EXOTECH

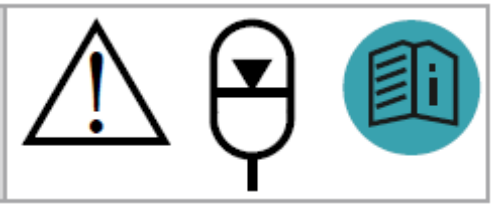
Fluid Management

ACCUMULATOR PRODUCT INFORMATION

Exotech Fluid Management
W21, 122-126 Old Pittwater Road
Brookvale NSW 2100

ABN 69 164 811 143

IMPORTANT SAFETY NOTE



Gas loaded accumulators operate at high pressures and must always be treated with caution.

You must ensure that you are competent to work with this equipment.

Strict compliance with the instructions given in this document and all relevant documents is essential. The supplier disclaims all liability for any direct or indirect damage to property or personal injury and all responsibility for consequential damage such as, for example, operating losses arising from the failure to follow the instructions given.

Exotech Fluid Management
W21, 122-126 Old Pittwater Road
Brookvale NSW 2100

ABN 69 164 811 143

Contents

Exotech Fluid Management
W21, 122-126 Old Pittwater Road
Brookvale NSW 2100

ABN 69 164 811 143

1 TRANSPORTATION, HANDLING & STORAGE

1.1 Accumulators and Related Products

1.1.1 Transportation and handling:

Accumulators must be stored securely to prevent damage caused from their weight / shape.
Safe lifting procedures should be implemented and weights should be identified on all packages.
Take special care not to damage the gas valve as an **UNEXPECTED RELEASE OF GAS MAY OCCUR.** Avoid skin contact with any fluid that might be expelled from the accumulator. Use personal protective equipment if appropriate.

1.1.2 Short Term Storage:

When stored in a stable, non-severe environment, accumulators can be left in their original packing for a number of weeks without fear of deterioration.

1.1.3 Long Term Storage:

If accumulators are to be stored for longer periods of time, special precautions may need to be taken. CONSULT EXOTECH FOR FURTHER INFORMATION.

1.2 Elastomeric Components

Most elastomeric (rubber) compounds specified by EXOTECH fall into the category of low susceptibility or high resistance to deterioration by ageing. Details of material classification and shelf life expectancy can be found in BS ISO 2230; 2002 and our Technical Specifications, available on request.

1.2.1 Ideal Storage Conditions:

Stored under ideal conditions, elastomeric components have an expected shelf life of 8-10 years.

- Elastomers, and bladders in particular, should be stored in a stress-free condition either due to natural shape or by partially inflating to natural size using nitrogen gas.
- At temperatures between –5°C and +5°C.
- In a dark, sealed box and away from direct sunlight, heat or rotational electrical equipment.

1.2.2 Storage Conditions Less Than Ideal:

Where ideal storage conditions cannot be met, elastomeric components, particularly bladders have an expected shelf life of 2-3 years if they are stored as follows:

- Stored in a stress-free condition either due to natural shape or by partially inflating with compressed air or nitrogen gas, so that they lay flat without bending or folding.
- Bladders should not be stacked.
- At temperatures up to 25°C.
- Stored in darkness either in a dark room or covered with clean, opaque polythene and away from direct sunlight, heat or rotational electrical equipment.

1.2.3 Inspection Before Use:

- If possible, inflate bladders to not more than 1½ times natural diameter.
- Visually examine seams for defects, and surface for cracking.
- Immerse in water to inspect for leakage or perforations.

NOTE: Elastomers not stored properly will be subject to attack from ozone, heat or UV light. Cracking will develop within one year. Elastomers should be replaced if storage extends beyond 2 years.

Exotech Fluid Management
W21, 122-126 Old Pittwater Road
Brookvale NSW 2100

ABN 69 164 811 143

2 INSTALLATION

2.1 Inspection of Accumulator

EXOTECH accumulators and associated products are thoroughly inspected at the factory prior to despatch and are ready for installation following pre-charging. After unpacking, inspect the accumulator for possible damage caused in transit. Check the following items for tightness;- all nuts, screws, locking rings, bleed screws, adaptors and fittings.

