



A-520/A-522/A-522A Series

4" Bottom Outlet Ball Valve

Installation, Operation & Maintenance (IOM) Manual

Table of Contents

| | | |
|-----|--------------------------------------------------|----|
| 1 | Regulations and Safety Requirements | 3 |
| 1.1 | Regulations | 3 |
| 1.2 | Safety Warnings and Precautions..... | 3 |
| 2 | Introduction | 4 |
| 2.1 | Component Identification and Parts Listings..... | 4 |
| 2.2 | Steam-Jacket Configurations..... | 10 |
| 3 | Valve Installation..... | 12 |
| 3.1 | Installation Procedure and Required Tools | 12 |
| 3.2 | Leak Inspection | 14 |
| 3.3 | Valve Operation Notes and Precautions..... | 14 |
| 4 | Valve Qualification | 15 |
| 4.1 | Valve Disassembly and Required Tools | 15 |
| 4.2 | Component Inspection..... | 18 |
| 4.3 | Special Inspection Considerations..... | 19 |
| 4.4 | Valve Assembly and Testing Requirements | 20 |
| 4.5 | Valve Assembly and Testing Procedure | 20 |
| 5 | Routine Maintenance | 27 |
| 5.1 | Leak Checking in the Field | 27 |

1 Regulations and Safety Requirements

1.1 Regulations

Midland bottom-outlet ball valves are used in contact with a variety of products, many of which are hazardous materials and could cause serious injury or damage if mishandled. The acceptance and transportation of products are regulated by the DOT and AAR in the U.S.A., and in Canada by CTC and Transport Canada. Regulations of other governmental bodies must be complied with for stationary and mobile applications. All personnel should be familiar with and follow these regulations. Nothing in these instructions is intended to conflict with or supersede these regulations. The information in this document was gathered from knowledgeable sources. However, Midland Manufacturing Corporation makes no representations or guarantees about its accuracy or completeness and assumes no liability for this information.

This valve should only be installed, operated and maintained by qualified personnel. Read all of these instructions carefully before proceeding.

Operation of the valve must conform to all applicable specifications from TC, AAR, DOT, CFR (Parts 173.31, 174.67, etc.) and other governmental bodies, along with the operating instructions of your company.

1.2 Safety Warnings and Precautions

Please carefully read each of the following warnings and cautions prior to performing any work.

WARNING: Toxic Hazard. Always use extreme caution and proper equipment when involved with hazardous materials. To avoid exposure to toxic or hazardous materials, make sure the tank car is empty and clean, and that the work area is free of hazardous chemicals before removing or installing any valve.



- **Wear protective clothing and equipment suitable for withstanding the materials to which you may be exposed**
- **Position yourself on the upwind side of the valve when possible**
- **Work in a well-ventilated area**
- **Work with a partner who can help you in the event of an emergency**
- **Follow approved safety precautions for hazardous or toxic materials**
- **Obtain MSDS sheets for all the commodities used with the associated valve**



CAUTION: Valve Damage. Avoid using forceful tools on seal-support surfaces when removing ball seals and stem packing, or damage may result.



CAUTION: Sealing-Surface Damage. A damaged sealing surface on the valve flange may prevent proper sealing on the tank-car mounting and result in leakage of the tank contents.

2 Introduction

The A-520, A-522, and A-522A 4" Bottom-Outlet Ball Valves offer greater resistance to abrasion. They also reduce the chance of leakage caused by particle contamination in harsh applications.

- Low and standard profiles available
- Available in carbon steel or stainless steel
- Updated sealing surfaces to reduce torque requirements

2.1 Component Identification and Parts Listings

| ITEM | QTY | DESCRIPTION | A-520-C1-CS | | A-520-C1-MO | |
|------|-----|-------------------------------------------------|--------------|-----------------|--------------|-----------------|
| | | | PART NO. | MATERIAL | PART NO. | MATERIAL |
| 1 | 1 | CAP | 520-112-CS | STEEL | 520-112-MO | STAINLESS STEEL |
| 2 | 1 | STEM | 520-2-SS | STAINLESS STEEL | 520-2-SS | STAINLESS STEEL |
| 3 | 1 | BALL | 520-3-MO | STAINLESS STEEL | 520-3-MO | STAINLESS STEEL |
| 4 | 1 | BODY | 520-45-CS | STEEL | 520-45-MO | STAINLESS STEEL |
| 5 | 1 | PACKING | 520-5-01-TF | VIRGIN TEFLON® | 520-5-01-TF | VIRGIN TEFLON® |
| 6 | 1 | SPACER | 520-6-SS | STAINLESS STEEL | 520-6-SS | STAINLESS STEEL |
| 7 | 1 | PIN | 520-7-CS | STEEL | 520-7-CS | STEEL |
| 8 | 1 | STOP PLATE | 520-8-CS | STEEL PLATED | 520-8-CS | STEEL PLATED |
| 9 | 8 | CAP SCREW, HEX-SOCKET, 5/8"-11 UNC-2A X 1"LG | 520-9-CS | STEEL | 520-9-CS | STEEL |
| 10 | 2 | SEAL, BALL | SEE TABLE | SEE TABLE | SEE TABLE | SEE TABLE |
| 11 | 1 | SEAL, VALVE BODY | 520-11-01-TF | VIRGIN TEFLON® | 520-11-01-TF | VIRGIN TEFLON® |
| 12 | 1 | WASHER, THRUST | 520-12-01-TF | VIRGIN TEFLON® | 520-12-01-TF | VIRGIN TEFLON® |
| 13 | 1 | LOCKNUT HEX THIN, 1-1/8"-12 UNF, NY. INSERT | 520-13-CS | STEEL PLATED | 520-13-CS | STEEL PLATED |
| 14 | 1 | NAME PLATE | 520-14-SS | STAINLESS STEEL | 520-14-SS | STAINLESS STEEL |

Table 2-1 A-520-C1 Component Parts Listing

| VALVE MODEL NO. | SEAL, BALL | | |
|-----------------|--------------|-----------------------|----------------------|
| | PART NO. | SEAL MATERIAL | SEAL MATERIAL SUFFIX |
| A-520-C1-CS | 520-10-01-TF | VIRGIN TEFLON® | PTFE |
| A-520-C1-MO | 520-10-01-TF | VIRGIN TEFLON® | PTFE |
| A-520-C1-CS-ST | 510-10-04-ST | 316-SS FILLED TEFLON® | ST |
| A-520-C1-MO-ST | 510-10-04-ST | 316-SS FILLED TEFLON® | ST |

