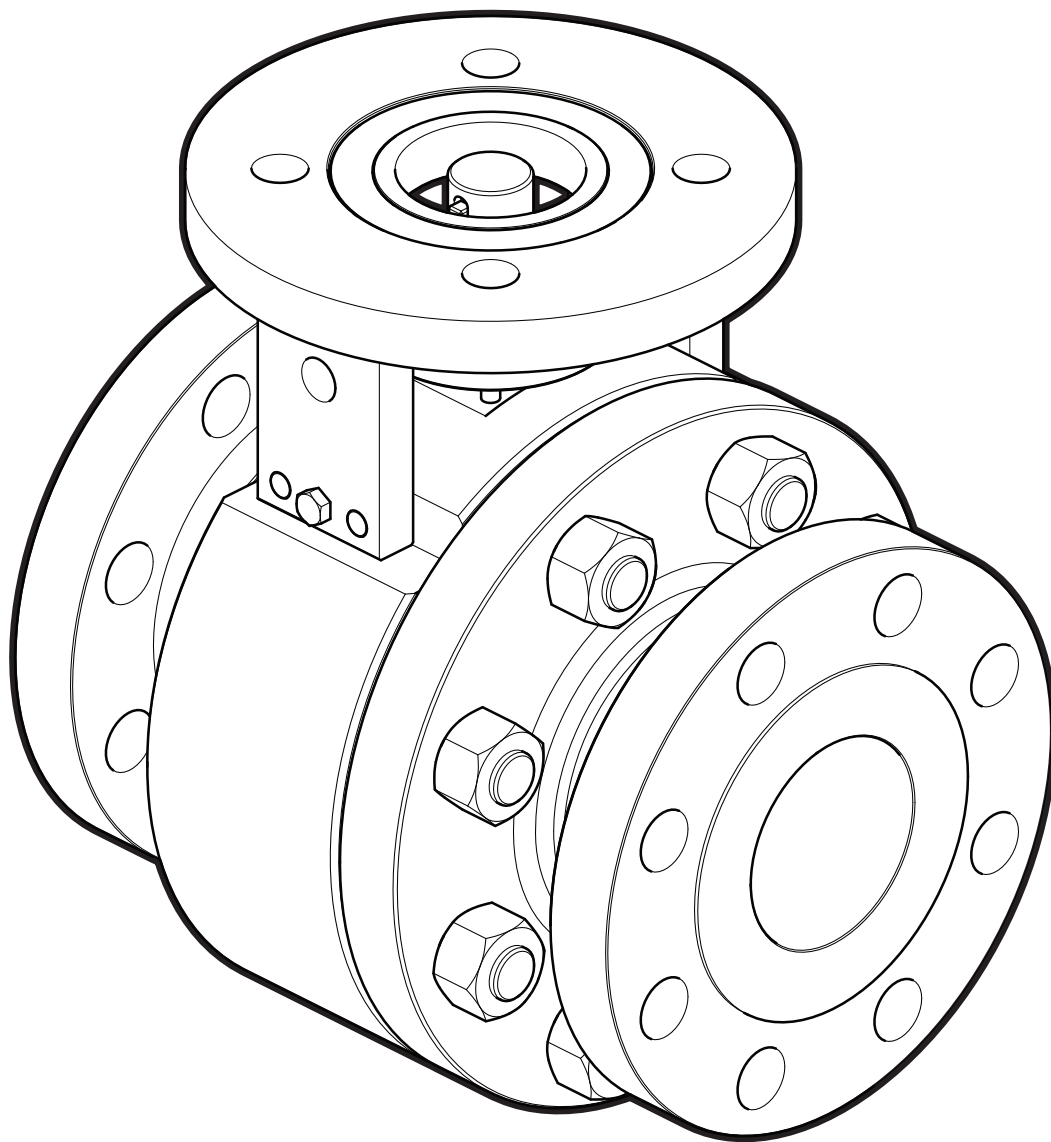


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**FLOW-TEK SERIES M1**

# **SEVERE SERVICE BALL VALVE**

Installation, Operation And Maintenance Manual



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 **Bray**<sup>®</sup>

## CONTENTS

1.0	DEFINITION OF TERMS AND SAFETY INSTRUCTIONS . . . . .	3
2.0	INTRODUCTION . . . . .	4
3.0	PARTS IDENTIFICATION . . . . .	5
4.0	SAFETY INFORMATION . . . . .	7
5.0	HAZARD-FREE USE . . . . .	9
6.0	QUALIFIED PERSONNEL . . . . .	10
7.0	HANDLING REQUIREMENTS . . . . .	11
8.0	STORAGE . . . . .	12
9.0	INSTALLATION . . . . .	13
10.0	OPERATION . . . . .	16
11.0	ACTUATION . . . . .	17
12.0	MAINTENANCE . . . . .	18
13.0	VALVE DISASSEMBLY . . . . .	21
14.0	RETURN MERCHANDISE AUTHORIZATION . . . . .	21

**READ AND FOLLOW THESE INSTRUCTIONS CAREFULLY.  
SAVE THIS MANUAL FOR LATER USE.**

## 1.0 DEFINITION OF TERMS AND SAFETY INSTRUCTIONS

Information in this manual is for standard Series M1 configurations only. Specific instructions for non-standard materials of construction, temperature range, etc. should be referred to the factory.

