

SL1.50, SLV.65

安装和使用说明书



SL1.50, SLV.65

产品合格声明书.....	4
中文 (CN)	
安装和使用说明书.....	5
English (GB)	
Installation and operating instructions.....	23
补充 1	42
补充 2	44

产品合格声明书

CN 产品合格声明书

我们格兰富在我们的全权责任下声明，产品 SL1.50 和 SLV65，即该合格证所指之产品，符合欧共体使其成员国法律趋于一致的以下欧共理事会指令：

- 机械设备指令 (2006/42/EC)。
所用标准：EN 809: 1998, EN 60204-1: 2006。
- 低电压指令 (2006/95/EC)。
适用于额定功率低于 2.2 kW。
所用标准：EN 60335-1: 2002, EN 60335-2-51: 2003。
- 电磁兼容性指令 (2004/108/EC)。
所用标准：EN 60335-1: 2002, EN 60335-2-41: 2003。
- 建筑产品指令 (89/106/EEC)。
所用标准：EN 12050-1: 2001, EN 12050-2: 2000。
- ATEX (欧洲防爆) 指令 (94/9/EC)。
仅适用于计划在潜在性爆炸环境中使用、II 2G、并且自身附带有。进一步信息请参见以下。

GB Declaration of Conformity

We, Grundfos, declare under our sole responsibility that the products SL1.50 and SLV65, to which this declaration relates, are in conformity with these Council directives on the approximation of the laws of the EC member states:

- Machinery Directive (2006/42/EC).
Standards used:
EN 809: 1998, EN 60204-1: 2006.
- Low Voltage Directive (2006/95/EC).
Applicable when the rated power is lower than 2.2 kW.
Standards used:
EN 60335-1: 2002, EN 60335-2-41: 2003.
- EMC Directive (2004/108/EC).
- Construction Products Directive (89/106/EEC).
Standards used:
EN 12050-1: 2001 or EN 12050-2: 2000.
- ATEX Directive (94/9/EC).
Applies only to products intended for use in potentially explosive environments. Ex II 2G, equipped with the separate ATEX approval plate and EC-type examination certificate. Further information, see below.

Tatabánya, 1st January 2011



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认证号

使用标准

KEMA 06ATEX0129

EN 60079-0: 2006, EN 60079-1: 2007, EN 13463-1: 2001, EN 13463-5: 2003

认证机构：KEMA Quality B.V. No 0344. Utrechtseweg 310, 6802 ED Arnhem, Netherlands.

制造商：GRUNDFOS A/S, Poul Due Jensens Vej 7, 8850 Bjerringbro, Denmark.

Original installation and operating instructions.

CONTENTS

	Page
1. Symbols used in this document	23
2. General description	24
2.1 Product drawings	24
2.2 Applications	25
2.3 Operating conditions	25
3. Delivery and handling	25
3.1 Transportation	25
3.2 Storage	25
4. Identification	26
4.1 Nameplate	26
4.2 Type key	27
5. Approvals	28
5.1 Approval standards	28
5.2 Explanation to the Ex approval	28
6. Safety	29
6.1 Potentially explosive environments	29
7. Installation	30
7.1 Submerged installation on auto-coupling	30
7.2 Free-standing submerged installation	31
8. Electrical connection	31
8.1 Wiring diagrams	32
8.2 CU 100 control box	32
8.3 Pump controllers	33
8.4 Thermal switches	34
8.5 Frequency converter operation	34
9. Start-up	35
9.1 General start-up procedure	35
9.2 Operating modes	35
9.3 Direction of rotation	36
10. Maintenance and service	36
10.1 Inspection	37
10.2 Adjusting the impeller clearance	37
10.3 Cleaning the pump housing	37
10.4 Replacing the shaft seal	38
10.5 Oil change	38
10.6 Service kits	39
10.7 Contaminated pumps	39
11. Fault finding	40
12. Technical data	41
13. Disposal	41

Warning

The use of this product requires experience with and knowledge of the product.

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



1. Symbols used in this document

Warning

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



Warning

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



Warning

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



Caution

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

Note

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



Warning

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

2. General description

This booklet includes instructions for installation, operation and maintenance of Grundfos SL1 and SLV submersible sewage and wastewater pumps with motors of 0.9 to 1.5 kW. Grundfos SL1 and SLV sewage pumps are portable and designed for pumping domestic and industrial sewage and wastewater.

Two types of pumps are available:

- SL1.50.65 sewage pumps with single-channel impeller
- SLV.65.65 sewage pumps with Vortex, free-flow impeller.

The pumps can be installed on an auto-coupling system or stand freely on the bottom of a tank.

The pumps can be controlled via the Grundfos LC, LCD 107, LC, LCD 108, LC, LCD 110 pump controllers or the Grundfos CU 100 control box. See installation and operating instructions for the selected controller.

2.1 Product drawings

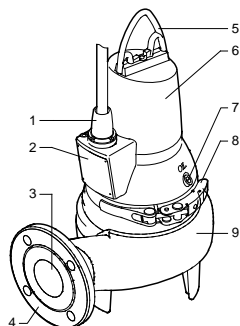


Fig. 1 SL1.50.65 pump

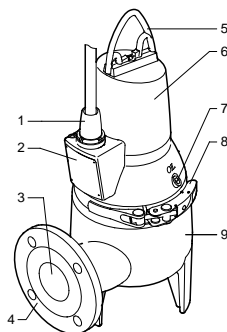


Fig. 2 SLV.65.65 pump

Explanation to figures 1 and 2:

Pos.	Description
1	Cable plug
2	Nameplate
3	Discharge
4	Discharge flange DN 65, PN 10
5	Lifting bracket
6	Stator housing
7	Oil screw
8	Clamp
9	Pump housing

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2.2 Applications

SL1.50.65 pumps are designed for pumping these liquids:

- large quantities of drainage and surface water
- domestic wastewater with discharge from toilets
- wastewater from commercial buildings without discharge from toilets
- sludge-containing industrial wastewater
- industrial process water.

