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STORAGE, INSTALLATION, OPERATION

&

**MAINTENANCE MANUAL**

**FOR**

**FLOATING BALL VALVES  
(TWO PIECE DESIGN)**

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1. **INTRODUCTION**

Safe and efficient operation of industrial installations requires not only complete knowledge of the engineering and functioning of all machinery and equipment but their continuous and proper maintenance as well. Improper operation or maintenance of a piece of valve may affect the whole installation. General information is given here for proper operation and maintenance of DPV steel ball valves, floating ball type with a two piece body.

1.1 **SCOPE**

This operation manual applies to ANSI Class 150 and 300 DPV steel ball valves, floating ball type, full and reduced bore, with a two piece body, figure-numbered and sized as below:

|           |               |                                  |
|-----------|---------------|----------------------------------|
| ½" to 10" | K123R & K323R | (REDUCED BORE - CARBON STEEL)    |
| ½" to 10" | K123F & K323F | (FULL BORE - CARBON STEEL)       |
| ½" to 10" | K133R & K333R | (REDUCED BORE - STAINLESS STEEL) |
| ½" to 10" | K133F & K333F | (FULL BORE - STAINLESS STEEL)    |

1.2 **ACTUATOR OPERATION MANUALS**

This operation manual cover manually operated ball valves only. For electric, pneumatic or hydraulic actuation of ball valves, refer to the actuator operation manuals prepared by relevant actuator manufacturers

2 **STORAGE OF VALVES**

- 2.1 Prior to shipment, blind covers are attached to the inlet and outlet of each valve for protection from mechanical damage as well as for prevention of the intrusion of dust and other foreign objects into the valve bore during transit.  
Do not remove these end protectors before valves are mounted.
- 2.2 Valves should be stored at a dust-free least humid and well ventilated place. Always be careful not to damage the valve stems during handling. Placing valves directly on the ground or on the concrete floor is not recommended. Under no circumstances should valves be store outdoors
- 2.3 All DPV ball valves are shipped with the ball in its fully opened position for protection of ball surface and resilient seats. Valves should be left fully open during storage.
- 2.4 For moving with a crane, valves should be positively rigged with a wire around the valve body and end flanges or through the lifting lugs. The wire should not be in direct contact with operational gears or actuators.



3. **VALVE INSTALLATION**

- 3.1 First of all, check the nameplate, the tag number or any other identification mark of the valve, and make sure that a correct DPV valve shown in your piping arrangement plan has been prepared.
- 3.2 As piping sites are usually very dusty, be sure not to remove the valve end protectors before valves are ready for mounting.
- 3.3 After removal of the end protectors, thoroughly clean the inlets and outlets of both pipes and valves so that the gasket faces of the flanges are free from dust, which will affect the sealing performance.
- 3.4 Any scratch or defect on the gasket contact face of the valve flanges and pipe flanges should be carefully detected. Correct such a scratch or defect with sand papers or grinding stones to have smooth surface.
- 3.5 Before flange coupling, first align the bolt of the valve flanges with those of the pipe flanges, then insert the gaskets and tighten the bolts. If the valve and pipeline are not aligned accurately, unbalanced tightening will cause excessive stress on the bolts. Make sure that valve flanges and pipe flanges are coupled with correct alignment
- 3.6 Tighten the bolts evenly and alternately on the tangential line. The ends of all tightened bolts should protrude equally beyond the nuts.
- 3.7 After mounting the valve, be sure to recheck all bolts and nuts of the coupled flanges and tighten them, if found loose.
- 3.8 Finally, the valve and pipe interior should be flushed to remove foreign objects, which may later cause fluid leakage. In fact, on plant commissioning, leakages are rather frequently detected due to the foreign objects getting stuck around valve seats because of incomplete flushing of the pipes and valve bores.
- 3.9 Then, straightness of pipelines and flange faces should be assured to avoid the piping stress unevenly loaded on the valve.
- 3.10 Make sure that the stress of the pipeline is not concentrated on the valves.
- 3.11 For valves mounted at the end of a pipeline, installation of a drain discharge device is recommended.



