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

Operation
&
Maintenance
Manual

Product Name: Two Piece Flanged Ball Valve

Product Type: Series F501 / F502

Version: 4.0
Status: Released on February27, 2025)

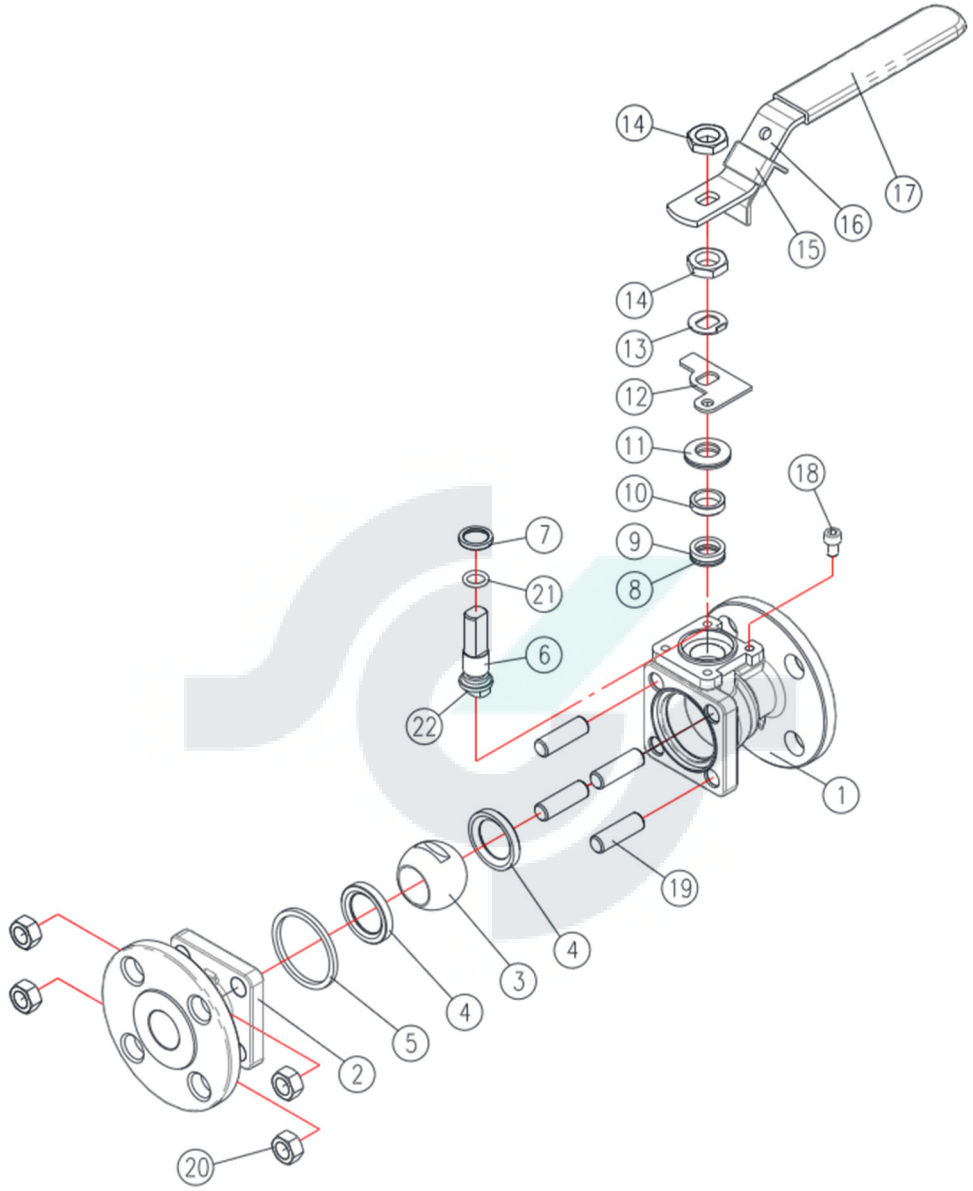
Headquarters: No. 34, Gongye 14th Rd., Taichung City, 412038, Taiwan (R.O.C.)
TEL: +886-04-22716107 | Email: info@tawdvalve.com

