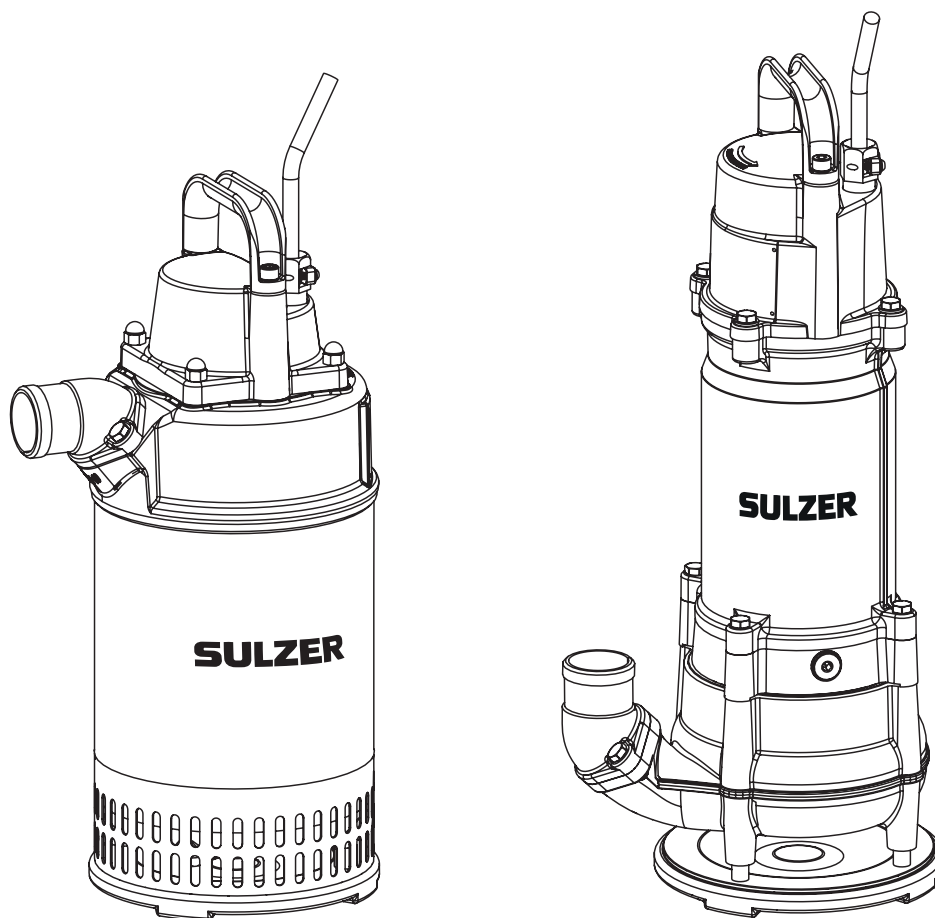


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## Submersible Drainage Pump J 12-J 15 Submersible Sludge Pump JS 12- JS 15

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**Submersible drainage pump J**

J 12 (50/60 Hz)

J 15 (50/60 Hz)

**Submersible sludge pump JS**

JS 12 (50/60 Hz)

JS 15 (50/60 Hz)

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## 1 General

### 1.1 Service intervals

This workshop manual can be used for both regular inspection and complete overhaul on the pump. For assistance contact Sulzer workshop or by Sulzer authorized workshop.

- For regular inspection on the pump such as electrical check, oil/motor check and check of hydraulic parts, proceed and follow section 1 to 6 in this manual.
- For complete overhaul on the pump proceed and follow section 1 to 9 in this manual.
- For electrical information and wiring diagrams see section 10.

Submersible drainage pumps J 12, J 15 and Submersible sludge pumps JS 12, JS 15 are built for long periods of trouble free operation. The pumps can “run on snore” without any risk for the mechanical seals. They get sufficient cooling from the pumped media and sufficient lubrication and cooling from the oil in the housing between the seals. All the ball bearings are sealed and prefilled with high performance bearing grease for life time duty.

Regular inspection and preventive maintenance will ensure more reliable operation. The pump should be inspected every six months and should have a complete overhaul once a year. If the operating condition of the pump is severe it may be required more frequently. A reason for inspection could be if a drop in capacity is being noticed.

### 1.2 Repair kits

The repair kit 00830940 include preselected spare parts which secure a fast and efficient maintenance and avoids unnecessary downtime for the pump. For contents of the repair kit see spare part lists.

### 1.3 Special tools

Sulzer submersible drainage pumps can be maintained with standard tools. Sulzer does not recommend the use of impact tools for removal and installation of screws and nuts. Some special tools are available for mechanical seal assembly. See attached drawing in section 11.

Tool for secondary seal 00830342

#### Torque rating

Size	M6	M8
Nm	7	17
lb-ft	5.2	12.5

Cable gland: A specific torque value cannot be given for the cable gland. Tighten it until the rubber offers resistance, and thereafter, one more full rotation.

### 1.4 Complete pump 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 more than a year. At low utilization of the pump the overhaul intervals can be extended.

For complete overhaul follow the workshop manual and dismantle the pump completely, replace damaged and worn parts. Use only Sulzer spare parts. Spare part lists are available in the download section of the Sulzer website at [www.sulzer.com](http://www.sulzer.com).

### 1.5 Cleaning of pump before service

Before overhaul or maintenance is started the pump should be cleaned. High pressure water is recommended. If the pump has been operating in tough applications additional solvents can be used. To clean the pump from lime deposits it is recommended to lower the pump in a bath containing formic acid (15 %) and 85 % water for some hours. If needed leave the pump longer. Clean the pump again with high pressure water. Another example is to use Beto 2000 which is a solvent for concrete deposits.

### 1.6 Recycling in case of scrapping the pumps

Recycling of individual pump parts is beneficial to the environment. The pump can be fully dismantled for recycling. Aluminium, stainless steel, ductile iron and high chrome cast iron can be recycled when a pump is scrapped. Wear parts which consists of rubber/polyurethane/aluminium/steel and cables/stators with copper must be treated before recycling is possible. Environmental white oil should be left to designated areas.

## 2 Electrical check

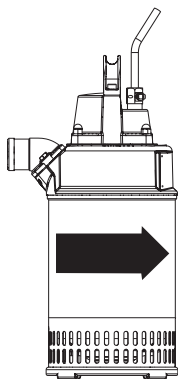


Figure 1: Direction of rotation



Figure 2: Removing cover and cable gland

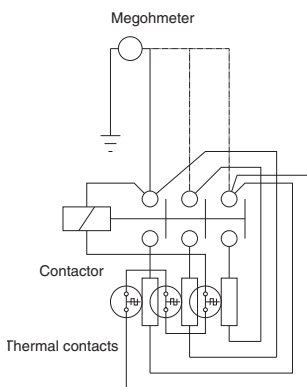


Figure 3: Meggering of windings

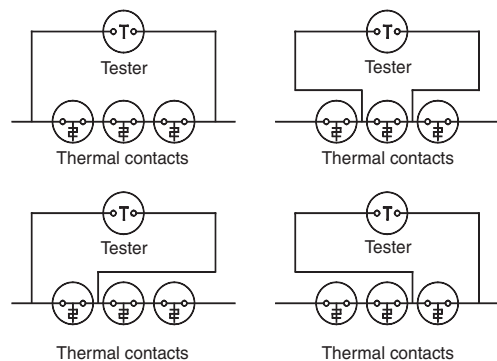


Figure 4: Testing of the thermal contacts

### 2.1 Pump start and cable check



**DANGER!** Always check that the pump is disconnected from the electric power supply before opening any part of the pump.

