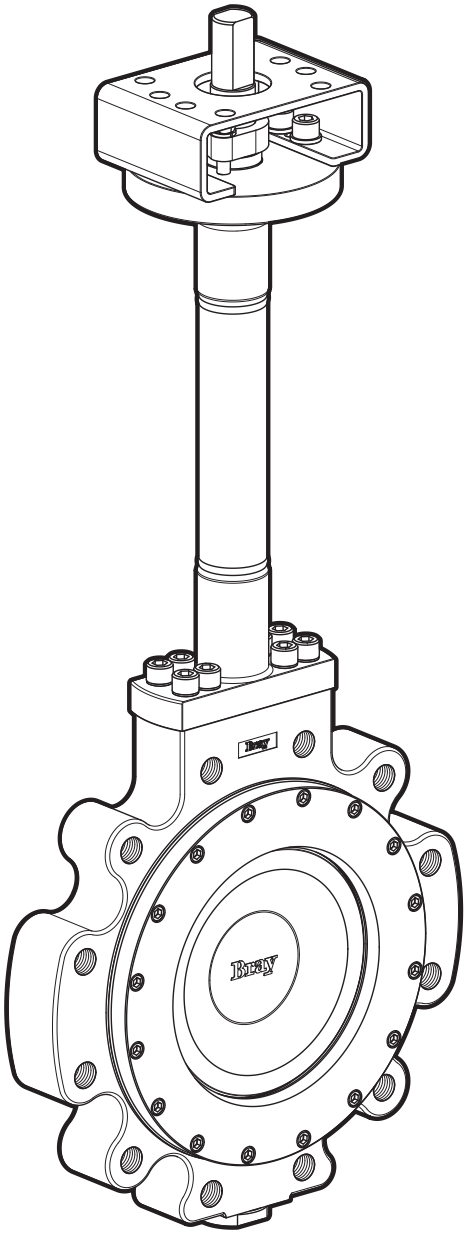
McCANNALOK SERIES

CRYOGENIC HIGH PERFORMANCE BUTTERFLY VALVES

Installation, Operation and Maintenance Manual



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READ AND FOLLOW THESE INSTRUCTIONS CAREFULLY.
SAVE THIS MANUAL FOR LATER USE.

1.0 DEFINITION OF TERMS

⚠ WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or injury.

⚠ CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in injury.

NOTICE

Used without the safety alert symbol, indicates a potential situation which, if not avoided, may result in an undesirable result or state, including property damage.

2.0 INTRODUCTION

2.1 The McCannalok Cryogenic high performance butterfly valve provides industry leading cryogenic sealing technology and performance while being produced to the highest quality standards. The valve is designed to handle the most difficult medias in today's industrial environments, liquid oxygen, liquid natural gas, and other cryogenic liquids.

