

## Vertical pumps for tanks



**This manual contains important instructions and warnings. You must read them before mounting, making the electrical connections and starting up. You must also comply with the instructions for the components related to this pump.**



**You should also remember that it is essential to keep this manual close to the motor pump equipment.**



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## 1 GENERAL

### NOTE

This PUMPIRAN pump has been developed in line with state-of-the-art technology, manufactured with great care and put through continuous Quality Control. The present Instructions Manual will provide you with knowledge of the pump and the ways it can be applied.

It contains important instructions to operate the pump appropriately and profitably. It is important to comply with the manual in order to guarantee reliability and a long useful life for the pump, whilst avoiding any possible risks.

This manual does not include any local regulations or any instructions with regards to assembly personnel, which the user shall be responsible for.



This group cannot be used in conditions in excess of those established in the technical documentation with regards to the liquid to be pumped, flow, speed (rpm), density, pressure and temperature, and with regards to the motor power or anything else set out in the instructions manual and contractual documentation. Check with the manufacturer as appropriate.

The factory plate shows the model/size, the main service data and the manufacture number of the pump. Please include these data in any queries, subsequent orders or requests for spare parts.

If you require additional information or have problems with regards to failures, please contact the nearest PUMPIRAN service.

## 2 Safety

This instructions manual contains fundamental indications which must be complied with in assembly, service and maintenance. It must be read by assembly personnel, competent technical personnel and users before installing and starting up, and it must be available at all times at the place of location of the machine.

Proceed not only in line with this main safety chapter, but also observing the instructions described in other similarly important safety points.

### 2.1 Marking of warnings in this manual

The instructions which may involve hazard if not observed are highlighted with the following general symbols.



Safety instructions which may involve a hazard to people and facilities if not complied with in accordance with ISO 7000-0434.



Safety instructions to prevent electrical hazards in accordance with IEC 417-5036.

### NOTE

Safety instructions which may affect the equipment and its operation if not complied with.



Safety instructions to prevent the risk of explosion.

Only applicable to group with ATEX plate, specially designed to satisfy Directive 94/9/EC on the prevention of the risk of explosion.

The details shown directly on the machine, such as:

- Rotation direction arrow

-Fluid connections identifications

These must be complied with, and conserved in a manner which ensures they are legible.

### 2.2 Personnel qualifications and instruction

All Service, Maintenance, Inspection and Assembly personnel must be duly qualified. The terms regarding responsibility, competence and supervision of personnel must be regulated by the user in an exact manner.

Any personnel lacking appropriate know-how must be duly instructed. This preparation can be obtained upon request by the machine user to the manufacturer or supplier of the machine.

Finally, the user must ensure that all personnel have fully understood the content of the instructions manual.

### 2.3 Risks of failing to comply with the safety instructions

Failure to comply with the safety instructions may lead to risks both for people, the environment and the machine, and may lead to the loss of any entitlement to claims.

In particular, failure to comply may cause the following hazards:

- Failure of important machine/facility functions.
- Failure of the prescribed maintenance and conservation methods.
- Personal hazard resulting from electrical, mechanical or chemical effects.
- Danger to the environment due to escaping noxious products

### 2.4 Conscientious safety at work

The safety instructions contained in this Manual must be observed, as must international prescriptions on Health and Safety at Work and any possible Safety Regulations at the workplace of the user.

### 2.5 Safety instructions for users and service personnel



The operator is responsible for keeping the temperature of the fluid within the pump classification temperature limits.

- The installer must ensure that the parts of the machine which may create danger due to heat or cold are protected against accidental contact. The operator shall check as well that the coupling guard is in place and firmly secured.
- The contact protections of moving parts (e.g. couplings) must not be removed whilst the machine is in service.
- Provide the personnel with protective equipment and make sure it is used.
- Any possible leaks (e.g. through the shaft sealing) of hazardous products must be channelled in such a manner as they do not present any risk to people or the environment, in line with corresponding legislation.
- Follow safety instructions due to use of power. In this respect refer to the applicable national safety regulations and /or regulations issued by the energy supply comp



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## 2.6 Safety instructions for maintenance, inspection and assembly work

The user must ensure that all maintenance, inspection and assembly tasks are carried out by authorised, qualified, specialised personnel who have been sufficiently informed through careful study of the instructions manual.

It is a fundamental principle that any work on the machine must be carried out whilst it is shutdown. It is essential to respect the pump shutdown procedure described in the instructions manual.

When the pump is stopped it is liable to remain under pressure. The pump frame must have returned to environmental temperature. Before dismantling it, it must be depressurized by making drain opening (or air vents) leading to a safe area.

All pumps or motor pumps which pump hazardous materials must be decontaminated.

Connect an earth conductor to metal casing of the pump or baseplate if the fluid handled is electro statically charged.

Never connect the earth conductor to the metal casing of the pump or baseplate if the fluid handled is electro statically charged.

Never connect the earth of the electric welding equipment to pump or baseplate.

As soon as the work is complete, all safety and protection devices must be installed and put into operation.

Before starting up again, all that described in the First Start-Up section must be fulfilled.

Due to the fact that the unit contains small parts such as nuts, screws, etc., whose accidental contact may lead to small cuts on the hands, operators are recommended to use gloves when handling.

The following additional risk-prevention instructions shall be fulfilled:

The pump liquid may cause injuries, burns, poisoning, etc. It is therefore necessary.

- To check the temperature and amount of leaks occurring at the mechanical seal or packing area. Conduct such leaks to a safe area through a controlled drainage system, specially indicated for the case of break of mechanical seal.
- To take appropriate measures to avoid direct with the pumped liquid when it is necessary to prime or fill the pump or unit.
- Before dismantling the pump, if the liquid is toxic or dangerous it must be decontaminated. For this purpose the unit must be cleaned inside by introducing a cleaning liquid into the pump and emptying it subsequently through the drainage connection. The cleaning liquid must not create hazardous situations and must be compatible with the pump components (CONSULT)
- To take appropriate measures to avoid contact with the pump if liquids are pumped at temperatures over 40 c.
- In the event of liquid with high steam pressure being used, beware of the danger of explosion due to pressure confinement with the pump stopped. This confinement must be avoided by opening inlet or discharge valves, or by providing a properly conducted air-vent connection in the pump discharge for liquid evacuation.

### For rotating parts:

- The pump should never work without its coupling guard in place and firmly secured.
- Do not wear loose or baggy clothing or wear long hair loose near rotation areas to avoid cloths or hair getting caught and causing serious accidents.
- Do not force jammed rotating parts manually when the pump is operation.

When the pump is joined to considerably long piping, water hammer may occur when it is stopped. Should this arise, appropriate anti-water hammer elements must be put in place.

All the safety regulations indicated by the pump drive manufacturer must be observed and complied with.

Inappropriate installation may lead to the unit breaking and consequent risks to persons and/or the environment. It is therefore necessary to:

- Vent to pumps appropriately before operation, checking that the pump is full of liquid.
- Check that the pump discharge and suction valves are fully open and that there is no dirt or foreign bodies in the piping

### Regarding overload conditions:

- Do not exceed the maximum permitted values (temperature, suction pressure, discharge pressure, rpm) indicated in this instructions manual, offer and technical catalogue.
- Do not exceed the maximum loads permitted on the suction and discharge connections.
- The pumps must only be used in the conditions and with the liquid in the offer and/or order.

An unforeseen failure in the drive power may lead to danger due to spontaneous start-up of the unit; it is up to the customer to take necessary steps to avoid this.

When the CONTROL SYSTEM is not supplied by PUMPIRAN, the customer is responsible for the entire machine complying with the machine safety directive, including these controls.

## 2.7 Modifications and arbitrary manufacture of spare parts

The machine must not be modified or changed without prior agreement from the manufacturer. Only original spare parts and accessories approved by the manufacturer can guarantee safety. The use of other components may terminate any liability for consequences deriving from their use.

## 2.8 Unauthorised operation modes

The safe service of the supplied pump can only be guaranteed through correct use, in line with section 4 of the Instructions Manual. The operation limits established in the Datasheet must not be exceeded under any circumstance.

## 2.9 warning for equipment with a marking



PUMPIRAN pumps marked with the ATEX pate are valid for group II category 2 and 3, zones 1, 21, 2 and 22 temperature class as shown on the plate and Conformity Certificated.