- Check if the pump starts by connecting it to the power supply.
- Check the direction of rotation, it should make a jerk in the direction of the arrow on the pump (anti-clockwise). To change direction of rotation shift two phases. (Figure 1)
- Check the cable for damage and that there is no water or corrosion in the connecting plug.
- Test the insulation between cable end / plug and earth.

### 2.2 Dismantling cover

Unscrew the cap nuts/screws for the cover. Lift off the cover and disconnect the power cables from the contactor/terminal block. If the 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, cable seal and washers. (Figure 2)

### 2.3 Insulation test

Disconnect all stator leads from the contactor/terminal block. Check that the contact points are not burned. Measure insulation resistance between the different phase windings, between windings and earth and between windings and thermal contacts circuit.

The insulation resistance should be measured with 500 V megohmmeter (megger) and the reading should be at least 1 MΩ. (Figure 3) If the insulation resistance is lower, the stator unit should be dried in an oven. If the stator insulation reading after drying is still low, the stator unit should be 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 resistance values and wiring diagrams check section 10.

### 2.4 Thermal contacts

The circuit with the three built-in thermal contacts should be checked for continuity, using an ohmmeter or buzzer. (Figure 4)

If the circuit is open the defective contact should be identified by checking each individual thermal contact. The faulty thermal contact can be bypassed in accordance with the wiring diagram.

### 3 J Diffuser check / JS Volute removal

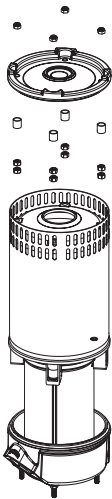


Figure 5: Removing J base plate, diffuser and cooling jacket

#### 3.1 Dismantling handle and discharge connection

Take off the handle and the discharge connection.

#### 3.2 Dismantling base plate, diffuser and cooling jacket (J 12, J 15)

Turn the pump upside down.

Loosen the bottom nuts and remove the base plate and the rubber sleeves.

Unscrew the nuts for the diffuser. Press out the cooling jacket and diffuser with a crow bar applied between the diffuser and the impeller nut. It can be easier to pull out the diffuser and cooling jacket together. (Figure 5)

Check the condition of the diffuser and that the rubber is intact (minimum 2 mm) and has a smooth surface.

#### 3.3 Dismantling base plate and volute (JS 12, JS 15)

Turn the pump upside down.

Loosen the bottom screws and remove the base plate and rubber sleeves. (Figure 6a)

Put the pump in upright position. Loosen the screws that hold the volute and remove it. (Figure 6b)

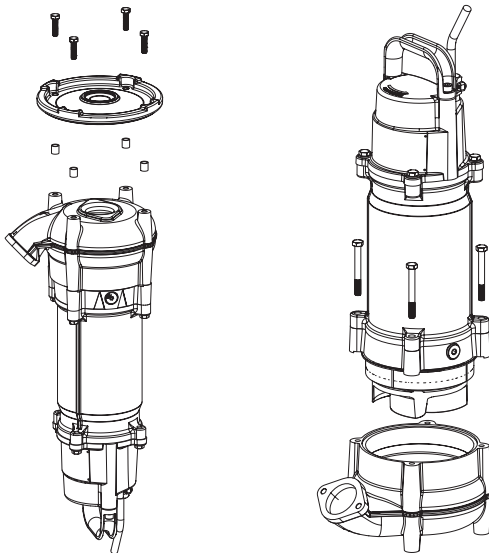


Figure 6a: Removing JS base plate and rubber sleeves  
Figure 6b: Removing volute

## 4 Oil / Motor check

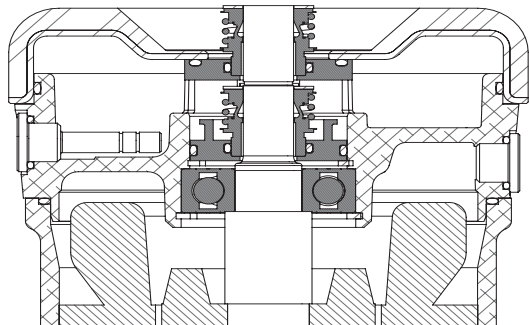


Figure 7: Removing oil plug and motor housing plug

### 4.1 Oil check

Unscrew the oil plug and drain off the oil in a clean can and inspect it. Oil screw is marked "Oil". Attached to the screw is an oil stick for checking the level and cleanliness of the oil.

### 4.2 Motor check

Opposite to the oil plug is a motor plug, giving access to the motor housing. Unscrew and check to make sure no oil or water has leaked into the motor housing.

## 5 Change of impellers

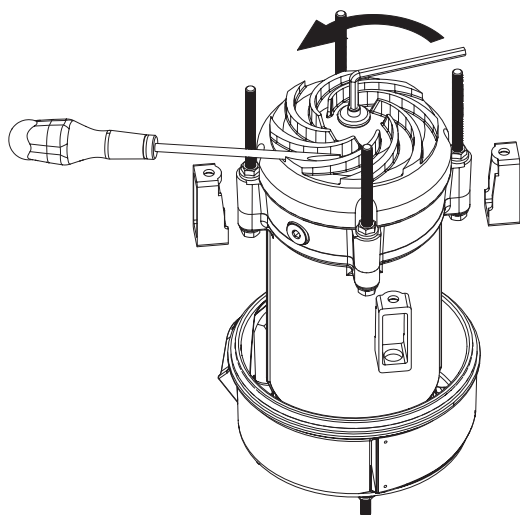


Figure 8a: Unscrew the impeller nut

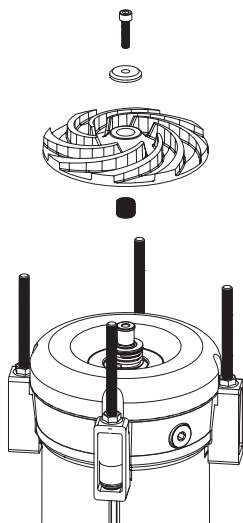


Figure 8b: Remove the impeller and the holding ring

### Dismantling



**CAUTION!** Impellers may have sharp edges. Take care not to cut yourself on them.

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 5 mm Allen key. Pry the impeller loose with two screwdrivers under the impeller hub. (Figure 8)

Remove the holding ring from the shaft.

### Assembly

Mount the holding ring on the shaft. Place the impeller on the shaft and fasten it while checking that the impeller runs straight. Check that the impeller runs free of wear plate with a clearance of 1-2 mm (0.04" - 0.08").



