

LPG Premier 21-Stage Pump Section

LPG Premier MidFlow 17-Stage Pump Section

LPG Premier HiFlow 24-Stage Pump Section

Installation Guide



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DAMAGE GOODS/LOST EQUIPMENT

Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

VR must be notified of any damages and/or shortages within 30 days of receipt of the shipment, as stated in our Terms and Conditions.

VEEDER-ROOT'S PREFERRED CARRIER

1. Fax Bill of Lading to V/R Customer Service at 800-234-5350.
2. Call V/R Customer Service at 800-873-3313 with the specific part numbers and quantities that were received damaged or lost.
3. VR will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

CUSTOMER'S PREFERRED CARRIER

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3. If "lost" equipment is delivered at a later date and is not needed, VR will allow a Return to Stock without a restocking fee.
4. VR will NOT be responsible for any compensation when a customer chooses their own carrier.

RETURN SHIPPING

For the parts return procedure, please follow the instructions in the "General Returned Goods Policy" pages of the "Policies and Literature" section of the Veeder-Root North American Red Jacket Mechanical Products Price Book. Veeder-Root will not accept any return product without a Return Goods Authorization (RGA) number clearly printed on the outside of the package.

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Introduction

Improvements and market demand have resulted in the development of the latest LPG Premier and LPG Premier MidFlow and LPG Premier HiFlow pumps for the Liquefied Petroleum Gas sector of the market place. These new ATEX certified pumps contain the latest high temperature, non-conductive engineered materials. EC - Type Examination Certificate marking is

$1180 \text{ Ex II IG IIA c}$ DEMKO 13 ATEX 1303849U

NOTE: This information is generated as a consequence of carrying out the ignition hazard assessment.

The Red Jacket submersible LPG pump design has more than twenty years of proven service throughout the world. All major oil and gas companies are using submersible technology. Red Jacket submersible LPG pumps are used in filling stations for bottles, automobiles, trucks and buses. In the industrial sector installations include, but are not limited to, loading facilities, foam, aerosol and paper mills.

The Red Jacket submersible LPG pumps are electrical motor-driven centrifugal types designed for use in petrol station flow metering systems. The pumps are typically installed in a separate manifold direct into the storage vessels and are approved for use in Autogas motor fuels. Pumps can be installed in vertical and horizontal applications. The pump has a maximum rotational speed of 3000 RPM and is to be rigidly mounted to the electrical motor. The pumps provide positive pressure at all times to the flow meters.

ATEX Schedule of Limitations










- This pump is for use in a Submersible LPG Pump/Motor Assembly that includes a certified motor for pumping automotive liquefied petroleum gas fuels. Risks of rare and expected malfunctions must be evaluated in the end use application.
- This pump has a maximum surface temperature of +53°C.
- Drawing No. 410700-001 details the non-metallic materials and operating limits.
- This pump is not intended to be repaired or adjusted. Contact the Submersible LPG Pump Assembly manufacturer for replacement.


Instructions for Safe Use

1. All installations shall provide reliable electrical connection between the submersible LPG pump, frame, piping, manifold or junction box and the tank structure for the electrical protection and equipotential bonding.
2. Where a differential pressure switch or transducer is installed, each must be capable of ensuring that the nominated temperature classification is not exceeded.
3. Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
EN 13463-1:2009 EN 13463-5:2011 DEMKO 13 ATEX 1303849U
4. Installation must comply with manufacturer's installation, operation and service manuals supplied and with local installation requirements.

Safety Precautions

The following safety symbols are used throughout this manual to alert you to important safety hazards and precautions.

