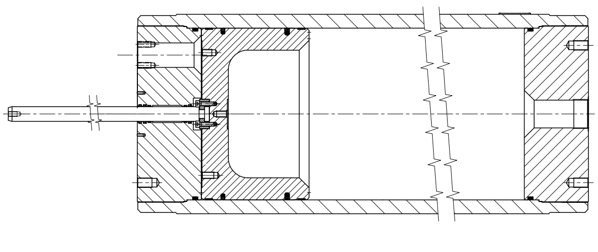
Data of the magnetic switch:
- Output function: **normally open**
- Operat. Temperature: **-25°C + 75°C**
- Connection: **cable 300 mm in PVC**

Electric data character:
- Max switch. voltage contact: **220 – 1500 V**
- Max switch. current contact: **1 – 3 A**
- Max switch. power contact: **60 – 120 VA**

General Character:
- Prot. Degree: **IP67**

You can require the intrinsically safe version for hazardous areas. For this type you should add **Ex** to the order code after the number of the magnetic micro-switches.

4.1.9.2 EXIT ROD "S" OR "U"

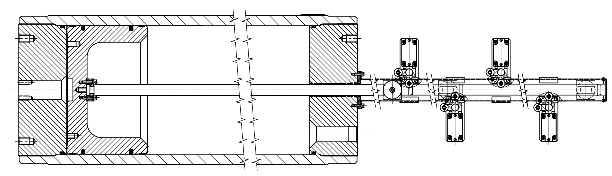


4.1g

The exit rod permits the position of the piston to be monitored over the whole stroke (visual indications). It consists of the piston rod, which is fixed to the piston, and what is known as the trip cam which activates the limit switches. The position of the piston can be monitored at any point, by using the potentiometric transducer T…..
This device is mainly used to switch the pump on and off.
Usually, the piston rod protrudes from the accumulator on the fluid side to (S) or the gas side (U).
On the protruding piston rod version, the hydraulic connection will be on the side if the size of the end cap does not permit otherwise.
The protruding piston rod works in any mounting position. There must however be sufficient space available for the piston to move in and out. The maximum piston speed must not exceed 0.5 m/s over the whole stroke.

4.1.9.3 EXIT ROD AND MECHANICAL SWITCH

"S…." (No. OF SWITCH) OR "U…." (No. OF SWITCH)



4.1h

On the exit rod type U or S, you can install mechanical micro-switches. On the standard version are installed mono-stable micro-switches with an exchanging contact. When using a number greater than or equal to three micro-switches, normally are required the bistable double contact ones, so it should be better to indicated the letters B and/or C in the order code after the necessary micro-switches amount:
B = bistable micro-switches
C= bistable micro-switches with double exchanging contact

Data of the mechanical switch:
- Rated operational voltage
- Rated impulse withstand voltage
- Switching overvoltage
- Conventional enclosed thermal current
- Conditional short circuit current
- Protective device
- IP code
- Pollution degree

Wiring:
- Use a lead wire less than 0.75 mm2
- Use a cable from 6 to 9 mm in O.D.
- Do not connect the terminal directly, use crimp terminals and tighten them according to a torque of 0.2 to 0.29 N • m. (when connecting NO side, use a crimp terminal with insulation cover).
- Connect a ground terminal. Do not connect the ground terminal directly, use crimp terminals and tighten them according to a torque of 0.39 to 0.59 N • m.
- Only the lead wire may be connected to a terminal.

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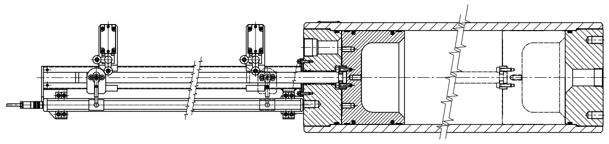
4.1.9.4 EXIT ROD WITH EXTERNAL TRANSDUCER POSITION AND MECHANICAL SWITCH

"S….T4" OR "T20" OR "U….T4" OR "T20"



4.1i

In addition to the micro-switches on the exit rod, you can mount a position transducer with an output 4 ÷ 20mA or 20 ÷ 4mA in order to monitor continuously the entire piston stroke. With the accumulator fully pre-charged with nitrogen and completely charged with oil if you want a 4mA output, you should order the version T4, while, for 20mA, you must order the T20 version.

Technical data:

- Output signal: analogue
- Output: potential-free
- Output current: 4…20 mA or 20…4 mA
- Charge resistance: ≤ 500 Ohm
- System resolution: ≤ 0,2ЧA
- Hysteresis: ≤ 4µm
- Reproducibility: system resolution/min. 2 µm
- Frequency of reading position: *f* standard = 1 kHz
- Maximum deviation from linearity: ± 100 µm up to a nominal length of 500 mm, ± 0.02% 500 up to a nominal length of 4000 mm
-Temperature coefficient: current output: [0.6 µA/°C + (10 ppm/°C x Px l/L)] x ΔT
- Working voltage: 24 VDC ± 20%
- Current absorption: ≤ 150mA
- Protected against reverse polarity: yes
- Protection against overvoltage: zener protection diodes
- Dielectric strength: 500 V (earth against vessel)
- Working temperature –40…+ 85°C…
- Storage temperature: -40…+ 100°C

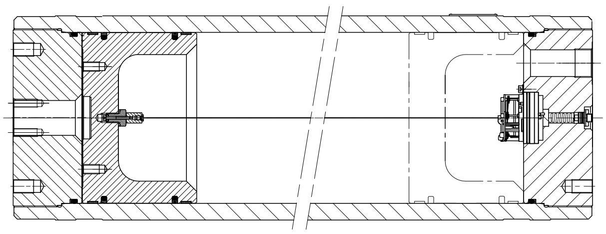
Pins:

Output signal
1 = yellow = 4…20 mA - 20…4 mA
2 = grey = 0 V output
3 = pink = 10…0 V
5 = green = 0…10 V

Working voltage
6 = blue= GND
7 = brown = +24 VDC
8 = white = GND
You can require intrinsically safe version for hazardous areas. For this type you should add

Ex. to the order code after the number of the magnetic micro-switches.

4.1.9.5 WIRE TENSION MEASUREMENT SYSTEM TI4

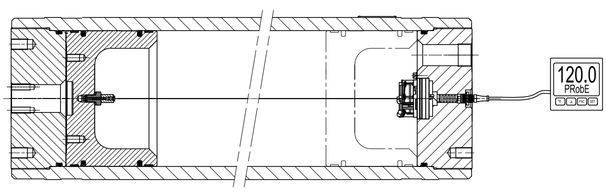


4.1j

Using the wire tension measurement system, the position of the piston can be determined by means of a cable which is fixed to the piston.
The cable is attached to a wheel, which is tensioned by a spring.
This wheel alters an electrical resistance via an attached rotary 4-20mA (or IO-link) during the piston movement.
This resistance is converted by a transducer into an electrical signal, so that it can be processed directly by a PLC system. The signal is supplied through the end cap via a pressure-tight cable gland.
Alternatively, various digital display units and transmitters can be connected. The max. pressure must not exceed 350 with picks up to 450 bar.
The piston acceleration is limited to certain values according to measurement system forces, approx. 7 … 30 g, and is limited to a max. speed of 0.5 m/s. The measurement system is not suitable for rapid volume changes. The piston should preferably be mounted with the gas-side at the top.
The cable tension measurement system can only be fitted to the gas-side of the piston accumulator.

Technical data
Working temperature: - 20°C + 80°C
Linearity: ± 0,25%

4.1.9.6 DISPLAY



4.1k

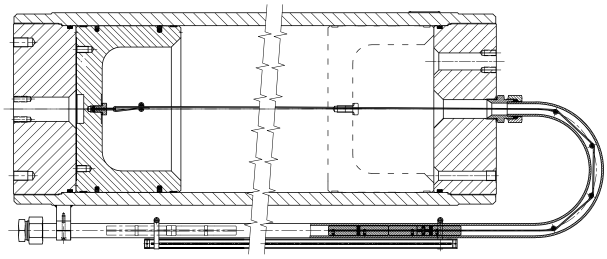
DISPLAY
The display provide local indication of the position (in mm or litres).
Moreover on the device you can set 2 intervention thresholds (relays) on the whole piston stroke. Order code: ATR 244-12-ABC.

Technical data:
Inlet
Strengthening: 4-20 mA

Output
Display, digit/type: 4 digits / LED
Display, digit height LED/LCD: 13.8 mm/
MA, signal range /min. range: 4…20 mA
Relays: 2 x 2A-250 VAC

Features:
Power supply: universal AC/DC
2-wire power supply: >15 VDC
Programmable: FKP/PCF
Ambient temperature: -20…+ 60°C
Supply voltage, uni. AC/DC: 21.6…253V /19.2… 300V
Consumption: 6 W
Insulation voltage, test/op.: 2.3 kVAC/250VaC
Protection degree, front: IP65
Assembly: panel 48x105 mm; holes 46x46 mm

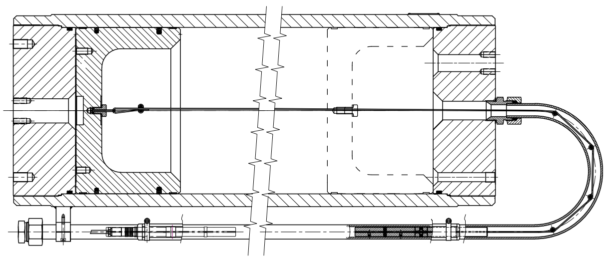
4.1.9.7 MAGNETIC FLAG INDICATOR W



4.1l

With the magnetic flags indicator, the position of a piston can be determined by the colour (white/red) of a set magnetic flags which turn when the piston moves and which are visible externally.
A non-magnetic tube is fitted to the piston accumulator containing a cable, one end of which is fastened to the gas side of the piston and the other end is attached to a magnet.
Along the length of the piston accumulator, it is also fitted a housing which contains red/white magnetic flags.
When the magnet moves up or down its tube, the flaps turn to their opposite colour to indicate the piston's position.
When the piston moves towards the gas side, the indicator moves to the direction of the oil-side.
The maximum piston speed must not exceed 0.5 m/s. Piston accumulators with magnetic flag indication must only be installed vertically, gas-side at the top.

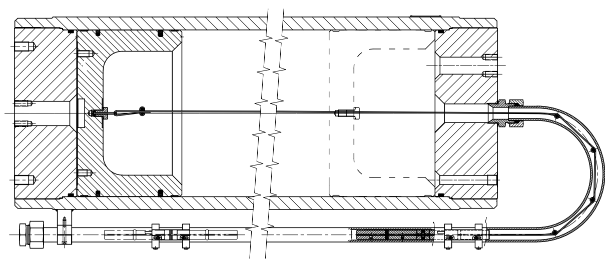
4.1.9.8 EXTERNAL MAGNETOSTRICTIVE TRANSDUCER MOUNTED ON STAINLESS STEEL PIPE "AT4" OR "AT20"



4.1m

For technical data, see Chap. 4.1.9.4

4.1.9.9 MAGNETIC SWITCH MOUNTED ON STAINLESS STEEL PIPE "A (No. OF MAGNETIC SWITCH)"



4.1n

For technical data, see Chap. 4.1.9.1

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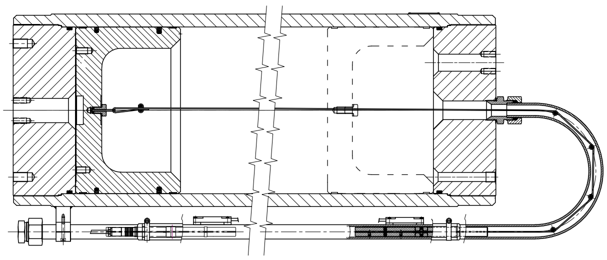
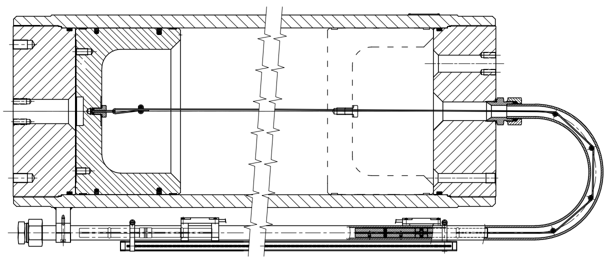
4.1.9.10 EXTERNAL MAGNETIC TRANSDUCER POSITION AND MAGNETIC SWITCH "A…" (No. OF MAGNETIC SWITCH T4 or T20) MOUNTED ON STAINLESS STEEL PIPE



4.1o

For technical data, see Chap. 4.1.9.1 and 4.1.9.4

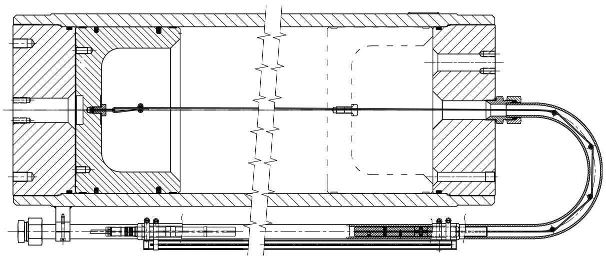
4.1.9.11 MAGNETIC FLAG AND MAGNETIC SWITCH "W…" (No. OF MAGNETIC SWITCH) MOUNTED ON STANLESS STEEL PIPE



4.1p

For technical data, see Chap. 4.1.9.1 and 4.1.9.7

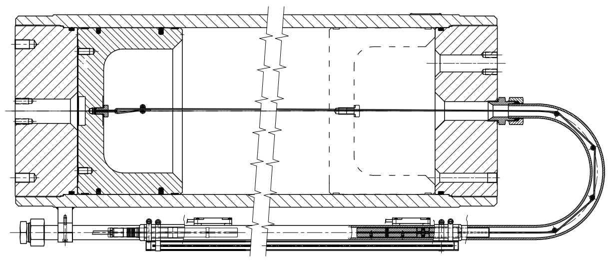
4.1.9.12 MAGNETIC FLAG INDICATOR AND MAGNETIC TRANSDUCER "W T4 or W T20" MOUNTED ON STANLESS STEEL PIPE



4.1q

For technical data, see Chap. 4.1.9.4 and 4.1.9.7

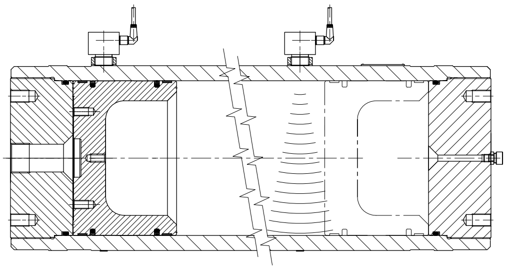
4.1.9.13 MAGNETIC FLAG, EXTERNAL MAGNETIC TRANSDUCER POSITION AND MAGNETIC SWITCH "W..." (No. OF MAGNETIC SWITCH) "T4" or "T20" MOUNTED ON STANLESS STEEL PIPE



4.1r

For technical data, see Chap. 4.1.9.4 and 4.1.9.7

4.1.9.14 ULTRASONIC SENSOR



4.1sa

The ultrasonic sensor identifies the position of piston in the accumulator. The ultrasonic procedure is harmless compared to methods based on radiation sources.
The retrofitting of cylinders can be carried out even in mounted condition.The integration of the system is feasible without interruption of ongoing operations. The installation of ultrasonic sensors is easy. No mechanical extension at pistons are needed. No sealing problems due to holes in the piston accumulator wall occur.
High safety of the system is guaranteed through a permanent couple and function control. A signal is always available.
Using compact sensors with active sensor electronics leads to a very high interfererence resistance and allows a reliable operation in rough industrial environmments.

The most important features of the system are:

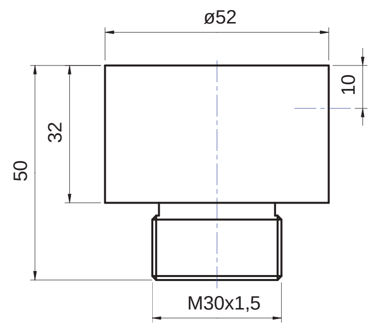
Measurement principle:	contactless ultrasound-pulse-echo-system, no contact between sensor and piston, no constructional changes at the piston accumulator.
Fastening at the piston accumulator:	installation at the desired position with fastening clamp with fitting panel and thread M30X1,5
Accuracy:	static ±1mm from the middle of sensor
Piston accumulator dimensions	inner diameter (mm) 100÷800 outer diameter (mm) 130÷950
Hydraulic fluid:	Mineral oil(HL,HLP),HFA,(HFB), HFC, HFD, water,viscosity 15….100 cSt. purity 20 µm.

Voltage supply: 18….30VDC, max.80 mA, undulation 10% undervoltage recognition, inverse-polarity protection, overvoltage protection.
Switching output: PNP/NPN, max. switching current 60 mA with max switching voltage 30 VDC.
Connectors: sensor pin and socket connector M12; cable 4-pin without shielding.
Brown: positive operating voltage 18…30 VDC
Blue: negative operating voltage (GND)
Black: switching output
White: synchronisation
Coupling: at the piston accumulator with coupling medium
Sensor cable length: 2 or 5m respectively with right-angle plug.
Switching point display: integrated LED in the right-angle plug. (green, yellow)
Temperature range: piston type accumulator temp.:-20 ... +80 °C
Ambient temperature: -20 ... +60 °C
Storage temperature: -40 ... +85 °C

Attention: The range of working temperature is further restricted by the absolute viscosity.

Housing: IP67, oil-resistant, aluminium anodized, H x Ø 50x52 mm,thread M30X1,5

Regulation: Protection Type DIN EN 60529:1991 + A1:2000
EMC active: DIN EN 61326-1:2006 EMC
passive: IEC61000-4-2, -3, -4, -5, -6



4.1sb

4.1.10 ACCESSORIES

For clamps, see Chap. 7
For safety blocks, see Chap. 9
For pre-loading and charging set, see Chap.11
For pulse damper adapters, see Chap. 12.1

4.1.11 SPARE PARTS CODE

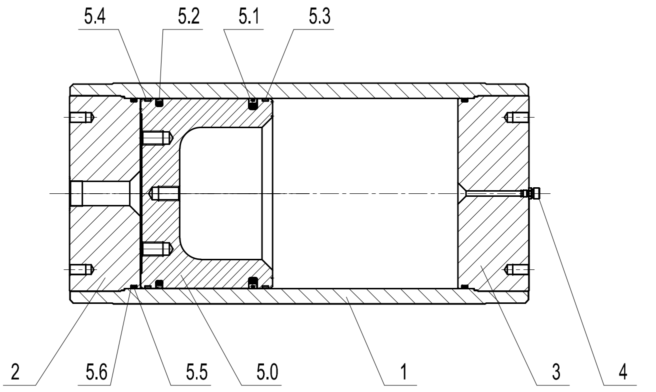


Fig. I

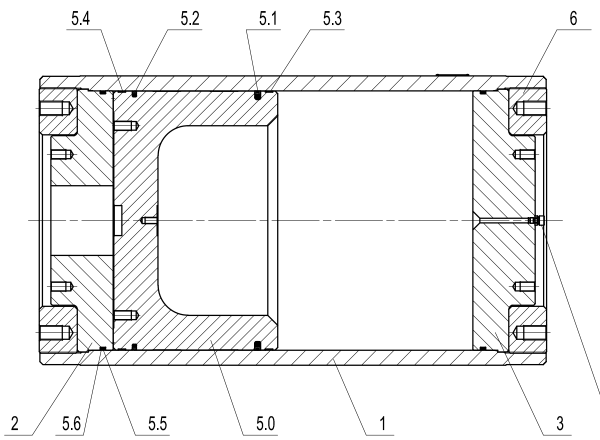


Fig. II

4.1t

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Pos.	Spare parts	Cylinder diameter	Fig.	Group code	Q.ty	Part description	Type / Code
1	Not supplied as spare parts					Accumulator cylinder	-
2						Oil side cap	
3						Gas side cap	
4				V 2072 ** / *	1	Gas filling valve 5/8" UNF	-
5.1	Accumulator gasket set	60	I	B2471 *** / ****	-	-	-
5.2					2	Gasket	B11500 - U
5.3					2	Piston guide	B11389 - T
5.5					2	O - ring	0010R6200 - *
5.6					2	Anti-extrusion ring	0011P8329 - *
5.0	Piston gasket set			B2477 ****	1	Piston	C11495 - 1 - A
5.1					-	-	-
5.2					2	Gasket	B11500 - U
5.3					2	Piston guide	B11389 - T
5.1	Accumulator gasket set	100	I	B2549 *** / ****	1	Gasket - gas side	0015GK753-100-*
5.2					1	Gasket - oil side	0015GK41-100-*
5.3					1	Piston guide gas side	0014KKT-100-TC
5.4					1	Piston guide oil side	0014K73-100-RP
5.5					2	O - ring	0010R185 -*
5.6					2	Anti-extrusion ring	0011P8341 -*
5.0	Piston gasket set			B2548 ****	1	Piston	C11496-13-A
5.1					1	Gasket - gas side	0015GK753-100-*
5.2					1	Gasket - oil side	0015GK41-100-*
5.3					1	Piston guide gas side	0014KKT-100-TC
5.4					1	Piston guide oil side	0014K73-100-RP
5.1	Accumulator gasket set	180	I	B2551 *** / ****	1	Gasket - gas side	0015GK753-180-*
5.2					1	Gasket - oil side	0015GK41-180-*
5.3					1	Piston guide gas side	0014KKT-180-TC
5.5					1	Piston guide oil side	0014K75-180-RP
5.6					2	O - ring	0010R228 - *
5.0	Piston gasket set			B2550 ****	2	Anti-extrusion ring	0011P8439 - *
5.0					1	Piston	C11497- 13 - A
5.1					1	Gasket - gas side	0015GK753180-*
5.2					1	Gasket - oil side	0015GK41-180-*
5.3					1	Piston guide gas side	0014KKT-180-TC
5.4					1	Piston guide oil side	0014K75-180-RP
5.1	Accumulator gasket set	250	I	B2553 *** / ****	1	Gasket - gas side	0015GK753-250-*
5.2					1	Gasket - oil side	0015GK41-250-*
5.3					1	Piston guide gas side	0014KKT-250-TC
5.4					1	Piston guide oil side	0014K75-250-RP
5.5					2	O - ring	0010R8925 - *
5.6					2	Anti-extrusion ring	0011P8447 - *
5.0	Piston gasket set			B2552 ****	1	Piston	C11498 - 13 - A
5.1					1	Gasket - gas side	0015GK753-250-*
5.2					1	Gasket - oil side	0015GK41-250-*
5.3					1	Piston guide gas side	0014KKT-250-TC
5.4					1	Piston guide oil side	0014K75-250-RP
5.1	Accumulator gasket set	350	I	B2555 *** / ****	1	Gasket - gas side	0015GK753-350-*
5.2					1	Gasket - oil side	0015GK41-350-*
5.3					1	Piston guide gas side	0014KKT-350-TC
5.4					1	Piston guide oil side	0014K75-350-RP
5.5					2	O - ring	0010R81300 - *
5.6					2	Anti-extrusion ring	0011P8455 - *
5.0	Piston gasket set			B2554 ****	1	Piston	C11499 -13 - A
5.1					1	Gasket - gas side	0015GK753-350-*
5.2					1	Gasket - oil side	0015GK41-350-*
5.3					1	Piston guide gas side	0014KKT-350-TC
5.4					1	Piston guide oil side	0014K75-350-RP
5.1	Accumulator gasket set	520	II	B2557 *** / ****	1	Gasket - gas side	0015GK753-520-*
5.2					1	Gasket - oil side	0015GK41-520-*
5.3					1	Piston guide gas side	0014KKT-520-TC
5.4					1	Piston guide oil side	0014K75-520-RP
5.6					2	O - ring	0010R82000 - *
5.6					2	Anti-extrusion ring	0011P8469 - *
5.0	Piston gasket set			B2556 ****	1	Piston	D11962 - 3 - A
5.1					1	Gasket - gas side	0015GK753-520-*
5.2					1	Gasket - oil side	0015GK41-520-*
5.3					1	Piston guide gas side	0014KKT-520-TC
5.4					1	Piston guide oil side	0014K75-520-RP
6	Not supplied as spare parts					Thread ring	-

* Gasket material ** Component material *** Gasket material – caps **** Gasket material – piston

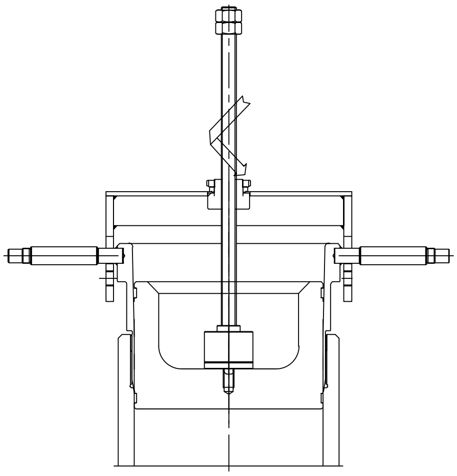
4.1u

4.1.12 REPAIR TOOL

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

4.1.12.1 ORDER CODE

Nominal diameter	Sleeve with screw order code
60	2487
100	2450
180	2483
250	2484
350	2485
520	2486



4.1z

Fig. Sleeve with screw

4.1.13 COMMISSIONING AND MAINTENANCE

Installation

Piston accumulators are delivered pre-charged with nitrogen at a pressure of 30 bar or at value of pressure required at time of order.
The pre-charge value is also on the nameplate of the accumulator.
Depending on the size and quantity ordered, the piston accumulators are shipped in boxes, in cartons, on pallets or wooden boxes on request.
Unless otherwise required, certificates and documentation are provided together with the accumulators.

Handling

The original packaging is suitable for handling and general storage.
Where necessary, you should use suitable lifting equipment to support the weight of the accumulators.
However protect from impact, the packaging and handle it with care.

Storage

During storage in the warehouse, leave the product in its original packaging, keeping it away from heat sources and naked flames. The storage temperature should be between +10 and +40°C.
After six years of storage, it is essential to proceed with the replacement of all elastomeric parts before the commissioning.

Marking on the nameplate of the accumulator

With reference to the PED 2014/68/EU classification, Article 3, Paragraph 3 and / or risk categories I or II depending on the volume and maximum working pressure, the accumulator indicates the following data:
- Logo, name and country of the manufacturer
- Month/year of production
- Product code
- Serial number
- Maximum PS pressure and PT test pressure in bar
- Min. and max. TS working temperature in Celsius
- Volume V in litres
- Group of fluids allowed (II)
- CE marking (for volume greater than 1 litre) with the identification number of the notified body
- Pre-charge pressure in bar

It is strictly forbidden to:
- weld, rivet or screw any item of 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 (dangerous) fluid of Group 1 with equipment designed and manufactured for fluids of Group 2.

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 security valve (see Chapter 8) or a security block type BS (see Chapter 9). This

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device provides user and equipment protection against possible damage caused by pressure surges and also makes the maintenance of the accumulator easier, facilitating the interception and the discharge.
Provide for a space of 200 mm above the gas pre-charge valve to allow access to and control of the pre-charge equipment (see Chap.11.1).
The accumulators type AP may be installed in any position from horizontal to vertical (preferably with the pre-charge valve at the top), and the nameplate 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 (please see Chapter 7) to avoid the transmission of vibrations.
If are not used EPE safety blocks, make sure that the accumulator is connected to the hydraulic circuit by suitable connection devices.
Make sure the fluid is compatible with the seals installed. 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.

Pre-charge of nitrogen

Normally, the piston accumulators are delivered pre-charged with pressurized gas. The pre-charge of gas can be controlled and / or adjusted before or after installation of the accumulator in the hydraulic circuit.
For the pre-charge, use only industrial dry nitrogen with a purity of min. 99%. It is important to use the nitrogen from a bottle equipped with a pressure reducing valve (see Chap.11.3).
Use the EPE pre-charge and charging set type PC to check the charging pressure required, and adjust if necessary.
If the pre-charge pressure is lower than required, connect the charging hase on one side and the other side connect it to the nitrogen bottle or to the pressure reducer. Slowly fill the nitrogen in the accumulator until reaching a pressure slightly higher than that set value (+ 10 ÷ 15%).
Close the bottle and remove the charging hase from the pre-loading set; wait until the gas temperature has stabilized (2 hours) and calibrate the pressure, discharging the excess gas.
Make sure that the gas valve is not subject to losses and, if necessary, use soap and water. Tighten the protective caps manually.

Hydraulic pressurization

- Check that the pre-charge pressure is adequate for the application
- Ensure that the hydraulic pressure never exceeds the max. allowed pressure (PS) shown on the accumulator shell.

To avoid this risk, use a safety device (see Chap. 9).

Maintenance

Accumulators must be regularly examined, checked for general condition and maintained on a periodic basis. The frequency and extent of inspection required will depend on application. Epe recommends to check the accumulator after one year, whichever occurs first.

Examination

Shall consist of visual check of the physical integrity of the equipment and, where applicable, a functional test.
Repair kits are available for all accumulator models; replacement of the piston seals is generally the only maintenance operation required.
Replacement of other seals on end caps and the gas valve is also recommended. Periodic checking of the pre-charge pressure will provide early warning of deteriorating piston seal performance.
If pre-charge pressure is low, check also for gas valve and/or end cap seal leakage.
Allowing for temperature difference, if any, the pre-charge pressure will rise if fluid collects in the gas side and will drop if gas leaks into the fluid side or past gas end cap seals.
It is suggested to carry out a check a week after the installation and thereafter once every three months or at intervals determined by the Manufacturer.

Disassembling AP piston accumulators removing the accumulator from a hydraulic system

- Shut down the hydraulic system and make sure that the hydraulic pressure at the accumulator is zero. In this condition, the piston will be bottomed at the hydraulic end.
- Remove the mounting screws or release the clamp(s) and remove the accumulator from the hydraulic system. Threaded holes in the hydraulic cap may be used to connect the lifting equipment or a rape may be used around the tube.

If a gas bottle is connected to the accumulator, make sure that it is discharged before disconnecting the accumulator.

Disassembling an AP accumulator

Gas pressure should always be discharged before the disassembly of an accumulator AP. Those accumulators have the oil and gas end caps threaded into the pipe. Always remove the gas cap first – identifiable by the gas valve or by a gas bottle connection.

- Place the accumulator horizontally and hold it down with a strap wrench or in a vice.
  When disassembling the larger accumulators, it is recommended to work with the accumulator in the vertical position.
- Unscrew the gas valve. Remove and discard the O-ring.
- To remove the gas end cap, fit screws into the tapped holes in the cap, then, using a long bar working against screws, unscrew the cap from the tube. When removing the end caps from the larger accumulators, it is recommended that the weight of the cap is supported by a hoist and sling.
- Remove the O-rings and parbak ring from the gas end cap, taking care

not to damage the grooves.
- Repeat the two last steps for the hydraulic end cap.
- Remove the piston by pushing it away from the hydraulic end with a soft-faced bar. Never try to remove the piston by applying compressed air to the opposite end.
- Remove the seals from the piston and the PTFE bearing rings

Cleaning
Thoroughly clean and dry the metal parts and clean the bore of the tube with clean, lint-free cloth.

Inspection
Inspect the piston for cracks, burrs around O-ring grooves, or damage. Examine the bore of the tube for scratches or scoring, using a lamp. Inspect the end caps for damaged threads or burrs on O-ring grooves.

Reassembly

Coat all internal parts with clean hydraulic fluid before reassembly. In order to protect the piston seals and for ease assembly purposes, the use of a loading sleeve is recommended – details of a suitable loading sleeve can be provided by Epe. To minimize the risk of damage to the piston and seals, it is recommended that the replacement piston assembly should be installed with the accumulator pipe positioned vertically.

Piston

- Lubricate and fit new seals and PTFE bearing rings. For inserting the piston into the body, the weight of the piston must be supported with a rape, taking care not to damage the seals or to introduce contamination when the piston enters the loading sleeve.
- Lubricate the piston and insert it, plain end first, into the loading sleeve positioned at the gas end of the pipe.
- Using a **clean** hammer and block, tap the piston into place

End Caps

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The O-ring and parbak ring, fitted to the accumulator end caps, have a flat face and a concave face to allow the ring and the parbak ring seaying correctly.

Hydraulic end cap

- Lubricate and install a new parbak ring in the groove in the hydraulic end cap, with its concave surface facing the inner end of the cap.
- Lubricate and fit a new O-ring on the concave face of the parbak ring.
- Lubricate the threads of the end cap and insert them into the pipe, facing the plain (hydraulic) side of the piston. Care should be pay not to scrape the O-ring over the pipe threads.
- Tighten the end cap using a bar against the screws threaded into the holes of the cap. When fully tight, the end cap will abut against the chamfer leading into the honed bore; extreme tightness is not required as sealing is achieved by the O-ring. The cap should not protrude beyond the end of the accumulator pipe by more than 1mm.

Gas end cap

- Repeat the instructions above for the hydraulic gas end cap. The gas end cap, when fitted, will face the dished side of the piston.
- For accumulators with a gas valve, lubricate and fit a new O-ring to the gas valve, thread the valve into the gas end cap and torque tighten to 30 + 5 Nm. Refit the gas valve cap.

Installation

Remount the accumulator and connect it to the hydraulic system, then pre-charge it.

Pre-charge

- Screw the pre-charge PC equipment on the gas valve.
- Connect the equipment to the nitrogen bottle or to the pressure reducer with the charging hase.
- Slowly enter the nitrogen in the accumulator until reaching a pressure slightly higher than the set value (+ 10 ÷ 15%).
- Close the bottle and remove the charging hase from the PC equipment.
- Wait until the gas temperature has stabilized (2 hours).
- Calibrate the pressure discharging the excess gas.

Demolition and recycling of the accumulator

Before accumulator demolition or recycling, you should always discharge completely the pre-charge pressure and remove the gas valve.
If you need, proceed decontaminating in relation to the fluid used prior to demolition.

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DIAPHRAGM ACCUMULATORS

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5.1.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS): (carbon steel) 210 - 330 bar
(stainless steel) 150 ÷ 210 bar

PRESSURE TEST (PT): 1,43 x PS

NOMINAL CAPACITIES: 0,05 - 0,1 - 0,35 - 0,5 - 0,75 - 1,5 - 2,5 litres

WORKING TEMPERATURE: -20 ÷ +150 °C

COMPRESSION RATIO (Po : P2): max 1 : 6

FLUID VISCOSITY RANGE: 10 ÷ 400 cSt

RECOMMENDED VISCOSITY: 36 cSt

FLUID CONTAMINATION DEGREE:
class 21/19/16 according to ISO 4406/99

BODY MATERIAL:
- carbon steel shell on painted with a black coat of rust inhibitor
- nickel coating 25 - 40 µ
- stainless steel AISI 316L
- duplex stainless steel SAF 2205

FILLING VALVE MATERIAL:
- galvanized carbon steel in compliance with Directive 2002/95/EC (RoHS) to resist to corrosion
- stainless steel AISI 316L

DIAPHRAGM MATERIAL:
- P = Nitrile rubber (NBR)
- F = Low temp. nitrile rubber
- K = Hydrogenated nitrile (HNBR)
- B = Butyl (IIR)
- E = Ethylene-propylene (EPDM)
- Y = Epichlorohydrin (ECO)
- V = Fluorocarbon (FKM)

See Table 5.1c and/or Chapter 1.5.

FILLING VALVE CONNECTION: - 5/8" UNF
FLUID PORT CONNECTION: - M18 x 1,5
- 1/2" - 3/4" BSP ISO228
- 1/2" - 3/4" NPT-F

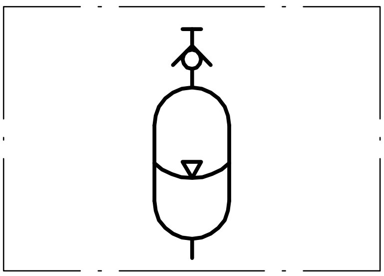
FLOW RATE: see table 5.1e
WEIGHT: see table 5.1e

5.1.2 "AM" DIAPHRAGM ADVANTAGES

- dirt tolerant
- light weight
- compact
- simple construction
- quick response
- works well on water, low lubricity fluids
- quick, easy installation
- low cost

5.1a

5.1.3 HYDRAULIC SYMBOL



5.1b

5.1.4 DESCRIPTION

Diaphragm accumulators type "AM" are pressure vessels composed of a spherical or spherical-cylindrical shaped body in 2 or 3 pieces depending on its capacity. The separator of the diaphragm accumulators comprises an elastic diaphragm.
At the centre of the diaphragm, there is a metal disk, which serves to prevent the extrusion from the oil side in the event of complete discharge of the accumulator. The separator of the accumulators type "AM" can be replaced by removing the hemispherical caps.
The diaphragm has no friction. Therefore, there is no pressure drop between the oil and gas side. The diaphragm also has a low mass inertia. Diaphragm accumulators are then preferably used as shock absorbers and pulsation dampeners in the following sectors: industrial, machine tools, furniture and agriculture.
Accumulators type "AM" have a recommended compression ratio of 1:6, which, depending on the number of cycles of the loading and unloading time can also be of 1:8 without compromising the life of the diaphragm.
Losses by diffusion of diaphragm accumulators are 1 ÷ 3% per year, de-

pending on the application characteristics.
The diaphragm may be made of different materials, so making the accumulators also suitable for corrosive liquids under pressure.
Compared to other accumulator types, the diaphragm ones have the highest energy density (energy content / mass). This feature is due to the spherical shape of the accumulator shell.
For the diaphragm accumulators, you can choose any type of installation. The preferred assembly is, however, the vertical one.

5.1.5 DIAPHRAGM - TEMPERATURE - LIQUID COMPATIBILITY

When selecting the accumulator variant, pay attention to the following non-binding notes with regard to hydraulic fluid, diaphragm material and the permissive temperature range.

Code letter	Polymer	ISO	Temperature range (°C)	Some of the liquids compatible with the polymer
P	Standard nitrile (Perburan)	NBR	-15 ÷ +80	Aliphatic hydrocarbons (propane, butane, gasoline, oils, mineral greases, diesel fuel, fuel oil, kerosene), mineral greases and oils, HFA - HFB - HFC fluids, many dilute acids, alkalis, saline solutions, water, water glycol.
F	Low temperature nitrile	NBR	-40 ÷ +70	The same as with standard nitrile + a number of different types of Freon. (This contains less acrylonitrile than the standard and is therefore more suitable for low temperatures, but its chemical resistance is slightly lower).
K	Hydrogenated nitrile	HNBR	-30 ÷ +130	The same as with standard nitrile but with excellent performance at high and low temperatures.
B	Butyl	IIR	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many acids and bases, salt solutions, polar solvents such as alcohols, ketones and esters, polyglycol-based hydraulic fluids (HFC fluids) and bases of esters of phosphoric acid (HFD-R fluids), silicone oils and greases, resistance to ozone, aging and weathering.
E	Ethylene-Propylene	EPDM	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many organic and inorganic acids, detergents, solutions of sodium and potassium, phosphate ester-based hydraulic fluids, (HFD-R), silicone oils and greases, many polar solvents (alcohol, ketones, esters), Skydrol LD4 and 500B-4, resistance to ozone, aging and weathering.
Y	Epichloridrin	ECO	-30 ÷ +110	Mineral oils and greases, aliphatic hydrocarbons (propane, butane and gasoline), silicone oils and greases, water at room temperature, resistance to ozone, aging and weathering.
V	Fluorocarbon	FKM	-10 ÷ +150	Mineral oils and greases, non-flammable fluids of HFD group, silicone oils and greases, animal and vegetable oils and greases, aliphatic hydrocarbons (gasoline, butane, propane, natural gas), aromatics hydrocarbons (benzene, toluene), chlorinated hydrocarbons (Tetrachloroethylene, carbon tetrachloride), fuel (regular, super and containing methanol), excellent resistance to ozone, weathering and aging.

5.1c

For other hydraulic fluid and/or temperatures, please consult us.

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5.1.6 ORDER CODE

1	2	3	4	5	6	7	8		9		10
AM	0,5	P	210	C	G	4	V	-	0	/	30

1	Series
	Diaphragm accumulator = **AM**

2	Nominal capacity
	0,05 lt = **0,05**
	0,1 lt = **0,1**
	0,35 lt = **0,35**
	0,5 lt = **0,5**
	0,75 lt = **0,75**
	1,5 lt = **1,5**
	2,5 lt = **2,5**

3	Diaphragm material	
	Nitrile rubber (NBR)	= **P**
	Nitrile for low temp.	= **F**
	Hydrogenated nitrile (HNBR)	= **K**
	Butyl (IIR)	= **B**
	Ethylene-propylene (EPDM)	= **E**
	Epichlorohydrin (ECO)	= **Y**
	Fluorocarbon (FKM)	= **V**

4 Max working pressure (PS)

Capacity litres	Carbon steel	Stainless steel
0,05 =	**210**	**150 – 210**
0,1 =	**210 - 330**	**150 – 210**
0,35 =	**210 - 330**	**150 – 210**
0,5 =	**210 - 330**	**150 – 210**
0,75 =	**210**	**150 – 210**
1,5 =	**210**	**150 – 210**
2,5 =	**210**	**150 – 210**

10	Precharge pressure (bar)
	Standard 30 bar = **0 ÷ 280** (< PS)

9	Test and certification	
	Factory testing	= **0**
	PED 2014/68/EU (for capacity 1,5-2,5 l)	= **8**
	EAC Passport (Russia)	= **11**
	Algeria passport	= **12**
	Standard regulation (NR13) (Brazil)	= **13**
	Tunisian passport	= **14**

8	Gas side connection	
	Standard filling valve with 5/8" UNF tread	= **V**
	Standard filling valve with 5/8" UNF tread in stainless steel	= **VX**

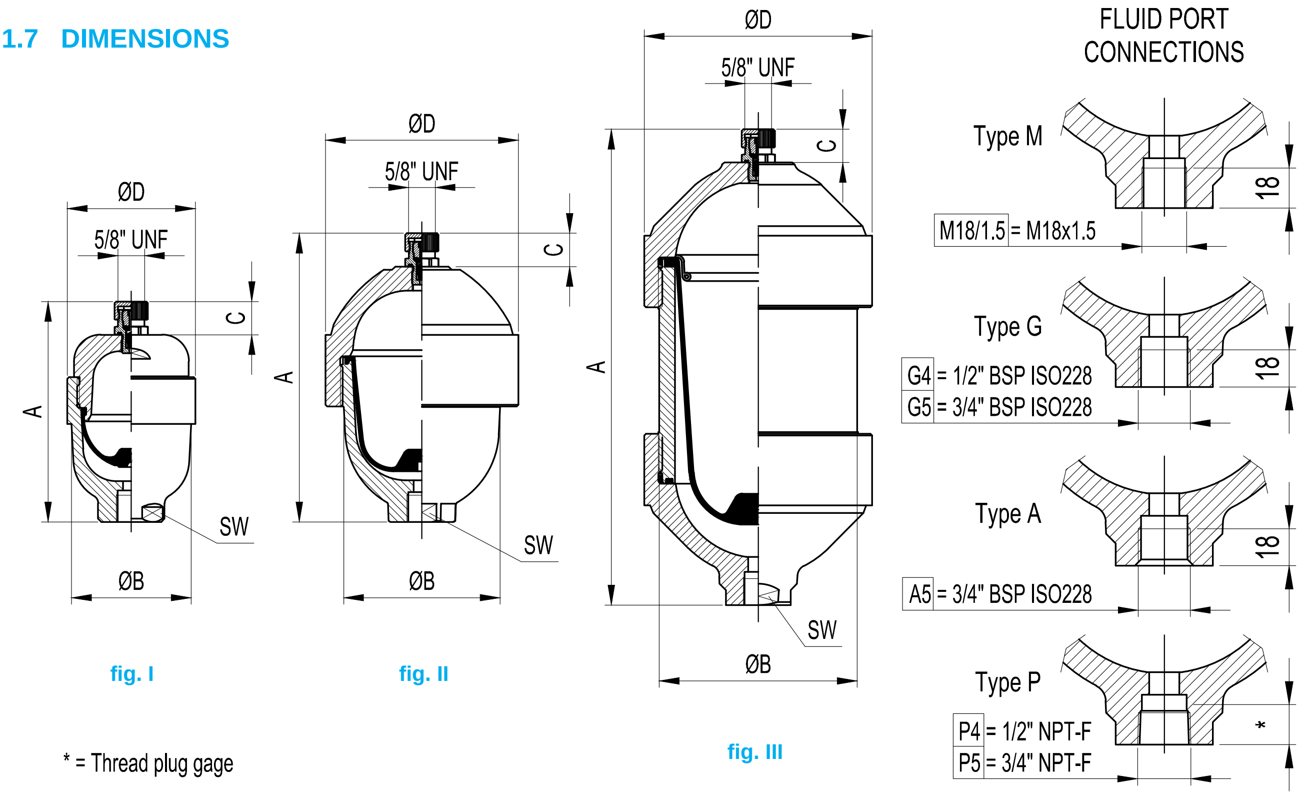
7	Dimension of connection side	
	For the type of connection:	
	M = (Diameter/Pitch)	**18/1,5**
	G (for capacity 0,05 ÷ 0,35 l) 1/2"	= **4**
	G (for capacity 0,5 ÷ 2,5 l) 1/2"	= **4**
	3/4"	= **5**
	A (for capacity 0,5 ÷ 2,5 l) 3/4"	= **5**
	P (for capacity 0,05 ÷ 0,35 l) 1/2"	= **4**
	P (for capacity 0,5 ÷ 2,5 l) 1/2"	= **4**
	3/4"	= **5**

6	Fluid port connection	
	Metric	= **M**
	BSP ISO 228	= **G**
	BSP ISO 228 with chamfer for OR	= **A**
	NPT-F (standard for stainless steel)	= **P**

5	Body material	
	Carbon steel	= **C**
	Carbon steel nickel coated 25 µ	= **N**
	Carbon steel nickel coated 40 µ	= **M**
	Stainless steel (150 bar)	= **X**
	Duplex stainless steel (210 bar)	= **D**

Special variants upon request

5.1.7 DIMENSIONS



* = Thread plug gage

5.1d

Accumulator type AM	Fig.	Nominal gas volume litres	Real gas volume litres	Working pressure bar	PED category for the liquids of group 2	Maximum differential pressure * bar	Flow rate ** l/min	Maximum compression ratio Po/P2	A mm	Ø B mm	C mm	Ø D mm	SW mm	Dry weight Kg
AM 0,05	I	0,05	0,05	150 210	Art.3 (3)	110	10	1 : 6	108	65	20	65	41	1,3
AM 0,1	I	0,1	0,1	150 210 330	Art.3 (3)	110	10	1 : 6	130	73	20	77	36	1,6
AM 0,35	I	0,35	0,32	150 210 330	Art.3 (3)	110	40	1 : 6	160	94	20	99	36	2,6
AM 0,5	II	0,5	0,48	150 210 330	Art.3 (3)	110	40	1 : 6	175	94	20	116	36	3,6
AM 0,75	II	0,75	0,72	150 210	Art.3 (3)	110	40	1 : 6	190	115	20	137	41	5,6
AM 1,5	III	1,5	1,4	150 210	II	110	50	1 : 6	290	120	20	137	41	9,4
AM 2,5	III	2,5	2,4	150 210	II	110	60	1 : 6	445	120	20	137	41	13,2

5.1e

* The maximum differential pressure is the maximum allowable difference between the maximum pressure and the minimum working pressure (P2-P1) to have an infinite life cycle of the accumulator (greater than 2,000,000 cycles).
** Flow rate measured using mineral oil with viscosity of 36 cSt at 50°C and ΔP = 5 bar

5.1.8 EUROPE MARKET

All hydraulic accumulators are pressure vessels and are subjected to the national regulations and directives, valid at the place of installation.
Diaphragm accumulators type AM, up to and including 1 litre, must not be CE marked.

For diaphragm accumulators type AM, greater than 1 litre, every shipping batch is provided with a conformity declaration a use and maintenance instructions and/or all the documents requested.
All vessel categories (see Table 5.1e) must be protected by means of a pressure relief valve in accordance with Directive 2014/68/EU.

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5.1.9 SPARE PARTS CODE

Item	Description	AM 0,05	AM 0,1	AM 0,35	AM 0,5	AM 0,75	AM 1,5	AM 2,5
1	Diaphragm P	MM0,05-P	MM0,1-P	MM0,35-P	MM0,5-P	MM0,75-P	MM1,5-P	MM2,5-P
	Diaphragm F	MM0,05-F	MM0,1-F	MM0,35-F	MM0,5-F	MM0,75-F	MM1,5-F	MM2,5-F
	Diaphragm K	MM0,05-K	MM0,1-K	MM0,35-K	MM0,5-K	MM0,75-K	MM1,5-K	MM2,5-K
	Diaphragm B	MM0,05-B	MM0,1-B	MM0,35-B	MM0,5-B	MM0,75-B	MM1,5-B	MM2,5-B
	Diaphragm E	MM0,05-E	MM0,1-E	MM0,35-E	MM0,5-E	MM0,75-E	MM1,5-E	MM2,5-E
	Diaphragm Y	MM0,05-Y	MM0,1-Y	MM0,35-Y	MM0,5-Y	MM0,75-Y	MM1,5-Y	MM2,5-Y
	Diaphragm V	MM0,05-V	MM0,1-V	MM0,35-V	MM0,5-V	MM0,75-V	MM1,5-V	MM2,5-V
2	Gas valve V	V2072-CP	V2072-CP	V2072-CP	V2072-CP	V2072-CP	V2072-CP	V2072-CP
	Gas valve VX	V2072-XP	V2072-XP	V2072-XP	V2072-XP	V2072-XP	V2072-XP	V2072-XP
3	Seal kit P						KG2087-P	KG2087-P
	Seal kit F						KG2087-F	KG2087-F
	Seal kit K						KG2087-K	KG2087-K
	Seal kit B						KG2087-B	KG2087-B
	Seal kit E						KG2087-E	KG2087-E
	Seal kit Y						KG2087-Y	KG2087-Y
	Seal kit V						KG2087-V	KG2087-V

5.1f

5.1.10 ACCESSORIES

For clamps see section 7
For safety blocks see section 9
For pre-loading and charging set see section 11
For pulse damper adapters see section 12.1

5.1.11 COMMISSIONING AND MAINTENANCE

Delivery condition

Diaphragm accumulators are delivered pre-charged with nitrogen at a pressure of 30 bar or at value of pressure required at time of order.
The preload value is still on the nameplate of the accumulator.
Depending on the size and quantity ordered, the diaphragm accumulators are shipped in boxes or in cartons or on pallets, or wooden boxes on request.
Unless otherwise required certificates and documentation are provided together with the accumulators.

Handling

The original packaging is suitable for handling and general storage.
Where necessary, you should use suitable lifting equipment to support the weight of the accumulators.
Protect from impact, however, the packaging and handle it with care.

Storage

During storage in the warehouse, leave the product in its original packaging, keeping it away from heat sources and naked flames. The storage temperature should be between +10 and +40°C.
After six years of storage, it is essential to proceed with the replacement of all elastomeric parts before the commissioning.

Marking on the nameplate of the accumulator

With reference to the PED 2014/68/EU classification, Article 3, Paragraph 3 and / or risk categories I or II according to the amount and maximum working pressure, the accumulator indicates the following

- logo, name and country of the manufacturer
- product code
- Month / year of production
- Serial number
- Maximum PS pressure and PT test pressure in bar
- Min. and max. TS working temperature in Celsius
- Volume V in litres
- Group of fluids allowed (II)
- CE marking (by volume exceeding 1 litre) with the identification number of the notified body
- Pre-charge pressure in bar

It is strictly forbidden to:

- weld, rivet or screw any item of 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 (dangerous) fluid of Group 1 with equipment designed and manufactured for fluids of Group 2.

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. The accumulator can be mounted in any position.
We recommend using the accumulator with a suitable safety valve (see section 8) or with a safety blocks type BS (see section 9).
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 (see Chap.11).
The accumulators type AM may be installed in any position from horizontal to vertical (preferably with the pre-charge valve at the top), and the nameplate 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 (please see section 7) to avoid the transmission of vibrations.
In the absence of the use of safety EPE blocks, make sure that the accumulator is connected to the hydraulic circuit through appropriate connecting devices.
Make sure the fluid is compatible with the elastomer of the diaphragm.
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.

Pre-charge of nitrogen

Normally, the diaphragm accumulators are delivered pre-charged with pressurized gas. The pre-charge of gas can be controlled and / or adjusted before or after installation of the accumulator in the hydraulic circuit.
For the pre-charge, use only industrial dry nitrogen with a purity of min. 99%. It is important to use the nitrogen from a cylinder equipped with a pressure reducing valve (see Chap.11.3). Use the EPE pre-loading and charging set type PC to check the charging pressure Calculated Against the pressure, and adjust if necessary.
If the pre-charge pressure is lower than required, connect the inflation tube on one side and the other of the equipment. Connect it to the cylinder of nitrogen or to the pressure reducer.
Slowly enter the nitrogen in the accumulator until reaching a pressure slightly higher than that set (+ 10 ÷ 15%).
Close the cylinder and remove the connecting pipe from the equipment; wait until the gas temperature has stabilized (1 hour) and calibrate the pressure, discharging the excess gas.
Make sure that the gas pipe is not subject to losses and, if necessary, use soap and water.
Tighten the protective cap manually.

Hydraulic pressurization

- Check that the pre-charge pressure is adequate for the application
- Ensure that the hydraulic pressure never exceeds the max. (PS) allowed and shown on the accumulator shell.

To avoid this risk, use a safety item (see section 9).

Maintenance

- Periodically check the pre-charge pressure of the gas: after the com-missioning, check after 2-3 weeks of operation and if there were no leaks, repeat the operation after 3 months; if the pressure at the same temperature was stable, repeat the test at annual intervals.
  For heavy-duty applications, check the pre-charge every 6 months.
- Periodically (annually) carry out a visual inspection of the accumulator in order to detect any early signs of deterioration such as corrosion, deformation, etc.
- Comply with the requirements of the regulations concerning the verification of the functionality of the equipment according to the country of installation of the accumulator.

Disassembly

If for failure, scheduled check or retest it is necessary to remove the accumulator from the system, prior to removal, isolate the accumulator from the installation and discharge pressure of the liquid.
All diaphragm EPE accumulators of the AM series may be repaired.
- Fix the bottom in a vice.
- Remove the pre-charge valve (after having discharged completely the nitrogen).
- Unscrew the top cap with a strap wrench or a spanner.

Remove the diaphragm and any seal.

Repair

It may consist in replacing the diaphragm, seals (if any) or pre-charging valve 5/8"UNF.
For reasons of functionality and security, it is recommended to use only original spare parts.
Before starting the repair, drain completely the nitrogen contained in the accumulator.

Refitting

After thorough cleaning, check and replace the damaged components.
The exterior of the diaphragm and any seal must be wetted with the working liquid.
Replace the cover and tighten it firmly.
Finally, replace the pre-charge valve with a tightening torque of 35 Nm.

Pre-charge

- Screw the pre-charge PC equipment on the gas valve.
- Connect the equipment to the cylinder of nitrogen or to the pressure reducer with the inflation tube.
- Slowly enter the nitrogen in the accumulator until reaching a pressure slightly higher than the set value (+ 10 ÷ 15%).
- Close the cylinder and remove the connecting pipe from the equipment.
- Wait until the gas temperature has stabilized (2 hours).
- Calibrate the pressure discharging the excess gas.

Demolition and recycling of the accumulator

Before accumulator demolition or recycling, you should always discharge completely the pre-charge pressure and remove the gas valve.
If you need, proceed decontaminating in relation to the fluid used prior to demolition.

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5.2.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS): (carbon steel) 250 - 350 bar
(stainless steel) 150 ÷ 210 bar

PRESSURE TEST (PT): 1,43 x PS

NOMINAL CAPACITIES: 0.8 - 1.5 litres

WORKING TEMPERATURE: -40 ÷ +150 °C

COMPRESSION RATIO (Po : P2): max 1 : 6

FLUID VISCOSITY RANGE: 10 ÷ 400 cSt

RECOMMENDED VISCOSITY: 36 cSt

FLUID CONTAMINATION DEGREE:
class 21/19/16 according to ISO 4406/99

BODY MATERIAL:
- carbon steel shell on painted with a black coat of rust inhibitor
- nickel coating 25 - 40 μ
- stainless steel AISI 316L
- duplex stainless steel SAF 2205

FILLING VALVE MATERIAL:
- galvanized carbon steel in compliance with Directive 2002/95/EC (RoHS) to resist to corrosion
- stainless steel AISI 316L

DIAPHRAGM MATERIAL:
- P = Nitrile rubber (NBR)
- F = Low temp. nitrile rubber
- K = Hydrogenated nitrile (HNBR)
- B = Butyl (IIR)
- E = Ethylene-propylene (EPDM)
- Y = Epichlorohydrin (ECO)
- V = Fluorocarbon (FKM)

See Table 5.2c and /or Chapter 1.5

FILLING VALVE CONNECTION: 5/8” UNF
FLUID PORT CONNECTION:
- M18 x 1,5
- 1/2” - 3/4” BSP ISO228
- 1/2” - 3/4” NPT-F

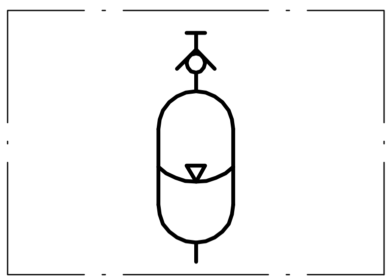
FLOW RATE: see table 5.2d
WEIGHT: see table 5.2d

5.2.2 “AML” DIAPHRAGM ADVANTAGES

- dirt tolerant
- light weight
- compact
- simple construction
- quick response
- works well on water, low lubricity fluids
- quick, easy installation
- low cost

5.2a

5.2.3 HYDRAULIC SYMBOL



5.2b

5.2.4 DESCRIPTION

Diaphragm accumulators type "AML" are pressure vessels composed of a forged shell, whose ends have a semi-spherical shape. The separator of the diaphragm accumulators comprises an elastic diaphragm.
At the centre of the diaphragm, there is a metal disk, which serves to prevent the extrusion from the oil side in the event of complete discharge of the accumulator.
The separator of the accumulators type "AML" can be replaced by removing the ring nuts on the gas site.
The diaphragm has very low friction. Therefore, the pressure drop between the oil and gas side is irrelevant. The diaphragm also has a low mass inertia. Diaphragm accumulators are then preferably used as shock absorbers and pulsation dampeners in the following sectors: industrial, machine tools, furniture and agriculture.
Accumulators type "AML" have a recommended compression ratio of 1:6, which, depending on the number of cycles of the loading and unloading time can also be of 1:8 without compromising the life of the dia-

phragm. Losses by diffusion of diaphragm accumulators are 1.5 ÷ 4% per year, depending on the application characteristics.
The diaphragm may be made of different materials, so making the accumulators also suitable for corrosive liquids under pressure.
For the diaphragm accumulators, you can choose any type of installation. The preferred assembly is, however, the vertical one.

5.2.5 DIAPHRAGM - TEMPERATURE - LIQUID COMPATIBILITY

When selecting the accumulator variant, pay attention to the following non-binding notes with regard to hydraulic fluid, diaphragm material and the permissive temperature range.

Code letter	Polymer	ISO	Temperature range (°C)	Some of the liquids compatible with the polymer
P	Standard nitrile (Perburan)	NBR	-20 ÷ +80	Aliphatic hydrocarbons (propane, butane, gasoline, oils, mineral greases, diesel fuel, fuel oil, kerosene), mineral greases and oils, HFA - HFB – HFC fluids, many dilute acids, alkalis, saline solutions, water, water glycol.
F	Low temperature nitrile	NBR	-40 ÷ +70	The same as with standard nitrile + a number of different types of Freon. (This contains less acrylonitrile than the standard and is therefore more suitable for low temperatures, but its chemical resistance is slightly lower).
K	Hydrogenated nitrile	HNBR	-30 ÷ +130	The same as with standard nitrile but with excellent performance at high and low temperatures.
B	Butyl	IIR	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many acids and bases, salt solutions, polar solvents such as alcohols, ketones and esters, polyglycol-based hydraulic fluids (HFC fluids) and bases of esters of phosphoric acid (HFD-R fluids), silicone oils and greases, resistance to ozone, aging and weathering.
E	Ethylene-Propylene	EPDM	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many organic and inorganic acids, detergents, solutions of sodium and potassium, phosphate ester-based hydraulic fluids, (HFD-R), silicone oils and greases, many polar solvents (alcohol, ketones, esters), Skydrol LD4 and 500B-4, resistance to ozone, aging and weathering.
Y	Epichloridrin	ECO	-30 ÷ +110	Mineral oils and greases, aliphatic hydrocarbons (propane, butane and gasoline), silicone oils and greases, water at room temperature, resistance to ozone, aging and weathering.
V	Fluorocarbon	FKM	-10 ÷ +150	Mineral oils and greases, non-flammable fluids of HFD group, silicone oils and greases, animal and vegetable oils and greases, aliphatic hydrocarbons (gasoline, butane, propane, natural gas), aromatics hydrocarbons (benzene, toluene), chlorinated hydrocarbons (Tetrachloroethylene, carbon tetrachloride), fuel (regular, super and containing methanol), excellent resistance to ozone, weathering and aging.

5.2c

For other hydraulic fluid and/or temperatures, please consult us.

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5.2.6 ORDER CODE

1	2	3	4	5	6	7	8		9		10
AML	1,5	P	250	C	M	18/1,5	V	-	8	/	30

1 Series
Diaphragm accumulator = **AML**

2 Nominal capacity
0,8 lt = **0,8**
1,5 lt = **1,5**

3 Diaphragm material	
Nitrile rubber (NBR)	= **P**
Nitrile for low temp.	= **F**
Hydrogenated nitrile (HNBR)	= **K**
Butyl (IIR)	= **B**
Ethylene-propylene (EPDM)	= **E**
Epichlorohydrin (ECO)	= **Y**
Fluorocarbon (FKM)	= **V**

4 Max working pressure (PS)		
Capacity litres	Carbon steel	Stainless steel
0,8 =	**250 - 350**	**150 – 210**
1,5 =	**250 - 350**	**150 – 210**

5 Body material	
Carbon steel	= **C**
Carbon steel nickel coated 25 µ	= **N**
Carbon steel nickel coated 40 µ	= **M**
Stainless steel (150 bar)	= **X**
Duplex stainless steel (210 bar)	= **D**

10 Precharge pressure (bar)
Standard 30 bar = **0 ÷ 280** (< PS)

9 Test and certification	
Factory testing	= **0**
PED 2014/68/EU (for capacity 1,5)	= **8**
EAC Passport (Russia)	= **11**
Algeria passport	= **12**
Standard regulation (NR13) (Brazil)	= **13**
Tunisian passport	= **14**

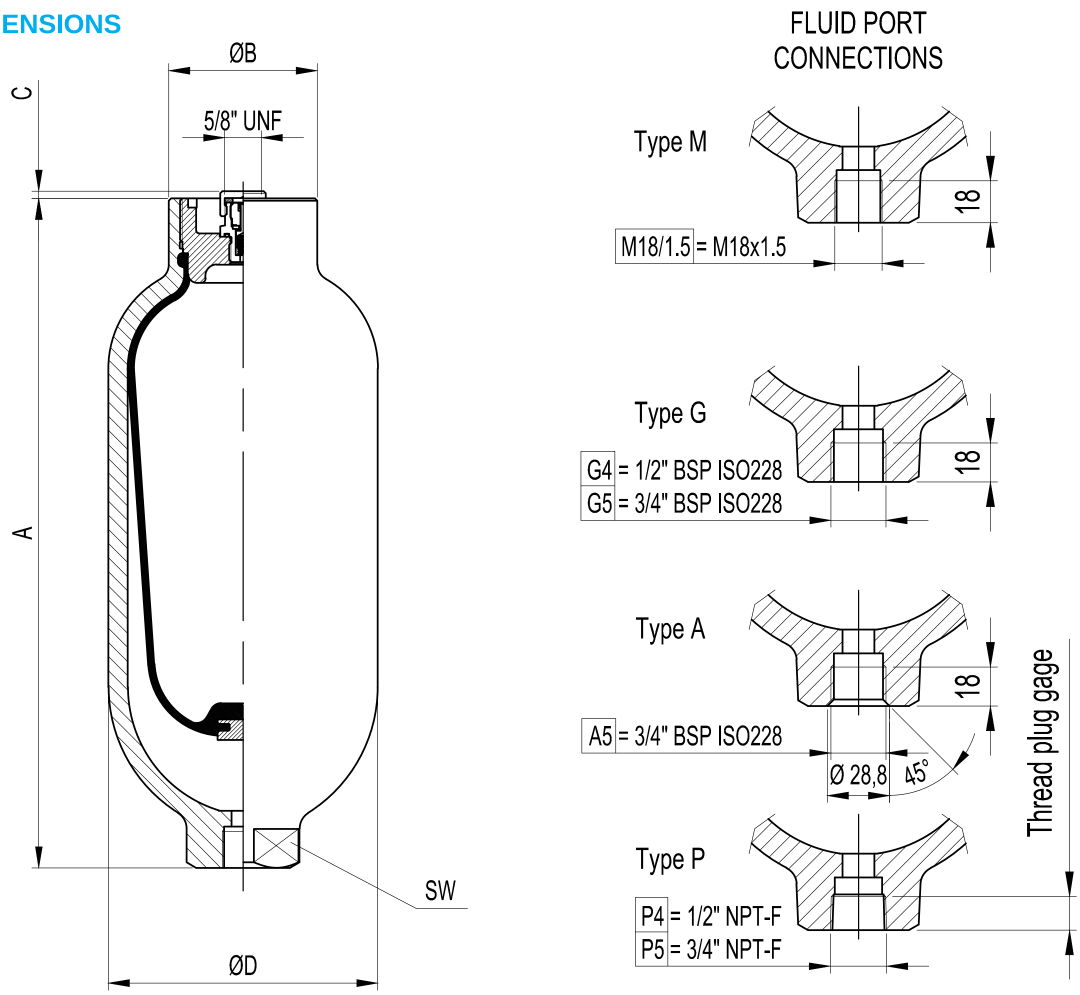
8 Gas side connection	
Standard filling valve with 5/8” UNF tread	= **V**
Standard filling valve with 5/8” UNF tread in stainless steel	= **VX**

7 Dimension of connection side		
For the type of connection:		
M = (Diameter/Pitch)		**18/1,5**
G	1/2”	= **4**
	3/4”	= **5**
A	3/4”	= **5**
P	1/2”	= **4**
	3/4”	= **5**

6 Fluid port connection	
Metric	= **M**
BSP ISO 228	= **G**
BSP ISO 228 with chamfer for OR	= **A**
NPT-F (standard for stainless steel)	= **P**

Special variants on request

5.2.7 DIMENSIONS



5.2d

Accumulator type AML volume	Nominal gas litres	Real gas volume litres	Working pressure bar	PED category for the liquids of group 2	Maximum differential pressure* bar	Flow rate ** l/min	Maximum compression ratio Po/P2	A mm	Ø B mm	C mm	Ø D mm	SW mm	Dry weight Kg
AML 0,8	0,8	0,8	150 210 250 350	Art.3 (3)	110	40	1 : 6	200	65	3	116	36	4,5
AML 1,5	1,5	1,5	150 210 250 350	II	110	40	1 : 6	295	65	3	116	36	5,6

- The maximum differential pressure is the maximum allowable difference between the maximum pressure and the minimum working pressure (P2-P1) to have an infinite life cycle of the accumulator (greater than 2,000,000 cycles). 5.2e
- Flow rate measured using mineral oil with viscosity of 36 cSt at 50°C and ΔP = 5 bar

5.2.8 EUROPE MARKET

All hydraulic accumulators are pressure vessels and are subjected to the national regulations and directives, valid at the place of installation.
Diaphragm accumulators type AML, up to and including 1 litre, must not be CE marked.

For diaphragm accumulators type AML, greater than 1 litre, every shipping batch is provided with a conformity declaration, use and maintenance instructions and/or all the documents requested.
All vessel categories (see Table 5.1c) must be protected by means of a pressure relief valve in accordance with Directive 2014/68/EU.

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5.2.9 SPARE PARTS CODE

Item	Description		AML 0,8	AML 1,5
1	Diaphragm	P	ML0,8-P	ML1,5-P
		F	ML0,8-F	ML1,5-F
		K	ML0,8-K	ML1,5-K
		B	ML0,8-B	ML1,5-B
		E	ML0,8-E	ML1,5-E
		Y	ML0,8-Y	ML1,5-Y
		V	ML0,8-V	ML1,5-V
2	Gas valve	V	V2072-CP	V2072-CP
		VX	V2072-XP	V2072-XP

5.2f

5.2.10 ACCESSORIES

For clamps see section 7
For safety blocks see section 9
For pre-loading and charging set see section 11
For pulse damper adapters see section 12.1

5.2.11 COMMISSIONING AND MAINTENANCE

Delivery condition

Diaphragm accumulators are delivered pre-charged with nitrogen at a pressure of 30 bar or at value of pressure required at time of order.
The pre-charge value is still on the nameplate of the accumulator.
Depending on the size and quantity ordered, the diaphragm accumulators are shipped in boxes, in cartons, on pallets or wooden boxes on request.
Unless required, certificates and documentation are provided together with the accumulators.

Handling

The original packaging is suitable for handling and general storage.
Where necessary, you should use suitable lifting equipment to support the weight of the accumulators.
However protect from impact the packaging and handle it with care.

Storage

During storage in the warehouse, leave the product in its original packaging, keeping it away from heat sources and naked flames. The storage temperature should be between +10 and +40°C.
After six years of storage, it is essential to proceed with the replacement of all elastomeric parts before the commissioning.