## 6 Change of primary seal and wear plate

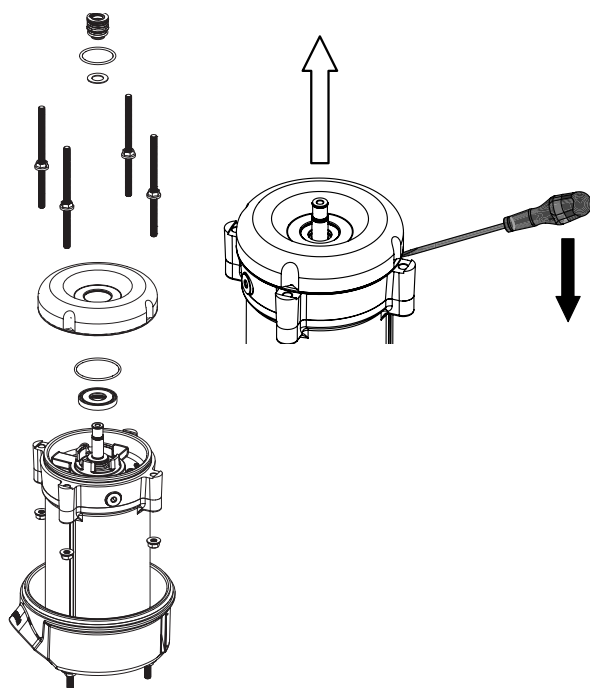


Figure 9: Removing primary seal and wear plate

### Dismantling

Remove washer, circlip and rotating parts of primary seal from the shaft. Remove the stud bolts. Withdraw the wear plate by using a screwdriver and remove the stationary ring of the primary seal. (Figure 9)

Always use new mechanical seals for assembly.

### Assembly

Mount stationary ring of primary seal with o-ring in its seat in the oil casing.

Before the outer o-ring is mounted on the oil casing, check that the wear plate is compressing the o-ring in the stationary seal enough to give efficient sealing.

Grease and mount o-ring on the oil casing, and assemble wear plate with stud bolts and nuts. Mount the rubber covers on the stud bolts and over the knobs on stator housing and oil casing. Grease and mount a new primary seal o-ring on the shaft. Oil the sealing surfaces of the mechanical seal and push the rotating ring onto the shaft. Assemble the spring and the steel cup. For assembly of pump proceed in reverse order from section 6 to 2.

## 7 Complete pump overhaul / dismantling

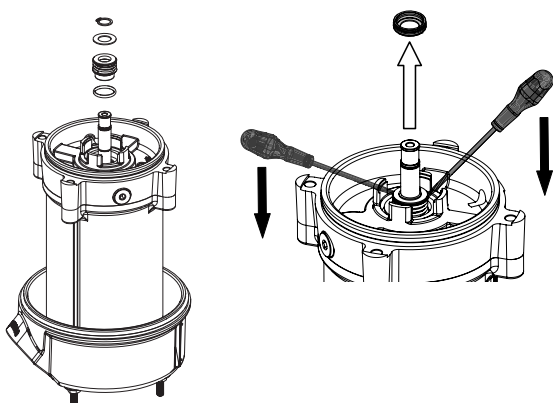


Figure 10: Removing secondary seal

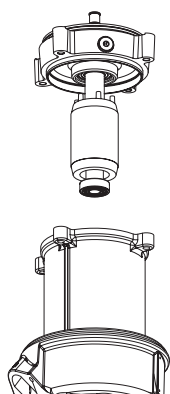


Figure 11: Removing rotor unit

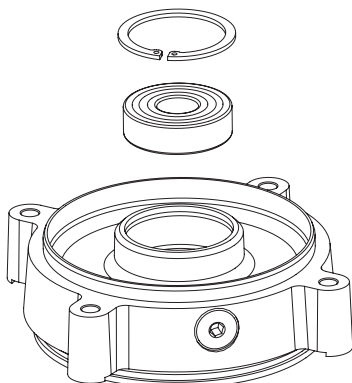


Figure 12: Removing lower bearing

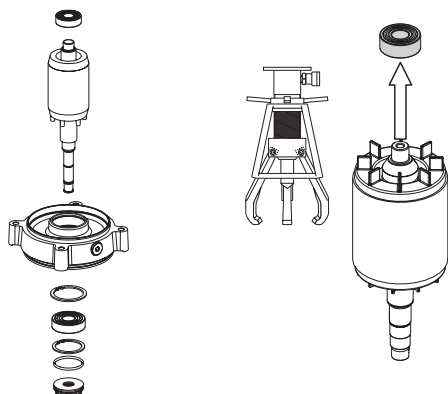


Figure 13: Removing rotor and upper bearing

### 7.1 Secondary seal

Remove circlip and rotating parts of secondary seal from the shaft. Remove the stationary ring with two screwdrivers. (Figure 10)

### 7.2 Rotor unit with oil casing

Turn the oil casing about 15 degrees and pry it loose from the stator housing with a screwdriver. Lift out the rotor unit. (Figure 11)

The rotor shaft has to be pressed out of the ball bearing. Place 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 high pressure is needed, screw the impeller nut fully on the shaft end in order to protect it.

### 7.3 Ball bearings

Remove the circlip on the oil casing holding the ball bearing and press out the bearing. The bearing seat can be heated quickly with LP-gas to facilitate the removal. Pull out the upper ball bearing with a puller. (Figure 13)

### 7.4 Stator unit with contactor

Unscrew the studs for the main cover and lift off the main cover from the stator unit.

## 8 Exchange of the stator

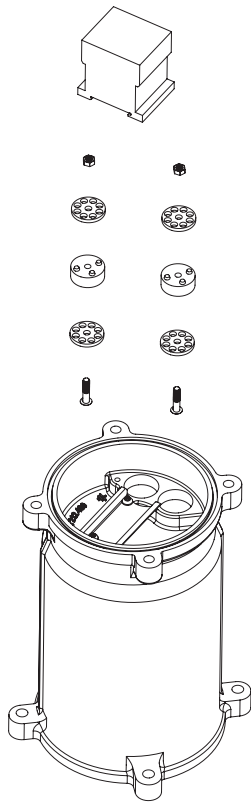


Figure 14: Removing wire seal

### 8.1 Removal of stator

Remove the contactor. Loosen nuts for the motor housing cable seal and pull out the seals. (Figure 14)

Arrange the motor cables so as to avoid jamming when the stator is falling out of the housing. Remove the o-ring in the upper bearing seat.

Put the motor housing on distance pieces.

Heat the motor housing with two LP gas flames (Large propane burner) at the stator laminations and downwards until the temperature of about 250°C (482°F) is reached or till the stator starts to fall out. (Figure 15)

Clean the housing and check it for damages, particularly on the sealing surfaces and in ball bearing seat. If damages cannot be corrected, the housing must be rejected.

### 8.2 Mounting of stator

Block up the new stator and make sure that the housing can be fully pushed down onto the stator. Protect the stator insulation from damages and put down the thermal wires (free from insulation resin and smooth) into the stator to avoid contact with the hot housing during assembly.

Heat the housing with two LP-gas flames to about 198° to 250°C (388° to 482°F). With two 25 mm nozzles this will take about one minute. Take the hot housing with heat-resistant gloves and push it down till it stops over the housing. (Figure 16)

**Note!**

Locate the holes for the thermal cables in the housing about 10 mm from the exit of the cable groups on the winding head.

When the housing has been mounted it may be cooled by 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 3 cables.