- Check that the maximum working pressure of the accumulator is equal to or greater than the maximum pressure of the system. (see **COMMISSIONING**)
- Ensure that you are using the correct accumulator for the application paying particular attention to the risk of corrosion from either the system fluid or the environment.

2.2 Installation Recommendations

All accumulators are supplied un-pre-charged unless a pre-charge pressure is specified when ordering. Prior to applying hydraulic pressure to the system all accumulators must be pre-charged with **NITROGEN GAS ONLY.** (for pre-charging procedure see **PRE-CHARGING PROCEDURE**)

It will be necessary to check the gas pre-charge pressure at regular intervals, (see **ROUTINE MAINTENANCE**). Consideration should therefore be given to the following:

- The provision of a safety block fitted between the accumulator and fluid pressure line to enable isolation of hydraulic system pressure.
- The location of the gas charging valve with regard to the potential for accidental damage and safe discharge of high-pressure gas.
- The provision of a warning label (in addition to that provided on the accumulator nameplate) stating “PRE-CHARGED WITH N2 GAS AT....bar”.
- It is necessary to ensure that the accumulator is protected from over pressurisation. General protection is usually provided by the hydraulic system relief valve, which should be set at no higher than the maximum working pressure (MWP) of the accumulator.
- Specific protection for the accumulator can be provided in the following ways:
    - A hydraulic relief valve located in a safety block (under low flow conditions) will prevent fluid over pressurisation.
    - A fusible plug will relieve gas side pressure in the event of a fire.
    - A burst disc will relieve gas side over pressurisation.
- On storage applications a check valve fitted between pump and accumulator will ensure non-reversal of the pump.
- The accumulator should be safely mounted using the correct sealing system and OEM connectors. Special adaptors are available if required.
- For maximum efficiency and service life, accumulators should be mounted vertically where possible, fluid port down.
- A range of clamps, support brackets and other accessories are available to assist in installation.
- It is strictly **FORBIDDEN** to weld any form of bracket or attachment to accumulator bodies. **CONSULT EXOTECH FOR FURTHER INFORMATION**

Exotech Fluid Management
W21, 122-126 Old Pittwater Road
Brookvale NSW 2100

ABN 69 164 811 143

3 COMMISSIONING

3.1 Important Notes

Commissioning and particularly pre-charging contains inherent risks associated with:

- release of high pressure gaseous energy
- Gas jet effects and the acceleration of loose particulate.
- Asphyxiation due to the release of nitrogen gas in a confined space.
- Accumulator acceleration in the event of unexpected release of gas.
- Note the maximum working pressure of the accumulator and do not over pressurise.
- Ensure that any protective caps (usually plastic) are removed prior to pre-charging.
- Noise may be emitted in the event of sudden release of gas.
- Avoid direct contact with oil mists.
- Select the correct charging equipment in good working condition ensuring that pressure
- gauges are safety pattern type and all hoses must be designed to be used with gas.

3.2 Pre-Charging

- **USE ONLY OXYGEN FREE DRY NITROGEN GAS**
- All accumulators are supplied without pre-charge unless a pre-charge pressure is specified when ordering. Prior to applying hydraulic pressure to the system all accumulators must be pre-charged with nitrogen.
- Check details of accumulator on label and shell for **maximum working pressure**. The maximum hydraulic system pressure must not exceed the MWP of the accumulator.
- Always use a nitrogen pressure regulator valve when pre-charging
- Pre-charge pressures vary with operating conditions. Consult EXOTECH if no pre-charge has been previously recommended. For a guide the following values can be used:
    - Storage application: 90% of minimum allowable system pressure
    - Shock application: 60% of flow pressure at accumulator position
    - Pulsation application: 60% of mean pumping pressure.
- Allowing pre-charge to fall below 25% of maximum system pressure in a bladder accumulator may cause **premature failure of the bladder**. Excessive pre-charge pressures in relation to minimum system pressure may cause failures of the bladder and/or poppet valve and in piston accumulators, may cause excessive stresses due to the piston frequently contacting the end cap.
- Ensure that moving parts such as bladders and pistons are adequately lubricated with system fluid before commencing pre-charging. This is especially important where the system fluid is of low viscosity e.g. water based.

