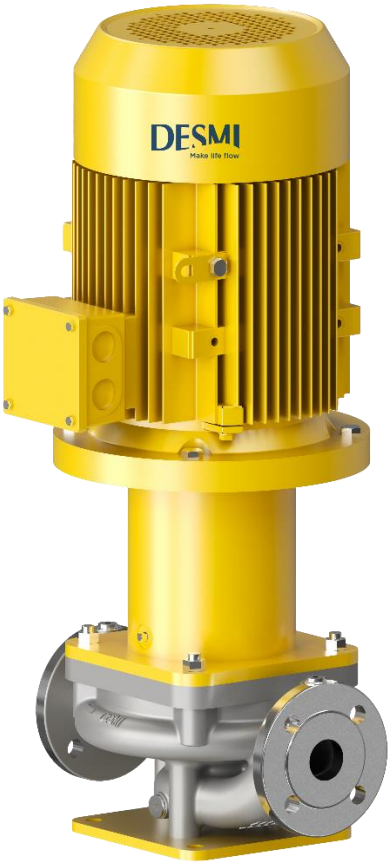
DESMI

Original instructions

DESMI Vertical In-Line Centrifugal Pump

OPERATION AND MAINTENANCE INSTRUCTIONS

ESL Magnetic Drive



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Contents

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1. GENERAL DESCRIPTION

These operation and maintenance instructions apply to DESMI ESL pumps in compact and magnetic drive design. DESMI reserves the right to make any type of update, without prior notice. The latest version of the manual is acquirable by scanning the QR code in the front page of this manual.

The pumps are seal-less magnetic drive single stage centrifugal pumps equipped with stainless steel shaft and closed impeller. A magnetic coupling transmits the torque of the motor to the pump shaft which is carried in two plain bearings lubricated by the pumped liquid. Between outer magnet and inner magnet, a canister provides hermetic sealing between the wetted pump areas and the atmosphere.

The pump is particularly suitable for the pumping of emerging fuel types, including Methanol, Ethanol, Ammonia, various Hydrocarbons, Chemicals and Amine/Water Mixtures.

The pump suction and discharge ports are casted flanges which comply with European Union flange standards as well as other compatible flange standards, e.g., ASME, ISO and JIS standards.

1.1. General

This manual contains general installation, operation and maintenance instructions that must be observed to ensure safe pump operation and prevent personal injury and damage to property.

The safety information in all sections of this manual must be complied with. This manual must be read and completely understood by the specialist personnel /operators responsible, prior to installation and commissioning.

The content of this manual must be available to the specialist personnel at the site at all times.

Information attached directly to the pump must always be complied with and be kept in a perfectly legible condition at all times. This applies to, for example:

- Arrow indicating the direction of rotation
- Marking for connections
- Name plate

The operator is responsible for ensuring compliance with all local regulations not taken into account in this manual.

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1.2. Personnel qualification and training

All personnel involved must be fully qualified to transport, install, operate, maintain and inspect the machinery this manual refers to. The responsibilities, competence and supervision of all personnel involved in transport, installation, operation, maintenance and inspection must be clearly defined by the operator.

Deficits in knowledge must be rectified by means of training and instruction provided by sufficiently trained specialist personnel. If required, the operator can commission the manufacturer / supplier to train the personnel. Training on the pump (set) must always be supervised by technical specialist personnel.

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1.3. EU & UK declaration of conformity

DESMI PUMPING TECHNOLOGY A/S, hereby declare that our pumps of ESL compact and magnetic driven 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/ISO 13857:2019	Safety of machinery. Safety distances to prevent danger zones being reached by the upper limbs
EN 809:1998 + A1:2009	Pumps and pump units for liquids – Common safety requirements
EN12162:2001+A1:2009	Liquid pumps – Safety requirements – Procedure for hydrostatic testing
EN 60204-1:2018	Safety of machinery – Electrical equipment of machines (item 4, General requirements)
Ecodesign Directive (2009/125/EC).	Water pumps: Commission Regulation No 547/2012. Applies only to water pumps marked with the minimum efficiency index MEI. See pump nameplate
Directive 2014/34/EU	Equipment and protective systems intended for use in potentially explosive atmospheres. Applies only to pumps marked with Ex. See pump nameplate

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, Jan. 10 2025

Henrik Mørkholt Sørensen

Managing Director

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1.4. ATEX declaration of conformity

1.4.1. Product description

The precautions to be taken using the pumps in areas where the ATEX rules for “Ex II 2G Ex h IIb T4 Gb X” marked equipment apply. Only pumps mounted with EX-marked nameplate from DESMI are approved for / allowed to be used in EX areas.

The pumps have been examined according to EN80079-36:2016 and EN80079-37:2016. Constructional safety “c” and an Ignition Hazard Assessment has been made. As a result of this assessment the following precautions are to be taken.

1.4.2. Precautions

NOTE: *Dry run is not allowed. Fill pump with liquid before start up. A cos φ measuring device can be fitted to the power circuit and set to trip the drive power in case of the power consumption being too low. The liquid in the pump also serves as coolant for bearing unit and canister. Dry run will result in frictional heat being developed causing hot surface.*

NOTE: *Pumping against closed outlet valve is not allowed for more than 2 minutes. A pressure switch can be fitted to trip the drive power in case of the outlet pressure being too high.*

NOTE: *Choking or clogging of the pump can result in either too low load or overload of the motor or bending of the shaft. Use a strainer / filter in the suction pipe. A cos φ measuring device can be fitted to the power circuit and set to trip the drive power in case of power consumption being too low or too high. The thermistors (if any) in the electric motor can only be used to trip the drive power at overload.*

NOTE: *User must replace motor bearings after 90% of rated life i.e. 22.500 hours. The motor can be fitted with a continuous temperature monitoring device set to trip the drive power 10°C above normal operating temperature.*

NOTE: *A PT100 temperature sensor is mounted on the pump and shall be connected to the electric control system for monitoring the canister surface temperature. The control system to be set to trip the drive power in case the measured temperature is above 90°C.*

NOTE: *Max. allowed liquid temperature is 80°C for fresh water and most likely less for other liquids. The pump housing can be fitted with a temperature sensor to be connected to the electrical control system on site and then set this to trip the drive power 10°C above normal operating temperature. Contact DESMI in case of doubt about max. allowed liquid temperature.*

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Note: The magnetic coupling might slip and be damaged / overheat in case the pump torque exceeds the max. torque of the coupling. A flowmeter can be fitted to trip the drive power in case of discontinued flow from the pump or a cos φ measuring device can be fitted to the power circuit and set to trip the drive power in case of power consumption being too low or too high.

Nørresundby, Jan. 10 2025

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1.5. Information relevant for disassembly or disposal at end-of-life

No harmful materials are used in DESMI pumps – please refer to DESMI Green Passport (can be sent on request – contact a DESMI sales office) – i.e. common recycling companies can handle the disposal at end-of-life. Alternatively the pump and motor can be returned to DESMI at end-of-life for safe recycling.

2. SAFETY

All the information contained in this section refers to hazardous situations.

2.1. Key to safety symbols/markings

2.1.1. Signal words

The following signal words and symbols are used to identify safety messages in these instructions:

⚠ **DANGER**	**DANGER** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
⚠ **WARNING**	**WARNING** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
CAUTION	**CAUTION** indicates a hazard with a low level of risk which, if not avoided, could result in damage to the product or system.

Information with this heading is used to address practices not related to personal injury.

2.1.2. Hazard symbols

General hazard

In conjunction with one of the signal words, this symbol indicates a hazard which will or could result in death or serious injury.

Electrical hazard

In conjunction with one of the signal words, this symbol indicates a hazard involving electrical voltage and identifies information about protection against electrical voltage.

Magnetic field

In conjunction with one of the signal words, this symbol indicates a hazard involving magnetic field and identifies information about protection against magnetic field.

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Toxic hazard

This symbol indicates “hazardous substances and toxic fluid” safety instructions where non-compliance would affect personnel safety and would damage the equipment or property.

Explosion protection

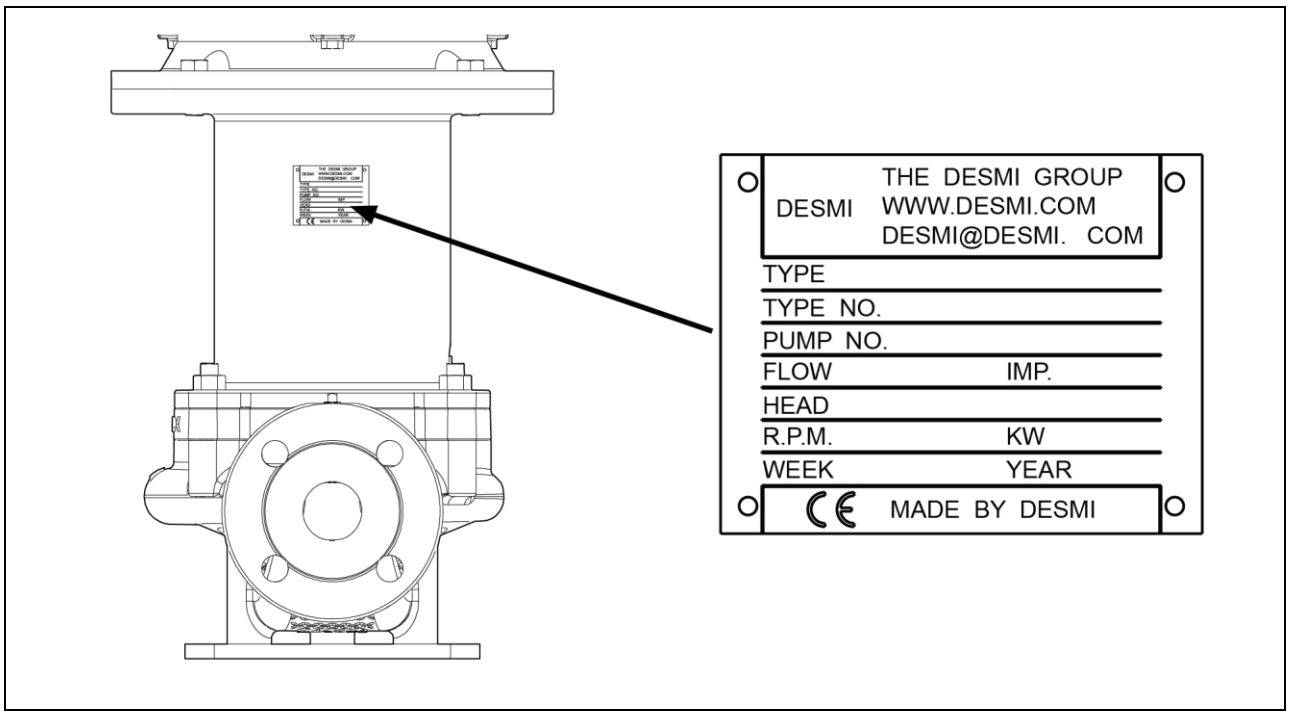
This symbol identifies information about avoiding explosions in potentially explosive atmospheres in accordance with EC Directive 2014/34/EU (ATEX).

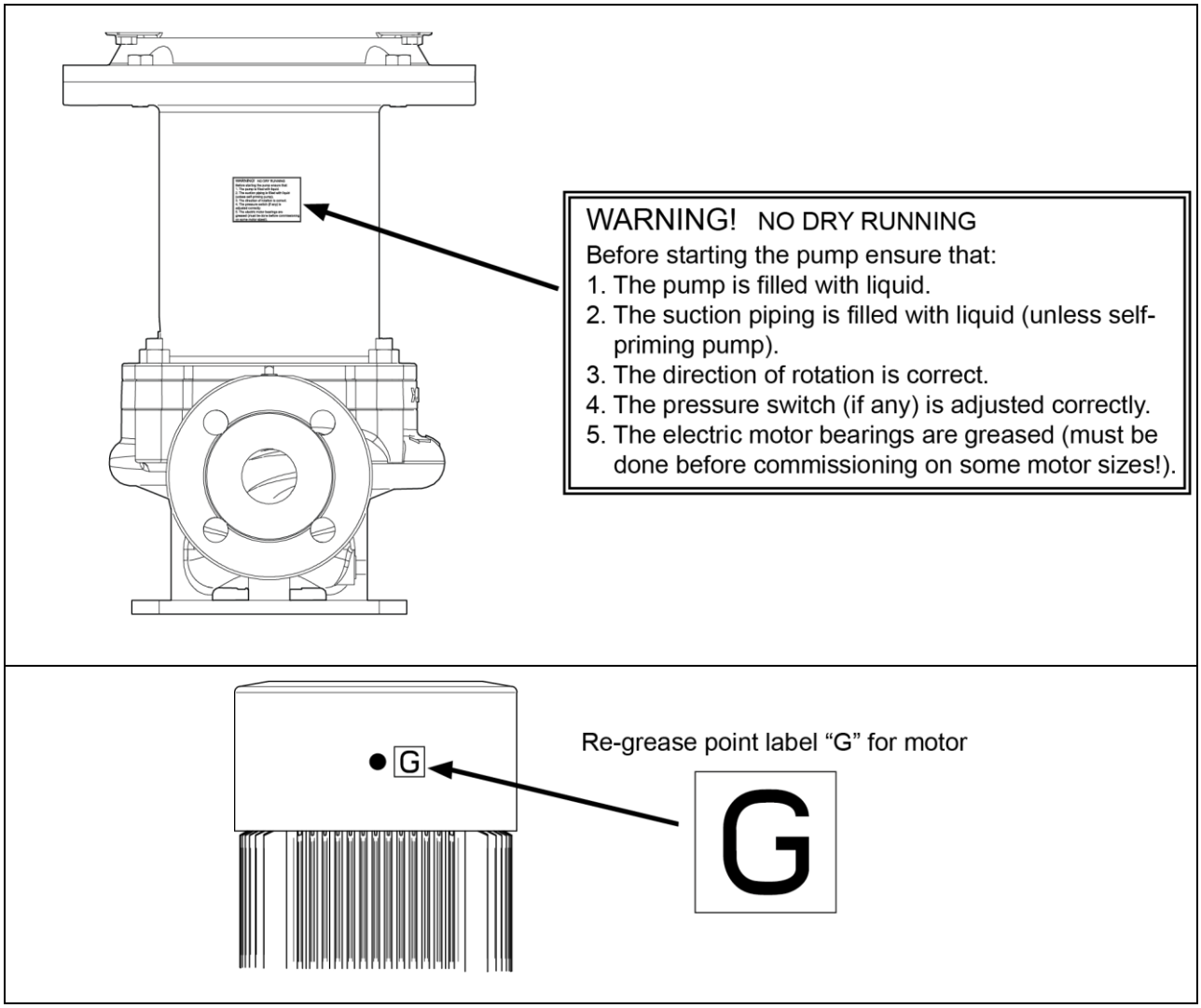
Machine damage

In conjunction with the signal word CAUTION, this symbol indicates a hazard for the machine and its functions.

