SEG

0.9 - 4.0 kW ~ 60 Hz

Installation and operating instructions

be
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GRUNDFOS

English (GB) Installation and operating instructions

Original installation and operating instructions

CONTENTS

Warning

Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

Warning

The use of this product requires experience with and knowledge of the product.
Persons with reduced physical, sensory or mental capabilities must not use this product, unless they are under supervision or have been instructed in the use of the product by a person responsible for their safety.
Children must not use or play with this product.

1. Symbols used in this document

Warning

If these safety instructions are not observed, it may result in personal injury.

Warning

If these instructions are not observed, it may lead to electric shock with consequent risk of serious personal injury or death.

Warning

These instructions must be observed for explosion-proof pumps. We recommend that you also follow these instructions for standard pumps.

Warning

These instructions must be observed for explosion-proof pumps. It is advisable also to follow these instructions for standard pumps.

Caution

If these safety instructions are not observed, it may result in malfunction or damage to the equipment.

Note

Notes or instructions that make the job easier and ensure safe operation.

2. General description

Grundfos SEG pumps are designed with a grinder system which grinds solid particles into small pieces so that they can be led away through pipes of a relatively small diameter.

SEG pumps are used in pressurised systems, e.g. in hilly areas.

The pumps can be controlled via the Grundfos LC, LCD 107, LC, LCD 108, LC, LCD 100 pump controllers or the Grundfos CU 100 control box.

See installation and operating instructions for the selected unit.

2.1 Product drawing

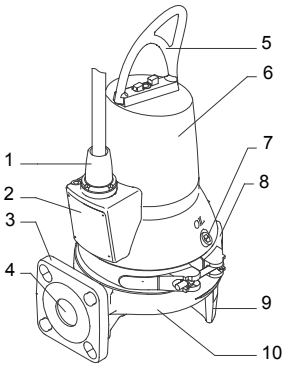


Fig. 1 SEG pump

Pos.	Designation
1	Cable plug
2	Nameplate
3	Discharge flange DN 40 / DN 50
4	Discharge
5	Lifting bracket
6	Stator housing
7	Oil screw
8	Clamp
9	Pump foot
10	Pump housing

2.2 Applications

SEG pumps are designed for pumping the following liquids:

- domestic wastewater with discharge from water closets
- sewage from restaurants, hotels, camping sites, etc.

The compact design makes the pumps suitable for both temporary and permanent installation. The pumps can be installed on an auto-coupling system or stand freely on the bottom of the pit.

2.3 Operating conditions

The Grundfos SEG range are designed for intermittent operation (S3). When completely submerged, the pumps can also run continuously (S1). See section *9.2 Operating modes*.

Installation depth

Maximum 10 metres below liquid level.

Operating pressure

Maximum 6 bar.

Number of starts per hour

Maximum 30.

pH value

Pumps in permanent installations can cope with pH values ranging from 4 to 10.

Liquid temperature

0-40 °C.

For short periods (maximum 15 minutes), a temperature of up to 60 °C is permissible (non-Ex versions only).

Warning

FM

Explosion-proof pumps must never pump liquids with a temperature higher than 40 °C.

Note

For single-phase pumps of 1.5 kW working at 10 % overvoltage, pumping 40 °C liquid, the maximum continuous operating time is six minutes. If the six minutes are exceeded, the thermal switch inside the motor windings might be activated and cause the pump to stop.

Density and viscosity of pumped liquid

When pumping liquids with a density and/or a kinematic viscosity higher than that of water, use motors with correspondingly higher outputs.

3. Delivery and handling

The pump may be transported and stored in a vertical or horizontal position. Make sure that it cannot roll or fall over.

3.1 Transportation

All lifting equipment must be rated for the purpose and checked for damage before any attempts to lift the pump. The lifting equipment rating must under no circumstances be exceeded. The pump weight is stated on the nameplate.

Warning

Always lift the pump by its lifting bracket or by means of a fork-lift truck if the pump is fixed on a pallet. Never lift the pump by means of the motor cable or the hose/pipe.

The polyurethane-embedded plug prevents water from penetrating into the motor via the motor cable.

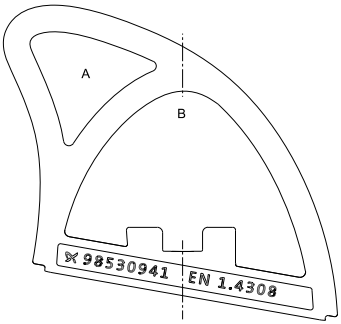
3.2 Storage

For long periods of storage, the pump must be protected against moisture and heat.

After a long period of storage, the pump should be inspected before it is put into operation. Make sure that the impeller can rotate freely. Pay special attention to the shaft seals and the cable entry.

3.3 Lifting points

When lifting the pump, it is important to use the right lifting point to keep the pump balanced. Place the lifting chain hook in point A for auto-coupling installations and in point B for other installations. See fig. 2.



TM06 0066 4813

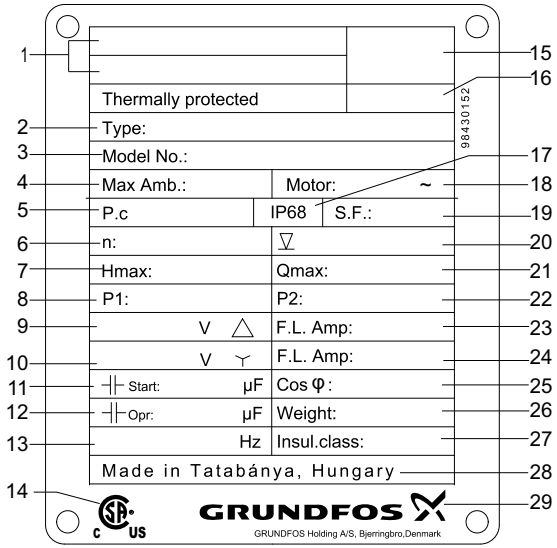
Fig. 2 Lifting points

4. Identification

4.1 Nameplate

The nameplate states the operating data and approvals applying to the pump. The nameplate is fixed with rivets to the side of the stator housing near the cable input to the motor.

The additional nameplate supplied with the pump can be fixed close to the pit.



TM06 5866 0216

Fig. 3 SEG nameplate

Pos.	Description
1	FM-description
2	Type designation
3	Product number + serial number
4	Maximum liquid temperature
5	Production code (YYWW)
6	Speed [rpm]
7	Maximum head [m]
8	Rated power input [kW]
9	Rated voltage, Δ
10	Rated voltage, Y
11	Starting capacitor [µF]
12	Run capacitor [µF]
13	Frequency [Hz]
14	Electrical safety*
15	Approval

Pos.	Description
16	Mark for continuously operated motor
17	Enclosure class to IEC
18	Phases
19	Motor safety factor
20	Maximum installation depth [m]
21	Maximum flow rate [l/s]
22	Rated power output
23	Rated current, Δ
24	Rated current, Y
25	Cos φ, 1/1 load
26	Net weight [kg]
27	Insulation class / temperature rise
28	Place of production
29	Grundfos logo

* For USA and Canada

4.1.1 Warning plate for Ex pumps

Fig. 4 Warning plate for Ex pumps (FM)

4.2 Type key

The type key covers the entire Grundfos SEG range of wastewater pumps. This is why the type key has a number of empty fields for the grinder pumps.

Each SEG grinder pump is identified by means of the type key below. Please note that not all combination options are available.

Code	Example	SE	G	.40	.09		.Ex	.2	.1	.6	03
	Type range										
SE	Grundfos sewage pumps										
	Impeller type										
G	Grinder system in the pump inlet										
	Pump discharge										
40	Nominal diameter of discharge port [mm],										
50	DIN PN10 flange										
K40	JIS B 2239 10K / KS B 2332 10K / KS B 1511 10K flange										
K50											
	Output power, P2										
	P2 [100 W]										
	Equipment										
[ ]	Standard, without equipment										
	Pump version										
[ ]	Non-explosion-proof pump, CSA approved										
Ex	Explosion-proof motor, CSA and FM approved										
	Number of poles										
2	2-pole motor										
	Number of phases										
1	Single-phase motor										
[ ]	Three-phase motor										
	Mains frequency										
6	60 Hz										
	Voltage										
03	208-230 V										
0G	380 V										
0H	460 V										
0M	200-230 V										
Z	**Custom-built pump**										

5. Approvals

The standard versions of SEG 60 Hz pumps have been approved by CSA and the explosion-proof version holds a CSA and FM type examination certificate no.: 3053414 (USA), 3053414C (Canada).