Reliability may be lost through incorrect use, poor connections or any modifications, however small.



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It is necessary to take into account the rules on the connection and use of electrical devices hazardous areas. In particular national regulations on installation. Only qualified personnel who are familiar with these rules should handle this type of machine.



Any repair made by the end user, unless explicitly approved by PUMPIRAN, shall release the manufacture from any liability relating to Directive 94/9/EC. Individual pieces supplied as spare parts must be originals, supplied and checked by PUMPIRAN.

### 3 Transport and storage

#### 3.1 Transport and handling



The transport and handling of the equipment must be carried out using suitable means in line with the weight to be supported. The weight is generally shown on the delivery note or on the factory plate; if it is not, and the equipment cannot be handled safely, please contact PUMPIRAN.

Remember that the equipment should never be lifted using the ring bolts of each of the elements, e.g. the motor and pump ring bolts, which are exclusively for independent transport.

#### NOTE

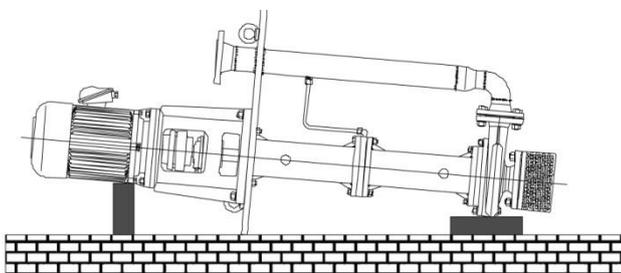
It is also important not to use the pump and pipe flanges or joining elements, e.g. couplings.

#### NOTE

If the equipment is to be lifted using straps, these must always be run underneath the motor and pump support.

#### NOTE

Do not position the pump on the filter/suction the well on the ground, place a wooden plug at the height of the pump casing, in order to prevent the filter being the support point for the pump.



When the pumps are dismantled from their transport pallet, suitable means must be used to ensure the stability of the equipment, until it is finally secured at its definitive location.

#### 3.2 Provisional storage/conservation

During provisional storage, it is necessary to protect with preservation products those low alloy parts in contact with the liquid (e.g. grey cast, nodular cast, etc.). Preservation products available on the sector market can be used, in line with the manufacturer's instructions on application and disposal.

The pump, or motor pump, shall be deposited in a dry site where the relative humidity is as constant as possible.

When stored outside, it is necessary to keep the pump/motor pump in an impermeable box, ensuring it does not come into contact with external humidity.

#### NOTE

Protect the stored product from humidity, dirt, parasites and unauthorised access. All openings

must remain closed, and must not be opened until necessary during assembly.

The shiny (mechanised) parts and surfaces of the pump must be protected from corrosion using silicone-free oil or grease.



The electric motor must be disconnected, the connection cables removed and the terminal box closed with its cover on.

The switchboards must be in vertical position and disconnected.

#### 3.3 Disposal

Fluids and supplies a health hazard and/or hot fluids and supplies. Hazard to persons and environment.

- Collect and properly dispose of flushing medium and any residues of the fluid handled.
- Wear safety clothing and a protective mask, if required.
- Observe all the legal regulations on the disposal of fluids posing a health hazard.

1- Dismantle the pump (set). Collect greases and other lubricants during dismantling

2-Separate and sort the pump materials, e.g.by:

- Metals
- Plastics
- Electronic waste
- Greases and other lubricants.

Dispose of materials in according with local or in another controlled manner.



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#### 4 Group descriptions

##### 4.1 General description

Vertical centrifugal designed for wells, ditches and tanks. For neutral or aggressive liquids, both clean and with light solid particles.

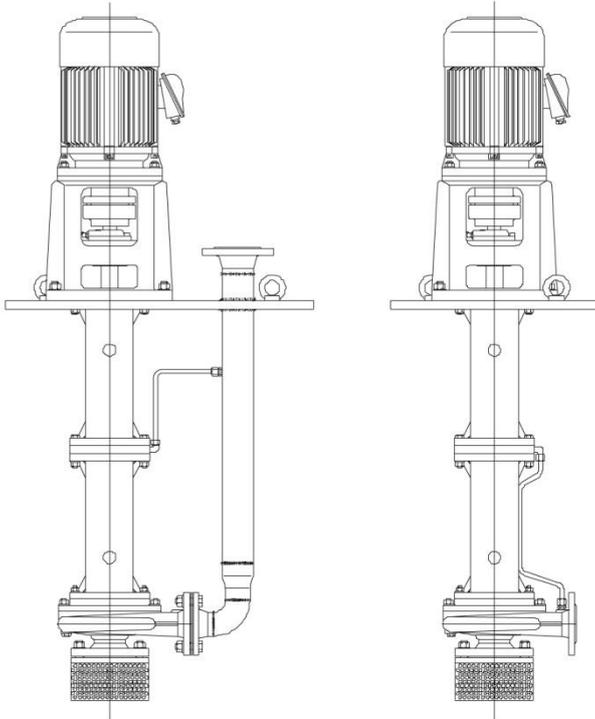
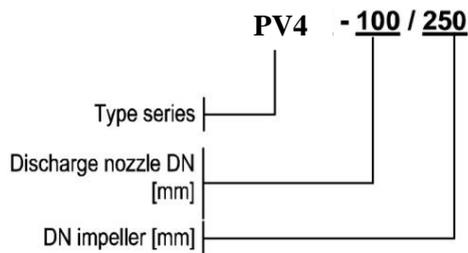


Fig.1

Fig.2

##### 4.2 Denomination



##### 4.3 Form of construction

Spiral pump casing wit axial suction and radial impulsion  
Single-stage impeller closed or semi-open. Filter in suction.

Fig.1 has a discharge pipe to outside of the base plate.

Fig.2 does not have a discharge pipe.

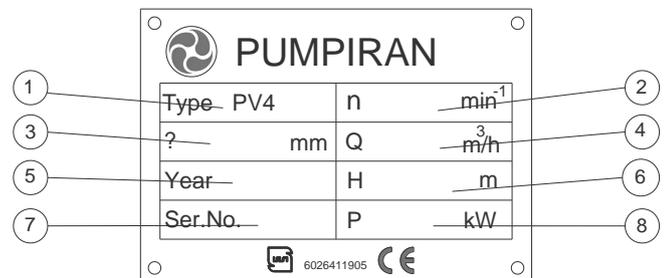
**Bearing:** Both series are fitted with two classes of bearing: grease-lubricated ball bearing and friction lubricated by the pumped liquid (when possible) or through exterior injection of liquid or grease.

**Shaft sealing:** The standard sealing system is by way of a lip seal. This can be done optionally using a packing or mechanical sea.

##### 4.4 Noise. Permitted levels

The acoustic pressure level of these pumps is less than 90 dB (A) at 1 m in any operation point within the operation range without cavitation.

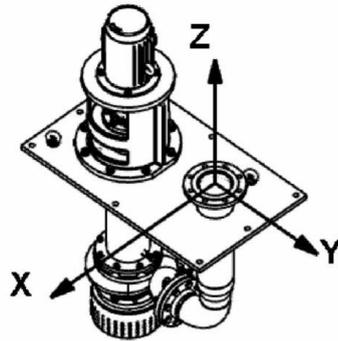
##### 4.5 Name plate



1	PUMP TYPE	5	YEAR
2	SPEED	6	HEAD
3	IMPELLER DIA.	7	SERIAL NO.
4	FLOW RATE	8	POWER



4.6 Force and moments permitted



Maximum permitted strain in the upper discharge flange						
DN	Force [N]			Moment [N..m]		
	Fz	Fx	Fy	Mz	Mx	My
32-1 1/4"	630	510	540	450	510	660
40- 1 1/2"	750	600	660	540	630	780
50-2"	990	810	900	600	690	840
65- 2 1/2"	1260	1020	1110	660	720	900
80-3"	1500	1230	1350	690	780	960
100-4"	2010	1620	1800	750	870	1050
125-5"	2370	1920	2130	900	1140	1260
150-6"	3000	2430	2700	1050	1230	1500
200-8"	4020	3240	3600	1380	1590	1950
250-10"	5010	4050	4470	1890	2190	2670
300-12"	6000	4830	5370	2580	2970	3630
350-14"	6990	5640	6270	3300	3810	4650
400-16"	7980	6450	7170	4140	4770	5820

5 Installations

The electropump is dispatched totally mounted and prepared for installation and operation (except for the few cases of the motor being dispatched disassembled, as is the case of large, heavy motors).

