



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

Operation & Maintenance Manual

Product Name: Three Piece Ball Valve

Product Type: Series S300 / S303 / S304 / S305 / S320 /
S400 / S501 / S504 / S600 / S603 / S604 /
S605 / S701 / S704 / S711 / S802 / S900 /
S904 / T531 / T801

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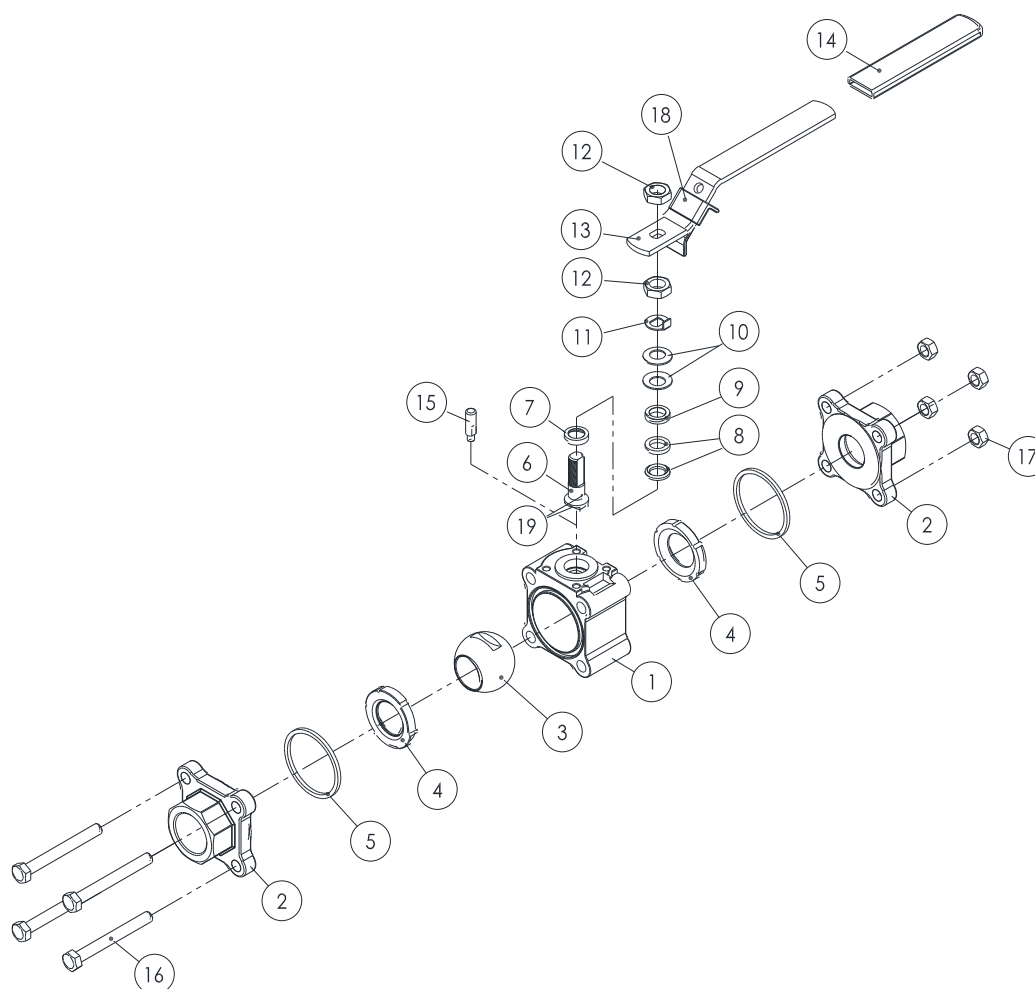
INSTALLATION & MAINTENANCE MANUAL

For Series S300 / S303 / S304 / S305 / S320 / S400 / S501 / S504 / S600 / S603 / S604 / S605 / S701 / S704 / S711 / S802 / S900 / S904 / T531 / T801

1. Product Structure

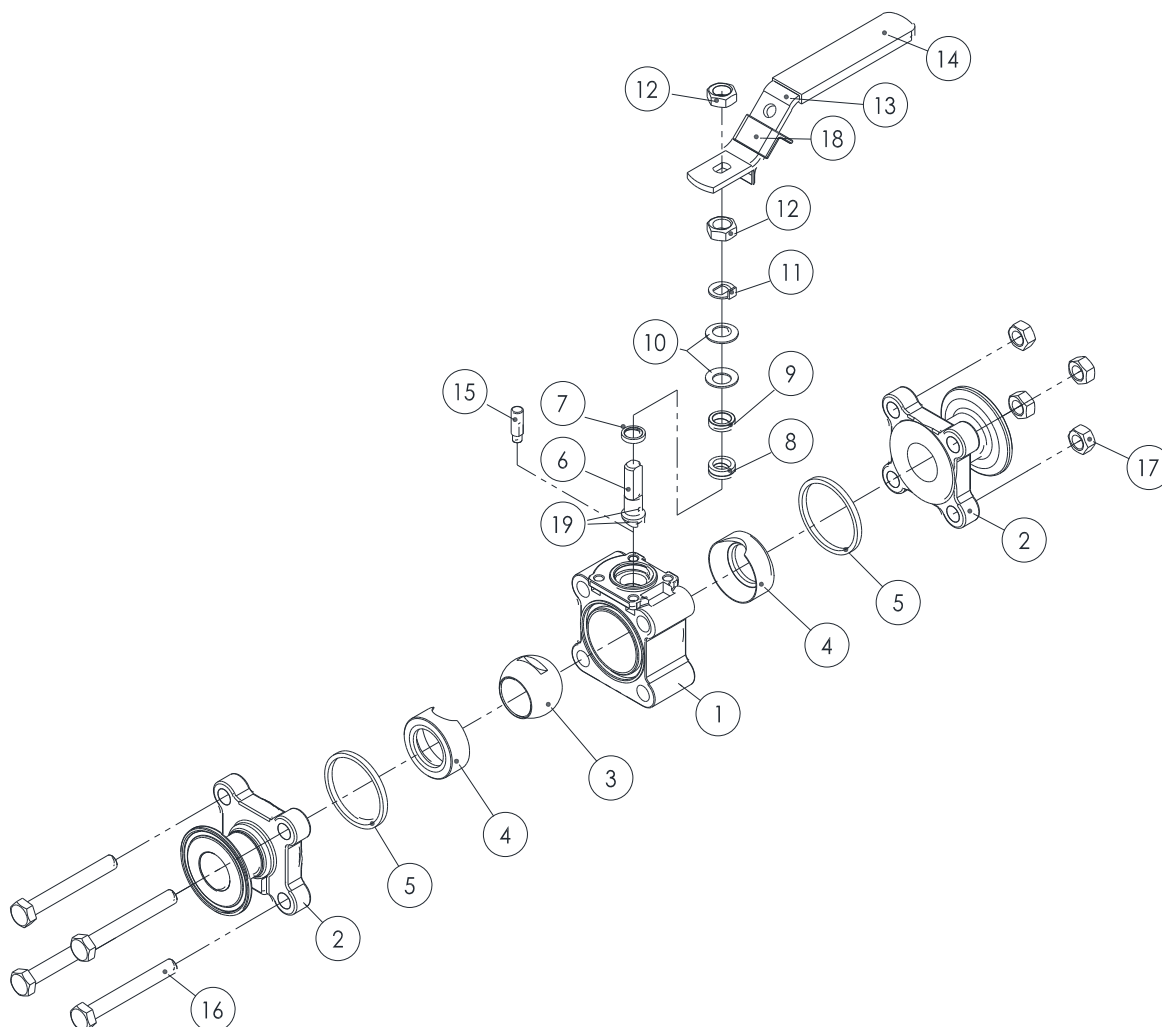
TAWD 3-Piece ball valve has a main body and two end caps connecting pipes, available in full-bore and reduced-bore specifications

Series S300/S303



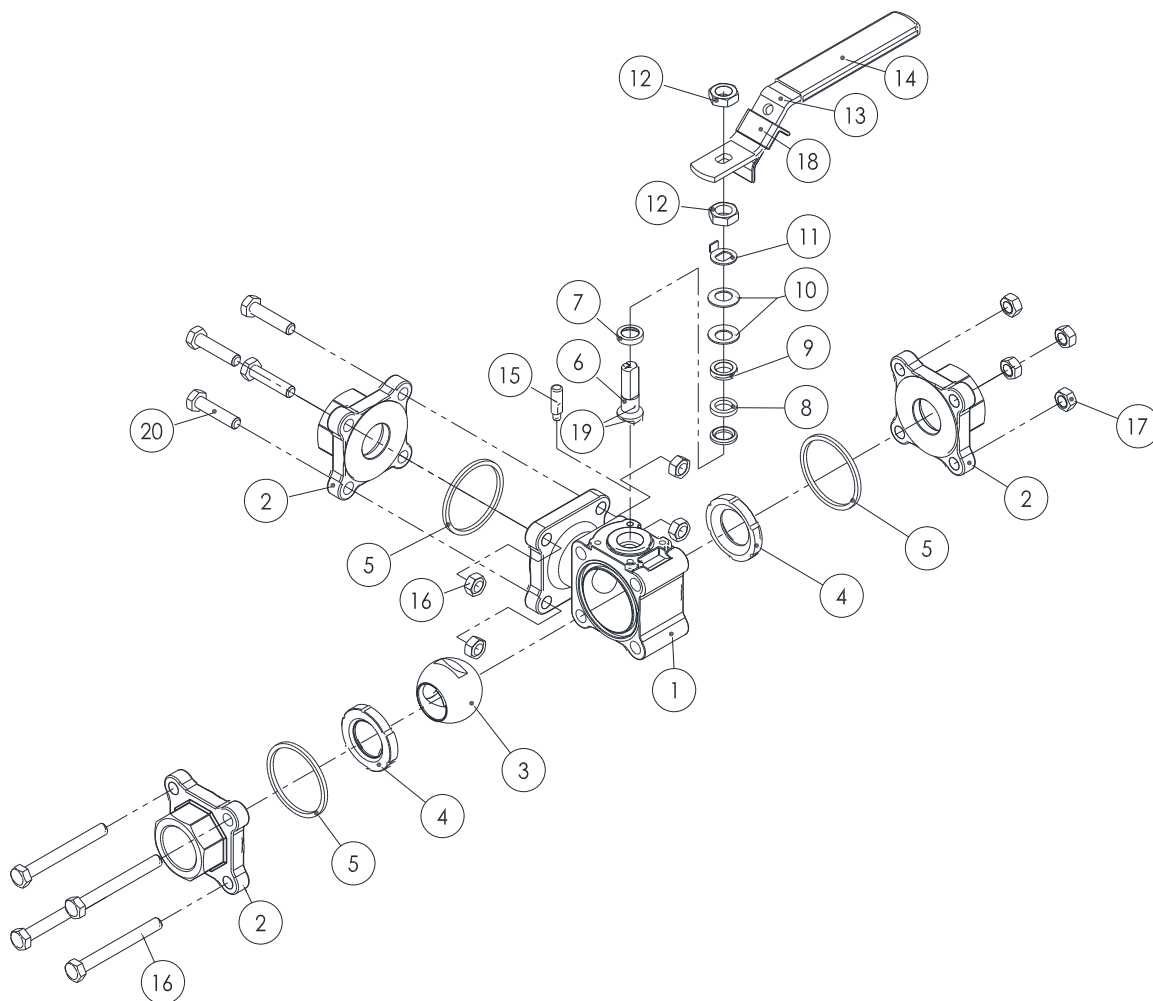
No.	Part Name	No.	Part Name	No.	Part Name
1	Body	8	Gland Packing	15	Stop Pin
2	End Cap	9	Gland Bush	16	Bolt
3	Ball	10	Belleville Washer	17	Bolt Nut
4	Seat	11	Stop Washer	18	Locking Device
5	Joint gasket	12	Stem Nut	19	Anti-Static Device
6	Stem	13	Handle	20	
7	Thrust Washer	14	Handle Cover	21	

