

S pumps, Range 50-70

S1, S2, S3, ST, SV 10-208 hp

Installation and operating instructions



S pumps, Range 50-70

English (US)

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Français (CA)

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Original installation and operating instructions

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1. Limited warranty

New equipment manufactured by seller or service supplied by seller is warranted to be free from defects in material and workmanship under normal use and service for a minimum of twelve (12) months from date of installation, eighteen (18) months from date of shipment, unless otherwise stated in product warranty guide (available upon request). In the case of spare or replacement parts manufactured by seller, the warranty period shall be for a period of twelve months from shipment. Seller's obligation under this warranty is limited to repairing or replacing, at its option, any part found to its satisfaction to be so defective, provided that such part is, upon request, returned to seller's factory from which it was shipped, transportation prepaid. Parts replaced under warranty shall be warranted for twelve months from the date of the repair, not to exceed the original warranty period. This warranty does not cover parts damaged by decomposition from chemical action or wear caused by abrasive materials, nor does it cover damage resulting from misuse, accident, neglect, or from improper operation, maintenance, installation, modification or adjustment. This warranty does not cover parts repaired outside seller's factory without prior written approval. Seller makes no warranty as to starting equipment, electrical apparatus or other material not of its manufacture. If purchaser or others repair, replace, or adjust equipment or parts without seller's prior written approval, seller is relieved of any further obligation to purchaser under this paragraph with respect to such equipment or parts, unless such repair, replacement, or adjustment was made after seller failed to satisfy within a reasonable time seller's obligations under this paragraph. Seller's liability for breach of these warranties (or for breach of any other warranties found by a court of competent jurisdiction to have been given by seller) shall be limited to: (a) accepting return of such equipment exw plant of manufacture, and (b) refunding any amount paid thereon by purchaser (less depreciation at the rate of 15 % per year if purchaser has used equipment for more than thirty [30] days), and canceling any balance still owing on the equipment, or (c) in the case of service, at seller's option, redoing the service, or refunding the purchase order amount of the service or portion thereof upon which such liability is based. These warranties are expressly in lieu of any other warranties, express or implied, and seller specifically disclaims any implied warranty of merchantability or fitness for a particular purpose, and in lieu of any other obligation or liability on the part of the seller whether a claim is based upon negligence, breach of warranty, or any other theory or cause of action. In no event shall seller be liable for any consequential, incidental, indirect, special or punitive damages of any kind. For purposes of this paragraph, the equipment warranted shall not include equipment, parts, and work not manufactured or performed by seller. With respect to such equipment, parts, or work, seller's only obligation shall be to assign to purchaser the warranties provided to seller by the manufacturer or supplier providing such equipment, parts or work. No equipment furnished by seller shall be deemed to be defective by reason of normal wear and tear, failure to resist erosive or corrosive action of any fluid or gas, purchaser's failure to properly store, install, operate, or maintain the equipment in accordance with good industry practices or specific recommendations of seller, including, but not limited to seller's installation and operation manuals, or purchaser's failure to provide complete and accurate information to seller concerning the operational application of the equipment.

2. General information

2.1 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.

2.2 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.



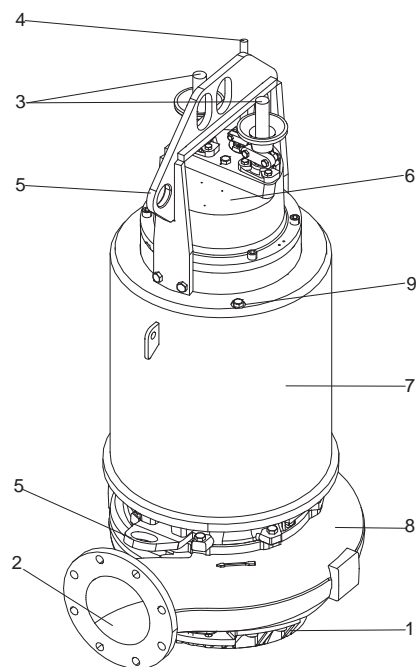
Tips and advice that make the work easier.

2.3 Target group

These installation and operation instructions are intended for professional installers.

3. Product introduction

3.1 Product description



S pump

Pos.	Description
1	Inlet
2	Outlet
3	Power supply cables
4	Control cable
5	Lifting bracket
6	Terminal box
7	Submersible motor
8	Pump
9	Air vent screw

3.2 Intended use

S pumps are designed for the pumping of sewage and wastewater in a wide range of municipal and industrial applications.

3.3 Pumped liquids

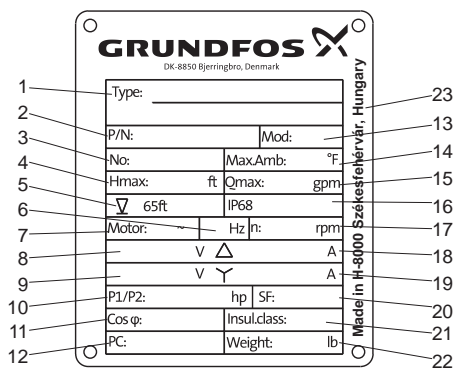
S pumps are ideal for transferring the following liquids:

- sewage
- wastewater.

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3.4 Identification

3.4.1 Nameplate



Pump nameplate

Pos.	Description
1	Type designation
2	SAP code
3	Serial number
4	Maximum head (ft)
5	Maximum installation depth (ft)
6	Frequency (Hz)
7	Number of phases
8	Voltage, delta connection
9	Voltage, star connection
10	Power input/output (hp)
11	Cos φ, 1/1 load
12	Production code (YYWW)
13	Production number
14	Maximum liquid temperature (°F)
15	Maximum flow rate (gpm)
16	Enclosure class
17	Rated speed
18	Current, delta connection
19	Current, star connection
20	Motor safety factor
21	Insulation class
22	Weight (lb)
23	Production site

3.4.2 Type key

The S pumps are identified by the type designation stated on the order confirmation and other documentation supplied with the pump.

Note: The pump type described in this booklet is not available in all variants.

Example: S1.40.A80.9804.66H.S.358.G.N.D.611.Z

Code	Example	Designation
S	Grundfos sewage and wastewater pump	Pump type
ST	Multi-channel impeller pump installed in column pipe	
1	Single-channel	
2	Two-channel	Impeller type
3	Three-channel	
V	SuperVortex	
40	Maximum solids size: code number from type designation / 10 [inch] = 4" (100 mm)	Pump passage [inch]
A80	Nominal diameter of pump outlet port: code number from type designation / 10 [inch] = 8" (200 mm)	Pump outlet, S-type [inch]
	Nominal diameter of column pipe: code number from type designation / 10 [inch] = 8" (200 mm)	Column diameter, ST-type [inch]
980	P2: code number from type designation / 10 [hp] = 98 hp	Output power P2 [hp]
2	2-pole motor	Number of poles
4	4-pole motor	
6	6-pole motor	
8	8-pole motor	
50	Range 50	Pump range
54	Range 54	
58	Range 58	
62	Range 62	
66	Range 66	
70	Range 70	
H	High	Pressure version
M	Medium	
L	Low	
E	Extra-low	
S	Submersible installation without cooling jacket	Installation type
C	Submersible installation with cooling jacket	
D	Dry, vertical installation	
H	Dry, horizontal installation	
		Impeller diameter (average) [mm]
G	Cast iron impeller, pump housing and motor housing	Material code for impeller, pump housing and motor housing
Q	Stainless steel impeller, AISI 316 (DIN W.-Nr. 1.4408)	
N	Pump with non-explosion-proof motor	Pump version
Ex	Pump with explosion-proof motor	
B	S pump with built-in SM 113 module. PTC sensors are connected directly to IO 113 or other PTC relay.	Sensor version
C	Not in use	
D	S pump without built-in SM 113 module	
6	60 Hz	Frequency
		3 x 460 V D
01	3 x 460 / (797) V Y/D	Voltage code and connection
11	3 x 460 V, factory wired (dual voltage, 230 V or 460 V)	
3A	3 x 230 V, factory wired (dual voltage, 230 V or 460 V)	
3B	3 x 230 V, factory wired (dual voltage, 230 V or 460 V)	
Z	Custom-built products	Customization

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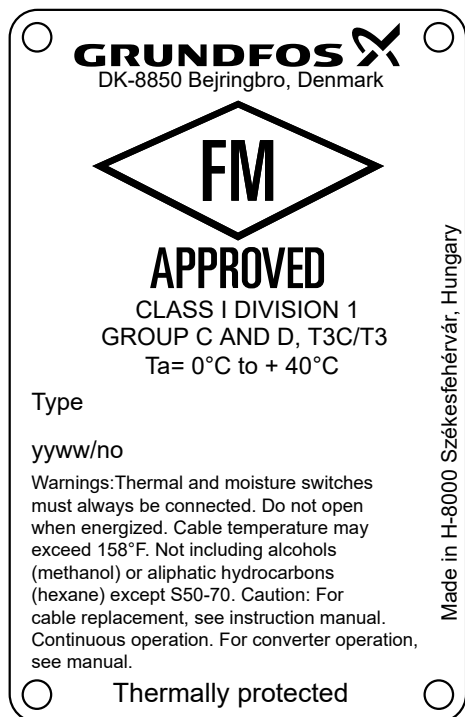
3.5 Approvals (FMus)

The S pumps are approved by FM, and the explosion-proof versions have an FM-type examination certificate No FM21US0018.

3.5.1 FM certification and classification


Pump	Approval
50-70	Class I Division 1 Group C and D Hazardous (Classified) Locations. Temperature class T3C/T3.

3.6 FM approval plate



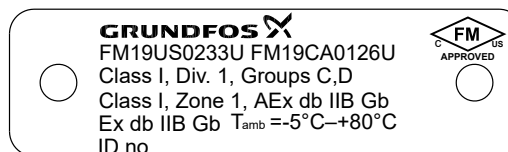
Approval plate of explosion-proof pumps

According to NEC500, the following classification applies for this electrical equipment:

	FM approval symbol.
Class I	Permitted for locations where flammable gases or vapors may be present.
Division 1	Permitted for locations where flammable or combustible gases can exist under normal operating conditions or due to repair, breakdown or faulty operation of the equipment.
Group C and D	Permitted for specific gases or vapors of Group C and D that may be present.
T3C	Temperature class (T code). Maximum surface temperature is 320 °F (160 °C).
T3	Maximum surface temperature of the equipment during frequency converter operation.
Type	FM listing code (such as S50X13.5/4.60).
yyww/no	Production year, week and serial number (such as 1052/123456).


3.6.1 Cable entry approval plate

The cable entry is tested and approved by FM Approvals under project number 449879 for the US and Canadian markets.



Cable entry approval plate

The cable entry approval plates provide the following details:

Pos.	Description
	The equipment conforms to the Canadian and US standards.
FM19US0233U	US certificate number
FM19CA0126U	Canadian certificate number
Class I	Explosive atmosphere is caused by gas or vapors.
Div. 1	Division 1. area classification, flammable material is present intermittently.
Groups C and D	Gas groups, ethylene and propane
Zone 1	Area classification, flammable material is present intermittently.
AEx	Explosion protected based on the American National Standard.
db	Type of protection, flameproof
IIB	Gas groups, ethylene and propane
Gb	Equipment protection level, gas atmosphere, „high” level of protection
Ex	Explosion-proof
T _{amb}	Ambient temperature
ID no	Cable entry identification number



Ex-approved cable entries must be maintained and replaced by a Grundfos-authorized service.

3.7 Potentially explosive environments

Use the explosion-proof S pumps in potentially explosive environments.



The explosion classification of the pump is Class 1, Division 1, Group C and D, T3C and T3 for frequency converter operation.



Installation must comply with the relevant requirements of the National Electrical Code® (ANSI/NFPA 70) and this installation and operating instructions.



In potentially explosive environments, use only FM-approved pumps.

Special conditions for safe use of explosion-proof pumps:

1. Make sure the moisture- and thermal switches are connected in two separate circuits and 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 ASTM F738M-01 (A4-80 or A2-80) according to ISO 3506-1.
3. The flame path gaps of the motor are specified by the manufacturer and are narrower than the standard.

WARNING: In case of repairs, always use original service parts from the manufacturer to ensure the correct dimensions of the flame path gaps.