#### 4. VALVE OPERATION

- 4.1 Rotation of the valve stem by 90° fully opens or closes ball valves. To close a valve, turn the operating handle clockwise according to the letter, symbol or mark indicating operational direction. Counter-clockwise turn of the handle will open the valve. Valve operation usually needs lower torque when it is half opened, and higher torque when fully opened or closed.
- 4.1.1 In new valves or when the gland packing of old valves is replaced, the lever torque may be found to be relatively high, due to the new packing rings. This however, will reduce after the valves have been operated several times.
- 4.1.2 The lever operating torque also depends on the type and size of each valve, and its opening position. Note that the operating torque is extremely high when a fully closed valve is opened, or when the ball comes close to the extremity of its travel to the fully closed position.
- 4.1.3 Special tools such as levers or wrenches provided with pipe extension should not be used to turn levers, as it may damage the stems and balls of valves. Manual gears or valve actuators are recommended for easier operation of larger size valves.
- 4.2 By observing the position indicator of the valve or the actuator, make sure that the valve is always fully opened or closed. Ball valves are not recommended for controlling volume of fluid. Their main purpose is to completely free or shut the fluid in the pipeline. Leaving ball valves to half open or close position may damage ball seats and cause fluid leakage
- 4.3 On valve commissioning, be sure to detect fluid leakage from the gland area, pipe flange gaskets or threaded area of the valve.
- 4.3.1 Leakage through gland packings may be stopped by tightening the gland bolts or handle nut.
- The gland bolts should be tightened not too much, because excessive tightening may affect resiliency and, after all, sealing performance of packings. If tightening the gland as above cannot stop fluid leakage, replace gland packings.
- 4.3.2 To solve leakage problem through the flange gasket, retighten all related flange boltings evenly and alternately on the tangential line. If retightening bolts cannot solve the problem, replace flange gasket.
- 4.3.3 In case of leakage through the drain plug or other threaded areas, retighten the relevant threads securely, or replace the relevant parts when retightening cannot solve the problem.



4.

**SERVICING LIQUID WITH HIGH VELOCITY**

When ball valves are operated very frequently to service liquid with very high velocity, it is recommended to ask the manufacturer for appropriate advice to minimize the possible problem of seat deformation, particularly when they are highly pressurized under high temperature.

5. **PRECAUTIONS FOR TROUBLE FREE OPERATION**

5.1 For safe operation of valves, daily inspection is very important. The following are main items required for daily inspection:

- a) Correct indication of valve opening or closing position by the position indicator.
- b) Contamination of valve drive mechanism such as dust, sand and other foreign objects.
- c) Tightness of threading of handle nuts and gland bolts.
- d) Leakage from the gland area.
- e) Leakage from the flange connection.
- f) Leakage from the drain plug and other threaded area.
- g) Leakage through the valve body surface.
- h) Generation of abnormal noises from the valve interior.
- i) Vibration of pipelines transferred to valves.

5.2 In case of detecting any of the above problems, remedial measures must be taken immediately as follows:

- a) Adjust the incorrect indication of valve indicator for its indication.
- b) Clean the contaminated valve drive mechanism such as dust, sand and other foreign objects with an adequate cleaning agent.
- c) Retighten loosened boltings of handle nuts and gland bolts evenly and securely.
- d) Refer to section 4.3 to remedy the leakage from the gland area, flange connection or threaded area.



- e) Ask a valve repair specialist to remedy the leakage through the valve body surface.
- f) Ask a piping engineer to remedy noises from the valve interior or vibration of the pipeline.

