

TØV Triple Offset Butterfly Valve Class 150/300 3"-12"



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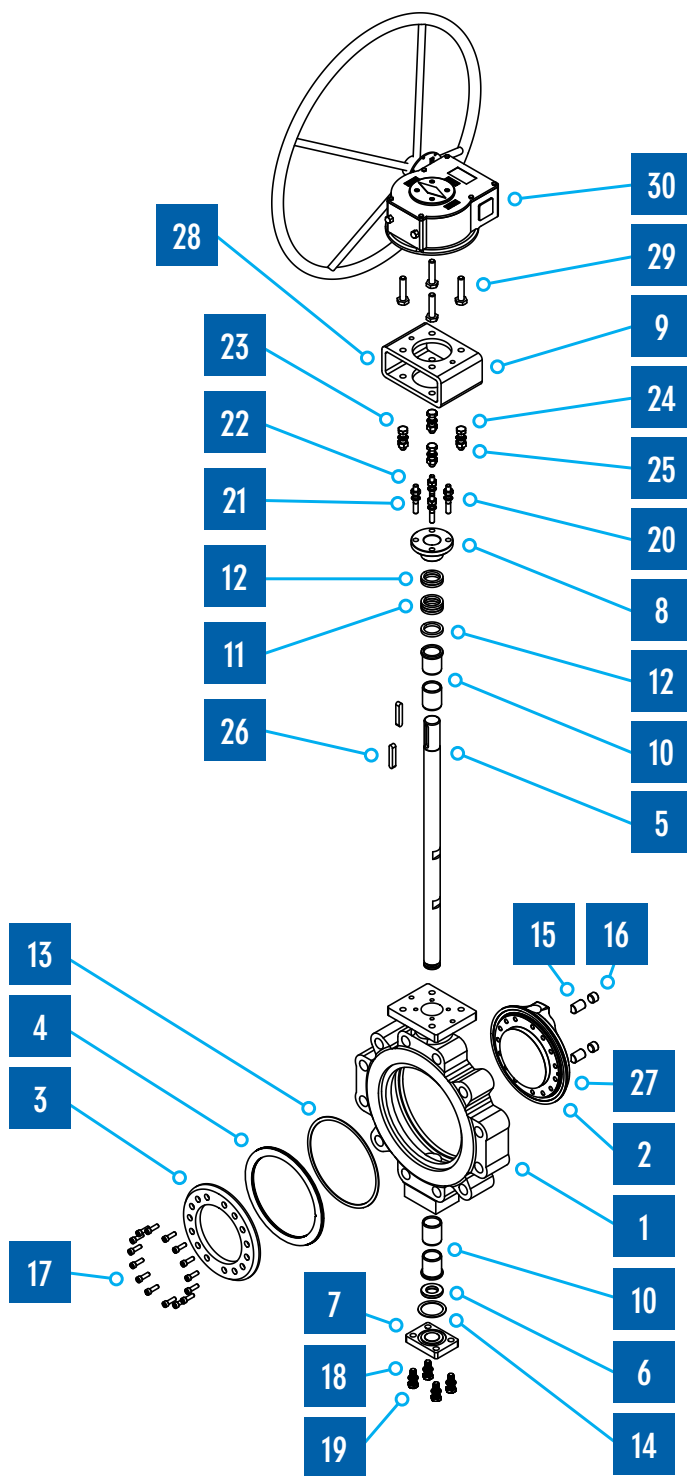
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1.0 Part Identification

Part Description

- 1 Body
- 2 Disc
- 3 Disc Seat Retainer
- 4 Seal Ring*
- 5 Stem
- 6 Stem Limit Block
- 7 Bottom Cap
- 8 Packing Gland
- 9 Adapter Bracket
- 10 Bearing
- 11 Packing, Reinforced*
- 12 Packing*
- 13 Seal*
- 14 Seal, Bottom Cap*
- 15 Wedge, Disc-Stem
- 16 Set Screw, Disc
- 17 SHCS, Retainer
- 18 Hex Bolt, Bottom Cap
- 19 Lock Washer, Bottom Cap
- 20 Stud, Packing Gland
- 21 Lock Washer, Packing Gland
- 22 Nut, Packing Gland
- 23 Stud, Adapter Bracket
- 24 Lock Washer, Adapter Bracket
- 25 Nut, Adapter Bracket
- 26 Key, Stem
- 27 Key, Seat
- 28 Key, Adapter Bracket
- 29 Bolt, Gear Operator
- 30 Gear Operator