Table 2-2 A-520-C1 Ball Seal Parts Listing

| ITEM | QTY | DESCRIPTION | A-520-C2-CS | | A-520-C2-MO | |
|------|-----|-------------------------------------------------|--------------|-----------------|--------------|-----------------|
| | | | PART NO. | MATERIAL | PART NO. | MATERIAL |
| 1 | 1 | CAP | 520-112-CS | STEEL | 520-112-MO | STAINLESS STEEL |
| 2 | 1 | STEM | 520-2-SS | STAINLESS STEEL | 520-2-SS | STAINLESS STEEL |
| 3 | 1 | BALL | 520-30-MO | STAINLESS STEEL | 520-30-MO | STAINLESS STEEL |
| 4 | 1 | BODY | 520-45-CS | STEEL | 520-45-MO | STAINLESS STEEL |
| 5 | 1 | PACKING | 520-5-01-TF | VIRGIN TEFLON® | 520-5-01-TF | VIRGIN TEFLON® |
| 6 | 1 | SPACER | 520-6-SS | STAINLESS STEEL | 520-6-SS | STAINLESS STEEL |
| 7 | 1 | PIN | 520-7-CS | STEEL | 520-7-CS | STEEL |
| 8 | 1 | STOP PLATE | 520-8-CS | STEEL PLATED | 520-8-CS | STEEL PLATED |
| 9 | 8 | CAP SCREW, HEX-SOCKET, 5/8"-11 UNC-2A X 1"LG | 520-9-CS | STEEL | 520-9-CS | STEEL |
| 10 | 2 | SEAL, BALL | SEE TABLE | SEE TABLE | SEE TABLE | SEE TABLE |
| 11 | 1 | SEAL, VALVE BODY | 520-11-01-TF | VIRGIN TEFLON® | 520-11-01-TF | VIRGIN TEFLON® |
| 12 | 1 | WASHER, THRUST | 520-12-01-TF | VIRGIN TEFLON® | 520-12-01-TF | VIRGIN TEFLON® |
| 13 | 1 | LOCKNUT HEX THIN, 1-1/8"-12 UNF, NY. INSERT | 520-13-CS | STEEL PLATED | 520-13-CS | STEEL PLATED |
| 14 | 1 | NAME PLATE | 520-14-30-SS | STAINLESS STEEL | 520-14-SS | STAINLESS STEEL |

Table 2-3 A-520-C2 Component Parts Listing

| VALVE MODEL NO. | SEAL, BALL | |
|-----------------|--------------|-----------------------|
| | PART NO. | SEAL MATERIAL |
| A-520-C2-CS | 520-10-01-TF | VIRGIN TEFLON® |
| A-520-C2-MO | 520-10-01-TF | VIRGIN TEFLON® |
| A-520-C2-CS-ST | 510-10-04-ST | 316-SS FILLED TEFLON® |
| A-520-C2-MO-ST | 510-10-04-ST | 316-SS FILLED TEFLON® |

Table 2-4 A-520-C2 Ball Seal Parts Listing

| ITEM | QTY | DESCRIPTION | A-522-C1-CS | | A-522-C1-MO | |
|------|-----|-------------------------------------------------|--------------|-----------------|--------------|-----------------|
| | | | PART NO. | MATERIAL | PART NO. | MATERIAL |
| 1 | 1 | CAP | 520-112-CS | STEEL | 520-112-MO | STAINLESS STEEL |
| 2 | 1 | STEM | 520-2-SS | STAINLESS STEEL | 520-2-SS | STAINLESS STEEL |
| 3 | 1 | BALL | 520-3-MO | STAINLESS STEEL | 520-3-MO | STAINLESS STEEL |
| 4 | 1 | BODY | 522-45-CS | STEEL | 522-45-MO | STAINLESS STEEL |
| 5 | 1 | PACKING | 520-5-01-TF | VIRGIN TEFLON® | 520-5-01-TF | VIRGIN TEFLON® |
| 6 | 1 | SPACER | 520-6-SS | STAINLESS STEEL | 520-6-SS | STAINLESS STEEL |
| 7 | 1 | PIN | 520-7-CS | STEEL | 520-7-CS | STEEL |
| 8 | 1 | STOP PLATE | 520-8-CS | STEEL PLATED | 520-8-CS | STEEL PLATED |
| 9 | 8 | CAP SCREW, HEX-SOCKET, 5/8"-11 UNC-2A X 1"LG | 520-9-CS | STEEL | 520-9-CS | STEEL |
| 10 | 2 | SEAL, BALL | SEE TABLE | SEE TABLE | SEE TABLE | SEE TABLE |
| 11 | 1 | SEAL, VALVE BODY | 520-11-01-TF | VIRGIN TEFLON® | 520-11-01-TF | VIRGIN TEFLON® |
| 12 | 1 | WASHER, THRUST | 520-12-01-TF | VIRGIN TEFLON® | 520-12-01-TF | VIRGIN TEFLON® |
| 13 | 1 | LOCKNUT HEX THIN, 1-1/8"-12 UNF, NY. INSERT | 520-13-CS | STEEL PLATED | 520-13-CS | STEEL PLATED |
| 14 | 1 | NAME PLATE | 520-14-SS | STAINLESS STEEL | 520-14-SS | STAINLESS STEEL |

Table 2-5 A-522-C1 Component Parts Listing

| VALVE MODEL NO. | SEAL, BALL | | |
|-----------------|--------------|-----------------------|----------------------|
| | PART NO. | SEAL MATERIAL | SEAL MATERIAL SUFFIX |
| A-522-C1-CS | 520-10-01-TF | VIRGIN TEFLON® | PTFE |
| A-522-C1-MO | 520-10-01-TF | VIRGIN TEFLON® | PTFE |
| A-522-C1-CS-ST | 510-10-04-ST | 316-SS FILLED TEFLON® | ST |
| A-522-C1-MO-ST | 510-10-04-ST | 316-SS FILLED TEFLON® | ST |

Table 2-6 A-522-C1 Ball Seal Parts Listing

| ITEM | QTY | DESCRIPTION | A-522-C2-CS | | A-522-C2-MO | |
|------|-----|-------------------------------------------------|--------------|-----------------|--------------|-----------------|
| | | | PART NO. | MATERIAL | PART NO. | MATERIAL |
| 1 | 1 | CAP | 520-112-CS | STEEL | 520-112-MO | STAINLESS STEEL |
| 2 | 1 | STEM | 520-2-SS | STAINLESS STEEL | 520-2-SS | STAINLESS STEEL |
| 3 | 1 | BALL | 520-30-MO | STAINLESS STEEL | 520-30-MO | STAINLESS STEEL |
| 4 | 1 | BODY | 522-45-CS | STEEL | 522-45-MO | STAINLESS STEEL |
| 5 | 1 | PACKING | 520-5-01-TF | VIRGIN TEFLON® | 520-5-01-TF | VIRGIN TEFLON® |
| 6 | 1 | SPACER | 520-6-SS | STAINLESS STEEL | 520-6-SS | STAINLESS STEEL |
| 7 | 1 | PIN | 520-7-CS | STEEL | 520-7-CS | STEEL |
| 8 | 1 | STOP PLATE | 520-8-CS | STEEL PLATED | 520-8-CS | STEEL PLATED |
| 9 | 8 | CAP SCREW, HEX-SOCKET, 5/8"-11 UNC-2A X 1"LG | 520-9-CS | STEEL | 520-9-CS | STEEL |
| 10 | 2 | SEAL, BALL | SEE TABLE | SEE TABLE | SEE TABLE | SEE TABLE |
| 11 | 1 | SEAL, VALVE BODY | 520-11-01-TF | VIRGIN TEFLON® | 520-11-01-TF | VIRGIN TEFLON® |
| 12 | 1 | WASHER, THRUST | 520-12-01-TF | VIRGIN TEFLON® | 520-12-01-TF | VIRGIN TEFLON® |
| 13 | 1 | LOCKNUT HEX THIN, 1-1/8"-12 UNF, NY. INSERT | 520-13-CS | STEEL PLATED | 520-13-CS | STEEL PLATED |
| 14 | 1 | NAME PLATE | 520-14-SS | STAINLESS STEEL | 520-14-SS | STAINLESS STEEL |

