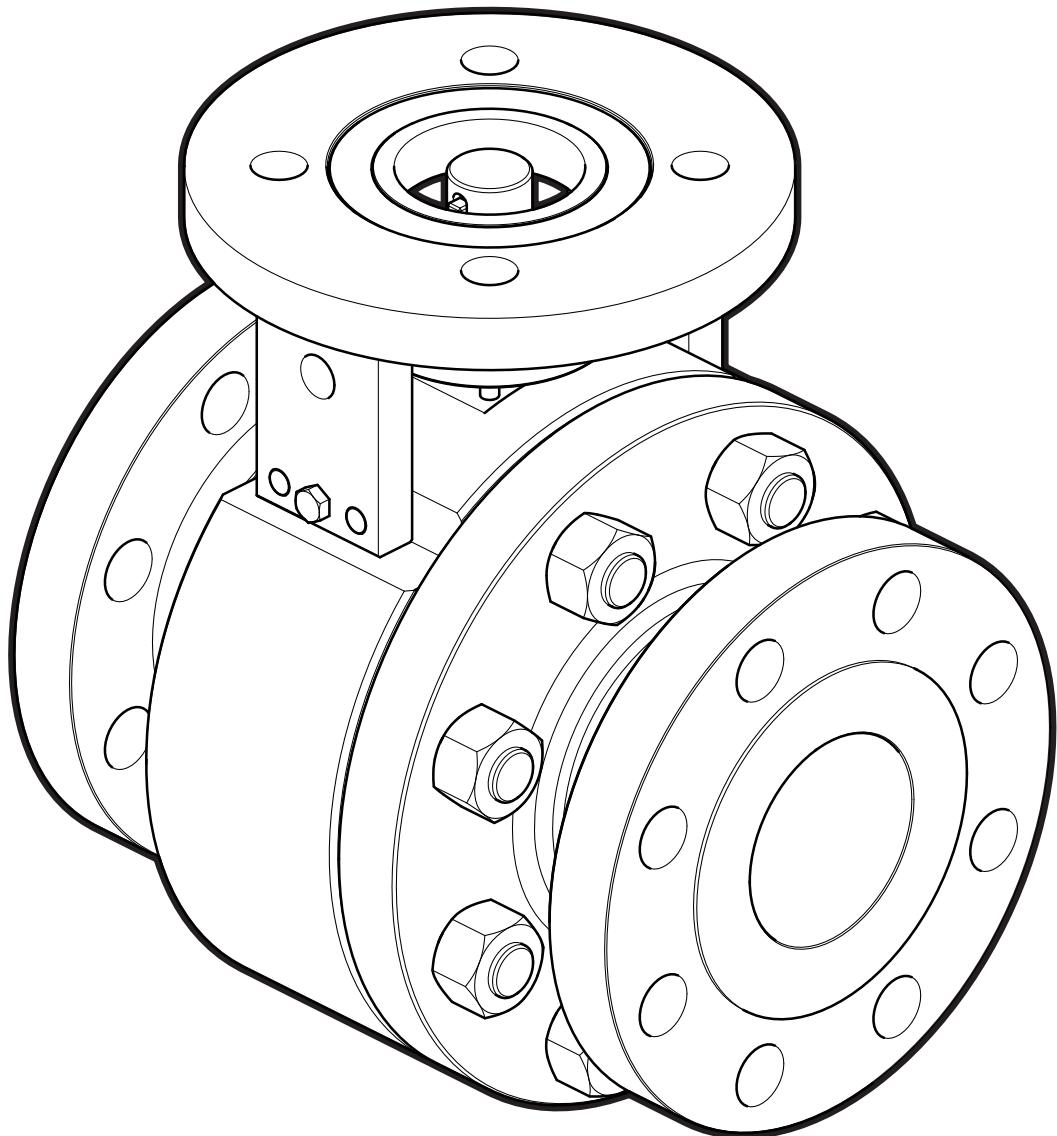


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**SERIES M1**

# **SEVERE SERVICE BALL VALVE**

Installation, Operation And Maintenance Manual



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**Bray**

**CONTENTS**

1.0	DEFINITION OF TERMS . . . . .	3
1.1	Safety Statements . . . . .	3
2.0	GENERAL INFORMATION . . . . .	4
2.1	Introduction . . . . .	4
2.2	Use . . . . .	5
2.3	Applicability . . . . .	5
3.0	SAFETY INFORMATION . . . . .	6
3.1	Special Conditions for Safe Use . . . . .	7
3.2	Material Considerations . . . . .	7
3.3	Temperature Considerations . . . . .	7
3.4	Protective Clothing . . . . .	8
3.5	Service and Repair . . . . .	8
3.6	Hazard Free Use . . . . .	8
3.7	Qualified Personnel . . . . .	9
4.0	PARTS IDENTIFICATION . . . . .	10
4.1	Parts Callout - Side Entry Stem Assembly Design - Two Piece . . . . .	10
4.2	Parts List - Side Entry Stem Assembly Design - Two Piece . . . . .	11
4.3	Parts Callout - Side Entry Stem Assembly Design - Three Piece . . . . .	12
4.4	Parts List - Side Entry Stem Assembly Design - Three Piece . . . . .	13
4.5	Parts Callout - Bottom Entry Stem Assembly Design . . . . .	14
4.6	Parts List - Bottom Entry Stem Assembly Design . . . . .	15
4.7	Spare Parts . . . . .	15
5.0	VALVE IDENTIFICATION . . . . .	16
6.0	HANDLING REQUIREMENTS . . . . .	17
6.1	Packed Valves . . . . .	17
6.2	Unpacked Valves . . . . .	17
6.3	Moving Valves . . . . .	18
7.0	TRANSPORT AND STORAGE . . . . .	19
7.1	Transport . . . . .	19
7.2	Short-Term Storage . . . . .	19
7.3	Long-Term Storage . . . . .	19
7.4	General Storage Requirements . . . . .	20
8.0	INSTALLATION . . . . .	21
8.1	Consideration . . . . .	21
8.2	Actuator Installation . . . . .	22
8.3	Actuator Mounting . . . . .	22
8.4	Installation of Flanged Ends . . . . .	23
8.5	Installation of Threaded Valves . . . . .	23
8.6	Installation of Weld-end Valves . . . . .	24
8.7	Special End Connections . . . . .	25
8.8	Valve Insulation . . . . .	25
8.9	After Installation . . . . .	25
9.0	OPERATION . . . . .	26
9.1	Valve in Open Position . . . . .	26
9.2	Valve in Closed Position . . . . .	26
9.3	Visual Indicator - Scribe Line . . . . .	26
10.0	MAINTENANCE AND REPAIR . . . . .	27
10.1	Stem Seal Adjustment . . . . .	27
10.2	Actuator Removal . . . . .	28
10.3	Stem Packing Replacement . . . . .	28
10.4	Valve Removal from System and Cleaning Procedure . . . . .	30
10.5	Valve Disassembly . . . . .	31
10.6	Visual Inspection . . . . .	32
10.7	Valve Assembly Procedure - 2 Piece Construction . . . . .	32
10.8	Valve Assembly Procedure - 2 Piece Construction with Bottom Stem Entry . . . . .	34
10.9	Valve Assembly Procedure - 3 Piece Construction . . . . .	37
11.0	REPAIR KITS . . . . .	41
12.0	TROUBLESHOOTING . . . . .	42
13.0	RETURN MERCHANDISE AUTHORIZATION . . . . .	43
14.0	APPENDIX - TABLES . . . . .	44

**READ AND FOLLOW THESE INSTRUCTIONS CAREFULLY.  
FOR THE LATEST IOM VERSION, VISIT [BRAY.COM](http://BRAY.COM)**

## 1.0 DEFINITION OF TERMS

All information within this manual is relevant to the safe operation and proper care of your Bray valve. Please understand the following examples of information used throughout this manual.

Specific instructions for non-standard materials of construction, temperature range, etc. should be referred to the factory.

### 1.1 Safety Statements

To prevent unwanted consequences, standard symbols and classifications are used as shown below:

**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.

**NOTE:** Provides important information related to a procedure.

## 2.0 GENERAL INFORMATION

### 2.1 Introduction

**NOTICE**

Failure to follow these procedures and observe these notes, cautions and warnings including the use of non-OEM parts could lead to hazards and/or void product warranties, either expressed or implied.

The design features of this valve include a split body, two or three piece metal seated construction, allowing ease of maintenance without special tools. These valves feature a "free floating" ball. The ball is not fixed, but is free to move with the line pressure.

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.

The Series M1 can be supplied as either unidirectional or bidirectional sealing. The preferred sealing 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 and in the customer submittal drawing.

**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.

The valve should be maintained as part of a preventative maintenance program and in accordance with Bray's recommended pressure and temperature to ensure a long service life. During shipment, storage, and in operation, the valve should be fully open or fully closed "open" is preferred for shipping and storage.

Additional product information such as application data, engineering specifications, actuator selection, etc. is available from your local Bray distributor or sales representative, or online at **BRAY.COM**.

For a detailed list of product certifications please contact your local Bray representative.

## 2.2 Use

The following instructions are designed to assist in the unpacking, installation, and maintenance as required for Bray ball valves. Product users and maintenance personnel should thoroughly review this manual prior to installing, operating, or performing any maintenance. In most cases, Bray valves, actuators, and accessories are designed for specific applications e.g. with regard to medium, pressure and temperature. For this reason, they should not be used in other applications without first contacting the manufacturer.

**WARNING**

Before installing the 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.

## 2.3 Applicability

The following instructions are applicable to the maintenance and installation of Bray ball valves. These instructions cannot claim to cover all details of all possible product variations, nor can they provide information for every possible example of installation, operation, or maintenance. This means that the instructions normally include only the directions to be followed by qualified personnel using the product for its defined purpose. If there are any uncertainties in this respect, particularly in the event of missing product related information, clarification must be obtained via the appropriate Bray sales office.

### 3.0 SAFETY INFORMATION

**NOTICE**

Failure to follow these procedures could affect product warranty.

Read completely and understand all instructions provided prior to beginning installation or maintenance.

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 identifications 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.

**WARNING**

Prior to servicing, remove actuation media and power and confirm there is no stored energy in the actuation such as compressed springs or trapped air before beginning service. Stored energy devices can cause serious injury if the energy is released without warning.

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!

**WARNING**

Before working on valve being in service make sure that service media has been flushed and line is safe. Make sure that all applicable MSDS sheets are available. Follow all safety related procedures.

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

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

**NOTICE**

Before disassembly valve shall be cycled several times to assure there is no pressure trapped in body cavity.

**WARNING**

During the pressure test of reassembled valve follow all safety precautions to avoid possible injury. Use of proper test equipment, correct parts assemblies, follow test procedures.

**WARNING**

While line is under pressure DO NOT remove packing gland or any other valve parts.

