

## 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

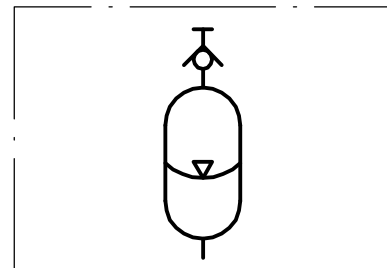
## 5.2.2 "AML" DIAPHRAGM ADVANTAGES

- 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  $1.5 \div 4\%$  per year, depending on the application characteristics.

The diaphragm may be made of different materials, so making the accu-

mulators 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, Skydrol 500 and 7000, 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 500 and 7000, 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.

## 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)	=	<b>P</b>
Nitrile for low temp.	=	<b>F</b>
Hydrogenated nitrile (HNBR)	=	<b>K</b>
Butyl (IIR)	=	<b>B</b>
Ethylene-propylene (EPDM)	=	<b>E</b>
Epichlorohydrin (ECO)	=	<b>Y</b>
Fluorocarbon (FKM)	=	<b>V</b>

**4 Max working pressure (PS)**

Capacity litres	Carbon steel	Stainless steel
0,8 =	<b>250 - 350</b>	<b>150 - 210</b>
1,5 =	<b>250 - 350</b>	<b>150 - 210</b>

**5 Body material**

Carbon steel	=	<b>C</b>
Carbon steel nickel coated 25 µ	=	<b>N</b>
Carbon steel nickel coated 40 µ	=	<b>M</b>
Stainless steel (150 bar)	=	<b>X</b>
Duplex stainless steel (210 bar)	=	<b>D</b>

**10 Precharge pressure (bar)**  
 Standard 30 bar = **0 ÷ 280** (< PS)

**9 Test and certification**

Factory testing	=	<b>0</b>
TR (Russia)	=	<b>1</b>
PED97/23/EC(for capacity 1,5)	=	<b>8</b>
EAC Passport (Russia)	=	<b>11</b>
Algeria passport	=	<b>12</b>
Standard regulation (NR13) (Brazil)	=	<b>13</b>
Tunisia passport	=	<b>14</b>

**8 Gas side connection**

Standard filling valve with 5/8" UNF tread	=	<b>V</b>
Standard filling valve with 5/8" UNF tread in stainless steel	=	<b>VX</b>

**7 Dimension of connection side**

For the type of connection:  
 M = (Diameter/Pitch) **18/1,5**

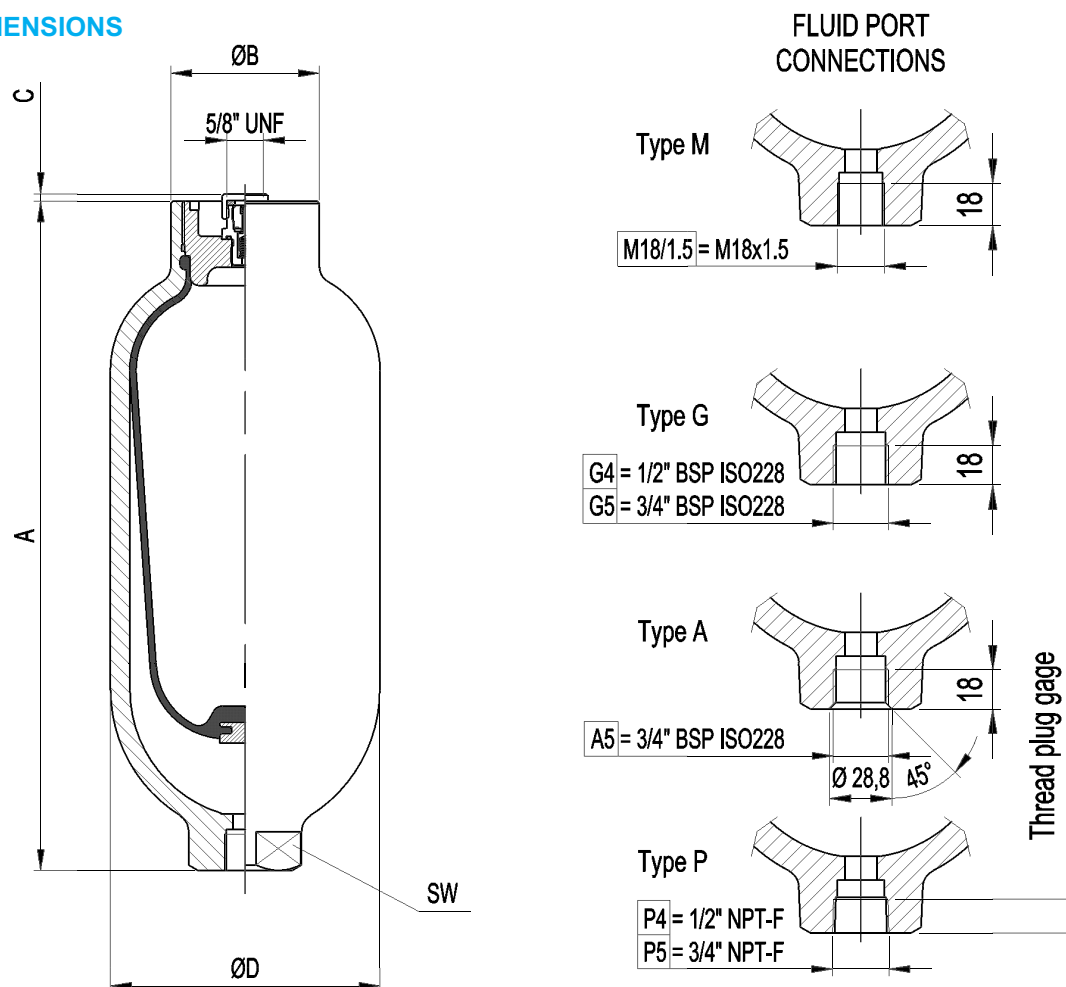
G 1/2"	=	<b>4</b>
3/4"	=	<b>5</b>
A 3/4"	=	<b>5</b>
P 1/2"	=	<b>4</b>
3/4"	=	<b>5</b>

**6 Fluid port connection**

Metric	=	<b>M</b>
BSP ISO 228	=	<b>G</b>
BSP ISO 228 with chamfer for OR	=	<b>A</b>
NPT-F (standard for stainless steel)	=	<b>P</b>

Special variants on request

## 5.2.7 DIMENSIONS



5.2d

Accumulator type AML	Nominal gas volume	Real gas volume	Working pressure	PED category for the liquids of group 2	Maximum differential pressure*	Flow rate **	Maximum compression ratio	A	Ø B	C	Ø D	SW	Dry weight
volume	litres	litres	bar		bar	l/min	Po/P2	mm	mm	mm	mm	mm	Kg
AML 0,8	0,8	0,8	150	Art.3 (3)	110	40	1 : 6	200	65	3	116	36	4,5
			210										
			250										
			350										
AML 1,5	1,5	1,5	150	II	110	40	1 : 6	295	65	3	116	36	5,6
			210										
			250										
			350										

\* 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  $\Delta P = 5$  bar

5.2e

## 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 97/23/EC.

## 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 97/23/EC 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 pre-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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