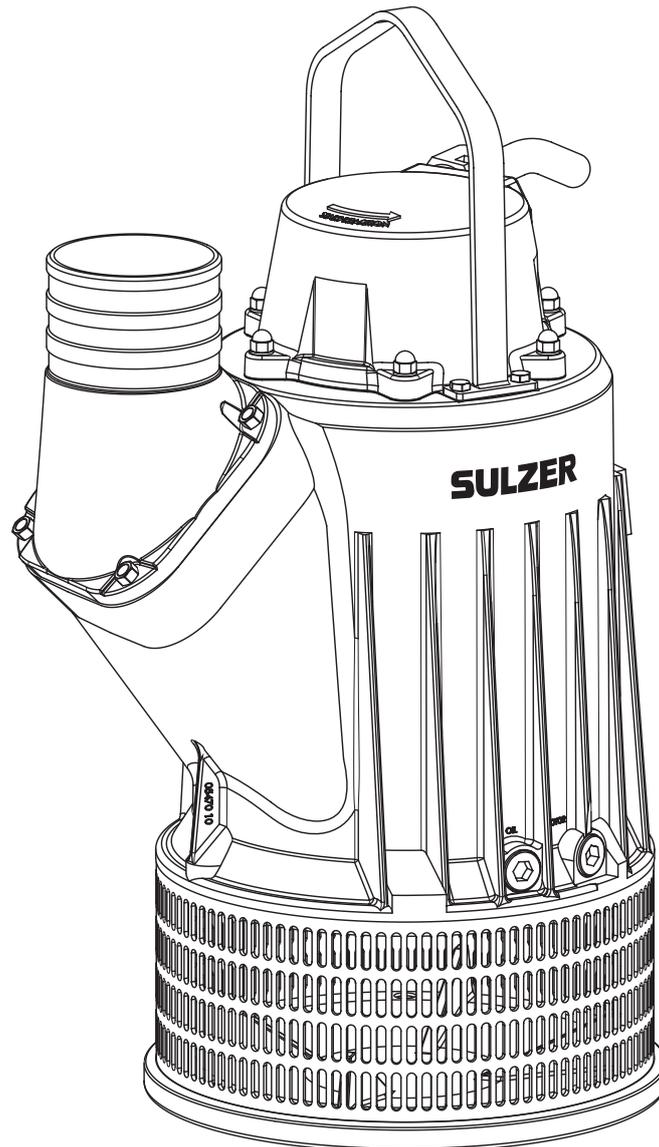

Submersible Drainage Pump J 205 - J 405 - J 604



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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 205 - J 604 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 pre-filled 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 conditions 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 kits includes preselected spare parts which secures a fast and efficient maintenance and avoids unnecessary downtime for the pump. For contents of repair kits see spare part lists.

J 205: 00831607

J 405: 00831608

J 604: 00831609

1.3 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 bearing assembly and mechanical seal dismantling/assembly. See attached drawings in section 11.

Lower ball bearing J 205: 00831644
 J 405: 00831650
 J 604: 00831645

Upper ball bearing J 205: 00831649
 J 405: 00831649
 J 604: 00831648

Primary seal J 604: 00831647
Secondary seal J 604: 00831646

Lifting tool for stator J 205-604: 00831847

For lifting J 205: M14 eye-bolt (x2)
 J 405: M12 eye-bolt
 J 604: M16 eye-bolt

Torque rating

Size	M6	M8	M10	M12	M14*	M16	M20
Nm	7	17	33	57	91	140	273
lb-ft	5.2	12.5	24.3	42.0	67.1	103.3	201.5

(*=M14 nuts under diffuser and bottom plate use 45 Nm.)

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. Sulzer recommends to always use anti seize UNLOCK 2000 or equal lubrication on gland threads.

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.

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 are 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

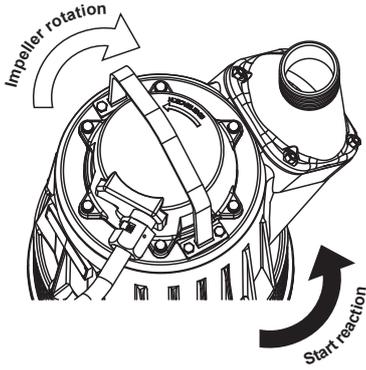


Figure 1: Direction of rotation

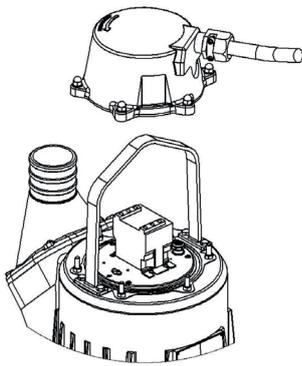


Figure 2: Pump with contactor/terminal block/SoftDrive (J 205)

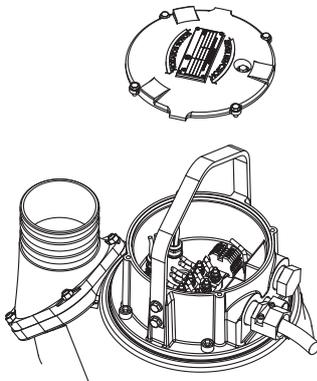


Figure 3: Pump with contactor/terminal block (J 405)

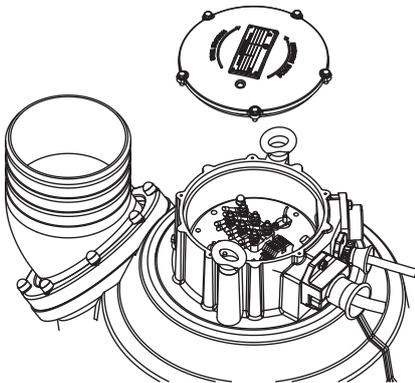


Figure 4: Pump with terminal block (J 604)

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. **Note!** DO NOT MEGGER 1000V PUMPS WITH GROUND CHECK DIODE (GC) CONNECTED.

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 2-4)

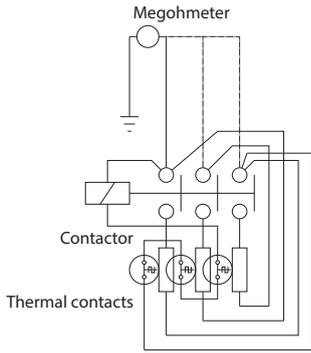


Figure 5: Megging of windings

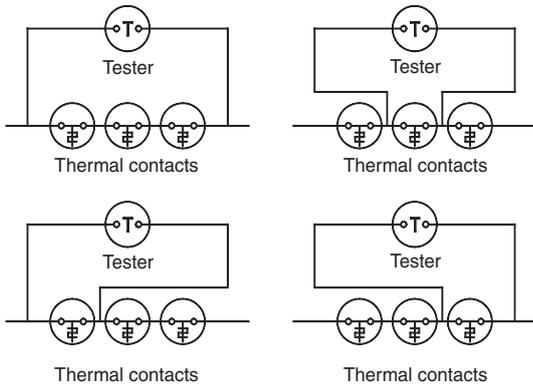


Figure 6: Testing of the thermal contacts

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 500V megohmmeter (megger) and the reading should be at least 1 MΩ. (Figure 5) 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.

Note!

DO NOT MEGGER 1000V PUMPS WITH GROUND CHECK DIODE (GC) CONNECTED.

2.4 Thermal contacts

The circuit with the three built-in thermal contacts should be checked for continuity, using an ohmmeter or buzzer. (Figure 6)

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 Oil / Motor check

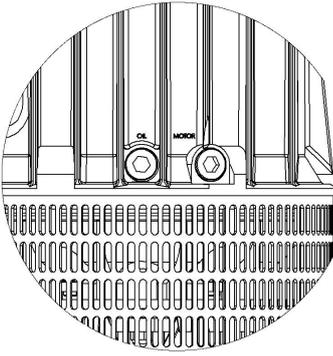


Figure 7: Oil and motor inspection plug (J 205)

3.1 Oil check

If the pump is connected to an external starter and the leakage monitor lamp lights up then the oil must be checked. Check the leakage-seal monitor by disconnecting the leakage-lead from the terminal board. Measure the insulation between the leakage-lead and Earth. The value should be larger than 100 k Ω , if it is not the oil should be checked.

J 205 - J 405: Unscrew outer and inner oil plug (Figure 7)

J 604: Unscrew oil plug

Hint! To ease the drain of the oil on J 405 and J 604 unscrew both of the oil plugs on the pump.

Hint! Put some grease on the hex tool to lift up the inner oil screw on J 405.

Hint! If pump will be completely dismantled the drain of the oil can be done later in the overhaul. See section 7



CAUTION! The lifting tackle must always be designed to suit the pump weight.

TILT THE PUMP OR LAY THE PUMP DOWN IN HORIZONTAL POSITION. REMEMBER TO ALWAYS SECURE THE PUMP WITH THE LIFTING CHAIN. Drain off the oil into a clean can and examine it. If it is clean and contains no water, the mechanical seal unit / shaft seals are free from defects and can be used again. If the oil contains water (milky emulsion) and sediments, the mechanical seal unit / shaft seals must be changed and the lower ball bearing checked.

3.2 Motor check J 205

Unscrew inspection plug marked "Motor" and check that no water or oil has entered into the motor housing.

Hint! Use an air tool to blow into motor housing and check if water comes out of housing. For motor check on J 405, J 604 see section 7.

4 Impeller clearance check

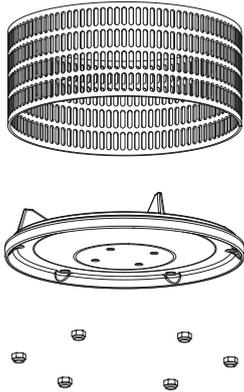


Figure 8: Dismantling base plate and strainer

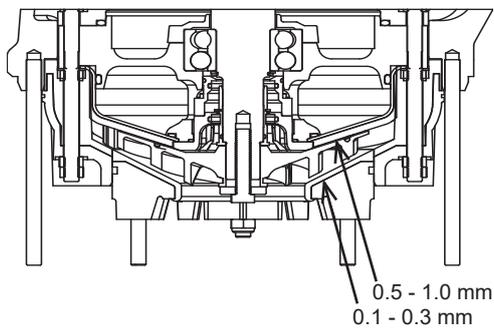


Figure 9: Clearance measure

4.1 Dismantling base plate and strainer

Loosen the bottom nuts that secures the base plate and remove the base plate and the strainer. (Figure 8)

Hint! Use an extension socket M16 (J 405), M20 (J 604) to dismantle base plate.

4.2 Clearance measure

Check the impeller for damage and that the impeller runs free of the wear ring with a clearance of 0.1-0.3mm (0.004"-0.012"). If not, adjust it or if the wear is too high go on with "change of impeller". (Figure 9)

Note!

A drop in capacity due to wear is compensated in a few minutes. Just remove base plate and tighten nuts below the wear ring to reestablish a clearance between impeller and wear ring of 0.1-0.3 mm (0.004"-0.012").

5 Change of impeller / Check of diffuser and wear ring

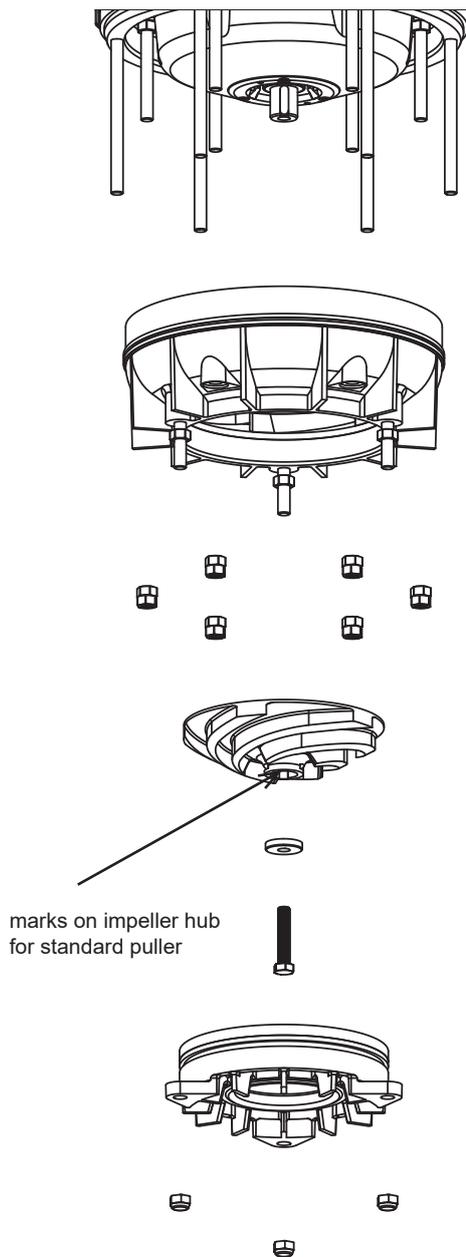


Figure 10: Change of impeller / Check of diffuser and wear ring

Dismantling



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

Unscrew the nuts that secures the wear ring and remove it. Lock the impeller with a screwdriver or similar and unscrew the impeller screw and remove the screw and the impeller washer.

