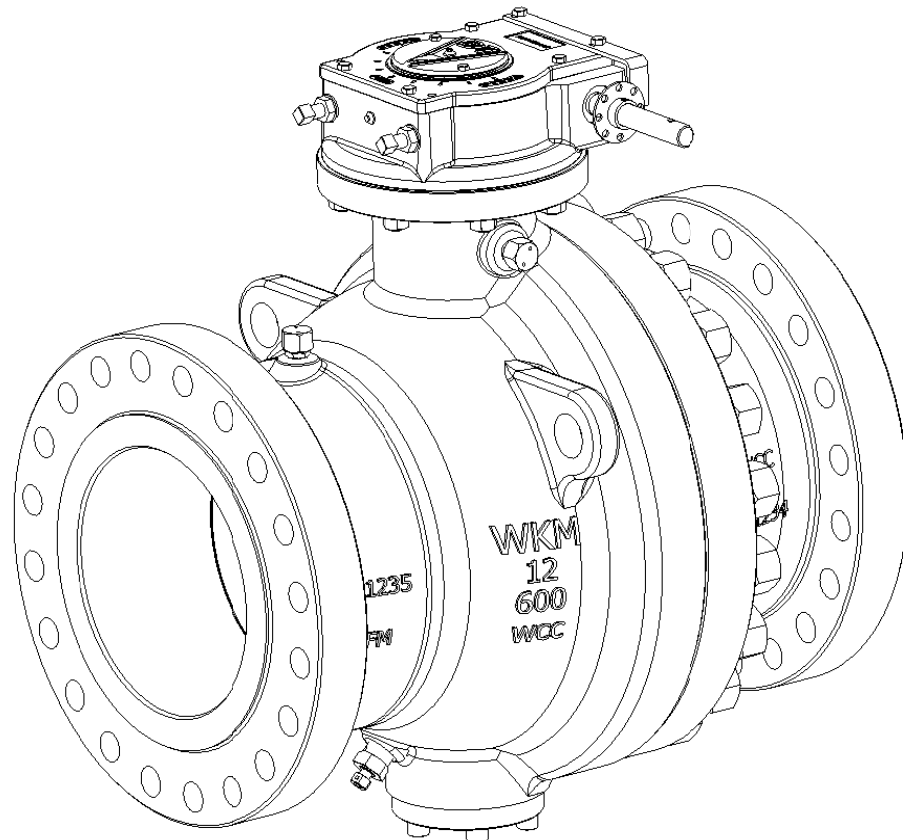


WKM[®] 370D6 Ball Valve

Installation, Operation, and Maintenance Manual



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The procedures included in this book are to be performed in conjunction with the requirements and recommendations outlined in API Specifications. Any repairs to the equipment covered by this book should be done by an authorized Cameron service representative. Cameron will not be responsible for loss or expense resulting from any failure of equipment or any damage to any property or death or injury to any person resulting in whole or in part from repairs performed by other than authorized Cameron personnel. Such unauthorized repairs shall also serve to terminate any contractual or other warranty, if any, on the equipment and may also result in equipment no longer meeting applicable requirements.

File copies of this manual are maintained. Revisions and/or additions will be made as deemed necessary by Cameron. The drawings in this book are not drawn to scale, but the dimensions shown are accurate.

BILL OF MATERIALS

370D6 Series Standard Gearless Valve (see parts list in Table 1)

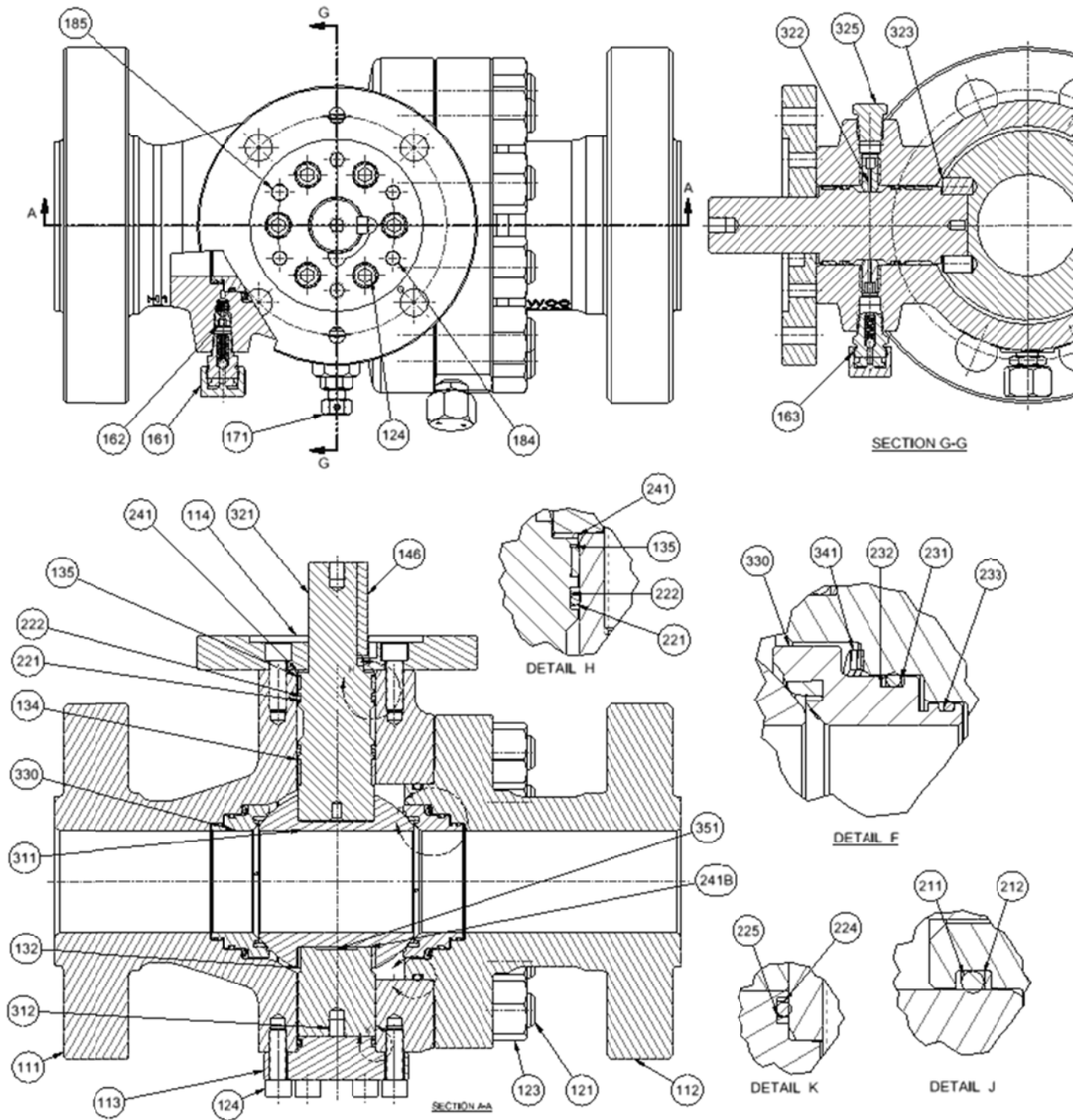


Figure 1 – 370D6 Series Standard Less Gear Valve

Table 1 – Parts List for Standard Gearless Valve

Item	Qty	Description
111	1	Body
112	1	Tailpiece
113	1	Lower Cover Plate
114	1	Adapter Plate
121	*	Body Studs
123	*	Body Nuts
124	*	Cap Screws – Lower Cover Plate/ Adapter Plate
132	1	Trunnion Bearing
134	1	Lower Stem Bearing
135	1	Upper Stem Bearing
146	1	Stem Key
151	1	Nameplate (Not Shown)
153	2	Caution Tag (Not Shown)
161	2	Grease Fitting
162	2	Check Valve
163	1	Stem Grease Fitting
171	1	Bleed Fitting
184	3	Torque Pin
185	1	Locating Torque Pin
211	1	O-Ring, Tailpiece
212	1	BACK-UP RING, TAILPIECE (Only For Class 1500 & 2500)
221	2	O-Ring, Stem
222	2	Back-Up Ring, Stem
224	1	O-Ring, Lower Cover Plate
225	1	BACK-UP RING, LOWER COVER PLATE (Only For Class 1500 & 2500)
231	2	O-Ring, Seat, Outer
232	2	Back-Up Ring, Seat, Outer
233	2	O-Ring, Seat, Inner
241	1	Stem Thrust Washer
241b	1	BALL THRUST WASHER (Only For 6" 900/1500 And All 8" Through 16")
311	1	Ball
312	1	Trunnion
321	1	Stem
322	*	Stem Retaining Screw
323	2	Ball Drive Pin
325	*	Pipe Plug
330	2	Seat Assembly
341	2	Seat Spring
351	1	Ground Spring

*Quantities depend on valve size and class. Customer assembly drawings available upon request shall specify quantities.

