



KELSO

Installation, Operation, Inspection and Maintenance Manual



ANGLE VALVE MODELS:

K2AV – Kelso 2" Angle Valve Series

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1.0 Introduction

Kelso Technologies is known for offering innovative products with safety and reliability in mind. Our K2AV Angle Valve has been designed and engineered to withstand the harsh commodities and severe environmental conditions present in rail tank car service.



1.1 Precautions

The 2" Angle Valve can be used as a safety device in the storage and transportation of a wide variety of fluids, many of which are hazardous and could cause serious injury or damage. Only personnel which are properly qualified should install, repair or rebuild the Angle Valve. Only certified parts from Kelso or one of its authorized representatives should be used in the Angle Valve. The Angle Valve 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.

1.2 Regulations

Kelso valves are used in contact with a variety of products, many of which are hazardous. 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

1.3.1 Figure 1.1 shows attributes of the K2AV Angle Valve. Figure 1.2 shows the General Arrangement of the valve and Figure 1.3 is a general Bill of Materials for the given arrangement.

Valve Model	Orifice (In)	Weight (lbs.)	Flange Thickness (In)
K2AV	2.125	30	0.75

Figure 1.1 K2AV Series Attributes

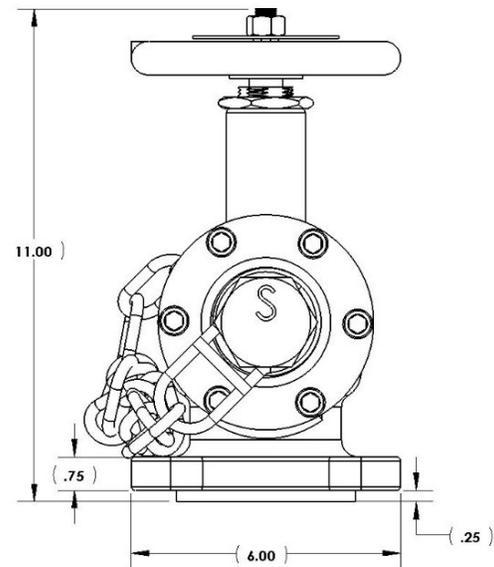
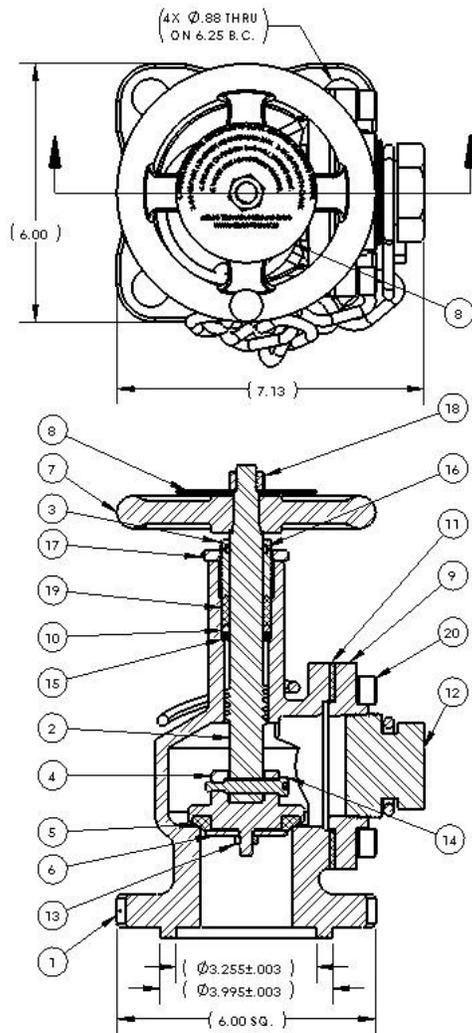


