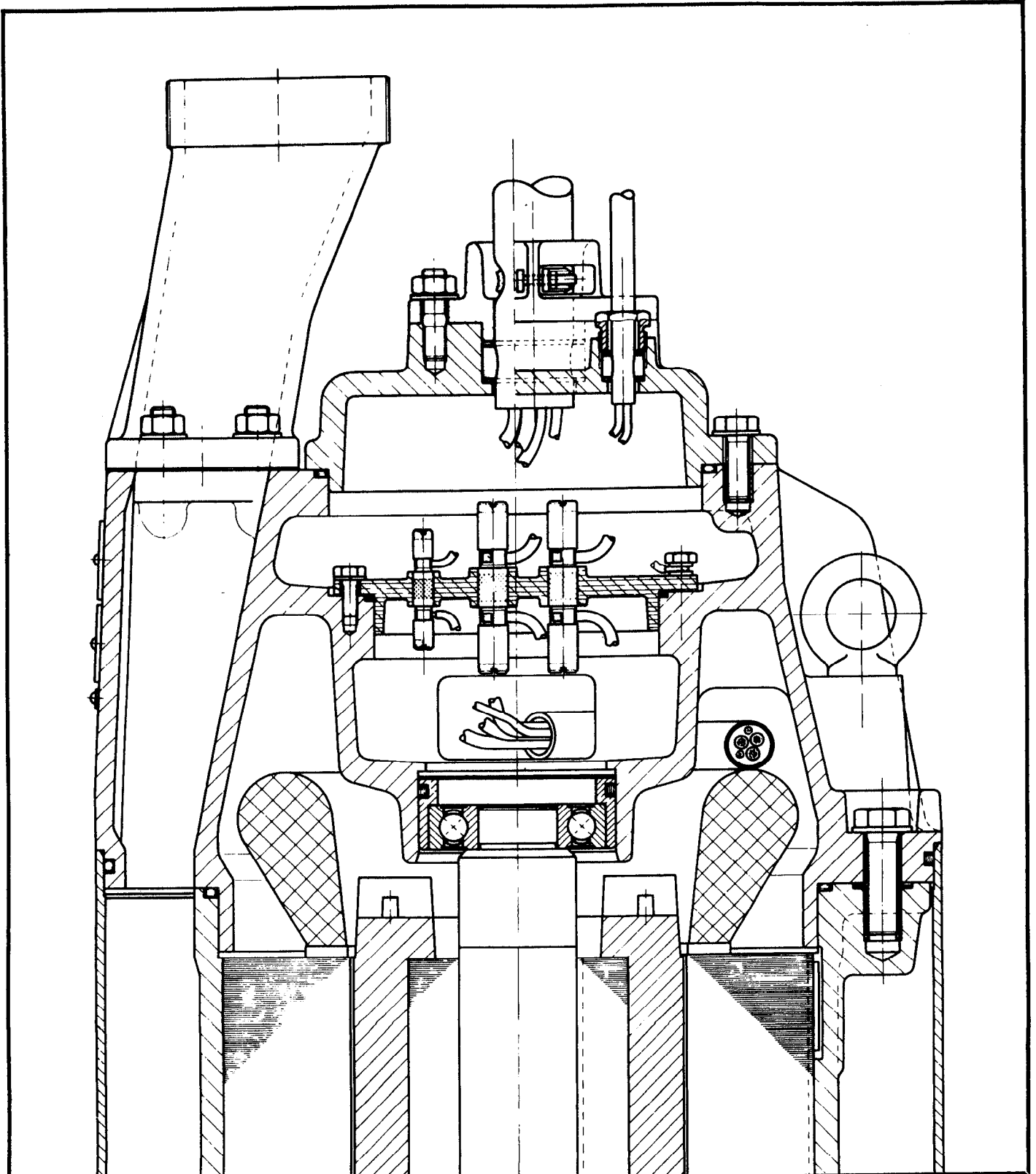
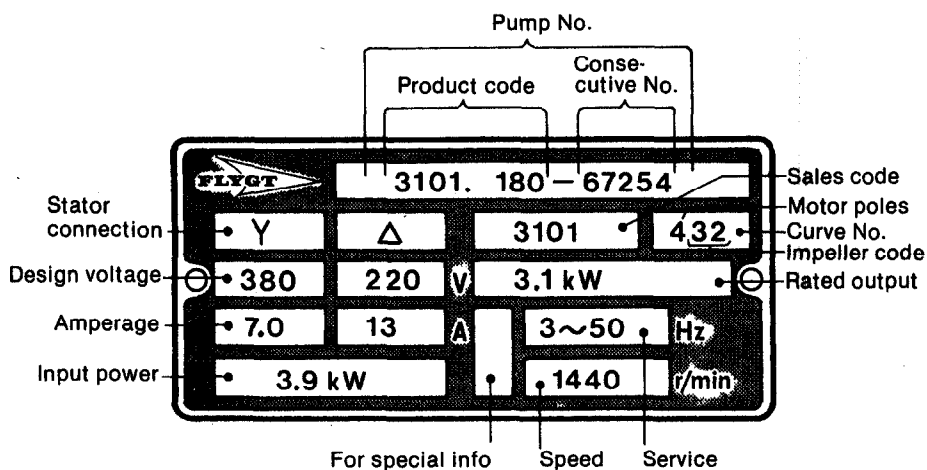


2201.010
011

Workshop manual



Data plate interpretation



Flygt undertakes to remedy faults in products sold by Flygt provided:

- that the fault is due to defects in design, materials or workmanship;
- that the fault is reported to Flygt or Flygt's representative during the guarantee period;
- that the product is used only under conditions described in the care and maintenance instructions and in applications for which it is intended;
- that all service and repair work is done by a workshop authorized by Flygt;
- that genuine Flygt parts are used.

Hence, the guarantee does not cover faults caused by deficient maintenance, improper installation, incorrectly executed repair work or normal wear and tear.

Flygt assumes no liability for either bodily injuries, material damages or economic losses beyond what is stated above.

Flygt guarantees that a spare parts stock will be kept for 10 years after the manufacture of this product has been discontinued.

The manufacturer reserves the right to alter performance, specification or design without notice.

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2201.011 and 2201.010

Pump 2201.011 is a modified version of pump 2201.010.

The design of the pumps differs with respect to the following essential points:

- **Shaft/Rotor unit**
- **Outer seal**
- **Oil casing bottom**
- **Oil casing/Pressure equalizer**
- **Terminal board/Earth connection**
- **Impeller attachment**

2201.011:

Shaft design

The shaft has no circlip and no O-ring groove for the outer seal. The shaft has a keyway and a threaded end. The impeller key has been shortened.

Outer seal

The seal has a compression spring around the shaft in a stainless steel sleeve.

The rotating force is transmitted by a stainless steel driver. The driver holds the seal unit together during assembly when the key is fitted on the shaft.

Oil casing bottom

The oil casing bottom has been modified to fit the outer seal.

The replaceable wear ring used in the 2201.010 is omitted in the 2201.011.

Oil casing/Pressure equalizer

The lower part of the stator casing has been modified so that a given volume of air is entrapped in the casing when the pump is placed with the oil hole marked "OIL FILLING" up during oil filling. The pressure equalizer is therefore omitted in pump 2201.011.

Terminal board/Earth connection

The terminal board has been modified so that the earth connection is now threaded directly to the body of the upper bearing housing.

Impeller attachment

2201.011:

Torque is transmitted to the impeller by means of a key. The impeller is tightened to the shaft by means of a nut that is locked with a locking washer.

2201.010:

This version is available with two different types of impeller attachment:

1. Key, washer, screw.
2. Taper sleeve, washer, screw.

PRODUCT DESCRIPTION

Applications

2201.011 is intended to be used for:
pumping of water which may contain abrasive particles.

Liquid temperature: max. 40°C (103°F).

Liquid density: Max. 1100 kg/m³ (9.2 lb per US gal).

The pumped liquid may contain particles up to a size which corresponds to the openings in the strainer.

The pH of the pumped liquid: 5—8.

Depth of immersion: max. 20 m (65 ft).

The pump shall not be used in explosive or flammable environments or with flammable liquids.

For other applications, contact your nearest Flygt representative for information.

Design

2201 is a submersible, electric motordriven pump.

Impellers

The pump is available with the following types of impellers:

radial-flow impeller of hardened nodular iron. HT-version.
mixed-flow impeller of chromium-alloyed cast iron. MT-version.

Shaft seals

The pump has two mechanical seals which provide the isolation necessary between the electric motor and the pumped liquid.

Materials:

Inner seal: tungsten carbide — carbon.

Materials:

Outer seal: tungsten carbide — tungsten carbide.

Shaft

Shaft material: stainless steel.

Oil casing

The oil lubricates and cools the seals and acts as a buffer between the pump casing and the electric motor.

2201.011: A built-in air volume reduces the pressure rise in the oil casing.

2201.010 has an air-filled rubber hose that serves as a pressure equalizer.

Monitoring equipment

The stator incorporates three thermal protectors connected in series.

The thermal protectors:

open at 125°C (260°F)

close at 70°C (160°F)

See also "Electrical connections" and separate instructions for starters.

Cooling

The stator is cooled by the pumped liquid passing through the space between the stator casing and the outer casing.

ELECTRICAL DATA

Motor

Squirrel-cage 3-phase induction motor for 50 Hz or 60 Hz.

The motor is started by means of:

direct on-line start

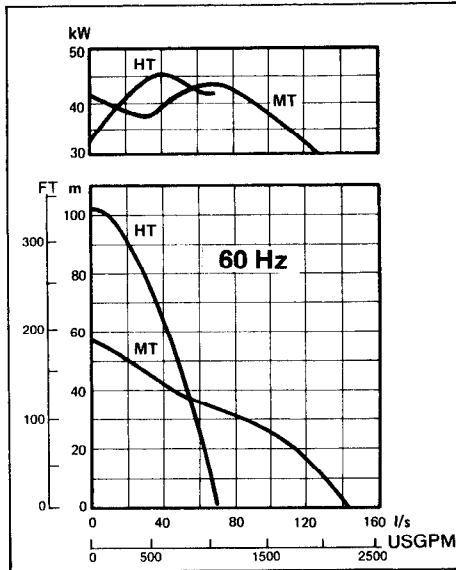
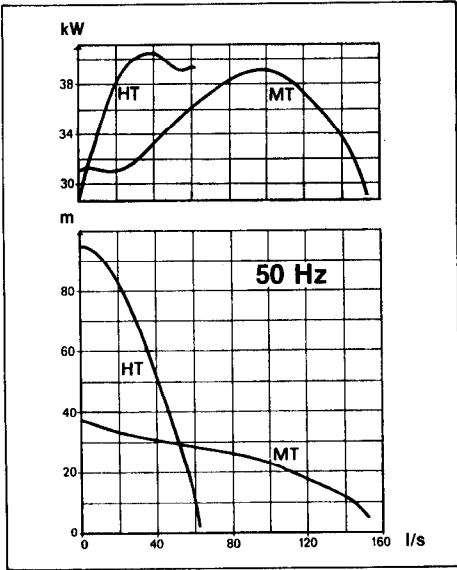
star-delta start

The motor can be run:

continuously or intermittently with a maximum of 15 evenly spaced starts per hour.

The stator is insulated to IEC 85 class F (155°C). The motor is designed to supply its rated output at $\pm 5\%$ variation of the rated voltage. $\pm 10\%$ variation of the rated voltage can be permitted without overheating. The motor is designed to operate with a voltage imbalance of up to 2% between the phases (according to IEC 34-1).

TECHNICAL DATA



The pump curves show:
 — input power at various operating points.
 — flow rate versus total head.

The following abbreviations are used:
 MT = medium-head version
 HT = high-head version

Dimensions and weights

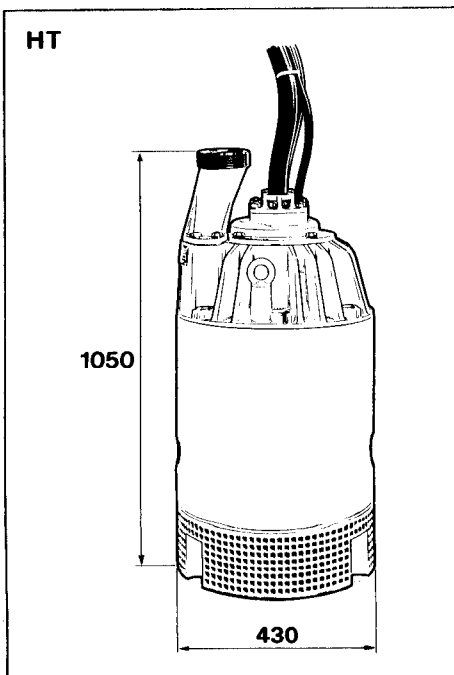
All dimensions are in mm (in).

See the table.

Weight in kg (lb) without motor cable and discharge connection:

MT = 280 (618)

HT = 240 (530)



MT	
A	B
6"	1253
8"	1253
R6, NPT 6	1153
R8, NPT 8	1153

Technical drawing of the MT pump model. The drawing shows a cylindrical pump with a motor cable and a discharge connection. Dimension A is the diameter of the top connection, and dimension B is the total height. The diameter of the main body is labeled as 500 mm.

OIL VOLUME = 5 L (5.3 quarts)

The oil hole is marked "OIL FILLING" (2201.011).

Use the following oil or their equivalent:

BP, Energol TOU 10W-30

Castrol, Castrolite 10W-30

Esso Extra Motor Oil 10W-30

Gulf Multi G 10W-30

Mobil Delvac Oil 1210

Delvac special 10W-30

Shell, Tractor Oil Universal 10W-30

Tellus T Oil 27

Shell Clavus Oil 27

Texaco Havoline Motor Oil 10W-40

Mobil Whiterex 309 or an equivalent paraffin oil is recommended for raw or clean water pumping.

BEARINGS

The lower bearing consists of a two-row angular-contact ball bearing mounted in pair.

The upper bearing consists of a deep-groove bearing.

The pump bearings are designed for at least 15,000 hours of operation.

BEARING GREASE

Below stated bearing greases are recommended:

Esso Unirex N3

BP Energrease LS3

Chevron Industrial Grease Heavy

Esso Beacon 3

Shell Alvania Grease R3

Texaco Regal Starfax Premium 3

Quantities of grease

upper bearing: 40 g (20 + 20 reserve) 1.4 oz (0.7 + 0.7 reserve)

lower bearings: 140 g (4.7 oz)

TIGHTENING TORQUE

Impeller 2201.011: 200 Nm (147.5 ft lb)

Impeller 2201.010: 75—100 Nm (55—74 ft lb)

Oil hole screws: 40—45 Nm (Locking washer) (29.5—33 ft lb)
10—20 Nm (O-ring) (7.4—15 ft lb)

DISMANTLING

Draining the oil

Lay the pump on its side on a bench or over two supports.

Remove the plug (23) and the washer (24) from the oil hole marked "OIL DRAINING" ("OIL" on the 2201.010).

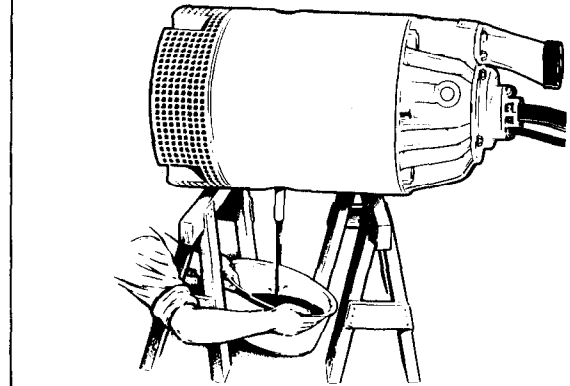
WARNING. If the seal leaks, the oil casing may be under pressure. Hold a rag over the oil plug to prevent splatter.

Unscrew the oil casing screw (36) and remove the O-ring (20). Screw in the oil drainage tube (the tube is included with the pump at delivery).

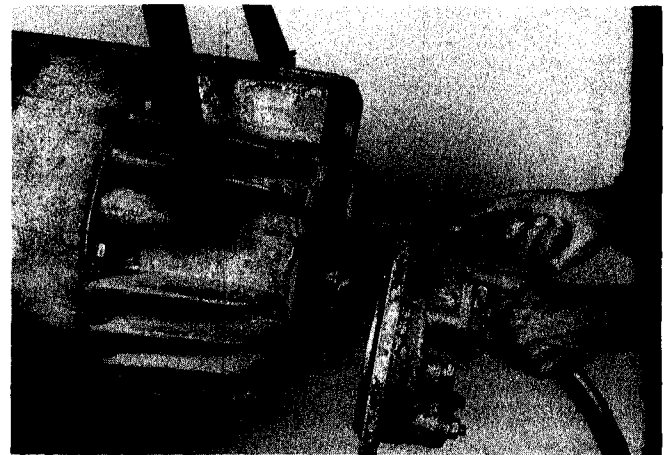
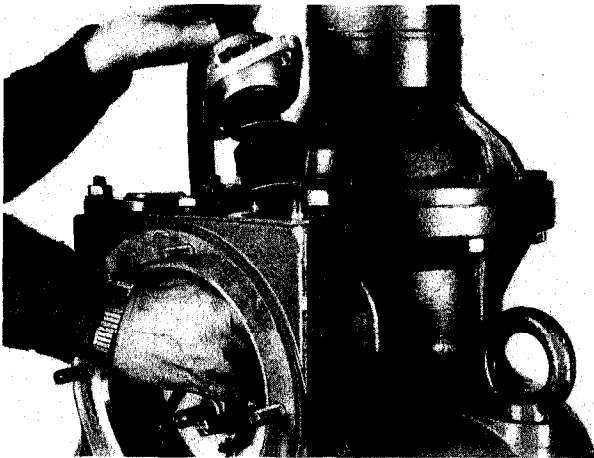
Turn the pump so that the oil drainage tube points downwards. It is easier to drain the oil if the other oil hole screw is also removed.