370D6 Standard Wrench Head Valve (see parts list in Table 2)

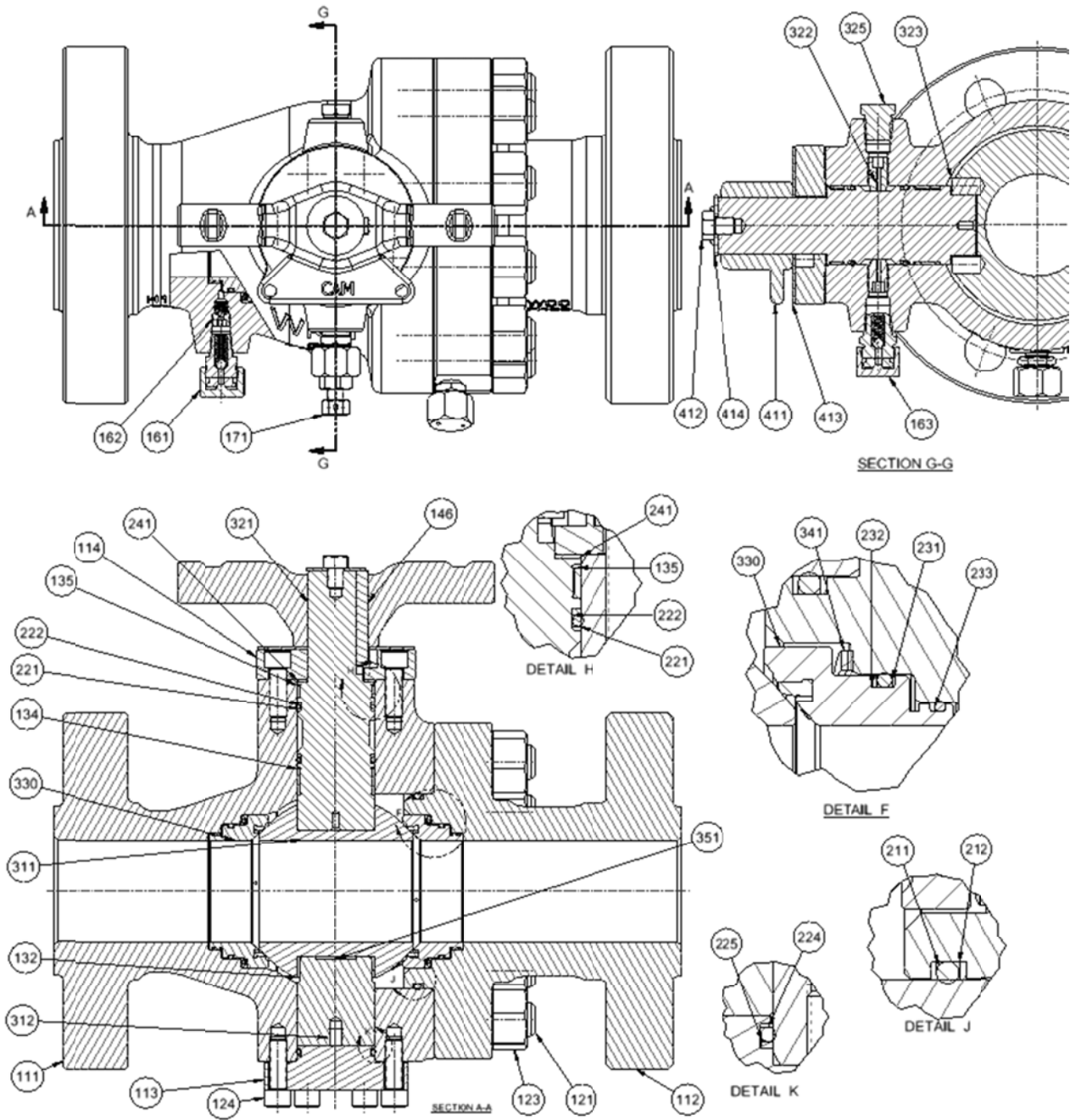


Figure 2 – 370D6 Series Standard Wrench Head Valve

Table 2 – Parts List for Standard Wrench Head Valve

Item	Qty	Description
111	1	Body
112	1	Tailpiece
113	1	Lower Cover Plate
114	1	Wrench Plate
121	*	Body Studs
123	*	Body Nuts
124	*	Cap Screws – Lower Cover Plate / Wrench Plate
132	1	Trunnion Bearing
134	1	Lower Stem Bearing
135	1	Upper Stem Bearing
146	1	Stem Key
151	1	Nameplate (Not Shown)
153	2	Caution Tag (Not Shown)
161	2	Grease Fitting
162	2	Check Valve
163	1	Stem Grease Fitting
171	1	Bleed Fitting
185	1	Locating Torque Pin (Not Shown)
211	1	O-Ring, Tailpiece
212	1	BACK-UP RING, TAILPIECE (Only For Class 1500 & 2500)
221	2	O-Ring, Stem
222	2	Back-Up Ring, Stem
224	1	O-Ring, Lower Cover Plate
225	1	BACK-UP RING, LOWER COVER PLATE (Only For Class 1500 & 2500)
231	2	O-Ring, Seat Outer
232	2	Back-Up Ring, Seat, Outer
233	2	O-Ring, Seat, Inner
241	1	Stem Thrust Washer
311	1	Ball
312	1	Trunnion
321	1	Stem
322	*	Stem Retaining Screw
323	2	Ball Drive Pin
325	*	Pipe Plug
330	2	Seat Assembly
341	2	Seat Spring
351	1	Ground Spring
411	1	Wrench Head
412	1	Wrench Screw
413	1	Weather Protector
414	1	Wrench Washer

*Quantities depend on valve size and class. Customer assembly drawings available upon request shall specify quantities.

SCOPE

370D6 ball valves 2” FP to 16” FP are full bore, through conduit, bi-directional, anti-blowout stem, double block and bleed in closed and open position, with trunnion mounted ball for easy operation. These valves can be equipped with plastic seat inserts made of RTFE, NYLON, or PEEK as the customer requires. All the seats are self-relieve type seats to eliminate cavity pressure lock. All valves have a built-in sealant injection system for emergency seat seal and also a stem sealant fitting for stem seal recovery. The valve uses backed self-lubricating PTFE sleeve bearings and thrust washers for low torque operation.

The 370D6 valves are available in the sizes and classes as per Table 3.

Unless otherwise specified on the purchase order, all the small sizes of valves are equipped with a wrench head (noted W in Table 3) as standard; all other valves are equipped with a gear operator (noted G in Table 3). The hand wheel can be removed from the gear shaft by taking out the roll pin.

Table 3 – 370D6 Series Ball Valve Availability

Valve Availability						
Valve Class/Size	150	300	600	900	1500	2500
2FP	W	W	W	W	W	W
3RP			W	W		
3FP	W	W	W	W	W	W
4RP			W	W		
4FP	W	W	W	W	G	G
6RP	W	W	W	W	G	G
6FP	W	W	G	G	G	
8RP	W	W	G	G	G	
8FP	G	G	G	G	G	
10RP	G	G	G	G	G	
10FP	G	G	G	G		
12RP	G	G	G	G		
12FP	G	G	G			
14FP	G	G	G			
16FP	G	G	G			

All valves are built with trim selection and seals as the customer requires. Contact a WKM representative for proper trim selection for the required application.

