



## Apollo Standard Port, Full Port & One Piece Flanged Ball Valves Installation, Operation, & Maintenance Guide

### Introduction

This manual presents guidelines for the Installation, Operation and Maintenance of manual and automated Apollo standard port, full port & one piece, end entry flanged ball valves.

### Storage & Protection

Valves should be stored in original shipping containers until installation with protective means in place to prevent any damaging effects from the environment or other potentially damaging influences. Valves should be properly supported and secured before moving to prevent possible damage to property or harm to personnel.

### Limitations

- Conditions supporting no greater than European Pressure Equipment Directive (PED) Category III valves. Valves are not to be used in safety functions such as safety loops or separating incompatible fluids.
- For gases and liquids in European Pressure Equipment Directive (PED) Groups 1 & 2.
- Service to be compatible with the materials of construction. Prior to selection it is the user's responsibility to determine that the valve is appropriate for the intended application. Applications should not allow corrosion  $>.002"/\text{year}$  ( $.05\text{mm}/\text{year}$ ).
- The possibility of material deterioration in service and need for periodic inspections is the responsibility of the user.
- For carbon steel valves, complete valve replacement will be necessary after 10 years of continuous service above  $800^{\circ}\text{F}$  ( $426^{\circ}\text{C}$ ).
- Mechanical supports are not to be welded directly to the valve; however, they may be fitted to the associated piping.

- It is the piping system designer's responsibility to implement appropriate protection measures to minimize reaction forces and moments which result from supports, attachments, piping, etc.
- Laws of the state must be observed as they apply.
- In-service inspections may be required by national authorities of the country where the valve is installed.
- Some national or local authorities may require periodic hydrostatic testing.
- Only use Conbraco replacement parts.
- Valves are intended for on-off service only and should not to be used for throttling applications.
- Valves are primarily intended for industrial use.
- Level of training, experience or ability of users should be at least that of trained and skilled maintenance personnel or technicians.

### Installation

Proper valve selection is the first step in any successful installation. Refer to an "Apollo Industrial Applications Guide" catalog for application guidance or contact your distributor or the factory for more detailed assistance. **WARNING: All installations shall be provided with pressure relief devices in accordance with the requirements of the Pressure Equipment Directive 97/23/EC. Proper installation prior to initial operation is the user's responsibility. Furthermore, where an additional hazard can occur due to valve exposure to fire or other unexpected external heat source, a supplemental pressure relief device shall be installed to protect against excessive pressure. This device shall prevent the pressure from rising more than 21% above the maximum allowable working pressure. Means must also be provided to monitor valve filling to prevent over pressurization and instability.**

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### **Pre-Installation Inspection**

Inspect the piping system prior to valve installation whenever possible, to ensure that it has been properly flushed and cleared of construction and fabrication debris. The seating surfaces in soft seated valves are particularly susceptible to weld slag and sand blasting grit. Pipe scale, metal chips and other foreign materials should be removed.

Just prior to installation, remove each valve from its packing and remove any end covers. Examine the flow bore for debris. All Apollo ball valves are shipped in the open position to prevent damage to the ball surface. Any grit or foreign matter must be removed. Scratched or dented balls must be replaced. Do not install a damaged valve.

It is also important to check for valve operation clearances. With the exception of special directional valves, installation is acceptable in any position using standard pipe fitting practices.

### **Flanged-End Installation**

Flanged-End installation shall be done in accordance with the applicable Code or regulation covering the system into which the valve is being installed. It is the end-user's responsibility to select the Code Section(s) that apply to a proposed piping installation. The end-user is fully responsible for assuring safe piping for the proposed installation, including all additional necessary supplementary requirements.

### **Threaded-End Valve Installation**

After removing the valve from its packing, inspect the NPT threads for damage. Occasionally threads may require chasing prior to installation to remove burrs or other minor imperfections.

Apply pipe sealant compound or PTFE tape to the male pipeline threads only. Do not use sealant on the female threads because excess compound may be forced into the valve body. This could cause sticking of the ball or encourage the accumulation of dirt and debris that could prevent positive valve shutoff.