SLV.65.65 pumps are designed for pumping these liquids:

- surface water with abrasive particles
- municipal sewage
- sewage from commercial buildings
- sludge- or fibre-containing industrial wastewater.

The compact design makes the pumps suitable for both temporary and permanent installation.

2.3 Operating conditions

The SL1 and SLV pumps are designed for intermittent operation (S3). When completely submerged in the pumped liquid, the pumps can also operate continuously (S1). See 9.2 *Operating modes*.

Installation depth

Maximum 10 metres below liquid level.

Operating pressure

Maximum: 6 bar.

Intermittent operation

Maximum 20 starts per hour.

pH value

SL1 and SLV pumps in permanent installations can be used for pumping liquids with a pH value between 4 and 10.

Liquid temperature

0 °C to +40 °C.

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



Warning

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

Density and viscosity of pumped liquid

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

3. Delivery and handling

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

3.1 Transportation

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

Warning



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

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

3.2 Storage

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

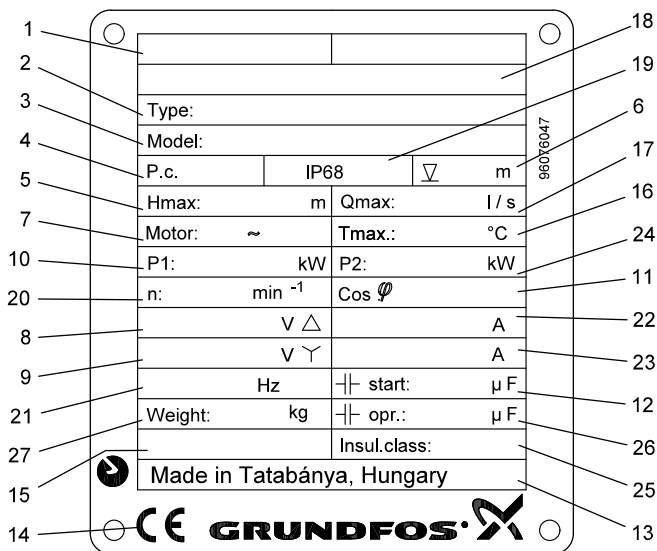
After a long period of storage, the pump should be inspected before it is put into operation. Make sure that the impeller can rotate freely. Pay special attention to the condition of the shaft seals and the cable entry.

4. Identification

4.1 Nameplate

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

Fix the additional nameplate supplied with the pump close to the tank.



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Fig. 3 Nameplate

Pos.	Description	Pos.	Description
1	Ex mark	15	EN approval
2	Type designation	16	Maximum liquid temperature
3	Product number	17	Maximum flow rate
4	Production code (year/week)	18	Explosion protection
5	Maximum head	19	Enclosure class to IEC
6	Maximum installation depth	20	Rated speed
7	Number of phases	21	Frequency
8	Rated voltage, Δ	22	Rated current, Δ
9	Rated voltage, Y	23	Rated current, Y
10	Rated power input	24	Shaft power
11	Power factor	25	Insulation class
12	Starting capacitor	26	Run capacitor
13	Country of production	27	Weight without cable
14	CE mark		

4.2 Type key

Please note that not all combination options are available.

Code	Example	SL	1	50	.65	.11	.EX	.2	.1	.5	02
Pump type											
SL	Grundfos sewage/wastewater pumps										
Impeller type											
1	Single-channel impeller										
V	Free-flow impeller (SuperVortex)										
[]	Semi-open impeller										
Pump passage											
50	Maximum solids size [mm]										
Pump discharge											
65	Nominal diameter of pump discharge port [mm]										
Output power, P2											
11	P2 = Code number from type designation/10 [kW]										
Equipment											
[]	Standard (without equipment)										
A	Pump equipped with a control box CU 100										
Ex version											
[]	Standard version of submersible sewage/wastewater pump										
EX	Pump designed to the ATEX standard indicated or Australian standard, AS 2430.1										
Number of poles											
2	2-pole, 3000 min ⁻¹										
Number of phases											
1	Single-phase motor										
[]	Three-phase motor										
Mains frequency											
5	50 Hz										
Voltage and starting method											
02	230 V, DOL										
0B	400-415 V, DOL										
0C	230-240 V, DOL										
Generation											
[]	1st generation										
A	2nd generation										
B	3rd generation, etc										
	The pumps belonging to the individual generations differ in design but are similar in terms of power rating.										
Material in pump											
[]	Standard material in pump										


5. Approvals


The standard version of SL1 and SLV pumps has been tested by VDE, and the explosion-proof version approved by KEMA according to the ATEX directive.

5.1 Approval standards

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

5.2 Explanation to the Ex approval

The explosion protection classification of the pump is CE 0344  II 2 G Ex d IIB T4 X.

Directive/ standard	Code	Description
ATEX	CE 0344	CE marking of conformity according to the ATEX directive 94/9/EC, Annex X. 0344 is the number of the notified body which has certified the quality system for ATEX.
		Marking of explosion protection
	II	Equipment group according to the ATEX directive, Annex II, point 2.2, defining the requirements applicable to the equipment in this group.
	2	Equipment category according to the ATEX directive, Annex II, point 2.2, defining the requirements applicable to the equipment in this category.
	G	Explosive atmospheres caused by gases, vapours or mists.
Harmonized European standard EN 60079-0	Ex	The equipment conforms to harmonized European standard.
	d	Flame-proof enclosure according to EN 60079-1: 2007.
	II	Suitable for use in explosive atmospheres (not mines.)
	B	Classification of gases, see EN 60079-0: 2006, Annex A. Gas group B includes gas group A.
	T4	Maximum surface temperature is 135 °C.
	X	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 the installation and operating instructions.

