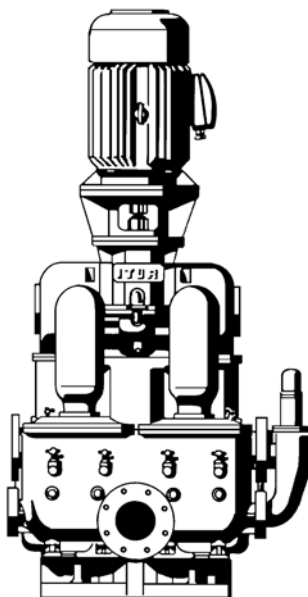


Alternating Piston Pumps



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1 General Items

Note

This KSB ITUR pump has been developed in line with current technical levels, manufactured with great care and put through stringent 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 also 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.

Should you require further details or have a breakdown problem, please contact the nearest KSB ITUR service agent.

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 Signalling of warnings in this manual

All instructions in this manual which may involve personal hazard if not complied with are indicated with a general hazard sign.



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.

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 installer must ensure that the parts of the machine which may create danger due to heat or cold are protected against accidental contact.
- The protection devices which prevent contact with moving parts (e.g. couplings) must not be removed whilst the machine is in service.
- 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.
- Electrical hazard must be avoided (see details in the specific legislation of the country and/or the electricity supply company).

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.

The pump frame must have returned to environmental temperature. It must then be depressurised and emptied of liquid.

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.

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

All safety and protection devices must be installed and put into operation as soon as work concludes.

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

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 4.0 of the Instructions Manual. The operation limits established in the Datasheet must not be exceeded under any circumstance.

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 KSB ITUR.

Remember that the equipment must never be lifted using the ring bolts of the different items (e.g. motor and pump ring bolt), 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.



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 the parts with preservation products from contact with the low alloy liquid (e.g. grey casting, nodular casting, 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 grease or oil.



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

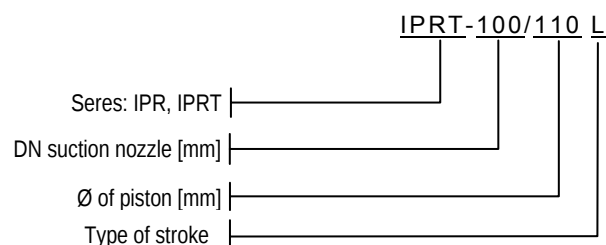
The switchboards must be in vertical position and disconnected.

4 Group description

4.1 General description

Positive movement pumps with two cylinders and alternating pistons. Used mainly for general vessel services: emptying bilges, ballast, hosing, fire extinguishers, etc.

4.2 Denomination



4.3 Form of construction

Constructed with a vertical attachment base and electrical motor for semi-elastic coupling. The front suction and the two side discharges (except for IPR-125/150, with side suction and discharge), allowing discharge to be selected through either of the two ends.

They have a relief bypass valve, adjustable and with automatic opening.

Bearings: Includes bearings and friction bearing bushes, all lubricated with oil or grease.

Shaft sealing: Packing.

4.4 Noise. Permitted levels

The acoustic pressure level of these pumps is less than 96 dB (A) at 1 m in any operation point within the operation range without cavitation. The acoustic power is less than 110 dB (A).

5 Installation

Note

The design of the pipe systems, anchorings and other installation areas corresponds to other parties. KSB ITUR 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 should check with a specialist in the design of castings, pipes, wells, etc. to supplement and interpret the information provided by KSB ITUR and to ensure proper 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.

If 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 discharge nozzles until the equipment is completely installed on its base.

5.2 Group positioning

5.2.1 Vertical groups

Levelling

Use a spirit level to level the equipment. Use wedges to alter the height at different points. The maximum deviation permitted is 0.2 mm/m.

The separation between the two coupling halves must be maintained.

Note

The equipment must always be aligned after mounting and preparing for start up.

Pump - motor alignment

The equipment is aligned at factory, and this alignment must never be lost. The following instructions must be followed when dismantling or returning the motor:

- Check that the flange support surface 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 flange

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



The pipe system must at no time exercise force (due to connection, thermal variation, etc.) greater than those permitted 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.

Note

The convenience of installing foot valves when the pump is working in suction or retention when loaded, along with seal valves, will depend on the type of installation.

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, meaning the fluid speeds will be:

- Speed in the discharge pipe: from 2 to 3 m/s
- Speed in the suction pipe: from 1 to 2 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!



The suction and discharge nozzle 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. We recommend using an oversized sieve filter in suction in order to prevent dirt larger than that permitted by the pump from coming in.

5.3.1 Auxiliary connections

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

When using clean fluids, the cooling of the mechanical seal is by way of the recirculation of the pumping fluid (it is not necessary to inject exterior fluid).

Note

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

5.4 Electrical connection:



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

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

The technical connection conditions and the conditions 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 and IP-55 protection grades, with frame sizes of between 56L and 355S, both inclusive, with voltages of 200 to 500 V between phases.

5.4.1 Motor connection



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



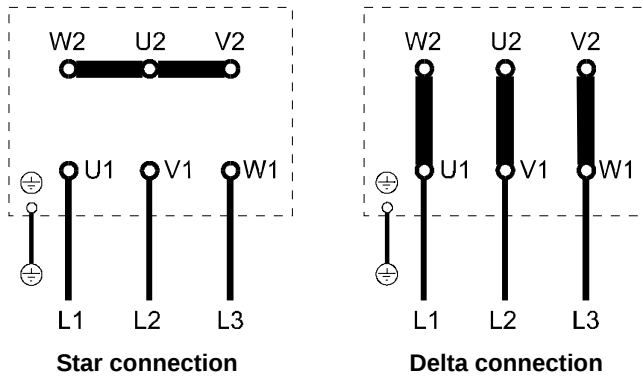
Check that the earth connection is in line with local regulations.