Table 2-7 A-522-C2 Component Parts Listing

| VALVE MODEL NO. | SEAL, BALL | | |
|-----------------|--------------|-----------------------|----------------------|
| | PART NO. | SEAL MATERIAL | SEAL MATERIAL SUFFIX |
| A-522-C2-CS | 520-10-01-TF | VIRGIN TEFLON® | PTFE |
| A-522-C2-MO | 520-10-01-TF | VIRGIN TEFLON® | PTFE |
| A-522-C2-CS-ST | 510-10-04-ST | 316-SS FILLED TEFLON® | ST |
| A-522-C2-MO-ST | 510-10-04-ST | 316-SS FILLED TEFLON® | ST |

Table 2-8 A-522-C2 Ball Seal Parts Listing

| ITEM | QTY | DESCRIPTION | A-522A-C2-CS | | A-522A-C2-MO | |
|------|-----|-------------------------------------------------|---------------|-----------------|---------------|-----------------|
| | | | PART NO. | MATERIAL | PART NO. | MATERIAL |
| 1 | 1 | CAP | 520-113-CS | STEEL | 520-113-MO | STAINLESS STEEL |
| 2 | 1 | STEM | 520-2-SS | STAINLESS STEEL | 520-2-SS | STAINLESS STEEL |
| 3 | 1 | BALL | 520-30-MO | STAINLESS STEEL | 520-30-MO | STAINLESS STEEL |
| 4 | 1 | BODY | 522-45-CS | STEEL | 522-45-MO | STAINLESS STEEL |
| 5 | 1 | PACKING | 520-5-01-TF | VIRGIN TEFLON® | 520-5-01-TF | VIRGIN TEFLON® |
| 6 | 1 | SPACER | 520-6-SS | STAINLESS STEEL | 520-6-SS | STAINLESS STEEL |
| 7 | 1 | PIN | 520-7-CS | STEEL | 520-7-CS | STEEL |
| 8 | 1 | STOP PLATE | 520-8-CS | STEEL PLATED | 520-8-CS | STEEL PLATED |
| 9 | 8 | CAP SCREW, HEX-SOCKET, 5/8"-11 UNC-2A X 1"LG | 520-9-CS | STEEL | 520-9-CS | STEEL |
| 10 | 1 | BALL SEAL, BODY | 522-10-03A-TF | SEE TABLE | 522-10-03A-TF | SEE TABLE |
| 11 | 1 | SEAL, VALVE BODY | 520-11-01-TF | TEFLON | 520-11-01-TF | TEFLON |
| 12 | 1 | WASHER, THRUST | 520-12-01-TF | TEFLON | 520-12-01-TF | TEFLON |
| 13 | 1 | LOCKNUT HEX THIN, 1-1/8"-12 UNF, NY. INSERT | 520-13-CS | STEEL PLATED | 520-13-CS | STEEL PLATED |
| 14 | 1 | NAME PLATE | 520-14-SS | STAINLESS STEEL | 520-14-SS | STAINLESS STEEL |
| 15 | 1 | BALL SEAL, CAP | 522-10-03-TF | TEFLON | 522-10-03-TF | TEFLON |

Table 2-9 A-522A-C2 Component Parts Listing

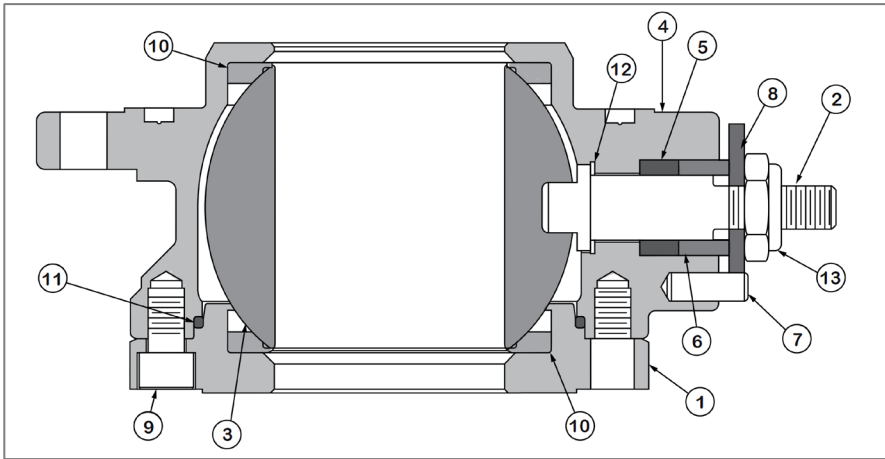


Figure 2-1 A-52X Component Identification

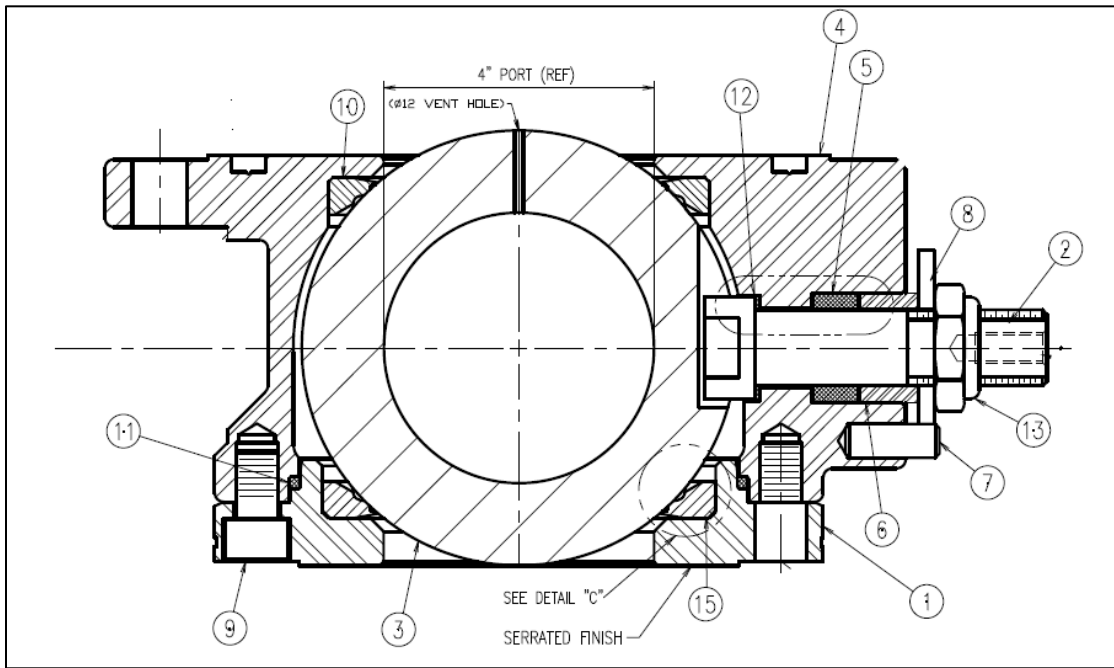


Figure 2-2 A-522A Component Identification

2.2 Steam-Jacket Configurations

Note that only the legacy A-522 models have a steam jacket configuration; the updated A-522A does not have this configuration.

