

# SE1 50, 80, 100-SEV 65, 80, 100

Installation and operating instructions





## SE1 50, 80, 100-SEV 65, 80, 100

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## English (GB) Installation and operating instructions

### Original installation and operating instructions

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## 1. General information

### 1.1 General information

This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved.

Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.



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

### 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 grey circle with a white graphical symbol indicates that an action must be taken.



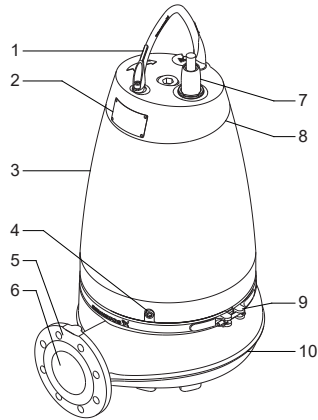
A red or grey circle with a diagonal bar, possibly with a black graphical symbol, indicates that an action must not be taken or must be stopped.



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**

*SE pump*

Pos.	Description
1	Lifting bracket
2	Nameplate
3	Sleeve
4	Oil screw
5	Outlet flange
6	Outlet opening
7	Cable plug
8	Top cover
9	Clamp
10	Pump housing

TM065987

## 2.2 Intended use

The SE1 and SEV pumps are designed for transferring wastewater, process water and unscreened raw sewage in heavy-duty municipal, utility and industrial applications.

The pumps are available with S-tube® or SuperVortex impellers allowing the free passage of solids up to 100 mm.

The pumps can be used in permanent, dry- or submerged installations on auto-coupling systems. The pumps are also suitable for free-standing installations or as portable pumps.

## 2.3 Pumped liquids

The standard cast iron versions are designed for pumping the following liquids:

- large quantities of drainage, surface and storm water
- domestic wastewater with discharge from toilets
- wastewater with a high content of fibres (SuperVortex impeller)
- industrial process water
- wastewater with gaseous sludge
- municipal and commercial sewage and wastewater.

### Stainless steel versions

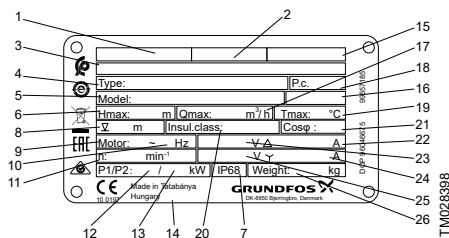
The stainless steel versions are suitable for pumping the following liquids:

- industrial process water containing chemicals
- aggressive or corrosive drain water and effluent
- wastewater containing abrasives
- seawater contaminated with wastewater.

## 2.4 Identification

### 2.4.1 Nameplate

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



Nameplate

Pos.	Description
1	Approved body and explosion protection classification
2	EU Explosion protection certificate number
3	Explosion protection mark
4	Type designation
5	Product number
6	Maximum head [m]
7	Enclosure class
8	Maximum installation depth [m]
9	Number of phases
10	Frequency [Hz]
11	Speed [min <sup>-1</sup> ]
12	Motor input power P1 [kW]
13	Motor output power P2 [kW]
14	Country of production
15	UK Explosion protection certificate number
16	Standard for wastewater lifting stations for buildings and installation sites
17	Maximum flow rate [m <sup>3</sup> /h]
18	Production code (year/week)
19	Maximum liquid temperature [°C]
20	Insulation class
21	Power factor
22	Rated current [A], delta connection
23	Rated voltage [V], delta connection
24	Rated current [A], star connection
25	Rated voltage [V], star connection
26	Net weight [kg]

## 2.4.2 Type key

Example: **SE1.80.80.40.A.Ex.4.51D.B**

Code	Explanation	Designation
SE	Sewage and wastewater pump	Pump type
1	S-tube® impeller	Impeller type
V	SuperVortex impeller	
80	Maximum solids size [mm]	Pump passage
80	Nominal diameter [mm]	Pump outlet
40	Output power P2/10	Power [kW]
[ ]	Standard (without sensor)	Sensor version
A	Sensor version	
[ ]	Non-explosion-proof pump (standard)	Pump version
Ex	Explosion-proof pump	
2	2-pole	Number of poles
4	4-pole	
50	50 Hz	Frequency [Hz] <sup>1)</sup>
0B	400-415 V, DOL	Voltage and starting method
0D	380-415 V, DOL	
1D	380-415 V, Y/D	
0E	220-240 V, DOL	
1E	220-240 V, Y/D	
[ ]	First generation	Generation <sup>2)</sup>
B	Second generation	
[ ]	Cast iron impeller, pump housing and top cover	Pump materials
Q	Stainless steel impeller, cast iron pump housing and top cover	
R	Entire pump of stainless steel	
D	Stainless steel	
Z	Custom-built products	Customisation

1) Maximum frequency in case of frequency-converter operation.

2) The generation code distinguishes between pumps of different design but with the same power rating.

## 2.5 Approvals

SE1 and SEV pumps have been tested by Dekra/ KEMA. The explosion-proof version holds the following examination certificates:

- ATEX(EU): KEMA 04ATEX2201X
- IECEX: IECEX DEK 21.0017X.

All certificates are issued by Dekra. The standard versions of SE1 and SEV pumps are tested by VDE.

### 2.5.1 Approval standards


The standard variants are approved by TÜV Rheinland (LGA) approved body under the Construction Products Directive according to EN 12050-1 or EN 12050-2 as specified on the nameplate.



## 2.5.2 Explanation of the Ex approval

The SE1 and SEV pumps have the following explosion protection classifications:

- CE 0344  II 2 GD Ex db eb h mb IIB T4 / T3 Gb; Ex h mb tb IIIC T135 °C / 200 °C Db.

Directive or standard	Code	Description
	CE 0344	CE marking of conformity according to ATEX directive 2014/34/EU. 0344 is the number of the approved body which has certified the quality system for ATEX.
		The equipment conforms to harmonised European standard.
ATEX	II	Equipment group according to the ATEX Directive, defining the requirements applicable to the equipment in this group
	2	Equipment category according to the ATEX Directive, defining the requirements applicable to the equipment in this category
	G	Explosive atmosphere caused by gases, vapours or mists
	D	Explosive atmosphere caused by dust
	Ex	Marking of explosion protection
Harmonised European standard	h	Constructional safety (c) and Liquid immersion (k) according to EN ISO 80079-36 and EN ISO 80079-37
	db	Flameproof enclosure according to EN 60079-1
	eb	WIO sensor protection according to EN 60079-7
	mb	WIO sensor encapsulation according to EN 60079-18
	IIB	Classification of gases, see EN 60079-0. Gas group B includes gas group A.
	T4/T3	The maximum surface temperature is T4 (135 °C) in direct-drive pumps and T3 (200 °C) in pumps operated by frequency converter, according to EN 60079-0 <sup>1</sup> .
	Gb	Suitable for use in explosive gas atmospheres in zone 1 and zone 2
	tb	Protection by enclosure EN 60079-31
	IIIC	Conductive dust
	T135 °C / T200 °C	The maximum surface temperature is 135 °C in direct-drive pumps and 200 °C in pumps operated by frequency converter, according to EN 60079-0 <sup>1</sup> .
	Db	Suitable for use in explosive dust atmospheres in zone 1 and zone 2

<sup>1</sup> For motors connected to a frequency converter, the maximum surface temperature T3 is 200 °C.

### 2.5.3 Australia and New Zealand

Explosion-proof variants for Australia are approved as Ex nA II T3 according to IEC 60079-15 (corresponding to AS 2380.9).

Standard	Code	Description
IEC 60079-15:1987	Ex	Area classification according to AS 2430.1
	nA	Non-sparking according to AS 2380.9:1991, section 3 (IEC 79-15:1987)
	II	Suitable for use in explosive atmospheres (not mines)
	T3	Maximum surface temperature is 200 °C
	X	The letter X in the certificate number indicates that the equipment is subject to special conditions for safe use.