### 8.3 Thermal contacts

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

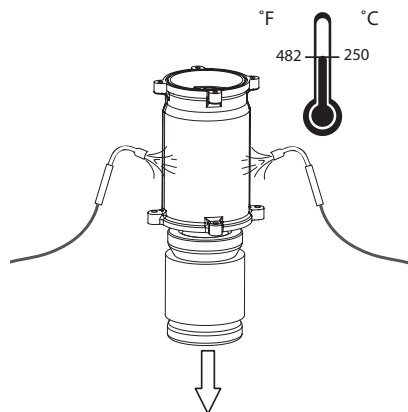


Figure 15: Removing stator from housing

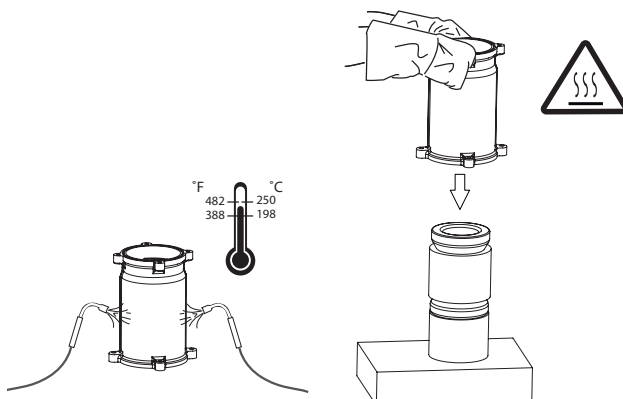


Figure 16: Mounting of stator

## 9 Complete pump overhaul assembly

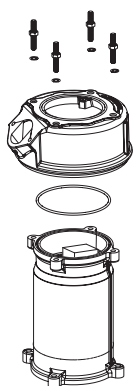


Figure 17: Assembling stator unit, contactor, main cover

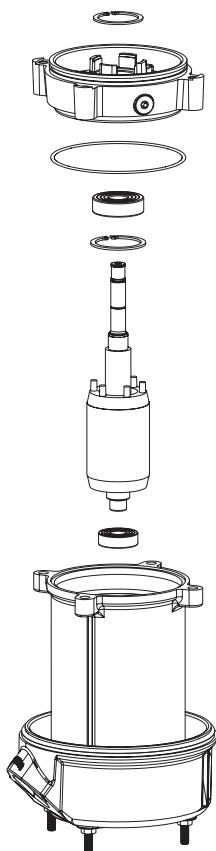


Figure 18: Mounting rotor unit

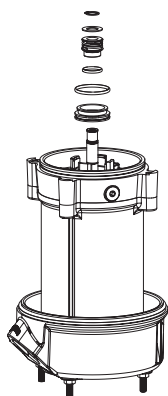


Figure 19: Mounting secondary seal

### 9.1 General

Prior to assembly, clean all parts carefully, especially o-ring grooves and mating surfaces. Grease or oil o-ring to eliminate damage during assembly. Put some grease or oil on the screw threads to simplify disassembly during future overhaul.

### 9.2 Stator unit, contactor, main cover

Grease and mount the o-ring in the upper bearing seat. Connect all stator leads to the contactor according to the wiring diagram (see section 10) and mount the contactor at the bottom of the contactor chamber.

Grease and mount the o-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 the o-ring and stator leads so that they have not been jammed. (Figure 17)

### 9.3 Ball bearings and rotor unit

Turn the stator unit with main cover mounted upside down.

Clean the oil casing and all sealing surfaces thoroughly. Remove burrs and scratches. All ball bearings are sealed and pre-filled with grease for lifetime performance.

Mount the circlip below the bearing seat on the oil casing (stop for secondary seal).

Heat the bearing seat with LP-gas to about 150°C (302°F) and mount the bearing in the seat. Mount the circlip on top of the bearing.

Place the oil casing on the mandrel 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.

Turn the rotor by hand and check that it turns freely without seizing.

Grease and mount o-ring on the casing. Slip the rotor unit into the stator unit and check that the o-ring is not jammed. (Figure 18)

### 9.4 Secondary seal

Clean and grease the seal seat in the oil casing and mount the stationary ring with o-ring. The small o-ring should be replaced. (Figure 19)

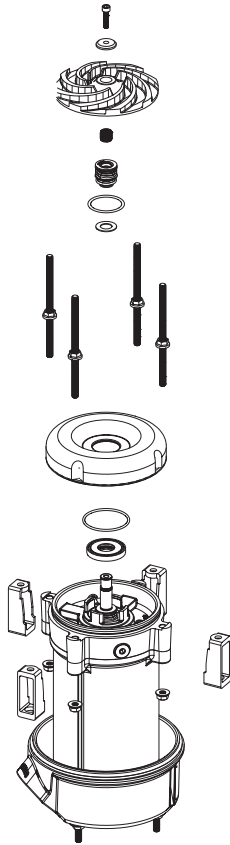


Figure 20: Mounting primary seal, wear plate and impeller

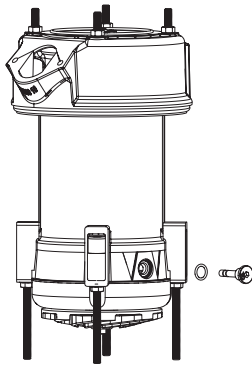


Figure 21: Filling oil

## 9.5 Primary seal and wear plate

Mount stationary ring of primary seal with o-ring in its seat in the oil casing.

Before the outer o-ring is mounted on the oil casing, check that the wear plate is compressing the o-ring in the stationary seal enough to give efficient sealing.

Grease and mount o-ring on the oil casing, and assemble wear plate with stud bolts and nuts. Mount the rubber covers on the stud bolts and over the knobs on stator housing and oil casing.

Oil the sealing surfaces of the mechanical seal and push the rotating part of the seal onto the shaft. Mount the circlip and push the tool down till the circlip fits into the groove.

## 9.6 Impeller



**CAUTION! Use gloves when mounting impeller, impellers may have sharp ends.**

Always use a new impeller washer for assembly. Mount the impeller washer and impeller on the shaft and fasten the impeller screw. Check that the impeller runs free of wear plate with a clearance of 1 - 2 mm (0.04 - 0.08").

## 9.7 Refilling of oil

Fill new oil in the oil chamber (Figure 21)

### Oil type:

Paraffin oil (white oil) with viscosity 10 - 15 cSt, e.g. BP Enerpar M 002 or equivalent

### Correct quantities:

J/JS 12 - 15	0.35 litres	0.09 US gallon
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Tighten the oil plug with a new o-ring.

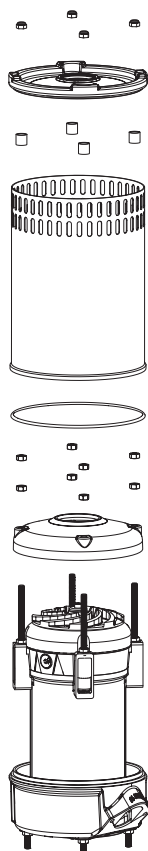


Figure 22: Mounting diffuser, cooling jacket and base plate

### 9.8 Diffuser and cooling jacket

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 being jammed.

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 of a turn and lock with jam nuts. For single-phase pumps and polyurethane the clearance should be 0.3 mm or more. Mount the rubber sleeves. (Figure 22)

### 9.9 Base plate

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

Turn the pump around to an upright position.

### 9.10 Handle, cable gland, cover and discharge connection

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

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

Connect the phase leads to the contactor according to wiring diagram and screw the yellow / green earth lead in the main cover. Grease and mount the o-ring on the cover. Mount the cover on the main cover and arrange the leads so that they may not be jammed or block the functioning of the contactor. Tighten the cover with the cap nuts.