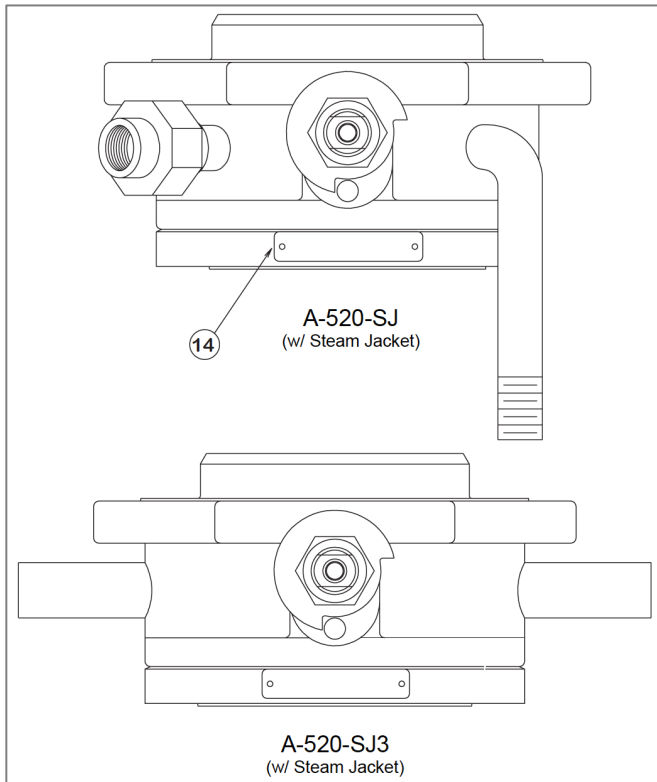


Figure 2-3 A-520-SJ Valve w/Steam-Jacket Configuration

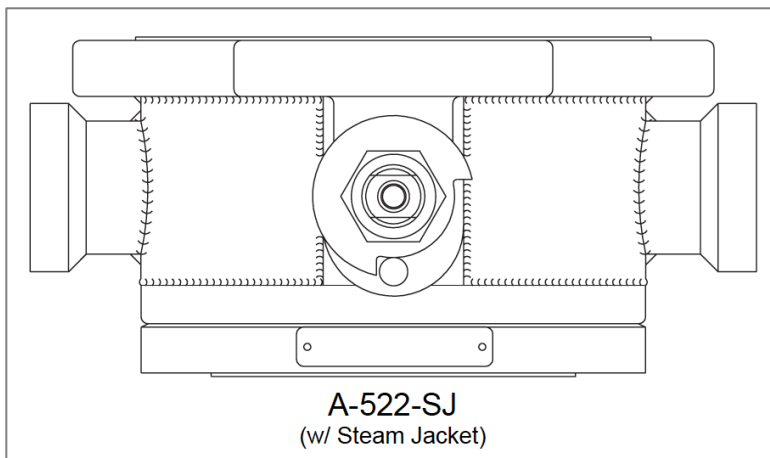


Figure 2-4 A-522-SJ w/Steam-Jacket Configuration



NOTICE

NOTICE: Shown for information only. For specific details on steam jackets (i.e., part numbers and dimensions), contact Midland Customer Service.

3 Valve Installation

Keep the new valve in its original shipping container. This will ensure it remains clean and will protect the gasket groove and ball from nicks and damage.

Prior to installation, ensure that the valve remains clean and the gasket-sealing surfaces are not damaged.

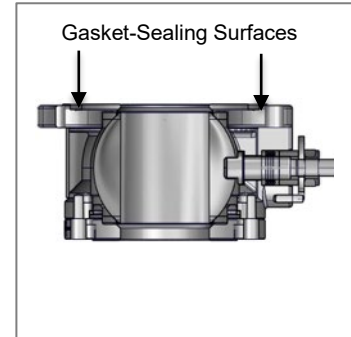


Figure 3-1 Gasket-Sealing Surfaces

3.1 Installation Procedure and Required Tools

| SAE Wrench | Component(s)/Description | Torque |
|----------------------------------------------|----------------------------------|--------|
| 1-1/4" | Mounting Bolts | |
| Other Tools, Supplies, and Equipment: | | |
| Solvent | To Clean the mounting and tongue | |
| Lint-Free Cloth | To Clean Sealing Surfaces | |

Table 3-1 Required Tools for Valve Installation

- 3.1.1 Remove the old valve from the tank car. Clean the tank-car mounting flange and saddle plate (if present) of all product, debris and corrosion. Wipe the inside bottom of the tank near the outlet opening to remove loose debris. Clean out the threaded holes in the mounting to ensure easy installation of the new mounting hardware.
- 3.1.2 Using a lint-free cloth and appropriate cleaning solvent, wipe clean the mounting and tongue.
- 3.1.3 Inspect the sides and edges of the tank-car tongue. Because the valve fits tightly over the tongue, any opening over of its edges may make it difficult to properly seat the new valve. Mounted flange surfaces should be within 0.015 inches TIR. If any irregularities are found, correct them according to approved repair practices.
- 3.1.4 Inspect the gasket groove of valve for nicks and burrs. The mounting tongue and gasket groove dimensions have diameter tolerances of ± 0.003 inches, thus any excess material on these diameters will make it difficult to locate the valve groove on the tongue. If minor irregularities are found, correct them according to approved repair practices.
- 3.1.5 Install the new gasket in the gasket groove of the valve. Ensure it is fully seated. When the gasket is fully seated, 3/16" of free space should remain above the gasket to permit locating and entry of the tongue.



CAUTION: Gasket Damage. Do not use a sharp tool to press the new gasket into place or gasket damage may result.



NOTICE: The ball valve should be installed in the “open” position so that the ball surfaces are protected during the following steps.



Figure 3-2 Ball Valve in Open Position

- 3.1.6 Raise the valve up to the tank-car mounting flange surface. Orient with the valve handle shaft so that it is pointing away from the tank car. Carefully align the mounting-flange tongue with the gasket groove in the valve. Take care to align the mounting holes in the valve flange with those in the mounting flange.



CAUTION: Potential Lifting Injury. The ball valve, with the outlet cap in place, weighs in excess of 95 lb (depending on model). Use mechanical assistance or additional manpower when lifting and locating the valve during installation

- 3.1.7 Raise the valve only until the gasket groove engages with the mounting flange tongue.
- 3.1.8 Install four (4) mounting bolts 90° apart and tighten them gradually in an even sequence only enough to retain engagement of the valve with the mounting-flange tongue.
- 3.1.9 Remove the mechanical lifting device. Install the remaining four (4) mounting bolts.
- 3.1.10 Tighten all eight (8) mounting bolts alternating diagonally. Do not over-tighten one side as it may tilt the valve and prevent a proper seal.

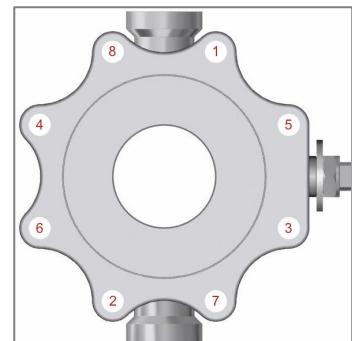


Figure 3-3 Bolt-Tightening Sequence

- 3.1.11 Tighten the mounting bolts in 1/3-torque increments to a final torque setting as determined by gasket selection.
- 3.1.12 Ensure that an even gap exists between the valve flange and the mounting flange. The gap should be 1/8” to 3/16” depending on the mounting flange tongue height (which may vary between 5/16” and 3/8”).
- 3.1.13 Fully close and open the valve a few times to confirm free operation.

3.2 Leak Inspection

3.2.1 Test all newly installed valves to conform to car-owner specifications. No leaks should be present.



WARNING: Valve Leakage. Improper flange-tongue seating in the valve groove, loose bolts and damaged gaskets may result in leaks at the valve-mounting joint.

