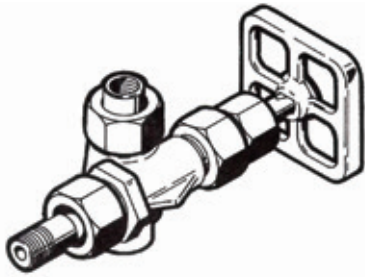




# PENBERTHY SERIES 100, 200, 300 AND 400 ARMORED GAGECOCKS

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

Before installation these instructions must be read fully and understood



### PRODUCT WARRANTY

Emerson warrants its Penberthy products as designed and manufactured to be free of defects in the material and workmanship for a period of one year after the date of installation or eighteen months after the date of manufacture, whichever is earliest. Emerson will, at its option, replace or repair any products which fail during the warranty period due to defective material or workmanship.

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Prior to submitting any claim for warranty service, the owner must submit proof of purchase to Emerson and obtain written authorization to return the product. Thereafter, the product shall be returned to Emerson with freight prepaid.

This warranty shall not apply if the product has been disassembled, tampered with, repaired or otherwise altered outside of the Emerson factory, or if it has been subject to misuse, neglect or accident.

The responsibility of Emerson hereunder is limited to repairing or replacing the product at its expense. Emerson shall not be liable for loss, damage or expenses related directly or indirectly to the installation or use of its products, or from any other cause or for consequential damages. It is expressly understood that Emerson is not responsible for damage or injury caused to other products, buildings, personnel or property, by reason of the installation or use of its products.

*This is Emerson's sole warranty and in lieu of all other warranties, expressed or implied which are hereby excluded, including in particular all warranties of merchantability or fitness for a particular purpose.*

This document and the warranty contained herein may not be modified and no other warranty, expressed or implied, shall be made by or on behalf of Emerson unless made in writing and signed by the company's general manager or director of engineering.

# PENBERTHY SERIES 100, 200, 300 AND 400 ARMORED GAGECOCKS

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

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### 1 ABOUT THE MANUAL

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This manual has been prepared as an aid and guide for personnel involved in installation or maintenance. All instructions must be read and understood thoroughly before attempting any installation, operation or maintenance.

#### Safety instructions

Emerson does not have any control over the manner in which its gagecocks are handled, installed or used. Emerson cannot and will not guarantee that a gagecock is suitable for or compatible with the user's specific application.

#### WARNING

*Vessel fluids may be pressurized and can exit vessel connections unexpectedly due to apparatus or material failure. Safety glasses should be worn when installing a gagecock. Failure to follow any instruction could possibly result in a malfunction of the gagecock with resulting sudden release of pressure, severe physical injury or property damage.*

### 2 INTRODUCTION

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Penberthy armored gagecocks are used to isolate gage glass, magnetic gages or other apparatus from the holding or pressure vessel when it becomes necessary to drain and service the gage. Series 100, 200, 300 and 400 gagecocks are supplied in pairs (upper and lower) and are available with socketweld, flanged and NPT connections.

These gagecocks are equipped, as a standard feature, with a floating shank union vessel connection, which permits up to 3/8" (10 mm) variation in center to center distance and with ball check shut-offs to prevent leakage of contained fluid in case of accidental gage glass breakage. Series 100, 200, 300 and 400 gagecocks for process use should include a ball check shut-off feature. Gagecocks without the ball check shut-off feature will not stop leakage of contained fluid automatically in the event of accidental gage glass breakage.

#### 2.1 System description

Penberthy armored gagecocks comprise six basic components. Each component may vary slightly, depending on the desired physical and mechanical properties for the gagecock. Use the exploded parts view in Section 11 as additional reference material.

**Body** - a pressure retaining structure through which liquid passes to enter a gage glass or other apparatus. Provides a rigid, union or spherical union connection to the vessel and seating surfaces for most gagecock components. Series 100 and 200 are straight pattern bodies; Series 300 and 400 are offset pattern bodies.

**Ball checks** - sphere installed loosely within the body of the gagecock that seats to prevent significant leakage when a differential pressure surge occurs (e.g. mechanical failure). Ball checks for ASME steam service incorporate a vertically rising lower and leaky horizontal upper or omit ball checks completely. 'Reverse acting' ball checks are available for vacuum service.

