P 601 - P 3001
SERVICE INSTRUCTION

PUMPEX

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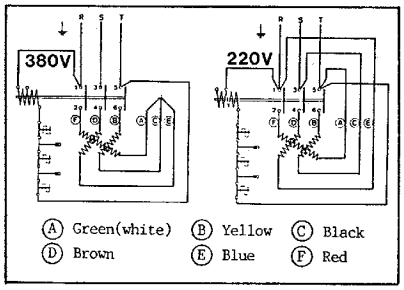
P 601 - P 3001

P 601/701/801/1001/1501/2001/3001.58.0308.Eng/Digital

These Service Instructions apply to PUMPEX electric submersible drainage pump models **P 601-701-801-1001-1501-2001 and 3001.** All configurations; including, centerline, high volume, normal head, and high head.



Pump models P601 P 701 and P 1001 and P 2001 are available in either 3-phase or single-phase operation; other models for 3-phase operation only. All pumps for 3-phase operation are equipped for D.O.L. start, and do not require an external start control. Model P 2001W is equipped as 230v 1-phase, and is supplied with a factory control box. **Only** a factory supplied control box should be used on this pump.

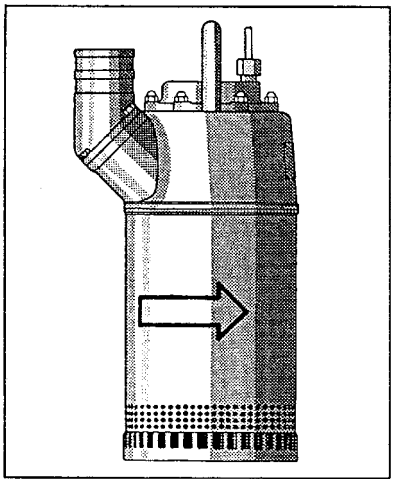
All 3-phase pumps are fitted with a built-in contactor unit and thermal switches in the stator windings, connected in series with the contactor coil. Single phase pumps have start capacitors or factory supplied control box. In case of the motor overheating, the thermal switches open and disconnect the contactor and the power supply to the pump. **Note!!** When the motor has cooled down the thermal switches close and re-start the pump automatically.

Connection at the job site

Check that the pump is connected for the actual mains voltage. Reconnection between 230 volts and 460 volt 3-phase is made by changing the contactor coil and reconnect according to the wiring diagram.

If the contactor is not equipped with a dual voltage contactor coil, the coil must be replaced to coincide with the desired voltage at the site. Separate external motor protector is not required, but fuses of correct size should be installed as short-circuit protection. Use time lag fuses according to the following table.

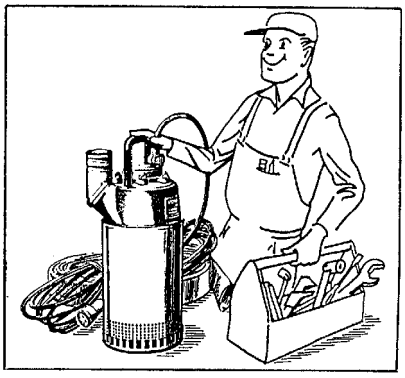
Pump-modell	3-fas		1-fas	
	220 V	346-500 V	110 V	220V
P 601	10 A	6 A	16 A	10 A
P 701	10 A	6 A	16 A	10 A
P 801	16 A	10 A		
P 1001	16 A	10 A		16 A
P 1501	25 A	16 A		
P 2001	25 A	16 A		
P 3001	63 A	35 A		



Check the direction of rotation in all 3-phase pumps. Tilt the pump and start it. It should jerk in a counter clockwise direction as indiciated by an arrow on the pump. If it jerks in the other direction, two phases should be shifted. If the bottom of the sump is soft and muddy, place the pump on some planks, put it into a bucket, or suspend it from a rope to prevent it from digging itself into the mud.

Never lift or pull the pump by the electric cable. **Note!!** Harm to the pump cable may cause injury or death.

Always disconnect the pump from the power supply before opening any part of the pump. Always use a qualified electrical technician when servicing pump.



If the seals are worn so severely that the oil has leaked out and only water mixed with mud and sand remains, the pump must be dismantled for a complete overhaul.

Maintenance

Inspection at regular intervals and preventive maintenance should be performed in order to reduce the number of functional troubles and to avoid serious break-down of the pump unit. During normal opera-tion service is not required until a reduction of the pump capacity is noted. Inspection **must** be performed once a year, or 2000 operating hours.

When the pump is taken out of service for seasonal storage, a full maintenance service should be carried out. Special attention should be paid to the following points.

Cleaning and Removal of Lime Deposits

At a construction site the pump is often working in water mixed with clay, concrete, lime, etc. When it is taken out of service it should be flushed out in fresh water and fully inspected before it is put into storage.

Hard and solid lime deposits are easily removed if the pump is fully submersed in a vessel with a mixture of one part formic acid (HCOOH) and 15 parts water.

Remove the pump after 5 minutes and flush it in fresh water. Some deposits may remain, and a second treatment may be necessary. Not all deposits may be removed.

Inspection of Shaft Seals

Check the condition of the shaft seal by inspection of the oil in the oil chamber. Proceed as follows:

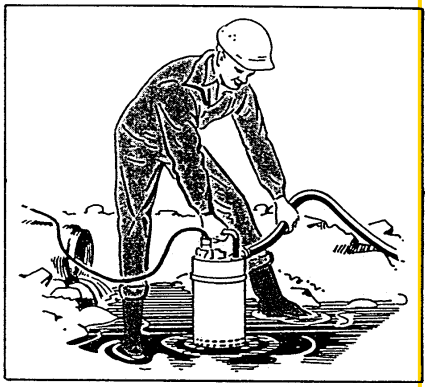
Remove base plate and outer casing. If it is difficult to remove the casing due to deposits or build-up on the inside, the diffuser can be removed together with the casing.

Unscrew the oil plug and drain the oil into a clean can and inspect it. If the oil is clean and contains no water, the primary seal is free from defects and can be used again. If the oil contains water and appears ”milky”, the seals must be changed and ball bearings checked. After inspection and possible change of shaft seals new oil should be filled into the oil chamber.

Oil type: Oil type: White oil with a viscosity of 10-15cSt, such as BP Enerpar M 002 or equivalent.

Oil quantity:		P 601	0.35
	P 801	0.35	
		P 701	0.50
		P 1001	0.50
		P 1501	0.50
		P 2001	0.90
		P 3001	0.90

Replace inspection plug O-ring



Inspection of Hydraulic Parts

Remove the diffuser, and check the rubber coating for wear, missing or heavly scored material, and deposits.

Minor wear is easily compensated by tightening the nuts for the diffuser thus reducing the clearance from the impeller to .0004 in. Replace diffuser and wear plate if the rubber coating is worn to the point where the metal backing is showing, or if any pieces of rubber material are missing or severly gouged.

Inspection of electric cable

Check that the cable is undamaged, if the outer sheath is damaged, water may wick into the motor housing along the inner core. If the cable is damaged, repair or replace. Also check that the cable has not been stretched or deformed. Hard jerks or pulls on the cable may have damaged the bushing in the cable gland.

Trouble shooting

The most frequent functional troubles are usually caused by improper electrical installation, cables, or wiring connections. **Always** have pumps installed by a qualified electrician. A volt ohm meter and valid wiring diagram for the correct voltage are required in order to trouble-shoot the electrical portion of the equipment.

All troubleshooting should be carried out with the equipment disconnected from the electric power supply. The power supply **must** be locked out when performing routine maintenance, or troubleshooting pump. **Always** check that no other person is working with the pump before connecting the pump to power supply and energizing the pump. **All** work with the electrical installation must be carried out by a qualified electrician, or under the supervision of an authorized electrician.

