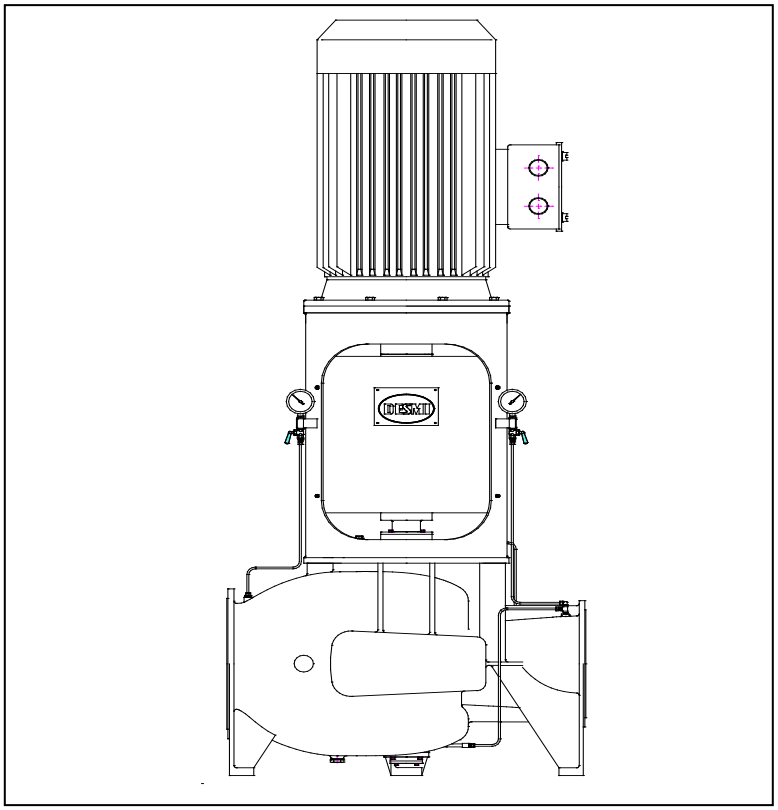
THE DESMI GROUP

DESMI

OPERATION AND MAINTENANCE INSTRUCTION

DESMI “in-line“ centrifugal pump

Type DSL



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Manual:	Language:	Revision:
T1343	English	H (06/10)

Special pump No. .....

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1. PRODUCT DESCRIPTION

These operation and maintenance instructions apply to the DESMI DSL-pump series, in spacer and compact design. The pumps are available in sizes ranging from 300 mm to 400 mm on the pressure flange. The suction flange is bigger than the pressure flange.

The DESMI DSL-pump is a 1-stage centrifugal pump with stainless steel shaft, mechanical shaft seals and closed impeller of the double-suction type.

The pump is a so-called "in-line" type, i.e. suction and pressure branches are mounted on the centre line. It is vertical with impeller of the double-suction type with double-curved blades, and it has a helical pump casing in one casting.

The pump is driven by an electric motor which may be a standard AC motor or a DC motor.

1.1 DELIVERY

- Check on delivery that the shipment is complete and undamaged.

- Defects and damages, if any, to be reported to the carrier or 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 paragraph 2.3.

2.1 ACCESSORIES

As extra equipment the pump may be mounted with a priming pump of the water ring type, complete with filter and feed water tank, or it may be delivered with an ejector pump.

Manometers are standard equipment.

2.2 SPACE AROUND THE PUMP

On the spacer pump it is possible to dismantle the impeller and the shaft without dismantling the electric motor. Therefore, no minimum distance is required above the electric motor. The ventilation of the motor should, however, be taken into consideration.

On the compact pump the motor and the motor bracket must be removed before dismantling shaft and impeller. This means that there is to be so much space above the motor that motor with bracket can be lifted abt. 250 mm up.

Generally, there is to be sufficient space in front of the pump to allow inspection of the shaft seal for leaks and dismantling of the coupling and the internal parts of the pump. It must also be possible to dismantle the entire pump, if required.
If the pump is equipped with a slide bearing at the bottom, there is to be a distance of abt. 100 mm under the middle of the pump measured from the pump feet for dismantling of the slide bearing. In the standard pump type, i.e. roller bearing and shaft seal at the bottom, this is not

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necessary, but nevertheless it would be an advantage to provide space under the pump, as it would facilitate the servicing of the bottom bearing of the pump and the shaft seal considerably.

2.3 EXPLANATION OF THE TYPE NUMBER

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

DSL-XXX-YYY/M-R

XXX : Diameter DN (mm) of the pressure branch (300, 400)
YYY : Diameter (mm) of standard impeller (320, 430).
M : The material combination of the pump.
R : The assembly combination of the pump.

R may be the following:

a : Spacer design.
b : Compact design.
i : With TN 16 flanges.
j : With TN 25 flanges.
k : Identical suction and pressure flanges.
l : Other stuffing box.
m : BS-flanges.
n : ANSI-flanges.
o : Shock-proof combination.
p : Other combination.
q : JIS-flanges.

