

LPM-200

LP-Gas Flowmeter

Operating & Maintenance

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INSTALLATION

Installation Planning

Plan the installation for maximum rate of delivery, sizing the supply tank outlet, piping and valve for free gravity flow to the pump suction. To accomplish this, locate the pump as close as possible to the supply tank and use short inlet connections with few restrictions. Keep the number of elbows to a minimum, and use large radius elbows, whenever possible. To reduce the likelihood of causing vapor in the pump suction line, install a pump bypass valve in a return line to the supply.

Flowmeter Location

Locate the flowmeter at any convenient place in the pump discharge line. If the flowmeter is to be operated under extremes of environment (dirt, water, physical damage, etc.) an enclosure or

other protection should be provided. Allow sufficient clearances for removal of the register, strainer and vapor release. Do not install any bypass around the flowmeter; the valve in such a line might eventually leak, work open, or be left open causing improper measurement.

Configuration

The meter and vapor release assembly may be rotated 90 degrees for better fit on board the truck. To conform with Weights and Measures requirements, install flowmeter (right- or left-hand assembly) so that flowmeter nameplate is visible.

Cleaning

All piping on the inlet side of the flowmeter should be very thoroughly cleaned out. Flush out all lines thoroughly before installing the flowmeter. While installation is still new, the strainer should be cleaned very frequently. After the system has been thoroughly flushed of foreign material, only periodic cleaning is required.

Piping and Bolting Considerations

The meter is supplied with ANSI-compatible companion flanges on the inlet and outlet. Secure the connecting piping to prevent strain on the flowmeter. Use pipe compound sparingly or suitable pipe tapes on male threads only.

OPERATION

Pressurize the system slowly by allowing vapor to flow through the vent line. Then pass sufficient liquid through the system to clear the lines of air and vapor.

After starting the pump, slowly open outlet valve downstream of the flowmeter. Check the rate of flow after the system is filled; it should not exceed 100 gpm.

Adjust the external pump bypass to deliver the maximum practical rate of flow for the least amount of pump pressure.

NOTE: The pump relief valve (normally built into the pump assembly) should relieve at a pressure above which the external bypass has been set.

Maximum working pressure on the system must not exceed 350 psi. Avoid the use of small diameter hose and excessive pressures to achieve the desired flow rates; these may result in leakage and undue wear on the pump.

Although all flowmeters are carefully calibrated and tested after assembly and no changes should be necessary; field calibration is recommended after installation is complete.

While the installation is still new, clean the strainer frequently. After the system has been in service, only periodic cleaning is necessary.

CALIBRATION AND ADJUSTMENT

Erratic Registration

Erratic registration is an indication of trouble in the system. Over-registration is an indication of vaporization of the product, faulty differential valve or faulty vapor release valve; under registration is generally caused by dirt or pipe scale in measuring chamber or the liquid by-passing the flowmeter in some manner.

Do not try to correct this by recalibration of the flowmeter immediately; first check over the piping for air leaks, clean the strainer and then, if the trouble has not been found, clean the flowmeter as directed. If this does not correct the trouble, check for faulty installation.

Consistent Over- or Under-Registration

When the flowmeter consistently registers either more or less than delivered, and no other cause in system function can be determined, calibration of the metering system is recommended.

Calibration

Test the flowmeter using a volumetric prover large enough to permit the flowmeter to operate for at least one minute at maximum flow rate. Slip tube and rotary gauge reading are not sufficiently accurate for proving flowmeters. A detailed description of LP-Gas test procedure may be found in the National Bureau of Standards Handbook 99, Testing Liquefied Petroleum Gas Liquid - Measuring Devices. Specifications and Tolerances are contained in NBS Handbook H-44.

A thermometer well is provided for taking temperature reading while calibrating. It is located in the compensator on compensated flowmeters. On uncompensated flowmeters, it will be found in the strainer cover. It is covered by a snap plug to keep dirt from entering the well. The well should be filled with permanent type anti-freeze, if available, or with a light oil when temperature readings are to be obtained.

If a gravimetric test is used, the conversion to gallons must be on the basis of specific gravity determined at the time of test (not an assumed value), at the temperature of the product as it is passed through the flowmeter. Slip tube and rotary gauge readings are not sufficiently accurate for use as flowmeter checks and will produce erratic results.