2.2 Features Include:

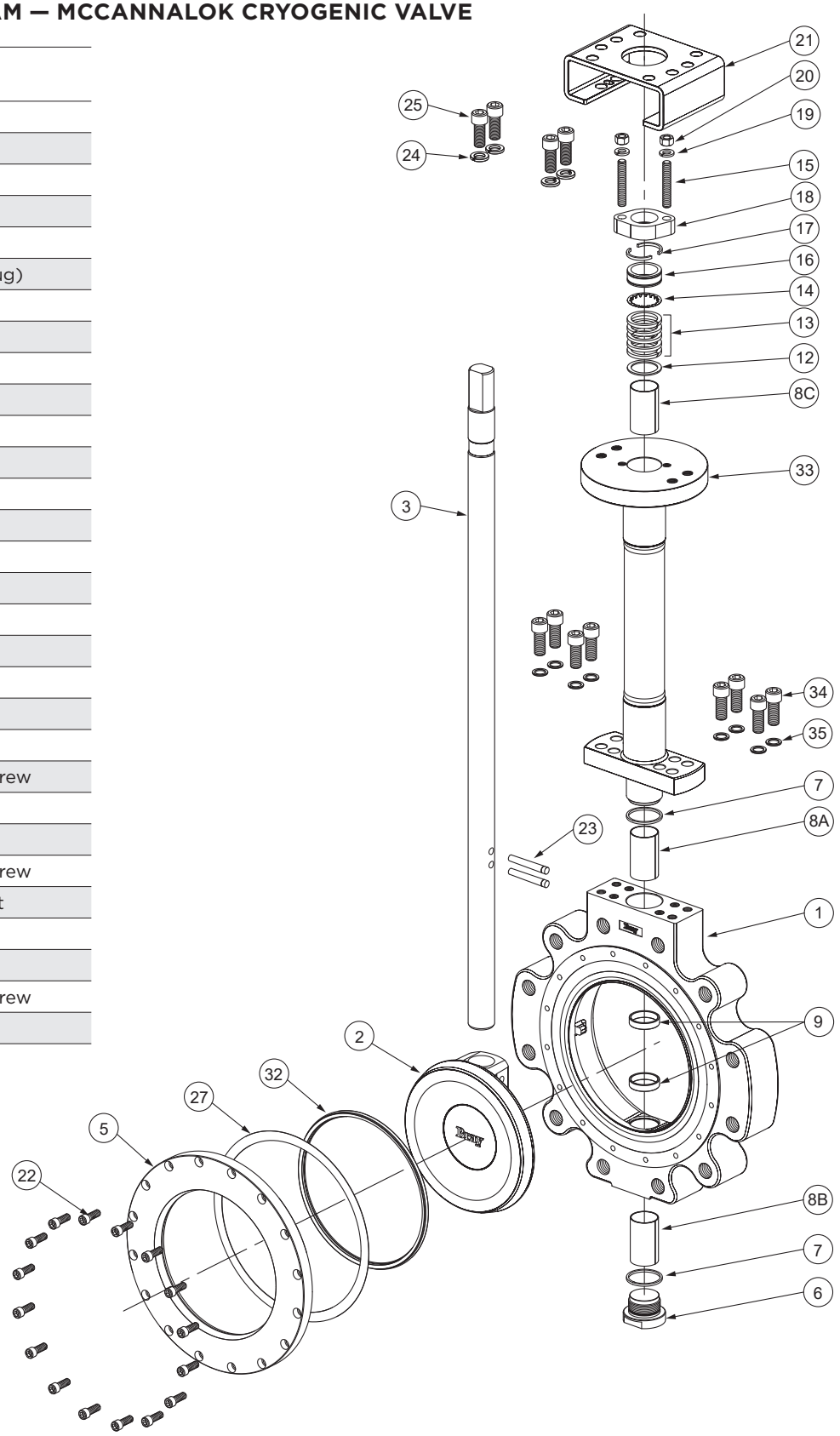
2.2.1 Tight shutoff provided throughout a wide range of operating conditions.

2.2.2 Suitable for both modulating and on/off services, the McCannalok Cryogenic butterfly valve is easily automated with your choice of manual operators, electric and pneumatic actuators, positioners, and controls.

2.3 For additional information about McCannalok Cryogenic butterfly valves — including application data, engineering specifications and actuator selection, visit www.bray.com or contact your Bray distributor or sales representative.

3.0 PARTS DIAGRAM — MCCANNALOK CRYOGENIC VALVE

ITEM NO.	DESCRIPTION
1	Body
2	Disc
3	Stem
5	Seat Retainer
6	Locating Plug
7A	Gasket (Locating Plug)
7B	Gasket (Bonnet)
8A	Upper Body Bearing
8B	Lower Body Bearing
8C	Bonnet Bearing
9	Disc Spacer
12	Thrust Washer
13	Stem Seal Set
14	Grounding Washer
15	Stud
16	Gland Ring
17	Retaining Ring
18	Gland Retainer
19	Lock Washer
20	Hex Nut
21	Mounting Bracket
22	Socket Head Cap Screw
23	Taper Pin
24	Lock Washer
25	Socket Head Cap Screw
27	Seat Retainer Gasket
32	Seat
33	Bonnet
34	Socket Head Cap Screw
35	Lock Washer



4.0 HANDLING REQUIREMENTS

4.1 **Packed Valves**

4.1.1 **Crates:** Lifting and handling of the packed valves in crates shall be carried out by a fork lift truck, by means of the appropriate fork hitches.