2.1.3. Labels on the product

The diagrams below indicate the location of the machine's safety and information labels.





2.2. Intended use

- The pump (set) must only be operated within the operating limits described in the other applicable documents.
- Only operate pumps / pump sets which are in perfect technical condition.
- Do not operate the pump (set) in partially assembled condition.
- Only use the pump to handle the fluids described in the order or product literature of the pump model or variant.
- Never operate the pump without the fluid to be handled.
- Observe the information on minimum flow rates specified in the product literature (to prevent overheating, bearing damage, etc.).
- Observe the information on maximum flow rates specified in the product literature (to prevent overheating, mechanical seal damage, cavitation damage, bearing damage, etc.).

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- Do not throttle the flow rate on the suction side of the pump (to prevent cavitation damage).
- Consult the manufacturer about any other modes of operation not described in the product literature.

Prevention of foreseeable misuse

- Never open the discharge-side shut-off elements further than permitted.
  - The maximum flow rate specified in the technical product literature would be exceeded.
  - Risk of cavitation damage
- Never exceed the permissible operating limits (pressure, temperature, etc.) specified in the product literature.
- Observe all safety information and instructions in this manual.

2.3. Consequences and risks caused by non-compliance with this manual

- Non-compliance with this manual will lead to forfeiture of warranty cover and of any and all rights to claims for damages.
- Non-compliance can, for example, have the following consequences:
  - Hazards to persons due to electrical, thermal, mechanical and chemical effects and explosions
  - Failure of important product functions
  - Failure of prescribed maintenance and servicing practices
  - Hazard to the environment due to leakage of hazardous substances.

2.4. Safety awareness

In addition to the safety information contained in this manual and the intended use, the following safety regulations shall be complied with:

- Accident prevention, health and safety regulations
- Explosion protection regulations
- Safety regulations for handling hazardous substances
- Applicable standards, directives and laws

2.5. Safety information for the operator/user

- The operator shall fit contact guards for hot, cold and moving parts and check that the guards function properly.
- Do not remove any contact guards during operation.
- Provide the personnel with protective equipment and make sure it is used.
- Contain leakages (e.g. at the shaft seal) of hazardous fluids handled (e.g. explosive, toxic, hot) so as to avoid any danger to persons and the environment. Adhere to all relevant laws.
- Eliminate all electrical hazards. (In this respect, refer to applicable national safety regulations and/or regulations issued by the local energy supply companies.)
- If shutting down the pump does not increase potential risk, fit an emergency stop control device in the immediate vicinity of the pump (set) during pump set installation.

2.6. Safety information for maintenance, inspection and installation

- Modifications or alterations of the pump are only permitted with the manufacturer's prior consent.
- Use only original spare parts or parts authorized by the manufacturer. The use of other parts can invalidate any liability of the manufacturer for resulting damage.
- The operator ensures that maintenance, inspection and installation is performed by authorized, qualified specialist personnel who are thoroughly familiar with the manual.
- Only carry out work on the pump (set) during standstill of the pump.
- The pump casing must be cooled down to ambient temperature.
- Pump pressure must be released and the pump must have been drained.
- When taking the pump set out of service, always adhere to the procedure described in the manual.
- Decontaminate pumps which handle fluids posing a health hazard.
- As soon as the work is completed, re-install and/or re-activate any safety relevant and protective devices. Before returning the product to service, observe all instructions on commissioning.

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2.7. Unauthorized modes of operation

Never operate the pump (set) outside the limits stated in the order documentation and in this manual. The warranty relating to the operating reliability and safety of the supplied pump (set) is only valid if the equipment is used in accordance with its intended use.

2.8. Explosion protection

Always observe the information on explosion protection given in this section when operating the product in potentially explosive atmospheres. Only pumps/pump sets marked as explosion-proof and identified as such in the data sheet may be used in potentially explosive atmospheres.

Special conditions apply to the operation of explosion-proof pump sets to EU Directive 2014/34/EU (ATEX). Especially adhere to the sections in this manual marked with the Ex symbol and the following sections.

The explosion-proof status of the pump set is only assured if the pump set is used in accordance with its intended use. Never operate the pump set outside the limits stated in the data sheet and on the name plate. Prevent impermissible modes of operation at all times.

2.8.1. Marking

The marking on the pump refers to the pump part only. DESMI's standard EX marking for pumps is: Ex II 2G Ex h IIb T4 Gb X.

The motor has its own marking. The marking is maintained on the condition that the temperatures the pump causes to develop at the motor flange and motor shaft are permitted by the motor manufacturer. The motors used DESMI on pumps with ATEX certification meet this condition.

2.8.2. Temperature limits

In normal pump operation, the highest temperatures are to be expected on the surface of the pump casing and at the shaft seal. The surface temperature at the pump casing corresponds to the temperature of the fluid handled. If the pump is heated in addition, the operator of the system is responsible for observing the specified temperature class and fluid temperature (operating temperature). The max. allowed liquid temperature is 80°C for fresh water and most likely less for other liquids.

If the pump is to be operated at a higher temperature or if the pump is part of a pool of pumps, contact DESMI for the maximum permissible operating temperature.

If a pump is supplied without motor (as part of a pool of pumps), the motor specified in the order

documentation of the pump must meet the following conditions:

- The permissible temperature limits at the motor flange and motor shaft must be higher than the temperatures generated by the pump.
- Contact the manufacturer for the actual pump temperatures.

2.8.3. Monitoring equipment

The pump (set) must only be operated within the limits specified in the order documentation and on the name plate. If the system operator cannot warrant compliance with these operating limits, appropriate monitoring devices must be used. Check whether monitoring equipment is required to ensure that the pump set functions properly.

Contact DESMI for further information on monitoring equipment.

2.8.4. Operating limits

Refer to the *chapter 1.4* – i.e. if there's a risk of too high liquid temperatures, then a PT100 sensor should be mounted in the pump casing. As standard the max. allowed liquid temperature is 80°C for ATEX marked ESL pumps.

2.9. 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.

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3. TRANSPORTATION, PREVENTATION AND TEMPORARY STORAGE

3.1. Checking the condition upon delivery

1. On transfer of goods, check each packaging unit for damage.
2. In the event of in-transit damage, assess the exact damage, document it and notify DESMI or the supplying dealer (as applicable) and the insurer about the damage in writing immediately.

3.2. Transport

⚠ DANGER

FALLING OBJECT HAZARD!

The pump (set) could slip out of the suspension arrangement, which will cause death or serious injury

Always transport the pump (set) in the specified position.

Do not attach the suspension arrangement to the free shaft end or the motor eyebolt.

Monitor the weight data and the center of gravity.

Obey the applicable local health and safety regulations.

Use suitable, permitted lifting accessories, for example, self-tightening lifting tongs.

⚠ DANGER

STRONG MAGNETIC FIELD HAZARD!

The inner and outer magnetic rotor have a strong magnetic field.

Keep data carriers and electronic components away from dismantled components.

Persons carrying inside their body a pacemaker or other electronic devices should not be involved in assembly or maintenance works.

To transport the pump / pump set from the lifting, tackle as shown below.

Before shipment, fasten the pump securely on pallets or the like.

The weights of the pumps are given in *chapter 4.5*. The weight of the motor is given in motor operation manual. It can be found in

- Shipping documents together with the cargo

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- Shipping mark on cargo box
- Other documents for the shipment, contracts or orders, etc.

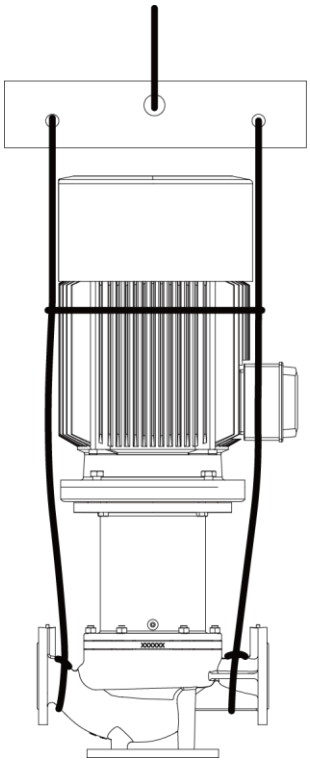

Figure 3-1: Transport for ESL

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

3.3. Storage

If commissioning is to take place some time after delivery, we recommend that the following measures be taken for pump (set) storage.

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CAUTION

RISK OF PROPERTY DAMAGE!

Incorrect storage condition could cause damage to the pump (set)!

Make sure that the storage space is in correct humidity.

Make sure that the storage location is clean and without vermin.

For outdoor storage, cover the packed or unpacked pump (set) and accessories with waterproof material.

CAUTION

RISK OF PROPERTY DAMAGE!

Wet, contaminated or damaged openings and connections could cause leakage or damage to the pump!

When you put the pump into storage, clean and cover the pump openings and connections as needed.

Store the pump (set) in a dry, protected room where the atmospheric humidity is as constant as possible. Rotate the shaft by hand once a month. For storing a pump (set) that was operated, the shutdown measures must be adhered to.

See also: DESMI Pump Storage and Preservation at:

www.desmi.com/media/vqkjqh54/t1534uk.pdf

3.4. Return to supplier

1. Drain the pump as per operating instructions.
2. Always flush and clean the pump, particularly if it was used for handling noxious, explosive, hot or other hazardous fluids.
3. If the pump set handled fluids whose residues could lead to corrosion damage in the presence of atmospheric humidity or could ignite upon contact with oxygen, the pump set must also be neutralised, and anhydrous inert gas must be blown through the pump to ensure drying.
4. Always complete and enclose a certificate of decontamination when returning the pump (set). Always indicate any safety and decontamination measures taken.

3.5. Disposal

⚠ WARNING

ENVIRONMENTAL AND HEALTH HAZARD!

The pump might contain fluids that could cause harm to the environment and your health.

Obey all legal regulations on the disposal of fluids posing a health hazard.

Collect and properly dispose of flushing fluid and any residues of the fluid handled.

Handle the chemicals and machine components according to instructions and local regulations.

Wear safety clothing and a protective mask. Obey the instructional material.

At the end of the service life of the product or its parts, the relevant materials and parts should be recycled or disposed of using local environmental regulation methods. If the product contains substances that are harmful to the environment, these shall be removed or disposed of in accordance with local/regional regulations.

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4. TECHNICAL SPECIFICATION

4.1. Work range

The working range depends on the basic hydraulic design, the type of connection and sealings. The module in the pumps with the strictest specification determines the allowable pressure and temperature of the medium in the pumps. Pumps with ATEX (explosion safety) marking, which are applied in explosive hazardous atmospheres, have an additional restriction of the medium temperature. The general working specifications can be summarized as follows:

Media temperature range for:

Lower limit temperature: - 40°C

Upper limit temperature: +120°C (+80°C for pumps with ATEX marking)

(Please contact DESMI if the media temperature exceeds the above value)

Ambient temperature range for:

Lower limit temperature: - 20°C

Upper limit temperature: + 45°C

(1. Avoid freezing the pump.

2. If the ambient temperature exceeds the above value or the motor is located more than 1000 m above sea level, the motor cooling is less effective and could require an adapted motor power. Please contact DESMI.)

Media density and viscosity

Density: Max. 2500 kg/m^3

Viscosity: Min. 0.3 cSt and upper to 300 cSt.

(Pumping liquids with a higher density and/or viscosity than water requires more mechanical torque from pump shaft and more power from the electric motor. This could cause overloading of the pump shaft and motor. Contact your supplier for advice, if needed.)

Imposed vibration:

During DESMI factory testing the accumulated vibration on pump shall be less than 2.8 mm/s. Adding any external excited vibrations on site the pump vibrations to be less than 7 mm/s otherwise anti-vibration foundation or other vibration reduction measure on pump to be applied. Refer to DESMI Installation Guidelines at:

http://www.desmi.com/media/sd5ltlox/guidelines_uk.pdf

Minimum inlet pressure

$NPSH_{req}$ + Suction pipework friction + Fluid vapour pressure – Fluid surface pressure+0.5m

(It is the pressure that will not lead pump cavitation in specific pump operational conditions and specific pumping media. NPSHreq. is given in the contract technical documentation.)

Maximum inlet pressure

Pump maximum working pressure – pump shut head

(It is the pressure that shall not lead pump outlet pressure to excess pump allowed maximum working pressure in specific pump operational conditions and specific pumping media. Pump maximum working pressure and shut head is given in the technical documentation.)

Minimum number of revolution

The minimum number of revolutions depends on the minimum revolution number of the coupled motor. Refer to motor operation manual or contact motor supplier for the minimum revolution number of the motor, if needed.

Maximum number of revolution

The following number of revolutions are allowed in standard pumps.

Pump	Max. RPM
ESL25-180N	3600
ESL32-180N	3600
ESL40-180N	3600
ESL50-180N	3600
ESL65-180M	3600
ESL80-180N	3600

Notice: Some pumps allow higher speeds than stated in the table, see actual pump name plate.

(The real operation number of revolution is given in the contract technical documentation, which also might be less than the number in the table, because in specific applications, pumping liquids with a higher density and/or viscosity than water require more torque from pump shaft and more mechanical power from the electric motor. This could cause overloading of the pump shaft and the motor. Contact your supplier for advice, if needed.)

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The permissible loads on the flanges

The permissible loads on the flanges are indicated in the following table. The values apply to standard pumps in bronze (Rg5) and cast iron (GG20). As for pumps in stainless steel, the values are to be increased by factor 1.5.

