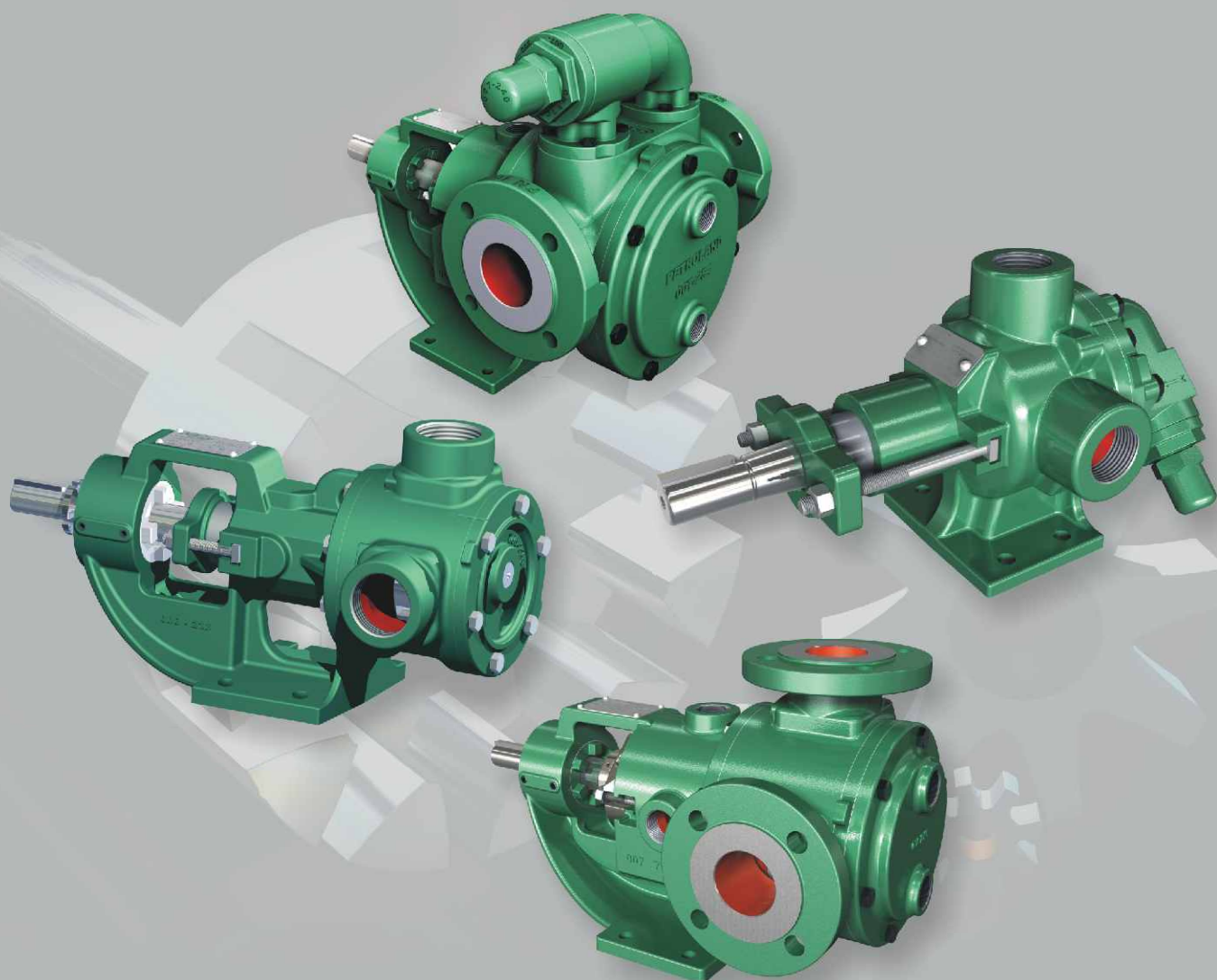




## PD SERIES INTERNAL GEAR PUMP

# User Manual 2010



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## General Information

- This user manual relates to PETROLAND PD Series internal gear pumps.
- The entire user manual must be read thoroughly before the pump is transported, lifted, installed, assembled and any other activity described in this user manual. Everyone who is to work with this pump must read this user manual before it is taken into operation.
- Check that the delivery is complete and undamaged. Any deficiencies or damage must be reported immediately to the transport company and the supplier.
- The user is responsible for compliance with the safety requirements described in this user manual.
- If people who are expected to have a need to refer to the user manual are of a different linguistic origin than the language in which the user manual has been supplied, it is recommended that the user manual is translated into the language in question.
- In addition to the instructions contained in this user manual, we also refer to the prevailing local national laws and regulations. The user is responsible for compliance with these.
- The owner of the pump is responsible for ensuring that everyone who works with the pump has the necessary background.
- In the event that this user manual or other regulations recommend the use of personal protective equipment.
- The pump may only be used under the operating conditions specified when the order was placed. Any deviation from this requires, the user should contact supplier.
- The owner or user of the pump must ensure that this manual is updated.
- In the event that the pump is transferred to a third party, this user manual with any updated amendments and the operating conditions defined when the order was submitted must accompany the pump.

**PETROLAND assumes no liability for any personal injury or damage to the pump or other material damage resulting from:**

- Any amendments to the pump not approved by PETROLAND
- A failure to observe the safety regulations or other instructions in this user manual
- The use of non-original PETROLAND spare parts
- Any fault, blockage or breakdown in the pipe system

**The owner or user is responsible for protecting the pipe system against faults, blockages and explosions.**



## 1. Quality Management System

PETROLAND pumps are manufactured in accordance with PETROLAND's quality management system, which is certified by TÜV NORD in accordance with the requirements of ISO 9001:2000

## 2. Testing of Pumps

- All PETROLAND pumps have been statically and dynamically tested in the factory.
- All bypass valves have been statically tested in the factory.
- Static pressure testing is conducted to ensure that the pumps do not leak, and that they can maintain the specified maximum operating pressure.
- The dynamic test is conducted to ensure that the pump can deliver the specified volume of liquid at the specified pressures.
- The pumps are tested and preserved with oil type VG 68 with a viscosity of about 70 cSt.
- Pumps which will be used for food application are preserved in the factory using vegetable oil.
- Pumps fitted with a heating/cooling jacket are also specially tested to achieve extra safety to ensure that the heating/cooling liquid cannot pass into the pump liquid.
- After testing the pump is emptied, but it has not been cleaned for test oil in the factory.
- If the specific test certificate is demanded, contact PETROLAND to supply it certified by accredited institution accordance with requirements of norm in question.
- The tests described are conducted in accordance with the procedures set out in PETROLAND's quality management system and in accordance with international classification companies.

## 3. Working Principle

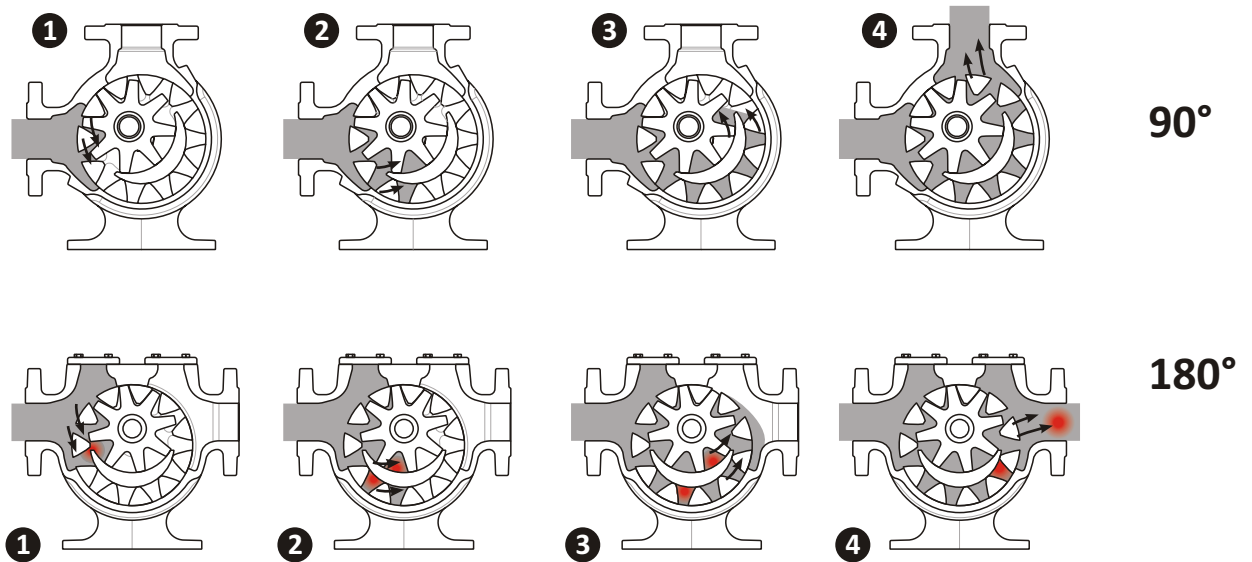


Figure 1: Shows the liquid flow through the PD Series pump – seen from the front end.

## 4. Pump Versions

- This user guide covers all standard versions of the PETROLAND pumps.
- Pump sizes described in *Table 1*: A list of pump sizes based on the internal diameter of the pump's inlet/outlet.
- Pump versions described in the section entitled “**Pump models and sizes**”
- The versions shown in *9.1. Code System*; the codes of the various pump versions together with an explanation of what they mean.

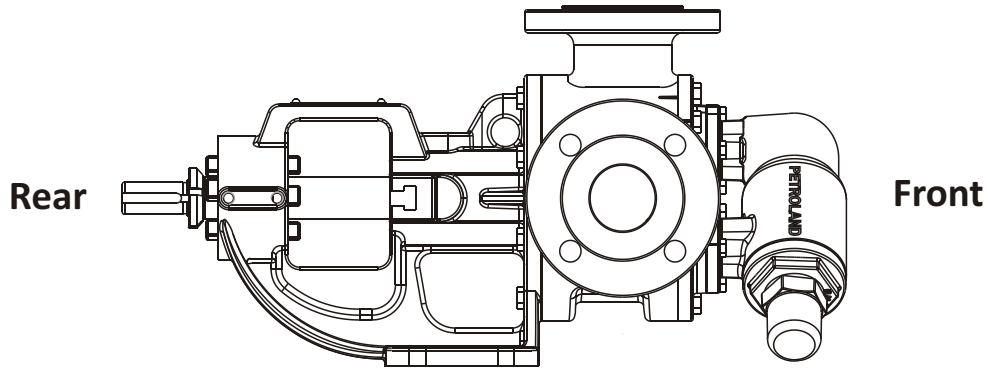




Figure 2: Shows what is designated as front and rear of the PETROLAND pump.
















In this manual the front and the rear ends of the PETROLAND pump are referred to shows which end is called front and which is called rear.

			
www.petroland.com.tr		Tel: 0(216) 634 45 00 Pbx	
Pump Code:			
Flow Rate:	m <sup>3</sup> /h	Pressure:	mSS
Serial No:			

**PETROLAND Pump Label**

## 5. Pump Models and Sizes

### 5.1. PD Series Pump Models

PD SERIES		
		
MODEL: 122	MODEL: 122 (With by-pass)	MODEL: 132 (Jacket on the cover)
		
MODEL: 222	MODEL: 222 (With by-pass)	MODEL: 232 (Jacket on the cover)
		
MODEL: 252 (Jacket on the bracket)	MODEL: 262 (Jackets on the bracket and cover)	MODEL: 332 (Jacket on the cover)
		
MODEL: 422	MODEL: 422 (With by-pass on the cover)	MODEL: 422 (With by-pass on the casing)
		
MODEL: 432 (Jacket on the cover)	MODEL: 452 (Jacket on the bracket)	MODEL: 462 (Jackets on the bracket and cover)

## 5.2. PD Series Pump Sizes

The PETROLAND pump is supplied in the following pump models and sizes:

PD Series					
Model					
122 - 132 - 222 - 232 - 242 - 252 - 262 - 272 - 282 - 292 - 422 - 432 - 452 - 462					
Pump Sizes					
A - B - CL - GL - FL - H - HL - J - JL - K - KL - S - SL - M - ML - N - NL - P - R - Z - ZL					
Size	Inlet / Outlet	Size	Inlet / Outlet	Size	Inlet / Outlet
A	Dn15	J	Dn50	ML	Dn80
B	Dn25	JL	Dn50	N	Dn80
CL	Dn25	K	Dn50	NL	Dn100
GL	Dn25	KL	Dn50	P	Dn125
FL	Dn40	S	Dn65	R	Dn150
H	Dn40	SL	Dn65	Z	Dn200
HL	Dn40	M	Dn80	ZL	Dn250

Table 1: Inlet/Outlet norm accordance with pump size  
(Contact PETROLAND for different connection systems and norms.)

## 6. Heating / Cooling Jackets

Petroland pumps can be fitted with a heating jacket on the front cover, brackets and pump casing. Heating jackets are used to keep the pump liquid fluid, and are often necessary when pumping highly viscous liquids or liquids that tend to coagulate. We recommend that the pump be heated before operation.

The heating/cooling chambers are heated or cooled by connecting a separate circulatory system that circulates heating liquids such as water, steam or oil.



The pressure in the heating jacket may not exceed 10 bar.



The liquid in the heating chambers must have an ignition temperature of at least 50°C above the pump's maximum surface temperature.

The pump's inlet/outlet can be supplied with internal threads or flanges.

## 7. EC Declaration of Conformity

PETROLAND pumps are CE-labelled from the factory and supplied with an EC Declaration of Conformity depending on whether the pump has been bought with or without a motor.

When fitting a PETROLAND pump in an existing system and connecting pumps and motors, we would point out that the whole plant/combination of motor and pump must be assessed and given a new CE label in order to ensure that the combination represents no new hazards with regard to health and safety.

A PETROLAND pump may not be put into operation until this CE labelling procedure has taken place. The manufacturer that ultimately assembles the final system is responsible for ensuring that such compliance is achieved. PETROLAND is not responsible for this compliance. The above requirement is valid within the EC.

## 8. Safety Warnings

### 8.1. Safety Warnings – In General

- The pressure in the heating jacket may not exceed 10 bar.
- Lift the pump mechanically, if the pump's weight is more than the permitted number of kilos that people may lift.
- Do not place fingers in the pump's ports when lifting or handling the pump.
- Motors fitted with lifting eyes must be used to lift the whole pump, but only to lifting the motor separately.
- Lift of the pump should be performed in stable suspension points so that the pump is balanced and the lifting straps are not placed over sharp edges.
- Lift of the pump shall be performed in conformity with the lifting instructions in section **11. Lifting Pump** (Figure 4-5).
- Carefully shield the coupling between the pump and motor.
- Bolt the pump securely to the foundation.
- Clean out any impurities from the pipe system before the pump is connected to it.
- Flange couplings must always be undertaken by skilled professionals.
- Connecting a pump with an internal thread to a pipe with a conical thread can cause the pump casing to burst if the coupling is over-tightened.
- Fit the pump unit with an emergency stop.
- Remove the protective plugs from the pump ports before connecting the pipes.
- Achieve parallelism between the flanges and observe the maximum tightening torque to prevent tension in the pump casing.
- Threaded couplings must always be made by skilled professionals.
- Connect and adjust any monitoring and safety systems – controls, manometers, flowmeters, etc. – according to the operating condition for safe operation.
- If the liquid which will be pumped is not suitable to be mixture with test oil, it is must to clean the pump for test oil before operation.
- Use suitable safety equipment when aerating the pump such as gloves, protective goggles etc. – depending on the pump liquid.
- Never bleed the pump in operation on account of the danger of squirting cold, hot, etching or poisonous liquids under pressure.
- The pipe system must be secured against excess pressure in other ways than using the PETROLAND safety by-pass valve. (See figure 13)
- PETROLAND pumps can be fitted with a by-pass valve on the cover and pump casing to control operating pressure value.
- In the event of liquid properties which may block the bypass valve in its function, other comparable devices should be used instead of the PETROLAND bypass valve.
- Pumps without a PETROLAND bypass valve must use another equivalent safety device which protects pump and motor.
- Any change to the pump's max. operating pressure must be followed by a change to the valve's setting. Valve pressure should be 2-3 bar more than operating pressure.
- Check daily that the max. allowed temperature is observed.
- The pump must be shielded when pumping hot liquids that create a surface temperature on the pump of more than +80° C. A warning sign must be displayed in a clearly visible location!
- PETROLAND pumps may not be used to pump liquids at a temperature higher than the liquid's ignition temperature and with reference to the maximum temperatures specified in the *Table 7* and no higher than the temperature in the *Table 8* depending on the type of elastomer used – and for pumps with bypass valve max. 150°C.
- The shaft seal must not be adjusted during operation.
- When pumping hazardous liquids, circulate neutralising liquid before emptying the pump.
- The system must be depressurised before emptying the pump.



**NEVER OPERATE THE PUMP DRY**

## 8.2. Safety Warnings – In Electricity

- Electrical couplings must always be established by authorised professionals, in accordance with the prevailing standards and directives.
- It is must to obey the national laws and local regulations addition to instructions of motor manufacturer.
- Set the protective motor switch maximum to the motor's rated current.
- Grounding must be connected to motor.
- It is must to check the motor plate to correct voltage, phase and frequence values are all adequate for local main network values before start-up.
- It is must to shut-off all electrical connections before any perform on motor/pump.
- Cables must to have no contact with pipe line, pump and motor body.
- Safety fuse must be adjusted accordance with operation values or 5% greater.
- We refer to use PTC (Passive Thermal Control-Thermistor) for motor. If PTC exists, contacts should be connected to motor's terminal box. This connection should be followed with control panel thermistor relay connection.
- Before electrical supply connected, check the shaft that can be rotated by hand easily.
- Schematics of motor connection should be found in terminal box or user manuals.
- Connection type is chosen accordance with power, main supply valves. Connection types of terminal box are shown on Table 2 and Figure 3.

Electrical Connection		
Main Supply Voltage / 3 ~ 400 V		
Delta Connection (4a)	Star Connection (4b)	Delta-Star Connection (4c)
$\Delta$ - Start	Y - Start	Y / $\Delta$ - Start

Table 2: Types of Electrical Start

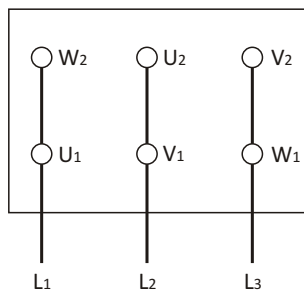


Figure 3a.  $\Delta$  – Connection

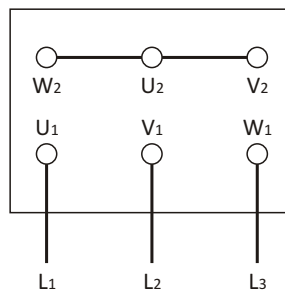


Figure 3b. Y – Connection

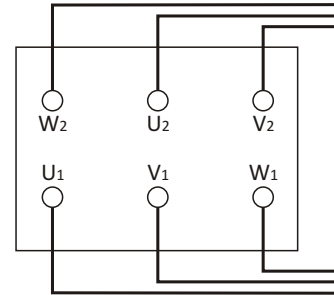


Figure 3c.  $\Delta$  / Y – Connection

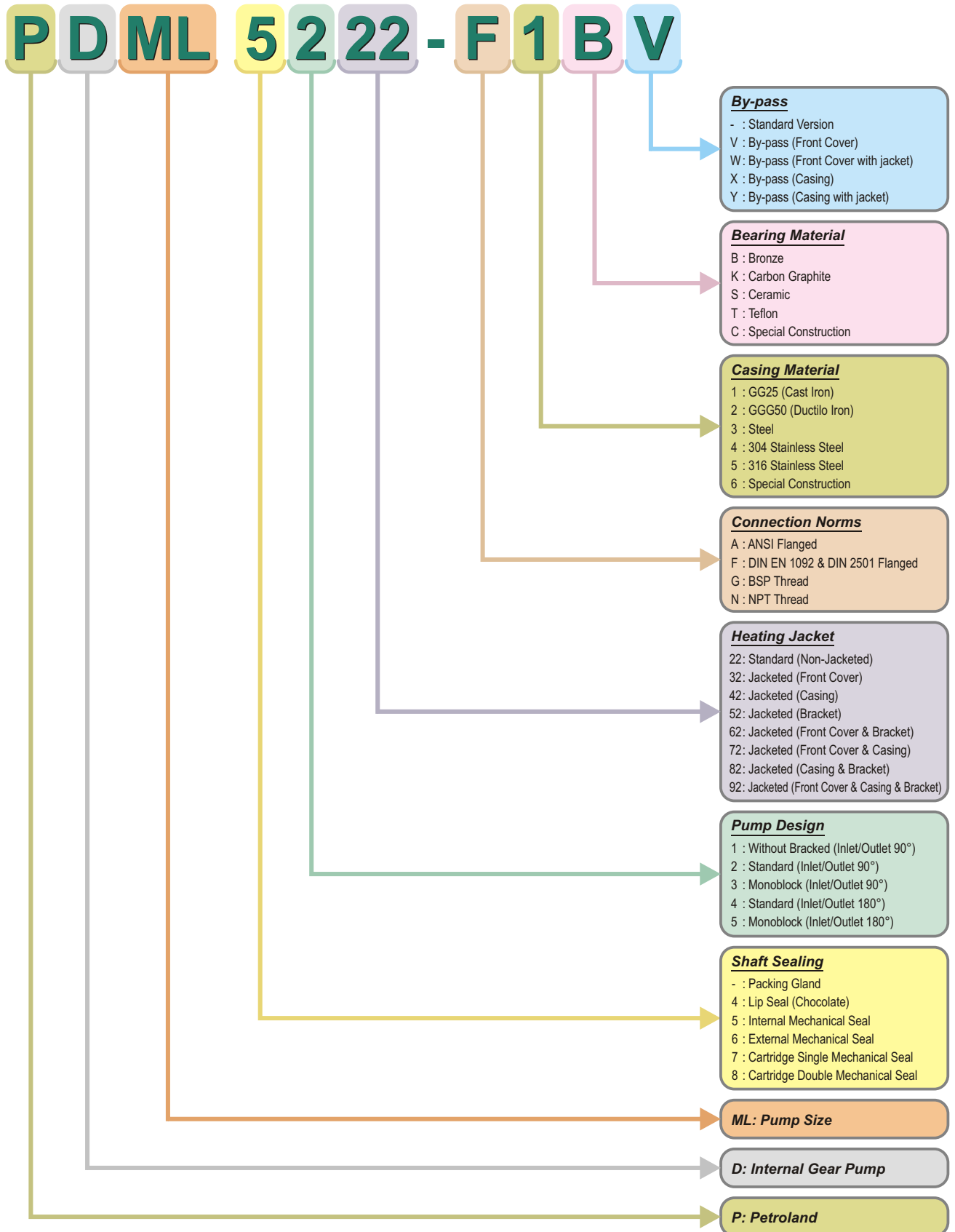
Figure 3: Electrical Connection Schematics

## 9. Pump Models and Versions

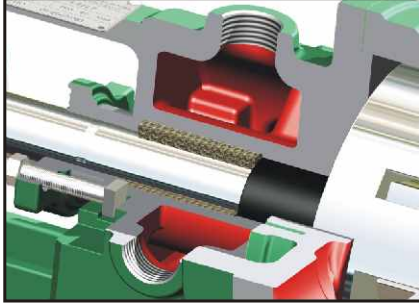
The PETROLAND pump has a modular construction, and can be supplied in a large number of models. The pump's designation is made up of a series of codes which describe various features of the pump. Below is an example of some of the codes.



