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 M602

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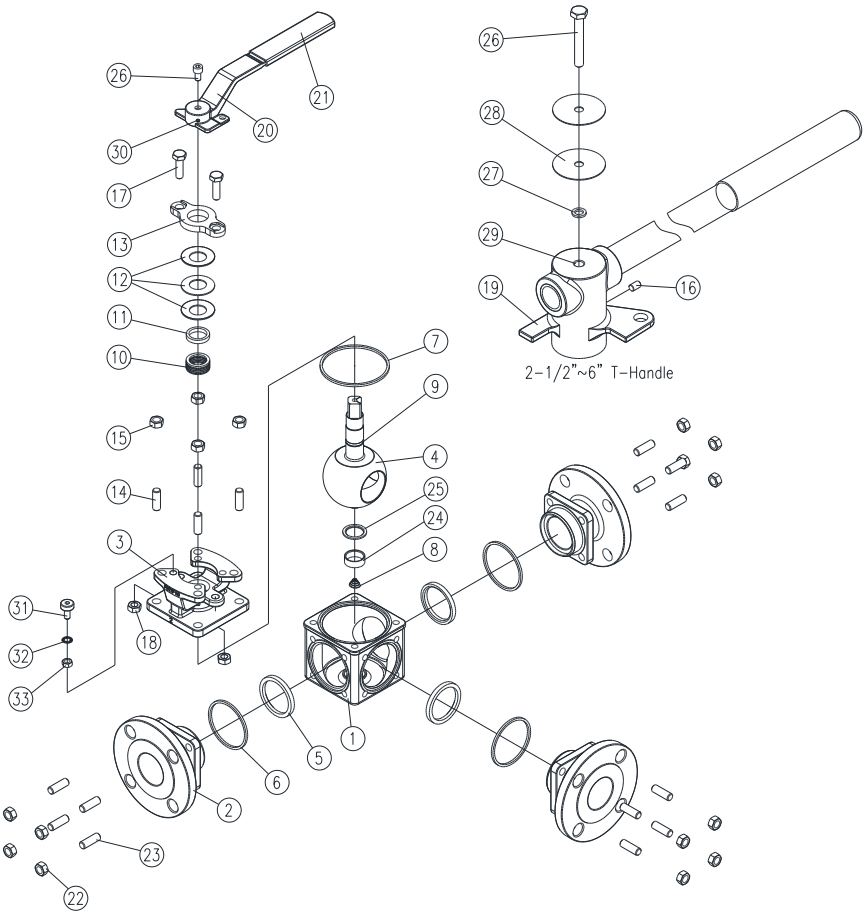
INSTALLATION & MAINTENANCE MANUAL

For Series M602

1. Product Structure

TAWD Series M602 multi-way ball valve provides three-way flow path control and features flanged end connections. Multi-port series ball valves feature multi-directional control combined with shutoff capacity in one valve.



No.	Part Name	No.	Part Name	No.	Part Name
1	Body	12	Belleville Washer	23	Bolt
2	End Cap	13	Gland	24	Trunnion Bearing
3	Top Cover	14	Cover Bolt	25	Gasket
4	Ball & Stem	15	Cover Nut	26	Handle Bolt
5	Seat	16	Handle Screw	27	Washer
6	Joint gasket	17	Gland Bolt	28	Position Indication
7	Cover Joint Gasket	18	Gland Nut	29	Handle Bush
8	Spring	19	Handle-A	30	Handle Screw
9	O-ring	20	Handle-B	31	Stop Pin
10	Gland Packing	21	Handle Cover	32	Washer
11	Gland Bush	22	Bolt Nut	33	Bolt Nut

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

- To change flow direction, turn handle 1/4" turn (90 degrees)
- Both T port and L port are available

4. General Information for Installation

- 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.
- Make sure valve is horizontally mounted on pipe line to avoid flange ends to be deformed because of non-horizontal mounting.
- 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.

