BLADDER & PISTON ACCUMULATORS
TRANSFER BARRIERS
GAS BOTTLES
HYDRACUSHION ACCUMULATORS

OILAIR
HYDRAULICS INC.

TABLE OF CONTENTS

LEADERSHIP THROUGH EXCELLENCE

TRADITION AND FUTURE

OilAir's Headquarters in Houston, TX

OilAir Hydraulics, Inc. has served the American Fluid Power Market since 1981. This experienced and highly motivated team was strengthened still further when in 1989, it became part of Olaer Industries S.A. The OilAir tradition of excellence and service has been enhanced by this partnership with the world market leader. Thus OilAir is now part of the most powerful hydraulic accumulator group in the world.
Customer service levels are very high, with an ability to offer a design solution to each customer's individual problems.
OilAir Hydraulics, Inc. is dedicated to providing superior customer service and excellent products. We deliver this commitment through an expenditure of 6% of turnover on Research and Development and 2% of total employment costs devoted to training.

OilAir Hydraulics, Inc. leadership through excellence.

Experience.
OilAir's management and staff have more experience designing, manufacturing and selling bladder accumulators than other domestic suppliers.

Engineering, Design and Quality Assurance.
OilAir has fully integrated the manufacture of all main components, through long term relationships with its major suppliers.

- **SACATEC is our affiliated rubber manufacturing company producing accumulator bladders primarily for the Olaer Group companies including OilAir.**
- **ROTH, wholly owned, manufactures accumulator shells.**

Final assembly, test and quality control are carried out only in its factory. This control delivers the conformance to specifications guaranteed by OilAir.

All OilAir products are produced under the strictest controls to ensure reliable, trouble-free service to customers. Beginning with carefully reviewed designs, products are continually reviewed for high performance under OilAir's agency approved Quality Assurance Program.
The main plant is a National ASME and State Agency approved manufacturer of pressure vessels and is also under constant review by other agencies.
All standard accumulators are available with most domestic and international code approvals and meet their respective rigid requirements. Most standard accumulators are available with an ASME, USCG, TUV, Lloyds or DNV code stamp. Other codes are also available.

SAFETY FEATURES

- Safety factor exceeding code requirements.
- Cannot be disassembled when pressurized.
- Pressure relief design feature.
- Factory shipped with Inert Gas(N_2).
- Complies with all applicable transportation safety codes.

TECHNICAL ADVANTAGES

- Instantaneous response time.
- High Natural frequency.
- Extensive range of elastomers.
- Predictable pre-charge control through permeation calculation.

GENERAL INFORMATION
BLADDER ACCUMULATOR

SHELL

The Shell of a Bladder accumulator is manufactered from a homogeneous, seamless tubing with one or both ends formed hemispherically by either spinning or hammering operation. Strict heat treatment and stress relieving is performed on all shells after the forging operation to ensure compliance with the required mechanical properties.

BLADDER

OilAir has developed a full range of bladders made from the most advanced elastomers capable of meeting exceptional stresses found in aeronautics and aerospace; low temperature (down to -45°F), high temperature (up to 400°F).
Other special applications, the food industry (contamination), nuclear, permeability, and for agressive or corrosive fluids.
We have developed a computer program which enables us to calculate gas permeation level of different elastomers in operation from gas into liquid. This allows us to recommend and set up a pre-charge maintenance program for our customers.

FLUID PORT ASSEMBLY

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.

FUNCTION

The design of the OilAir 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 of the volume of the shell, Fig. 1, from there the working 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, Fig. 2.

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, Fig. 3.

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 as illustrated in Fig. 2.

three lobes

Fig. 1

Fig 2

Fig 3

STATE OF THE ART TECHNOLOGY

CUSTOMER TECHNICAL SUPPORT

Whether for a standard application or design for a specific requirement, OilAir engineers have the experience and knowledge of the latest technological developments in metal shells, and thermoplastic composites used in winding metal tubes and tanks for strength and durability while reducing weight.

Utilizing our extensive applications data base, CAD/CAM, enables us to perform stress calculations by finite element analysis. Simulation software integrates all the physical phenomena to optimize accumulator sizing recommendations.

The following is a list of a few typical application calculation which are available through this system:

- Fluid Storage
- Pulsation Dampening
- Surge Control
- Suction Stabilizing
- Permeation
- Pressure Drop
- Thermal Expansion
- Noise Attenuation
- High Flow Performance

Our technical experts provide consulting services to OilAir customers for the design and application of accumulators in complex circuits.

Customer: OilAir Hyd.
Project: Sample Calc. Date: 00-00-00

Calculation Type: Discharge and Stabilization
Calculation Type: Discharge and Stabilization
Real Gas Calculation

Calculation Characteristics

P0	P1	P2	PSI
984.7	1100.0	2499.9	

Accumulator 10./3000 V0 = 10.0 Gallon
Time 10.0 SEC
Liquid Temperature 100.0 F
Starting Gas Temperature 75.0 F
Starting Gas Volume 4.16 Gallon
Flow Rate .295 Gallon/S

Results After Cycle
Final Pressure 1100.0 PSI
Final Temperature -22.0 F
Final Gas Volume 7.11 Gallon
DV Gas 2.95 Gallon

N = 1.530

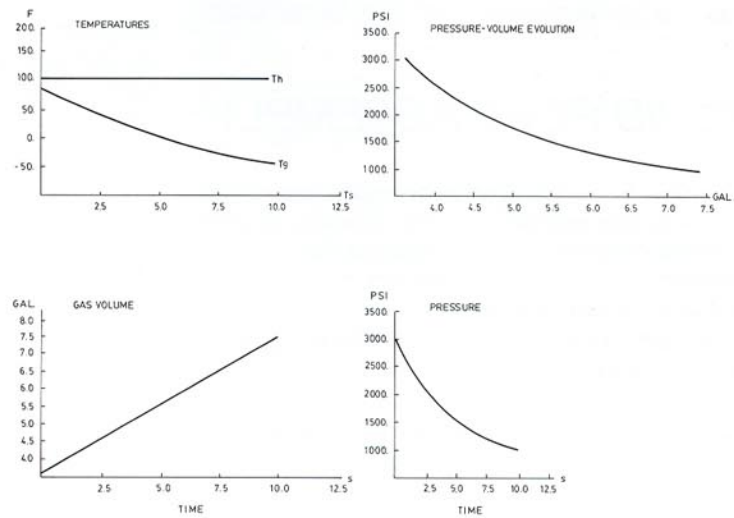
Isothermal Energy: 222.3 Kjoules
Energy Restored: 126.4 Kjoules

Results After Stabilization 120.0 SEC

Final Pressure: 1438.9 PSI
Final Temperature: 82.4 F
Final Gas Volume 7.11 Gallon
DV Gas 2.95 Gallon

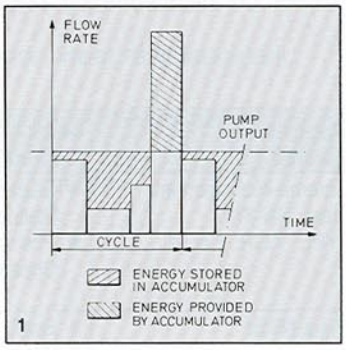
N = 1.030

Energy Restored : 144.1 Kjoules

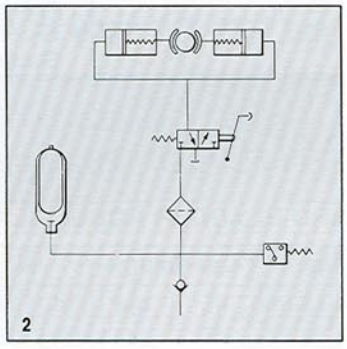


APPLICATIONS

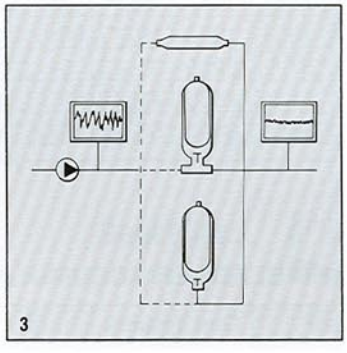
1. Reduction of Installed Power.
Using an accumulator as an energy storage device effectively reduces the required flow rate capacity of the hydraulic pump. This results in a reduction of the installed power.



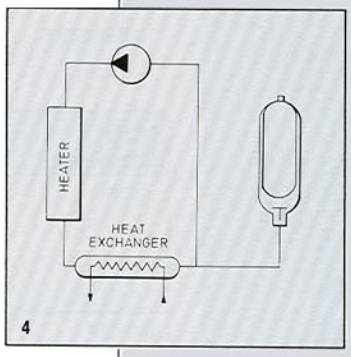
2. Emergency and Safety.
An accumulator which is kept constantly under pressure allows for instant and/or repetitive operations as required (braking, opening of door, etc.)