Hint! Use a standard 2-arm impeller puller or two bending tools and pull out the impeller from the shaft. The impeller hub has marks for the puller.

For removal of diffuser unscrew nuts that secures the diffuser and pull out the diffuser.

Hint! On J 205 it is preferred to dismantle the diffuser and wear ring together by using a pair of bending tools.

Hint! On J 405 there are two threaded holes M10 where bolts can be threaded in to pull out the diffuser.

Check the condition of the diffuser, wear ring and impeller. The diffuser/impeller must be replaced if it is worn down. The wear ring should be replaced if the rubber is worn down to 2 mm (1/16") or is uneven. Always remove the key and inspect the shaft seals when changing the impeller.

Assembly

Clean the shaft end. Mount the impeller on the shaft, secured by the key, impeller washer and impeller screw. Check that the back side of the impeller runs free of the wear plate with a clearance of 0.5-1.0 mm (0.02"-0.04"). Adjust the clearance with shims between impeller and shaft / shaft sleeve if necessary. Mount the diffuser and tighten the nuts to J 205=45 Nm, J 405=140 Nm, J 604=273 Nm. Mount the wear ring with nuts until the impeller runs free with a clearance of 0.1-0.3 mm (0.004"-0.012"). Mount strainer and base plate, and tighten the nuts firmly. (Figure 10)

Note!

J 205 - J 405: Never run the motor without having the impeller mounted. This can cause damage to o-rings in seal unit.

J 604: When impeller is removed, be aware that the rotating primary seal is loose.

6 Change of mechanical seal unit on J 205, J 405 / Mechanical seals J 604

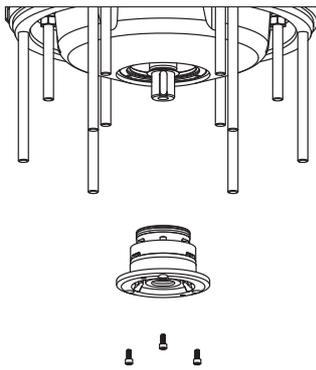


Figure 11: Dismantling mechanical seal unit (J 205, J 405)

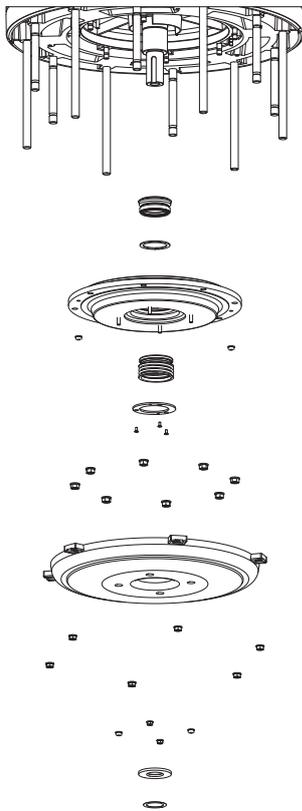


Figure 12: Dismantling mechanical seals (J 604)

Dismantling

Clean the shaft end.

J 205 - J 405: Unscrew the screws holding the mechanical seal unit. Use the same screws in the alternative holes on the seal unit to carefully pull the seal unit out from the shaft. Check that there are no burrs on the shaft. If wear plate must be replaced, continue on complete pump overhaul 7.1. (Figure 11)

J 604: Release pressure on spring and lift off rotating part of primary seal. Note that the stationary ring is still in the oil casing cover. Unscrew inner and outer nuts that secures both the rubberized wear plate and the oil casing cover and remove them. Dismantle the stationary ring of the primary seal from the oil casing cover. Remove circlip under the secondary seal. Pull out rotating part on secondary seal. Remove the stationary ring from the oil casing. (Figure 12)

Assembly

J 205 - J 405: Grease the shaft end. Mount the mechanical seal unit carefully with new and well greased o-rings and tighten it firmly with screws.

J 604: Mount the secondary seal, first the stationary ring on the oil casing and then the rotating ring and circlip, by using the special tool. Mount the oil casing cover and then put the primary seal stationary ring in place and fix it with the retaining ring (pos 82 + 85 in spare part list). Push on the rotating part of the primary seal by using a special tool, see section special tools. Mount the rubberized wear plate and tighten inner and outer nuts.

For assembly of pump proceed directly to section 9.

Note!

Never run the motor without having the impeller mounted. This can cause damage to o-rings in seal.

7 Complete pump overhaul / Dismantling

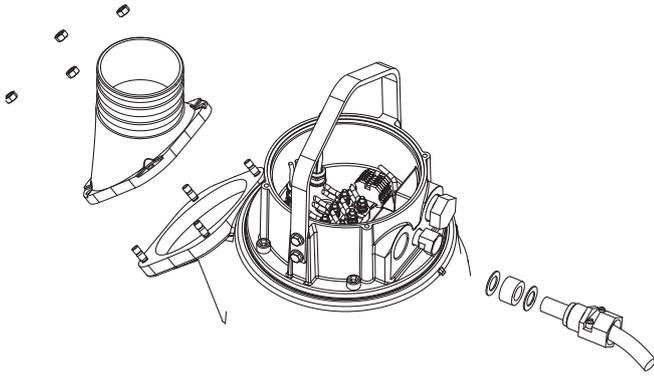


Figure 13: Cable and discharge removal

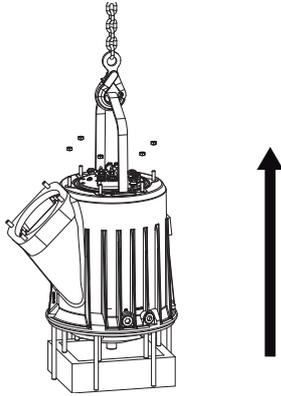


Figure 14: Cooling jacket removal (J 205)

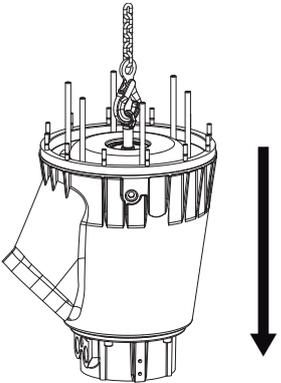


Figure 15: Cooling jacket removal (J 405, J 604)

Dismantle the pump as described in the sections 2-6.

Note!

Oil drainage, mechanical seal and wear plate dismantling can wait until cooling jacket is removed.

7.1 Electrical supply leads

Disconnect all electrical leads from the terminal board / contactor in the pump. Then start to remove power and control cables from the pump. (Figure 13)

J 205: The power and control cable are incorporated in the top cover and will be removed when cables are disconnected from the terminal board /contactor. Remove cable clamps prior to unscrewing cable gland from cover. Pull out cables.

J 405: Remove cable clamps prior to unscrewing cable gland from upper motor part. Unscrew cable gland and pull the cable out together with the cable gland.

J 604: Remove cable clamps prior to unscrewing nuts that hold the cable gland and pull the cable together with the cable gland out.

Check the condition of the cable, cable seals and cable glands when cover is removed. When a cable seal is removed always replace it with a new.

7.2 Discharge connection

Unscrew the nuts that hold the discharge elbow and remove it. (J 604 has a clamping ring holding the discharge connection.) (Figure 13)

7.3 Cooling jacket

Make sure all inspection plugs are removed from the cooling jacket prior to dismantling cooling jacket.

J 205: Lift the pump up in the handle into a vertical position with a lifting device and secure it. Put the pump standing on the outer longer stud bolts. Place a distance piece under the diffuser stud bolts (preferably a wooden frame at a diameter of the diffuser stud bolts). Loosen the stud bolts holding the cooling jacket and lift off the cooling jacket from the motor housing. (Figure 14)

J 405: Remove the handle from the pump when it is lying down. Thread on an eye bolts on to the shaft end. Lift the pump and place it in an upside down position on the connection chamber secured by the lifting device. Use a dead blow (plastic hammer) to force the cooling jacket down until it releases from the motor housing. Lift out the complete motor housing and put it lying down. (Figure 15)

J 604: Unscrew the lifting eye on top of the pump and remove them. Fit an eye-bolt at the end of the shaft and use a chain to lift and raise the pump into an upside down position standing on the connection chamber. Unscrew nuts to release the oil housing from the outer jacket. Lift up and withdraw the motor housing and oil housing together out of the cooling jacket. (Figure 15)

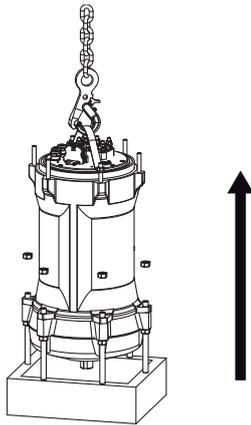


Figure 16: Removal of motor housing (J 205, J 405)

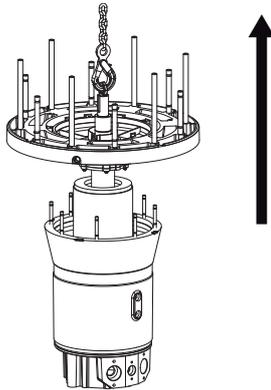


Figure 17: Removal of motor housing (J 604)

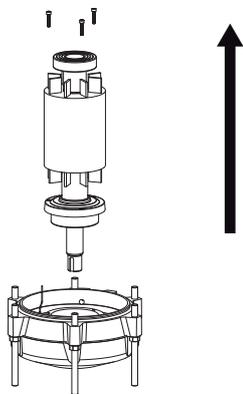


Figure 18: Removal of rotor unit (J 205, J 405)

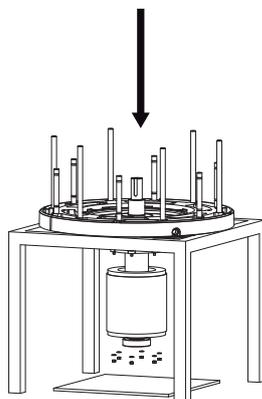


Figure 19: Removal of rotor unit (J 604)

7.4 Motor housing

It is advisable to mount the oil plugs back on the oil casing to avoid unnecessary spill of oil.

J 205: Mount a lifting chain/wire with two screws on the upper part of the motor housing and keep it in an upright position secured by the lifting crane. Unscrew the nuts holding the motor housing/oil casing together and lift off the motor housing. (Disconnect the cable for the leakage sensor). (Figure 16)

J 405: MOUNT THE HANDLE BACK TO THE MOTOR HOUSING. Use a lifting crane to lift the pump in the handle to an upright position standing on the stud bolts. Unscrew the nuts holding the motor housing (use a pipe tong to contra hold the diffuser stud bolts) and lift off the motor housing separating it from the rotor/oil casing package (Disconnect the cable for the leakage sensor). (Figure 16)

J 604: Keep the pump secured by the lifting eye bolt on the shaft end and the lifting crane. Disconnect the cable for the leakage sensor and bearing sensor. Unscrew the nuts and lift off the oil housing together with the rotor + shaft from the motor housing. Release the seal leakage monitor plug out of its rubber housing and the lower bearing monitor plug out of the bearing flange. (Figure 17)

7.5 Rotor + shaft and ball bearings

J 205: Keep the rotor unit standing upright and unscrew the lower bearing bracket. Lift out the rotor with bearings from the oil casing (Can be lifted manually or alternatively a lifting strap can be attached to the upper bearing). Use a bearing puller to remove both bearings from the shaft (Use a long arm puller for the lower bearing). (Figure 18)

J 405: Lift the rotor unit standing upright and unscrew the lower bearing bracket. Remove the upper bearing with a puller and mount a lifting bow on the shaft end and lift out the rotor from the oil casing. (Alternatively a lifting strap can be attached to the upper bearing to lift out the rotor from the oil casing). Use a bearing puller with long arms to remove lower bearings from the shaft. (Figure 18)

J 604: Dismantle the oil housing from the rotor + shaft completely. Unscrew the screws on the bearing flange. Place the oil housing on the auxiliary tool on the press. Press out the rotor + shaft with the lower bearing of the oil housing. The bearing seat can be heated quickly with LP-gas to facilitate the removal. (Figure 19)

Hint! Make sure the oil casing is well supported on the press when the rotor with bearings is pressed out. This is to avoid unwanted changes on the bearing seat on the oil casing.

Hint! Place a hard rubber sheet under the table in order to avoid damage to rotor shaft and upper bearing.

Remove the circlip under the lower ball bearing. Lay the rotor + shaft down on the side. Use a bearing puller with long arms to remove lower bearings from the shaft.

