

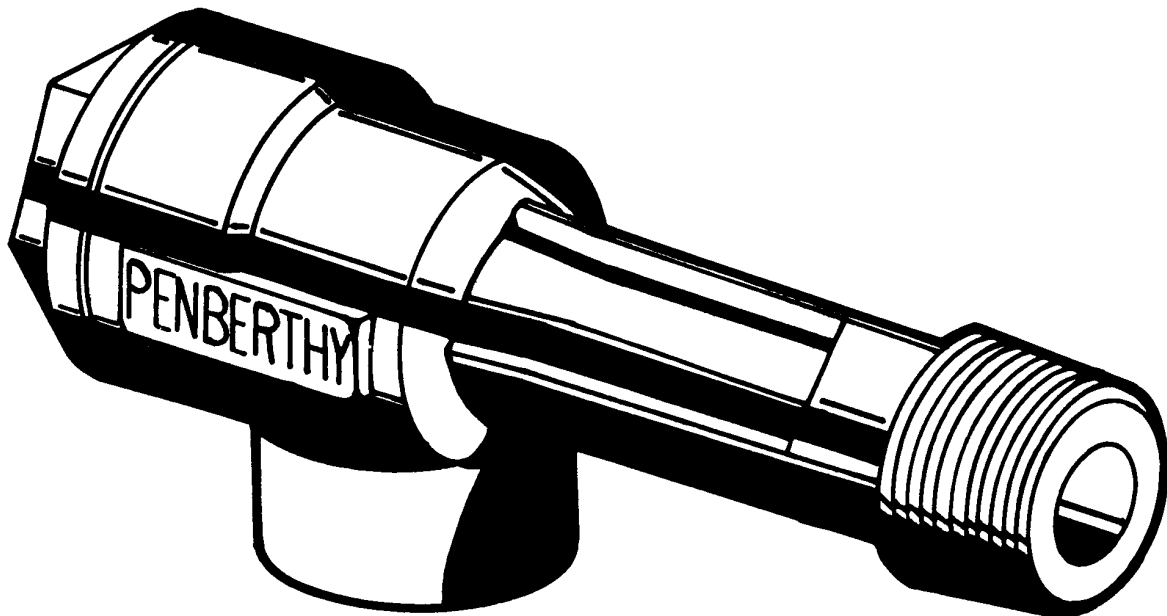


**PENBERTHY®**

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# Jet Pumps

**Models LL, LM, LH, ELL, GL, GH  
PLASTIC MATERIAL CONSTRUCTION**



**Installation, Operation and Maintenance Instructions**

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## **PENBERTHY PRODUCT WARRANTY**

Pentair Valves & Controls Black Mountain warrants its Penberthy products as designed and manufactured by PV&C Black Mountain 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. PV&C Black Mountain 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 PV&C Black Mountain and obtain written authorization to return the product. Thereafter, the product shall be returned to PV&C in Black Mountain, North Carolina, with freight paid.

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

The responsibility of PV&C Black Mountain hereunder is limited to repairing or replacing the product at its expense. PV&C Black Mountain 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 PV&C Black Mountain 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 PV&C BLACK MOUNTAIN'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 PV&C Black Mountain unless made in writing and signed by the General Manager or Director of Engineering of PV&C Black Mountain.

## INSTALLATION, OPERATION and MAINTENANCE MANUAL FOR PENBERTHY MODELS LL, LM, LH, ELL, GL, GH PLASTIC JET PUMPS

### 1.0 About the Manual

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

# SAFETY INSTRUCTIONS

Penberthy does not have any control over the manner in which its jet pump is handled, installed, or used. Penberthy cannot and will not guarantee that a jet pump is suitable or compatible for 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.

### 2.0 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 published application data or Penberthy product proposal for the particular application.

#### 2.2 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]

**Table 1**

To determine the maximum allowable working pressure for a specific temperature within the design limits stated above, the user should refer to Penberthy Dimension Sheets, or when provided, the specifically stated design limits on a Penberthy product proposal.