NAMEPLATE INFORMATION

The valve information, including trim, is clearly identified on the valve nameplate that is permanently affixed on the valve. Figure 3 shows a standard valve nameplate and Table 4 details the information stamped on the nameplate.

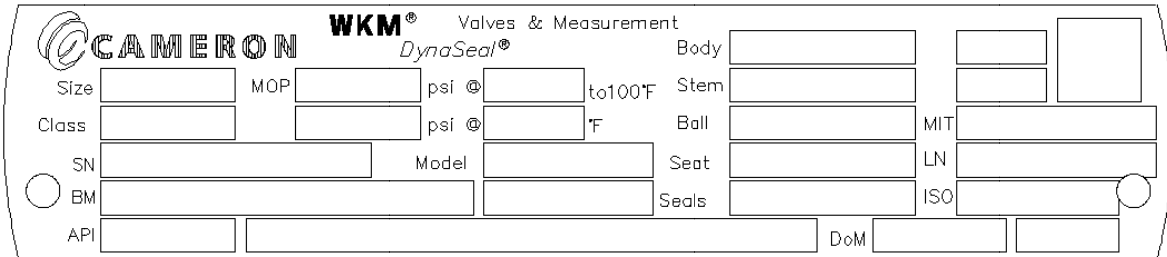


Figure 3 – 370D6 Ball Valve Standard Nameplate

Table 4 – Nameplate Information

Item	Preprint	Stamp
1	Size	If full bore, size is the nominal bore size If reduced bore, size is end size x bore through ball x end size
2	Class	Valve Class Designation as defined per API 6D
3	SN*	Valve's unique Serial Number
4	BM	Valve Bill of Material part number
5	MOP	Maximum Operating Pressure; the working pressure of the valve @ 100°F and at maximum temperature
6	API	API Number the valve is in compliance with
7	Body**	Body Material Symbol
8	Temp	Operating Temperature Range
9	Model	Valve's Model Designation
10	Stem**	Stem Material Symbol
11	Ball**	Ball Material Symbol
12	Seat**	Seat Material Symbol
13	Seals**	Seals Material Symbol
14	DOM	Date of Manufacture
15	MIT	Maximum Impact Temperature
16	LN	API License Number

*- Most important data for obtaining replacement parts

** - Consult a WKM Representative for material's symbol correspondence

STORAGE

VALVES DELIVERED BY WKM

Following testing and prior to shipment, valves are drained of water and through bores and flange faces are coated with grease and covered by protectors. This will protect the valves for a minimum of six months in covered storage from the date of shipment. For long periods of storage and particularly harsh environments (i.e. as found in an uncovered marine atmosphere) additional precautions must be taken.

All 370D6 valves should be stored in the full open position as received, with the flange seal surfaces and the bore greased, and the protectors installed on the flanges. If long term storage is necessary, the valve should be conditioned according to standard engineering practices; contact a WKM representative for long term storage procedures.

INSTALLATION AND OPERATION INSTRUCTIONS

BEFORE INSTALLATION SAFETY INFORMATION

Valves shall be operated and maintained strictly in accordance with these procedures. Operation or maintenance outside of these procedures constitutes abuse of the product and voids all warranty and claims.

When special operation is required, a formal written request to the company must be made for approval to operate in this manner if warranty and product liability is to be maintained.

Before any work is performed on a valve, personnel working on the valve must obtain the proper work permits required by his employer. Personnel shall always use safety precautions set forth by the law and regulations required by his employer. Personnel shall also be aware that any venting or draining of fluids from the valve shall be done in accordance with safety and environmental procedures enforced at the particular location.

The maintenance personnel doing the repairs shall be well trained and familiar with all of the information contained in this manual.

The valves shall be appropriately used for the intended purpose. Any safety or protection devices on the valve shall not be permanently removed or altered unless written approval is received from a WKM representative.

Transport, unpacking, lifting, and connections to the different types of systems (electric, pneumatic, hydraulic systems, etc.) shall be made by expert and qualified personnel.

Should any difficulties or abnormalities arise that cannot be solved by the technician, contact a WKM representative.

Any servicing not covered by these instructions must be made by an authorized service center, after preliminary approval has been given by a WKM representative.

INSTALLATION

Before installation, ensure the grease fittings and sealing surfaces of connection flanges were not damaged during transportation. Clearly identify the valve through its nameplate, check its weight with the packing list or relevant documents, and then place it on a horizontal surface using suitable handling equipment.

Handling equipment must be provided which is appropriate for the total weight of the package. Pay particular attention that slings do not damage the gear or actuator.

For 370D6 valves 8FP to 16FP use the lifting lugs or eyes on the valve for slinging. Do not use lifting lugs or eyes provided on the gear or actuator, if present.

To avoid the ingress of debris or sand into the ball and seat area, the protective covers should not be removed until the valve is ready to be installed in the line. When the valve is ready to be installed in the line, remove the protective plastic or wooden flange protectors.

During installation the valve must be fully open and the line sections, between which the valve will be installed, must be aligned, cleaned, and correctly spaced. Should the valve be closed, the exposed face of the ball must be protected with grease or other anti-adhesive product.

When the valve has butt welding ends, welding on the line must be performed using the proper welding procedure. After welding, clean and check the weld bead and repair as required.

WKM 370D6 valves are bidirectional and may be installed with either end facing upstream. The valve should be installed in such a way as to facilitate maintenance, easy access to the valve fittings, and actuating operations.

370D6 valve standard position is with the stem in the vertical, upwards position and gear/wrench on the top side of valve. In this position the drain/bleed fittings are located in the lowest part of the body which allows for the most effective drainage. However, the valve may be installed in any position as far as stem location, but the drain fitting will not be in the lowest part of body and the drainage may not be as effective.

CAUTION: If the valve cannot be properly drained (see Section 6.1) and the line's foreign particles removed, the seats may wear out, get damaged, or accumulate particles and water that may prevent easy operation and affect the valve performance. It is the responsibility of the user to determine if the application may include abrasive particles and the valve may be need to be installed in a different position than the standard stem-upwards position.

When installing the valve, allow for possible deformations caused by the expansion of the line. The valve must not support the line. Avoid any strain in the valve body.

CAUTION: Do not overload the valve beyond the design piping loads stated on the requirements.

Use studs, nuts, and raised face gaskets or ring joints as per size and class conforming to ASME B16.5. Alternately tighten the studs using a cross pattern method, several times, following the procedure recommended by ASME PCC-1-2010 "Guidelines for Pressure Boundary Bolted Flange Joint Assembly" or gasket manufacturer specification.

CAUTION: While all 370D6 trunnion ball valves have self-relieving seats as standard equipment, it is recommended that appropriate safeguards be put into place to prevent exceeding the pressure/temperature limits given by the manufacturer.

FIELD TESTING

When field testing is required, the following procedures are recommended:

1. Ensure that the test fluids are compatible with the valve seat and seal material
2. Flush the system to remove foreign material that may be in the line as a result from installation procedures to avoid damaging the ball and seats
3. If performing line shell testing, the valve shall be in half open position. The maximum line pressure can be 1-1/2 times the valve maximum cold working pressure
4. If performing seat testing, make sure the valve is fully closed. The maximum pressure for seat testing is the maximum cold working pressure
5. After completion of testing, purge all test fluids from the valve

CAUTION: If the seats are tested to a higher pressure than the maximum cold working pressure, the seats can be permanently damaged. If a higher test pressure is desired contact a WKM representative for details.

OPERATION

370D6 series ball valves only work in the fully closed or fully open position; these valves work for on/off service only.

WARNING: These valves shall never be operated partially open or partially closed. Throttling (partial opening) or “pinching” flow may cause non-uniform wear on seats and ball over the sealing surfaces where it is exposed to the flow line, preventing tight shut-off.