INSTALLATION & MAINTENANCE MANUAL

For Series F501 / F502

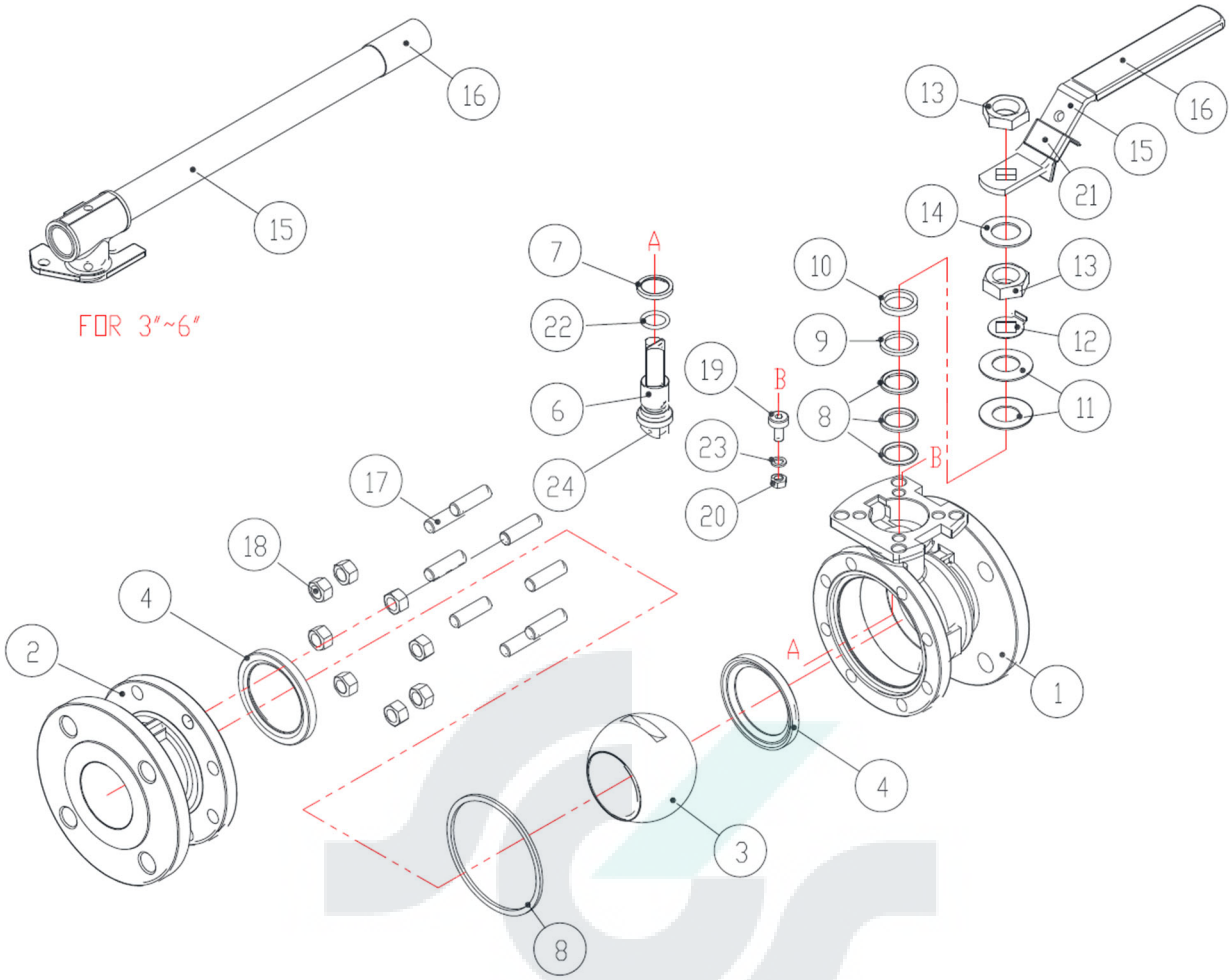
1. Product Structure

Series F501



No.	Part Name	No.	Part Name	No.	Part Name
1	Body	**9**	Gland packing	**17**	Handle Cover
2	End cap	**10**	Gland Bush	**18**	Stop Pin
3	Ball	**11**	Belleville Washer	**19**	Bolt
4	Seat	**12**	Locking Plate	**20**	Bolt Nut
5	Joint gasket	**13**	Stop Washer	**21**	O-ring
6	Stem	**14**	Stem nut	**22**	Anti-Static Device
7	Thrust washer	**15**	Locking Device		
8	Gland packing	**16**	Handle		

Series F502



No.	Part Name	No.	Part Name	No.	Part Name
1	Body	**9**	Gland packing	**17**	Bolt
2	End cap	**10**	Gland Bush	**18**	Bolt Nut
3	Ball	**11**	Belleville Washer	**19**	Stop Pin
4	Seat	**12**	Stop Washer	**20**	Pin Nut
5	Joint gasket	**13**	Stem nut	**21**	Locking Device
6	Stem	**14**	Stem Washer	**22**	O-ring
7	Thrust washer	**15**	Handle	**23**	Washer
8	Gland packing	**16**	Handle Cover	**24**	Anti-Static Device

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.

3. Manual Operation

The valve's open or closed state is altered by giving the lever a quarter-turn (90-degrees).

— Valve in Open Position: The lever is parallel to the valve or pipeline.

— Valve in Closed Position: The lever is perpendicular to the valve or pipeline.

4. Automated Operation:

For valves fitted with actuators, ensure proper alignment of the valve stem. Misalignment, either angular or linear, will lead to increased operational torque and unnecessary wear on the stem seal.

5. General Information for Installation:

—The valve may be fitted in any position on the pipeline.

— 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.

6. Disassembling & Cleaning the Valve:

—If the valve has been in contact with hazardous substances, decontamination is required before disassembly.

—The valve arrives pre-lubricated with a silicone-free lubricant from the manufacturer. If this is incompatible with your needs, you may disassemble and clean the valve parts using a suitable solvent.