*Included in repair part kits



1.0 Part Identification

Part Description		Material		Specification
		TOXXCS48G3XX (Cast Steel)	TOXXSS48G3XX (Stainless Steel)	
1	Body	Carbon Steel w/Stellite 21 Seat Inlay		ASTM A216, WCB
			Stainless Steel w/Stellite 21 Seat Inlay	ASTM A351, CF8M
2	Disc	Stainless Steel		ASTM A351, CF8M
3	Disc Seat Retainer	Stainless Steel		ASTM A276, TY. 316
4	Seal Ring*	Stainless Steel/Graphite Laminate		UNS S30408/GRAPHITE LAMINATE
5	Stem	17-4PH Stainless Steel		17-4PH
6	Stem Limit Block	Stainless Steel		ASTM A276, TY. 304 NITRIDED
7	Bottom Cap	Carbon Steel		ASTM A216, WCB
			Stainless Steel	ASTM A351, CF8M
8	Packing Gland	Carbon Steel		ASTM A216, WCB
			Stainless Steel	ASTM A351, CF8M
9	Adapter Bracket	Carbon Steel		AISI 1020
10	Bearing	Stainless Steel		ASTM A276, TY. 304 NITRIDED
11	Packing, Reinforced*	Reinforced Graphite		Commercial
12	Packing*	Graphite		Commercial
13	Seal*	Graphite/Stainless Steel TY. 304		Commercial
14	Seal, Bottom Cap*	Graphite/Stainless Steel TY. 304		Commercial
15	Wedge, Disc-Stem	17-4PH Stainless Steel		17-4PH
16	Set Screw, Disc	Stainless Steel		Commercial
17	SHCS, Retainer	Stainless Steel		ASTM A193, Gr. B8M or ISO 4762 A4-70
18	Hex Bolt, Bottom Cap	Carbon Steel		ASTM A193, Gr. B7
			Stainless Steel	ASTM A193, Gr. B8M or ISO 4762 A4-70
19	Lock Washer, Bottom Cap	Carbon Steel		AISI 1066
			Stainless Steel	ANSI B18.21.1
20	Stud, Packing Gland	Carbon Steel		ASTM A193, Gr. B7
			Stainless Steel	ASTM A193, Gr. B8M or ISO 4762 A4-70
21	Lock Washer, Packing Gland	Carbon Steel		AISI 1066
			Stainless Steel	ANSI B18.21.1
22	Nut, Packing Gland	Carbon Steel		ASTM A194, Gr. 2H
			Stainless Steel	ASTM A194, Gr. 8M
23	Stud, Adapter Bracket	Carbon Steel		ASTM A193, Gr. B7
24	Lock Washer, Adapter Bracket	Carbon Steel		AISI 1066
25	Nut, Adapter Bracket	Carbon Steel		ASTM A194, Gr. 2H
26	Key, Stem	Carbon Steel		Commercial
27	Key, Seat	Stainless Steel		Commercial
28	Key, Adapter Bracket	Carbon Steel		Commercial
29	Bolt, Gear Operator	Carbon Steel		ASTM A193, Gr. B7
30	Gear Operator			

*Included in repair part kits

2.0 Pre-Installation

2.1 General

Milwaukee Valve Triple Offset Valves (TØV) are metal-seated butterfly valves designed for high pressure and temperature requirements found in rigorous industrial or critical commercial applications. Carefully following the correct installation and maintenance procedures will maximize the life and performance of the TØV.

1. Complete a full inspection of the valve, including the disc, seal ring, and waterway, to ensure they are free from foreign material such as dust, dirt, welding slag, pipe scale, etc. Do not install a valve that shows signs of damage to the sealing surfaces or pressure containing components.
2. Check the valve identification tag for valve class, materials, and operating pressure to ensure they are correct for the application.
3. Mount the operator on the valve, if required, prior to installation in the pipeline to facilitate proper alignment of the disc in the valve seat.
4. Flange bolts/studs are not provided by Milwaukee Valve. Ensure bolting is the proper size, thread pitch, and length to fully secure the TØV.
5. Operate the valve to fully open and fully closed to ensure the disc position is properly set.