**Trim** - wetted parts that control the liquid path from the vessel to the gage glass or other apparatus mechanically. The ball and stem act to seal and release the liquid. In the event of mechanical failure, the ball will seat to prevent large quantities of the contained fluid from exiting the vessel. Liquid is allowed to exit the vessel into the gage glass or other apparatus when the stem is screwed away from its seated position. The liquid is sealed when the stem is screwed into its seated position.

The stem packing retainer provides a compression surface between the process liquid and the stem packing. A stem packing gland is used to compress the packing against the retainer and around the stem to prevent leakage.

**Stem packing** - under compression the stem packing is forced to mold around the stem and prevent leakage of media during operation.

**Gage connection** - provides connection between the gagecock and the gage glass or other apparatus. A union, spherical union or rigid connection may be used. A union connection can move in a plane parallel to the vessel connection.

**Handwheel/lever** - rotated to engage threads and provide screw action of stem.

# PENBERTHY SERIES 100, 200, 300 AND 400 ARMORED GAGECOCKS

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### 3 AVAILABLE MODELS

Armored gagecock standard features are listed in the table below.

**TABLE 1**

Features	Model number							
	120	130	220	230	320	330	420	430
Straight pattern	x	x	x	x				
Offset pattern					x	x	x	x
Integral bonnet	x	x			x	x		
Union bonnet			x	x			x	x
Union gage connection	x		x		x		x	
Rigid gage connection		x		x		x		x
Union vessel connection	x	x	x	x	x	x	x	x
Screwed in seat			x	x			x	x

Additional gagecock models are available with gasketed union connections. The gaskets are a spiral wound style, stainless steel/graphite, which are inserted into the body at the union connection to provide a gasketed seal between the body and tailpipe as opposed to the standard metal-to-metal joint. These gaskets provide a seal even with small angular misalignments and with less closure force than the standard metal-to-metal seals.

**TABLE 2**

Features	Model number															
	121	122	123	131	221	222	223	231	321	322	323	331	421	422	423	431
Straight pattern	x	x	x	x	x	x	x	x								
Offset pattern									x	x	x	x	x	x	x	x
Integral bonnet	x	x	x	x					x	x	x	x				
Union bonnet					x	x	x	x					x	x	x	x
Metal union gage connection	x				x				x					x		
Rigid gage connection				x					x			x				x
Metal union vessel connection		x				x				x				x		
Screwed in seat					x	x	x	x					x	x	x	x
Gasket union gage connection		x	x			x	x			x	x			x	x	
Gasket union vessel connection	x		x	x	x		x	x	x		x	x	x		x	x

#### 3.1 Design ratings at maximum and minimum operating temperatures

To determine the maximum allowable working pressure for a specific temperature within the design limits stated below, the user must refer to applicable technical data sheets or, when provided, the specifically stated design limits on a product proposal.

**TABLE 3 - DESIGN RATINGS FOR THREADED OR WELDED CONNECTIONS**

Gagecock Series	Material of construction	Maximum allowable working pressure	
		Teflon® packing	Grafoil® packing
100 200 300 400	Carbon steel	4000 psig [27580 kPa] at -20°F [-29°C] to +100°F [38°C] 3525 psig [24300 kPa] at 500°F [260°C]	4000 psig [27580 kPa] at -20°F [-29°C] to +100° [38°C] 2620 psig [18060 kPa] at 750°F [399°C]
	316 STS construction	4000 psig [27580 kPa] at -300°F [-184°C] to +100°F [38°C] 3525 psig [24300 kPa] at 500°F [260°C]	4000 psig [27580 kPa] at -300°F [-184°C] to +100°F [38°C] 2755 psig [18990 kPa] at 750°F [399°C]

For other materials or connections consult factory

#### WARNING

*NEVER exceed these design ratings or application data. Exceeding design ratings or application data may result in mechanical failure of gagecock components resulting in serious personal injury or property damage.*

# PENBERTHY SERIES 100, 200, 300 AND 400 ARMORED GAGECOCKS

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

### 3.2 Steam application

Series 100, 200, 300 and 400 gagecocks are designed for process conditions. In low pressure steam/water applications (< 350 psig [2410 kPa] at 434°F [223°C]), the use of 300 and 400 series gagecocks is allowed because the potential mechanical stress imposed on the gagecock assembly by the thermodynamic steam environment is relatively small. Request applicable technical data sheets for more detailed information.