3.3 Pre-Charging Procedure

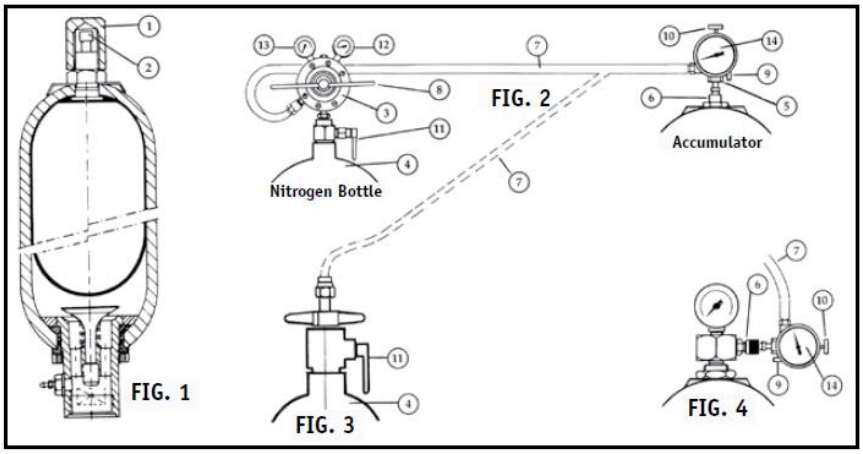
!!! ONLY COMPETENT PERSONS SHOULD ATTEMPT THIS WORK !!!

The following procedures should be adopted for safe pre-charging of accumulators.

- For accumulators having a working pressure less than the nitrogen source refer to fig.2.
- For accumulators having a working pressure equal to or greater than the nitrogen source refer to fig.3. see note 4.
- For accumulators fitted with a permanent charging set refer to fig.4.
- For transfer barrier accumulators fitted with a back-up-bottle or remote charging point, refer to fig.5.

3.3.1 Procedure 1. – using a Nitrogen Pressure Regulator Valve (NPRV) fig.2.

- Remove protective cap (1) if fitted and sealing cap (2).
- Attach NPRV (3) to nitrogen cylinder (4). Ensure centre spindle (10) is fully unwound.
- Attach charging set (5) to accumulator gas valve assembly (6) and connect charging hose (7) between NPRV (3) and charging set connection.
- Back off handle (8) anti-clockwise until loose, check gas bleed valve (9) on charging set is closed and screw handwheel (10) clockwise to open gas valve. **Do not screw knob down tight.**
- Open nitrogen cylinder valve by turning key (11), cylinder pressure will register on right-hand gauge (12). This pressure should be checked against the required pre-charge pressure.
- Turn handle (8) clockwise until outlet pressure on left-hand gauge (13) registers 10% higher than required pre-charge pressure. When pressure on the charging set and outlet gauges are equal, close nitrogen cylinder valve.
- Turn handwheel (10) anti-clockwise to seal gas valve.
- Crack bleed valve (9) to exhaust gas from charging hose and remove hose from charging set and replace hose connection sealing cap.
- Close bleed valve, turn handwheel (10) clockwise to open gas valve. **Do not screw knob down tight**. Crack bleed valve (9) to vent down to required pre-charge pressure. Close bleed valve.
- Turn handwheel (10) anti-clockwise to reseal gas valve, crack bleed valve and remove charging set from accumulator.
- Test gas valve for leaks using a leak detection spray or a soapy water solution.
- Replace sealing cap (2), tighten with pliers, and protective cap (1) if fitted.