5.1 Approval standards

CSA approval according to UL778 and C22.2 No. 108, No. 0.4, No. 30, No. 145 and No. 60529.

FM approval according and FM 3600, FM 3615 and FM 3650 and ANSI/IEC 60529.

5.2 Explanation to FM approval

The SEG 60 Hz pumps have the following explosion protection classification: Class I, Division 1, Groups C and D hazardous locations, T4/T3C, IP68.

Standards	Code	Description
FM 3600 FM 3615 FM 3650 ANSI/IEC 60529	Class I	Explosive atmosphere is caused by gas or vapours (permitted class)
	Division 1	Area classification (permitted division)
	Group C and D	Classification of gases
	T4/T3C	Maximum surface temperature is 135 °C/ 160 °C
	IP68	Enclosure class according to IEC 60529.

6. Safety

Warning

Pump installation in pits must be carried out by specially trained persons.

Work in or near wastewater pits must be carried out according to local regulations.

Warning

Persons must not enter the installation area when the atmosphere is explosive.

Warning

It must be possible to lock the mains switch in position 0.

Type and requirements as specified in local regulations.

For safety reasons, all work in pits must be supervised by a person outside the pump pit.

Note

It is advisable to make all maintenance and service work when the pump is placed outside the pit.

Pits for submersible wastewater pumps contain wastewater with toxic and/or disease-causing substances. Therefore, all persons involved must wear appropriate personal protective equipment and clothing and all work on and near the pump must be carried out under strict observance of the hygiene regulations in force.

Warning

Make sure that the lifting bracket is tightened before attempting to lift the pump. Tighten if necessary. Carelessness during lifting or transportation may cause injury to personnel or damage to the pump.

6.1 Potentially explosive environments

Use explosion-proof SEG pumps for applications in potentially explosive environments.

Warning

SEG pumps must under no circumstances pump flammable, combustible or explosive liquids.

Warning

The classification of the installation site must be approved by the local firefighting authorities in each individual case.

Warning

Special conditions for safe use of SEG explosion-proof pumps:

1. Make sure the moisture switches and thermal switches are connected in the same circuit but have separate alarm outputs (motor stop) in case of high humidity or high temperature in the motor.
2. Bolts used for replacement must be class A2-70 or better according to EN/ISO 3506-1.
3. Contact the manufacturer for information on the dimensions of the flameproof joints.
4. The level of pumped liquid must be controlled by two stop level switches connected to the motor control circuit. The minimum level depends on the installation type and is specified in these installation and operating instructions.
5. Make sure the permanently attached cable is suitably mechanically protected and terminated in a suitable terminal board placed outside the potentially explosive area.
6. Sewage pumps have an ambient temperature range of -20 °C to +40 °C and a maximum process temperature of +40 °C.
7. The thermal protection in the stator windings has a nominal switch temperature of 150 °C and must guarantee the disconnection of the power supply; the power supply must be reset manually.

7. Installation

Caution Prior to installation, make sure the pit bottom is even.

Warning

Before beginning the installation, switch off the power supply and lock the mains switch in position 0.

Any external voltage connected to the pump must be switched off before working on the pump.

Warning

Before installation and the first start-up of the pump, check the cable for visible defects to avoid short-circuits.

Fit the extra nameplate supplied with the pump at the installation site or keep it in the cover of this booklet.

All safety regulations must be observed at the installation site, e.g. the use of blowers for fresh-air supply to the pit.

Prior to installation, check the oil level in the oil chamber. See section *10. Maintenance and service*.

The SEG pumps are suitable for different installation types which are described in sections *7.1 Installation on auto coupling* and *7.2 Free-standing submerged installation*.

All pump housings have a cast DN 40 or DN 50, PN 10 discharge flange. The DN 40 flange can also be connected to a DN 50, PN 10 flange.

Note The pumps are designed for intermittent operation. When completely submerged in the pumped liquid, the pumps can also run continuously. See section *12. Technical data*.

Warning

Do not put your hands or any tool into the pump suction or discharge port after the pump has been connected to the power supply, unless the pump has been switched off by removing the fuses or switching off the mains switch. Make sure that the power supply cannot be accidentally switched on.

Caution We recommend to always use Grundfos accessories to avoid malfunctions due to incorrect installation.

Warning

Only use the lifting bracket for lifting the pump. Do not use it to hold the pump when in operation.

7.1 Installation on auto coupling

Pumps for permanent installation can be mounted on a stationary auto-coupling guide rail system or a hookup auto-coupling system.

Both auto-coupling systems facilitate maintenance and service as the pump can easily be lifted out of the pit.

Warning

FM

Before beginning installation procedures, make sure that the atmosphere in the pit is not potentially explosive.

Note

Make sure that the pipework is installed without the use of undue force. No loads from the pipework weight must be carried by the pump. We recommend the use of loose flanges to ease the installation and to avoid pipe tension at flanges and bolts.

Note

Do not use elastic elements or bellows in the pipework; these elements should never be used as a means to align the pipework.

Auto-coupling guide rail system

Proceed as follows:

1. Drill mounting holes for the guide rail bracket on the inside of the pit and fasten the guide rail bracket provisionally with two screws.
2. Place the auto-coupling base unit on the bottom of the pit. Use a plumb line to establish the correct positioning. Fasten the auto coupling with heavy-duty expansion bolts. If the bottom of the pit is uneven, the auto-coupling base unit must be supported so that it is level when being fastened.
3. Assemble the discharge pipe in accordance with the generally accepted procedures and without exposing the it to distortion or tension.
4. Insert the guide rails in the auto-coupling base unit and adjust the length of the rails accurately to the guide rail bracket.
5. Unscrew the provisionally fastened guide rail bracket, fit it on top of the guide rails, and finally fasten it firmly to the pit wall.

Note

The guide rails must not have any axial play as this would cause noise during pump operation.

6. Clean out debris from the pit before lowering the pump into the pit.
7. Fit the guide claw to the discharge port of the pump.
8. Slide the guide claw down the guide rails and lower the pump into the pit by means of a chain fastened to the lifting bracket. When the pump reaches the auto-coupling base unit, the pump will automatically connect tightly.

Warning

Grease the gasket of the guide claw before lowering the pump into the pit.

Note

When the pump has reached the auto-coupling base unit, shake the pump by means of the chain to make sure that it is placed in the correct position.

9. Hang up the end of the chain on a suitable hook at the top of the pit and in such a way that the chain cannot come into contact with the pump housing.
10. Adjust the length of the motor cable by coiling it up on a relief fitting to ensure that the cable is not damaged during operation. Fasten the relief fitting to a suitable hook at the top of the pit. Make sure that the cables are not sharply bent or pinched.
11. Connect the motor cable and the monitoring cable, if any.

Note

The free end of the cable must not be submerged as water may penetrate through the cable into the motor.

Hookup auto coupling

Proceed as follows:

1. Fit a crossbar in the pit.
2. Fit the stationary part of the auto coupling on top of the crossbar.
3. Fit the adapted piece of pipe for the movable part of the hookup auto coupling to the pump discharge port.
4. Fasten a shackle and a chain to the movable part of the hookup auto coupling.
5. Clean out debris from the pit before lowering the pump.
6. Lower the pump into the pit by means of the chain secured to the lifting bracket. When the movable part of the auto coupling reaches the stationary part, the two will automatically connect tightly.
7. Hang up the end of the chain on a suitable hook at the top of the pit and in such a way that the chain cannot come into contact with the pump housing.
8. Adjust the length of the motor cable by coiling it up on a relief fitting to ensure that the cable is not damaged during operation. Fasten the relief fitting to a suitable hook at the top of the pit. Make sure that the cables are not sharply bent or pinched.
9. Connect the motor cable and the monitoring cable, if any.

Note

The free end of the cable must not be submerged as water may penetrate through the cable into the motor.