Series S304



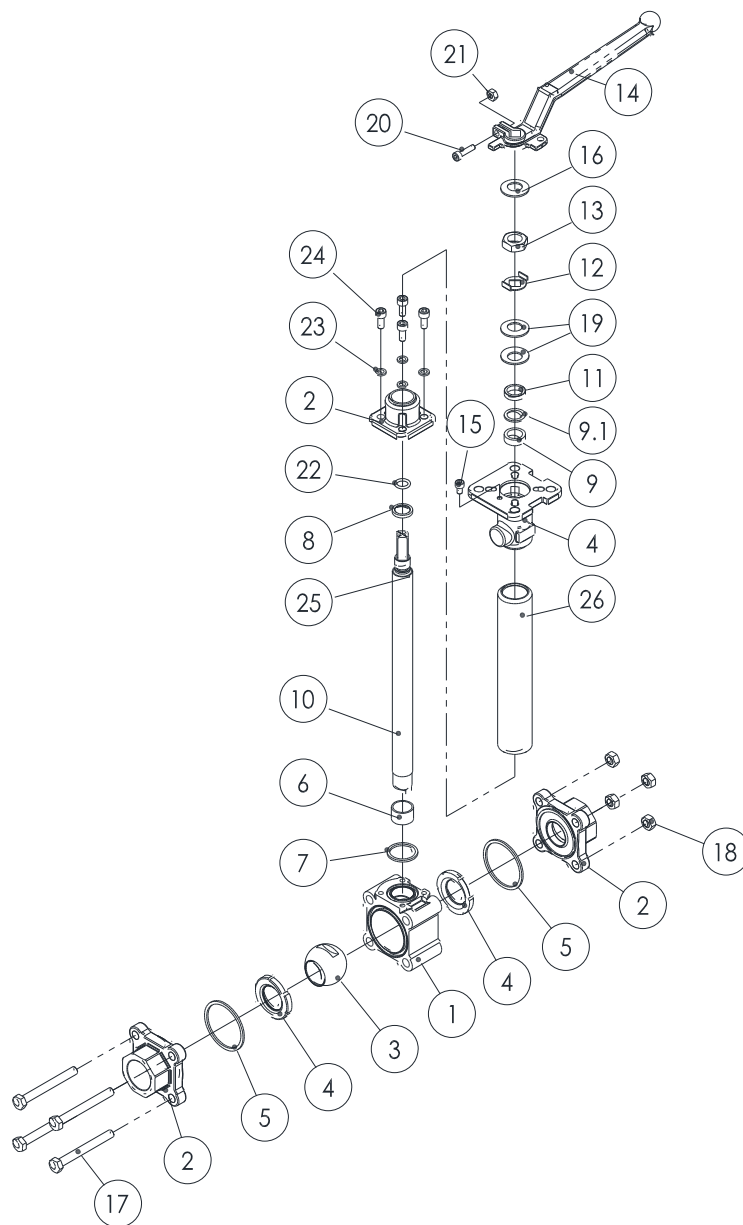
No.	Part Name	No.	Part Name	No.	Part Name
1	Body	8	Gland Packing	15	Stop Pin
2	End Cap	9	Gland Bush	16	Bolt
3	Ball	10	Belleville Washer	17	Bolt Nut
4	Seat	11	Stop Washer	18	Locking Device
5	Joint gasket	12	Stem Nut	19	Anti-Static Device
6	Stem	13	Handle	20	
7	Thrust Washer	14	Handle Cover	21	

Series S305



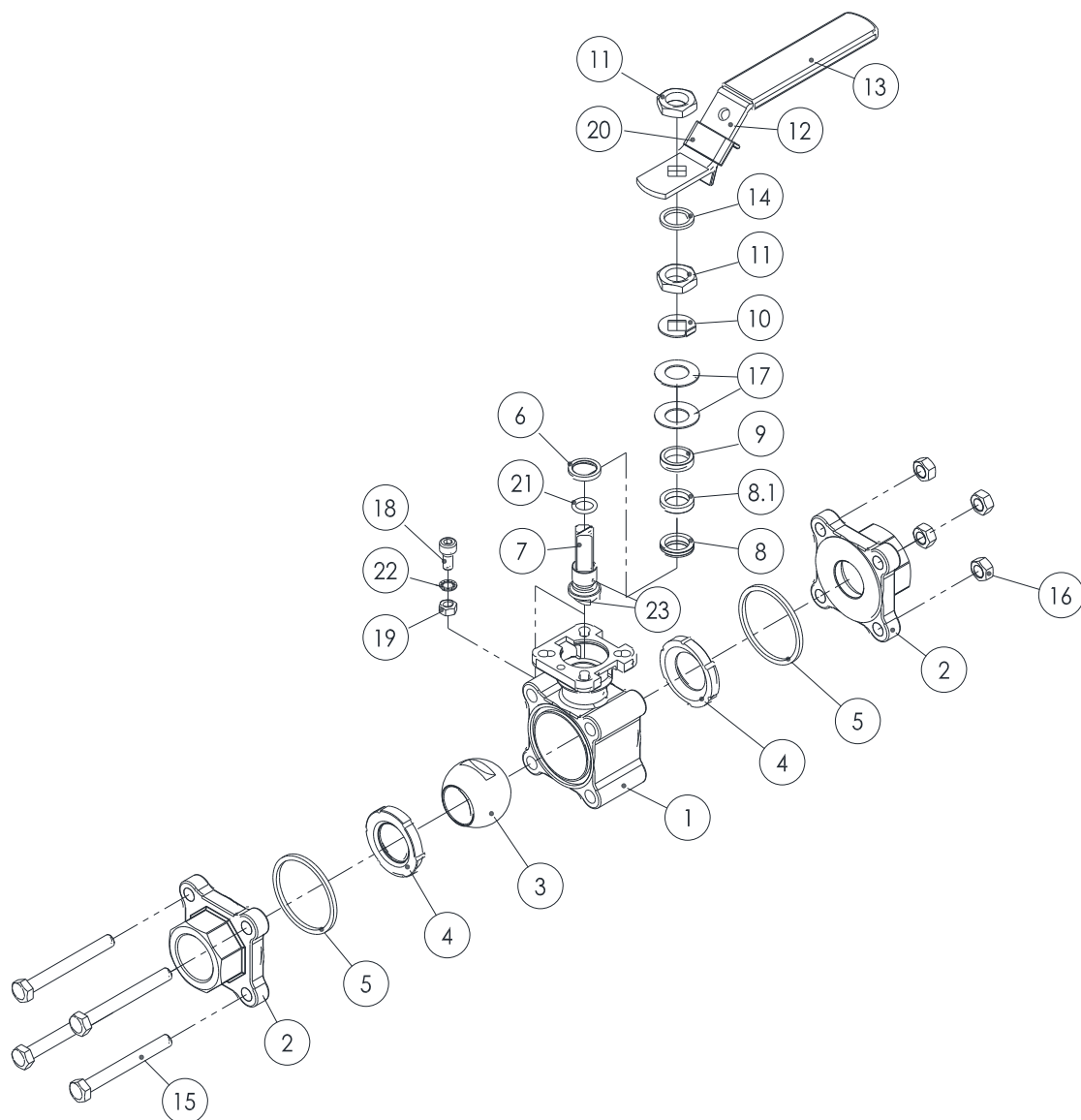
No.	Part Name	No.	Part Name	No.	Part Name
1	Body	8	Gland Packing	15	Stop Pin
2	End Cap	9	Gland Bush	16	Bolt
3	Ball	10	Belleville Washer	17	Bolt Nut
4	Seat	11	Stop Washer	18	Locking Device
5	Joint gasket	12	Stem Nut	19	Anti-Static Device
6	Stem	13	Handle	20	Bolt
7	Thrust Washer	14	Handle Cover	21	

Series S320



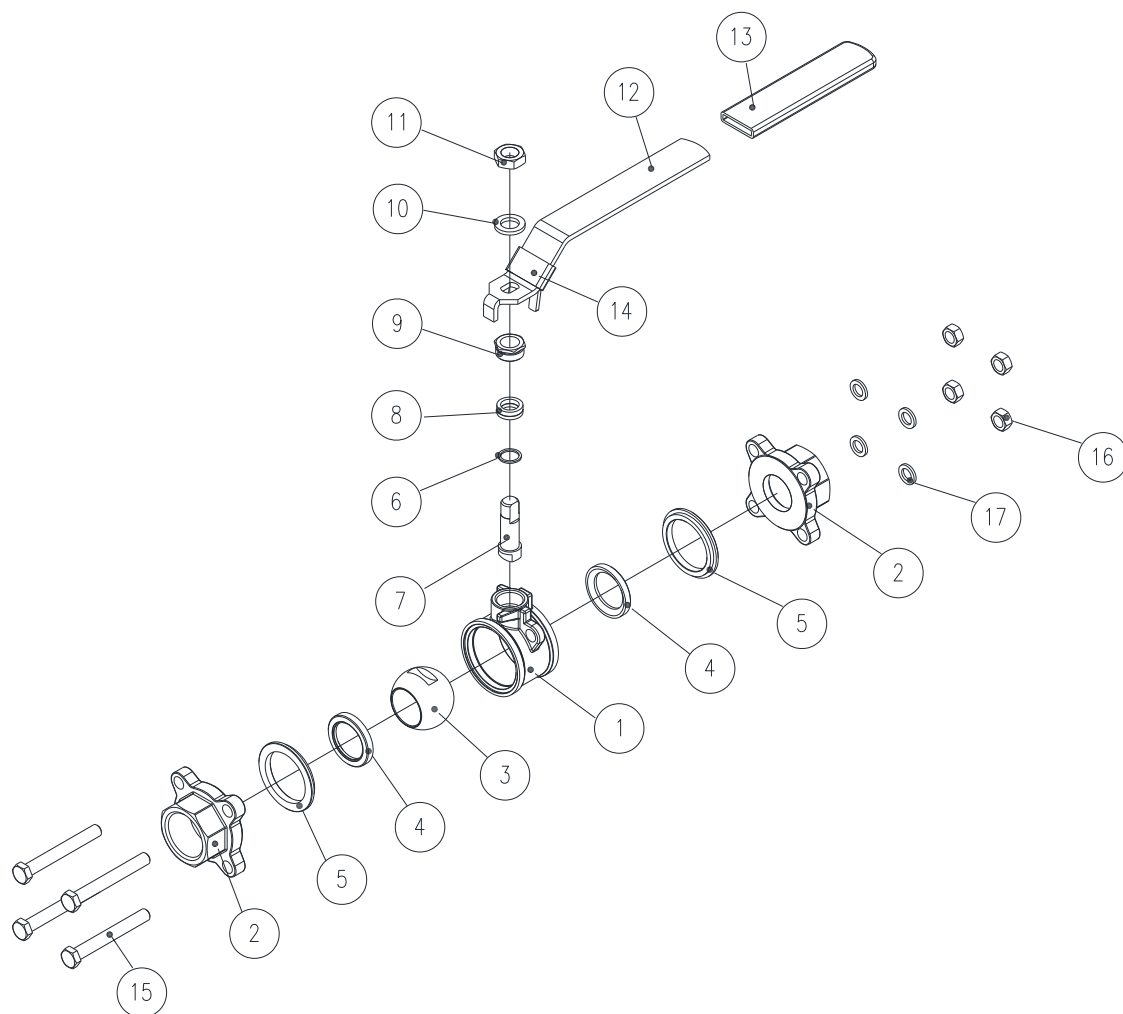
No.	Part Name	No.	Part Name	No.	Part Name
1	Body	10	Stem	19	Belleville Washer
2	End Cap	11	Gland Bush	20	Screw
3	Ball	12	Stop Washer	21	Nut
4	Seat	13	Stem Nut	22	O-Ring
5	Joint Gasket	14	Handle	23	Screw
6	Stem Bearing	15	Stop Pin	24	Screw
7	Join Gasket	16	Stem Washer	25	Anti-Static Device
8	Thrust Washer	17	Bolt	26	Extended Bonnet
9	Gland Packing	18	Bolt Nut	27	