**3.1 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.

**3.2 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

**3.3 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.**

**3.4 Protective Clothing**

Bray products are often used in critical applications e.g. under extremely high pressures with dangerous, toxic, or corrosive mediums. When performing service, inspection, or repair operations, always ensure that the valve and the actuator are depressurized, the valve has been cleaned, and the valve is free of harmful substances. In such cases, pay particular attention to personal protection e.g. protective clothing, gloves, glasses,etc..

**3.5 Service and Repair**

To avoid possible injury to personnel or damage to products,safety terms must be strictly adhered to. Modifying this product, substituting non-factory parts, or using maintenance procedures other than those outlined in these Installation, Operation and Maintenance instructions could drastically affect performance, be hazardous to personnel and equipment, and may void existing warranties.

Apart from the operating instructions and the obligatory accident prevention directives valid in the country of use, all recognized regulations for safety and good engineering practices must be followed.

**3.6 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:

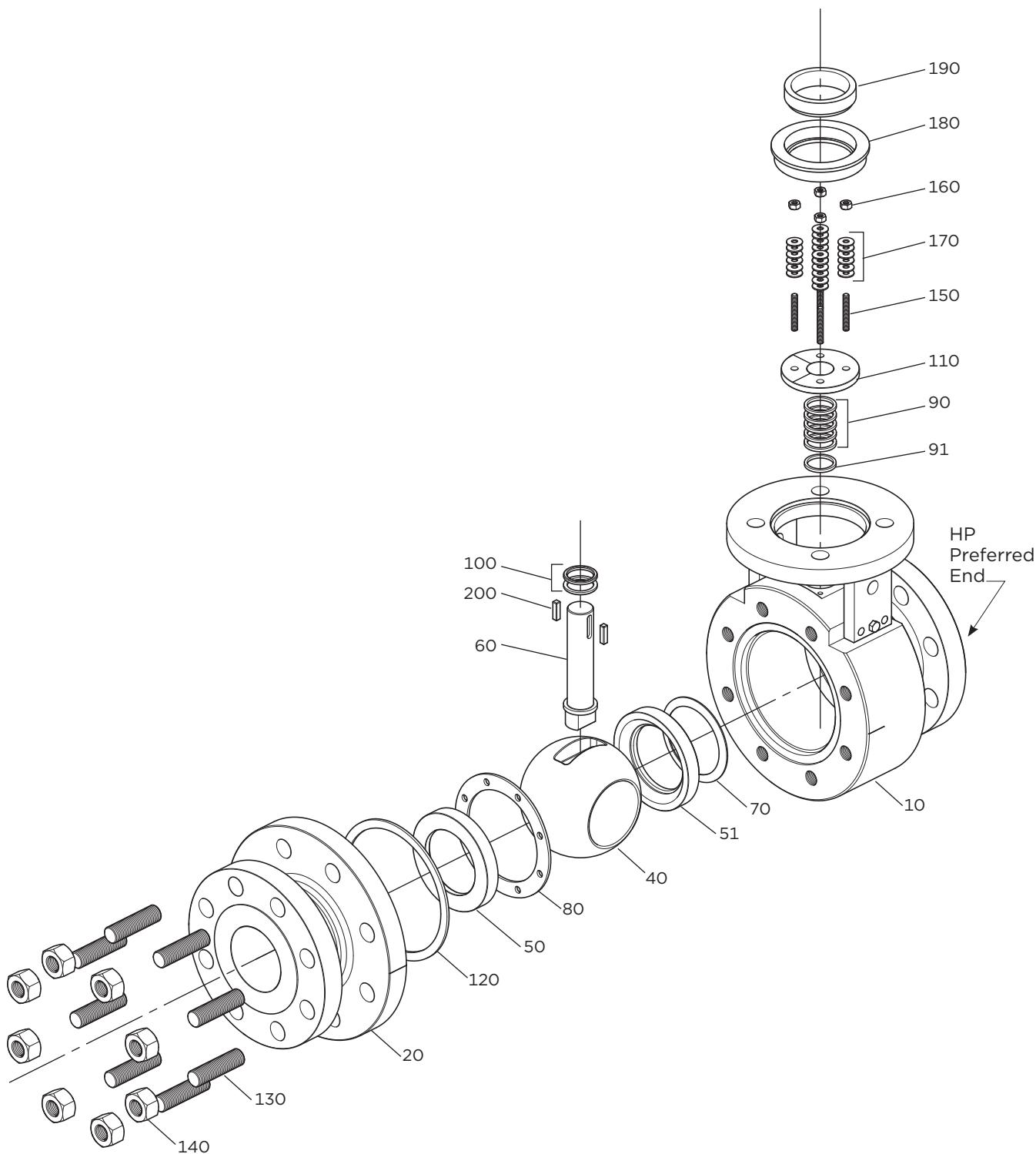
- > Declaration on EU Directives (if applicable).
- > IOM Manual supplied with the product.

**3.7 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:

1. Is trained in the operation and maintenance of pressure equipment and systems in accordance with established safety practices
2. Is trained in the operation and maintenance of electrical equipment and systems in accordance with established safety practices.
3. Is trained or authorized to energize, de-energize, ground, tag, and lock electrical circuits and equipment in accordance with established safety practices.
4. Is trained in the proper use and care of personal protective equipment PPE in accordance with established safety practices.
5. 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.

**4.0 PARTS IDENTIFICATION****4.1 Parts Callout - Side Entry Stem Assembly Design - Two Piece**

**4.2 Parts List - Side Entry Stem Assembly Design - Two Piece**

ITEM	DESCRIPTION	RECOMMENDED SPARE PARTS <sup>3</sup>
<b>10</b>	Body	
<b>20</b>	End Cap/Closure	
<b>40</b>	Ball	
<b>50</b>	Seat Ring - Downstream	
<b>51</b>	Seat Ring - HP End	
<b>52<sup>2</sup></b>	O-Ring	■
<b>60</b>	Stem	
<b>70</b>	Seat Spring - HP End	
<b>80<sup>1</sup></b>	Locking Ring - Downstream	
<b>90</b>	Packing Set	■
<b>91</b>	Anti-Extrusion Ring	
<b>100</b>	Inner Stem Bushing	
<b>110</b>	Gland Retainer	
<b>120</b>	Body Gasket	■
<b>130</b>	Body Studs	
<b>140</b>	Body Nut	
<b>150</b>	Gland Studs	
<b>160</b>	Gland Nut	
<b>170</b>	Belleville Washers	
<b>180</b>	Bearing Retainer	
<b>190</b>	Bearing	
<b>200</b>	Key	

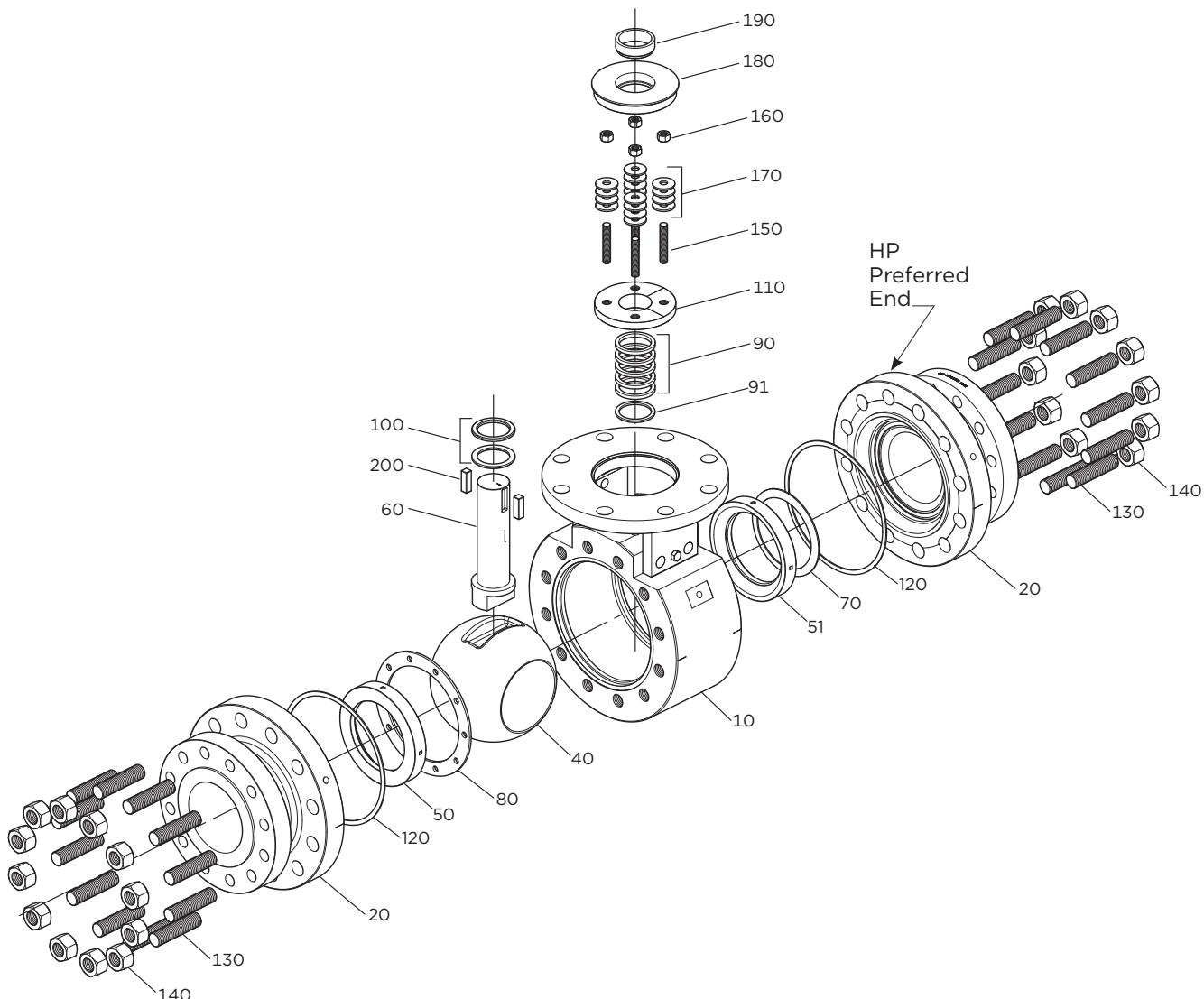
## NOTES:

1. Used on R100 and R200 Models

2. Used on M100 and M120 Models

3. Items contained in soft good repair kits

### 4.3 Parts Callout - Side Entry Stem Assembly Design - Three Piece



**4.4 Parts List - Side Entry Stem Assembly Design - Three Piece**

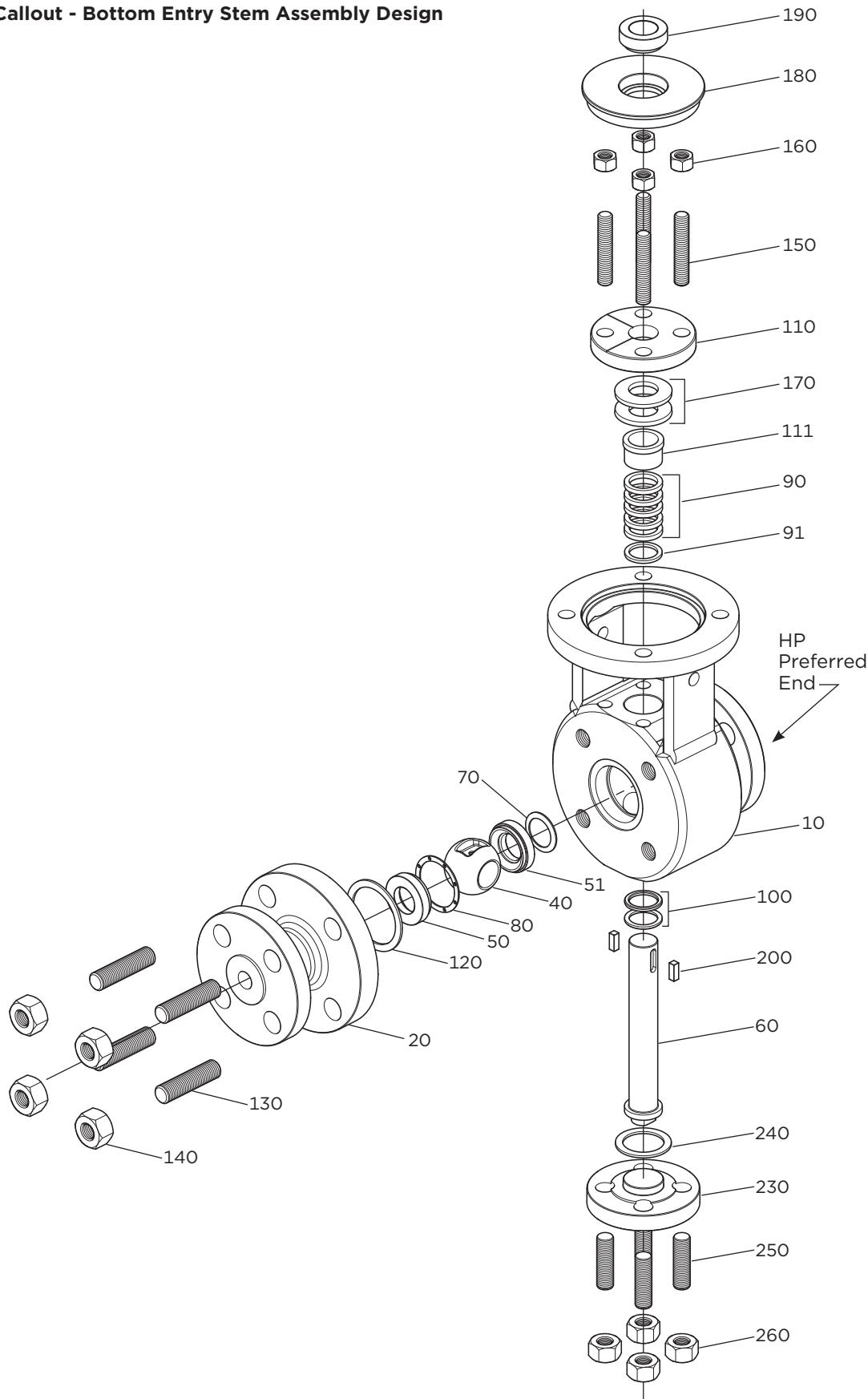
ITEM	DESCRIPTION	RECOMMENDED SPARE PARTS <sup>3</sup>
<b>10</b>	Body	
<b>20</b>	End Cap/Closure	
<b>40</b>	Ball	
<b>50</b>	Seat Ring - Downstream	
<b>51</b>	Seat Ring - HP End	
<b>52<sup>2</sup></b>	O-Ring	■
<b>60</b>	Stem	
<b>70</b>	Seat Spring - HP End	
<b>80<sup>1</sup></b>	Locking Ring - Downstream	
<b>90</b>	Packing Set	■
<b>91</b>	Anti-Extrusion Ring	
<b>100</b>	Inner Stem Bushing	
<b>110</b>	Gland Retainer	
<b>120</b>	Body Gasket	■
<b>130</b>	Body Studs	
<b>140</b>	Body Nut	
<b>150</b>	Gland Studs	
<b>160</b>	Gland Nut	
<b>170</b>	Belleville Washers	
<b>180</b>	Bearing Retainer	
<b>190</b>	Bearing	
<b>200</b>	Key	

## NOTES:

1. Used on R100 and R200 Models

2. Used on M100 and M120 Models

3. Items contained in soft good repair kits

**4.5 Parts Callout - Bottom Entry Stem Assembly Design**

**4.6 Parts List - Bottom Entry Stem Assembly Design**

ITEM	DESCRIPTION	RECOMMENDED SPARE PARTS <sup>3</sup>
<b>10</b>	Body	
<b>20</b>	End Cap/Closure	
<b>40</b>	Ball	
<b>50</b>	Seat Ring - Downstream	
<b>51</b>	Seat Ring - HP End	
<b>52</b>	O-ring	■
<b>60</b>	Stem	
<b>70</b>	Seat Spring - HP End	
<b>80<sup>2</sup></b>	Locking Ring - Downstream	
<b>90</b>	Packing Set	■
<b>91</b>	Anti-Extrusion Ring	
<b>100</b>	Inner Stem Bushing	
<b>110</b>	Gland Retainer	
<b>120<sup>1</sup></b>	Body Gasket	■
<b>130</b>	Body Studs	
<b>140</b>	Body Nut	
<b>150</b>	Gland Studs	
<b>160</b>	Gland Nut	
<b>170</b>	Belleville Washers	
<b>180</b>	Bearing Retainer	
<b>190</b>	Bearing	
<b>200</b>	Key	
<b>230</b>	Bottom Plate	
<b>240</b>	Bottom Plate Gasket	■
<b>250</b>	Bottom Plate Studs	
<b>260</b>	Bottom Plate Nuts	

## NOTES:

1. Used on R100 and R200 Models
2. Used on M100 and M120 Models
3. Items contained in soft good repair kits

**4.7 Spare Parts**

1. Use only Bray original spare parts.
2. Recommended spare parts are identified in the Parts Identification and list for each product model.
3. Bray cannot accept responsibility for any damages that occur from using spare parts or fastening materials from other manufacturers. If Bray products especially soft good materials have been stored for long periods of time, check them for corrosion or deterioration before putting them into use.

**WARNING**

Before products are returned to Bray for repair or service, Bray must be provided with a certificate that confirms that the product has been decontaminated and is clean.

## 5.0 VALVE IDENTIFICATION

### Identification Tag

All valves, actuators, or control products are provided with a permanently affixed identification tag meeting the requirements of applicable standards and certifications for the product.

As each product is unique, data may vary.

### Body Markings

Manufacturer's Name

Valve Model

Valve NPS

End Connection

Valve Bore

Pressure Class Rating

Body Material

Valve Part Number

Valve Serial Number

	MODEL: xxxx	SIZE: xxx	B16.34: xxxx
	BODY: xxxx	BALL: xxxx	SEAT: xxxx
	STEM: xxxx	B/S CTG: xxx	MAX T °F: xxxx
	MAX P: xxxx	psi@100F	xxxx bar@38C
S/N: xxxxxxxx		P/N: xxxxxxxxxxxx	

<b>Model</b>	Valve Seat Configuration
<b>Size</b>	Valve Size
<b>B16.34</b>	Compliance to B16.34 plus other standards as applicable
<b>Body</b>	Body Material
<b>Ball</b>	Ball Material
<b>Seat</b>	Seat Material
<b>Stem</b>	Stem Material
<b>B/S CTG</b>	Ball/Seat Material
<b>Max T</b>	Maximum Temperature
<b>Max P</b>	Maximum Pressure
<b>S/N</b>	Valve Serial Number
<b>PN</b>	Valve Part Number

High Pressure End or Preferred High Pressure End of valve is marked on the high pressure side of each valve.

## 6.0 HANDLING REQUIREMENTS

**WARNING**

A potential hazard exists with handling valves. Failure to handle valves properly may cause a valve to shift, slip or fall causing serious injury or death and/or equipment damage.

### 6.1 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 in the lifting points and in the center of gravity position which has been marked. The transportation of all packed material must be carried out safely and following the local safety regulations.

Moving crated, packed, or palleted products must be done in a safe manner, using appropriate lifting equipment i.e., forklift, hand truck, pallet jack, etc.

**NOTICE**

When lifting the valve from shipping container, use straps through valve body. Take care to position lifting straps to avoid damage to the tubing and mounted accessories.

### 6.2 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**

Product is shipped in protected position and must be transported in such a way as to avoid damage during movement.

For handling and/or lifting, the lifting equipment fasteners, hooks, etc. must be sized and selected while considering the product weight indicated in our packing list and/or delivery note.

Lifting and handling must be performed only by qualified personnel.

Fasteners must be protected by plastic covers in sharp corner areas.

Caution must be taken during handling to avoid this equipment passing over workers, or over any other place where a possible fall could cause injury or damage. In all cases, local safety regulations must be respected.

**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.

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.

Contact your shipper immediately if there is shipping damage. Should any problem arise, call your Bray representative.

**WARNING**

A potential hazard exists with handling valves. Failure to handle valves properly may cause a valve to shift, slip or fall causing serious injury or death and/or equipment damage.

**6.3 Moving Valves**

Moving crated, packed, or palleted products must be done in a safe manner, using appropriate lifting equipment i.e., forklift, hand truck, pallet jack, etc.

Lifting of products should be done using lifting points, and in the center of gravity position as marked, in observance of existing carrying limits.

**CAUTION**

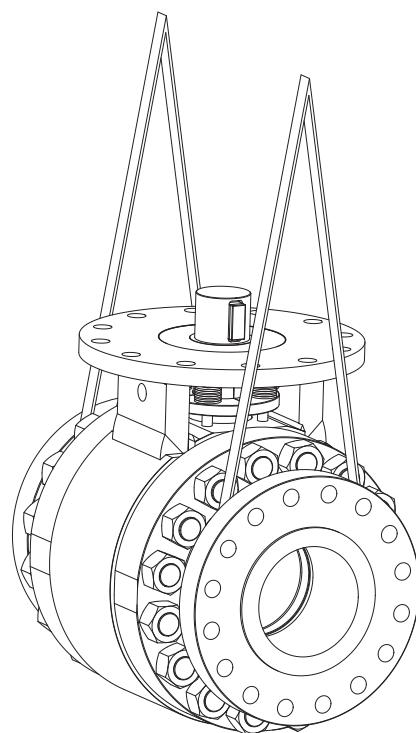
Product is shipped in protected position and must be transported in such a way as to avoid damage during movement.

