

# SERIES TS2, TS3, TM3 TRUNNION MOUNTED BALL VALVES INSTALLATION, OPERATION & MAINTENANCE MANUAL



## Contents

1	SCOPE .....	3
2	DESIGN.....	3
3	INSTALLATION .....	4
4	TESTING .....	4
5	VALVE OPERATION .....	5
6	DRAINING, VENTING THE VALVE .....	5
7	REMOVING AND REPLACING THE VENT/DRAIN PLUGS .....	6
8	DISASSEMBLY .....	6
9	STORAGE .....	6
10	MATERIAL DESCRIPTION.....	7
	10.1 MATERIAL DESCRIPTION – SERIES TS2.....	7
	10.2 MATERIAL DESCRIPTION – SERIES TS3.....	8
	10.3 MATERIAL DESCRIPTION – SERIES TM3 (2"-14") .....	9
	10.4 MATERIAL DESCRIPTION – SERIES TM3 (16"-24).....	10
11	SPARE PARTS AND REPAIR KITS .....	11

## 1 SCOPE

This IOM provides a general guideline in installing and operating Series TS2/TS3/TM3 Trunnion Mounted Ball Valves with standard features. It is responsibility of the end user to determine that the valve is appropriate for the intended service and proper Personal Protective Equipment (PPE) are used when installing or operating the valves. Contact factory for any specific technical details.

## 2 DESIGN

Depending on the specific valve configurations, Trunnion Mounted Ball Valves may have the following features:

### **Double Block and Bleed (DBB)**

This feature is based on Double Block and Bleed feature as defined in API 6D standard where the line pressure can be applied simultaneously to one single valve from both valve ends in closed position. The pressure inside the body cavity can be released thru a vent valve.

Note that the DBB concept as defined in API 6D standard is different from OSHA standards, which carry different meanings. OSHA describes DBB as two in-line valves with a method or device to bleed the pressure between two valves.

### **Emergency sealant injection fittings**

Standard soft seated trunnion ball valves (TS2/TS3) include emergency sealant injection fittings for the valve stem and seat sealing area. Due to the flange thickness, some of the smaller valves may not have an emergency sealant injection fitting for the seats.

**WARNING:** Fittings must be replaced if there are any signs of damage or corrosion. Some sealant injection fittings for the seat sealing area may have another internal check valve installed below the injection fitting. DO NOT remove the fittings or the internal check valves when the valve is under pressure.

### **Body Vent and Drain plug**

Typical construction includes a vent plug at the upper body and a drain plug at the lower valve body.

### **Single Piston Effect Seats (SPE) or Self-Relieving Seats**

SPE seats or Self-relieving seats are standard design features. The SPE seats are designed to prevent any excess pressure build-up inside the body cavity.

### **Double Piston Effect (DPE) Seats and Double Isolation and Bleed (DIB)**

DPE seats are optional features. Usually a pressure relief valve is installed on the body to provide overpressure protection inside the body cavity. If equipped, check the operating conditions and make sure that the pressure relief valve is installed properly.

Valves equipped with DPE seats are also referred to as Double Isolation and Bleed (DIB) valves per API 6D standard.

Design Features	Series TS2	Series TS3	Series TM3
Double Block and Bleed (API 6D)	Standard	Standard	Optional
Emergency Sealant Injection Fittings*	Standard	Standard	Optional
Vent/Drain Plug	Standard	Standard	Optional
Single Piston Effect Seats	Standard	Standard	Standard
Double Piston Effect Seats	Optional	Optional	Optional

\* Some smaller valves may not have an emergency sealant injection fitting for the seats.

The valve may be supplied with different configurations. Contact factory if there are any questions regarding the specific valve design features.

### 3 INSTALLATION

Except for the fail-safe closed configuration, the valves should be installed in open position. Prior to installation, check the valve for any sign of damage. The valve must be properly cleaned as any foreign material, weld slag or construction debris may damage the sealing surfaces during operation.

Verify that proper studs and nuts are being used and check flange surfaces for correct finishes, blemishes, etc.

