

EAT•N

Vickers

Accumulators



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Typical lead time for standard (**bold**) diaphragm and bladder accumulators is two weeks.
Typical lead time for piston accumulators is six weeks.

The Eaton Advantage

Eaton understands the need to improve machine performance, efficiency and reliability with cost effective hydraulic systems. Eaton accumulators help to achieve these goals while contributing to lower energy costs, reduced noise levels and a reduction in hydraulic system leakage and maintenance costs.

Manufacturing is conducted in a plant which is approved and monitored by various national and state agencies. For example, the plant is authorized to use the American Society of Mechanical Engineers (ASME) "U" Code to certify that the accumulator meets all requirements of the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1. Other codes are also available upon request on a special order basis.

Eaton offers bladder, piston and diaphragm type accumulators in a wide range of sizes, bladder materials, port configurations and pressure ratings to provide optimum design flexibility.

Eaton also offers a complete line of accessories needed for proper installation and maintenance including safety shut-off blocks, clamps, repair kits, and charging and gauging units. There is also the assurance that the materials used in construction and manufacturing are controlled to exacting specifications and backed by Eaton's no-nonsense warranty. The warranty can be found at <http://hydraulic.eaton.com/products>. Accumulators can be purchased certified for China, Japan, India, and most other countries on a special order basis.

Eaton accumulators offer customers the following advantages:

- **Lower System Installed Costs**

Accumulator assisted hydraulics can reduce the size of the pump and electric motor which results in a smaller amount of oil used, a smaller reservoir and reduced cooling capacity

- **Reduced Energy Costs**

Cost savings up to 33% are achievable in high performance industrial machinery using accumulators.

- **Less Leakage & Maintenance Costs**

The ability to reduce system shocks will prolong component life, reduce leakage from pipe joints and minimize hydraulic system maintenance costs.

- **Improved Performance**

Low inertia accumulators can provide instantaneous response time to meet peak flow requirements.

They can also help to achieve constant pressure in systems using variable displacement pumps for improved productivity and quality.

- **Reduced Noise Levels**

Reduced pump and motor size coupled with system shock absorption lowers overall machine sound levels and results in higher operator productivity.

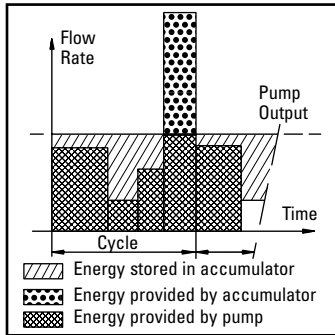
- **Flexible Design Approaches**

A wide range of accumulator types and sizes, including accessory items, provides a versatile and easy to apply design approach. All accumulators meet a 4:1 safety requirement.

In addition to the standard products described in this catalog, Eaton has the capability to provide special accumulator shells, bladders and fluid ports to meet specific customer specifications. Special coatings can also be provided to resist corrosive fluids or environments. Please contact your local distributor or Eaton representative to discuss your requirements.

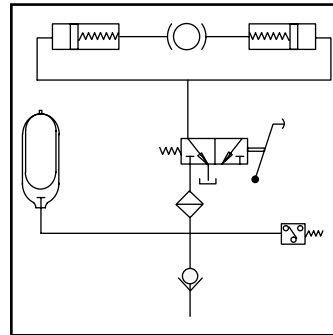
Basic Models & Features

Type	Series	Features
Bottom Repairable Bladder	A2	<ul style="list-style-type: none"> • Seven sizes from 1 l to 54 l (1 US qt to 15 US gal) • 210 bar (3000 psi) and 345 bar (5000 psi) ratings • Wide range of bladder materials • Interchangeable with major competitors
Top Repairable Bladder	A3	<ul style="list-style-type: none"> • Five sizes from 10 l to 54 l (2.5 US gal to 15 US gal) • Can be repaired from both ends • 210 bar (3000 psi) • Wide range of bladder materials
Diaphragm	A9	<ul style="list-style-type: none"> • Ten sizes from 0.075 l to 3.5 l (5 in³ to 230 in³) • Lightweight, compact design • Working pressures to 250 bar (3600 psi)
Piston	AP	<ul style="list-style-type: none"> • Thirteen sizes from 1 l to 38 l (1 US qt to 10 US gal) • Units are rated at 210 bar (3000 psi) • Compact and simple design provides long life
Gas Bottles	A6	<ul style="list-style-type: none"> • One size up to 57 l (15 US gal) • 210 bar (3000 psi) • 1 5/16"-12 Ports • Meets 4:1 safety requirements



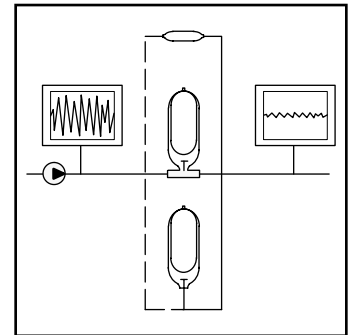
1. Reduction of installed power.

Using an accumulator as an energy storage device effectively reduces the required flow rate capacity of the hydraulic pump. This results in a reduction of the installed power.



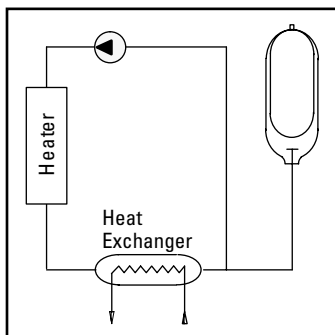
2. Emergency and safety.

An accumulator which is kept fully charged allows for instant and/or repetitive operations as required (braking, opening of door, etc.).



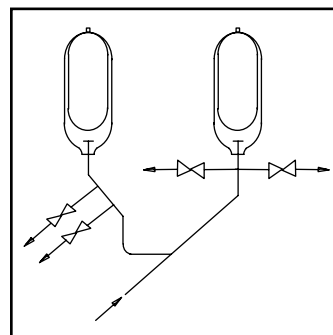
3. Dampening of pulsation and reduction of noise

In order to dampen pressure changes, which are caused by the pulsation of a pump, an accumulator makes it possible, due to the low inertia of its bladder, to improve the precision of operation and to reduce the sound level of the installation.



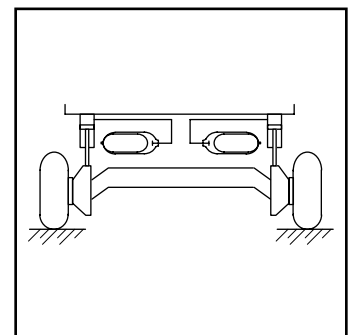
4. Thermal expansion.

The pressure differences caused by thermal variation in a closed hydraulic circuit are absorbed by fitting an accumulator.



5. Surge control.

Designed to protect high volume flow systems from surge and water hammer damage. In order to protect the system, an accumulator correctly sized and located in the system transforms pressure wave oscillations into liquid mass oscillations which are easily absorbed by the accumulator, bringing the pressure peak level back to acceptable levels.



6. Suspension of heavy vehicles.

On maintenance machinery, transport platforms etc., an accumulator which is connected to the suspension chamber acts as an adjustable shock absorber.

Introduction

General description

The shells of bladder and piston type accumulators are manufactured from homogeneous, seamless tubing. In bladder accumulators one or both ends is formed hemispherically by either spinning or hammering operations. Strict heat treatment and stress relieving is performed on all shells after the forging operation to ensure compliance with the required mechanical properties.

A full range of bladders have been developed from the most advanced elastomers capable of meeting low temperatures (down to -50°F) and high temperatures (up to 300°F). These same bladder materials are compatible with most fluids.

The fluid port incorporates a poppet valve which prevents the extrusion of the bladder. Special care has been taken in the design of the fluid port assembly to prevent turbulent flow, pressure drop, and potential preclosure of the poppet valve. A heavy duty spring prevents premature closure of the poppet valve.

The design of the bladder accumulator makes use of the considerable difference in compressibility between a gas and fluid. The bladder contained in the shell is precharged with nitrogen gas to a pressure determined by the work to be done.

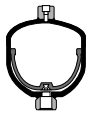
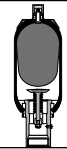
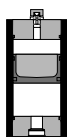
After precharging, the bladder occupies the whole volume of the shell and from there the process can be split into three stages.

Stage 1: When the hydraulic pump in the system causes the fluid to enter the accumulator, the nitrogen contained in the bladder compresses and its pressure is increased.

Stage 2: The deformation of the bladder ceases when the pressure of the fluid and the nitrogen become balanced. During this stage the bladder is not subject to any abnormal mechanical stress and due to its design deforms sideways forming three lobes.

Stage 3: On demand, system pressure falls and the stored fluid is returned to the system under pressure exerted by the compressed nitrogen. On completion of the hydraulic system functions, the accumulator returns to stage 1.

Comparison of Standard Accumulators

Type	Nominal Volume	MAWP (psi)	Pressure Ratio	Flow Rate	Mounting Position	Weight	Cost	Design Consideration
Diaphragm								
	5 to 230 in ³	3000	8:1 typically (some 4:1)	up to 40 gpm	any	lowest	lowest	<ul style="list-style-type: none"> • small volume and flow • low weight • compact design • good for shock applications (good response characteristics)
Bladder								
	1 qt. to 15 gal	3000, 5000	4:1	up to 240 gpm	prefer vertical	middle	middle	<ul style="list-style-type: none"> • best general purpose • wide range of standard sizes • good for shock applications (good response characteristics)
Piston								
	1 qt. to 10 gal	3000	10:1 or greater	up to 240 gpm	prefer vertical	highest	middle to highest	<ul style="list-style-type: none"> • best for large stored volumes • best for high flow rates • not recommended for shock applications • best for use with backup nitrogen bottles

Bladder Accumulators

General Information

Description

The bladder accumulator consists of a fluid section and a gas section, with the bladder acting as a gas-proof screen. The fluid around the bladder is connected with the hydraulic circuit, so that the bladder accumulator draws in fluid when the pressure increases thus compressing the gas. When the pressure drops, the compressed gas expands and forces the stored fluid into the circuit.