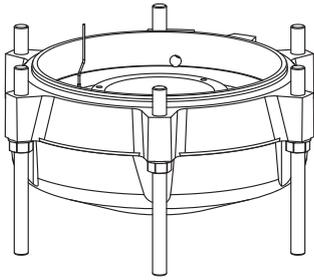


Figure 20: Removal of wear plate (J 205, J405)

8 Exchange of stator

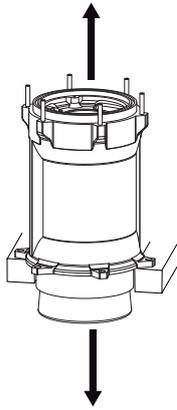


Figure 21: Removal of stator

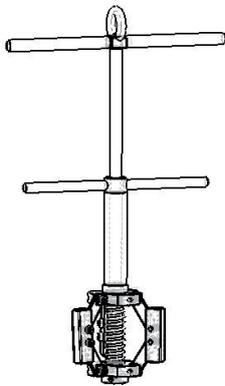


Figure 22: Stator lifting tool

7.6 Wear plate on J 205 and J 405 (Figure 20)

J 205: Lye the oil casing/wear plate down and take out the stud bolts holding the wear plate. Remove the wear plate and check the condition if it must be replaced. Also check the condition of the oil casing.

J 405: Lye the oil casing /wear plate down. The stud bolts can be left on the oil casing if condition is OK. Remove the wear plate and check the condition if it must be replaced. Also check the condition of the oil casing.

8.1 Removal of stator (Figure 21, 22)

J 205: Keep the lifting chain mounted on the motor housing. Put it standing upright. Dismantle the terminal plate completely.

J 405: Dismantle the upper motor part/bearing bracket from the motor housing completely and mount a lifting chain on the motor housing to secure it with the lifting crane. Put it standing upright.

J 604: Mount the lifting eye bolts back on the motor housing and put the motor housing upright. Dismantle the terminal plate completely.

Unscrew the stator lock key inside the motor housing just below the stator (from serial no 60400400).

For all models:

When contactor/terminal plate/upper bearing bracket has been removed together with all cable seals, arrange motor cables well folded together to smoothly follow when the stator is released from the motor housing.

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.

Then lift the motor housing up smoothly to make sure it is released from the stator. If necessary tap the motor housing with a rubber hammer in order to release the stator. Lift the motor housing up away from the stator.

A stator lifting tool may be used for an alternative way to lift out the old stator from the motor housing. Check section 11 for part No. (Figure 22)

Clean the motor housing and check for damages, particularly on the sealing surfaces and in the upper bearing seat.

Remove the o-ring in the upper bearing seat. If damages cannot be corrected, the housing must be rejected.

Note!

Do not use a welder as a burner as this can cause damages on the motor housing.

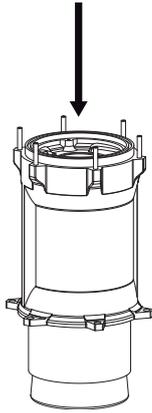


Figure 23: Mounting of Stator (J 205, J 405)

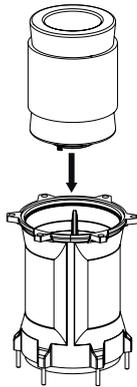


Figure 24: Mounting of Stator (J 604)

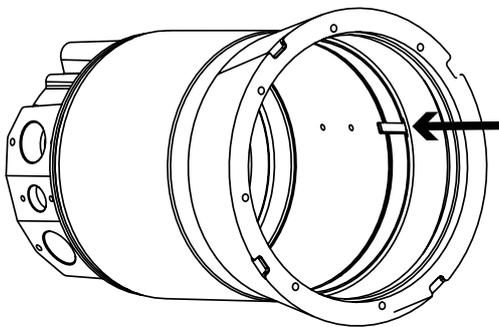


Figure 25: Axial groove in the motor housing (J 604)

8.2 Mounting of new stator

J 205, J 405: (Figure 22, 23) Block up the new stator and make sure that the motor housing can be fully pushed down onto the stator. Protect the stator insulation from damages and fold stator cables together in two groups and put them into a position so they can easily be pulled up through the holes/openings in the motor housing when stator is mounted. Avoid cables to get in contact with the hot motor housing during assembly. Make sure the motor housing is secured by the lifting crane and that it can be fully lowered on to the stator.

Use Two LP-gas flames to heat the housing till about 198° to 250 °C (388 ° to 482 °F). With two 25 mm nozzles this will take about one minute.

Rotate the motor housing into a position, so the stator/ thermal/control cables can be pulled up smoothly through the motor housing and later pulled through and assembled on the terminal plate/upper bearing bracket.

A stator lifting tool may be used for an alternative way to lift back the new stator into the motor housing. Check section 11 for part No. (Figure 22)

When the stator has been mounted the motor housing may be cooled by compressed air.

Grease and mount the o-ring for the upper bearing in the upper part of the motor housing on J 205.

J 604: (Figure 22, 24, 25) Block up the motor housing and make sure that the new stator can be fully lowered into the motor housing. Protect the stator insulation from damages and fold stator cables together in two groups and put them into a position so they can easily be pulled up through the holes/openings in the motor housing when stator is mounted. Avoid cables to get in contact with the hot motor housing during assembly. Make sure the stator is secured by the lifting crane and that it can be fully lowered into the motor housing.

Use Two LP-gas flames to heat the housing till about 198° to 250°C (388 ° to 482 °F). With two 25mm nozzles this will take about one minute.

Rotate the stator into a position, so the two threaded holes used by the locking key are placed on each side of the axial groove in the motor housing (2xMC6S). (Figure 25)

A stator lifting tool is used to lift back the new stator into the motor housing. Check section 11 for part No. (Figure 22)

When the stator has been mounted the motor housing may be cooled by compressed air.

Grease and mount the o-ring for the upper bearing in the upper part of the motor housing.



Figure 26: Mounting of terminal plate (J 205)



Figure 27: Mounting of upper bearing bracket (J 405)

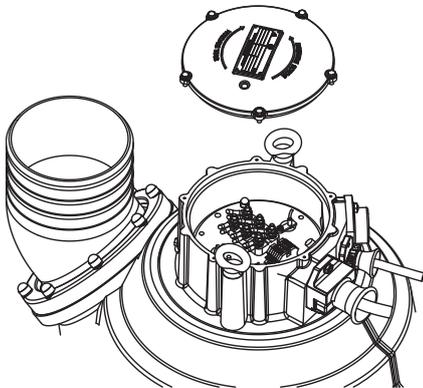


Figure 28: Mounting of terminal plate (J 604)

8.3 Mounting of terminal plate/ Upper bearing bracket

Pull up all stator cables through the holes/openings in the motor housing with a hook check markings on the cables together with the wiring diagram. The motor cable are usually two groups of 3 cables (except on J 205 there are 2 groups of 6 power cables for 230/460V 60Hz). The thermal control is most common 6 cables and the leakage sensor a single cable and they are all thinner. Check that no stator cables get jammed between parts.

J 205: Pull the cables through the terminal plate and mount all cable seals, Remember to keep the markings on all cables. Grease the o-ring on the terminal plate and mount it on the motor housing. (Figure 26)

J 405: Pull the cables through the upper bearing bracket and mount the bracket on the motor housing. Mount all cable seals. Remember to keep the markings on all cables. Grease the o-ring between the upper bearing bracket and the motor housing. Grease and mount the o-ring for the upper bearing on the bracket. (Figure 27)

J 604: Pull the cables through the terminal plate and mount all cable seals, Remember to keep the markings on all cables. Grease the o-ring on the terminal plate and mount it on the motor housing. On J 604 there are also four bearing sensor cables to pulled up (Figure 28)

9 Complete pump overhaul assembly

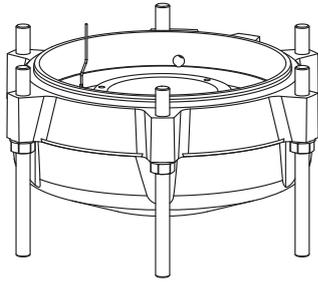


Figure 29: Mounting of wear plate (J 205, J 405)

9.1 General

Prior to assembly, clean all parts carefully, especially o-ring grooves and mating surfaces. Grease or oil all o-rings to eliminate damage during assembly. Sulzer recommends to use anti seize UNLOCK 2000 or equivalent when service is made on the pump. It is mainly used as lubrication for aluminium threads and stainless steel threads. Anti seize UNLOCK 2000 is used on all cable gland threads and stud screw threads during assembly. This will simplify dismantling when the pump returns for service/maintenance.

9.2 Terminal blocks & contactor

J 205: Can be equipped with contactor unit or terminal block or SoftDrive.

J 405: Can be equipped with terminal block

J 604: Can be equipped with terminal block

Connect all stator leads with cable shoes to the contactor/terminal block according to the wiring diagram (see section 10) and mount the contactor/terminal block in the connection chamber. For earth and power cables a contactor or conventional terminal block is used, for control cables terminal sections on a DIN-rail is used.

9.3 Wear plate on J 205 and J 405 (Figure 29)

J 205: Grease and mount the o-ring between the oil casing and wear plate. Mount the wear plate on the oil casing and then the stud bolts with washers holding the wear plate. Put the unit standing on the studs.

Note!

The stud bolts are not fastened so the unit can feel a little unbalanced.

J 405: Grease and mount the o-ring between the oil casing and wear plate. Mount the wear plate on the oil casing and if stud bolts are replaced thread on the stud bolts so it reaches enough trough the oil casing (30 mm) to mount contra nuts for motor housing. Put the unit standing on the studs.

9.4 Ball bearings and rotor + shaft mounted on oil casing

Check the condition of the rotor + shaft. There should be no scars or burrs on the shaft. If the rotor shows signs of corrosion use an emery paper to clean the laminates on the rotor.

Note!

The bearing cover and nilos ring (only J 604) must be slipped on to the shaft before the lower bearing is mounted on the shaft.

Note!

Use assembly tools to mount bearings correctly on the shaft (see special tools at the end of the manual). For easy assembly heat the top bearings to 80 °C

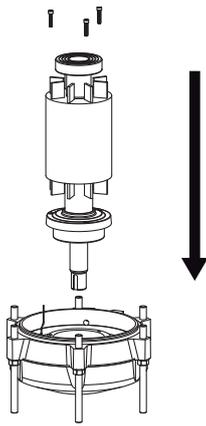


Figure 30: Mounting of ball bearing (J 205, J 405)

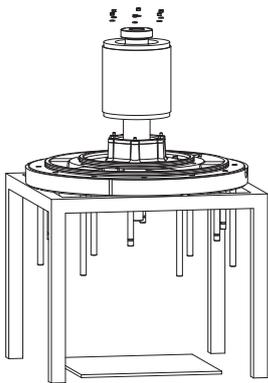


Figure 31: Mounting of ball bearing (J 604)

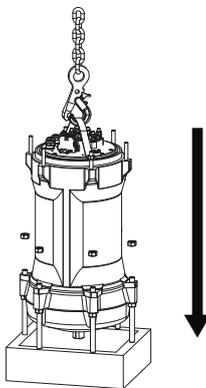


Figure 32: Mounting of motor housing (J 205, J 405)

(176 °F) / the lower bearings to 110 °C (230 °F) with an induction heater or LP-gas. Angular contact ball bearings should be mounted only by pressing on the inner ring.

Top bearings on J 205-J 604 are type sealed and pre-filled with high temperature grease for life time performance.

Lower bearings on J 205/J 405 are type sealed and pre-filled with high temperature grease for lifetime performance.

Lower bearing on J 604 is type open and should be filled to 65% with SKF LGHP-2 high performance grease for lifetime performance.

Note!

Bearings must be filled in a clean environment avoiding dirt to come into the bearing.

J 205: Lift the rotor with top/bottom bearing and bearing cover mounted (Can be lifted manually) and slip it smoothly in to the bearing seat on the oil casing. Mount the screws on the bearing cover. Mount the circlip and the washer on the shaft below the lower bearing. (Figure 30)

J 405: Lift the rotor with bottom bearing and bearing cover mounted. Mount a lifting bow on the top bearing seat to lift the rotor and slip it smoothly in to the bearing seat on the oil casing. Then mount the top bearing on the shaft with assembly tool. Mount the screws on the bearing cover. Mount the circlip on the shaft below the lower bearing. (Figure 30)

J 604: Lift the oil casing with bearing seat facing upwards and place it on a frame which allows enough space to assemble the rotor into the oil casing. (The cooling jacket turned upside down can be used as support frame). Mount a lifting bow on the top bearing seat on the shaft, then lift the rotor unit and lower it into the bearing seat on the oil casing. Heat the bearing seat with LP-gas to approx. 150 °C (302 °F) to easy slip the lower bearing into place. Mount the screws on the bearing cover. Mount the washer and the circlip on the shaft below the bearing. (Figure 31)

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

Check the conditions of the bearing sensors and leakage sensors. It is important that leakage sensor seals the motor chamber from the oil chamber.