Standard	Code	Description
IEC Standard	Ex	Area classification according to IEC 60079-10-1
	h	Constructional safety "c" and Liquid immersion "k" according to ISO 80079-36 and ISO 80079-37
	db	Flameproof enclosure according to IEC 60079-1.
	eb	WIO sensor protection according to IEC 60079-7
	mb	WIO sensor encapsulation according to IEC 60079-18.
	II B	Classification of gases, see IEC 60079-0:2017. Gas group B includes gas group A.
	T4/T3	The maximum surface temperature is T4 (135 °C) in direct-drive pumps and T3 (200 °C) in pumps operated by frequency converter, according to EN 60079-0. <sup>1</sup>
	Gb	Equipment protection level.
	tb	Protection by enclosure EN 60079-31
	IIIC	Conductive dust
	T135 °C / T200 °C	The maximum surface temperature is 135 °C in direct-drive pumps and 200 °C in pumps operated by frequency converter, according to EN 60079-0. <sup>1</sup>
Db	Suitable for use in explosive dust atmospheres in zone 1 and zone 2	

<sup>1</sup> For motors connected to a frequency converter, the maximum surface temperature T3 is 200 °C.

## 2.6 Potentially explosive environments

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




SE1 and SEV pumps must under no circumstances pump combustible liquids.



The classification of the installation site must be defined by the owner.

Special conditions for safe use of explosion-proof pumps:

1. Make sure the moisture switch 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 the pumped liquid must be controlled by 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. The pumps have an ambient temperature range of -20 to +40 °C and a maximum process temperature of +40 °C. The minimum ambient temperature for a pump with a water-in-oil (WIO) sensor is 0 °C.
  7. The thermal protector in the stator windings has a rated switch temperature of 150 °C and must guarantee the disconnection of the power supply. The power supply must be reset manually.
  8. The control unit must protect the WIO sensor against short circuit current. The maximum current from the control unit must be limited to 350 mA.
  9. For painted pumps, minimise the risk of electrostatic discharge by:
    - Earthing (mandatory).

- In dry installations, keep a safety distance between pumps and walking paths.
  - Use wet cloths for cleaning.
10. The WIO sensor must be used only with a galvanically isolated circuit.
  11. The lock nut of the cable connector must only be replaced with an identical one.

### 3. 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.

### 3.1 Handling 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 stated on the nameplate.

**WARNING**  
**Crushing hazard**

Death or serious personal injury



- Do not stack pump packages or pallets on the 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.

### 3.2 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.



**WARNING**  
**Crushing hazard**

Death or serious personal injury

- When lifting the pump, make sure your hand cannot get 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.
- Make sure that the lifting bracket is tightened before lifting the pump.



**WARNING**  
**Crushing hazard**

Death or serious personal injury

- Do not stand near or under the pump when it is lifted.



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

For horizontal, dry-installed pumps, a special lifting bracket can be ordered to ease the lifting of the pump. See the service instruction on [www.grundfos.com](http://www.grundfos.com).

## 4. Installation requirements

All safety regulations must be observed at the installation site.

Prior to installation, check the oil level in the oil chamber.



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



The pump must be installed vertically in both auto-coupling or free-standing submerged installation.



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 on the installation area when the environment 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 are at least 3 m free cable above the maximum liquid level.



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



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

### **DANGER**

#### **Crushing hazard**

Death or serious personal injury

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



Carelessness during lifting or transportation may cause personal injury or damage to the pump.

## 5. Mechanical installation

When mounted on a base stand or brackets, the pump must be installed outside the pit. An inlet line must be connected to the pump.

A dimensional sketch for each installation type can be found at the end of this booklet.



Before installing the product, make sure that the bottom of the pit is even.

### **WARNING**

#### **Electric shock**

Death or serious personal injury

- It must be possible to switch off the power supply and lock the main switch in position 0 to ensure that the power supply cannot be switched on unintentionally.
- Any external voltage connection to the pump must be switched off before working on the pump.



The pump must not run dry. Dry running can cause ignition hazard.



Install an independent secondary level switch to ensure that the pump is stopped in case the primary stop level switch is not working.

Inspect the oil level and condition every 3000 operating hours or at least once a year.



When the pump is new or after replacement of the shaft seal, check the oil level and water content after one week of operation.



Use the lifting bracket only for lifting the pump.

Do not use it to hold the pump during operation.

### **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 for submersible drainage and effluent pumps may contain drainage or effluent with toxic and/or contagious substances.
- Wear appropriate personal protective equipment and clothing.
- Observe the local hygiene regulations in force.

**CAUTION****Sharp element**

Minor or moderate personal injury

- Do not touch the sharp edges of the impeller without wearing protective gloves.



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

**5.1 Mounting the product**

SE1 and SEV pumps are designed for two installation types:

- submerged installation:
  - vertically on an auto coupling
  - vertically, free-standing on a ring stand.
- dry installation:
  - vertically on a base stand
  - horizontally with brackets secured to a concrete floor or foundation.

For WIO-sensor versions, the outlet pipe must be directed upwards to ensure proper operation of the sensor.

All Ex pumps are equipped with a WIO sensor.



In case of dry, horizontal installation, the outlet pipe must be directed upwards to ensure the proper operation of the WIO sensor.

**5.1.1 Submerged installation**

Pumps for permanent installation can be installed on a stationary auto-coupling guide rail system. The auto-coupling system facilitates maintenance and service as the pump can easily be lifted out of the pit.



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



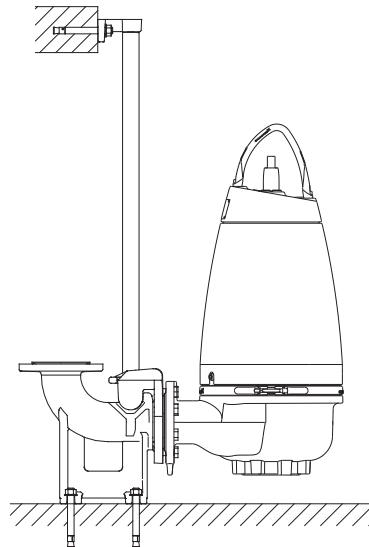
Make sure that the pipes are installed without the use of undue force. Do not allow loads from the weight of the pipes to be carried by the pump. Use loose flanges to ease the installation and to avoid pipe tension at flanges and bolts.



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



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



*Submerged pump on auto coupling*

TIM028404

Proceed as follows:

1. Drill mounting holes for the guide-rail bracket on the inside of the pit and provisionally fasten it 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 auto coupling 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 and adjust the length of the rails accurately to the guide-rail bracket at the top of the pit.
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. The guide rails must not have any axial play as this would cause noise during operation.
6. Clean out debris from the pit before lowering the pump.
7. Fit the guide shoe to the pump outlet and grease its gasket before lowering the pump into the pit.
8. Slide the guide shoe along the guide rails and lower the pump into the pit by using the chain secured to the lifting bracket. See fig. *Submerged pump on auto coupling*. When the pump reaches the auto-coupling base unit and the chain is unstrained, pull it towards the guide-rail several times to ensure proper connection.
9. Hang up the end of the chain on a suitable hook at the top of the pit. Make sure that the chain is straight but not strained.
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. Ensure that the coiled cable cannot fall into the pit. Make sure that the cables are not sharply bent or pinched.
11. Connect the power and control cables, if any.



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

### 5.1.2 Free-standing submerged installation

Pumps for free-standing submerged installation can stand freely on the bottom of the pit. The pump must be installed on a ring stand. See fig. *Free-standing submerged pump on ring stand*.

The ring stand is available as an accessory.

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

If a hose is used, make sure that it 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.

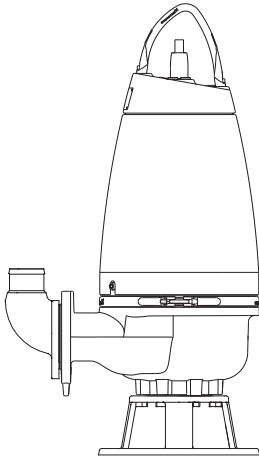
If the pump is supposed to be installed in muddy conditions or on uneven ground, place it on a solid support.

Proceed as follows:

1. Fit a 90 ° elbow to the pump outlet and connect the outlet pipe or hose.
2. Lower the pump into the liquid by a chain secured to the lifting bracket of the pump. Place the pump on a plain, solid foundation.
3. Hang up the end of the chain on a suitable hook at the top of the pit, so the chain cannot touch the pump housing.
4. 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 cables are not sharply bent or pinched.
5. Connect the power and control cables, if any.



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



Free-standing submerged pump on ring stand

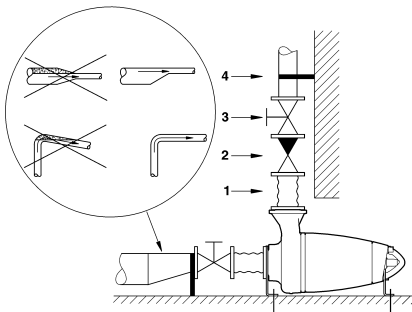
### 5.1.3 Dry installation

In dry installations, the pump must be installed permanently outside the pit.

