FLOWSERVE

USER INSTRUCTIONS

McCANNA CryoSeal® Ball Valves

FCD MMENIM2007-01-AQ – 04/15

Installation
Operation
Maintenance

Experience In Motion

Contents

1 Introduction

1.1 Purpose

This Installation, Operation and Maintenance Manual explains how to install and maintain McCANNA CryoSeal® ball valves. Information on installation, disassembly, reassembly, lubrication, and parts is provided.

1.2 User Safety

Safety notices in this manual detail precautions the user must take to reduce the risk of personal injury and damage to the equipment. The user must read and be familiar with these instructions before attempting installation, operation, or maintenance. Failure to observe these precautions could result in serious bodily injury or death, damage to the equipment, warranty void, or operational difficulty.

Safety notices are presented in this manual in three forms:

⚠ **WARNING:** Refers to personal safety. Alerts the user to potential danger. Failure to follow warning notices could result in personal injury or death.

⚠ **CAUTION:** Directs the user's attention to general precautions that, if not followed, could result in personal injury and/or equipment damage.

NOTE: Highlights information critical to the user's understanding of the valve's installation and operation.

2 Installation

2.1 General

McCANNA Cryoseal valves may be installed up to 45° from the vertical position. These valves are unidirectional due to the need for cavity relief and must be installed in the correct orientation. Installation methods and procedures should follow good industry practice, such as contained in MSS-SP-92, or similar document.

⚠ **CAUTION:** Check adjuster nut and bonnet fastener torques prior to testing or installation, and re-tighten as needed (see tables 2 & 3). These fasteners may loosen during shipment, which could result in external leakage.

⚠ **WARNING:** Do not attempt any maintenance of these valves while in operation or under pressure. Actuated valve air and/or electrical power supplies must be locked off and isolated prior to any maintenance work. Failure to do so may result in significant equipment damage, hazardous material discharge, or serious personal injury.

2.2 Flanged End Valves:

Flanged end valves are to be bolted in line to companion flanges of the same pressure class and facing as the valve flanges, using the proper size and pressure class flange gaskets. Flowserve does not provide companion flanges or flange gaskets. Flange bolt torquing should follow proper tightening sequence outlined in Figure 6 on Page 13.

2.3 Weld End Valves:

2.3.1 Before installing weld end valves in line, remove bonnet, ball, and seats. Protect parts from dirt or damage while out of valve, especially the seating surfaces in the body. Be very careful to avoid heat distortion of the valve body during welding. A spare bonnet gasket has been provided and should replace the original gasket during reassembly.

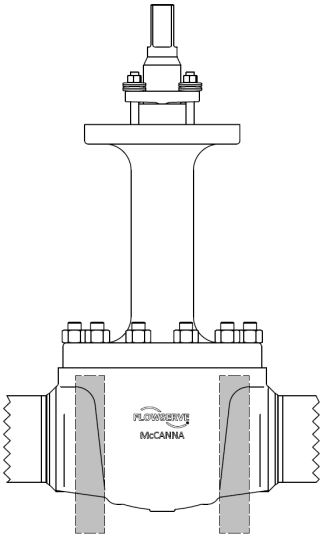
2.3.2 If necessary, valves may be welded in line without disassembly, however special precautions must be taken. The valve should be in the open position during welding and remain open until it cools to ambient temperature. Welding procedures should be followed by qualified personnel and in accordance with Section IX of ASME Boiler Pressure Vessel Code. The critical temperature areas (shown in Figure 1) should not exceed 350° F.

⚠ **WARNING:** Do not attempt any welding on in-line valves under pressure.

2.3.3 When more than one weld is required for each end, the weld passes should alternate from end to end until the welds are completed.

After the valve has cooled, the bonnet fasteners must be re-torqued to the recommended torque value (shown in Table 3). When possible, a final seat test should be performed before placing the valve into service.