Bladder Materials

The following bladder materials are readily available. Buna-N bladders and seals are standard and are suitable for most fluid power applications.

Other materials are offered to provide compatibility with a wide range of fluids, working temperatures and permeation requirements. Please consult your Eaton representative when special requirements are encountered.

- **BN** - Buna-N (nitrile) (5°-180°F using mineral oil)
- **VT** - Fluorocarbon (viton) (5°-300°F)
- **BL** - Butyl (-40°-200°F)
- **EP** - Ethylene Propylene
- **CW** - Special nitrile blend for low temperature applications (-40°F to 180°F)
- **HL** - Hydrin for applications requiring extremely low permeation.

To determine which material is appropriate...

ALWAYS REFER TO FLUID MANUFACTURER'S RECOMMENDATION

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Corrosion Protection

For use with certain aggressive or corrosive fluids, or in a corrosive environment, EATON offers protective coatings and corrosive resistant materials (i.e. stainless steel) for the accumulator parts that come in contact with the fluid, or are exposed to the hostile environment.

Mounting Position

EATON bladder accumulators can be installed vertically, at any angle, or horizontally depending upon the application. When installing vertically or at an angle, the fluid port must be at the bottom. On certain applications listed below, specific positions are preferable:

- Energy Storage: vertical
- Pulsation Damping: any position from vertical to horizontal
- Maintaining Constant Pressure: any position from vertical to horizontal
- Volume Compensation: any position from vertical to horizontal

System Mounting

EATON bladder accumulators are designed to be screwed directly onto the system. We also recommend the use of our mounting components, which are detailed on page 21, to minimize risk of failure due to system vibrations.

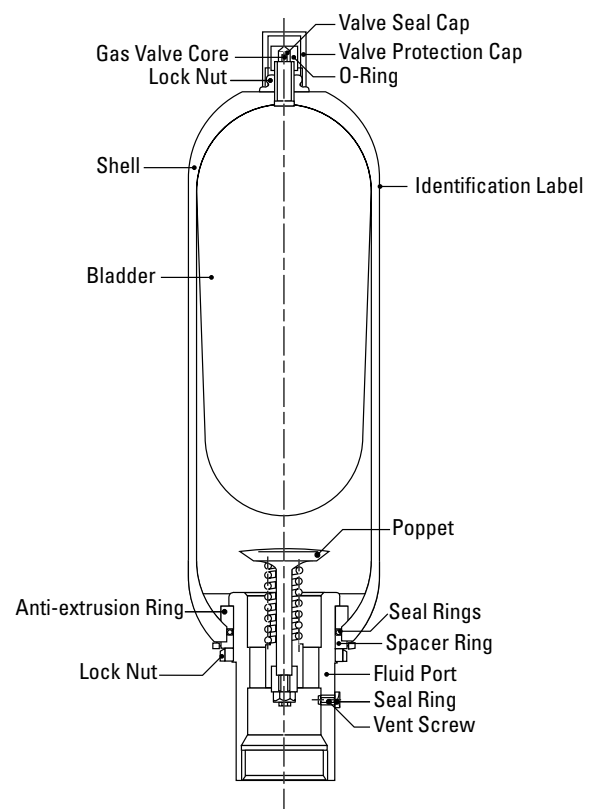
Applications

Some common applications of bladder accumulators are:

- Agricultural Machinery & Equipment
- Forestry Equipment
- Oil Field & Offshore
- Machine Tools
- Mining Machinery & Equipment
- Mobile & Construction Equipment
- Off-road Equipment

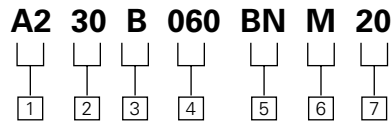
Construction

EATON bladder accumulators consist of a welded or forged pressure vessel (shell), a bladder and ports for gas and fluid inlet. The gas and fluid sides are separated by the bladder.



Bottom Repairable

Model Code



1 Type

A2 – Bottom repairable

2 Pressure Rating

30 – 210 bar (3000 psi)

50 – 345 bar (5000 psi)

3 Port Configuration

A – 3/4" str. thd.

B – 1 1/16" str. thd.

C – 1 5/16" str. thd.

D – 1 5/8" str. thd.

E – 1 7/8" str. thd.

F – 1 1/4" str. thd.

G – 2" split flange (code 61)

H – 1 1/2" split flange (code 62)

P – NPTF pipe thd.

(not recommended)

4 Size

060 - 0.95 l (1.0 USquart)

230 - 3.79 l (1.0 USgal.)

578 - 9.46 l (2.5 USgal.)

05G - 18.9 l (5 USgal.)

10G - 37.9 l (10 USgal.)

11G - 41.6 l (11 USgal.)

15G - 54.0 l (15 USgal.)

5 Bladder Material

BN – Buna-N

VT – Viton

BL – Butyl

EP – EPR

CW – Cold weather, low temperature buna

HL – Hydrin

6 Service

M – Petroleum oil

W – Water

S – Stainless steel

7 Certification

20 – For use in the United States

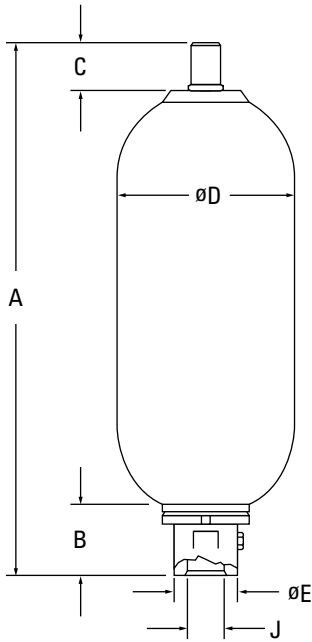
21 – For use in Canada (CRN)

Note: Not all combinations are available. Model codes in bold are standard items.

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Bottom Repairable

Dimensions



A2 30 - 3000 PSI Bladder Accumulators

Size	Nom. Vol. gal.	Eff. Gas Vol. in ³	Weight	A	B ¹	C	ØD	ØE	Port Option SAE (see model code)	Thread J	Q ² gpm
060	1/4	66	10 (4.5)	12.0 (303)	2.0 (51)	2.3 (58)	4.6 (117)	1.4 (36)		1 1/16-12 UN	60
230	1	226	30 (14)	16.3 (415)	2.6 (66)	2.3 (58)	6.6 (168)	2.1 (53)		1 5/8-12 UN	160
578	2 1/2	566	86 (39)	22.0 (559)	3.1 (80)	2.3 (58)	9.1 (231)	3.0 (76)		1 7/8-12 UN	240
05G	5	1125	140 (63)	34.5 (876)	3.1 (80)	2.3 (58)	9.1 (231)	3.0 (76)		1 7/8-12 UN	240
10G	10	2080	226 (102)	54.7 (1390)	3.1 (80)	2.3 (58)	9.1 (231)	3.0 (76)		1 7/8-12 UN	240
11G	11	2320	270 (123)	60.2 (1530)	3.1 (80)	2.3 (58)	9.1 (231)	3.0 (76)		1 7/8-12 UN	240
15G	15	3205	330 (150)	78.3 (1990)	3.1 (80)	2.3 (58)	9.1 (231)	3.0 (76)		1 7/8-12 UN	240

Dimensions are in inches/(millimeters) and lbs./(kg)

A2 50 - 5000 PSI Bladder Accumulators

Size	Nom. Vol. gal.	Eff. Gas Vol. in ³	Weight	A	B ¹	C	ØD	ØE	Port Option SAE (see model code)	Thread J	Q ² gpm
578	2 1/2	566	114 (52)	22.4 (568)	3.1 (80)	2.8 (70)	9.1 (232)	3.0 (76)		1 7/8-12 UN	240
05G	5	1125	162 (73)	35.0 (888)	3.1 (80)	2.8 (70)	9.1 (232)	3.0 (76)		1 7/8-12 UN	240
10G	10	2080	250 (113)	55.2 (1402)	3.1 (80)	2.8 (70)	9.1 (232)	3.0 (76)		1 7/8-12 UN	240
15G	15	3180	370 (168)	78.8 (2002)	3.1 (80)	2.8 (70)	9.1 (232)	3.0 (76)		1 7/8-12 UN	240

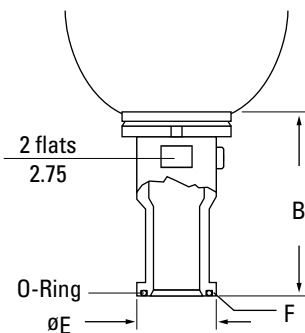
Dimensions are in inches/(millimeters) and lbs./(kg)

Split Flange Connection (sizes 2.5 - 15)³

Series	B in./(mm)	ØE in./(mm)	Split Flange Connection F	Q ² gpm
A2 & A3 30	4.1 (104)	2.8 (71.4)	SAE 2" - 3000 psi Code 61	240
A2 & A3 50	5.5 (140)	2.5 (63.5)	SAE 1 1/2" - 6000 psi Code 62	240

Dimensions are in inches/(millimeters) and lbs./(kg)

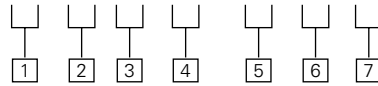
- 1) Applies to SAE thread type only. For Split Flange, see chart and illustration below.
- 2) Maximum discharge flow rate recommended for vertically mounted accumulators.
- 3) Sizes 2.5 to 15 only.



Top Repairable

Model Code

A3 30 E 578 BN M 20



1 Type

A3 – Top repairable

2 Pressure Rating

30 – 210 bar (3000 psi)
50 – 345 bar (5000 psi)

3 Port Configuration

E – 1 7/8" str. thd.
G – 2" split flange (code 61)³
H – 1 1/2" split flange (code 62)
P – NPTF pipe thd.
 (not recommended)

4 Size

578 – 9.5 l (2.5 USgal.)
05G – 18.9 l (5 USgal.)
10G – 37.9 l (10 USgal.)
11G – 41.6 l (11 USgal.)
15G – 54.0 l (15 USgal.)

