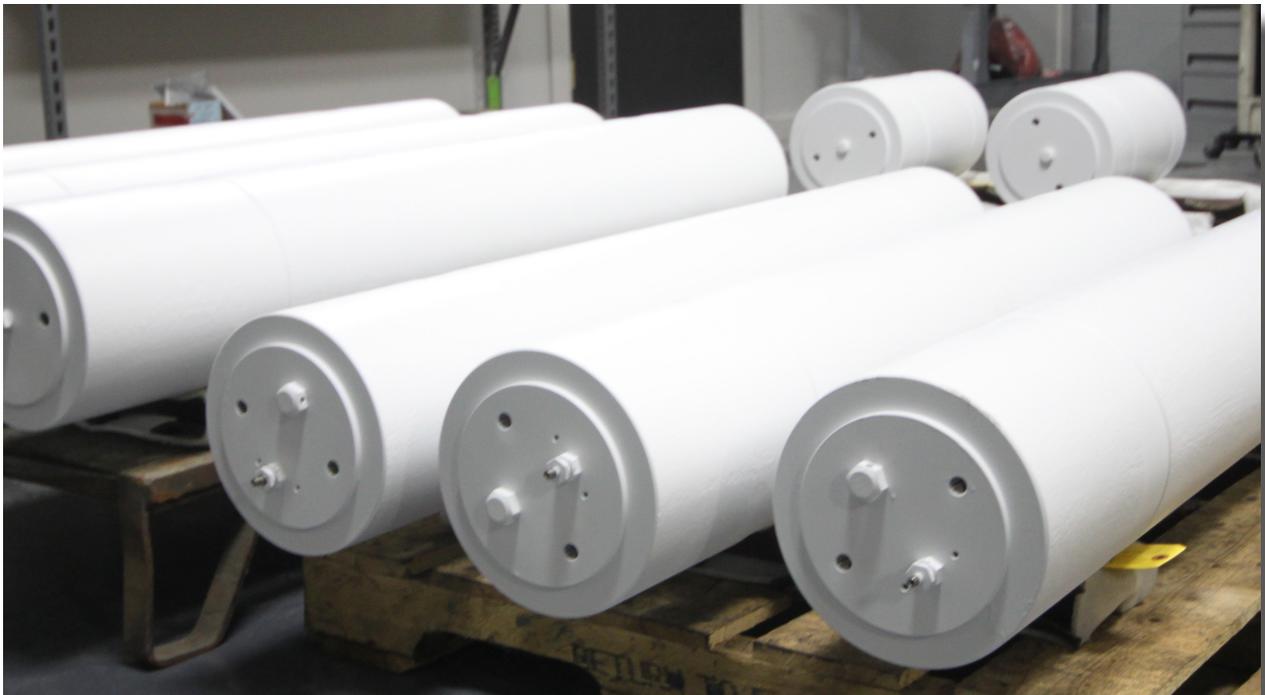




PISTON ACCUMULATOR OPERATING INSTRUCTIONS



These operating instructions apply to both the accumulators of retaining ring style and threaded flat head design.

Please reference the model specification sheets or accumulator drawing for more in-depth information about specific accumulators.



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Inspection of the piston accumulator after shipment

After receipt of the accumulator, the unit must be inspected in order to determine if any damage resulted during shipment. Furthermore, the accumulator must be positively identified.

Suggested Checklist Items:

- Determine if the correct accumulator has been shipped. Verify features such as pressure rating, capacity, sealing compounds, surface treatments (i.e. paint, plating, etc.), pre-charge, certification (i.e. ASME, CE, ABS, Coast Guard, Lloyd's, etc.), pressure fuse, etc. This information can be found either marked on the accumulator labeling or the enclosed paperwork. Drawings and 3D models of each piston accumulator assembly are available from your local KTI representative.
- Please note that all piston accumulators are shipped from Kocsis Technologies, Inc. without a nitrogen pre-charge.

CAUTION
All pre-charged accumulators must be handled with care to avoid personal injury or death
(Please reference the pre-charging instructions for specific pre-charging precautions)!!!

- Check for any possible damage from shipment such as:
- Damaged paint or damaged surfaces on the accumulator housing or accumulator end-caps
- Damaged gas valve, gas valve cover, pressure fuse/burst disc, or any other mounted accessories.
- Verify that all open ports have remained covered.

Precautions

Handling Precautions:

- When handling the piston accumulator, care must be exercised in order to avoid damaging surfaces, whether they are painted or metallic, on the housing or end-caps. In addition, the gas valve, gas valve cover, pressure fuse, or other mounted accessories must be also kept free of any damage.
- When lifting or moving a piston accumulator, qualified personnel and the correct equipment must be used in conjunction with sound procedures. All of the required lifting devices (i.e. chains, belts, cranes, etc.) must be rated for the appropriate load. Furthermore, the load must be balanced for safe lifting and moving. If the accumulator is not handled correctly, damage to the product, personal injury, or death may result.