Figure 1. Critical Weld Areas

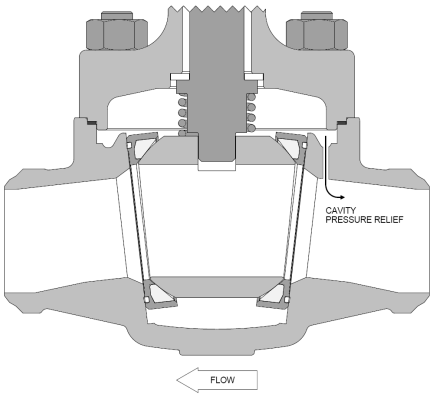


CRITICAL TEMPERATURE AREAS

2.4 Valves with Vented Cavity Relief:

2.4.1 Install vented valves with the arrow on the body pointed in the direction of normal flow. (Figure 2)

Figure 2. Cavity Relief



RELIEF HOLE IN BODY

3 Periodic Inspection and Adjustment

3.1 General

3.1.1 Good operating and maintenance procedures include periodic inspection of valves and other piping system components to ensure that they are operating properly. Inspection schedules must be determined by individual user, but as a minimum should consist of visually examining valves for external leakage, and making adjustments as necessary.

⚠ **WARNING:** Do not attempt any maintenance of these valves while in operation or under pressure. Actuated valve air and/or electrical power supplies must be locked off and isolated prior to any maintenance work. Failure to do so may result in significant equipment damage, hazardous material discharge, or serious personal injury.

3.2 Stem Seal Adjustment

3.2.1 Stem seal leakage must be stopped immediately to avoid damage to the valve stem seals, stem or bonnet, as well as possible contamination of the surrounding area. Tightening the adjuster bolts (see Figure 3) can most often eliminate stem seal leakage. Tighten adjuster bolts by turning each clockwise ¼ turn at a time until the torque value (given in Table 2) is reached.

3.2.2 If stem leakage continues, disassemble valve and replace stem seal set (see Disassembly/ Reassembly sections).

⚠ **CAUTION:** Do not overtighten the adjuster bolts. Packing friction may increase excessively, making the valve difficult or impossible to operate.

3.3 Bonnet Gasket Bolting Re-tightening

3.3.1 Bonnet gasket leakage must be stopped immediately to avoid damage to the valve body/ bonnet joint surfaces, and contamination of the surrounding area. Tighten bonnet bolting to the torque values specified (in Table 3) following the sequence shown in Figure 6. Also, If leakage continues, remove valve bonnet and replace bonnet gasket (see Disassembly/ Reassembly sections).

3.3.2 Valves which become difficult to operate or stuck, or show excessive seat (through valve) leakage, should be disassembled and inspected for internal damage from corrosion or wear, and repaired as necessary (see Disassembly/Reassembly sections).

3.4 Correcting Through Leakage – Soft Seated Valves

The wedge seat design permits soft-seated valves to be self-adjusting for seat wear, and thereby extend service life. In many instances where through-leakage is discovered, it may be corrected by simply cycling the valve open to closed several times, to allow the seats to "snug down" into the wedge. Soft seats are also more prone to damage from particles or abrasives in the flow stream. When through leakage cannot be reduced or eliminated by cycling, the valve should be taken out of service and disassembled for inspection and possible replacement of seats (see Disassembly/ Reassembly sections).

3.5 Other Specially Prepared Valves

Some valves with special preparation such as for Oxygen, Chlorine, Vacuum or other special services may have special maintenance instructions. See any special instructions which were supplied with the valve shipment.

NOTE: These instructions may also be obtained from your McCANNA distributor.

4 Disassembly

4.1. Dissassembly

⚠ **WARNING:** Do not attempt any maintenance of these valves while in operation or under pressure. Actuated valve air and/or electrical power supplies must be locked off and isolated prior to any maintenance work. Failure to do so may result in significant equipment damage, hazardous material discharge, or serious personal injury.

4.1.1. Refer to CryoSeal Parts Identification (Figure 3) for this section.

4.1.2. Make sure valve is in full open position, and remove actuation assembly (handle, gear, or power actuator).

⚠ **CAUTION:** Do not try to remove ball while in closed position. Damage to ball sealing surfaces will result if this is attempted.