To close the valve, turn gear hand wheel clockwise until it stops; to open the valve turn the gear hand wheel counter-clockwise until it stops.

All the wrench operated valves have the wrench levers aligned along with valve through bore when opened and perpendicular with the through bore when closed.

All gear operated valves have the gear indicator aligned with the valve through bore when opened and perpendicular with the through bore when closed. The gear also has “OPEN” and “CLOSE” markings.

While opening or closing, the ball must reseat; this reseating torque is higher than the run torque. Turn the hand wheel until the gear has a positive stop.

If the valve is operated by a power actuator, carefully read the actuator operation manual.

CAUTION: The end stops have been shop set to assure the correct 90 degree rotation from the fully open to fully closed position. Do not change their adjustment. If the valve is not correctly resealed at the end of opening or closing, the ball and the seats can quickly be damaged when exposed to flow pressure, preventing tight shut-off.

These valves can be operated by one person. It is recommended that no extensions be used for operating the valve. Using an extension or power tool to operate the valve voids all warranty and claims, and may result in failure.

MAINTENANCE PROCEDURES

Under normal working conditions, 370D6 ball valves are designed for lengthy, reliable service. The following recommended practices and procedures will ensure optimum performance.

DRAINAGE PROCEDURE

All valves can be drained and lubricated depending on application conditions, or anytime if desired. Valves may accumulate water, scale, deposits, and other foreign matter during their service. These materials may damage the valve in the following ways:

1. At low temperature, ice may form inside the valve and hinder its normal operation
2. Foreign matter may prevent the valve from fully closing and the ensuing throttling may damage the ball or the seat seals
3. Foreign matter may get caught between the ball and the seat and damage their surfaces

A drainage schedule is the best way to prevent damage caused by foreign matter. However, it is recommended that drainage should be carried out in the following cases:

1. Whenever the valve does not close
2. Before and during the cold season
3. After washing the line
4. After hydraulic test
5. Periodically to remove the accumulation of body debris. The frequency may be established based on the contaminants in the application

For a drainage procedure, the following procedure is recommended:

1. 370D6 valves are double block and bleed in closed and also open position. The drainage can be done in either the closed or open position. Make sure the valve is fully closed or fully open.

NOTE: The time to drain the valve depends on the size of the valve and the fluid in the line; significant time may be required if the line contains a gas fluid. If the valve is drained in the open position, the time will be shorter compared to if drained in the valve in the closed position due to the smaller body cavity to drain when the valve is fully open.

2. Slowly open the bleed fitting (171) located on the lower side of the body.

CAUTION: Open the drain fitting slowly until the pressure in the body cavity has been discharged. Make sure the fitting body does not unscrew while loosening the fitting stem. If necessary, use another wrench to prevent the fitting body from unscrewing.

LUBRICATION – GREASE INJECTION

The implementation of a regular lubrication program extends the service life of the valve before carrying out maintenance operations and improves its performance. It is recommended to schedule a regular lubrication program based on the frequency of operations and the severity of service. All 370D6 series ball valves have two grease injection fittings located on the body seat area with the exception of the 2", 3", and 4" Class 150 & 300 that have one grease fitting located in the center of the body.

Lubrication also may be necessary for a temporary seal restoration in the event of slight damage to the seats caused by debris in the line; before operating the valve if the valve has been left in its position for a long period of time; or as soon as an increase in stem torque is noticed.

CAUTION: Grease fittings should not be removed if there is pressure in the line. Grease fittings should never be painted.

The gear operators are factory lubricated for life. If desired, the gear can be lubricated using the lube fitting located on the side of the gear operator.

WKM 103 is an effective sealant; it is viscous grease with a thick consistency. It consists of synthetic oils, a suspending agent, friction-reducing filler, plastic, and an antioxidant. WKM 103 Sealant may be used in valves with a temperature range of -50° F through 250° F. This sealant is suitable in lines transporting hydrocarbon liquids and gases where water, dilute acids, alkalis, or salt solutions may be present; as well as where sweet or sour produced gas with water or organic condensate, LPG, and aqueous solutions are being transported. The gallon containers are for use with bucket-type high-pressure grease guns. Gun cartridges are poly bags sized to fit screw/prime high pressure handguns.

WKM 103 Sealant part numbers:

- | | | |
|---|---------|-------------------|
| - | K155812 | Gun Cartridge |
| - | K155849 | 1 gal – 10 lbs. |
| - | K155853 | 3 gal – 30 lbs. |
| - | K155857 | 5 gal – 50 lbs. |
| - | K155866 | 16 gal – 150 lbs. |
| - | K155869 | 55 gal – 551 lbs. |

WKM Lubricant 58G part number – K154208 – Gun Cartridge

For Lubrication and temporary seat or stem seal restoration with the valve under line pressure, follow the instructions below:

1. Fill the WKM high pressure grease gun with valve sealant
2. Make sure the valve is in the fully open or fully closed position. For 2", 3", and 4" Class 150 & 300 valves, lubrication is recommended in the fully open position

Warning: Back up the seat grease fitting so only the safety vent cap will be removed from the fitting. Carefully remove the safety cap from the seat grease fitting. NEVER remove the grease fitting when the valve is under pressure.

3. Remove safety vent cap from grease fitting. Attach grease gun connection onto grease fitting and inject sealant. If injection of the sealant is difficult, flush the valve seats and attempt to inject sealant again.
4. Repeat process for the second seat grease fitting as applicable, or the stem fitting. Replace safety caps on all grease fittings.

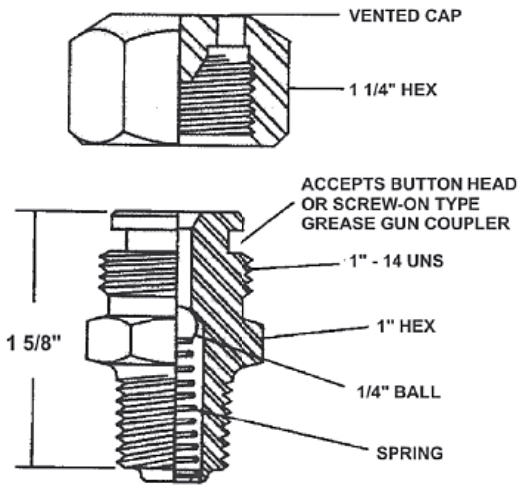


Figure 4 – Typical Injection Fitting

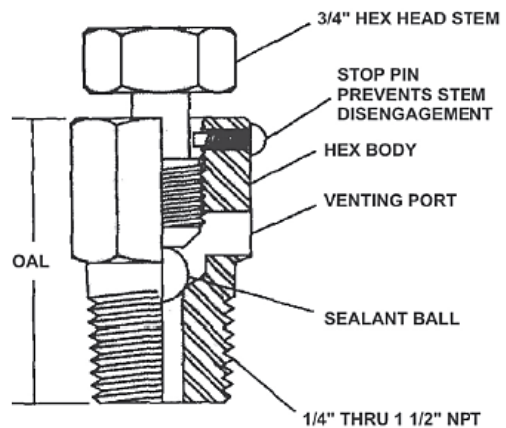


Figure 5 – Vent or Bleed Fitting

Table 5 shows a list of recommended lubricants by the cleaner/sealant manufacturer for the indicated service and conditions. Use of other lubricants without WKM approval voids all warranty and claims. Contact WKM representatives for availability.

