緯凡金屬股份有限公司
TRANSWORLD STEEL ENTERPRISE CO., LTD

Operation
&
Maintenance
Manual

Product Name: Multi Port Ball Valve

Product Type: Series M302

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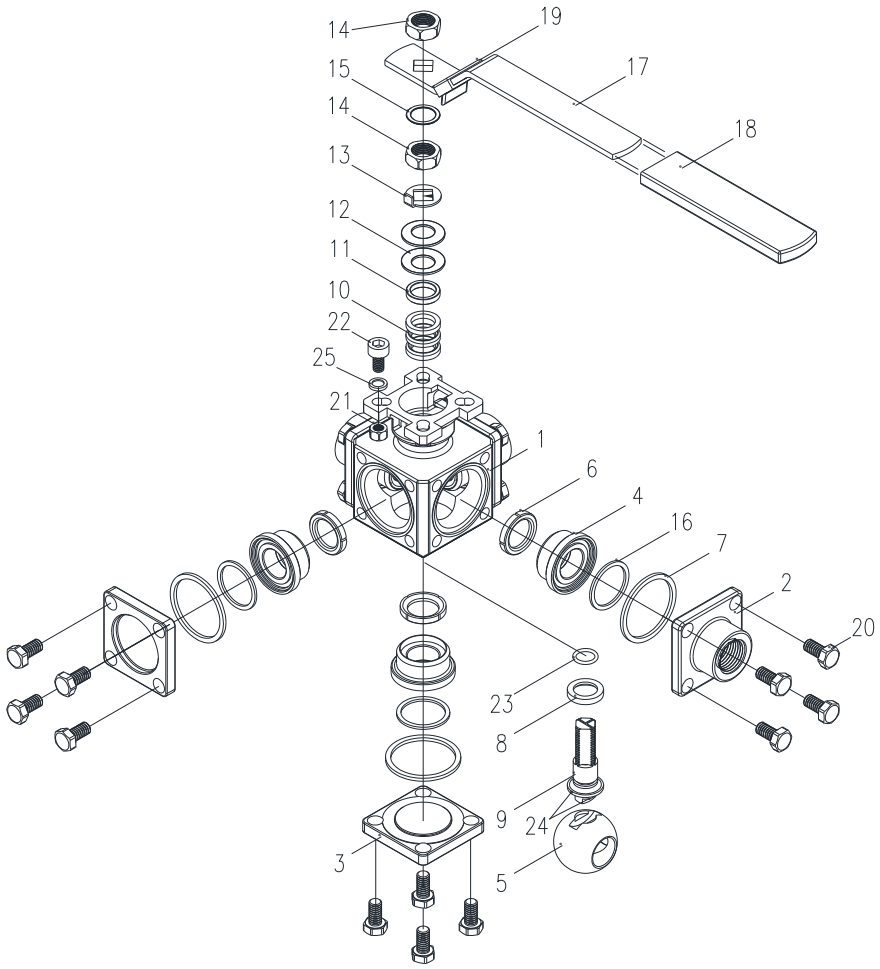
INSTALLATION & MAINTENANCE MANUAL

For Series M302

1. Product Structure

TAWD Series M302 multi-port ball valves offer 3-way、4-way、5-way flow control. Multi-port series ball valves feature multi-directional control combined with shutoff capacity in one valve.

Series M302



No.	Part Name	No.	Part Name	No.	Part Name
1	Body	**10**	Gland Packing	**19**	Locking Device
2	End Cap-A	**11**	Gland Bush	**20**	Bolt
3	End Cap-B	**12**	Belleville Washer	**21**	Pin Nut
4	Seat Retainer	**13**	Stop Washer	**22**	Stop Pin
5	Ball	**14**	Stem Nut	**23**	O-Ring
6	Seat	**15**	Stem Washer	**24**	Antistatic Device
7	Joint Gasket	**16**	Retainer Seal	**25**	Washer
8	Thrust Washer	**17**	Handle		
9	Stem	**18**	Handle Sleeve		

2. USE

- Life of valve can be prolonged if the valve is used within the rated range, in accordance with pressure, temperature, and corrosion parameters.
- To avoid damaging the internal components, such as the seats and ball, the pipeline must be flushed, free of dirt, burrs, and welding residues before installing the valve.
- Before installation, carefully check the nameplate to ensure valve type, size, seat material and the pressure-temperature grade are suitable to the condition of pipeline.
- The valve installed on the pipeline. For media flow requirements of the valve, confirm the upstream and downstream accordance with the direction of valve to be installed.

3. Manual Operation

According to the requirements of 3-way, 4-way, and 5-way, the valve's opening or closing state can be changed by rotating the valve stem 90 degrees, 180 degrees, 270 degrees, and 360 degrees.