 <p>EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.</p>	 <p>FLAMMABLE Fuels and their vapors are extremely flammable.</p>
 <p>WARNING Warning Alert - read message and follow instructions to avoid serious injury, death, or substantial property damage.</p>	 <p>TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.</p>
 <p>ELECTRICITY High voltage exists in, and is supplied to, the device. A potential shock hazard exists.</p>	 <p>FENCE OFF WORK AREA Fuels and their vapors are extremely explosive if ignited. Keep hazardous zone free of unauthorized personnel and vehicles. Put up fencing and/or barricades to safeguard work area.</p>
 <p>WEAR EYE PROTECTION Wear eye protection when working with pressurized fuel lines or epoxy sealant to avoid possible eye injury.</p>	 <p>GLOVES Wear gloves to protect hands from irritation or injury.</p>
 <p>READ ALL RELATED MANUALS Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.</p>	

⚠ WARNING	
	<p>Portions of this product are to be installed and operated in the highly combustible environment of a LPG storage tank. It is essential that you carefully read and follow the warnings and instructions in this manual, failure to do so, can result in damage to property, environment, personal injury or death.</p>

Basic Principle of the Red Jacket Submersible LPG Pump

Red Jacket submersible LPG pumps are multi-stage centrifugal pumps. The advantage of the multi-stage technology is maximum performance by a minimum of energy, respectively 2.25 kW (3 hp) for the Premier pump, 2.25 kW (3 hp) for the MidFlow and 3.75 kW (5 hp) for the HiFlow pump. During operation, the pressure increases with approximately 50 kPa (7.25 psi) per stage up to the maximum design pressure of the pump respectively 1000 kPa (145 psi) for Premier, 880 kPa (127 psi) for MidFlow and 1220 kPa (180 psi) for HiFlow. LPG is a mixture of gasses, primarily propane and butane which are vapors at atmospheric pressure. This means as long as the mixture is under sufficient pressure the mixture remains liquid.

Every stage consists of three parts; a. the diffuser, b. the diffuser plate and c. the impeller. The impellers are working on the floating principal. This means that during operation the impellers are floating in the liquid. Between the impeller and the diffuser and between the impeller and the diffuser plate there is a liquid film. This floating principle avoids any unnecessarily resistance in the pump. As long as all the impellers are floating in the liquid, the pump runs on maximum capacity with a minimum of energy. All respectively, 17, 21 or 24 diffusers are interlocked and are enclosed in a stainless steel shell. There is not a requirement for initial bearing running-in period for the Red Jacket submersible LPG pumps.

For all types of Red Jacket submersible LPG pumps, the minimum differential pressure can never be allowed to go below 400 kPa (58 psi). This minimum required differential pressure of 400 kPa (58 psi) is to guarantee that during operation all respectively 17, 21 or 24 stages are submerged in the LPG liquid.

Another basic rule for a centrifugal pump is that there must be sufficient liquid available by the inlet of the pump. The pump can only build differential pressure when the first stage of the pump is completely submerged in the liquid. This NPSH (Net Positive Suction Head) is for all types Red Jacket submersible LPG pumps 127 mm (5.0 inches) above pump inlet opening.

The Red Jacket submersible LPG pumps are required to be rigidly coupled to explosion-proof type motors with a maximum speed of 3000 RPM and designed to permit the LPG to flow through and around the motor. Red Jacket submersible LPG motors P300V17 and P500V17 are designed with the required features and when coupled to Red Jacket submersible LPG pumps they are ATEX certified with the marking

CE₁₁₈₀  II 2G IIA b c d T4 DEMKO 13 ATEX 9990794X

The pumped liquid flows from the impellers between the motor shell and the stator, upward to the column pipe. A calculated part of the liquid passes through the motor flame barriers (breathers), motor bearings for cooling and lubrication. This amount of liquid passes through a self-adjusting bypass back into the pumped liquid. A calculated part of the pumped liquid passes through the internal by-pass to the manifold or storage tank to provide cooling for the pump/motor assembly.