## 9.1. Pump Code System



## 9.2. Pump Accessories (Cut-away view)



*Jacket on bracket*



*Jacket on cover*



*Cartridge mechanical seal*



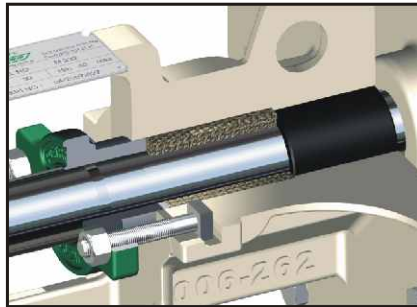
*Pressure relief valve (By-pass)*



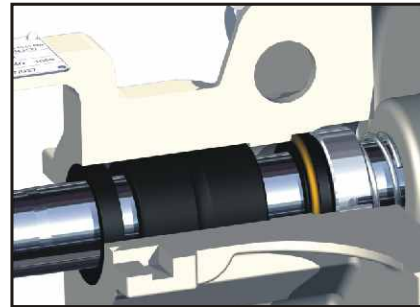
*By-pass valve with jacket*



*Ball bearing for pump coupled  
Belt -Pulley*



*Soft shaft seal*



*Mechanical seal (Inner mounted)*

## 10. Transporting the Pump

The pump must be secured properly on pallets or similar before transport and shipment. The pump should be transported in such a way that it is not damaged by impacts or blows during transit.

## 11. Lifting the Pump

If the pump's weight is more than the permitted number of kilos that people may lift in accordance with the prevailing national rules at the location, it must be lifted mechanically.

We refer to the prevailing national rules at the location!

- Lift the pump mechanically, if the pump's weight is more than the permitted number of kilos that people may lift.
- Do not place fingers in the pump's ports when lifting or handling the pump.
- Motors fitted with lifting eyes must be used to lift the whole pump, but only to lifting the motor separately.
- Lift of the pump shall be performed in conformity with the lifting instructions (see Figure 4-5).
- Carefully shield the coupling between the pump and motor.
- Bolt the pump securely to the foundation.

The table below shows the weight in kg of the various pump types in the various pump.

Weight of the Pumps (kg)																					
Model	Pump Sizes																				
	A	B	CL	GL	FL	H	HL	J	JL	K	KL	S	SL	M	ML	N	NL	P	R	Z	ZL
122	5	-	-	8	9.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
222	-	8	11	-	-	17	16	42	41	45	44	68	75	76	-	-	-	-	-	-	-
222 F	-	-	13	-	-	19	20	43	42	51	50	75	78	82	165	170	280	300	315	600	720
262	-	-	-	-	-	19	18	43	42	52	50	79	85	85	-	-	-	-	-	-	-
262 F	-	-	-	-	-	21	20	49	48	57	56	85	90	90	184	186	326	348	365	650	790
422 F	-	-	-	-	-	21	20	43	42	51	50	79	83	86	168	170	286	310	335	620	750
462 F	-	-	-	-	-	22	21	49	48	57	56	89	94	94	190	192	333	358	382	660	800

Table 3: Table showing the weight in kg of the various pump types in the various pump sizes.

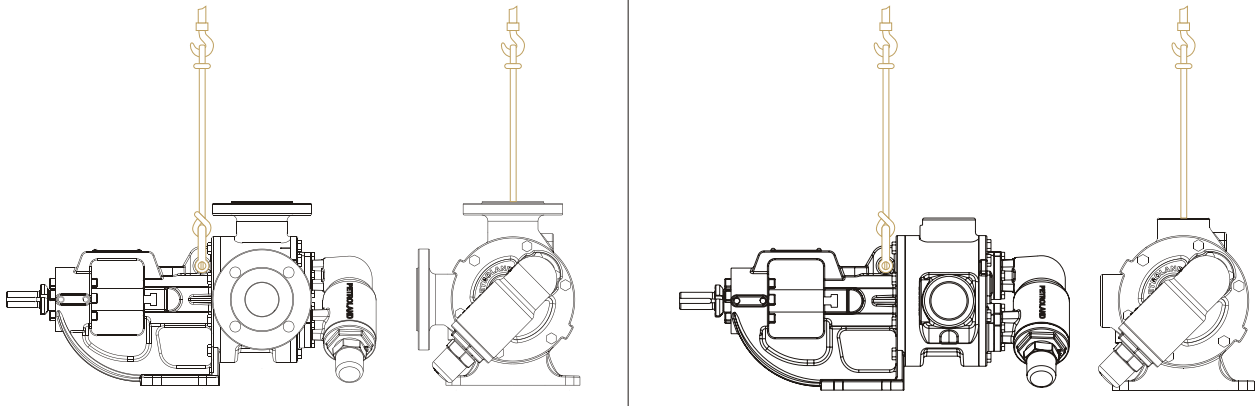
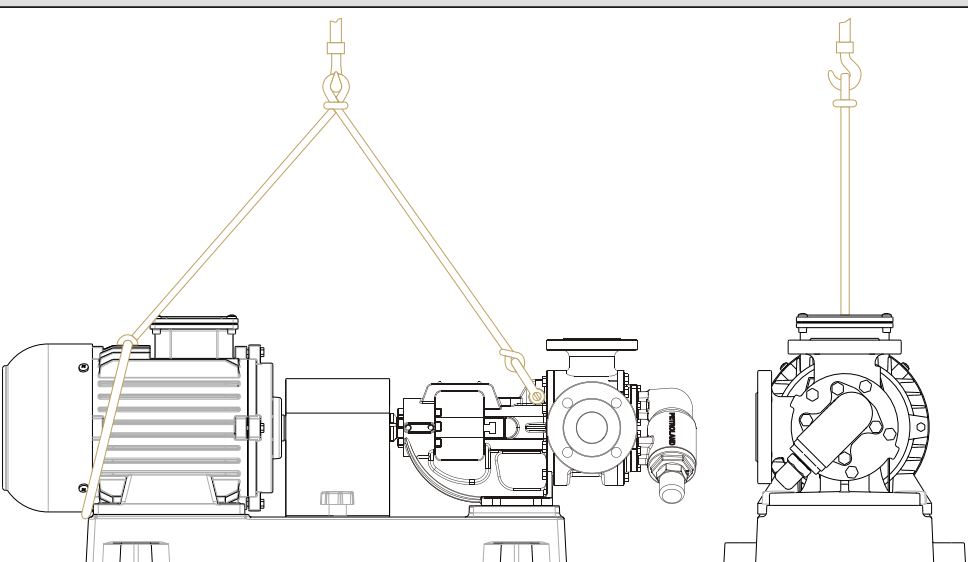
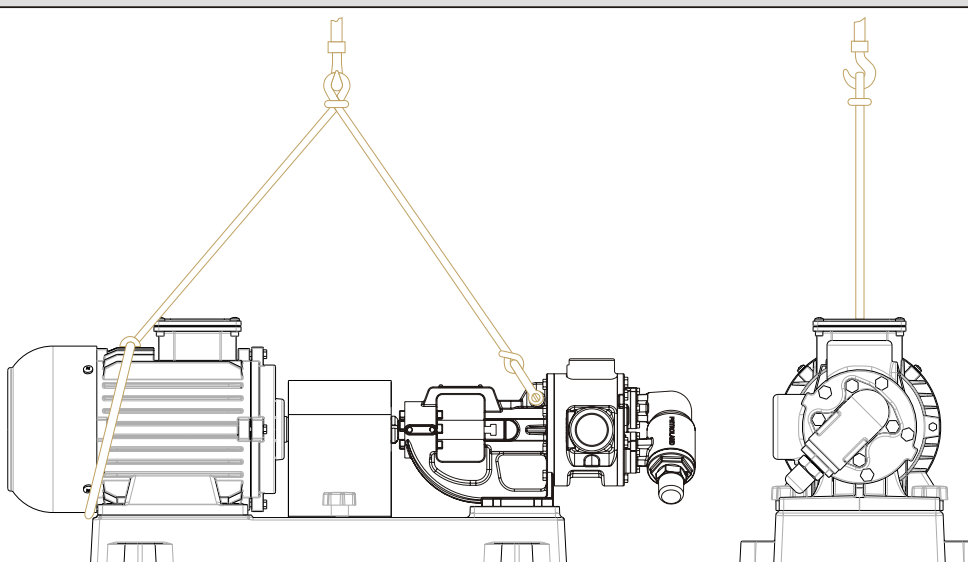
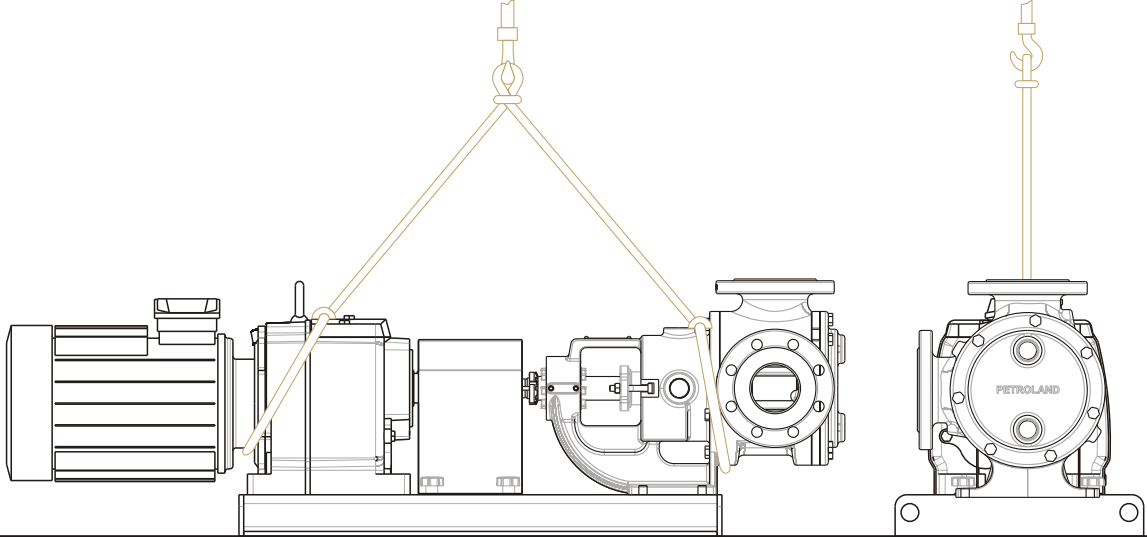
Lifting instructions for pumps	
90° Flanged Port - Bare Shaft Pump	90° Threaded Port - Bare Shaft Pump
	
90° Flanged Port - Pump Coupled with Motor	
	
90° Threaded Port - Pump Coupled with Motor	
	

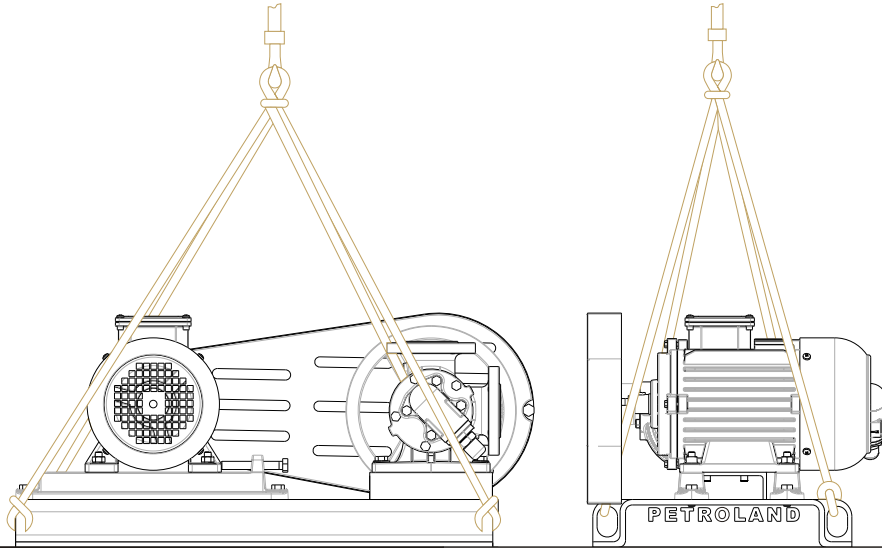
Figure 4: Lifting instructions for pumps 1

## Lifting instructions for pumps

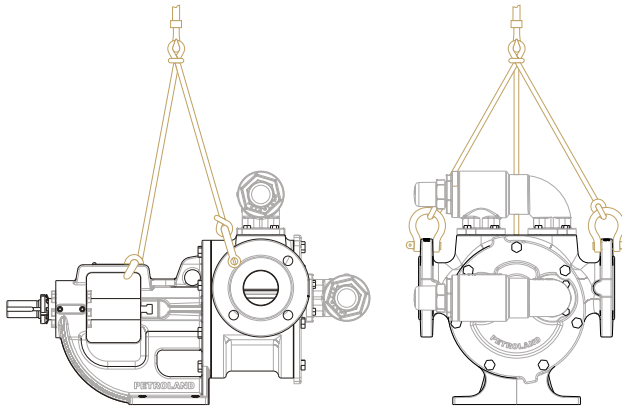
### 90° Flanged Port - Pump Coupled with Gearbox and Motor



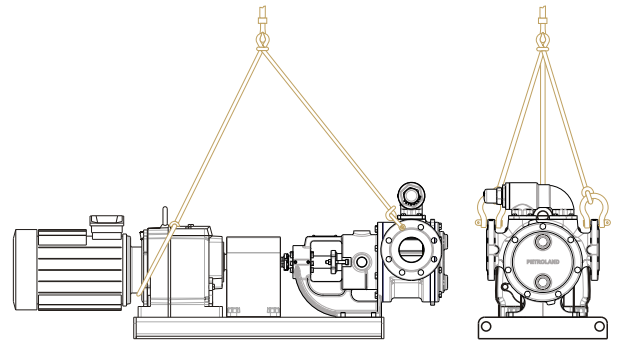
### 90° Flanged Port - Pump Coupled with Belt-Pulley and Motor



### 180° Flanged Port - Bare Shaft Pump



### 180° Flanged Port - Pump Coupled with Gearbox and Motor



Şekil 4: Lifting instructions for pumps 2

## 12. Storage

PETROLAND Pumps are protected against corrosion at the factory. Flanges and pipe couplings are closed using plastic plugs. This protection will last for approximately six months, on the condition that the pump is stored indoors in a dry, dust-free, non-aggressive atmosphere.

- When stored for a longer period of time, the pump must be inspected after no more than six months – depending on the storage conditions.
- The pump shaft must however be turned manually approx. every 4 weeks to avoid standstill damages to bearings and seals.

### Frost Protection

Pumps that are out of operation during periods of frost must be emptied of liquid to avoid frost damage. You can use anti-frost liquids, but you must make sure that the elastomers used in the pump will not be damaged by the liquid used.

Avoid storage:
• In an environment containing chloride
• On foundations with continuous vibrations as the bearings may be damaged
• In unventilated rooms

Recommended storage:
• Indoors in a dry, dust-free, non-aggressive atmosphere
• In well-ventilated rooms to prevent condensation
• Flanges and pipe couplings using plastic plugs
• Pump packed if necessary in plastic film with moisture-absorbing Silica Gel bags

## 13. Connecting the Motor and the Pump

All items in this section must be read and observed by authorized and qualified person when installing PETROLAND pumps.

### 13.1. Aligning the Motor and the Pump



If you intend to use the pump in a potentially explosive environment, the pump must be connected to an explosion-proof motor/gear.



Carefully shield the coupling between the pump and motor. (see Figure 7)

- Before connecting the motor and the pump, check that the pump shaft can revolve easily and regularly.
- When connecting the motor with the pump, you must make sure that the pump shaft and the motor shaft are on precisely the same centre line and that there are a few mm between the shaft ends. (See Figure 7)
- Pumps must be connected to the motor by means of an elastic coupling.
- Pulleys must be aligned correct for belt-pulley connections between motor and pump. (See Figure 8)
- If a PETROLAND standard coupling is used, the pump and the motor are aligned as described in the following section.
- Other couplings are fitted and aligned in accordance with the coupling supplier's instructions – refer to these!



