



Installation, Operation, Inspection, and Maintenance Manual



VACUUM RELIEF VALVE MODELS: KVR4.5S, 3.0S, 1.5S

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Table of Contents

1.0 — Introduction	3
1.1. Precautions	3
1.2. Regulations	4
1.3. Technical Specification.....	4
1.4. Required Tools.....	6
2.0 — Valve Installation.....	7
2.1. Preliminary Considerations	7
2.2. Procedure.....	7
2.3. Leak Inspection	8
2.4. Valve Operation.....	8
3.0 — Disassembly	9
3.1. Procedure.....	9
4.0 — Inspection	11
4.1. Components.....	11
4.2. Cleaning.....	12
5.0 — Assembly	12
6.0 — Pressure Testing and Adjustment	16
7.0 — Maintenance	17
7.1. Testing valves in storage	17
7.2. Valve Repair	18
8.0 — Special Guidelines	18
9.0 — Warranty Information	18

1.0 — Introduction

The Kelso KVR Series (VRV) offers performance and reliability with today's Best and Safest Available Technology.

This superior product includes features such as a stem which is seal welded, a unique baffle which prohibits debris (optional), stainless steel components, a closed spring housing and an oversized seal. All features developed to increase longevity, ensure lading does not contact critical components and increase sealing / reset assurance.



1.1 - Precautions

The KVR series can be used as a safety device in the storage and transportation of a wide variety of fluids, many of which are hazardous materials and could cause serious injury or damage. Only personnel which are properly qualified should install, repair or rebuild the KVR Series. Only certified parts from Kelso or one of its authorized representatives should be used in the KVR series. The KVR series may be installed on DOT tank cars that carry hazardous chemicals and may travel under pressure.



Read these instructions prior to performing periodic maintenance or repairs.



Valve view port covers should not be removed while valve is in service. View port covers should only be removed during valve rebuild or recertification. The view port cover allows for the examination of seating surfaces.

1.2 — Regulations

Kelso valves are used in contact with a variety of products, many of which are hazardous materials. The acceptance and transportation of products are regulated by 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. All personnel should be familiar with and follow these regulations. Nothing in these instructions is intended to conflict with or supersede these regulations.

NOTE: Specifications are subject to change without notice.