3.2.2 Inspect for leaks. Follow your company's leak-testing procedure.

3.3 Valve Operation Notes and Precautions



NOTICE: Valve Operation. Operation and use of the valve must conform with all applicable TC, AAR, DOT (Parts 173.31, 174.68, etc.) regulations, other governmental bodies and the operating instructions of your company.

3.3.1 Rotate shaft to operate valve open and close.

3.3.2 Ensure the valve is fully open, and close by the indicator fully engaging the pin stops.

4 Valve Qualification

Follow these instructions and guidelines for assessing the condition of a leaking ball valve prior to rebuilding it.



NOTICE: To ensure best practices and consistency of your qualification procedure, gaskets, O-rings, valve seats and wire seals should always be replaced.

4.1 Valve Disassembly and Required Tools

| SAE Wrench | Component(s)/Description |
|----------------------------------------------|--------------------------|
| 1-5/8" Wrench | Locknut (item 13) |
| 5/8" Allen Wrench | Cap Screws (item 9) |
| Other Tools, Supplies, and Equipment: | |
| Thread Go/No-Go Gauge | Stem (item 2) |

Figure 4-1 Required Tools for Valve Disassembly

- 4.1.1 Set the valve to the closed position. This must be done to allow removal of the valve ball.



Figure 4-2 Set to Closed Position

- 4.1.2 Locate the valve on a bench (preferably on a pressure-test fixture) so it may be bolted for safety and rigidity during hardware removal. Secure it with the eight-bolt flange.

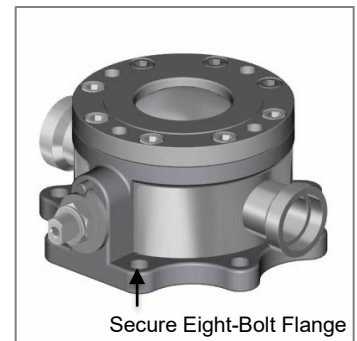


Figure 4-3 Valve Inverted

- 4.1.3 Remove the outlet cap assembly (if present).

- 4.1.4 Remove the eight (8) socket hex-head cap screws (item 9) from the valve cap (Item 1).



CAUTION

CAUTION: Valve Damage. Avoid using forceful tools on seal-support surfaces when removing ball seals and stem packing, or damage may result.



TIP: Use 5/8" Allen wrench.

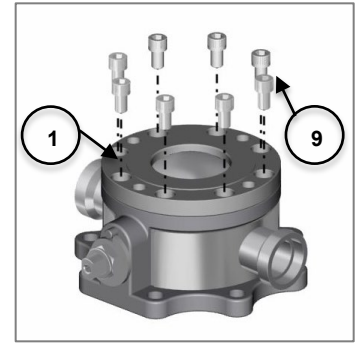


Figure 4-4 Remove Cap Screws

- 4.1.5 Carefully lift off the valve cap (item 1) taking care to avoid contacting it with the valve ball (item 3). Remove valve body seal (item 11) from the body (item 4).

- 4.1.6 Remove the ball seal (Item 10) from the cap (item 1).

- 4.1.6.1 If handling an A-522A, remove the cap ball seal (item 15) from the cap (item 1).

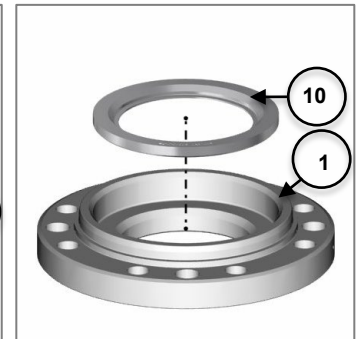
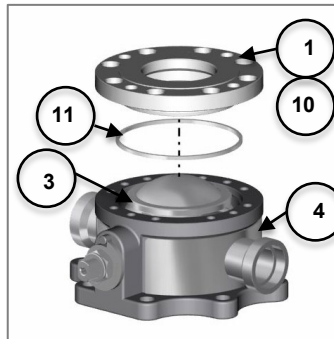


Figure 4-5 Remove Valve Cap and Ball Seal

- 4.1.7 Reach both hands into the valve body (item 4) on either side of the valve ball (item 3). Lift the ball out of the body and set it on a padded surface.

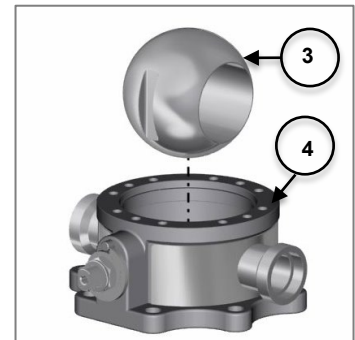


Figure 4-6 Remove Valve Ball

- 4.1.8 Remove the locknut (Item 13) from the valve stem (item 2) by turning it counterclockwise.



TIP: Use a 1-5/8" wrench.

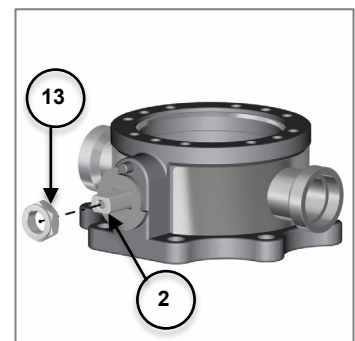


Figure 4-7 Remove Locknut

4.1.9 Remove the stop plate (item 8) and then carefully press the valve stem (item 2) into the body (item 4) cavity and remove it.



TIP: The use of a brass or plastic hammer may be required to overcome the resistance of the compressed stem packing.

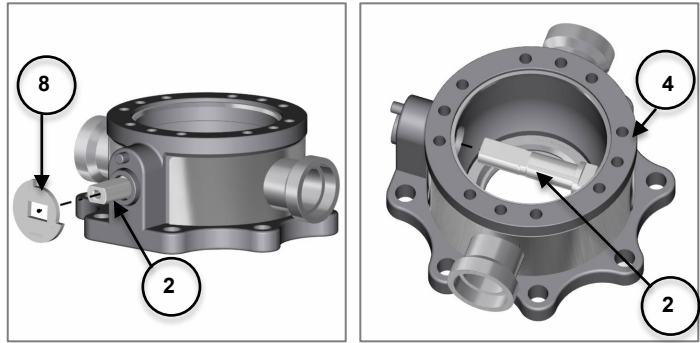


Figure 4-8 Remove Stop Plate and Stem

4.1.10 Remove the stainless-steel spacer collar (Item 6) from the valve-stem bore.

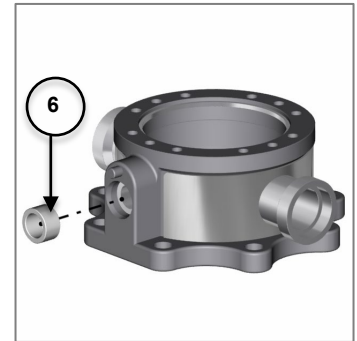


Figure 4-9 Remove Space Collar

4.1.11 Remove the Teflon® packing (item 5) from the valve-stem bore. Avoid scratching or gouging the interior surfaces for the valve-stem bore.