**NOTE** The design of the pipe systems, anchorings and other installation areas corresponds to other parties. PUMPIRAN only offers details and comments as a help, but does not assume any responsibility with regards to the design, assembly and operation of any installation. We recommend that customers check with a specialist in the design of castings, pipes, wells, etc., in order to interpret and supplement the information provided by PUMPIRAN and to ensure correct operation.

5.1 Check before assembly

Before positioning, check that the assembly base is in line with the dimensional plan of the equipment.

The upper surface of the base must be horizontal and flat.

In the anchor pins are to be placed in existing holes, place the anchor pins in their orifices suspended from the pump.

Do not connect the suction and impulsion nozzles until the equipment is completely installed on its base.



## 5.2 Group positioning

### 5.2.1 Vertical groups

#### Levelling

In case of a concrete deck it is recommended to use a sectional steel frame fixed on the deck as supporting surface for the base plate of the group.

For leveling, use a spirit level and put it in the upper side of the pedestal (part Nr-341).

Make the leveling in both longitudinal and transversal direction to the group. Use wedges to alter the height at different points of the base, if necessary. The maximum deviation permitted is 1 mm/m.

#### Pump-motor alignment

In order to prevent misalignment between the shafts, it is necessary to correctly install, check and maintain the coupling see the instruction manual of the coupling.



The coupling may produce a source of ignition or high temperature in the event of incorrect operation. The couple must be classified as non-electric equipment with at least the same type of area and temperature as the pump.

It is necessary to follow the instruction in the coupling manual which is included with the pump.

The equipment is aligned at factory, and this alignment will never be lost. In case of dismantling of the motor and when mounting gain the motor following instruction must be followed:

- Check that the flange support of the motor support and of the motor itself are perfectly clean and smooth.
- - Check the correct separation between the two halves of the coupling.
- Check that the alignment between both shafts is correct by turning the equipment by hand.

### 5.3 Pipe joint

In no case can the pump be used as a fixed point for the pipes.



The pipe system must at no time exercise force in excess of the values shown in the chart in point 4.6 (due to connection, thermal variation, etc.) in the pump.

The short pipes must be of at least the diameter of the pump connections. The diameter of long pipes is, in some cases, determined by economic criteria.

Transition pieces at larger diameters must have an extension angle of around 8°, in order to prevent pressure drops.

The thermal expansions of the pipes must be compensated with suitable measures, in order not to exceed the maximum strains permitted on the pump.

The diameters of the pipes, valves and accessories must be calculated in line with the load losses envisaged in the installation, so that the fluid impulsion speeds in the pipes will be: from 2 to 3 m/s



Exceeding the admitted strains of the pipes may lead to leaks in the pump and to the fluid escaping. Hazard of death with hot liquids!

When designing the suction piping check that the available NPSH is higher than required NPSH of the pump in order to avoid cavitation in whole admissible operation range.

The suction and impulsion flange covers of the pump must be removed before connecting the pipes.

Before starting up a new installation, it is necessary to thoroughly clean the tanks, pipes and accessories by brushing and blowing. Welding material, scales and other impurities are often cast off some time after.

In order to prevent the rotation of the pumps in inverse direction (danger of the impeller breaking out), a retention valve must be placed in the discharge pipe.

#### Wet well. Suction conditions

It is not enough to simply submerge the pump in the well to make it primed. We need to pay attention to the suction of the pump, since in this case good suction will depend more on the environment surrounding the pump (physical conditions of the well or sump) than on the pump itself.

An insufficient liquid submergence level may lead to dry operation of the pump, which in turn leads to the heating of the parts in sliding contact. This circumstance should be avoided, with plant operators manually checking or equipment stop devices ensuring that the liquid level in the suction well is never lower than the indicated submergence level.

High suction pressure may overload the bearing and lead to their overheating. This circumstance must be avoided, to which end the suction pressure must not exceed that shown in the data sheet, either through manual control by the operators or through devices which stop the equipment in the event of excessive pressure.

The pump must not work liquid under any circumstance. If this condition may come about, the installation must be fitted with safety devices which prevent the operation of the pump without liquid inside, or have automatic devices to discharge the minimum flow of the pump.

See the section [Minimum flow necessary for the pump](#).

As a general rule we can make some observations:

- The minimum liquid level in the well must be at the distance indicated in the table in annex 9.2, except for particular pump plans or datasheets showing other greater or lower values for minimum submergence.
- The input of liquid to the well must be carried out gently, without any fluctuation or turbulence which may harm the pump suction, always aiming to achieve the most stable flow possible.
- If several pumps are working in parallel in a single well, they should be at a suitable distance from each other, or precautions should be taken to ensure there is no disturbance which may affect the suction conditions of the pump.



The maximum liquid level must always be below the base plate in order for it not to overflow.

#### Dry well. Suction condition

In this type of installation we need to:

- In the pump suction, avoid elbows and accessories which lead to brusque narrowing and widening.
- Position a gate valve in the suction to isolate the pump during maintenance.

With a pipe, take the excess fluid of the column from the orifice in the upper column through to an upper level at the



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maximum mater level of the suction tank or suitable drainage system.

The minimum liquid level in the well in start-up must be a least 0.5 m above the pump suction flange, and must be maintained at sufficient height as to avoid air coming in through suction due to the vortex effect.

### 5.3.1 Auxiliary connection

The equipment is normally delivered mounted and ready for immediate operation, with only the hydraulic and exterior electrical connections being necessary.

In The case of dirty or abrasive pumping liquid in which it is necessary to connect the auxiliary refrigeration connections or lubrication of the equipment, follow the instruction detailed in 7.2.2 or in annexes to this manual.

Auxiliary pipes are designed exclusively to support internal strains due to the pressure of the circulating fluid, to which end it is forbidden to subject them to additional exterior strains (e.g. leaning on them, etc.).



If the pumping liquid is fuel and the leak can lead to ignition, this contingency should be avoided through constant control of the seal tightness of the auxiliary pipe joints by the plant operator.

### 5.4 Electrical mains connection



The electrical connection must be carried out by a specialist electrician! Applicable regulation must be complied with.

Check the mains voltage available with the factory plate data and choose the appropriate connection.

The technical connection condition and the condition of the local energy supply company must be observed when carrying out the connections.

We strongly recommend the use of a safety circuit breaker for the motor and a thermistor associated to a trigger device.

These instructions apply to asynchronous three-phase standard electric motors with a squirrel cage both in horizontal and vertical execution. In IP-23, IP-54 protection grades, with frame sizes of between 56L and 355S, both inclusive, with voltages of 200 to 500 V between phases.

The electric motor as well as whole electric installation shall accomplish with all safety norms that may be applied to it.

### Earthing

Before starting up the pump, the earth of the pump, the baseplate or the motor must be connected to an effective earthed point of the installation.

#### 5.4.1 Motor connection



Whilst connecting the cables, ensure it is not possible for voltage to appear.



Check that the earth connection is in line with local regulation.



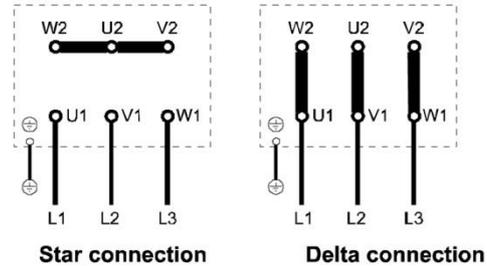
The coupling may produce a source of ignition or high temperature in the event of incorrect operation. For this reason, the motor must be classified with at least the same type of zone and temperature as the pump. It is necessary to follow the instruction in the coupling manual which is included with the pump.

### Connection in single speed motors

#### Direct start-up:

In direct start-up the motor can be used in two different connections:

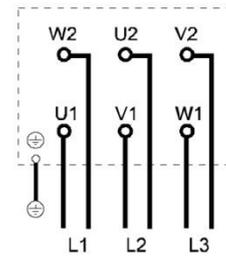
The voltage and the connection, e.g. 400 VY,240VD is stamped on the motor plate. This means that the motor can connect at 400 volts in star connection (Y) or at 240 volts in delta connection (D).