A. The pump will not start.
May be caused by:
1. Dead incoming power lines.
2. Blown fuses or breakers.
3. Defective cable.
4. Defective contactor unit or burned motor
5. Blocked impeller

B. The motor trips out.
May be caused by:
1. Wrong direction of rotation
2. Pump overloaded due to material build up.
3. Excessive water temperature. (Max 105 F)
4. Impeller blocked by stones, pieces of wood.
5. Blocked rotor.
6. Low voltage due to long cables, or inadequate power supply (generator).
7. Phase failure.
8. Burned motor caused by water entering pump either through shat seal or cable entry area.

C. Water inside top cover, and /or main cover
May be caused by:
1. Pump cable damaged or cut permitting water to penetrate into top of pump
2. Loose cable gland or faulty assembly of gland.
3. Damaged 0-ring , foreign matter between motor housing and main cover, or top cover
4. Wire(s) pinched between top cover and main cover.
5. Loose or missing nuts that secure top cover to main cover.

D. Pump operating at too low capacity
May be caused by:
1. Wrong direction of rotation.
2. Worn or damaged impeller and / or diffuser.
3. Clogged strainer.
4. Sharp bends, folds or restrictions of the discharge hose.
5. Total Delivery Head (static head + friction losses) too high

E. Water-in-the-oil-chamber
May be caused by:
1. Defective shaft seal
2. Faulty assembly of 0-rings, mechanical seal, wear plate or

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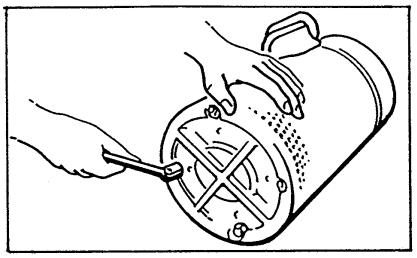
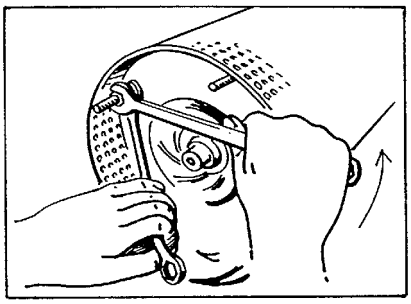
Complete overhaul

A complete overhaul of the pump should be carried out if there has been water or oil in the motor housing, or if the pump has been in daily operation for one year or 2000 operating hours. At low utilization the pumps overhaul intervals can be extended.



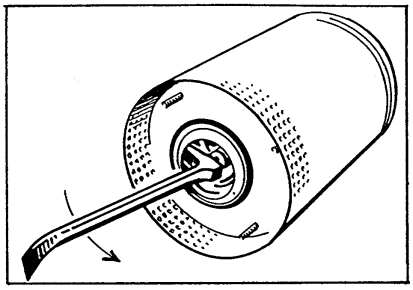
Dismantle the pump completely, replace damaged and worn parts. Clean all sealing surfaces and check that they are not damaged. If water or oil has leaked into the motor housing, inspect and replace ball bearings and shaft seals as required.

Warning
Prior to any work being carried out, always check that the pump is disconnected from the power supply, and cannot be energized.

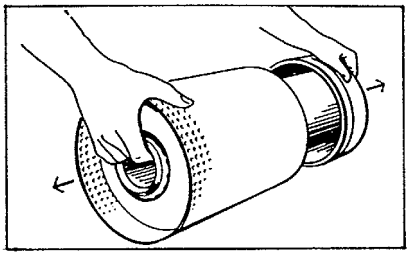


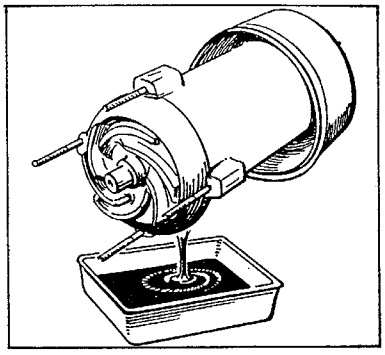
Dismantling

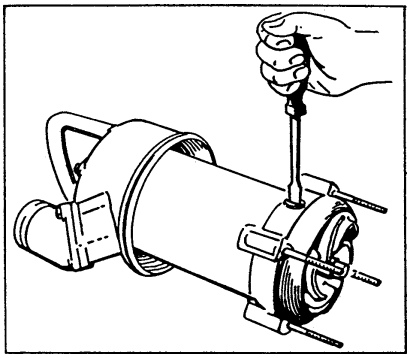
Loosen the bottom nuts/screws and remove the base plate. Unscrew the nuts for the diffuser. Remove outer casing and diffuser with a crow bar applied between diffuser and impeller nut. Pull out the diffuser from the outer casing.



Unscrew the oil plug and drain the oil into a clean can and inspect it. Check the oil. See **maintenance** of Shaft Seals.



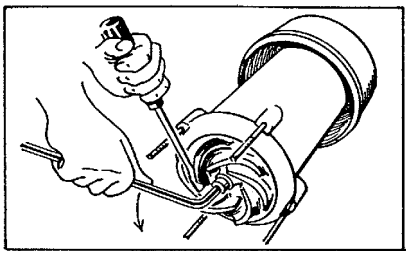


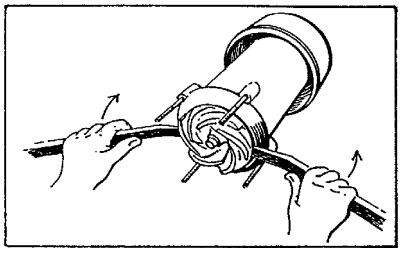


Impeller

Remove the rubber covers from the stud bolts. Hold the impeller with a large screwdriver or similar between the vanes and unscrew the impeller nut with an 8 mm Allen key.

Prize the impeller loose with two screwdrivers under the impeller hub. Remove the key from the shaft. Replace if damaged.

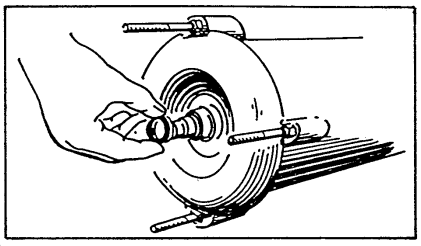


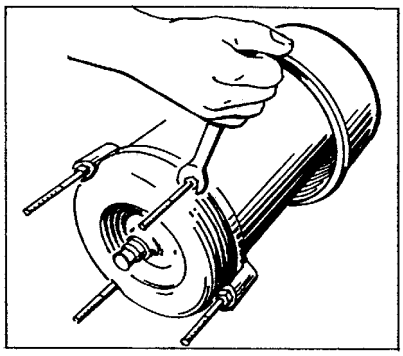


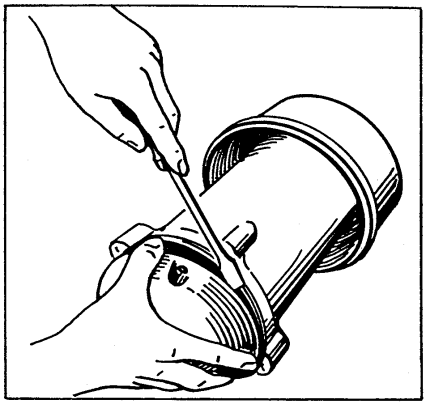
Shaft Seals

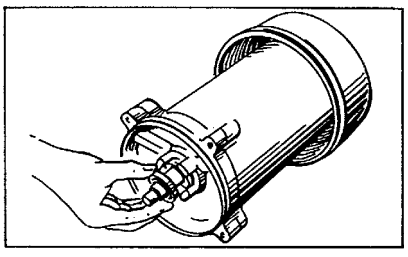
Pull out the rotating ring of the primary seal with sleeve and spring and remove the 0-ring from the shaft.