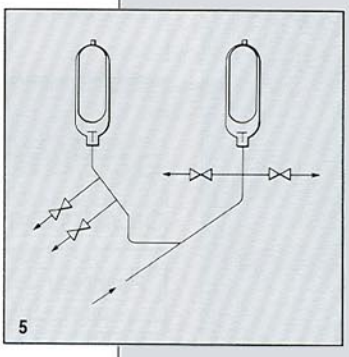
3. Dampening of Pulsation and Reduction of Noise.
In order to dampen the pressure changes, which are caused by the pulsation of a pump, an accumulator makes it possible, due to low inertia of its bladder, to improve the precision of operation and to reduce the sound level of the installation.



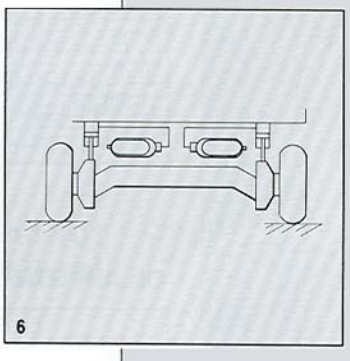
4. Thermal Expansion.
The pressure differences caused by thermal variation in a closed hydraulic circuit are absorbed by fitting an accumulator.



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.



BLADDER ACCUMULATORS

THE INDUSTRY STANDARD

- Accumulators and parts are interchangeable with accumulators produced by other manufacturers
- Accumulator cannot be disassembled under pressure.

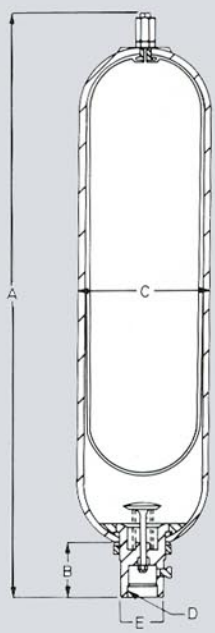
Major Component	Standard Material	Material Options*	Features
Shell	Chrome-Molybdenum Steel, SA-372 TYPE V,GR. I or II.	• Electroless-Nickel Plating 1.2 Mil. • Phenolic Resin Coating	• Meets 4:1 safety requirements. • Homogenous seamless shell. • Integral pressure relief. • Available with foreign or domestic codes.
Bladder Assembly	Buna-Nitrile	• Butyl • Hydrin • Viton • EPR • Cold Weather	• Fully enclosed bladder. • Molded steel valve stem. • Temperature range of Buna: -45° to 180° F.
Oil Port Assembly	AISI 4130	• Electroless-Nickel Plating • SA351, GR. CF8M, Stainless	• Design has over 40 years of proven reliability, • See Fluid Port options, page 16.

*Some material options are at extra cost.

SPECIFICATIONS *(U.S./Metric)*

OILAIR STANDARD BLADDER ACCUMULATOR — 3000 PSI (207 bars)

Part No.	Size		Gas Volume		A		B		C		D	E		Weight	
	Gal	Litres	In.³	cm³	In.	cm.	In.	cm.	In.	cm.	FPT*	In.	cm.	Lbs.	Kg
10CI-100-1	.04	0.17	10	151	10 1/2	26.5	1 1/2	3.9	2 1/4	5.7	3/4"	1 1/16	2.7	4	1.7
1 PT-100-1	0.13	0.6	30	492	9 3/4	24.8	2 1/8	5.4	3 1/2	9.0	3/4"	1 1/4	3.2	6	2.5
1 Qt-100-1	.25	.95	73	1196	11 1/2	29.2	2 1/8	5.4	4 1/2	11.4	1"	1 5/8	4.1	10	4.5
1-100-1	1	3.78	235	3851	17	43.1	3 1/2	8.8	6 3/4	17.1	1 1/4"	2 3/8	6.0	34	15
2.5-100-2	2.5	9.5	600	9834	21	53.3	3 1/2	8.8	9 1/16	23.0	2"	3	7.6	80	36
5-100-2	5	18.9	1203	19717	33 1/4	84.4	3 1/2	8.8	9 1/16	23.0	2"	3	7.6	120	54
10-100-2	10	37.8	2259	37025	54	137	3 1/2	8.8	9 1/16	23.0	2"	3	7.6	220	100
11-100-2	11	41.6	2535	41549	59 1/2	151	3 1/2	8.8	9 1/16	23.0	2"	3	7.6	240	109
15-100-2	15	56.7	3440	56382	77 1/2	196	3 1/2	8.8	9 1/16	23.0	2"	3	7.6	305	138



OILAIR STANDARD BLADDER ACCUMULATOR — 5000 PSI (345 bars)

Part No.	Size		Gas Volume		A		B		C		D	E		Weight	
	Gal	Litres	In.³	cm³	In.	cm.	In.	cm.	In.	cm.	FPT*	In.	cm.	Lbs.	Kg
G-2.5-5-100-2	2.5	9.5	600	9834	21 1/2	54.6	3 3/4	9.5	9 9/16	24.3	2"	3	7.6	120	54
G-5-5-100-2	5	18.9	1203	19717	33 3/4	85.7	3 3/4	9.5	9 9/16	24.3	2"	3	7.6	220	100
G-10-5-100-2	10	37.8	2259	37025	54 1/2	138	3 3/4	9.5	9 9/16	24.3	2"	3	7.6	335	152
G-15-5-100-2	15	56.7	3440	56382	78	198	3 3/4	9.5	9 9/16	24.3	2"	3	7.6	485	220

***CAUTION:** Standard manufacturing tolerances should be taken into account when designing systems.

HYDROPNEUMATIC PISTON ACCUMULATORS

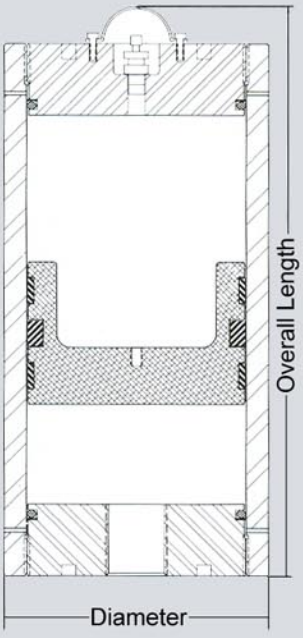
THE OPTIMUM DESIGN

- Cannot be disassembled when pressurized.
- Minimum maintenance.
- Double acting piston seal for low friction, fast response, wear resistance and operates at wide range of temperatures.
- Compact and simple design allows longer life, maximum efficiency and high performance.
- Designed to meet ASME pressure vessel code specifications with a safety factor 4:1*

*Does not carry "U" stamp

OILAIR STANDARD PISTON ACCUMULATOR 3000 PSI (207 bar)

Part No.	Nominal Volume	Overall Length (inches)	Diameter (inches)	Weight (lbs.)	Fluid Port Connection
PA4-.25-100-SA	1.0 quart	10.50	4.75	25	1 5/16-12UN
PA4-0.5-100-SA	0.5 gal	15.50	4.75	35	1 5/16-12UN
PA4-1.0-100-SA	1.0 gal	25.50	4.75	45	1 5/16-12UN
PA4-1.5-100-SA	1.5 gal	35.50	4.75	60	1 5/16-12UN
PA4-2.0-100-SA	2.0 gal	45.50	4.75	68	1 5/16-12UN
PA4-2.5-100-SA	2.5 gal	55.00	4.75	80	1 5/16-12UN
PA6-1.0-100-SB	1.0 gal	18.25	6.75	70	1 5/8-12UN
PA6-1.5-100-SB	1.5 gal	22.75	6.75	90	1 5/8-12UN
PA6-2.0-100-SB	2.0 gal	27.75	6.75	120	1 5/8-12UN
PA6-2.5-100-SB	2.5 gal	31.50	6.75	135	1 5/8-12UN
PA6-5.0-100-SB	5.0 gal	53.50	6.75	210	1 5/8-12UN
PA6-7.5-100-SB	7.5 gal	76.00	6.75	290	1 5/8-12UN
PA6-10-100-SB	10 gal	100.00	6.75	370	1 5/8-12UN



OILAIR PISTON ACCUMULATORS ARE DESIGNED TO MEET ALL STANDARD AND SPECIAL APPLICATIONS.