## 4 INSPECTION

On receipt of a gagecock set, check all components carefully for damage incurred in shipping. If damage is evident or suspected, do not attempt any installation. Notify the carrier immediately and request a damage inspection. Refer to exploded view in Section 11 to inventory parts.

### 4.1 User rating inspection

The user should confirm that:

1. The gagecock set model number and pressure/temperature rating stamped on the nameplate conform to the description on the user's purchase order.
2. The operating conditions described in the purchase order agree with the actual operating conditions at the installation site.
3. The actual operating conditions at the installation site are within the application data shown on the relevant technical data sheet or product proposal referred to previously.
4. The materials of construction of the gagecock set are compatible with both the contained fluid and the surrounding atmosphere in the specific application.

### Safety instructions

If the size, model or performance data of the gagecock set as received does not conform with any of the criteria above, do not proceed with installation. Contact an authorized Penberthy distributor for assistance. The incorrect gagecock can result in unacceptable performance and potential damage to the gage.

## 5 INSTALLATION

Installation should only be undertaken by qualified personnel who are familiar with this equipment. They should have read and understood all of the instructions in this manual. The user should refer to relevant technical data sheets or the product proposal to obtain dimensional information for specific size and model gagecock.

Our recommendations on gagecock installations are not necessarily related to the installation of flat glass liquid level gages. The number of different types of gage and gagecock installations is too great to explain adequately in an installation manual. Therefore, it is the user's responsibility to ensure that knowledgeable installation personnel plan and carry out the installation in a safe manner. The following procedures are some of the guidelines that should be employed:

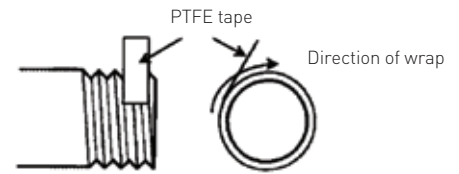


FIGURE 1

### 5.1 Piping strain

The gagecock should be mounted and connected so that it can support the gage without binding. Torsional stresses can make it difficult or impossible to seal tailpipes. Although union connections will allow marginal errors in piping alignment, misalignment can still create unusual strain on connectors. Gages not properly supported by brackets may subject the gagecock to stresses that can cause leaks or mechanical failure. Typical gage load should NOT exceed 50 lbs (22.7kg) per gagecock.

### 5.2 Differential thermal expansion

High mechanical loading may be imposed on a gagecock by expanding and contracting gages due to hot or cold service. Such mechanical loads on the gagecock must be minimized by controlling process conditions in the system or by using expansion loops.

### 5.3 Mounting

1. Prior to installation, turn the handwheel of each gagecock clockwise until the stem closes against the seat.
2. Remove union vessel connections from gagecocks, where applicable, and apply heavy grease (where allowable) to tailpipe seat (the grease minimizes galling of the seat surfaces when tightening the coupling nuts).
3. Wrench tighten tailpipes of upper and lower gagecocks to the vessel using PTFE tape, or equivalent, on all male tapered pipe thread connections as shown in Figure 1. If the gagecock is flanged or weld mount, use proper industry standard procedures.
4. If installing with a flat glass gage, follow all installation instructions for the specific liquid level gage as there are many points to consider on gage installation; among them, piping strain, differential thermal expansion, weight and bolt torque.
5. Install gage tailpipes to union gage connections, where applicable, making sure that the coupling nuts are in place.

# PENBERTHY SERIES 100, 200, 300 AND 400 ARMORED GAGECOCKS

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

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### 6 OPERATION

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Before initializing gagecock operation, check that all installation procedures have been completed. Use only qualified, experienced personnel who are familiar with gagecock equipment and understand the implications of the tables and all the instructions thoroughly. Check to determine that all connections are pressure tight.

#### WARNING

*Gagecock installations should be brought into service slowly. Gagecocks should be opened slightly and the gagecock assembly temperature and pressure allowed to equalize slowly. If the gagecocks are equipped with ball checks, the gagecocks must be opened all the way after the pressure and temperature have equalized to permit operation of the automatic ball check in the event of gage glass failure. Failure to follow the recommended operating procedures can result in severe personal injury or property damage.*

#### 6.1 Hydrostatic test

Take all precautions necessary to handle the possibility of leakage during the test. Hydrostatic pressure test all installations to 100 psig (690 kPa) and correct any leakage before proceeding.