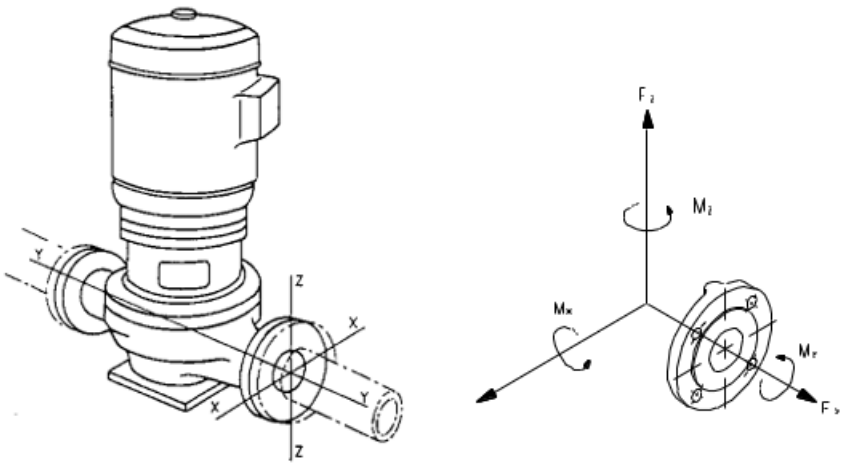

Figure 4-1: The permissible loads on the flanges

Piping	DN mm	Force (N)				Torques (Nm)			
		Fy	Fz	Fx	∑F	My	Mz	Mx	∑ M
Horizontal pipeline at right angles to the shaft Suction and pressure flanges above level of installation	25	250	320	250	480	300	150	260	420
	32	320	400	320	620	300	150	260	420
	40	400	500	400	750	400	200	300	550
	50	500	600	550	1000	450	250	350	600
	65	650	840	750	1340	510	310	380	700
	80	800	950	850	1500	550	350	400	750

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

$$\left(\frac{\sum F\ calclated}{\sum F_{Max.permissible}}\right)^2 + \left(\frac{\sum M\ calculated}{\sum M_{Max.permissible}}\right)^2 < 2$$

Where index “calc” is the valves calculated by the user.

At the same time, none of the forces or moments may exceed the indicated figure multiplied by 1.4.

4.2. Technical data

4.2.1. Maximum work pressure

The following working pressures (pressure in piping incl. the pressure rise caused by the pump) are allowed in standard pumps with pump casing in stainless steel and canister in PEEK/CF20.

Pump	Max. working pressure[bar] S18
ESL25-180N	16
ESL32-180N	16
ESL40-180N	16
ESL50-180N	16
ESL65-180M	16
ESL80-180N	16

The above-mentioned max. working pressure is a design value – delivered pumps are pressure tested according to actual application requirements or actual flange standards.

For instance, the above-mentioned max. working pressure is **NOT** valid for pumps approved by a classification society. Pumps approved by classification societies are 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.

4.2.2. Noise emission

The noise level indicated is the airborne noise including the motor. The noise level 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 is for pumps with electric motors.

The motor noise in rated work condition is given in motor operation manual.

4.2.3. Generated vibration

The pump vibration at rated work condition is less than 2.8 mm/s which are measured on designated position.

The vibration can change when work condition changes, e.g. rotation speed, duty point shift by external force, liquid type, etc.

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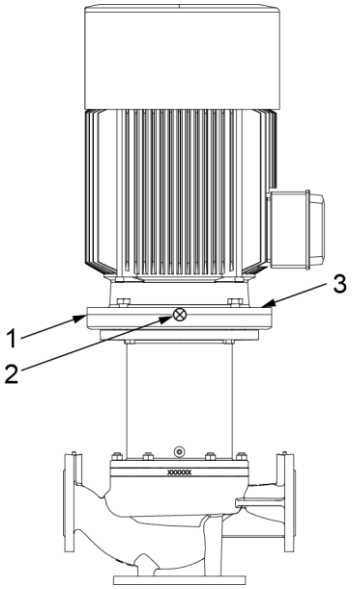

Figure 4-2: Vibration measuring position

4.2.4. Hydraulic capacity

The capacity of flow and head of the pump is stated on the name plate on the pump. If the pump is delivered without motor, the pump capacity is to be indicated on the plate when mounting the motor.

4.2.5. Allowed maximum motor frame size

Pump size	Motor range
ESL25-180N	≤132
ESL32-180N	≤132
ESL40-180N	≤160
ESL50-180N	≤160
ESL65-180M	≤180
ESL80-180N	≤180

4.3. Name plate

All the ESL pumps are provided with a name plate on body to describe pump hydraulic and mechanical specification.

(Individual motor name plate on motor body, of which description is given in motor operation manual.)

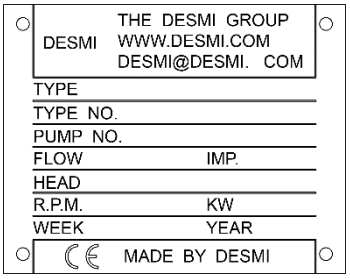

Figure 4-3: Name plate with CE mark

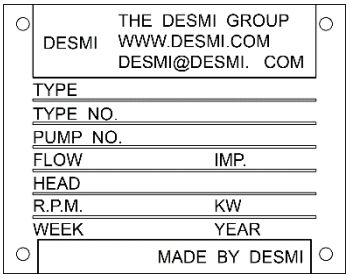

Figure 4-4: Name plate without CE mark

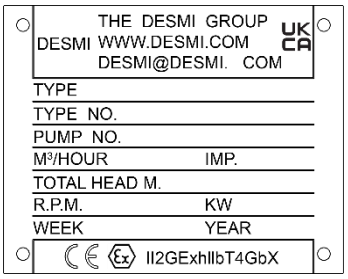

Figure 4-5: Name plate with ATEX mark

4.3.1. Explanation of the type

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

ESLXXX-YYY-MR-Z

XXX: Pressure branch diameter

YYY: Standard impeller diameter

M: The material combination of the pump.

R: The assembly combination of the pump.

Z: Other variants

M may be the following:

S:	Casing, rear cover, impeller: 1.4410 or stainless steel alloy.

The pumps can be delivered in other material combinations according to agreement with the supplier.

R may be the following:

18:	Compact and magnetic drive

Z may be the following:

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i:	PN16 flanges
j:	PN25 flanges
k:	Special flange
m:	BS flanges
n:	ANSI flanges
p:	Other design
q:	JIS flanges

Any use of the pump is to be evaluated on the basis of the materials used in the pump. In case of doubt, contact the supplier.

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

1. Pump No.
2. Pump type
3. Application
4. Comment

4.3.2. Explanation of the type number and pump number

The type number is a number to describe the main feature configuration of the pumps.

The pump number is a serial number to identify individual pump contract and manufacture information for service and spare parts ordering. The pump number can also be found on technical documentation.

4.3.3. Explanation of pump performance

M3/HOUR & TOTAL HEAD M is rated flow and corresponding total head, which is achievable by the pump by verification, or by test on mutual agreement. If test is performed, ISO9906 Grade 2B is applied as DESMI standard, or other test standard on mutual agreement.

IMP is impeller's real diameter after trimming to obtain rated flow and total head. IMP is a necessary pump specification in spare parts ordering.

RPM is pump rotation speed given from motor to obtain the rated flow and total head. The real pump rotation speed can have minor shift due to real load on the motors.

KW is the required nominal motor power output, which is greater than pump power consumption to avoid motor overloading.

WEEK and **YEAR** is manufacturing completion date.

4.4. Dimensional drawing

All the flanges in the manual are drilled according to EN1092 PN10. Some products may differ from PN10 in dimension ØD. Customized drilling solutions are available upon request.

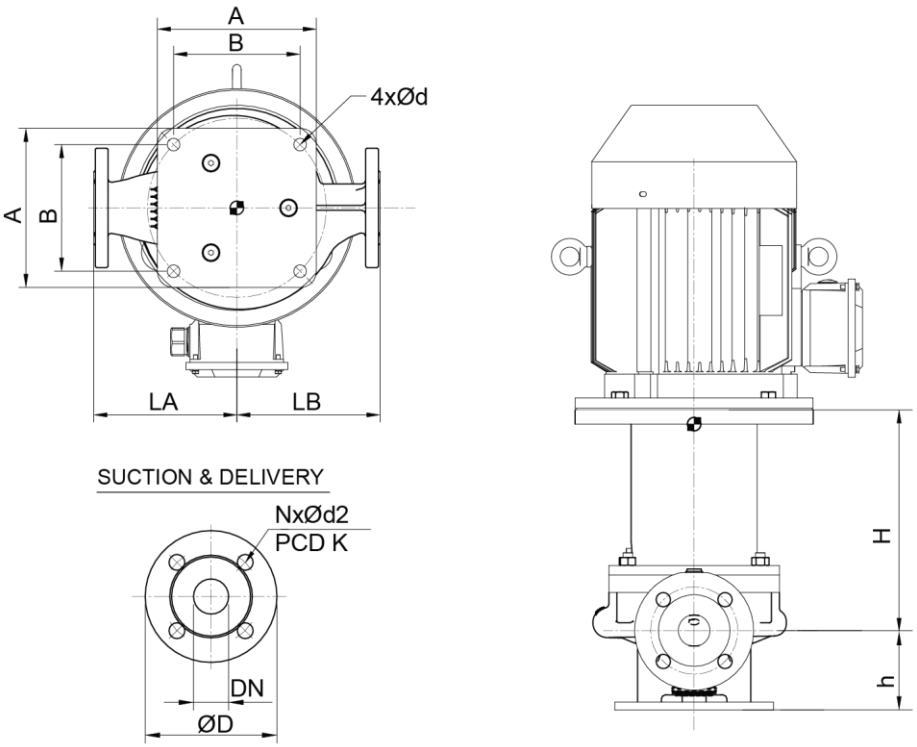

Figure 4-6: Dimensional ESL

Type	H	h	LA	LB	D	DN	d	d2	K	N	A	B
ESL25-180N	296	110	150	150	115	25	16	14	85	4	200	159
ESL32-180N	296	110	160	160	140	32	16	18	100	4	200	159
ESL40-180N	316	100	180	180	150	40	16	18	110	4	200	159
ESL50-180N	318	98	200	200	165	50	16	18	125	4	230	170
ESL65-180M	359	155	220	220	185	65	14	18	145	4	250	220
ESL80-180N	361	160	240	240	200	80	14	18	160	8	250	220

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Table with thread sizes of manometer, drain and vent plug hole (if any) on the next page.

Pump	Manometer	Drain
ESL25-180N	1/4”	1/4”
ESL32-180N	1/4”	1/4”
ESL40-180N	1/4”	3/8”
ESL50-180N	1/4”	3/8”
ESL65-180M	1/4”	3/8”
ESL80-180N	1/4”	3/8”

4.5. Pump weight

The weights of the pumps in stainless steel combination (without motor, include base plate) are stated in the following table

Pump	Weight in kg S18 comb. Incl. base plate. [KG]
ESL25-180N	54
ESL32-180N	56
ESL40-180N	62
ESL50-180N	68
ESL65-180M	78
ESL80-180N	84

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5. INSTALLATION

5.1. Mounting / Fastening

⚠ DANGER

TEMPERATURE HAZARD!

When you install the pump that is used for pumping hot or very cold liquids, touching the pump surface might cause serious injury.

Always wear approved personal protective equipment.

The pump shall be mounted and fastened on a solid foundation with a flat and horizontal surface to avoid distortion. In case gaps bigger than 0.3 mm appear between any ESL pump base plate corner and foundation then insert shim(s) (at least 50x50 mm) between pump base plate corner and foundation before tightening the four bolts in the pump base plate corners.

The max. permissible loads on the flanges stated in *chapter 4.1* are to be observed.

5.2. Wiring

⚠ WARNING

SPECIAL SKILLS REQUIRED!

Incorrect wiring could cause death or serious injury.

Wiring work requires professional knowledge. Only authorized skilled person can do the work.

Always obey the valid rules and regulations.

For final design and installation of pumps supplied by DESMI, use DS information DS/CEN/TR 13930 (recommendations for installing pipe systems) and 13932 (recommendations for installing pumps) as guidelines.

Key elements of pump installation:

- Foundation
- Pipe system
- Pipe support
- Ventilation for installation

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- Service areas and lifting points for motor and pump
- Pipe medium flow
- Optimum operating range
- Electrical connections (cables and screw assemblies)
- Electrical interference
- Using Common Mode filter for minimizing bearing currents when installing frequency convert

Pipe system before pump - suction line

DS13930/13932 recommends length of suction pipe ”X” before the pump is around 3 to 5 x pipe diameter. For a DN100 pump, this will be equivalent to X=300 to 500mm. This rule of thumb ensures laminar flow before and after the pump that will give optimum operating conditions. But in practice, there are many installations where this is not obtained.

X= minimum length of suction pipe before flow-changing components.

Flow-changing components:

- Compensators
- Valves
- Filters
- Bends
- Orifice plate
- Etc.

Ensure a solid base plate to minimise vibrations and extend service intervals.

Avoid 90-degree bends, T-pieces or other components that can impede flow on the pump suction side.

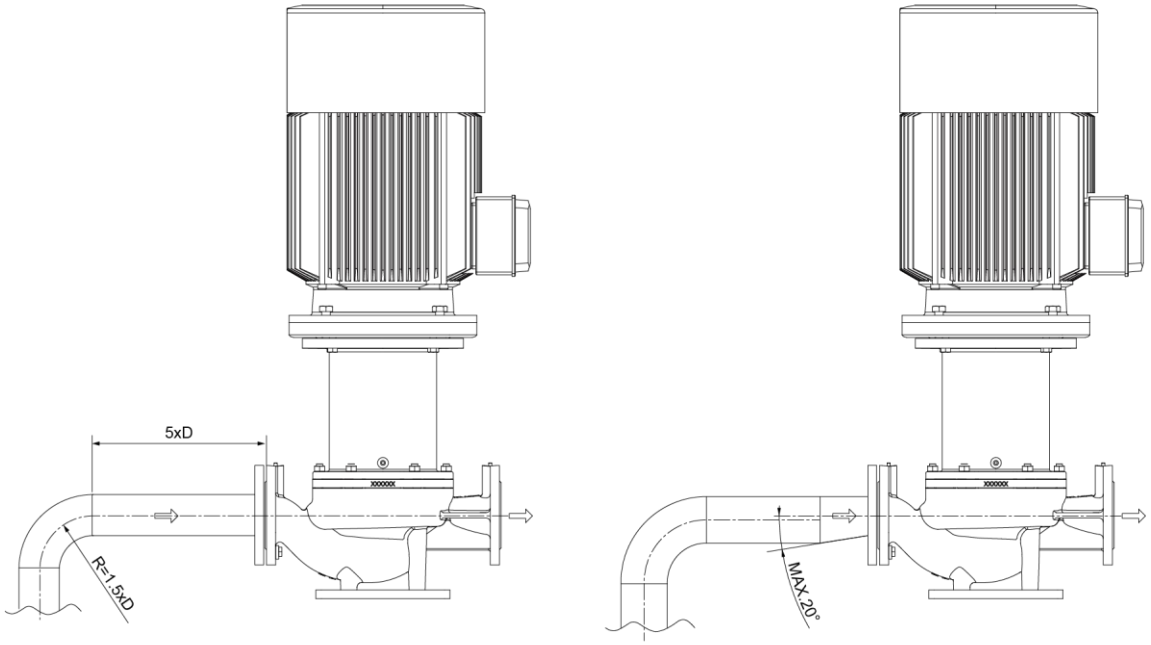
Avoid radius of curvature of less than 1.5 times the nominal pipe diameter.

