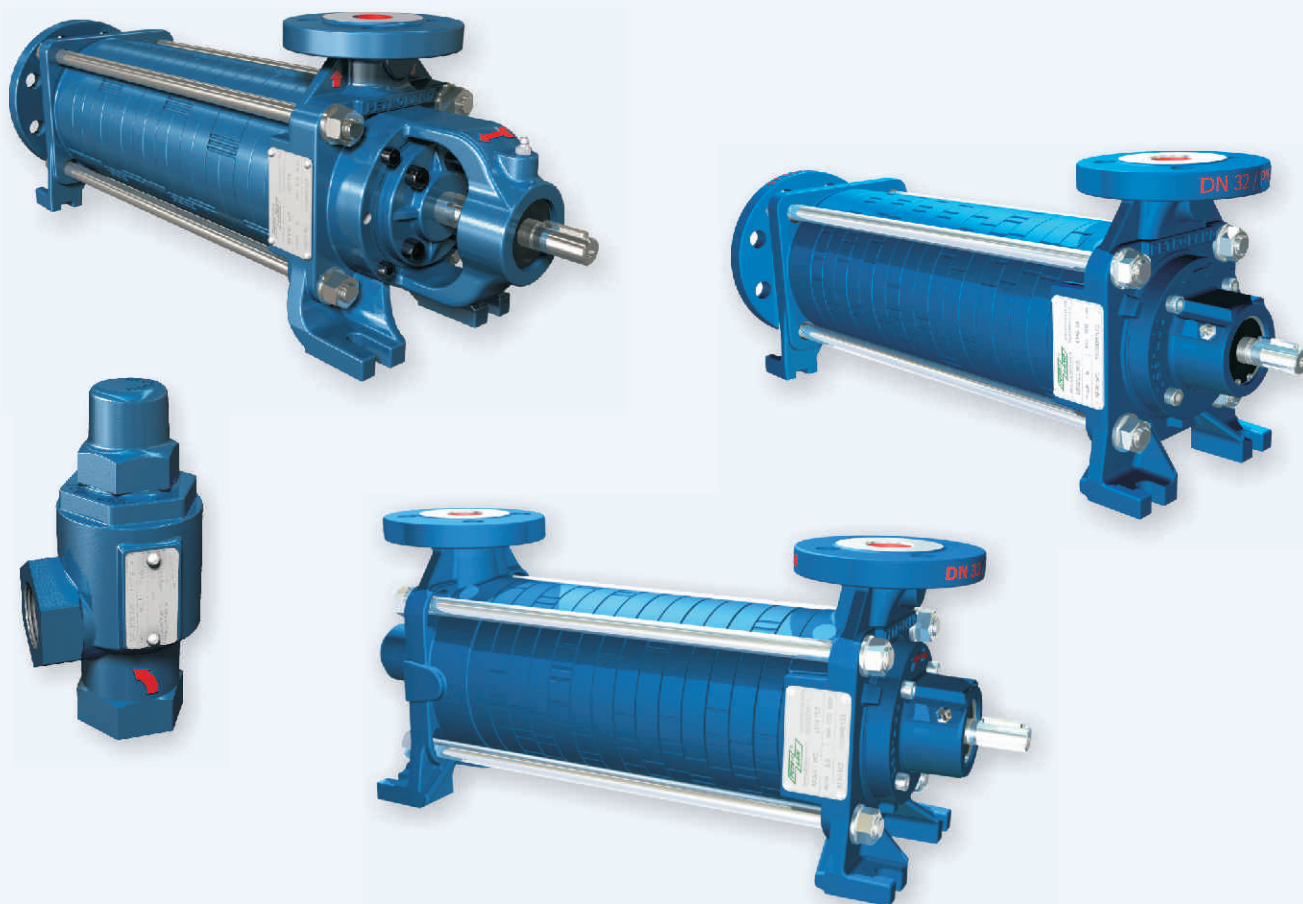




PS SERIES MULTISTAGE SIDE CHANNEL PUMPS

User Manual



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General Informations

- This user manual relates to PETROLAND PS Series Self Priming Multistage Side Channel 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 be 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 them.
- The owner of the pump is responsible for ensuring that everyone who works with the pumps 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 the required, 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 operation Conditions defined when the order was submitted must accompany the pump.


PETROLAND assumes no liability for any personal injury or damage to the PS Series 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.

		 II 2 G c II B T4	
www.petroland.com.tr		Standard: EN 13463-1-5	
Series / Type:			
Serie No:			
Flow:	m ³ /h	Head:	Bar
Motor Power:	kW	Motor Speed:	rpm
Certificate Number (ATEX): 09 FTZU ATEX XXX			

The above shows the name plate fixed on the PETROLAND pump.

If the pump's and the motor's name plate bears an  and the designation group II, zone 2 or 3, G or GD, c X and T-class – e.g. II 3 GD c T4 X -, the unit is prepared for use in a potentially explosive environment. As a standard PETROLAND pump units are not prepared for use in a potentially explosive environment.



The name plate must never be removed from the pump.

If the name plate is removed, the pump cannot be identified immediately, and therefore warnings in this manual cannot be compared with the specific pump application.

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 9001:2008

2. 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.

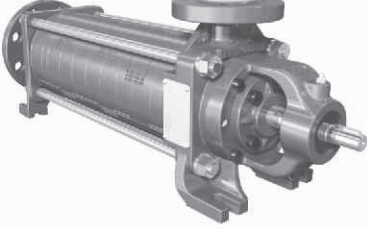
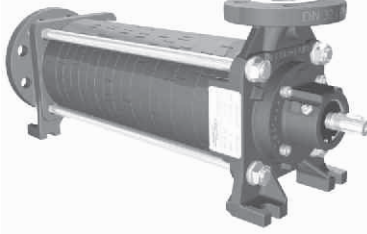
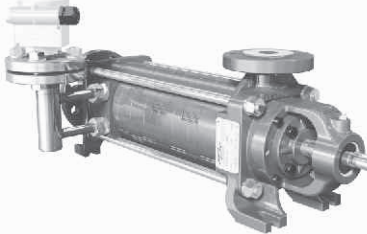
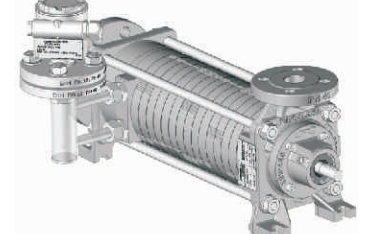
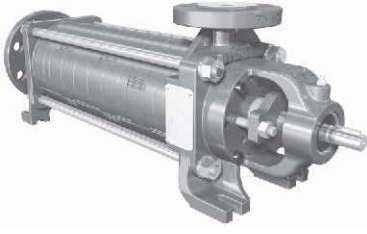
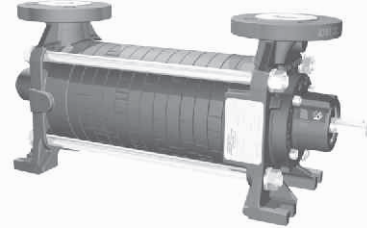
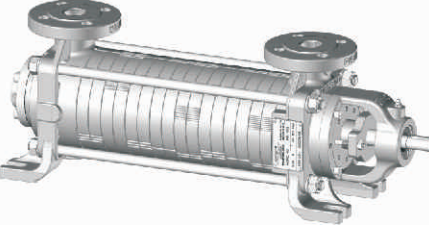
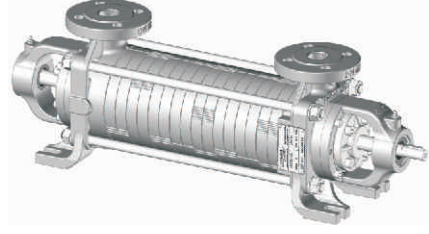
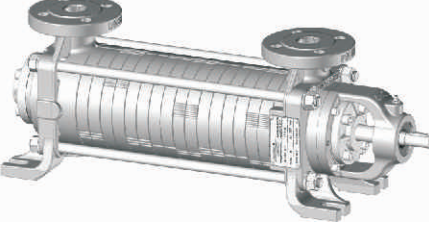
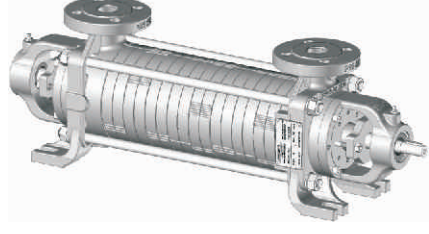
When fitting a PETROLAND pump in an existing system and connecting pumps and motors, we would point out that the whole plant/combination of motor and pump must be assessed and given a new CE label in order to ensure that the combination represents no new hazards with regard to health and safety.

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.

3. PS Series Pump Models

PS SERIES	
	
MODEL: PSC	MODEL: LPG 50
	
MODEL: PSC (WITH LIQUID SENSOR)	MODEL: LPG 50 (WITH LIQUID SENSOR)
	
MODEL: PSC (WITH PACKING GLAND)	MODEL: LPG 150
	
MODEL: PSV (WITH PACKING GLAND)	MODEL: PSD (BALL BEARING ON BOTH TWO SIDES)
	
MODEL: PSV (WITH MECHANICAL SEAL)	MODEL: PSD (BALL BEARING ON BOTH EACH SIDES, WITH PACKING GLAND)

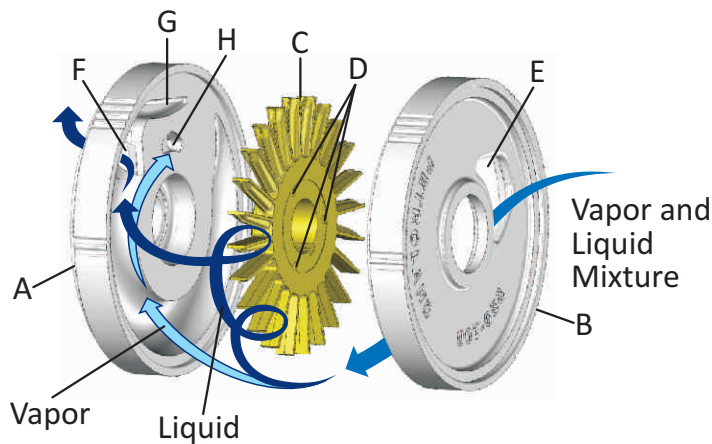
4. Working Principle of Pump

The design of the side channel pump allows for the transfer of liquid-gas mixture with up to 50% vapor; therefore eliminating possible air or vapor locking that can occur in other pump designs. A special suction impeller lowers the NPSH requirement for the pump.

The side-channel pump design is similar to a regenerative turbine in that the impeller makes regenerative passes through the liquid. However, the actual design of the impeller and casing as well as the principles of operation differ greatly. The side-channel pump has a channel only in the discharge stage casing (A) and a flat surface which is flush with the impeller on the suction stage casing (B). A star-shaped impeller (C) is keyed to the shaft and is axially balanced through equalization holes (D) in the hub of the impeller.

The liquid or liquid/vapor mixture enters each stage of the pump through the inlet port (E). Once the pump is initially filled with liquid, the pump will provide a siphoning effect at the inlet port. The effect is similar to what happens in water ring pumps. The water remaining in the pump casing forms a type of water ring with a free surface. A venturi effect is created by the rotation of the impeller and the free surface of the water, thus pulling the liquid into the casing.

After the liquid is pulled through the inlet port, it is forced to the outer periphery of the impeller blade by centrifugal action. It is through this centrifugal action that the liquid is accelerated and forced into the side channel. The liquid then flows along the semicircular contour of the side channel from the outermost point to the innermost point until once again it is accelerated by the impeller blade.



Item	Description
A	Discharge Casing
B	Suction Casing
C	Vane Wheel Impeller
D	Equalization Holes
E	Liquid Inlet
F	Liquid Outlet
G	Mini Channel
H	Vapor Balance Outlet

Figure 1: Principle of Side Channel Operation

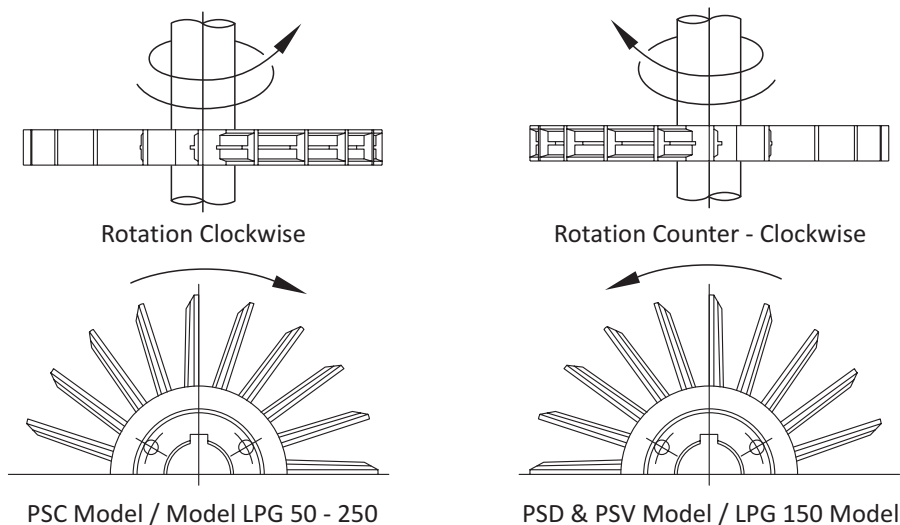


Figure 2: Directions of rotation of vane wheel impellers

5. Testing Pump

- All PETROLAND Pumps have been statically and dynamically tested in the factory.
- All by-pass valves have been statically tested in factory.
- Static pressure testing is conducted to ensure that the pumps do not leak, and that they can maintain the specified pressures.
- 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 with special liquid which protect pump against the corrosive effects.
- After testing the pump is emptied and filled with anti-corrosive protection oil.
- If the specific test certificate is demanded, contact PETROLAND to supply it certified by accredited institution accordance with international classification companies.
- All tests are performed accordance with PETROLAND Quality Management System and International Standards.

6. Safety Warnings

6.1. Safety Warnings - In General

- 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 in section **"10. Lifting Pump"** (See Figure 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.
- 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.
- Fit the pump unit with an emergency stop.
- Connect and adjust any monitoring and safety systems - controls, manometers, flow meters, etc. - according to the operating condition for safe operation.
- Use suitable safety equipment when aerating the pump such as gloves, protective goggles etc. - depending on the pump liquid. Never operate the pump until inlet and outlet connected to facilities.
- 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.
- Protect piping by PETROLAND by-pass valve against excessive pressure build-up (See figures 12, 13, 14)..
- It is recommended to use by-pass valve or equivalent safety devices which protects pump and motor.
- Any change 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.
- The shaft seal must not be adjusted during operation.
- The system must be depressurized before emptying or demounting the pump from facilities.
- When pumping hazardous liquids, circulate neutralizing liquid before emptying the pump.
- The pump is not recommended drive higher temperature of flashing point. Look at the *Table 4* for max. temperature of pump. Look at the table 6 for according to using elastomer max. temperature of pump.
- The pump is not recommended drive higher temperature of flashing point. Look at the table 4 and look and at the table 6 for according to using elastomers for max. temperatures



NEVER OPERATE THE PUMPS DRY

6.2. Safety Warnings - Electric

- 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.
- Grounding must be connected to motor.
- It is must to check the motor plate to correct voltage, phase and frequency 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.
- PETROLAND Multistage Side Channel pumps can not be shut off more than 15 times during one-hour-operating.
- Schematics of motor connection should be found in terminal box or user manuals.
- Connection type is chosen accordance with power, main supply values. Connection types of terminal box are shown on Table 1 and Figure 3.

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

Table 1: Types of Electrical Start

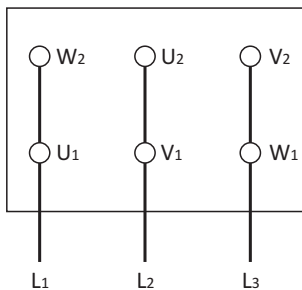


Figure 3a. Δ - Connection

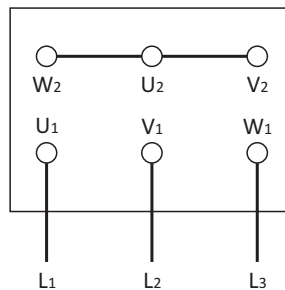


Figure 3b. Y - Connection

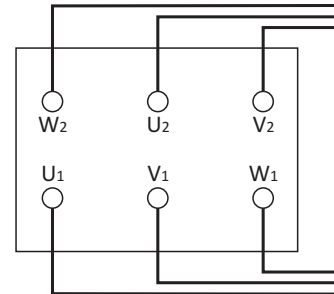


Figure 3c. Δ / Y - Connection

Figure 3: Electrical Connection Schematics



PETROLAND recommends the usage of soft starter for the electric motor which has power more than 7,5 kW.



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.



PETROLAND assumes no liability for any personal injury or damage to the electrical motor damage resulting from a failure to observe the safety regulations or other instructions in this user manual.

7. ATEX Environment Classification

Ex-proof Pumps

PETROLAND PS Series pumps are side channel, multicellular, self-priming pumps designed with up to 8 stages, having a horizontal configurations and offering numerous metallurgical variants. They allow for the simultaneous pumping of gas and liquid. The use of a pre-compression turbine at the suction end makes it possible to obtain a very small required NPSH, so that this pump can be used under very difficult suction condition. It is possible to add a retaining stage at the suction end of the pump. The shaft outlet sealing can be adapted to suit the majority of operating conditions.

PETROLAND produces pump units for potentially explosive environments, but as a standard PETROLAND pump units are not prepared for use in potentially explosive environments, and therefore they must not be used in such contexts without PETROLAND's consent. The information on the pump's name plate will define whether it can be used in a potentially explosive environment.

PETROLAND can supply pump units for potentially explosive environment within the areas indicated in *Table 2*.

Table 1: Shows the group (G=Gas/D=Dust), the categories, zones and temperature classes (T1/T2/ T3/T4) for which PETROLAND can supply pump units within potentially explosive environments.

Atex			
Group II - G/D			
Category 2		Kategori 3	
Zone 1	Zone 21	Zone 2	Zone 22
Gas / Steam / Mist	Dust	Gas / Steam / Mist	Dust
T1 / T2 / T3 / T4 /			

Table 2: Shows the groups, the categories, zones and temperature classes.

PETROLAND supplies security equipment listed below.

Control Equipment	Protection
Liquid Sensor	Protects the pump against running dry.
By-Pass Relief Valve	Protects the facilities and piping against over pressure.



All pump types and pump sizes must always be protected against dry running either by means of a liquid sensor or other comparable devices



Pumps supplied with a soft stuffing box must always be fitted with a liquid sensor or other comparable devices.

Before ordering, you must first as a customer fulfil the minimum requirements in the current, relevant ATEX Directive concerning improvement of safety and health protection for employees who may be exposed to danger resulting from potentially explosive environments and have prepared an overall risk assessment in conformity with the mentioned directive in collaboration with the local fire authorities.



This risk assessment must be in conformity with the ATEX labelling PETROLAND has stated on the name plate of the supplied pump – before start-up of the pump is allowed.

8. Pump Models and Versions

8.1. Pump Code System

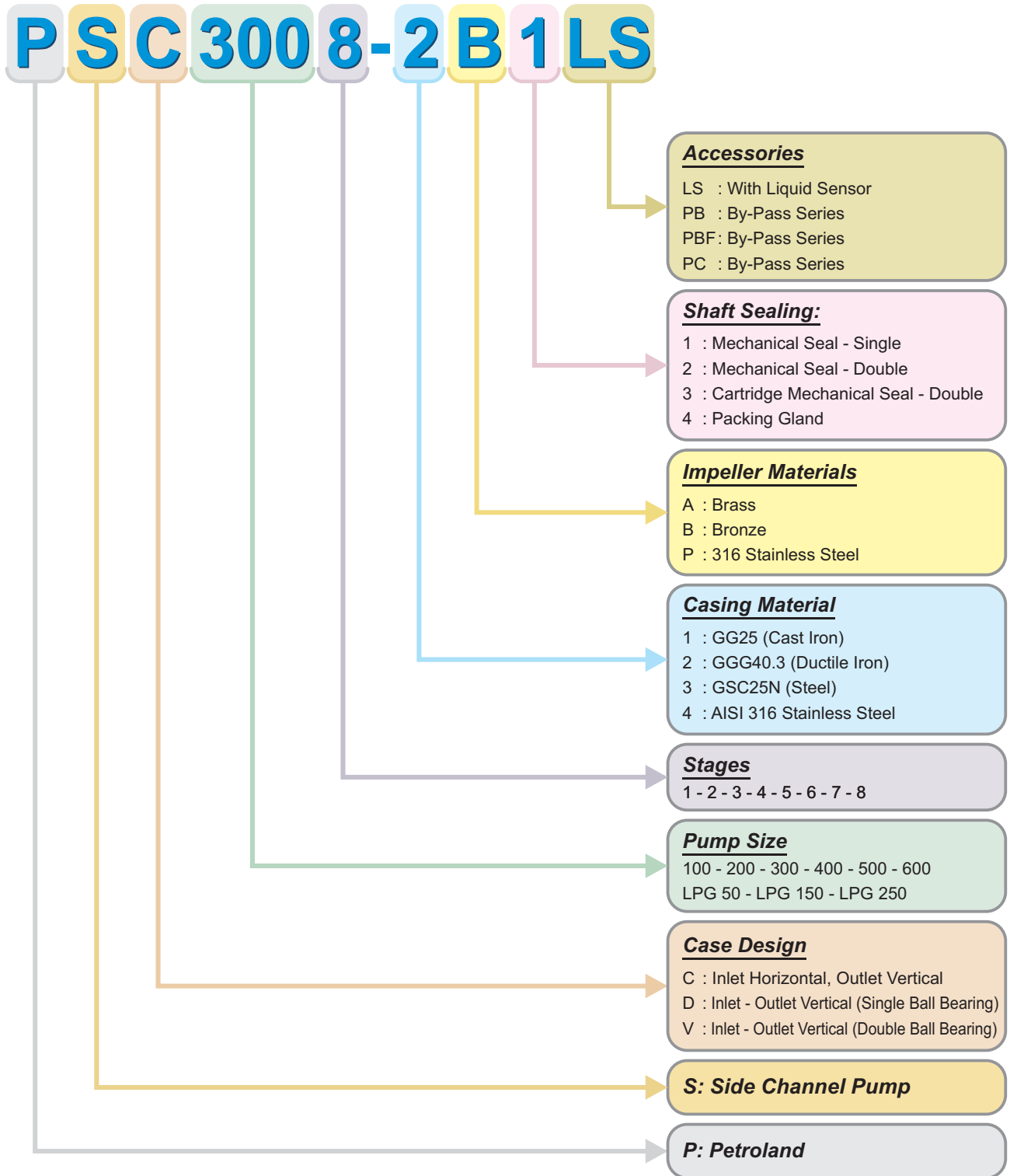


Table 3: Pump Code System

8.2. Pump Models and Technical Specifications

PS Series						
SERİ	1000	2000	3000 / LPG 50	4000	5000	6000 / LPG 250
Number of Stages	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8					
Inlet Flange	1½ (DN40)	2½ (DN65)	2½ (DN65)	3 (DN80)	4 (DN100)	4 (DN100)
Outlet Flange	¾ (DN20)	1¼ (DN32)	1¼ (DN32)	1½ (DN40)	2 (DN50)	2½ (DN65)
Inlet - Outlet Flanges for PSD, PSV and LPG 150	¾ (DN20)	1¼ (DN32)	1¼ (DN32) LPG 150	1½ (DN40)	2 (DN50)	2½ (DN65)
Speed (50 Hz) / Speed (60Hz)	1450 / 1750					
Maximum Working Pressure, Bar (psi)	35 Bar (510)					
Differential Range Head ft (m)	50 (15)–690 (210)	65 (20)–1050 (320)	30 (10)–820 (250)	30 (10)–805 (245)	30 (10)–950 (290)	30 (10)–1150 (350)
Minimum Temperature °C (°F)	-40° (-40°)					
Maximum Temperature °C (°F)	220° (430°)					
NPSH ft (m)	1.6 (.5) – 13 (4)	2 (.6) – 3.3 (1)	1.6 (.5) – 6.6 (2)	1.3 (.4) – 8.2 (2.5)	1.3 (.4) – 12 (3.5)	4.6 (1.4) – 8.2 (2.5)
Maximum Viscosity cSt (SSU)	230 (1050)					
Maximum Proportion of Gas Allowable	% 50					
Connection Norms	ANSI 150 & 300 Flange / DIN EN 1092 & DIN 2501 PN40 Flange					
Casing Material Options	GG25 (Cast Iron) / GGG50 (Ductile Iron) / GSC25N (Steel) / AISI 316 Stainless Steel					
Impeller Material Options	Brass / Bronze / AISI 316 Stainless Steel					
Shaft Sealing Options	Mechanical Seal / Cartridge Mechanical Seal / Cartridge Double Mechanical Seal / Packing Gland					
Mechanical Seal Material Options	SIC-Car-Viton / SIC-SIC-Kalrez / SIC-SIC-Teflon					
Operating Temperature	Min: -40C° Max: +120C°					
Pump rpm	1450 rpm (1750 rpm / 60Hz)					
Capacity	Max: 35 m³/h (42 m³/h / 60Hz)					
Accessories	Liquid Sensor (Liquid Level Switch) / Collector / Reducer / Exproof Coupling / By-Pass Valve					

Table 4: Pump Models and Technical Specifications

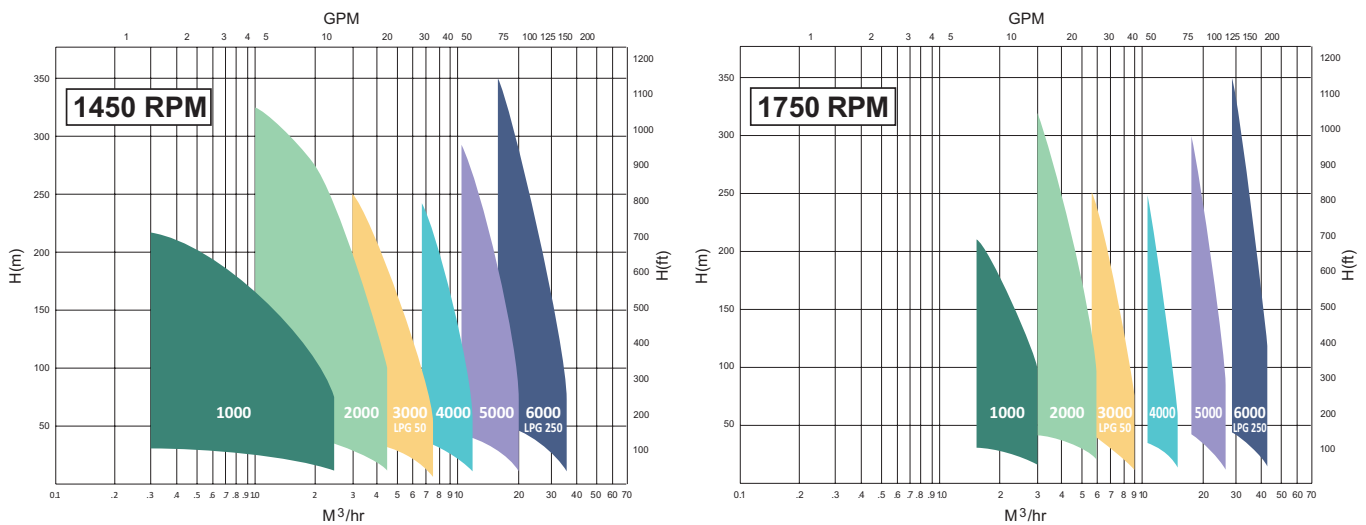
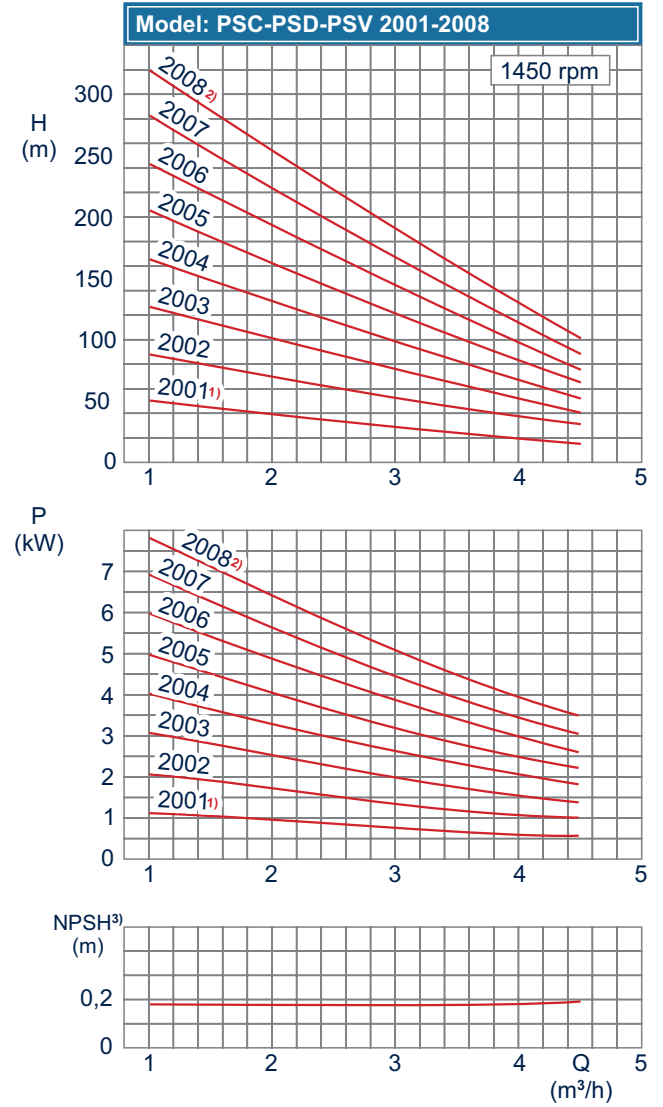
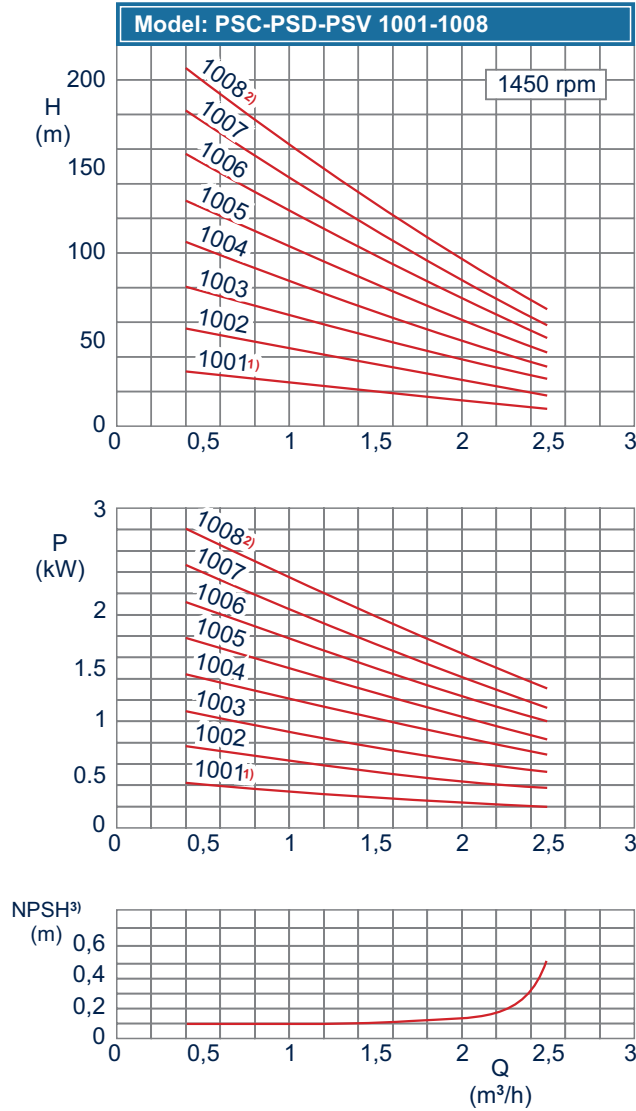


Figure 4: Performance Curves

8.3. Performance Curves

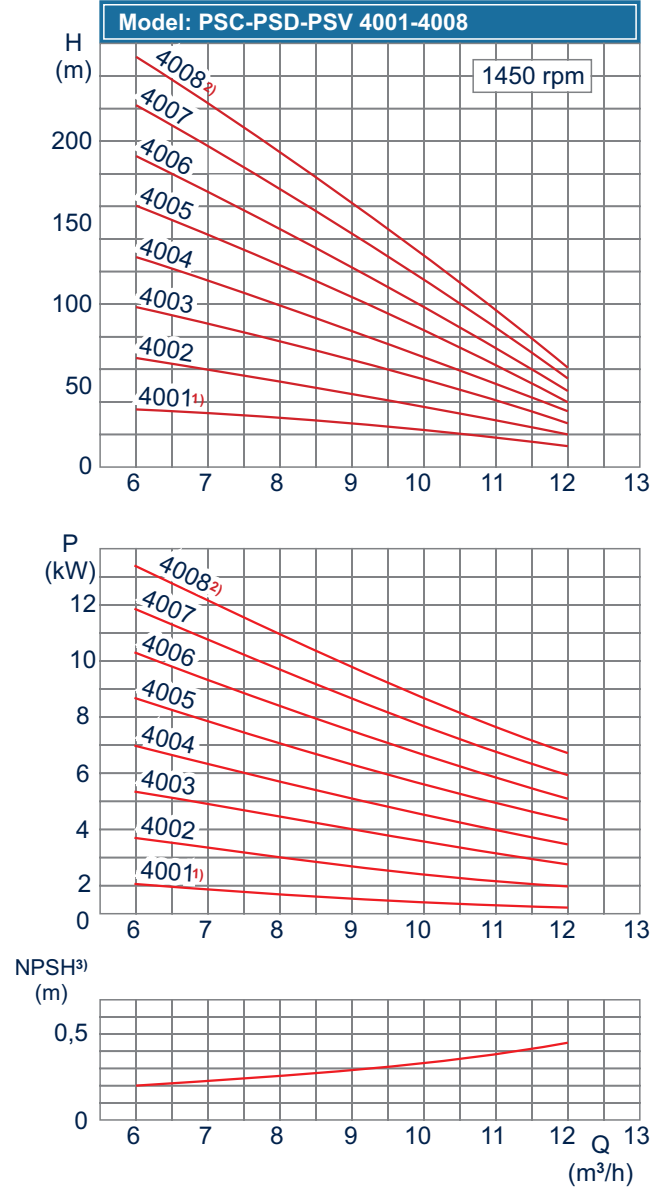
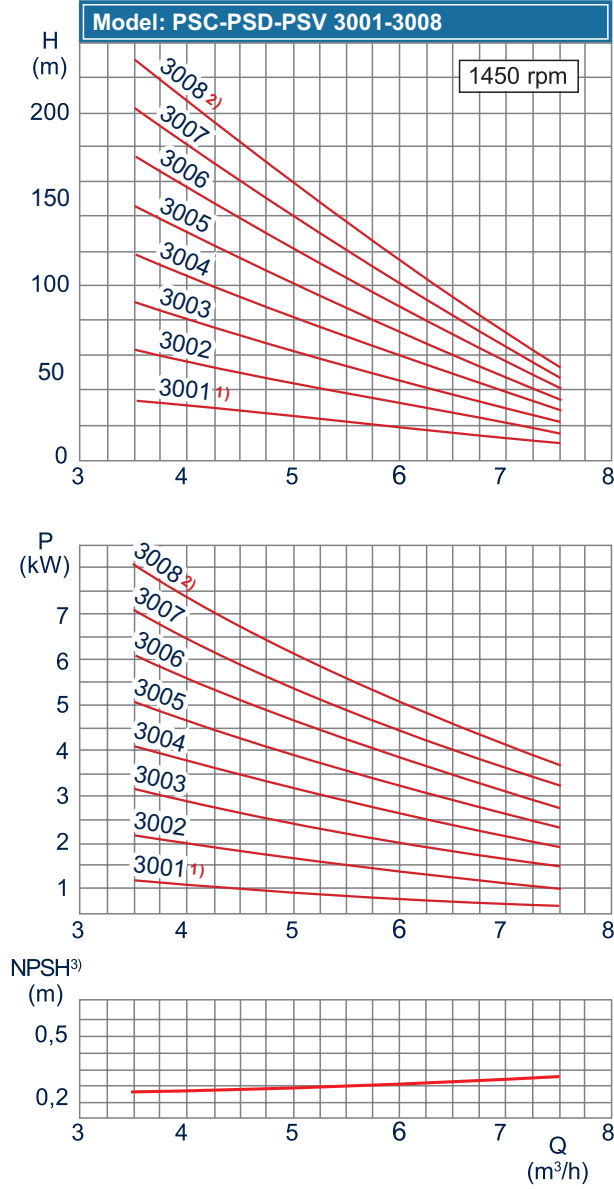


Liquid sensor is applicable for only PSC model pumps.

- 1) 1 Stage pump can not be ordered with liquid sensor.
- 2) 8 Stage pump with liquid sensor is produced upon request

General: Values are valid for water $\rho = 1 \text{ kg/dm}^3$ and $\nu = 1 \text{ cSt}$.

Design tolerances: Capacity $\pm 5\%$ - Delivery head $\pm 5\%$ - Power $+ 10\%$
The tolerance for the delivery head is extended by 5% each.