Figure 1.2 K2AV Series General Arrangement

ITEM NO.	QTY.	DESCRIPTION
1	1	BODY
2	1	STEM
3	1	PACKING SCREW
4	1	SEAL DISC
5	1	SEAT
6	1	SEAL RETAINER
7	1	K2AV HANDLE
8	1	KAV OPERATION DECAL
9	1	FACE PLATE
10	1	PACKING BOTTOM WASHER
11	1	FACE PLATE GASKET
12	1	2" NPT PLUG & CHAIN
13	1	JAM NUT
14	1	SHOULDER BOLT
15	1	WAVE SPRING
16	1	O-RING
17	1	JAM NUT
18	1	HEX NUT
19	1	PACKING KIT
20	6	SOCKET HEAD CAP SCREW
21	1	KAV NAMEPLATE (NOT SHOWN)

Figure 1.3 K2AV Series General Arrangement Bill of Materials

1.4 Required Tools and Torque Values

Required Tools

Sockets/Wrenches – ½" and ¾"	Lint Free Cloth
Adjustable Wrench	400 Grit Alum. Oxide Emery Cloth
Hook and Pick Tool	Thread Locker
Ratchet	Anti-Seize
Torque Wrench	Hey Key/Allen Wrench 3/8"
Wire Brush	

Torque Values

Item No.	Description	Torque Value
14	Seal Disc Bolt	8 ft.-lbs.
13	Seal Retainer Nut	20 ft.-lbs.
18	Handle Nut	30 ft.-lbs.
3	Packing Screw	25 ft.-lbs.
17	Packing Screw Jam Nut	40 ft.-lbs.
20	Face Plate Bolt	50 ft.-lbs.
12	Valve Plug	Wrench Tight

2.0 Valve Installation



Only companies and their personnel which are certified by the Association of American Railroads shall perform maintenance and testing of Kelso angle valves, pursuant to either M1002 or M1003.

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. If the valve has exceeded six months, it must be returned for retesting and 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 Installation Procedure

1. Prior to removing any valve or fitting from a tank, ensure that the internal pressure is atmospheric and that personnel 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.
3. The flange mating surface should be free from gouges, scrapes, and excessive corrosion. With a tongue and groove mating surface, ensure that while removing the old gasket no damage is done to the bottom of the groove. Any burrs, radial gouges and debris should be removed.
4. A new valve should be kept in its original packaging to prevent damage to the valve or its components.
5. A test certificate should be available to 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 requalifying.
6. Place a new gasket on the tank mounting flange. Kelso Technologies does not supply the flange gasket. Gasket material should be compatible with the chemical being shipped. Inspect the valve mating flange for defects as described in Paragraph 3 above. Install the valve on the mounting flange and secure using bolts, tightening to a prescribed
7. Torque of 200 to 250 ft.-lbs. Our suggested value is only to be used in the event your company does not have a procedure for this.
8. Once the angle valve has been secured to the car, a suitable leak test should be performed to ensure the flange mating surfaces are pressure tight.

2.3 Leak Inspection

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



WARNING: Loose nuts, improper tongue seating in the flange, damaged and wrong size gaskets can result in leaks at the valve mating surfaces.

2.4 Valve Operation



Operation of all valves must conform to all applicable TC, AAR, DOT (Part 173.31, 174.67, etc.) and other governmental bodies. Follow install facilities company policies regarding valve operation.

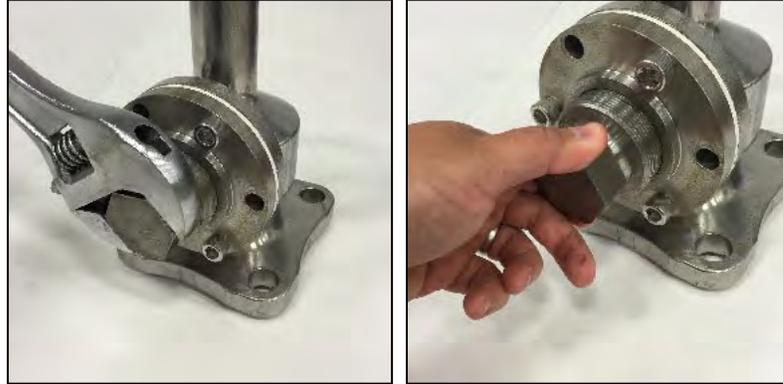
1. A handle extension or “cheater” bar should not be used to close valve. Excessive force will shear the angle valve’s Teflon seat, making valve inoperable or difficult to seal. Leaking valves that will not close by normal means (closing using hand wheel) are defective and should be removed from service.
2. Pipe plug threads should be clean, free from corrosion and crossed and/or worn threads. The mating threads of the valve body should also be in proper working condition.
3. The angle valve contains an adjustable packing gland. The Gland is factory set and under normal circumstances a new valve needs no adjustment. To prevent the packing screw jam nut from backing off, torquing it to 40 ft.-lbs. is required. Its primary function is to prevent the packing screw from backing out while the stem is turning.