9.5 Motor housing & rotor unit with oil casing

J 205: Grease and mount the o-ring on the oil casing and check that the o-ring in the upper bearing seat in the motor housing is in place OK. Lift the assembled motor housing in the lifting chain/wire and lower it onto the rotor unit. Put a distance piece between motor housing and oil casing so leakage sensor cable can be connected. Lower it carefully on to the oil casing. Mount the nuts and tighten them firmly. (Figure 32)

J 405: Grease and mount the o-ring on the oil casing and check that the o-ring in the upper bearing seat in the motor housing is in place OK. Lift the assembled

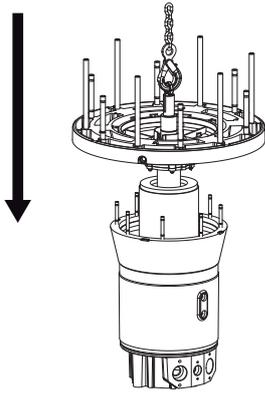


Figure 33: Mounting of motor housing (J 604)

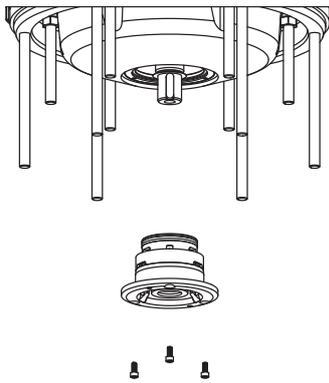


Figure 34: Mounting of mechanical seal unit (J 205, J 405)

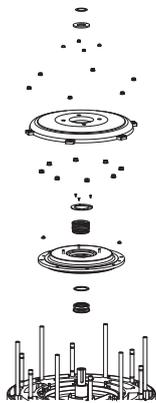


Figure 35: Mounting of mechanical seals (J 604)

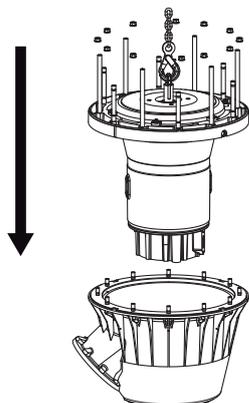


Figure 36: Mounting of cooling jacket (J 604)

motor housing in the handle and lower it onto the rotor unit. Put a distance piece between motor housing and oil casing so leakage sensor cable can be connected. Lower it carefully on to the oil casing. Mount the nuts and tighten them firmly (use a pipe tong to contra hold the diffuser stud bolt). (Figure 32)

J 604: Use the lifting crane to turn the motor housing standing upside down on the connection chamber. Mount the stud bolts on the motor housing. Fit an eye bolt on the impeller shaft end. Lift the rotor unit with oil casing up and start to lower it into the motor housing. Grease and mount the o-ring on the motor housing. Leave a distance between motor housing and oil casing so the leakage and bearing sensors can be connected. (Figure 33)

9.6 Mechanical seals on J 205-J 604 and upper/lower oil casing on J 604

Check that there are no burrs on the shaft end. Clean and grease the seal seat in the oil casing and the shaft end. Oil can be used on seal surfaces to ease assembly.

Note!

Seal units and seal rings must be handled with care as seals surfaces are very hard. Keep seals in original packing until they are assembled.

J 205 - J 405: Lift the pump in the handle with a crane and lye the pump down in a horizontal position. Mount the mechanical seal unit carefully with new and well greased o-rings and tighten it firmly with screws. (Figure 34)

Note!

All mechanical seal units delivered from factory are pressure tested and approved.

J 604: Keep the pump standing upside down. Mount the stud bolts on the oil casing for the wear plate. Place the stationary ring of the secondary seal on the oil casing and then the rotating ring by using the special tool. Mount the circlip for the secondary seal. Assemble the upper wear plate, mount the stud bolts for the wear plate. Then put the primary seal stationary ring in place and fix it with the retaining ring (pos 82 + 85 in spare part list). Push on the rotating part of the primary seal by using a special tool, see section special tools. Mount the rubberized wear plate and tighten inner and outer nuts. (Figure 35)

Note!

Never run the motor without having the impeller mounted. Especially on pumps with mechanical seal units as it will damage the o-ring in the shaft sleeve

9.7 Cooling jacket J 604

Put the cooling jacket upside down on a distance frame so the motor housing can be fully lowered. Lift the motor housing assembly in the shaft and lower it into the cooling jacket. Make sure the stud bolts passes through the oil casing. Mount the nuts on the stud bolts and tighten them firmly. (Figure 36)

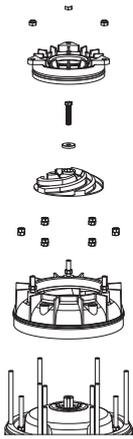


Figure 37: Mounting of impeller, diffuser and wear ring

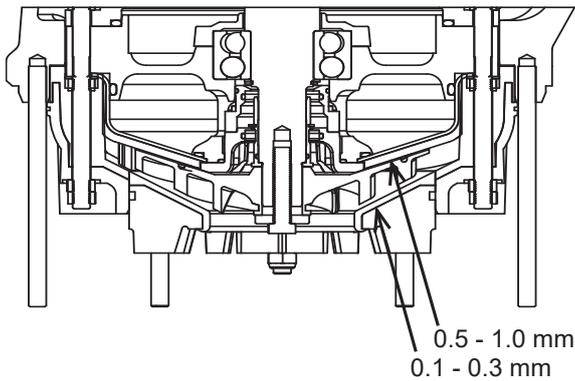


Figure 38: Clearance measure

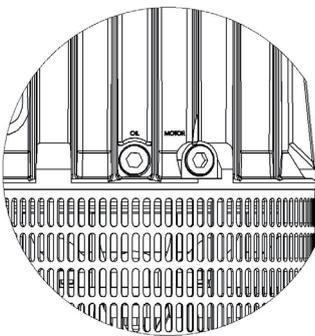


Figure 39: Oil and motor inspection plug (J 205)

9.8 Impeller, diffuser & wear ring (Figure 37, 38)

Clean the shaft end. Mount the impeller on the shaft secured by the key, impeller washer and impeller screw.

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

Check: The back side of the impeller should run free from the wear plate with a clearance of 0.5-1.0 mm (0.02"-0.04").

Adjust the clearance with shims between impeller and shaft / shaft sleeve if necessary.

Mount the diffuser and tighten the nuts to J 205= 45 Nm, J 405=140 Nm, J 604=273 Nm. No adjustments or distance has to be considered when diffuser is mounted.

Mount the wear ring on the stud bolts and adjust it. The wear ring has a contra nut on the back side which eases the possibility to adjust the wear ring exact and close to the impeller

Check: The impeller should run free with a clearance of 0.1-0.3 mm (0.004"-0.012").

9.9 Leakage test of mechanical seals

A leakage test of the mechanical seal and the oil chamber may be performed. Mount a pressure gauge in one of the oil plug holes. Compress air into the oil chamber of max 0.15 - 0.20 bar. The pressure gauge must be equipped with a closing valve. Close the valve and check that the compressed air of 0.15 - 0.20 bar is maintained in the oil chamber.

9.10 Refilling of oil

Put the pump in a horizontal position to fill new oil. Secure the pump by the handle/eye bolts.

Make sure that the oil plug on the contra side from filling is mounted.

Oil type:

Paraffin oil (white oil) with viscosity 8 - 10 cSt.

Correct quantities:

J 205	2.5 litres	0.66 US gallon
J 405	3.0 litres	0.80 US gallon
J 604	6.2 litres	1.60 US gallon

Tighten inner oil plug with a new o-ring.

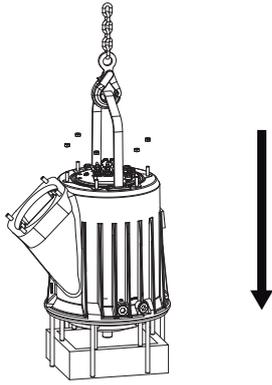


Figure 40: Mounting of cooling jacket (J 205, J 405)

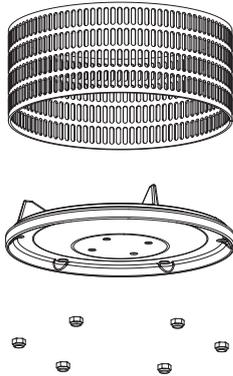


Figure 41: Mounting of base plate and strainer

9.11 Cooling jacket J 205 and J 405

J 205: Lift the motor housing with hydraulic parts mounted standing upright on a distance piece under the diffuser stud bolts (preferably a wooden frame at a diameter of the diffuser stud bolts). Take off the lifting bracket/wire on the motor housing. Grease and mount the o-ring on the motor housing. Mount the handle on the cooling jacket and the long stud bolts at the bottom of the cooling jacket (if they are replaced). Lift up the cooling jacket and lower it into place on the motor housing.

Note!

Rotate the motor housing so it's plugs matches the cooling jacket plugs.

When motor housing is placed on the distance frame this allows the cooling jacket to be lowered so the stud bolts easily can grip and tighten the cooling jacket with the motor housing. (Figure 40)

J 405: Lift the motor housing with hydraulic parts mounted standing upright on the diffuser stud bolts. Grease and mount the o-ring sealing the motor housing/cooling jacket. Then lift the cooling jacket (can be done manually by two persons) and lower it on to the motor housing.

Note!

Rotate the motor housing so it's plugs matches the cooling jacket plugs.

Use a dead blow (plastic hammer) to force the cooling jacket down until it fits in place. Make sure the stud bolts passes through the holes on the diffuser. Mount washers and nuts on the studs. (Figure 40)

Make sure all inner and outer inspection plugs are mounted on the motor housing and cooling jacket

9.12 Strainer, base plate and handle

Lift the pump and tilt it to a horizontal position secured by the lifting chain.

Mount the strainer and base plate and tighten the lock nuts to J 205= 45 Nm, J 405=140 Nm, J 604=273 Nm. J 405 and J 604 also uses rubber bushings on stud bolts between strainer and diffuser. Use extension sockets to tighten the nuts on J 405 (M16) and J 604 (M20). (Figure 41)

Hint! Use some grease and put on the washers and use the extension socket to mount the washers on the stud bolts on J 405 and J 604.

Mount the handle on J 205 and J 405 and two eye bolts on J 604 if not done earlier.

Lift the pump back to an upright position.

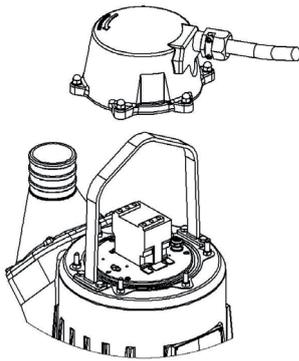


Figure 42: Pump with contactor/terminal block/SoftDrive (J 205)

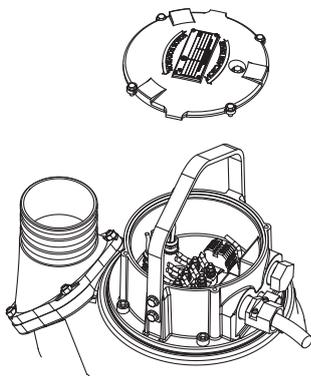


Figure 43: Pump with contactor/terminal block (J 405)

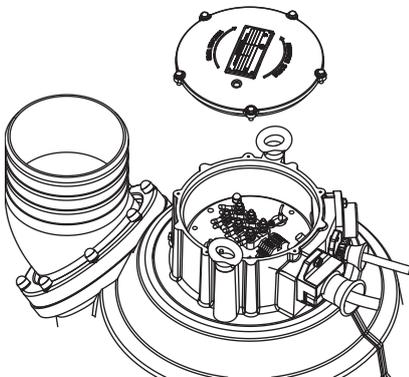


Figure 44: Pump with terminal block (J 604)

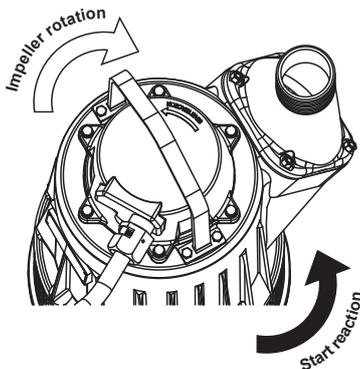


Figure 45: Direction of rotation

9.13 Cable gland, cover and discharge connection

Measure the inner diameter of cable seal to check that it corresponds to the cable diameter. Start to put the cable gland without cable clamps on the cable and then cable seals and one washer on each side of the bushing (washers are not used on J 604). Blind covers may be used on some models.

Pull the cable through the cable inlet hole, far enough to have cable length to mount the cable and to let the cable seal fit on a non-deformed part of the cable shield. Use UNLOCK 2000 on all gland threads. Tighten the cable gland and strain relief clamp for all cables.

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



DANGER! The earth cable must be longer than the power cables so it pulls away last if cable is pulled out by mistake.