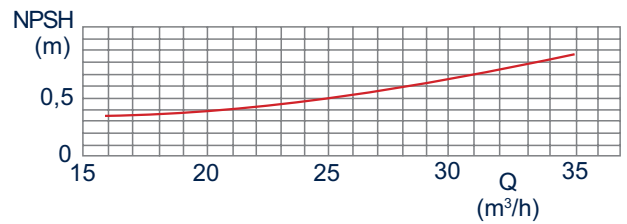
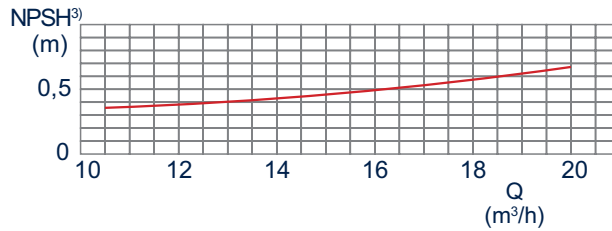
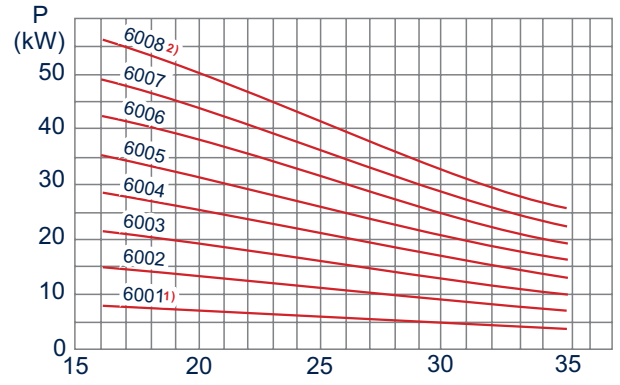
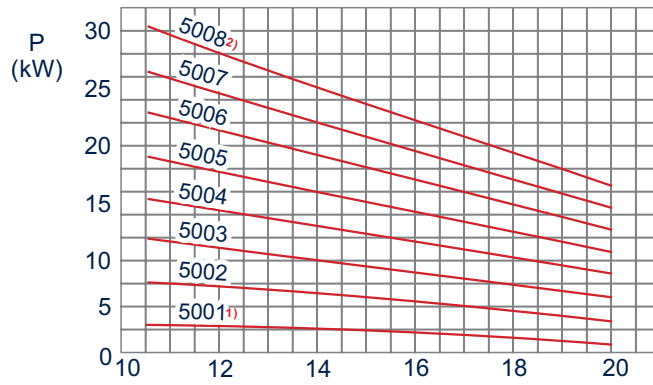
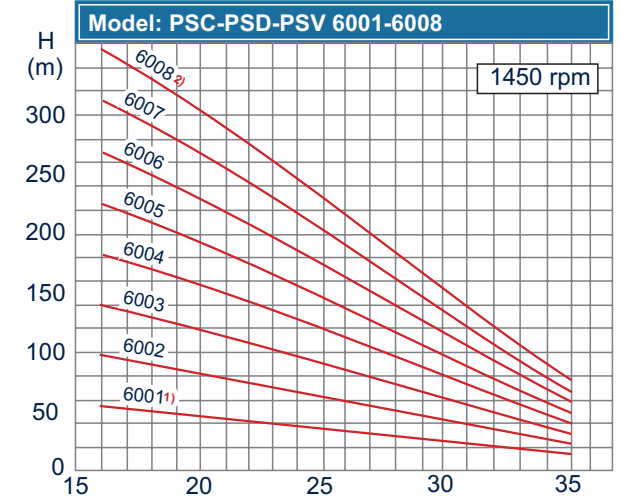
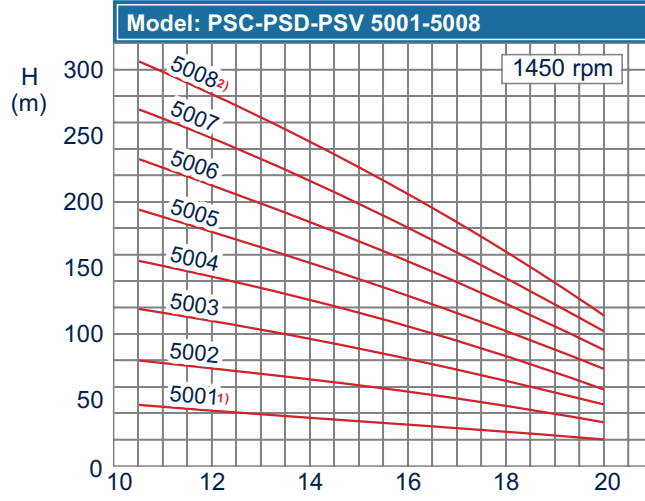


Liquid sensor is applicable for only LPG 50 and LPG 250 model pumps.

- 1) 1 Stage pump can not be ordered with liquid sensor.
2) 8 Stage pump with liquid sensor is produced upon request

General: Values are valid for water $\rho = 1 \text{ kg/dm}^3$ and $\nu = 1 \text{ cSt}$.

Design tolerances: Capacity $\pm 5\%$ - Delivery head $\pm 5\%$ - Power $+ 10\%$
The tolerance for the delivery head is extended by 5% each.

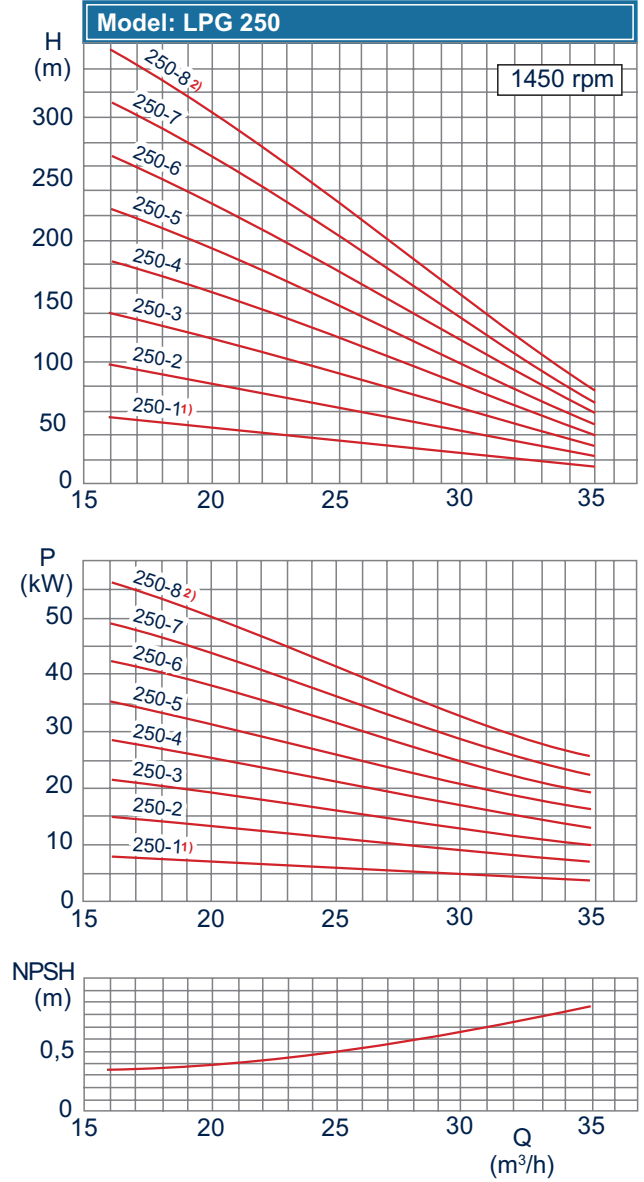
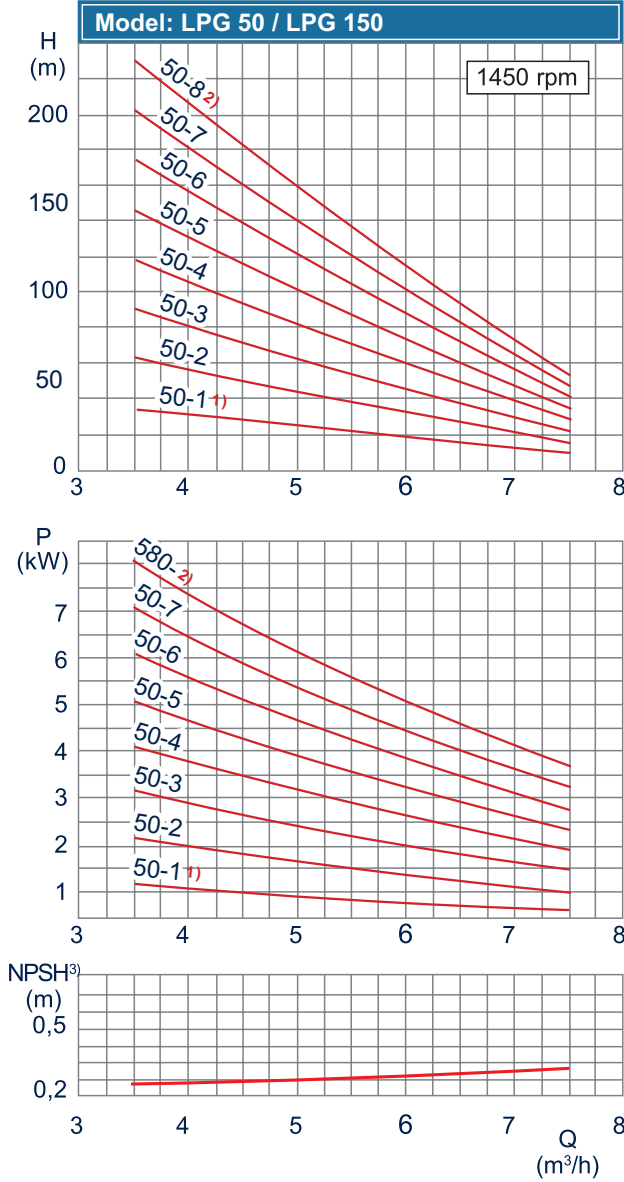


Liquid sensor is applicable for only PSC model pumps.

- 1) 1 Stage pump can not be ordered with liquid sensor.
- 2) 8 Stage pump with liquid sensor is produced upon request

General: Values are valid for water $\rho = 1 \text{ kg/dm}^3$ and $\nu = 1 \text{ cSt}$.

Design tolerances: Capacity $\pm 5\%$ - Delivery head $\pm 5\%$ - Power $+ 10\%$
The tolerance for the delivery head is extended by 5% each.



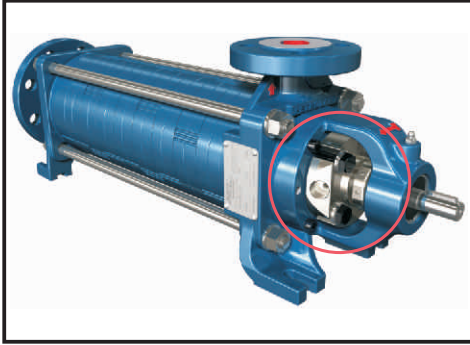
Liquid sensor is applicable for only LPG 50 and LPG 250 model pumps.

- 1) 1 Stage pump can not be ordered with liquid sensor.
- 2) 8 Stage pump with liquid sensor is produced upon request

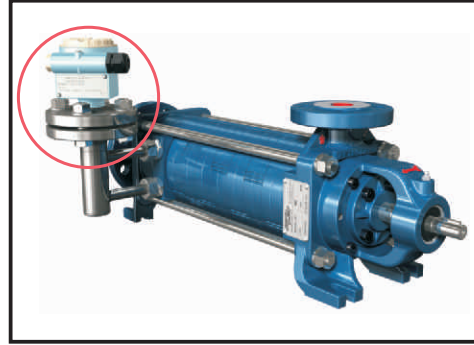
General: Values are valid for water $\rho = 1 \text{ kg/dm}^3$ and $\nu = 1 \text{ cSt}$.

Design tolerances: Capacity $\pm 5\%$ - Delivery head $\pm 5\%$ - Power $+ 10\%$
The tolerance for the delivery head is extended by 5% each.

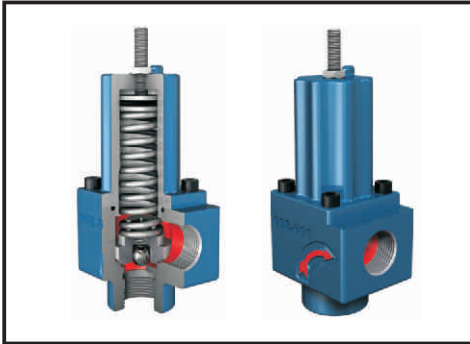
8.4. Pump Accessories



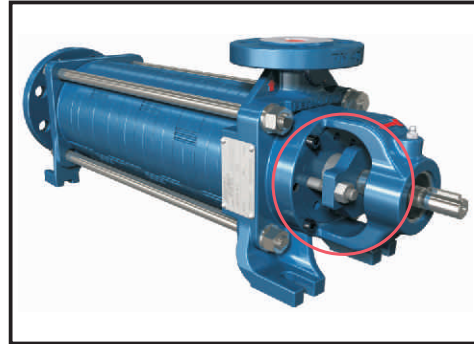
Cartridge Mechanical Seal



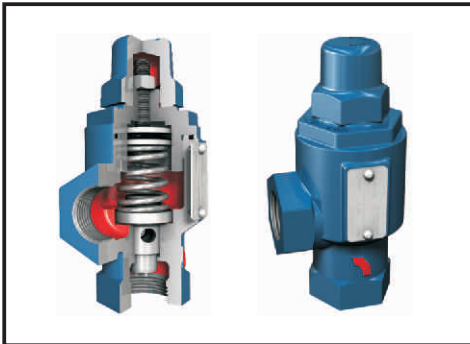
Liquid Sensor



PC Series By-Pass Valve



Packing Gland



PB Series By-Pass Valve



Collector



Exproof Coupling



Reducer

9. 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.

10. 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!

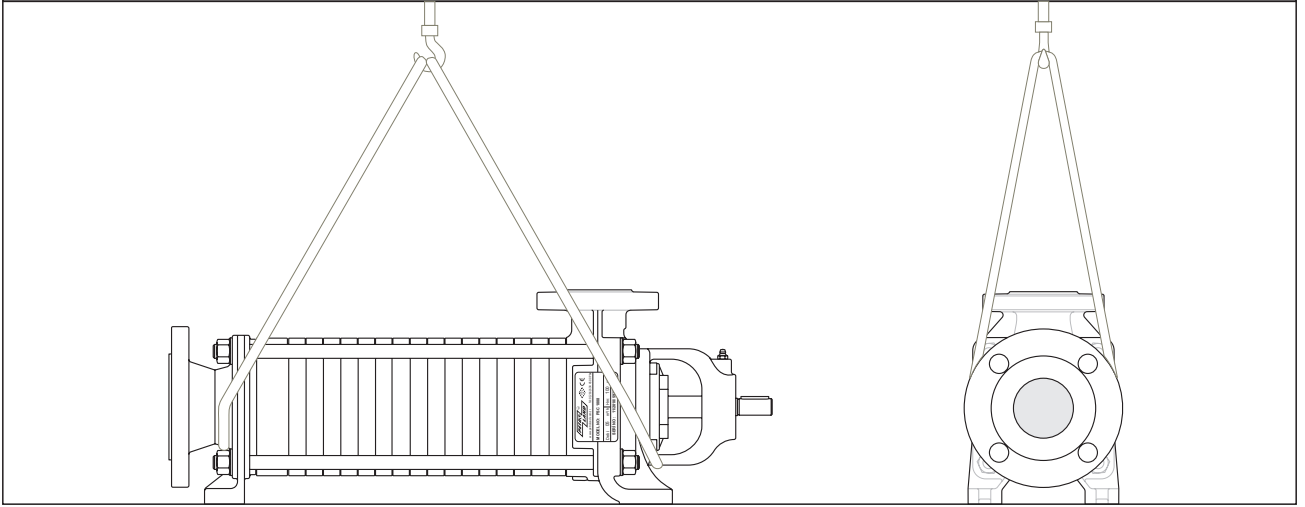
- Lift the pump mechanically, if the pump's weight is more than the permitted number of kilos that people may lift.
- Do not place fingers in the pump's ports when lifting or handling the pump.
- Motors fitted with lifting eyes must be used to lift the whole pump, but only to lifting the motor separately.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



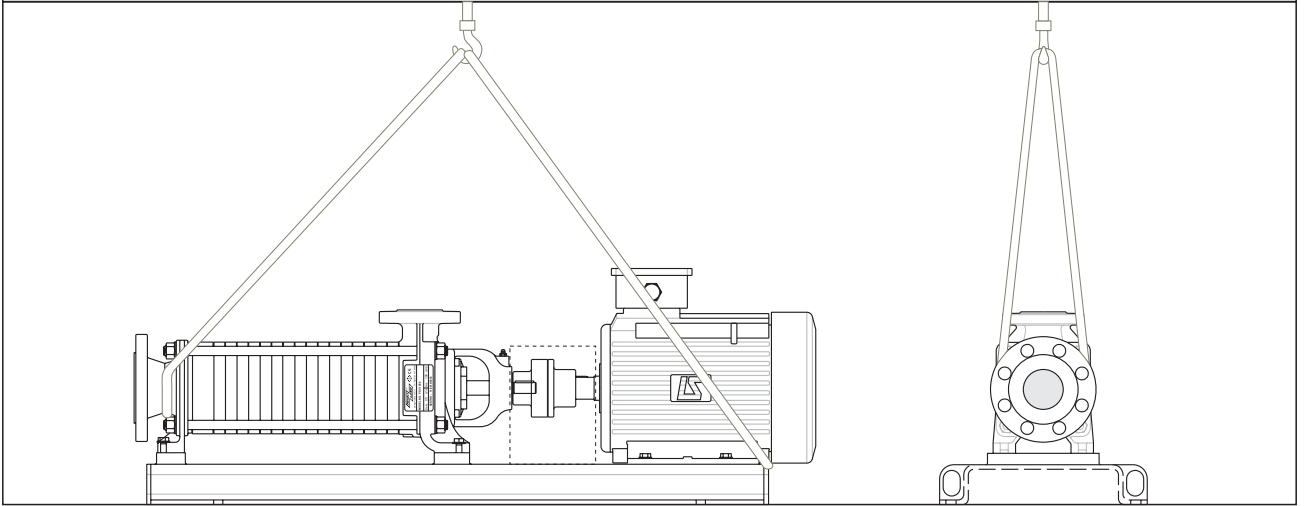
Ensure that the ropes are covered the pump and hanged on the hook securely.

Pump Lifting Instructions

Lifting The Bare Shaft Pump



Lifting The Small Size Pump Acoupled with Electrical Motor



Lifting The Big Size Pump Acoupled with Electrical Motor

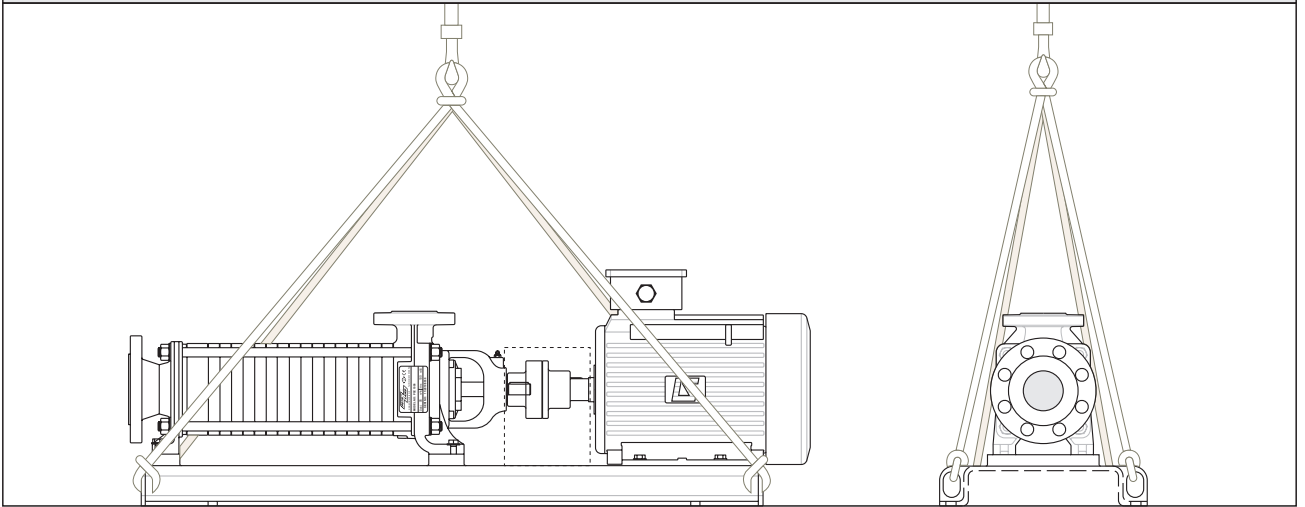


Figure 5: Pump Lifting Instructions

11. 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 3 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 3 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.
- In the event of installation stopping for more than 4 weeks (this period could be much more shorter in unfavorable climatic conditions) drain the pump, wash it with fresh water and spray the corrosion-resistant agent inside. After this operation ensure that the flange have been plugged.

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

12. 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.



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

12.1. Aligning the Motor and the Pump

- 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 center line and that there are a few mm between the shaft ends (See Figure 11).



Carefully shield the coupling between the pump and motor (See Figure 11).

- Pumps must be connected to the motor by means of an elastic coupling.
- If a PETROLAND standard coupling is used, the pump and the motor are aligned as described in the following section.

12.2. PETROLAND The Patented Exproof Coupling



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

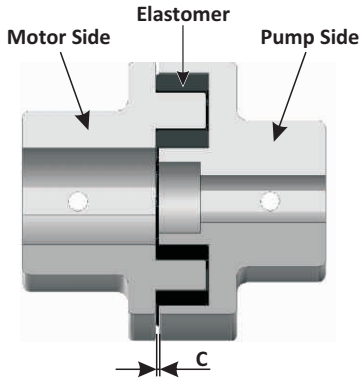


Figure 6: Sectional View Of Exproof Coupling

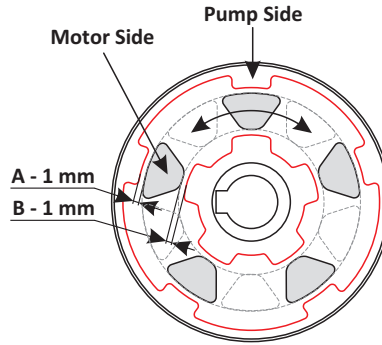


Figure 7: Clearances Of Exproof Coupling

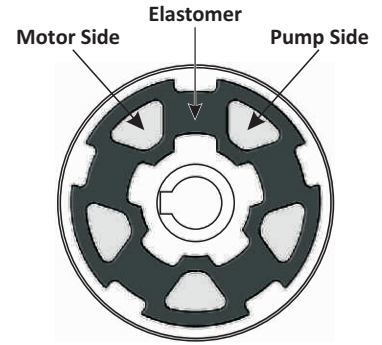


Figure 8: Schematic Of Assembly Of Exproof Coupling

Exproof coupling should be turn freely without any metal-to-metal contact even if the elastomer damaged. PETROLAND patented exproof coupling have 1mm gaps to be turned freely (See Figure 7).

PETROLAND patented exproof couplings have C gap 1 mm fixed between sides. This gap is the one of the most important feature which protects the coupling sides against to contact each other so prevent any possible sparking even if the setscrews are loosened caused by vibration.

12.3. Adjusting The Standard Coupling

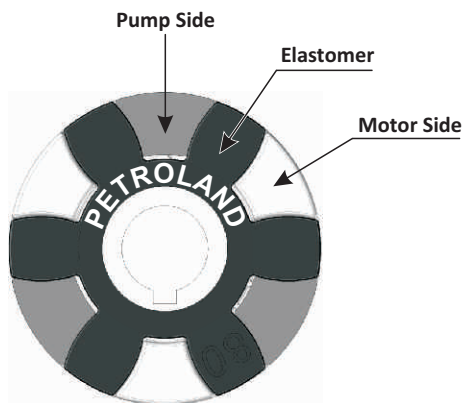
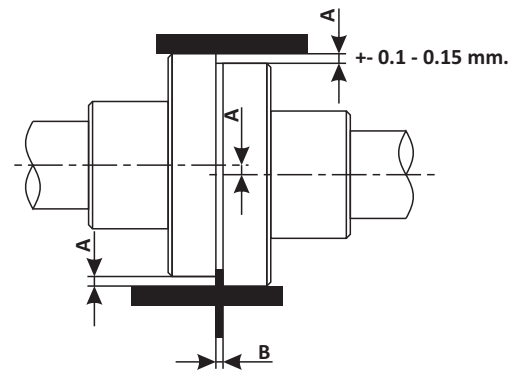


Figure 9: PETROLAND Standard Coupling



B: Gap should be between: 1 - 1.5 mm.

Figure 10: Adjusting Elastical Coupling

The Standard Construction Coupling which is shown Figure 9 should not be used in a potentially explosive environment. This coupling design can not prevent any possible sparking caused by metal-to-metal contact when the elastomer damaged and broken.

12.4. Locating the Pump onto Base Plate

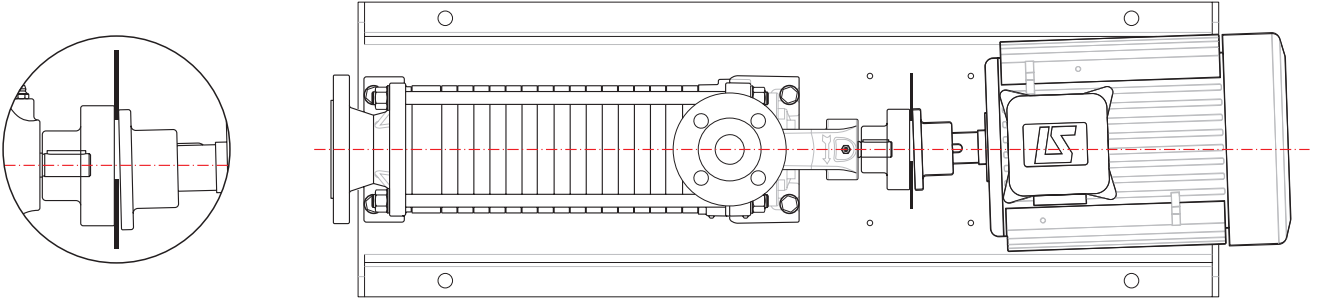


Figure 11a: Horizontally angular fault.

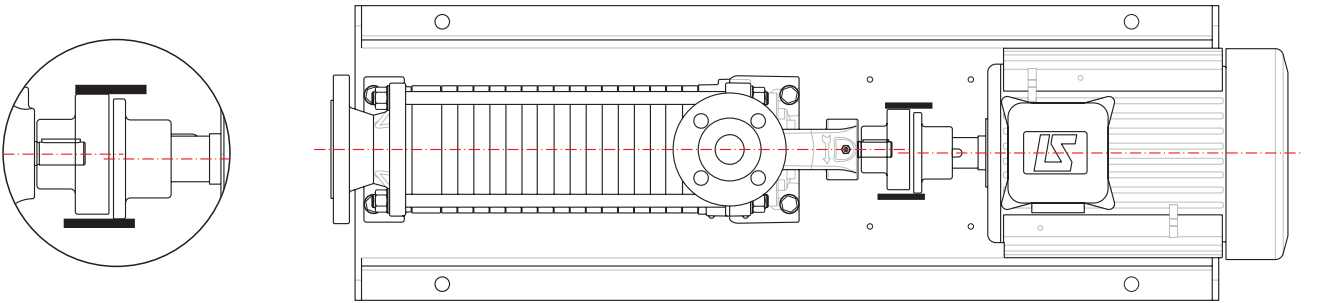


Figure 11b: Horizontally parallelism fault.

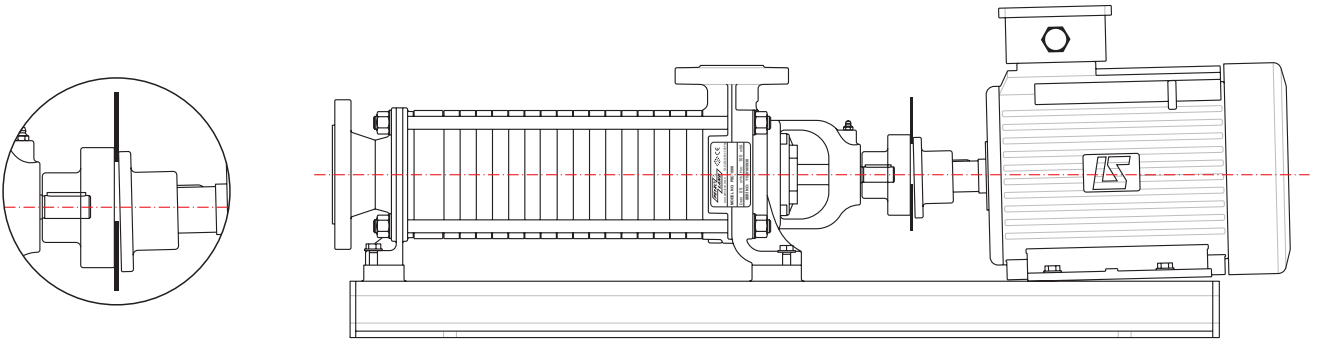


Figure 11c: Vertically angular fault.

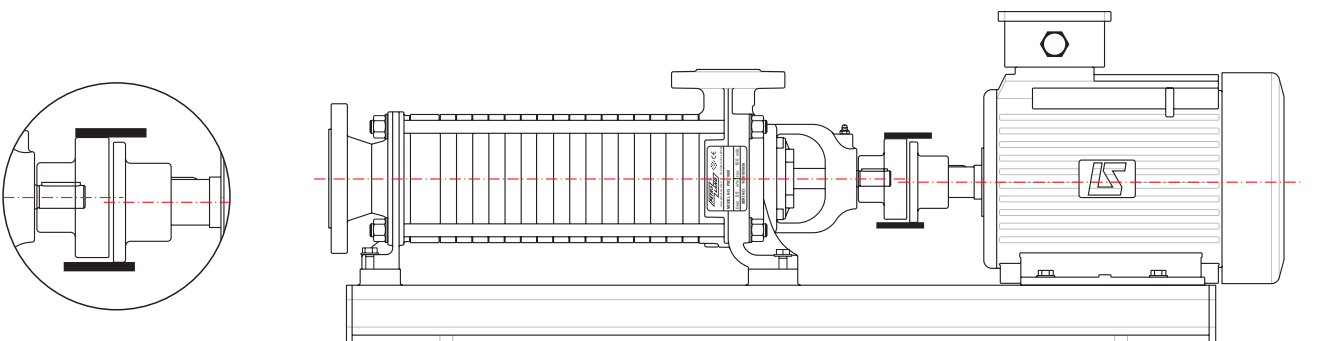


Figure 11d: Vertically parallelism fault.

13. Before Starting the Pump

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. If the By-Pass valve or equivalent device has not been mounted to pipeline, Impellers and shaft can be bent, broken and damaged.
• That any by-pass valve is fitted correctly.
• That any by-pass valve is adjusted to the correct opening pressure.
Facilities and Pipeline:
• 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 is not empty after the last operation. Otherwise pump can be jammed.
• 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.

14. 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 transferring the liquid.
• That there is no cavitation in the pump casing
• That the electrical motor has adequate speed and power values for the pump
• That the electrical motor has adequate insulation and protection class.
• That the direction of rotation is correct.
• That the pump is not vibrating or emitting a jarring sound.
• That the packing gland and bearing heating are controlled.
• That there is no leakage. Mechanical seal faces can leak slightly at the first start up. The components take up their positions in 30 minutes then will be stopped unprompted.
• 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.
• That the operating pressure is correct.
• That the pressure of the underground tank is not dropped below 2 Bar.
• 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 feeding tank liquid level is controlled.

15. By-Pass Valve

By-Pass 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 By-Pass valve has return flow to the liquid tank.

PETROLAND By-Pass valves have been showed as below.

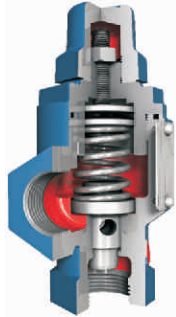


Figure 12: PB Type By-Pass Valve



Figure 13: PBF Type By-Pass Valve



Figure 14: PC Type 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 by-pass valve protects pumps in the event of brief pulsating excess pressures and not in the event of constant pressure increase. By-pass should not be open continuously to protect system against any damage or explosion.

PETROLAND Pumps can be supplied with or without By-Pass Valves.



The pipe system must be protected against excess pressure by use of the PETROLAND By-Pass valve.



The By-Pass line should return to feeding tank.



By-pass valve should be fitted correctly.

Technical Specifications and Models of PB Series By-Pass valves				
By-Pass Type	Max. Operating Pressure	By-Pass Inlet-Outlet	Connection Type	
PB 25	15 BAR (217.5 psi)	1"	BSP	NPT
PB 32		1¼"		
PB 40		1½"		
PB 50		2"		

Technical Specifications and Models of PC Series By-Pass valves				
By-Pass Type	Max. Operating Pressure	By-Pass Inlet-Outlet	Connection Type	
PC 25	15 BAR (217.5 psi)	1"	BSP	NPT
PC 32		1¼"		
PC 40		1½"		
PC 50		2"		

Technical Specifications and Models of PBF Series By-Pass valves.					
By-Pass Type	Max. Operating Pressure	By-Pass Inlet-Outlet	Connection Type		
PBF 32	15 BAR (217.5 psi)	1¼"	BSP	NPT	Special Flange Application Upon Request
PBF 40		1½"			
PBF 50		2"			
PBF 65		2½"			

Table 5: By-Pass models and technical specifications.

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.



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.

15.1. Working Principle of By-Pass Valve

Fluid forces to open the poppet of the by-pass valve as the pressure raises in the discharge pipeline instantly. If the pressure raised greater then the setting pressure, pressurized spring lets the poppet to open and start by-pass circulation. Fluid returns into feed tank. Circulation over a long period of time through the by-pass valve causes a significant heating up.

By-pass valve is the most important component for the LPG and anhydrous ammonia handling applications. By-pass valve opens precisely at the preset spring pressure even if the capacity changes. *Figure 15* shows that the by – pass opens at 9 Bar preset value between 40 liters /minute and 400 liters /minutes. By-pass valve has only two moving parts which provides simple and safe construction.

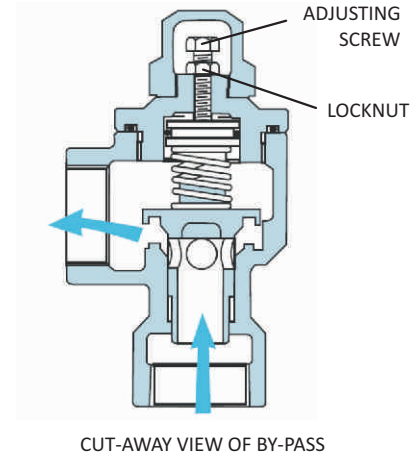
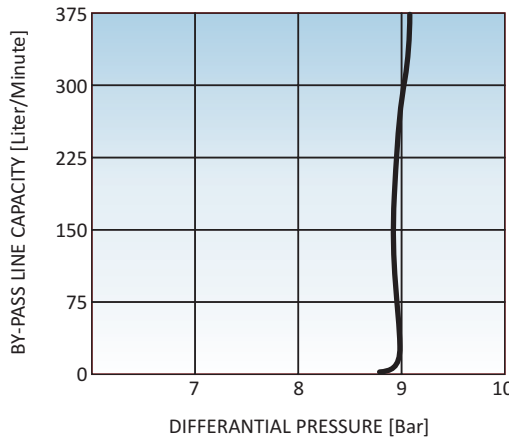


Figure 15: Performance curve of By-Pass Valve 9 Bar preset pressure values and Cut-away view

15.2. 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) or 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 (See Figure 15).

17. Maintenance

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

17.1. 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 there is liquid in connection with liquid-greased slide bearing.
- That open ball bearings are lubricated.
- That power output and power consumption are correct.
- That flow and operational pressure is correct.
- That the max. allowed temperature is observed.

17.2. 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.

17.3. 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 re packed if worn.

17.4. 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.

Tool list for maintenance , disassembly and assembly is given below:

1. Allen wrench set
2. Wrench set
3. Inner Snap Ring Plier
4. Outer Snap Ring Plier
5. Screwdriver (2 Pieces)
6. Hammer (1 Kg)
7. Soft Hammer (PTFE)
8. Special Tool (For assemble of Ball Bearing and Lip Seal)

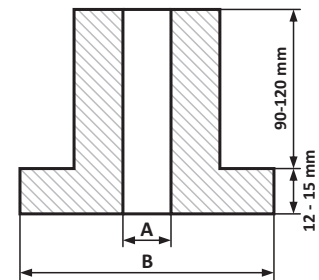


Figure 17: Special Tool for assemble of Ball Bearing and Lip Seal.

DIMENSIONS OF SPECIAL TOOLS FOR EACH SIZES OF PETROLAND PUMP [mm]						
MODEL	1000	2000	3000 LPG 50 & 150	4000	5000	6000 LPG 250
A	17.5	20.5	20.5	25.5	30.5	35.5
B	46.5	51.5	51.5	61.5	71.5	79.5

Table 7: Dimensions of special tools for each sizes of PETROLAND pump.

17.5. Disassembly and Assembly of Mechanical Seal (For LPG 50,150,250 Models)

PETROLAND recommends to dismount the pump from pipeline and take to workshop for changing the mechanical seal.

