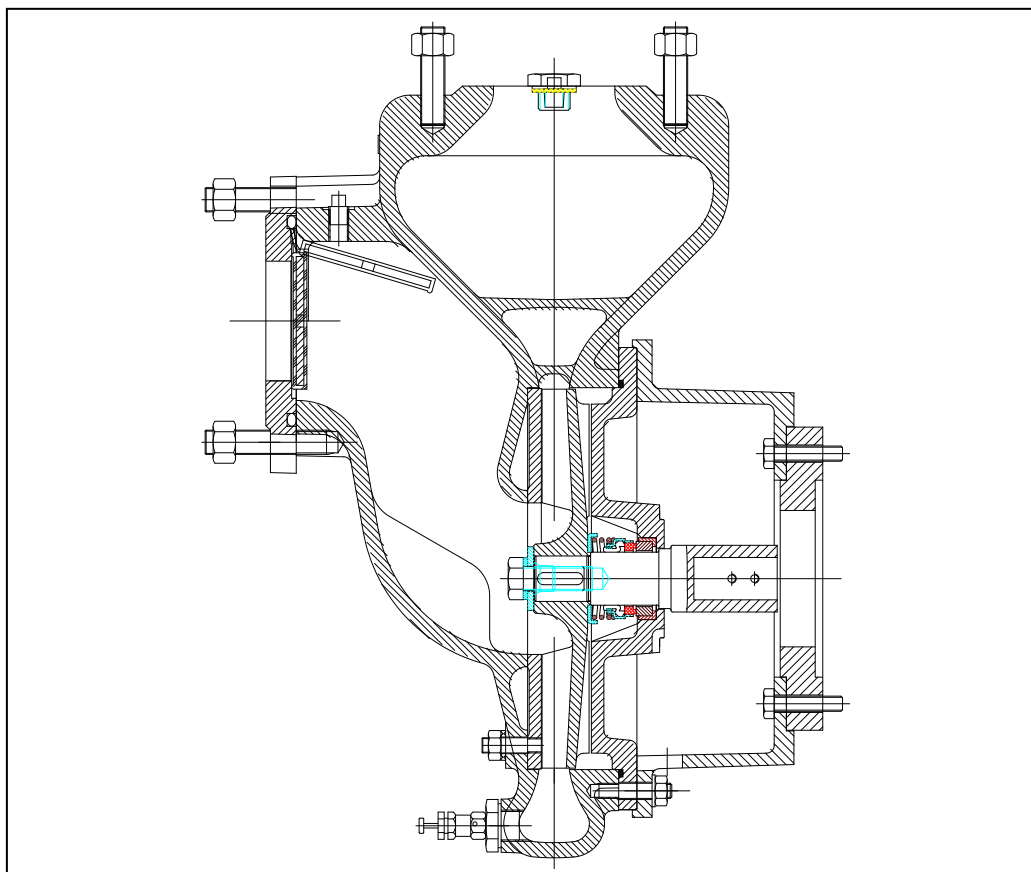


OPERATION AND MAINTENANCE INSTRUCTIONS

DESMI self-priming centrifugal pump TYPE NSA



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Special pump No.

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1. PRODUCT DESCRIPTION

These operation and maintenance instructions apply to the DESMI NSA-pump series. The pumps are available in the sizes DN50 and DN80 discharge.

DESMI NSA is a single-stage self-priming centrifugal pump with stainless steel shaft, and mechanical shaft seal. The NSA-pump is further equipped with a semi-open impeller, which does not choke as easily as a closed impeller.

The pump is suited for clean and polluted liquids with temperatures between 0 and 80°C. With special shaft seal up to 140°C.

The suction branch of the pump is mounted well above impeller inlet. This is an advantage as the pump will not - in case of a clack flap leakage - lose all the priming water and consequently the priming ability. As the pump is self-priming, contrary to ordinary centrifugal pumps it will resume pumping if, for a short moment, the liquid has been lowered to a level below the suction pipe.

The pump is particularly suitable for the pumping of water in connection with e.g. cooling of diesel engines, as bilge pump, ballast pump, irrigation, washing plants, air conditioning, cooling systems, and sanitary systems, etc. Furthermore, in the majority of cases where the transport of liquid is required within industry.