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CAUTION

When handling a piston accumulator with a pre-charge, special care must be exercised since the potential energy stored within this vessel may be released if the unit is mishandled (i.e. dropped, roughly handled, etc.).

Personal injury or death may result in reckless handling procedures!!!

- The accumulator must be securely supported (i.e. brackets, saddles frames, etc.) when it is mounted. If the unit is not securely fastened, it may fall down and cause damage to nearby equipment and result in bodily harm due to the unit’s weight. Furthermore, the stored gas may also be uncontrollably released presenting a hazard.
- When considering different structural supports for a piston accumulator, special care must be exercised in the specification of these supports and the impending installation. The size and strength of these supports must adequately contain the accumulator without physically damaging or distorting the accumulator components (i.e. housing, end-caps, etc.).
- Do not use the fluid port to support the accumulator.
- Absolutely no welding of supports or any other items to the accumulator is allowed.
- The nitrogen pre-charge should be checked periodically to monitor the performance of the seals. If a decrease in pre-charge is detected, the unit should be disassembled, fully inspected and reassembled. Proper assembly and disassembly procedures are outlined within this document.

Operating Precautions:

- DO NOT operate the accumulator beyond it’s design pressure rating. This value is listed on the nameplate as “MAWP” and is located on all drawings as “design pressure”.

The hydro-pressure listed on drawings is a test pressure performed @ KTI’s facility. The unit is not permitted to be used at this pressure!

- DO NOT operate the accumulator beyond it’s specified temperature range. This value is located on the nameplate and drawings.
- Use only DRY NITROGEN for pre-charging the accumulator.
- DO NOT USE OXYGEN OR AIR for pre-charging the accumulators due to the risk of explosion.
- Only use air/gas valves approved by the manufacturer for the specified accumulator.
- When working near the gas end of a pre-charged accumulator, always exercise caution. The compressed gas stores energy, which may be released and may cause personal injury or death!!!
- When attaching the accumulator to the system, consider these additional suggestions:
- Thread/fitting compatibility with the accumulator
- Material (i.e. sealing compounds, housing materials, end-cap materials, etc.) compatibility with the system fluid



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- Installation techniques of the connections (i.e. torque values, etc.)
- DO NOT operate the accumulator in a corrosive environment without protection (i.e. paint, plating, etc.). Failure to do so may weaken the accumulator and result in an accident. Contact factory for specific solutions to corrosion issues.
- DO NOT operate the accumulator at a temperature outside of the acceptable range. The operating temperature is listed on the nameplate as well as the drawing available from your local KTI representative.
- If situations occur which are not covered within these instructions, use care and good judgment. Contact Kocsis Technologies, Inc. for assistance.

Optional Safety Equipment:

Depending on the specific application, additional safety equipment may be attached to the accumulator.

- Thermal relief devices may be attached to the gas side of the accumulator to avoid an uncontrolled increase in gas pressure due to high temperatures.
- Pressure relief devices may be attached to the gas side of the accumulator to avoid over pressurization of the unit (i.e. burst disks, relief valve, etc.).
- Pressure relief devices may also be attached on the oil side of the accumulator to avoid over pressurization of the unit (i.e. relief valve).

****Any safety equipment, nozzles, piping, etc. attached to the accumulator is to be installed by the user and is therefore the responsibility of the user.****

Pre-charging

General Information:

- Use only DRY NITROGEN for pre-charging the accumulator.
- Pre-charge pressure below a pressure of 2000 psi (pressure rating of CGA-300445) may be verified using the CGA-300445 charging and gaging assembly. The correct pre-charge is critical to the performance of the accumulator. If the incorrect pre-charge is used, the hydraulic system and/or the accumulator may be damaged.
- The CGA-300445 charging and gaging assembly should only be used with the VA-200932 gas valve (MS 28889-1 type). Do not use this assembly with inner tube type needle valves. Always use a pressure regulator valve on the nitrogen bottle when the required accumulator pre-charge pressure is less than the pressure in the supply bottle.
- Only use gas valves approved by the manufacturer of the specified accumulator
- Do not exceed the working pressure limit of the accumulator while pre-charging. This may cause failure

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in the pressure-retaining components. The personnel charging the unit must follow the charging and gaging instructions within this document. An appropriately rated charging and gaging kit must be used for filling. Ideally the nitrogen source should be at a pressure lower than pressure rating of the accumulator. If a pressure booster pump is being used, it should have a pressure relief valve set at no more than 10% of the accumulator's rated pressure.

- Wear eye protection whenever servicing an accumulator

Determining the Pre-charge Pressure:

Pre-charge pressures depend upon the application and operating conditions. Please contact the factory for assistance regarding pre-charge pressures.

Below are listed guidelines for determining pre-charge pressures for different applications.

- Energy storage: 100 psi below minimum system pressure
- Shock absorption: 100% - 120% of the system pressure
- Pulsation dampening: 50% - 70% of the system pressure

These suggestions are intended as general guidelines only.