0.0.1 Australia

Ex variants for Australia are approved as Ex nC II T3 X according to IEC 79-15 (corresponding to AS 2380.9).

Standard	Code	Description
IEC 79-15: 1987	Ex	Area classification according to AS 2430.1.
	n	Non-sparking according to AS 2380.9: 1991, section 3 (IEC 79-15: 1987).
	C	The environment is adequately protected against sparking components.
	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. The conditions are mentioned in the certificate and the installation and operating instructions.

6. Safety



Warning

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

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



Warning

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



Warning

It must be possible to lock the mains switch in position 0. Type and requirements as specified in EN 60204-1, 5.3.2.

Warning

The use of this product requires experience with and knowledge of the product.



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

Children must not use or play with this product.

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

Note

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

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

Warning



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

6.1 Potentially explosive environments

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



Warning

SL1 and SLV pumps must under no circumstance pump combustible liquids.




Warning

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



Warning

The explosion protection classification of the pumps is CE  II 2 G, Ex d IIB T4 X. The classification of the installation site must be approved by the local fire-fighting authorities in each individual case.

Special conditions for safe use of SL1 and SLV explosion-proof pumps:

1. Bolts used for replacement must be class A2-70 or better according to EN/ISO 3506-1.
2. The level of pumped liquid must be controlled by two stop level switches connected to the motor control circuit. The minimum level depends on the installation type and is specified in these installation and operating instructions.
3. Make sure the permanently attached cable is suitably mechanically protected and terminated in a suitable terminal board placed outside the potentially explosive area.
4. The thermal protection in the stator windings has a nominal cut-out temperature of 150 °C guaranteeing the disconnection of the power supply; the resetting of the supply is manual.



7. Installation

Caution

Prior to installation, make sure the tank bottom is even.



Warning

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

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

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

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

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

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

All pump housings have a cast DN 65, PN 10 discharge flange.

The pumps are designed for intermittent operation.

Note

When completely submerged in the pumped liquid, the pumps can also operate continuously. See section 12. *Technical data.*

Warning

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



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

Caution

Warning

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



7.1 Submerged installation on auto-coupling

Pumps for permanent installation can be installed on a stationary auto-coupling guide rail system. See fig. A, page 8.

The auto-coupling system facilitates maintenance and service as the pump can easily be lifted out of the tank.

Warning

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



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

Note

Note

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

Proceed as follows:

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

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

Note

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

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

Note

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

7.2 Free-standing submerged installation

Pumps for free-standing submerged installation can stand freely on the bottom of the tank or the like. See fig. B, page 9.

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

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

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

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

Proceed as follows:

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

Note

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

8. Electrical connection

Warning

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



It must be possible to lock the mains switch in position 0. Type and requirements as specified in EN 60204-1, 5.3.2.

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

Warning

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



Warning

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



Warning

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

The explosion protection classification of the pump is CE Ⓜ II 2 G, Ex d IIB T4 X. The classification of the installation site must be approved by the local fire-fighting authorities in each individual case.

On explosion-proof pumps, make sure that an external earth conductor is connected to the external earth terminal on the pump using a conductor with 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 mm², e.g. type H07 V2-K (PVT 90 °) yellow/green. Make sure that the earth connection is protected against corrosion.

Make sure that all protective equipment has been connected correctly.

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

**Warning**

If the supply cable is damaged, it must be replaced by the manufacturer, its 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 pump nameplate.

**Warning**

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

The supply voltage and frequency are marked on the pump nameplate. The 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 cable and a free cable end.

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

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

See fig. 4 or 5 and the installation and operating instructions for the selected control box or pump controller.

Potentially explosive environments

In potentially explosive environments you have two options:

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

**Warning**

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

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

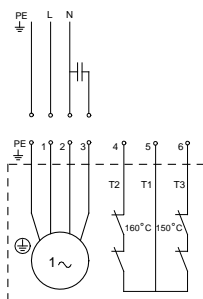
8.1 Wiring diagrams

Fig. 4 Wiring diagram for single-phase pumps

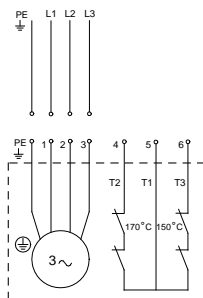


Fig. 5 Wiring diagram for three-phase pumps

8.2 CU 100 control box

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

Single-phase pumps: A run capacitor must be connected to the control box.

For capacitor size, see the table:

Pump type	Run capacitor	
	[μF]	[V]
SL1 and SLV	30	450

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TM02 5588 3602

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

Long free cable = large difference in level
Short free cable = small difference in level.

Note Both the two following points must be observed.

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



Warning

The CU 100 control box must not be used for Ex applications.
See section 8.3 Pump controllers.

Warning

The pump must not run dry.
An additional level switch must be installed to ensure that the pump is stopped in case the stop level switch is not operating. See fig. 6.



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

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

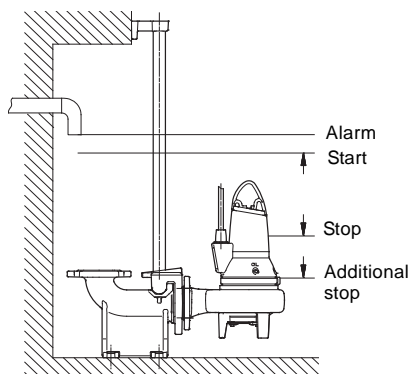


Fig. 6 Start and stop levels

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8.3 Pump controllers

The following LC and LCD pump controllers are available:

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

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

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

Controllers for single-phase pumps incorporate capacitors.