### 13.2. Adjusting the Coupling

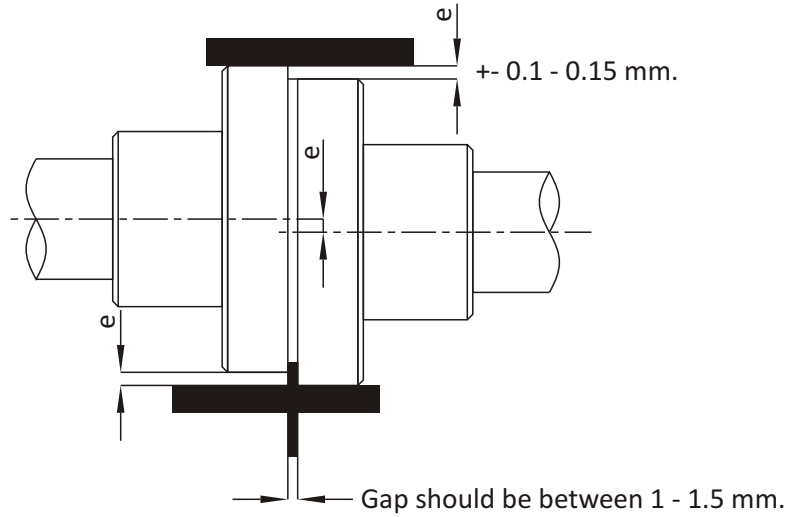


Figure 6: Adjusting elastical coupling

### 13.3. Locating the Pump onto Base Plate

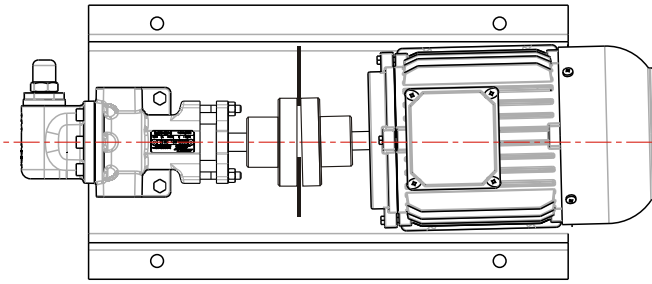


Figure 7a: Horizontantly angular fault and its compensation

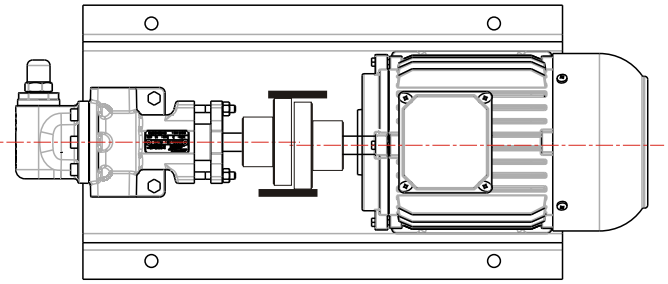


Figure 7c: Horizontantly parallelism fault and its compensation

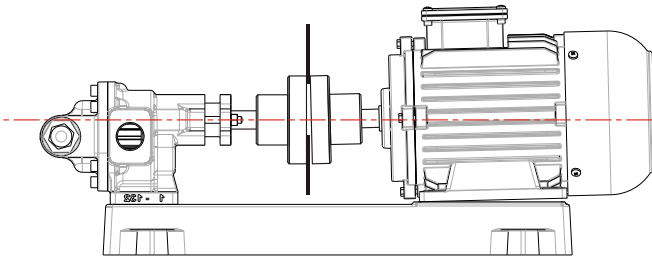


Figure 7b: Vertically angular fault and its compensation

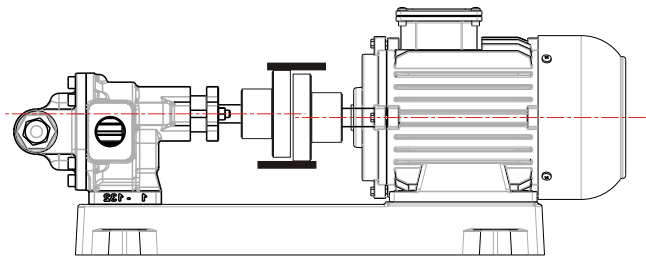


Figure 7d: Vertically parallelism fault and its compensation

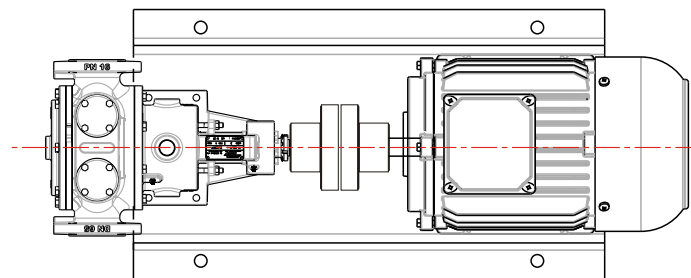


Figure 7: Correct mounting

### 13.4. Alignment of Belt-Pulley Connection

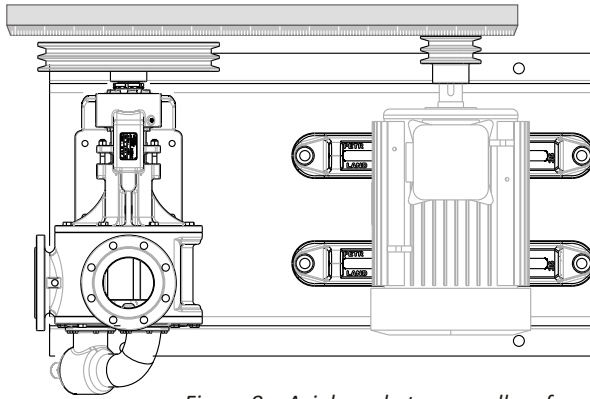


Figure 8a: Axial gap between pulleys faces

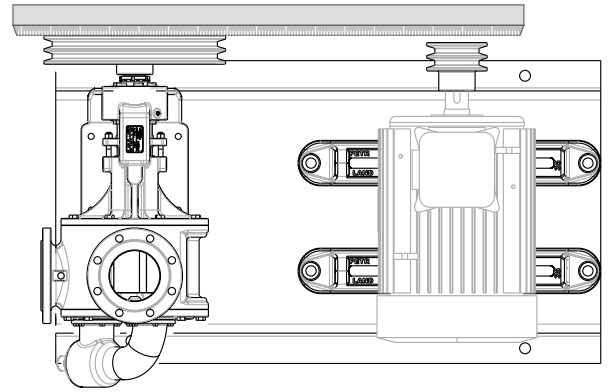


Figure 8b: Axial gap between pulleys faces

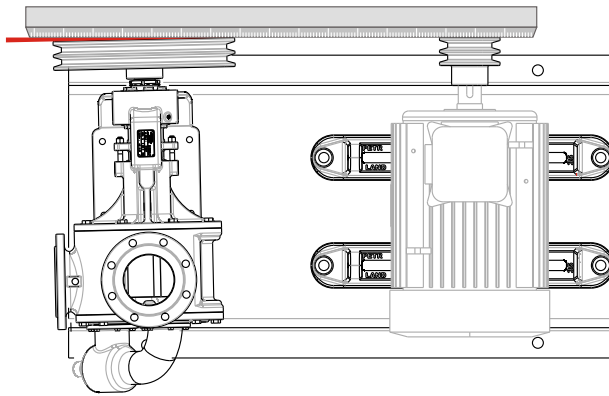


Figure 8c: Angular gap between pulleys faces

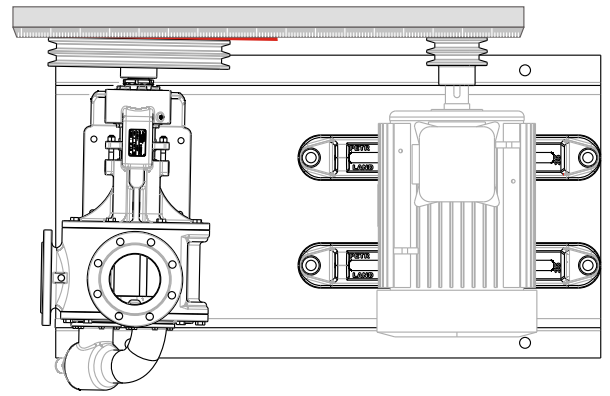


Figure 8d: Angular gap between pulleys faces

Recommended number of groove and belt widths for each type of pumps		
Pump Type	Number of Groove on Pulley	Belt Width
B - CL H - HL	1 GROOVE	17
J - JL K - KL	2 GROOVES	17
S - SL M	3 GROOVES	17
ML - N	4 GROOVES	17
NL - P R	4 GROOVES	22

Table 4: Properties of Belt-Pulley for each pump type.

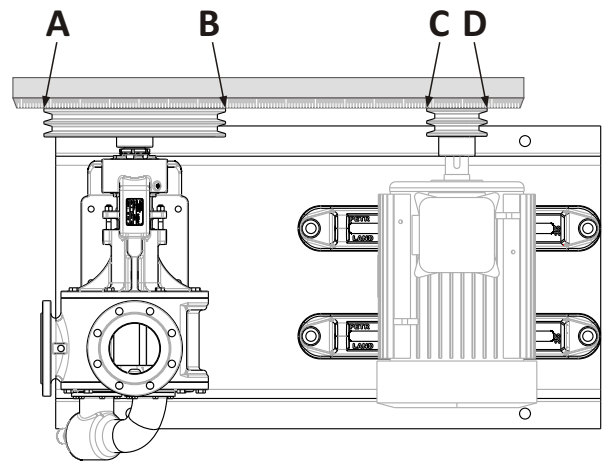


Figure 8: Correct Mounting

Points A,B,C and D shown of Figure 8 must be aligned for the correct mounting.

### Pulley calculation according to operating Speed:

#### Example:

Operating Speed	350 rpm	] 1450 / 350 = 4.14 (Operating transmission ratio)
Speed of motor	1450 rpm	
Diameter of the pulley on pump side	450 mm	] 450 / 110 = 4.09 (Belt Pulley transmission ratio)
Diameter of the pulley on the motor side	110 mm	



Overmuch tightness of belt damages ball bearings of motor and pump. Flexion should be less then belt thickness when the belt is pressed by finger. (See Figure 9)



PETROLAND does not recommend Belt-Pulley connection for 122 and 132 types. Otherwise pumps would be out of Warranty.

### Pulley of motor;

- For motors 0.75 kW -1.5 kW 1450 RPM minimum diameter of pulley is 90 mm
- For motors 2.2 kW -4 kW 1450 RPM minimum diameter of pulley is 100 mm
- For motors 5.5 kW -7.5 kW 1450 RPM minimum diameter of pulley is 100-110 mm
- For motors 11 kW -37 kW 1450 RPM minimum diameter of pulley is 110-130 mm



Figure 9: Belt tension adjustment



Şekil 10: PETROLAND's standard design of protective plate for belt-pulley unless the CE Standard is required.



Şekil 11: Standard design of CE protective plate for belt-pulley.

### 13.5. Minimum Distance Between the Pump and Wall

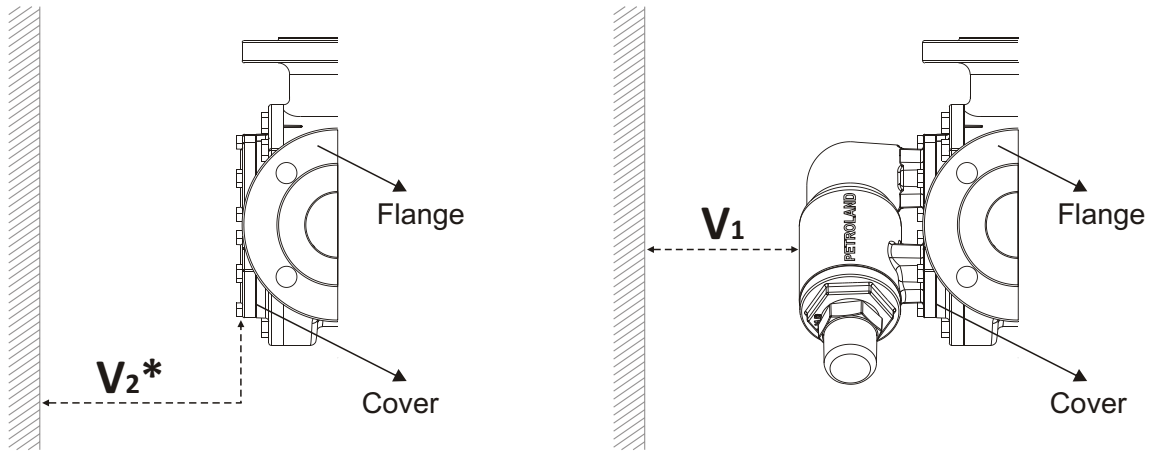


Figure 12: Minimum Distance between the pump and wall.

\* V2 is the distance for the pump which is about fitted with by-pass valve afterwards.

Distance between the pump and wall (mm)																					
	Model																				
	A	B	CL	GL	H	FL	HL	J	JL	K	KL	S	SL	M	ML	N	NL	P	R	Z	ZL
V <sub>1</sub>	45	45	50	50	50	70	70	80	95	85	100	105	135	135	155	155	160	185	210	260	310
V <sub>2</sub>	105	105	110	110	110	130	130	175	190	200	215	225	255	235	345	345	360	385	410	500	600

Table 5: Minimum distance between the pump and wall for each size of pump.

- Pump should be based on non-vibrating surface.
- If the surface is not flat, external materials ought to be used to make the foundation surface flat.
- Afterwards the pump has been based on foundation, the bolts have to be tightened.

### 13.6. "Emergency Stop" Button



Pump must have an **Emergency Stop** button.

If the pump is the part of the whole system, emergency stop button should be placed near to pump foundation.

PETROLAND does not supply the emergency stop button for standard orders. The emergency button should be supplied by other companies.

## 14. Checking the Pump Before Starting

Before starting the pump, check:
• That the pump shaft can be turned around freely.
• That the inlet/outlet diameters are selected correct according to pipe line.
• That the pump is lubricated which is about being operated after long storage term.
• That the maximum service life is suitable for the application.
• That all isolating valves in the suction and pressure pipe are fully open, to avoid the pressure being too high and the pump running dry otherwise the pump may be damaged.
• That any by-pass valve is fitted correctly. (See Figure 17)
• That any by-pass valve is adjusted to the correct opening pressure.
• That the diameter of the suction pipe line does not have size smaller than the diameter of inlet.
• That the pump is filled with fluid if the pump is not suction pump.
• That the pump does not need to be filled with fluid if the pump is suction pump and the suction line lets the fluid flow inside.

## 15. After Starting the Pump

PETROLAND pumps may only run without liquid flow for the short period required for self-priming – with regard to the slide bearings and shaft seals.

After starting the pump, check:
• That the pump is drawing the liquid.
• That there is no cavitation in the pump casing
• That the speed is correct.
• That the direction of rotation is correct. (See Figure 17)
• That the pump is not vibrating or emitting a jarring sound.
• That the stuffing box and bearings are not becoming hot.
• That there are no leaks by the pump
• That the mechanical shaft seal is fully sealed Stuffing boxes with packing rings may, however, permitted a low level of leakage – 10-100 drops of leakage per minute – see section entitled: “Adjustment of soft shaft seal”
• That the operating pressure is correct.
• That the by-pass valve opens at the correct pressure (it is recommended to adjust the by-pass pressure approximately 2-3 bar higher than operating pressure).
• That the pressure in the heating jacket does not exceed 10 bar – if the pump has one.

### 15.1. Cavitation

There must be no cavitation in the pump casing as this results in extensive damage to the pump. The cause of cavitation should be found and the problem solved.

Cavitation is defined as formation and deflation of steam-filled bubbles. This process may exist in areas within the pump where the pressure falls to a level below the steam pressure of the liquid. Always ensure that there is adequate pressure at the pump inlet to avoid cavitation so that the liquid does not boil or evaporate.

Always check that the pump suction pressure is greater than the liquid's steam pressure irrespective of the temperature. Cavitation can be ascertained in the form of vibrations and jarring sound from the pump. It may sound as if gravel was running through the pump. Cavitation arises when the vacuum in the pipe on the suction side is too high.

The increased vacuum may be caused by the following:

- That any filters in front of the pump are blocked or too narrow
- That the liquid viscosity is too high
- That the suction pipe is too long
- That the suction pipe is too narrow

Check if any filters fitted in front of the pump are blocked. If so, clean the filter thoroughly. If there is feed flow to the pump, you should bleed the pump before starting again. If there is no feed flow to the pump, the pump should be filled with liquid before start-up to avoid dry running as no dry running is allowed.

If this does not solve the problem, you should check some of the other options.

If cavitation is due to too high viscosity, the problem may be remedied by fitting a suction pipe with a larger diameter or by heating the pump liquid so to increase the fluidity of the liquid and in this way a lower viscosity.

If cavitation is due to the suction pipe being too long, this may be remedied by moving the pump closer to the tank from which the pump is drawing or by fitting a suction pipe with a larger diameter.

After this, bleed the pump of fill in liquid before starting again.

Bleed the pump by turning the screw on top of the bypass valve fitted on the pump. Bleeding of the pump is completed when excess liquid flows out above.

### 15.2. Running in the Soft Shaft Seal – When Starting the Pump



A soft shaft seal may only be used on pumps in potentially explosive environments if the soft shaft seal is equipped with thermal sensors to control the temperature.

**When starting a new pump, the shaft seal must be run in as described below:**

- Once the pump has started, the shaft seal must leak more than 200 drops per minute to saturate the rings.
- When the shaft seal is saturated – after approx. 30 minutes' operation – the packing gland screws must be tightened gradually, so that the leakage is reduced.
- Check that the gasket does not become hot.  
If the gasket becomes hot, loosen the packing rings slightly, after which you must check that the temperature is falling.
- When the leakage is between 10 – 100 drops per minute, do not tighten the screws any more.  
The number of drops per minute depends on the pump size, pressure and speed.
- The gasket must not be tightened so much that there is no leakage.  
The soft shaft seal must leak continuously.
- The leakage rate must be checked at regular intervals.

## 16. By-Pass Valve

The section below uses both the designations bypass valve and safety valve.

Safety valve is defined as a valve fitted on the pressure pipe in the pipe system and which secures the whole pipe system in the event of constant pressure increase. The safety valve has return flow to the liquid tank.

This information is applicable only safety valve. (see Figure 14)



PETROLAND By-Pass has shown on (see Figure 13)



Figure 13: PETROLAND by-pass valve



Figure 14: PETROLAND safety by-pass valve



If the possibility exists to block the pump's pressure line, the pressure line must be fitted with a bypass valve to take the full liquid volume - as otherwise there is a risk of explosion

The bypass valve secures only pump and motor. The bypass valve does not secure the whole pipe system. The by-pass valve protects pumps in the event of brief pulsating excess pressures and not in the event of constant pressure increase.

Petroland pumps are supplied both *with* and *without* a bypass valve.



The bypass valve is not approved for protection of the pipe system, and therefore it must not be used for this purpose.



The pipe system must be protected against excess pressure by use of the PETROLAND safety by-pass valve. (See Figure 14)



Do not use the valve for constant pressure control – such as "keep-pressure valve"



The liquid volume may not circulate through the by-pass valve for a long period of time. Circulation over a long period of time through the by-pass valve causes a significant heating up of the pump and pump liquid, and this may result in destruction of the pump

Please note that certain liquids' properties or heated liquids may block the bypass valve's function, e.g. paint, chocolate, asphalt, etc.

Blocking of the valve may be caused by the liquid containing particles or the liquid being heated and subsequently coagulating in connection with bypass in the valve.

In such cases it is recommended not to use a Petroland bypass valve, but another device instead.

If liquids possess properties which may block the bypass valve and prevent it from working, you must use another equivalent device rather than a Petroland by-pass valve.

If a pump is supplied without a PETROLAND bypass valve, it will be fitted with a blind cover.

By-pass valve can be supplied with heating jacket if the fluid has possibility to coagulate. (See Figure 15)



Figure 15: PETROLAND by-pass valve with heating jacket

By-Pass Sizes for Pump Sizes		
Pump Type	By-Pass Size	Size of By-Pass with Jacket
A - GL - FL	1	-
B - CL - H - HL	1	-
J - JL	2*	-
K - KL	3	13
M - S - SL	4	14
ML - N	5	15
NL - P - R	6	16
Z - ZL	7	17

Tablo 6: By-Pass Sizes for Pump Sizes

\* 180° Port pumps can be fitted with by-pass number 3.



The liquid volume may not circulate through the by-pass valve for a long period of time. Circulation over a long period of time through the by-pass valve causes a significant heating up of the pump and pump liquid, and this may result in destruction of the pump



Never set or adjust the bypass valve in operation on account of the danger of squirting cold, hot, etching or poisonous liquids under pressure

### 16.1. Working Principle of By-Pass Valve

When the pressure increases in the pump, the pump liquid is forced into the valve's pressure side. If the valve's preset pressure is exceeded, the internal spring is depressed, after which the pump liquid is forced out of the outlet side of the valve and down into the pump again. In this way re-circulation of the pump liquid is created.

This re-circulation may not last for a long period of time, as this will cause the liquid and the pump to heat up significantly.

### 16.2. Setting the by-pass valve

**The bypass valve is always set at the factory. The valve is set in accordance with either;**

- Customer instructions (Usually 2 bar greater than operating pressure)
- PETROLAND's default setting (5-6 Bar)

Any change to the pump's operating pressure must be followed by a change to the valve's setting - the working pressure must however not exceed the maximum allowable pressure of the pump/valve.

**If the valve is not reset, this will mean either of below**

That the valve's safety function fails so that there is a risk of pressure accumulation.

That the valve remains open permanently, creating a significant heating up of the pump and pump liquid – which must

**not** last for a long period of time.



After setting the valve, locknut must be tightened.

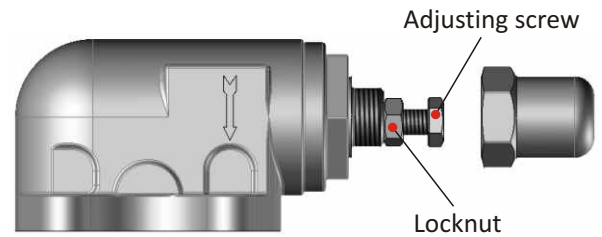


Figure 16: The location of the regulating screw and locknut on the PETROLAND by-pass valve.

