



PENBERTHY MODELS LL,LM, LH, ELL, GL, GH PLASTIC MATERIAL CONSTRUCTION JET PUMPS INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

Before installation, these instructions must be read carefully and understood

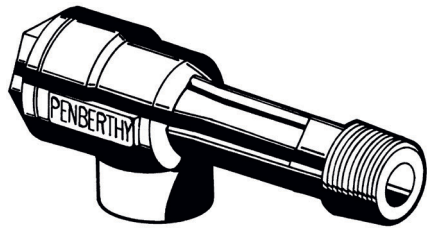


TABLE OF CONTENTS

Product warranty	1
1 About the manual.....	2
2 Introduction	2
2.1 Features and specifications	2
2.2 Design ratings at max. and min. operating temperatures	2
2.3 Application data	2
3 Inspection and performance confirmation	2
3.1 Receiving inspection	2
3.2 User's rating inspection	2
4 Installation.....	3
4.1 Special handling of plastic material jet pump.....	3
4.2 Effect of related piping and precautions ...	3
5 Operation	4
5.1 Pre-operational check.....	4
5.2 Operating.....	4
6 Maintenance	4
6.1 Preventative maintenance.....	4
6.2 Troubleshooting.....	4
7 Removal.....	5
8 Disposal at end of useful life	5
9 Telephone assistance	5
10 Exploded parts drawing.....	6
Tables and figures	
Table 1 - Design ratings at max. and min. operating temperatures	2
Table 2 - Troubleshooting	4
Figure 1 - Typical installation schematic liquid operated pumping liquids	4
Figure 2 - Typical installation schematic gas operated pumping gases	4
Figure 3 - Barstock PVC one-piece section cut-away	6
Figure 4 - Barstock exploded cut-away.....	6
Figure 5 - Welded polypropylene section cut-away	6
Figure 6 - Molded exploded cut-away.....	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 MODELS LL,LM, LH, ELL, GL, GH PLASTIC MATERIAL CONSTRUCTION JET PUMPS 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 jet pump is handled, installed or used. Emerson cannot and will not guarantee that a jet pump is suitable for or compatible with the user's specific application.

WARNING

Failure to follow any instruction may cause a malfunction of the jet pump resulting in a sudden release of pressure, severe physical injury or property damage.

2 INTRODUCTION

2.1 Features and specifications

Penberthy molded and bar stock plastic material jet pumps are designed to handle corrosive fluids where their corrosion resistance is superior to that of standard metal construction units. For specific recommendation on temperature/corrosion resistance of plastic material, consult the relevant technical data sheet or a product proposal for the particular application.

2.2 Design ratings at maximum and minimum operating temperatures (see Table 1)

To determine the maximum allowable working pressure for a specific temperature within the design limits stated in Table 1, the user should refer to relevant technical data sheets or, when provided, the specifically stated design limits on a product proposal.

2.3 Application data

Models LL, LM and LH are liquid operated jet pumps for pumping liquids against low, medium and high discharge pressures respectively.

Models LM and ELL are liquid operated jet pumps for exhausting gases. Model ELL is self priming and has greater suction capacity at vacuum.

Models GL and GH are gas operated jet pumps for pumping gases against low and high discharge pressures respectively.

Note: For specific application data within the ranges stated in Table 1, the user should consult the product proposal for the specific model and size jet pump, or should request the supply of the applicable technical data sheet.

WARNING

Under no circumstances should these design ratings or application data be exceeded. Exceeding design ratings or application data may cause severe physical injury or property damage.

3 INSPECTION AND PERFORMANCE CONFIRMATION

3.1 Receiving inspection

Upon receipt of the jet pump, 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.

3.2 User's rating inspection

The user should confirm that:

1. The jet pump size and model designation (stamped on delivery jet or label) conforms 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 above.
4. The materials of construction of the jet pump are compatible with both the contained fluid and the surrounding atmosphere in the specific application.

IMPORTANT

If the size, model or performance data of the jet pump as received does not conform with any of the criteria above, do not proceed with installation. Contact an authorized Penberthy distributor for assistance.