### **Operation**

Apollo valves are shipped with a securely fastened nameplate and attached warning tags. Most Apollo ball valves are non-directional. However, valves may be ordered with the vented ball option which safe guards against excessive pressure build-up in the body cavity. This option renders the valves directional. Valves with this feature are identified by a special tag permanently affixed to the valve body with the word "Flow" and an arrow showing the required orientation of the valve shown in red.

Although each valve is thoroughly tested and inspected before it leaves the factory, nameplates and/or warning tags could be lost or destroyed during shipment or while in storage. If either is missing or not legible, contact your distributor or the factory for assistance before placing the valve in service.

Ball valves are intended to be on-off devices operating through 90° of stem rotation. Operation is clockwise to close.

The most common service failures not related to the installation and start-up processes are:

- Exceeding the operating temperature or pressure limits of the valve due to a process upset condition.
- A chemical attack on valve components due to either misapplication or changes in the service.

Violating temperature and pressure limits can result in immediate valve failure where chemical attack or corrosion generally occurs gradually.

### **Maintenance**

#### **Preventive Maintenance Schedule**

A regularly scheduled and documented preventive maintenance program needs to be established to achieve maximum useful valve life at the lowest cost. Initially, it is recommended that valves be inspected monthly for smooth operation and leak free performance.

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For manual valves After an initial break-in period of approximately 500 cycles, stem packings may require adjustment. In most applications, inspection and or adjustments twice a year will be sufficient to assure reasonable valve life.

For automated valves After an initial break-in period of approximately 5,000 cycles, stem packings may require adjustment. Monthly adjustments (approximately 20,000 cycles) should be sufficient thereafter. Valves may be ordered with a “live-loading” feature. The “live loading” feature has design allowances for compaction and wear of the stem packing. It also makes allowance for thermal expansion and contraction as the valve goes through temperature cycles.

### Valve Adjustments

At some point in the service life of the valve, leakage may occur. This should be noted in the maintenance history log of the valve. The stem packing was adjusted at the factory to provide a leak tight seal when the valve was new, but compaction can occur within these seals that may make re-adjustment necessary. Stem packing leakage should be stopped as soon as it is detected. On actuated valves, most mounting hardware allows access to the packing adjustment screws. If this is not the case, it may be necessary to remove the actuator to gain adequate access to make the packing adjustment. Packing adjustment can be accomplished by turning the stem packing adjustment screws clockwise to the maximum torque shown in Table 1 and Table 2. **Caution: Never back off the stem packing adjustment screws when the valve is under pressure.**

**Table 1: Stem Packing Adjustment Torque (Class 150/300)**

Valve Size <sup>(1)(2)</sup>			Torque <sup>(3)</sup>		-EF Option Torque	
mm	(in)		N·m	(in-lb)	N·m	(in-lb)
40	(1-1/2)	SP	2,03	(18)	3,62	(32)
40	(1-1/2)	FP	5,09	(45)	8,37	(74)
50	(2)	SP				
50 - 65	(2 - 2-1/2)	FP	9,94	(88)	16,95	(150)
65 - 80	(2-1/2 - 3)	SP				
80 - 100	(3 - 4)	FP	17,40	(154)	29,72	(263)
100 - 150	(4 - 6)	SP				
150 - 200	(6 - 8)	FP	48,14	(426)	80,22	(710)
200 - 250	(8 - 10)	SP				
250 - 300	(10 - 12)	FP	86,11	(762)	146,66	(1298)