**CAUTION:** Lifting and handling of the valve assembly should be done by qualified personnel and in compliance with the applicable law and safety regulations. Lifting equipment must be rated and suitable for lifting the entire valve and actuator assembly.

Lifting lugs on the actuators or gear operators are not designed to support the weight of the valve and actuator assembly. Never lift the valve assembly by handle, hand wheel, gear operator or actuator.

Valves should be lifted by using lifting lugs on the valve body or using a strap to lift the valve assembly. Do not stand near and under the valve assembly during lifting operation.

### 4 TESTING

Most piping system requires a pressure test that includes a hydrostatic shell test and a seat (closure) test. Hydrostatic shell test must be performed with the valve in partially open position. Seat test can be performed in closed position.

Test fluid must be fresh water mixed with a corrosion inhibitor or liquid that is compatible with the metal and soft seal components. Valves should be pressure tested at ambient temperature and the maximum test pressure is listed as follows:

Test	Maximum Test Pressure	Valve Position
Hydrostatic Shell Test	1.5 times valve rated pressure	Partially Open
Hydrostatic Seat (Closure) Test	1.1 times valve rated pressure	Closed

The pressure rating of the valve is listed on the nameplate.

Due to the danger of testing with air or gas, test pressure for a pneumatic shell test may be lower. Check the design specifications or standard for the correct test pressure for air or gas.

After testing, valve should be drained, cleaned and kept dry.

## 5 VALVE OPERATION

The ball valve is designed for on-off service. In other words, the valve should be operated either in fully open or fully closed position. Do not operate the valve in partially open position.

### Wrench Operated Valves:

To open the valve, rotate the handle until it is parallel to the flow direction. To close the valve, rotate the handle until the orientation of the handle is perpendicular to the flow direction.

### Gear Operated Valves:

A position locator on top of the gear operator shows the valve position. Turn the hand wheel clockwise to close the valve and counter clockwise to open the valve. The valve is open when the position indicator is parallel to the flow direction. The valve is closed when the position indicator is perpendicular to the flow direction.

### Valves with Actuators:

Contact factory or suppliers of the actuators for the specific operating procedures for actuators.

## 6 DRAINING, VENTING THE VALVE

**WARNING:** Allow the surface temperature of the valve and flow media to cool down until it is safe for handling before attempting to drain the valve or remove the plugs.

Check with local regulations regarding the proper procedures of disposing off the drain fluid.

The vent valve assembly consists of a vent valve body and a bleed screw. The vent valve can be open by loosening the bleed screw in counter-clockwise direction.

**CAUTION:** To open the vent valve, unscrew the bleed screw slowly until the pressure starts to vent. Once the bleed valve is fully open, do not unscrew the bleed screw any further as the bleed screw could disengage from the bleed valve assembly.

Exercise caution and make sure that the vent pressure or the discharge is directed away from the operator and other people.

## 7 REMOVING AND REPLACING THE VENT/DRAIN PLUGS

Vent and drain plugs must be replaced if there are any signs of damage or corrosion.

**WARNING:** DO NOT remove or loosen the vent plugs or drain plug when the valve is under pressure.

Check and make sure that the valve is not under pressure before removing or replacing the vent plugs or drain plugs. Under certain circumstances, the bleed valve may be clogged due to debris, overspray paint, etc., and this may give the false impression that the valve is depressurized. Cycle the valve a few times and make sure that there is no pressure trapped inside the body cavity before removing the plugs.

Contact factory for the correct type of vent and drain plugs. Before installing the plugs, wrap the thread of the plug with PTFE/Teflon tape or coat with anti-seize compound. When installing the plug assembly, make sure to tighten it properly but do not over-tighten. Ensure the bleed valve is closed before operating the valve.

## 8 DISASSEMBLY

Prior to removing the valve from the line, it is recommended to keep the valve in open position.

Ensure that the valve is completely depressurized before removing the valve from the line. Do not attempt to remove or work on any valve under pressure. For valves intended for high temperature service, wait until the temperature cools down first before handling the valves.

For valves actuators that are equipped with electric or pneumatic actuators, disconnect electrical supplies, shut off pneumatic supply and vent the actuator.