1.1 DELIVERY

- Check on receipt that the delivery is complete and undamaged.
- Defects and damages, if any, to be reported to the carrier and the supplier immediately in order that a claim can be advanced.

2. TECHNICAL DATA

The pumps are manufactured in various material combinations which appear from the type number on the name plate. See below.

2.1 EXPLANATION OF THE TYPE NUMBER

All the NSA-pumps are provided with a name plate. The type number indicated on the name plate is built up as follows:

NSAXXX-YYYB/ZZ-MR/O

- XXX : Discharge flange diameter.
- YYY : Standard impeller diameter.
- B : If mounted with special impeller for 2-pole motor
- ZZ : Height of the impeller blades.
- M : The material combination of the pump.
- R : The assembly combination of the pump.
- O : Actual impeller diameter.

M may be the following:

- A : Standard. casing: GG20. Impeller/wear plate: RG5.
- B : Standard. casing: GG20. Impeller/wear plate: Stainless steel.
- C : All cast iron.
- D : Casing: RG5. Impeller/wear plate: RG5.
- E : Special bronze casing and/or impeller

The pumps are available in other material combinations at request.

R may be the following:

- 07 : Mounted on base frame with petrol or diesel engine, or with hydraulic or electric motor.
- 09 : With bare shaft end.
- 12 : Flange-mounted with electric motor.

Before putting a pump into operation, the suitability of the material combination of the pump must always be taken into consideration. In case of doubt, contact the supplier.

Pumps in material combinations A and C are primarily used for freshwater.
Pumps in material combination D are primarily used for seawater.

If the pumps are designed for special purposes the following is to be indicated:

Pump No. :
Pump type :
Application :
Comment :

2.2 TECHNICAL DESCRIPTION

The noise level from the pump depends on the motor type supplied, as the noise from the pump can be calculated as the noise level of the motor + 2dB(A).

The noise level of the motor appears from the instruction manual for the motor.

The pump capacity appears on the nameplate of the pump. If the pump has been delivered without motor, the pump capacity is to be indicated on the plate when mounting the motor.

The permissible loads on the flanges are indicated in the following table:

Pump	Fv (N)	Fh (N)	ΣF (N)	ΣMt (Nm)
NSA-50-200	1250	950	1550	170
NSA-80-250	1450	1050	1800	270

- Fv : The max. permissible sum of the vertical forces on the two flanges.
 Fh : The max. permissible sum of the horizontal forces on the two flanges.
 ΣF : The vectorial sum of the two forces Fv and Fh.
 ΣMt : The max. permissible sum of the torques on the two flanges.

In connection with the permissible loads on the flanges the following is to be observed:

$$\left(\frac{\sum F_{calc}}{\sum F} \right)^2 + \left(\frac{\sum M_{calc}}{\sum M_t} \right)^2 < 2$$

where index "calc" is the values calculated by the user.

3. INSTALLATION

3.1 MOUNTING/FASTENING

The pump should be mounted and fastened on a solid base plate with a flat and horizontal surface to avoid distortion. Check that the centre line of the shaft is horizontal.

The max. permissible loads on the flanges stated in paragraph 2.2. are to be observed.

The suction line to the pump is to be mounted carefully, so that it is absolutely tight, as even minor leakages may impede the priming. When pumping polluted liquids a strainer is necessary. The strainer must be equipped with a sieve, the passage area of which is to be 3 x the area of the suction pipe. The mesh size is to be 1-3 mm smaller than the height of the impeller blades of the pump in question.

The pipes are to be arranged in such a way that stresses resulting from fluctuations in temperature will not have any effect on the pump. Because of the priming of the pump the pressure pipe is to be arranged so that water locks in the pipe are avoided. If the pump is to be driven by a motor through a flexible coupling, motor and coupling are to be placed on a common base plate. In this connection the following must be observed:

- Avoid distortion of the base plate.
- Avoid distortion of the piping system.
- Check carefully that pump and motor are accurately aligned.



At installations pumping hot or very cold liquids, the operator must be aware that it is dangerous to touch the pump surface, and, consequently, he must take the necessary safety measures.

When connecting the pump and a prime mover the power transmission is to be equipped with a guard in accordance with the provisions of the COUNCIL DIRECTIVE OF June 14, 1989, on the safety of machines.

3.2 WIRING



Wiring to be carried out by authorised skilled workmen according to the rules and regulations in force.