Procedure for Uncompensated Flowmeters

Test the flowmeter to determine any error in percentage in registration. If error is found, proceed as follows:

1. Remove the register to expose the calibration change gears on top of the gearplate.
2. Determine the percentage change needed to eliminate the error in registration. Refer to change gear chart and select appropriate gears.
3. Install new gears being sure to put change gear R on the R spindle and change gear S on the proper spindle.
4. Replace register and tighten screws.

Procedure for Compensated Flowmeters:

1. Remove the two seal screws and cover from the temperature compensator. Do not remove sealing wax at top of lever arm.
2. Move anchor pin from Compensated Anchor to Uncompensated Anchor. (Flowmeter reading will now be uncompensated).
3. Perform same LP-Gas flowmeter test procedure as outlined for uncompensated flowmeters.
4. If necessary to change flowmeter calibration, refer to **Procedure For Uncompensated Flowmeters**, steps 1 to 4.
5. Move anchor pin to Compensated Anchor and operate flowmeter for at least 50 gallons before proceeding with calibration tests. (Flowmeter reading will now be temperature compensated).
6. Perform same flowmeter test procedure used for uncompensated flowmeter. Temperature reading must be taken at the prover only. (Temperature at flowmeter is assumed to be 60°F).
7. If necessary, to adjust compensated registration, turn calibration dial located at the lower end of the lever arm (to turn adjustment, use wrench on hex hub of dial). Turn clockwise To Give More or counterclockwise To Give Less. Each dial graduation will change compensated delivery approximately 0.15%; that is, 34 cubic inches per 100 gallons.

GENERAL MAINTENANCE

For sustained accuracy of Liqua-Tech LP-Gas Flowmeters, little maintenance is required other than to see that the proper conditions of operation are preserved. Once the flowmeter has been installed correctly, these conditions consist merely in guarding against foreign matter, such as vapor, air, sediment or water entering into the measuring chamber. However, should any malfunction develop do not dismantle flowmeter until the cause of the trouble has first been determined. Refer to suggestions in **TROUBLESHOOTING**.

The liquid passing through the measuring chamber must be free of grit and other forms of sediment to prevent unnecessary friction and to eliminate scoring of the piston and chamber walls. Evidence of trouble from this source will be found in under registration of the flowmeter. Periodic cleaning and inspection of the flowmeter strainer will help to insure maximum flow rate and to prevent possible damage of the flowmeter if clogged strainer ruptures.

Being an instrument that measures by volume, a flowmeter will record the passage of vapor or air as well as the liquid being measured, resulting in over registration. In LP-Gas, this will not occur with proper vapor release and differential valve function and installation.

Incidental water will cause no damage to the flowmeter. Trouble from this source may be expected only when water is allowed to stand in and around the flowmeter for a considerable period of time.

When washing trucks, care should be taken to cover the register. Water in the register will cause trouble particularly in cold weather when ice may form and cause sticking.

While the installation is still new, the strainer should be cleaned frequently. After the system has been thoroughly flushed of foreign material, only periodic cleaning is recommended.

Meter Evacuation

CAUTION: Flowmeter must be completely relieved of all LP-gas liquid and vapor pressure before performing any internal maintenance.

Storage

Before a flowmeter is put in storage, the measuring chamber must be flushed with a light lubricating oil of the best quality to prevent injury from condensation.

MEASURING CHAMBER MAINTENANCE

To Remove and Disassemble

This operation is not difficult and may be performed by a competent mechanic. No special tools are required. No trouble need be expected, if these few simple, but important, directions are followed. Do not open the flowmeter until you have checked over all other possible causes of erratic registration.

CAUTION: Flowmeter must be completely relieved of all LP-gas liquid and vapor pressure before performing any internal maintenance.

1. Prepare a clean surface on which to place the parts as they are removed. The parts are machined to close tolerances and should be handled with care. Have a replacement gasket ready before opening the flowmeter.
2. Remove the four bolts on the underside of the register. Lift the register off.
3. Remove the bolts securing the main case cover and lift off cover.
4. Lift the measuring chamber from the flowmeter casing.
5. Remove the upper cylinder head by removing the screws and then tapping the lugs protruding at the sides. Be careful not to scratch or nick any part of the chamber.
6. Lift out the piston by its spindle. If care is taken to draw it

straight, it should come out easily. Do not force it.

