

SEG pumps

0.9 - 4.0 kW, 50/60 Hz DIN



SEG

Installation and operating instructions

(all available languages)

<http://net.grundfos.com/qr/i/96076046>



SEG pumps

English (GB)

Installation and operating instructions	4
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English (GB) Installation and operating instructions

Original installation and operating instructions

Table of contents

1.	General information	4
1.1	General information	4
1.2	Hazard statements	4
1.3	Notes	5
2.	Product introduction	5
2.1	Product description	5
2.2	Applications	5
2.3	Identification	6
2.4	Approvals	8
2.5	Potentially explosive environments	9
3.	Receiving the product	10
3.1	Transporting the product	10
3.2	Handling and lifting the product	10
4.	Installing the product	11
4.1	Mechanical installation	11
4.2	Installation types	12
5.	Electrical connection	13
5.1	Wiring diagrams	14
5.2	Pump controllers	15
5.3	LC level controllers	15
5.4	Thermal switches	15
5.5	Moisture switch	16
5.6	Run and start capacitor	16
5.7	Frequency converter operation	16
6.	Startup	17
6.1	General startup procedure	17
6.2	Operating modes	18
6.3	Start and stop levels	19
6.4	Direction of rotation	19
6.5	Resetting the pump	20
7.	Maintenance and service	20
7.1	Contaminated pumps	21
7.2	Maintenance	21
7.3	Oil check and change	22
7.4	Adjusting the impeller clearance	22
7.5	Replacing the grinder system	23
7.6	Cleaning the pump housing	23
7.7	Checking or replacing the shaft seal	23
8.	Storage	25
9.	Fault finding the product	26
9.1	The pump does not start. The fuses blow or the motor-protective circuit breaker trips out immediately. Caution: Do not start again!	26

9.2	The pump starts, but the motor-protective circuit breaker trips after a short time.	26
9.3	The thermal switch trips after the pump is running for some time.	26
9.4	The pump operates at below-standard performance and the power consumption is increased.	27
9.5	The pump operates but delivers no liquid.	27
9.6	The pump is blocked.	27
10.	Technical data	28
10.1	Liquid temperature	28
10.2	Ambient temperature	28
10.3	Density of the pumped liquid	28
10.4	Sound pressure level	28
10.5	Electrical data	28
10.6	Winding resistances	28
11.	Disposing of the product	29

1. General information

1.1 General information



Read this document before you install the product. Installation and operation must comply with local regulations and accepted codes of good practice.



This appliance shall not be used by children.

Children shall not play with the appliance.

Cleaning and user maintenance shall not be carried out by children.

Appliances can be used by persons with reduced physical, sensory, or mental capabilities, as well as persons with a lack of experience and knowledge. This requires that they are given supervision or instruction concerning the use of the appliance in a safe way and that they understand the hazards involved.

1.2 Hazard statements

The symbols and hazard statements below may appear in Grundfos installation and operating instructions, safety instructions and service instructions.



DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious personal injury.



WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious personal injury.



CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate personal injury.

The hazard statements are structured in the following way:



SIGNAL WORD

Description of the hazard

Consequence of ignoring the warning

- Action to avoid the hazard.

1.3 Notes

The symbols and notes below may appear in Grundfos installation and operating instructions, safety instructions and service instructions.



Observe these instructions for explosion-proof products.



A blue or gray circle with a white graphical symbol indicates that an action must be taken.



A red or gray circle with a diagonal bar, possibly with a black graphical symbol, indicates that an action must not be taken or must be stopped.



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



Tips and advice that make the work easier.

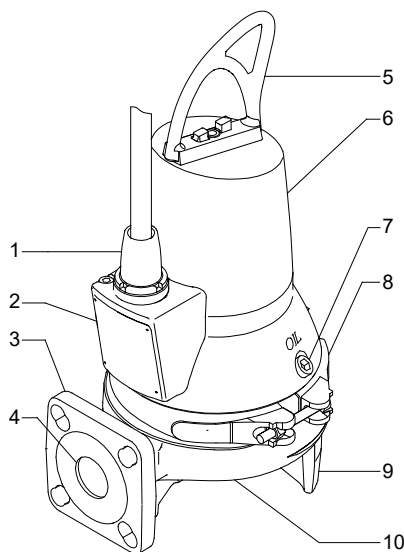
2. Product introduction

2.1 Product description

This manual includes instructions for installation, operation, and maintenance of Grundfos SEG submersible sewage and wastewater pumps with 0.9 to 4.0 kW motors. The SEG pumps are designed for pumping domestic, municipal and industrial sewage and wastewater.

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. SEG pumps are designed with a grinder system which grinds solid particles into small pieces. SEG pumps are used in pressurized systems.



TM065740

SEG pump

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

2.2 Applications

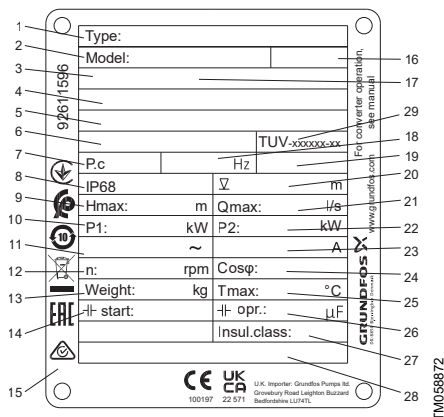
SEG pumps are designed for pumping the following liquids:

- domestic wastewater with discharge from toilets
- sewage from restaurants, hotels, camping sites, and similar areas.