### 7 MAINTENANCE

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#### WARNING

*Use only qualified, experienced personnel who are familiar with gagecock equipment and understand the implications of the tables and all the instructions thoroughly. DO NOT proceed with any maintenance unless the gagecock assembly has been relieved of all pressure or vacuum, has been allowed to reach ambient temperature and has been drained or purged of all fluids. Failure to do so can cause serious personal injury and property damage.*

The user must create maintenance schedules, safety manuals and inspection details for each gagecock. These will be based on the users own operating experience with their specific application. Realistic maintenance schedules can only be determined with full knowledge of the services and application situations involved.

During system shutdown, the gagecocks should be left open to permit the gage to lose pressure and cool with the rest of the system. Failure to leave the gagecock open during system shutdown may trap high-pressure fluid in the gage.

#### 7.1 Preventative maintenance

On all installations the following items should be evaluated regularly by the user for purposes of maintenance:

1. Leakage around stem area
2. Internal stem leak
3. Leakage around union connections
4. Internal or external corrosion

The user must determine an appropriate maintenance schedule necessary for his or her own specific application, upon evaluation of their own operating experience. Realistic maintenance schedules can only be determined with full knowledge of the services and application situation involved.

#### 7.2 Ball check shut-off

##### Safety instructions

Ball checks, when installed, may fail to seat due to corrosion of the ball or seat, foreign material in ball chamber or viscous material in the ball chamber. A routine operational test of the ball check can prevent significant seepage of liquid in the event of glass breakage.

An operational check can be performed on the gagecock ball check by closing both the upper and lower gagecock stems completely. Drain contents from and relieve pressure on liquid gage to an appropriate safe container/area.

**Note:** some loss of process fluid to the drain line is expected with this test procedure.

#### WARNING

*Use only qualified, experienced personnel who are familiar with gagecock equipment and understand the implications of the tables and all the instructions thoroughly. DO NOT proceed with any maintenance unless the gagecock assembly has been relieved of all pressure or vacuum, has been allowed to reach ambient temperature, and has been drained or purged of all fluids. Failure to do so can cause serious personal injury and property damage.*

With a drain line in place, open BOTTOM gagecock as rapidly as possible. Listen for 'click' sound, which will indicate that the ball has seated. If possible, observe the quantity of flow from the drain line. Flow should either stop completely or be no greater than single drips (no solid stream). Close lower gagecock. Repeat above procedure for UPPER gagecock. There must be a pressure differential of at least 5 psig (35 kPa) for the above procedure to work properly.

If the procedure is not successful, the only alternative is to isolate the gage and gagecock assembly from the vessel or to shut the process down completely. Disassemble the gagecock as outlined in section 8.1 using the exploded parts drawing in Section 11 as a reference. Visibly inspect ball check and ball seats in the gagecock body. Remove any foreign matter and/or replace with new ball checks if inspection indicates this is required. If the ball seat is damaged, consider replacing the gagecock or the seat (if it is removable). Reassemble gagecocks as outlined in Section 8.2.

# PENBERTHY SERIES 100, 200, 300 AND 400 ARMORED GAGECOCKS

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

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### 7.3 Troubleshooting

**Stem packing leakage** can often be stopped by tightening the stem packing nut. If leakage persists, the stem packing should be replaced by following steps 1 through 5 of the Disassembly and 1 through 7 of the Reassembly instructions.

**Internal seat leakage** is an indication of a worn or damaged stem or seat. To replace the stem follow steps 1 through 5 of the Disassembly and 1 through 7 of the Reassembly instructions. To renew the seat surface, follow steps 1 and 2 of the Disassembly instructions. Renew the seats by using a fine lapping compound and a mandrel the same size, shape and seat angle as the stem. Flush the gagecock body clean and reassemble by following steps 4 and 5 of the Reassembly instructions.

Renewable threaded seats (Series 200 and 400). Remove the seat by inserting a 1/4" (6 mm) hexagon driver in the seat and turning it counterclockwise. Install the new seat by turning it clockwise using the hexagon driver, making sure that the ball check, if used, is replaced in the body. Tighten the seat in place.