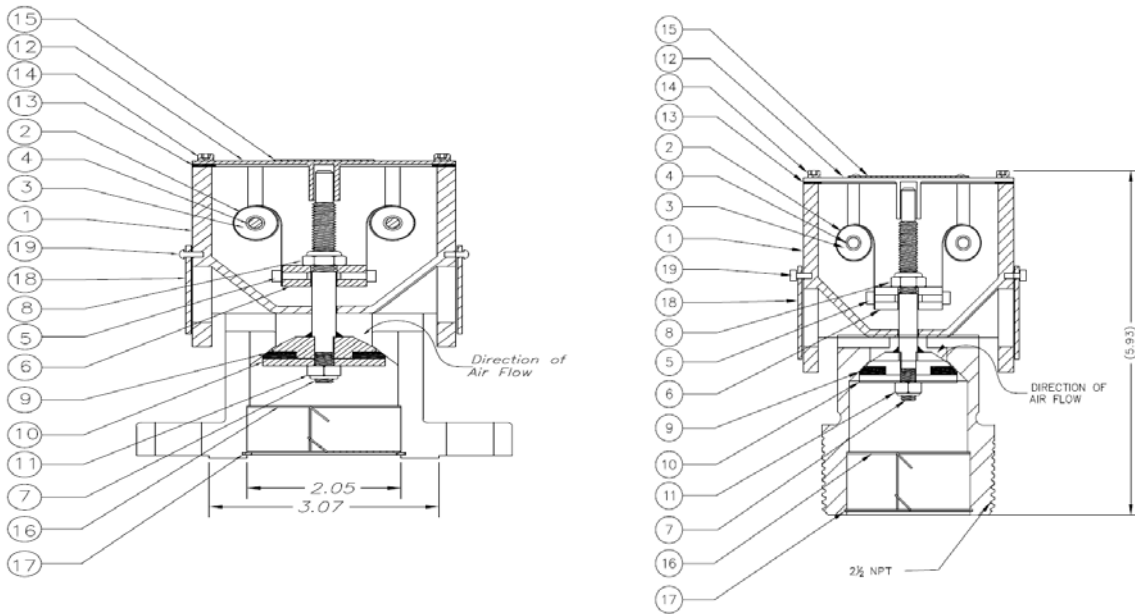
1.3 — Technical Specifications

Valve Model	KVR4.5S	KVR3.0S	KVR1.5S
Set Pressure (psig - vacuum)	4.5	3.0	1.5
Orifice Diameter (in)	1.28	1.28	1.28
Flow Area (sq. in)	1.28	1.28	1.28
Weight (lbs.)	6	6	6
Height (in)	5.33	5.33	5.33
Flange Thickness (in)	0.57	0.57	0.57
Number of Bolt Holes	4	4	4
Bolt Hole Size (in)	5/8	5/8	5/8
Bolt Circle (in)	3-7/8	3-7/8	3-7/8
Interface Options	Raised Face	Raised Face	Raised Face
Number of Springs	2	2	2

Figure 1.3.1

Valve Model	KVR4.5S	KVR3.0S	KVR1.5S
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Flow Area (sq. in)	1.28	1.28	1.28
Weight (lbs.)	6	6	6
Height (in)	5.33	5.33	5.33
Flange	2 ½" NPT	2 ½" NPT	2 ½" NPT
Number of Springs	2	2	2

Figure 1.3.2



		AAR Approval Number	E152103
ITEM #	QTY.	DESCRIPTION	MATERIAL
1	1	Body Assy.	Stainless Steel
2	2	1" Single Spring	301 SS
3	2	Drum	Nylon
4	2	Drum Shaft	304 SS
5	2	Spring Screw	18-8 SS
6	1	Spring Block	304 SS
7	1	Adjustment Screw Assy.	316 SS
8	1	Jam Nut	18-8 SS
9	1	Seal	Varies
10	1	Seal Retainer	316 SS
11	1	Seal Retainer Jam Nut	316 SS
12	1	Cover	304 SS
13	1	Cover Seal	Elastomeric
14	4	Cover Screw	18-8 SS
15	1	Nameplate	Aluminum
	2	Nameplate Rivets (not shown)	18-8 SS
16	1	Baffle (optional)	316 SS
17	1	Retainer Ring	316 SS
18	2	View Port Cover	304 SS
19	2	View Port Screw	304 SS

Figure 1.3.2

1.4 — Required Tools

- Sockets/ Boxed/ Open End Wrenches -
- Several sizes including ,7/16” and 1/2”
- Allen Wrench
- Wire Brush
- Flash Light
- Pipe Wrench
- Ratchets
- Screw Drivers
- Channel Locks
- Lint-free Cloth
- Emery Paper (400 grit)
- Loctite 242®
- Mirror

2.0 — Valve Installation



Only companies and their personnel which are certified by the Association of American Railroads shall perform maintenance and periodic testing of Kelso KVR Series.

2.1 — Preliminary Considerations



New valves are tested, adjusted, and sealed at Kelso. If a new valve has been left in its original packaging, is undamaged, and is not more than six months old, it may be installed on a tank car without retesting or recalibration. Prior to installation, ensure that the valve remains clean and that the gasket sealing surfaces are not damaged in any way, shape, or form.