M may be the following:

Material combination	A	C	D	Q
Pump casing	Cast iron	Cast iron	Bronze	See note 1)
Impeller	Bronze	Cast iron	Alu-bronze	See note 1)
Sealing ring	Bronze	Cast iron	Alu-bronze	See note 1)
Rear cover	Cast iron	Cast iron	Bronze	See note 1)
Shaft	Stainless steel	Stainless steel	Stainless steel	Stainless steel
Shaft seal	Mechanical	Mechanical	Mechanical	Mechanical
Elastomer	Nitrile	Nitrile	Nitrile	Nitrile

Note 1): The pumps are available in other material combinations at request.

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.

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Max. temperature for standard combination is 80°C.

The pump is particularly suitable for the pumping of water in connection with the cooling of diesel engines and cooling units, as ballast pump, and for waterworks and district heating stations.

Pumps in material combinations A and C are primarily used for fresh water.
Pumps in material combination D are primarily used for sea water.

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

Pump No. .....:_____
Pump type .....:_____
Application .....:_____
Comment .....:_____

2.4 TECHNICAL DESCRIPTION

The pumps are as a standard equipped with an electric motor with protection class IP 54.This means that the motor is protected against penetrating dust, and that splashes of water without pressure do not ruin the motor. If the pumps are installed in explosive areas they must be equipped with explosion-proof motors. The motors are designed for continuous operation at a max. ambient temperature of 40°C.

The following table indicates the max. permissible number of revolutions for the individual pump types:

Pump type	Motors: 6-pole / 50 Hz 6-pole / 60 Hz	Motors: 4-pole / 50 Hz 4-pole/ 60 Hz
DSL 300-320		X
DSL 400-430	X	

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

The capacity of the pump appears on the name plate 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.

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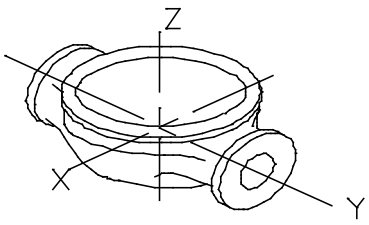
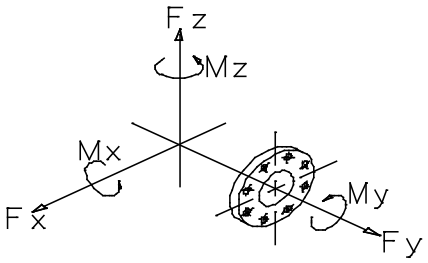
The permissible loads on the flanges are stated in the table below:





Pump type	DN	Forces (N)				Torques (Nm)			
		F_y	F_z	F_x	$\sum F$	M_y	M_z	M_x	$\sum M_t$
DSL 300-320	300	3000	3750	3350	5860	2750	1900	2200	4000
DSL 400-430	400	4000	5000	4480	7820	4600	3200	3700	6720

In connection with the permissible loads on the flanges stated in the above table there is also the following limitation :

$$\left(\frac{\sum F \quad calc}{\sum F}\right)^2 + \left(\frac{\sum M \quad calc}{\sum M_t}\right)^2 \prec 2$$

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.

The max. permissible loads on the flanges indicated in paragraph 2.4 are to be observed.

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.

3.2 WIRING

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

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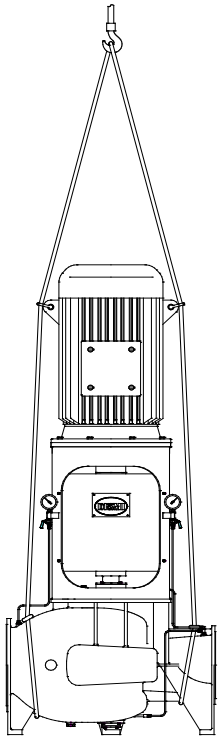
4. TRANSPORT/STORAGE

The pumps are to be lifted as shown on the figure. The weight appears from the table below.
The pump is to be stored in a dry area.
The centre of gravity of the pump is on the centre line of the shaft.
Before shipment the pump is to be fastened and supported securely on a pallet or the like.



The pump is to be lifted as follows:

The lifting straps must not bear against sharp edges and corners.

The pump weights do not include motor.

PUMP TYPE	WEIGHT IN KG SPACER	WEIGHT IN KG COMPACT A/D-COMBINATION
DSL 300-320	710/795	645/730
DSL 400-430	1360/1520	1240/1400

5. DISMANTLING

5.1 DISMANTLING MOTOR AND BRACKET
Normally, it will not be necessary to dismantle motor and bracket in the spacer pump, whereas it has to be done in the compact type. Remove the copper pipes to the manometers and the rear cover, then unscrew the nuts (920.1) . Motor with bracket can now be lifted up and out. It is also possible to dismantle the motor only by removing the screws (901.1).

5.2 DISMANTLING COUPLING
The spacer shaft (860.1) can be taken out after the screws (914.5) have been removed. Pull the pump half off the shaft. In the compact pump the motor has to be removed before the coupling can be dismantled as described in paragraph 5.1.

5.3 DISMANTLING TOP BEARING AND SHAFT SEAL
Dismantle the bearing cover (360.1). Remove the circlip (932.1). Pull out carefully the bearing with bearing housing by means of the threads of the bearing housing (382.1). Press out the bearing from behind the bearing housing. Press out the ceramic ring of the shaft seal (433.1) from the cover, and pull up the remaining components of the shaft seal.