4. TRANSPORT/ STORAGE

The weights of the pumps without motor are stated in the following table:

Pump	Weight kg	Pump	Weight kg
NSA50-200/zz-A12	60	NSA80-250/zz-A12	95
NSA50-200/zz-D12	60	NSA80-250/zz-D12	105
		NSA80-250/zz-A09	92
		NSA80-250/zz-D09	102

Lift the pump by placing the rope around it and see to it that the pump is balanced.

The rope must not bear against sharp edges and corners.

Lifting eyes might be mounted in the pump and used instead. The pump weights appear from the above table.

Before shipment the pump is to be fastened securely on a pallet or the like.

The pump is to be stored in a dry area.

5. INSPECTING THE PUMP

5.1 INSPECTION

When the pump has been dismantled, check the following parts for wear and damage:

- Wear plate/impeller : Max. clearance 0.4 - 0.5 mm.
- Shaft seal/rear cover : Check seat for flatness and cracks.
Check rubber parts for elasticity.
- Bearings : Replace in case of wear and noise.

5.2 FITTING SHAFT

When the pump has been assembled, check that the shaft rotates freely. In case the shaft has been dismantled in the 12-combination, adjust the shaft to the original, axial position on the electric motor to obtain a 0,2-0,5 mm gap between impeller and wear plate. Fasten the pointed screws (if three screws first the middle screw) according to the below table – screws to be secured with Loctite 243 or Omnifit 40M or similar. Check that the wobble, measured as close to the shaft end as possible, is within the limits indicated in the table.

Motor size	Torque Pointed screws	Max. wobble
100/112	10 Nm	70 µm
132	24 Nm	70 µm

5.3 FITTING SHAFT SEAL

Before fitting the seat, clean the recess in the shaft seal cover. When fitting the seat, remove the protective coating without scratching the lapped surface. Dip the outer rubber ring of the seat into soapy water. Now press the seat into place with the fingers and check that all parts are correctly imbedded.

If it is necessary to use tools for assembling, protect the sliding surface of the seat to prevent it from being scratched or cut. Lubricate the inner surface of the slide ring rubber bellows with soapy water and push it over the shaft. The use of a conical fitting bush as shown on the assembly drawing is recommended to avoid that the rubber bellows is cut.

Push the slide ring over the shaft with the hand. If the rubber bellows is tight, use a fitting tool and take care that the slide ring is not damaged. If the carbon ring is not fixed, it is important to check that it is fitted correctly, i.e. the chamfered/lapped side is to face the seat. The carbon ring can be held by a little grease.

When using soapy water on the shaft, the bellows will settle and seat in about 15 minutes, and until then tightness should not be expected. After start, check by viewing the leak hole that there are no leaks.

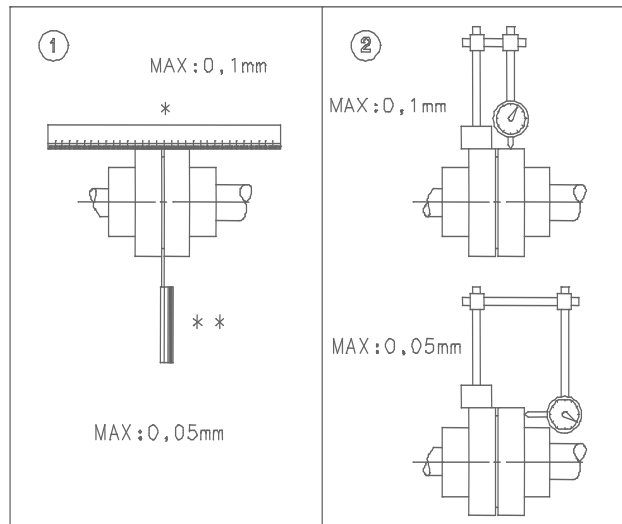
5.4 ALIGNING COUPLING

In order to avoid break-downs of a pump coupled to a motor on the same base plate through a flexible coupling, the following should be observed:

1. Avoid distortion of the base plate.
2. Avoid distortion in the piping system.
3. Check on the coupling that pump and motor are aligned accurately.

Below please find 2 proposals for alignment. The deviations mentioned cover a complete revolution of the coupling. The distance between the coupling halves is to be between 2 and 4 mm.