Mechanical Seal can be changed when the pump has not dismounted from pipeline but the pump may contain poisonous , flammable or explosive fluid. Therefore this operation should be handled by qualified and authorized people who may accept liability.

The most important feature of PETROLAND pumps is that mechanical seal can be changed without disassembling the whole parts of pump.

17.5.1. Disassembly of Mechanical Seal

- Use screwdriver and hammer to remove the key on the shaft (9500).
- Use inner snap ring plier to extract the inner ring of lip seal (7220).

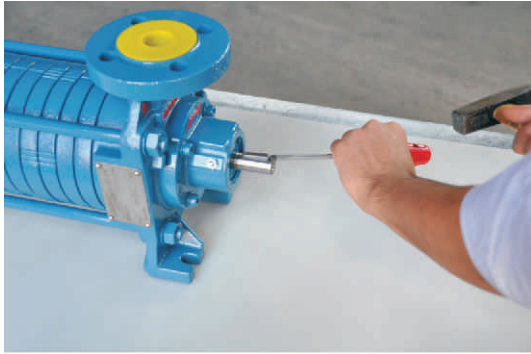


Figure 18: Shows replacing the key by using screwdriver and hammer.

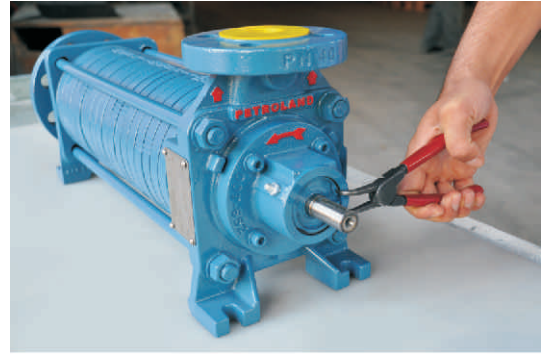


Figure 19: Shows extracting the inner snap ring by using plier.

- Use screwdriver to extract the lip seal (4145).
- Use outer snap ring plier to extract snap ring of bearing (7210).

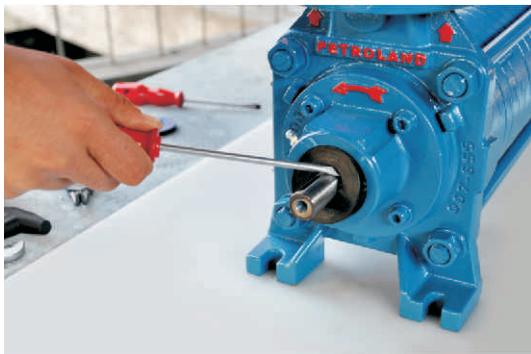


Figure 20: Shows extracting the lip seal by using screwdriver.



Figure 21: Shows extracting the bearing snap ring by using plier

- Loosen the screws (9170) of mechanical seal casing by using allen wrench.
- Use the puller bolts to extract mechanical seal casing by gradually tightening puller screws two by two diagonally.



Figure 22: Shows removing the screws by using allen wrench.

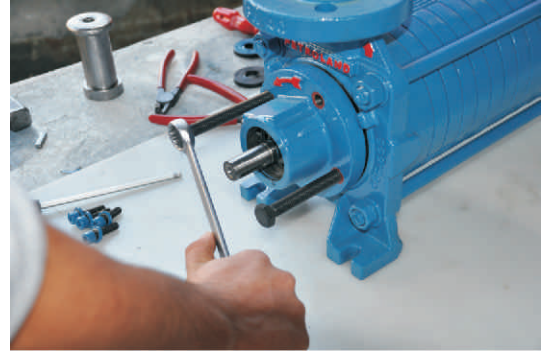


Figure 23: Shows pulling the mechanical seal casing by using puller bolt.

- Replace the o-ring (2820) from mechanical seal casing.
- Pull the stationary face (4440) softly which places in mechanical seal casing.



Figure 24: Shows removing the o-ring on mechanical seal casing.



Figure 25: Shows pulling the stationary face from mechanical seal casing.

- Use two screwdriver to remove the rotating face (4440) and its spring by sliding on the shaft.
- Use the inner snap ring plier to extract the inner snap ring (7230).

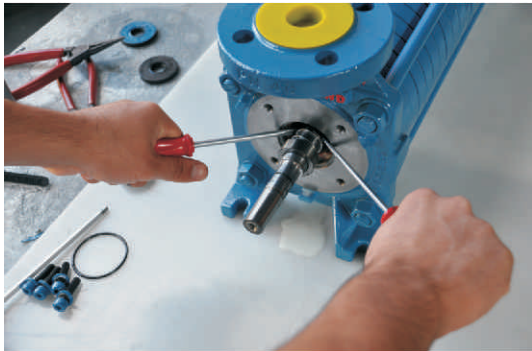


Figure 26: Shows pulling the rotating face and its spring



Figure 27: Shows extracting the inner snap ring by using plier.

- Place the bearing casing on the flat surface and tap slightly to extract the ball bearing by using screwdriver and hammer.



Figure 28: Shows extracting the ball bearing from mechanical seal casing.

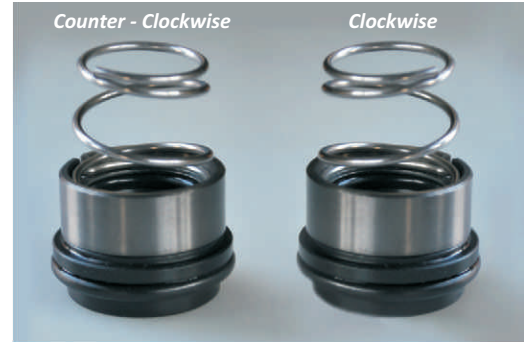


Figure 29: Shows mechanical seals. CW rotation and CCW rotation.

- Counter-Clockwise rotating mechanical seals are used for LPG 50 and LPG 250 models and clockwise rotating mechanical seals are used for LPG 150. Direction of rotation can be determined by direction of seal spring.
- PETROLAND uses double rotation mechanical seal for special applications.

17.5.2. Assembly of Mechanical Seal

- Place the Ball Bearing into mechanical seal casing by using hammer and special tool.
- Use the inner snap ring plier to place the inner snap ring.



Figure 30: Shows placing the bearing into mechanical seal casing.



Figure 31: Shows fixing the inner snap ring by using plier.

- Place the rotating face and its spring by sliding on the shaft.
- Press the stationary face into mechanical seal casing by fingers.
- Lubricate surfaces before placing the rotating seal face and stationary seal o-ring.



Figure 32: Shows placing the rotating seal on the shaft.



Figure 33: Shows placing the stationary face into mechanical seal casing.

- Place the mechanical seal casing which stationary seal face and bearing have already been assembled in. Check the direction of rotation arrow is located upward.
- Use the special tool and hammer to fix the mechanical seal casing onto shaft and discharge casing.

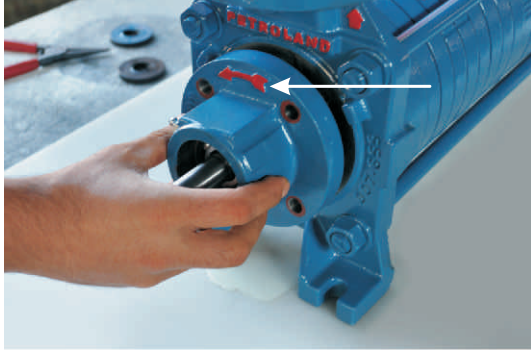


Figure 34: Shows the direction of rotation arrow



Figure 35: Shows fixing the mechanical seal face onto discharge casing.

- Tighten the screws by using allen wrench.
- Fix the snap ring of shaft by using outer snap ring plier after screws of mechanical seal casing are tightened.



Figure 36: Shows tightening the screws by using allen wrench.



Figure 37: Shows fixing snap ring onto shaft

- Use special tool and hammer to fix the lip seal into mechanical seal casing.
- Use inner snap ring plier to fix snap ring of lip seal.
- Apply adhesive (Loctite®) onto setscrew then tighten to fix the coupling after placing the key in shaft key hole.



Figure 38: Shows fixing the lip seal into mechanical seal casing.

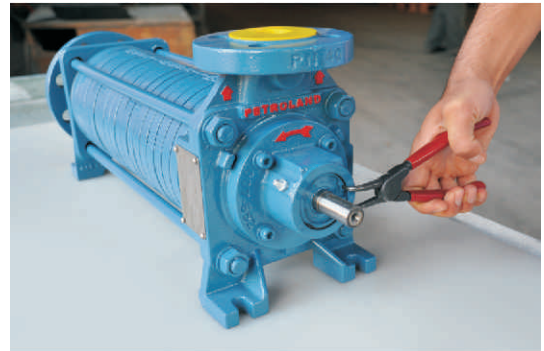


Figure 39: Shows fixing the snap ring of lip seal.



Check that the shaft can be rotated by hand easily after coupling assembled.

17.6. Disassembly and Assembly of The Pump (For LPG 50 and 250 models)

17.6.1. Disassembly of The Pump



The pump can still contain a residue of pumped fluid or rinsing product. Take precautions to contain any leakage.

See sectional drawings before any disassembly performed. Refer to part numbers shown on the lists of sectional drawings.

- The working surface must be clean, free from dirt, filings etc. And be perfectly clear.
- To facilitate later assembly make a mark over the entire length of the pump body and number the parts.
- Disassembly starts at the suction end. It is becoming to demounting from discharge body on LPG 50 model pumps.
- Disassembly successively nuts (9120), flat washers (9130), tie bolts (9110) and suction casing (1120). Discharge casing (1130) for LPG 150.
- Loosen the hexagonal nut (2490) while holding the shaft with a strap wrench or special tool.



The hexagonal nut (2490) has left-hand thread

- Disassembly successively the impeller (2410), the key (9502), the centrifugal body (1170) and the bushing (0241 if it is worn), then retaining stage (for pumps with this feature). For LPG 150 model, start disassembly of the stages after replacing the discharge casing (1130).
- Then disassemble the inlet body (1150) the vane impeller (2460) the key (9501) and the discharge body (1160). Repeat this procedure as many times as there are stages. It follows demounting discharge casing, discharge stage and suction stage on LPG 150 model pumps.
- Remove snap ring (7220) and the lip seal (4145) and snap ring (7210) of shaft.
- Loosen bolts (9170) and extract mechanical seal casing (1180) and discharge flange (1130).
- Disassembly the mechanical seal and protect to not be damaged until assembly.

Disassembly of mechanical seal described step by step particularly by using pictures in section “17.5. Disassembly and assembly of the mechanical seal”.

17.6.2. Assembly of The Pump

- Fix the rotating seal face (4440) onto shaft (2200).
- Insert ball bearing (3320) , snap ring (7230) , stationary seal face into the mechanical seal casing (1180). Check that the stationary seal face has parallelism with rotating seal face. Then fix snap ring (7110) of bearing.
- After inserting the lip seal (4145) into mechanical seal casing (1180), fix the snap ring (7220).
- Place the key and coupling then tighten the setscrew.
- Place the mechanical seal casing with o-ring (2820) onto pump casing (1130) then tighten the screws (9170) slightly.
- Position the pump vertically on the bench (drive shaft end downwards) wedge it or clamp the shaft end in the an opening in the bench. Start assembly from end and determine the location of bodies according to section “18.6.3. Assembly Schematics of Stages”. Replace all o-rings with new ones.
- Place the suction impeller casing (1170), key (9502) and Suction impeller (2410) then tighten the hexagonal nut (2490)
- For LPG 150 models Suction impeller casing (1170), key (9502) and Suction impeller (2410) do not exist.



The hexagonal nut (2490) has left-hand thread

- Place suction casing (1120), tie bolts (9110) and flat washers (9130). Tighten tie nuts (9120) slightly.
- Locate the pump on the flat surface and check that the pump is fixed.
- Tighten nuts (9110) diagonally with torque recommended.
- Check that the shaft can be rotated by hand easily after coupling assembled.

17.7. Disassembly and Assembly of Mechanical Seal

(For PSC-PSD-PSV 1000-2000-3000-4000-5000-6000 models)

PETROLAND recommends to dismount the pump from pipeline and take to workshop for changing the mechanical seal.

Mechanical Seal can be changed when the pump has not dismounted from pipeline but the pump may contain poisonous, flammable or explosive fluid. Therefore this operation should be handled by qualified and authorized people who may accept liability.

The most important feature of PETROLAND pumps is that mechanical seal can be changed without disassembling the whole parts of pump.

17.7.1. Disassembly of Mechanical Seal

- Use screwdriver and hammer to remove the key on the shaft (9500).
- Use inner snap ring plier to extract the inner ring of lip seal (7220).



Figure 40: Shows replacing the key by using screwdriver and hammer.



Figure 41: Shows extracting the inner snap ring by using plier.

- Use screwdriver to extract the lip seal (4145).
- Use outer snap ring plier to extract snap ring of bearing (7210).



Figure 42: Shows extracting the lip seal by using screwdriver.

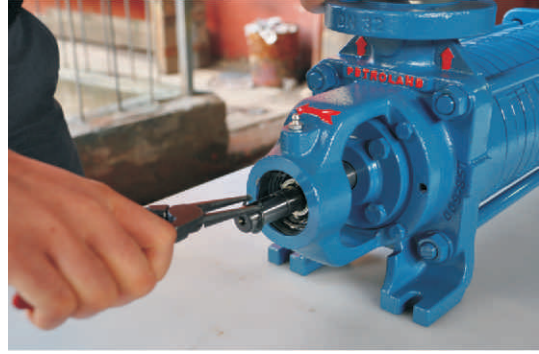


Figure 43: Shows extracting the bearing snap ring by using plier

- Loosen the screws (9140) of bearing casing by using wrench.
- Use the puller bolts to extract bearing casing by gradually tightening puller screws two by two diagonally.



Figure 44: Shows removing the screws by using allen wrench.

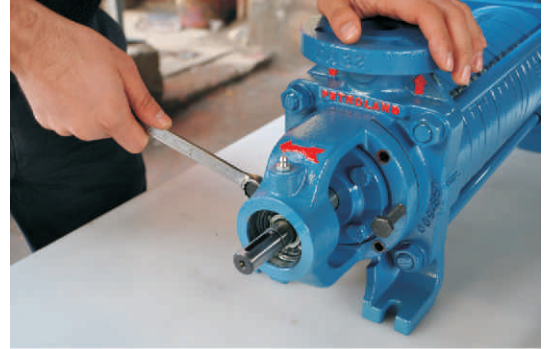


Figure 45: Shows pulling the mechanical seal casing by using puller bolt.

- Replace mechanical seal casing.
- Change the o-ring (2815) of the mechanical seal if it is worn or damaged.
- Pull the stationary face (4440) softly which places in mechanical seal casing.



Figure 46: Shows untightening the screws of mechanical seal casing.



Figure 47: Shows pulling the stationary face from mechanical seal casing.

- Use two screwdrivers to remove the rotating face (4440) and its spring by sliding on the shaft.
- Use the inner snap ring plier to extract the inner snap ring (7230).



Figure 48: Shows pulling the rotating face and its spring



Figure 49: Shows extracting the inner snap ring by using plier.

- Place the bearing casing on the flat surface and tap slightly to extract the ball bearing (3320) by using screwdriver and hammer.

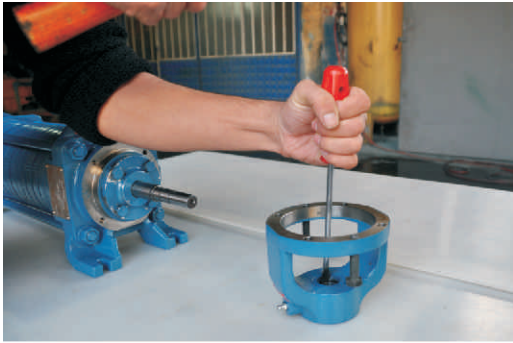


Figure 50: Shows extracting the ball bearing from bearing casing.

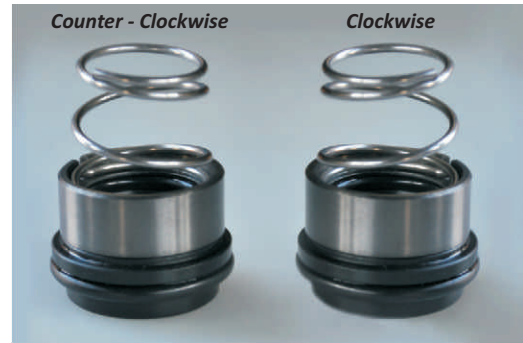


Figure 51: Shows mechanical seals. CW rotation and CCW rotation.

- Clockwise rotating mechanical seals are used for PSC models. Specially PSD models have two types of mechanical seal as clockwise rotating on suction side and counter - clockwise rotating on discharge side. Direction of rotation can be determined by direction of seal spring.
- PETROLAND uses double rotation mechanical seal for special applications.

17.7.2. Assembly of Mechanical Seal

- Place the Ball Bearing into bearing casing by using hammer and special tool.
- Use the inner snap ring plier to place the inner snap ring.



Figure 52: Shows placing the bearing into casing.



Figure 53: Shows fixing the inner snap ring by using plier.

- Place the rotating face and its spring by sliding on the shaft.
- Press the stationary face into mechanical seal casing by fingers.
- Lubricate surfaces before placing the rotating seal face and stationary seal o-ring.



Figure 54: Shows placing the rotating seal on the shaft.



Figure 55: Shows placing the stationary face into mechanical seal casing.

- Place the mechanical seal casing which stationary seal face has already been assembled in. Check the direction of rotation arrow is located upward.
- Use the special tool and hammer to fix the ball bearing casing onto shaft and pump casing.

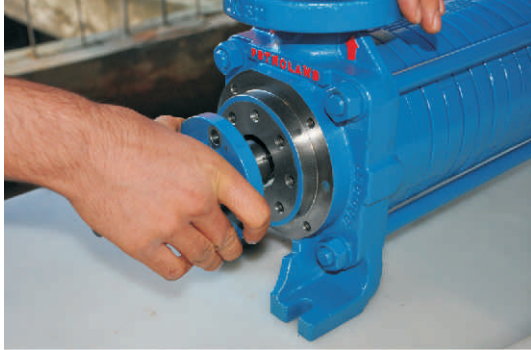


Figure 56: Shows fixing the mechanical seal casing onto pump casing.

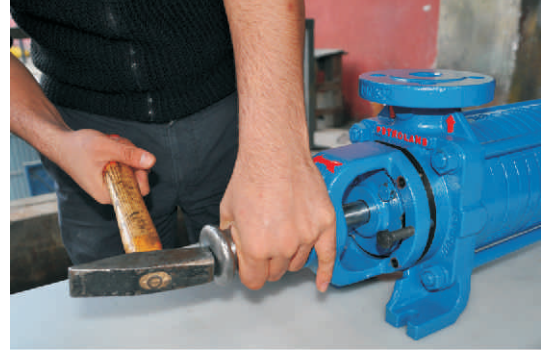


Figure 57: Shows fixing the bearing onto pump casing.

- Tighten the screws of bearing casing.
- Fix the snap ring of shaft by using outer snap ring plier after screws of bearing casing are tightened.

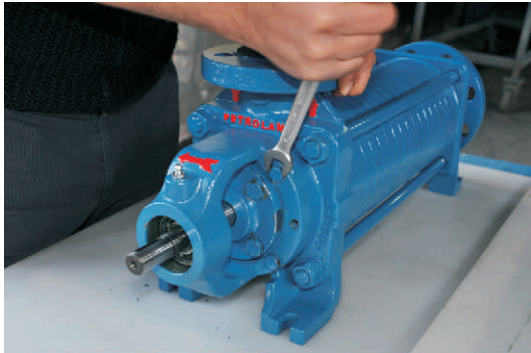


Figure 58: Shows tightening the screws of bearing casing.



Figure 59: Shows fixing snap ring onto shaft

- Use special tool and hammer to fix the lip seal into mechanical seal casing.
- Use inner snap ring plier to fix snap ring of lip seal.
- Apply adhesive (Loctite®) onto setscrew then tighten to fix the coupling after placing the key in shaft key hole.

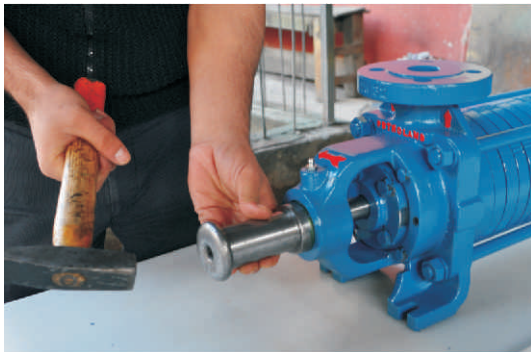


Figure 60: Shows fixing the lip seal into mechanical seal casing.



Figure 61: Shows fixing the snap ring of lip seal.



Check that the shaft can be rotated by hand easily after coupling assembled.

17.8. Disassembly and Assembly of The Pump (For PSC / PSD / PSV Models)

17.8.1. Disassembly of The Pump



The pump can still contain a residue of pumped fluid or rinsing product. Take precautions to contain any leakage.

See sectional drawings before any disassembly performed. Refer to part numbers shown on the lists of sectional drawings.

- The working surface must be clean, free from dirt, filings etc. And be perfectly clear.
- To facilitate later assembly make a mark over the entire length of the pump body and number the parts.
- Disassembly starts at the suction end. It is becoming to demounting from discharge body on PSD and PSV models.
- Disassembly successively nuts (9120), flat washers (9130), tie bolts (9110) and suction casing (1120). Discharge casing (1130) for PSD and PSV.
- Before disassembly of the discharge casing of PSD models, disassemble successively the bearing casing screws (9140), the bearing casing (1280), mechanical seal casing screws (9170), mechanical seal casing (1195) and mechanical seal (4450).
- Loosen the hexagonal nut (2490) while holding the shaft with a strap wrench or special tool.



The hexagonal nut (2490) has left-hand thread.

- Disassembly successively the impeller (2410), the key (9502), the centrifugal body (1170) and the bushing (0241 if it is worn), then retaining stage (for pumps with this feature). For PSD and PSV model, start disassembly of the stages after replacing the discharge casing (1130).
- Then disassemble the inlet body (1150) the vane impeller (2460) the key (9501) and the discharge body (1160). Repeat this procedure as many times as there are stages. It follows demounting discharge casing, discharge stage and suction stage on PSD and PSV pump models.
- Remove snap ring (7220) and the lip seal (4145) and snap ring (7210) of shaft.
- Loosen bolts (9140) and take out bearing casing (1280). Loosen screw of mechanical seal casing (1195) and it takes out from suction or discharge casings. If the pump has soft shaft seal, disassemble the packing gland then packing rings.
- Disassembly the mechanical seal and protect to not be damaged until assembly.

Disassembly of mechanical seal described step by step particularly by using pictures in section “17.7. Disassembly and assembly of the mechanical seal”.

17.8.2. Assembly of The Pump

- Fix the rotating seal face (4440) onto shaft (2200).
- Insert, bearing casing (1280), lip seal-inner (4140) and snap ring for bearing (7230) and stationary seal face into the mechanical seal casing. Check that the stationary seal face has parallelism with rotating seal face. Then fix snap ring (7110) of bearing.
- Tighten, bearing casing screws. Insert snap ring for shaft (7210), lip seal-outer (4145) and snap ring for lip seal (7220)
- The pump shaft is being holded on vertical position from coupling side by special part and it goes on mounting..
- Stages, suction body (1150), discharge body (1160) and impeller body (1170) mount according to stage number s.
- Suction casing is mounted (1120), Discharge casing is being mounted on PSD and PSV models. Tie bolts (9110) and tie bolt washer (9130) are mounted. Tighten tie bolt nuts (9120).
- Check the place of pump, if it is straight..
- It is recommended of the tie bolts (9110) should be cross tighten.
- After coupling mounting on pump shaft, the pump shaft should check, if it turn by person hands.
- Place suction casing (1120), tie bolts (9110) and flat washers (9130). Tighten tie nuts (9120) slightly.
- Locate the pump on the flat surface and check that the pump is fixed.
- Tighten nuts (9110) diagonally with torque recommended.
- Check that the shaft can be rotated by hand easily after coupling assembled.



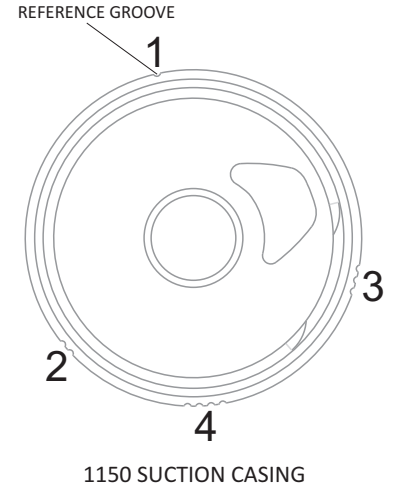
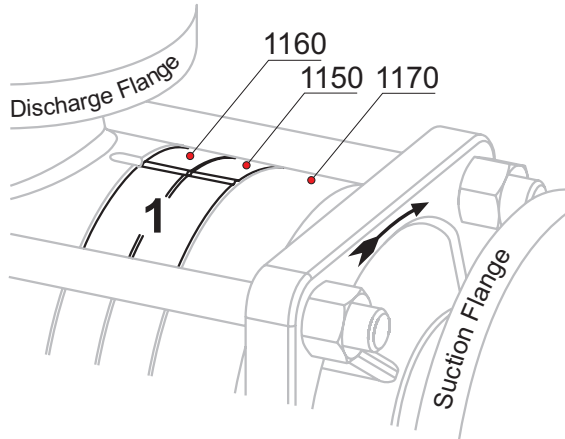
The hexagonal nut (2490) has left-hand thread

17.9. Assembly Schematics of Stages

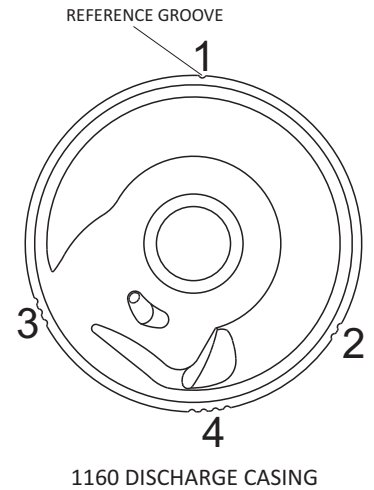
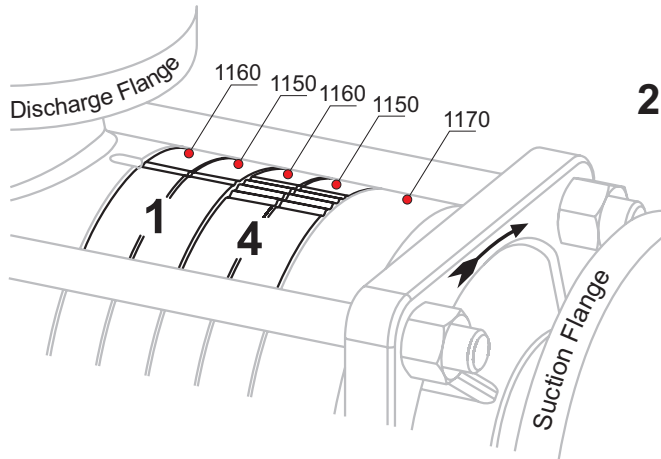
PSC 1000 - 2000 - 3000 (LPG 50) - 4000 - 5000 - 6000 (LPG 250)

Schematics have been shown according to number of stages below.

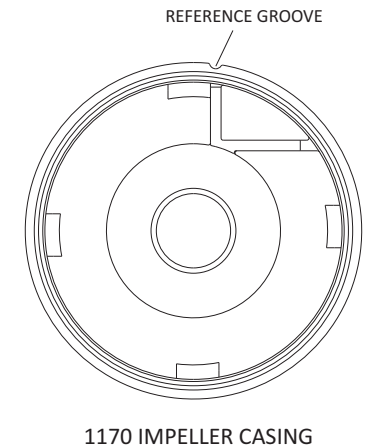
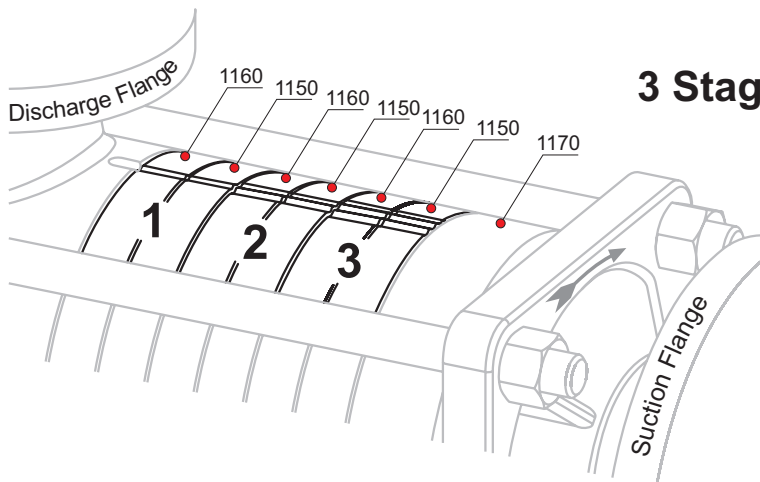
1 Stage

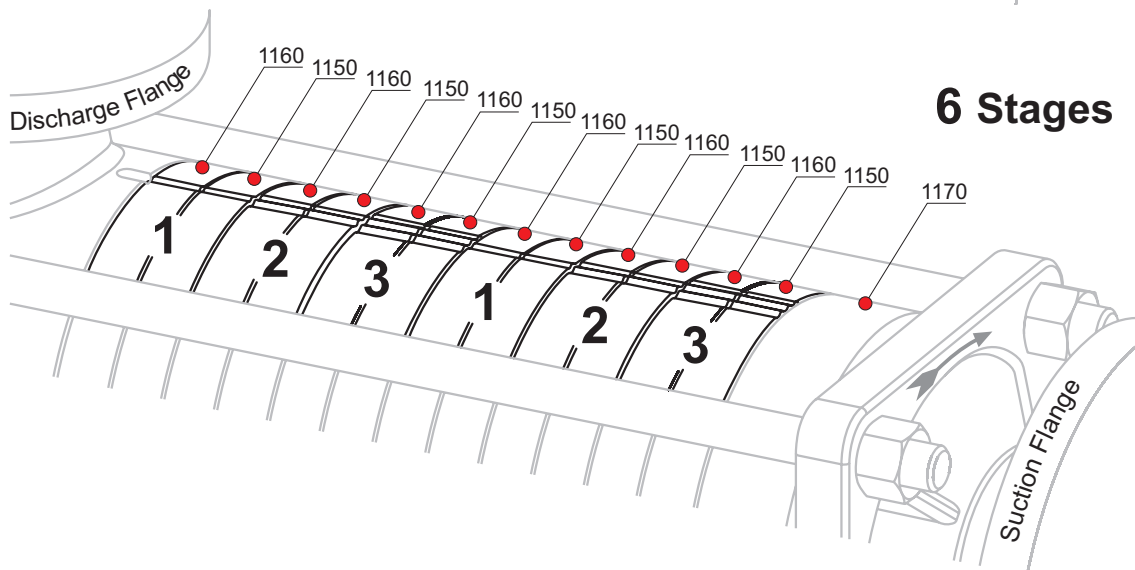
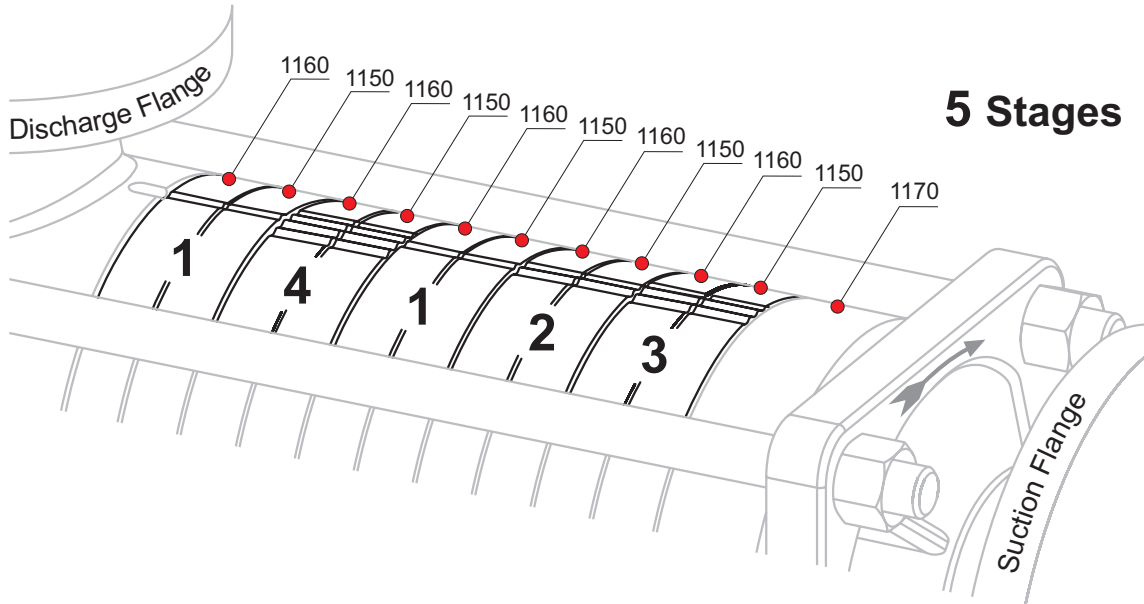
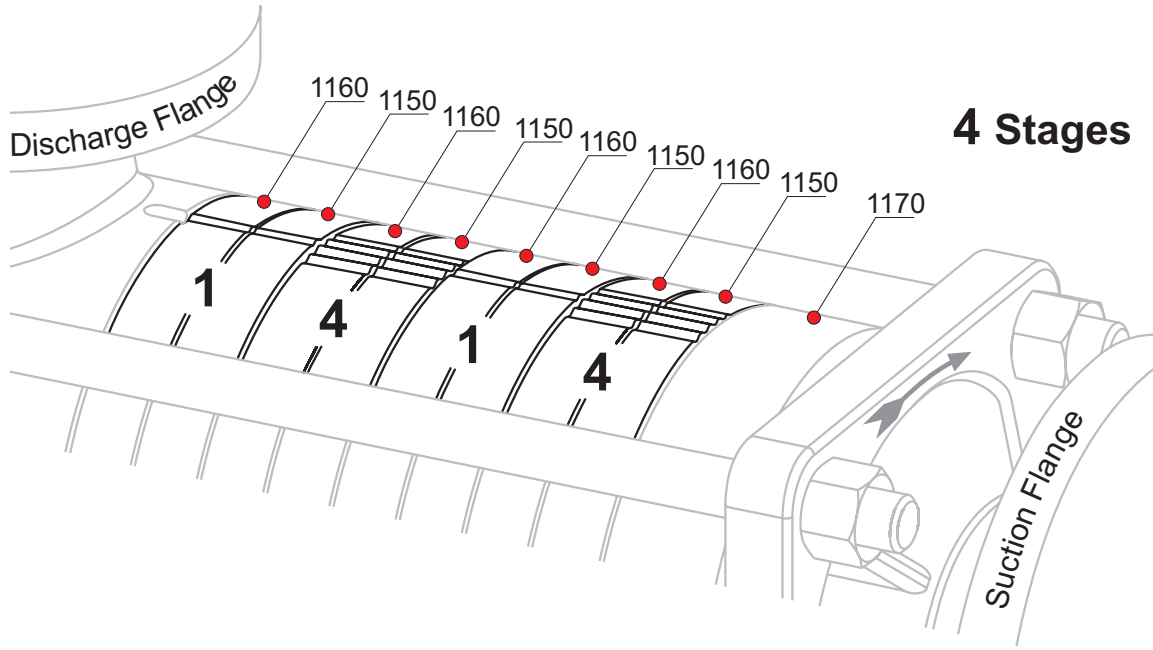


2 Stages

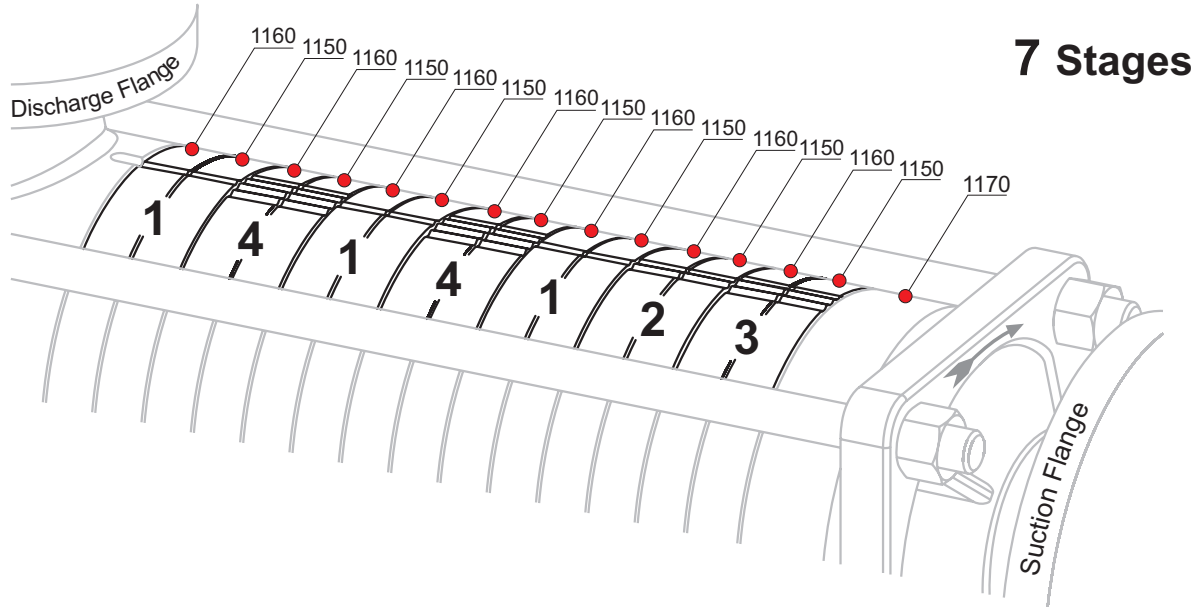


3 Stages



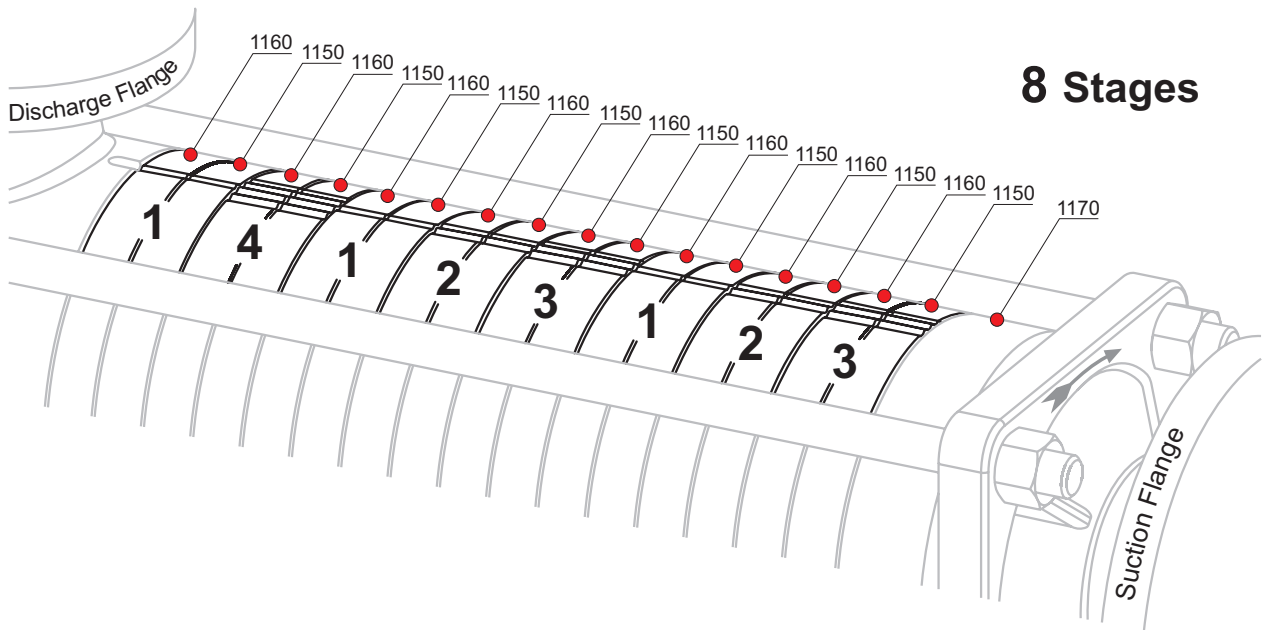


- The suction bodies (1150), and discharge bodies (1160) with a vane impeller (2460) form a stage.
- The foundry marks I, II, III, IV, are visible on the external sides of the bodies
- Assembly is carried out by juxtaposing the marks with the upper generating line as indicated on the assembly drawing
- The foundry groove in the body 1170 of PSC and LPG 50, LPG 250 models should be always located opposite the foundry groove in body 1150 which precedes it.