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

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

When installing the level switches, observe the following points:

- To prevent air intake and vibrations, install the **stop level switch** in such a way that the pump is stopped before the liquid level is lowered below the middle of the motor housing.
- Install the **start level switch** in such a way that the pump is started at the required level; however, the pump must always be started before the liquid level reaches the bottom inlet pipe to the tank.
- If installed, 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 to the tank.

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

Warning

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



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

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

8.4 Thermal switches

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

Thermal switch, circuit 1 (T1-T3), breaks the circuit at a winding temperature of approx. 150 °C.

Note

This thermal switch must be connected for all pumps.

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

Warning



After thermal cutout, explosion-proof pumps must be restarted manually. The thermal switch (circuit 2) must be connected for manual restarting of these pumps.

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

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

Warning



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

8.5 Frequency converter operation

For frequency converter operation please observe the following information.

Requirements must be fulfilled.

Recommendations ought to be fulfilled.

Consequences should be considered.

0.0.2 Requirements

- 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 motor terminals. The cable influence has not been taken into account. See data sheet for the frequency converter used regarding the actual values and cable influence on the peak voltage and dU/dt .

Max. repetitive peak voltage (V)	Max. dU/dt U_N 400 V (V/ μ sec.)
650	2000

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

0.0.3 Recommendations

Before installing a frequency converter, calculate the lowest allowable frequency in the installation in order to avoid zero flow.

- Do not reduce the motor speed to less than 30 % of rated speed.
- Keep the flow velocity above 1 m/sec.
- Let the pump run at rated speed at least once a day in order to prevent sedimentation in the piping system.
- Do not exceed the frequency indicated on the nameplate. In this case there is risk of motor overload.
- Keep the motor cable as short as possible. The peak voltage will increase with the length of the motor cable. See data sheet for the frequency converter used.
- Use input and output filters on the frequency converter. See data sheet for the frequency converter used.
- Use screened motor cable if there is a risk that electrical noise can disturb other electrical equipment. See data sheet for the frequency converter used.

0.0.4 Consequences

When operating the pump via a frequency converter, please be aware of these possible consequences:

- The locked-rotor torque will be lower. How much lower will depend on the frequency converter type. See the installation and operating instructions for the frequency converter used for information on the locked-rotor torque available.
- The working condition of bearings and shaft seal may be affected. The possible effect will depend on the application. The actual effect cannot be predicted.
- The acoustic noise level may increase. See the installation and operating instructions for the frequency converter used for advice as to how to reduce the acoustic noise.

9. Start-up

Warning

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

Make sure that all protective equipment has been connected correctly.

The pump must not run dry.



Warning

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

Warning

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



9.1 General start-up procedure

Proceed as follows:

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 also section 10.5 Oil change.
3. Check that the monitoring units, if used, are operating satisfactorily.
4. Check the setting of the air bells, float switches or electrodes.
5. Open the isolating valves, if fitted.
6. Lower the pump into the liquid and insert the fuses.
7. Check whether the system has been filled with liquid and vented. The pump is self-venting.
8. Start the pump.

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

Caution

After one week of operation or after replacement of the shaft seal, check the condition of the oil in the chamber. See section 10. Maintenance and service for procedure.

9.2 Operating modes

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

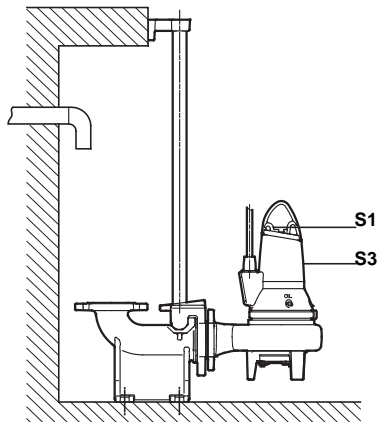


Fig. 7 Operating levels

• S3, intermittent operation

Operating mode S3 means that within 10 minutes the pump must be in operation for 4 minutes and stopped for 6 minutes. See fig. 8. In this operating mode, the pump is partly submerged in the pumped liquid, i.e. the liquid level reaches at minimum the middle of the motor. See fig. 7.

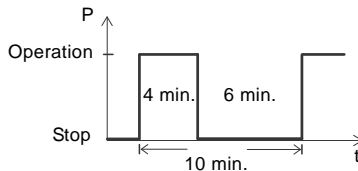


Fig. 8 S3 operation

• S1, continuous operation

In this operating mode, the pump can operate continuously without being stopped for cooling. Being completely submerged, the pump is sufficiently cooled by the surrounding liquid. See fig. 7.

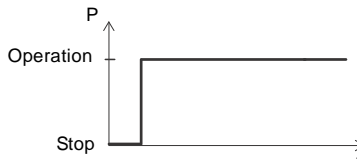


Fig. 9 S1 operation

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TM04 4527 1509

TM04 4528 1509

9.3 Direction of rotation

Note

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

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

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

An arrow on the motor housing indicates the correct direction of rotation.

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

If the direction of rotation is wrong, interchange any two of the phases in the power supply cable. See fig. 4 or 5.

Checking the direction of rotation

The direction of rotation should be checked in one of the following ways every time the pump is connected to a new installation.