## 2.3 Application Data

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

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

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

For specific application data within the above ranges, the user should consult the Penberthy product proposal for the specific model and size jet pump, or should request Penberthy to supply the applicable technical data bulletin.



## 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.**

## 3.0 Inspection and Performance Confirmation

### 3.1 Receiving Inspection

Upon receipt of jet pump, check all components carefully for damage incurred in shipping. If damage is evident or suspected, do not attempt any installation. Notify carrier immediately and request 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 applications data shown on the Penberthy Technical Data Bulletin or product proposal referred to previously
4. The materials of construction of the jet pump 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 jet pump as received does not conform with any of the criteria above, do not proceed with installation. Contact an authorized Penberthy distributor for direction on what to do.**

## 4.0 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 Penberthy dimension sheets or Penberthy product proposal to obtain dimensional information for the specific size and model 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 Teflon<sup>®</sup> 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.

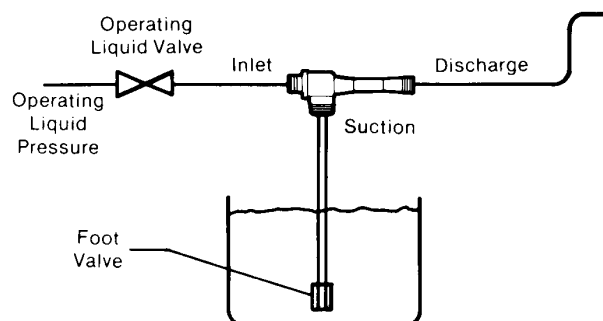
Examples of coefficients of thermal expansion are as follows:

Kynar <sup>®</sup> .....	$8 \times 10^{-5}$ in/in/F <sup>°</sup>
Polypropylene.....	$5 \times 10^{-5}$ in/in/F <sup>°</sup>
PVC.....	$3 \times 10^{-5}$ in/in/F <sup>°</sup>
Stainless Steel.....	$6 \times 10^{-5}$ in/in/F <sup>°</sup>

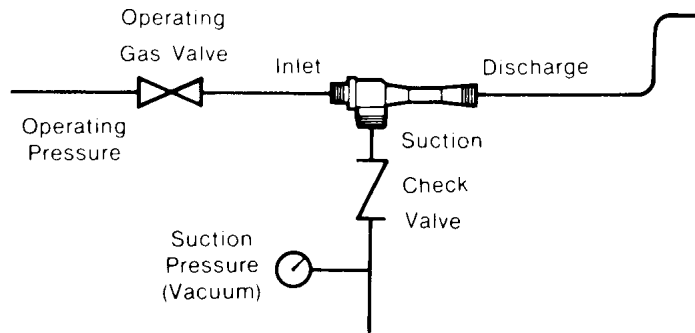
4. Thread jet pump into piping per instructions below to avoid upsetting straight threaded joints, if any, and to avoid damage to the plastic. Avoid over tightening.
  - a. Suction Connection  
Use ejector discharge for leverage when connecting to suction.
  - b. Operating Connection  
Hold hex or flats 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. Penberthy plastic jet pumps can be installed and operated in any position. For applications handling gases, it is more desirable to install the models of 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 gage 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 gages to identify the problem.
4. When pumping liquid, suction piping should be sized so that the velocity of the liquid does not exceed 4 feet per second. This is almost always automatically obtained 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 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.



**Figure 1**  
**Typical Installation Schematic Liquid Operated Pumping Liquid**



**Figure 2**  
**Typical Installation Schematic Gas Operated Pumping Gases**

## 5.0 Operation

### 5.1 Pre-Operational Check

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

### 5.2 Operating

1. Open the operating gas or fluid 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 on Penberthy Technical Data Bulletin or product proposal referred to above.
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.

## 6.0 Maintenance

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 in 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.

On all installations the following items should be regularly evaluated 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

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

## 6.2 Troubleshooting

Problem	Cause	Cure
The suction flow is less than expected	Suction piping is too restrictive	Remove restriction
	Discharge pressure is too high	Remove restriction
	Operating fluid or gas pressure is lower than required	Increase pressure
	Suction liquid is at much higher than ambient temperature	Lower temperature or size larger jet pump
	Suction piping leaks	Tighten fittings

Table 2

## 7.0 Removal



Do not proceed with removal of 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.