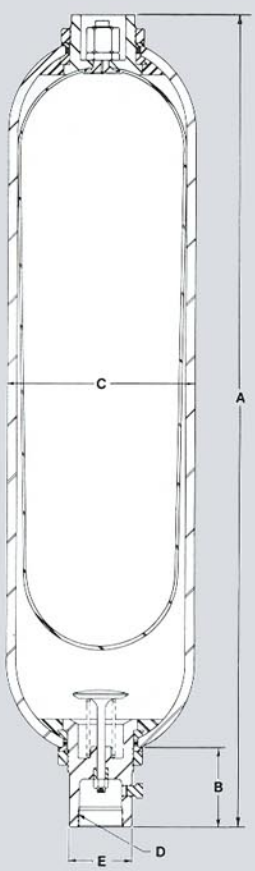
Seal Kits: **4" = PA4-101**
6" = PA6-101

MAJOR COMPONENTS AND OPTIONS:

Standard Material: Carbon Steel
Seals: Nitrile, Viton, EPR and Composite Material

AN ALTERNATE DESIGN

CONVENTIONAL STYLE TOP REPAIRABLE BLADDER ACCUMULATORS



- Can be serviced from both ends.
- Utilizes many standard bladder accumulator parts.
- Gas-end adapter mechanically locks to prevent disassembly under pressure.
- Can be serviced with or without removal from manifold or line.
- Interchangeable with similar style top repairable accumulators.
- Use P.N. (T-CG-3000) charging and gauging assembly for charging this type of accumulator.

PART FOR PART INTERCHANGEABLE WITH TOP REPAIRABLE ACCUMULATORS SUPPLIED BY OTHER MAJOR MANUFACTURERS

Major Component	Standard Material	Material Options*	Features
Shell	Chrome-Molybdenum Steel. SA-372 TYPE V, GR. I or II.	• Electroless-Nickel Plating 1.2 Mil. • Phenolic Resin Coating	• Meets 4:1 safety requirements. • Homogenous seamless shell. • Integral pressure relief. • Available with foreign or domestic codes.
Bladder Assembly	Buna-Nitrile	• Butyl • Hydrin • Viton • EPR • Cold Weather	• Fully enclosed bladder. • Molded steel valve stem. • Temperature range of Buna: -45° to 180°F.
Oil Port Assembly	AISI 4130	• Electroless-Nickel Plating • SA351, GR. CF8M Stainless	• Design has over 40 years of proven reliability. • See Fluid Port options, page 16

*Some material options are at extra cost.

SPECIFICATIONS (U.S./Metric)

OILAIR CONVENTIONAL STYLE TOP REPAIRABLE BLADDER ACCUMULATOR – 3000 PSI (207 bars)

Part No.	Size		A	B	C	D	E	Weight
	Gal.	Litre	Inches	Inches	Inches	NPT	Inches	Lbs.
T-2.5-100-2	2.5	9.5	21	3-1/2	9-1/16	2	3	80
T-5-100-2	5	18.9	33-1/4	3-1/2	9-1/16	2	3	120
T-10-100-2	10	37.8	54	3-1/2	9-1/16	2	3	220
T-11-100-2	11	41.6	59-1/2	3-1/2	9-1/16	2	3	240
T-15-100-2	15	56.7	77-1/2	3-1/2	9-1/16	2	3	305

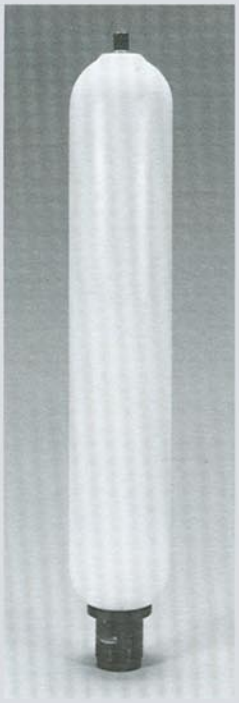
OILAIR CONVENTIONAL STYLE TOP REPAIRABLE BLADDER ACCUMULATOR – 5000 PSI (345 bars)

Part No.	Size		A	B	C	D	E	Weight
	Gal.	Litre	Inches	Inches	Inches	NPT	Inches	Lbs.
T-2.5-5-100-2	2.5	9.5	21-1/2	16	9-9/16	2	3	120
T-5-5-100-2	5	18.9	33-3/4	28-1/4	9-9/16	2	3	220
T-10-5-100-2	10	37.8	54-1/2	49	9-9/16	2	3	335
T-11-5-100-2	11	41.6	60	54-1/2	9-9/16	2	3	395
T-15-5-100-2	15	56.7	78	72-1/2	9-9/16	2	3	485

MAJOR COMPONENTS See components and options for standard accumulators (Pages 16)
AND OPTIONS: Gas-End-Adapter – Part No. T-11-208

HIGH FLOW BLADDER ACCUMULATORS

- For systems requiring faster response.
- Accumulator and parts are interchangeable with accumulators produced by other major manufacturers.
- Accumulator cannot be disassembled under pressure.

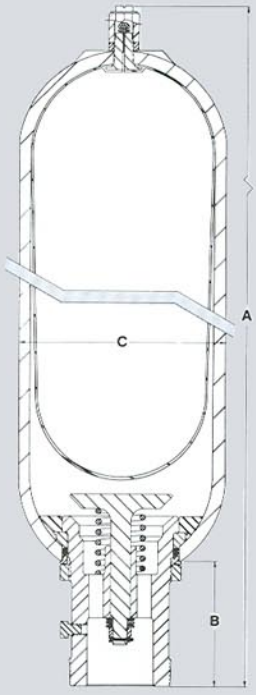


FOR SYSTEMS SUBJECT TO HIGH CHARGING AND DISCHARGING FLOW RATES

Major Component	Standard Material	Material Options*	Features
Shell	Chrome-Molybdenum Steel. SA-372 TYPE V, GR. I or II.	• Electroless-Nickel Plating 1.2 Mil. • Phenolic Resin Coating	• Meets 4:1 safety requirements. • Homogenous seamless shell. • Integral pressure relief.
Bladder Assembly	Buna-Nitrile	• Butyl • Hydrin • Viton • EPR • Cold Weather	• Fully enclosed bladder. • Molded Steel valve stem. • Temperature range of Buna: -45° to 180°F.
Oil Port Assembly	AISI 4130	• Electroless-Nickel Plating • SA351, GR. CF8M, Stainless	• Design has over 40 years of proven reliability. • Up to 600 GPM flow rate

* Some material options are at extra cost.

SPECIFICATIONS (U.S./Metric)



OILAIR HIGH FLOW BLADDER ACCUMULATORS—3000 PSI (207 bars)

Part No.	Size		Gas Volume		A		B		C		Weight	
	Gal.	Litres	In.³	cm³	In.	cm.	In.	cm.	In.	cm.	Lbs.	Kg.
H-2.5-100-2	2.5	9.5	600	9,834	22½	57.1	5⅜	13.6	9 1/16	23.0	80	36
H-5-100-2	5	18.9	1,203	19,717	34¾	88.3	5⅜	13.6	9 1/16	23.0	120	54
H-10-100-2	10	37.8	2,259	37,025	55½	141.0	5⅜	13.6	9 1/16	23.0	220	100
H-11-100-2	11	41.6	2,535	41,549	61.0	155.0	5⅜	13.6	9 1/16	23.0	240	109
H-15-100-2	15	56.7	3,440	56,382	79.0	200.6	5⅜	13.6	9 1/16	23.0	305	138

***CAUTION:** Standard manufacturing tolerances should be taken into account when designing systems.

MAJOR COMPONENTS AND OPTIONS:

Bladders—See standard accumulator options (Page 16).
Fluid Port—Part No. H-11-400-2 (4″-8 MPT), Part No. H-11-400-3 (4¼″-8 UN-2 SAE).

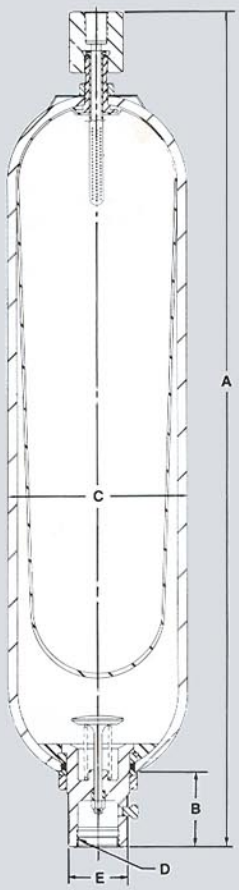
ULTIMATE SEPARATOR

HIGH PRESSURE DIFFERENTIAL

TRANSFER BARRIER ACCUMULATORS

Major Component	Standard Material	Material Options*	Features
Shell	Chrome-Molybdenum Steel. SA-372 TYPE V, GR. I or II.	• Electroless-Nickel Plating 1.2 Mil. • Phenolic Resin Coating	• Meets 4:1 safety requirements. • Homogenous seamless shell. • Integral pressure relief. • Available with foreign or domestic codes.
Bladder Assembly	Buna-Nitrile	• Butyl • Hydrin • Viton • EPR • Cold Weather	• Fully enclosed bladder. • Molded steel valve stem. • Temperature range of Buna: -45° to 180°F.
Oil Port Assembly	AISI 4130	• Electroless-Nickel Plating • SA351, GR. CF8M Stainless	• Design has over 40 years of proven reliability. • See Fluid Port Options, page 16.
Air Tube Assembly	304 Stainless	None	• Available in 4½", 5½", 6½" length.
Air Valve Adapter	AISI 4130	• Electroless-Nickel Plating	• Available with ¼" to 1¼" • FPT or SAE.