Procedure 1:

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

Procedure 2:

1. Let the pump hang from a lifting device, e.g. the hoist used for lowering the pump into the tank.
2. Start and stop the pump while observing the movement (jerk) of the pump.
3. If connected correctly, the pump will jerk in the opposite direction of the direction of rotation. See fig. 10.
4. If the direction of rotation is wrong, interchange any two of the phases in the power supply cable. See fig. 4 or 5.

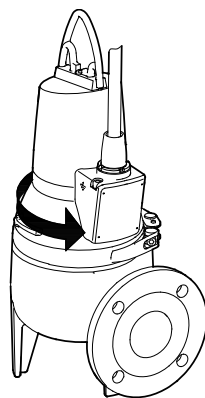


Fig. 10 Jerk direction

10. Maintenance and service

Warning

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

All rotating parts must have stopped moving.



Warning

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



Before carrying out maintenance and service, make sure that the pump has been thoroughly flushed with clean water. Rinse the pump parts in water after dismantling.

Warning

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



10.1 Inspection

Pumps running normal operation should be checked every 3000 operating hours or at least once a year. If the dry solids content of the pumped liquid is very high or sandy, check the pump at shorter intervals.

Check the following points:

- **Power consumption**

See pump nameplate.

- **Oil level and oil condition**

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

If the pump has been in operation for a long period of time, if the oil is drained off shortly after the pump has been stopped, and if the oil is greyish white like milk, it contains water.

If there is more than 20 % extra liquid (water) in the oil chamber, the shaft seal is defective.

See section *10.4 Replacing the shaft seal*.

In any case, the oil should be changed after 3000 operating hours or once a year.

Use Shell Ondina 917 oil or similar type.

See sections *10.5 Oil change* and *10.6 Service kits*.

The oil chamber of all pump models holds 0.17 litre.

Note

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

- **Cable entry**

Make sure that the cable entry is watertight and that the cables are not sharply bent and/or pinched. See section *10.6 Service kits*.

- **Pump parts**

Check impeller, pump housing, etc. for possible wear. Replace defective parts. See section *10.6 Service kits*.

- **Ball bearings**

Check the shaft for noisy or heavy operation (turn the shaft by hand). Replace defective ball bearings. A general overhaul of the pump is usually required in case of defective ball bearings or poor motor function. This work must be carried out by Grundfos or a service workshop authorized by Grundfos.

10.2 Adjusting the impeller clearance

This section applies to SL1 pumps only.

For position numbers, see page 16.

Proceed as follows:

1. Loosen the locking screws (pos. 188b).
2. Loosen the adjusting screws (pos. 189) and push the wear plate (pos. 162) until it touches the impeller.
3. Tighten the adjusting screws so that the wear plate still touches the impeller. Then loosen all the adjusting screws about half a turn.

Note

The impeller must be able to rotate freely without touching the wear plate.

4. Tighten the locking screws.
5. Rotate the impeller by hand to check that it is not touching the wear plate.

See also section *10.3 Cleaning the pump housing*.

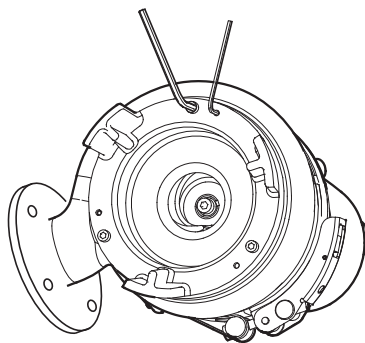


Fig. 11 Pump viewed from suction port

10.3 Cleaning the pump housing

For position numbers, see page 16 or 17.

Proceed as follows:

Dismantling

1. Stand the pump upright.
2. Loosen and remove the clamp (pos. 92) joining pump housing and motor.
3. Lift the motor part out of the pump housing (pos. 50). As the impeller is fastened to the shaft end, the impeller is removed together with the motor part.
4. Clean the pump housing and the impeller.

Assembly

1. Place the motor part with impeller in the pump housing.
2. Fit and tighten the clamp.

See also section *10.4 Replacing the shaft seal*.

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10.4 Replacing the shaft seal

As described in section 10.1 *Inspection*, the oil check will reveal whether the shaft seal is intact.

If the oil contains more than 20 % water, it is an indication that the shaft seal is defective and must be replaced. If the shaft seal is not replaced, the motor will be damaged.

For position numbers, see page 16 or 17.

Proceed as follows:

1. Loosen and remove the clamp (pos. 92) joining pump housing and motor.
2. Lift the motor part out of the pump housing (pos. 50). As the impeller is fastened to the shaft end, the impeller is removed together with the motor part.
3. Remove the screw (pos. 188a) from the shaft end.
4. Remove the impeller (pos. 49) from the shaft.
5. If it was not already done, drain the oil from the oil chamber.

See section 10.5 *Oil change*.

The shaft seal is a complete unit for all pumps.

6. Remove the screws (pos. 188a) securing the shaft seal (pos. 105).
7. Lift the shaft seal (pos. 105) out of the oil chamber using the lever principle, the two dismounting holes in the shaft seal carrier (pos. 58) and two screwdrivers.
8. Check the bush (pos. 103).
If the bush is worn and must be replaced, the pump must be checked by Grundfos or a service workshop authorized by Grundfos.

If the bush is intact, proceed as follows:

1. Check and clean the oil chamber.
2. Lubricate the faces in contact with the shaft seal with oil.
3. Insert the new shaft seal (pos. 105) using the plastic bush included in the kit.
4. Tighten the screws (pos. 188a) securing the shaft seal to 16 Nm.
5. Fit the impeller. Make sure that the key (pos. 9a) is fitted correctly.
6. Fit and tighten the screw (pos. 188a) securing the impeller to 22 Nm.
7. Place the motor part with impeller in the pump housing (pos. 50).
8. Fit and tighten the clamp (pos. 92).
9. Fill the oil chamber with oil.