4. General Information for Installation

4.1 Installation of Threaded Valves:

- Use suitable thread sealing material such as Teflon, and screw ball valve body to the pipeline.
- Apply wrench only on the hexagon of the valve ends. Tightening by using the valve body or lever can seriously damage the valve.
- In some applications, screwed valves are back welded on site, these valves must be treated as per instructions for weld end valves before back welding.

4.2 Installation of Weld-End Valves:

- Tack welds the valve on the pipe in four points on both end caps.
- With the valve in the open position, (lever to be parallel to the axis of the pipe), remove all the body bolts except one. Loosen the nut on the remaining bolt
- Swing the body outside the pipe and remove seats and ball to prevent accidental damage and protect the exposed valve body and ends from weld splatter.
- Finish welding both end caps on the pipe.
- When cooled down, clean both end caps and body surface.
- Lightly lubricate ball seats (with a media compatible lubricant) and Install ball and seats into body taking care to install lager curve of the seats facing the ball.
- Swing the body back in position and replace the bolts. Tighten all nuts slightly. This Operation is very important, to keep body and end caps perfectly parallel, thus preventing distortion of the end caps.
- Tighten body bolts evenly. Make sure that maximum tightening torque is observed.
- Check proper operation of the valve and hydrostatic system and check for leaks.

2.2 Installation of flanged-End Valves:

- The pipeline flanges must comply to the same flange standard in order to fit properly with the valve.
- The Tightness between the flanges must be guaranteed by means of a gasket, whose choice and assembly must be made by the installer.

— Ensure that flanges and pipe flanges are properly mounted, tighten the screws in two steps (smooth screwing to join and lock with a torque wrench), opposing bolts sequentially.

5. Maintenance and Normal Trouble

Most ball valve problems are caused by incorrect installation of the valve or incorrectly installed parts, but causes of ball valve failure may also include:

No.	Problem	Cause Analysis	Solution
1	Valve leaks during installation	Improper transportation and lifting may result in valve damage.	Only transport the ball valve by suitable means, do not drop it.
2	Valve leaks during installation	Both ends of the valve are lacking blind flanges.	According to the requirements of pipeline design.
3	Valve leaks during installation	The valve is misaligned with the pipeline.	According to the plant and pipeline installation standards.
4	Leakage between the sealing surface	Dirty sealing surface or the sealing surface damaged.	Remove dirt or replace it.
5	Leakage at stem packing	Insufficient packing pressure or prolonged use can lead to damage to the packing material.	Tighten the bolts evenly to compact the packing or replace packing.

(Table 1)

6. Maintenance and Repair

	**OPENING THE VALVE UNDER PRESSURE CAN BE DEADLY. DISMANTLING THE VALVE MUST BE COOLED DOWN AND PRESSURE-FREE. HEAD PROTECTION, PROTECTION GLASSES AND SAFETY SHOES ARE MANDATORY.**

6.1 Caution ! Ball valve may be residual fluid in the ball cavity when closed.

If the valve has been used to control hazardous media, it must be decontaminated before disassembly. It is recommended that the following steps are taken for safe removal and reassembly.

— Relieve the line pressure.
— Place valve in half-open position and flush the line to remove any hazardous material from the valve.
— All persons involved in the removal and disassembly of the valve should wear the proper Protective clothing, such as face shield, gloves, etc.
— By removing all the body bolts except one, then loosening the remaining bolt, the valve body can be swung out. Seats, gaskets and ball can be replaced without disturbing pipe alignment.
— On threaded lines, valve can be screwed on without the use of unions, as the three-piece construction makes valve ends free, by removing the bolts.

6.2 Repair Kit Replacement and Reassembly (OPERATE ON THE PIPELINE)

Note: when reassembling, a standard repair kit designated for each size and style valve is available, each repair kit to contain all the soft parts.

Note: When replacing Teflon parts, please replace all seats and seals at the same time. Replace Thrust Washer, Packing and O-Ring according to actual needs.

- Relieve the pipe line pressure.
- Removing all the bolts (20) of end caps (2).
- Take out the body (1) and away from the end caps-A (2). Beware not to let the seat retainer (4) and other parts fall off.
- Removing the bolts (20) of end caps-B (3).
- Take out the seat retainer (4), joint gasket (7), retainer seal (16), seat (6), ball (5).
- Remove the handle nut (14), take off the handle (17) and the stem washer (15), remove stop washer (13), then remove the stem nut (14), and take off the 4elleville washer (12), gland bush (11) and gland packing (10), stem (9), O-ring (23), thrust washer (8).
- Clean stem (9) and check for damage.
- Install the O-Ring (23) and the thrust washer (8) to the stem (9). Apply lubrication (LE4025 or equivalent) to the O-Ring (23), and then install the stem (9) to the body (1). (Refer Fig.1)
- Take a hollow fixture and place the body (1) with the stem (9) upside down on the fixture, with the ribs of the body (1) facing you. (Refer Fig.2)
- Place the ball (5) into the body (1). The direction of the ball flow port should be the same as the direction indicated by the stem (9). (Refer Fig.3)