For handling and/or lifting, the lifting equipment fasteners, hooks, etc. must be sized and selected while considering the product weight indicated in our packing list and/or delivery note.

Lifting and handling must be performed only by qualified personnel.

Fasteners must be protected by plastic covers in sharp corner areas.

Caution must be taken during handling to avoid this equipment passing over workers, or over any other place where a possible fall could cause injury or damage. In all cases, local safety regulations must be respected.

**Figure 1 - Lifting Slings**

## 7.0 TRANSPORT AND STORAGE

**NOTICE**

Failure to follow these procedures could affect product warranty.

The packaging is designed to protect the products only during shipping. If the product is not installed immediately after delivery, then it must be stored according to these requirements.

These are general guidelines for valve storage. Storage guidelines for accessories fitted on valves shall be as per respective Installation, Operation and Maintenance manual. Please consult the factory for information regarding specific requirements.

### 7.1 Transport

Upon arrival at the site, valves general condition should be inspected right away for any potential shipping damage. Any damage should be reported to Bray.

### 7.2 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:

1. Valves must be stored in a covered, clean, and dry environment
2. Ball valves should be stored in the fully open position to protect the ball and seats.
3. 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.

### 7.3 Long-Term Storage

Long-term storage is defined as storage of products and/or equipment for periods longer than 3 months. Long-term storage must be carried out in a controlled manner as follows:

1. Valves must be stored in a closed, clean, and dry environment.
2. Ball valves should be stored in the fully open position to protect the ball and seats.
3. 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.
4. A visual inspection with results recorded shall be performed every three months to ensure the above conditions are maintained.

Inspection, as a minimum, shall include reviewing the following:

- > Packaging
- > Flange covers
- > Dryness
- > Cleanliness

These are general guidelines for valve storage. Please consult the factory for information regarding specific requirements.

**CAUTION**

Do not stack the products on top of each other.

**7.4****General Storage Requirements**

Manually actuated valves may be stored in the vertical or horizontal position. For air or hydraulically actuated valves, the preferred orientation is with the valve stem in the vertical position. Access ports should be secured to prevent unauthorized entry and prevent contamination.

The preferred storage location is a closed, clean, and dry environment. Do not expose the product to temperature extremes.

**NOTICE**

The preferred temperature range is 40°F (4°C) to 85°F (29°C). For long-term storage in temperatures lower or higher than the preferred range, please consult the factory for information regarding specific requirements.

End protectors shall remain on the valve ends to prevent the entrance of dirt, debris, or insects/wildlife.

Product shall remain in the original shipping container with the original packaging materials.

Valves and equipment containing elastomers, including O-rings, must be stored in a climate-controlled warehouse according to SAE-ARP5316D requiring:

1. The ambient relative humidity to be less than 75%.
2. No exposure from direct ultraviolet or sunlight.
3. Protection from ozone generating equipment or combustible gases and vapors.
4. Storage at temperatures below 100°F (38°C), away from direct sources of heat.
5. No exposure to ionizing radiation.

## 8.0 INSTALLATION

### 8.1 Consideration

**NOTICE**

The Series M1 can be supplied for unidirectional or bidirectional flow. The preferred flow direction and high pressure side is indicated on the valve.

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" (Figure 2). 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.

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.

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

Before installing the valves, the pipes must be flushed clean of dirt, burrs, and welding residues, or the seats and ball surface will be damaged. Check pipe end connections threads, flanges, weld end connections, etc to ensure they are not damaged.

If for any reason the valve is installed prior to flushing of the piping system, the valve must remain in the full open position until the piping system has been fully flushed clean of debris.

Ensure the adjoining pipe on each end of the valve is aligned to prevent external piping loads. Piping misalignment may cause excessive external loads on the valve resulting in body joint leaks.

For hydrostatic testing of the piping system, the valves must be placed in the full or half open position prior to pressurizing the system.

**NOTICE**

Hydrostatic system testing with the valve in the closed position may result in damage to the valve seats, affecting their ability to create a proper seal.

Failure to implement the installation and testing instructions as outlined, resulting in a valve failure, will void the warranty coverage of the product.

When installing valves verify the orientation of handle, actuator and/or actuation accessories are not interfering with existing piping, equipment, or structure.

**Figure 2 - HP Preferred Side**

## 8.2 Actuator Installation

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

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.

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.

1. It is recommended to allow sufficient space for removal when actuator package is installed.
2. It is recommended to install the actuator package with the valve stem in the upright position. If stem is in other than vertical position, actuator package weight support is recommended to avoid any possibility of side load during operation.
3. It is recommended to avoid installing the actuator package where the actuator or accessories are in contact with the pipeline or pipeline structure.



### WARNING

Keep hands and other body parts clear of the valve flow port and other rotating machinery.

4. Prior to putting the valve into service, cycle valve/actuator to ensure valve, actuator and accessories operate properly.

## 8.3 Actuator Mounting

1. Inspect the valve actuator mounting surface, stem, mounting hardware, bracket, coupling/adapter and actuator package for damage, wear or any other irregularity which could affect the operation and performance of the valve or actuator package.
2. Follow specific actuator installation, operating and maintenance instructions.
3. Select a desired orientation for the actuator mounting relative to the ball position as indicated by the scribe line on the stem.
4. Valve stem shall be in the upright position.
5. Ensure valve is properly supported when mounting the actuator.
6. Valve closure position per **Section 9**.
  - a. If the actuator is a spring return fail to close or double acting style actuator, the valve closure shall be set to closed position.
  - b. If the actuator is a spring return fail to open style actuator, the valve closure shall be set to open position.

7. Attach the mounting bracket to the valve with provided hardware hand tight. A lifting device may be required based on the size and weight of the bracket.
8. Install the coupling/adapter on the valve stem. A lifting device may be required based on the size and weight of the coupling/adapter.
9. Proper valve and actuator performance requires alignment between the valve stem and actuator drive. Misalignment can cause premature wear of the valve and actuator components.
10. Ensure actuator drive orientation is in the proper position.
11. Lift the actuator package from its storage location and lower the actuator so the actuator drive is in a direct line with the valve stem. Support actuator package once actuator is on the mounting bracket. Be careful not to force the valve stem into the valve as the actuator drive and stem are in contact.

**NOTICE**

It may be necessary to loosen the mechanical stop to allow the mounting holes to align properly. Refer to actuator installation instructions.

12. Tighten the actuator provided mounting hardware hand tight. Maintain the actuator package support.
13. Cycle actuator 2 to 3 times to allow the assembly to center the valve stem, coupling/adapter, and actuator drive.
14. Tighten the mounting hardware at the valve and actuator. Torque values per **Table 1A** and **Table 1B**.
15. The actuator travel stops shall be adjusted to ensure proper valve closure position, open and closed. The actuator stops shall be set every time the actuator is removed from the valve.

**CAUTION**

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

**8.4****Installation of Flanged Ends**

Gaskets conforming to ASME standards are recommended for proper sealing between the valve and piping flanges.

When bolting the valve into the line, use standard bolting tightening practices and bolting torques as recommended by applicable piping standards and gasket manufacturer.

The valve body seal is independent of the flange bolting. Additional force from the flange bolts is not required.

**8.5****Installation of Threaded Valves**

Valve can be screwed on without the use of union.

The use of a thread sealant is recommended.

**CAUTION**

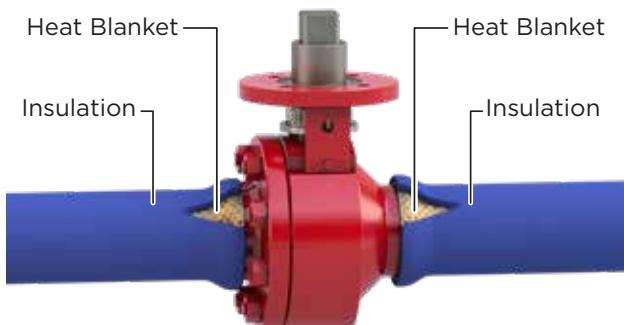
Tightening by using the valve body, handle or the opposite end can seriously damage the valve; use a wrench on both the near thread and pipe to avoid applying torque to the body.

In some applications, screwed valves may be back-welded.

**8.6 Installation of Weld-end Valves****NOTICE**

Ensure that appropriate weld procedures are implemented that are compatible with the materials used.

1. Clean the pipeline, connecting valve weld end, and the weld area on the pipe.
2. Remove the plastic protective caps from the valve ends. Do not remove the contraction rings.
3. Inspect the valve bore and remove any debris.
4. Ensure that the piping and valve end connections are properly aligned to avoid line bind.
5. Place the valve in open position, the valve is in the open position when the handle is parallel to the axis of the valve and pipe or when the scribe line on the stem is aligned with the scribe line on the gland, which is parallel to the valve bore.
6. Apply a welding ground strap adjacent to the valve end being welded to prevent current flow through the valve.
7. 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 250°F. (121°C)
8. 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. Ensure that the temperature does not exceed 1100°F (593°C).

**Figure 3 - Insulation During PWHT Process**

**WARNING**

Do not allow valve body temperature to exceed 121°C 250°F during welding or 593°C 1100°F post weld heat treating. To avoid body temperature exceeding requirements, perform PWHT on one end then normalize to room temperature before proceeding to the second end. Valve body reaching to higher temperatures will lead to void of warranty.

9. 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.
10. After installation and flushing of the piping system, verify smooth operation by cycling the valve several times.

**8.7 Special End Connections**

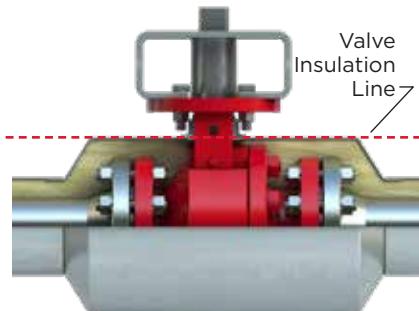
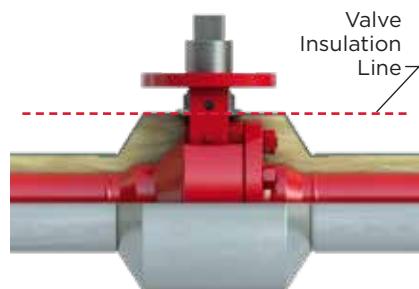
For ends other than threaded, weld end or standard ASME/EN flanges, special end connections shall be attached to the mating piping per their installation instructions.

**8.8 Valve Insulation**

Valve insulation should not extend above the packing gland. Refer to the dotted line in the illustration. See **Figure 4**.

**8.9 After Installation**

After valve has been installed in the pipeline and prior to any system testing or start up, tighten the gland nuts per **Table 2**.