⚠ CAUTION: Personal injury or property damage may result if the valve is installed in service conditions that exceed the valve ratings

2.2 Storage

If the TØV will be in storage prior to installation, the valve should be stored in a clean, dry environment. Flange protectors should only be removed at the time of installation.

2.0 Pre-Installation

2.3 Gear Operator Stop Adjustment

While the TØV are shipped from the factory with the gear operator open stop set, it is recommended that the valve be operated from the fully open to fully closed position to verify it is properly set. The CLOSE stop is not adjustable and shall not be altered, as the TØV requires a torque-seated closure. The open stop can be adjusted if needed. To adjust the open stop, follow the procedure below.

1. With the adjustment screws facing you, remove the cap nut from the left adjustment hole.
2. If the valve is in the fully open position, close the valve slightly to release any pressure the gear operator may be applying to the open position set screw.
3. Adjust set screw to desired position. Turning CW will reduce travel and CCW will increase travel.
4. Open the valve until the disc is in the desired open position. NOTE: It is not recommended to set the open position greater than 90 degrees from the fully closed position.
5. Adjust the open position internal set screw until it contacts the gear. DO NOT over-torque the set screw into the gear as this may result in improper positioning.
6. With the open position set screw adjusted, install the cap nut, and tighten until it contacts the internal set screw.
7. Verify the disc closes to the desired position.

2.4 Gear Operator Orientation

The standard gear operator that operates the TØV is capable of being mounted in 90-degree increments to position the handwheel in different orientations. NOTE: Rotating 90-degrees and 270-degrees from the default position may not be possible due to pipe interference with the handwheel. The following procedure details the best method to safely change the gear operator orientation.

1. Unbolt the gear operator (30) from the adapter bracket (9).
2. Remove the gear operator and reposition it in the desired orientation.
3. Bolt the gear operator back onto the adapter bracket ensuring all connection points are fully tightened referencing the torque values and procedure in Appendix A.

3.0 Installation

3.1 General

The TØV is designed to ASME B16.34 and complies with API 609.

The TØV can be installed in the pipeline with the stem in the vertical, horizontal, or other intermediate position, based on the application. However, in mediums with concentrations of solid or abrasive particles or media subject to solidification buildup, valve performance and service life will be improved by mounting the valve with the stem in the horizontal position.

Although the lug style TØV is capable of dead-end service, Milwaukee Valve recommends using a downstream flange for safety in these installations.