Connection in single speed motors

Direct start-up:

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

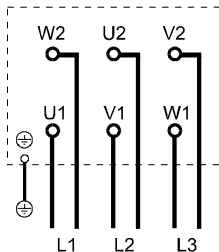
The voltage and the connection, e.g. 400 VY, 240 VD is stamped on the motor plate. This means that the motor can connect at 400 volts in star connection (Y) or at 240 volts in delta connection (D).



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 Timer relay adjustment

In the star-delta start-up of three-phase motors, it is necessary to ensure that the passage from star to delta takes place quickly. Prolonged time will cause damage to the pump.

Timer relay adjustment in the star-delta 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 shutting down. 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 or L3 of the power cable must be inverted in the motor terminal box.

6 Start-up

Start-up shall be carried out when all the necessary mechanical, hydraulic, electrical and pneumatic connections are complete.

The safety bypass valve should be regulated before starting up, bearing in mind the work pressure values and the maximum permitted by the facility.

Motor checks



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

Follow the indications described in the motor manual.

6.1 First start-up

6.1.1 Lubricant

BEARINGS:

Reducer box oil:

Note

The pump leaves the factory without oil in the reducer box. Once assembled, proceed to fill it. See section 7.2.2.

Lubricated with grease. PUMP WITH GREASE NIPPLES:

The pump leaves the factory with the bearings greased for approximately 1000 hours of operation. See lubricant in section 7.2.2.

6.1.2 Filling (priming) of the pump

The pump must be primed before starting up for the first time or following a long period of inactivity. To do this:

EQUIPMENT IN LOAD:

1. Disconnect the voltage from the motor or batteries.
2. Close the suction valve and the discharge valve.
3. Remove the venting plug located in the casing or open a discharge pipe vent (before the check valve).
4. Partially open the suction valve until the liquid overflows through the vent.
5. Close the vent.
6. Fully open the suction valve and partially open the discharge valve.
7. Start up the motor and check the rotation direction of the pump.
8. Fully open the discharge valve.

EQUIPMENT IN SUCTION:

1. Disconnect the voltage from the motor or batteries.
2. Remove the venting plug located in the casing or open an discharge pipe vent (before the check valve).
3. Close the discharge valve.
4. Pour the liquid to be pumped through the vent until it overflows.
5. Close the vent and partially open the discharge valve.
6. Start up the motor and check the rotation direction of the pump.
7. Fully open the discharge valve.

The priming should be checked in subsequent start-ups.

Shaft sealing

Packing: The gland nuts must be gently tightened (by hand). The gland must form a right angle to the shaft. There should be a larger leak after filling the pump and before starting up.

Ensure that the gland boxes in the piston spindles are packed and moderately tightened.

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.

Note

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 guard be excluded from supply, it must be provided by the user.

6.1.4 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 impulsion and suction valves completely open.

Discharge the valve chamber using the different airing cocks. When the pump is working "heavily", regulate the volume of air in the air tank by opening the corresponding cock.

Bypass safety valve: All models have an internal safety valve which, should the impulsion pressure exceed a calibration value, recirculates the fluid to aspiration. The danger of the pump and facility being subjected to excessive pressure is therefore avoided. The maximum pressure value depends on each facility, and in consequence this valve should be regulated as necessary in each case. In order to regulate the valve, it is important to remember that there is generally a pressure difference from opening until it is capable of recirculating all the flow (maximum system pressure). Depending on the fluid, this margin may be greater than 1.5 kg/cm².

Proceed as follows to regulate the valve:

- With the pump shut down, remove the protector cap and release the tensor until we see that the spring does not exercise any pressure or the thread is introduced by at least two threads, in such a manner as it does not shoot out when starting up the pump. Replace the protector cap. If this is not returned, incoming air may invalidate the process when starting up the pump.
- If not done already, correctly prime the pump.
- Ensure there is a pressure gauge (of suitable scale) in the pump discharge.
- Start up the pump and proceed to gradually close the impulsion valve to the full. In this manner the impulsion gauge will show the pressure necessary to recirculate all the pumped flow.
- Replace the protector cap and gradually tighten the tensor until the pressure gauge shows the maximum value permitted in the facility.
- Shut down the pump and set the position of the tensor with the counternut or with the protector cap.



If the regulation of the valve is unduly altered, there is a danger of excess pressure (breakage of pipes and/or pumps) and/or destruction of the motor through excess required power. The bypass valve is a SAFETY valve and should not be used to regulate the flow or the discharge pressure. Doing this may jeopardise the entire facility.

6.1.5 Shutdown

Close the discharge pipe valve.

If there is anti-return in discharge with counterpressure, leave the discharge valve open.

- Shutdown the motor. Check that shutdown is normal.
- In prolonged periods of non-operation, close the suction pipe valve and the auxiliary connection valves.
- In suction pumps using a low vacuum tank, the supply of liquid must also be maintained at the shaft seal whilst the pump remains shutdown.
- 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 shutdown, 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 Start-up frequency

In order to prevent abnormally high temperatures and overloading of the motor, pump, coupling, seals, etc, the start-up frequencies indicated below must not be exceeded:

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

Note

Never operate the pump at a temperature higher than that shown in the data sheet and/or factory plate.

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

Note If the equipment is to be shutdown 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 must not be started up involuntarily, and so must be disconnected from the grid (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 instructions

During the first minutes of operation:

In cases of packing seal:

- There is no leak; immediately loosen the gland to obtain small dripping.
- Excessive fluid leak; leave to settle for 10 minutes; tighten the gland by turning 1/6th and leave 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.

7.2.2 Lubrication

Before lubricating the pump, ensure that:



The pump is shutdown 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.

BEARINGS:

Pumps lubricated with oil

Note The pump leaves the factory without oil in the reducer box. Once assembled, proceed to fill it.

Oil filling

- Release the upper reducer cap.
- Pour oil through this orifice until the level reaches the sight.
- Replace the upper cap.

Oil change

- Before changing the oil, start up the pump for a few minutes in order to fluidify it.
- Release the upper filling cap and the lower drainage cap.
- Empty the support oil and let it drain off. Once the reducer box has been emptied, clean the cover and the bearings using petrol.
- Replace the lower cap and proceed to fill as indicated in the preceding section.