6.2 Repair Kit Replacement and Reassembly

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 joint gaskets as well. Gland packing and o-ring need to be replaced depending on actual conditions.

- Relieve the pipe line pressure.
- Loosen Stop Pin (31) or Bolt Nut (33), Handle Screw (16) and Handle Bolt (26), take out Handle-B (20) and Handle-A (19), loosen Gland Nut (18), take out Gland Bush (13), Gland Bolt (17), Belleville Washer (12), Gland Bush (11).
- Loosen Bolt Nuts (22), take out End Caps (2), Seats (5) and Joint Gaskets (6).
- Loosen Cover Nut (15), take out Top Cover (3) and Cover Joint Gasket (7).
- Take out Gland Packing (10) from Top Cover (3) by using a suitable tool.
- Take out Ball & Stem (4) and O-ring (9).
- Take out trunnion bearing (24) and spring (8).
- Put the disassembled components in a clean and safe place.
- Check and clean the Body (1), End Cap (2) and Ball & Stem (4).
- Put the Trunnion Bearing (24) into the notch of body. (Refer Fig.1)
- Put the Spring (8) into the notch of body. (Refer Fig.2)
- Put on the Gasket (25) over the groove in the bottom of the valve body. (Refer Fig.3)

Fig.1

Fig.2

Fig.3

— Adjust body center which opening direction towards yourself first, and put Ball & Stem (4) into Body (1). Be aware that the bottom of ball (convex) must be put into body notch exactly, and the ball score direction must be oriented in the direction of the valve body opening. (Refer Fig.4)

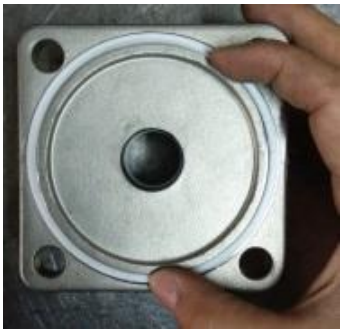
— Put O-ring (9) onto the Ball & Stem (4), Daub lubricant oil on O-ring(9) (LE4025 or the similar level). (Refer Fig.5)

— Put the Cover Joint Gasket (7) and put the Top Cover (3). Note the top cover which affixed with nameplate needs towards the left side. (Refer Fig.6 and Fig.7)

Fig.4

Fig.5

Fig.6



— Following up the diagonal direction to tighten the Cover Nut (15) sequentially by hand. (Refer Fig.8)

— Take out End Cap (2), and put the Seat (5), and then the Join Gasket (6). (Refer Fig.9)

Fig.7

Fig.8

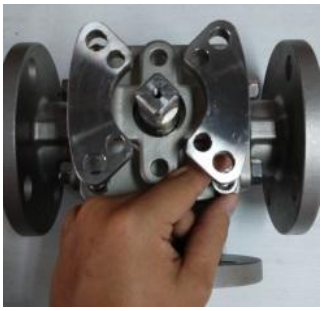


Fig.9

— Mount 3 pcs End Caps (2) to the body, material code must be facing up and to tighten bolt nut sequentially on the opposite side (diagonal direction) by hand. (Refer Fig.10 and Fig.11 and Fig.12)

Fig.10

Fig.11

Fig.12

— Use Handle-B(20) to turn the Ball & Stem (4) by Clockwise and Counter-Clockwise at 90 degree repeat 3 times, then fix the Ball & Stem (4) on the position as shown on below picture, to make sure that seat and ball are fit perfectly. (Refer Fig.13 and Fig.14)

— Put the Gland Packing (10). (Refer Fig.15)

Fig.13

Fig.14

Fig.15

— Put the Gland Bush (11). (Refer Fig.16)

— Put the Belleville Washer (12). (Refer Fig.17)

— Put the Gland (13). (Refer Fig.18)

Fig.16

Fig.17

Fig.18

— Put the Gland Bolt (17), tighten the Gland Nut (18) by hand, in order to make sure both side are tightly and balance. (Refer Fig.19)