2.3 Identification

Nameplate

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



Pos.	Description
21	Maximum flow rate [l/s]
22	Rated power output [kW]
23	Maximum current [A]
24	Cos ϕ , 1/1 load
25	Maximum liquid temperature [°C]
26	Run capacitor [μ F]
27	Insulation class
28	Country of production
29	TUV-certificate number

Nameplate

Pos.	Description
1	Type designation
2	Product number
3	EX approval marking
4	ATEX certificate number
5	UKEX certification number
6	IEC Ex certificate number
7	Production code, year and week
8	Enclosure class according to IEC 60529
9	Maximum head [m]
10	Rated input power [kW]
11	Rated voltage
12	Speed [rpm]
13	Net weight [kg]
14	Start capacitor [μ F]
15	Room for approval and informational logos
16	Safety instructions, publication number
17	Ex description
18	Frequency [Hz]
19	AUTOADAPT Y/N
20	Maximum installation depth [m]

Type key

Example: SEG.40.12.Ex.2.1.502

Code	Description	Designation
SE	Grundfos sewage pumps	Type range
G	Grinder system in the pump inlet	Impeller type
40	Nominal diameter of the outlet port	Pump outlet [mm]
50	Nominal diameter of the outlet port for high-flow variants	
09 12	P2 = code number from type designation / 10	Output power [kW]
[]	Standard version of submersible wastewater pumps	Pump version
Ex	Pump designed according to the IECEx/ ATEX/UKEX standards	
2	2-pole	Number of poles
1	Single-phase motor	Number of phases
[]	Three-phase motor	
5	50 Hz	Frequency [Hz] ¹⁾
6	60 Hz	
02	230 V, DOL	Voltage and starting method
03	208-230 V	
0B	400-415 V, DOL	
0C	230-240 V, DOL	
0G	380-400 V	
0H	460 V	
0M	200-230 V	
0L	575 V	
[]	1 st generation	Generation ²⁾
A	2 nd generation	
B	3 rd generation	
[]	Standard material (EN-GJL-200)	Pump material
Z	Custom-built pump	Customization

¹⁾ Maximum frequency in case of frequency converter operation.

²⁾ The pumps in the individual generations differ in design but are similar in terms of power rating.

2.4 Approvals

The standard version of SEG pumps is tested by VDE according to the Low Voltage Directive and approved by TÜV Rheinland LGA according to Construction Product Regulation.
The explosion-proof version is approved by DEKRA.

2.4.1 Europe

The explosion protection classification of the pumps is Europe & UK, CE 0344, UKCA 8505  II 2 G Ex db IIB T4/T3 Gb.

Directive or standard	Code	Description
ATEX & UKEX	CE 0344	CE marking of conformity according to the ATEX Directive 2014/34/EU. 0344 is the number of the notified body that has certified the quality system for ATEX.
	UKEX 8505	UKEX marking of conformity according to the UKEX Regulation 2016, UKSI 2016:1107. 8505 is the number of the approved body that has certified the quality system for UKEX.
		= Explosion protection mark.
	II	= Equipment group according to the ATEX Directive/UKEX Regulation, defining the requirements applicable to the equipment in this group.
	2	= Equipment category according to the ATEX Directive/UKEX Regulation, defining the requirements applicable to the equipment in this category.
	G	= Explosive atmosphere caused by gases, vapours or mists.
International (IEC) Standards	Ex	= Explosion protection marking.
	db	= Flameproof enclosure according to IEC 60079-1.
	IIB	= Classification of gases, see IEC 60079-0. Gas group B includes gas group A.
	T3	= The maximum surface temperature of the motor is 200 °C.
	T4	= The maximum surface temperature of the motor is 135 °C.
	Gb	= Equipment for explosive gas with "high" level of protection.

2.4.2 International (IEC)

For IEC countries, such as Australia, the pumps also have certificates by IEC standards, IECEx 18.0038X approved by DEKRA: Ex db IIB T4/T3 Gb.

 Only 50 Hz pumps are suitable for use in explosive environment.

2.5 Potentially explosive environments

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



Only 50 Hz pumps are suitable for use in explosive environment.



The pumps must under no circumstances pump combustible or flammable liquids.



The classification of the installation site must comply with local rules.



Before the first startup and after a long standstill period, make sure that the pump is filled with the pumped liquid.



The letter X in the certificate number indicates that the equipment is subject to special conditions for safe use. The conditions are mentioned in the certificate and in this installation and operating instructions. Special conditions for safe use of explosion-proof pumps:

1. Bolts used for replacement must be class A2-70 or better according to EN/ISO 3506-1.
2. The pump must not run dry. The level of pumped liquid must be controlled by two stop level switches connected to the motor control circuit. The pumps can only be used completely submerged.
3. Make sure that the cable is securely connected to the terminal board placed outside the potentially explosive area. The power cable plug can only be disconnected by the manufacturer or his representative.
4. The thermal protector in the stator windings has a rated cut-out temperature of 150 °C ensuring the disconnection of the power supply. The power supply must be reset manually.
5. The IP68 rating is limited to a maximum of 10 m submersion depth.
6. The temperature range is limited to -20 to +40 °C for ambient temperature and 0-40 °C for liquids.
7. Contact the manufacturer regarding the "d" protection type for pumps and for information on the dimensions of the flameproof joints.
8. The lock nut of the cable connector must only be replaced with an identical one.
9. Compliance with the standards EN 60079-14, EN 60079-17, and EN 60079-19 is a customer responsibility.

3. Receiving the product

Before installation, make sure:

- The product corresponds to the order.
- The pump is suitable for the supply voltage and frequency available at the installation site.
- Accessories or any other equipment are not damaged during transport.

3.1 Transporting the product

The pump may be transported and stored in a vertical or horizontal position.

CAUTION

Crushing hazard

Minor or moderate personal injury



- Make sure the pump cannot roll or fall over.

3.2 Handling and lifting the product

All lifting equipment must be rated for the purpose and checked for damage before lifting the pump. The lifting equipment rating must not be exceeded. The pump weight is indicated on the nameplate.

WARNING

Crushing hazard

Death or serious personal injury



- Do not stack pump packages or pallets on top of each other when lifting or moving them.
- Always lift the pump by its lifting bracket or by a forklift truck if the pump is fixed on a pallet. Never lift the pump by the power cable, hose, or pipe.

CAUTION

Sharp element

Minor or moderate personal injury



- Wear protective gloves when opening the pump package.



Keep the cable end protectors in storage for later use.

DANGER

Crushing hazard

Death or serious personal injury



- Make sure that the lifting bracket is tightened before lifting the pump.

WARNING

Crushing hazard

Death or serious personal injury



- When lifting the pump, make sure your hand cannot be caught between the lifting bracket and the hook.

WARNING

Crushing hazard

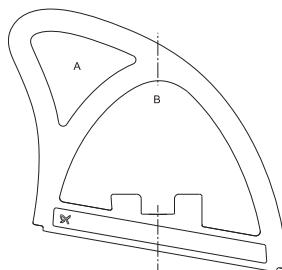
Death or serious personal injury



- Make sure that the hook is fixed properly to the lifting bracket.
- Always lift the pump by its lifting bracket or by a forklift truck if the pump is fixed on a pallet.
- Never lift the pump by the power cable, hose, or pipe.
- Make sure that the lifting bracket is tightened before lifting the pump.

