

Direct Mount 4-Seated 3-Way Flanged Ball Valve

Series MM1F

Installation, Operation,
& Maintenance Manual

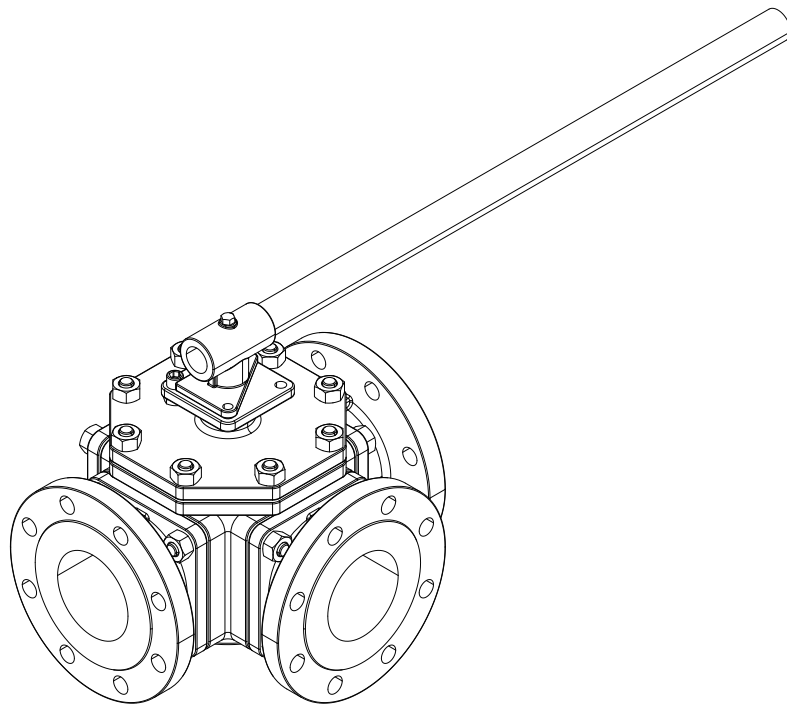


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Chapter I

Introduction

This manual is provided to ensure proper installation, operation, and maintenance for Series MM1F Direct Mount 4-Seated 3-Way Flanged Ball Valves, manufactured and supplied by Sesto Valves. Each valve can be identified by a marking on the body, a name plate, or both.

1.1 Contact Information

For information concerning warranties, or for questions pertaining to installation, operation or maintenance of Sesto Valves products, contact:

Sesto Valves.
114 Resource Drive
Wentzville, MO 63385
United States

Phone: +1-636-856-8576
Fax: +1-636-856-8930
Email: sales@sestovalves.com

To order replacement parts, contact Sesto Valves using the information listed above.

1.2 General Notes

The following instructions refer to Series MM1F Direct Mount 4-Seated 3-Way Flanged Ball Valve as described in the Sesto Valves current catalog.

Keep the protective covers in place until the valve is ready for installation. Valve performance depends upon prevention of damage to ball surface. After removing the cover, make sure that the valve is completely open and free of obstructions, dirt, particles, or any materials that may cause seat or seal damage.

Valves may contain a silicon-based lubricant for transportation, which aids in the assembly of the valve. Lubricant may be removed with a solvent if found objectionable. Alternatively, valves can be ordered free of lubricants upon request.

Certain ferrous valves contain phosphate material and are oil dipped during the manufacturing process. However, the processes used are completely non-toxic.

1.3 Precautions and Warnings

Carefully review application criteria before selecting valve materials. The user should be aware of the operating conditions, fluid properties, and the potential outcomes of implementing valves into their pipeline system. Sesto Valves suggests that the user be prepared with this information before submitting an inquiry.

Fluids can experience property changes under a variety of conditions, especially when left inside the sealed cavity. Failure may occur when temperature and pressure exceed the valves operational capacity. Users should be aware of that excessive pressure and temperature at nearby pipeline system can also cause valve failure as well.

The Series MM1F Direct Mount 4-Seated Flanged 3-Way Ball Valves are generally not recommend for throttling services as this can deform the resilient ball seats and cause leakage issues. Additionally, high fluid velocity or the presence of solid particles in suspension will further reduce seat life in throttling applications.

Do not attempt to remove the bonnet from the body during operation, especially with the presence of high pressure in the pipeline system.

For safety, unstable fluid should not be used in the pipeline system, unless otherwise specified with the category III in Declaration of conformation.

CAUTION:

Before removing valve from pipeline, operator should be aware of that: media flowing through the valve may be corrosive, toxic, flammable, or of a contaminant nature. Where there is evidence of harmful fluids having flowed through the valve, the utmost care must be taken. It is suggested that the following safety precautions should be taken when handling valves.

- 1) Always wear eye shields.
- 2) Always wear gloves and footwear.
- 3) Wear protective headgear.
- 4) Ensure that running water is readily accessible.
- 5) Fire extinguisher must be obtainable if media is flammable.

Check the line gauge to ensure that no pressure is present at the valve. Slowly operate the valve to the half OPEN position and check that the media has completely exited the valve. The valve should be decontaminated at this point.

These valves, when installed, have body connections which form an integral part of the pipeline. The valve cannot be removed from the pipeline without being dismantled.

1.4 Storage

If the valves will not be immediately installed, it is preferable to store them indoors and in a clean dry place. The valve ports should be sealed by plastic caps to prevent dirt from entering and damaging interior parts.

Note:

For any 3-way ball valve, do not keep the ball in a partially open position for an extended period of time. This could cause seat leakage issues.