Oil chart

Oil recommended for normal use (bearing temperature up to +70°C), in line with the operation revolutions and the size of the pump (ISO-VG oil grade is shown)

Sizes / rpm	Oil	Regularity [h] (1)	Quantity [l]
ALL	ISO VG 100	1000	5

(1) First oil change at 100 hours

Lubricated with grease. PUMP WITH GREASE NIPPLES:

The pump leaves the factory with the bearings greased for approximately 1000 hours of operation.

For lubrication, a chart is attached with the amount of grease to be applied in each greaser, along with the regularity.

Size	Regularity [h]	Amount of grease [g]
ALL	4000	30

Lubricant change

In order to completely change the grease, first dismount the bearings and carefully clean their positions in the support in order to remove old grease.

Type of grease:

We recommend using lytic-based lubrication grease with antioxidant additives, of consistency 2, in line with DIN-51502 K2K.

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 discharge valves must be closed.

The pump frame must have returned to environmental temperature.

The pump frame must be depressurised and 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

- 1.- Remove the coupling guard
- 2.- Uncouple the pump from the motor, as indicated:
 - 2.1.- COUPLING WITHOUT DISTANCER. Release the motor attachment bolts and remove the motor along with the male coupling.
 - 2.2.- COUPLING WITH DISTANCER. Release the coupling attachment screws and remove the intermediate pipe. Separate the male coupling.
- 3.- 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.

7.4.3 Packing

- Release the gland.
- Extract the seal. If the lantern ring is also extracted, note down the order.

7.4.4 Pump valves

- Remove the nuts from the valve box cover, and then remove the gaskets. Also remove the high cap nuts and their seals.
- Remove the cover from the valve box. Also remove the seal for the valve box. The upper chamber and the discharge valves will then be visible.
- Remove the discharge and suction valves.
- Release the pin which secures the nut to the spindle.
- Release the nut which secures the suction valve. All the valve pieces can now be released.
- Make a visual inspection to see whether the valves and their elements are in the correct position.
- If the pieces are in a good condition, clean them and reassemble.
- If they are not in a good condition, replace the damaged part.

7.4.5 Segments and pump casing

- Separate the cross guide support and the reducer box of the valve box.
- Release the male and female couplings, unscrewing the Allen setscrew.
- Release the motor lantern by unscrewing the hexagonal head screws and the nuts with their washers.
- Position clamp bolts in the motor lantern and position the hooks of a hoist in the clamp bolts.
- Release the nuts and flat washers which join the cross guide support and the valve box.
- Also release the adjustment screws of the casing and the nuts.
- Lift the cross guide support and reducer box, exposing the segments, and simply remove the pump casing.
- Make a visual inspection to check the state of the segments and the casing. If they are in a good state, clean them and return them, otherwise replace them.

7.4.6 Reducer box

Dismount the reducer box in reverse order to assembly.

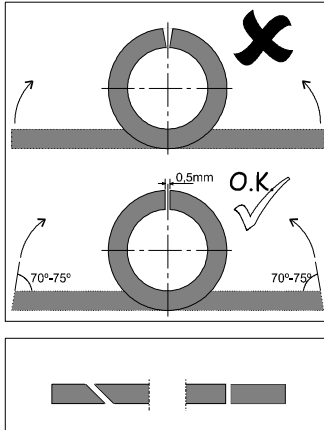
7.5 Assembly

7.5.1 Coupling

- 1.- Assemble the pump (if it has been dismantled)
- 2.- Couple the pump to the motor, as indicated:
 - 2.1.- COUPLING WITHOUT DISTANCER. Position the motor in place, introducing the male coupling. Position the pins, but DO NOT tighten them until alignment is complete.
 - 2.2.- COUPLING WITH DISTANCER. Mount the male coupling, introducing the teeth in the rubber plugs located in the female coupling. Mount the intermediate pipe and secure it using the screws, both to the plate and to the male coupling.
- 3.- Align the coupling (see point 5.2.1 of this manual)
- 4.- Mount the coupling guard.

7.5.2 Packing

- Cut the new packing, forming as many rings as required. The cuts, seen from above, may be straight or inclined at 45°. (see figure)
- We recommend leaving a small clearance of 0.5 mm in the packing cut.
- Position the rings one by one, pushing on them but without excessive force. The rings shall be introduced with the cut ends alternated 90°.



- Take care to introduce the ring in the same order as before.
- Once the packing has been introduced, check that the shaft rotates freely without any stiff points.
- The gland must not penetrate the entire free length. If necessary, introduce more rings.
- Gently tighten the gland nuts.
- In order to determine the appropriate torque of the packet, proceed as indicated in point 6.1.2 of this manual.

7.5.3 Pump valves

- Assemble the suction and discharge valves on the shaft with all the corresponding elements. Replace the Parker flange. Thread the nut on the spindle and secure with a pin.
- Position the valve with the valve shaft in the corresponding place.
- Position the threaded studs in their place, and then position the valve box seal, the cover, the flat washers and the nuts, and tighten.
- Position the valve pressure screws, the washers and the high cap nuts and tighten.

7.5.4 Segments and pump casing

- Introduce the casing with the help of a plastic hammer. The segments shall be positioned with their cuts separated by 180°.
- With the help of the hoist, position the cross guide support and the reducer box of the valve box. Position the flat washers and the nuts, and tighten.
- Release the clamp bolt hooks and then release these from the motor lantern.
- Position the motor on the lantern motor.
- Secure it with its screws, washers and nuts.
- Also position the adjustment screws of the casing and the nuts.
- Position the male and female couplings, securing them with their setscrews.