*Some material options are at extra cost.



SPECIFICATIONS *(U.S./Metric)*

OILAIR TRANSFER BARRIER ACCUMULATOR-3000 PSI (207 bars)

Part No.	Size		Gas Volume		A		B		C		D	E		Weight	
	Gal.	Litre	In.³	cm³	In.	cm.	In.	cm.	In.	cm.	FPT*	In.	Cm.	Lbs.	Kg.
TB-2.5-100-2	2.5	9.5	600	9,834	21½	54.6	3½	8.8	9 1/16	23.0	2"	3	7.6	80	36
TB-5-100-2	5	18.9	1,203	19,717	33¾	85.7	3½	8.8	9 1/16	23.0	2"	3	7.6	120	54
TB-10-100-2	10	37.8	2,259	37,025	54½	137.8	3½	8.8	9 1/16	23.0	2"	3	7.6	220	100
TB-11-100-2	11	41.6	2,535	41,549	60	152.4	3½	8.8	9 1/16	23.0	2"	3	7.6	240	109
TB-15-100-2	15	56.7	3,440	56,382	78	198.1	3½	8.8	9 1/16	23.0	2"	3	7.6	305	138

OILAIR TRANSFER BARRIER ACCUMULATOR-5000 PSI (345 bars)

Part No.	Size		Gas Volume		A		B		C		D	E		Weight	
	Gal.	Litre	In.³	cm³	In.	cm.	In.	cm.	In.	cm.	FPT*	In.	Cm.	Lbs.	Kg
GTB-2.5-5-100-2	2.5	9.5	600	9,834	22	55.9	3¾	9.5	9 9/16	24.3	2"	3	7.6	120	54
GTB-5-5-100-2	5	18.9	1,203	19,717	34½	87.0	3¾	9.5	9 9/16	24.3	2"	3	7.6	220	100
GTB-10-5-100-2	10	37.8	2,259	37,025	55	139.7	3¾	9.5	9 9/16	24.3	2"	3	7.6	335	152
GTB-15-5-100-2	15	56.7	3,440	56,382	79	199.4	3¾	9.5	9 9/16	24.3	2"	3	7.6	485	220

***CAUTION:** Standard manufacturing tolerances should be taken into account when designing systems.

AIR SIDE COMPONENTS

Adapter, Part No. 11-312-TB
2½ Gallon Tube, Part No. 11-311-TB-A
5, 10 Gallon Tube, Part No. 11-311-TB-B
11,15 Gallon Tube, Part No. 11-311-TB-C
Seal Kit, Part No. 11-313-TB

BLADDERS

2½ Gallon, Part No. TB-2.5-300
5 Gallon, Part No. TB-5-300
10 Gallon, Part No. TB-10-300
11 Gallon, Part No. TB-11-300
15 Gallon, Part No. TB-15-300

NOTE: Consult Factory for Pressure Differential Applications.

GAS BOTTLES

HIGH PRESSURE GAS CAPACITOR

- Gas bottle cannot be disassembled under pressure.
- Variety of air valve adapters available.
- Variety of Ports available.
- Can be used in conjunction with transfer barrier accumulator.

DESIGNED TO EXTEND THE OPERATING RANGE OF ACCUMULATOR SYSTEMS.

Major Component	Standard Material	Material Options*	Features
Shell	Chrome-Molybdenum Steel. SA-372 TYPE V, GR. I or II.	• Electroless-Nickel Plating 1.2 Mil. • Phenolic Resin Coating	• Meets 4:1 safety requirements. • Homogenous seamless shell. • Integral pressure relief. • Available with foreign or domestic codes.
Port Assembly	AISI 4130	• Electroless-Nickel Plating • SA351, GR. CF8M Stainless	• Design has over 40 years of proven reliability.

*Some material options are at extra cost.

SPECIFICATIONS (U.S./Metric)

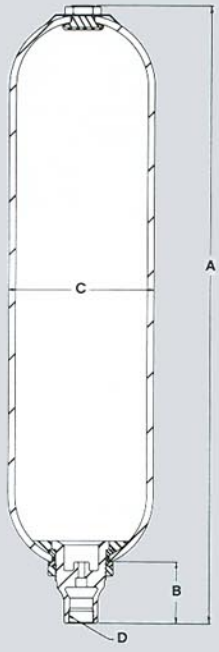
OILAIR GAS BOTTLES—3000 PSI (207 bars)

Part No.	Size		Gas Volume		A		B		C		D	Weight	
	Gal.	Litres	In.³	cm³	In.	cm.	In.	cm.	In.	cm.	FPT**	Lbs.	Kg.
GB-1Qt.-100-1	.25	.95	73	1,196	11¼	29.8	2⅛	5.4	4½	11.4	1″	10	4.5
GB-1-100-1	1	3.7	235	3,851	17	43.1	3.5	8.8	6¾	17.1	1¼″	34	15
GB-2.5-100-1	2.5	9.5	600	9,834	21	53.3	3.5	8.8	9 1/16	23.0	1¼″	80	36
GB-5-100-1	5	18.9	1,203	19,717	33¼	84.4	3.5	8.8	9 1/16	23.0	1¼″	120	54
GB-10-100-1	10	37.8	2,259	37,025	54	137.0	3.5	8.8	9 1/16	23.0	1¼″	220	100
GB-11-100-1	11	41.6	2,535	41,549	59½	151.0	3.5	8.8	9 1/16	23.0	1¼″	240	109
GB-15-100-1	15	56.7	3,440	56,382	77½	196.0	3.5	8.8	9 1/16	23.0	1¼″	305	138

OILAIR GAS BOTTLES—5000 PSI (345 bars)

Part No.	Size		Gas Volume		A		B		C		D	Weight	
	Gal.	Litres	In.³	cm³	In.	cm.	In.	cm.	In.	cm.	FPT**	Lbs.	Kg
GGB-2.5-5-100-2	2.5	9.5	600	9,834	21	53.0	3¾	9.5	9 9/16	24.3	2″	120	54
GGB-5-5-100-2	5	18.9	1,203	19,717	33¾	85.7	3¾	9.5	9 9/16	24.3	2″	220	100
GGB-10-5-100-2	10	37.8	2,259	37,025	54½	138.0	3¾	9.5	9 9/16	24.3	2″	335	152
GGB-15-5-100-2	15	56.7	3,440	56,382	78	198.0	3¾	9.5	9 9/16	24.3	2″	485	220

***CAUTION:** Standard manufacturing tolerances should be taken into account when designing systems.



MAJOR COMPONENTS AND OPTIONS:

****Ports**—See standard accumulator Oil Port options on page 16.
(Other options available)

Plug Body for 3000# units	1-15 Gallon	Part No. GB-11-302
Plug Body for 3000# units	1 Quart	Part No. GB 1 qt.-302
Plug Body for 5000# units	2½-15 Gallon	Part No. GGB-11-5-302

(Other options available)

SURGE ARRESTORS

- Accumulator and parts are interchangeable with accumulators produced by other major manufacturers.
- Cannot be disassembled under pressure.
- Can also be used as low pressure accumulator.

DESIGNED TO CONTROL SURGE AND WATER HAMMER

Major Component	Standard Material	Material Options*	Features
Shell	Carbon Steel	• Electroless-Nickel Plating 1.2 Mil. • Phenolic Resin Coating • Stainless Steel	• Meets 4:1 safety requirements. • 25, 40, 80, 100, 120 Gallon sizes are top repairable.
Bladder Assembly	Buna-Nitrile	• Butyl • Hydrin • Viton • EPR • Cold Weather	• Fully Enclosed bladder. • Molded Steel valve stem. • Temperature range of Buna-N: -45° to 180°F.
Port Assembly	ANSI Specifications	• Electroless-Nickel Plating • SA182, GR. F304, Stainless	• See Specification C below.

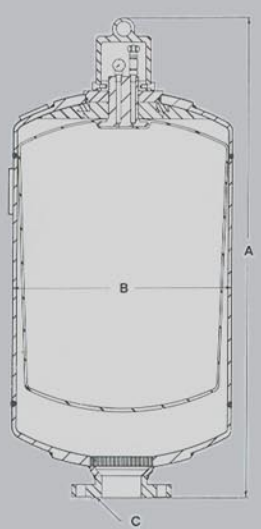
*Some material options are at extra cost.