Unscrew the stud bolts. Withdraw the wear plate and remove the stationary ring of the primary seal.

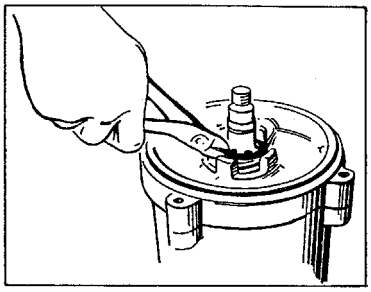


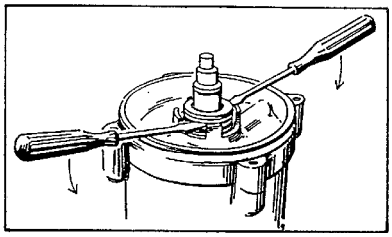


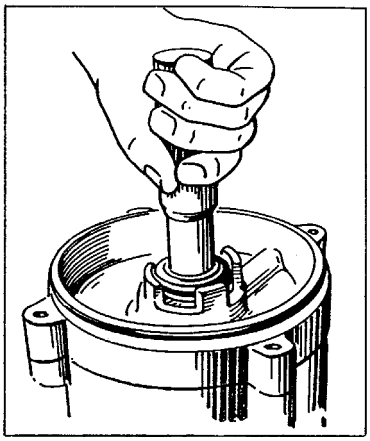


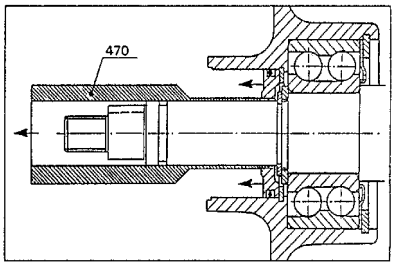


Cut the lock washer part No. 00471 with a pair of nippers. Pull out the lock washer carefully in order to avoid scratching the shaft. Remove any possible scratches before pulling out the rotating part of the secondary shaft seal. Screw puller part No. 00470 into the stationary ring of secondary seal and pull out the ring.



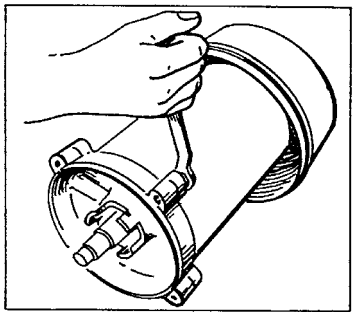


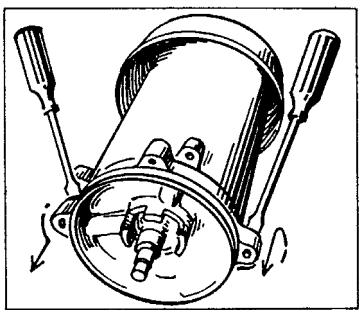




Rotor Unit

Unscrew the screws which hold stator housing and oil casing together. Turn the housing about 15° and prize it loose from the casing with a screwdriver. Remove the stator unit.

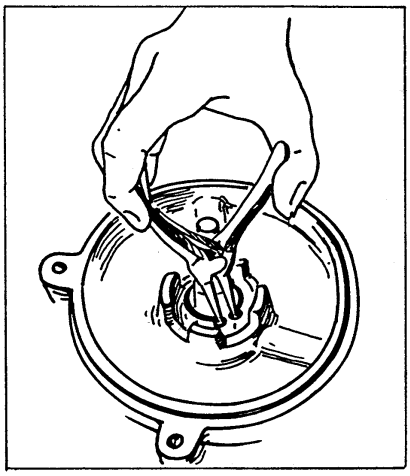


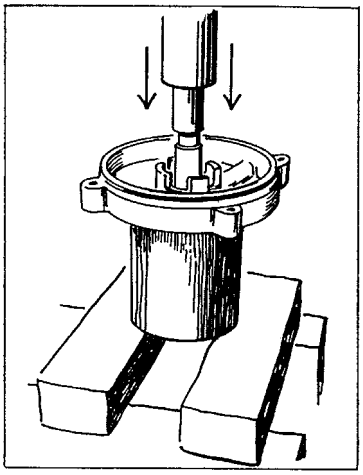


Remove the external circlip on the shaft (inside secondary seal) with a pair of circlip pliers for Dia. 25 mm.

The rotor shaft has to be pressed out of the ball bearing. Put the rotor into a tube of the same length as the rotor shaft and with an inner diameter slightly larger than the outer diameter of the bearing seat.

Press against the end of the shaft until the rotor comes loose. If a high pressure is needed, screw the impeller nut fully on the shaft end in order to protect it.

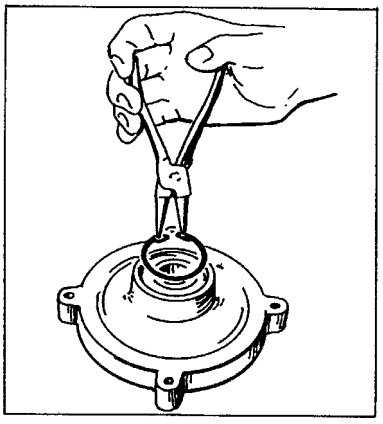


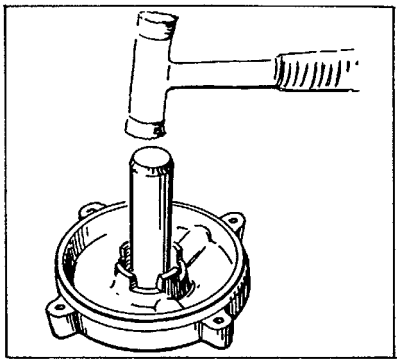


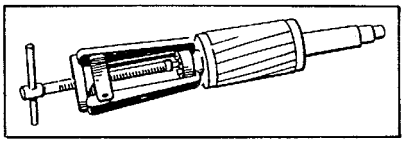
Ball Bearing

Remove the internal circlip and Nilos ring for the ball bearing and press out the bearing. If necessary, the bearing seat can be heated quickly with LP-gas to facilitate the removal.

Remove the washer and circlip in the bottom of the bearing seat. Pull out the upper ball bearing with a puller.





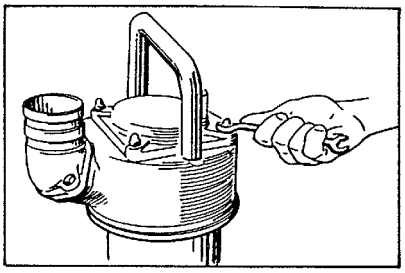


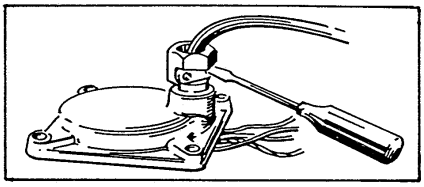
Cover and Cable Gland

Unscrew the cap nuts for the cover. Lift off the cover and disconnect the cable from the contactor (3-phase units only).

If water has penetrated through the cable gland, the cable seal should be replaced. Remove strain relief clamp prior to unscrewing cable gland body. Pull out cable, rubber bushing and washers.

NOTE!! It is very important that the replacement parts be correctly sized for the cable. Incorrect sizing can cause severe damage to the pump.