Marking on the nameplate of the accumulator

With reference to the PED 2014/68/EU classification, Article 3, Paragraph 3 and / or risk categories I or II depending on the volume and maximum working pressure, the accumulator indicates the following data:
- Month / year of production
- logo, name and country of the manufacturer
- product code
- Serial number
- Maximum pressure PS and test pressure PT in bar
- Min. and max. working temperature TS in Celsius
- Volume V in litres
- Group of fluids allowed (II)
- CE marking (for volumes exceeding 1 litre) with the identification number of the notified body
- Pre-charge pressure in bar

It is strictly forbidden to:

- 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 (dangerous) fluid of Group 1 with equipment designed and manufactured for fluids of Group 2.

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 security valve (see section 8) or a security block type BS (see section 9). This device provides user and equipment protection against possible damage caused by pressure surges and also makes the maintenance of the accumulator easier, and facilitate the interception and the discharge.
Provide for a spare of 200 mm above the gas pre-charge valve to allow access to and control of the pre-charge equipment (see section 11.2).
The accumulators type AML may be installed in any position from horizontal to vertical (preferably with the pre-charge valve at the top), and the nameplate 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 (please see Chapter 7) to avoid the transmission of vibrations.
Make sure the fluid is compatible with the elastomer of the diaphragm.
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.

Pre-charge of nitrogen

Normally, the diaphragm accumulators are delivered pre-charged with pressurized gas. The pre-charge of gas can be controlled and / or adjusted before or after installation of the accumulator in the hydraulic circuit.
For the pre-charge, use only industrial dry nitrogen with a purity of min. 99%. It is important to use the nitrogen from a cylinder equipped with a pressure reducing valve (see section 11.3). Use the EPE pre-charge and charging set type PC to check the charging pressure required and adjust if necessary.
If the pre-charge pressure is lower than required, connect the charging nose to the per-loading set on one side and the other side connect it to the nitrogen bottle or to the pressure reducer. Slowly free the nitrogen in the accumulator until reaching a pressure slightly higher than the set value (+ 10 ÷ 15%).
Close the bottle and remove the charging nose from the pre-loading set; wait until the gas temperature has stabilized (1 hour) and calibrate the pressure, discharging the excess gas. Make sure that the gas pipe is not subject to losses and, if necessary, use soap and water.
Tighten the protective cap manually.

Hydraulic pressurization

- Check that the pre-charge pressure is adequate for the application
- Ensure that the hydraulic pressure never exceeds the max. allowed pressure (PS) and shown on the accumulator shell.

To avoid this risk, use a safety device (see Chap. 9).

Maintenance

- Periodically check the pre-charge pressure of the gas: after the commissioning, check after 2-3 weeks of operation and if there were no leaks, repeat the operation after 3 months; if the pressure at the same temperature was stable, repeat the test at yearly. For heavy duty applications, check the pre-charge every 6 months.
- Periodically (yearly) carry out a visual inspection of the accumulator in order to detect any early signs of deterioration such as corrosion, deformation, etc.
- Comply with the requirements of the regulations concerning the verification of the functionality of the equipment according to the country of installation of the accumulator.

Disassembly

If for failure, scheduled check or retest it is necessary to remove the accumulator from the system, prior to removal, isolate the accumulator from the installation and discharge pressure of the liquid.
All diaphragm EPE accumulators of the AML series may be repaired.

- Fix the bottom in a vice simply.
- Remove the pre-charge valve (after having discharged completely the nitrogen).
- Unscrew the upper internal nut ring with a suitable wrench.

Remove the diaphragm.

Repair

It may consist in replacing the pre-charge valve of 5/8" UNF. For reasons of functionality and security, it is recommended to use only original spare parts.
Before starting the repair, discharge completely the nitrogen contained in the accumulator.

Reassembling

After thorough cleaning, check and replace the damaged components.
The exterior of the diaphragm must be wetted with the working liquid.
Refit the nut ring and tighten it firmly.
Finally, refit the pre-charge valve with a tightening torque of 35 Nm.

Pre-charge

- Screw the pre-charge PC equipment on the gas valve.
- Connect the equipment to the bottle of nitrogen or to the pressure reducer with the charging nose.
- Slowly jill the nitrogen in the accumulator until reaching a pressure slightly higher than the set value (+ 10 ÷ 15%).
- Close the bottle and remove the charging nose from the equipment.
- Wait until the gas temperature has stabilized (2 hours).
- Calibrate the pressure discharging the excess gas.

Demolition and recycling of the accumulator

Before accumulator demolition or recycling, you should always discharge completely the pre-charge pressure and remove the gas valve.
If you need, proceed decontaminating in relation to the fluid used prior to demolition.

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5.3.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS):
(carbon steel) 210 - 250 - 330 - 350 bar
(stainless steel) 100 bar (other, upon request)

PRESSURE TEST (PT): 1,43 x PS

NOMINAL CAPACITIES: litres
0.075 - 0.16 - 0.25 - 0.32 - 0.5 - 0.75 - 1 - 1.4 - 2 - 2.8 - 3.5

WORKING TEMPERATURE: -40 ÷ +80 °C

COMPRESSION RATIO (Po : P2): max 1 : 8; see Tab.5.3e

FLUID VISCOSITY RANGE: 10 ÷ 400 cSt

RECOMMENDED VISCOSITY: 36 cSt

FLUID CONTAMINATION DEGREE:
class 21/19/16 according to ISO 4406/99

BODY MATERIAL:
- carbon steel shell painted with a black rust inhibitor coat RAL 5005
- stainless steel AISI 316L

FILLING VALVE MATERIAL (internal screw):
- galvanized carbon steel in compliance with Directive 2002/95/CE (RoHS) to resist to corrosion
- stainless steel AISI 316L

DIAPHRAGM MATERIAL:
- P = Nitrile rubber (NBR)
- Y = Epichlorohydrin (ECO)
- B = Butyl (IIR)
- V = Fluorocarbon (FKM)

See Table 5.3c and /or Chapter 1.5

FILLING VALVE CONNECTION:
- M28 x 1.5
- without and closed

FLUID PORT CONNECTION:
- internal thread: 1/2” - 3/4” BSP ISO228
- external thread: M33x1.5

See Table 5.3e

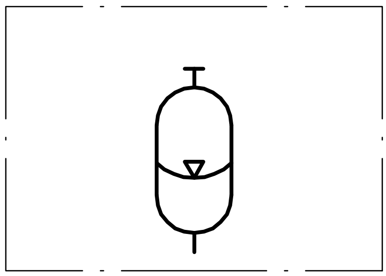
FLOW RATE: see Table 5.3e
WEIGHT: see Table 5.3e

5.3.2 “AMS” DIAPHRAGM ADVANTAGES

- high compression ratio
- dirt tolerant
- light weight
- compact
- simple construction
- quick response
- permanently sealed for maintenance free operation
- works well on low lubricity fluids
- quick, easy installation and replacement
- can be mounted in any position
- long service life
- low cost

5.2a

5.3.3 HYDRAULIC SYMBOL



5.2b

5.3.4 DESCRIPTION

The welded type diaphragm accumulators cannot be repaired, as they are specially designed for high quantity and economical applications, where it is more practical to replace the unit rather than refurbishing it.
These accumulators consist of a shell manufactured with a high strength alloy steel and a welded electron-beam.
The flexible diaphragm provides excellent gas and fluid separation. Diaphragm are available in two compounds:
- “P” nitrile (NBR)
- “Y” hydrin (ECO)
- “B” = Butyl (IIR)
- “V” = Fluorocarbon (FKM)

The button closes the fluid port when the accumulator is fully discharged to prevent diaphragm extrusion.
The fluid port is available provided with two types of connections:
- “G” BSP UNI228 female
- “W” BSP UNI228 female and external metric male

The gas valve is available in two versions:
- “VT” fixed pre-charge
-“VM” metric M28x1.5 gas valve and leak-free. It offers flexibility of checking or charging the accumulator (see charging kit type PCM).

This rugged gas valve features an internal hexagonal locking screw with sealing washer.
Diaphragm accumulators type AMS are then preferably used as shock absorbers and pulsation dampeners in the following sectors: industrial, machine tools, furniture and agriculture.

Compared to other accumulator types, the diaphragm ones have the highest energy density (energy content / mass). This feature is due to the spherical shape of the accumulator shell.
For the diaphragm accumulators, you can choose any type of installation. The preferred assembly is, however, the vertical one.

5.3.5 DIAPHRAGM - TEMPERATURE - LIQUID COMPATIBILITY

When selecting the accumulator variant, pay attention to the following non-binding notes with regard to hydraulic fluid, diaphragm material and the permissive temperature range.

Code letter	Polymer	ISO	Temperature range (°C)	Some of the liquids compatible with the polymer
P	Standard nitrile (Perburan)	NBR	-10 ÷ +80	Aliphatic hydrocarbons (propane, butane, gasoline, oils, mineral greases, diesel fuel, fuel oil, kerosene), mineral greases and oils, HFA - HFB - HFC fluids, many dilute acids, alkalis, saline solutions, water, water glycol.
Y	Epichloridrin	ECO	-30 ÷ +110	Mineral oils and greases, aliphatic hydrocarbons (propane, butane and gasoline), silicone oils and greases, water at room temperature, resistance to ozone, aging and weathering.
B	Butyl	IIR	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many acids and bases, salt solutions, polar solvents such as alcohols, ketones and esters, polyglycol-based hydraulic fluids (HFC fluids) and bases of esters of phosphoric acid (HFD-R fluids), silicone oils and greases, resistance to ozone, aging and weathering.
V	Fluorocarbon	FKM	-10 ÷ +150	Mineral oils and greases, non-flammable fluids of HFD group, silicone oils and greases, animal and vegetable oils and greases, aliphatic hydrocarbons (gasoline, butane, propane, natural gas), aromatics hydrocarbons (benzene, toluene), chlorinated hydrocarbons (Tetrachloroethylene, carbon tetrachloride), fuel (regular, super and containing methanol), excellent resistance to ozone, weathering and aging.

5.3c

For other hydraulic fluid and/or temperatures, please consult us.

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5.3.6 ORDER CODE

1	2	3	4	5	6	7	8		9		10
AMS	1,4	P	210	C	W	4	VM	-	0	/	30

1 Series

Diaphragm accumulator = **AMS**

2 Nominal capacity

0,075 lt	=	**0,075**
0,16 lt	=	**0,16**
0,32 lt	=	**0,32**
0,5 lt	=	**0,5**
0,75 lt	=	**0,75**
1 lt	=	**1**
1,4 lt	=	**1,4**
2 lt	=	**2**
2,8 lt	=	**2,8**
3,5 lt	=	**3,5**

3 Diaphragm material

Gomma nitrilica (NBR)	= **P**
Epicloridrina (ECO)	= **Y**
Butyl (IIR)	= **B**
Fluorocarbon (FKM)	= **V**

4 Max working pressure (PS)

Capacity (litres)	Carbon steel (bar)	Stainless steel
0,075 =	**250**	**100**
0,16 =	**250**	**100**
0,32 =	**210**	**100**
0,5 =	**210**	**100**
0,75 =	**150 - 210 - 330**	**100**
1 =	**210**	**100**
1,4 =	**210 - 350**	**100**
2 =	**100 - 210**	**100**
2,8 =	**210 - 350**	**100**
3,5 =	**250 - 350**	**-**

Special variants on request

10 Precharge pressure (bar)

Standard 30 bar = **0 ÷ 130** (max 130 bar)

9 Test and certification

Factory testing	= **0**
PED 2014/68/EU (for capacity 1,5-3,5 l)	= **8**
EAC Passport (Russia)	= **11**
Algeria passport	= **12**
Standard regulation (NR13) (Brazil)	= **13**
Tunisian passport	= **14**

8 Gas side connection

Standard filling valve thread M28x1.5 = **VM**

Without pre-charge valve with fixed pre-charge calibration = **VT**

7 Dimension of connection side

For the type of connection:

G (for capacity 0.075 ÷ 2,8 lt) 1/2" = **4**

G (for capacity 3.5 lt) 3/4" = **5**

6 Fluid port connection

BSP ISO 228 Female = **G**

BSP ISO 228 Female and metric male M33x1.5 = **W**

5 Body material

Carbon steel	= **C**
Stainless steel (100 bar)	= **X**
Carbon steel -40°C	= **L**

Types normally available from stock:

- AMS0.32P210CW4VM-0/30
- AMS0.5P210CW4VM-0/30
- AMS0.75P210CW4VM-0/30

5.3.7 DIMENSIONS

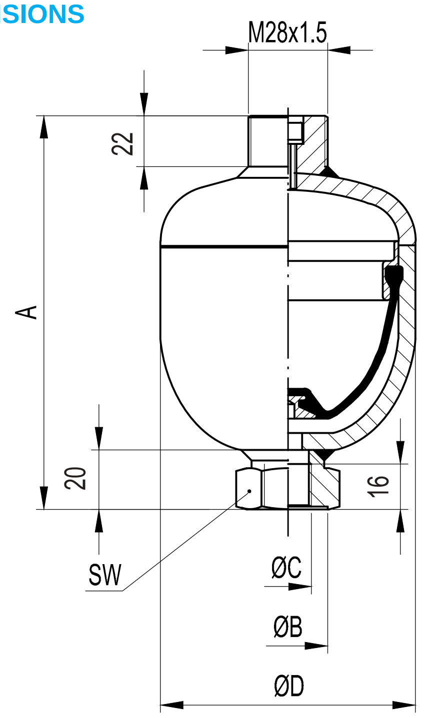

fig. I

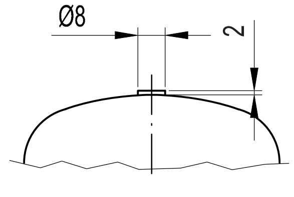

fig. III

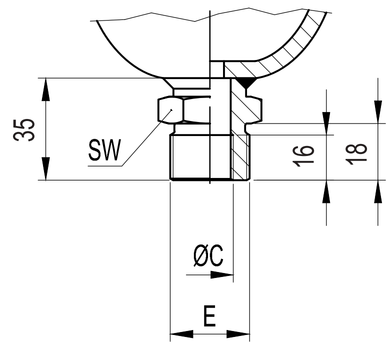

fig. II

5.3d

Accumulator type AMS	Fig.	Nominal gas value litres	Actual gas value litres	Working pressure bar	PED category for the liquids of group 2	Maximum differential pressure * bar	Flow rate ** l/min	Maximum compression ratio Po/P2	A mm	Ø B mm	Ø C mm	Ø D mm	E	SW mm	Dry weight Kg
AMS 0,075	I - II	0,075	0,075	250	Art.3 (3)	210	20	1 : 8	111	29	1/2”	64	-	32	0,7
AMS 0,16	I - II	0,16	0,16	250	Art.3 (3)	210	20	1 : 8	120	29	1/2”	75	M33x1,5	32	1
AMS 0,32	I - II	0,32	0,32	210	Art.3 (3)	140	40	1 : 8	138	29	1/2”	93	M33x1,5	32	1,4
AMS 0,5	I-II-III	0,5	0,5	210	Art.3 (3)	175	50	1 : 8	152	34	1/2”	105	M33x1,5	41	2
AMS 0.75	II-III I-II-III I-II-III	0.75	0.75	150 210 330	Art.3 (3)	120 175 150	50	1 : 8	161 162 169	34	1/2”	115 118 121	M33x1.5	41	2.6 2.6 4.4
AMS 1	I-II-III	1	1	210	Art.3 (3)	170	50	1 : 8	180	34	1/2”	130	M33x1.5	41	3.5
AMS 1.4	I-II-III	1.4	1.4	140 250 350	I II II	100 120 150	50	1 : 8	199 202 197	34	1/2”	148 157 160	M33x1.5	41	4.2 5.4 7.4
AMS 2	I-II-III I-II-III I-II I-II	2	2	100 210 250 350	I II II II	80 120 140 200	50 50 70 70	1 : 8	213 249 253 219	34	1/2” 1/2” 3/4” 3/4”	163 155 157 180	M33x1.5 M33x1.5 - -	41 41 41 55	3.5 4.2 7.5 11.3
AMS 2.8	I-II-III I-II I-II-III	2.8	2.8	210 250 350	II	100 140 200	50 70 70	1 : 4	269 273 279	34	1/2” 3/4” 3/4”	166,5 170,5 180	M33x1.5 - M45x1.5	41 41 55	8.2 10 14.3
AMS 3.5	I-II I-II-III	3.5	3.5	250 350	II III	140 200	70	1 : 4	300 385,5	34	3/4”	174 180	- M45x1.5	41 55	11.5 16

- The maximum differential pressure is the maximum allowable difference between the maximum pressure and the minimum working pressure (P2-P1) to have an infinite life cycle of the accumulator (greater than 2,000,000 cycles).
- Flow rate measured using mineral oil with viscosity of 36 cSt at 50°C and ΔP = 5 bar

5.3e

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5.3.8 EUROPE MARKET

All hydraulic accumulators are pressure vessels and are subject to the national regulations and directives, valid at the place of installation.
Diaphragm accumulator type AMS, up to and including 1 litre, must not be CE marked.
For diaphragm accumulator type AMS, greater than 1 litre, every shipping batch is provided with a conformity declaration and use and maintenance instructions and/or all documents requested.
All vessel categories (see Table 5.3e) must be protected by means of a pressure relief valve in accordance with Directive 2014/68/EU.

5.3.09 ACCESSORIES

For clamps, see Cap.7
For pre-loading and charging set, see Cap.11.2
For pulse damper adapters, see Cap.12.1

5.3.10 COMMISSIONING AND MAINTENANCE

Delivery condition

Diaphragm accumulators are delivered pre-charged with nitrogen at a pressure of 30 bar or at value of pressure required at time of order.
The pre-charge value is still on the nameplate of the accumulator.
Depending on the size and quantity ordered, the diaphragm accumulators are shipped in boxes or in cartons or on pallets, or wooden boxes on request.
Unless otherwise required, certificates and documentation are provided together with the accumulators.

Handling

The original packaging is suitable for handling and general storage.
Where necessary, you should use suitable lifting equipment to support the weight of the accumulators.
Protect from impact, however, the packaging and handle it with care.

Storage

During storage in the warehouse, leave the product in its original packaging, keeping it away from heat sources and naked flames. The storage temperature should be between +10 and +40°C.
After six years of storage, it is essential to proceed with the replacement of all elastomeric parts before the commissioning.

Marking on the nameplate of the accumulator

With reference to the 2014/68/EU classification, Article 3, Paragraph 3 and / or risk categories I or II according to the amount and maximum working pressure, the accumulator indicates the following
- logo, name and country of the manufacturer
- product code
- Month / year of production
- Serial number
- Maximum PS pressure and PT test pressure in bar
- Min. and max. TS working temperature in Celsius
- Volume V in litres
- Group of fluids allowed (II)
- CE marking (by volume exceeding 1 litre) with the identification number of the notified body
- Pre-charge pressure in bar

It is strictly forbidden to:

- engrave or permanently stamp the surfaces of the accumulator shell and / or carry out other operations that could affect or change the me chanical 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 (dangerous) fluid of Group 1 with equipment designed and manufactured for fluids of Group 2.

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 (see section 8) or a security safety block type BS (see section 9). 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 (see section 11.2).
The accumulators type AMS may be installed in any position from horizontal to vertical (preferably with the pre-charge valve at the top), and the nameplate 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 (please see Chapter 7) to avoid the transmission of vibrations.
Make sure the fluid is compatible with the elastomer of the diaphragm.
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.

Pre-charge of nitrogen

Normally, the diaphragm accumulators are delivered pre-charged with pressurized gas. The pre-charge of gas can be controlled and / or adjusted before or after installation of the accumulator in the hydraulic circuit.
For the pre-charge, use only industrial dry nitrogen with a purity of min. 99%. It is important to use the nitrogen from a cylinder equipped with a pressure reducing valve (see Chap.11.3). Use the EPE pre-charge and charging set type PCM to check the charging pressure Calculated Against the pressure, and adjust if necessary.
If the pre-charge pressure is lower than required, connect the inflation tube on one side and the other of the equipment. Connect it to the cylinder of nitrogen or to the pressure reducer. Slowly enter the nitrogen in the accumulator until reaching a pressure slightly higher than that set (+ 10 ÷ 15%).
Close the cylinder and remove the connecting pipe from the equipment; wait until the gas temperature has stabilized (1 hour) and calibrate the pressure, discharging the excess gas. Make sure that the gas pipe is not subject to losses and, if necessary, use soap and water.

Hydraulic pressurization

- Check that the pre-charge pressure is adequate for the application

- Ensure that the hydraulic pressure never exceeds the max. (PS) allowed and shown on the accumulator shell.

To avoid this risk, use a safety item (see Chap. 9).

Maintenance

- Periodically check the pre-charge pressure of the gas: after the commissioning, check after 2-3 weeks of operation and if there were no leaks, repeat the operation after 3 months; if the pressure at the same temperature was stable, repeat the test at annual intervals. For heavy-duty applications, check the pre-charge every 6 months.
- Periodically (annually) carry out a visual inspection of the accumulator in order to detect any early signs of deterioration such as corrosion, deformation, etc.
- Comply with the requirements of the regulations concerning the verification of the functionality of the equipment according to the country of installation of the accumulator.

Disassembly

If for failure, scheduled check or retest it is necessary to remove the accumulator from the system, prior to removal, isolate the accumulator from the installation and discharge pressure of the liquid.

All diaphragm EPE accumulators of the AMS series may be repaired.

- Fix the accumulator.
- Remove the pre-charge valve (after having discharged completely the nitrogen).

Repair

It may consist in replacing the pre-charge valve. For reasons of functionality and security, it is recommended to use only original spare parts.

Before starting the repair, drain completely the nitrogen contained in the accumulator.

Refitting

After thorough cleaning, check and replace the pre-charge valve.

Pre-charge

- Screw the pre-charge PCM equipment on the gas valve.
- Connect the equipment to the cylinder of nitrogen or to the pressure reducer with the inflation tube.
- Slowly enter the nitrogen in the accumulator until reaching a pressure slightly higher than the set value (+ 10 ÷ 15%).
- Close the cylinder and remove the connecting pipe from the equipment.
- Wait until the gas temperature has stabilized (1 hour).
- Calibrate the pressure discharging the excess gas.

Demolition and recycling of the accumulator

Before accumulator demolition or recycling, you should always discharge completely the pre-charge pressure and remove the gas valve.

If you need, proceed decontaminating in relation to the fluid used prior to demolition.

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6.1.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS): 360 bar

PRESSURE TEST (PT): 1.43 x PS

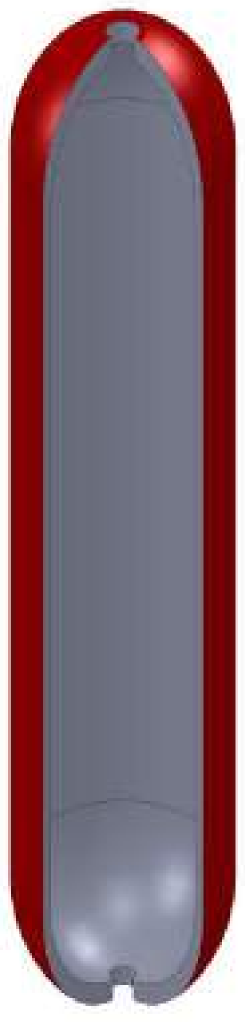
NOMINAL CAPACITIES: 52 - 75 litres

WORKING TEMPERATURE: -40 ÷ +150 °C

BODY MATERIAL: - carbon steel shell painted with rust Inhibitor RAL 8012
- nickel coating 25 - 40 μ

FLUID PORT CONNECTION: 3/4"BSP ISO 228 and
1" BSP ISO 228

WEIGHT: see Table 6.1c



6.1a

6.1.2 DESCRIPTION

Additional bottles type B consist of a seamless cylindrical pressure vessel made of high-tensile steel. They have one connection of 3/4" BSP ISO 228 and one of 1" BSP ISO 228.
The additional bottles are used to take in and store nitrogen to increase the gas volume in the accumulator station (with bladder or piston accumulator). This means that smaller accumulators can be used for the same gas volume and costs can be reduced. EPE offers a wide selection of bottles type, such as forged "B" version, shell of bladder accumulator "ASS" and "ASSA" versions or body piston type "AB" version.

6.1.3 "B" ADDITIONAL CYLINDERS ADVANTAGES

- compact
- simple construction
- quick, easy installation
- low cost

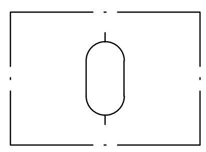
6.1.4 EUROPE MARKET

All hydraulic cylinders are pressure vessels and are subject to the national regulations and directives valid at the place of installation. For additional bottles type B, every shipping batch is complete of a conformity declaration and instructions of use and maintenance and/or all documents requested.
All vessel categories (see Table 6.1c) must be protected by means of a pressure relief valve in accordance with Directive 2014/68/EU.

6.1.5 ACCESSORIES

For support equipment, see section 7
For gas side's safety equipment, see section 8
For pre-loading and charging set, see section 11
For other components, see section 12

6.1.6 HYDRAULIC SYMBOL



6.1b

6.1.7 ORDER CODE

1	2	3	4	5	6	7	8	9		10
B	52	P	360	C	G	6	G	5	-	8

1 Series

Seamless additional bottle = **B**

2 Nominal capacity (litres)

52 = **52**
75 = **75**

3 Seals

Without

4 Max working pressure (bar)

360 = **360**

5 Body material

Carbon steel = **C**
Nickel coated carbon steel 25 µ = **N**
Nickel coated carbon steel 40 µ = **M**

6 Bottom connection

BSP ISO 228 = **G**

7 Bottom connection dimension

3/4” = **5**

8 Top connection

BSP ISO 228 = **G**

9 Top connection dimension

1” = **6**

10 Test and certification

Factory testing = **0**
ML (China) = **3**
RINA = **4**
PED 2014/68/EU (for capacity greater than1 l) = **8**
EAC Passport (Russia) = **11**
Algeria passport = **12**
Standard regulation (NR13) (Brazil) = **13**
Tunisian passport = **14**

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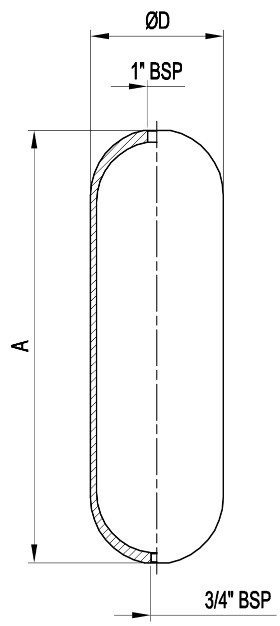
6.1.8 DIMENSIONS



Addittional bottle type B in carbon steel	Nominal gas volume litres	Effective gas volume litres	Working pressure bar	Ped category for the liquids of group 2	Maximum differential pressure bar	A mm	OD mm	Dry weight kg
B52	52	50	360	IV	100	1722± 10	220	93,5
B75	75	75	360	IV	100	2280± 10	229	142

6.1c

- The maximum differential pressure is the maximum allowable difference between the maximum pressure and the minimum working pressure (P2-P1) to have an infinite life cycle of the accumulator (greater than 2,000,000 cycles).

6.1.9 COMMISSIONING AND MAINTENANCE

Delivery condition

The additional bottles type B are shipped on pallets or wooden boxes upon request. Unless otherwise required, certificates and documentation are provided together with the bottles.

Handling

The original packaging is suitable for handling and storage. Where necessary, you should use suitable lifting equipment to support the weight of the bottles. However protect from impact the packaging and handle it with care.

Storage

During storage in the warehouse, leave the product in its original packaging, keeping it away from heat sources and naked flames. The storage temperature should be between +10 and +40°C.

Marking of the cylinder body

With reference to the PED 2014/68/EU classification, Article 3, Paragraph 3 and / or risk categories I or IV depending on to the volume and maximum working pressure, the cylinder indicates the following data:

- logo and country of the manufacturer
- month / year of production
- product code
- serial number
- maximum PS pressure and PT test pressure in bar
- min. and max. TS working temperature in Celsius
- volume V in litres
- group of fluids allowed
- CE marking with the identification number of the notified body

It is strictly forbidden to:

- weld, rivet or screw any item of the cylinder
- engrave or permanently stamp the surfaces of the cylinder shell and / or carry out other operations that could affect or change the mechanical properties of the cylinder
- use the cylinder as a structural element: it should not be subjected to stresses or loads
- change the data of the nameplate without the permission of the manufacturer
- use a (dangerous) fluid of Group 1 with equipment designed and manufactured for fluids of Group 2.

Installation

Before installation, you must perform a visual check to verify that the bottles has not suffered any damage during shipping / handling.
Verify that the requested type matches with what stamped on the nameplate.
We recommend using the additional bottles connected to the accumulator with a suitable safety valve (see Chapter 8).
This device provides the user and equipment protection against damage caused by pressure peaks.
The additional bottles type B may be installed in any position from horizontal to vertical (preferably with the connections vertically) and the data must be visible.
Proceed to the assembly so that no abnormal force affects the pipes connected directly or indirectly to the additional bottles, so we recommend
the use of supporting components and also fastening (please see Chapter 7) to avoid the transmission of vibrations.
Make sure that the cylinder is connected to the circuit through suitable connection devices.
Check that the max. allowed bottles pressure is equal to or greater than that of the circuit and that the temperature during operation is maintained within the range expected.
Make sure the fluid does not contain contaminants.

Maintenance

- Periodically check the pre-charge pressure of the system: after the commissioning, check after 2-3 weeks of operation and if there were no leaks, repeat the operation after 3 months; if the pressure at the same temperature was stable, repeat the test yearly. For heavyduty applications, check the pre-charge every 6 months.
- Periodically (yearly) carry out a visual inspection of the bottle in order to detect any early signs of deterioration such as corrosion, deformation, etc.
- Comply with the requirements of the regulations concerning the verification of the functionality of the equipment according to the country of installation of the bottle.

Disassembly

If for failure, scheduled check or retest it is necessary to remove the additional bottle from the system, prior to removal, completely discharge the pressure within the circuit.

Demolition and recycling of the additional cylinder

Before demolition or recycling of the additional cylinder, you should always discharge the internal pressure.
If needed, proceed decontaminating in relation to the gas/fluid used prior to demolition.

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6.2.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS): 360 bar

PRESSURE TEST (PT): 1.43 x PS

NOMINAL CAPACITIES: 3 - 5 - 10 - 15 - 20 - 25 - 35 - 55 litres

WORKING TEMPERATURE: -40 ÷ +150 °C

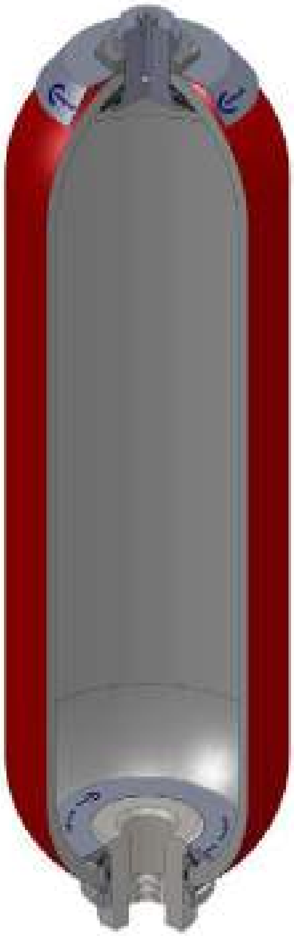
BODY MATERIAL - carbon steel shell painted with rust inhibitor RAL 8012
- nickel coating 25 - 40 µ
- internal and external coating with RILSAN th. 0.6 mm

VALVES MATERIAL: - phosphated or
- galvanized carbon steel in compliance with Directive 2002/95/EC (RoHS) to resist to corrosion
- stainless steel AISI 316L
- nickel coating 25-40 µ

SEALS MATERIAL: - **P** = Nitrile rubber (NBR)
- **F** = Low temp. nitrile rubber
- **H** = Nitrile for hydrocarbons
- **K** = Hydrogenated nitrile (HNBR)
- **B** = Butyl (IIR)
- **E** = Ethylene-propylene (EPDM)
- **N** = Chloroprene (Neoprene)
- **Y** = Epichlorohydrin (ECO)
- **V** = Fluorocarbon (FKM)

See Table 6.2c and/or Chapter 1.5

CONNECTIONS: see Table 6.2db - 6.2dc - 6.2df
WEIGHT: see Table 6.2db- 6.2df

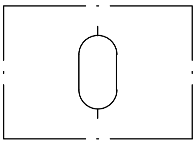


6.2a

6.2.2 DESCRIPTION

Additional bottles type ASS consist of a seamless cylindrical pressure vessel made of high-tensile steel.
They are derived from the same shells of the AS bladder accumulator.
The additional bottles are used to take in and store nitrogen to increase the gas volume in the accumulator station (with bladder or piston accumulator). This means that smaller accumulators can be used for the same gas volume and costs can be reduced. EPE offers a wide selection of bottles type, such as forged “B” version, shell of bladder accumulator “ASS” and “ASSA” versions or body piston type “AB” version.

6.2.4 HYDRAULIC SYMBOL



6.2b

6.2.3 “ASS” ADDITIONAL CYLINDERS ADVANTAGES

- compact
- simple construction
- wide range of small-medium capacity
- works well on water, low lubricity fluids
- quick, easy installation

6.2.5 SEALS-TEMPERATURE-LIQUID COMPATIBILITY

When selecting the additional cylinder variant, pay attention to the following non-binding notes with regard to hydraulic fluid, seals material and the permissive temperature range. (see Section)

Code letter	Polymer	ISO	Temperature range (°C)	Some of the liquids compatible with the polymer
P	Standard nitrile (Perburan)	NBR	-20 ÷ +80	Aliphatic hydrocarbons (propane, butane, gasoline, oils, mineral greases, diesel fuel, fuel oil, kerosene), mineral greases and oils, HFA - HFB - HFC fluids, many dilute acids, alkalis, saline solutions, water, water glycol.
F	Low temperature nitrile	NBR	-40 ÷ +70	The same as with standard nitrile + a number of different types of Freon. (This contains less acrylonitrile than the standard and is therefore more suitable for low temperatures, but its chemical resistance is slightly lower).
H	Nitrile for hydrocarbons	NBR	-10 ÷ +90	Regular and premium grade slightly aromatic gasoline (and all the liquids for standard nitrile).
K	Hydrogenated nitrile	HNBR	-30 ÷ +130	The same as with standard nitrile but with excellent performance at high and low temperatures.
B	Butyl	IIR	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many acids and bases, salt solutions, polar solvents such as alcohols, ketones and esters, polyglycol-based hydraulic fluids (HFC fluids) and bases of esters of phosphoric acid (HFD-R fluids), silicone oils and greases, resistance to ozone, aging and weathering.
E	Ethylene-Propylene	EPDM	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many organic and inorganic acids, detergents, solutions of sodium and potassium, phosphate ester-based hydraulic fluids, (HFD-R), silicone oils and greases, many polar solvents (alcohol, ketones, esters), Skydrol LD4 and 500B-4, resistance to ozone, aging and weathering.
N	Chloroprene (Neoprene)	CR	-30 ÷ +100	Mineral oils of paraffin, silicone oils and greases, water and aqueous solutions, refrigerants (ammonia, carbon dioxide, Freon), naphthenic mineral oils, low molecular aliphatic hydrocarbons (propane, butane, fuel), brake fluids based on glycol, better resistance to ozone, weathering and aging compared to NBR rubber.
Y	Epichloridrin	ECO	-30 ÷ +110	Mineral oils and greases, aliphatic hydrocarbons (propane, butane and gasoline), silicone oils and greases, water at room temperature, resistance to ozone, aging and weathering.
V	Fluorocarbon	FKM	-10 ÷ +150	Mineral oils and greases, non-flammable fluids of HFD group, silicone oils and greases, animal and vegetable oils and greases, aliphatic hydrocarbons (gasoline, butane, propane, natural gas), aromatics hydrocarbons (benzene, toluene), chlorinated hydrocarbons (Tetrachloroethylene, carbon tetrachloride), fuel (regular, super and containing methanol), excellent resistance to ozone, weathering and aging.

For other hydraulic fluid and/or temperatures, please consult us.

6.2c

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6.2.6 ORDER CODE

1	2	3	4	5	6	7	8		9
ASS	25	P	360	C	G	5	VT	-	8

1	Series
Additional bottle = **ASS**	

2	Nominal capacity (litres)
3 = **3**	
5 = **5**	
10 = **10**	
15 = **15**	
20 = **20**	
25 = **25**	
35 = **35**	
55 = **55**	

3	Seals material material
Nitrile rubber (NBR)	= **P**
Nitrile for low temp.	= **F**
Nitril for hydrocarbons	= **H**
Hydrogenated nitrile (HNBR)	= **K**
Butyl (IIR)	= **B**
Ethylene-propylene (EPDM)	= **E**
Chloroprene (Neoprene)	= **N**
Epichlorohydrin (ECO)	= **Y**
Fluorocarbon (FKM)	= **V**

4 Max working pressure (PS)	
Capacity litres	Carbon steel
3 ÷ 55	**360** 210 only for the version with connection L

5	Body material
Carbon steel	= **C**
Nickel coated carbon steel 25 µ	= **N**
Nickel coated carbon steel 40 µ	= **M**
Rilsan coating	= **V**

6	Bottom connection
BSP ISO 228 (std)	= **G**
adapter for flange SAE 3000 Psi	= **L**
adapter for flange SAE 6000 Psi	= **H**

9	Test and certification
Factory testing	= **0**
Australian Standard	= **2**
ML (China)	= **3**
RINA	= **4**
Lloyd's Register	= **5**
PED 2014/68/EU (for capacities greater than 1 l)	= **8**
ATEX 2014/34/EU (for surface)	= **9**
ATEX 2014/34/EU (for mine)	= **9M**
DNV	= **10**
EAC (Russia)	= **11**
Algeria passport	= **12**
Standard regulation (NR13) (Brazil)	= **13**
Tunisian passport	= **14**
Bureau Veritas	= **15**
ABS	= **16**
CCS	= **17**
Dosh	= **20**
CRN	= **21**

8	Top connection
Thread hole M12x1.5 plugged	= **VT**
1/4" BSP ISO 228	= **G2**
1/2" BSP ISO 228	= **G4**
3/4" BSP ISO 228	= **G5**
1" BSP ISO 228	= **G6**
1"1/4 BSP ISO 228	= **G7**
1"1/2 BSP ISO 228	= **G8**

7	Bottom connection dimension
For the type of connection:	
G 3/4"BSP ISO 228	= **5**
1" BSP ISO 228	= **6**
1"1/4 BSP ISO 228	= **7**
1"1/2 BSP ISO 228	= **8**
L (3÷5 l) 1" ¼ SAE3000	= **7**
(10÷55 l) 1" ½ SAE 3000	= **8**
2" SAE 3000	= **9**
H (3÷5 l) 1" ¼ SAE6000	= **7**
(10÷55 l) 1" ½ SAE 6000	= **8**
2" SAE 6000	= **9**
Special variants upon request	

6.2.7 DIMENSIONS

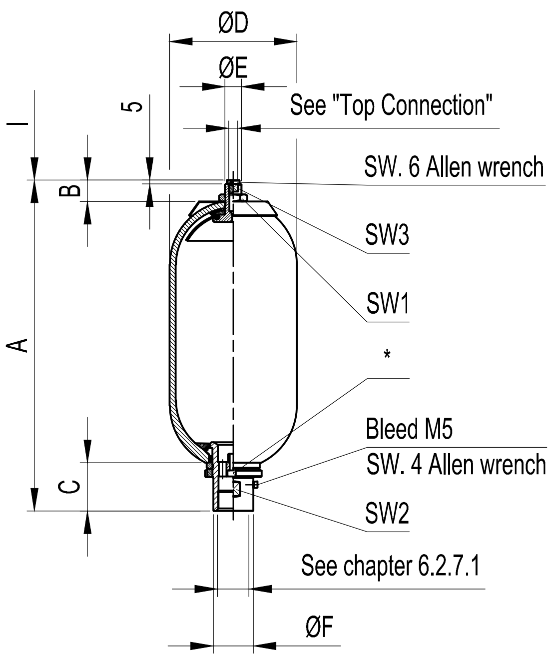

Fig. I

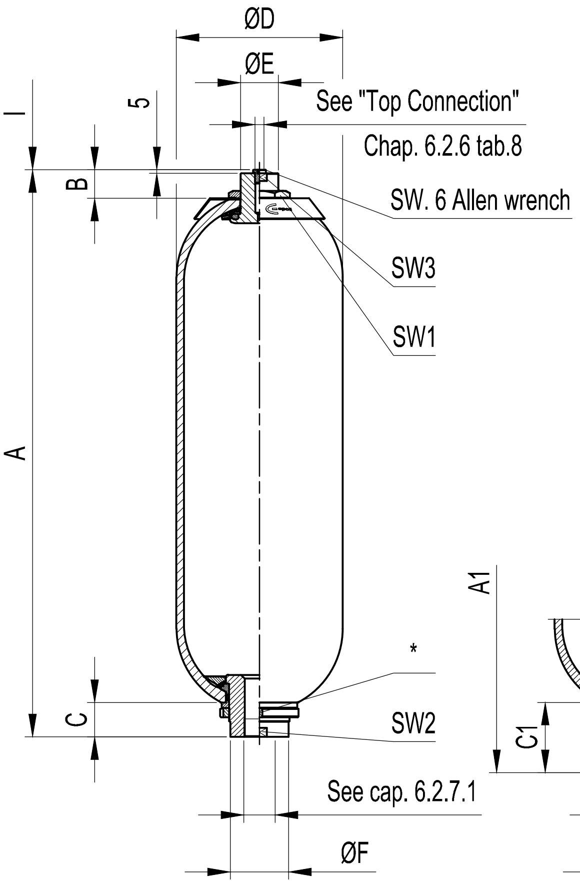

Fig. II

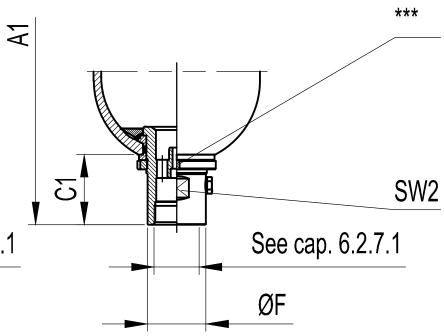

Fig. III

6.2da

Acc. type ASS in carbon steel	Nominal gas volume litres	Working pressure *bar*	Ped cat. fluids of group 2 AS	Fig.	A *mm*	A1** *mm*	B *mm*	C *mm*	C1** *mm*	ØD *mm*	ØE *mm*	ØF *mm*	I *mm*	SW 1 *mm*	SW 2 *mm*	SW 3 *mm*	Acc. dry weight *kg*
ASS 3	3	360	III	I	534 ± 8	-	28	65	-	114	M22x1,5	53	140	32	50	18	8
ASS 5	5	360	III	I	438 ± 10	-	28	65	-	168	M22x1,5	53	140	32	50	18	13
ASS 10	10	360	IV	II-III	500 ± 10	546 ± 10	35	55	93	220	M50x1,5	77	140	70	70	41	31
ASS 15	15	360	IV	II-III	650 ± 10	696 ± 10	35	55	93	220	M50x1,5	77	140	70	70	41	41
ASS 20	20	360	IV	II-III	810 ± 10	856 ± 10	35	55	93	220	M50x1,5	77	140	70	70	41	45
ASS 25	25	360	IV	II-III	975 ±15	1021 ±15	35	55	93	220	M50x1,5	77	140	70	70	41	56
ASS 35	35	360	IV	II-III	1325 ±15	1371 ±15	35	55	93	220	M50x1,5	77	140	70	70	41	74
ASS 55	55	360	IV	II-III	1835 ±15	1881 ±15	35	55	93	220	M50x1,5	77	140	70	70	41	102

* For tools see chapter 6.2.12 table 6.2di
** Only for connection type "A" see chapter 6.2.7.1

6.2db

- The maximum differential pressure is the maximum allowable difference between the maximum pressure and the minimum working pressure (P2-P1) to have an infinitelife cycle of the accumulator (greater than 2,000,000 cycles).
- Flow rate measured using mineral oil with viscosity of 36 cSt at 50°C and ΔP = 5 bar

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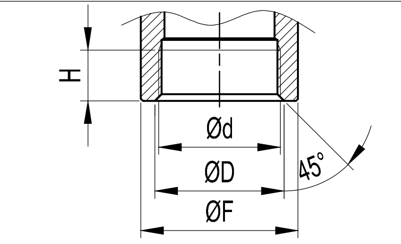
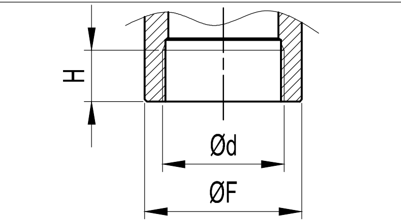
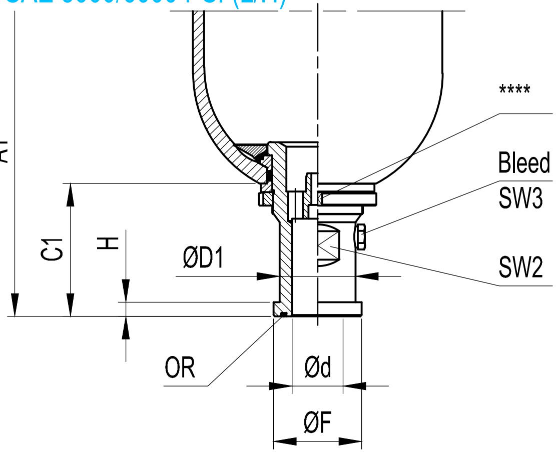
6.2.7.1 STANDARD THREAD CONNECTIONS

Dimensions	Connection Type	Accumulator type	Complete spare valve order code	Ød	ØD mm	ØF mm	H mm
	A BSP ISO 228 with chamfer for OR	ASS 3	V 2250-A7-**/*	1" 1/4 BSP	46	53	25
		ASS 5	V 2253-A7-**/*				
		ASS 10 ÷ 55	V 2064-A9-**/*	2" BSP	63,35	77	28
	G BSP ISO 228	ASS 10 ÷ 55	V 2267-G8-**/*	1" 1/2 BSP	-	77	25

* Gasket material ** Components material

6.2dc

6.2.7.2 ADAPTER FOR FLANGE SAE 3000/6000 PSI (L/H)



6.2de

Acc. type ASS in carbon steel	Dim.	A1 mm	C1 mm	SW2 mm	SW3 mm	Bleed	Ød mm	SAE 3000 (L) Spare valve order code	SAE 3000 (L) ØD1 mm	SAE 3000 (L) ØF mm	SAE 3000 (L) H mm	SAE6000 (H) Spare valve order code	SAE6000 (H) ØD1 mm	SAE6000 (H) ØF mm	SAE6000 (H) H mm	OR	Acc. dry weight kg
ASS 3	1"	589 ± 8	100	38	4***	M5	-	-	-	-	-	V 2025-H6-**/*	38	47,6	9,5	0010R4131-*	11
	1"1/4	578 ± 8	89				31	V 2025-L7-**/*	43	50,8	8	V 2025-H7-**/*	44	53,3	10,3	0010R4150-*	
ASS 5	1"	493 ± 10	100	38	4***	M5	-	-	-	-	-	V 2044-H6-**/*	38	47,6	9,5	0010R4131-*	15
	1"1/4	482 ± 10	89				31	V 2044-L7-**/*	43	50,8	8	V 2044-H7-**/*	44	53,3	10,3	0010R4150-*	
ASS 10	1"1/2	583 ± 10	115	42	19****	1/4"	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	33
	2"			55		BSP	45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	
ASS 15	1"1/2	733 ± 10	115	42	19****	1/4"	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	43
	2"			55		BSP	45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	
ASS 20	1"1/2	893 ± 10	115	42	19****	1/4"	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	48
	2"			55		BSP	45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	
ASS 25	1"1/2	1058 ± 15	115	42	19****	1/4"	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	59
	2"			55		BSP	45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	
ASS 35	1"1/2	1408 ± 15	115	42	19****	1/4"	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	78
	2"			55		BSP	45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	
ASS 55	1"1/2	1918 ± 15	115	42	19****	1/4"	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	108
	2"			55		BSP	45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	

* Gasket material ** Components material *** Allen wrench **** Ex. Wrench ***** see chapter 6.2.11 table 6.2dh

6.2df

6.2.8 SPARE PARTS CODE (STANDARD VERSION)

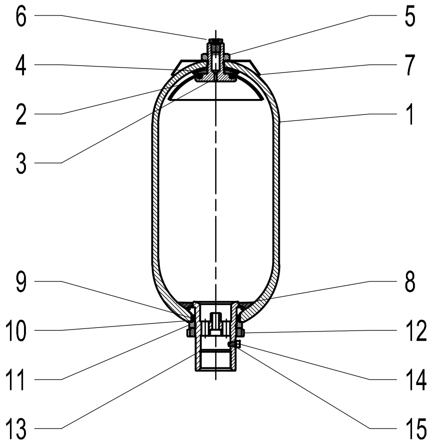


Fig. I

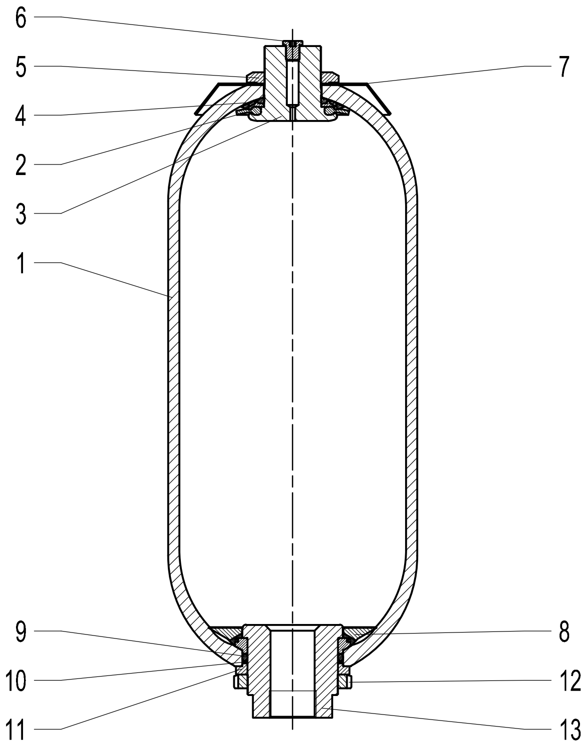


Fig. II

6.2dg

Item	Description	Q.ty	Type		
			ASS 3 (Fig. I)	ASS 5 (Fig. I)	ASS 10 ÷ 55 (Fig. II)
1	Accumulator shell	1	Not supplied as spare part		
2	Seal gas side	1	B11250 - *	B11252 - *	B10052 - *
3	Gas valve body	1	B10107 - **	B10202 - **	B10333 - **
4	Rubber-coated washer	1	B10106 - ** / *	B10205 - ** / *	B10334 - ** / *
5	Gas valve looknut	1	B10109 - **		B10302 - **
6	Plug	1	B10043 - **		
7	Name plate	1	D10300B-A	D10300C-A	D10300D-A
8	Retaining ring	1	B10146- ** / *	B10222 - ** / *	B10317 - ** / *
9	"O" ring	1	0010R0159 - *	0010R6212 - *	0010R0181 - *
10	Supporting ring	1	B10150-T	B10227-T	B10320-T
11	Space ring	1	B10223 - **		B10319 - **
12	Fluid port ring nut	1	B10217 - **		B10321 - **
13	Fluid port body	1	B10144 - *** - **		B10311 - *** - **
14	Bleed screw ****	1	B10128 - **		-
15	Seal ring ****	1	B10129-R		-
Standard gas valve ass. (parts 2 ÷ 6)		1	V 2033 - ** / *	V 2049 - ** / *	V 2270 - ** / *
Standard fluid port ass. (parts 8 ÷ 15)		1	V 2250 - *** - ** / *	V 2253 - *** - ** / *	V 2267 - *** - ** / *
Gasket sets		1	B2031-1-* { B11250-* 0010R0159-* B10150-T }	B2050-1-* { B11525-* 0010R6212-* B10227-T }	B2080-1-* { B10052-* 0010R0181-* B10320-T }

* Gasket material ** Component material *** See chapter 6.2.6 table 8 - 9

**** Only for Fig. I

6.2dh

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6.2.9 EUROPE MARKET

All hydraulic additional bottles are pressure vessels and are subject to the national regulations and directives valid at the place of installation.
For additional cylinders type ASS, every shipping batch is complete of a conformity declaration and instructions of use and. All vessel categories (see Table 6.2d) must be protected by means of a pressure relief valve in accordance with Directive 2014/68/EU.

6.2.10 ACCESSORIES

For support equipment, see section 7
For gas side's safety equipment, see section 8
For pre-loading and charging set, see section 11
For other components, see section 12

6.2.11 COMMISSIONING AND MAINTENANCE

Delivery condition.
Depending on the size and quantity ordered, the additional bottles are shipped in cartons or in cartons on pallets, or wooden boxes upon request. Unless otherwise required, certificates and documentation are provided together with the bottles.

Handling
The original packaging is suitable for handling and storage.
Where necessary, you should use suitable lifting equipment to support the weight of the bottles. However protect from impact the packaging and handle it with care.

Storage
During storage in the warehouse, leave the product in its original packaging, keeping it away from heat sources and naked flames. The storage temperature should be between +10 and +40°C.
After six years of storage, it is essential to proceed with the replacement of all elastomeric parts before the commissioning.

Marking on the nameplate of the additional cylinder.
With reference to the PED 2014/68/EU classification, Article 3, Paragraph 3 and / or risk categories I or IV depending on volume and maximum working pressure, the cylinder indicates the following data:
- logo, name and country of the manufacturer
- month / year of production
- product code
- serial number
- maximum PS pressure and PT test pressure in bar
- min. and max. TS working temperature in Celsius
- volume V in litres
- group of fluids allowed
- CE marking (by category I ÷ IV) with the identification number of the notified body

It is strictly forbidden to:
- weld, rivet, bolt or screw any item of the cylinder shell
- engrave or permanently stamp the surfaces of the cylinder shell and / or carry out other operations that could affect or change the mechanical properties of the cylinder
- use the cylinder as a structural element: it should not be subjected to stresses or loads
- change the data of the nameplate and / or the cylinder without the permission of the manufacturer
- use a (dangerous) fluid of Group 1 with equipment designed and manufactured for fluids of Group 2.

Installation
Before installation, you must perform a visual check to verify that the bottles has not suffered any damage during shipping / handling.
Verify that the requested type matches with what stamped on the nameplate.
We recommend using the additional bottles connected to the accumulator with a suitable safety valve (see Chapter 8).
This device provides user and equipment protection against possible damages due to pressure peaks.
The additional bottles type ASS may be installed in any position from horizontal to vertical (preferably with the connections vertically) and the nameplate must be visible.
Proceed to the assembly so that no abnormal force affects the pipes connected directly or indirectly to the additional bottles, so we recommend the use of supporting components and also fastening (please see Chapter 7) to avoid the transmission of vibrations.
Make sure that the bottle is connected to the hydraulic circuit through suitable connection devices.
Make sure the gas is compatible with the elastomer of the seals.
Check that the max. allowed bottle 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.

Maintenance
- Periodically check the pre-charge pressure of the system: after the commissioning, check after 2-3 weeks of operation and if there were no leaks, repeat the operation after 3 months; if the pressure at the same temperature was stable, repeat the test yearly. For heavy-duty applications, check the pre-charge every 6 months.
- Periodically (yearly) carry out a visual inspection of the bottle in order to detect any early signs of deterioration such as corrosion, deformation, etc.
- Comply with the requirements of the regulations concerning the verification of the functionality of the equipment according to the country of installation of the bottle.

Disassembly
If for failure, scheduled check or retest it is necessary to remove the additional bottle from the system, prior to removal, completely discharge the pressure within the circuit.
All additional EPE bottles of the ASS series can be repaired.

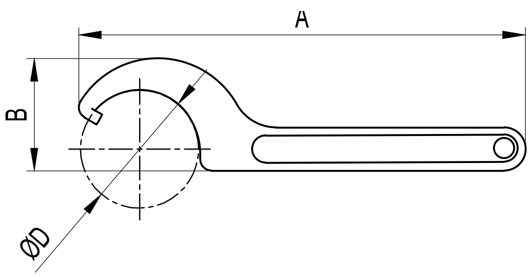
Repair
It can consist in replacing the seals and/or parts of the valves.
For reasons of functionality and security, it is recommended to use only original spare parts.

Demolition and recycling of the additional cylinder
Before demolition or recycling of the additional bottle, you should always discharge the internal pressure.
If needed, proceed decontaminating in relation to the gas/fluid used prior to demolition.

6.2.12 SPANNER WRENCH

Fits all standard size additional bottle type ASS, it is used to remove or install lock nut on fluid port essembly.
0.7÷1.5 lt code 2506/58
3÷5 lt code 2506/68
10÷55 lt code 2506/105

Dimension



CODE	A	B	ØD	For Accumulator
B2506/58	241	45	58	0.7 ÷ 1.5
B2506/68	241	43	68	3 ÷ 5
B2506/105	336	82	105	10 ÷ 55

6.2di

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6.3.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS): 4000 PSI

PRESSURE TEST (PT): 1.5 x PS

NOMINAL CAPACITIES: 1/4 - 1 - 2.5 - 5 - 10 - 15 gallons

WORKING TEMPERATURE: -40 ÷ +200 °F (-40 ÷ +93 °C)

BODY MATERIAL: - carbon steel shell (SA 372 grade E class 70) painted with rust inhibitor RAL 8012
- nickel coating 25 - 40 µ
- internal and external coating with RILSAN th. 0.6 mm

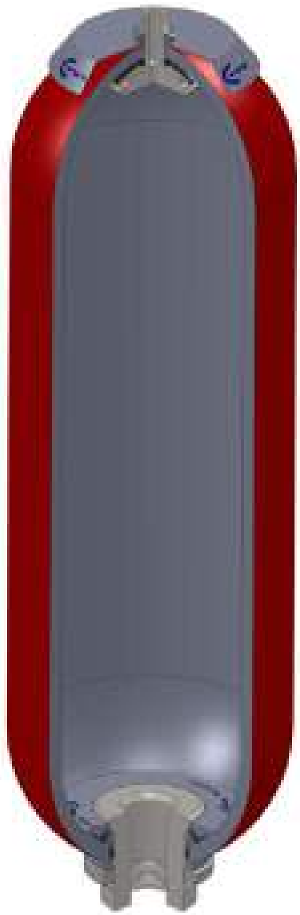
VALVES MATERIAL:- phosphated or
- galvanized carbon steel in compliance with Directive 2002/95/EC (RoHS) to resist to corrosion
- stainless steel AISI 316L
- nickel coating 25-40 µ

SEALS MATERIAL: - **P** = Nitrile rubber (NBR)
- **F** = Low temp. nitrile rubber
- **H** = Nitrile for hydrocarbons
- **K** = Hydrogenated nitrile (HNBR)
- **B** = Butyl (IIR)
- **E** = Ethylene-propylene (EPDM)
- **N** = Chloroprene (Neoprene)
- **Y** = Epichlorohydrin (ECO)
- **V** = Fluorocarbon (FKM)

See Table 3.1c and/or Chapter 6.2.5

CONNECTIONS: see Table 6.2db - 6.2dc - 6.2df

WEIGHT: see Table 6.2db - 6.2df



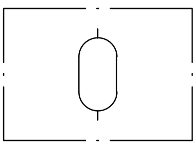
6.3a

6.3.2 DESCRIPTION

Additional bottles type ASSA consist of a seamless cylindrical pressure vessel made of high-tensile steel.
They are derived from the same shells of the bladder accumulator type ASSA.
The additional bottles are used to take in and store nitrogen to increase the gas volume in the accumulator station (with bladder or piston accumulator). This means that smaller accumulators can be used for the same gas volume and costs can be reduced. EPE offers a wide selection of bottles type, such as forged “B” version, shell of bladder accumulator “ASS” and “ASSA” versions or body piston type “AB” version.

6.3.4 HYDRAULIC SYMBOL

.



6.3b

6.3.3 “ASSA” ADDITIONAL CYLINDERS ADVANTAGES

- compact
- simple construction
- wide range of small-medium capacity
- works well on water, low lubricity fluids
- quick, easy installation

6.3.5 SEALS-TEMPERATURE-LIQUID COMPATIBILITY

When selecting the additional cylinder variant, pay attention to the following non-binding notes with regard to hydraulic fluid, seals material and the permissive temperature range. (see Section)

Code letter	Polymer	ISO	Temperature range (°C)	Some of the liquids compatible with the polymer
P	Standard nitrile (Perburan)	NBR	-20 ÷ +80	Aliphatic hydrocarbons (propane, butane, gasoline, oils, mineral greases, diesel fuel, fuel oil, kerosene), mineral greases and oils, HFA - HFB - HFC fluids, many dilute acids, alkalis, saline solutions, water, water glycol.
F	Low temperature nitrile	NBR	-40 ÷ +70	The same as with standard nitrile + a number of different types of Freon. (This contains less acrylonitrile than the standard and is therefore more suitable for low temperatures, but its chemical resistance is slightly lower).
H	Nitrile for hydrocarbons	NBR	-10 ÷ +90	Regular and premium grade slightly aromatic gasoline (and all the liquids for standard nitrile).
K	Hydrogenated nitrile	HNBR	-30 ÷ +130	The same as with standard nitrile but with excellent performance at high and low temperatures.
B	Butyl	IIR	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many acids and bases, salt solutions, polar solvents such as alcohols, ketones and esters, polyglycol-based hydraulic fluids (HFC fluids) and bases of esters of phosphoric acid (HFD-R fluids), silicone oils and greases, resistance to ozone, aging and weathering.
E	Ethylene-Propylene	EPDM	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many organic and inorganic acids, detergents, solutions of sodium and potassium, phosphate ester-based hydraulic fluids, (HFD-R), silicone oils and greases, many polar solvents (alcohol, ketones, esters), Skydrol LD4 and 500B-4, resistance to ozone, aging and weathering.
N	Chloroprene (Neoprene)	CR	-30 ÷ +100	Mineral oils of paraffin, silicone oils and greases, water and aqueous solutions, refrigerants (ammonia, carbon dioxide, Freon), naphthenic mineral oils, low molecular aliphatic hydrocarbons (propane, butane, fuel), brake fluids based on glycol, better resistance to ozone, weathering and aging compared to NBR rubber.
Y	Epichloridrin	ECO	-30 ÷ +110	Mineral oils and greases, aliphatic hydrocarbons (propane, butane and gasoline), silicone oils and greases, water at room temperature, resistance to ozone, aging and weathering.
V	Fluorocarbon	FKM	-10 ÷ +150	Mineral oils and greases, non-flammable fluids of HFD group, silicone oils and greases, animal and vegetable oils and greases, aliphatic hydrocarbons (gasoline, butane, propane, natural gas), aromatics hydrocarbons (benzene, toluene), chlorinated hydrocarbons (Tetrachloroethylene, carbon tetrachloride), fuel (regular, super and containing methanol), excellent resistance to ozone, weathering and aging.

For other hydraulic fluid and/or temperatures, please consult us.