**Figure 4: Insulation Line**

## 9.0 OPERATION

Operation of the valve is done by turning the stem a quarter-turn 90 degree turn. Clockwise to close, counterclockwise to open.

### 9.1 Valve in Open Position

See **Figure 5** - 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.

### 9.2 Valve in Closed Position

See **Figure 6** - 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.

### 9.3 Visual Indicator - Scribe Line

See **Figure 7** - Scribe Line

The scribe line can be used to set operator open/close stops if the operator cannot be removed from valve. Valve shown in closed position.



#### CAUTION

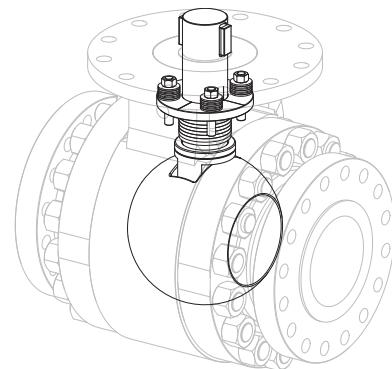
Valves with actuators should be checked for actuator/valve alignment. Misalignment will result in high operational torque, and cause damage to valve stem and seals.

Avoid 180° rotation of the ball and/or stem as this could cause premature wear to the ball/seat lapping surface thus reducing effective sealing/isolation which may lead to void of warranty.

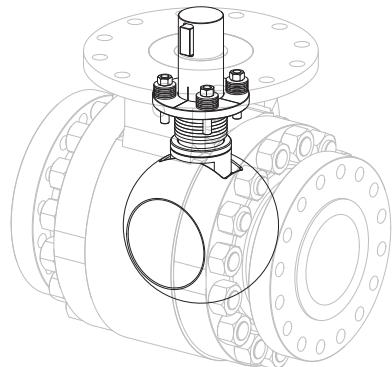
When cycling the valve open or close, make sure that the valve is fully opened and fully closed to wipe away any accumulation of debris on the ball and seat sealing surfaces. This ensures optimal performance and long valve life.

The actuator must not be re-oriented without removal from the valve. This prevents 180° rotation of the ball and assures the mate-lapped ball and seat surfaces to match. Seat leakage may occur when the ball and seat surfaces are not matched.

**Figure 5** - Open Position



**Figure 6** - Closed Position



**Figure 7** - Scribe Line



## 10.0 MAINTENANCE AND REPAIR

**NOTICE**

The valve may be assembled and operated dry where no lubricants are allowed in the system; however, a light lubrication of mating parts will aid in assembly and reduce initial operating torque. Lubricant used must be compatible with the intended line fluid.

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, re-torque bolting as necessary.

See **Table 2** for torques.

**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.

### 10.1 Stem Seal Adjustment

**WARNING**

DO NOT attempt to remove packing components or any other valve parts while line is under pressure.

Stem packing leakage may be corrected without disassembly by tightening the gland nuts until such leakage stops. If the leakage continues or valve operating torque becomes excessive, the seals are worn and replacement will be necessary

Simply tighten gland bolts evenly in 1/4 turn increments until leak stops. Do not over tighten.

Be careful to not over tighten the packing as this can result in excess operating torque and accelerated wear of the stem packing. See **Table 2** for recommended stem gland nut torque for a new valve assembly. When making stem packing adjustments while the valve is in service, torque values may vary due to cycle frequency, temperature, and other operating conditions.

**10.2 Actuator Removal**

1. Follow specific actuator installation, operating and maintenance instructions.
2. Ensure valve is properly supported when removing the actuator.
3. If the valve is in the pipeline, the process shall be stopped.
4. Disconnect all energy sources electrical, pneumatic, or hydraulic prior to removing the actuator.
5. Properly support actuator assembly.
6. Remove and store mounting hardware.
7. Lift the actuator package in a direct line with the valve stem until the actuator, coupling/adapter is clear of the valve.
8. The actuator package shall be placed in a location which will avoid damage and personal injury.
9. Remove and store mounting bracket and coupling/adapter. A lifting device may be required based on the size and weight of the bracket and coupling/adapter.

**10.3 Stem Packing Replacement****CAUTION**

Line must be depressurized before disassembly. Valve should be cycled to assure there is no pressure is trapped in valve cavity. Ball valves can trap pressurized media when closed. Flush line with valve 1/2 open to remove media. If the valve has been used to control hazardous media, it must be decontaminated before disassembly.

**WARNING**

DO NOT attempt to remove packing components or any other valve parts while line is under pressure.

**WARNING**

Remove actuation media and power connections and confirm that there is no stored energy in the actuation such as compressed springs or trapped air before beginning. Stored energy devices can cause serious injury if the energy is released without warning.

1. Mark any matching components with a marker or tape for parts orientation prior to disassembly, for ease of reassembly.
2. Ensure the line pressure is relieved. Remove the operator, bracket or mounting flange adaptor, and stem adaptor if present.
3. Remove stem keys.

4. Remove bearing retainer and bearing.
5. Loosen and remove the gland nuts holding the gland retainer in place.

**NOTICE**

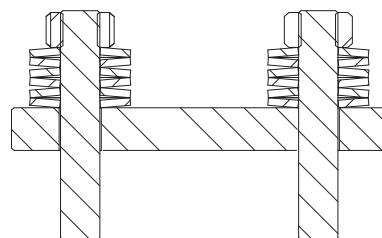
Take note of Belleville washer and gland retainer orientation.

6. Remove Belleville washers, and gland retainer.
7. 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.

8. Clean and inspect metal parts. It is not necessary to replace the stem unless the sealing surfaces have been damaged by scratches, abrasion or corrosion. Verify threads and threaded holes are clean and free from thread locker, paint, media and foreign material. Check all sealing areas on metal parts for damage.
9. 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. See **Figure 8** for orientation. The gland flange retainer may be used as a packing assembly tool to press each ring into the packing box.
10. Rotate the stem so that the scribe line is facing the body end cap/closure joint. See **Figure 7**.
11. Install the gland retainer over the stem, aligning the retainer and stem scribe lines.
12. Apply a small amount of anti-seize compatible with the media to gland stud threads and bottom face of gland nuts.
13. If previously removed, insert gland 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 9**. Install gland nuts onto each stud and torque to specified value. Be sure to torque in a cross pattern to avoid uneven loading. See **Table 2** for torques.
14. Install bearing retainer and bearing into the mounting flange. If necessary, tap gently into place using a rubber mallet.
15. 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.

**Figure 8 -** Packing Orientation**Figure 9 -** Belleville Spring Stack Orientation

**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.

**10.4 Valve Removal from System and Cleaning Procedure****CAUTION**

Line must be depressurized before disassembly. Valve should be cycled to assure there is no pressure is trapped in valve cavity. Ball valves can trap pressurized media when closed. Flush line with valve 1/2 open to remove media. If the valve has been used to control hazardous media, it must be decontaminated before disassembly.

**WARNING**

DO NOT attempt to remove packing components or any other valve parts while line is under pressure.

**CAUTION**

Properly support the valve before removing or loosening anybody bolts. The larger sizes are heavy and may cause injury if allowed to swing or fall freely.

**WARNING**

Remove actuation media and power connections and confirm that there is no stored energy in the actuation such as compressed springs or trapped air before beginning. Stored energy devices can cause serious injury if the energy is released without warning.

**NOTICE**

Certain valve constructions are unidirectional. A flow arrow will indicate the flow direction. Care should be take when rebuilding the valve to ensure these special constructions are considered.

It is recommended that the following steps be taken for safe removal and assembly.

## 10.5 Valve Disassembly

**NOTICE**

Certain valve constructions are unidirectional. Identify the preferred flow direction of the valve for proper maintenance. When using a unidirectional design, the valve's high pressure end is marked with "HP END" (See **Figure 2**). 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". Care should be taken when rebuilding the valve to ensure these special constructions are considered.

1. Support valve and actuator assembly before removing from pipeline.
2. Open valve.
3. Remove valve from pipeline either by unscrewing threaded portion of pipe while supporting valve end with a wrench, loosen and remove pipeline flange bolting, remove center section or by cutting the mating pipe.
4. Lift valve from line for servicing. Proper lifting and handling techniques shall be followed to remove valve and actuator from pipeline. They should be adequately supported before removal from the line is begun.

**NOTICE**

Care should be taken to avoid scratching or damaging mating faces. The valve should be adequately supported and in the open position before beginning.

5. Remove actuator and mounting set if not previously done.
6. Once valve has been removed from the pipeline, hold the body in a vise or mount to work surface firmly enough to prevent movement but do not crush or damage the body. Preferred body position is on the body end connection with end cap facing up.
7. Mark any matching components with a marker or tape for parts orientation prior to disassembly, for ease of reassembly. When removing the valve components such as seats, seat springs, and locking ring, note which side of valve "HP END" or "HP PREFERRED END" (see **Figure 2**) to ensure proper orientation of replacement parts during assembly.
8. Remove stem keys.
9. Remove bearing retainer and bearing.
10. Loosen and remove the gland nuts holding the gland retainer in place.
11. Remove Belleville washers, and gland retainer.
12. Remove body nuts, using proper wrench size. Lift off end cap. One seat should come out with end cap.

13. Carefully remove body gasket watching to not damage sealing surfaces. Damage to sealing surfaces will affect the performance of the valve.
14. To remove the ball, rotate the stem so ball is fully closed. Lift the ball from body, using a strap and lift device if necessary.

**NOTICE**

Extreme caution should be taken to avoid damage to the ball.

15. Remove the body seat and seals.
16. The stem must be removed from inside the body - a tap with a block of wood or hard plastic rod on the top of the stem should loosen it. The inner stem bushing should come out with the stem. Then remove the stem packing.
17. Carefully remove all soft goods watching to not damage sealing surfaces. Damage to sealing surfaces will affect the performance of the valve.
18. Discard all soft seals.

**10.6 Visual Inspection**

Clean and inspect metal parts. It is not necessary to replace the ball, seat, and stem unless the sealing surfaces have been damaged by scratches, abrasion, or corrosion. Verify threads and threaded holes are clean and free from thread locker, paint, media, and foreign material.

Check all sealing areas on metal parts for damage. Replacement of all soft parts is strongly recommended whenever the valve is disassembled for reconditioning. This is the surest protection against subsequent leakage after valve assembly. The replacement parts can be ordered in kit form.

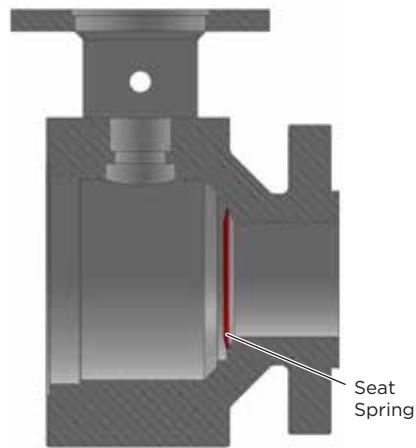
**10.7 Valve Assembly Procedure - 2 Piece Construction****NOTICE**

Certain valve constructions are unidirectional. Identify the preferred flow direction of the valve for proper maintenance. When using a unidirectional design, the valve's high pressure end is marked with "HP END" (see **Figure 2**). 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". Care should be taken when rebuilding the valve to ensure these special constructions are considered.