7.2 Free-standing submerged installation

Pumps for free-standing submerged installation can stand freely on the bottom of the pit or similar location.

The pump must be mounted on separate feet (accessory).

In order to facilitate service on the pump, fit a flexible union or coupling to the discharge pipe for easy separation.

If a hose is used, make sure that the hose does not buckle and that the inside diameter matches that of the discharge port.

If a rigid pipe is used, the union or coupling, non-return valve and isolating valve should be fitted in the order mentioned, when viewed from the pump.

If the pump is installed in muddy conditions or on uneven ground, it is recommended to support the pump on bricks or a similar support.

1. Fit a 90 ° elbow to the pump discharge port and connect the discharge pipe/hose.
2. Lower the pump into the liquid by means of a chain secured to the lifting bracket of the pump. It is recommended to place the pump on a plane, solid foundation. Make sure that the pump is hanging from the chain and not the cable.
3. Hang up the end of the chain on a suitable hook at the top of the pit and in such a way that the chain cannot come into contact with the pump housing.
4. Adjust the length of the motor cable by coiling it up on a relief fitting to ensure that the cable is not damaged during operation. Fasten the relief fitting to a suitable hook. Make sure that the cables are not sharply bent or pinched.
5. Connect the motor cable and the monitoring cable, if any.

Note

The free end of the cable must not be submerged as water may penetrate through the cable into the motor.

Note

If several pumps are to be installed in the same pit, the pumps must be installed at the same level in order to allow for optimum utilization of pump alternation.

8. Electrical connection

Warning

Connect the pump to an external mains switch which ensures all-pole disconnection with a contact separation according to EN 60204-1, 5.3.2.

It must be possible to lock the mains switch in position 0.

Type and requirements as specified in EN 60204-1, 5.3.2.

The electrical connection must be carried out in accordance with local regulations.

Warning

The pumps must be connected to a control box with a motor protection relay with an IEC trip class 10 or 15.

Warning

The permanent installation must be fitted with earth leakage circuit breaker (ELCB) with a tripping current < 30 mA.

Warning

Pumps installed in hazardous locations must be connected to a control box with a motor protection relay with an IEC trip class 10.

Warning

Do not install Grundfos control boxes, pump controllers, Ex barriers and the free end of the supply cable in potentially explosive environments.

The classification of the installation site must be approved by the local fire-fighting authorities in each individual case.

On explosion-proof pumps, make sure that an external earth lead is connected to the external earth terminal of the pump via a lead with a secure cable clamp. Clean the surface for external earth connection and fit the cable clamp.

The cross-section of the earth conductor must be at least 4 mm^2, e.g. type H07 V2-K (PVT 90 °) yellow/green.

Make sure that the earth connection is protected from corrosion.

Make sure that all protective equipment has been connected correctly.

Float switches used in potentially explosive environments must be approved for this application. They must be connected to the Grundfos LC, LCD 108 pump controller via the intrinsically safe LC-Ex4 barrier to ensure a safe circuit.

Warning

If the supply cable is damaged, it must be replaced by the manufacturer, his service agent or similarly qualified person.

Caution

Set the motor-protective circuit breaker to the rated current of the pump. The rated current is stated on the pump nameplate.

Warning

FM

If the pump has an FM mark on the nameplate, make sure that the pump is connected in accordance with the instructions given in this booklet.

The supply voltage and frequency are marked on the pump nameplate. The permissible voltage tolerance is - 10 %/+ 6 % of the rated voltage. Make sure that the motor is suitable for the power supply available at the installation site.

All pumps are supplied with 10 metres of cable and a free cable end.

All pumps are supplied without a control box.

The pump must be connected to one of these two controller types:

- a control box with motor-protective circuit breaker, such as a Grundfos CU 100 control box
- a Grundfos LC, LCD 107, LC, LCD 108 or LC, LCD 110 pump controller.

See fig. 5 or 6 and the installation and operating instructions for the selected control box or pump controller.

Potentially explosive environments

In potentially explosive environments you have two options:

- Use float switches made for Ex environment and a safety barrier in combination with either DC, DCD or LC, LCD 108.
- Use air bells in combination with LC, LCD 107.

Warning

FM

Before installation and the first start-up of the pump, check the condition of the cable visually to avoid short circuits.

For more information about the function of the thermal switches, see section *8.4 Thermal switches*.

8.1 Wiring diagrams

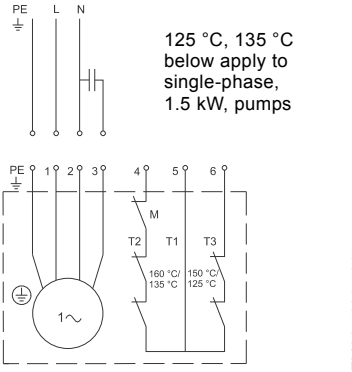


Fig. 5 Wiring diagram for single-phase pumps

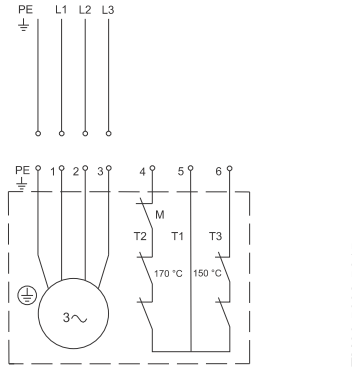


Fig. 6 Wiring diagram for three-phase pumps

8.2 CU 100 control box

The CU 100 control box incorporates a motor-protective circuit breaker and is available with level switch and cable.

Single-phase pumps

A run capacitor must be connected to the control box.

For capacitor sizes, see the table below.

Pump type [kW]	CS (starting capacitor)		CR (run capacitor)	
	[µF]	[V]	[µF]	[V]
0.9 and 1.2	150	230	30	450
1.5	150	230	40	450

Start and stop levels

The difference in level between start and stop can be adjusted by changing the free cable length.

Long free cable = large difference in level.

Short free cable = small difference in level.

Note Both the two following points must be observed.

- To prevent air intake and vibrations, install the stop level switch in such a way that the pump is stopped before the liquid level is lowered below the upper edge of the clamp on the pump.
- Install the start level switch in such a way that the pump is started at the required level; however, the pump must always be started before the liquid level reaches the bottom inlet pipe to the pit.

Warning

FM The CU 100 control box must not be used for explosion proof applications.

See section *8.3 Pump controllers*.

Warning

The pump must not run dry.

An additional level switch must be installed to ensure that the pump is stopped in case the stop level switch is not operating. See fig. 7.

FM The pump must be stopped when the liquid level reaches the upper edge of the clamp on the pump.

Float switches used in potentially explosive environments must be approved for this application.

They must be connected to the Grundfos DC, DCD and LC, LCD 108 pump controller via an intrinsically safe barrier to ensure a safe circuit.

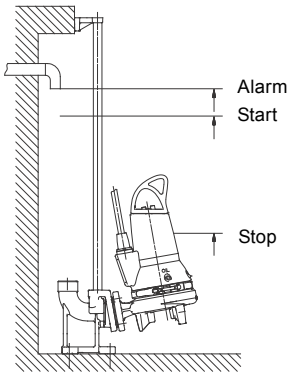


Fig. 7 Start and stop levels

8.3 Pump controllers

The following LC and LCD pump controllers are available:

LC controllers are for one-pump-installations and LCD controllers are for two-pump-installations.

- LC 107 and LCD 107 with air bells.
- LC 108 and LCD 108 with float switches.
- LC 110 and LCD 110 with electrodes.

In the following description, "level switches" can be air bells, float switches or electrodes, depending on the pump controller selected.

Controllers for single-phase pumps incorporate capacitors.

LC: The controller is fitted with two or three level switches: One for start and the other for stop of pump. The third level switch, which is optional, is for high-level alarm.

LCD: The controller is fitted with three or four level switches: One for common stop and two for start of the pumps. The fourth level switch, which is optional, is for high-level alarm.

When installing the level switches, the following points should be observed:

- To prevent air intake and vibrations, install the stop level switch in such a way that the pump is stopped before the liquid level is lowered below the middle of the motor housing.
- The start level switch should be installed in such a way that the pump is started at the required level; however, the pump must always be started before the liquid level reaches the bottom inlet pipe to the pit.
- The high-level alarm switch, if installed, should always be installed about 10 cm above the start level switch; however, the alarm must always be given before the liquid level reaches the inlet pipe to the pit.