6.3c

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6.3.6 ORDER CODE

1	2	3	4	5	6	7	8	9	10	11	12	13
ASSA	5	P	4000	C	H	8	VT	-	7	C	0	C	0

1 Series

Additional bottle with ASME U-Stamp = **ASSA**

2 Nominal capacity (gallons)

1/4 (0.95 l) = **1/4**
1 (3.78 l) = **1**
2.5 (9.46 l) = **2.5**
5 (18.93 l) = **5**
10 (37.85 l) = **10**
15 (56.78 l) = **15**

3 Seals material material

Nitrile rubber (NBR)	= **P**
Nitrile for low temp.	= **F**
Nitril for hydrocarbons	= **H**
Hydrogenated nitrile (HNBR)	= **K**
Butyl (IIR)	= **B**
Ethylene-propylene (EPDM)	= **E**
Chloroprene (Neoprene)	= **N**
Epichlorohydrin (ECO)	= **Y**
Fluorocarbon (FKM)	= **V**

4 Max working pressure (PS)

4000 PSI (275 bar) = **4000**
(3000 only for the version with connection L)

5 Body material

Carbon steel	= **C**
Nickel coated carbon steel 25 µ	= **N**
Nickel coated carbon steel 40 µ	= **M**
Rilsan coating	= **V**

9 Testing and certification

ASME U-STAMP (ASME VIII div.1 appendix 22)	= **7**
Australian standard	= **2**
Dosh	= **20**

8 Top connection

Thread hole M12x1.5 plugged	= **VT**
1/4" BSP ISO 228	= **G2**
1/2" BSP ISO 228	= **G4**
3/4" BSP ISO 228	= **G5**
1" BSP ISO 228	= **G6**
1"1/4 BSP ISO 228	= **G7**
1"1/2 BSP ISO 228	= **G8**

7 Bottom connection dimension

For the type of connection:

G 3/4"BSP ISO 228	= **5**
1" BSP ISO 228	= **6**
1"1/4 BSP ISO 228	= **7**
1"1/2 BSP ISO 228	= **8**
2" BSP ISO 228	= **9**
L (3÷5 l) 1" 1/4 SAE3000	= **7**
(10÷55 l) 1" 1/2 SAE 3000	= **8**
2" SAE 3000	= **9**
H (3÷5 l) 1" 1/4 SAE6000	= **7**
(10÷55 l) 1" 1/2 SAE 6000	= **8**
2" SAE 6000	= **9**
(1/4 gallon) 1"1/16 12UN	= **1 1/16-12**
(1 gallon) 1"5/8 12UN	= **1 5/8-12**
(2.5÷15 gallons) 1"7/8 12UN	= **1 7/8-12**

Special variants upon request

6 Bottom connection

BSP ISO 228	= **G**
BSP ISO 228 with chamfer for OR	= **A**
adapter for flange SAE 3000 Psi	= **L**
adapter for flange SAE 6000 Psi	= **H**
SAE connection	= **S**

6.3.7 DIMENSIONS

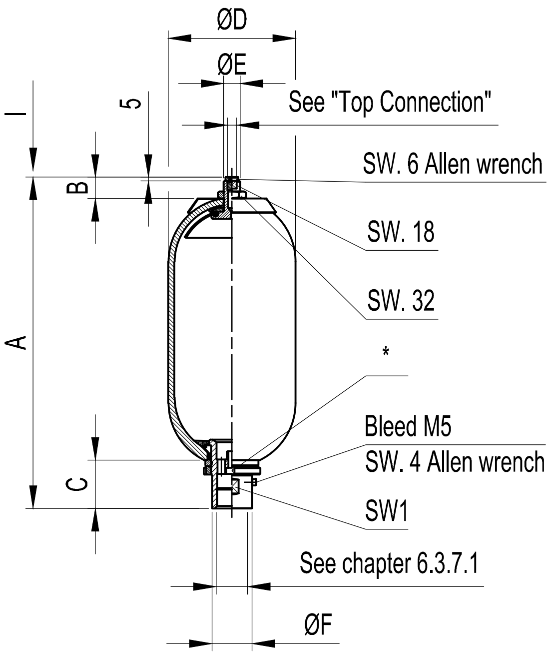

Fig. I

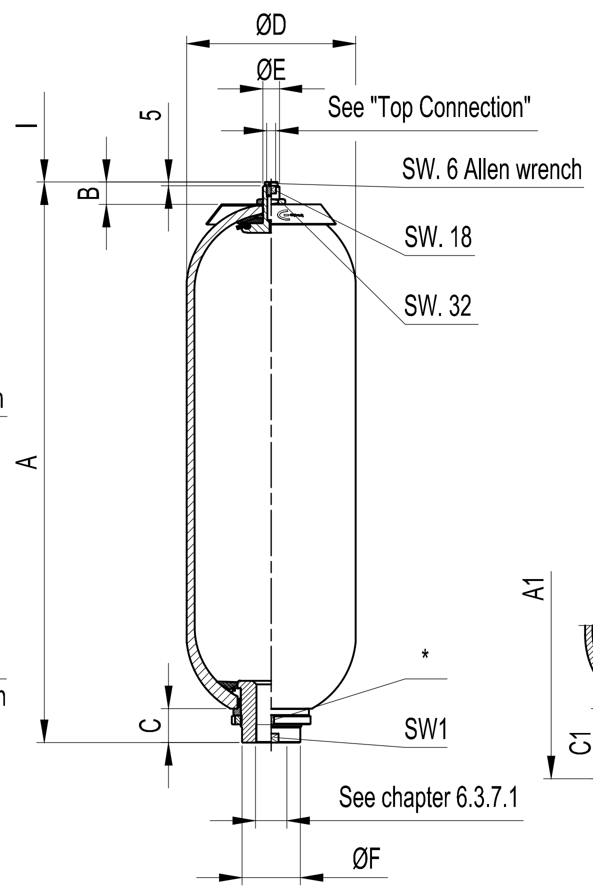

Fig. II

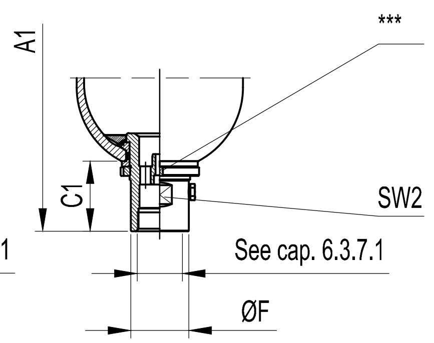

Fig. III

Acc. type ASSA in carbon steel	Nominal gas volume gallons	Effective gas volume litres	Working pressure *psi*	Max.diff. pressure P2-P1 *psi*	Flow rate *l/min*	Max.comp. ratio P0/P2	Fig.	A *mm*	A1** *mm*	B *mm*	C *mm*	C1** *mm*	Ø D *mm*	Ø E *mm*	ØF *mm*	I *mm*	SW 1 *mm*	Acc. dry weight *kg*
ASSA 1/4	1/4	1	4000	1450	300	1:4	I	261 ± 5	-	15	52	-	114	M22x1.5	36	140	32	11
ASSA 1	1	3,5	4000	1450	600	1:4	I	364 ± 10	-	20	65	-	168	M22x1.5	53	140	50	21
ASSA 2,5	2,5	9,1	4000	1450	1000	1:4	II-III	471 ± 10	527 ± 10	30	45	93	223	M22x1.5	77	140	70	35
ASSA 5	5	18,2	4000	1450	1000	1:4	II-III	775 ± 10	831 ± 10	30	45	93	223	M22x1.5	77	140	70	55
ASSA 10	10	33,5	4000	1450	1000	1:4	II-III	1309 ± 10	1365 ± 10	30	45	93	223	M22x1.5	77	140	70	91
ASSA 15	15	50	4000	1450	1000	1:4	II-III	1830 ± 10	1886 ± 10	30	45	93	223	M22x1.5	77	140	70	127

* see chapter 6.3.12 table 6.3dj

** Only for connection type "A" see chapter 6.3.7.1

6.3db

- The maximum differential pressure is the maximum allowable difference between the maximum pressure and the minimum working pressure (P2-P1) to have an infinitelife cycle of the accumulator (greater than 2,000,000 cycles).
- Flow rate measured using mineral oil with viscosity of 36 cSt at 50°C and ΔP = 5 bar

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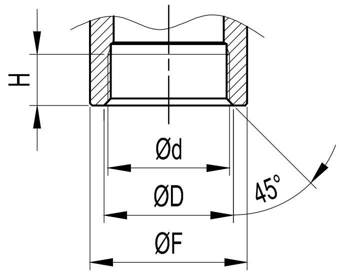
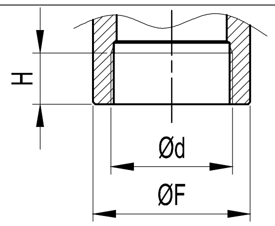
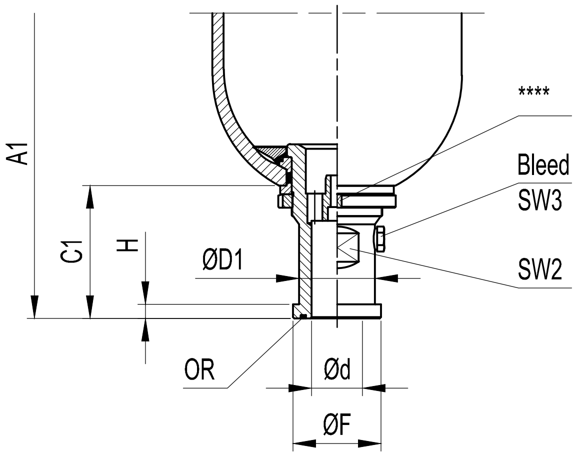
6.3.7.1 STANDARD THREAD CONNECTIONS

Dimensions	Connection Type	Accumulator type	Complete spare valve order code	Ød	ØD mm	ØF mm	H mm
	G BSP ISO 228	ASSA 1/4"	V 2250-A7-**/*	1" 1/4 BSP	46	53	25
		ASSA 1	V 2253-A7-**/*	1" 1/4 BSP	46	53	25
		ASSA 2,5 ÷ 15	V 2064-A9-**/*	2" BSP	63,35	77	28
		ASSA 2,5 ÷ 15	V 2267-G8-**/*	1" 1/2 BSP	-	77	25

* Gasket material ** Components material 6.3dc

6.2.3.2 ADAPTER FOR FLANGE SAE 3000/6000 PSI (L/H)



6.3de

Acc. type ASSA in carbon steel	Dim.	A1 mm	C1 mm	SW2 mm	SW3 mm	Bleed	Ød mm	SAE 3000 (L) Spare valve order code	SAE 3000 (L) ØD1 mm	SAE 3000 (L) ØF mm	SAE 3000 (L) H mm	SAE6000 (H) Spare valve order code	SAE6000 (H) ØD1 mm	SAE6000 (H) ØF mm	SAE6000 (H) H mm	OR	Acc. dry weight kg
ASSA 1/4"	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ASSA 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ASSA 2,5	1"1/2	541± 10	115	42	19****	1/4" BSP	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	38
	2"			55			45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	
ASSA 5	1"1/2	845 ± 10	115	42	19****	1/4" BSP	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	58
	2"			55			45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	
ASSA 10	1"1/2	1379± 10	115	42	19****	1/4" BSP	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	94
	2"			55			45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	
ASSA 15	1"1/2	1900± 10	115	42	19****	1/4" BSP	32	V 2064-L8-**/*	50	60,3	8	V 2064-H8-**/*	51	63,5	12,5	0010R4187-*	130
	2"			55			45	V 2064-L9-**/*	62	71,5	9,5	V 2064-H9-**/*	67	77,6		0010R4225-*	

* Gasket material ** Components material *** Allen wrench **** Ex. Wrench ***** see chapter 6.3.11 table 6.3dh 6.3df

6.3.8 SPARE PARTS CODE (STANDARD VERSION)

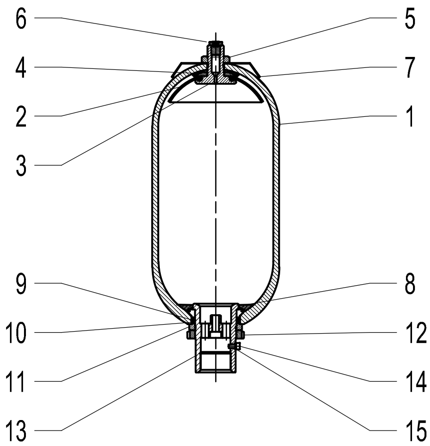


Fig. I

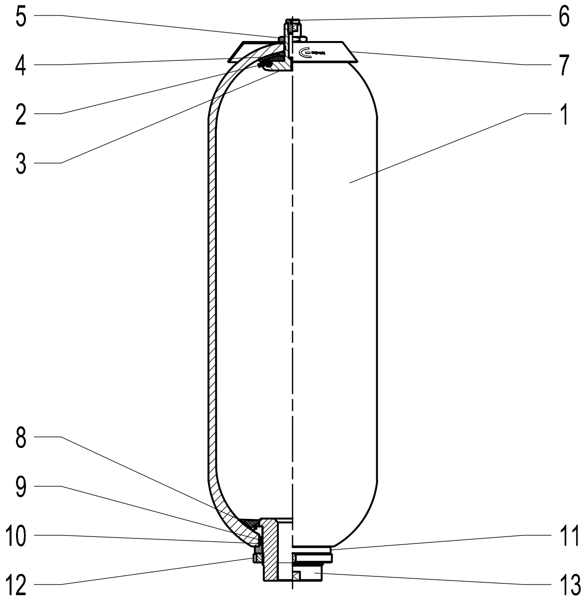


Fig. II

6.3dg

Item	Description	Q.ty	Type		
			ASSA 1/4 (Fig. I)	ASSA 1 (Fig. I)	ASSA 2,5 ÷ 15 (Fig. II)
1	Accumulator shell	1	Not supplied as spare part		
2	Seal gas side	1	B11250 - *	B11252 - *	B10052 - *
3	Gas valve body	1	B10107 - **	B10202 - **	B10333 - **
4	Rubber-coated washer	1	B10106 - ** / *	B10205 - ** / *	B10334 - ** / *
5	Gas valve looknut	1	B10109 - **		B10302 - **
6	Plug	1	B10043 - **		
7	Name plate	1	D10300B-A	D10300C-A	D10300D-A
8	Retaining ring	1	B10146- ** / *	B10222 - ** / *	B10317 - ** / *
9	"O" ring	1	0010R0159 - *	0010R6212 - *	0010R0181 - *
10	Supporting ring	1	B10150-T	B10227-T	B10320-T
11	Space ring	1	B10223 - **		B10319 - **
12	Fluid port ring nut	1	B10217 - **		B10321 - **
13	Fluid port body	1	B10144 - *** - **		B10311 - *** - **
14	Bleed screw ****	1	B10128 - **		-
15	Seal ring ****	1	B10129-R		-
Standard gas valve ass. (parts 2 ÷ 6)		1	V 2033 - ** / *	V 2049 - ** / *	V 2270 - ** / *
Standard fluid port ass. (parts 8 ÷ 15)		1	V 2250 - *** - ** / *	V 2253 - *** - ** / *	V 2267 - *** - ** / *
Gasket sets		1	B2380-1-* { B11250-*, 0010R0159-*, B10150-T }	B2381-1-* { B11525-*, 0010R6212-*, B10227-T }	B2382-1-* { B10052-*, 0010R0181-*, B10320-T }

* Gasket material ** Component material *** See chapter 6.3.6 table 8 - 9

**** Only for Fig. I

6.3dh

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6.3.9 EUROPE MARKET

All the additional bottles are pressure vessels and are subject to the national regulations and directives valid at the place of installation.
For additional bottles type ASSA, every shipping batch is complete of a conformity declaration and instructions of use and. All vessel categories (see Table 6.3d) must be protected by means of a pressure relief valve in accordance with Directive 2014/68/EU.

6.3.10 ACCESSORIES

For support equipment, see section 7
For gas side's safety equipment, see section 8
For pre-loading and charging set, see section 11
For other components, see section 12

06.3.11 COMMISSIONING AND MAINTENANCE

Delivery condition.

Depending on the size and quantity ordered, the additional bottles are shipped in cartons or in cartons on pallets, or wooden boxes upon request. Unless otherwise required, certificates and documentation are provided together with the bottles.

Handling

The original packaging is suitable for handling and storage. Where necessary, you should use suitable lifting equipment to support the weight of the bottles. However protect from impact the packaging and handle it with care.

Storage

During storage in the warehouse, leave the product in its original packaging, keeping it away from heat sources and naked flames. The storage temperature should be between +10 and +40°C.
After six years of storage, it is essential to proceed with the replacement of all elastomeric parts before the commissioning.

Marking on the nameplate of the additional bottle:

The additional bottle will be supplied with th following data stamped on the nameplate:

- Logo, name and country of the manufacturer
- Month/year of production
- Product code
- Serial number
- Maximum PS pressure and PT test pressure in Psi
- Min. and max. TS working temperature in Fahrenheit
- Volume V in gallons
- ASME U-stamp
- Pre-charge pressure in Psi

It is strictly forbidden to:

- weld, rivet, bolt or screw any item of the cylinder shell
- engrave or permanently stamp the surfaces of the cylinder shell and / or carry out other operations that could affect or change the mechanical properties of the cylinder
- use the cylinder as a structural element: it should not be subjected to stresses or loads
- change the data of the nameplate and / or the cylinder without the permission of the manufacturer
- use a (dangerous) fluid of Group 1 with equipment designed and manufactured for fluids of Group 2.

Installation

Before installation, you must perform a visual check to verify that the bottles has not suffered any damage during shipping / handling.
Verify that the requested type matches with what stamped on the nameplate.
We recommend using the additional bottles connected to the accumulator with a suitable safety valve (see Chapter 8). This device provides user and equipment protection against possible damages due to pressure peaks.
The additional bottles type ASSA may be installed in any position from horizontal to vertical (preferably with the connections vertically) and the nameplate must be visible.
Proceed to the assembly so that no abnormal force affects the pipes connected directly or indirectly to the additional bottles, so we recommend the use of supporting components and also fastening (please see Chapter 7) to avoid the transmission of vibrations.
Make sure that the bottle is connected to the hydraulic circuit through suitable connection devices.
Make sure the gas is compatible with the elastomer of the seals.
Check that the max. allowed bottle 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.

Maintenance

- Periodically check the pre-charge pressure of the system: after the commissioning, check after 2-3 weeks of operation and if there were no leaks, repeat the operation after 3 months; if the pressure at the same temperature was stable, repeat the test yearly. For heavy-duty applications, check the pre-charge every 6 months.
- Periodically (yearly) carry out a visual inspection of the bottle in order to detect any early signs of deterioration such as corrosion, deformation, etc.
- Comply with the requirements of the regulations concerning the verification of the functionality of the equipment according to the country of installation of the bottle.

Disassembly

If for failure, scheduled check or retest it is necessary to remove the additional bottle from the system, prior to removal, completely discharge the pressure within the circuit.
All additional EPE cylinders of the ASSA series can be repaired.

Repair

It can consist in replacing the seals and/or parts of the valves.
For reasons of functionality and security, it is recommended to use only original spare parts.

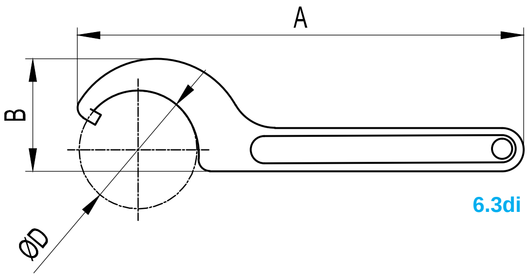
Demolition and recycling of the additional cylinder

Before demolition or recycling of the additional cylinder, you should always discharge the internal pressure.
If you needed, proceed decontaminating in relation to the gas/fluid used prior to demolition.

6.3.12 SPANNER WRENCH

Fits all standard size bladder accumulator. It is used to remove or install lock nut on fluid port essembly.
1/4 gal code 2506/58
1 gal code 2506/68
2.5÷15 gal code 2506/105

Dimension



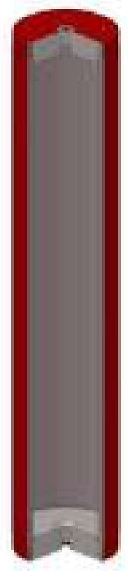
6.3di

CODE	A	B	ØD	For Accumulator
B2506/58	241	45	58	1/4 gal
B2506/68	241	43	68	1 gal
B2506/105	336	82	105	2.5 ÷ 15 gal

6.3dj

6.4.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS): 375 bar
PRESSURE TEST (PT): 1.43 x PS
NOMINAL CAPACITIES: 0.1 ÷ 1000 litres
WORKING TEMPERATURE: -50 ÷ +150 °C
BODY MATERIAL: - carbon steel shell painted with rust inhibitor RAL 8012
- nickel coating 25 - 40 μ
FLUID PORT CONNECTION: upon request
WEIGHT: see Table 6.4d



6.4a

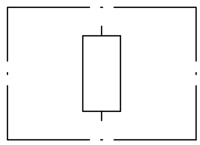
6.4.2 DESCRIPTION

Additional bottles type AB consist of a pipe of high-tensile steel. The same pipe of the piston accumulator type AP.
The additional bottles are used to take in and store nitrogen to increase the gas volume in the accumulator station (with bladder or piston accumulator). This means that smaller accumulators can be used for the same gas volume and costs can be reduced. EPE offers a wide selection of bottless type, such as forged “B” version, shell of bladder accumulator “ASS” and “ASSA” version or body piston type “AB” version.

6.4.3 “AB” ADDITIONAL CYLINDERS ADVANTAGES

- compact
- simple construction
- quick, easy installation
- large volume

6.4.4 HYDRAULIC SYMBOL



6.4b

6.4.5 SEALS-TEMPERATURE-LIQUID COMPATIBILITY

When selecting the additional cylinder variant, pay attention to the following non-binding notes with regard to hydraulic fluid, seals material and the permissive temperature range. (see Section)

Code letter	Polymer	ISO	Temperature range (°C)	Some of the liquids compatible with the polymer
P	Standard nitrile (Perburan)	NBR	-20 ÷ +80	Aliphatic hydrocarbons (propane, butane, gasoline, oils, mineral greases, diesel fuel, fuel oil, kerosene), mineral greases and oils, HFA - HFB - HFC fluids, many dilute acids, alkalis, saline solutions, water, water glycol.
F	Low temperature nitrile	NBR	-40 ÷ +70	The same as with standard nitrile + a number of different types of Freon. (This contains less acrylonitrile than the standard and is therefore more suitable for low temperatures, but its chemical resistance is slightly lower).
K	Hydrogenated nitrile	HNBR	-30 ÷ +130	The same as with standard nitrile but with excellent performance at high and low temperatures.
L	Hydrogenated nitrile	HNBR	-60 ÷ +130	The same as with standard nitrile but with excellent performance at high and very low temperatures.
V	Fluorocarbon	FKM	-10 ÷ +150	Mineral oils and greases, non-flammable fluids of HFD group, silicone oils and greases, animal and vegetable oils and greases, aliphatic hydrocarbons (gasoline, butane, propane, natural gas), aromatics hydrocarbons (benzene, toluene), chlorinated hydrocarbons (Tetrachloroethylene, carbon tetrachloride), fuel (regular, super and containing methanol), excellent resistance to ozone, weathering and aging.

For other hydraulic fluid and/or temperatures, please consult us.

6.4c

6.4.6 ORDER CODE

1	2	3	4	5	6	7	8	9	10		11
AB	200	P	220	C	350	G	6	G	5	-	8

1 Series

Additional bottle = **AB**

2 Nominal capacity (litres)

ø 60 mm = **0.1 ÷ 2.5**
ø 100 mm = **1 ÷ 10**
ø 180 mm = **6 ÷ 80**
ø 250 mm = **30 ÷ 180**
ø 350 mm = **80 ÷ 400**
ø 520 mm = **180 ÷ 1000**

3 Seals material material

Nitrile rubber (NBR)	=	**P**
Nitrile for low temp.	=	**F**
Fluorocarbon (FKM)	=	**V**
Hydrogenated nitrile	=	**K**
Hydrogenated nitrile for low temp.	=	**L**

4 Max working pressure (bar)

ø 60 mm = **375**
ø 100 mm = **375**
ø 180 mm = **250 - 375**
ø 250 mm = **250 - 350**
ø 350 mm = **220 - 350**
ø 520 mm = **220 - 350**
(210 only for the version with connection L
or other pressure related to connections B or U)

5 Body material

Carbon steel	=	**C**
Nickel coated carbon steel 25 μ	=	**N**
Nickel coated carbon steel 40 μ	=	**M**

6 Nominal internal diameter

Ø 60mm =**60**
Ø 100mm =**100**
Ø 180mm =**180**
Ø 250mm =**250**
Ø 350mm =**350**
Ø 520mm =**520**

11 Test and certification

Factory testing	=	**0**
ML (China)	=	**3**
PED 2014/68/EU (for capacity greater than1 l)	=	**8**
EAC Passport (Russia)	=	**11**
Algeria passport	=	**12**
Standard regulation (NR13) (Brazil)	=	**13**
Tunisian passport	=	**14**

10 Dimension of port connection B

See the table on page 2

9 Type of port connection B

Without connection	=	**0**
Female thread:		
BSP ISO 228	=	**G**
BSP ISO 228 with chamfer for OR	=	**A**
NPT-F	=	**P**
SAE	=	**S**
METRIC	=	**M**
Holes for flange:		
SAE 3000 metric threads	=	**L**
SAE 6000 metric threads	=	**H**
ANSI metric threads	=	**B**
UNI - DIN	=	**U**
CETOP	=	**C**
Special flange	=	**F**

8 Dimension of port connection A

See the table on page 2

7 Type of port connection A

Without connection	=	**0**
Female thread:		
BSP ISO 228	=	**G**
BSP ISO 228 with chamfer for OR	=	**A**
NPT-F	=	**P**
SAE	=	**S**
METRIC	=	**M**
Holes for flange:		
SAE 3000 metric threads	=	**L**
SAE 6000 metric threads	=	**H**
ANSI metric threads	=	**B**
UNI - DIN	=	**U**
CETOP	=	**C**
Special flange	=	**F**

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8	Dimension of port connection A
	Without connection = **0** For the type of connection: G-A-P-L-H 1/8" = **1** 1/4" = **2** 3/8" = **3** 1/2" = **4**(std. DN 60) 3/4" = **5** 1" = **6**(std. DN 100) 1"1/4 = **7** 1"1/2 = **8** (std. DN 180-250-350) 2" = **9**(std. DN 520) 2"1/2 = **10** 3" = **11** 3"1/2 = **12** 4" = **13** S = **Diameter "inch"-Pitch "inch"** Former. 9/16-18 = 9/16-18 M =**Diameter/pitch** Former. M 22x1.5 = 22/1.5 B = **Dimension/Rating** Former. 4" ANSI 300 = 4/300 U = **DN/PN** Former. DN100 PN16 = 100/16 C = **Diameter "inch"/max Pressure "bar"** Former. 3"Cetop 400 = 3/400 F = to specify and EPE will assign a number

9	Dimension of port connection B
	Without connection = **0** For the type of connection: G-A-P-L-H 1/8" = **1** 1/4" = **2** 3/8" = **3** 1/2" = **4** (std. DN 60) 3/4" = **5** 1" = **6** (std. DN 100) 1"1/4 = **7** 1"1/2 = **8** (std. DN 180-250-350) 2" = **9** (std. DN 520) 2"1/2 = **10** 3" = **11** 3"1/2 = **12** 4" = **13** S = **Diameter "inch" - Pitch "inch"** Former. 9/16-18 = 9/16-18 M =**Diameter/pitch** Former. M 22x1.5 = 22/1.5 B = **Dimension/Rating** Former. 4" ANSI 300 = 4/300 U = **DN/PN** Former. DN100 PN16 = 100/16 C = **Diameter "inch"/max Pressure "bar"** Former. 3"Cetop 400 = 3/400 F = to specify and EPE will assign a number

6.4.7 EUROPE MARKET

All hydraulic bottles are pressure vessels and are subject to the national regulations and directives valid at the place of installation.
For additional cylinders type AB, every shipping batch is complete of a conformity declaration and instructions of use and maintenance and/or all documents requested. All vessel categories (see Table 6.4d) must be protected by means of a pressure relief valve in accordance with Directive 2014/68/EU.

6.4.8 ACCESSORIES

For support equipment, see Cap. 7
For gas side's safety equipment, see Cap. 8
For pre-loading and charging set, see Cap. 11
For other components, see Cap. 12

6.4.9 DIMENSIONS

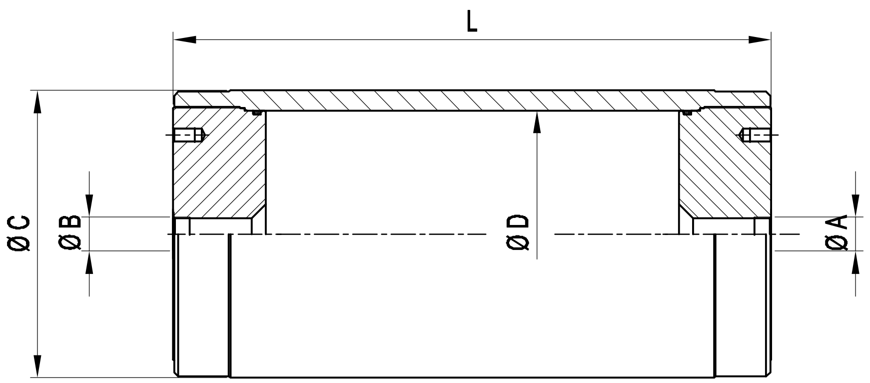

Fig. I

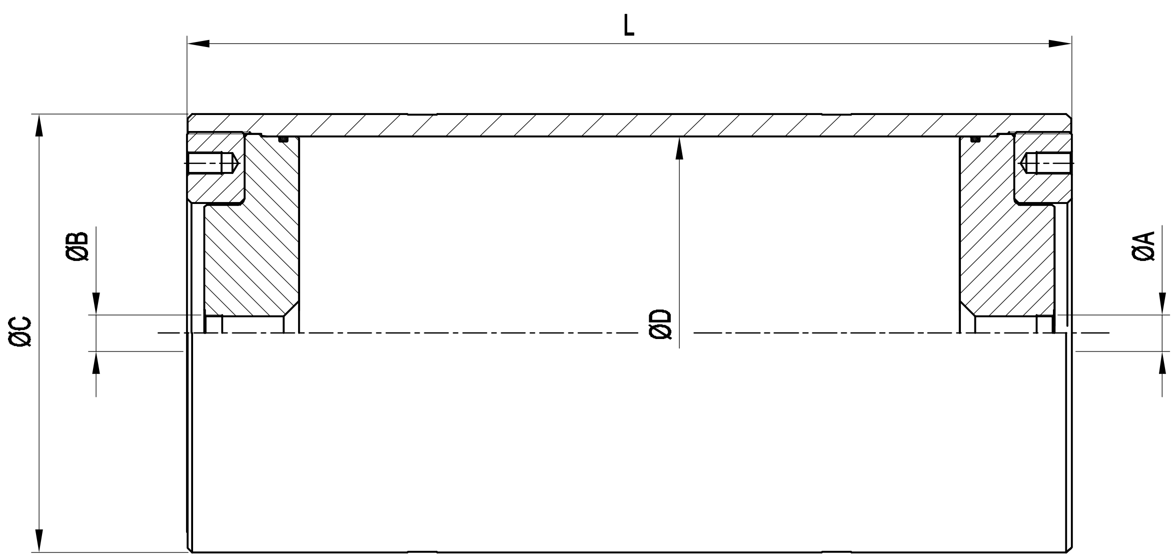

Fig. II

6.4d

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ADDITIONAL BOTTLES type AB

Bottle type ABXXX Ø bore (ØD)	Fig	Gas capacity liters	Working pressure bar	Ped category for the liquids of group 2	Maximum differential pressure bar	ØA	ØB	ØC mm	ØD mm	L mm	Dry Weight Kg 220 bar	250 bar	350 bar	375 bar
		0,25		Art 4 par. 3						169				4,9
		0,5								257				6,4
60	I	1	375		300	M12 x 1,5	1/2" BSP	80	60	434				9,5
		1,5		II						611				12,5
		2								788				15,5
		1		Art 4 par. 3						240				17,1
		1,5		II						303				20,1
		2								368				22,5
		2,5								430				25,1
		3	375							494				27,9
		4		III	300	M12 x 1,5	1" BSP	130	100	622				33,2
100	I	5								750				38,7
		6								877				44,1
		8		IV						1132				54,9
		10								1387				65,5
		6								416		65,5		76
		8								495		71		83,5
		10	250		180,5			210		573		76,5		91,5
		15								770		90,5		110,5
		20					1 1/2"			966		104,5		130
180	I	25				M12 x 1,5			180	1163		118,5		149
		30					BSP			1360		133		168,5
		40	375	IV	240			220		1752		161		207
		50								2145		189		245,5
		60								2538		197		284
		80								3324		217		361
		30								849		205	300,5	
		40	250		180			292		1065		240	353	
		50								1280		274,5	405,5	
		60								1496		309,5	453	
250	I	80				M12 x 1,5	1 1/2"		250	1928		379,5	558	
		100		IV						2359		449,5	663	
		120	350		220		BSP	312		2790		519,5	768	
		150								3457		624,5	925,5	
		180								4084		729	1083	
		100								1370	563		650	
		120	220		165			406		1592	625		726	
		150					1 1/2"			1924	718		840,5	
		180		IV		M12 x 1,5			350	2256	811		954,5	
350	I	200					BSP			2478	873		1031	
		250								3032	1028		1221	
		300	350		210			419		3586	1183		1411	
		400								4694	1493		1792	
		200								1288	1028		1525,8	
		250	220		120			584		1447	1130,5		1694,2	
		300								1759	1232,5		2162	
		350		IV						1997	1334,6		2030	
520	II	400				M12 x 1,5	2" BSP		520	2229	1437		2197	
		500								2700	1641,2		2533,4	
		600	350		200			635		3171	1845,7		2869,4	
		800								4113	2555,4		3541,7	
		1000								5055	2663,7		4213,6	

6.4e

- The maximum differential pressure is the maximum allowable difference between the maximum pressure and the minimum working pressure (P2-P1) to have an infinite life cycle of the accumulator (greater than 2,000,000 cycles).

6.4.10 SPARE PARTS CODES

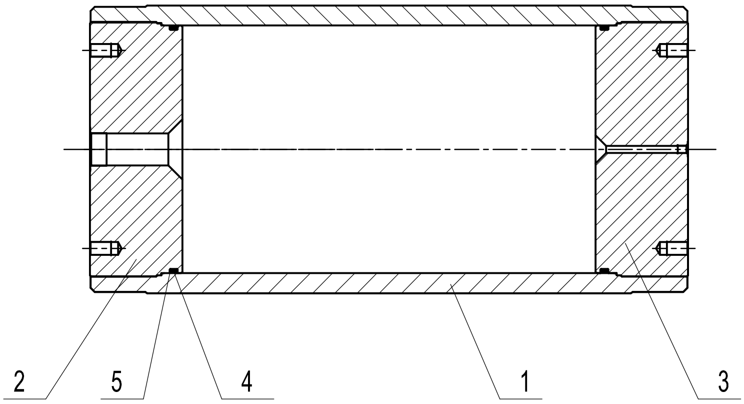

fig. I

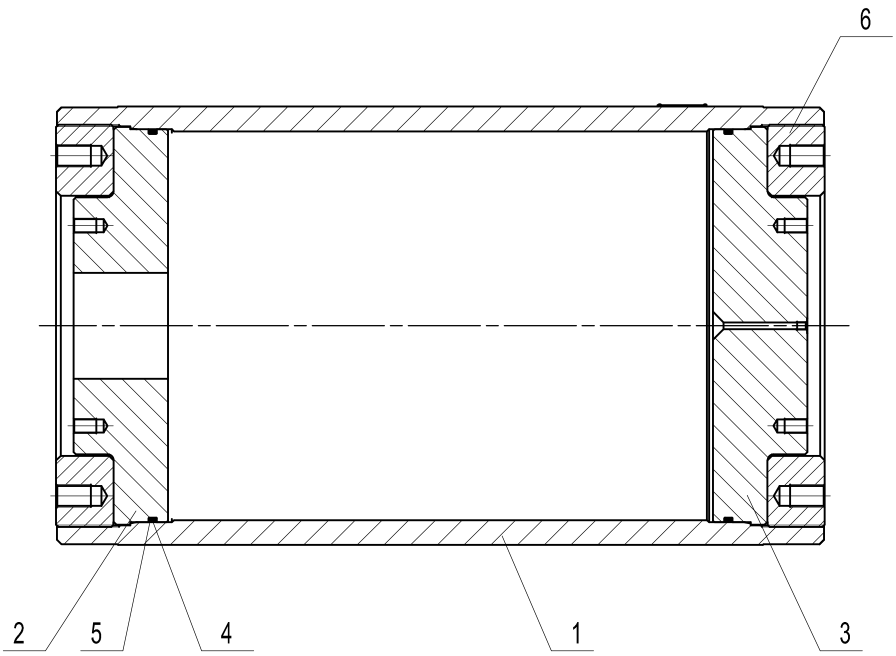

fig. II

6.4f

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Pos.	Spare parts	Cylinder diameter	Fig.	Group code	Q.ty	Part description	Type / Code
1	Not supplied as spare parts					Accumulator cylinder	-
2						Oil side cap	
3						Gas side cap	
4	Accumulator gasket set	60	I	B2471-1 *	2	O - ring	0010R6200 - *
5					2	Anti-extrusion ring	0011P8329 - *
4	Accumulator gasket set	100	I	B2472-1 *	2	O - ring	0010R0185 - *
5					2	Anti-extrusion ring	0011P8341 - *
4	Accumulator gasket set	180	I	B2473-1 *	2	O - ring	0010R0228 - *
5					2	Anti-extrusion ring	0011P8439 - *
4	Accumulator gasket set	250	I	B2474-1 *	2	O - ring	0010R8925 - *
5					2	Anti-extrusion ring	0011P8447 - *
4	Accumulator gasket set	350	I	B2475-1 *	2	O - ring	0010R81300 - *
5					2	Anti-extrusion ring	0011P8455 - *
4	Accumulator gasket set	520	II	B2476-1 *	2	O - ring	0010R82000 - *
5					2	Anti-extrusion ring	0011P8469 - *
6	Not supplied as spare parts					Thread ring	-

* Gasket material

6.4g

6.4.11 COMMISSIONING AND MAINTENANCE

Delivery condition

The additional bottles type AB are shipped on pallets or wooden boxes upon request. Unless otherwise required, certificates and documentation are provided together with the bottles.

Handling

The original packaging is suitable for handling and storage.
Where necessary, you should use suitable lifting equipment to support the weight of the bottles.
However protect from impact the packaging and handle it with care.

Storage

During storage in the warehouse, leave the product in its original packaging, keeping it away from heat sources and naked flames. The storage temperature should be between +10 and +40°C.
After six years of storage, it is essential to proceed with the replacement of all elastomeric parts before the commissioning.

Marking on the nameplate of the additional cylinder

With reference to the PED 2014/68/EU classification, Article 3, Paragraph 3 and / or risk categories I or IV depending on the volume and maximum working pressure, the cylinder indicates the following data:

- logo, name and country of the manufacturer
- month / year of production
- product code
- serial number
- maximum PS pressure and PT test pressure in bar
- min. and max. TS working temperature in Celsius
- volume V in litres
- group of fluids allowed
- CE marking (by category I ÷ IV) with the identification number of the notified body

It is strictly forbidden to:

- weld, rivet, bolt or screw any item of the cylinder shell
- engrave or permanently stamp the surfaces of the cylinder shell and / or carry out other operations that could affect or change the mechanical properties of the cylinder
- use the cylinder as a structural element: it should not be subjected to stresses or loads
- change the data of the nameplate and / or the cylinder without the permission of the manufacturer
- use a (dangerous) fluid of Group 1 with equipment designed and manufactured for fluids of Group 2.

Installation

Before installation, you must perform a visual check to verify that the bottles has not suffered any damage during shipping / handling.
Verify that the requested type matches with what stamped on the nameplate. We recommend using the additional bottles connected to the accumulator with a suitable safety valve (see Chapter 8). This device provides user and equipment protection against possible damages due to pressure peaks.
The additional bottles type AB may be installed in any position from horizontal to vertical (preferably with the connections vertically) and the nameplate must be visible.
Proceed to the assembly so that no abnormal force affects the pipes connected directly or indirectly to the additional bottles, so we recommend the use of supporting components and also fastening (please see Chapter 7) to avoid the transmission of vibrations.
Make sure that the bottle is connected to the hydraulic circuit through suitable connection devices.
Make sure the gas is compatible with the elastomer of the seals.
Check that the max. allowed bottle 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.

Maintenance

- Periodically check the pre-charge pressure of the system: after the commissioning, check after 2-3 weeks of operation and if there were no leaks, repeat the operation after 3 months; if the pressure at the same temperature was stable, repeat the test yearly. For heavy-duty applications, check the pre-charge every 6 months.
- Periodically (yearly) carry out a visual inspection of the bottle in order to detect any early signs of deterioration such as corrosion, deformation, etc.
- Comply with the requirements of the regulations concerning the verification of the functionality of the equipment according to the country of installation of the bottle.

Disassembly

If for failure, scheduled check or retest it is necessary to remove the additional bottle from the system, prior to removal, completely discharge the pressure within the circuit.
All additional EPE cylinders of the AB series can be repaired.

Repair

It may consist in replacing the seals.
For reasons of functionality and security, it is recommended to use only original spare parts.

Demolition and recycling of the additional cylinder

Before demolition or recycling of the additional cylinder, you should always discharge the internal pressure.
If needed, proceed decontaminating in relation to the gas/fluid used prior to demolition.

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7.1.1 DESCRIPTION

The mounting clamps can be used with all type of accumulators. Secure design provides independent mounting on installations.
Rubber insert provided to reduce mechanical vibration, to compensate for shell manufacturing tolerances and to not lie with outward stresses on the connection.
The clamp type C90 has one piece construction with one central screw.
All other types have a two pieces construction for easy installation and removal while improving the strength to weight ratio.
We recommend using a single clamp when the length of the accumulator is less than twice the diameter.
For greater lengths, we recommend using two clamps or one clamp and one bracket with support ring.

7.1.2 CONSTRUCTION

The clamps are manufactured of galvanized carbon steel in compliance to directive 2002/95/CE (RoHS) for resist to the corrosion, on request they can be supplied in stainless steel version.
The rubber insert is black NBR rubber nitrile at 80 Shore A.

7.1a

7.1.3 ORDER CODE

1	2		3	4
C	220	-	C	P

1	Series
	CLAMP = **C**

2	Nominal diameter	
Internal diameter range	89÷93 =	**90**
	114÷122 =	**115**
	167÷172 =	**170**
	209÷230 =	**220**

3	Elastomer material
	Rubber in NBR = **P**
	Other on request

4	Clamp material	
	Carbon steel galvanized	= **C**
	Stainless steel AISI 316	= **X**

7.1.4 DIMENSIONS

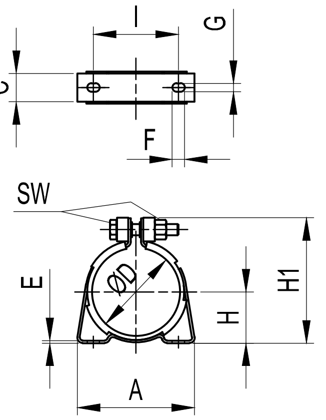

fig. I

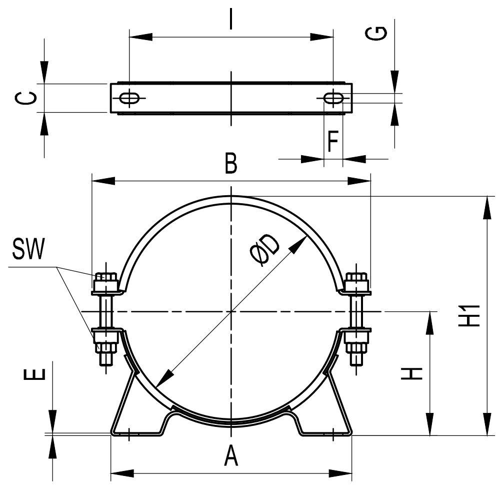

fig. II

7.1b

Clamp nominal size	Clamp order code	Fig.	A *mm*	B *mm*	C *mm*	Ø D *mm*	E *mm*	F *mm*	G *mm*	H *mm*	H 1 *mm*	I *mm*	SW *mm*	Acc. dry weight *kg*
90	C90-**/*	I	125	-	30	89 ÷ 93	2.5	13	9	53 ÷ 55 (9 + 1/2 ØD)	132.5	90	18	0,65
115	C115-**/*	II	135	195	30	114÷122	3	13	9	66 ÷ 70 (9 + 1/2 ØD)	131÷139 (17+ØD)	100	18	0,85
170	C170-**/*	II	185	250	30	167÷172	3	13	9	95.5 ÷ 98 (12 + 1/2 ØD)	187 ÷ 192 (20+ØD)	146	18	1,1
220	C220-**/*	II	255	295	30	209÷230	3	20	10	117 ÷ 127.5 (12.5 + 1/2 ØD)	230 ÷ 251 (21+ØD)	216	18	1,35

7.1c

7.1.5 USAGE TABLE

Clamp nominal size	Int. Ø dimension	Bladder accumulator *type*	Piston accumulator *type*	Diaphragm accumulator *type*	Additional bottle *type*
90	89 ÷ 93	AS / ASP 0.7 ASL 0.7	-	AMS 0.32 - 0.75	
115	114÷122	AS / ASP 1 - 1.5 - 3 ASL / AST 1 - 1.5 - 3 ASB 1.5 - 3 ASBL / ASBT 1.5 - 3 ASA 1/4	-	AM 0.5 - 0.75 - 1.5 - 2.5 AML 0.8 - 1.5	ASS 3 ASSA 1/4
170	167÷172	AS / ASP 5 ASL / AST 5 ASB 5 ASBL / ASBT 5 ASA 1	-	-	ASS 5 ASSA 1
220	209÷230	AS / ASP 10 ÷ 55 ASL / AST 10 ÷ 55 ASB 10 ÷ 55 ASBL / ASBT 10 ÷ 55 ASA 2.5 ÷ 15	AP */*/*/*/*/* 180	-	B 52-75 ASS 10 ÷ 55 ASSA 2.5 ÷ 15 AB */*/*/* 180

7.1d

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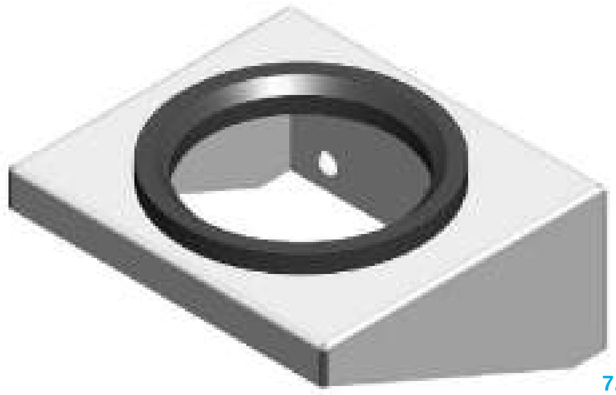
7.2.1 DESCRIPTION

Brackets can be used with all type of accumulators. Secure design provides independent mounting on installations.
Rubber insert provided to reduce mechanical vibration, to compensate for shell manufacturing tolerances and to not lie with outward stresses on the connection.
The brackets can be easily bolted to the system. We recommend using a bracket and support ring with one or two clamps or U-bolts.

7.2.2 CONSTRUCTION

All the brackets are manufactured of galvanized carbon steel in compliance to directive 2002/95/CE (RoHS) for resist to the corrosion, on request they can be supplied in stainless steel version.
The support ring is manufactured of black NBR rubber nitrile at 85 Shore A.



7.2a

7.2.3 BRACKET ORDER CODE

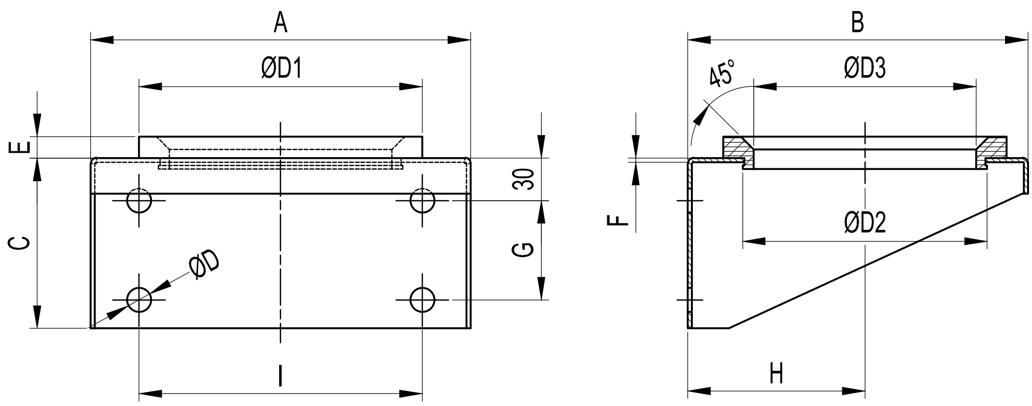
1	2		3	4
MA	150	-	C	P

1	**Series**
	Bracket = **MA**

2	**Nominal diameter**
	Nominal internal diameter 100 = **100**
	150 = **150**

3	**Clamp material**
	Carbon steel galvanized = **C**
	Stainless steel AISI 316 = **X**

4	**Support ring material**
	Rubber in NBR = **P**
	Other on request



7.2b

7.2.4 BRACKET DIMENSIONS

Bracket nominal size	A	B	C	øD	øD1	øD2	øD3	E	F	G	H	I	Weight (Kg)
100	200	175	90	11	140	120	90	10	3	40	96	140	1,5
150	260	232	120	17	200	170	150	15	3	70	125	200	3,6
150-1	260	235	120	17	200	170	150	15	3	70	128	200	3,7

7.2c

BRACKETS type MA and SUPPORT RING type AG

7.2.5 SUPPORT RING ORDER CODE

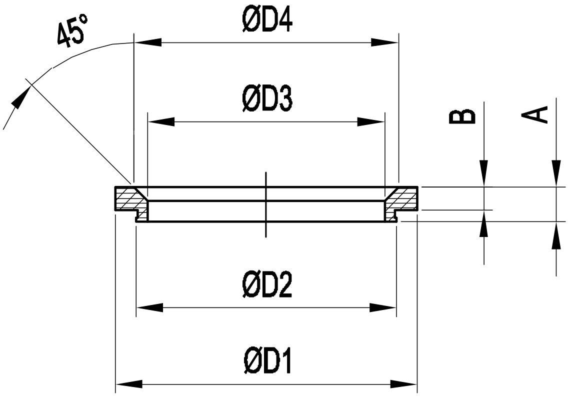
1	2		3
AG	150	-	P

1 Series
Support ring = **AG**

2 Nominal diameter		
Nominal internal diameter	100	= **100**
	150	= **150**

3 Support ring material
Rubber in NBR = **P**
Other on request

7.2.6 SUPPORT RING DIMENSIONS



7.2e

Support Ring nominal size	A	B	øD1	øD2	øD3	øD4	Weight (Kg)
100	18	10	140	120	100	112	0,13
150	23	15	200	170	150	175	0,22

7.2f

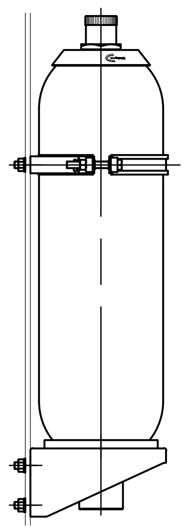
7.2.7 USAGE TABLE

Bracket nominal size	Supporting ring nominal size	Bladder accumulator *type*	Additional bottle *type*
100	100	AS / ASP 5 ASL / AST 5 ASB 1.5 - 3 ASBL / ASBT 1.5 - 3 ASA 1	ASS 5 ASSA 1
150	150	AS / ASP 10 ÷ 55 ASL / AST 10 ÷ 55 ASB 10 ÷ 55 ASBL / ASBT 10 ÷ 55 ASA 2.5 ÷ 15	B 52-75 ASS 10 ÷ 55 ASSA 2.5 ÷ 15 AB */*/* 180

7.2g

7.2.8 MOUNTING

Example for mounting.



7.2h

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7.3.1 DESCRIPTION

Round U-bolts clamp with plastic saddles can be used with all type of accumulators.

Secure design provides independent mounting on installations. The plastic saddle provided to reduce mechanical vibration, to compensate for shell manufacturing tolerances and to not lie with outward stresses on the connection.

We recommend using a single U-bolt when the length of the accumulator is less than twice the diameter. For greater lengths, we recommend using two or three U-bolts with saddles.

7.3.2 CONSTRUCTION

The all U-bolts are manufactured of galvanized carbon steel in compliance to directive 2002/95/CE (RoHS) for resist to the corrosion, on request they can be supplied in stainless steel version.

The U-bolts are supplied with two hex nuts UNI 5588 CLASS 8 A 2-70 and two washer UNI6592 class 100 HV.

The plastic saddles are manufactured of green polypropylene.

7.3a

7.3.3 U-BOLT ORDER CODE

1	2		3
U	150	-	C

1	Series
	U - bolt = **U**

3	Material
Carbon steel galvanized	= **C**
Stainless steel AISI 316	= **X**

2	Nominal diameter		
Nominal internal diameter	115	=	**115**
	130	=	**130**
	168	=	**168**
	220	=	**220**
	312	=	**312**
	420	=	**420**
	585	=	**585**

7.3.4 U-BOLT DIMENSIONS

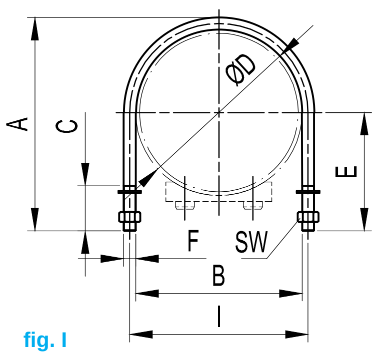


fig. I

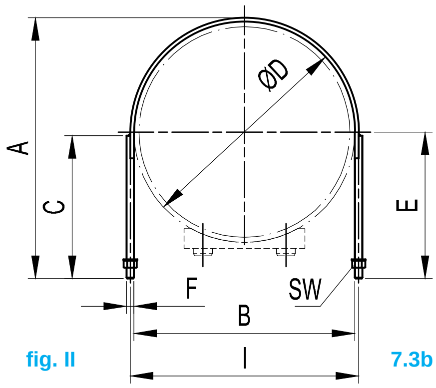


fig. II

7.3b

U-Bolt nominal size	fig.	A	B	C	øD	E	F	I	SW	Weight (Kg)
115	I	149	115	35	115	84	M8	123	13	0,12
130	I	177	140	35	140	99	M8	148	13	0,15
168	I	211	168	45	168	118	M10	178	17	1,74
220	I	282	220	60	220	157	M16	236	24	2,75
230	I	290,5	230	60	230	162	M16	246	24	3,00
312	I	399	324	70	324	217	M20	344	30	2,16
420	I	481	408	70	410	258	M20	428	30	2,5
585	II	611	585	75	585	308	M20	605	30	3,78

7.3.5 PLASTIC SADDLE ORDER CODE

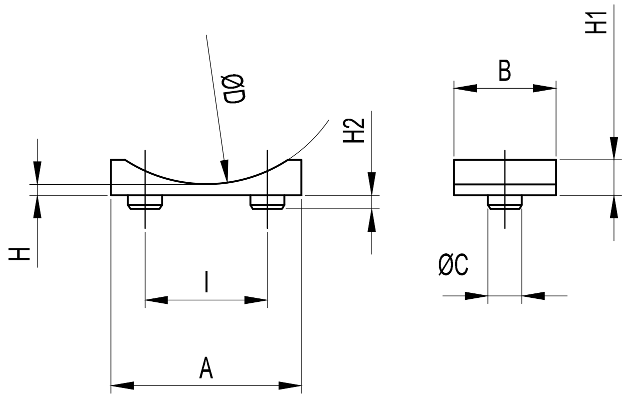
1	2		3
P	220	-	PP

1	Series
	Plastic saddle = **P**

3	Material
	Green polypropylene = **PP**
	Other on request

2	Nominal diameter
Nominal diameter of the tube 114	= **115**
133	= **130**
168	= **168**
219	= **220**
316	= **312**
419	= **420**

7.3.6 PLASTIC SADDLE DIMENSIONS

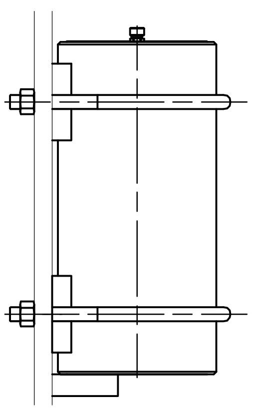


7.3c

Saddles nominal size	A	B	ØC	øD	H	H1	H2	I	WEIGHT (Kg)
115	75	70	15	113	8	17	10	40	0,049
130	75	70	15	133	8	17	10	40	0,047
168	140	75	25	168	8	26	10	90	0,135
220	140	75	25	219	8	26	10	90	0,124
312	220	75	30	318	8	32	10	150	0,244
420	220	75	30	419	8	32	10	150	0,225

7.3.7 MOUNTING

Example for mounting.



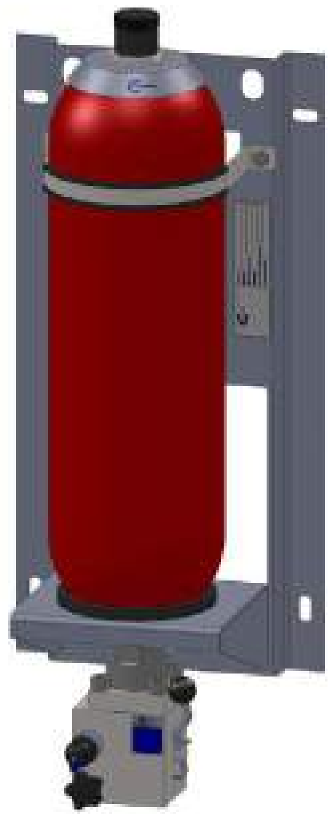
7.3c

7.4.1 DESCRIPTION

The single accumulator unit consist of a bladder accumulator (1 ÷ 50 liters or 1/4 ÷ 15 gallons), a safety and shut-off block and the appropriate steel support.
This solution is designed in order to simplify the mounting at the installation site, the connection of the accumulator to the hydraulic system, and in order to reduce the assembling costs.

7.4.2 CONSTRUCTION

All the single accumulator units are manufactured of galvanized carbon steel in compliance to directive 2002/95/CE (RoHS) for resist to the corrosion, on request they can be supplied in stainless steel version.
DESIGN: Pressure Equipment Directive PED 2014/68/EU (others on request)
CONSTRUCTION:
- accumulator AS: see section 3.1
- accumulator low pressure type ASB: see section 3.3
- accumulator ASA: see section 3.5
- safety and shut-off block: see section 8 and 9



7.4a

7.4.3 ORDER CODE

1	2		3	4	5
BA1S	55	-	C	P	A74...

1	Series
	Single accumulator unit = **BA1S**

2	Capacity
	Bladder accumulator see cap. 3

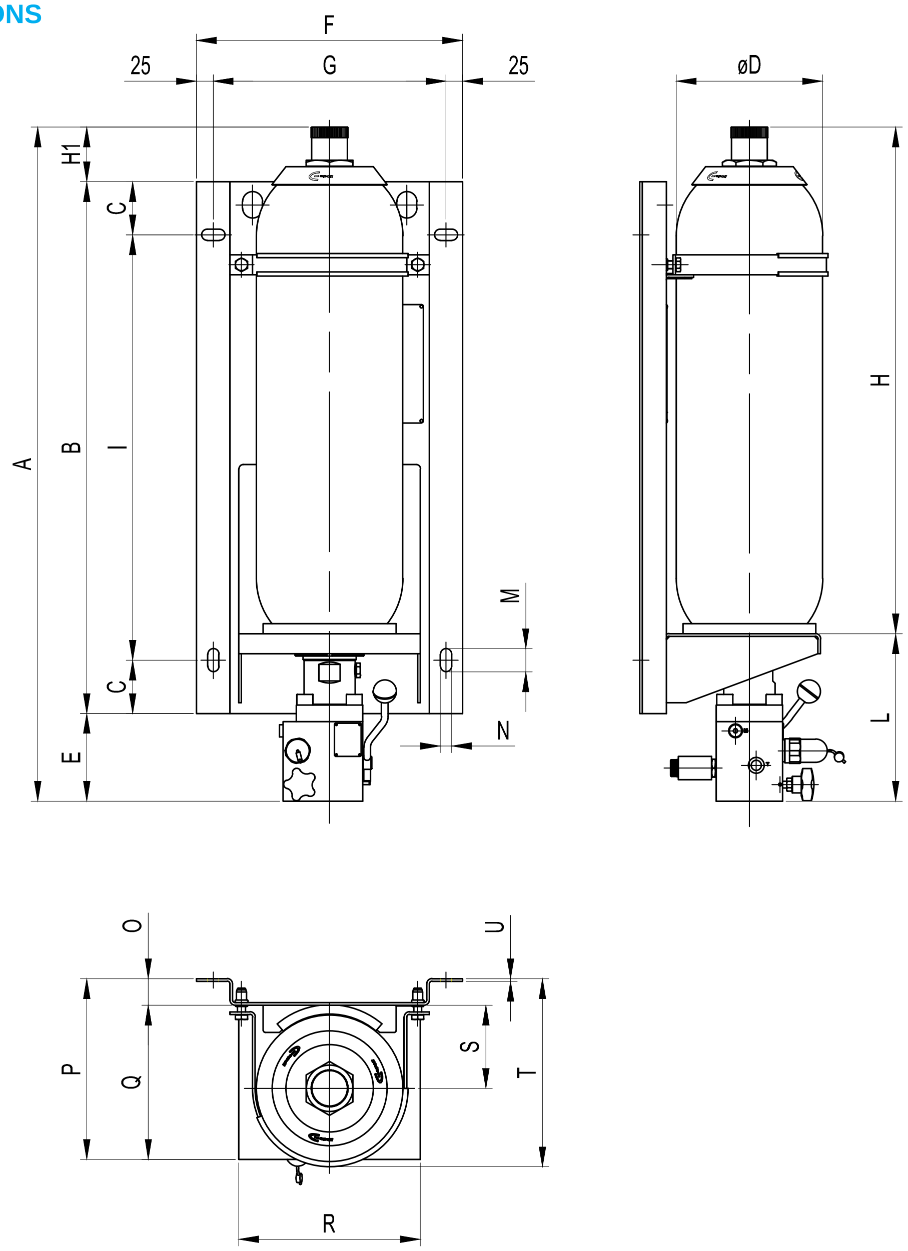
5	No. of the drawing
	Assigned by EPE ITALIANA after the order = **74...**

4	Elastomer of the support
	Rubber in NBR = **P**
	Other on request

3	Support material
	CARBON STEEL GALVANIZED = **C**
	STAINLESS STEEL AISI 316 = **X**

SINGLE ACCUMULATOR UNIT type BA1S

7.4.5 DIMENSIONS



7.4b

Accumulator type	A	B	C	øD	E	F	G	H	H1	I	L	M	N	O	P	Q	R	S	T	U
AS10	714	540	40	220	144	400	350	450	30	460	264	35	17	40	272	232	270	125	283	4
AS15	864	540	40	220	144	400	350	600	180	460	264	35	17	40	272	232	270	125	283	4
AS20	1019	790	40	220	144	400	350	755	85	710	264	35	17	40	272	232	270	125	283	4
AS25	1189	790	40	220	144	400	350	925	255	710	264	35	17	40	272	232	270	125	283	4
AS35	1539	1360	40	220	144	400	350	1275	35	1280	264	35	17	40	272	232	270	125	283	4
AS55	2049	1360	40	220	144	400	350	1785	545	1280	264	35	17	40	272	232	270	125	283	4

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8.1.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS): 400 bar

PRESSURE SETTING (P): 10 ÷ 400 (upon request)

ORIFICE: 8 mm

LIFT: 3.3 mm

WORKING TEMPERATURE: -40 ÷ +150 °C

REPETIBILITY: ± 3% of P

CALIBRATION ERROR: < 3%

OVERPRESSURE BY FULL FLOW: 10% of P

BLOW DOWN: 15% of P

GAS DISCHARGE COEFFICIENT (K): 0.95

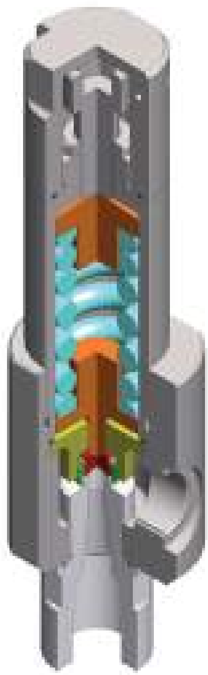
BODY MATERIAL: stainless steel AISI 316L

SEALING MATERIAL: Duplex Stellite®

CONNECTIONS: 3/4" BSP ISO228

FLOW RATE: see Table 8.1.11

WEIGHT: 2,16 Kg.

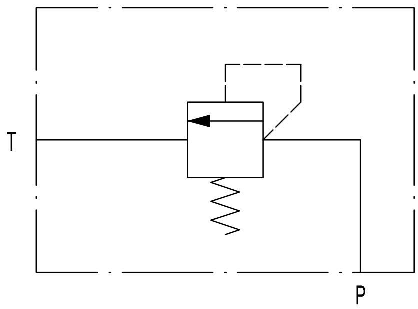


8.1a

8.1.2 DESCRIPTION

The safety valves VS224 are designed and manufactured by Epe Italiana. They have soft seal and total lift. They have a high flow coefficient (K = 0.95) and are suitable for gas and liquids.
VS224 valves are safety devices as specified in Article 1, Section 2.1.3 of Directive 2014/68/EU and are subject to Article 3, Section 1.4 of the same Directive.
These valves are direct acting safety valves, used for protection against overpressure with respect to the operating conditions of the accumulators. They can be installed directly on the accumulator, through the appropriate use of adapters (see Cap.8.3) or on the safety block gas side (BC32G) or on manifold on the gas side of the accumulator stations.
The valve opening is determined by the force exerted by the fluid under pressure on the poppet in contrast with the spring acting on the cut-off itself.

8.1.3 HYDRAULIC SYMBOL



8.1e

8.1.4 CONSTRUCTION

Body: of stainless steel AISI316L, obtained by mechanical processing, in which are obtained the connections and the seal seat.
Poppet: obtained by mechanical processing from bar and provided with a seal, it ensures the necessary seal degree on the valve seat. The seal is made of Duplex Stellite®, a material that, over the estimated useful life for the valve, maintains good strength and does not cause phenomena of poppet sticking on the seat. The poppet is well led and pushed by the spring.
Spring: it counteracts the pressure and the dynamic actions of the fluid and always ensures the closing of the valve after the discharge.
The coils of the spring, even when the poppet has reached its maximum lift, are never at pack.
The poppet has a mechanical lock and when it has reached it, the arrow of the spring does not exceed 85% of the maximum deviation.
Calibration system: threaded hexagon head screw which screws into the top of the valve by compressing the spring below. After the calibration, the position of the adjusting screw is kept unaltered by locking the counter nut and sealing the adjusting screw to the body.

8.1.5 CALIBRATION

All valves are calibrated on the test bench with atmospheric counter pressure. The repeatability error of calibration is less than 3% of P.
The leak test is performed according to API Standard 527: with air and up to a pressure equal to 97% of the calibration pressure verifying that there's no leakages.

8.1.6 ORDER CODE

1	2	3		4
VS	224	X	/	360

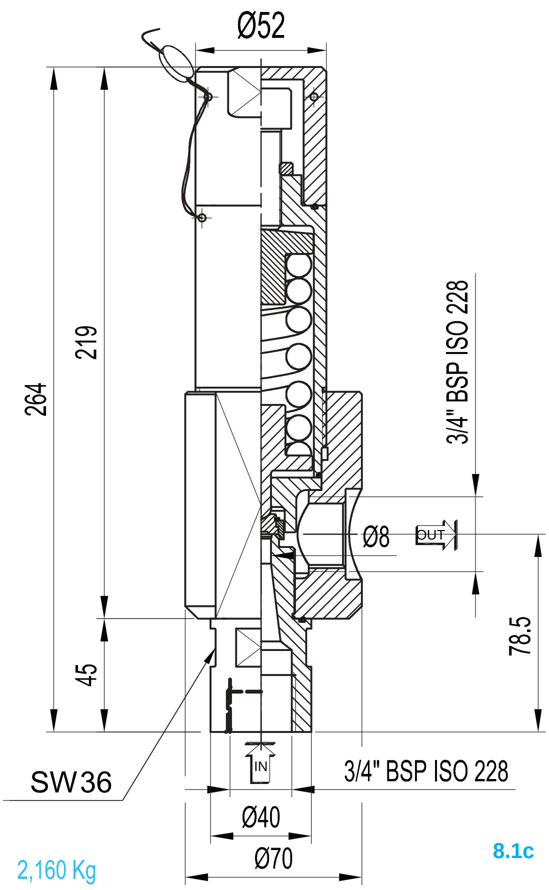
1 Series	
Safety valves	= VS

2 Model	
Model	= 224

4 Pressure setting (P)
10 ÷ 400 bar = **upon request**

3 Body material	
Stainless steel AISI316L	= X

8.1.7 DIMENSIONS



8.1c

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SAFETY VALVES type VS214

8.1.8 TECHNICAL DATA

MAX OPERATING PRESSURE (PS): 413 bar

PRESSURE SETTING (P): 10 ÷ 413 (upon request)

ORIFICE: 9,5 mm

LIFT: 2.1 mm

WORKING TEMPERATURE: -20 ÷ +150 °C

REPETIBILITY: ± 3% of P

CALIBRATION ERROR: < 3%

OVERPRESSURE BY FULL FLOW: 10% of P

BLOW DOWN: 7% of P

GAS DISCHARGE COEFFICIENT (K): 0.95

BODY MATERIAL: carbon steel A105

SEALING MATERIAL: AISI 431

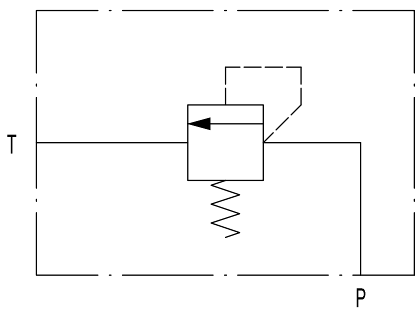
CONNECTIONS: 3/4” BSP (IN), 1” BSP (OUT)

FLOW RATE: see Cap. 8.1.18

WEIGHT: 2,65 Kg.

8.1d

8.1.10 HYDRAULIC SYMBOL



8.1e

8.1.9 DESCRIPTION

The safety valve VS214 is a full nozzle, full lift type valve. It has a high discharge coefficient (K=0.95) and is suitable both for gas and fluids.
VS214 valves are safety devices as specified in Article 1, Section 2.1.3 of Directive 2014/68/EU and are subjected to Article 3, Section 1.4 of the same Directive.
Those valves are direct acting safety valves, used for protection against overpressure with respect to the operating conditions of the accumulators. They can be installed directly on the accumulator, using the proper adapters (see Cap. 8.3), or on the safety block gas side (BC32V see Cap. 8.6) or can be installed on gas manifolds of accumulator stations.

8.1.11 CONSTRUCTION

Body and bonnet: made from castings.
Seal: the valve has a flat, metal to metal seat
Spring: it counteracts the pressure and the dynamic actions of the fluid and always ensures the closing of the valve after the discharge.
Calibration system: threaded hexagon head screw which screws into the top of the valve by compressing the spring below. After the calibration, the position of the adjusting screw is kept unaltered by locking the counter nut and sealing the adjusting screw to the body.

8.1.12 CALIBRATION

All valves are calibrated on the test bench with atmospheric counter pressure. The repeatability calibration error is less than 3% of P.
The leak test is performed according to API Standard 527 with air and up to a pressure equal to 97% of the calibration pressure verifying that there's no leakages.

8.1.13 ORDER CODE

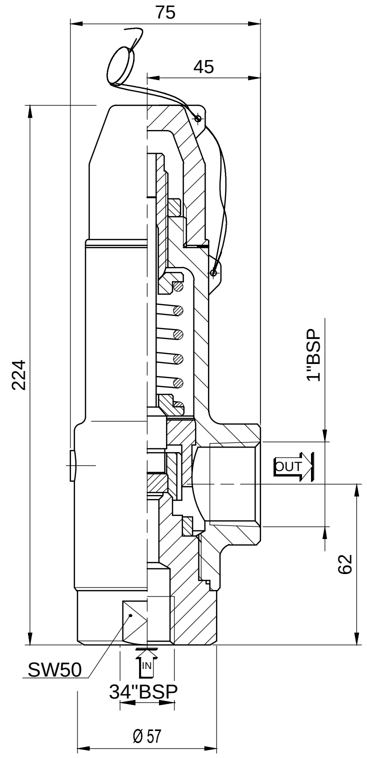
1	2		3
VS	214	/	360

1	Series
Safety valves	= VS

2	Model
Model	= 214

3	Pressure setting (P)
	10 ÷ 413 bar = **upon request**

8.1.14 DIMENSIONS



8.1f

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8.1.15 EUROPEAN MARKET

Directive 2014/68/EU provides that pressure equipment, in which it's reasonably expected to be exceeded the allowable limits, should be provided with adequate protective equipment; for example, safety accessories such as safety valves type VS or burst disk type DR (see Chap. 8.2). These devices shall prevent that pressure permanently exceeds the maximum allowable pressure PS of the equipment protected by them.
However, it is permissible a pressure peak of short duration limited to 10% of the maximum allowable pressure.
For the choice and sizing of the adequate safety device, the user should refer to specific standards.
In accordance with the regulations 2014/68/EU, the safety valves are classified in Category IV.

8.1.16 ACCESSORIES

Two-way shut-off valves, see Chap. 8.4
Three-way shut-off valves, see Chap. 8.5
Gas side dumpers, see Chap. 8.3

8.1.17 COMMISSIONING AND MAINTENANCE

Installing the valves

Regarding the installation of the safety valves, you should be kept in mind the following key points:

- the safety valves must be installed in the area that need to be protected from overpressure in the vertical position with the inlet connection facing down;
- the vessels, connected each other by appropriate piping with a diameter adapted by the Manufacturer and User and on which there weren't interposed interceptions, can be considered for the installation of the safety valves, as a single vessel;
- the connection between the valve and the equipment to be protected should be as short as possible and must not have a cross section smaller than the one of the valve inlet. In any case, the standard EN 13136:2001/A1: 2005 states that the pressure drop between the protected vessel and the safety valve, at flow rate of full discharge, should not exceed 3% of the pressure value P, including any accessory inserted on the line;
- the choice of the safety valve displacement should consider that the operation of the valve results in the discharge of the gas under pressure, if not sent directly to atmosphere.

Where there is a risk of causing direct damage to individuals who are nearby, you will have to provide a pipe for conveying the discharge, sized so as not to affect the operation of the valve.
Standard EN 13136:2001/A1: 2005 requires that this pipeline should not generate, at full capacity, a pressure higher than 10% of the value of the calibration pressure for conventional unbalanced valves.

Disassembly

Before removing the valve, make sure that the plant on which it is mounted is not under pressure and that there is no pressure within the valve.

Ordinary maintenance

Checking the seals of the shutter and the seat on the system at each opening of the valve or every 6 months of operation. Periodic retest according to the related standards of the country of installation. In Italy, see the Ministerial Decree 329 dd. 12/01/2004: for fluids of the group 1: every 2 years you must carry out a functional test and every 10 years you must check the integrity; for fluids of the group 2, every 3 years, you must check the operation and every 10 years you must check the integrity.