Avoid abrupt changes of cross-section along the piping system.

Gentle curves or Y-pieces to ensure optimum flow before (and after) the pump are best.

Use shims between pump base plate and foundation to avoid tension in the pump foot when the installation is secured.

Recommended design of pipes



Pump installation foundation should be in good condition and shape.

- All the edges of pump foot have full contact with the supporting brackets.
- Pipes shall be connected correctly and not overloading the pump flanges. Refer to *chapter 4.1* regarding max. permissible loads on the pump flanges.
- Pipe support shall be designed according to the pipe forces at every possible operating condition, including cold/warm, empty/full, unpressurized/pressurized.
- All bolts on base plate / base frame shall be tightened with recommended torques.
- For Marine & Offshore installation, foundation should be made from proper steel plate or profile steel with enough stiffness to support pump to run stably and reduce potential vibrations.

Recommended flow velocity in pipeline

Flow velocity (v) in following ranges

Note: Higher velocities might be acceptable in some installations and/or for short term operation.

- v < 3 m/s at inlet side (note: v<1.5 m/s in manifolds splitting flow to several pumps in parallel)
- v < 6 m/s at outlet side
- Avoid impurities

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CAUTION

RISK OF PROPERTY DAMAGE!

Solid magnetic particles adhering to the outer rotor and / or inner rotor can cause friction between the rotor and the canister, leading to failure!

Solid magnetic particles are not permitted in the permanent magnetic coupling area.

Recommend installing filter and monitor device to avoid impurities, especially the magnetic-particle, into pump.

- Install a filter into the suction pipe (recommended the mesh size not bigger than 0.3mm).
- Install a differential pressure gauge to monitor impurity.

Bypass

The pump must not run against a closed valve as this will cause a rise in temperature / formation of steam in the pump which may cause damage to the pump.

If there is any special design of the pump running against a closed valve, ensure a minimum liquid flow through the pump by connection of a bypass or drain to the outlet pipe. The minimum flow rate must be at least 30% of maximum flow rate for short term operation, the flow rate and head are stated on the pump name plate. **Note:** Operation outside 70 to 120 % of BEP flow reduce the pump life significantly.

Allowable vibration levels on the pumps

As standard, DESMI centrifugal pumps with electric motor generate less than 2.8 mm/s vibration velocity (measured in 3 directions at motor flange level on vertical pumps) during a factory test. The pump and electric motor industry generally agrees that vibration levels above 7 mm/s are damaging – i.e. this will result in shorter lifetimes of e.g. bearings in motors than normally expected. This agrees with the recommendations in the international standard ISO10816-3.

DESMI recommends the following values for protective settings:

Location	Vibration alarm level (mm/s)	Vibration trip level(mm/s)
Pump	>7	>10
Motor (drive end)	>7	>10
Motor (non drive end)	>10	>15

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Maximum suction up height (suction lift)

If the pump inlet pressure is lower than the vapor pressure of the pumped liquid, cavitation will occur. To avoid cavitation, a minimum pressure at the side of pump must be guaranteed.

The maximum suction up height should be lower than the following calculated value. If not, the pump will not work normally and might be damaged due to cavitation and/or deliver less flow and/or less differential pressure.

$$H = Hb - NPSHr - Hf - Hv - Hs$$

Here:

Hb = Barometric liquid head (m) = Pb×10.2/SG (m)

Pb = Atmospheric pressure (bar) (can normally be set as 1 bar – but might be significantly less).

SG=Specific Gravity (e.g. set as 1 for fresh water, 1.025 for seawater, 0.84 for diesel fuel)

In a closed system, Pb means system pressure (bar).

NPSHr = Net positive suction head required (m) (read at actual flow on NPSHr curve for pump)

Hf = Pipeline loss at the inlet (m)

Hv = Vapor pressure for actual liquid (m)

Hs = Safety margin, at least 0.5 meter recommended

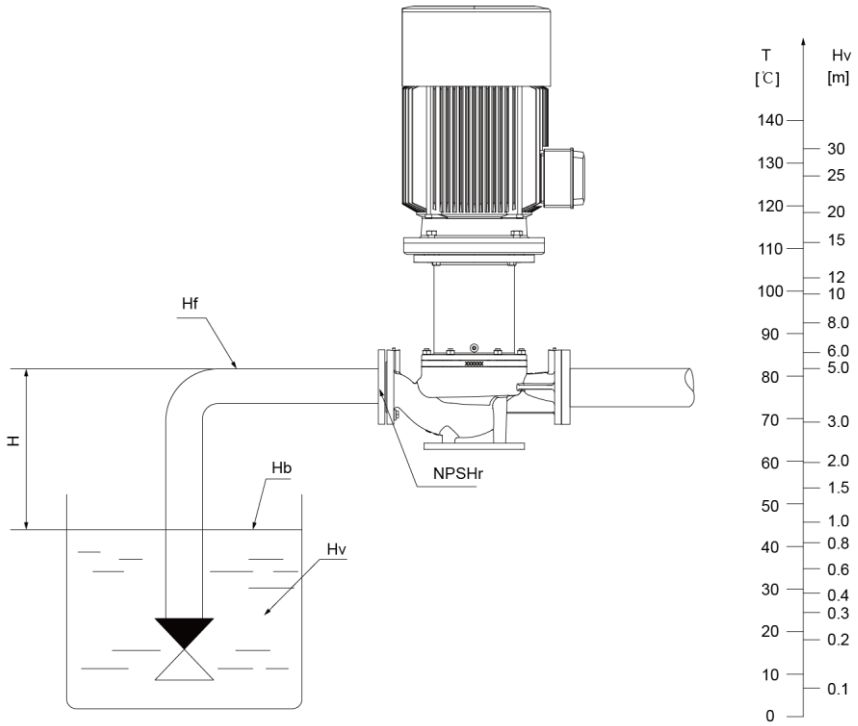

Figure 5-1: Suction up height

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Ventilation

Ambient conditions-

Pay attention to the correct arrangement of air feed and discharge lines so that:

- The pump is efficiently ventilated.
- The room temperature not exceeding 45 °C.
- Ensure airflow around the pump motor.

The rating of the electrical apparatus is critical in this respect.

Operation under other ambient conditions to be agreed with the manufacturer.

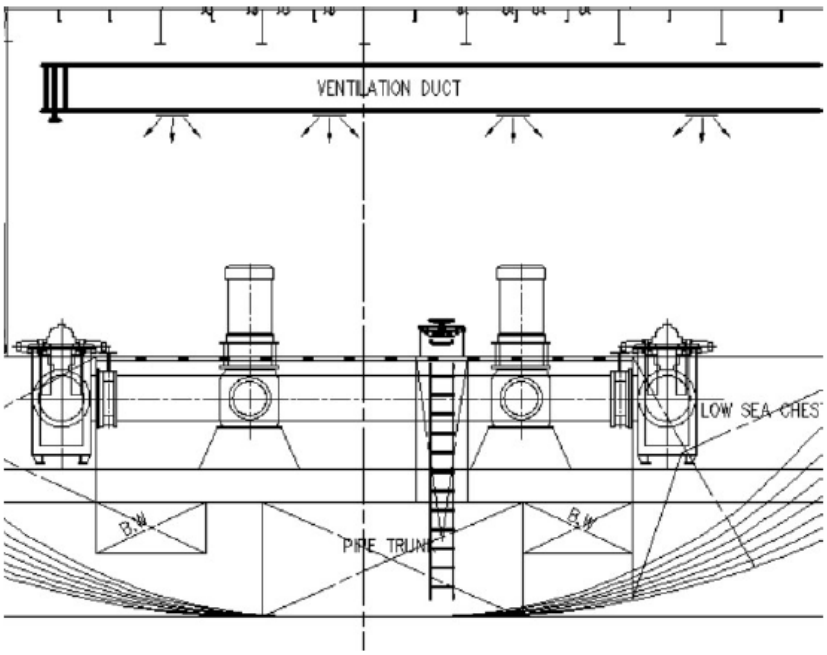

Figure 5-2: Ventilation

***NOTE**: If the admissible temperature is exceeded, additional measures must be taken. Maintenance intervals and maintenance measures may have to be adjusted accordingly.*

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6. COMMISSIONING, START-UP AND SHUTDOWN

6.1. Prerequisites for commissioning / start-up

Before commissioning / starting up the pump set, make sure that the following conditions are met:

- The pump set is properly connected to the power supply and is equipped with all protection devices.
- The pump is primed with the fluid to be handled.
- The direction of rotation is checked.
- All auxiliary connections required are connected and operational.
- If re-greaseable then motor bearings to be greased acc. to motor manual before starting the pump! Any pump bearing(s) are fully greased from DESMI factory = do not re-grease any pump bearing(s) before scheduled running hours in re-grease table in Section 8 are obtained).
- After prolonged shutdown of the pump (set), the activities required for returning the pump (set) to service are carried out.

6.2. Priming and venting the pump

⚠DANGER

EXPLOSION HAZARD!

Incorrect start-up of the pump will cause potentially explosion atmosphere inside the pump, which will cause death or serious injury.

Before starting up the pump, vent the suction line and the pump, and prime them with the fluid to be handled.

CAUTION

RISK OF PROPERTY DAMAGE!

Dry running will cause increased wear to the pump.

Do not operate the pump set without liquid fill.

Do not close the shut-off element in the suction line and / or supply line during pump operation.

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NOTE: *For design-inherent reasons, some unfilled volume in the hydraulic system cannot be excluded after the pump is primed for commissioning/start-up. However, once the motor is started up the pumping effect will immediately fill this volume with the fluid handled.*

1. Vent the pump and the suction line and prime both with the fluid to be handled.
2. Fully open the shut-off element in the suction line.
3. Fully open all auxiliary feed lines (barrier fluid, flushing liquid, etc.), if any.
4. Open the shut-off element, if any, in the vacuum balance line, and close the vacuum-tight shut-off element, if any.

Venting and priming

Automatic venting and priming system is designed for centrifugal pumps to prevent dry running while the liquid level is below the pump inlet.

When the centrifugal pump is turned on, only the automatic priming system will be activated. After the time limit relay sequence is completed, the centrifugal pump is also activated. As soon as the centrifugal pump builds up the necessary discharge pressure, the priming system is switched off via the pressure switch.

DESMI priming unit has two types: priming pump and priming air ejector.

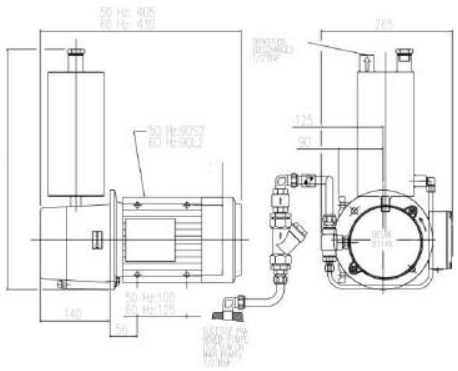

Figure 6-1: Priming pump B114N

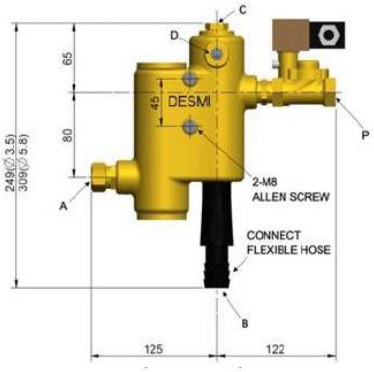

Figure 6-2: Priming air ejector

Please see manual for more details.

http://www.desmi.com/media/fo2dilig/t1488uk.pdf

http://www.desmi.com/media/dtojxa0h/t1521uk.pdf

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6.3. Start up

⚠DANGER

EXPLOSION HAZARD!

LEAKAGE OF HOT OR TOXIC FLUIDS!

If the pump is operated with the suction and/or discharge line closed will cause incorrect pressure and temperature. Hot or hazard fluids under pressure will cause death or serious injury.

Do not operate the pump with the shut-off elements in the suction line and/or discharge line closed.

Only start up the pump set with the discharge-side shut-off element slightly or fully open.

⚠DANGER

EXPLOSION HAZARD!

DAMAGE TO THE PUMP SET!

High temperature due to dry running or too much gas content in the fluid handled will cause death or serious injury.

Do not operate the pump set without liquid fill.

Prime the pump according to operating instructions.

Always operate the pump in the permissible operating range.

CAUTION

RISK OF PROPERTY DAMAGE!

Abnormal noises, vibrations, temperatures or leakage could cause damage to the pump.

Stop the pump (set) immediately.

Eliminate the causes before returning the pump set to service.

NOTE:

A centrifugal pump will not function until it is filled with liquid between the foot valve and somewhat above the impeller of the pump.

The liquid also serves as coolant for the bearing unit and the pump must not run dry.

For safety reasons the pump is only allowed to operate against closed discharge valve for a short time (max. 2 minutes and at a max. temperature of 80 °C for standard pumps). Otherwise there is

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a risk of damage to the pump and, at worst, of a steam explosion. If the pump is not monitored, the installation of a safety device is recommended.

6.3.1. Start-up procedure

Before starting the pump check that:

- The shaft rotates freely without jarring sounds.
- The pump casing and the suction line are 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.

- The system piping is cleaned.
- The suction line and inlet tank, if any, are vented and primed with the fluid to be pumped.
- The lines for priming and venting are closed.

CAUTION

RISK OF PROPERTY DAMAGE!

Start-up against open discharge line could lead to motor overload, which could damage the motor.

Make sure that the motor has sufficient power reserves.

Use a soft starter.

Use speed control.

1. Fully open the shut-off element in the suction head / suction lift line.
2. Start up the motor and immediately slightly open the shut-off element in the discharge line.
3. Once the operating speed has been reached and the normal pressure has been created, slowly open the shut-off element in the discharge line and adjust it to comply with the duty point.

6.4. Shut down

1. Switch off the motor and make sure the pump set runs down smoothly to a standstill.
2. Close the shut-off element in the discharge line.
3. Close the shut-off element in the suction line.

NOTE: *If the discharge line is equipped with a check valve, the shut-off element in the discharge line may remain open, provided the site's requirements and regulations are taken into account and observed.*

6.4.1. For prolonged shut down periods

For prolonged shut down periods, a monthly operation of the pump unit is required to avoid deposits in the pump and suction inlet and prevent blockages.

1. Close the shut-off element in the suction line.
2. Close the auxiliary connections.

CAUTION

RISK OF PROPERTY DAMAGE!

Liquids may freeze during long-term shutdown periods, which could damage the pump.

Drain the pump and the cooling / heating chambers (if any), or take other actions to prevent them from freezing.