The motor is enclosed and watertight, so it cannot be damaged in case the installation site is flooded.

#### Precautions

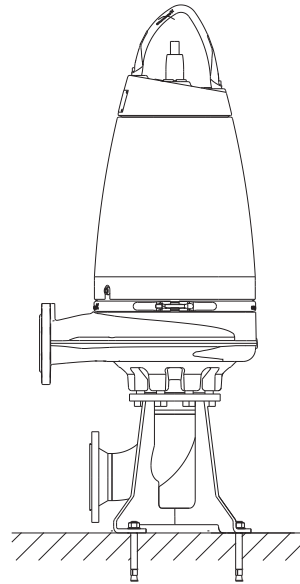
- As the pump is installed outside the pit, make sure that the liquid level in the pit is high enough to ensure sufficient NPSH.
- Size the inlet line according to the length and the desired pump performance. A possible difference in level between the pit and the pump inlet must also be taken into account.
- Support the pipes to avoid strain or other mechanical influences being transmitted to the pump. Install expansion joints and pipe hangers. See fig. [Horizontal dry installation with brackets](#).



Horizontal dry installation with brackets

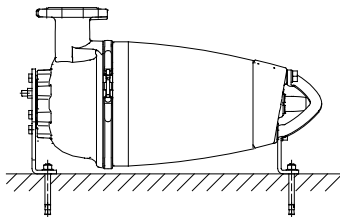
Pos.	Description
1	Expansion joint
2	Non-return valve
3	Isolating valve
4	Pipe hanger

- If a reducer is fitted between the inlet line and the pump, it must be eccentric. Fit the reducer with the straight edge facing upwards to avoid air pockets in the inlet line. Air in the inlet line may cause cavitation. See fig. [Horizontal dry installation with brackets](#).
- Install the pump on a separate foundation, for instance a concrete foundation. The weight of the foundation must be approximately 1.5 times the weight of the pump. To prevent vibrations from being transmitted to the building and pipes, place the pump on vibration absorbing material.



Vertical dry installation on a base stand





TM028-402

### Horizontal dry installation with brackets

Proceed as follows:

1. Fit the base stand or brackets to the pump. See dimensional sketches at the end of this booklet.
2. Mark and drill fixing holes in the concrete floor or foundation.
3. Fasten the pump with expansion bolts.
4. Check that the pump stands vertically or horizontally. Use a spirit level.
5. Connect the power cable.



Fit an isolating valve on the inlet side of the pump and a non-return valve as well as an isolating valve on the outlet side.

6. Install the inlet and outlet lines as well as the valves, if any. Make sure that the pump is not stressed by the pipes.

### Tightening torques for inlet and outlet flanges

Grade 4.6 (5) galvanised steel screws and nuts.

DN	DC	Screw	Torque [Nm +/- 5]	
			Slightly oiled	Well lubricated
DN 65	145	4 × M16	70	60
DN 80	160	8 × M16	70	60
DN 100	180	8 × M16	70	60
DN 150	240	8 × M20	140	120

Grade A2.50 (AISI 304) steel screws and nuts.

DN	DC	Screw	Torque [Nm +/- 5]	
			Slightly oiled	Well lubricated
DN 65	145	4 × M16	-	60
DN 80	160	8 × M16	-	60
DN 100	180	8 × M16	-	60
DN 150	240	8 × M20	-	120



The gasket must be a full face, reinforced paper gasket, such as Klingersil C4300. If softer gasket material is used, torques must be reconsidered.

## 6. Electrical connection

### WARNING

#### Electric shock

Death or serious personal injury



- Before starting any work on the product, make sure that the fuses have been removed or the main switch has been switched off and locked in position 0. Make sure that the power supply cannot be switched on unintentionally.

### WARNING

#### Electric shock

Death or serious personal injury



- Make sure the earth and phase conductors are not mixed up, follow the description in the wiring diagram.
- Make sure the earth conductor is connected first.

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



Make sure that the main switch is locked in position 0. Type and requirements as specified in EN 60204-1.



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

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



In hazardous locations, connect pumps to a control box with a motor protection relay with IEC trip class 10.

Observe the following:

- Do not install Grundfos control boxes, pump controllers, Ex barriers, or leave the free end of the power cable in potentially explosive environments.
- The classification of the installation site must be defined by the owner of the site.
- On explosion-proof pumps, make sure that an external earth conductor is connected to the external earth terminal on the pump by using a secure cable clamp. Clean the surface of the external earth connection and mount the cable clamp.
- The cross section of the earth conductor must be at least 4 mm<sup>2</sup>, such as H07 V2-K (PVT 90 °) yellow and 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 231 or LC 241 or DC, DCD pump controller by the intrinsically safe barrier to ensure a safe circuit.



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



A damaged power cable must be replaced by the manufacturer, its service agent or similarly qualified persons.

The supply voltage and frequency are marked on the nameplate. The voltage tolerance must be within - 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 m power cable and a free cable end, except for pumps for Australia, which have 15 m cable.

**Pumps without sensor** must be connected to one of the following controllers:

- a control box with motor-protective circuit breaker, such as a Grundfos CU 100
- a Grundfos LC 231, LC 241 or DC, DCD pump controller.

**Pumps with sensor** must be connected to a Grundfos IO 113 and one of the following controllers:

- a control box with motor-protective circuit breaker, such as a Grundfos CU 100
- Grundfos level controllers LC 231, LC 241 or DC, DCD pump controller.



Before installation and the first startup of the pump, check the condition of the power cable to avoid short circuits.

### WIO sensor

Every explosion-proof pump is assembled with a WIO sensor.

For safe installation and operation of pumps equipped with a WIO sensor, install an RC filter between the power supply and the pump.



If an RC filter should be installed to avoid any kind of transients in the installation, install it between the power supply and the pump.

The following may cause problems in case of transients in the power supply system:

- Motor power:
  - The bigger the motor, the higher the transients.
- Length of power cable:
  - Where power and signal cables are running in parallel close to each other, the risk of transients causing interference between power and signal cables increases with the length of the cables.
- Switchboard layout:
  - Power and signal cables must be separated as much as possible. Close installation can cause interference in case of transients.
- Supply network "stiffness":
  - If a transformer station is located close to the installation, the supply network may be "stiff" and transient levels can be higher.

If combinations of the above aspects are present, it may be necessary to install RC filters for pumps with WIO sensors to protect against transients.

Transients can be completely eliminated if soft starters are used. Be aware that soft starters and variable-speed drives have other EMC-related issues that must be taken into consideration.

For further information, see the installation and operating instructions for the selected control box or pump controller.

## 6.1 Frequency converter operation

In principle, all three-phase motors can be connected to a frequency converter.

However, frequency converter operation often exposes the motor insulation system to a heavier load and causes the motor to be more noisy due to eddy currents caused by voltage peaks.

In addition, large motors operated with a frequency converter are loaded by bearing currents.

For frequency converter operation, observe the following:

- The thermal protection of the motor must be connected.
- 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  $dU/dt$ .
- Minimum switching frequency is 2.5 kHz. Variable switching frequency is accepted.
- If the pump is Ex-approved, 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 or standards must be complied with.

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 30 %.
- Keep the flow rate above 1 m/sec.
- Let the pump run at rated speed at least once a day to prevent sedimentation in the piping system.
- Do not exceed the frequency indicated on the nameplate as this may cause motor overload.
- Keep the power cable as short as possible. The peak voltage increases with the length of the power cable.
- Use input and output filters on the frequency converter.
- Use a screened power cable, if there is a risk that electrical noise may disturb other electrical equipment.
- Set frequency converter for constant-torque operation. Pulse width modulation should be used.

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

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

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



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

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

## 7. Protection and control functions

### 7.1 Pump controllers

The pumps can be controlled by the Grundfos LC 231, LC 241, DC and DCD controllers.

Pumps with a sensor are supplied with an IO 113, which can receive signals from the following transmitters:

- water-in-oil (WIO) sensor in the pump
- moisture sensor in the motor
- temperature sensor in the stator windings
- winding resistance sensor in the motor.

For further information, see installation and operating instructions for the specific sensor.

#### 7.1.1 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 customisation 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 customised. Level switches can be used with 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 of the 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 pump 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 the pump controllers.

