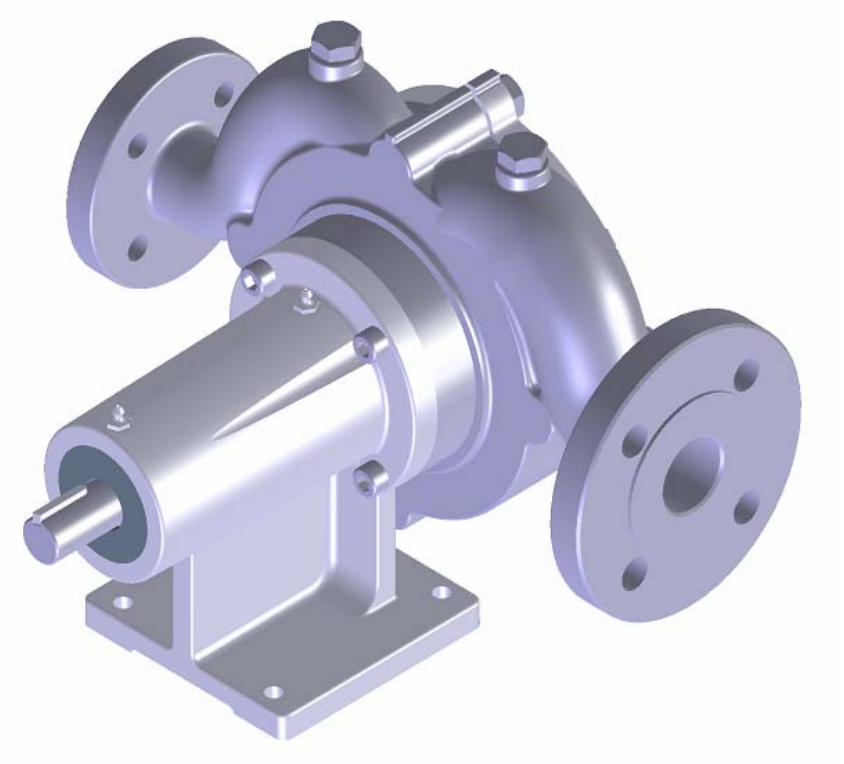

Yenen LPG Pump
Installation, Operation & Maintenance Manual

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PRINCIPLES OF THE YENEN LPG PUMP

The Yenen LPG Pump is a special type of pump known as a turbine or regenerative pump. The liquid flows into the inlet nozzle and into the passageway on each side of an impeller (the rotating element) and is recirculated constantly between the vanes or teeth of the impeller and this passageway as the impeller rotates. The fluid makes a complete revolution in the pump case and is diverted out the outlet nozzle. The horsepower required to drive the pump increases as the differential pressure increases, but the capacity decreases at the same time. Differential pressure is the difference between the pressure at the inlet of the pump and at the outlet of the pump.

The impeller is the only moving part and has no contact with the casing. Consequently, practically no wear occurs to the impeller, even when pumping volatile liquids such as LPG or ammonia which have little lubricating qualities.

The pumping of volatile liquids is one of the most difficult of all pumping applications. Unlike other pumping applications, more attention must be given to the design, manufacture, installation and operation of the pump.

Ductile iron has been used in the manufacture of this pump for parts under pressure.

The impeller floats on a shaft and may be replaced easily without disturbing the piping or driver by simply removing the cover. No special tools are needed.

The mechanical seal assembly may be replaced easily by removing the cover and impeller without disturbing the piping or driver. No special tools are needed.

Pressure gauge connections, ¼" NPT, are provided on the inlet and outlet nozzles.

INSTALLATION OF YENEN LPG PUMP

However, in order for the pump to deliver optimum performance, the principles discussed in this book should be followed. The piping details are furnished to illustrate methods proved by hundreds of installations. Your own needs may require slight variations, but every effort should be made to follow the recommendations identified in this manual.

No pump can discharge more liquid than it receives, so the location and the inlet piping must be given careful attention. If the inlet piping is inadequate to supply the demand of the pump, you may expect trouble! The inlet line size should be the same size as the pump suction or next size larger. Pressure loss between the storage tank and the pump should be minimized.

The pump should be located as close to the storage tank as possible. The complete inlet line, including the vertical line from the tank, should not exceed 3.6 m in length. The bottom of the tank should be at least 0.6 m above the pump inlet nozzle, and 1.2 m should be considered standard.

The inlet should include the following:

1. The tank excess flow valve should have a flow rate of 1-1/2 to 2 times the capacity of the pump.
2. Pressure gauge at pump suction nozzle.
3. The tank shutoff valve should be a full port ball valve or an internal valve.
5. A flexible connection should be used on the pump inlet or outlet to accommodate piping strains.
6. An eccentric swage should be used at the pump inlet nozzle to change line size (flat side up).
7. The inlet line must be level or slope downward to the pump.

The outlet piping should include the following:

1. A pressure gauge should be installed in the opening provided on the outlet nozzle or in the outlet piping near the pump. This pressure gauge will tell you the complete story of the operation inside your pump. Be sure you have one installed.
2. A hydrostatic relief valve is required to be installed in the outlet piping.
3. If the outlet piping exceeds 50 feet (15.2 m) in length, a check valve should be installed near the pump outlet.

Pump foundation for frame mounted models

The total weight of the concrete foundation should be approximately twice the weight of the pump assembly.

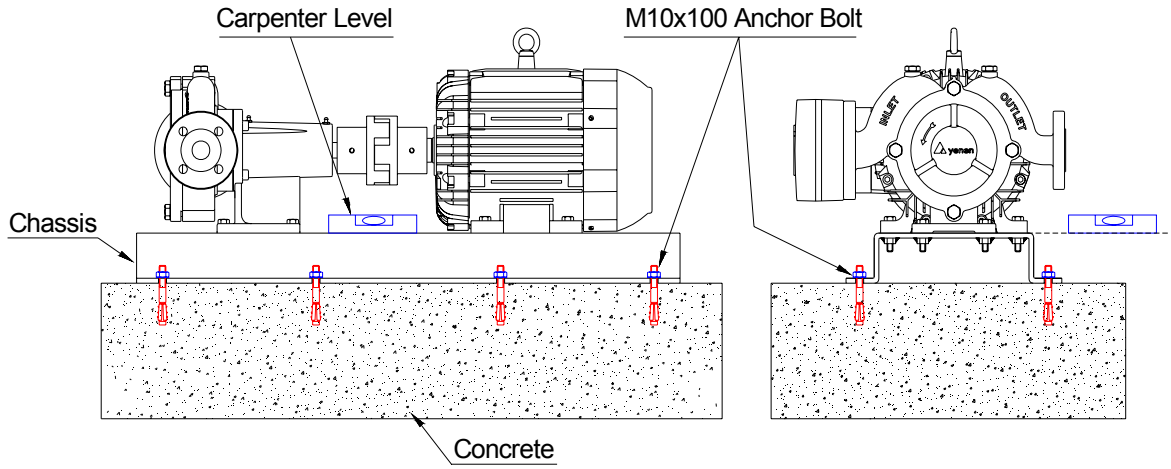


Figure 1

Level base (Level chassis)

After the concrete has set, check the pump base for level. Drive metal shims under the base near the anchor bolts as below. Tighten anchor bolts and recheck the base for level (see figure 2).

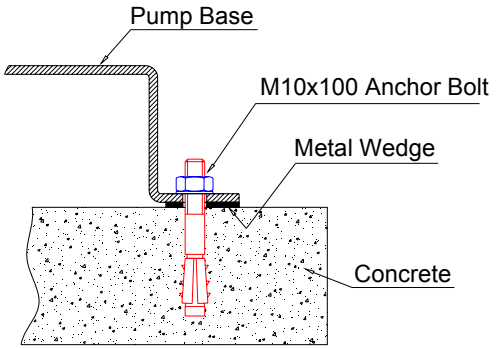


Figure 2

Coupling alignment for frame mount models

The coupling must be properly aligned to give quiet, long-life service to the pump and driver. The pump and driver shafts areca refully aligned at the factory but should always be checked after the pump is installed and before the initial operation.