## 9 STORAGE

Valves should be stored indoor in open position and kept dry. Unpainted surface areas must be coated with oil that is compatible with metal and soft seal components.

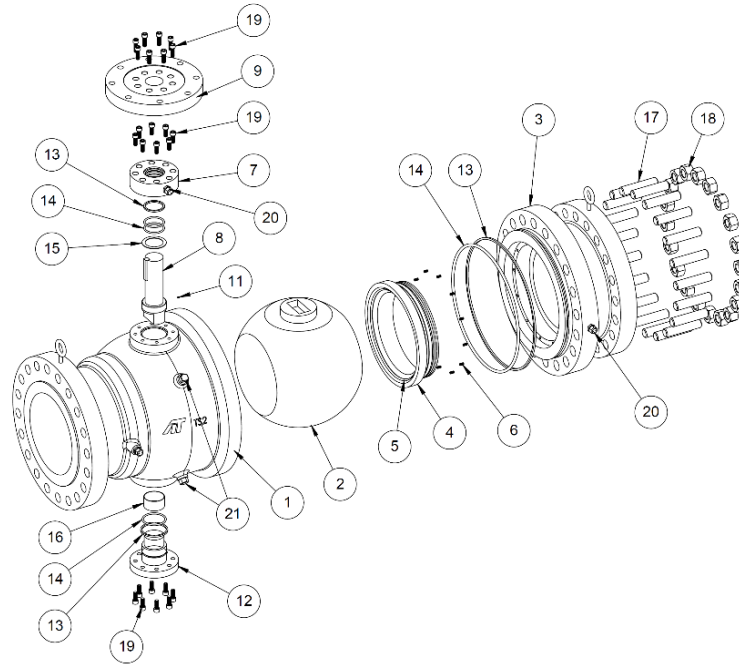
Original port protectors should be kept in the ports during storage.

Valves must be cycled at least once every 90 days in storage or in operation.

Consult factory for proper storage procedures if valves are required to be stored for longer than 6 months.