7.5.5 Reducer box

- Heat the conical bush bearings on the spiral screw shaft and place on the shaft.
- Place the key on the shaft with the help of a hammer, and place it in the gearing, banging with a plastic hammer. Position the circlip with the help of the appropriate tool.
- Mount the lower conical bush bearing of the spiral screw shaft on the box, and cover and tighten with Allen screws. Place a flange in the centre, apply sealant, then thread and place the reducer shaft with the gearing and finally the spiral.
- Apply grease to the upper bearing of the vertical shaft and position it with the help of a hammer.
- Place sealant on the reducer box cover and put it in place with the help of a plastic hammer. Tighten the Allen screws.
- Position the reducer shaft bearings with the help of a normal hammer, a plastic hammer and a pusher.
- Replace the seals on the covers and apply sealant, and then tighten with Allen screws.
- Position the hatch cover of the reducer with its seal.

7.5.6 Tightening torque of the screws/nuts

	Steel	Stainless steel
ISO Metric thread	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

7.6 Recommended spare parts

Piece denomination	Reference No. (2)	Recommended spare parts (1)		
		Start-up	2 years	5 years
Flanges (set)	---	1	2	5
Packing	---	1	2	5
Valve spring (set)	---		1	2
Segments (set)	---		1	2
Bearing (set)	---		1	2
Lip seal (set)	---		1	2
Lantern ring (set)	---		1	2
Shaft bushing (set)	---		1	2
Shaft casing (set)	---		1	2
Bearing bush (set)	---		1	2
Flexible coupling part (set)	---		1	2
Safety ring (set)	---		1	2
Key (set)	---		1	2
Coupling	---			1
Piston casing (set)	---			1
Pistons (set)	---			1
Valves (set)	---			1

(1) Amounts recommended for a continuous service pump.

(2) Check specific sectional plan for each pump

7.7 Preventative maintenance

Nº	DESCRIPTION OF THE OPERATION TO BE CARRIED OUT	PROCEDURE	REGULARITY	CONSEQUENCE
1	Check the valve vents	Visual inspection	Weekly	
2	Check for packing leaks	Visual inspection	Weekly	16, 19
3	Check the support oil level	Visual inspection	Weekly	20, 21
4	Check for leaks between the valve box and the cover	Visual inspection	Monthly	15
5	Check for leaks between flanges	Visual inspection	Monthly	15
6	Check for grease or oil leaks	Visual inspection	Monthly	
7	Check for heating of the bearings	With thermocouple	Quarterly	3, 6, 14 Dismount the support
8	Check tightness of connecting bolts for cover/valve box, cover/reducer box	Manually	Twice a year	13
9	COMPLETE PUMP CHECK	Check and dismount the pump. See point 7 of the manual	Yearly	1, 2, 4, 5, 6, 7, 8, 10, 11, 20, 21
10	PISTON CASING SEGMENTS DETERIORATION	Dismount pistons, visual inspection	Yearly	
11	Check for wear of the shaft and bearings	Dismount support visual inspection	Yearly	
12	Change the rubber coupling plugs	See point 7.5.1 of the manual	Yearly	
13	Check and align the coupling	See point 5.2.1 of the manual	Twice a year and every time they are dismounted	
14	Check functional characteristics loss	Instrument reading	In accordance with use	Check the installation, 9
15	Change the flanges	Manually	Every time they are removed	
16	Tighten gland	See point 6.1.2 of the manual	When the leaks are excessive	
17	Check for wear of the gears	Dismount the casing. Visual inspection	Yearly	
18	Check the relief valve spring	Manually	Twice a year	
19	Change the packing	See point 7.4.3 and 7.5.2 of the manual	Every 4000 hours	
20	Change the reducer oil	See point 7.2.2 of the manual	First change 100 h Others 1000 h (1)	
21	Change the grease of the bearings	See point 7.2.2 of the manual	4000 hours	

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

8 Operation anomalies

Bang inside the drive reducer

| The pump works "heavily", the valves bang

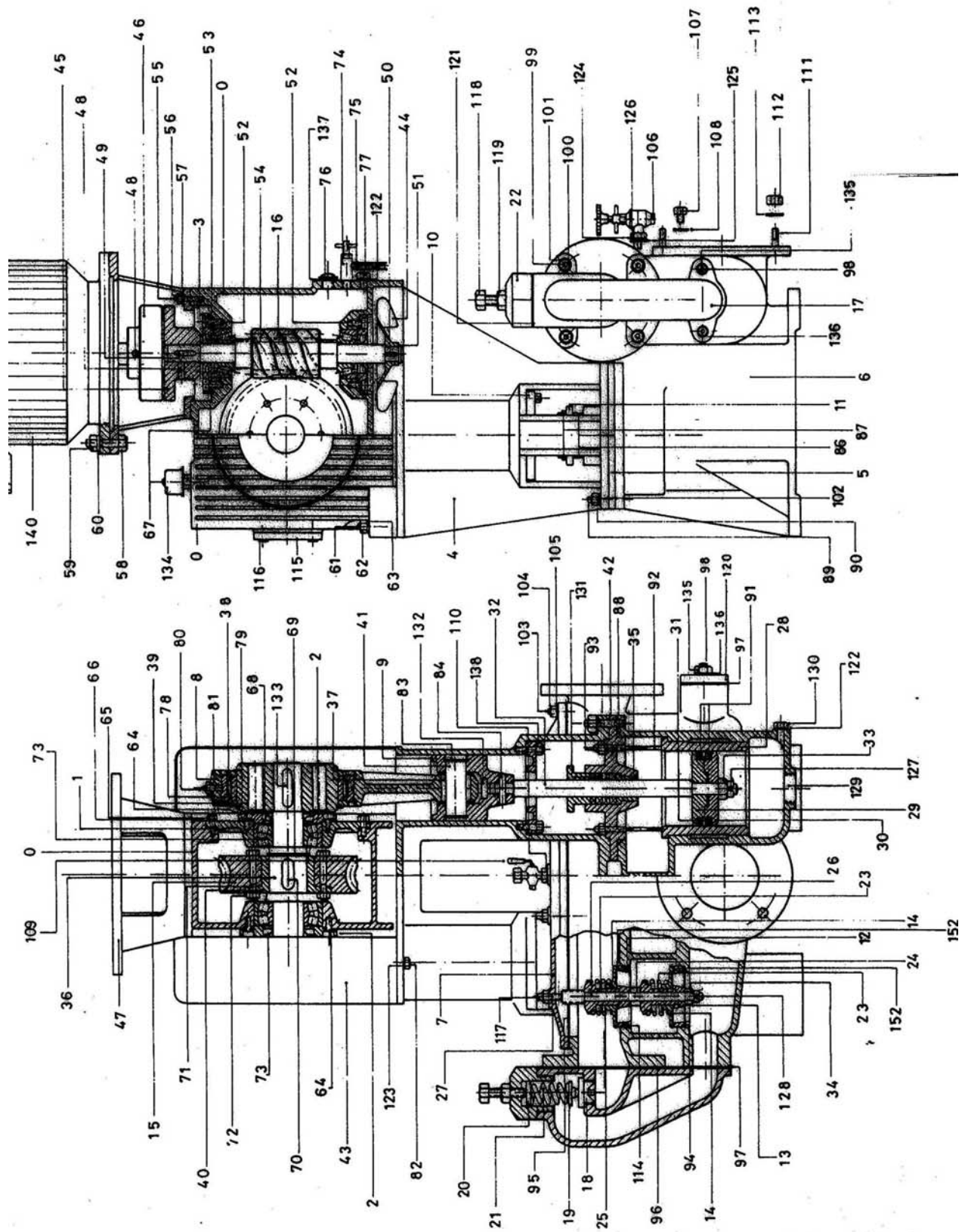
| | Metal bang on the side part of the pump

