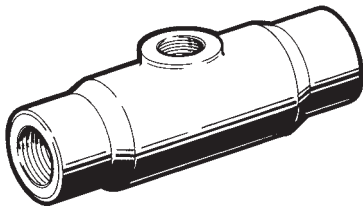




**PENBERTHY STEAM RING HEATER**  
 INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

Before installation, these instructions must be read carefully and understood.



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**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.

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 STEAM RING HEATER

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

### 1 ABOUT THE MANUAL

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.

**Important:** Emerson does not have any control over the manner in which its SRH is handled, installed or used. Emerson cannot and does not warrant or guarantee that the SRH is suitable for or compatible with the user's specific application.

#### WARNING

*Always wear safety glasses when installing, servicing or operating a steam ring heater. Failure to follow any instruction could possibly result in a malfunction of the steam ring heater, severe physical injury or property damage.*

### 2 INTRODUCTION

#### 2.1 Features and specifications

Penberthy SRHs (Steam Ring Heaters) are designed for in-line heating of liquids using steam as the heating fluid and liquid as the motive inlet fluid.

Heating is accomplished by steam entering the unit and passing through the annular orifice in the form of a steam ribbon which blends into the surrounding process flow. The annular orifice forms the steam into a circular ribbon resulting in immediate condensation in the process fluid. The large surface of steam exposed to the fluid, together with the resulting rapid condensation, produces a quieter, more efficient heating process.

#### 2.2 Design Ratings at Maximum and Minimum Operating Temperatures

TABLE 1

| Material | Maximum allowable working temperature                    |
|----------|--|
| Bronze   | 200 psig [1380 kPaG] at -20°F [-29°C] to +150°F [66°C]   |
|          | 125 psig [860 kPaG] at +400°F [204°C]                    |
| 316 SS   | 200 psig [1380 kPaG] at -150°F [-101°C] to +150°F [66°C] |
|          | 125 psig [860 kPaG] at +400°F [204°C]                    |

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

### 2.3 Application data

**Note:** for specific application data, consult the product proposal for the specific model and size SRH or request the supply of the applicable technical data sheet.

#### WARNING

*Never exceed these design ratings or application data limits. Exceeding design ratings or application data limits can cause serious personal injury or property damage.*

### 3 INSPECTION AND PERFORMANCE CONFIRMATION

On receipt of a steam ring heater, check all components carefully for damage incurred in shipping. If damage is evident or suspected, do not attempt installation. Notify the carrier immediately and request a damage inspection.

#### 3.1 User's rating inspection

The user should confirm that:

1. The SRH size and model designation (cast on side of body) conforms to the description on the user's purchase order.
2. The operating conditions described in the purchase order agree with the actual conditions at the installation site.
3. The actual operating conditions at the installation site are within the application data shown on the applicable technical data sheet.
4. The materials of construction of the SRH are compatible with both the contained fluid and surrounding atmosphere in the specific application.

**Important:** if the size, model or performance data of the SRH as received do not conform with any of the criteria above, do not proceed with installation. Contact an authorized Penberthy distributor for direction.

### 4 INSTALLATION

Use qualified, experienced personnel who are familiar with this equipment and thoroughly understand all the instructions in this manual for the installation of this equipment. Refer to the relevant technical data sheet or product proposal to obtain dimensional information for the specific size and model SRH. Check the SRH cut-away view in Figure 1 for the location of the liquid inlet and outlet and steam inlet connection to insure correct hook up.

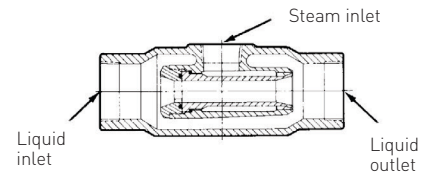


FIGURE 1

# PENBERTHY STEAM RING HEATER

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

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### 4.1 Mounting

Although the SRH can be oriented in any position, it is recommended to position the SRH horizontally. In this manner, the steam piping and SRH will be in a position to facilitate the removal of condensate at start up.

### 4.2 Effect of related piping and precautions

1. The SRH should be installed with piping and fittings which provide the minimum resistance to flow. Pipe line friction losses must always be a consideration when estimating SRH performance.
2. It is recommended that provisions be made for pressure gauge connections near the liquid inlet and outlet and steam inlet connection of the SRH. If operating difficulties are encountered at any time, it may be necessary to install pressure gauges to identify the problem.
3. It is also recommended that check valves be installed in both the steam inlet and liquid inlet lines.
4. Steam must not have over 20°F [-7°C] of superheat or performance will differ from that published in the applicable technical data sheet or product proposal.
5. The steam line must be clean, insulated and as short as possible to prevent condensation of steam and excessive line friction losses.
6. Do not impose piping loads on the SRH. The unit is designed to be supported by the combined liquid inlet and outlet and steam inlet piping.
7. Provide the steam line with a hand operated valve for maintenance and emergency shut-off. The steam line should be provided with a steam trap.

## 5 OPERATION

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### 5.1 Pre-operational check

1. Check that all installation instructions have been completed.
2. Check that any restrictions in the discharge line have been removed.
3. Check that discharge line valves are fully open.
4. Check that the manually operated steam line valve is fully closed.

### 5.2 Operating

1. Turn the operating liquid valve fully open and establish full flow. Keep it on throughout the entire operating process.