Table 5 – Manufacturer Recommended Lubricants

Flush/Sealant Recommendations				
Service Condition	Product	Cleaner/Sealant Manufacturer		The valve Cleaner/Sealant Manufacturer's contact information can be found below:
		WKM	VAL-TEX	
Natural Gas	Flush		Valve flush	Headquarters Cameron Valves & Measurement 3250 Brairpark Drive, Suite 300 Houston, TX 77042 Tel. (281) 499-8511 Order 1-800 323-9160 Fax (281) 261-3588
	Standard valve lubricant	WKM 58G	2000 light lube	
	Standard sealant	WKM 103	80 bulk/ 80-HS stick	
	Standard low Temp.		50 bulk / stick	
Sour Gas	Severe leak sealant		80+PTFE bulk / stick	
	Flush		Valve flush	
	Standard valve lubricant	WKM 58G	2065 light lube	
	Standard sealant	WKM 103	65 bulk / stick	

	Standard low Temp.		65 bulk / stick	www.c-a-m.com VAL-TEX Valves Inc. of Texas 10600 Fallston Rd. Houston, TX 77099 Tel. (281) 530-4848 Order 1-800-627-9771 www.valtex.com
	Severe leak sealant		80+PTFE bulk / stick	
Dry CO2	Flush		Valve flush	
	Standard valve lubricant	WKM 58G	2300 light lube	
	Standard sealant	WKM 103	302 bulk / stick	
	Standard low Temp.		65 bulk / stick	
Crude Oil	Severe leak sealant		80+PTFE bulk / stick	
	Flush		Valve flush	
	Standard valve lubricant	WKM 58G	2000 light lube	
	Standard sealant	WKM 103	80 bulk/ 80-HS stick	
	Standard low Temp.		50 bulk / stick	
	Severe leak sealant		80+PTFE bulk / stick	

Table 6 lists the recommended quantity of lubricant per valve size and class.

Table 6 – Recommended Lubricant Quantities

Lubricant and Flush Volume (per valve size and class)			
Valve size	Valve class	Lubricant per seat (ounces)	Valve Flush per seat (ounces)
2"	150-300	12	-
2"	600-2500	3	5
3"	150-300	16	-
3"	600-2500	4	7
4"	150-300	20	-
4"	600-2500	5	9
6"	150-1500	7	13
8"	150-900	9	17
10"	150-900	12	21
12"	150-900	14	26
14"	150-600	16	30
16"	150-600	20	36

Several high pressure guns can be used for lubrication:

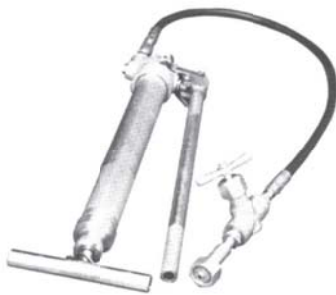


Figure 6 – Screw/Prime Hand Gun
Part No. 2122495-01



Figure 7 – Bucket-type Gun
Part No. K065189



Figure 8 – Air Over Hydraulic Foot Pump
Part No. 2330398-01



Figure 9 – Adapter Fitting
Part No. K296434

370D6 VALVE RECONDITIONING

The 370D6 valves can be rebuilt if necessary. The disassembly and reassembly of the valve requires proper lifting equipment and normal maintenance tools.

Spare parts are determined by the individual customer specification; however the following list is suggested as a minimum for typical maintenance operations:

- Stem and ball radial bearings
- Stem thrust washers and ball thrust washer (if applicable)
- All O-rings and applicable back-up rings
- Seat springs
- Seat subassemblies
- Drain fitting
- Grease injection fittings

CAUTION: Prior to disassembly, the valve must first be isolated from system pressure and flow. Operate the valve at least two times and drain the valve to make sure there is no residual pressure left in the body.

After observing the above precautions, remove the valve from the pipe line system. Set the valve in a clean place free of dust and/or metallic chips.

DISASSEMBLY

1. Operate the Valve to the closed position.

CAUTION: Prior to disassembly, verify that there is no pressure in the body cavity. Operate the valve at least two times to bleed any residual pressure.

2. Stand the valve on the body flange end. Care should be taken to avoid damaging the sealing surface of the raised face or ring groove (if applicable).
3. If wrench operated – remove the wrench screw on top of the stem, the washer, and the wrench.
4. If actuated valve – check the actuator operation manual and remove the actuator.
5. If gear operated – loosen the gear mounting hardware while lifting the gear until it comes off of the stem.

6. Remove stem key. Unscrew the adapter plate or lever plate cap screws and remove the adapter plate paying attention not to damage the torque pins.
7. Unscrew the stem grease fitting and the plug (if applicable), unscrew the stem retainer screw(s) and remove it.

CAUTION: Failure to remove the stem retainer screw (one or two as applicable) will prevent the stem removal from the body and may cause severe stem and screw damage during the following step.

8. Carefully pull the stem out of the body. To remove the stem, install a cap screw through the gear plate into the threaded hole located on the top of the stem. Use a rubber mallet to hit against the gear plate and gently pull the stem out. Remove the O-rings, back-up rings, and stem thrust washer and use a screwdriver to also remove the stem bearings.
9. Remove the cap screw from the stem, and again utilize the gear plate to remove the trunnion from the body.
10. Remove the lower cover plate O-ring and back-up ring (if applicable). Carefully remove the ground spring located between the trunnion and ball.
11. Loosen and remove the body nuts.
12. Lift the tailpiece off of the body paying attention not to damage the body O-ring.
13. Remove the tailpiece O-ring and back-up ring if applicable.
14. Using a strap, lift the ball out of the body and lower it onto wood blocks. Take out the drive pins and inspect the trunnion bearing and thrust bearing (if applicable). Remove bearings as necessary.
15. Remove the seat ring from the tailpiece, taking care not to damage the seals.
16. Remove the O-rings and the back-up ring from the seat assembly.
17. Remove the seat spring from the tailpiece pocket.
18. Repeat steps 15-17 for removal of the body seat assembly.
19. Remove the drain fitting and grease fittings.

CLEANING

CHEMICAL RESISTANT VINYL OR RUBBER GLOVES SHOULD BE WORN DURING CLEANING OPERATIONS

- Remove any foreign and corrosive products within the body.

CAUTION: Abrasive cleaning products should never be used, especially on sealing area. If water jetting is used, dry with compressed air.

- Clean all metallic parts with a soft cloth saturated with a solvent. Observe all sealing surfaces.
- Clean the grease fittings and, if present, the grease channels.

Clean the sealing rings and the gaskets with a soft cloth. If necessary, wash them with soap and rinse them with clean water.

INSPECTION

After cleaning, all valve components should be inspected for damage, dents, scoring, wear, or corrosion. If any damage is found, proceed with the repair where possible or with replacement of the parts.

For a complete inspection procedure, the following operations should be carried out:

1. Check the metallic parts for damage along the sealing surfaces and on moving surfaces. Particular attention should be paid to surface nicks and corner damage.
2. Make sure that the sealing rings and gaskets are not slashed, extruded and/or otherwise damaged.
3. Check for scratches and plating defects on the surfaces of the bearings, the thrust washers, the O-ring grooves, the ball, and the seat components.
4. Inspect all replacement components that are going to be used to ensure damage has not occurred in storage or transportation.
5. If any damage is found, the minor repairs should be carried out by trained personnel, otherwise contact WKM representative.

The minor repairs that may be carried out on site by maintenance personnel shall be in accordance with the following points:

1. Use standard engineering practices to repair the damaged metallic surfaces.
2. Remove surface nicks on ball and stem by using a mild abrasive such as Scotch Brite pads.
3. Remove all corner damages by using a mild abrasive or with a bearing scraper.
4. Replace all faulty parts and components.
5. Flush lube and sealant while the valve is disassembled.

REASSEMBLY

After inspecting the parts and getting the replacement parts as required, use the following procedure to assemble the 370D6 ball valve:

1. Place the body, on the ANSI flange, on a clean and solid surface that will hold the weight of the assembled valve securely. Place the tailpiece on the ANSI flange. Take care not to damage the sealing surfaces.
2. If studs have been removed, install the studs in the body with the ID stamping up and the short end threaded into the body and screw them down completely. Remove any particles which may have flaked off the studs.

- Inspect the seats, paying careful attention to the insert sealing surfaces. Reject and replace all seats with dings, scratches, or any other physical defects. Install the O-rings and the backup ring. The back-up ring should be on the head side of the seat as shown in Fig. 10. Apply lubricant until completely covering the O-rings and back-up ring.

