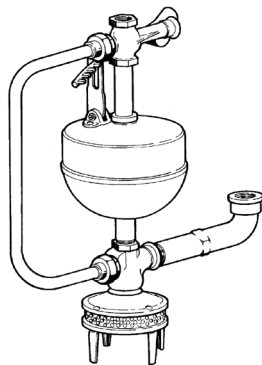




## PENBERTHY SUBMERSIBLE AUTOMATIC SUMP DRAINER

### INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

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



#### TABLE OF CONTENTS

Product warranty .....	1
<b>1 About the manual.....</b>	<b>2</b>
<b>2 Introduction .....</b>	<b>2</b>
2.1 System description .....	2
2.2 Assembly .....	2
<b>3 Available models .....</b>	<b>2</b>
3.1 Maximum design pressure ratings at operating temperature ranges .....	3
<b>4 Inspection .....</b>	<b>3</b>
<b>5 Installation.....</b>	<b>3</b>
5.1 Effect of related piping and precautions ....	3
5.2 Mounting.....	3
<b>6 Operation .....</b>	<b>4</b>
6.1 Pre-operational check.....	4
6.2 Start-up .....	4
<b>7 Maintenance .....</b>	<b>4</b>
7.1 Preventative maintenance.....	4
7.2 Troubleshooting .....	4
<b>8 Disassembly - reassembly .....</b>	<b>5</b>
<b>9 Disposal at end of useful life .....</b>	<b>5</b>
<b>10 Telephone assistance .....</b>	<b>5</b>
<b>11 Exploded parts diagram .....</b>	<b>6</b>

#### Tables and figures

Table 1 - Maximum design pressure ratings at operating temperature ranges.....	3
Table 2 - Troubleshooting .....	4
Figure 1 - Exploded parts diagram .....	6

#### 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 SUBMERSIBLE AUTOMATIC SUMP DRAINER

## 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.

Emerson does not have any control over the manner in which its submersible automatic sump drainer is handled, installed or used. Emerson cannot and will not guarantee that the submersible automatic sump drainer is suitable for or compatible with the user's specifications.

#### WARNING

*Pressurized fluid streams for sump drainer operation can exit pipelines unexpectedly or unusual mechanical stresses can cause material failure. Safety glasses should be worn when in the area of a submersible automatic sump drainer installation. Failure to follow any instruction could result in severe personal injury or property damage.*

### 2 INTRODUCTION

---

Penberthy submersible automatic sump drainers are designed to perform as the primary means of draining sumps in areas with no electricity. They can also be used as a standby system when electrical power is lost. Their jet technology uses either water or steam as the motive (driving force) source to pump your liquid.

A combination of bronze, copper, brass and stainless steel materials are used to make the submersible automatic sump drainer highly corrosion resistant. When combined with the small number of moving parts, this minimizes your maintenance.

The submersible automatic sump drainer is available in either a loop (2R-xL) or non-loop (2R-x) models ['x' denotes the use of either steam or water as the motive fluid]. The loop model provides greater efficiency but the non-loop can be used in tighter areas.

#### 2.1 System description

The Penberthy submersible automatic sump drainer consists of a valve, eductor, float guide pipe and float. When the liquid in the sump reaches a predetermined level, the float opens the valve which allows the motive fluid to enter either the float guide pipe (non-loop model) or the bypass loop (loop model). From here the motive fluid travels to the eductor at the base of the unit. As the fluid passes through the eductor nozzle it reduces the pressure in the eductor. Consequently, the higher atmospheric pressure forces the sump into the drainer. The combination of motive fluid and suction liquid is then discharged. This process continues

until the liquid in the sump is lowered to a predetermined level. At that point the float closes the valve to stop the flow of motive fluid.

#### 2.2 Assembly

Refer to the exploded parts view on page 6.

##### A. 2R-x

Discharge elbow to eductor

Place PTFE tape or equivalent on the male pipe threads of the discharge elbow. Slide the discharge elbow over the delivery jet (male threads first) and thread it into the eductor. Secure the discharge elbow until it forms a pressure tight joint. The open end of the elbow should point up.

##### B. 2R-xL

Discharge elbow to eductor

Place PTFE tape or equivalent on the male pipe threads of the discharge elbow. Slide the discharge elbow over the delivery jet (male threads first) and thread it into the eductor. Secure the discharge elbow until it forms a pressure tight joint. The open end of the elbow should point up.

Loop to valve and eductor

The bypass loop is shipped with the sump drainer but unattached. This is to prevent possible damage during transport. Prior to installing the sump drainer, attach the loop to the valve body and eductor body. This is done by threading the coupling nuts located on the loop to the corresponding fittings. Secure the coupling nuts until they form a pressure-tight joint.