8.1.18 SIZING (Nitrogen flow rate)

In most cases, the flow rate of the valve ensures the fire safety function as the pressure rises gradually with the temperature and therefore the required flow rate will hardly be higher than the minimum value guaranteed by the valve.
For an exact calculation of the maximum guaranteed flow rate, please refer to the UNI EN 4126-1 standard that can be summarized with the formula shown below and applied to calibration pressures greater than 5 bar for which the discharge regime is definitely critical and then you must apply the following formulas

Mass flow rate $$Q_m = 0{,}2883 \times C \times A \times K_{dr} \times \sqrt{p_0 \times \rho} \quad (kg/h)$$

Volume flow rate $$Q_v = 4{,}806 \times C \times A \times K_{dr} \times \sqrt{p_0 / \rho} \quad (l/m)$$

Where: C = 2,703 is a flow coefficient; A = 50.27 is the minimum area of transition expressed in mm2; Kdr = 0.855 is the discharge coefficient of the that is typical of the Kd valve reduced by 10%; p0 is the discharge pressure in absolute bar; ρ is the density in kg/m3

To give a more precise indication, below please find a table with the values calculated at 150°C.

Po (barg)	10	25	50	100	250	360	400
Qv (l/m)	620	630	630	640	660	685	690
Qm (kg/h)	300	750	1.500	2.900	7.100	9.800	11.000

In summary, with the gas at a temperature of 150°C, and passing by the pressure of 10 bar to that of 400 bar, the volumetric flow rate varies from 620 to 690 l/m; the mass flow instead varies much more because the density of the gas is approximately proportional to the pressure, and then passes from 300 to 11,000 kg/h.

These data already take into account the notional reduction of 10% set by the EN 4126 standard, and then the actual flow rate will always be greater.

Always as indicative data, the flow rate of at least 600 l/m in all conditions implies that the pressure in a hypothetical group of accumulation of 6000 liters will drop of about 10% per minute regardless of the value of the pressure itself. This example involves the extreme rapidity idea of the gas outflow.

BURST AND FUSE DISK type DR and DF

8.2.1 TECHNICAL DATA

INTERNAL DIAMETER: 8 mm

INFLUX DIAMETER: 4

MAX OPERATING PRESSURE: 400 BAR

OVERPRESSURE: 0 + 10%

WORKING TEMPERATURE: -40°C +150°C

TESTING CERTIFICATE: CE/PED (2014/68/EU)

CALIBRATION ERROR: <3%

OVERPRESSURE BY FULL FLOW: 10% of P

MATERIAL: stainless steel AISI 316L

MEDIUM: nitrogen (N2)

WEIGHT: see table 8.2c

8.2a

8.2.2 DESCRIPTION

The BURST DISK is a safety device that can be mounted on the gas side of the bladder and piston accumulators.
Its function is to protect the accumulator from any excessive pressure that may exceed the maximum design limit of the accumulator itself causing damages to equipment and people.
The rupture of the disk is a drastic measure; in fact you will assist to the full release of all the contents of the accumulator (nitrogen).
Reaction to end of overpressure: it does not close, and then the disk must be replaced.
The burst disk is composed of a properly drilled hexagonal cap in stainless steel AISI 316L on which it is brazed a calibrated and concave membrane, which will explode at the pre-set value. It can be installed in any position.

8.2.3 ORDER CODE

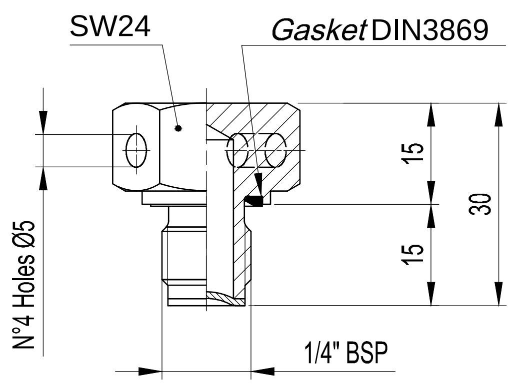
1	2		3
DR	8G2	/	360

1 Series
BURST DISK= **DR**

2 Size
INTERNAL DIAM. 8 mm = **8**

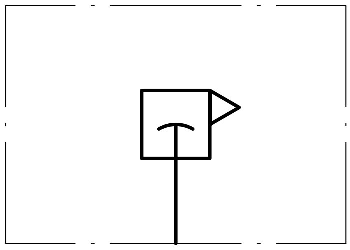
3 Standard calibration
210 bar = **210**
250 bar = **250**
270 bar = **270**
330 bar = **330**
360 bar = **360**

8.2.4 DIMENSIONS



8.2c

8.2.5 HYDRAULIC SYMBOL



8.2b

8.2.6 ACCESSORIES

For adapter, see Section 8.3

8.2.7 EUROPE MARKET

All burst disk cure the safety device Certification: CE/PED
Periodic check of calibration: is not required in accordance with Ministerial Decree No. 329.

8.2.8 SIZING

Mass flow for glass (Nitrogen)
Calculation according to ISO 4126-6
Equation 6c **Q= C*Kb*α*A*P*radp (M/T*Z)**

Fixed setting (std)	210 bar = 210
	250 bar = 250
	270 bar = 270
	330 bar = 330
	360 bar = 360

Definitions

A	= mm2	Minimum cross sectional flow area
Q	= Kg/h	Mass flow rate
P	= bar abs	Relieving pressure (=barg + 1.013)
K	=	Isoentropic exponent
C	=	Function of isoentropic exponent (=2.401 for k=1)
A	=	Discharge coefficient (0.62 – 0.80)
T	= °K	Relieving temperature
Z		Compressibility factor
M	= Kg/Kmol	Molecular factor
Kb	=	Capacity correction factor for subcritical flow
Pb	= bar abs	Back pressure

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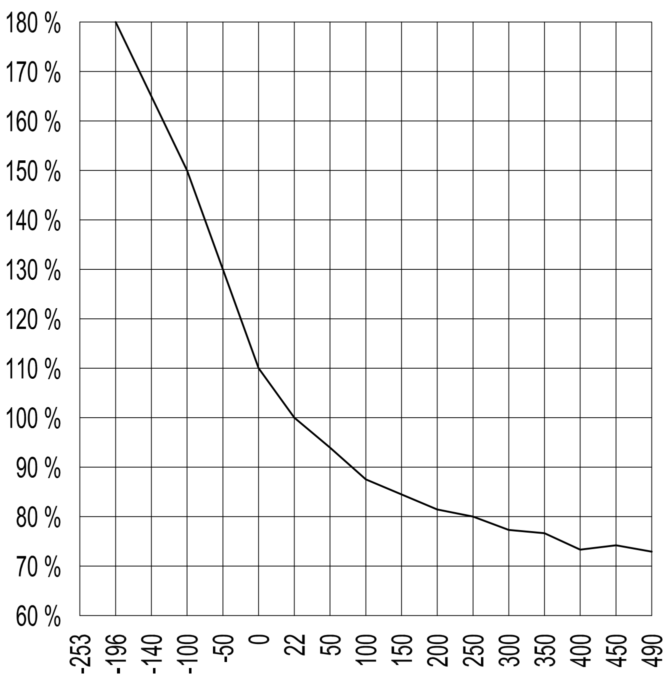
Calculation example

PRESS. SETTING 330 BAR	
DN	**8 mm**
A	50
Pb	1.013 bar abs
Ps	330 bar g
P	331.013 bar abs
Ts	80°C
T	353°K
M	29
Z	1
C	2,703
A	0,62
Kb	1

In the selection of the range of burst disk, it must be remembered that the nominal setting pressure has a tolerance 0 +10% and the burst pressure varies according to the temperature as shown below.



8.2d

8.2.9 FUSE DISK

Temperature fuses are “devices with a safety function” and are used to release the gas pressure by discharging the nitrogen completely when a rise in temperature reaches unacceptable levels (i.e. in the case of fire).

Permitted operation pressure: ≤ 800 bar
Temperature range: - 10 °C … +80 °C
Melting point: Approx. 79°C - 93°C ± 3,5%

Installation:
Simple to retrofit by replacing the sealing cap with the temperature fuse.

8.2.10 ORDER CODE OF THE FUSE DISK

1	2		3	
DFBSV		/	93	G2-X

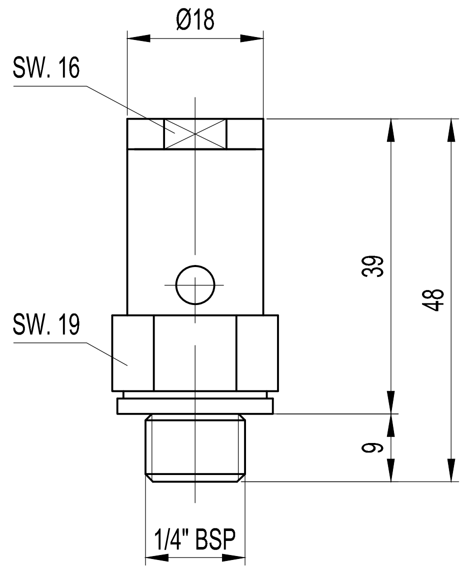
Series
FUSE DISK= **DF**

1

3 Fuse tamperature
79°C = **79**
93°C = **93**

8.2.11 FUSE DISK DIMENSIONS

2



8.2e

GAS SIDE ADAPTERS type TG

8.3.1 TECHNICAL DATA

INTERNAL DIAMETER: 10 mm

MAX OPERATING PRESSURE: 400 BAR

WORKING TEMPERATURE:-20 ÷ 80 °C (“P” version with NBR seals)
-10 ÷ 150°C(“V” version with VITON seals)

SAFETY VALVE: see catalogue section 8.1

BURST DISK: see catalogue section 8.2

FUSE DISK: see catalogue section 8.2

MATERIAL:
- phosphated or
- galvanized carbon steel in compliance with Directive 2002/95/EC (RoHS) to resist to corrosion
- stainless steel AISI 316L
- nickel coating 25-40 µ

MEDIUM: nitrogen (N2)

WEIGHT: see table 8.3c

8.3a

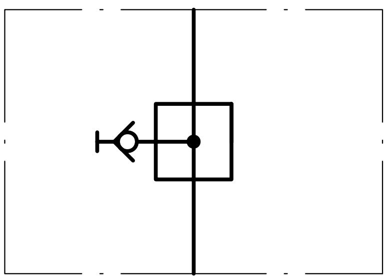
8.3.2 ADVANTAGES

- compact design
- flexible connection options
- the accumulator can be charged with nitrogen using PC kit , directly via standard or special filling valve.

8.3.3 DESCRIPTION

The gas side adapters are blocks of various type, which is possible to mount on the gas side of an accumulator and which can be fit many pressure devices, charging equipment, gas safety valve, burst disk, fuse disk, needle valve, pressure gauge, minimess and other components. Special seal allows this adapter to be installed simply and securely in any position on all gas valves of the bladder accumulators. It’s important to select the correct adapter based on the thread of the gas valve.

8.3.4 HYDRAULIC SYMBOL



8.3b

8.3.5 MOUNTING

Before mounting a gas side supplied as individual item, you should fully discharge the nitrogen pressure inside the accumulator.
The you should unscrew the existing pre-charge valve.
External valve

Internal valve
Use a wrench with code B2508

Now make sure the seal is correctly fitted into its seat inside the adapter on the threaded side
In order to mount the adapter on the valve of the accumulator, screw the adapter on the gas valve body of the accumulator and tighten with torque 80+20Nm.
If necessary, connect the various connections.
Pre-charge the accumulator as shown in the manual of use and maintenance.

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8.3.6 ORDER CODE

1	2	3	4		5		6	7
TG	50	P4	V	-	1G2	-	C	P

1	Series
Gas side adapter	= **TG**

2	Gas valve dimension
M50X1.5	= **50**
M22X1.5	= **22**
7/8” UNF	= **7/8**

3	Top central connection
1/2” NPT-F	= **P4**
3/4” BSP male	= **G5M**
1/2” BSP female	= **G4**
Burst disk set at xxx bar	= **Rxxx**
Safety valve set at xxx	= **Gxxx**
1/4” BSP female	= **G2**
Connection for pressure gauge of 1/4” BSP	= **M000**
Pressure gauge dia. 63 mm with full scale xxx	= **Mxxx**
Ball valve of 1/2” BSP	= **B4**
Needle valve of 1/4” BSP	= **N2**
Stainless steel needle valve of 1/4” BSP	= **N2X**
Stainless steel ball valve of 1/4” BSP	= **B2X**
Needle valve of 1/4” BSP + cap	= **N2T**
1/4” BSP Plug	= **T2**
1/2” BSP Plug	= **T4**
N°1 exclusion device at 90° with pressure gauge dia. 63 mm with full scale xxx	= **ELMxxx**

4	Pre-charge valve (Lateral)
Valve of 5/8” UNF	= **V**
Stainless steel valve of 5/8” UNF	= **VX**
Valve of 7/8” UNF	= **V4**
Valve of 1/4” BSP	= **V2**

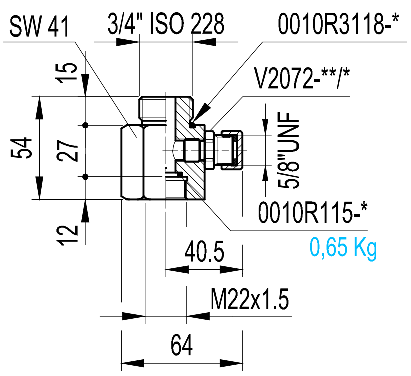
7	Seals material
Nitrile NBR	= **P**
Viton FKM	= **V**

6	Material
Carbon steel	= **C**
Nickel carbon steel 25 µ	= **N**
Nickel carbon steel 40 µ	= **M**
Stainless steel AISI 316 L	= **X**

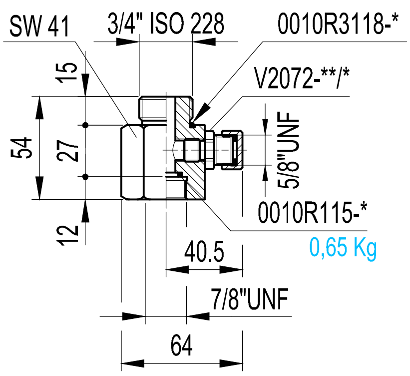
5	Eventually lateral connections
No. 2 of 1/4” BSP	= **2G2**
No. 3 of 1/4” BSP	= **3G2**
No. 1 exclusion device with pressure gauge dia. 63 mm with full scale xxx	= **1EMxxx**
No. 1 exclusion device at 90° with pressure gauge dia. 63 mm with full scale xxx	= **1ELMxxx**
No. 1 of 1/4” NPT-F	= **1P2**
No. 2 of 1/4” NPT-F	= **2P2**
No. 3 of 1/4” NPT-F	= **3P2**
No. 1 needle valve of 1/4” BSP	= **1N2**
No. 1 stainless steel ball valve of 1/4” BSP	= **1B2X**
No. 1 needle valve of 1/4” BSP + cap	= **1N2T**
Fuse disk at xxx°C	= **DFxxx**

8.3.7 DIMENSIONS

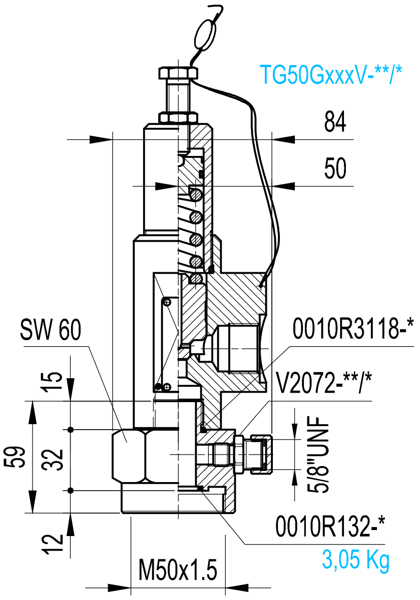
TG22G5MV-**/*



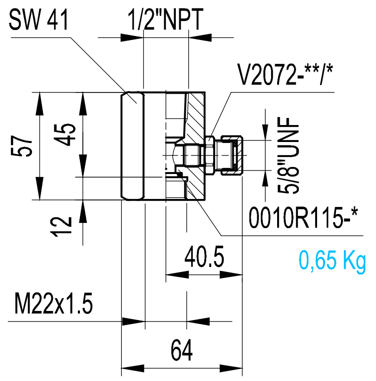
TG7/8G5MV-**/*



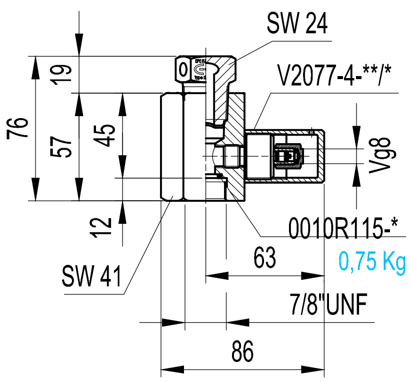
TG50GxxxV-**/*



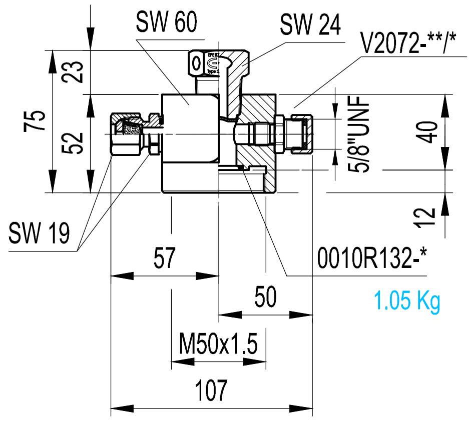
TG22P4V-**/*



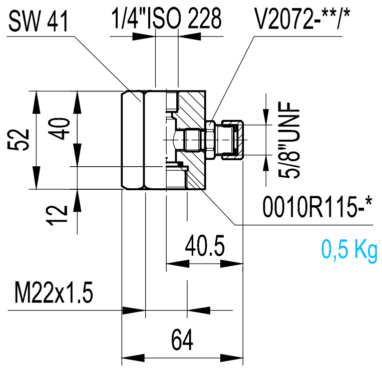
TG7/8RxxxV4-**/*



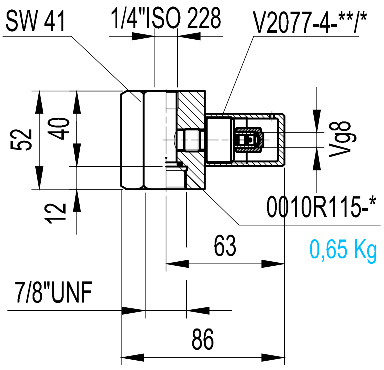
TG50RxxxV-DFxxx-**/*



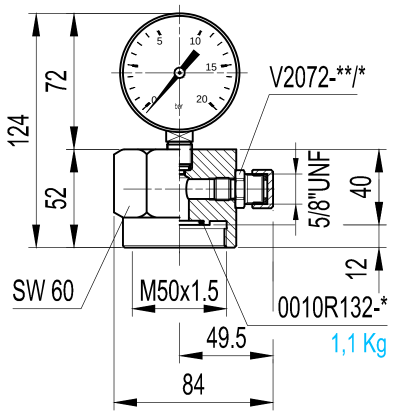
TG22M000V-**/*



TG7/8G2V4-**/*



TG50MxxxV-**/*



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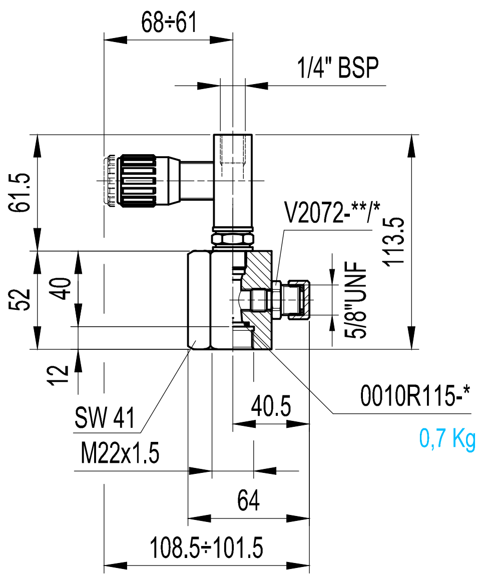
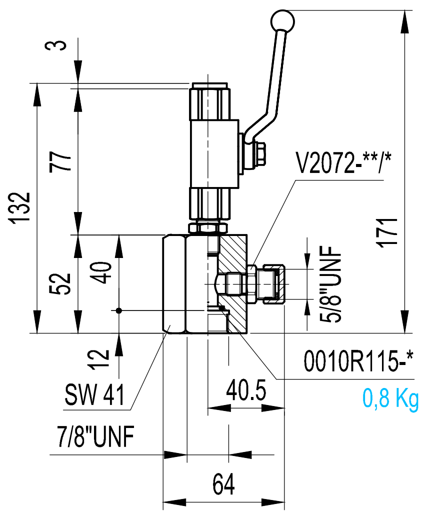
TG22N2V-**/*



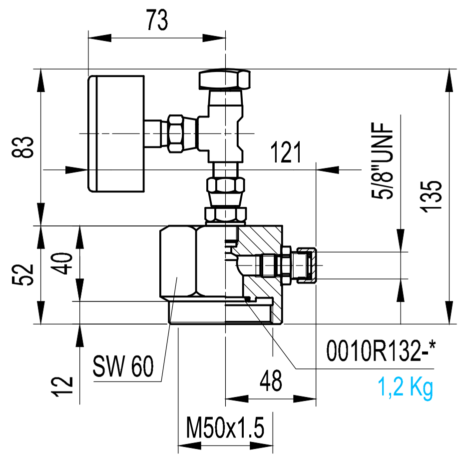
0,7 Kg

TG7/8B2XT4V-**/*



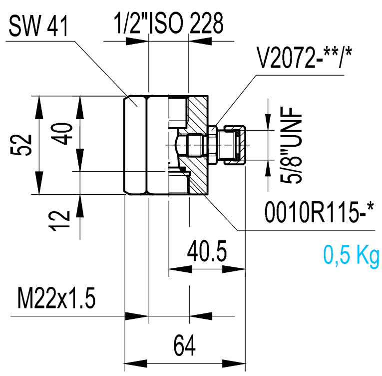
0,8 Kg

TG50ELMxxxV-**/*



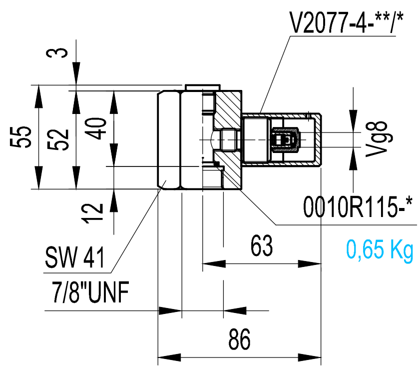
1,2 Kg

TG22G4V-**/*



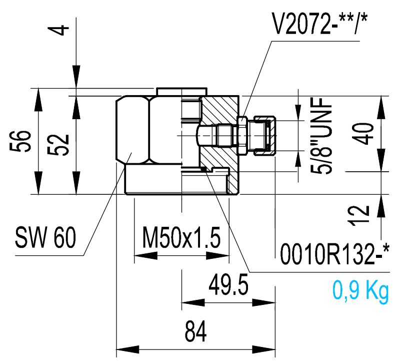
0,5 Kg

TG7/8T2V4-**/*



0,65 Kg

TG50T4V-**/*



0,9 Kg

SHUT OFF 2-WAY VALVES GAS SIDE

8.4.1 TECHNICAL DATA

MAX OPERATING PRESSURE: 320 bar

MINIMUM DIAMETER: 19 mm

CONNECTIONS: 3/4 BSP UNI/ISO 228

WORKING TEMPERATURE: -20 ÷ 100

FLUID VISCOSITY RANGE: 10 ÷ 400 cSt

RECOMMENDED VISCOSITY: 36 cSt

FLUID CONTAMINATION DEGREE:
class 20/18/15 according to ISO 4406/99

BODY MATERIAL: phosphated carbon steel

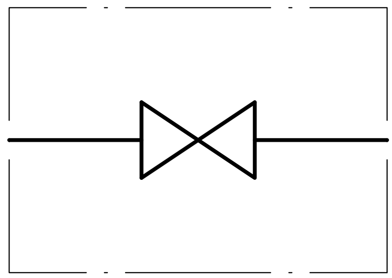
BALL: in chromed thick steel

SEALS: polyacetal resin and NBR

LEVER: zinc-stamped

8.4a

8.4.4 HYDRAULIC SYMBOL



8.4b

8.4.2 DESCRIPTION

The two-way ball valve is used to detect the safety valve type VS224 and to remove it for periodic recalibration, without having to fully discharge all the nitrogen of accumulator / accumulator station. The ball of the valve is located between two pre-compressed seals provided with a floating system, so it is guaranteed a perfect seal at both low and high pressure.

8.4.3 ORDER CODE

1		2	3
B2459	**/**	**05**	**K**

1	Series
Shut off 2-way valves gas side = **B2459**	

2	Size
Connection of 3/4" BSP	= **5**

3	Variants
Version with padlock	= **K**
Plumbing of the handle in one of two positions	= **PB**

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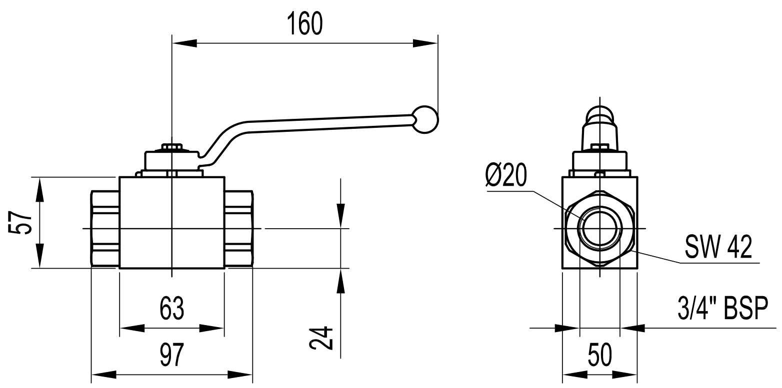
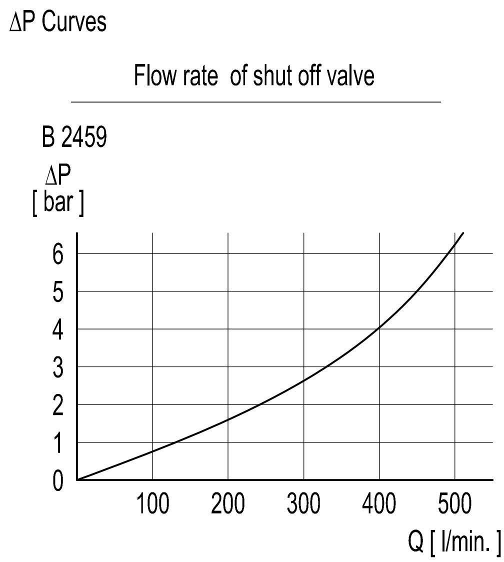
8.4.5 DIMENSION



8.4c

8.4.6 CHARACTERISTIC CURVES

Measured with viscosity of 36 cSt at 50°C.



8.4d

SHUT OFF 3-WAY VALVES GAS SIDE

8.5.1 TECHNICAL DATA

MAX OPERATING PRESSURE: 320 bar

MINIMUM DIAMETER: 19 mm

CONNECTIONS: 3/4" BSP UNI/ISO 228

WORKING TEMPERATURE: -20 ÷ 100

FLUID VISCOSITY RANGE: 10 ÷ 400 cSt

RECOMMENDED VISCOSITY: 36 cSt

FLUID CONTAMINATION DEGREE:
class 20/18/15 according to ISO 4406/99

BODY MATERIAL: phosphated carbon steel

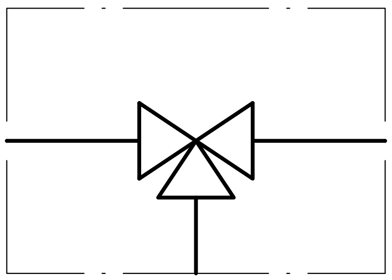
BALL: in chromed thick steel

SEALS: polyacetal resin and NBR

LEVER: zinc-stamped

8.5a

8.5.4 HYDRAULIC SYMBOL



8.5b

8.5.2 DESCRIPTION

The three-way ball valve is used to mount two safety valves type VS224 and toggling the lever in a timely manner. You can also disassembly them once at a time for periodic recalibration, always having the system in safety, protected by at least one valve. In fact, the central transitory of the valve connects both valves with the sistem.
The ball of the valve is located between two pre-compressed seals with a floating system, so it is guaranteed a perfect seal at both low and high pressure.

8.5.3 ORDER CODE

1		2	3
B2460	/	05	K

1	Series
Shut off 3-way valves gas side = **B2460**	

2	Size
Connection of 3/4" BSP	= **5**

3	Variants
Version with padlock	= **K**
Plumbing of the handle in one of two positions	= **PB**

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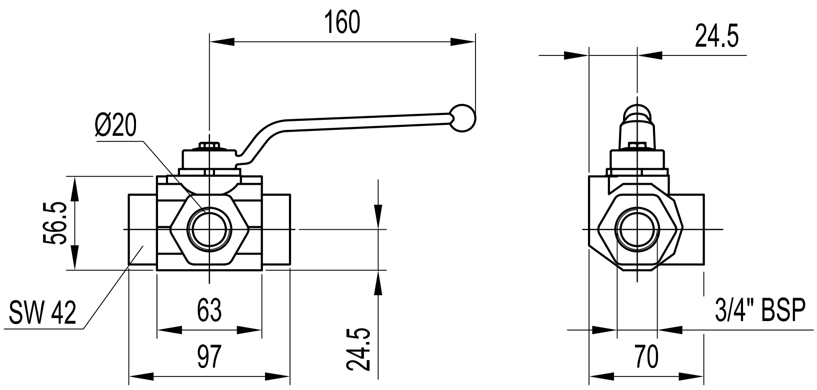
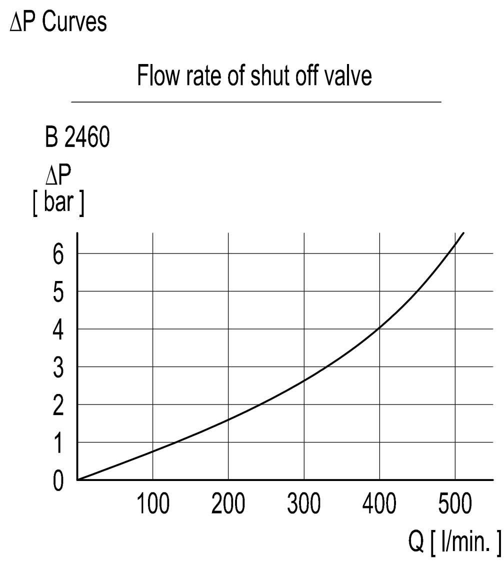
8.4.5 DIMENSION



8.5c

8.5.6 CHARACTERISTIC CURVES

Measured with viscosity of 36 cSt at 50°C.



8.5d

CHARGING AND SHUT-OFF SAFETY BLOCK type BC

8.6.1 TECHNICAL DATA

INTERNAL DIAMETER: 32 mm

MAX OPERATING PRESSURE: 400 BAR

WORKING TEMPERATURE:
-20 ÷ 80 °C ("P" version with NBR seals)
-10 ÷ 150°C("V" version with VITON seals)

SAFETY VALVE: see catalogue section 8.1

BURST FUSE DISK: see catalogue section 8.2

MATERIAL: - phosphated

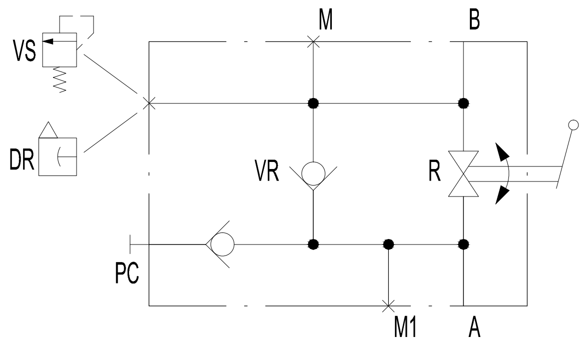
WEIGHT: see table 8.6c

8.6a

8.6.2 DESCRIPTION

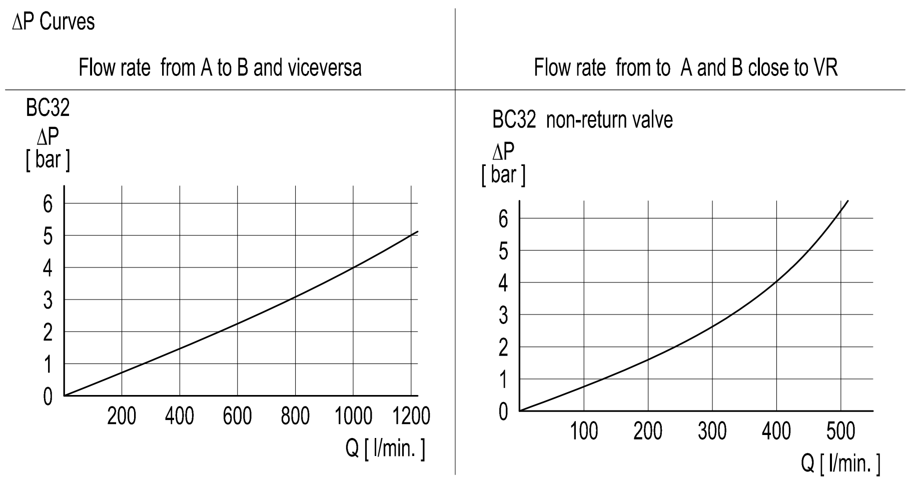
Accumulator charging and shut-off safety block type BC is used in order to make safer and more practical the connection of one or more additional nitrogen cylinders with a bladder (transfer version "AST") or a piston accumulator. It includes the filling valve to charge and test the pre-charge of the accumulator through pre-loading set PC (see catalogue Section 10). In addition, it allows the additional nitrogen cylinders to be shut-off from the (bladder or piston) accumulator. The check valve guarantees the nitrogen passage from the accumulator to the cylinders even when the ball valve is closed. It is possible to connect directly a safety valve or a burst/fuse disk. Also it has two connections for pressure gauge / pressure transmitter / pressure plugs Minimess or needle-valve. When the shut-off valve remains open during the operation in order to assure the free nitrogen flow between cylinders and accumulator and vice versa, it should be closed only for a check or for the accumulator maintenance or for use the accumulator as pump for filling the cylinders/accumulation station.

8.6.3 HYDRAULIC SYMBOL



8.6b

8.6.4 CHARACTERISTIC CURVES



8.5d 8.6d

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8.6.5 ORDER CODE

1	2	3	4	5	6	7	8		9	10
BC	32	R	210	G8	G8	V	8	-	C	P

1 Series

Charging and shut-off safety block = **BC**

2 Internal nominal diameter

32mm = **32**

3 Safety accessory

Connection 1/2” BSP
(with a plastic cap) = **A**
Fuse disk = **F**
Safety valve type VS214/VS215 = **V**
Burst disk = **R**
Connection 1/2” BSP
with closing cap) = **T**

4 Calibration of the safety valve

See Section 8.1 or 8.2 = **5 ÷ 360**

5 Accumulator side connection

1”1/2 BSP ISO 228 = **G8**

10 Seals material

Nitrile NBR = **P**
Viton FKM = **V**

9 Body Material

Carbon steel = **C**

8 Certifications

2014/68/EU = **8**
EAC (Russia) = **11**

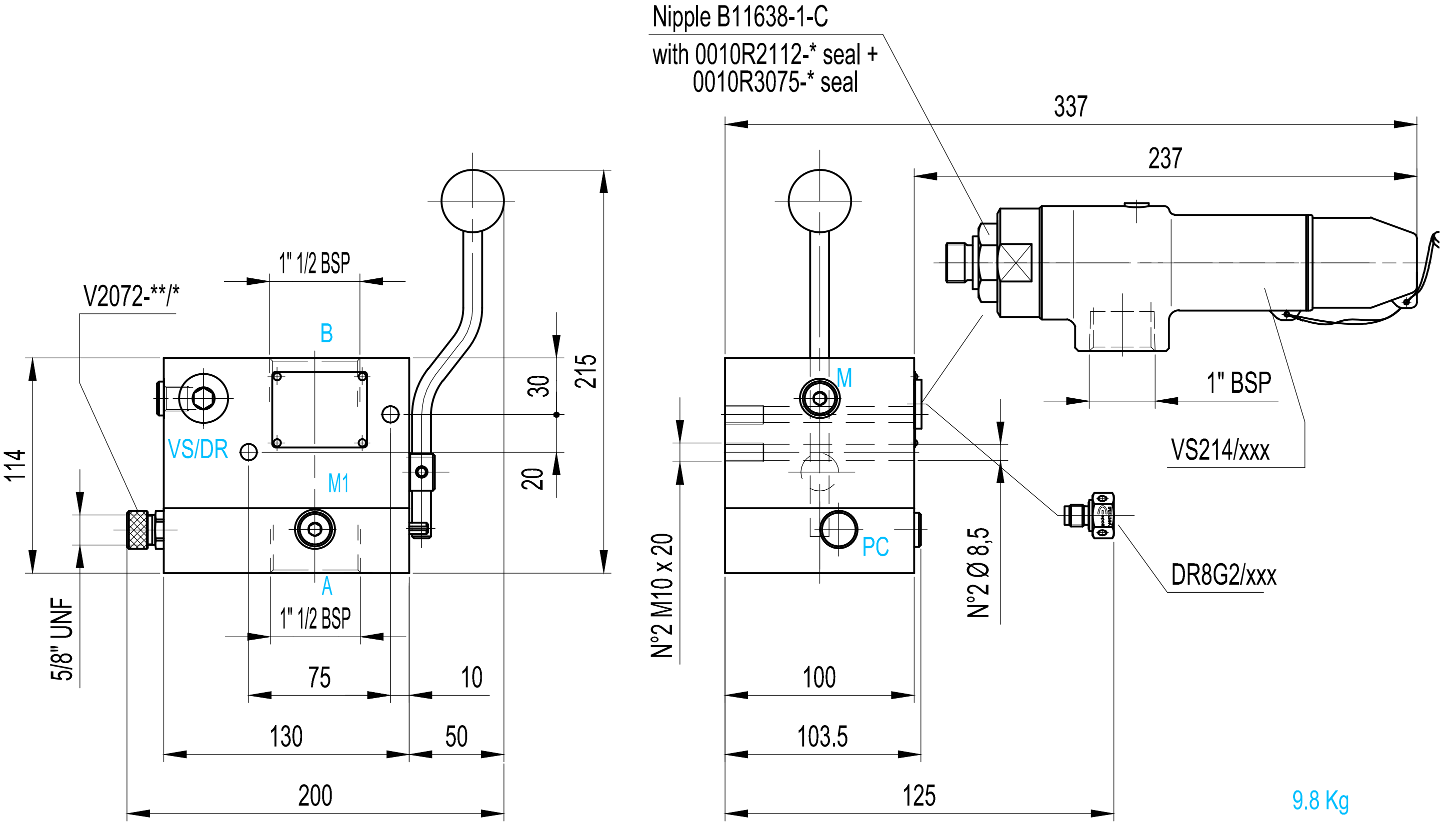
7 Filling valve

5/8” UNF (std) = **V**
5/8” in stainless steel = **VX**
7/8” UNF = **V4**
1/4” BSP = **V2**

6 Bottle side connection

1”1/2 BSP ISO 228 = **G8**

8.6.6 DIMENSIONS



8.6e

M	= 1/4" BSP
M1	= 1/4" BSP
VS/DR	= 1/2" BSP
A	= 1" 1/2 BSP Accumulator connection
B	= 1" 1/2 BSP Bottle connection
PC	= 5/8" UNF

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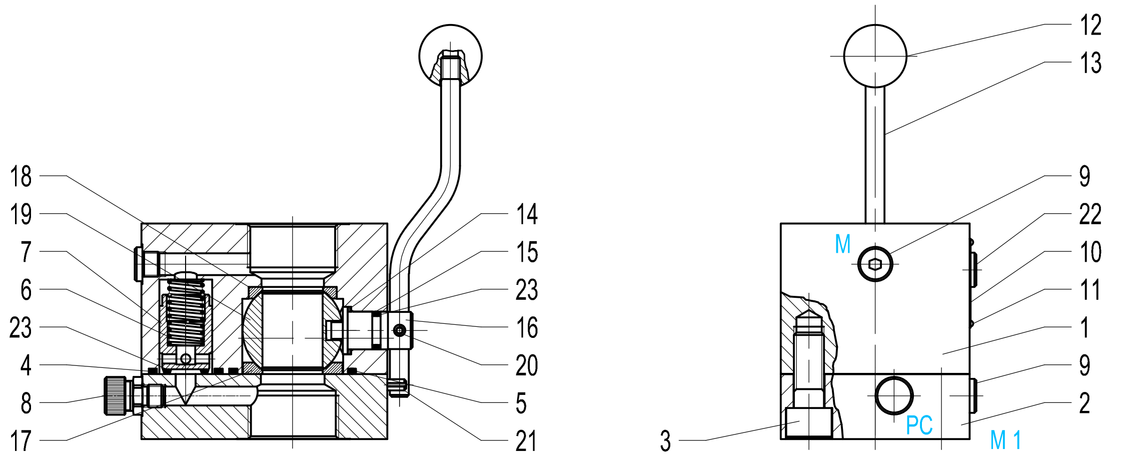
8.6.7 SPARE PARTS CODES



8.6f

Item	Description	Q.ty	Order code
1	Safety block BC32	1	Not supplied as spare part
2	Plate of closing	1	
3	Hex. socket head cap screws M16x40 UNI5931	6	0022VTCEIM16x40-C2
4	"O" ring	1	0010R4131 - *
5	"O" ring	1	0010R0164 - *
6	Spring	1	B10149 - X
7	Noozle	1	B11637 - CP
8	Standard gas valve assembly	1	V 2072 - ** / *
9	Plug with rubber seals 1/4" BSP	2	0031TG2-CP
10	Plate for block	1	B11024 - 6 - A
11	Hammer rivet	4	0029R1,9x5-C
12	Knob M10	1	0055P5.35-M10-EA
13	Handle	1	B10482 - C
14	Seal for pin	1	B10487 - D
15	"O" ring	1	0010R0119 - *
16	Pin	1	B10480R - C
17	Gasket for ball 52.7x6	1	0013913815-RN
18	Gasket for ball 46.5x6	1	0013G913813-RN
19	Ball DN32	1	0052S907344-RN
20	Set screw M6x8 UNI 5927–67	1	0022VSTEIM6x8-CZ
21	Spring pins 6x26 UNI 6873	2	0023E6x26-C
22	Plug 1/2" BSP	1	0031TG4-CP
23	Antiextrusion ring Parbak	1	0011P8113 - *
	Gasket sets	1	B2371-* { 0010R4131-* 0010R0164-* B10487-D 0010R0119-* 0010P8113-* }
	Ball sets	1	B2135-* { 0013913815-RN 0013G913813-RN 0052S907344-RN }

* Gasket material ** Component material

8.6g

9.1.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS): sizes 6, 20: 400 bar
size 10: 630 bar
size 30: 315 bar

PRESSURE SETTING (P): (upon request)
sizes 6, 20: 6 ÷ 400 bar
size 10: 6 ÷ 630 bar
size 30: 30 ÷ 315 bar

NOMINAL SIZE: 6, 10, 20, 30

LIFT: 2 mm

WORKING TEMPERATURE: -20 ÷ +150 °C

REPETIBILITY: ± 3% of P

CALIBRATION ERROR: 3%

OVERPRESSURE BY FULL FLOW: 10% of P

BLOW DOWN: 10% of P

FLUID VISCOSITY RANGE: 10 ÷ 400 cSt

RECOMMENDED VISCOSITY: 36 cSt

FLUID CONTAMINATION DEGREE:
class 20/18/15 according to ISO 4406/99

BODY MATERIAL: - phosphated carbon steel or galvanized carbon steel in compliance with Directive 2002/95/EC (RoHS) to resist to corrosion.
- stainless steel (only DBDS 10 K)

SEALING MATERIAL: - **P** = Nitrile rubber (NBR)
- **V** = Fluorocarbon (FKM)

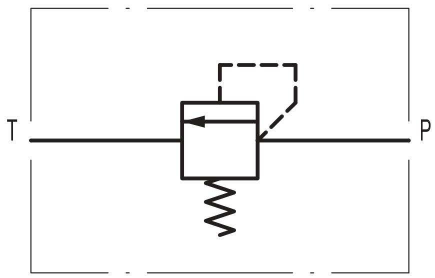
CONNECTIONS: see Table 9.1d

FLOW RATE: see Table 9.1d

WEIGHT: see Table 9.1d

9.1a

9.1.2 HYDRAULIC SYMBOL



9.1b

9.1.3 DESCRIPTION

Valves DBDS type are pressure direct command relief valves. Their function is to limit the pressure of a hydraulic system. The calibration of the system pressure is carried out continuously through the calibration device, which, by the spring, pushes the wedge against the seat.
The P channel is connected to the pressure line of the system, entering the valve, and acts on the active area of the wedge (or of the ball for the DBDS 10 at 630 bar).
When the pressure in channel P exceeds the value set on the spring, the wedge or the ball raises in contrast to the spring. The fluid now flows from the channel P to the channel T. The stroke of the wedge is limited by a pin in the damping chamber.
To obtain a good resolution of the pressure setting from 0 to 400 (630) bar, this has been divided into 7 pressure ranges. Each range has a specific spring for adjusting a maximum working pressure.

9.1.4 STRUCTURE

Body: in high strength steel, obtained by mechanical processing, in which are obtained the seats.
Poppet: obtained by mechanical processing from bar, it ensures the necessary seal degree on the valve seat. The poppet is well led by the damping piston and pushed by the spring against the seat.
Spring: it counteracts the pressure and the dynamic actions of the fluid and always ensures the closing of the valve after the discharge. The

coils of the spring, even when the obturator has reached its maximum lift, are never at pack.
The poppet has a mechanical lock and when it has reached it, the arrow of the spring does not exceed 85% of the maximum deviation.
Calibration system: threaded hexagon head screw which screws into the top of the valve by compressing the spring below. After the calibration, the position of the adjusting screw is kept unaltered by locking the counter nut and sealing the adjusting screw (valve with PED/EC certification).

9.1.5 CALIBRATION

All valves are calibrated on the working bench with a flow rate of 2 l / min. and with an atmospheric counter pressure. The repeatability error of calibration is less than 3% than the pressure P. Up to a pressure equal to 97% of the calibration pressure verifyng that there's no leackages.

9.1.6 ORDER CODE

1	2	3	4	5		6		7		8	9
DBD	S	10	K	13	/	360	-	8P	-	C	P

1	Series
Fluid safety valves	= **DBD**

2	Type of adjustment
Size 6, 10, 20	
Hexagon socket set screw	= **S**
Rotary knob	= **H**
Size 30	
Hexagon socket set screw	= **S**

3	Nominal diameter
6 mm =	**6**
10 mm =	**10**
20 mm =	**20**
30 mm =	**30**

4	Type of connection
Screw cartridge valve	= **K**
Threaded connection	= **G**
Sub-plate mounting	= **P**

5	Series number 5
Overall and mounting dimensions remain unchanged from 10 to 19.	

9	Sealing material
Nitrile (NBR)	= **P**
Viton (FKM)	= **V**

8	Body material
Carbon steel	= **C**
Stainless steel	= **X**

7	Certification
Without certification	= **0**
EAC (Russia)	= **11**
PED 2014/68/EU	= **8P**

Fixed Pressure setting (with certifications)		
DBDS6	6 ÷ 400	: **upon request**
DBDS10	6 ÷ 400	: **upon request**
DBDS20	6 ÷ 630	: **upon request**
DBDS30	30 ÷ 315	: **upon request**

6 Pressure rating (without certification)			
DBDS6	up to	25	: **25**
	up to	50	: **50**
	up to	100	: **100**
	up to	200	: **200**
	up to	315	: **315**
	up to	400	: **400**
DBDS10	up to	25	: **25**
	up to	50	: **50**
	up to	100	: **100**
	up to	200	: **200**
	up to	315	: **315**
	up to	400	: **400**
	up to	630	: **630**
DBDS20	up to	25	: **25**
	up to	50	: **50**
	up to	100	: **100**
	up to	200	: **200**
	up to	315	: **315**
	up to	400	: **400**
DBDS30	up to	200	: **200**
	up to	315	: **315**

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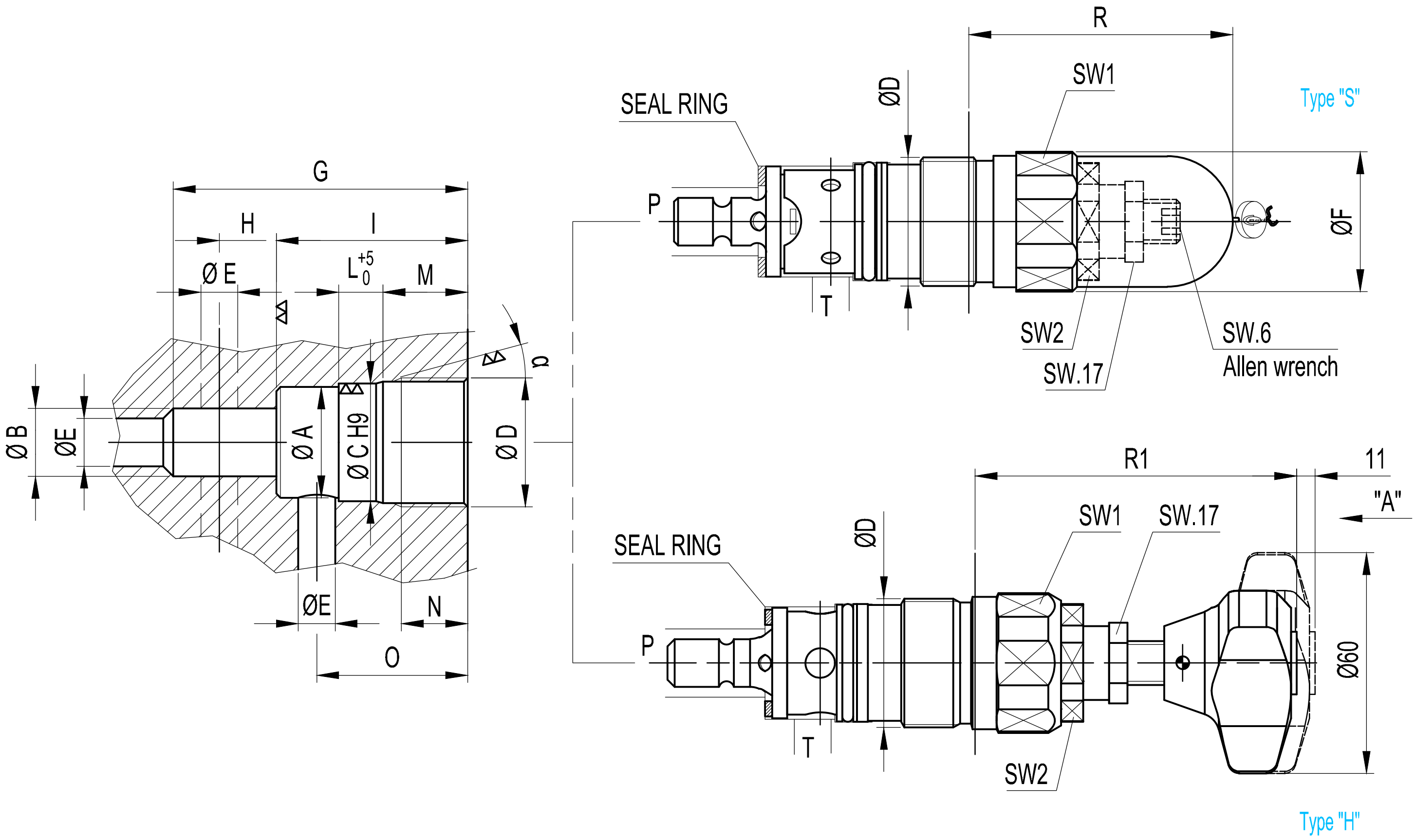
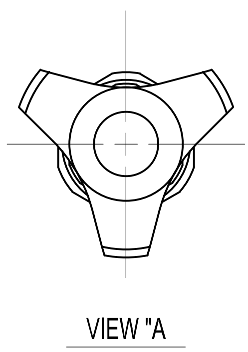
9.1.7.1 “K” VERSION DIMENSIONS





9.1c

Valve order code (seal ring included)	Loose seal ring order code	Gasket set order code	Set for "H" type order code
DBD... 6 K 1....	0012B17.4x24x1.5 - *	B 2423 - *	B 2427
DBD... 10 K 1....	0012B24.7x31x2 - *	B 2424 - *	
DBD... 20 K 1....	0012B31x39x2 - *	B 2425 - *	
DBD... 30 K 1....	0012B42x52x3 -*	B 2426 - *	

* Gasket material

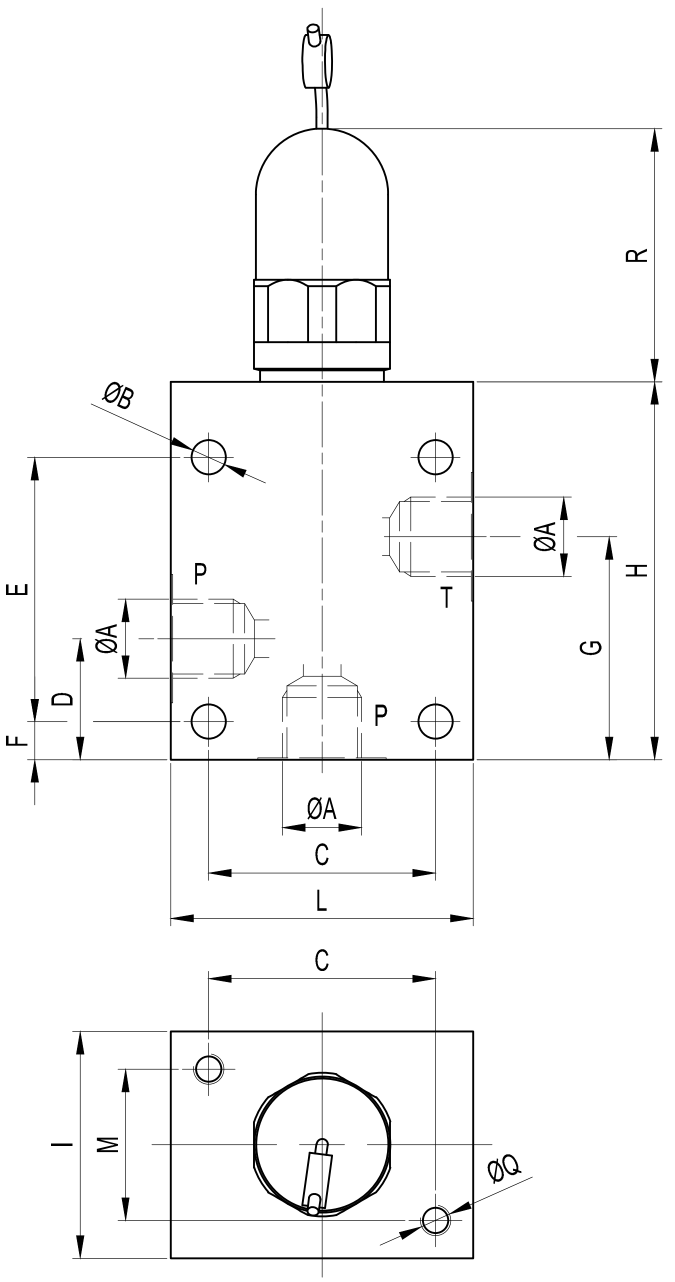
9.1d

Valve order code (seal ring included)	Ø A mm	Ø B mm	Ø C mm	Ø D	Ø E mm	Ø F Type S mm	G mm	H mm	I mm	L mm	M mm	N mm	O mm	R S type mm	R1 H type mm	SW1 mm	SW2 mm	α	Weight Kg
DBD... 6 K 1....	Ø24.9	15	Ø25 H9	M28x1.5	6	34	65	11.5±5.5	45	11	19	15	36	72	83	32	30	15°	0.36
DBD... 10 K 1....	Ø31.9	18.5	Ø32 H9	M35x1.5	10	38	80	15.5±7.5	52	12	23	18	41.5	68	79	36	30	15°	0.48
DBD... 20 K 1....	Ø39.9	24	Ø40 H9	M45x1.5	20	48	110	21.5±8.5	70	18	27	21	55	65	77	46	36	20°	0.86
DBD... 30 K 1....	Ø54.9	38.75	Ø55 H9	M60x2	30	63	140	29.5±11.5	84	16	29	23	63	83	-	60	46	20°	2

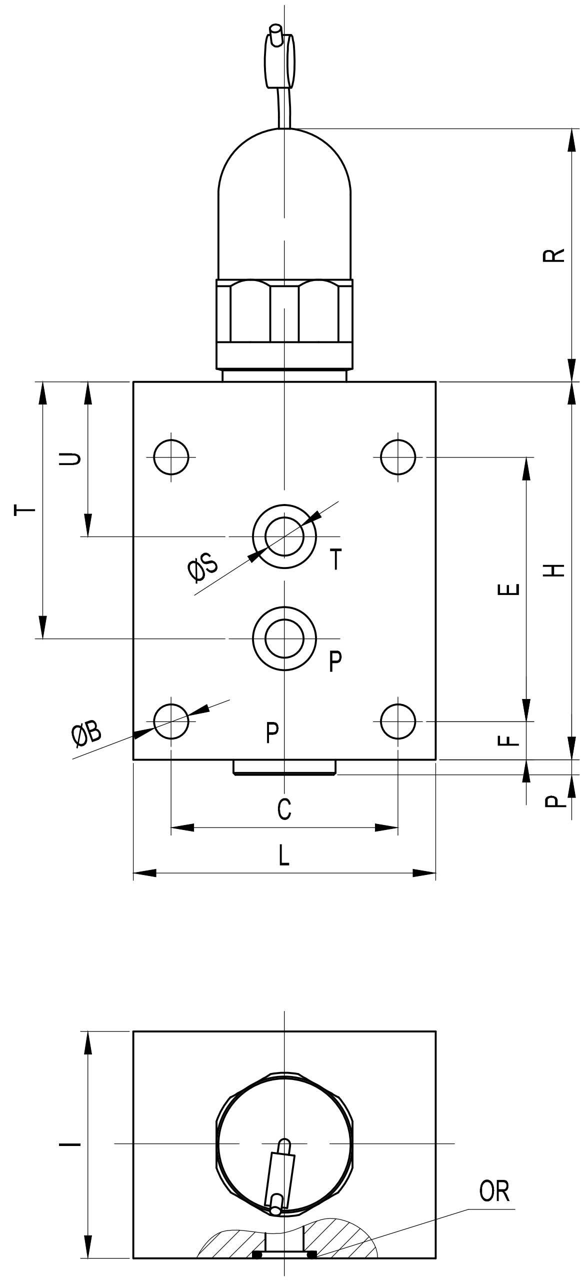
DBD... 30 K 1.... type "H" not avaiable

9.1e

9.1.7.2 “G” & “P” VERSIONS DIMENSIONS



BLOCK "G" TYPE



BLOCK "P" TYPE

9.1f

Complete valve order code	Ø A BSP	Ø B mm	C mm	D mm	E mm	F mm	G mm	H mm	I mm	L mm	M mm	P mm	Ø Q mm	R mm	S mm	T mm	U mm	OR* metric	Weight Kg
DBDS6G1....	1/4"	6.6	45	25	55	10	45	80	40	60	25	4	M6	72	6	-	-	-	1.5
DBDS10G1....	1/2"	9	60	32	70	10	59	100	60	80	40	4	M8	68	10	-	-	-	3.7
DBDS20G1....	1"	9	70	50	100	15	81	135	70	100	50	5.5	M8	65	20	-	-	-	6.4
DBDS30G1....	1" 1/2	11	100	70	130	25	120	180	90	130	60	5.5	M10	83	30	-	-	-	13.9
DBDS6P1....	1/4"	6.6	45	25	55	10	45	80	40	60	25	4	M6	72	6	55	35	0010M7x1.5-*	1.5
DBDS10P1....	1/2"	9	60	32	70	10	59	100	60	80	40	4	M8	68	10	65	41	0010M12.3x2.4-*	3.7
DBDS20P1....	1"	9	70	50	100	15	81	135	70	100	50	5.5	M8	65	20	85	54	0010M22x3-*	6.4
DBDS30P1....	1" 1/2	11	100	70	130	25	120	180	90	130	60	5.5	M10	83	30	110	60	0010M22x3-*	13.9

DBD... 30 K 1.... type "H" not avaiable   * Gasket material

9.1g

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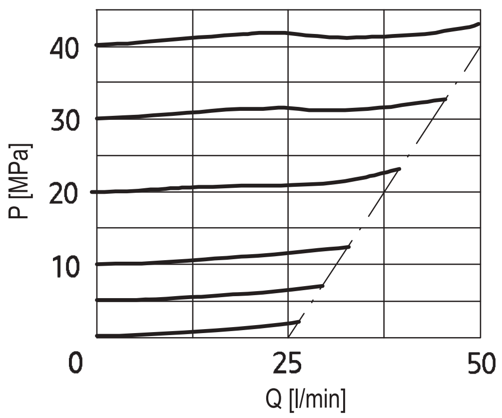
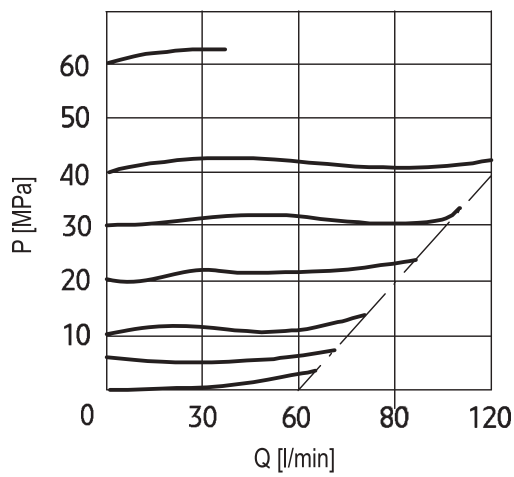
9.1.8 CHARACTERISTIC CURVES

Measured with viscosity of 36 cSt at 50°C.

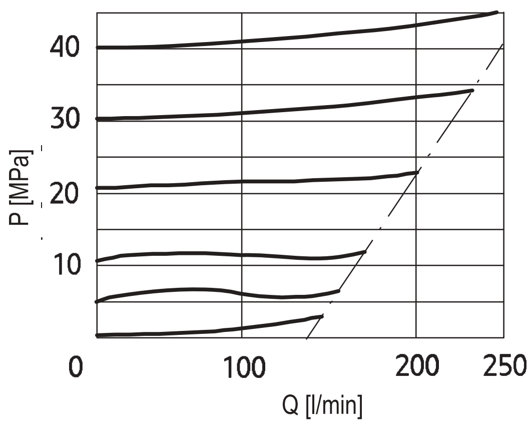
DBDS 6



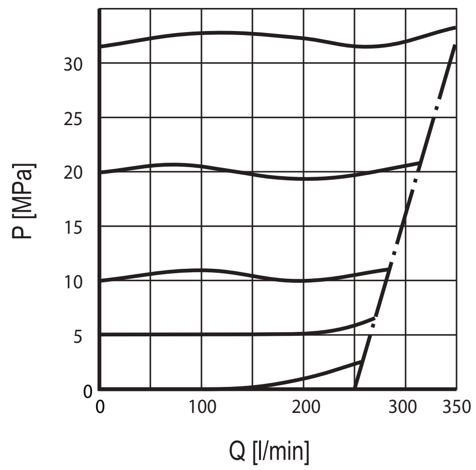
DBDS 10



DBDS 20



DBDS 30



9.1h
9.1

9.1.9 EUROPEAN MARKET

Directive 2014/68/EU provides that pressure equipment, in which it's reasonably expected to be exceeded the allowable limits, should be provided with adequate protective equipment; for example, safety accessories such as the valves DBDS “G”/ DBDS “P” or the safety blocks type BS. These devices shall prevent that pressure permanently exceeds the maximum allowable pressure PS of the equipment protected by them. However, it is permissible a pressure peak of short duration limited to 10% of the maximum allowable pressure. For the choice and sizing of the adequate safety device, the user should refer to specific standards.
In accordance with the regulations 2014/68/EU, the safety valves are classified in Category IV.

9.1.10 ACCESSORIES

Blocks for relief valves, see section 9.2
Safety blocks, see section 9.3

9.1.11 COMMISSIONING AND MAINTENANCE

Installing the valves
Regarding the installation of the safety valves, you should be kept in mind the following key points:
- safety valves must be installed in correspondence of the area to be protected by any overpressures; the vessels, connected each other by appropriate piping with a diameter adapted by the Manufacturer and User and on which there weren't interposed the interceptions, can be considered for the installation of the safety valves as a single vessel;
- the connection between the valve and the equipment to be protected should be as short as possible and must not have a cross section smaller than the one of the valve inlet. In any case, the standard EN 13136:2001/A1: 2005 states that the pressure drop between the protected vessel and the safety valve, at flow rate of full discharge, should not exceed 3% of the pressure value P, including any accessory inserted on the line;
- the choice of the safety valve displacement should consider that the operation of the valve results in the discharge of the fluid under pressure to be sent into the tank. The discharging pipe must be sized as not to affect the operation of the valve. Standard EN 13136:2001/A1:2005 requires that this pipeline should not generate, at full capacity, a pressure higher than 10% of the value of the calibration pressure.

Disassembly
Before removing the valve, make sure that the system on which it is mounted is not under pressure and that there is no pressure within the valve.

Ordinary maintenance
Check the system in order to verify that there are no leakages of oil into the tank, with overheating of the assembly.
Periodic retest according to the related standards of the country of installation. In Italy, see the Ministerial Decree 329 dd. 12/01/2004: for fluids of the group 1: every 2 years you must carry out a functional test and every 10 years you must check the integrity; for fluids of the group 2, every 3 years, you must carry out a functional tes and every 10 years you must check the integrity.

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9.2.1 TECHNICAL DATA

MAX OPERATING PRESSURE: 630 BAR

PRESSURE TEST: 1.43 X PS

NOMINAL SIZE: 6, 10, 20

BODY MATERIAL: galvanized carbon steel

SEALS MATERIAL: Nitrile (NBR)
Viton (FKM)
See Table 9.2c and or Section 1.8

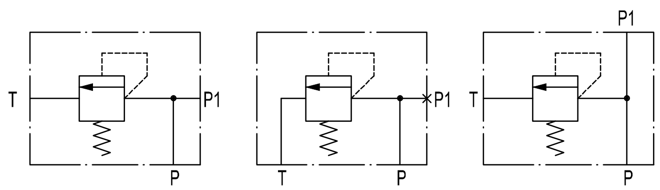
WEIGHT: see Table 9.2

9.2.2 DESCRIPTION

These blocks are used for installation of safety valves type DBDS (see Section 9.1) which must be ordered separately. The BPV type is built in sizes 6, 10, 20 and in the "G" versions with the threaded connections BSP ISO 228 or in the "P" version for mounting on plate. BAPV type instead can be mounted through a double thread nipple directly on the fluid valve of the bladder accumulators with a connection of 1"1/4 (type AS5 and ASA1) or 2" BSP (type AS10÷55, ASA2.5÷15) or with appropriate adaptors (see Section 9.4) directly on the back side of a fluid piston accumulator. This version is built only to accommodate the safety valves DBDS10.