Series S400 / S600 / S603



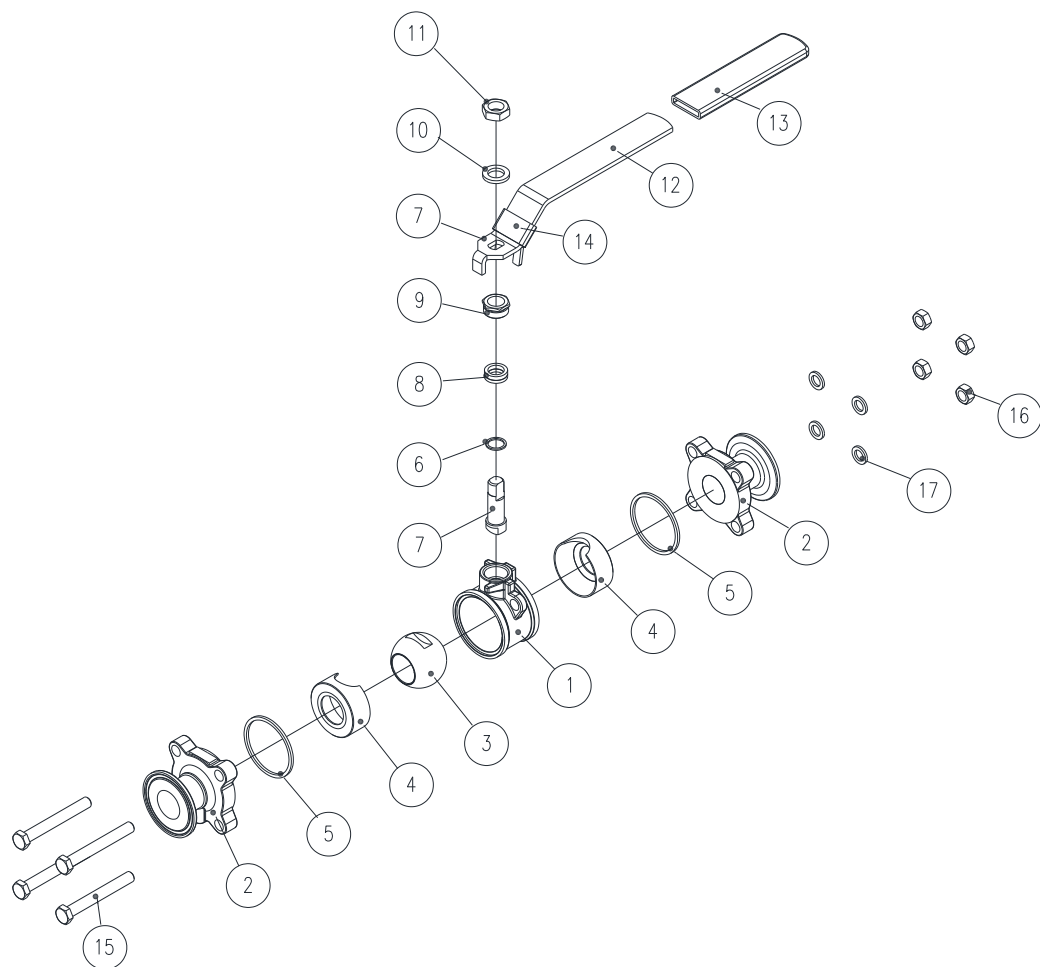
No.	Part Name	No.	Part Name	No.	Part Name
1	Body	9	Gland Bush	18	Stop Pin
2	End Cap	10	Stop Washer	19	Pin Nut
3	Ball	11	Stem Nut	20	Locking Device
4	Seat	12	Handle	21	O-Ring
5	Joint Gasket	13	Handle Cover	22	Washer
6	Thrust Washer	14	Stem Washer	23	Anti-Static Device
7	Stem	15	Bolt	24	
8	Gland Packing	16	Bolt Nut	25	
8.1	Gland Packing	17	Belleville Washer	26	

Series S501



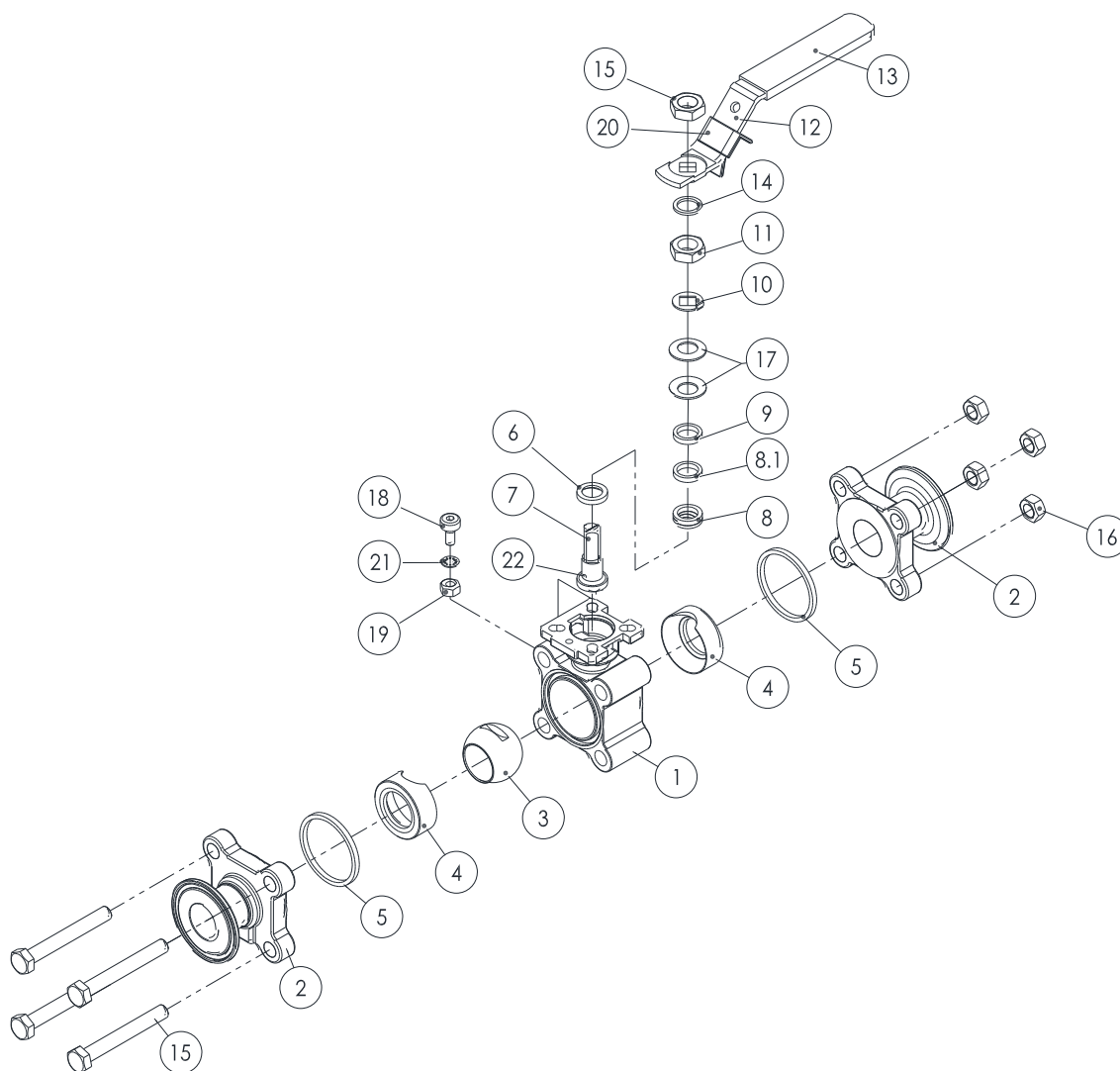
No.	Part Name	No.	Part Name	No.	Part Name
1	Body	7	Stem	13	Handle Cover
2	End Cap	8	Gland Packing	14	Locking Device
3	Ball	9	Gland Bush	15	Bolt
4	Seat	10	Stem Washer	16	Bolt Nut
5	Joint Gasket	11	Stem Nut	17	Bolt Washer
6	Thrust Washer	12	Handle		

Series S504



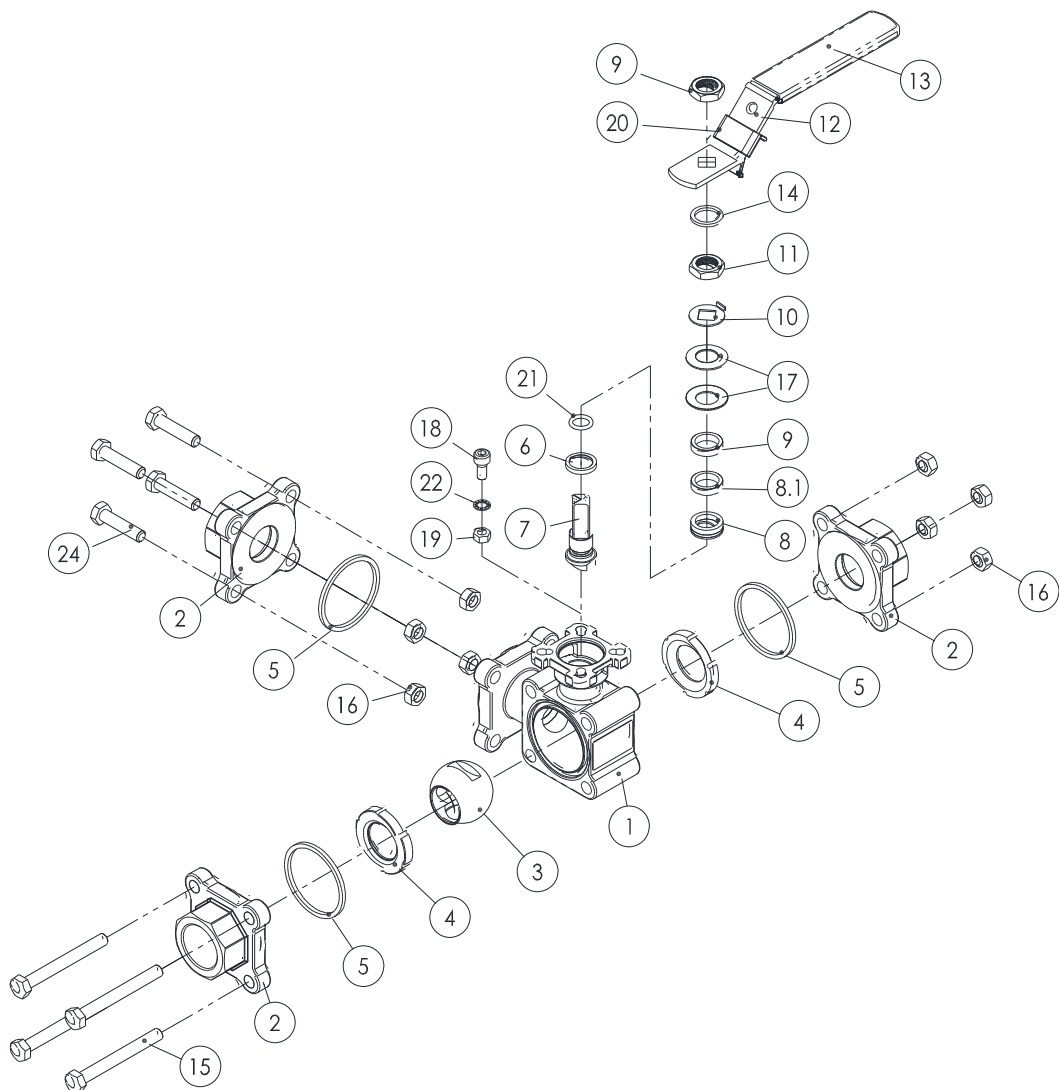
No.	Part Name	No.	Part Name	No.	Part Name
1	Body	7	Stem	13	Handle Cover
2	End Cap	8	Gland Packing	14	Locking Device
3	Ball	9	Gland Bush	15	Bolt
4	Seat	10	Stem Washer	16	Bolt Nut
5	Joint Gasket	11	Stem Nut	17	Bolt Washer
6	Thrust Washer	12	Handle		