Remove the hose connection (100).

Draining the oil



Removing the motor cable (45) and cable entry unit (47)



Remove the junction box cover and the cable entry unit (47) with motor cable.

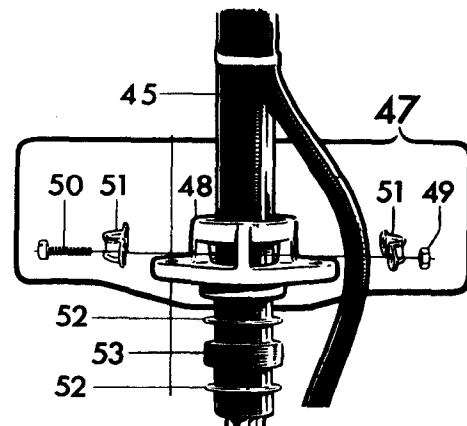
Remove the junction box cover (107). Disconnect the cable entry unit (47).

Disconnect the control and motor cable from the terminal board (81).

Remove the nuts (12) that hold the flange (48).

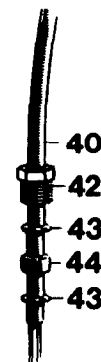
Pull out the motor cable (45) and remove the washers (52) and the seal sleeve (53).

Undo the nuts (49) and pull the flange off the motor cable.



Removing the control cable (40)

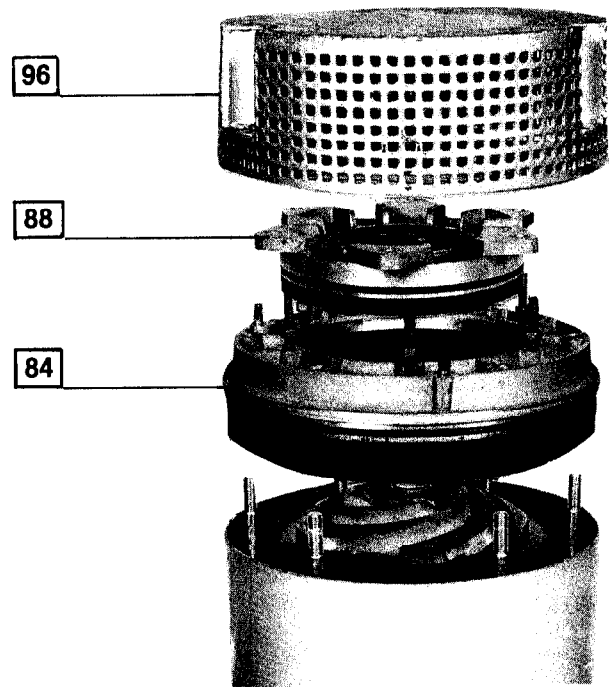
Unscrew the gland screw (42), pull out the control cable and remove the washers (43) and the rubber seal (44).



Hydraulic parts:

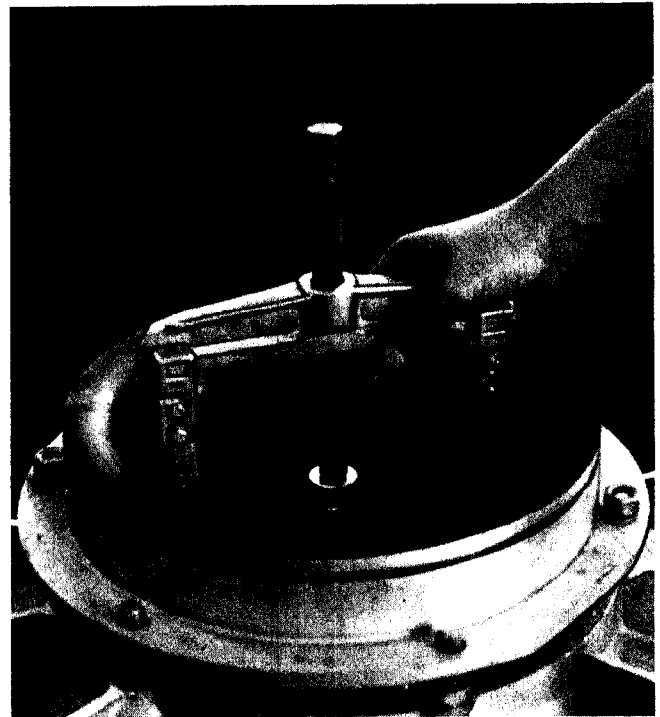
Turn the pump with the strainer upwards and place it on a piece of wood or some other soft surface.

Remove the strainer (96), the lower diffuser (88) and the diffuser ring (84).



Removing the diffuser ring (84)

If the diffuser ring is difficult to lift off, put back the lower diffuser (88) upside down and secure it to the diffuser ring with two nuts. Use puller 84 13 60 as shown in the picture.



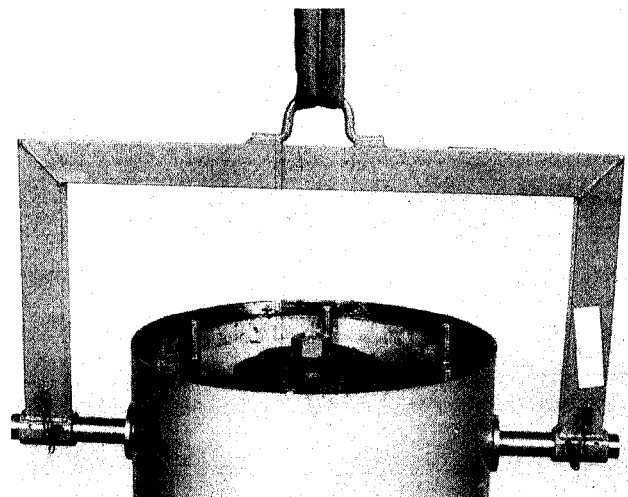
Removing the outer casing (95)

Mount lifting tool 399 49 00 in place of the oil plugs.

Lift carefully until the outer casing comes loose from the upper bearing housing (82).

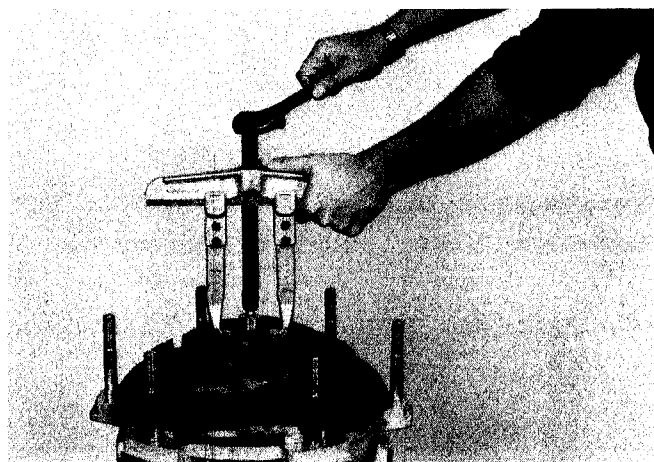
Turn the outer casing so that the oil plugs' threaded connection sleeves can pass freely between the stator casing's support tabs.

Lift off the outer casing.



Removing the impeller (99) 2201.011

Use impeller puller 84 13 60 or pry off carefully with two strong screwdrivers or bars.

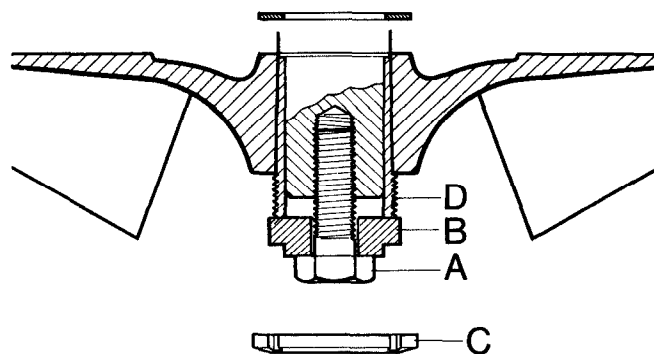


Removing the impeller with taper sleeve 2201.010

Remove the rubber ring that protects the threads on the taper sleeve, D.

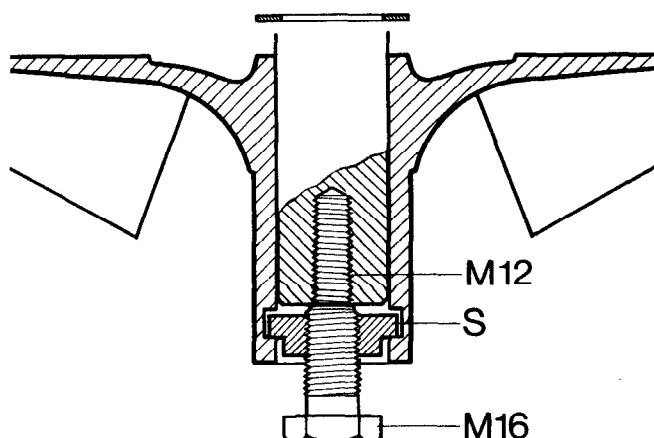
Remove screw A and washer B.

Thread puller nut C onto the taper sleeve thread and tighten until sleeve D comes loose. The sleeve may be seated so tightly on the shaft end that it is necessary to use a puller, which is applied to the puller nut.



Removing the impeller with a special nut in the impeller hub 2201.010

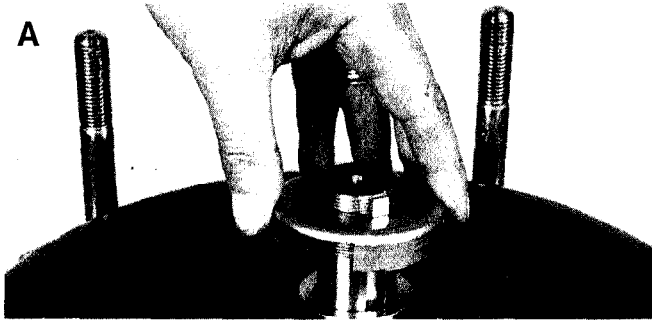
Unscrew the impeller screw (M12) and screw an M16 bolt into the special nut S. When the M16 bolt pushes against the shaft journal, the impeller will be pulled off.



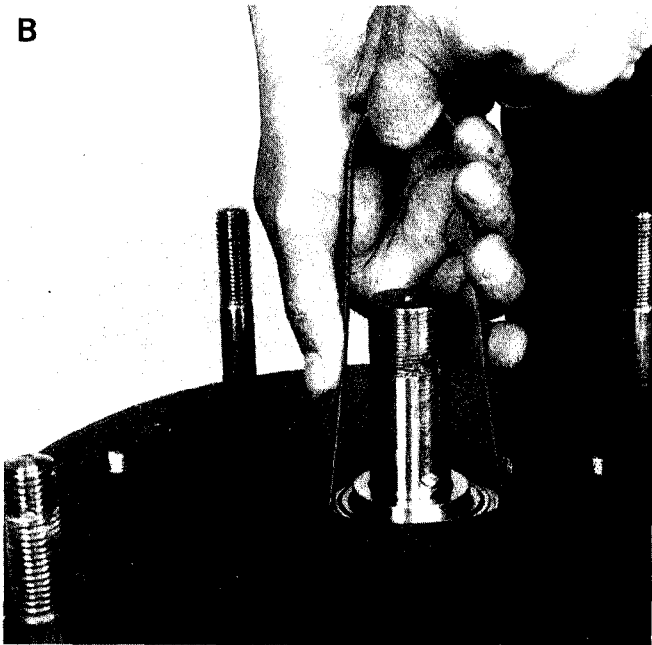
Removing the outer seal unit (62) 2201.011

Rotating seal ring unit (124):

Remove the key (1) and the adjusting washers (59).



Remove the drive ring (140).



Lift up the seal unit (133) by pulling up the seal ring with puller tool 216 68 00.



Remove the seal ring holder (138).



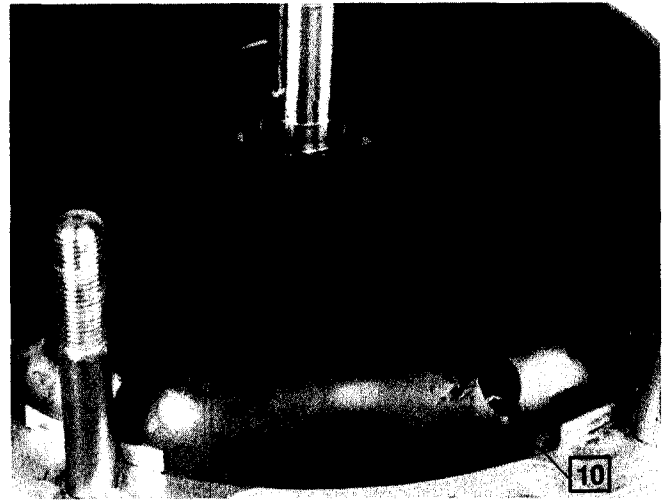
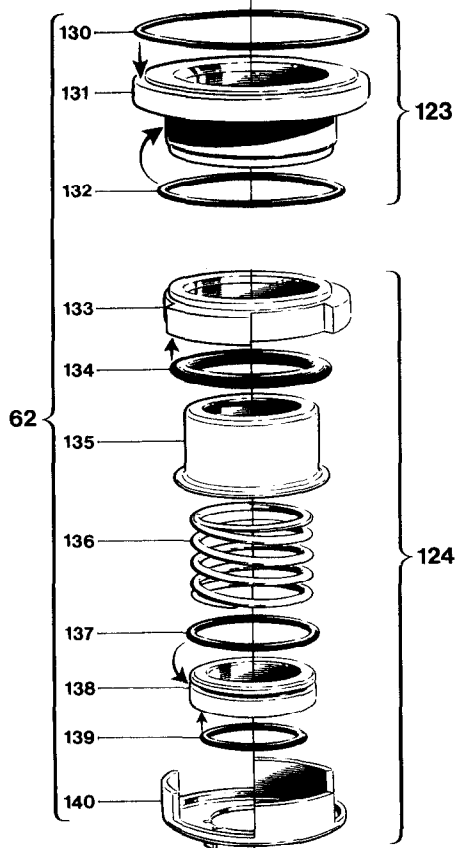
Remove the compression spring (136).



Remove the sleeve (135) together with the seal ring (133).
Press the sleeve out of the seal ring.

2201.011 Outer mechanical seal unit

Stationary seal ring unit (123) in oil casing bottom:



Unscrew the hex socket screw (10).

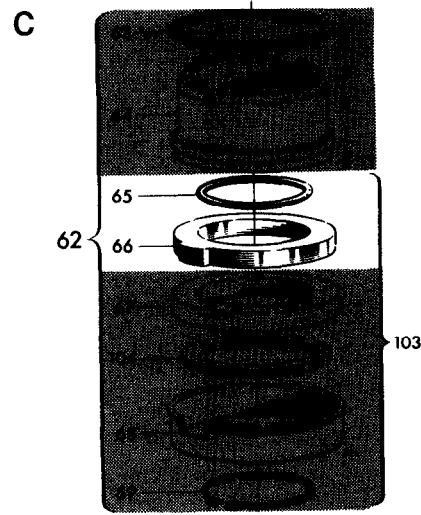
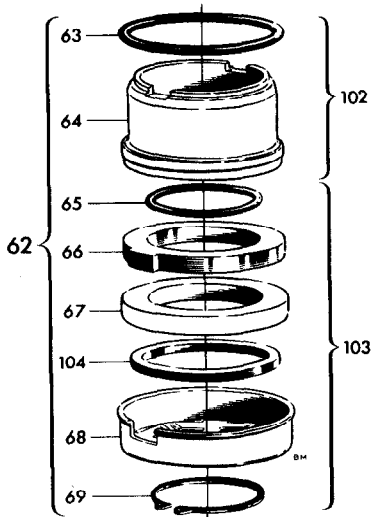


Unscrew the retainer (61).
Remove O-ring (130) and O-ring (30).



Pull out the stationary seal ring (131).
Remove the O-ring (132) in the shaft hole in the oil casing bottom.

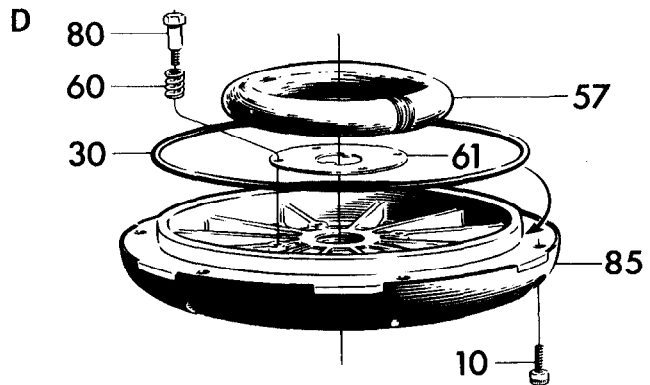
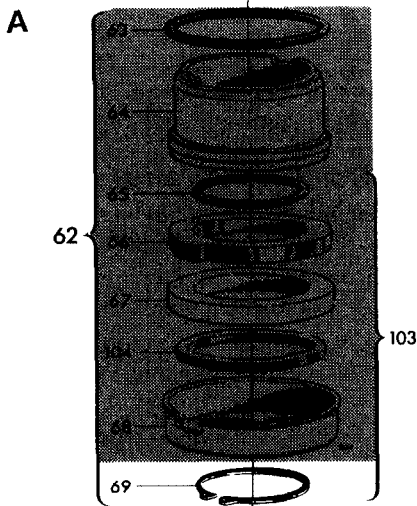
Removing the outer seal unit (62) 2201.010



Remove the seal ring (66) and the O-ring (65), which is seated in a groove on a shaft.