4. During operation, the cooling jacket, when fitted, must be filled with the pumped liquid.
5. 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 this installation and operating instructions.
6. Dry-running is not allowed.
7. Make sure the permanently attached cables are suitably mechanically protected and terminated in a suitable terminal board.
8. The sewage pumps have an ambient temperature range of 32-104 °F (0-40 °C) and a maximum process temperature of 104 °F (+40 °C).
9. If a WIO sensor is installed, the control unit must protect the WIO sensor against short circuit current from the power supply to which it is connected. The maximum current from the control unit must be limited to 350 mA.
10. The maximum submersion depth is 66 ft (20 m).
11. Dry-installed pumps often have a higher temperature in the cable inlet than submerged pumps. This may reduce the lifetime of the Ex-protection. According to EN 60079-14, it is a user-responsibility to regularly inspect the condition of the permanently attached cable and cable entry for any visual damage, cracks or embrittlement caused by rubber aging.



DANGER

Explosive environment

Death or serious personal injury

- Check the cable entry for any visible damage, cracks or embrittlement to avoid sparks that can cause an explosion.

Special conditions for safe use of the WIO sensor:

1. The IO 113 control unit must protect the sensor against short-circuit currents from the power supply.
2. Install the sensor without being exposed to mechanical impact.
3. The WIO sensor must not be used in oil with a flash point below 482 °F (250 °C).
4. The WIO sensor is approved according to EN 60079-0, EN 60079-7, EN 60079-18, IEC 60079-0, IEC 60079-18, IEC60079-7. In FM and IEC Ex applications, the maximum current supplied to the sensor must be limited to 350 mA according to EN/IEC 60079-18 and EN/IEC 60079-0.
5. The WIO sensor is intended for use only with a galvanically isolated circuit.



3.8 Applications

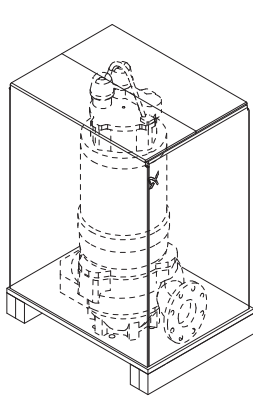
Depending on the installation type, the pumps can be used for submerged or dry, horizontal or vertical installation.

Maximum solids size: 3-6" (80-145 mm) depending on the impeller type.

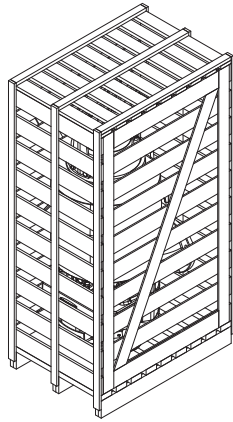
Installation type	Description	Accessories
S	Sewage pump without cooling jacket for submerged installation on auto coupling.	Auto coupling
C	Sewage pump with cooling jacket for submerged installation on auto coupling.	Auto coupling
D	Sewage pump with cooling jacket for dry, vertical installation.	Ranges 50, 54, 58 and 62: Base stand for vertical installation. Ranges 66 and 70: Base plate or stand for vertical installation.
H	Sewage pump with cooling jacket for dry, horizontal installation.	Base stand or plate for horizontal installation
ST	Sewage pump without cooling jacket for installation in vertical column pipe.	Seat ring

4. Receiving the product

S pumps are supplied from the factory either in a horizontal or vertical position. Range 50 is supplied on a wooden pallet and in a cardboard box. Ranges 54-70 are supplied on a wooden pallet and in a crate.



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Transportation method S pumps, range 50

Transportation method S pumps, range 54-70

Make sure to dispose of pallets and other packaging material according to local waste disposal regulations.



Keep the cable end protectors in storage for later use.

4.1 Handling the product

Before handling the product, check the following:

- Lifting equipment and lifting points. See section Lifting the pump.
- Raising the pump to vertical position. See section Raising the pump to vertical position.
- Move the pump only with a forklift or a lifting crane.

DANGER

Crushing hazard

Death or serious personal injury

- Make sure the center of gravity is between the fork-lift arms when lifting the pump.



4.2 Lifting the pump

S pumps weigh up to 5235.97 lb (2375 kg) without accessories. It is, therefore, crucial to use the appropriate lifting equipment. The pump weight is stated on the nameplate.



Always use lifting equipment that is rated for the load.

DANGER

Crushing hazard

Death or serious personal injury

- Always check the lifting bracket and chain for corrosion or wear before lifting.
- Always lift the pump by its lifting bracket or by a forklift truck.



DANGER

Crushing hazard

Death or serious personal injury

- Make sure the center of gravity is between the forklift arms when lifting the pump. The approximate center of gravity is marked with a label attached to the transportation stand.



DANGER

Electric shock

Death or serious personal injury

- Never lift the pump by the power supply cables.

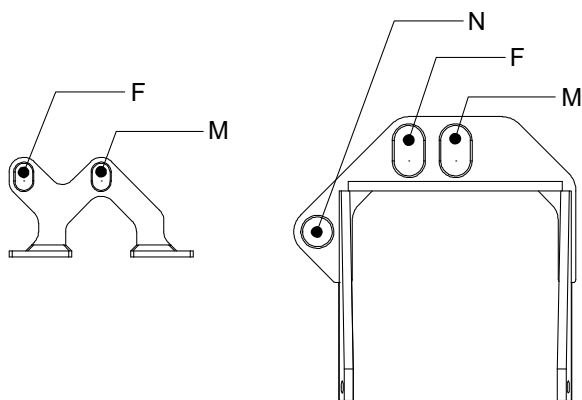


Lifting the pump by the power supply cables may result in an electrical short circuit and risk of electric shock when the pump is connected to the mains. The cables and cable entries may be damaged that can lead to loss of water resistance and severe damage to the motor.

If the pump is tilted more than 10° in any direction from its normal position, the pump may lose its stability.

Lifting points (top)

Use the right lifting point to keep the pump balanced. S pumps are equipped with a lifting bracket with lifting points to ensure the pump can be lifted safely.



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Lifting points

Range 50 and 54

Range 58, 62, 66 and 70

Pos.	Description
F	Front
M	Middle
N	Nose

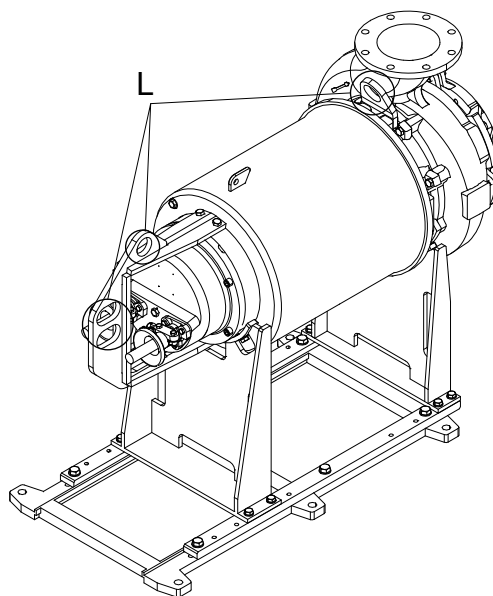
Outlet flange size	Pump range					
	50	54	58	62	66	70
A30 (DN 80)	Middle	Middle	-	-	-	-
A40 (DN 100)	Middle	Middle	-	-	-	-
A50 (DN 125)	Middle	Middle	Middle	Middle	-	-
A80 (DN 200)	Front	Front	Front	Middle	Middle	Middle
A100 (DN 250)	-	Front	-	-	Middle	Middle
A120 (DN 300)	-	-	Front	Middle	Middle	Middle
A200 (DN 500)	-	-	-	-	Nose	Front
A240 (DN 600)	-	-	-	-	Nose	Front

! Always lift the installation type ST (submerged in vertical column pipe without cooling jacket) pumps by the lifting bracket to make sure the pump is balanced.

Note: The design of the lifting bracket may differ from the one on the drawing. This difference does not affect the handling of the product.

Lifting points (bottom)

S pumps, ranges 66-70, are equipped with a lifting bracket on the motor top cover and with a lifting bracket on the lower bearing bracket.



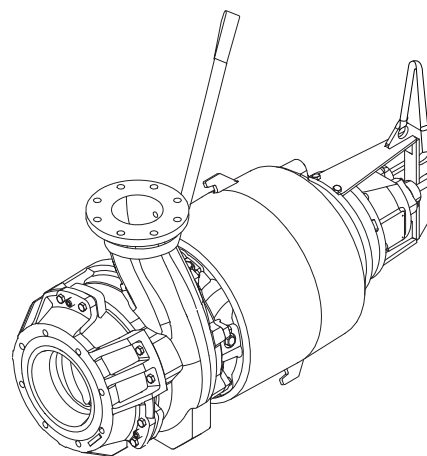
TM065922

Lifting points for ranges 66-70

Pos.	Description
L	Lifting points

S pumps, ranges 50 and 62, are equipped only with a lifting bracket on the motor top cover. Use the pump outlet as the lower lifting point. Lift the pump by a lifting strap or a lifting chain secured below the pump outlet.

Secure and lift by a strap.



TM065923

Lifting points for installation type H, range 50-62

Related information

[3.4.1 Nameplate](#)

[11.3 Dimensions and weights](#)

4.2.1 Raising the pump to vertical position

DANGER

Crushing hazard

Death or serious personal injury

- Make sure the lifting bracket or straps are tightened before lifting the pump.



DANGER

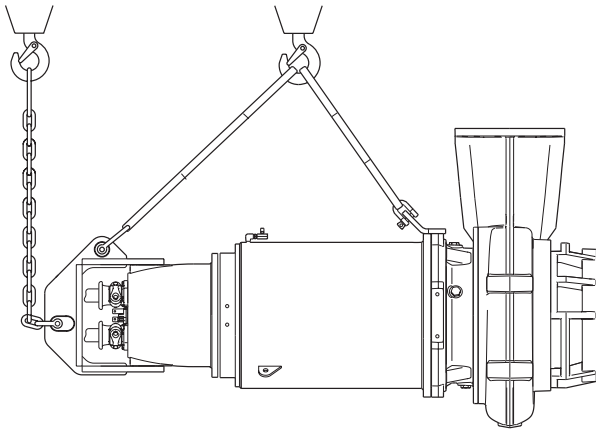
Crushing hazard

Death or serious personal injury

- Do not stand under or next to the pump when raising it to vertical position.
- Make sure the pump is raised carefully into vertical position to avoid the lifting chain slipping off the crane when the pump is unbalanced.

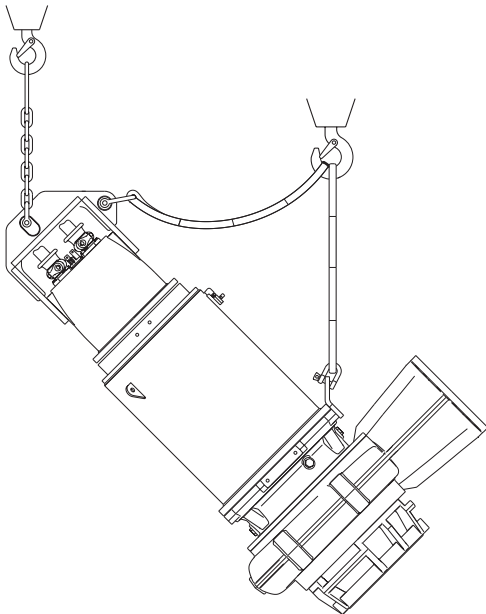


Carelessness during lifting or transportation may cause personal injury or damage to the pump.



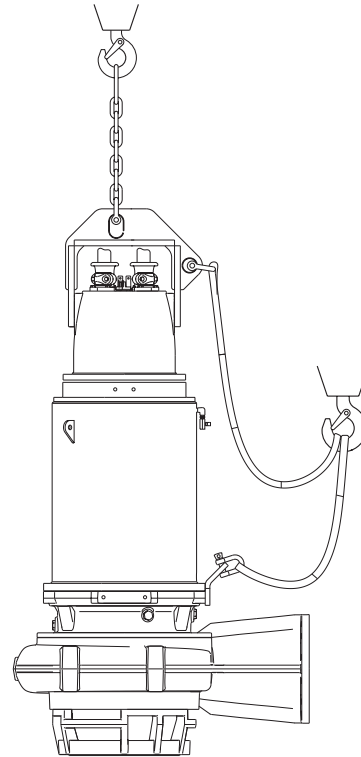
TM033034

Raising the pump to vertical position, step 1



TM033035

Raising the pump to vertical position, step 2

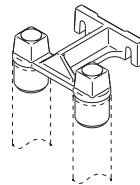


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Raising the pump to vertical position, step 3

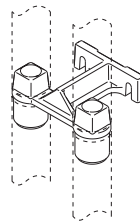
4.2.2 Lowering the pump on auto coupling

The pump can easily be pulled out and lowered into the pit by the guide rails. The stop level is lower for installation type C than for installation type S.