Pre-charging Instructions:

- *Checking Pre-charge Pressure*

1. Remove the gas valve cover from the end-cap (See Figure 1). Not all units are supplied with this cover.

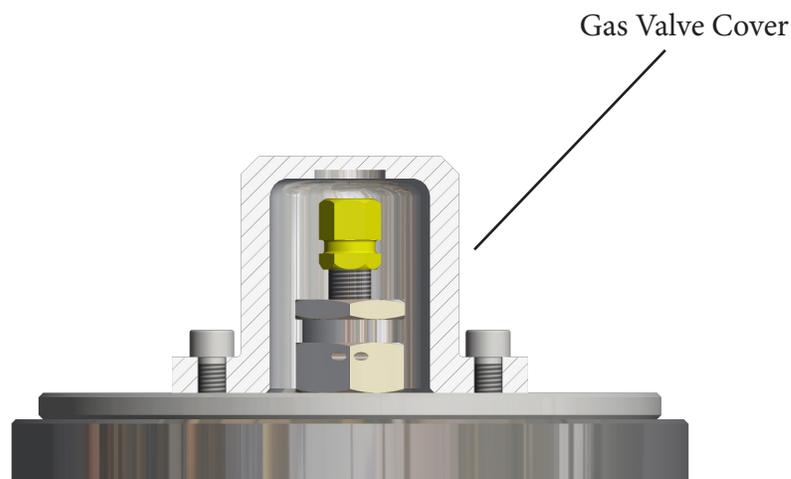


Figure 1 - Gas Valve Cover

2. Remove the protective cap from the gas valve assembly (See Figure 2).

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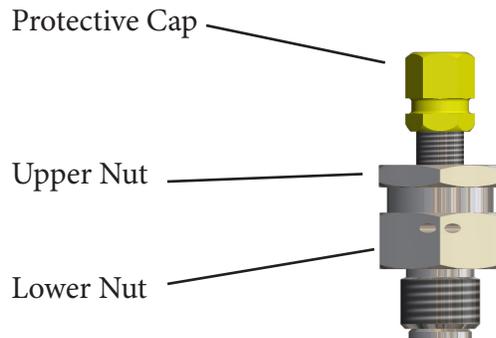
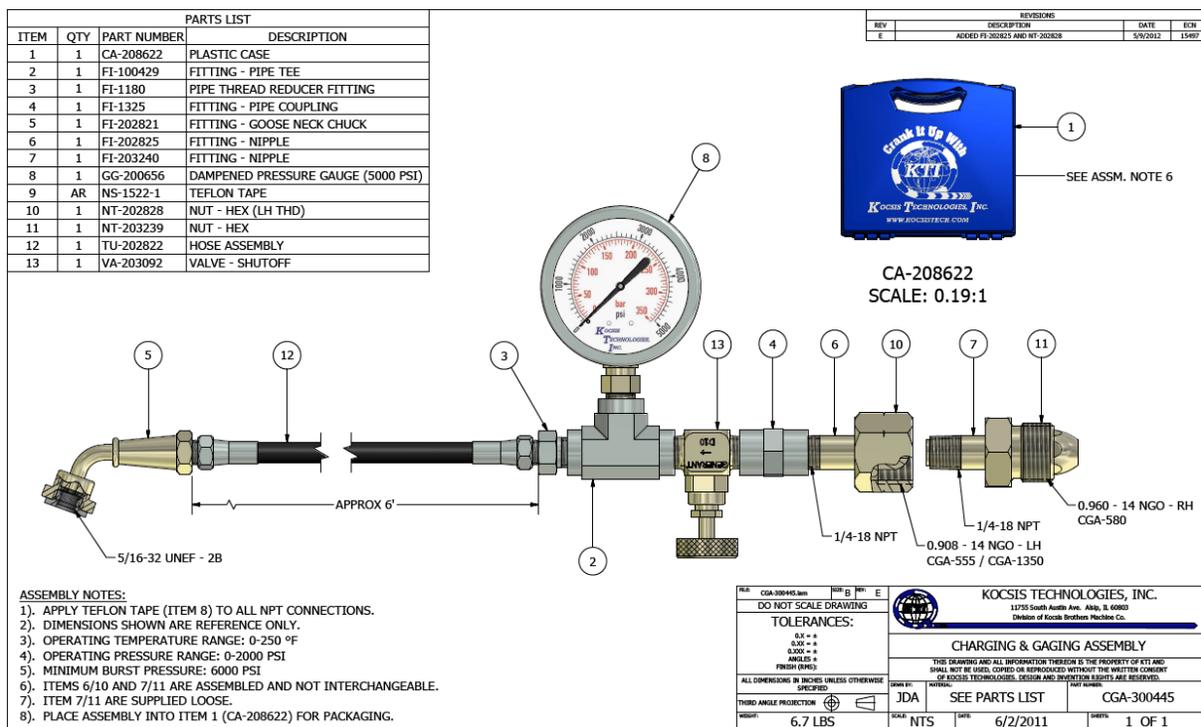


Figure 2 – VA-200932 Gas Valve Assembly

3. Before attaching the goose-neck fitting of the CGA-300445 charging assembly to the gas valve assembly, be sure that the shutoff valve is in the closed position (See Figure 3). Valve is closed when the handle is turned clockwise.