#### Star-delta start-up:

In star-delta start-up, the line voltage must coincide with the voltage shown on the motor for delta start up (D). The six terminals indicated in the following diagram will be connected:

Connection to the star-delta contactor



#### 5.4.2 Time relay adjustment

In the star-delta start-up of three-phase motors, it is necessary to ensure that the switching form star to delta takes place quickly. Prolonged switchover periods may damage the pump.

Time relay adjustment in the star-triangle connection:

Motor power	Time adjustment-Y
≤ 30 kW	<3 sec.
>30 kW	<5 sec.

#### 5.4.3 Rotation direction Check

**NOTE**

Check the motor rotation direction by starting up and immediately stopping. The rotation direction must correspond with that shown by the pump arrow located on the pump casing or support. If the rotation direction is not correct, any two phases L1, L2, L3 of the power cable must be inverted in the motor terminal box.

The incorrect rotation of the pump may lead to the incorrect operation of the seal and heating of its faces. For this reason, correct rotation direction must be ensured using the arrow shown on the pump, with the pump completely filled with liquid and properly vented.



## 6 Start-up

It is necessary to prevent the formation of explosive atmospheres within the well or tank where the pump is to be installed.

Start-up shall be carried out when all the necessary mechanical, hydraulic, electrical and pneumatic connections are complete. The coupling guard must as well be in place and firmly secured.

### Motor checks.



When making the electrical connection, ensure the type of current and nominal voltage shown on the motor's data plate concur with the type of current and the mains voltage in the place of installation.

Follow the instruction described in the motor manual.

### 6.1 First start-up

The pump cannot operate with a closed impulsion valve, as this may lead to overheating of the pumped liquid. If it is necessary to work with the discharge valve closed, a minimum flow relief device is required at the output. This device does not form part of the pump and will be separate from the pump's discharge flange.

Other recommended devices include the constant output orifice plates, constant bypass valves and automatic recirculation valves. If you require further details, please check with PUMPIRAN.

The pump cannot work in closed suction valve conditions. If this condition may come about, the plant operator must use a device which detects this condition and forces the pump to stop when it occurs.

#### 6.1.1 Lubricant

##### BEARING:

Lubricated with grease. PUMP WITH GREASE NIPPLES: the pump leaves the factory with the bearings greased for approximately 1000 hours of operation. See lubricant on section 7.2.2.

##### FRICION BEARING:

Lubricated with pumping fluid: If the pumped fluid is clean (without particles in suspension) and non-aggressive, the friction bearing are lubricated with the pumped fluid. Lubricant is not required.

Lubricated with external fluid, PUMPS WITH EXTERIOR AUXILIARY CONNECTION IN THE BASE PLATE: if the pumped fluid is dirty, aggressive, abrasive, etc., the PUMP HAS A CONNECTION for the lubrication and cooling of the bearings through an exterior means. Clean water or another fluid compatible with the pumped fluid must be injected. See section 7.2.2.

Lubricated WITH AUTOMATIC LUBRICATION PUMP IN THE PLATE:

If the pumped fluid is dirty, aggressive, abrasive, etc, the PUMP HAS AN AUTOMATIC LUBRICATION PUMP ON THE BASE PLATE for the lubrication and cooling of the bearings.

The automatic pump container must be filled with grease before starting up. See lubricant in section 7.2.2.

The bearings must be lubricated with oil/grease in a good state, to which end it is essential to follow the lubrication instruction indicated in 7.2.2.

If the bearings support suffers impediments which prevent correct air- cooling, the resulting excess temperature may be excessive for the classification temperature class. For this reason, the support must be kept free of obstacles, thus facilitating natural air cooling.

### 6.1.2 Filling (priming) of the pump

- Check that the level of liquid in the well is sufficient.
- Turn the pump shaft by hand in order to break any adherence.

### Shaft sealing

Packing: The packing gland nuts must be gently tightened (by hand). The packing gland must form a right angle to the shaft.

### 6.1.3 Final control

Make the final check of the group alignment in accordance with 5.2.1. The coupling/shaft must allow easy manual rotation.



Check all the auxiliary connections are correct and functioning.



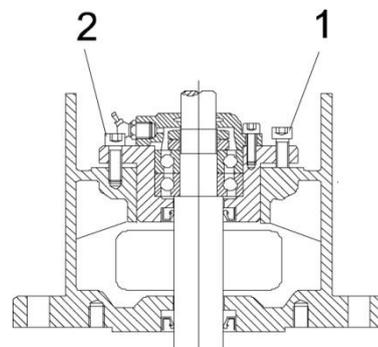
According to the **rules on the prevention of accidents at work**, equipment cannot be started up without protection for the coupling. If the buyer has expressly requested that this protector be excluded from supply, it must be provided by the user.

Before and during the operation of the pump, the coupling guard must be in place and firmly secured. Regularly check this state in order to prevent problems resulting from incorrect be free of any foreign elements.

### 6.1.4 Impeller adjustment

Turn the pump shaft by hand to check the rotor is not blocked. Should interior contact in the pump be detected, carry out an axial regulation. To do this:

- Release the attachment screws (2)
- Tighten the adjusting screws (1) to slightly raise the whole moving section.
- Turn the shaft again by hand and check that the rotor rotates freely without any internal contact. If there is still contact, tighten a little more using the adjusting screws.
- Tighten the attachment screws (2) to fix position reached.



If a mechanical seal is used, remove it first before regulation. Please contact us before carrying out this operation.



### 6.1.5 Start-up

Before starting up the group, check all the sections with regards to chapter 6.

The start-up must be carried out with the suction valve (where fitted) completely open and the impulsion valve partially closed. Once the pump has reached its service speed and the suction air has been eliminated, regulate the operation point using the discharge impulsion valve.

If the electric motor guard is triggered when starting up, close the impulsion valve more until the equipment starts up normally.



The pump must NEVER work with zero flow or flow which is less than the operating minimum, as internal recirculation will cause the fluid to heat up quickly, leading to hazards (including explosion) as a result of the high pressures reached within the frame. Check the minimum flow in the operation curves.

#### Minimum flow necessary for the pump

The pumps cannot work below the minimum flow specified in the datasheets.

If this condition may come about, the installation must be fitted with safety devices which prevent the operation of the pump without liquid inside, or have automatic devices to discharge the minimum flow of the pump.

For liquids other than water, the minimum flow is determined by the following formula"

$$Q_{min} = \frac{3.600.000 * Pa}{Pe * Ce}$$

In which:

$Q_{min}$ : Minimum flow in m<sup>3</sup>/h.

Pa: Power absorbed by the pump in kW closed valve.

Ce: Specific heat of the fluid in J/kg\*°C.

Pe: Specific weight of the fluid in kg/m<sup>3</sup>

#### Maximum flow permitted by the pump

Unless indicated in another datasheet, the maximum flow permitted is 1.1 x optimum flow of the pump with supplied impeller diameter.

### 6.1.6 Shutdown

Close the impulsion pipe valve.

If there is anti-return in discharge with counter pressure, leave the impulsion valve open.

- Shutdown the motor. Check that shutdown is normal.
  - In prolonged periods of non-operation, close the suction pipe valve (where fitted) and the auxiliary connection valves.
  - The pump must be protected from freezing whenever this risk exists, and must be emptied in prolonged periods of non-operation.
- If, whilst the pump is in standstill, it must remain on standby for service, start up at regular intervals for around 5 minutes. (See also 7.2.1)
- Fire pumps: 1x/month, at minimum.
  - Drink-safe water pumps: 1x/48 hours, at minimum.

- Reserve pumps: 1x/week, at minimum. (It is best to change the operating pump every day).

The seal tightness and function of the auxiliary connections must be examined during these start-ups.

## 6.2 Service limits

### 6.2.1 Switching frequency

In order to prevent abnormally high temperatures and overloading of the motor, pump, coupling, seals, etc., the switching frequency must not exceed the following number:

MOTOR POWER	MAX. START-UPS/HOUR
Up to 3 kW	20
From 4 to 11 kW	15
From 11 to 45 kW	10
From 45 kW	5

### 6.2.2 Temperature of the liquid to be pumped



The permitted operation is indicated in the order and the ATEX conformity declaration. If the pump is to work at a higher temperature or you do not have the data sheet, please ask PUMPIRAN.