### 5.3

#### **Excessive cavity pressure**

When fluid temperatures or ambient temperatures rise very high, thermal expansion of the fluid left in the body cavity of the ball valve will also increase the pressure of the cavity extraordinarily. This sometimes increases excessively and causes deformation of the sealing materials or the ball, unless the valve is designed with adequate provision for cavity relief. Excess cavity pressure may occur in the following conditions:

- a) When temperatures rise by more than 30 degrees, while valves are left unoperated.
- b) When valves are operated less frequently than the frequency of temperature changes.
- c) When the differential pressure between the upstream and downstream side of the fully closed valve is lower than the nominal pressure level of the valve.

### 5.4

#### **Extremely High Temperature and/or High Pressure**

The pressure-temperature ratings publicised by each manufacturer is usually considered fairly appropriate to guide you to the maximum of the temperature and/or pressure that your ball valves may withstand. Our recommendation, however, is to consult the manufacturer for an assured advice to protect your valve from deformation or damage of the sealing materials, when they are subjected to the following conditions:

- a) Floating ball valves are left closed for long period of service under extremely high temperature and/or high pressure.
- b) Floating ball valves are operated very frequently for a long period of service under extremely high temperature and/or high pressure.



6 **VALVE INSPECTION AND MAINTENANCE**

- 6.1 Inspection should be made periodically to detect wear or corrosion of the ball and stem, corrosion of the body insert and wear of the threads. Usually, gland packings, gaskets, ball seats, thrust washers and stem bearings shall be replaced after periodic inspections. Do not forget to maintain a sufficient quantity of such spare parts at all times.
- 6.2 Before disassembly of valves, be sure to follow the preliminary procedures below:
  - 6.2.1 Before dismantling valves from the pipeline, mark the valve end flanges and coupled pipe flanges adequately with their original positions of coupling each other, to avoid confusion or mistake on subsequent remounting of valves.
  - 6.2.2 Give identification marks on the valve body and the end piece of the valve for easy coupling on subsequent valve reassembly.
  - 6.2.3 If boltings of flanges are found seized or stuck to each other, apply some lubricant and leave it for a while for easier unthreading.
  - 6.2.4 Even after the live fluid has been discharged through the pipeline, some fluid is always trapped inside the body and body cavity (the room surrounded by the body, ball and two seats). Be sure to completely discharge the pressure trapped in the body cavity.



6.3

**Disassembly of valves; size ½” to 3” (Fig. 1)**

- a) Remove the handle nut and/or circlip (No.18) and then the handle (No.17)
- b) Separate the body cap (No. 2) from the body (No. 1) by unthreading flange bolting (No. 15).
- c) Remove the ball (No. 4) from the stem (No. 3).
- d) Remove the gland nut (No. 18), the bevelled washers (No.7) and the gland (No.
- e) Push the stem (No. 3) from the exterior into the valve interior to remove it from the body.
- f) Remove the gland packing (No. 8) from the body to complete disassembly of valves, size ½” to 3”.

6.4

**Disassembly of valves; size ½” to 3” (Fig. 1)**

- a) Remove the snap ring (No. 18) and handle (No. 17).
- b) Separate the body cap (No. 2) from the body (No. 1) by unthreading flange bolting (No. 15).
- c) Remove the ball (No. 4) from the stem (No.3).
- d) Disassemble the indicator/stopper (No. 16).
- e) Remove the gland (No. 6) and gland flange (No. 7) by unthreading gland bolts (No. 12).
- f) Remove the stem (No. 3) from the body (No. 1).
- g) Remove the gland packing (No. 8), body gasket (No. 14), ball seats (No. 5) to complete disassembly of valves 4” to 10”.





6.5

**EXAMINATION OF VALVE COMPONENTS**

- 6.5.1 Soiled valve interior should be cleaned by either adequate means of water, steam, acid or oil before examination. Examine the invisible internal area with a tube inspector or a small mirror and a flashlight. Liquid penetrant examination or radiographic inspection shall be also be performed if found necessary.
- 6.5.2 Worn or corroded area or part shall be carefully examined visually or, if necessary, with a magnifying glass. The wear or corrosion taking place in the limited area of the valve body is extremely dangerous as it may develop fears of leakage rather quickly. Cracks should be also carefully detected.
- 6.5.3 Wall thickness should be periodically measured for recording undesired variation which may happen through the passage of time.