4.1.3 Remove bonnet nuts. Loosen evenly; bonnet will lift due to internal spring.

4.1.4 Remove bonnet assembly, spring, and bonnet gasket. Place bonnet assembly on clean work surface.

4.1.5 Loosen nuts on adjuster bolts evenly and remove nuts, Belleville washers, adjuster rocker, and gland follower.

4.1.6 Slide stem out through the inner side of the bonnet.

⚠ **CAUTION:** Do not force stem out of bonnet as severe damage may result. Be careful not to scratch the stem throughout disassembly. There is a washer present at the bottom of the stem.

NOTE: Stem has a shoulder which prevents blowout under pressure.

4.1.7 Remove o-ring cartridge, stem seals, metal washer and lipseal from bonnet taking care not to scratch the bonnet bore surface.

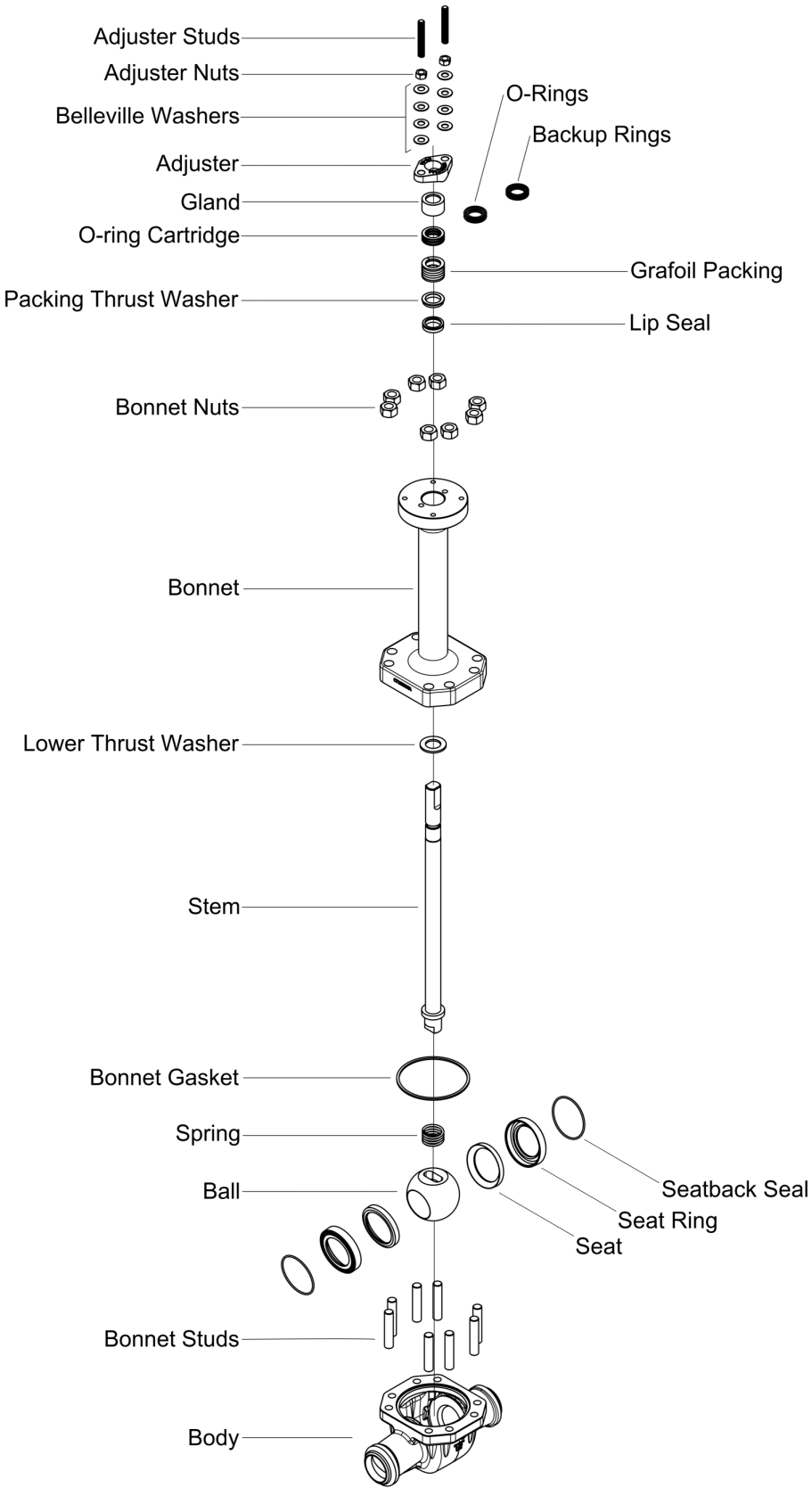
4.1.8 Insert a large screwdriver or similar tool into the oval slot of the ball and loosen by moving the screwdriver in a direction 90° to the pipe line until the screwdriver rests against the valve body (cover only gasket edge).