Stationary seal ring unit (102):

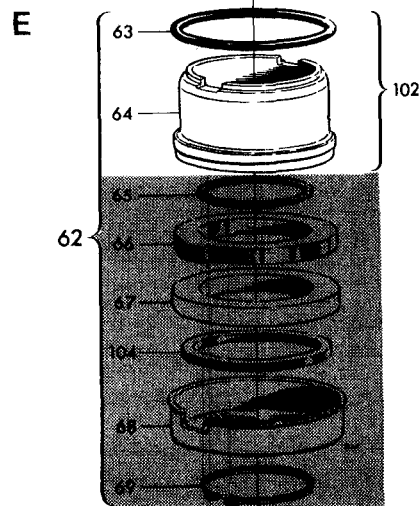
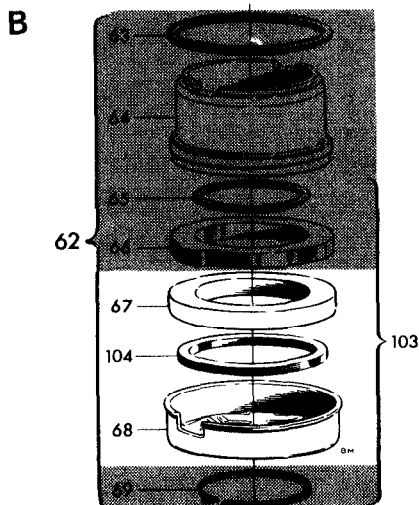
Rotating seal ring unit (103):



Unscrew the hex socket screws (10), lift and turn over the oil casing bottom (85) and remove the O-ring (30).

Leave the washer (61), the compression springs (60) and the special screws (80) in the oil casing if they are undamaged.

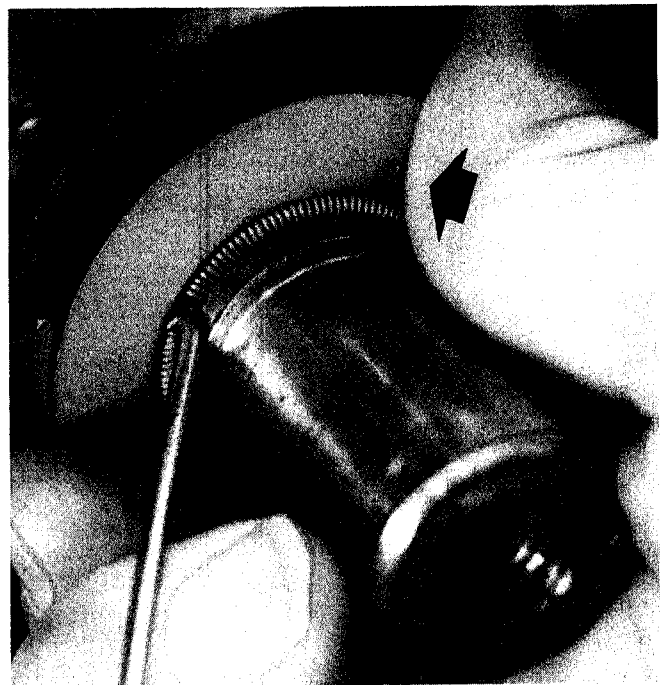
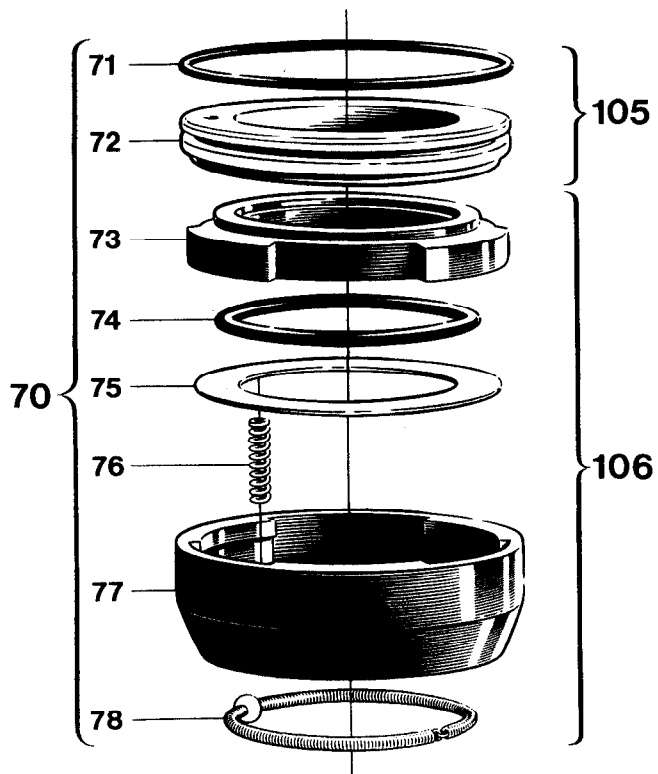
Remove the circlip (69) using a circlip pliers.



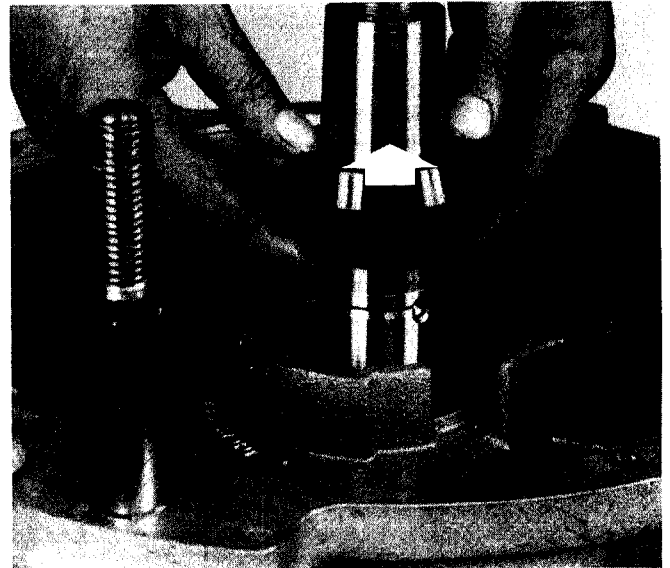
Remove the end washer (68) and the washer (67) with its compression spring (104).

Pull out the seal ring (64) and the O-ring (63) in the shaft hole in the oil casing bottom.

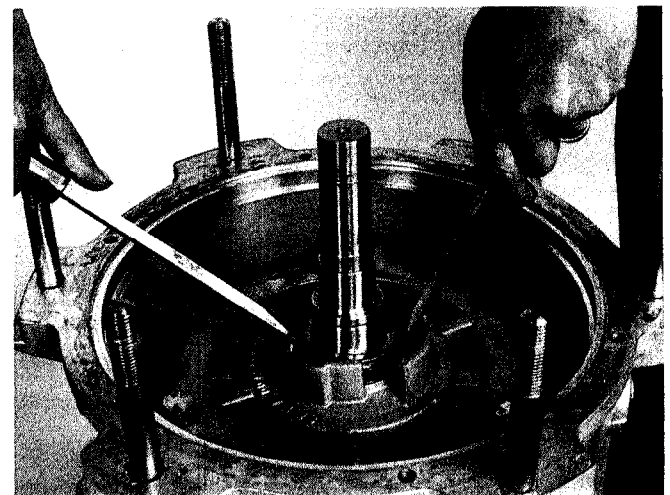
Removing the inner seal unit (70)



Press up the spring housing (77) and remove the stop spring (78) using a spring puller (332 91 00).



Remove the rotating seal ring unit (106).



The stationary seal ring (72) with O-ring (71) is detached by carefully prizing using two screwdrivers as shown in the picture.

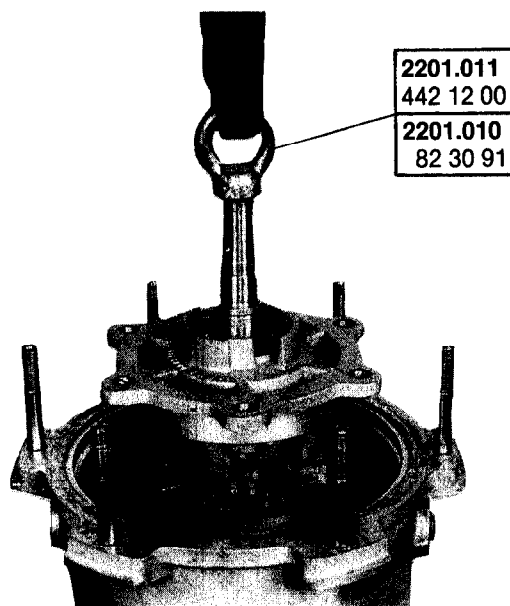
Removing the shaft/rotor unit with ball bearing

Remove the screws (7) that hold the lower bearing housing (86).

On pump 2201.011 with threaded shaft journal, screw on the special lifting eyebolt 442 12 00 and lift up the rotor unit.

On pump 2201.010 with a threaded hole in the shaft end, use lifting eyebolt 82 30 91.

NOTE: HT pumps have a washer (92) in the upper bearing seat.

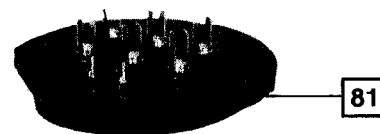


Removing the terminal board (81)

Turn over the pump and place it with the studs (4) on a soft surface.

Remove the screws (5) that hold the terminal board.

Disconnect the stator leads and control cables from the underside of the terminal board.

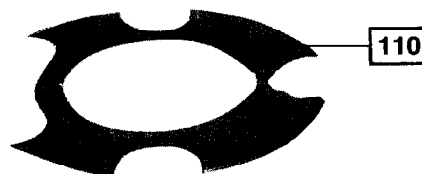
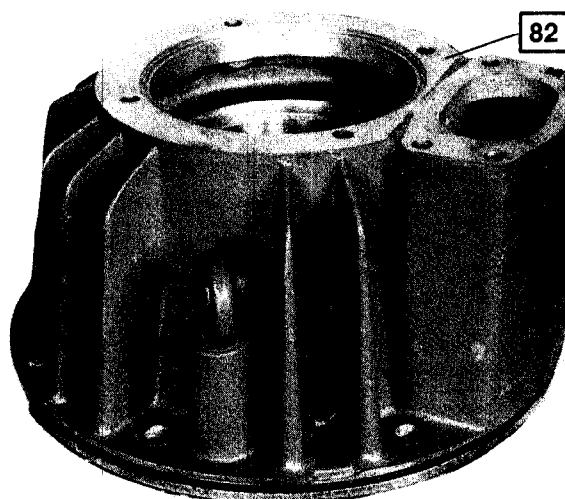


Removing the upper bearing housing (82)

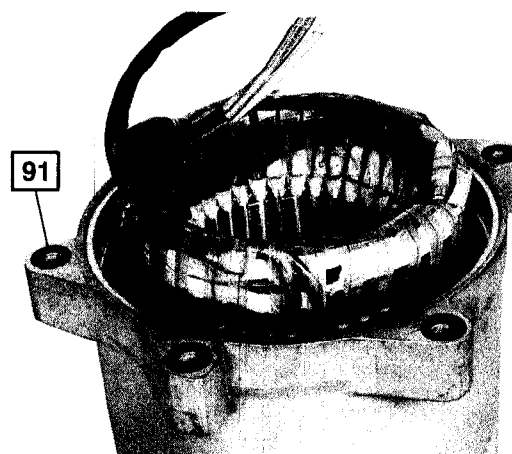
Remove the screws (37) on the HT version and the nuts (13) on the MT version.

Remove the bearing housing (82) and the O-ring (36).

Remove the protective disc (110).



HT pumps have a washer (92) in the upper bearing seat and six packings (91) that seal around the screws (37).



Replacing the stator

The stator (98) is shrink-fitted in the stator casing (83) and can be taken out after the casing has been heated to about 150°C (300°F).

Place the stator casing as shown in the picture on some wide planks.

Apply the lifting tool 394 69 00 in the rotor position just above the centre of gravity of the stator.

Lift the stator casing about 100 mm above the planks.

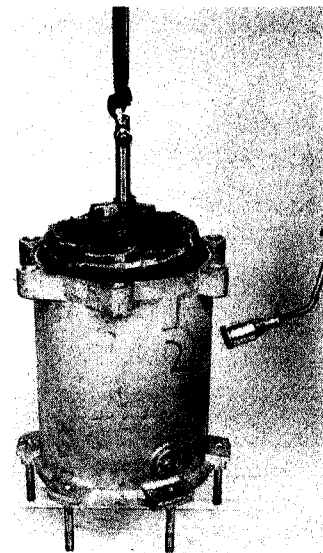
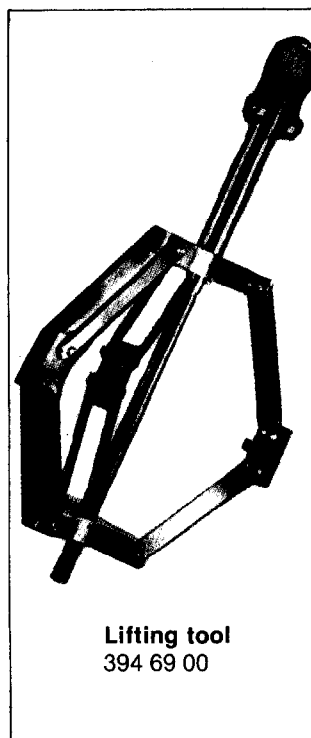
Heat the stator casing with a gas torch or blowlamps.

Heating should be done quickly and evenly all around. At a temperature of about 150°C (300°F), the stator casing will slide off the stator.

Lift up the stator and quickly move the lifting tool to the new stator.

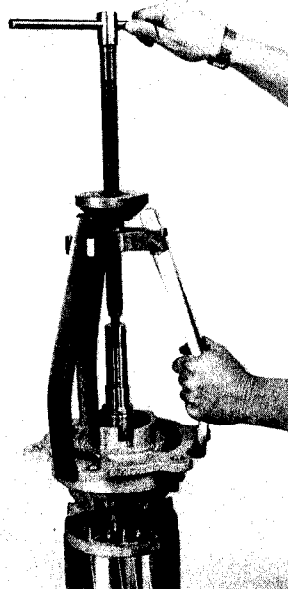
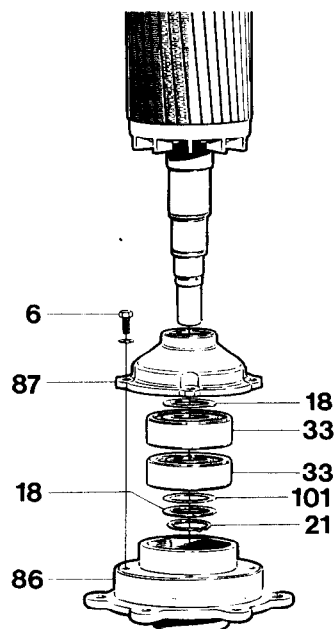
Tuck the stator leads into the rotor space and lower the stator into the heated stator casing.

Make sure that the key on the outside of the stator fits into the keyway in the stator casing.



Lifting tool
394 69 00

Removing the lower ball bearings



Remove the screws (6) that connect the bearing housing (86) to the bearing cover (87).

Knock off the bearing housing with a soft mallet or use a puller 84 13 63. See the picture.

Remove the circlip (21) using a circlip pliers 84 08 02.

Remove the supporting washer (18) and adjusting washer (101).

Pull off the bearing cover (87) with both ball bearings (33) at the same time.

Use puller 84 13 63 as shown in the picture.

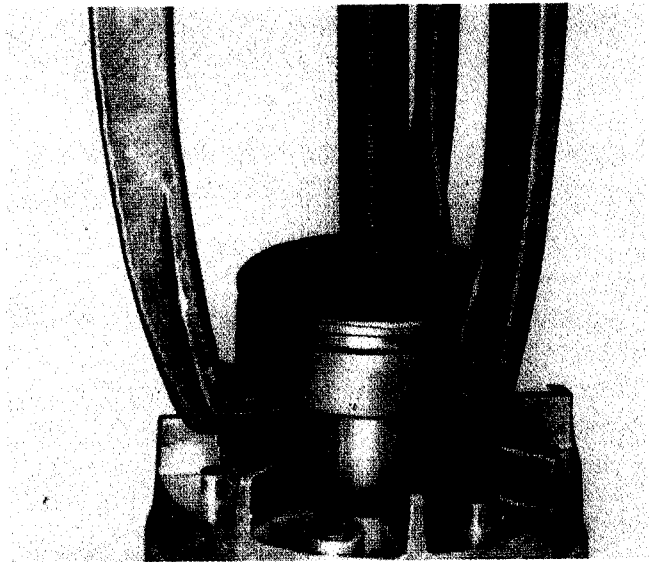
Removing the upper ball bearing

Use puller 84 13 63 and pull off both the bearing guide (93) and the ball bearing (32) simultaneously.