For further settings, see the installation and operating instructions for the pump controller selected.

Warning

The pump must not run dry.

An additional level switch must be installed to ensure that the pump is stopped in case the stop level switch is not operating.

FM Stop the pump when the liquid level reaches the upper edge of the clamp on the pump.

Float switches used in explosive environments must be approved for this application. They must be connected to the Grundfos LC, LCD 108 pump controller via the intrinsically safe LC-Ex4 barrier to ensure a safe circuit.

8.4 Thermal switches

All SEG pumps have two sets of thermal switches incorporated in the stator windings.

Thermal switch, circuit 1 (T1-T3), breaks the circuit at a winding temperature of approx. 150 °C. In single-phase pumps, 1.5 kW, the thermal switch will break the circuit at a winding temperature of approx. 125 °C.

Note

This thermal switch must be connected for all pumps.

Thermal switch, circuit 2 (T1-T2), breaks the circuit at a winding temperature of approx. 170 °C (three-phase pumps) or 160 °C (single-phase pumps).

Warning

After thermal cutout, explosion-proof pumps must be restarted manually.

The thermal switch (circuit 2) must be connected for manual restarting of these pumps.

The maximum operating current of the thermal switches is 0.5 A at 500 VAC and cos φ 0.6. The switches must be able to break a coil in the supply circuit.

In the case of standard pumps, both thermal switches can (when closing the circuit after cooling) generate automatic restarting of the pump via the controller.

Warning

The separate motor-protective circuit breaker/control box must not be installed in potentially explosive environments.

9. Start-up

Warning

Before starting work on the pump, make sure that the fuses have been removed or the mains switch has been switched off. Make sure that the power supply cannot be accidentally switched on.

Make sure that all protective equipment has been connected correctly.

The pump must not run dry.

Warning

The pump must not be started if the atmosphere in the pit is potentially explosive.

Warning

It may lead to personal injuries or death to open the clamp while the pump is operating.

9.1 General start-up procedure

1. Remove the fuses, and check whether the impeller can rotate freely. Turn the grinder head by hand.
2. Check the condition of the oil in the oil chamber. See also section *10.2 Oil change*.
3. Check whether the monitoring units, if used, are operating satisfactorily.
4. Check the setting of the air bells, float switches or electrodes.
5. Open the isolating valves, if fitted.
   Auto-coupling: It is important to grease the gasket of the guide claw before lowering the pump into the pit.
6. Lower the pump into the liquid and insert the fuses.
   Auto-coupling: Check that the pump is in right position on the auto-coupling base unit.
7. Check whether the system has been filled with liquid and vented. The pump is self-venting.
8. Switch on the power supply to the pump. When power is on, the pump will start and pump down to the dry-running level. This process can be used to check that the pump functions correctly.

Caution

In case of abnormal noise or vibrations from the pump, other pump failure or power supply failure, stop the pump immediately. Do not attempt to restart the pump until the cause of the fault has been found and the fault corrected.

After one week of operation after replacement of the shaft seal, the condition of the oil in the chamber should be checked. See section *10. Maintenance and service*.

9.2 Operating modes

The pumps are designed for intermittent operation (S3). When completely submerged, the pumps can also run continuously (S1).

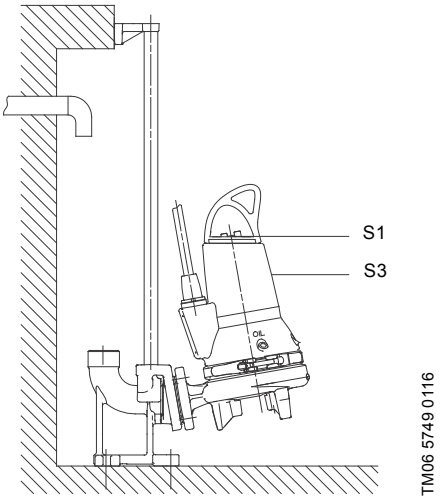


Fig. 8 Operating levels

S3, intermittent operation

S3 operation is a series of identical duty cycles (TC) each with a constant load for a period, followed by a rest period. Thermal equilibrium is not reached during the cycle. See fig. 9.

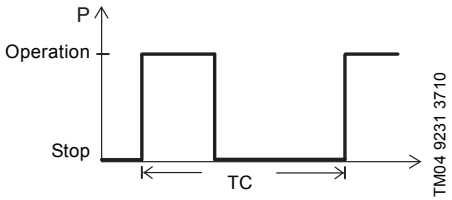


Fig. 9 S3 operation

S1, continuous operation

In this operating mode, the pump can run continuously without having to be stopped for cooling. Being completely submerged, the pump is sufficiently cooled by the surrounding liquid. See fig. 10.

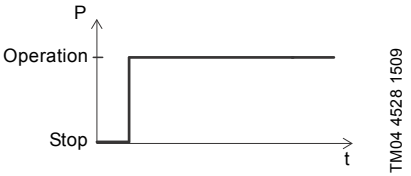


Fig. 10 S1 operation

9.3 Direction of rotation

Note The pump may be started for a very short period without being submerged to check the direction of rotation.

All single-phase pumps are factory-wired for the correct direction of rotation.

Before starting up three-phase pumps, check the direction of rotation.

An arrow on the stator housing and an arrow at the pump inlet indicate the correct direction of rotation.

Correct direction of rotation is clockwise when viewed from above. When started, the pump will jerk in the opposite direction of the direction of rotation.

If the direction of rotation is wrong, interchange two phases. See fig. 5 or 6.

Checking the direction of rotation

Check the direction of rotation in one of the following ways every time the pump is connected to a new installation.

Procedure 1:

1. Start the pump and measure the quantity of liquid or the discharge pressure.
2. Stop the pump and interchange two phases.
3. Restart the pump and measure the quantity of liquid or the discharge pressure.
4. Stop the pump.
5. Compare the results taken under points 1 and 3. The connection which gives the larger quantity of liquid or the higher pressure is the correct direction of rotation.

Procedure 2:

1. Let the pump hang from a lifting device, e.g. the hoist used for lowering the pump into the pit.
2. Start and stop the pump while observing the movement (jerk) of the pump.
3. If connected correctly, the pump will jerk in the opposite direction of the direction of rotation. See fig. 11.
4. If the direction of rotation is wrong, interchange two phases. See fig. 5 or 6.

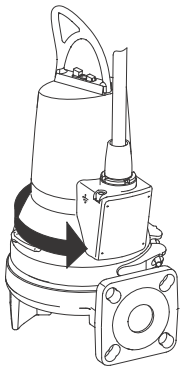


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Fig. 11 Jerk direction

10. Maintenance and service

Warning

Before starting work on the pump, make sure that the fuses have been removed or the mains switch has been switched off. Make sure that the power supply cannot be accidentally switched on.

All rotating parts must have stopped moving.

Warning

Except for service on the pump parts, all other service work must be carried out by Grundfos or a service workshop authorised by Grundfos.

Flush the pump thoroughly with clean water before maintenance and service. Rinse the pump parts in water after dismantling.

Warning

When loosening the screws of the oil chamber, note that pressure may have built up in the chamber. Do not remove the screws until the pressure has been fully relieved.

10.1 Inspection

Pumps running normal operation should be checked every 3000 operating hours or at least once a year.

If the dry solids content of the pumped liquid is very high or sandy, check the pump at shorter intervals.

Check the following points:

- **Power consumption**
  See section *4.1 Nameplate*.
- **Oil level and oil condition**
  When the pump is new or after replacement of the shaft seal, check the oil level after one week of operation.
  Use Shell Ondina X420 oil or similar type.
  See sections *10.2 Oil change*.

Note: Used oil must be disposed of in accordance with local regulations.

- **Cable entry**
  Make sure that the cable entry is watertight and that the cables are not sharply bent and/or pinched.
  See section *10.5 Service kits*.

Note: A possible replacement of the cable must be carried out by Grundfos or a service workshop authorised by Grundfos.