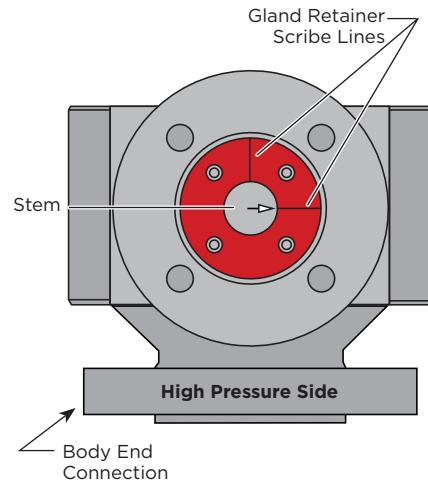
1. Ensure all parts are inspected and accepted prior assembly, including visual inspection, dimensional inspection per applicable quality procedures.
2. Ensure parts are clean, dry, and free of rust.
3. Ensure all lapping process is complete and the lapped mating components are not interchanged with other parts.

4. Place the body on work bench or vise with the body end connection side facing down and hold firmly enough to prevent movement but do not crush or damage the body. Support the body if other than flanged end connection as to not damage the connection.
5. Insert gland studs into body if previously removed. Apply a small amount of anti-seize compatible with the media to stud threads.
6. Install seat spring HP End (**Figure 10**) in body seat pocket.
7. Insert seat ring - HP end. Make sure the spherical curvature side of the seat will face the ball.
8. Place inner stem bushings onto the stem making sure the chamfer ends are facing away from each other. Careful not to scratch stem.
9. Insert stem into body through side and into the packing bore. Stem shall be in closed position. Careful not to scratch stem or stem bore.
10. Insert anti-extrusion ring onto stem. Careful not to scratch stem or stem bore. Lower into stem bore.
11. Insert the packing set over the stem. 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. See **Figure 8** for packing orientation.
12. Insert the gland retainer onto the stem. Ensure scribe lines in the gland retainer are in direction shown in **Figure 11**.
13. Apply a small amount of anti-seize compatible with the media to gland stud threads and bottom face of hex nuts.
14. 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 9**. Install gland nuts onto each stud and torque to specified value. Be sure to torque in a cross pattern to avoid uneven loading. Fastener torque should be applied at 30%, 50% and at 100% increments per **Table 2**.
15. Install the ball inside the valve body with ball matching body seat. The stem flats will fit into the slot on top of the ball. Lifting aid may be required to install the ball. Be careful not to damage sealing surfaces of ball or body.
16. Lubricate threads of the body stud with anti-seize compatible with the media. Thread body studs into the body.
17. Insert locking ring - downstream. Careful not to damage the body or ball.
18. Insert body gasket.

**Figure 10 -** Seat Spring Orientation



**Figure 11 -** Top View Scribe Lines



19. Place seat ring - downstream to top of the locking ring.  
Align the seat center. Make sure the spherical curvature side of the seat will face the ball.

**NOTICE**

Be careful not to damage body seal when assembling end cap/closure into body.

20. Install the end cap/closure to the body paying attention to proper end flange bolt hole alignment. Bolt holes on flange should always straddle the centerline. Use match marks from disassembly to ensure proper orientation.

21. Ensure seat ring - downstream fits into the end cap/closure.

**NOTICE**

Body bolts/body nuts must be tightened in a cross or star pattern, to prevent uneven loading of the body seal.

22. Lubricate the body stud threads and body nut faces in contact with the end cap/closure with anti-seize compatible with the media. Tighten the body nuts in a cross pattern per **Figure 12** based on number of fasteners per body joint. Fastener torque should be applied at 30%, 50% and once more at 50% increments per **Table 3**.

23. Apply a small amount of machine oil to the ball and seat surfaces.

24. Install the bearing retainer and bearing.

25. Cycle the valve slowly two complete cycles.

**NOTICE**

Body bolts/body nuts must be tightened in a cross or star pattern, to prevent uneven loading of the body seal.

26. Tighten the body nuts in a cross pattern per **Figure 12** based on number of fasteners per body joint. Fastener torque should be applied at 60%, 100% and once more at 100% increments per **Table 3**.

27. Mount actuation per installation section instructions.

**10.8 Valve Assembly Procedure – 2 Piece Construction with Bottom Stem Entry****NOTICE**

Certain valve constructions are unidirectional. Identify the preferred flow direction of the valve for proper maintenance. When using a unidirectional design, the valve's high pressure end is marked with "HP END" (see **Figure 2**). 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". Care should be taken when rebuilding the valve to ensure these special constructions are considered.

1. Ensure all parts are inspected and accepted prior to assembly, including visual inspection, dimensional inspection per applicable quality procedures.
2. Ensure parts are clean, dry, and free of rust.
3. Ensure all lapping process is complete and the lapped mating components are not interchanged with other parts.
4. Place the body on work bench or vise with the body end connection side facing down and hold firmly enough to prevent movement but do not crush or damage the body. Support the body if other than flanged end connection as to not damage the connection.
5. Insert gland studs into body if previously removed. Apply a small amount of anti-seize compatible with the media to stud threads.
6. Install seat spring - HP end in body seat pocket.
7. Insert body seat ring - HP end. Make sure the spherical curvature side of the seat will face the ball.
8. Place inner stem bushings onto the stem making sure the chamfer ends are facing away from each other. Careful not to scratch stem.
9. Insert stem into body through bottom entry and into the packing bore. Stem shall be in closed position. Careful not to scratch stem or stem bore.
10. Insert anti-extrusion ring onto stem. Careful not to scratch stem or stem bore. Lower into stem bore.
11. Insert the packing set over the stem. 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. See **Figure 8** for packing orientation.
12. Insert the gland retainer onto the stem. Ensure scribe lines in the gland retainer are in direction shown in **Figure 11**.
13. Apply a small amount of anti-seize compatible with the media to gland stud threads and bottom face of gland nuts.
14. 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 9**. Install gland nuts onto each stud and torque to specified value. Be sure to torque in a cross pattern to avoid uneven loading. Fastener torque should be applied at 30%, 50% and at 100% increments per **Table 2**.
15. Insert bottom plate stud into body if previously removed. Apply a small amount of anti-seize compatible with the media to stud threads.

16. Insert the bottom plate gasket and bottom plate into the body.
17. Apply a small amount of anti-seize compatible with the media to bottom plate stud threads and bottom face of bottom plate nuts.

**NOTICE**

Body bolts/body nuts must be tightened in a cross or star pattern, to prevent uneven loading of the body seal.

18. Install bottom plate nuts onto each stud and tighten the nuts in a cross pattern per **Figure 12** based on number of fasteners. Fastener torque should be applied at 30%, 60% and 100% and once more at 100% increments per **Table 4**.
19. Install the ball inside the valve body with ball matching body seat. The stem flats will fit into the slot on top of the ball. Lifting aid may be required to install the ball. Be careful not to damage sealing surfaces of ball or body.
20. Lubricate threads of the body stud with anti-seize compatible with the media. Thread body studs into the body.
21. Insert locking ring - downstream. Careful not to damage the body or ball.
22. Insert body gasket.
23. Place seat ring - downstream to top of the locking ring. Align the seat center. Make sure the spherical curvature side of the seat will face the ball.

**NOTICE**

Be careful not to damage body seal when assembling end cap/closure into body.

24. Install the end cap/closure to the body paying attention to proper end flange bolt hole alignment. Bolt holes on flange should always straddle the centerline. Use match marks from disassembly to ensure proper orientation
25. Ensure seat ring - downstream fits into the end cap/closure.

**NOTICE**

Body bolts/body nuts must be tightened in a cross or star pattern, to prevent uneven loading of the body seal.

26. Lubricate the body stud threads and body nut faces in contact with the end cap/closure with anti-seize compatible with the media. Tighten the body nuts in a cross pattern per **Figure 12** based on number of fasteners per body joint. Fastener torque should be applied at 30%, 50% and once more at 50% increments per **Table 3**.
27. Apply a small amount of machine oil to the ball and seat surfaces.
28. Install the bearing retainer and bearing.

29. Cycle the valve slowly two complete cycles.

**NOTICE**

Body bolts/body nuts must be tightened in a cross or star pattern, to prevent uneven loading of the body seal.

30. Tighten the body nuts in a cross pattern per **Figure 12** based on number of fasteners per body joint. Fastener torque should be applied at 60%, 100% and once more at 100% increments per **Table 3**.

31. Mount actuation per installation section instructions.

**10.9 Valve Assembly Procedure - 3 Piece Construction****NOTICE**

Certain valve constructions are unidirectional. Identify the preferred flow direction of the valve for proper maintenance. When using a unidirectional design, the valve's high pressure end is marked with "HP END" (see **Figure 2**). 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". Care should be taken when rebuilding the valve to ensure these special constructions are considered.

1. Ensure all parts are inspected and accepted prior assembly, including visual inspection, dimensional inspection per applicable quality procedures.
2. Ensure parts are clean, dry, and free of rust.
3. Ensure all lapping process is complete and the lapped mating components are not interchanged with other parts.
4. Lubricate threads of the body stud with anti-seize compatible with the media. Thread body studs into the body.
5. Insert body gasket on the upstream HP end cap/closure.

**NOTICE**

Be careful not to damage body seal when assembling HP end cap/closure into body.

6. Install the upstream HP end cap/closure onto the body center section paying attention to proper end flange bolt hole alignment. Bolt holes on flange should always straddle the centerline. Use match marks from disassembly to ensure proper orientation.

**NOTICE**

Body bolts/body nuts must be tightened in a cross or star pattern, to prevent uneven loading of the body seal.

7. Lubricate body nut faces in contact with the HP end cap/closure with anti-seize compatible with the media. Tighten the body nuts in a cross pattern per **Figure 12** based on number of fasteners per body joint. Fastener torque should be applied at 30%, 60% and 100% and once more at 100% increments per **Table 3**.
8. Place the body assembly (body and fastened closure) on work bench or vise with the body end connection side facing down and hold firmly enough to prevent movement but do not crush or damage the body. Support the body if other than flanged end connection as to not damage the connection.
9. Install seat spring - HP End in seat pocket of the body assembly.
10. Insert gland studs into body if previously removed. Apply a small amount of anti-seize compatible with the media to stud threads.
11. Insert body assembly seat ring - HP End. Make sure the spherical curvature side of the seat will face the ball.
12. Place inner stem bushings onto the stem making sure the chamfer ends are facing away from each other. Careful not to scratch stem.
13. Insert stem into body through side and into the packing bore. Stem shall be in closed position. Careful not to scratch stem or stem bore.
14. Insert anti-extrusion ring onto stem. Careful not to scratch stem or stem bore. Lower into stem bore.
15. Insert the packing set over the stem. 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. See **Figure 8** for packing orientation.
16. Insert the gland retainer onto the stem. Ensure scribe lines in the gland retainer are in direction shown in **Figure 11**.
17. Apply a small amount of anti-seize compatible with the media to gland stud threads and bottom face of gland nuts.
18. 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 9**. Install gland nuts onto each stud and torque to specified value. Be sure to torque in a cross pattern to avoid uneven loading. Fastener torque should be applied at 30%, 50% and at 100% increments per **Table 2**.
19. Install the ball inside the valve body with ball matching body seat. The stem flats will fit into the slot on top of the ball. Lifting aid may be required to install the ball. Be careful not to damage sealing surfaces of ball or body.