7. Remove the control roller, seal pin, and diaphragm from the lower cylinder head.

To Clean the Measuring Chamber

The parts may be easily cleaned of scale, etc., by means of a good, coarse, stiff bristle (not wire) brush and a petroleum solvent. All foreign matter, except deeply embedded chips or heavy corrosion due to water, may be removed in this manner. Do not use abrasives, such as emery cloth or sand paper. When the piston is badly corroded, the whole chamber should be replaced.

The parts of the measuring chamber which may show wear after long periods of service are the diaphragm and control roller. These parts will not require replacement until the accuracy begins to fall off at low rates of flow. To change these parts, merely substitute the new for the old, when the flowmeter has been taken down for cleaning.

To Reassemble the Chamber in the Flowmeter

1. Before reassembling the flowmeter, rinse all parts in a petroleum solvent. If possible, flush out the flowmeter body. Assemble the parts carefully; they should slide together easily without hammering or forcing. It is essential that all contact surfaces be clean and free from nicks.

2. Assemble the diaphragm to the lower cylinder head.

3. Place the control roller on its pin and see that it will rotate freely.

4. Replace the piston and oscillate it carefully by hand; it should move easily without binding. If it sticks, do not force it, but remove and locate the cause. Do not file down the roller as this will impair the accuracy of the flowmeter.

5. Replace the upper cylinder head and again oscillate the piston to make sure that it is free.

6. When replacing the measuring chamber in the casing, be sure that the seat is clean and free from nicks. Make sure that the dowel pin in the main casing enters the hole in the bottom cylinder head properly and allows the chamber to rest on its seat.

7. Before replacing the cover, first be sure the chamber is properly seated and insert the gasket.

8. Place cover over measuring chamber and install bolts.

GEAR TRAIN MAINTENANCE

To Repair Leaking U Cup Seal Stuffing Box

Keep dirt out of register and avoid injury to gasket. Remove the register and gear plate. If tightening the stuffing box nut with the fingers does not stop this leak, replace U cup shaft seal. It may also be necessary to replace U cup shaft seal and to replace the gear train.

CAUTION: Flowmeter must be completely relieved of all LP-gas liquid and vapor pressure before performing any internal maintenance.

1. Remove the register and gear plate. On flowmeters with compensator, disassemble to compensator. On flowmeters without compensator, remove the register and the flowmeter cover.

2. Remove the star connection using 5/64" allen wrench.

3. Unscrew the stuffing box nut.

4. Remove shaft seal.

5. Inspect upper end of spindle to be sure it is free from nicks or burrs which might damage the new shaft seal when it is placed on spindle. Remove the clamp nut; gear train assembly can be removed from underside of flowmeter cover or compensator.

6. Replace shaft seal with new part. Be sure expander and spring are in position before inserting new seal.

7. Assemble nut and tighten down all the way.

To Replace Gear Train

CAUTION: Flowmeter must be completely relieved of all LP-gas liquid and vapor pressure before performing any in-

ternal maintenance.

1. Remove the register and gear plate.

2. Remove the star connection using a 5/64" allen wrench.

3. Remove the flowmeter cover, with gear train assembly attached. Keep dirt out of flowmeter and avoid injury to the cover gasket.

4. Unscrew the stuffing box nut.

5. Remove clamp nut; gear train assembly can be removed from underside of flowmeter cover.

TEMPERATURE COMPENSATOR MAINTENANCE

Most 2" LPM-200 LP-Gas meters are purchased with temperature compensation devices, also called an ATC. The information following may be used for maintenance of ATC meters.

The ATC is designed to give long and dependable service when properly installed. The unit has been thoroughly performance-tested prior to shipment, and in normal service requires no further lubrication.

Maintenance of the compensator should be limited to those operations outlined below. If it becomes apparent that the unit is in need of repair, the compensator should be returned to the nearest authorized Liqua-Tech distributor.

To Remove Temperature Compensator

1. Remove register and gear plate.

2. Remove cover bolts at the base of the compensator and lift the unit off, taking care not to damage the gasket.

To Replace Temperature Compensator

1. Mount the compensator with the cover toward the front of the flowmeter. Care should be exercised to set arm of compensator gear train so that it will not come down on top of the piston spindle.

