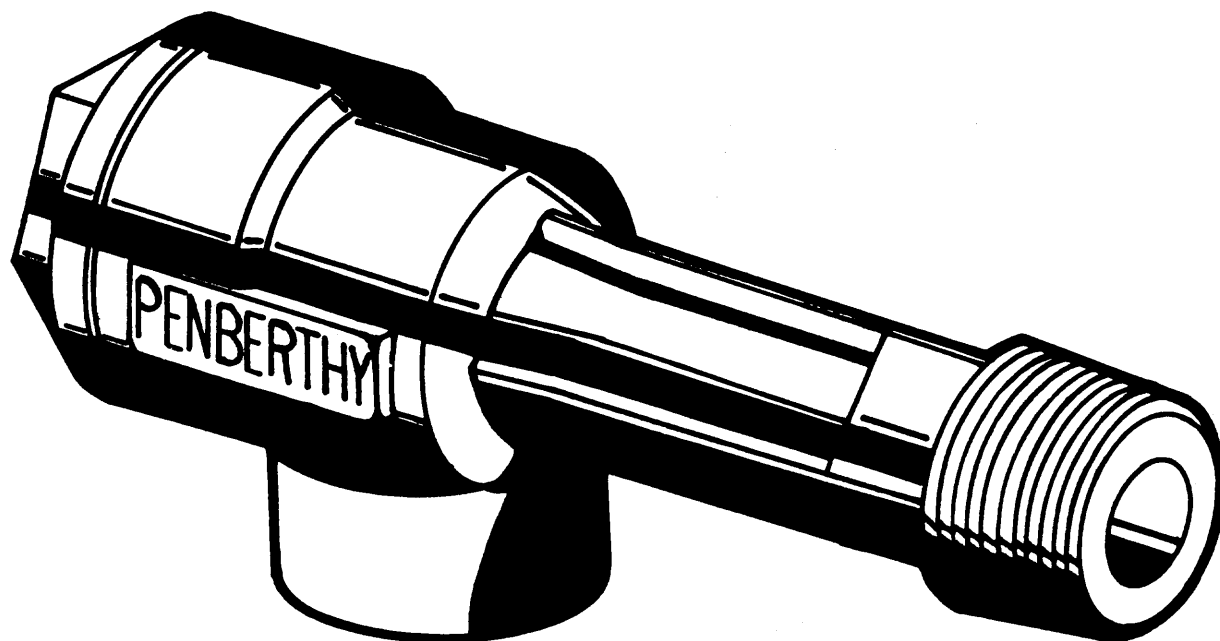


PENBERTHY®

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Jet Pumps

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



Installation / Operation / Maintenance Instructions

PENBERTHY

INSTALLATION / OPERATION / MAINTENANCE FOR MODELS LL, LH, ELL, GL, GH JET PUMPS

PLASTIC MATERIAL CONSTRUCTION

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 or maintenance. Failure to follow any instruction could possibly result in a malfunction of the jet pump with resulting leakage of the contained fluid, property damage or physical injury to personnel.

CAUTION

Penberthy does not have any control over the manner in which its jet pump is handled, installed, or used, and Penberthy cannot and does not warrant or guarantee that a jet pump is suitable or compatible with the user's specific application.

WARNING

Safety glasses should be worn when in the area of a jet pump installation.

I. INTRODUCTION:

A. 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.

B. Design Ratings PSIG at Maximum and Minimum Operating Temperatures

MATERIAL	MAXIMUM ALLOWABLE WORKING PRESSURE
PVC	100 PSIG at + 70°F 20 PSIG at + 140°F
Kynar	100 PSIG at + 70°F 20 PSIG at + 275°F
Polypropylene	100 PSIG at + 70°F 25 PSIG at + 170°F

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.

C. 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 property damage or physical injury to personnel.

II. INSPECTION AND PERFORMANCE CONFIRMATION:

A. 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 installation. Notify carrier immediately and request damage inspection.

B. User's Rating Inspection

The user should confirm:

1. That the jet pump size and model designation stamped on delivery jet or label conforms to the description on the user's purchase order.
2. That the operating conditions described in the purchase order agree with the actual operating conditions at the installation site.
3. That the actual operating conditions at the installation site are within the application data shown on the Penberthy Technical Data Bulletin or product proposal referred to above.
4. That the materials of construction of the jet pump are compatible with both the contained fluid and surrounding atmosphere in the specific application.

CAUTION

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.

III. INSTALLATION:

Installation 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.

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 ensure correct hook up.

A. Special Handling of Plastic Material Jet Pump

1. Use Teflon® 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®	8x10 ⁻⁵ in/in/F°
Polypropylene	5x10 ⁻⁵ in/in/F°
PVC	3x10 ⁻⁵ in/in/F°
Stainless Steel	6x10 ⁻⁵ in/in/F°

4. Thread jet pump into piping per instructions below to avoid upsetting straight threaded joints if any, and to avoid damage to 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.

B. 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 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 liquid, suction piping should be sized so that the velocity of the liquid does not exceed 4 ft. 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 exhauster. 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 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.