20. Lubricate threads of the body stud with anti-seize compatible with the media. Thread body studs into the body.
21. Insert locking ring - downstream. Careful not damage the body or ball.
22. Insert body gasket.
23. Place seat ring - downstream to top of the locking ring. Align the seat center. Make sure the spherical curvature side of the seat will face the ball.

**NOTICE**

Be careful not to damage body seal when assembling end cap/closure into body.

24. Install the end cap/closure to the body paying attention to proper end flange bolt hole alignment. Bolt holes on flange should always straddle the centerline. Use match marks from disassembly to ensure proper orientation.
25. Ensure seat ring - downstream fits into the end cap/closure.

**NOTICE**

Body bolts/body nuts must be tightened in a cross or star pattern, to prevent uneven loading of the body seal.

26. Lubricate body nut faces in contact with the end cap/closure with anti-seize compatible with the media. Tighten the body nuts in a cross pattern per **Figure 12** based on number of fasteners per body joint. Fastener torque should be applied at 30%, 50% and once more at 50% increments per **Table 3**.
27. Apply a small amount of machine oil to the ball and seat surfaces.
28. Install the bearing retainer and bearing.
29. Cycle the valve slowly two complete cycles.

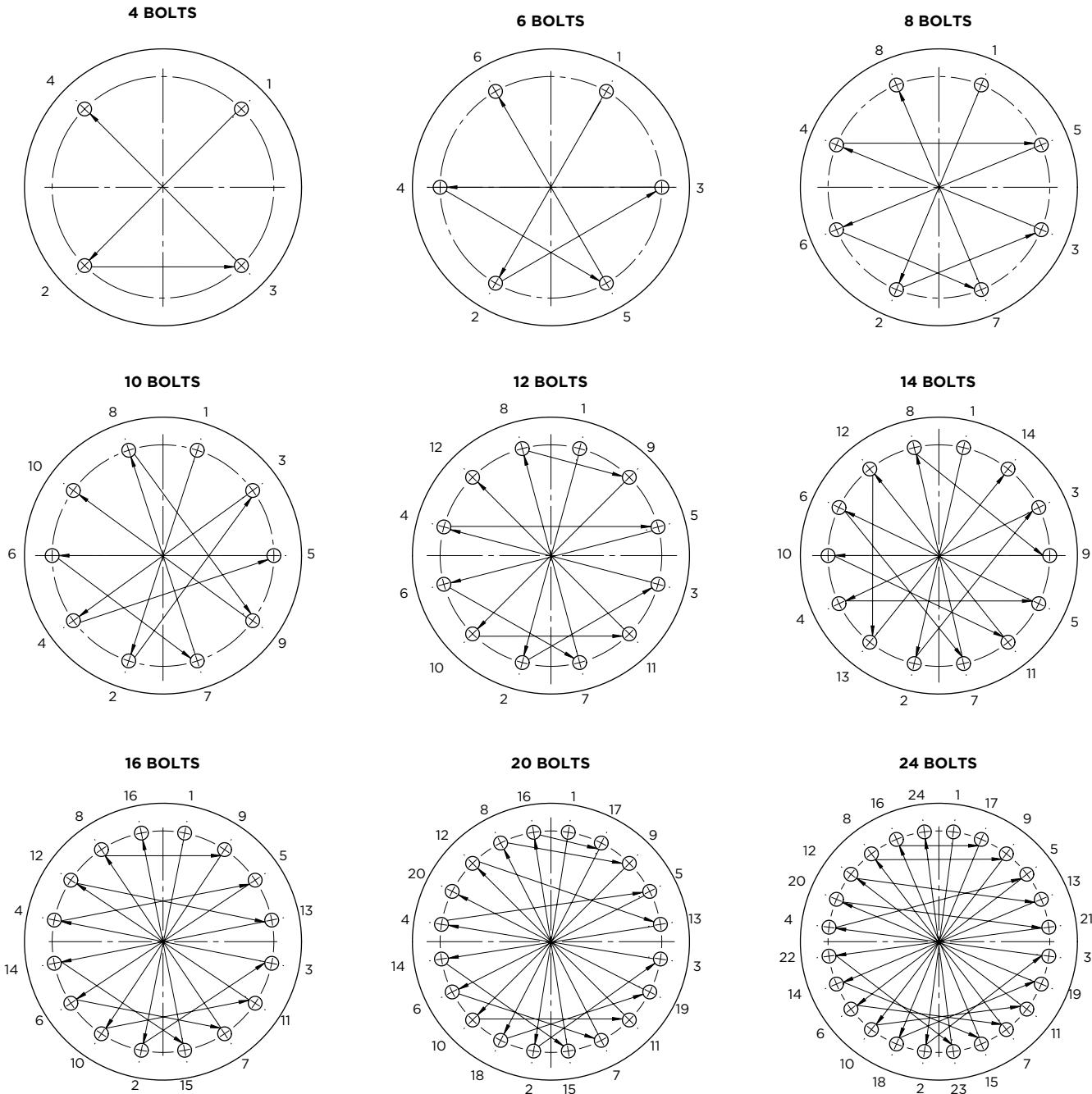
**NOTICE**

Body bolts/body nuts must be tightened in a cross or star pattern, to prevent uneven loading of the body seal.

30. Tighten the body nuts in a cross pattern per **Figure 12** based on number of fasteners per body joint. Fastener torque should be applied at 60%, 100% and once more at 100% increments per **Table 3**.
31. Mount actuation per installation section instructions.

**Figure 12 - Body Joint Bolting Guide**

**NOTE:** For valves with different quantity of bolts than specified here, contact your local Bray sales office



## 11.0 REPAIR KITS

Only Bray repair parts shall be used to service Bray products. Contact Bray for ordering proper repair kit and any valve replacement parts not provided in the repair kit.

When ordering repair kit and replacement parts, include:

1. Valve identification information
2. Valve serial number if provided
3. Replacement part item number, part description and quantity.

**12.0 TROUBLESHOOTING**

TROUBLE	POSSIBLE CAUSE	SOLUTION
Packing Leakage	Packing Consolidation Packing Wear Improper Repair	Tighten gland nut to eliminate leak. If leak continues follow proper maintenance and repair
Seat Leakage	Seat Wear Media Damage Improper Repair Improper Installation Direction	Follow Proper Installation, maintenance and repair.
Body Seal Leakage	Improper installation or welding technique Improper repair	Tighten body bolts per <b>Table 3</b> following tightening technique outlined in valve assembly section. If leak continues, follow proper maintenance and repair

**NOTES:**

- > Bray does not accept any responsibility for the product if wear parts not tested and approved by Bray are used.
- > Bray does not accept any responsibility for the product if maintenance instructions are not followed during maintenance.

## 13.0 RETURN MERCHANDISE AUTHORIZATION

**WARNING**

Before products are returned to Bray for repair or service, Bray must be provided with a certificate that confirms that the product has been decontaminated and is clean.

All products that are returned require a Return Merchandise Authorization RMA. Contact a Bray representative to obtain authorization and shipping instructions.

The following information must be provided when submitting RMA:

- > Serial number
- > Part number
- > Month and year of manufacture
- > Time of purchase if known
- > Actuator and actuator accessories/controls 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.

## 14.0 APPENDIX - TABLES

TABLE 1A: MOUNTING SET FASTENER TO VALVE TIGHTENING TORQUES

Valve Size		Pressure Class <sup>1</sup>	Valve Bore <sup>1</sup>		Material <sup>1</sup>			
					ASTM A193 Grade B7		ASTM A193 Grade B8M, Class 1	
					Marking		Marking	
NPS		inch		mm		B7		B8M
1	25	150	1	25.4			Note 2	
		300	1	25.4	19	25.8	14	19.0
		600	1	25.4	19	25.8	14	19.0
		900	0.87	22.1	19	25.8	14	19.0
		1500	0.87	22.1	19	25.8	14	19.0
		2500	0.75	19.1	47	63.7	33	44.7
1½	40	150	1.5	38.1	47	63.7	33	44.7
		300	1.5	38.1	47	63.7	33	44.7
		600	1.5	38.1	47	63.7	33	44.7
		900	1.37	34.8	94	127.4	66	89.5
		1500	1.37	34.8	94	127.4	66	89.5
		2500	1.12	28.4	167	226.4	118	160.0
2	50	150	2	50.8	19	25.8	14	19.0
		300	2	50.8	19	25.8	14	19.0
		600	2	50.8	47	63.7	33	44.7
		900	1.87	47.5	167	226.4	118	160.0
		1500	1.87	47.5	167	226.4	118	160.0
		2500	1.5	38.1	167	226.4	118	160.0
3	80	150	3	76.2	47	63.7	33	44.7
		300	3	76.2	94	127.4	66	89.5
		600	3	76.2	167	226.4	118	160.0
		900	2.87	72.9	94	127.4	66	89.5
		1500	2.75	69.9				
		2500	2.25	57.2	Note 2			
4	100	150	4	101.6	94	127.4	66	89.5
		300	4	101.6	167	226.4	118	160.0
		600	4	101.6	94	127.4	66	89.5
		900	3.87	98.3	167	226.4	118	160.0
		1500	3.62	91.9	593	804	418	566.7
		2500	2.87	72.9	167	226.4	118	160.0
6	150	150	6	152.4	167	226.4	118	160.0
		300	6	152.4	167	226.4	118	160.0
		600	6	152.4	593	804	418	566.7
		900	5.75	146.1	593	804	418	566.7
		1500	5.37	136.4				
		2500	4.37	111	1492	2022.9	1052	1426.3
8	200	150	8	203.2	593	804	418	566.7
		300	8	203.2	593	804	418	566.7
		600	7.62	193.5	1492	2022.9	1052	1426.3
		900	7.5	190.5				
		1500	7	177.8	1492	2022.9	1052	1426.3
		2500	5.75	146.1	Note 2			
10	250	150	10	254	Note 2			
		300	10	254	1492	2022.9	1052	1426.3
		600	9.5	241.3	1492	2022.9	1052	1426.3
		900	9.37	238				
		1500	8.75	222.3	Note 2			
		2500	7.25	184.2				
12	300	Note 2						
14	350							
16	400							
18	450							
20	500							
24	600							

**NOTES:** 1. For materials, pressure classes, bore internal diameter, and valve sizes not listed, contact your local Bray sales office for details.  
 2. Refer to the order submittal drawings for recommended bolting torques or contact your local Bray sales office.