Please pay attention to the following types of alerts throughout this document:



### **DANGER**

Indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.



### **WARNING**

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



### **CAUTION**

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.



### **NOTICE**

Used without the safety alert symbol, indicates a potential situation which, if not avoided, may result in an undesirable result or state, including property damage.

Follow all instructions as described using the correct tools for the job.

Before installing this equipment, confirm that it is suitable for the intended service. The identification tags describe the maximum allowable service conditions for this product.

Be sure that the installation is protected by appropriate pressure control and safety devices to ensure that acceptable limits are not exceeded.

Confirm that line pressure has been removed and that there is no pressure trapped within the valve prior to beginning service. Do not attempt to remove any packing components or other fittings before confirming that pressure has been completely removed!

Do not begin service work without proper tools and protective safety measures.

The work area should be clear of obstructions and other safety hazards.

## 2.0 INTRODUCTION

This IOM covers Series M1 products for the following range:

ASME Classes	Sizes	Body Style
150, 300, 600, 900, 1500, 2500, 4500	1" - 36" 25.4mm - 915mm	Flanged, Butt Weld Socket Weld, Ring Joint, Grayloc

The Series M1 metal seated severe service ball valve is designed in accordance with ASME B16.34 and ASME BPVC Section VIII, Division 1, Appendix 2.

The Series M1 is designed as a free floating ball valve with metal seats. It is important to install the valve in the pipe as intended to achieve optimal performance. If there are any questions, please contact the manufacturer.



### WARNING

Do not remove or de-energize actuation devices while the valve is under line pressure.

The Series M1 can be configured for unidirectional or bidirectional flow. The preferred flow direction and high pressure side is indicated on the valve. Proper attention must be paid to ensure that the valve is installed according to the preferred flow direction and designated high pressure side.

The preferred flow direction is indicated on the nameplate or valve.



### NOTICE

The M1 severe service ball valve is designed to handle entrained solids and the corresponding abrasive/erosive conditions that are associated with such applications. Depending upon the specific application, the M1 may be equipped with purge port and/or flushing ports in order to flush particulates from the body cavity, prevent scaling, or remove accumulated media. Please refer to the trim of your specific product for the corresponding seat design and presence of such ports. Proper trim and maintenance greatly extends the life of the valve in these harsh environments.