- * : Steel ruler.
 ** : Thickness gauge.



6. FROST PROTECTION

Pumps, which are not in operation during frost periods, are to be drained to avoid frost damage. Remove the plug at the bottom to empty the pump. Alternatively, it is possible to use anti-freeze liquids in normal constructions.

7. DISMANTLING



Before dismantling the pump make sure that it has stopped. Empty the pump of liquid before it is dismantled from the piping system. If the pump has been pumping dangerous liquids you are to be aware of this and take the necessary safety measures.

If the pump has been pumping hot liquids, take great care that it is drained before it is removed from the piping system.

8. START-UP



A self-priming centrifugal pump will not function until the pump casing has been filled with liquid. Remove the plug at the top of the pump casing and fill the pump with cold liquid. Fit the plug and the pump is ready for service. The liquid also serves as coolant for the shaft seal. Consequently, the pump must in no circumstances be started before it has been primed with liquid. Furthermore, the pump must never run dry.

WARNING

For safety reasons the pump is only allowed to operate against a closed discharge valve for a short time (max. 5-10 minutes and at a max. temperature of 130°C). The pump is equipped with a relief valve, which opens at a pre-set pressure. Be careful: If the valve opens, the escaping liquid will most likely be hot. The relief valve must in **NO** circumstances be removed or re-adjusted !
As regards maintenance of the relief valve - see paragraph 10.

8.1 STARTING

Before starting the pump check that

- the shaft rotates freely without jarring sounds.
- the pump casing is filled with liquid.

Start the pump for a moment to check the direction of rotation. If the direction is correct (i.e. in the direction of the arrow), the pump may be started.

9. SYSTEM BALANCING

It is often difficult to calculate a manometric delivery head in advance. It is, however, decisively important to the quantity of liquid delivered.

A considerably smaller delivery head than expected will increase the quantity of liquid delivered, causing increased power consumption and perhaps cavitation in pump and piping. In the pump the impeller may show signs of heavy erosion caused by cavitation (corrosion) which may at times render an impeller unfit for use in a very short time. Not unusually do similar erosions occur in pipe bends and valves elsewhere in the piping system.

Therefore, after start-up, it is necessary to check either the quantity of liquid delivered or the power consumption of the pump e.g. by measuring the current intensity of the connected motor. Together with a reading of the differential pressure the quantity of water delivered can be determined against the characteristics of the pump.

Should the pump not function as intended, please proceed according to the fault-finding list. Bear in mind, though, that the pump was carefully checked and tested at the factory and that the majority of faults stem from the piping system.

FAULT	CAUSE	REMEDY
The pump does not prime	<ol style="list-style-type: none"> 1. The pump is not filled with liquid 2. Leaking non-return valve in pump 3. Wrong direction of rotation 4. Air is drawn in because of too little liquid or leaking suction line 5. Liquid lock in outlet line 6. Temperature of liquid too high 7. Air cannot escape on pressure side 	<p>Fill pump casing with liquid</p> <p>Remove foreign body in pump/Remove any coating on mating faces Change direction of rotation</p> <p>Lower suction pipe/Tighten suction line</p> <p>Change the pressure line so that the air can pass out freely</p> <p>Replace liquid in pump casing/Wrong dimensioning/ Contact DESMI</p> <p>Ventilate the system</p>
The pump has no or too low capacity	<ol style="list-style-type: none"> 1. Wrong direction of rotation 2. Piping system choked 3. The pump is choked 4. Suction line leaks, pump takes air 5. Suction lift too high 6. Pump and piping system wrongly dimensioned 7. RPM too low 	<p>Change direction of rotation to clockwise when viewed from shaft end (the direction of the arrow)</p> <p>Clean or replace</p> <p>Clean the pump</p> <p>Find the leakage, repair the fault, non-return valve not submerged</p> <p>Check data sheet Q/H curve and NPSH or contact DESMI As 5</p> <p>Electric motor running on two phases or lower frequency?</p>