Series S604



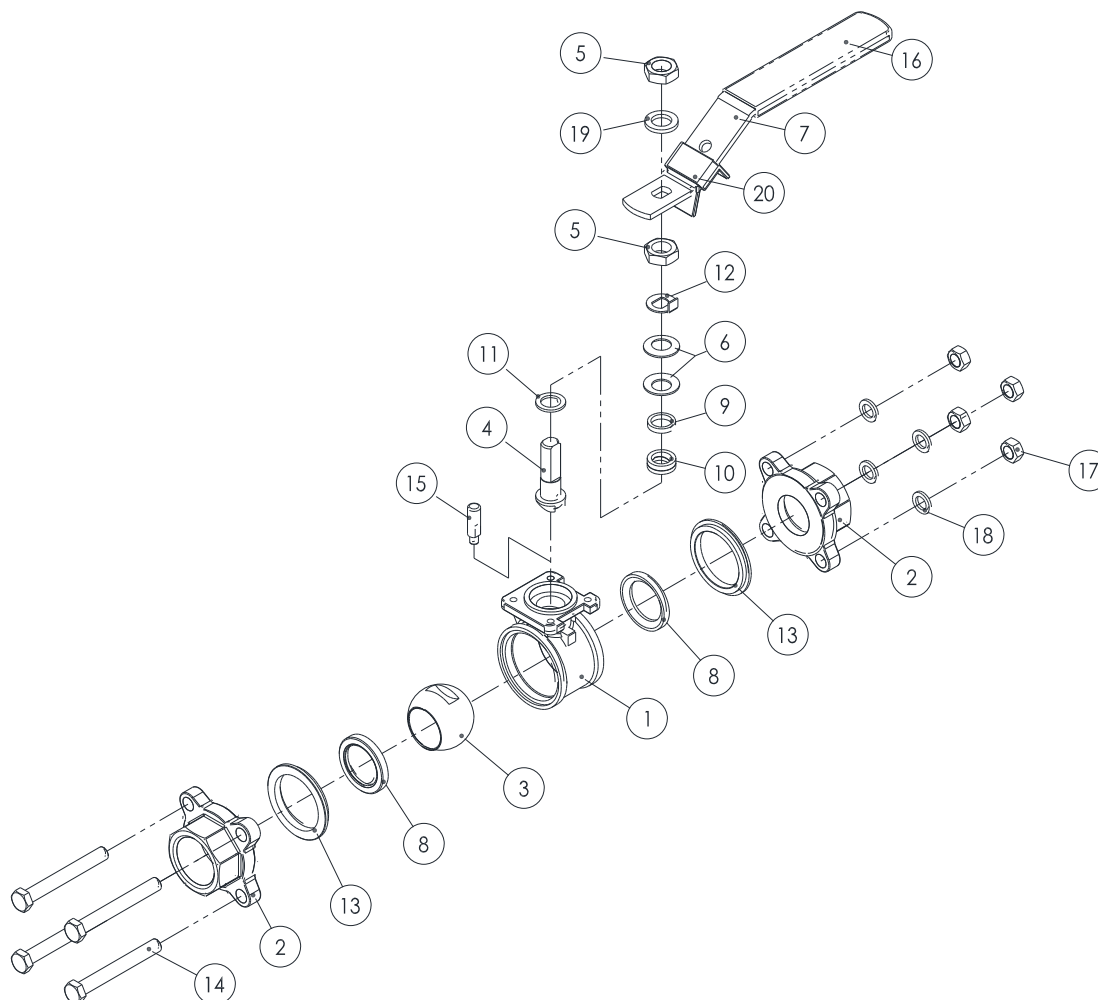
No.	Part Name	No.	Part Name	No.	Part Name
1	Body	9	Gland Bush	18	Stop Pin
2	End Cap	10	Stop Washer	19	Pin Nut
3	Ball	11	Stem Nut	20	Locking Device
4	Seat	12	Handle	21	Washer
5	Joint Gasket	13	Handle Cover	22	Anti-Static Device
6	Thrust Washer	14	Stem Washer	23	
7	Stem	15	Bolt	24	
8	Gland Packing	16	Bolt Nut	25	
8.1	Gland Packing	17	Belleville Washer	26	

Series S605



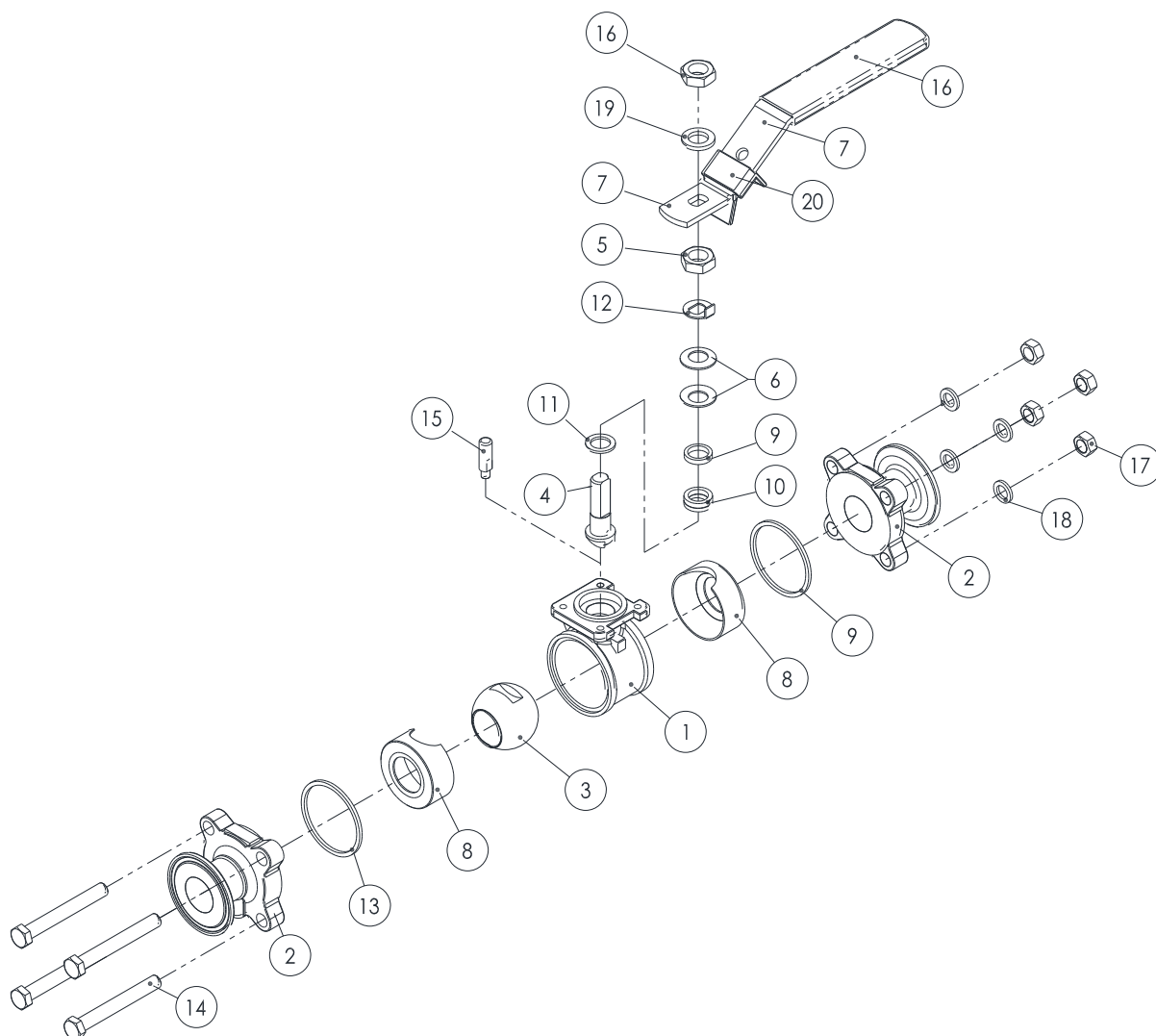
No.	Part Name	No.	Part Name	No.	Part Name
1	Body	9	Gland Bush	18	Stop Pin
2	End Cap	10	Stop Washer	19	Pin Nut
3	Ball	11	Stem Nut	20	Locking Device
4	Seat	12	Handle	21	O-Ring
5	Joint Gasket	13	Handle Cover	22	Washer
6	Thrust Washer	14	Stem Washer	23	Anti-Static Device
7	Stem	15	Bolt	24	Welding Cap
8	Gland Packing	16	Bolt Nut	25	Bolt
8.1	Gland Packing	17	Belleville Washer	26	Cap Seal

Series S701



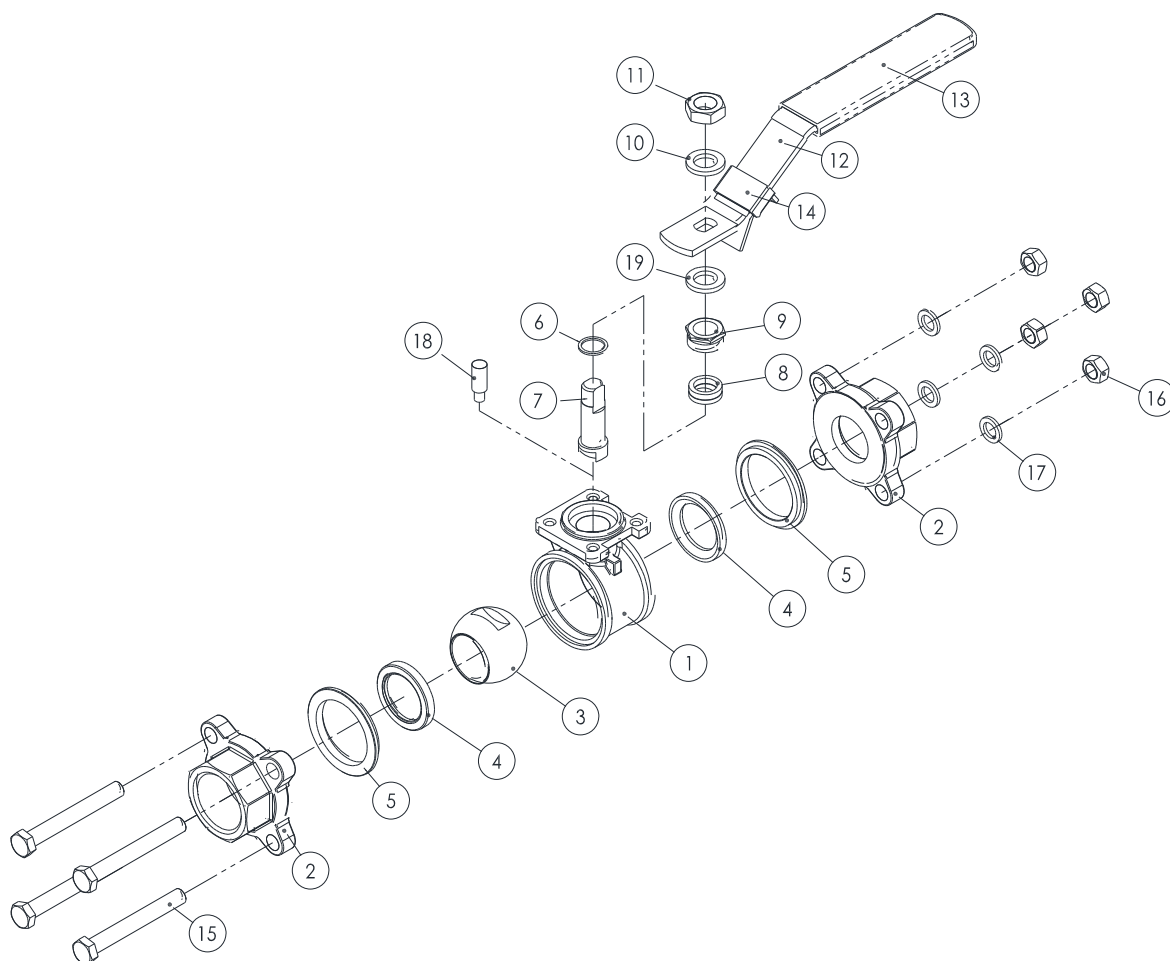
No.	Part Name	No.	Part Name	No.	Part Name
1	Body	8	Seat	15	Stop Pin
2	End Cap	9	Gland Bush	16	Handle Cover
3	Ball	10	Gland Packing	17	Bolt Nut
4	Stem	11	Thrust Washer	18	Bolt Washer
5	Stem Nut	12	Stop Washer	19	Stem Washer
6	Belleville Washer	13	Joint Gasket	20	Locking Device
7	Handle	14	Bolt	21	