See section 10.5 *Oil change*.

For adjustment of impeller clearance, see section 10.2 *Adjusting the impeller clearance*.

10.5 Oil change

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

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

See section 10.4 *Replacing the shaft seal*.

Draining of oil

Warning



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

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 has been removed, the oil will give a good indication of the condition of the shaft seal.

Note

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

Oil filling, pump lying down

See fig. 12

1. Place the pump in such a position that it is lying on the motor housing and the discharge flange with the oil screws 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.
For oil quantity, see section 10.1 *Inspection*.
3. Fit both oil screws using the packing material included in the kit.
See section 10.6 *Service kits*.

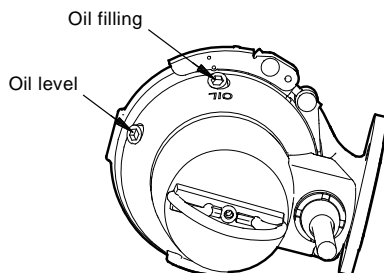


Fig. 12 Oil filling holes

Oil filling, pump in upright position

1. Place the pump on a plane, horizontal surface.
2. Fill oil into the oil chamber through one of the holes until it starts running out of the other hole.
For oil quantity, see section 10.1 *Inspection*.
3. Fit both oil screws using the packing material included in the kit. See section 10.6 *Service kits*.

10.6 Service kits



Warning

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

All rotating parts must have stopped moving.

The following service kits are available for all pumps.

Service kit	Contents	Pump type	Material	Order number	
Shaft seal	Shaft seal complete	All	BQQP	96106536	
		All	BQQV	96645161	
O-ring	O-rings and gaskets for oil screws	All	NBR	96115107	
		All	FKM	96646049	
				SL1.50.65.09	96115096
				SL1.50.65.11	96115097
Impeller	Impeller complete with adjusting screw, shaft screw and key			SL1.50.65.15	96115098
				SLV.65.65.09	96115110
				SLV.65.65.11	96115099
				SLV.65.65.15	96115100
Oil	1 litre of oil, type Shell Ondina 917. See section 10. <i>Maintenance and service</i> for required quantity in oil chamber.	All types		96076171	

Note

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

10.7 Contaminated pumps



Warning

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

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

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

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

The pump must be cleaned in the best possible way before it is returned.

11. Fault finding

Warning



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

All rotating parts must have stopped moving.



Warning

All regulations applying to pumps installed in potentially explosive environments must be observed.

It must be ensured that no work is carried out in potentially explosive atmosphere.

Fault	Cause	Remedy
1. Motor does not start. Fuses blow or motor-protective circuit breaker trips out immediately. Caution: Do not start again!	a) Supply failure; short-circuit; earth-leakage fault in cable or motor winding.	Have the cable and motor checked and repaired by a qualified electrician.
	b) Fuses blow due to use of wrong type of fuse.	Install fuses of the correct type.
	c) Impeller blocked by impurities.	Clean the impeller.
	d) Air bell, float switch or electrode out of adjustment or defective.	Readjust or replace the air bells, float switches or electrodes.
2. Pump operates, but motor-protective circuit breaker trips out after a short while.	a) Low setting of thermal relay in motor-protective circuit breaker.	Set the relay in accordance with the specifications on the nameplate.
	b) Increased current consumption due to large voltage drop.	Measure the voltage between two motor phases. Tolerance: - 10 %/+ 6 %. Reestablish correct voltage supply.
	c) Impeller blocked by impurities. Increased current consumption in all three phases.	Clean the impeller.
	d) Adjustment of impeller clearance incorrect.	Readjust the impeller. See section 10.2 <i>Adjusting the impeller clearance</i> , fig. 11.
3. The pump's thermal switch trips out after the pump has been operating for some time.	a) Too high liquid temperature.	Reduce the liquid temperature.
	b) Too high liquid viscosity.	Dilute the liquid.
	c) Wrong electrical connection (If the pump is star-connected to a delta connection, the result will be very low undervoltage).	Check and correct the electrical installation.
4. Pump operates at below-standard performance and power consumption.	a) Impeller blocked by impurities.	Clean the impeller.
	b) Wrong direction of rotation.	Check the direction of rotation and possibly interchange any two phases of the incoming supply cable. See section 9.3 <i>Direction of rotation</i> .
5. Pump operates, but gives no liquid.	a) Discharge valve closed or blocked.	Check the discharge valve and possibly open and/or clean.
	b) Non-return valve blocked.	Clean the non-return valve.
	c) Air in pump.	Vent the pump.

12. Technical data

Supply voltage

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

Winding resistances


Motor size	Winding resistance *	
Single-phase		
[kW]	Starting winding	Main winding
0.6	4.5 Ω	2.75 Ω
0.9		
1.1		
Three-phase		
	3 x 230 V	3 x 400 V
0.6	6.8 Ω	9.1 Ω
0.9		
1.1		
1.5		

* The table values do not include the cable.
Resistance in cables: 2 x 10 m, approx. 0.28 Ω.

Enclosure class

IP68, according to IEC 60 529.

Ex protection

CE  II 2 G, Ex d IIB T4 X, according to EN 60079-0: 2006.

Insulation class

F (155 °C).

Pump curves

Pump curves are available via the internet at www.grundfos.com.

The curves are to be considered as a guide.
They must not be used as guarantee curves.

Test curves for the supplied pump are available on request.

Sound pressure level

The sound pressure level of the pumps is lower than the limiting values stated in the EC Council directive 98/37/EC relating to machinery.