SPECIFICATIONS (U.S./Metric)

OILAIR SURGE ARRESTOR—275 PSI (19 bars)

Part No.	Size		Gas Volume		A		B		C	Weight	
	Gal.	Litres	In.³	cm³	In.	cm.	In.	cm.	ANSI Flange	Lbs.	Kg.
S-2.5-100	2.5	9.5	580	9,505	16⅞	42.8	8¼	20.9	3″-150#	30	13.6
S-5-100	5	18.9	1,164	19,078	28⅞	73.3	8¼	20.9	3″-150#	42	19.1
S-10-100	10	37.8	2,310	37,867	50⅜	128.5	8¼	20.9	3″-150#	68	30.8

OILAIR SURGE ARRESTOR—500 PSI (34.5 bars)
(SPECIAL ORDER ITEM)



Part No.	Size		Gas Volume		A		B		C	Weight	
	Gal.	Litres	In.³	cm³	In.	cm.	In.	cm.	ANSI Flange	Lbs.	Kg.
S-25-5-100	25	94.6	5,780	94,734	35 9/16	90.3	22	55.8	4″-300#	310	140.6
S-40-5-100	40	151.4	9,240	151,444	43 5/16	110.0	22	55.8	4″-300#	368	167.0
S-80-5-100	80	302.8	18,480	302,887	64¼	163.2	22	55.8	4″-300#	650	294.8
S-100-5-100	100	378.5	23,100	378,609	83 13/16	215.4	22	55.8	4″-300#	875	397.0
S-120-5-100	120	454.2	27,720	454,331	101 5/16	257.3	22	55.8	4″-300#	1,000	453.6

***CAUTION:** Standard manufacturing tolerances should be taken into account when designing systems.

MAJOR COMPONENTS AND OPTIONS PARTS LIST

Component/Size	All 275 PSI	Size & Part No.				
		25 Gallon	40 Gallon	80 Gallon	100 Gallon	120 Gallon
Bladder Assembly-Buna	See 3000# Standard Accumulator Bladders on Page 16	S-25-5-300	S-40-5-300	S-80-5-300	S-100-5-300	S-120-5-300
Bladder Assembly-Butyl		S-25-5-300-B	S-40-5-300-B	S-80-5-300-B	S-100-5-300-B	S-120-5-300-B
Bladder Assembly-EPR		S-25-5-300-E	S-40-5-300-E	S-80-5-300-E	S-100-5-300-E	S-120-5-300-E
Bladder Assembly-Viton		S-25-5-300-V	S-40-5-300-V	S-80-5-300-V	S-100-5-300-V	S-120-5-300-V

HYDRACUSHION ACCUMULATOR

ECONOMICAL DESIGN

The OilAir Hydracushion is a non-repairable accumulator which has been especially designed for high quantity, economical applications where it is more practical to replace the unit rather than have it refurbished.

SPECIAL FEATURES

- Compact, lightweight, simple construction.
- Permanently sealed for maintenance-free operation.
- Quick, easy installation and replacement.
- Long service life.

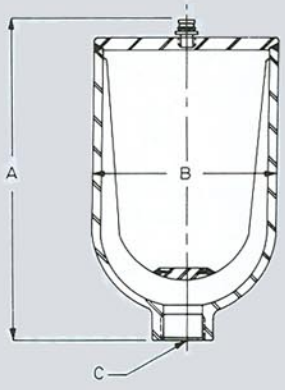
OILAIR HYDRACUSHION ACCUMULATOR—2000 PSI (138 bars)

Part No.	Size	Dim'n. 'A'		Dim'n. 'B'		Dim'n. 'C'		Weight	
	Cu. In.	In.	mm	In.	mm	FPT	SAE	lbs.	Kg.
FC-30-100-1	30	8¾	210	3¾	95	½	¾	7.0	3.2
FC-60-100-1	60	10¼	222	4⅝	117	½	¾	14.0	6.4
FC-120-100-1	120	12¾	284	5¾	146	1	1 5/16	24.0	10.9
FC-230-100-1	230	15¼	358	7.0	178	1	1 5/16	49.0	22.2

***CAUTION:** For vertical installation only, as pictured.

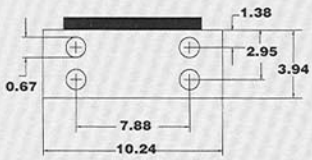
APPLICATIONS

- Agriculture Equipment
- Braking Systems
- Construction Equipment
- Controlling "float" on long boom vehicles
- Car Wash Systems
- Fuel Lines
- Fail-safe hydraulic systems
- Lift Trucks
- Machine Tools
- Railway Equipment
- Steering
- Tensioning
- Tripping and resetting plows, tillers
- Water Systems

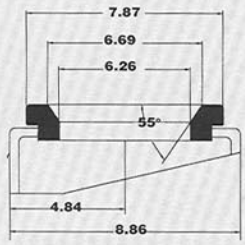


If you wish us to recommend the accumulator best suited for your application, please furnish us the following data, noting any special features:

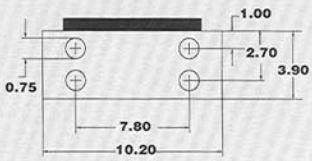
Application
Type of fluid
System Pressures
Temperatures
Flow Requirements
Corrosive Environment
Package Envelope Dimensions
Weight Importance
Quantity



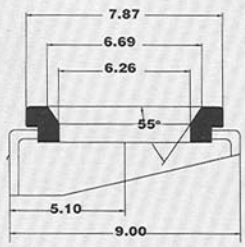
MOUNTING SADDLE 2.5 - 15 GAL
3000 PSI



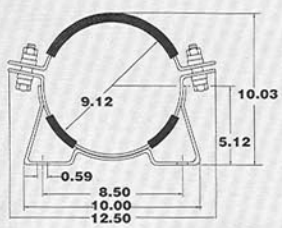
P-N 2.5-531
MOUNTING SADDLE 2.5 - 15 GAL
3000 PSI



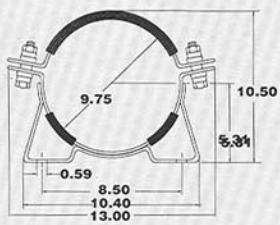
MOUNTING SADDLE 2.5 - 15 GAL
5000 PSI



P-N 2.5-5-531
MOUNTING SADDLE 2.5 - 15 GAL
5000 PSI



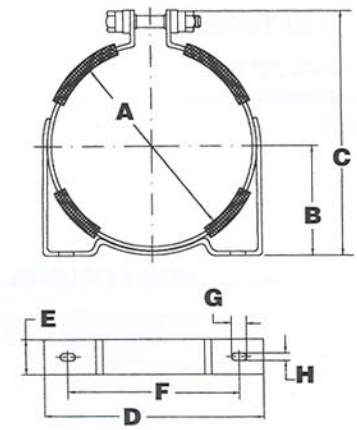
P-N 2.5-530
MOUNTING BRACKET 2.5 - 15 GAL
3000 PSI



P-N 2.5-5-530
MOUNTING BRACKET 2.5 - 15 GAL
5000 PSI

ACCESSORIES

- Can be used with all types of accumulators (Bladder, Piston, Diaphragm).
- Secure design provides independent mounting on installations.
- Galvanized to resist corrosion.
- Rubber insert provided to reduce mechanical vibration, and to compensate for shell manufacturing tolerances.
- Use one Bracket for sizes 1 Qt. thru.5 Gal. and two brackets for sizes 10 thru.15 Gal.
- Use one Saddle for sizes 1 Gal. and up.
- Use Mounting Brackets and Saddles for Vertical installations only.



STANDARD MOUNTING BRACKET

STANDARD BRACKET DIMENSIONS

Part No.	A	B	C	D	E	F	G	H
1QT-530	4.49	2.78	6.5	5.35	1.25	3.94	.5	.38
1-530	6.75	4.06	9.0	7.8	1.25	6.4	.70	.38

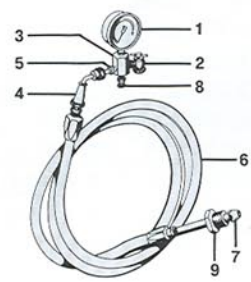
1QT-530 for 1 Quart Accumulators
1-530 for 1 Gallon Accumulators

CHARGING AND GAUGING ASSEMBLY

Part Number	Description
CG-3000 CG-5000	*Charging and Gauging Assembly* consists of 10′ charging hose with standard right-hand thread nitrogen fitting.
CG-3014 CG-5014	*Head Assembly* consisting of adaptor incorporating tank valve, bleeder valve and air chuck (less gauge).
CG-3013 CG-5013	*Gauging and Head Assembly* consisting of head assembly plus gauge.

CHARGING AND GAUGING PARTS LIST

Description	Part No.	Description	Part No.
1-Gauge 3000#	CG-3001	6-Hose	CG-3007
2-Air Chuck	CG-3002	7-Gland	CG-3008
3-Adaptor	CG-3003	8-Bleeder Valve	CG-3009
4-Swivel Connection	CG-3004	9-Nut	CG-3011
5-Tank Valve	CG-3005		



ACCUMULATOR MAINTENANCE TOOLS

Bladder Pull Rods - (Bladder Type Accumulator) Pull rods are available in different lengths for different size accumulators. The pull rods attach to the gas valve of the bladder for ease of assembly into shell during reassembly. Item A.