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FAULT	CAUSE	REMEDY
The pump uses too much power	<ol style="list-style-type: none"> Counter-pressure too low The liquid is heavier than water Foreign body in pump Electric motor is running on 2 phases RPM too high Pump and electric motor not aligned. 	<p>Insert orifice plate or check valve/Contact DESMI Contact DESMI</p> <p>Dismantle the pump, remove the cause Check fuses, cable connection, and cable Frequency too high.</p> <p>Align unit (see para. about alignment)</p>
The pump capacity is unstable	<ol style="list-style-type: none"> Suction line leaks Air pockets in suction line The pump takes air 	<p>Tighten suction line Normally they disappear in a short time Liquid reservoir emptied/ Suction line not sufficiently submerged</p>
The pump makes noise	<ol style="list-style-type: none"> Cavitation in pump Incorrect alignment Defective bearings 	<p>Suction lift too high/ Suction line wrongly dimensioned/ liquid temperature too high. Align the pump and motor (see para. about alignment) Replace bearings</p>

10. INSPECTION AND MAINTENANCE

- Before any inspection of the pump, check that the unit cannot be started unintentionally.
- The system is to be without pressure and drained of liquid.
- The repairman must be familiar with the type of liquid, which has been pumped as well as with the safety measures he is to take when handling the liquid.
- Inspect the shaft seal for leaks at regular intervals.
- Activate the relief valve at regular intervals in order to check the function. If the valve is choked, replace or clean it, if possible.

10.1 DRAINING THE PUMP

When the piping system has been drained, note that there is still some liquid left in the pump. Remove the remaining liquid by dismantling the pipe plug at the bottom of the pump.

10.2 BEARINGS

The pump (09 design only) is equipped with ball bearings, which were lubricated for life before leaving the factory. Therefore, they require no attention but are to be replaced in case of noise or bearing wear. Place a bead of grease on the sides of cleaned or newly mounted bearings. As far as semi-closed bearings are concerned, place grease on the open side of the bearing only.

A recommended grease quality on a lithium-basis is used:

ESSO.....	Beacon 2
BP.....	Energrease EP grease 2
Shell.....	Alvania grease 2
Mobil.....	Mobil lux grease EP 2 or Mobil plex 47
Castrol.....	Spherol AP2
Texaco.....	Multifak EP 2
Q8.....	Rembrandt EP 2 and Rubens
Statoil.....	Statoil Uniway U2

11. REPAIRS - ORDERING SPARE PARTS

When ordering spare parts please always state pump type and pump No. (appears on the name plate of the pump). See also spare parts drawing with item Nos.

12. OPERATING DATA

The following working pressures are allowed:

PUMP	NSA50-200	NSA80-250
PRESSURE [bar]	8	12

The above-mentioned max. working pressure is **NOT** valid for pumps approved by a classification society. Pumps approved by classification societies have been pressure tested according to the requirements of these societies, i.e. a test pressure of 1.5 x the permissible working pressure. The test pressure is stated in the test certificate and stamped into the discharge flange of the pump.

The following max. numbers of revolutions are allowed for NSA-pumps with full impeller diameter:

Pump	Max. number of revolutions	Pump	Max. number of revolutions
NSA50-200	3000 RPM	NSA80-250	3000 RPM

The capacities of the pumps appear from the nameplates.

13. EU DECLARATION OF CONFORMITY

DESMI A/S, hereby declare that our pumps of the NSA type are manufactured in conformity with the following essential safety and health requirements in the COUNCIL DIRECTIVE 2006/42/EC on machines, Annex 1.

The following harmonized standards have been used:

EN 294:1994	Safety of machinery. Safety distances to prevent danger zones being reached by the upper limbs
EN 809 + A1	Pumps and pump units for liquids – Common safety requirements
EN 12162:2001	Liquid pumps – Safety requirements – Procedure for hydrostatic testing
EN 60204-1:2006	Safety of machinery – Electrical equipment of machines (item 4, General requirements)

Pumps delivered by us connected with prime movers are CE-marked and comply with the above requirements.

Pumps delivered by us without prime movers (as partly completed machinery) must only be used when the prime mover and the connection between prime mover and pump comply with the above requirements.