4.1.9 Carefully lift ball and seats upward by pushing down on the screwdriver until they can be removed by hand.

NOTE: Avoid marring bonnet gasket surfaces and ball surfaces

4.1.10. Clean and inspect all parts for wear or damage. Pay particular attention to gasket and seating surfaces, ball surface, travel stop and soft parts.

Figure 3. Exploded View



4.2 Cleaning, Inspection, and Lubrication Instructions

4.2.1 After disassembly, discard bonnet gasket and stem seals (if removed). Gaskets and seals are not re- usable. Carefully clean and inspect all parts for wear or damage, paying particular attention to seating/sealing surfaces on ball and seats, stem journal and bonnet bore, and body/bonnet gasket areas.

4.2.2 Damaged or badly worn parts should be replaced using only parts or repair kits supplied by Flowserve. Valve parts considered for repair should be evaluated by an Authorized McCANNA Repair Center to determine if repair is possible.

NOTE: Body seat surfaces are lapped flat, and must be checked for flatness and cleanliness before reassembly. If re-lapping is required, contact the nearest Authorized McCANNA Repair Center.

4.2.3 Lubrication of valve parts to aid assembly and initial operation is recommended, when permitted by service and operating conditions. The lubricant used must be compatible with the intended service (see Table 1 below for recommended lubricants). If necessary, valve internal wetted parts may be assembled without lubrication.

Table 1 - Lubricants

Recommended Lubricants	
Stem	Krytox
O-Rings / Stem Packing	Krytox
Ball / Seats	Molykote 321
Studs / Nuts (Bonnet and Adjuster)	Never-Seez

4.2.4 Lubricants are to be applied sparingly; a thin wipe is sufficient. Do not apply lubricants with a brush or other means. Excessive lubricant on the ball, seat, or in the stem bore can affect valve performance and should be removed from the valve. If lubricant build-up or caking is visible on the ball or seats, too much has been used.

5 Reassembly

Refer to CryoSeal Parts Identification (Figure 3) for this section.

NOTE: Lubricating this valve during assembly is recommended as described in preceding steps 4.2.3 and 4.2.4 Assembly will be easier, the valve operating torque will be lower, and the valve seal will be tighter. The lubricant selected must be compatible with the intended valve service. It is also possible to assemble without the use of lubricants if required by the service conditions.

Standard valves

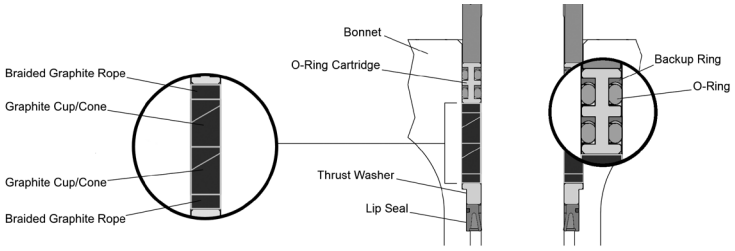
5.1 Install adjuster studs into the top of the bonnet. Anti-seize lubricant is suggested to be applied to the threads. These are the holes located closest to the packing bore. Depending on valve size there will be 2 or 4 adjuster studs.