Remove the O-ring (25).

Press the ball bearing out of the bearing guide.

The ball bearing will be easier to get out if the bearing guide is heated first.



ASSEMBLY

IMPORTANT! Before starting assembly, proceed as follows:

Clean all machined surfaces thoroughly.

Check that the O-ring grooves are clean and free of deep scratches, burrs and other defects.

Always oil the shaft end, O-rings and the sliding surfaces on the seals.

Replace damaged or worn parts.

Fitting the upper ball bearing

Heat the bearing guide (93) and press in the ball bearing (32). Make sure that the bearing's seal washer will face the shaft shoulder.

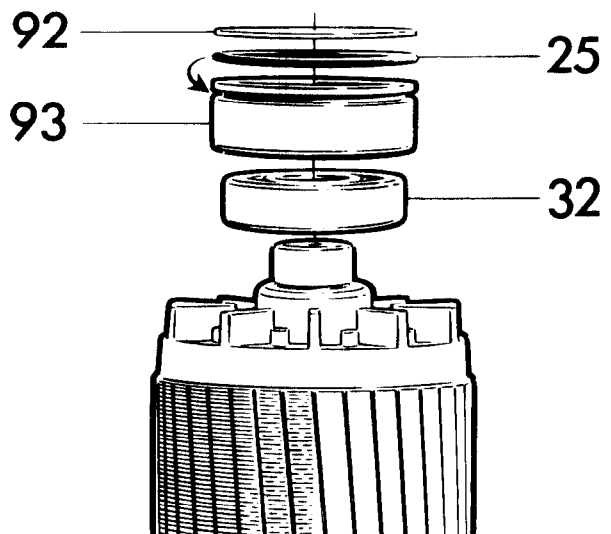
Heat the bearing's inner race to max. 120°C (250°F) using bearing heater 400 29 03.

Push on the bearing up against the shaft shoulder.

Fit the O-ring (25) on the bearing guide (93).

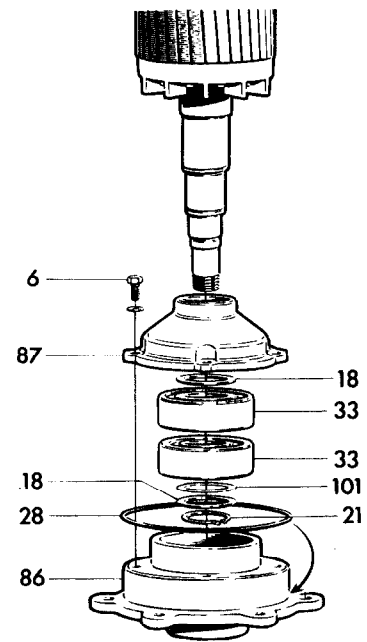
Pack the bearing with 20 g (0.7 oz) of grease. Apply an additional 20 g (0.7 oz) as a reserve on top of the bearing. See "Recommended bearing greases".

NOTE: Washer (92) is only found in HT pumps.

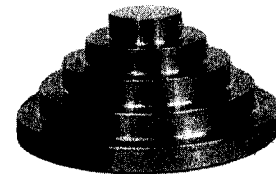


Fitting the lower ball bearings (33)

Push the bearing cover (87) and one of the supporting washers (18) onto the shaft end.



Heat the two bearings (33) to 100 — max. 120°C (250°F) using bearing heater 400 29 00.



400 29 00

IMPORTANT: The bearings should face each other as shown in the picture.

Press the bearings onto the shaft so that the supporting washer (18) is flush up against the shoulder in the bearing seat.

Push on a suitable number of adjusting washers (101) and the second supporting washer (18).

Secure with the circlip (21).

Pack each bearing with 30 g (1 oz) of grease. Apply further 20 g (0.7 oz) in the bearing holder under the lower bearing, and an additional 60 g (2 oz) as a reserve on top of the upper bearing. See "Recommended bearing greases".

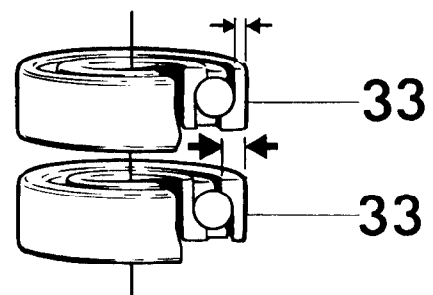
Press up the bearing housing (86) onto the ball bearings (33).

It will be easier to fit the bearings if the bearing housing is first heated slightly.

Screw the bearing cover to the bearing housing.

Fit the O-ring (28).

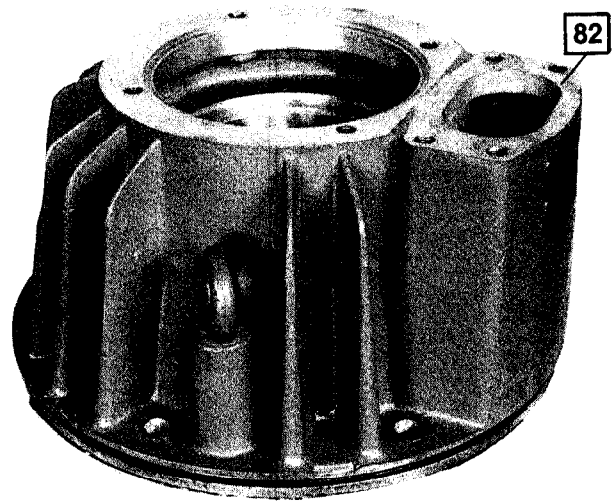
Check that the bearing housing can rotate evenly without wobbling.



Fitting the upper bearing housing (82)

Place the stator casing with the shrunk-in stator so that it is resting on its studs (4) on a flat surface.

Fit the O-ring (30) around the bearing housing's inner guide rim.



Place the protective disc (110) at the stator leads.

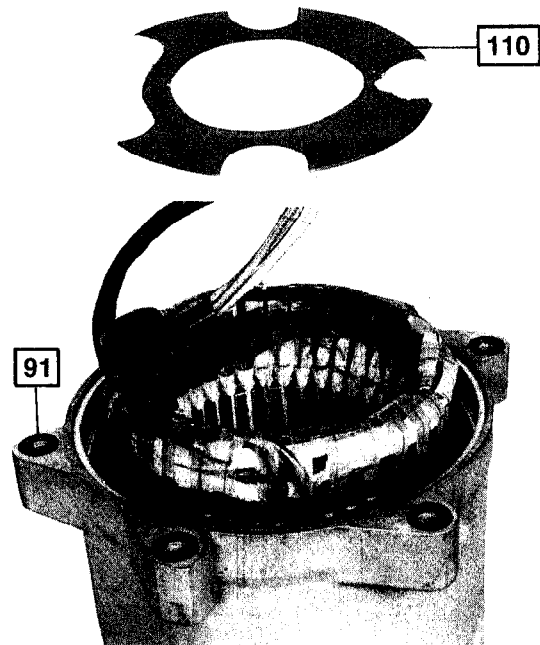
Lift the bearing housing up above the stator casing.

Tuck the stator leads into the junction box.

Turn the bearing housing so that the screw holes — or the studs (111) on MT pumps — are aligned with the holes in the stator casing.

NOTE: The HT pumps have six sealing washers (91) that are supposed to seal around the screws (37).

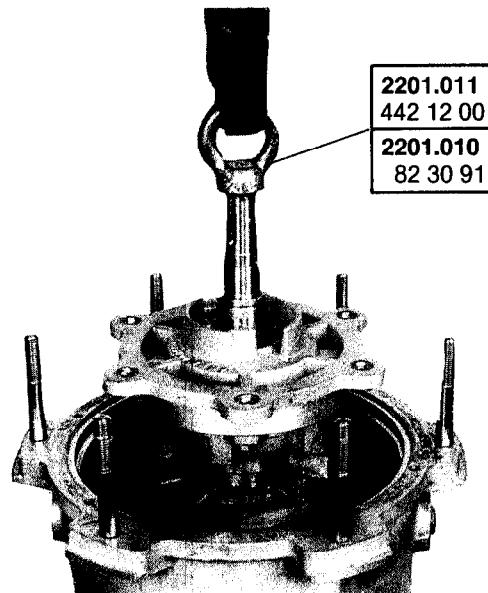
Tighten the bearing housing with nuts (13) on MT pumps and screws (17) on HT pumps.



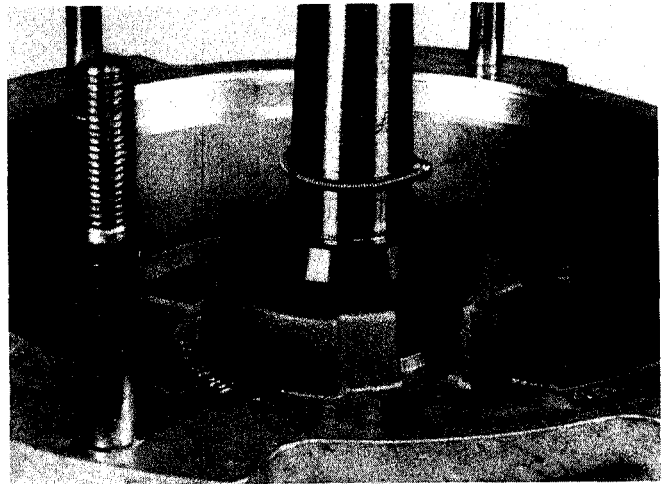
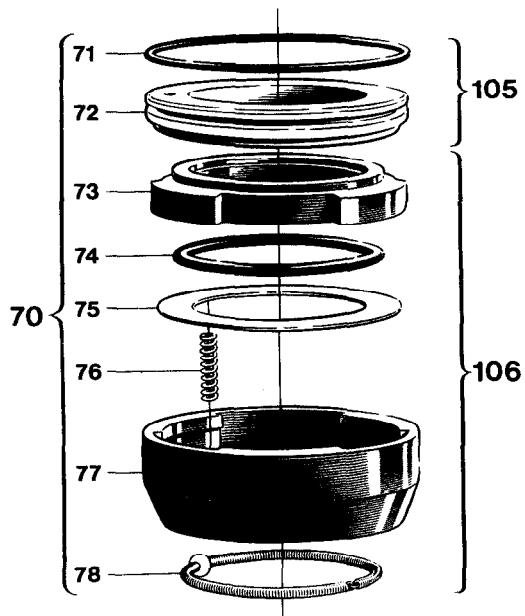
Fitting the shaft/rotor unit with ball bearing

Turn the pump so that it is resting on the flat top of the bearing housing. On HT pumps, a washer (92) shall be placed in the bottom of the upper bearing seat.

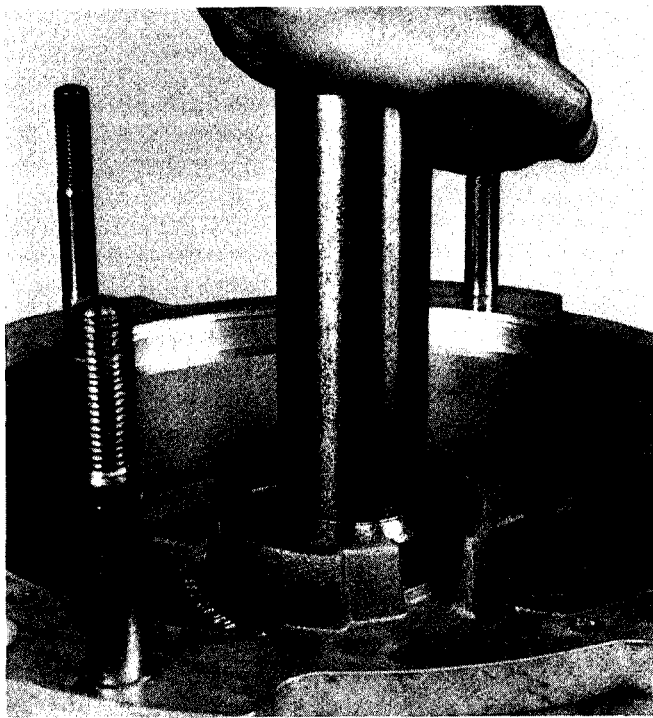
Apply a lifting eye bolt to the shaft journal and lift the shaft/rotor unit. Carefully lower the shaft/rotor unit into the rotor space until the upper ball bearing can be fitted into its bearing seat.



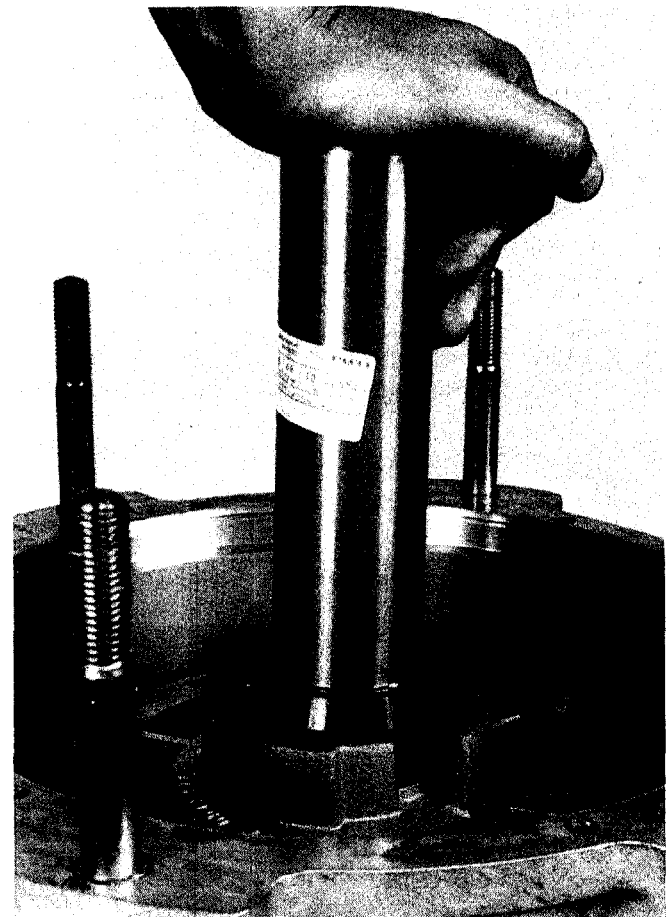
Fitting the inner seal unit (70)



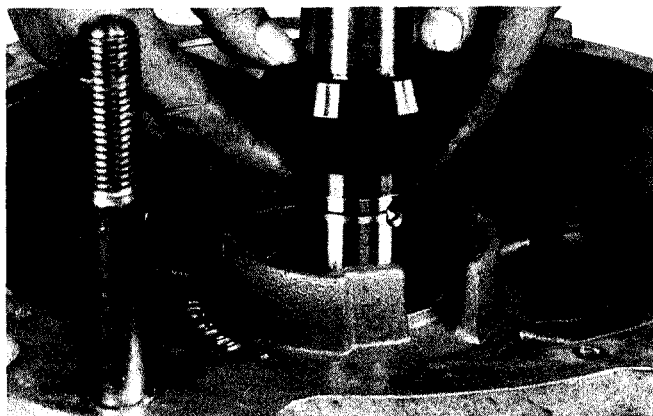
Make sure that the ball on the stop spring (78) is aligned with the recess on the shaft and the recess on the spring housing (77).



Fit the O-ring (71) on the stationary seal ring (72). Use assembly sleeve 398 58 00 to press the seal into its seat. Oil the shaft and the sealing surface.



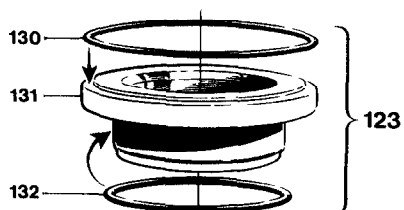
Use assembly sleeve 398 22 00 to press down the stop spring (78) so that the ball fits into the recess on the shaft and the stop spring slips into the groove on the shaft.



Place the assembly sleeve 398 35 01 over the shaft end. Slip the parts included in the rotating seal unit (106) over the assembly sleeve.

Fitting the outer seal unit (62) in pump 2201.011

Stationary seal ring unit (123)



Fit the O-ring (132) in the oil casing bottom (85).
Press in the stationary seal ring (131).



Fit the O-ring (130) and the retainer (61).

Important

Screw down the retainer screws (80) evenly and in a diagonal pattern. Then tighten the screws in sequence all around.

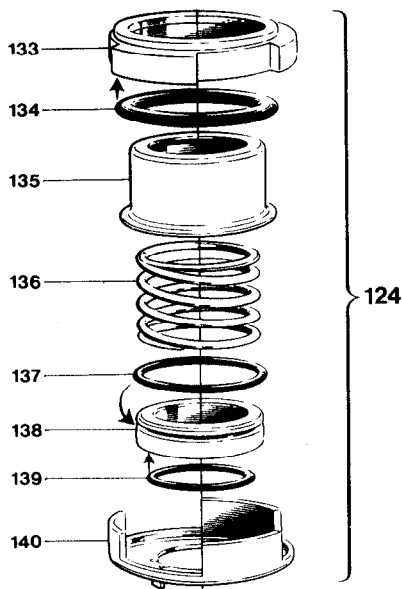
Fit the O-ring (30) around the guide rim on the oil casing bottom.