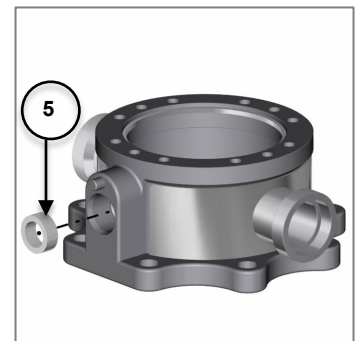


Figure 4-10 Remove Teflon Packing

4.1.12 Carefully remove the body ball seal (item 10) from the inside-bottom of the valve body (item 4).

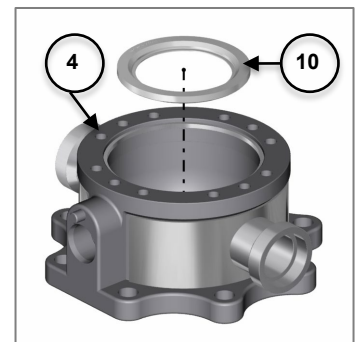


Figure 4-11 Remove Ball Seal

4.2 Component Inspection



NOTICE: Without consent from the valve manufacturer or car owner, repair work is limited to cleaning and polishing. See AAR M1002, Paragraph A3.11.1 of the Tank-Car Specifications.



WARNING: Machining Not Allowed. Without consent from the valve manufacturer or car owner, machining, grinding, welding or other alterations to the valve seat or stem seat is not allowed per AAR M1002, Paragraph A3.11.1 of the Tank-Car Specifications.



NOTICE: Procedures may not cover all conditions encountered in the field. Therefore, it is the responsibility of the repair agency to obtain approval from Midland for inspection, evaluation, repair and maintenance procedures not covered herein. Evaluation of critical component metal surfaces of the valves after cleaning, inspection, specialized testing performed by agencies other are the responsibility of the repair facility. Where numerical tolerances can be provided, the disposition of the internal integrity and surface quality of parts is under the jurisdiction of the repair facility and dependent on its experience and judgment.

Key components must be thoroughly inspected during the qualification process. These components include the valve-body, valve-ball and valve stem.

4.2.1 Valve-Body Inspection

4.2.1.1 Check the valve body (item 4), cap (item 1), and the ball-seal surfaces for signs of corrosion, cracks and scratches. **No defects are allowed.**

4.2.1.1.1 Inspect the sealing areas of the body (item 4). Ensure there is no visible corrosion, intrusions or voids in the sealing area.

4.2.1.2 Outside the sealing area, the depth of the voids/intrusions must not exceed 0.060" in depth and 0.090" in width.

4.2.1.3 A maximum of one void per square inch is allowable outside the sealing area. Total void area must not exceed 5% of total surface.

4.2.1.4 Bottom of voids must be visible, well-rounded and without inclusions.

4.2.1.5 Using a light, visually inspect the valve stem bore for gouges or corrosions. It must be free of defects.

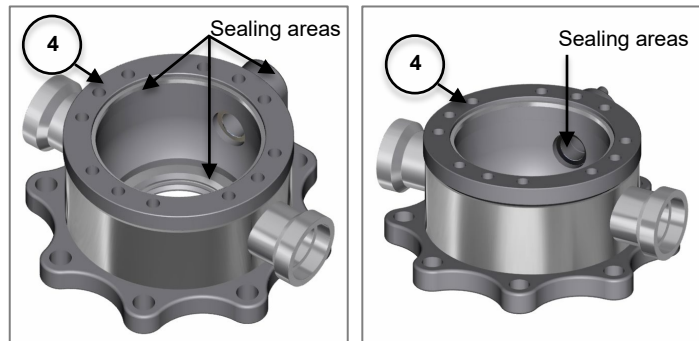


Figure 4-12 Inspect Sealing Areas

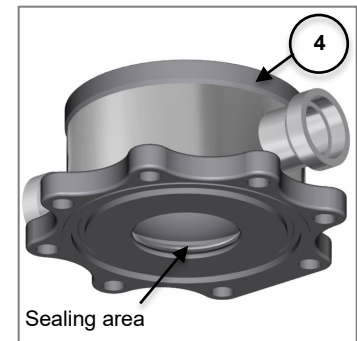


Figure 4-13 Inspect Sealing Areas

4.2.2 Valve Ball Inspection

- 4.2.2.1 Clean the valve ball (item 3) with soap and water or in an ultrasonic bath, or both, to remove adhering product.
- 4.2.2.2 Slide your fingernail over scratches to determine severity. If your fingernail is unable to “catch” in an abrasion, it is not of a depth that would allow leakage or affect the ball seals.
- 4.2.2.3 If any of the scratches fail the fingernail test, replace the ball. It cannot be repaired.



Figure 4-14 Check Scratch Severity

4.2.3 Valve-Stem Components Inspection

- 4.2.3.1 The stem (item 2) 1-1/8"-12 UNF threads should pass a thread-ring Go-Gauge test. If the threads exhibit stripping or irreparable damage, replace the valve stem.
- 4.2.3.2 Inspect the surfaces of the spacer (item 6) bushing that contacts the stem packing and thrust washer as shown in Figure 4-5. Also, inspect the surface of the stem shaft. These surfaces should be smooth and clean.
- 4.2.3.3 Inspect the valve stem locknut for damage to the threads and the Nylon® locking insert. Replace the locknut if damage is observed and if the Nylon® insert is cracked, damaged or frayed.

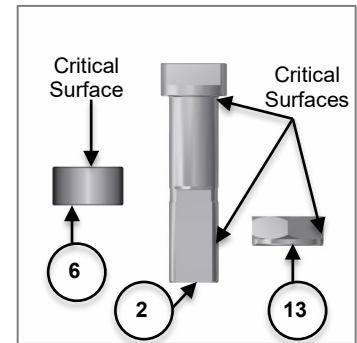


Figure 4-15 Valve Stem and Spacer Surfaces

4.3 Special Inspection Considerations

- 4.3.1 Previous procedures may not cover all conditions encountered in the field. Therefore, it is the responsibility of the repair agency to contact an authorized Midland technical representative for recommendations regarding unusual valve conditions or repair circumstances that may be encountered.
- 4.3.2 Evaluation of critical component metal surfaces of the valves after cleaning and inspection, by the repair facility are the responsibility of the repair facility.
- 4.3.3 Where numerical tolerances cannot be provided, the disposition of the part or parts is under the jurisdiction of the repair facility and dependent on its experience and judgment.



NOTICE

NOTICE: To ensure best practices and consistency of your qualification procedure, gaskets, O-rings, valve seats and wire seals should always be replaced.

4.4 Valve Assembly and Testing Requirements



NOTICE: Valve assembly and testing is to be done at a recommended temperature of 70°F. The acceptable temperature range for valve assembly is 40°F to 100°F.



NOTICE: When re-assembling it is important to notice which valve it is. To distinguish the A-522A from the A-522 the cap (item 1) should be inspected for grooves, if grooves are identified the valve is going to be an A-522A.

4.4.1 Test Equipment Requirements

4.4.1.1 Test Stand and Gauge Requirements

The test stand must have an appropriate mounting for the valve being tested. The pressure gauge must meet the requirements of D4.5 Test Gauge Standards and be date-tagged.

4.4.1.2 Valve Testing Procedure

If your company has its own reassembly/test procedure, follow it. If it does not, the following procedure provides the essential guidelines.

4.5 Valve Assembly and Testing Procedure

| SAE Wrench | Component(s)/Description | Torque (ft-lb) |
|----------------------------------------------|----------------------------------|----------------|
| 1-5/8" Wrench | Locknut (item 13) | |
| 5/8" Allen Wrench | Cap Screws (item 9) | |
| 1-5/8" Torque Wrench | Locknut (item 13) | 150 |
| 5/8" Allen Torque Wrench | Cap Screws (item 9) | 130 |
| Other Tools, Supplies, and Equipment: | | |
| Solvent | To Clean the mounting and tongue | |
| Lint-Free Cloth | To Clean Sealing Surfaces | |
| Loctite® | | |
| Feeder Gauge | | |
| Grease | | |

Table 4-2 Valve Assembly Required Tools



NOTICE: Perform this procedure only after you have conducted procedures in Section 4.0 Valve Qualification for determining the condition of the valve components, repairing and replacing them.