— Please refer to torque of body bolt to tighten the body Bolts & Nuts (22) completed. Tighten the bolts of right side end cap, and Tighten the bolts of left side end cap. And then middle end cap. Finally, Tighten the top cover. Extremely care must be exercised during adjustment of cap end nuts to make sure the port of Ball & Stem (4) and port of End Cap (2) should be concentric. (Refer Fig.20 and Table 2)

— Please refer to torque of stem nut to tighten the Gland Bolt (13) averagely. (Refer Fig.21 and Table 3)

Fig.19

Fig.20

Fig.21

— 1-1/2"~2" Assemble Handle Method: Place the Handle-B (20) in position, then secure it by installing the Stop Pin (31), Washer (32), and Bolt Nut (33) together, and tighten them. Next, insert the Handle Bolt (26) and the Handle Screw (16), then tighten them. Once completed, check whether the ball valve opens and closes smoothly, and perform a functional test. (Refer Fig.22)

— 2-1/2"~6" Assemble Handle Method:

- Put the Handle-A (19). (Refer Fig.23)
- Put the Handle-B (20). (Refer Fig.24)

Fig.22

Fig.23

Fig.24

- Put on the Handle bush (29). (Refer Fig.25)
- After inserting the Stop Pin (31) and tightening it, insert the Washer (27) and Position Indication (28), Handle Screw (16), and tighten the Handle Screw (26) and Handle Screw. The assembly is complete. Once completed, check whether the ball valve opens and closes smoothly, and perform a functional test. (Refer Fig.26)

Fig.25

Fig.26

6.3 Tightening Sequence and Torque

The tightening sequence for all possible number of bolting is beyond the scope of this manual. The logic to be followed is as follows.

- Tighten the first four nuts in the sequence shown in Fig.27 and Fig.28 to correctly position the part, then tighten the other bolts in the same sequence.
- The sequence goes clockwise around the bolt.
- Ensure that the recommended torque is maintained in all bolting. (Refer Table 2~3)

End Caps:

1-1/2” ~ 3” 4” 6”

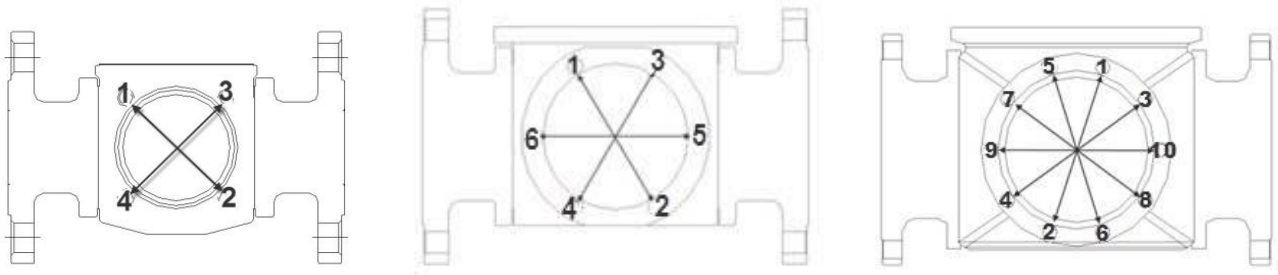


Fig.27

Top Cover:

1-1/2” ~ 3” 4” 6”