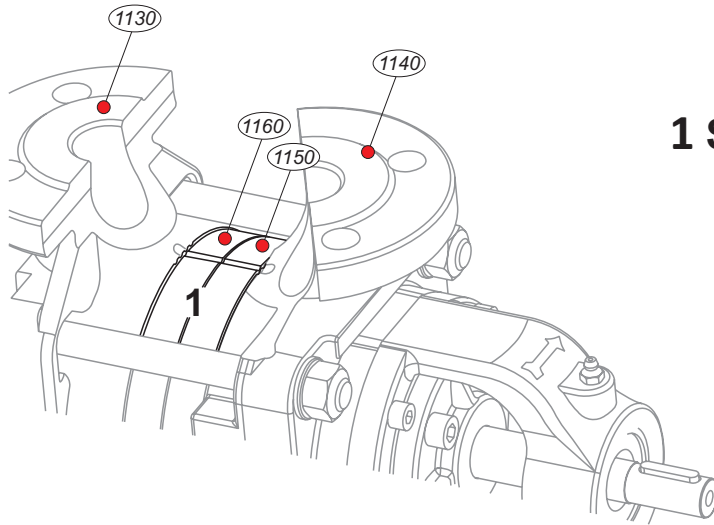
IMPORTANT!

If the specified angular position of the stages, as defined, is not respected, pump performance will be adversely affected.



17.10. Assembly Schematics For Ps Series Pump Stages

PSD & PSV 1000 - 2000 - 3000 - 4000 - 5000 - 6000 / LPG 150



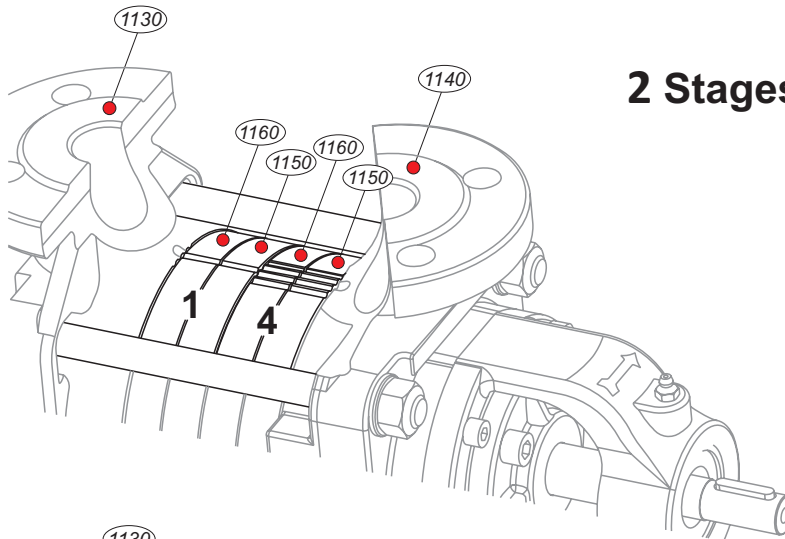
1 Stage



See sectional drawings before any disassembly and assembly performed. Refer to part numbers shown on the lists of sectional drawings.

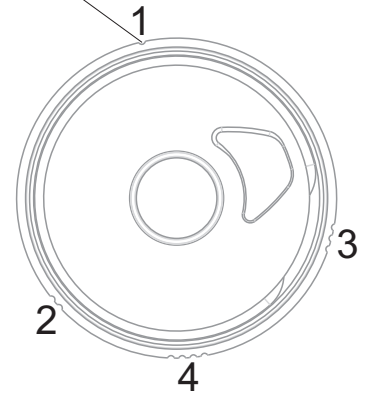


PSD , PSV and LPG 150 model single stage pumps have to be assemble similar to PSC model 2 stages. Stage No.1 has impeller but Stage No.4 is empty without impeller.

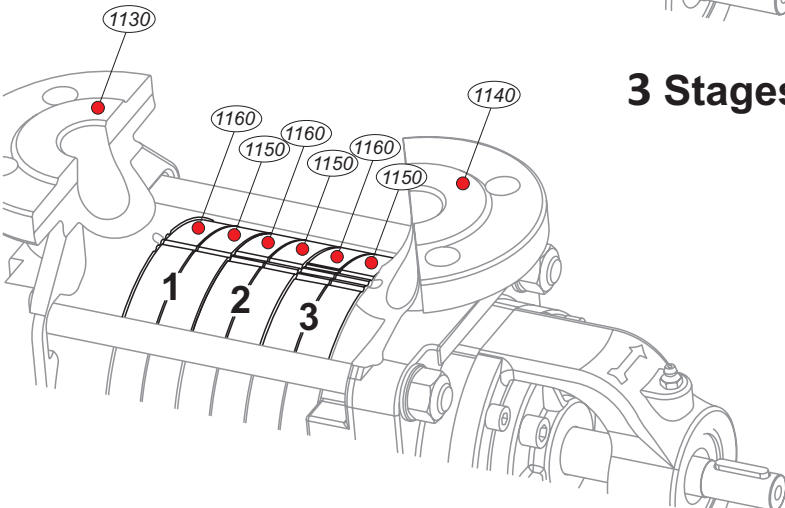


2 Stages

REFERENCE GROOVE

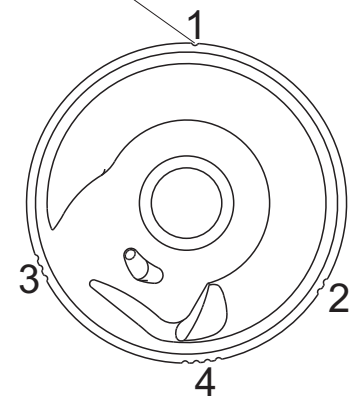


1150 SUCTION CASING

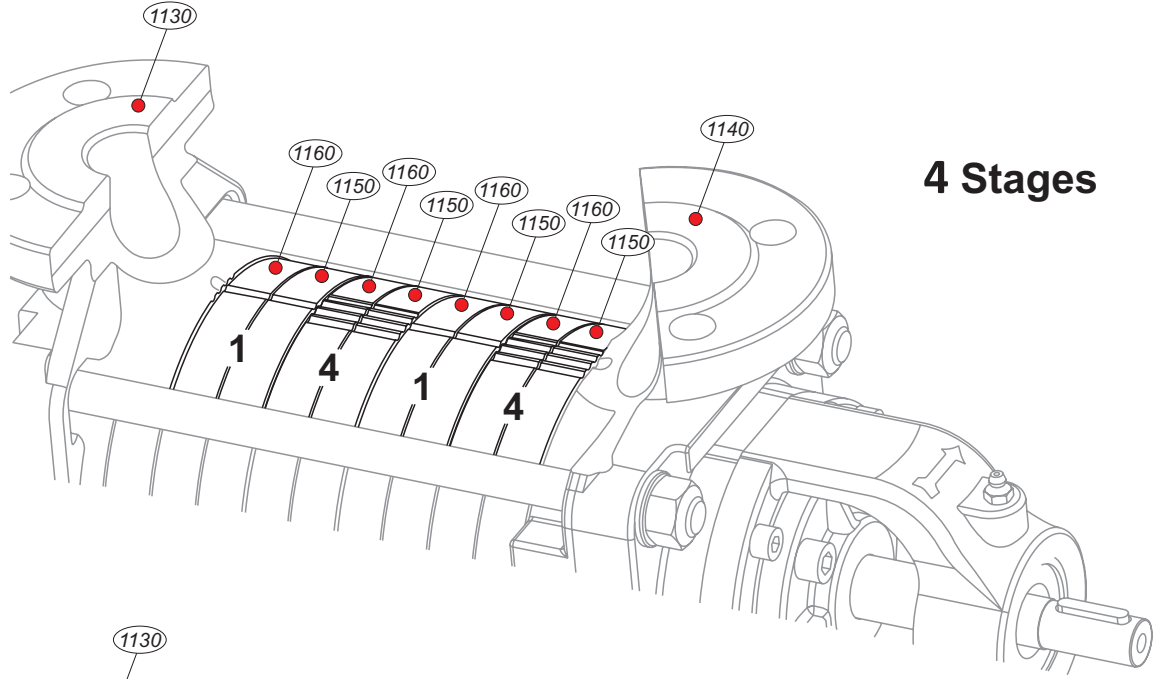


3 Stages

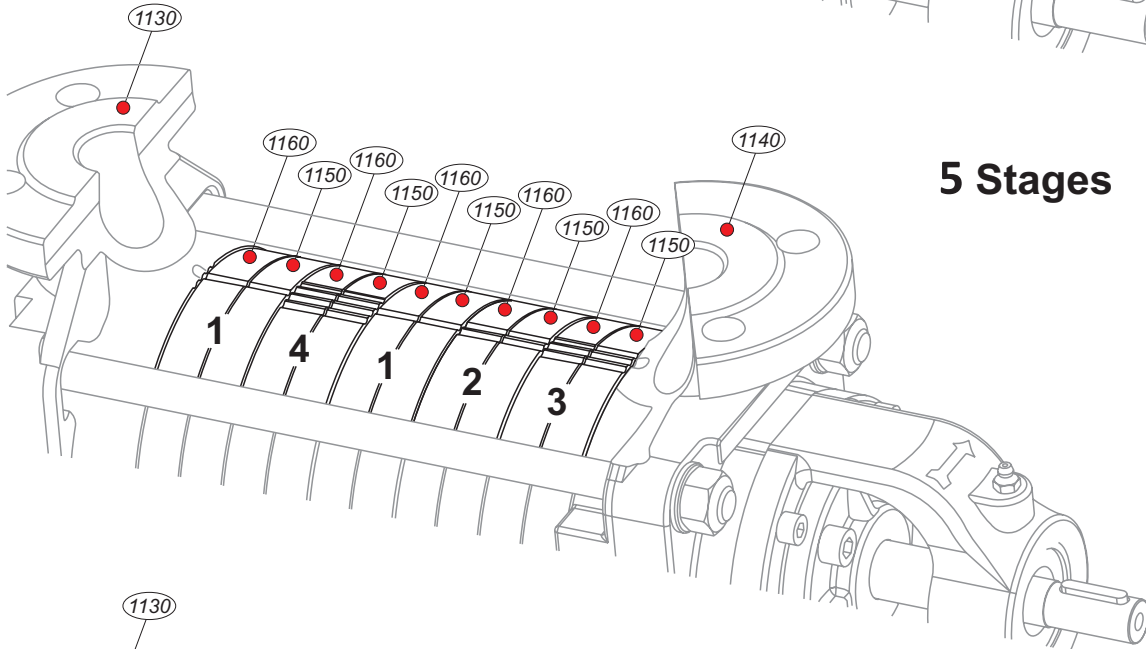
REFERENCE GROOVE



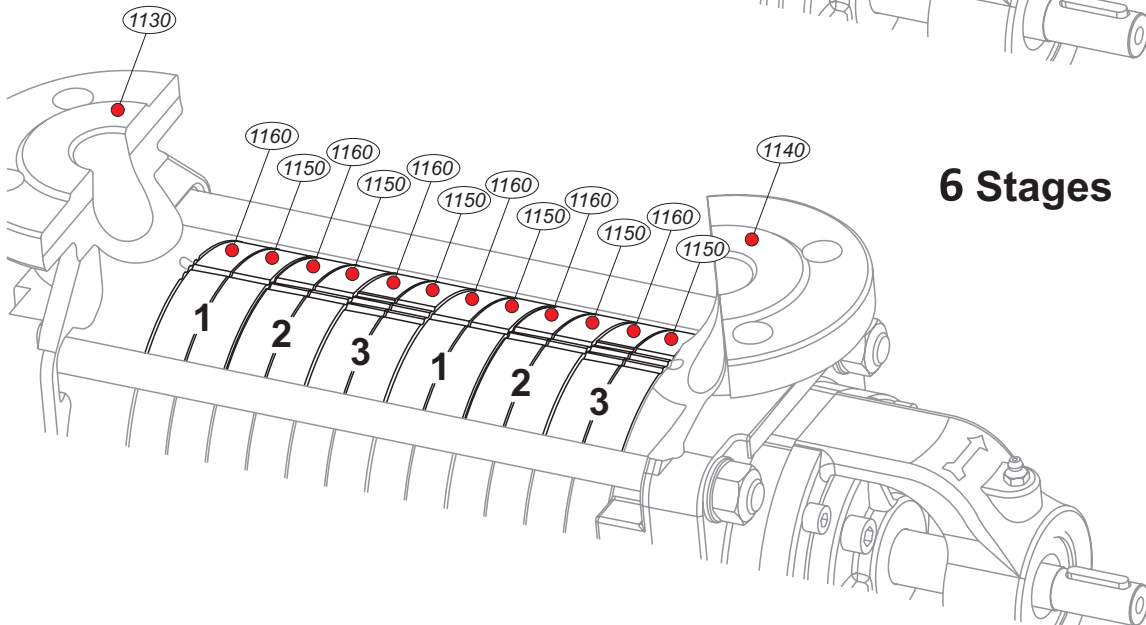
1160 DISCHARGE CASING



4 Stages

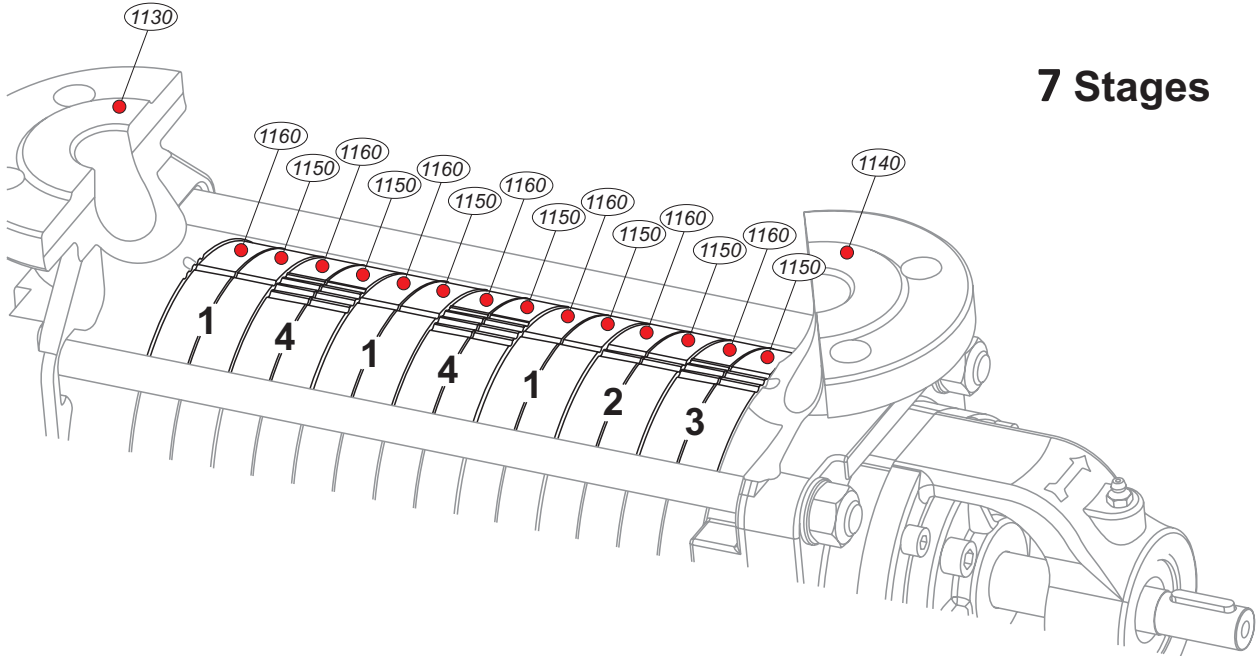


5 Stages



6 Stages

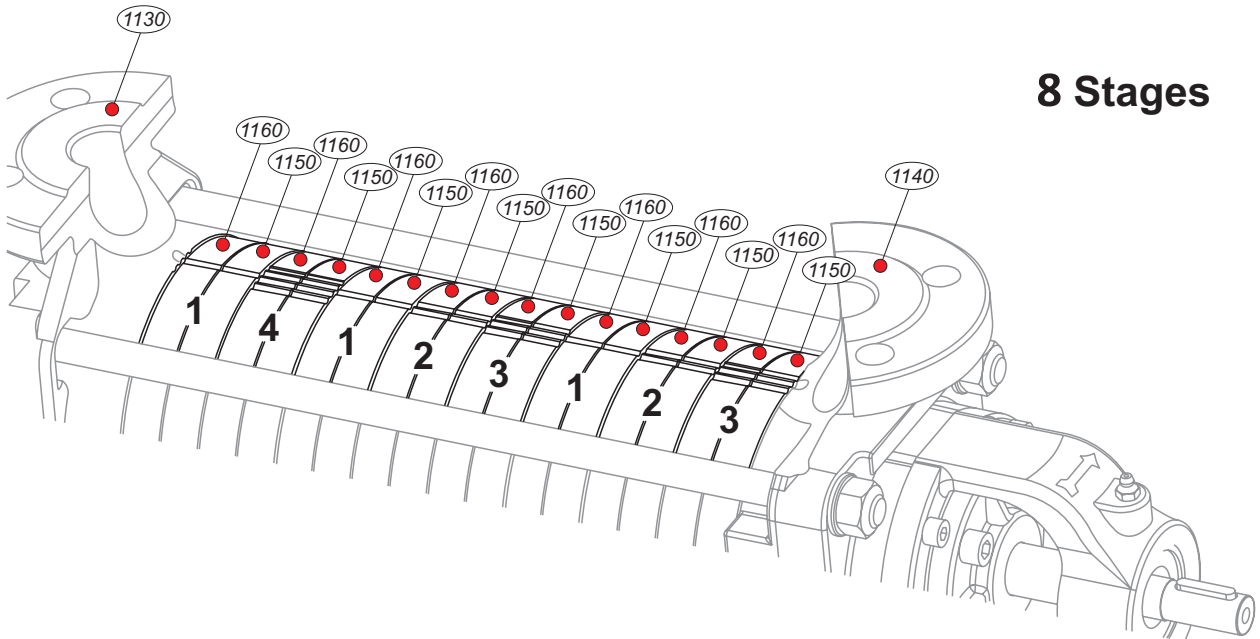
- The suction bodies (1150), and discharge bodies (1160) with a vane impeller (2460) form a stage.
- The foundry marks I, II, III, IV, are visible on the external sides of the bodies.
- Assembly is carried out by juxtaposing the marks with the upper generating line as indicated on the assembly drawing



7 Stages

IMPORTANT!

If the specified angular position of the stages, as defined, is not respected, pump performance will be adversely affected.



8 Stages

18. Sample Facilities for PETROLAND PS Series Pumps

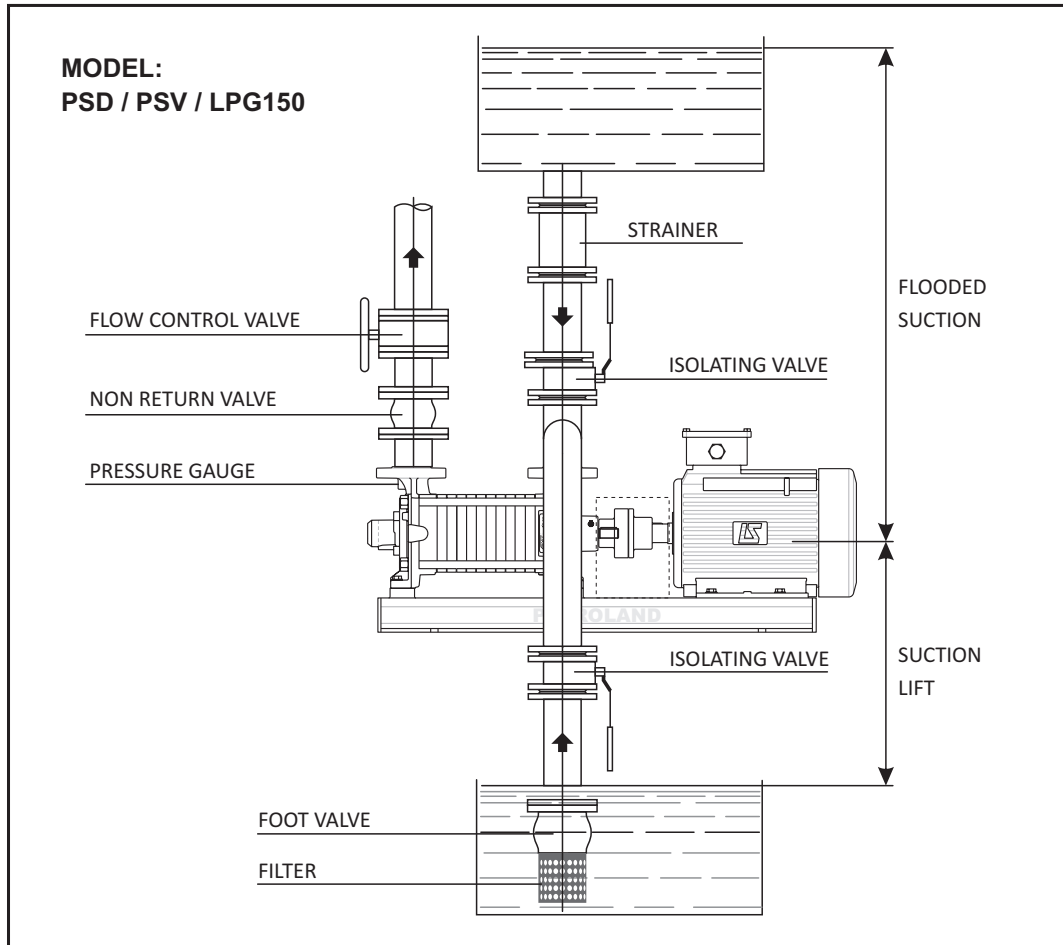


Figure 63: Sample Facility for PETROLAND PS Series Pumps (For PSD, PSV, LPG 50 Models)

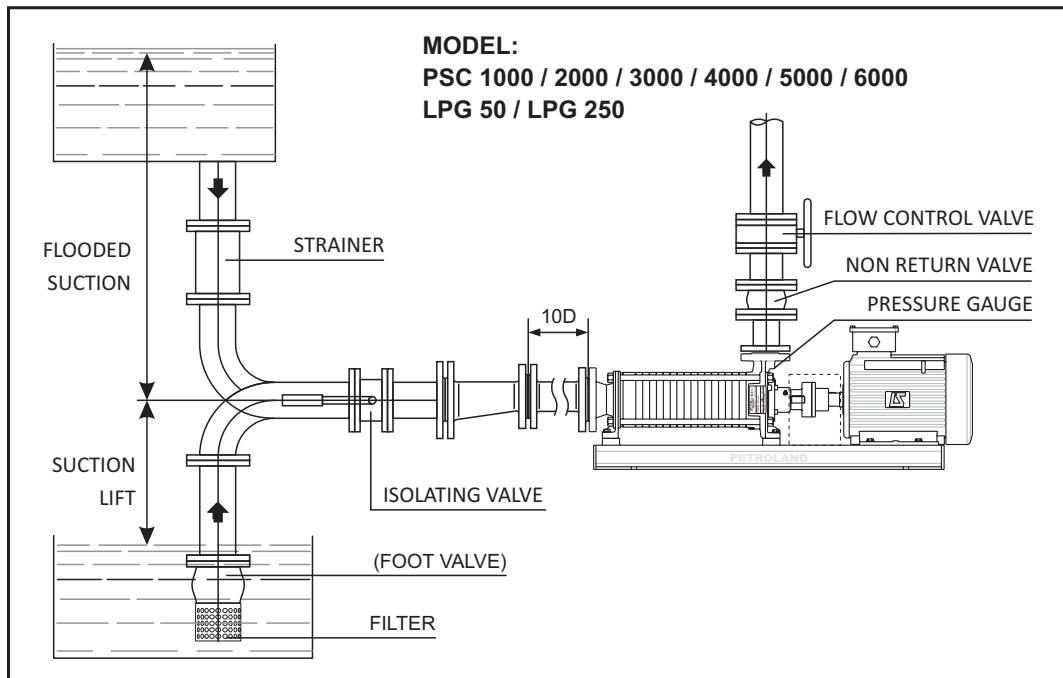
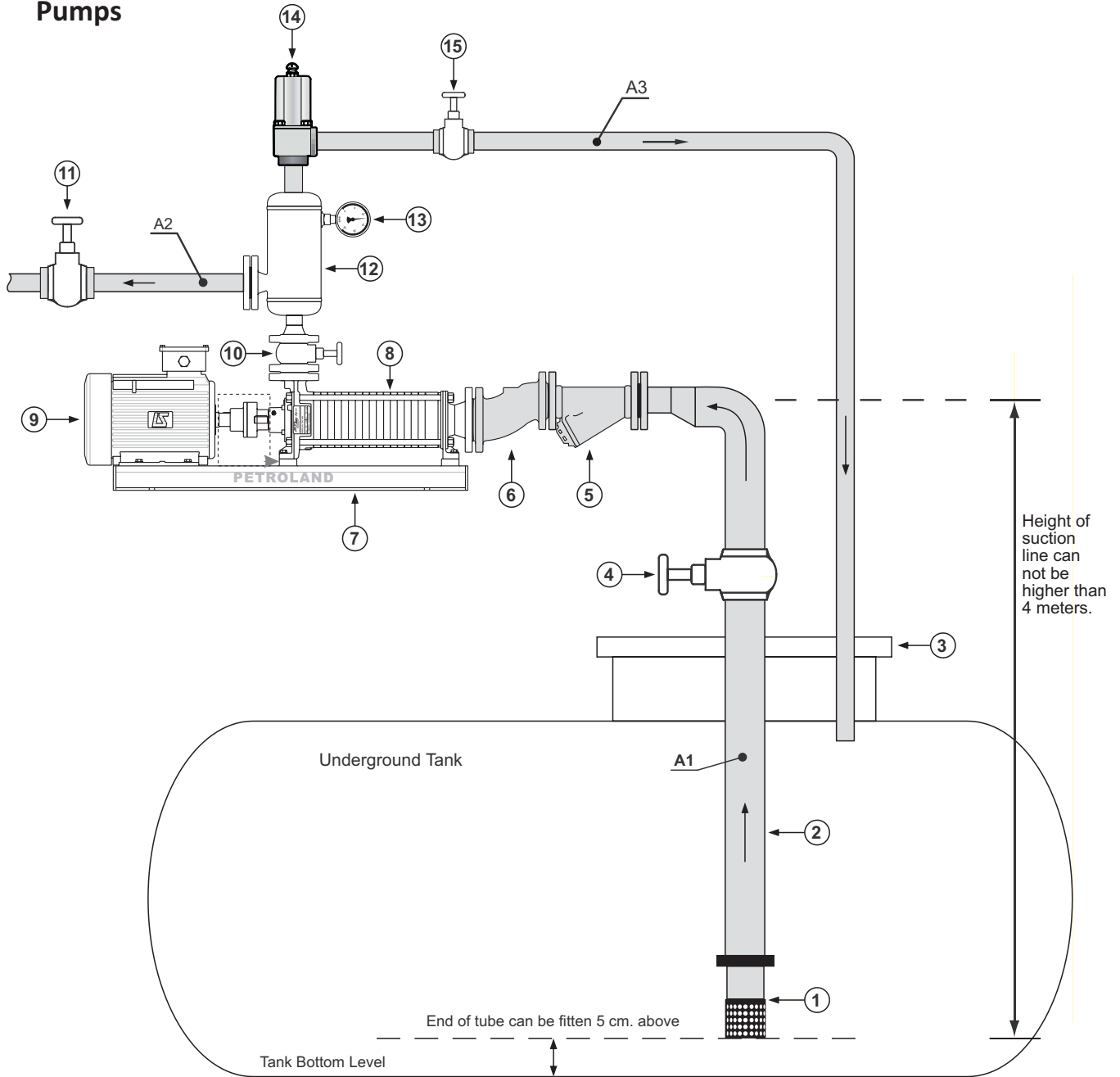


Figure 64: Sample Facility for PETROLAND PS Series Pumps (For PSC, LPG 50-250 Models)

19. Sample Facilities for Underground Tank Applications for PETROLAND PS Series Pumps



1. Poppet and Filter
2. Suction Line
3. Tank Main Port
4. Suction Valve
5. Filter
6. Reducer
7. Base Plate
8. LPG 50-8 Pump

9. Exproof Motor
10. Discharge Valve (Monoblok)
11. Valve
12. Collector (Seperatör)
13. Manometre (25 Bar)
14. By-Pass (PC 25)
15. Pipe Line of By-Pass Valve

A1. It is recommended to choose the diameter of suction line same or smaller than the diameter of suction inlet.

A2. Pipe diameters should be chosen same with pump outlet size if the fluid is not viscous.

A3. It is recommended to choose the diameter of recycle pipe same as relief valve inlet-outlet size.

Figure 65: PETROLAND Sample Facilities for Underground Tank Applications.

20. Troubleshooting

Problems								
8. Low Pressure								
7. Motor is overheated and overloaded								
6. Pump is jammed and locked								
5. Noise and Vibration								
4. Pump is leaking								
3. Pump is overheated								
2. Low Capacity								
1. Irregular Flow								
Causes	1	2	3	4	5	6	7	8
1. Wrong direction of rotation			X					X
2. Pump is not filled	X		X			X		X
3. Inadequate NSPH	X	X						
4. Vapourizing in the suction line	X							X
5. Air is drawn into suction line	X	X						X
6. Suction line has air gaps.	X	X						X
7. Inadequate Static Pressure on the suction line		X						
8. High viscosity		X	X		X		X	
9. Fluid has high temperature		X	X		X			X
10. Fluid contains impurities					X	X	X	
11. High pressure on the discharge line					X	X	X	
12. Tie bolts are loosened				X				
13. Pump speed is too high			X		X	X		
14. Pump speed is too low	X	X	X					X
15. Mechanical seal faces are worn and damaged				X				
16. Packing gland is overtightened			X			X	X	
17. Packing gland is loosened				X				
18. Coupling is not aligned					X	X	X	
19. Bushings are worn		X						X
20. Vane impeller is worn and broken	X	X			X	X		X

Table 8: Shows Troubleshooting table

21. Forces and Permissible Moments on the Flanges

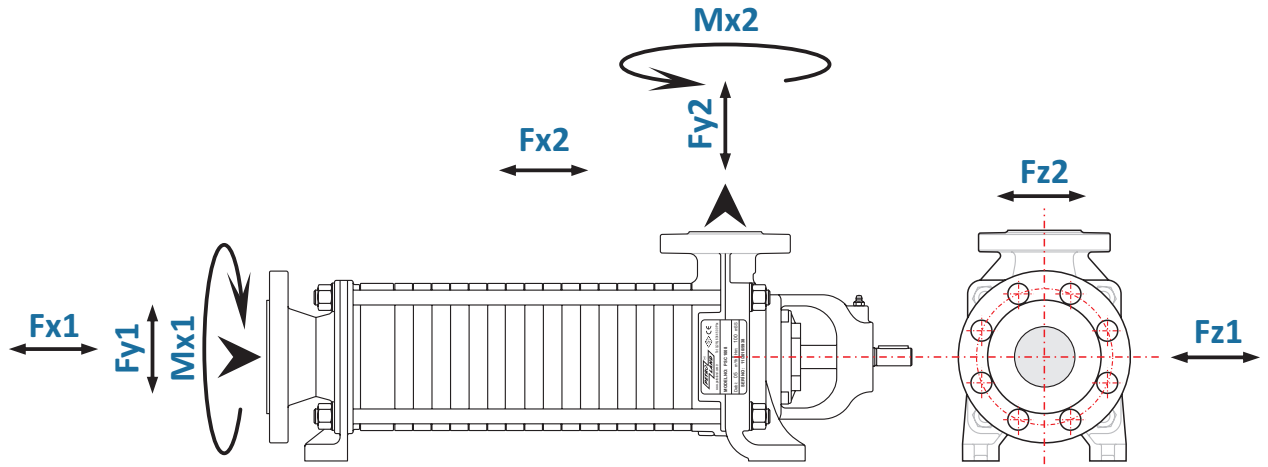


Figure 66: Forces and Permissible Moments on the Flanges

If several individual forces are developed, the components of the resultants of these forces should not exceed the acceptable values in each x-y-z direction.

The pump brackets must be fixed on a plane base plate with uniform tightening.

If these conditions are not met, it is no longer possible to guarantee either the sealing or the general mechanical behaviour of the pump.