6.6

Valve should be assembled in the following sequence after all the component parts have been cleaned and new spare parts of gland packings, gaskets, ball seats, thrust washers, and stem bearings have been prepared. Be sure to remove rusts and other soils out of the seat retaining area of the body to have satisfactory sealing performance.

Also apply rust preventative to the inner surface of the body, including stem holes.

6.7 **Re-assembly of valves: Size ½” to 3” (Fig. 1)**

- a) Mount a ball seat (No. 5) on the body.
- b) Assemble the stem (No. 3) and insert it from the valve body interior into the stem hole.
- c) Mount the gland packing (No. 8) and the gland (No. 6) on the stem and secure it tight with the gland nut (No. 18).
- d) Assemble the ball (No. 4) on the stem (No. 3). Apply a little lubricant on the ball seat.
- e) Mount the gasket (No. 14) on the gasket face of the body.
- f) Assemble another ball seat (No.5) with the cap (No.2) and apply a little lubricant.
- g) Align cap to body and tighten body bolting in sequential order so as not to put too much stress on any one stud/nut.
- h) Thread the handle nut (No. 18) to securely load the gland packings (No. 8) into the packing chamber.
- i) Assemble the handle (No. 17) firmly with the handle nut and/or circlip (No. 18), according to the position indicator.



**6.8 Re-assembly of valves: size 4" to 10" (Fig.2)**

- a) Mount a ball seat (No. 5) on the body
- b) Assemble the stem and insert it from the valve body interior into the stem hole./
- c) Mount the gland packing (No.8) on the stem. V-type packings should be carefully handled so that their lips may not be damaged.
- d) Assemble the gland flange (No.7) with the gland (No.6) and mount it on the stem (No.3) and tighten it tight with the gland bolts (No.12).
- e) Mount the stopper (No.16) on the stem and secure it with the snap ring (No.18). Take care so that the stopper is mounted properly for correct indication of the valve opening position. Valves should be opened or closed when the stem is rotated counter-clockwise or clockwise respectively.
- f) Mount the ball (No.4) on the stem. Apply a little lubricant on the ball seat.
- g) Mount the gaskets (No.14) on the gasket face of the body.
- h) Mount another ball seat (No.5) on the body cap (No.2) and apply a little lubricant.
- i) Align cap to body and tighten bolting in sequential order, so as to put too much stress on any one stud/nut.
- j) Tighten the gland bolts (No.12) evenly and mount the handle on the stem. Confirm again that position indicator indicates the correct position of the valve operation to finish re-assembly of the valve.

**7. ACCEPTANCE TEST**

All valves, after re-assembly, should be subjected to a shell test at the required test pressure, and then a pneumatic seat test at the pressure of 6 bar to insure the valve performance for final acceptance.