2.2 — Procedure

1. Prior to removing any valve or fitting from a tank, ensure that the internal pressure is at atmospheric and that exposure to hazardous chemicals are eliminated.
2. When the securement bolts have been removed from the mounting flange, remove the valve and discard the old flange gasket. For valves with 2 ½” NPT threaded connection, remove the valve and any pipe tape/pipe thread compound.
3. The flange mating surface should be free from gouges, scrapes, and excessive corrosion. If the valve has a flat mating surface, clean the mating surface using a wire brush if scale, rust, adhesive, or dirt are evident. Ensure that while removing the old gasket no damage is done to the bottom of mating flange. Any burrs, radial gouges, and debris should be removed. For valves with 2 ½” NPT Threaded connection, thread shall be inspected with 2 - 1/2” NPT thread gage. Any damaged thread could cause sealing issues.
4. A new vacuum relief valve should be kept in its original shipping container to prevent harmful damage to the valve or its components.

5. The nameplate will verify the test date of the valve, if the last known test date was within six months, the valve can be installed without retesting or re-qualifying. If the test date is not within 6 months, the KVR must be retested.
6. Place a new gasket on the tank mounting flange, gasket materials should be compatible with the chemical being shipped. Inspect the valve mating flange or threaded area for defects as described in Paragraph 2.2.3 above.
 - a. Flanged - Install the valve on the mounting flange and secure using bolts tightening to a prescribed torque of 100 to 180 foot pounds. Our suggested value is only to be used in the event your company does not have a procedure for this.
 - b. Threaded - Install the valve, use PTFE tape or pipe compound to lubricate threads, allowing for pressure tight seal. Tighten valve with proper wrench, using flat portions above threads for wrenching surface.
7. Once the vacuum relief valve has been secured to the car, a suitable leak test should be performed to ensure the flange mating surfaces and/or threaded connection are pressure tight.
8. With the view port covers removed, the use of a flash light and a mirror will allow for inspection of the valve seating surface and leak detection.

2.3 — Leak Inspection

All newly installed valves must be tested under pressure to confirm that no leaks are present.



WARNING: Loose nuts, improper flange seating in the flange, damaged, wrong size gaskets and improper threaded valve tightening can result in leaks at the valve joints.

2.4 — Valve Operation



Operation of all valves must conform with all applicable TC, AAR, DOT and other governmental bodies.



Kelso valves are spring loaded by a constant force set of springs and there are no provisions for a manual activation. Valves are activated when a negative pressure occurs in the rail tank.



A change in commodity may require a rebuild in order to change the internal seals of the KVR.

3.0 — Disassembly

Prior to any servicing of Kelso Valves, ensure all participating personnel have adequate personal protective equipment.

3.1 — Procedure

1. Remove the four Cover bolts from the top of the valve with a 3/32" Allen wrench (*Figure 1*). Remove the cover and cover seal once bolts are removed.

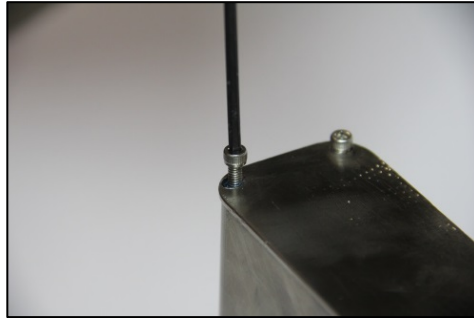


Figure 1

2. The Baffle and Baffle retainer are located on the bottom of the valve. This is optional equipment. Using a small flathead screwdriver or other prying tool remove the Baffle retainer (*Figure 2*). Lift the Baffle out of the body of the valve.



Figure 2

3. Use a 1/2" deep socket and ratchet to remove the Jam Nut from the Adjustment Screw. Hold the Adjustment Screw Seal retainer nut at the Seal end of the valve with another 7/16" socket and extension to loosen the nut (*Figure 3*). This releases tension on the Seal and allows the Adjustment Screw assembly to be removed from the valve.



Figure 3

4. Remove the Seal Retainer nut with a 7/16" socket/wrench, use pliers to clamp the Adjustment Screw while loosening the nut (*Figure 4*). Once the nut is removed, separate the Seal retainer and Seal from the Adjustment Screw (*Figure 5*).