### 16.3. Directions of suction / discharge and by-pass valve accordance with direction of rotation

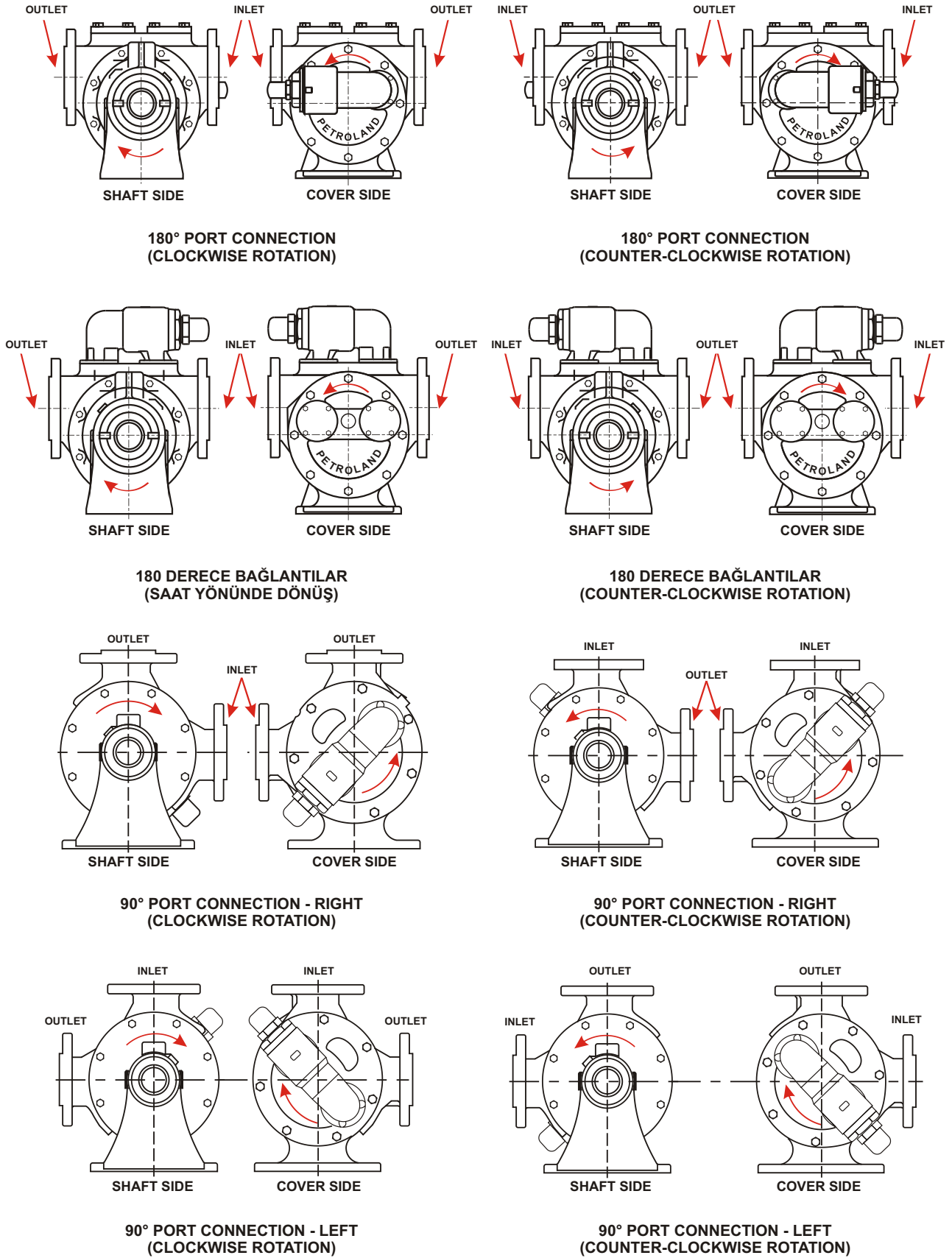


Figure 17: Directions of suction / discharge and by-pass valve accordance with direction of rotation

## 17. Pump Liquids



It should be checked that the max. allowed temperature is observed.



The pump must be shielded when pumping hot liquids that create a surface temperature on the pump of more than +80°C.

A warning sign must be displayed in a clearly visible location!



When pumping hot liquids, the pipes must be fitted with compensators to prevent tensions in the pump casing.

There are various maximum temperatures for Petroland pumps, depending on the pump type and the type of elastomer used, see *Table 7-8*.



Petroland pumps may not be used to pump liquids at a temperature that is higher than the liquid's ignition temperature, depending on the type of elastomer used - and for pumps with bypass valve max. 150°C.

PUMP MODELS	TEMPERATURE
122 - 132 - 222 - 232 - 242 - 252 - 262 - 272 - 282 - 292 - 422 - 432 - 452 - 462	150°C*

*Table 7: Max. temperature value for standart pumps.*

\* The pump liquid's maximum permitted temperature for the standard pump models Temperature can be rised up to 350°C for special application.

Min./Max. Elastomer Temperature		
Elastomer type	Elastomer brand	Temperature
FKM	Viton®	– 20°C / + 200°C
FEP	Teflon® with Viton core	– 60°C / + 205°C
EPDM	Ethylene-propylene	– 65°C / + 120°C
FFKM	Kalrez®	– 50°C / + 316°C
NBR	Nitril	– 30°C / + 70°C
PTFE	Teflon	– 15°C / + 170°C

*Table 8: The pump liquid's minimum/maximum temperature limits for the various elastomers used in Petroland pumps.*

## 18. Maintenance

The pump must be inspected and maintained on an ongoing basis in accordance with the list below.

### 18.1. During daily inspection, check:

- That the pump does not vibrate or emit jarring sounds.
- That there is no cavitation inside the pump casing.
- That lubricated slide bearings are lubricated.
- That open ball bearings are lubricated.
- That there is liquid in connection with liquid-greased slide bearing.
- That any lubricating devices are in working order.
- That any circulation pipes – cooling, heating or pressurized water pipes are in working order.
- That power output and power consumption are correct.
- That flow and operational pressure is correct.
- That the max. allowed temperature is observed.

### 18.2. During weekly inspection, check:

- That any filters and drainage holes are clean.
- That the soft stuffing box is leaking 10-100 drops per minute.
- That mechanical shaft seals are not leaking.
- That the surroundings of the stuffing box and bearings are free from dirt.
- Whether flexible connecting elements are worn. To be replaced if worn.

### 18.3. During monthly inspection, check:

- That the bearings do not have too much play.
- That the bypass valve, if any, functions correctly and opens at the right pressure.
- That the stuffing box is intact. To be after-packed or repacked if worn.

### 18.4. In connection with service work, check:

- All parts for wear and tear. Replace worn parts.
- That all parts are located correctly in connection with assembly.

## 19. Adjusting the soft shaft seal



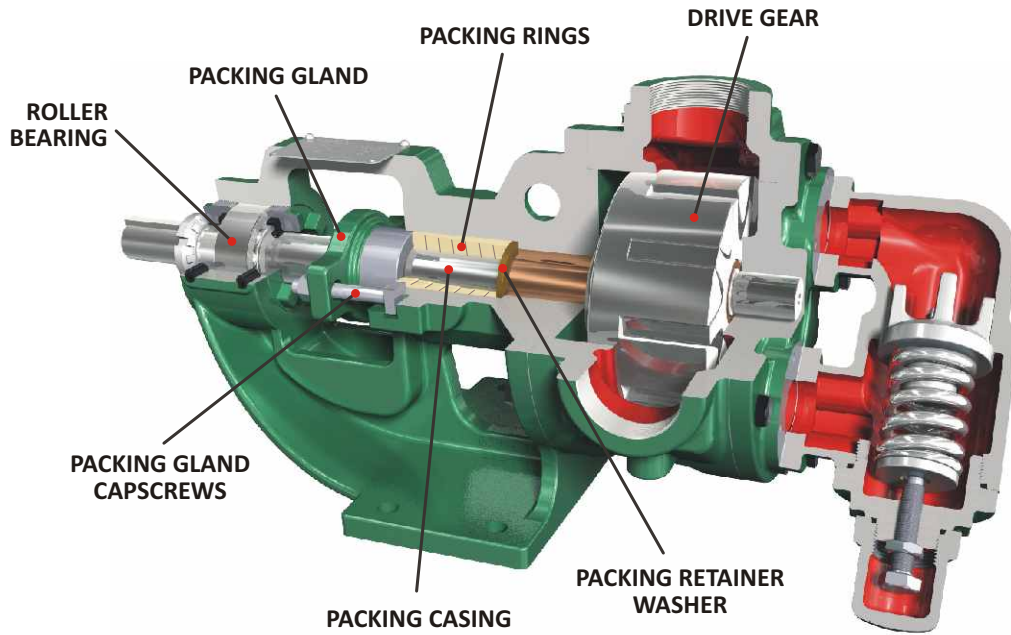
The shaft seal must not be adjusted during operation

It is important that the soft shaft seal leaks during operation, as this provides lubrication and also releases the frictional heat that is generated.

The shaft seal with packing coil requires continuous adjustment, to make sure that the volume of leakage by the stuffing box is correct.

Depending on the speed, pressure, pump size and viscosity, the stuffing box must leak 10-100 drops per minute to remove the frictional heat that is generated between the shaft and the packing rings. If there is insufficient leakage, the heat generated can cause the gasket rings to harden and create increased wear on the shaft.

The leakage described above is achieved by tightening the packing rings axially, so that they apply a pressure against the shaft. This pressure restricts the flow of the liquid, as the play between the shaft and the packing ring is in the order of a few thousandths of a millimetre.



Şekil 18: The location of the soft shaft seal, the shaft seal casing and the packing gland on the pump. The design of the shaft seal casing, does, however, depend on the individual pump application.

#### Repacking – soft shaft seal

1. Pull the packing gland back on the shaft once the screws have been removed.
2. The packing rings can now be pulled out using a packing extractor. (see Figure 19)
3. Check the shaft and the shaft seal housing thoroughly for wear, scratches and deposits.
4. Replace worn parts and remove deposits with care.
5. Always conduct a control measurement of the shaft and the shaft seal housing before specifying the packing dimension.



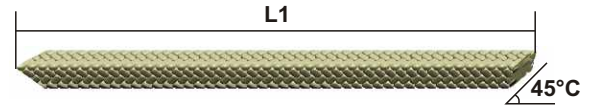
Never use old packing rings when measuring



Figure 19: Repacking with hook tool and packing new rings.



The packing dimension is defined on the basis of the following:



PUMP SIZE	SEAL THICKNESS (mm)	L1 LENGTH	PACKING RINGS
A	6 x 6	94	6 pcs.
B - CL - GL - FL	6 x 6	108	6 pcs.
H - HL	6 x 6	120	8 pcs.
J - JL - K - KL	10 x 10	162	7 pcs.
S - SL - M	8 x 8	166	9 pcs.
ML - N	10 x 10	205	9 pcs.
NL - P - R	12 x 12	270	7 pcs.
Z - ZL	18 x 18	408	7 pcs.

Table 9: The A and B dimensions on the shaft and the shaft seal housing



Figure 20: Packing Gland Rings

- New packing rings are bought as spare parts or produced as described in step below.
- Trim the new packing rings on the shaft or a mandrel of the same diameter as the shaft. Wrap the packing around the shaft/mandrel the number of times that packing rings are to be used, and cut through with a sharp knife.
- If the packing rings are difficult to move into position, they can be rolled with a pipe or similar item. (see Figure 21)  
Never strike a gasket, as the fibres in the material will be destroyed and the sealing property will be significantly worsened.
- Lubricate the individual rings with a little oil to facilitate installation.
- Turn the ring openings so that the two rings lying alongside one another are diametrically offset.
- Finally, tighten the packing gland gently by hand, and restart the pump.



Figure 21: Packing Tool

## 20. Ball bearings

### 20.1. Lubrication of ball bearings



Ball bearings must be lubricated with heat-resistant grease when pumping liquids over 100°C – to guarantee explosion protection.

Ball bearings with one single seal ring or no seal ring require re-lubrication via the lubrication nipple. If the ball bearings require lubrication, they are fitted with a lubrication nipple. The bearings must be lubricated at the lubrication intervals and using the volume of grease as stated in the Table 10.



The re-lubrication interval is halved for every 15°C that the temperature exceeds 70°C.

Example:

Temperature: up to

70°C = 3.500 hours

85°C = 1.750 hours

100°C = 875 hours

Lubrication of Ball Bearing					
Pump Size	Ball Bearing Type	Relubrication interval in hours at max. 70°C	Amount of grease required per relubrication in grams	Min. Service Life in hours at 70°C	Maximum Operating Pressure
B - CL	6304	2.000	6	24.000	16
H - HL	3205	2.000	8	18.000	16
J - JL	2306	1.500	15	12.000	16
K - KL	2306	1.200	15	10.000	16
S	3207	1.200	15	10.000	16
SL - M	3207	1.200	15	8.000	16
ML - N	3309	1.000	20	13.000	16
NL	3313	1.000	20	15.000	10
P	3313	1.000	20	13.500	10
R	3313	1.000	20	12.000	10
Z - ZL	3217	800	25	8.000	10

Table 10: Shows ball bearing types, re-lubrication interval in hours at max. 70°C, the minimum service life in hours and the amount of grease required per re-lubrication in grams for the pump types and sizes indicated.

## 20.2. Service life – ball bearings

Ball bearings with two seal rings have a limited service life, after which they must be replaced. The ball bearing's minimum service life is shown in the Table 10. The ball bearing's service life is reduced to 90% of the value indicated if the pump is to be used in a potentially explosive environment.

Example: Ball bearing's service life = 10.000 hours  
The bearing's service life is also halved for every temperature increase of 15°C above 70°C  
Example: Temperature: up to 70°C = 9000/10,000 hours  
85°C = 4500/5,000 hours

The service life is calculated on the basis of a temperature of 70°C and a viscosity of 1000 cSt. (4500 SSU) and based on the maximum operating pressure of the various pump types.

## 21. Lubrication of slide bearings



Main slide bearings must be lubricated with heat-resistant grease when pumping liquids over 100°C.

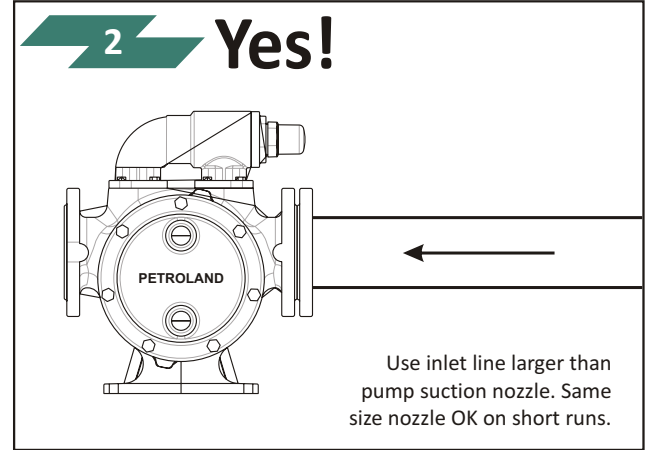
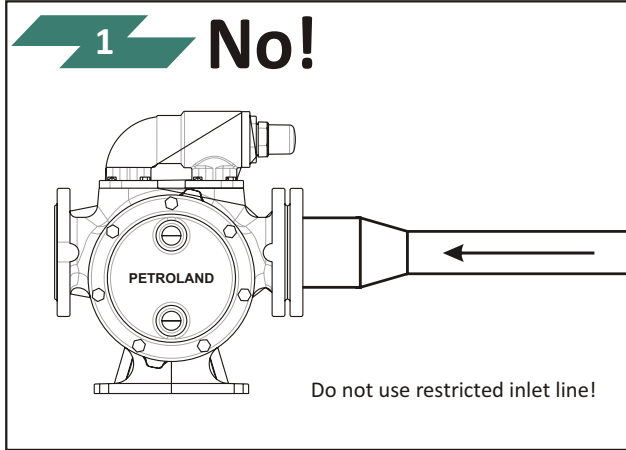
As the re-lubrication interval in particular is largely dependant on the conditions. Contact PETROLAND for correct guidance! The main bearings must be lubricated with a grease type suitable for the liquid and liquid temperature. Contact PETROLAND for selection of the correct grease type!



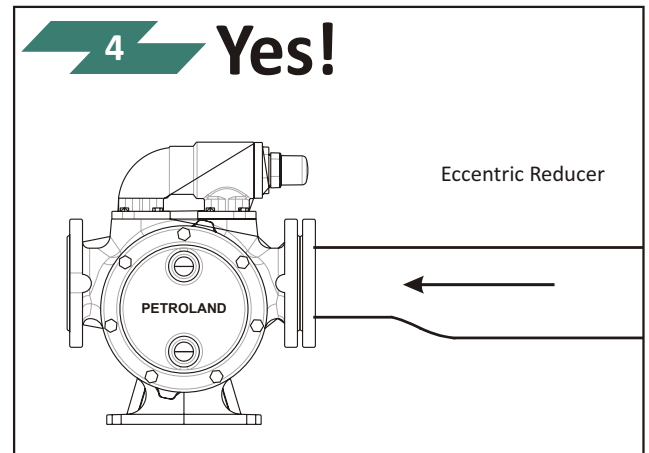
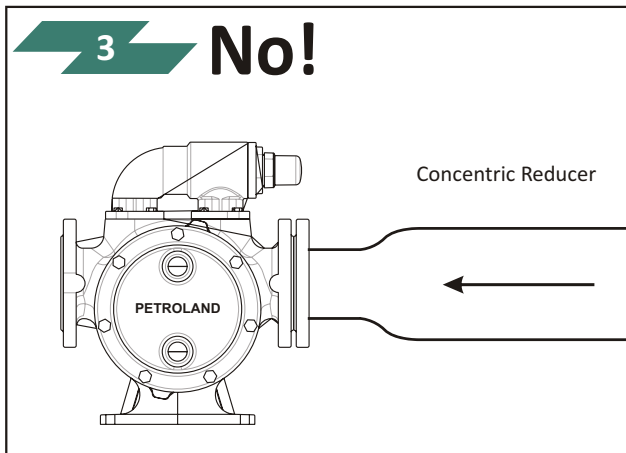
The lubricant for chocolate pumps must not be harmful. The lubricant must be compatible with the chocolate mass.

## 22. Fault of facilities and trouble shooting

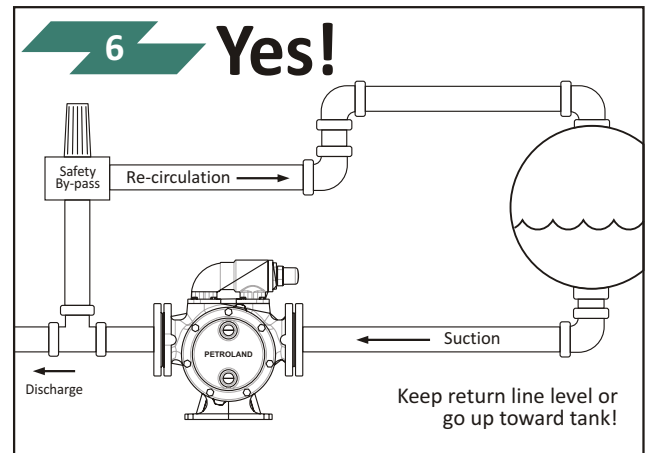
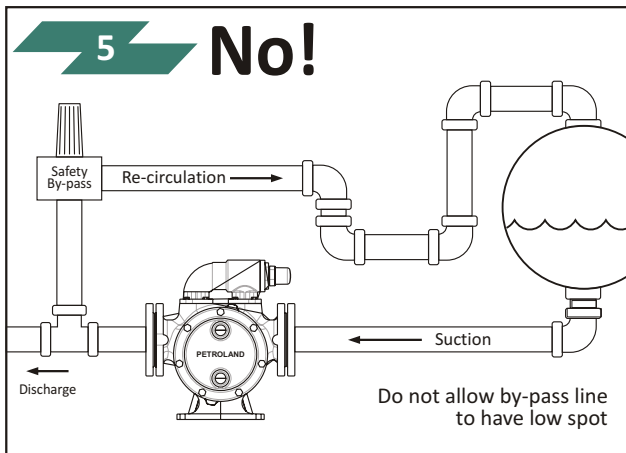
### 22.1. Model 422 (Inlet-Outlet 180°)



Pressure drop caused by restriction in suction line will cause vaporization and cavitation.



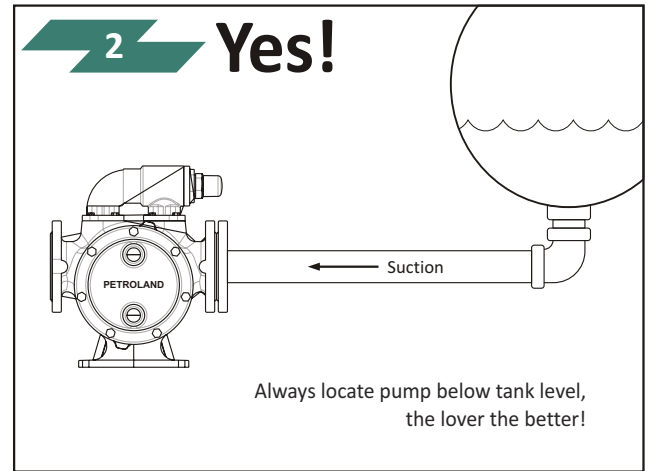
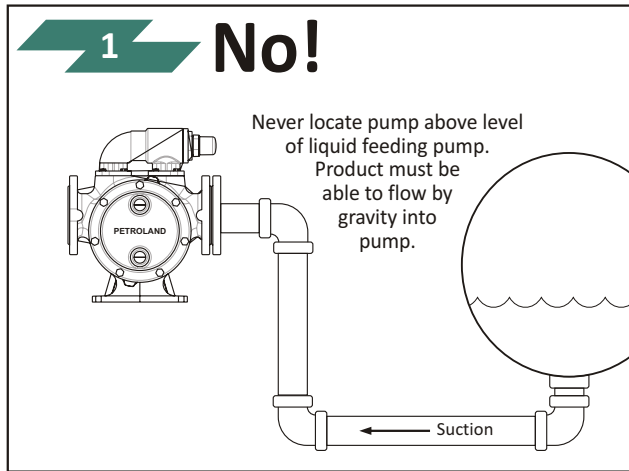
An eccentric reducer should always be used when reducing into any pump inlet where vapor might be encountered in the pumpage. The flat upper portion of the reducer prevents an accumulation of vapor that could interfere with pumping action.