7. Maintenance - Replacing the Thrust Washer and Packing:

	**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.**

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.

Note: Leakage from the stem seal might be fixed without replacing the seal and/or packing. Tighten the packing nut to compress the belleville washers. If leakage persists or valve' s operating torque becomes excessive, it is likely that the seals are worn and must be replaced.

— 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.

— Remove all flange bolts and nuts and lift the valve from the pipeline. Care should be taken to avoid scratching or damaging serrated gasket. The valves are heavy, and they should be properly supported before detachment.

— Unscrew the stem nut and remove handle and stop plate. Proceed to, remove lock saddle, packing nuts, belleville washers and the gland. Finally, complete the welding for both end caps on the pipe.

— Use appropriate wrench to remove the body bolt nuts and lift off the body end. One seat should come out with the body end.

— Remove the body seal.

— To take out the ball, rotate the stem so the ball is in a fully closed position. To lift the ball from the body, use a lifting strap and lifting device if needed. Extreme caution should be taken to avoid damage to the ball.

— Remove the other seat.

— Stem must be removed from inside the body. A gentle tap on the top should loosen it. The thrust washer should come out with the stem. Lastly, remove the stem packing.

8. Visual Inspection:

— Clean and inspect the metal parts. Replacement of the ball or stem is only required if there are visible signs of abrasion or corrosion. We strongly recommend replacement of all soft parts whenever the valve is disassembled for reconditioning. We supply replacement kits that contain all the replaceable components.

Note: The valve may be assembled and operated dry without any lubricant. However, a light lubrication will help with assembly and reduce initial operating torque. Lubricant used must be compatible with the intended line fluid.