Series S704



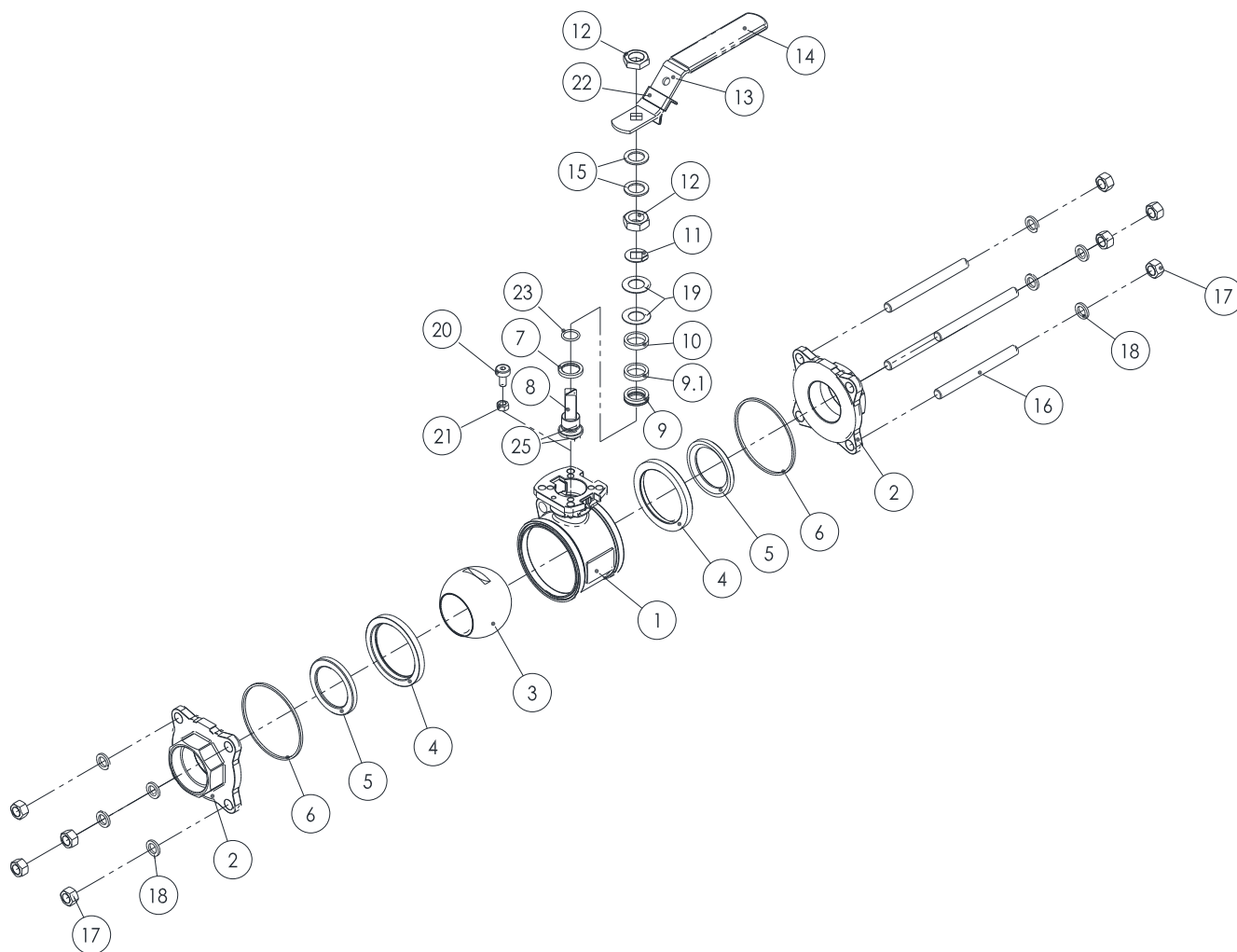
No.	Part Name	No.	Part Name	No.	Part Name
1	Body	8	Seat	15	Stop Pin
2	End Cap	9	Gland Bush	16	Handle Cover
3	Ball	10	Gland Packing	17	Bolt Nut
4	Stem	11	Thrust Washer	18	Bolt Washer
5	Stem Nut	12	Stop Washer	19	Stem Washer
6	Belleville Washer	13	Joint Gasket	20	Locking Device
7	Handle	14	Bolt	21	

Series S711



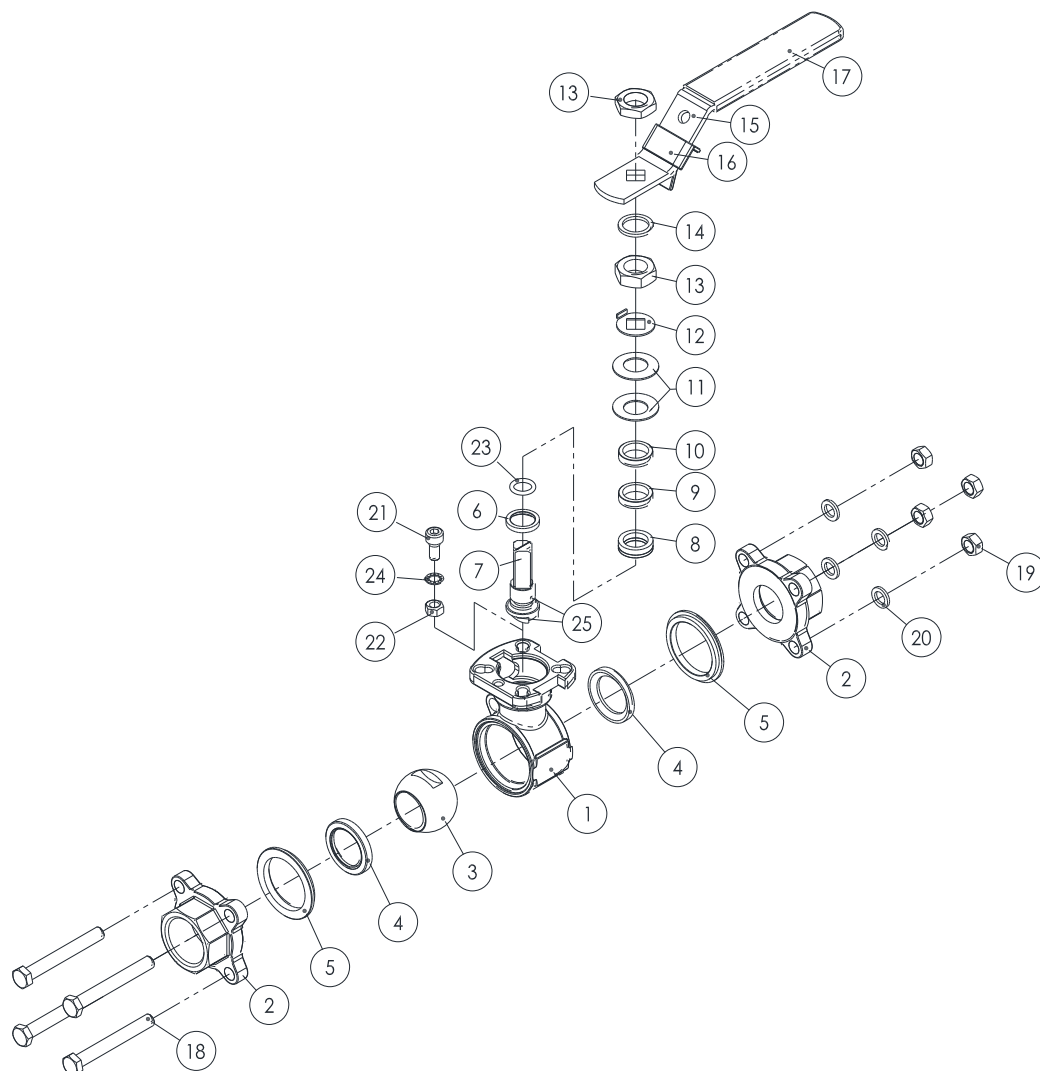
No.	Part Name	No.	Part Name	No.	Part Name
1	Body	8	Gland Packing	15	Bolt
2	End Cap	9	Gland Bush	16	Bolt Nut
3	Ball	10	Stem Washer	17	Bolt Washer
4	Seat	11	Stem Nut	18	Stop Pin
5	Joint Gasket	12	Handle	19	Handle Washer
6	Trust Washer	13	Handle Cover	20	
7	Stem	14	Locking Device	21	

Series S802



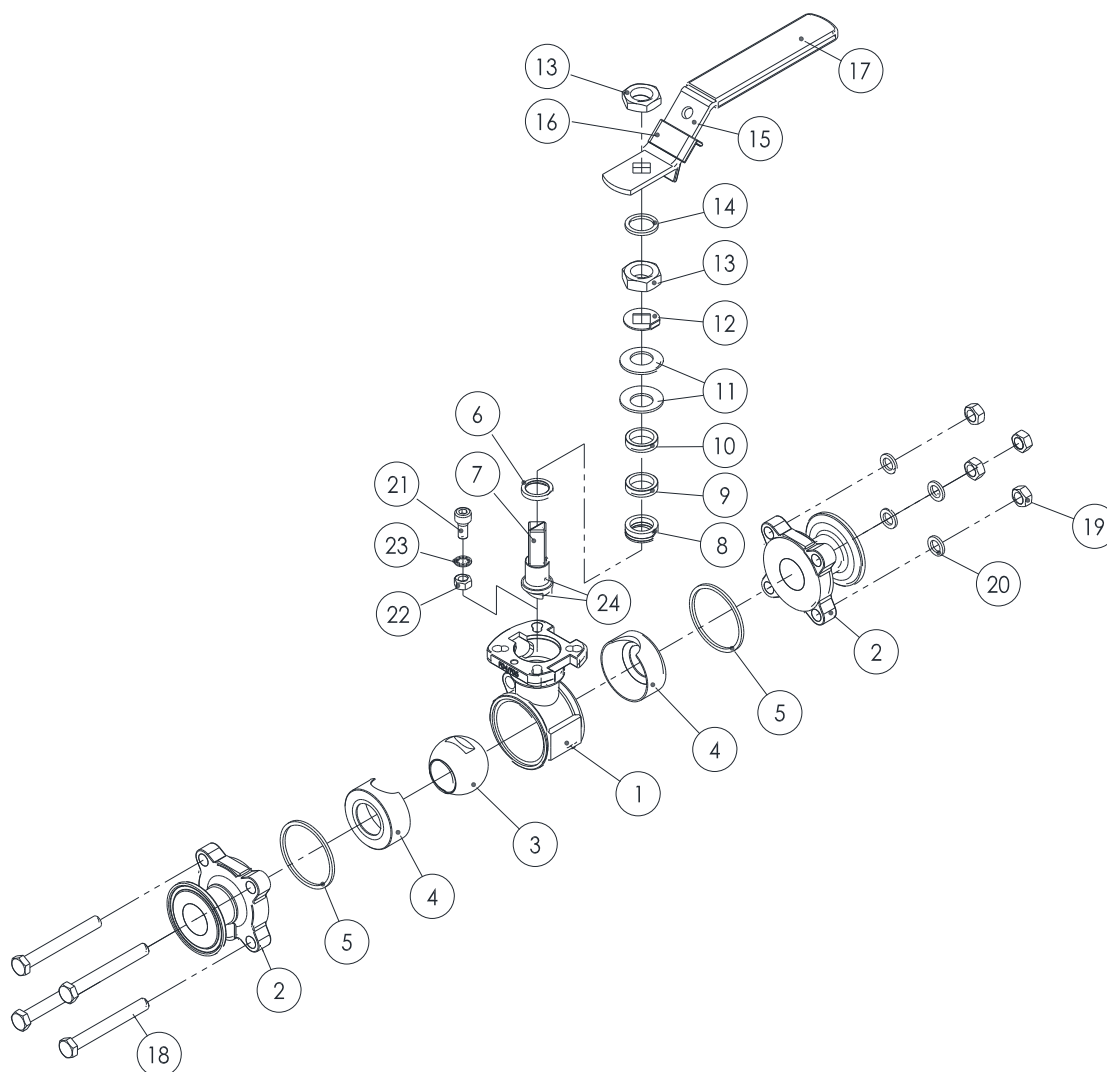
No.	Part Name	No.	Part Name	No.	Part Name
1	Body	9.1	Gland Packing	18	Bolt Washer
2	End Cap	10	Gland Bush	19	Belleville Washer
3	Ball	11	Stop Washer	20	Stop Pin
4	Seat Ring	12	Stem Nut	21	Pin Nut
5	Seat	13	Handle	22	Locking Device
6	Joint Gasket	14	Handle Cove	23	O-Ring
7	Trust Washer	15	Stem Washer	24	Washer
8	Stem	16	Bolt	25	Anti-Static Device
9	Gland Packing	17	Bolt Nut	26	