4. Hand-tighten the goose-neck fitting sufficiently to compress the gasket and to prevent gas leakage.



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CAUTION

While loosening the upper nut, place a 3/4 inch wrench on the LOWER NUT of the gas valve assembly to prevent the loosening of the entire gas valve assembly from the gas cap.

Failure to adhere to this procedure may result in equipment damage, personal injury, or death!!!

5. Place a 3/4 inch wrench on the upper nut (See Figure 2) of the gas valve assembly and turn in a counter clockwise direction until the pre-charge pressure on the pressure gage is indicated.

NOTE: Upper nut on gas valve assembly will stop turning after approximately 3 to 4 turns.

6. After reading the pre-charge pressure, tighten the upper nut to 90 – 110 in-lbs.

7. Unscrew the goose-neck fitting to disconnect the charging and gaging assembly.

8. Re-install the gas valve protective cap.

9. Re-install the gas valve cover to the end-cap (Not all units are supplied with a gas valve cover).

Check accumulator pre-charge pressure routinely as a part of the accumulator maintenance schedule. The frequency of these checks depends upon each individual application.

• *Reducing Pre-charge Pressure*

1. Remove the gas valve cover from the end-cap (See Figure 1). Not all units are supplied with this cover.

2. Remove the protective cap from the gas valve assembly (See Figure 2).

3. Before attaching the goose-neck fitting of the CGA-300445 charging assembly to the gas valve assembly, be sure that the shutoff valve is in the closed position (See Figure 3). Valve is closed when the handle is turned clockwise.

4. Hand-tighten the goose-neck fitting sufficiently to compress the gasket and to prevent gas leakage.

CAUTION

While loosening the upper nut, place a 3/4 inch wrench on the LOWER NUT of the gas valve assembly to prevent the loosening of the entire gas valve assembly from the gas cap.

Failure to adhere to this procedure may result in equipment damage, personal injury, or death!!!



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5. Place a 3/4 inch wrench on the upper nut (See Figure 2) of the gas valve assembly and turn in a counter clock- wise direction until the pre-charge pressure on the pressure gage is indicated.

NOTE: Upper nut on gas valve assembly will stop turning after approximately 3 to 4 turns.

6. With the charging and gaging assembly (CGA-300445) connected to the gas valve assembly, carefully open and close the shutoff valve until the desired pre-charge pressure is indicated on the gage.

7. Tighten the upper nut to 90 – 110 in-lbs.

8. Unscrew the goose-neck fitting to disconnect the charging and gaging assembly.

9. Re-install the gas valve protective cap.

10. Re-install the gas valve cover to the end-cap (Not all units are supplied with a gas valve cover).

- *Pre-charging an Accumulator*

1. Remove the gas valve cover from the end-cap (See Figure 1). Not all units are supplied with this cover.

2. Remove the protective cap from the gas valve assembly (See Figure 2).

3. Before attaching the goose-neck fitting of the CGA-300445 charging assembly to the gas valve assembly, be sure that the shutoff valve is in the closed position (See Figure 3). Valve is closed when the handle is turned clock-wise.

4. Hand-tighten the goose-neck fitting sufficiently to compress the gasket and to prevent gas leakage.

CAUTION

While loosening the upper nut, place a 3/4 inch wrench on the LOWER NUT of the gas valve assembly to prevent the loosening of the entire gas valve assembly from the gas cap. Failure to adhere to this procedure may result in equipment damage, personal injury, or death!!!

5. Place a 3/4 inch wrench on the upper nut (See Figure 2) of the gas valve assembly and turn in a counter clock- wise direction until the pre-charge pressure on the pressure gage is indicated.

NOTE: Upper nut on gas valve assembly will stop turning after approximately 3 to 4 turns. Use DRY NITRO-GEN ONLY to pre-charge the accumulator.

6. Connect the appropriate nut to the nitrogen tank and tighten.



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NOTE: Left hand threaded nut fits male connections usually found on bottles per Compressed Gas Association #550 or #1550. For female connections on inert gas bottles per Compressed Gas Association #580, use nipple fitting and hex nut with teflon tape (Reference Figure 3).

7. Open shutoff valve on the charging and gaging assembly.

IMPORTANT: Shutoff valve on the charging and gaging assembly must be in the open position before opening the nitrogen tank valve.

8. After completing step 7, slowly open the nitrogen tank valve to allow gas to flow into the accumulator, closing occasionally to allow the needle on the gage to settle into position and for reading the pre-charge pressure.

CAUTION

Never disconnect the charging and gaging assembly from the accumulator gas valve and/or nitrogen tank valve until each is fully locked in the off position!!!