Place a straight edge across coupling halves, top and side; both positions must line up to be correct.

If misalignment exists, adjust the shims between the pump base and the foundation until exact alignment is accomplished (see figure 3)

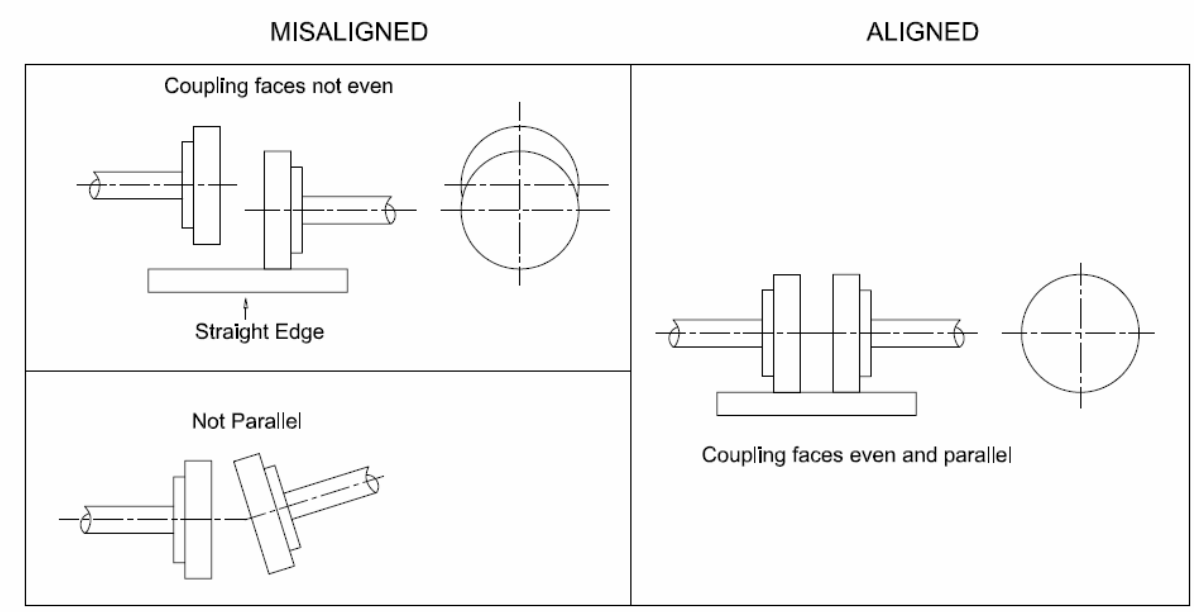


Figure 3

The alignment of the coupling must be made correctly. If the couplings are not aligned correctly, they will cause an increase in temperature and noise.

The coupling will move axially between the pump and electric motor shaft and they may touch to these parts, if they are not fixed well enough. Because of this contact, sparks or an increase in temperature may occur.

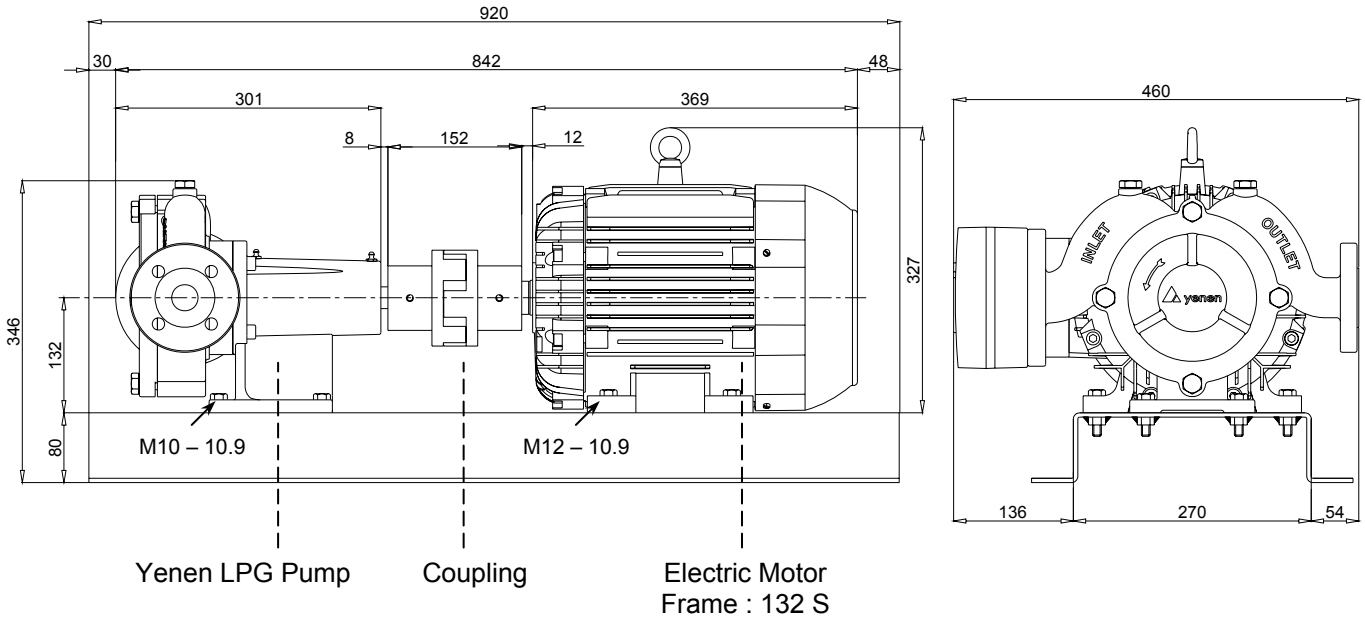
The coupling must have ATEX certificates.

WIRE SIZE CHART FOR WIRING ELECTRIC MOTOR

MOTOR				RECOMMENDED WIRE SIZE, AWG		
HP	MOTOR PHASE	VOLTS	APPROX. FULL LOAD AMPERES	LENGTH OF RUN IN FEET		
				0-100	TO 200	TO 300
Pump must rotate clockwise when viewed from the motor. If not, switch any two of the three incoming 3 phase lines.						
3	1	115	34.0	6	4	2
		230	17.0	12	8	8
	3	230	9.6	12	12	12
		460	4.8	12	12	12
5	1	115	56.0	4	1	1/0
		230	28.0	10	6	4
	3	230	15.2	12	12	10
		460	7.6	12	12	12
7-1/2	1	230	40.0	8	6	4
	3	230	22.0	10	10	8
		460	11.0	12	12	12
10	3	230	28	8	6	4
		460	14	12	12	10
15	3	230	42	6	4	4
		460	21	10	10	8
20	3	230	54	6	6	4
		460	27	10	10	10

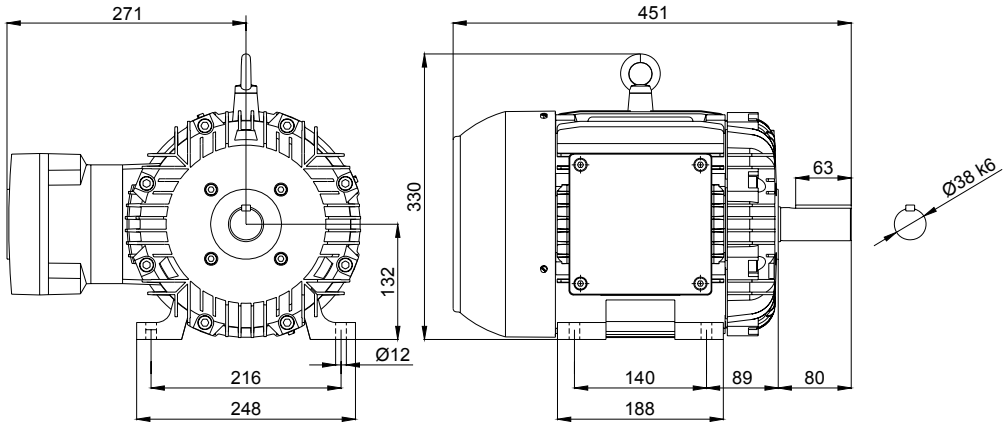
Figure 4

Figure 5



ATEX

Yenen LPG pump and the electric motor must be mounted on a single piece metal chassis. The chassis must be made of stainless steel and min.6 mm thick. Thinner or partite chassis will cause vibration, a shorter lifetime of bearings and an increase in temperature.