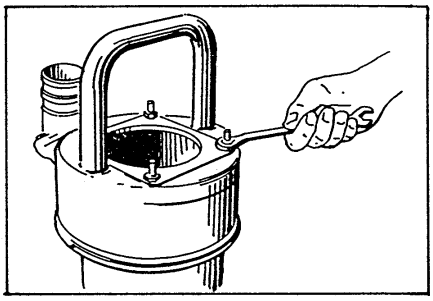


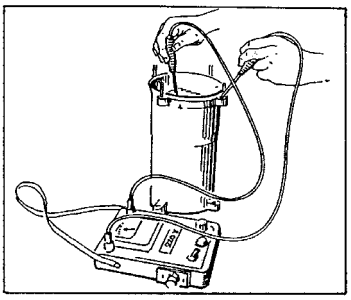
Stator Unit with Contactor

Unscrew the nuts for main cover and remove the main cover from the stator unit.

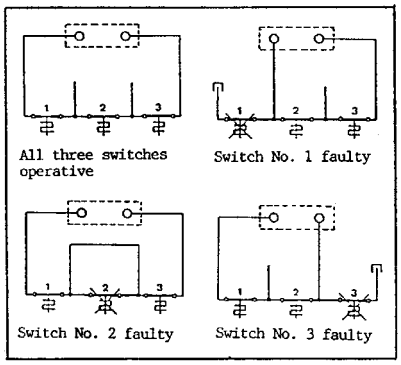
The motor insulation should always be tested in connection with service or repair. Measure insulation resistance between the different phase windings, between windings and ground, and between windings and thermal switch circuit. The insulation resistance should be measured with 500 V megohm-meter, and the reading should be at least I megaohm. If the reading is lower, but not completely open, drying the stator may recover usage of the motor.

If insulation resistance test shows motor open, the stator unit should be rewound, or replaced.





The insulation between the separate turns in the winding should also be checked. This can be done by measuring the resistance of the phase windings, which should give the same reading for all three windings for 3-phase motors. For single-phase motors, the resistance in the auxiliary field is roughly double that in the main field.



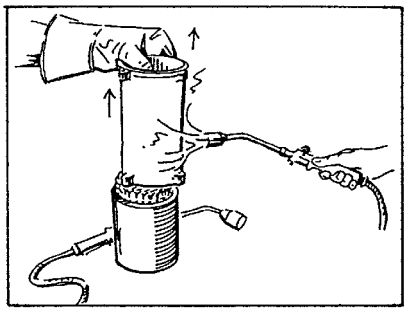
The circuit with the three built-in thermal contacts should be checked for continuity, using an ohmmeter or buzzer.

If the circuit reads open, the defective contact should be identified by checking each individual thermal contact. The faulty thermal contact can be by-passed in accordance with the adjacent wiring diagram.

Disconnect all stator leads from the contactor and remove the contactor. Check that the contactor holding coil is free from defects, and that the contact points are not burned. Replace holding coil, or entire contactor if necessary.

Removal of Stator

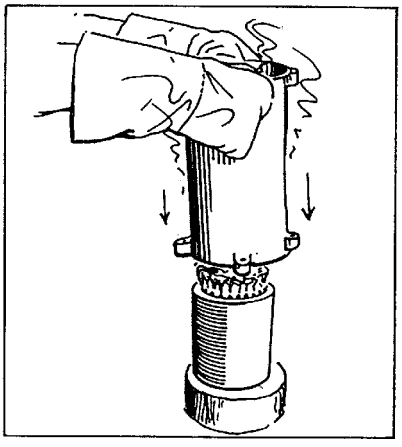
Loosen nuts for the 6-hole seals and pull out the seals. Pull out the cables and arrange them so as to avoid jamming when the stator is falling out of the housing.



Remove the 0-ring in the upper bearing seat. Block up the housing so that the stator can drop freely out of the housing. It is important that the sealing surfaces of the housing not get damaged.

Heat the housing quickly with two LP- gas flames at the stator laminations and downwards, until the stator drops out at a temperature of about 250° C (480° F).

Caution!! Housing and stator will be very hot!!

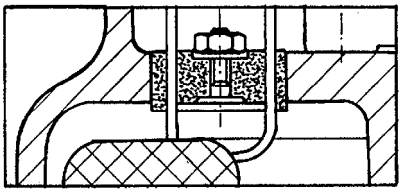


Clean the housing and check it for damage or cracks, particularly on sealing surfaces and in ball bearing seat. If damage cannot be corrected, the housing must be replaced.

Block up the new stator and make sure that the housing can be fully pushed down onto the stator. Protect the stator insulation from damage and insert the terminal wires (free from insulation resin, clean and smooth) into the stator.

Note!! avoid contact with the hot housing during assembly. Burns may occur.

Heat the housing with two LP-gas flames to about 250° C (480° F). With two nozzles, this will take about one minute. Take the hot housing with heat resistant gloves and push it down to its stop over the housing.



Note!! Locate the holes for the terminal cables in the housing about 4 inches from the exit of the cable groups on the winding head.

When the housing has been mounted it may be cooled with compressed air. When the housing has cooled down, the terminal cables can be pulled up through the holes in the housing with a hook made of steel wire. Mount the cable bushings (6-hole seals) on the two groups of cables.

The thermal switches are connected in series and the connections should be well insulated.

Assembly

Prior to assembly, clean all parts carefully, especially 0-ring grooves and mating surfaces.

Grease or oil 0-rings to eliminate damage during assembly. Lubricate screw threads to protect them and to simplify future disassembly.

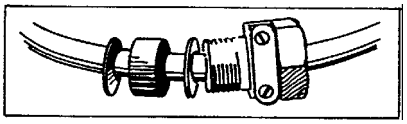
Stator Unit, Contactor and Main Cover

Grease and mount the 0-ring in the upper bearing seat. Connect all stator leads to the contactor according to wiring diagram and mount the contactor at the bottom of the contactor chamber to the mounting rail.

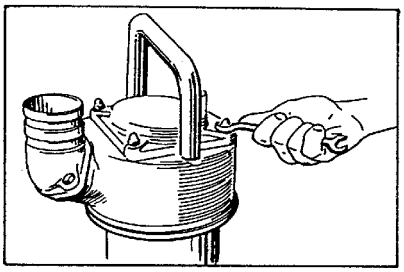
Grease and mount the 0-ring between stator unit and main cover. Mount the main cover on the housing and tighten it against the stator housing with the nuts. Check that the 0-ring or stator leads have not been jammed.

Cable Gland and Cover

Measure inner diameter of cable rubber bushing to see that it corresponds to cable diameter. Place rubber bushing and washers (one on each side of the bushing) on the cable.



Pull cable through the junction box cover, far enough to let the rubber bushing seat on a non-deformed portion of the cable. Tighten the cable gland body and the strain relief clamp.

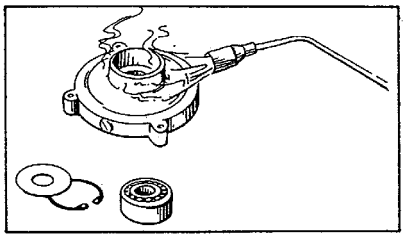


Grease and mount the 0-ring in the cover. Connect the phase leads to the contactor according to wiring diagram and screw the green ground lead in the main cover.

Mount the cover on the main cover and arrange the leads so that they are not jammed or block the functioning of the contactor. Tighten the cover with the cap nuts.