### 6.2.3 Density of the liquid to be pumped



The power absorbed by the pump increases in direct proportion to the density of the impelled liquid. In order to prevent overloading in the motor, pump and coupling, this intensity must not exceed that shown in the order and the ATEX declaration of conformity.

### 6.2.4 Viscosity of the liquid to be pumped



The power absorbed by pump increases with the viscosity of the impelled liquid. In order to prevent overloading in the motor, pump and coupling, this viscosity must not exceed that shown in the order and in the ATEX declaration of conformity.

### 6.2.5 Maximum pump speed

In order to protect the pump from over speed, the maximum rotation speed shall be that shown on the name plate engraved in the pump. If the speed shall not be indicated in the name plate it is necessary to consult with PUMPIRAN.

Is eventually it would be wished to perform the pump at higher speed, it is necessary to consult with PUMPIRAN.

## 6.3 Starting up after storage

If the storage and/or shutting down of the pump has been for a prolonged period of time (over 6 months), it is necessary to: Check the state of the joints.

- Check the levelling
- Check all the auxiliary connections.
- Renew the lubrication of the bearings (where fitted).
- Check the packing (when fitted).
- After a short storage period, simply turn the pump shaft manually to unlock the rotor equipment.
- Follow the specific post-storage instructions in the motor manuals and other items.
- Observe all the steps shown in the "Start-up" section.



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**NOTE**

If the equipment is going to be in shutdown state for a certain period of time and there is the possibility of freezing temperatures, it is necessary to completely drain the pump in order to prevent any deterioration from the freezing of the contained fluid.

**7 Maintenance/Conservation**

**7.1 General instructions**

Before dismounting, ensure that:



The motor cannot be operated accidentally, by disconnecting from the electricity supply (e.g. removing cut-outs, unplugging, disconnecting the automatic circuit breaker, etc.) or the start-up batteries (disconnect operating energy).



The pump is free of pumped fluid, cleaning it internally with appropriate liquid whenever it is a hazardous fluid (hot, contaminant, inflammable...).

**7.2 Maintenance/inspection**

**7.2.1 Checking instruction**

During the first minutes of operation:

In case of mechanical seal

- There may be a brief large leak during start up. Should this leak persist, shutdown the group and determine the cause. The causes may be, amongst due to incomplete discharge of the pump air.

In case of packing:

- There in no leak; immediately loosen the packing gland until a small dripping is achieved.
- Excessive fluid leak; leave to settle for 10 minutes; tighten the packing gland by turning 1/6th and leaving for 5 minutes. Repeat the process until between 20 and 60 drops per minute are achieved.

After a few hours operation:

**NOTE**

Check the bearing temperature at the point in the bearing location area. Normal temperature can reach up to 40°C above environmental temperature, but must never exceed 90°C.

Observe the possible anomalies shown in point 8 of this manual.

The reserve pumps should be started up and shutdown once a week in order to ensure they are always in service conditions.



The failure of one or both sides of the seal may lead to excess heating. This can be corrected following the instruction of the seal manufacturer, both with regards to its assembly and the maintenance of the auxiliary seal devices, where appropriate. Alternatively, the pump may be fitted with a surveillance device if the purchase has so specified.

**7.2.2 Lubrication**

Before lubricating the pump, ensure that



The pump is stopped and cannot be started up accidentally.

The bearing support temperature is less than 40°C in order to prevent burns to the hands. To do this, measure the temperature with a thermocouple.

The absence of grease in the bearing support may lead to a lack of lubrication of the lip seals, which will come into dry contact with the shaft. This contact may lead to a high shaft temperature which might cause ignition. To prevent this, regularly check the grease level in the bearing support.

**Bearings:**

Lubricated with grease, PUMP WITH GREASE NIPPLES:

1st re-lubrication

The pump leaves the factory with the bearings greased for approximately 1000 hours of operation. After this time (or one year, whatever may occur first) proceed to first re-lubrication.

Check re-lubrication quantity in each grease in the attached chart

Subsequent re-lubrication

The periodicity of subsequent re-lubrication should be 2000 hours of operation or once a year (whatever may occur first).

Check re-lubrication quantity in each greaser in the attached chart.

Grease change (re-filling)

Change grease after aprox. 8000hours of operation or once every two years (whatever may occur first).

For complete grease change it is necessary first to dismantle the bearing and carefully clean their position in the support in order to remove old grease.

Afterwards proceed to re-filling of grease up to aprox. 75% of the free space in the bearing and aprox 40% of the free space at bearing cover. See aprox.re-filling quantity in the attached chart.



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**Type of grease:**

We recommend using lytic-based lubrication grease with antioxidant additives, of consistency 3 in line with DIN-51502 K3K.

of approximately 3 kg/cm<sup>2</sup> (manometer). The flow necessary per bearing can be seen in the chart in annex 9.2.

**NOTE** 3. Lubricated WITH AUTOMATIC LUBRICATION PUMP IN THE BASE PLATE:

The auxiliary pump has a container with grease to lubricate the bearings. We recommend using lytic-based lubrication grease with antioxidant additives, of consistency 2, in line with DIN-51502 class K2K. The auxiliary pump does not require maintenance, although the container must contain grease at all times.

**NOTE** The automatic pump container must be filled with grease before starting up.

Excessive wear of the bearings may cause friction of the metal parts. Thus locally increasing the temperature. The pump shall have forced refrigeration from the pumping fluid if it is clean or with exterior lubrication of clean liquid if the pumping fluid is dirty. In the latter case, the plant operator must maintain a permanent input of clean liquid to ensure the correct maintenance of the bearing refrigeration fluid and conducts.

**7.3 Emptying/Drainage**



The emptying and drainage of pumps used to expel liquids which are a health hazard must be carried out in such a way as there is no risk to people or to the environment, in line with legislation. If necessary, use protective clothing and mask.

**7.4 Dismounting**

**7.4.1 Fundamental instructions/observations**

**NOTE** Before dismounting, ensure the pump cannot be started up.

The suction and impulsion valves must be closed.

The pump frame must have returned to environmental temperature.

The pump frame must be emptied.

Comply with all safety measures in accordance with 7.1. When working on the motor, also take into account the rules and instructions of the manufacturer.

**7.4.2 Coupling**

**Motor pump coupling**

- Release the motor attachment screw and remove the motor along with the male coupling.
- The rubber plugs can then be extracted from the female coupling.
- If you need to release the coupling, use an extractor.

Never bang in order to extract, as this may cause serious damage to the bearings.

**Intermediate coupling**

- Release the cover halves on both ends of the coupling.
- Uncouple the two shafts by gently and uniformly banging the coupling with a plastic hammer.

**7.4.3 Mechanical seal (where fitted)**

In order to have access to the mechanical seal, It is necessary to dismount almost the whole pumps as described

PUMP SIZE	MOTOR FRAMEE					
	80 to 90 S/L	100L to 112M	132S/M to 180 M/L	2200L to 280 S/M	250M to 280 S/M	315S/M
32/125 32/160 32/200 32/250 40/125 40/160 40/200 40/250 50/125 50/160 50/200 50/250 65/125 65/160 65/200 80/160	Bearing: 2 x 7307 Re-lubrication: 17g Re-filling: aprox, 25 g					
40/315 50/315 65/250 65/315 80/200 80/250 80/315 100/190 100/200 100/250 100/315 125/240 125/250 150/200 150/240 150/250 200/240 200/250	Bearing: 2 x 7317 Re-lubrication: 30g Re-filling: aprox, 70 g					
80/400 100/400 125/315 125/400 150/315 150/400 200/330 250/300						
150/500 200/400 250/400 300/300 300/350				Bearing: 2 x 7314-6314 Re-lubrication: 80 g Re-filling: aprox, 180 g		

**FRICION BEARINGS:**

The friction bearings are found in the cover of pump (always) and also in case of double/tripe intermediate pipe pumps, un the intermediate couplings. These bearings must always be lubricated and cooled. There are three types of lubrication:

1. Lubricated with pumping fluid: If the pumped fluid is clean (without particles in suspension) and non-aggressive, the friction bearings are lubricated with the pumped fluid. Lubricant is not required.