5.2 Lightly lubricate the area of the stem that will be in contact with the O-rings and stem seals. Also lubricate the O-rings and stem seals. This should be a very light layer of lubrication.

5.3 Install the lip seal into the packing bore at the top of the bonnet. The o-ring shall be at the top of the lip seal. See Figure 4 for correct orientation.

5.4 Install packing into packing bore. Install bottom rope first, then each additional piece as it was stacked up. If there are cuts present in the graphoil rings, these cuts are to be placed 180° apart. Install top packing rope.

Figure 4. Stem Seal Assembly



5.5 Install O-rings and back-up rings into metal cartridge. Back up rings have a flat side and concave side. Concave side is to be facing the o-ring. Ensure that back-up rings do not become twisted during assembly. There will be 4 O-rings in a cartridge (2 on the OD and 2 on the ID). Install the smaller O-rings and back-up rings on the inner diameter of the cartridge, and the larger O-rings and back-up rings on the outer diameter of the cartridge.

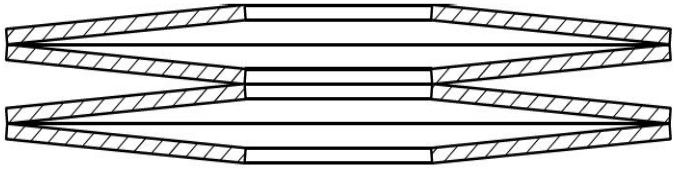
5. 6 Insert o-ring cartridge into packing bore. O-rings are to be at the bottom of each groove, with a back-up ring on top of each o-ring. See Figure 4 for correct orientation.

5. 7 Install the gland follower into the packing bore. This follower has a step with a smaller inner diameter on one side. The step should be placed at the top.

5. 8 Place adjuster onto top adjuster studs. The rounded rocker portion of the adjuster will be in contact with the gland follower.

5. 9 Install Belleville washers on adjuster studs. An equal number of washers will be on each adjuster stud. Pairs of Belleville washers are to be installed cup-to-cup. See Figure 5 for correct orientation

Figure 5. Belleville Washer



5. 10 Tighten nuts onto adjuster bolts finger tight. This is not to compress the packing, but only to hold it in place during stem insertion.

5. 11 Slide the lower thrust bearing washer onto the stem. This will be above the blowout proof step on the stem.

5. 12 Insert stem into bonnet, taking care not to scratch the stem or damage the packing. Ensure that when the bonnet is placed on the body, the stem will be in the open position.

5. 13 Torque adjuster nuts to proper torque value specified in Table 2.

Table 2 - Minimum Torque Requirements for Adjuster Bolts

Recommended Torque (ft-lbs)			
Regular Port Valve Size	Full Port Valve Size	Class 150/300	Class 600
1.5	0.5, 0.75, 1	15	15
2	1.5	15	15
3	2	15	15
4	3	40	40
6	4	40	40
8	6	40	40

5. 14 Assemble plastic seat inserts into seal rings. Place a PTFE seat seal in the back of each seat. Lightly lubricate ball sealing surface and seat sealing surfaces.

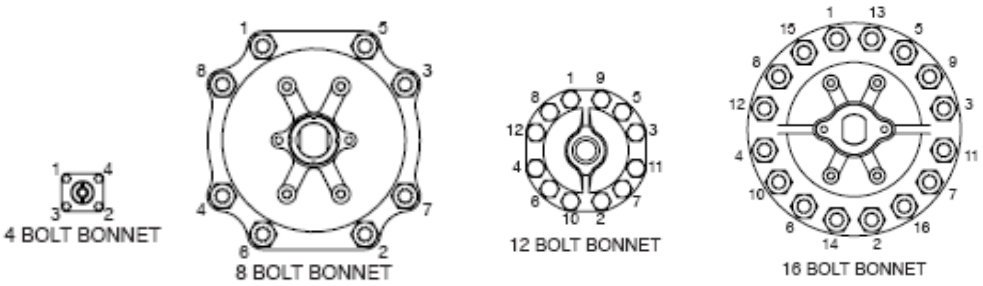
5. 15 Place seats in position on ball so that seats are aligned with the ball flow passage, with the ball slot facing upwards. Holding ball and seats in position, lift as a unit and carefully lower into valve body, lining up seat backs with body seat surfaces. Carefully align the ball stem slot so that it is perpendicular to the body flow passage and the top flat of the ball is parallel to the bonnet flange.