Fig.1

Fig.2

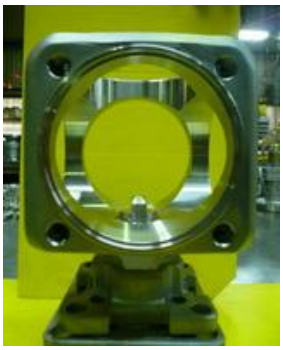


Fig.3

- Place the seat (6) into the seat retainer (with pressure relief hole) (4). (Refer Fig.4)
- Place the retainer seal (16) into the seat retainer (with pressure relief hole) (4). (Refer Fig.5)
- Install the seat retainer (with pressure relief hole) (4) with the seat (6) and the retainer seal (16) into the bottom of the valve body, and install the joint gasket (7) on it. (Refer Fig.6)

Fig.4

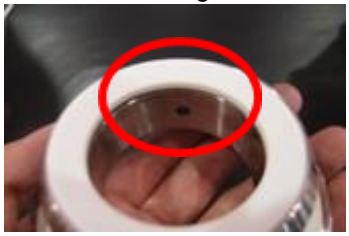


Fig.5

Fig.6

— Install the end cap-B (3). (Refer Fig.7)

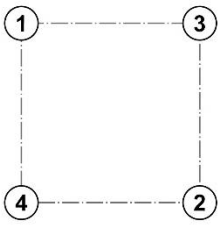
— Tighten the first four nuts in the sequence shown in Figure 9 to correctly position the part, then tighten the other bolts in the same sequence. (Refer Fig.8 and Fig.9)

— Rotate the valve body forward 90° and lay it down with the ribs of the body (1) facing down. (Refer Fig.10)

Fig.7

Fig.8

Fig.9



— Install the seat retainer (with pressure relief hole) (4) with the seat (6) and the retainer seal (16) into the bottom of the valve body, and install the joint gasket (7) on it. (Refer Fig.11)

— Install the end cap-B (3) and tighten the first four nuts in the sequence shown in Figure 9 to correctly position the part, then tighten the other bolts in the same sequence. (Refer Fig.12)

Fig.10

Fig.11

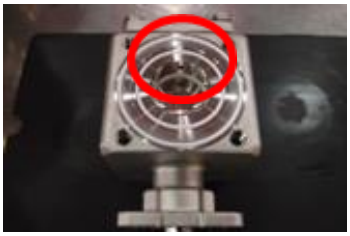


Fig.12

— Install the gland packing (10) (Refer Fig.13)

— Install the gland bush (11) (Refer Fig.14)

— Install the 5elleville washer (12) (Refer Fig.15)

Fig.13

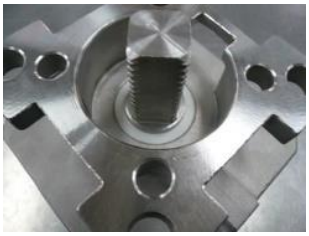


Fig.14

Fig.15

— Install the stop washer (13) (Refer Fig.16)

— Install the handle nut (14) (12) (Refer Fig.17)

— Tighten the stem nut (14) according to the stem torque. (Refer Fig.18 and Table 3)

Fig.16

Fig.17

Fig.18

— Put the stop washer (13) back into the stem (9) and then put the stem nut (14) back on and tap stop washer (13) until it is in position. (Refer Fig.19)
— Put the stem washer (15) back and then install the handle (17) and stem nut (14). (Refer Fig.20)
— Tighten the stem nut (14). (Refer Fig.21)

Fig.19

Fig.20

Fig.21

— Place the seat (6), seat retainer (4), retainer seal (16) into the body (1), and then install the joint gasket (7).
— Place the whole body and parts back the pipe line, beware not to let them fall off.
— Tighten the bolt (20), and make sure the body (1) won't drop off.
— Check the indication mark on the stem (9) to confirm that the flow port of the ball (5) is consistent with the flow port of the end cap (2).
— Make sure tighten each bolt (20).
— Turn the handle 45° to the right. (Refer Fig.22)
— Turn the handle 90° to the left. (Refer Fig.23)
— Turn the handle 90° to the right. Repeat the above action 2 to 3 times, install stop pin (22), and then turn the handle (7) to the required position. (Refer Fig.24)
— After assembly is completed, check whether the ball valve operates smoothly and perform a pipeline test.