5 Bladder Material

BN – Buna-N
VT – Viton
BL – Butyl
CW – Cold weather, low temperature buna
HL – Hydrin

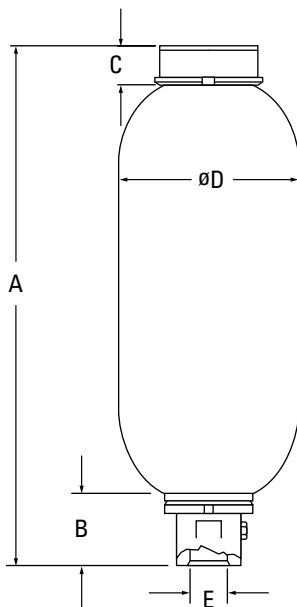
6 Service

M – Petroleum oil
W – Water
S – Stainless steel

7 Certification

20 – For use in the United States
21 – For use in Canada (CRN)

Note: Not all combinations are available. Model codes in bold are standard items.



A3 30

Size	Nom. Vol. gal.	Eff. Gas Vol. in ³	Weight	A	B ¹	C	ØD	Port Option Thread E SAE (see model code)	Q ² gpm
578	2.5	566	94 (43)	21.0 (540)	3.1 (80)	1.6 (40)	9.1 (231)	E, G	240
05G	5	1125	140 (63)	34.8 (883)	3.1 (80)	1.6 (40)	9.1 (231)	E, G	240
10G	10	2080	226 (102)	55.0 (1397)	3.1 (80)	1.6 (40)	9.1 (231)	E, G	240
11G	11	2320	270 (123)	60.2 (1530)	3.1 (80)	1.6 (40)	9.1 (231)	E, G	240
15G	15	3205	330 (150)	78.6 (1997)	3.1 (80)	1.6 (40)	9.1 (231)	E, G	240

Dimensions are in inches/(millimeters) and lbs./(kg)

- 1) Applies to SAE thread type only. For Split Flange, see chart and illustration below.
- 2) Maximum discharge flow rate recommended for vertically mounted accumulators.
- 3) Sizes 2.5 to 15 only.

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Diaphragm Accumulators

General Information

Description

EATON diaphragm accumulators utilize the compressibility of a gas (nitrogen) in storing hydraulic energy. The gas is required because fluids are practically incompressible and thus, cannot store energy by themselves. The diaphragm is utilized to separate the gas and the fluid sides of the accumulator.

The diaphragm accumulator functions by drawing in fluid from the hydraulic circuit when the pressure increases and thus, compresses the gas. It returns this energy to the circuit as the pressure decreases by the expansion of the gas.

A poppet is incorporated into the diaphragm to prevent its extrusion through the fluid port.

Eaton diaphragm accumulators have been successfully applied to both industrial and mobile applications for energy storage, maintaining pressure, leakage compensation, and vehicle hydraulic systems (e.g. brake and suspension).

Diaphragm Materials

Not all fluids are compatible with every elastomer at all temperatures. Therefore, EATON offers the following choice of elastomers:

- **BN** - Buna-N (nitrile) (5°-180°F using mineral oil)
- **VT** - Fluorocarbon (viton) (5°-300°F)
- **BL** - Butyl (-40°-200°F)
- **CW** - Special nitrile blend for low temperature applications (-40°F to 180°F)
- **HL** - Hydrin for applications requiring extremely low permeation.

To determine which material is appropriate...
ALWAYS REFER TO FLUID MANUFACTURER'S RECOMMENDATION

Viton is a registered trademark of Dupont

Corrosion Protection

For use with certain aggressive or corrosive fluids, or in a corrosive environment, EATON offers protective coatings and corrosive resistant materials (i.e. stainless steel) for the

accumulator parts that come in contact with the fluid, or are exposed to the hostile environment.

Mounting Position

Diaphragm accumulators by design may be mounted in any position. In systems where contamination is a problem, we recommend a vertical mount with fluid port oriented downward.

System Mounting

EATON diaphragm accumulators are designed to be screwed directly onto the system. We also recommend the use of our mounting components, which are detailed on page 21, to minimize risk of failure due to system vibrations.

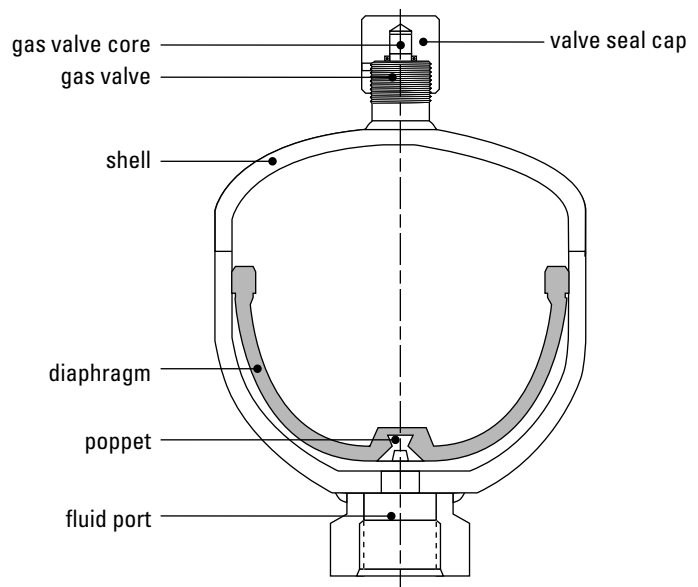
Applications

Some common applications of diaphragm accumulators are:

- Agricultural Machinery & Equipment
- Forestry Equipment
- Machine Tools
- Mining Machinery & Equipment
- Mobile & Construction Equipment
- Off-road Equipment

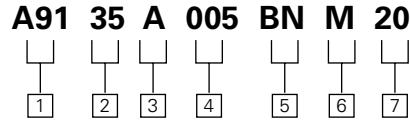
Construction

EATON diaphragm accumulators are electron-beam welded and contain a flexible diaphragm that separates the gas and fluid sides.



Diaphragm Accumulators

Model Code



1 Type

A91 – ISO 4570 gas valve (7/8" -14)
A92 – M28x1.5 gas valve
A93 – Sealed gas port

2 Pressure Rating

15 – 100 bar (1500 psi)
 20 – 138 bar (2000 psi)
30 – 210 bar (3000 psi)
35 – 250 bar (3600 psi)
 47 – 330 bar (4700 psi)

3 Port Configuration (SAE)*

A – 9/16" str. thd. - 18 UNF
B – 3/4" str. thd. - 16 UNF
C – 1 1/16" str. thd. - 12 UNF

4 Size

005 – 0.08 l (5 in³)
010 – 0.16 l (10 in³)
020 – 0.32 l (20 in³)
030 – 0.50 l (30 in³)
045 – 0.73 l (45 in³)
060 – 0.98 l (60 in³)
085 – 1.4 l (85 in³)
120 – 2.0 l (120 in³)
170 – 2.8 l (170 in³)
230 – 3.5 l (230 in³)

5 Bladder Material

BN – Buna-N
 VT – Viton
 BL – Butyl
 EP – EPR
 CW – Cold weather, low temperature buna
 HL – Hydrin

6 Service

M – Petroleum oil
 W – Water
 S – Stainless steel

7 Certification

20 – For use in the United States
 22 – Pressure equipment directive, CE marked

Note: Not all combinations are available. Model codes in bold are standard items.

*See drawings for standard port configurations.

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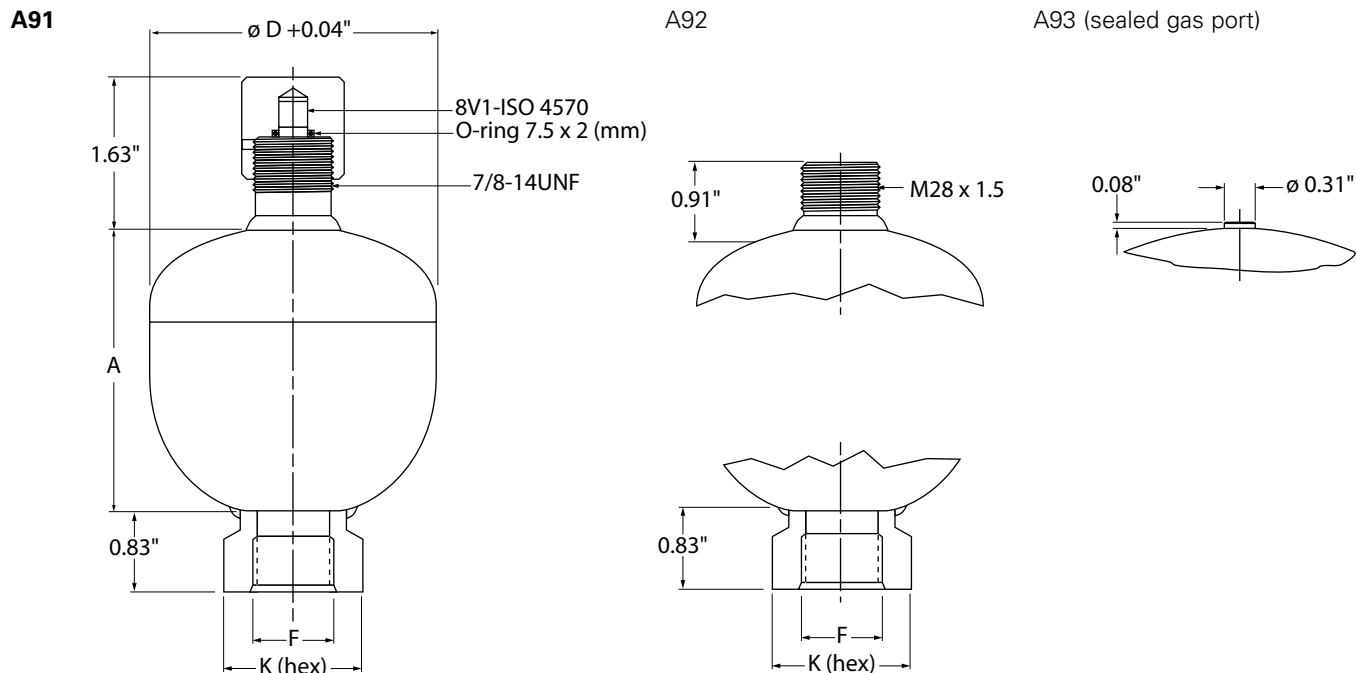
Diaphragm Accumulators