Strip the outer shield on the power/control cable and mount cable shoes on all cables. Connect the power phase leads to the contactor/terminal block according to wiring diagram and connect the yellow / green earth cable in the main cover/connection chamber marked with the earth symbol.

Grease and mount the o-ring on the cover. Mount the cover on the pump and arrange the leads so that they may not be jammed or blocking the functioning of the contactor. Tighten the cover with the cap nuts.

Mount the discharge connection back on the pump and tighten the nuts.

Mount the plug if supplied at the end of the cable.

9.14 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.

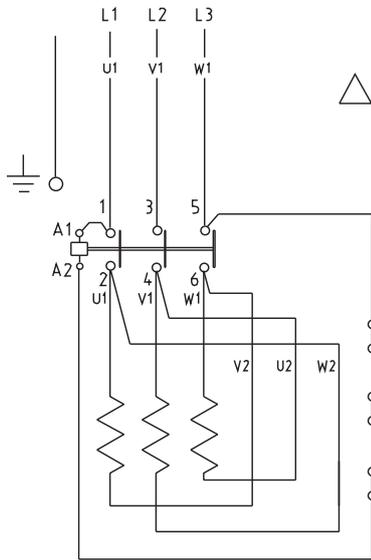
If possible, test the pump in water and measure the head against closed valve to get confirmation that the wear ring is correctly adjusted.

10 Electrical information and wiring diagrams

10.1 J 205/J 405 three phase Direct Start D.O.L. with contactor (6-leads stator)

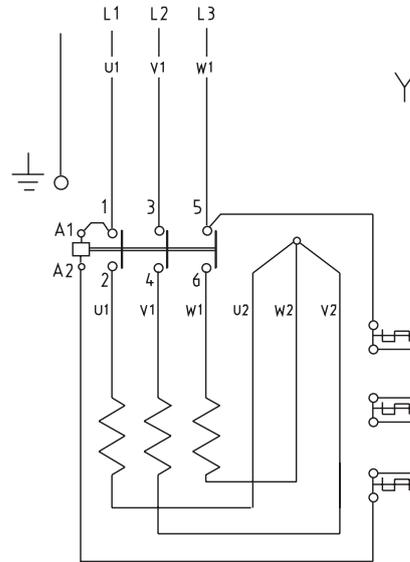
The stators are wound for different voltages/frequencies and can be Delta- or Star-connected. For example stator 400/690V 50Hz is Delta-connected for 400V duty. The contactor is activated by the same voltage as the supply voltage. Therefore, when changing from one voltage to another the contactor must also be changed.

(Figure 46, 47, 48, 49)



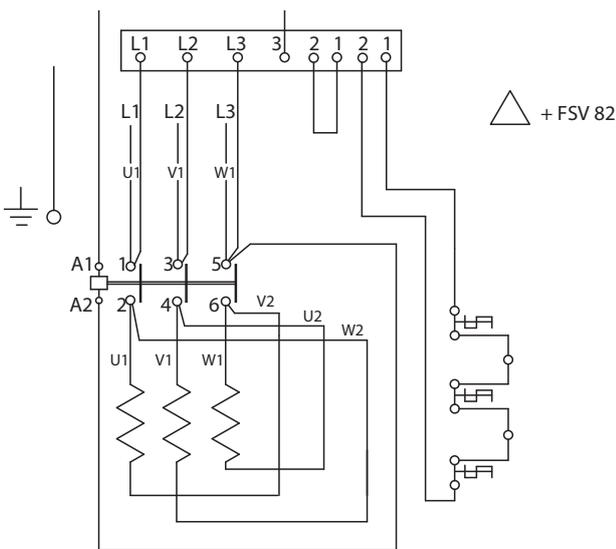
354010AB

Figure 46: Delta connected winding D.O.L.



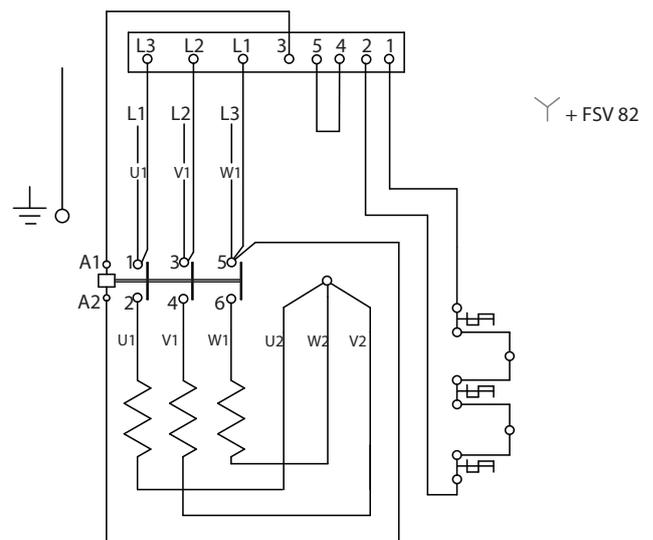
354009AA

Figure 47: Star connected winding D.O.L.



354020 AC

Figure 48: Delta connected winding D.O.L. with FSV



354019 AB

Figure 49: Star connected winding D.O.L. with FSV

10.2 J 205 three phase Direct Start D.O.L. 230/460V 60Hz with contactor (12-leads stator)

The stators are wound for dual voltage and can be changed from one voltage to the other by changing the parallel connection (e.g. 230V) to serial connection (e.g. 460V) 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.

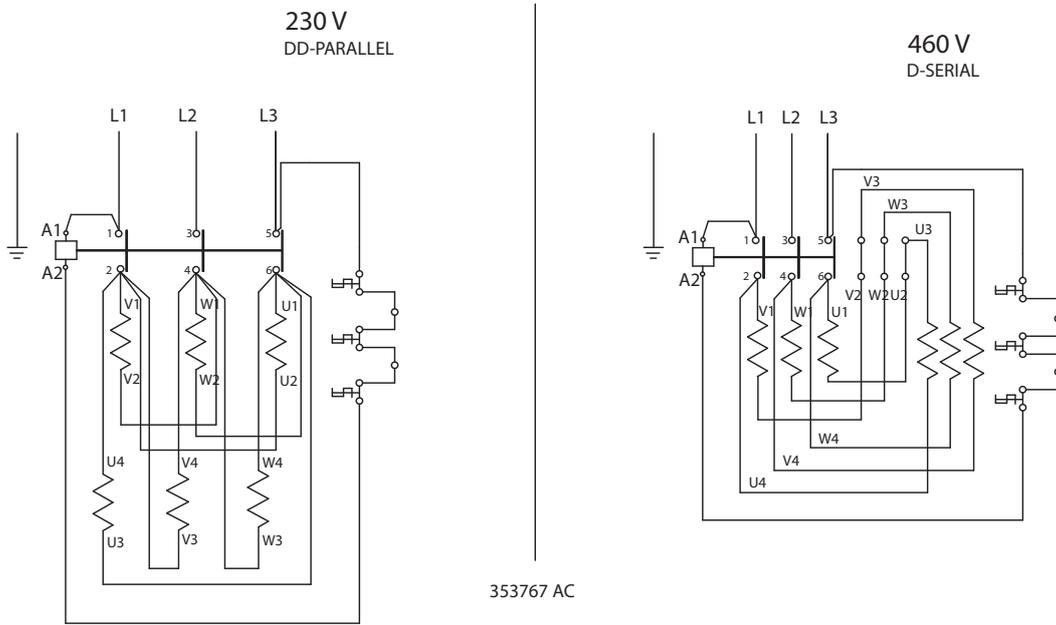


Figure 50: 230/460V 60Hz 12-lead D.O.L.

10.3 J 205 three phase Direct Start D.O.L. 230/460V 60Hz with terminal block (12-leads stator)

The stators are wound for dual voltage and can be changed from one voltage to the other by changing the parallel connection (e.g. 230V) to serial connection (e.g. 460V). (Figure 51)

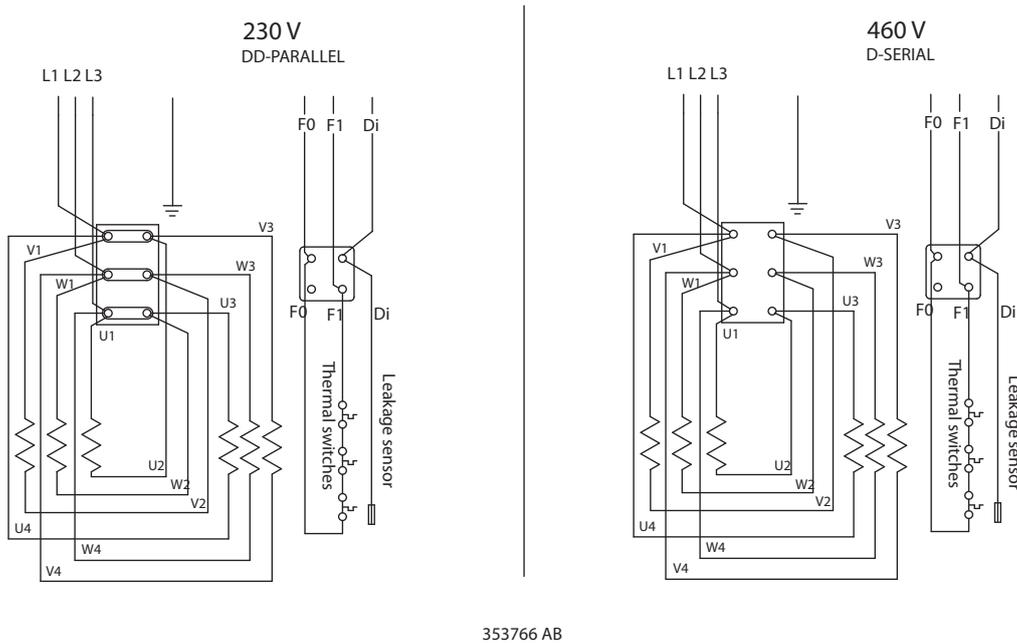
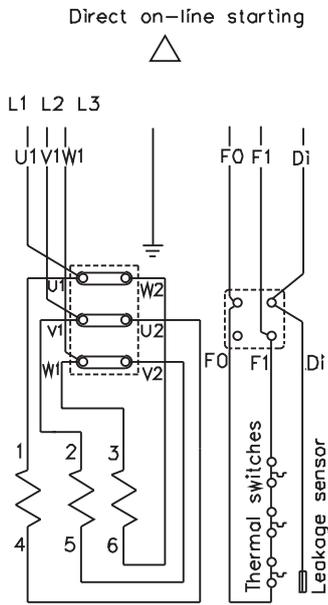


Figure 51: 230/460V 60Hz 12-lead D.O.L.

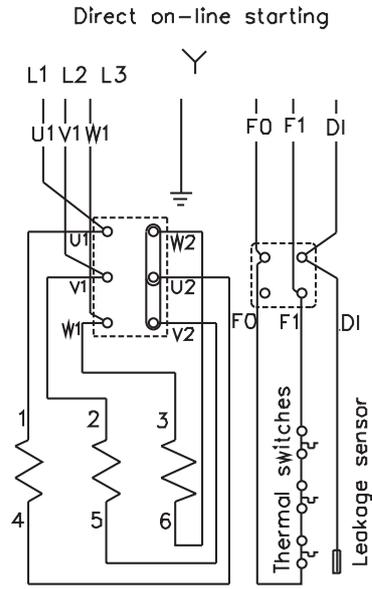
10.4 J 205/J 405 three phase Direct Start D.O.L. with terminal block (6-leads stator)

The stators are wound for different voltages/frequencies and can be Delta- or Star-connected. For example stator 400/690V 50Hz is Delta-connected for 400V duty and 578/1000V is Star-connected for 1000V duty. (Figure 52, 53)



351183AD

Figure 52: Delta connected winding D.O.L.

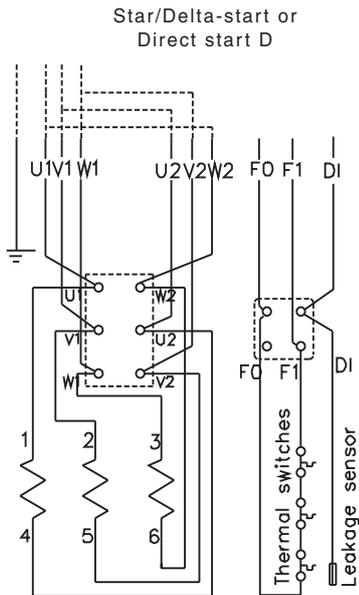


351182AD

Figure 53: Star connected winding D.O.L.