# FLOW-TEK SERIES M1 SEVERE SERVICE BALL VALVE

Installation, Operation and Maintenance Manual



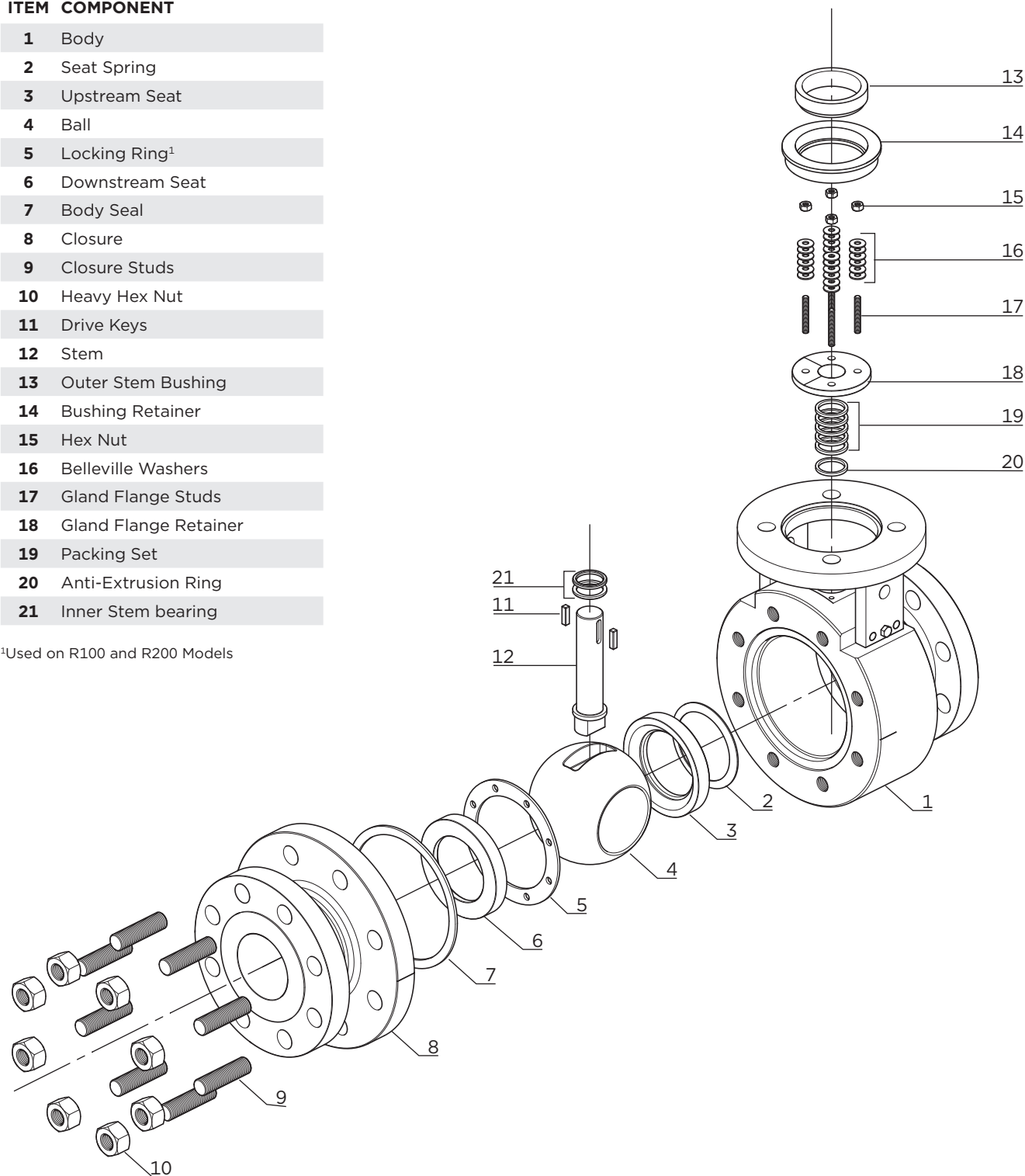
## 3.0 PARTS IDENTIFICATION

### 3.1 Side Entry Stem Assembly Design

**ITEM COMPONENT**

1	Body
2	Seat Spring
3	Upstream Seat
4	Ball
5	Locking Ring <sup>1</sup>
6	Downstream Seat
7	Body Seal
8	Closure
9	Closure Studs
10	Heavy Hex Nut
11	Drive Keys
12	Stem
13	Outer Stem Bushing
14	Bushing Retainer
15	Hex Nut
16	Belleville Washers
17	Gland Flange Studs
18	Gland Flange Retainer
19	Packing Set
20	Anti-Extrusion Ring
21	Inner Stem bearing