Sizes	SUCTION FLANGE [N]			DISCHARGE FLANGE [N]			[Nm]	
	Fx1*	Fy1*	Fz1*	Fx2	Fy2	Fz2	Mx1*	Mx2
PS 1000	2700	4300	3200	2200	4300	2200	230	80
PS 2000	3200	4800	3800	2700	4800	2400	340	125
PS 3000 LPG 50	3200	4800	3800	2700	4800	2400	340	125
PS 4000	3800	5500	4300	3300	5500	2700	420	175
PS 5000	4300	6500	4800	3800	6500	3000	600	225
PS 6000 LPG 50	4800	7500	4800	4300	7500	3200	690	300

* For PSV, PSD, LPG 150 models, $F_{x1}=F_{x2}$, $F_{y1}=F_{y2}$, $F_{z1}=F_{z2}$, $M_{x1}=M_{x2}$

Table 9: Flange torque values

22. Stage Tolerances

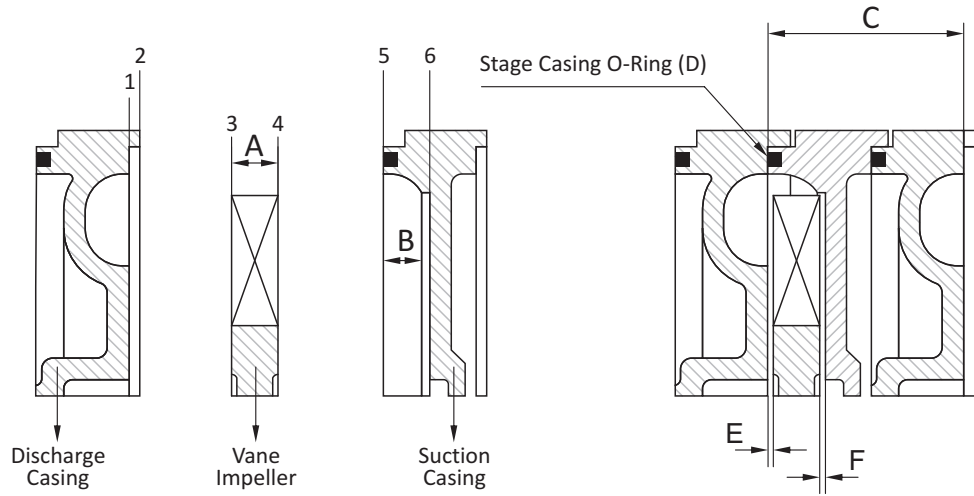


Figure 67: PETROLAND pump stage tolerances

PETROLAND PUMP STAGE TOLERANCES						
MODEL PSC / PSD / PSV	1000	2000	3000 LPG 50 & 150	4000	5000	6000 LPG 250
Thickness of Vane Impeller A [mm]	10	10	10	15	20	20
Depth of Stage Casing B [mm]	10.08	10.13	10.13	15.16	20.20	20.22
Length of Each Stage C [mm]	34	40	40	55	75	88
Dimension of O-Ring D [mm] (Diameter x Thickness)	114 x 2	140 x 2	140 x 2	165 x 2	188 x 3	210 x 3
Total Tolerance E + F [mm]	MIN.	0.05	0.08	0.08	0.12	0.18
	MAX.	0.08	0.13	0.13	0.16	0.22

Table 10: PETROLAND pump stage tolerances

22.1. Dimensions of Mechanical Seals

PETROLAND PUMP BORE DIAMETERS OF MECHANICAL SEALS						
MODEL PSC, PSD, PSV	1000	2000	3000 LPG 50 & 150	4000	5000	6000 LPG 250
Bore Diameters	20	25	25	30	35	40

Table 11: Dimensions of Mechanical Seals

22.2. Dimensions of Bearings

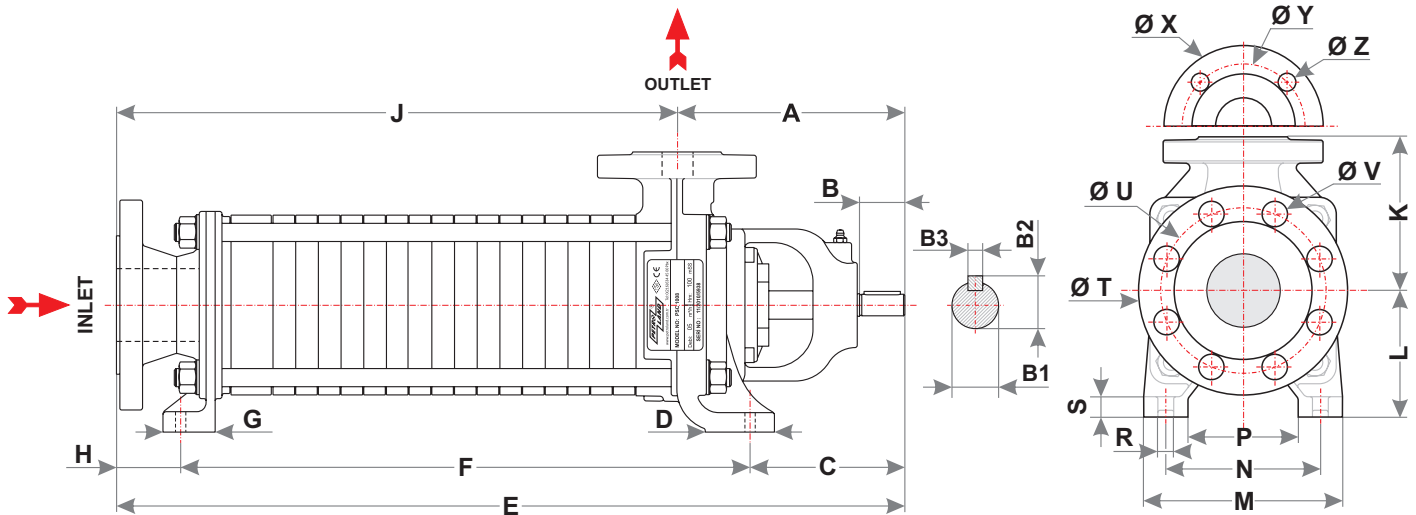
PETROLAND PUMP IDENTIFYING NUMBERS FOR BEARINGS						
MODEL PSC, PSD, PSV	1000	2000	3000 LPG 50 & 150	4000	5000	6000 LPG 250
Ball Bearing	6303	6304	6304	6305	6306	6307

Table 12: Dimensions of Bearings

Bearing Series according to DIN 625

23. PSC Models Multistage Side Channel Pumps Dimensional Drawings

23.1. PSC Models Dimensional Drawings of Bare Shaft Pump

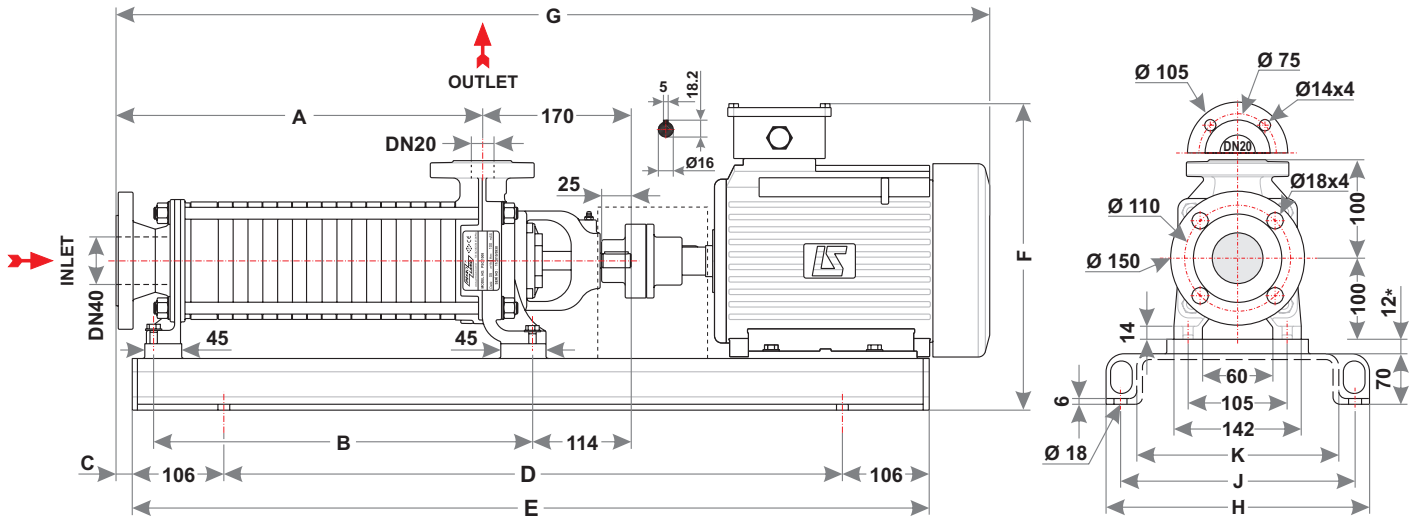


Pump Size	Pump Inlet	Pump Outlet	Dimensions [mm]																					
			A	B	C	D	G	H	K	L	M	N	P	R	S	T	U	V	X	Y	Z	B1	B2	B3
1000	40	20	170	25	114	45	45	45	100	100	142	105	60	12	14	150	110	18x4	105	75	14x4	16	18.2	5
2000	65	32	200	40	134	60	50	53	135	112	180	135	110	14	16	185	145	18x8	140	100	18x4	19	21.5	6
3000	65	32	200	40	134	60	50	53	135	112	180	135	110	14	16	185	145	18x8	140	100	18x4	19	21.5	6
4000	80	40	195	45	140	65	55	63	140	132	200	155	120	14	16	200	160	18x8	150	110	18x4	24	27.0	8
5000	100	50	237	50	160	65	60	68	165	160	220	170	120	16	18	235	190	22x8	165	125	18x4	28	31.0	8
6000	100	65	262	65	172	70	60	70	180	180	255	195	145	16	18	235	190	22x8	185	145	18x8	32	35.5	10

Dimensions and Weights According to Stage Numbers																											
Pump Size	Number of Stage																										
	1			2			3			4			5			6			7			8					
	E	F	J	E	F	J	E	F	J	E	F	J	E	F	J	E	F	J	E	F	J	E	F	J	E	F	J
1000	365	206	195	20	399	240	229	22	433	274	263	24	467	308	297	26	501	342	331	28	535	376	365	30	569	410	399
2000	415	228	213	33	455	268	253	36	495	308	293	39	535	348	333	42	575	388	373	45	615	428	413	48	655	468	453
3000	415	228	213	33	455	268	253	36	495	308	293	39	535	348	333	42	575	388	373	45	615	428	413	48	655	468	453
4000	463	260	268	46	518	315	323	53	573	370	378	60	628	425	433	67	683	480	488	74	738	535	543	81	793	590	598
5000	542	315	305	69	617	390	380	80	692	465	455	91	767	540	530	102	842	615	605	113	917	690	680	124	992	765	755
6000	600	358	338	99	688	441	426	115	776	529	514	131	864	617	602	147	952	705	690	163	1040	793	778	179	1128	881	866

Flange dimensions in accordance with PN40 DIN 2545

23.2. PSC 1001-1008 Dimensional Drawings of Pump Coupled with Motor



* 12 mm plate using for 112 size motor

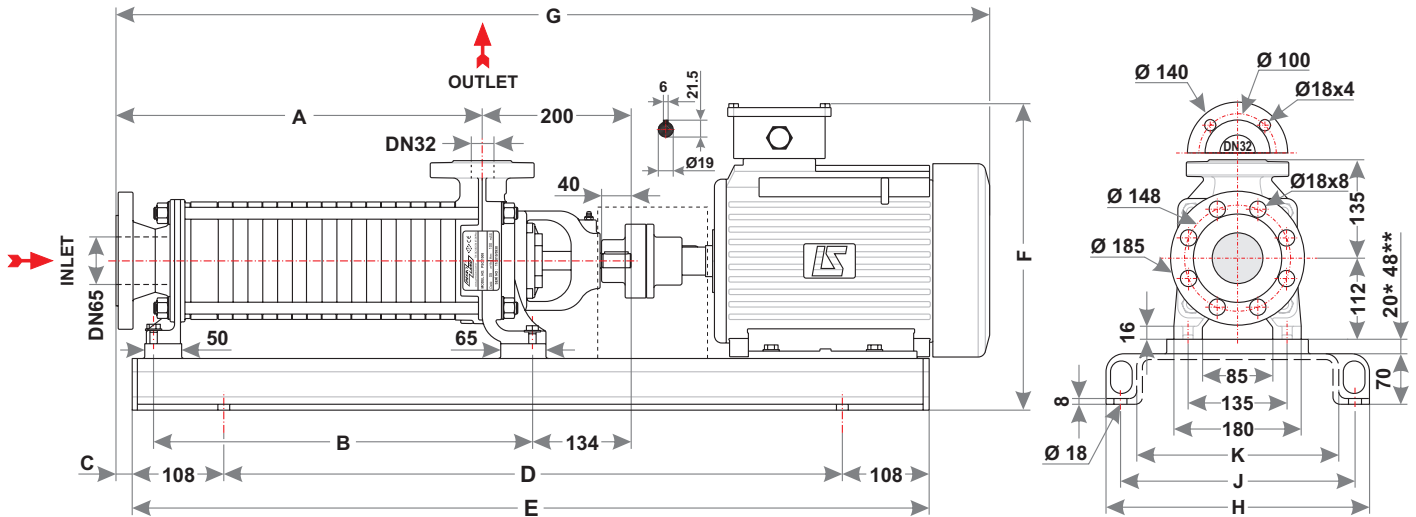
Model No:	Motor 1450 rpm		Dimensions [mm]										Weight [Kg.]		
	kW	Size	A	B	C*	D	E	F	G	H	J	K	Bare Shaft Pump	With Standard Electric Motor **	With Ex-Proof Electric Motor (FLSE - Ex e IIT3)
PSC 1001	0.55	80 L	195	206	25	370	582	370	680	260	230	180	20	42	50
	0.75	80 L												44	53
PSC 1002	0.75	80 L	229	240	25	400	612	370	715	260	230	180	22	48	55
	1.1	90 S				440	652	385	765	280	250	200		51	74
PSC 1003	0.75	80 L	263	274	25	440	652	370	750	260	230	180	24	52	60
	1.1	90 S				480	692	385	800	280	250	200		53	76
	1.5	90 L				510	722	385	830	280	250	200		55	80
PSC 1004	1.1	90 S	297	308	25	510	722	385	830	280	250	200	26	53	79
	1.5	90 L				560	772	385	890	300	270	220		58	83
	2.2	100 L				600	812	385	920	300	270	220		66	88
PSC 1005	1.1	90 S	331	342	25	540	752	385	865	280	250	200	28	59	82
	1.5	90 L				600	812	385	920	300	270	220		61	86
	2.2	100 L				630	842	385	955	300	270	220		70	90
PSC 1006	1.5	90 L	365	376	25	580	792	385	900	280	250	200	30	63	88
	2.2	100 L				630	842	385	955	300	270	220		70	92
	3	100 L				670	882	385	990	300	270	220		74	97
PSC 1007	1.5	90 L	399	410	25	610	822	385	935	280	250	200	32	66	90
	2.2	100 L				670	882	385	990	300	270	220		73	95
	3	100 L				700	912	385	1025	300	270	220		76	100
PSC 1008	2.2	100 L	433	444	25	700	912	385	1025	300	270	220	34	75	98
	3	100 L				700	912	410	1025	340	310	260		80	102
	4	112 M				700	912	410	1025	340	310	260		90	115

* Tolerances ± 3 mm.

** Weight of aluminium electric motor.

Flange dimensions in accordance with PN40 DIN 2545

23.3. PSC 2001-2008 Dimensional Drawings of Pump Coupled with Motor



* 20mm plate using for 132 size motor

**48mm plate using for 160 size motor

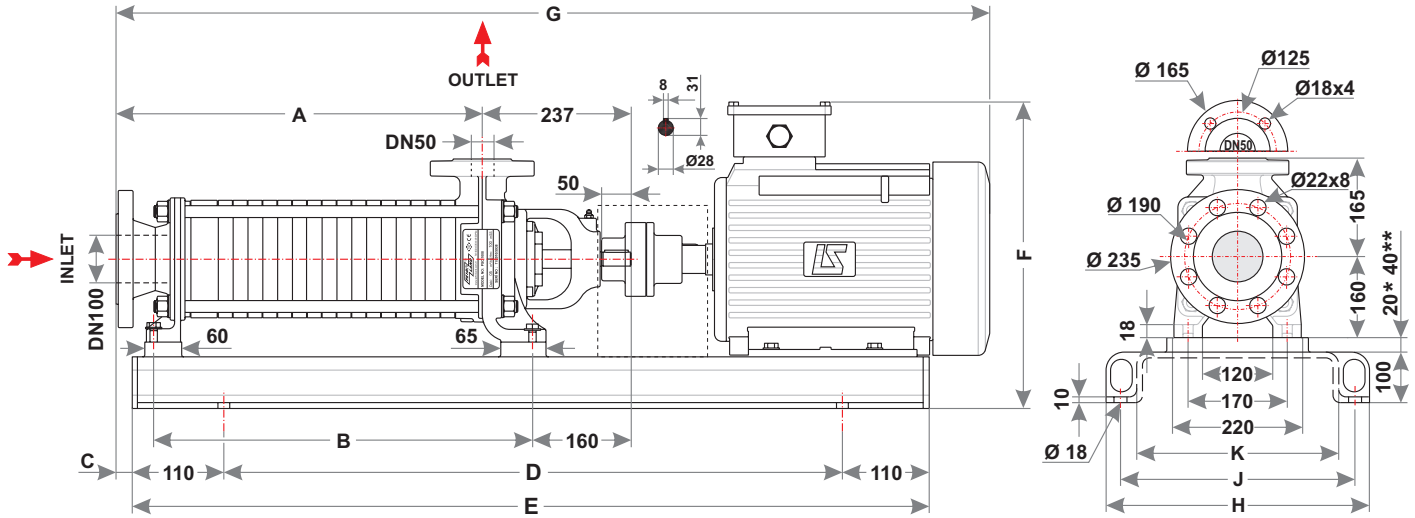
Model No:	Motor 1450 rpm		Dimensions [mm]										Weight [Kg.]		
	kW	Size	A	B	C*	D	E	F	G	H	J	K	Bare Shaft Pump	With Standard Electric Motor **	With Ex-Proof Electric Motor (FLSE - Eex e IIT3)
PSC 2001	0.75	80 L	213	228	30	410	626	355	735	300	260	200	33	73	93
	1.1	90 S				460	676	400	785	300	260	200		74	95
PSC 2002	1.5	90 L	253	268	30	510	726	400	825	300	260	200	36	77	102
	2.2	100 L				560	776	410	880	320	280	220		85	106
PSC 2003	2.2	100 L	293	308	30	600	816	410	920	320	280	220	39	90	110
	3	100 L												92	115
PSC 2004	2.2	100 L	333	348	30	640	856	410	960	320	280	220	42	92	114
	3	100 L												95	118
	4	112 M				640	856	420	960	360	320	260		103	128
PSC 2005	3	100 L	373	388	30	680	896	410	1000	320	280	220	45	100	122
	4	112 M				680	896	420	1000	360	320	260		110	135
	5.5	132 S				780	996	455	1140	380	340	280		132	182
PSC 2006	4	112 M	413	428	30	720	936	420	1040	360	320	260	48	110	138
	5.5	132 S				820	1036	455	1180	380	340	280		130	178
	7.5	132 M												150	185
PSC 2007	4	112 M	453	468	30	760	976	420	1080	360	320	260	51	115	142
	5.5	132 S				860	1076	455	1220	380	340	280		135	182
	7.5	132 M												155	190
PSC 2008	4	112 M	493	508	30	800	1016	420	1125	360	320	260	54	120	145
	5.5	132 S				900	1116	455	1255	380	340	280		138	187
	7.5	132 M												158	195
	11	160 M				1030	1246	560	1390	450	410	350		190	240

* Tolerances ± 3 mm.

** Weight of aluminium electric motor.

Flange dimensions in accordance with PN40 DIN 2545

23.6. PSC 5001-5008 Dimensional Drawings of Pump Coupled with Motor



* 20 mm plate using for 180 size motor
** 48 mm plate using for 200 size motor

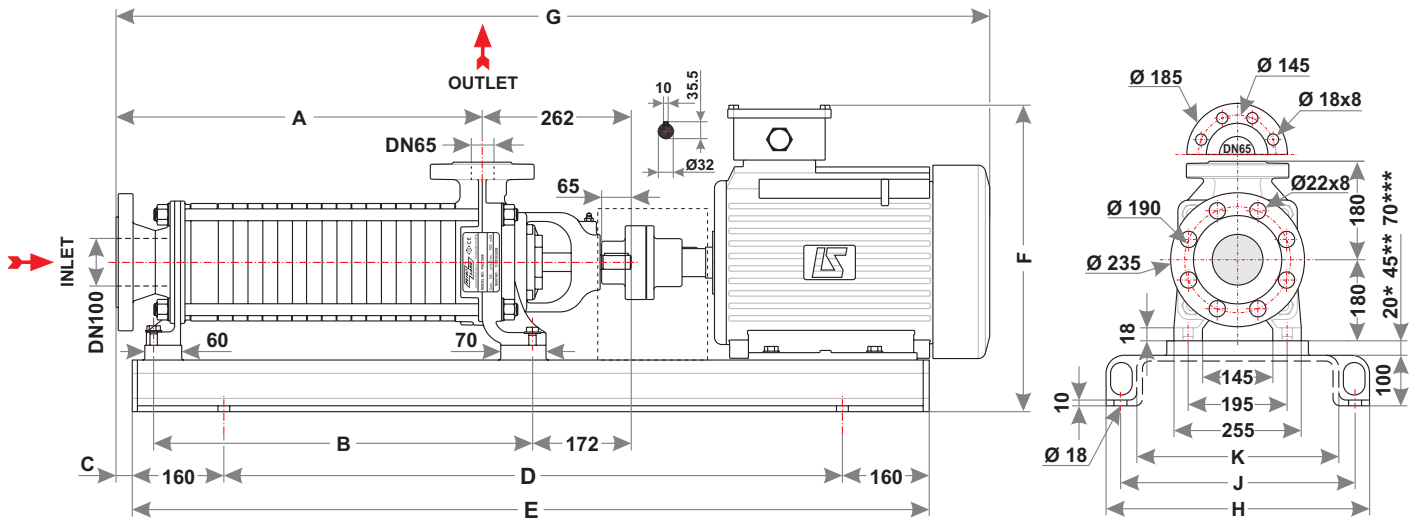
Model No:	Motor 1450 rpm		Dimensions [mm]										Weight [Kg.]		
	kW	Size	A	B	C*	D	E	F	G	H	J	K	Bare Shaft Pump	With Standard Electric Motor **	With Ex-Proof Electric Motor (FLSE - Eex e IITG)
PSC 5001	3	100 L	305	315	40	640	860	500	970	380	330	260	69	140	165
	4	112 M												145	175
PSC 5002	5.5	132 S	380	390	40	780	1000	515	1120	420	370	300	80	182	232
	7.5	132 M												203	240
PSC 5003	5.5	132 S	455	465	40	860	1080	515	1195	420	370	300	91	198	248
	7.5	132 M												217	255
	11	160 M												240	295
PSC 5004	7.5	132 M	530	540	40	940	1160	515	1270	420	370	300	102	233	270
	11	160 M												260	310
	15	160 L												270	335
PSC 5005	11	160 M	605	615	40	1160	1380	590	1540	470	420	350	113	270	325
	15	160 L												280	350
	18.5	180 M												325	380
PSC 5006	15	160 L	680	690	40	1240	1460	690	1615	470	420	350	124	300	365
	18.5	180 M												338	395
	22	180 L												345	415
PSC 5007	18.5	180 M	755	765	40	1340	1560	590	1760	520	470	400	135	365	420
	22	180 L												372	440
	30	200 L												420	550
PSC 5008	18.5	180 M	830	840	40	1420	1640	590	1830	520	470	400	146	370	425
	22	180 L												378	445
	30	200 L												437	566

* Tolerances ± 3 mm.

** Weight of aluminium electric motor.

Flange dimensions in accordance with PN40 DIN 2545

23.7. PSC 6001-6008 Dimensional Drawings of Pump Coupled with Motor



* 20 mm plate using for 200 size motor
 ** 45 mm plate using for 225 size motor
 *** 70 mm plate using for 250 size motor

Model No:	Motor 1450 rpm		Dimensions [mm]										Weight [Kg.]		
	kW	Size	A	B	C*	D	E	F	G	H	J	K	Bare Shaft Pump	With Standard Electric Motor **	With Ex-Proof Electric Motor (FLSE Ex e IIT3)
PSC 6001	5.5	132 S	338	358	40	660	980	490	1100	420	370	300	99	205	255
	7.5	132 M												228	262
PSC 6002	11	160 M	426	441	40	900	1220	610	1400	470	420	350	115	280	335
	15	160 L												295	360
PSC 6003	11	160 M	514	529	40	1000	1320	610	1490	470	420	350	131	300	355
	15	160 L				1020	1340	610	1555	520	470	400		315	380
	18.5	180 M				1080	1400	610	1575	470	420	350		345	400
PSC 6004	15	160 L	602	617	40	1080	1400	610	1575	470	420	350	147	330	400
	18.5	180 M				1120	1440	610	1645	520	470	400		365	420
	22	180 L				1120	1440	610	1645	520	470	400		375	440
PSC 6005	18.5	180 M	690	705	40	1200	1520	610	1730	520	470	400	163	390	445
	22	180 L				1240	1560	665	1760	540	590	420		400	465
	30	200 L				1240	1560	665	1760	540	590	420		455	582
PSC 6006	18.5	180 M	778	793	40	1280	1600	610	1820	520	470	400	179	410	465
	22	180 L				1330	1650	665	1850	540	490	420		420	485
	30	200 L				1330	1650	665	1850	540	490	420		480	605
PSC 6007	22	180 L	866	881	40	1380	1700	610	1910	520	470	400	195	440	505
	30	200 L				1420	1740	665	1940	540	490	420		500	625
	37	225 S				1500	1820	690	2040	620	570	500		570	675
	45	225 M				1500	1820	690	2040	620	570	500		610	710
PSC 6008	30	200 L	954	969	40	1520	1840	665	2025	540	490	420	211	520	645
	37	225 S				1580	1900	690	2125	620	570	500		590	695
	45	225 M				1640	1960	780	2235	670	620	550		625	730
	55	250 M				1640	1960	780	2235	670	620	550		670	930

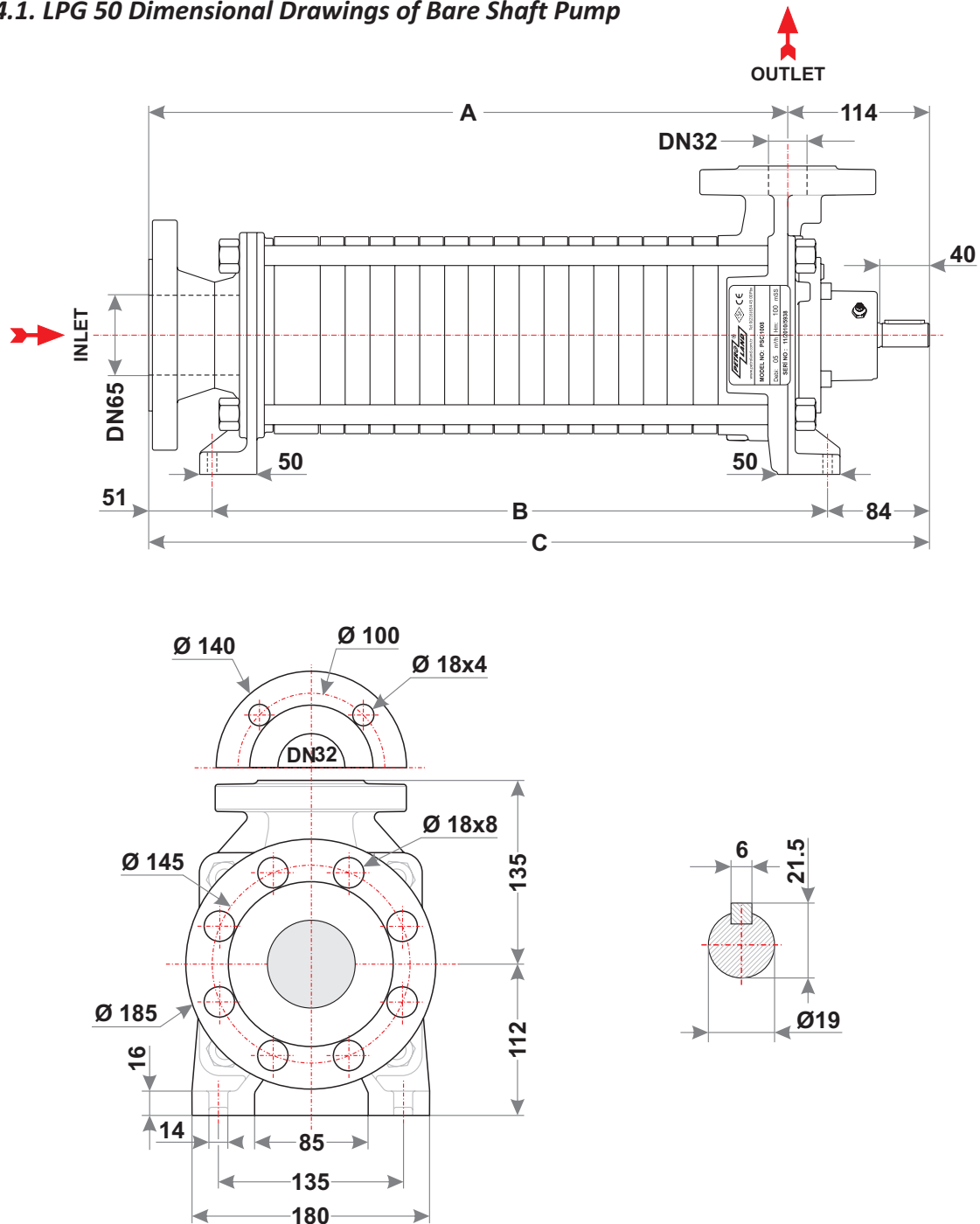
* Tolerances ± 3 mm.

** Weight of aluminium electric motor.

Flange dimensions in accordance with PN40 DIN 2545

24. LPG Models Multistage Side Channel Pumps Dimensional Drawings

24.1. LPG 50 Dimensional Drawings of Bare Shaft Pump

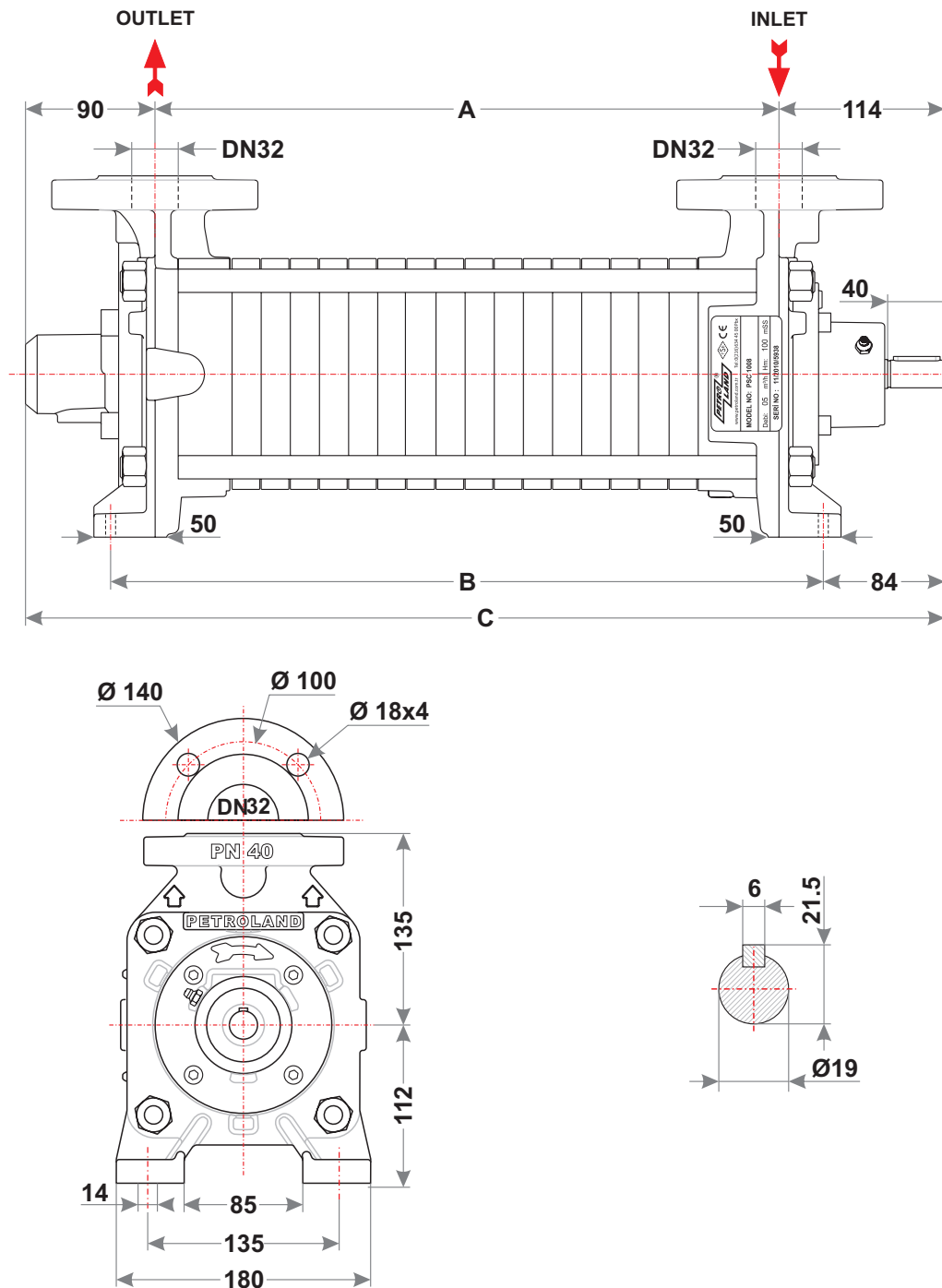


Dimensions and Weights According to Stage Numbers																																
Pump Size	Stage Numbers																															
	1				2				3				4				5				6				7				8			
	A	B	C	Kg	A	B	C	Kg	A	B	C	Kg	A	B	C	Kg	A	B	C	Kg	A	B	C	Kg	A	B	C	Kg				
50	234	215	348	33	274	255	388	36	314	295	428	39	354	335	468	42	394	375	508	45	434	415	548	48	474	455	588	51	514	495	628	54

Flange dimensions in accordance with PN40 DIN 2545

Dimensions is mm.

24.2. LPG 150 Dimensional Drawings of Bare Shaft Pump

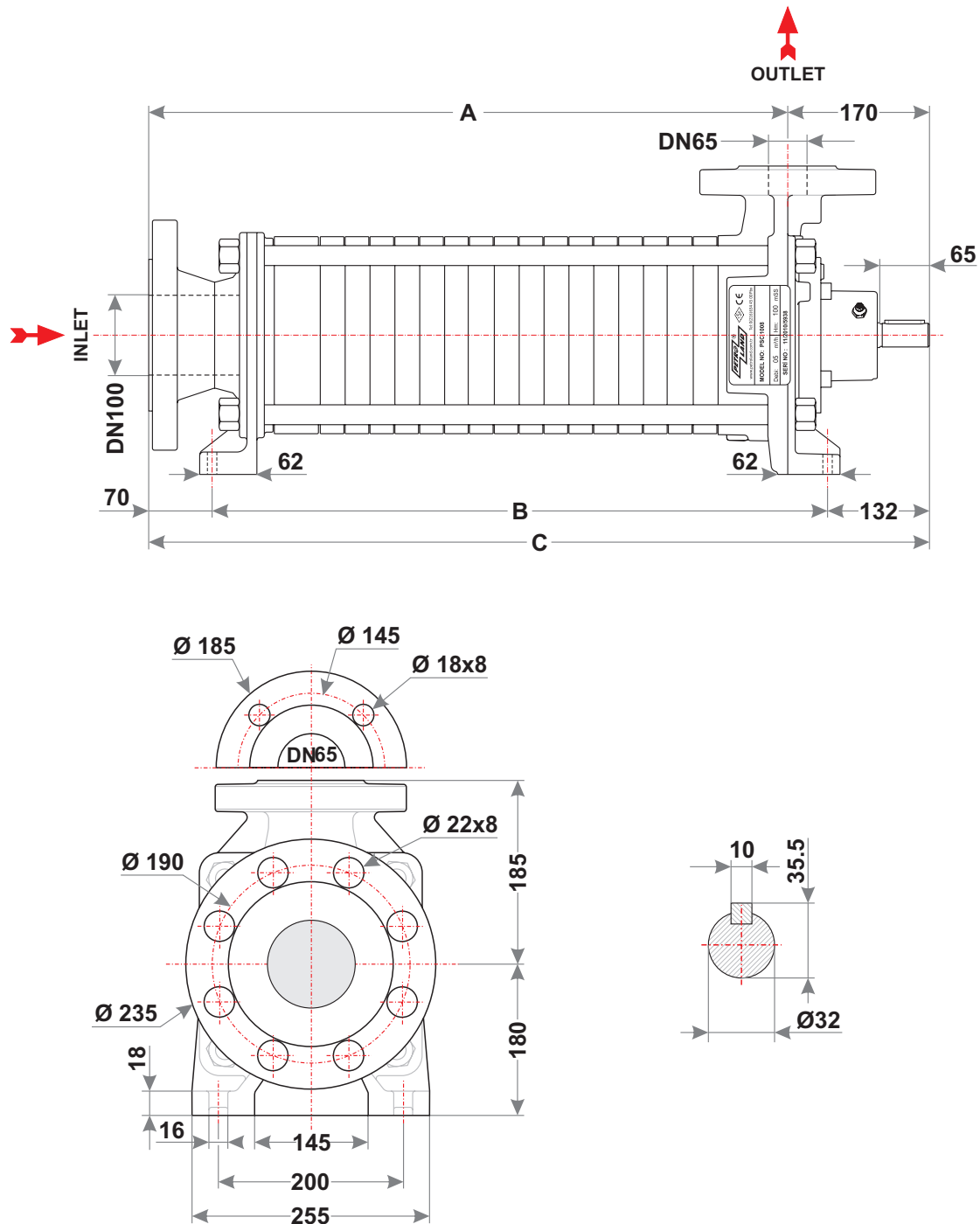


Dimensions and Weights According to Stage Numbers																																
Pump Size	Stage Numbers																															
	1				2				3				4				5				6				7				8			
	A	B	C	Kg	A	B	C	Kg	A	B	C	Kg	A	B	C	Kg	A	B	C	Kg	A	B	C	Kg	A	B	C	Kg				
150	150	210	352	31	190	250	392	34	230	290	432	37	270	330	472	40	310	370	512	43	350	410	552	46	390	450	592	49	430	490	632	52

Flange dimensions in accordance with PN40 DIN 2545

Dimensions is mm.