Low spots in by-pass line can collect liquid which prevents normal vapor passage for priming purposes just like the P trap in the drain of a kitchen sink. This is not a problem for by-pass lines where vapor elimination is not required.

Figure 22: Fault of facilities and trouble shooting - 1

**Model 422 (Inlet-Outlet 180°)**



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.

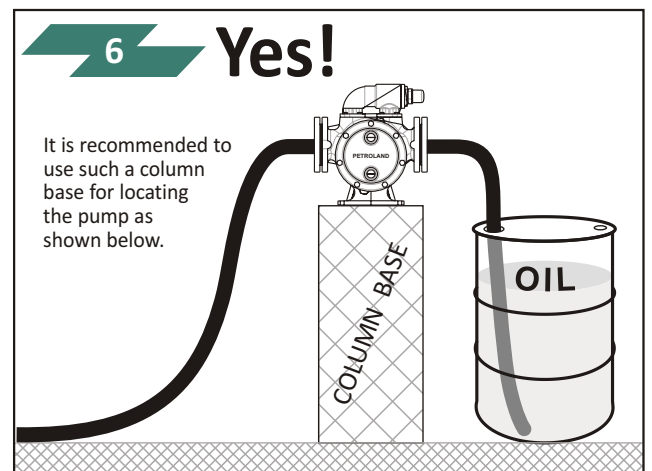
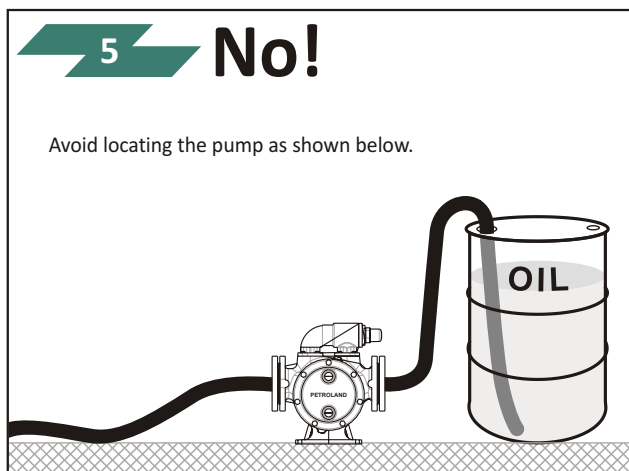
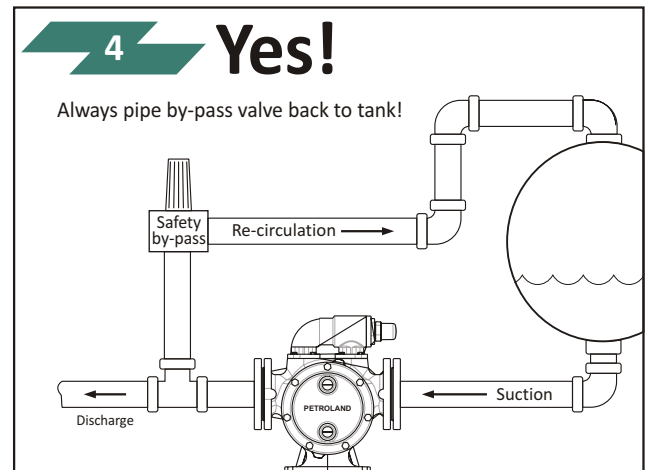
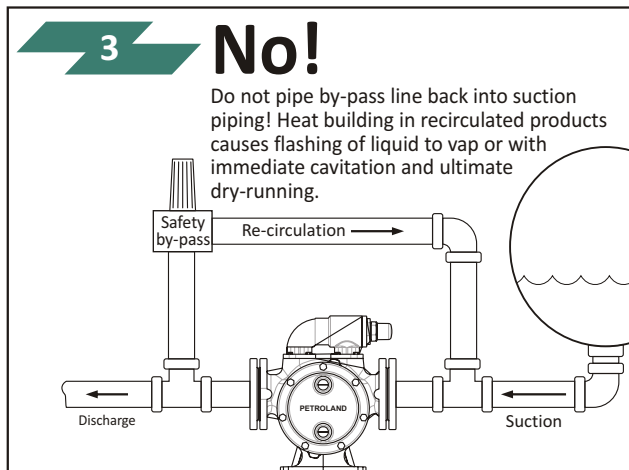
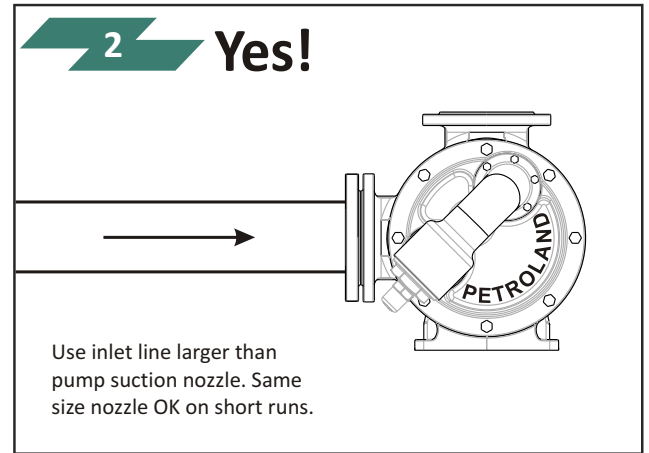
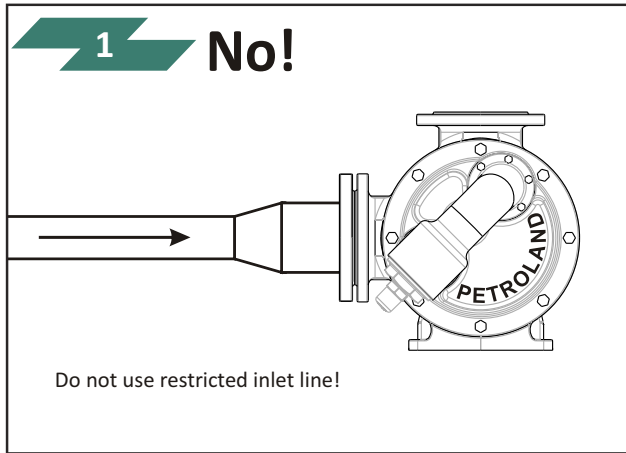
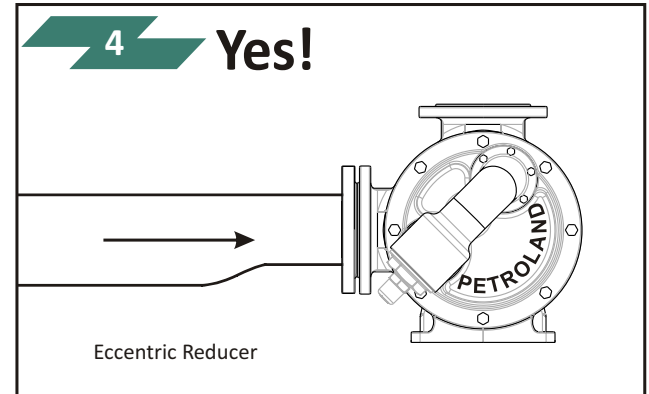
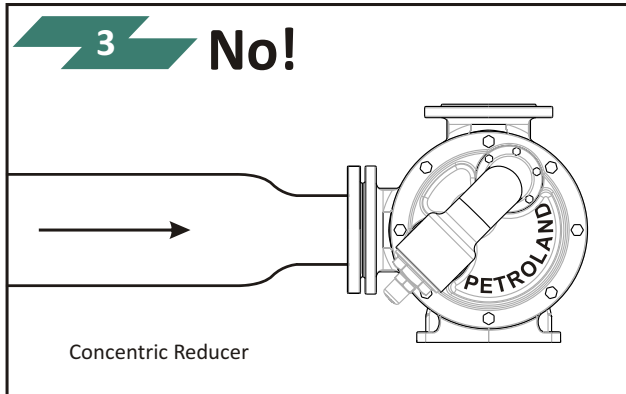


Figure 23: Fault of facilities and trouble shooting - 2

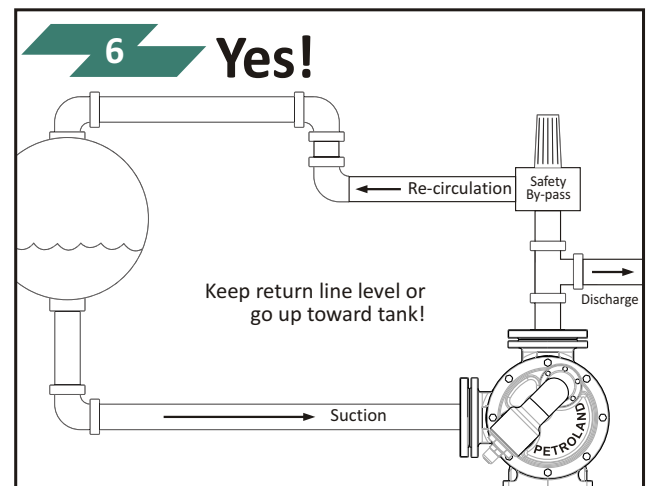
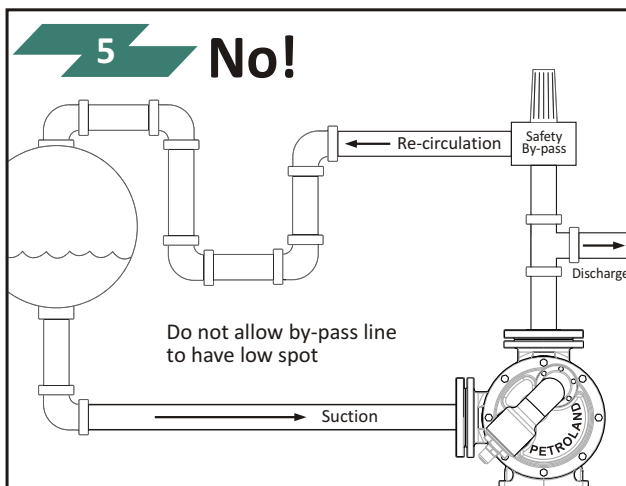
## 22.2. Model 222 (Inlet-Outlet 90°)



Pressure drop caused by restriction in suction line will cause vaporization and cavitation.



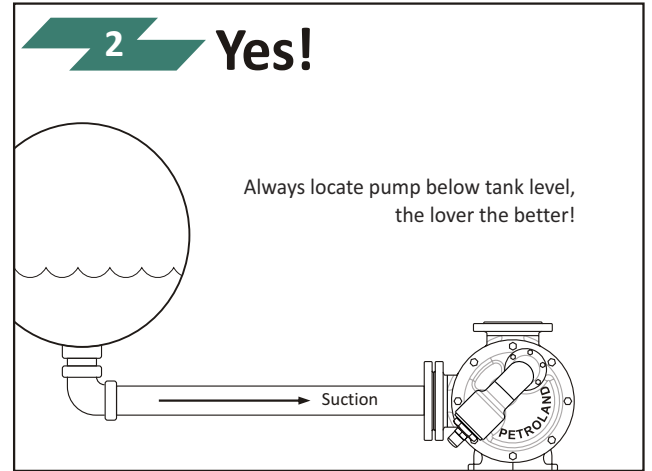
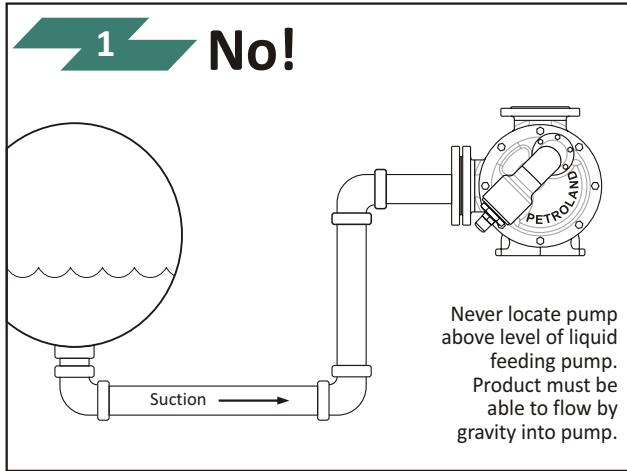
An eccentric reducer should always be used when reducing into any pump inlet where vapor might be encountered in the pumpage. The flat upper portion of the reducer prevents an accumulation of vapor that could interfere with pumping action.



Low spots in by-pass line can collect liquid which prevents normal vapor passage for priming purposes just like the P trap in the drain of a kitchen sink. This is not a problem for by-pass lines where vapor elimination is not required.

Figure 24: Fault of facilities and trouble shooting - 3

**Model 222 (Inlet-Outlet 90°)**



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.

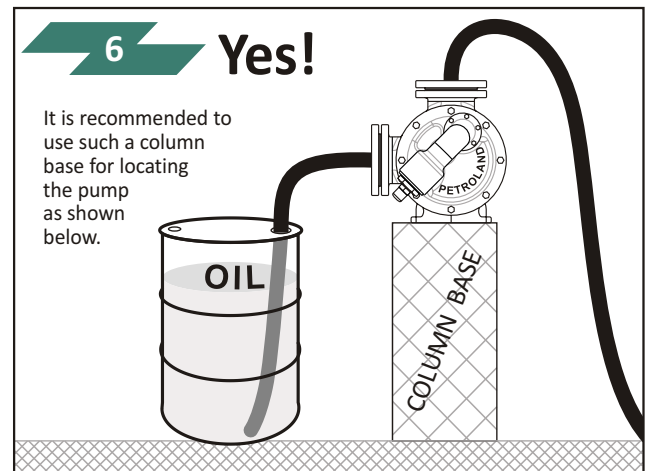
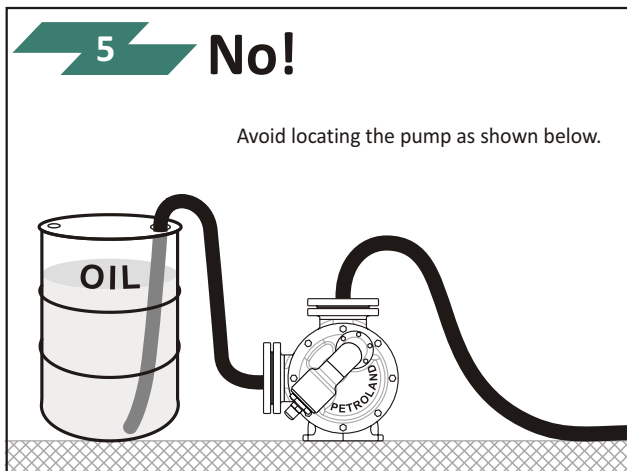
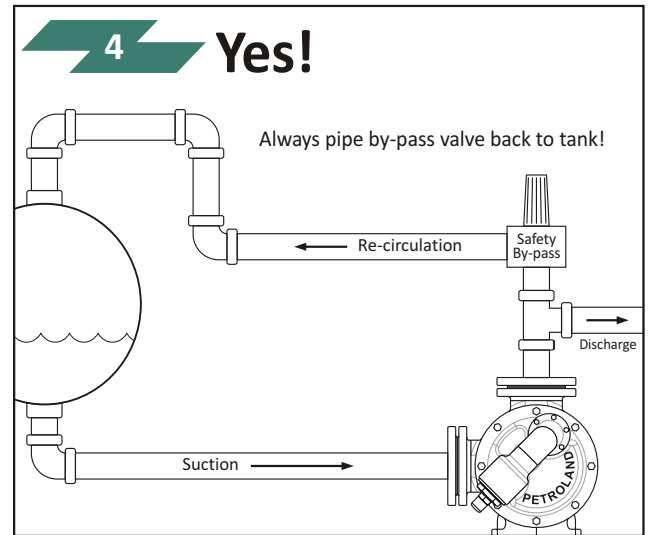
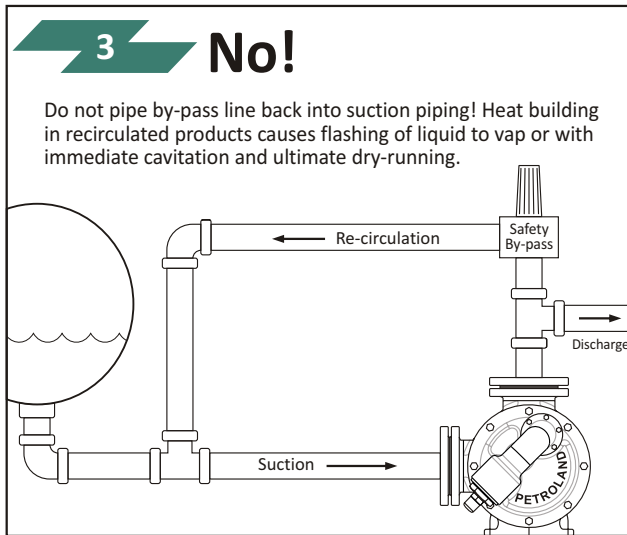
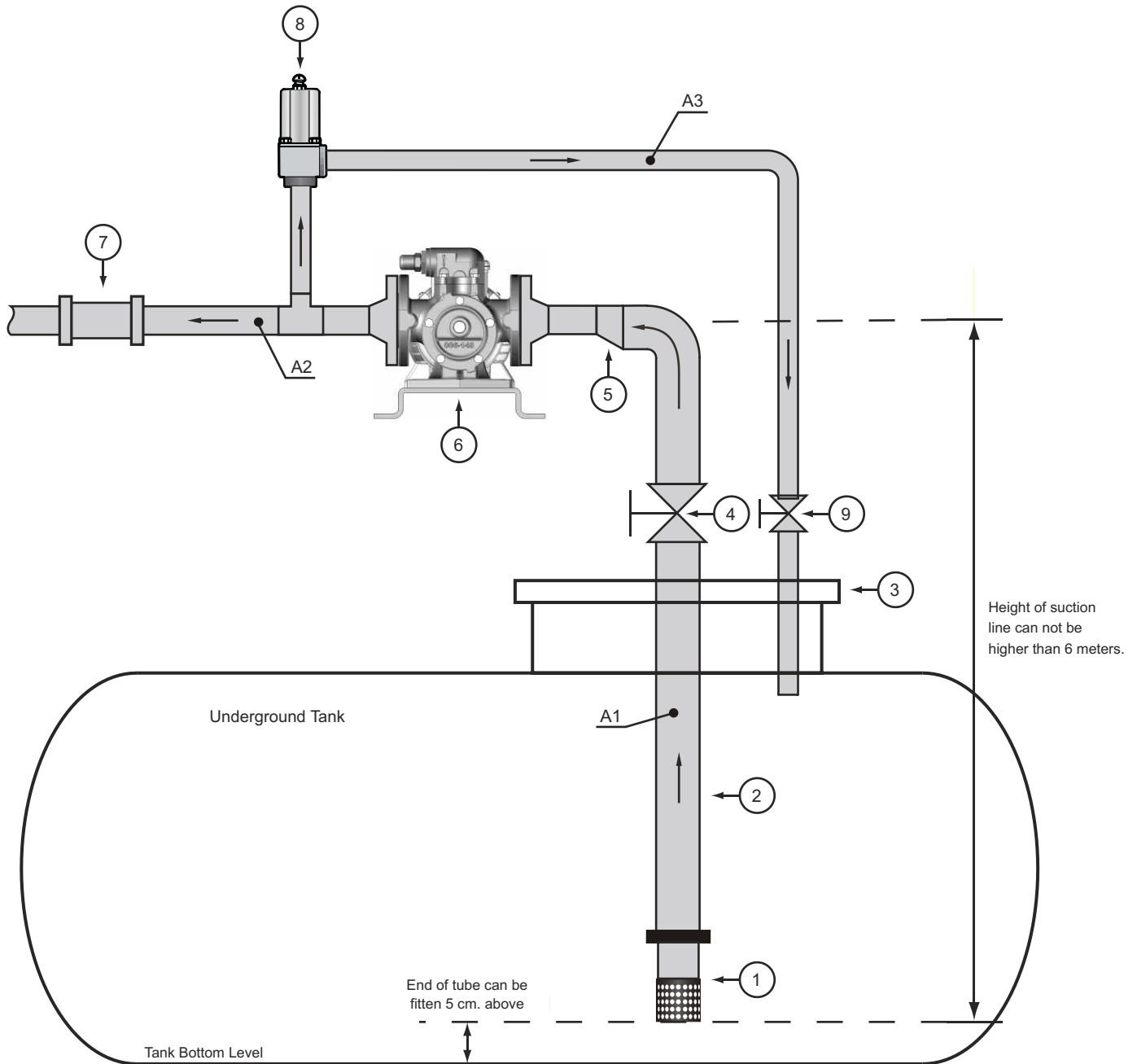


Figure 25: Fault of facilities and trouble shooting - 4

## 23. Schematic of Sample Underground Tank Facilities for PETROLAND Gear Pump

### 23.1. Model 422 (Inlet-Outlet 180°)



1. Poppet and filter
2. Suction line
3. Tank main port
4. Suction valve
5. Reducer
6. PETROLAND PD 422 Series Pump
7. Discharge valve
8. PETROLAND pipe line by-pass
9. Recycle valve

A1. It is recommended to choose the diameter of suction line greater than the diameter of suction inlet.