Submerged LPG System Explanation

Table 1. LPG Pump Models

<p>Premier Nomenclature: LPG-21</p>	50 hertz
	70 liter/min by 680 kPa (18.5 gallon/min. by 98.6 psi) (max. efficiency)
	Max differential pressure 1000 kPa (145 psi)
	Capacity internal by-pass at max pressure: 20 liter/min. (5.3 gallon/min.)
	Minimum external flow - not required.
	Designed for 1-2 nozzles of 35 liter (9.2 gallon) simultaneously
<p>Premier MidFlow Nomenclature: LPG-17</p>	50 hertz
	130 liter/min by 580 kPa (34.3 gallon/min. by 84 psi) (max. efficiency)
	Max differential pressure 880 kPa (127 psi)
	Capacity internal by-pass at max pressure: 20 liter/min. (5.3 gallon/min.)
	Minimum external flow - not required.
	Designed for 2-4 nozzles of 35 liter (9.2 gallon) simultaneously
<p>Premier HiFlow Nomenclature: LPG-24</p>	50 hertz
	130 liter/min by 810 kPa (34.3 gallon/min. by 117 psi) (max. efficiency)
	Max differential pressure 1220 kPa (180 psi)
	Capacity internal by-pass at max pressure: 20 liter/min. (5.3 gallon/min.)
	Minimum external flow - not required.
	Designed for 4-5 nozzle's of 35 liter (9.2 gallon) simultaneously or 150 liter (39.6 gallon) for one nozzle

All calculations assume atmospheric pressure is 1013 mbar (14.7 psi) and outside temperature 15°C (59°F). Mixture is assumed to be 40% propane and 60% butane.

The pumps are approved for use with butane and propane and any mix of butane and propane. This may include up to 15% ethanol, 10% methanol or 15% MTBE. It has been assumed that automotive LPG contains toluene, benzene, xylene and iso-octane in varying percentages.

By-Pass

All Red Jacket submersible LPG pumps are required to be coupled to a motor containing an internal bleed (by-pass).

The Premier pump developed maximum pressure is 1000 kPa (145 psi) differential pressure. The Premier MidFlow pump developed maximum pressure is 880 kPa (127 psi) differential pressure. The Premier HiFlow pump developed maximum pressure is 1220 kPa (180 psi) differential pressure. For pump technical reasons an externally mounted by-pass is not required.

According to the Regulations for LPG Service Stations and Road Tank Trucks in the Netherlands; Dutch Ministry of Housing, Physical Planning and Environment, "An LPG pump shall be provided with an overflow/relief valve to protect the pump casing from overpressure when pumping against closed discharge. This bypass valve shall discharge into the LPG storage tank at a predetermined set pressure selected in relation to the pump operating pressure. This bypass valve shall be of sufficient capacity to handle the maximum flow at this pressure." The internal bleed in the Red Jacket LPG motor is designed according to this regulation.

When a local safety regulation requires an external by-pass this requirement must be applied. By the use of an external by-pass the setting must be above normal pump maximum pressure as stated above. By-pass must be of the soft-seat type without permanent bleed.

