



The Right Connection®

Loading Arm Manual

dixonvalve.com

Customer Service

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Introduction

This manual contains installation and operating instructions, maintenance, troubleshooting, and safety notes for the Dixon® Specialty Products loading arm. Please read and understand this manual prior to installing, operating, or servicing this product.

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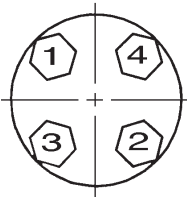
Installation Instructions

1. Wear Personal Protective Equipment (PPE) when installing, performing maintenance, or working on the loading arm, always wear adequate personal protection, including hard hats, gloves, safety glasses, and steel-toed work boots.

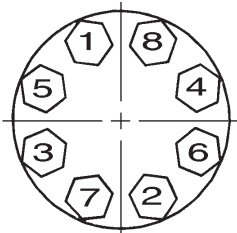
2. Lift using appropriately rated straps. Common attachment points shown on the right.



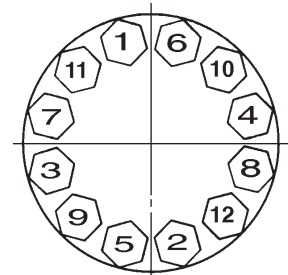
3. Tighten bolts using the appropriate torque and tightening sequence. Use the correct gaskets and bolts.



4 Bolt



8 Bolt



12 Bolt

- a. TTMA flange (tank truck flange) bolt(s) = 25 ft.lbs. (35 ft.lbs. for Klingersil® and PTFE)
- b. Torque 150 pound flange bolt(s) = In three stages (40, 80, and 120 ft.lbs.)
- c. Counterbalance clamp bolt(s) 30 ft.lbs.

4. Prior to installing the loading arm on an existing riser pipe flange, inspection of the riser piping and connection flange should be conducted. Ensure that the inlet is leveled and plumb which will prevent the loading arm from rotational drift. Also, confirm the flange sealing surface is not damaged to prevent leaks.
5. The entire loading arm should be assembled on the ground in a horizontal position and then raised to the inlet piping flange as a complete overall unit. Most of our assemblies will be shipped completely assembled. Be sure to align all flange gaskets properly in between the flanges and tighten connections per the bolt tightening sequence diagram.
6. Once installed, adjust the spring tension per the appropriate spring adjustment section and position the upward/downward travel stop(s). Reference Operating Instructions on pages 4 - 7.

ESB1 Operating Instructions

The loading arm is balanced and adjusted at the manufacturer for all complete loading arm packages but may require some fine-tuning once placed on-site due to the weight of media, shipment vibrations, and other factors. The tension of the spring can be seen through the window using the minimum/maximum gage. Item numbers can be found on page 8, ESB1 Exploded View.

1. Spring Adjustment:

a. Prior to any work, reference the Safety section on page 18. Wear Personal Protective Equipment (PPE) during the adjustment process.

- Remove Dixon® cover (item 2) on the side with the pivot arm (item 10)
- Remove the mechanical stop secured with two socket head bolts (items 4, 5, and 9)



- Lift the primary leg up to relieve tension on the spring. Next, lift the loading arm to its highest possible position to relieve spring tension, then secure the arm.



- Once tension is removed, rotate the adjustment bolt (item 17) in 1/2 turn increments to the adjustment bolt. Using caution, lower the loading arm until it is self-supporting. Allow the arm to 'settle' into a natural position before determining whether or not further adjustment is required.
 - If further adjustment is not necessary, replace the factory installed travel stop at the desired location based on application.
 - Tightening increases spring torque, loosening decreases spring torque.



ESB1 Operating Instructions, Continued

2. Spring Wear (removal and replacement):

- a. As the spring is used over time, the spring will wear until it has reached the end of its service life:
 - To change the spring out, all tension must be removed from the spring and the pivot arm bar must be removed.



- Remove 3 bolts on the pivot arm side of the counterbalance (item 13)
- Pull the carbon steel side mount end plate (item 3) and associated parts off of the housing
- Remove the spring (item 11) and replace
- Reinstall in the reverse order

3. Effects of Pipe Clamp Movement:

- a. As the clamp is moved further out on the arm, the result will be less felt weight at the terminal end. If the clamp is moved closer to the pivot location, more felt weight will result.
- b. Clamp bolts should be tightened in a crisscross pattern to 30 ft.lbs. and checked during a regular maintenance schedule.

ESB2 Operating Instructions

Counterbalance adjustment and balancing information is as follows. The loading arm is balanced and adjusted at the factory for all complete arm packages but may need minor fine tuning once installed on-site due to weight of media, shipping vibrations etc. The spring's tension can be observed through the window with the minimum/maximum gage. Refer to page 9, ESB2 Exploded View for item numbers.

1. Spring Adjustment:

- a. Prior to any work, reference the Safety section on page 18. Wear Personal Protective Equipment (PPE) during the adjustment process.
 - Remove tension from the spring by lifting the primary leg up. Lift the loading arm to the highest possible position to unload the spring tension and then secure the arm. It may be necessary to remove the travel stop (item 7) prior to lifting the arm.



- Once tension is removed, rotate the adjustment bolt (item 23) in 1/2 turn increments. Using caution, lower the loading arm until it is self-supporting. Allow the arm to 'settle' into a natural position before determining whether further adjustment is required.
 - Tightening increases spring torque, loosening decreases spring torque.



2. Spring Wear (removal and replacement)

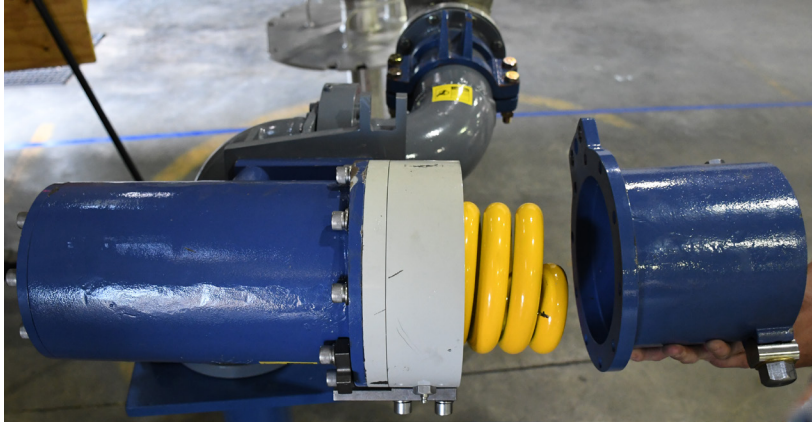
- a. As the spring is used over time, the spring will wear until it has reached the end of its service life:
 - To change the spring out, all tension must be removed from the spring and the pivot arm bar must be removed.