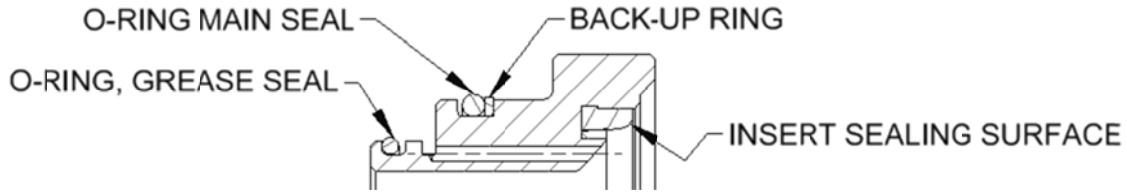


Figure 10 – 370D6 Seat Assembly

- Install the O-rings and back-up ring (as applicable) to the tailpiece and cover. If the valve size and class require back-up rings, those shall be positioned above the O-ring towards the flange of the part as shown in detail J and detail K of Fig. 1 and Fig. 2.
- Install the radial bearings on the stem using a bearing tool shown in Fig. 11. The lower bearing is wider than the upper bearing. Both bearings shall fit into the designated grooves.

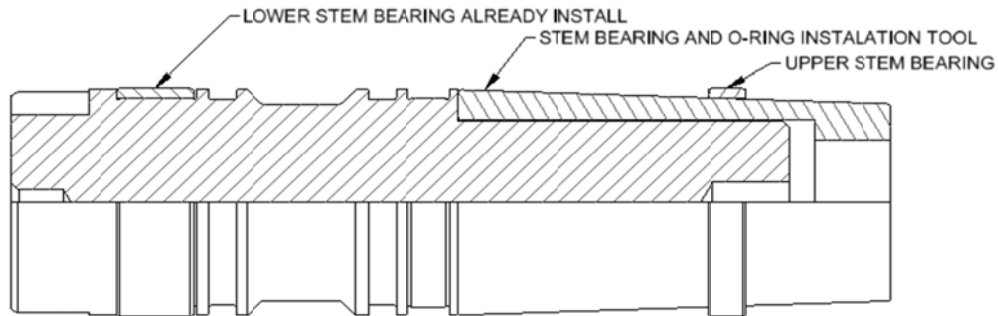


Figure 11 – Stem Bearing Installation

Using the same tool, install the O-rings. Install the back-up rings above the O-rings on the stem gear side, as shown in Fig. 12.

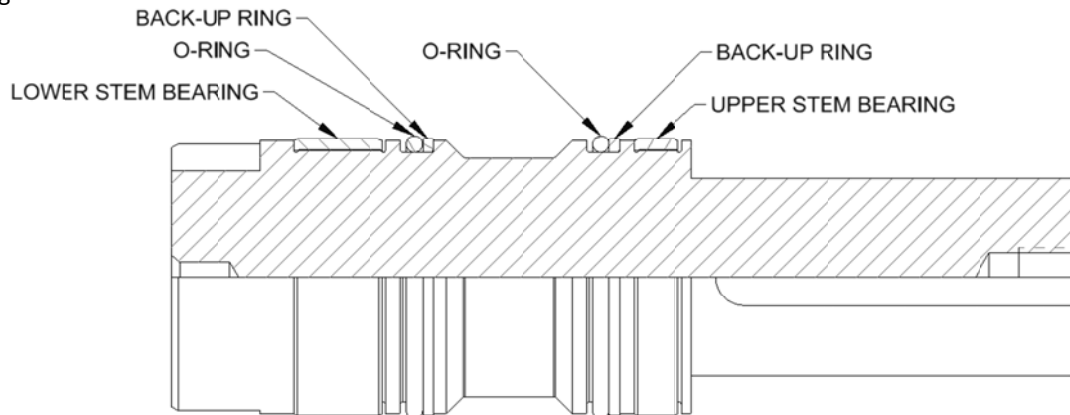


Figure 12 – Stem O-ring Installation

6. Install the ball thrust washer (if applicable) and the trunnion radial bearing in the ball trunnion bore.
7. Grease the ball drive pin holes and install the drive pins. Make sure the drive pins are placed correctly in the holes and do not stick above the ball.
8. Apply a coat of lubricant on the entire surface of body and tailpiece seat pockets and install the seat springs into the seat pockets.
9. Lower one seat assembly, with the insert facing up, into the body pocket. Press the seat using a proper tool until the O-rings and back-up rings are completely engaged in the pocket. Take care to avoid damaging the seat insert.
10. Repeat the procedure with the other seat into the tailpiece seat pocket.
11. Lift the ball and slightly lower into the body until it rests on the body seat, then orient the ball trunnion hole with the body trunnion hole. The ball should be in the closed position and symmetrically oriented over the body seat. There should be an equal amount of the body seat visible on both sides of the ball.
12. Grease the body trunnion hole and stem hole.
13. Set the ground spring on top of the trunnion with a generous amount of grease, and push the trunnion into the body bore hole until the trunnion engages the ball. Use a rubber mallet if necessary. Install the lower cover plate over the trunnion and thread at least two cap screws until the cover plate back face contacts the body trunnion boss face.
14. Flip the tailpiece over using the proper lifting equipment. Lift the tailpiece and start lowering it onto the body. Before the tailpiece engages the studs, orient it such that the grease fittings of the tailpiece are on the same side as the grease fittings of the body, towards the front of the valve or aligned with the stem bore (if applicable). At the same time, the tailpiece end flange bolt holes must be aligned with the body end flange bolt holes. After these two alignments are completed, slowly lower the tailpiece onto the body until it rests on the ball.
15. Install two nuts, 180° apart, and tighten sequentially until the tailpiece is contacting the body around the entire flange. Install the remainder of the nuts.
16. The stem should be installed at this time.

NOTE: The ball was installed in the closed position and the drive pins should be aligned with the valve bore. Check to make sure the drive pins are in the correct place on the ball holes. Orient the stem (as shown in Fig. 13) with the key groove toward the valve body markings and the drive pin holes matching the drive pins in the ball. Orient the bearing splits towards the stem key groove and drive the stem into the body using a rubber mallet until the stem completely engages the ball and drive pins.

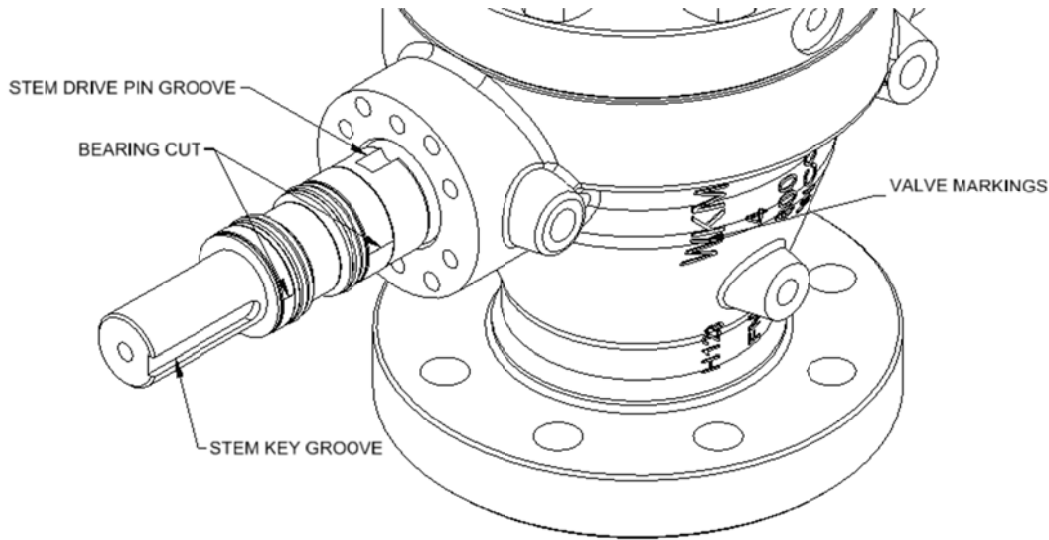


Figure 13 – Stem Orientation for Installation

17. If a wrench operated valve, use the following procedure to install the wrench (as detailed in Fig. 14):
 - a. Install the stem thrust washer over the stem with the Teflon backing oriented towards the ball.
 - b. Install the locating pin into the correctly sized hole.
 - c. Install the lever plate over the stem. The lever plate should fit over the locating pin with the key grooves oriented towards the valve body markings and the tailpiece.
 - d. Install all cap screws and torque as required per Table 7.
 - e. Install the key. The key should not stick above the stem.
 - f. Install the weather protector.
 - g. Install the wrench head and secure the washer and screw on top of the stem.