Fit and tighten the oil casing bottom to the stator casing
with the hex socket screws (10).

Oil the sealing surface and the shaft.

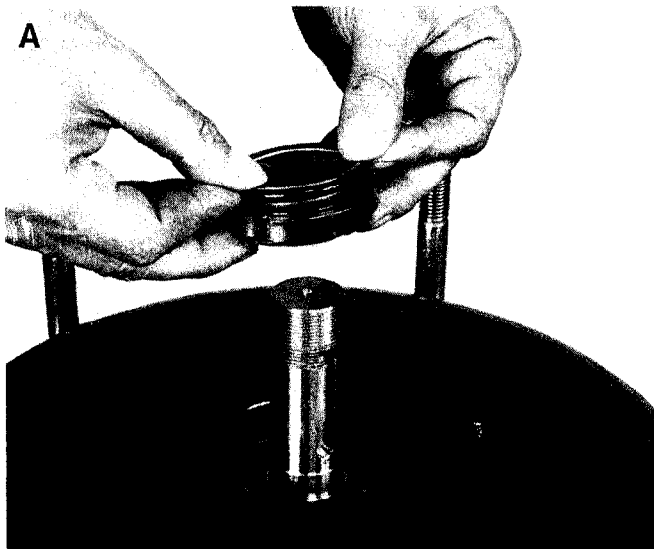
Rotating seal ring unit (124)



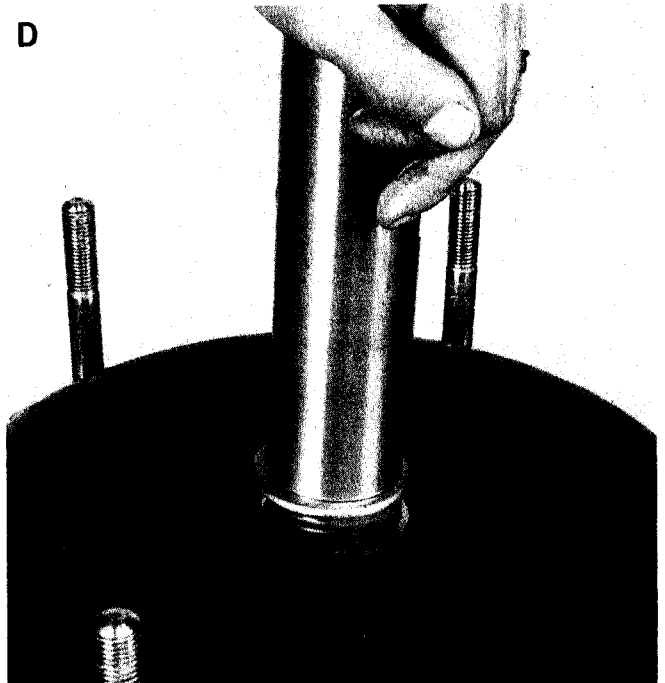
Fit the O-rings (137) and (139) in their grooves in the seal ring holder (138).

Check that the thread and the keyway are free of burrs and sharp edges.

Then carefully push the seal ring holder (138) down over the shaft end. **Make sure the ring is oriented correctly**, as shown in the picture.



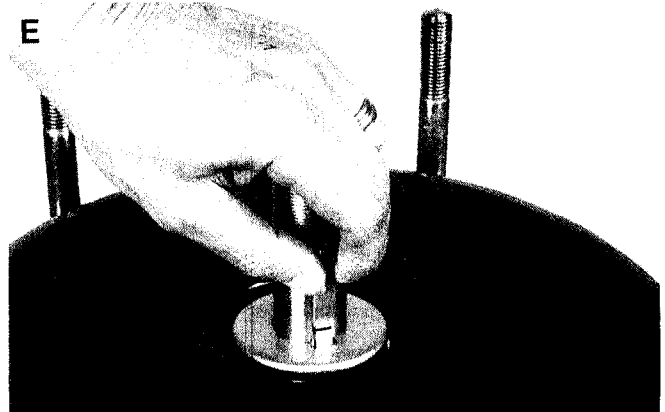
Fit the O-ring (134) on the sleeve (135).
Press the sleeve into the seal ring (133).
Push the whole unit down against the stationary seal ring.



Fit the drive ring (140).
Press the seal together with the assembly sleeve 398 22 00 so that the O-ring (139) slides up onto the sealing shoulder on the shaft.



Place the compression spring (136) in the sleeve (135).

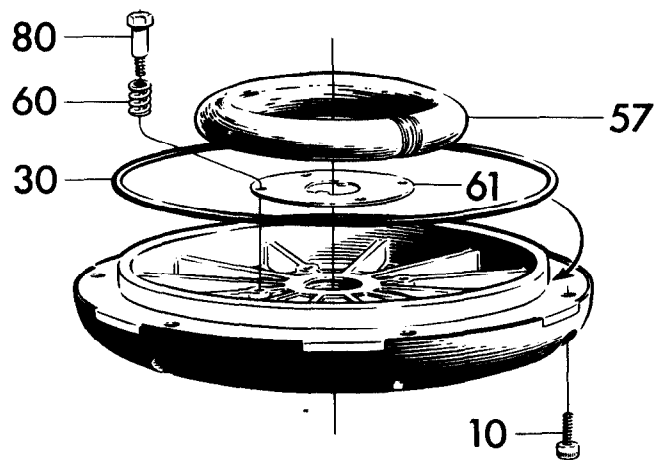


Turn the shaft so that the keyway is aligned with the drive ring's pin.
Fit the key.

Fitting the outer seal ring unit (62) in pump 2201.010

Fit the washer (61), the compression springs (60) and the special screws (80) on the inside of the oil casing bottom.

Check the spring movement for the washer (61).



Stationary seal ring unit (102)

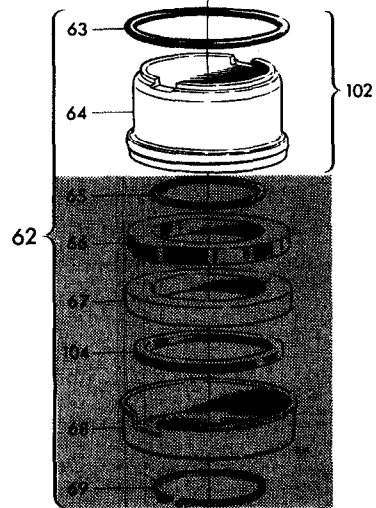
Oil and fit the O-ring (63) in the shaft hole in the oil casing bottom.

Press in and turn the stationary seal ring (64) so that the tabs on the washer (61) engage the recesses on the seal ring (64).

Place the pressure equalizer (57) around the shaft and fit the O-ring (30) on the oil casing bottom.

Fit and tighten the oil casing bottom to the stator casing with the hex socket screws (10).

Oil the sealing surface.



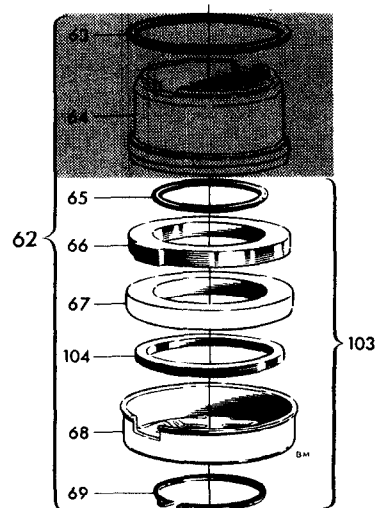
Rotating seal ring unit (103)

Place assembly sleeve 398 37 00 over the shaft end and push the O-ring (65) down into the groove on the shaft.

Push the seal parts down against the seal seat in the following order.

Seal ring (66), washer (67), compression spring (104, of rubber), end washer (68) and circlip (69).

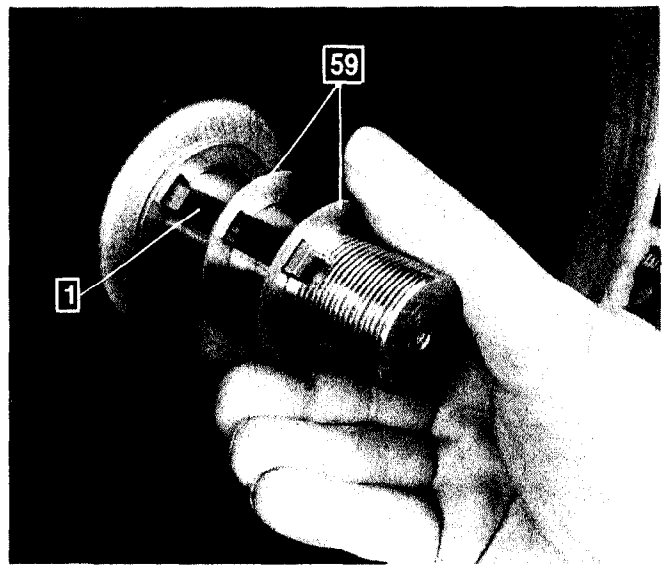
Press the seal together with assembly sleeve 398 37 00 until the circlip slips into its groove on the shaft.



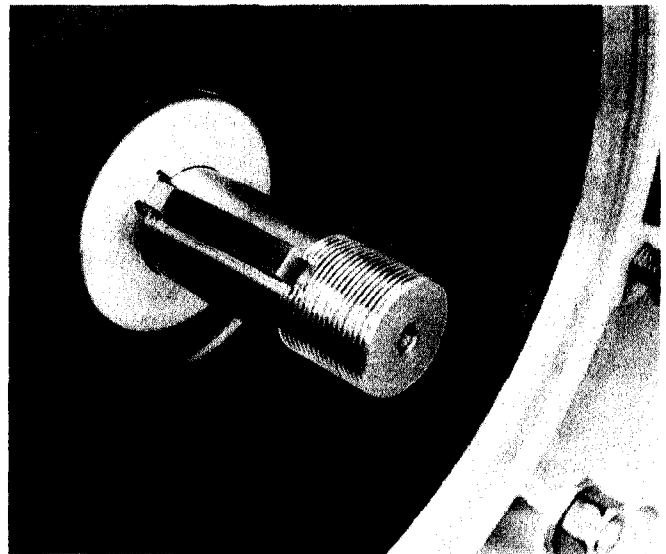
Hydraulic parts

Installing the Impeller in Pump 2201.011

Fit an appropriate number of adjusting washers (59) on the shaft so that a minimum clearance is obtained between the impeller (99) and the oil casing bottom (85).



IMPORTANT: Check that the outer seal's driving pin is aligned with the key (1).



Push the impeller carefully without turning the shaft in relation to the driving ring so that the pin fits into the impeller keyway.

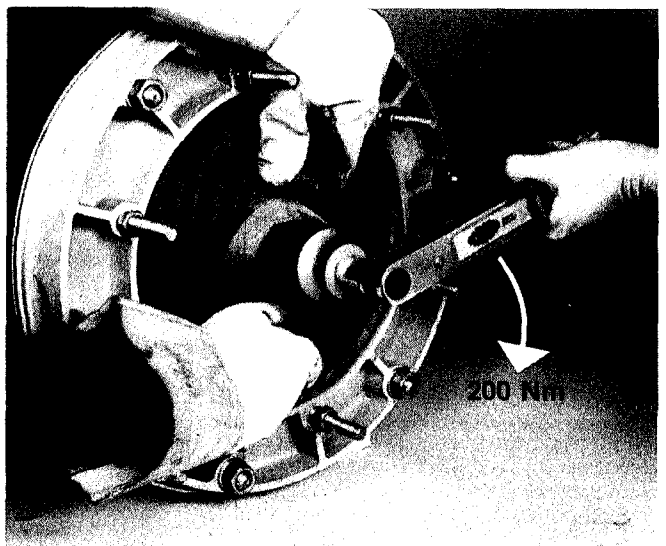
Fit washer (97) and nut (9).

Tighten the impeller nut.

Tightening torque 200 Nm (147.5 ft lb).

Secure with washer (97).

Check that the impeller can easily be rotated by hand.



Fitting impeller with taper sleeve 2201.010

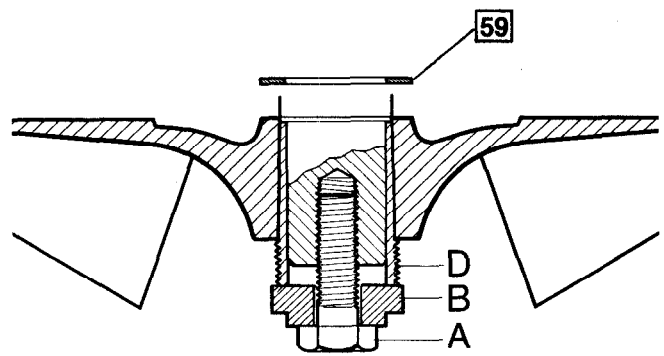
Fit an appropriate number of adjusting washer (59) on the shaft so that a minimum of clearance is obtained between the impeller (99) and the oil casing bottom (85).

Push the taper sleeve (D) into the impeller hub.

Fit the rubber ring that protects the threads on the taper sleeve.

Fit the washer (B) and tighten the impeller with the screw (A). Tightening torque 75—100 Nm (55—74 lbf ft).

Check that the impeller can easily be rotated by hand.



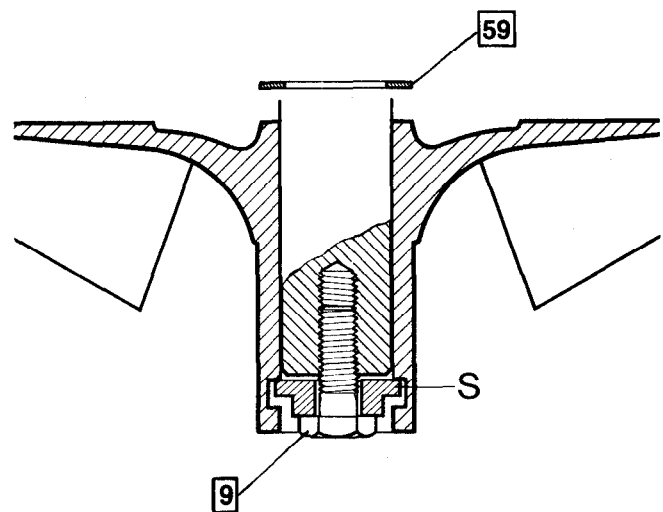
Fitting impeller with special nut in the impeller hub 2201.010

Fit an appropriate number of adjusting washers (59) on the shaft so that a minimum of clearance is obtained between the impeller (99) and the oil casing bottom (85).

Fit the key (1) and the special nut S (343 53 00) in position and tighten the impeller with the screw (9).

Tightening torque 75—100 Nm (55—74 lbf ft).

Check that the impeller can easily be rotated by hand.



Fitting the outer casing (95)

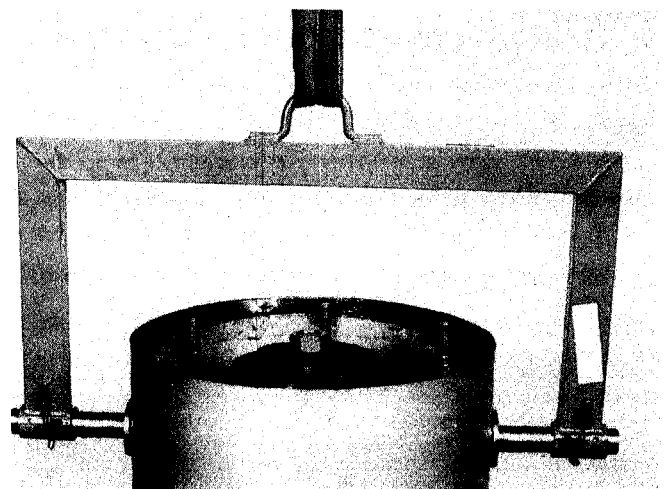
Fit the O-ring (31) on the upper bearing (82).

Lift up the outer casing and lower it over the pump.

Use lifting tool 399 49 00.

Turn the outer casing so that the hole marked "INSP" is directly opposite the corresponding hole in the stator casing (36).

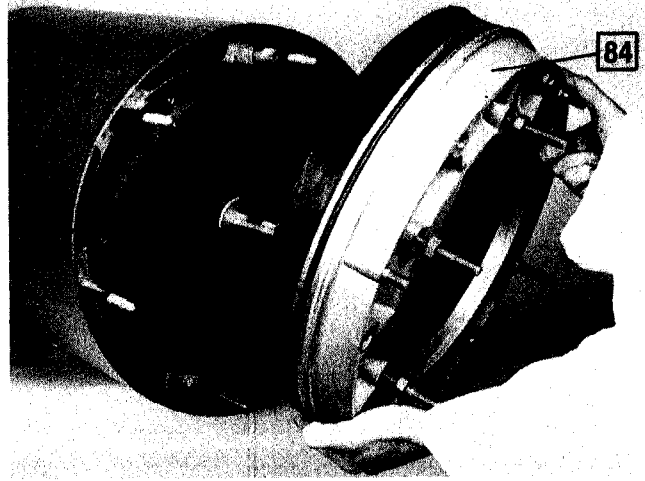
Press down the rim of the outer casing over the O-ring (31) on the upper bearing housing.