Dimensions

Model	Size	Max. p2:p0	Size (liters)	Effective Gas Vol in ³	MAWP psi/(bar)	Weight	A	øD ¹	Thread F Port Option SAE (see model code)	K (hex) in./(mm)	Q gpm
A9	005	8 : 1	0.075	5	3600 (250)	1.5 (0.7)	2.68 (68)	2.52 (64)	9/16-18 UNF	1.18 (30)	10
A9	010	8 : 1	0.16	10	3000 (210)	1.8 (0.8)	3.15 (80)	2.91 (74)	9/16-18 UNF	1.18 (30)	10
A9	020	8 : 1	0.32	20	3000 (210)	2.9 (1.3)	3.66 (93)	3.66 (93)	3/4-16 UNF	1.42 (36)	25
A9	030	8 : 1	0.5	30	3000 (210)	3.7 (1.7)	4.35 (124)	4.13 (105)	3/4-16 UNF	1.42 (36)	25
A9	045	8 : 1	0.75	45	3000 (210)	6.2 (2.8)	4.88 (124)	4.76 (121)	3/4-16 UNF	1.42 (36)	25
A9	060	8 : 1	1	60	3000 (210)	7.9 (3.6)	5.39 (137)	5.35 (136)	3/4-16 UNF	1.42 (36)	25
A9	085	8 : 1	1.4	85	3000 (210)	11.9 (5.4)	6.14 (156)	5.91 (150)	3/4-16 UNF	1.42 (36)	25
A9	120	8 : 1	2	120	3000 (210)	14.6 (6.6)	6.81 (173)	6.57 (167)	1 1/16-12 UNF	1.81 (46)	40
A9	170	4 : 1	2.8	170	3000 (210)	18.0 (8.2)	8.94 (227)	6.57 (167)	1 1/16-12 UNF	1.81 (46)	40
A9	230	4 : 1	3.5	230	3000 (210)	24.6 (11.2)	11.14 (283)	6.69 (170)	1 1/16-12 UNF	1.81 (46)	40

Dimensions are in inches/(millimeters) and lbs./(kg)

1) Diameter at electron beam weld may be up to +0.150" larger



Piston Accumulators

General Information

Description

Fluids are practically incompressible and cannot therefore store pressure energy. The compressibility of a gas (nitrogen) is utilized in hydro-pneumatic accumulators for storing fluids. EATON piston accumulators are designed on this principle, using nitrogen as the compressible medium.

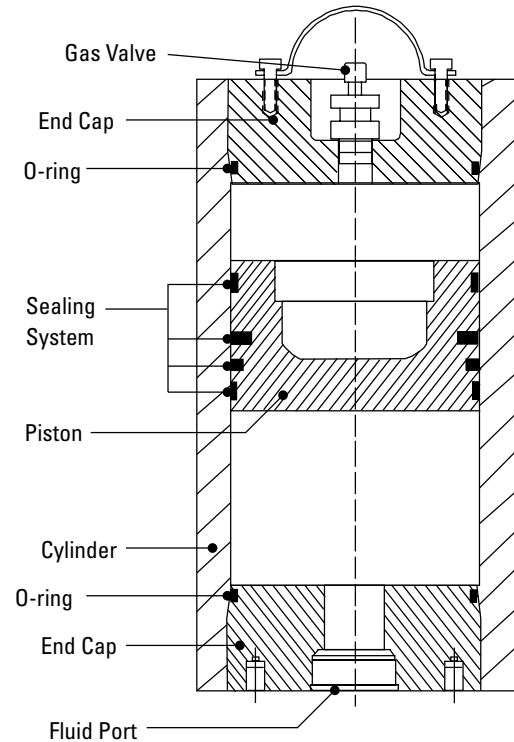
A piston accumulator consists of a fluid section and a gas section with the piston acting as a gas proof screen. The gas section is precharged with dry nitrogen gas.

The fluid section is connected to the hydraulic circuit so that the piston accumulator draws in fluid when the pressure increases thus compressing the gas. When the pressure drops, the compressed gas expands and forces the stored fluid into the circuit.

Construction

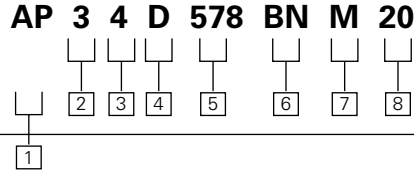
EATON piston accumulators consist of:

- A cylinder with a finely finished internal surface
- An end cap on the gas side and fluid side, sealed with O-rings
- A lightweight metal piston
- A variety of sealing systems are available depending on the application



Piston Accumulators

Model Code



1 Type
AP – Piston Accumulator

2 Pressure Rating
3 – 210 bar (3000 psi)

3 Bore Diameter
4 – 4.00" diameter
6 – 5.90" diameter

4 Port Configuration
D – 1 5/8 - 12 straight thread

5 Size
058 – 0.95 l (0.25 USgal.)
115 – 1.89 l (0.5 USgal.)
230 – 3.79 l (1.0 USgal.)
346 – 5.70 l (1.5 USgal.)
460 – 7.60 l (2.0 USgal.)
578 – 9.46 l (2.5 USgal.)
05G – 18.90 l (5.0 USgal.)
075G – 28.40 l (7.5 USgal.)
10G – 37.90 l (10.0 USgal.)

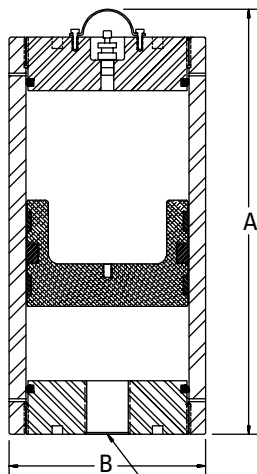
6 Seal Material
BN – Buna-N
 VT – Viton

7 Service
M – Petroleum oil
 W – Water
 S – Stainless steel

8 Certification
20 – For use in the United States
 21 – For use in Canada (CRN)
 22 – Pressure equipment directive, CE marked

Note: Not all combinations are available. Model codes in bold are standard items.

Viton is a registered trademark of Dupont



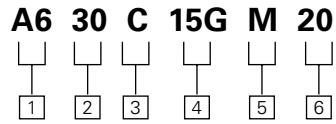
1 5/8" - 12 str. thd.
 Hydraulic port connection

Model	Size	A inches (mm)	øB inches (mm)	Weight lbs (kg)
AP 34	058	10.5 (267)	4.75 (121)	25 (11.3)
AP 34	115	15.5 (394)	4.75 (121)	35 (16.0)
AP 34	230	25.5 (648)	4.75 (121)	45 (20.4)
AP 34	346	35.5 (902)	4.75 (121)	55 (25.0)
AP 34	460	45.5 (1156)	4.75 (121)	68 (31.0)
AP 34	578	55.0 (1397)	4.75 (121)	80 (36.3)
AP 36	230	18.3 (464)	6.75 (171.4)	70 (32.0)
AP 36	346	22.8 (578)	6.75 (171.4)	90 (41.0)
AP 36	460	27.3 (692)	6.75 (171.4)	120 (54.4)
AP 36	578	31.5 (800)	6.75 (171.4)	135 (61.2)
AP 36	05G	53.5 (1359)	6.75 (171.4)	210 (95.3)
AP 36	075G	76.0 (1930)	6.75 (171.4)	290 (132.0)
AP 36	10G	100.0 (2540)	6.75 (171.4)	370 (168.0)

Note: Piston accumulator should be securely supported by brackets and clamps on end caps only, to prevent pinching the piston tube. Unrestricted piston movement is critical.

Gas Bottle

Model Code



1 Type

A6 – Gas bottle

2 Pressure Rating

30 – 210 bar (3000 psi)

3 Port Configuration

C – 1 5/16" str. thd.

4 Size

15G - 54.0 l (15 USgal.)

5 Service

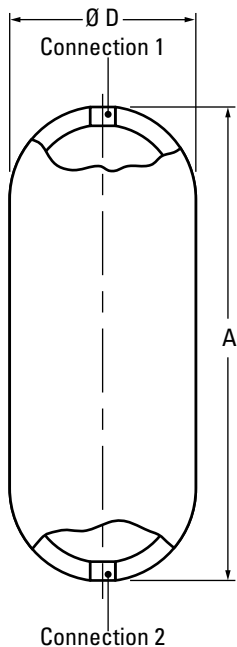
M – Petroleum oil
W – Water
S – Stainless steel

6 Certification

20 – For use in the United States
21 – For use in Canada (CRN)

Note: Not all combinations are available. Model codes in bold are standard items.

Gas bottles are used in combination with piston accumulators to increase available gas volume without increasing piston size.



Model	Size	Connections (1 and 2)	Weight (lbs.)	A (inches)	D (inches)
A6 30	15G	1 5/16-12UN	247	72"	9"

Safety & Shut-off Blocks

General Information

Description

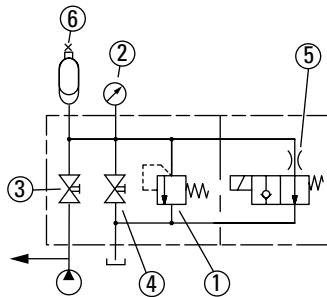
Eaton safety and shut-off blocks are designed to protect, shut-off, and discharge hydraulic accumulators or user units. The compact design simplifies the hydraulic system connection and offers the following advantages:

- Minimum space compared to individual components
- Reduced installation time
- Various system connections
- Accumulator lockout

Safety & Shut-off Block Features:

- 1 Pressure relief valve
- 2 Pressure gauge (optional)
- 3 Main shut-off valve
- 4 Manual bleed valve
- 5 2-way solenoid operated bleed valve (optional)

Circuit Diagram



Note: When using hydro-pneumatic accumulators for stored hazardous energy, Eaton recommends the use of its Safety and Shut-off Block (ESS) with solenoid operated bleed valve.