Mount the handle and the discharge connection back on the pump and tighten the screws. Mount the plug if supplied at the other end of the cable. (Figure 23)

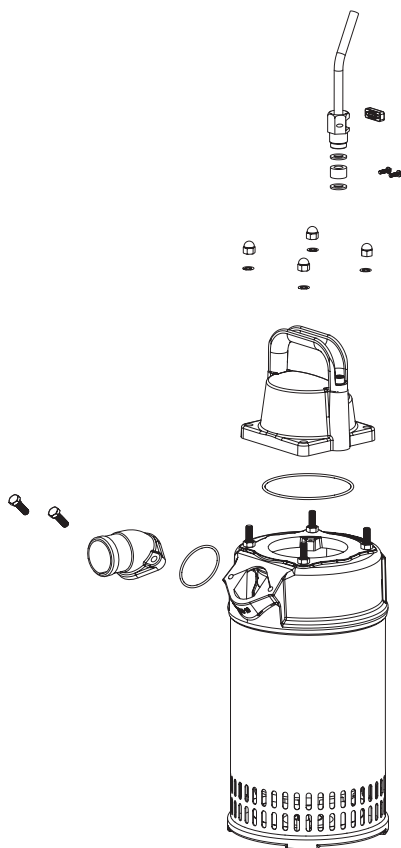


Figure 23: Assembly handle, cable gland, cover and discharge connection

## **9.11 Testing**

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

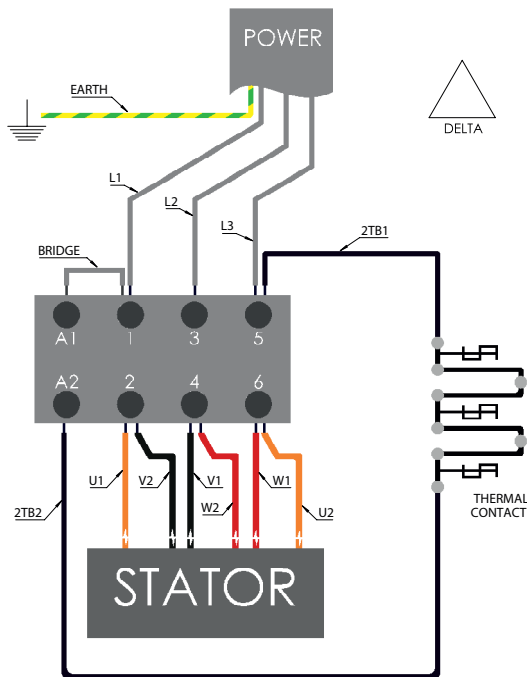
If possible, operate the pump in water and measure the head against closed valve.

## 10 Electrical information and wiring diagrams

### 10.1 Three phase Direct Start D.O.L. (6-leads stator) with contactor

The stators are wound for different voltages and can be Delta- or Star-connected. For example stator 400/690 V 50 Hz is Delta-connected for 400 V duty. Pumps can be equipped with float switch direct connected at the pump. (Figure 24, 25,)

The contactor is activated by the same voltage as the supply voltage. Therefore, when changing from one voltage to another the contactor must also be changed.

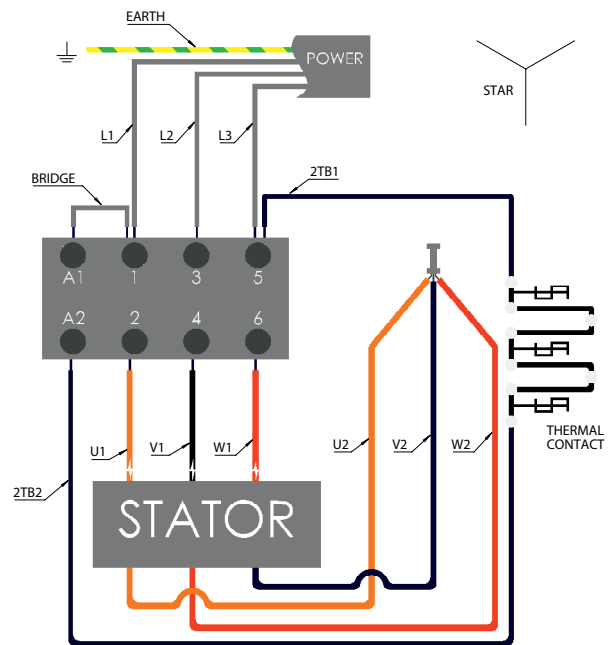


U1 - ORANGE  
 U2 - ORANGE  
 V1 - BLACK  
 V2 - BLACK  
 W1 - RED  
 W2 - RED

J 12-15 D  
 Connection Diagram  
 DELTA

310 100 475 - 00

Figure 24: Delta connected windings D.O.L.



U1 - ORANGE  
 U2 - ORANGE  
 V1 - BLACK  
 V2 - BLACK  
 W1 - RED  
 W2 - RED

J 12-15D  
 Connection Diagram  
 Y

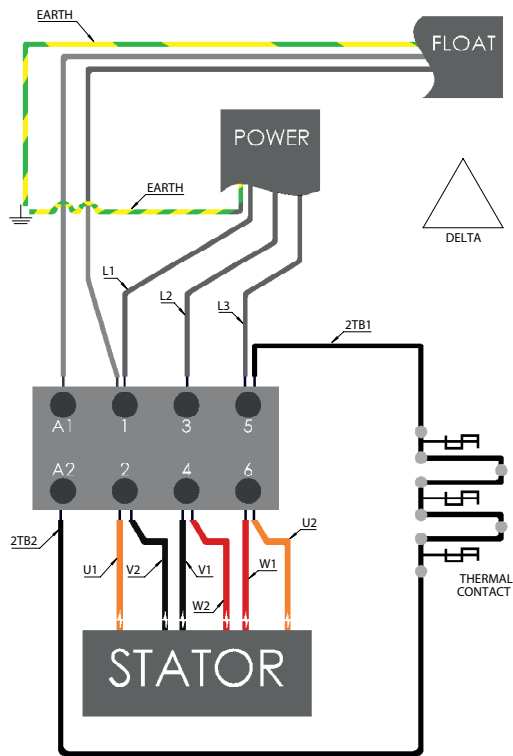
310100476 - 00

Figure 25: Star connected windings D.O.L.



### 10.2 Three phase Direct Start D.O.L. (6-leads stator) with contactor and float switch

Pumps can be equipped with float switch direct connected at the pump. (Figure 26, 27)

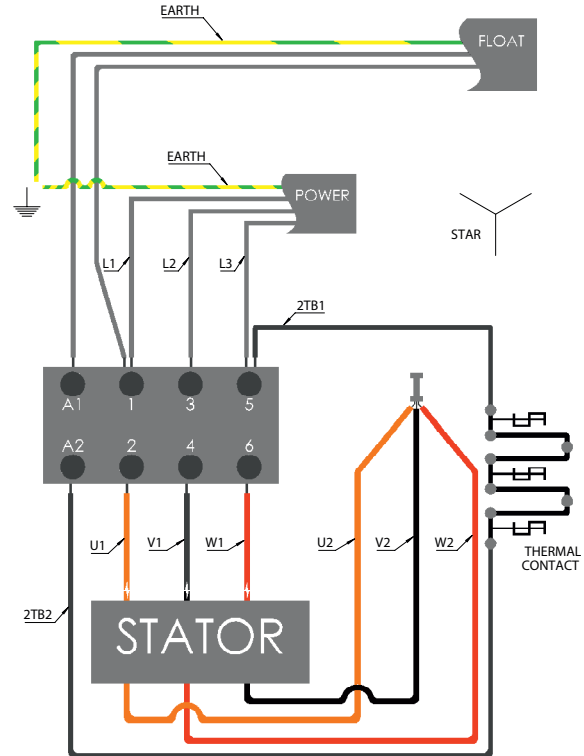


U1 - ORANGE  
 U2 - ORANGE  
 V1 - BLACK  
 V2 - BLACK  
 W1 - RED  
 W2 - RED

J 12-15 D  
 Connection Diagram  
 DELTA with Float

310 100 477 - 00

Figure 26: Delta connected windings D.O.L. Optional float switch.