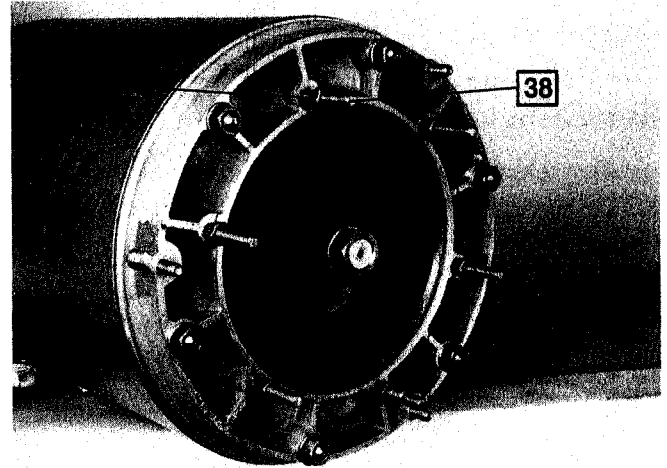
Installing the diffuser (84)

Fit the O-ring (31) on the diffuser.

Screw the diffuser in place with the nuts against the stator casing (13).



Screw the adjusting nuts (13) alt. (12) down toward the bottom of the studs (38).



Adjusting the impeller against the lower diffuser (88)

Fit the O-ring (29) on the lower diffuser (88).

Press on the lower diffuser so that it lies flush against the impeller.

Screw the adjusting nuts (13) alt. (12) so that they lie flush against the lower diffuser.

Back off all adjusting nuts another half-turn (counter-clockwise).

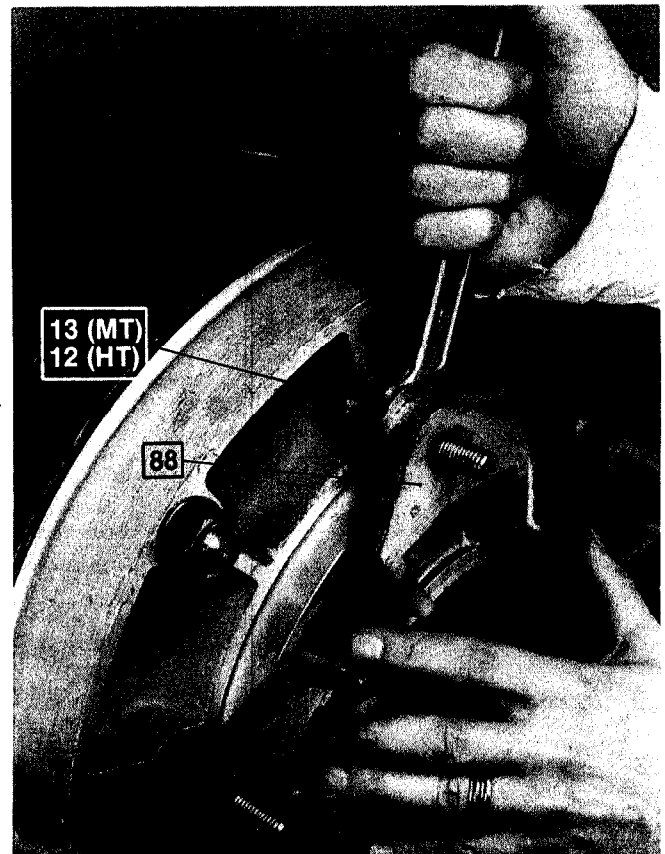
Place washers and nuts on the studs (38).

Tighten the nuts evenly all around.

The clearance between the impeller and the lower diffuser shall be as little as possible.

Check that the impeller can easily be rotated by hand.

Fit the strainer (96) and place the pump (right side up) on the floor.



ELECTRICAL CONNECTIONS

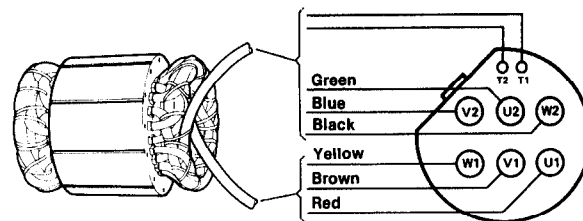
All electrical work shall be carried out under the supervision of an authorized electrician. Local codes and regulations shall be complied with.

Check that the main (line) voltage and frequency agree with the specifications on the pump data plate.

The motor can be connected for different voltages as shown on the data plate.

Fit the O-ring (26) on the terminal board and connect the stator leads to the underside of the terminal board as shown in the figure.

Fit the terminal board in the junction box.

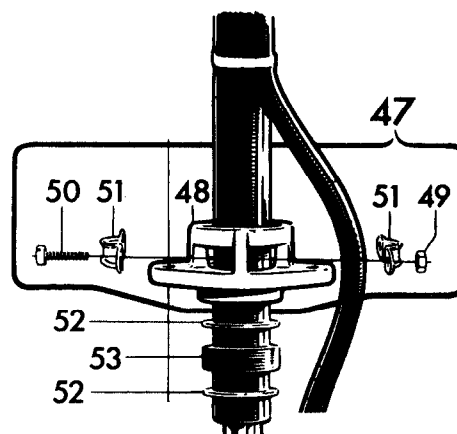


Connection of the stator to the underside of the terminal board.

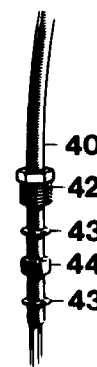
Motor and control cable

Fit the cable entry unit (47) on the motor cable. Check that the seal sleeve (53) and the washers (52) conform to the outside diameter of the cable.

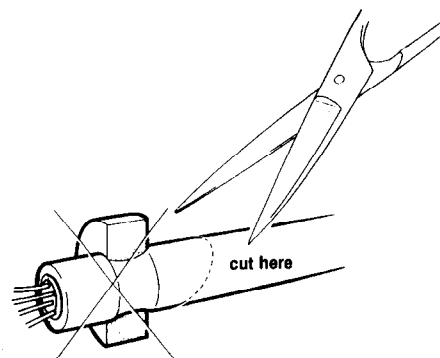
NOTE: For safety reasons, the earth lead shall be 5—10 cm (2—4 in) longer than the phase leads. If the motor cable is jerked loose from the terminal board by mistake, the earth lead should be the last lead to come loose from the pump.



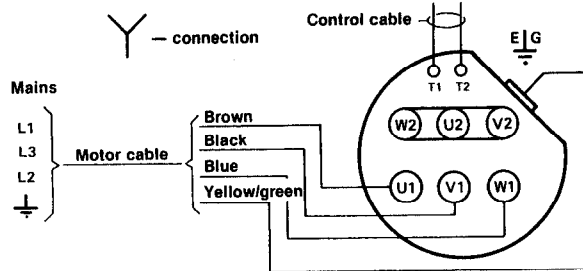
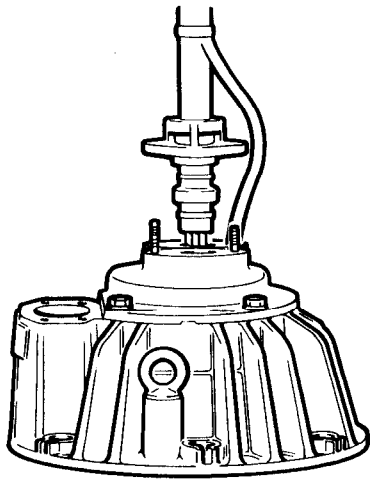
Install the control cable (40) as illustrated in the figure.



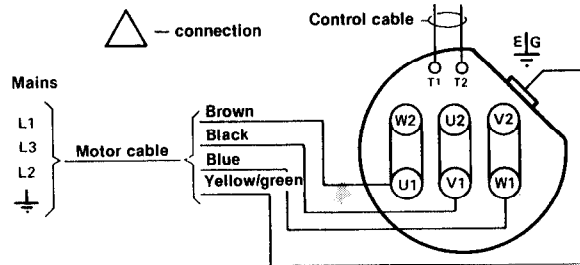
NOTE: When refitting a cable which has been used before, **always** cut off a short piece of the cable so that the cable entry seal sleeve does not close around the cable at the same point again. See figure.



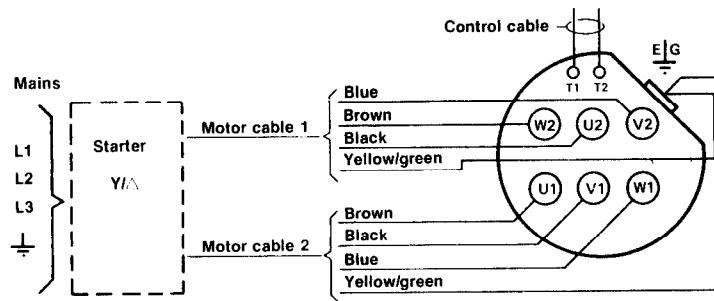
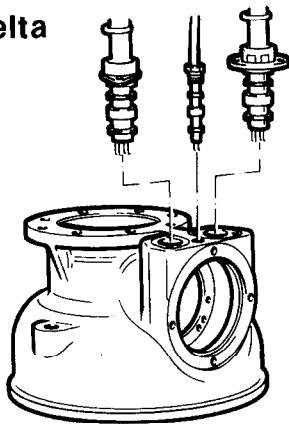
Direct on-line start



△ - connection



Star-delta start



Connecting the motor cable

Connect the different-coloured leads of the motor cable or cables (star-delta start) to the terminal board as follows:

Brown = U1
 Black = V1
 Blue = W1
 Yellow/green = E/G

Fit the closing links for star-delta connection. See the figure.

If star-delta start is used, 2 motor cables are connected but no closing links. See the figure.

The control cable is connected between terminals T1, T2 on the terminal board and the starter's control circuit.

Fit the cover (107) or (94) on the junction box. Tighten the nuts (12) so that the motor cable's cable entry flange (48) bottoms out.

Connecting to mains supply

Check the mains phase sequence with a phase sequence indicator.

The impeller will rotate in the right direction when the motor cable is connected to the mains supply as follows:

Alt. 1 Clockwise phase sequence

Alt. 2 Anti-clockwise phase sequence

Mains (line)	Lead	Mains (line)	Lead
L1	Brown	L1	Brown
L2	Blue	L3	Black
L3	Black	L2	Blue

Check the direction of rotation, see "Inspection". If the impeller rotates in the wrong direction, transpose 2 phase leads.

INSPECTION

Regular inspection and preventive maintenance ensure more reliable operation.

The pump should be inspected at least every sixth month, more frequently under severe operating conditions.

Under normal operating conditions, the pump should have a major overhaul in a service shop.

This requires special tools and should be done by an authorized service shop.

When the pump is new or when the seals have been replaced, inspection is recommended after one week of operation.

Tightness control

(Shall be performed without oil in the oil casing.)

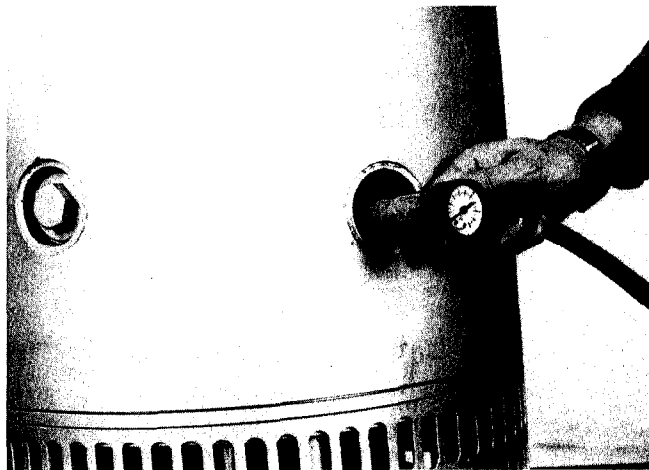
By pressurizing the oil casing, it is possible to detect any faults in the manner in which the seals have been fitted.

Screw pressure valve 400 22 00 into one of the oil holes in the oil casing. Fill the oil casing with compressed air until the pressure is max. 100 kPa (14.5 lbf/in²).

WARNING: The use of higher pressure may involve the risk of explosion.

If no pressure drop can be detected in the space of half an hour, the seals have been properly fitted.

The seals can also be tested with the aid of a tracer gas detector.



Checking the motor cable

Make sure that the outer jacket on the motor cable is not damaged. Pay special attention to cuts, which could allow water to enter the cable. Always replace a damaged cable.

Use a megger to check the insulation resistance between the phases and between each phase and earth (ground). The insulation resistance should be ≥ 1 Mohm. During this test, the cable should not be connected to the power mains or the pump.

When the cable is fitted to the pump, the earth connection should be checked. Measure with the megger between the body of the pump and the earth lead at the free end of the cable. The insulation resistance should be 0 ohm.

Insulation resistance of the stator

Check that the insulation resistance between the phase windings and between each phase and earth (ground) ≥ 1 Mohm. Use a 1000 V megger.



Checking the electrical resistance of the stator winding

Stator Part No.	50 Hz	Stator 60 Hz	Ohm/phase	Tol.
336 66 28	190—200 V	380/200—220 V	0.053	± 6 %
336 66 34	380/220 V	440/260 V	0.070	
336 66 38	380 V	440—460 V	0.212	
336 66 44	400—440 V	—	0.262	
336 66 50	500 V	575 V	0.35	
336 66 55	910/550 V	—	0.40	

The above resistance values apply at 20°C (68°F). The tolerance for measurements on the same stator is ± 4 %.

Filling with oil

Lay the pump on its side with the oil hole marked "OIL FILLING" (on the 2201.011) or "OIL" (on the 2201.010) upwards.

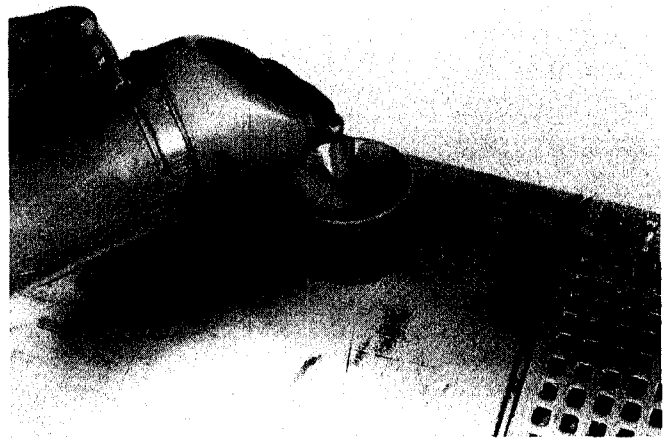
Fill with 5 litres (4.3 quarts) of new oil. See under "Technical data" for the recommended types of oil.

Always replace the O-rings (20) on the oil screws (36) on pump 2201.011 and the locking washer (20) on pump 2201.010. See the parts list.

Tightening torque:

Screw with O-ring 10—20 Nm (7.5—15 lbf ft)

Screw with washer 40—45 Nm (30—60 lbf ft)



Condition of the oil

A check of the condition of the oil can show whether there has been any leakage. Maximum permissible leakage is 0.05 ml/h (0.0017 oz/h). (Note: Air/oil mixture can be confused with water/oil mixture).

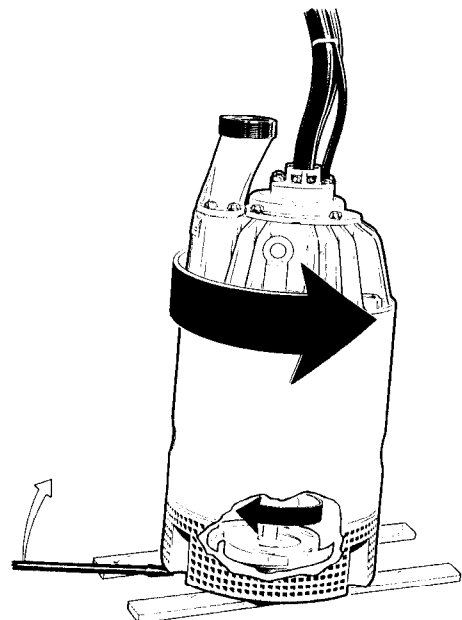
Check the direction of the rotation

If the impeller rotates in the wrong direction, the capacity of the pump will decrease and the motor might be overloaded.

When started, the pump will jerk in the opposite direction to the direction in which the impeller rotates. See fig.

Beware! The starting jerk on large pumps can be powerful.

Transpose two phase leads if the impeller is rotating in the wrong direction.



Operating test under no load

Start the pump and let it run under no load for about 5 minutes.

Check that the voltage lies within $\pm 5\%$ of the rated voltage that the difference between the voltage level of the different phases does not exceed 2%.

Measure the different phase currents, which should have the following nominal values at the rated voltage:

CURRENT UNDER NO LOAD

Stator No.	50 Hz		60 Hz	
	Volt	Ampere	Volt	Ampere
336 66 28	190—200	29	380/200—220	15/26
336 66 34	380/220	15/26	440/260	13/21
336 66 38	380	15	440—460	12
336 66 44	400—440	14	—	—
336 66 50	500	12	575	10
336 66 55	910/550	6/11	575	10

Operating test at max. head

Place the pump in a water tank.

Mount a tight-fitting steel disc with pressure gauge and vent cock on the hose connection socket.

Start the pump and open the vent cock until a steady stream of water issues from the cock.