Technical Specifications

Fluids
Mineral oil, hydraulic oil, water glycol, non-flammable fluids (other fluids upon request)

Temperature (for carbon steel)
5°F to 180°F (-15°C to 80°C)

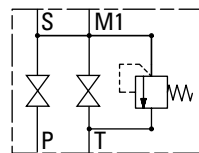
Maximum Working Pressure
Up to 5075 psi (350 bar)

Construction

The Safety and Shut-off Block consists of a valve block, a built-in pressure relief valve, a main shut-off valve, and a manually operated bleed valve. In addition, an optional solenoid operated bleed valve allows automatic release of the accumulator or user unit and therefore of the stored energy in an emergency or during shut-down. The necessary return line connection is provided in addition to the gauge connection.

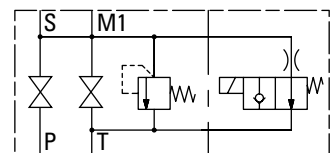
Standard Models

The basic model type "M" contains a manually operated bleed valve for manual pressure release of the accumulator.



Model with solenoid operated bleed valve

In addition to the features of the type "M" block, the type "E" model also contains a solenoid operated bleed valve for automatic pressure release of the accumulator.

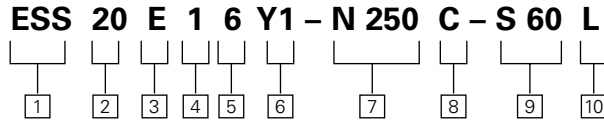


Connections

- S Accumulator Connection
- P System Connection
- T Tank Connection
- M1 Gauge Connection

Safety & Shut-off Blocks

Model Code



1 Designation
ESS – Safety & Shut-off Block

2 Size of Shut-off valve
10 – DN 10
20 – DN 20
32 – DN 32

3 Model
M – Manual discharge
E – Solenoid operated and manual discharge

4 Block Material
1 – Carbon Steel

5 Seal Material
6 – FPM

6 2-Way Solenoid Operated Bleed Valve
 Operating Function (omit) – if manual discharge was selected
Y – Normally Open (2SV5E2Y)
Z – Normally Closed (2SV5E2Z)

Solenoid (omit) – if manual discharge was selected
1 – 24 VDC
2 – 110 VAC – 60 Hz

7 Pressure Relief Valve
N 250 – Adjustable up to max pressure of 250 bar (3625 psi)
N 350 – Adjustable up to max pressure of 350 bar (5075 psi)
T XXX – Factory set and lead sealed, CE certified Safety Relief Valve, non-adjustable (xxx is pressure in bar)

8 Connection Type
 Threaded:
A – BSPP (ISO 228)
C – SAE (ANSI B 1.1)
 Flanged (SAF 32 only):
E – SAE 2" - 3000 psi (Code 61)
F – SAE 1-1/2" - 6000 psi (Code 62)

9 S Adapter
 (required only for safety and shut-off blocks with threaded connection)

SAE - Sizes 10 & 20
S 60 – 1 1/16"-12UN
S 62 – 1 5/8"-12UN
S 63 – 1 7/8"-12UN
S 64 – 3/4"-16UNF

SAE - Size 32
S 620 – 1 5/8"-12UN
S 630 – 1 7/8"-12UN

BSPP - Sizes 10 & 20
S 10 – G3/4"
S 11 – G1"
S 12 – G1 1/4"
S 13 – G2"

BSPP - Size 32
S 309 – G2"

10 Locking Device (if required)

Not all combinations are available. Model codes in bold are standard items.

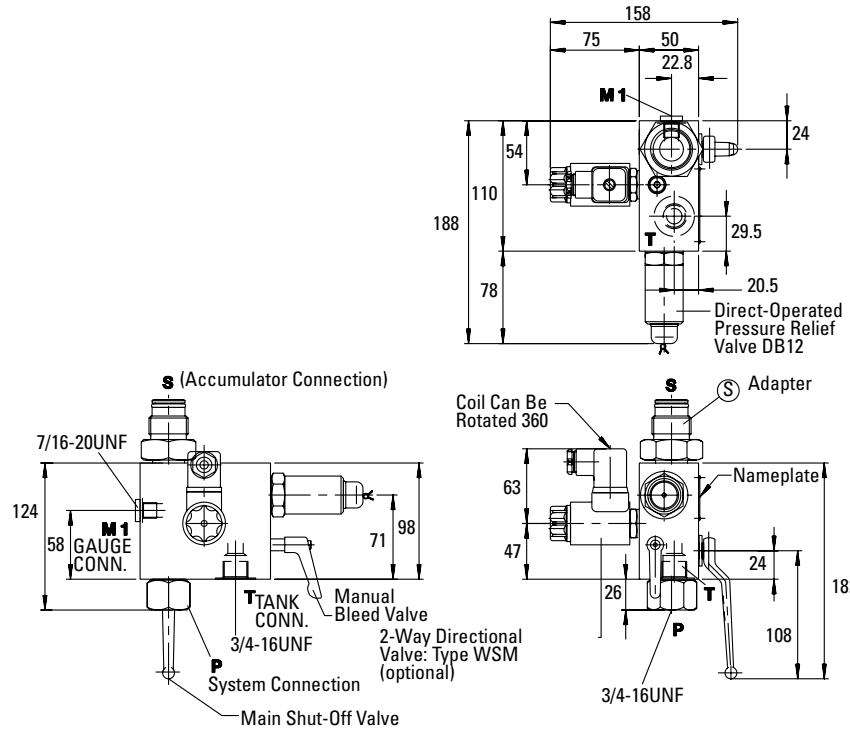
Safety & Shut-off Blocks

Dimensions

ESS 10 M/E...C

Type	Approx. Weight	
	kg	(lbs.)
ESS 10 M	4.2	(9.3)
ESS 10 E	4.6	(10.1)

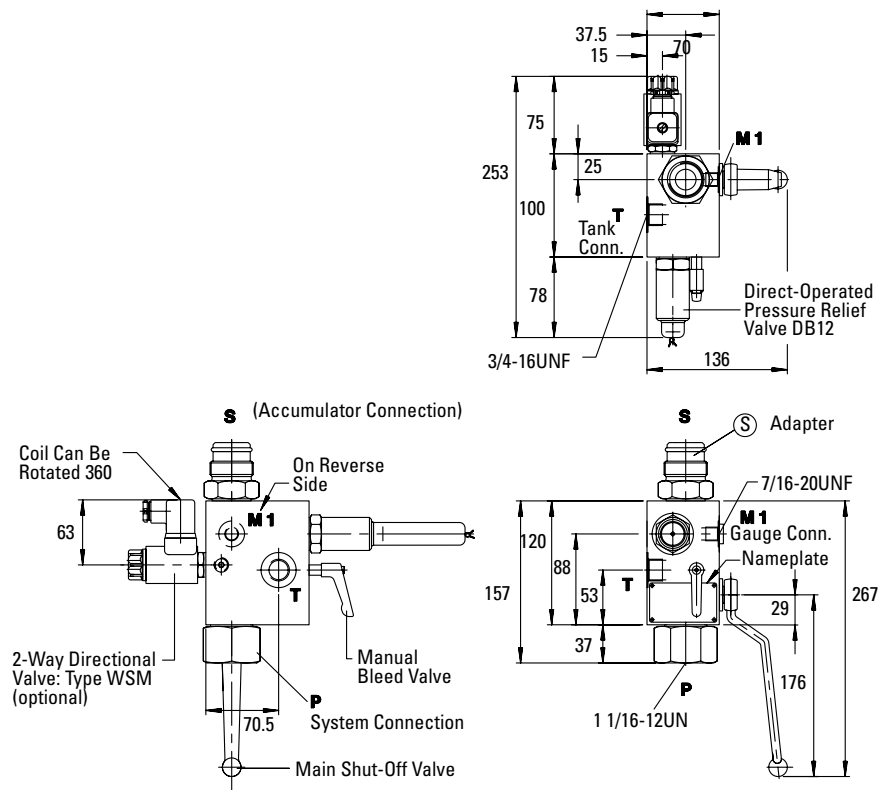
Dimensions in millimeters.
 Note: for "M" Type block the 2-way directional valve is replaced with a plug



ESS 20 M/E...C

Type	Approx. Weight	
	kg	(lbs.)
ESS 20 M	6.8	(15.0)
ESS 20 E	7.2	(15.8)

Dimensions in millimeters.
 Note: for "M" Type block the 2-way directional valve is replaced with a plug



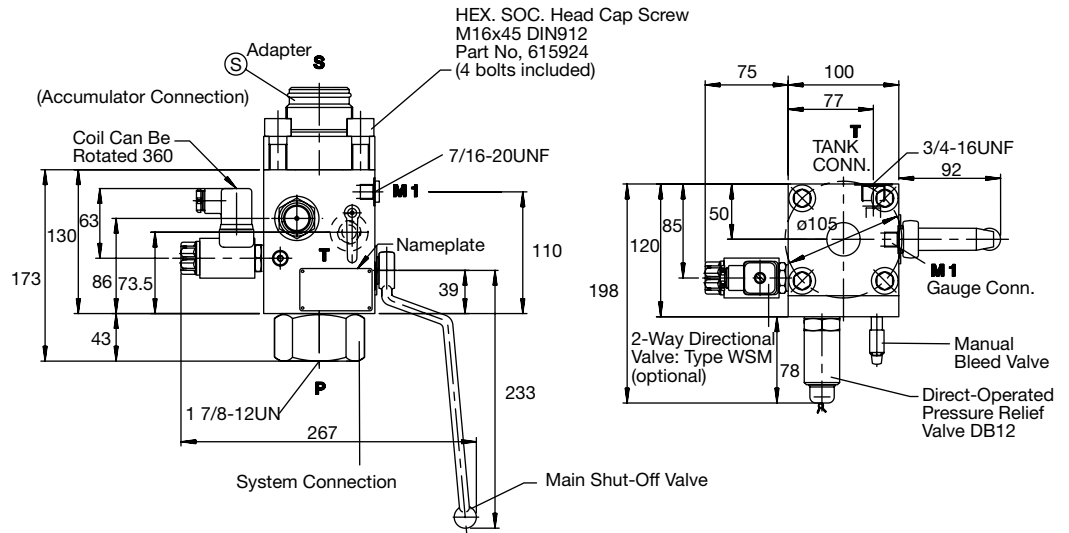
Safety & Shut-off Blocks

Dimensions

ESS 32 M/E...C

Type	Approx. Weight	
	kg	(lbs.)
ESS 32 M	12.0	(26.4)
ESS 32 E	12.4	(27.2)