Prior to Installing or Replacing LPG Pump

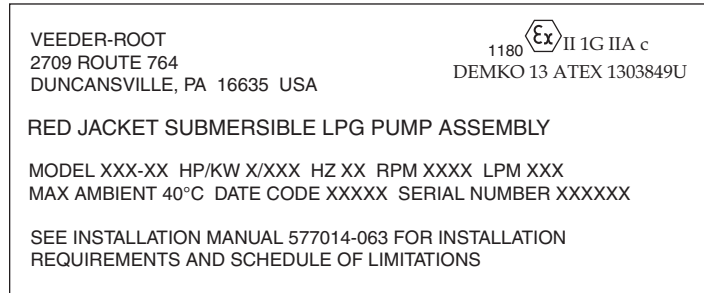
Read This Section Before Proceeding

1. The Red Jacket submersible Liquefied Petroleum Gas (LPG) pump is designed to pump liquefied petroleum gas in the liquid state. This includes butane and propane and any mix of butane and propane. The vapor pressure of the liquid should not be more than 1380 kPa (200 psi) at 37.8°C (100°F). The density of the liquid should be less than 0.6 kg/l (37.4 lb/ft³). Pumping fluids other than LPG will overload the motor and damage the pump.
2. The pump should be installed according to local code regulations governing submersible LPG installations and also for ease in servicing. The pump is earthed (grounded) through the column pipe or the conduit pipe. The design of the mounting for the pumping unit shall be such as to prevent imposing any unacceptable loads on the on the storage vessel. Such loads might be caused by the weight of the various parts and/or by the forces due to operation of the pump including its starting and stopping but also by vibration. To minimize vibration, all pipe workings need to be securely mounted.
3. If manifold or pump well is used, the maximum flow velocity at any point in the suction line from the tank must not exceed 1.0 m/sec. (3.3 ft/sec.). The equalization line must be of sufficient size to equalize the pressure of the manifold and supply vessel.
4. Installing the submersible pump directly into the storage tank without a manifold is allowable only when permitted by local regulations. In such installations, the clearance between the tank bottom and pump inlet must be a minimum of 125 mm (5 inches). A sump directly underneath the pump may be used if the size is at least DN200 (8 inches).
5. The pump is cooled and lubricated by the product being pumped. The required minimum differential pressure of 400 kPa (58 psi) is to guarantee that during operation all stages are submerged in the LPG liquid. The pump is designed to operate continuously or with an intermittent duty cycle, not to exceed 30 on/off cycles per hour.
6. Never wire pump to operate at less than 400 kPa (58 psi) differential pressure.
7. Red Jacket submersible LPG pumps are designed to operate in conjunction with motors containing a self-adjusting internal by-pass system.
8. Red Jacket submersible LPG pumps are not designed to handle abrasive or foreign particles in the product being pumped other than small parts of LPG dust or iron oxide, which can normally be found in LPG. Do not use a pump inlet filter without written approval from Veeder-Root prior to its use. Installation of a strainer 0.1 mm (100 micron) in the inlet to the storage tank is recommended.
9. Red Jacket LPG pumps are designed in accordance with European CEN Standards and the European Directive 94/9/EC (ATEX) "Equipment for Potentially Explosive Atmospheres." (II 1 G IIA c).
10. For maximum life, a submersible pump should not be run dry.
11. The ambient temperature is to be -20°C to +40°C.

Marking and Pump Weights

Marking

The manufacturer's name and address, the pump model, serial number and date code, horsepower (KW) rating, RPM, LPM and the EC-Type Examination Certificate and warnings are permanently printed on the pump shell (see example below).



Pump Weights

Part Number	Model	Hp/kW	Hz	RPM	LPM	Pump Weight kg (lbs.)
410687-001	LPG-21	3 / 2.2	50	3000	50	10 (21)
410687-002	LPG-24	5 / 3.7	50	3000	145	10 (21)
410687-003	LPG-17	3 / 2.2	50	3000	100	11 (24)

Note: the weights are approximate values and will vary due to manufacturing tolerances.

Installing a Red Jacket Submersible LPG Pump

General



These instructions must be read fully before putting a submersible turbine pump for LPG into operation.

This LPG submersible pump is designed to pump a mixture of liquid petroleum gasses consisting of butane and propane, used as fuel to power motor vehicles.

These instructions only relate to the installation and operation of the submersible pump and not to the dispenser, which measures and registers the actual sales of the product.

The installation of the Red Jacket submersible LPG pumps should only be conducted in the presence of an authorized technician.

LPG Pump Installation

Each package of Red Jacket submersible LPG pumps contain the parts listed below:

- LPG pump
- Cap screws and lock washers, 5/16-24 inch (4 of each)
- This Installation manual

The O-ring (53.6 x 2.6 mm [2.11 x 0.103 in.]) installed in the groove at the top of the pump should be lubricated with petroleum-based jelly, PTFE lubricant or a suitable alternative.

Verify that the end of the motor coupling extends a minimum of 43 mm (1.7 in.) from the mounting face.