4.1.2 **Cases:** The lifting of packed valves in cases shall be carried out in the lifting points and in the center of gravity position which has been marked. The transportation of all packed material must be carried out safely and following the local safety regulations.

4.2 **Unpacked Valves**

4.2.1 Lifting and handling of valves should be carried out by using appropriate means and observing the carrying limits. Handling must be carried out on pallets, protecting all machined surfaces to avoid any damage.

4.2.2 With large bore valves, rigging the load must be carried out by using the appropriate tools to prevent the valve from falling or moving during the lifting and handling.

⚠ CAUTION

For valve handling and/or lifting, the lifting equipment (fasteners, hooks, etc.) must be sized and selected while taking into account the valve weight indicated in our packing list and/or delivery note. Lifting and handling must be made only by qualified personnel.

Fasteners must be protected by plastic covers in sharp corner areas.

Caution must be taken during the handling to avoid this equipment passing over workers or over any other place where a possible fall could cause injury or damage. In any case, local safety regulations must be respected

5.0 LONG TERM STORAGE

5.1 McCannalok Cryogenic valves are cleaned and double bagged to form a vapor barrier with desiccant bags to prevent moisture from collecting on the valve. If the valves are to be stored before installation, storage must be carried out in a controlled manner as follows:

5.1.1 Valves must be stored in a closed, clean and dry environment.

5.1.2 Valve disc to be in closed position and the body end faces must be covered with appropriate flange protection. Flange protectors should only be removed at the time of installation.

5.1.3 If the valve is automated for fail open service, the valve shall be carefully protected to ensure there is no damage to the sealing surfaces.

5.1.4 Valves should be stored indoors with a preferred temperature range from 40°F (4°C) to 85°F (29°C).

5.1.5 The valves should be checked every three months to ensure the above conditions are maintained.

5.1.6 If the valve vapor barrier bags are broken or compromised in any way, valve shall be evaluated to determine if cleaning is necessary. Any dirt or debris can prevent the valve from functioning properly.

⚠ WARNING

If valve is for oxygen service and the vapor barrier bags are compromised, the valve must be disassembled and re-cleaned using approved oxygen cleaning procedures before installation.

5.2 These are general guidelines for valve storage. Please consult the factory for information regarding specific requirements.

6.0 INSTALLATION

6.1 The McCannalok Cryogenic valve is designed to be mounted between ANSI flanges. When the valve is open, the disc will extend into the pipe on both sides of the valve (the disc extends further on the body side than the seat retainer side of the valve). Piping must be large enough to allow the disc to clear the pipe.

6.2 In general, Class 150 valves will clear Schedule 40 pipe, and Class 300 valves will clear Schedule 80 pipe adequately.

⚠ CAUTION

If handle or actuator has been removed do not rotate disc beyond full open or closed position — this could cause damage to sealing surfaces.

6.3 **NOTE:** McCannalok valves are equipped with travel limiters to prevent over closure. The valve is opened by turning counterclockwise, closed by turning clockwise. The double "D" flats or keyway at the top of the stem is parallel to the disc edge.

⚠ CAUTION

Verify and check the preferred flow direction prior to installation.

6.4 The McCannalok Cryogenic valve's installation orientation is with the seat retainer downstream. This will enable positive shutoff and a long service life.