ESB2 Operating Instructions, Continued

2. Spring Wear (continued)

- Remove 10 bolts (items 5 and 6) connecting the pivot arm half of the counterbalance to the mounting side (item 4.)
- Carefully separate the pivot arm half of the counterbalance from the mounting half, ensuring the spring (item 17) stays in the fixed side and doesn't become a falling hazard. ⚠

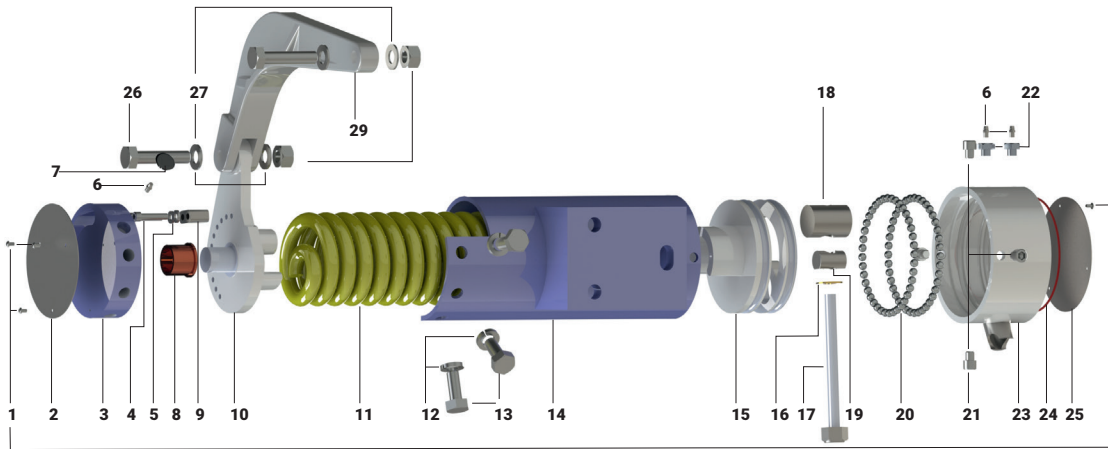


- Remove the spring from the mounting half. You may have to twist the spring to get it loose from the housing. Replace with the new spring, ensuring the spring tang sits within the preload cup (item 3) correctly.
- Reinstall pivot arm half in the reverse order. Be sure to place the travel stop (item 7) back in the appropriate location using the longer bolts (item 6.)

3. Effects of Pipe Clamp Movement:

- a. As the clamp is moved further out on the arm, the result will be less felt weight at the terminal end. If the clamp is moved closer to the pivot location, the more felt weight will result.
- b. Clamp bolts should be tightened in a crisscross pattern to 30 ft.lbs. and checked during a regular maintenance schedule.