			Cause	Solution
x			The cross bolt has become loose	Tighten the safety screw within the cross piece and secure again
x			The rod bearing has too much clearance.	Remove the adjustment sheets, and, if necessary, tighten the bearing.
x			The piston spindle in the crosspiece is set	Tighten the counternut
	x		The pump takes in air. The suction pipe takes in air.	The seal cover in the suction valve spindle is not tight.
	x		Formation of steam in the pump chamber, the liquid handled is too hot, the suction height is too high.	The start of the suction pipe is not correctly submerged.
		x	The piston nut has become loose	Tighten it
		x	The valves have become loose	Tighten them
		x	The valve plates have become deteriorated due to impurities	Replace them

9 Annexes

9.1 Sectional plans

Sectional C-606, IPR-100

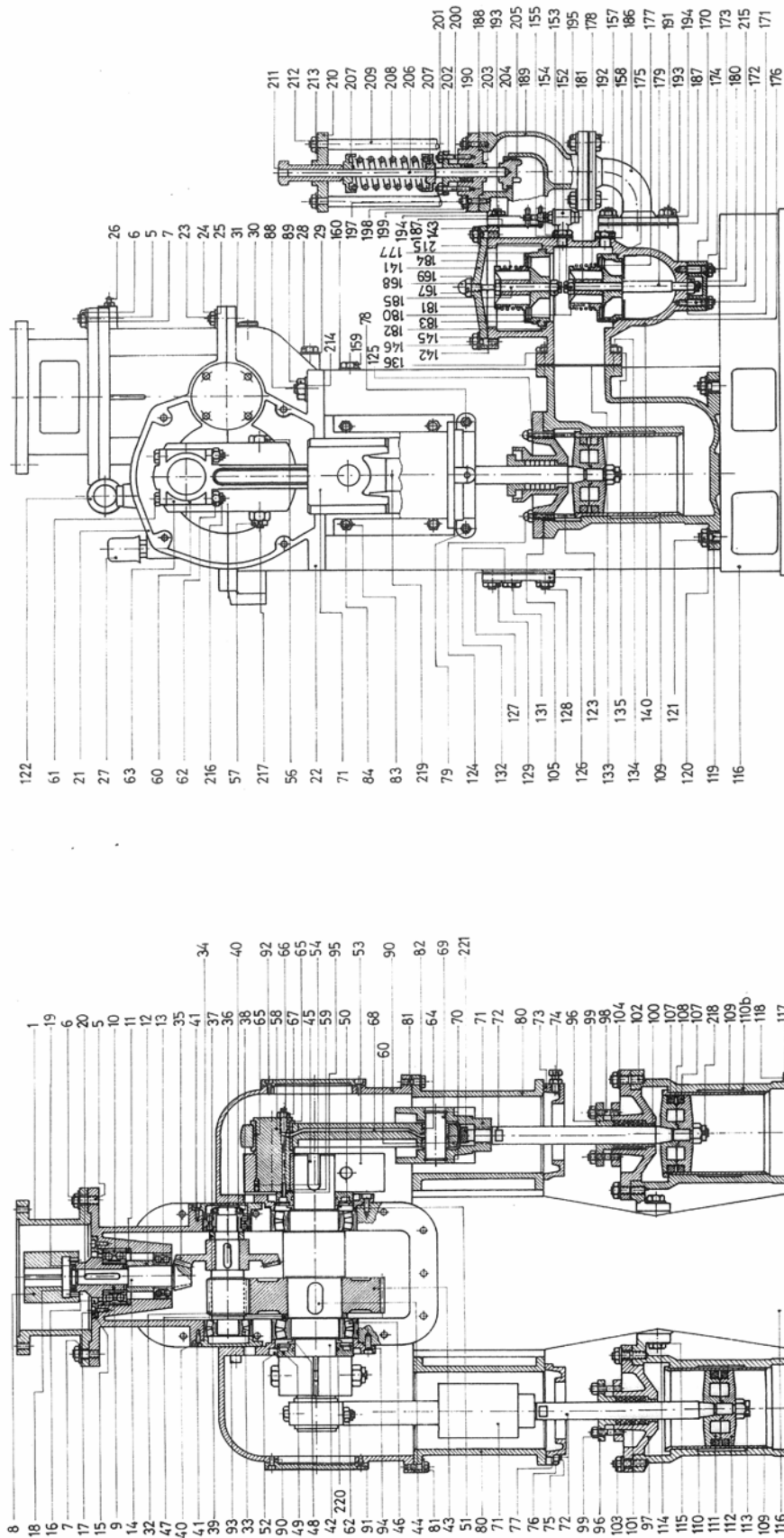


Ref.	Denomination
0	Reducer box
1	Reducer box cover
2	Lip seal cover (crown)
3	Cover
4	Cross guide support
5	Gland cover (with guide)
6	Valve box with feet
7	Valve box cover
8	Rod
9	Crosspiece
10	Lubrication cover
11	Glands
12	Discharge valve casing
13	Suction valve casing
14	Suction and discharge valve
15	Spiral wheel
16	Spiral screw
17	Return valve casing (by-pass)
18	Return valve (by-pass)
19	Spring guide (lower side)
20	Spring guide (upper side)
21	Return valve spring
22	Spring guide plug (return valve)
23	Suction and discharge valve guide
24	Intermediate valve bushing
25	Valve spring
26	Valve shaft
27	Valve shaft stopper stud
28	Piston casing
29	Male piston
30	Female piston
31	Spacer ring
32	Piston shaft
33	Piston shaft nut
34	Valve shaft nut
35	Pressure shaft guide bushing
36	Reducer shaft
37	Rod bushing
38	Stopper washer for roller bearings
39	Crankshaft counterweight
40	Spiral crown sleeve
41	Cross bolt
43	Rod cover
44	Fan
45	Female sleeve (pump side)
46	Male sleeve (motor side)
48	Allen setscrew (cone tip)
49	Key
50	Key

Ref.	Denomination
51	Safety ring
52	Allen screw
53	Lip seal
54	Bearing
55	Stud
56	Nut
57	Flat washer
58	Screw
59	Nut
60	Flat washer
61	Stud
62	Nut
63	Flat washer
64	Allen screw
65	Allen screw
66	Flat washer
67	Motor shaft flange
68	Lip seal
69	Safety ring
70	Key
71	Screw
72	Nut
73	Oscillating bush bearing
74	Threaded cock
75	Plastic pipe
76	Level sight
77	Filling and emptying plug
78	Bearing
79	Safety ring
80	Ball grease nipple
81	Safety ring
82	Hexagonal head screw
83	Safety ring
84	Flexible pin
86	Stud
87	Nut
88	Parker flange
89	Stud
90	Nut
91	Segment
92	Casing adjustment screw
93	Nut
94	Joint
95	Flange for valve box
96	Return valve flange joint
97	Small return flange joint
98	Return stud
99	Screw
100	Nut

Ref.	Denomination
101	Flat washer
102	Flat washer
103	Stud
104	Nut
105	Flat washer
106	Vacuum breaker valve
107	Plug
108	Flange
109	Discharge cock
110	Flange
111	Suction stud
112	Nut
113	Flat washer
114	Parker flange
115	Hatch cover of the reducer
116	Allen screw (reducer hatch cover)
117	High cap nut
118	Screw
119	Nut
120	Flange
121	Flange
122	Flange
123	Washer
124	Washer
125	Flange
126	Narrow nut
127	Pin
128	Pin
129	Thread for back of valve box
130	Plug for emptying valve box
131	Piston shaft packing
132	Crosspiece plug
133	Key for pin
134	Air filter
135	Nut
136	Flat washer
137	Flange for sight
138	Screw
139	Screw
140	Motor
143	Suction flange joint
144	Discharge flange joint
145	Copper flange
146	Copper flange
147	Fan protection grid
148	Screw for grid
149	Screw
150	Washer
151	Hexagonal head screw