6.5 Ensure the disc (2) is in the closed position then carefully center the valve between flanges. The valve guide holes (wafer pattern valve) or tapped holes (lug pattern valve) should be used to align the valve with the mating flanges.

6.6 Use flange gasket manufacturer's recommended torques when bolting valve into the line.

6.7 Gaskets should conform to the requirements of API Standard 601, Edition 3 for ASME/ANSI B16.5 class flanges. Spiral wound gaskets, such as Flexitallic CGI series, conforming to ASME/ANSI B16.20 are acceptable.

7.0 MAINTENANCE

7.1 Reasonable precautions should be taken before beginning work on the valve. Protective clothing, as required by the specific line fluid, should be worn. If the valve was removed from cryogenic service, allow plenty of time for it to warm up to a safe temperature.

⚠ WARNING

Before removing handle or the actuator from the valve, or before removing seat retainer from a valve in dead end service, close the valve and depressurize the line.

7.2 The eccentric design of the McCannalok valve may allow line pressure to open the valve if the handle/actuator is not in place while the valve is under pressure.

⚠ WARNING

Do not pressurize the line without a handle or actuator on the valve.

7.3 The McCannalok valve must be in the closed position to be removed from the line.

7.4 Begin all work on a valve that has been removed from service by cleaning the valve, removing any grit or scale.

⚠ CAUTION

When handling the valve, care should be taken not to scratch the disc edge or seat.

7.5 Replacement seats, seals and other parts are available from authorized distributors. Contact your distributor or sales representative for details of price and delivery.

⚠ WARNING

Verify if the valves are required to be cleaned for oxygen service. Depending on the application, the valves may need to be cleaned and assembled at a qualified oxygen cleaning facility.

8.0 STEM SEAL REPLACEMENT

8.1 Refer to McCannalok Cryogenic parts diagram for parts identification.

NOTICE

Note actuation assembly position before removal.

8.2 For handle operated valves, remove handle assembly. Remove socket head cap screws (25) and lock washers (24). Remove mounting bracket (21). For actuated valves, unbolt mounting bracket (21) from bonnet (33) and lift actuator assembly off stem (3).

8.3 Remove gland retainer nuts (20) and lock washers (19). Remove gland retainer (18) anti-blowout retaining ring or split ring (17) (depending on size), gland ring (16), and grounding washer (14).

⚠ CAUTION

When removing stem seals, care should be taken not to scratch stem (3) or packing box bore.

8.4 Remove stem seals (13).

8.5 Do not remove thrust washer (12), unless further valve disassembly is required.

8.6 Examine body packing box bore and stem (3), clean as necessary to remove any corrosion or foreign matter before installing new seals.

8.7 Install new seals (13) in packing box one at a time. Stagger seal ring joints 180° apart when installing. Tamp each ring to bottom before installing next ring. Table 3 shows the correct number of stem seals to install in each valve.

NOTICE

On the larger valves it will be necessary to compress each seal before adding the next.

8.8 Install grounding washer (14) on top of the stem seals (13) with the tines facing down.

8.9 Slide gland ring (16) over stem (3) on top of grounding washer (14). Install anti-blowout retaining ring or split ring (17) (depending on valve size). Slide gland retainer (18) over stem (3) and onto gland studs (15). Place lock washers (19) and hex nuts (20) on studs (15) and tighten finger tight.

8.10 Remount actuator assembly with lock washers (24) and mounting bracket cap screws (25). Tighten mounting bracket cap screws (25) to the correct torque per Table 6. If required, remount handle assembly. Ensure handle or actuator is mounted in the original orientation.

8.11 Operate valve open and closed several times to check for binding and to set the stem seals. Loosen gland nuts (20) and retighten to torque value given in Table 4 .

9.0 SEAT REPLACEMENT

9.1 Refer to McCannalok Cryogenic parts diagram for parts identification. With the disc (2) in the closed position, remove the valve from service.