**NOTE** 2. Lubricated with external fluid. PUMPS WITH EXTEROR AUXILIARY CONNECTION

IN THE BASE PLATE: for this purpose there is an adapter in he base plate which the ustomer will inject with clean water or another fluid compatible with the pumped fluid at a pressure



in point 7.4.5 (until the mechanical seal dismantling section is reached).

Once this process is complete:

- Release the joining screws between fixing ring and cover and slide the fixing ring carefully together with the drainage sleeve along the shaft pump side until the ring is taken out.
- Release the keep pin from the rechargeable bushing and slide this together with the mobile part of the mechanical seal along the shaft towards pump side until bushing is removed.
- Slide (toward pump side) and remove carefully the assembly composed by mechanical seal cover and the static part of the mechanical seal. Once this assembly is removed proceed to dismantling of the mechanical seal.
- Release the joining Allen screw between cover and mechanical seal cover.
- Release the static part of the seal pushing from top side of the mechanical seal cover taking care for not to touch the rubbing of the seal.

#### 7.4.4 Packing (where fitted)

In order to access the seal, first dismount almost all the pump as described in point 7.4.5 (until the packing dismantling section is reached). Once this process is complete:

- Release the packing gland.
- Release the extract the cover with the packing along the shaft towards the pump side.
- Extract the packing from the cover. If the lantern ring is also extracted, note down the order in which is disposed.

#### 7.4.5 Pump

For the extraction of ball bearings, shaft, bearings, etc., it is necessary to dismantle the entire pump.

To do this, see the sectional plan and diagram with a breakdown of the attached pieces.

Before dismantling the pump, remove it from its location:

- Release the pins which fix the attachment plate to the support plate of the well.



First check the lifting clamp bolts are securely in place, as they will be used to lift the equipment. In this position, leave to drain for a few moments to discharge the fluid contained in the pump.

- Lay or support the equipment on the edge of the attachment plate, supporting the motor to ensure it does not rest it as a cantilever.

#### Dismantling

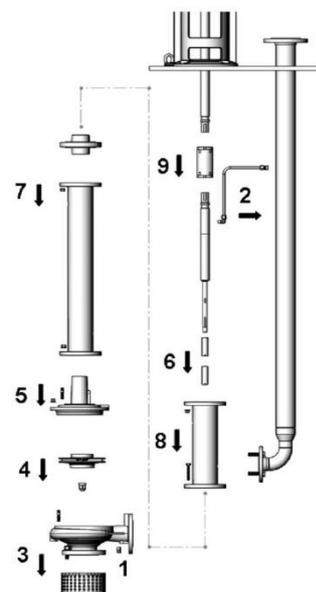
As a general guide to dismount the equipment, follow these steps:

- Loosen the screws which join the pump to the impulsion pipe, therefore releasing it. (1)
- Release the auxiliary connection. (2)
- Release the nuts which join the cover to the pump casing and separate. Use extractor screws to separate the casing. It is not necessary to release the suction filter, although we can clean it if the orifices are blocked. (3)
- Release the impeller attachment nuts and extract it. At this moment the wear rings are accessible (where appropriate). (4)

- Release the nuts which attach the cover to the intermediate pipe and extract the cover. (5)
- Release the impeller key and remove the re-changeable bushing. Check the state of the friction located in the bearing carrier cover. (6)
- If an intermediate bearing is fitted (7):
  - o Release the nuts which join the intermediate bearing support to the lower intermediate pipe and extract it.
  - o Release the nuts which join the intermediate bearing support to the lower intermediate pipe and extract it.
  - o Release the nuts which join the intermediate bearing support to the upper intermediate pipe
  - o Release the whole intermediate bearing by taking it to the sides of the impeller, sliding it along the shaft without coming into contact with the edges.
  - o Observe the state of the friction bearing.
- Release the nuts which join the intermediate pipe to the support, and remove the intermediate pipe. (8)
- When an intermediate coupling is fitted, follow that indicated in point 7.4.2.(9)
- Release the bolts which join the motor to the support, and dismount the motor and the coupling as shown in point 7.4.2.
- If fitted, release the seal or the packing as described in point 7.4.3 or 7.4.4, if not, releases the lip seal.
- The support cover is released.
- Using a plastic hammer, gently bang the shaft on the side opposite the motor, causing the shaft and the bearings to come up where the motor was.
- Losing the nut(s) of the bearings will release them and the pump as a whole.

#### Pumps bearing failure

Failure of the bearings may cause ignition through increased heat on the surface of the bearings. This can be avoided by using officially approved quality bearings, which are supplied as original spare parts.





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## 7.5 Assembly

### 7.5.1 Coupling

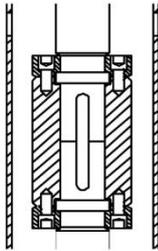
#### Motor pump coupling

**NOTE**

- Proceed in inverse order to assembly. It is not necessary to check the alignment, due to the design of the pump in which the concentricity of the shafts is guaranteed by way of guides between the motor and the pump support.

#### Intermediate coupling

- The two shafts are positioned: motor side and pump side in line, then position the key.
- Introduce the coupling in both ends of shaft and attach axially with two screwed cover halves on each side.



#### 7.5.2 Mechanical seal (where fitted)

Mount is reverse order to dismounting.

**NOTE**

For the correct operation of the seal it is necessary to at least:

- Take great care when cleaning the different parts of the mechanical seal, especially the contact faces. Not use lubricant; use only clean water with a cloth for cleaning optical devices.
- Not damage the O-rings during assembly.

#### 7.5.3 Packing (where fitted)

- Introduce the packing gland and the cover along the shaft.
- Mount and secure the cover on the lantern support.
- Cut the new packing, forming as many rings as required.

The cuts, seen from above, may be straight or inclined at 45°.

- We recommend leaving a small clearance of 0.5 mm in the packing out.
- Position the ring one by one, pushing on them but without excessive force. The ring shall be introduced with the cut ends alternated 90°.
- Take care to introduce the lantern ring in the same order as before.
- Once the packing has been introduced. Check that the shaft rotates freely without any stiff points.
- Secure the packing gland. The packing gland must not penetrate entire free length. If necessary, introduce more rings.
- Gently tighten the gland nuts.
- In order to determine the appropriate torque of the gasket, proceed as indicated in point 7.2.

#### 7.5.4 Pump

Proceed in reverse order to that describes above, taking special care:

- When mounting the shaft in the support, take care to ensure it does not tilt and maintains axial direction with the support.
- To introduce the different elements, use a plastic hammer, bearing gently in order to prevent damage to the ball bearings, seals and bearings.
- Proceed to lubricate the bearings.
- Do not forget to position new joints. There should be no clearances and the joints should be perfect.

The pump materials have been selected in accordance with the process fluid indicated in the datasheets. If this fluid is modified, check with PUMPIRAN that the new fluid is suitable for the pump.

- Note that the mounted intermediate bearing support is not symmetrical, since it presents a larger interior diameter on one side than on the other. Tighten the keep pin which secures the intermediate bearing. The smaller interior diameter part of the intermediate bearing support must remain towards the bottom, on the side of the pump.
- Use your hand to check that the shaft rotates freely every time a piece is mounted.
- If the friction bearing has been removed from its position in the cover and the exterior bearing surface before returning it, and use a plastic hammer to hit an intermediate piece into place. Do not forget to position the keep pin which fixes the bearing to the pump cover.
- It is very important to check that the bearings are perfectly aligned with the shaft, without any gaps which may lead to the deviation of the shaft.
- The impulsion pipes of the INVCP series pumps must take a position perpendicular to the support plate without presenting tensions or deviation from the shaft.

**NOTE**

Check the correct positioning of pieces, especially seals bushing and impellers.