5. 16 Lubricate bonnet fasteners (studs & nuts) per Table 1.

5. 17 Place a new bonnet gasket in the machined groove in the body. Place spring on ball, centered on stem slot.

5. 18 Place bonnet assembly on body, aligning stem tang with spring and ball slot, and bonnet bolt holes with body studs. Carefully press down on bonnet, making sure bonnet gasket register is properly aligned with body bore. Spring resistance will be felt; this is normal. Continue pressing down, taking care not to damage gasket, until studs extend through the bonnet enough to engage nuts. Holding bonnet in place, thread nuts on to studs and tighten finger tight. Follow the bolt tightening sequence (Figure 6).

Figure 6. Bolting Sequence



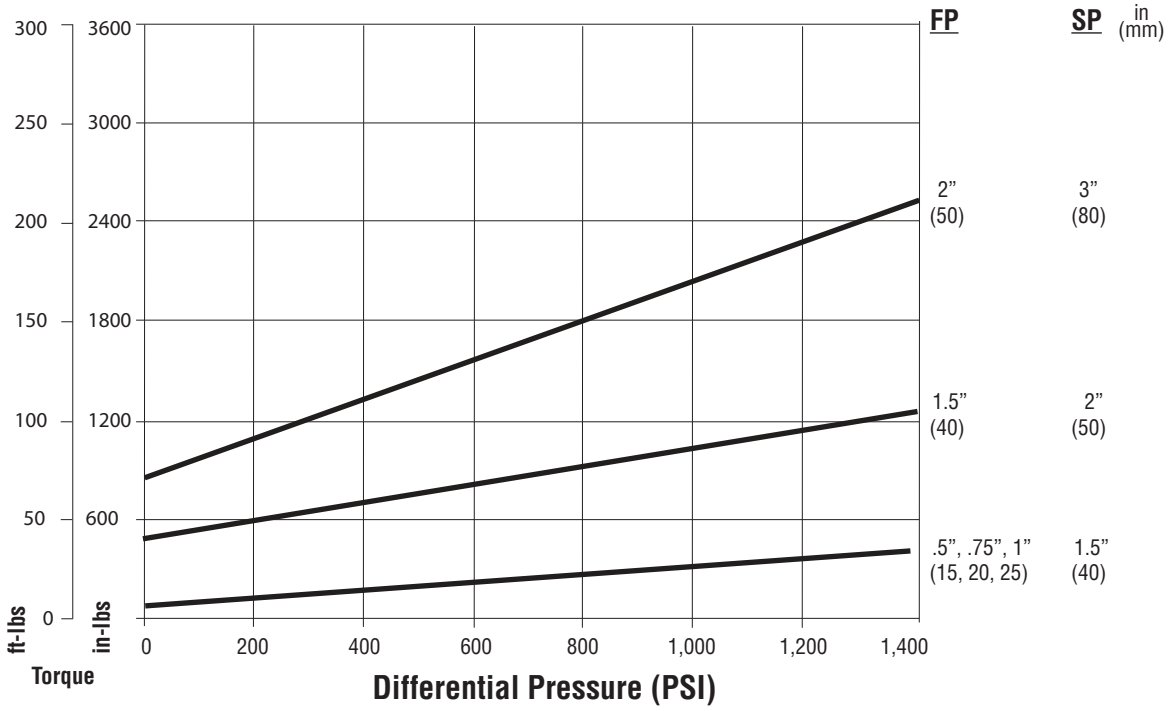
5. 19 Tighten bonnet bolting evenly to the torque values (Table 3) following the bolt tightening sequence (Figure 6). Manually cycle valve several times to verify proper operation. Reinstall actuation (handle, gear, or actuator). Testing before reinstallation is recommended.