Chapter II Installation

Flush the pipe line carefully before installing the valve. Dirt, welding, or other debris particles may damage the balls sealing surface and seats. Before installation, check all valve and mating flanges to ensure gasket surfaces are free from defects.

⚠ CAUTION:

Do not exceed the valve performance limitations.

⚠ CAUTION:

Before installing, make sure the line pressure has been relieved and any hazardous fluids have been drained or purged from the system.

2.1 General Notes

1) Direction

User must define the preferred mounting orientation with respect to the system pressure. The marking on the top of stem and handle help to identify the upstream side (high pressure) and downstream side (low pressure).

Note:

The pattern and flow direction of the ball will be marked on the top of valve stem. The marking on the handle is ONLY for initial reference when receiving the goods. The user may change the installation of the handle, and invalidate the markings on the handle, resulting in erroneous flow control.

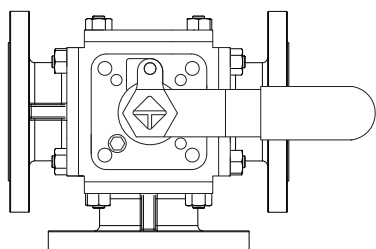


Figure 2.1.2 The T-Port marking on the top of stem and initial installation of handle.

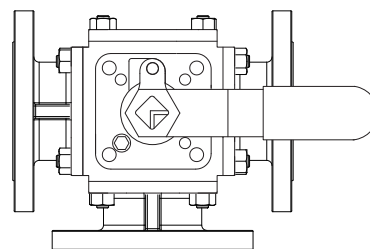


Figure 2.1.1 The L-Port marking on the top of stem and initial installation of handle.

2) Position

The body, cap and gasket are in the connection area of ball valve and pipeline. The bear weight ability and gradient are very important to the pipe installation. Do not allow the pressure and stress from the pipeline to concentrate on the connecting area of the body and cap. Otherwise, the ball, seat, and stem could be damaged, deformed, and leak.

Note:

When trying to balance the forces on the valve seat, Sesto Valves recommends installing 3-way ball valves horizontally for sizes under 3" (DN80). This should maximize the sealing capability and reduce accumulation of particles.

3) Fittings

Select the correct fitting sizes according to the pipeline specifications and mate the valve to the pipeline adequately with appropriate bolts. Do not attempt to correct pipeline misalignment using the flanged bolting.

Note:

Over tightening of any side may cause leakage.

4) Systems hydrostatic test

Before delivery, valves are tested in the OPEN position to 1.5 times the allowable pressure under ambient conditions. However, after installation, the piping system may need to be re-tested, if possible, to ensure the application conditions do not exceed the tolerable pressure of the valve.

5) Pre-Installation Wash

Before installing the valve, clean the pipelines of the system to remove any foreign deposits. Clean the connecting flanged end surfaces as well to ensure a tight and uncompressed seal.

2.2 Installation of Flanged Ends

1. Before installing the valves, make sure the flanges and the pipe are free from grit, dirt or burrs.
2. The flanges must be aligned in parallel at the correct distance to allow the valves face-to-face length and gaskets to fit between the gap.

3. Tighten the flange bolts in a crossover pattern. The gasket type, bolts, flange, and lubricant affect the tightening torque values so it is important to review this information first.
4. Note that the bolts must be tightened in uniform order to create a parallel movement of the two flanges therefore a uniform deformation of the gasket in between them.
5. Before pressure testing the valves, bring them to the half OPEN position to ensure pressure reaches the stem seals and to avoid unnecessary loading of the seats. Fail-CLOSE actuated valves should be brought to the half-OPEN position as well.

NOTE:

Do not fasten supports to the flange bolting or the actuator.

2.3 Pneumatic and Electrical Connections

When installing the actuator, make sure that the valve-actuator combination functions properly. The flow direction is indicated by a slit at the top of valve stem. See Figure 2.2.

If possible, install the valve so that the actuator can be disconnected without removing the valve from the piping.

Please refer to the appropriate instruction manuals when installing automation packages using an actuator, positioner, filter/regulator, solenoid, and/or limit switch.

When making pneumatic connections, it is recommended to use PTFE tape or paste on threaded joints, unless otherwise specified by the components instruction manual. The pneumatic supply, such as dry air or nitrogen, should be clean. When making electrical connections, wiring of components should be in accordance with any and all applicable local and national codes and standards.

Before installing the actuator, use an adjustable wrench to manually rotate the valve stem several times. This rotation breaks the torque that may have built up during long-term storage.

Chapter III Operation

To change the flow pattern of the valve, turn the handle 90 degrees ($\frac{1}{4}$ turn). The default connection between the flow path and handle are shown in Figure 3.1. **Please note that the change of stop pin and handle installation makes various flow control.**

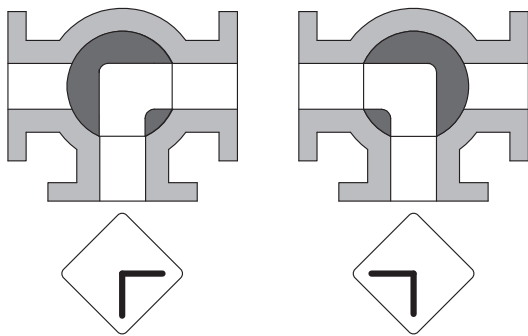
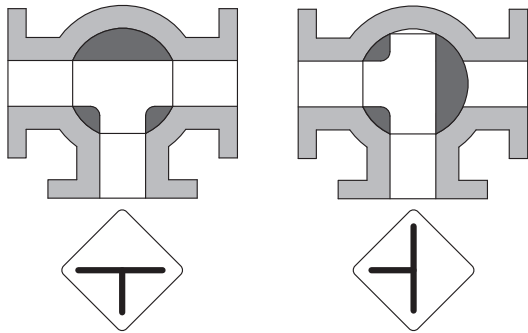


Figure 2.2 Top view of the valve: when the actuator is installed, the flow direction can be identified by the slit on the stem top.