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5.4 DISMANTLING BOTTOM BEARING

Dismantle the four screws (914.3). Pull down bearing housing (382.2) with outer ring and rollers. If the bearing has to be replaced, it is necessary to dismantle the inner ring. Remove the circlip (932.2) and heat the inner ring by means of a heating ring. Press out the outer ring from the bearing housing after the bearing cover has been removed.

The procedure is the same if the bottom bearing of the pump is a slide bearing with the only exception that instead of the outer ring it is the slide bearing (310.1) which follows the bearing housing. The shaft lining can be pulled off after the shaft nut (922.2) has been removed. If the slide bearing has to be replaced, it can be pressed out of the housing.

5.5 DISMANTLING BOTTOM SHAFT SEAL

Dismantle the bearing housing as described in paragraph 5.4. Loosen the screws holding the shaft seal housing (441.1) and pull out the shaft seal housing. Remove intermediate ring (550.1 it is not found in all the pumps) and the water deflector from the housing. Press the ceramic ring of the shaft seal (433.2) out of the housing. Pull the remaining seal components off the shaft.

If the bottom bearing of the pump is a slide bearing, there is no mechanical shaft seal at the bottom.

5.6 DISMANTLING REAR COVER WITH SHAFT AND IMPELLER

This operation offers 3 different possibilities dependent on the aids available. First, dismantle coupling and bottom bearing/shaft seal as described in paragraphs 5.2, 5.4, and 5.5.

A. Crane/Lifting Hoist available and sufficient space above motor:

Remove motor with bracket as described in paragraph 5.1. It is not necessary to remove the motor bracket, if the rear cover can pass the top flange in the bracket. Remove the nuts (920.1) which hold the rear cover. Mount a lifting eye at the shaft end and lift up the complete arrangement. Loosen the pointed screw (904.3), remove the shaft nut (922.1), and pull the impeller off the shaft. Now check the sealing rings (502.1) for wear.

B. Lifting Hoist Available:

This possibility applies to the spacer pump only. Remove the nuts (920.3) which hold the rear cover. Dismantle the copper pipe to the rear cover. Mount lifting eyes in the rear cover and at the top of the motor bracket. Pull up the complete arrangement by means of hoists and tip it out through the opening of the motor bracket. Follow item A.

C. Limited Lifting Possibilities:

This possibility applies to the spacer design only. Dismantle the top bearing and the shaft seal as described in paragraph 5.3. Remove the nuts (920.3) which hold the rear cover. Dismantle the copper pipe to the rear cover. Dismantle the rear cover, e.g. by means of a pulley drawer. Pull up the shaft with impeller. Follow item A.

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6. ASSEMBLING

6.1 FITTING SEALING RING AND IMPELLER

Press the sealing ring into place. It is to bear against the shoulders of pump casing and rear cover. Fit the keys (940.3) in the shaft, and lead the impeller towards the shoulder of the shaft. Tighten the shaft nut (922.1). Tighten the pointed screw (904.4). Lead the shaft with impeller into the rear cover (130.1).

6.2 FITTING TOP BEARING AND SHAFT SEAL

Before fitting the seat, clean the recess in the bearing housing (382.1). Dip the outer rubber ring of the seat into olive oil (or another neutral oil) or in silicone grease. Now press the seat into place with the fingers and check that it is correctly embedded. If it is necessary to use fitting tools, then protect the sliding surface of the seat to prevent it from being scratched or cut. Lubricate the inner diameter of the rubber bellows of the slide ring and the shaft piece under the rubber bellows with silicone grease. Lead the slide ring unit down over the shaft and make sure that the slide ring is protected. Push the slide ring down along the shaft until the spring locates over the thrust collar and contacts the shell. Push and compress the spring. When you let go of the seal, the slide ring unit is to move slowly across the shaft. 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. Push the O-ring (412.3) into place in the track of the bearing housing, then lead the bearing housing with the ceramic ring carefully down over the shaft. Tighten the screws (914.4). When using oil or silicone grease 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 that there are no leaks.

When replacing the shaft seal the bearing (321.1) should also be replaced. Lead the support disc (505.1) down over the shaft, and press the bearing (321.1) into place. Use pressing tools which are fitted by means of the thread in the shaft end. Lead down the other support disc, and fit the circlip (932.1). Fit the bearing cover.

6.3 FITTING REAR COVER WITH SHAFT AND IMPELLER

Fit the O-rings (412.1) and (412.4) in the rear cover and use a little grease. If there is only 1 0-ring in the rear cover, use the gasket (400.2) between rear cover and pump casing instead. Lower rear cover with shaft and impeller into the pump casing. Fit the rear cover by tightening the nuts (920.3), as there is resistance from the O-rings.