#### 7.1.2 DC, DCD

The Dedicated Controls (DC) system consists of a CU 362 control unit connected to one or two IO 351 modules. An optional IO 113 sensor can be connected to each pump.

CU 362 must be incorporated in all installations. The units in the system can be combined in different ways based on user requirements.

DC controls the pumps by power contactors and IO 351 modules. Power contactors, cable and other high-voltage components must be positioned as far as possible from the control system and the signal cables.

DC is operated through a user-friendly control panel on the CU 362 or a PC. Wireless remote control is available. DC can be integrated into an existing SCADA system.

### 7.1.3 IO 113

IO 113 provides an interface between a Grundfos wastewater pump equipped with sensors and the pump controller(s). The most important sensor status information is indicated on the front cover.

One pump can be connected to one IO 113. Together with the sensors, IO 113 provides a galvanic isolation between the motor voltage in the pump and the connected controller(s).

As standard, IO 113 is capable for the following:

- protect the pump against overheating
- monitor the status of:
  - motor winding temperature
  - leakage (WIO or WIA)
  - moisture in the pump.
- measure the stator insulation resistance
- stop the pump in case of alarm
- remotely monitor the pump by RS-485 communication (Modbus or GENibus)
- control the pump by a frequency converter.

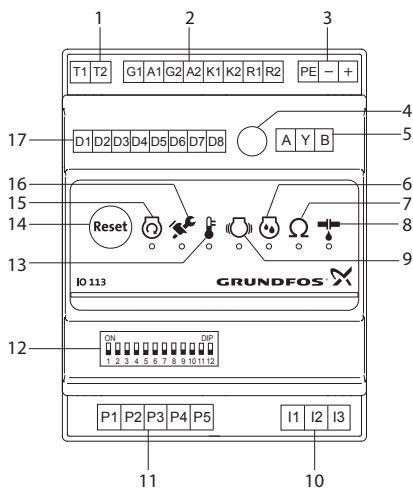
Note: not all pumps with sensors have IO 113 as standard. The IO 113 module needs to be ordered separately, as an accessory.



Do not use IO 113 for other purposes than those mentioned in the installation and operating instructions for IO 113.



Do not connect pumps with sensors to LC 231 as it may cause damage to the level controller.



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Pos.	Description
1	Terminals for alarm relay
2	Terminals for analog and digital inputs and outputs
3	Terminals for supply voltage
4	Potentiometer for setting the warning limit of stator insulation resistance
5	Terminals for RS-485 for GENibus or Modbus
6	Indicator light for moisture measurement
7	Indicator light for stator insulation resistance
8	Indicator light for leakage (WIO or WIA)
9	Indicator light for vibrations in the pump
10	Terminals for measurement of stator insulation resistance
11	Terminals for connection of pump sensors
12	DIP switch for configuration
13	Indicator light for motor temperature
14	Button for resetting alarms
15	Indicator light for motor running
16	Indicator light for service
17	Terminals for digital outputs

#### General installation data

Supply voltage	24 VAC $\pm$ 10 % 50 or 60 Hz 24 VDC $\pm$ 10 %
Supply current	Min. 2.4 A; max. 8 A
Power consumption	Max. 5 W
Ambient temperature	-25 to +65 °C
Enclosure class	IP20

## 7.2 Switches and sensors

All SE1 and SEV pumps have thermal protection incorporated in the stator windings.

### 7.2.1 Thermal switch, PT1000 and thermistor (PTC)

#### Pumps without sensor

Pumps without sensor have a thermal switch or a PTC thermistor.

Through the pump controller safety circuit, the thermal switch stops the pump by breaking the circuit in case of overtemperature (approximately 150 °C). The thermal switch recloses the circuit after cooling. For pumps equipped with a PTC thermistor, connect the thermistor to either the PTC relay or the IO module to break the circuit at 150 °C.

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

#### Pumps with sensor

Pumps with sensor have either a thermal switch and a Pt1000 sensor or a PTC thermistor in the windings, depending on the installation site.

Through the pump controller safety circuit, the thermal switch or the thermistor stops the pump by breaking the circuit in case of overtemperature (approximately 150 °C). The thermal switch or the thermistor recloses the circuit after cooling.

The maximum operating current of both the Pt1000 and the thermistor is 1 mA at 24 VDC.

Measure the motor winding resistance to find out whether the pump is fitted with a thermal switch or a PTC thermistor. See table below.

	Without cable	With 10 m cable	With 15 m cable
Thermal switch	< 50 mΩ	< 320 mΩ	< 390 mΩ
PTC thermistor	> 100 mΩ	> 370 mΩ	> 440 mΩ

#### Non-explosion-proof pumps

When closing the circuit after cooling, the thermal protection restarts the pump automatically through the controller. Pumps with 4 kW and larger motors sold in Australia or New Zealand are fitted with a PTC thermistor.

## Explosion-proof pumps

The thermal protection of explosion-proof pumps must not restart the pump automatically. This ensures protection against overtemperature in potentially explosive environments. In pumps with sensor, this can be done by removing the short circuit between terminals R1 and R2 in the IO 113.



See electrical data in the IO 113 installation and operating instructions.



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

### 7.2.2 WIO sensor

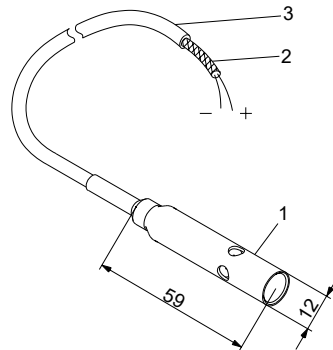
The WIO sensor measures the water content in the oil and converts the value into an analog current signal. The two sensor conductors are for power supply as well as for carrying the signal to the IO 113. The sensor measures the water content from 0 to 20 %. It also sends a signal if the water content is outside the normal range (warning), or if there is air in the oil chamber (alarm).

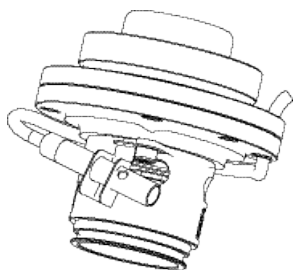


The IO 113 module must be configured to stop explosion-proof pumps in case the WIO sensor sends an alarm signal.

The pump must not restart automatically.

The sensor is fitted in a stainless steel tube for mechanical protection.





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WIO sensor

### Fitting the WIO sensor

Fit the sensor next to one of the shaft seal openings. See fig. *Jerk direction*. The sensor must be tilted into the direction of rotation to ensure that oil is led into the sensor. Make sure that the sensor is submerged in the oil.

### Technical data

Input voltage	12-24 VDC
Output current	3.5 - 22 mA
Power input	0.6 W
Ambient temperature	0 to 70 °C

### 7.2.3 Moisture switch

The moisture switch is positioned in the bottom of the motor. If there is moisture in the motor, the switch breaks the circuit and sends a signal to IO 113.

The moisture switch is non-reversing and must be replaced after use.

The moisture switch is connected in series with the thermal switch and connected to the control cable, and it must be connected to the safety circuit of the separate pump controller.

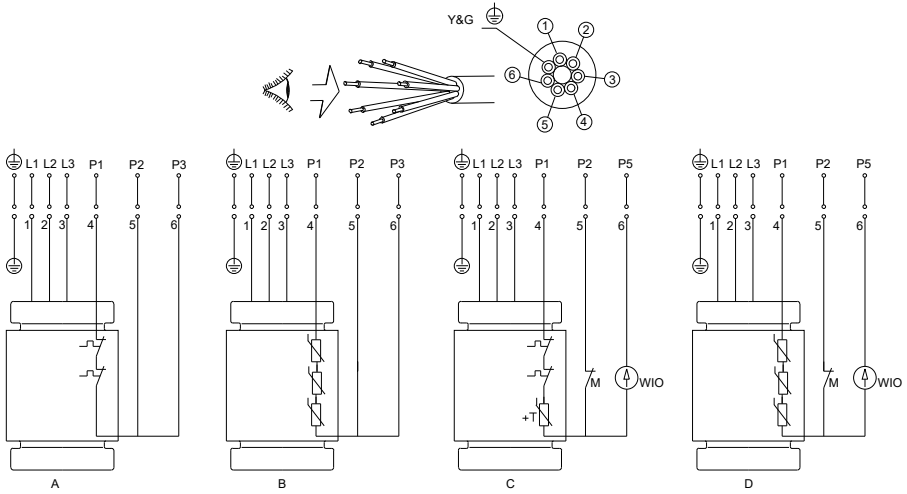


The motor-protective circuit breaker of the pump controller must include a circuit which automatically disconnects the power supply in case the protective circuit for the pump is opened.