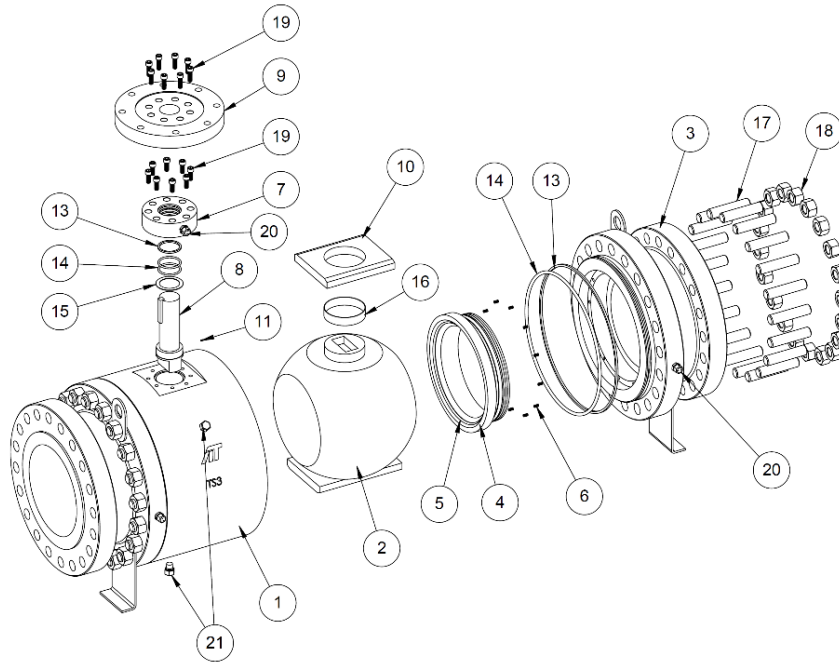
## 10 MATERIAL DESCRIPTION

### 10.1 MATERIAL DESCRIPTION – SERIES TS2



ITEM NO	COMPONENT	TS2 - STANDARD	TS2 - LOW TEMP	TS2 - STAINLESS STEEL
1	<b>BODY</b>	A216 WCB	A352 LCC	A352 CF8M
2	<b>BALL</b>	A105N	A350 LF2	A182 F316
3	<b>CLOSURE</b>	A216 WCB	A352 LCC	A352 CF8M/CF3M
4	<b>SEAT RING</b>	A105N	A350 LF2	A182 F316
5	<b>SEAT INSERT</b>	RPTFE/Devlon®/PEEK	RPTFE/Devlon®/PEEK	RPTFE/Devlon®/PEEK
6	<b>SPRING</b>	Inconel X750	Inconel X750	Inconel X750
7	<b>BODY COVER</b>	A105N	A350 LF2	A182 F316
8	<b>STEM</b>	A105N/4140	A350 LF2/4140	A182 F316
9	<b>ADAPTER PLATE</b>	A105N	A350 LF2	A182 F316
11	<b>ANTI-STATIC DEVICE</b>	Stainless Steel	Stainless Steel	Stainless Steel
12	<b>TRUNNION</b>	A105N	A350 LF2	A182 F316
13	<b>FIRE-SAFE SEAL</b>	Graphite	Graphite	Graphite
14	<b>O-RING</b>	FKM	HNBR (Low Temp)	FKM
15	<b>THRUST WASHER</b>	CS/TFE	SS/TFE	SS/TFE
16	<b>BEARING</b>	CS/TFE	SS/TFE	SS/TFE
17	<b>STUD</b>	A193 B7M	A193 L7M	A193 B8M
18	<b>NUT</b>	A194 2HM	A194 7M	A194 8M
19	<b>CAP SCREW</b>	A193 B7M	A193 L7M	A193 B8M
20	<b>SEALANT FITTING</b>	Stainless Steel	Stainless Steel	Stainless Steel
21	<b>DRAIN VALVE</b>	Stainless Steel	Stainless Steel	Stainless Steel