When lifting the pump, use the right lifting point to keep the pump balanced:

- Place the lifting chain hook in point A for auto-coupling installations.
- For other installations, place it in point B.



Lifting points

TM060066

4. Installing the product



Do not install the pump more than 2000 metres above sea level.

All work in pits must be supervised by a person outside the pit.



Compliance with the standard EN 60079-14 is a customer responsibility.



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

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



Persons must not work in the installation area when the atmosphere is explosive.

DANGER

Electric shock

Death or serious personal injury



- It must be possible to lock the main switch in position 0. Type and requirements as specified in EN 60204-1.

DANGER

Electric shock

Death or serious personal injury



- Make sure there is at least 3 m free cable above the maximum liquid level.



Make all maintenance and service work when the pump is placed outside the pit.

4.1 Mechanical installation



Make sure the pit bottom is even before installing the product.

DANGER

Electric shock

Death or serious personal injury



- Switch off the power supply and lock the main switch in position 0.
- Switch off any external voltage connected to the product before working on it.

CAUTION

Hot surface

Minor or moderate personal injury



- Make sure that the pump has cooled down before touching it.

DANGER

Electric shock

Death or serious personal injury



- Before installing the pump and starting it up for the first time, check the power cable for visible defects to avoid short circuits.

CAUTION

Biological hazard

Minor or moderate personal injury



- Flush the pump thoroughly with clean water and rinse the pump parts after dismantling. Pits may contain sewage or wastewater with toxic and/or contagious substances.
- Wear appropriate personal protective equipment and clothing.
- Observe the local hygiene regulations in force.

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

Observe all safety regulations at the installation site.

Check the oil level in the oil chamber before installing the pump.

The pumps are suitable for different installation types.



The pump must be installed in a vertical position, in both auto-coupling or free-standing submerged installation.



The pumps are designed for intermittent operation. When completely submerged in the pumped liquid, the pumps can also operate continuously (S1).



Always use Grundfos accessories to avoid malfunctions due to incorrect installation.



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

CAUTION**Crushing hazard**

Minor or moderate personal injury



- Do not put your hands or any tool into the pump inlet or outlet port after the pump is connected to the power supply unless it is switched off by removing the fuses or switching off the main switch.
- Make sure that the power supply cannot be switched on unintentionally.

CAUTION**Sharp element**

Minor or moderate personal injury



- Do not touch the sharp edges of the impeller, grinder head, and grinder ring without wearing protective gloves.

CAUTION**Biological hazard**

Minor or moderate personal injury



- Make sure to seal the pump outlet properly when fitting the outlet pipe, otherwise, water may spray out.

4.2 Installation types

SEG pumps are designed for two installation types:

- submerged installation on auto coupling
- free-standing submerged installation

4.2.1 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.



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

Use loose flanges to ease the installation and to avoid pipe tension at the flanges and bolts.



Make sure that the pipes are installed without undue force. No loads from the weight of the pipes must be carried by the pump.



Do not use elastic elements or bellows in the pipes. Never use these elements to align the pipes.

Installation of auto-coupling guide-rail system

1. Drill mounting holes for the guide-rail bracket on the inside of the pit, and fasten the guide-rail bracket provisionally with two anchor bolts.
2. Place the auto-coupling base unit on the bottom of the pit. Use a plumb line to establish the correct positioning. Fasten the base plate or auto coupling base unit with heavy-duty anchor bolts. If the bottom of the pit is uneven, the auto-coupling base unit must be supported.
3. Connect the outlet pipe in accordance with the generally accepted procedures. Avoid exposing the pipe to distortion or tension.
4. Place the guide rails in the auto-coupling base unit, then adjust the length of the rails accurately to the guide-rail bracket at the top of the pit.
5. Unscrew the guide-rail bracket, fit it on the top of the guide rails and finally fasten it firmly to the pit wall.



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

6. Clean out debris from the pit before lowering the pump.
7. Fit the guide claw to the pump outlet. Grease the gasket of the guide claw before lowering the pump into the pit.
8. Slide the guide claw between the guide rails and lower the pump into the pit by a chain secured to the lifting bracket. When the pump reaches the auto-coupling base unit, the pump automatically connects. Shake the pump by 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 so the chain cannot come into contact with the pump housing.
10. Adjust the length of the power 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 cable is not sharply bent or pinched.
11. Connect the power cable and the control cable, if any.



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

4.2.2 Installation of hookup auto-coupling system

1. Fit a crossbar in the pit.
2. Fit the stationary part of the auto coupling on the top of the crossbar.

3. Fit the adapted piece of pipe for the movable part of the hookup auto coupling to the pump outlet.
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 the chain secured to the lifting bracket of the pump. When the movable part of the auto coupling reaches the stationary part, the two connect automatically. When the pump reaches the auto-coupling base unit, shake it by the chain to make sure that it is placed in the correct position.
7. Hang up the end of the chain on a suitable hook at the top of the pit, so the chain cannot come into contact with the pump housing.
8. Adjust the length of the power 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 cable is not sharply bent or pinched.
9. Connect the power- and the control cables, if any.



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

4.2.3 Free-standing, submerged installation

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

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

To facilitate service on the pump, fit a flexible union or coupling to the outlet pipe for easy separation.

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

If a rigid pipe is used, fit the parts in the following order:

1. union or coupling
2. non-return valve
3. isolating valve.

If the pump is installed in muddy conditions or on uneven ground, place it on a solid support.

1. Fit a 90° elbow to the pump outlet port and connect the outlet pipe or hose.
2. Lower the pump into the liquid by a chain secured to the lifting bracket. Place the pump on a plain, solid foundation. Make sure that the pump is hanging from the chain and not the cable. Make sure that the pump stands securely.

3. Hang up the end of the chain on a suitable hook at the top of the tank so the chain cannot come into contact with the pump housing.
4. Adjust the length of the power cable by coiling it up on a relief fitting. Ensure that the cable is not damaged during operation. Fasten the relief fitting to a suitable hook at the top of the tank. Make sure that the cable is not sharply bent or pinched.
5. Connect the power cable.



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



If several pumps are installed in the same pit, the pumps must be installed at the same level to ensure optimum pump alternation.

5. Electrical connection

Electrical connection must comply with local regulations.

DANGER

Electric shock

Death or serious personal injury



- Connect the pump to an external main switch which ensures all-pole disconnection with a contact separation according to EN 60204-1.
- It must be possible to lock the main switch in position 0.