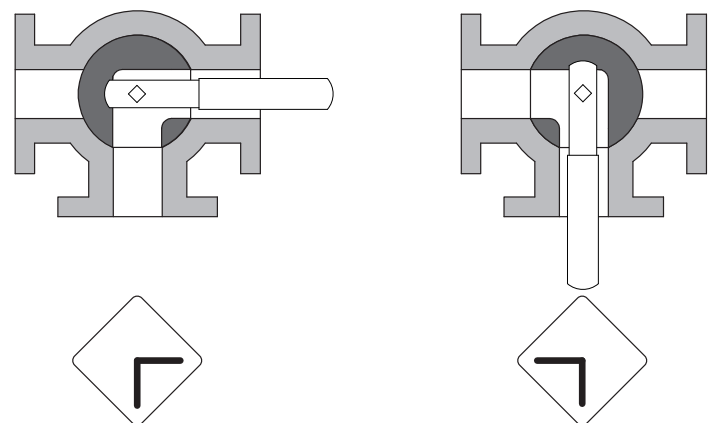
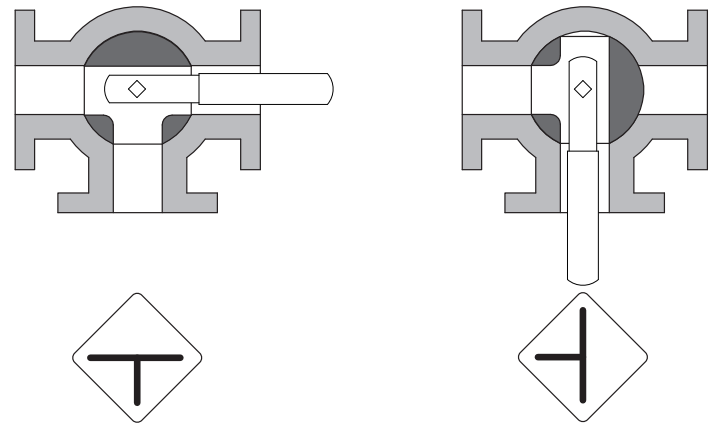


Figure 3.1 Default connection between the flow path and handle

Note:

Please correct the flow pattern on the handle when changing the connection between the handle and the stop pin. Wrong markings may lead to operational error and cause system damage.

CAUTION:

After installing the handle, operate the valve to ensure it is stable and working properly. Improper handle installation and forcible operation may result in damage or injury.

3.1 Handling

Lift small individual valves by the body during installation. When using a cable or other overhead lifting device make sure it is strong enough to safely handle the weight and follow strict procedure. Never lift the automation package by the actuator, positioner, limit switch, or piping. Always lift or secure straps/cables to the valve body during installation. Follow these steps to prevent valve damage or human injury.

3.2 Cleaning

No matter the circumstance, the operator must check for any foreign body or dust particles inside the bore. If anything is present, clean the valve before installation using water, compressed air, or steam. However, valve automation packages shall be cleaned only with water or steam. Using compressed air to clean the valve automation devices is strictly prohibited. To clean, place the valve bore perpendicular to the ground and clean until all debris has been removed from the bore. Then check and clean the bores on all of the connecting pipes and connection areas. To avoid the blocking and leakage, no flush, rust, or foreign bodies are allowed within the bore.

3.3 Manual Operation

Sesto Valves Series MM1F Direct Mount 4-Seated 3-Way Flanged Ball Valves have 90 degree ($\frac{1}{4}$ turn) operation in a counter-clockwise direction to divert the flow.

CAUTION:

Do not use the valves at a partially OPEN position. Using partially opened valves may lead to seat deformation and leakage.

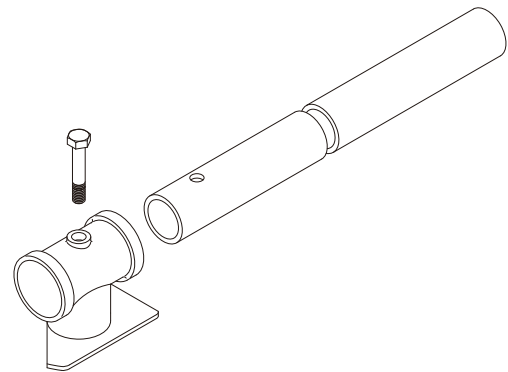


Figure 3.2 HANDLE HEAD BOLT

3.4 Remote Operation

Where manual operation is not required, valves may be automated for remote operation, instrument controls etc. Sesto Valves offers a wide range of pneumatic and electric actuators for different working conditions.

When automated with an actuator, no travel stop plate is installed since this is controlled by the actuator. Operation will be in accordance with Sesto Valves Installation, Operation and Maintenance Instructions for the relevant actuator.

CAUTION:

Keep hands, other parts of the body, tools and other objects out of the open flow port. Do not leave any foreign object inside the pipeline. When the valve is actuated, the ball segment acts as a cutting device. Failure to use caution may result in damage or personal injury.

3.5 Technical Data

Table 3.1 Break Torque at room temp

Please refer to the data sheet of MM1F on Sesto Valves' official website.

3.6 Limitation of Flow Direction

For Series MM1F 3-way ball valves, sizes under 2-1/2" (DN65) are suitable for switching, dividing, or mixing fluids instead of blocking due to their floating ball design. There is a limitation to the differential pressure between the pressure in central port (P1) and side port (P2). See the below figures to avoid flow operations that might cause leakages.