4.5.1 Thoroughly clean the valve components to remove paint, dirt, oils and tank-car product from all surfaces. Clean the valve ball (item 3) with water or immerse it in a heated, ultrasonic bath to ensure removal of all particulates. Dry and wipe down the valve ball and all valve interior surfaces with a lint-free cloth. Secondary cleaning is recommended during reassembly procedure.

4.5.2 Mount the valve body (item 4) onto the assembly fixture and secure it in place.

4.5.3 Install the thrust washer (item 12) onto the valve stem (item 2).



TIP: Apply a thin layer of grease (such as Panef Petrolatum) to smooth section of the stem (item 2).

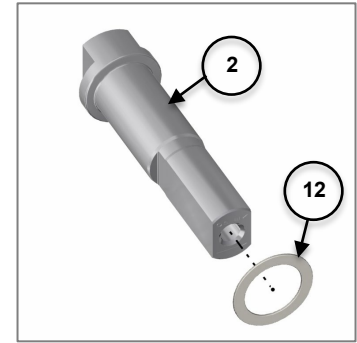


Figure 4-16 Install Washer

4.5.4 Insert the valve stem (item 2) through the shaft bore from inside the valve body (item 4).

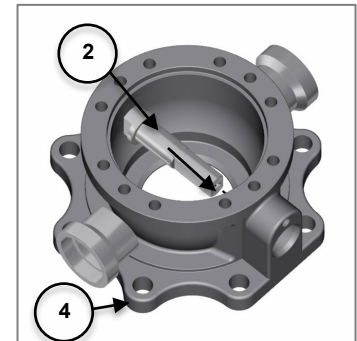


Figure 4-17 Install Stem

4.5.5 Install the five (5) packing rings onto the valve stem, pushing them into the shaft bore.



CAUTION: Packing-Ring Order. There are three (3) types of Teflon rings that comprise the valve-stem packing [five (5) rings total]. Do not alter their arrangement or improper sealing will result.

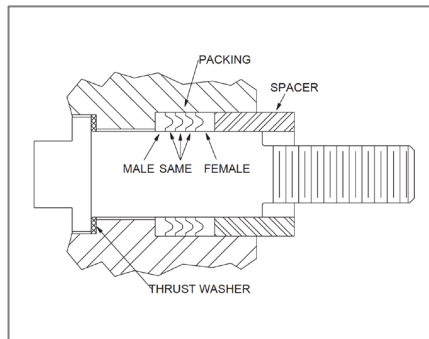
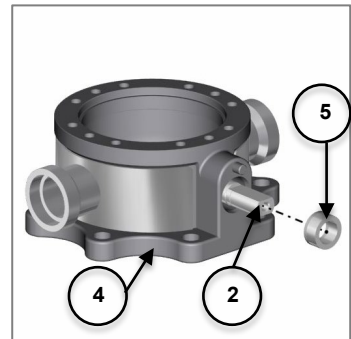


Figure 4-18 Note Packing Rings Orientation and Install Onto Valve Stem



TIP: Apply a thin layer of grease to the interior diameter of the packing rings (item 5).



4.5.6 Insert the spacer (item 6) collar into the stem (item 2) bore. It will protrude about 1/4" when seated. This is normal.



TIP: Apply a thin layer of grease to the interior diameter of the spacer (item 6).

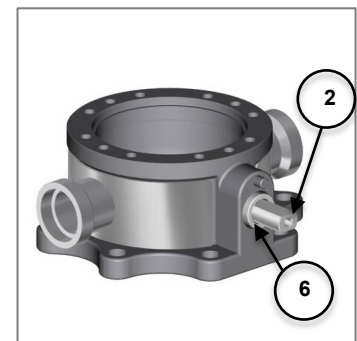


Figure 4-19 Install Spacer

4.5.7 Install the stop plate (item 8). When oriented as shown, and with the valve “Open” (as recommended to prevent ball-handling damage), the stop plate part number etching will be visible and there should be an etched “O” nearest the limiting pin. In this orientation, the stop plate assures that the valve will be counterclockwise to “Close”

4.5.7.1 (Alt.) Stop plate installation for *optional change of handle rotation* to make it clockwise to “Close”. Disregard Steps 4.5.7.1 through 4.5.7.3 if not specified.



Figure 4-20 Install Stop Plate



CAUTION: The following instruction is critical to be completed as described here. Failure to follow this specifically could result in an incorrect orientation of the ball and its vent hole that would negatively impact orientation.

(Alt) Using an assembly tool that is compatible with the threaded end of the stem or temporary handle installation, turn the stem to put the valve in the “Closed” position.

4.5.7.2 (Alt) Install the stop plate (item 8) as shown, except flip the stop plate so that the part number etching is on the opposite side and not visible.

In addition, the stop plate must be oriented so that the etched “C” is nearest the position-limiting pin. (It will be necessary to view the opposing side of the stop plate to ensure this is correct.)

4.5.7.3 (Alt.) Using an assembly tool compatible with the threaded end of the stem or temporary handle installation, turn the stem to put the valve in the “Open” position.

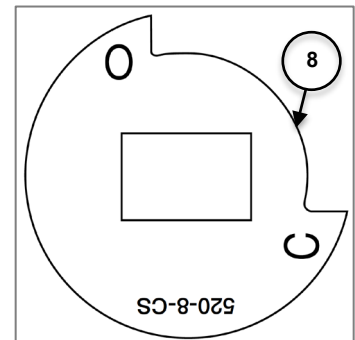


Figure 4-21 Stop Plate Etching Identification

4.5.8 Install the locknut (item 13) and torque it to 150 ft-lb.

4.5.9 The gap between the stop plate (item 8) and the valve body (item 4) must be 1/8” minimum and 1/4” maximum.

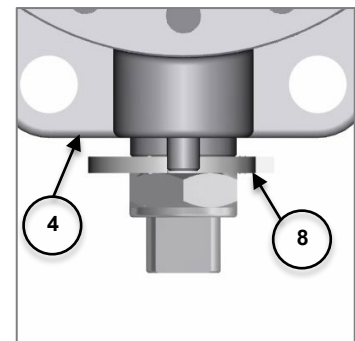


Figure 4-22 Gap Between Stop Plate and Valve Body

4.5.10 Wipe down one of the body ball seals (item 10) and then place it into the bottom seat of the valve body (item 4), flat side downwards. Be very careful to avoid damaging the seat during installation.



TIP: For valve assemblies using SS/TF seats, apply a thin layer of grease (such as Panef Petrolatum) to the chafer portion of the seat (item 10).



CAUTION

CAUTION: If working with an A-522 the ball seals are the same for the body and the cap, but if working with an A-522A make sure to identify the body ball seal correctly, not to be confused with the cap ball seal (item 15).

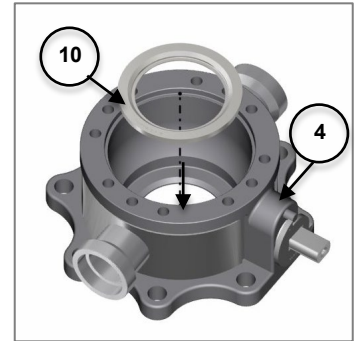


Figure 4-23 Install Ball Seal

4.5.11 If not done in prior inspection, clean the valve ball (item 3) with warm water and soap, or immerse it in a heated ultrasonic bath (125°F - 150°F) for five (5) minutes. Then rinse the ball with clean, cold water. Dry it with a lint-free cloth.