Upper guide-rail bracket

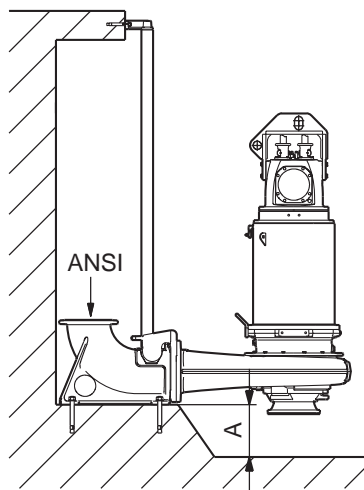
TM033066



Intermediate guide-rail bracket; guide rails longer than 19.7 ft (6 m) require intermediate guide-rail brackets

TM033068

The correct plinth height for installation on auto coupling is essential to obtain the best efficiency of the pump.



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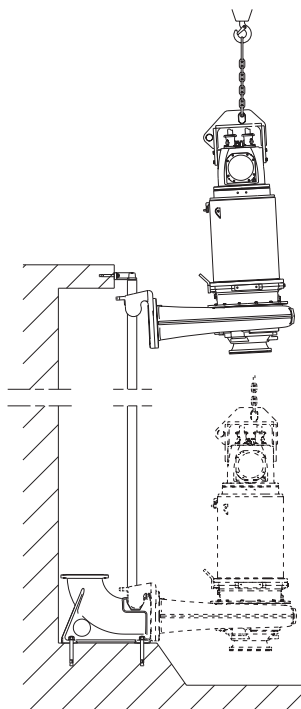
Auto-coupling base installation on a plinth

The minimum required plinth heights (A) for installation on auto coupling are indicated in the following table.

Pump type	Minimum plinth height (A) [in (mm)]
Range 50	
S1.30.A40.xxx	2 (50)
S1.40.A40.xxx	2 (50)
S1.40.A50.xxx	0 (0)
SV.30.A30.xxx	0 (0)
Range 54	
S1.30.A40.xxx	2 (50)
S1.40.A50.xxx	0 (0)
S1.40.A80.xxx	4 (100)
Range 58	
S1.30.A50.xxx	0 (0)
S1.40.A50.xxx	0 (0)
S1.45.A80.xxx	6 (150)
S2.40.A80.xxx	6 (150)
S2.40.A120.xxx	6 (150)
Range 62	
S1.30.A50.xxx	0 (0)
S1.40.A50.xxx	0 (0)
S2.40.A80.xxx	8 (200)
Range 66	
S1.40.A80.xxx	6 (150)
S2.40.A80.xxx	6 (150)
S2.45.A100.xxx	6 (150)
S2.55.A120.430 /550	6 (150)
S2.55.A120.760	16 (400)
S3.45.A200.760	10 (250)
Range 70	
S2.35.A80.xxx	6 (150)

Pump type	Minimum plinth height (A) [in (mm)]
S2.45.A100.xxx	8 (200)
S2.55.A120.xxx	16 (400)
S3.45.A120.xxx	16 (400)
S3.45.A200.xxx	10 (250)

Required tilt angle when the pump is lowered on the auto coupling:
 $\pm 5^\circ$



TM033067

Lowering the pump on an auto coupling

Related information

[5.1.1 Installation types](#)

5. Installing the product

S pumps are designed for various installation types.



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.

DANGER

Electric shock

Death or serious personal injury



- It must be possible to lock the mains switch in position 0. Type and requirements as specified in the National Electrical Code and all local codes.



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

DANGER

Overhead load

Death or serious personal injury



- Never work under a pump when it is hanging from a crane.

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

Pits for submersible sewage and wastewater pumps contain sewage and wastewater with toxic and/or contagious substances. Therefore, all persons involved must wear appropriate personal protective equipment and clothing. All work on and near the pump must be carried out in compliance with the hygiene regulations in force.

DANGER

Crushing hazard

Death or serious personal injury



- Make sure the rated capacity of the lifting equipment, including the lifting chain, is adequate for the lifting work.

The rated capacity of the lifting equipment is stated on the equipment nameplate. The weight of the pump is stated on the pump nameplate.

CAUTION

Hot surface

Minor or moderate personal injury



- Do not touch the pump or cables during operation because the surface temperature may exceed 158 °F (70 °C).

Related information

[5.1.1 Installation types](#)

5.1 Mechanical installation

DANGER

Electric shock

Death or serious personal injury



- Before installation, switch off the power supply and lock the main power switch in position 0.
- Before working on the pump, switch off any external voltage connected to the pump.

DANGER

Crushing hazard

Death or serious personal injury



- During installation, always support the pump by lifting chains or place it in horizontal position to secure stability.

Fix the extra nameplate supplied with the pump at the installation site.

Observe all safety regulations at the installation site.

CAUTION

Crushing of hands

Minor or moderate personal injury



- Do not put your hands or any tool into the pump inlet or outlet port after the pump is connected to the power supply unless the main power switch is locked in position 0.
- Make sure that the power supply cannot be switched on unintentionally.

Prior to installation, check the oil level in the oil chamber. See section Oil check and change.



Always use Grundfos accessories to ensure correct functioning.



If the installation has to be tested at a pressure higher than 1.3 times the maximum pump head, isolate the pump from the installation before the test to avoid damage to the pump.

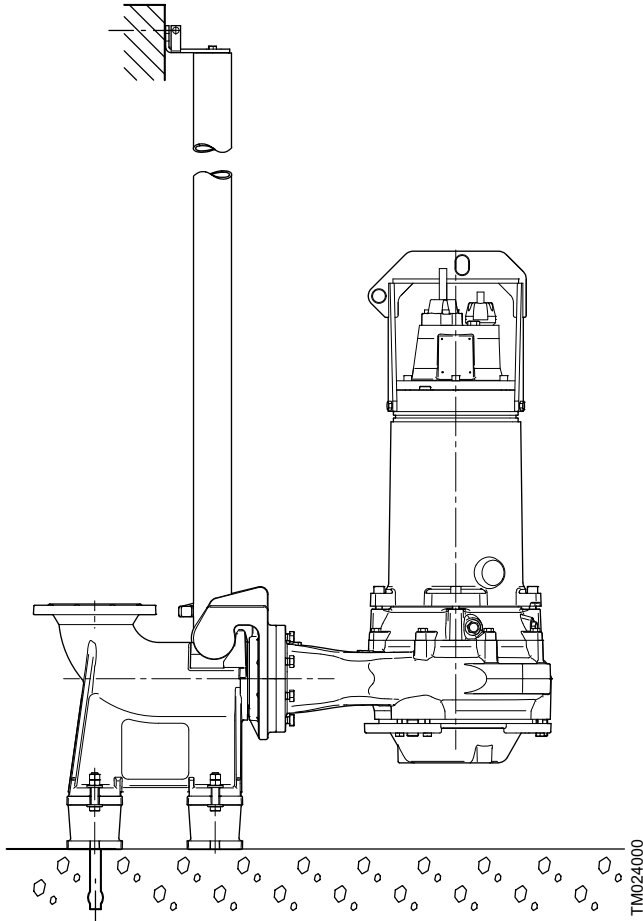
Related information

[9.3 Oil check and change](#)

5.1.1 Installation types

Installation types C and S

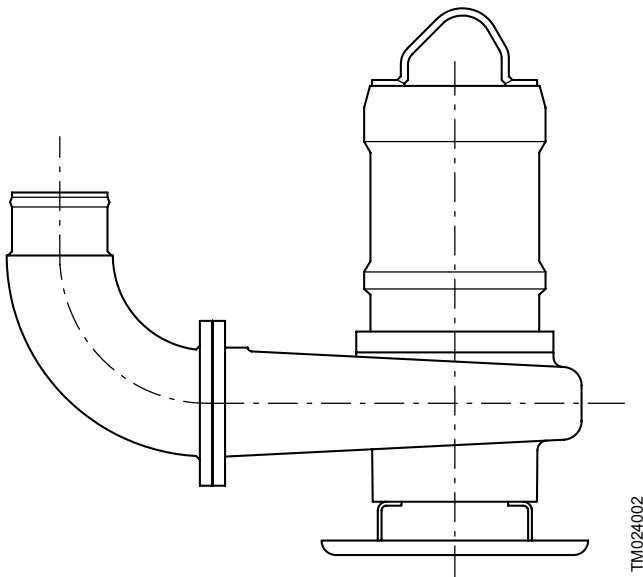
Submerged installation on auto coupling.



Permanent installation in pit

Base stand installation

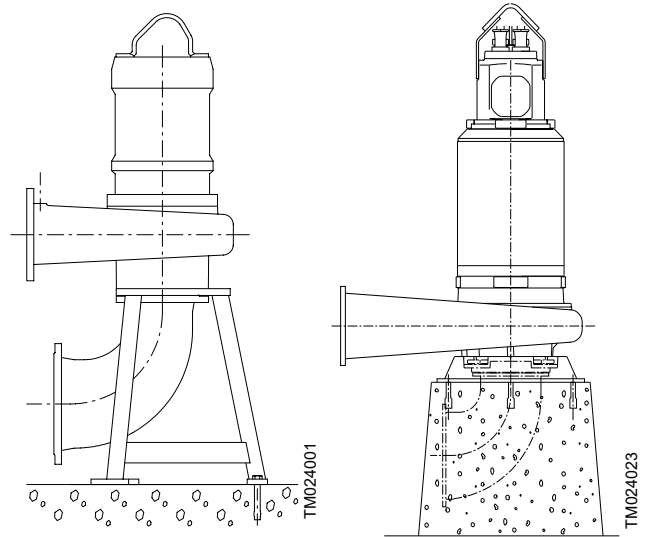
S pumps, ranges 50, 54 and 58, types S and C, can be temporarily installed on a base stand.



Submerged installation on a base stand

Installation type D

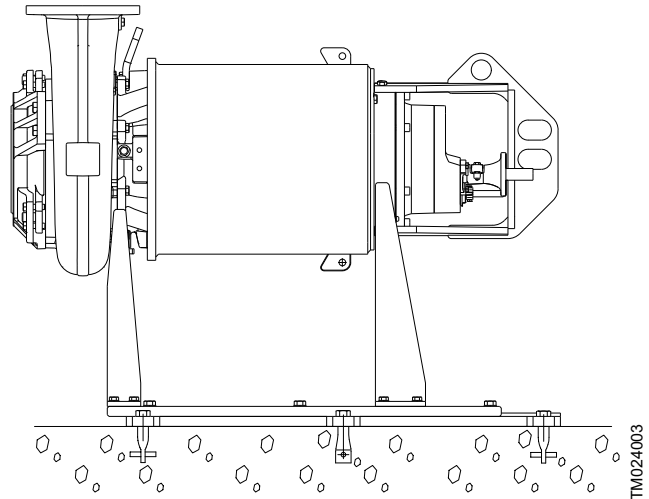
The pump is bolted to the inlet and outlet pipes by flange connections. Pumps with ANSI 20" or ANSI 24" (DN 500 or DN 600) flange are to be installed on a plinth (concrete foundation).



Permanent vertical dry installation with base stand (left) and base plate on two concrete plinths (right)

Installation type H

Permanent, horizontal, dry installation.

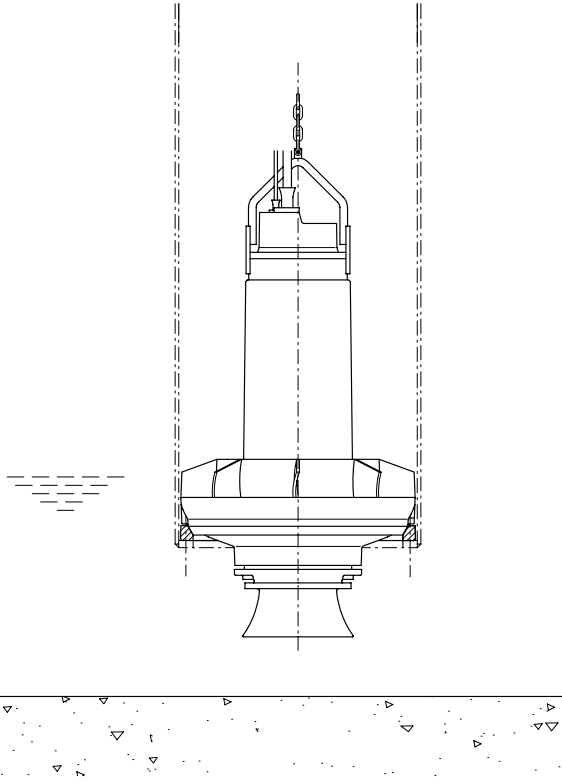


Permanent, horizontal, dry installation

The pump is bolted to the inlet and outlet pipes by flange connections.