Core Repair Tool - The core repair tool is used to remove and reinstall the valve core. It is also used to chase gas valve threads. Item B.

Core Tool - Can be used to remove and reinstall the valve core. Item D.

Spanner Wrench - Fits all standard size bladder accumulators. Used to remove or install lock nut on fluid port assembly. Item C.

E.Z. Out - Is used to remove broken valve core out of the valve stem. Item E.

HOW TO ORDER: SELECT THE FEATURES DESIRED AND PLACE IN PROPER SEQUENCE

Type	Size	Pressure	Designation	Fluid Port Size	Bladder Compound	Service

EXAMPLE: B 5 5 100 2 V W

Description	Symbol
TYPE	
Standard	Blank
High flow	H
High flow conv. Top Repairable	HC
Gas Bottle	GB
Surge Arrestor	S
Conventional Top Repairable	T
Transfer Barrier	TB
Hydracushion	FC
5000 PSI 2" Stem	G

Description	Symbol
PRESSURE	
3000 PSI	Blank
3300 PSI	3.3
5000 PSI	5
Surge Arrestors 275 PSI 500 PSI	Blank 5
For Hydracushion 2000 PSI	Blank

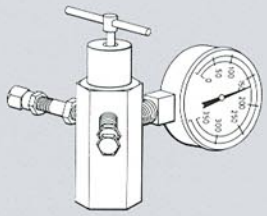
Description	Symbol
SIZE	
10 in	10 CI
1 Pint	1 Pt
1 Quart	1 Qt
1 Gal.	1
2.5 Gal.	2.5
5 Gal.	5
10 Gal.	10
11 Gal.	11
15 Gal.	15
For Hydracushion 1 Pint 1 Quart 120 cu. in. 1 Gal.	30 60 120 230

Description	Symbol
FLUID PORT	
NPT 1/2", 3/4", 1", 1-1/4"	1
NPT 2", 3", 4"	2
SAE w/ NPT Bleeder	3
SAE w/SAE Bleeder	6
Split Flange 3000 PSI	61
Split Flange 5000 PSI	62
Special	SPC
Standard for that type	Blank
British Pipe Thread	BSP

Description	Symbol
DESIGNATION	
Accumulators	100
Shells	200
Bladders	300
Fluid Ports	400
Accessories	500

Description	Symbol
SERVICE	
Oil	Blank
Water Service	W
Special	SPC
Stainless Steel	S

Description	Symbol
BLADDER COMPOUND	
Buna-N	Blank
Butyl	B
Ethylene Propylene	E
Viton	V
Cold Weather	C
Hydrin	H



T-CG-3013

D
11-501

B
R-302

E
R-301

A
11-503-1

C
11-502

MAJOR COMPONENTS FOR BLADDER ACCUMULATORS

OPTIONS FOR 3,000 PSI ACCUMULATORS

STANDARD ACCUMULATORS*

	Size	Size & Part No.								
		10 Cu. In.	1 Pint	1 Quart	1 Gallon	2-1/2 Gallon	5 Gallon	10 Gallon	11 Gallon	15 Gallon
Complete Assembly	NPT Port	10CI-100-1	1Pt-100-1	1Qt-100-1	1-100-1	2.5-100-2	5-100-2	10-100-2	11-100-2	15-100-2
	SAE Port	10CI-100-3	1Pt-100-3	1Qt-100-3	1-100-6	2.5-100-6	5-100-6	10-100-6	11-100-6	15-100-6
	Water Service	10CI-100-1-W	1Pt-100-1-W	1Qt-100-1-W	1-100-1-W	2.5-100-2-W	5-100-2-W	10-100-2-W	11-100-2-W	15-100-2-W
	Butyl	10CI-100-1-B	1Pt-100-1-B	1Qt-100-1-B	1-100-1-B	2.5-100-2-B	5-100-2-B	10-100-2-B	11-100-2-B	15-100-2-B
	EPR	10CI-100-1-E	1Pt-100-1-E	1Qt-100-1-E	1-100-1-E	2.5-100-2-E	5-100-2-E	10-100-2-E	11-100-2-E	15-100-2-E
	Viton	10CI-100-1-V	1Pt-100-1-V	1Qt-100-1-V	1-100-1-V	2.5-100-2-V	5-100-2-V	10-100-2-V	11-100-2-V	15-100-2-V
	Cold Weather	10CI-100-1-C	1Pt-100-1-C	1Qt-100-1-C	1-100-1-C	2.5-100-2-C	5-100-2-C	10-100-2-C	11-100-2-C	15-100-2-C
	Split Flange	N/A	N/A	N/A	1-100-61	2.5-100-61	5-100-61	10-100-61	11-100-61	15-100-61

BLADDERS*

	Size	Size & Part No.								
		10 Cu. In.	1 Pint	1 Quart	1 Gallon	2-1/2 Gallon	5 Gallon	10 Gallon	11 Gallon	15 Gallon
Bladder Assembly	Buna-N	A10CI-300	A1Pt-300	A1Qt-300	A1-300	A2.5-2-300	A5-2-300	A10-2-300	A11-2-300	A15-2-300
	Butyl	A10CI-300-B	A1Pt-300-B	A1Qt-300-B	A1-300-B	A2.5-2-300-B	A5-2-300-B	A10-2-300-B	A11-2-300-B	A15-2-300-B
	EPR	A10CI-300-E	A1Pt-300-E	A1Qt-300-E	A1-300-E	A2.5-2-300-E	A5-2-300-E	A10-2-300-E	A11-2-300-E	A15-2-300-E
	Viton	A10CI-300-V	A1Pt-300-V	A1Qt-300-V	A1-300-V	A2.5-2-300-V	A5-2-300-V	A10-2-300-V	A11-2-300-V	A15-2-300-V
	Cold Weather	A10CI-300-C	A1Pt-300-C	A1Qt-300-C	A1-300-C	A2.5-2-300-C	A5-2-300-C	A10-2-300-C	A11-2-300-C	A15-2-300-C

FLUID PORT ASSEMBLIES*

	Size	Size & Part No.								
		10 Cu. In.	1 Pint	1 Quart	1 Gallon	2-1/2 Gallon	5 Gallon	10 Gallon	11 Gallon	15 Gallon
Fluid Port Assembly	NPT	10CI-400-1	1Pt-400-1	1Qt-400-1	1-400-1	11-400-2	11-400-2	11-400-2	11-400-2	11-400-2
	SAE	10CI-400-3	1Pt-400-3	1Qt-400-3	1-400-6	11-400-6	11-400-6	11-400-6	11-400-6	11-400-6
	1-1/4' NPT	N/A	N/A	N/A	1-400-1	11-400-1	11-400-1	11-400-1	11-400-1	11-400-1
	Split Flange	N/A	N/A	N/A	1-400-SPF	11-400-61	11-400-61	11-400-61	11-400-61	11-400-61
	NPT Water SVC	10CI-400-1-W	1Pt-400-1-W	1Qt-400-1-W	1-400-1-W	11-400-2-W	11-400-2-W	11-400-2-W	11-400-2-W	11-400-2-W

Fluid Port Specifications (Internal Threads)	10 Cu. In. Accumulators	1 Pint Accumulators	1 Quart Accumulators	1 Gallon Accumulators	2.5 to 15 Gallon Accumulators
	-1 3/4 - 14 NPT	-1 3/4 - 14 NPT	-1 1" - 11 1/2 NPT**	-1 1 1/4" - 11 1/2 NPT**	-1 1 1/4" - 11 1/2 NPT*
	-3 3/4 - 16 SAE	-3 1 1/16-12 SAE	-3 1 5/16" - 12 SAE	-6 1 5/8" - 12 SAE	-2 2" - 11 1/2" NPT **
					-6 1 7/8" - 12 SAE
	N/A	N/A	N/A	61 1 1/4" CODE 61	61 2" CODE 61 (3000 PSI)
	N/A	N/A	N/A	61 N/A	62 1 1/2" CODE 62 (5000 PSI)

*Other styles and combinations available. Some options are at extra cost. ** Standard

QUESTIONNAIRE

Please read carefully and complete the following questionnaire. By doing this you will allow us to propose the best possible solution to enhance your system performance. We suggest you photocopy the form, and FAX it to us.