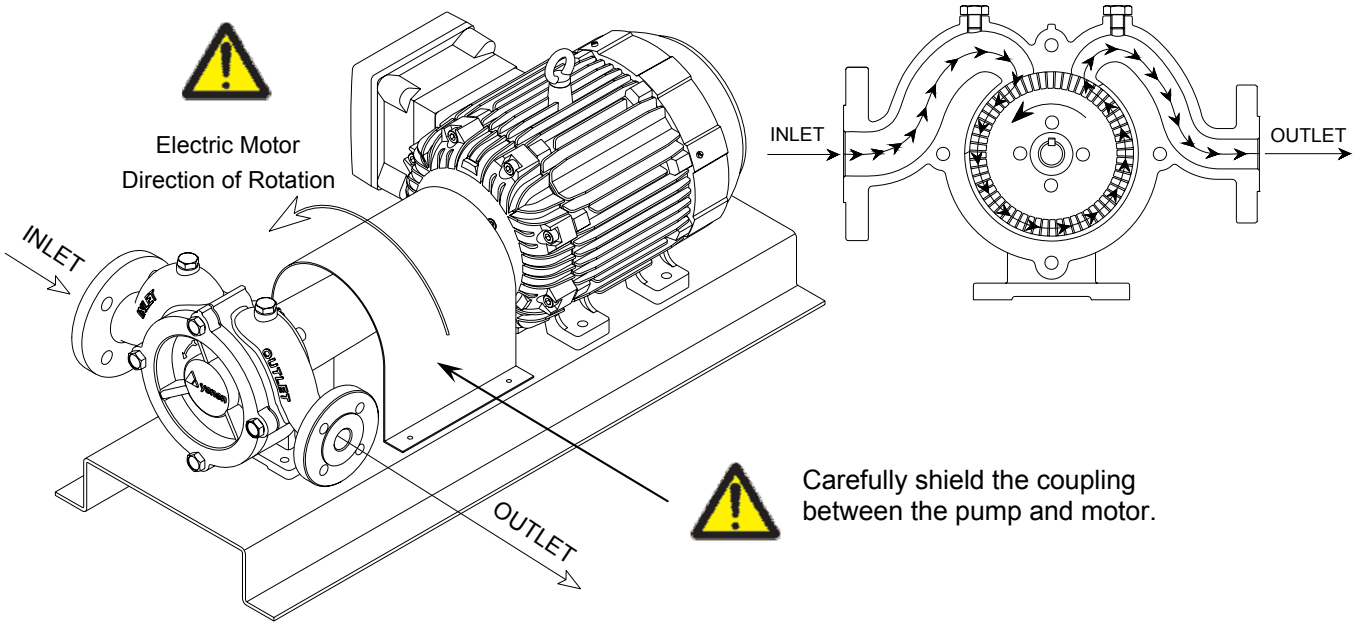
132 S Electric Motor

Figure 6

ATEX

The Yenen LPG Pump must be connected to an explosion-proof motor.

Figure 7



ATEX

The electric motor should have a counter-clockwise rotation when you look at the direction from pump to the electric motor. In case the electric motor runs in clockwise direction, there will be excess pressure and temperature on the suction end of the pump.

OPERATION OF YENEN LPG PUMP

It is absolutely essential that the operator be fully informed of the pump's recommended operation procedures and safety precautions. See Appendix A pages 19&20 for operating specifications and performance. The operator must be made aware of the specific risks generated by the product handled and be familiar with the purpose and function of all piping, valves, and instrumentation, etc. of the installation.

The following steps should be performed for the initial pumping operation:

1. Close shutoff valve on the end of the delivery hose.
2. Open the storage tank bottom shutoff valve.
3. Open the shutoff valve in the pump bypass system.
4. Check the motor for the proper voltage
5. Record pressure gauge readings on suction of pump.
6. Start the pump and circulate liquid through the bypass system.
7. Adjust the bypass valve by turning the adjusting screw counterclockwise until the pump pressure gauge shows nearly the same pressure it did before you started the pump. Screw the adjusting screw clockwise until the pressure gauge indicates the required pressure or until the pump starts to lose discharge pressure (you will know this , by the rapid fluctuating of the pointer), then back the adjusting screw out a turn or two until the

Pressure gauge again indicates a steady pressure. Lock the lock nut and permit the pump to circulate liquid for a half hour or more. If the motor overload protection device stops the motor during this period, this indicates the bypass system valve is set too high and should be readjusted by turning the adjusting screw out until the motor will run for this period.

PREVENTIVE MAINTENANCE CHART YENEN LPG PUMP

Item to Check	Daily	Monthly	3 Monthly	6 Monthly
1. Visual Inspection; leaks, hoses, pipes, etc.	X			
2. Clean Inlet Strainer Screen			X	
3. Inspect Drive Coupling and Guard		X		
4. Lubricate Pump's Bearing [1]			X	
5. Lubricate Motor's Bearing [2]				
6. Performance Test				X
7. Re-tighten Bolts				X
8. Inspect Motor Starter Points				X

1 If the pump runs continuously, it should be lubricated more frequently.
2 Follow the motor manufacturer's recommendations.

Figure 8

PREVENTIVE MAINTENANCE PROGRAM FOR YENEN LPG PUMP

Purpose

By following an effective preventive maintenance program, unscheduled downtime can be eliminated. This program should be used by the Operation Manager to get a maximum utilization of manpower and equipment as well as to prevent possible unsafe situations and/or production delays due to equipment breakdown.

Scope

The Preventive Maintenance chart in figure 8 includes the items to be regularly checked and inspected with a recommended time schedule. These are basic maintenance recommendations, and each company should develop their own comprehensive preventive maintenance program schedule, tailor-made to their individual operational procedures and requirements.

Maintenance must only be performed by a properly trained and qualified individual that follows all the applicable safety procedures.

Procedures

Every procedure herein recommended must be performed in a safe manner (utilize tools and/or equipment which are free of hazards) and follow the safety codes of practice set by the authorities having jurisdiction. These are general guidelines and are not intended to cover all the safety aspects that must be considered and followed while performing this procedure.

1. Visual Inspection:
This includes checking for leaks, corroded areas, condition of hose, piping and fittings, and any unsafe condition which may hinder the safety of the personnel and/or the facility.

2. Clean Inlet Strainer Screen:
A clogged strainer screen will create too much flow restriction and vapor will be formed causing the pump to cogitate. This reduces the pump's capacity and accelerates the wear of the internal parts.

3. Inspect Drive Coupling and Guard:
Check the coupling alignment and the condition of the coupling's rubber insert for cuts, broken sections and wear.

4. Lubricate Pump Bearings:
Use only ball bearing grease, applied with a manual lubrication pump or gun. Always clean the grease openings thoroughly before greasing.

In order to provide protection against explosion, the bearings must be lubricated. Please check the user manual to see the lubrication periods **(Figure 8, page 8)**

The grease used should be resistant to a temperature of 130 ˚C..

The recommended lubricating grease types: DIN 51852 FAG ACANOL MULTI 3 / K3N-30

Service life of ball bearings in Yenen LPG Pump		
Ball Bearing Type	Min. service life in hours at 70ºC	Max. Dif. Pressure
FAG 3306 DIN628	20000 hours	17,2 bar
FAG 6206 DIN625	20000 hours	17,2 bar

Figure 9

5. Lubricate Motor Bearing:
Follow the recommendations of the electric motor manufacturer for the type of grease to use and the lubrication frequency.

6. Performance Test:

A. While transferring liquid with the pump, check the pressure at the pump's inlet port. The pressure drop in the inlet piping should not be greater than 3 psi.

B. While transferring liquid with the pump, close the discharge valve(s) so the full flow will be directed back to the storage tank through the by-pass valve. Then slowly close the valve downstream of the by-pass valves. The discharge pressure of the pump should increase to the maximum differential pressure of the pump at no flow conditions

C. If the maximum differential pressure is not obtained, the pump must be serviced. Visually inspect the pump's impeller (refer to instructions on page 11 and 12 steps 1 through 8:

Replace the impeller if damaged, broken, warped or worn.