Installation type ST

Installation in vertical column pipe.



TM065921

Submerged installation in vertical column pipe

5.1.2 Submerged installation on auto coupling

Pumps for permanent installation can be installed on a stationary auto coupling and operated completely or partially submerged in the pumped liquid.

Before installing the auto-coupling base unit, ensure the quality and strength of the concrete foundation. See the pull-out strengths required for anchor bolts in the table at the end of this section. To ensure adequate pull-out strength, weld the threaded bushings to the steel reinforcement in the concrete.



For auto-coupling installations, types S and C, including A100 (DN 250) and upwards, the guide claw is mounted on the outlet flange from the factory.

1. Drill mounting holes for the guide-rail bracket on the inside of the pit and fasten the guide-rail bracket provisionally with two anchor screws.
2. Place the auto-coupling base unit on the bottom of the pit. Use a plumb line to establish the correct positioning. Fasten the auto coupling with expansion bolts. If the bottom of the pit is uneven, the auto-coupling base unit must be supported so that it is level when being fastened.
3. Assemble the outlet pipe in accordance with the generally accepted procedures and without exposing the pipe to distortion or tension. Do not allow loads from the weight of the pipes to be carried by the auto coupling.
4. Fit the guide rails. An intermediate guide-rail bracket is required if guide rails are more than 19.7 ft (6 m) long. Place the guide rails on the auto coupling, then place the guide-rail bracket on the guide rails and fasten the guide-rail bracket to the pit wall. Tighten the anchor bolts.
5. Clean out debris from the pit before lowering the pump into it.
6. Before lowering the pump into the wet pit, check the cables visually for cuts or ruptures which may be caused by rough handling during transportation or installation.
7. Slide the guide claw of the pump between the guide rails and lower the pump into the pit by a certified chain secured to the lifting bracket. When the pump reaches the auto-coupling base unit, the pump automatically connects.
8. Hang up the end of the chain on a suitable hook at the top of the pit so the chain cannot come into contact with the pump.
9. Adjust the length of the motor cables, but ensure to have enough cable length to be able to make service on the pump. Make sure that the cables are not sharply bent or pinched. Fix the cables at the top of the pit so that no extra cable slides into the pit.
10. Connect the motor- and the sensor cables.



Avoid pipe tension at flanges and bolts.



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

Pull-out strengths for anchor bolts

Auto-coupling base unit	Bolts	Pull-out strength [kip (kN)]
ANSI 4" (DN 100)	4 x 5/8" (M16)	1.1 (5)
ANSI 5" (DN 125/150)*		7.8 (8)
ANSI 8" (DN 200)	4 x 1" (M24)	3.6 (16)
ANSI 10" (DN 250)		6.7 (30)
ANSI 12" (DN 300)		9.0 (40)
ANSI 20" (DN 500)		9.0 (40)
ANSI 24" (DN 600)	6 x 1-1/4" (M30)	9.0 (40)

* Pump outlet ANSI 5" (DN 125) and base plate outlet ANSI 6" (DN 150).



The pull-out strengths are stated without safety factor. The required safety factor may depend on the materials and the methods used for anchoring.

5.1.3 Submerged installation, portable

1. Fit the ring stand to the pump inlet flange.
2. Fit a 90° elbow to the pump outlet port and connect the outlet pipe or hose. If a hose is used, make sure that the hose does not buckle and the inside diameter matches the outlet port.
3. 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. Make sure that the pump is hanging from the chain.
4. Hang up the end of the chain on a suitable hook at the top of the pit so that the chain cannot come into contact with the pump housing.
5. 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.
6. Connect the motor cable and the control cable, if any.

5.1.4 Dry installation

Install pumps in dry installation permanently in a pump room.

The motor is enclosed and watertight. It is resistant to water if the installation site is flooded.



For vertical, dry installations, type D, install the pump on a permanent concrete foundation.



For horizontal, dry installations, type H, the pump is mounted on a base stand from factory.

1. Mark and drill mounting holes in the concrete foundation.
2. Fit the bracket or base stand on the concrete with anchor bolts. Check the pull-out strengths required for bolts at the end of this section.
3. Check that the bracket or base stand is horizontal or vertical.
4. Fasten the pump to the bracket or base stand.
To facilitate service on the pump, fit isolating valves on either side of the pump.
5. Fit the inlet and outlet pipes and isolating valves, if used, and ensure that the pump is not stressed by the pipes.
6. 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, but ensure to have enough cable length to be able to service the pump. Fasten the relief fitting to a suitable hook. Make sure that the cables are not sharply bent or pinched.
7. Connect the motor cable and the control cable, if any.



Use a reducer between the inlet pipe and the pump in horizontal installations. In horizontal installations, the reducer must be eccentric and must be installed so that the straight edge is pointing upwards. In this way, the accumulation of air in the inlet pipe is avoided and the risk of operation disturbance is eliminated.



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 inlet and outlet pipes are bolted to the pump by flange connections.

Foundation

To ensure acceptable vibration levels in the field, all parts of the system should be sufficiently stiff and firmly anchored to minimize vibrations:

- The foundation and concrete must be adequate to support the weight of the pump including accessories, the weight of the liquid passing through the pump, and the forces generated by the pump.
- The mass of the concrete foundation must be minimum three to five times the mass of the supported equipment and must have sufficient rigidity to withstand the axial, transverse and torsional loads generated by these machines.
- The foundation must be 6 in (15 cm) wider than the base plate for pumps up to 470 hp (350 kW) and 9.8 in (25 cm) wider for larger pumps.
- The concrete used in the foundation must have a minimum tensile strength of 363 psi (250 N/cm²).
- Always use epoxy grout to fasten the pump base plate to the foundation.

Pull-out strengths for anchor bolts

Installation type H

Range	Bolts	Pull-out strength [kip (kN)]
50-62	4 x 5/8" (M16)	2.2 (10)
66-70	6 x 1" (M24)	5.6 (25)

Installation type D

Dry installation	Bolts	Pull-out strength [kip (kN)]
ANSI 4" (DN 100)	3 x 3/4" (M20)	4.0 (18)
ANSI 6" (DN 150)	6 x 3/4" (M20)	
ANSI 8" (DN 200)		
ANSI 10" (DN 250)	6 x 1" (M24)	5.6 (25)
ANSI 12" (DN 300)		
ANSI 20" (DN 500/400)*		
ANSI 20" (DN 500)		

* Base plate inlet ANSI 20" (DN 500) and pump inlet ANSI 16" (DN 400).

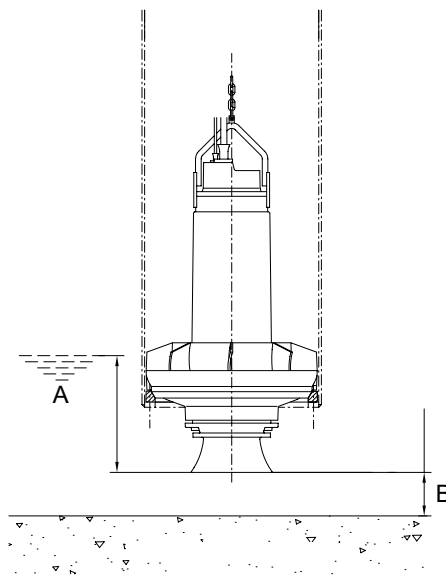


The pull-out strengths stated are without safety factor. The required safety factor may depend on the materials and the methods used for anchoring.

5.1.5 Column pipe installation

Pumps for column pipe installation are installed permanently in a column pipe. Grundfos usually does not supply the column pipe. Dimensioning of the column pipes is suggested in the pump-specific dimensional drawings.

1. Fit the seat ring to the bottom of the column pipe.
2. Clean out debris from the pit.
3. Before lowering the pump into the column pipe, check the cables visually for cuts or ruptures which may be caused by rough handling during transportation or installation.
4. Lower the pump into the column pipe by a certified chain secured to the lifting bracket of the pump. The pump rests on the conical surface of the seat ring. Normally the friction between the conical surfaces prevents the pump from rotating. As an extra precaution, there are three guide pins on the seat ring which limit the possible rotation to a maximum of 60°.
5. Hang up the end of the chain above or at the top of the column pipe so that the chain cannot come into contact with the pump.
6. Adjust the length of the cables, but ensure to have enough cable length to be able to service the pump. Make sure that the cables are not sharply bent or pinched. Fix the cables so that there is no extra slack inside the column pipe. In case of long column pipes, it may be necessary to arrange cable support for the cable inside the column pipe. If necessary, contact Grundfos.
7. Connect the motor cables and the sensor cable.



Column pipe installation type ST

Pos.	Description
A	Minimum 14" (350 mm)
B	Minimum 6" (150 mm)

TM022494

5.2 Electrical connection

DANGER

Electric shock

Death or serious personal injury



- Before starting any work on the product, make sure that the power supply is switched off and that it cannot be switched on unintentionally.

Connect the pump to an external main switch to ensure all-pole disconnection with a contact separation according to the National Electrical Code. It must be possible to lock the main switch in position 0. Type and requirements as specified in the National Electrical Code and all local codes.

The supply voltage and frequency are marked on the nameplate. Make sure that the motor is suitable for the power supply available at the installation site.



Carry out the electrical connection in accordance with local regulations.

The pump must be connected to a motor-protective circuit breaker.



Connect the pumps to a control box with a motor protection relay with an IEC trip class 10 or 15.



Connect pumps installed in hazardous locations to a control box with a motor protection relay with an IEC trip class 10.

The motor is effectively earthed through the earth conductor of the power cable and the pipes. The motor top cover for Ex pumps is equipped with connections for external earthing or an equipotential bonding conductor.

DANGER

Short-circuit

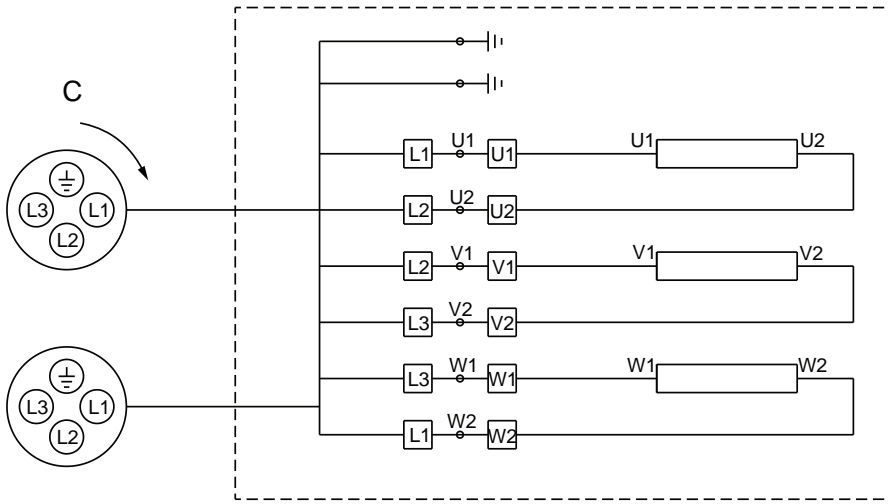
Death or serious personal injury



- For Ex models in dry-installation, version D and H, connect an external earthing.