Connect the pump to a control unit with a motor protection relay with IEC trip class 10 or 15.



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



The permanent installation must be fitted with an earth-leakage circuit breaker.



Make sure there are at least 3 m free cable above the maximum liquid level.

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

The classification of the installation site must comply with local rules.

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



The cross-section of the earth conductor must be at least 4 mm², such as type H07 V2-K (PVT 90°) yellow and green.

Make sure that the earth connection is protected against corrosion.

Make sure that all protective equipment is connected correctly.

Float switches used in potentially explosive environments must be approved for this application. They must be connected to the pump controller by an intrinsically safe barrier to ensure a safe circuit.

DANGER

Electric shock

Death or serious personal injury

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



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

The supply voltage and frequency are marked on the nameplate. For voltage tolerance, see the section Technical data. Make sure that the motor is suitable for the power supply available at the installation site.

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

DANGER

Electric shock

Death or serious personal injury

- Before the first startup of the pump, check the power cable for visible defects to avoid short circuits.



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

The pump must be connected to one of the following controller types:

- a control unit
- a Grundfos LC 231 or LC 241 pump controller.

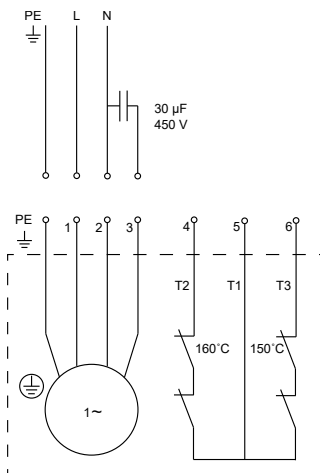
In potentially explosive environments, use one of the following:

- float switches made for an Ex environment and a safety barrier in combination with either DC, DCD or LC 231, or LC 241.
- air bells in combination with LC 231 or LC 241.



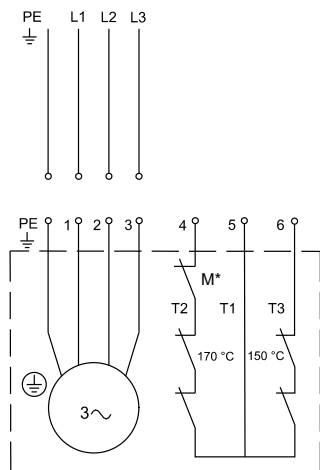
In case of single-phase pumps, an LC 241 or LC 242 controller must be used to comply with household standards.

5.1 Wiring diagrams



Wiring diagram for single-phase pumps

TM084165



TM065692

Wiring diagram for three-phase pumps

5.2 Pump controllers

The liquid level can be controlled by the Grundfos LC 231 and LC 241 level controllers. The pumps are protected by thermal switches connected to the LC controller.

5.3 LC level controllers

Suitable level controllers:

- LC 231: compact solution with certified motor protection for single- and dual-pump versions.
- LC 241: cabinet solution offering modularity and customization for single- and dual-pump versions.
- Dedicated Controls (DC): high-end cabinet solution for multi-pump versions up to 6 pumps.

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

Depending on the security and the number of the pumps, level switches can be used in the following setups:

- Dry run (optional)
- Stop
- Start pump 1 (single-pump version)
- Start pump 2 (dual-pump version)
- High level (optional)

An analogue level transmitter can be used and all levels can be customized. Level switches can be used with a level transmitter (one for dry and one for high level).

When installing the level switches, observe the following:

- To prevent air intake and vibrations, install the stop level switch so the pump is stopped before the liquid level is lowered to the middle of the motor housing.
- Install the start level switch so the pump is started at the required level. The pump must always be started before the liquid level reaches the bottom inlet pipe.
- Always install the high-level alarm switch about 10 cm above the start level switch. However, the alarm must always be given before the liquid level reaches the inlet pipe.

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



The pump must not run dry.

Install an additional level switch to ensure that the pump is stopped in case the stop level switch is not operating.

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



Float switches used in potentially explosive environments must be approved for this application. They must be connected to the Grundfos LC 231 or LC 241 level controller by an intrinsically safe barrier to ensure a safe circuit. In potentially explosive environments, the anti-seizing function must be disabled on pump controllers.

5.4 Thermal switches

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

The thermal switch in circuit 1 (T1-T3) breaks the circuit at the following approximate winding temperatures:

- 150 °C for three-phase pumps
- 125 °C for 1.5 kW, single-phase pumps.

This thermal switch must always be connected (T1-T3), and the pump must be switched off in case of thermal cutout.

The thermal switch in circuit 2 (T1-T2) breaks the circuit at the following approximate winding temperatures:

- 170 °C for three-phase pumps
- 160 °C for single-phase pumps
- 135 °C for 1.5 kW, single-phase pumps.



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

The thermal switch in circuit 2 (connection T1-T2) must be connected for manual restarting of these pumps.

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

When the thermal switches in standard pumps close the circuit after cooling, the pump is restarted automatically by the controller.

DANGER

Explosive environment

Death or serious personal injury



- Do not install the separate motor-protective circuit breaker or control unit in potentially explosive environments.

5.5 Moisture switch

Moisture switch is available as an option. In case of a moisture switch version, the sensor is connected to circuit 2 (T1-T2) in serial.

It opens if moisture is detected and breaks an electric circuit. The pump must be switched off and checked.

The maximum current and voltage on the moisture switches are limited to 0.5 A and 250 V.

5.6 Run and start capacitor

In case of single-phase pumps, connect a run and start capacitor to the control unit.

For capacitor sizes, see the table below:

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

5.7 Frequency converter operation

Grundfos SEG pumps are designed for frequency converter operation. However; due to application reasons, frequency converter operation is not recommended.

To avoid sedimentation in the pipes, operate the speed-controlled pump at above 1 m/s flow rate.

For frequency converter operation, observe the following:

- Before installing a frequency converter, calculate the lowest permissible frequency in the installation to avoid zero flow.
- Do not reduce the motor speed to less than 35 Hz.
- Let the pump run at the rated speed at least 2-3 times a day for 5-10 minutes to prevent sedimentation in the piping system.
- Do not exceed the frequency indicated on the nameplate. Neglecting this poses the risk of motor overload.