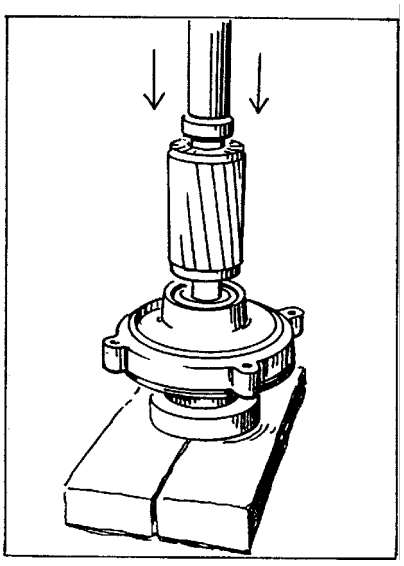
Ball Bearings

Clean the oil casing and all sealing surfaces thoroughly. Remove burrs and scratches. Pack the ball bearing up to 2/3 of its volume with a ball bearing grease e.g. Shell Alvania Grease 3 or SKF Alfalub LGMT 3/1.



Mount the washer in the bottom of the bearing seat on the circlip.

Heat the bearing seat with LP-gas to about 150° C (340° F), and mount the bearing in the seat. Mount the nilos ring and circlip on top of the bearing.



Place the oil casing on a press with hole for the rotor shaft and resting against the inner ring of the ball bearing. Place upper bearing on the shaft and press both bearings into position against the shaft shoulders.

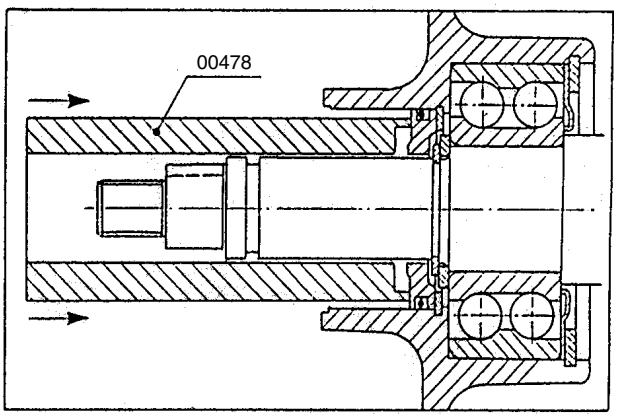
Mount washer and circlip on the shaft below lower bearing. Turn the rotor by hand and check that it turns freely without seizing.

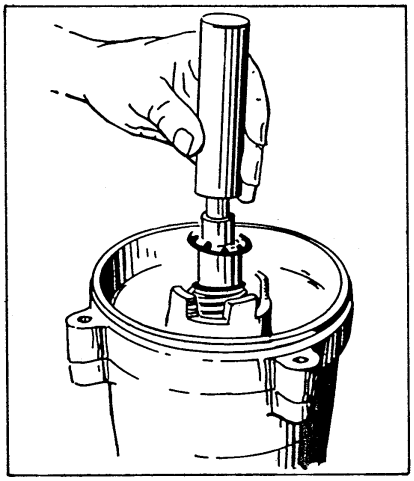
Grease and mount the 0-ring between stator housing and oil casing, put grease on the casing side. Slip the stator unit onto the rotor unit and check that the 0-ring is not jammed or pinched. Tighten the stator housing to the oil casing with the screws.

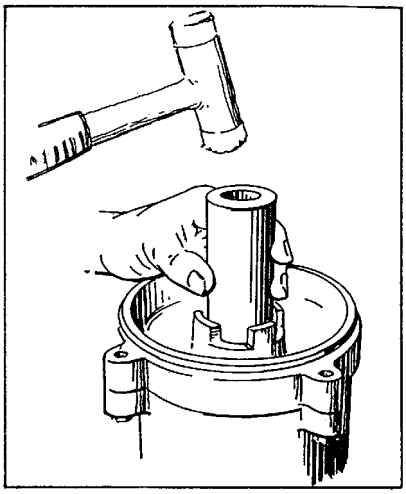
Secondary seal

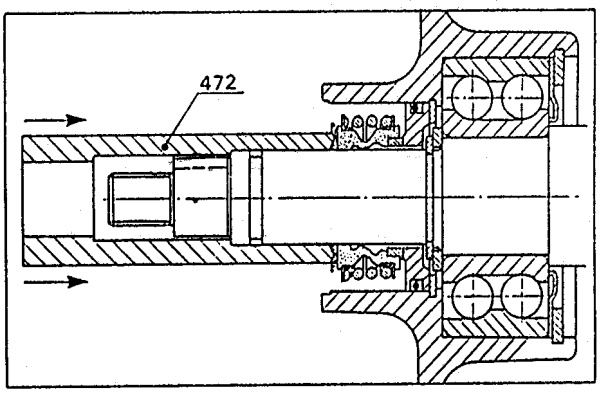
Clean and grease the seal seat in the oil casing and mount the stationary ring with 0-ring part No. 00461. Push it down to the bottom of the seat with tool part No. 00478.

Push the rotating part of the secondary seal onto the shaft with tool part No. 00472. Mount lock washer (included) part No. 00471, using the same tool. Push the tool down to its stop against the shaft end. Shaft seal should then be fully seated.









SERVICE INSTRUCTION
P 601 - P 3001

P 601/701/801/1001/1501/2001/3001.58.0308.Eng/Digital

Primary Seal

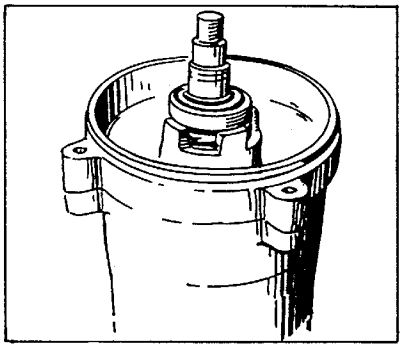
Mount stationary ring of primary seal with 0-ring in its seat in the oil casing. The clearance between the lock washer and the stationary ring of the primary shaft seal should be about .001".

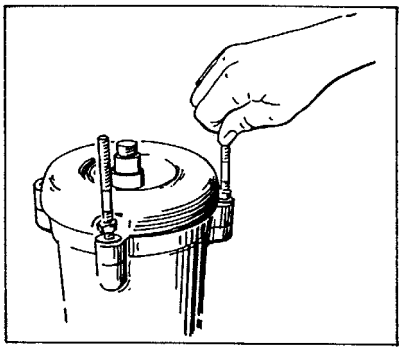
Before the outer 0-ring is mounted on the oil casing, check that the wear plate is sealed tightly against 0-ring.

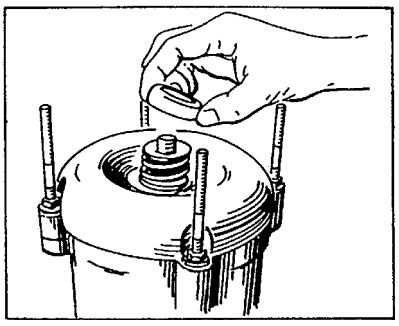
Grease and mount 0-ring in casing, and assemble wear plate with washers and stud bolts.

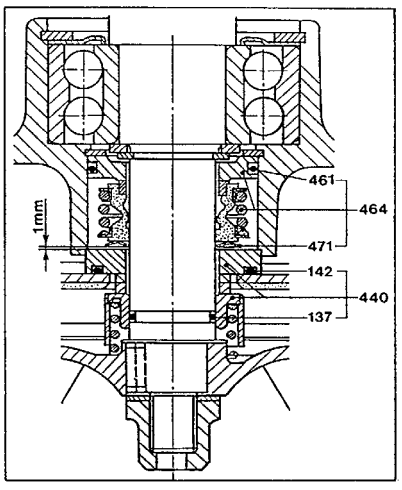
Mount the rubber covers on the stud bolts and over the knobs on stator housing and oil casing.

Grease and mount a new 0-ring (included in new replacement seal) on the shaft. Oil the sealing surfaces of the mechanical seal and carefully push the rotating ring onto the shaft. Avoid touching seal face, contaminants from fingers may damage seal face. Assemble the seal spring and spring sleeve.