9.2a

9.2.2 HYDRAULIC SYMBOL



9.2b

9.2.3 ORDER CODE

1	2	3		4	5
BPV	6	G	-	C	P

1 Series

Valve-holder block = **BPV**

2 Nominal sizes

Size 6 = **6**
Size 10 = **10**
Size 20 = **20**
Size 30 = **30**

3 Connections P and P1

Thread BSP ISO 228 = **G**
Plate mounting = **P**

4 Body Material

Carbon steel = **C**

5 Seals material only for type P

Nitrile NBR = **P**
Viton (FKM) = **V**

1	2	3		4	5
BAPV	10	A/G	-	C	P

1 Series

Valve-holder block for accumulator = **BAPV**

2 Nominal sizes

Size 10 = **10**

3 Connections P and T

Accumulator connection 1” 1/4-2”
fluid port connection 1” 1/4-2” BSP = **A/G**

4 Body Material

Carbon steel = **C**

5 Seals material

Nitrile NBR = **P**
Viton (FKM) = **V**

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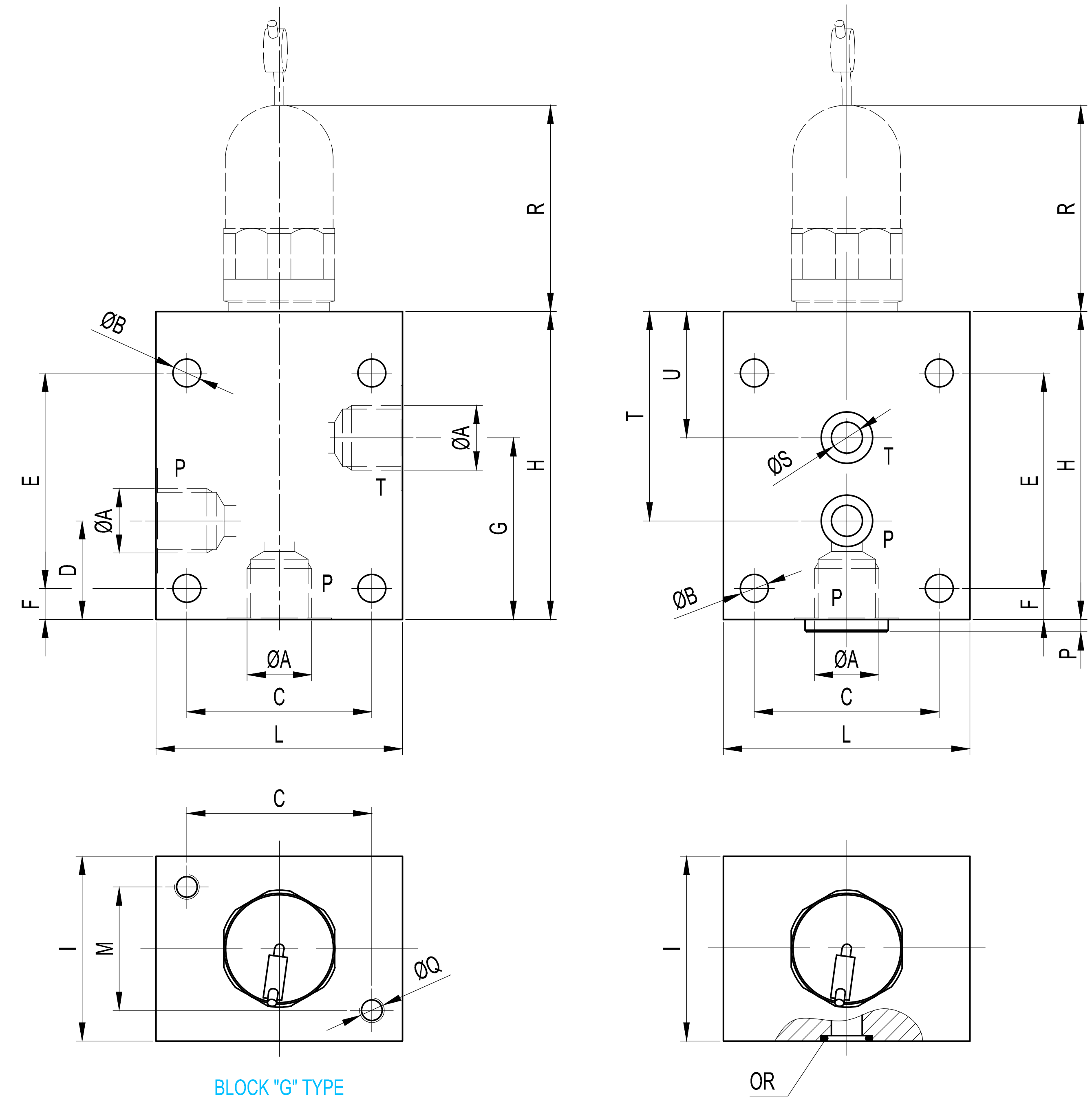
9.2.4.1 DIMENSIONS
BPV “G” & “P” TYPE



BLOCK "G" TYPE

BLOCK "P" TYPE

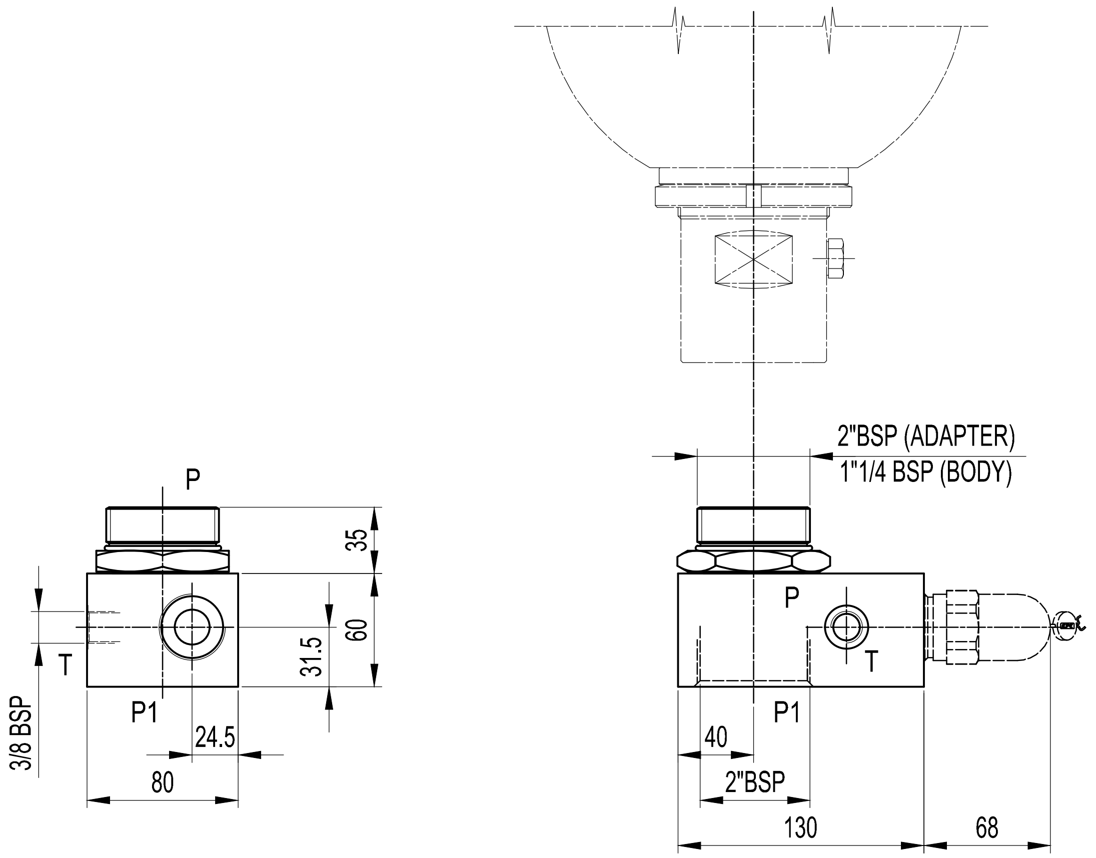
9.2c

Block order code	Valve order code	Ø A BSP	Ø B mm	C mm	D mm	E mm	F mm	G mm	H mm	I mm	L mm	M mm	P mm	Ø Q mm	R mm	S mm	T mm	U mm	OR metric	Weight Kg
BPV 6.. - C*	DBD... 6 K 1....	1/4"	6.6	45	25	55	10	45	80	40	60	25	4	M6	72	6	55	35	0010M7x1.5-*	1.5
BPV 10.. - C*	DBD... 10 K 1....	1/2"	9	60	32	70	10	59	100	60	80	40	4	M8	68	10	65	41	0010M12.3x2.4-*	3.7
BPV 20.. - C*	DBD... 20 K 1....	1"	9	70	50	100	15	81	135	70	100	50	5.5	M8	65	20	85	54	0010M22x3-*	6.4
BPV 30.. - C*	DBD... 30 K 1....	1" 1/2	11	100	70	130	25	120	180	90	130	60	5.5	M10	83	30	110	60	0010M22x3-*	13.9

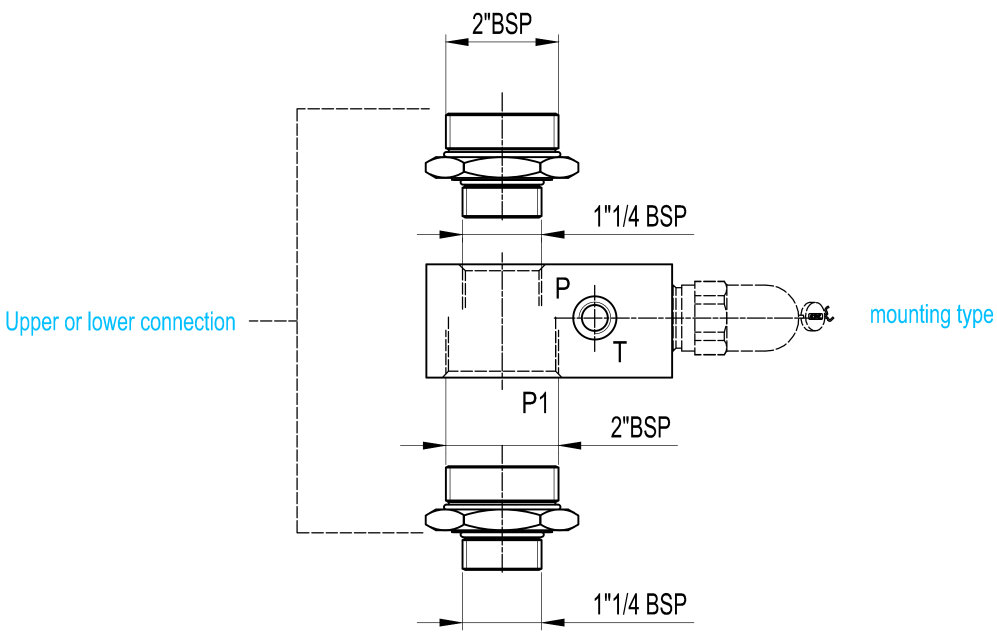
For "DBDS K" valve seat see chapter 9.1.7.1 table 9.1e

9.2d

BAPV10 TYPE



9.2e



9.2f

Block order code BAPV 10 A/G - C *

* gasket material

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9.3.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS): 420 bar

PRESSURE TEST (PT): 1.43 x PS

NOMINAL PASSAGE DIAMETER: 10mm, 20mm, 25mm, 32mm

WORKING TEMPERATURE: -40 ÷ +150

FLUID VISCOSITY RANGE: 10 ÷ 400 cSt

RECOMMENDED VISCOSITY: 36 cSt

FLUID CONTAMINATION DEGREE: class 21/19/16 according to ISO 4406/99

SHUT-OFF VALVE: ball type

SAFETY VALVE: with DBDS 10 cartridge

DISCHARGE VALVE: manual and electric

MOUNTING POSITION: every position

BODY MATERIAL: - phosphated or galvanized carbon steel in compliance with Directive 2002/95/EC (RoHS) to resist to corrosion.
- nickel coating 25 - 40 µ
- stainless steel AISI 430 (only for BS25)

VALVES MATERIAL: - phosphated or galvanized carbon steel in compliance with Directive 2002/95/EC (RoHS) to resist to corrosion
- stainless steel

SEALS MATERIAL:
- **P** = Nitrile rubber (NBR)
- **F** = Low temp. nitrile rubber
- **K** = Hydrogenated nitrile (HNBR)
- **E** = Ethylene-propylene (EPDM)
- **V** = Fluorocarbon (FKM)

See Table 9.3B and/or section 1.5

ACCUMULATOR SIDE CONNECTION:
- 3/4" BSP with O-Ring for chamfer
- 1”1/4 BSP with O-Ring for chamfer
- 2” BSP with O-Ring for chamfer

FLUID PORT CONNECTION: see Chapter 9.3.8
FLOW RATE: see Chapter 9.3.10
POWER SUPPLY: 24 VDC, 105 VDC, 110 VDC, 220 VDC, P=26W, 100%ED, IP65 in compliance with DIN 40050, connector in compliance with DIN 43650 type A 2 poles + earthling with AC voltage; the internal connector has a bridge rectifier
WEIGHT: see Chapter 9.3.8

9.3a

9.3.2 HYDRAULIC SYMBOL

See section 9.3.8

9.3.3 DESCRIPTION

The EPE range of safety blocks BS is available in sizes NG10, NG20, NG25 and NG32. The safety blocks BS combine all the features to protect, isolate and discharge a hydraulic accumulator. The shut-off valve rotates of 90 degrees to instantly isolate the accumulator from the hydraulic system in emergency conditions or for maintenance. Once isolated, the accumulator can be discharged into a tank through a discharging valve with manual or electric controls. In version BS10 and BS20 when switching over the ball valve, the pump flow rate is stopped and simultaneously the accumulator discharged to the tank. During switching all three ports (P, A and T) are momentarily interconnected (negative switching overlap). Ball valves are not designed to be used as flow control valves; therefore they should always be either fully open or fully closed, to avoid damaging the sealing cups. The system security is ensured by a pressure PED an anti-tempering pressure valve certified CE/PED. The safety blocks BS allow easy and secure connection of an accumulator to a hydraulic system. Suitable for use with all types of bladder, piston and diaphragm accumulators, the compact and multifunction design allows saving space and reducing the wiring. By reducing the times required by the procedures of installation and maintenance, the security blocks BS help maximizing the productivity and profitability, minimizing the downtime of the system. For easy installation, we offer a full range of adapters, suitable for all standard fittings of any size and type. For diagnostic purposes and for continuous monitoring of pressure, all the security blocks BS are provided with a manometer connection of 1/4"BSP. The European Directive on pressure equipment 2014/68/EU states that all accumulators must be provided with a safety device that intercepts, limit and discharge the pressure as well as allows carrying out the measurements. BS range satisfies all these requirements with a single and compact device. The safety block should always be mounted as close as possible to the accumulator.

9.3.4 PRESSURE RELIEF VALVE

The function of the pressure relief valve is to protect the accumulator during its operation. If the pressure exceeds the valve setting, this opens and discharges the fluid into the tank and allows the pressure in the system returning to a safe level. Thanks to its cartridge design, the pressure relief valve can be recalibrated to another pressure setting. Thischange requires a new approval according to PED 2014/68/EU. The vessels discharge pressure expressed in bar, is stamped on the nameplate. The pressure relief valve is controlled and carefully sealed after approval in accordance with the rules of pressurized vessels. On their body there are stamped the CE mark, the certification ID and the serial number. All valves are supplied with a certificate attesting the calibration pressure. The documents provided with the pressure relief valve must be kept as they may be necessary in the event of repetition of the tests.

Manual and electric discharge valve

The discharge valve allows the discharge of the accumulator fluid in the tank. All models of the safety block BS have a manually operated valve. In addition to the manual valve on request, could be installed a discharging electrically-controlled valve.

9.3.5 SAFETY BLOCK ADVANTAGES

- dirt tolerant
- light weight
- compact
- simple construction
- quick response
- works well on water, low lubricity fluids
- quick, easy installation
- low cost

9.3.6 SEALS-TEMPERATURE-LIQUID COMPATIBILITY

When selecting the additional seal variant, pay attention to the following non-binding notes with regard to hydraulic fluid, seals material and the permissive temperature range. (see Section 1.5)

Code letter	Polymer	ISO	Temperature range (°C)	Some of the liquids compatible with the polymer
P	Standard nitrile (Perburan)	NBR	-20 ÷ +80	Aliphatic hydrocarbons (propane, butane, gasoline, oils, mineral greases, diesel fuel, fuel oil, kerosene), mineral greases and oils, HFA - HFB - HFC fluids, many dilute acids, alkalis, saline solutions, water, water glycol
F	Low temperature nitrile	NBR	-40 ÷ +70	The same as with standard nitrile + a number of different types of Freon. (This contains less acrylonitrile than the standard and is therefore more suitable for low temperatures, but its chemical resistance is slightly lower).
K	Hydrogenated nitrile	HNBR	-30 ÷ +130	The same as with standard nitrile but with excellent performance at high and low temperatures.
E	Ethylene-Propylene	EPDM	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many organic and inorganic acids, detergents, solutions of sodium and potassium, phosphate ester-based hydraulic fluids, (HFD-R), silicone oils and greases, many polar solvents (alcohol, ketones, esters), Skydrol LD4 and 500B-4, resistance to ozone, aging and weathering.
V	Fluorocarbon	FKM	-10 ÷ +150	Mineral oils and greases, non-flammable fluids of HFD group, silicone oils and greases, animal and vegetable oils and greases, aliphatic hydrocarbons (gasoline, butane, propane, natural gas), aromatics hydrocarbons (benzene, toluene), chlorinated hydrocarbons (Tetrachloroethylene, carbon tetrachloride), fuel (regular, super and containing methanol), excellent resistance to ozone, weathering and aging.

9.3b

For other hydraulic fluid and/or temperatures, please consult us.

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9.3.7 ORDER CODE

1	2	3	4	5	6	7	8	9		10	11	12
BS	10	M	P	360	A	5	G	4	-	C	P	...

1 Series

Safety block = **BS**

2 Internal nominal diameter

10mm = **10**
20mm = **20**
25mm = **25**
32mm = **32**

3 Discharge

Only manual = **M**
Electric and manual = **E**
Manual plus drilling for solenoid valve = **F**
Drilling for solenoid valve plugged = **T**

4 Relief valve

Without valve, with plastic plug = **A**
Valve type DBDS…(CE certified) = **P**
Without valve (with plug B 2375)= **T**
Valve type VS224X = **G**
Valve type DBDS (NR - 13) = **N**
Valve type DBDS (EAC) = **Z**

5 Valve setting (bar)

Valves type DBDS or VS224 calibrated and certificate = **5 ÷ 400**

6 Accumulator side connection

BSP ISO 228
with chamfer for OR (std) = **A**
For BS25 and BS32:
Holes for flange SAE 3000 Psi = **L**
Without adapter = **W**

7 Dimension of the accumulator side connection

For connection A:
3/4"BSP = **5**
1"1/4BSP = **7**
2"BSP = **9**
For connection L:
2" = **9**
Without adapter = **0**

8 Type of installation side connection

For BS25 and BS32:
holes for flange CETOP -400, metric threads = **C**
with flange FC
For BS32:
holes for flange SAE 3000 Psi, metric threads = **L**
For BS25 e BS32:
holes for flange SAE 6000 Psi, metric threads = **H**
Thread BSP ISO 228 = **G**

12 Other variants

For type BS...E
Sol. valve power supply 24VDC normally closed = **24D-C**
Sol. valve power supply 110VDC normally closed = **110D-C**
Sol. valve power supply 220VDC normally closed = **220D-C**
Sol. valve power supply 24VAC normally closed = **24A-C**
Sol. valve power supply 110VAC normally closed = **110A-C**
Sol. valve power supply 220VAC normally closed = **220A-C**
Sol. valve power supply 24VDC normally open = **24D-O**
Sol. valve power supply 110VDC normally open = **110D-O**
Sol. valve power supply 220VDC normally open = **220D-O**
Sol. valve power supply 24VAC normally open = **24A-O**
Sol. valve power supply 110VAC normally open = **110A-O**
Sol. valve power supply 220VAC normally open = **220A-O**

Handle of the padlocked ball valve = K
Micro-switch on the ball handle = S
Two connections for manometer = M2
Discharge connection in installation side only for BS 25/32 = 1
With pressure gauge dia 63 mm with full scale xxx bar= Mxxx
Special variants on request

11 Seal material

Nitrile rubber (NBR) = **P**
Nitrile for low temp. (NBR-BT) = **F**
Hydrogenated nitrile (HNBR) = **K**
Ethylene-propylene (EPDM) = **E**
Fluorocarbon (FKM) = **V**

10 Block material

Carbon steel = **C**
Stainless steel AISI 316 L
(only for BS25) = **X**
(only for DBDS in stainless steel; = **CX**
without PED)

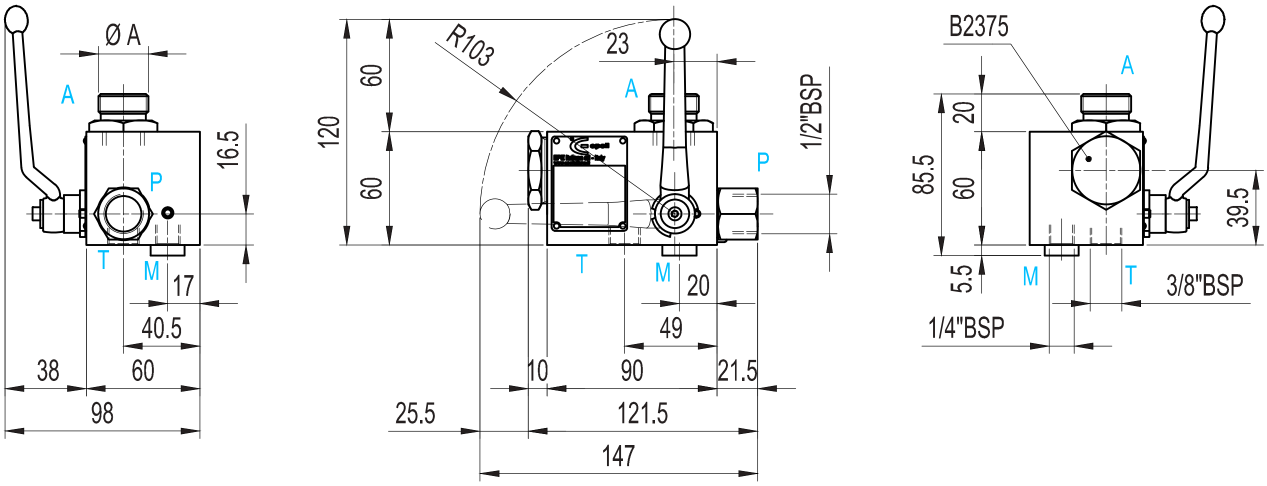
9 Dimension of the installation side connection

For BS10 1/2"BSP= **4**
For BS20 3/4"BSP= **5**
For BS25 G 1" = **6**
H 1"1/4 = **7**
C 1"1/4 = **7**
For BS32 G1"1/2 = **8**
L 1"1/2 = **8**
L 2" = **9**
H 1"1/4 = **7**
H 1"1/2 = **8**
C 1"1/4 = **7**
C 1"1/2 = **8**

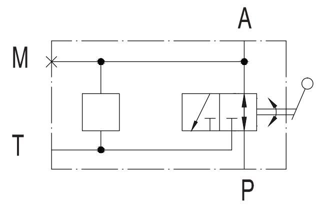
Special variants on request

9.3.8 DIMENSIONS

BS10MT..A..G.. - ...

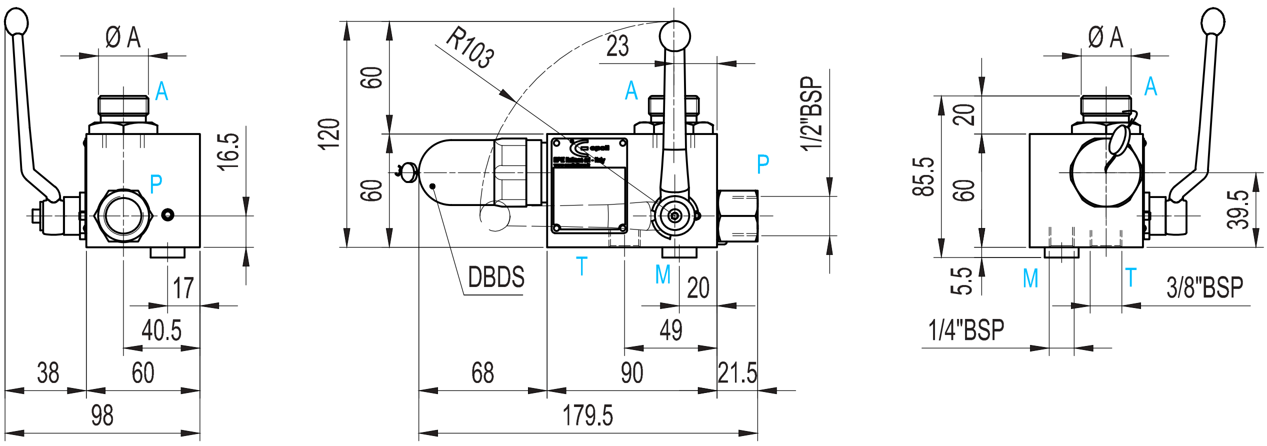


Order code	ØA	Weight
BS10MT...A5...	3/4" BSP	2.7
BS10MT...A7...	1" 1/4 BSP	2.9
BS10MT...A9...	2" BSP	3

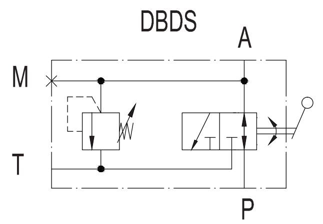


9.3ca

BS10MP..A..G.. - ...



Order code	ØA	Weight
BS10MP...A5...	3/4" BSP	3.2
BS10MP...A7...	1" 1/4 BSP	3.4
BS10MP...A9...	2" BSP	3.5



9.3cb

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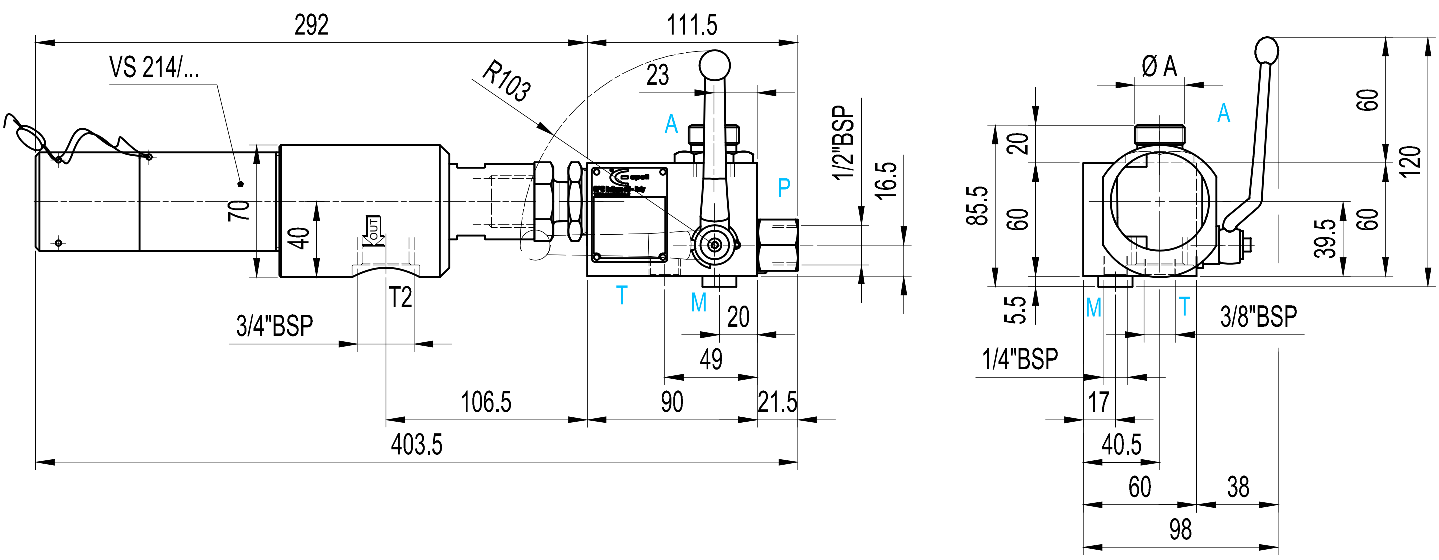
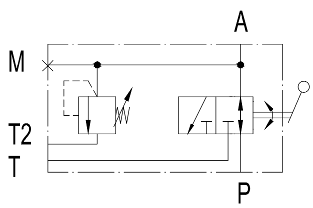
BS10MV..A..G.. - ...

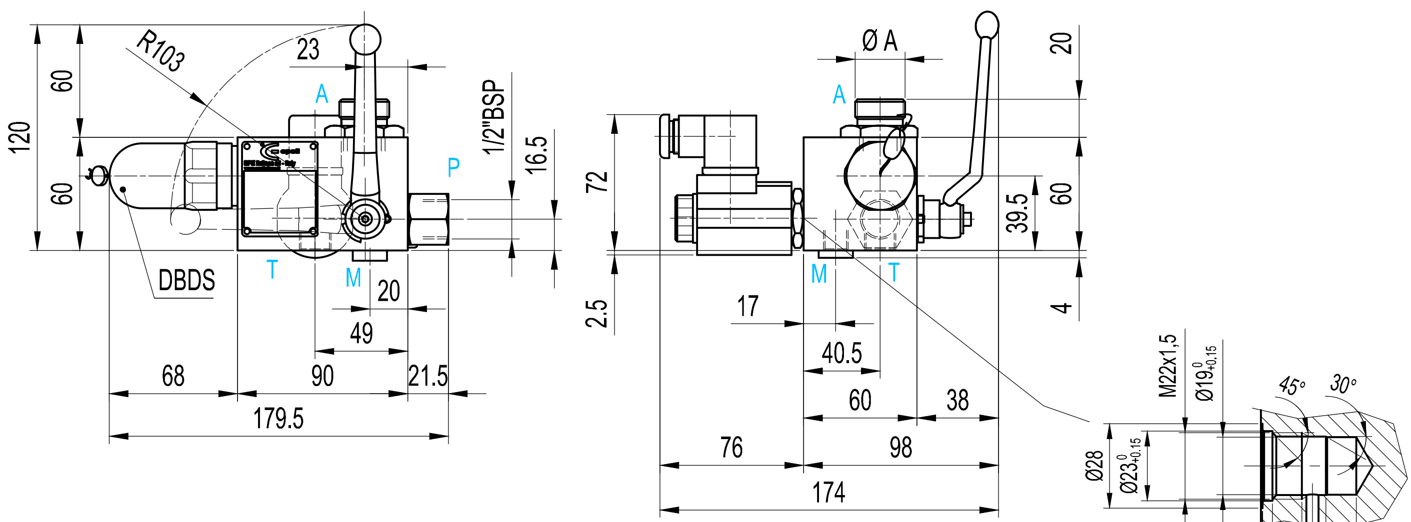


Order code	ØA	Weight
BS10MV...A5...	3/4" BSP	4.9
BS10MV...A7...	1" 1/4 BSP	5.1
BS10MV...A9...	2" BSP	5.2

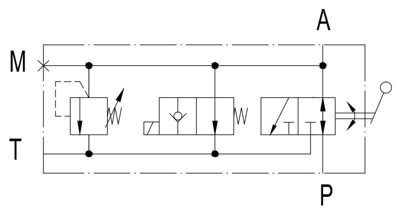


9.3cc

BS10EP..A..G.. - ...



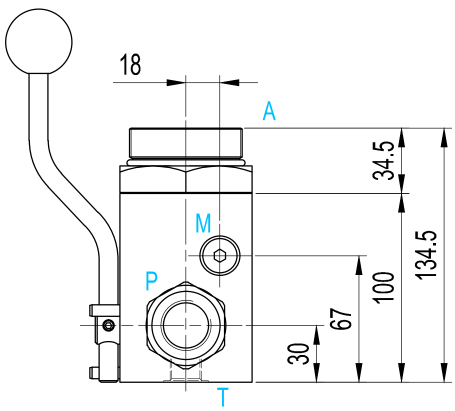
Order code	ØA	Weight
BS10EP...A5...	3/4" BSP	3.4
BS10EP...A7...	1" 1/4 BSP	3.6
BS10EP...A9...	2" BSP	3.7

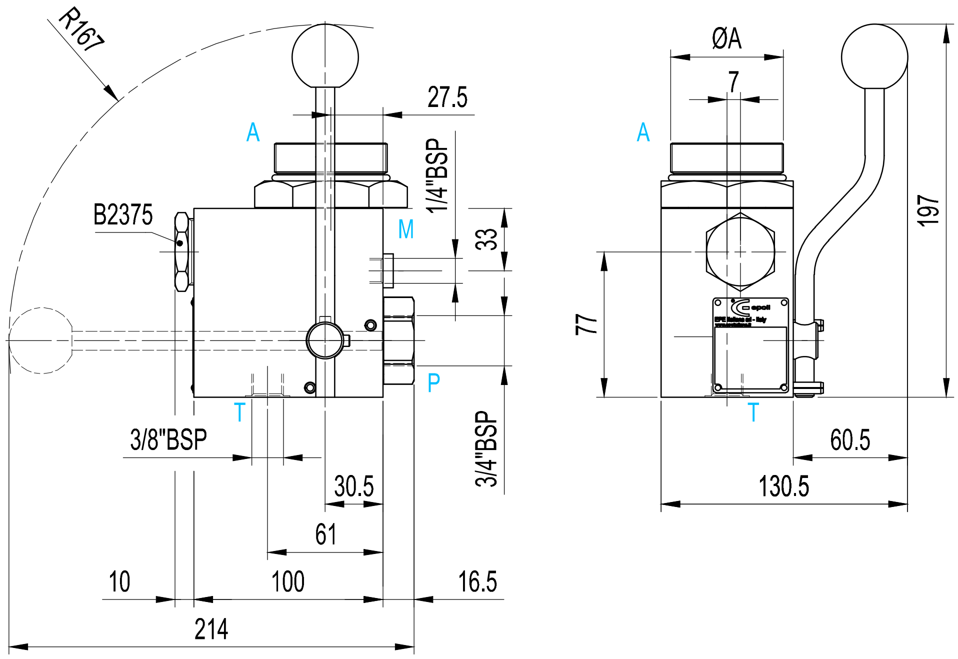


9.3cd

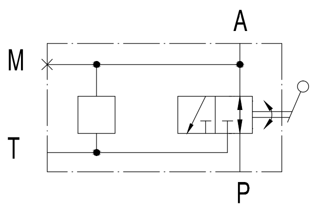
SAFETY BLOCK type BS

BS20MT..A..G.. - ...



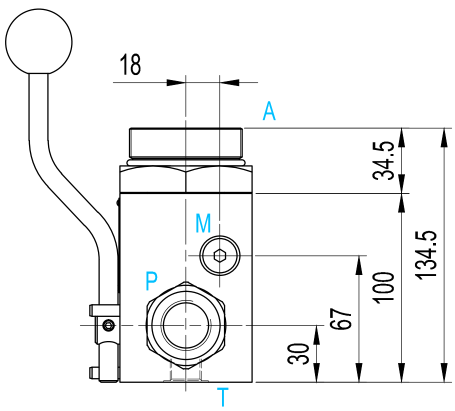


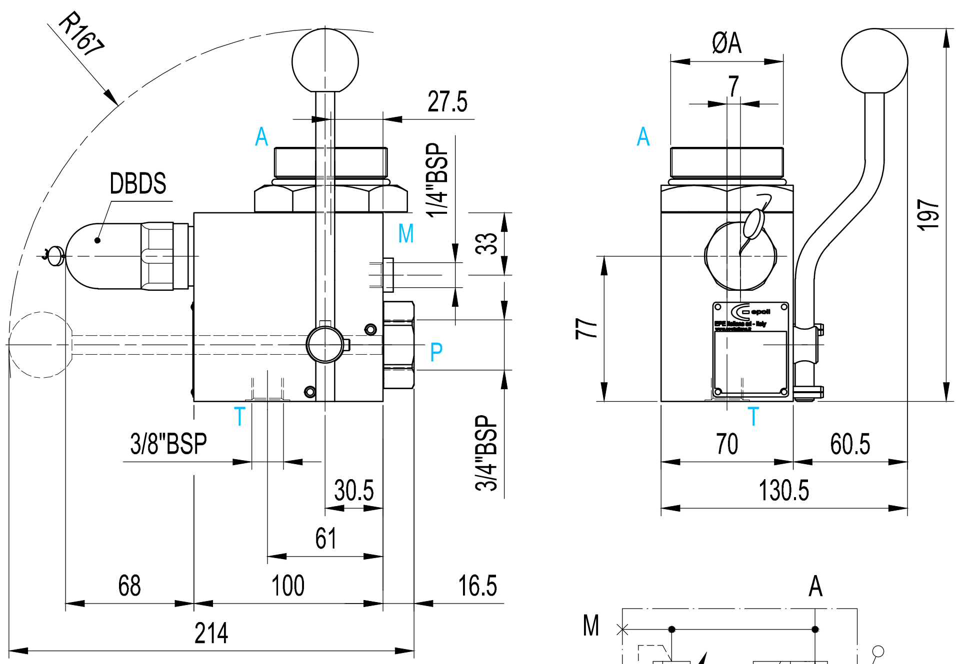
Order code	ØA	Weight
BS20MT...A7...	1" 1/4 BSP	5.6
BS20MT...A9...	2" BSP	6.1



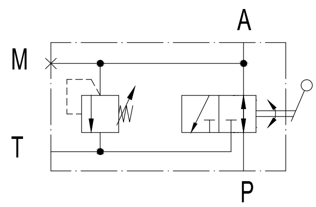
9.3ce

BS20MP..A..G.. - ...





Order code	ØA	Weight
BS20MP...A7...	1" 1/4 BSP	6.1
BS20MP...A9...	2" BSP	6.7



9.3cf

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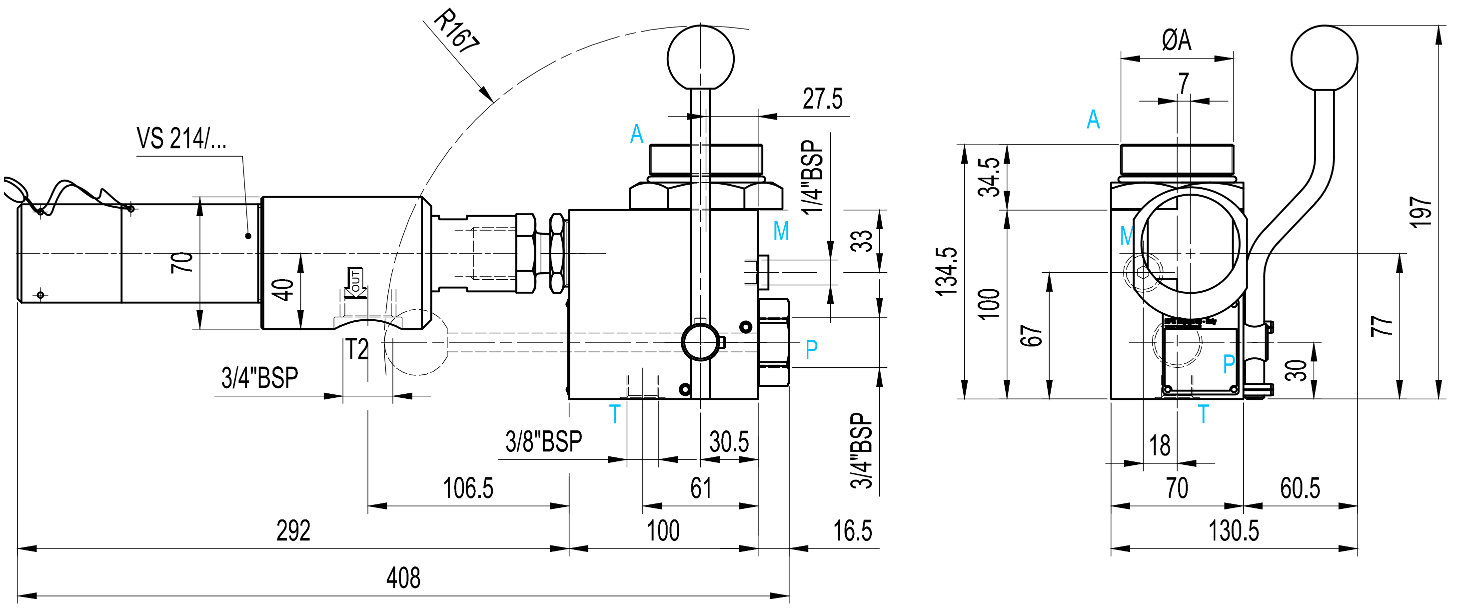
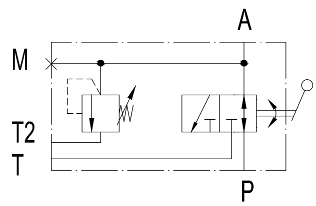
BS20MV..A..G.. - ...

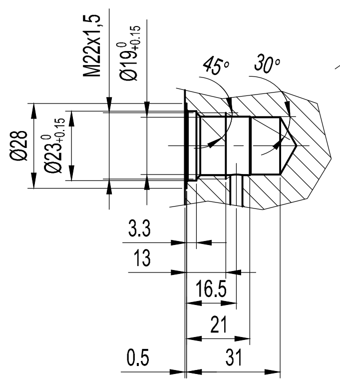


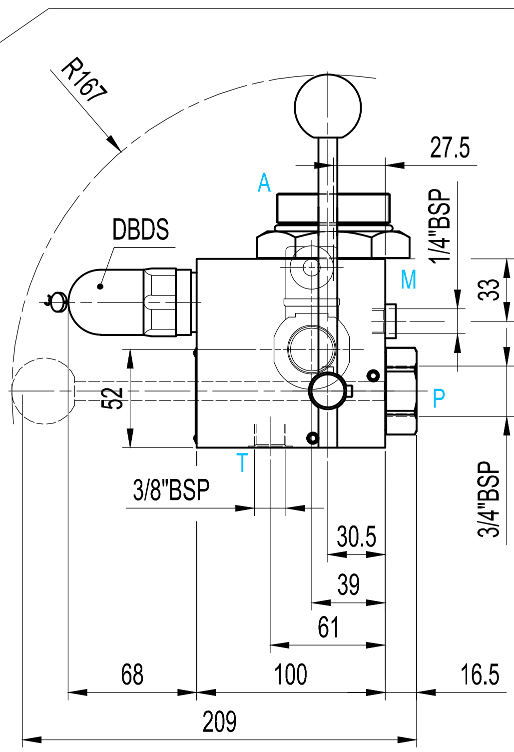
Order code	ØA	Weight
BS20MV...A7...	1" 1/4 BSP	7.8
BS20MV...A9...	2" BSP	8.3

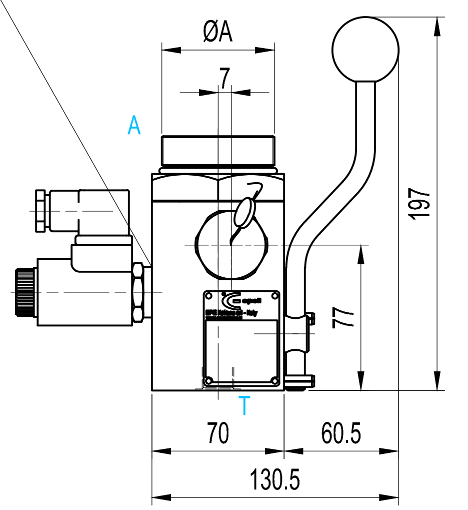


9.3cg

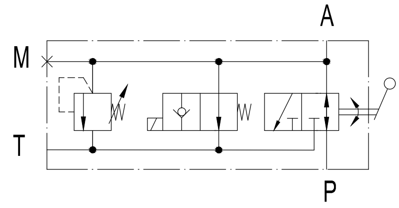
BS20EP..A..G.. - ...







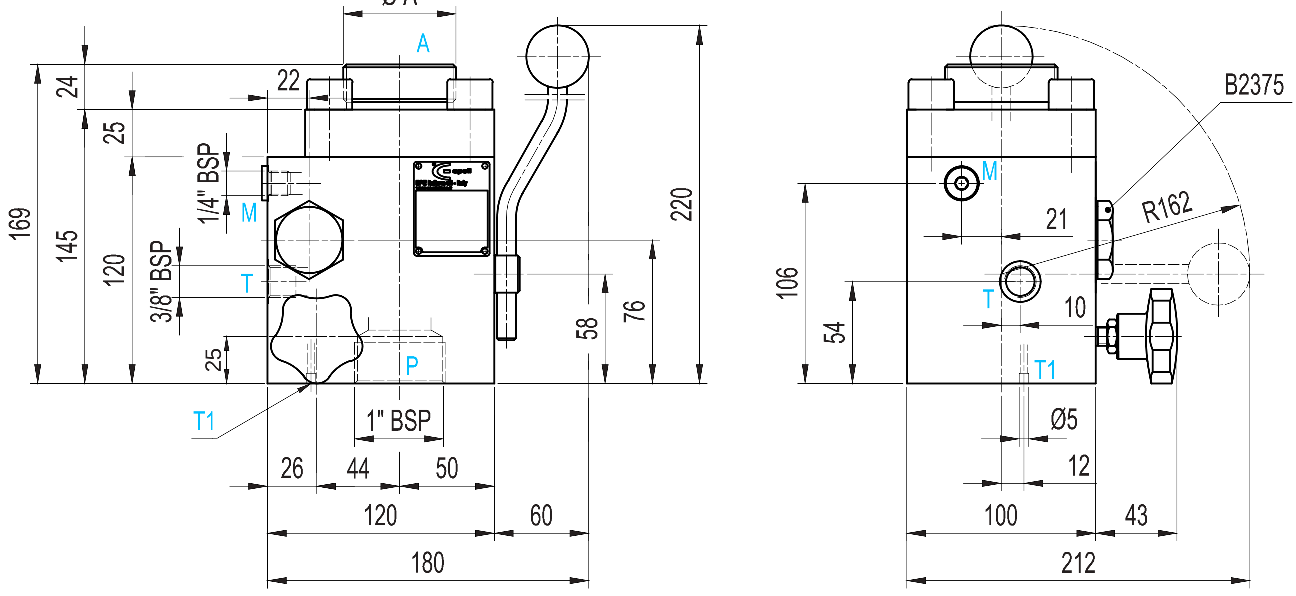
Order code	ØA	Weight
BS20EP...A7...	1" 1/4 BSP	6.6
BS20EP...A9...	2" BSP	7.2



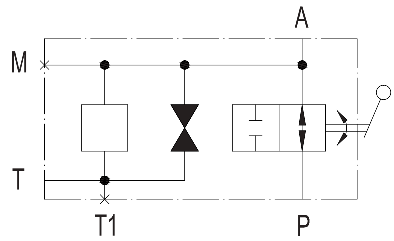
9.3ch

SAFETY BLOCK type BS

BS25MT..A..G.. - ...

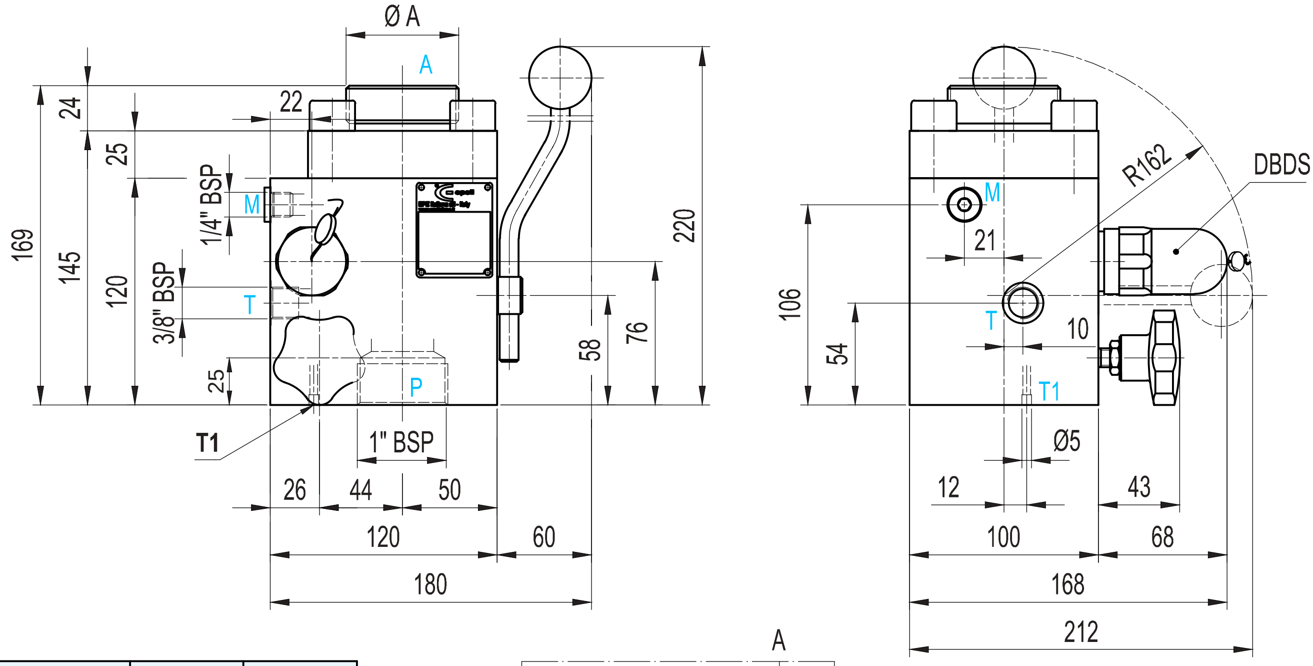


Order code	ØA	Weight
BS25MT...A7...	1" 1/4 BSP	12.4
BS25MT...A9...	2" BSP	12.5

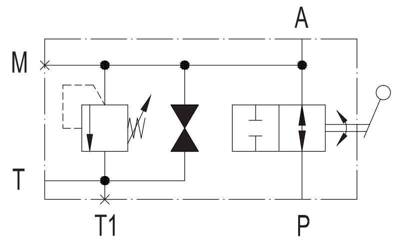


9.3ci

BS25MP..A..G.. - ...



Order code	ØA	Weight
BS25MP...A7...	1" 1/4 BSP	12.7
BS25MP...A9...	2" BSP	12.9



9.3cj

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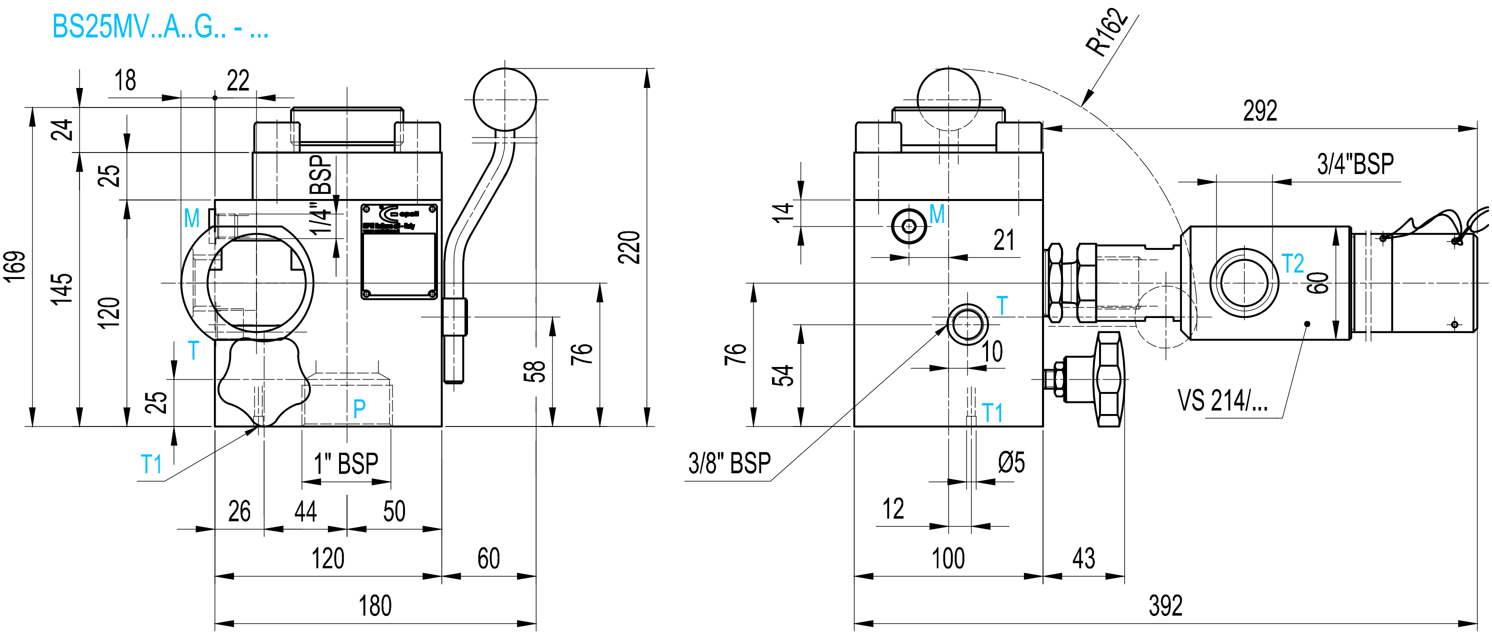
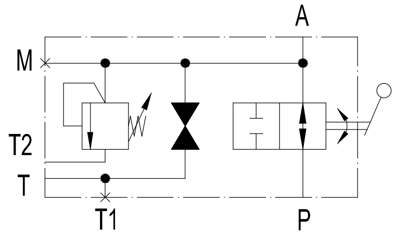
SAFETY BLOCK type BS

BS25MV..A..G.. - ...

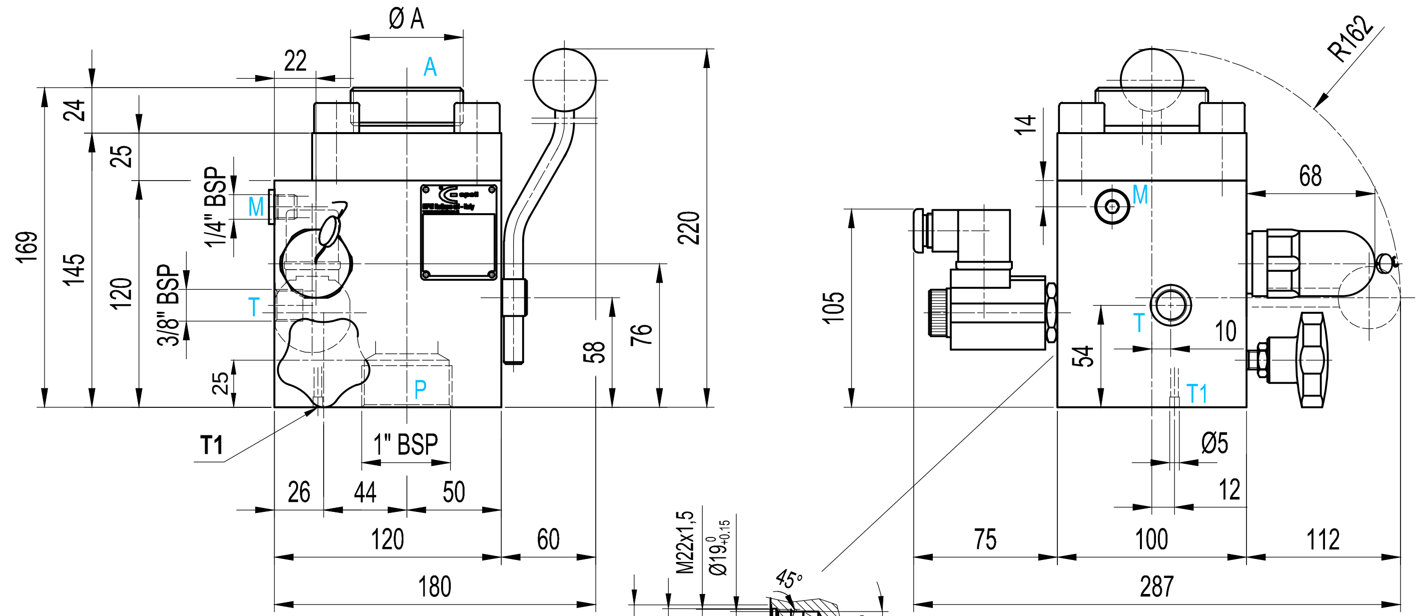


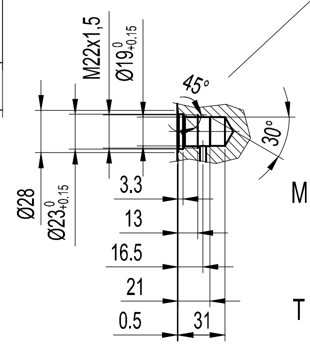
Order code	ØA	Weight
BS25MV...A7...	1" 1/4 BSP	14.5
BS25MV...A9...	2" BSP	14.6



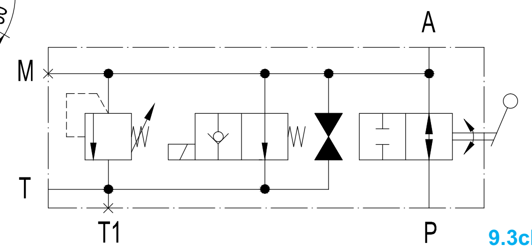
9.3ck

BS25EP..A..G.. - ...



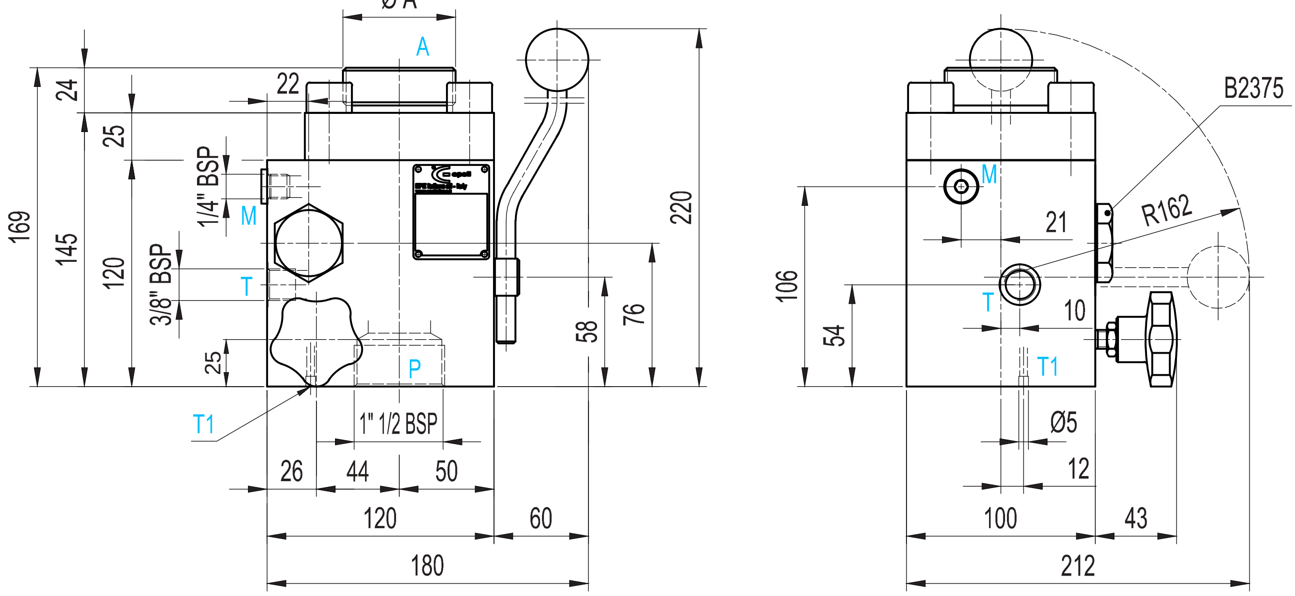


Order code	ØA	Weight
BS25EP...A7...	1" 1/4 BSP	12.9
BS25EP...A9...	2" BSP	13.1

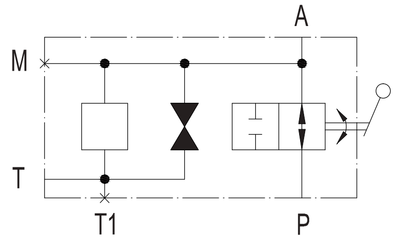


9.3cl

BS32MT..A..G.. - ...

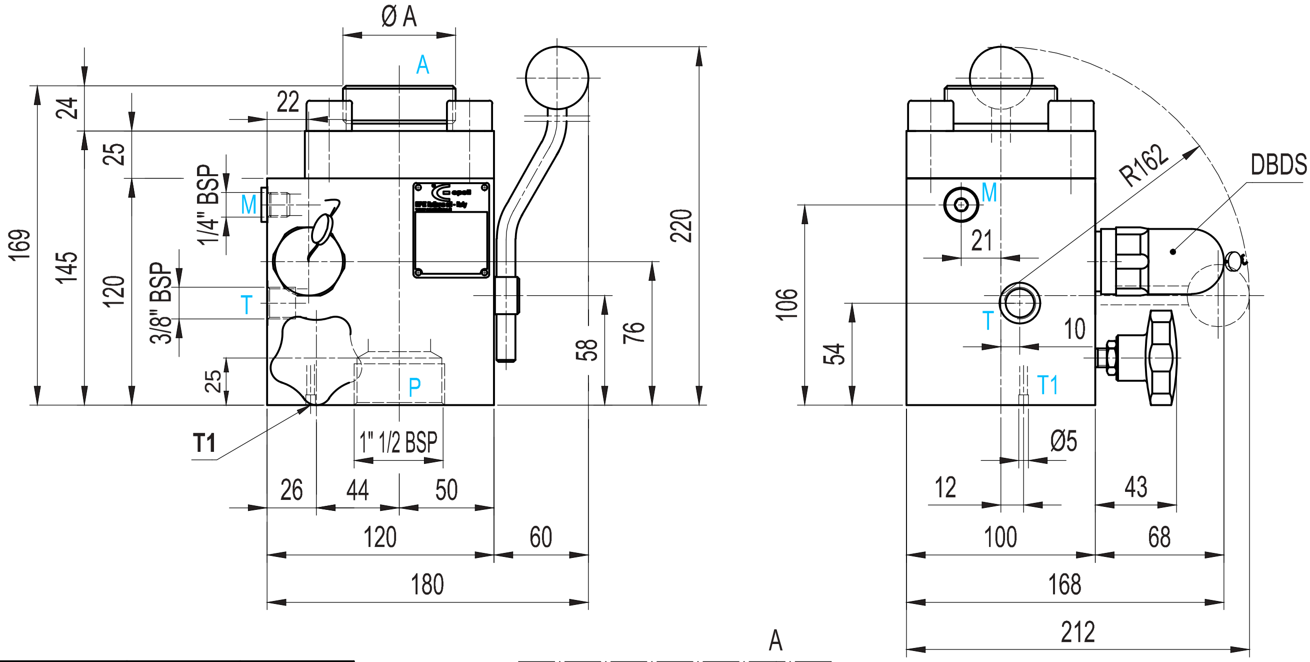


Order code	ØA	Weight
BS32MT...A7...	1" 1/4 BSP	12.4
BS32MT...A9...	2" BSP	12.5

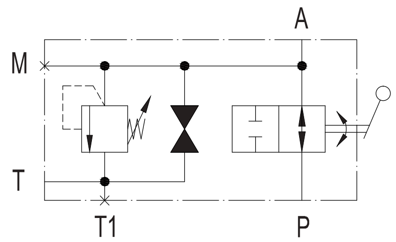


9.3cm

BS32MP..A..G.. - ...



Order code	ØA	Weight
BS32MP...A7...	1" 1/4 BSP	12.7
BS32MP...A9...	2" BSP	12.9



9.3cn

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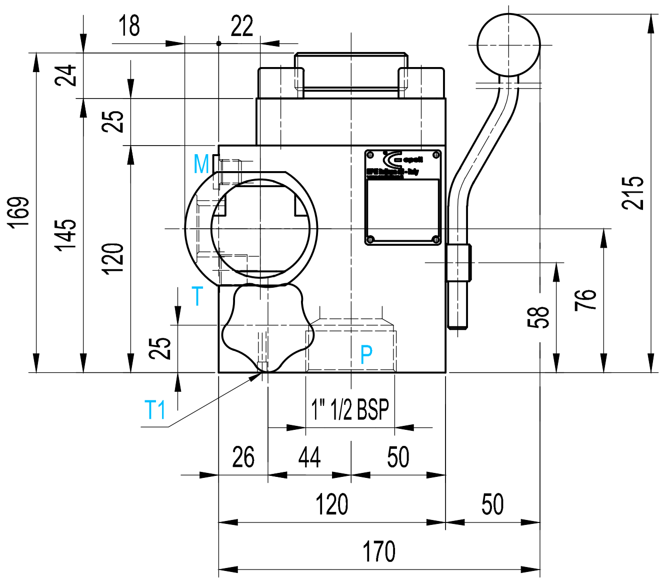
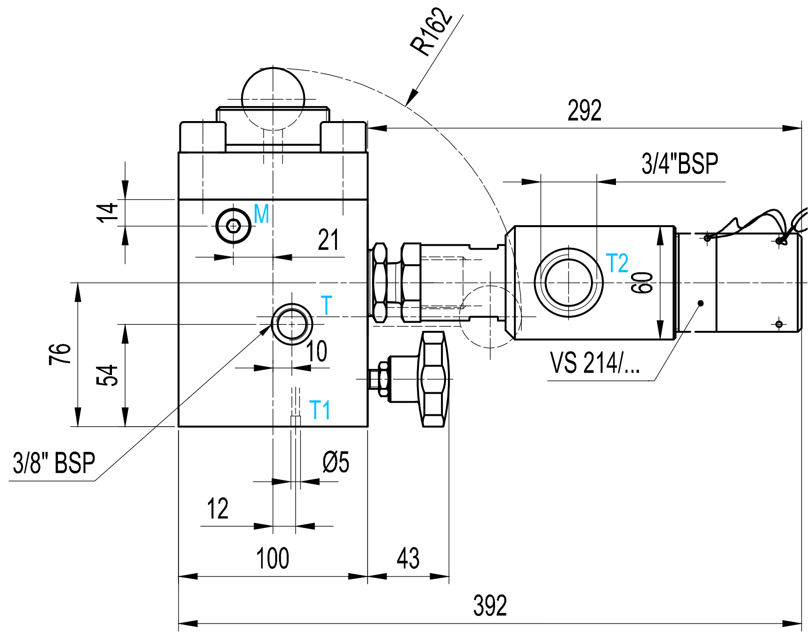
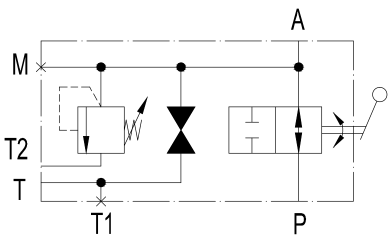
BS32MV..A..G.. - ...



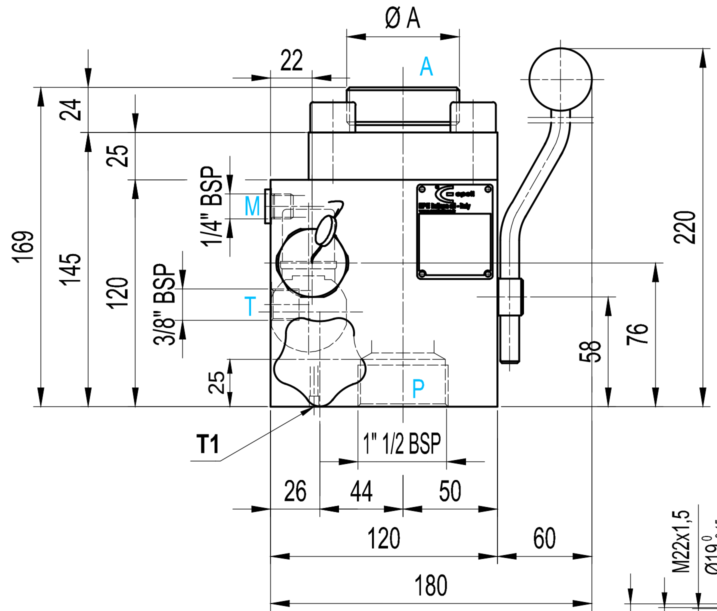


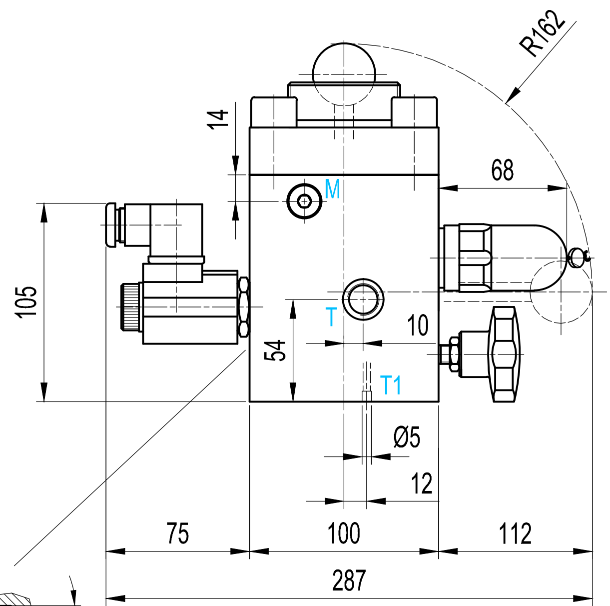
Order code	ØA	Weight
BS32MV...A7...	1" 1/4 BSP	14.5
BS32MV...A9...	2" BSP	14.6

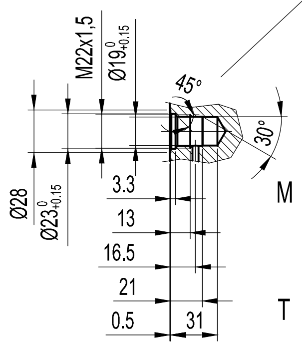


9.3co

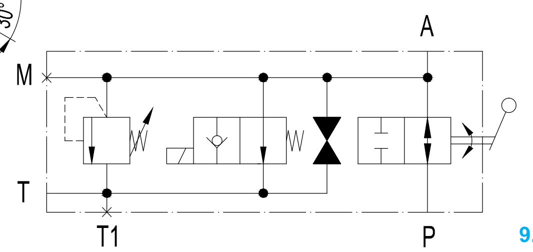
BS32EP..A..G.. - ...