WARNING: Protect the threads of the Adjustment Screw while clamping with pliers. If burrs do occur, file/sand them smooth.



Figure 4



Figure 5

5. Use a screwdriver or prying tool to remove the Spring Block assembly from the Valve Body (*Figure 6*). The springs can be removed from the Spring Block with a 3/32" Allen wrench (*Figure 7*).



Figure 6



Figure 7

6. Remove the View Port covers using a 3/32" Allen wrench to take off the View Port cover bolts (*Figure 8*). (Removal of the View Port is Optional)

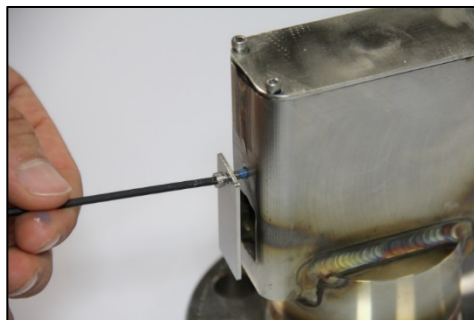


Figure 8

4.0 — Inspection

The Valve and several components can be visually inspected without removal from the car. However, a proper inspection should be made whenever the valve is rebuilt or when suspect operation warrants.

4.1 — Components

1. Remove any foreign debris if any exist on any of the parts.
2. Inspect threads on all of the socket head cap screws and both thread locations on the adjustment screw for signs of galling, excessive wear and/or other damage (*Figure 9 and 10*). Adjustment screw threads; 5/16 - 24 UNC, Class 2A (long) and 1/4-20 UNC, Class 2A (short) can be renewed using proper size die.



Figure 9



Figure 10

3. Inspect the adjustment screw seating surface and the seal area for scratches, gouges or dents (*Figure 11*). Any damage is not acceptable and part will need to be replaced.



Figure 11

4. Inspect the seating surface of the seal contact area and the seal itself for excessive wear or damage, i.e.; scratches, gouges, dents, etc.

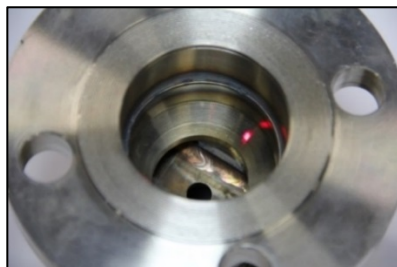


Figure 12

5. Any damage detected on the above parts will condemn that part and that part will need to be replaced.



Repair work on valves involving machining, grinding, welding or other alterations and modifications can be performed only by the valve manufacturer, by the car owners, or users with the valve manufacturer's permission. (AAR M1002 Appendix A, Paragraph 3.11)

4.2 — Cleaning

All Components, except the springs and drums, of the Kelso VRV may be cleaned using:

1. Wire brushes and/or clean towel / cloth.
2. Low pressure water, glass bead, sand or soda blasting provided the blast media is not angular in form or leaves iron content on stainless parts.
3. A chemical / surfactant application, in conjunction with manufactures prescribed instructions, to achieve a desired result. It is suggested the chemical / surfactant be of neutral pH to ensure the integrity of the metal composition.
4. Regardless of cleaning method, it is suggested that the parts be double rinsed and dried (w/ sanitary towel) prior to reinstallation and immediately after any chemical / surfactant application.



Disposal should be managed in accordance with all applicable state and federal regulations

5.0 — Assembly

1. Begin by placing the spring block assembly into the Valve Body, the spring orientation should match (*Figure 13*). Press the assembly into the Valve Body until the spring block assembly rests at the bottom of the valve.



Figure 13

2. Place the seal onto the mating surface of the Adjustment Screw (*Figure 14*) followed by the Seal retainer (*Figure 15*). Use a 7/16" socket to tighten the Seal retainer nut and ensure the Seal is properly fixed to the Adjustment Screw (*Figure 16*).