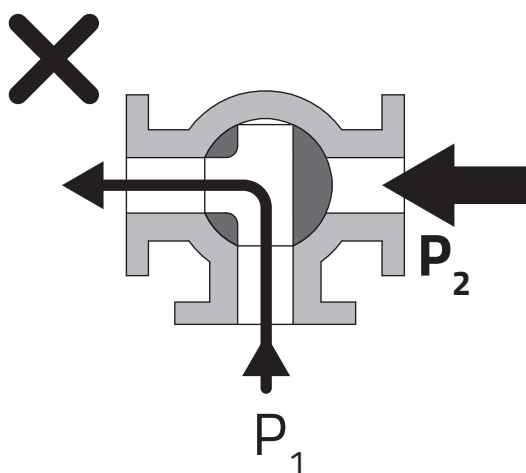


Figure 2.3.1
For a T-Port 3-Way Ball Valve,
when $P_2 > P_1$, leakage from
Port 2 to Port 1 may occur.

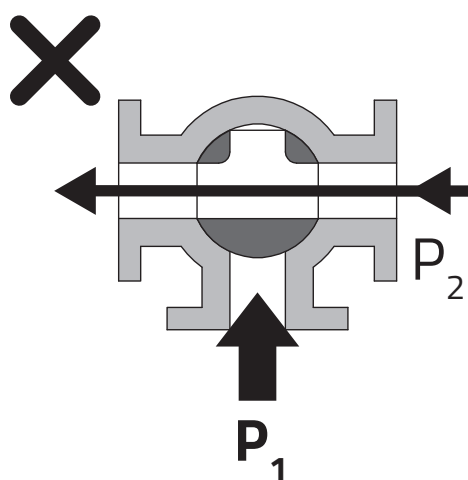


Figure 2.3.2
For a T-Port 3-Way Ball Valve,
when $P_1 > P_2$, leakage from
Port 1 to Port 2 may occur.

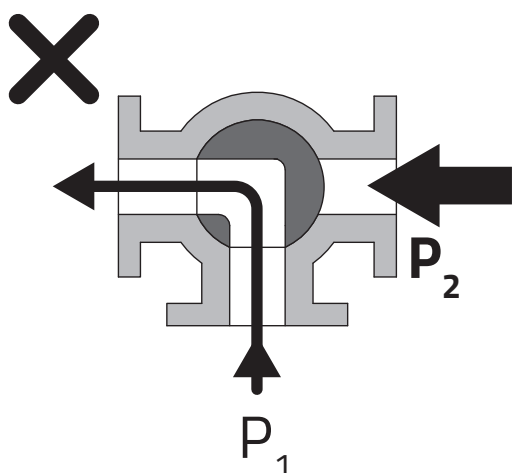


Figure 2.3.3
For an L-Port 3-Way Ball Valve,
when $P_2 > P_1$, leakage from
Port 2 to Port 1 may occur.

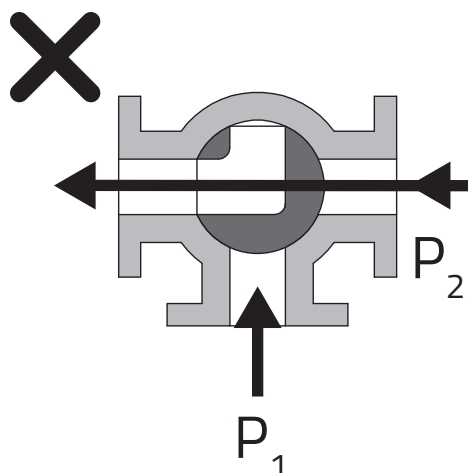


Figure 2.3.4
For an L-Port 3-Way Ball Valve,
Whether it is $P_2 > P_1$ or $P_1 > P_2$, Port 1
and Port 2 may leak into each other.

Chapter IV: Maintenance

⚠ CAUTION:

Do not dismantle the valve or remove it from the pipeline while the valve is pressurized.

4.1 General Notes

Sesto Valves valves can have a long lifetime with little required maintenance. They may be refurbished using a minimal number of components, none of which require machining. The valves are designed for easy service and assembly in the field.

Before performing maintenance, the user should check on the availability of Series MM1F Ball Valve repair kits. We strongly recommend using the genuine repair kit produced directly from the manufacture facility. For more information, please contact your Sesto Valves representatives. Repair kits may be available locally; however, Sesto Valves is not responsible for any of the valve damage caused by using non-genuine spare parts.

4.2 Maintenance Frequency

The maintenance frequency is determined by the application of the valve. Users should consider the following factors when determining a suitable maintenance schedule: fluid type, flow velocity, operation frequency, pressure, and temperature.

Note:

For the Series MM1F Direct Mount 4-Seated 3-Way Flanged Ball Valve, Sesto Valves recommends inspecting the valve once per year.

Note:

Please use genuine spare parts to ensure the valve functions well.

Note:

When sending back the valve to Sesto Valves for investigation, do not disassemble it. Clean the valve carefully and flush the valve internals. If possible, inform us of the service conditions.

4.3 Disassembly

⚠ CAUTION:

Pipeline and valve must be depressurized by shutting off the valve and bleed line, cycle the valve once and leave it half OPEN to relieve the pressure from the body cavity.

Note:

Series M4F(a) Direct Mount 4-Seated 3-Way Flanged Ball Valve according to the size, it can be divided into "floating ball with integral top cap design" and "trunnion ball with separated top cap design". The user must confirm the design form when disassembling or assembling to avoid unnecessary fails. Please see figures in Page 12 to Page 14.