U1 - ORANGE  
 U2 - ORANGE  
 V1 - BLACK  
 V2 - BLACK  
 W1 - RED  
 W2 - RED

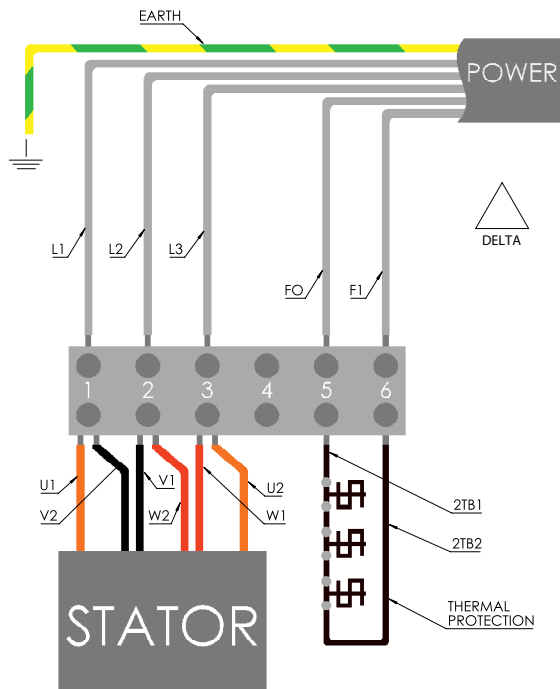
J 12-15 D  
 Connection Diagram  
 "Y" with Float

310 100 478 - 00

Figure 27: Star connected windings D.O.L. Optional float switch.

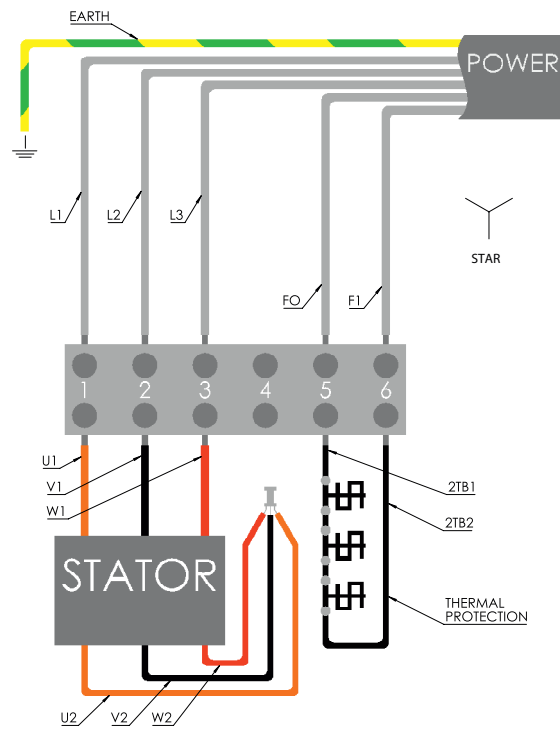
### 10.3 Three phase Direct Start with terminal block Star connected and Delta connected

The Direct start (Star or Delta) is done by using a separate starter. The power wires and control wires are in one cable connected as shown in figure 28, 29.



U1 - ORANGE  
 U2 - ORANGE  
 V1 - BLACK  
 V2 - BLACK  
 W1 - RED  
 W2 - RED

ASSEMBLY DRAWING / ZUSAMMENSTELLUNG /  
 ASSEMBLAGE  
 Delta Connection Cable 7 leads 350074 AC



U1 - ORANGE  
 U2 - ORANGE  
 V1 - BLACK  
 V2 - BLACK  
 W1 - RED  
 W2 - RED

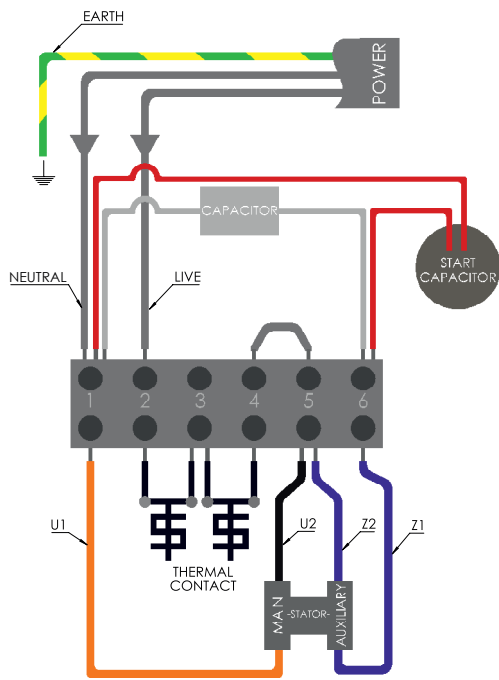
Wiring Diagram  
 Star Connection Cable 7-Leads 350073 AC

Figure 28: Delta connection cable 7-leads.

Figure 29: Star connection cable 7-leads

### 10.4 Single phase

The stators are wound for different voltage and all Sulzer single phase pumps are equipped with built in capacitors for start. Pumps can be equipped with float switch direct connected at the pump. Figure 30, 31, 32 and 33.

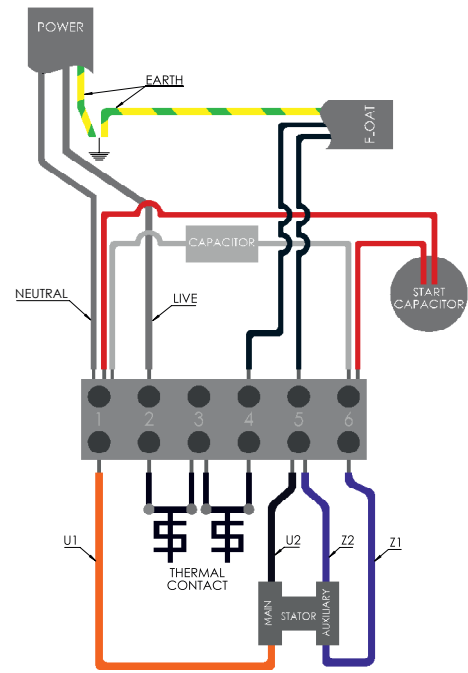


U1 - ORANGE  
U2 - BLACK  
Z1 - BLUE  
Z2 - BLUE

ASSEMBLY DRAWING / ZUSAMMENSTELLUNG /  
ASSEMBLAGE  
J 12-15 W

310 100 479 - 00

Figure 30: Pump with built-in contactor and capacitor.

