

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



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## 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.

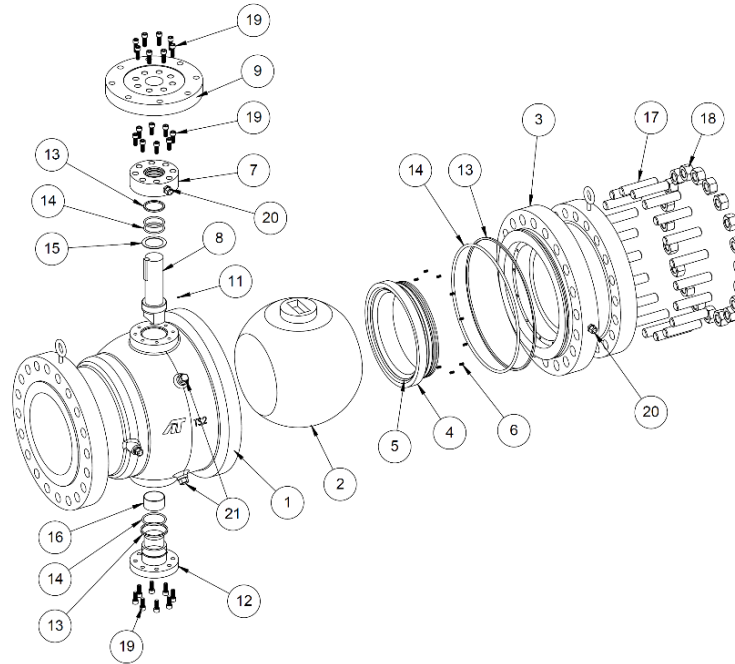
Original port protectors should be kept in the ports during storage.

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**

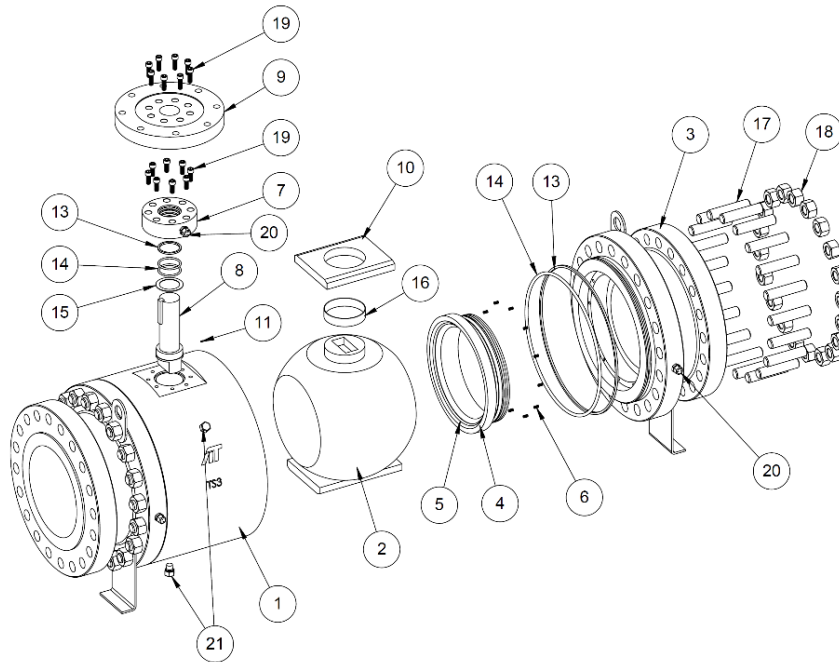
**10.1 MATERIAL DESCRIPTION – SERIES TS2**