Before attempting to remove the valve from the pipeline, please cycle the valve with the line pressure completely released to ensure that the valve cavity is under no pressure.

1) For sizes 1/2" to 2" (DN15 to DN50)

1. Remove the HANDLE NUT (15), HANDLE (16), LOCKING PLATE (14), HANDLE WASHER (13), and LOCK SADDLE (12).
2. Loosen the STEM NUT (11).
3. Remove all CAP BOLTS (22) and END CAPS (2).
4. Remove and discard the BALL SEATS (4) and CAP GASKETS (5).
5. Support the BALL (3) to prevent it from falling out of the BODY (1).
6. Remove the BALL (3) from the BODY (1) and place it in a clean and safe area for reuse.
7. Push the valve STEM (7) down from the BODY (1) and then remove it.
8. Remove the STEM NUT (11), BELLEVILLE WASHER (10), GLAND (9), and STEM PACKINGS (8) from the stuffing box. Then remove the O-RING (20) and THRUST WASHER (6) from the STEM (7).
9. Taking care not to scratch the inside surface of stuffing box and surface of the STEM (7). Clean the valve STEM (7) and stem hole area.

2) For sizes 2-1/2" to 4" (DN65 to DN100)

1. Remove the HANDLE HEAD (12).
2. Remove all CAP NUTS (18) and END CAPS (2).

3. Remove and discard the BALL SEATS (5) and CAP GASKETS (6).
4. Remove all BONNET NUTS (18). Push the stem of the TRUNNION BALL (3) down from the TOP BONNET (20) and leave the TRUNNION BALL (3) in the BODY (1). Finally, remove the TOP BONNET (20) with the stem set and TOP BONNET GASKET (21).
5. Remove the TRUNNION BALL (3) and BALL BUSHING (4) out of Body (1) and place them in a clean and safe area for reuse.
6. Remove the GLAND PLATE (11), BELLEVILLE WASHER (10) and GLAND (9).
7. Remove STEM PACKINGS (8) and remove the O-RING (7) from stuffing box.
8. Taking care not to scratch the inside surface of stuffing box and surface of stem of TRUNNION BALL (3). Clean the TRUNNION BALL (3) and stem hole area.

3) For SIZE from DN125 to DN200 (5" to 8")

1. Remove the HANDLE HEAD (12). The WASHER (24) and STOP PLATE (23) can also be removed.
2. Remove all CAP NUTS (18) and END CAPS (2).
3. Remove and discard the BALL SEATS (5) and CAP GASKETS (6).
4. Remove all BONNET NUTS (18). Push the stem of the TRUNNION BALL (3) down from the TOP BONNET (20), and leave the TRUNNION BALL (3) in the BODY (1). Finally remove the TOP BONNET (20) with the stem set and TOP BONNET GASKET (21).
5. Remove the TRUNNION BALL (3) and BALL BUSHING (4) out of Body (1) and place them in a clean and safe area for reuse.
6. Remove the GLAND BOLTS (22) and GLAND (11).
7. Remove STEM PACKINGS (8) from stuffing box and remove the O-RING (7) from the stem of TRUNNION BALL (3).
8. Taking care not to scratch the inside surface of stuffing box and surface of stem of TRUNNION BALL (3). Clean the TRUNNION BALL (3) and stem hole area.

Note:

Damaged internals to be replaced using Sesto Valves repair kits only.

4.4 Reassembly

Before reassembly, inspect the valve for any damage on body and all internals.

1) For sizes 1/2" to 2" (DN15 to DN50)

1. Lubricate the STEM (7), O-RING (20), and THRUST WASHER (6) with appropriate lubricant.
2. Place the THRUST WASHER (6) and O-RING (20) on the STEM (7).
3. Insert the BLANK CAP (23) into the valve BODY (1) together with the BALL SEAT (4) and CAP GASKETS (5). Tighten CAP BOLTS (22) using a diagonal sequence.
4. Insert the STEM (7) horizontally into the bottom side of stuffing box and carefully guide it up through the stem bore.
5. Place the BALL (3) into the center BODY (1), according to the flow pattern, until the stem tongue is engaged.
6. Insert the END CAP (2) opposite to the BLANK CAP (23) into the valve BODY (1) with the BALL SEAT (4) and CAP GASKETS (5). Tighten CAP BOLTS (22) using a diagonal sequence.
7. Insert other END CAPS (2) into the valve BODY (1) with the BALL SEAT (4) and CAP GASKETS (5). Tighten CAP BOLTS (22) using a diagonal sequence.
8. Insert the STEM PACKINGS (8) over the STEM (7) and into the stem bore. Insert the GLAND (9) and BELLEVILLE WASHER (10). Then tighten the STEM NUT (11).
9. Insert the LOCK SADDLE (12), HANDLE WASHER (13), LOCKING PLATE (14), and HANDLE (16). Then then tighten the HANDLE NUT (15).
10. Ensure smooth operation of valve during opening and closing.

2) For sizes 2-1/2" to 4" (DN65 to DN100)

1. Lubricate the stem of the TRUNNION BALL (3) and O-RING (7) with appropriate lubricant.
2. Insert the BALL BUSHING (4) on the bottom hole of the BODY (1). Place the bottom TRUNNION

BALL (3) into the center BODY (1). Aligning it to the BALL BUSHING (4). Then reinsert the TOP BONNET (20) and TOP BONNET GASKET (21).