<sup>1</sup>Used on R100 and R200 Models



# FLOW-TEK SERIES M1 SEVERE SERVICE BALL VALVE

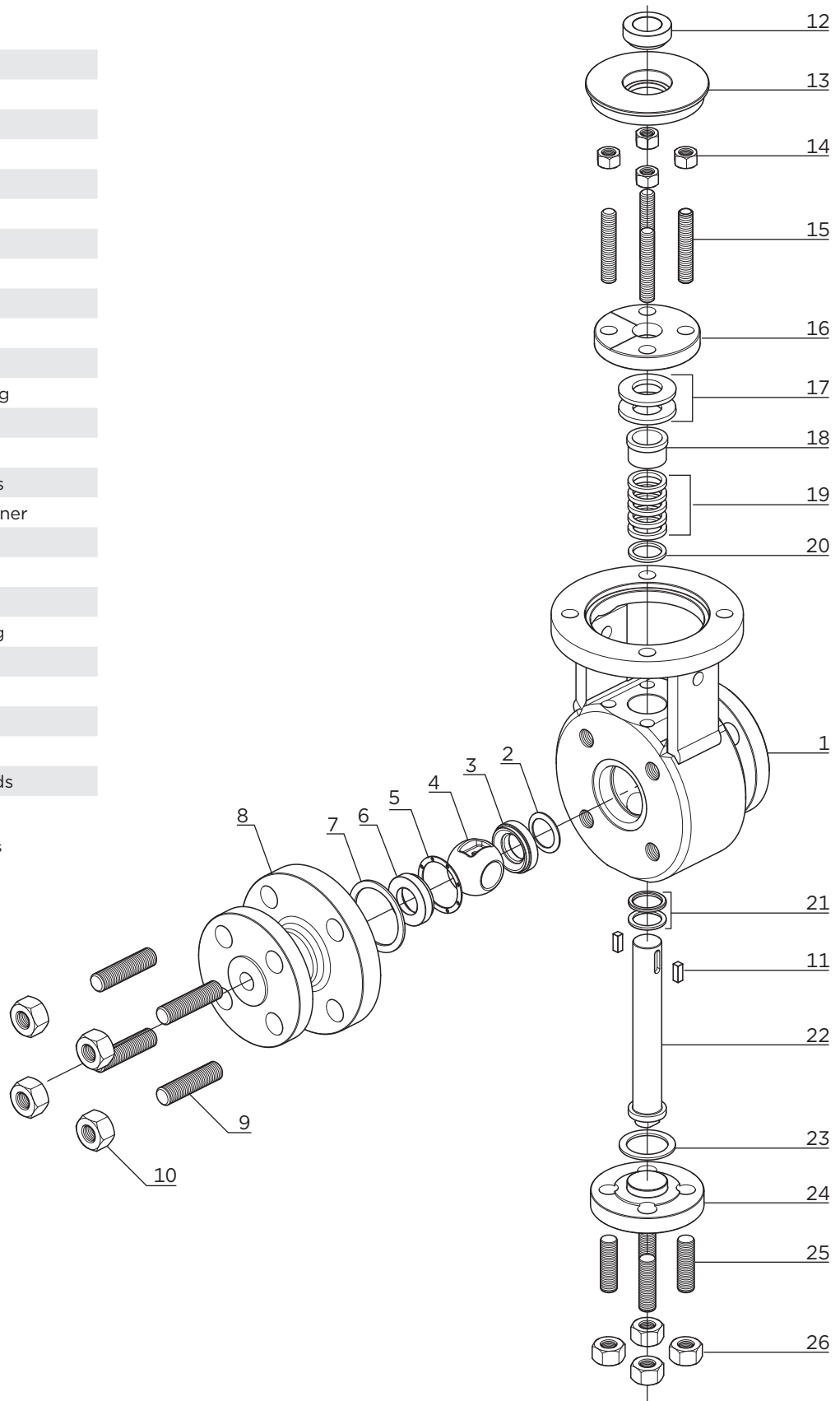
Installation, Operation and Maintenance Manual



## 3.2 Bottom Entry Stem Assembly Design

ITEM	COMPONENT
1	Body
2	Seat Spring
3	Upstream Seat
4	Ball
5	Locking Ring <sup>1</sup>
6	Downstream Seat
7	Body Seal
8	Closure
9	Closure Studs
10	Heavy Hex Nut
11	Drive Keys
12	Outer Stem Bushing
13	Bushing Retainer
14	Hex Nut
15	Gland Flange Studs
16	Gland Flange Retainer
17	Belleville Washers
18	Gland Follower
19	Packing Set
20	Anti-Extrusion Ring
21	Inner Stem Bearing
22	Stem
23	Lower Closure Seal
24	Lower Closure
25	Lower Closure Studs
26	Heavy Hex Nuts

<sup>1</sup>Used on R100 and R200 Models



## 4.0 SAFETY INFORMATION

### 4.1 Special Conditions for Safe Use

The following factors must be carefully considered in order to ensure the valve is compatible with the atmosphere in which it is applied. The system designer and/or end user should formally address each severe service ball valve and carefully document the reasoning behind specific measures taken to ensure continued compliance throughout the life of the severe service ball valve.

### 4.2 Material Considerations

Titanium is not to be used in Group I mining applications and Group II Category 1 equipment, due to the potential of ignition from sparks caused by mechanical impacts. Please consult factory for details regarding material limitations

### 4.3 Temperature Considerations

Series M1 severe service ball valves are designed in accordance with ASME B16.34 pressure/temperature ratings and are suitable for operating temperatures up to 593°C (1,100°F), depending on the materials of construction. Custom designs are available upon request and the pressure and temperature ratings will be marked on the valve tagging. Service media should be considered when evaluating pressure and temperature ratings.

The system designer is responsible for ensuring the maximum temperature, either inside the valve body or on the external surface, will remain well below the ignition temperature of the atmosphere. Additional protective devices may be required to ensure a sufficient thermal safety margin including but not limited to: thermal shut off devices and cooling devices.

**For operating temperatures above 200°C (392°F) Bray recommends thermal insulation of the valve body.**

### 4.4 Static Electricity Considerations

Where the process medium is a liquid or semi-solid material with a surface resistance in excess of 1 G-ohms, special precautions should be taken to ensure the process does not generate electrostatic discharge. This may be done through ensuring the flow rate of the process media remains below 1 m/s or providing sufficient discharge points along the process path to eliminate electrostatic buildup.

Appropriate grounding may be necessary through the use of grounding straps or other means.

### 4.5 Stray Electric Current Considerations

When the severe service ball valve is used near sources of high current or magnetic radiation, a secure bonding to earth ground should be made so as to prevent ignition due to inductive currents or a rise in temperature due to these currents.