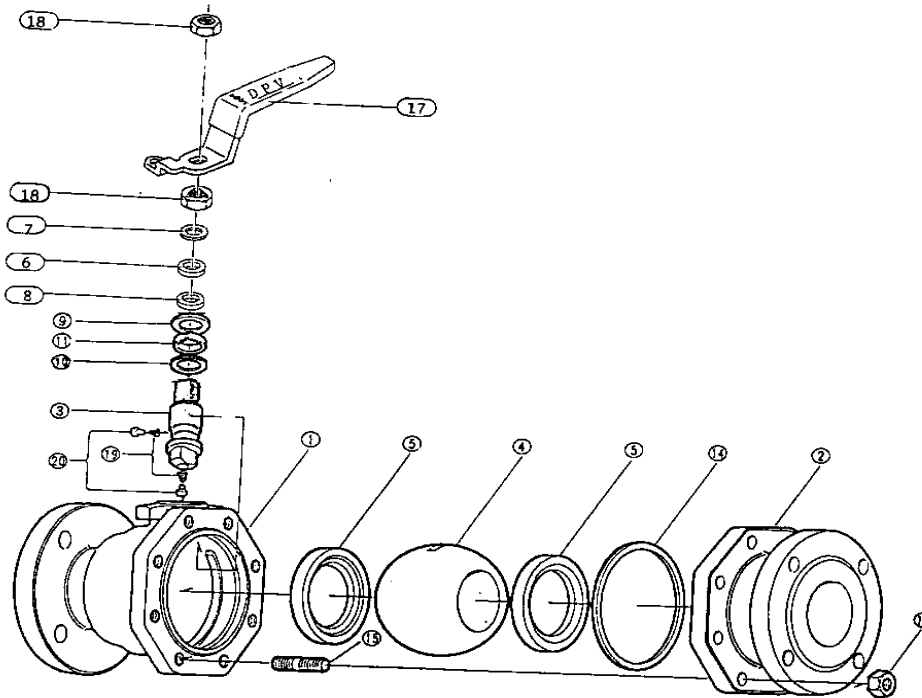
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- |             |                    |               |
|-------------|--------------------|---------------|
| 1. Body     | 7. Bevelled Washer | 14. Gasket    |
| 2. Body Cap | 8. Gland Packing   | 15. Bolt/Nut  |
| 3. Stem     | 9. Packing Washer  | 17. Handle    |
| 4. Ball     | 10. Thrust Washer  | 18. Snap Ring |
| 5. Seat     | 11. Stem Bearing   | 19. Spring    |
| 6. Gland    | 13. Gland Bush     | 20. Pin       |

Fig. 1



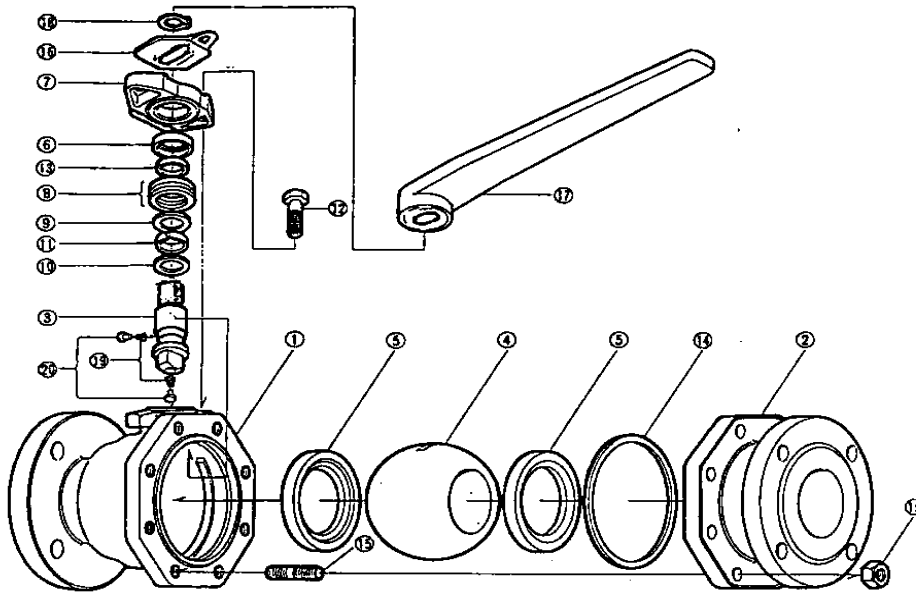
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- |             |                   |                       |
|-------------|-------------------|-----------------------|
| 1. Body     | 7. Gland Flange   | 14. Gasket            |
| 2. Body Cap | 8. Gland Packing  | 15. Bolt/Nut          |
| 3. Stem     | 9. Packing Washer | 16. Indicator/Stopper |
| 4. Ball     | 10. Thrust Washer | 17. Handle            |
| 5. Seat     | 11. Stem Bearing  | 18. Snap Ring         |
| 6. Gland    | 12. Gland Bolt    | 19. Spring            |
|             | 13. Gland Bush    | 20. Pin               |

Fig. 2