#### Safety instructions

Pressurized fluid streams could exit the connection joints unexpectedly if the coupling nuts are not attached correctly. Care should be taken when securing the fittings. Proper safety equipment should be worn in the vicinity of the sump drainer at all times. Neglecting to do so could result in damage to the loop connections and fluid coming in contact with operators.

### 3 AVAILABLE MODELS

---

Penberthy submersible automatic sump drainers are available in four models: 2R-W, 2R-WL, 2R-S and 2R-SL. They are designed to operate using either water (W) or steam (S) as the motive and with or without a bypass loop. The bypass loop provides greater operating efficiency. Operating without the loop reduces efficiency slightly but allows you to install the unit in smaller diameter sumps.

# PENBERTHY SUBMERSIBLE AUTOMATIC SUMP DRAINER

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

### 3.1 Maximum design pressure ratings at operating temperature ranges

TABLE 1

Model	Pressure	Temperature
2R-W, 2R-WL, 2R-S and 2R-SL	200 psig [29 kPaG]	-20°F to +150°F [-29°C to +302°C]
	125 psig [18 kPaG]	+400°F [+204°C]

### 4 INSPECTION

On receipt of the submersible automatic sump drainer, 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.

A Penberthy submersible automatic sump drainer consists of (1) valve, (1) valve lever, (1) float guide tube, (1) float w/ hanger, (1) eductor, (1) strainer assembly, (1) discharge elbow and (1) ea. bypass loop [loop models only].

The user should confirm that:

1. The unit delivered matches the size and model on the purchase order.
2. The operating conditions originally described match the actual conditions at the installation site.
3. The unit delivered accommodates the actual operating conditions at the installation site.

#### Safety instructions

If the size, model or performance data of the sump drainer 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 sump drainer can result in unacceptable performance and potential material failure.

### 5 INSTALLATION

Installation should only be undertaken by qualified, experienced personnel who are familiar with this type of equipment. They should have read and understood all the instructions in this manual.

Check the exploded view for the location of operation [99] and discharge [206] connections to insure correct hook up.

#### 5.1 Effect of related piping and precautions

Penberthy submersible automatic sump drainers are designed to be installed and operated in a vertical position. This places the valve and motive inlet connection at the top. The pipes and fittings used to install the sump drainer should be sized to provide minimum resistance to fluid flow. Pipe line friction losses must always be a consideration when estimating jet pump performance.

The discharge pipe should be as short as possible. Design it with a minimum number of turns and restrictions. Should friction losses inhibit jet pump performance, you may wish to increase the discharge line size. This will reduce the loss.

All piping should be free of foreign materials. Their presence could contribute to clogging of the drainer.

Provisions should be made for pressure gauge connections near the inlet connection of the sump drainer. If operating difficulties are encountered at any time, it may become necessary to install a pressure gauge to identify the problem.

Do not impose system piping loads on the sump drainer. The unit is NOT designed to be a load bearing fitting. Support all piping with brackets to avoid excessive mechanical loads.

#### WARNING

*Do not use plastic discharge piping when operating with steam. If steam is discharged, it may soften the piping and release live steam into the work area. This could result in severe physical injury or property damage.*

#### 5.2 Mounting

- a. The sump diameter should be a minimum of 16 inches (406 mm).
- b. The sump drainer must be placed on a hard level surface. Use bricks or other suitable support in the bottom of open tile sumps. The unit should never be placed directly on or in clay or earth surfaces.
- c. The inlet piping should be equipped with the special strainer union supplied with your sump drainer. This strainer will protect the valve and nozzle from dirt and debris.
- d. Install a swing type check valve in the discharge line to prevent backflow when the sump drainer stops.
- e. Flush out the inlet line before making final connections to the sump drainer.
- f. The sump drainer is factory calibrated to operate at motive pressures from 10 to 150 psig [70 to 1035 kPaG]. The valve lever arm has numbers which correspond to these possible motive pressures. The float hanger should be placed on the number which matches or exceeds your motive pressure (if your motive pressure is 50 psig [345 kPaG], set the hanger on 60).

# PENBERTHY SUBMERSIBLE AUTOMATIC SUMP DRAINER

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

### 6 OPERATION

#### 6.1 Pre-operational check

Before start-up, the operator should ensure that:

- All installation procedures have been completed.
- Any restrictions in the discharge line have been removed.
- Any discharge line valves are fully open.