## 4.6 Entrained Solids & Process Media

Special consideration should be made regarding the filtration of the process medium if there is a potential for the process medium to contain solid particulates. The process medium is recommended to be filtered to allow particles no greater than 1.0 mm in diameter through the valve assembly where there is a high probability of solid particulates. Larger particulate sizes may be deemed appropriate based on the possibility of particulates within the process medium and the area classification. The decision regarding filtration levels and limits should be well documented by the system designer and/or end user to ensure continued compliance through the life of the valve.



## 5.0 HAZARD FREE USE



### NOTICE

Failure to follow these procedures could affect product warranty.

This device left the factory in proper condition to be safely installed and operated in a hazard free manner. The notes and warnings in this document must be observed by the user if this safe condition is to be maintained and hazard free operation of the device assured.

Take all necessary precautions to prevent damage to the valve due to rough handling, impact, or improper storage. Do not use abrasive compounds to clean the valve, or scrape metal surfaces with any objects.

The control systems in which the valve is installed must have proper safeguards — to prevent injury to personnel, or damage to equipment — should failure of system components occur.

The upper limits of permitted pressure and temperature (depending on the valves materials of construction) must be observed. These limits are shown on the valve identification tag.

The valve must not be operated until the following documents have been observed:

- > Declaration on EU Directives
- > IOM Manual (supplied with the product).

## 6.0 QUALIFIED PERSONNEL



### NOTICE

Failure to follow these procedures could affect product warranty.

A **qualified person** (in terms of this document) is one who is familiar with the installation, commissioning, and operation of the device, and who has appropriate qualifications, such as:

- > Is trained in the operation and maintenance of electrical equipment and systems in accordance with established safety practices.
- > Is trained or authorized to energize, de-energize, ground, tag, and lock electrical circuits and equipment in accordance with established safety practices.
- > Is trained in the proper use and care of personal protective equipment (PPE) in accordance with established safety practices.
- > Is trained in the commissioning, operation, and maintenance of equipment in hazardous locations — in cases where the device is installed in a potentially explosive (hazardous) location.

## 7.0 HANDLING REQUIREMENTS

### 7.1 Packed Valves

**Crates:** Lifting and handling of the packed valves in crates will be carried out by a fork lift truck, by means of the appropriate fork hitches.

**Cases:** The lifting of packed valves in cases will be carried out by utilizing the marked lifting points with consideration for the identified center of gravity position. The transportation of all packed material must be carried out safely and following the local safety regulations.

### 7.2 Unpacked Valves

Lifting and handling of valves should be carried out by using appropriate means and observing the carrying limits. Handling must be carried out on pallets, protecting all machined surfaces to avoid any damage.

With larger valves, the valve must be rigged for transport using appropriate rated lifting methods including straps and/or lifting lugs.



#### CAUTION

If design specific lifting eyes are not provided, the valve may be lifted by the neck of the end connections with slings as shown in Figure 1. When rigging the slings for lifting, first identify the center of gravity to ensure the valve is stable and will not rotate during the lift.

Lifting straps are suitable for smaller valves, however, lifting eyes are recommended for larger/heavier valves as shown in Figure 2.

Never lift the valve by the actuator, gearbox, handwheel, or other protruding components as they are not intended to support the entire weight of the valve.

During handling, protect the end connection faces and fittings against damage from the lifting devices. Failure to cover faces and fittings could cause damage to the valve. End protector covers should remain on the valve until ready for final installation.

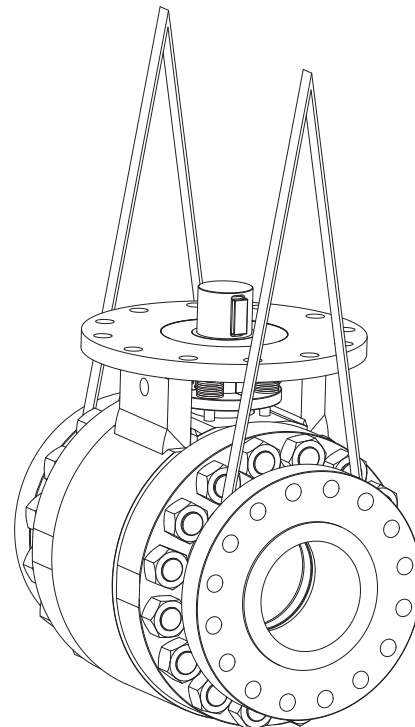


Figure 1

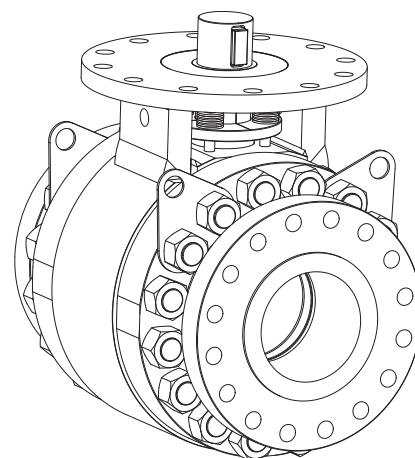


Figure 2

## 8.0 STORAGE

### 8.1 Short-Term Storage

Short-term storage is defined as storage of products and/or equipment to be used in the construction of a project for periods of one to three months. Short-term storage must be carried out in a controlled manner as follows:

- > Valves must be stored in a covered, clean, and dry environment
- > Ball valves should be stored in the fully open position to protect the ball and seats.
- > Ball valves should remain in the original shipping container and be placed on pallets of wood or other suitable materials. End protectors should remain on the valve ends to prevent the entrance of dirt and removed only at time of installation.

### 8.2 Long-Term Storage

Long-term storage is defined as storage of products and/or equipment for periods longer than three months. Long-term storage must be carried out in a controlled manner as follows:

- > Valves must be stored in a covered, clean, and dry environment.
- > Ball valves should remain in the original shipping container and be placed on pallets of wood or other suitable materials. End protectors should remain on the valve ends to prevent the entrance of dirt and removed only at time of installation.
- > Periodically, the valves should be checked to ensure the above conditions are maintained. These are general guidelines for valve storage. Please consult the factory for information regarding specific requirements.

**Note:** Valves will be shipped in a manner to minimize damage during transit. Upon arrival at the site, valves general condition shall be inspected right away for any shipping damage. Any damage shall be reported to manufacturer.

## 9.0 INSTALLATION

The Series M1 severe service ball valves are designed with ASME B16.5 / EN 1092-1 flanged, ASME B16.25 butt welded, or ASME B16.11 socket welded end connections. Special connections are also available with applicable standards. The standard face-to-face dimensions for flanged and butt welded end connections are designed per ASME B16.10 long pattern / EN 558-1. The face-to-face dimension for the socket welded end connection design is per the manufacturer's standard. For specific dimensions, contact your local Bray representative. Any non-standard connection type will be supplied with applicable special instructions from the manufacturer.

The valve may be installed in any position, vertically or horizontally on the pipeline. Before installing the valve, the valve should be placed in the fully open position.

When the valve is mounted with the bore in the vertical position or the stem in the horizontal position, supporting the operator is strongly recommended to limit uneven stem seal wear.

When installing the valve into the piping system, ensure the adjoining pipe is aligned with the valve end connections to reduce the affects of external piping loads on the valve.

The M1 can be supplied in both unidirectional and bidirectional sealing configurations. Identify the preferred flow direction of the valve to determine installation orientation in the piping system. When using a unidirectional design, the valve's high pressure end is marked with "HP END". The high pressure side of the valve indicates where the high pressure should be acting when the valve is in the closed position. When using a bidirectional design, the preferred high pressure side of the valve will be marked with "PREFERRED HP END".

Position and install the "HP END" or "PREFERRED HP END" of the valve in the direction of the piping system where the higher pressure would be expected to accumulate in the event that the valve was closed.

When positioning the valve in the piping system, ensure the actuator or gear mounted to the valve is oriented properly for ease of operation.

**Note:** Support or lift as required, using lifting lugs or nylon straps around the valve body as shown in Section 7 - Handling Requirements. Do not lift or support by the actuator alone.



## WARNING

Before installing this equipment, confirm that it is suitable for the intended service. The identification tags describe the maximum allowable service conditions for this product. Be sure that the installation is protected by appropriate pressure control and safety devices to ensure acceptable limits are not exceeded.

Reasonable precaution should be taken before beginning any work on the valve.

Protective clothing as required should be worn.

Always use the proper tools and personal protective equipment (PPE).

When using this product in hazardous environments, the national directives and laws which apply in your country for hazardous areas must be followed. The specifications of the examination certificate valid in country of operation must also be observed.



## CAUTION

Prior to installing the valves into line, flush the pipes clean of dirt, burrs, and welding residue to protect the ball and seat sealing surfaces. If the valve is installed prior to flushing the piping system, it is recommended to keep the valve in the fully open position until the piping system has been fully flushed clean of debris.

Larger valves and actuators may need external support to prevent excess piping loads from effecting valve operation.



## NOTICE

Spiral wound gaskets conforming to ASME B16.20 are recommended for proper sealing between the valve and piping flanges.

When bolting the valve into the line, use standard bolting torques as recommended by applicable piping standards. The valve body seal is independent of the flange bolting. Additional force from the flange bolts is not required.

Install valve in line by bolting, clamping or welding.