**Leakage around union** connections can often be stopped by tightening union coupling nut or remaking the connection using PTFE tape, or equivalent, on all male pipe threads as shown in Figure 1.

**Internal or external corrosion** could be an indication of a misapplication. An investigation should be carried out immediately to determine the cause of the problem. It is the user's responsibility to choose a material of construction compatible with both the contained fluid and the surrounding atmosphere.

### 8 REMOVAL - DISASSEMBLY - REASSEMBLY

#### WARNING

Use only qualified, experienced personnel who are familiar with gagecock equipment and understand the implications of the tables and all the instructions thoroughly. DO NOT proceed with any maintenance unless the gagecock assembly has been relieved of all pressure or vacuum, has been allowed to reach ambient temperature and has been drained or purged of all fluids. Failure to do so can cause serious personal injury and property damage.

### 8.1 Disassembly

Refer to the exploded parts drawing in Section 11 for additional reference during disassembly and reassembly of the gagecocks.

1. Remove handwheel nut (30), nameplate (163) and handwheel (28) or lever (261) from stem.
2. Loosen and remove stem packing nut (26).
3. Remove stem by turning counterclockwise, along with stem packing gland (19), stem packing (25) and stem packing retainer (18).
4. Slip the stem packing gland (19), stem packing (25) and stem packing retainer (18) off stem (17).
5. On Series 200 and 400 gagecocks, remove bonnet nut (21) and bonnet (20).
6. To replace seat on Series 200 and 400 gagecocks, follow instructions as described in maintenance procedures, section 7.3.

### 8.2 Reassembly

Refer to the exploded parts drawing in Section 11 for additional reference during disassembly and reassembly of the gagecocks.

1. Prepare for installation of new packing by cleaning all packing chambers and glands of upper and lower gagecocks.
2. On Series 200 and 400 gagecocks, replace bonnet (20) and bonnet nut (21) and tighten securely in place.
3. Slip packing retainer (18) on stem (17).
4. Install new stem packing (25) and stem packing gland (19).
5. Thread stem assembly into gagecock by turning clockwise until stem seats and then back off one turn (1/8 turn with quick close stem).
6. Assemble stem packing nut (26) and tighten in place.
7. Assemble handwheel (28) or lever (261), nameplate (163) and handwheel nut (30) on stem and tighten securely in place.
8. Close both gagecocks by turning handwheel or lever clockwise until stem seats.

Refer to Section 6 for operation of the gagecock when returned to service.

### 9 DISPOSAL AT END OF USEFUL LIFE

Series 100, 200, 300 and 400 gagecocks are used in a variety of fluid applications. By following the appropriate federal and industry regulations, the user must determine the extent of preparation and treatment the Series 100, 200, 300 and 400 gagecocks must incur before their disposal. A Material Safety Data Sheet (MSDS) may be required before disposal services accept certain components.

Metal, glass and polymers should be recycled whenever possible. Refer to order and applicable technical data sheets for materials of construction.

# PENBERTHY SERIES 100, 200, 300 AND 400 ARMORED GAGECOCKS

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

### 10 TELEPHONE ASSISTANCE

If you are having difficulty with your Series 100, 200, 300 and 400 gagecocks, contact your local Penberthy distributor. You may also contact the factory direct at (956) 430-2500 and ask for an applications engineer. So that we may assist you more effectively, please have as much of the following information available as possible when you call:

- Model #
- Name of the company from whom you purchased the Series 100, 200, 300 and 400 gagecocks
- Invoice # and date
- Process conditions (pressure, flow rates, tank shape, etc)
- A brief description of the problem
- Trouble shooting procedures that failed

If attempts to solve your problem fail, you may request to return your Series 100, 200, 300 and 400 gagecocks to the factory for intensive testing. You must obtain a Return Authorization (R.A.) number from Emerson before returning anything. Failure to do so will result in the unit being returned to you without being tested, freight collect. To obtain an R.A. number, the following information (in addition to that above) is needed:

- Reason for return
- Person to contact at your company
- 'Ship-to' address

There is a minimum charge for evaluation of non-warranty units. You will be contacted before any repairs are initiated should the cost exceed the minimum charge. If you return a unit under warranty, but it is not defective, the minimum charge will apply.

Grafoil® is a registered trademark of Grafftech, Inc.  
Teflon® (PTFE) is a registered trademark of E.I. du Pont de Nemours and Company.