Table 3 - Bonnet Bolting Torques

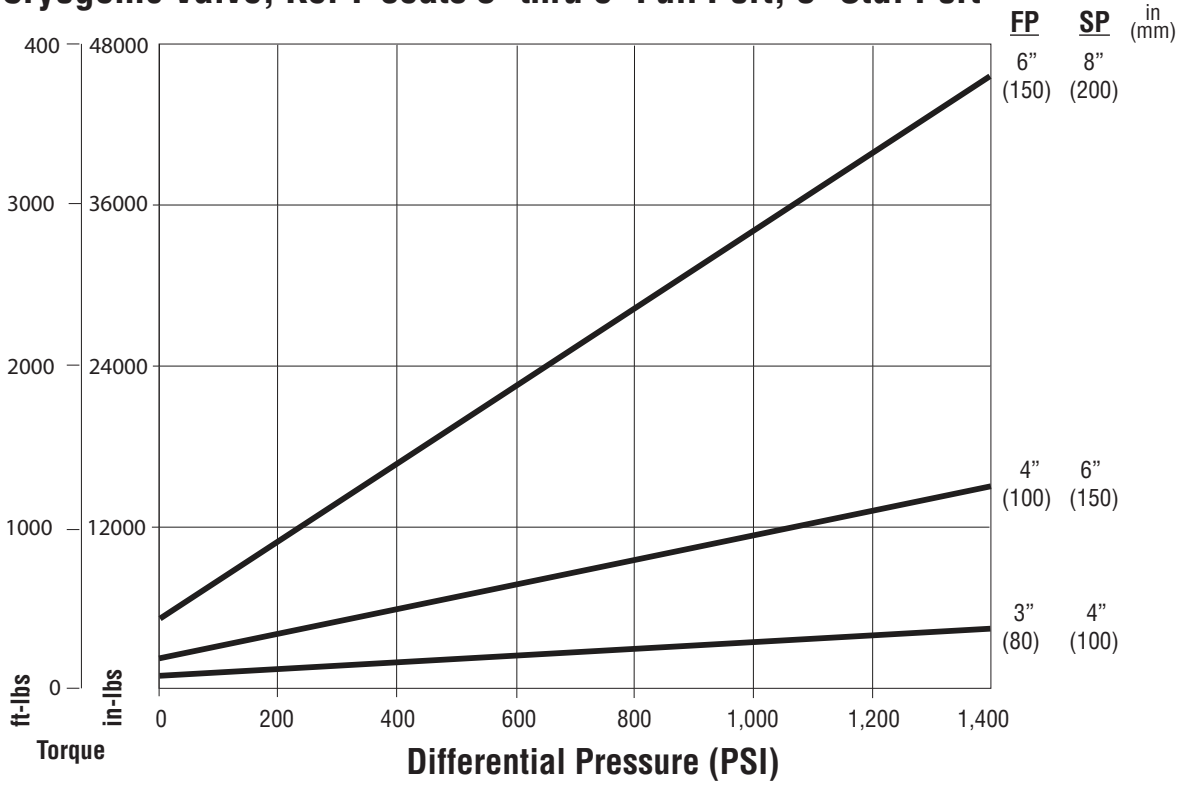
Torque (ft-lbs)			
Regular Port Valve Size	Full Port Valve Size	Class 150/300	Class 600
1.5	0.5, 0.75, 1	40	65
2	1.5	95	95
3	2	195	195
4	3	345	345
6	4	345	445
8	6	665	795

6 Torque Charts

Cryogenic Valve, Kel-F Seats 0.5" thru 2" Full Port, 3" Std. Port



Cryogenic Valve, Kel-F seats 3" thru 6" Full Port, 8" Std. Port



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