6.5. Operating limits

The working range in *chapter 4.1* and technical data in *chapter 4.2* to be complyed with.

⚠DANGER

EXPLOSION HAZARD!

LEAKAGE OF HOT OR TOXIC FLUID HANDLED!

When you operate the pump, incorrect pressure, temperature, fluid handled and speed will cause damage to property, death or serious injury.

Observe the operating data in the order documentation.

Do not use the pump to handle unauthorized fluids.

Do not operate the pump against a closed shut-off element for long periods

Without getting written approval from DESMI, do not operate the pump in incorrect condition (for example, temperature, pressures or speeds exceeding those specified in the order documentation or on the name plate).

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CAUTION

RISK OF PROPERTY DAMAGE!

When you operate the pump, incorrect ambient temperature could damage the pump (set).

Observe the specified limits for permitted ambient temperatures.

6.6. Frequency of starts

⚠DANGER

EXPLOSION HAZARD!

DAMAGE TO THE MOTOR!

Too high temperature of the motor surface may cause explosion, which will cause damage to the motor, death or serious injury.

For explosion-proof motors, observe the frequency of starts in manufacturer's documents.

The frequency of starts is usually determined by the maximum temperature increase of the motor. This largely depends on the power reserves of the motor in steady state operation and on the starting conditions (DOL, star-delta, moments of inertia, etc.). If the start-ups are evenly spaced over the period indicated, the following limits serve as orientation for start-up with the discharge-side gate valve slightly open:

Impeller material	Maximum number of start-ups [Start-ups/hour]
Stainless steel (1.4410)	6

CAUTION

RISK OF PROPERTY DAMAGE!

Re-starting while motor is still running could damage the pump (set).

Do not re-start the pump set before the pump motor is fully stopped.

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6.7. Fluid handled

6.7.1. Flow rate

Recommend operate pump at 70 to 120% of BEP flow for high efficiency, operation outside the range reduce the pump life (incl. shaft seal and pump bearings) significantly.

The minimum flow rate must be at least 30% of maximum flow rate for short term operation, the flow rate and head are stated on the pump name plate.

⚠DANGER

EXPLOSION HAZARD!

DAMAGE TO PUMP!

Too high temperature of the pump surface may cause explosion, which will cause damage to the pump, death or serious injury.

Do not run pump below minimum flow. In case of doubt, contact DESMI.

6.7.2. Density of fluid handled

The pump input power changes in proportion to the density of the fluid handled.

CAUTION

RISK OF PROPERTY DAMAGE!

Too high density of the fluid pumped could lead to motor overload, which could damage the motor.

Observe the density information in the order documentation.

Make sure that the motor has sufficient power reserves.

6.7.3. Abrasive fluids

When handling flammable fluid, make sure the fluid does not contain any abrasive or magnetic particles. For applications where there is a risk of magnetic particles entering the pump, suitable provisions need to be taken to prevent the magnetic particles entering.

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6.8. Decommissioning / out of service

When the pump is decommissioned or put out of service for a longer period of time, it has to be stored properly.

The pump (set) remains installed

Sufficient fluid is supplied for the operation check run of the pump.

1. Start up the pump (set) regularly between once a month and once every three months for approximately five minutes during prolonged shutdown periods. This will prevent the formation of deposits within the pump and the pump intake area.

The pump (set) is removed from the pipe and stored

The pump was properly drained and the safety instructions for dismantling the pump was observed.

1. Spray-coat the inside wall of the pump casing, and in particular the impeller clearance areas, with a preservative.
2. Spray the preservative through the suction and discharge nozzles. It is recommended to close the pump nozzles (e.g. with plastic caps or similar).
3. Apply oil or grease (silicone-free oil and grease, food-approved if required) on all exposed machined parts and surfaces of the pump (with silicone-free oil and grease, food-approved if required) to protect them against corrosion.

Observe the additional instructions.

If the pump set is to be stored temporarily, only preserve the wetted components made of low-alloy materials. Commercially available preservatives can be used for this purpose. Observe the manufacturer's instructions for application / removal.

Observe any additional instructions and information provided.

6.9. Return to service

For returning the pump to service, observe the sections on commissioning / start-up and the operating limits. In addition, do all servicing / maintenance operations before returning the pump (set) to service.

⚠WARNING

PERSONAL INJURY HAZARD!

Moving parts or escaping fluid could cause death or serious injury.

Immediately after the work is complete, re-install and/or re-activate all safety-relevant and protective devices.

NOTE: *If the pump has been out of service for more than one year, replace all elastomer seals.*

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7. TROUBLESHOOTING

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. Similar erosions also 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.

If the pump does 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 has no or too low capacity	1. Wrong direction of rotation	Change direction of rotation to clockwise when viewed from shaft end (the direction of the arrow)
	2. The pump or the piping system is chocked	Clean or replace the piping system
	3. Suction line or pump leakage	Find the leakage, repair the fault
	4. Pump takes air	Vent all air from pump and pipe system
	5. Suction lift is too high or insufficient NPSHA	Check data sheet Q/H curve and NPSH or contact DESMI
	6. The magnetic coupling is decoupled	Check the operation condition Check if the pump is blocked
The pump uses too much power	1. Counter-pressure is too low	Insert orifice plate or check valve / Contact DESMI
	2. The liquid is heavier	Contact DESMI
	3. Foreign body in pump	Dismantle the pump and remove the cause

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FAULT	CAUSE	REMEDY
	4. Electric motor is running on 2 phases	Check fuses, cable connections, and cables
	5. Too much friction in the pump	Check if pump can rotate freely Check the internal bearings
Abnormal noise or vibration from pump	1. Cavitation in pump	Suction lift is too high / Suction line wrongly dimensioned / Liquid temperature is too high
	2. Too much friction in the pump	Check if pump can rotate freely Check the internal bearing and replace the bearing if necessary
	3. The magnetic coupling is decoupled	Check the operation condition Check if the pump is blocked
	4. Pump takes air	Vent all air from pump and pipe system
	5. Foreign matter in pump	Dismantle the pump to remove the cause
	6. Pump operate outside the recommended flow range	Check data sheet Q/H curve
The pump temperature increase	1. Wrong direction of rotation	Change direction of rotation to clockwise when viewed from shaft end (the direction of the arrow)
	2. Rotating part contact the stationary part	Check if pump can rotate freely Check the internal bearings
	3. The magnetic coupling slips	Check the operation condition Check if the pump is blocked

Troubleshooting:

For the maker to begin troubleshooting we need at least the supporting documents “letter of investigation of pump failure” and possibly “commissioning check list” to be properly filled in. We recommend retrieving information in the following order (to optimize the time usage):

1. Description of the failure and pictures of the damage together with operational readings/log data. This can eliminate or verify many of the possible failures and is the easiest and best way to begin troubleshooting.
2. If nothing can be concluded after point no. 1. pictures and description of the piping system

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(especially suction piping) should be provided. Also verify if there has been any observation of excessive vibrations or noise coming from the vessel/pump/system.

3. If we cannot conclude possible root cause from information received under point 1. or 2. it might be necessary to send a service engineer to investigation and further troubleshooting.

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8. INSPECTION AND SERVICE PLAN

8.1. Supervision of operation

⚠DANGER

EXPLOSION HAZARD!

Potentially explosive atmosphere inside the pump will cause death or serious injury.

The pump internals in contact with the fluid to be handled, including the seal chamber and auxiliary systems, must be filled with the fluid to be handled at all times.

Provide sufficient inlet pressure.

Provide an appropriate monitoring system.

⚠DANGER

EXPLOSION HAZARD!

LEAKAGE OF HOT OR HAZARD FLUIDS!

DAMAGE TO THE PUMP SET!

RISK OF BURNS AND FIRE HAZARD!

Damaged or deformed shaft seal will cause damage to the pump, death or serious injury.

Do the maintenance on the shaft seal regularly.

⚠DANGER

EXPLOSION HAZARD!

FIRE HAZARD!

DAMAGE TO THE PUMP SET!

RISK OF BURNS!

Excessive temperature as a result of bearings running hot or defective bearing seals will cause damage to the pump, death or serious injury.

Regularly check the lubricant level.

Regularly check the rolling-element bearings for running noises.

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⚠DANGER

EXPLOSION HAZARD!

FIRE HAZARD!

DAMAGE TO THE PUMP SET!

LEAKAGE OF HOT AND/OR TOXIC FLUIDS!

Incorrectly serviced barrier fluid system will cause damage to the pump, death or serious injury.

Regularly service the barrier fluid system.

Monitor the barrier fluid pressure.

CAUTION

RISK OF PROPERTY DAMAGE!

Dry running will cause increased wear to the pump

Do not operate the pump set without liquid fill.

Do not close the shut-off element in the suction line and/or supply line during pump operation.

CAUTION

RISK OF PROPERTY DAMAGE!

Too high temperature of fluid handled could damage the pump.

Do not operate the pump against a closed shut-off element for long periods.

Observe the temperature limits in the section on operating limits. (*chapter 2.8.4*)

While the pump is in operation, observe and check the following:

- The pump must run quietly and free from vibrations at all times.
- Check the static seals for leakage.

Vibrations, noise and an increased in current input occurring during unchanged operating conditions indicate wear.

- Monitor the correct functioning of any auxiliary connections.
- Monitor the stand-by pump.

To make sure that the stand-by pumps are ready for operation, start them up once a week.

- Monitor the bearing temperature.

The bearing temperature must not exceed 85 °C (measured at the motor housing).

Inspect the shaft seal for leaks at regular intervals.

- Before inspection of a pump without guard, check that the pump 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 the safety measures is to be taken when handling the liquid.

CAUTION

RISK OF PROPERTY DAMAGE!

Operation of the pump at incorrect bearing temperature could damage the pump.

Make sure that the bearing temperature of the pump (set) is not more than 90 °C (measured on the outside of the motor housing).

Inspection and maintenance intervals for normal applications:

(Half intervals are recommended for a new application – until required intervals can be determined for the actual application)

(If daily inspection is not done remote monitoring of pump is recommended – e.g. via temperature sensors on canister surface)

Inspect (I) or Maintain (M) at the indicated calendar time or run time interval – whichever comes first	**Daily**	**Monthly**	**8000 running hours or 2 years**
There are no abnormal fluid leaks	**I**		
Motor ampere and/or power consumption within normal range	**I**		
Unusual noise	**I**		
Unusual vibration (normally less than 2.8 mm/s from pump itself – and less than 7 mm/s incl. external excited vibrations)	**I**		
Pressure gauge readings to be within normal range (i.e. keep flow within 70 to 120% of BEP flow if allowed by NPSHa <> NPSHr, see note below)	**I**		
Unusual temperature increasing	**I**		

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Inspect (I) or Maintain (M) at the indicated calendar time or run time interval – whichever comes first	Daily	Monthly	8000 running hours or 2 years
Pumps not running: Start shortly (ensure pump is filled with liquid before starting)		M	
Re-grease motor bearings	Refer to the motor manual (if motor bearings are re-greaseable)		
All internal bearing parts and pump shaft should be free of cracks or heavy wear scratches.			M

Operation outside 70 to 120 % of BEP flow reduce the pump life significantly

8.2. Inspection work

⚠DANGER

FIRE AND EXPLOSION HAZARD!

Too high temperature caused by friction, impact or frictional sparks can cause fire, and if not avoided, will lead to death or serious injury.

Regularly check the coupling guard regarding screws being tightened and/or regarding deformation for ensuring sufficient distance from rotating parts.

8.2.1. Cleaning filter

CAUTION

RISK OF PROPERTY DAMAGE!

Incorrect inlet pressure due to clogged filter in the suction line could damage the pump.

Monitor contamination of filter with suitable instruments (for example, using differential pressure gauge).

Clean the filter at appropriate intervals.

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8.2.2. Drainage and cleaning

⚠WARNING

ENVIRONMENTAL HAZARD!

Hot fluids, consumables and supplies are hazardous to health and to the environment.

Collect and properly dispose of flushing fluid and any residues of the fluid handled.

Wear safety clothing and a protective mask.

Dispose of all fluids in accordance with local regulations.

1. Drain the fluid handled by dismantling the pipe plug (3) at the bottom of the pump.
2. Always flush the system if it has been used for handling noxious, explosive, hot or other hazardous fluids.
3. Always flush and clean the pump before transporting it to the workshop.
4. Provide a certificate of decontamination for the pump.

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9. DISMANTLING THE PUMP SET

⚠DANGER

IGNORING INSTRUCTIONS HAZARD!

Insufficient preparation of work on the pump (set) will cause death or serious injury.

Properly shut down the pump set. (*See chapter 6.4*)

⚠WARNING

SPECIAL SKILLS REQUIRED!

Repair and maintenance procedures require professional knowledge and thorough training regarding the tasks and working methods.

Do not do any repair or maintenance tasks without proper training.

Always follow the instructions.

Use appropriate personal protective equipment, depending on the task.

⚠WARNING

HOT SURFACE HAZARD!

Touching any part of a hot pump can cause severe injury.

Always allow the pump set to cool down to ambient temperature.

⚠WARNING

FALLING LOAD HAZARD!

Incorrect lifting methods and faulty lifting equipment, can cause lifting equipment to snap under load, which could cause death or severe injury.

Use appropriate transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.

Always observe the safety instructions and information.

For any work on the motor, observe the instructions of the relevant motor manufacturer.

For dismantling and reassembly observe the exploded views and the general assembly drawing.

In case of damage you can always contact our service staff.

***NOTE:** 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, toxic, corrosive or burning fluid, take great care that it is drained before it is removed from the piping system.

***NOTE:** All maintenance, service and installation work can be carried out by DESMI or authorized workshops. Contact our sales staff to discuss your requirement.*

***NOTE:** After a prolonged period of operation the individual components may be hard to pull off the shaft. If this is the case, use a brand name penetrating agent and/or – if possible – an appropriate puller.*

If regular maintenance log off the pump/motor cannot be demonstrated, the manufacturer's warranty obligations shall become void.

Preparing the pump set

1. De-energise the pump set and secureit against unintentional start-up.
2. Reduce pressure in the piping by opening a consumer installation.
3. Disconnect and remove all auxiliary pipework.

Draining the pump

When the piping system has been drained, note that there is still liquid in the pump. Remove the liquid by dismantling the pipe plug (03/50) at the bottom of the pump.

Dismounting the complete pump set

***NOTE:** The pump casing can remain installed in the piping for further dismantling.*

The notes and steps stated in have been observed/carried out.

1. Disconnect the discharge and suction nozzle from the piping.
2. Depending on the pump/motor size, unscrew the bolts that fix the support foot and/or motor foot to the foundation.

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3. Remove the complete pump set from the piping.

Remove the motor together with the outer magnet rotor

⚠WARNING

CRUSHING HAZARD!