3.0 Disassembly

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

3.1 Procedure

1. Use an adjustable wrench to remove the valve plug from the face plate of the angle valve. (Figures 3.1 & 3.2)



Figures 3.1. and 3.2 Valve Plug Removal

2. A 3/8" Allen/hex key wrench with ratchet/socket is needed to remove the six bolts securing the face plate. Remove the face plate and the face plate gasket. (Figures 3.3 & 3.4)



Figures 3.3. and 3.4 Face Plate Removal

3. Turn handle until the head of the seal disc bolt is visible. Loosen and remove the seal disc bolt with a 5/32" hex key wrench. Turn handle counterclockwise until the stem is free from the seal disc. (Figures 3.5, 3.6 & 3.7)



Figures 3.5, 3.6 and 3.7 Seal Disc Removal

4. Remove seal disc from angle valve. Set aside. (Figure 3.8)



Figure 3.8 Seal Disc Removed

5. With 3/4" wrench or socket remove handle nut and lift the handle from the stem. (Figures 3.9 & 3.10)



Figures 3.9 and 3.10 Handle Removal

6. Loosen and remove the packing screw jam nut using an adjustable wrench. (Figure 3.11)



Figure 3.11 Jam Nut Removal

7. Loosen and remove the packing screw using an adjustable wrench. Remove O-ring from packing screw using a hook and pick. (Figures 3.12, 3.13 & 3.14)



Figures 3.12, 3.13 and 3.14 Packing Screw / O-Ring Removal

8. Rotate the stem counter clockwise to remove the stem from the angle valve body. (Figure 3.15)



Figure 3.15 Valve Stem Removal

9. Remove packing kit, packing base ring/bottom washer and wave spring from stem. (Figures 3.16, 3.17 & 3.18)



Figures 3.16, 3.17 and 3.18 Stem Components Removal

10. To disassemble the seal disc, first remove the seal retainer nut with a ½" wrench. (Figure 3.19)



Figure 3.19 Disassemble Seal Disc

11. Lift off seal retainer. (Figure 3.20)



Figure 3.20 Seal Retainer Removal

12. Remove seal from seal disc. Use a hook and pick as needed. (Figures 3.21 & 3.22)



Figures 3.21 and 3.22 Seal Removal

4.0 Inspection

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

4.1 Components

1. **Seal** - The seal must be replaced when the valve is rebuilt. Upon inspection the seal should be secured and concentric in the sealing disc groove. For seals with etch, install with etch facing up, toward (against) sealing disc. The etch identifies the current seal pedigree compound and should be validated with the car owner specifications. If the seal is installed with etch down (away from) the sealing disc, it will not impact form, fit or function but it may impact the integrity of the etch. Impact of etch is not cause for condemnation. The seal should be free from tears, folds, abrasions, cracking and a buildup of debris. Replace when any of these defective conditions occur.



The seal has been manufactured with a proprietary composition and should only be replaced with Kelso supplied material.



It is recommended that any replacement parts be purchased through Kelso Technologies for form, fit and function.

2. **Seal Disc** - The seal disc seat face and the seal retainer should be smooth and free from scratches, nicks and gouges. The seat face should also be free from paint, dirt, rust and scale prior to the application of the seal.
3. **Valve Seat** - The valve seating area within the valve body must be free from radial cuts, rust, and corrosion. The valve seat is most crucial for correct valve operation and any discontinuity can cause the valve to leak.
4. **Stem** - The stem once removed from the valve body should have its threads examined. Some dings and wear are allowed as long as the parallel wrenching surfaces at the top of the screw remains square. If the surfaces become rounded, the stem must be replaced. The threads of the stem should be clean and lightly lubricated. An appropriate sized thread die can be used to correct small imperfections and a flat file can be used to correct slightly damaged ACME threads. If cracks and/or fractures are discovered, replace the stem. The area where the packing screw contacts the body must be free from nicks, scratches and/or dings.
5. **Body** - Inspect body for corrosion degradation, particularly in the seat area. Clean seat area from corrosion, contamination, pits, etc., that may form leak paths. Tapped holes at side flange are 7/16-14. Discard body if threads are stripped, crossed or corroded.