Series S900



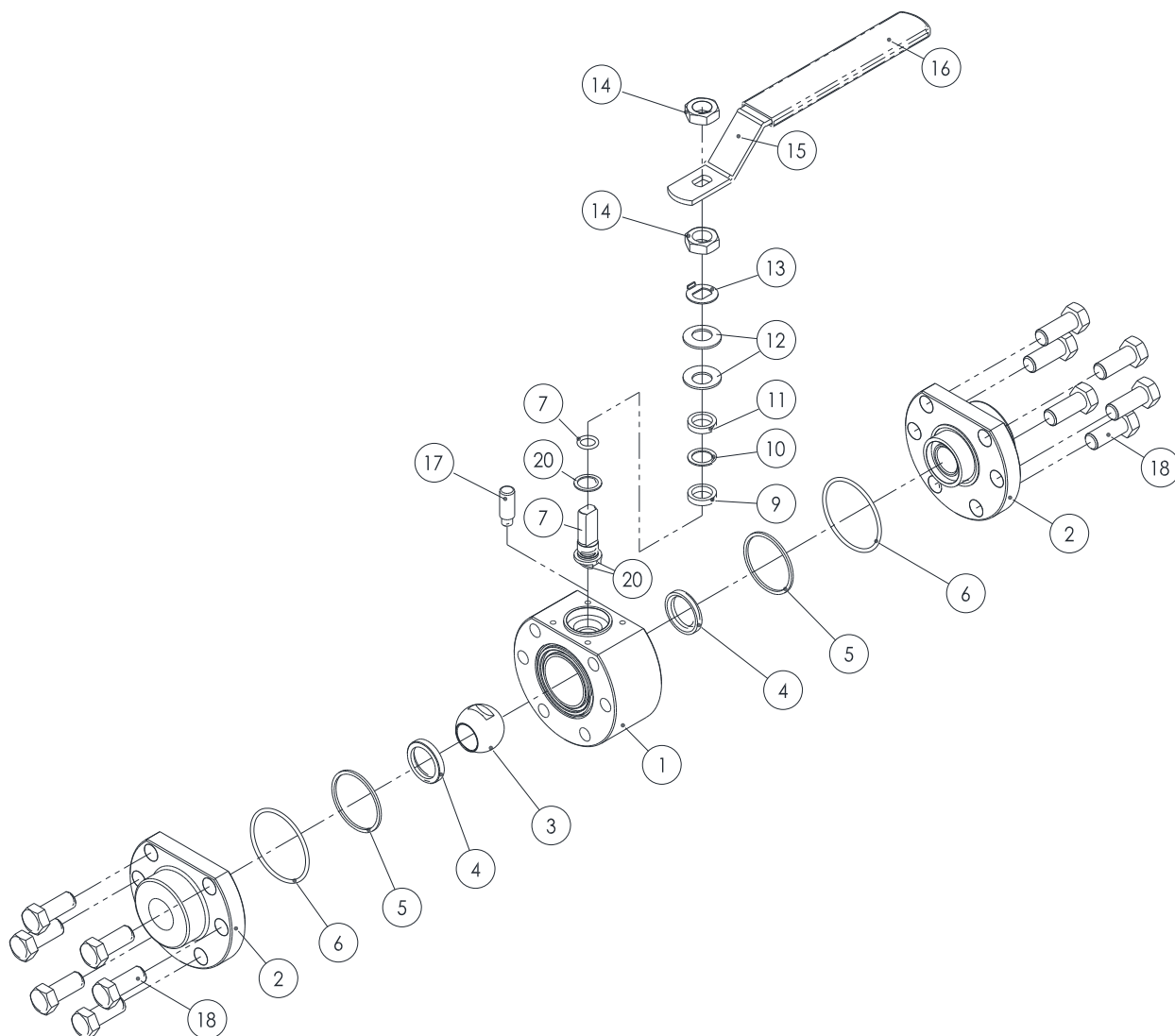
No.	Part Name	No.	Part Name	No.	Part Name
1	Body	10	Gland Bush	19	Bolt Nut
2	End Cap	11	Belleville Washer	20	Bolt Washer
3	Ball	12	Stop Washer	21	Stop Pin
4	Seat	13	Stem Nut	22	Pin Nut
5	Joint Gasket	14	Stem Washer	23	O-Ring
6	Trust Washer	15	Handle	24	Washer
7	Stem	16	Locking Device	25	Anti-Static Device
8	Gland Packing	17	Handle Cover	26	
9	Gland Packing	18	Bolt	27	

Series S904



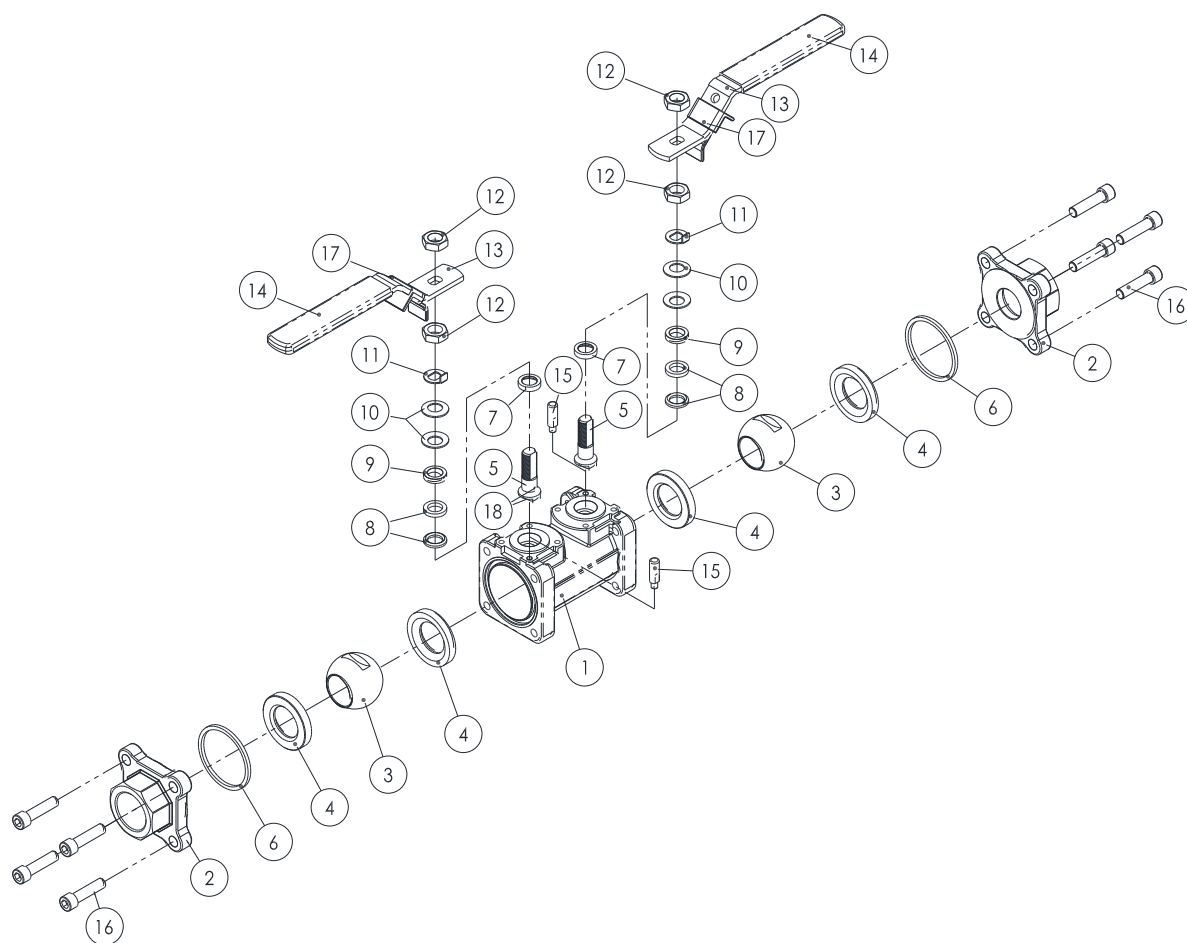
No.	Part Name	No.	Part Name	No.	Part Name
1	Body	10	Gland Bush	19	Bolt Nut
2	End Cap	11	Belleville Washer	20	Bolt Washer
3	Ball	12	Stop Washer	21	Stop Pin
4	Seat	13	Stem Nut	22	Pin Nut
5	Joint Gasket	14	Stem Washer	23	Washer
6	Trust Washer	15	Handle	24	Anti-Static Device
7	Stem	16	Locking Device	25	
8	Gland Packing	17	Handle Cover	26	
9	Gland Packing	18	Bolt	27	

Series T531



No.	Part Name	No.	Part Name	No.	Part Name
1	Body	10	Gland Packing	19	Anti-Static Device
2	End Cap	11	Gland Bush	20	O-Ring
3	Ball	12	Belleville Washer	21	
4	Seat	13	Stop Washer	22	
5	Joint Gasket	14	Stem Nut	23	
6	O-Ring	15	Handle	24	
7	Stem	16	Handle Cover	25	
8	Trust Washer	17	Stop Pin	26	
9	Gland Packing	18	Bolt	27	

Series T801



No.	Part Name	No.	Part Name	No.	Part Name
1	Body	8	Gland Packing	15	Stop Pin
2	End Cap	9	Gland Bush	16	Screw
3	Ball	10	Belleville Washer	17	Locking
4	Seat	11	Stop Washer	18	Anti-Static Device
5	Stem	12	Stem Nut	19	
6	Joint Gasket	13	Handle	20	
7	Thrust Washer	14	Handle Cover	21	

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

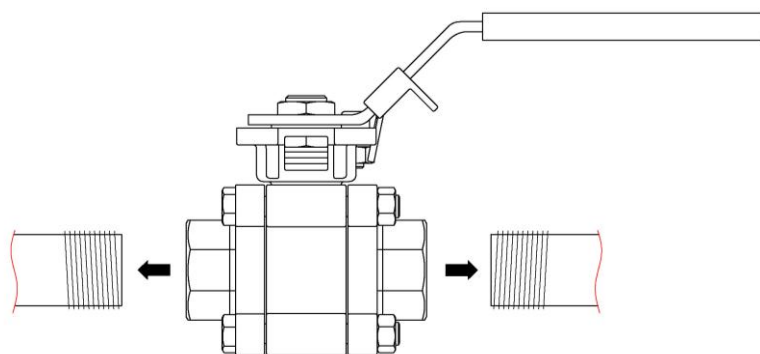
The valve's open or closed state is altered by giving the lever a quarter-turn (90-degrees).

- 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. 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.

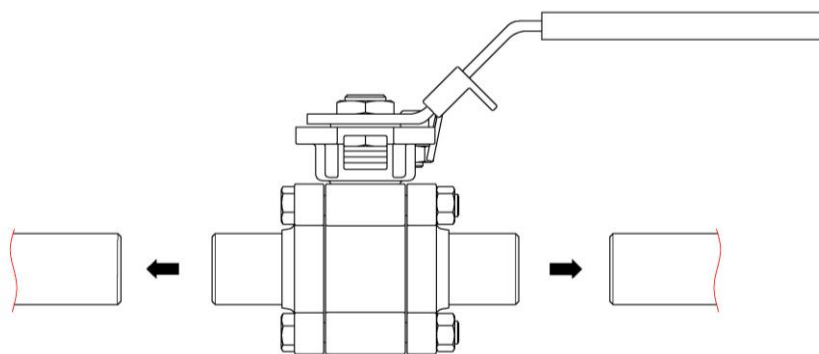


(Figure 1)

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 larger 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.

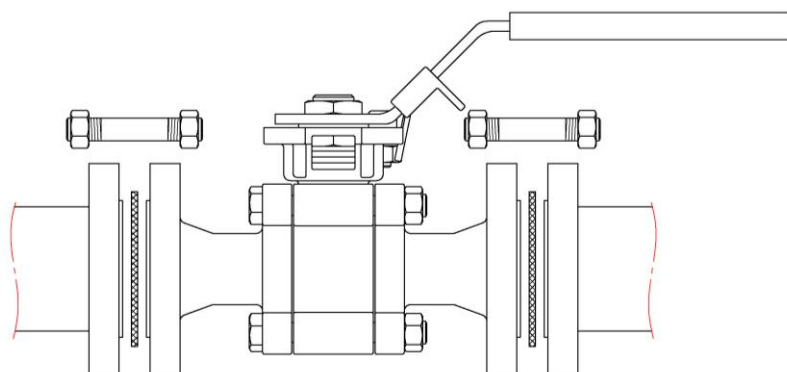
- Check proper operation of the valve and hydrostatic system and check for leaks.



(Figure 2)

4.3 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.



(Figure 3)

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.