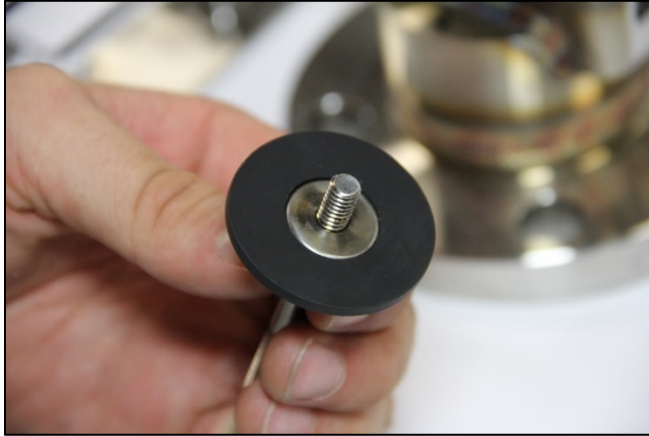


Figure 14



Figure 15



Figure 16

3. Turn the valve over and check the seating surface of the body for any imperfections. If needed, clean the surface with the Emery Paper then wipe the surface clean. Insert the Adjustment Screw assembly into the valve (*Figure 17*).



Figure 17

4. Secure the Adjustment Screw assembly within the Valve Body with the Jam Nut. Use a 1/2" deep socket and a ratchet to tighten the Jam Nut while using a 7/16" socket and extended ratchet to hold the Adjustment Screw at the Seal retainer nut (*Figure 18*). Turn the Jam Nut until the Spring Block is 1-1/2" from the top of the Valve Body. This height will be adjusted in the Testing stage.

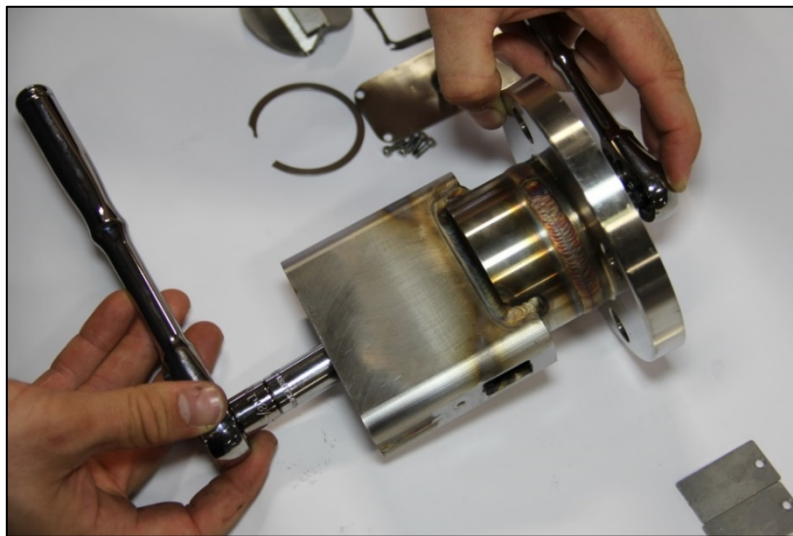


Figure 18

5. Place the Cover Seal on top of the valve body, align the holes of the cover seal with the holes of the valve body (*Figure 19*). Place the cover on top of the valve body, aligning holes (*Figure 20*). Apply Loctite 242 to the four Cover bolts and place them in the holes, tighten wrench tight (*Figure 21*).