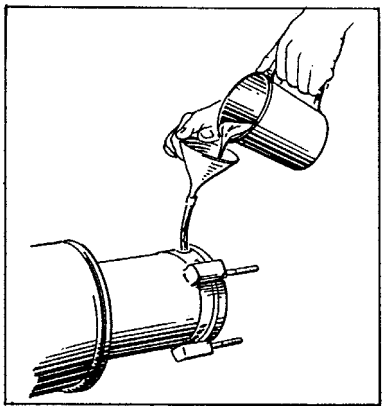






Impeller

Mount the impeller on the shaft, securing it with key, spring washer and nut. Check that impeller runs free of wear plate with a clearance of 0.5- 1 mm (0.02"-0.04"). For P 601/801 the clearance should be 1-2 mm (0.04"-0.08"). Adjust the clearance with shims between impeller and shaft if necessary.



Fill new oil in the oil chamber, check quantity by model.

Oil type: White oil with a viscosity of 10-15cSt, such as BP Enerpar M 002 or equivalent.

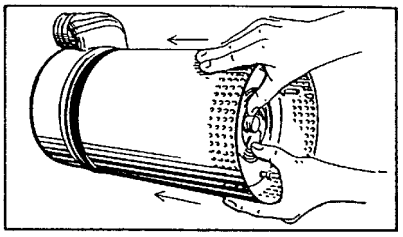
Correct quantities of oil are as follows:

P 601-801	0.35 liters (0.75 pint)
P 1001-1501	0.50 liters (1.5 pt.)
P 2001	0.90 liters (1 qt.)
P 3001	0.90 liters (1 qt.)

Tighten the oil plug using a new 0- ring.

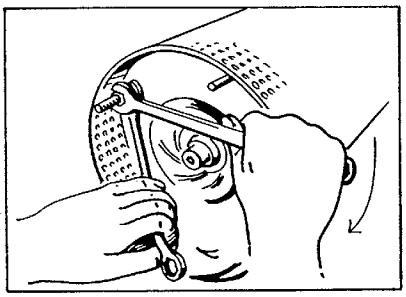
Diffuser and Outer casing

Insert the coil springs onto the stud bolts (P 2001-3001). Mount the diffuser on the stud bolts and screw one nut onto each stud bolt.



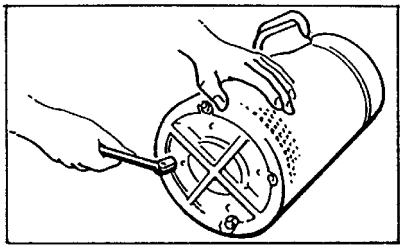
Grease and mount the O-ring on the main cover. Also grease the outer diameter of the diffuser. Push the outer casing over the diffuser towards the main cover, and check that the O-ring is not pinched or caught between the outer case and the main cover.

Tighten the nuts for the diffuser alternately until the impeller runs free from the diffuser with a clearance of 0.1-0.3 mm (0.004-0.012").



Loosen the nuts about 1/3 turn and lock with jam nuts. For single phase pumps and Enduro Lining™ the diffusers should be adjusted with a clearance of 0.3 mm (0.012") minimum. Mount the rubber sleeves on the stud screws.

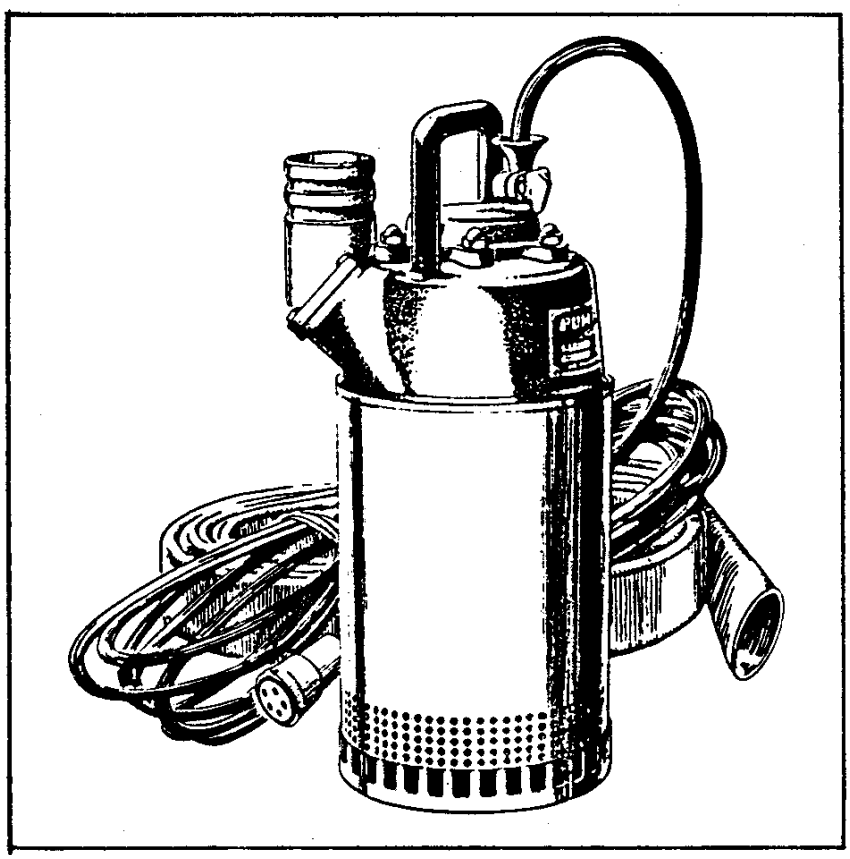
Mount the base plate and tighten it firmly with lock nuts.



Testing

Connect power cable to power supply and start the pump. Check the direction of rotation. Seen from above, the pump should make a counter-clockwise jerk.

If possible, operate the pump in water and measure the head against a PSI gauge. Measure the PSI and use formula-Feet = PSI X 2.31 Check against pump curve, it should be close to max lift.



P 3001 H - 50 Hz

Assembly and adjusting the diffuser and impellers (two impellers).

Please note that the second impeller, 353477, is adjusted by washer 03176 and locked by a distance sleeve, having the same length as the hub of the first impeller, 03016.

The guide vane, 03174, is screwed together with the diffuser, 03210, by three screws, 03189, + Loctite in the treads. Nuts, 03031, are placed between the diffusor and the guide vane. Partly mounted details are put down on the stud bolts, 03249. Then put six pcs of washer 03121 and six pcs of nuts, 03031, on the guide vane.

Adjust the diffuser, 03210, against the impeller. After this the nuts are slacked loosen (opened) a quater of one turn. *It is important that the impeller is close to the diffuser in order for the pump to give the promised high head.*

That the diffuser is correct installed (parallell) can be checked by measuring the distance from the guide vane up to the motor. The distance between the upper side of the impeller and the guide vane is adjusted by shims, 00179, to about 1 to 1,5 mm. Please note that the shaft key, 03149, should be fitted after the shims.

The washers, 03121(six pcs), are placed on the stud bolts and thereafter the diffuser, 03172. The distance between the impeller and the diffuser are adjusted by one or several adjusting shims, 03235. It has to be the same amount on each stud bolt. The distance should be about 0,1 to 0,2 mm. Two nuts on eachother are then locking it all.