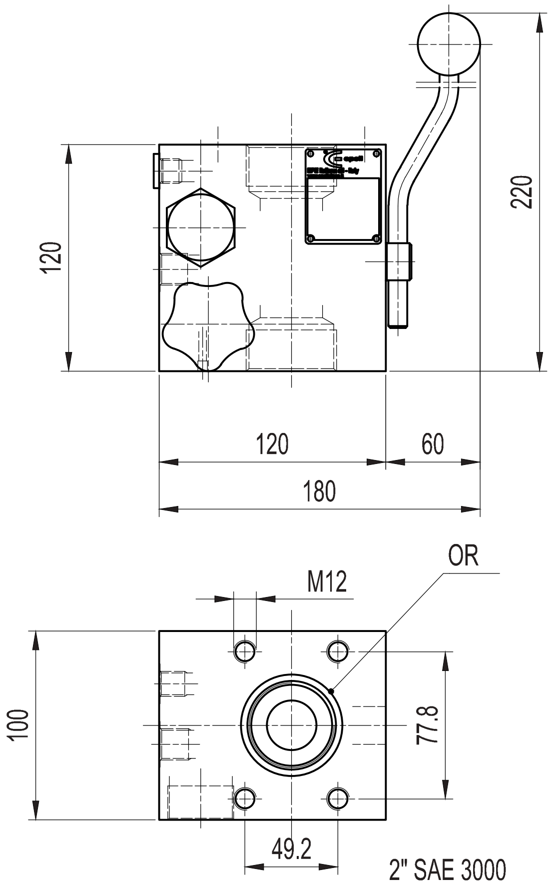
Order code	ØA	Weight
BS32EP...A7...	1" 1/4 BSP	12.9
BS32EP...A9...	2" BSP	13.1



9.3cp

ACCUMULATOR SIDE CONNECTION

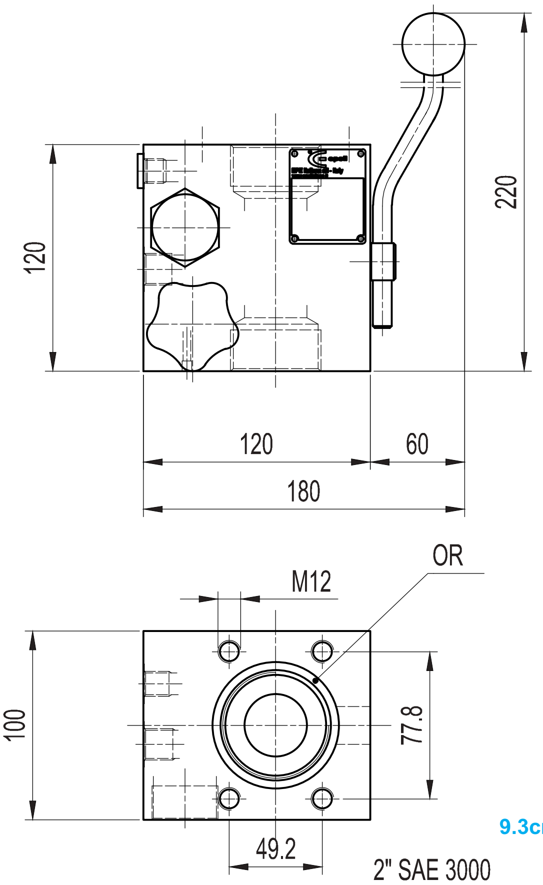
BS25M..L9..G.. - ...



9.3cq

Other dimensions see previus pages

BS32M..L9..G.. - ...

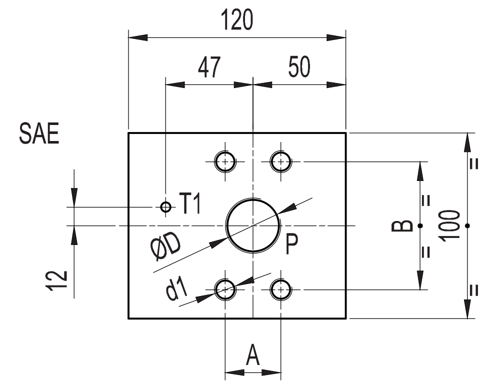


9.3cr

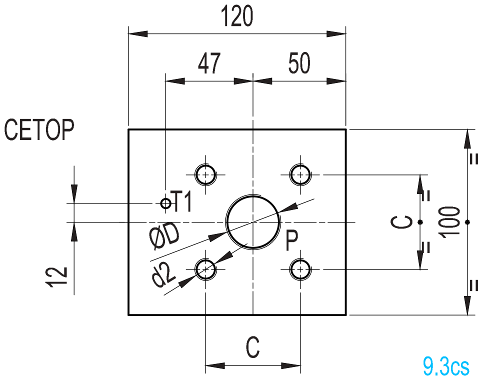
Other dimensions see previus pages

INSTALLATION SIDE CONNECTION

SAE



CETOP



9.3cs

Type.	On request								
	For SAE Flanges					For CETOP Flanges			
		A	B	d1	Thread deep		C	d2	Thread deep
BS25	1" 1/4 SAE 6000	31,6	66,7	M14	24	CETOP 1" 1/4-400	51,6	M12	20
BS32	1" 1/4 SAE 6000	31,6	66,7	M14	24	CETOP 1" 1/4-400	51,6	M12	20
	1" 1/2 SAE 6000	36,7	79,4	M16	24				
	1" 1/2 SAE 3000	35,7	70	M12	20	CETOP 1" 1/2-400	60,1	M14	24
	2" SAE 3000	42,9	77,8	M12	20				

9.3ct

9.3cs

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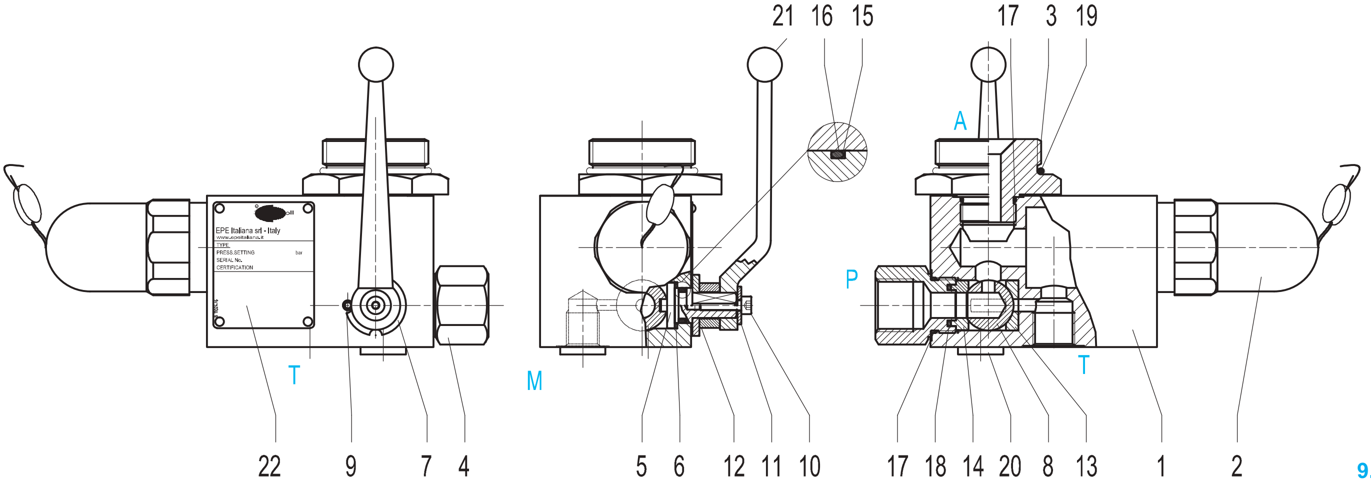
9.3.9.1 BS10 SPARE PARTS CODES



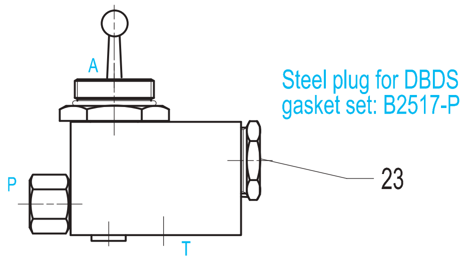
9.3da

BS10MP ..A..G.. - ...

Item	Description	Q.ty	Order code
1	Body block BS10	1	Not supplied as spare part
2	Safety valve DBD ...10 k 1....	1	DBD... 10 k 1....
3	Niple side accumulator	1	3/4" B10450 - ** 1" 1/4 B10451 - ** 2" B10452 - **
4	Niple installation side	1	B11855 - **
5	Pin ball	1	B11856 - **
6	Gasket	1	B11857 - *
7	Washers stop end	1	B11858 - C
8	Ball DN10	1	0052S906831RN
9	Spring pins 4x8 UNI 6873	1	0023E4x8C
10	Hex. socket head cap screws M4x10 UNI5931	1	0022VTCEIM4x10CZ
11	Large whaser Ø4x12x1 UNI 6593	1	0021RL4x12x1CZ
12	Whaser Ø10 UNI 6592	1	0021RP10CZ
13	Seal for ball Ø10	1	0013G914497RN
14	Seal for ball Ø10	1	0013G913112RN
15	Antiextrusion ring Parbak	1	0011P8013 - *
16	"O" ring	1	0010R2043 - *
17	"O" ring	2	0010M20x1.5 - *
18	"O" ring	1	0010M12x2 - *
19	"O" ring	1	3/4" 0010R2093 - * 1" 1/4 0010R3218 - * 2" 0010R3150 - *
20	Plug with rubber seals 1/4" BSP	1	0031TG2
21	Handle for BS10	1	0054L8KT8MM-RN
22	Description plate	1	B11024 - 6 - A
23	Steel plug for DBDS	1	B2375 - **/*
24	Adapter	1	B10456-C
25	Nipple	1	B11638-C
26	Valve VS 224 X	1	VS224X / xxx
27	Complete solenoid valve	1	Normally open B2372-xxx-O Normally closed B2395-xxx-C
28	Coil + connector	1	B2370-xxx
Standard nipple ass. (parts 3-17-19)		1	3/4" N-M22/1.5A5 - ** - * 1" 1/4 N-M22/1.5A7 - ** - * 2" N-M22/1.5A9 - ** - *
Safety block gasket sets		1	B 2140-*
Ball sets		1	B 2132-*

* Gasket material ** Component material

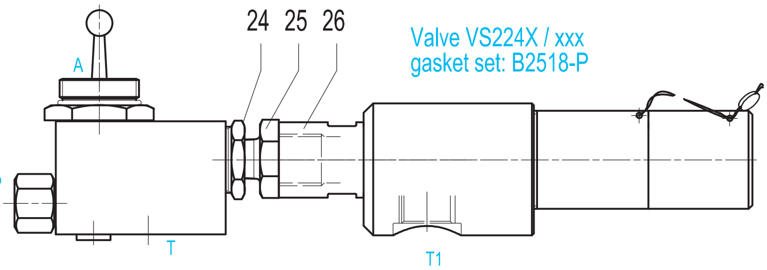
9.3de



Steel plug for DBDS gasket set: B2517-P

9.3db

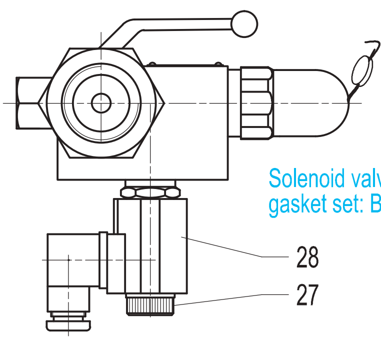
BS10MT ..A..G.. - ...



Valve VS224X / xxx gasket set: B2518-P

9.3dc

BS10MG ..A..G.. - ...

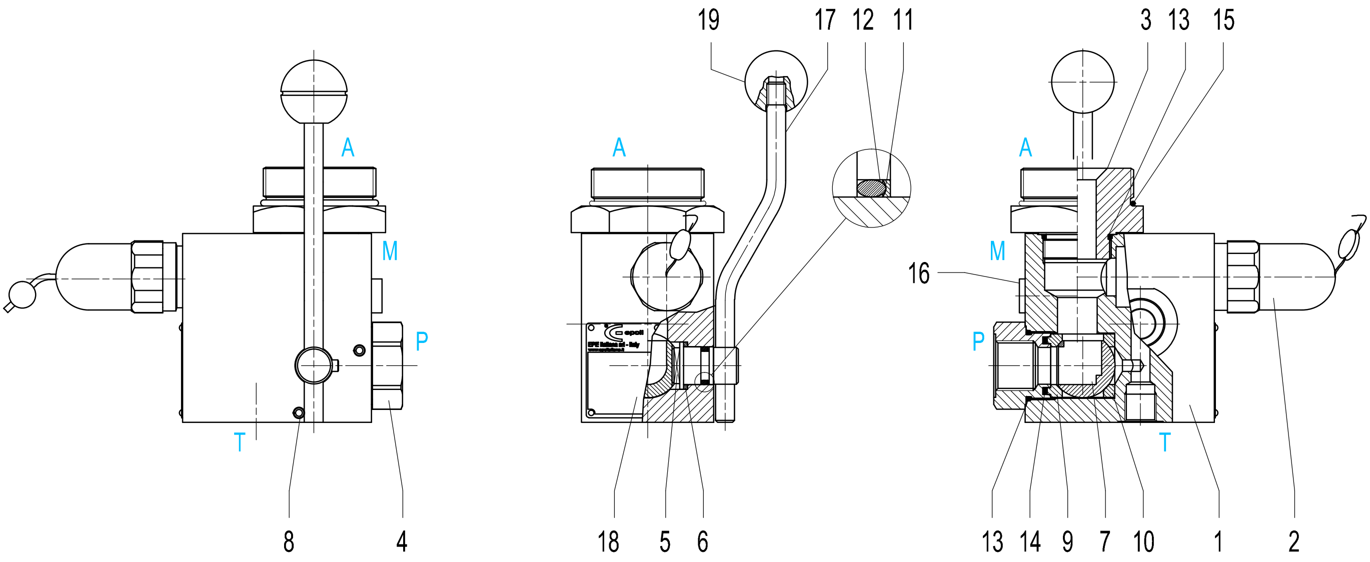


Solenoid valve gasket set: B2519-P

9.3dd

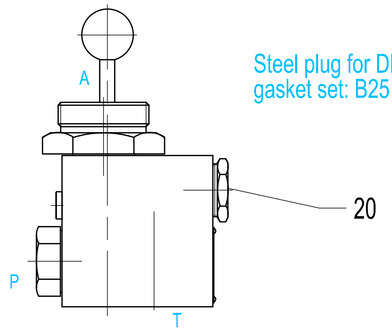
BS10EP ..A..G.. - ...

9.3.9.2 BS20 SPARE PARTS CODES



BS20MP ..A..G.. - ...

9.3df



Steel plug for DBDS
gasket set: B2517-P

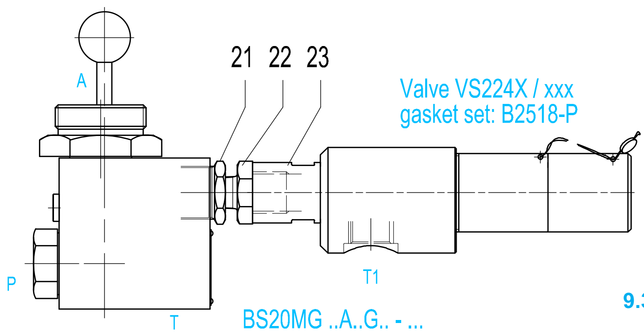
BS20MT ..A..G.. - ...

9.3dg

Item	Description	Q.ty	Order code
1	Body block BS20	1	Not supplied as spare part
2	Safety valve DBD... 10 k 1....	1	DBD... 10 k 1....
3	Niple side accumulator	1	1" 1/4 B10470 - ** 2" B10471 - **
4	Niple installation side	1	B10463 - **
5	Pin ball	1	B10462 - **
6	Gasket	1	B10487 - *
7	Ball DN20	1	0052S906356RN
8	Spring pins 6x26 UNI 6873	2	0023E6x26C
9	Seal for ball Ø20	1	0013G913911RN
10	Seal for ball Ø20	1	0013G914051RN
11	Antiextrusion ring Parbak	1	0011P8113 - *
12	"O" ring	1	0010R119 - *
13	"O" ring	2	0010R3131 - *
14	"O" ring	1	0010M24x3 - *
15	"O" ring	1	1" 1/4 0010R3218 - * 2" 0010R3150 - *
16	Plug with rubber seals 1/4" BSP	1	0031TG2
17	Handle for BS20	1	B10482 - **
18	Description plate	1	B11024 - 6 - A
19	Knob M10	1	0055PS.35-M10-EA
20	Steel plug for DBDS	1	B2375 - **/*
21	Adapter	1	B10456-C
22	Nipple	1	B11638-C
23	Valve VS 224 X	1	VS224X / xxx
24	Complete solenoid valve	1	Normally open B2372-xxx-O Normally closed B2395-xxx-C
25	Coil + connector	1	B2370-xxx
Standard nipple ass. (parts 3-13-15)		1	1" 1/4 N-M36/1.5A7 - ** - * 2" N-M36/1.5A9 - ** - *
Safety block gasket sets		1	B 2141 - *
Ball sets		1	B 2133 - *

* Gasket material ** Component material

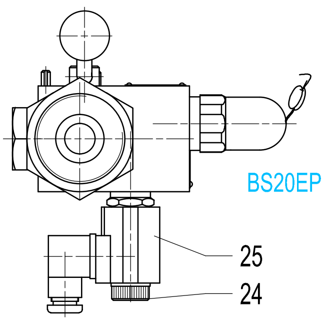
9.3dj



Valve VS224X / xxx
gasket set: B2518-P

BS20MG ..A..G.. - ...

9.3dh



BS20EP ..A..G.. - ...

Solenoid valve
gasket set: B2519-P

9.3di

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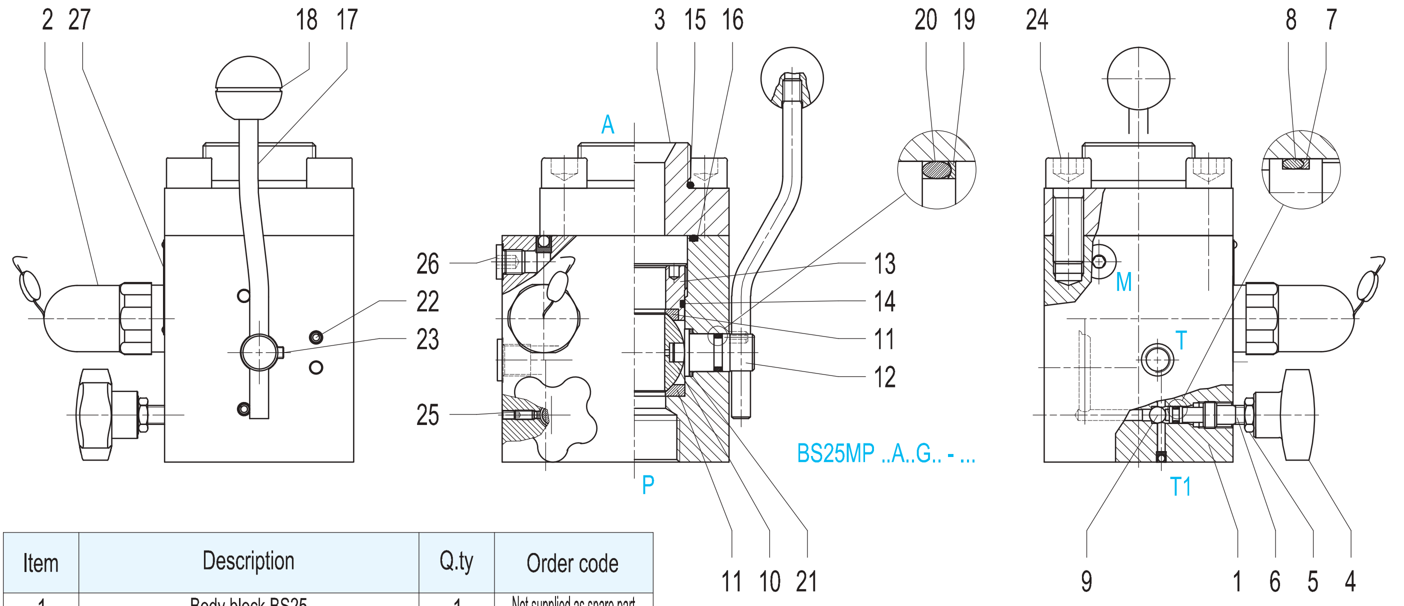
9.3.9.3 BS25 SPARE PARTS CODES

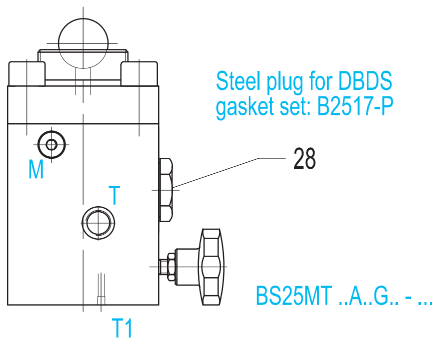


9.3dk

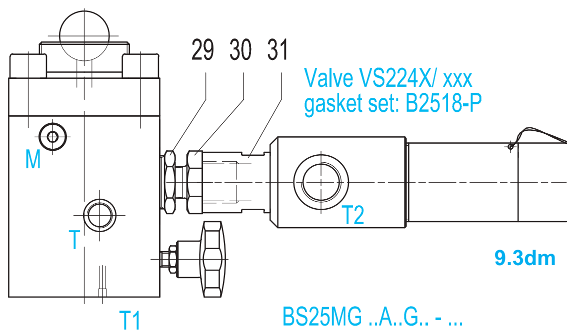
Item	Description	Q.ty	Order code
1	Body block BS25	1	Not supplied as spare part
2	Safety valve DBD... 10 k 1....	1	DBD... 10 k 1....
3	Flange accumulator side	1	1" 1/4 B10473 - ** 2" B10349 - **
4	Knob M10	1	055MVC.192/50B-M10EA
5	Hex. nut M10 UNI 5588	1	0020DNM10CZ
6	Manual discharge pin	1	B10417 - **
7	Antiextrusion ring Parbak	1	0011P8010 - *
8	"O" ring	1	0010R2025 - *
9	Ball Ø8.5	1	0051S8.5-C
10	Ball DN25	1	0052S906063RN
11	Seal for ball Ø25	2	0013G913912RN
12	Pin for ball	1	B10498 - **
13	Ring nut	1	B10494 - **
14	"O" ring	1	0010R3150 - *
15	"O" ring	1	1" 1/4 0010R3150 - * 2" 0010R3218 - *
16	"O" ring	1	0010R0159 - *
17	Handle	1	B10482 - **
18	Knob M10	1	0055PS.35-M10-EA
19	Antiextrusion ring Parbak	1	0011P8113 - *
20	"O" ring	1	0010R0119 - *
21	Seal for pin	1	B10487 - *
22	Spring pin 6x26 UNI 6873	2	0023E6x26CZ
23	Set screw M6x8 UNI 5923-67	1	0022VSTEIM6x8CZ
24	Hex. socket head cap screws M16x40 UNI5931	4	0022VTCEIM16x40CZ
25	Set screw M5x12 UNI 5925-67	1	0022VSTEIM5x12CZ
26	Plug with rubber seal 1/4" BSP	1	0031TG2
27	Description plate	1	B11024 - 6 - A
28	Steel plug for DBDS	1	B2375 - ** / *
29	Adapter	1	B10456-C
30	Nipple	1	B11638-C
31	Valve VS 224 X	1	VS224X / xxx
32	Complete solenoid valve	1	Normally open B2372-xxx-O Normally closed B2395-xxx-C
33	Coil + connector	1	B2370-xxx
Standard flange accumulator assembly (parts 3 - 15 - 16)		1	1" 1/4 F 2454 A7 - ** / * 2" F 2455 A9 - ** / *
Safety block gasket sets		1	B 2142 - *
Ball sets		1	B 2134 - *

* Gasket material ** Component material

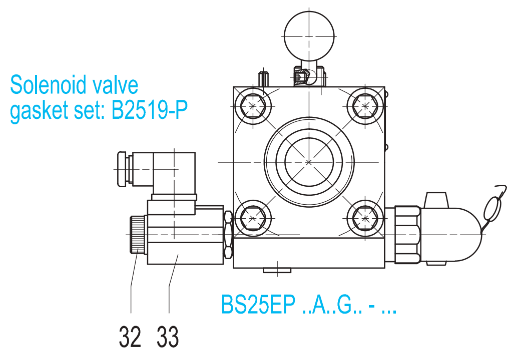
9.3do



9.3dl

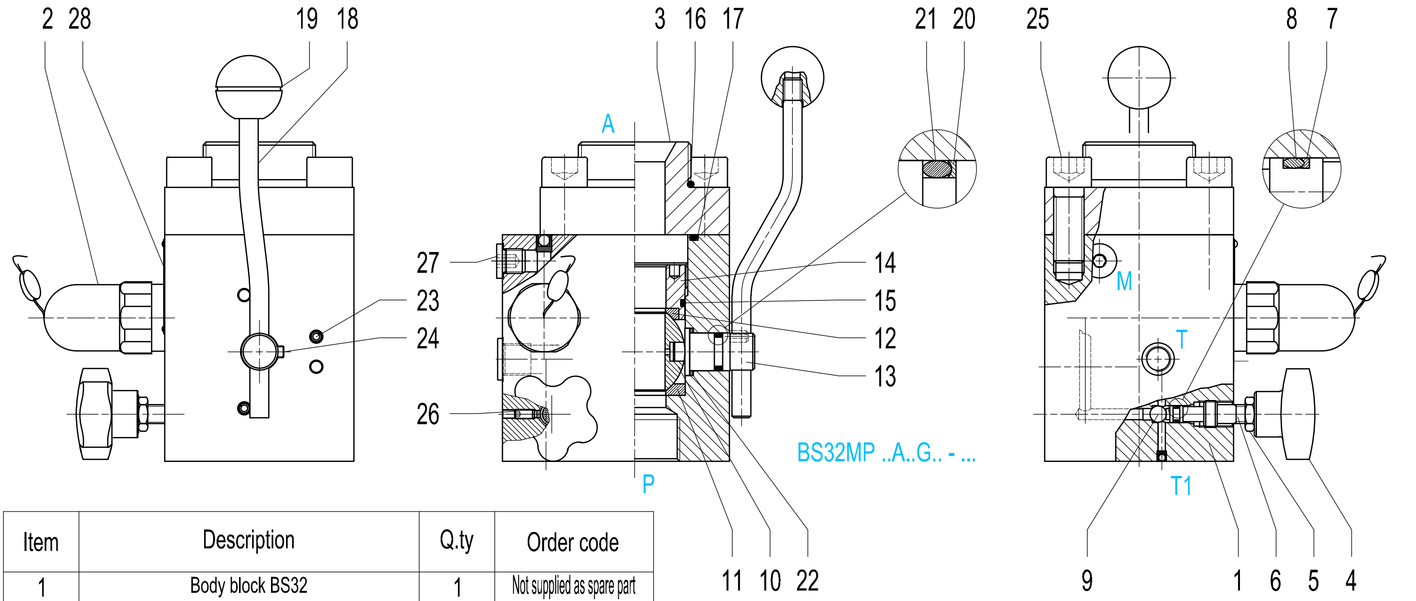


9.3dm



9.3dn

9.3.9.4 BS32 SPARE PARTS CODES

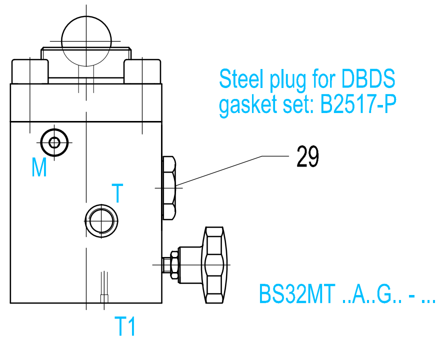


9.3dp

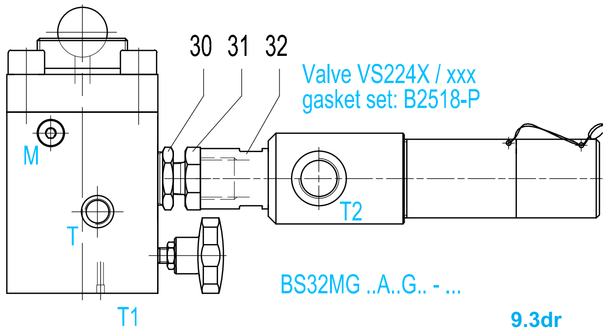
Item	Description	Q.ty	Order code
1	Body block BS32	1	Not supplied as spare part
2	Safety valve DBD... 10 k 1....	1	DBD... 10 k 1....
3	Flange accumulator side	1	1" 1/4 B10473 - ** 2" B10349 - **
4	Knob M10	1	055MVC.192/50BM10EA
5	Hex. nut M10 UNI 5588	1	0020DNM10CZ
6	Manual discharge pin	1	B10417 - **
7	Antiextrusion ring Parbak	1	0011P8010 - *
8	"O" ring	1	0010R2025 - *
9	Ball Ø8.5	1	0051S8.5-C
10	Ball DN32	1	0052S907744RN
11	Seal for ball Ø32	1	0013G913815RN
12	Seal for ball Ø32	1	0013G913813RN
13	Pin for ball	1	B10480R - **
14	Ring nut	1	B10478R - **
15	"O" ring	1	0010R3181 - *
16	"O" ring	1	0010R3218 - *
17	"O" ring	1	0010R0164 - *
18	Handle	1	B10482 - **
19	Knob M10	1	0055PS.35-M10-EA
20	Antiextrusion ring Parbak	1	0011P8113 - *
21	"O" ring	1	0010R0119 - *
22	Seal for pin	1	B10487 - *
23	Spring pin 6x26 UNI 6873	2	0023E6x26CZ
24	Set screw M6x8 UNI 5923-67	1	0022VSTEIM6x8CZ
25	Hex. socket head cap screws M16x40 UNI5931	4	0022VTCEIM16x40CZ
26	Set screw M5x12 UNI 5925-67	1	0022VSTEIM5x12CZ
27	Plug with rubber seal 1/4" BSP	1	0031TG2
28	Description plate	1	B11024 - 6 - A
29	Steel plug for DBDS	1	B2375 - ** / *
30	Adapter	1	B10456-C
31	Nipple	1	B11638-C
32	Valve VS 224 X	1	VS224X / xxx
33	Complete solenoid valve	1	Normally open B2372-xxx-O Normally closed B2395-xxx-C
34	Coil + connector	1	B2370-xxx
Standard flange accumulator assembly (parts 3 - 16 - 17)		1	1" 1/4 F 2454 A7 - ** / * 2" F 2455 A9 - ** / *
Safety block gasket sets		1	B 2143 - *
Ball sets		1	B 2135 - *

* Gasket material ** Component material

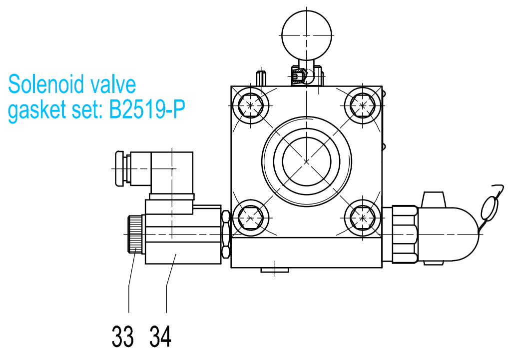
9.3dt



9.3dq



9.3dr



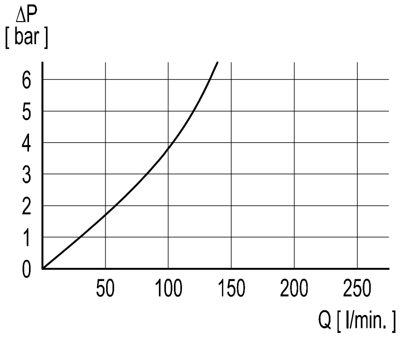
9.3ds

9.3.10 CHARACTERISTIC CURVES

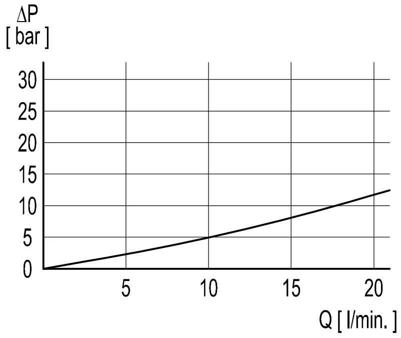
ΔP Curves

Flow rate from line to the accumulator and viceversa	Flow rate from the accumulator to the tank	

BS10

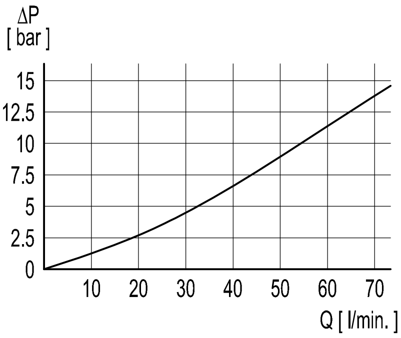


BS10

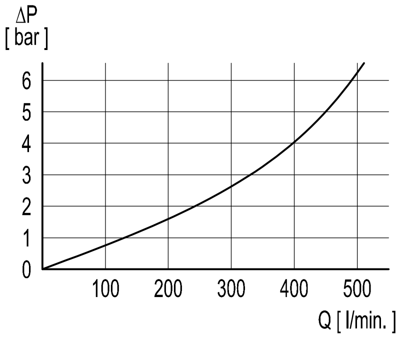


Flow rate from the accumulator via the solenoid valve to the tank

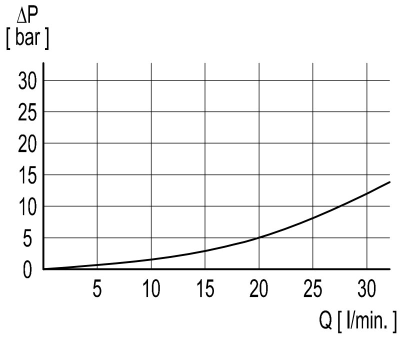
BS10, BS20 , BS25 , BS32



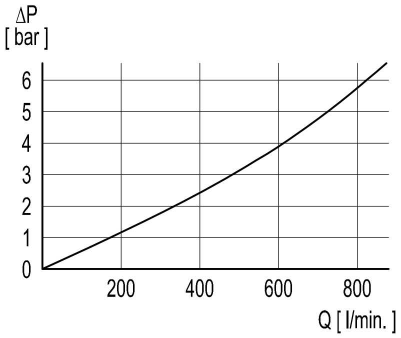
BS20



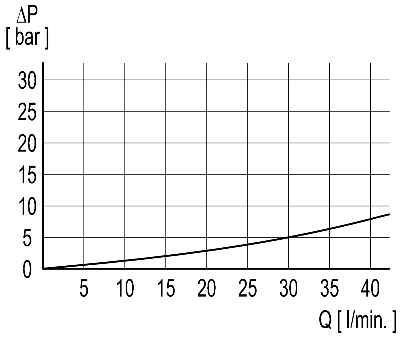
BS20



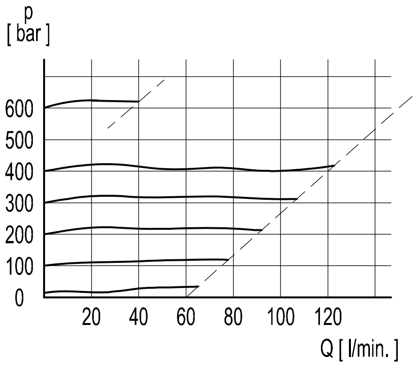
BS25



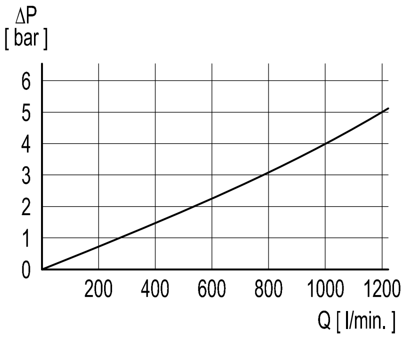
BS25



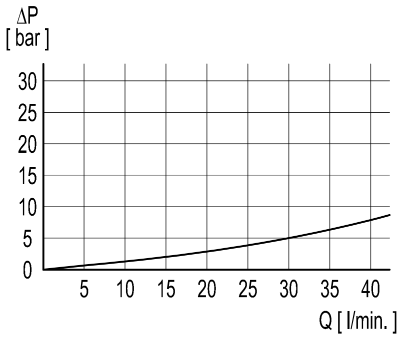
Flow rate from pressure relief valve to tank
(only DBDS10)



BS32



BS32



Curves measured using mineral oil with viscosity of 36 cSt at 50°C

9.3.11 EUROPEAN MARKET

Directive 2014/68/EU provides that pressure equipment, in which it's reasonably expected to be exceeded the allowable limits, should be provided with adequate protective equipment; for example, safety accessories such as the valves or the safety blocks type DBDS or BS. These devices shall prevent that pressure permanently exceeds the maximum allowable pressure PS of the equipment protected by them. However, it is permissible a pressure peak of short duration limited to 10% of the maximum allowable pressure. For the choice and sizing of the adequate safety device, the User should refer to specific standards. In accordance with the regulations 2014/68/EU, the safety valves are classified in Category IV.

9.3.12 ACCESSORIES

For safety valve type VS, see section 8.1
For safety valve type DBDS, see section 9.1
For fluid side adapter, see section 9.4
For single acting flow control valves, see section 12.5

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9.4.1 TECHNICAL DATA

INTERNAL DIAMETER: 30 mm

MAX OPERATING PRESSURE (PS): 400 BAR

WORKING TEMPERATURE):
-20 ÷ 80 °C (“P” version with NBR seals)
-10 ÷ 150 °C (“V” version with VITON seals)

MATERIAL: phosphated or galvanized carbon steel in compliance with Directive 2002/95/EC (RoHS)
to resist to corrosion
- stainless steel

WEIGHT: see Table 9.4d

9.4a

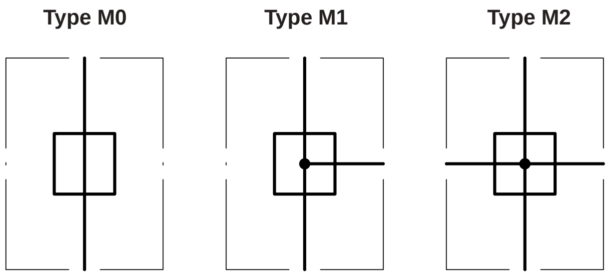
9.4.2 ADVANTAGES

- compact design
- flexible connection options

9.4.3 DESCRIPTION

The gas side adapters are blocks of various type, which can be mounted on the fluid side of an accumulator and which can fit the safety block. Special seal allows this adapter to be installed simply and securely in any position on all fluid valves of the bladder or piston accumulators. It’s important to select the correct adapter based on the correct thread fluid valve and the connection of installation side.

9.4.4 HYDRAULIC SYMBOL



9.4b

9.4.5 ORDER CODE

1	2	3	4	5	6		7	8
TF	G	8	A	8	M1	-	C	P

1 Series	
Gas side adapter	= TF

2 Up connection	
Thread BSP 150228 male	= G
Adapter SAE 3000	= L
Adapter SAE 6000	= H

3 Dimension of up connection	
1”1/2 =	8
2” =	9

4 Bottom connection	
Thread BSP ISO 228 with chamfer for OR	= A
Adapter SAE 3000 without OR	= L
Adapter SAE 6000 without OR	= H

5 Dimension of bottom connection	
1”1/2 =	8
2” =	9

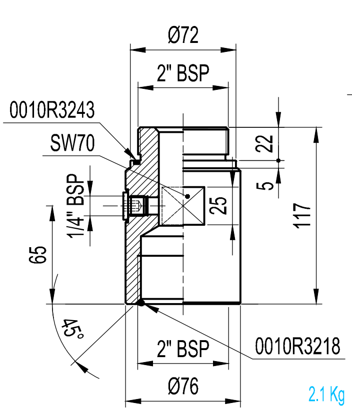
6 Lateral connection	
Without connction 1/4”	= M0
1 connection 1/4” BSP plugged	= M1
2 connections 1/4” BSP plugged	= M2

7 Block material	
Carbon steel	= C
Nickel coating 25 μ.	= N
Nickel coating 40 μ	= M
Stainless steel	= X

8 Seal material	
Nitrile (NBR)	= P
Viton (FKM)	= V

9.4.6 DIMENSIONS

TFG9A9M1-**/*



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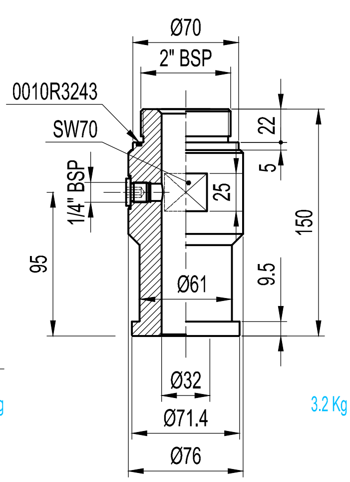

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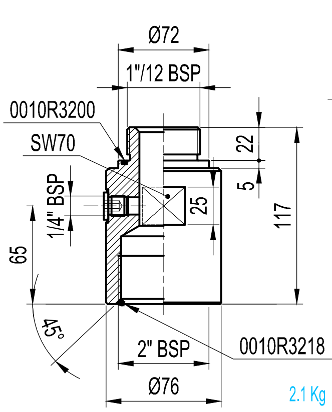

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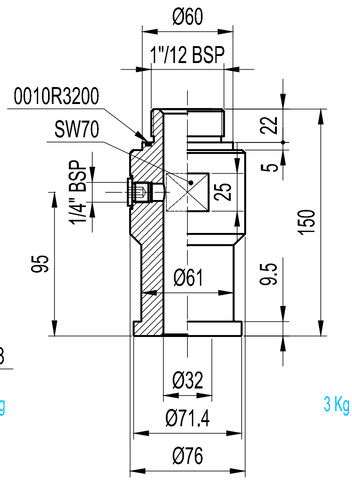

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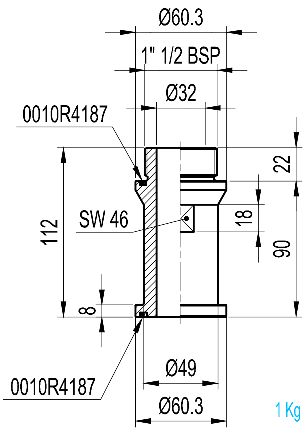

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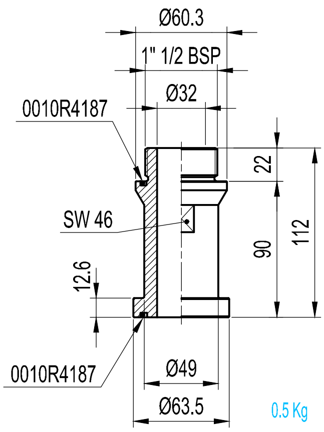
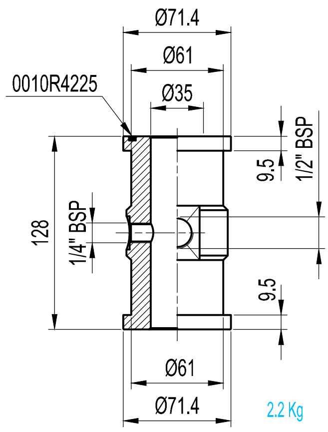


TFL9L9M2-**/*



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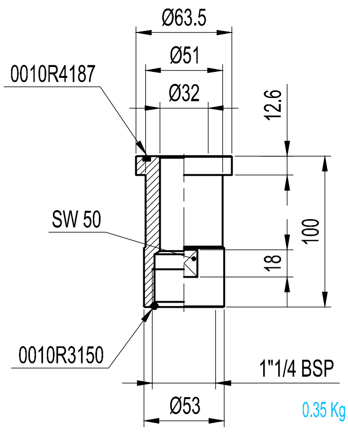
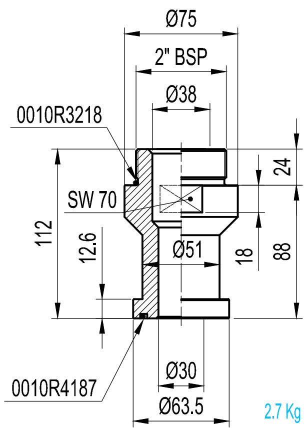


9.4c

TFG9H8M0-**/*



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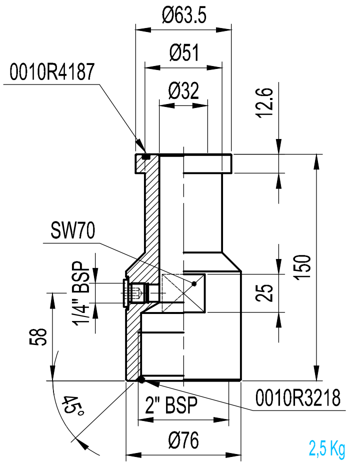

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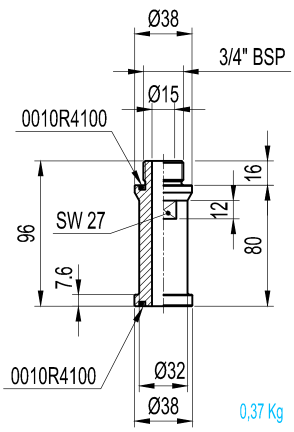

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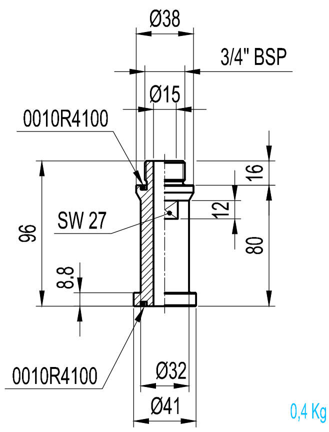

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10.1.1 DESCRIPTION

Epe Italiana supplies fully assembled accumulator stations which are ready for operation and complete with the necessary ball valve controls and safety equipment

- as an individual accumulator unit or
- in a back-up version with nitrogen bottles to increase the effective volume.

Nitrogen bottles, used as back-up, increase the gas volume inside the accumulator. This means that smaller accumulators can be used for the same gas volume and costs can be reduced.

An accumulator station can be composed of:

- single piston accumulator with support frame and instrumentations
- piston accumulators with nitrogen bottles.
- only bladder accumulators connected together by fluid side with manifold
- bladder accumulators with nitrogen bottles. In this version, the bladder accumulator must be of AST type (transfer) where the gas side is designed especially for connection to nitrogen bottles. Internal diffuser rod prevents damage to the bladder when the accumulator is full of fluid.
- nitrogen bottles alone.

Each accumulation station can be customized according to customer requirements/ technical specifications, painting included.

Epe Italiana can provide the complete group with all accessories such as pressure gauges, pressure switches, transducers, as well as safety accessories; all hydraulically connected to pipes in carbon steel or stainless steel and fittings free from leaks. In addition, all electrical equipment can be wired and connected to the terminal board. For this reason, all the accumulator stations have the order code followed by the specific drawing that incorporates the dimensional drawing, the hydraulic and electric chart and, of course, the list of components and any nameplate.

For the selection of the individual components and specifications, please refer to the relevant catalogue.

10.1b

10.1a

10.1c

10.1.2 ORDER CODE

1	2		3	4	5	6	7
BA	1	/	4	P	400	A	105…

1 Series	
Accumulator station	= **BA**

2 No. of accumulators (if any)	
Examples 1 =	**1**
2 =	**2**
3 =	**3**
4 =	**4**
5 =	**5**
… =	**…**
16 =	**16**

3 No. of additional bottles (if any)	
Examples 1 =	**1**
2 =	**2**
3 =	**3**
4 =	**4**
5 =	**5**
… =	**…**
16 =	**16**

Special versions on request

7 Drawing number	
Drawing number assigned by EPE after the PO:	
accumulator station with bladder accumulator/s	= **102…**
accumulator station with bladder accumulator/s + additional cylinders	= **103…**
accumulator station with piston accumulator/s	= **104…**
accumulator station with piston accumulator/s + additional cylinders	= **105…**
accumulator station with additional cylinders	= **106…**

6 Assembly drawing	
Assembly drawing	= **A**

5 Total volume of nitrogen "Vo" in liters	
Total volume of nitrogen in the accumulator station	= **…**

4 Type of the station	
With piston accumulator	= **P**
With bladder accumulators	= **S**
With additional bottles	= **B**

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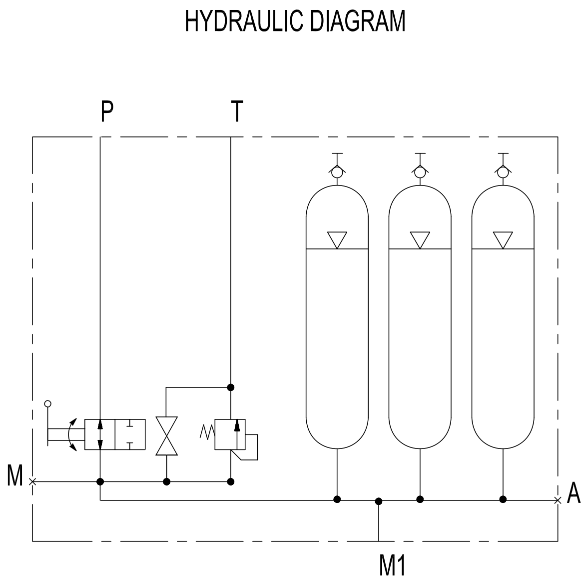
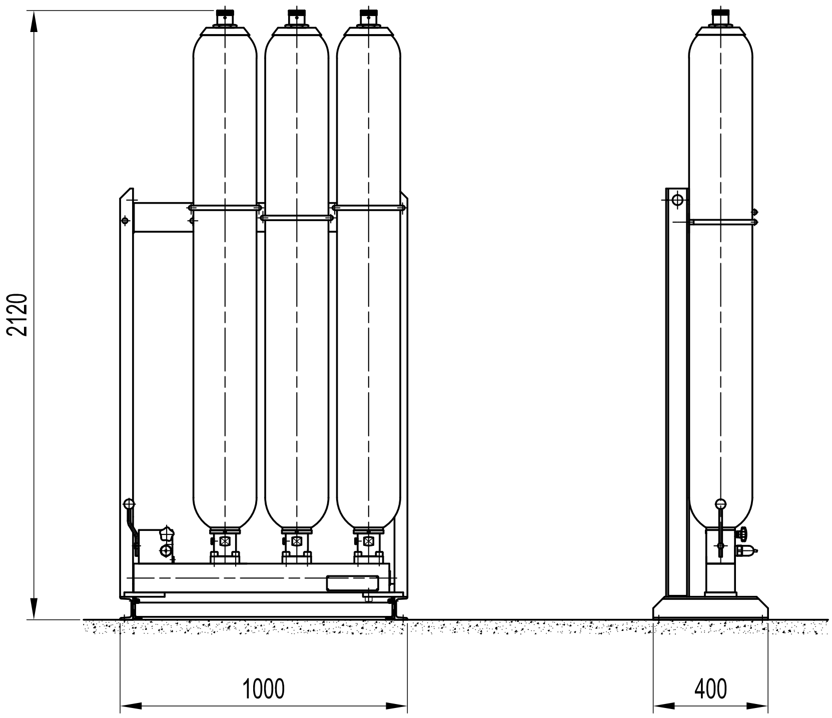
10.2.1 EXAMPLES OF BLADDER ACCUMULATOR STATION

10.2a



10.2b

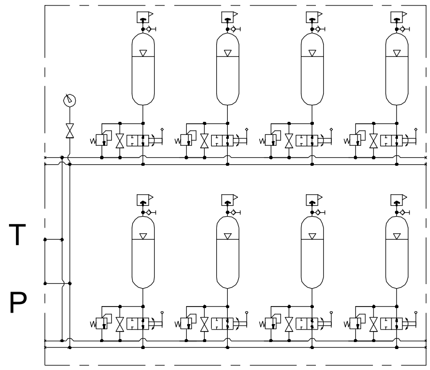


10.2c

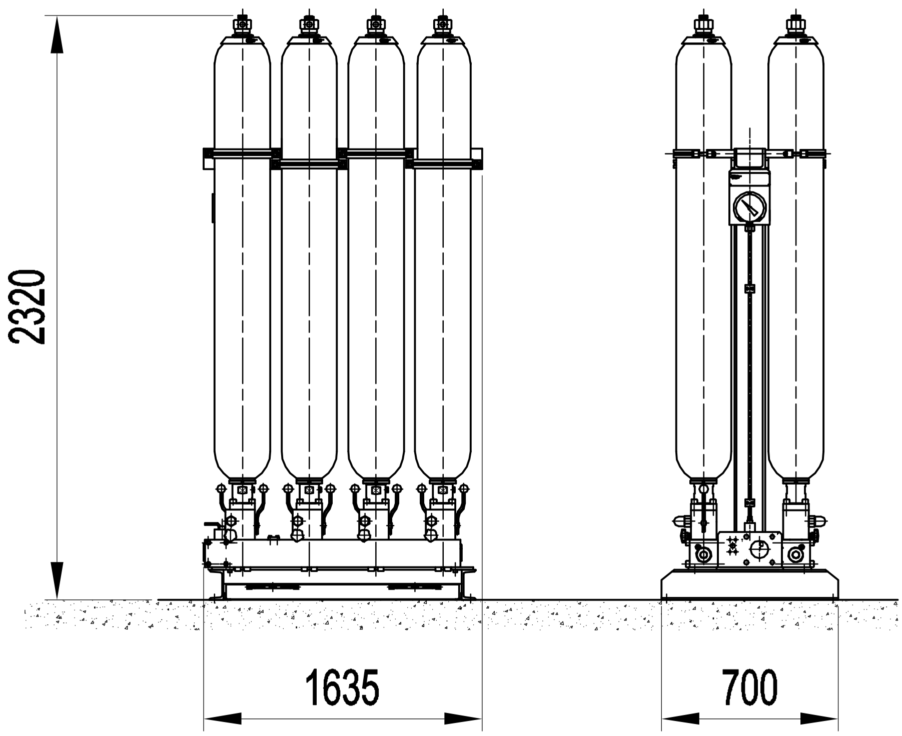
EXAMPLES OF BLADDER ACCUMULATOR STATIONS

10.2d

HYDRAULIC DIAGRAM



10.2e



10.2f

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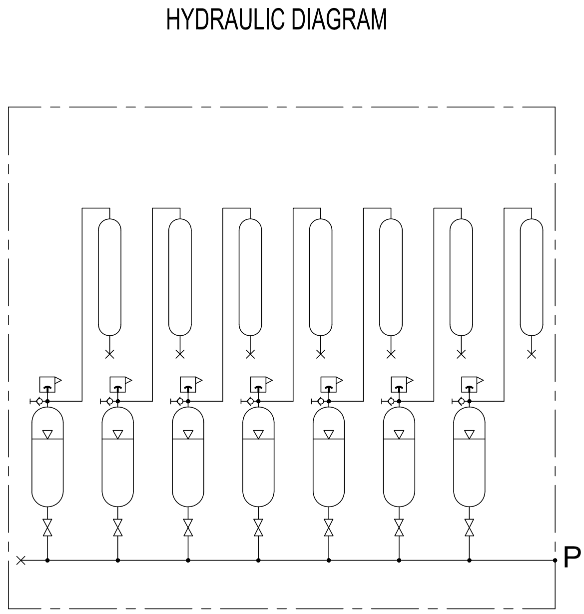
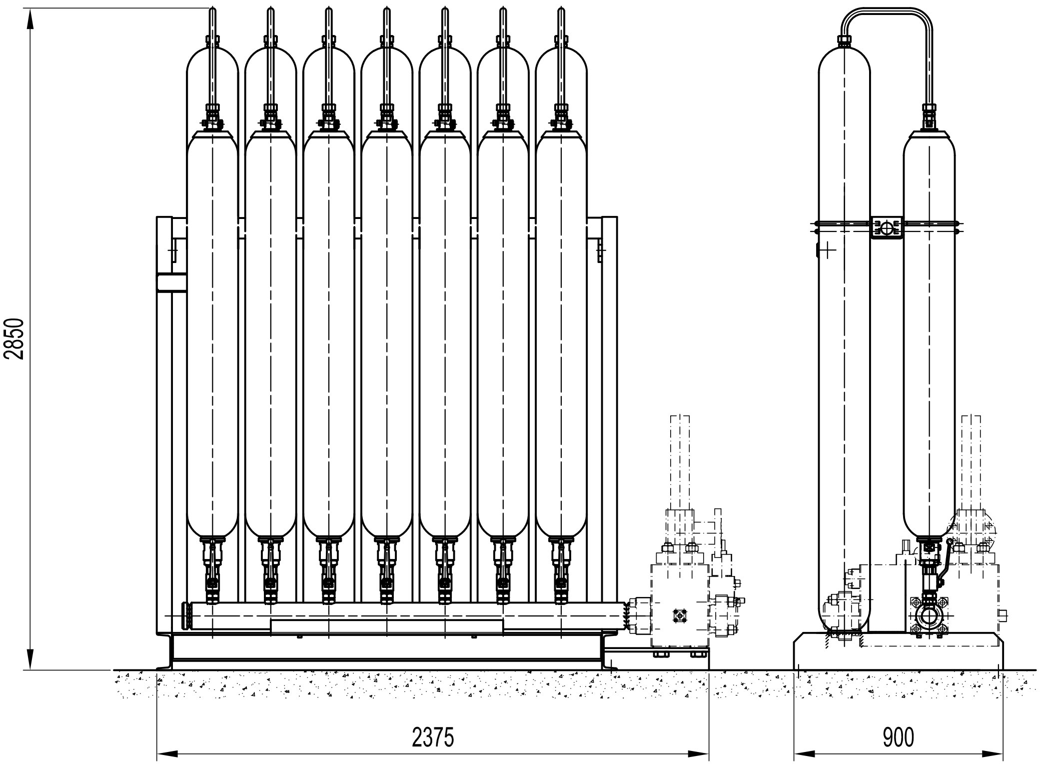
10.3.1 EXAMPLES OF BLADDER ACCUMULATOR STATION

10.3a



10.3b

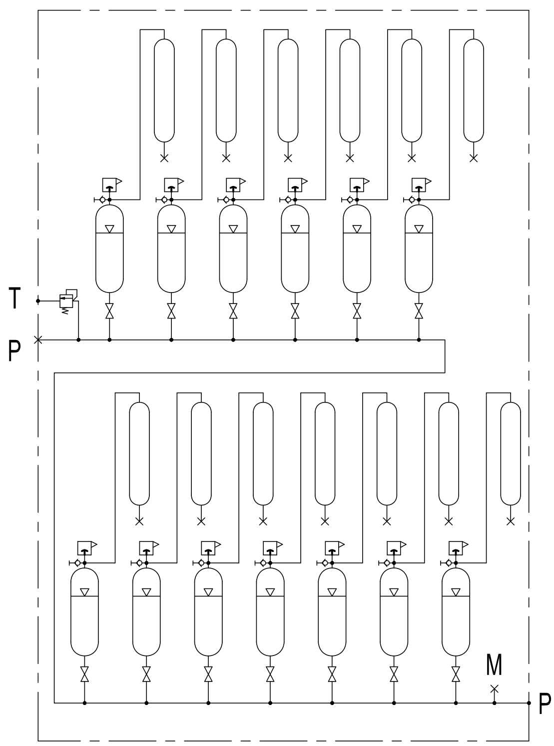


10.3c

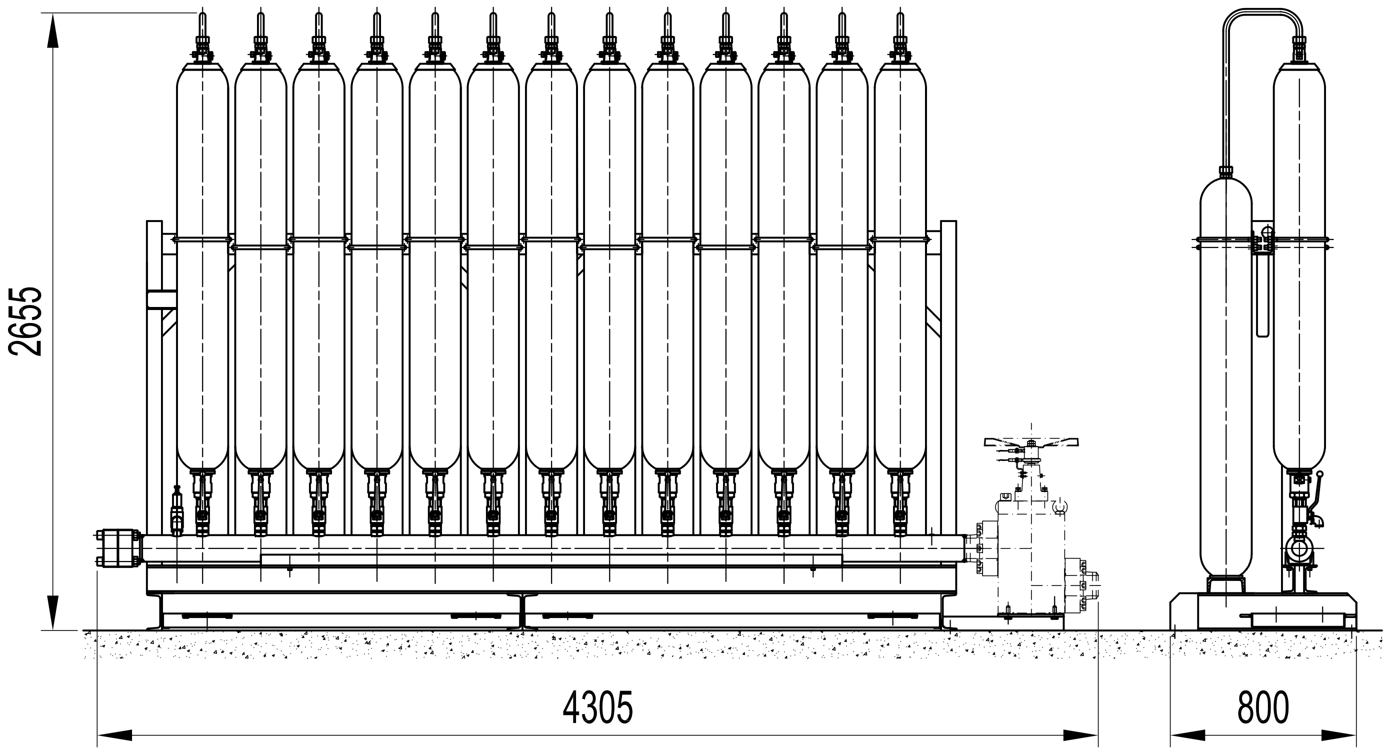
EXAMPLES OF BLADDER ACCUMULATOR STATIONS

10.3d

HYDRAULIC DIAGRAM



10.3e



10.3f

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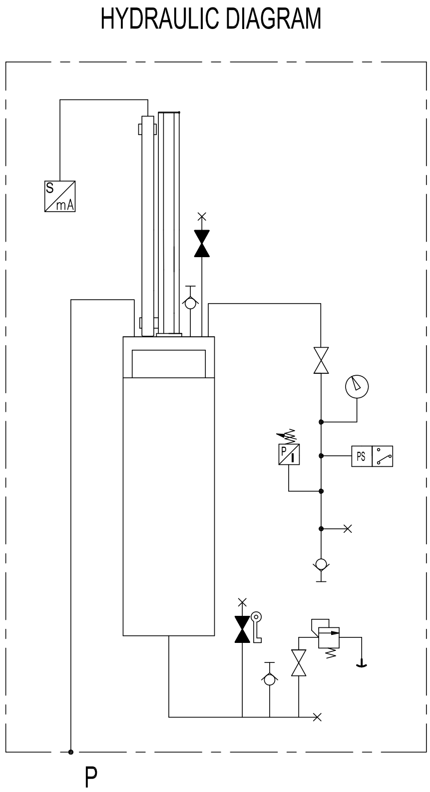
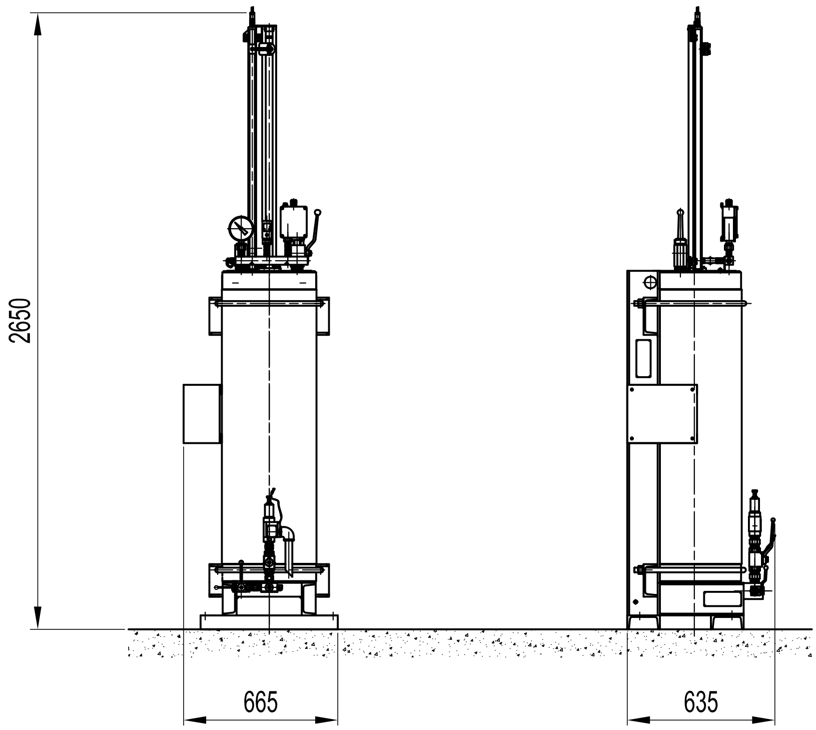
10.4.1 EXAMPLES OF PISTON ACCUMULATOR STATION

10.4a



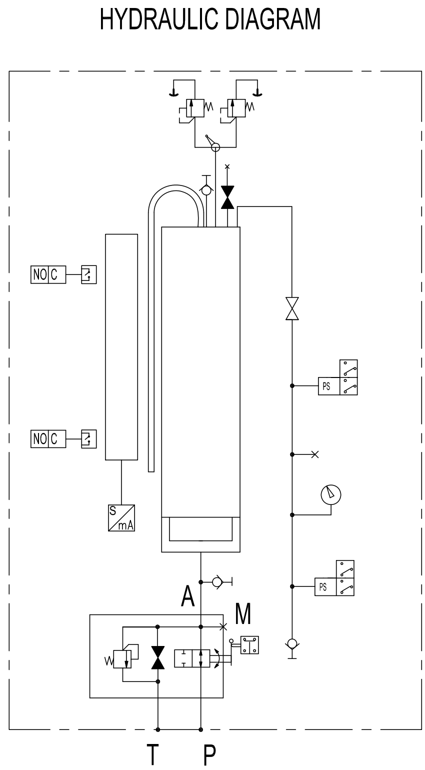
10.4b



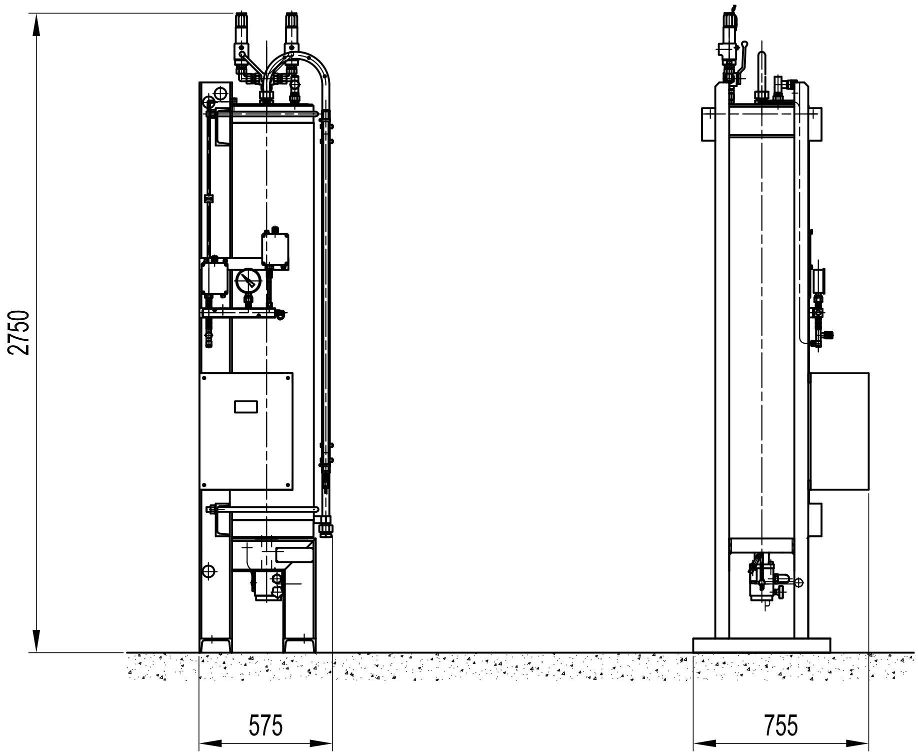
10.4c

EXAMPLES OF BLADDER AND ADDITIONAL BOTTLE STATIONS

10.4d



10.4e



10.4f

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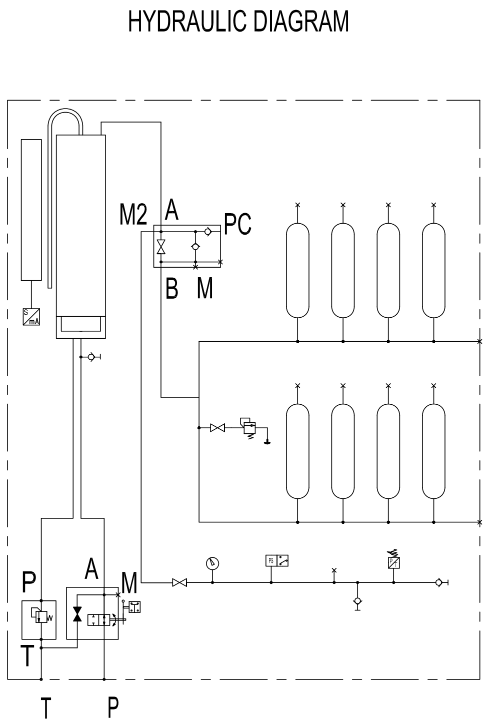
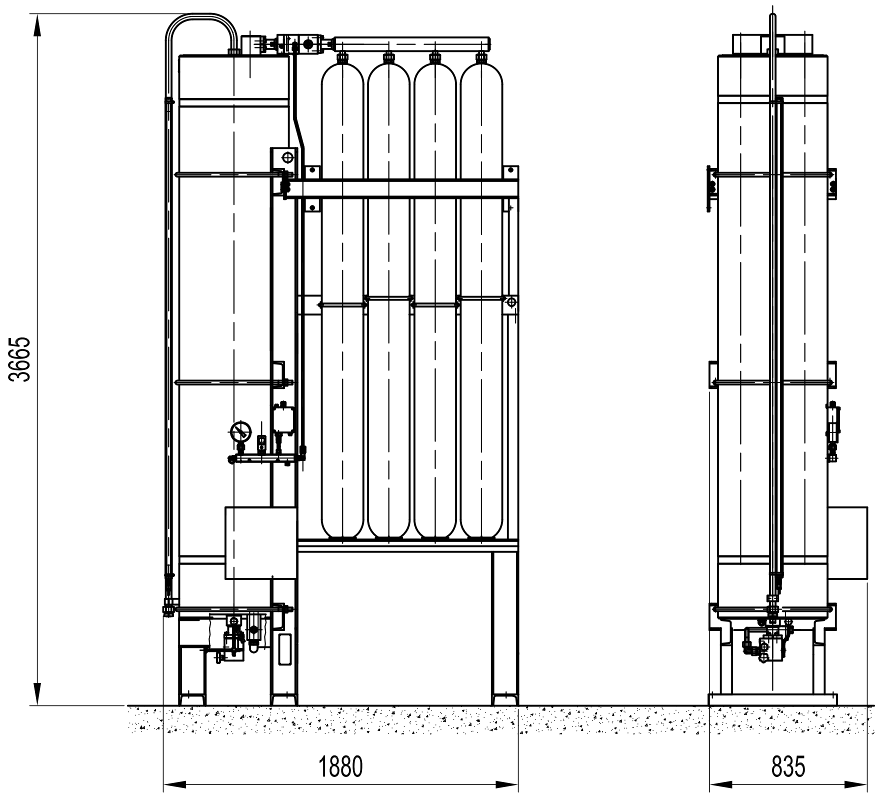
10.5.1 EXAMPLES OF PISTON AND ADDITIONAL BOTTLE STATION