9. Assembly:

— Install one seat in the body cavity with the spherical curvature oriented towards the ball.
— Place the stem seal on the stem and carefully insert the stem horizontally into the center body with the threaded side first and guide it up through the stem bore.
— Hold the stem up and place the new packing set over the stem and fitting it into the stem bore. Then place the gland, belleville washer, lock saddle, stem nut onto the stem.
— Secure the stem nut onto the stem. Tighten the stem nut with proper torque.
— Rotate the handle to the closed position. Align the ball slot with the stem end and slide the ball into position. Then rotate the handle to the open position to hold the ball in place.
— Install the remaining seat into body side.
— Fit the body seal gasket into the body and aligned with the end flange. Because the body flange bolt pattern is different from the line flange bolt pattern, it is possible to assemble the valve such that the line flanges bolt pattern don' t line up. Be certain to align end flanges bolt holes to straddle valve center lines. Be careful not to damage body seal when putting cap end into body.
— Secure the cap end nuts and tighten in the "star pattern" to the proper torque. Extreme care must be exercised during adjustment of cap end nuts to make sure that complete engagement of the studs with body flange is maintained. There should be at least one stud thread exposed on each side.
— Cycle the valve slowly, with a gentle back and forth motion, to build gradually to the full quarter turn. By cycling
— slowly, the seat lips will assume a permanent seal shape against the ball. A quick turn may cut the seats before they have a chance to form the proper seal.
— If feasible, test the valve before reinstalling it. If not properly secured, the valve can separate from the pressure source, resulting in possible injury. Always join the valve to companion flanges of same pressure rating as valve and secure with a full set of flange bolts.

10. Test As Follows:

— Secure valve to a test fixture by means of a matching flange and full bolting, along with an appropriate sealing gasket. Orient valve so seat to be tested is facing up.
— Apply air pressure between 50 to 100 psi, and partially operate the valve under this pressure, then slowly close to

make sure the cavity is pressurized (while using ear protection). Pour water into the upper port to cover the ball and visually check for bubbles. If any bubbles surface, drain the water, cycle the valve a few more times and recheck. To check for leakage in the other port, reverse the valve and apply air pressure to the port just checked.

— To assess the stem seal, apply a water /soap solution to the top area of the stem. If a leakage is found, tighten stem seal just until leakage stops.

— **Torque of Body Bolts (Applicable to Series F501-10、F502-10 / 20):**

Size	Threads	lbf-in			kgf-cm			N-m		
1/2"	5/16"-18UNC	174	~	200	200	~	230	19.6	~	22.5
3/4"	5/16"-18UNC	200	~	217	230	~	250	22.5	~	24.5
1"	7/16"-14UNC	260	~	286	300	~	330	29.4	~	32.3
1.1/4"	7/16"-14UNC	286	~	304	330	~	350	32.3	~	34.3
1.1/2"	7/16"-14UNC	286	~	304	330	~	350	32.3	~	34.3
2"	1/2"-13UNC	347	~	391	400	~	450	39.2	~	44.1
2.1/2"	1/2"-13UNC	347	~	391	400	~	450	39.2	~	44.1
3"	9/16"-12UNC	477	~	521	550	~	600	53.9	~	58.8
4" (#150)	9/16"-12UNC	477	~	521	550	~	600	53.9	~	58.8
4" (#300)	5/8"-11UNC	625	~	694	720	~	800	70.6	~	78.4
5"	9/16"-12UNC	477	~	521	550	~	600	53.9	~	58.8
6" (#150)	9/16"-12UNC	477	~	521	550	~	600	53.9	~	58.8
6" (#300)	3/4"-10UNC	1302	~	1476	1500	~	1700	147.0	~	166.6
8"	3/4"-10UNC	1302	~	1476	1500	~	1700	147.0	~	166.6
10"	3/4"-10UNC	1302	~	1476	1500	~	1700	147.0	~	166.6
12"	3/4"-10UNC	1302	~	1476	1500	~	1700	147.0	~	166.6

(Table 1)