13. Disposal

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

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

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补充

位置号	描述 CN	Description GB
6a	定位销	Pin
7a	铆钉	Rivet
9a	平键	Key
26a	O型圈	O-ring
37	O型圈	O-ring
37a	O型圈	O-ring
48	定子	Stator
48a	接线板	Terminal board
49	叶轮	Impeller
50	泵壳	Pump housing
55	定子外壳	Stator housing
58	轴封载体	Shaft seal carrier
66	锁环	Locking ring
76	铭牌	Nameplate
92	卡箍	Clamp
102	O型圈	O-ring
103	衬套	Bush
104	密封环	Seal ring
105 105a	轴封	Shaft seal
107	O型圈	O-ring
153	轴承	Bearing
154	轴承	Bearing
155	油室	Oil chamber
158	波纹弹簧	Corrugated spring
159	O型圈	O-ring
162	耐磨护板	Wear plate
172	转子/轴	Rotor/shaft
173	螺栓	Screw
173a	垫圈	Washer
176	内部插头组件	Inner plug part
181	外部插头组件	Outer plug part
185	O型圈	O-ring
187	O型圈	O-ring
188a	螺栓	Screw
188b	锁定螺丝	Locking screw
189	调节螺丝	Adjusting screw
190	起吊支架	Lifting bracket
193	加油螺丝	Oil screw
193a	油	Oil
194	垫片	Gasket
198	O型圈	O-ring

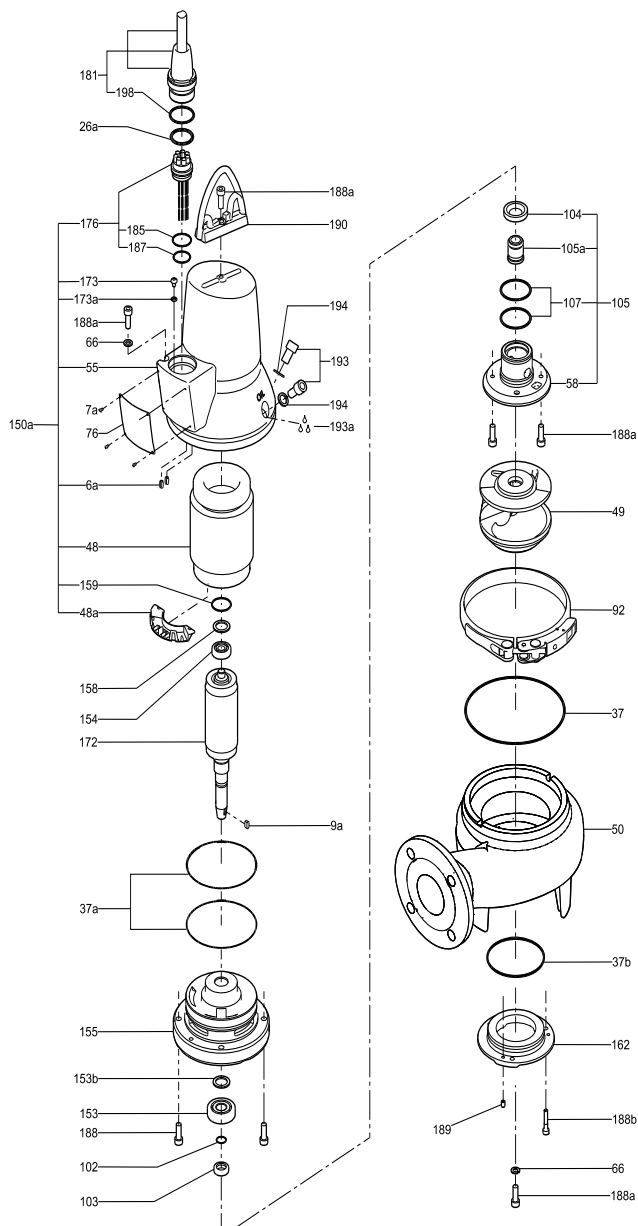


Fig. C SL1.50 水泵爆炸图

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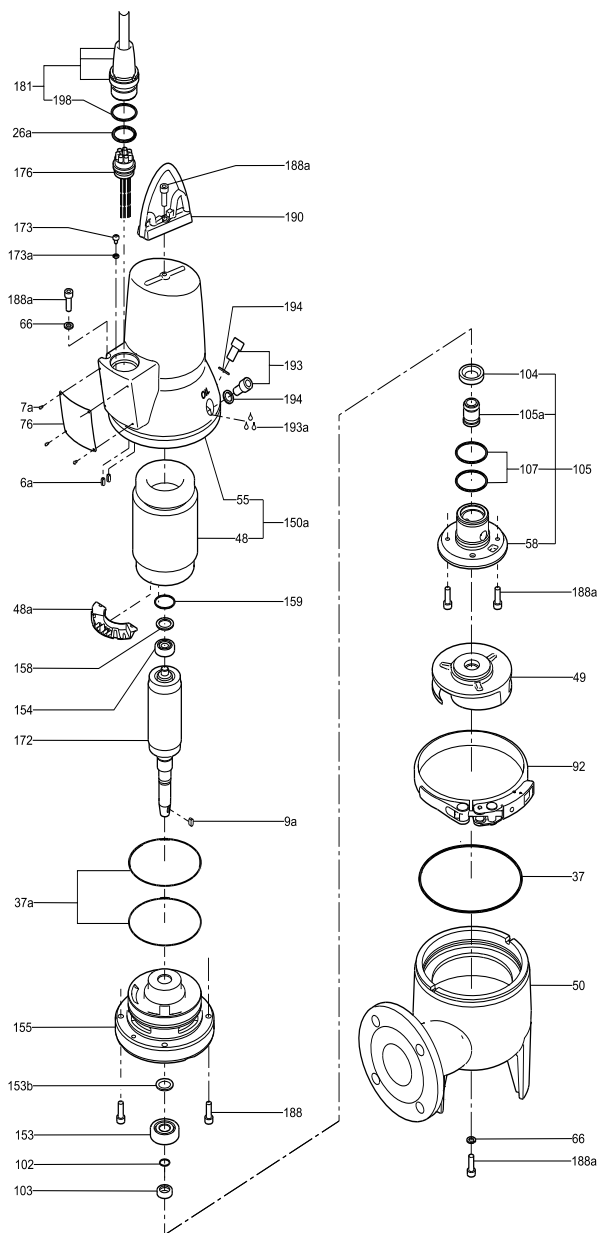