- **Pump parts**
  Check the impeller, pump housing, etc. for possible wear. Replace defective parts.
  See section *10.5 Service kits*.
- **Ball bearings**
  Check the shaft for noisy or heavy operation (turn the shaft by hand). Replace defective ball bearings.
  A general overhaul of the pump is usually required in case of defective ball bearings or poor motor function. This work must be carried out by Grundfos or a service workshop authorised by Grundfos.
- **Grinder system/parts**
  In case of frequent choke-ups, check the grinder system for wear. When worn, the edges of the grinding parts are round and worn. Compare with a new grinder system.

10.2 Oil change

Every 3000 operating hours or at least once a year, change the oil in the oil chamber as described below.

If the shaft seal has been changed, the oil must be changed as well.

Warning

When loosening the screws of the oil chamber, note that pressure may have built up in the chamber. Do not remove the screws until the pressure has been fully relieved.

Motor oil quantities

The table below states the quantity of oil in the oil chamber of SEG pumps:

Pump type	Quantity of oil in oil chamber [l]
0.9 to 1.5 kW	0.17
2.2 to 4.0 kW	0.42

Draining the motor oil

1. Remove both oil screws to allow all the oil to drain from the chamber.
2. Check the oil for water and impurities. If the shaft seal has been removed, the oil will give a good indication of the condition of the shaft seal.

Note: Used oil must be disposed of in accordance with local regulations.

Oil filling, pump lying down

1. See fig. 12. Place the pump in such a position that it is lying on the stator housing and the discharge flange and that the oil screws are pointing upwards.
2. Fill oil into the oil chamber through the upper hole until it starts running out of the lower hole. The oil level is now correct. See section *10.3 Checking the shaft seal*.
3. Fit both oil screws using the packing material included in the kit. See section *10.5 Service kits*.

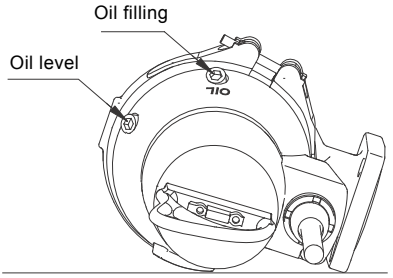

Fig. 12 Oil filling holes

Oil filling, pump in upright position

1. Place the pump on a plane, horizontal surface.
2. Fill oil into the oil chamber through one of the holes until it starts running out of the other hole. For oil quantity, see table in section *10.2 Oil change*.
3. Fit both oil screws using the packing material included in the kit. See section *10.5 Service kits*.

10.3 Checking the shaft seal

To make sure that the shaft seal is intact, the oil should be checked.

If the oil is greyish white like milk or contains a large quantity of water, the shaft seal should be replaced as the primary part of the seal is worn. If the seal is still used, the motor will be damaged within a short time.

If the oil is clean, it can be reused.

10.4 Adjustment of impeller clearance

For position numbers, see figs 5 and 6 in Appendix.

Warning

Before inspection, make sure that the motor is switched off and that the mains switch is locked in position 0.

To adjust impeller you need to dismantle the grinder system first:

1. See section *10.2 Oil change*.
2. Place the pump in horizontal position on the table.
3. Remove the screw (188a) from the pump feet (M).
4. Loosen the grinder ring (44) by knocking it clockwise with punch. See fig. 13.

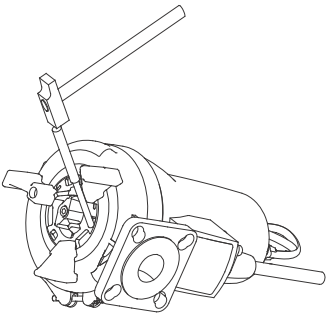

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Fig. 13 Removing the grinder ring

5. Remove the grinder ring (44).
6. Insert the punch into the hole to hold the impeller to prevent it movement during removal.
7. Remove the screw (188a) including washer (66) from the shaft end. See fig. 14.
8. Remove the grinder head (45).

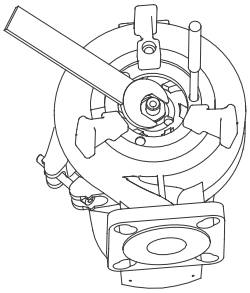

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Fig. 14 Removing the screw and grinder head

9. Tighten the adjusting nut (68) until the impeller (49) cannot rotate any more.
10. Loosen the adjusting nut (68) by 1/4 turn.

Assembly of grinder system:

1. Fit grinder head (45). The dogs on the back of the grinder head must engage with the impeller holes (49).
2. Tighten screw (188a) in the shaft end to torque of 20 Nm ± 2. Do not forget the lock washer.
3. Fit grinder ring (44) and turn grinder ring (44) 15 to 20 ° anti-clockwise until it is tightened.
4. Check that the grinder ring does not touch the grinder head.
5. Tighten screw (188a) to torque of 16 Nm ± 2.
6. Check that the grinder head rotates freely and noiselessly.

10.5 Service kits

Warning

Before starting work on the pump, make sure that the fuses have been removed or the mains switch has been switched off. Make sure that the power supply cannot be accidentally switched on.

All rotating parts must have stopped moving.

The following service kits are available for all SEG pumps and can be ordered as required:

Service kit	Description	Pump type	Material	Product number
Shaft seal kit	Shaft seal complete	SEG.40.09 - 15	BQQP	96076122
			FKM	96645160
		SEG.40.26 - 40	BQQP	96076123
			FKM	96645275
O-ring kit	O-rings and gaskets for oil screws	SEG.40.09 - 15	BQQP	96076124
			FKM	96646061
		SEG.40.26 - 40	BQQP	96076125
			FKM	96646062
Grinder system	Grinder head, grinder ring, shaft screw and locking screw	DN 40 system	-	96076121
	Grinder head, grinder ring, shaft screw and locking screw High-flow stationary cutter	DN 50 system	-	98453210
Impeller	Impeller complete with adjusting nut, shaft screw and key	SEG.(K)40.09	-	98453205
		SEG.(K)40.12	-	98453203
		SEG.(K)40.15	-	98453192
		SEG.(K)40.26	-	98453178
		SEG.(K)40.31	-	98453177
		SEG.(K)40.40	-	98453172
		SEG.(K)50.26	-	98453206
		SEG.(K)50.31	-	98453179
		SEG.(K)50.40	-	98453172
Pump housing	Pump housing complete	SEG.(K)40 0.9 - 1.5 kW	-	98453277
		SEG.(K)40 2.6 - 4.0 kW	-	98453280
		SEG.(K)50 2.6 - 4.0 kW	-	98453300
Oil	1 litre of oil, type Shell Ondina X420. See section *10. Maintenance and service* for required quantity in oil chamber.	All types	-	96586753

Note

A possible replacement of the cable must be carried out by Grundfos or a service workshop authorised by Grundfos.

10.6 Contaminated pumps

Warning

If a pump has been used for a liquid which is injurious to health or toxic, the pump will be classified as contaminated.

If Grundfos is requested to service the pump, Grundfos must be contacted with details about the pumped liquid, etc. before the pump is returned for service. Otherwise Grundfos can refuse to accept the pump for service.

Possible costs of returning the pump are paid by the customer.

However, any application for service (no matter to whom it may be made) must include details about the pumped liquid if the pump has been used for liquids which are injurious to health or toxic.

Before a pump is returned, it must be cleaned in the best possible way.

11. Fault finding

FM

Warning

All regulations applying to pumps installed in potentially explosive environments must be observed. Make sure that no work is carried out in potentially explosive atmosphere.

Warning

Before attempting to diagnose any fault, make sure that the fuses have been removed or the mains switch has been switched off. Make sure that the power supply cannot be accidentally switched on.

All rotating parts must have stopped moving.