9. Once the desired pressure has been reached, lock the upper nut of the gas valve assembly (See Figure 2) and torque between 90 – 110 in-lbs by turning it clock-wise.

10. Close the nitrogen tank valve.

11. Unscrew the goose-neck fitting to disconnect the charging and gaging assembly.

12. Re-install the gas valve protective cap

13. Re-install the gas valve cover to the end-cap (Not all units are supplied with a gas valve cover).

Service Instructions

CAUTION

Before disassembly of an accumulator, all pressure, both hydraulic and gas, must be removed from the unit. Failure to adhere to this procedure may result in equipment damage, personal injury, or death!!!



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Disassembly Instructions

Prior to any disassembly, the following should be performed:

- Relieve any hydraulic pressure supplied to the accumulator or stored in the accumulator.
- Drain the hydraulic fluid from the unit.
- Discharge all pre-charge from the accumulator following the “Reducing Pre-charge Pressure” instructions.

- *Disassembly of the Accumulator with Threaded End Caps*
 1. After fully discharging the nitrogen from the accumulator, remove the gas valve assembly by turning the lower nut counter clock-wise (See Figure 2).
 2. If the accumulator has been provided with a fuse assembly, DO NOT REMOVE it unless the fuse o-ring has leaked or the fuse must be replaced due to rupture.
 3. Secure the housing in a vise or clamping device. Cover the clamping jaws using wood or rubber to avoid damaging the accumulator housing. Do not clamp the housing to the point where the housing distorts. This will result in an unusable housing.
 4. Remove the end-caps using a spanner wrench. Support the end-caps during disassembly to avoid damaging the threads during removal from the housing.
 5. With a wooden or plastic dowel, push the piston out of the housing. To avoid damaging the piston or housing threads, special care must be exercised when the piston is being pushed beyond the housing threads. Loading sleeves are available from the manufacturer.
 6. Remove the o-rings and back-up rings from the end-caps.
 7. Remove the piston seal(s) and wear ring(s) from the piston.

- *Disassembly of the Accumulator with Segment Rings*
 1. After fully discharging the nitrogen from the accumulator, remove the gas valve assembly by turning the lower nut counter clock-wise (See Figure 2).
 2. If the accumulator has been provided with a fuse assembly, DO NOT REMOVE it unless the fuse o-ring has leaked or the fuse must be replaced due to rupture.

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3. Secure the housing in a vise or clamping device. Cover the clamping jaws using wood or rubber to avoid damaging the accumulator housing. Do not clamp the housing to the point where the housing distorts. This will result in an unus- able housing.
4. Remove the hex head screw, lockwasher and retaining plate. Screw a 1/2”-20 fitting into the gas valve assembly port and push the gas cap away from the segment ring retainers. Remove the segment ring retainers. Remove the segment rings and carefully pull out the gas cap.