Removing the motor could cause it tipping over leading to death or severe injury.

Suspend or support the motor to prevent it from tipping over.

⚠DANGER

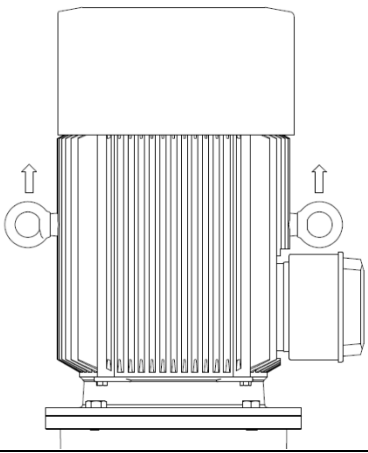
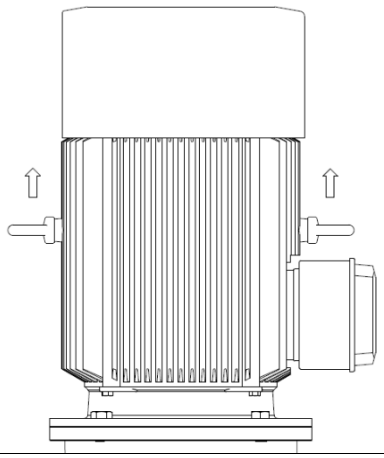
STRONG MAGNETIC FIELD HAZARD!

The inner and outer magnetic rotor have a strong magnetic field.

Keep data carriers and electronic components away from dismantled components.

Persons carrying inside their body a pacemaker or other electronic devices should not be involved in assembly or maintenance works.

Lifting eyes must be of the type shown and shoulder must rest on the electric motor – if required use a spring washer if the lifting eye cannot be tightened and placed in the correct orientation as shown below.

Correct lifting eye orientation for lift of vertical motor	Not allowed lifting eye orientation for lift of vertical motor
	

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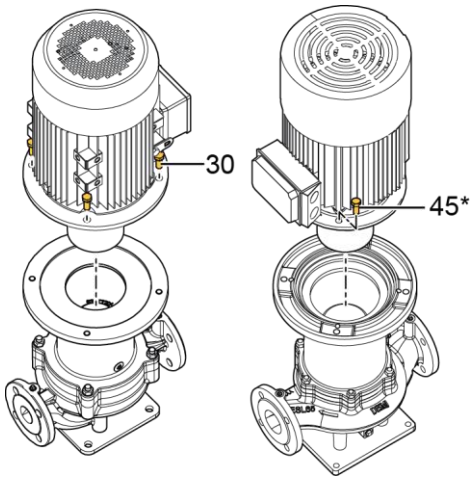
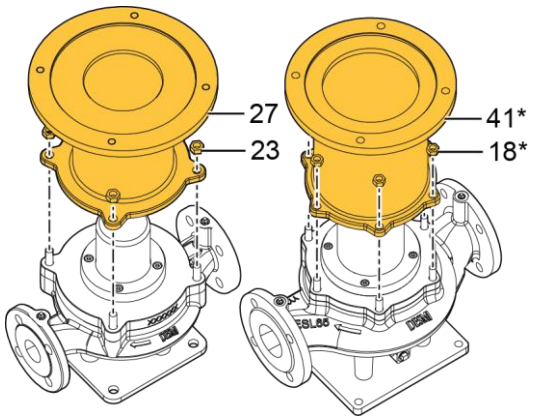
The corresponding relationship between the material number in the exploded view and each model is as follows:

- **Material numbers without an asterisk** are applicable to models ESL25/32/40/50-180N/S18.
- **Material numbers with an asterisk** are applicable to models ESL65-180M, ESL80-180N/S18.

1. Loosen the motor flange screw (30/45*), remove the motor together with the outer magnet rotor.	
2. If a PT100 is installed, remove the PT100 before disassembling the motor bracket.	
3. Loose the nuts (23/18*) and then remove the motor bracket (27/41*).	

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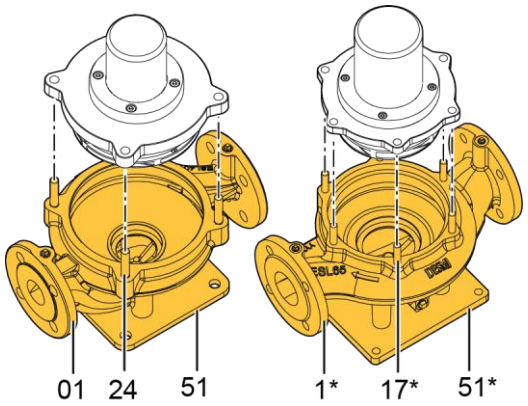
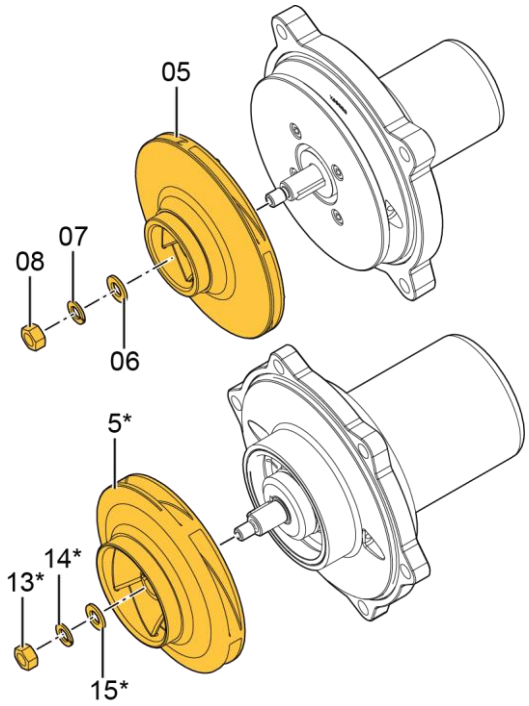
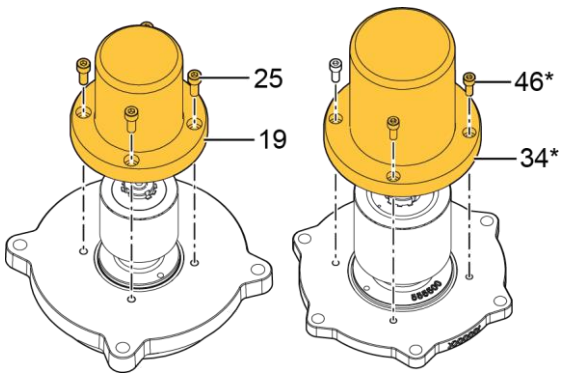
4. Remove the pump casing (01/1*) with the studs (24/17*) and the base plate (51/51*).	
5. Loose the impeller nut (08/13*), spring washer (07/14*) and washer (06/15*) and to remove the impeller (05/5*).	
6. Loose the screws (25/46*) to remove the canister (19/34*).	

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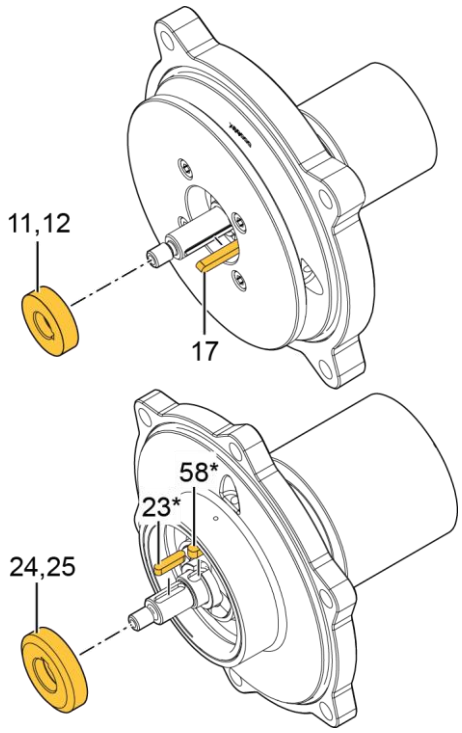
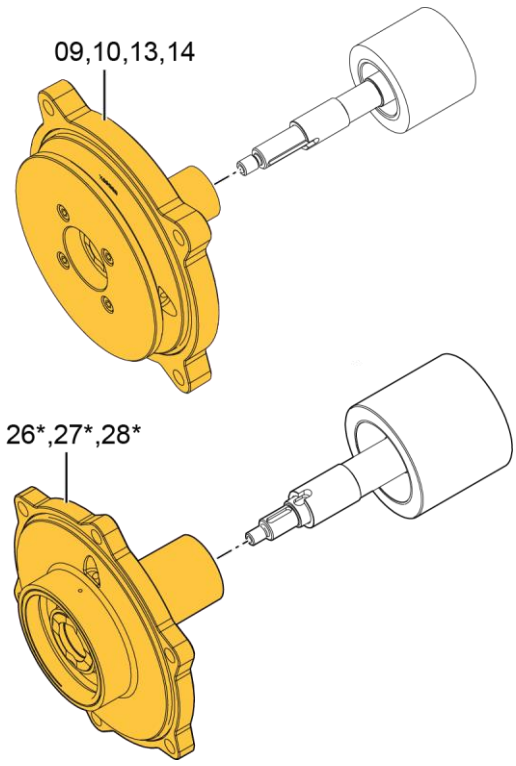
7. Remove the key (17/23* and 58*), and then remove the thrust bearing rotating (12/25*) together with the bearing seat (11/24*).	
8. Remove the rear cover (09/28*) together with the guide plate (10), slide bearing (14/27*) and thrust bearing stationary (13/26*). Note: The guide plate (10) is only available for models ESL25/32/40/50-180N/S18.	

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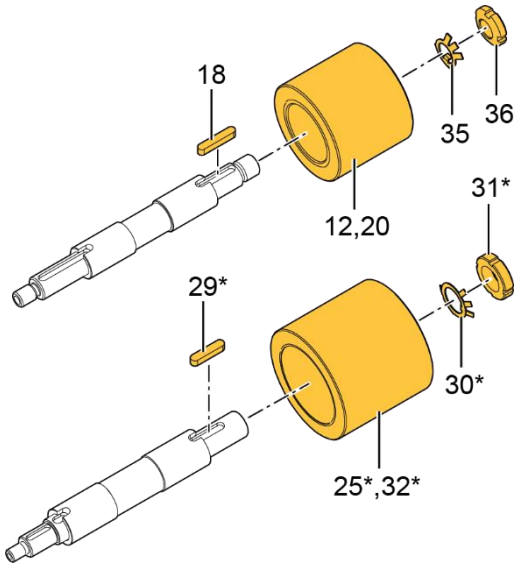
9. Remove the lock nut (36/31*) and the lock washer (35/30*), and then remove the inner magnet rotor (20/32*) together with the thrust bearing rotating (12/25*) and remove the key (18/29*).	

9.1. Inspection

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

- Sealing ring/impeller: Max. clearance 0.6 mm measured in radius.
- Slide bearing/shaft: should be free of cracks or heavy wear scratches, replace in case of wear and noise.
- Thrust bearing: should be free of cracks or heavy wear scratches, replace in case of wear and noise.
- Check the rubber parts for elasticity.

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10. ASSEMBLING THE PUMP SET

CAUTION

RISK OF PROPERTY DAMAGE!

The type of accessories used during assembling work including oil and grease shall meet the requirement from application, food-approved if required.

⚠DANGER

STRONG MAGNETIC FIELD HAZARD!

The inner and outer magnetic rotor have a strong magnetic field.

Keep data carriers and electronic components away from dismantled components.

Persons carrying inside their body a pacemaker or other electronic devices should not be involved in assembly or maintenance works.

10.1. Tightening Torques

ESL25/32/40/50-180N/S18

Pos.	Thread Size (mm)	Tightening Torque (Nm)
08	M8	16
22	M8	16
23	M8	16
25	M8	16
29	M8	16
30	M12	54
	M16	130
31	M8	24
34	M10	30
	M12	54
	M16	130
52	M10	30

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ESL65-180M, ESL80-180/S18

Pos.	Thread Size (mm)	Tightening Torque (Nm)
13	M8	16
18	M8	16
43	M8	16
44	M8	24
45	M12	54
	M16	130
46	M8	16
49	M12	54
52	M10	30
56	M10	30
	M12	54
	M16	130

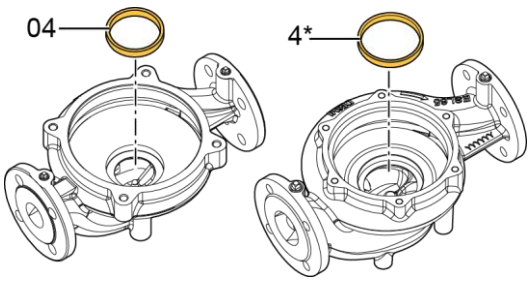
10.2. Assembling

The corresponding relationship between the material number in the exploded view and each model is as follows:

- **Material numbers without an asterisk** are applicable to models ESL25/32/40/50-180N/S18.
- **Material numbers with an asterisk** are applicable to models ESL65-180M, ESL80-180N/S18.

10.2.1. Fitting sealing rings

1. When fitted, the sealing ring (04/4*) is to bear against the shoulder of the pump casing.



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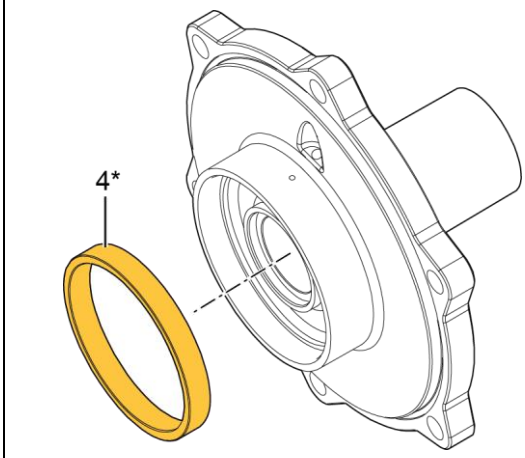
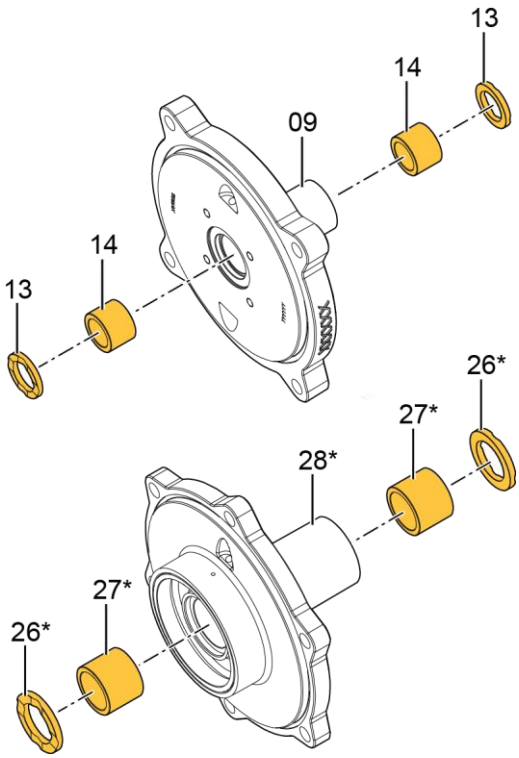
2. Fit the seal ring (04*) to the rear cover. For models ESL65-180M, ESL80-180N/S18.	