Fault	Cause	Remedy
1. Motor does not start. Fuses blow, or motor-protective circuit breaker trips immediately. **Caution:** Do not start again!	a) Supply failure; short-circuit; earth-leakage fault in cable or motor winding.	Have the cable and motor checked and repaired by a qualified electrician.
	b) Wrong type of fuse.	Install fuses of the correct type.
	c) Impeller blocked by impurities.	Clean the impeller.
	d) Air bell, float switch or electrode out of adjustment or defective.	Check the air bells, float switches or electrodes.
2. Pump operates, but the motor-protective circuit breaker trips after a short while.	a) Low setting of thermal relay in motor-protective circuit breaker.	Set the relay in accordance with the specifications on the nameplate.
	b) Increased current consumption due to large voltage drop.	Measure the voltage between two motor phases. Tolerance: - 10 %/+ 6 %.
	c) Impeller blocked by impurities. Increased current consumption in all three phases.	Clean the impeller.
	d) Adjustment of impeller clearance incorrect.	Readjust the impeller. See fig. 12 in section *10.2 Oil change*.
3. The pump's thermal switch trips when the pump has been operating for some time.	a) Too high liquid temperature.	Reduce the liquid temperature.
	b) Too high liquid viscosity.	Dilute the liquid.
	c) Wrong electrical connection. (If the pump is star-connected to a delta connection, the result will be very low under voltage).	Check and correct the electrical installation.
4. Pump operates at below-standard performance and increased power consumption.	a) Impeller blocked by impurities.	Clean the impeller.
	b) Wrong direction of rotation.	Check the direction of rotation. If is not correct, interchange two phases. See section *9.3 Direction of rotation*.
5. Pump operates but delivers no liquid.	a) Discharge valve closed or blocked.	Check the discharge valve and open/clean it.
	b) Non-return valve blocked.	Clean the non-return valve.
	c) Air in pump.	Vent the pump.
6. Pump is blocked.	a) Grinder system is worn.	Replace the grinder system.

12. Technical data

Supply voltage

- 1 x 208-230 V - 10 %/+ 6 %, 60 Hz
- 3 x 200-230 V - 10 %/+ 6 %, 60 Hz
- 3 x 380 V - 10 %/+ 6 %, 60 Hz
- 3 x 460 V - 10 %/+ 6 %, 60 Hz
- 3 x 575 V - 10 %/+ 6 %, 60 Hz.

Enclosure class

IP68. According to IEC 60529.

Explosion protection classification

Class 1, division 1, group C and D, T4/T3C, IP68.

Insulation class

F (155 °C).

Pump curves

Pump curves are available at www.grundfos.com.

The curves are to be considered as a guide.

They must not be used as guarantee curves.

Test curves for the supplied pump are available on request.

Sound pressure level

The sound pressure level of the pumps is lower than the limiting values stated in the EC Council Directive 2006/42/EC relating to machinery.

13. Disposal

This product or parts of it must be disposed of in an environmentally sound way:

1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Grundfos company or service workshop.

Subject to alterations.

Dimension tables

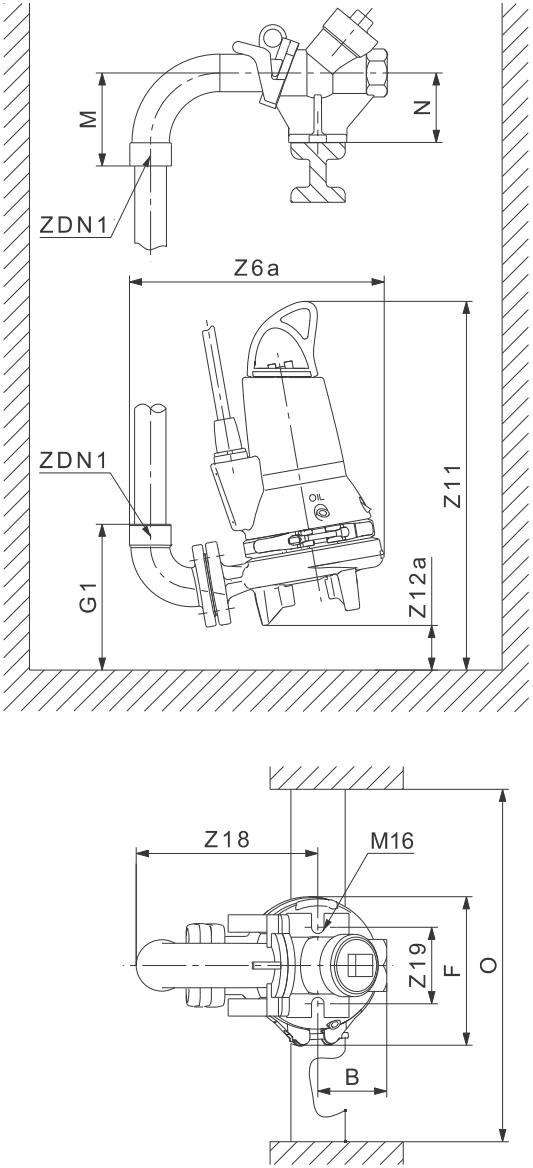

Fig. 1 Installation on hookup auto-coupling

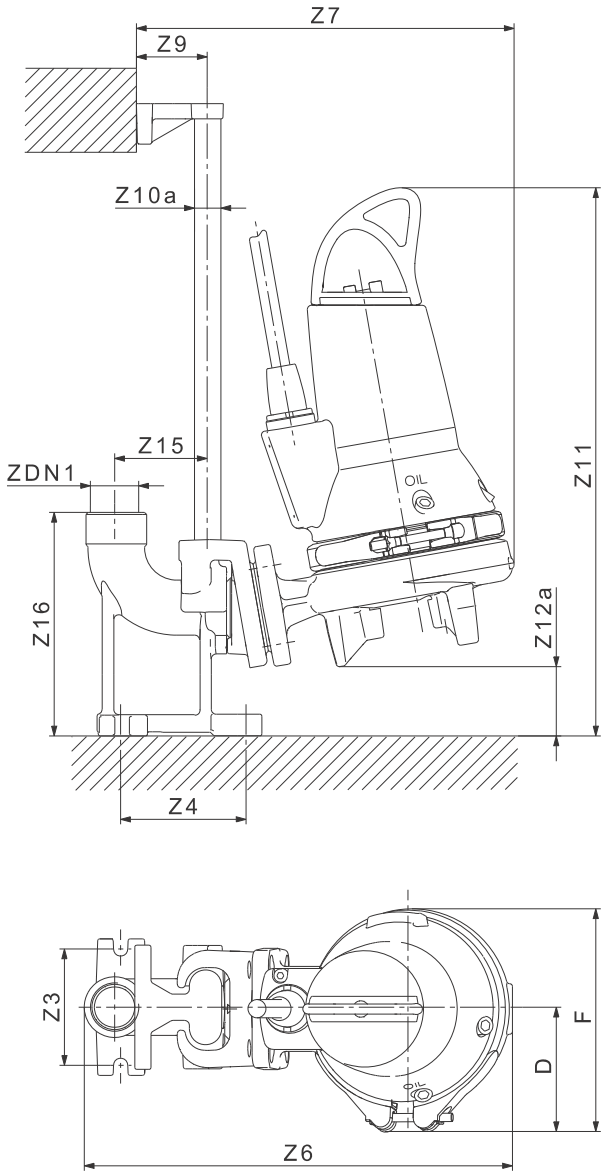

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Fig. 2 Installation on auto-coupling

	Power [kW]	A	B	D	F	G1	M	N	O	Z4	Z6
SEG.(K)40	0.9 and 1.2	467	100	99	216	214	134	100	Min. 600	118	421
	1.5 (1-phase)	482	100	99	216	214	134	100		118	421
	1.5 (3-phase)	467	100	99	216	214	134	100		118	421
	2.6	521	100	119	256	215	134	100		118	462
	3.1 and 4.0	561	100	119	256	215	134	100		118	462

	Power [kW]	Z6a	Z7	Z9	Z10a	Z11	Z12a	Z15	Z16	Z18	Z19	ZDN1
SEG.(K)40	0.9 and 1.2	362	371	70	3/4" - 1"	546	66	90	221	271	120	NPT 2
	1.5 (1-phase)	362	371	70	3/4" - 1"	561	66	90	221	271	120	NPT 2
	1.5 (3-phase)	362	371	70	3/4" - 1"	546	66	90	221	271	120	NPT 2
	2.6	367	412	70	3/4" - 1"	614	80	90	221	271	120	NPT 2
	3.1 and 4.0	367	412	70	3/4" - 1"	651	80	90	221	271	120	NPT 2