10.5 J 205/J 405 three phase Star Delta starting with terminal block (6-leads stator)

The stators are wound for different voltages/frequencies For example stator 400/690V 50Hz is Delta connected for 400V duty. The Star delta starting is obtained by using a separate starter. (Figure 54)



351184AC

Figure 54: Connection for Star Delta Start with 2x power cable including 3-core control cable

10.6 J 205 three phase Direct Start D.O.L. with soft start

Soft start is available built-in on 380-415V 50Hz and 400-480V 60Hz. (Figure 55)

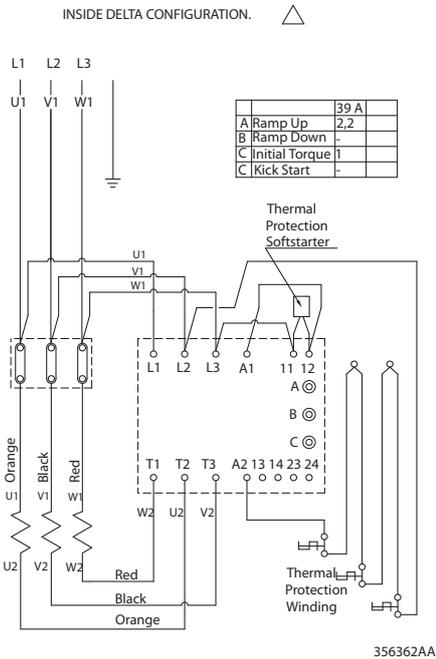


Figure 55 Direct Start D.O.L. with soft start

10.7 J 205/J 405 three phase Direkt Start D.O.L. 1000V 50Hz with ground check diode

The stators are wound for 1000V 50Hz duty Star-connected and for thermal protection and ground check control with diode. (Figure 56)

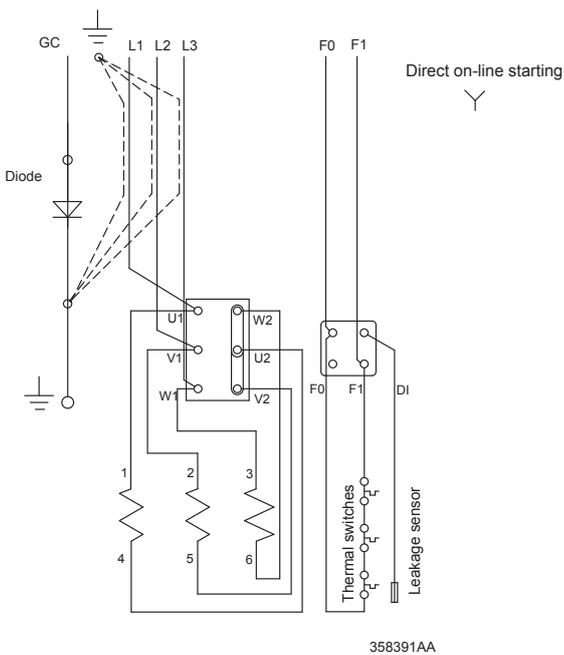


Figure 56: Star Connected for 1000V 50Hz with Ground Check GC Diode

10.8 J 604 three phase Star Delta Start with terminal block (6-leads stator)

The stators are wound for different voltages/frequencies For example stator 400/690V 50Hz is Delta connected for 400V duty. The Star delta starting is obtained by using a separate starter. (Figure 57)

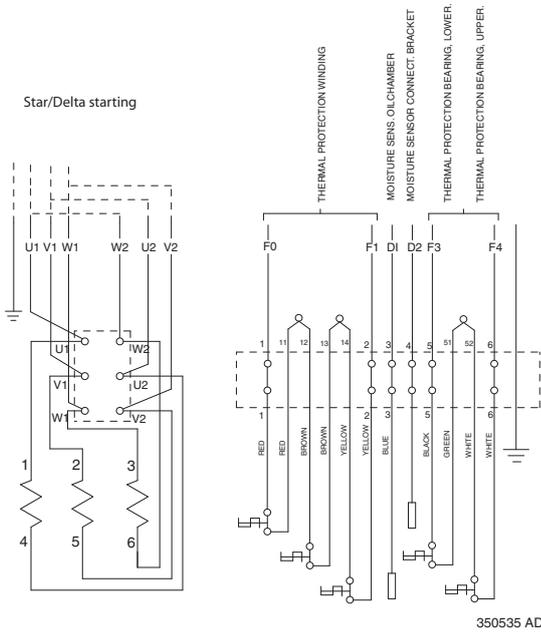


Figure 57: Connection for Star Delta Start with 2x power cable including 7-core control cable

10.9 J 604 three phase Direct Start D.O.L. with terminal block (6-leads stator) and with power cable including 3-core control cable.

The stators are wound for different voltages/frequencies and can be Delta- or Star-connected. For example stator 400/690V 50Hz is Delta-connected for 400V duty and 578/1000V is Star-connected for 1000V duty. (Figure 58, 59)

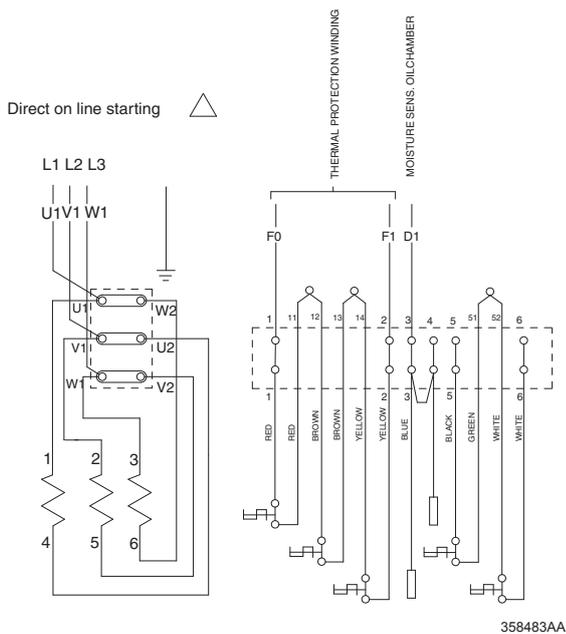


Figure 58: Delta connected winding D.O.L.

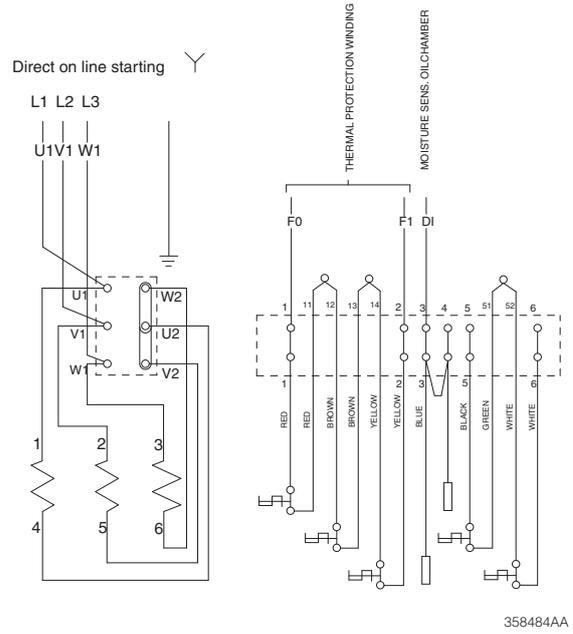


Figure 59: Star connected winding D.O.L.

10.10 J 604 three phase Direct Start D.O.L. with terminal block (6-leads stator) and with power cable and separate 7-core control cable.

The stators are wound for different voltages/frequencies and can be Delta- or Star-connected. For example stator 400/690V 50Hz is Delta-connected for 400V duty and 578/1000V is Star-connected for 1000V duty. (Figure 60, 61)

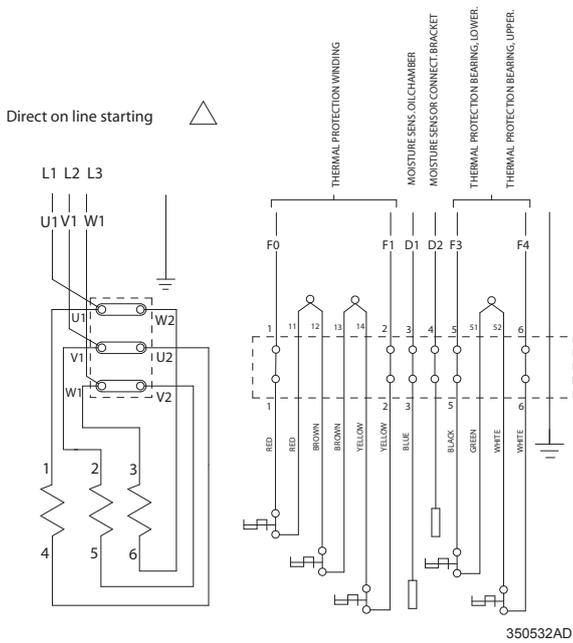


Figure 60: Delta connected winding D.O.L.

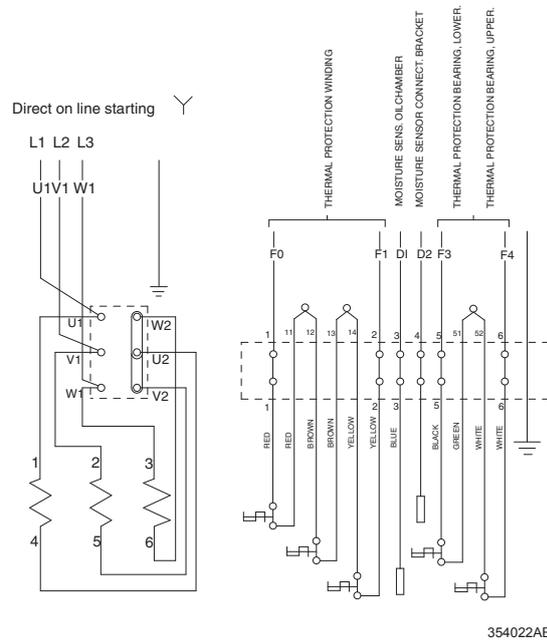


Figure 61: Star connected winding D.O.L.

10.11 J 604 three phase Direkt Start D.O.L. 1000V 50Hz with ground check diode

The stators are wound for 1000V 50Hz duty star-connected and for thermal protection and ground check control with diode. (Figure 62)

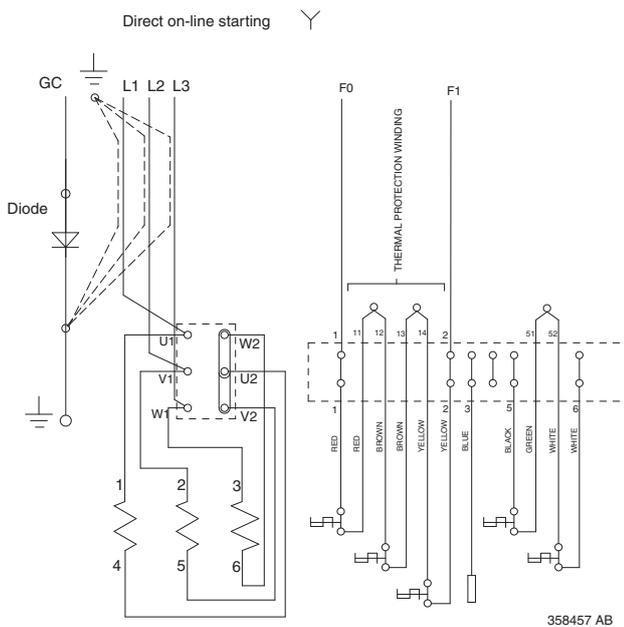


Figure 62 Star Connected for 1000V 50Hz with Ground Check GC Diode

10.12 Fuses

Fuses are to be installed in the power circuits as a short circuit protection. Fuses with a time lag are to be used. The table shows the nominal current on sizes:

Three-phase 50Hz						
Pump	230V	400V	500V	690V	1000V	Starting current factor
J 205	68A	39A	31A	-	16A	7.5
J 405	-	66.5A	53.2A	39A	27A	6.9
J 604	184A	106A	84A	-	42A	5.5

Three-phase 60Hz					
Pump	230V	380V	460V	575V	Starting current factor
J 205	82A	-	41A	33A	6.0
J 405	136A	82A	68A	54A	7.2
J 604	226A	-	113A	91A	6.0