ESB1 Exploded View

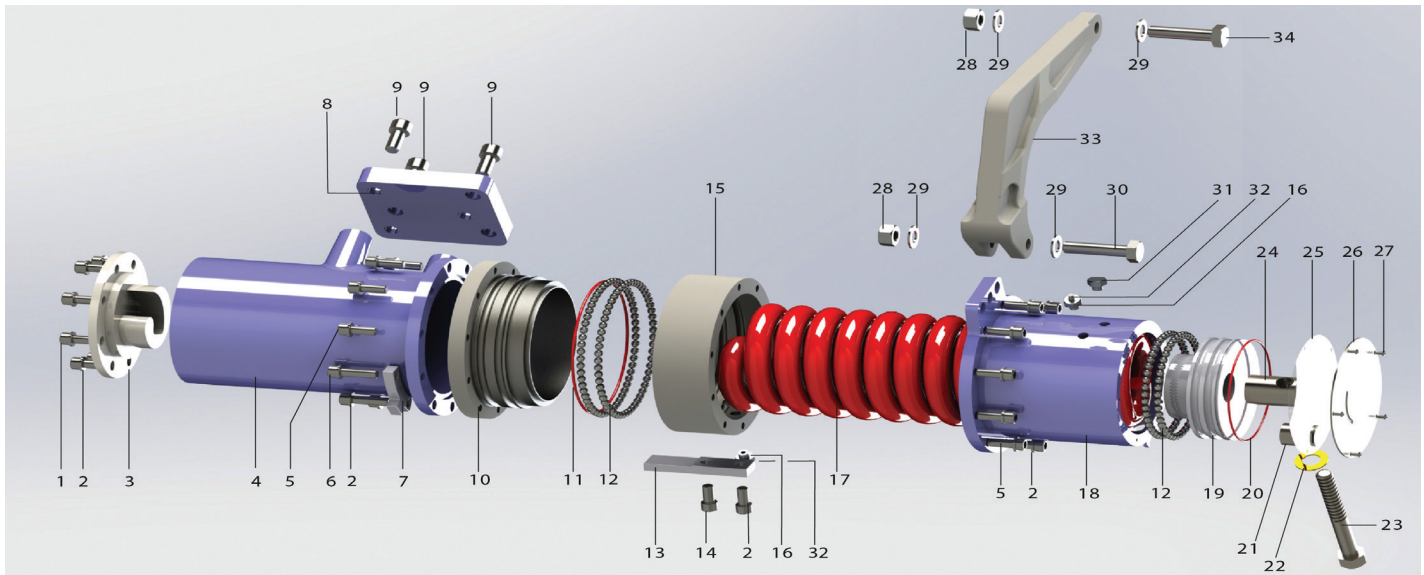


Item	Qty	Part #	Description
1	6	ESB-AT1321	button head stainless steel Allen screw - metric 4
2	1	ESB-AT1299R ESB-AT1296L	stainless steel nameplate
3	1	ESB-AT1264R ESB-AT1263L	carbon steel side mounting plate
*4	2	ESB-AT1302	socket head stainless steel Allen screw - 5/16" x 1-1/2"
*5	2	ESB-AT1303	stainless steel grower washer 5/16"
6	3	ESB-AT1320	grease fitting
7	1	ESB-AT1332	environmental plastic cup
8	1	ESB-AT1325	brass bushing
*9	1	ESB-AT1301	stainless steel travel stop
10	1	ESB-AT1261R ESB-AT1362L	ductile iron pivot arm bar
11	1	View Details	torsion spring
12	3	ESB-AT1319	stainless steel grower washer 5/8"
13	3	ESB-AT1318	stainless steel hexagonal head nut 5/8"-11 x 1-1/2"
14	1	ESB-AT1255R ESB-AT1265L	carbon steel main body
15	1	ESB-AT1257R ESB-AT1363L	ductile iron male raceways adjusting device
**16	1	ESB-AT1327	brass washer 5/8"
**17	1	ESB-AT1262	adjustment bolt
**18	1	ESB-AT1330	adjusting cylindrical nut
**19	1	ESB-AT1258	stainless steel cylindrical washer
20	84	ESB-AT1328	ball bearings 3/8"
21	4	ESB-AT1331	stainless steel Allen bolt 7/16"
22	2	ESB-AT1296	aluminum grease fitting adapter cup
23	1	ESB-AT1256R ESB-AT1268L	carbon steel female raceways body
24	1	ESB-AT1329	environmental seal
25	1	ESB-AT1300R ESB-AT1298L	stainless steel torque plate
26	2	ESB-AT1707	stainless steel 5/8" fastener
27	2	ESB-AT1518	stainless steel washer 5/8"
28	2	ESB-AT1520	stainless steel 5/8" self-breaking nut
29	1	ESB-AT1323	ductile iron arm
-	1	*ESB-AT1952-KIT	travel stop kit (includes items 4, 5, and 9)
-	1	**ESB1-BOLT-KIT	adjustment bolt kit (includes items 16, 17, 18, and 19)
-	1	ESB1/RH-CAN	right hand complete canister assembly - less spring
-	1	ESB1/LH-CAN	left hand complete canister assembly - less spring

Torsion Spring Details

Item	Qty	Part #		Description	Color
		Right Hand	Left Hand		
11	1	ESB1/A-SPRING	---	torsion spring - light	white
		ESB1/B-SPRING	---	torsion spring - medium	yellow
		ESB1/C-SPRING	---	torsion spring - heavy	red
		---	ESB1/E-SPRING	torsion spring - light	black
		---	ESB1/F-SPRING	torsion spring - medium	gray
		---	ESB1/G-SPRING	torsion spring - heavy	orange

ESB2 Exploded View

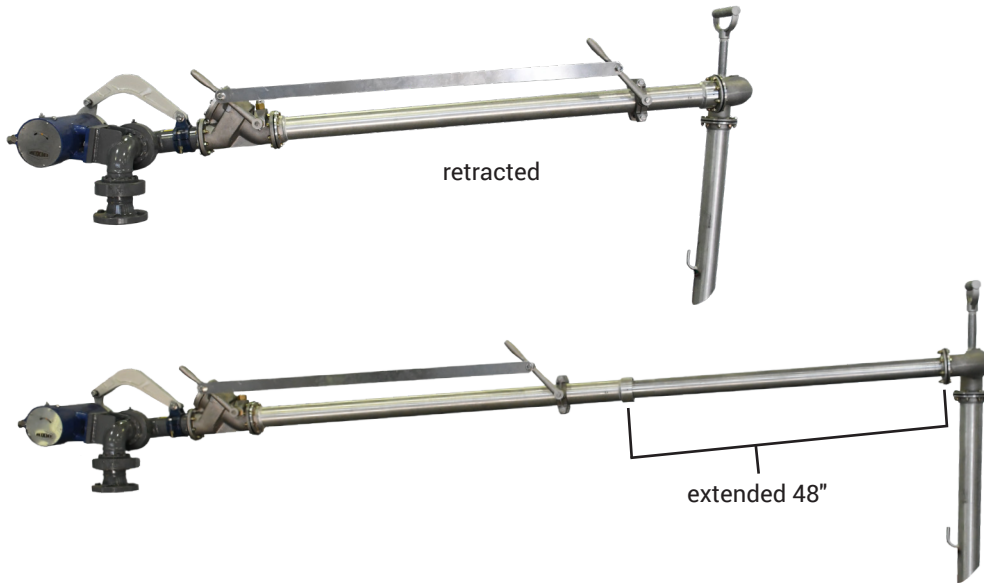


Item	Qty	Part #	Description
1	8	ESB-AT1607	stainless steel socket head bolt, 7/16" x 1"
2	28	ESB-HG502140	stainless steel spring washer 7/16"
3	1	ESB-AT1613R ESB-AT1599L	spring preload cup
4	1	ESB-AT1602	main static body
5	8	ESB-AT1608	stainless steel socket head bolt, 7/16" x 1-1/4"
6	2	ESB-AT1609	stainless steel socket head bolt, 7/16" x 2"
7	1	ESB-AT1604	stainless steel travel stop accessory
8	1	ESB-AT1866R ESB-AT1601L	interface accessory
9	3	ESB-AT1557	stainless steel socket head bolt, 5/8" x 1
10	1	ESB-AT1611	male raceway body
11	1	ESB-AT1617	environmental gasket
12	206	ESB-H6712M	ball bearing 3/8"
13	1	ESB-AT1600	stainless steel travel stop end
14	2	ESB-AT1624	stainless steel socket head bolt M12 x 30mm
15	1	ESB-AT1614	female raceway body
16	1	ESB-AT1868	aluminum race cup, M6
17	1	View Details ESB-AT1610	torsion spring actuator body
18	1	ESB-AT1610	actuator body
19	1	ESB-AT1612R ESB-AT1598L	torsion tune accessory
20	1	ESB-AT1616	environmental gasket
21	1	ESB-AT1605	cylicndric washer
22	1	ESB-AT1814	brass washer
23	1	ESB-AT1615	adjustment bolt
24	1	ESB-AT1603	adjustment cylindric nut
25	1	ESB-AT1746	transparent separator
26	1	ESB-AT1872R ESB-AT1606L	stainless steel brand cap
27	5	ESB-AT1321	stainless steel socket head bolt, M4
28	2	ESB-AT1520	stainless steel lock nut, 5/8"
29	2	ESB-AT1518	stainless steel flat washer, 5/8"
30	1	ESB-AT1619	stainless steel threaded pin, 5/8" x 3 1/2"
31	2	ESB-AT1867	aluminum race cup
32	2	ESB-H6713M-SS	stainless steel grease fitting
33	1	ESB-AT1708	main handle
34	1	ESB-AT1625	stainless steel threaded pin, 5/8" x 3"