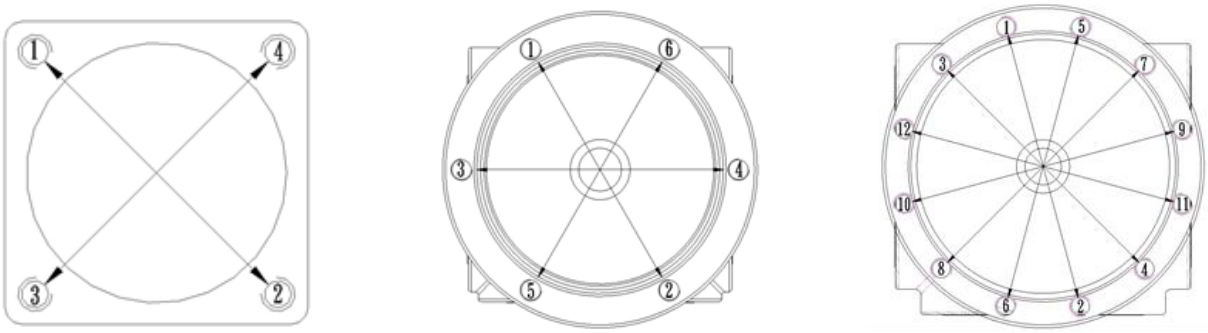


Fig.28

6.4 Torque of Body Bolts

Size	Threads	lbf-in	kgf-cm	N-m
1.1/2”	3/8”-16UNC	347~451	400~520	39~51
2”	7/16”-14UNC	434~564	500~650	49~64
2.1/2”	9/16”-12UNC	781~911	900~1050	88~103
3”	5/8”-11UNC	1041~1172	1200~1350	118~132
4” (Top Cover)	5/8”-18UNF	1041~1172	1200~1350	118~132
4” (End Cap)	1/2”-20UNF	434~607	500~700	49~69
6”	5/8”-18UNF	1041~1172	1200~1350	118~132

(Table 2)

6.5 Torque of Stem Nut

Size	lbf-in	kgf-cm	N-m
1.1/2"	87	100	9.8
2"	87	100	9.8
2.1/2"	156	180	17.6
3"	156	180	17.6
4"	243	280	27
6"	312	360	35

(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 Table 4)

— 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

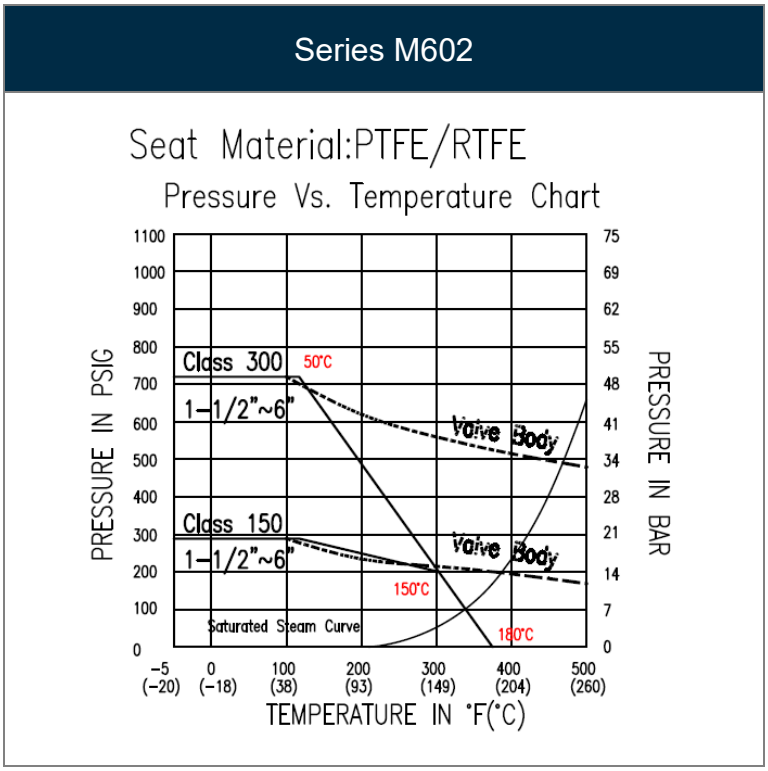
— Transport the ball valve using appropriate methods; throwing or dropping is prohibited.

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

9. Appendix

Pressure-Temperature Chart

Series M602



(Table 4)