#### 7.5.5 Tightening torque of the screws/nuts

ISO Metric thread	Steel	Stainless steel
	Tightening Torque in [N·m] (for non-lubricated thread)	
M4	3.1	2.15
M5	6.1	4.25
M6	10.4	7.3
M8	25.2	17.7
M10	49.5	34.8
M12	85.2	59.9
M16	211	148
M20	412	290
M24	710	276
M27	1050	409
M30	1420	554

#### 7.5.6 Tightening torque of the impeller nuts

Metric thread	Tightening Torque in [N·m] (for non-lubricated thread)
M14x1.5	38
M20x1.5	100
M27x1.5	250
M33x1.5	460
M52x1.5	2000



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## 7.6 Recommended spare parts

Piece denomination	Reference Nr.	Recommended spare parts (1)		
		Start-up	2 years	5 years
Joints (set)	-	1	2	5
Mechanical seal	433	1	2	3
Packing	461	1	2	5
Wear plate (2)	135		1	2
Bearing (set)	320		1	2
Lip seal (set)	420		1	2
Felt ring (set)	422		1	2
Lantern ring	458		1	2
Wear ring (set) (3)	502		1	2
Shaft bushing	520		1	2
Shaft casing (4)	523		1	2
Bearing (set)	545		1	2
Coupling flexible (set)	867		1	2
Impeller nut	922		1	2
Key (set)	940		1	2
Pump shaft(s) (set)	211 , 213			1
Impeller	230			1
Coupling (set)	840, 844			1

(1) Amounts recommended for a pump in continuous service (2) Only for version with semi-open impeller (3) Only for version with closed impeller (4) Only for version with mechanical seal or packing

## 7.7 Preventative maintenance

Nº	DESCRIPTION OF THE OPERATION TO BE CARRIED OUT	PROCEDURE	REGULARITY	CONSEQUENCE
1	Check for mechanical seal leaks	Visual inspection	Weekly	18
2	Check for packing leaks	Visual inspection	Weekly	19, 20
3	Check for leaks between flanges	Visual inspection	Monthly	17
4	Check for grease leaks	Visual inspection	Monthly	10, 16
5	Check for heating of the bearing	With thermocouple	Quarterly	5, 14, 16 Dismount the support
6	COMPLATE PUMP CHECK	Checking and dismounting the pump. See point 8 of the manual	Yearly	1,2,3,6,7,8,9,12,14,17,21
7	Check tightness of connecting bolts	Manually	Yearly	
8	Check for wear of the shaft, bearing and lip seals	Dismount casing Visual inspection	Yearly	
9	Check for wear of the shaft, bearing and lip seals	Dismount casing Visual inspection	Yearly	
10	Change the lubricant	See point 7.2. of the manual	Yearly (1)	
11	Change the rubber coupling plugs	See point 7.4.2 and 7.5.1 of the manual	Yearly	
12	Check for wear of the bearing	Dismount pump visual inspection	Yearly	
13	Clean the auxiliary automatic pump of any lubrication (2)	Clean the pump	Yearly	
14	Check functional characteristics loss	Instrument reading	In accordance with use	Check the installation
15	Fill the auxiliary automatic lubrication pump with grease (2)	Manually	In accordance with use	
16	Fill with grease	See point 7.2.2 of the manual	See point 7.2.2	
17	Change the joints	Manually	Every time they are removed	
18	Change mechanical seal	See point 7.4.3 and 7.5.2 of the manual	When detecting leaks	
19	Tighten gland	Manually	When the leaks excessive	
20	Change the packing	See point 7.4.4 and 7.5.3 of the manual	Every 4000 hours	
21	Cary out the axial regulation	See point 6 of the manual	When detecting contact and when dismounting	

(1) If the environment is dusty, humid or aggressive, the grease change should be carried out more often

(1) Where fitted

### 8 Trouble-shooting

The pump does not move the fluid

Insufficient pressure or flow

Excessive absorbed power

Excessive vibration and noise

Excessive support temperature

Loss of fluid through the mechanical seal

Wear rings deteriorate quickly

							Cause	Solution
X	X						Suction impulsion valves closed or poorly regulated	Open the suction valve or search for work point with the impulsion valve
X							Incorrect pump rotation direction	Change the motor connections
X	X						Pipe, filter or impeller obstructed	Dismount and unblock
X	X		X				Pump not correctly submerged	Check minimum submergence (See point 5.3)
X	X						Maximum height generated by the pump lower than that required by the installation or counter pressure too high.	Increase the rotation speed. If this is not possible, a larger impeller or larger pump needs to be assembled. Please ask
	X						Rotation speed incorrect	Measure the speed. Check the motor drive power supply voltage
	X		X				Wear rings or bearing deteriorated or incorrectly assembled	Dismount and change, or reinstall them
	X						Leaks between the casing and pipes	Dismount and check the joints
	X						Unsuitable installation/disturbances from other pumps	Check with the installer
		X	X	X		X	Liquid viscosity or density greater than normal.	Reduce the design point or change the motor
		X					Poor motor assembly	Check and clean the pump-motor joint.
		X					Obstruction inside the pump	Dismount the pump and clean the impeller inlets, pipe or filter
		X					The real height to be generated by the pump is lower than that of the design point, meaning the flow and power are greater	Partially close the impulsion valve
		X	X	X			Ball bearings deteriorated, poorly assembled and poorly lubricated	Check them, check the assembly or lubricate them, adjust them properly in their positions.
		X					Excessive contact in rotating parts	Dismount the pump and check elements are correctly assembled and/or worn
		X	X	X		X	Misaligned or deformed shaft	Dismount it and replace it
			X				Loose impeller support nuts	Dismount the pump and tighten them
		X	X	X		X	Pipe tension on the pump	Check the installation
			X				Lack of rigidity in the foundations or anchor bolts loose	Make new foundations or tighten the bolts
			X				Pump cavitation	Improve the suction. Please ask.
			X	X		X	Impeller imbalanced or deteriorated	Balance the impeller or change it
			X			X	Bearing excessively worn or deteriorated	Change bearing
						X	Very deteriorated mechanical seal, seal spring broken or without elasticity, poorly assembled seal, or joints broken, deformed or without elasticity, or contact faces of the seal very deteriorated.	Dismount and replace the seal, or dismount, review damage and change as appropriate.
				X			High suction pressure	Please ask
					X		Re-changeable bushing or deteriorated	Dismount and change the bushing