Nørresundby, June 1, 2010

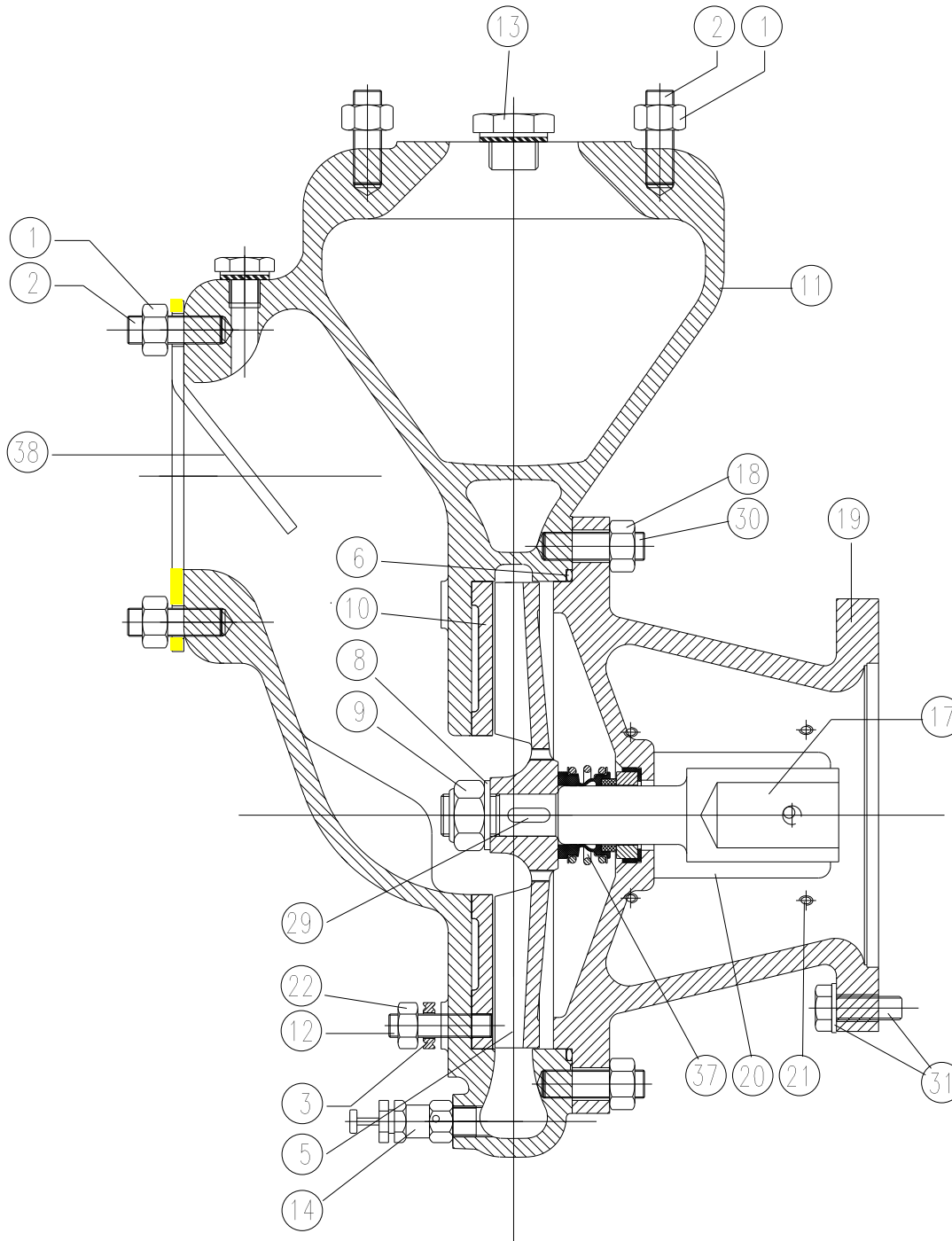


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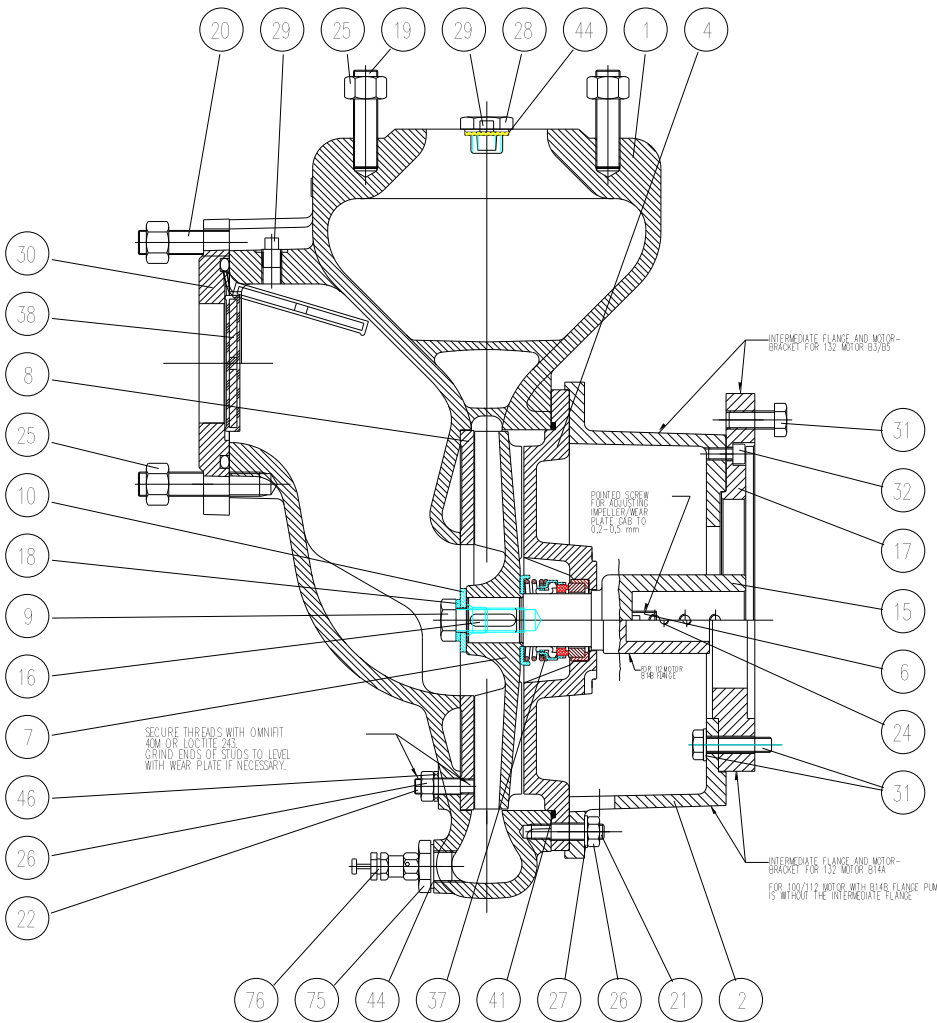
14. ASSEMBLY DRAWINGS AND SPARE PARTS LISTS

14.1 ASSEMBLY DRAWING NSA50-200/zz-M12



- 1 Nut
- 2 Stud
- 3 Sealing washer
- 5 Impeller
- 6 O-ring
- 8 Washer
- 9 Nut
- 10 Wear plate
- 11 Pump casing
- 12 Stud
- 13 Plug/sealing washer
- 14 Relief valve
- 17 Shaft/Pointed screw
- 19 Motor bracket
- 20 Name plate
- 21 Screw for nameplate
- 22 Nut
- 29 Key
- 30 Stud
- 31 Screw/washer
- 33 Plug/sealing washer
- 37 Shaft seal
- 38 Check valve