The pump should be carefully positioned to the bottom of the motor by first aligning the pump shaft with the motor coupling. Secure the pump to the motor by using the cap screws and lock washers supplied with the pump. Using a torque wrench, the screws must be tightened to 37.8 - 41.9 N•m (28 - 31 ft-lb.) each.

Follow instructions provided by the pump/motor unit manufacturer for installation of the pump/motor unit.

Maintenance of the Red Jacket Submersible LPG Pump

There is not a requirement for initial bearing running-in period for the Red Jacket submersible LPG pumps. There is also no required maintenance or servicing frequency for the pump. All components of the pump are designed to last for many years.

Yearly Inspections

Check pump capacity, pressure, and power. If the pump performance does not satisfy your process requirements, the pump/motor assembly should be removed from the storage vessel and inspected. A Red Jacket submersible Premier, Premier Mid-Flow or Premier Hi-Flow LPG pump is not repairable. The pump and motor of all three must be replaced as a complete set, not individually unless prior approval from Veeder Root is received.


Troubleshooting

Troubleshooting Guide

The table below lists suggested troubleshooting procedures for pump related problems.

Symptom	Cause of Trouble	What to Check	How to Correct
Vehicle Does Not Fill	AFL valve in vehicle tank not open	Contents gauge	AFL valve is faulty if tank is not full
	Blockage in discharge line to vehicle	Compare flow rate on other lines	Clear blockage
	Blocked filter in dispenser or nozzle	Compare flow rate on other lines	Clean filters
	Differential pressure low	See SYMPTOM	
	Dispenser is not authorized	Power to dispenser	Re-establish power to dispenser
		Nozzle connection to vehicle	Correct connection
	High pressure in vehicle tank	Vehicle tank temperature	Cool tank or reduce number of open nozzles
	Inadequate product in supply tank	Liquid level in supply tank	Fill supply tank
	Pump not running	See SYMPTOM	
Vehicle tank is full	Contents gauge	No problem exists	
Differential Pressure Low	Discharge head or pump is loose, creating pressure leak	Pump/motor assembly	Pull pump/motor assembly, check condition of O-rings and gasket. Assemble and re-tighten screws properly.
	External bypass is set incorrectly or is faulty	Bypass	Correct bypass to required setting
	Motor is running in wrong direction	Reverse two motor wires at the contactor	Proper connection will always provide highest pressure
	Motor is single phased	Amperage or voltage to motor	If one leg is zero, contactor or power supply is faulty
	Pump staging has failed	Have filters been clogged?	Clean filters and service pump
	Restriction into pump well	Ball valve and excess flow valve	Open ball valve
	Equalization line restricted	Ball valve in equalization line	Open ball valve or increase size line
	Too many open nozzles per pump	Single pump installation	Limit number of nozzles per pump
		Dual pump installation	Are both pumps running?
Vapor balance line between supply tank and pump well is restricted	All valves in line	Open valves or clear obstruction	

Symptom	Cause of Trouble	What to Check	How to Correct
Low Flow Rate	Blockage in discharge line to vehicle	Compare flow rate on other lines	Clear blockage
	Blocked filter in dispenser or nozzle	Filters	Clean tank or service pump
	Differential pressure low	See SYMPTOM	
	Discharge valve not fully open	Differential pressure	Replace valve if pressure is correct
	Excess flow valve in line is shut	Return nozzle to dispenser and wait for valve to reset	Service nozzle if necessary
	High pressure in vehicle tank	Vehicle tank temperature	Cool tank or reduce number of open nozzles
Pump Not Running	Contactor coil is not engaged	Emergency stop, dispenser switch and contactor wiring	Close all switches, replace contactor or coil if faulty
	Contactor faulty	With coil engaged, is there voltage to pump?	Replace contactor
	No power	Voltage into control box	Check circuit breakers
Pump Is Noisy	Pump staging has failed	Have filters been clogged?	Clean filters and service pump
	Motor is single phased	Amperage or voltage to motor	If one leg is zero, contactor or power supply is faulty
	Motor bearings have failed	Pressure and amperage	Replace motor



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