Torsion Spring Details

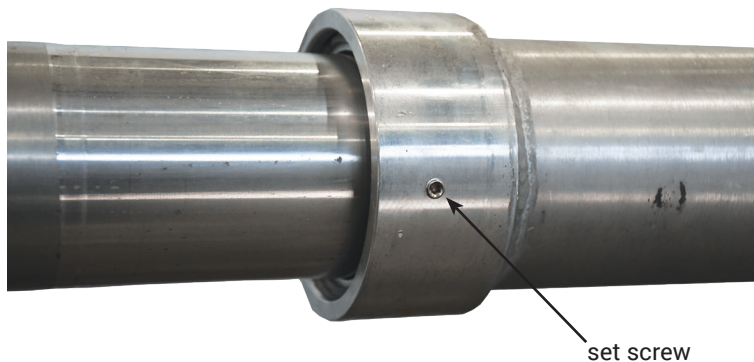
Item	Qty	Part #		Description	Color
		Right Hand	Left Hand		
17	1	ESB2/A-SPRING	---	torsion spring - light	white
		ESB2/B-SPRING	---	torsion spring - heavy	yellow
		---	ESB2/E-SPRING	torsion spring - light	black
		---	ESB2/F-SPRING	torsion spring - heavy	gray

Telescoping Loading Arm Operating Instructions



Changing the Seals:

1. Refer to page 11, Telescoping Loading Arm Exploded View, for item numbers.
2. Remove the retaining ring (item 5) from the groove being careful not to damage the coupler.
3. Pull the inner tube (item 7) out of the outer pipe (item 1). You can set the outer pipe to the side.
4. Remove both wear rings (item 6) from their grooves by pulling the opening apart and sliding them off the tube.
5. Slide off the three spacers (item 3), the two U-cup seals (item 4), and the retaining ring from the inner tube and remove them from the tube altogether.
6. Slide on new components from the seal kit (Part #: 3RKT) in this order: retaining ring, spacer, U-cup seal (U-cup side facing retaining ring), spacer, U-cup seal (opposing the other U-cup seal), spacer. Apply a small amount of grease to the seals for ease of assembly.
7. Assemble the two new wear rings into their respective grooves.
8. Assemble the inner tube into the outer pipe.
9. Push the spacers and seals into the coupler until they bottom out. A special tool is optional to aid in the assembly. Consult Dixon for more details.
10. Clip the new retaining ring into its groove.



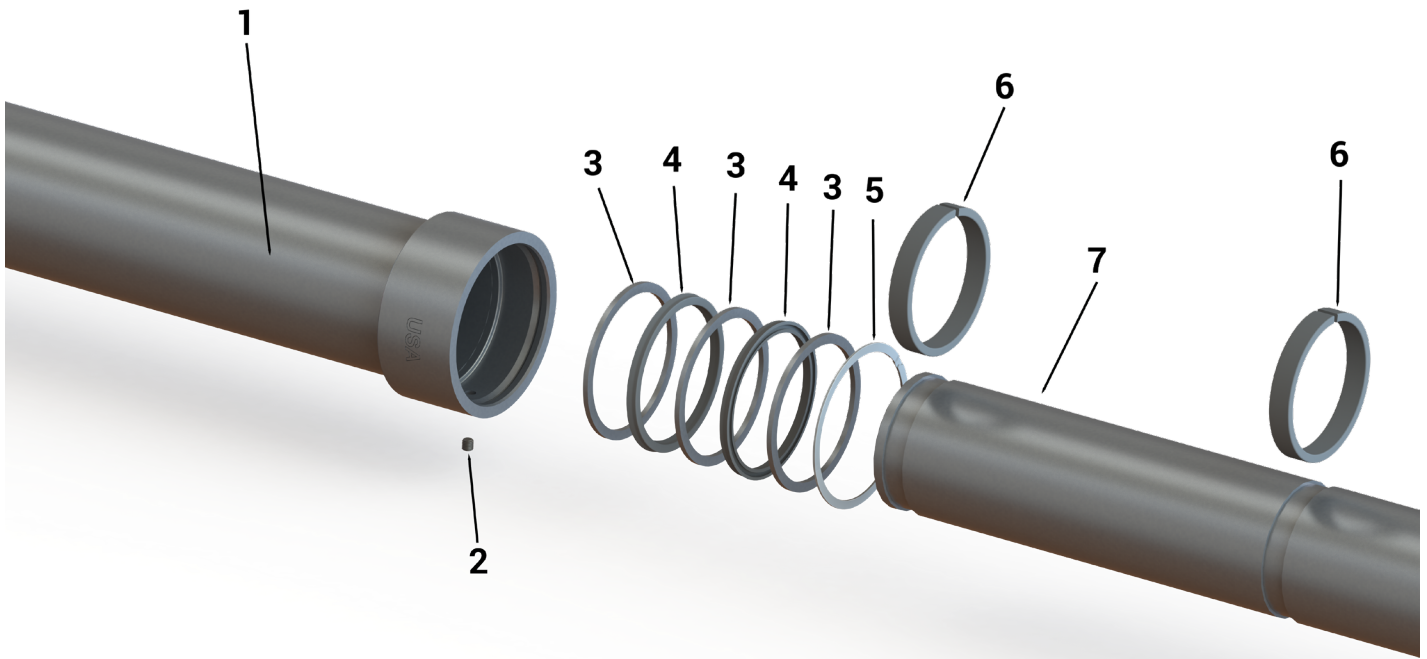
Grease Port:

- A set screw (item 2) has been included on the coupler between the inner tube and outer pipe. This can be switched out and replaced with a grease fitting (Part #: GP) if needed (1/4"-28 UNF)

Other:

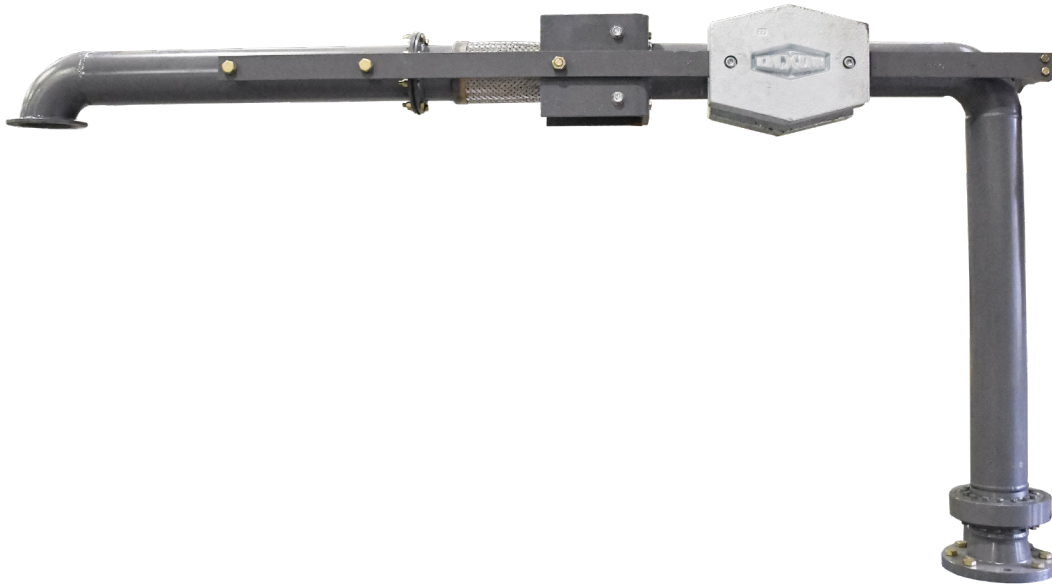
- Any loading arm containing a telescoping arm is not designed to retain pressure
- For any counterbalance adjustment, please refer to the operating instructions that pertain to the counterbalance on your loading arm
- Other common accessories that work with the telescoping arm: Top Load Valve (Part #: TLV-300TFVBVIAL) and the Remote Handle Kit (Part #: TLRVK-300X58AL)

Telescoping Loading Arm Exploded View



Item	Qty	Part #	Description
1	1	LA-EXT-3PWELD	3" outer pipe
2	1	14-28SETSS	1/4"- 28 UNF set screw
3	3	LA-EXT-3SPACER	3" metal spacer
4	2	9505K116	3" U-cup seal
5	1	WH-354-S16	3" retaining ring
6	2	WB0325-0500-187	3" wear ring
7	1	LA-EXT-3TWELD	3" inner tube

Counterweight Operating Instructions



Weight Adjustment:

1. Refer to page 13, Counterweight Exploded View, for item numbers.
2. Ensure the loading arm is full prior to adjusting.
3. Loosen the socket head cap screws (item 5) on the weights (item 4) near the inlet of the loading arm.
4. Slide the weights along the side brace (item 10) until the arm sits horizontal at the flex hose (item 16) (slide them toward the inlet if less than horizontal, slide them towards the outlet if above horizontal.)
5. Retighten all socket head cap screws on the weights (hand tight.)

Weight Adjustment

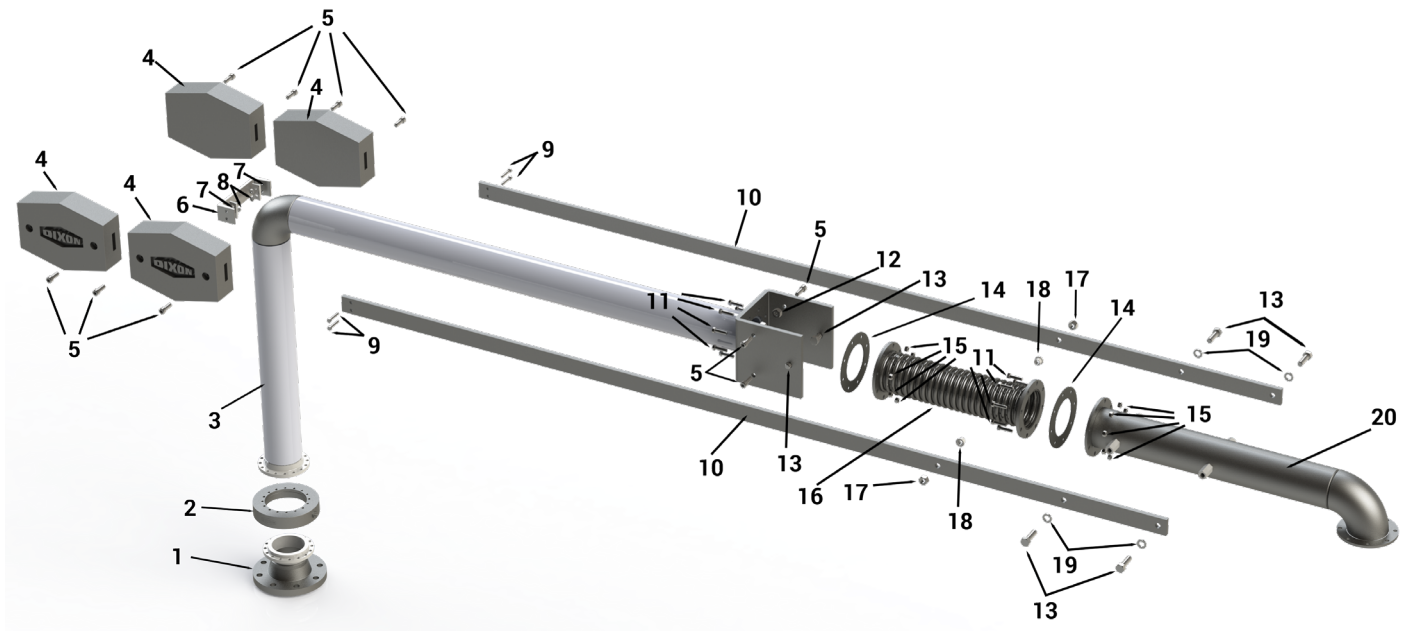


Counterweight Part Number Key

Counterweight	Quantity of Weights	-LA4-	Overall Reach	-	Seal Option
CW	2 = 2 weights 4 = 4 weights	-LA4-	078 = 78" 090 = 90" 102 = 102" 114 = 114"	-	0 = Baylast™ 1 = FKM 2 = PTFE A = Low-Temp FKM

NOTE: When lifting the loading arm to install onto process piping, DO NOT lift by the counterweight brace and/or hose.