5.2.1 Wiring diagrams

Power cable

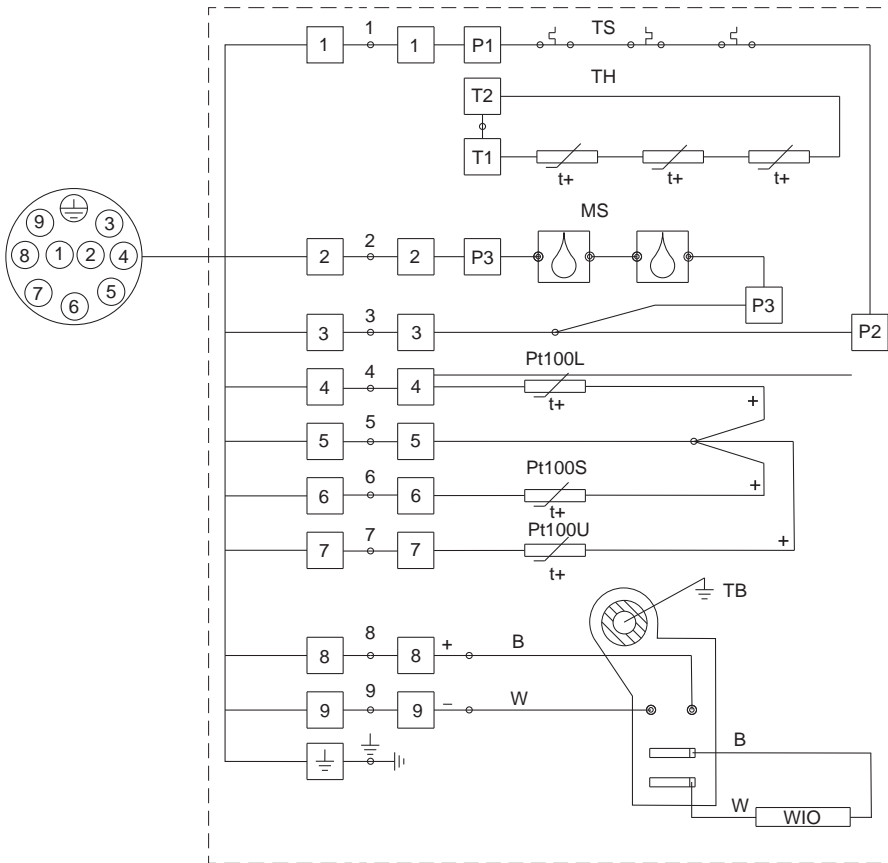


TM068310

Wiring diagram for power cable - DOL starting, dual cables

Pos.	Description
C	Read clockwise

5.2.2 Sensors



TM079382

Wiring diagram for sensors

Pos.	Description
TS	Thermal switches
TH	Thermistors
MS	Moisture switches
Pt100L	Pt100 in lower bearing
Pt100S	Pt100 in stator
Pt100U	Pt100 in upper bearing
TB	Transient barrier
WIO	WIO sensor



The wiring diagrams in custom-built products may differ from the standard. In this case, contact the nearest Grundfos company or an authorized workshop.

5.2.3 Frequency converter operation



Connect pumps installed in hazardous locations to a control box with a motor protection relay with an IEC trip class 10.

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 than usual.

In this product range, only negligible amounts of bearing currents occur during the use of frequency converter.

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 datasheet regarding the actual values and the cable influence on the peak voltage and dU/dt.
- Minimum switching frequency is 2 kHz. Variable switching frequency is accepted.
- If the pump is an Ex-approved pump, check if the Ex certificate of the specific pump allows the use of a frequency converter.
- Set the frequency converter U/f ratio according to the motor data.
- Local regulations 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 50 %.
- Keep the flow rate above 3.3 ft/s (1 m/s).
- Let the pump run at rated speed at least once a day to prevent sedimentation in the pipe network.
- 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 frequency converter type.
- 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/μ sec.]
850	2000



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



For more information about the pump speed/torque curves when operated by a frequency converter, visit Grundfos Product Center at <https://product-selection.grundfos.com>.

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

6. Protection and control functions

6.1 Motor protective devices

The motors have three thermal protectors connected in series and one moisture switch. Ex pumps have two moisture switches connected in series. Protectors and switches are connected in two separate circuits. The thermal protectors are reversible, and the moisture switches are irreversible. The thermal protection circuit, conductors 1 and 3, and the moisture protection circuit, conductors 2 and 3, have separate outputs to enable separate alarms if the motor is overheated or affected by moisture.

All other sensor connections are either led out of the motor, sensor version D, through conductors 4 to 9, or connected to the sensor board, sensor version B, and led out of the motor through conductors 4 and 5.

6.2 Pump controller

S pumps can be connected to a separate Grundfos pump controller for level control, which is available as an accessory:

- Grundfos Dedicated Controls (DC) for one- to six-pump installations.

The Dedicated Controls system starts/stops the S pumps by:

- float switches
- pressure sensor
- ultrasonic sensor.

Furthermore, it is possible to control the water level by both float switches and an analog pressure sensor or ultrasonic sensor.

Optionally, DC can control a mixer. The DC system can be extended with an IO 113 module per pump (for S pumps, with a built-in sensor).

When installing the level switches, observe the following:

- To prevent air intake and vibrations in submerged pumps, fit the stop level switch so that the pump is stopped before the liquid level is lowered below the top of the pump housing. As a principal rule for pumps in dry installations, the lowest stop level must be at least 8" (20 cm) above the opening of the inlet pipe.
- Install the start level switch so that the pump is started at the required start level; however, the pump must always be started before the liquid level reaches the bottom inlet pipe to the pit.
- If installed, always install the high-level alarm switch about 4" (10 cm) above the start level switch; however, an alarm must always be given before the liquid level reaches the inlet pipe to the pit.



Do not install the pump controller in potentially explosive atmospheres.



Level switches must comply with IEC/EC 50495, Annex D.

6.3 IO 113

IO 113 forms the interface between a Grundfos sewage and wastewater pump with analog and digital sensors and the pump controller. The most important sensor data are indicated on the front panel.

One pump can be connected to an IO 113 module.

Together with the sensors, the IO 113 forms a galvanic separation between the motor voltage in the pump and the controller connected.

IO 113 can do the following as standard:

- protect the pump against overheating
- monitor the moisture in the pump
- measure the stator insulation resistance. See section Measurement of insulation resistance
- stop the pump in case of alarm
- remotely monitor the pump through RS-485 communication, Modbus or GENIbus
- control the pump by a frequency converter.

Combined with SM 113, IO 113 can monitor the bearing temperature and rotor speed when the motor is switched off.

Related information

[6.3.2 Measurement of insulation resistance](#)

6.3.1 Motor protection

Galvanic separation

Double-insulated sensors for all measurements of high voltages ensure electrical safety. Furthermore, there is a galvanic separation inside the IO 113.

6.3.2 Measurement of insulation resistance

IO 113 measures the insulation resistance between a stator winding and earth:

- Resistance above 10 megaohms is ok.
- Resistance between 10 and 1 megaohms causes a warning.

Resistance below 1 megaohm causes an alarm.

6.4 SM 113, optional

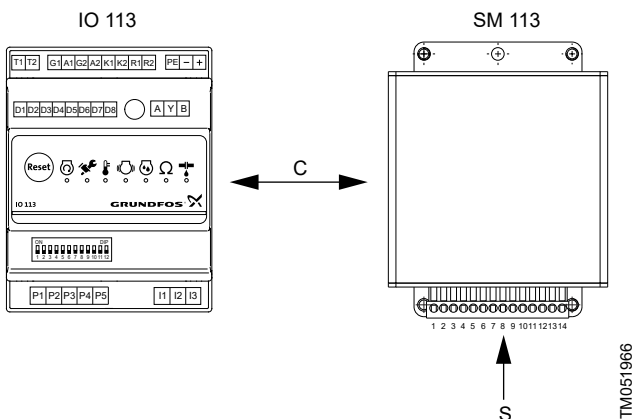
SM 113 is designed and used for the collection and transfer of additional sensor data. SM 113 works together with IO 113 with a communication module, product number 98097390, as indicated in the figure below.

SM 113 can collect data from the following devices:

- Current sensors, 4-20 mA *
- Pt100 ** thermal sensors.

* Vibration sensor (FPV)

** Maximum three Pt100 sensors.



IO 113 and SM 113

Pos.	Description
C	Power line communication using Grundfos GENIbus protocol
S	Sensor inputs

6.5 Switches and sensors

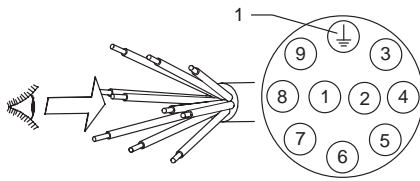


Do not let the pump run dry.

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

A pump includes the following switches and sensors:

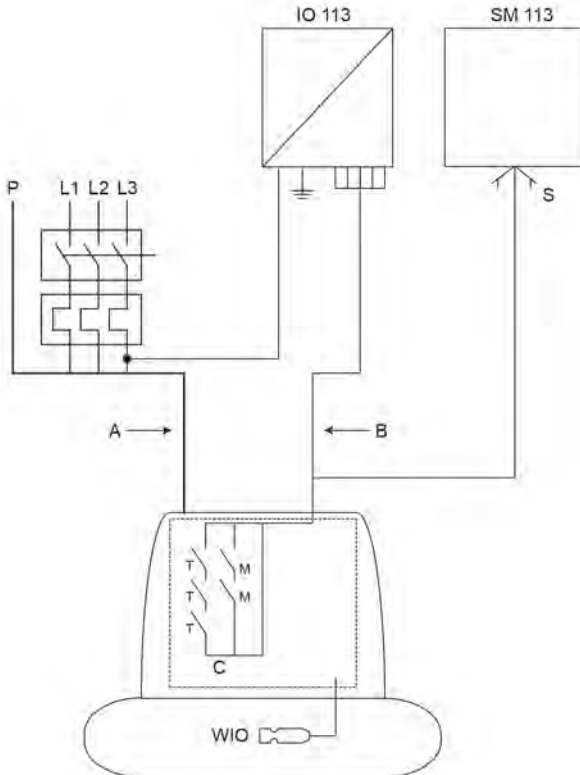
- three thermal switches or three thermal protectors in the stator windings
- moisture switches:
 - in range 50-70: one under the motor top cover
 - in Ex-pumps, range 50-58 and 66-70: one under the motor top cover and one in the stator housing
 - in Ex pump, range 62: two under the motor top cover.
- one optional Pt100 sensor in the bearing or in the stator winding
- one analog and optional WIO sensor in the oil chamber.



TM032802

Sensor cable

Pos.	Description
1	Yellow and green



TM046067

Sensor connections, SM 113 outside the motor

Symbol	Description
A	Power side
B	Signal side
WIO	WIO sensor "mb" approval
C	"d" enclosure
T	Thermal switch
M	Moisture switch
P	Power input
S	Sensor input
SM 113	Sensor board
IO 113	IO 113 with internal alarm relay (250 VAC)
"d"	Flameproof enclosure
"mb"	Protection according to EN/IEC 60079-18:2004

6.5.1 Thermal switches

The thermal protection against overheating is ensured through bimetallic switches as standard or thermistors as optional.

The three thermal switches that are hardwired from the pump to IO 113, or a similar controller, open if the stator windings become overheated. The thermal switches are reversible and close again when the motor is cooled down.

This generates both a hardware and a software alarm in IO 113, and the alarm relay opens.



Install an automatic circuit breaker, which disconnects the power supply in case the thermal switches or the moisture switches are not operating.



Maximum switching current for the thermal switch is 0,5 A at $\cos \varphi 0.6$.

6.5.2 Moisture switches

Non-explosion-proof pumps have one moisture switch which is fitted in the chamber below the motor top cover.

Ranges 50-58 and 66-70 explosion-proof pumps have two moisture switches, one below the motor top cover and one in the stator housing in the bottom of the motor.

Range 62 has both moisture switches placed below the motor top cover.

The moisture switches are hardwired from the pump to IO 113, or a similar controller. They open if moisture is detected and break an electric circuit. This generates both a hardware and a software alarm in IO 113, and the alarm relay opens.



The switching current on the moisture switch is 6 A.

6.5.3 Pt100, optional

The Pt100 temperature sensor is available as an accessory or as a Factory Product Variant (FPV).

The Pt100 sensor is primarily used for the monitoring of the bearing temperature, but it can also be used in the stator.

If the pump does not have an SM 113, hardwire the Pt100 sensor out of the pump and connect it to an external unit. See fig. Sensor connections, SM 113 outside the motor. If the pump has an SM 113, connect the Pt100 sensor to SM 113. An external unit is not required.



For range 50 and 54 explosion-proof pumps, the temperature sensor is only available for monitoring the lower bearing temperature.

The maximum alarm temperatures are indicated in the table below:

Pump range	Alarm temperatures		
	Winding temperature [°F (°C)]	Upper bearing [°F (°C)]	Lower bearing [°F (°C)]
50-54	302 (150)	266 (130)	194 (90)
58-70	302 (150)	248 (120)	212 (100)



In case of overheating, the Pt100 sensor trips an alarm and disconnects the power supply at a preset temperature.

For the maximum acceptable alarm temperature, see the table above.

Related information

[6.5 Switches and sensors](#)

6.5.4 Thermistors, optional

Thermistors are available as an accessory or as an FPV.

The thermistors can be used as motor protection devices to monitor stator temperature instead of thermal switches and must be connected to the thermistor relay in the control cabinet.

6.5.5 WIO sensor, optional



Lack of oil may cause overheating and damage to the mechanical shaft seals. The WIO sensor in the oil chamber trips the alarm if the oil quality or quantity is inadequate.



Do not use Shell Ondina X420 oil without emulsifying detergent in a pump fitted with a WIO sensor.