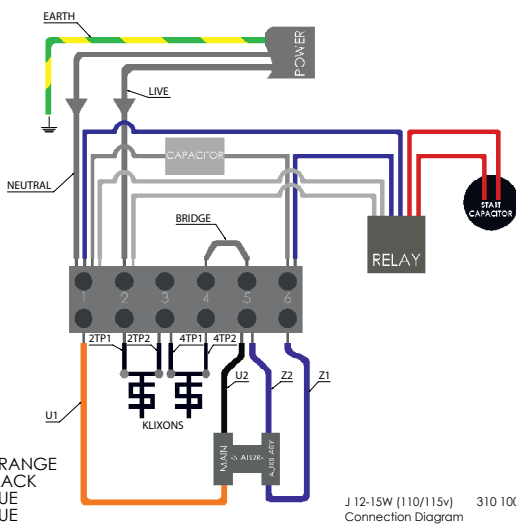


U1 - ORANGE  
U2 - BLACK  
Z1 - BLUE  
Z2 - BLUE

ASSEMBLY DRAWING / ZUSAMMENSTELLUNG /  
ASSEMBLAGE  
J 12-15 W (Float)

310 100 480 - 00

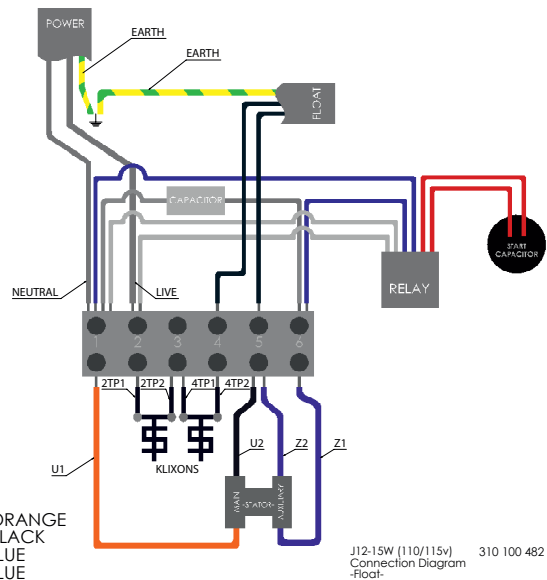
Figure 31: Pump with built-in contactor and capacitor. Optional float switch.



U1 - ORANGE  
U2 - BLACK  
Z1 - BLUE  
Z2 - BLUE

J 12-15W (110/115V)  
Connection Diagram  
310 100 481 - 00

Figure 32: Pump 110/115 V with built-in contactor and capacitor.



U1 - ORANGE  
U2 - BLACK  
Z1 - BLUE  
Z2 - BLUE

J12-15W (110/115V)  
Connection Diagram  
-Float-  
310 100 482 - 00

Figure 33: Pump 110/115 V with built-in contactor and capacitor. Optional float switch.

## 10.5 Fuses

Fuses are to be installed in the power circuits as a short circuit protection. Fuses with a time lag are recommended. The table shows the nominal current and starting current factor. Multiply factor with nominal current to get the pumps starting current.

Three-phase 50 Hz				
Pump	230 V	400 V	500 V	Starting current factor
J 12	3.8 A	2.2 A	1.8 A	3.7
J 15	5.2 A	3.0 A	2.4 A	4.8
JS 12	3.8 A	2.2 A	1.8 A	3.7
JS 15	5.2 A	3.0 A	2.4 A	4.8

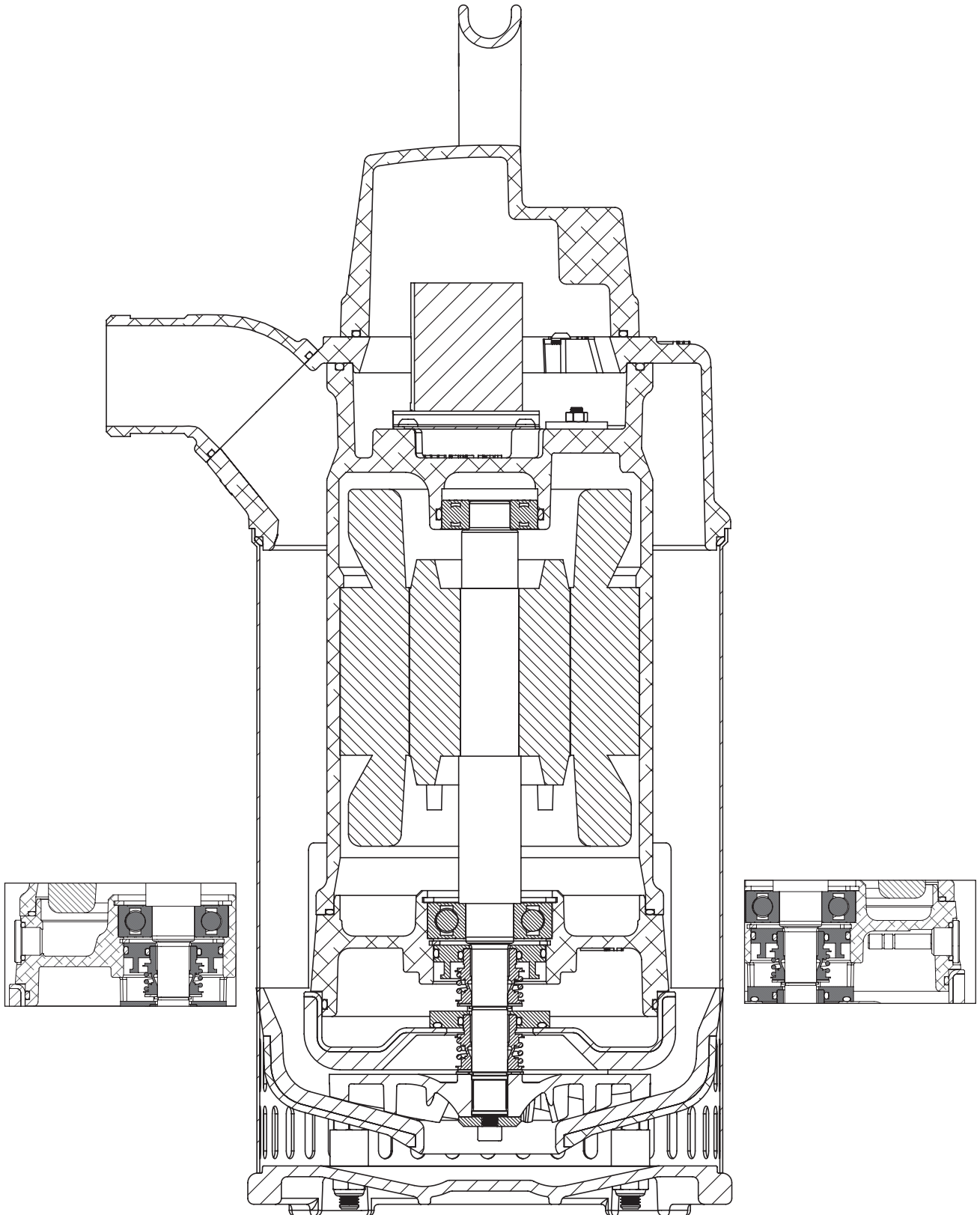
Three-phase 60 Hz				
Pump	230 V	460 V	575 V	Starting current factor
J 12	4.3 A	2.1 A	1.7 A	3.9
J 15	6.2 A	3.1 A	2.5 A	4.5
JS 12	4.3 A	2.1 A	1.7 A	3.9
JS 15	6.2 A	3.1 A	2.5 A	4.5