Sectional C-607 IPR 125/150

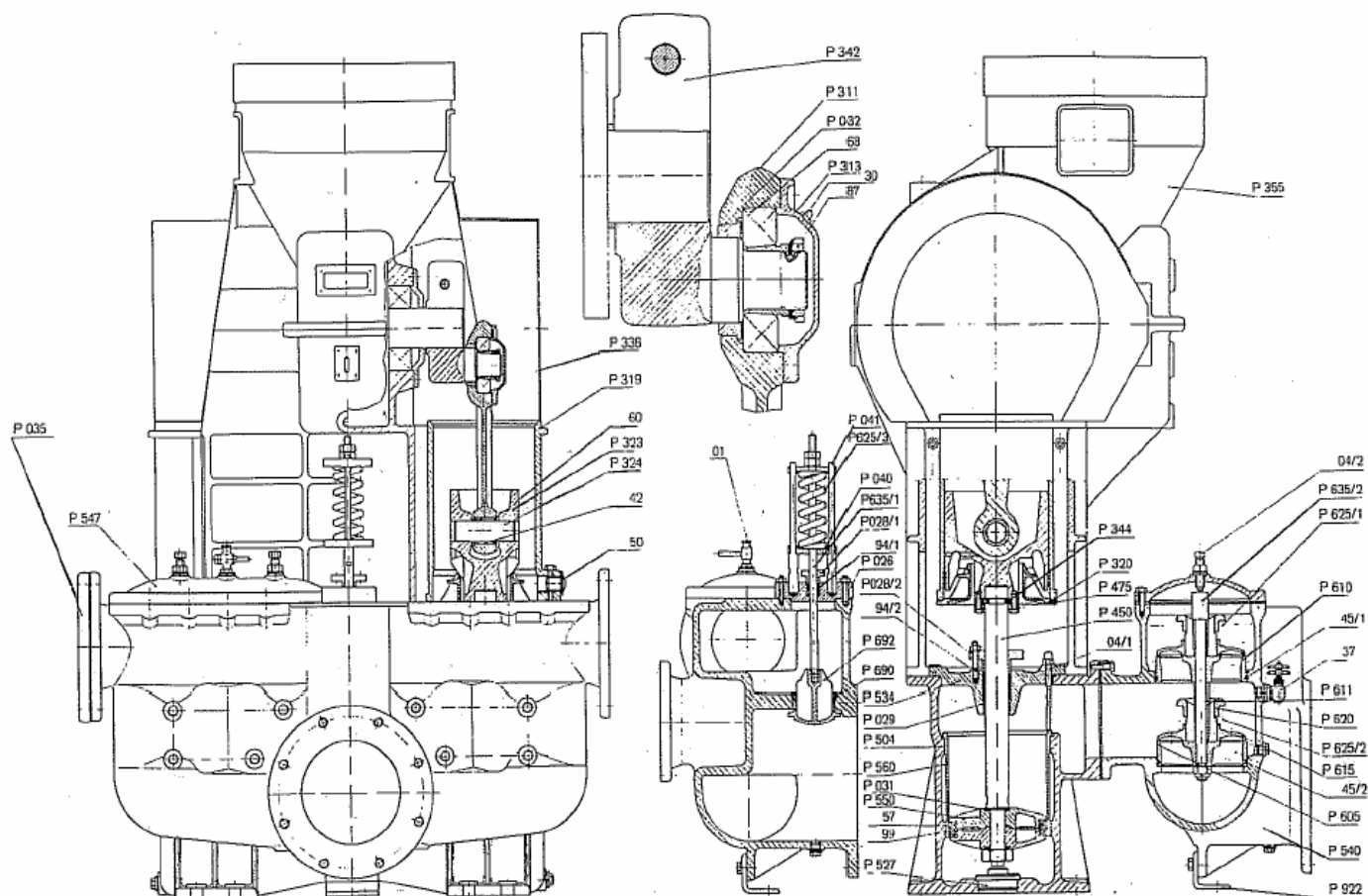


Ref.	Denomination
1	Motor lantern
5	M16x55 stud attachment reducer-lantern
6	M16 nut
7	Flat washer with bevel for M16
8	Female sleeve
9	Male sleeve
10	Bearing N° 3310 angular contact (male sleeve)
11	Separation washer
12	Separation bushing
13	Bearing N° 3308 angular contact (pinion)
14	Power takeoff shaft (pinion)
15	Reducer driveshaft lip seal holder
16	Lip seal of 78x100x10 (reducer driveshaft)
17	Allen screw M10x15 (driveshaft cover)
18	Safety washer for driveshaft
19	Sleeve attachment nut M30x1.5
20	Key of 8x7x70
21	Upper reducer casing
22	Lower reducer casing
23	M12x46 studs reducer casing
24	M12 nut
25	Flat washer with bevel for M12
26	Ball grease nipple 1/4" for gas
27	Filter 1/2" gas for reducer
28	Outflow plug 3/8" gas reducer
29	Washer for 3/8" gas
30	Viewer level for reducer casing 1" gas
31	Flange for 1" gas viewer
32	Driveshaft
33	Bearing Spherical rollers n° 22308 (driveshaft)
34	Bearing Angular contact n° 3308 (driveshaft)
35	Crown
36	Key for driveshaft of 14x9x50
37	Safety washer for Ø40 shaft
38	Driveshaft nut M40x1.5
39	Crown separation bushing
40	Driveshaft solid cover (reducer)
41	Allen screw of M8x15 for driveshaft solid cover
42	Output shaft
43	Drive gear
44	Drive gear key 28x16x65
45	20x12x70 key for counterweight
46	Bearing Spherical rollers n° 22218 HL
47	Separation washer (lubrication ring)
48	Separation washer (lubrication ring)
49	Lubrication ring (reducer)
50	Safety washer
51	Reducer output shaft lip seal holder
52	Lip seal of Ø140xØ170x13
53	Crankshaft counterweight
54	Crankshaft pin attachment setscrew M10x30
55	Pin bush bearing
56	Counterweight screw M24x170
57	Counterweight screw nut
58	Crankshaft pin