Company Name _____ Name _____

Address _____

Telephone _____ Fax _____

A. GENERAL CHARACTERISTICS:

Product Specifications:

- Internal Coating ..... _____
- External Coating ..... _____
- Shell Material ..... _____
- Bladder Material ..... _____

Design Approval ..... _____
Ultimate Installation Location (City, Country) ..... _____
System Fluid ..... _____
Maximum Working Temperature ..... (^{0}F) _____
Minimum Working Temperature ..... (^{0}F) _____
Maximum Working Pressure ..... (PSI) _____
Minimum Working Pressure ..... (PSI) _____
Fluid Port Connection ..... _____

B. APPLICATIONS:

1) Energy Storage:

Volume of Fluid Needed ..... (GAL) _____
Dual Time (Charge-Discharge) ..... (SEC) _____
Maximum Ambient Temperature ..... (^{0}F) _____
Minimum Ambient Temperature ..... (^{0}F) _____
Work Cycle Profile (number of stages, time and pressure) ..... (Enclose Drawing or Graph)
Minimum Working pressure ..... (PSI) _____
Maximum Working Pressure ..... (PSI) _____

2) Pulsation Dampening:

Flow Rate ..... (GPM) _____
Type of Pump (Piston, Gear, Etc) ..... _____
Number of Elements (Pistons, Gears, Etc) ..... _____
Pump Speed ..... (RPM) _____
Working Temperature ..... (^{0}F) _____
Working Pressure ..... (PSI) _____
Pressure Peaks (High and Low) ..... (PSI) _____
Nominal Pipe Size ..... (INCHES) _____
Maximum Allowable Pressure Drop ..... (PSI) _____
Minimum Allowable Working Pressure ..... (PSI) _____

Continued on next page

3) Suction Stabilizing:

Flow Rate ..... (GPM) _____
Type of Pump (Piston, Gear, Etc) ..... _____
Number of Elements (Pistons, Gears, Etc) ..... _____
Pump Speed ..... (RPM) _____
Working Temperature ..... (^{0}F) _____
Working Pressure ..... (PSI) _____
Nominal Pipe Size ..... (INCHES) _____
Minimum Allowable Working Pressure ..... (PSI) _____

If Possible (Applicable to Both Sections 2 and 3)
Minimum Pump Frequency ..... (HZ) _____
Maximum Pump Frequency ..... (HZ) _____
The Band Width Which the Accumulator is Attenuating Above 20 db ..... _____

4) Surge Dampening:

Valve Opening * ..... _____
Time of Operation ..... (SEC) _____
Valve Closing * ..... _____
(If Possible Enclose the Schematic of Valve Closure Sequence.)
Pump Start-up Time ..... (SEC)* _____
Pump Shut-off Time ..... (SEC)* _____
(If Possible Enclose the Schematic of the Pump Start-up/Shut-off Sequence.)

Pipe Characteristics:

Nominal Internal Diameter ..... (INCHES) _____
Pipe Thickness ..... (INCHES) _____
Pipe Length ..... (FEET) _____
Pipe Material ..... _____
Maximum Allowable Pressure for Pipe ..... (PSI) _____

Hydraulic Characteristics:

Pressure at the Pump*/Valve* ..... (PSI) _____
At Maximum Flow Rate ..... (PSI) _____
At 0 Flow Rate ..... (PSI) _____
Flow Rate ..... (GPM) _____
Maximum Allowable Working Pressure ..... (PSI) _____
Minimum Allowable Working Pressure ..... (PSI) _____
(Supply the Schematic of the Piping in the System)

* Delete When Not Applicable

5) Thermal Expansion:

Total System Volume ..... (GAL) _____
System Fluid ..... _____
Fluid Thermal Expansion Coefficient ..... _____

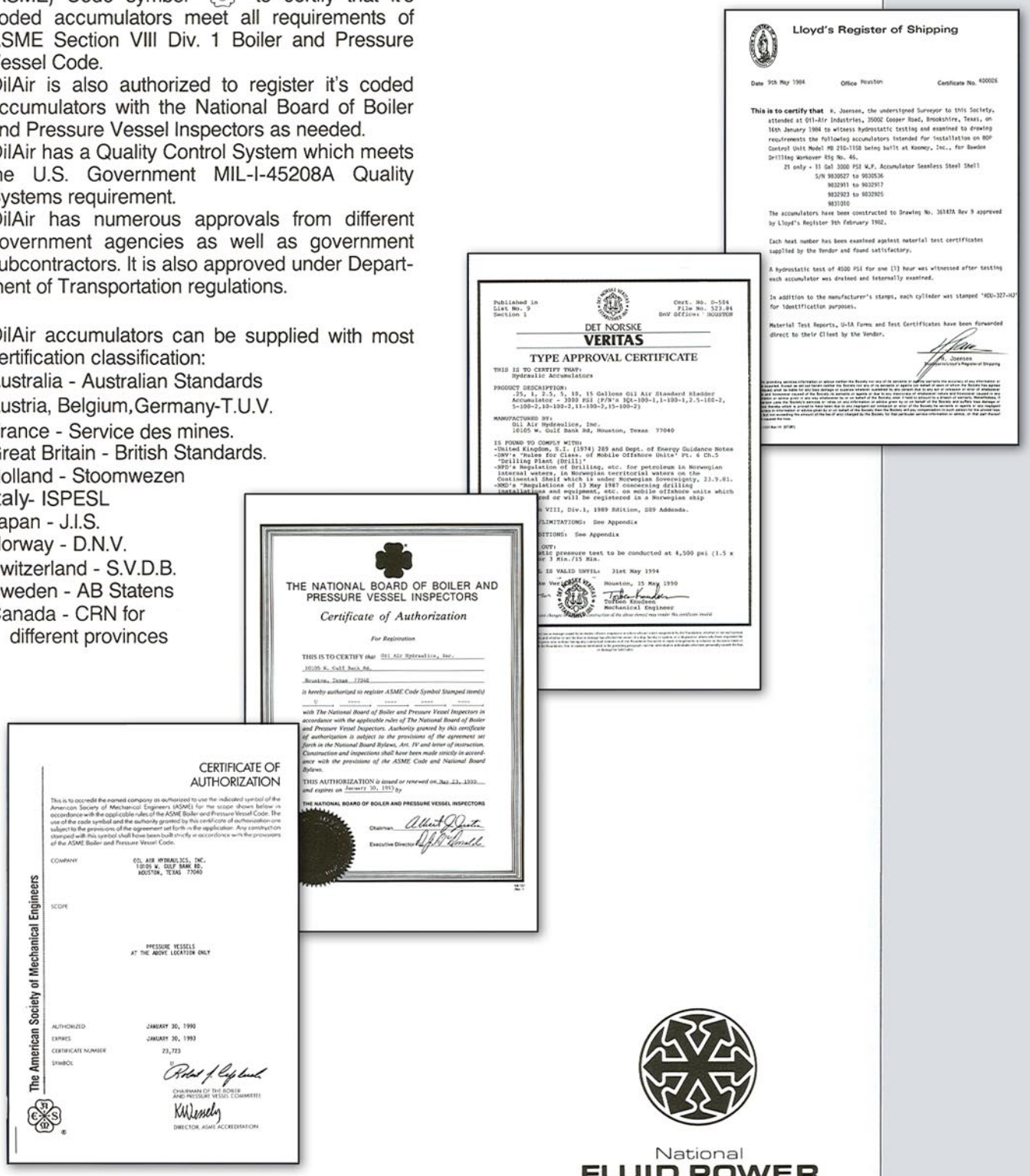
THIS QUESTIONNAIRE IS TO BE RETURNED BY MAIL OR FAX.

OILAIR Hydraulics, Inc. • 11505 West Little York • Houston, Texas 77041
Tel. (713) 937-8900 • Fax: (713) 937-0438

QUALITY LEGISLATIONS

OilAir Hydraulics is authorized to use the American Society of Mechanical Engineers (ASME) Code symbol Ⓤ to certify that it's coded accumulators meet all requirements of ASME Section VIII Div. 1 Boiler and Pressure Vessel Code.
OilAir is also authorized to register it's coded accumulators with the National Board of Boiler and Pressure Vessel Inspectors as needed.
OilAir has a Quality Control System which meets the U.S. Government MIL-I-45208A Quality Systems requirement.
OilAir has numerous approvals from different government agencies as well as government subcontractors. It is also approved under Department of Transportation regulations.

OilAir accumulators can be supplied with most certification classification:
Australia - Australian Standards
Austria, Belgium, Germany-T.U.V.
France - Service des mines.
Great Britain - British Standards.
Holland - Stoomwezen
Italy- ISPESL
Japan - J.I.S.
Norway - D.N.V.
Switzerland - S.V.D.B.
Sweden - AB Statens
Canada - CRN for different provinces



Lloyd's Register of Shipping

Date 9th May 1984 Office Houston Certificate No. 400026

This is to certify that H. Joensen, the undersigned Surveyor to this Society, attended at Oil-Air Industries, 35002 Cooper Road, Brookshire, Texas, on 16th January 1984 to witness hydrostatic testing and examined to drawing requirements the following accumulators intended for installation on BOP Control Unit Model MB 210-115B being built at Koomey, Inc., for Bawden Drilling Workover Rig No. 46.

21 only - 11 Gal 3000 PSI W.P. Accumulator Seamless Steel Shell
S/N 9830527 to 9830536
9832911 to 9832917
9832923 to 9832925
9831010

The accumulators have been constructed to Drawing No. 36387A Rev 9 approved by Lloyd's Register 9th February 1982.