### 11 EXPLODED PARTS DIAGRAM

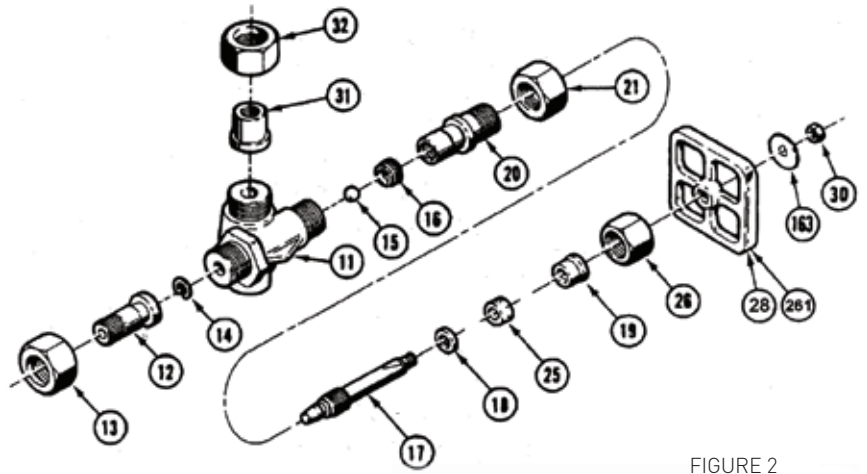


FIGURE 2

#### PARTS LIST

Ref #	Item
7	Gasket
11	Body
12	Tailpipe
13	Nut, vessel coupling
14	Retainer, ball check
15	Ball
16	Seat
17	Stem
18	Retainer, stem packing
19	Gland, stem packing
20	Bonnet
21	Nut, bonnet
25	Packing, stem
26	Nut, stem packing
28	Handwheel
30	Nut, handwheel
31	Tailpipe, gage
32	Nut, gage coupling
163	Nameplate
261	Lever

#### RECOMMENDED SPARE PARTS

Ref. no.	Item	Min. qty.
18	Retainer, stem packing	1
19	Gland, stem packing	1
25	Packing, stem	1
30	Nut, handwheel	1

Recommended maximum quantities should provide spare parts for 10% of the gagecocks in service.

**Note:** Seat (16), Bonnet (20) and Nut (21) are to be used on Series 200 and 400 gagecocks only.

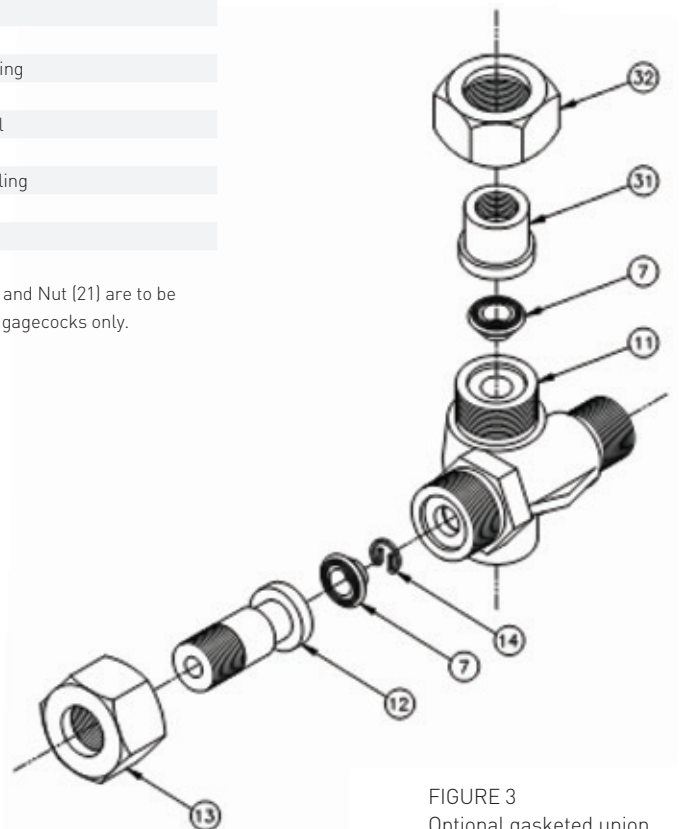


FIGURE 3  
Optional gasketed union