— **Torque of Body Bolts (Applicable to Series F501-40 / 60、F502-40 / 60):**

Size	Threads	lbf-in			kgf-cm			N-m		
1/2"	M8	174	~	200	200	~	230	19.6	~	22.5
3/4"	M8	200	~	217	230	~	250	22.5	~	24.5
1"	M10	260	~	286	300	~	330	29.4	~	32.3
1.1/4"	M10	286	~	304	330	~	350	32.3	~	34.3
1.1/2"	M12	347	~	391	400	~	450	39.2	~	44.1
2"	M12	347	~	391	400	~	450	39.2	~	44.1
2.1/2"	M12	347	~	391	400	~	450	39.2	~	44.1
3"	M14	477	~	521	550	~	600	53.9	~	58.8
4"	M14	477	~	521	550	~	600	53.9	~	58.8
5"	M14	477	~	521	550	~	600	53.9	~	58.8

6" (PN16)	M14	477	~	521	550	~	600	53.9	~	58.8
6” (PN40)	M16	1042	~	1215	1200	~	1400	117.6	~	137.2
8"	M16	1042	~	1215	1200	~	1400	117.6	~	137.2
10"	M16	1042	~	1215	1200	~	1400	117.6	~	137.2
12"	M16	1042	~	1215	1200	~	1400	117.6	~	137.2

(Table 2)

— Torque of Stem Nut

Series F501	Non-fire Safe Valve						Fire Safe Valve					
	With O-ring			Without O-ring			With O-ring			Without O-ring		
Size	lbf-in	kgf-cm	N-m	lbf-in	kgf-cm	N-m	lbf-in	kgf-cm	N-m	lbf-in	kgf-cm	N-m
1/2"	69.4	80	7.8	78.1	90	8.8	86.8	100	9.8	86.8	100	9.8
3/4"	69.4	80	7.8	78.1	90	8.8	86.8	100	9.8	86.8	100	9.8
1"	95	110	10.8	121.5	140	13.7	104	120	11.8	130.2	150	14.7
1.1/4"	95	110	10.8	121.5	140	13.7	104	120	11.8	130.2	150	14.7
1.1/2"	165	190	18.6	191	220	21.6	191	220	21.6	208.3	240	23.5
2"	165	190	18.6	191	220	21.6	191	220	21.6	208.3	240	23.5
2.1/2"	165	190	18.6	191	220	21.6	191	220	21.6	208.3	240	23.5
3"	234	270	26.5	277.7	320	31.4	260	300	29.4	303.8	350	34.3
4"	234	270	26.5	277.7	320	31.4	260	300	29.4	303.8	350	34.3
5"	321	370	36.3	364.5	420	41.2	347	400	39.2	390.6	450	44.1
6”	321	370	36.3	364.5	420	41.2	347	400	39.2	390.6	450	44.1

(Table 3)

— Torque of Stem Nut

Series F502	Non-fire Safe Valve						Fire Safe Valve					
	With O-ring			Without O-ring			With O-ring			Without O-ring		
Size	lbf-in	kgf-cm	N-m	lbf-in	kgf-cm	N-m	lbf-in	kgf-cm	N-m	lbf-in	kgf-cm	N-m
1/2"	95	110	10.8	121.5	140	13.7	104	120	11.8	130.2	150	14.7
3/4"	95	110	10.8	121.5	140	13.7	104	120	11.8	130.2	150	14.7
1"	95	110	10.8	121.5	140	13.7	104	120	11.8	130.2	150	14.7
1.1/4"	139	160	15.7	165	190	18.6	148	170	16.7	173.6	200	19.6
1.1/2"	165	190	18.6	191	220	21.6	191	220	21.6	208.3	240	23.5
2"	165	190	18.6	191	220	21.6	191	220	21.6	208.3	240	23.5
2.1/2"	165	190	18.6	191	220	21.6	191	220	21.6	208.3	240	23.5
3"	234	270	26.5	277.7	320	31.4	260	300	29.4	303.8	350	34.3
4"	234	270	26.5	277.7	320	31.4	260	300	29.4	303.8	350	34.3