- Keep the power cable as short as possible. The peak voltage increases with the length of the power cable. See the data sheet of the selected frequency converter.
- Use input and output filters on the frequency converter. See the data sheet of the selected frequency converter.
- Use screened power cable if there is a risk that electrical noise can disturb other electrical equipments. See the data sheet of the selected frequency converter. The screened power cable should be ordered additionally.
- The thermal protection of the motor must be connected.
- The minimum switching frequency is 2.5 kHz.
- Peak voltage and dU/dt must be in accordance with the table below. The values stated are maximum values supplied to the motor terminals. The cable influence is not taken into account. See the frequency converter data sheet regarding the actual values and the cable influence on the peak voltage and dU/dt .

Maximum repetitive peak voltage [V]	Maximum dU/dt U_N 400 V [V/μ sec.]
850	2000

- In case of an Ex-approved pump, check if the Ex certificate of the specific pump allows the use of a frequency converter.
- Set the frequency converter U/f ratio according to the motor data.
- Local regulations and standards must be fulfilled.

When operating the pump by a frequency converter, consider the following:

- The locked-rotor torque will be lower, depending on the frequency converter type. See the installation and operating instructions of the selected frequency converter.
- The noise level may increase. See the installation and operating instructions of the selected frequency converter.



Frequency converter use may reduce the lifespan of the bearings and the shaft seal, depending on operating mode and other circumstances.



Information about pump speed/torque curves when operated by frequency converter, can be found at Grundfos Product Center.

For further information about the frequency converter operation, see the data sheet and the installation and operating instructions for the selected frequency converter.

6. Startup

CAUTION

Crushing of hands

Minor or moderate personal injury



- Do not put your hands or any tool into the pump inlet or outlet port after the pump is connected to the power supply unless it is switched off.
- Make sure that the power supply cannot be switched on unintentionally.

CAUTION

Biological hazard

Minor or moderate personal injury



- Make sure to seal the pump outlet properly when fitting the outlet pipe, otherwise water may spray out of the sealing.

WARNING

Crushing hazard

Death or serious personal injury



- When lifting the pump, make sure your hand cannot be caught between the lifting bracket and the hook.

DANGER

Crushing hazard

Death or serious personal injury



- Make sure that the hook is fixed properly to the lifting bracket.
- Always lift the pump by its lifting bracket or by a forklift truck if the pump is fixed on a pallet.
- Never lift the pump by the power cable, hose, or pipe.
- Make sure that the lifting bracket is tightened before lifting the pump.

DANGER

Electric shock

Death or serious personal injury



- Before starting up the product for the first time, check the power cable for visible defects to avoid short circuits.
- If the power cable is damaged, it must be replaced by the manufacturer, his service agent, or a similarly qualified person.
- Make sure that the product is earthed properly.
- Switch off the power supply and lock the main switch in position 0.
- Switch off any external voltage connected to the product before working on it.

CAUTION

Biological hazard

Minor or moderate personal injury



- Flush the pump thoroughly with clean water and rinse the pump parts after dismantling. Pits may contain sewage or wastewater with toxic and/or contagious substances.
- Wear appropriate personal protective equipment and clothing.
- Observe the local hygiene regulations.

CAUTION

Hot surface

Minor or moderate personal injury



- Do not touch the surface of the pump while it is running.



Do not open the clamp while the pump is running.

6.1 General startup procedure



The pump must not run dry.



If the environment is potentially explosive, use only Ex-approved pumps.

1. Remove the fuses, and check that the impeller can rotate freely. Turn the grinder head by hand.
2. Check the condition of the oil in the oil chamber. See the section Checking the oil level.

- 3. Check if the monitoring units are operating.
- 4. Check the setting of the air bells, float switches, or electrodes.
- 5. Open the isolating valves, if fitted.
 - a. **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.
 - a. **Auto coupling:**Check that the pump is in the right position on the auto-coupling base unit.
- 7. Check that the system is filled with liquid and vented. The pump is self-venting.
- 8. Switch on the power supply. When power is on, the pump starts and pumps down to the dry-running level.

After one week of operation following the replacement of the shaft seal, check the condition of the oil in the chamber. See section Servicing the product.



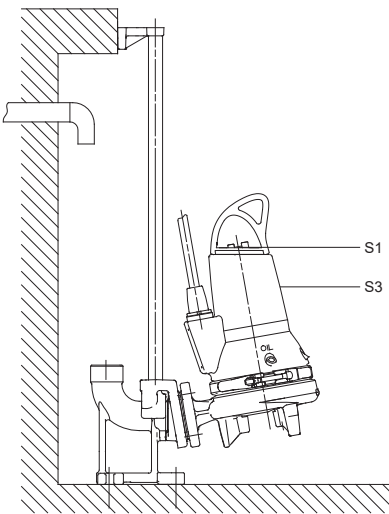
To remove trapped air from the pump housing, tilt the pump by the lifting chain during operation.



In case of abnormal noise or vibrations, stop the pump immediately. Do not restart the pump until the cause of the fault is identified and eliminated.

6.2 Operating modes

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



TM065749

Operating levels

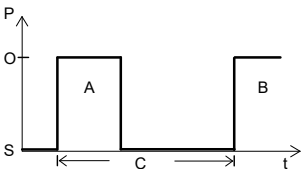


Explosion-proof pumps must not be used lower than the S1 level as shown above.

S3, intermittent operation

S3 operation is a series of 10-minute duty cycles (TC): the pump must run for a maximum of 4 minutes and stop for a minimum of 6 minutes. Thermal equilibrium is not reached during the cycle.

In this operating mode, the pump is partly submerged in the surrounding liquid. The minimum liquid level (S3) is at the top of the cable entry.



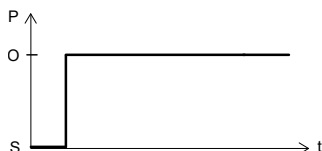
TM044527

S3 operation

Pos.	Description
O	Operation
S	Stop
C	10 min.

S1, continuous operation

In this operating mode, the pump can operate continuously without being stopped for cooling. When the pump is completely submerged, it is sufficiently cooled by the surrounding liquid.