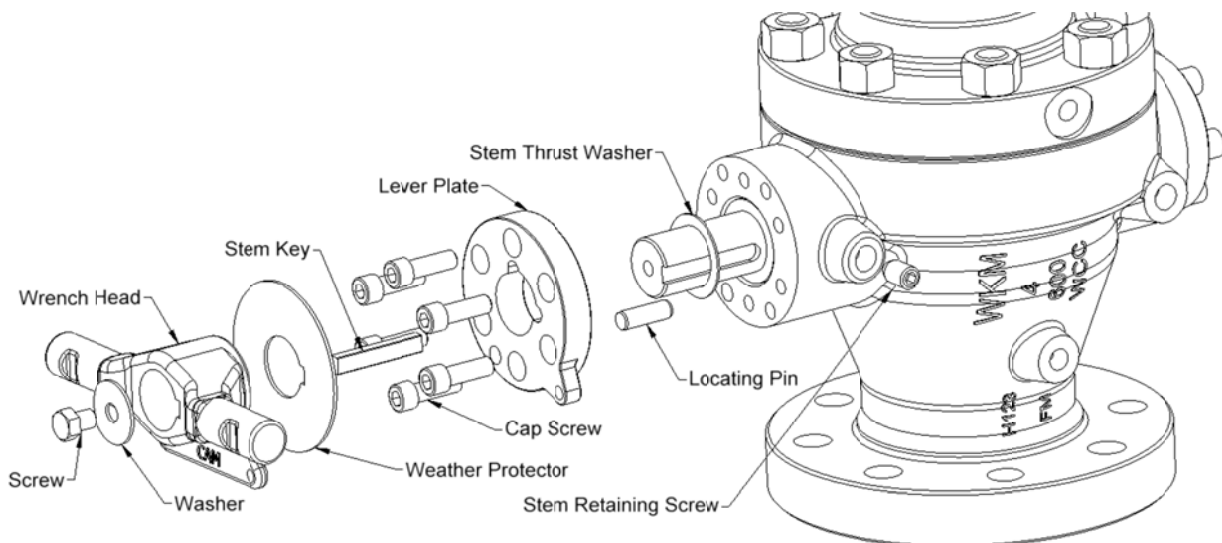


Figure 14 – Wrench Operated Valve Assembly

18. If a bare stem valve, use the following procedure to install the adapter plate (as detailed in Fig. 15):
 - h. Install the stem thrust washer over the stem with the Teflon backing oriented towards the ball.

- i. Install the torque pins and the locating pin into the correctly sized holes.
- j. Install the gear adapter plate over the stem. The plate should fit over all the pins including the locating pin, with the key grooves oriented towards the valve body markings and the tailpiece.
- k. Install all the cap screws and torque as required per Table 7.
- l. Install the key. The key should not stick above the stem.

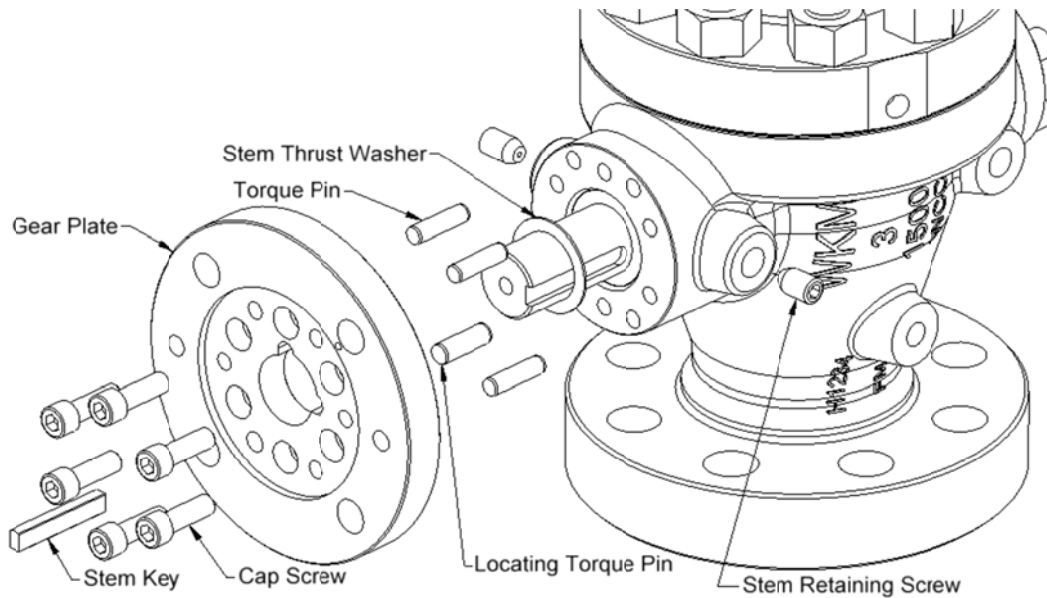


Figure 15 – Gear Adapter Plate Assembly

19. Install the stem retaining screw(s). Thread the screws until contacting the stem and turn back a half turn.

CAUTION: If the stem retaining screw is not backed off and remains in contact with the stem, the valve torque may increase and affect actuator performance.

20. If removed, tape all check valves and external fittings with Teflon tape and install them at this time. Use the installation torques noted in Table 8.
21. The body stud nuts and cap screws should be torqued as required per Table 7, in a cross pattern sequence. Check each at least twice to make sure they have been tightened correctly.
22. If the valve requires a gear operator, see Gear Operator Assembly. If otherwise actuated, carefully read the actuator operation manual before installation.

GEAR OPERATOR ASSEMBLY

Contact a WKM Representative for part numbers and other relevant information to select the proper gear operator. The gear can be installed in two positions, with the gear shaft on either side of the valve so the valve can be operated from either side of the pipeline. However, unless otherwise specified by the customer, the gear is installed with the gear shaft on the front of the valve (valve body markings) and the procedure below shows the steps for this installation (detailed in Fig. 16).

1. With the gear positioned with the indicator cap down, install the mounting studs provided with the order.
2. Before sliding the gear completely against the adapter plate, check the position of the hand wheel gear shaft. On all 370D6 series valves the shaft will be oriented to the top right. The shaft will always be at 90° from the centerline of the valve and never at an angle.
3. After correctly positioning the hand wheel gear shaft, slide the gear operator towards the adapter plate. Start all nuts onto the studs and tighten them with the proper open end wrench.
4. Remove the indicator cap. Using the hand wheel, turn the hand wheel gear shaft so that the key slot on the stem and operator are aligned with each other.
5. Using a rubber mallet, tap the key gently into the key slot until it is below the top of the stem. **Do not use excessive force to drive the key.** If the key does not fit properly, recheck the alignment of the key slots. If the key sticks out above the end of the stem slightly rotate the gear shaft to make sure the key is engaging the adapter plate groove. Another key or punch should be used to drive in the key to prevent damaging the gear operator key slot.
6. Loosen the locknuts and rotate both stop screws on the gear operator counter clockwise.
7. To set the closed stop, turn the hand wheel gear shaft clockwise until the key stops on the adapter plate groove. Back off a quarter turn, then turn the close position stop screw clockwise until it stops and tighten approximately 1 Ft-lb. for each inch of valve bore. Retighten the locknut. **The hand wheel gear shaft should always be turned in the closed direction to set the closed stop, so that all slack will be taken out of the gearing. This ensures a more accurate stop setting.**