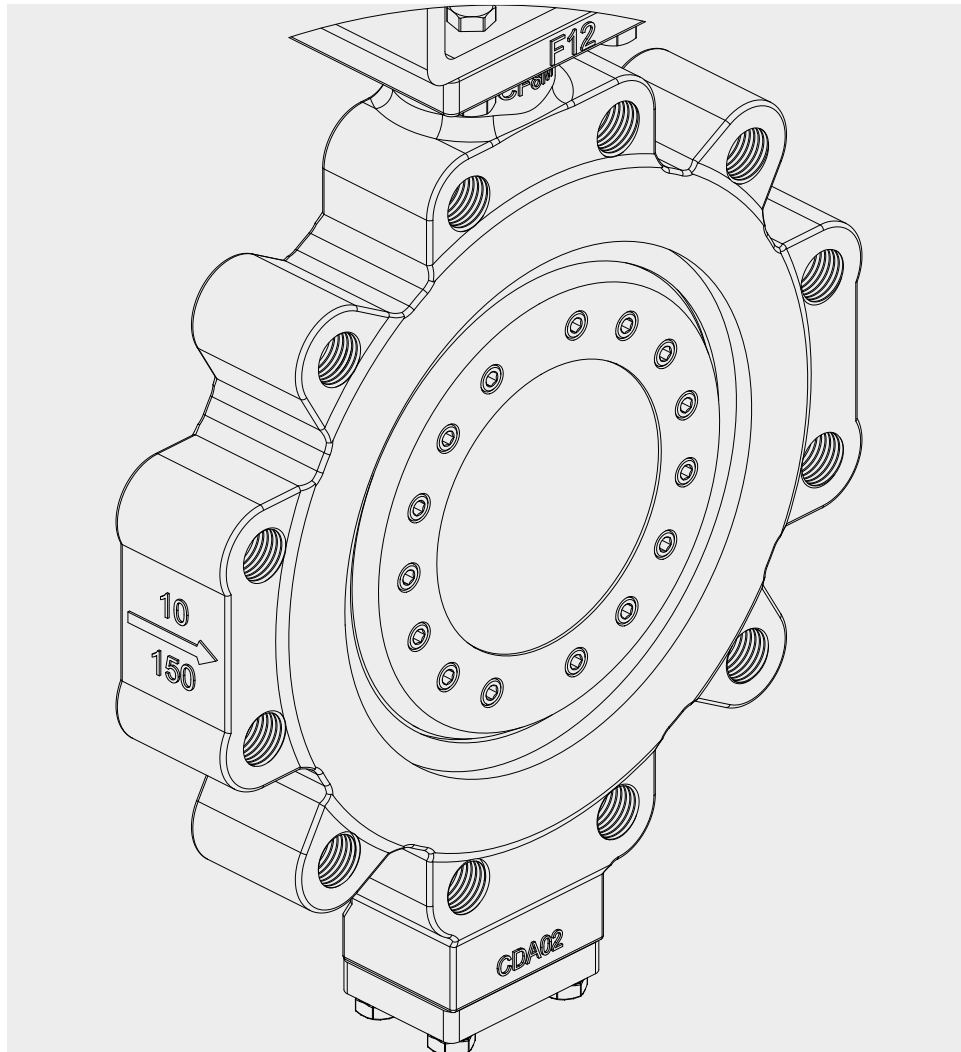
During initial valve cycling, perform a system flush before closing the valve to prevent debris, weld slag, or other piping installation debris from getting trapped and impinging upon the seat when the valve is closed.

⚠ NOTE: As with most valves, stem seals may require periodic adjustment; an installation that does not allow access to the valve stem should be avoided.

3.0 Installation

3.2 Flow Direction

The TØV is bi-directional and can operate in either flow direction. To benefit from the most favorable low operating torque and best sealing conditions, install the valve with the stem on the upstream (pressure side) of the installation. The valve body is marked with an arrow indicating the preferred direction of flow.



3.0 Installation

3.3 Gaskets

Selected flange gaskets should be made of appropriate material suitable for the line media and the piping application.

Nonmetallic flat gaskets should be in accordance with ASME B16.21. Ring or full-face fiber gaskets can be used for the full-size range. Do not use thick elastomeric gaskets. If the application requires metallic spiral wound gaskets, they should be in accordance with ASME B16.20 and can be used for the full-size range.

3.4 Flange Bolting

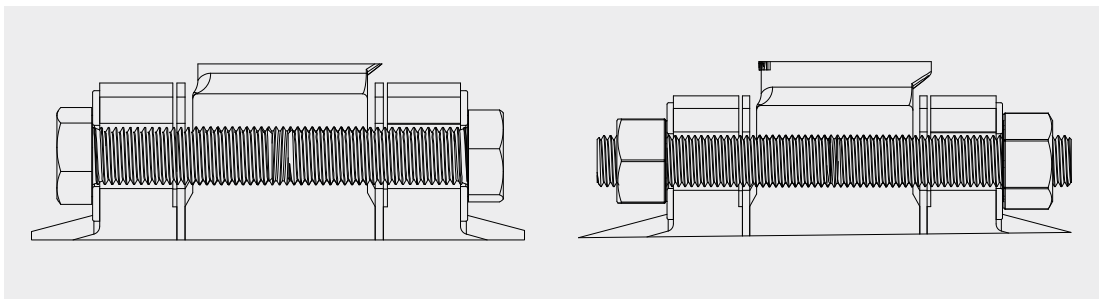
The TØV is designed to be installed between ASME B16.5 flanges. Visually examine studs/bolts and nuts before installation to assure they are free from defects or damage. Studs/bolts and nuts with damaged threads should not be used. Lubricant (MOLYKOTE®) shall be applied on threads and nut-to-flange contact surfaces. Lubricant shall not be used in the gasket or gasket sealing area.

The final required torque is dependent on the type of gasket, bolting material, lubrication, pressure conditions, and application fluid. Milwaukee Valve recommends consulting ASME standards and the gasket manufacturer to determine the appropriate bolting torque based on the specific application.