59	Elastic pin of Ø10x30
60	Rod
61	Screw for rod
62	Grooved nut for rod

Ref.	Denomination
63	Rod base
64	Lower rod bushing
65	Pin bush bearing
66	Adjustment screw
67	M12 nut for adjustment screw
68	Pipe of Ø4x240
69	Rod bolt
70	Safety washer (circlips) for orifice
71	Crosspiece
72	Spindle
73	Lubrication ring
74	CLIFCO adapter of 1/4" gas for lubrication ring
75	M12x44 stud (lubrication ring)
76	M12 nut (lubrication ring)
77	Flat washer with bevel for M12
78	M10x35 screw for lubrication ring
79	M10 nut for lubrication ring
80	Cross guide
81	M12x35 screw (plating cross guide)
82	Flat washer with bevel for M12
83	M16x50 stud for cross guide
84	M16 nut for cross guide
88	M20x75 stud for reducer
89	M20 nut for reducer
90	Plating
91	Plating cover
92	Screw for plating cover M10x20
93	Allen screw of M12x30 for plating
94	Allen screw of M10x20 for output shaft lip seal holder
95	O-ring of Ø10xØ14x2 for pin
96	Glands for piston cover
97	Gland holder cover (piston)
98	M12x64 gland stud
99	M12 nut for gland
100	Dispersion bushing
101	Packing rings of 10
102	M16x55 for gland holder cover
103	M16 nut for gland holder
104	Flat washer with bevel for M16
105	Seal press flange
107	Segment
108	Segments separation washer
109	Piston casing
110	Cylinder (1 right and 1 left)
111	Male disc (piston)
112	Female disc (piston)
113	Grooved nut for piston spindle
114	M16x40 screw for cylinder attachment
115	Flat washer with bevel for M16
116	Support
117	Outflow plug 3/8" gas for-cylinder
118	Flange for 3/8" gas
119	M20x60 screw for cylinder attachment in support
120	Grower safety washer for M20 (support)
121	M20 nut for reducer
122	Clamp bolt screws M20
123	Piston casing adjustment screws
124	Blind cap nut for adjustment screw
125	Washer for M12