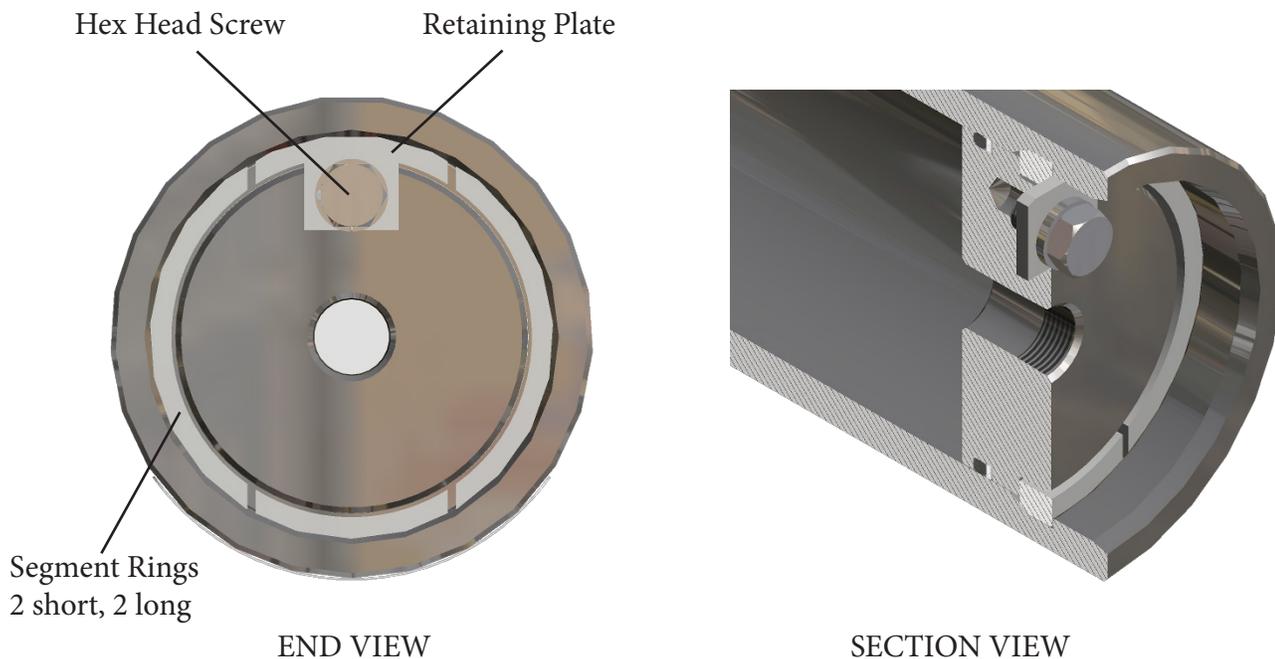


Figure 4 - Typical End-cap with Segment Ring Arrangement

5. Repeat step 4 above for removing the fluid end-cap while using the proper fitting for the fluid port size.
6. With a wooden or plastic dowel, push the piston out of the housing. To avoid damaging the piston or housing threads, special care must be exercised when the piston is being pushed beyond the segment ring grooves. Loading sleeves are available from the manufacturer.
7. Remove the o-rings and back-up rings from the end-caps.
8. Remove the piston seal(s) and wear ring(s) from the piston.



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• Examination of Parts

- **Housing:** Externally, the housing must be examined to locate any possible damage such as corrosion, physical damage, surface / paint issues, plating imperfections, etc. Internally, the housing must be very closely inspected. The bore must be smooth, free of scratches, or noticeable wear, and there should be no evidence of corrosion. Furthermore, the housing threads must also be inspected for any physical damage. If any damage is detected, experienced personnel must evaluate the specific issues to determine a corrective course of action.
- **End-caps:** Externally, the end-caps must be examined to locate any possible damage such as corrosion, physical damage, surface / paint issues, plating imperfections, etc. Also, the end-cap threads, connection threads (i.e. oil ports, gas valve port, etc.) and seal grooves must be inspected for corrosion, scratches, noticeable wear and any other physical damage. If any damage is detected, experienced personnel must evaluate the specific issues to determine a corrective course of action.
- **Gas Valve Assembly:** Examine the threads and other surfaces to locate any possible damage. Replace the valve if it is damaged. If any damage is detected, experienced personnel must evaluate the specific issues to determine a corrective course of action.
- **Piston:** Examine piston surfaces for any damage such as scratches, scoring, corrosion / oxidation, etc. If the piston exhibits any excessive wear, the housing and seals should also be closely inspected for damage. If any damage is detected, experienced personnel must evaluate the specific issues to determine a corrective course of action.
- **Seals:** All seals / soft goods must be replaced whenever an accumulator is disassembled. Nonetheless, examine all seals / soft goods (i.e. o-rings, back-up rings, piston seals, wear strips, etc.) for damage. Any damage should be analyzed by experienced personnel, to determine if it is more than expected wear. If any damage is appears to be unusual, experienced personnel must evaluate the specific issues to determine a corrective course of action.
- **Fuse Assembly:** (Not standard on all units) Examine the threads and other surfaces to locate any possible damage. Replace the fuse if it is damaged or has ruptured. If any damage is detected, experienced personnel must evaluate the specific issues to determine a corrective course of action.
- **Segment Rings:** Externally, the segment rings must be examined to locate any possible damage such as corrosion, physical damage, surface / paint issues, plating imperfections, etc. If any damage is detected, experienced personnel must evaluate the specific issues to determine a corrective course of action.
- **Hex Head Screws - Lockwashers - Retaining Plate Assemblies:** Externally, the hex head screws, lockwashers, and retaining plate assemblies must be examined to locate any possible damage such as corrosion, physical damage, surface issues, plating imperfections, etc. If any damage is detected, experienced personnel must evaluate the specific issues to determine a corrective course of action.



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Reassembly Instructions:

- Prior to reassembly, the following items should be performed and adhered to:
 - Thoroughly clean all parts before assembly. Foreign matter may damage the accumulator parts during operation.
 - Use a lubricant, which is compatible with the seal compound, accumulator materials, and system fluid, to aid the reassembly.
 - Always handle the seals with care throughout the assembly process. This will avoid damage, which will affect the accumulator performance.
 - When assembling a stainless steel accumulator, special care must be exercised by using an appropriate lubricant to avoid thread galling.

- Reassembly of the Accumulator
 1. Secure the housing in a vise or clamping device. Cover the clamping jaws using wood or rubber to avoid damaging the accumulator housing. Do not clamp the housing to the point where the housing distorts. This will result in an unusable housing.

 2. Lubricate each piston seal and install the seals onto the piston. Reference Figure 4 for the different sealing arrangements. Position the seals accordingly (Helpful hint: coat wear ring(s) with a system compatible grease to hold it / them in place.).