TABLE 1 - DESIGN RATINGS AT MAXIMUM AND MINIMUM OPERATING TEMPERATURES

Material	Bodies
PVC	100 psig [690 kPaG] at + 70°F [21°C]
	20 psig [140 kPaG] at + 140°F [60°C]
Kynar®	100 psig [690 kPaG] at + 70°F [21°C]
	20 psig [140 kPaG] at + 275°F [135°C]
Polypropylene	100 psig [690 kPaG] at + 70°F [21°C]
	25 psig [172 kPaG] at + 170°F [77°C]

Kynar® is the registered trademark of Arkema polyvinylidene fluoride (PVDF) resin.

PENBERTHY MODELS LL,LM, LH, ELL, GL, GH PLASTIC MATERIAL CONSTRUCTION JET PUMPS

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

4 INSTALLATION

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

Check Figures 1-6 for the location of operating, suction and discharge connections to insure correct hook up.

4.1 Special handling of plastic material jet pump

1. Use PTFE tape on all pipe connections to reduce friction, improve sealing and facilitate disassembly.
2. All threaded connections of jet pumps made of polypropylene material must be back welded or leaks may develop in time.
3. Connecting piping must be made of the same material as the jet pump if the unit will be exposed to changes in temperature. Changes in ambient or fluid temperature on connections of dissimilar materials can cause loosening of joints resulting in leaks, or tightening of joints resulting in rupture. This is caused by the difference in thermal expansion of the materials.
Examples of coefficients of thermal expansion are as follows:
Kynar®..... 8×10^{-5} in/in/°F
Polypropylene..... 5×10^{-5} in/in/°F
PVC..... 3×10^{-5} in/in/°F
Stainless steel..... 6×10^{-5} in/in/°F
4. Thread the jet pump into piping per instructions below to avoid upsetting straight threaded joints, if any, and to avoid damage to the plastic. Avoid over tightening.
 - a. Suction connection
Use ejector discharge for leverage when connecting to suction.
 - b. Operating connection
Hold hex or flats on nozzle, if any, with a wrench when attaching piping to operating connection. If hex or flats are not provided, then use existing suction connection piping or temporarily thread a short piece of pipe into the suction connection to hold the jet pump.
 - c. Discharge connection
Hold flats, if any, with a wrench near the discharge connection when attaching piping to the discharge connection. If flats are not provided, then use existing suction connection piping, or a strap wrench, or temporarily thread a short piece of pipe into the suction connection to hold the jet pump.

4.2 Effect of related piping and precautions

1. Plastic jet pumps can be installed and operated in any position. For applications handling gases, it is more desirable to install models LM and ELL with the discharge pointing down at 45° or more. This prevents back splash of motive liquid into the suction line.
2. Jet pumps should be installed with pipe and fittings which provide minimum resistance to fluid flow. Pipe line friction losses must always be a consideration when estimating jet pump performance.
3. It is recommended that provisions be made for pressure gauge connections near the operating inlet, suction and discharge connections of the jet pump. If operating difficulties are encountered at any time, it may become necessary to install pressure gauges to identify the problem.
4. When pumping liquids, suction piping should be sized so that the velocity of the liquid does not exceed 4 feet per second. This is almost always obtained automatically when the suction line is the same pipe size as the suction connection.
5. Some back pressure is necessary to prime models LL, LM and LH when pumping liquids and when using the model LM as an exhaustor. A simple arrangement which would provide the minimum necessary back pressure is the installation of two consecutive 90° elbows in the discharge line.
6. When flow reversal into the suction must be prevented, a check valve should be installed in the suction line close to the jet pump. Pressure drop created by the check valve must be considered when applying the jet pump.
7. Install a valve in the suction line if it is desirable to:
 - a. Prevent contamination of suction fluid by motive fluid at start up.
 - b. Prime a centrifugal pump.
 - c. Throttle suction flow.
8. When a gas operated jet pump is used to lift liquids by suction or vacuum the jet pump should be located as close to the level of the liquid as practical. However, any liquid entrained into the jet pump will cause the jet pump to stop pumping, resulting in a possible suction flow reversal.
9. Discharge piping should be sized as short as possible and with the least number of turns and restrictions. Discharge piping friction losses must always be considered when estimating jet pump performance. Increase discharge line pipe size if necessary to minimize loss.