### WARNING

*Failure to maintain the liquid flow while operating the SRH with steam can cause serious personal injury or property damage as a result of live steam being driven into the liquid piping.*

2. Slowly and partially open the manually operated steam line valve to first check for leaks. If leaks are evident, close valve, allow line to cool off, tighten connections, and repeat procedure until all leaks are stopped.
3. Slowly and partially open the manually operated steam line valve to remove condensate in the steam line. When the steam line at the heater is hot, open the steam line valve slowly until the desired liquid outlet temperature is established.

### 5.3 Shutdown

1. Turn the manually operated steam line valve off in order to first lower the steam pressure as much as possible before shutdown.
2. Gradually turn the operating liquid flow fully off.

### WARNING

*Failure to maintain the liquid flow throughout the shutdown procedure can cause serious personal injury or property damage as a result of live steam being driven into the liquid piping.*

## 6 MAINTENANCE

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Use only qualified, experienced personnel who are familiar with this equipment and thoroughly understand all the instructions in this manual for all maintenance.

### WARNING

*Do not proceed with any maintenance unless the SRH 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 could result in serious personal injury or property damage.*

### 6.1 Preventative maintenance

The user must create maintenance schedules, safety manuals and inspection details for each specific installation of a steam ring heater.

On all installations, check the following items regularly for purposes of maintenance:

1. SRH(s) for corrosion or debris build up.
2. Piping and fittings for corrosion or debris build up.
3. All connections for tightness and leaks.
4. Units for wear

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

# PENBERTHY STEAM RING HEATER

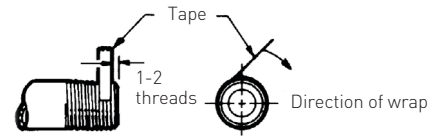
## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

### 6.2 Troubleshooting

**TABLE 2**

| Problem  | Cause   | Solution   |
|--|---|--|
| Surges in liquid flow                            | Pumping action  | Increase pressure discharge  |
| Both steam and hot liquid are produced by heater | Not enough liquid flow, or too much steam flow                            | Reduce steam pressure or increase liquid flow  |
| Gravel like sound coming from heater             | Steam pressure is only 1/2 to 2 psig (0 to 10 kPaG) above liquid pressure | Cycle steam on and off instead of throttling, or use smaller heater so that steam pressure will have to be increased |
| Heater produces high frequency noise             | Heater is operating in the noise range                                    | Either raise or lower liquid pressure outside the noise range  |

**Note:** Refer to noise band information stated in the relevant technical data sheet.



**FIGURE 2**

### 7 REMOVAL - DISASSEMBLY - REASSEMBLY

#### WARNING

*Do not proceed with removal of the SRH from connecting piping unless the SRH 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 could result in serious personal injury or property damage.*

#### 7.1 Disassembly

- If nut (4) is difficult to remove, heat the SRH to 350°F (177°C).
- Remove O-rings (39, 39A) and nozzle (61).
- All removed O-rings should be destroyed and disposed of and under no circumstances should be re-used and installed in a SRH.
- Inspect nozzle for wear or damage and replace if necessary.

#### 7.2 Reassembly

- Prior to reassembly, O-rings must be lubricated with General Electric Versilube 0300 silicone grease or equivalent.
- Assemble nozzle and O-ring (39) into body (11) of SRH.
- Apply Loctite® type CW or equivalent to threads of nut and assemble O-ring (39A) and nut inside body of SRH.
- Replace SRH into piping system using PTFE tape or equivalent on all male pipe threads as shown in Figure 2.
- Refer to Section 5 when returning SRH to service.

### 8 DISPOSAL AT END OF USEFUL LIFE

Penberthy steam ring heaters 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 SRH must incur before its 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.

### 9 TELEPHONE ASSISTANCE

If you are having difficulty with your SRH, contact your local Penberthy distributor. 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 SRH
- 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 steam ring heater 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.

#### NOTES

Loctite® is a registered trademark of the Henkel Loctite Corporation

# PENBERTHY STEAM RING HEATER

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

### 10 EXPLODED PARTS DIAGRAM

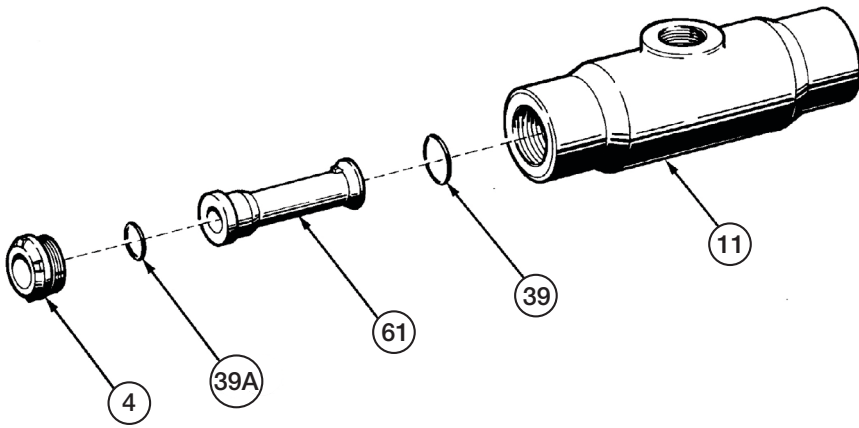


FIGURE 3

### PARTS LIST

| Ref # | Item   |
|-------|--------|
| 4     | Nut    |
| 11    | Body   |
| 39    | O-ring |
| 39A   | O-ring |
| 61    | Nozzle |

### RECOMMENDED SPARE PARTS

| Ref # | Item   | Min. qty. |
|-------|--------|-----------|
| 39    | O-ring | 1         |
| 39A   | O-ring | 1         |

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