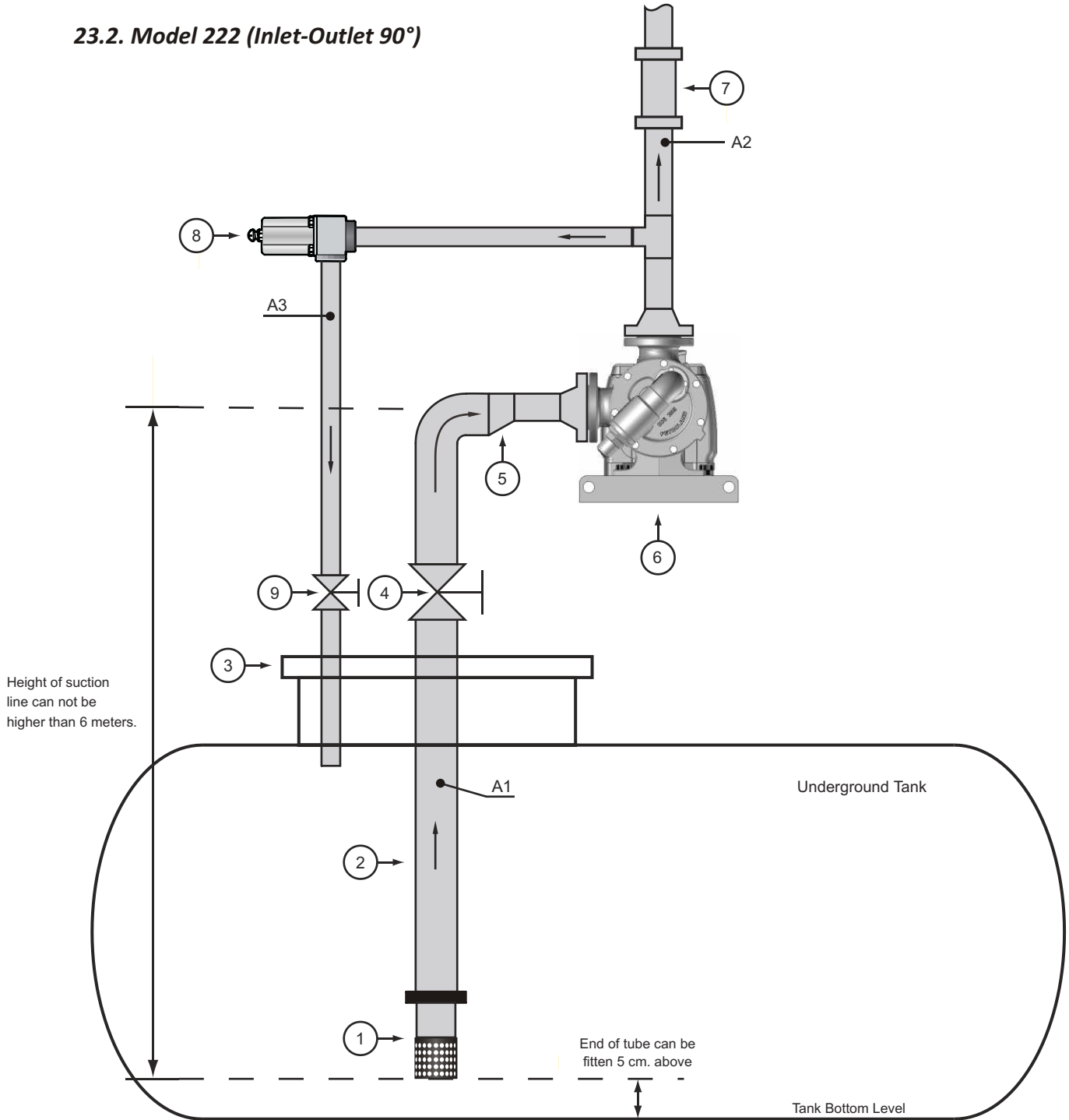
A2. Pump outlet and pipe diameters can be chosen same size if the fluid is not viscous. For viscous fluid, pipe diameter must be larger than inlet diameter.

A3. It is recommended to choose the diameter of recycle pipe same as diameter of pump.

Figure 26: Schematic of Sample Underground Tank Facilities for PETROLAND Gear Pump (180° inlet-outlet)



### 23.2. Model 222 (Inlet-Outlet 90°)



1. Poppet and filter
2. Suction line
3. Tank main port
4. Suction valve
5. Reducer
6. PETROLAND PD 222 Series Pump
7. Discharge valve
8. PETROLAND pipe line by-pass
9. Recycle valve

A1. It is recommended to choose the diameter of suction line greater than the diameter of suction inlet.

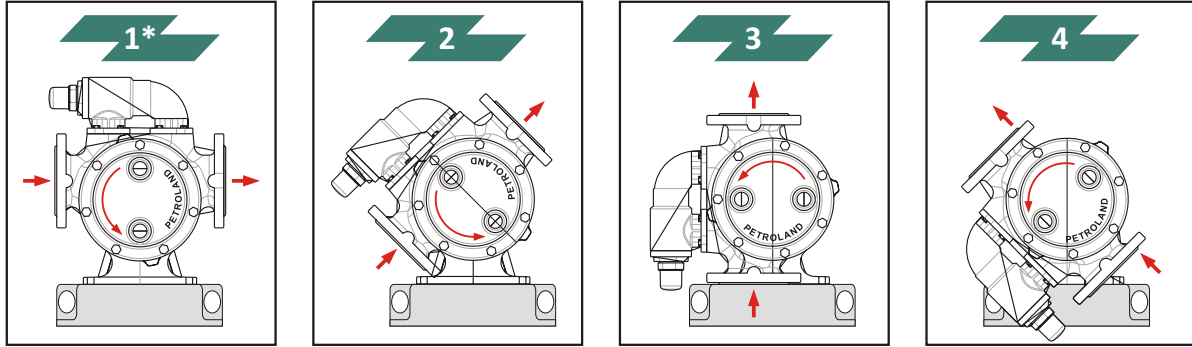
A2. Pump outlet and pipe diameters can be chosen same size if the fluid is not viscous. For viscous fluid, pipe diameter must be larger than inlet diameter.

A3. It is recommended to choose the diameter of recycle pipe same as diameter of pump.

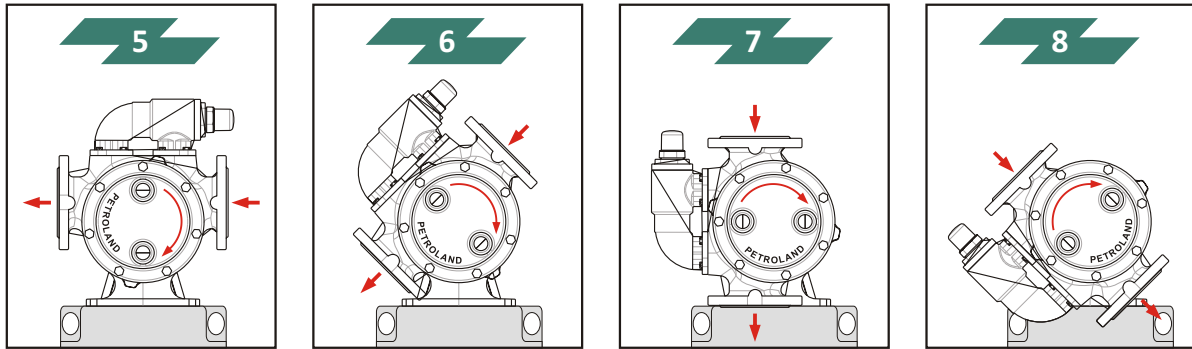
Figure 27: Schematic of Sample Underground Tank Facilities for PETROLAND Gear Pump (90° inlet-outlet)

## 24. PETROLAND Pump's inlet/outlet directions for various applications

### 24.1. 180° (Applicable for pump sizes from H to ZL)



Clockwise rotation viewed from the motor, counter-clockwise rotation viewed from the cover.



Clockwise rotation viewed from the cover, counter-clockwise rotation viewed from the motor.

Figure 28: PETROLAND Pump's inlet-outlet directions for various applications (180° inlet-outlet).

\* Unless otherwise specified, PETROLAND always supplies the option number 1 shown on the figure as a standard pump's inlet/outlet direction.

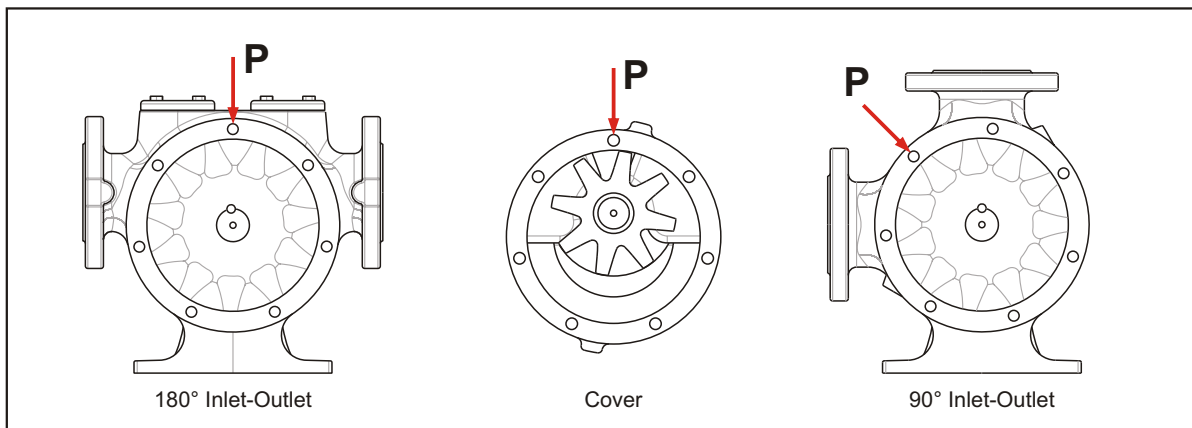
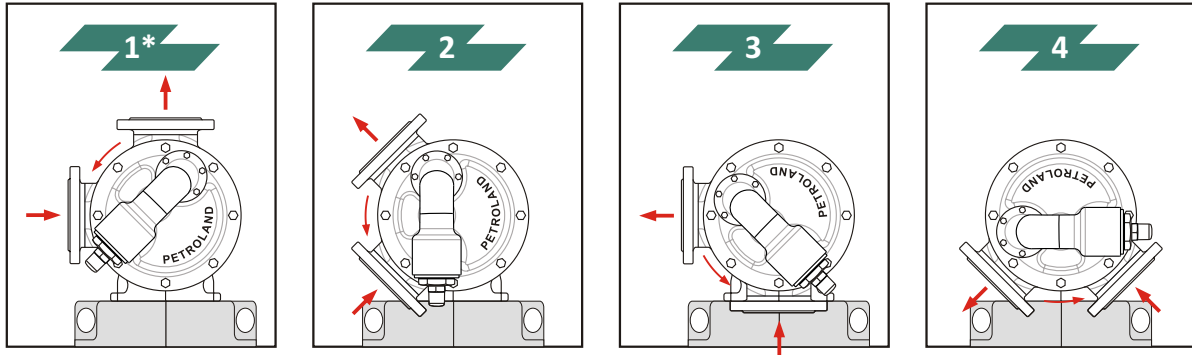
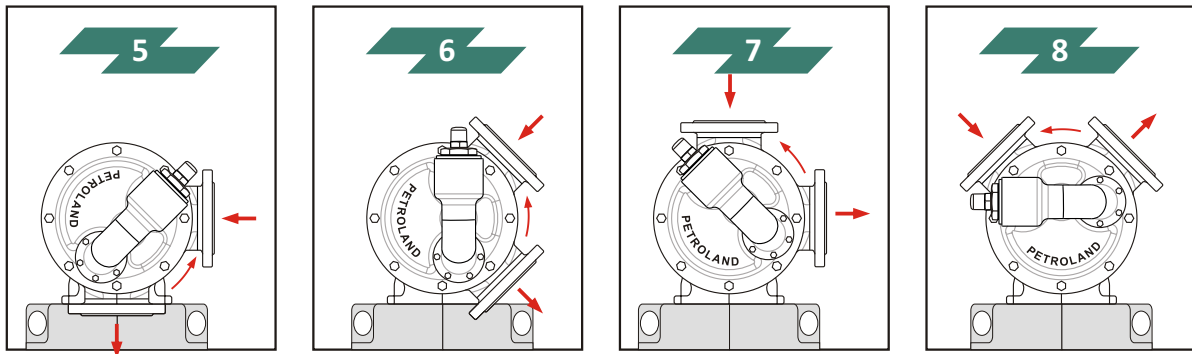


Figure 29: Point "P" must be reference point to guide assembly of cover onto PETROLAND pump casing.

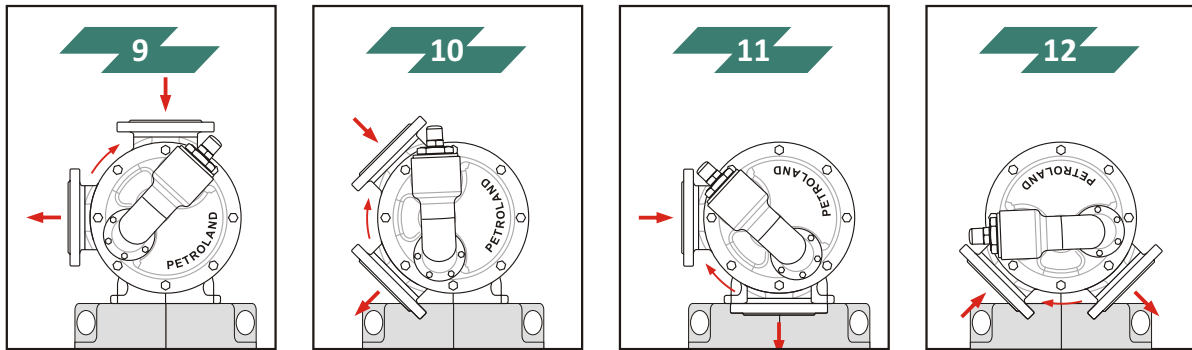
## 24.2. 90° (Applicable for pump sizes from B to ZL)



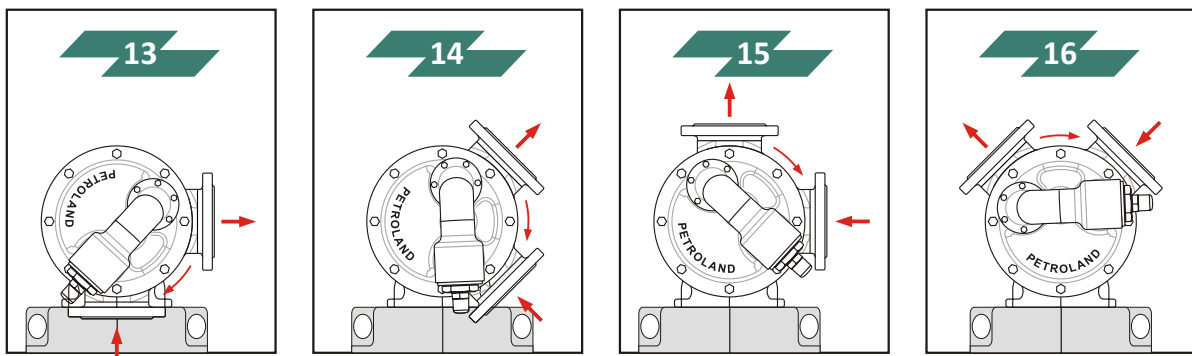
Clockwise rotation viewed from the motor, counter-clockwise rotation viewed from the cover.



Clockwise rotation viewed from the cover, counter-clockwise rotation viewed from the motor.



Clockwise rotation viewed from the motor, counter-clockwise rotation viewed from the cover.



Clockwise rotation viewed from the cover, counter-clockwise rotation viewed from the motor.

Figure 30: PETROLAND Pump's inlet-outlet directions for various applications. (90° inlet-outlet)

\* Unless otherwise specified, PETROLAND always supplies the option number 1 shown on the figure as a standard pump's inlet/outlet direction.

## 25. Troubleshooting

<b>Problem:</b>								
8. Lack of co-ordination between pressure and capacity								
7. The pump cannot self-prime								
6. The pump loses liquid after self-priming								
5. The capacity is too low								
4. The pump is making a noise								
3. The motor is overloaded								
2. The pump has jammed								
1. The pump wears quickly								
<b>Cause:</b>	1	2	3	4	5	6	7	8
1. Too great a vacuum				X	X	X	X	
2. Cavitation				X	X	X		
3. Viscosity too high			X	X	X		X	X
4. Temperature too high		X	X				X	
5. The pump is drawing air				X	X	X	X	X
6. Pressure too high	X	X	X		X			
7. Defective valve			X	X	X			
8. The pump is corroded	X				X		X	
9. The pump is worn					X		X	
10. Impurities in the pump	X	X	X					
11. The stuffing box is over-tightened	X		X					
12. Fault in the motor			X					
13. Pipe too constricted or blocked					X		X	
14. Wrong speed							X	
15. The pump runs without liquid	X	X					X	
16. Liquid temp. too high – lack of lubricant	X	X						
17. Speed too low					X			
18. Speed too high				X				X
19. Suction line not dipped in liquid							X	
20. Liquid being fed above liquid level				X				
21. Valve incorrectly adjusted					X			
22. The pump's shaft end is bent	X			X				
23. Coupling incorrectly aligned	X			X				
24. Pump twisted in relation to pipe system	X	X	X	X				
25. Leaking pipes/assemblies							X	

Table 11: Various problems that can arise and possible causes of the problems.

## 26. Technical specifications

Because of the PETROLAND pumps large number of possible combinations and the many pump liquids used, the following values should be viewed as guideline maximum values, as an individual PETROLAND pump may have further limitations due to the pump liquid, the shaft seal selected and in particular the motor selected.

The technical specifications of the motor are contained in the manual supplied by the motor manufacturer.

### 26.1. Maximum capacity values for the various pump model

Model	Capacity (m <sup>3</sup> /h)	Model	Capacity (m <sup>3</sup> /h)
122	18	272	60
222	350	282	60
232	350	422	350
242	60	432	350
252	350	452	350
262	350	462	350

Table 12: Maximum capacity values for the various pump model.

### 26.2. Maximum Speed

Pump Size	Speed (rpm)	Pump Size	Speed (rpm)	Pump Size	Speed (rpm)
A	1750	J	1200	ML	600
B	1750	JL	1200	N	600
GL	1750	K	950	NL	450
CL	1750	KL	950	P	400
FL	1750	S	700	R	350
H	1750	SL	700	Z	300
HL	1750	M	700	ZL	300

Table 13: The maximal speed per minute for the various pump sizes – for pump liquids with viscosities under 400 cSt. Reduce the speed in the event of higher viscosities in order to avoid cavitation.

### 26.3. Maximum Operating Pressure

Pump Size	Operational Pressure*	
	Pump Casing	Heating Jacket
B - CL - H - HL - J - JL K - KL - S - SL - M - ML N - NL - P	16 BAR	10 BAR
A - GL - FL R - Z - ZL	10 BAR	10 BAR

Table 14: Maximum operational pressure in bar for the various pump types.

The stated max. operational pressure depends on the inlet pressure to the pump and the pump size.

\* System pressure + differential pressure must not exceed 25 bar.



Total of system pressure and differential pressure should be lower than 25 bar.

#### 26.4. Suction height

PUMP MODELS	SUCTION HEIGHT
122 - 132 - 222 - 232 - 242 - 252 - 262 272 - 282 - 292 - 422 - 432 - 452 - 462	Max. 0.5 bar priming vacuum Max. 0.8 bar vacuum in operation

Table 15: The max. suction height in bar for priming vacuum and operational vacuum.