The recommended torquing procedure is detailed in Appendix A.

Recommended bolt and stud lengths for installation in ASME B16.5 flanges are listed on the following pages.

⚠ CAUTION: Flange bolting lengths are intended only as a guide to installation. Bolt lengths may vary depending on manufacturing tolerances of the valve, flange, gaskets, and bolting.



3.0 Installation

3.4 Flange Bolting

LUG CLASS 150								
IN	Thread	Studs & Hex Nuts					Hex Bolts	
		Stud Length	Qty Studs	Qty Nuts	Qty Washers		Bolt Length	Qty Bolts
3	5/8" - 11UNC	3.25	8	8	16	OR	NR	NR
4	5/8" - 11UNC	3.25	16	16	32		2.00	16
6	3/4" - 10UNC	3.75	16	16	32		2.25	16
8	3/4" - 10UNC	4.00	16	16	32		2.50	16
10	7/8" - 9UNC	4.25	24	24	48		2.75	24
12	7/8" - 9UNC	4.50	24	24	48		3.00	24

LUG CLASS 300								
IN	Thread	Studs & Hex Nuts					Hex Bolts	
		Stud Length	Qty Studs	Qty Nuts	Qty Washers		Bolt Length	Qty Bolts
3	3/4" - 10UNC	3.50	16	16	32	OR	NR	NR
4	3/4" - 10UNC	3.75	16	16	32		2.50	16
6	3/4" - 10UNC	4.00	24	24	48		2.75	24
8	7/8" - 9UNC	4.75	24	24	48		3.25	24
10	1" - 8UNC	5.25	24	32	64		3.50	24
		4.25	8				2.75	8
12	1-1/8" - 8UN	5.75	24	32	64		4.00	24
		4.75	8				3.00	8

WAFER CLASS 150								
IN	Thread	Studs & Hex Nuts					Hex Bolts	
		Stud Length	Qty Studs	Qty Nuts	Qty Washers		Bolt Length	Qty Bolts
3	5/8" - 11UNC	6.25	4	8	8	OR	5.5	4
4	5/8" - 11UNC	6.50	8	16	16		5.75	8
6	3/4" - 10UNC	7.25	8	16	16		6.25	8
8	3/4" - 10UNC	7.75	8	16	16		6.75	8
10	7/8" - 9UNC	8.50	12	24	24		7.25	12
12	7/8" - 9UNC	9.00	12	24	24		7.75	12

WAFER CLASS 300								
IN	Thread	Studs & Hex Nuts					Hex Bolts	
		Stud Length	Qty Studs	Qty Nuts	Qty Washers		Bolt Length	Qty Bolts
3	3/4" - 10UNC	7.00	8	16	16	OR	6.00	8
4	3/4" - 10UNC	7.50	8	16	16		6.50	8
6	3/4" - 10UNC	8.25	12	24	24		7.25	12
8	7/8" - 9UNC	9.50	12	24	24		8.25	12
10	1" - 8UNC	10.5	12	32	32		9.25	12
		4.25	8				2.75	8
12	1-1/8" - 8UN	11.5	12	32	32		11.50	12
		4.75	8				3.00	8

*NOMINAL WASHER THICKNESS INCLUDED IN CALCULATIONS

*HEAVY HEX NUTS IAW B18.2.2

*STANDARD GASKETS (0.125") INCLUDED

*STUD/BOLT CALCULATIONS INCLUDE A MINIMUM OF TWO THREADS EXTRUDING PAST THE HEX NUT

*NR = NOT RECOMMENDED

3.0 Installation

3.5 Installation Procedure

The TØV is designed to be installed between standard ASME B16.5 flanges. Recommended flow direction is detailed in Section 3.2. The gear operator should not be removed from the valve during installation.

When the valve is open, a portion of the disc will protrude on both sides of the valve. Adjacent piping must be large enough to allow the open disc to clear the pipe. Reference the Product Specification Sheets for information regarding minimum allowable pipe ID dimensions.

Whenever possible, install the TØV with the stem in the horizontal position. If this is not possible, orienting the stem at an inclined angle above the horizontal centerline is preferred.

⚠ CAUTION: Avoid uncontrolled rotation of the disc beyond fully open position as this could damage the sealing surfaces.