24.3. LPG 250 Dimensional Drawings of Bare Shaft Pump

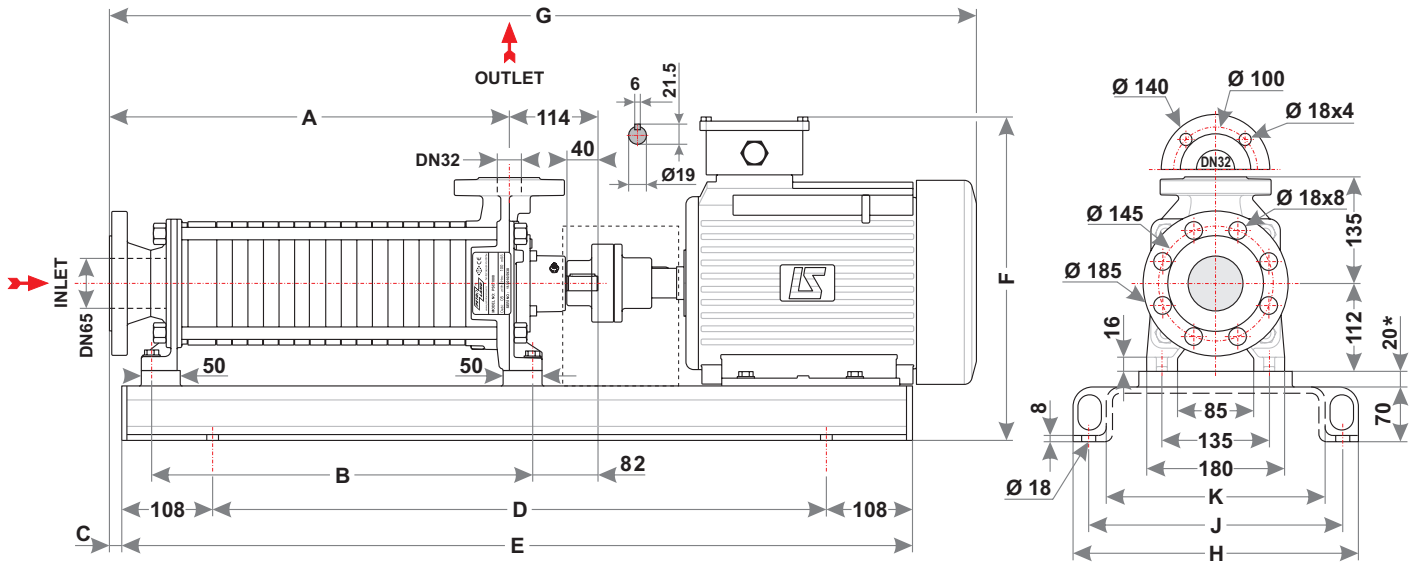


Dimensions and Weights According to Stage Numbers																																
Pump Size	Stage Numbers																															
	1				2				3				4				5				6				7				8			
	A	B	C	Kg	A	B	C	Kg	A	B	C	Kg	A	B	C	Kg	A	B	C	Kg	A	B	C	Kg	A	B	C	Kg				
250	346	304	516	78	434	392	604	95	522	480	692	111	610	568	780	128	698	656	868	144	786	744	956	161	874	832	1040	177	961	920	1132	194

Flange dimensions in accordance with PN40 DIN 2545

Dimensions is mm.

24.4. LPG 50 Dimensional Drawings of Pump Coupled with Motor



* 20 mm plate using for 132 size motor

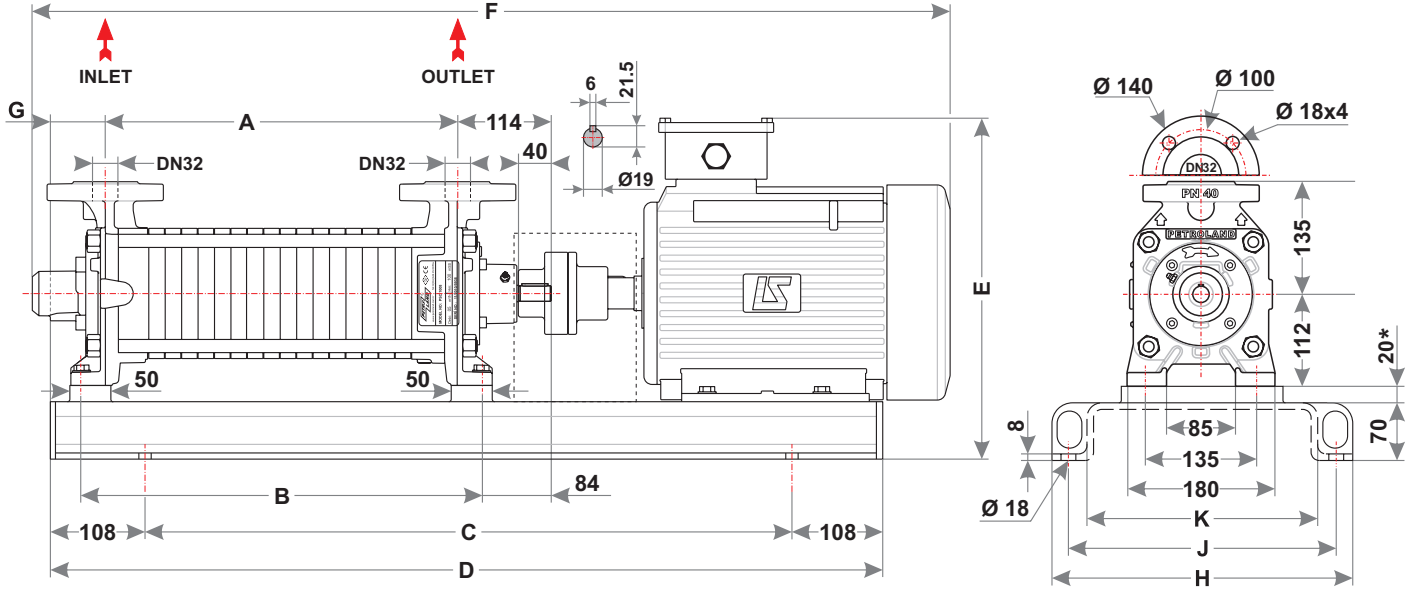
Model No:	Motor ^{1450 rpm}		Dimensions [mm]										Weight [Kg.]		
	kW	Size	A	B	C*	D	E	F	G	H	J	K	Bare Shaft Pump	With Standard Electric Motor	With Ex-Proof Electric Motor (FLSE Ex e IIT3)
LPG 50-1	1.1	90 S	234	215	30	380	596	320	668	300	260	200	33	66	74
	1.5	90 L				420	636	320	708	300	260	200		68	76
LPG 50-2	1.5	90 L	274	255	30	460	676	365	795	340	280	220	36	74	82
	2.2	100 L				460	676	365	795	340	280	220		83	103
LPG 50-3	2.2	100 L	314	295	30	500	716	365	835	340	280	220	39	86	106
	3	100 L				500	716	365	835	340	280	220		89	109
LPG 50-4	3	100 L	354	335	30	550	766	365	865	340	280	220	42	93	113
	4	112 M				550	766	380	885	360	320	260		100	121
LPG 50-5	3	100 L	394	375	30	600	816	365	905	340	280	220	45	97	117
	4	112 M				600	816	380	925	360	320	260		105	126
LPG 50-6	3	100 L	434	415	30	650	866	365	945	340	280	220	48	102	122
	4	112 M				650	866	380	965	360	320	260		109	130
	5.5	132 S				700	916	440	1035	380	340	280		138	147
LPG 50-7	4	112 M	474	455	30	660	876	380	1005	350	305	260	51	111	134
	5.5	132 S				740	956	440	1075	380	340	280		125	152
LPG 50-8	4	112 M	514	495	30	700	916	380	1045	360	320	260	54	114	137
	5.5	132 S				800	1016	440	1115	380	340	280		128	155
	7.5	132 M				800	1016	440	1115	380	340	280		138	162

* Tolerances ± 3 mm.

Dimensions is mm.

Flange dimensions in accordance with PN40 DIN 2545

24.5. LPG 150 Dimensional Drawings of Pump Coupled with Motor



* 20 mm plate using for 132 size motor

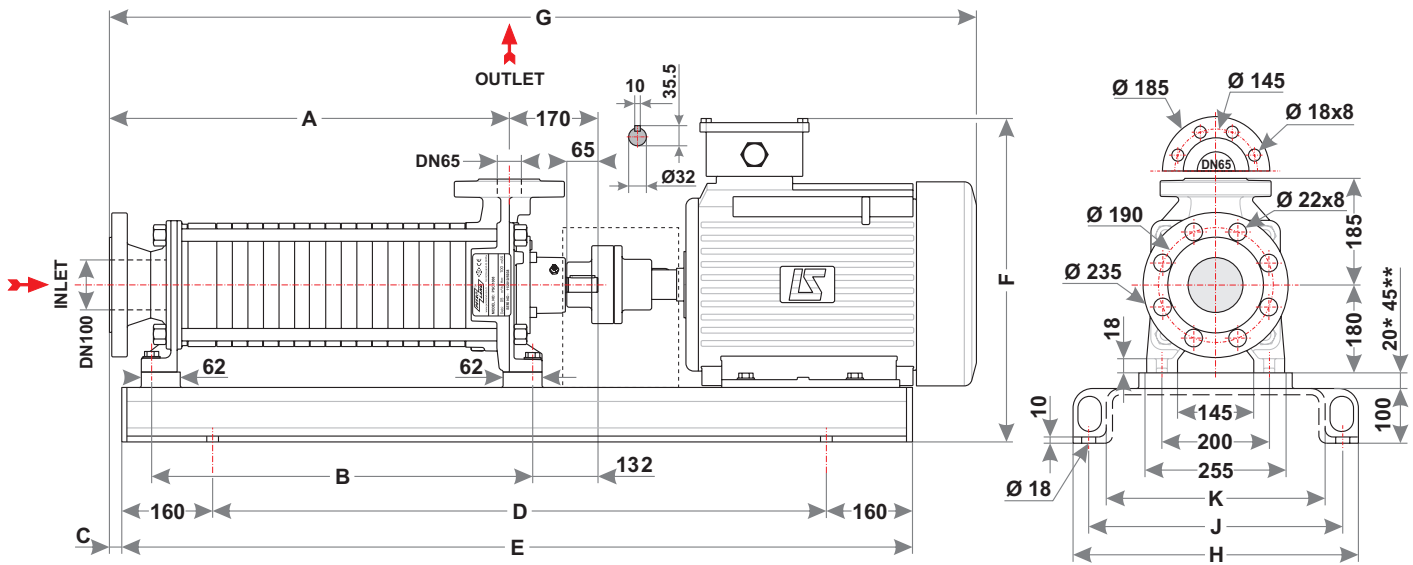
Model No:	Motor 1450 rpm		Dimensions [mm]										Weight [Kg.]		
	kW	Size	A	B	C*	D	E	F	G	H	J	K	Bare Shaft Pump	With Standard Electric Motor	With Ex-Proof Electric Motor (FLSE Ex e IIT3)
LPG 150-1	1.1	90 S	150	210	380	596	320	670	57	300	260	200	31	64	72
	1.5	90 L			450									66	74
LPG 150-2	1.5	90 L	190	250	450	666	320	710	72	300	260	200	34	72	80
	2.2	100 L			450									81	101
LPG 150-3	2.2	100 L	230	290	500	716	365	830	56	320	280	220	37	84	104
	3	100 L			550									87	107
LPG 150-4	3	100 L	270	330	550	766	380	890	61	360	320	260	40	91	111
	4	112 M			550									98	119
LPG 150-5	3	100 L	310	370	600	816	365	910	66	320	280	220	43	95	115
	4	112 M			600									103	124
LPG 150-6	3	100 L	350	410	650	866	365	950	71	320	280	220	46	100	120
	4	112 M			650									107	128
	5.5	132 S			700									136	145
LPG 150-7	4	112 M	390	450	700	916	380	1010	76	360	320	260	49	109	132
	5.5	132 S			800									123	150
LPG 150-8	4	112 M	430	490	700	916	380	1050	56	360	320	260	52	112	135
	5.5	132 S			800									126	153
	7.5	132 M			800									136	160

* Tolerances ± 3 mm.

Dimensions in mm.

Flange dimensions in accordance with PN40 DIN 2545

24.6. LPG 250 Dimensional Drawings of Pump Coupled with Motor



* 20mm plate using for 200 size motor

** 45mm plate using for 225 size motor

Model No:	Motor 1450 rpm		Dimensions (mm)										Weight (Kg.)		
	kW	Size	A	B	C*	D	E	F	G	H	J	K	Bare Shaft Pump	With Standard Electric Motor	With Ex-Proof Electric Motor (FLSD EEx d IIBT4)
LPG 250-1	5.5	132 S	345	304	40	580	900	490	1000	420	370	300	78	175	230
	7.5	132 M												185	235
LPG 250-2	11	160 M	433	392	40	840	1160	610	1310	470	420	350	95	235	290
	15	160 L												250	315
LPG 250-3	15	160 L	521	480	40	920	1240	610	1400	470	420	350	111	270	335
	18.5	180 M				960	1280	610	1470	520	470	400		305	370
LPG 250-4	18.5	180 M	609	568	40	1040	1360	610	1550	520	470	400	128	325	380
	22	180 L												330	400
LPG 250-5	22	180 L	697	656	40	1140	1460	610	1640	520	470	400	144	375	440
	30	200 L				1180	1500	665	1675	540	490	420		445	570
LPG 250-6	22	180 L	785	744	40	1220	1540	610	1730	520	470	400	161	395	565
	30	200 L				1260	1580	665	1760	640	490	420		455	585
	37	225 S				1320	1640	690	1860	620	570	500		520	630
LPG 250-7	30	200 L	873	832	40	1350	1670	665	1850	540	490	420	177	475	605
	37	225 S				1420	1740	690	1950	620	570	500		540	645
LPG 250-8	30	200 L	961	920	40	1450	1770	665	1940	540	490	420	194	500	630
	37	225 S				1500	1820	690	2040	620	570	500		565	675
	45	225 M												605	710

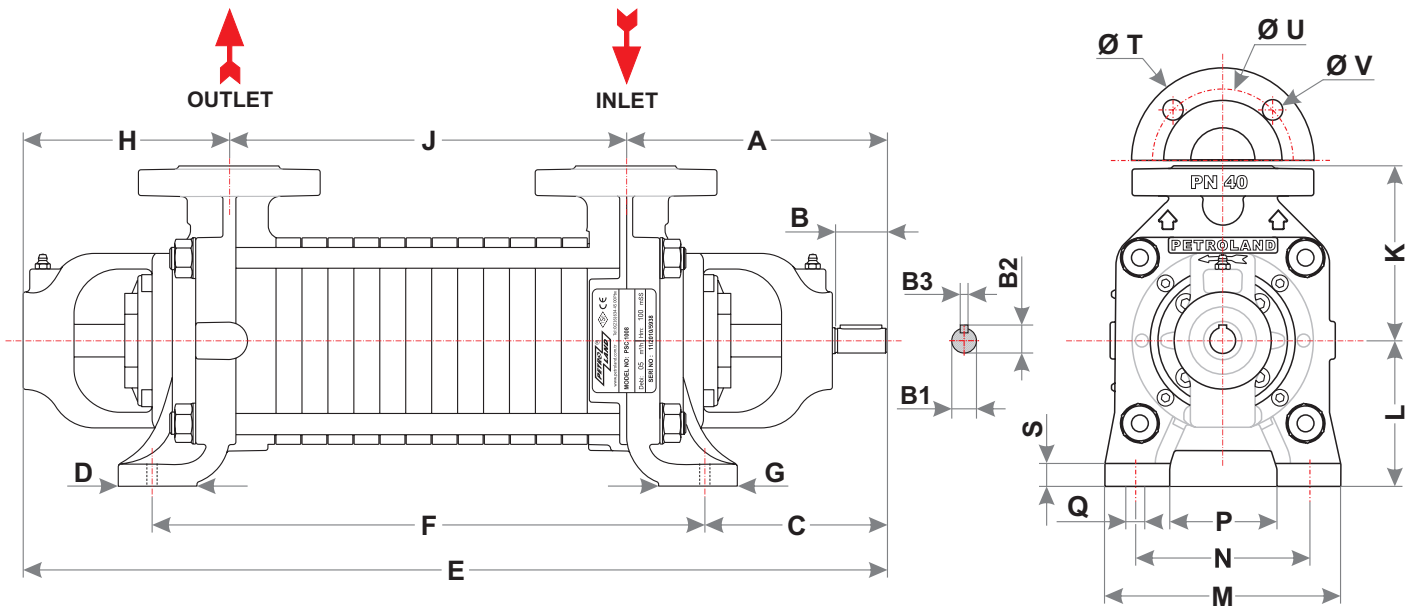
* Tolerances ± 3 mm.

Dimensions is mm.

Flange dimensions in accordance with PN40 DIN 2545

25. PSD & PSV Models Multistage Side Channel Pumps Dimensional Drawings

25.1. PSD Model Dimensional Drawings of Bare Shaft Pump

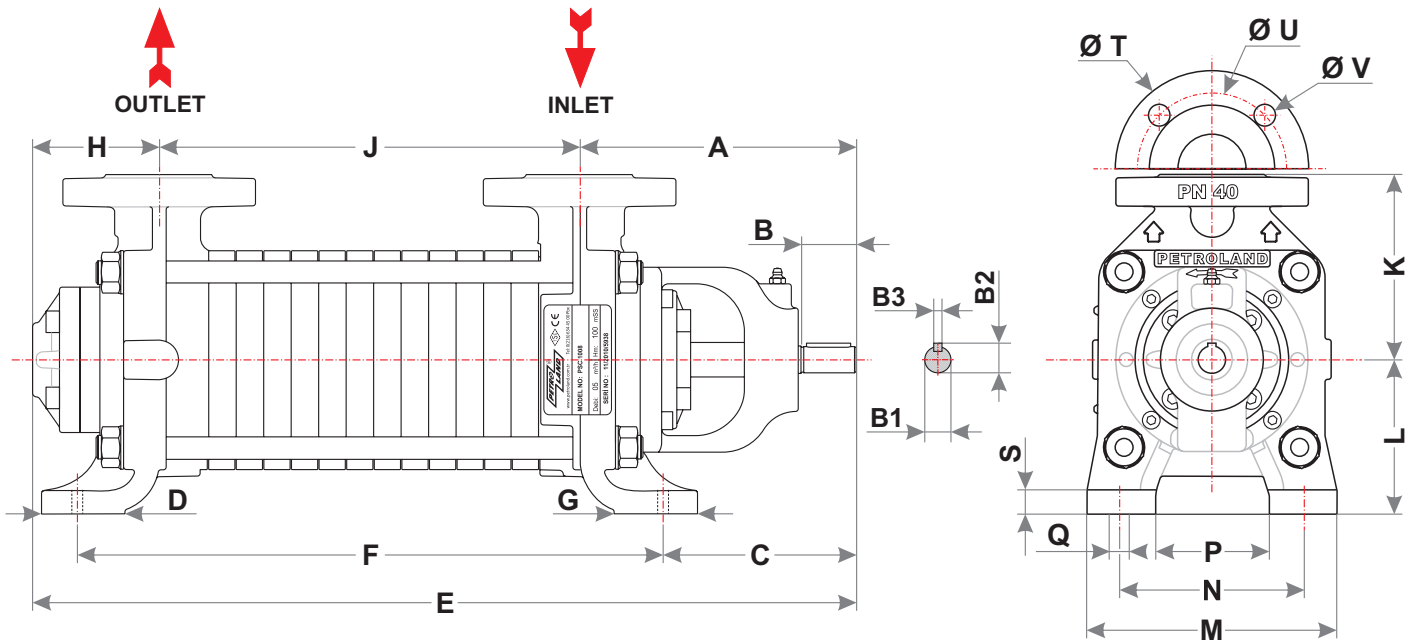


Pump Size	Pump Inlet	Pump Outlet	Dimensions [mm]																		
			A	B	C	D	G	H	K	L	M	N	P	Q	S	T	U	V	B1	B2	B3
1000	20	20	170	25	112	45	45	140	100	100	142	105	60	12	14	105	75	14x4	16	18.2	5
2000	32	32	200	40	134	65	65	160	132	112	180	135	110	14	16	140	140	18x4	19	21.5	6
3000	32	32	200	40	134	65	65	160	132	112	180	135	110	14	16	140	140	18x4	19	21.5	6
4000	40	40	195	45	140	70	70	147	140	132	200	155	120	14	16	150	150	18x4	24	27.0	8
5000	50	50	237	50	160	70	70	182	165	160	220	170	120	16	18	165	165	18x4	28	31.0	8
6000	65	65	262	65	172	70	70	197	180	180	260	195	145	16	18	185	185	18x8	32	35.5	10

Dimensions and Weights According to Stage Numbers																								
Pump Size	Number of Stage																							
	1				2				3				4				5				6			
	E	F	J	Kg	E	F	J	Kg	E	F	J	Kg	E	F	J	Kg	E	F	J	Kg	E	F	J	Kg
1000	432	232	122	23	432	232	122	23	466	266	156	25	500	300	190	27	534	334	224	29	568	368	258	31
2000	506	280	146	41	506	280	146	42	546	320	186	45	586	360	226	48	626	400	266	51	666	440	306	54
3000	506	280	146	41	506	280	146	42	546	320	186	45	586	360	226	48	626	400	266	51	666	440	306	54
4000	500	270	159	47	555	325	214	54	610	380	269	61	665	435	324	68	720	490	379	75	775	600	434	82
5000	594	330	175	73	669	405	250	84	744	480	325	95	819	555	400	106	894	630	475	117	969	705	550	128
6000	669	384	210	103	757	472	298	119	845	560	386	135	933	648	474	151	1021	736	562	167	1109	824	650	183

Flange dimensions in accordance with PN40 DIN 2545

25.2. PSV Model Dimensional Drawings of Bare Shaft Pump

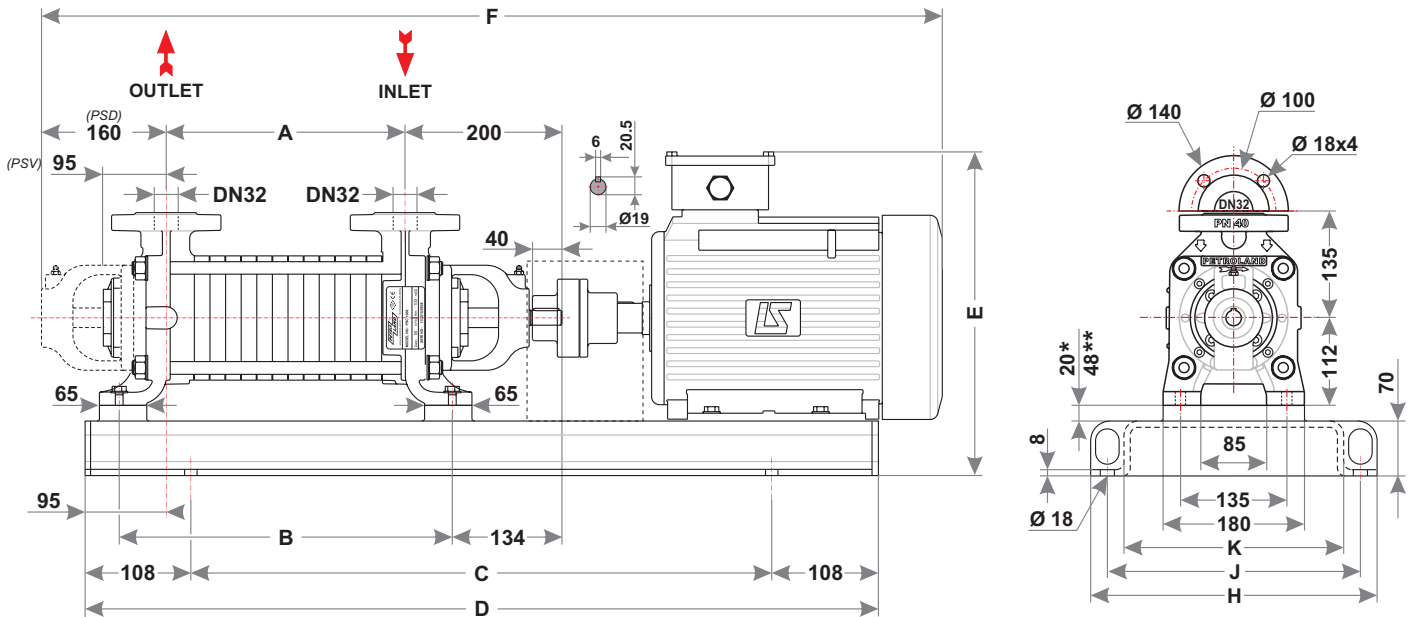


Pump Size	Pump Inlet	Pump Outlet	Dimensions [mm]																		
			A	B	C	D	G	H	K	L	M	N	P	Q	S	T	U	V	B1	B2	B3
1000	20	20	170	25	112	45	45	70	100	100	142	105	60	12	14	105	75	14x4	16	18.2	5
2000	32	32	200	40	134	65	65	95	132	112	180	135	110	14	16	140	140	18x4	19	21.5	6
3000	32	32	200	40	134	65	65	95	132	112	180	135	110	14	16	140	140	18x4	19	21.5	6
4000	40	40	195	45	140	70	70	70	140	132	200	155	120	14	16	150	150	18x4	24	27.0	8
5000	50	50	237	50	160	70	70	100	165	160	220	170	120	16	18	165	165	18x4	28	31.0	8
6000	65	65	262	65	172	70	70	100	180	180	260	195	145	16	18	185	185	18x8	32	35.5	10

Dimensions and Weights According to Stage Numbers																								
Pump Size	Number of Stage																							
	1				2				3				4				5				6			
	E	F	J	Kg	E	F	J	Kg	E	F	J	Kg	E	F	J	Kg	E	F	J	Kg	E	F	J	Kg
1000	362	232	122	23	362	232	122	23	396	266	156	25	430	300	190	27	464	334	224	29	498	368	258	31
2000	440	280	146	41	440	280	146	42	480	320	186	45	520	360	226	48	560	400	266	51	600	440	306	54
3000	440	280	146	41	440	280	146	42	480	320	186	45	520	360	226	48	560	400	266	51	600	440	306	54
4000	424	270	159	43	479	325	214	50	534	380	269	57	589	435	324	64	644	490	379	71	699	545	434	78
5000	512	330	175	69	587	405	250	80	662	480	325	91	737	555	400	102	812	630	475	113	887	705	550	124
6000	572	384	210	98	660	472	298	114	748	560	386	130	836	648	474	146	924	736	562	162	1012	824	650	178

Flange dimensions in accordance with PN40 DIN 2545

25.4. PSD / PSV 2001 - 2008 Dimensional Drawings of Pump Coupled with Motor

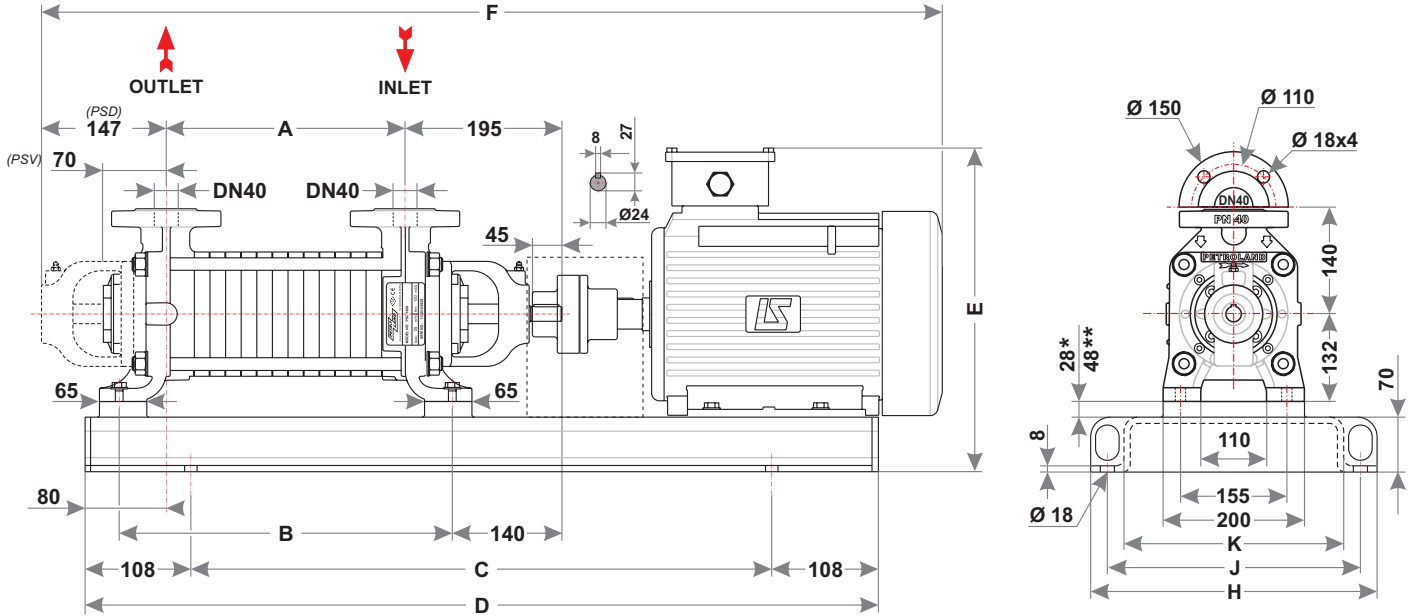


* 20 mm plate using for 132 size motor
** 48 mm plate using for 160 size motor

Model No:	Motor <small>1450 rpm</small>		Dimensions [mm]									Weight [Kg.]		
	kW	Size	A	B	C	D	E	F	H	J	K	Bare Shaft Pump	With Standard Electric Motor *	With Ex-Proof Electric Motor <small>(FLSD Ex d IIBT4)</small>
PSD / PSV 2001	0.75	80 L	146	280	480	696	355	825	300	260	200	41	79	99
	1.1	90 S			510	726	400	875	300	260	200		80	101
PSD / PSV 2002	1.5	90 L	146	280	510	726	400	875	300	260	200	42	83	108
	2.2	100 L			560	776	410	930	320	280	220		91	112
PSD / PSV 2003	2.2	100 L	186	320	600	816	410	970	320	280	220	45	96	116
	3	100 L											98	121
PSD / PSV 2004	2.2	100 L	226	360	640	856	410	1010	320	280	220	48	98	120
	3	100 L											101	124
	4	112 M			640	856	420	1015	360	320	260		109	134
PSD / PSV 2005	3	100 L	266	400	680	896	410	1050	320	280	220	51	106	128
	4	112 M			680	896	420	1050	360	320	260		116	141
	5.5	132 S			780	996	455	1190	380	340	280		138	182
PSD / PSV 2006	4	112 M	306	440	720	936	420	1095	360	320	260	54	116	144
	5.5	132 S			820	1036	455	1130	380	340	280		136	184
	7.5	132 M											156	191
PSD / PSV 2007	4	112 M	346	480	760	976	420	1135	360	320	260	57	121	148
	5.5	132 S			860	1076	455	1270	380	340	280		141	188
	7.5	132 M											161	196
PSD / PSV 2008	4	112 M	386	520	800	1016	420	1175	360	320	260	60	126	151
	5.5	132 S			900	1116	455	1310	380	340	280		144	193
	7.5	132 M											154	201
	11	160 M			1030	1246	560	1445	450	410	350		196	246

* Weight of aluminium electric motor.
Flange dimensions in accordance with PN40 DIN 2545

25.6. PSD / PSV 4001 - 4008 Dimensional Drawings of Pump Coupled with Motor



* 28 mm plate using for 160 size motor
**48 mm plate using for 180 size motor

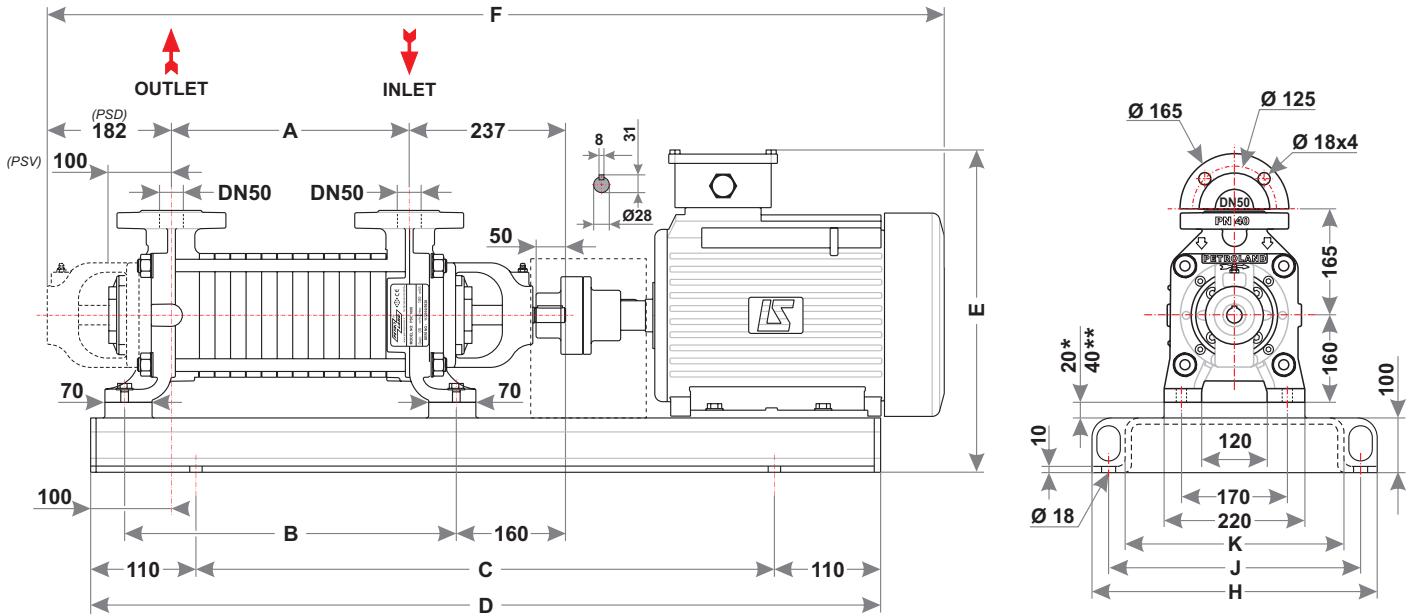
Model No:	Motor 1450 rpm		Dimensions [mm]									Weight [Kg.]		
	kW	Size	A	B	C	D	E	F	H	J	K	Bare Shaft Pump	With Standard Electric Motor *	With Ex-Proof Electric Motor (FLSE Ex e IIT3)
PSD / PSV 4001	1.5	90 L	159	270	540	556	440	905	320	280	220	47	92	115
	2.2	100 L											97	120
PSD / PSV 4002	3	100 L	214	325	620	836	450	995	360	320	260	54	88	135
	4	112 M											118	143
PSD / PSV 4003	4	112 M	269	380	680	896	450	1050	360	320	260	61	111	150
	5.5	132 S			770	986	460	1185	380	340	280		147	195
PSD / PSV 4004	5.5	132 S	324	435	820	1036	460	1240	380	340	280	68	148	198
	7.5	112 M											168	205
PSD / PSV 4005	5.5	132 S	379	490	880	1096	460	1295	380	340	280	75	159	208
	7.5	112 M			1000	1216	590	1425	450	420	350		179	215
	11	160 M											212	265
PSD / PSV 4006	5.5	132 S	434	545	940	1156	460	1350	380	340	280	82	68	215
	7.5	132 M			1060	1276	590	1480	450	420	350		188	222
	11	160 M											220	272
PSD / PSV 4007	7.5	132 M	489	600	1000	1216	460	1405	380	340	280	89	193	230
	11	160 M			1120	1336	590	1535	450	420	350		232	285
	15	160 L											245	310
PSD / PSV 4008	11	160 M	544	655	1180	1396	590	1590	450	420	350	96	240	295
	15	160 L			1200	1416	590	1655	500	470	400		255	320
	18.5	180 M											290	345

* Weight of aluminium electric motor.

Weights of PSV Models are lower by 4 kg rather than weights given on the table.