6.4 FITTING BOTTOM SHAFT SEAL

Before fitting the seat, clean the recess in the shaft seal housing (441.1). Dip the outer rubber ring of the seat in olive oil (or another neutral oil) or in silicone grease. Now press the seat into place with the fingers and check that it is correctly imbedded. If it is necessary to use fitting tools, then protect the sliding surface of the seat to prevent it from being scratched or cut. Lubricate the inner diameter of the rubber bellows of the slide ring and the shaft piece under the rubber bellows with silicone grease. Lead the slide ring unit over the shaft and make sure that the slide ring is protected. Push the slide ring along the shaft until the spring locates over the thrust collar and contacts the shell. Push and compress the spring. When you let go of the sealing the slide ring unit is to move slowly across the shaft. 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.Lead the O-ring or the gasket into place in the bearing housing (441.1). Lead the bearing housing carefully up over the shaft and tighten the screws (914.1).
When using oil or silicone grease on the shaft the bellows will settle and seat in about 15 minutes, and until then tightness should not be expected. After start, check for leaks by viewing the leak hole.

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6.5 FITTING BOTTOM BEARING

If a new bearing has to be mounted, heat the inner ring of the new bearing with a heating ring and lead the bearing into place on the shaft. Fit the circlip (932.2). Press the outer ring with rollers into place in the bearing housing. Tighten the bearing cover. Push up the water deflector (507.1) until it bears against the shoulder of the shaft. Fit the intermediate ring (550.1 is not found on all the pumps). Then fit the O-ring in the track of bearing housing. Lead bearing housing with outer ring and rollers into place and tighten.

If the pump is equipped with slide bearing at the bottom, and this has to be replaced, press a new slide bearing (310.1) into the bearing housing (382.2) until it bears against the shoulder. Lead the O-ring into place in the bearing housing. Fit the key (940.4) in the shaft and push the shaft lining (524.1) onto the shaft so that it catches the key. Tighten and and secure the shaft nut (922.2) by means of the pointed screw (904.3). Lead the bearing housing with slide bearing up and see to it that the pin is guided into the little hole in the pump casing Lead the O-ring (412.5) into place in the bottom cover (361.1). Tighten the cover and make sure that the pin is guided into the hole of the bearing housing.

6.6 FITTING COUPLING

Fit the key (940.2) in the shaft. Press the coupling half against the shoulder of the shaft and fasten it with the pointed screw (904.1).

If the pump is a spacer, proceed with the assembling as follows:

1. Inspect Allen screws (914.5) and coupling bushes (867.1) for damage and clean them with a cloth. Replace screws or bushes if damaged!

2. Degrease the screw threads with e.g. benzine and clean the threaded holes in the coupling half pump and coupling half motor with compressed air. If new coupling halves are mounted at the same time, clean the threaded holes with benzine as well.

3. Place the coupling bushes in the top holes of the spacer (860.1). The chamfering on the bushes to face downwards! Place the coupling bushes in the bottom holes of the spacer. The chamfering on the bushes is to face upwards.

4. Hold your hand under the spacer and the bottom coupling bushes, and push the spacer carefully into place.

5. Apply screw locking to the screws - LOCTITE type 242 is recommended as it allows dismantling - and fit and fasten all the screws with the hand. It might be necessary to push the spacer a little until the screws catch the thread and you feel that the spacer has found its right place.

6. Now tighten the screws with a torque wrench (5.3 kgm = 12 mm screws). As the shaft will rotate during this operation it is necessary to "lock" the spacer by wedging a mandrel or a piece of flat iron or the like in between the two following screw heads in order to lock the system while tightening the screws.

7. When the coupling guard and the copper pipe to the rear cover have been fitted, and the procedure in paragraph 6.1 has been followed, the pump is ready for start.

The fitting of the coupling in a compact pump is to be carried out just as carefully as described above,

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but in a slightly different order:

Place the coupling bushes in the coupling half (861.2). The chamfering on the bushes is to face downwards. Fit motor bracket and motor. Fit and fasten the screws (914.5) as described above. Fit the copper pipe to manometers and rear cover. Fasten the coupling guard.

6.7 COUPLING GUARD
Protect the coupling guard against unintentional access to shaft and coupling. The pump must not be started when the coupling guard (598.1) is dismantled. The coupling guard is either open below (spacer design) or perforated (compact design) to allow inspection of leaks at the shaft seal.

7. 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.

8. DISMANTLING

Before dismantling the pump make sure that it has stopped. Wiring to be dismantled by skilled workmen. Then 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.

9. START-UP

A centrifugal pump will not function until it has been filled with liquid between the foot valve and up to somewhat above the impeller.

The liquid also serves as coolant for the shaft seal. In order to protect the shaft seal the pump must not run dry.

ATTENTION

For safety reasons the pump is only allowed to operate against a closed discharge valve for a short

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time (max. 5-10 minutes and at a max. temperature of 130°C). Otherwise there is s risk of damage to the pump, and, at worst, of a steam explosion. If the pump room is unmanned, the installation of a safety device is recommended.

9.1 STARTING

Before starting the pump check that

1. the shaft can rotate freely without jarring sounds.

2. pump and suction line are filled with liquid:

a. Pump with positive suction lift : Ventilate by means of the valve (741.1) of the rear cover.
b. Pump with priming unit : Check that the priming continues until liquid comes out.

The above is important as the liquid serves as coolant for the shaft seal.

3. Start the pump for a moment to check the direction of rotation. If the direction is correct (i.e. clockwise when viewed from above), the pump may be started.