TM044528

S1 operation

Pos.	Description
O	Operation
S	Stop

6.3 Start and stop levels

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

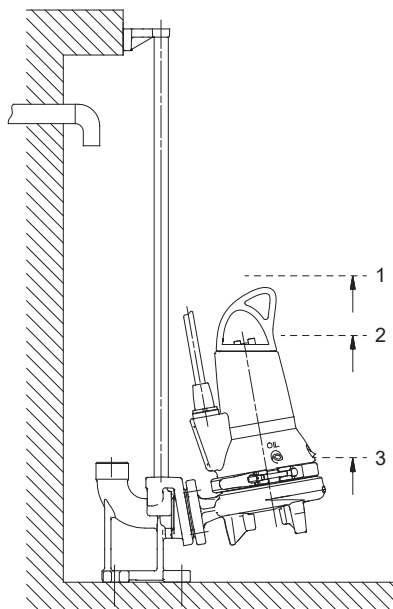
Long free cable = large difference in level.

Short free cable = small difference in level.

- Install the stop level switch to prevent air intake and vibrations, so the pump is stopped before the liquid level is lowered to the upper edge of the clamp.
- Install the start level switch, so the pump is started at the required level. The pump must always be started before the liquid level reaches the bottom inlet pipe to the pit.



CU 100 must not be used for Ex applications.



TM065741

Start and stop levels

Pos.	Description
1	Alarm
2	Start
3	Stop

6.4 Direction of rotation



To check the direction of rotation, the pump may be started for a very short period without being submerged.



Checking of the direction must be done outside of the hazardous area.

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 indicates the correct direction of rotation.



The impeller rotates clockwise. When started, the pump jerks counterclockwise.

If the direction of rotation is wrong, interchange two phases in the power cable.

Checking the direction of rotation

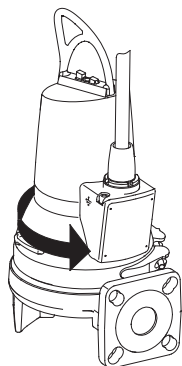
Check the direction of rotation when the pump is connected to a new installation.

Procedure 1:

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

Procedure 2:

1. Let the pump hang from a lifting device, such as 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 jerks counterclockwise.
4. If the direction of rotation is wrong, interchange two phases in the power cable.



Jerk direction

6.5 Resetting the pump

To reset the pump, switch off the power supply for one minute, and switch it on again.

7. Maintenance and service

DANGER

Electric shock

Death or serious personal injury



- Before starting work on the pump, make sure that the fuses are removed or the main switch is switched off.
- Make sure that the power supply cannot be switched on unintentionally.

CAUTION

Crushing hazard

Minor or moderate personal injury



- Do not put your hands or any tool into the pump inlet or outlet port after the pump is connected to the power supply unless it is switched off.
- Make sure that all the rotating parts have stopped moving.

CAUTION

Sharp element

Minor or moderate personal injury



- Do not touch the sharp edges of the impeller, grinder head and grinder ring without protective gloves.

CAUTION

Biological hazard

Minor or moderate personal injury



- Make sure to seal the pump outlet properly when fitting the outlet pipe, otherwise water may spray out.

CAUTION

Hot surface

Minor or moderate personal injury



- Do not touch the surface while the pump is running.

WARNING

Crushing hazard

Death or serious personal injury



- When lifting the pump, make sure your hand cannot be caught between the lifting bracket and the hook.

TM065811

DANGER**Crushing hazard**

Death or serious personal injury



- Make sure that the hook is fixed properly to the lifting bracket.
- Always lift the pump by its lifting bracket or by a forklift truck if the pump is fixed on a pallet.
- Never lift the pump by the power cable, hose or pipe.
- Make sure that the lifting bracket is tightened before lifting the pump.

DANGER**Electric shock**

Death or serious personal injury



- Before installing the pump and starting it up for the first time, check the power cable for visible defects to avoid short circuits.
- If the power cable is damaged, it must be replaced by the manufacturer, his service agent or a similarly qualified person.
- Make sure that the product is earthed properly.
- Switch off the power supply and lock the main switch in position 0.
- Switch off any external voltage connected to the pump before working on it.

CAUTION**Biological hazard**

Minor or moderate personal injury



- Flush the pump thoroughly with clean water and rinse the pump parts after dismantling. Pits may contain sewage or wastewater with toxic and/or contagious substances.
- Wear appropriate personal protective equipment and clothing.
- Observe the local hygiene regulations.

CAUTION**Pressurised system**

Minor or moderate personal injury



- The oil chamber may be under pressure. Loosen the screws carefully and do not remove them until the pressure has been fully relieved.

Before carrying out maintenance and service, flush the pump thoroughly with clean water and rinse the pump parts after dismantling.



If the pump is inactive for longer periods, check its function.



If the pump is inactive for a longer period (more than 1-3 months), inspect the free rotation of the shaft by rotating it by hand. In case of any seizing, refer to the section Maintenance.



Service videos can be found on Grundfos Product Center at www.grundfos.com.



The power cable must be replaced by Grundfos or an authorised service workshop.



All service work must be carried out by Grundfos or an authorised service workshop approved for servicing explosion-proof products.

7.1 Contaminated pumps**CAUTION****Biological hazard**

Minor or moderate personal injury



- Flush the pump thoroughly with clean water and rinse the pump parts after dismantling.

The product is classified as contaminated if it is used for contagious or toxic liquid.

Contact Grundfos with details about the pumped liquid before returning the product for service. Otherwise, Grundfos can refuse to accept the product.

Any application for service must include details about the pumped liquid.

Clean the product in the best possible way before returning it.

7.2 Maintenance

Compliance with the standards EN 60079-17 and EN 60079-19 is a customer responsibility.

Inspect pumps running normal operation 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:

- **Power consumption**
See the nameplate.

- **Oil level and 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 equivalent type. Oil auto-ignition temperature must be above 180 °C.

- **Cable entry**



Make sure that the cable entry is watertight and the cables are not sharply bent or pinched.

- **Pump parts**

Check the wearing parts and replace the defective ones.

- **Ball bearings**

Check the shaft for noisy or heavy operation by turning 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 an authorized service workshop. Bearings are lubricated for a lifetime.

- **Grinder system and parts**

In case of frequent choke-ups, check the grinder system for visible wearing. If necessary, replace the grinder system.

7.3 Oil check and change

Change the oil in the oil chamber every 3000 operating hours or at least once a year or if the shaft seal is replaced. The table below indicates the oil quantity in the oil chamber.

In case of the drained oil contains water, check and replace the shaft seal.

Pump type	Quantity of oil in the oil chamber [l]
SEG up to 1.5 kW	0.17
SEG 2.6 - 4.0 kW	0.42

Draining of oil

CAUTION

Pressurised system

Minor or moderate personal injury



- The oil chamber may be under pressure. Loosen the screws carefully and do not remove them until the pressure is completely relieved.