When welding the valve into line, verify that the ball is in the fully open position prior to welding to protect the ball sealing surface from possible damage. Ensure that the piping and valve end connections are properly aligned to avoid line bind. Apply a welding ground strap adjacent to the valve end being welded to prevent current flow through the valve. Follow the appropriate welding procedures per the applicable industry standards, that are compatible with the valve and piping materials being joined. While welding, monitor the valve body temperature near the seat pockets using a temperature indicator stick, ensuring that the temperature does not exceed 121°C (250°F). After welding, follow the appropriate post weld heat treatment (PWHT) procedures per the applicable standards. PWHT shall be performed localized. To avoid excessive body temperatures, perform PWHT to one end of the valve and then normalize to ambient temperature before proceeding to the second end of the valve.

After installation, with the valve still in the open position, flush the piping system and valve clean again to remove any dirt, burrs, and welding residue that may have accumulated during valve installation.

After installation and flushing of the piping system, verify smooth operation by cycling the valve several times.

Verify that the recommended packing bolt torque is applied prior to pressurizing the line.

---

## 10.0 OPERATION

Operation of the valve is done by turning the valve stem 90°. Rotate the stem clockwise (CW) to close the valve and rotate the stem counterclockwise (CCW) to open the valve.

It may be required to operate greater than a 90° rotation to account for ball-to-stem clearances.

### 10.1 Valve in Open Position

The valve handle, stem keyways or actuator indicator is parallel with the pipeline.

When the valve is in the "open" position, the scribe line on the stem will be aligned with the scribe line on the gland, which is parallel to the valve bore.

Valves with actuators should be checked for alignment. Consult actuator manufacturer's instructions for proper setting of stops.

### 10.2 Valve in Closed Position

The valve handle, stem keyways or actuator indicator is perpendicular to the pipeline.

When the valve is in the "closed" position, the scribe line on the stem will be aligned with the scribe line on the gland, which is perpendicular to the valve bore.

### 10.3 Visual Indicators

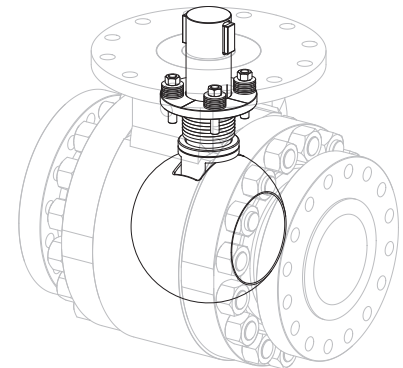
The scribe line is used to set operator open/close stops if the operator cannot be removed from valve.



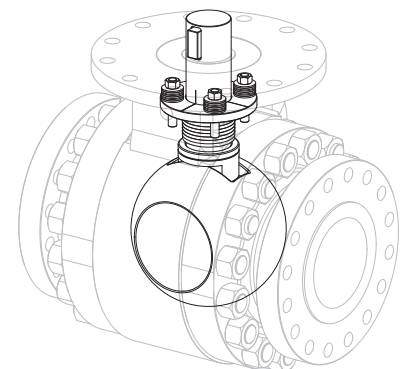
#### CAUTION

Do not rotate the ball/stem 180° as this may cause premature wear to the ball and seat lapping surface, reducing the ability to effectively seal.

Periodic stroking of the valve from fully open to fully closed or fully closed to fully open will clear debris from the ball and seat sealing surfaces, preventing scale accumulation. This ensures optimal performance and long service life.



Open Position



Closed Position



## 11.0 ACTUATION

### 11.1 Installing the Actuator

M1 Severe Service Ball Valves do not contain an internal mechanical stop to indicate the closed position.

When installing ANY type of actuator on an M1 valve, the following general instructions should be closely followed. The general instructions include all actuation types: manual, gear, pneumatic, hydraulic and electric actuators.

Select a desired orientation for the actuator mounting relative to the ball position as indicated by the scribe line on the stem.

Rotate BOTH valve and actuator to either the full “open” or full “closed” position to establish a common reference point.

Mount actuator to the valve and secure.



#### NOTICE

With valve/actuator in the closed position, it may be necessary to loosen the “closed” mechanical stop to allow the mounting holes to align properly.

Special applications may require more specific instructions. Please consult the factory for further instruction.

### 11.2 Actuator Stop Settings

The M1 is a position seated valve. The mechanical stops in the actuator or gear must be set in accordance with the valves fully opened and closed position.

Procedure:

1. With the valve in the closed position, set the actuator closed position stop.
2. Using the actuator, operate the valve 90° counter clockwise, placing the valve in the fully opened position with the ball bore in alignment with the body bore.
3. With the valve now in the fully opened position, set the actuator open position stop.



#### CAUTION

Valves can leak through bore if proper care is not exercised during the setting of Open and /or Closed stops.