Check the pressure on the pressure gauge and measure the various phase currents, which should have the following nominal values at the rated voltage:

CURRENT AT MAX. HEAD

50 Hz Volt	50 Hz Ampere		60 Hz Volt	60 Hz Ampere	
	MT	HT		MT	HT
190—200	116	89	380/200—220	75/136	53/91
380/220	59/103	46/79	440—260	65/110	46/77
380	59	46	440—460	64	45
400—440	54	41	—	—	—
500	45	35	575	50	35
910/550	25/41	19/32	575	50	35

TOOLS

The following tools are recommended for a total pump repair.

These tools have been thoroughly tested and many of them are specially made to facilitate work on these particular pumps. See Flygt's tool catalogue for further information on tools.

Order No.	Description
84 08 02	Circlip pliers
84 12 69	Socket wrench Across-flat = 24 mm Length = 160 mm
84 12 75	Socket wrench Across-flat = 30 mm
84 13 60	Puller
84 13 63	Puller
84 13 87	Socket M8 Across-flat = 13 mm
84 13 92	Socket M12 Across-flat = 19 mm
84 13 96	Socket M16 Across-flat = 24 mm
84 15 55	Extension bar Length = 125 mm
84 15 61	Swivel handle Length = 310 mm
84 15 64	Torque wrench Max. 225 Nm

Order No.	Description
84 11 43	Combination wrench Across-flat = 24 mm
84 11 41	Combination wrench Across-flat = 19 mm
84 16 73	Screwdriver Width = 10 mm
84 17 30	Allen key Across-flat = 6 mm
394 69 00	Lifting tool for stator
399 49 00	Lifting tool for outer casing
400 22 00	Pressure valve for leakage test
400 29 00	Bearing heater (lower bearing)
400 29 03	Bearing heater (upper bearing)
442 12 00	Lifting eyebolt, spec. (shaft/rotor unit, pump, 2201.011)
82 30 91	Lifting eyebolt (pump 2201.010)
Seal tools	
216 68 00	Seal puller
332 91 00	Spring puller
398 22 00	Assembly sleeve
398 35 01	Assembly sleeve
398 37 00	Assembly sleeve
398 58 00	Assembly sleeve

Fault tracing (troubleshooting)

A universal instrument (VOM), a test lamp (continuity tester) and a wiring diagram are required in order to carry out fault tracing on the electrical equipment.

Fault tracing shall be done with the power supply disconnected and locked off, except for those checks which cannot be performed without voltage.

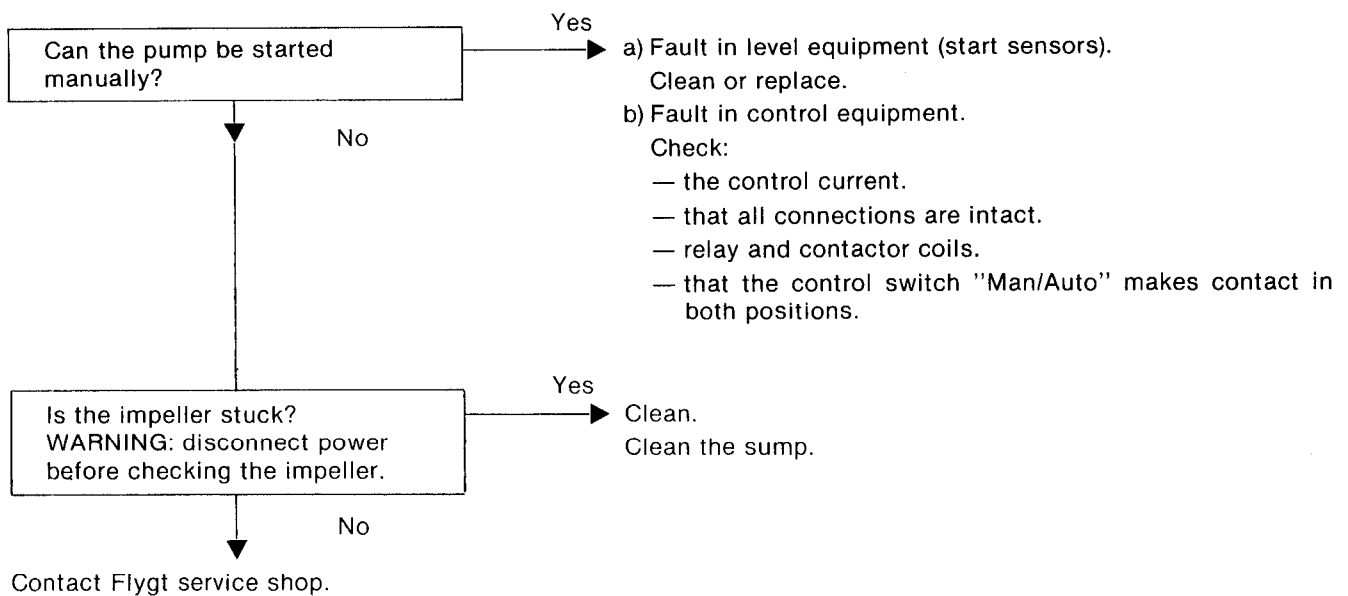
Always make sure that there is no one near the pump when the power supply is turned on.

Use the following checklist as an aid to fault tracing. It is assumed that the pump and installation have formerly functioned satisfactorily.

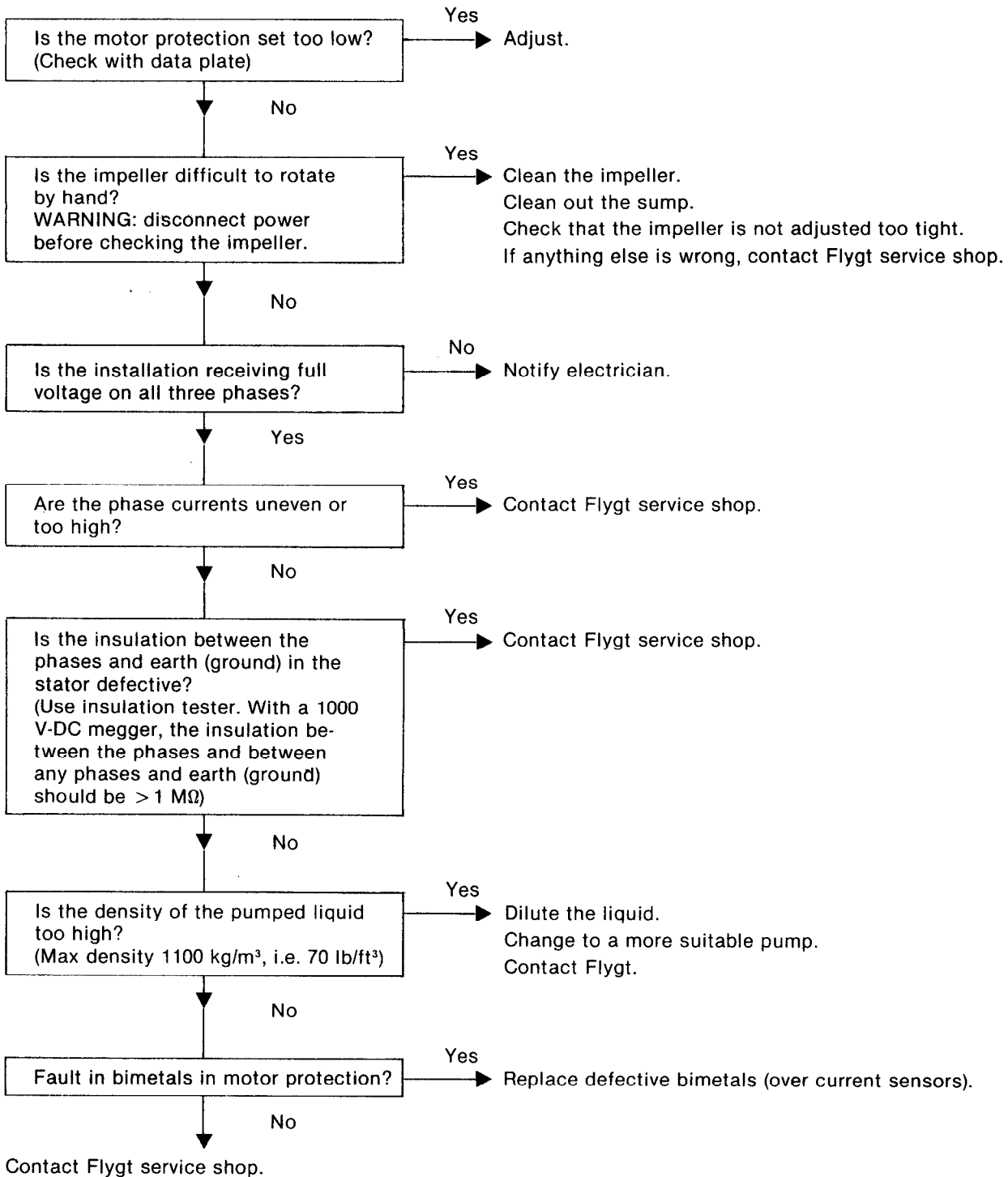
Electrical work shall be performed by an authorized electrician.

Follow local safety regulations and observe recommended safety precautions.

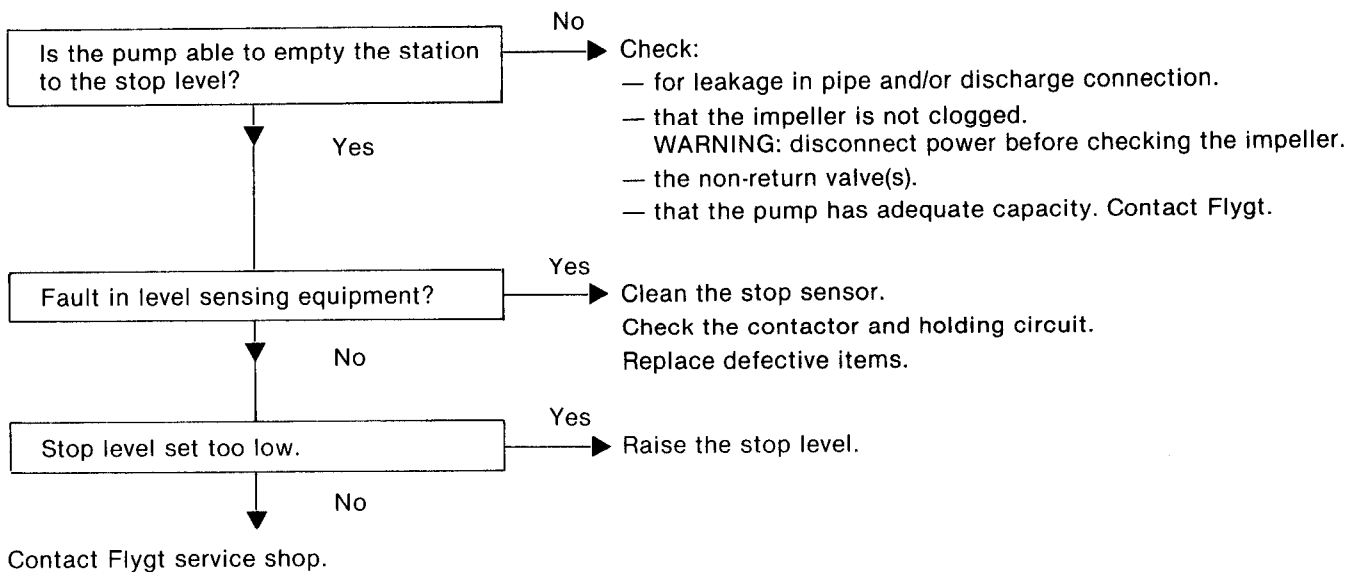
1. Pump fails to start



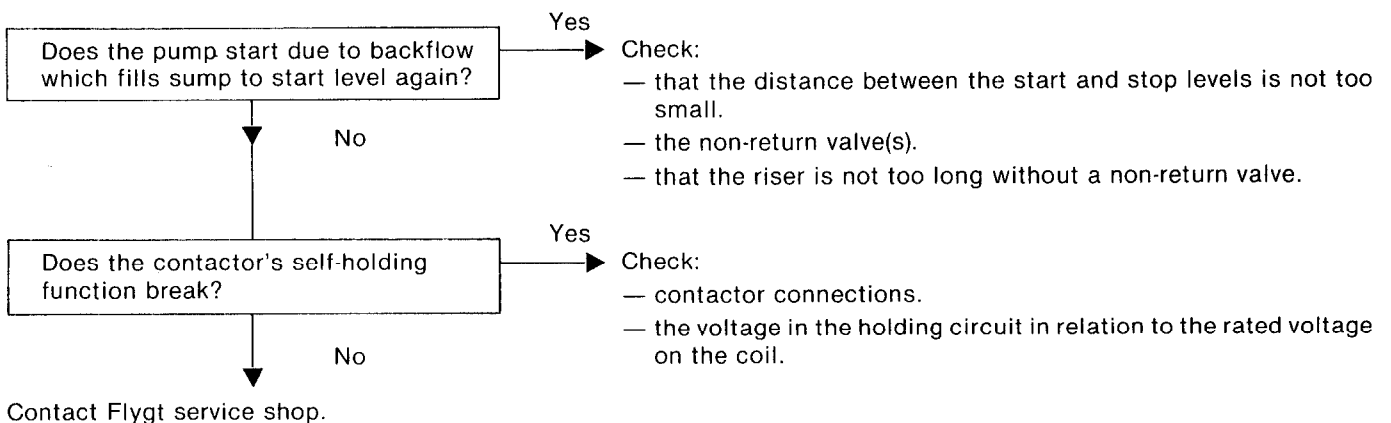
2. Pump starts but motor protection trips



3. The pump does not stop (when using level equipment)



4. The pump starts-stops-starts in rapid sequence (when using level equipment)



5. Pump runs but delivers too little or no water

Check:


- direction of rotation of pump, see "Before starting".
- that valves are open and intact.
- that pipes, impeller and strainer are not clogged.
- that the impeller rotates easily.
- that the suction lift has not been altered.
- for leakage in the pump installation.
- for wear on wear ring, impeller, suction bottom, diffuser disc, diffuser.

See also under "Inspection".

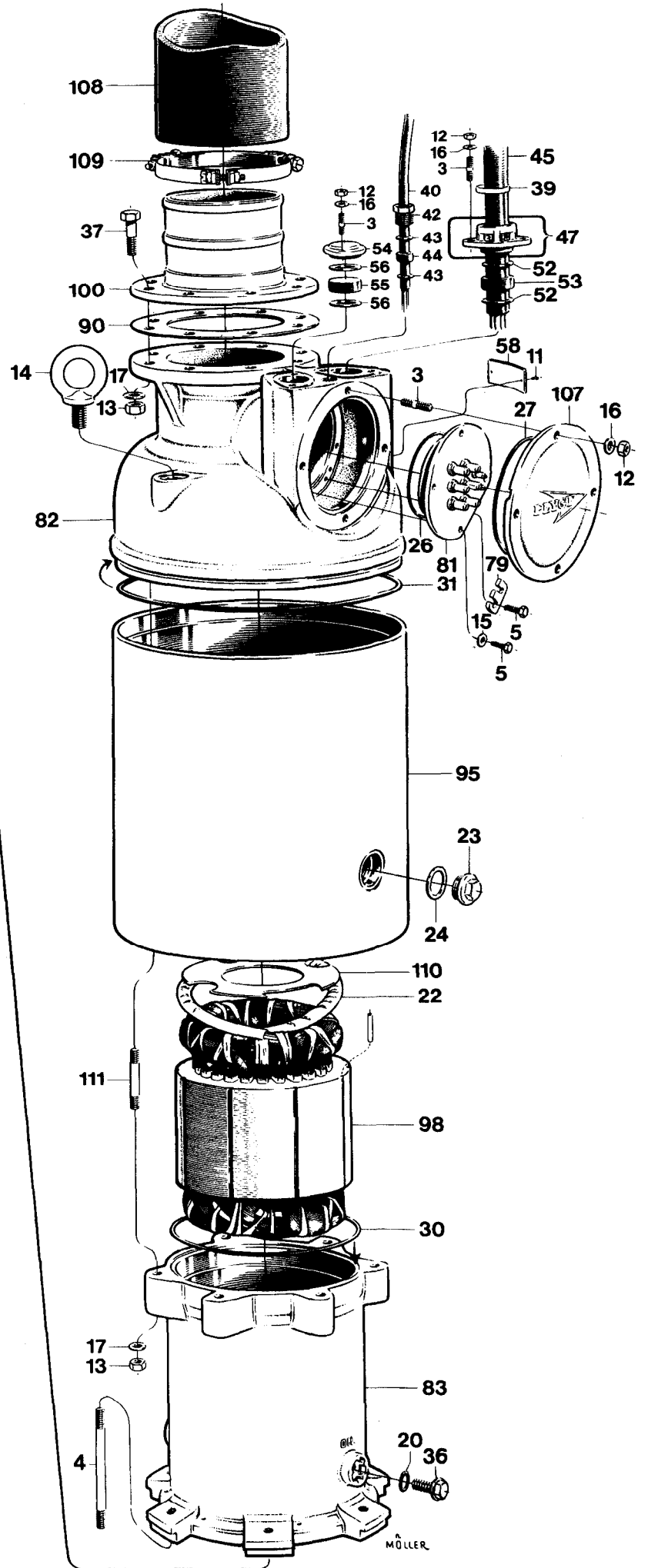
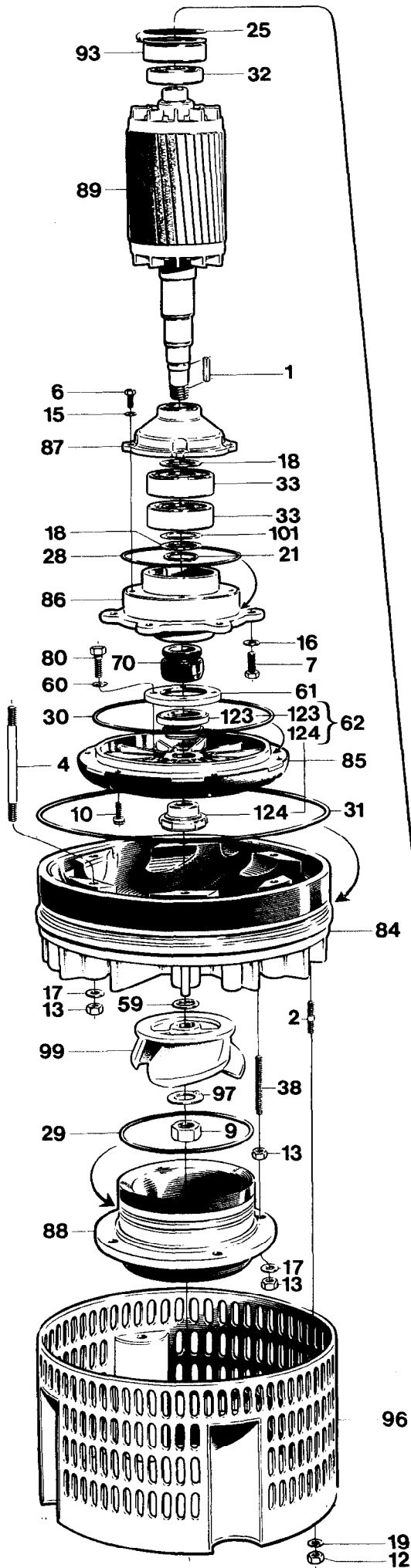
Do not override the motor protection repeatedly if it has tripped.