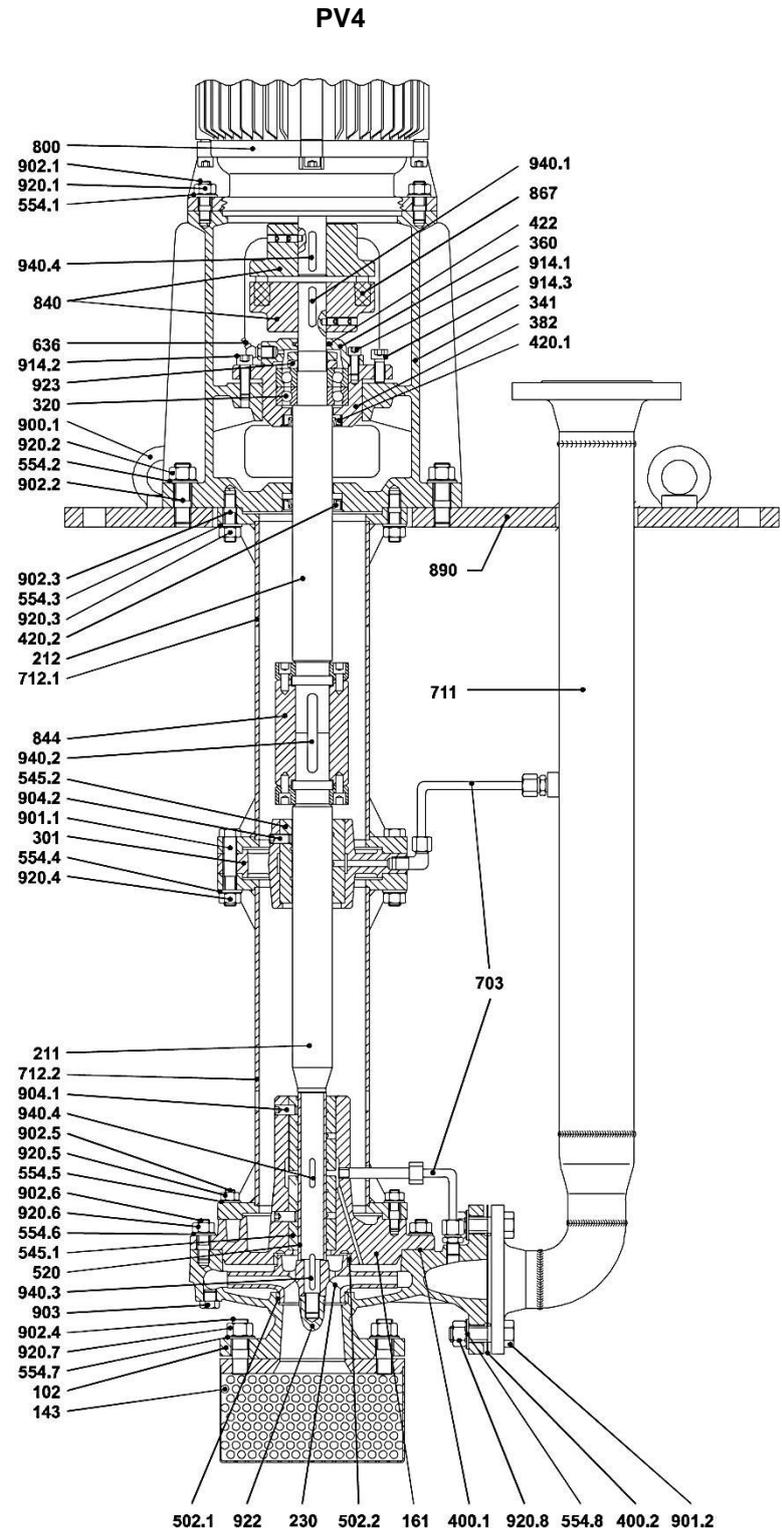


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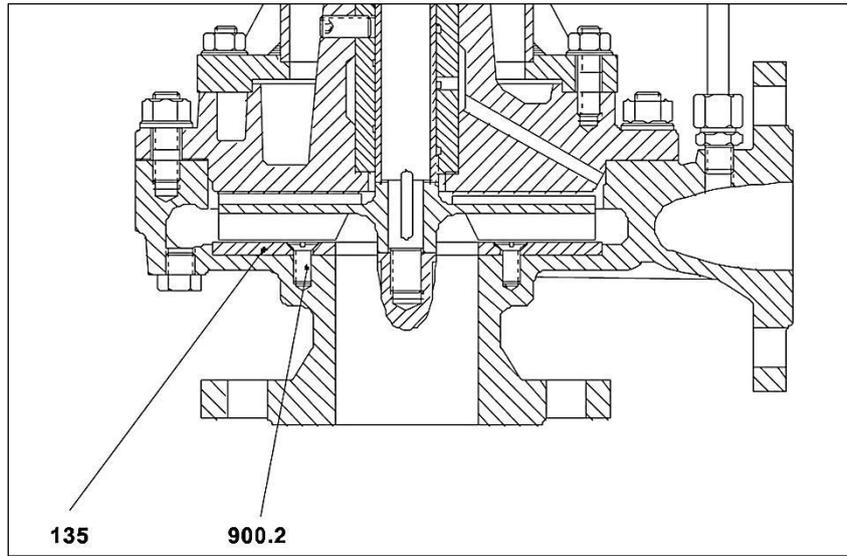
9 Annexes

9.1 Sectional plans

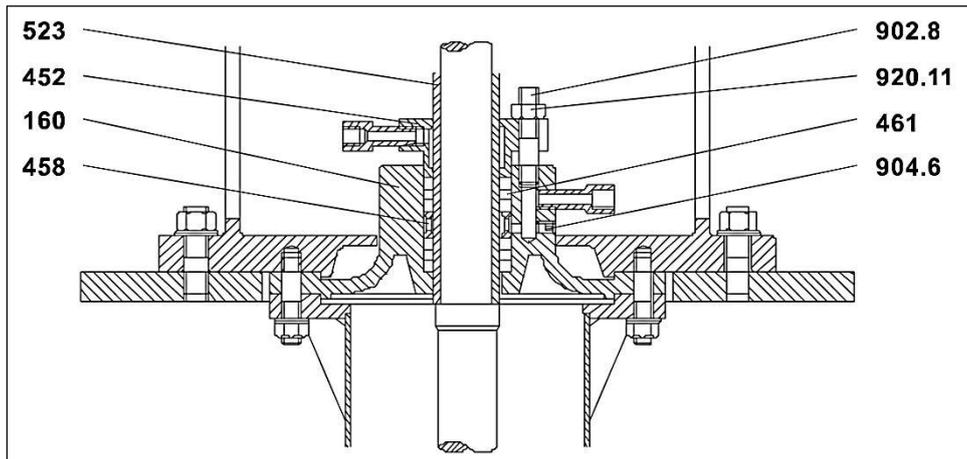
Nr.	Denomination
102	Volute casing
135	Wear plate
143	Suction strainer
160	Cover
161	Pump cover
211	Pump shaft
212	Intermediate drive shaft
230	Impeller
301	Intermediate bearing
320	Bearing
341	Pedestal
360	Bearing cover
382	Bearing support
400	Gasket
412	O'ring
420	Lip seal
422	Felt ring
433	Mechanical seal
452	Packing gland
458	Lantern ring
461	Packing
471	Mechanical seal cover
502	Wear ring
505	Retaining ring
520	Shaft sleeve
523	Shaft wearing sleeve
542	Throttling bush
545	Fiction bearing bush
554	Flat washer
636	Grease nipple
703	Cooling pipe
711	Discharge pipe
712	Intermediate pipe
800	Motor
840	Coupling
844	Rigid coupling
867	Coupling flexible
890	Base plate
900	Screw
901	Hexagon head screw
902	Bolt
903	Plug
904	Setscrew
914	Allen screw
920	Nut
923	Bearing nut
940	Key



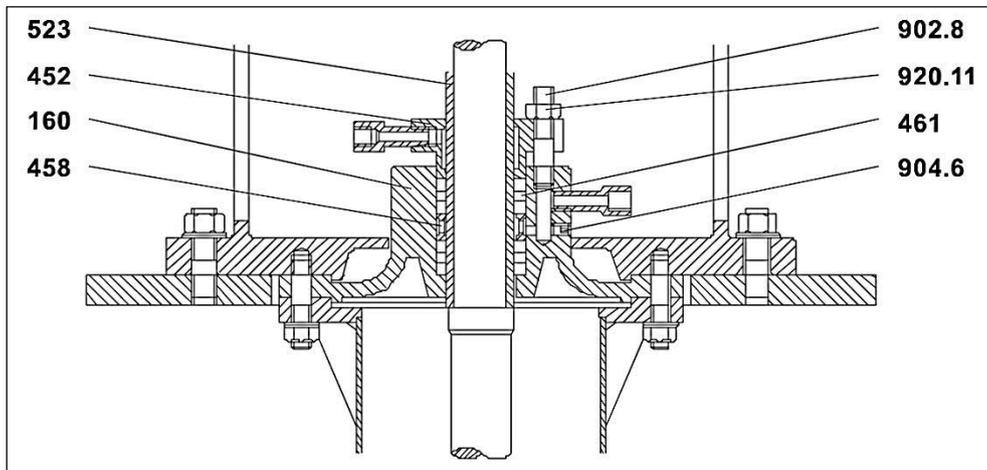
**Details of variant with semi-open impeller**



**Details of variant mechanically sealed shaft**



**Detail of variant with packing sealed shaft**





PUMPIRAN

**9.2 Minimum submergence chart and exterior bearings water consumption.**

Size	Minimum submergence S [mm]	Bearing/exterior water consumption Qe [l/h] (1)
32/125	120	250
32/160	120	250
32/200	200	250
32/250	200	250
40/125	120	250
40/160	120	250
40/200	200	250
40/250	200	250
40/315	220	320
50/125	120	250
50/160	120	250
50/200	220	250
50/250	220	250
50/315	220	320
65/125	120	250
65/160	220	250
65/200	220	250
65/250	220	320
65/315	220	320
80/160	220	250
80/200	220	320
80/250	240	320
80/315	240	320
80/400	240	500
100/190	220	320
100/200	220	320
100/250	220	320
200/315	220	320
100/400	240	320
125/240	220	320
125/250	240	320
125/315	240	500
125/400	250	500
150/200	240	320
150/240	240	320
150/250	240	320
150/315	240	500
150/400	240	500
150/500	440	650
200/240	260	320
200/250	260	320
200/330	260	500
200/400	300	650
250/300	400	500
250/400	300	650
300/300	400	650
300/350	500	650

(1)At pressure of 3 kg/cm<sup>2</sup> (manometric). This consumption is only applicable when there is an external connection (case of dirty or abrasive fluids)