10. Do not impose system piping loads on the jet pump. The unit is not designed to be a load-bearing fitting.
11. All piping should be free of foreign materials which could clog the jet pump.

PENBERTHY MODELS LL,LM, LH, ELL, GL, GH PLASTIC MATERIAL CONSTRUCTION JET PUMPS INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

5 OPERATION

5.1 Pre-operational check

1. Ensure that all installation procedures have been completed.
2. Take all precautions necessary to handle the possibility of leakage.
3. Ensure that any restrictions in the discharge line have been removed.
4. Ensure that any discharge line valves are fully open.
5. Ensure that the suction line valve, if installed, is fully closed.

5.2 Operating

1. Open the operating liquid valve quickly.
2. On liquid applications, throttle operating fluid flow, if possible, until desired motive pressure is obtained.
3. Open the suction line valve, if any.
4. Regulate the discharge pressure as desired to a value within the capability published in the relevant technical data sheet or product proposal referred to previously.
5. For pump priming applications, when evacuation is completed, close the suction valve and immediately start the centrifugal pump. Then shut off the operating gas valve to the jet pump.

6 MAINTENANCE

WARNING

Maintenance should only be undertaken by qualified, experienced personnel who are familiar with this equipment and have read and understood all the instructions in this manual. DO NOT proceed with any maintenance unless the jet pump 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 follow these instructions may cause a sudden release of pressure resulting in 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 jet pump.

FIGURE 1

Typical installation schematic liquid operated pumping liquids

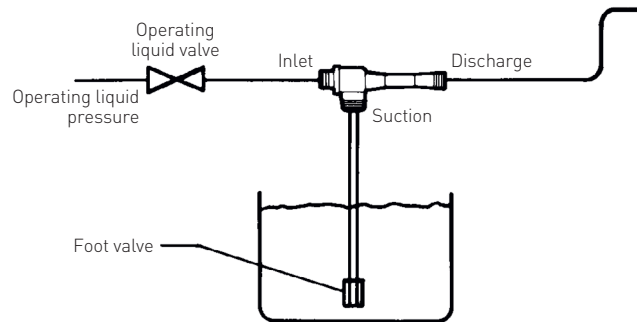
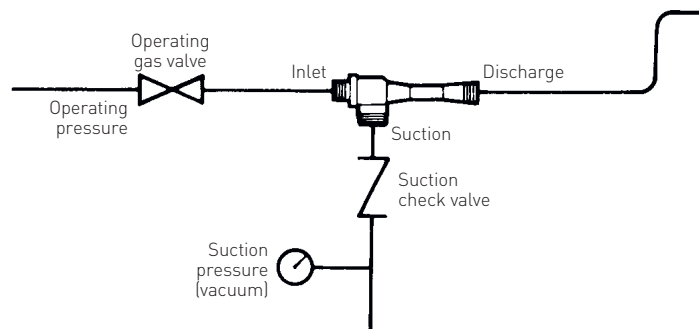


FIGURE 2

Typical installation schematic gas operated pumping gases



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

1. Jet pump units for corrosion or debris build up.
2. Piping and fittings for corrosion or debris build up.
3. All connections for tightness.
4. Strainers for debris build up.
5. 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.

6.2 Troubleshooting (see Table 2)

TABLE 2 - TROUBLESHOOTING

Problem	Cause	Solution
The suction flow is less than expected	<ol style="list-style-type: none"> 1. Suction piping is too restrictive 2. Discharge pressure is too high 3. Operating fluid or gas pressure is lower than required 4. Suction or motive liquid is at much higher than ambient temperature 5. Suction piping leaks 	<ol style="list-style-type: none"> 1. Remove restriction 2. Remove restriction 3. Increase pressure 4. Lower temperature or size larger jet pump 5. Tighten fittings

PENBERTHY MODELS LL,LM, LH, ELL, GL, GH PLASTIC MATERIAL CONSTRUCTION JET PUMPS INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

7 REMOVAL

WARNING

Do not proceed with removal of the jet pump from connecting piping unless the jet pump 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 follow these instructions may cause a sudden release of pressure resulting in personal injury or property damage.