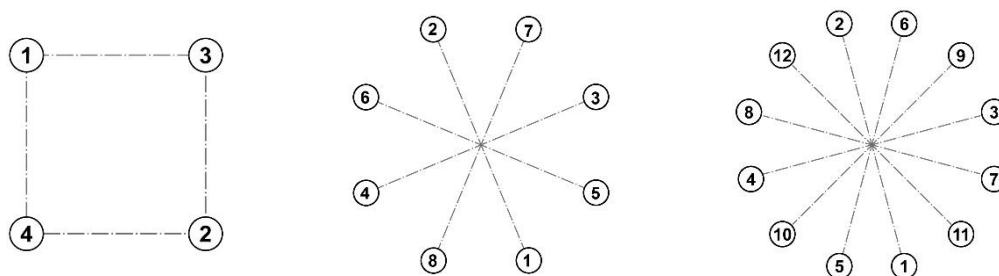
If the valve has been used to control hazardous media, it must be decontaminated before disassembly. It is recommended that the following steps are taken for safe removal and reassembly.

- 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 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 Figure 4 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 2~16)



(Figure 4)

6.3 Torque of Body Bolts

— Series S300 / S303 / S305 / S320 / S600 / S603 / S605

Size		Threads	lbf-in	kgf-cm	N-m	Threads	lbf-in	kgf-cm	N-m
Full port	Red port								
1/4"		1/4"-20UNC	87 ~ 95	100 ~ 110	9.8 ~ 10.8	M6	87 ~ 95	100 ~ 110	9.8 ~ 10.8
3/8"	1/2"	1/4"-20UNC	87 ~ 95	100 ~ 110	9.8 ~ 10.8	M6	87 ~ 95	100 ~ 110	9.8 ~ 10.8
1/2"	3/4"	1/4"-20UNC	95 ~ 130	110 ~ 150	10.8 ~ 14.7	M6	95 ~ 130	110 ~ 150	10.8 ~ 14.7
3/4"	1"	5/16"-18UNC	122 ~ 156	140 ~ 180	13.7 ~ 17.6	M8	122 ~ 156	140 ~ 180	13.7 ~ 17.6
1"	1.1/4"	5/16"-18UNC	165 ~ 200	190 ~ 230	18.6 ~ 22.5	M8	165 ~ 200	190 ~ 230	18.6 ~ 22.5
1.1/4"	1.1/2"	3/8"-16UNC	191 ~ 217	220 ~ 250	21.6 ~ 24.5	M10	191 ~ 217	220 ~ 250	21.6 ~ 24.5
1.1/2"	2"	3/8"-16UNC	330 ~ 365	380 ~ 420	37.2 ~ 41.2	M10	330 ~ 365	380 ~ 420	37.2 ~ 41.2
2"	2.1/2"	7/16"-14UNC	391 ~ 434	450 ~ 500	44.1 ~ 49	M12	391 ~ 434	450 ~ 500	44.1 ~ 49
2.1/2"	3"	9/16"-12UNC	625 ~ 694	720 ~ 800	70.6 ~ 78.4	M14	625 ~ 694	720 ~ 800	70.6 ~ 78.4
3"	4"	5/8"-11UNC	694 ~ 781	800 ~ 900	78.4 ~ 88.2	M16	694 ~ 781	800 ~ 900	78.4 ~ 88.2
4"	-	5/8"-11UNC	694 ~ 781	800 ~ 900	78.4 ~ 88.2	M16	694 ~ 781	800 ~ 900	78.4 ~ 88.2

(Table 2)

— Series S304 / S604

Size	Threads	lbf-in		kgf-cm		N-m	
1/2"	M6	95	~ 130	110	~ 150	10.8	~ 14.7
3/4"	M8	95	~ 130	110	~ 150	10.8	~ 14.7
1"	M8	122	~ 156	140	~ 180	13.7	~ 17.6
1.1/2"	M10	191	~ 217	220	~ 250	21.6	~ 24.5
2"	M12	391	~ 434	450	~ 500	44.1	~ 49.0
2.1/2"	M14	625	~ 694	720	~ 800	70.6	~ 78.4
3"	M16	694	~ 781	800	~ 900	78.4	~ 88.2
4"	M16	694	~ 781	800	~ 900	78.4	~ 88.2

(Table 3)

— Series S501 / S504 / S701 / S704 / S711 / S900 / S904

Size	Threads	lbf-in		kgf-cm		N-m	
1/4"	1/4"-20UNC	74	~ 87	85	~ 100	8.3	~ 9.8
3/8"	1/4"-20UNC	74	~ 87	85	~ 100	8.3	~ 9.8
1/2"	5/16"-18UNC	95	~ 113	110	~ 130	10.8	~ 12.7
3/4"	5/16"-18UNC	104	~ 122	120	~ 140	11.8	~ 13.7
1"	5/16"-18UNC	113	~ 139	130	~ 160	12.7	~ 15.7
1.1/4"	3/8"-16UNC	174	~ 217	200	~ 250	19.6	~ 24.5
1.1/2"	7/16"-14UNC	286	~ 312	330	~ 360	32.3	~ 35.3
2"	7/16"-14UNC	391	~ 434	450	~ 500	44.1	~ 49
2.1/2"	N/A	N/A	N/A	N/A	N/A	M14	625 ~ 694 720 ~ 800 70.6 ~ 78.4

3"	N/A	N/A	N/A	N/A	M16	694 ~ 781	800 ~ 900	78.4 ~ 88.2
4"	N/A	N/A	N/A	N/A	M16	694 ~ 781	800 ~ 900	78.4 ~ 88.2

(Table 4)
— Series S400

Size	Threads	Standard			NACE		
		lbf-in	kgf-cm	N-m	lbf-in	kgf-cm	N-m
1/4"	1/4"-28UNF	78 ~ 95	90 ~ 110	8.8 ~ 10.8	61 ~ 69	70 ~ 80	6.9 ~ 7.8
3/8"	1/4"-28UNF	78 ~ 95	90 ~ 110	8.8 ~ 10.8	61 ~ 69	70 ~ 80	6.9 ~ 7.8
1/2"	1/4"-28UNF	78 ~ 95	90 ~ 110	8.8 ~ 10.8	61 ~ 69	70 ~ 80	6.9 ~ 7.8
3/4"	5/16"-24UNF	104 ~ 122	120 ~ 140	11.8 ~ 13.7	104 ~ 122	120 ~ 140	11.8 ~ 13.7
1"	3/8"-24UNF	165 ~ 200	190 ~ 230	18.6 ~ 22.5	165 ~ 174	190 ~ 200	18.6 ~ 19.6
1.1/4"	7/16"-20UNF	191 ~ 217	220 ~ 250	21.6 ~ 24.5	191 ~ 200	220 ~ 230	21.6 ~ 22.5
1.1/2"	1/2"-20UNF	330 ~ 365	380 ~ 420	37.2 ~ 41.2	330 ~ 339	380 ~ 390	37.2 ~ 38.2
2"	7/16"-20UNF	391 ~ 399	450 ~ 460	44.1 ~ 45.1	391 ~ 399	450 ~ 460	44.1 ~ 45.1
2.1/2"	9/16"-18UNF	625 ~ 694	720 ~ 800	70.6 ~ 78.4	625 ~ 642	720 ~ 740	70.6 ~ 72.5
3"	5/8"-18UNF	694 ~ 781	800 ~ 900	78.4 ~ 88.2	694 ~ 712	800 ~ 820	78.4 ~ 80.4
4"	5/8"-18UNF	694 ~ 781	800 ~ 900	78.4 ~ 88.2	694 ~ 712	800 ~ 820	78.4 ~ 80.4

(Table 5)
— Series S802

Size	Threads	lbf-in		kgf-cm		N-m	
2"	1/2"-13UNC	781	868	900	~ 1000	88.3	98.1
3"	5/8"-11UNC	1042	~ 1215.1	1200	~ 1400	117.6	~ 137.3
4"	5/8"-11UNC	1042	~ 1215.1	1200	~ 1400	117.6	~ 137.3

(Table 6)
— Series T531

Size	Threads	lbf-in		kgf-cm		N-m	
1/4"	3/8"-16UNC	521	~ 608	600	~ 700	58.8	~ 68.6
3/8"	3/8"-16UNC	521	~ 608	600	~ 700	58.8	~ 68.6
1/2"	3/8"-16UNC	521	~ 608	600	~ 700	58.8	~ 68.6
3/4"	3/8"-16UNC	521	~ 608	600	~ 700	58.8	~ 68.6
1"	1/2"-13UNC	781	~ 868	900	~ 1000	88.2	~ 98
1.1/4"	1/2"-13UNC	781	~ 868	900	~ 1000	88.2	~ 98
1.1/2"	5/8"-11UNC	1042	~ 1128	1200	~ 1300	117.6	~ 127.4
2"	5/8"-11UNC	1042	~ 1128	1200	~ 1300	117.6	~ 127.4

(Table 7)

— Series T801

Size	Threads	lbf-in			kgf-cm			N-m		
1/4"	5/16"-18UNC	87	~	95	100	~	110	9.8	~	10.8
1/2"	5/16"-18UNC	95	~	130	110	~	150	10.8	~	14.7
3/4"	5/16"-18UNC	122	~	156	140	~	180	13.7	~	17.6
1"	5/16"-18UNC	165	~	200	190	~	230	18.6	~	22.5
1.1/2"	7/16"-14UNC	330	~	365	380	~	420	37.2	~	41.2
2"	M14	391	~	434	450	~	500	44.1	~	49
2.1/2"	M14	625	~	694	720	~	800	70.6	~	78.4

(Table 8)

6.4 Torque of Stem Nut
— Series S320 / S600 / S603 / S605 / S400 / S900 / S904

Size		Non-fire Safe Valve						Fire Safe Valve					
		With O-ring			Without O-ring			With O-ring			Without O-ring		
Full port	Red port	lbf-in	kgf-cm	N-m	lbf-in	kgf-cm	N-m	lbf-in	kgf-cm	N-m	lbf-in	kgf-cm	N-m
1/4"		60.8	70	6.9	69.4	80	7.8	78.1	90	8.8	78.1	90	8.8
3/8"	1/2"	60.8	70	6.9	69.4	80	7.8	78.1	90	8.8	78.1	90	8.8
1/2"	3/4"	69.4	80	7.8	78.1	90	8.8	86.8	100	9.8	86.8	100	9.8
3/4"	1"	69.4	80	7.8	78.1	90	8.8	86.8	100	9.8	86.8	100	9.8
1"	1.1/4"	95.5	110	10.8	121.5	140	13.7	104.2	120	11.8	130.2	150	14.7
1.1/4"	1.1/2"	95.5	110	10.8	121.5	140	13.7	104.2	120	11.8	130.2	150	14.7
1.1/2"	2"	138.9	160	15.7	199.6	230	22.6	147.6	170	16.7	173.6	200	19.6
2"	2.1/2"	138.9	160	15.7	199.6	230	22.6	147.6	170	16.7	173.6	200	19.6
2.1/2"	3"	164.9	190	18.6	191	220	21.6	191	220	21.6	208.3	240	23.5
3"	4"	182.3	210	20.6	191	220	21.6	191	220	21.6	208.3	240	23.5
4"		199.6	230	22.6	217	250	24.5	208.3	240	23.5	225.7	260	25.5

(Table 9)

— Series S604

Size	With O-ring			Without O-ring		
	lbf-in	kgf-cm	N-m	lbf-in	kgf-cm	N-m
1/2"	69.4	80	7.8	78.1	90	8.8
3/4"	69.4	80	7.8	78.1	90	8.8
1"	69.4	80	7.8	78.1	90	8.8
1.1/2"	95.5	110	10.8	121.5	140	13.7
2"	138.9	160	15.7	199.6	230	22.6
2.1/2"	164.9	190	18.6	191	220	21.6
3"	182.3	210	20.6	191	220	21.6
4"	199.6	230	22.6	217	250	24.5

(Table 10)

— Series S300 / S303 / S305 / T801

Size		Non-fire Safe Valve						Fire Safe Valve					
		With O-ring			Without O-ring			With O-ring			Without O-ring		
Full port	Red port	lbf-in	kgf-cm	N-m	lbf-in	kgf-cm	N-m	lbf-in	kgf-cm	N-m	lbf-in	kgf-cm	N-m
1/4"		60.8	70	6.9	69.4	80	7.8	78.1	90	8.8	78.1	90	8.8
3/8"	1/2"	60.8	70	6.9	69.4	80	7.8	78.1	90	8.8	78.1	90	8.8
1/2"	3/4"	78.1	90	8.8	86.8	100	9.8	86.8	100	9.8	95.5	110	10.8
3/4"	1"	78.1	90	8.8	86.8	100	9.8	86.8	100	9.8	95.5	110	10.8
1"	1.1/4"	95.5	110	10.8	121.5	140	13.7	104.2	120	11.8	130.2	150	14.7
1.1/4"	1.1/2"	95.5	110	10.8	121.5	140	13.7	104.2	120	11.8	130.2	150	14.7
1.1/2"	2"	138.9	160	15.7	164.9	190	18.6	147.6	170	16.7	173.6	200	19.6
2"	2.1/2"	138.9	160	15.7	164.9	190	18.6	147.6	170	16.7	173.6	200	19.6