Counterweight Exploded View



Item	Qty	Part #	Description
1	1	4SFNPCSFG	4" split flange nose piece x 150 lbs. flange
2	1	4SFBP	4" split flange bearing pack
3	1	CW-LA4W-XXX	4" counterweight primary leg
4	2/4	CW-75-CS	counterweight
5	8/12	CAPSCREW1/2-13	1/2-13" X 3/8" socket head cap screw
6	1	CW-4BBACK	channel C8 x 12-3/4" x 2"
7	4	91151A030	5/16 leveling washer
8	4	LOCKNUT516-18G8	lock nut 5/16-18"
9	4	B516-18X1.75G8Z	hex bolt 5/16-18" x 1-3/4"
10	2	CW-4BSIDE-XXX	4" counterweight side brace
11	16	B3/8-16X1.5G8Z	hex bolt 3/8-16" x 1-1/2"
12	4	HEXNUT1/2-13G8	hex nut 1/2-13"
13	6	B5/8-11X2G8Z	hex bolt 5/8-11" x 2"
14	2	400GTTFBL ¹	4" TTMA flange gasket
15	16	LOCKNUT3/8-16G8	lock nut 3/8-16"
16	1	979T14T14001800	4" metal hose w/ TTMA flanges
17	2	HEXNUT5/8-11G8	hex nut 5/8-16"
18	2	2934T18	5/8" shaft sleeve bearing
19	4	LOCKWASHER5/8G8	lock washer 5/8"
20	1	4LCS-TFXETW-032	4" pipe w/ TTMA flange x TTMA elbow and threadolet

¹Standard with nitrile rubber seals, PTFE is standard with all other seal materials

Loading Arm Maintenance

Reference the following information to assist in general maintenance and seal replacement for all Dixon® Specialty Products swivel joints. Take all necessary safety precautions when assembling and operating these units. Handle all components with cleanliness and care.

1. Lubrication (grease fittings):

- a. Grease schedule: Lubrication should be performed on a regularly scheduled basis (e.g. bi-annually, quarterly, or monthly), depending on service and operating conditions.

Application:

- b. Inject grease and rotate the unit as it is applied to ensure an even application throughout the raceway. Do not over-lubricate, as this may displace the seals and result in leakage. Use a manual grease gun in order to feel pressure inside the swivel; if you feel the pressure is high, the swivel may be over greased and one of the ball retainer screws should be removed for a visual inspection. Periodically remove both ball retainer screws in order to visually inspect the ball race and one or two of the ball bearings. If there is material inside this cavity, the pressure seal has been compromised resulting in a leak and the swivel should be rebuilt. If you find metal in the grease or have any concerns about the shape of the ball bearings or races, please contact us immediately as this could be signs of excessive wear.

- c. Grease points: All swivel joints are supplied with a grease fitting at each plane of rotation. Special note about the split flange style swivel: remove the "grease inspection port" prior to greasing (see page 17).

- d. Type of grease: All swivels are filled with Renolit S2 TX grease at the factory with NLGI Grade 2. Some applications may require the use of a different grease, which is available upon request.

2. Re-torque bolts (clamps, counterbalance bolts, flanges etc.) and ensure the E-clips are in place on the counterbalance pivot bar (e.g. bi-annually, quarterly or monthly), depending on service and operating conditions. We recommend using a thread lock sealant (Loctite Blue) or lock washers to prevent any loosening due to vibration.

3. A spring adjustment on the counterbalance is recommended after the first 2 months in service depending on use to account for initial spring wear. (see spring adjustment section in this manual)

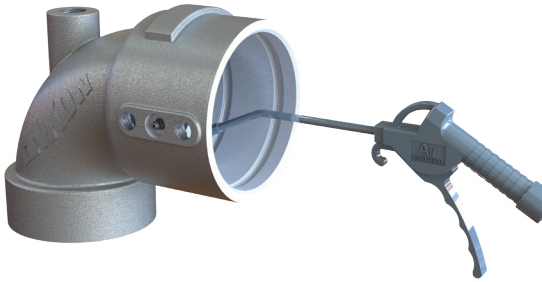
4. All swivels are designed to be re-buildable once they have reached the end of their service life. Refer to pages 15 - 17 instructions for replacing O-ring, V-ring, and split flange swivel seals.

Loading Arm Maintenance, Continued

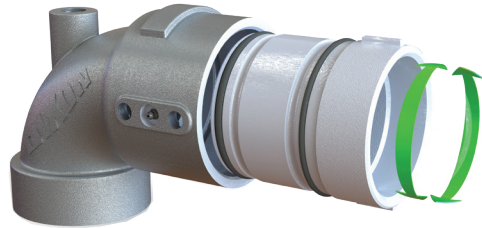
Instructions for replacing O-ring swivel seals.

NOTE: Instructions are not for assembly with spring-loaded PTFE pressure seal, consult Dixon®.

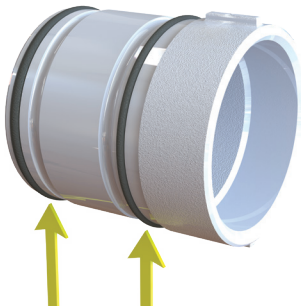
- 1** Remove the ball retainer screws. Add a sufficient amount of solvent into each raceway to flush out the lubricant. Rotate the sleeve, catching the balls as they fall out. When all the balls have been removed, the body and sleeve can be separated. Discard old seals. Thoroughly clean the body and sleeve.



- 4** Insert the sleeve into the body, and slowly rotate the sleeve while inserting into the body.



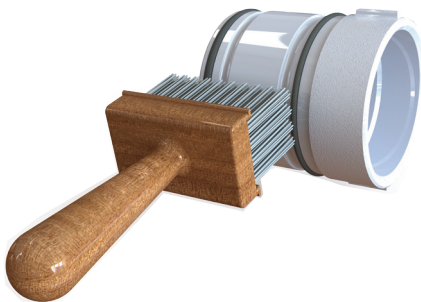
- 2** Install the new O-rings on the sleeve, dust seal to the rear, product (pressure) seal up front.



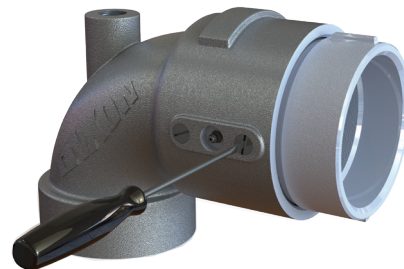
- 5** When the sleeve is fully inserted, feed the ball bearings into the raceways while rotating the sleeve. To make space for all the balls, insert a screw driver into the raceway, while continuing to rotate the sleeve in one direction (be careful not to damage the threads). This will cause the balls to jam up, making room for the remaining balls. Now reverse rotation of sleeve and insert the remaining balls.