5"	321	370	36.3	364.5	420	41.2	347	400	39.2	390.6	450	44.1
6”	321	370	36.3	364.5	420	41.2	347	400	39.2	390.6	450	44.1
8"	347	400	39.2				373	430	42.2			
10"	347	400	39.2				373	430	42.2			
12"	347	400	39.2				373	430	42.2			

(Table 4)

11. Media and Service Factors for sizing:

Torque Determination: = Basic Torque * Media Factor * Service Factor= Sizing Torque

Media Factors	Multiplier
Clean, particle free, non-lubricating (water, alcohol, etc)	1.00
Clean, particle free, non-lubricating (oils, hydraulic fluid, etc)	0.80
Slurries or heavily corroded and contaminated systems	2.00
Gas or saturated steam, clean and wet	1.00
Gas or superheated steam, clean and dry	1.30
Gas, dirty unfiltered e.g. natural gas, Chlorine	1.50
Service Factors	**Multiplier**
Simple On and Off Operations	1.00
Throttling	1.20
Positioner Control	1.50
Once per day Operations	1.20
Once every two days or a “Plant Critical” Operation	1.50

(Table 5)

12. 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 6)

13. Safety Notice

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

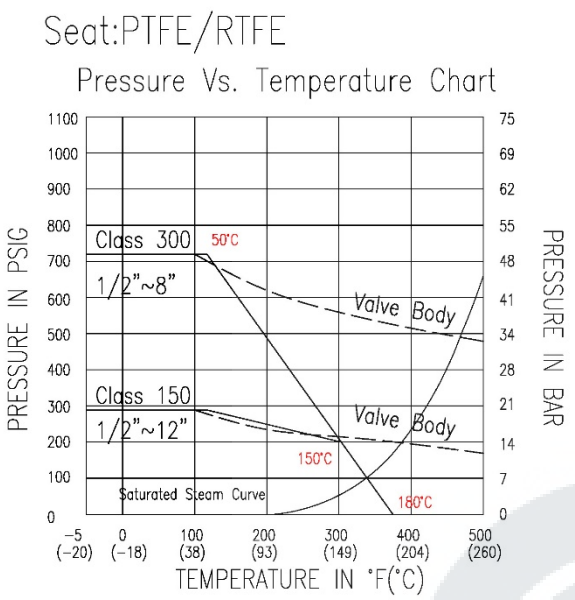
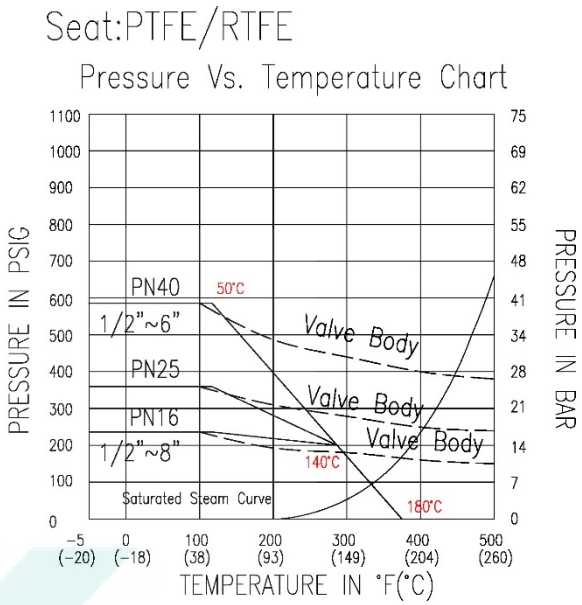
- Installation work must only be performed by trained personnel.
- Use appropriate protective gear as specified in plant operator's guidelines.
- Choose the installation location and suitable means, the ball valve cannot be used as a foothold or climbing aid.
- Do NOT apply external force to the ball 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 3)
- Any servicing work and repairs not described in the installation, operating and maintenance instructions must not be performed without consulting the manufacturer first.

14. 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.

16. Appendix

Pressure-Temperature Chart

Series F501-10、F502-10 / 20	Series F501-40 / 60、F502-40/60
	

(Table 7)