(Table 11)

— Series S304

Size	With O-ring			Without O-ring		
	lbf-in	kgf-cm	N-m	lbf-in	kgf-cm	N-m
1/2"	60.8	70	6.9	69.4	80	7.8
3/4"	78.1	90	8.8	86.8	100	9.8
1"	78.1	90	8.8	86.8	100	9.8
1.1/2"	95.5	110	10.8	121.5	140	13.7
2"	138.9	160	15.7	164.9	190	18.6

(Table 12)

— Series S701 / S704

Size	With O-ring			Without O-ring		
	lbf-in	kgf-cm	N-m	lbf-in	kgf-cm	N-m
1/4"	60.8	70	6.9	60.8	70	6.9
3/8"	60.8	70	6.9	60.8	70	6.9
1/2"	60.8	70	6.9	60.8	70	6.9
3/4"	60.8	70	6.9	60.8	70	6.9
1"	86.8	100	9.8	112.8	130	12.7
1.1/4"	86.8	100	9.8	112.8	130	12.7
1.1/2"	130.2	150	14.7	147.6	170	16.7
2"	130.2	150	14.7	147.6	170	16.7
2.1/2"	164.9	190	18.6	191	220	21.6
3"	182.3	210	20.6	191	220	21.6
4"	199.6	230	22.6	217	250	24.5

(Table 13)

— Series S501 / S504 / S711

Size	lbf-in			kgf-cm			N-m		
1/4"	95.5	~	104.2	110	~	120	10.8	~	11.8
3/8"	95.5	~	104.2	110	~	120	10.8	~	11.8
1/2"	121.5	~	130.2	140	~	150	13.7	~	14.7
3/4"	121.5	~	130.2	140	~	150	13.7	~	14.7
1"	434	~	477.4	500	~	550	49	~	53.9
1.1/4"	434	~	477.4	500	~	550	49	~	53.9
1.1/2"	694.4	~	781.2	800	~	900	78.5	~	88.3
2"	694.4	~	781.2	800	~	900	78.5	~	88.3
2.1/2"	1215.1	~	1388.7	1400	~	1600	137.3	~	156.9
3"	1215.1	~	1388.7	1400	~	1600	137.3	~	156.9
4"	1735.9	~	1909.5	2000	~	2200	196.1	~	215.7

(Table 14)

— Series S802

Size	lbf-in	kgf-cm	N-m
2"	138.9	160	15.7
3"	199.6	230	22.6
4"	234.3	270	26.5



(Table 15)

— Series T531

Size	lbf-in	kgf-cm	N-m
1/4"	78.1	90	8.8
3/8"	78.1	90	8.8
1/2"	95.5	110	10.8
3/4"	95.5	110	10.8
1"	130.2	150	14.7
1.1/4"	130.2	150	14.7
1.1/2"	173.6	200	19.6
2"	173.6	200	19.6

(Table 16)

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.

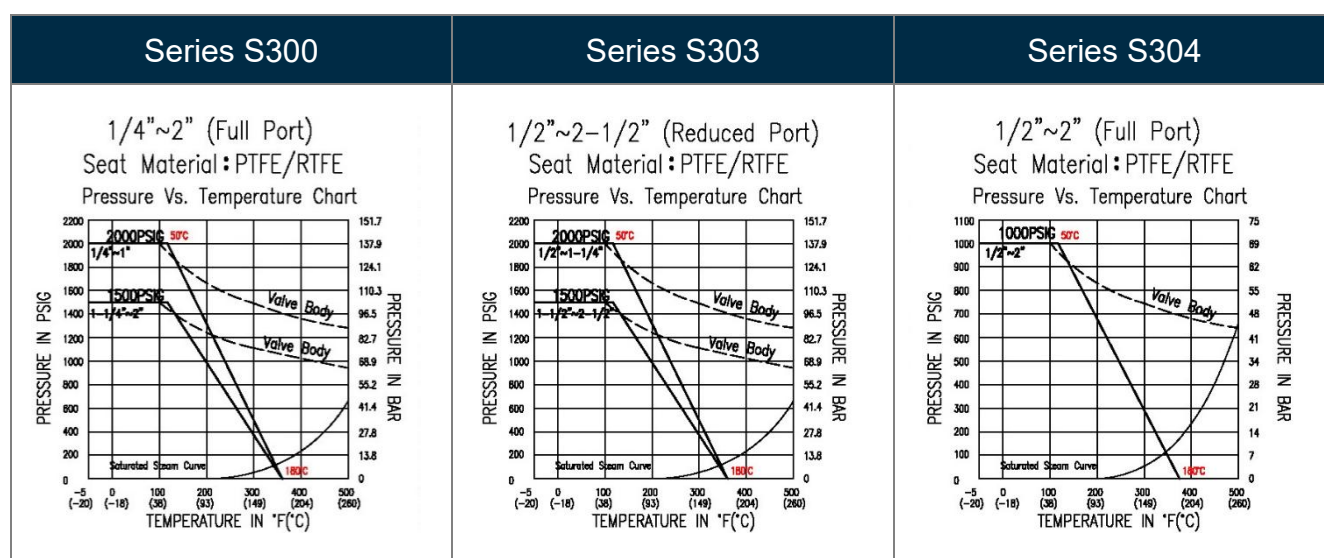
- Use appropriate protective gear as specified in plant operator's guidelines.
- Choose the installation location and suitable means, the ball valve cannot be used as a foothold or climbing aid.
- Do NOT apply external force to the ball valve.
- Inside diameter of the piping must correspond to the nominal 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 17, Table 18)
- 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

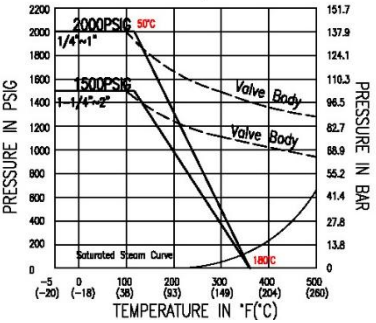
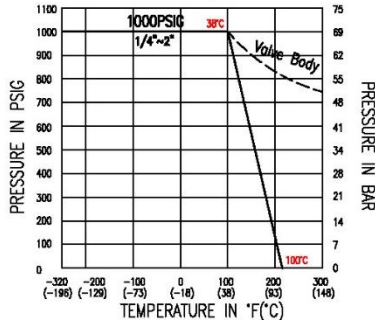
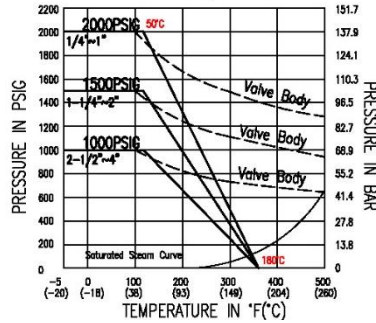
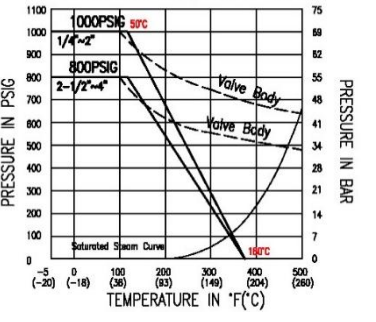
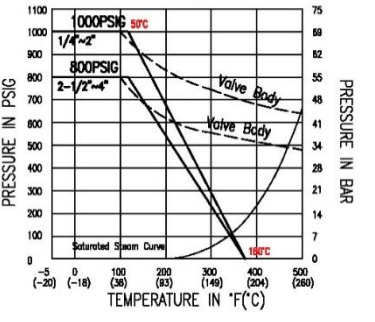
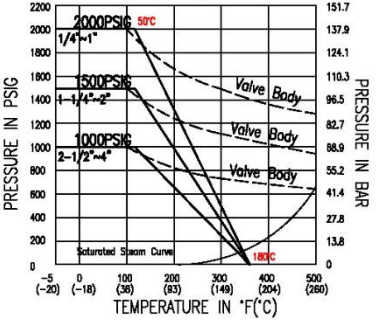
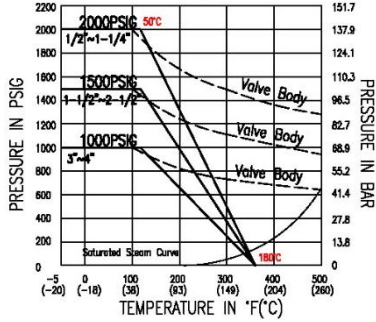
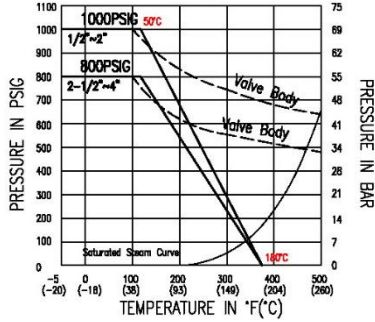
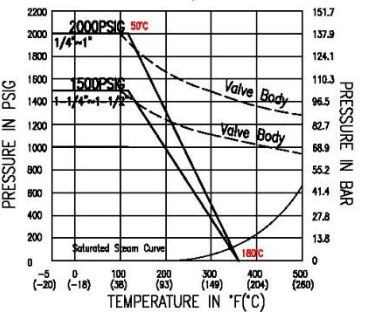
- Transport the ball valve using appropriate methods; throwing or dropping is prohibited.
- Dispose of packaging materials in accordance with relevant local or national disposal regulations/environmental protection laws.

9. Appendix

- Pressure-Temperature Chart



(Table 17)

<p>Series S305</p> <p>1/4"~2" (Full Port) Seat Material: PTFE/RTFE Pressure Vs. Temperature Chart</p> 	<p>Series S320</p> <p>1/4"~2" (Full Port) Seat Material: PCTFE Pressure Vs. Temperature Chart</p> 	<p>Series S400</p> <p>1/4"~4" (Full Port) Seat Material: PTFE/RTFE Pressure Vs. Temperature Chart</p> 
<p>Series S501</p> <p>1/4"~4" (Full Port) Seat Material: PTFE/RTFE Pressure Vs. Temperature Chart</p> 	<p>Series S504</p> <p>1/4"~4" (Full Port) Seat Material: PTFE/RTFE Pressure Vs. Temperature Chart</p> 	<p>Series S600</p> <p>1/4"~4" (Full Port) Seat Material: PTFE/RTFE Pressure Vs. Temperature Chart</p> 
<p>Series S603</p> <p>1/2"~4" (Reduced Port) Seat Material: PTFE/RTFE Pressure Vs. Temperature Chart</p> 	<p>Series S604</p> <p>1/4"~4" (Full Port) Seat Material: PTFE/RTFE Pressure Vs. Temperature Chart</p> 	<p>Series S605</p> <p>1/4"~4" (Full Port) Seat Material: PTFE/RTFE Pressure Vs. Temperature Chart</p> 

(Table 18)

<p>Series S701</p> <p>1/4"~4" (Full Port) Seat Material: PTFE/RTFE Pressure Vs. Temperature Chart</p>	<p>Series S704</p> <p>1/4"~4" (Full Port) Seat Material: PTFE/RTFE Pressure Vs. Temperature Chart</p>	<p>Series S711</p> <p>1/4"~4" (Full Port) Seat Material: PTFE/RTFE Pressure Vs. Temperature Chart</p>
<p>Series S802</p> <p>2"~4" (Full Port) Seat Material: PTFE/RTFE Pressure Vs. Temperature Chart</p>	<p>Series S900</p> <p>1/4"~4" (Full Port) Seat Material: PTFE/RTFE Pressure Vs. Temperature Chart</p>	<p>Series S904</p> <p>1/4"~4" (Full Port) Seat Material: PTFE/RTFE Pressure Vs. Temperature Chart</p>
<p>Series T531</p> <p>1/4"~2" (Full Port) Seat Material: PEEK Pressure Vs. Temperature Chart</p>	<p>Series T801</p> <p>1/4"~2-1/2" (Full Port) Seat Material: PTFE/RTFE Pressure Vs. Temperature Chart</p>	

(Table 19)