9.2 Lay the valve down with the disc (2) in the closed position and the seat retainer (5) side facing up.

9.3 Remove the socket head cap screws (22), the seat retainer (5), seat retainer gasket (27) and seat (32).

9.4 Carefully clean the seat (32) area in the body (1) and seat retainer (5). Remove foreign matter, dirt, oil, etc. Check disc seating area for nicks or scratches.

9.5 With the disc (2) in the CLOSED position, place the new seat (32) on disc (2), carefully centering it on the disc (2).

9.6 Install the new seat retainer gasket (27) centered onto the body (1).

9.7 Align the holes in the seat retainer (5) with matching holes in body (1) and carefully place in position on top of seat (32). Make sure that the seat (32) remains centered on the disc (2) and the seat retainer gasket (22) remains centered on the body (1) when positioning seat retainer (5). The seat retainer bolt counterbores must be facing away from the face of the body.

⚠ CAUTION

Do not shift the retainer in order to align holes. It may shift the seat or seat retainer gasket from its correct position.

9.9 Apply to the thread of the socket head cap screws GPL225 Krytox PTFE thread lubricant.

9.9.1 Install the socket head cap screws (22) finger tight to the body (1) through the seat retainer counter bores.

9.9.2 Tighten the cap screws (22) to approximately 30% of the torque value listed in Table 4 in a crisscross pattern.

9.9.3 Repeat Step 2, increasing the torque value to approximately 60% of the final torque value.

9.9.4 Repeat Step 3, increasing the torque value to the final required torque value.

9.9.5 Open the disc (2). Re-torque all cap screws (22) to the final required torque value.

9.10 A final tightening should be checked prior to installation. Operate valve several times and examine seat for any damage before reinstalling the valve in service.

10.0 DISC AND STEM REPLACEMENT

10.1 Refer to McCannalok Cryogenic parts diagram for parts identification.

NOTICE

Stem (3) and disc (2) are supplied as a matched set with taper pins (23) and are to be replaced as a set.

10.2 For handle-operated valves remove handle assembly. Remove socket head cap screws (25) and lock washers (24). Remove mounting bracket (21). For actuated valves, unbolt mounting bracket (21) from bonnet (33) and lift actuator assembly off stem (3).

NOTICE

Note actuation assembly position before removal.

10.3 Remove gland retainer nuts (20) and lock washers (19). Remove gland retainer (18), anti-blowout retaining ring or split ring (17) (depending on valve size), gland ring (16), and grounding washer (14).

10.4 Remove stem seals (13).

⚠ CAUTION

Take care not to scratch stem (3) or body packing box bore.

10.5 Remove locating plug (6) and gasket (7A).

10.6 Remove cap screws (22), seat retainer (5),seat retainer gasket (27) and seat (32).

10.7 Turn disc (2) to the full open position and drill out tack welds on large end of taper pins (23).

⚠ CAUTION

Take care to support valve so that disc (2) surfaces are not damaged.

10.8 Drill sizes to remove tack welds as given in Table 5. Use center-punch to dimple center of tack welds prior to drilling.

10.9 Place valve in horizontal position, with flat face of disc (2) up. Support disc (2) and body (1) on wooden blocks to protect disc (2) and body (1) surfaces. Disc (2) will rest in partially open position.

10.10 Knock out taper pins (23) using a rod or punch on small end of pin (opposite tack weld). It may be necessary to lift body (1) and rotate disc (2) slightly to do this. Make sure disc (2) is resting on wood blocks since it will swing freely on stem (3) with pins removed. When taper pins (23) are out, lay body (1) down so disc (2) and body (1) are evenly supported on flat surface.

10.11 Using a brass bar or drift punch, knock stem (3) loose from bottom of valve and pull from bonnet (33). After long or severe service this may take considerable force.

⚠ CAUTION

Be careful not to damage bearings (8), disc spacers (9), body (1) or bonnet (33).