10.2.2. Fitting bearing

1. Shrink thrust bearing stationary (13/26*) with lubrication grooves and slide bearing (14/27*) with rear cover (09/28*). Heat the rear cover to 300°C and maintain this temperature for 60 minutes.	

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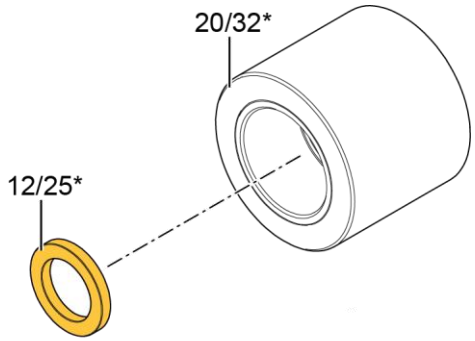
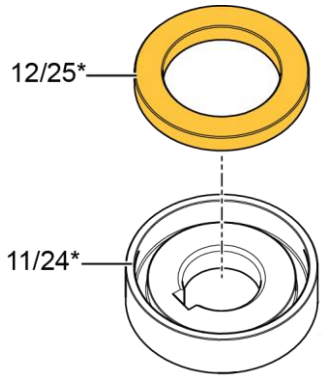
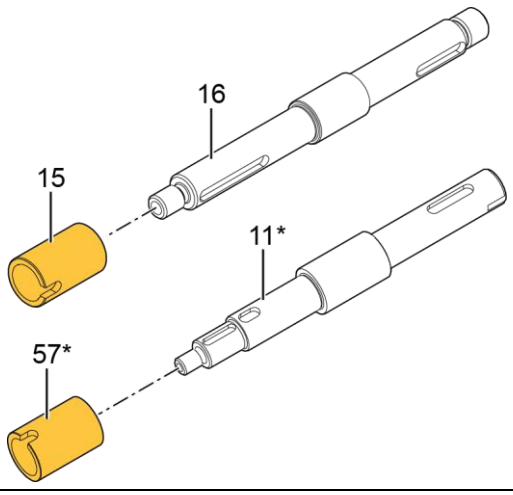
2. Press the thrust bearing rotating (12/25*) without lubrication grooves into the inner magnetic rotor (20/32*).	
3. Press the thrust bearing rotating (12/25*) without lubrication grooves into the bearing seat (11/24*).	

10.2.3. Fitting impeller

1. Mount the lower shaft sleeve (15/57*) onto the shaft (16/11*).	

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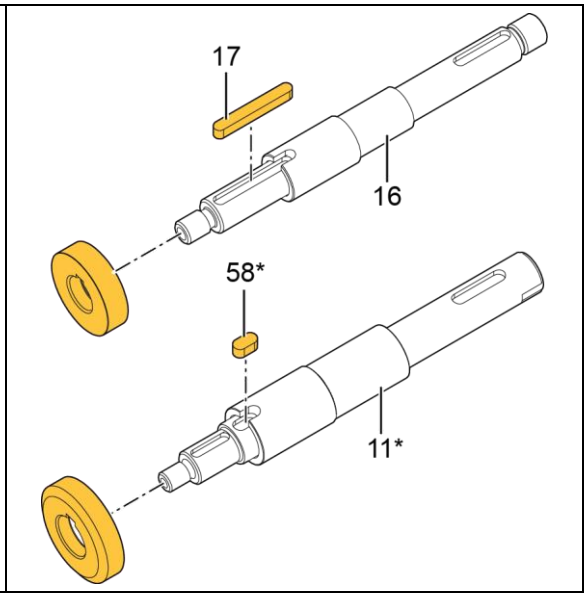
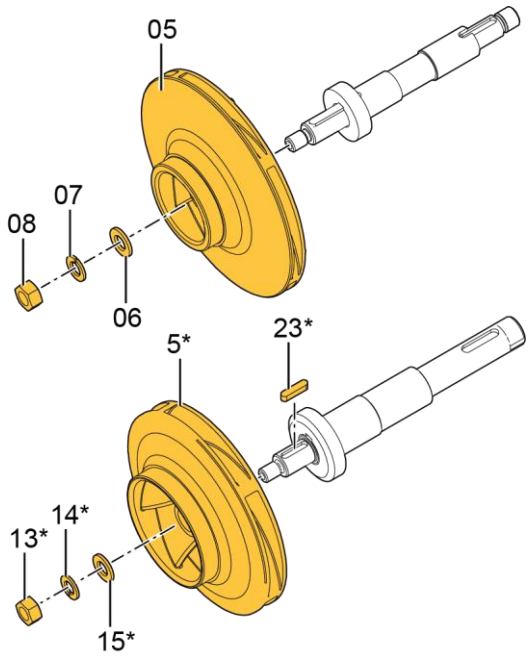
2. Fit the sunk key (17/58*) in the shaft (16/11*) and push the rotating bearing ring together with the bearing seat towards the shaft sleeve.	
3. Fit the sunk key (23*) in the shaft (11*) and push the impeller (05/5*) towards the bearing seat. Secure the impeller with the washer (06/15*), spring washer (07/14*) and impeller nut (08/13*). Note: The sunk key (23*) is only available for models ESL65-180M, ESL80-180N/S18.	

10.2.4. Fitting rear cover

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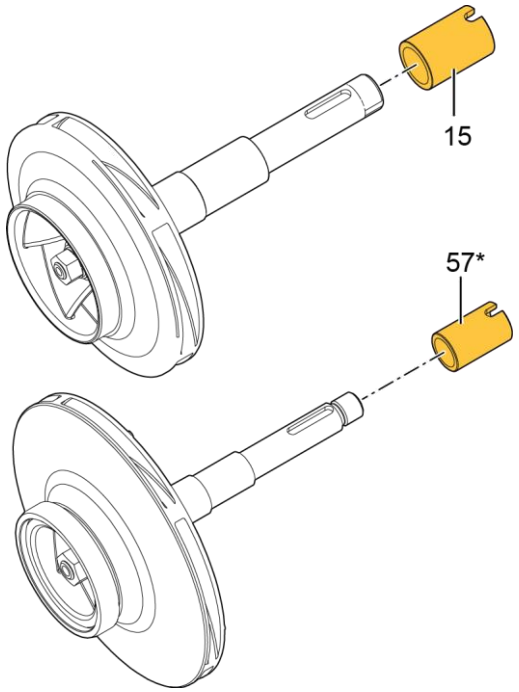
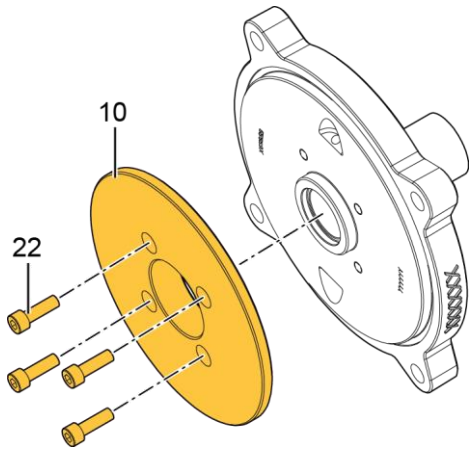
1. Mount the upper shaft sleeve (15/57*).	
2. Mount the guide plate (10) onto the rear cover and tighten the screws (22). For models ESL25/32/40/50-180N/S18.	

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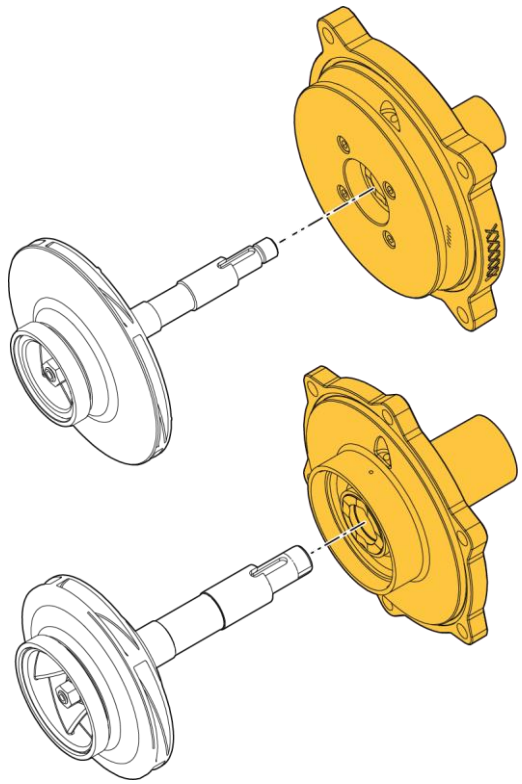
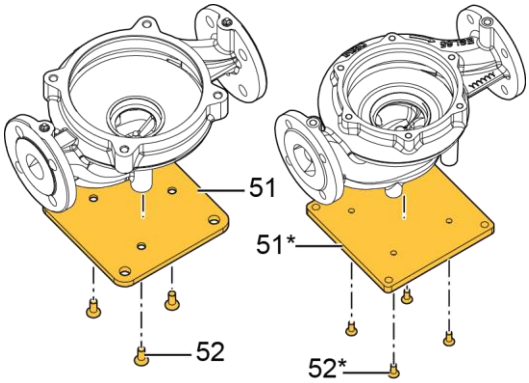
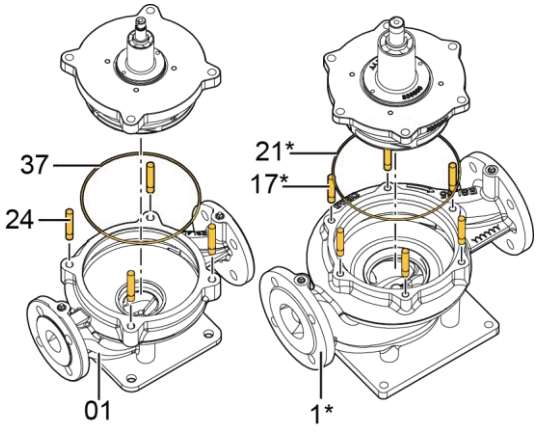
3. Mount the pre-assembled rear cove.	
4. Mount the base plate (51/51*) onto the pump casing and tighten the sunk Allen screw (52/52*).	
5. Mount the studs (24/17*) onto pump casing, and then assemble O-Ring (37/21*) and pump casing (01/1*).	

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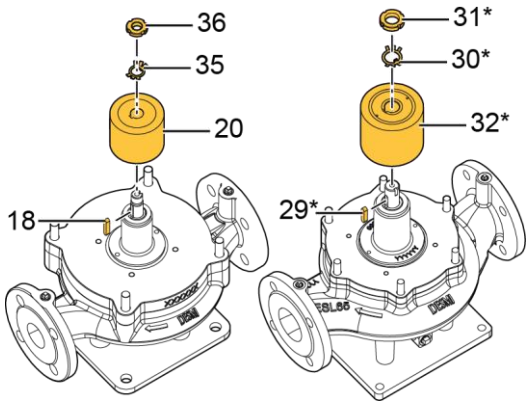
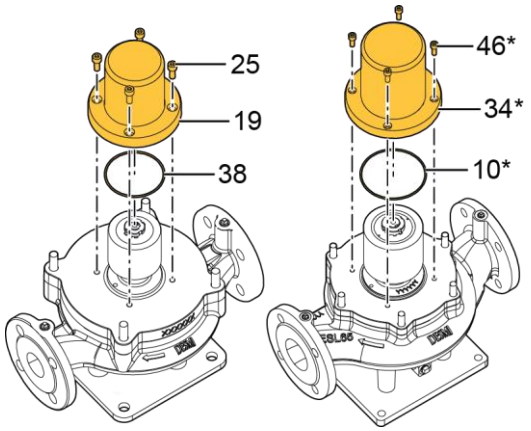
10.2.5. Fitting inner magnet rotor

1. Fit the sunk key (18/29*) in the shaft. Mount the inner magnet rotor (20/32*) and lock washer (35/30*), then tighten the lock nut (36/31*).	