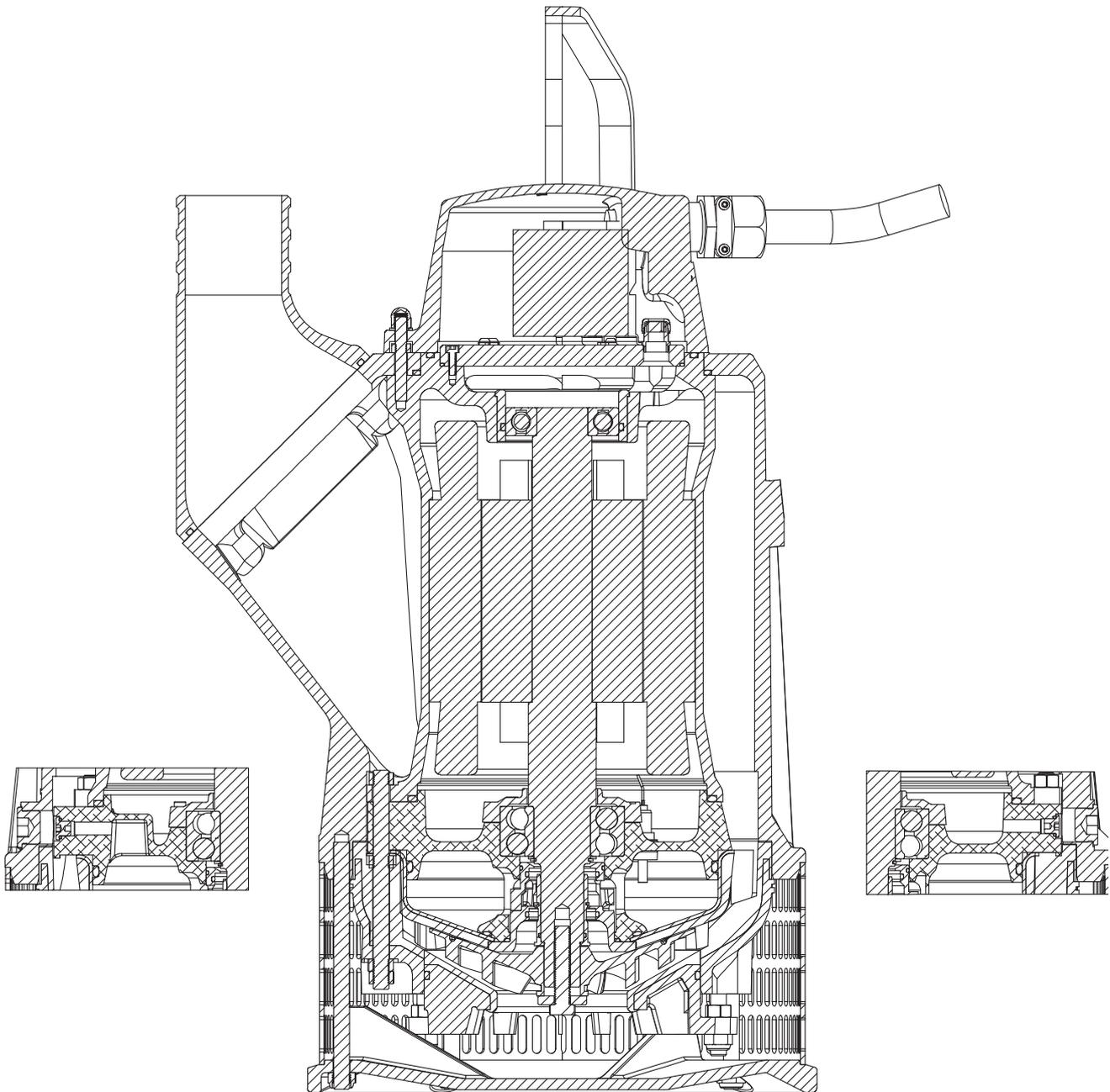
10.13 Winding resistance

Correct readings should be:

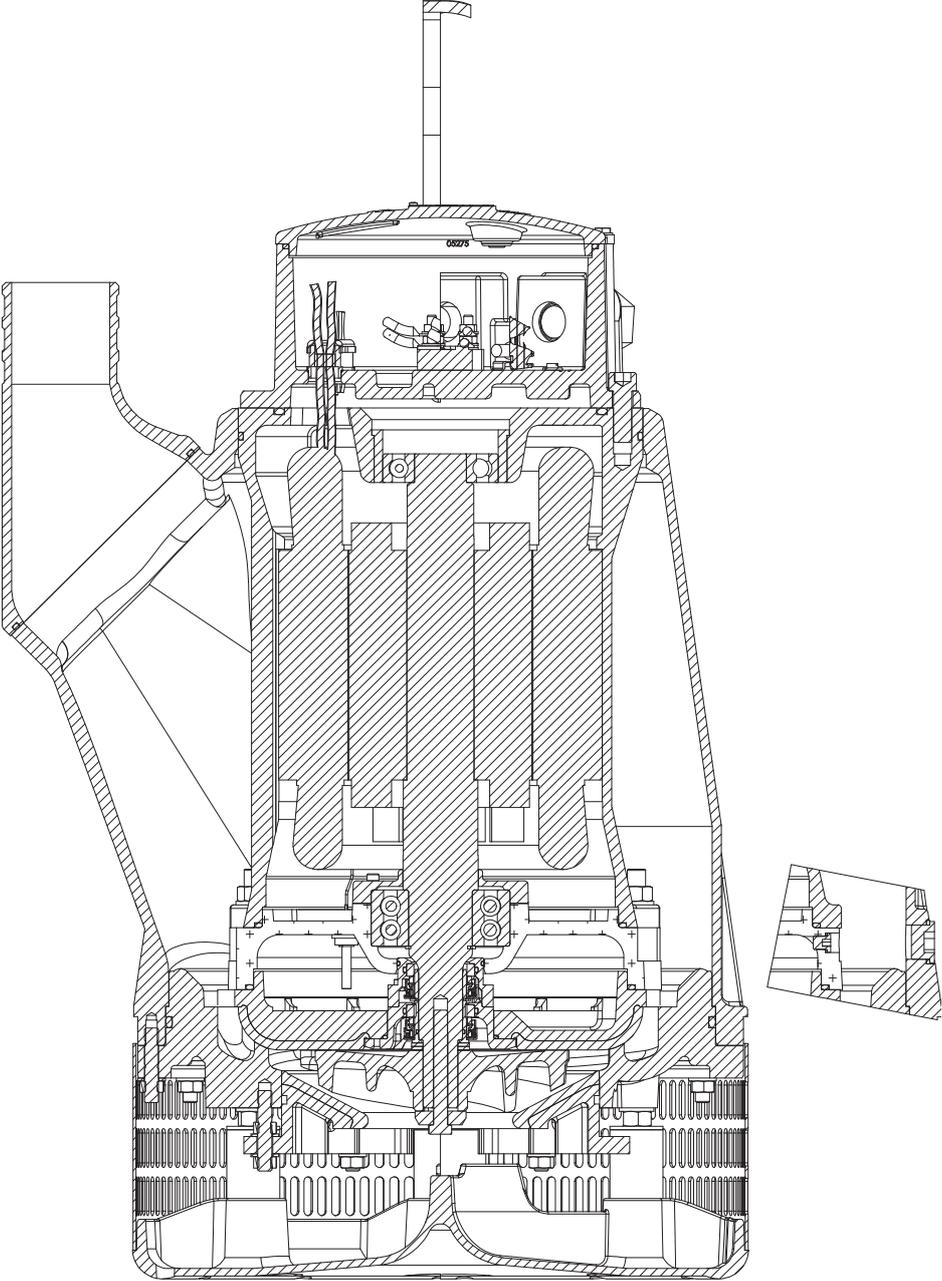
Pumptype	50 Hz	60 Hz	Resistance
J 205	230/400 V	-	0.18 ohm
		230/460 V	0.68 ohm
	400/690 V	460 V	0.50 ohm
	500/865 V	575 V	0.79 ohm
	1000 V		1.10 ohm
J 405	400/690 V	460 V	0.198 ohm
	500/865 V	575 V	0.326 ohm
	1000 V		0.429 ohm
J 604	400/690 V	460 V	0.128 ohm
	500 V	575 V	0.198 ohm
	1000 V		0.255 ohm