A uniform wear of the impeller will not be visually detected. If the impeller has no visible damages,
It can be re-used. The impeller's wear can be compensated by removing the adjustment shims on the pump's cover. Remove one shim at a time, tighten the pump's cover and assure that the pump's shaft rotates. If the pump is locked, re-install the last shim and make sure the shaft rotates easily. For additional help, refer to Appendix D page 22 Troubleshooting guide.

7. Re-tighten all holdown bolts.

8. Inspect Motor Starter Contact Points:
This must be performed by an authorized and qualified electrician, based on the electric motor manufacturer's guidelines.

REPAIR AND SERVICE ON YOUR YENEN LPG PUMP

All repairs to the pump must be performed by qualified personnel in a safe manner, utilizing tools and/or equipment that are free of hazards, and follows the applicable safety codes of practice set by the local authorities having jurisdiction. Make sure the system pressure has been relieved before attempting any repair to the pump.

After a long service life, repairs are limited to replacing the impeller or mechanical seal.

The only wearing part influencing the pumping action is the impeller, so we suggest the pump be given an "efficiency" test before any attempt is made to repair it. The trouble may lie in the piping system rather than in the pump. If the pump will still produce
As much differential pressure when circulating through the bypass system as it did when new, you can be sure that your problem is in the system and not with the pump. If the pump does not produce as much pressure as it did originally, remove the cover
And inspect the impeller. If visual inspection indicates the impeller is in good condition, remove the thin shim gasket and replace the cover. Many times this procedure will adjust for slight impeller wear. If the impeller is badly worn or damaged, it should be replaced. For additional help, refer to Appendix D, page 22, Troubleshooting guide.

Replacing the impeller is a matter of removing the cover and removing the old impeller from the shaft.
If the old impeller is tight on the shaft, threaded bolt holes are provided in the impeller to use for pulling. The new impeller must be a good slip fit on the shaft; it should "float" on the shaft, so it may be necessary to lightly sand the shaft. Clean the pump prior to reassembly (refer to steps 1, 2 and 10, pages 11 and 12)

Replacing the mechanical seal is simple and replacement parts are immediately available.

The pumps can be configured with various types of seals and O-rings. Selection of the seals and O-ring materials are based on the product that is being transferred. The most compatible seals and O-ring materials must be selected. Consult the factory or distributor for recommendations if the pump is not handling the product for which it was initially purchased. The model code in the identification plate of the pump indicates the materials in the pump. Refer to page 19 Appendix A , for the material in your pump.

There may be a leakage of gas because of a defect on mechanical seal. A gas leakage detector should always be kept somewhere near the pump in LPG station.

SEAL REPLACEMENT INSTRUCTIONS

CAUTION

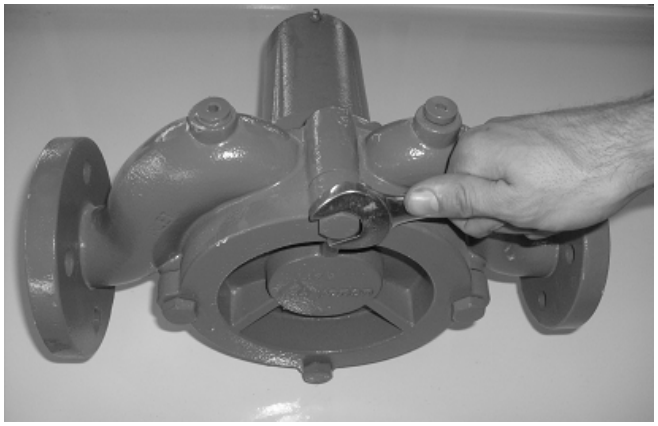
Bleed all pressure from the pump and piping before installing your new seal assembly.

CLEANLINESS

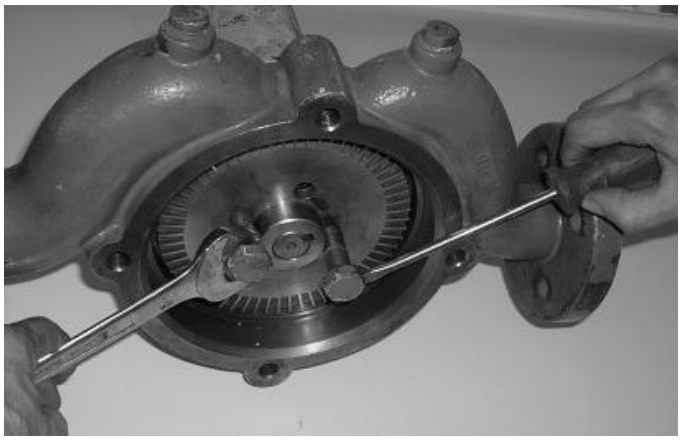
Even the smallest amount of dirt on your new seal can cause early failure. Keep all parts, tools and your hands clean while installing the seal. Never touch the smooth lapped faces of the carbon rotor or seal seat. For LP-gas, anhydrous ammonia and similar liquids, you are trying to seal a fluid that is 5 to 10 times thinner than water! Your new seal needs every chance it can get, so keep it clean.

WORKMANSHIP

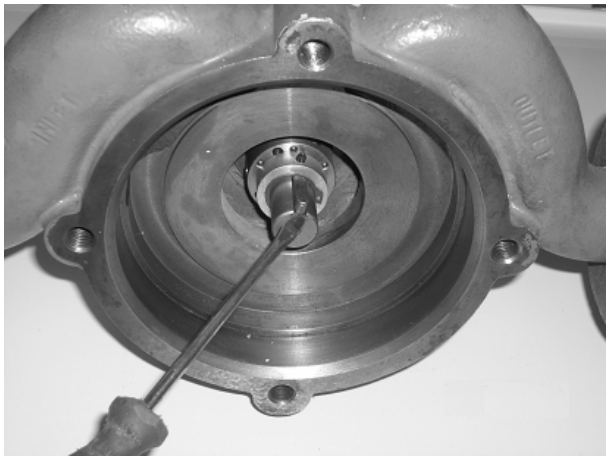
Your Yenen LPG pump is a precision piece of equipment with very close clearances. Treat it as such. Never use force during assembly or disassembly



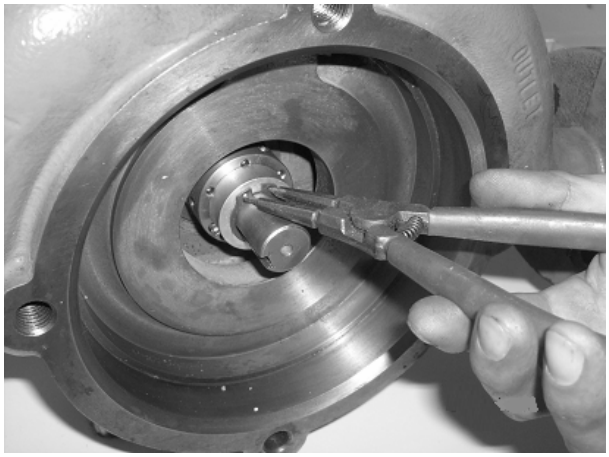
1. Remove the cover cap screws and remove the cover from the case. If the cover does not pull away by hand, use two screwdrivers to pry the cover from the case.



2. Remove the impeller. It should slide freely. If the impeller does not slide off the shaft freely, insert two cover screws in the threaded holes provided and pry off carefully. Be careful not to warp the impeller or damage the case O-ring groove.

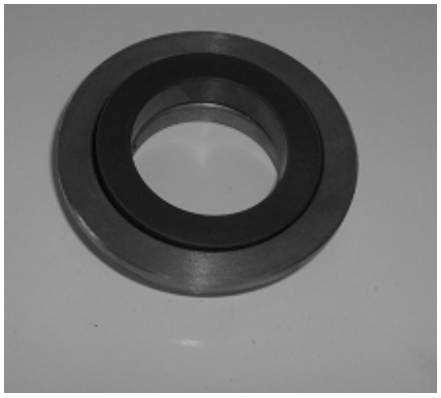


3. Remove the impeller key with side cutters or by tapping with a punch or screw driver. Force the key up and out of the keyway, taking care not to damage the shaft.