## 7.3 Wiring diagrams

### 7-core cable

The figure below shows the wiring diagrams for SE1, SEV pumps with 7-core cable in three versions, one without sensors and two with WIO sensor and moisture switch.



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Wiring diagram, 7-core cable, DOL

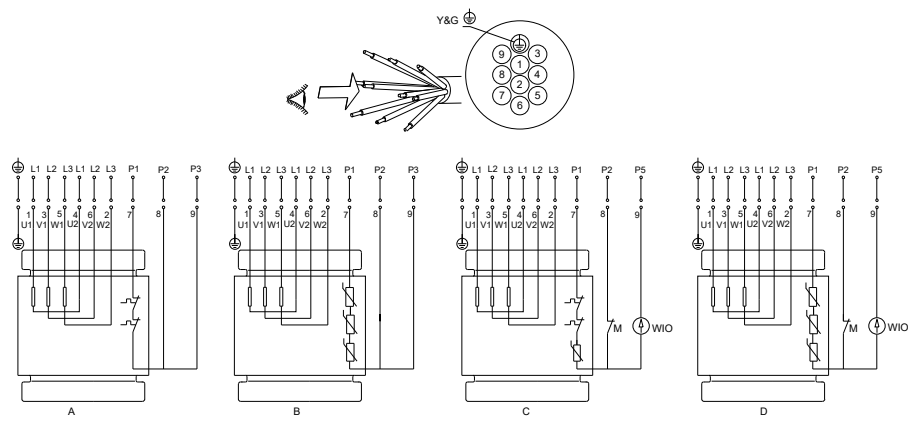
Pos.	Description
Y&G	Yellow and green
A	Standard version with thermal switches
B	Standard version with PTC thermistors <sup>3)</sup>
C	Sensor version with thermal switches, Pt1000, moisture switch and WIO sensor
D	Sensor version with PTC thermistors, moisture switch and WIO sensor <sup>3)</sup>

<sup>3)</sup> Pumps with 4 kW and larger motors sold in Australia or New Zealand are fitted with a PTC thermistor.



### 10-core cable

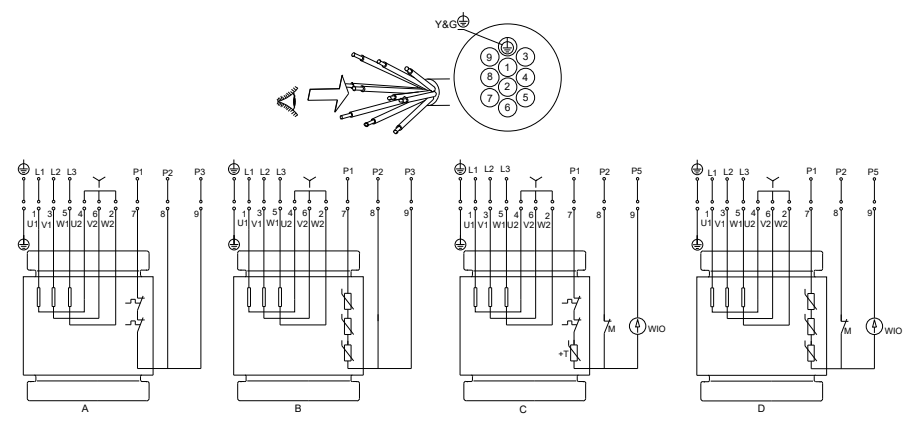
The figures below show the wiring diagrams for SE1, SEV pumps with 10-core cable in three versions, one without sensors and two with WIO sensor and moisture switch.



TM04-6885

Wiring diagram, 10-core cable, star/delta (Y/D)

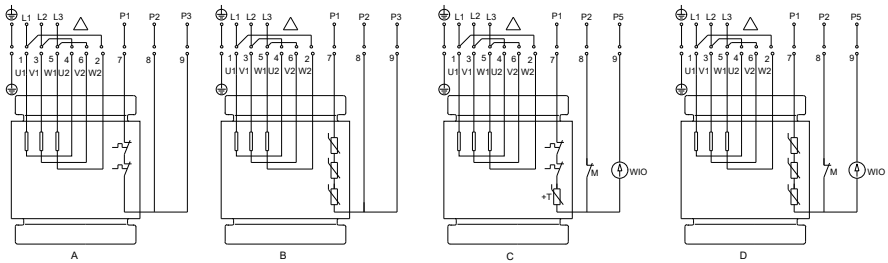
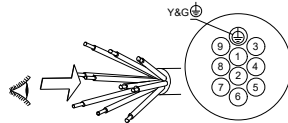
Pos.	Description
Y&G	Yellow and green
A	Standard version with thermal switches
B	Standard version with PTC thermistors <sup>3)</sup>
C	Sensor version with thermal switches, Pt1000, moisture switch and WIO sensor
D	Sensor version with PTC thermistors, moisture switch and WIO sensor <sup>3)</sup>



TM04-6886

Wiring diagram, 10-core cable, star-connected (Y)

Pos.	Description
Y&G	Yellow and green
A	Standard version with thermal switches
B	Standard version with PTC thermistors <sup>3)</sup>
C	Sensor version with thermal switch, Pt1000, moisture switch and WIO sensor
D	Sensor version with PTC thermistors, moisture switch and WIO sensor <sup>3)</sup>



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Wiring diagram, 10-core cable, delta-connected (D)

Pos.	Description
Y&G	Yellow and green
A	Standard version with thermal switches
B	Standard version with PTC thermistors <sup>3)</sup>
C	Sensor version with thermal switch, Pt1000, moisture switch and WIO sensor
D	Sensor version with PTC thermistors, moisture switch and WIO sensor <sup>3)</sup>

## 8. Starting up the product



The pump must not run dry.



Dry running can cause ignition hazard.



Do not open the clamp while the pump is operating.



The pumps are fitted with impellers of S-tube® design. S-tube® impellers are wet balanced, which reduces the vibration during operation. If the pumps are started with the pump housing containing air, the vibration level can be higher compared to normal operation.

Local balancing of S-tube® impellers may damage the wet balancing and lead to higher vibration levels during operation.



The pumps are designed for continuous operation, both for submerged and dry installations.

### CAUTION Crushing hazard

Minor or moderate personal injury

- Do not put your hands or any tool into the pump inlet or outlet 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 main switch.
- Make sure that the power supply cannot be switched on unintentionally.



Before starting the product:

- Make sure that the fuses have been removed.
- Make sure that all protective equipment has been connected correctly.



### CAUTION Biological hazard

Minor or moderate personal injury

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



### WARNING Crushing hazard

Death or serious personal injury

- When lifting the pump, make sure your hand cannot get 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 for submersible drainage and effluent pumps may contain drainage or effluent with toxic and/or contagious substances.
- Wear appropriate personal protective equipment and clothing.
- Observe the local hygiene regulations in force.



**CAUTION****Hot surface**

Minor or moderate personal injury

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

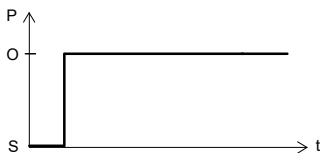
**8.1 Operating mode**

SE1 and SEV pumps are suitable for:

- dry installation without separate motor cooling
- submerged installation.

**S1, continuous operation**

In this operating mode, the pump can operate continuously when the pump housing is completely submerged.

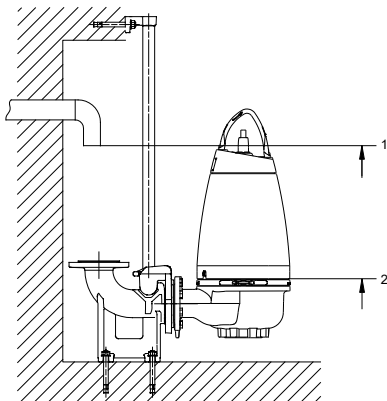


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*S1 operation***Pos. Description**

O Operation

S Stop



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*Start and stop levels***Pos. Description**

1 Max.

2 Min.

**8.2 Start and stop levels**

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

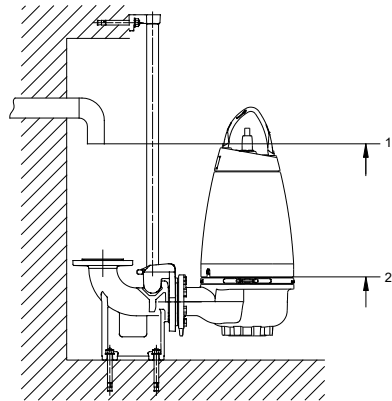
Long free cable = large difference in level.