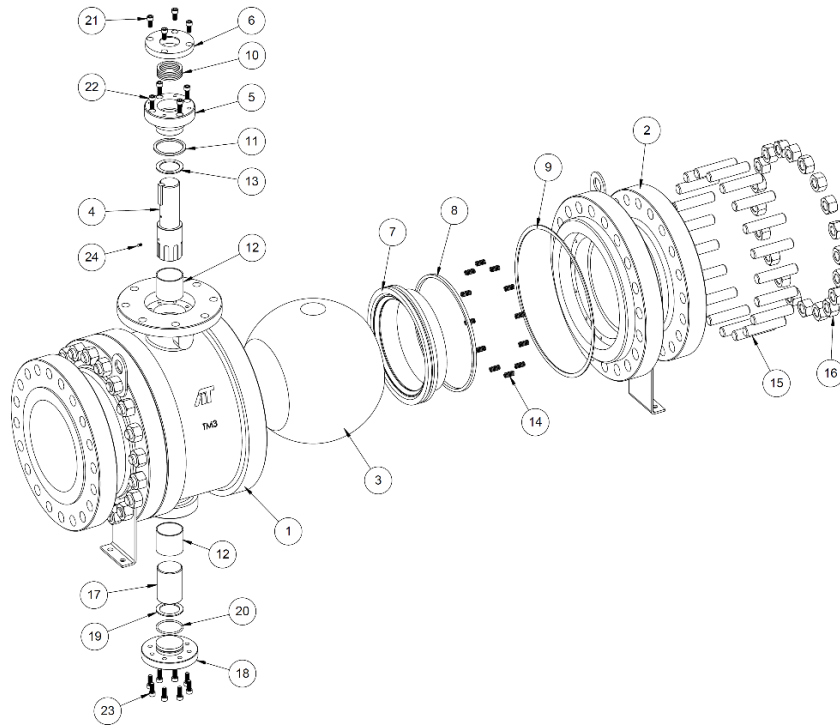
10.2 MATERIAL DESCRIPTION – SERIES TS3



ITEM NO	COMPONENT	TS3 - STANDARD	TS3 - LOW TEMP	TS3 - STAINLESS STEEL
1	<b>BODY</b>	A105N	A350 LF2	A182 F316
2	<b>BALL</b>	A105N	A350 LF2	A182 F316
3	<b>CLOSURE</b>	A105N	A350 LF2	A182 F316/F316L
4	<b>SEAT RING</b>	A105N	A350 LF2	A182 F316
5	<b>SEAT INSERT</b>	RPTFE/Devlon®/PEEK	RPTFE/Devlon®/PEEK	RPTFE/Devlon®/PEEK
6	<b>SPRING</b>	Inconel X750	Inconel X750	Inconel X750
7	<b>BODY COVER</b>	A105N	A350 LF2	A182 F316
8	<b>STEM</b>	A105N/4140	A350 LF2/4140	A182 F316
9	<b>ADAPTER PLATE</b>	A105N	A350 LF2	A182 F316
10	<b>BEARING RETAINER</b>	A105N	A350 LF2	A182 F316
11	<b>ANTI-STATIC DEVICE</b>	Stainless Steel	Stainless Steel	Stainless Steel
13	<b>FIRE-SAFE SEAL</b>	Graphite	Graphite	Graphite
14	<b>O-RING</b>	FKM/NBR/HNBR	HNBR (Low Temp)	FKM
15	<b>THRUST WASHER</b>	CS/TFE	SS/TFE	SS/TFE
16	<b>BEARING</b>	CS/TFE	SS/TFE	SS/TFE
17	<b>STUD</b>	A193 B7M	A193 L7M	A193 B8M
18	<b>NUT</b>	A194 2HM	A194 7M	A194 8M
19	<b>CAP SCREW</b>	A193 B7M	A193 L7M	A193 B8M
20	<b>SEALANT FITTING</b>	Stainless Steel	Stainless Steel	Stainless Steel
21	<b>DRAIN VALVE</b>	Stainless Steel	Stainless Steel	Stainless Steel