**Table 2: Stem Packing Adjustment Torque (Class 600)**

Valve Size <sup>(1)(2)</sup>			Torque <sup>(3)</sup>		-EF Option Torque	
mm	(in)		N·m	(in-lb)	N·m	(in-lb)
25	(1)	FP	5,09	(45)	8,37	(74)
40	(1 1/2)	FP	9,94	(88)	16,95	(150)
50-65	(2-2-1/2)	FP	14,34	(127)	24,97	(221)
80	(3)	FP	17,40	(154)	29,72	(263)
100	(4)	FP	20,11	(177)	39,32	(348)
150	(6)	FP	48,12	(426)	80,22	(710)
200	(8)	FP	86,11	(762)	146,66	(1298)
250	(10)	FP	135,58	(1200)	224,51	(1987)
300	(12)	FP	162,70	(1440)	280,32	(2481)

(1) SP = Standard Port, FP = Full Port

(2) Nominal

(3) Increase adjustment screw torque's by 25% for valves with graphoil packing (-24 option)

Do not over tighten the adjustment screws. Over-tightening will result in excessive operating torque and shorten the packing's service life. If stem leakage continues, or operating torque becomes excessive, de-pressurize the valve and replace the stem seals.

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Valves with high operating torque not resulting from stem seal over-tightening or valves, which have leakage by the seats, may have damaged seats or ball surfaces. These valves should be de-pressurized, disassembled, and inspected for damage.

### Valve Overhaul

As part of planned maintenance or as a result of a problem that cannot be adjusted away, a valve may require a complete overhaul. Due to the uncomplicated design of the Apollo flanged ball valves, this can easily be accomplished.

The first step is to contact your distributor to acquire an appropriate rebuild kit. These kits typically contain a complete set of seats, seals, and gaskets. If seat or ball damage is suspected, it is wise to order a new ball when the seal kit is purchased. To properly order spare parts, you will need the valve model number as shown on the permanent nameplate. A list of recommended spare parts to hold as maintenance items are shown in Appendix "A". This list is generic, as the severity of the service and availability of some exotic alloys can also affect recommended spare parts stocking levels.

### Disassembly

- Once the spare parts are on hand, the first step in the valve disassembly is to isolate the valve from line pressure.  
**WARNING: Do not attempt to work on any valve under pressure. Depending on the service, valve surface temperature may be hot. Use proper protective gear to protect against burns and any possible uncontrolled release of fluid.**
- Using an adjustable wrench, valve lever, or properly sized open end wrench, rotate the stem until the valve is in the one half open, one half closed position. Be careful not to damage the stem. This will allow any cavity pressure to be released into the pipeline. Place the valve in the open position after this is done.
- Next, loosen each of the ANSI flange nuts approximately one turn only initially. This will allow a second chance for any cavity pressure stored within the valve to be released. Leakage may occur outside of the pipeline.

- Before removing the ANSI flange bolting, take precautions to assure the safety of maintenance personnel. Make sure the valve and piping system are properly stabilized.
- Carefully remove the ANSI flange bolting. Take precautions not to scar the ANSI raised face surface when removing the valve from the piping system. Reinstall the raised face protectors supplied with the valve if they are available.
- Next, remove the lockplate, lever, external grounding spring, stem packing adjustment screws and the packing gland. Do not attempt to remove the stem packing at this time.
- **Standard & Full Port only** The next step is to remove the body bolting nuts. Properly secure the valve before attempting to remove the body bolting nuts. It is not necessary to remove the body bolting studs.
- **One Piece only** The next step is to remove the retainer from the valve body. Properly secure the valve before attempting to remove the retainer. See Figure 3 for dimensions to be used in fabricating a retainer removal tool using a flat piece of steel.
- Next, lift the retainer away from the body and remove the body seal. Make sure the valve is in the closed position before attempting the removal of the ball. Once the ball is removed, the stem can easily be pressed down into the body and removed.
- Seat removal may require the use of a wood or sheet metal screw. If the seats cannot be vibrated or easily lifted from their pockets, thread the screw into the face of the seat taking care not to damage the seat pocket. Threading approximately 1/8" (3 mm) deep should be sufficient. The use of two opposing screws may be necessary.
- Finally, remove the stem packing using care not to scratch or scar the stem packing box.