6. **Outlet Flange** - The 2" NPT flange must be in good condition, threads should not be stripped, crossed, etc. Threads can be cleaned using a standard 2" NPT tap. A thread gage should be used to ensure threads are not oversized. The standard hand-tight engagement is 0.436" for 2" thread. The acceptable tolerance is plus or minus one thread. If tolerance is exceeded a new part must be obtained.
7. **Packing Screw** - The thread should be clean and sharp without nicks, scratches, defects, etc. that will strip or gall the threads when screwed into the body.
8. **Plug** - 2" NPT plug must be in good condition, threads should not be stripped, crossed, etc. Threads can be cleaned using a standard 2" NPT die. A thread gage should be used to ensure threads are not oversized. The standard hand-tight engagement is 0.436" for 2" thread. The acceptable tolerance is plus or minus one thread. If tolerance is exceeded a new part must be obtained.

4.2 Cleaning

All components, excluding the Packing Kit and seal, of the Kelso Angle Valve may be cleaned using the following:

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
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

5.1 Procedure

1. Insert the seal in the seal disc and ensure that the seal is seated. Install so that the flat portion of the seal is against the seal disc and the bevel of the seal is away from the seal disc. (Figures 5.1 & 5.2)



Figures 5.1 and 5.2 Seal Area and Orientation

2. Install the seal retainer with the bevel facing away from the seal disc. (Figures 5.3 & 5.4)



Figures 5.3 and 5.4 Seal Retainer and Orientation

3. Apply thread locker to retainer thread of seal disc and install the seal retainer nut. Tighten and torque to 20 ft-lb. (Figure 5.5)



Figure 5.5 Seal Retainer Installation

4. Place assembled seal disc into valve body. The seal faces down and flat portion that accepts stem should face out through the face of the body. (Figures 5.6 & 5.7)



Figures 5.6 and 5.7 Seal Disc in Valve Body

5. Apply lube to the outside diameter of the stem and the interior of the packing kit. Then insert the wave spring, packing base ring/bottom washer (flat side against wave spring) and packing kit onto stem. The packing kit should interlock with the peaks fitting into the groove, place on stem groove face first. Note: 6 spacers are in the packing kit. Install on the square end of stem. (Figures 5.8 & 5.9)



Figures 5.8 and 5.9 Packing Kit onto Stem

6. Apply a thin coating of dry moly lube to the stem threads and thread stem into valve body with square end of stem up, until the through hole of the stem is centered in face of valve. (Figures 5.10 & 5.11)



Figures 5.10 and 5.11 Stem into Valve Body

7. Apply thread locker to seal disc bolt threads before installation. Lift seal disc and install seal disc bolt. Tighten to 8 ft-lbs. (Figure 5.12)



Figure 5.12 Seal Disc Installation

8. Insert O-ring into packing screw. (Figure 5.13)



Figure 5.13 O-Ring Installed into Packing Screw

9. Thread packing screw into body, square end up. Tighten and torque to 25 ft-lbs. (Figure 5.14)



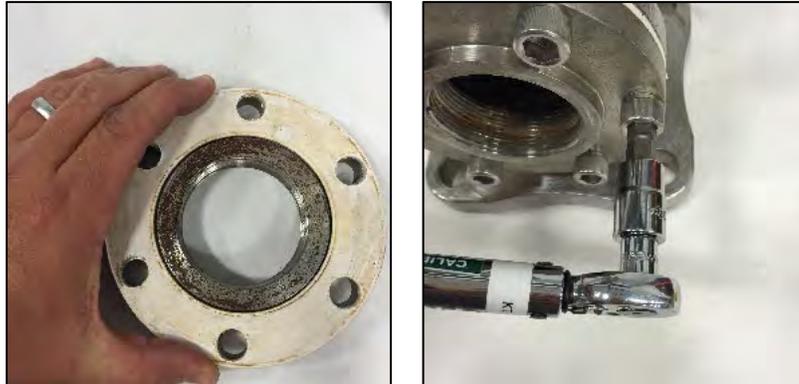
Figure 5.14 Packing Screw into Valve Body