- 3** Lubricate the body and the sleeve with grease.



- 6** Reinstall ball retainer screws until tight. If this interferes with the smooth rotation of the ball bearings, then back off 1/8 - 1/4 turn. A thread locking sealant is recommended to prevent screws from backing off. After pressure testing, the unit is ready for installation.



Body and sleeve are matched during manufacturing. Do not mix components with other units.

Loading Arm Maintenance, Continued

Instructions for replacing V-ring swivel seals.

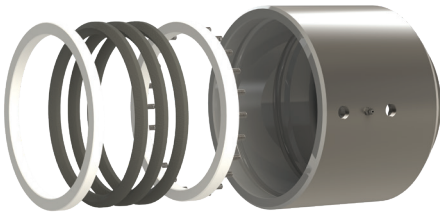
1 Remove the ball retainer screws. Add a sufficient amount of solvent into each raceway to flush out the lubricant. Rotate the sleeve, catching the balls as they fall out. When all the balls have been removed, the body and sleeve can be separated. Discard old seals. Thoroughly clean the body, sleeve retainer, spring retainer, and springs.



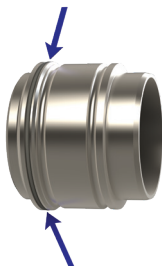
2 Lubricate the body unit with a moly lubricant or equivalent.



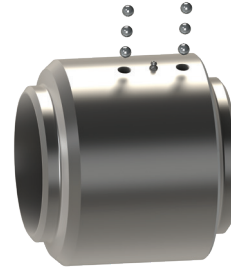
3 Place the assembled spring retainer unit (spring end first) into the body. Place the set of V-rings onto the spring retainer. Be sure V-rings are installed with the sealing lips facing toward the retainer. Lubricate the body and seals with a moly lubricant or equivalent.



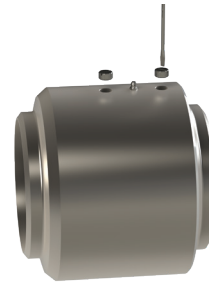
4 Set the dust seal into O-ring groove on the sleeve. Place the seal retainer on the sleeve with the grooved end facing the V-rings. Lubricate the sleeve with grease.



5 Insert sleeve into body, compressing swivel joint together until ball races or body and sleeve are in alignment (do not rotate either unit while compressing). Care should be taken to avoid pinching or scoring of V-rings. Drop balls into raceway holes, rotating the sleeve slowly as you load. To make space for all the balls, insert a screw driver into the raceway while continuing to rotate the sleeve in one direction (be careful not to damage the threads). This will cause the balls to jam up, making room for the remaining balls. Now reverse the rotation of the sleeve and insert the remaining balls.



6 Reinstall ball retainer screws until tight. If this interferes with the smooth rotation of the ball bearings, then back off 1/8 - 1/4 turn. A thread locking sealant is recommended to prevent screws from backing off. After pressure testing, the unit is ready for installation.



* The last coil of the springs has been upset (O.D. slightly larger). When upset end is inserted into the holes provided in the spring retainer, the springs remain secure.



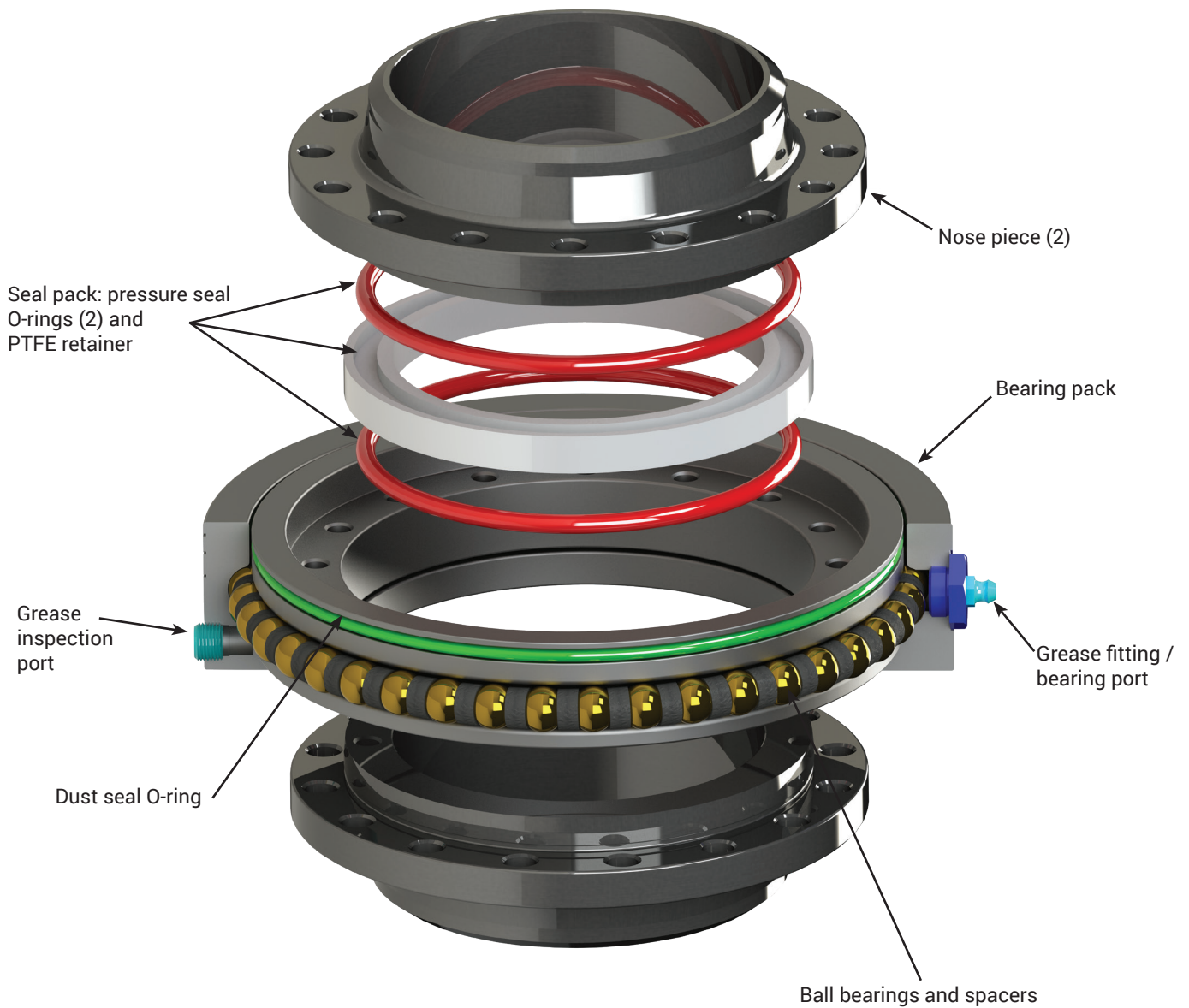
Body and sleeve are matched during manufacturing. Do not mix components with other units.