10.5a



10.5b

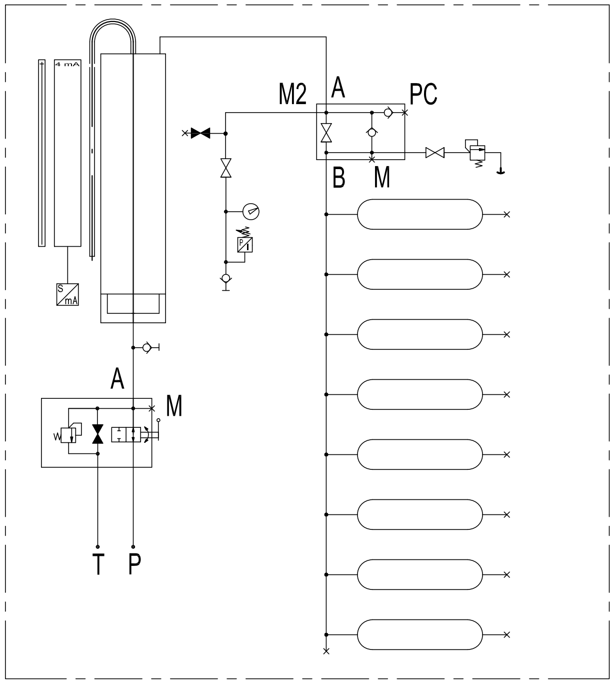


10.5c

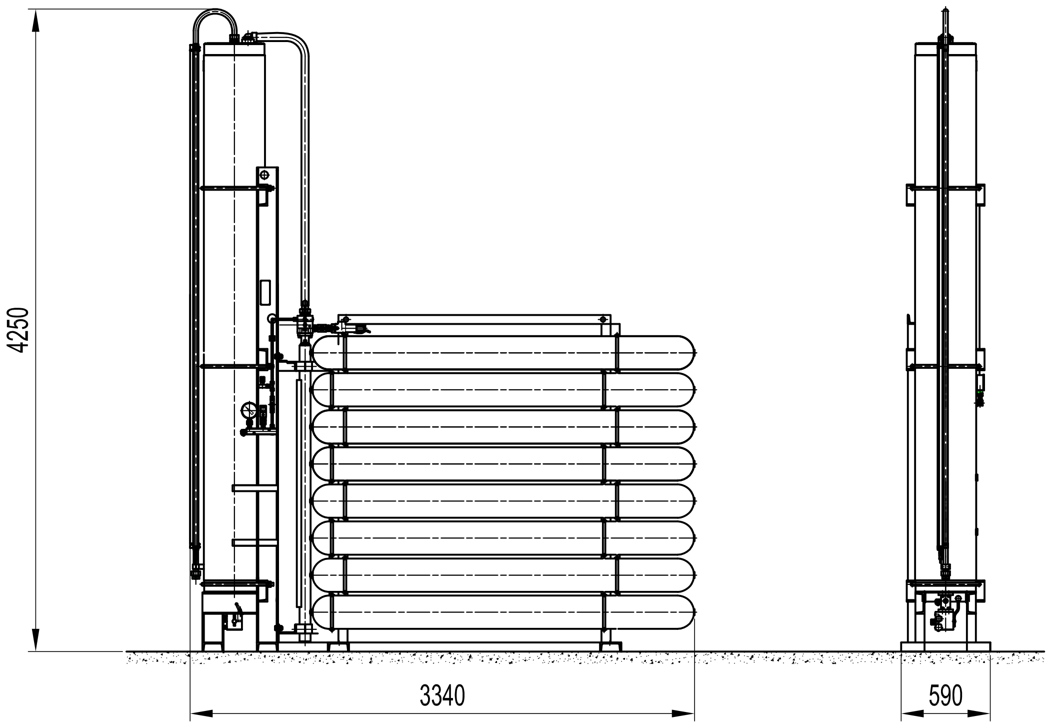
EXAMPLES OF PISTON AND ADDITIONAL BOTTLE STATIONS

10.5d

HYDRAULIC DIAGRAM



10.5e



10.5f

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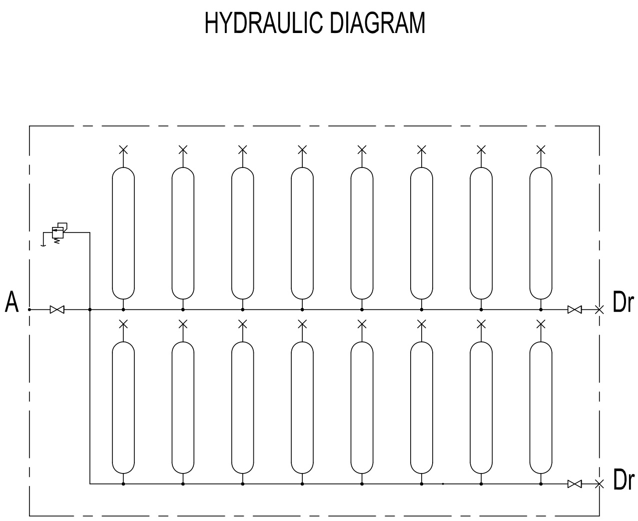
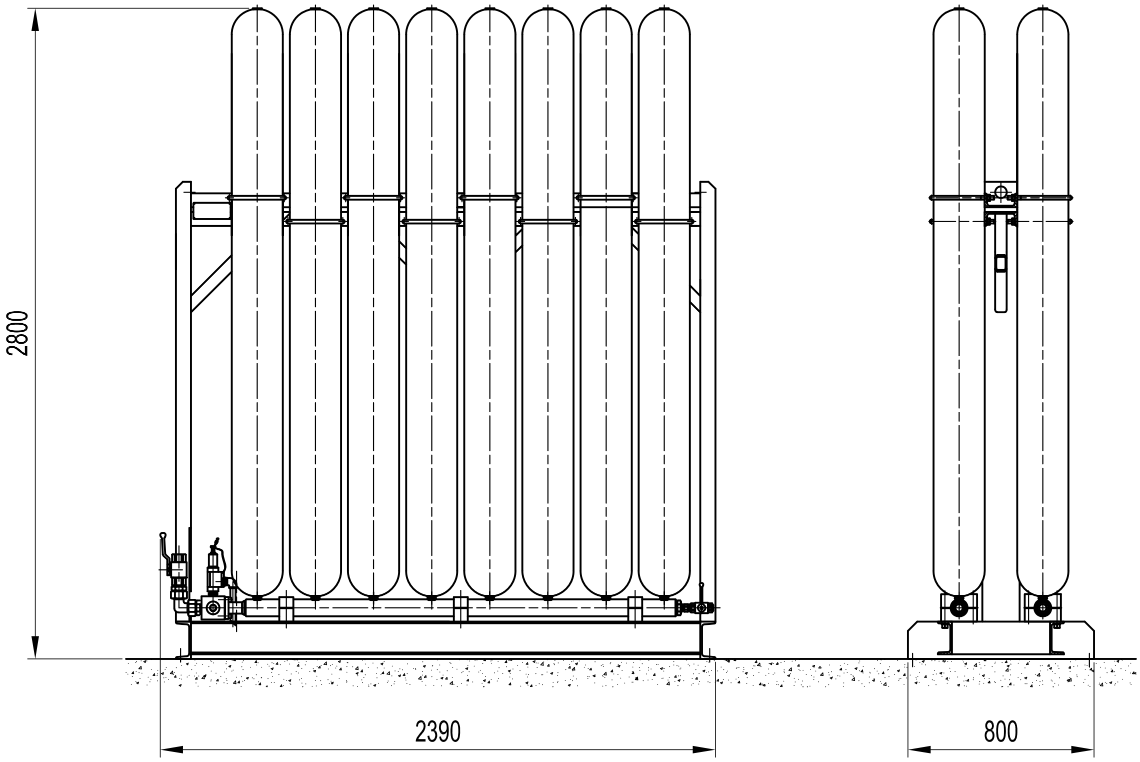
10.6.1 EXAMPLES OF ADDITIONAL BOTTLE STATION

10.6a



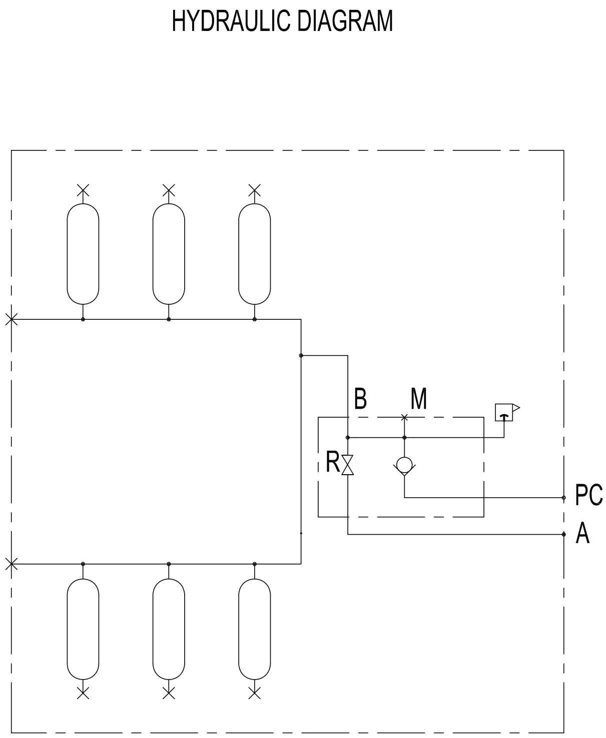
10.6b



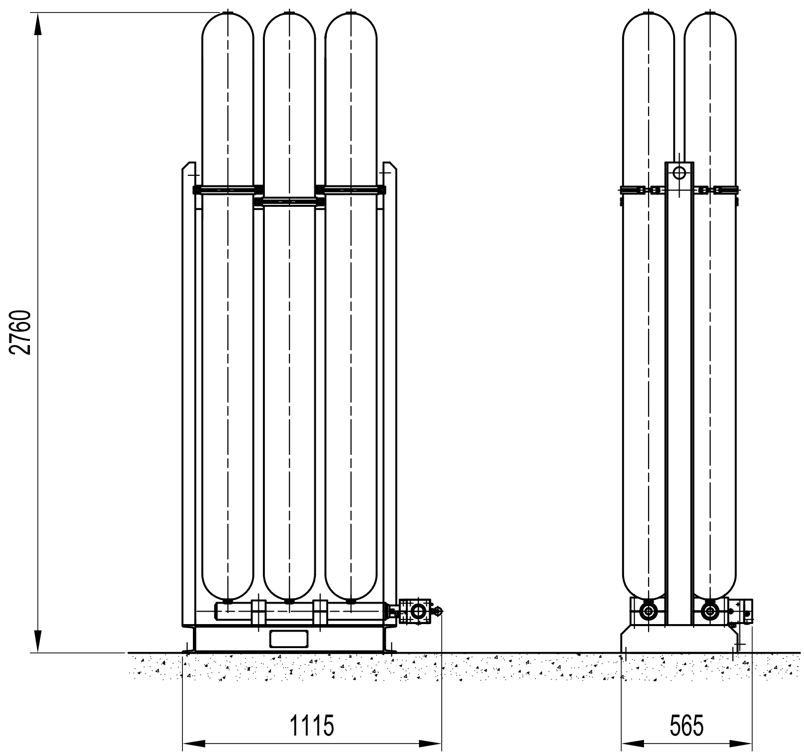
10.6c

EXAMPLES OF ADDTIONAL BOTTLE STATIONS

10.6d



10.6e



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10.6f

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PRE-LOADING SET AND MOBILE PRECHARGE UNIT

11.1.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS): 600 BAR

PRESSURE TEST (PT): 1.43 x PS

SCALE OF PRESSURE GAUGE:
4 - 10 - 16 - 25 - 60 - 100 - 250 (std.) - 400 - 600 bar

WORKING TEMPERATURE: - 20 ÷ +80°C

MEDIUM: Nitrogen

NITROGEN CONTAMINATION DEGREE:
class 20/18/15 according to ISO 4406/99

BODY MATERIAL: phosphated carbon steel or galvanized carbon steel in compliance with Directive 2002/95/EC (RoHS) to resist to corrosion

SEALS MATERIAL: P = Nitrile rubber (NBR) and Delrin

FILLING VALVE CONNECTION: 5/8” UNF + adapters (upon request)

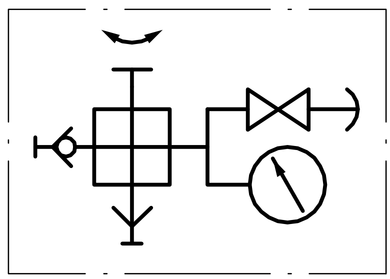
WEIGHT: 1.8 Kg. (complete with case)

11.1a

11.1.2 DESCRIPTION

The charging and gauging assembly consists of 3 mt. charging hose with standard nitrogen nipples, body incorporating gas valve connection, bleed valve and check valve. These kits are packed in a plastic storage case. Gauge is diameter 63 mm. diam type pressure gauges with 0÷250 bar graduation. The following charging kit are recommended to be used on all piston accumulators (with standard filling valves V or VX), on all bladder accumulators, on screwed and forged diaphragm accumulators. It is used for the periodic check of accumulator pre-charge and for the inflation of accumulators after the maintenance or it is used for the change of pre-charge value. For the inflation, it is necessary a connection to a bottle filled with industrial dry nitrogen with a pressure higher than the pre-charge value required, provided with pressure reducer (mandatory, for safety reasons, during the inflation of accumulators with PS < 210 bar).
Furthermore, the use of a pressure reducer makes easier the slow and graduated inflow of nitrogen on the bladder, thus avoiding the possibility of damaging the bladder itself.
NOTE: These assemblies are not recommended for continuous monitoring of gas pre-charge. For continuous monitoring, see Gas Adapters at Section 8.3

11.1.3 HYDRAULIC SYMBOL



11.1b

11.1.4 CONSTRUCTION

STANDARD VERSION includes:
- Valve body complete with ring nut connection to accumulator gas valve, pressure gauge, bleed and non return snap-in hose connection.
- 3 mt charging hose for high pressure series complete with bottle connection.
- Set of spare gaskets.
- Case.

UPON REQUEST:
- Nipple for to pressure reducer.
- ADAPTERS for special accumulator gas valves.
- CHARGING HOSE with length of 1 - 4 - 6 mt.

11.1.5 ORDER CODE

1	2	3	4		5
PC	250	S	1	-	-

1 Series	
Pre-loading and checking	= PC

2 Scale of pressure gauge (bar)	
0 ÷ 4 =	**4**
0 ÷ 10 =	**10**
0 ÷ 16 =	**16**
0 ÷ 25 =	**25**
0 ÷ 60 =	**60**
0 ÷ 100 =	**100**
0 ÷ 250 =	**250** (standard)
0 ÷ 400 =	**400**
0 ÷ 600 =	**600**

3 Filling valve connection	
5/8” UNF	= **S** (standard)
VG8 (Ø 7.7 x 1/32”)	= **A**
7/8” UNF	= **B**
1/4” BSP ISO 228	= **C**
VG8 (Ø 7.7 x 1/32”) long thread	= **D**
7/8” UNF with pin	= **E**

5 Charging hose (meters)	
Standard 3 mt =	**-**
1 mt =	**C**
6 mt =	**L**

4 Connection to bottle (according to Country standards)			
Italy	= **1**	Indonesia	
Austria	= **2**	Ireland	
Czech Republic		Jamaica	
Denmark		Kenya	
Finland		Malaysia	
Germany		Malta	
Netherlands		New Zealand	
Norway		Pakistan	
Poland		Portugal	
Sweden		Singapore	
Switzerland		Sri Lanka	
Belgium	= **3**	Sudan	
Algeria		Tanzania	
Bahrain		Thailand	
Bulgaria		Turkey	
Egypt		Vietnam	
France		Zambia	
Gabon		Brazil	= **5**
Guinea		Puerto Rico	
Hungary		South Africa	= **6**
Iran		Philippines	
Iraq		Australia	
Israel		Canada	= **7**
Ivory Coast		U.S.A.	
Jordan		Albania	= **8**
Kuwait		Russia	
Libya		Venezuela	
Mauritius		Japan	= **9**
Mexico		Taiwan	=**10**
Morocco		China	=**11**
Mozambique		Korea	=**12**
Nigeria		Bolivia	=**13**
Oman		Chile	
Qatar		Colombia	
Romania		Dominican Republic	
Saudi Arabia		Ecuador	
Slovenia		Guatemala	
Spain		Guyana	
Syria		Honduras	
Tunisia		Paraguay	
United Arab Emirates		Peru	
Argentina	= **4**	Uruguay	
Bahamas			
Barbados			
Costa Rica			
Cyprus			
Ethiopia			
Gambia			
Ghana			
Great Britain			
Greece			
Hong Kong			
India			

Special variants on request

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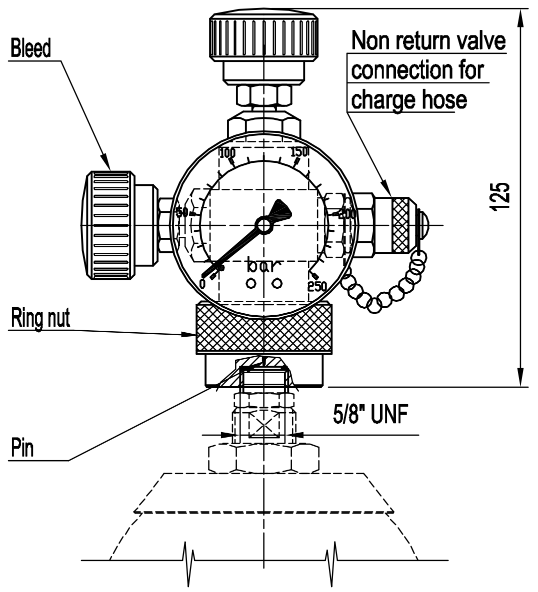
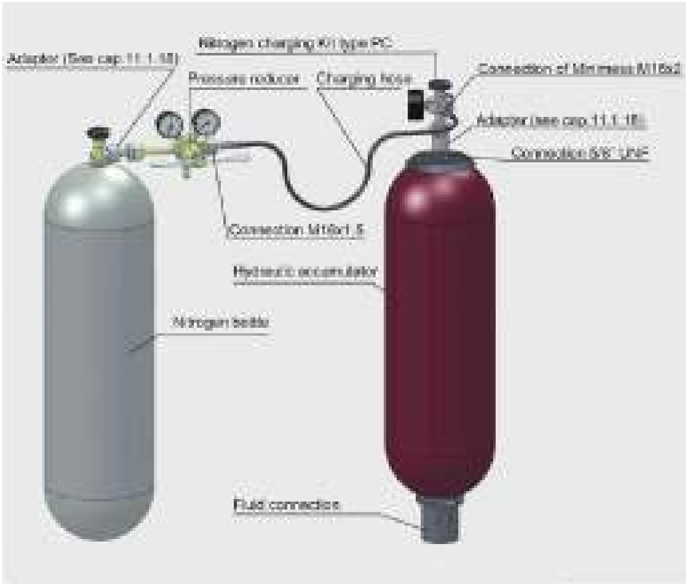
11.1.6 DIMENSIONS



11.1c



11.1d

11.1.7 SPARE PARTS CODE

Spare parts	number code
Complete PC body with manometer	**B2156/***
PC body without manometer	**B2157**
Manometer	**B2163/***
Flexible hose of 1 meter	**B2166/1**
Flexible hose of 3 meters (standard)	**B2166/3**
Flexible hose of 4 meter	**B2166/4**
Flexible hose of 6 meter	**B2166/6**
Complete central pin	**B2165**
Complete bleed	**B2164**
Non return valve	**B2162**
Seals kit	**B2160/****
Seal face for filling valve	**B10342 D**

* = see scale of pressure gauge at Section 11.1.4

** = see table 11.1h for country codes

11.1d

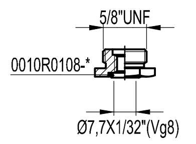
11.1.8 ACCESSORIES

Adapters

All adapters represented below serve to use the EPE pre-charge equipment on the accumulators of the main international manufacturers.

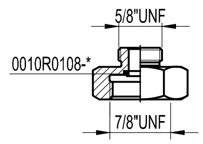
Type "A"

Adapter B2510



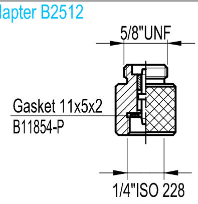
Type "B"

Adapter B2511



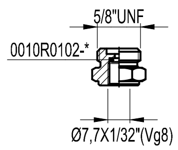
Type "C"

Adapter B2512



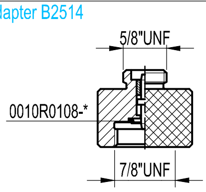
Type "D"

Adapter B2513



Type "E"

Adapter B2514



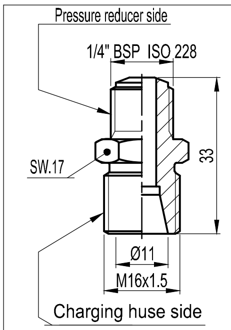
11.1e

Connection nipple for pressure reducer

The use of pre-charging equipment for the inflation of "low pressure" accumulators requires, for safety reasons, a pressure reducer (see Section 11.3) mounted on the nitrogen bottle, which is calibrated according to a pressure equal or lower than the maximum PS operating pressure, stamped on the accumulator shell.

The fitting nipple between the charging hose and the pressure reducer must be ordered separately with code 11447.

Nipple No. B2515



for pressure reducer see chapter 11.3

11.1f

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NITROGEN CHARGING KIT type PC

Connection nipple for nitrogen cylinder

For “high pressure” accumulators and for all models with PS ≥ 210 bar, you can connect to the nitrogen bottle through the proper fitting without the use of the pressure reducer.

The suitable nipple must be chosen according to the Country of origin of the nitrogen bottle, as shown in the side Table.

The no. of the column marked by the **x** indicates the figure of the nipple valid for that Country and coincides with the number used to indicate the bottle connection in the designation code of the complete equipment (Chapter 11.1.4).

Each nipple has its own code (in brackets) to be used for ordering spare parts and not indicated in the designation of the pre-charging equipment.

Fig. 1
(No.B2167)

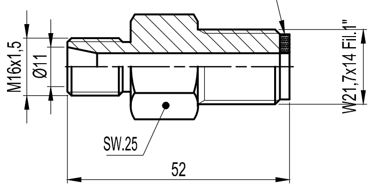


Fig. 2
(No.B2168)

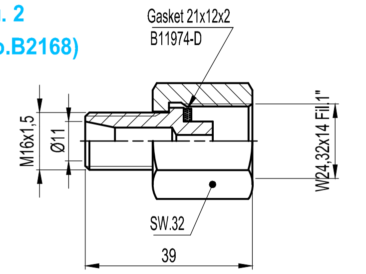


Fig. 3
(No.B2169)

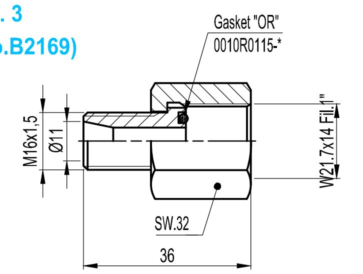


Fig. 4
(No.B2171)

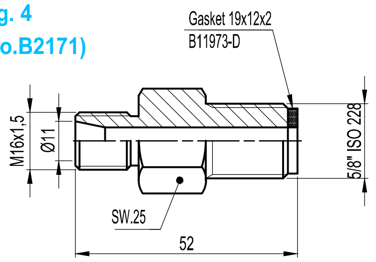


Fig. 5
(No.B2516)

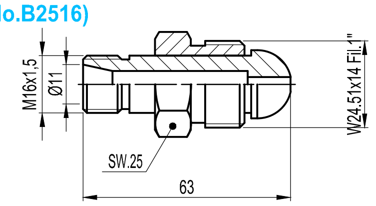
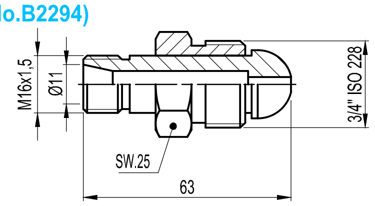


Fig. 6
(No.B2294)



* For Australia only high pressure bottle

Fig. 7
(No.B2172)

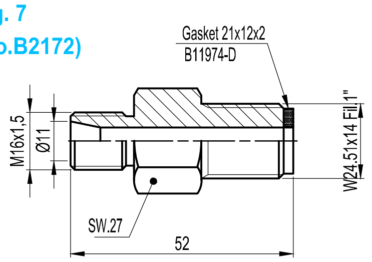


Fig. 8
(No.B2254)

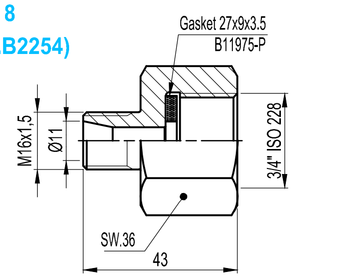


Fig. 9
(No.B2170)

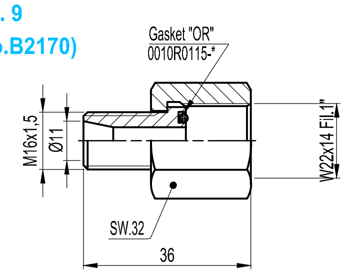


Fig. 10
(No.B2174)

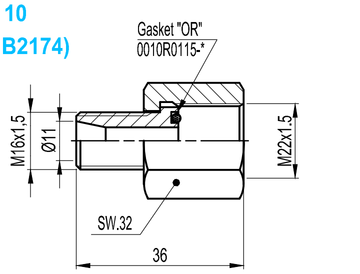


Fig. 11
(No.B2266)

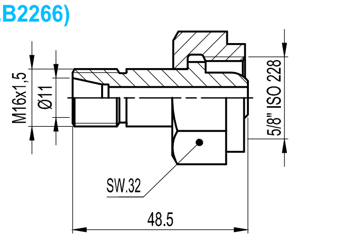


Fig. 12
(No.B2295)

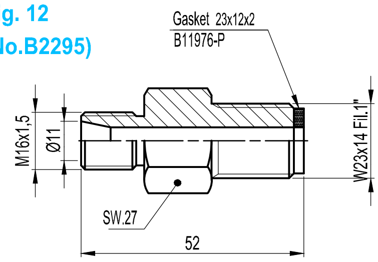
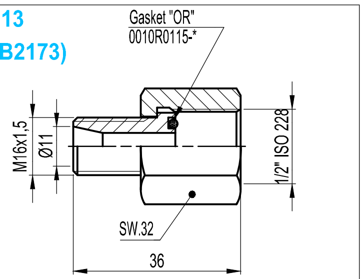


Fig. 13
(No.B2173)



11.1g

Country	Type / part code												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Albania								x					
Algeria			x										
Argentina				x									
Australia						x							
Austria		x											
Bahamas				x									
Bahrain			x										
Barbados				x									
Belgium			x										
Bolivia													x
Brazil					x								
Bulgaria			x	x									
Canada							x						
Chile													x
China											x		
Colombia													x
Costa Rica				x									
Cyprus				x									
Czech Republic		x											
Denmark		x											
Dominican Republic													x
Ecuador													x
Egypt			x										
Ethiopia				x									
Finland		x											
France			x										
Gabon			x										
Gambia				x									
Germany		x											
Ghana				x									
Great Britain				x									
Greece				x									
Guatemala													x
Guinea			x										
Guyana													x
Honduras													x
Hong Kong				x									
Hungary			x										
India				x									
Indonesia				x									
Iran			x										
Iraq			x										
Ireland				x									
Israel			x										
Italy	x												
Ivory Coast			x										
Jamaica				x									
Japan									x				

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Country	Type / part code												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Jordan			x										
Kenya				x									
Korea												x	
Kuwait			x										
Libya			x										
Malaysia				x									
Malta				x									
Mauritius			x										
Mexico			x										
Morocco			x										
Mozambique			x										
Netherlands		x											
New Zealand											x		
Nigeria			x										
Norway		x											
Oman			x										
Pakistan				x									
Paraguay													x
Perù													x
Philippines						x							
Poland		x											
Portugal				x									
Puerto Rico					x								
Qatar			x										
Romania			x										
Russia								x					
Saudi Arabia			x										
Singapore				x									
Slovenia			x										
South Africa						x							
Spain			x										
Sri Lanka				x									
Sudan				x									
Sweden		x											
Switzerland		x											
Syria			x										
Taiwan										x			
Tanzania				x									
Thailand				x									
Tunisia			x										
Turkey				x									
United Arab Emirates			x										
Uruguay													x
U.S.A.							x						
Venezuela								x					
Vietnam				x									
Zambia				x									

11.1h

11.1.9 COMMISSIONING AND MAINTENANCE

General

For proper operation of the accumulator, it is necessary to maintain a constant pre-charge pressure, which should be checked periodically using **the pre-charge and checking set type PC250.**

The same equipment is also used to inflate the accumulator (after a repair, for a change of use, etc.) connecting it with the appropriate charging hose to a dry nitrogen bottle equipped with pressure reducer (see Section 11.3), so that the nitrogen enters the accumulator very slowly to avoid possible breakage of the bladder or the diaphragm and to limit the temperature change.

In fact, the process of charging or discharging an accumulator with nitrogen causes a temperature change which is transmitted to the surrounding air until the temperature of the accumulator stabilizes.

For the effects of temperature transfer, the accumulator should be allowed to stand for a minimum of 60 minutes before a final reading of the pre-charge pressure is taken.

Checking the pre-charge

Before proceeding, it is necessary to isolate the accumulator from the system and discharge completely the fluid under pressure.

Remove the cap of the gas valve and the cap of the filling valve.

Before mounting the PC250 equipment, make sure that the knob **A is unscrewed**, that the bleed **B is closed**, that the check valve **C has its cap screwed** and that the pressure gauge has mounted a full scale appropriate to the pressure to read (normally the pressure to be read must not exceed the 3/4 of full scale).

Tighten by hand, using the knurled nut **D**, the charging set on the gas valve.

Screw, without forcing, the knob **A** to read the pressure on the gauge.

If the value corresponds to the one required, you can proceed to unscrew the **knob A** until it stops, but without forcing, open the **bleed B** and disassemble the equipment by unscrewing the nut **D**.

Decreasing the pre-charge

If the pre-charge value is **greater** than the one required, you should discharge the exceeding pressure by acting on the bleed **B** until reaching the desired value.

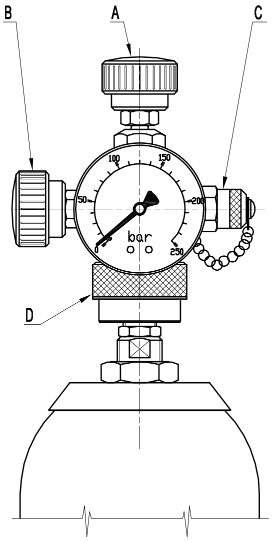
We suggest **discharging slowly** and then carrying out the final reading after at least 15 minutes from the discharge operation. Then you can remove the equipment as above indicated.

Increasing or restoring the pre-charge

If the pre-charge is less than the established value (or if it is necessary to re-inflate the accumulator after a repair), proceed as follows (place the equipment as indicated in the Section "**Checking the pre-charge**"):

- Mount the nipple to the nitrogen bottle or to the pressure reducer.
- Connect the hose extremity to the nipple.
- Connect the other hose extremity to the check valve **C** after having removed its cap.
- Open **slowly** the shut-off valve of the nitrogen bottle or the knob of the pressure reducer and keep it open until it reaches a pressure slightly higher than the required value (+ 10 ÷ 15%), then **close** the valve.
- **Unscrew** the knob **A** and decompress the equipment with the bleed valve **B**.
- Disconnect the charging hose of the check valve **C**.
- **Close** the bleed valve, place the **cap** to the check valve **C** and wait at least 15 minutes for the pressure stabilization.
- **Screw** again the knob **A** until reading the pressure that should be slightly higher than requested. Adjust the pre-charge value, using the bleed valve, and disassemble the equipment, as already indicated.
- Check with soapy water that there are no leaks coming out from the filling valve of the accumulator.
- Screw the cap of the filling valve and the external protection cap.

Now the accumulator is ready for commissioning.



11.1i

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NITROGEN CHARGING KIT type PCM

11.2.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS): 400 BAR

PRESSURE TEST (PT): 1.43 x PS

SCALE OF PRESSURE GAUGE:
4 - 10 - 16 - 25 - 60 - 100 - 250 (std.) - 400 bar

WORKING TEMPERATURE: - 20 ÷ +80°C

MEDIUM: Nitrogen

NITROGEN CONTAMINATION DEGREE:
class 20/18/15 according to ISO 4406/99

BODY MATERIAL: phosphated carbon steel or galvanized carbon steel in compliance with Directive 2002/95/EC (RoHS) to resist to corrosion

SEALS MATERIAL: P = Nitrile rubber (NBR) and Delrin

FILLING VALVE CONNECTION: M28x1.5 + adapters (upon request)

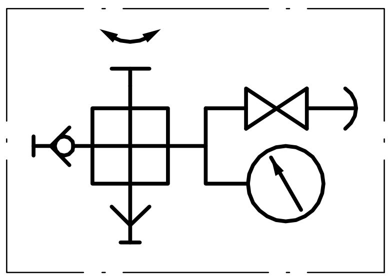
WEIGHT: 1.8 Kg. (complete with case)

11.2a

11.2.2 DESCRIPTION

The charging and gauging assembly consists of 3 mt. charging hose with standard nitrogen nipples, body incorporating gas valve connection, bleed valve and check valve. These kits are packed in a plastic storage case. Gauge is diameter 63 mm. diam. type pressure gauges with 0÷250 bar graduation. The following are recommended for use on all piston accumulators (with standard filling valve type VM) and on all welded diaphragm accumulators.
It is used for the periodic check of accumulator pre-charge and for the inflation of accumulators after the maintenance or it is used for the change of pre-charge value. For the inflation, it is necessary a connection to a bottle filled with industrial dry nitrogen with a pressure higher than the pre-charge value required, provided with pressure reducer (mandatory, for safety reasons, during the inflation of accumulators with PS < 210 bar).
Furthermore, the use of a pressure reducer makes easier the slow and graduated inflow of nitrogen on the bladder, thus avoiding the possibility of damaging the bladder itself.
NOTE: These assemblies are not recommended for continuous monitoring of gas pre-charge. For continuous monitoring, see Gas Adapters at Section 8.3

11.2.3 HYDRAULIC SYMBOL



11.2b

11.2.4 CONSTRUCTION

STANDARD VERSION includes:
- Valve body complete of ring nut connection to accumulator gas valve, pressure gauge, bleed and non return snap-in hose connection.
- 3 mt charging hose for high pressure series complete with bottle connection.
- Set of spare gaskets.
- Case.

UPON REQUEST:
- Nipple for pressure reducer.
- ADAPTERS for special accumulator gas valves.
- CHARGING HOSE with length of 1 - 4 - 6 mt.

11.2.5 ORDER CODE

1	2	3	4	5	
PCM	250	M	1	-	-

1 Series

Pre-loading and checking	= **PCM**

2 Scale of pressure gauge (bar)

0 ÷ 4 =	**4**
0 ÷ 10 =	**10**
0 ÷ 16 =	**16**
0 ÷ 25 =	**25**
0 ÷ 60 =	**60**
0 ÷ 100 =	**100**
0 ÷ 250 =	**250** (standard)
0 ÷ 400 =	**400**

3 Filling valve connection

M28x1.5	= **M** (standard)
3/4 BSP ISO 228	= **R**

5 Charging hose (meters)

Standard 3 mt =	**-**
1 mt =	**C**
4 mt =	**M**
6 mt =	**L**

Special variants on request

4 Connection to bottle (according to Country standards)

Italy	= **1**
Austria	= **2**
Czech Republic	
Denmark	
Finland	
Germany	
Netherlands	
Norway	
Poland	
Sweden	
Switzerland	
Belgium	= **3**
Algeria	
Bahrain	
Bulgaria	
Egypt	
France	
Gabon	
Guinea	
Hungary	
Iran	
Iraq	
Israel	
Ivory Coast	
Jordan	
Kuwait	
Libya	
Mauritius	
Mexico	
Morocco	
Mozambique	
Nigeria	
Oman	
Qatar	
Romania	
Saudi Arabia	
Slovenia	
Spain	
Syria	
Tunisia	
United Arab Emirates	
Argentina	= **4**
Bahamas	
Barbados	
Costa Rica	
Cyprus	
Ethiopia	
Gambia	
Ghana	
Great Britain	
Greece	
Hong Kong	
India	
Indonesia	
Ireland	
Jamaica	
Kenya	
Malaysia	
Malta	
New Zealand	
Pakistan	
Portugal	
Singapore	
Sri Lanka	
Sudan	
Tanzania	
Thailand	
Turkey	
Vietnam	
Zambia	
Brazil	= **5**
Puerto Rico	
South Africa	= **6**
Philippines	
Australia	
Canada	= **7**
U.S.A.	
Albania	= **8**
Russia	
Venezuela	
Japan	= **9**
Taiwan	=**10**
China	=**11**
Korea	=**12**
Bolivia	=**13**
Chile	
Colombia	
Dominican Republic	
Ecuador	
Guatemala	
Guyana	
Honduras	
Paraguay	
Peru	
Uruguay	

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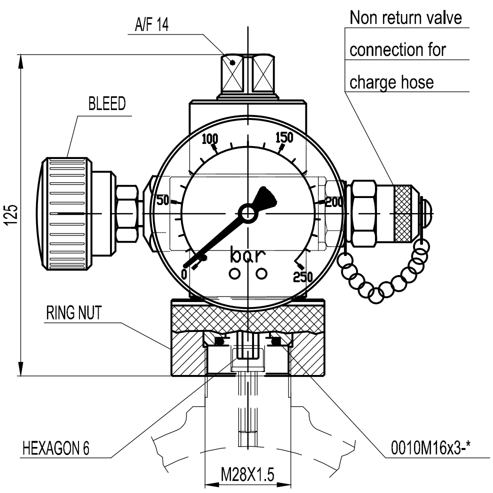
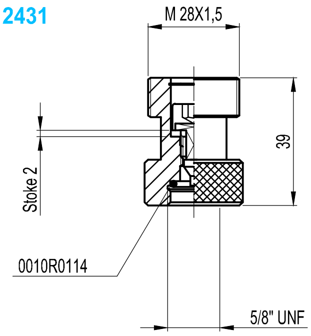
11.2.6 DIMENSIONS



Adapter. 2431



11.2c

11.2.7 SPARE PARTS CODE

Spare parts	number code
Complete PCM body	**B2154/***
PCM body without manometer	**B2155**
Manometer	**B2163/***
Flexible hose of 1 meter	**B2166/1**
Flexible hose of 3 meters (standard)	**B2166/3**
Flexible hose of 4 meter	**B2166/4**
Flexible hose of 6 meter	**B2166/6**
Central pin (key)	**B10850-C**
Complete bleed	**B2164**
Non return valve	**B2162**
Seals kit	**B2161/****
Seal face for filling valve	**0010M16x3-P**

* = see scale of pressure gauge at Section 11.2.5

** = see table 11.2h for country codes

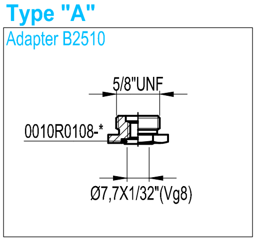
11.2d

11.2.8 ACCESSORIES

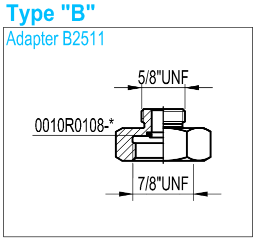
Adapters

All adapters represented below serve to use the EPE pre-charge equipment on the accumulators of the main international manufacturers.

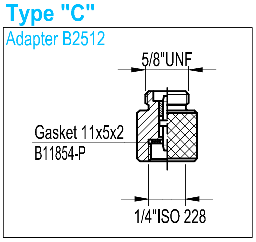
Type "A"



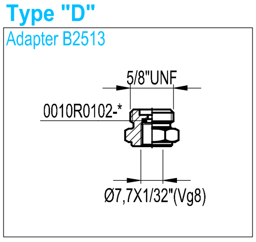
Type "B"



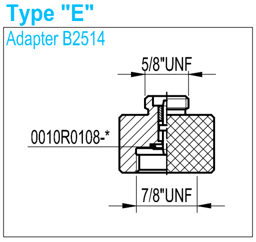
Type "C"



Type "D"



Type "E"



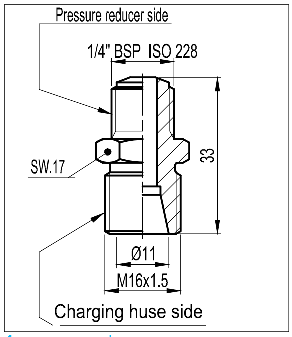
11.2e

Connection nipple for pressure reducer

The use of pre-charging equipment for the inflation of “low pressure” accumulators requires, for safety reasons, a pressure reducer (see Section 11.3) mounted on the nitrogen bottle, which is calibrated according to a pressure equal or lower than the maximum PS operating pressure, stamped on the accumulator shell.

The nipple between the charging hose and the pressure reducer must be ordered separately with code 11447.

Nipple No. B2515



for pressure reducer see chapter 11.3

11.2f

Connection nipple for nitrogen cylinder

For "high pressure" accumulators and for all models with PS ≥ 210 bar, you can connect to the nitrogen bottle through the proper nipple without the use of the pressure reducer.

The suitable nipple must be chosen according to the Country of origin of the nitrogen bottle, as shown in the side Table.

The no. of the column marked by the **x** indicates the figure of the nipple valid for that Country and coincides with the number used to indicate the bottle connection in the designation code of the complete equipment (Chapter 11.1.4).

Each nipple has its own code (in brackets) to be used for ordering spare parts and not indicated in the designation of the pre-charging equipment.

Fig. 1
(No.B2167)

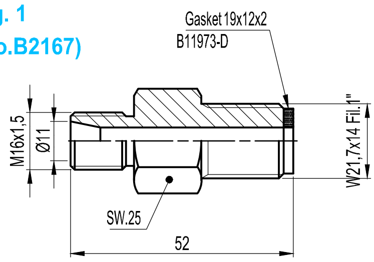


Fig. 2
(No.B2168)

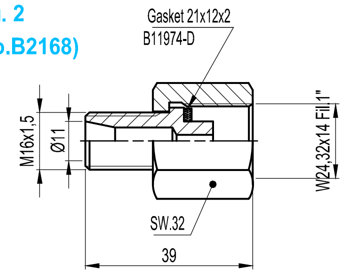


Fig. 3
(No.B2169)

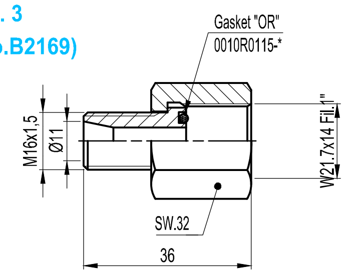


Fig. 4
(No.B2171)

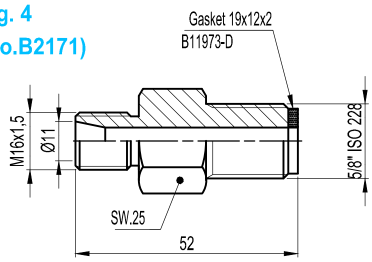


Fig. 5
(No.B2516)

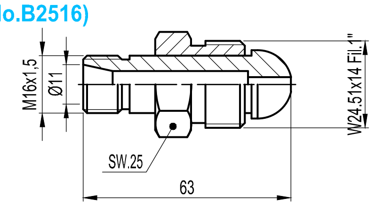
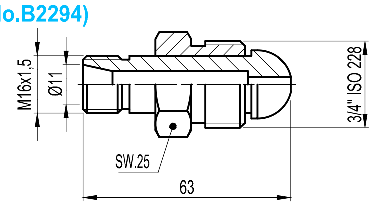


Fig. 6
(No.B2294)



* For Australia only high pressure bottle

Fig. 7
(No.B2172)

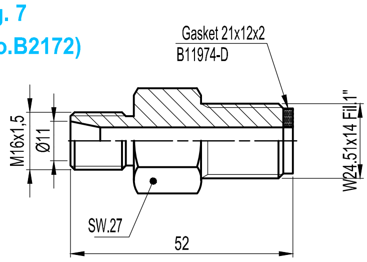


Fig. 8
(No.B2254)

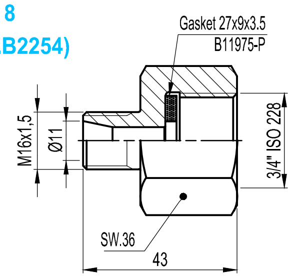


Fig. 9
(No.B2170)

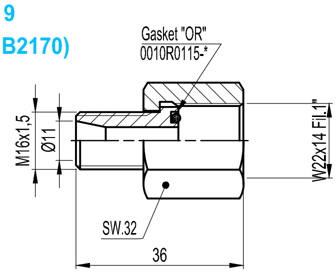


Fig. 10
(No.B2174)

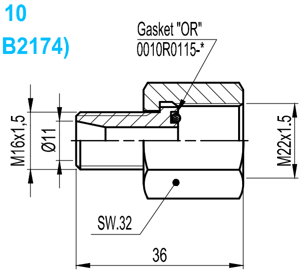


Fig. 11
(No.B2266)

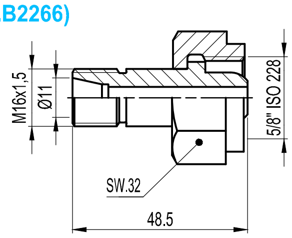


Fig. 12
(No.B2295)

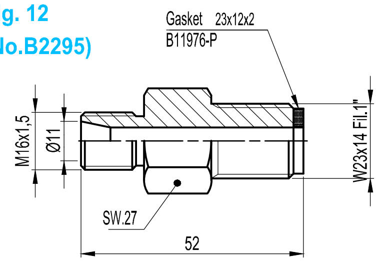
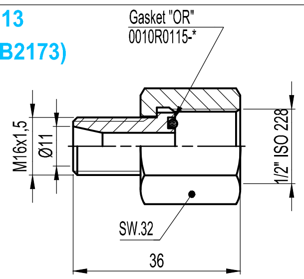


Fig. 13
(No.B2173)



11.2g

Country	Type / part code												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Albania								x					
Algeria			x										
Argentina				x									
Australia						x							
Austria		x											
Bahamas				x									
Bahrain			x										
Barbados				x									
Belgium			x										
Bolivia													x
Brazil					x								
Bulgaria			x	x									
Canada							x						
Chile													x
China											x		
Colombia													x
Costa Rica				x									
Cyprus				x									
Czech Republic		x											
Denmark		x											
Dominican Republic													x
Ecuador													x
Egypt			x										
Ethiopia				x									
Finland		x											
France			x										
Gabon			x										
Gambia				x									
Germany		x											
Ghana				x									
Great Britain				x									
Greece				x									
Guatemala													x
Guinea			x										
Guyana													x
Honduras													x
Hong Kong				x									
Hungary			x										
India				x									
Indonesia				x									
Iran			x										
Iraq			x										
Ireland				x									
Israel			x										
Italy	x												
Ivory Coast			x										
Jamaica				x									
Japan									x				

Country	Type / part code												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Jordan			x										
Kenya				x									
Korea												x	
Kuwait			x										
Libya			x										
Malaysia				x									
Malta				x									
Mauritius			x										
Mexico			x										
Morocco			x										
Mozambique			x										
Netherlands		x											
New Zealand											x		
Nigeria			x										
Norway		x											
Oman			x										
Pakistan				x									
Paraguay													x
Perù													x
Philippines						x							
Poland		x											
Portugal				x									
Puerto Rico					x								
Qatar			x										
Romania			x										
Russia								x					
Saudi Arabia			x										
Singapore				x									
Slovenia			x										
South Africa						x							
Spain			x										
Sri Lanka				x									
Sudan				x									
Sweden		x											
Switzerland		x											
Syria			x										
Taiwan										x			
Tanzania				x									
Thailand				x									
Tunisia			x										
Turkey				x									
United Arab Emirates			x										
Uruguay													x
U.S.A.							x						
Venezuela								x					
Vietnam				x									
Zambia				x									

11.2h

11.2.9 COMMISSIONING AND MAINTENANCE

General

For proper operation of the accumulator, it is necessary to maintain a constant pre-charge pressure, which should be checked periodically using **the pre-charge and checking set type PC250.**

The same equipment is also used to inflate the accumulator (after a repair, for a change of use, etc.) connecting it with the appropriate charging hose to a dry nitrogen bottle equipped with pressure reducer (see Section 11.3), so that the nitrogen enters the accumulator very slowly to avoid possible breakage of the bladder or the diaphragm and to limit the temperature change.

In fact, the process of charging or discharging an accumulator with nitrogen causes a temperature change which is transmitted to the surrounding air until the temperature of the accumulator stabilizes.

For the effects of temperature transfer, the accumulator should be allowed to stand for a minimum of 60 minutes before a final reading of the pre-charge pressure is taken.

Checking the pre-charge

Before proceeding, it is necessary to isolate the accumulator from the system and discharge completely the fluid under pressure.

Remove the cap of the gas valve and the cap of the filling valve.

Before mounting the PCM equipment, make sure that the knob **A is unscrewed**, that the bleed **B is closed**, that the check valve **C has its cap screwed** and that the pressure gauge has mounted a full scale appropriate to the pressure to read (normally the pressure to be read must not exceed the 3/4 of full scale).

Tighten by hand, using the knurled nut **D**, the charging set on the gas valve.

Screw, without forcing, the knob **A** to read the pressure on the gauge.

If the value corresponds to the one required, you can proceed to unscrew the **knob A** until it stops, but without forcing, open the **bleed B** and disassemble the equipment by unscrewing the nut **D**.

Decreasing the pre-charge

If the pre-charge value is **greater** than the one required, you should discharge the exceeding pressure by acting on the bleed **B** until reaching the desired value.

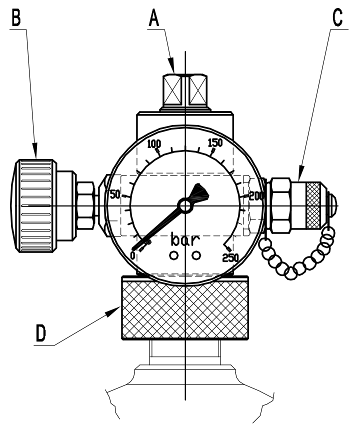
We suggest **discharging slowly** and then carrying out the final reading after at least 15 minutes from the discharge operation. Then you can remove the equipment as above indicated.

Increasing or restoring the pre-charge

If the pre-charge is less than the established value (or if it is necessary to re-inflate the accumulator after a repair), proceed as follows (place the equipment as indicated in the Section "**Checking the pre-charge**"):

- Mount the nipple to the nitrogen bottle or to the pressure reducer.
- Connect the hose extremity to the nipple.
- Connect the other hose extremity to the check valve **C** after having removed its cap.
- Open **slowly** the shut-off valve of the nitrogen bottle or the knob of the pressure reducer and keep it open until it reaches a pressure slightly higher than the required value (+ 10 ÷ 15%), then **close** the valve.
- **Unscrew** the knob **A** and **decompress** the equipment with the bleed valve **B**.
- Disconnect the charging hose of the check valve **C**.
- **Close** the bleed valve, place the cap to the check valve **C** and wait at least 15 minutes for the pressure stabilization.
- **Screw** again the knob **A** until reading the pressure that should be slightly higher than requested. Adjust the pre-charge value, using the bleed valve, and disassemble the equipment, as already indicated.
- Check with soapy water that there are no leaks coming out from the filling valve of the accumulator.
- Screw the cap of the filling valve and the external protection cap.

Now the accumulator is ready for commissioning.



11.2i

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11.3.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS): 220 bar

PRESSURE TEST (PT): 1.43 x PS

WORKING TEMPERATURE: - 20 ÷ +60°C

MEDIUM: Nitrogen

NITROGEN CONTAMINATION DEGREE:
class 20/18/15 according to ISO 4406/99

MATERIAL BODY AND INTERNAL PARTS: brass

DIAPHGRAM: stainless steel

PLATING: chromium plating

SEALS MATERIAL: P = Nitrile RUBBER (NBR) and Delrin

PORT CONNECTIONS: M16x1.5 tube dia. 8

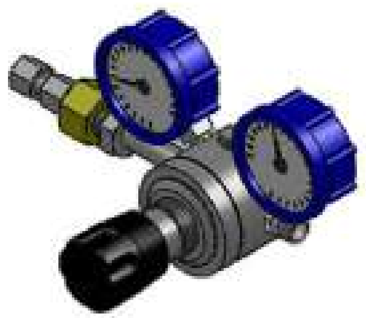
WEIGHT: 1,75 Kg.

11.3.2 DESCRIPTION

The pressure reducer it is used for adjusting the required pre-charge pressure between the nitrogen bottle and the accumulator.
For safety reasonsthe user it is obliged, when using nitrogen gas bottles, to install a nitrogen reducer.
This nitrogen reducer enables you to reduce the pressure, available from the gas bottle, to the pressure required.
Also with the big hand kinds on the reducer it is easier to adjust the flow of the gas. By using this reducer you eliminate the possibility to over-charge an accumulator which has a lower working pressure than the gas pressure stored on the nitrogen bottle.
The reducer is easy to adjust to the required gas pressure.
Also the connections fit directly to the gas bottle (using the nipple 11447) and the charging hose of the EPE pre-loading set.
The reducer has a heavy duty construction and it is suitable for nitrogen gas bottles, 200 bar max.

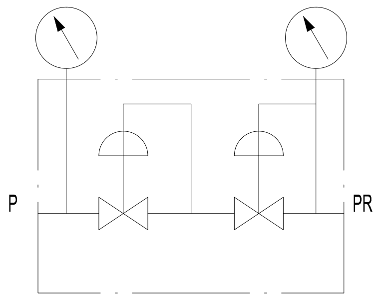
Standard version includes:

- 2 pressure gauges, indicating pressure of gas bottle and reduced pressure out. Pressure range is 0-300 bar.
- Reduction pressure is adjustable from 0 to 200 bar.



11.3a

11.3.3 HYDRAULIC SYMBOL



11.3b

11.3.4 MOUNTING

During the setting up operations, all components in contact with gas must be free of grease and oil.
Follow scrupulously the instructions either before then during the operations. Before installation check that the pressure regulator is suitable to work with the specific gas.
Check that the connections are clean and not damaged, otherwise the reducer has not to be installed. Before connection of the regulator, open and close completely the valve of the bottle to remove any possible impurity.
Never stay and put your hand in front of the bottle valve.
Tighten the nut or the hanger (1 - 7) to connect the pressure of the bottle valve.
The regulator has to be placed as showed in drawing 11.3C and the adjusting screw have to be unloosen turning it anticlockwise.
Connect the regulator to the system by the outlet fitting. Open slowly the valve of the bottle and the inlet gauge will show the bottle pressure.
Adjust the outlet pressure on the gauge turning clockwise the adjusting screw.

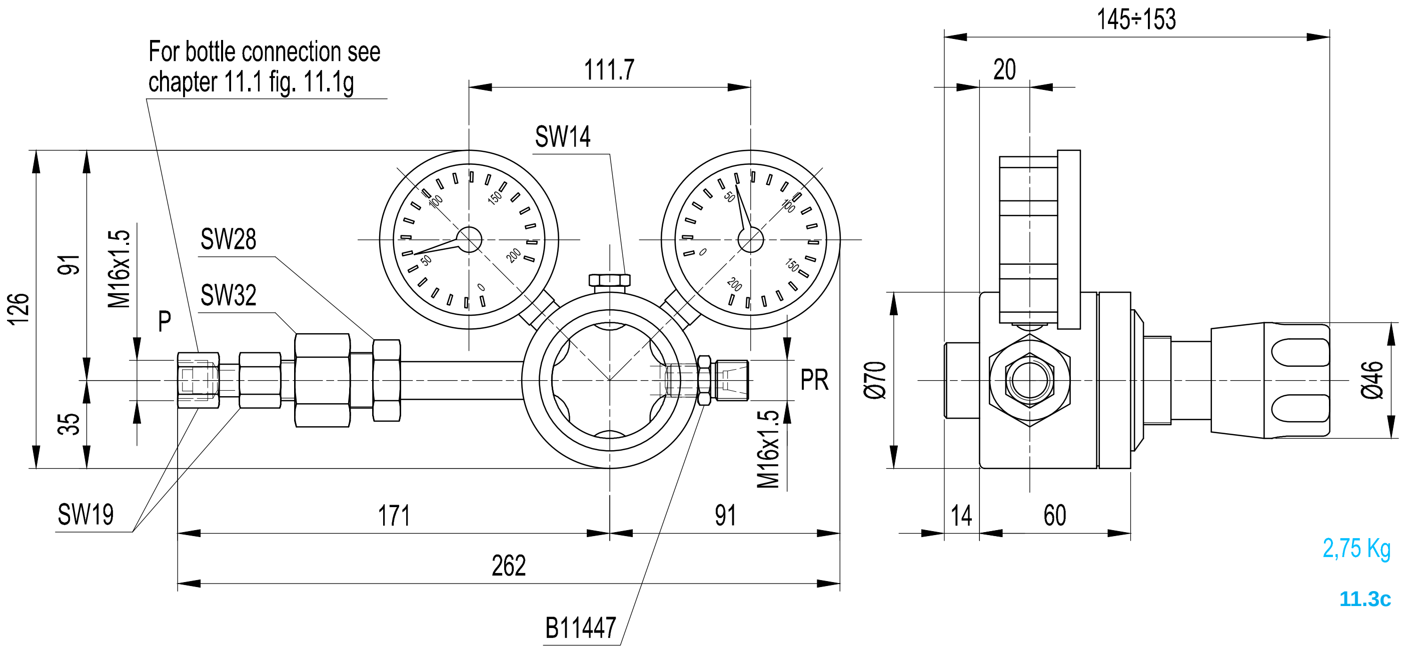
11.3.5 ORDER CODE

B2494	/	8

Scale of pressure gauge (bar)	
Outlet pressure:	
1 ÷ 8 bar	**8**
1,5 ÷ 15 bar	**15**
3 ÷ 30 bar	**30**
5 ÷ 50 bar	**50**
10 ÷ 100 bar	**100**
30 ÷ 200 bar	**200**

Special variants on request

11.3.6 DIMENSIONS



2,75 Kg

11.3c

Model	Inlet max pressure bar	Outlet pressure bar	Max flow Nm³/h	Regulation sytem	Gauges IN bar	Gauges OUT bar
B2494/8	220	1 ÷ 8	30	Diaphgram	0 ÷ 315	0 ÷ 16
B2494/15	220	1,5 ÷ 15	45	Diaphgram	0 ÷ 315	0 ÷ 25
B2494/30	220	3 ÷ 30	60	Piston	0 ÷ 315	0 ÷ 63
B2494/50	220	5 ÷ 50	60	Piston	0 ÷ 315	0 ÷ 100
B2494/100	220	10 ÷ 100	60	Piston	0 ÷ 315	0 ÷ 160
B2494/200	220	20 ÷ 200	60	Piston	0 ÷ 315	0 ÷ 315

11.3d

11.3.7 INSTRUCTIONS

Avoid that the reducer could be damaged (by duly visual check). Don't change calibration of the over-pressure valve. Keep gasket and gauges in perfect conditions.

In case of bad working of the pressure reducer (e.g. raising of outlet pressure without consumption, gauges and safety valve's leakage) lock immediately the flow to the reducer closing of the bottle valve.

11.3.8 REPAIRING

The pressure reducer must be repaired only by skilled personnel or in our factory. Original spare parts are compulsory for EPE ITALIANA guarantee.

EPE ITALIANA will not respond for arbitrary repair or changing made by users or other persons without its previous autorisation.

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MOBILE NITROGEN CHARGING UNIT type CCA 9/350

11.4.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS) of oil: 350 bar

MAX OPERATING PRESSURE (PS) of nitrogen: 350 bar

PRESSURE TEST (PT): 1.43 x PS

MIN. SUPPLY PRESSURE NITROGEN: 5 bar

WORKING TEMPERATURE: -20 ÷ +80 °C

MEDIUM: Nitrogen

PRESSURE GAUGE RANGE: 0 ÷ 400 bar

FLOW RATE OF THE HYDRAULIC PUMP: 9 l/min

CAPACITY OIL TANK: 70 l

SIDE CONNECTION BOTTLE: W 21.7 X 14 (Other upon request)

ACCUMULATOR SIDE CONNECTION: 5/8" UNF (Other upon request)

HOSE LENGTH: 6 mt.

THREE-PHASE MOTOR: 400 V - 50Hz

MAX. P.: 5.5 Kw

SAFETY TYPE: IP 55

ELECTRICAL CONNECTION: CEE plug, 5-pole, 16 Amp 400V

CABLE LENGTH: 10 mt.

WEIGHT: Kg. 280

11.4.2 DESCRIPTION

Nitrogen preloading carts are useful in many circumstances and have many advantages compared to simple gas bottle, which are usually loaded at 200 bar. Different models of carts can operate to enhance pressure and flow of standard gas bottles, or to directly generate nitrogen for loading purpose or for storage.

Major advantages are:

- Use of the whole gas bottle content even when preloading pressure is higher than bottle pressure
- Faster loading when there is high preloading pressure or big accumulator volume

11.4a

11.4.3 ACCESSORIES

Alternatively, you can use, instead of pre-compressed nitrogen stored in bottles, a trolley which produces nitrogen from compressed air at 8 ÷ 10 bar.

For more information and / or requests, please contact our technical service.

11.4.4 ORDER CODE

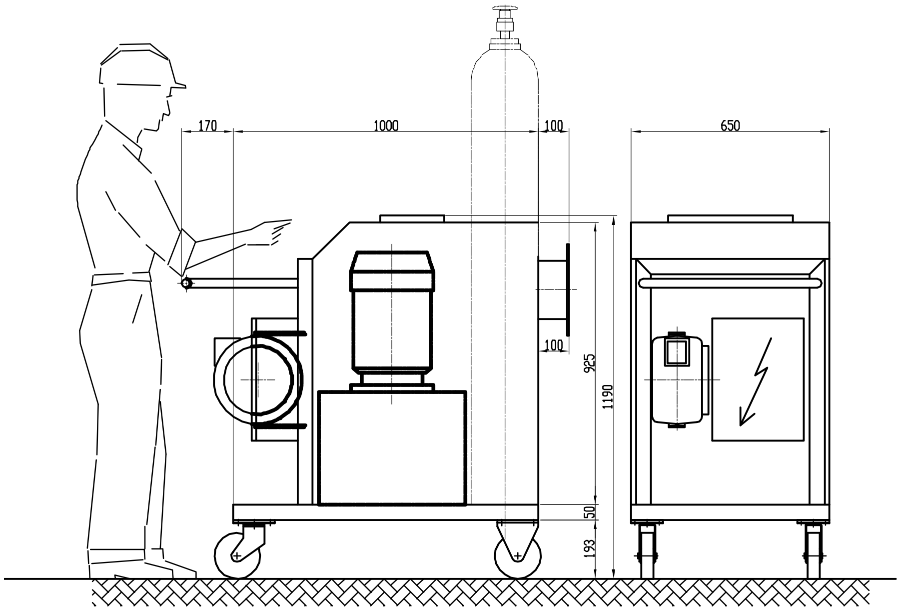
1	2		3
CCA	9	/	350

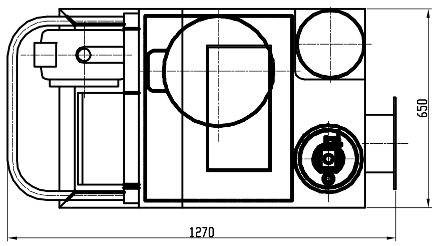
1	Series
Nitrogen charging unit type	= CCA

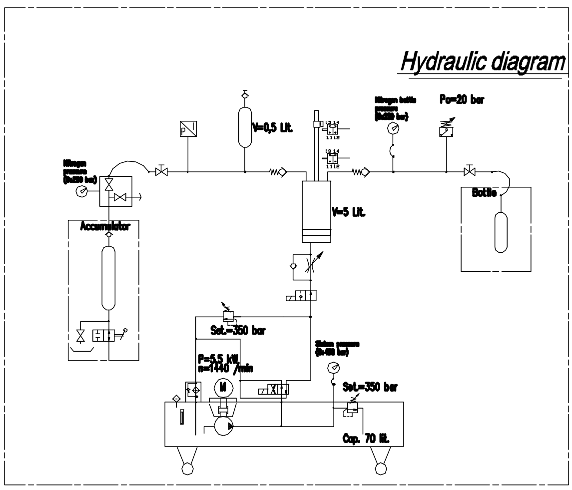
2	Flow rate
Flow rate 9 l/min	= 9

3	Pressure
Max pressure of Nitrogen charging	= 350

11.4.5 DIMENSIONS AND HYDRAULIC DIAPHRAGM







11.4b

MOBILE NITROGEN CHARGING UNIT type CPC 13/300

11.5.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS) of nitrogen: 300 bar

PRESSURE TEST (PT): 1.43 x PS

MIN. SUPPLY PRESSURE NITROGEN: 6 bar

WORKING TEMPERATURE: -20 ÷ +80 °C

MEDIUM: Nitrogen

PRESSURE GAUGE RANGE: 0 ÷ 400 bar

FLOW RATE: 13 m^3/h

SIDE CONNECTION BOTTLE: upon request

ACCUMULATOR SIDE CONNECTION: upon request

HOSE LENGTH: 6 mt.

THREE-PHASE MOTOR: 400 V - 50Hz

MAX. P.: 4 Kw

SAFETY TYPE: IP 55

ELECTRICAL CONNECTION: CEE plug, 5-pole, 16 Amp 400V

CABLE LENGTH: 10 mt.

WEIGHT: Kg. 250

11.5.2 DESCRIPTION

Nitrogen preloading carts are useful in many circumstances and have many advantages compared to simple gas bottle, which are usually loaded at 200 bar. Different models of carts can operate to enhance pressure and flow of standard gas bottles, or to directly generate nitrogen for loading purpose or for storage.
Major advantages are:
- Use of the whole gas bottle content even when preloading pressure is higher than bottle pressure
- Faster loading when there is high preloading pressure or big accumulator volume

11.5a

11.5.3 ACCESSORIES

Alternatively, you can use, instead of pre-compressed nitrogen stored in bottles, a trolley which produces nitrogen from compressed air at 8 ÷ 10 bar.
For more information and / or requests, please contact our technical service.