Short free cable = small difference in level.

- To prevent air intake and vibrations, install the stop level switch, so the pump is stopped before the liquid level reaches 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 of the inlet pipe to avoid back flooding the sewers.



CU 100 must not be used for Ex applications.



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*Start and stop levels***Pos. Description**

1 Max.

2 Min.

Make sure that the effective volume of the pit does not become so low that the number of starts per hour exceeds the maximum permissible number.

### 8.3 Checking the direction of rotation



Start and let the pump run for a few seconds to check the direction of rotation.

An arrow on the top cover indicates the correct direction of rotation. Correct direction of rotation is clockwise.

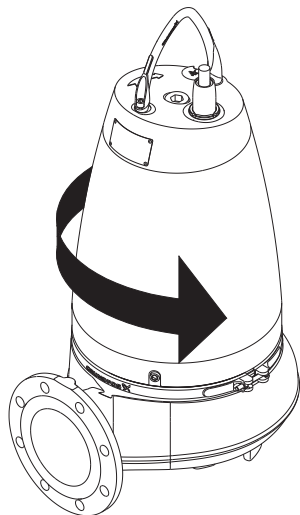
When started, the pump jerks counterclockwise. See fig. *Jerk direction*.

#### Procedure

The direction of rotation must be checked every time the pump is connected to a new installation.

Proceed as follows:

1. Let the pump hang from a lifting device, for example the hoist used for lowering the pump into the pit.
2. Start and stop the pump while observing the movement or jerk of the pump. If connected correctly, the pump rotates clockwise and it jerks counterclockwise. See fig. *Jerk direction*.
3. If the direction of rotation is wrong, interchange any two of the phases in the power cable. See figs *Wiring diagram, 7-core cable, DOL to 7.3 Wiring diagrams*.



*Jerk direction*

### 8.4 Startup



The pump must not run dry.



If the environment is potentially explosive, use pumps with Ex approval.



In case of abnormal noise or vibration, stop the pump immediately.

Do not restart the pump until the cause of the fault is identified and eliminated.

#### CAUTION

##### Sharp element

Minor or moderate personal injury

- Do not touch the sharp edges of the impeller without wearing protective gloves.



After a short period of storage, vent the pump to let any explosive gasses escape.

#### 8.4.1 SE1 pumps

1. Remove the fuses and check that the impeller can rotate freely. Turn the impeller by hand.
2. Check the condition of the oil in the oil chamber. See section *Checking and changing the oil*.
3. Check that the system, bolts, gaskets, pipes and valves are in correct condition.
4. Check the direction of rotation. See section *Checking the direction of rotation*.
5. Mount the pump in the system.
6. Switch on the power supply.
7. Check whether the monitoring units, if used, are operating satisfactorily.
8. For pumps with sensor, switch on IO 113 and check that there are no alarms or warnings. See section *Servicing the product*.
9. Check the setting of the air bells, float switches or electrodes.
10. Open the isolating valves, if fitted.
11. Check that the liquid level is above the upper edge of the clamp. If the level is below the clamp, add liquid to the pit until the minimum level is obtained.
12. Remove trapped air from the pump housing by tilting the pump by the lifting chain.

TM066007

13. Start the pump and let it run briefly. Check if the liquid level is falling. A correctly vented pump quickly lowers the liquid level.

After one week of operation or after replacement of the shaft seal, check the condition of the oil in the chamber. For pumps without sensor, this can be done by taking a sample of the oil. See section [Servicing the product](#).

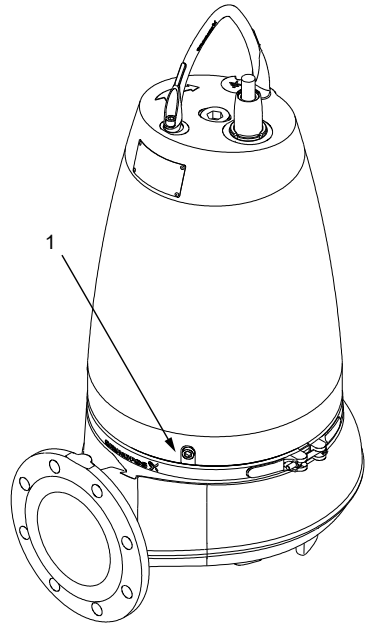
#### 8.4.2 SEV pumps

1. Remove the pump from the system.
2. Check that the impeller can rotate freely. Turn the impeller by hand.
3. Check the condition of the oil in the oil chamber. See section [Checking and changing the oil](#).
4. Check whether the monitoring units, if used, are operating satisfactorily.
5. Check the setting of the air bells, float switches or electrodes.
6. Check the direction of rotation. See section [Checking the direction of rotation](#).
7. **Submerged pumps:**
  - Start the pump above water level and lower the pump into the pit to avoid air being trapped in the pump housing.
8. **Dry-installed pumps with positive inlet pressure** (the pump is installed in a pump room next to the pit):



Check that there is positive inlet pressure before starting up the pump.

- Open the isolating valve on the inlet side.
  - Loosen the vent screw until water comes out of the vent hole, then tighten the vent screw again.
  - Open the isolating valve on the outlet side and start the pump.
9. **Dry-installed pumps with inlet pipe and foot valve:**
    - Open the isolating valve on the outlet side to let the water above the valve run backwards to prime the inlet pipe.
    - Loosen the vent screw until water comes out of the vent hole, then tighten the vent screw again.
    - Start the pump.
  10. **Dry-installed pumps with inlet pipe and foot valve, without or with short outlet pipe** (use a vacuum system):
    - Keep the isolating valve on the outlet side closed.
    - Start the vacuum system until liquid is sucked in and the pump is vented.
    - Open the isolating valve on the outlet side and start the pump.



Position of the air vent screw

Pos.	Description
1	Air vent screw

## 9. Storing the product

### 9.1 Storing the product

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



If the product is stored for more than one year, turn the impeller by hand at least once a month.

Leave the polyurethane-embedded plug mounted in the pump to prevent moisture from penetrating into the motor.

If the pump has been in use, the oil needs to be changed before storage. See section [Checking and changing the oil](#).

After a long period of storage, the pump must be inspected before it is put into operation. Make sure that the impeller can rotate freely. Pay attention to the condition of the shaft seal, O-rings, oil and the cable entry.

## 10. Servicing the product

### WARNING

#### Crushing hazard

Death or serious personal injury

- Do not stand near or under the pump when it is lifted.



### WARNING

#### Electric shock

Death or serious personal injury

- Make sure the earth and phase conductors are not mixed up, follow the description in the wiring diagram.
- Make sure the earth conductor is connected first.



### WARNING

#### Electric shock

Death or serious personal injury

- Before starting any work on the product, make sure that the fuses have been removed or the main switch has been switched off and locked in position 0. Make sure that the power supply cannot be switched on unintentionally.



### WARNING

#### Crushing of hands

Death or serious personal injury

- Make sure that all rotating parts have stopped moving.



### CAUTION

#### Sharp element

Minor or moderate personal injury

- Do not touch the sharp edges of the impeller without wearing protective gloves.



Inspect the oil level and condition every 3000 operating hours or at least once a year.



When the pump is new or after the replacement of the shaft seal, check the oil level and water content after one week of operation.

Maintenance work on explosion-proof pumps must be carried out by Grundfos or an authorised service workshop.



However, this does not apply to the hydraulic components, such as pump housing and impeller.



Observe all regulations applying to pumps installed in potentially explosive environments.

Make sure that no work is carried out in potentially explosive environment.

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

### 10.1 Maintenance schedule



Explosion-proof pumps must be checked by an authorised Ex workshop after 3000 working hours or at least once a year.

When the pump is new or after the replacement of the shaft seal, check the oil level and water content after one week of operation.



After a short period of storage, vent the pump to let any explosive gasses escape.

Pumps running normal operation must be inspected every 3000 operating hours or at least once a year. If the pumped liquid is muddy or sandy, inspect the pump at shorter intervals.

Pumps with sensor offer the possibility of constant monitoring of key components in the pump, such as shaft seal condition, bearing temperature, winding temperature, insulation resistance and moisture in the motor.