| 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       |



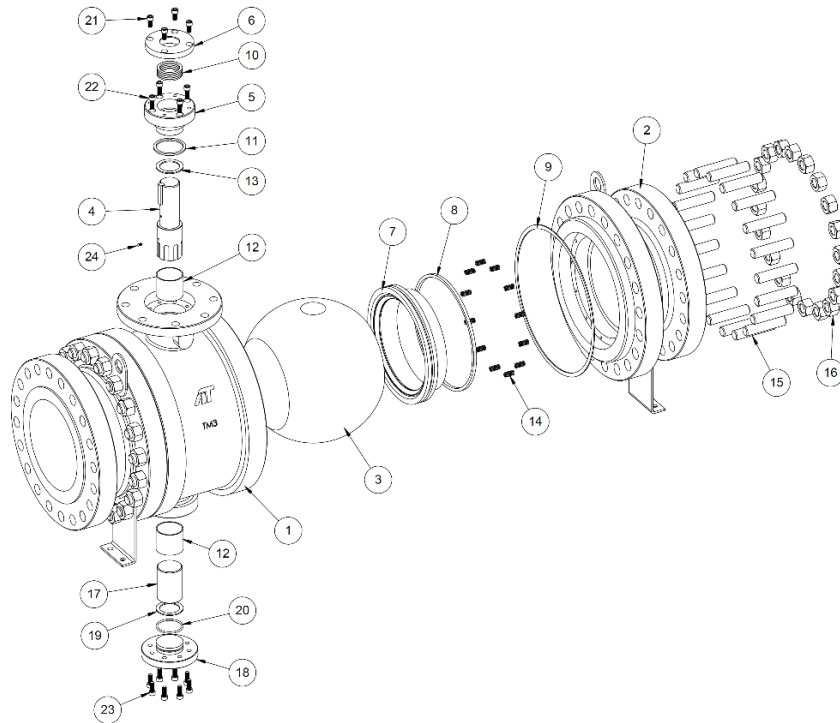
10.2 MATERIAL DESCRIPTION – SERIES TS3



| 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       |

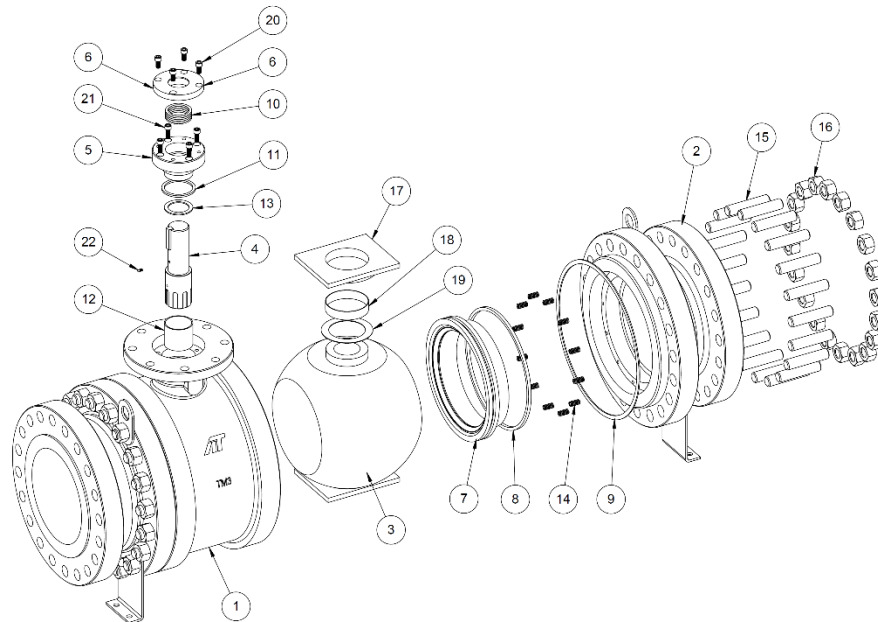


10.3 MATERIAL DESCRIPTION – SERIES TM3 (2”-14”)



| 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 NAME PLATE

The information on the nameplate includes the following:

The nameplate form contains the following fields:

- P/N
- SIZE
- CL
- S/N
- BODY
- BALL
- SEAT
- STEM
- SEAL
- F/F
- MFG
- P/T

- P/N: Part number
- SIZE: Nominal pipe size
- CL: Pressure class
- S/N: Serial Number
- BODY: Body material
- BALL: Ball material
- SEAT: Seat material
- STEM: Stem material
- SEAL: Seal material
- F/F: Face-to-face dimension
- MFG: Manufacture date
- P/T: Pressure temperature rating of the valves (Imperial and Metric)

## 12 SPARE PARTS AND REPAIR KITS

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

- Part number of the valve
- Serial Number
- Type of spare part kit

*A-T Controls product, when properly selected, is designed to perform its intended function safely during its useful life. However, the purchaser or user of A-T Controls products should be aware that A-T Controls products might be used in numerous applications under a wide variety of industrial service conditions. Although A-T Controls can provide general guidelines, it cannot provide specific data and warnings for all possible applications. The purchaser / user must therefore assume the ultimate responsibility for the proper sizing and selection, installation, operation, and maintenance of A-T Controls products. The user should read and understand the installation operation maintenance (IOM) instructions included with the product, and train its employees and contractors in the safe use of A-T Controls products in connection with the specific application.*

*While the information and specifications contained in this literature are believed to be accurate, they are supplied for informative purposes only. Because A-T Controls is continually improving and upgrading its product design, the specifications, dimensions and information contained in this literature are subject to change without notice. Should any question arise concerning these specifications, the purchaser/user should contact A-T Controls.*

For product specifications go to <http://download.a-tcontrols.com/>

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