3. Tighten BONNET NUTS (18) on the TOP BONNET (20) using a diagonal sequence.
4. Insert the BLANK CAP (16) and END CAPS (2) into the valve BODY (1) with the BALL SEATS (5) and CAP GASKETS (6). Tighten the CAP NUTS (18) using a diagonal sequence.
5. Insert the O-RING (7), STEM PACKINGS (8), GLAND (9), and BELLEVILLE WASHER (10) over the stem and into its bore. Tighten the GLAND PLATE (11) onto the TOP BONNET (20). Check if the stem set is fixed with the TOP BONNET (20).
6. Adjust the stem orientation to the flow pattern.
7. Insert the HANDLE HEAD (12) and tighten the HANDLE BOLT (14) to fix it in place.
8. Ensure smooth operation of valve during opening and closing.

3) For sizes 5" to 8" (DN125 to DN200)

1. Lubricate the stem of the TRUNNION BALL (3), O-RING (7) with appropriate lubricant. Place the O-RING (20) on the stem.
2. Put the BALL BUSHING (4) on the bottom hole of the BODY (1) inside. Place the bottom TRUNNION BALL (3) into the center BODY (1), aligning it with the BALL BUSHING (4). Then reinstall the TOP BONNET (20) and TOP BONNET GASKET (21).
3. Tighten the BONNET NUTS (18) on the TOP BONNET (20) using a diagonal sequence.
4. Insert the BLANK CAP (16) and END CAPS (2) into the valve BODY (1). Then insert the BALL SEATS (5) and CAP GASKETS (6). Tighten the CAP NUTS (18) using a diagonal sequence.
5. Insert the STEM PACKINGS (8) and GLAND (11), over the stem and into its bore. Tighten the GLAND BOLTS (22) onto the GLAND (11) and TOP BONNET (20). Check if the stem set is fixed with the TOP BONNET (20).
6. Adjust the stem orientation to the flow pattern.
7. Insert the STOP PLATE (23), WASHER (24), HANDLE HEAD (12), and HANDLE (15).
8. Ensure smooth operation of valve during

opening and closing.

4.5 Troubleshooting

Use table 4.1 to diagnose possible malfunctions.

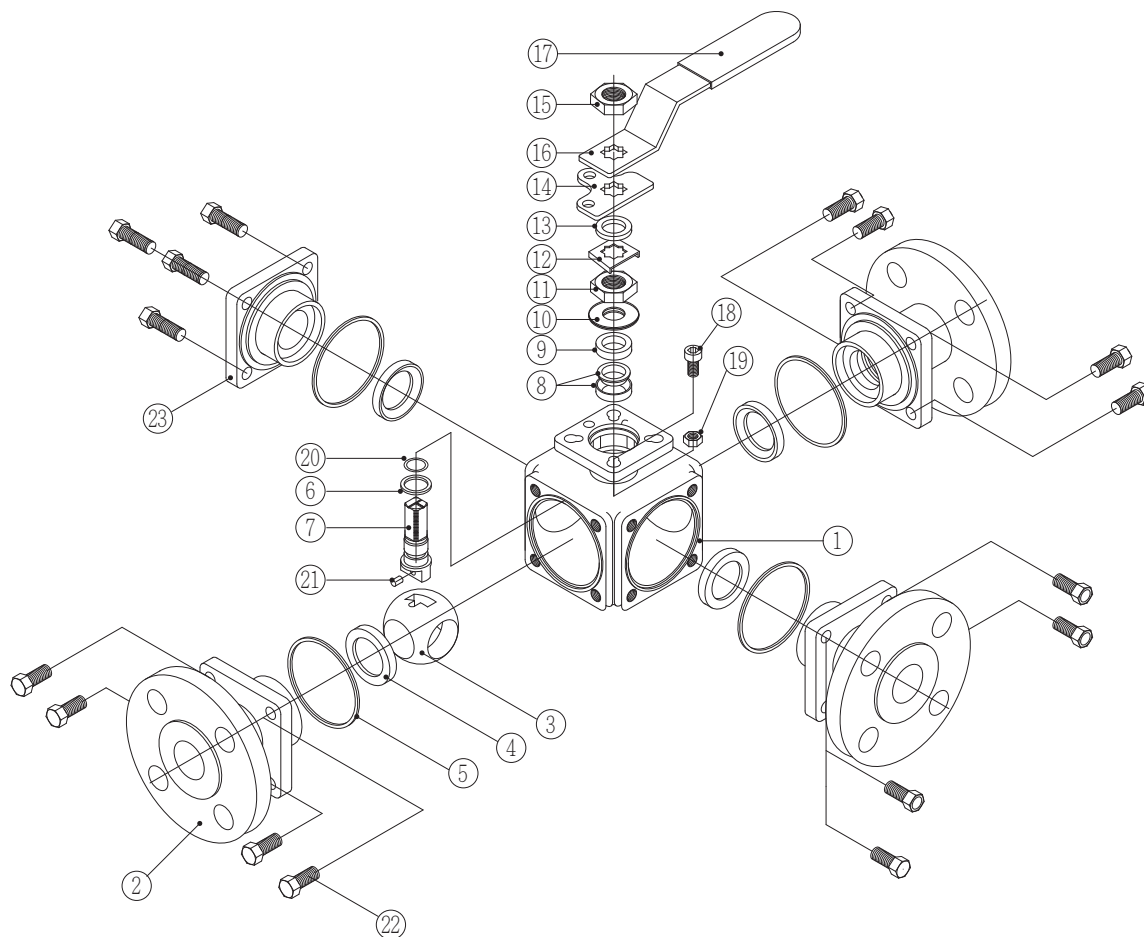
Table 4.1 Troubleshooting Table

Symptom	Possible fault	Actions
Leakage through a closed Valve (Internal Leakage)	Damaged ball surface	Replace the ball
	Damaged seats	Replace seats
	Ball might not be fully closed	Realign the ball
Irregular ball movement	Fluid accumulated on the surface.	Flush the ball from inside
	Ball or seat damaged	Clean or replace the ball or seat
Leaking from stem (External Leakage)	Stem nut are loosened	Tighten the stem nuts
	Parts are worn or damaged	Replace the necessary parts
Valve leaking from body and cap joint (External Leakage)	Damaged or breakage of gasket	Replace gaskets
	Relaxation of studs due to gasket creep	Re-tighten the studs evenly
Valve too hard to operate	Damaged seats	Replace seats
	High pressure	Confirm the pressure rating
	Foreign particles in valve	Clean the internals