3.3.2 Procedure 2. – Nitrogen Pressure Regulator Valve (NPRV) not required fig.2,3 & 4.

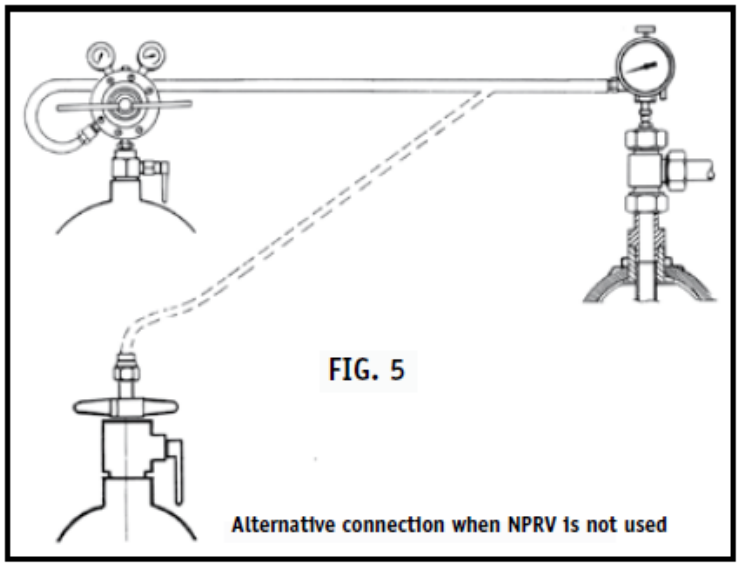
- Remove protective cap (1) if fitted and sealing cap (2).
- Attach charging set (5) to accumulator gas valve assembly (6). Ensure centre spindle (10) is fully unwound.
- Connect charging hose (7) to nitrogen cylinder (4) using the appropriate adaptor, and attach the free end to the charging set.
- Turn handwheel (10) clockwise to open gas valve. **Do not screw knob down tight**.
- Slowly open nitrogen cylinder by turning key (11).
- Allow pressure on the gauge (14) to read slightly in excess of required pre-charge and then close nitrogen cylinder valve.
- Turn handwheel (10) anti-clockwise to seal gas valve.
- Crack bleed valve (9) to exhaust gas from charging hose and remove hose from charging set and replace hose connection sealing cap.

3.3.3 Procedure 3. – Permanent Charging Set fitted fig.4.

Follow steps of Procedures 1 or 2 as appropriate but connect to the permanent charging set as shown in fig.4.

3.3.4 Procedure 4. – Transfer Barrier Type fig.5

When pre-charging transfer barrier accumulators the pre-charge pressure should never allow the fluid volume in the shell to exceed 80% of the total shell volume when working between max system Pressure P3 and pre-charge pressure P1. The method of connecting is as shown in fig.5 and the Procedures 1 or 2 should be followed depending on the working pressure of the system.



4 ROUTINE MAINTENANCE

When a new accumulator has been in service for a short period, the precharge should be checked to ensure there is no leakage. Subsequent checks need only be at 6 monthly intervals except for very low pressure applications - **CONSULT EXOTECH FOR FURTHER INFORMATION.**

When checking the precharge of an accumulator installed in a system, the accumulator must be isolated from the system pressure and the fluid removed by carefully opening the bleed valve and collecting the fluid in a suitable receptacle. Alternatively, shut the system down and release the fluid pressure back to tank.

Fit a charging set (without charging hose fitted) ensuring the bleed valve is closed and cap is fitted to the charging connector.

Turn handwheel (10) clockwise and check precharge. **Do not screw down tight.**
Replenish if required, following steps of Procedures 1 or 2 appropriately. (see **COMMISSIONING**)

5 SERVICING

Before carrying out anything other than routine maintenance, consult EXOTECH for guidance in servicing specific types of accumulators.

6 RECYCLING

Before recycling or disposing of an accumulator, depressurise it and remove the gas valve.
Decontaminate if necessary and dispose of in accordance with local regulations.