10.12 Disc spacers (9) are used at top and bottom of disc (2) to properly position disc (2) in body (1). Proper spacers were selected at initial assembly and rarely require replacement. The location of these spacers should be noted, and the spacers marked at disassembly so that they are reinstalled in the same positions, top and bottom.

10.13 Separate body (1) from disc (2), and remove thrust washer (12) from packing bore.

10.14 Examine body bearings (8A/8B) for excessive wear. Two body bearings are located in the body (1) near the disc spacers (9), one stem bearing is located in the bonnet (33) below the thrust washer (12). If removed from body (1) or bonnet (33), note position of stem bearing and mark to reinstall in same location. If bearing liner is worn through to the shell, or if severe damage is evident on the bearing, it should be replaced. Replacement is rarely needed.

10.15 Clean body (1) and bonnet (33) thoroughly to remove all dirt, foreign matter, rust, etc.

⚠ WARNING

If this valve is to be reinstalled into a oxygen cleaned service, the cleaning and reassembly of this product needs to occur in a clean room environment via approved procedure.

10.16 Place the body (1) flat, seat retainer side facing down, and support it on wooden blocks sufficiently above the work surface as to facilitate insertion of the disc (2) in open position. Assemble disc spacers (9) into each stem hole counterbore on ID of body (1). Lower the disc (2) into position, aligning the bores in body (1) and disc (2).

10.17 Insert new stem (3) in the bonnet (33), through the body (1), bearings (8), disc spacers (9), and disc (2).

10.18 Align taper pin holes in disc (2) and stem (3), and install taper pins (23). Drive pins in tightly with rod or punch until large end of taper pins (23) sit below disc (2) surface. Tack weld each pin (23) to disc (2) at large end of pin.

10.19 Install new gasket (7A) on locating plug (6), apply approved thread lubricant to locating plug (6) threads, and install locating plug in body (1). Tighten locating plug to the proper torque value given in Table 6.

10.20 Install new stem seals (13), following instructions in “Stem Seal Replacement” Section 8.

10.21 Install new seat (32), following instructions in “Seat Replacement” Section 9.

10.22 Remount handle or actuator assembly, and operate valve several times to verify proper operation. Examine disc (2) and seat for any damage before reinstalling in line.

11.0 FIELD ADJUSTMENTS

11.1 **Stem Seal Leakage**

11.1.1 Should leakage occur at the stem seals, it may be stopped by retightening the gland retainer nuts to the values specified in Table 4.

NOTICE

Do not overtighten gland nuts, as this may cause increased operating torque and improper valve operation or closure.

11.1.2 If the leakage cannot be stopped by this action, the stem seals require replacement.

11.2 **Adjusting Valve Closure**

11.2.1 Valves with gear actuators or electric/pneumatic actuators may require adjustment of the travel stops in the actuator to properly close the valve for tight shut off. The following procedure should be followed to set travel or limit stops. (It is recommended that the valve must be removed from line for this procedure.)

NOTICE

The valve has a positive travel stop to ensure valve disc (2) cannot be over closed.

11.2.2 Loosen the “close actuator” stop screw completely to permit proper disc (2) positioning. Close the valve until the disc (2) touches the valve body (1) positive travel stop. Adjust and lock down the close actuator stop screw while the disc (2) is in this position. Open and close the valve to visually check that the valve opens and closes to the correct position.

11.2.3 The valve disc (2) is at the full open position when the disc (2) is perpendicular to the body (1). Set the “open” actuator stop for this position.

⚠ CAUTION

Do not allow the valve to over-open as this may damage the disc seating surfaces by hitting body (1) or attached piping.

11.2.4 For other power actuators, consult the manufacturer’s instructions for setting travel stops, as these vary with actuator model and type.