Dimensions in millimeters.
 Note: for "M" Type block the 2-way directional valve is replaced with a plug

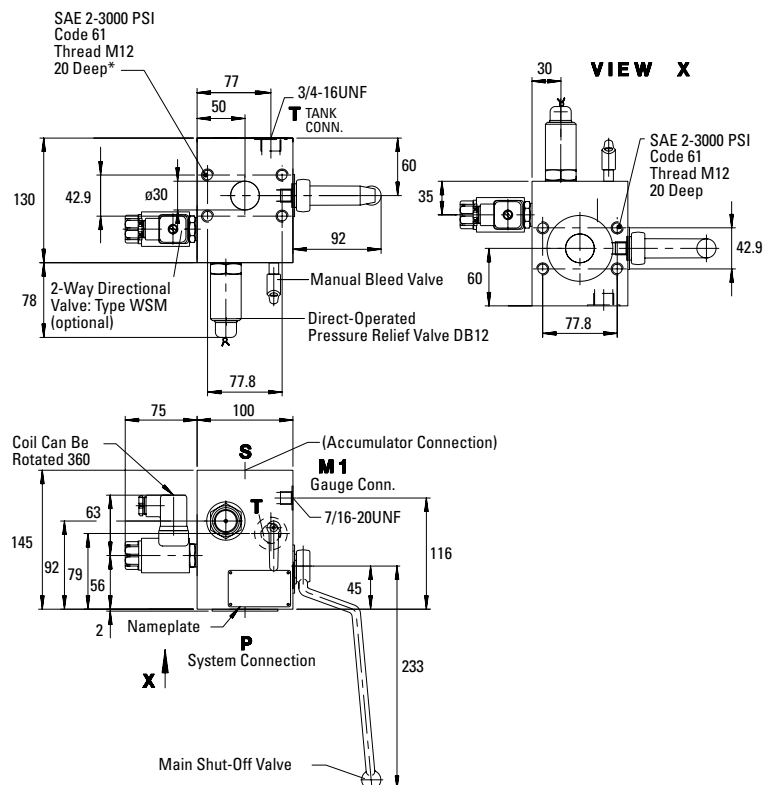


ESS 32 M/E...E

Type	Approx. Weight	
	kg	(lbs.)
ESS 32 M	15.0	(33.1)
ESS 32 E	15.4	(33.9)

*Hexagonal socket head cap screws M 12x35-DIN 912 have to be ordered separately

Dimensions in millimeters
 Note: for "M" Type block the 2-way directional valve is replaced with a plug



Safety & Shut-off Blocks

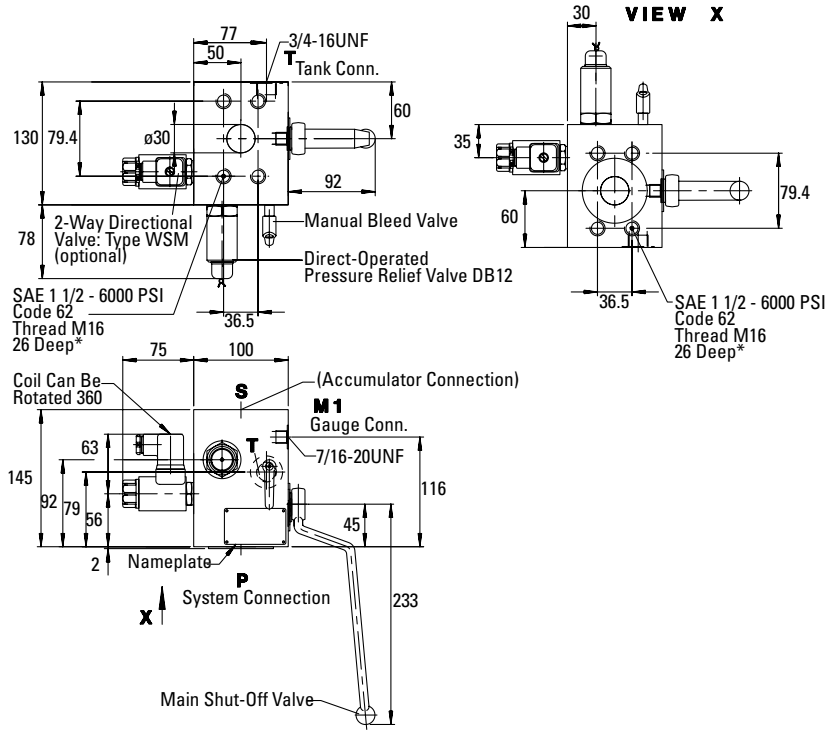
Dimensions

ESS 32 M/E...F

Type	Approx. Weight
	kg (lbs.)
ESS 32 M	15.0 (33.1)
ESS 32 E	15.4 (33.9)

*Hexagonal socket head cap screws M 16x55-DIN 912 have to be ordered separately

Dimensions in millimeters
Note: for "M" Type block the 2-way directional valve is replaced with a plug



S Adapters

Fig. 1

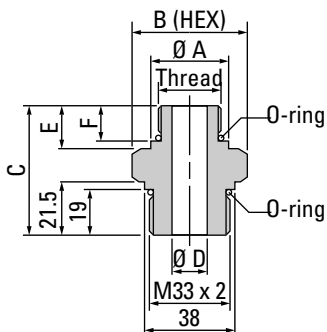
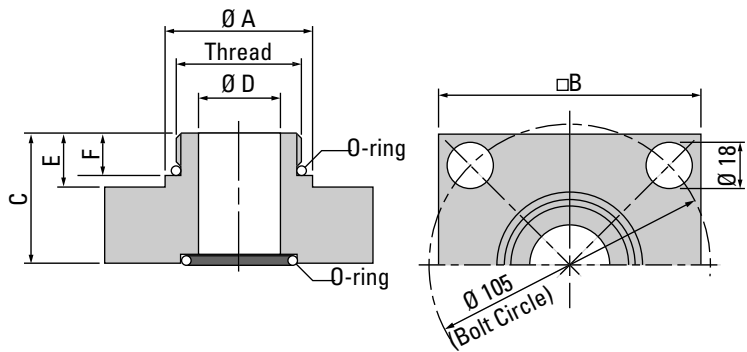


Fig. 2



Type SAF	Adapter	Fig.	Thread	A	B	C	D	E	F
ESS 10/20	S 60	1	1 1/16-12 UN	32	41	55	14	19	15
	S 62	1	1 5/8-12 UN	48	66	57	23	19	15
	S 63	1	1 7/8-12 UN	54	66	57	23	19	15
	S 64	1	3/4-16 UNF	23	41	51	10	15	11
ESS 32	S 620	2	1 5/8-12 UN	48	100	49	22	19	15
	S 630	2	1 7/8-12 UN	54	100	49	30	19	15

Dimensions In millimeters

Mounting Components

General Information

EATON mounting components are used to mount all types of hydro-pneumatic accumulators safely and simply. Our wide range includes suitable mounting components for every type of static hydro-pneumatic accumulator.

Function

Mounting components are used primarily for the following:

- To fix the accumulator into its position
- To carry the weight of the accumulator
- To counteract the forces exerted by the hydraulic lines

Types

EATON offers three styles of clamps:

- Light Duty (ELD)
- Regular Duty (ERD)
- Heavy Duty (EHD)

Additionally, for larger accumulators, EATON offers:

- Base Brackets (EBB)

Refer to the illustrations and photos to the right.

Construction

Clamps are constructed out of zinc-plated sheet steel or stainless steel strap (depending on style), utilizing a rubber insert to absorb vibration.

The light and regular duty have a one piece construction with center adjustment.

Conversely, the heavy duty clamps have a two piece construction. This allows for easy installation and removal while improving the strength to weight ratio.

EATON also offers base brackets for larger accumulators for proper support and isolation from system vibrations. The brackets incorporate a rubber support ring for this reason.

All mounting components can be easily bolted to your system.

Application guides are provided on the following pages to easily match the appropriate mounting components with EATON accumulators.

Mounting Components

- Can be used with all types of accumulators (bladder, piston, diaphragm).
- Secure design provides independent mounting on installations.
- Zinc plated to resist corrosion.
- Rubber insert provided to reduce mechanical vibration, and to compensate for shell manufacturing tolerances.
- Use one clamp for sizes 1 USqt. thru 5 USgal.
- Use two brackets for sizes 10 thru 15 USgal.
- Use mounting clamps and brackets for vertical installations only.