WARNING

Jet pumps manufactured in PVC, molded polypropylene or Kynar® materials are of one-piece construction and are not intended for disassembly or field repair, see Figure 1. PVC, molded polypropylene or Kynar® units which have been damaged, worn out or have developed leaks should be taken out of service, disposed of in a safe manner determined by the user, and replaced. Attempted repair of defective PVC, molded polypropylene or Kynar® one-piece units may cause severe personal injury or property damage.

8 DISPOSAL AT END OF USEFUL LIFE

Penberthy jet pumps 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 jet pump 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 relevant technical data sheet for materials of construction.

9 TELEPHONE ASSISTANCE

If you are having difficulty with your jet pump, 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 number
- Name of the company from whom you purchased the jet pump
- Invoice number 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 jet pump 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 MODELS LL,LM, LH, ELL, GL, GH PLASTIC MATERIAL CONSTRUCTION JET PUMPS INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

10 EXPLODED PARTS DRAWING

FIGURE 3
Barstock PVC one-piece section cut-away

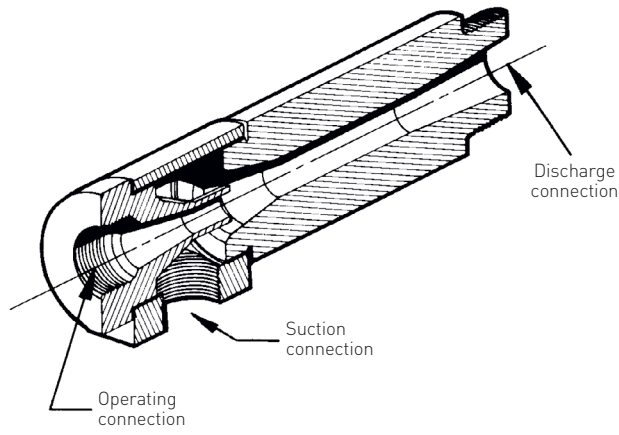


FIGURE 4
Barstock exploded cut-away

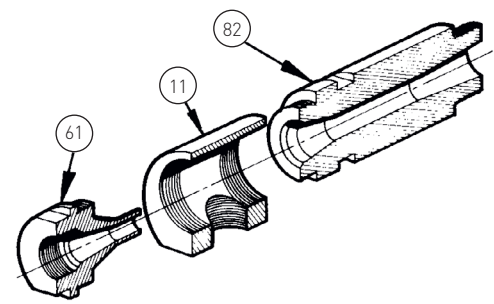


FIGURE 5
Welded polypropylene section cut-away

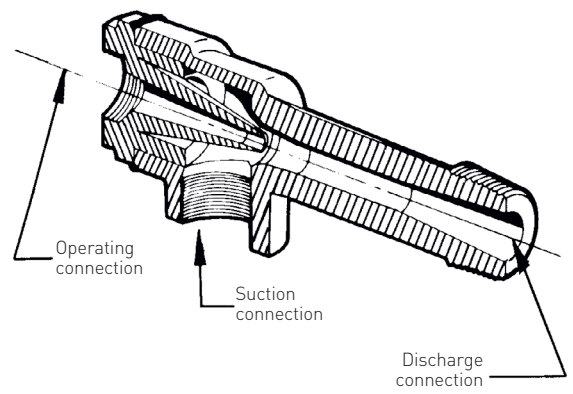
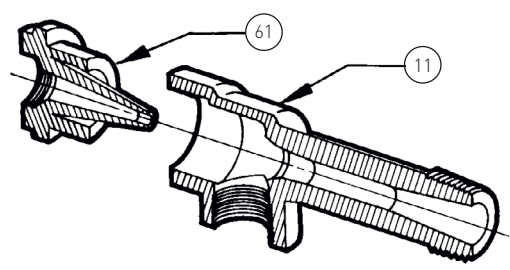


FIGURE 6
Molded exploded cut-away



PARTS LIST

Ref. nr	Item
11	Body
61	Nozzle
82	Delivery jet

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.