12.0 APPENDIX A - TABLES

Table 1: NOMINAL INSIDE DIAMETER OF PIPE (inches)

Valve Size	Schedule	
NPS	**40**	**80**
3	3.07	2.90
4	4.03	3.83
6	6.07	5.76
8	7.98	7.63
10	10.02	9.56
12	11.94	11.38

Table 1: NOMINAL INSIDE DIAMETER OF PIPE (mm)

Valve Size	Schedule	
DN	**40**	**80**
80	78	74
100	102	97
150	154	146
200	203	194
250	255	243
300	303	289

Table 2: MINIMUM INSIDE DIAMETER OF PIPE WITH THE RECOMMENDED CLEARANCE (inches)

Valve Size	Class	
NPS	**150**	**300**
3	2.86	2.86
4	3.72	3.72
6	5.88	5.75
8	7.80	7.56
10	9.78	9.44
12	11.74	11.31

Table 2: MINIMUM INSIDE DIAMETER OF PIPE WITH THE RECOMMENDED CLEARANCE (mm)

Valve Size	Class	
DN	**150**	**300**
80	73	73
100	94	94
150	149	146
200	198	192
250	248	240
300	298	287

NOTES:

1. Minimum I.D. of pipe with recommended clearances (per API 609) have been calculated by adding the minimum I.D. with zero clearance to a minimum recommended diametric clearance for each pipe size.
2. These tables assume that the pipe is on the body side of the valve and that the pipe is perfectly centered. The seat retainer side of the valve will always have more clearance than the body side.
3. A minimum of 1/16" thick gasket is used between the pipe flange and valve body face.
4. When using a pipe whose I.D. is smaller than the recommended minimum inside diameter of pipe with adequate clearance, a chamfer of 45° should be provided on the end of the pipe so that it clears the disc.

Table 3: TOTAL NUMBER OF STEM SEALS

Valve Size		Class
NPS	**DN**	**150/300**
3	80	4
4	100	4
6	150	4
8	200	5
10	250	5
12	300	5

Table 4: GLAND RETAINER NUT AND SEAT RETAINER SCREW TORQUES (Lb-in)

Valve Size	Gland Nut		Seat Retainer Screws	
NPS	150	300	150	300
3	60	60	100	100
4	60	60	175	175
6	80	120	100	175
8	80	140	175	175
10	110	190	175	300
12	130	220	300	300

Table 4: GLAND RETAINER NUT AND SEAT RETAINER SCREW TORQUES (Nm)

Valve Size	Gland Nut		Seat Retainer Screws	
DN	150	300	150	300
80	7	7	11	11
100	7	7	20	20
150	9	14	11	20
200	9	16	20	20
250	12	21	20	34
300	15	25	34	34

Table 5: DRILL SIZE TO REMOVE TACK WELD (inches)

Valve Size	Class			
NPS	150		300	
3	.234	15/64	.234	15/64
4	.234	15/64	.234	15/64
6	.234	15/64	.234	15/64
8	.234	15/64	.234	15/64
10	.234	15/64	.234	15/64
12	.234	15/64	.234	15/64

Table 5: DRILL SIZE TO REMOVE TACK WELD (mm)

Valve Size	Class	
DN	150	300
80	6	6
100	6	6
150	6	6
200	6	6
250	6	6
300	6	6

Table 6: LOCATING PLUG AND MOUNTING BRACKET CAP SCREW TORQUE (Lb-in)

Valve Size	Locating Plug	Mounting Bracket Cap Screws	
NPS	150 & 300	150	300
3	2520	175	175
4	2520	175	175
6	2700	300	300
8	3000	300	756
10	4200	756	756
12	4200	756	756

Table 6: LOCATING PLUG AND MOUNTING BRACKET CAP SCREW TORQUE (Nm)

Valve Size	Locating Plug	Mounting Bracket Cap Screws	
DN	150 & 300	150	300
80	285	20	20
100	285	20	20
150	305	34	34
200	339	34	85
250	475	85	85
300	475	85	85

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