Light Duty Clamp: ELD



Regular Duty Clamp: ERD



Heavy Duty Clamp: EHD



Base Bracket: EBB



Mounting Components

Selection Guides

Bladder Accumulators and Nitrogen Bottles

A2, A3, A6

Accumulator Size (capacity)	Clamp Type (quantity)	Base Bracket Type (quantity)
1 (0.25 gal)	ELD 110-118 ST (1)	None
4 (1 gal)	ERD 167 (1)	EBB 167/G (1)
10 to 20 (2.5 to 5 gal)	EHD 222/229 (1)	EBB 222/G (1)
32 to 54 (10 to 15 gal)	EHD 222/229 (2)	EBB 222/G (1)

Piston Accumulators

AP34, AP36

Accumulator Size	Clamp Type (quantity)	Base Bracket Type (quantity)
4 in. (100 mm)	ELD 121-129 ST (2)	EBB 167/G (1)
5.9 in. (150 mm)	ELD 167-175 ST (2)	EBB 222/G (1)

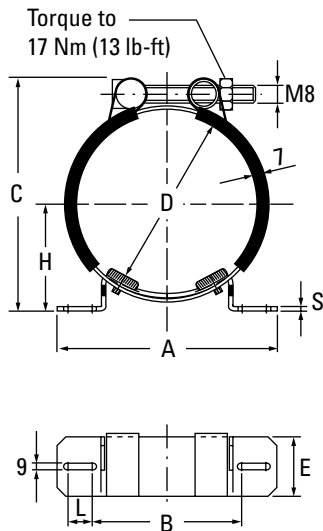
Diaphragm Accumulators

Accumulator Size	Clamp Type (quantity)	Base Bracket Type (quantity)
005	ELD 62-65 ST	N/A
010	ELD 73-76 ST	N/A
020	ELD 89-92 ST	N/A
030	ELD 100-105 ST	N/A
045	ELD 121-129 ST	N/A
060	ELD 133-142 ST	N/A
085	ELD 152-159 ST	N/A
120	ER 167	N/A
170	ER 167	N/A
230	ER 167	N/A

Note: One clamp is needed for each diaphragm accumulator listed.

Mounting Components

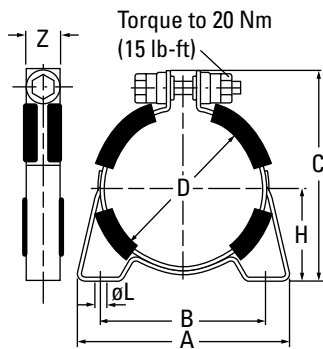
Dimensions



ELD - Eaton Light Duty - Stainless Steel Strap with swivel-bolt adjustment

Clamp Model	A	B	C	D (range)	E	H	L	S	Weight kg.(lbs)
ELD 62-65 ST	120 4.72	85 3.34	90 3.54	62-65 2.4-2.6	40 1.6	39-40.5 1.5-1.6	6 0.24	3 0.12	0.16 0.35
ELD 73-76 ST	120 4.72	85 3.34	101 3.98	73-76 2.9-3.0	40 1.6	49.5-46 1.9-1.8	6 0.24	3 0.12	0.16 0.35
ELD 89-92 ST	120 4.72	85 3.34	116 4.57	89-92 3.5-3.6	40 1.6	51.5-53 2.0-2.1	6 0.24	3 0.12	0.17 0.37
ELD 100-105 ST	156 6.14	100 3.94	135 5.31	100-105 3.9-4.1	60 2.4	59-62 2.3-2.4	18 0.71	3 0.12	0.40 0.88
ELD 110-118 ST	156 6.14	100 3.94	156 6.14	110-118 4.3-4.6	60 2.4	72.5-77 2.8-3.0	18 0.71	3 0.12	0.42 0.93
ELD 121-129 ST	156 6.14	100 3.91	165 6.50	121-129 4.8-5.1	60 2.4	75.5-80 3.0-3.1	18 0.71	3 0.12	0.43 0.95
ELD 133-142 ST	156 6.14	100 3.91	174 6.85	133-142 5.2-5.6	60 2.4	76.5-82 3.0-3.2	18 0.71	3 0.12	0.44 0.97
ELD 152-159 ST	156 6.14	100 3.91	191 7.52	152-159 6.0-6.3	60 2.4	87-91 3.4-3.6	18 0.71	3 0.12	0.46 1.01
ELD 167-175 ST	236 9.29	152 5.98	207 8.15	167-175 6.58-6.89	60 2.36	92.5-96.5 3.64-3.80	32 1.26	4 0.16	0.72 1.6

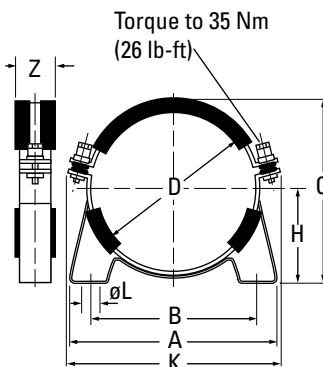
Dimensions in mm (inches shown below)



ERD - Eaton Regular Duty Clamp, with single center adjustment

Clamp Model	D	D (range)	A	B	C(ref.)	H	ØL	Z	Weight kg.(lbs)
ERD 167	167 6.57	164-170 6.46-6.69	185 7.28	153 6.02	211 8.31	92.5 3.64	9 0.35	30 1.18	0.9 2.0

Dimensions in mm (inches shown below)



EHD - Eaton Heavy Duty Clamp with two-piece construction

Clamp Model	D	D (range)	A	B	C(ref.)	H	K	ØL	Z	Weight kg.(lbs)
EHD 222/229	226 8.90	220-231 8.66-9.10	270 10.63	216 8.50	244 9.61	123 4.84	295 11.61	15 0.59	40 1.57	1.7 3.8

Dimensions in mm (inches shown below)

Mounting Components

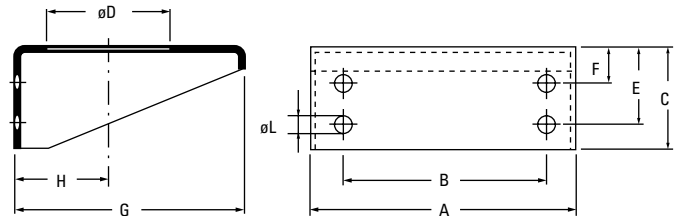
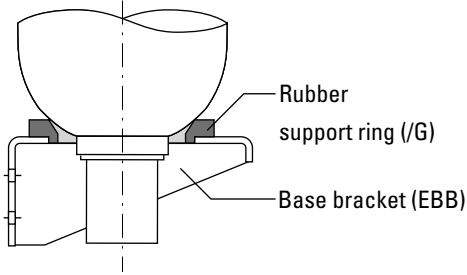
Dimensions

EBB - Eaton Base Bracket for Bladder and Piston Accumulators

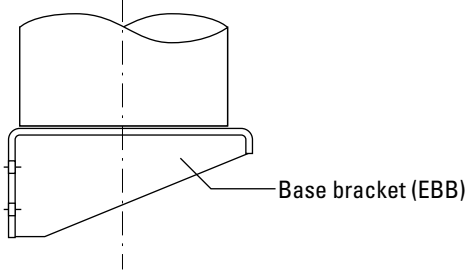
Base Bracket Model	A	B	C	ϕD	E	F	G	H	ϕL	Weight kg.(lbs)	Rubber Support Ring
EBB 167/G	260 10.24	200 7.87	100 3.94	120 4.72	75 2.95	35 1.38	225 8.86	92 3.62	14 0.55	2.6 (5.7)	G 167
EBB 222/G	260 10.24	200 7.87	100 3.94	170 6.69	75 2.95	35 1.38	225 8.86	123 4.84	14 0.55	2.4 (5.3)	G 222

Dimensions are in millimeters / inches

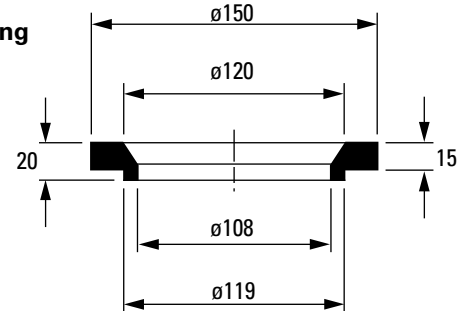
Bladder Accumulator



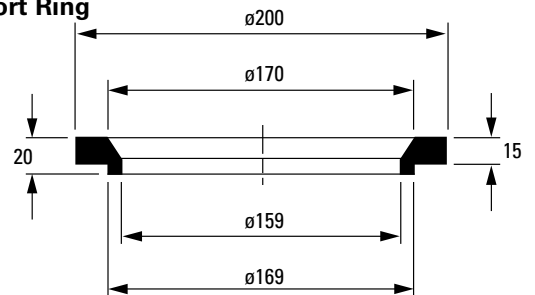
Piston Accumulator



G 167 Rubber Support Ring



G 222 Rubber Support Ring



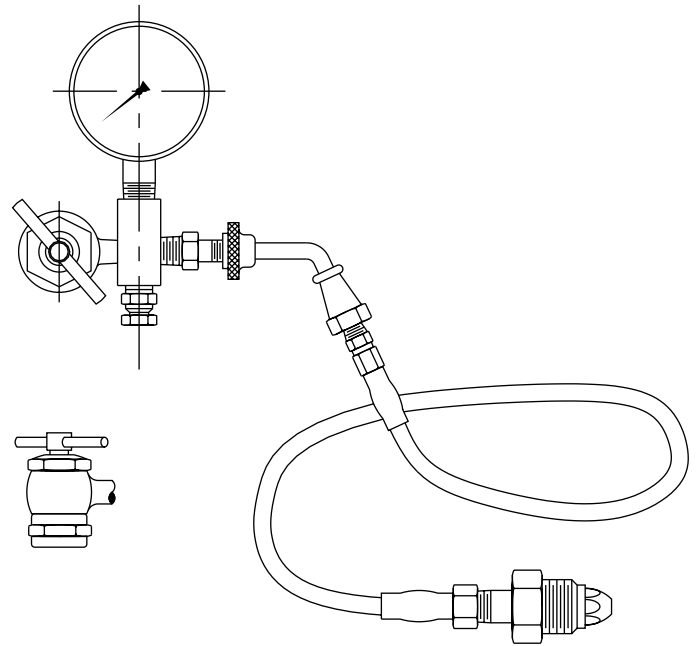
Charging & Gauging

General Information

Assembly consists of charging hose with standard right-hand thread nitrogen fittings, adapter incorporating gas valve, bleeder valve and gas chuck. Assemblies are packed in a plastic storage case. Gauge and carrying case included.

For use with nitrogen bottles having CGA 580 female shut-off valve threads.