NOTICE

NOTICE: Allow the valve ball to return to room temperature before continuing.



Figure 4-24 Check for Nicks

4.5.12 Perform a final check of the valve ball (item 3) for scratches or nicks. Run your fingernail around both rims of the ball. Any damage is cause for rejection.

4.5.13 Rotate the valve stem (item 2) so that it end that engages the ball (item 3) slot is oriented vertically.

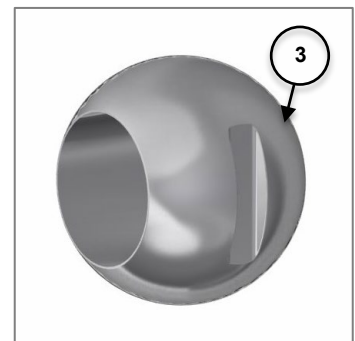


Figure 4-25 Orientate Vertically

4.5.14 Carefully place the valve ball (item 3) into the valve body (item 4), aligning the ball slot with the stem end.

4.5.15 For valves with vented balls, the “Tank-Side Only” stamp on the ball near the vent hole should be oriented facing down when installing the ball.



Figure 4-26 Install Valve Ball

4.5.16 Check the inside surfaces of the cap plate for nicks and debris.

4.5.17 Wipe down the second ball seal (item 10) and then place it into the seat of the cap plate (item 1) with the flat side downward. Be very careful to avoid damaging the seal during installation.



TIP: For valve assemblies using SS/TF seats, apply a thin layer of grease (such as Panef Petrolatum) to the chamfer portion of the seat (item 10).



Figure 4-27 Install Ball Seal

4.5.18 Wipe down the large Teflon valve-body seal (item 11) and install onto the body (item 4).

4.5.19 Place the cap plate (item 1) with seal (item 10) onto the valve body (item 4).

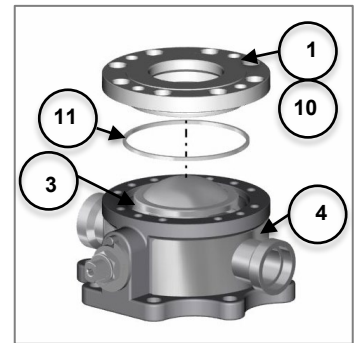


Figure 4-28 Install Seal on Cap

4.5.20 Orient the cap plate (item 1) so the name plate (item 14), or its holes, straddles the valve stem (item 2).



TIP: Next, fully open the valve with a wrench.



Figure 4-29 Name Plate Holes Orientation

4.5.21 Apply two (2) drops of Loctite® (medium or equivalent) to the threads of four (4) hex-head cap screws (item 9) and then screw them into the four (4) counter bore holes.



TIP: Apply Loctite® to cap screws.

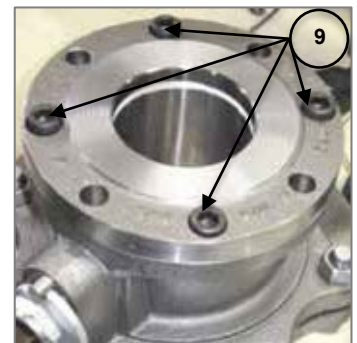


Figure 4-30 Install Cap Screws

- 4.5.22 Install four (4) extra 5/8"-11 UNC 2A 1-3/4" long cap screws (item 9) **without Loctite**.



TIP: Use a 5/8" wrench to tighten the cap screws (item 9).

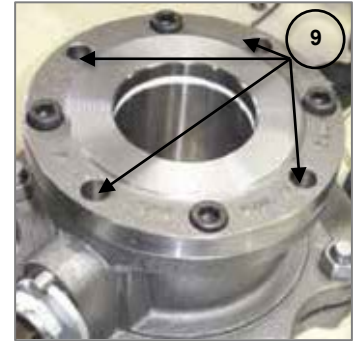


Figure 4-31 Install Cap Screws

- 4.5.23 Tighten the eight (8) cap screws (item 9) in a crisscross sequence until the cap plate contacts the valve body (item 4).



NOTICE

NOTICE: Tighten the cap screws (item 9) to 130 ft-lbs.



Figure 4-32 Tighten Cap Screws

- 4.5.24 Use a 0.002-inch feeler gauge to confirm that the cap is in contact with the valve body (item 4) all around, **with no gaps allowed**.



NOTICE

NOTICE: Cap-Bolt Torque. If uniform cap-to-body contact is not achieved, increase the torque on the cap bolts in 10 ft-lb increments until it is, but do not exceed a maximum of 250 ft-lb.



Figure 4-33 Check Cap-to-Body Contacts

- 4.5.25 Attach the updated valve nameplate to the cap. It must be oriented upside-down (with respect to the valve position in these photos) so that it will read properly when the valve is inverted and mounted on the tank car.
- 4.5.26 Use an applicable valve handle (two-feet long) to fully close the ball valve [with the stem stop plate (item 8) contacting the stop pin (item 7)].

- 4.5.27 Place the valve in a suitable test fixture and pour water into the valve outlet port so that it covers the sealing area.



Figure 4-34 Immerse Seal for Leak Test

- 4.5.28 Apply air pressure to the valve at 300 psig.
- 4.5.29 Brush away initial bubbles and look for any new ones during a two-minute dwell period. No new bubbles are allowed. If any new bubbles appear during test period, the valve must be rejected.
- 4.5.30 Siphon or wipe the water from the valve port. Blow it dry with an air gun.
- 4.5.31 Depressurize the valve body (item 4).
- 4.5.32 Manually adjust the valve so that it is half open.

- 4.5.33 Pressurize the assembly with air to 300 psig for two (2) minutes using a blind flange or outlet leg closure. During this period, apply leak-detecting fluid (snoop) to the exterior of the spacer protruding from the shaft bore while watching for any bubbles and foaming. **No leaks are allowed.**
- 4.5.34 After first inspection use a fine brush to pop the bubbles that were created from the first test.
- 4.5.35 Using the vent valve, lower the pressure to 50 psig for two (2) more minutes. During this second period, re-apply leak-detecting fluid (Snoop or commercial synthetic bubble-leak solution equivalent) to the exterior of the spacer protruding from the shaft bore while watching for any bubbles and foaming. **No leaks are allowed.**



Figure 4-35 Valve Stem Leak Test

- 4.5.36 Depressurize the valve body (item 4) and remove the sealing cap. Wipe off any remaining water.
- 4.5.37 Fully open the valve and install a protective cap in the outlet port.
- 4.5.38 Remove the four (4) 5/8"-11 UNC 2A 1-3/4" long cap screws (item 9) from the valve cap (item 1).
- 4.5.39 Remove the valve from the assembly/test fixture.

5 Routine Maintenance

5.1 Leak Checking in the Field

Because of the ball valve's simplicity, the only maintenance procedure consists of checking the valve for leaks. If the valve is leaking from its outlet port, rebuild or replace it. If minor leakage is detected only at the valve-stem packing, remove the handle and increase the tightening torque on the locknut (item 13). If this fails to stop the leak, rebuild or replace the ball valve.



WARNING

WARNING: Do not exceed 150 ft-lbs of torque when tightening the locknut (item 13).



TIP: Use a 1-5/8" wrench to tighten the locknut (item 13).