The WIO sensor is available as an accessory for pumps with 10 to 208 hp (7.5 to 155 kW) motors. It can be factory-fitted or installed after the pump is already operating.

The oil chamber is filled with oil acting as lubricant and coolant for both mechanical seals. The WIO sensor measures the water content in the oil chamber:

- 0-20 % water in the oil causes no reaction
- water content outside the measuring range causes a warning
- too low oil level causes an alarm.

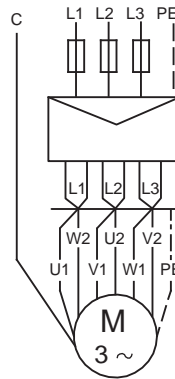
The sensor consists of a plate capacitor that is immersed in the oil and measures the electronic circuit, emitting a 4-20 mA proportional current signal.

More detailed information can be found in the installation and operation instructions (96591899) or on Grundfos Product Center at www.grundfos.com.

7. Starting up the product

The pump can be started direct-on-line (DOL).

The wiring diagrams for direct-on-line starting are indicated in fig. Direct-on-line starting, dual cables. See also the wiring diagram for sensors in fig. Wiring diagram for sensors.



Direct-on-line starting, dual cables

Pos. Description

C	Control cable
---	---------------

Related information

[5.2.2 Sensors](#)

7.1 Preparations for starting up

DANGER

Rotating elements

Death or serious personal injury



- Before manual startup or changeover to automatic control, make sure that no persons are working on or near the pump.

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

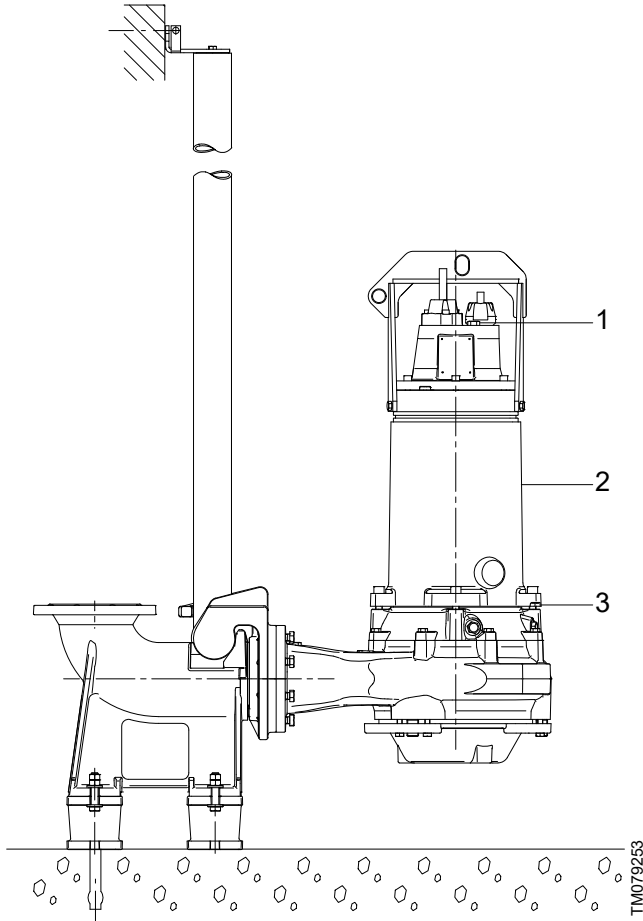
In dry installations with cooling jacket, the cooling jacket must always be filled with pumped liquid during operation. Ensure this by venting before the first startup.



7.1.1 Start and stop levels for auto-coupling installation

The start and stop levels are specified during the design stage. Always check that the start and stop levels function and possibly alter them when commissioning the pump to ensure proper operation.

Stop levels



Stop levels for auto-coupling installations

Pos.	Description
1	Installation type S (Ex pumps)
2	Installation type S (standard pumps)
3	Installation type C (standard and Ex pumps)

! In the case of an Ex pump, install an additional level sensor for the stop level.

! Ex pumps must always be completely submerged.

Set the stop level according to fig. Stop levels for auto-coupling installations, so that the flow velocity in the pit increases towards the end of the working cycle. In pits with several different stop levels, such as in frequency-controlled installations, program the control sequence to pump down to the lowest stop level at least once a day to clean out the bottom of the pit.

The stop level limits are determined by the motor submergence required to ensure cooling, prevent cavitation, or avoid air being sucked into the pump inlet. The lowest level cannot always be foreseen but must be confirmed through trials during commissioning.

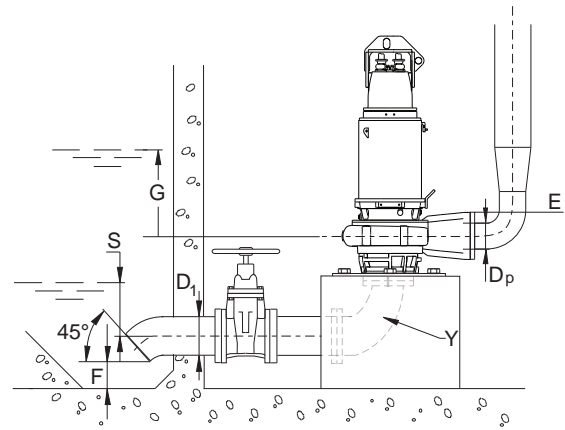
7.1.2 Start and stop levels for dry installation

Stop levels

The stop level setting for dry-installed pumps depends on the inlet pipe height, shape and flow velocity. Set the stop level approximately one inlet pipe diameter above the inlet pipe. The final stop level must be confirmed through test runs during commissioning.

Start levels

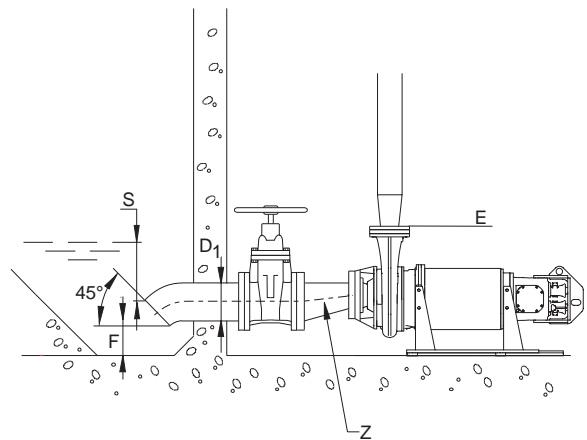
In pits with dry-installed pumps, set the starting level above the pump housing to ensure that the cooling jacket is filled up before the pump starts pumping. For vertical pumps, this height may be considerable and should be set with a margin according to fig. Vertical, dry installation (D).



Vertical, dry installation (D)

Pos.	Description
Y	Reduction elbow

Horizontal pumps do not normally require special considerations for the start level if the inlet pipe is designed to prevent air pockets from forming. See fig. Horizontal, dry installation (H).



Horizontal, dry installation (H)

Pos.	Description
Z	Eccentric reducer

Minimum stop level	$S = D_1$
Minimum distance between the bottom of the pit and the lowest part of the inlet pipe	$F = 0.5 \times D_1$
Minimum start level	$G = D_p$

TM058187

TM046901

S is the minimum stop level. The minimum distance **S** above the inlet pipe is required to avoid the formation of vortices at the inlet pipe and to avoid air being sucked into the pump. Air in the pumped liquid may cause vibrations, cavitation and loss of pump performance.

G is the minimum start level of a dry-installed, vertical pump if other actions are not taken to ensure the pump housing is filled with pumped liquid when the pump is started.

Other possible actions:

- Use a vacuum pump to suck liquid into the pump housing. This requires an isolating valve on the outlet side.
- Install a non-return valve in the outlet pipe after the first startup. This prevents the draining of the pump housing between running periods.

7.2 Checking the direction of rotation



Only start an unsubmerged pump for a few seconds to check the direction of rotation.

A label with an arrow on the pump housing indicates the correct direction of rotation. The direction of rotation is clockwise.



DANGER

Crushing of hands

Death or serious personal injury

- Do not touch the pump when starting it up.



Make sure that the bottom of the pit is clean before startup to avoid material or objects being sucked into the impeller.

Installation types S, C and ST

Proceed as follows:

1. Lift the pump approximately 0.8 - 2 in (2-5 cm) from the ground or base by the lifting chain and a crane.
2. Start the pump for a few seconds.
3. Observe the jerk of the pump. If the pump jerks counter-clockwise, the direction of rotation is correct.

In case the direction of rotation is wrong, interchange two phases in the power supply cable.

Installation types D and H

Check the duty point.

7.3 Startup

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

Proceed as follows:

1. Lock the main switch in position 0.
2. Check the oil level in the oil chamber. See section Oil check and change.
3. Check that the impeller can rotate freely.
4. Check whether the monitoring units, if used, are operating properly.
5. Open the isolation valves, if fitted.
6. **Pumps in installation types S and C:** Ensure visually that the pump is properly connected to the auto coupling.
7. Make sure that the pump is submerged in the liquid.
8. **Pumps in installation types D and H:** Make sure that there is liquid in the pit and that the pump housing and cooling jacket are filled with water. Open the air vent screw on the top of the cooling jacket, pos. 9 in fig. S pump, before or during the startup until water comes out. Close the screw.

Pumps in installation type ST: Make sure that the pump is properly seated in the column pipe and secured against rotation.

9. Start the pump and check the operation for abnormal noise or vibrations.



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

10. After startup, establish the actual pump duty point as accurately as possible so it can be checked whether the operating conditions are as desired.

Always operate the pump in accordance with established routines with scheduled checks of the pump monitoring equipment and accessories. Make sure that the pump and equipment settings cannot be changed by unauthorized persons.

Related information

[3.1 Product description](#)

[9.3 Oil check and change](#)

8. Storing the product

8.1 Storing the product



Leave the cable end protectors on the power supply and sensor cables until making the electrical connection.

Whether insulated or not, the free cable end must never be exposed to moisture or water.

Non-compliance with this may cause damage to the motor.

For long periods of storage (six months or longer), the pump must be protected against moisture and heat.

If the pump is being stored for more than two months, turn the impeller by hand at least every two months to prevent the seal faces of the lower mechanical shaft seal from seizing up.



Avoiding this may cause the shaft seal to be damaged when the pump is started.

If the impeller cannot be turned by hand, contact an authorized service workshop.



For dry-installed pumps, make sure the cooling jacket is empty before storing the pump.

After a long period of storage (six months or longer), inspect the pump before putting it into operation. Make sure that the impeller can rotate freely.

Pay attention to the condition of the shaft seals, O-rings and the cable entry.

9. Servicing and maintaining the product

9.1 Safety instructions and requirements

DANGER

Pump can tilt

Death or serious personal injury



- During maintenance and service, including transportation to service workshops, always support the pump by lifting chains or place it in horizontal position to secure stability.

DANGER

Electric shock

Death or serious personal injury



- Before starting work on the pump, make sure that the main switch is 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 are stopped moving.



Maintenance and service must be carried out by specially trained persons.

Maintenance and service work on explosion-proof pumps must be carried out by Grundfos or a service workshop authorized by Grundfos.

In case of repairs, always use original service parts from the manufacturer to ensure correct dimensions of flame path gaps.



The bolts used in the motor must be class A4-80 or A2-80 according to EN/ISO 3506-1. VER 2.

A defective bearing may reduce the Ex safety.

WARNING

Toxic material

Death or serious personal injury



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

9.2 Maintenance schedule

Inspect pumps running normal operation once a year.

Check the following points:

- **Power consumption**
- **Oil level and oil condition**
- **Cable entry** Make sure that the cable entry is waterproof, the cables are not sharply bent or pinched, and the cable sheaths have no visual defects.
- **Impeller clearance**
- **Pump parts** Check the pump parts for possible wear. Replace defective parts.
- **Ball bearings** Check the shaft for noisy or heavy operation; turn the shaft by hand. Replace defective bearings. A general overhaul of the pump is usually required in case of defective bearings or poor motor function. This work must be carried out by an authorized service workshop.

Related information

[9.4 Inspection and adjustment of the impeller clearance](#)

[12. Disposing of the product](#)

9.3 Oil check and change

The oil chamber is filled with oil acting as a lubricant and coolant for both mechanical seals.



Check the oil once a year to avoid damage and breakdown of the pump.

Low oil level may indicate that the upper mechanical shaft seal is defective. Contact an authorized service workshop for further overhaul of the pump and repair, if required.



Lack of oil may cause overheating and damage to the mechanical seals. The WIO sensor in the oil chamber trips the alarm if the oil quality or quantity is inadequate.