### Inspection

- Thoroughly clean all the components in preparation for inspection.
- Inspect stem packing contact surfaces for scratches and pits. If either of these is apparent and can be removed with #120 or finer grit emery cloth, body replacement will not be necessary. Deep

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scratches running down the side of the packing gland or excessive pitting will necessitate the replacement of the valve body.

- Inspect the ball and seat pockets in the same manner, replace the ball if necessary.
- Inspect remainder of body & retainer interior for pitting or corrosion and replace either if excessive.
- Inspect all parts for wear due to erosion or abrasion and replace if excessive.

Note: Carbon steel component parts are zinc phosphate treated and oil dipped to improve fatigue properties and increase wear and corrosion resistance.

### **Re-assembly**

- Begin the re-assembly process by cleaning each of the component parts with a clean towel or cloth.
- First, install the body side seat. Use a light grease or oil on the seats if the system permits.
- Place the stem bearing on the stem, and insert the stem into the valve body stem bore. Place the flats on top of the stem perpendicular to the pipeline.

**For -EF Packing Option** Lightly lubricate the stem with a lubricant compatible with the intended service (MorOil FLO 1150 <sup>(5)</sup> is recommended). \*Do not perform on valves requiring dry assembly or special cleaning for chlorine services <sup>(4)</sup>.

- Place the internal grounding spring on the stem and carefully insert the ball into the body and install the body seal.
- **Standard & Full Port only** Insert the retainer seat and place the retainer on the body. The ANSI flange bolting will always straddle the valve centerlines. See Figure 1. Loosely assemble the body bolting nuts.
- **One Piece only** Insert the retainer seat and thread the retainer into the body. See Figure 2.

- Reinstall the stem packing, packing gland, gland plate, and stem packing adjustment screws in the order given. Do not over-tighten the stem packing adjustment screws. Refer to the maintenance section, Table 1 and Table 2, for torque requirements.

**For -EF Packing Option** Packing shall be pre-compressed two rings at a time (for packing sets that have an odd number of packing rings: the final packing pre-compression will be compressing a single ring). Install two rings of the -EF option packing. Offset packing rings such that each consecutive ring has 180° of separation between the skive cuts in the packing rings. Use the appropriate compression spacers, listed in Table 6, and the valve's packing retention system (gland, gland plate, and stem packing adjustment screws) as the means for packing pre-compression. Carefully insert the appropriate compression spacer into the stuffing box; avoid scratching the stuffing box or compressing the packing by hand. For valves that use two compression spacers, the spacer indicated as spacer #1 in Table 6 shall be used for the first pre-compression of the packing and spacer #2 shall be used for the second pre-compression of the packing. Lubricate the stem packing adjustment screws. Install the packing gland, gland plate, and stem packing adjustment screws in the order given. Ensure the gland and gland plate remain parallel to the valve body and centered about the valve stem. Torque the stem packing adjustment screws to the applicable value specified in Table 1 and Table 2. Ensure that the gland plate does not make contact with the valve's mounting pad or anything that could prevent desired compression of the stem packing. Remove the packing retention system and compression spacer. Repeat the packing installation and packing pre-compression process as listed above until the entire packing set has been pre-compressed. If the final pre-compression does not require a compression spacer, then the packing retention system does not have to be removed after the final pre-compression has been performed.

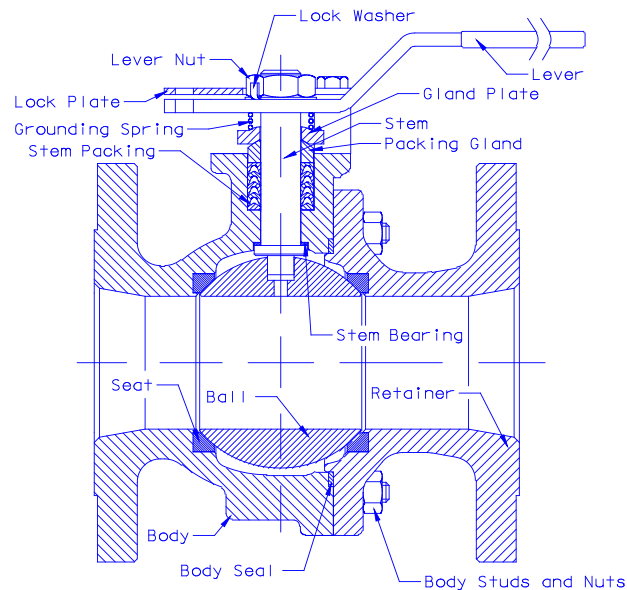
- **Standard & Full Port only** Torque the body bolts to the torque given in Table 3.
- **One Piece only** Torque the retainer to the torque given in Table 4.