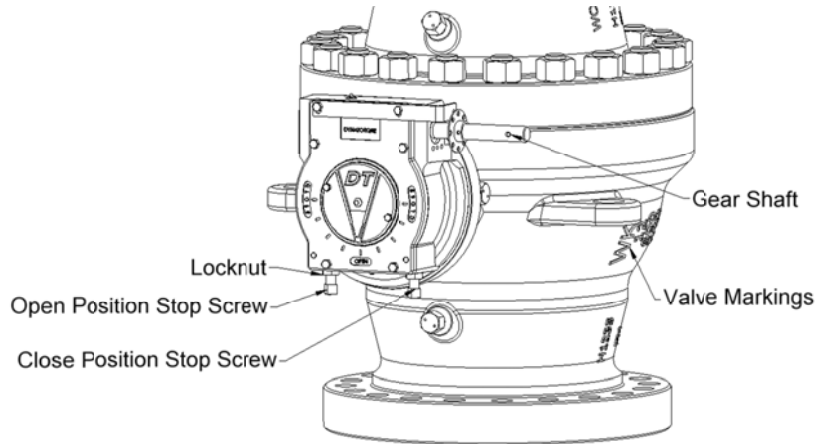


Figure 16 – Gear Operator Assembly

8. After setting the closed stop a quick check can verify that it has been correctly set. Turn the hand wheel gear shaft towards the open position, and then return the valve to the closed position until contacting the closed stop. After fully closing the gear, mark the ball with a circle tangent to the adapter flow bore (or body flow bore) in a plane 90° with the stem axis. Open the ball halfway and measure the minimum distance from the ball corner (ball flow bore to sphere corner) to the mark. The distance should meet the dimension L detailed in Table 9.

Table 9 – Dimension L

Distance from Ball Corner to Mark		
Valve Size	Valve Class	Dimension L (+/- 0.04")
2" FP & 3" RP	150-900	0.67"
2" FP	1500	0.96"
2" FP	2500	1.28"
3" FP & 4" RP	150-900	0.87"
3" FP	1500	1.19"
3" FP	2500	1.81"
4" FP & 6" RP	150-900	1.03"
4" FP & 6" RP	1500	1.24"
4" FP & 6" RP	2500	1.87"
6" FP & 8" RP	150-600	1.05"
6" FP & 8" RP	900-1500	1.37"
8" FP & 10" RP	150-600	1.19"
8" FP & 10" RP	900	1.40"
10" FP & 12" RP	150-900	1.35"
12" FP & 14" RP	150-600	1.50"
12" FP & 14" RP	900	1.74"
14" FP	150-600	1.56"
16" FP	150-600	1.87"

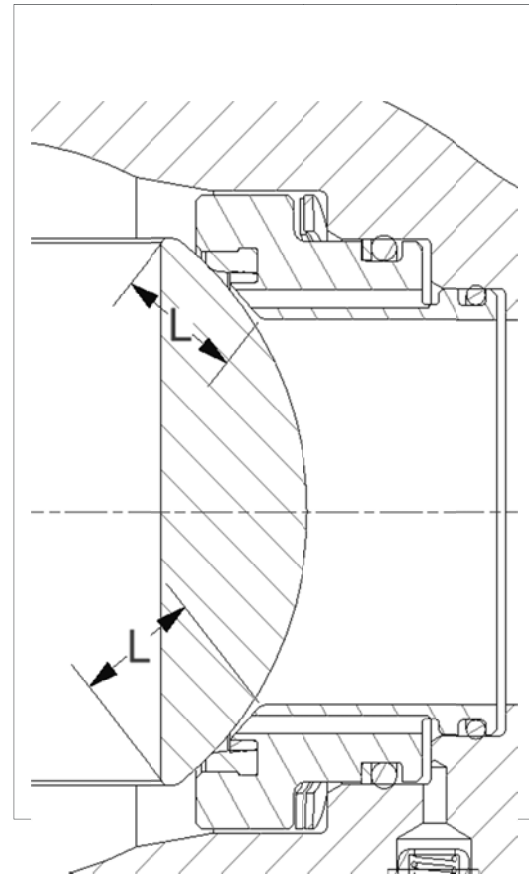


Figure 17 – Dimension L

9. To set the open stop, turn the hand wheel gear shaft counter clockwise until the key stops on the adapter plate groove. Look into the bore of the valve, the flow bore of the ball should be aligned with the flow bore of the seat assemblies with not more than 1/16" of the ball radius protruding into the flow bore. Turn the open position stop screw clockwise until it stops and tighten approximately 1 Ft-lb. for each inch of valve bore. Retighten the locknut. **The hand wheel gear shaft should always be turned in the open direction to set the open stop, so that all slack will be taken out of the gearing. This ensures a more accurate stop setting.**
10. After setting the open stop a quick check can verify that it has been set correctly. Turn the hand wheel gear shaft several turns towards the closed direction, and then return the valve to the open position until the key hits the stop. There should be no more than 1/16" of the ball radius exposed into the flow bore after the stop if properly set.
11. Reinstall the indicator cap and tighten the indicator cap screws.
12. Install the hand wheel and secure it with the hand wheel pin.

ASSEMBLY TORQUE VALUES

Table 7 – Installation Torque for B7, B7M, L7, and L7M Studs and Cap Screws

Thread Size	Dry/Zinc Plated (Ft-lbs.)	Cad/Teflon Coated (Ft-lbs.)
3/8"- 16UNC	19	11
1/2"- 13UNC	45	27
5/8"-11UNC	88	52
3/4"-10UNC	153	90
7/8"- 9UNC	243	143
1"- 8UNC	361	213
1 1/8"- 8UN	523	305
1 1/4"- 8UN	726	421
1 3/8"- 8UN	976	562
1 1/2"- 8UN	1278	733
1 5/8"- 8UN	1653	934
1 3/4"- 8UN	2054	1169
1 7/8"- 8UN	2539	1440
2"- 8UN	3094	1750

Table 8 – NPT Fitting Installation Torque

Fitting Thread Size	Installation Torque (Ft-lbs.)
1/4" NPT	25
3/8" NPT	39
1/2" NPT	75
3/4" NPT	135
1" NPT	288

TROUBLESHOOTING

Table 9 – Troubleshooting

Issue	Probable Cause	Repair
Will not open or close	Iced up due to restricted flow or low temperature	Inject antifreeze solution into valve body. Check the compatibility of antifreeze solution to avoid damaging the seals. Drain periodically to eliminate water accumulation
	Improper setting of gear or actuator stops	Reset gear or actuator stops
Hard to operate	Accumulation of foreign material in the body	Drain the valve – see drainage procedure
	Infrequent operation, lack of lubrication	Grease the valve – see lubrication procedure
	Gear hard to operate or stuck	Check gear. Lubricate or replace
	Operator not properly installed	Check gear operator
Leak around the seat	Foreign material between seat and ball	Grease the valve – see lubrication procedure. Operate several times to wipe clean
	Valve not fully closed	Check the adapter plate or gear operator for fully closed position
	Worn or damaged seat inserts and/or ball	Disassemble the valve and replace worn parts
	Operator stops not properly set	Adjust stops to proper settings
	Worn or damaged seat O-ring seal	Disassembly the valve and replace seat O-ring. Check O-ring material for application*
Leak around stem	Worn or damaged stem O-ring seal	Grease the stem. Disassemble the valve and replace stem O-ring. Check O-ring material for application*
Leak between body and adapter plate	Worn or damaged adapter O-ring seal	Disassemble the valve and replace adapter O-ring. Check O-ring material for application*
	Adapter studs and nuts not properly tightened	Tighten nuts to specified torque
Leak between body and lower cover plate	Worn or damaged lower cover plate O-ring seal	Disassemble the valve and replace cover plate O-ring. Check O-ring material for application*
	Cover plate cap screws not properly tightened	Tighten cap screws to specified torque
Grease fitting leaking	Debris in the fitting	Inject small amount of cleaner to flush debris
	Damaged fitting	Tighten safety cap or replace fitting. WARNING: Never remove the entire fitting with the valve under pressure

*Contact a WKM representative for proper trim selection for the required application

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