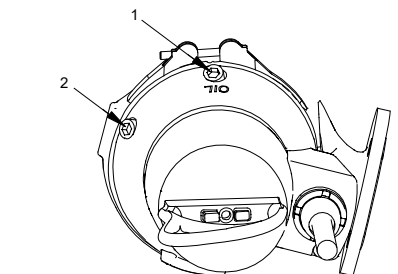
1. Loosen and remove both oil screws to allow all the oil to drain from the chamber.
2. Check the oil for water and impurities. If the shaft seal is removed, the oil indicates the condition of the shaft seal.



Dispose of used oil in accordance with local regulations.

Oil filling, pump in a horizontal position

1. Place the pump horizontally on the stator housing and make sure the outlet flange and 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.
3. Fit both oil screws with the gaskets included in the O-ring service kit.



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Oil filling holes

Pos.	Description
1	Oil filling
2	Oil level

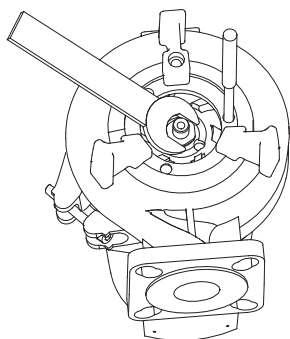
Oil filling, pump in a vertical position

1. Place the pump on a plain, horizontal surface.
2. Fill the oil into the oil chamber through one of the holes until it starts running out of the other hole. Fit both oil screws with the gaskets included in the O-ring service kit.

7.4 Adjusting the impeller clearance

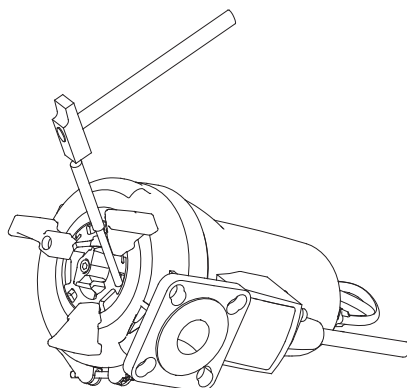
For position numbers in brackets, see the Exploded view.

1. Gently tighten the adjusting nut (68) until the impeller (49) cannot rotate anymore. Use a spanner size 24.
2. Loosen the adjusting nut by 1/4 turn.



Adjusting the impeller clearance

TM065747



TM065746

Removing the grinder ring

7.5 Replacing the grinder system

CAUTION

Sharp element

Minor or moderate personal injury



- Wear protective gloves when touching the sharp edges of the impeller, grinder head, and grinder ring.



During service, the painted surface may be damaged. Apply new paint if necessary.

For position numbers in brackets, see the Exploded view.

Dismantling

1. Loosen the screw (188a) in one of the pump feet.
2. Loosen the grinder ring (44), and open the bayonet socket by knocking or turning the grinder ring 15 to 20° clockwise.
3. Gently pry the grinder ring (44) out of the pump housing with a screwdriver.



Make sure that the grinder ring does not get stuck against the grinder head.

4. Insert a punch into the hole in the pump housing to hold the impeller.
5. Remove the screw (188a) in the shaft end and the locking ring (66).
6. Remove the grinder head (45).

Assembly

1. When fitting the grinder head (45), the projections on the back of the grinder head must engage with the holes in the impeller (49).
2. Tighten the screw (188a) for the grinder head to 20 Nm. Do not forget the lock washer.
3. Fit the grinder ring (44).
4. Turn the grinder ring (44) 15 to 20° counterclockwise until it is tightened.
5. Check that the grinder ring does not touch the grinder head.
6. Tighten the screw (188a) to 20 Nm.

7.6 Cleaning the pump housing

For position numbers in brackets, see the Exploded view.

Dismantling

1. Adjust the pump vertically.
2. Loosen and remove the clamp (92) joining the pump housing and the motor.
3. Lift the motor out of the pump housing (50). As the impeller and grinder head are fastened to the shaft end, the impeller and the grinder head are removed together with the motor.
4. Clean the pump housing and the impeller.

Assembly

1. Place the motor with the impeller and the grinder head in the pump housing.
2. Fit and tighten the clamp (92).

7.7 Checking or replacing the shaft seal

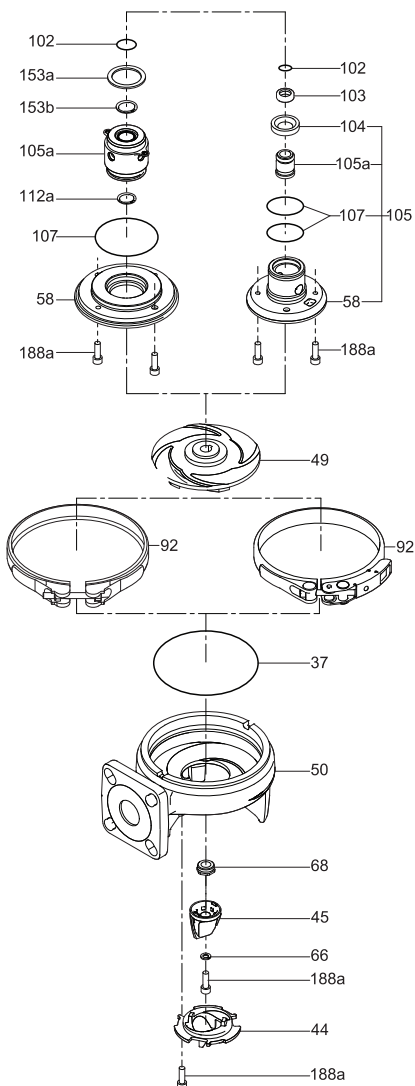
To make sure that the shaft seal is intact, check the oil.

If the oil contains water, the shaft seal is defective and must be replaced. If the shaft seal is still used, the motor can be damaged.

If the oil is clean, it can be reused.

For position numbers in brackets, see the Exploded view.