Loading Arm Maintenance, Continued

Instructions for replacing **split flange swivel seals**.

Instructions to replace the seal pack:

1. Remove the bolts connecting the nose piece on only one side of the swivel body (bearing pack).
2. Pull out the seal pack and install the new seals (ensure the O-rings are in the groove of the PTFE retainer).
3. Reinstall the bolts and torque in an alternating star pattern to 25 ft.lbs.

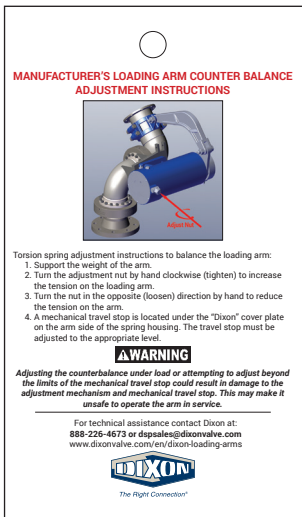


Troubleshooting

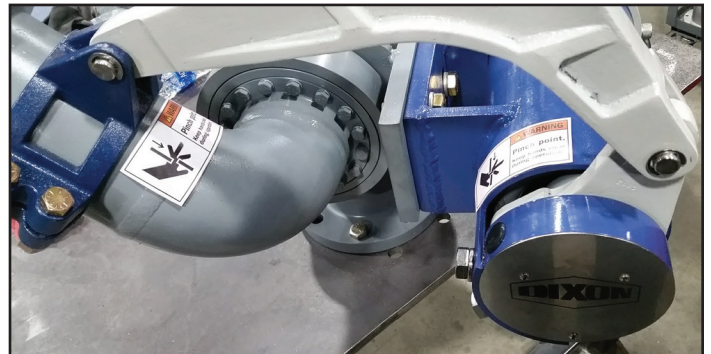
Problem	Solution
Loading arm becomes unbalanced	Check clamp placement (ensure the clamp did not slide). Re-adjust and torque bolts
	Use adjustment nut as described previously to re-adjust spring tension
	Consult Dixon® for further information
Swivel leaking	Re-torque flange bolts
	Grease per the loading arm service section on pages 14 - 17
	Replace seals
API coupler leaking	Visit dixonvalve.com for information on rebuilding, maintenance, and operating.
Loading arm adjustment limited by obstructions (ceiling height, piping, etc.)	Remove all the spring tension and turn the adjustment bolt using a standard wrench. Never use a cheater or breaker bar. The entire loading arm should be removed from the inlet standpipe connection, brought to the ground, adjusted, and then re-installed. To avoid this step, use a shorter inlet standpipe.

Safety

All counterbalances are shipped with the following label:



DANGER! Be aware of several pinch points around moving loading arms.



DANGER! Prior to any maintenance, secure the loading arm and remove tension from the spring inside the counterbalance housing. The loading arm utilizes a torsion spring which contains a substantial amount of tension. Tension must be released prior to any disassembly. Failure to remove all tension from the spring may cause serious injury.



Warning: Never exceed the rated working pressure of the unit. Never modify or alter a unit beyond that to which it has been designed. Should any unit appear damaged, remove it from service immediately and contact Dixon.



CAUTION: Loading arms are not provided with a pressure relief valve. Temperature variations and thermal expansion of liquid media can cause increased internal pressure. Therefore a pressure relief valve prior to the inlet connection point is required. Failure to install a relief valve prior to the loading arm may damage the equipment and cause injury.

Users must consider the size, temperature, application, media, pressure and hose and coupling manufacturer's recommendations when selecting the proper hose assembly components. Dixon recommends that all hose assemblies be tested in accordance with the Rubber Manufacturers Association's recommendations and be inspected regularly (before each use) to ensure that they are not damaged or have become loose. Visit arpminc.com for more information.

Limited Warranty

DIXON VALVE AND COUPLING COMPANY, LLC (herein called "Dixon") warrants the products described herein and manufactured by Dixon to be free from defects in material and workmanship for a period of one (1) year from date of shipment by Dixon under normal use and service. Its sole obligation under this warranty being limited to repairing or replacing, as hereinafter provided, at its option any product found to Dixon's satisfaction to be defective upon examination by it, provided that such product shall be returned for inspection to Dixon's factory within three (3) months after discovery of the defect. The repair or replacement of defective products will be made without charge for parts or labor. This warranty shall not apply to: (a) parts or products not manufactured by Dixon, the warranty of such items being limited to the actual warranty extended to Dixon by its supplier; (b) any product that has been subject to abuse, negligence, accident, or misapplication; (c) any product altered or repaired by others than Dixon; and (d) to normal maintenance services and the replacement of service items (such as washers, gaskets, and lubricants) made in connection with such services. To the extent permitted by law, this limited warranty shall extend only to the buyer and any other person reasonably expected to use or consume the goods who is injured in person by any breach of the warranty. No action may be brought against Dixon for an alleged breach of warranty unless such action is instituted within one (1) year from the date the cause of action accrues. This limited warranty shall be construed and enforced to the fullest extent allowable by applicable law.

Other than the obligation of Dixon set forth herein, Dixon disclaims all warranties, express or implied, including but not limited to any implied warranties of merchantability or fitness for a particular purpose, and any other obligation or liability. The foregoing constitutes Dixon's sole obligation with respect to damages, whether direct, incidental or consequential, resulting from the use or performance of the product.

Some products and sizes may be discontinued when stock is depleted or may require a minimum quantity for ordering.