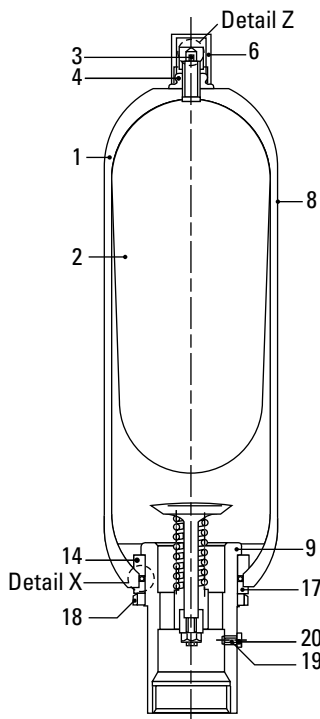
Part Number: 100AV00093A



Seal Kits & Spare Parts

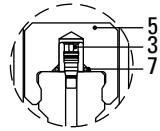
Bladder Accumulators

Bottom Repairable A2

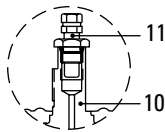


Detail Z

A2: 1 qt to 1 gal

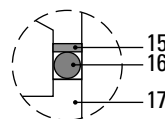


A2: 2 1/2 to 15 gal

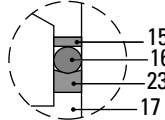


Detail X

A2 (3000psi): size 1 qt to 1 gal



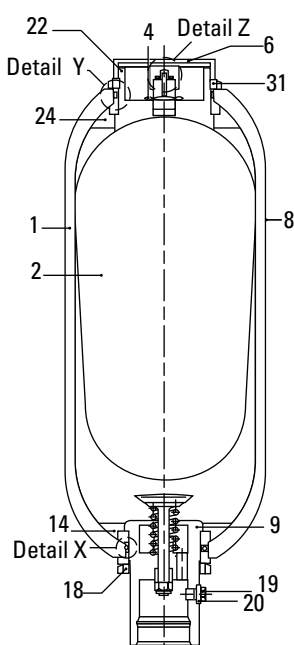
A2 (3000 & 5000psi): size 2 1/2 to 15 gal



Item Description:

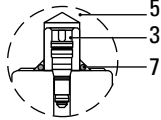
Gas Side	Fluid Side
1 Shell (not offered as spare part)	9 Fluid Port
2 Bladder	14 Anti-extrusion Ring
3 Gas Valve Core	15 Flat Ring
4 Bladder Stem Lock Nut	16 O-ring
5 Valve Seal Cap	17 Spacer Ring
6 Valve Protection Cap	18 Fluid Port Lock Nut
7 O-ring	19 Vent Screw
8 Identification Label	20 Seal Ring
10 Bladder Gas Valve Stem	23 Back-up Ring
11 Bladder Gas Valve Insert	
22 Gas Port Adapter	
24 Anti-extrusion Ring	
28 Flat Ring	
29 O-ring	
30 Back-up Ring	
31 Gas Port Lock Nut	
32 Spacer Ring	

Top Repairable A3



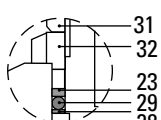
Detail Z

A3 (3000psi): size 2 1/2 to 15 gal



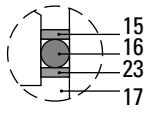
Detail Y

A3 (3000psi): size 2 1/2 to 15 gal



Detail X

A3 (3000psi): size 2 1/2 to 15 gal



A2-30 & A2-50 (1 qt to 1 gal)

Replacement Bladder consists of items:
2, 3, 5, 7, 15, 16

A2 Complete Repair Kits consist of items
2, 3, 4, 5, 6, 7, 14, 15, 16, 18

A2-30 & A2-50 (2 1/2 to 15 gal)

Replacement Bladder consists of items:
2, 15, 16, 23

A2 Complete Repair Kits consist of items
2, 4, 14, 15, 16, 18, 23

A3-30 (2 1/2 to 15 gal)

Replacement Bladder consists of items:
2, 15 (2 each), 16 (2 each), 23 (2 each)

A3 Complete Repair Kits consist of items
2, 14 (2 each), 15 (2 each), 16 (2 each), 18 (2 each), 23 (2 each)

Note: Spare parts are sold in kits only.

Seal Kits & Spare Parts

Bladder Accumulators

A2 - 30 Bottom Repairable	Description	Part Number
	BLADDER 1 QT 3000 PSI BUNA W/SEALS	100AV00063A
	BLADDER 1 GAL 3000 PSI BUNA W/SEALS	100AV00064A

A2 & A3 - 30 Bottom/Top Repairable	Description	Part Number
	BLADDER 2.5 GAL 3000 PSI BUNA W/SEALS	100AV00065A
	BLADDER 5 GAL 3000 PSI BUNA W/SEALS	100AV00066A
	BLADDER 10 GAL 3000 PSI BUNA W/SEALS	100AV00067A
	BLADDER 11 GAL 3000 PSI BUNA W/SEALS	100AV00068A
	BLADDER 15 GAL 3000 PSI BUNA W/SEALS	100AV00069A

A2 - 50 Bottom Repairable	Description	Part Number
	BLADDER 2.5 GAL 5000 PSI BUNA W/SEALS	100AV00070A
	BLADDER 5 GAL 5000 PSI BUNA W/SEALS	100AV00071A
	BLADDER 10 GAL 5000 PSI BUNA W/SEALS	100AV00072A
	BLADDER 15 GAL 5000 PSI BUNA W/SEALS	100AV00073A

A2 - 50 Bottom Repairable	Description	Part Number
	COMPLETE BLADDER R/K 1 QT 3000 PSI BUNA	100AV00074A
	COMPLETE BLADDER R/K 1 GAL 3000 PSI BUNA	100AV00075A

A2 & A3 - 30 Bottom/Top Repairable	Description	Part Number
	COMPLETE BLADDER R/K 2.5 GAL 3000 PSI BUNA	100AV00076A
	COMPLETE BLADDER R/K 5 GAL 3000 PSI BUNA	100AV00077A
	COMPLETE BLADDER R/K 10 GAL 3000 PSI BUNA	100AV00078A
	COMPLETE BLADDER R/K 11 GAL 3000 PSI BUNA	100AV00079A
	COMPLETE BLADDER R/K 15 GAL 3000 PSI BUNA	100AV00080A

A2 - 50 Bottom Repairable	Description	Part Number
	COMPLETE BLADDER R/K 2.5 GAL 5000 PSI BUNA	100AV00081A
	COMPLETE BLADDER R/K 5 GAL 5000 PSI BUNA	100AV00082A
	COMPLETE BLADDER R/K 10 GAL 5000 PSI BUNA	100AV00083A
	COMPLETE BLADDER R/K 15 GAL 5000 PSI BUNA	100AV00084A

Fluid Ports	Description	Part Number
	Replacement Fluid Port 1 quart B	100AV00085A
	Replacement Fluid Port 1 Gallon D	100AV00086A
	Replacement Fluid Port 2.5 -15 Gallon E	100AV00087A

"COMPLETE" includes: bladder, seals (O-ring, Flat ring, and Back up ring), Anti-extrusion ring, lock nuts (fluid and gas sides) valve protection cap.

"BLADDER" includes: Bladder and seals only!

For seal kits and repair kits other than Buna N, and for sizes not listed please consult factory.

Accessories

Maintenance Tools

Bladder Pull Rods

The pull rods attach to the gas valve of the bladder for ease of assembly into shell during reassembly.



Pull Rod - comes complete with fitting for EATON gas valve type, and 3 extension segments to accommodate accumulators up to 15 gallon.

Gas Valve Torque Wrench

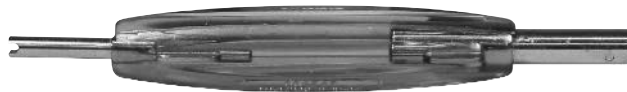
Can be used to properly torque gas valve core into place.



Gas Valve Torque Wrench

Core Tool

Can be used to remove and reinstall the valve core.



Gas Valve Core Tool

Spanner Wrench

Fits all standard size bladder accumulators. Used to remove or install lock nut on fluid port assembly.



Spanner Wrench

Data Sheet

Please read carefully and complete Section A plus the appropriate application section. By doing this you will allow us to propose the best possible solution to enhance your system performance. We suggest you photocopy this form and FAX it to us.

Company Name _____ Name _____
Address _____ City _____ State & Zip _____
Telephone _____ FAX _____

A. Product Specifications:

Maximum Working Temp. _____ °C (°F) _____
Minimum Working Temp. _____ °C (°F) _____
Maximum Working Pressure _____ bar (psi) _____
Minimum Working Pressure _____ bar (psi) _____
Internal Coating _____
External Coating _____
Shell Material _____
Bladder Material _____
Design Approval _____
Installation Location (City, Country) _____
System Fluid _____
Fluid Port Connection _____

B. Applications:

Fill out the necessary info for desired application.

1. Energy Storage:

Volume of Fluid Needed _____ l (USgal) _____
Dual Time (Charge-Discharge) _____ (sec.) _____
Maximum Ambient Temperature _____ °C (°F) _____
Minimum Ambient Temperature _____ °C (°F) _____
Work Cycle Profile (number of stages, time & pressure) _____ (Enclose drawing or graph)
Minimum Working Pressure _____ bar (psi) _____
Maximum Working Pressure _____ bar (psi) _____

2. Pulsation Dampening:

Flow Rate _____ l/min (USgpm) _____
Type of Pump (Piston, Vane, Gear, etc.) _____
Number of Elements (Pistons, Vanes, Gears, etc.) _____
Pump Speed _____ (rpm) _____
Working Temperature _____ °C (°F) _____
Working Pressure _____ bar (psi) _____
Pressure Peaks (high and low) _____ bar (psi) _____
Nominal Pipe Size _____ (inches) _____
Maximum Allowable Pressure Drop _____ bar (psi) _____
Minimum Allowable Working Pressure _____ bar (psi) _____

Please call for assistance selecting accumulators for other applications such as suction stabilizing, surge dampening, or thermal expansion.

Please return this questionnaire to Eaton by FAX or mail to the attention of Product Technical Support:

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