1. Remove the grinder ring (44).
2. Remove the screw (188a) from the shaft end.
3. Loosen and remove the clamp (92).
4. Lift the motor out of the pump housing (50). As the impeller and grinder head are fastened to the shaft end, the impeller and the grinder head can be removed together with the motor.
5. Remove the screw (188a) from the shaft end.
6. Remove the grinder head (45).
7. Remove the impeller (49) from the shaft.
8. Drain the oil from the oil chamber. The shaft seal is a complete unit for all pumps.
9. Remove the screws (188a) securing the shaft seal (105).
10. Lift the shaft seal (105) out of the oil chamber with the lever principle using the two dismantling holes in the shaft seal carrier (58) and two screwdrivers.
11. Check the condition of the bush (103) where the secondary seal of the shaft seal touches the bush. The bush must be intact. If the bush is worn and must be replaced, the pump must be checked by Grundfos or an authorised service workshop. If the bush is intact, proceed as follows:
 - a. Check and clean the oil chamber.
 - b. Lubricate the surfaces in contact with the shaft seal with oil.
 - c. Insert the new shaft seal (105) using the plastic bush included in the kit.
 - d. Tighten the screws (188a) securing the shaft seal to 20 Nm.
 - e. Fit the impeller and the grinder head. Make sure that the key (9a) is fitted correctly.
 - f. Place the motor with the impeller and grinder head in the pump housing (50).
 - g. Fit and tighten the clamp (92).
 - h. Fill the oil chamber with oil.



8. Storage

During long periods of storage, protect the pump against moisture and heat.

After a long period of storage (1-3 months), rotate the shaft of the pump at least once a month to avoid seizing internal parts.

After a long period of storage, inspect the pump before putting it into operation. Make sure that the impeller can rotate freely. Pay attention to the condition of the shaft seal and the cable entry.

Storage temperature: - 20 to + 40 °C.

A product that is not indicated to be protected against freezing shall not be left outside in freezing weather conditions.

9. Fault finding the product



Observe all regulations applying to pumps installed in potentially explosive environments.
Make sure that no work is carried out in a potentially explosive atmosphere.



Before diagnosing any fault, make sure:

- The fuses are removed or the main switch is switched off.
- The power supply cannot be switched on unintentionally.
- All rotating parts have stopped moving.

9.1 The pump does not start. The fuses blow or the motor-protective circuit breaker trips out immediately. **Caution: Do not start again!**

Cause	Remedy
Power supply failure, short circuit, or earth leakage in the power cable or the motor windings.	• Have the power cable and motor checked and repaired by a qualified electrician.
The fuses blow due to the use of incorrect fuses.	• Install the correct fuses.
The impeller is blocked by impurities.	• Clean the impeller.
The air bells, the float switches, or the electrodes are out of adjustment or defective.	• Readjust or replace the air bells, float switches, or electrodes.

9.2 The pump starts, but the motor-protective circuit breaker trips after a short time.

Cause	Remedy
Low setting of the thermal relay in the motor-protective circuit breaker.	• Set the relay in accordance with the specifications on the nameplate.
Increased current consumption due to large voltage drop.	• Measure the voltage between two motor phases. Tolerance: $-10\% \pm 6\%$. Re-establish the correct voltage supply.
The impeller is blocked by impurities. Increased current consumption in all three phases.	• Clean the impeller.
The impeller clearance is incorrect.	• Readjust the impeller.

9.3 The thermal switch trips after the pump is running for some time.

Cause	Remedy
The liquid temperature is too high.	• Reduce the liquid temperature.
The liquid viscosity is too high.	• Dilute the liquid.
Wrong electrical connection. (If the pump is star-connected to a delta connection, it results in very low undervoltage).	• Check and correct the electrical installation.

9.4 The pump operates at below-standard performance and the power consumption is increased.

Cause	Remedy
The impeller is blocked by impurities.	Clean the impeller.
The direction of rotation is wrong.	Check the direction of rotation. If it is incorrect, interchange two phases in the power cable.

9.5 The pump operates but delivers no liquid.

Cause	Remedy
The outlet valve is closed or blocked.	Check the outlet valve and open or clean it, if necessary.
The non-return valve is blocked.	Clean the non-return valve.
There is air in the pump.	Vent the pump.

9.6 The pump is blocked.

Cause	Remedy
The grinder system is worn.	Replace the grinder system.

10. Technical data

Operating conditions

SEG pumps are designed for intermittent operation (S3). When completely submerged in the pumped liquid, the pumps can also operate continuously (S1).

Operating pressure	Maximum 6 bar
Number of starts per hour	Maximum 30
pH value	In permanent installations, between 4-10

Installation depth

Maximum 20 m below liquid level.



Ensure a minimum power cable length of the installation depth plus 3 meters.

10.1 Liquid temperature

0-40 °C.

For short periods (maximum 10 minutes), a temperature of up to 60 °C is permissible. This applies to standard versions only.



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

10.2 Ambient temperature

The allowed ambient temperature is -20 to +40 °C.



For explosion-proof pumps with WIO sensor, the ambient temperature at the installation site must be within 0-40 °C.

10.3 Density of the pumped liquid

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

10.4 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.

10.5 Electrical data

50 Hz

	1 × 230 V - 10 ± 6 %, 50 Hz
Power supply	3 × 230 V - 10 ± 6 %, 50 Hz
	3 × 400 V - 10 ± 6 %, 50 Hz
Enclosure class	IP68, according to IEC 60529
Insulation class	F (155 °C)

60 Hz

	1 × 208-230 V - 10 %/+ 6 %, 60 Hz
	3 × 200-230 V - 10 %/+ 6 %, 60 Hz
Power supply	3 × 380-400 V - 10 %/+ 6 %, 60 Hz
	3 × 460 V - 10 %/+ 6 %, 60 Hz
	3 × 575 V - 10 %/+ 6 %, 60 Hz
Enclosure class	IP68, according to IEC 60529
Insulation class	F (155 °C)

10.6 Winding resistances

50 Hz / 60 Hz

Motor size [kW]	Single-phase motor	
	Starting winding	Main winding
0.9 - 1.2	4.5 Ω	2.75 Ω
1.5	4.1 Ω	2.9 Ω
Three-phase motor		
	3 × 230 V	3 × 400 V
0.9 - 1.5	6.8 Ω	9.1 Ω
2.6	3.4 Ω	4.56 Ω
3.1 - 4.0	2.52 Ω	3.36 Ω

The table values do not include the cable. Resistance in cable: 2 × 10 m, approximately 0.28 Ω.

11. Disposing of the product

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.



The crossed-out wheeled bin symbol on a product means that it must be disposed of separately from household waste. When a product marked with this symbol reaches its end of life, take it to a collection point designated by the local waste disposal authorities. The separate collection and recycling of such products will help protect the environment and human health.

See also end-of-life information at www.grundfos.com/product-recycling.

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