Flange dimensions in accordance with PN40 DIN 2545

25.7. PSD / PSV 5001 - 5008 Dimensional Drawings of Pump Coupled with Motor



* 20 mm plate using for 180 size motor
** 40 mm plate using for 200 size motor

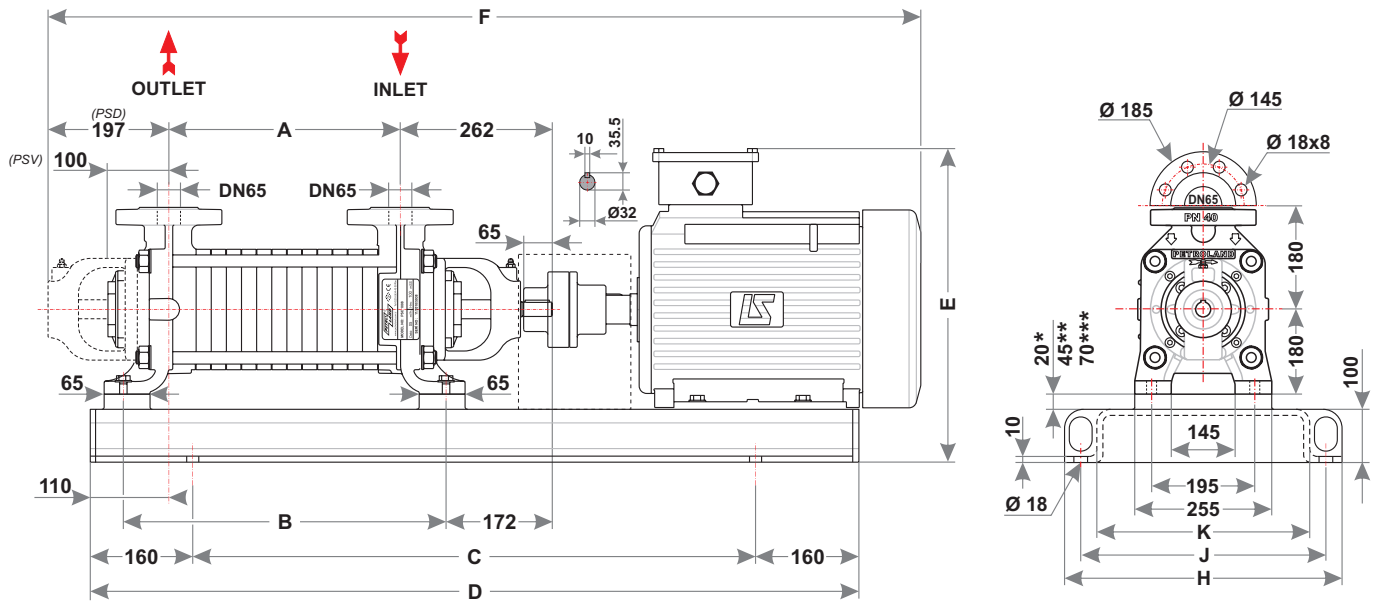
Model No:	Motor 1450 rpm		Dimensions (mm)									Weight (Kg.)		
	kW	Size	A	B	C	D	E	F	H	J	K	Bare Shaft Pump	With Standard Electric Motor *	With Ex-Proof Electric Motor (FLSE Ex e IIT3)
PSD / PSV 5001	3	100 L	175	330	640	860	500	1010	380	330	260	73	145	170
	4	112 M											450	180
PSD / PSV 5002	5.5	132 S	250	405	780	1000	515	1170	420	370	300	84	187	237
	7.5	132 M											208	247
PSD / PSV 5003	5.5	132 S	325	480	860	1080	515	1250	420	370	300	95	203	252
	7.5	132 M			1000	1220	590	1440	470	420	350		222	260
	11	160 M			1080	1300	590	1515	470	420	350		245	300
PSD / PSV 5004	7.5	132 M	400	555	940	1160	515	1320	420	370	300	106	238	275
	11	160 M			1080	1300	590	1515	470	420	350		265	315
	15	160 L			1080	1300	590	1515	470	420	350		275	340
PSD / PSV 5005	11	160 M	475	630	1160	1380	590	1590	470	420	350	117	275	330
	15	160 L			1180	1400	690	1660	520	470	400		285	355
	18.5	180 M			1180	1400	690	1660	520	470	400		330	385
PSD / PSV 5006	15	160 L	550	705	1240	1460	690	1665	470	420	350	128	305	370
	18.5	180 M			1260	1480	590	1730	520	470	400		343	400
	22	180 L			1260	1480	590	1730	520	470	400		350	420
PSD / PSV 5007	18.5	180 M	625	780	1340	1560	590	1810	520	470	400	139	370	425
	22	180 L			1380	1600	665	1840	540	490	420		377	445
	30	200 L			1380	1600	665	1840	540	490	420		425	555
PSD / PSV 5008	18.5	180 M	700	855	1420	1640	590	1880	520	470	400	150	375	430
	22	180 L			1460	1680	665	1915	540	490	420		383	450
	30	200 L			1460	1680	665	1915	540	490	420		442	570

* Weight of aluminium electric motor.

Weights of PSV Models are lower by 4 kg rather than weights given on the table.

Flange dimensions in accordance with PN40 DIN 2545

25.8. PSD / PSV 6001 - 6008 Dimensional Drawings of Pump Coupled with Motor



* 20 mm plate using for 200 size motor
 ** 45 mm plate using for 225 size motor
 *** 70 mm plate using for 250 size motor

Model No:	Motor <small>1450 rpm</small>		Dimensions (mm)									Weight (Kg.)			
	kW	Size	A	B	C	D	E	F	H	J	K	Bare Shaft Pump	With Standard Electric Motor *	With Ex-Proof Electric Motor <small>(FLSE Ex e IIT3)</small>	
PSD / PSV 6001	5.5	132 S	210	384	660	980	490	1162	420	370	300	103	210	260	
	7.5	132 M											230	265	
PSD / PSV 6002	11	160 M	298	472	920	1240	610	1467	470	420	350	119	285	340	
	15	160 L											300	365	
PSD / PSV 6003	11	160 M	386	560	1020	1340	610	1557	470	420	350	135	305	360	
	15	160 L			1040	1360	610	1622	520	470	420		400	320	385
	18.5	180 M												350	405
PSD / PSV 6004	15	160 L	474	648	1100	1420	610	1642	470	420	350	151	335	405	
	18.5	180 M			1140	1460	610	1712	520	470	400		370	425	
	22	180 L											380	445	
PSD / PSV 6005	18.5	180 M	562	736	1220	1540	610	1797	520	470	400	167	395	450	
	22	180 L			1260	1580	665	1827	540	590	420		405	470	
	30	200 L											460	585	
PSD / PSV 6006	18.5	180 M	650	824	1300	1620	610	1887	520	470	400	183	415	470	
	22	180 L			1360	1680	665	1917	540	490	420		425	490	
	30	200 L											485	610	
PSD / PSV 6007	22	180 L	738	912	1400	1720	610	1977	520	470	400	199	445	510	
	30	200 L			1440	1760	665	2007	540	490	420		505	630	
	37	225 S			1500	1820	690	2107	620	570	500		575	680	
	45	225 M											615	715	
PSD / PSV 6008	30	200 L	826	1000	1540	1860	665	2087	540	490	420	215	525	650	
	37	225 S			1600	1920	690	2192	620	570	500		595	700	
	45	225 M											630	735	
	55	250 M			1660	1980	780	2302	670	620	550		675	935	

* Weight of aluminium electric motor.

Weights of PSV Models are lower by 5 kg rather than weights given on the table.

Flange dimensions in accordance with PN40 DIN 2545

26. 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-5009 for standard pumps. Consult to PETROLAND if other color is required.
- Thickness of paint is between 40-60 microns.

27. 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!

28. 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.

29. Spare parts

We recommend that you use original spare parts.

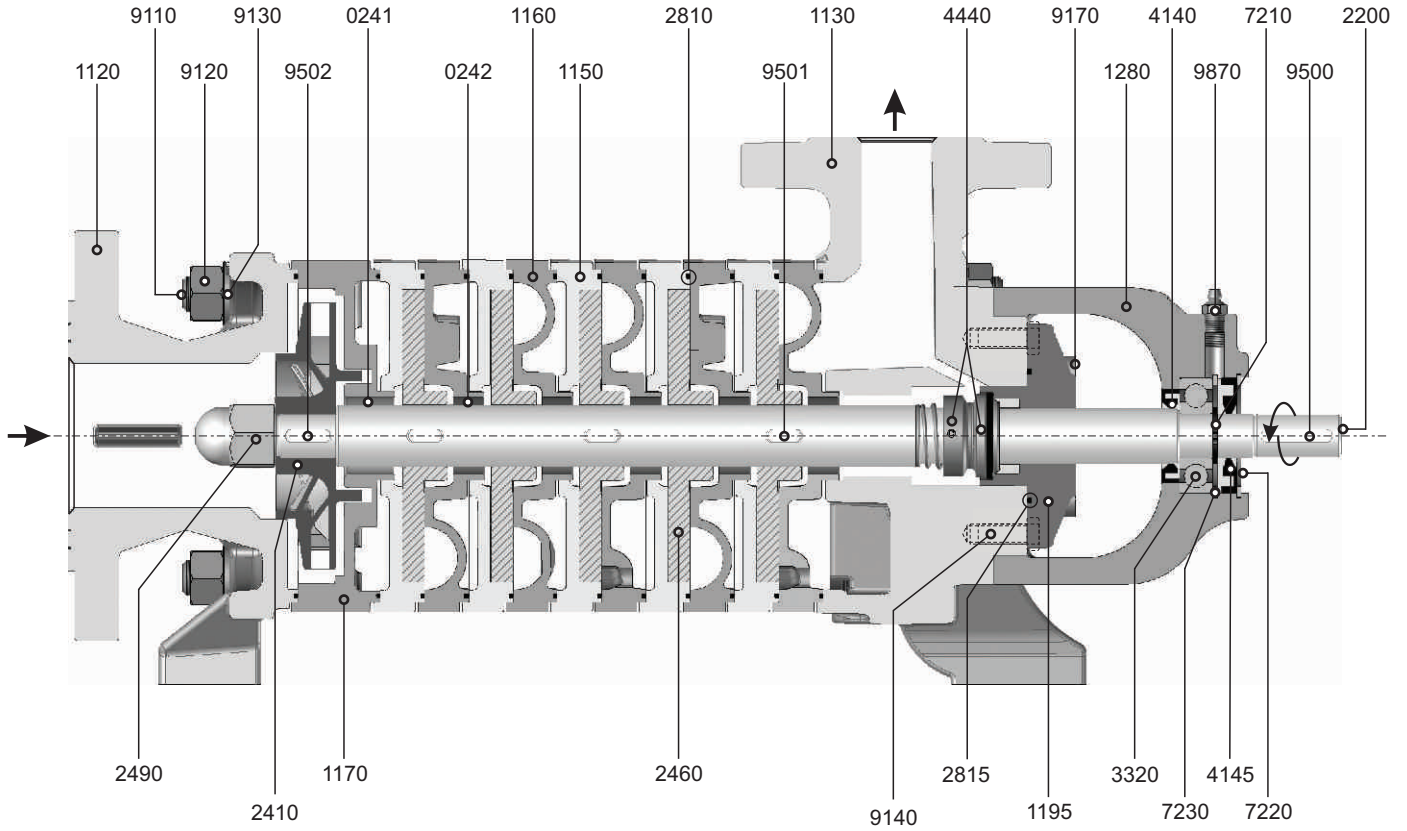
Petroland accepts no liability for any personal injury or damage to the pump as a consequence of the use of non-original spare parts that do not satisfy precisely the same strict quality requirements as original PETROLAND spare parts.

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

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

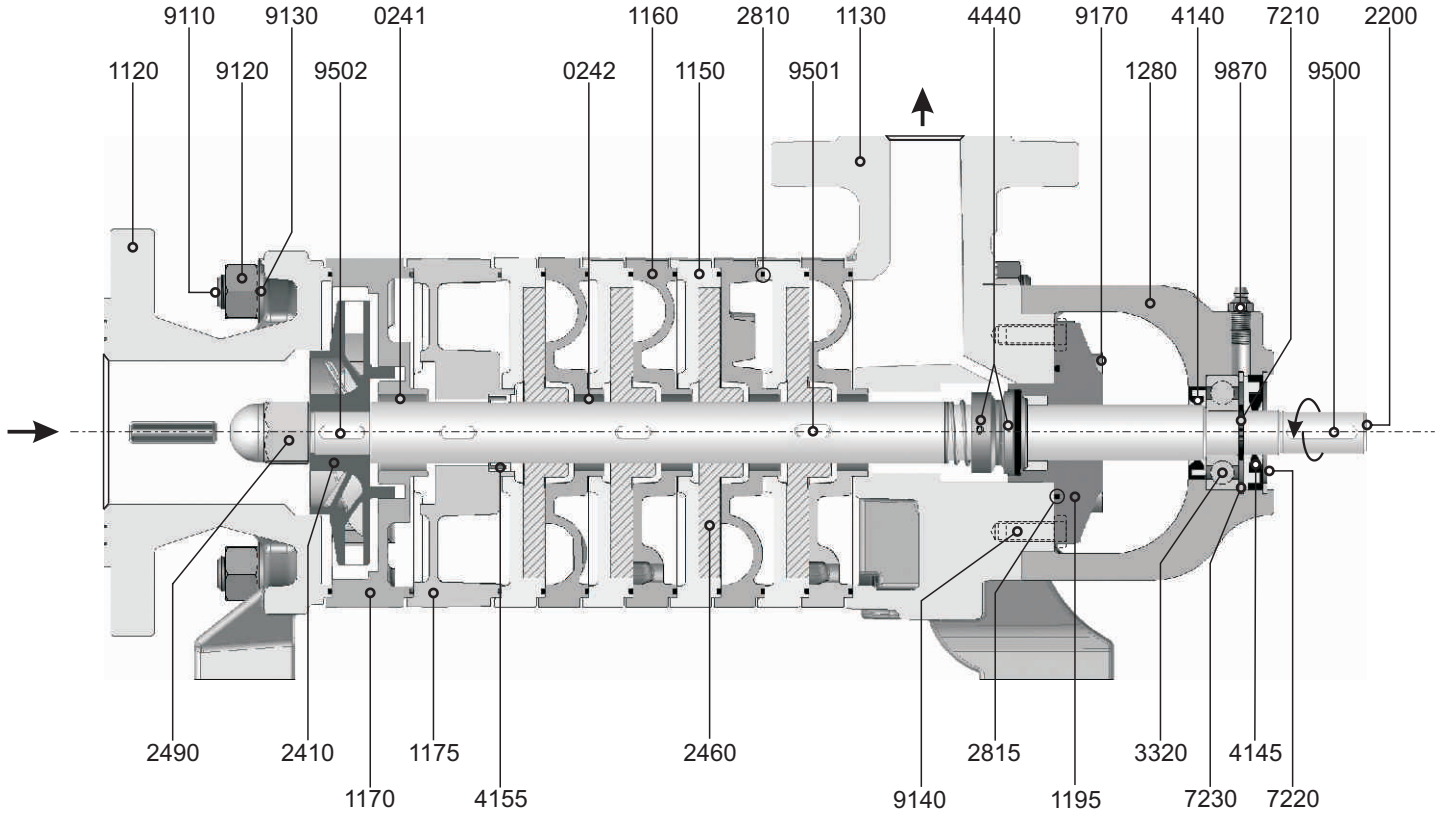
30. Spare Part List of PS Series Multistage Side Channel Pumps

30.1. Spare Part List of PSC Model Pumps with Mechanical Seal



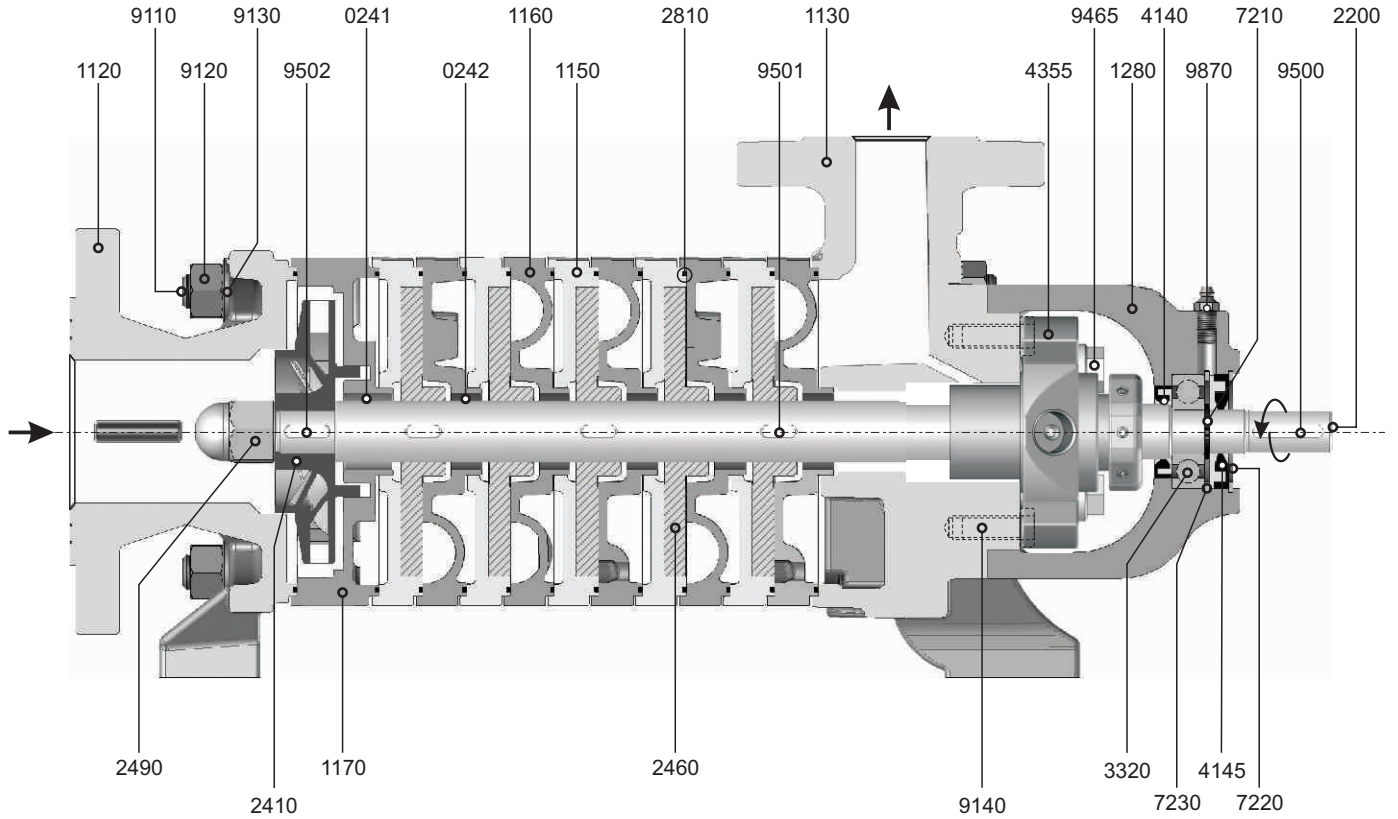
Item	Part List	Item	Part List	Item	Part List
0241	Impeller Bushing	2460	Vane Impeller	9110	Tie Bolt
0242	Vane Impeller Bushing	2490	Hexagonal Shaft Nut (<i>Left-Hand Thread</i>)	9120	Tie Bolt Nut
1120	Suction Casing	2810	Stage O-Ring	9130	Tie Bolt Washer
1130	Discharge Casing	2815	Mechanical Seal Casing O-Ring	9140	Screw for Bearing Casing
1150	Suction Body	3320	Ball Bearing	9170	Screw for Mechanical Seal Casing
1160	Discharge Body	4140	Lip Seal (Inner)	9500	Flat Key for Coupling
1170	Impeller Body	4145	Lip Seal (Outer)	9501	Flat Key for Vane Impeller
1195	Mechanical Seal Casing	4440	Mechanical Seal	9502	Flat Key for Impeller
1280	Bearing Casing	7210	Snap Ring for Shaft	9870	Grease Fitting
2200	Shaft	7220	Snap Ring for Bearing		
2410	Impeller	7230	Snap Ring for Lip Seal		

30.2. Spare Part List of PSC Model Pumps with Liquid Sensor



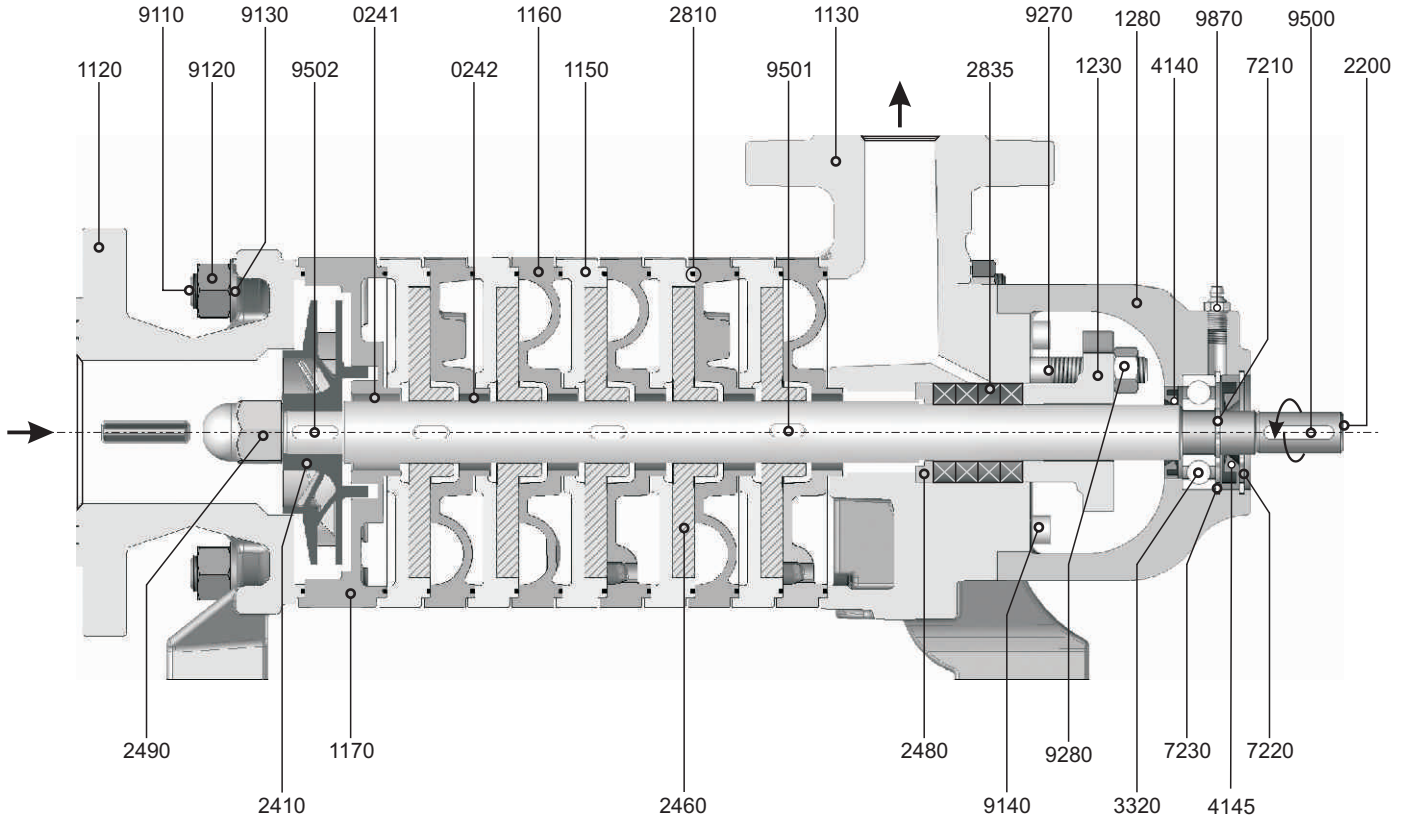
Item	Part List	Item	Part List	Item	Part List
0241	Impeller Bushing	2410	Impeller	7220	Snap Ring For Lip Seal
0242	Vane Impeller Bushing	2490	Hexagonal Shaft Nut (<i>Left-Hand Thread</i>)	7230	Snap Ring For Bearing
1120	Suction Casing	2460	Vane Impeller	9110	Tie Bolt
1130	Discharge Casing	2810	Stage O-Ring	9120	Tie Bolt Nut
1150	Suction Body	2815	Mechanical Seal Casing O-Ring	9130	Tie Bolt Washer
1160	Discharge Body	3320	Ball Bearing	9140	Screw for Bearing Casing
1170	Impeller Body	4140	Lip Seal (Inner)	9170	Screw for Mechanical Seal Casing
1175	Retaining Stage	4145	Lip Seal (Outer)	9500	Flat Key for Coupling
1195	Mechanical Seal Casing	4155	Liquid Sensor Gasket	9501	Flat Key for Vane Impeller
1280	Bearing Casing	4440	Mechanical Seal	9502	Flat Key for Impeller
2200	Shaft	7210	Snap Ring for Shaft	9870	Grease Fitting

30.3. Spare Part List of PSC Model Pumps with Cartridge Mechanical Seal



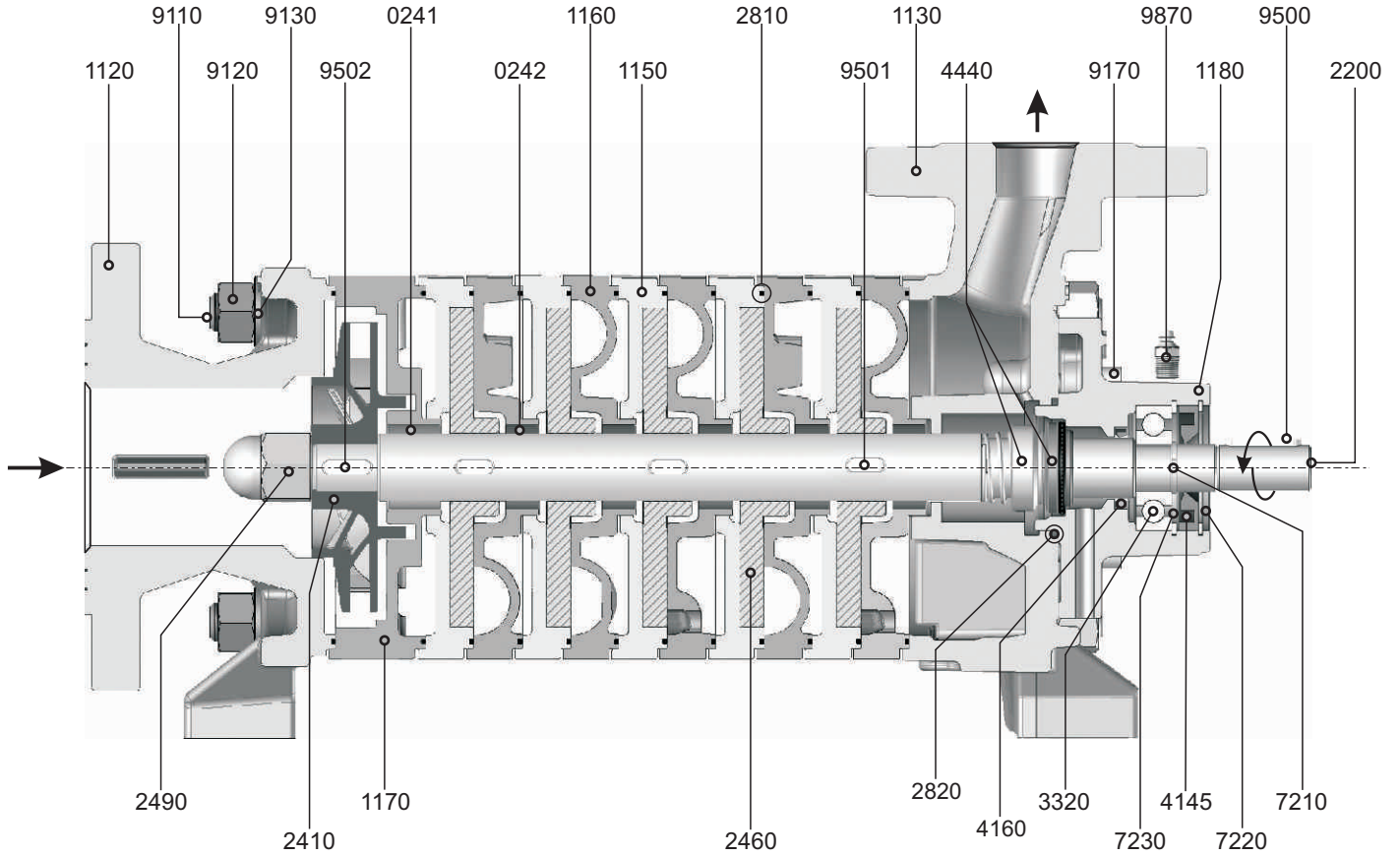
Item	Part List	Item	Part List	Item	Part List
0241	Impeller Bushing	2460	Vane Impeller	9110	Tie Bolt
0242	Vane Impeller Bushing	2490	Hexagonal Shaft Nut (Left-Hand Thread)	9120	Tie Bolt Nut
1120	Suction Casing	2810	Stage O-Ring	9130	Tie Bolt Washer
1130	Discharge Casing	3320	Ball Bearing	9140	Screw for Bearing Casing
1150	Suction Body	4140	Lip Seal (Inner)	9465	Tighten Screw for Cartridge Mechanical Seal
1160	Discharge Body	4145	Lip Seal (Outer)	9500	Flat Key for Coupling
1170	Impeller Body	4355	Cartridge Mechanical Seal	9501	Flat Key for Vane Impeller
1280	Bearing Casing	7210	Snap Ring for Shaft	9502	Flat Key for Impeller
2200	Shaft	7220	Snap Ring for Bearing	9870	Grease Fitting
2410	Impeller	7230	Snap Ring for Lip Seal		

30.4. Spare Part List of PSC Model Pumps with Packing Gland



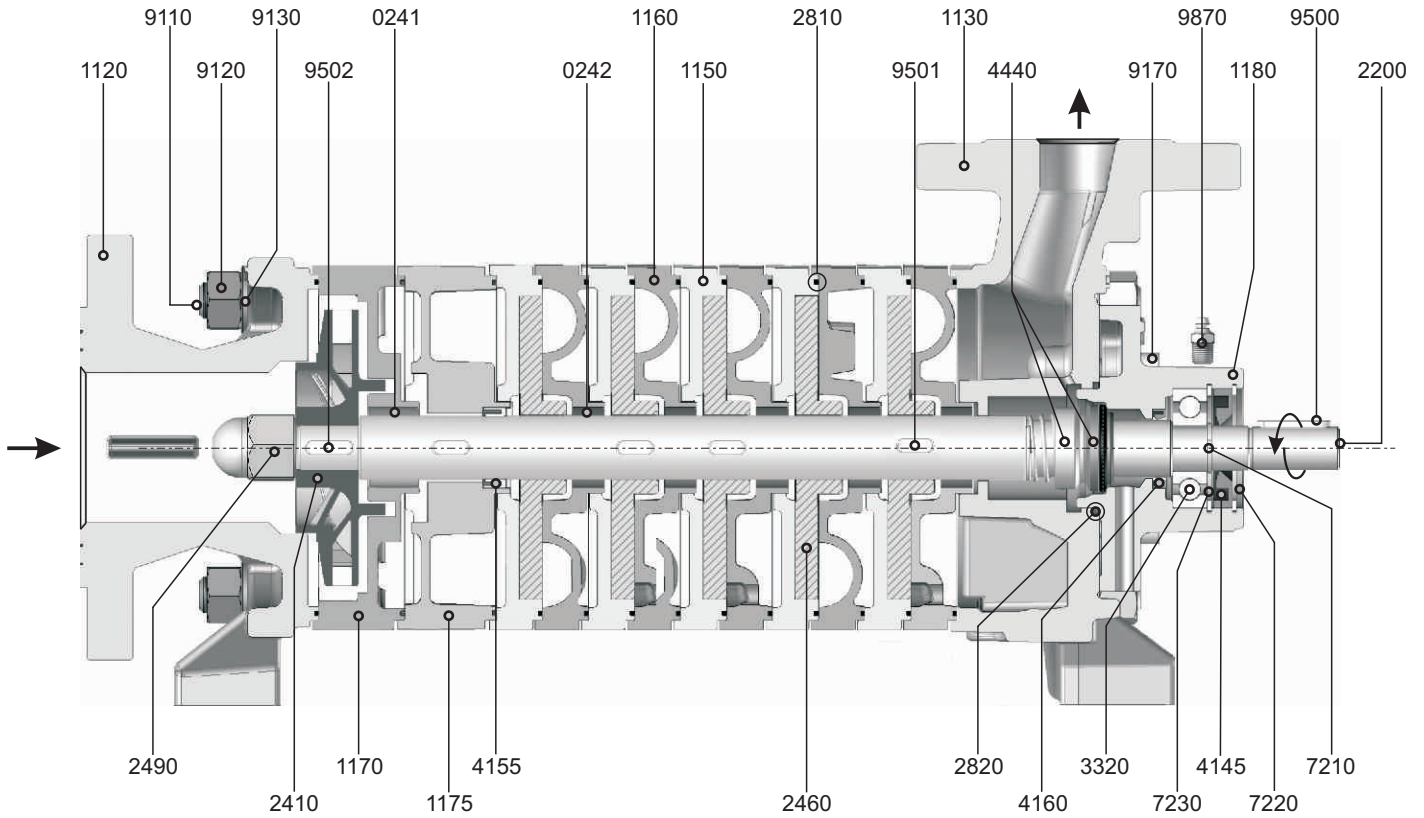
Item	Part List	Item	Part List	Item	Part List
0241	Impeller Bushing	2460	Vane Impeller	9110	Tie Bolt
0242	Vane Impeller Bushing	2490	Hexagonal Shaft Nut (<i>Left-Hand Thread</i>)	9120	Tie Bolt Nut
1120	Suction Casing	2480	Packing Gland Washer	9130	Tie Bolt Washer
1130	Discharge Casing	2810	Stage O-Ring	9140	Screw for Bearing Casing
1150	Suction Body	2835	Packing Gland Ring	9170	Screw for Mechanical Seal Casing
1160	Discharge Body	3320	Ball Bearing	9180	Screw for Bushing Casing
1170	Impeller Body	4140	Lip Seal (Inner)	9500	Flat Key for Coupling
1230	Packing Gland	4145	Lip Seal (Outer)	9501	Flat Key for Vane Impeller
1280	Bearing Casing	7210	Snap Ring for Shaft	9502	Flat Key for Impeller
2200	Shaft	7220	Snap Ring for Bearing	9870	Grease Fitting
2410	Impeller	7230	Snap Ring for Lip Seal		

30.5. Spare Part List of LPG 50 & LPG 250 Model Pumps



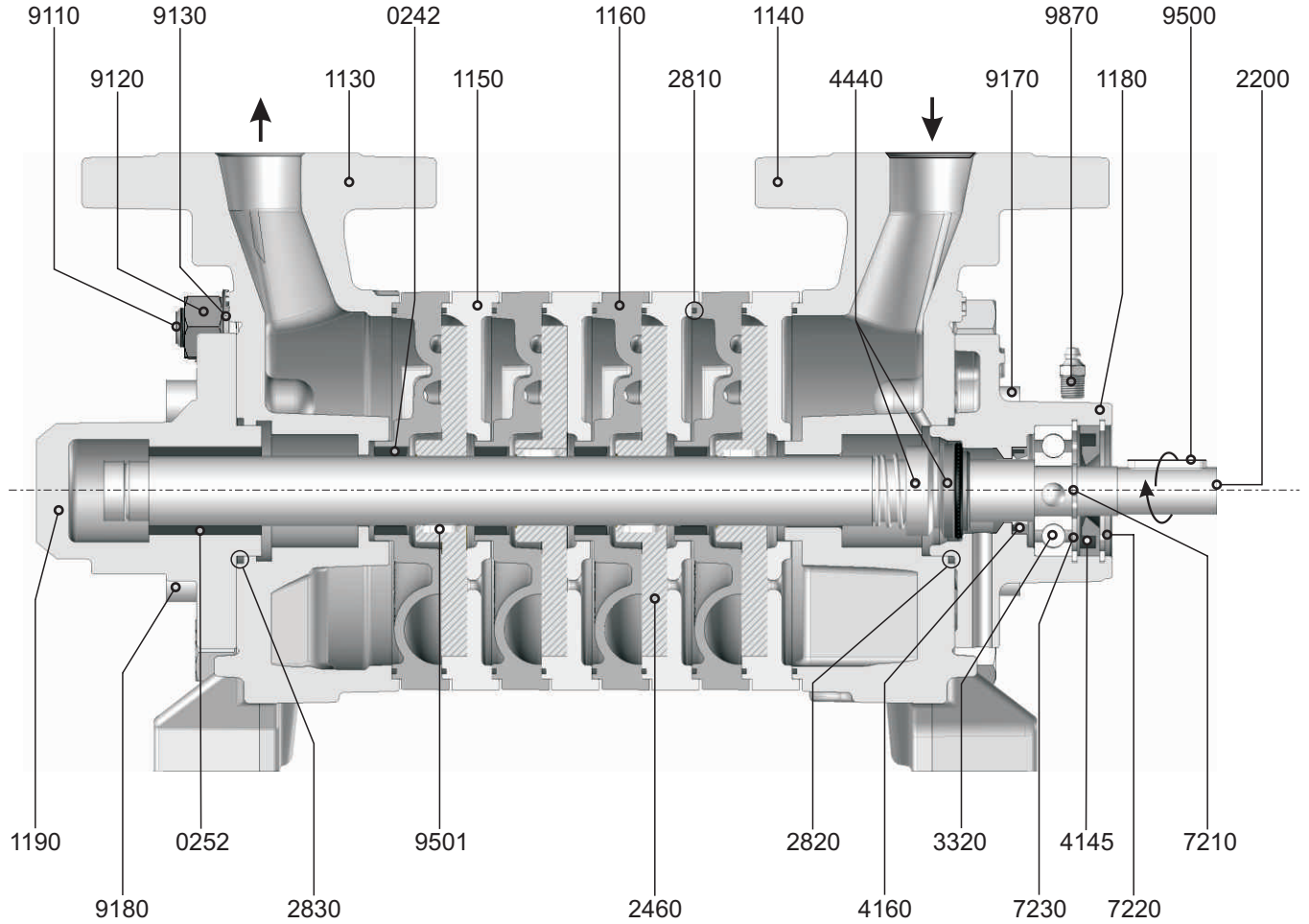
Item	Part List	Item	Part List	Item	Part List
0241	Impeller Bushing	2460	Vane Impeller	7230	Snap Ring for Lip Seal
0242	Vane Impeller Bushing	2490	Hexagonal Shaft Nut (<i>Left-Hand Thread</i>)	9110	Tie Bolt
1120	Suction Casing	2810	Stage O-Ring	9120	Tie Bolt Nut
1130	Discharge Casing	2820	Mechanical Seal Body O-Ring	9130	Tie Bolt Washer
1150	Suction Body	3320	Ball Bearing	9170	Screw for Mechanical Seal Casing
1160	Discharge Body	4145	Lip Seal (<i>Outer</i>)	9500	Flat Key for Coupling
1170	Impeller Body	4160	Lip Seal	9501	Flat Key for Vane Impeller
1180	Mechanical Seal Body	4440	Mechanical Seal	9502	Flat Key for Impeller
2200	Shaft	7210	Snap Ring for Shaft	9870	Grease Fitting
2410	Impeller	7220	Snap Ring for Bearing		