14.2 ASSEMBLY DRAWING NSA80-250/zz-M12

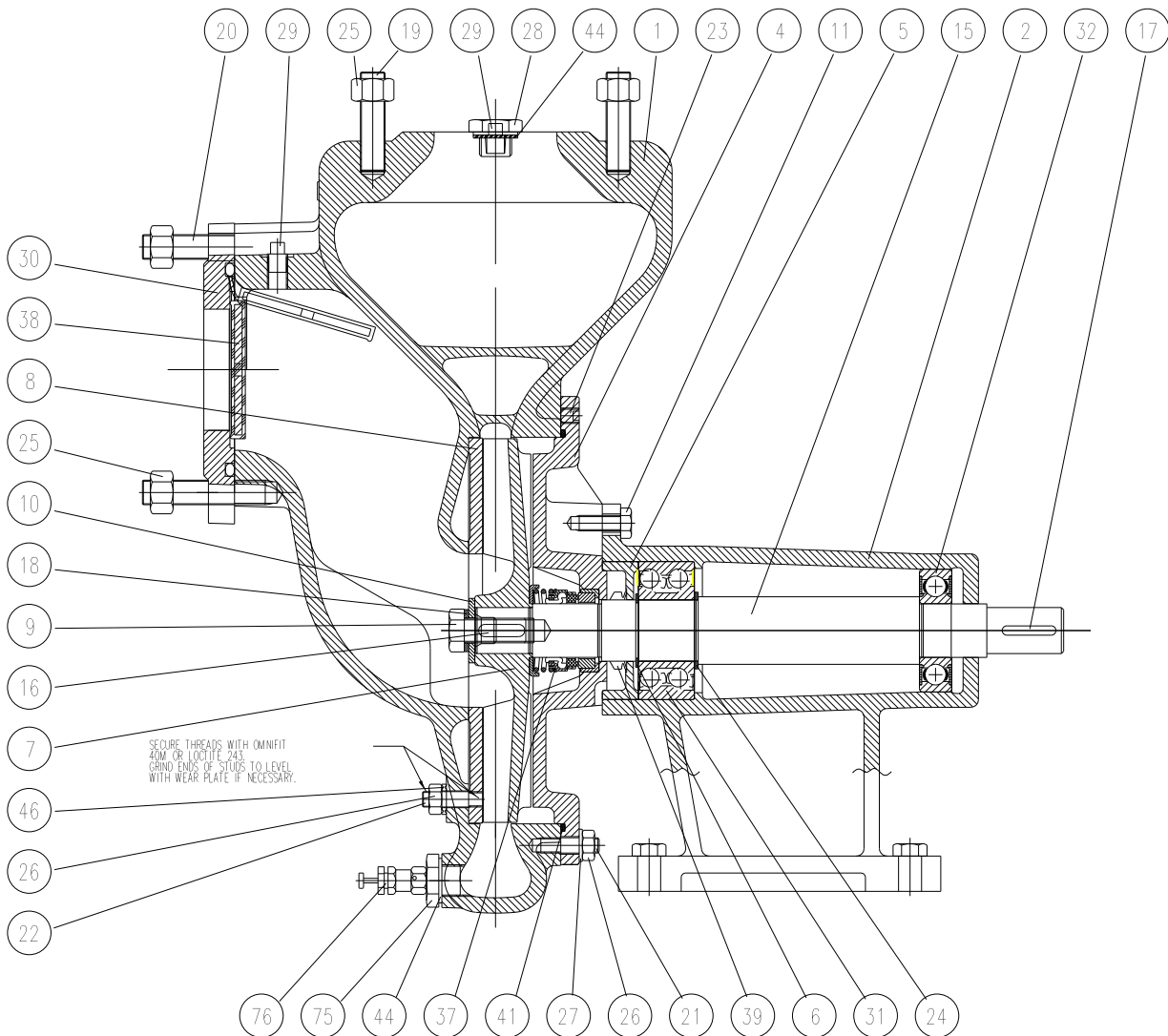


- 1 Pump casing
- 2 Motor bracket
- 4 Rear cover
- 6 Pointed screw
- 7 Impeller
- 8 Wear plate
- 9 Set screw
- 10 Washer
- 15 Shaft
- 16 Key
- 17 Intermediate flange*
- 18 Spring washer
- 19 Stud
- 20 Stud
- 21 Stud
- 22 Stud
- 24 Pointed screw
- 25 Nut
- 26 Nut
- 27 Washer
- 28 Pipe plug
- 29 Pipe plug
- 30 Inlet flange
- 31 Screw/washer
- 32 Allen screw**
- 37 Shaft seal
- 38 Check valve
- 41 O-ring
- 44 Sealing washer
- 46 Sealing washer
- 75 Pipe plug
- 76 Relief valve

*) Only for size 132 motor

***) If B5 motor

14.3 ASSEMBLY DRAWING NSA80-250/zz-M09



1	Pump casing	17	Key	29	Pipe plug
2	Bearing housing	18	Spring washer	30	Inlet flange
4	Rear cover	19	Stud	31	Bearing
5	Cover under bearing	20	Stud	32	Bearing
6	Lock ring	21	Stud	37	Shaft seal
7	Impeller	22	Stud	38	Check valve
8	Wear ring	23	Pointed screw	39	V-ring
9	Set screw	24	Support washer	41	O-ring
10	Washer	25	Nut	44	Sealing washer
11	Set screw	26	Nut	46	Sealing washer
15	Shaft	27	Washer	75	Pipe plug
16	Key	28	Pipe plug	76	Relief valve