Exotech Fluid Management
W21, 122-126 Old Pittwater Road
Brookvale NSW 2100

ABN 69 164 811 143

7 INTERPRETATION OF MARKINGS

7.1 LABEL MARKINGS

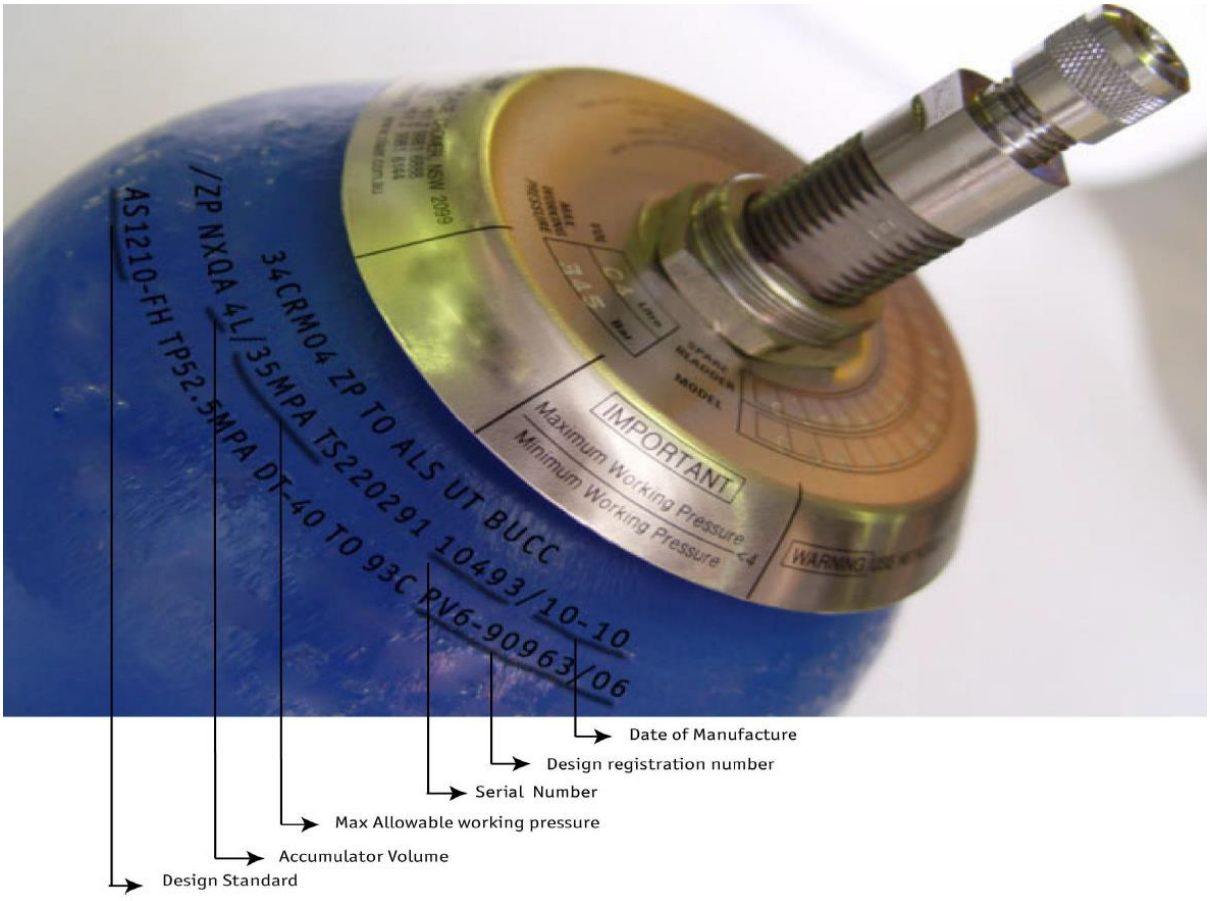
Metal labels (or hard stamping as appropriate) are fitted to all EXOTECH accumulators and show essential user information:

- Name and Address of Manufacturer / Supplier
- Model Identification Number
- Maximum Working Pressure (MWP)
- Actual Volume of Vessel
- Accumulator part number
- Gas Pre- Charge sequence
- Design Code

Warning and Safety Information is provided on adhesive labels.

Other essential information required by the applicable design code can be found permanently stamped on the shell itself. Typical details are shown below:

7.2 TYPICAL SHELL STAMPINGS



Exotech Fluid Management
W21, 122-126 Old Pittwater Road
Brookvale NSW 2100

ABN 69 164 811 143

8 CERTIFICATION

8.1 Introduction

This document is a summary of OH&S requirements relating to hydraulic accumulators. Hydraulic accumulators are pressure vessels and as such are covered by statutory regulation. Any person importing, selling, or working on a pressure vessel must comply with these regulations.

8.2 1. Design Registration

Hydraulic accumulators with Hazard Levels A, B,C & D (as specified in AS4343:2014)shall have their design registered with the local Work Cover authority.

Design registration is a process of having the design verified by a qualified 3rd party verifier then registering this design with WorkCover. Acceptable pressure vessel designs are AS1210 or any published pressure vessel standard accepted by the WorkCover authorities. Imported machinery & equipment shall be design verified & registered to meet this requirement based on the requirements of AS4343:2014. Older equipment should also be design verified & registered, this can be carried out, given applicable documentation on the vessels is available.