2. Make sure that compensator is down on gasket before tightening bolts.

3. Tighten all bolts.

To assemble a compensator on uncompensated flowmeters follow above steps after first removing main case cover and replace gasket, if necessary. Re-use bolts taken from main case cover.

To Remove Temperature Compensating Mechanism

1. Remove two seal screws and take off Liqua-Tech cover.

2. Withdraw anchor pin after removing cotter pin.

3. Remove three screws and take off lever arm plate.

4. Remove four screws around top edge of compensator and lift off upper housing.

To Replace Thermostat

CAUTION: Flowmeter must be completely relieved of all LP-gas liquid and vapor pressure before performing any internal maintenance.

1. Perform steps 1-3 found under To Remove Temperature Compensating Mechanism .

2. Remove four screws and lift off thermostat cover.

3. Lift out thermostat being careful not to damage thermostat gasket

VAPOR RELEASE MAINTENANCE

Trouble with this unit may arise from: (1) collapsed ball float allowing vent to remain open; (2) dirty or worn valve parts; (3) binding of float linkage.

CAUTION: Flowmeter must be completely relieved of all LP-gas liquid and vapor pressure before performing any internal maintenance.

1. Uncouple the vent connection.

2. Remove the cap screws on the vapor release cover and lift out the mechanism

3. Inspect for damaged or worn parts and replace if necessary.

STRAINER MAINTENANCE

CAUTION: Flowmeter must be completely relieved of all LP-gas liquid and vapor pressure before performing any internal maintenance.

To Clean the Strainer

1. Remove the four strainer cover bolts and remove cover.
2. Remove the strainer.
3. Inspect and clean with compressed air/light brush and rinse in solvent.
4. Reinstall strainer, o-ring, cover, and tighten bolts.

DIFFERENTIAL VALVE MAINTENANCE

CAUTION: Flowmeter must be completely relieved of all LP-gas liquid and vapor pressure before performing any internal maintenance.

Internal maintenance.

To Disassemble Differential Valve

1. Remove connecting tube at top of unit.
2. Remove 10 of the 12 cover bolts leaving 2 screws on opposite sides in place.
3. Slowly remove last 2 screws while holding down to oppose internal spring.
4. Disassemble diaphragm assembly as necessary to replace parts.

To Reassemble Differential Valve

1. Assemble diaphragm assembly.
2. Insert spring and diaphragm assembly into cover.
3. Align bolt holes in diaphragm with those in cover using 2 screws on opposite sides, and engage threads of screws.
4. Mount cover assembly on valve body and assemble and tighten.

TROUBLESHOOTING

Complaint	Possible Cause
Register not working when liquid is flowing	Bypass around flowmeter is not shut off.
	Ice inside register.
	Loose register or worn gear train.
	Register in need of repair.
Sheared key on change gear - caused by ice in register or mechanically tight mechanism.	
Leakage at the stuffing box nut	Worn shaft seal or spindle.
Chronic leakage at the main case gaskets	Dirty or defective seat or excessive shock pressure.
	Defective gasket or loose bolts.
Unsatisfactory flow rate or complete stoppage of flow	Obstruction in vapor vent line between differential pressure valve and vapor space in tank.
	Pump too small or inefficient (NOTE: The pump must have sufficient capacity and efficiency to pump against higher heads than are normally found in gasoline or fuel oil installations. This is especially true when the delivery nears completion.)
	Pump vapor bound due to improper installation of bypass relief valve or restriction in suction line.
	Pump bypass stuck open or spring weak.
	High loss of head. (This is caused by too many valves and elbows and the length, diameter and condition of the delivery hose.)
	Pressure build-up in tank being filled. Condition becomes worse as delivery nears completion unless vapor return line (not recommended) is used or vapor space type filling is used.
	Blocked strainer, or piston in flowmeter stuck. Clean strainer and/or measuring chamber.
	Open valve in piping allowing liquid to circulate around pump.
	Worn pump.
	Vapor release valve fails to close.
Under-registration - erratic	Pressure build-up on vent line.
	Dirt in the measuring chamber.
	Badly worn control roller or diaphragm.
	Main casing damaged.
Over-registration - erratic	Dirt under seat of measuring chamber.
	Diaphragm in differential pressure valve ruptured.
Consistent over- or under-registration	Vapor release valve remaining closed, allowing vapor to pass through flowmeter.
	Flowmeter in need of calibration.