#### 6.2 Start-up

- Open the inlet supply valve and leave it open.
- To check the installation, gradually fill sump with water. The sump drainer valve will open when the water level reaches a point  $\frac{3}{4}$ " (19 mm) below the float rim. The sump drainer will operate until the water level drops sufficiently for the float to pull the valve shut.
- On liquid motive units, it is likely that you will notice a small amount of liquid exiting the valve where the valve lever is attached to the valve body. This is normal. Do not attempt to stop this by tightening the valve packing gland. Doing so will restrict float movement and result in excessive or insufficient sump drainer operation.

### 7.2 Troubleshooting

TABLE 2

Problem	Cause	Solution
Sump drainer fails to empty sump	1. Suction piping is too restrictive	1. Remove restriction
	2. Discharge pressure is too high	2. Remove restriction
	3. Operating pressure is lower than required	3. Increase pressure
	4. Suction or motive liquid is at much higher than ambient temperature	4. Lower temperature
	5. Discharge piping leaks	5. Tighten fittings
	6. Suction strainer is clogged	6. Clean strainer
Sump drainer fails to operate	1. Float movement is restricted	1. Remove restriction
	2. Float is damaged or leaking	2. Replace float
	3. Clogged inlet line or eductor	3. Remove restriction
	4. Valve is sticking	4. Disassemble and clean or loosen packing gland until the valve works freely
Valve will not shut off	1. Float movement is restricted	1. Remove restriction
	2. Valve is sticking	2. Disassemble and clean or loosen packing gland until the valve works freely

### 7 MAINTENANCE

Maintenance should only be undertaken by qualified, experienced personnel who are familiar with this type of equipment and have read and understand all the instructions in this manual.

#### WARNING

*Do not proceed with any maintenance with the submersible automatic sump drainer still at operating pressure or temperature. Allow the unit to reach ambient temperature, relieve the unit of pressure, and purge or drain it of all fluids. Failure to follow these instructions could result in severe personal injury or property damage.*

#### 7.1 Preventative maintenance

The user must create maintenance schedules, safety manuals and inspection details for each submersible automatic sump drainer installation.

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

- Check sump drainer operation by adding water to the sump.
- Remove debris from the sump.
- Clean the strainer (76) of any foreign material.
- Clean the inlet union strainer (159).

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

# PENBERTHY SUBMERSIBLE AUTOMATIC SUMP DRAINER

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

---

### 8 DISASSEMBLY-REASSEMBLY

---

Prior to any disassembly, shut off the motive source. Disconnect the submersible automatic sump drainer at the inlet and discharge connections. Remove the unit from the sump.

#### a. Water or steam nozzle and delivery jet disassembly

1. On 2R-x models remove plug (38A) and the water or steam nozzle (61) from the ejector body.
2. On 2R-xL models remove the loop (283) then water or steam nozzle (61) from the ejector body.
3. Remove the discharge elbow (206) and delivery jet (82) from the ejector body.

#### Reassembly

4. Reverse the procedure for reassembly.

#### b. Float disassembly

1. The hanger (279) is removed from the float (151) by unfastening the hanger screw (100A) and lock washer (125B).
2. Remove the valve body (11) and tube washer (125A) from the float guide tube (278).
3. Slide float off the guide tube.
4. Loosen guide tube from the ejector body (11A).
5. Remove the hanger from the valve lever (261).

#### Reassembly

6. Reverse the procedure for reassembly.

#### c. Valve disassembly

1. Remove the hanger (279) from the float (151) by unfastening the hanger screw (100A) and lock washer (125B).
2. Remove the valve body (11) from the float guide tube (278). On 2R-L models it will be necessary to take the loop (283) off prior to removing the valve body.
3. Remove the valve body plug (38). On 2R-L models remove the adapter (134) as well.
4. Loosen and remove the valve bonnet (20).
5. The valve disc holder (110) as well as the valve disc (43) and screw (100) may be removed at this time.
6. To disassemble the valve packing, remove pin (17) from lever (261) and slide lever off stem. Loosen valve packing gland (87) from valve bonnet and remove. Valve packing (211) and gland washer (125) may be pulled out from valve bonnet.
7. Valve seat (16) may now be unscrewed from valve body.

#### Reassembly

8. Reverse the procedure above.
9. Replace the two valve packings (211) and valve disc (43) with new.
10. Do not over tighten the valve packing gland (87). Doing so will affect valve lever movement.

### 9 DISPOSAL AT END OF USEFUL LIFE

---

Penberthy submersible automatic sump drainers 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 submersible automatic sump drainer 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.