11.5.4 ORDER CODE

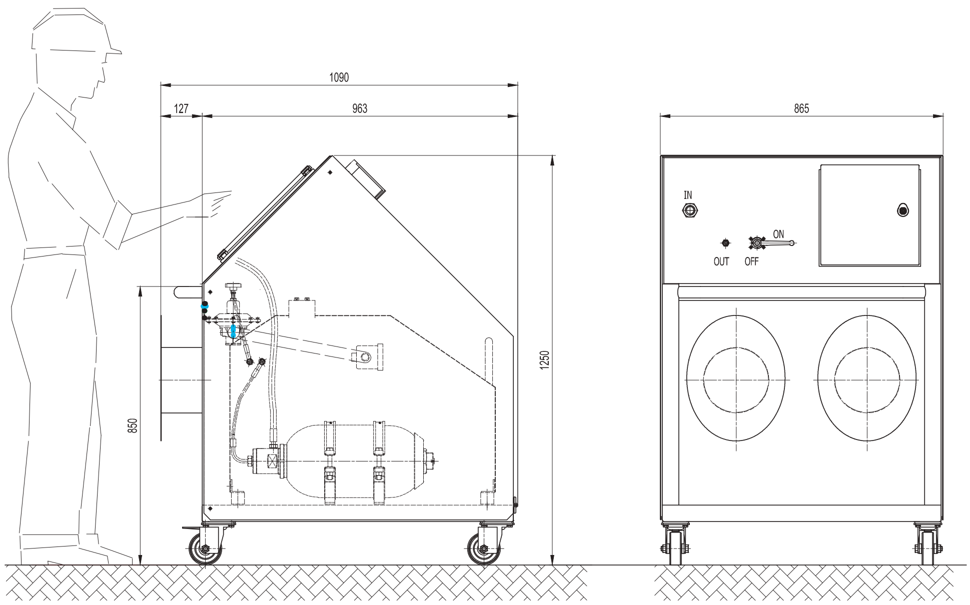
1	2		3	
CPC	13	/	300	-1

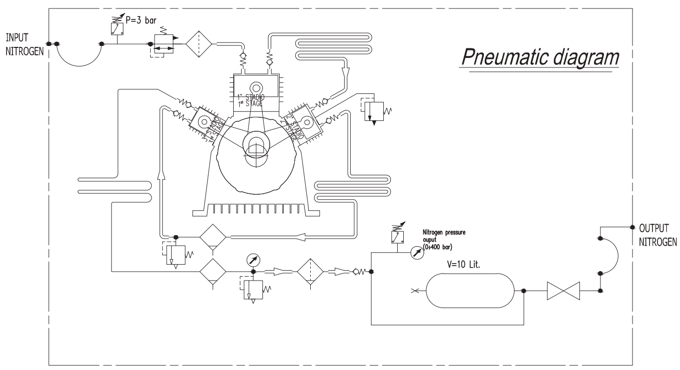
1	Series
Nitrogen charging unit type	= CPC

2	Flow rate
Flow rate 13 m^3/h	= 13

3	Pressure
Max pressure of Nitrogen charging	= 300

11.5.5 DIMENSIONS AND HYDRAULIC DIAPHRAGM





11.5b

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12.1.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS): 360 bar

PRESSURE TEST (PT): 1.43 x PS

WORKING TEMPERATURE: -40 ÷ +150 °C

FLUID VISCOSITY RANGE: 10 ÷ 400 cSt

RECOMMENDED VISCOSITY: 36 cSt

BODY MATERIAL: - phosphated carbon steel or galvanized carbon steel in compliance with Directive 2002/95/CE (RoHS) to resist to corrosion.
- nickel coating 25 - 40 µ
- stainless steel AISI 316L

DIMENSIONS: see Table 12.1h

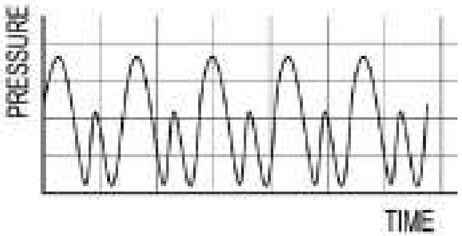
WEIGHT: see Table 12.1h

12.1a

12.1.2 APPLICATIONS

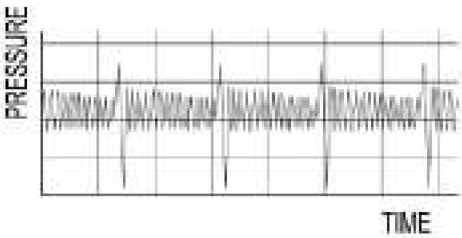
The pulsation damper is particularly suitable for: hydraulic systems, displacement pumps of all types, sensitive measurement and control instruments and manifolds in process circuits in the chemical industry.
The EPE pulsation damper prevents pipe breaks caused by material fatigue, pipe oscillations and irregular flow rates; it protects valves, control devices and other instruments and improves noise level damping.

without damper



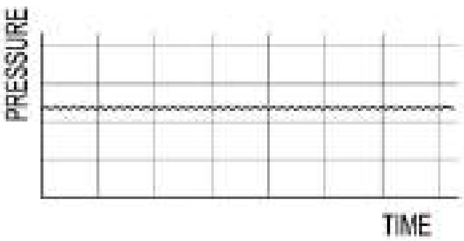
12.1b

with accumulator
(standard connection bladder accumulator)



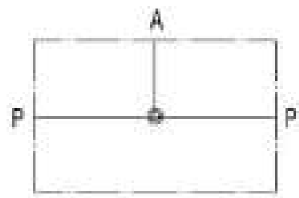
12.1c

with accumulator and pulsation dumper



12.1d

12.1.3 HYDRAULIC SYMBOL



12.1e

12.1.4 DESCRIPTION

The pulsation damper adapters has two fluid connections and can therefore be fitted directly inline and connected directly to the accumulator (bladder or diaphragm ones).
The flow is directed straight to the bladder or diaphragm by diverting it in the fluid valve. This causes direct contact of the flow with the bladder or diaphragm which, in an almost inertia less operation and balances the flow rate fluctuations via the gas volume.
It particularly compensates higher frequency pressure oscillations. The pre-charge pressure is adjusted to individual operating conditions.

Installation

As close as possible to the pulsation source. Mounting position preferably vertical (gas valve pointing upwards).

12.1.5 SEALS-TEMPERATURE-LIQUID COMPATIBILITY

When selecting the pulsation damper variant, observe the following non-binding notes with regard to hydraulic fluid, diaphragm material and the permissive temperature range.

Code letter	Polymer	ISO	Temperature range (°C)	Some of the liquids compatible with the polymer
P	Standard nitrile (Perburan)	NBR	-20 ÷ +80	Aliphatic hydrocarbons (propane, butane, gasoline, oils, mineral greases, diesel fuel, fuel oil, kerosene), mineral greases and oils, HFA - HFB - HFC fluids, many dilute acids, alkalis, saline solutions, water, water glycol.
F	Low temperature nitrile	NBR	-40 ÷ +70	The same as with standard nitrile + a number of different types of Freon. (This contains less acrylonitrile than the standard and is therefore more suitable for low temperatures, but its chemical resistance is slightly lower).
K	Hydrogenated nitrile	HNBR	-30 ÷ +130	The same as with standard nitrile but with excellent performance at high and low temperatures.
B	Butyl	IIR	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many acids and bases, salt solutions, polar solvents such as alcohols, ketones and esters, polyglycol-based hydraulic fluids (HFC fluids) and bases of esters of phosphoric acid (HFD-R fluids), silicone oils and greases, resistance to ozone, aging and weathering.
E	Ethylene-Propylene	EPDM	-30 ÷ +100	Hot water up to 100°C, glycol-based brake fluids, many organic and inorganic acids, detergents, solutions of sodium and potassium, phosphate ester-based hydraulic fluids, (HFD-R), silicone oils and greases, many polar solvents (alcohol, ketones, esters), Skydrol LD4 and 500B-4, resistance to ozone, aging and weathering.
Y	Epichloridrin	ECO	-30 ÷ +110	Mineral oils and greases, aliphatic hydrocarbons (propane, butane and gasoline), silicone oils and greases, water at room temperature, resistance to ozone, aging and weathering.
V	Fluorocarbon	FPM	-10 ÷ +150	Mineral oils and greases, non-flammable fluids of HFD group, silicone oils and greases, animal and vegetable oils and greases, aliphatic hydrocarbons (gasoline, butane, propane, natural gas), aromatics hydrocarbons (benzene, toluene), chlorinated hydrocarbons (Tetrachloroethylene, carbon tetrachloride), fuel (regular, super and containing methanol), excellent resistance to ozone, weathering and aging.

For other hydraulic fluid and/or temperatures, please contact us.

12.1f

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12.1.6 ORDER CODE

1	2	3	4	5	6		7	8
TA	360	A	9	G	8	-	C	P

1 Series

Pulse damper adapter	= TA

2 Max working pressure (PS) (bar)

30 =	30
60 =	60
210 =	210
360 =	360

3 Accumulator port connection

(Diaphragm accumulator)
BSP ISO 228 = **G**
(Bladder accumulator)
BSP ISO 228 with chamfer for OR
= **A**

4 Dimension of accumulator connection

For the type of connection G:

G:	1/2" =	4
	3/4 =	5
A:	3/4" =	5
	1"1/4 =	7
	2" =	9
	2"1/2 =	10
	4" =	13

8 Seal material

Nitrile rubber (NBR)	= P
Nitrile rubber for low temp	= F
Hydrogenated Nitrile(HNBR)	= K
Butyl (IIR)	= B
Ethylene-propylene (EPDM)	= E
Epichlorohydrin (ECO)	= Y
Fluorocarbon (FKM)	= V

7 Body material

Carbon steel	= C
Nickel coated carbon steel 25 µ	= N
Nickel coated carbon steel 40 µ	= M
Stainless steel (150 bar)	= X
Duplex stainless steel (210 bar)	= D

6 Dimension of fluid connection

For the type of connection G:

G:	1/2" =	4
	3/4 =	5
	1" =	6
	1"1/4 =	7
	1"1/2 =	8
	2" =	9
	2"1/2 =	10
	3" =	11

Other upon request

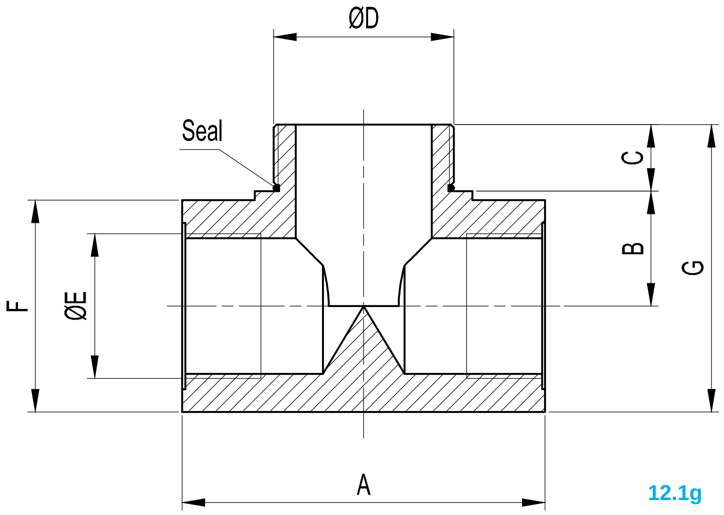
5 Fluid port connection

BSP ISO 228 female	= G

Other upon request

Special variants on request

12.1.7 DIMENSIONS



12.1g

Pulsation dumper order code	A mm	B mm	C mm	ØD BSP	ØE BSP	F mm	G mm	Seal order code	Weigth Kg
TA360A9G8-**/*	120	38	22	2"	1" 1/2	⧄ 70	95	0010R3218-*	3.3
TA360A7G6-**/*	90	27	18	1" 1/4	1"	⧄ 50	70	0010R3150-*	1.3
TA360A5G5-**/*	65	19	14	3/4"	3/4"	⧄ 40	53	0010R2093-*	0.54
TA360A4G4-**/*	46	16	12	1/2"	1/2"	⧄ 30	43	0012B21.5x28.7x2.5-**/*	0.24
TA30A13G11-**/*	240	112	21	4"	3"	Ø114.5	190	0010R4425-*	3.3
TA60A10G9-**/*	180	82	22	2" 1/2	2"	Ø73.5	141	0010R3281-*	2.8
TA60A9G8-**/*	150	70	22	2"	1" 1/2	Ø60.5	122	0010R3218-*	2.3

* Gasket material ** Component material

12.1h

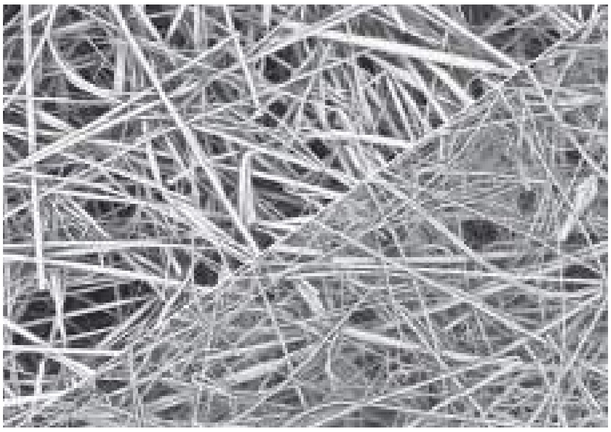
12.2.1 DESCRIPTION

EPE Italiana Filter Elements for filters

Application
Filtration of hydraulic fluids, lubricants, industrial liquids and gases.

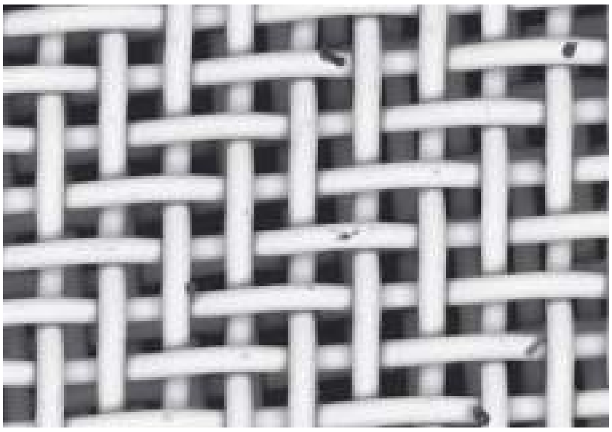
Construction
Special star pleated media filter, mounted on a perforated support tube. It is glued with a 2-component adhesive in a longitudinal direction and with metal end-caps.
Sealed with O-ring or profile seal.

Media Filter H...XL
Combination of inorganic glass fibre paper laminated with protective non-woven media, high dirt holding capacity through 2-layer glass fibre technique.
Filtration grade: 1/3/6/10/16/20 µm "absolute". For performance data complying with ISO 16889, please refer to "filter element characteristics".
Use: for highest cleanliness requirements of hydraulic fluids and lubricants. Non cleanable.



12.2a

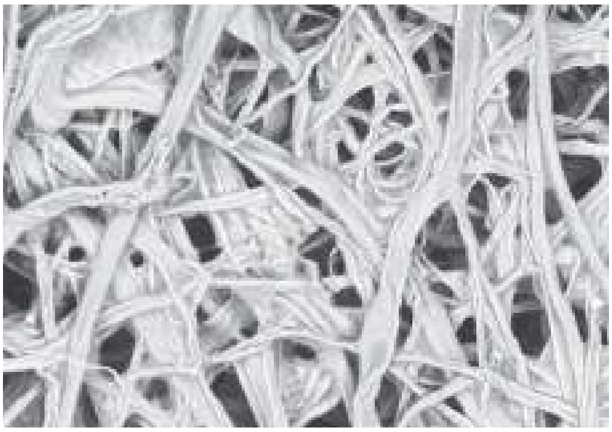
G...
Surface filter made of stainless steel mesh underlaid with supporting mesh.
Mesh size: 10-1500 µm.
Use: For protective, surface, coarse and pre-filtration.
Cleanable, regenerative.



12.2b

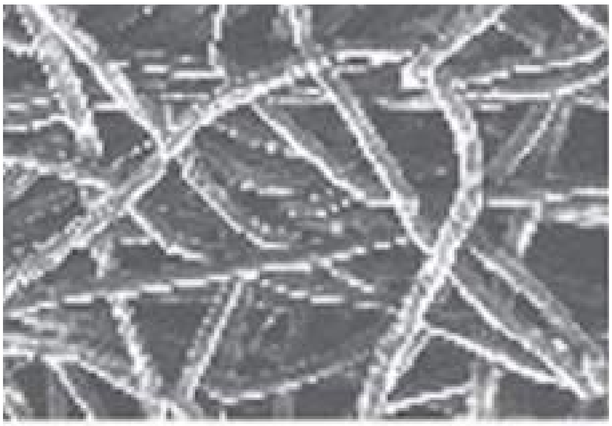
12.2c

P...
Low-priced depth filter made of filter paper, underlaid with supporting mesh. Made of special impregnated cellulose fibres to resist moisture and swelling.
Nominal filtration grade: 5/10/25 µm.
Use: for coarse and preliminary filtration. Non cleanable.



12.2d

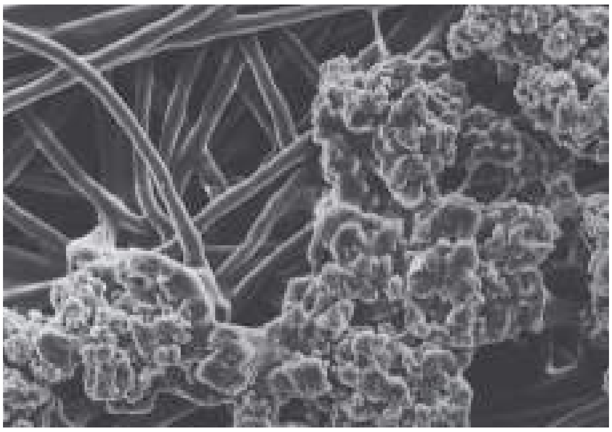
M...
Depth filter in stainless steel fibre with supporting fabric underlay.
Filtration grade 5, 10, 15 µm "absolute" according to ISO 16889.
Use: for highest cleanliness requirements with aggressive industrial and chemical liquids at high operating temperatures.
Cleanable dependent on application.



12.2e

VS...

Surface filter of extremely solid reinforced fibre made of polyethylene-wrapped polypropylene fibre.
Filtration grade: 25, 40 and 60 µm nominal.
Use: surface, coarse and pre-filtration.
Especially recommended for cooling lubricants. Non cleanable



12.2f

AS...

Nonwoven media with water-adsorbent material combined with glass fibre paper.
Filtration grade: 1/3/6/10/20 µm "absolute" according to ISO 16889.
Use: Dehydration of hydraulics, lubricants and air. Non cleanable.

12.2g

Filtration grade and achievable oil cleanliness code

Besides the direct protection of machine components, the most important target when using an industrial filter is to achieve oil cleanliness. This is defined by oil cleanliness codes which classify the particle size distribution of the existing contamination.

Filtration ratio βx

The filtration ratio βx represents the most important filter efficiency characteristic for a hydraulic filter. The average value during initial and final test Δp is measured by the multi pass test method according to ISO 16889, using ISOMTD test dust contaminant. It is defined as the ratio of particles upstream divided by the particles downstream larger than the size of interest.
Previously, the β - ratio was measured according to the multi pass test as per ISO 4572. The test results from ISO 4572 are not directly comparable to those of ISO 16889. Further information about the β - ratio characteristic is given in our technical documentations.

Dirt holding capacity

This is also measured using the Multipass test and gives the amount of test dust ACFTD or ISOMTD that the filter media can retain until a definite increase in pressure is reached.
Compared to the conventional filter material, the EPE material displays superior dirt holding capacity, due to its two separate filter layers.

Δp (Pressure Drop)

The sizing of the EPE filter and filter element by means of the initial Δp or pressure drop can be easily carried out with the filter data sheet.

Filter Element Test

EPE Filter elements are tested at our own test benches in accordance with various ISO test standards.

12.2h

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12.3.1 TECHNICAL DATA

MAX OPERATING PRESSURE (PS): 650 bar

PRESSURE TEST (PT): 1.43 x PS

SETTING RANGE: 6 ÷ 630 bar

WORKING TEMPERATURE: -20 ÷ +120 °C

REPEATABILITY: ≤ 1% of the value set

HYSTERESIS: see Table 12.3l/m

FLUID VISCOSITY RANGE: 10 ÷ 400 cSt

RECOMMENDED VISCOSITY: 36 cSt

FLUID CONTAMINATION DEGREE:
class 20/18/15 according to ISO 4406/99

BODY MATERIAL: die-cast aluminium

SEALS:
- P = Nitrile rubber (NBR)
- V = Fluorocarbon (FKM)

See Table 12.3e and/or Chapter 1.5

HYDRAULIC CONNECTION:
- G = 1/4" BSP ISO 228, female
- F = plate with screws

ELECTRICAL CONNECTION: Electrical 3 poles connector + earthling DIN 43650 Pg 9

ELECTRICAL FEATURES: see Table 12.3c

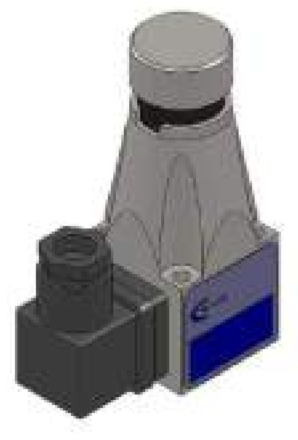
WEIGHT: see Table 12.3f/g/h/i

Hydraulic features		PS* 35	PS*150	PS* 350	PS* 630
Adjustment range	bar	3 ÷ 35	6 ÷ 140	10 ÷ 350	20 ÷ 630
Maximum operating pressure (PS)	bar	350	350	650	650

12.3b

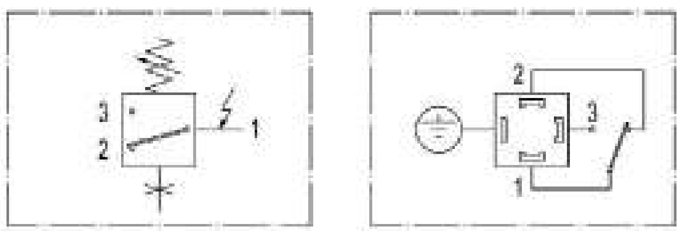
Electrical features		Alternate current		Continuous current	
Power supply	V	125	250	30	250
Maximum resistive load on contacts	A	7	5	5	0.2
Maximum inductive load on contacts	A	4	2	3	0.02
Electrical insulation (according to CEI EN 60204		> 1 MΩ a 500 Vdc			
Maximum frequency of insertion	Cycles/min.	120			
Mean time between failures for mechanical parts	Cycles	10,000,000			
mean time between failures for electrical parts	Cycles	2,000,000			
Protection degree		IP 65			

12.3c



12.3a

12.3.2 HYDRAULIC SYMBOL



12.3d

12.3.3 DESCRIPTION

The pressure switches PS* are electro-hydraulic piston type, with an electric exchange contact that switches to achieve a predetermined pressure value.
The pressure in the hydraulic circuit acts on the internal piston, opposed by the spring, whose load can be adjust by or with the adjustment screw or the knurled knob. Upon reaching the set pressure, the piston moves causing the exchange switching of the micro-contact.

The pressure switches are available with four pressure ranges from 6 to 630 bar, with wall mount or threaded of 1/4" BSP, female.
The version with the adjustment knob is provided with a graduated vernier with the values of pressure.

12.3.4 DIAPHRAGM - TEMPERATURE - LIQUID COMPATIBILITY

When selecting the accumulator variant, pay attention to the following non-binding notes with regard to hydraulic fluid, diaphragm material and the permissive temperature range.

Code letter	Polymer	ISO	Temperature range (°C)	Some of the liquids compatible with the polymer
P	Standard nitrile (Perburan)	NBR	-20 ÷ +80	Aliphatic hydrocarbons (propane, butane, gasoline, oils, mineral greases, diesel fuel, fuel oil, kerosene), mineral greases and oils, HFA - HFB – HFC fluids, many dilute acids, alkalis, saline solutions, water, water glycol.
V	Fluorocarbon	FKM	-10 ÷ +120	Mineral oils and greases, non-flammable fluids of HFD group, silicone oils and greases, animal and vegetable oils and greases, aliphatic hydrocarbons (gasoline, butane, propane, natural gas), aromatics hydrocarbons (benzene, toluene), chlorinated hydrocarbons (Tetrachloroethylene, carbon tetrachloride), fuel (regular, super and containing methanol), excellent resistance to ozone, weathering and aging.

For other hydraulic fluid and/or temperatures, please contact us.

12.3e

12.3.5 ORDER CODE

1	2	3	4	5
PS	M	250	G	P

1 Series

Pressure switch = **PS**

2 Setting type

Allen key = **V**
Knob with scale = **M**
Calibrated at our premise(V type) = **P**

3 Setting range (bar)

For type V and M:
3 ÷ 35 = 35
6 ÷ 150 = 150
10 ÷ 350 = 350
20 ÷ 630= 630
For type P:
Calibration value required = …

4 Connection type

Plate with OR and screws = **F**
Threat of 1/4" BSP ISO228, female= **G**

5 Seal material

Nitrile rubber (NBR) = **P**
Fluorocarbon (FKM) = **V**

Special variants upon request

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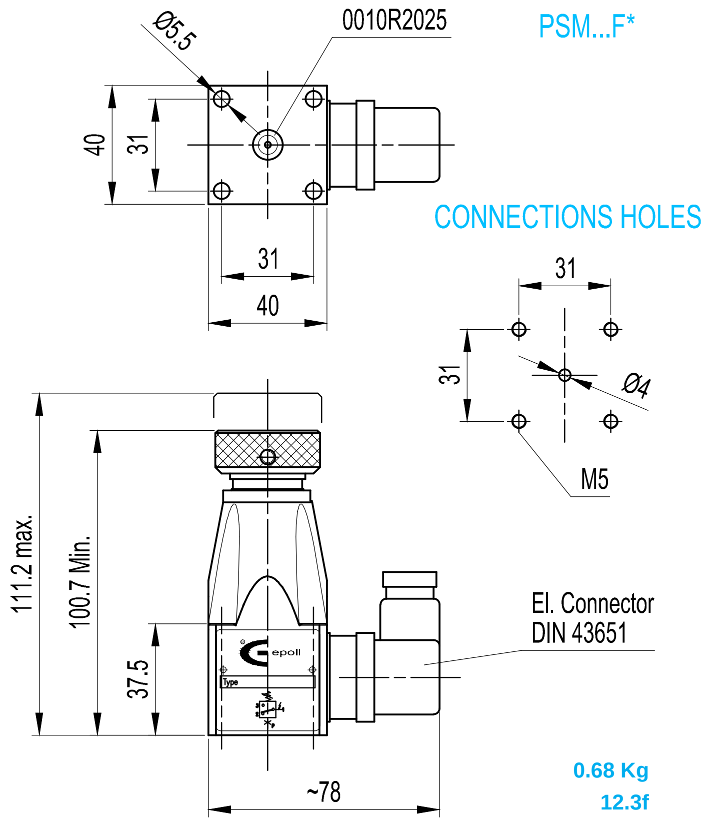
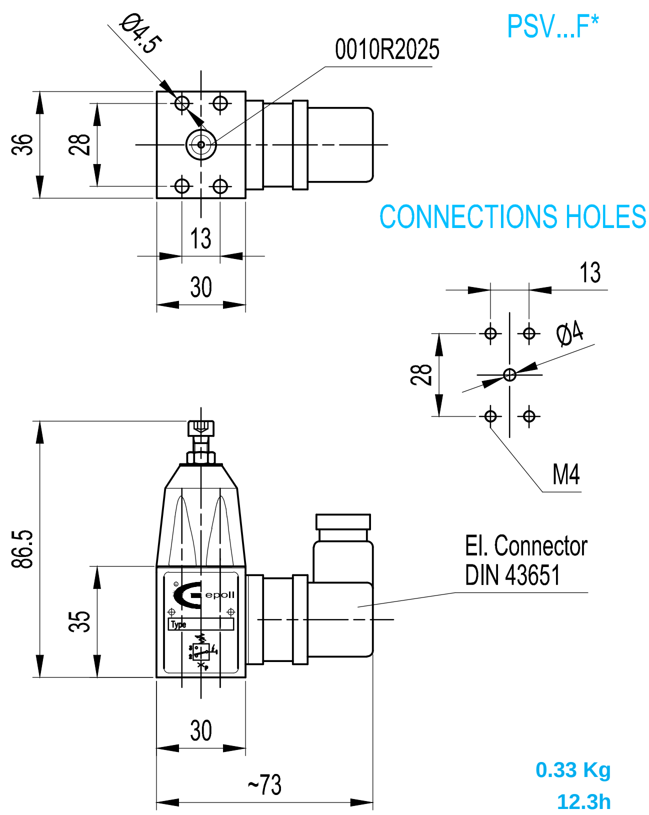
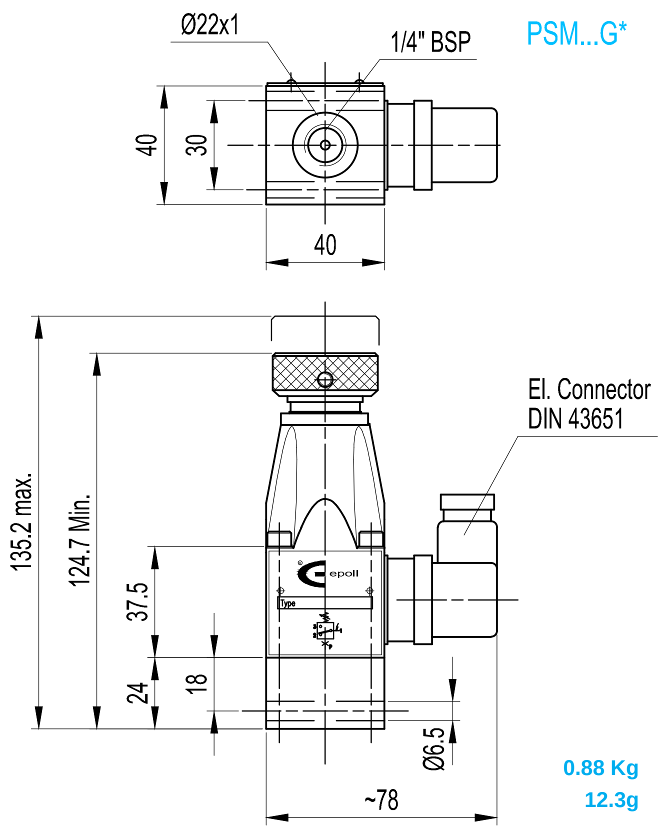
12.3.6 DIMENSIONS



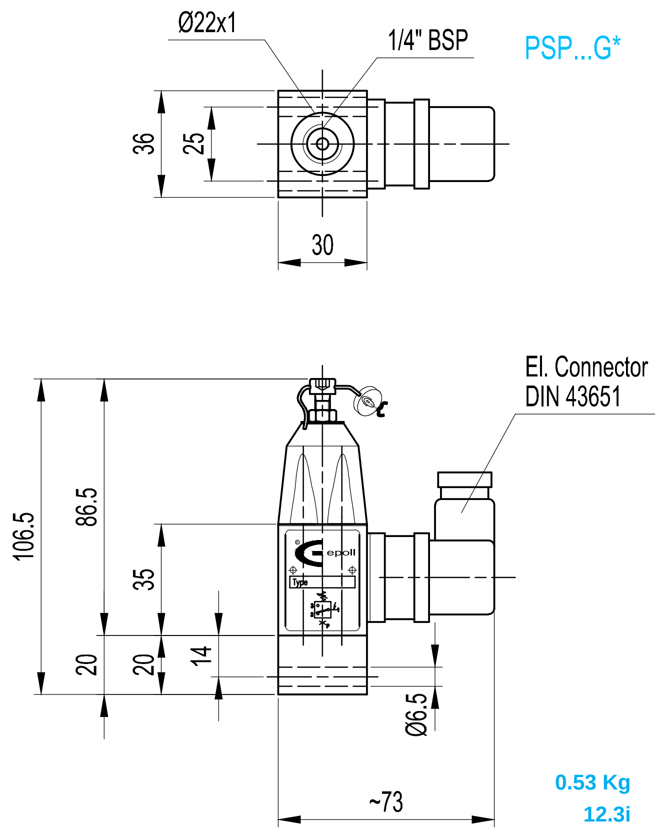
0.68 Kg
12.3f



0.33 Kg
12.3h

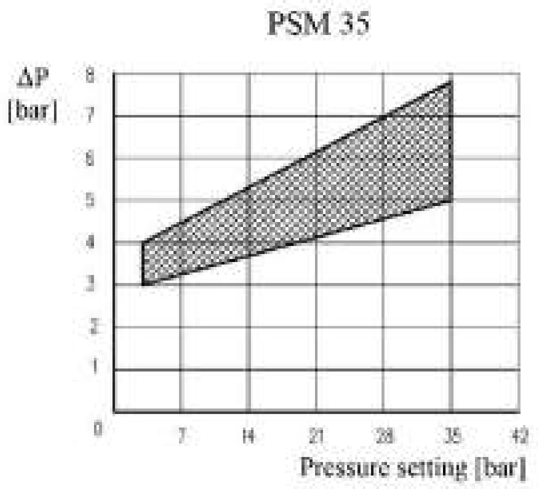


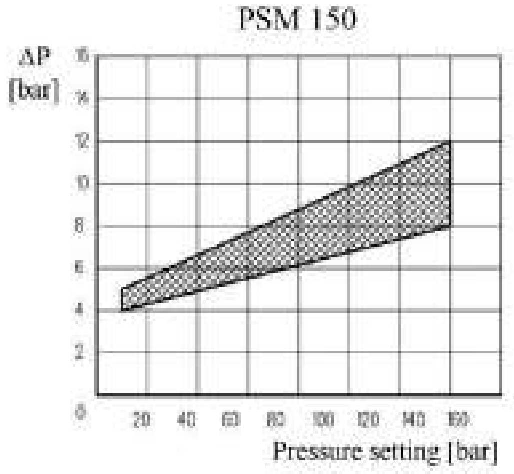
0.88 Kg
12.3g

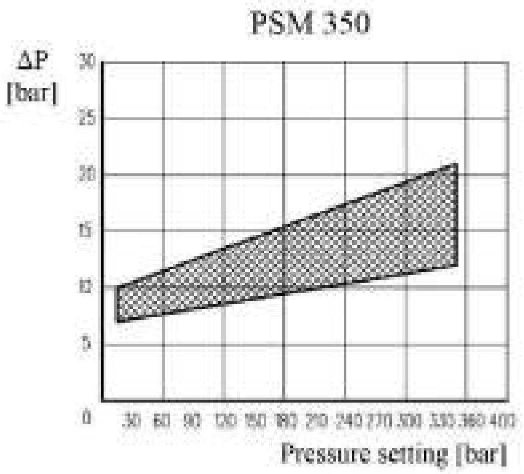


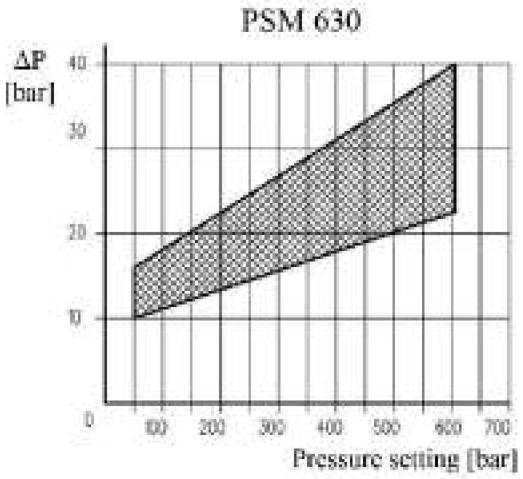
0.53 Kg
12.3i

12.3.7 HYSTERESIS CURVES









12.3I

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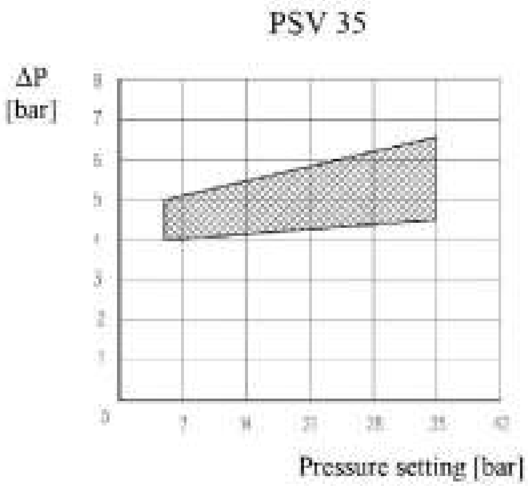
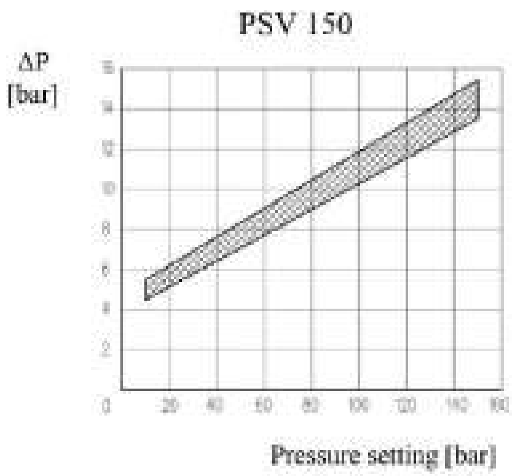
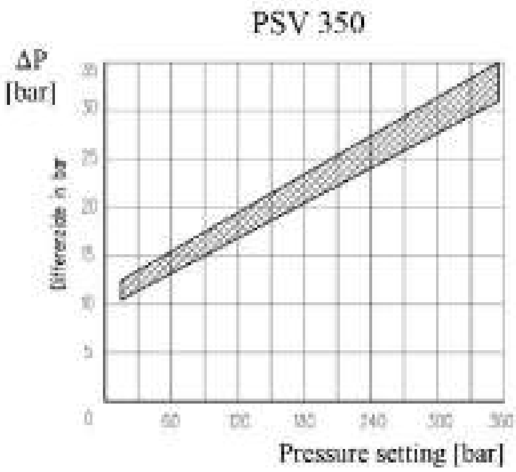
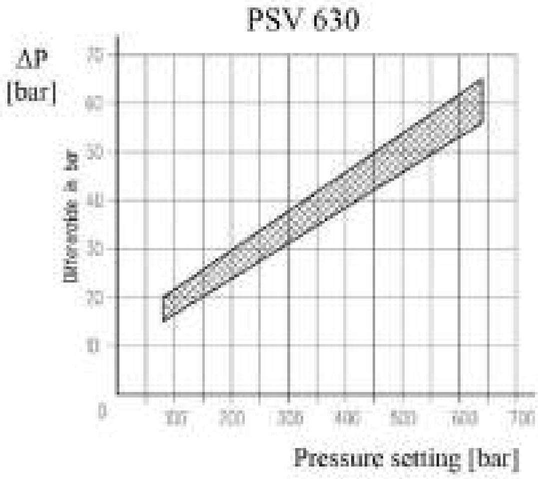

PSV 35
ΔP
[bar]
Pressure setting [bar]


PSV 150
ΔP
[bar]
Pressure setting [bar]


PSV 350
ΔP
[bar]
Pressure setting [bar]


PSV 630
ΔP
[bar]
Pressure setting [bar]

12.3m

12.3.8 INSTALLATION

The pressure switches can be installed in any position without impairing their proper functioning.
Make sure the hydraulic system has no air.
The fixing of the pressure switches for the plate mounting type PS…F is carried out by 4 screws laying on a ground surface according to flatness and roughness values equal to or better than those indicated by the adequate symbols If the minimum values of flatness and / or roughness are met, fluid leakages can easily occur between the switch and the laying plan.
The pressure switch comes with the electrical 3 poles connector DIN 43650 PG9 already assembled and, in the version PS...F, it is supplied complete with rings and screws.

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12.4.1 TECHNICAL DATA

MAX OPERATING PRESSURE: 315 bar

CRACKING PRESSURE: 0,5 ÷ 3 BAR

WORKING TEMPERATURE: : -30 ÷ +80 °C

HYDRAULIC FLUID: mineral oil HL or HM

FLUID VISCOSITY RANGE: 10 ÷ 400 cSt

RECOMMENDED VISCOSITY: 36 cSt

FLUID CONTAMINATION DEGREE:
class 20/18/15 according to ISO 4406/99

MATERIAL: phosphating carbon steel or galvanized carbon steel in compliance to directive 2002/95/CE (RoHS) for resist to the corrosion.

FLOW RATE: 25 ÷ 650 l/min see table 12.4e

CONNECTIONS: 1/4” ÷ 1”1/2 BSP

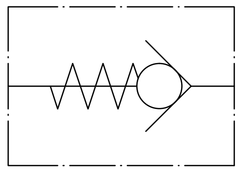
WEIGHT: see table 12.4d

12.4a

12.4.2 DESCRIPTION

The check valves type” WS” are valves with threaded “BSP” ports for mounting in-line on hydraulic lines in any position.
They allow the flow to pass freely in one direction, blocking it in the opposite direction.
In rest conditions, the valve poppet is kept closed by a spring.
Fluid flowing through the valve overcomes the resistance of the spring and causes the poppet to lift. This allows free flow.
In the opposite direction the spring and the fluid push the poppet into the seat in the housing and close the connection.

12.4.3 HYDRAULIC SYMBOL



12.4b

12.4.4 ORDER CODE

1	2	3	4	5
WS	20	A	1	0

1 Series	
Check valves	= **WS**

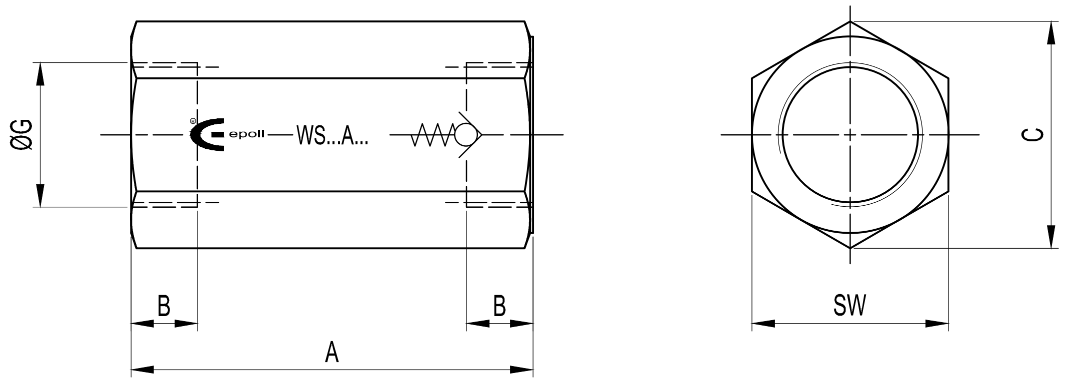
2 Nominal size		
Size 6	(1/4”)	= **6**
Size 8	(3/8”)	= **8**
Size 10	(1/2”)	= **10**
Size 15	(3/4”)	= **15**
Size 20	(1”)	= **20**
Size 25	(1”1/4)	= **25**
Size 30	(1”1/2)	= **30**

3 Connections	
BSP threaded ports	= **A**

4 Cracking pressure	
Without spring	= **0**
Cracking pressure 0,5 bar	= **1**
1,5 bar	= **2**
3,0 bar	= **3**

5 Series number
The overall and mounting dimensions remain unchanged from 0 to 9

12.4.5 DIMENSIONS



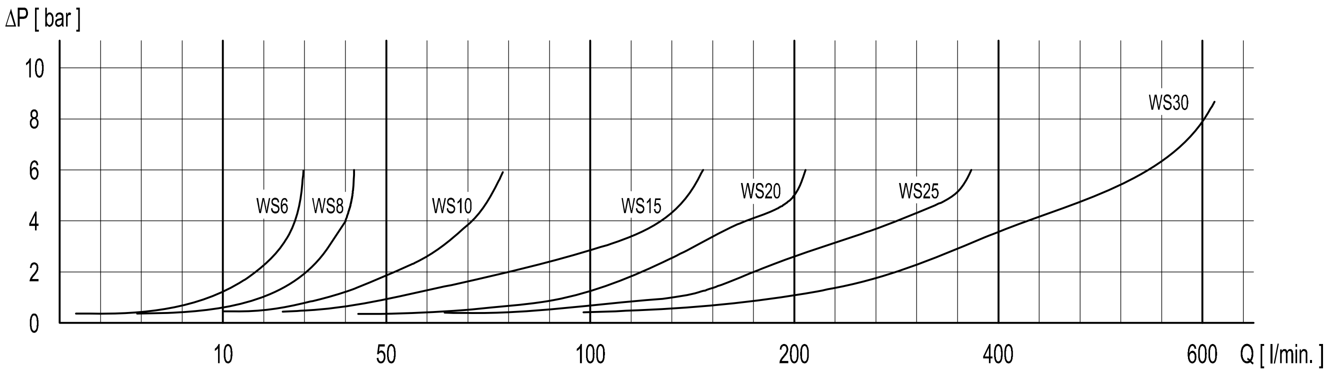
12.4c

Order code	Nominal size	ØG BSP	A mm	B mm	C mm	SW mm	Weigth Kg
WS6A...	6	1/4"	58	12	22	19	0.1
WS8A...	8	3/8"	58	12	28	24	0.2
WS10A...	10	1/2"	72	14	34.5	30	0.3
WS15A...	15	3/4"	85	16	41.5	36	0.5
WS20A...	20	1"	98	18	53	46	1.0
WS25A...	25	1" 1/4	120	20	69	60	2.0
WS30A...	30	1" 1/2	132	22	75	65	2.5

12.4d

12.4.6 PRESSURE DROP

Pressure ΔP related to flow Q.
Curves measured using mineral oil with viscosity of 36 cSt at 50°C.



12.4e

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12.5.1 TECHNICAL DATA

12.5a

MAX OPERATING PRESSURE: 315 bar

PRESSURE TEST (PT): 1.43 x PS

CRACKING PRESSURE: 0,5 bar

WORKING TEMPERATURE: -20 ÷ +80 °C

FLUID VISCOSITY RANGE: 10 ÷ 400 cSt

RECOMMENDED VISCOSITY: 36 cSt

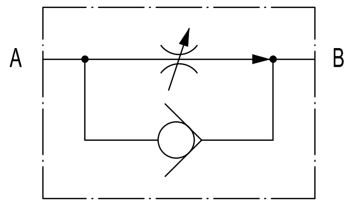
FLUID CONTAMINATION DEGREE:
class 20/18/15 according to ISO 4406/99

MATERIAL: : phosphated carbon steel or galvanized carbon steel in compliance with Directive 2002/95/CE (RoHS) to resist to corrosion.

FLOW RATE: see Table 12.5e

WEIGHT: see Table 12.5e

12.5.3 HYDRAULIC SYMBOL



12.5b

12.5.2 DESCRIPTION

The valves type WMK are single-acting throttle flow control valves for in-line mounting, directly on the line P, connected to the accumulator or to the safety block. They are designed to control the fluid flow rate in the fluid direction going out from the accumulator and allow a free flow rate in the opposite direction.
When there is a flow in throttle direction, fluid reaches the rear side of the poppet of the check valve which is pushed onto its seat in the housing by the spring. The fluid flows to the variable orifice through the side bores in the poppet. Throttling takes place between the housing and adjustable sleeves. With flow in the opposite direction, the fluid acts on the face surface of the poppet. The poppet is lifted from its seat and the fluid flows freely throught the valve. Simultaneously, part of the fluid getting through the ring slot creates the desired effect as self-cleaning.

12.5.4 ORDER CODE

1	2	3	4		5	6	7
WMK	20	G	6	-	C	P	0

1 Series

Single-acting flow control valves = **WMK**

2 Nominal size

Size 6	(1/4")	= **6**
Size 8	(3/8")	= **8**
Size 10	(1/2")	= **10**
Size 15	(3/4")	= **15**
Size 20	(1")	= **20**
Size 25	(1"1/4)	= **25**
Size 30	(1"1/2)	= **30**

3 Fluid port connection

Threat BSP ISO 228, female = **G**

6 Seals material

Nitrile rubber (NBR) = **P**

7 Series number

The overall and mounting dimensions remain unchanged from **0** to **9**

5 Body material

Carbon steel = **C**

4 Dimension of connection side

For the type of connection G:

1/4" = **2**
3/8" = **3**
1/2" = **4**
3/4" = **5**
1" = **6**
1"1/4 = **7**
1"1/2 = **8**

12.5.5 SEALS - TEMPERATURE - LIQUID COMPATIBILITY

When selecting the valve variants, pay attention to the following non-binding notes with regard to hydraulic fluid, seals material and the permissive temperature range.

Code letter	Polymer	ISO	Temperature range (°C)	Some of the liquids compatible with the polymer
P	Standard nitrile (Perburan)	NBR	-20 ÷ +80	Aliphatic hydrocarbons (propane, butane, gasoline, oils, mineral greases, diesel fuel, fuel oil, kerosene), mineral greases and oils, HFA - HFB - HFC fluids, many dilute acids, alkalis, saline solutions, water, water glycol.

For other hydraulic fluid and/or temperatures, please contact us.

12.5c

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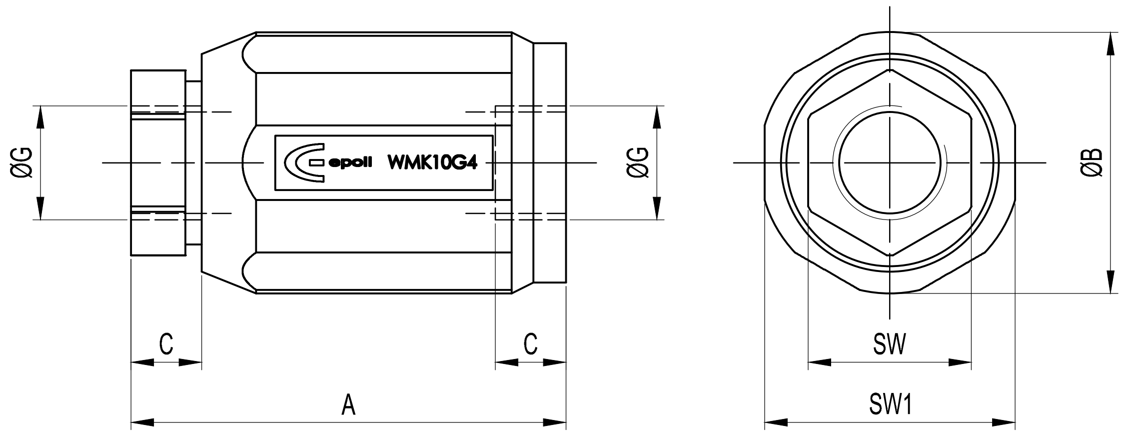
12.5.6 DIMENSIONS



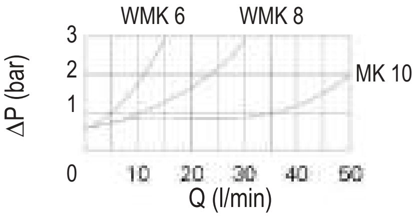
12.5d

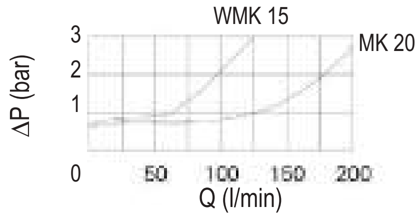
Order code	ØG BSP	Flow rate l/min	A mm	ØB mm	C mm	SW mm	SW1 mm	Dry weigth Kg
WMK6	1/4"	15	65	34	12	22	32	0.3
WMK8	3/8"	30	65	38	12	24	36	0.4
WMK10	1/2"	50	80	48	14	30	46	0.7
WMK15	3/4"	120	100	58	16	41	55	1.1
WMK20	1"	200	110	72	18	46	70	1.9
WMK25	1" 1/4	300	130	87	20	55	80	3.2
WMK30	1" 1/2	400	150	93	22	60	85	4.1

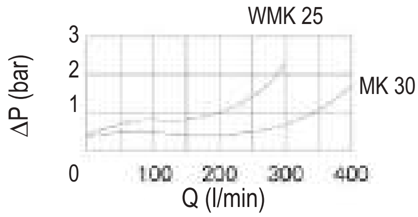
12.5e

12.5.7 CHARACTERISTIC CURVES

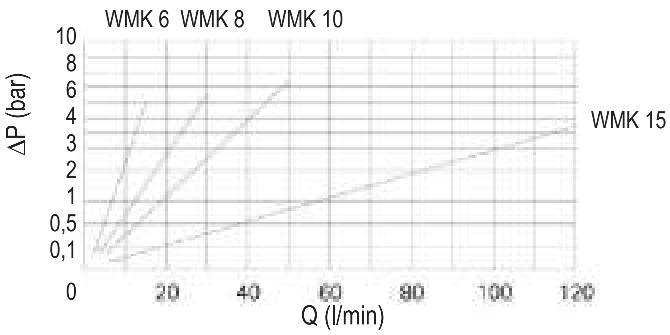
Flow rate via open check valve with closed throttle (measured with viscosity of 36 cSt at 50°C).

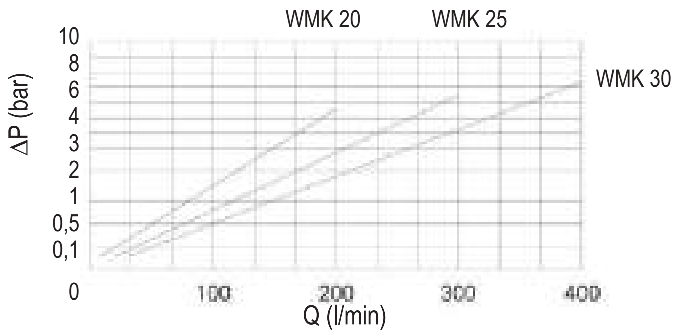






Flow rate via closed check valve with open throttle (measured with viscosity of 36 cSt at 50 °C).





12.5f

12.5.8. ASSEMBLY

For the installation into a hydraulic plant, please use the sw hexagon of the valve body.
It isn't allowed to lift up the valve by adjustable sleeve.
Do not adjust under pressure.

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12.6.1 VANE PUMPS

We offer many types of hydraulic vane pumps, applied in stationary and mobile machines.
Pumps of the following types may come as one-and multi-section pumps.
To supplement the pumps, we sell and offer a wide range of connectors and couplings.
We also offer repairs of the pumps we manufacture.

12.6a

Primary performance data:

Operating pressure: up to 16 Mpa
Capacity: up 100 cm3/rev

12.6.2 HYDRAULIC VALVES

The wide section of valves offered is divided into groups, depending on the valve's mounting and function in the hydraulic system.

Check valves:

Check valve with threaded connection type W**S**
Nominal size 6, 8, 10, 15, 20, 25, 30
Operating pressure up 31.5 Mpa
Opening pressure 0.05 ÷ 0.3 MPa
Flow up to 400 l/min

Cartridge check valve type W… **UZZD**
Nominal size 6, 10, 20, 32
Operating pressure up 31.5 Mpa
Opening pressure 0.05 ÷ 0.3 Mpa
Flow up to 360 l/min

Check valve type W… **UZZB** and
For sub-plate mounting
Nominal size 6, 10, 20, 32
Operating pressure up 31.5 Mpa
Opening pressure 0.05 ÷ 0.3 Mpa
Flow up to 400 l/min

Check valve type W… **WZZC**
For sandwich plate mounting between sub-plate and directional spool valve
Nominal size 6, 10
Operating pressure up to 32 Mpa
Opening pressure 0.05 Mpa
Flow up to 80 l/min

Pilot operated twin check valve (hydraulic lock) type W..**Z2S**
For sandwich mounting between sub-plate and directional spool valve
Nominal size 6, 10, 16, 22
Operating pressure up to 31.5 Mpa
Opening pressure 0.1 Mpa
Flow up to 300 l/min

Pilot operated check valve–type W..**UZSB**
For sub-plate mounting
Nominal size 6, 10, 20, 32
Operating pressure up to 32 Mpa
Opening pressure 0.05 Mpa
Flow up to 360 l/min

12.6b

Pressure relief valves:

Direct operated pressure relief valve W…**DBD**
sub-plate mounting, for threaded connection or cartridge design for use as a safety valve
Nominal size 6, 10, 20, 30
Operating pressure up to 63 Mpa
Flow up to 250 l/min
Operating pressure up to 63 Mpa
Flow up to 400 l/min

Pressure relief valve type W…**UZPR**
For sandwich mounting between sub-plate and directional spool valve
Nominal size 6, 10
Operating pressure up to 31.5 Mpa
Flow up to 80 l/min

Pilot operated pressure relief valve W..**DB**
for sub-plate mounting or threaded connection
Optional unloading by electrically operated spool valve type W…**DBW**
Nominal size 10, 20, 30
Operating pressure up to 31.5 Mpa
Flow up to 600 l/min

Pressure reducing valves:

Pilot operated pressure reducing valve W..**DR**
For sub-plate mounting or threaded connection
Nominal size 10, 20, 30
Operating pressure up to 31-5 Mpa
Flow up to 600 l/min

Direct operated pressure reducing valve W..**DR5DP**
For sub-plate mounting
Nominal size 5
Operating pressure up to 21 MPa
Flow up to 15 l/min

Direct operated pressure reducing valve W...**UZRB6**
For sub-plate mounting
Nominal size 6
Operating pressure up to 21 Mpa
Flow up to 30 l/min

Pressure reducing valve type W…**UZRC**
for sandwich plate mounting between sub-plate and directional spool valve
Nominal size 6, 10
Operating pressure up to 29 Mpa
Flow up to 50 l/mi

Pressure sequencing valves:

Pressure sequence valve type W…**DZ5DP**
For sub-plate mounting
Nominal size 5
Operating pressure up to 21 Mpa
Flow up to 15 l/min

Pressure sequence valve type W…**UZKB6**
For sub-plate mounting
Nominal size 6
Operating pressure up to 21 MPa
Flow up to 30 l/min

Pressure sequencing valve type W…**UZKP**
For sub-plate mounting
Nominal size 10, 20,3 0
Operating pressure up to 31.5 Mpa
Flow up to 400 l/min

Pressure sequence valve type W…**UZKC**
For sandwich plate mounting
Nominal size 6, 10
Operating pressure up to 21 Mpa
Flow up to 50 l/min

Flow control valves:

Throttle and throttle check valve W..**MK/MG**
For threaded connection with BSP thread
Nominal size 6, 8, 10, 15, 20, 25, 30
Operating pressure up to 31.5 Mpa
Flow up to 400 l/min

Twin throttle check valve W…**Z2FS**
For sandwich plate mounting between sub-plate and directional spool valve
Nominal size 6, 10, 16, 22
Operating pressure up to 31.5 Mpa
Flow up to 300 l/min

Flow regulator type W…**FRM/UDRD**
For sub-plate mounting
Nominal size 5, 6, 10, 16
Operating pressure up to 31.5 Mpa
Flow up to 160 l/min

Cartridge throttle and flow control W…**UDSD-UDZD-UDDD-UDUN-UDRN**
Nominal size 6
Operating pressure up to 29 Mpa
Flow up to 45 l/min

Flow regulator type W…**VRFB90**
Size 1/4 “ – 3/8” – 1/2” – 3/4”
Operating pressure up to 40 Mpa
Flow up to 80 l/min

Flow regulator with check valve **W…VRFU90**
Size 1/4 “ – 3/8” – 1/2” – 3/4”
Operating pressure up to 40 MPa
Flow up to 80 l/min

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12.6.3 DIRECTIONAL SPOOL VALVES

We offer of a wide selection of directional spool switching valves, optionally integrated with miscellaneous control elements for wide range of applications.

12.6c

Directional spool valve, type W…**WE**
2 – or 3 way, electrically operated (DC or AC)
for sub-plate mounting
Nominal size 5, 6, 10
Operating pressure up to 31.5 Mpa
Flow up to 120 l/min

Directional spool valve, type W…**WMM**
2- or 3 way, hand lever operated for
for sub-plate mounting
Normal size 5, 6, 10, 16, 22, 32
Operating pressure up to 35 MPa
Flow up to 1100 l/min

Directional spool valve, type W…**WH**
2-or 3 way, hydraulically operated,
For sub-plate mounting
Nominal size 6, 10, 16, 22, 32
Operating pressure up to 35 Mpa
Flow up to 1100 l/min
Directional spool valve, type W…**WMD**
2 – or 3 way, knob operated
For sub-plate mounting
Nominal size 5, 6, 10
Operating pressure up to 31.5 Mpa
Flow up to 100 l/min

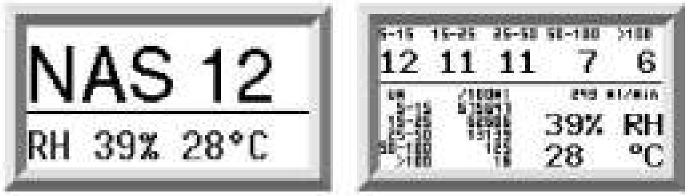
Directional spool valve, type W…**WEH**
2 or 3 way, electro-hydraulically operated
For sub-plate mounting
Nominal size 16, 22, 32
Operating pressure up to 35 Mpa
Flow up to 1100 l/min

Directional spool valve, type W…**WMR**
2 or 3 way, mechanical roller operated
For sub-plate mounting
Nominal size 5, 6, 10
Operating pressure up to 31.5 Mpa
Flow up to 100 l/min

We offer sub-plates for all types of directional spool valve. Optional requirements upon request. Electro-hydraulic spool valves can optionally be provided with switching time setting, stroke adjustment or limit switch.

12.7.1 DESCRIPTION

As contamination control in oleodynamic systems is increasingly important, as it is the main cause of breakage, failure and early degradation of the components, EPE Italiana is pleased to announce this new service for all its customer. With a new system and cleanliness experts to bring accumulator cleaning to the highest level. We can deliver a ready to operate unit meeting even the most stringent requirements.



Simple Detailed

12.7b

12.7.2 TECHNICAL DATA

SERVICE: all interior surface fully cleaned, flushed and factory sealed, ready for system commissioning

CLEANLINESS ACCORDING TO:
NAS 1638, ISO 4406-1999, AS4059E, ISO 11218

FLUSHING FLUIDS: selected for compatibility with your specified system fluid

CERTIFICATE: fully certified documentation delivered with each order

PROCEDURE: accredited to ISO 9001

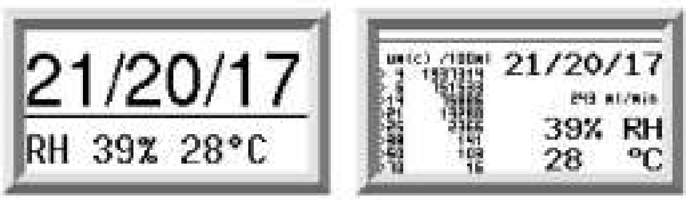
INSTRUCTION: experienced qualified trained technicians

COST: cost-effective, fast turnaround, environmentally responsible, proven result

BENEFIT: extends the life of your system and components

12.7.3 HOW TO MEASURE THE CONTAMINATION

The level of contamination is measured by counting the number of particles of a certain size per unit volume of fluid and classified into classes of contamination, according to international standards.
Measurement of particles is given by “automatic particle counters” examining the fluid on line or on sample.
Measurements of samples should be undertaken in accordance with International standards.
The most used in the oleodynamic systems are:
- ISO 4406
- NAS 1638



Simple Detailed

12.7a

12.7.4 CONTAMINATION CLASSES ACCORDING TO ISO 4406

Contamination class according to ISO 4406 is given by three numbers that indicate the number of particles per 100 ml, respectively with dimensions greater than 4 / 6 / 14 µm

ISO class	Number of particles per 100 ml	
	Greater than	till
22	2.000.000	4.000.000
21	1.000.000	2.000.000
20	500.000	1.000.000
19	250.000	500.000
18	130.000	250.000
17	64.000	130.000
16	32.000	64.000
15	16.000	32.000
14	8.000	16.000
13	4.000	8.000
12	2.000	4.000
11	1.000	2.000
10	500	1.000
9	250	500
8	130	250

12.7c

Ex.: Code ISO 18/16/13
18 = from 130.000 to 250.000 particles ≥ 4µm in 100 ml
16 = from 32.000 to 64.000 particles ≥ 6µm in 100 ml
13 = from 4.000 to 8.000 particles ≥ 14µm in 100 ml

12.7.5 CORRESPONDENCE BETWEEN CONTAMINATION CLASS ISO 4406 AND NAS 1638 AND THEIR APPLICATION AREAS

Contamination class ISO 4406	15/13/10	16/14/11	17/15/12	18/16/13	19/17/14	20/18/15	21/19/16	22/20/17
Contamination class NAS 1638	4	5	6	7	8	9	10	11
Application areas	Test-bench, aeronautics	Aeronautics, industrial robotics	Industrial robotics, precision machines tools	Industrial machines with high reliability, hydrostatic transmission	Industrial machines, earthmoving machines	Mobile machines	Machines for heavy industry	Agricultural machines, simple systems, not continous use

12.7d

12.7.6 CERTIFICATE OF TESTING AND FLUSHING

In relation to customer specifications, is issued a test certificate indicating the degree of flushing required according to the applicable law.

EPE Italiana Srl
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CERTIFICATO DI COLLAUDO N°. 4989 /A
TEST REPORT No.

Prodotto : / *Manufacture* : **Accumulatore a sacca** / ***Bladder Accumulator***
Tipo : / *Type* : **AS55P360CF8-XX**

Disegno : / *Drawing* : **A 1602-29**
Famiglia : / *Family* : **220**

Pressione max di esercizio (PS) : / *Max working pressure (PS)*: **360** bar
Temp. di esercizio TS : / *Working temperature TS*: **- 20 ÷ +80 °C**

Volume : / *Capacity* : **50 L**
Anno di fabbricazione : / *Year of Manufacture* : **2016**

Numero di fabbrica / *Manufacturer serial no.* : **72127/..**

72127/1 = 1018744 Ps start 286,8 / Ps final 286,5
72127/2 = 1018748 Ps start 286,2 / Ps final 286,1
72127/3 = 1018740 Ps start 286,4 / Ps final 285,9
72127/4 = 1016734 Ps start 286,4 / Ps final 285,9
72127/5 = 1018767 Ps start 284,7 / Ps final 284,2
72127/6 = 1018731 Ps start 290,1 / Ps final 289,2
72127/7 = 1018735 Ps start 290,1 / Ps final 289,2
72127/8 = 1018742 Ps start 285,8 / Ps final 285,6
72127/9 = 1018741 Ps start 284,0 / Ps final 283,6
72127/10 = 1016786 Ps start 284,7 / Ps final 284,4

OPERAZIONI DI COLLAUDO ESEGUITE IN ACCORDO ALLA PROCEDURA IO PROD 09 REV. 2
Testing operation executed according to procedure IO PROD 09 REV. 2

1) ESAME VISIVO E DIMENSIONALE IN ACCORDO AL DIS. NR.
Visual and dimensional test according to drawing No. **A 1602-29**
2) PROVA DI TENUTA A PRESSIONE
Nitrogen test (100%)

Pressione di prova idrostatica (*hydrostatic test pressure*) : **300 bar**
Fluido utilizzato per la prova idraulica : **Azoto**
Hydraulic test medium : **Nitrogen**
ESITO/*Result:* *Tempo:* **10 min**
Time: **10 min**

POS. 1) **CONFORME**
Up to drawing
POS. 2) **NESSUNA PERDITA O DEFORMAZIONE RISCONTRATA**.
Leakeges or deformations have not been evidenced.

RISULTATO : BUONO
RESULT : Good

Collaudo presenziato da:
Test attended by:

PMC **STATOIL** **FABRICOM**

EPE ITALIANA S.R.L.
(IL RESPONSABILE DEL COLLAUDO)
(Superintendent for the test)

Milano, (Italy) 30/06/2016

M CTR 03 REV.13

12.7e

12.8.1 TECHNICAL ASSISTANCE

EPE Italiana has the means and professionally qualified people with specific skills ready to intervene at any time, in any situation anywhere in the world. Interventions are promptly made and when the product is under warranty and for scheduled maintenance or in case of a sudden failure.

12.8a

12.8b

12.8c

12.8d

Many of our components can also be used on competitors products.
We can pre-charge accumulators with nitrogen up to 300 bar and at our company, either at the customer site.

12.8e

12.8.2 TRAINING

EPE Italiana can organize training courses for its customers, thanks to his experience in the sector, make available an educational initiative that could allow users to use the products in a comprehensive and dynamic way.
The courses are held at the offices of EPE Italiana at Viale Spagna, 112 in Cologno Monzese (MI) ITALY or at the customer site.

12.8f

Our courses are open to all users of EPE Italiana with the goal of teaching the basic use of the products or to deepen some topics, or to update its customers about new products.
Courses are also provided on request according to customer requirements.
Generally the courses provide a theoretical and a practical part and take place in appropriate areas to test the knowledge gained during the training days.
In these courses in oleodynamic can be treated one or all of the topics listed below for both theoretical and practical part:

THEORETICAL COURSE

- BASIC PRINCIPLES OF OLEODYNAMIC
- HYDRAULIC FLUIDS AND THEIR CONTAMINATION
- OLEODYNAMIC POWER UNITS AND COMPONENTS
- SEALS, PIPES AND FITTINGS
- OLEODYNAMIC ACCUMULATORS AND CE/PED CERTIFICATION
- VALVES AND SAFETY BLOCKS
- MAINTENANCE OF OLEODYNAMIC SYSTEMS , PRESSURE MEASUREMENT AND RESTORATION OF PRE-CHARGE ACCUMULATORS, PERIODIC CHECKS (LAW N° 329 OF 1st DEC. 2004)
- ACCUMULATOR STATIONS AND THEIR COMPONENTS

PRACTICAL COURSE

- RECOGNITION OF COMPONENTS
- MAINTENANCE
- MEASUREMENT OF PRE-CHARGE PRESSURE
- PRESSURE MONITORING
- PRE-CHARGE
- DISASSEMBLY OF COMPONENTS

At the end of the course will be given a certificate for the course/s attended.
This is an important commitment to EPE Italiana which confirms its willingness to be close to the needs of cultural growth of its customers.

12.8g

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