Ref.	Denomination
126	Hatch cover of support
127	Flange for hatch cover and safety valve
128	M16x55 studs for hatch cover
129	M16 nut for hatch cover
131	Plug 1/2" gas for hatch cover
132	Flange for 1/2" gas
133	Pump cylinder flange
134	M16x57 studs for valve box with cylinder
135	M16 nuts for valve boxes with cylinders
136	Flat washer with bevel for M16
140	Valve box
141	Valve box cover
142	Flange for valve box with cover
143	M16x53 stud (valve box cover)
145	M16 nuts (valve box cover)
146	Flat washer with bevel for M16
152	1/2" valve gas (Echauri)
153	Nut 1/2" gas for vacuum breaker valve
154	Flat washer with bevel for 1/2" gas Ø21xØ38x3
155	Plastic washer DUBO n° 111
157	Outflow plug 1/2" gas valve box
158	Flange for 1/2" gas for valve box
160	Flange for 1/4" gas
167	Adjustment screw (valves)
168	Blind nut for adjustment screw M16
169	Washer M16 adjustment screw
170	Neck bush
171	Neck bush
172	M12x64 stud for neck bush
173	M12x64 nut for neck bush
174	Flat washer with bevel for M12 neck bush
175	Flange for suction valve
176	Suction valve
177	Suction and discharge valve seal cover
179	Suction valve shaft
180	Grooved nut 8 for suction and 4 for discharge
181	Guide bushing for suction and discharge valve

Ref.	Denomination
182	Discharge valve flange
183	Discharge valve
184	Discharge valve spring
185	Discharge valve guide screw
186	Safety valve angle piece
187	Flange for angle piece and safety valve
188	Safety valve casing cover flange
189	Safety valve casing
190	Safety valve gland holder cover
191	M16x55 studs for safety valve input and output
193	M16 cover for angle piece and safety valve
194	Flat washer with bevel M16
195	M16 nut for angle flange with safety valve
197	M12x48 studs (safety valve casing cover)
198	M12 nut for safety valve cover
199	Flat washer with bevel for M12
200	Safety valve guide stud M10x49
201	M10 nut for safety valve glands
202	Safety valve glands
203	Packing ring 8 safety valve
204	Bypass safety valve
205	Bypass seal bushing
206	Safety valve shaft
207	Safety valve support cover
208	Safety valve spring
209	Safety valve guide stud
210	Safety valve guide glands
211	Safety valve adjustment screw
212	M12 nut for guide stud
213	Flat washer with bevel for M12
215	Pins Ø4x30mm for valves
216	Pin Ø4x30mm for rod
217	Flanged pin of Ø5x50 DIN-94
218	Pin for spindle of Ø5x45
219	Pins for drawn crosspiece of Ø8x70
220	Ø73xØ79 O-ring (lubrication ring)
221	Crosspiece plug (oil retention)

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Ref.	Denomination
1	Cock
04.1	Pressure screw
04.2	Pressure screw
30	Grease nipple
37	Air renewal cock
42	Bearing
45.1	O-ring
45.2	O-ring
50	Oil level viewer
57	Segment
60	Lip seal
68	Bearing
87	Assembly sleeve
94.1	Seal
94.2	Seal
99	Spacer ring
P026	Packing cover
P028.1	Glands
P028.2	Glands

Ref.	Denomination
P029	Rear bushing
P031	Pressure ring
P032	Bushing
P035	Flange
P040	Disc
P041	Bolt
P311	Rod
P313	Rod cover
P319	Cross guide
P320	Lubrication ring
P323	Crosspiece
P324	Cross bolt
P338	Plating
P342	Crankshaft
P344	Washer
P355	Frame
P450	Spindle
P504	Cylinder

Ref.	Denomination
P527	Plug
P534	Packing cover
P540	Valve box
P547	Valve box cover
P550	Piston
P560	Casing
P605	Valve seat suction
P610	Valve seat discharge
P611	Distancer
P615	Valve plate
P620	Guide bushing
P625.1	Suction spring
P625.2	Discharge spring
P625.3	Safety valve spring
P635.1	Safety valve spindle
P635.2	Suction and discharge valve spindle
P690	Valve seat
P692	Safety valve cone piece
P922	Valve box support

WARRANTY

KSB ITUR Spain, S.A. undertakes:

To repair or replace at any of its ASSOCIATED TECHNICAL SERVICE CENTRES or at its factory in Zarautz, free of charge and for a period of 12 months as of the date of dispatch from our warehouses, any product which shows manufacture defects. This warranty will be reduced to 6 months for continuous or permanent service pumps.

KSB ITUR Spain, S.A. shall not be liable for any direct or indirect damage which the product suffers as a result of defective installation, lack of maintenance, negligent handling, handling by unauthorised personnel, overloading or deficient functions.

The responsibility of KSB ITUR Spain, S.A. is limited in all cases to the replacement, as speedily as possible, of the defective part, without it being in any way liable for other responsibilities or compensation.

CERTIFICATE OF COMPLIANCE WITH EC MACHINERY DIRECTIVE

KSB ITUR

P.O. Box 41 – 20800 ZARAUTZ (Gipuzkoa) Spain

PRODUCT UNDER CERTIFICATION. PUMPS SERIES: IPR, IPRT

EC DECLARATION OF CONFORMITY

KSB ITUR hereby declares, under its responsibility, that its aforementioned products (when supplied with a motor), to which this Declaration refers, are in line with European Directive 98/37/EC on the approximation laws of the Member States on machinery.

Applied harmonised standards:

EN 292 Part 1, EN 292 Part 2 and EN 809

MANUFACTURER'S DECLARATION

KSB ITUR hereby declares that its aforementioned products (when supplied without a motor) are proposed for incorporation in machinery or assembled with other machines to form machinery covered by Directive 98/37/EC.

Warning is hereby given that the aforementioned products cannot be started up until the machinery in which they are to be incorporated has been declared to conform to the dispositions of the aforementioned Directive.

Applied harmonised standards:

EN 292 Part 1, EN 292 Part 2 and EN 809

Zarautz, October 2008

Post

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