Figure 19



Figure 20

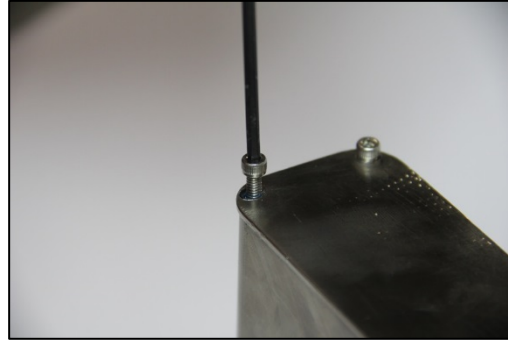


Figure 21

6. For installation of optional baffle, turn the valve over and place the baffle into the bottom of the valve. Push the baffle so that it clears the channel for the Baffle Retainer. When the Baffle is correctly seated apply the Baffle Retainer by inserting one end of the retainer into the channel and sliding your finger in a circular motion pressing the retainer in (*Figure 22*).



Figure 22

7. Apply Loctite 242 to the two View Port cover bolts (*Figure 23*) and install the View Port cover (*Figure 24*). Tighten View Port cover bolts with 3/32" Allen wrench. A seal tag is placed on one of the cover bolts between the view port cover and the bolt head. These should be wrench tight.



Figure 23

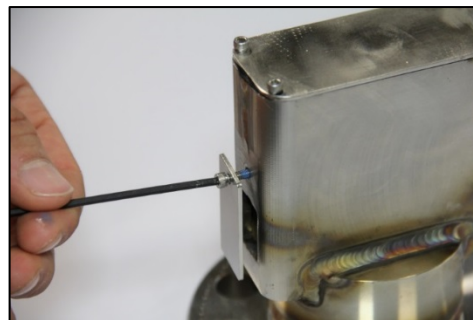



Figure 24

6.0 — Valve Testing and Adjustment

 Refer to AAR publication “Regulations for Tank Cars”. Appendix A applies specifically to valves. This section prescribes the start-to-discharge pressure (STD), the vapor-tight pressure (VTP), their tolerances, and integrity positive pressure test.

1. Apply appropriate fixture / seal to the stand with the correct gasket between the VRV and the test fixture, bolt it down so that there is no leak between the fixture and the stand (*Figure 25*). For valves with 2 ½” NPT thread connection, ensure that PTFE tape or pipe thread compound is used when attaching valve to test fixture. Valve should be tightened using the flat wrenching surface above the threads.

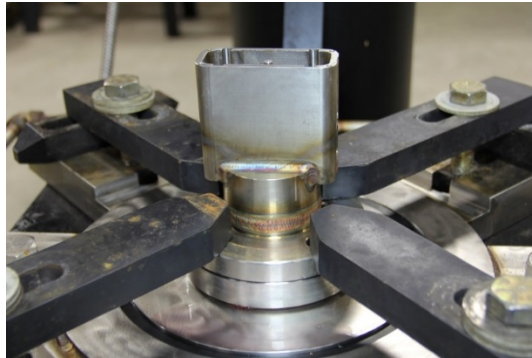


Figure 25

2. Spray every mating point of the stand, fixture, and valve, along with all the fittings of the stand with the Sherlock testing solution. Raise the pressure and check all areas to ensure that there are no leaks present during the test.
3. Turn on vacuum pump, pull vacuum on the valve until within the approved range of pressure is observed and note this pressure as the “Start to Discharge” (STD).
 - 3.2. If the pressure indicated is below the acceptable AAR tolerance for the valve setting, rotate adjustment screw clockwise and test again. Repeat this step until the desired set pressure of the model being tested has been established.
 - 3.3. If the pressure indicated is above the acceptable AAR tolerance for the valve setting, rotate adjustment screw counter-clockwise and test again. Repeat this step until the desired set pressure of the model being tested has been established.



Note: This is vacuum pressure (negative).



Note: Valve will need to be removed from the fixture to adjust.