1. Remove the protective flange covers from the valve and inspect the flange faces to be clear of any debris.
2. Ensure the valve is in the fully closed position. The valve closes with clockwise rotation of the stem and opens with counterclockwise rotation.
3. Ensure the valve is centered between the flanges and gaskets, then lightly thread the bolts.
4. Check the disc clearance by cycling the valve to the fully open position. Should the valve be too difficult to cycle in the installed position, check that the raised area on the valve faces and flanges line up properly.
5. Tighten the bolts per the recommendations in Section 3.4 Flange Bolting and Appendix A. Avoid overtightening that could result in damage to the valve or flanges.
6. Verify valve can operate to fully open and fully closed positions.

4.0 Operation

4.1 General

The standard TOV comes with a gear operator installed. The gear operator has an arrow that indicates if the valve is in the OPEN, SHUT, or intermediate position. Facing the handwheel from the front, operating the handwheel in a counterclockwise rotation will move the valve from the SHUT to the OPEN position. Alternatively, operating the handwheel in a clockwise rotation will move the valve from the OPEN to the SHUT position.

⚠ CAUTION: Avoid uncontrolled rotation of the disc beyond fully open position as this could damage the sealing surfaces.

5.0 Maintenance

5.1 General

The TOV requires limited maintenance during normal service. The packing gland can be tightened if needed while the valve is in service. Periodic stem packing adjustments may be required. To do this, slightly tighten packing gland nuts equally until leakage stops. Avoid over-tightening which may result in excessive valve torque or premature packing wear.

If the operating temperature of the system is substantially higher or lower than 80°F, initial stem seal adjustments may be required. Stem leaks should not go unattended. Lack of maintenance of stem leakage could cause premature valve degradation.

5.2 Valve Removal

⚠ WARNING: Before beginning any work, ensure that all Lock-Out/Tag-Out guidelines and safety procedures are followed.

1. Ensure the valve disc is in the fully closed position.
2. Attach lifting straps as necessary to secure the weight of the valve.
3. Loosen the flange bolts and remove the valve from the mating flanges.
4. Flange gaskets should always be replaced when reinstalling the valve.

5.0 Maintenance

5.3 Repair Parts

The components included in the repair part kits are the seal ring (4), seal (13), stem packing (11 & 12), and bottom cap seal (14). Replacement procedures for these components are detailed in the subsequent sections. Replaceable components are marked with an * in the Part Identification in Section 1.0. Below are the repair kit numbers that can be purchased from Milwaukee Valve.

CLASS 150	CLASS 300
RKTOV1-8 030	RKTOV3-8 030
RKTOV1-8 040	RKTOV3-8 040
RKTOV1-8 060	RKTOV3-8 060
RKTOV1-8 080	RKTOV3-8 080
RKTOV1-8 100	RKTOV3-8 100
RKTOV1-8 120	RKTOV3-8 120

5.4 Seal Ring Replacement

1. Remove the valve from the line following the procedure in Section 5.2.
2. Slightly open the valve so that the seal ring is disengaged from the body of the valve. Unscrew and remove the retainer cap screws (17).
3. Open the valve as needed, until the seat retainer (3) can be removed from the disc (2). Remove the seal ring (4) and the graphite seal (13).
4. Replace the graphite seal.
5. Place the new seal ring in line with the location seat key (27). Ensure the seal ring is conically upright when installing.
6. Orient the seat retainer in place without the retainer cap screws.
7. Partially close the valve while ensuring the seat retainer stays in the correct position.
8. Place the retainer cap screws in the seat retainer and lightly thread.
9. Fully tighten the retainer cap screws referencing the torque values and procedure in Appendix A.
10. Operate the valve to fully open and fully closed position to assess the full position range.

5.0 Maintenance

5.5 Stem Packing Replacement

1. Remove the valve from the line following the procedure in Section 5.2.
2. Unbolt and remove the gear operator (30) from the adapter bracket (9).
3. Remove the stem keys (26) from the stem (5). Pliers may be needed to remove the stem keys.
4. Unbolt and remove the packing gland (8).
5. Unbolt and remove the adapter bracket.
6. Use a packing puller or similar tool to remove the packing (11 & 12). Take care not to damage the stem or packing wall during this process.
7. Replace the packing. Orient the packing rings so that the slit does not line up across all rings.
8. Place and fully screw back into place the adapter bracket and packing gland. Reference the torque values and procedure in Appendix A when attaching the adapter bracket.
9. Reattach the stem keys, then place and fully bolt the gear operator back into place.