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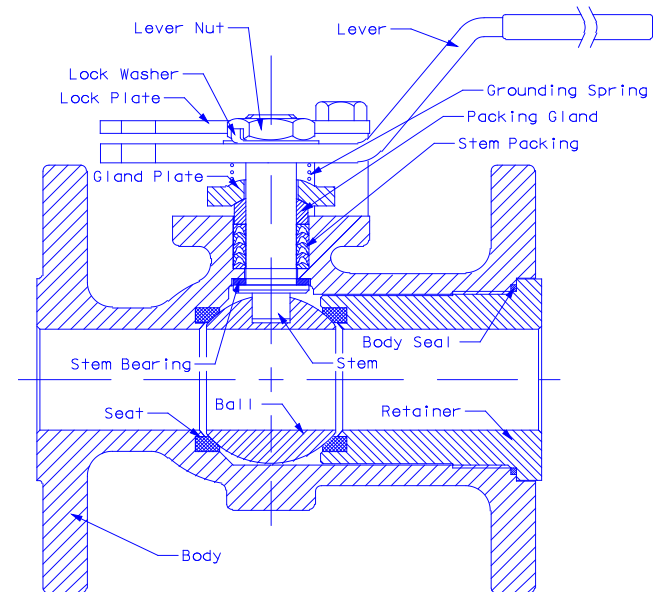
- Cycle the valve from open to close at least five (5) times to verify free operation and re-torque the stem packing adjustment screws to the applicable value specified in Table 1 and Table 2.
- Install the lever or actuator as applicable.
- The valve is now ready for testing and use.

**(4) Warning: For Chlorine, Oxygen and other like services, assemble without lubricants.**

**(5) MorOil FLO 1150 is a manufactured product of MorOil Technologies.**



**Figure 1: Typical Standard Port Assembly**



**Figure 2: Typical One Piece Valve Assembly**

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**Table 3: Body Bolting Torque**

Class	Valve Size <sup>(6)(7)</sup>			Torque	
	mm	(in)		N·m	(ft-lb)
150	40-50	(1-1/2-2)	FP	16,27	(12)
	65-80	(2-1/2-3)	SP		
150	80	(3)	FP	40,68	(30)
	100	(4)	SP		
150	100	(4)	FP	81,36	(60)
	150	(6)	SP		
150	150	(6)	FP	135,60	(100)
	200	(8)	SP		
150	200	(8)	FP	206,96	(160)
	250	(10)	SP		
150	250	(10)	FP	332,22	(245)
150	300	(12)	FP	481,38	(355)
300	40-50	(1-1/2-2)	FP	27,12	(20)
	65	(2-1/2)	SP		
300	65	(2-1/2)	FP	40,68	(30)
	80	(3)	SP		
300	80	(3)	FP	81,36	(60)
	100	(4)	SP		
300	100	(4)	FP	135,60	(100)
	150	(6)	SP		
300	150	(6)	FP	216,96	(160)
	200	(8)	SP		
300	200-250	(8-10)	FP	481,38	(355)
	250	(10)	SP		
300	300	(12)	FP	678,00	(500)
600	40	(1-1/2)	FP	81,36	(60)
	50	(2)	FP	81,36	(60)
600	65	(2-1/2)	FP	81,36	(60)
600	80	(3)	FP	135,60	(100)
600	100	(4)	FP	332,22	(245)
600	150	(6)	FP	40,11	(355)
600	200	(8)	FP	76,83	(680)
600	250	(10)	FP	76,83	(680)
600	300	(12)	FP	124,28	(1100)