Check the following:

- **Power consumption** See pump nameplate.
- **Oil level and oil condition** See section [Checking and changing the oil](#).
- **Cable entry** Make sure that the cable entry is watertight and the cable is not sharply bent or pinched.



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

- **Pump parts** Check the impeller, the pump housing, seal and wear ring for possible wear. Replace defective parts. See section [Cleaning and inspecting the pump](#).
- **Ball bearings** Check the shaft for noisy or heavy operation (turn the shaft by hand). Replace the defective 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 authorised service workshop.



Defective bearings may reduce the Ex safety.

- **O-rings and similar parts** During service or replacement, make sure that the grooves for the O-rings and the seal faces have been cleaned before the new parts are fitted.



Do not reuse used rubber parts.

- **Sensors** See section [Repairing the product](#).



## 10.2 Checking and changing the oil

Inspect the oil level and condition every 3000 operating hours or at least once a year.



When the pump is new or after the replacement of the shaft seal, check the oil level and water content after one week of operation.

- Change the oil after 3000 operating hours or once a year.
- Change the oil if the shaft seal has been replaced.

Check and change the oil in the oil chamber as described below.



Use Shell Ondina X420 oil or equivalent type.

	Power [kW]	Oil quantity [l]	
2-pole	2.2	0.30	
	3.0		
	4.0		
	6.0		
	7.5		
4-pole	9.2	0.55	
	11.0		
	1.0		0.30
	1.3		
	1.5		
2.2			
3.0			
4-pole	4.0	0.55	
	5.5		
	7.5		
	0.70		

### Draining of oil

Proceed as follows:

1. Place the pump on a plain surface with one oil screw pointing downwards.
2. Place a transparent container (approximately 1 litre) under the oil screw.

### WARNING

#### Pressurised system

Death or serious 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.

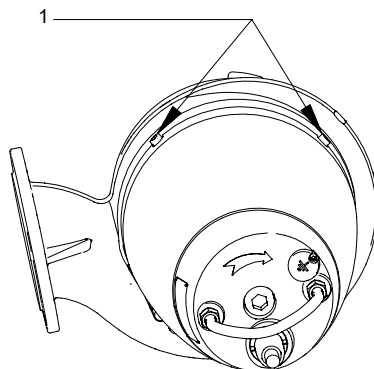
3. Loosen and remove the lower oil screw.
4. Remove the upper oil screw and allow the oil to drain into the container.
  - Check that the quantity of oil corresponds to the quantity stated in table above. If the quantity is smaller than stated, the shaft seal is defective and must be replaced.
  - Check the water content in the oil by letting the oil and water separate. If the quantity of water exceeds 20 %, the shaft seal is defective and must be replaced. Not replacing the shaft seal may cause damage to the motor.
5. Clean the faces for the gaskets for oil screws.



Dispose of used oil in accordance with local regulations.

### Filling with oil

1. Turn the pump, so that the oil filling holes are placed opposite each other, pointing upwards.



Oil filling holes

Pos.	Description
1	Oil filling/venting

2. Pour oil into the oil chamber through one filling hole until it starts coming out of the other hole.

- Fit the oil screws with new gaskets.

### 10.3 Cleaning and inspecting the pump

Clean the pump on site at regular intervals in the following way:

- Lift the pump out of the pit.
- Hose down the pump externally by using a high-pressure cleaner at maximum 100 bar.
- Remove caked dirt from the motor to ensure appropriate heat conductivity. A mild detergent, which is approved for disposal into the sewage system, may be used.
- If necessary, scrub the pump with a soft brush.

Visual inspection of the pump must include the following:

- Search for cracks or other external damage.
- Check the lifting bracket and lifting chain for wear and corrosion.
- Inspect the power cable for cracks, lacerations, kinks or other damage in the sheath.
- Inspect the visible parts of the cable entry for cracks.
- Check that the cable is firmly connected to the top cover.
- Check all visible screws for self-loosening and tighten them, if necessary.

The pump is fitted with a vent valve at the bottom of the cooling jacket. The valve may be removed and cleaned, if necessary. Clean the vent hole before refitting the valve after cleaning.

## 10.4 Repairing the product

### **DANGER**

#### **Electric shock**

Death or serious personal injury



- Before starting any work on the product, make sure that the fuses have been removed or the main switch has been switched off and locked in position 0. Make sure that the power supply cannot be switched on unintentionally.

### **WARNING**

#### **Crushing hazard**

Death or serious personal injury



- Do not stand near or under the pump when it is lifted.

Inspect the oil level and condition every 3000 operating hours or at least once a year.



When the pump is new or after the replacement of the shaft seal, check the oil level and water content after one week of operation.

### 10.4.1 Cleaning or replacing the pump housing

#### **Dismantling**

- Loosen the clamp (92).
- Remove the screw (92a).
- Remove the pump housing (50) by inserting two screwdrivers between the sleeve and the pump housing.
- Clean the pump housing, if necessary.

#### **Assembling**

- Fit the pump housing (50).
- Fit the clamp (92).
- Tighten the screw (92a) to a torque of 12 Nm.
- Check that the impeller (49) rotates freely.

### 10.4.2 Replacing the impeller

### **CAUTION**

#### **Sharp element**

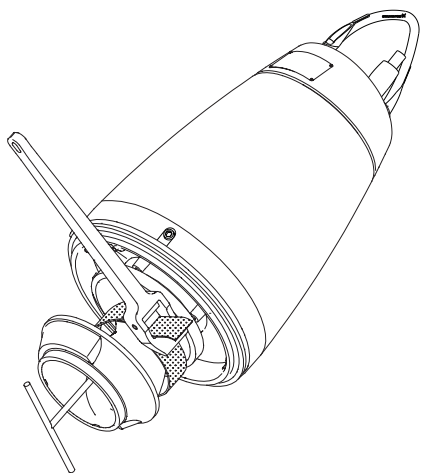
Minor or moderate personal injury



- Do not touch the sharp edges of the impeller without wearing protective gloves.

#### **Dismantling**

- See section [Cleaning or replacing the pump housing](#).



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#### Removing the impeller

2. Remove the screw (188a). Hold the impeller (49) with a strap wrench. See fig. [Removing the impeller](#).
3. Loosen the impeller (49) with a light blow on the edge. Pull it off.
4. Remove the key (9a) and the corrugated spring (157).

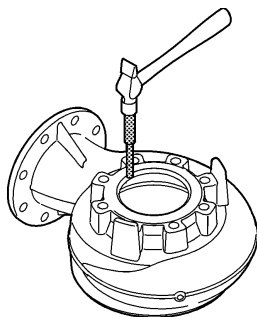
#### Assembling

1. Fit the corrugated spring (157) and the key (9a). Keep the key (9a) in position while fitting the impeller (49).
2. Fit the impeller (49).
3. Fit the washer (66) and the screw (188a).
4. Tighten the screw (188a) to a torque of 75 Nm. Hold the impeller (49) with the strap wrench.
5. Mark the position of the pin (6a) on the pump housing (50).
6. Mark the position of the pin hole on the oil chamber.
7. Fit and lubricate the O-ring (37) with oil.
8. See section [Cleaning or replacing the pump housing](#) for the final assembling steps.

### 10.4.3 Replacing the seal ring and the wear ring

#### Dismantling

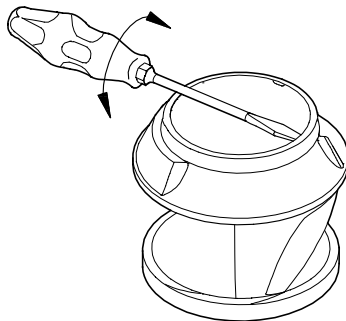
1. See section [Cleaning or replacing the pump housing](#).
2. Turn the pump housing (50) upside down.



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#### Removing the seal ring

3. Knock the seal ring (46) out of the pump housing using a punch. See fig. [Removing the seal ring](#).
4. Clean the pump housing (50) where the seal ring (46) was fitted.



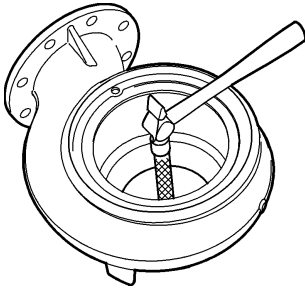
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#### Removing the wear ring

5. Remove the wear ring (49c) with a screwdriver. See fig. [Removing the wear ring](#).
6. Clean the impeller (49) where the wear ring (49c) was fitted.