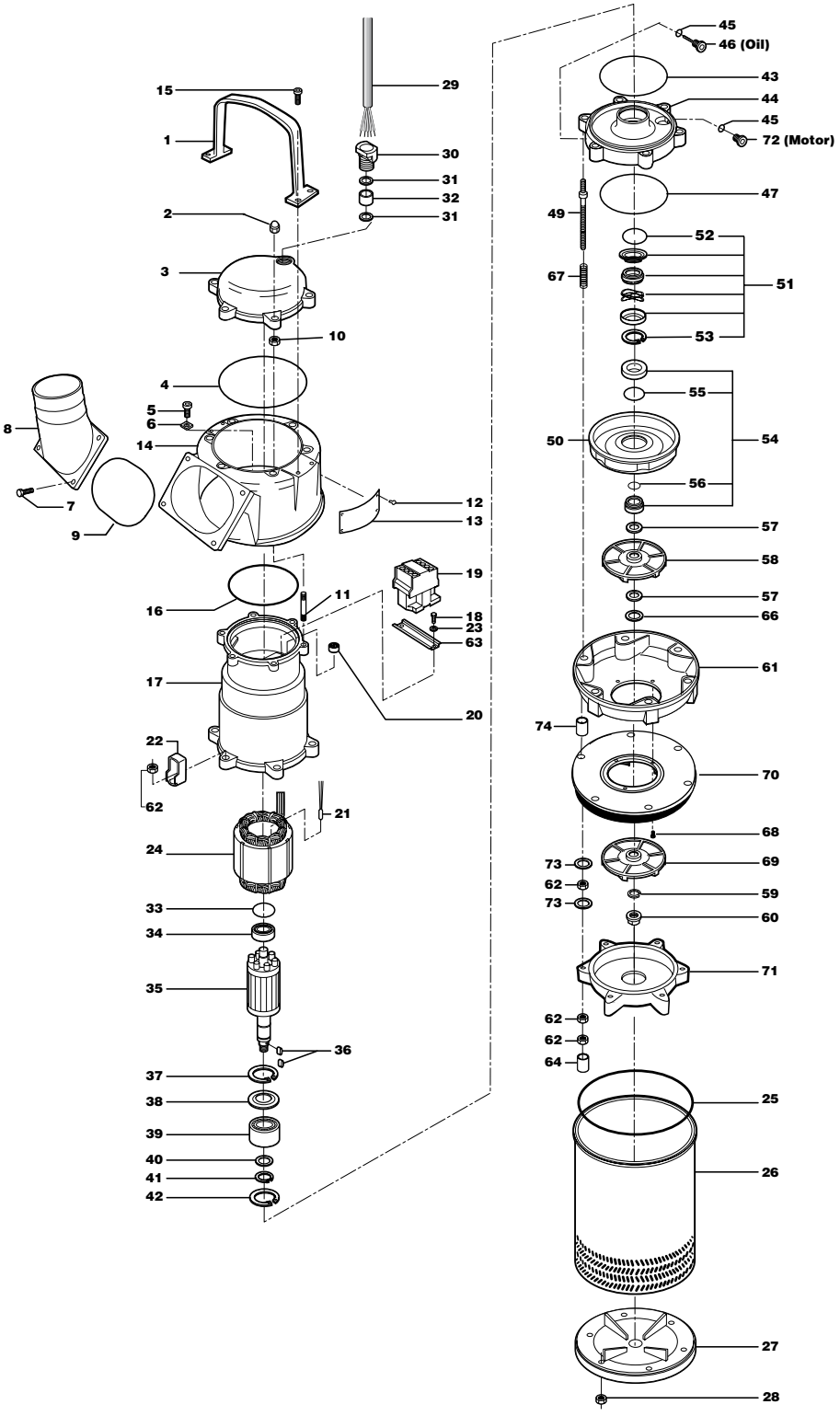
After this there are only the rubber sleeves, 03179, on the nuts, the outer casing and the bottomplate left to mount and the pump is ready to use again.

It is advisable, to save time, that the pump is always started for a few seconds to check that the impellers are rotating while still in the workshop. If the nuts are screwed on too tight the impellers are too close tho the diffusers.