Penberthy jet pumps manufactured in PVC, molded polypropylene or Kynar<sup>®</sup> materials, are of one-piece construction and are not intended for disassembly or field repair, see Figure 1, PVC, molded polypropylene or Kynar<sup>®</sup> 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<sup>®</sup> one-piece units may cause severe personal injury or property damage.

## 8.0 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 PV&C - Black Mountain Material Specification sheets for materials of construction.

## 9.0 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 #
- Name of the company from whom you purchased the Jet Pump
- 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 Jet Pump to the factory for intensive testing. You must obtain a Return Authorization (R.A.) number from PV&C Black Mountain 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 of \$75.00 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 is not defective, the minimum charge will apply.

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Kynar<sup>®</sup> is a registered trademark of Ausimont

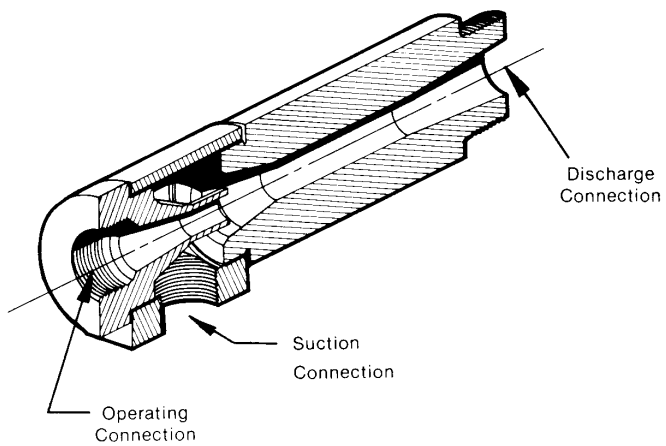


Figure 3  
Barstock PVC One Piece Section Cut-Away

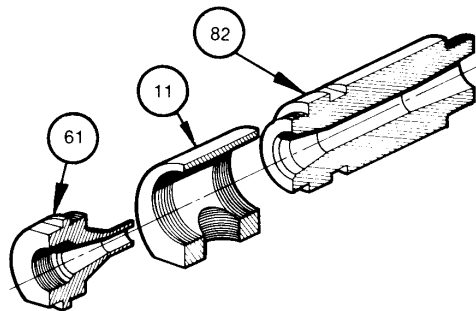


Figure 4 - Barstock Exploded Cut-Away

- 11 Body
- 61 Nozzle
- 82 Delivery Jet

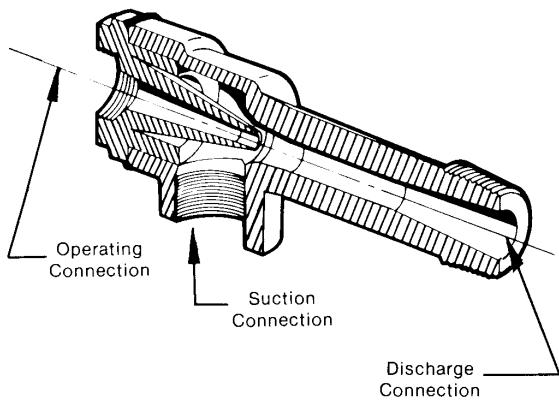


Figure 5  
Welded Polypropylene Section Cut-Away

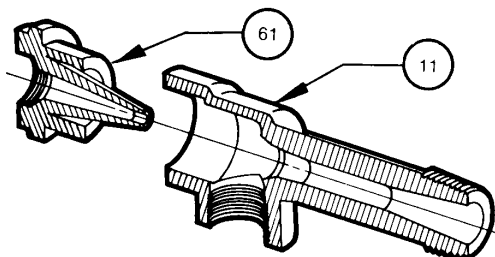


Figure 6 - Molded Exploded Cut-Away



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