#### 26.5. Viscosity

Size	Max. Viscosity	Size	Max. Viscosity	Size	Max. Viscosity
<b>A</b>	25.000 SSU / 5.500 cSt	<b>J</b>	75.000 SSU / 16.000 cSt	<b>ML</b>	1.000.000 SSU / 220.000 cSt
<b>GL</b>	25.000 SSU / 5.500 cSt	<b>JL</b>	25.000 SSU / 5.500 cSt	<b>N</b>	1.000.000 SSU / 220.000 cSt
<b>FL</b>	25.000 SSU / 5.500 cSt	<b>K</b>	250.000 SSU / 55.000 cSt	<b>NL</b>	1.000.000 SSU / 220.000 cSt
<b>B</b>	25.000 SSU / 5.500 cSt	<b>KL</b>	250.000 SSU / 55.000 cSt	<b>P</b>	1.000.000 SSU / 220.000 cSt
<b>CL</b>	25.000 SSU / 5.500 cSt	<b>S</b>	250.000 SSU / 55.000 cSt	<b>R</b>	1.000.000 SSU / 220.000 cSt
<b>H</b>	250.000 SSU / 55.000 cSt	<b>SL</b>	250.000 SSU / 55.000 cSt	<b>Z</b>	1.000.000 SSU / 220.000 cSt
<b>HL</b>	75.000 SSU / 16.000 cSt	<b>M</b>	250.000 SSU / 55.000 cSt	<b>ZL</b>	1.000.000 SSU / 220.000 cSt

Table 16: States the max. allowed viscosity in SSU&cSt. of the pump liquid – for standard versions of the various pump sizes.

#### 26.6. Temperature

PUMP MODELS	TEMPERATURE (MAX.)
122 - 132 - 222 - 232 - 242 - 252 - 262 272 - 282 - 292 - 422 - 432 - 452 - 462	150°C*

Table 17: The pump liquid's maximum temperature limits for the various pump types.

\* Petroland pumps – designed with special tolerances and materials – may in certain cases be use dup to 350°C.

## 27. Emptying and cleaning the pump

If the liquid being pumped is inflammable, toxic, corrosive or hazardous in any other way, or if the liquid has a temperature of more than 60°C, special safety measures must be implemented before the pump is emptied. The liquid's safety data sheet must be obtained and read before emptying the pump. Please refer to the relevant liquid's safety data sheet.



Observe the safety instructions in the data sheet for the liquid in question and use the specified safety equipment in the form of protective clothing, a breathing mask or similar necessary safety equipment



Use suitable safety equipment with pump liquids at temperatures of more than +60°C



When pumping hazardous liquids, circulate neutralising liquid before emptying the pump



The system must be depressurised before emptying the pump.

- Empty the pipe system. Note that there is still liquid in the bottom of the pump casing and in the shaft seal housing, even if the pipe system is empty.
- Stop the unit.
- Close the valves on the suction side and the pressure side, if the system is equipped with these, so that the system is depressurised.
- Place a collecting tank under the pump to take the volume of liquid contained in the part of the system to be emptied.
- Remove the front cover and the heating jacket.
- Remove the pump and place it with the ports pointing up/down, and then rotate the shaft manually to empty.

Please note that the drainage time is longer for highly-viscous liquids, as these find it difficult to make their way from the stuffing box house through the chamber between the rotor and the rear cover to the pump casing.

## 28. Disposal of liquid

The safety data sheet for the liquid used must be obtained, and the liquid must be disposed of in accordance with the safety data sheet's instructions.



Please refer to the relevant liquid's safety data sheet!

## 29. Paint of Pump

- All pumps produced in PETROLAND factory have been painted undercoat by thickness between 30-40 microns before machining..
- PETROLAND's default color is green RAL-6000 for standard pumps and RAL-9006 for food pumps. Consult to PETROLAND if other color is required.
- Thickness of paint is between 40-60 microns.



### 30. Repairs

- Pumps that are sent to Petroland for repair must have been emptied and cleaned before our factory can accept them, and the pumps must be accompanied by information about the pump liquid used.
- Cleaning and emptying of the pump must be undertaken with due regard to the safety of our repair technicians.
- We would point out that certain liquids coagulate and harden before arrival at our factory, which makes any repairs fully or partly impossible if the pump has not been emptied and cleaned before shipment.
- In such cases, inadequate emptying and cleaning will generate increased repair costs, or in the worst case mean that the pump has to be scrapped.
- PETROLAND pumps must be emptied and cleaned in accordance with the instructions in the section “Emptying and cleaning the pump” – see this!

### 31. Axial clearance

The axial clearance is the distance between the rotor/idler and the front cover.

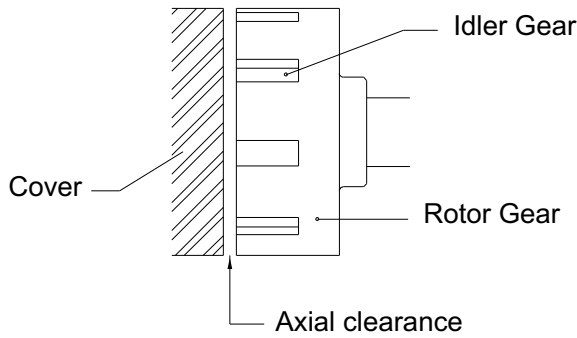


Figure 31: The axial clearance between the rotor/idler and the front cover.



Figure 32: Checking the axial clearance with air gap gauge (feeler gauge).

The axial clearance is set in the factory in accordance with the section entitled “Setting of axial clearance”.

The axial clearance must be reset after the pump has been repaired or if the pump is worn.

There are various ways of setting the axial clearance, depending on the pump type and whether or not the pump is installed in a pipe system. See the section entitled: “Setting of axial clearance”.

#### ***The axial clearance can be checked as described below:***

##### **Non-installed pump:**

The pump's axial clearance can be checked with an air gap gauge (feeler gauge) which is passed in through one of the pump's ports between the rotor/idler and the front cover (see Figure 32).

The axial clearance identified must correspond to the values in the table 18in.

##### **Installed pump:**

The axial clearance cannot be checked when the pump is installed in a pipe system.

AXIAL CLEARANCE								
Pump Size		Axial Clearance		Pump Size	Axial Clearance	Pump Size		Axial Clearance
A	Max.	0.15	J	Max.	0.20	ML	Max.	0.25
	Min.	0.10		Min.	0.15		Min.	0.20
B	Max.	0.15	JL	Max.	0.20	N	Max.	0.25
	Min.	0.10		Min.	0.15		Min.	0.20
GL	Max.	0.15	K	Max.	0.20	NL	Max.	0.35
	Min.	0.10		Min.	0.15		Min.	0.25
CL	Max.	0.15	KL	Max.	0.20	P	Max.	0.35
	Min.	0.10		Min.	0.15		Min.	0.25
FL	Max.	0.15	S	Max.	0.20	R	Max.	0.35
	Min.	0.10		Min.	0.15		Min.	0.25
H	Max.	0.15	SL	Max.	0.20	Z	Max.	0.50
	Min.	0.10		Min.	0.15		Min.	0.40
HL	Max.	0.15	M	Max.	0.20	ZL	Max.	0.50
	Min.	0.10		Min.	0.15		Min.	0.40

Table 18: The axial clearance in mm for the various pump sizes for standard pumps and pumps with special tolerances respectively.

## 32. Storing the user manual

- This user manual must be retained throughout the pump's full service life, and must always accompany the pump.
- The user manual must be available to operators, repair engineers and any maintenance staff or other people who may be considered to have a need to refer to it.
- The user manual must also be stored visible, in the immediate vicinity of the pump. If this is not possible, there must be a prominent sign by the pump stating where the user manual is kept.
- It is also recommended that a copy of the user manual is stored somewhere else.
- If people who are expected to have a need to refer to the user manual are of a different linguistic origin than the language in which the user manual has been legally supplied, it is recommended that the user manual is translated into the language in question.

## 33. Spare parts

We recommend that you use original spare parts.

Petroland accepts no liability for any personal injury or damage to the pump as a consequence of the use of non-original spare parts that do not satisfy precisely the same strict quality requirements as original PETROLAND spare parts.

The required informations for the ordering spare parts are listed below;

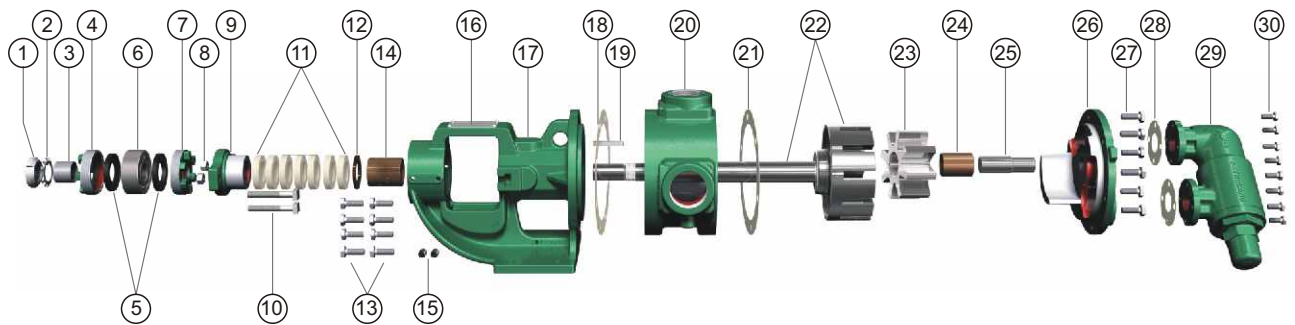
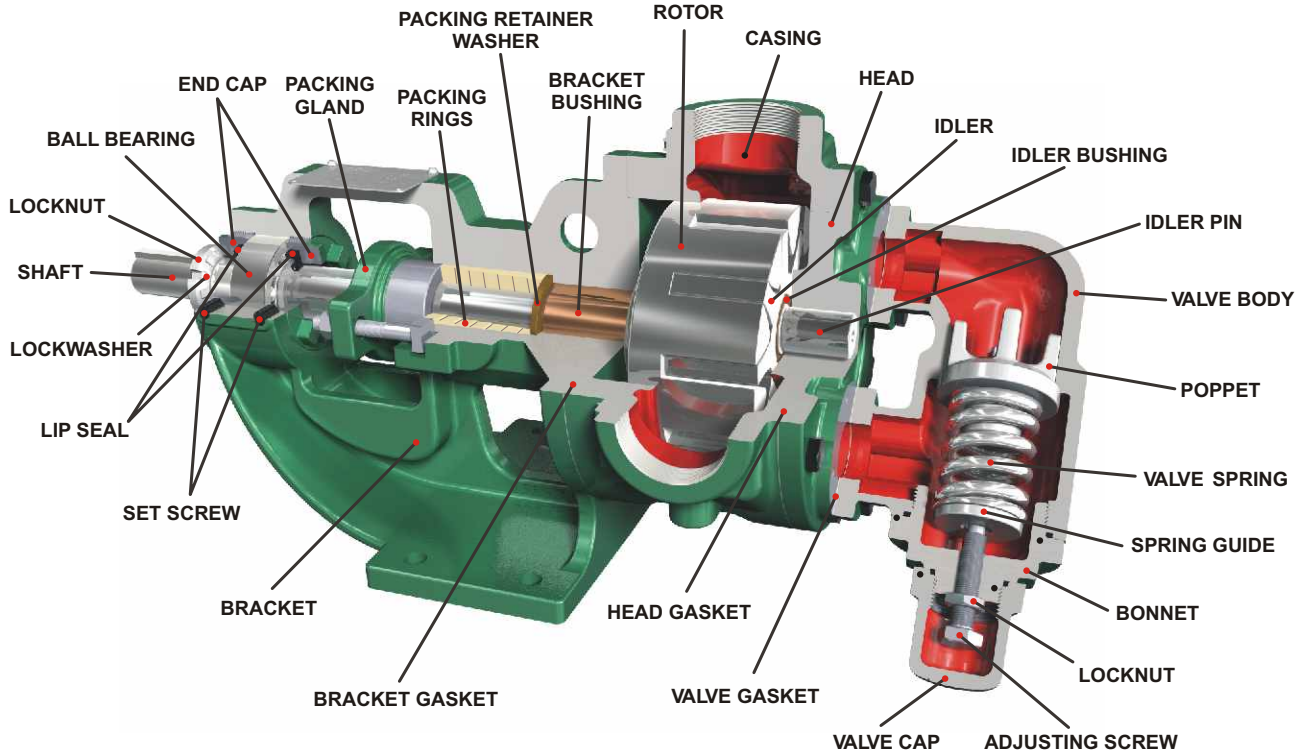
- Pump Code and Numbers
- Serial Number of Pump
- Number of Spare part.

## 34. Spare Part List

### 34.1. Spare part list of pumps with packing gland

(Model: B 222 - CL 222 - H 222 - HL 222 - J 222 - JL 222 - K 222 - KL 222 - S 222 - SL 222 - M 222)

#### Cut-away View

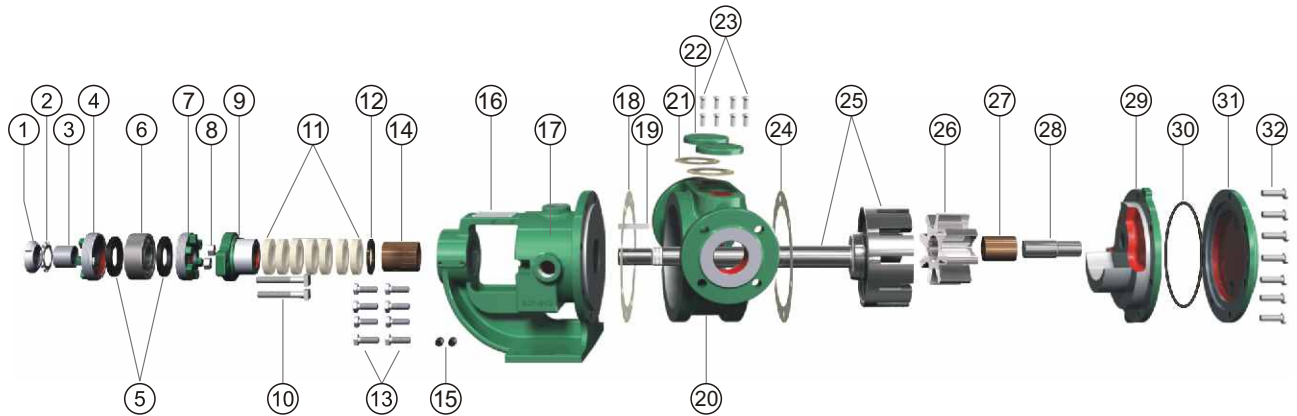
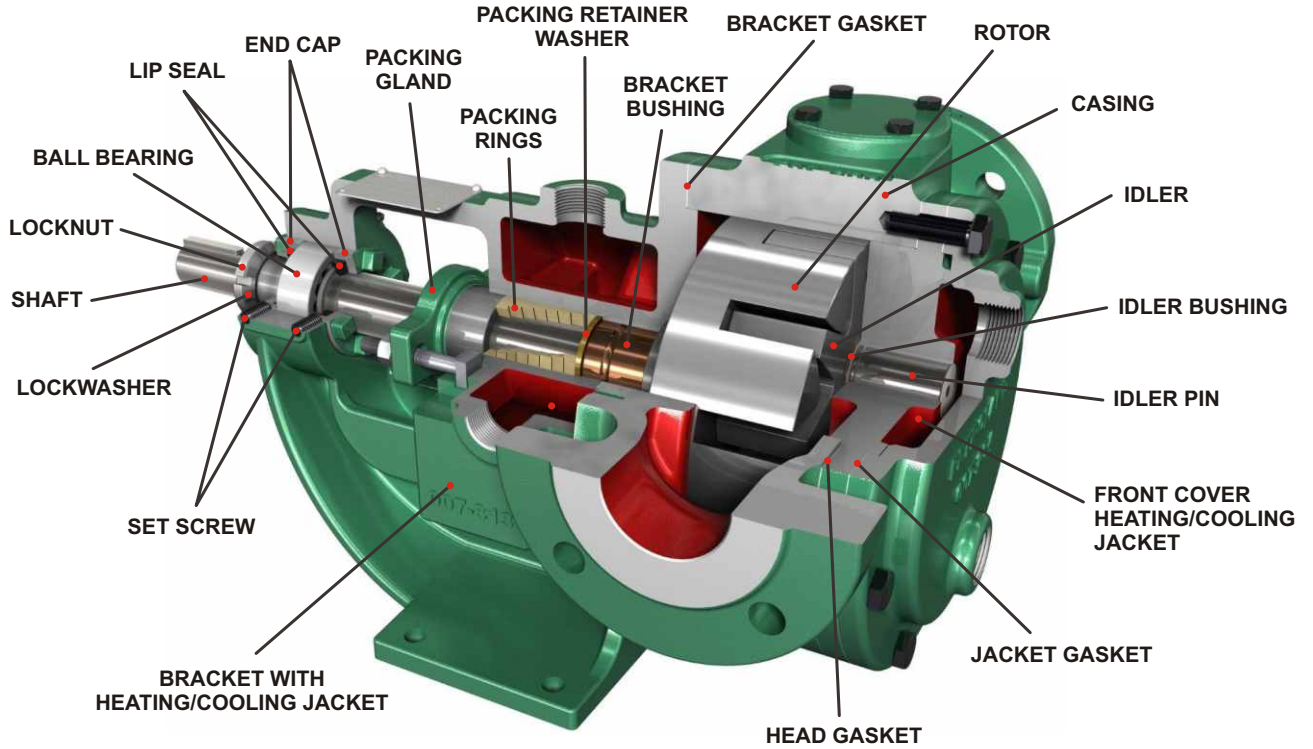


ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Locknut	11	Packing	21	Head Gasket
2	Lockwasher	12	Packing Retaining Washer	22	Rotor and Shaft
3	Bearing Spacer Collar	13	Capscrews for Bracket	23	Idler
4	End Cap (Outer)	14	Bracket Bushing	24	Idler Bushing
5	Lip Seal	15	Set Screws	25	Idler Pin
6	Ball Bearing	16	Label	26	Head
7	End Cap (Inner)	17	Bracket	27	Capscrews for Head
8	Packing Gland Nuts	18	Bracket Gasket	28	Relief Valve Gaskets
9	Packing Gland	19	Key	29	Internal Relief Valve
10	Packing Gland Capscrews	20	Casing	30	Capscrews for Relief Valve

### 34.2. Spare part list of pumps with packing gland

(Model: H 462F - HL 462F - J 462F - JL 462F - K 462F - KL 462F - S 462F - SL 462F - M 462F - ML 462F  
N 462F - NL 462F - P 462F - R 462F - Z 462F - ZL 462F)