8.3 2. Item Registration

Hydraulic Accumulators with Hazard Levels A, B and C (as specified in AS4343:2014) shall be item of plant registered with the local Work Cover authority. Person responsible for item registration is the owner of the equipment, Exotech Fluid Management can take care of this behalf of the owner.

Item registration involves filling out the form with identifying information about the plant (equipment identification number, location, serial number, volume, design pressure, inspection documentation etc.)

Registration fee is payable annually in most states.

Plant owners with multiple accumulators in same location should enquire about “Multiple Registration of Plant Items”.

8.4 3. In-Service Inspection

As part of the regulations, employer/owners must ensure that pressure equipment is inspected in accordance with AS3788:2006. Each or controller is responsible for ensuring that the extent and frequency of inspection is appropriate and adequate for the continued safe and economic operation of the pressure equipment. This may require seeking of expert outside advice to perform an audit & risk assessment on equipment.

All Pressure vessel inspections shall be carried out by a competent person, such as a boiler inspector or company that specializes in pressure vessel inspections in accordance with AS3788:2006. Plant owners should keep the inspection certificate as a record of inspection along with all documentation relating to the vessel.

Introduction

This document is a summary of OH&S requirements relating to hydraulic accumulators. Hydraulic accumulators are pressure vessels and as such are covered by statutory regulation. Any person importing, selling, or working on a pressure vessel **must** comply with these regulations.

Design Registration

(Responsibility of the manufacturer/importer)

Hydraulic accumulators (pressure vessels) with Hazard Levels A,B,C or D (as specified in AS4343:2014),shall have their design verified by a 3rd party & registered with the local WorkSafe authority. (4) (3)

Vessels may be designed & manufactured according to any recognised international standard (ie AS1210, AD2000, ASME, EN14359, PD5500) provided the design is verified by an Australian 3rd party qualified to do so.

Older equipment **must** also be design verified & registered, this can be carried out, given applicable documentation on the vessels is available. The old design **must** be shown to comply with current standards.

Servicing

Hydraulic service companies proposing to pre-charge or repair an accumulator have a responsibility to their workers and customers to ensure compliance with Workplace Health & Safety regulations.

Whilst in their possession a service company takes on the role of "owner" of the vessel.

"A PCBU[1] **must** not direct or allow a worker to use a registrable item of plant in the workplace if it has not been registered" (5)

The recommendation from WorkSafe/SafeWork is that "support organisations" such as hydraulic service companies have a duty of care to make a non compliant vessel safe (isolate, de-gas & strip if necessary) and make the owner aware of their legal responsibilities to maintain plant compliance.

In-Service Inspection

(Responsibility of the Owner)

employer/owners **must** ensure that pressure equipment is inspected in accordance with AS3788:2006.
All Pressure vessel inspections shall be carried out by a competent person, such as a boiler inspector or company that specialises in pressure vessel inspections.

Plant owners should keep the inspection certificate as a record of inspection along with all documentation relating to the vessel. (2)

NOMINAL REQUIREMENTS FOR STANDARD HYDRAULIC ACCUMULATORS

MODEL	HAZARD LEVEL	DESIGN VER + REG	ITEM OF PLANT	COMMISSIONING INSPECTION	1ST YEAR INSPECTION	EXTERNAL INSPECTION (2 yearly)	INTERNAL INSPECTION (12 yearly)
1L, 350 BAR	B	✓	✓	✗	✗	!	!
2.5-4L, 350 BAR	B	✓	✓	✓	✗	!	!
10-57L, 345 BAR	B	✓	✓	✓	✓	✓	✓

! Inspect in accordance with "Good Engineering Practice"

Item of Plant Registration

(Responsibility of the Owner)

Hydraulic Accumulators with Hazard Levels A, B or C shall be registered as an *item of plant* with the local WorkSafe authority. (4)

Registration **must** be renewed annually in most states.

Plant owners with multiple accumulators in same location should enquire about "Multiple Registration of Plant Items"

[1] persons conducting a business or undertaking (PCBU)

References: (1) AS4343:2014 , (2) AS3788:2006 , (3) AS3920:2015 , (4) OH&S Regulation 2004 , (5) Code Of practice 2021 (Managing the risks of plant in the workplace)