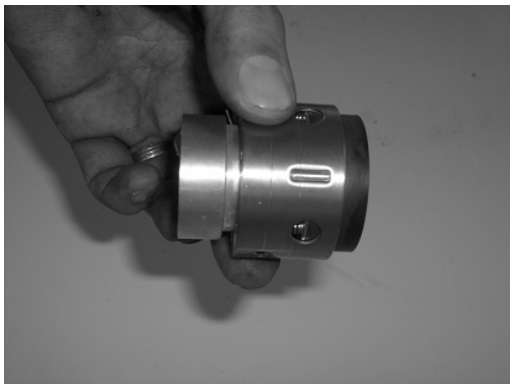
4. Remove the retainer ring and slide the seal sleeve, seal sleeve O-ring and seal assembly off the shaft.

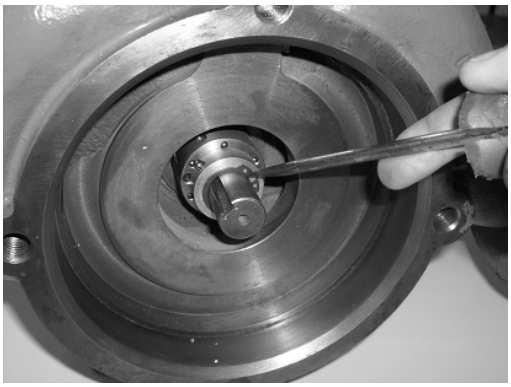
5. Carefully pry the old seal seat out of the seal housing using a small screwdriver.



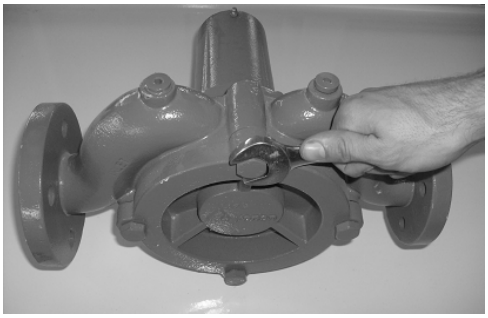
6. Clean the seal housing and apply a light coat of oil on the inside surfaces. Remove the new seal seat from its package and place a light coat of oil on the seal seat O-ring. Insert the seal seat with the notch pointing down and in line with the locator pin in the back of the seal housing. Place the small round piece of cardboard found in the seal package (making sure it is very clean) on the seal seat lapped face. Either use your fingers or a hammer handle with the cardboard disc to push the seal seat into place. Make sure the locator pin is in the seal seat notch.

7. Using a probe or pick, remove the old seal housing O-ring and install a new O-ring after applying a thin coat of oil. Clean the shaft and remove any burrs around the keyway. Apply a light coat of oil to the outside surfaces of the seal housing. Reinstall the seal housing by pressing into place by hand. Carefully unwrap the remainder of your new seal assembly, which includes the new retainer shell, carbon rotor and seal sleeve assembly. Apply a thin coat of oil to the carbon face and the O-ring behind the carbon.





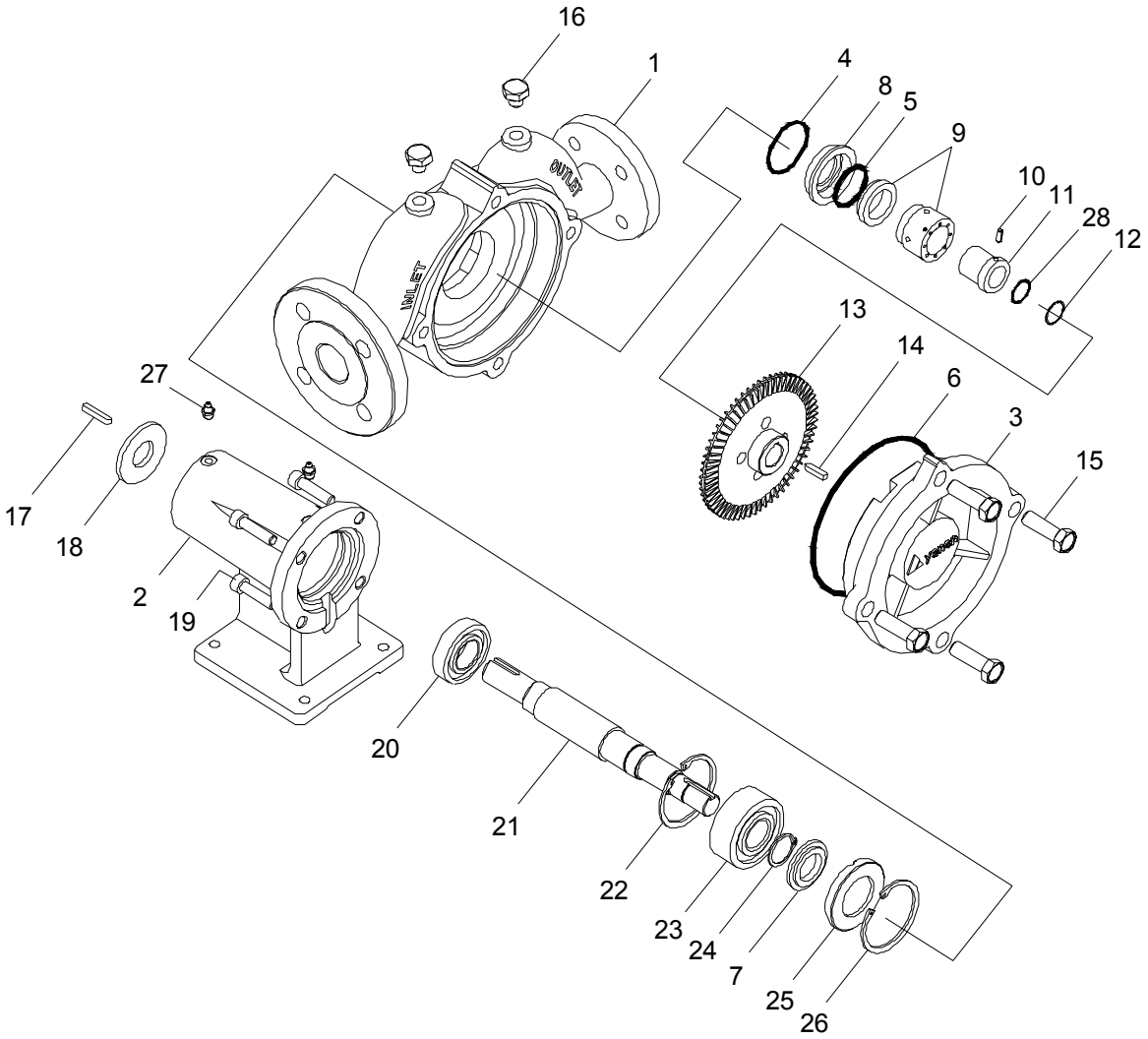
8. Slide the seal assembly onto the shaft by aligning the seal drive pin to the impeller keyway. Install the retainer ring by compressing the seal assembly into the pump, thus revealing the retainer ring groove on the shaft. Install the new impeller key into the keyway slot. The impeller must slide on the shaft very freely. If it is tight, carefully remove any burrs from the keyway or key with a small file. Be certain to clean all filings off of the impeller before reinstallation.



9. Replace the cover O-ring and case clearance shim. If the pump will not turn after installation of the cover, install another case clearance shim.