10. Apply a thin layer of lube to packing screw jam nut. Then install packing screw jam nut. While holding packing screw in place, tighten jam nut. (Figure 5.15)



Figure 5.15 Packing Screw Installation

11. Align face plate gasket and face plate with holes on valve body.
Apply thread locker to bolt before installing onto valve body.
Tighten to 50 ft-lb. (Figures 5.16 & 5.17)



Figures 5.16 and 5.17 Face Plate Installation

NOTE: After assembly is complete, the valve is held for a minimum of 12 hours, then torque check bolts at 50 ft-lb. Assure that the valve plug is available, in order to proceed to testing.

6.0 Pressure Testing and Final Assembly

Because of the valve's simplicity, testing is only required to check the valve for leaks.



Refer to AAR publication "Regulations for Tank Cars". Appendix A applies specifically to valves. This section prescribes pressures and their tolerances.



Test stand must have an appropriate mounting for valve. Test gauges must meet requirements of AAR D 4.5.



If your company has its own process and procedure for assembly and testing, follow it; otherwise this procedure offers only the essential steps and guidelines.

6.1 Testing Procedure

1. Perform bubble leak testing in accordance with an approved procedure.
2. Secure valve to test fixture.
3. Raise pressure on test fixture and test. If valve fails, investigate seal and gasket mating surfaces and torque on face plate to resolve problem. Also, check the packing gland for any leaks.
4. Remove valve from the test fixture and forward to final assembly.

6.2 Final Assembly

1. Remove valve plug and open valve.
2. Rinse valve to remove test solution and foreign material from the valve assembly.
3. Dry valve by wiping with a cloth or using pressurized air.
4. Place plastic tongue protector on valve body to prevent unintentional damage.
5. Open valve to ensure retainer is not in contact with the valve seat. Apply preservative to valve body.
6. While holding packing screw in place, torque jam nut to 40 ft-lbs. (Figure 6.1)



Figure 6.1 Torque Packing Screw

7. Place valve plug chain ring on stem. (Figure 6.2)



Figure 6.2 Plug Chain Ring on Stem

- Place handle on stem. Then place operation decal on handle. Attachment point for handle is a tapered to fit. Add thread locker to thread and install handle nut. Tighten to 30 ft-lbs. (Figures 6.3 & 6.4)



Figures 6.3 and 6.4 Handle Installation

- Apply teflon tape to threads of valve plug then insert plug into outlet flange. Engage only 2 or 3 threads. (Figure 6.5)



Figure 6.5 Valve Plug Engagement

7.0 Maintenance

Under normal operating conditions, the K2AV Series 2" Angle Valve 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 car and valve mounting flanges). DOT and AAR have set forth a retesting interval between tests.



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

7.1 Testing Valves in Storage

Valves that are factory set and sealed, have been left in their original packaging, are undamaged and are no more than six (6) months old, may be installed without being retested. If the valve has exceeded six months, it must be returned for retesting and recalibration.

7.2 Valve Repair

Repair work on valve involving machining, grinding, welding or other alterations and modifications can only be performed by the valve manufacturer, the car owner or user 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) Unless otherwise specified standard tolerances for decimal dimensions are +/- 0.003 in.



The tolerances on the gasket tongue must not be exceeded.

8.0 Special Guidelines



AAR requires that new seals are installed when a valve is rebuilt. AAR M1002 Appendix D 3.4



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

See the Warranty Terms and Conditions.

10.0 Revision Log

- 10.1 Original Release 6/30/2016
- 10.2 Revision 1 3/23/2017
 - 10.2.1 Routine document maintenance performed
- 10.3 Revision 2 6/1/2021
 - 10.3.1 Revised document format
 - 10.3.2 Updated to latest recommended standards & practices
- 10.4 Revision 3 2/7/2025
 - 10.4.1 Updated to latest recommended standards & practices