10. 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.

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10.1 FAULT-FINDING CHART

FAULT	CAUSE	REMEDY
The pump has no or too low capacity	1. Wrong direction of rotation	Change direction of rotation to clockwise when viewed from above (the direction of the arrow)
	2. Piping system choked	Clean or replace
	3. Pump choked	Clean the pump
	4. Suction line leaks/ Pump takes air	Find leakage, repair the fault, non-return valve not submerged
	5. Suction lift too high	Check data sheet Q/H curve and NPSH or contact DESMI
	6. Pump and piping system wrongly dimensioned	As 5
	7. The pump is not ventilated	Ventilate the pump
The pump uses too much power	1. Counter-pressure too low	Insert orifice plate or check valve/Contact DESMI
	2. The liquid is heavier than water	Contact DESMI
	3. Foreign body in pump	Dismantle the pump, remove the cause
	4. Electric motor is running on 2 phases	Check fuses, cable connection, and cable
The pump makes noise	1. Cavitation in pump	Suction lift too high/ Suction line wrongly dimensioned/Liquid temperature too high

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11. INSPECTION AND MAINTENANCE

11.1 INSPECTION DURING OPERATION

It is important to check at regular intervals that:

1. the pump pressure is as prescribed.
2. the pump does not vibrate, make noise or get hot.
3. there is no air in the pump.
4. no liquid is dripping from the drain holes for the shaft seals thus indicating leaks.

If one of the above points is not satisfactory, stop the pump and repair the fault.

11.2 DRAINING THE PUMP

When the piping system has been drained, note that there is still liquid left in the pump. Remove most of the liquid by dismantling the pipe plug (912.1) at the bottom. Remove the remaining liquid by tilting the pump casing (102.1) towards one of the flanges.

11.3 INSPECTION

- 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 liquid which has been pumped as well as the safety measures he is to take when handling the liquid.

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

- Sealing ring/impeller : .....Wear=max. 1.5 mm diameter difference.
- Shaft seal : Check seat for flatness and cracks.
  Check rubber parts for elasticity.
- Bearings : Slackness or noise.
- Coupling parts : Screws and coupling bushes, see paragraph 6.6.
- Pipes from pressure side to top and bottom shaft seal : Cleanness.

11.4 LUBRICATING BEARINGS

The top bearing is a closed ball bearing which does not need lubrication.

The bottom bearing is a cylindrical roller bearing, for which the lubricating procedure is as follows:

1. Dismantle the bearing as described in paragraph 5.4.
2. Remove the old grease from bearing and bearing housing.
3. If the bearing has just been cleaned or if it is a new bearing, fill bearing completely and bearing housing approx. 1/3 with grease.
4. Use a recommended lithium-based grease, see the table below.

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Recommended types of grease:

ESSO	Beacon 2
BP	Energrease EP grease 2
Shell	Alvania grease 2
Mobil	Mobil lux grease EP 2 and Mobil plex 47
Castrol	Spherol AP 2
Texaco	Multifak EP 2
Q8	Rembrandt EP 2 and Rubens
Statoil	Statoil Uniway u2

5. The intervals between the lubrication of the bearings depend on the number of revolutions:
   a. Pump with 4-pole motor: 5000 hours
   b. Pump with 6-pole motor: 6000 hours
   c. Pump with 8-pole motor: 7000 hours

If the pump is equipped with slide bearing, the bottom bearing needs no lubrication. The bearing is lubricated and cooled by the liquid pumped via the pressure side of the pump.

12. REPAIRS

12.1 ORDERING SPARE PARTS
When ordering spare parts please always state pump type and serial No. See the name plate of the pump and the spare parts drawing with item Nos. See assembly drawing.

13. OPERATING DATA

Type	Max. power consumption KW 740/870/980/1170/ 1450 / 1750 rpm	Max. permissible working pressure bar
DSL 300-320	- / - / 30 / 50 / 95 / 165	5
DSL 400-430	92 / 150 / 215 / 365 / - / -	5

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.

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14. EU DECLARATION OF CONFORMITY

DESMI A/S, hereby declare that our pumps of the type DSL 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