SERVICE INSTRUCTION

P 601 - P 3001

P 601/701/801/1001/1501/2001/3001.58.0308.Eng/Digital



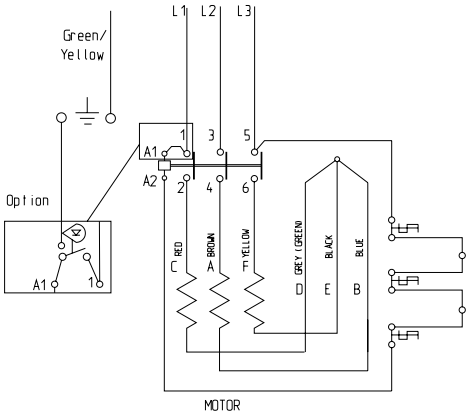
SERVICE INSTRUCTION

P 601 - P 3001

P 601/701/801/1001/1501/2001/3001.58.0308.Eng/Digital

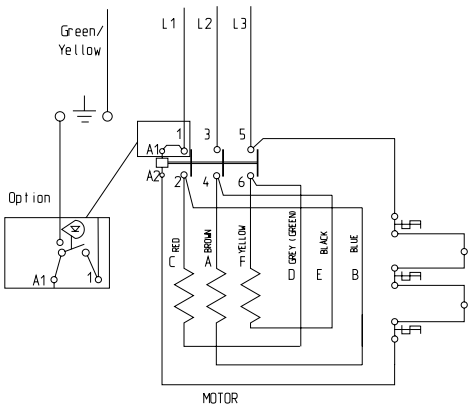
50 / 60 Hz

1 Y



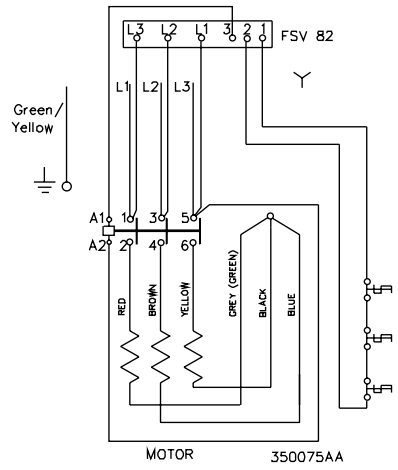
350072 AC

2 Δ



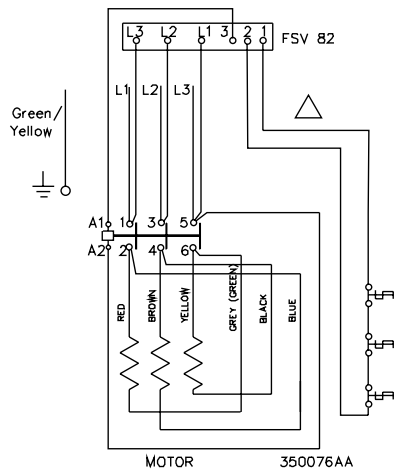
350071 AC

3 Y+FSV 82



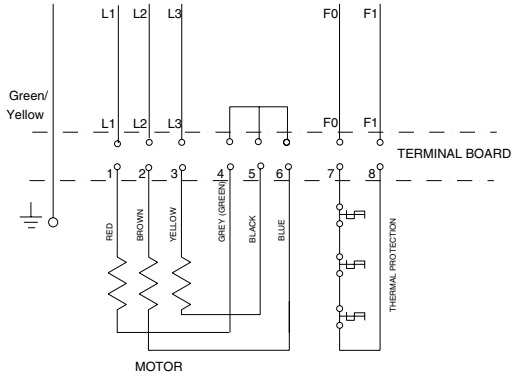
350075AA

4 Δ+FSV 82



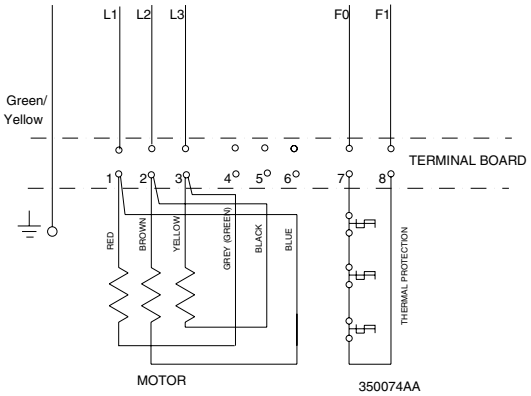
350076AA

5 Y



350073 AA

6 Δ



350074AA

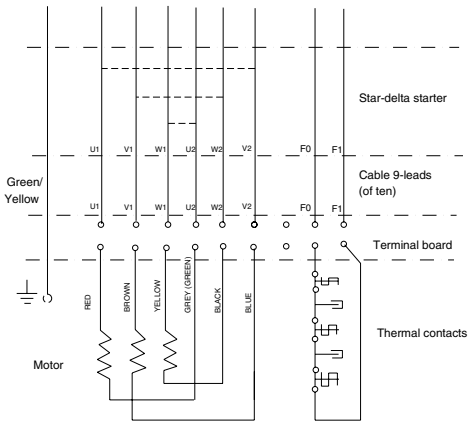
SERVICE INSTRUCTION

P 601 - P 3001

P 601/701/801/1001/1501/2001/3001.58.0308.Eng/Digital

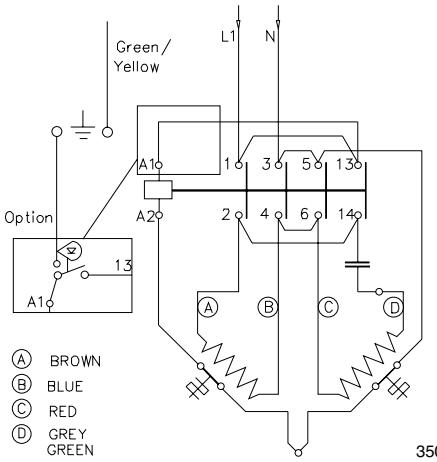
50 / 60 Hz

7 Y/



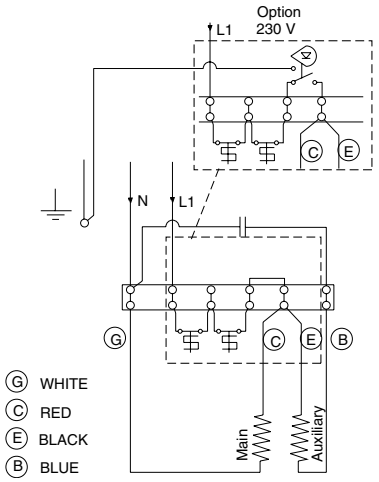
350078 AA

8 1~



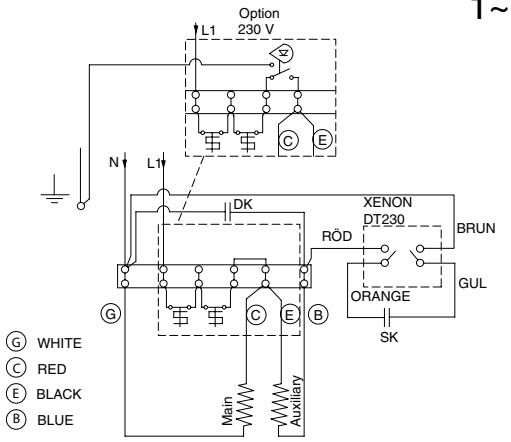
350077 AB

9 1~



350768 AC

10 1~



355349 AA

SERVICE INSTRUCTION

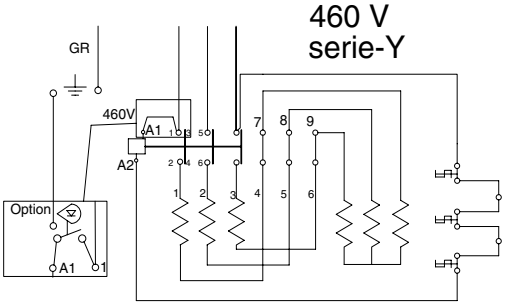
P 601 - P 3001

P 601/701/801/1001/1501/2001/3001.58.0308.Eng/Digital

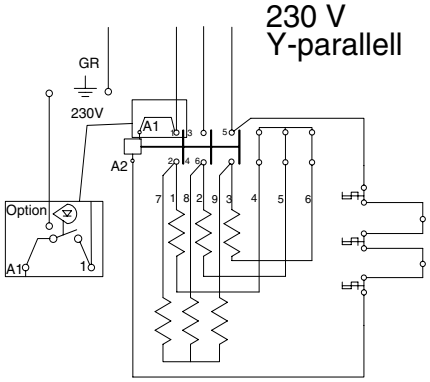
60 Hz, 230/460 V, 1~115/230 V

11

460 V
serie-Y



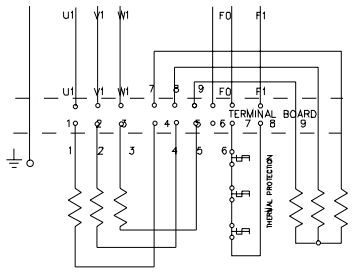
230 V
Y-parallell

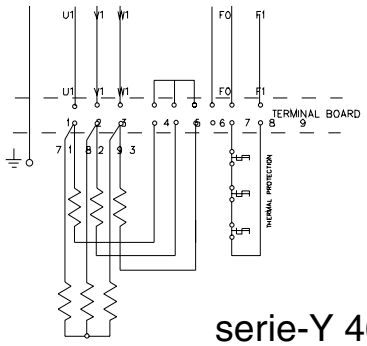


353687 AA

12

Y-parallell 230 V



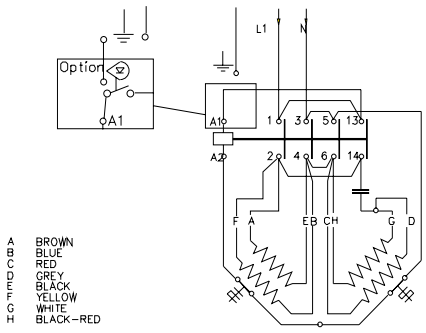


serie-Y 460 V

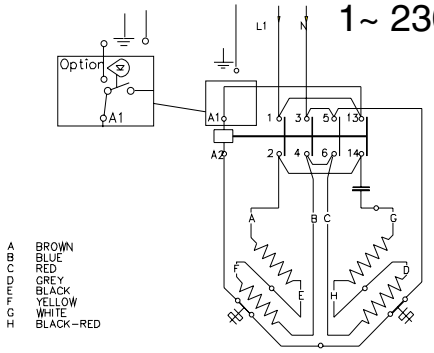
351039 AC

13

1~ 115 V



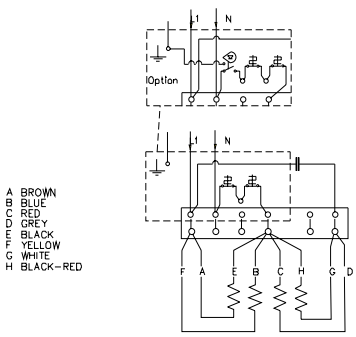
1~ 230 V



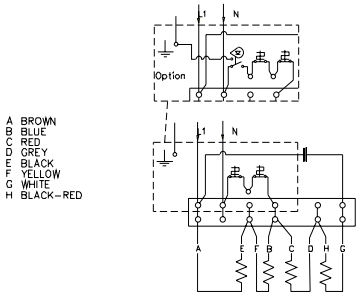
351041 AC

14

1~ 115 V



1~ 230 V



350766 AD