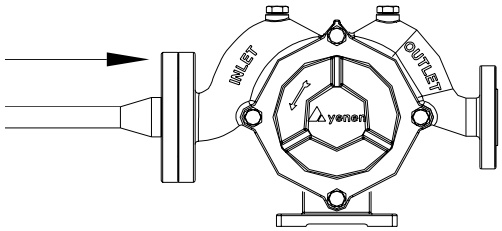
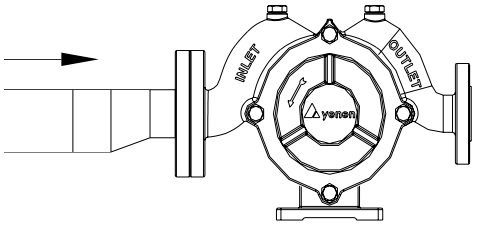
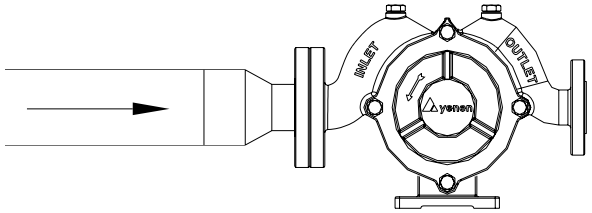
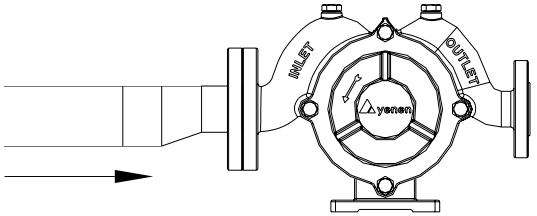
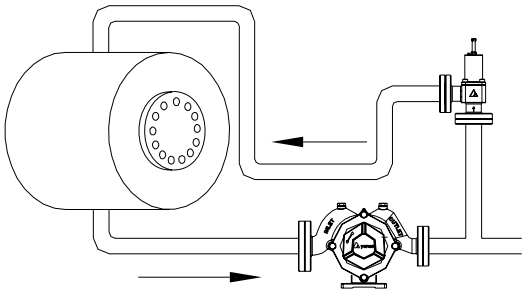
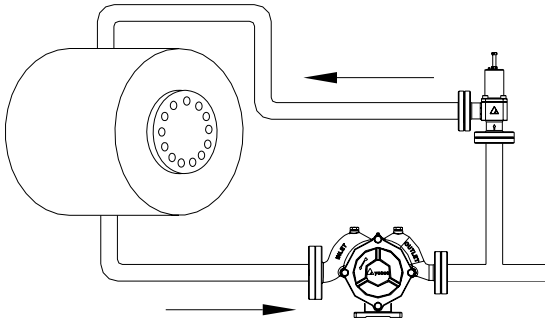
NOTE:
Pressurize the pump case with vapor first. After the pump has been pressurized with vapor, then allow liquid to slowly enter the pump.

PARTS DETAILS
YENEN LPG PUMP

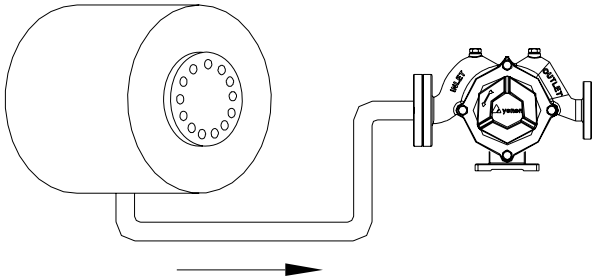
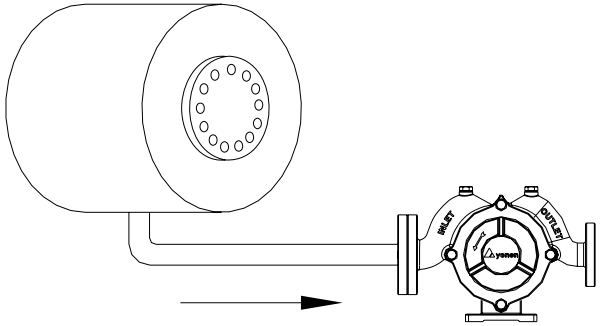
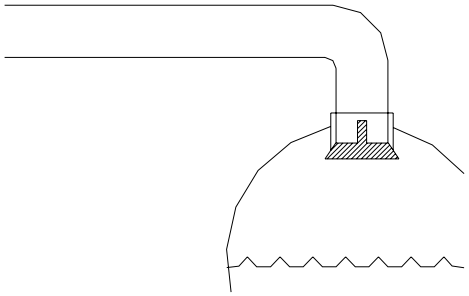
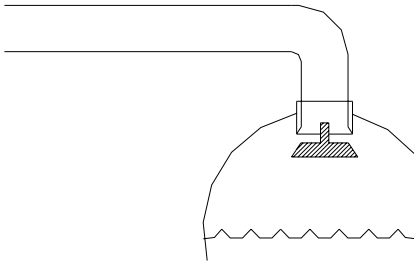
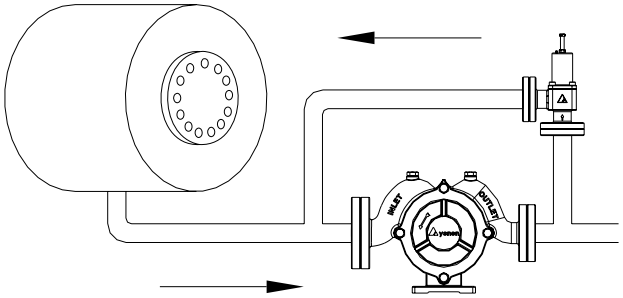
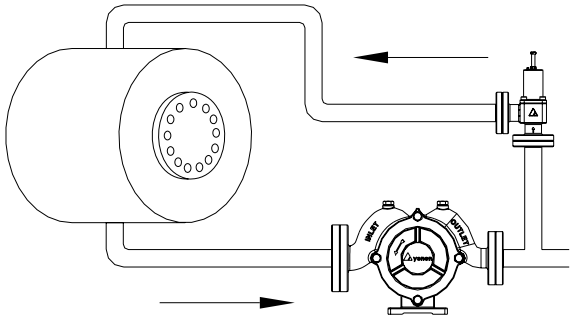


No	Part No	Part Name	Qty
1	50301190	Body	1
2	50300690	Bearing Bushing	1
3	50300790	Cover	1
4	04853690	O-ring	1
5	04853590	O-ring	1
6	04853390	O-ring	1
7	50301790	Grease Seal	1
8	50301590	Seal Housing	1
9	50300190	Mechanical Seal	1
10	08000790	Pin DIN1481-5x12	1
11	50301290	Seal Sleeve	1
12	08310690	Retainer Ring	1
13	50300990	Impeller	1
14	50300890	Impeller Key 6x6x25 DIN 6885	1

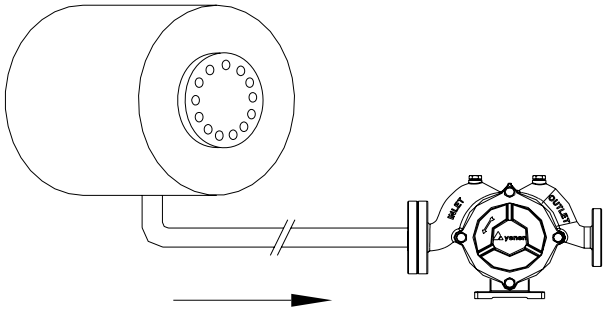
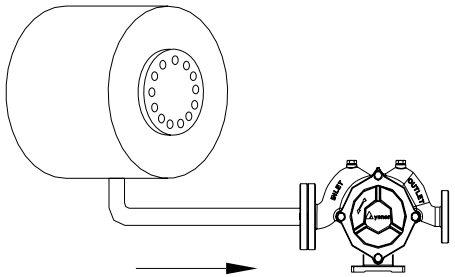
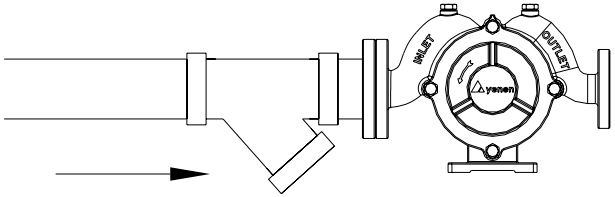
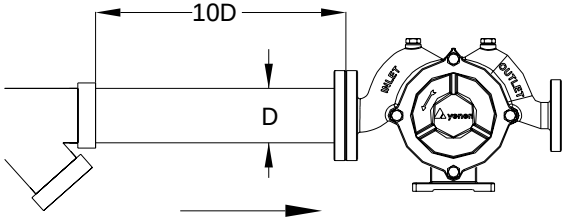
No	Part No	Part Name	Qty
15	08104190	Hex Head Bolt M14x40	4
16	50300590	Pipe Plug ¼" NPT	2
17	50300390	Shaft Key 6x6x32 DIN 6885	1
18	50300290	Bearing Plate	1
19	08150590	Allen Head Bolt M10x30	4
20	50301490	Bearing	1
21	50301090	Shaft	1
22	08310790	Retainer Ring	1
23	50301390	Bearing	1
24	08310890	Retainer Ring	1
25	50301690	Bearing Cap	1
26	08310790	Retainer Ring	1
27	50300490	Grease Nipple DIN71412 AM8x1	2
28	04853990	O-ring 2x22	1