30.6. Spare Part List of LPG 50 & LPG 250 Model Pumps with Liquid Sensor



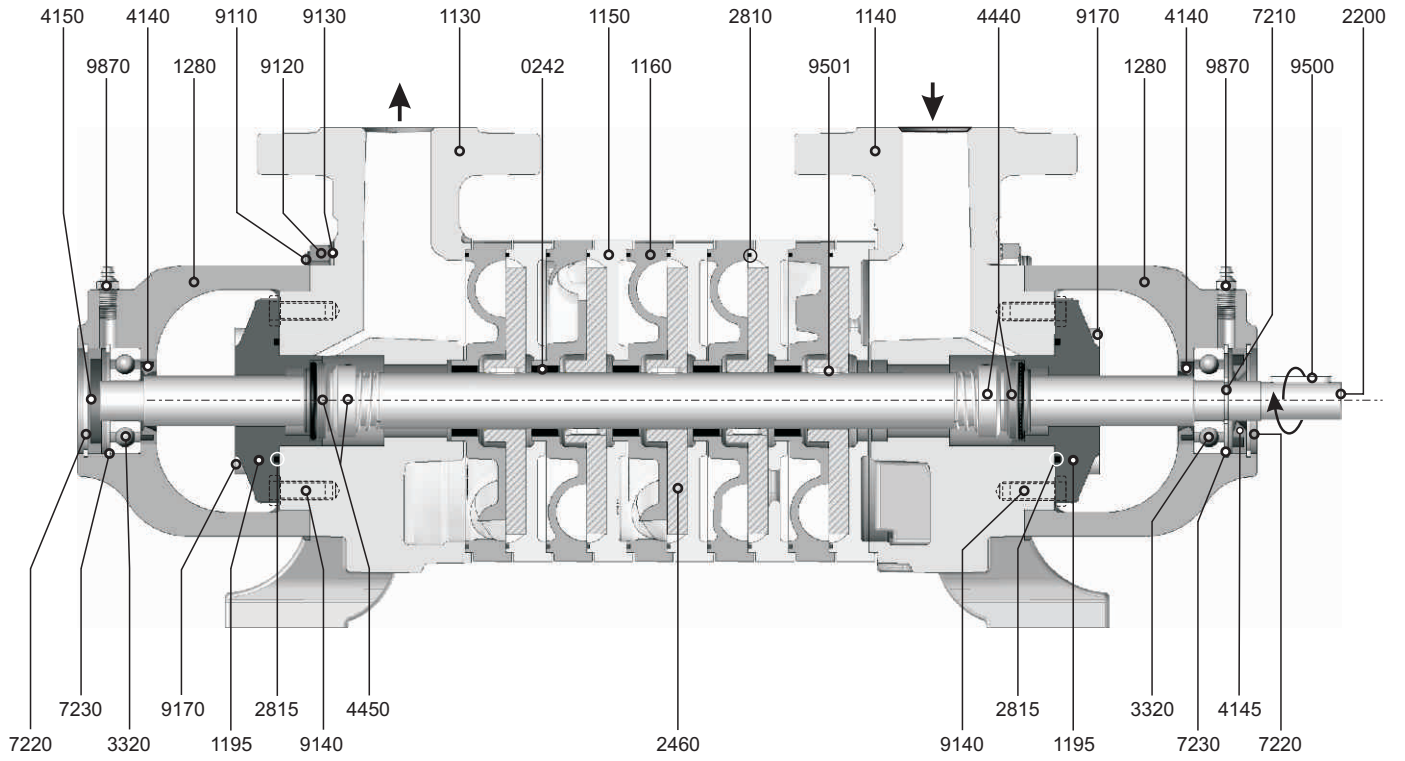
Item	Part List	Item	Part List	Item	Part List
0241	Impeller Bushing	2460	Vane Impeller	7230	Snap Ring for Lip Seal
0242	Vane Impeller Bushing	2490	Hexagonal Shaft Nut (<i>Left-Hand Thread</i>)	9110	Tie Bolt
1120	Suction Casing	2810	Stage O-Ring	9120	Tie Bolt Nut
1130	Discharge Casing	2820	Mechanical Seal Body O-Ring	9130	Tie Bolt Washer
1150	Suction Body	3320	Ball Bearing	9170	Screw for Mechanical Seal Casing
1160	Discharge Body	4145	Lip Seal (<i>Outer</i>)	9500	Flat Key for Coupling
1170	Impeller Body	4155	Liquid Sensor Gasket	9501	Flat Key for Vane Impeller
1175	Retaining Stage	4160	Lip Seal	9502	Flat Key for Impeller
1180	Mechanical Seal Body	4440	Mechanical Seal	9870	Grease Fitting
2200	Shaft	7210	Snap Ring for Shaft		
2410	Impeller	7220	Snap Ring for Bearing		

30.7. Spare Part List of LPG 150 Model Pumps



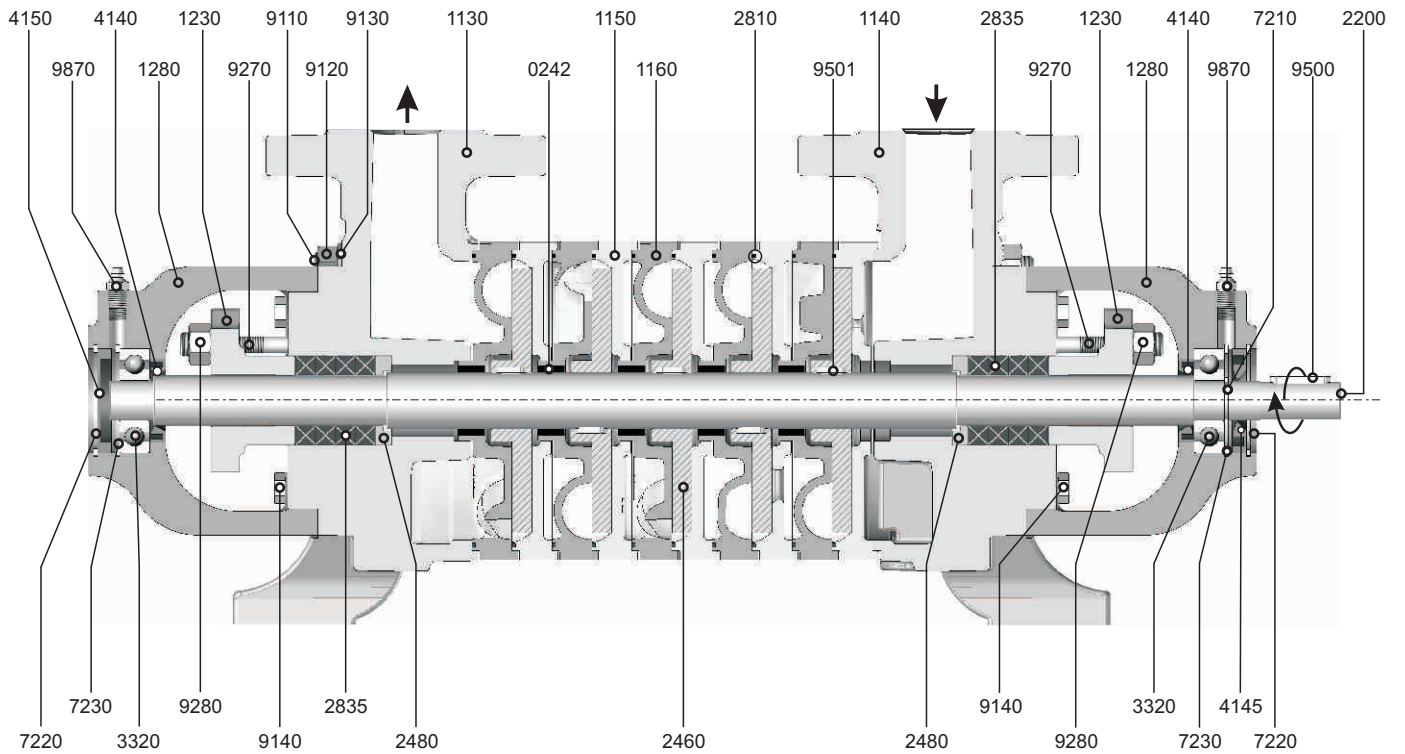
Item	Part List	Item	Part List	Item	Part List
0242	Vane Impeller Bushing	2810	Stage O-Ring	9110	Tie Bolt
0252	Discharge Casing Bushing	2820	Mechanical Seal Body O-Ring	9120	Tie Bolt Nut
1130	Discharge Casing	2830	Bushing Casing O-ring	9130	Tie Bolt Washer
1140	Suction Casing	3320	Ball Bearing	9170	Screw for Mechanical Seal Casing
1150	Suction Body	4145	Lip Seal (Outer)	9180	Screw for Bushing Casing
1160	Discharge Body	4160	Lip Seal	9500	Flat Key for Coupling
1180	Mechanical Seal Body	4440	Mechanical Seal	9501	Flat Key for Vane Impeller
1190	Discharge Bushing Casing	7210	Snap Ring for Shaft	9870	Grease Fitting
2200	Shaft	7220	Snap Ring for Bearing		
2460	Vane Impeller	7230	Snap Ring for Lip Seal		

30.8. Spare Part List of PSD Model Pumps with Mechanical Seal



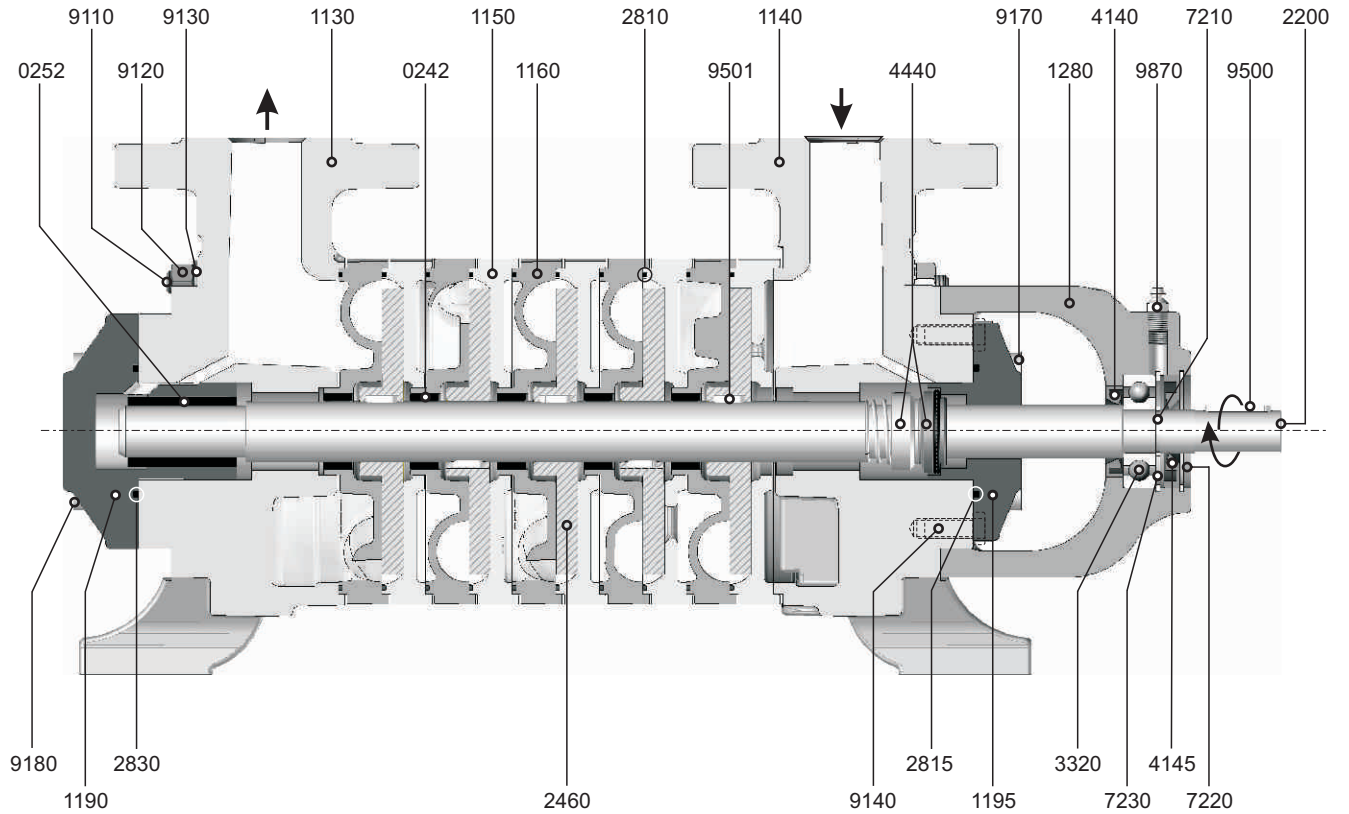
Item	Part List	Item	Part List	Item	Part List
0242	Vane Impeller Bushing	2815	Mechanical Seal Casing O-Ring	7230	Snap Ring for Lip Seal
1130	Discharge Casing	3320	Ball Bearing	9110	Tie Bolt
1140	Suction Casing	4140	Lip Seal (Inner)	9120	Tie Bolt Nut
1150	Suction Body	4145	Lip Seal (Outer)	9130	Tie Bolt Washer
1160	Discharge Body	4150	Dust Seal	9140	Screw for Bearing Casing
1195	Mechanical Seal Casing	4440	Mechanical Seal (Turn Right)	9170	Screw for Mechanical Seal Casing
1280	Bearing Casing	4450	Mechanical Seal (Turn Left)	9500	Flat Key for Coupling
2200	Shaft	7210	Snap Ring for Shaft	9501	Flat Key for Vane Impeller
2460	Vane Impeller	7220	Snap Ring for Bearing	9870	Grease Fitting
2810	Stage O-Ring				

30.9. Spare Part List of PSD Model Pumps with Packing Gland



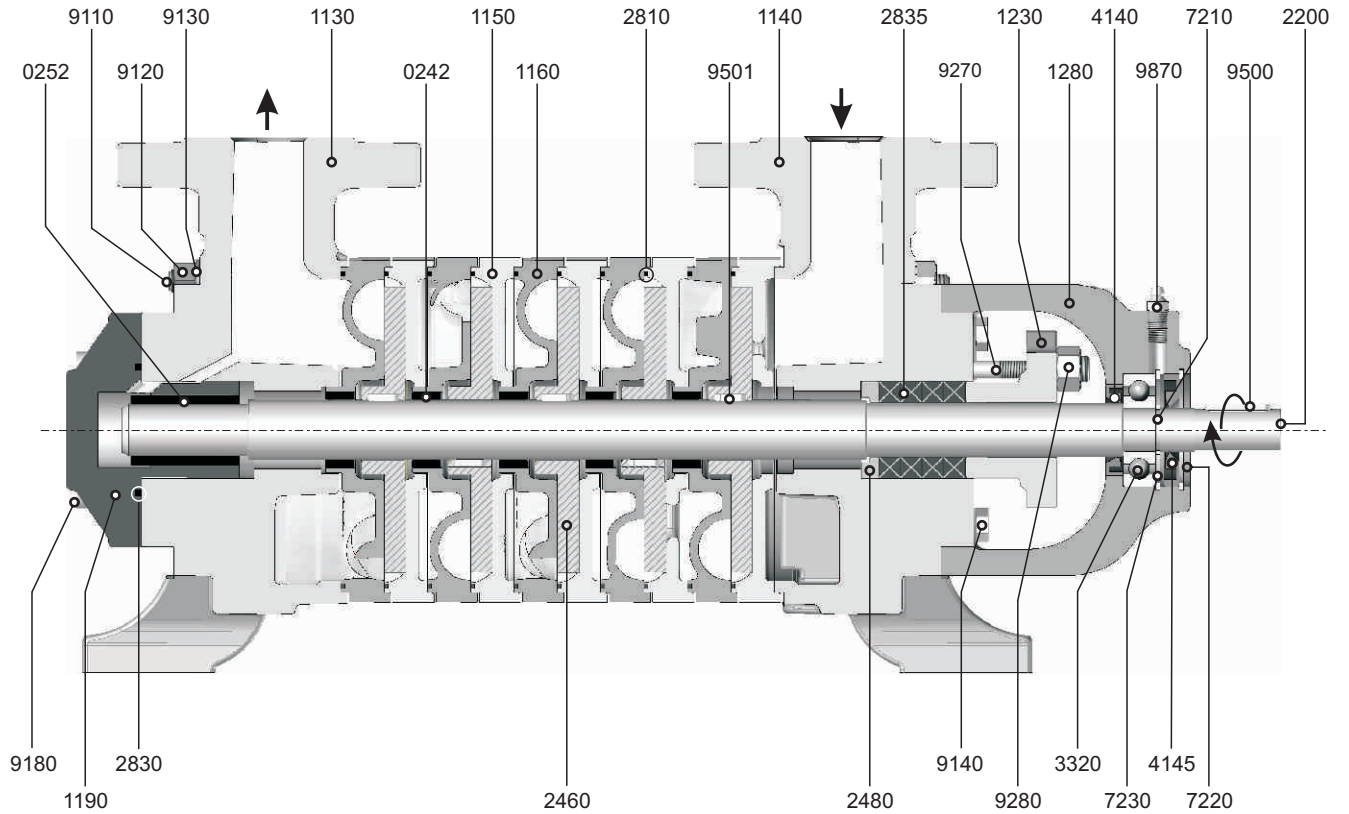
Item	Part List	Item	Part List	Item	Part List
0242	Vane Impeller Bushing	2480	Packing Gland Washer	9110	Tie Bolt
1130	Discharge Casing	2810	Stage O-Ring	9120	Tie Bolt Nut
1140	Suction Casing	2835	Packing Gland Ring	9130	Tie Bolt Washer
1150	Suction Body	3320	Ball Bearing	9140	Screw for Bearing Casing
1160	Discharge Body	4140	Lip Seal (Inner)	9270	Packing Gland Capscrews
1195	Mechanical Seal Casing	4145	Lip Seal (Outer)	9280	Packing Gland Capscrew Nuts
1230	Packing Gland	4150	Dust Seal	9500	Flat Key for Coupling
1280	Bearing Casing	7210	Snap Ring for Shaft	9501	Flat Key for Vane Impeller
2200	Shaft	7220	Snap Ring for Bearing	9870	Grease Fitting
2460	Vane Impeller	7230	Snap Ring for Lip Seal		

30.10. Spare Part List of PSV Model Pumps with Mechanical Seal



Item	Part List	Item	Part List	Item	Part List
0242	Vane Impeller Bushing	2460	Vane Impeller	7230	Snap Ring for Lip Seal
0252	Discharge Casing Bushing	2810	Stage O-Ring	9110	Tie Bolt
1130	Discharge Casing	2815	Mechanical Seal Casing O-Ring	9120	Tie Bolt Nut
1140	Suction Casing	2830	Bushing Casing O-ring	9130	Tie Bolt Washer
1150	Suction Body	3320	Ball Bearing	9140	Screw for Bearing Casing
1160	Discharge Body	4140	Lip Seal (Inner)	9170	Screw for Mechanical Seal Casing
1190	Discharge Bushing Casing	4145	Lip Seal (Outer)	9180	Screw for Bushing Casing
1195	Mechanical Seal Casing	4440	Mechanical Seal	9500	Flat Key for Coupling
1280	Bearing Casing	7210	Snap Ring for Shaft	9501	Flat Key for Vane Impeller
2200	Shaft	7220	Snap Ring for Bearing	9870	Grease Fitting

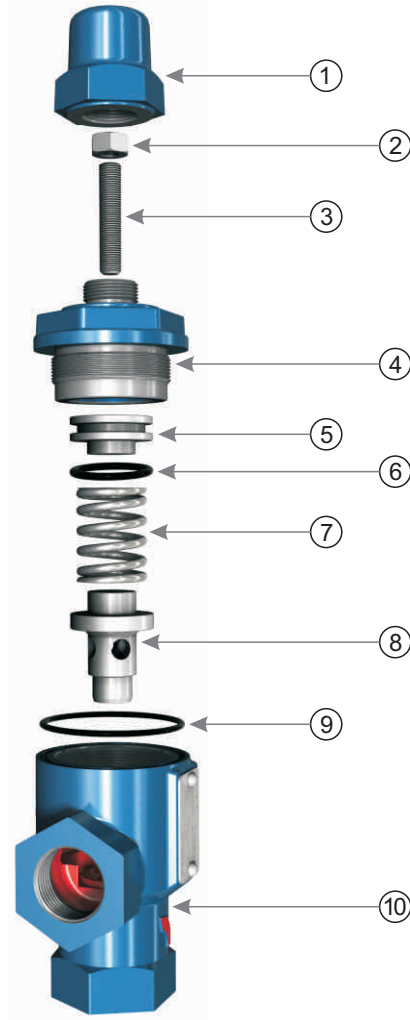
30.11. Spare Part List of PSV Model Pumps with Packing Gland



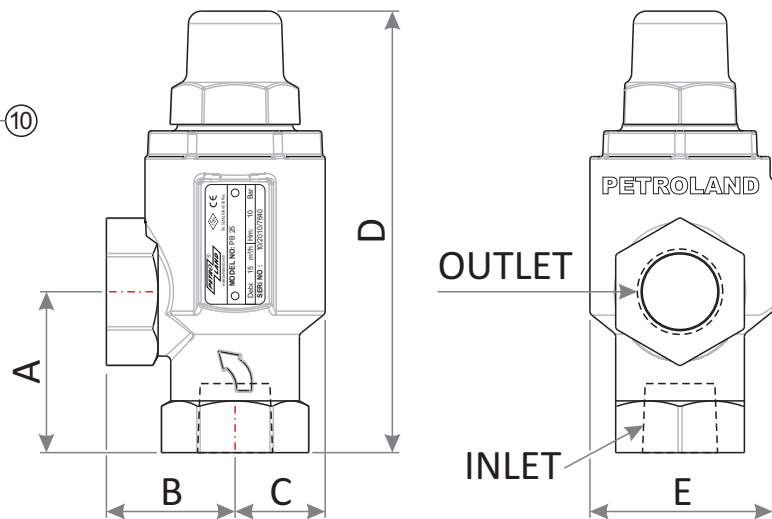
Item	Part List	Item	Part List	Item	Part List
0242	Vane Impeller Bushing	2480	Packing Gland Washer	9110	Tie Bolt
0252	Discharge Casing Bushing	2810	Stage O-Ring	9120	Tie Bolt Nut
1130	Discharge Casing	2830	Bushing Casing O-ring	9130	Tie Bolt Washer
1140	Suction Casing	2835	Packing Gland Ring	9140	Screw for Bearing Casing
1150	Suction Body	3320	Ball Bearing	9180	Screw for Bushing Casing
1160	Discharge Body	4140	Lip Seal (Inner)	9270	Packing Gland Capscrews
1190	Discharge Bushing Casing	4145	Lip Seal (Outer)	9280	Packing Gland Capscrew Nuts
1230	Packing Gland	7210	Snap Ring for Shaft	9500	Flat Key for Coupling
1280	Bearing Casing	7220	Snap Ring for Bearing	9501	Flat Key for Vane Impeller
2200	Shaft	7230	Snap Ring for Lip Seal	9870	Grease Fitting
2460	Vane Impeller				

31. Spare Part List of PETROLAND By-Pass Valve

31.1. Spare Part List of PB 25 - PB 32 - PB 40 - PB 50 Model By-Pass Valve

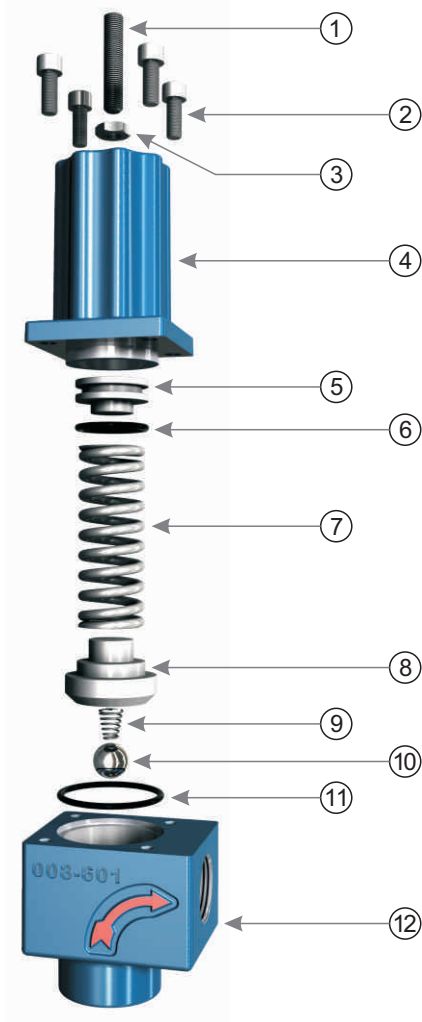


Item	Part Name
1	Cap
2	Lock Nut
3	Adjusting Screw
4	Cover
5	Spring Guide
6	Spring Guide O-Ring
7	Spring
8	Valve
9	Body O-Ring
10	Body

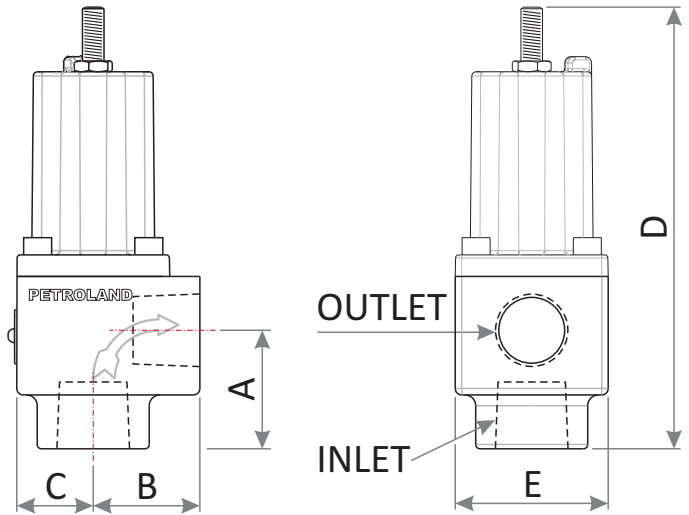


Model	Inlet / Outlet	A	B	C	D	E	Weight [Kg]
PB 25	Standard 1" BSP / Optional 1" NPT	65	55	35	180	70	3
PB 32	Standard 1 1/4" BSP / Optional 1 1/4" NPT	95	70	43	200	86	5
PB 40	Standard 1 1/2" BSP / Optional 1 1/2" NPT						
PB 50	Standard 2" BSP / Optional 2" NPT	95	85	50	220	100	8

31.2. Spare Part List of PC 25 - PC 32 - PC 40 - PC 50 Model By-Pass Valve

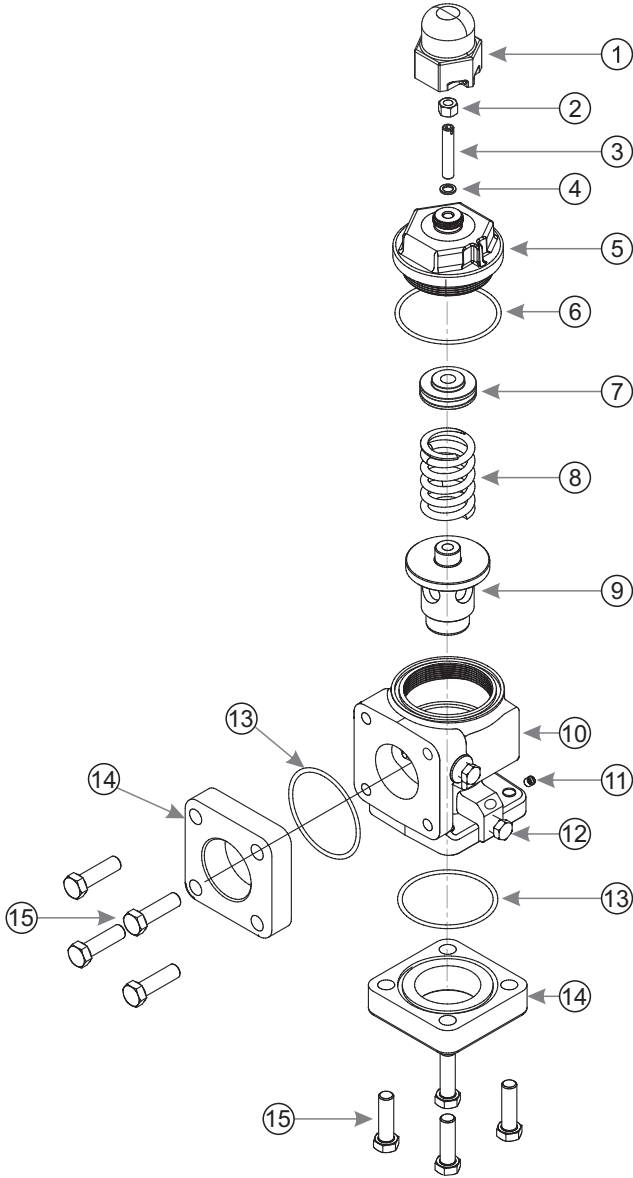


Item	Part Name
1	Adjusting Screw
2	Body Screws
3	Lock Nut
4	Spring Guide Casing
5	Spring Guide
6	Spring Guide O-Ring
7	Spring
8	Valve
9	Valve Spring
10	Ball
11	Body O-Ring
12	Body

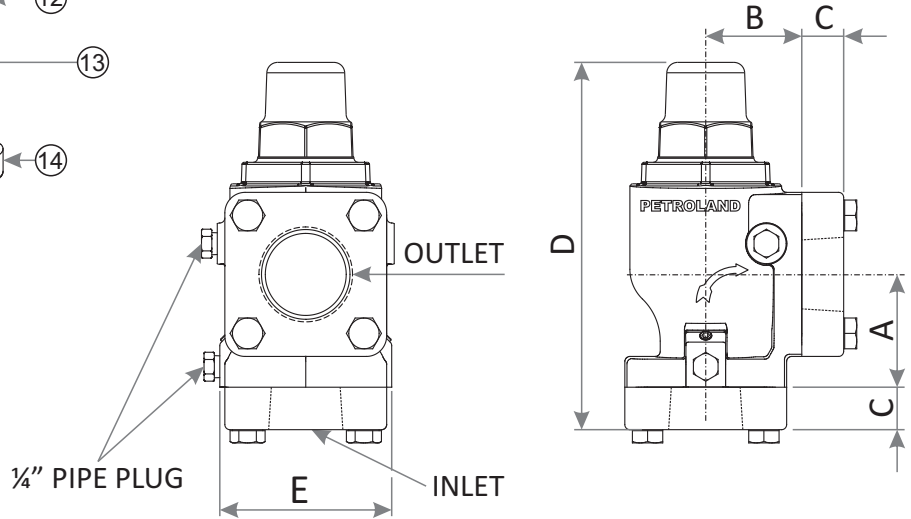


Model	Inlet / Outlet	A	B	C	D	E	Weight [Kg]
PC 25	Standard 1" BSP / Optional 1" NPT	55	50	35	215	70	3.5
PC 32	Standard 1¼" BSP / Optional 1¼" NPT	70	70	40	240	80	7
PC 40	Standard 1½" BSP / Optional 1½" NPT						
PC 50	Standard 2" BSP / Optional 2" NPT	115	75	50	290	100	10

31.3. Spare Part List of PBF 32 - PBF 40 - PBF 50 - PBF 65 Model By-Pass Valve



Item	Part Name
1	Cap
2	Lock Nut
3	Adjusting Screw
4	O-Ring
5	Cover
6	O-Ring
7	Spring Guide
8	Spring
9	Valve
10	Body
11	Flush Plug
12	1/4" Pipe Plug
13	O-Ring
14	Flange
15	Flange Bolt



Model	Inlet / Outlet	A	B	C	D	E	Weight [Kg]
PBF 32	Standard 1 1/4" BSP / Optional 1 1/4" NPT	60	50	25	180	80	8
PBF 40	Standard 1 1/2" BSP / Optional 1 1/2" NPT						
PBF 50	Standard 2" BSP / Optional 2" NPT	80	70	25	200	90	12
PBF 65	Standard 2 1/2" BSP / Optional 2 1/2" NPT	90	80	25	220	110	15

32. PS Series Part List and Material Options

PART LIST		PUMP MATERIAL			
CODE	NAME OF PART	CAST IRON	DUCTILE IRON	STEEL	STAINLESS STEEL
0241	Impeller Bushing	Carbon Graphite			
0242	Vane Impeller Bushing ⁽¹⁾	Bronze ⁽²⁾		Carbon Graphite ⁽³⁾	
0252	Discharge Casing Bushing	Carbon Graphite			
1120	Suction Casing	Cast Iron	Ductile Iron	Steel	Stainless Steel
1130	Discharge Casing	Cast Iron	Ductile Iron	Steel	Stainless Steel
1140	Suction Casing <i>(For Models PSD, PSV,LPG 150)</i>	Cast Iron	Ductile Iron	Steel	Stainless Steel
1150	Suction Body	Cast Iron	Ductile Iron	Steel	Stainless Steel
1160	Discharge Body	Cast Iron	Ductile Iron	Steel	Stainless Steel
1170	Impeller Body	Cast Iron	Ductile Iron	Steel	Stainless Steel
1175	Retaining Stage <i>(If applied)</i>	Cast Iron	Ductile Iron	Steel	Stainless Steel
1180	Mechanical Seal Body <i>(LPG 50, LPG 250)</i>	Cast Iron			Stainless Steel
1190	Discharge Bushing Casing <i>(For Models PSD, PSV, LPG150)</i>	Cast Iron			Stainless Steel
1195	Mechanical Seal Casing <i>(LPG 50, LPG 250)</i>	Cast Iron			Stainless Steel
1230	Packing Gland <i>(For Models PSD, PSV)</i>	Cast Iron			Stainless Steel
1280	Bearing Casing	Cast Iron			Stainless Steel
2200	Shaft	Steel			Stainless Steel
2410	Impeller	Bronze			Stainless Steel
2460	Vane Impeller ⁽⁴⁾	Bronze ⁽⁵⁾			Stainless Steel
2490	Hexagonal Shaft Nut <i>(Left-Hand Thread)</i>	Bronze			Stainless Steel
2480	Packing Gland Washer <i>(For Models PSD, PSV)</i>	Bronze			Stainless Steel
2810	Stage O-Ring	Standard Constrution NBR / Special applications for various fluid type			
2815	Mechanical Seal Casing O-Ring	Standard Constrution NBR / Special applications for various fluid type			
2820	Mechanical Seal Body O-Ring <i>(LPG 50-250)</i>	Standard Constrution NBR / Special applications for various fluid type			
2830	Bushing Casing O-ring <i>(PSD, PSV, LPG150)</i>	Standard Constrution NBR / Special applications for various fluid type			
2835	Packing Gland Ring	Standard Constrution NBR / Special applications for various fluid type			
3320	Ball Bearing	Steel			
4140	Lip Seal (Inner)	NBR			
4145	Lip Seal (Outer)	NBR			
4155	Liquid Sensor Gasket <i>(If applied)</i>	Standard Constrution NBR / Special applications for various fluid type			
4440	Mechanical Seal	Special applications for various fluid type			
7210	Snap Ring for Shaft	Steel			
7220	Snap Ring for Bearing	Steel			
7230	Snap Ring for Lip Seal	Steel			
9110	Tie Bolt	Steel			Stainless Steel
9120	Tie Bolt Nut	Steel			Stainless Steel
9130	Tie Bolt Washer	Steel			Stainless Steel
9140	Screw for Bearing Casing	Steel			Stainless Steel
9170	Screw for Mechanical Seal Casing <i>(For Models LPG 50-250)</i>	Steel			Stainless Steel
9180	Screw for Bushing Casing <i>(For Models PSD, PSV, LPG 150)</i>	Steel			Stainless Steel
9500	Flat Key for Coupling	Steel			Stainless Steel
9501	Flat Key for Vane Impeller	Steel			Stainless Steel
9502	Flat Key for Impeller	Steel			Stainless Steel
9870	Grease Fitting	Aluminium 3/8 24 Thread			

(1) Applications of PSC 1000 Model, Bush is not used.

(2) Applications of PSC 2000,3000 LPG 50 and LPG 150 models, material of bush is Bronze with Graphite.

(3) Applications of PSC 4000, 5000, 6000 ve LPG 250 models, material of bush is Carbon Graphite.

(4) Applications of PSC 1000, 2000, 3000, LPG 50 and LPG 150 models, material of Vane Impeller is Brass.

(5) Applications of PSC 4000, 5000, 6000 ve LPG 250 models, material of Vane Impeller is Bronze.



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