5.6 Bottom Cap Seal Replacement

NOTE: This procedure can be performed by one person, however it may be preferable to have two people available, so when the bottom cap is removed one person can hold a rag up into the opening while the second person removes and replaces the seal in the cover.

If one person performs the service, or in a wet (but otherwise depressurized) system where too much water could escape from the bottom of the valve while the cover is removed, simply hang a bucket under the valve to catch the drainage.

1. Remove bottom cap bolts (18) and lock washers (19). Set these aside and remove the bottom cap (7) and existing graphite seal (14). Take care not to scratch the metal sealing surfaces during this process.
2. Inspect mating surfaces on the bottom cap and valve body. Remove any debris that could impede full metal-to-metal contact on reassembly, taking care not to damage these surfaces which could create a leak path.
3. Replace the bottom cap graphite seal.
4. Put the bottom cap back into place and lightly torque the bottom cap bolts into place.
5. Fully torque the bottom cap bolts referencing the torque values and procedure in Appendix A.

⚠ Safety Precaution: Packing/Seal Replacement

Do not attempt to replace packing or bottom cap seal while the system is under pressure.

Ensure all pressure is fully relieved and the valve is isolated before beginning any packing replacement procedure.

If the valve or surrounding components were exposed to elevated temperatures, allow adequate time for cooling.

Hot surfaces can cause serious burns or injuries.

Always wear appropriate personal protective equipment (PPE) including gloves, eye protection, and any additional gear required by site safety protocols.

5.0 Maintenance

5.7 General Troubleshooting

Please contact Milwaukee Valve with other issues requiring assistance.

Issue	Cause	Solution	Section
Leaking at the valve stem	Packing gland nuts are too loose.	Slightly tighten packing gland nuts until leakage stops.	5.1
	Stem packing is damaged.	Replace stem packing.	5.5
Leaking through the bottom cap	Bottom cap bolting is loose.	Tighten bolts on the bottom cap until leakage stops.	5.6
	Bottom cap seal is damaged.	Replace bottom cap seal.	
Leaking past the seal ring	Foreign material is preventing the seat from sealing.	Operate the valve a couple times to clear material out of the way. If this does not work, manually clean the seating area of the valve.	2.1
	Seal ring is damaged.	Replace the seal ring.	5.4
	Retainer cap screws are loose.	Tighten retainer cap screws to recommended torque value.	

Appendix A – Torque Information

It is recommended to follow the procedure below while torquing bolts and nuts in a “crisscross” sequence.

1. Lightly tighten with fingers.
2. Torque to a maximum of 30% of the final torque value.
 - a. For flange bolting, check the gasket to ensure it is compressed uniformly.
3. Torque to a maximum of 60% of the final torque value.
4. Torque to the final torque value.
 - a. For flange bolting, finish by torquing two full passes in a clockwise sequence.

	Valve Size	Seat Retainer SHCS		Bottom Cap HHCS		Gear Operator HHCS		Adapter Bracket HHCS/STUD	
		ft-lb	Nm	Ft-lb	Nm	Ft-lb	Nm	Ft-lb	Nm
CLASS 150	3 inches	6	8	30	40	30	40	30	40
	4 inches	6	8.5	30	40	30	40	30	40
	6 inches	10	14	30	40	30	40	59	80
	8 inches	10	14	103	140	103	140	103	140
	10 inches	10	14	103	140	103	140	103	140
	12 inches	27	36	258	350	258	350	258	350
CLASS 300	3 inches	6	8.5	30	40	30	40	30	40
	4 inches	6	8.5	30	40	30	40	59	80
	6 inches	10	14	103	140	103	140	103	140
	8 inches	10	14	103	140	258	350	258	350
	10 inches	21	28	258	350	509	690	509	690
	12 inches	30	40	258	350	509	690	509	690

The information presented on this sheet is correct at the time of publication. Milwaukee Valve reserves the right to change design and/or materials without notice. For the most current product information, go to www.milwaukeevalve.com.

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