REMARK	NO	YES
Pressure drop caused by restriction in suction line will cause vaporization and cavitation	 Do not use restricted inlet line!	 Use inlet line larger than pump suction nozzle. Same size nozzle OK on short runs.
An eccentric reducer should always be used when reducing into any pump inlet where vapor might be encountered in the pumpage. The flat upper portion of the reducer prevents an accumulation of vapor that could interfere with pumping action.	 Concentric Reducer	 Eccentric Reducer
Low spots in bypass line can collect liquid which prevents normal vapor passage for priming purposes just like the trap in the drain of a kitchen sink. This is not a problem for bypass lines where vapor elimination is not required	 Do not allow bypass line to have low spot.	 Keep return line level or go up toward tank!

ABOVE GROUND INSTALLATION TIPS

REMARK	NO	YES
Since liquefied gases boil when drawn into a pump by its own suction, the pump must be fed by gravity flow to give stable, trouble-free operation.	 Never locate pump above level of liquid feeding pump. Product must be able to flow by gravity into pump.	
Positive closure of back check valve prevents proper vapor return for pump priming.		
Always pipe bypass back to tank! Make sure bypass line is large enough to handle full pump flow without excessive pressure build-up. Note that bypass line must be capable of bypassing full pump capacity without excessive pressure build-up. High pressure rise can cause bypass valve to chatter and vibrate.		

ABOVE GROUND INSTALLATION TIPS

REMARK	NO	YES
⚠	 Do not place pump far from tank!	 Locate pump close to tank! Directly under is best
⚠	 Do not locate restrictive fittings or elbows close to pump inlet.	 Best rule is 10 pipe diameters straight pipe upstream from pump! Not always possible.

SAFETY

The alignment of the coupling must be made correctly. If the couplings are not aligned correctly, they will cause an increase in temperature and noise.

The coupling will move axially between the pump and electric motor shaft and they may touch to these parts, if they are not fixed well enough. Because of this contact, sparks or an increase in temperature may occur.

The coupling must have ATEX certificates.

The grease used should be resistant to a temperature of 130 ˚C.

Yenen LPG pump and the electric motor must be mounted on a single piece metal chassis. The chassis must be made of stainless steel and min.6 mm thick. Thinner or partite chassis will cause vibration, a shorter lifetime of bearings and an increase in temperature.

The Yenen LPG Pump must be connected to an explosion-proof motor.

The electric motor should have a counter-clockwise rotation when you look at the direction from pump to the electric motor. Please check the user manual. In case the electric motor runs in clockwise direction, there will be excess pressure and temperature on the suction end of the pump.

The pump should not be operated dry, otherwise the temperature may increase because of the contact between the turbine and pump body. This action may also cause scratches on the sensitive surface of mechanical seal. To avoid dry operation of pump, a foot valve should be installed at the end of the suction pipe in the tank, and a check valve should be installed to the outlet of the pump.

If there are any unwanted particles inside the LPG, they may damage the mechanical gasket causing a gas leakage. The user is responsible of ensuring the cleanliness of the LPG inside the tank.

During the installation or disassembling pump and pump parts, you must use tools which will not create sparks in order to avoid explosions.

In pipe system of LPG stations, LPG dispensers are used to shut the pressure line of the pump. If the dispenser is not working, a bypass valve should be installed on the pressure line. In case no bypass valve is used, pumping to a closed line will cause a sudden increase in pressure and temperature inside the pump.

Bypass valve protects the pumps and motors against sudden pressure increase in the system.

Circulation of LPG through the bypass valve for a long time may cause a rise in temperature of the pump and pump liquid. This situation may bring out a possibility of explosion. For this reason the LPG pump must be operated together with the LPG dispenser simultaneously.

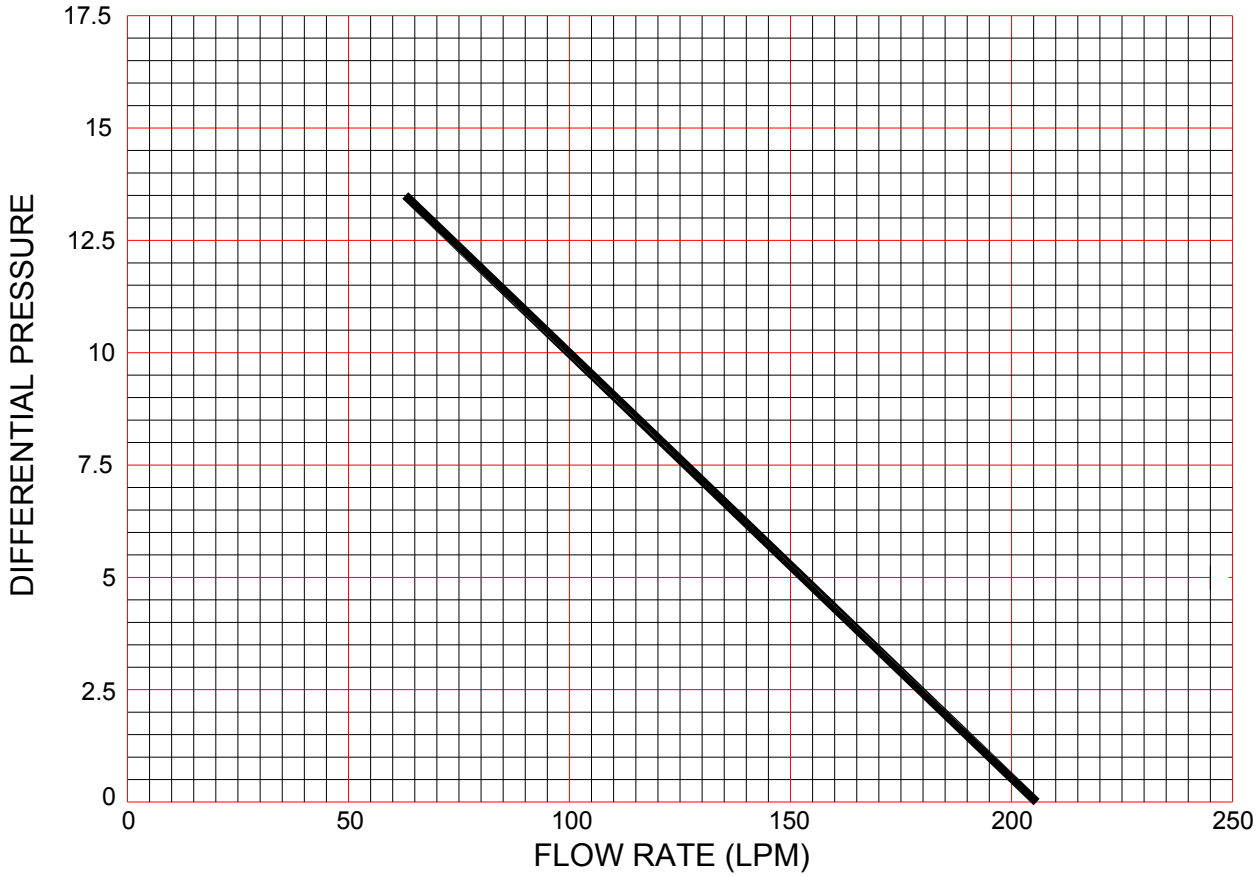
Except bypass valve, some other security valves must be installed in the pipe system in order to ensure a safety against pressure increase.