Kurt Bech Christensen
Technical Director

DESMI A/S
Tagholm 1
9400 Nørresundby

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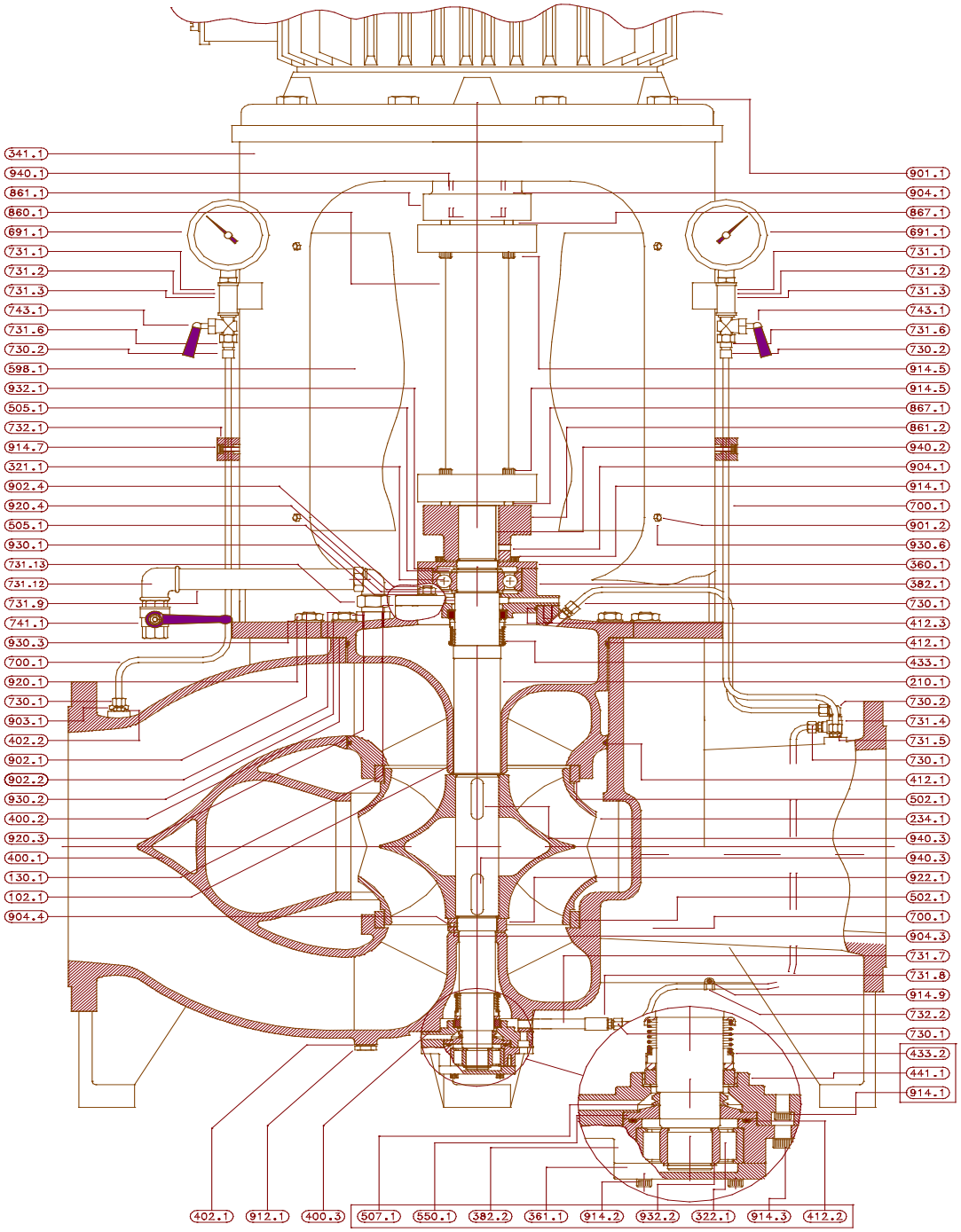
15. ASSEMBLY DRAWING

15.1 SPACER DESIGN



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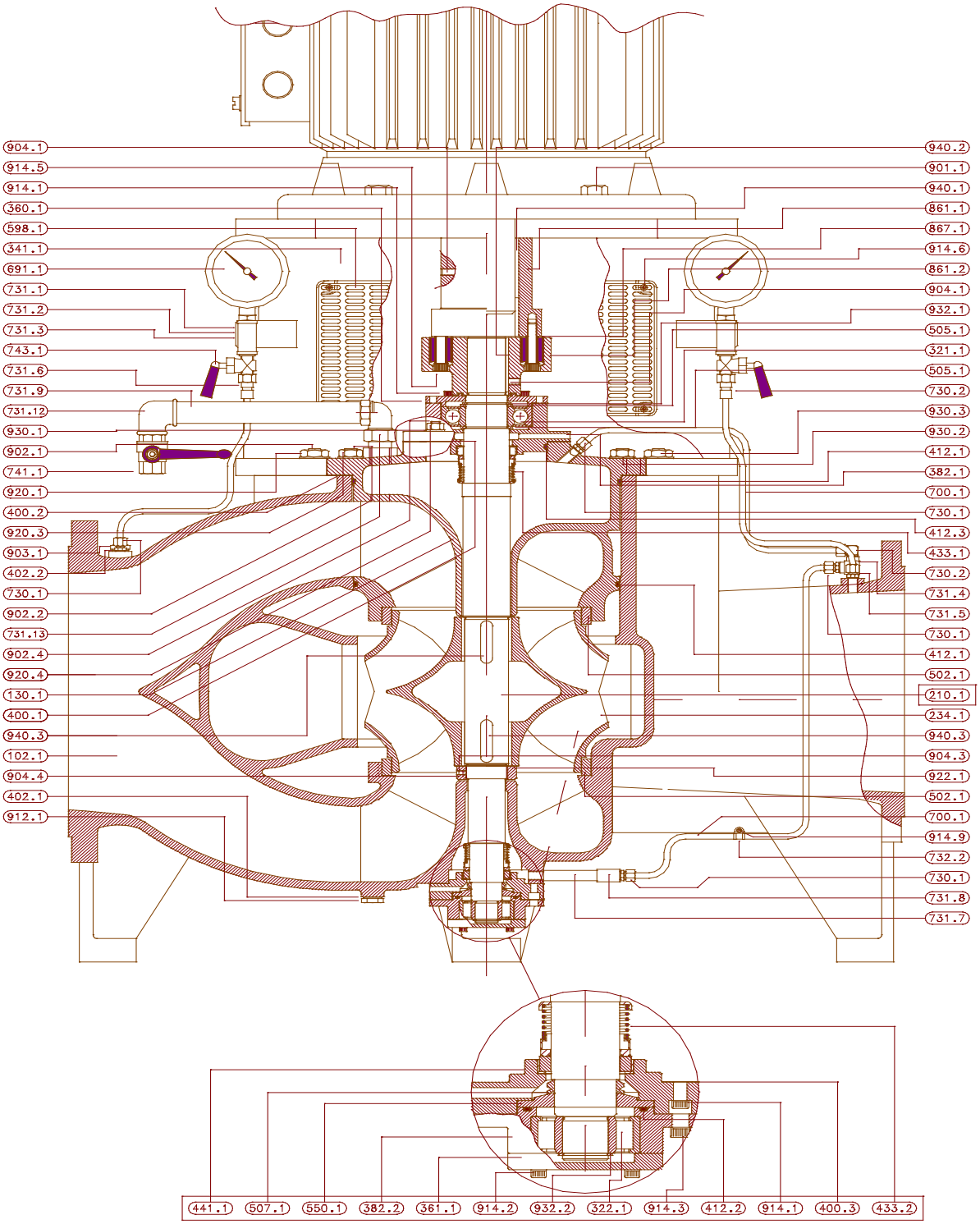
15.2 COMPACT DESIGN