**Table 4: Retainer Torque**

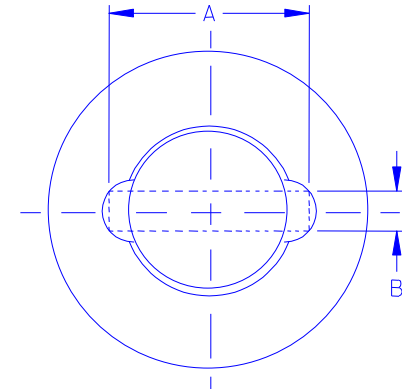
Valve Size <sup>(6)(7)</sup>			Torque	
mm	(in)		N·m	(ft-lb)
15	(1/2")	FP	81	(60)
20	(3/4")	FP	135	(100)
25	(1")	FP	271	(200)
40	(1-1/2)	SP	278	(205)
50	(2)	SP	624	(460)

**Table 5: Retainer Removal Tool Dimensions**

Valve Size <sup>(6)(7)</sup>			A		B	
mm	(in)		mm	(in)	mm	(in)
40	(1-1/2)	SP	34,3	(1.35)	9,14	(0.36)
50	(2)	SP	47,0	(1.85)	9,14	(0.36)

(6) SP = Standard Port, FP = Full Port

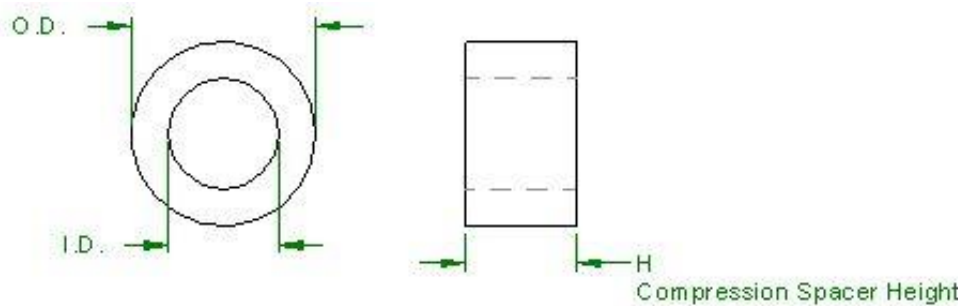
(7) Nominal



**Figure 3: Retainer Removal Tool**

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**Figure 4: -EF Packing Option Compression Spacer**