APPENDIX A
MECHANICAL AND MATERIAL SPECIFICATIONS

MECHANICAL SPECIFICATIONS	
Inlet connection	DIN2635 flange (optional 1½" ANSI 300# flange)
Outlet connection	DIN2635 flange (optional 1" ANSI 300# flange)
Flow	125 lpm @ 7.5 bar
Maximum working pressure	27.6 bar
Maximum differential pressure	17.2 bar
Recommend temperature range	-30°C up to +90°C
Maximum motor load	15kW (20Hp)
Rpm	2880 @ 50Hz or 3450 @ 60Hz

MATERIAL SPECIFICATIONS	
Pump body	Ductile iron
O-ring	NBR
Mechanical seal assembly	P752N (DIN24960)
Seal metal parts	Stainless steel
Seal rotor	Carbon
Seal housing	Bronze
Impeller	Bronze
Shaft	Steel
Retainer ring	Steel

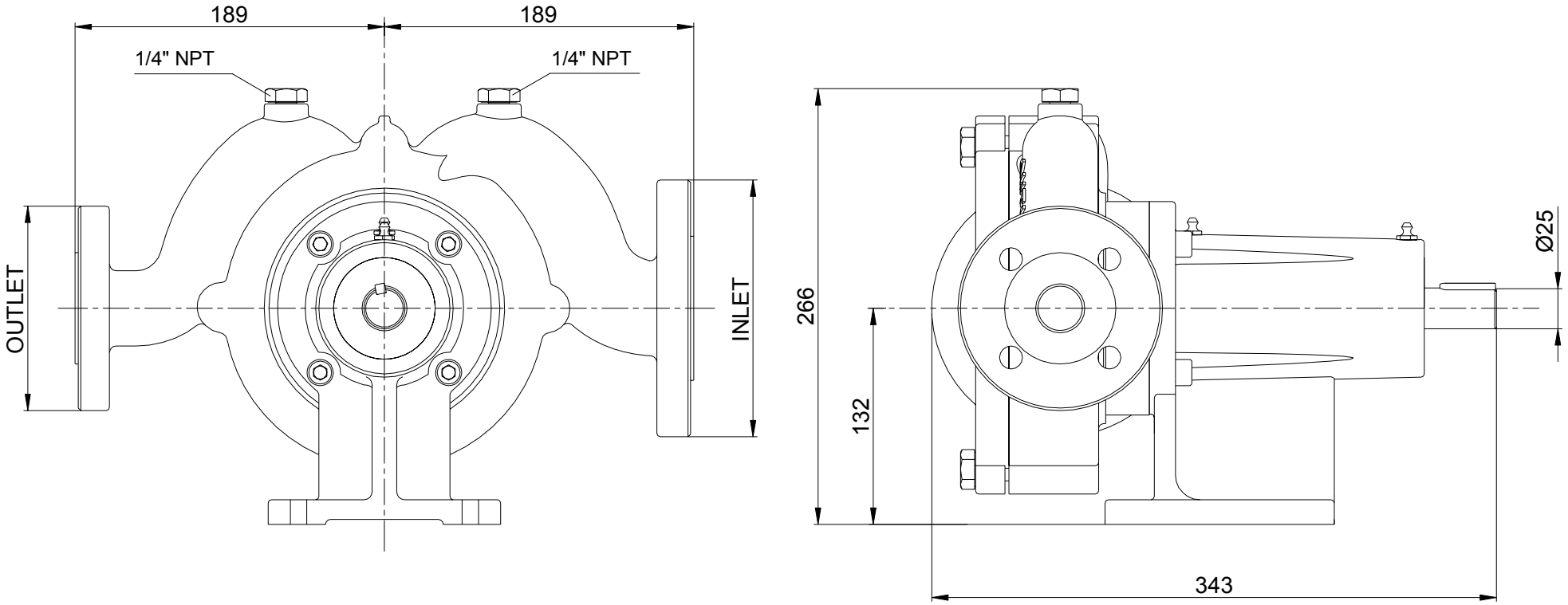
APPENDIX B
YENEN LPG PUMP PERFORMANCE CURVES



Tested with:

- Autogas: 70% propane
  30% butane
- 5.5 kW motor
- 50Hz, 2880 rpm

APPENDIX C
YENEN LPG PUMP - OUTLINE DIMENSIONS



FLANGE SIZES	
INLET	OUTLET
DIN 2635 , PN 40 , 40mm	DIN 2635 , PN 40 , 25mm
1 ½” ANSI 300 lb (optional)	1” ANSI 300 lb (optional)

APPENDIX D
TROUBLESHOOTING GUIDE

In diagnosing pump and "system" troubles, the following information is essential:

1. Pump model and serial number
2. Electric motor; hp and RPM
3. Product specific gravity
4. Product temperature
5. Pressure at pump's suction port
6. Pressure at pump's discharge port
7. Pressure in the storage tank
8. Pressure in the tank being filled
9. Size and length of the discharge pipe and hose

Problem	Cause	What To Do
Low Capacity 	Pump speed too low Wrong electric motor	Check the RPM of the electric motor.
	High differential pressure	Remove the restrictions in the discharge piping / hose, or increase their sizes.
	Vapor lock	Regenerative turbine pumps "vapor- lock" when reaching their maximum differential pressure capability. See above for high differential pressure.
	By-Pass valve stuck open or set too low	Readjust, repair or replace the by-pass valve
	Clogged strainer	Clean strainer screen.
	Worn impeller	Replace the impeller.
	Suction pipe too small or restricted	Indicated by pump's inlet pressure dropping when the pump is started. Remove restrictions and/or increase pipe size.
Pump runs but no flow 	Valve closed	Check valves and make sure they are in the open position.
	Excess flow valve slugged or closed	Stop pump until the excess flow valve opens. If the problem continues, install a new or larger capacity excess flow valve.
	Wrong rotation	Check the rotation of the electric motor and change the rotation.
	Suction pipe too small or restricted	Indicated by pump's inlet pressure dropping when the pump is started. Remove restrictions and/or increase pipe size.
Pump will not turn – locked 	Foreign matter in the pump	Clean out the pump – inspect the strainer screen.
	Bearing seized	Replace the pump's bear
	Moisture in the pump	Thaw and break loose carefully. Check with the product supplier if the product contains water. Properly remove the moisture from the product.
Pump will not build pressure 	Poor suction conditions	Check the storage tank excess flow valve – Clean or restricted. Remove restrictions and/or increase pipe size.
	By-Pass valve set too low	Set the valve for higher pressure
	Too much impeller's clearance	Do a Performance Test on the pump

APPENDIX D (CONTINUED)
TROUBLESHOOTING GUIDE

Problem	Cause	What To Do
Noise or vibration in the pump 	Cavitation from poor suction conditions	Make sure all valves are open, look for restrictions on the suction piping and clean the strainer screen.
	Coupling misaligned	Align the coupling.
	Coupling or coupling guard loose	Tighten the coupling and its guard.
	Coupling rubber insert worn or damaged	Replace the rubber insert and check coupling alignment.
	Worn bearings	Replace if necessary – Lubricate every three months.
	Defective or wrong size By-Pass valve	Confirm the size of the by-pass valve required for your application. Inspect, repair or replace the valve.
	Loose anchor bolts	Tighten all pump's anchor bolts.
Electric motor gets hot or overload protection kicks out 	High differential pressure	Check the motor's full load amperage. Adjust the by-pass valve setting to a lower setting. See recommendations for low capacity due to high differential pressure.
	Low line voltage	Check line voltage when in operation. Be sure motor is wired for the proper voltage. Check the electric motor's nameplate.
	Starter overload Heaters too small	Check the motor load with an ammeter and confirm the heater size with the starter's manufacturer.
	Motor shorted	Totally Enclosed Fan-Cooled electric motors (TEFC) and explosion proof electric motors are subject to moisture condensation inside when used intermittently. To eliminate moisture you might allow the motor to operate at least once a week until it get sufficiently hot to evaporate the
Leaks 	Failed O-rings or mechanical seal assembly	Inspect and replace the seals and O-rings, if needed.

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