Use oil with viscosity grade SAE 10W-30 or SAE 10W-40.

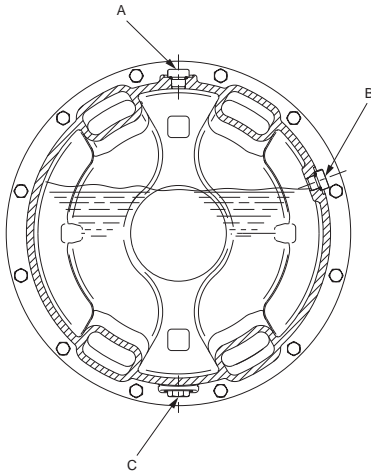
Range	Oil quantity	
	Installation type	
	S [qal (l)]	C, D and H [qal (l)]
50	0.7 (2.6)	0.5 (1.9)
54	0.9 (3.5)	0.7 (2.5)
58	1.2 (4.6)	1.0 (3.8)
62	2.4 (9.0)	1.9 (7.1)
66	3.30 (12.5)	2.6 (9.2)
70	3.28 (12.4)	2.4 (9.0)

The oil in the oil chamber can be changed with the pump in either horizontal or vertical position. However, it is recommended to carry out the oil change with the pump in a horizontal position as it is much easier to drain all the used oil out of the chamber.

Horizontal position

Proceed as follows:

1. Place the pump in such a position that inspection screw A is pointing upwards.



Pump with inspection screw A upwards

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CAUTION**Pressurized system**

Minor or moderate personal injury



- When loosening the screw of the oil chamber, note that pressure may have built up in the chamber. Do not remove the screw until the pressure is completely relieved.

2. Place a clean container under the pump to collect all the drained-off oil. Remove screw B and observe the oil level.
3. Check the oil level and take an oil sample to inspect the condition of the oil. The oil becomes greyish white like milk if it contains water. In normal operation, a small leakage through the mechanical shaft seals is expected, but if the water content in the oil is high, this may be the result of a defective shaft seal. Change the oil if it contains water. Oil not containing water can be reused.
4. If the oil needs to be changed, remove screw C and allow all the oil to drain from the chamber into the container. Emulsified oil must be changed and disposed of.



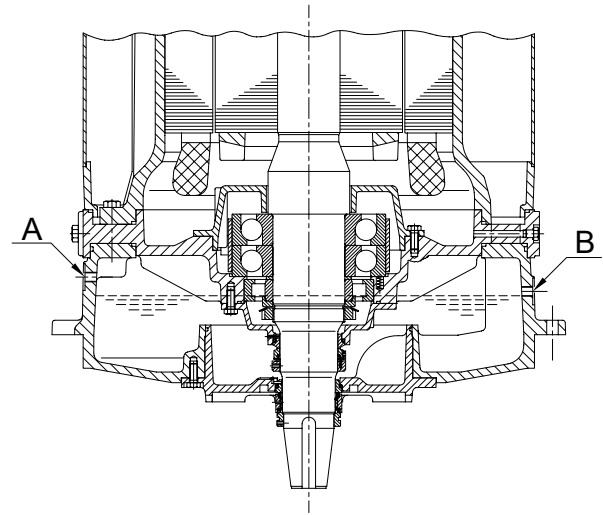
Used oil must be disposed of in accordance with local regulations.

5. Replace the O-rings, refit screw C and tighten securely. Fill the oil chamber with oil to the correct level. Refit screws A and B and tighten securely.

Vertical position

Proceed as follows:

1. Identify the screws A, B and C and their positions to each other. See fig. Pump with inspection screw A upwards.



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Correct oil level of a vertical pump

1. Use screw B for indication of the level of oil in the oil chamber. See fig. Correct oil level of a vertical pump.
2. When the pump is vertical, the oil has to be pumped out of the oil chamber. Use a suction pump with a flexible suction hose that can be inserted deep into the oil chamber.
3. Pump out the oil using all the screw holes in turns so as to reach all sections of the interior of the oil chamber. Collect the drained oil in a clean container.
4. Replace the O-rings, refit screw C and tighten securely. Fill the oil chamber with oil to the correct level. Refit screws A and B and tighten securely.

9.4 Inspection and adjustment of the impeller clearance

The correct axial clearance is 0.03" ± 0.0079 in (0.7 mm ± 0.2). Reset the clearance if it is 0.03 in (0.7 mm) or more. The method for resetting the clearance is different for submersible pumps, installation types S, C and ST, and for dry-installed pumps, installation types D and H.

9.4.1 Submersible pumps, installation types S, C and ST

Submersible pumps have a separate, adjustable pump inlet cover which may be shaped as an inlet bell. When the pump is installed or pulled out of the pit for service, locate the six fastening screws of the inlet cover and the three set screws.

Use a feeler gauge to check the clearance between the impeller and the inlet cover all around the perimeter of the inlet opening. See fig. Impeller clearance adjustment.

DANGER



Overhead load
Death or serious personal injury

- Never work under a pump when it is hanging from a crane.



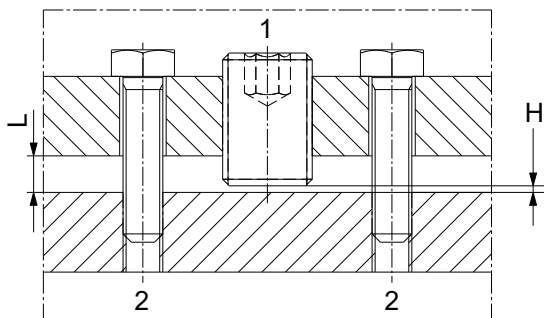
Before adjusting the clearance, clean the gap between the impeller and the inlet cover.

1. Loosen the set screws by two full turns each.
2. Close the impeller clearance by lightly tightening the fastening screws diagonally until the impeller touches the pump housing.



Do not use too much force when tightening the fastening screws as this may damage the bearings. The movement is usual 0.04 to 0.12 in (1 to 3 mm).

3. Loosen the fastening screws to make a 0.03 in (0.7 mm) gap under the heads of the fastening screws. See fig. Impeller clearance adjustment.
4. Tighten the set screws.
5. Tighten the fastening screws diagonally.



Impeller clearance adjustment

Pos.	Description
H	0.03 in
1	Set screw
2	Fastening screw

9.4.2 Dry-installed pumps, installation types D and H

Depending on the pump range, there are two ways to set the impeller clearance. Method 1 is for ranges 50-54 and method 2 for ranges 58-70.

Method 1

1. Loosen the set screws by two full turns each.
2. Close the impeller clearance by tightening the fastening screws diagonally until the impeller touches the pump housing.



Do not use too much force when tightening the fastening screws as this may damage the bearings. The movement is usually 0.04 to 0.12 in (1 to 3 mm).

3. Loosen the fastening screws to make a 0.03 in (0.7 mm) gap under the heads of the fastening screws. See fig. Impeller clearance adjustment.
4. Tighten the set screws.
5. Tighten the fastening screws diagonally.

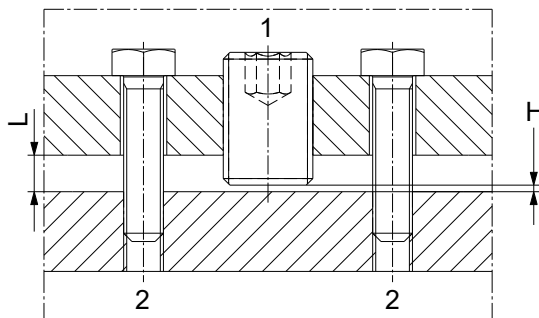
Method 2

1. Loosen the six fastening screws and close the impeller clearance by tightening the three set screws. Tighten the screws diagonally to move the inlet cover evenly.



Do not use too much force when tightening the fastening screws as this may damage the bearings. The movement is usually 0.04 to 0.12 in (1 to 3 mm).

1. Measure the distance "L" between the inlet cover and the pump housing at three points next to the set screws, using feeler gauges or calipers, and note the distance.
2. Loosen the set screws and draw back the inlet cover between 0.02 to 0.035 in (0.5 to 0.9 mm) using the six fastening screws (approximately one 270° turn of a 1/2" (M12) fastening screw) and the distance "L" as reference. See fig. Impeller clearance adjustment.
3. Tighten all set screws and check that the distance "L" at the three reference points is stable at the new value.



Impeller clearance adjustment

Pos.	Description
H	0.02 - 0.035 in
1	Set screw
2	Fastening screw

Related information

[9.4.1 Submersible pumps, installation types S, C and ST](#)

9.5 Pump cleaning and inspection

A simple maintenance measure is to clean the pumps at regular intervals. Lift the pumps out of the wet pit and clean the pumps on site. Hose down the pump externally using a high-pressure jet cleaner at maximum 1450 PSI (100 bar). Remove caked dirt from the motor to ensure good heat conductivity. A mild detergent approved for disposal into the sewage system may be used. The pumps may be scrubbed, using a soft brush, if necessary.

Visual inspection of the pump must include the following:

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

The pumps are fitted with an air vent valve at the top of the cooling jacket. The valve may be removed and cleaned, if necessary. Clean the vent hole before refitting the valve after cleaning.

9.6 Motor cables

Use only cables that are approved by the manufacturer and suitable for the cable entry as to diameter, number of conductors, conductor cross-section and sheath material.

9.6.1 Cable entry

Secure the cable entry to the motor top cover by tightening the screws evenly one by one until the cable entry is lying flat against the top cover.

The minimum bending radius for cables are indicated in the following table:

Range	Cable type	Cable size		Min. bending radius [in (cm)]
50 54 58		7 x 1.5 mm ²	7 x 16 AWG	3.9 (10)
		7 x 2.5 mm ²	7 x 14 AWG	4.3 (11)
		4 x 6.0 mm ²	4 x 10 AWF	3.9 (10)
62		4 x 6.0 mm ²	4 x 10 AWG	3.9 (10)
		4 x 10.0 mm ²	4 x 8 AWG	5.5 (14)
		4 x 16.0 mm ²	4 x 6 AWG	6.3 (16)
66	Power cables	4 x 10.0 mm ²	4 x 8 AWG	5.5 (14)
		4 x 16.0 mm ²	4 x 6 AWG	6.3 (16)
		4 x 25.0 mm ²	4 x 4 AWG	7.5 (19)
70		4 x 25.0 mm ²	4 x 4 AWG	7.5 (19)
		4 x 35.0 mm ²	4 x 2 AWG	8.3 (21)
		4 x 50.0 mm ²	4 x 1 AWG	9.8 (25)
All	Control cables	4 x 70.0 mm ²	4 x 2/0 AWG	11.0 (28)
		7 x 1.5 mm ²	7 x 16 AWG	3.9 (10)

9.7 Spare parts

Damaged motor parts must always be replaced by new and approved parts. Motor parts must never be reconditioned.

9.8 Contaminated pumps and service



CAUTION

Biological hazard

Minor or moderate personal injury

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

If a pump is used for a toxic or contagious liquid, the pump is classified as contaminated.

9.8.1 Sending the pump to service

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

- customer ID and/or installation ID, contact information
- pump type and type designation
- type of malfunction or fault
- pumped liquid
- frequency converter, if used
- level switch type, if used
- control panel information, if available.

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

10. Fault finding the product

Fault	Cause	Remedy
The pump does not start or it stops without visible cause.	No power supply.	Re-establish the power supply, start the pump manually and check contactor operation.
	Moisture in the stator housing or in the terminal box. The moisture switch interrupts the supply voltage.	Contact an authorized service workshop.
	The WIO sensor is not covered by oil. The sensor interrupts the supply voltage.	Contact an authorized service workshop.
The pump does not start or it stops. The control panel of the controller indicates that the motor-protective circuit breaker or protection equipment is tripped out.	Missing phase.	Re-establish all phases.
	The pump is overloaded.	Let the pump cool down for approximately 10 minutes and start it again. In case the pump starts now, the first stop was caused by a tripping thermal switch. If the fault occurs again, find the cause of the overload.
		Check the control panel fuses and switch them on in case they have tripped. Wait for approximately 10 minutes until the pump is cooled down, and start it again. In case the pump does not start, the overload relay has tripped and the pump needs service. Contact an authorized service workshop.
	The impeller is clogged by impurities.	Clean the impeller.
	The motor-protective circuit breaker is set incorrectly.	Set the motor-protective circuit breaker as required in relation to the rated current.
	The thermal switches are tripped out. Insufficient motor cooling.	Re-establish motor cooling.
	The moisture switch in the motor is tripped out.	Contact an authorized service workshop.
	A motor cable is defective.	Contact an authorized service workshop.
	Fluctuating voltage.	Re-establish correct voltage supply. The permissible deviation is $\pm 10\%$.
	The pump runs but does not deliver the rated flow.	Wrong direction of rotation.
The impeller is loose or worn.		Tighten or replace the impeller.
The pump or the pipes are blocked by impurities.		Clean the pump or the pipes.
The pump head is too high.		Measure the differential pressure and compare the value with the pump performance curve. Remove the blockage in the outlet pipe. Contact Grundfos, if necessary.
		The valves are closed or blocked. The non-return valve is not operating.
There is air in the pump or the inlet pipe.		Vent the pump or the inlet pipe. Set a higher stop level in the pit.
The pumped liquid is too dense.		Dilute the pumped liquid.
The pump is improperly connected to the auto coupling.		Pump down the liquid level in the pit. Lift out the pump and relocate it on the auto coupling.
There is leakage in the pipes.		Repair or replace the pipes.
The pump pit flushing system is inadvertently activated.		Check the function of the flushing system and repair as required.
The pump starts but stops immediately.	A clogged pump causes the motor-protective circuit breaker to trip out.	Clean the pump.
	An overheated motor causes the thermal switches to trip out.	Allow the pump to cool. Clean the pump.