**SERIES M1 SEVERE SERVICE BALL VALVE**

Installation, Operation and Maintenance Manual

**TABLE 1B: MOUNTING SET FASTENER TO ACTUATOR TIGHTENING TORQUES**

Bolt Dia	S92/93 Actuator All Bolt Material		Other /Ductile Iron / Steel Actuators				
			ASTM A193 Grade B7		ASTM A193 Grade B8M, Class 1		
			Marking		Marking		
Bolt Dia	Ibs-ft	N-m	Ibs-ft	N-m	Ibs-ft	B7	B8M
1/4-20UNC	4	5.1	5	7.2	4	5.1	
5/16-18UNC	8	10.4	11	14.8	8	10.4	
3/8-16UNC	14	18.5	19	26.3	14	18.5	
7/16-14UNC	22	29.6	31	42	22	29.6	
1/2-13UNC	33	45.2	47	64.1	33	45.2	
9/16-12UNC	48	65.2	68	92.5	48	65.2	
5/8-11UNC	66	90	94	127.7	66	90	
3/4-10UNC	118	159.8	167	226.7	118	159.8	
7/8-9UNC	190	257.5	269	365.2	190	257.5	
1-8UN	285	386	404	547.5	285	386	
1 1/8-8UN	418	566.7	593	803.8	418	566.7	
1 1/4-8UN	587	796.3	833	1129.5	587	796.3	
1 3/8-8UN	797	1080.8	1131	1533	797	1080.8	
1 1/2-8UN	1052	1426	1492	2022.7	1052	1426	
1 5/8-8UN	1355	1837.7	1923	2606.7	1355	1837.7	
1 3/4-8UN	1713	2321.9	2429	3293.5	1713	2321.9	
1 7/8-8UN	2127	2884.4	3018	4091.4	2127	2884.4	
2-8UN	2604	3531.1	3694	5008.6	2604	3531.1	
M10 x 1.5	17	22.6	24	32	17	22.6	
M12 x 1.75	29	39.3	41	55.8	29	39.3	
M16 x 2	72	97.5	102	138.3	72	97.5	
M20 x 2.5	140	190.4	199	270	140	190.4	
M24 x 3	242	328.1	344	466.4	242	328.1	
M30 x 3.5	482	654	684	927.6	482	654	
M36 x 4.0	843	1143.3	1196	1621.8	843	1143.3	

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Installation, Operation and Maintenance Manual

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**TABLE 2: GLAND BOLT FASTENER TIGHTENING TORQUES**

Valve Size		Pressure Class <sup>1</sup>	Valve Bore <sup>1</sup>		Torque			
NPS	DN		inch	mm	lbs-ft	N m		
1	25	150	1	25.4	Note 1			
		300	1	25.4	1.2	1.6		
		600	1	25.4	1.2	1.6		
		900	0.87	22.1	2.5	3.4		
		1500	0.87	22.1	3.5	4.7		
		2500	0.75	19.1	5.0	6.8		
1½	40	150	1.5	38.1	1.7	2.3		
		300	1.5	38.1	1.7	2.3		
		600	1.5	38.1	1.7	2.3		
		900	1.37	34.8	2.3	3.1		
		1500	1.37	34.8	3.2	4.3		
		2500	1.12	28.4	6.5	8.8		
2	50	150	2	50.8	1.4	1.9		
		300	2	50.8	1.4	1.9		
		600	2	50.8	1.6	2.2		
		900	1.87	47.5	2.8	3.8		
		1500	1.87	47.5	4.0	5.4		
		2500	1.5	38.1	7.9	10.7		
3	80	150	3	76.2	1.6	2.2		
		300	3	76.2	2.0	2.7		
		600	3	76.2	2.9	3.9		
		900	2.87	72.9	6.2	8.4		
		1500	2.75	69.9	Note 1			
		2500	2.25	57.2	Note 1			
4	100	150	4	101.6	2.0	2.7		
		300	4	101.6	3.1	4.2		
		600	4	101.6	7.1	9.6		
		900	3.87	98.3	10.7	14.5		
		1500	3.62	91.9	36.2	49.1		
		2500	2.87	72.9	57.5	78.0		
6	150	150	6	152.4	5.8	7.9		
		300	6	152.4	10.7	14.5		
		600	6	152.4	18.0	24.4		
		900	5.75	146.1	25.6	34.7		
		1500	5.37	136.4	Note 1			
		2500	4.37	111	200.6	272.0		
8	200	150	8	203.2	19.6	26.6		
		300	8	203.2	19.6	26.6		
		600	7.62	193.5	53.4	72.4		
		900	7.5	190.5	Note 1			
		1500	7	177.8	131.2	177.9		
		2500	5.75	146.1	Note 1			
10	250	150	10	254	Note 1			
		300	10	254	53.4	72.4		
		600	9.5	241.3	64.4	87.3		
		900	9.37	238	Note 1			
		1500	8.75	222.3	Note 1			
		2500	7.25	184.2	Note 1			
12	300	Note 1						
14	350	Note 1						
16	400	Note 1						
18	450	Note 1						
20	500	Note 1						
24	600	Note 1						

**NOTES**

1. Refer to the order submittal drawings for recommended bolting torques or contact your local Bray sales office.

# SERIES M1 SEVERE SERVICE BALL VALVE

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**TABLE 3: BODY BOLT FASTENER TIGHTENING TORQUES**

Valve Size		Pressure Class <sup>1</sup>	Valve Bore <sup>1</sup>		Material <sup>1</sup>						
					ASTM A193 Grade B16		ASTM A193 Grade B8M, Class 1				
					Marking		Marking				
NPS		inch		mm		B16		B8M			
NPS		25	150	25.4	Note 2						
NPS					47	63.7	33	44.7			
NPS					94	127.4	66	89.5			
NPS					167	226.4	118	160.0			
NPS					167	226.4	118	160.0			
NPS					167	226.4	118	160.0			
NPS		40	150	38.1	Note 2						
NPS					47	63.7	33	44.7			
NPS					47	63.7	33	44.7			
NPS					47	63.7	33	44.7			
NPS					269	364.7	190	257.6			
NPS					269	364.7	190	257.6			
NPS		50	150	50.8	404	547.8	285	386.4			
NPS					47	63.7	33	44.7			
NPS					47	63.7	33	44.7			
NPS					94	127.4	66	89.5			
NPS					593	804	418	566.7			
NPS					593	804	418	566.7			
NPS		80	150	76.2	404	547.8	285	386.4			
NPS					94	127.4	66	89.5			
NPS					167	226.4	118	160.0			
NPS					269	264.7	190	257.6			
NPS					593	804	807	566.7			
NPS					Note 2						
NPS		100	150	101.6	94	127.4	66	89.5			
NPS					94	127.4	66	89.5			
NPS					593	804	418	566.7			
NPS					833	1129.4	587	795.9			
NPS					1492	2022.9	1052	1426.3			
NPS					1492	2022.9	1052	1426.3			
NPS		150	150	152.4	404	547.8	285	386.4			
NPS					269	364.7	190	257.6			
NPS					1131	1533.4	797	1080.6			
NPS					1492	2022.9	1052	1426.3			
NPS					3694	5008.4	2604	3530.5			
NPS					Note 2						
NPS		200	150	193.5	269	364.7	190	257.6			
NPS					593	804	418	566.7			
NPS					1492	2022.9	1052	1426.3			
NPS					Note 2						
NPS					7404	10038.5	5220	7077.4			
NPS					Note 2						
NPS		250	150	254	Note 2						
NPS					833	1129.4	587	795.9			
NPS					3018	4091.4	2127	2883.8			
NPS					Note 2						
NPS					Note 2						
NPS					Note 2						
NPS		12	300		Note 2						
NPS		14	350		Note 2						
NPS		16	400		Note 2						
NPS		18	450		Note 2						
NPS		20	500		Note 2						
NPS		24	600		Note 2						

## NOTES

- For materials, pressure classes, bore internal diameter, and valve sizes not listed, contact your local Bray sales office for details.
- Refer to the order submittal drawings for recommended bolting torques or contact your local Bray sales office.

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Installation, Operation and Maintenance Manual



**TABLE 4: BOTTOM PLATE FASTENER TIGHTENING TORQUES**

Valve Size		Pressure Class <sup>1</sup>	Valve Bore <sup>1</sup>		Material <sup>1</sup>			
					ASTM A193 Grade B16		ASTM A193 Grade B8M, Class 1	
			Marking		Marking			
			B16		B8M			
NPS	DN	inch	mm	lbs-ft	N-m	lbs-ft	N-m	
1	25	150	1	25.4	Note 2			
		300	1	25.4	19	25.8	14	19.0
		600	1	25.4	19	25.8	14	19.0
		900	0.87	22.1	68	92.2	48	65.1
		1500	0.87	22.1	68	92.2	48	65.1
		2500	0.75	19.1	94	127.4	66	89.5
1 1/2	40	150	1.5	38.1	19	25.8	14	19.0
		300	1.5	38.1	19	25.8	14	19.0
		600	1.5	38.1	31	42	22	29.8
		900	1.37	34.8	167	226.4	118	160.0
		1500	1.37	34.8	167	226.4	118	160.0
		2500	1.12	28.4	167	226.4	118	160.0
2	50	150	2	50.8	Note 2			
		300	2	50.8				
		600	2	50.8				
		900	1.87	47.5	269	364.7	190	257.6
		1500	1.87	47.5	269	364.7	190	257.6
		2500	1.5	38.1	167	226.4	118	160.0
3	80	150	3	76.2	Note 2			
		300	3	76.2				
		600	3	76.2				
		900	2.87	72.9				
		1500	2.75	69.9				
		2500	2.25	57.2				
4	100	150	4	101.6	Note 2			
		300	4	101.6				
		600	4	101.6				
		900	3.87	98.3				
		1500	3.62	91.9	1131	1533.4	797	1080.6
		2500	2.87	72.9	833	1129.4	587	795.9
6	150	150	6	152.4	Note 2			
		300	6	152.4				
		600	6	152.4				
		900	5.75	146.1				
		1500	5.37	136.4				
		2500	4.37	111	1131	1533.4	797	1080.6
8	200							
10	250							
12	300							
14	350							
16	400							
18	450							
20	500							
24	600							

#### NOTES

1. For materials, pressure classes, bore internal diameter, and valve sizes not listed, contact your local Bray sales office for details.
2. Refer to the order submittal drawings for recommended bolting torques or contact your local Bray sales office.

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