Fig. D SLV.65 水泵爆炸图

TM02 7364 3303

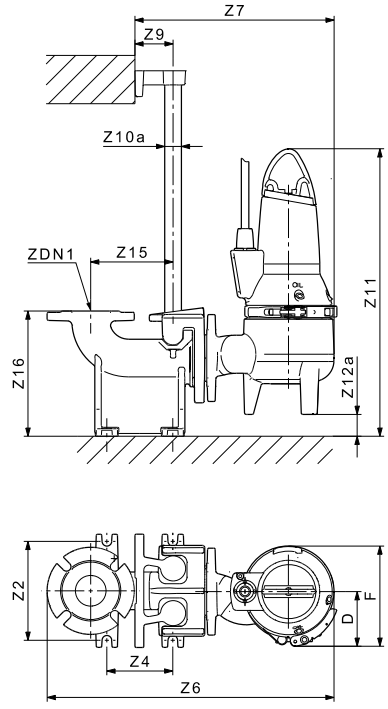
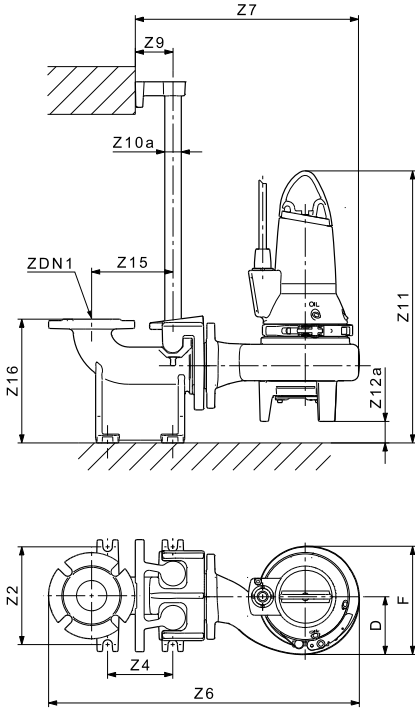
补充

CN: 自耦安装

GB: One-pump installation on auto-coupling

SL1.50

SLV.65

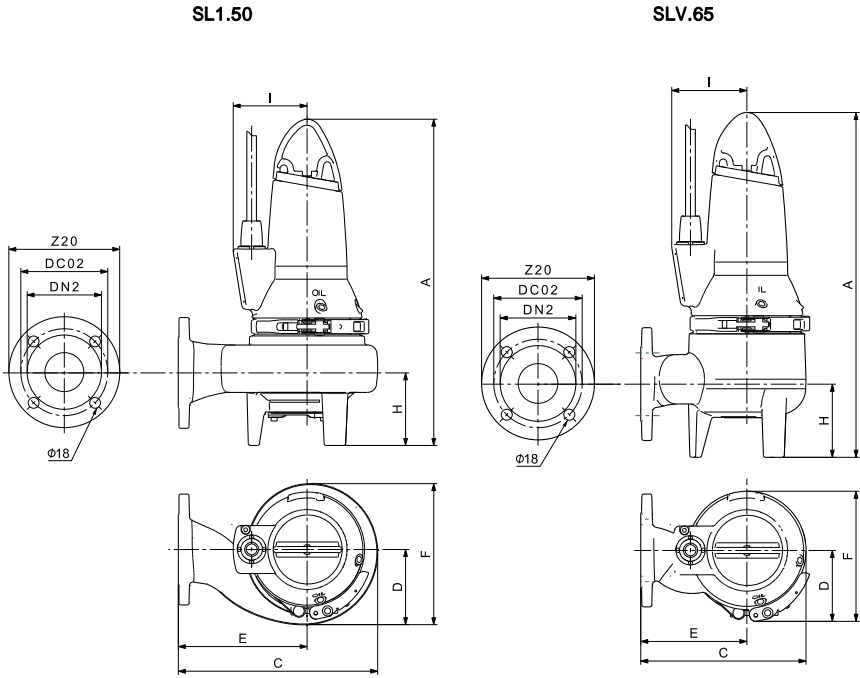


TM02 7420 1310 / TM02 7421 1310

Fig. A

水泵型号	功率 [kW]	D	F	Z2	Z4	Z6	Z7	Z9	Z10a	Z11	Z12a	Z15	Z16	ZDN1
SL1	0.9, 1.1 和 1.5	126	236	210	140	661	474	81	11/2"	588	43	175	266	DN65
SLV	0.9, 1.1 和 1.5	119	216	210	140	598	412	81	11/2"	610	45	175	266	DN65

CN: 移动式安装
 GB: Free-standing installation



TM02 7349 1310 / TM02 7350 1310

Fig. B

水泵型号	功率 [kW]	A	C	D	E	F	H	I	DC02	Z20	DN2
SL	0.6, 0.9, 1.1 和 1.5	544	333	126	217	242	121	123	145	185	DN65
SLV	0.6, 0.9, 1.1 和 1.5	565	271	97	176	213	120	123	145	185	DN65

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ECM: 1069980

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