Figure 26

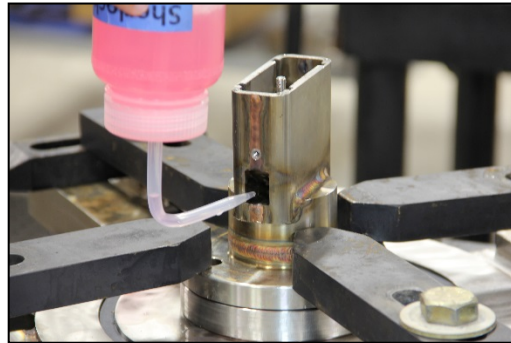


Figure 27

4. When STD is within approved range (*Figure 26*), allow the valve to bleed off pressure until sealed off again. This is “Vapor Tight Pressure” (VTP). The VTP is confirmed by spraying a continuous film of leak test solution at the intersection of the valve and the valve seat (*Figure 27*). If the VTP is not achieved, remove the valve from the fixture and check the valve and seat and make appropriate adjustments to resolve the issue. Once both STD and VTP are attained, record your data.
5. Once the STD and VTP have been achieved, the entire valve assembly must be pressurized to 165 psi. No leaks allowed.



Use a flash light and mirror to check for leaks through the valve view port.

7.0 — Maintenance

Under normal operating conditions, KVR series VRV should not require maintenance until a periodic retest is required by code or there are signs of leakage through the valve (not leakage between the tank and valve mounting flanges). DOT and AAR have set forth a retesting interval between tests. The KVR series VRV has been designed to minimize the valve exposure to any chemicals being shipped by mounting all components external to the tank. This advantage allows for immediate visual inspection of most components.



These instructions only describe maintenance to a valve which has been removed from the tank car and located in a suitable environment for retest. Kelso recommends all maintenance only be performed on valves which have been removed from the tank.



NOTE: AAR requires that new seals be installed when a valve is rebuilt.
(AAR M1002 Appendix D– 3.4)

7.1 — Testing valves in storage

Valves that are factory set and sealed and if they have been left in their original shipping containers, are undamaged, and are no more than six (6) months old; they may be installed without being retested. If the valve is older than (6) months it needs to be retested prior to being installed on a tank car.

7.2 — Valve Repair

Repair work on valves involving machining, grinding, welding, or other alterations and modifications can be performed only by the valve manufacturer, by the car owners, or users with the valve manufacturer's permission. The flat gasket face on the valve body mounting surface or the gasket tongue may be machined to remove nicks and burns.

(AAR M1002 Appendix A, Paragraph 3.11)

8.0 — Special Guidelines



Determining Applicable Pressure Values:

Refer to AAR publication “Regulations for Tank Cars”. Appendix A applies specifically to valves. This section prescribes the start-to-discharge pressure (STD), the vapor-tight pressure (VTP) and their tolerances, and the positive pressure integrity test.



Test Stand and Pressure Gauge Requirements:

It is recommended that the test stand mounting must be equivalent to the AAR M1002 figures in Appendix E for the valve being tested. The pressure gauge must meet the requirements of AAR M1002 Appendix D 4.5 “Test Gauge Standards” and must be date-tagged accordingly.

9.0 — Warranty Information

See the Warranty Terms and Conditions.

Revision Log

1. Section 2.4 Valve Operation – Note: Valve view port covers should not be removed while valve is in service.
Section 6.0 Valve Testing and Adjustment – Note: Use a flash light and mirror to check for leaks through the valve view port.
2. Section 1.1 – Note: Valve view port covers should not be removed...
Section 1.4 – Note: Flash Light and Mirror added to required tools.
Section 2.2 – Note: Step 8 added.
Section 5.0 – Note: Added to step 7, seal tag placed...
Section 2.4 – Note: Caution note added, Change in commodity...
October 29, 2015
3. Labeled all pictures (Figure #) and added notes to instructions steps referring to figure numbers.
Wording corrections and changes sections 2.0 – 5.0 per review.
4. Title page remove KVR4.5 and revised all headers from KRV to KVR
Section 1.0 – Remove reference to (available in Carbon)
Table on page 5 revised to reflect Doc. KTUD017

5. Added information for VRV's with threaded connection.