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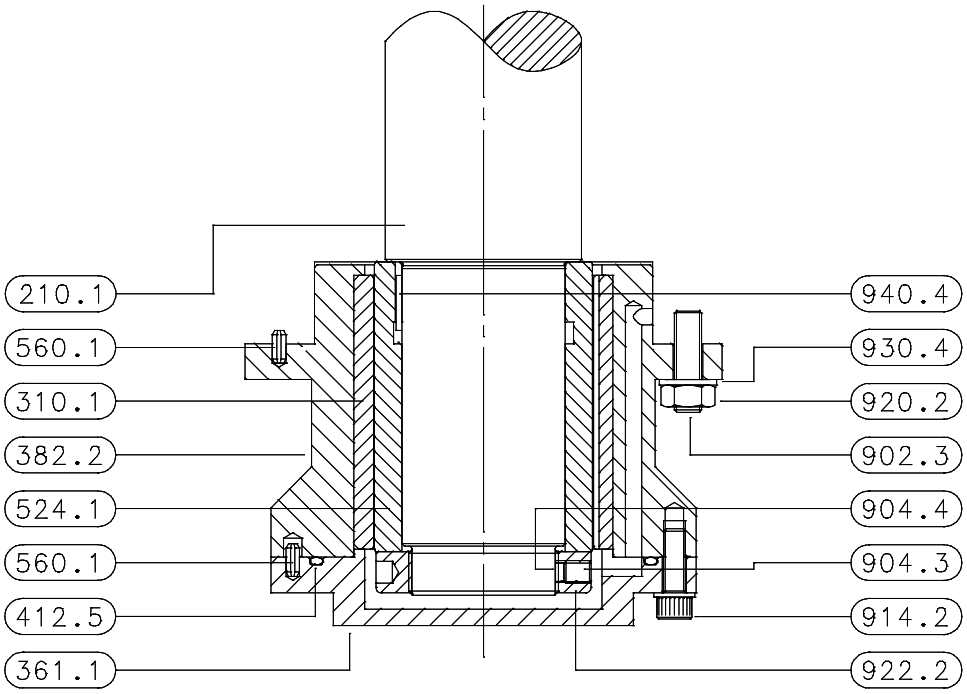
15.3 SLIDE-BEARING DESIGN

If the pump is with slide bottom bearing, the rectangle-framed position numbers on 15.1 and 15.2 are to be replaced by the below position numbers.