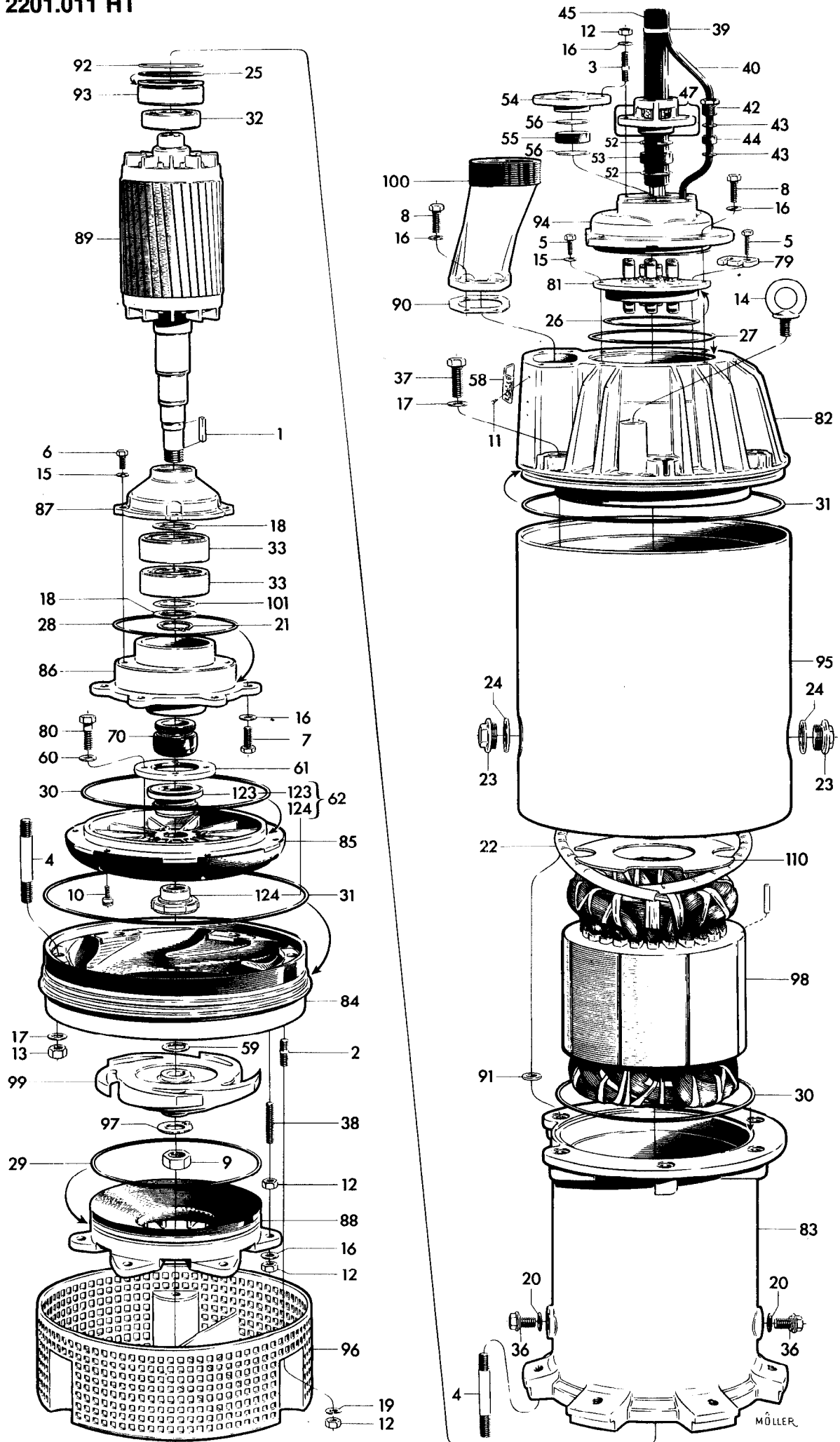
Pump conversion

The following parts shall be exchanged or omitted to convert pump 2201.010 to 2201.011.

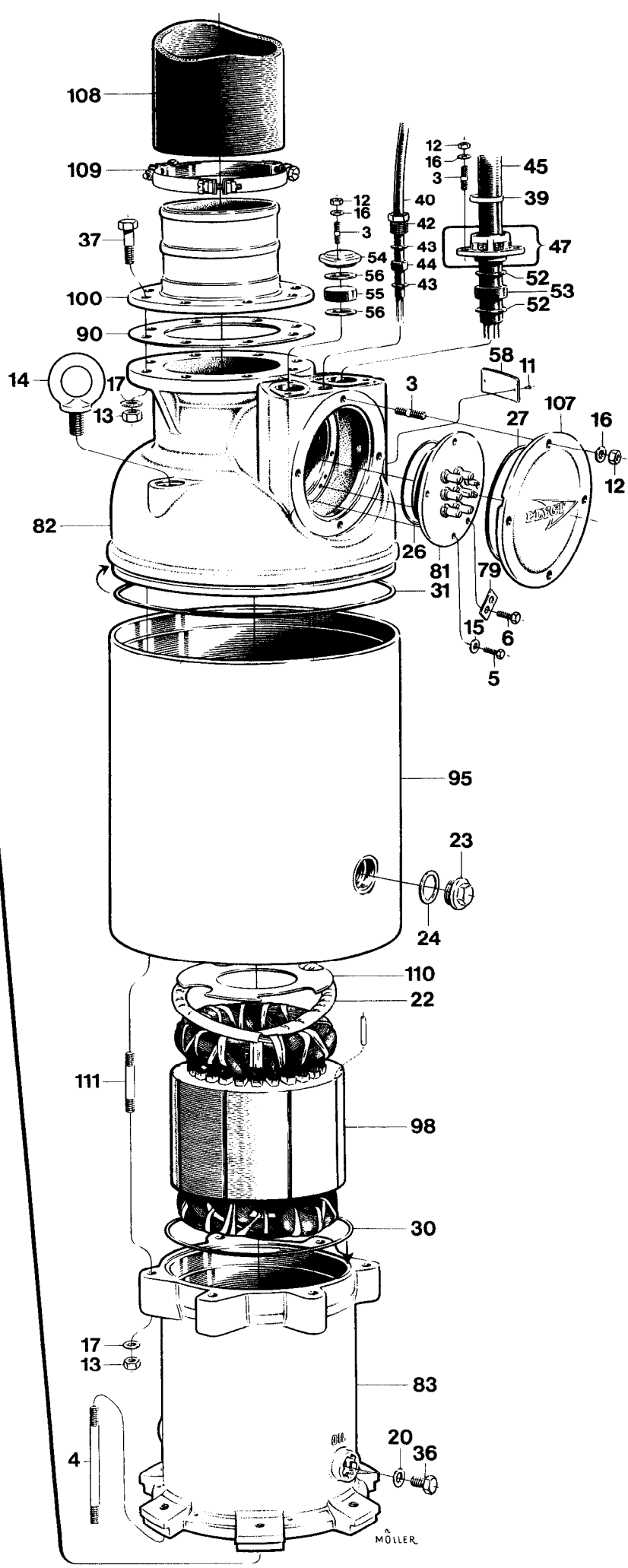
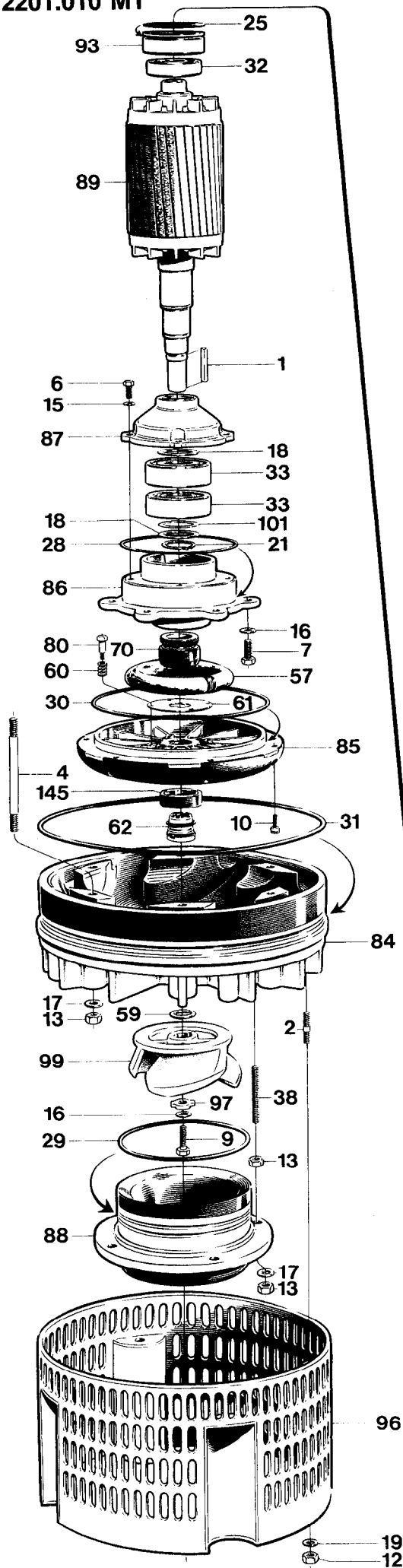
2201.010  2201.011

Item No.	Part No.	Description	Part No.	Description	Qty.	MT	HT
1	80 66 88	Key Exchanged for	80 68 87	Key	1	1	1
5	81 41 04	Screw increased number	81 41 04	Screw	6	6	6
6	81 41 06	Screw decreased number	81 41 06	Screw	4	4	4
9	81 42 88	Screw exchanged for	426 47 00	Nut	1	1	1
16	82 35 20	Washer decreased number	82 35 20	Washer	14	24	24
20	82 50 34	Locking washer	82 73 90	O-ring	3	3	3
36	84 34 00	INSP/OIL screw exchanged for	428 22 01	INSP/OIL screw			
57	275 23 00	Pressure equalizer omitted with stator casing, Part No. 429 96 02 or 429 96 00					
60	302 21 00	Compression spring omitted			—	—	—
61	302 22 00	Washer exchanged for	426 52 00	Retainer	1	1	1
62	302 24 03	Outer mechanical seal exchanged for	426 48 00	Outer mechanical seal	1	1	1
79	303 09 00	Earthing washer exchanged for	426 78 00	Earthing washer	2	2	2
80	306 73 00	Hex screw spec. exchanged for	81 40 85	Hex screw	4	4	4
81	319 70 00	Terminal board assembly exchanged for	426 82 00	Terminal board assembly	1	1	1
85	336 57 05	Oil casing exchanged for	336 57 06	Oil casing	1	1	1
89	336 70 01	Shaft/rotor unit exchanged for	336 70 02	Shaft/rotor unit	1	1	1
	336 77 01	Shaft exchanged for	416 37 00	Shaft	1	1	1
97	343 53 00	Washer spec. exchanged for	426 58 00	Locking washer	1	1	1
	402 75 00						
145	397 33 00	Wear protection omitted					

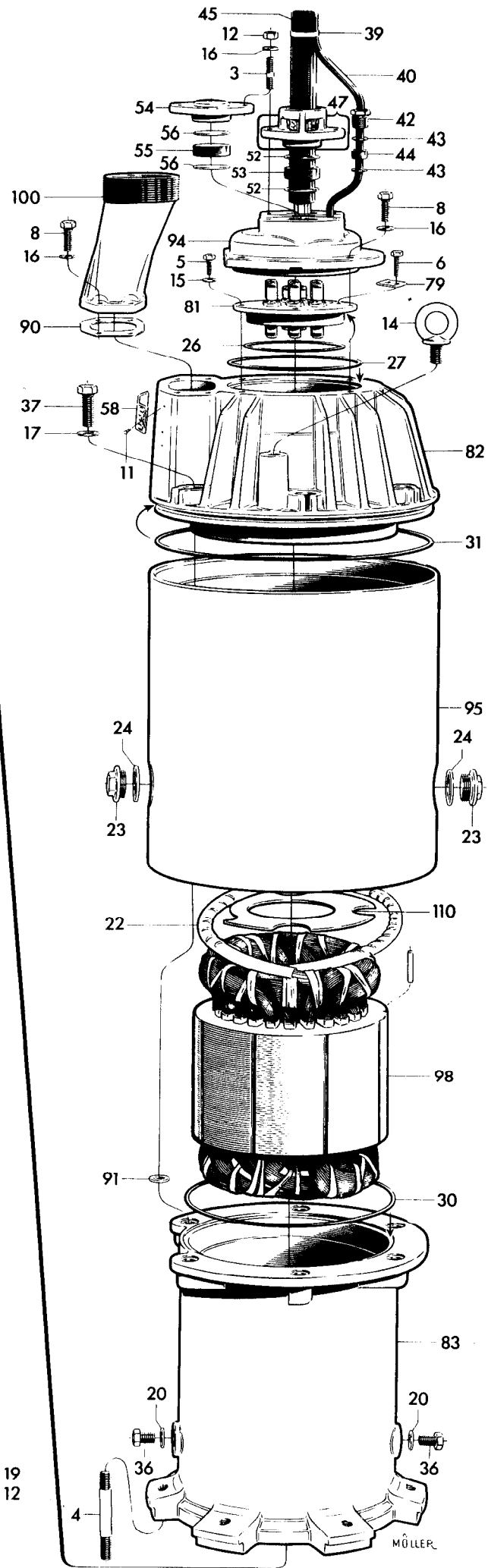
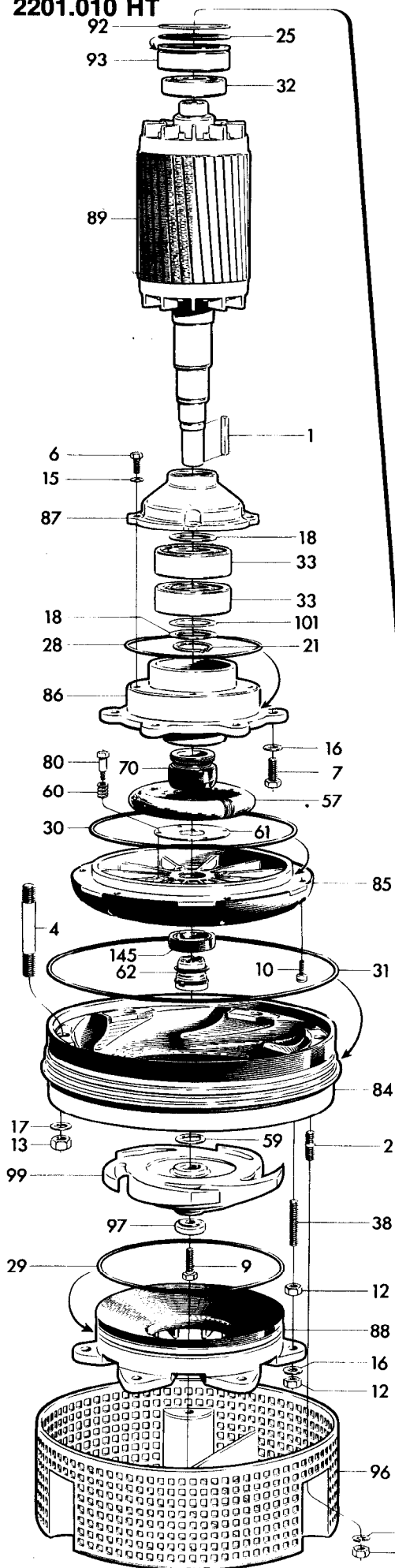




2201.010 MT



2201.010 HT



MÜLLER