**Table 6: -EF Packing Option Compression Spacers**  
(Data presented is in reference to Figure 4)

Used On	Compression Spacer Part #	Spacer #	I.D. [in]	O.D. [in]	H [in]	-EF Packing Part #
1" FP, 1-1/2" SP 150#/300# FLG	E306006	1	0.510 ± 0.003	0.745 ± 0.003	0.185 ± 0.003	D557000
1" FP 600# FLG	E306206	1	0.635 ± 0.003	0.995 ± 0.003	0.167 ± 0.003	D568100
1-1/2" FP, 2" SP 150#/300# FLG	E306106	1	0.635 ± 0.003	0.995 ± 0.003	0.416 ± 0.003	D567000
1-1/2" FP 600# FLG	E306406	1	0.760 ± 0.003	1.245 ± 0.003	0.387 ± 0.003	D569900
2" FP, 2-1/2" SP, 2-1/2" FP, 3" SP 150#/300# FLG	E306306	1	0.760 ± 0.003	1.245 ± 0.003	0.543 ± 0.003	D560200
2" FP, 2-1/2" FP 600# FLG	E306506	1	1.010 ± 0.003	1.495 ± 0.003	0.620 ± 0.003	D564400
3" FP, 4" SP, 4" FP, 6" SP 150#/300# FLG  3" FP 600# FLG	E306606	1	1.260 ± 0.003	1.750 ± 0.003	0.731 ± 0.003	D556600
	E306706	2	1.260 ± 0.003	1.750 ± 0.003	0.350 ± 0.003	
4" FP 600# FLG	E306806	1	1.510 ± 0.003	2.000 ± 0.003	1.000 ± 0.003	D567100
	E306906	2	1.510 ± 0.003	2.000 ± 0.003	0.600 ± 0.003	
6" FP, 8" SP, 8" FP, 10" SP 150#/300# FLG  6" FP 600# FLG	E307006	1	2.010 ± 0.003	2.625 ± 0.003	1.136 ± 0.003	D560300
	E307106	2	2.010 ± 0.003	2.625 ± 0.003	0.600 ± 0.003	
10" FP, 12" FP 150#/300# FLG  8" FP 600# FLG	E307206	1	2.500 ± 0.003	3.240 ± 0.003	1.400 ± 0.003	D567200
	E307306	2	2.500 ± 0.003	3.240 ± 0.003	0.778 ± 0.003	
10" FP 600# FLG	E307406	1	3.000 ± 0.003	3.740 ± 0.003	1.314 ± 0.003	D567300
	E307506	2	3.000 ± 0.003	3.740 ± 0.003	0.686 ± 0.003	
12" FP 600# FLG	E307606	1	3.750 ± 0.003	4.490 ± 0.003	1.200 ± 0.003	D567400
	E307706	2	3.750 ± 0.003	4.490 ± 0.003	0.600 ± 0.003	

### Final Adjustments

Occasionally after testing or initial start-up, a minor stem packing leak may occur. Adjust the stem packing as appropriate and as described in the section entitled "Valve Adjustments".



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### Name Plate/Hand Tag Information

One of three possible identification tags may be attached to the valve. ASME/ANSI qualified valves feature a stainless nameplate secured to the side of the body. On qualified 1-1/4" and larger designs, the stainless tag features the CE logo.

ASME/ANSI NAMEPLATE
MODEL
BODY
BALL
STEM
SEAT
PACKING
DESIGN CODE
DN – SIZE
CWP @ 100°F
CONBRACO IND., INC. Made In U.S.A.

CE NAMEPLATE
CE MARK
NOBO NO.
MODEL
MANUFACTURING DATE
DESIGN CODE
BALL/STEM
SEAT/PACKING
DN – SIZE
PS – MAXIMUM ALLOWABLE PRESSURE @ 38°C
CWP @ 100°F
CONBRACO IND., INC. Made In U.S.A.

### **WARNING TAG**

Carefully read the applicable Installation, Operation, & Maintenance Manual in its entirety before removing valve from shipping container. To obtain manual, download from <http://www.conbraco.com/iom>.  
**DO NOT REMOVE TAG.**



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### Appendix A

#### *Recommended Spare Parts for Initial Start-Up and 1 Year of Service*

Item	Number of Valves to be Supported				
	1 to 10	11 to 25	26 to 50	51 to 100	101 Plus
Seal Kits*	1	2	4	8	10
Stem	0	1	2	4	5
Ball	0	1	2	4	5
Spare Valve(s)**	0	0	1	2	3

#### *Recommended Spare Parts for 2 Years of Service*

Item	Number of Valves to be Supported				
	1 to 10	11 to 25	26 to 50	51 to 100	101 Plus
Seal Kits*	2	4	8	16	20
Stem	1	2	4	8	10
Ball	1	2	4	8	10
Spare Valve(s)**	0	1	2	3	4

#### *Recommended Spare Parts for 3 Years of Service*

Item	Number of Valves to be Supported				
	1 to 10	11 to 25	26 to 50	51 to 100	101 Plus
Seal Kits*	3	6	12	24	30
Stem	1	3	6	12	15
Ball	1	3	6	12	15
Spare Valve(s)**	1	2	3	4	5

\*Seal kits consist of stem packing set, bonnet gasket and seats (compression spacer kits are available for purchase for the -EF option packing)

\*\*Recommended if order quantities do not already include spare valves