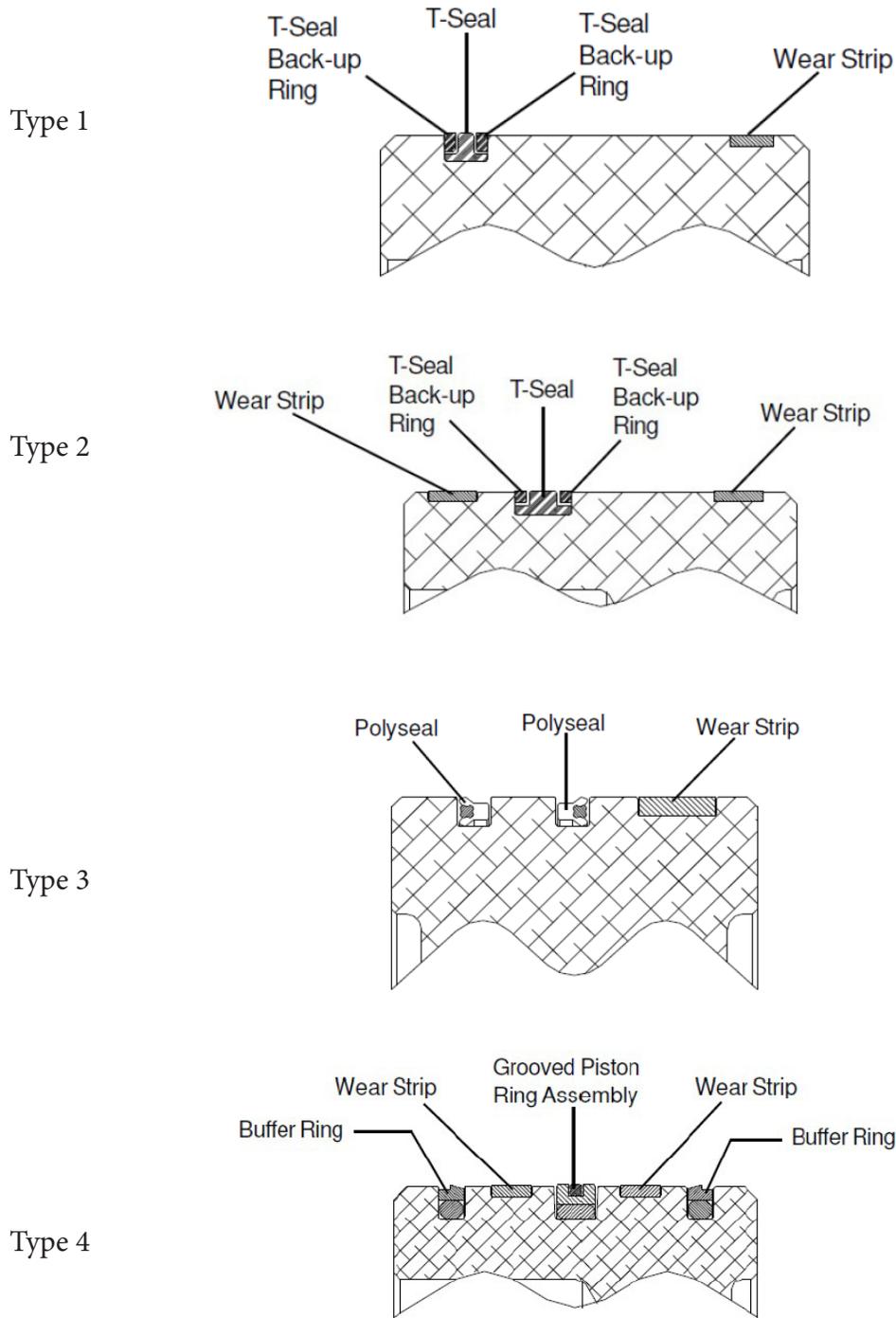


Figure 5 - Piston Sealing Arrangements

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3. Coat the id of the housing with a lubricant. Carefully insert the piston assembly into the bore of the housing. Once the piston has been inserted, push it beyond the threads and the end-cap sealing area.
4. Install the seals onto the end-caps. The most common sealing arrangement for the end-caps is an o-ring with a back-up ring. The o-ring should always be positioned on the pressure side of the end-cap (Closest to the installed piston). And, the back-up ring should always be positioned closest to the end-cap thread (See Figure 5).

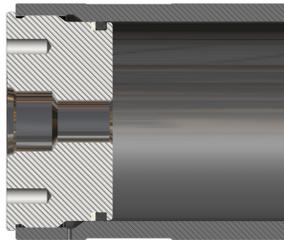


Figure 6 – Typical End-Cap Sealing Arrangement

5. Apply a system compatible lubricant to the end-cap threads. Turn the cap into the housing. Generally, this process is started by hand is followed by the use of a spanner wrench. The wrench is necessary to overcome the resistance of the o-ring and back-up ring while they are being inserted into the housing bore. Turn the cap until the flange seats or the end-cap is flush with the housing (See Figure 6). Finally, tighten the end-cap to the appropriate torque value (Reference the corresponding assembly drawing).