	Power [kW]	A	B	D	F	G1	M	N	O	Z4	Z6
SEG.(K)50	2.6	532	100	119	173	225	134	100	Min. 600	118	461
	3.1 and 4.0	572	100	119	173	225	134	100		118	461

	Power [kW]	Z6a	Z7	Z9	Z10a	Z11	Z12a	Z15	Z16	Z18	Z19	ZDN1
SEG.(K)50	2.6	366	411	70	3/4" - 1"	625	80	90	221	271	120	NPT 2
	3.1 and 4.0	366	411	70	3/4" - 1"	662	80	90	221	271	120	NPT 2

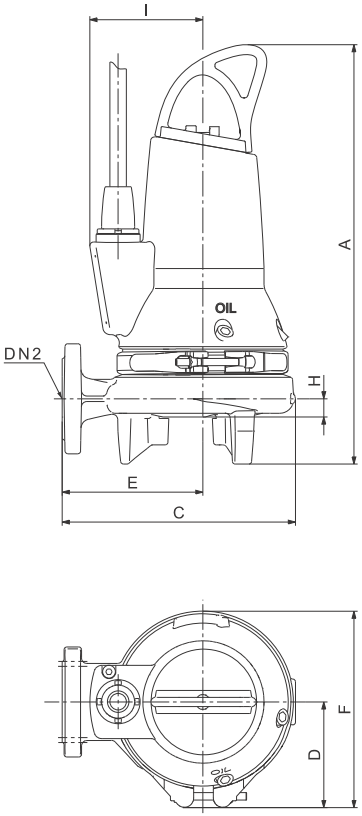

Fig. 3 Free-standing installation

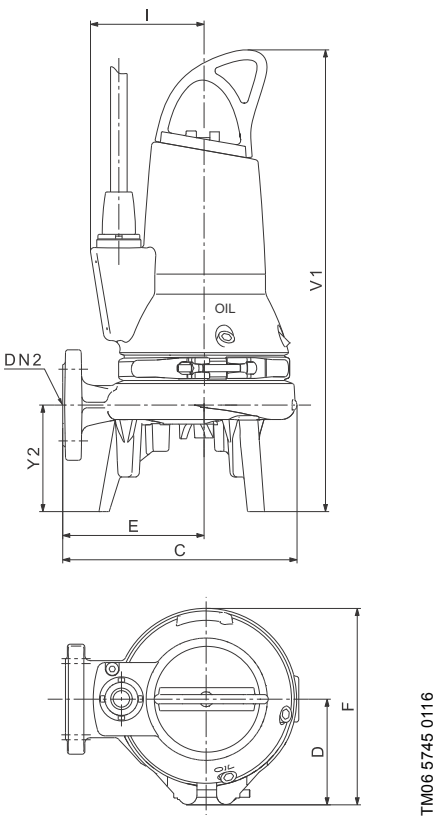

Fig. 4 Free-standing installation with foot extensions

	Power [kW]	A	C	D	DN2	E	F	H	I	V1	Y2
SEG.(K)40	0.9 and 1.2	467	252	99	DN 40	154	216	73	123	510	116
	1.5 (1-phase)	482	252	99	DN 40	154	216	73	123	525	116
	1.5 (3-phase)	467	252	99	DN 40	154	216	73	123	510	116
	2.6	521	294	119	DN 40	173	256	60	143	577	115
	3.1 and 4.0	561	294	119	DN 40	173	256	60	143	617	115

	Power [kW]	A	C	D	DN2	E	F	H	I	V1	Y2
SEG.(K)50	2.6	532	293	119	DN 50	173	256	60	143	577	115
	3.1 and 4.0	572	293	119	DN 50	173	256	60	143	627	115

Weight tables

Pumps - DN 40 outlet flange	Weight [kg]
SEG.40.09.2.1.603	48.0
SEG.40.09.2.60G/H/M	46.0
SEG.40.12.2.1.603	48.0
SEG.40.12.2.60G/H/M	46.0
SEG.40.15.2.1.603	50.0
SEG.40.15.2.60G/H/M	48.0
SEG.40.26...	70.0
SEG.40.31...	81.0
SEG.40.40...	81.0

Pumps - K40 outlet flange*	Weight [kg]
SEG.K40.09...	46.0
SEG.K40.12...	46.0
SEG.K40.15...	48.0
SEG.K40.26...	70.0
SEG.K40.31...	81.0
SEG.K40.40...	81.0

Pumps - DN 50 outlet flange	Weight [kg]
SEG.50.26...	70.0
SEG.50.31...	81.0
SEG.50.40...	81.0

Pumps - K50 outlet flange*	Weight [kg]
SEG.K50.26...	70.0
SEG.K50.31...	81.0
SEG.K50.40...	81.0

* For USA and Canada.

Pos.	Designation GB	Descripción ES	Designação PT	التســـمية AR	名稱 CN	명칭 KO
6a	Pin	Pasador	Pino	مسمار محور	插銷	핀
7a	Rivet	Remache	Rebite	مسـمار برشـام	鉚釘	리벳
9a	Key	Chaveta	Chave	مفتـــاح	栓體	키
37a	O-rings	Juntas tóricas	O-rings	حلقـات منـع تسـرب	O型環	O-링
44	Grinder ring	Anillo triturador	Anel de trituração	حلقـة مطحنـة	研磨機圈	그라인더 링
45	Grinder head	Cabezal triturador	Cabeça trituradora	رأس مطحنـة	研磨機頭部	그라인더 헤드
48	Stator	Estátor	Estator	سـاكن	定子	고정자
48a	Terminal board	Placa terminal	Quadro de terminais	لوحـــة التوصـــيلات الكهربائيـــة	端子板	터미널 보드
49	Impeller	Impulsor	Impulsor	مروحة	葉輪	임펠러
50	Pump housing	Carcasa de la bomba	Corpo da bomba	غـلاف المضـخة	泵浦外殼	펌프 하우징
55	Stator housing	Carcasa del estátor	Carcaça do estator	غـلاف السـاكن	定子外殼	고정자 하우징
58	Shaft seal carrier	Soporte del cierre del eje	Suporte do empanque	حامـل مـانع تسـرب عمـود الإدارة	軸封座	샤프트 씰 캐리어
66	Locking ring	Anillo de bloqueo	Anel de fixação	حلقـة زنـق	鎖環	잠금 링
68	Adjusting nut	Tuerca de ajuste	Porca de ajuste	صـــمولة ضـــبط	調整螺帽	조정 너트
76	Nameplate	Placa de características	Chapa de características	لوحـة اسـم الموديـل	銘牌	명판
92	Clamp	Abrazadera	Abraçadeira	مشـبك	卡鉗	클램프
102	O-ring	Junta tórica	O-ring	حلقـة منـع تسـرب	O型環	O-링
103	Bush	Casquillo	Junta	جلبـة	軸襯	부시
104	Seal ring	Anillo de cierre	Anel vedante	حلقـة سـد	封口圈	씰 링
105 105a	Shaft seal	Cierre del eje	Empanque	مـانع تسـرب عمـود الإدارة	軸封	샤프트 씰
107	O-rings	Juntas tóricas	O-rings	حلقـات منـع تسـرب	O型環	O-링

Pos.	Designation GB	Descripción ES	Designação PT	التســـمية AR	名稱 CN	명칭 KO
112a	Locking ring	Anillo de bloqueo	Anel de fixação	حلقـة زنـق	鎖環	잠금 링
153	Bearing	Cojinete	Rolamento	كرســي تحميــل	軸承	베어링
154	Bearing	Cojinete	Rolamento	كرســي تحميــل	軸承	베어링
155	Oil chamber	Cámara de aceite	Câmara do óleo	حجـرة الزيـت	油腔	오일 챔버
158	Corrugated spring	Muelle ondulado	Mola ondulada	نـابض ممـوج	波形彈簧	홈 스프링
159	Washer	Arandela	Anilha	حلقـة إحكـام ربـط	墊片	워셔
172	Rotor/shaft	Rotor/eje	Rotor/veio	العضــو الــدوار/عمود الإدارة	轉子/軸	로터/샤프트
173	Screw	Tornillo	Parafuso	مسـمار ملولـب	螺絲	나사
173a	Washer	Arandela	Anilha	حلقـة إحكـام ربـط	墊片	워셔
176	Inner plug part	Pieza interior del conector	Parte interna do bujão	الجـزء الـداخلي للفـــابس	內插頭零件	안쪽 플러그 부분
181	Outer plug part	Pieza exterior del conector	Parte externa do bujão	الجـزء الخـارجي للفـــابس	外插頭零件	바깥쪽 플러그 부분
188a	Screw	Tornillo	Parafuso	مسـمار ملولـب	螺絲	나사
190	Lifting bracket	Soporte de izado	Suporte de elevação	كتيفـــة الـــرفع	吊環	리프팅 브래킷
193	Oil screw	Tornillo del aceite	Parafuso do óleo	مسـمار الزيـت	機油螺絲	오일 나사
193a	Oil	Aceite	Óleo	زيـت	機油	오일
194	Gasket	Junta	Junta	حشـية	密合墊片	개스킷
198	O-ring	Junta tórica	O-ring	حلقـة منـع تسـرب	O型環	O-링