NOTE: *Tap the lock washer into the slot on the lock nut if the pump rotor can rotate freely.*

10.2.6. Fitting canister

1. Mount the O-Ring (38/10*), assemble the canister (19/34*) and tighten the screws (25/46*)	

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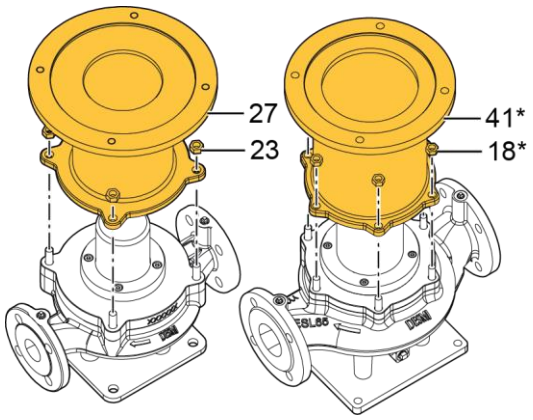
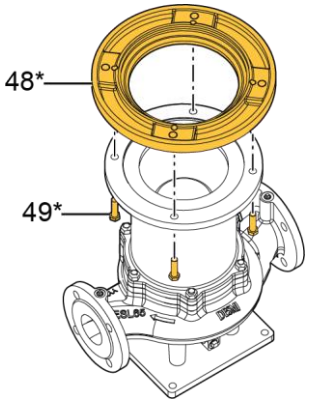
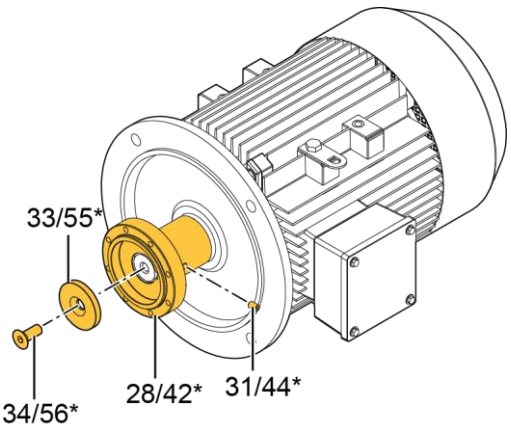
10.2.7. Fitting the motor

1. Assemble the motor bracket (27/41*) and tighten the nuts (23/18*).	
2. Mount the inter flange (36/48*) and tighten the screw (35/49*). For models with big motor.	
3. Push the motor coupling (28/42*) towards the motor shaft shoulder, mount the thrust plate (33/55*) and then tighten the sunk Allen screw (34/56*) and point screw (31/44*)	

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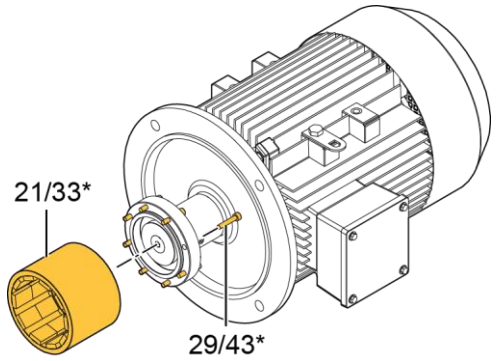
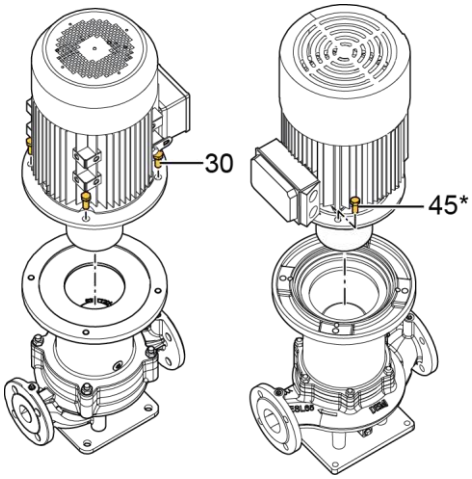
4. Assemble the outer magnet rotor (21/33*) and tighten the Allen screws (29/43*)	
5. Assemble the motor together with outer magnet rotor, tighten the set screws (30/45*).	

CAUTION

RISK OF PROPERTY DAMAGE!

Assembly aids or tools as well as the permanent magnetic coupling components can be attracted by magnetic field of the rotors and cause damage.

Make sure that tools or components are within safe range or shielded during assembly.

CAUTION

RISK OF PROPERTY DAMAGE!

Contact between the outer rotor and the canister may cause damage (especially in the case of larger permanent magnetic couplings).

The assembly requires forced guides if there is a risk of contact between the outer rotor and the canister.

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⚠ DANGER

STRONG MAGNETIC FIELD HAZARD!

The inner and outer magnetic rotor have a strong magnetic field.

Be careful regarding the force from the magnet field during assembling.

Never place your fingers between the coupling part and pump part during assembly as the magnets pull the parts together very forcefully.

NOTE: *Two or four guide rods can be used to guide the assembly to avoid the outer magnet being pulled against the canister.*

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11. ORDERING SPARE PARTS

When ordering spare parts please always state pump type, serial No. (appears on the name plate of the pump), position No. on the assembly drawing and designation on the spare parts list.

Spare parts or Spare Parts Kit (SPK) can be ordered via spareparts@desmi.com

Recommended spare parts stock for 2 years' operation to DIN 24296.

Quantity of spare parts for recommended spare parts stock.

ESL25/32/40/50-180N/S18

Part No.	Description	Number of pumps (including stand-by pumps)						
		2	3	4	5	6 and 7	8 and 9	10 and more
16	Shaft	1	1	1	2	2	2	20%
05	Impeller	1	1	1	2	2	2	20%
37	O-ring	4	6	8	8	9	10	100%
38	O-ring	4	6	8	8	9	10	100%
04	Wear ring	2	2	2	3	3	4	50%
12	Thrust bearing rotating	2	2	2	3	3	4	50%
13	Thrust bearing stationary	2	2	2	3	3	4	50%
14	Slide bearing	2	2	2	3	3	4	50%
15	Shaft sleeve	2	2	2	3	3	4	50%
	SPK	2	2	2	3	3	4	50%

ESL65-180M, ESL80-180N/S18

Part No.	Description	Number of pumps (including stand-by pumps)						
		2	3	4	5	6 and 7	8 and 9	10 and more
11	Shaft	1	1	1	2	2	2	20%
5	Impeller	1	1	1	2	2	2	20%
10	O-ring	4	6	8	8	9	10	100%
21	O-ring	4	6	8	8	9	10	100%

Part No.	Description	Number of pumps (including stand-by pumps)						
		2	**3**	**4**	**5**	**6 and 7**	**8 and 9**	**10 and more**
4	Wear ring	2	2	2	3	3	4	50%
25	Thrust bearing rotating	2	2	2	3	3	4	50%
26	Thrust bearing stationary	2	2	2	3	3	4	50%
27	Slide bearing	2	2	2	3	3	4	50%
57	Shaft sleeve	2	2	2	3	3	4	50%
	SPK	2	2	2	3	3	4	50%

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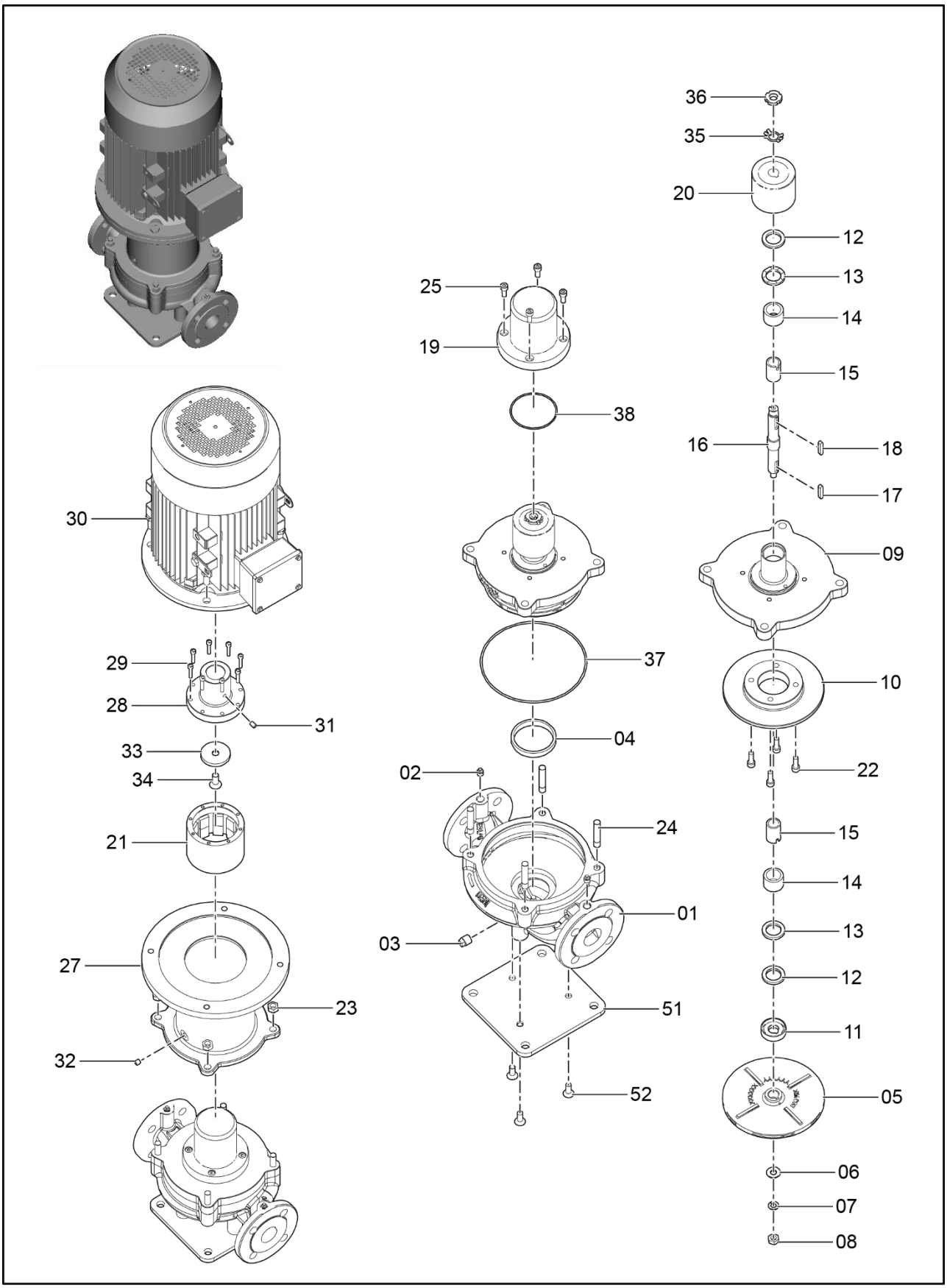
11.1. Assembly drawing ESL25/32/40/50-180N/S18



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11.2. Spare parts list ESL25/32/40/50-180N/S18

Pos. No	Description	Pos. No	Description
01	Pump casing	21	Outer magnet rotor
02	Plug	22	Screw
03	Draining Plug	23	Nut
04	Seal ring	24	Stud
05	Impeller	25	Allen screw
06	Washer	27	Motor bracket
07	Spring washer	28	Motor coupling
08	Impeller nut	29	Allen screw
09	Rear cover	30	Motor flange screw
10	Guide plate	31	Point screw
11	Bearing seat	32	Plug
12	Thrust bearing rotating	33	Thrust plate
13	Thrust bearing stationary	34	Sunk Allen screw
14	Slide bearing	35	Lock washer
15	Sleeve	36	Lock nut
16	Shaft	37	O-Ring
17	Key	38	O-Ring
18	Key	51	Base plate
19	Canister	52	Sunk Allen screw
20	Inner magnet rotor		

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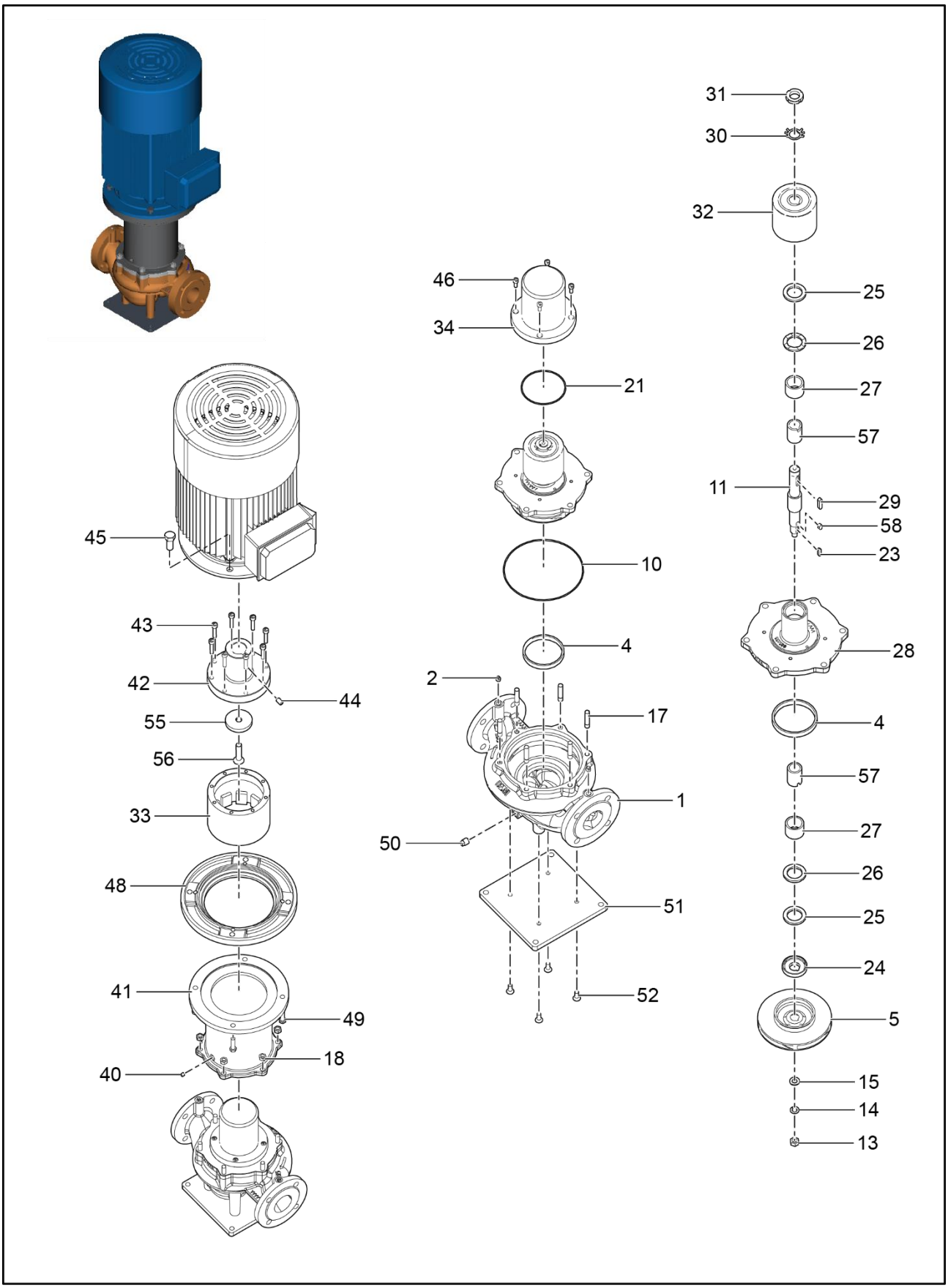
11.3. Assembly drawing ESL65-180M, ESL80-180N/S18



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11.4. Spare parts list ESL65-180M, ESL80-180N/S18

Pos. No	Description	Pos. No	Description
1	Pump casing	31	Lock nut
2	Plug	32	Inner magnet rotor
4	Seal ring	33	Outer magnet rotor
5	Impeller	34	Canister
10	O-Ring	40	Plug
11	Shaft	41	Motor bracket
13	Impeller nut	42	Motor coupling
14	Spring washer	43	Allen screw
15	Washer	44	Point screw
17	Stud	45	Motor flange screw
18	Nut	46	Allen screw
21	O-Ring	48	Inter flange
23	Key	49	Screw
24	Bearing seat	50	Draining Plug
25	Thrust bearing rotating	51	Base plate
26	Thrust bearing stationary	52	Sunk Allen screw
27	Slide bearing	55	Thrust plate
28	Rear cover	56	Sunk Allen screw
29	Key	57	Sleeve
30	Lock washer	58	Key

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