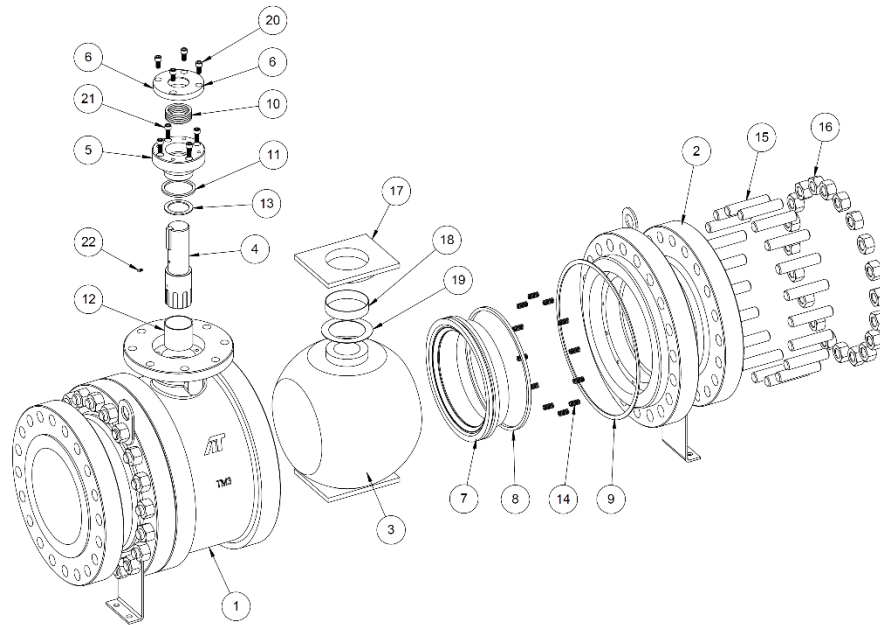


10.3 MATERIAL DESCRIPTION – SERIES TM3 (2”-14”)



ITEM NO	PART NAME	MATERIAL OPTION			MATERIAL OPTION		
1	BODY	A216 WCB			A351 CF8M		
2	CLOSURE	A216 WCB			A351 CF8M		
3	BALL	A351 CF8M + HCr	A351 CF8M + TC	A351 CF8M + CrC	A351 CF8M + HCr	A351 CF8M + TC	A351 CF8M + CrC
4	STEM	A564 17-4 PH	XM-19	XM-19	XM-19	XM-19	XM-19
5	BODY COVER	A216 WCB			A351 CF8M		
6	GLAND PLATE	A216 WCB			A351 CF8M		
7	SEAT ASSEMBLY	A351 CF8M + Stellite®	A351 CF8M + TC	A351 CF8M + CrC	A351 CF8M + Stellite®	A351 CF8M + TC	A351 CF8M + CrC
8	SEAT RING SEAL	Graphite			Graphite		
9	BODY GASKET	Stainless Steel + Graphite			Stainless Steel + Graphite		
10	GLAND PACKING	Graphite			Graphite		
11	GLAND SEAL	Graphite			Graphite		
12	STEM BEARING	Stainless Steel			Stainless Steel		
13	STEM THRUST WASHER	Stainless Steel			Stainless Steel		
14	SEAT SPRING	Inconel® X750			Inconel® X750		
15	STUD	A193 Gr B7			A193 Gr B8		
16	NUT	A194 Gr 2H			A194 Gr 8		
17	TRUNNION STEM	A564 17-4 PH	XM-19	XM-19	XM-19	XM-19	XM-19
18	LOWER COVER	A216 WCB			A351 CF8M		
19	TRUNNION STEM WASHER	Stainless Steel			Stainless Steel		
20	TRUNNION STEM GASKET	Graphite			Graphite		
21	CAP SCREW	Stainless Steel			Stainless Steel		
22	CAP SCREW	Stainless Steel			Stainless Steel		
23	CAP SCREW	Stainless Steel			Stainless Steel		
24	ANTI-STATIC DEVICE	Stainless Steel			Stainless Steel		

10.4 MATERIAL DESCRIPTION – SERIES TM3 (16”-24)



ITEM NO	PART NAME	MATERIAL OPTION			MATERIAL OPTION		
1	BODY	A216 WCB			A351 CF8M		
2	CLOSURE	A216 WCB			A351 CF8M		
3	BALL	A351 CF8M + HCr	A351 CF8M + TC	A351 CF8M + CrC	A351 CF8M + HCr	A351 CF8M + TC	A351 CF8M + CrC
4	STEM	A564 17-4 PH	XM-19	XM-19	XM-19	XM-19	XM-19
5	BODY COVER	A216 WCB			A351 CF8M		
6	GLAND PLATE	A216 WCB			A351 CF8M		
7	SEAT ASSEMBLY	A351 CF8M + Stellite®	A351 CF8M + TC	A351 CF8M + CrC	A351 CF8M + Stellite®	A351 CF8M + TC	A351 CF8M + CrC
8	SEAT RING SEAL	Graphite			Graphite		
9	BODY GASKET	Stainless Steel + Graphite			Stainless Steel + Graphite		
10	GLAND PACKING	Graphite			Graphite		
11	GLAND SEAL	Graphite			Graphite		
12	STEM BEARING	Stainless Steel			Stainless Steel		
13	STEM THRUST WASHER	Stainless Steel			Stainless Steel		
14	SEAT SPRING	Inconel® X750			Inconel® X750		
15	STUD	A193 Gr B7			A193 Gr B8		
16	NUT	A194 Gr 2H			A194 Gr 8		
17	BEARING RETAINER	A216 WCB			A351 CF8M		
18	BEARING	Stainless Steel			Stainless Steel		
19	THRUST WASHER	Stainless Steel			Stainless Steel		
20	CAP SCREW	Stainless Steel			Stainless Steel		
21	CAP SCREW	Stainless Steel			Stainless Steel		
22	ANTI-STATIC DEVICE	Stainless Steel			Stainless Steel		

## 11 SPARE PARTS AND REPAIR KITS

To order replacement seal kits or spare parts please provide the following information:

- Valve Model Number
- Serial Number
- Type of spare part kit

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