Single-phase 50 Hz			
Pump	110 V	230 V	Starting current factor
J 12	11.3 A	-	3.7
J 12	-	5.4 A	3.2
J 15	19.0 A	-	
J 15	-	9.1 A	2.7
JS 12	-	5.4 A	3.2

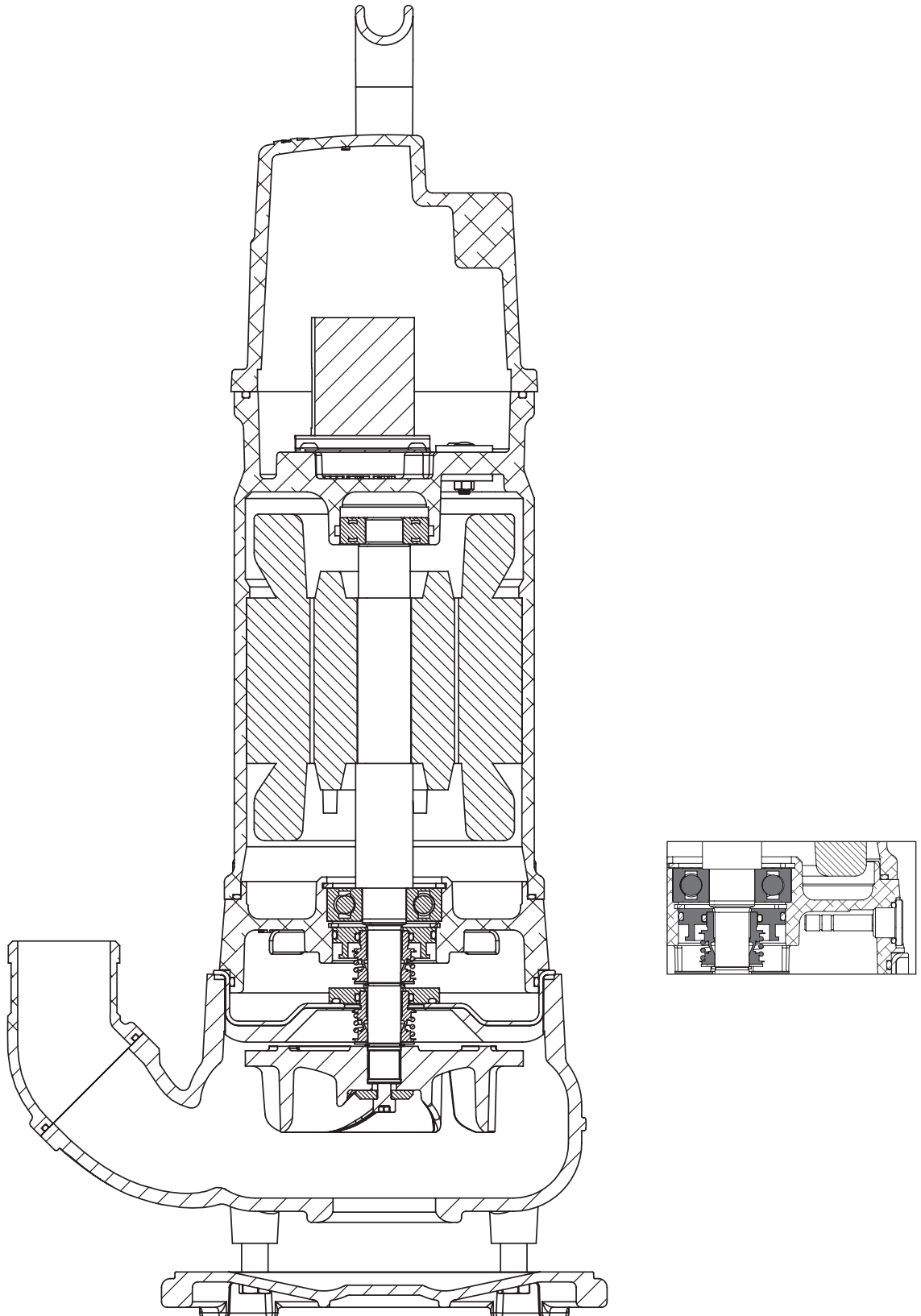
Single-phase 60 Hz			
Pump	115 V	230 V	Starting current factor
J 12	13.8 A	-	2.6
J 12	-	6.9 A	3.6
J 15	19.2 A	-	
J 15	-	9.6 A	4.1
JS 12	-	6.9 A	3.6

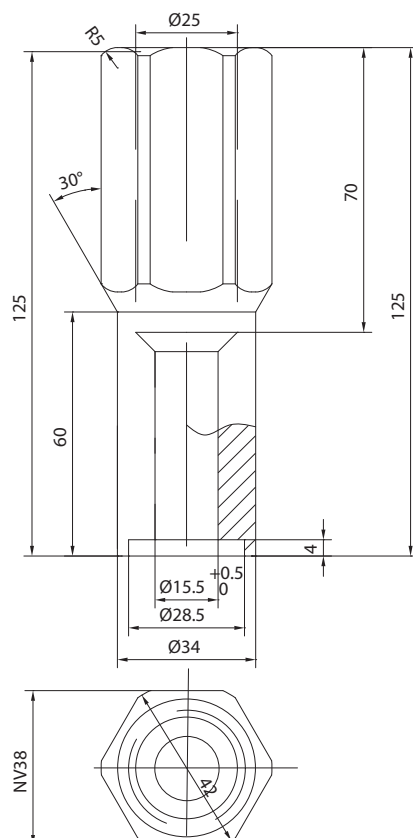
# 11 Sectional drawing / Tools

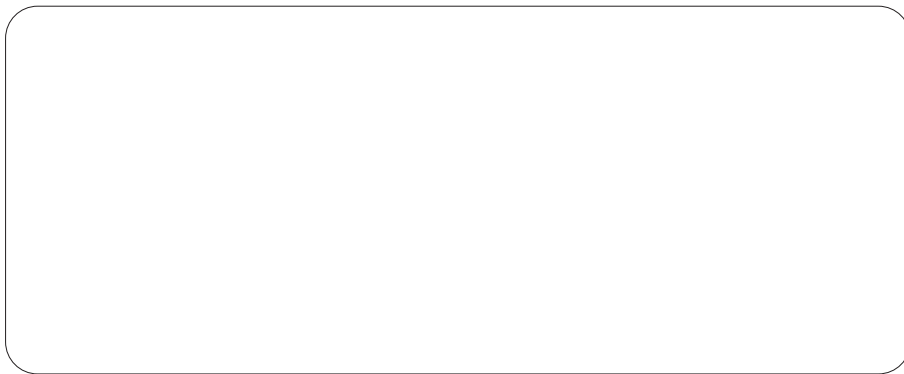
J



**JS**



**Special tool for secondary seal J 12-J 15, JS 12-JS 15  
(part No 00830342)**



**SULZER**

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