## 12.0 MAINTENANCE



### WARNING

Precaution should be taken before beginning any work on the valve assembly.

Protective clothing should be worn per local standard safety codes.

Review the material safety data sheet of the process media prior to performing any valve maintenance.

Ensure the line pressure is relieved and that the valve is in the open position prior to removing the operator or loosening the gland flange retainer nuts.

DO NOT pressurize the line without an actuator device properly installed and working on the valve.

### 12.1 General Maintenance

Periodically check the torque of the gland flange (stem packing) bolting and valve operator mounting bolting. If the bolting torque is lower than the specified values, retorque bolting as necessary. Refer to the order submittal drawings for recommended bolting torques or contact your local Bray representative.



### NOTICE

Open/Close the valve intermittently (at least once a year). Valves should always be fully opened or fully closed to wipe away any accumulation on the sealing surfaces.

If the service media builds scale or risks cold bonding, more frequent maintenance strokes should be performed.

In circumstances where partial stroke testing is the only viable option, plan to fully stroke the valve at standard plant overhaul intervals.

Metal Seated Ball valves are inherently “mated” or “married” and balls/seats may not be interchanged between units.

### 12.2 Stem Packing Replacement

Mark any matching components with a marker or tape for parts orientation prior to disassembly, for ease of reassembly.

Ensure the line pressure is relieved. Remove the operator, bracket (or mounting flange adaptor), and stem adaptor if present.

Remove stem keys.

Remove bushing retainer and outer stem bushing.

Loosen and remove the hex nuts holding the gland flange retainer in place.

Remove Belleville washers, and gland flange retainer.

Using a small pick, carefully remove stem packing set from the packing box. Use caution to avoid scratching the stem or packing box while removing the packing rings. Damage to the sealing area of the stem or packing box may result in a stem leak.



## CAUTION

Clean and examine the packing stuffing box before installing the new packing set.

Install the anti-extrusion ring into the packing box if removed with the packing. Install the new packing set into the packing box, inserting the rings one at a time. The gland flange retainer may be used as a packing assembly tool to press each ring into the packing box.

Rotate the stem so that the scribe line is facing the body closure joint.

Install the gland flange retainer over the stem, aligning the retainer and stem scribe lines.

Apply a small amount of anti-sieze to stud threads and bottom face of hex nuts.

If previously removed, insert studs into threaded holes. Insert the Belleville washers onto each stud. Belleville washers shall be stacked in alternating directions (series stack) with the concave side of each pair facing one another, as shown in Figure 3. Install hex nuts onto each stud and torque to specified value. Be sure to torque in a cross pattern to avoid uneven loading. **Note: Packing assembly torques are provided on the order submittal drawings.**

Install bushing retainer and outer stem bushing into the mounting flange. If necessary, tap gently into place using a rubber mallet.

Insert keys into the stem. Ensure the key length provides and maintains full engagement with the operator. Once keys are in place, the actuator or gear can be mounted. With the operator mounted, cycle the valve multiple times to ensure proper installation. See Section 11 Actuation for direction on mounting operators.



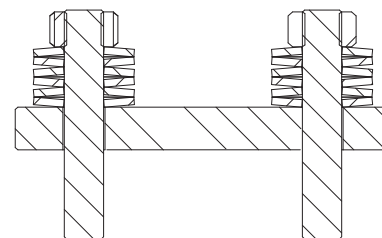
## WARNING

The gland flange must be pulled down evenly to prevent cocking or side loading, as this could cause damage to the packing and prevent the valve from operating properly.

Make sure that the gland flange remains perpendicular to the stem, and the gap around the stem remains concentric during tightening process.

Do not over tighten nuts. Torque hex nuts evenly per specified packing torque supplied in the order submittal drawings.

**Figure 3 - M1 Bonnet Belleville Spring Stack Orientation**



## 13.0 VALVE DISASSEMBLY

The M1 Severe Service Ball Valve is carefully manufactured and assembled for optimum performance and long service life. It is not recommended that the valve be disassembled without factory supervision or specific instructions provided by the manufacturer.

## 14.0 RETURN MERCHANDISE AUTHORIZATION

All products that are returned require a Return Merchandise Authorization (RMA). Contact a Bray representative for instructions and RMA forms to be completed prior to return of any product.

The following information must be provided when submitting RMA:

- > Serial number
- > Part number
- > Month and year of manufacture
- > Actuator specifics
- > Application
- > Media
- > Operating temperature
- > Operating pressure
- > Total estimated cycles (since last installation or repair)

**NOTE:** Product information is provided on identification tag attached to device.



### NOTICE

Materials must be cleaned and sanitized prior to return. MSDS sheets and Declaration of Decontamination are required.

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## **HEADQUARTERS**

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