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16. SPARE PARTS LIST

Pos.	Designation
102.1	Pump casing
130.1	Rear cover
210.1	Shaft
234.1	Impeller
310.1	Slide bearing
321.1	Ball bearing
322.1	Roller bearing
341.1	Motor bracket
360.1	Bearing cover
361.1	Bearing end cover
382.1	Bearing housing
382.2	Bearing housing
400.1	Gasket
400.2	Gasket
400.3	Gasket
402.1	Plastic seal
402.2	Plastic seal
412.1	O-ring
412.2	O-ring
412.3	O-ring
412.4	O-ring
412.5	O-ring
433.1	Mech. shaft seal
433.2	Mech. shaft seal
441.1	Shaft seal housing
502.1	Sealing ring
505.1	Support disc
507.1	Water deflector
524.1	Shaft lining
550.1	Intermediate ring
560.1	Pin
598.1	Coupling guard
691.1	Manometer
700.1	Copper pipe
730.1	Securex
730.2	Securex
731.1	Fitting
731.2	Fitting
731.3	Fitting
731.4	Fitting
731.5	Fitting
731.6	Fitting
731.7	Fitting
731.8	Fitting
731.9	Fitting
731.10	Fitting
731.11	Fitting
731.12	Fitting
731.13	Fitting
731.14	Fitting
732.1	Pipe holder
732.2	Pipe holder
741.1	Valve
743.1	Cock
860.1	Spacer shaft
861.1	Coupling half-motor
861.2	Coupling half-pump
867.1	Coupling bush
900.1	Eye bolt
900.2	Eye bolt
901.1	Hexagon head screw
901.2	Hexagon head screw
902.1	Stud
902.2	Stud
902.3	Stud
902.4	Stud
903.1	Pipe plug
904.1	Pointed screw
904.3	Pointed screw
904.4	Ball
912.1	Bottom plug
914.1	Allen screw
914.2	Allen screw
914.3	Allen screw
914.4	Allen screw
914.5	Allen screw
914.6	Allen screw
914.7	Allen screw
914.8	Allen screw
914.9	Allen screw
920.1	Nut
920.2	Nut
920.3	Nut
920.4	Nut
922.1	Shaft nut
922.2	Shaft nut
930.1	Disc
930.2	Disc
930.3	Disc
930.4	Disc
930.5	Disc
930.6	Disc
932.1	Seeger ring
932.2	Seeger ring
940.1	Key
940.2	Key
940.3	Key
940.4	Key

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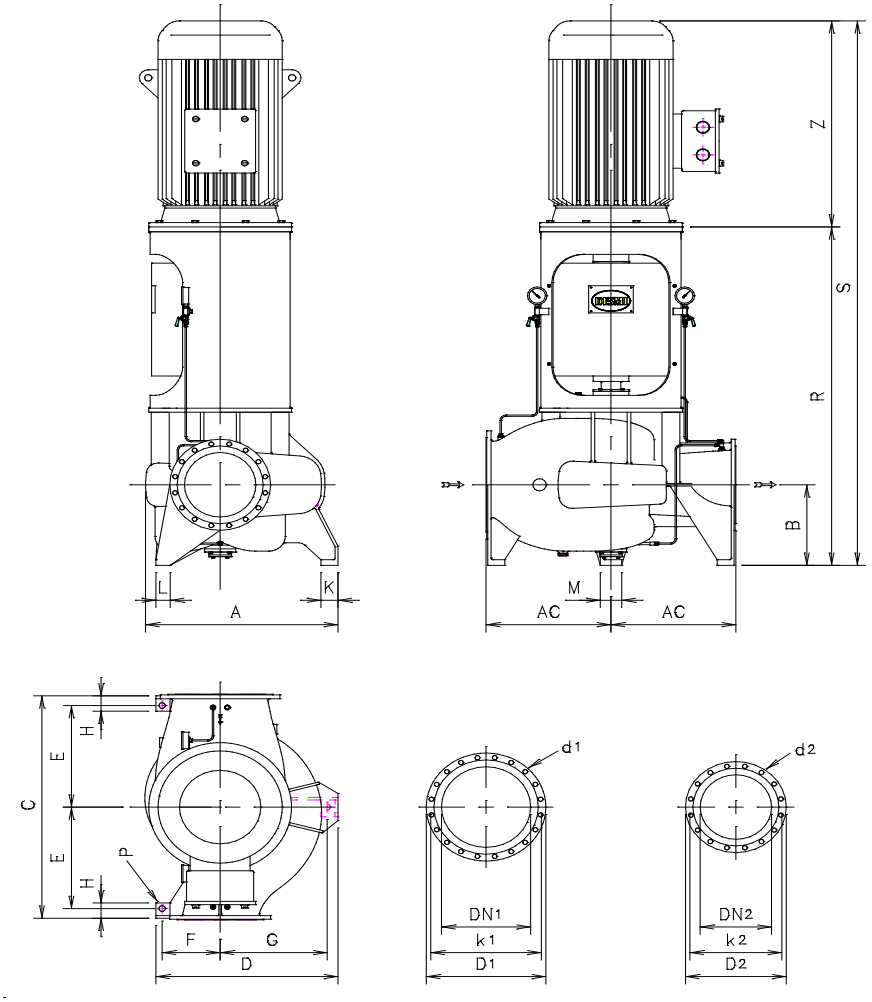
17. DIMENSIONAL SKETCH



	A	B	AC	C	D	E	F	G	H	K	L	M	R	Z	S	P
DSL 300-320	820	400	550	1072	750	490	111	450	75	70	65	90	1506 (1 1099 (2	(3	R+Z	ø 28
DSL 400-430	1078	500	700	1380	1020	630	325	600	95	95	80	120	2100 (1 1401 (2	(3	R+Z	ø 35

(1 : Spacer design. (2 : Compact design, (3 : Dependent on motor.

PUMP	DNI	KI	DI	DI	DN2	k2	D2	d2
DSL300-320	350	460	505	16 pcs ø22	300	400	445	12 pcs ø22
DSL 400-430	500	620	670	20 pcs ø26	400	515	565	16 pcs ø26

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