Each heat number has been examined against material test certificates supplied by the Vendor and found satisfactory.

A hydrostatic test of 4500 PSI for one (1) hour was witnessed after testing each accumulator was drained and internally examined.

In addition to the manufacturer's stamps, each cylinder was stamped "HOU-327-HJ" for identification purposes.

Material Test Reports, U-1A Forms and Test Certificates have been forwarded direct to their Client by the Vendor.

H. Joensen
Surveyor to Lloyd's Register of Shipping

DET NORSKE VERITAS

TYPE APPROVAL CERTIFICATE

THIS IS TO CERTIFY THAT:
Hydraulic Accumulators

PRODUCT DESCRIPTION:
.25, 1, 2.5, 5, 10, 15 Gallons Oil Air Standard Bladder Accumulator - 3000 PSI (P/N's EQL-100-1,1-100-1,2.5-100-2, 5-100-2,10-100-2,11-100-2,15-100-2)

MANUFACTURED BY:
Oil Air Hydraulics, Inc.
16105 W. Gulf Bank Rd, Houston, Texas 77040

IS FOUND TO COMPLY WITH:
-United Kingdom, S.I. (1974) 289 and Dept. of Energy Guidance Notes
-DNV's "Rules for Class. of Mobile Offshore Units' Pt. 4 Ch.5 "Drilling Plant (Drill)"
-NPD's Regulation of Drilling, etc. for petroleum in Norwegian internal waters, in Norwegian territorial waters on the Continental Shelf which is under Norwegian Sovereignty, 23.9.81.
-NND's "Regulations of 13 May 1987 concerning drilling installations and equipment, etc. on mobile offshore units which ed or will be registered in a Norwegian ship

VIII, Div.1, 1989 Edition, SD9 Addenda.

LIMITATIONS: See Appendix

DITIONS: See Appendix

OUT:
tic pressure test to be conducted at 4,500 psi (1.5 x r 3 Min./15 Min.

IS VALID UNTIL: 31st May 1994

Houston, 15 May 1990

Torben Knudsen
Mechanical Engineer

THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

Certificate of Authorization

For Registration

THIS IS TO CERTIFY that Oil Air Hydraulics, Inc.
16105 W. Gulf Bank Rd.
Houston, Texas 77040
is hereby authorized to register ASME Code Symbol Stamped item(s)
U
with The National Board of Boiler and Pressure Vessel Inspectors in accordance with the applicable rules of The National Board of Boiler and Pressure Vessel Inspectors. Authority granted by this certificate of authorization is subject to the provisions of the agreement set forth in the National Board Bylaws, Art. IV and letter of instruction. Construction and inspections shall have been made strictly in accordance with the provisions of the ASME Code and National Board Bylaws.

THIS AUTHORIZATION is issued or renewed on May 23, 1990 and expires on January 30, 1993 by
THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS
Chairman
Executive Director

CERTIFICATE OF AUTHORIZATION

This is to accredit the named company as authorized to use the indicated symbol of the American Society of Mechanical Engineers (ASME) for the scope shown below in accordance with the applicable rules of the ASME Boiler and Pressure Vessel Code. The use of the code symbol and the authority granted by this certificate of authorization are subject to the provisions of the agreement set forth in the application. Any construction stamped with this symbol shall have been built strictly in accordance with the provisions of the ASME Boiler and Pressure Vessel Code.

COMPANY: OIL AIR HYDRAULICS, INC. 16105 W. GULF BANK RD. HOUSTON, TEXAS 77040

SCOPE:
PRESSURE VESSELS AT THE ABOVE LOCATION ONLY

AUTHORIZED: JANUARY 30, 1990
EXPIRES: JANUARY 30, 1993
CERTIFICATE NUMBER: 23,723
SYMBOL: U

CHAIRMAN OF THE BOILER AND PRESSURE VESSEL COMMITTEE
DIRECTOR, ASME ACCREDITATION

The American Society of Mechanical Engineers

National FLUID POWER Association®

OILAIR HYDRAULICS INC.

11505 West Little York
Houston, Texas 77041
Tel: (713) 937-8900 • Fax: (713) 937-0438
www.fluidpower.com • www.oilairhydraulics.com

THE OLAER-GROUP AROUND THE WORLD

USA
Oil Air Hydraulics, Inc.
11505 West Little York
Houston, Texas 77041
Tel: +1 713 937 8900
Fax: +1 713 937 0438

AUSTRALIA
Olaer Fawcett Christie Pty Ltd.
13 Boola Place
Cromer. N.S.W.2099
Tel: +61 2 9938 4444
Fax: +61 2 9938 6879
E-mail: sales@olaer.com.au

AUSTRIA
Olaer Speicher-Technik Ges.m.b.H.
Haiderstraße 38
AT-4052 Ansfelden
Tel: +43 7229 80306
Fax: +43 7229 80306-21
E-mail: olaer@netway.at

BELGIUM
S.A. Olaer Beneiux N.V.
Doomveld 4
BE-1731 Zellik
Tel: +32 2 466 15 1 5
Fax: +32 2 466 16 24
E-mail: olaerbe@skynet.be

DENMARK
Oiltech AB
Møllebækvej 14
DK-9632 Møldrup
Tel: +45 86 69 20 38
Fax: +45 86 69 23 38
E-mail: oiltech@post.tele.dk

FINLAND
Oiltech Hydraulics OY
Vattuniemenkatu 8, PI 190
FI-00210 Helsinki
Tel: +358 9 682 0422
Fax: +358 9 682 2376
E-mail: sbg.soderstrom@oiltech-hydraulics.h

FRANCE
Olaer Industries S.A.
16, rue de Seine, B.P.7
FR-92704 Colombes Cedex
Tel: +33 1 41 191700
Fax: +33 1 41 191720
E-mail: olaer@olaer.com

GERMANY
Olaer Industries GmbH
Zum Gunterstal 4
DE-66440 Blieskastel
Tel: +49 6842 9204 0
Fax: +49 6842 9204 15
E-mail: olaergmbh@aol.com

HOLLAND
Olaer Nederland B.V.
De Lind 10, Postbus 75
NL-4840 AB Prinsenbeek
Tel: +31 76-5412453
Fax: +31 76-5411502
E-mail: info@olaer.nl

INDIA
Fawcett Christie Hydraulics Ltd.
C 30 Shankara Park
Bangalore 560 004
Tel: +91 806 61 05 08
Fax: +91 806 61 17 16
E-mail: ipeblr@bgl.vsnl.net.in

ITALY
Olaer Italiana S.p.A.
Stada Fantasia 83
IT-10040 Leini (TO)
Tel: +39 11 998.02.22
Fax: +39 11 998.02.02
E-mail: olacom@olaer.it

KOREA
Hyundai Olaer Hydraulic Company Ltd.
2NA-702 Shiwha Industrial Group
Jung Wang-dong
Shi Hung-Shi, Kyunggi-Do 429-450
Tel: +61 2 9938 444
Fax: +61 2 9938 6879
E-mail: hdolaer.hyundaiolaer.co.kr

NORWAY
Oiltech AS.
Dynamitveien 23, PB 133
NO-1401 Ski
Tel: +47 64 87 42 65
Fax: +47 64 87 43 21
E-mail: oiltech@oiltech.no

SOUTH AFRICA
Fawcett Christie Hydraulics S.A. (Pty) Ltd.
c/o Rolton Products CC
PO Box 43244
ZA-Industria 2042
Tel: +27 11 474 3095
Fax: +27 11 474 8384

SPAIN
Olaer-Oiltech Ibercia S.A.
Travesia Industrial, no 29
SP-08907 L'Hospitalet de Ll.
(Barcelona)
Tel: +34 3 336 14 12
Fax: +34 3 335 71 86
E-mail: olaer@olaer.es

SWEDEN
Oiltech AB
Förrådsvägen 2
SE- 181 41 Lidingö
Tel: +46 8 765 16 00
Fax: +46 8 767 97 56
E-mail: info@oiltech.se

SWITZERLAND
Olaer (Schweiz) AG
Bonnstraße 3
CH-3186 Düdingen
Tel: +41 26 492 70 00
Fax: +41 26 492 70 70
E-mail: info@olaer.ch

UNITED KINGDOM
Fawcett Christie Hydraulics Ltd.
Sandycroft Industrial Estate
Chester Rd, Sandycroft
Deeside, Flintshire CH5 2QP
North Wales
Tel: +44 1244 535515
Fax: +44 1244 533002
E-mail: sales@fch.co.uk

Please note: Being a renowned manufacturer of cooling systems for hydraulics, Oil Air is constantly seeking ways to improve the specification and design of its products and alterations take place continually. The products in this brochure may be updated, altered in any way or discontinued, without prior notice.

Form No. ACC0705

Member of the Olaer Group