#### Cut-away View

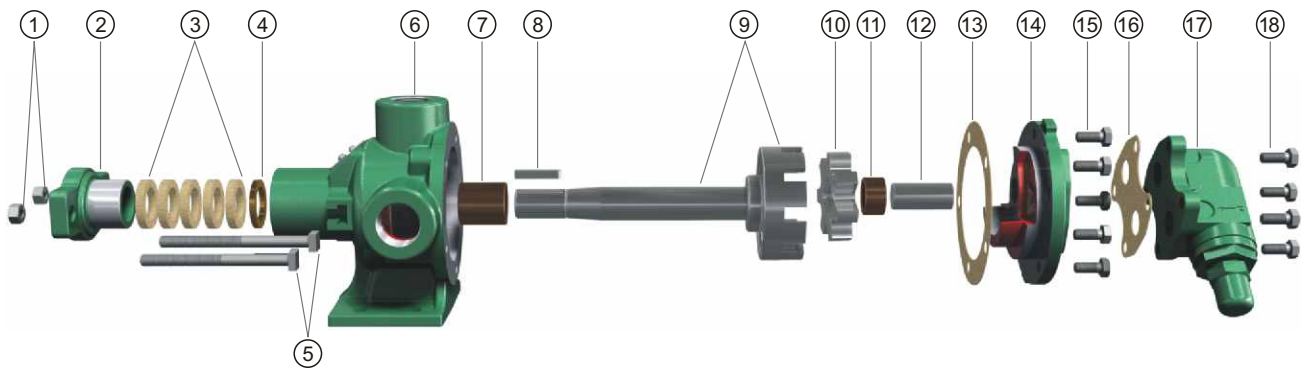
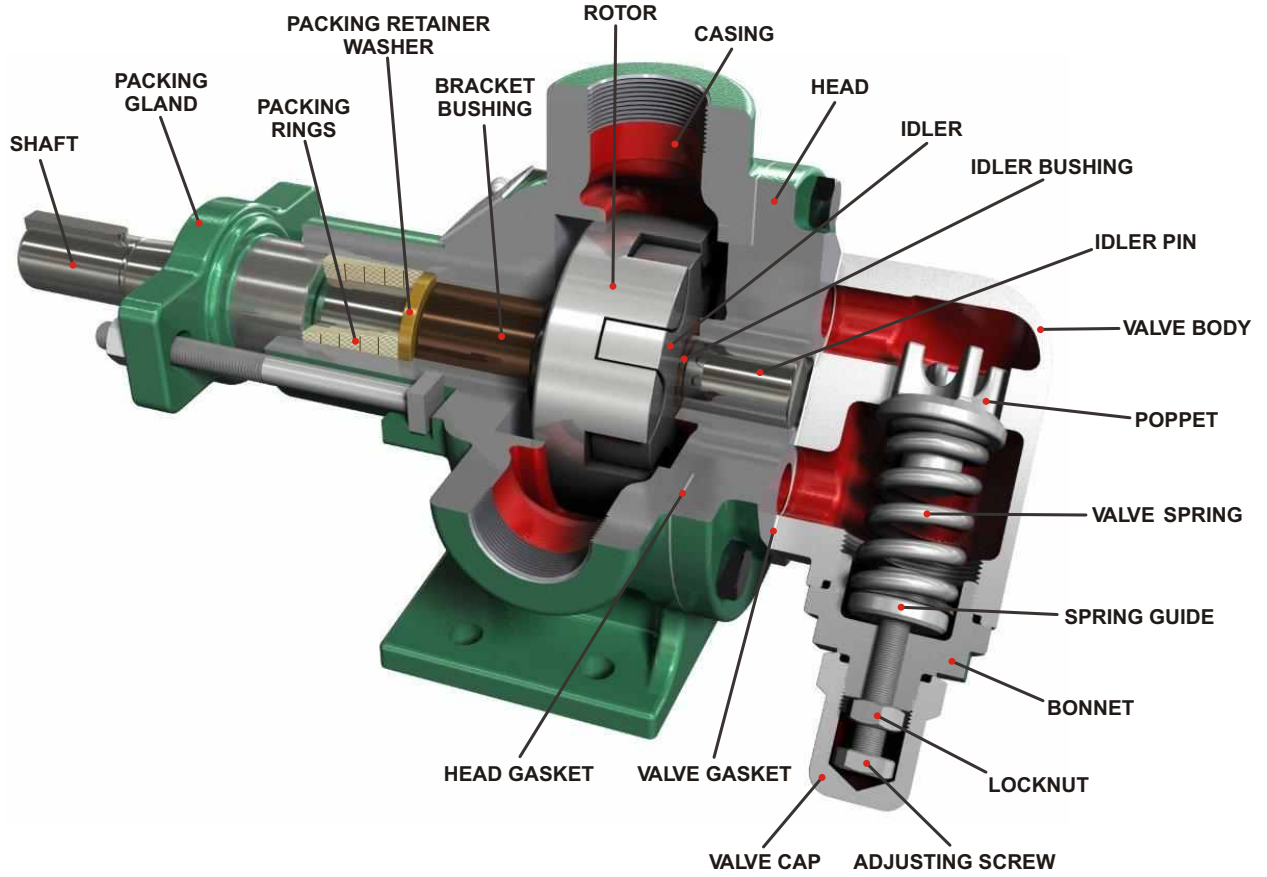


ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Locknut	12	Packing Retaining Washer	23	Blind Cap Screws
2	Lockwasher	13	Capscrews for Bracket	24	Head Gasket
3	Bearing Spacer Collar	14	Bracket Bushing	25	Rotor and Shaft
4	End Cap (Outer)	15	Set Screws	26	Idler
5	Lip Seal	16	Label	27	Idler Bushing
6	Ball Bearing	17	Bracket with jacket	28	Idler Pin
7	End Cap (Inner)	18	Bracket Gasket	29	Head for Front Cover Jacket
8	Packing Gland Nuts	19	Key	30	Front Cover Jacket O-ring
9	Packing Gland	20	Casing	31	Front Cover Jacket
10	Packing Gland Capscrews	21	By-pass Gasket	32	Front Cover Jacket Screws
11	Packing Rings	22	Blind Cap		

### 34.3. Spare part list of pumps with packing gland

(Model: A 122 - GL 122 - FL 122)

#### Cut-away View



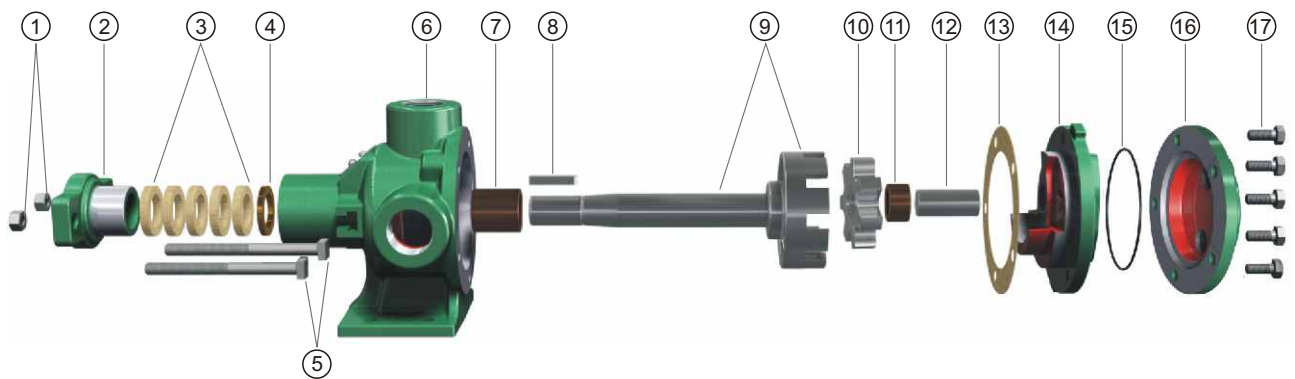
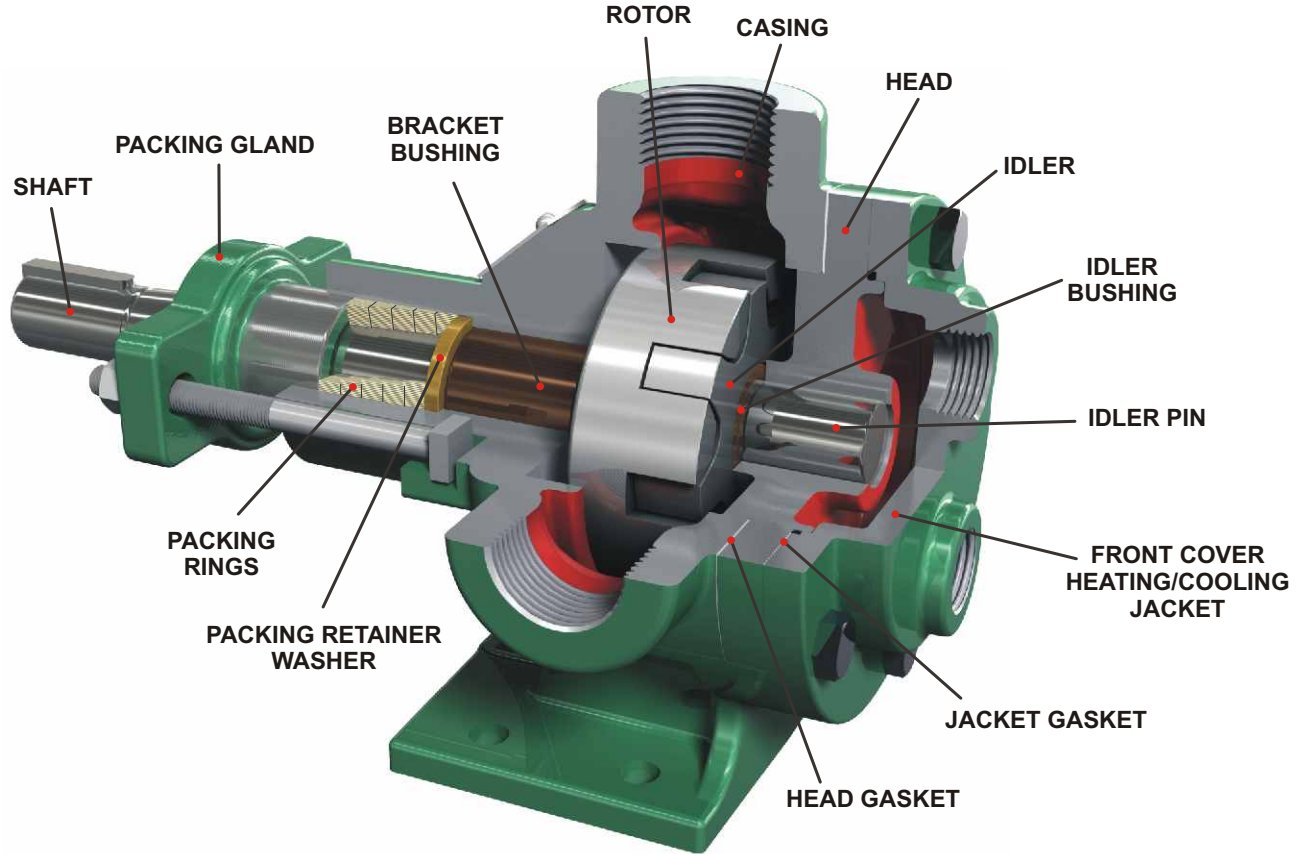
ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Packing Gland Nuts	7	Casing Bushing	13	Head Gasket
2	Packing Gland	8	Key	14	Head
3	Packing	9	Rotor and Shaft	15	Capscrews for Head
4	Packing Retaining Washer	10	Idler	16	Relief Valve Gaskets
5	Packing Gland Capscrews	11	Idler Bushing	17	Internal Relief Valve
6	Casing	12	Idler Pin	18	Capscrews for Relief Valve



### 34.4. Spare part list of pumps with packing gland

(Model: A 132 - GL 132 - FL 132)

#### Cut-away View

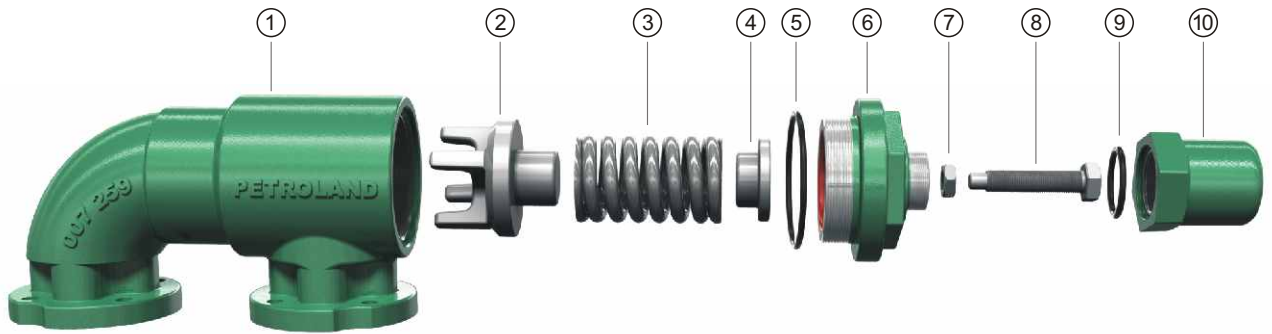
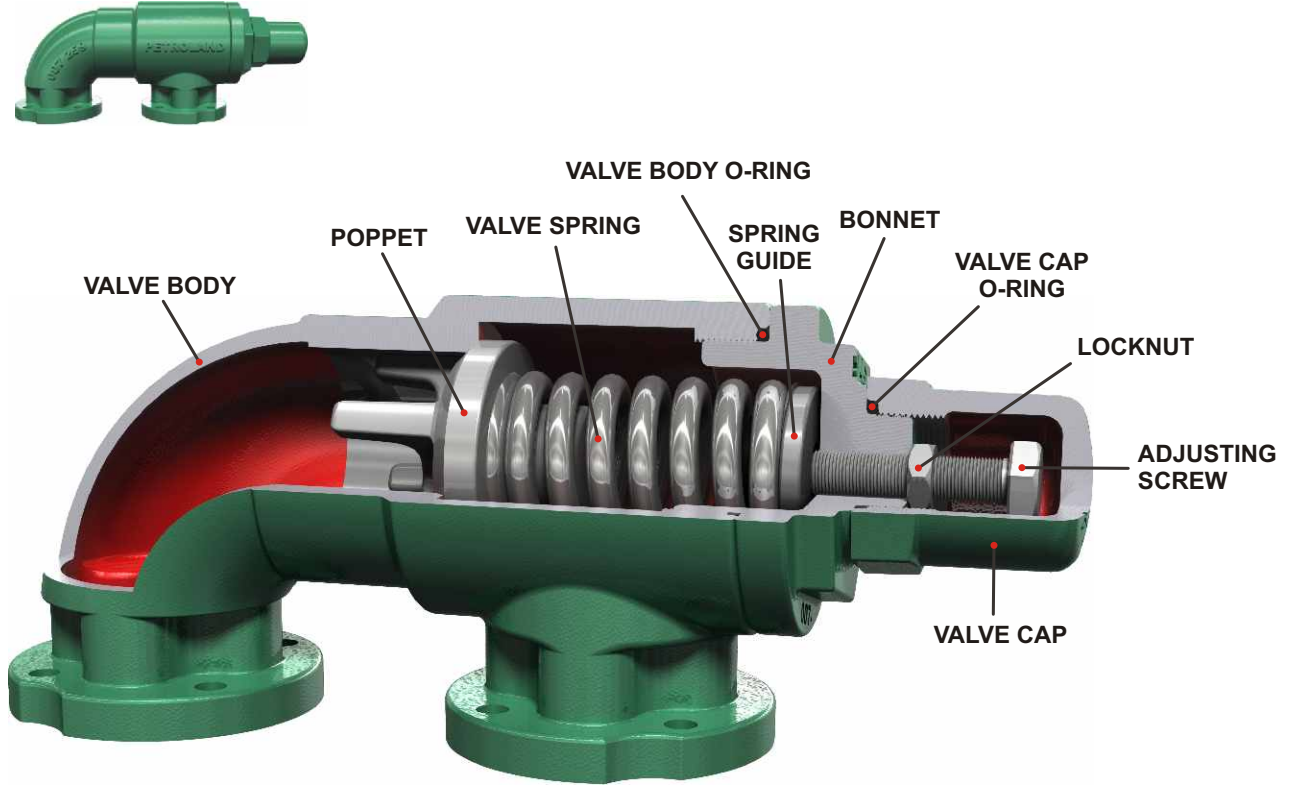


ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Packing Gland Nuts	7	Casing Bushing	13	Head Gasket
2	Packing Gland	8	Key	14	Head for Jacket
3	Packing	9	Rotor and Shaft	15	Jacket O-ring
4	Packing Retaining Washer	10	Idler	16	Jacket
5	Packing Gland Capscrews	11	Idler Bushing	17	Capscrews for Jacket
6	Casing	12	Idler Pin		

## 35. Spare Part List of By-pass Valve

### 35.1. Spare Part list and cut-away view of by-pass valve

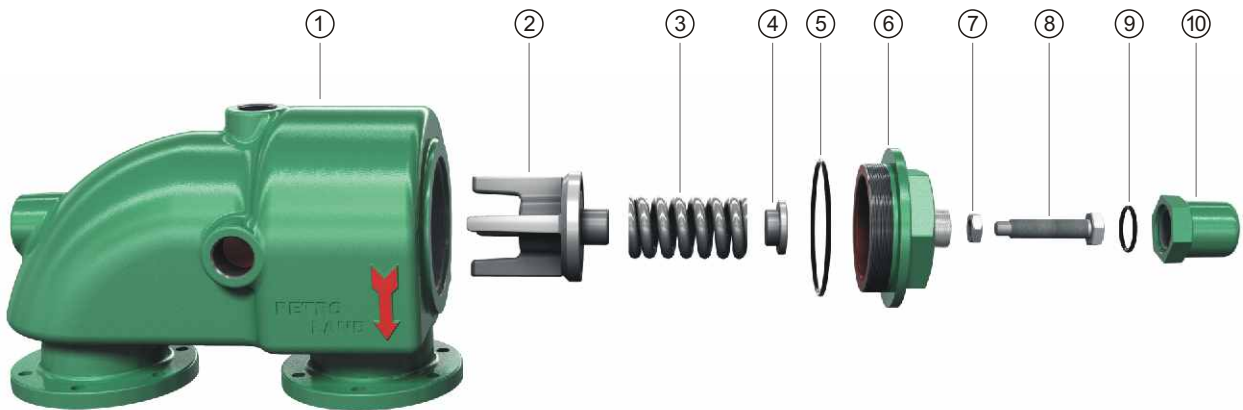
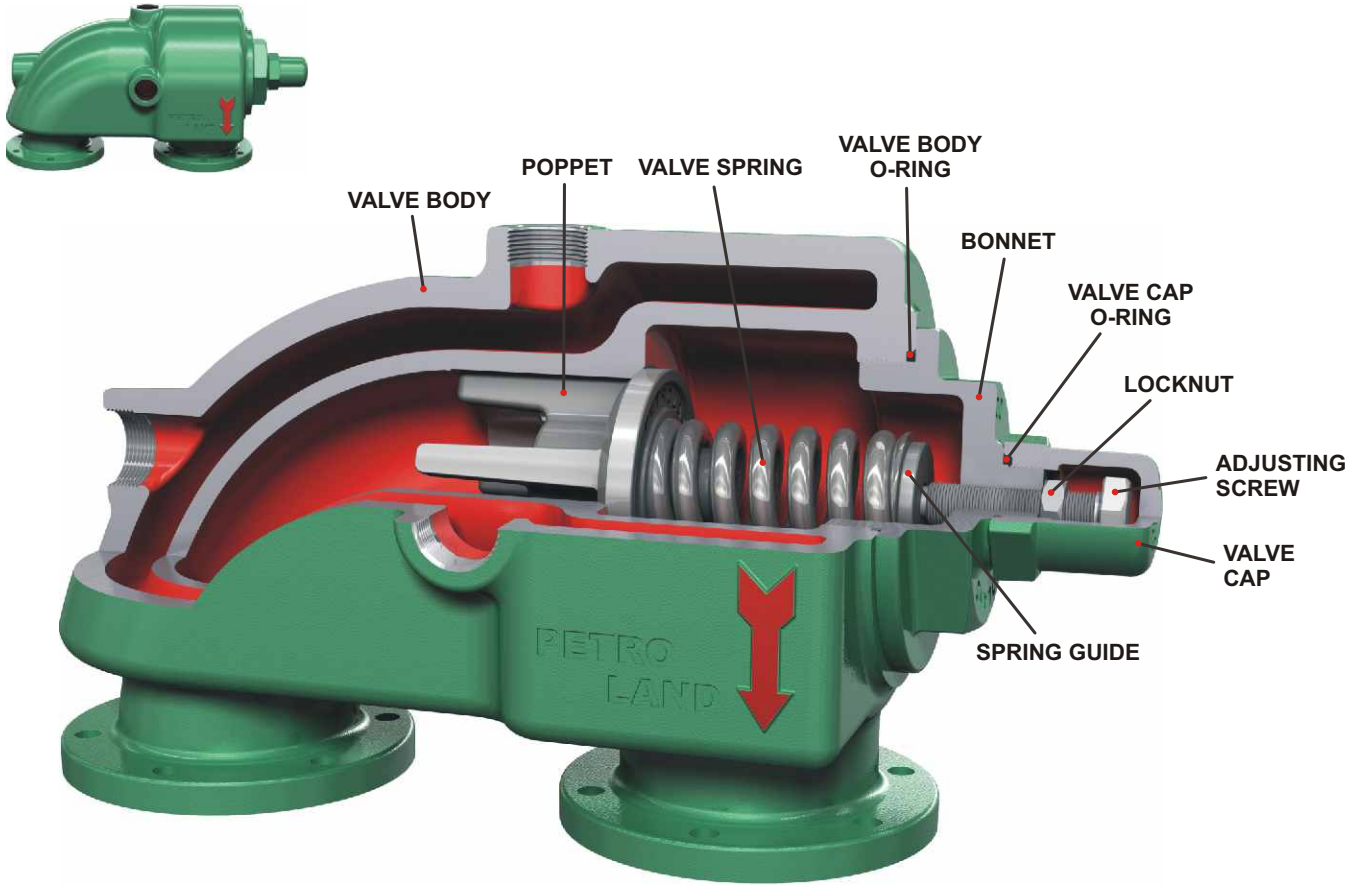
#### Cut-away View



ITEM	NAME OF PART	ITEM	NAME OF PART
1	Valve Body	6	Bonnet
2	Poppet	7	Locknut
3	Valve Spring	8	Adjusting Screw
4	Spring Guide	9	Valve Cap O-ring
5	Valve Body O-ring	10	Valve Cap



**35.2. Spare part list and cut-away view of by-pass valve with jacket**  
(Applicable for sizes: K, KL, S, SL, M, ML, N, NL, P, R, Z, ZL)



ITEM	NAME OF PART	ITEM	NAME OF PART
1	Valve Body	6	Bonnet
2	Poppet	7	Locknut
3	Valve Spring	8	Adjusting Screw
4	Spring Guide	9	Valve Cap O-ring
5	Valve Body O-ring	10	Valve Cap



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