Exploded views

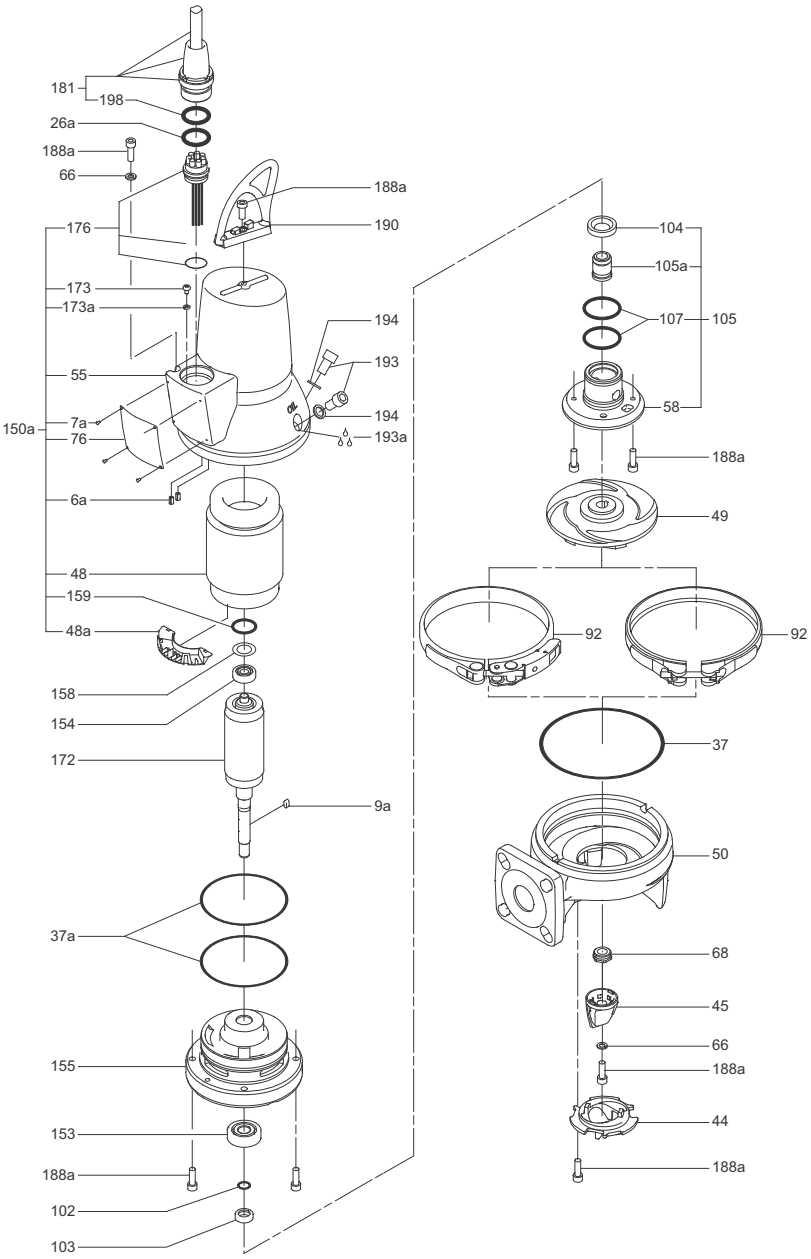

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Fig. 5 SEG, 0.9 to 1.5kW

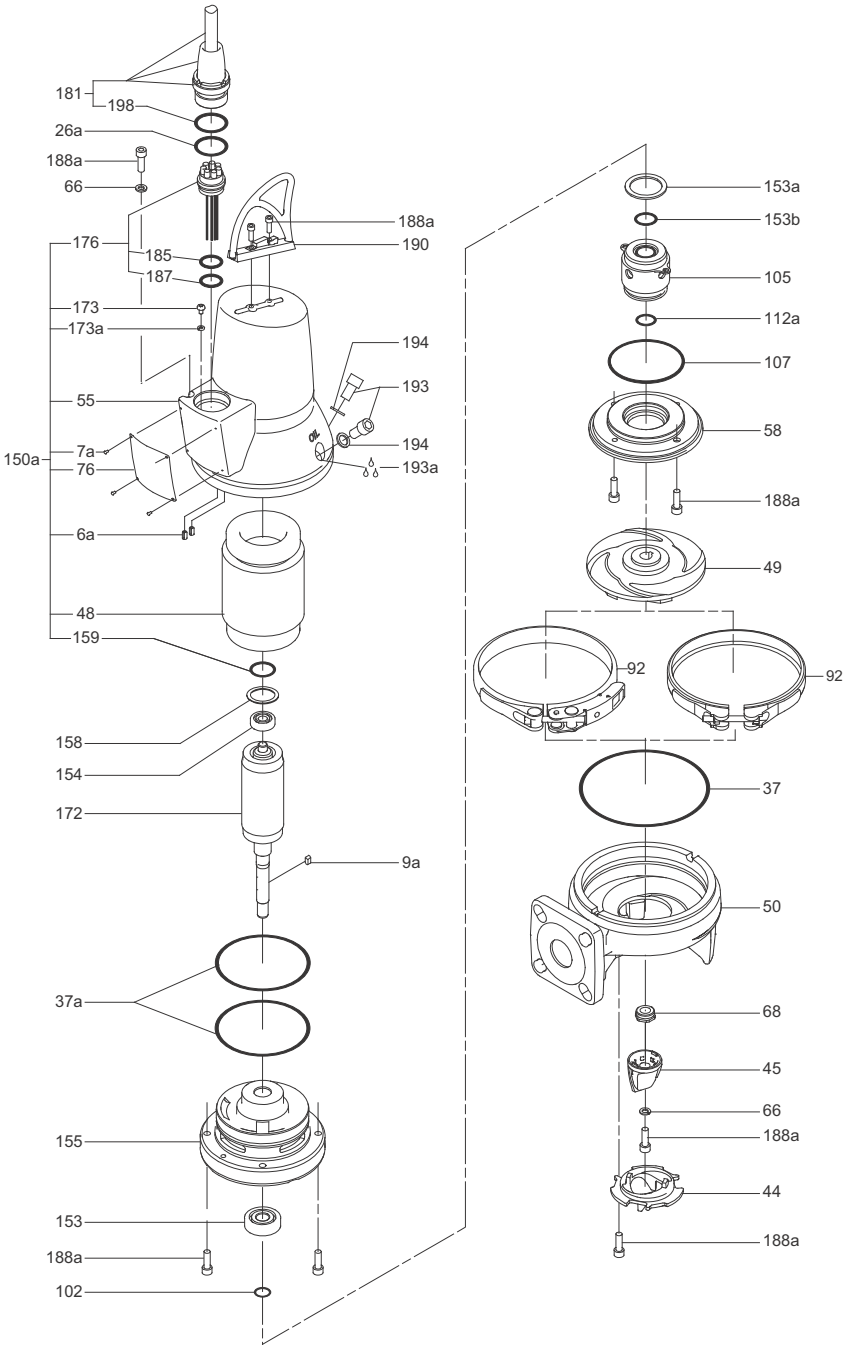

Fig. 6 SEG, 2.6 to 4.0 kW

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