11 Sectional drawing / Tools

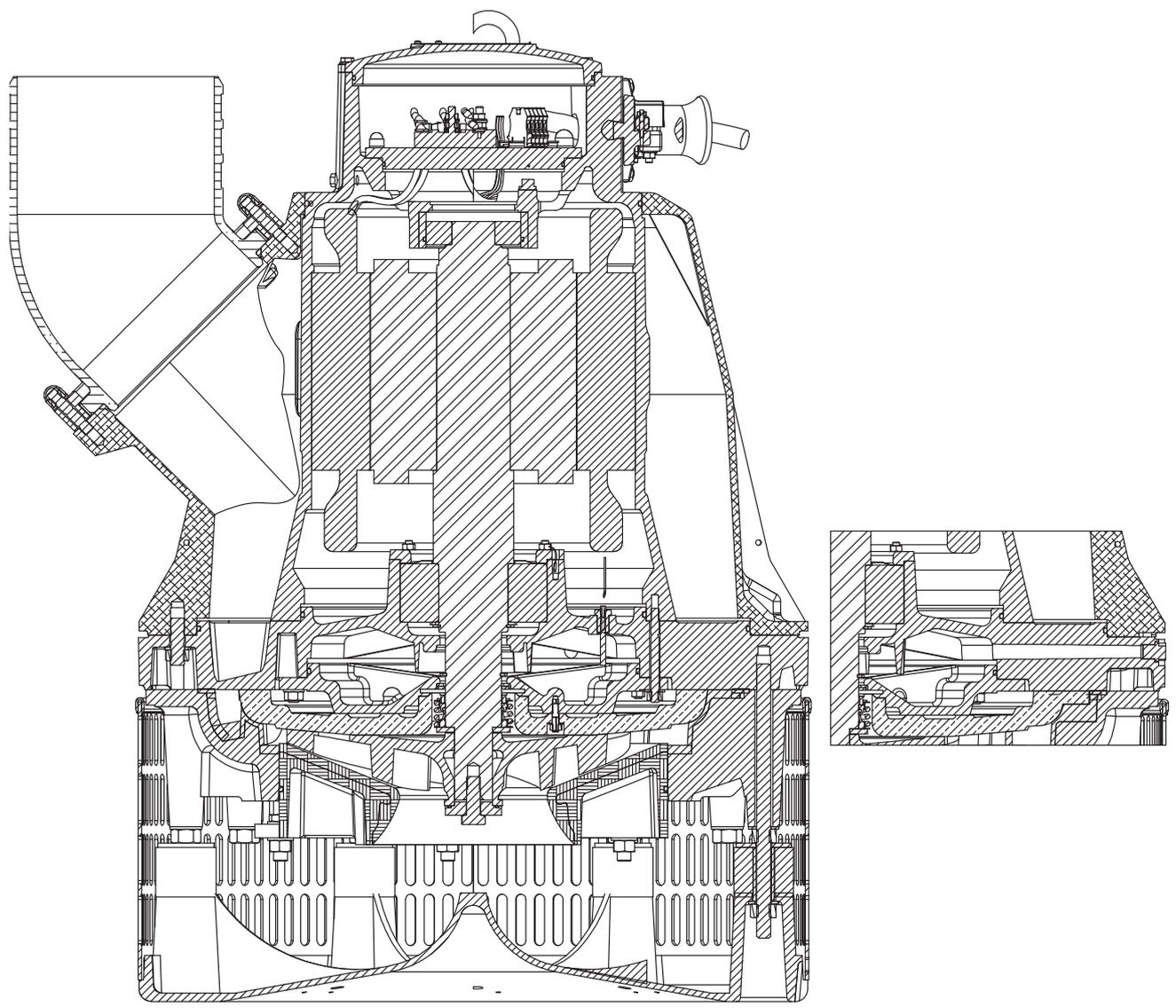
J 205



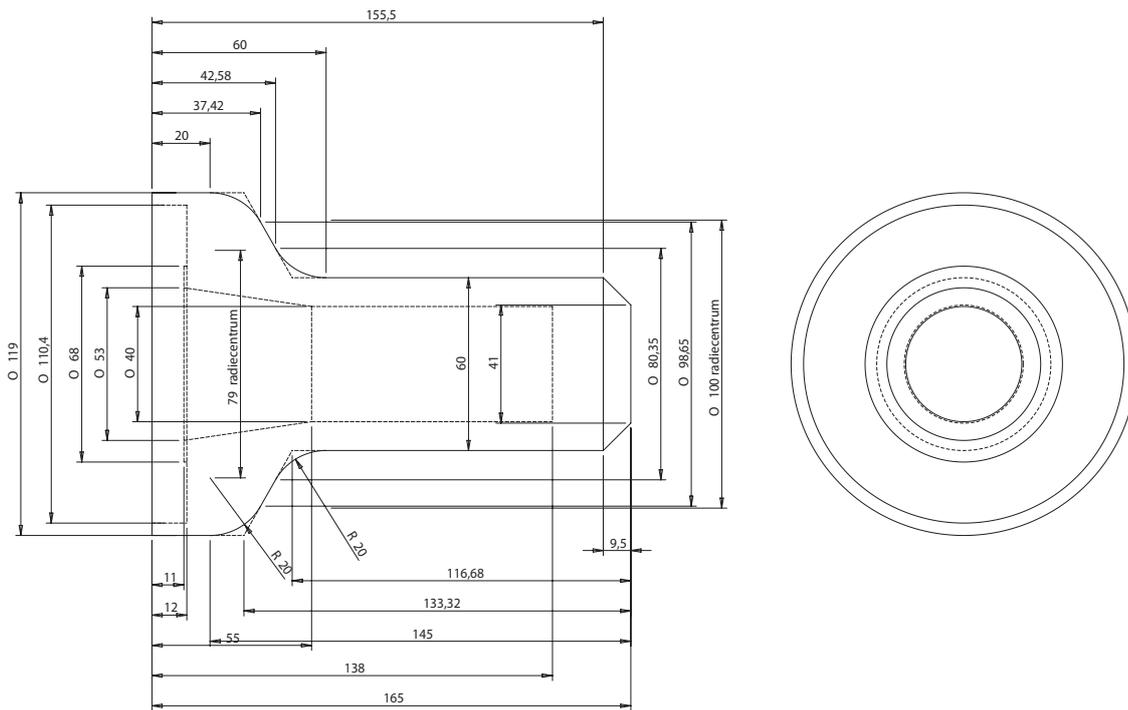
J 405



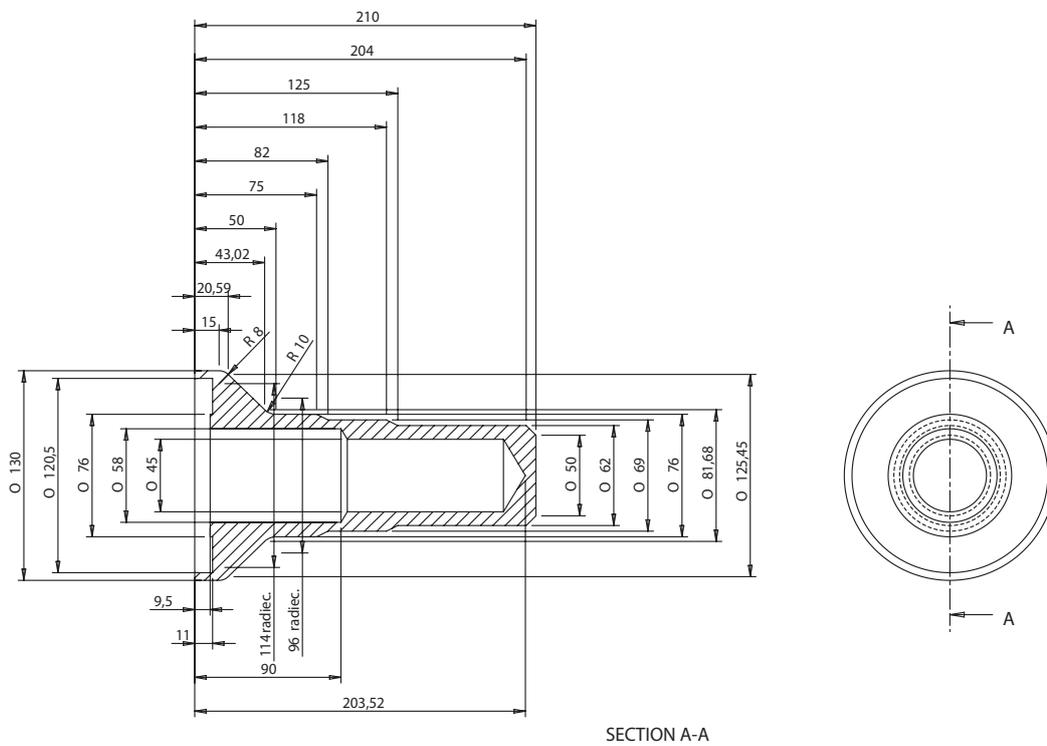
J 604



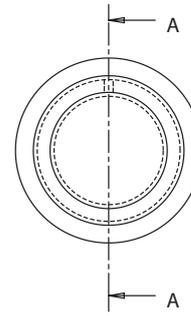
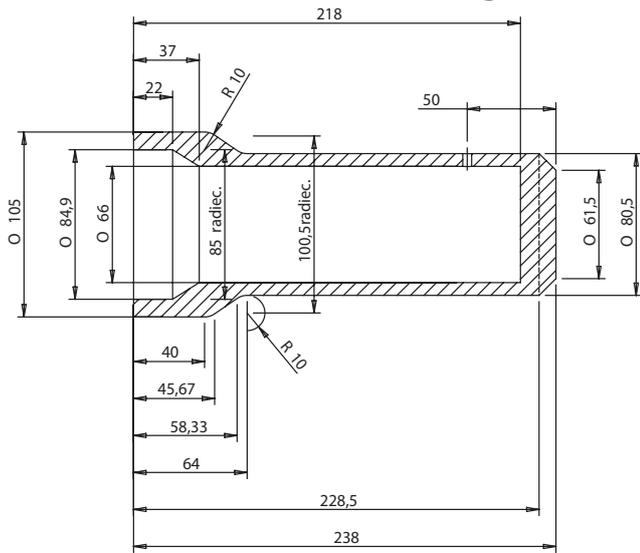
00831644: Tool for lower bearing J 205



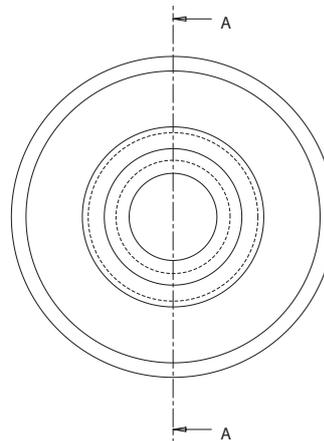
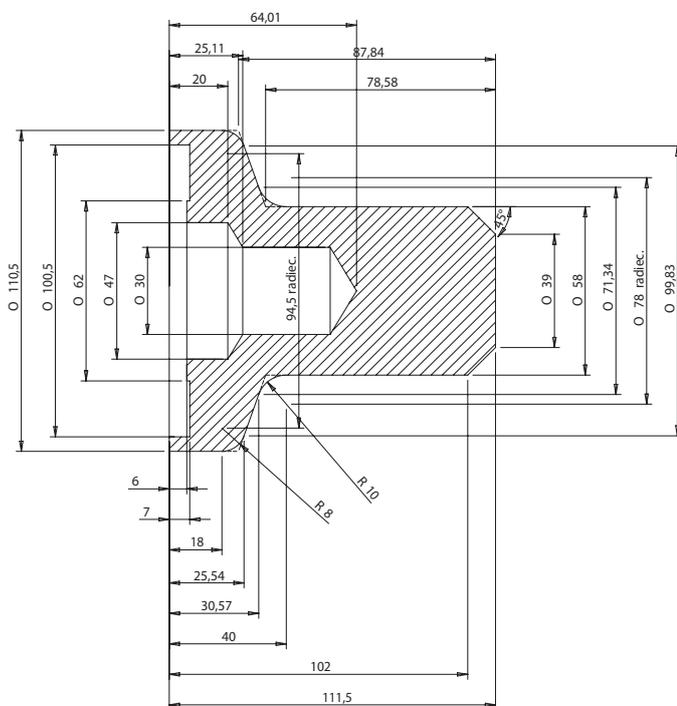
00831650: Tool for lower bearing J 405



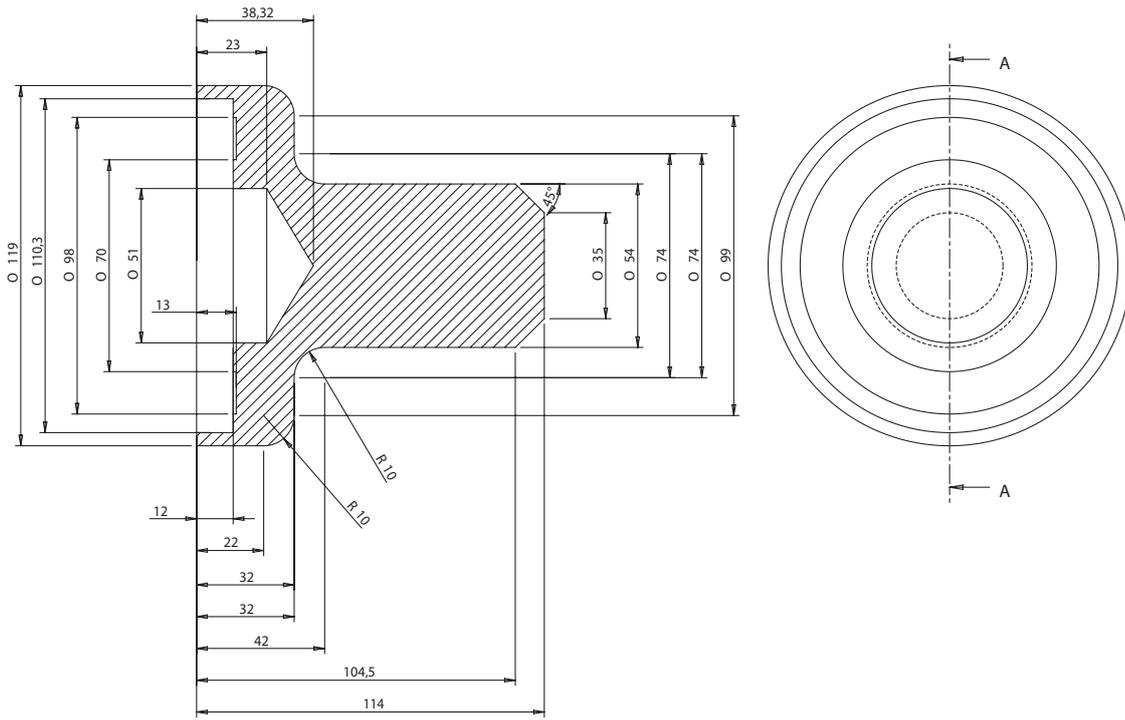
00831645: Tool for lower bearing J 604



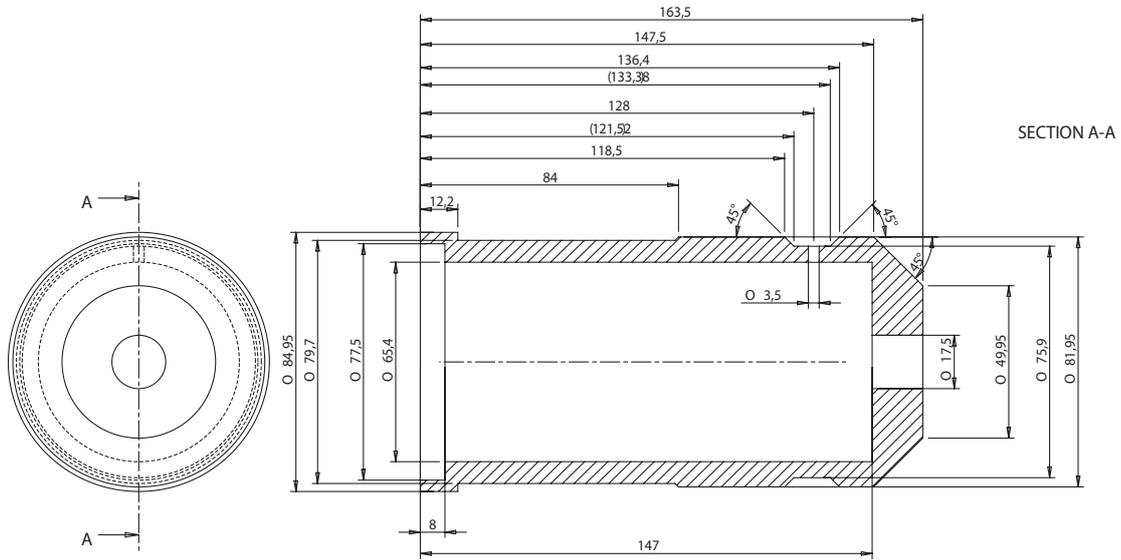
00831649: Tool for upper bearing J 205-405

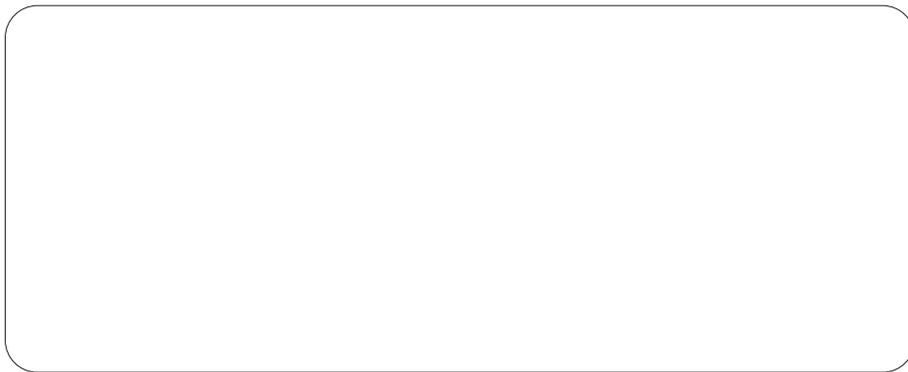


00831648: Tool for upper bearing J 604



00831647: Tool for primary seal J 604





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