Fig.22

Fig.23

Fig.24

6.3 Torque of Body Bolts

Size	Threads	lbf-in	kgf-cm	N-m
1/4”	M6x12	130.2~182.3	150~210	14.7~20.6
3/8”	M6x12	130.2~182.3	150~210	14.7~20.6
1/2”	M6x12	130.2~182.3	150~210	14.7~20.6
3/4”	M6x16	147.6~199.6	170~230	16.7~22.6
1”	M8x20	199.6~277.7	230~320	22.6~31.4
1.1/4”	M8x20	199.6~277.7	230~320	22.6~31.4
1.1/2”	M10x25	347.2~451.3	400~520	39.2~51
2”	M12x25	477.4~607.6	550~700	53.9~68.6
2.1/2”	M14x30	781.2~911.4	900~1050	88.3~103

3”	M16x30	1041.6~1171.7	1200~1350	117.7~132.4
4”	M20x35	1258.5~1388.7	1450~1600	142.2~156.9

(Table 2)

6.4 Torque of Stem Nut

Size	With O-ring			Without O-ring		
	lbf-in	kgf-cm	N-m	lbf-in	kgf-cm	N-m
1/4”	69	80	8	95	110	11
3/8”	69	80	8	95	110	11
1/2”	69	80	8	95	110	11
3/4”	95	110	11	139	160	16
1”	95	110	11	139	160	16
1.1/4”	139	160	16	182	210	21
1.1/2”	165	190	19	208	240	24
2”	165	190	19	208	240	24
2.1/2”	165	190	19	208	240	24
3”	234	270	27	278	320	32
4”	234	270	27	278	320	32

(Table 3)

7. Safety Notice

	**THE EQUIPMENT IS SUBJECT TO PRESSURE, RISK OF SEVERE INJURY OR DEATH. HANDLE CAREFULLY.**
	**DO NOT EXCEED THE MAXIMUM PERMISSIBLE PRESSURE.**

— Installation work must only be performed by trained personnel.

— Use appropriate protective gear as specified in plant operator’s guidelines.

— Choose the installation location and suitable means, the ball valve cannot be used as a foothold or climbing aid.

— Do NOT apply external force to the ball valve.

— Inside diameter of the piping must correspond to the nominal diameter of the ball valve.

— When laying pipelines, it is essential to protect the ball valve body from lateral and bending forces, as well as the influence of vibrations and tension.

— Only mount the ball valve between matching aligned pipelines.

— Do NOT connect the system before valve pipeline installation to the earthing connection has been inspected, examined, and approved by the client.

— The pipeline should be free of any potentially explosive environments.

— Do NOT allow dust layers on the transportation media as it could charge the valve during high velocity of transportation. The flammable material shall be prohibited to be used on the valve.

— Use only in accordance with the specifications. (Refer to Table 3).

— Any servicing work and repairs not described in the installation, operating and maintenance instructions must not

be performed without consulting the manufacturer first.

8. Transportation and Storage

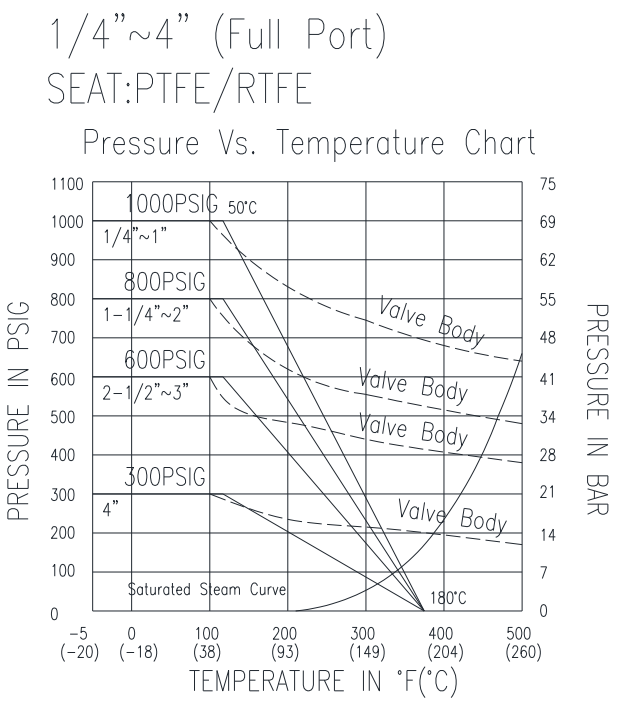
— Transport the ball valve using appropriate methods; throwing or dropping is prohibited.

— Dispose of packaging materials in accordance with relevant local or national disposal regulations/environmental protection laws.

9. Appendix

— Pressure-Temperature Chart

Series M302



(Table 4)