### 10 TELEPHONE ASSISTANCE

---

If you are having difficulty with your submersible automatic sump drainer, 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 submersible automatic sump drainer
- 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 submersible automatic sump drainer 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:

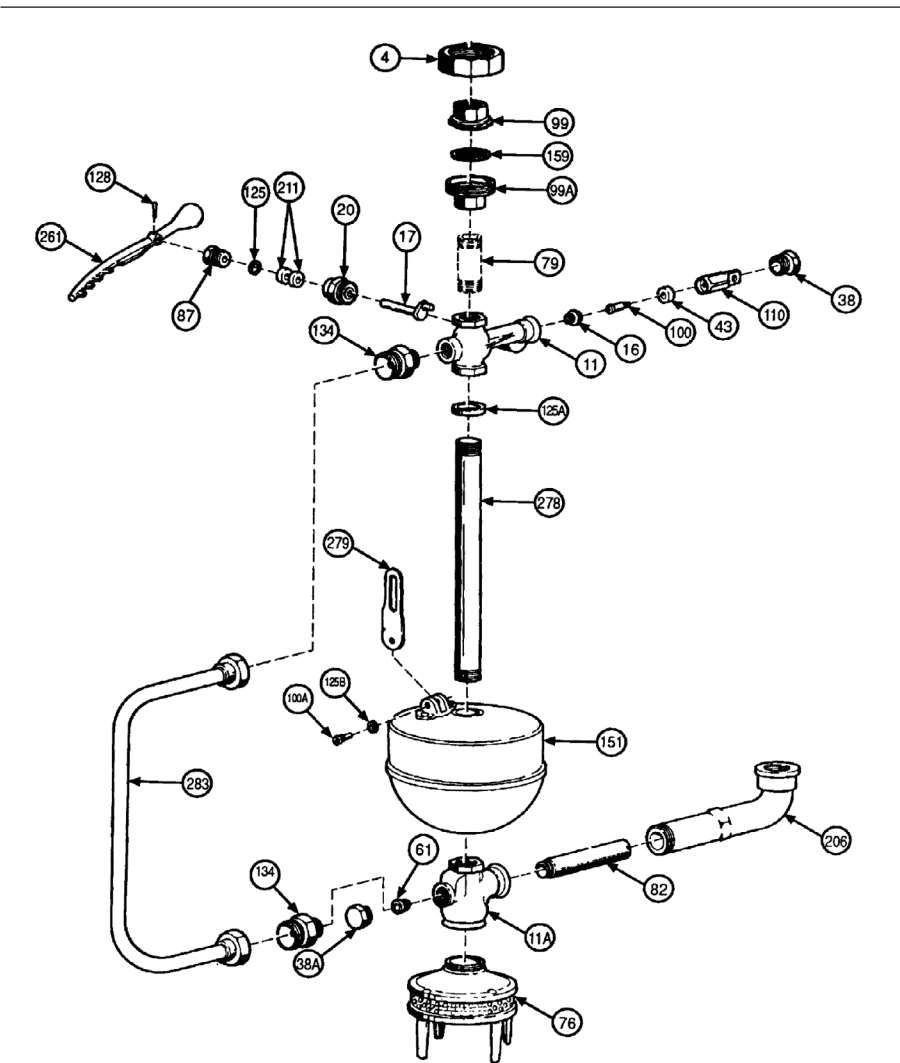
- Reason for return
- Person to contact at your company
- 'Ship-to' address

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.

# PENBERTHY SUBMERSIBLE AUTOMATIC SUMP DRAINER

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

### 10 EXPLODED PARTS DIAGRAM



### PARTS LIST

Ref #	Item
4	Nut
11	Body
11A	Body
16	Seat
17	Stem
20	Bonnet
38	Plug
38A	Plug (non-loop models only)
43	Disc
61	Nozzle
76	Strainer
82	Jet
87	Gland
99	Union - male seat
99A	Union - female seat
100	Screw
100A	Screw
110	Holder
125	Washer
125A	Washer
125B	Washer
128	Pin
134	Adapter (loop models only)
151	Float
159	Screen
206	Elbow
211	Packing (2 required)
261	Lever
278	Guide
279	Hanger
283	Loop

### RECOMMENDED SPARE PARTS

Ref #	Item	Qty.
43	Disc	1
211	Packing	2

FIGURE 1 Item 79 is not supplied.

Neither Emerson, Emerson Automation Solutions, nor any of their affiliated entities assumes responsibility for the selection, use or maintenance of any product. Responsibility for proper selection, use, and maintenance of any product remains solely with the purchaser and end user.

Penberthy is a mark owned by one of the companies in the Emerson Automation Solutions business unit of Emerson Electric Co. Emerson Automation Solutions, Emerson and the Emerson logo are trademarks and service marks of Emerson Electric Co. All other marks are the property of their respective owners.

The contents of this publication are presented for informational purposes only, and while every effort has been made to ensure their accuracy, they are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. All sales are governed by our terms and conditions, which are available upon request. We reserve the right to modify or improve the designs or specifications of such products at any time without notice.