4.6 Technical Data and Product Information

MM1F: 1/2"~2" (DN15~DN50)

Floating ball with integral top cap design



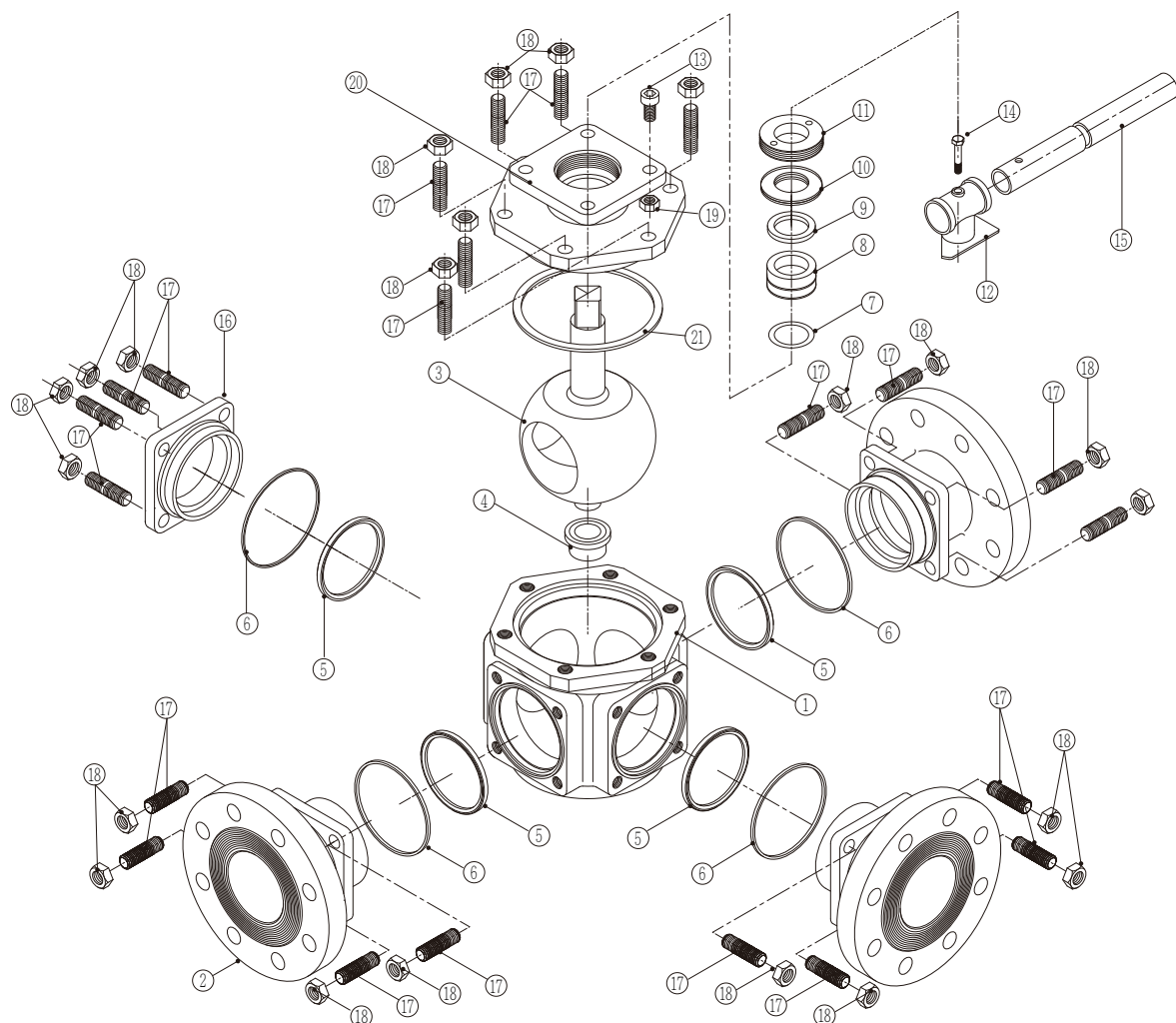
NO	PART NAME	MATERIAL
1	BODY	CF8M
2	END CAP	CF8M
3	BALL	CF8M
4	BALL SEAT	PTFE
5	CAP GASKET	PTFE
6	THRUST WASHER	RTFE
7	STEM	SS316
8	STEM PACKING	TFM
9	GLAND	SS304
10	BELLEVILLE WASHER	SS301
11	STEM NUT	SS304

NO	PART NAME	MATERIAL
12	LOCKING SADDLE	SS304
13	HANDLE WASHER	SS304
14	LOCKING PLATE	SS304
15	HANDLE NUT	SS304
16	HANDLE	SS304
17	HANDLE SLEEVE	VINYL
18	STOP PIN	SS304
19	STOP PIN NUT	SS304
20	O-RING	VITON
21	ANTI-STATIC DEVICE*	SS316
22	CAP BOLT	B8
23	BLANK CAP	CF8M