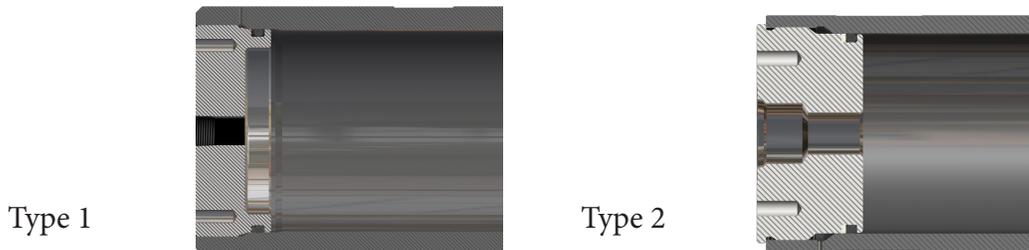


Figure 7 - Different End- Cap Arrangements

Installation of Accessories:

- Gas Valve Assembly: Install the gas valve assembly with the o-ring into the gas valve port on the gas-cap. Torque the lower nut (See Figure 1) between 45 – 50 ft-lbs. DO NOT tighten the upper nut when installing the gas valve. Re-install the gas valve cover to the end-cap (Not all units are supplied with a gas valve cover).
- Fuse Assembly: Install the fuse assembly with the o-ring into the fuse port on the gas-cap. Torque the fuse assembly to 20 – 25 ft-lbs.

Reassembly of an Accumulator with Segment Rings

1. Secure the housing in a vise or clamping device. Cover the clamping jaws using wood or rubber to avoid damaging the accumulator housing. Do not clamp the housing to the point where the housing distorts. This will result in an unusable housing.
2. Lubricate each piston seal and install the seals onto the piston. Reference Figure 4 for the different sealing arrangements. Position the seals accordingly (Helpful hint: coat wear ring(s) with a system compatible grease to hold it / them in place.).
3. Coat the ID of the housing with a lubricant. Carefully insert the piston assembly into the bore of the housing. Once the piston has been inserted, push it beyond the segment ring grooves and the end-cap sealing area.
4. Install the seals onto the end-caps. The most common sealing arrangement for the end-caps is an o-ring with a back-up ring. The o-ring should always be positioned on the pressure side of the end-cap (Closest to the installed piston). And, the backup ring should always be positioned closest to the end-cap segment ring groove (See Figure 7 below).
5. Apply a system compatible lubricant to the o-rings. Slide the fluid end-cap into the housing beyond the normal position.
6. Install the segment ring retainers and hold them in place. Using a wooden dowel, push the piston against the fluid end- cap and continue pushing until the end-cap is against the segment ring retainers. Install the retainer plate, lock washer, and hex head screw.
7. Slide the gas end-cap into the housing beyond the normal position. Install the segment ring retainers and hold them in place. Push the piston against the gas end-cap by inserting a wooden dowel through the fluid end-cap port. Continue pushing the piston and end-cap until the end-cap is against the segment ring retainers. Install the retainer plate, lock-washer, and hex head screw.

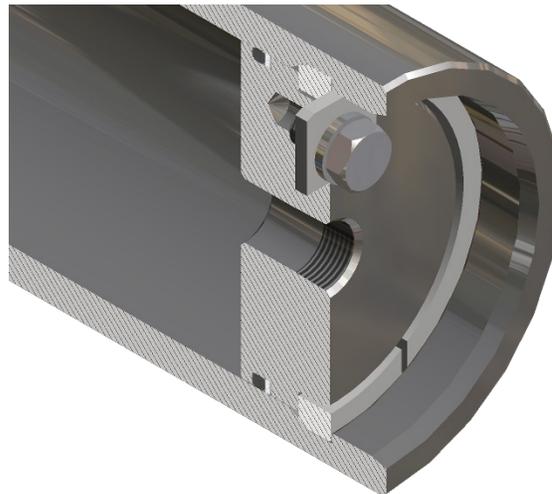


Figure 8 – Typical End-Cap with Segment Rings Sealing Arrangement



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Installation of Accessories:

- Gas Valve Assembly: Install the gas valve assembly with the o-ring into the gas valve port on the gas-cap. Torque the lower nut (See Figure 1) between 45 – 50 ft-lbs. DO NOT tighten the upper nut when installing the gas valve. Re-install the gas valve cover to the end-cap (Not all units are supplied with a gas valve cover).
- Fuse Assembly: Install the fuse assembly with the o-ring into the fuse port on the gascap. Torque the fuse assembly to 45 – 50 ft-lbs.

Storage Instructions

For prolonged storage after reassembly, all internal steel surfaces must be protected from corrosion using a rust inhibiting fluid, which is compatible with the system fluid. These surfaces can be coated, by cycling the accumulator with this rust inhibiting fluid.

- After the surfaces have been coated, fill the accumulator with a 25 psi dry nitrogen pre-charge.
- Plug the oil port to avoid any foreign matter from entering the accumulator.
- Store the unit in a cool dry location.
- If the unit has been stored for more than 2 years, it must be disassembled, re-inspected and the seals must be replaced.