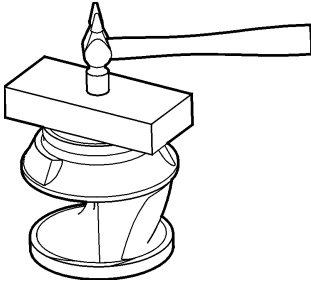
#### Assembling

1. Lubricate the new seal ring (46) with grease.
2. Place the seal ring (46) in the pump housing (50).



#### Fitting the seal ring

- Knock the seal ring (46) home in the pump housing (50) with a punch or a wooden block. See fig. [Fitting the seal ring](#).
- Place the wear ring (49c) on the impeller (49).



#### Fitting the wear ring

- Knock the wear ring (49c) home with a wooden block. See fig. [Fitting the wear ring](#).

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### 10.4.4 Replacing the shaft seal

#### Dismantling

- See section [Cleaning or replacing the pump housing](#).
- See section [Replacing the impeller](#).
- Remove the screws (187).
- Remove the cover for the oil chamber (58) with a puller.
- Remove the screws (186).
- Remove the sensor (521) and the bracket (522), if fitted, from the shaft seal.
- Remove the shaft seal (105) with the puller.
- Remove the O-ring (153b).

#### Assembling

- Fit and lubricate the O-ring (153b) with oil.
- Slide the new shaft seal (105) gently over the shaft.
- Fit the bracket (522) and the sensor (521), if fitted, with one of the screws (186).



Make sure the sensor is positioned correctly. See section [WIO sensor](#) and fig. [Jerk direction](#).

Pay attention when installing the sensor in horizontal pumps.

- Fit and tighten the screws (186).
- Fit and lubricate the O-ring (107) in the cover for the oil chamber (58) with oil.
- Fit the cover for the oil chamber (58).
- Fit and tighten the screws (187).

## 10.5 Spare parts

Damaged parts must always be replaced with new and approved ones. Do not recondition motor parts.

For service kits for SE1, SEV, see [www.grundfos.com](http://www.grundfos.com).

Service instruction and service video can be found on [www.grundfos.com](http://www.grundfos.com).

## 10.6 Contaminated pumps

### WARNING

#### Infection caused by wastewater

Minor or moderate personal injury



- Wear appropriate personal protective equipment and clothing.
- Observe the local hygiene regulations in force.

### WARNING

#### Biological hazard

Death or serious 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.

Before returning the product for service, contact Grundfos with details about the pumped liquid. Otherwise, Grundfos can deny to service the product.

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

Clean the product in the best possible way before you return it.

Costs of returning the product are to be paid by the customer.

## 11. Fault finding the product

For pumps with sensor, start fault finding by checking the status on the IO 113 front cover. See installation and operating instructions for IO 113.

### DANGER

#### Electric shock

Death or serious personal injury



- Before starting any work on the product, make sure that the fuses have been removed or the main switch has been switched off and locked in position 0. Make sure that the power supply cannot be switched on unintentionally.

### 11.1 The motor does not start. The fuses blow or the motor-protective circuit breaker trips immediately. Caution: Do not start again!

The motor does not start. The fuses blow or the motor-protective circuit breaker trips 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 cable and the motor checked and repaired by a qualified electrician.
The fuses blow due to use of incorrect fuses.	Fit the correct fuses.
The impeller is blocked by impurities.	Clean the impeller.
The air bells, float switches or electrodes are out of adjustment or defective.	Readjust or replace the air bells, float switches or electrodes.
Moisture in the stator housing (alarm). IO 113 interrupts the supply voltage.*	Replace the O-rings, the shaft seal and the moisture switch.
The WIO sensor is not covered by oil (alarm). IO 113 interrupts the supply voltage.*	Check, and possibly replace the shaft seal, fill up with oil and reset IO 113.
* Applies only to pumps with sensor and with IO 113.	
The stator insulation resistance is too low. Applies only to pumps with sensor and with IO 113.*	Reset the alarm on IO 113, see the installation and operating instructions for IO 113.

Cause	Remedy
* Applies only to pumps with sensor and with IO 113.	

### 11.2 The pump operates, but the motor-protective circuit breaker trips after a short while.

The pump operates, but the motor-protective circuit breaker trips after a short while.

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 a large voltage drop.	Measure the voltage between two motor phases. Tolerance: - 10 % / + 6 %. Re-establish the correct voltage supply.
The impeller is blocked by impurities. Increased current consumption in all three phases.	Clean the impeller.
The direction of rotation is wrong.	Check the direction of rotation and possibly interchange any two of the phases in the incoming power cable. See section <a href="#">Checking the direction of rotation</a> .

### 11.3 The thermal switch of the pump trips after a short while.

The thermal switch of the pump trips after a short while.

Cause	Remedy
The liquid temperature is too high.	Reduce the liquid temperature.
The viscosity of the pumped liquid is too high.	Dilute the pumped liquid.
The electrical connection is wrong. (If the pump is star-connected to a delta connection, the result is very low undervoltage.)	Check and correct the electrical installation.

#### 11.4 The pump operates at below-standard performance and power consumption.

The pump operates at below-standard performance and power consumption.

Cause	Remedy
The impeller is blocked by impurities.	Clean the impeller.
The direction of rotation is wrong.	Check the direction of rotation and possibly interchange any two of the phases in the incoming power cable. See section <a href="#">Checking the direction of rotation</a> .

#### 11.5 The pump operates, but gives no liquid.

The pump operates, but gives no liquid.

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

#### 11.6 The power consumption is high (SEV).

The power consumption is high (SEV).

Cause	Remedy
The direction of rotation is wrong.	Check the direction of rotation and possibly interchange any two of the phases in the incoming power cable. See section <a href="#">Checking the direction of rotation</a> .
The impeller is blocked by impurities.	Clean the impeller.

#### 11.7 Noisy operation and excessive vibrations (SE1).

Noisy operation and excessive vibrations (SE1).

Cause	Remedy
The direction of rotation is wrong.	Check the direction of rotation and possibly interchange any two of the phases in the incoming power cable. See section <a href="#">Checking the direction of rotation</a> .
The impeller is blocked by impurities.	Clean the impeller.

#### 11.8 The pump is clogged.

The pump is clogged.

Cause	Remedy
The pumped liquid contains large particles.	Select a pump with a larger-sized passage.
A float layer has formed on the surface of the liquid.	Install a mixer in the pit.

## 12. Technical data

### 12.1 Operating conditions

#### 12.1.1 Operating pressure

All pump housings have PN 10 outlet flanges.

#### 12.1.2 Operating mode

The pumps are designed for continuous (S1) operation.

#### 12.1.3 pH value

Pump type	Material variant	Installation	pH value
SE1, SEV	Standard	Dry and submerged	6.5 - 14 <sup>4)</sup>
SE1, SEV	Q	Dry and submerged	6-14 <sup>4)</sup>
SE1, SEV	R	Dry and submerged	1-14
SE1, SEV	D	Dry and submerged	0-14

4) For fluctuating pH values, the range is pH 4-14.

#### 12.1.4 Liquid temperature

0-40 °C.

For short periods (maximum 1 hour), a temperature of up to 60 °C is permissible for non-Ex versions.



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

#### 12.1.5 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.

#### 12.1.6 Density and viscosity of the pumped liquid

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

#### 12.1.7 Flow velocity

Keep a minimum flow velocity to avoid sedimentations in the pipes. Recommended flow velocities:

- in vertical pipes: 0.7 m/s
- in horizontal pipes: 1.0 m/s.

#### 12.1.8 Maximum solids size

From 50 to 100 mm, depending on the pump size.

#### 12.1.9 Maximum starts per hour

Maximum 20 starts per hour.

#### 12.1.10 Noise emission < 70 dB (A)

- Measurements were carried out on dry-installed pumps in a closed system.
- Sound power measurements were carried out according to ISO 3743.
- Sound power was calculated at a distance of 1 m according to ISO 11203.

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

### 12.2 Dimensions and weights

See Appendix.

### 12.3 Storage temperature

Storage temperature: -30 to +60 °C.

### 12.4 Electrical data

#### 12.4.1 Supply voltage

- 3 × 230 V - 10 % / + 6 %, 50 Hz
- 3 × 400 V - 10 % / + 6 %, 50 Hz.

#### Safety factor

The motor has a safety factor of 1.1.

#### 12.4.2 Enclosure class

IP68, according to IEC 60529.

#### 12.4.3 Insulation class

F (155 °C).



### 13. 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](http://www.grundfos.com/product-recycling).

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