* Optional

MM1F: 2-1/2"~4" (DN65~DN100)

Trunnion ball with separated top cap design

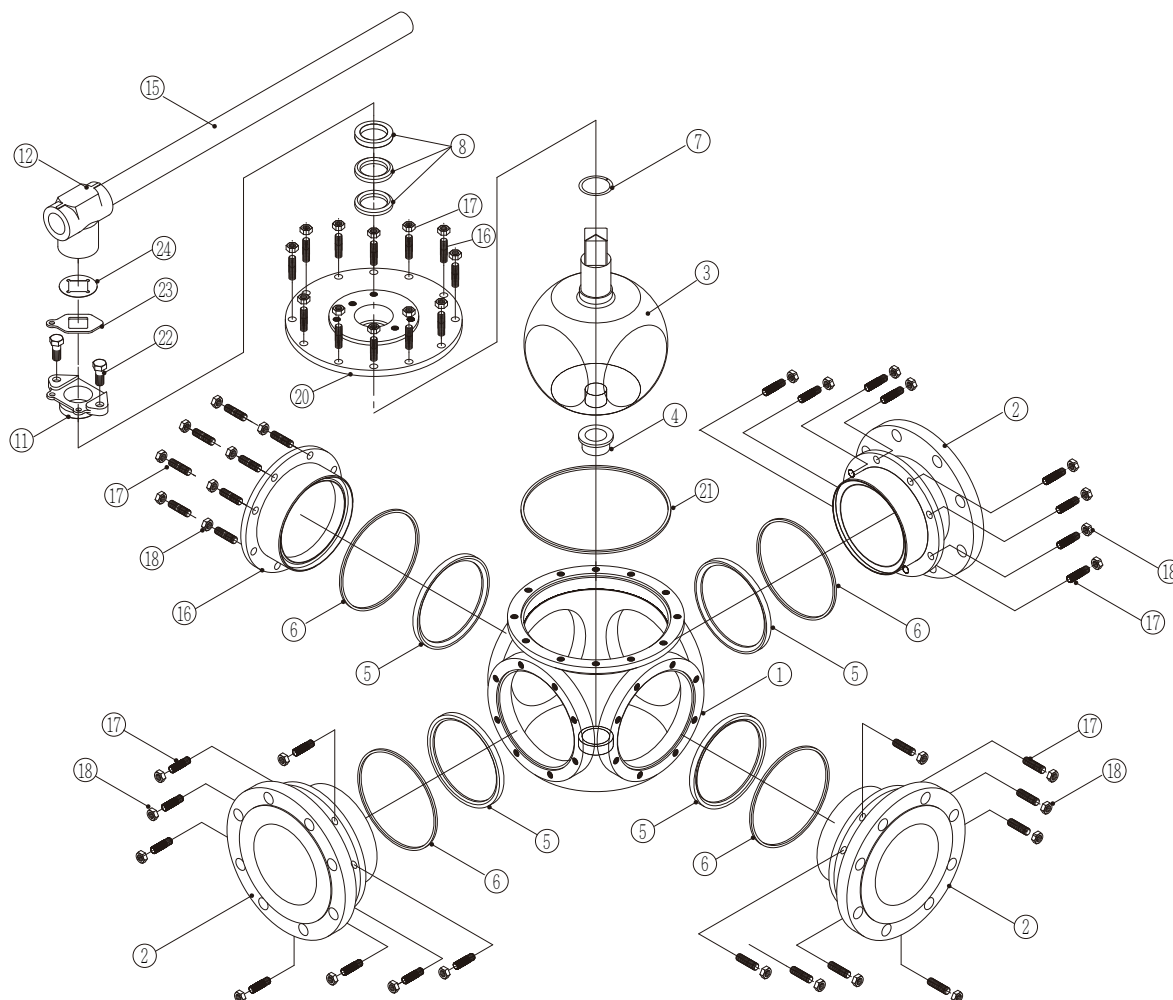


NO	PART NAME	MATERIAL
1	BODY	CF8M
2	END CAP	CF8M
3	TRUNNION BALL	CF8M
4	BALL BUSHING	TFM
5	BALL SEAT	TFM
6	CAP GASKET	TFM
7	O-RING	VITON
8	STEM PACKING	TFM
9	GLAND	SS304
10	BELLEVILLE WASHER	SS301

NO	PART NAME	MATERIAL
11	GLAND PLATE	SS304
12	HANDLE HEAD	CF8
13	STOP BOLT	SS304
14	BOLT	SS304
15	LEVER	CARBON STEEL
16	BLANK CAP	CF8M
17	STUD	SS304
18	CAP NUT/ BONNET NUT	SS304
19	STOP PIN NUT	SS304
20	TOP BONNET	CF8M
21	TOP BONNET GASKET	TFM

MM1F: 5"~8" (DN125~DN200)

Trunnion ball with separated top cap design



NO	PART NAME	MATERIAL
1	BODY	CF8M
2	END CAP	CF8M
3	TRUNNION BALL	CF8M
4	BALL BUSHING	PTFE + SS
5	BALL SEAT	PTFE
6	CAP GASKET	PTFE
7	O-RING	VITON
8	STEM PACKING	PTFE
11	GLAND	CF8

NO	PART NAME	MATERIAL
12	HANDLE HEAD	D.I.
15	LEVER	CARBON STEEL
16	BLANK CAP	CF8M
17	STUD	SS304
18	CAP NUT/ BONNET NUT	SS304
20	TOP BONNET	CF8M
21	TOP BONNET GASKET	PTFE
22	GLAND BOLT	SS304
23	STOP PLATE	SS304
24	WASHER	SS304