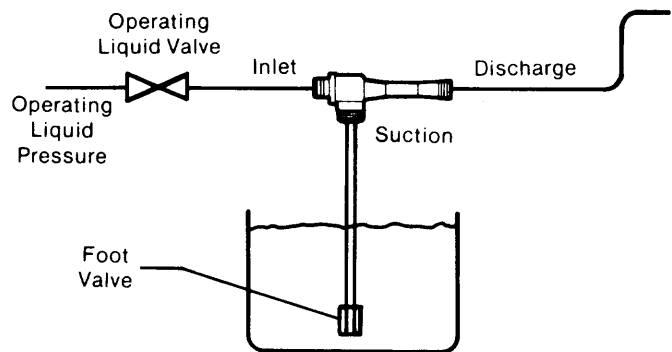


Figure 1 — Typical Installation Schematic
Liquid Operated Pumping Liquid

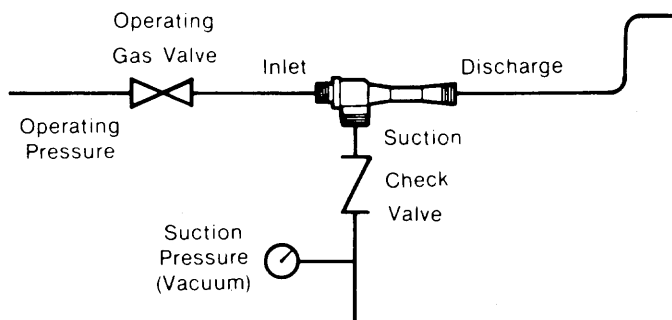


Figure 2 — Typical Installation Schematic Gas Operated Pumping Gases

IV. OPERATION:

A. Pre-Operational Check

1. Assure that all installation procedures have been completed.
2. Take all precautions necessary to handle 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.

B. 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 valve within 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.

V. 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.

CAUTION

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.

A. 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. Units for wear.
5. 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.

B. Troubleshooting

Problem

The suction flow is less than expected.

Cause

Cure

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.

C. Removal

CAUTION

Do not proceed with the 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.

WARNING

Penberthy 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 property damage or injury to personnel.

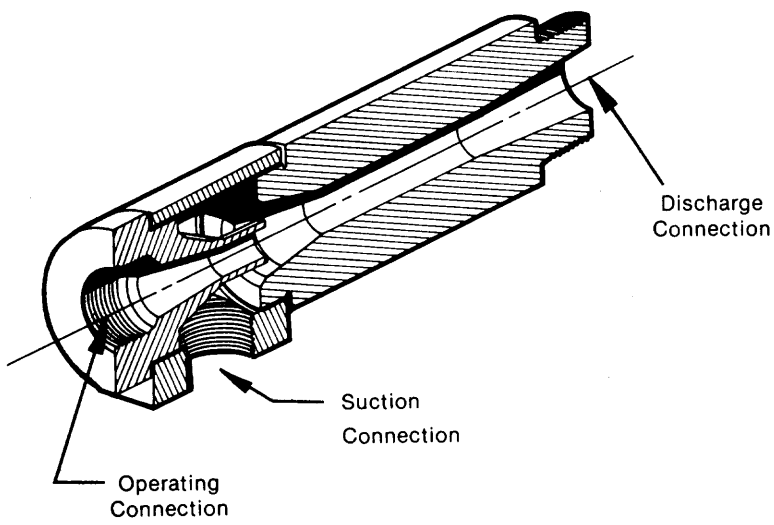


Figure 3
Barstock PVC One Piece Section Cut-Away

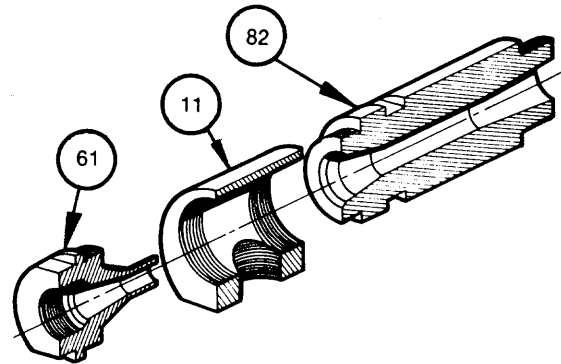


Figure 4 - Barstock Exploded Cut-Away

- 11 Body
- 61 Nozzle
- 82 Delivery Jet

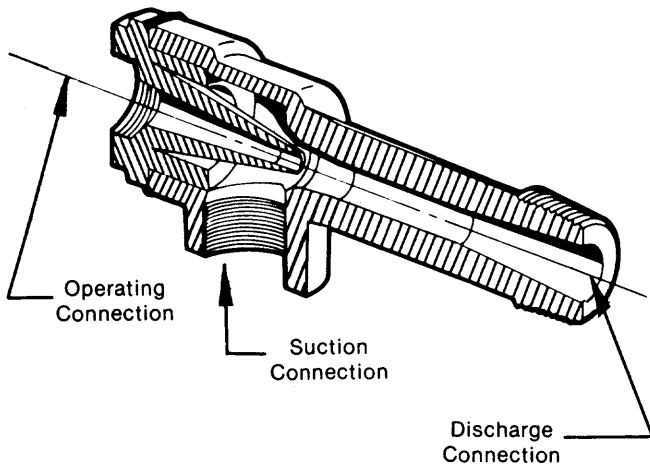


Figure 5
Welded Polypropylene Section Cut-Away

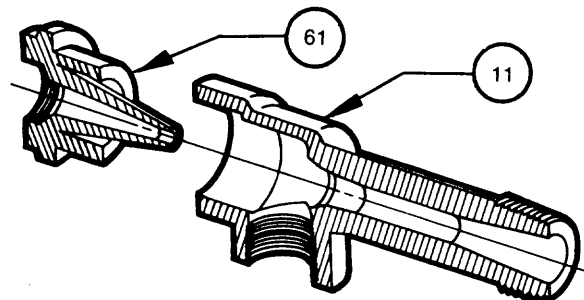


Figure 6 - Molded Exploded Cut-Away

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