Fault	Cause	Remedy
	The level switch is out of adjustment or defective.	Clean or reset the level switch or replace as required.
	The pump is partly clogged by impurities.	Clean the pump.
	Wrong direction of rotation.	Interchange two phases in the power supply to the motor.
	The pump is operating outside the specified operating range.	Re-establish proper operating conditions.
The pump is vibrating or emitting excessive noise.	The pump is defective.	Repair the pump or contact an authorized workshop, if necessary.
	The pump is improperly connected to the auto coupling.	Pump down the liquid level in the pit. Lift out the pump and relocate it on the auto coupling.
	The pump is cavitating.	Clean the inlet.
	The base stand, the auto coupling, the ring stand or the guide rails are installed incorrectly.	Install the components correctly.
The oil is watery or emulsified.	The lower mechanical shaft seal is leaking.	Contact an authorized service workshop.
The oil level is low.	The upper mechanical shaft seal is leaking.	Contact an authorized service workshop.

Related information

[9.1 Safety instructions and requirements](#)

11. Technical data

11.1 Operating conditions

11.1.1 pH value

All pumps can be used for pumping liquids with a pH value between 4 and 10.

11.1.2 Liquid temperature

The allowed temperature is 32-104 °F (0-40 °C).



In special situations, if the motor is not completely loaded, the temperature of the pumped liquid may be higher.

In this case, contact the nearest Grundfos company or service workshop.



Explosion-proof pumps must never pump liquids with a temperature higher than 104 °F (40 °C).

11.1.3 Ambient temperature

The allowed ambient temperature is -4 °F to 104 °F (-20 °C to +40 °C).



In special situations, if the motor is not completely loaded, the ambient temperature may be higher than 104 °F (40 °C).

In this case, contact the nearest Grundfos company or service workshop.



For explosion-proof pumps, the ambient temperature on the installation site must be in the range between -4 °F to 104 °F (-20 and +40 °C).

11.1.4 Density and viscosity of the pumped liquid

Density: 133.5 ounces/gallon (1000 kg/m³).

Kinematic viscosity: 1 cSt (1 mm²/s).



When pumping liquids with a density and/or a kinematic viscosity higher than the values stated above, use motors with correspondingly higher outputs.

11.1.5 Flow velocity

Keep a minimum flow velocity to avoid sedimentation in the piping system.

Recommended velocities:

Vertical pipes:	2.3 ft/s (0.7 m/s)
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Horizontal pipes:	3.3 ft/s (1.0 m/s)
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11.1.6 Installation depth

The maximum submersion depth is 66 ft (20 m).

11.1.7 Level of the pumped liquid



An Ex motor without cooling jacket, installation types S and ST, must be completely submerged during operation.



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

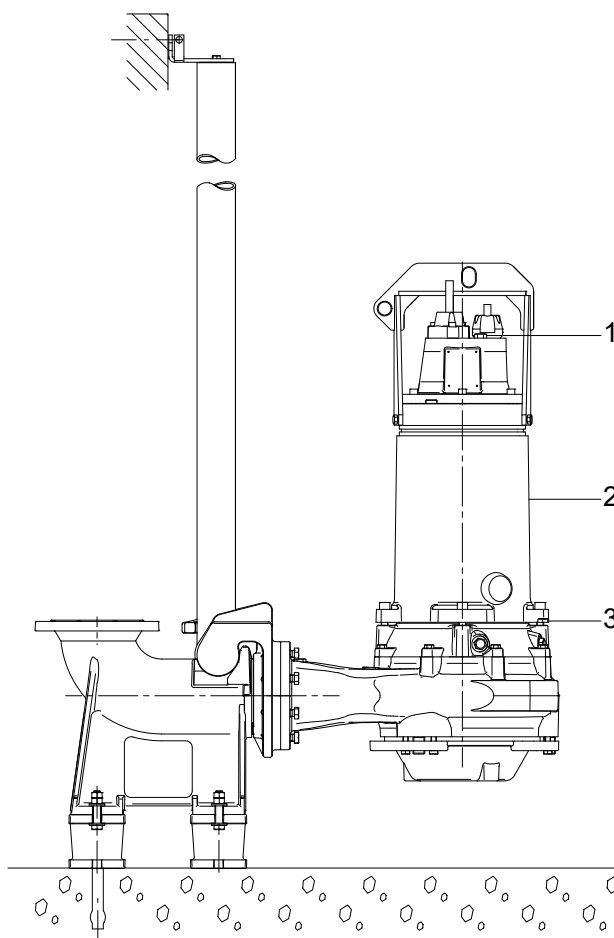
To avoid air being sucked into the pump and to ensure adequate cooling of the motor during operation, make sure to meet the following minimum requirements:

- **Installation type S:** Submerge the Ex pump to the top of the motor and the standard pump to the middle of the motor.



Installation type S pumps must always be completely submerged in the pumped liquid to be Ex protected.

- **Installation type C:** Submerge the pump to the top of the pump housing so that the liquid level is always above the pump housing.



Liquid level

Pos.	Description
1	Installation type S (Ex pumps)
2	Installation type S (standard pumps)
3	Installation type C (standard and Ex pumps)

- **Installation types D and H:**



For installation type D, air venting can be fulfilled through an air-vent screw in the top of the cooling jacket.

For installation type H, air venting is not necessary after the pump is filled with water.

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- **Installation type ST:** For standard pumps, the liquid level must be at least 14 in (350 mm) above the pump inlet.

Related information

5.1.4 Dry installation

5.1.1 Installation types

11.1.8 Operating mode

The pumps are designed for continuous operation with the maximum number of starts per hour stated in the table below:

S pump, range	Starts per hour
50, 54 and 58	20
62, 66 and 70	15

11.1.9 Enclosure class

IEC IP68.

11.1.10 Sound pressure level

CAUTION

Sound pressure level

Minor or moderate personal injury



- Use a hearing protection when working nearby an installation in operation. Depending on the installation type, the sound pressure level of the pump can be higher than 70 dB (A).

11.1.11 Storage temperature

Storage temperature: -4 to 131 °F (-20 °C to +55 °C). Maximum 158 °F (70 °C) for short periods not exceeding 24 hours (EN 60204-1, 4.5).

11.2 Electrical data

Voltage tolerances for the motor and the motor protection devices:

Component	Voltage	Tolerance
Motor	See the pump name-plate	± 10 %
Thermal switches	Maximum 240 V	± 10 %
Thermistors	2.5 - 7.5 V	-
Moisture switches	Maximum 240 V	-
Other sensors (optional)	Maximum 14 VDC	± 1 V
SM 113 (optional)	Maximum 14 VDC	± 1 V

11.3 Dimensions and weights

11.3.1 Dimensions

For pump dimensions, see the data booklet for each pump range at www.grundfos.com.

11.3.2 Weights



The weights stated include 49 ft (15 m) cable.



The weights of installation type S and C pumps include the weight of the guide claw.

The weight of installation type H pumps includes the weight of the horizontal base stand.



The weights stated are net weights including the accessories mounted from the factory.

Pump type	Net weight [lb (kg)]			
	S	C	D	H
Range 50				
SV.30.A30.139.2.50H	375 (170)	-	-	-
SV.30.A30.172.2.50H	419 (190)	-	-	-
S1.30.A40.134.4.50H.x.200	397 (180)	419 (190)	-	507 (230)
S1.30.A40.134.4.50H.x.212	441 (200)	485 (220)	-	552 (250)
S1.30.A40.147.4.50H	441 (200)	485 (220)	-	274 (260)
S1.30.A40.181.4.50H	441 (200)	485 (220)	-	274 (260)
S1.40.A40.134.4.50M	419 (190)	263 (210)	-	563 (255)
S1.40.A40.181.4.50H	419 (190)	263 (210)	-	274 (260)
S1.40.A50.134.4.50L	552 (250)	596 (270)	-	695 (315)
S1.40.A50.181.4.50L	552 (250)	596 (270)	-	695 (315)
Range 54				
S1.30.A40.210.4.54H	662 (300)	728 (330)	-	794 (360)
S1.30.A40.270.4.54H	706 (320)	772 (350)	-	838 (380)
S1.40.A50.210.4.54M	662 (300)	728 (330)	-	794 (360)
S1.40.A50.270.4.54H	706 (320)	772 (350)	-	838 (380)
S1.40.A80.210.4.54L	794 (360)	860 (390)	-	948 (430)
S1.40.A80.270.4.54L	816 (370)	904 (410)	-	970 (440)
Range 58				
S1.30.A50.340.4.58H	970 (440)	1059 (480)	1059 (480)	1147 (520)
S1.30.A50.420.4.58H	970 (440)	1059 (480)	1059 (480)	1147 (520)
S1.40.A50.420.4.58M	992 (450)	1103 (500)	1103 (500)	1191 (540)
S1.45.A80.420.4.58L	1081 (490)	1191 (540)	1191 (540)	1301 (590)
S2.40.A80.430.6.58L	1081 (490)	1191 (540)	1191 (540)	1301 (590)
S2.40.A120.430.6.58E	1235 (560)	1367 (620)	1323 (600)	1455 (660)
S range 62				
S1.30.A50.540.4.62H	1323 (600)	1455 (660)	1588 (720)	1698 (770)
S1.30.A50.700.4.62H	1323 (600)	1455 (660)	1588 (720)	1698 (770)

Pump type	Net weight [lb (kg)]			
S1.30.A50.790.4.62H	1367 (620)	1500 (680)	1500 (680)	1632 (740)
S1.40.A50.540.4.62M	1323 (600)	1455 (660)	1588 (720)	1698 (770)
S1.40.A50.700.4.62M	1323 (600)	1455 (660)	1455 (660)	1698 (770)
S1.40.A50.790.4.62M	1367 (620)	1500 (680)	1500 (680)	1632 (740)
S2.40.A80.540.4.62L	1411 (640)	1544 (700)	1544 (700)	1698 (770)
S2.40.A80.700.4.62L	1411 (640)	1544 (700)	1588 (720)	1698 (770)
S2.40.A80.790.4.62L	1455 (660)	1610 (730)	1610 (730)	1742 (790)
S range 66	S	C	D	H
S1.40.A80.980.4.66H	1985 (900)	2183 (990)	2381 (1080)	2381 (1080)
S2.45.A100.760.8.66H	2205 (1000)	2426 (1100)	2426 (1100)	2646 (1200)
S2.40.A80.980.4.66M	1985 (900)	2183 (990)	2381 (1080)	2381 (1080)
S2.55.A120.430.8.66M	2426 (1100)	2668 (1210)	2911 (1320)	2911 (1320)
S2.55.A120.550.8.66M	2426 (1100)	2668 (1210)	2911 (1320)	2911 (1320)
S2.55.A120.760.8.66M	2536 (1150)	1800 (1270)	3043 (1380)	3043 (1380)
S3.45.A200.760.8.66L	2977 (1350)	3285 (1490)	3285 (1490)	3528 (1600)
S range 70	S	C	D	H
S2.35.A80.1270.4.70H	2315 (1050)	2558 (1160)	2558 (1160)	2866 (1300)
S2.35.A80.1610.4.70H	2425 (1100)	2536 (1150)	2756 (1250)	3087 (1400)
S2.45.A100.1070.8.70H	2536 (1150)	2800 (1270)	2800 (1270)	3043 (1380)
S2.45.A100.1470.6.70H	2536 (1150)	2800 (1270)	2800 (1270)	3043 (1380)
S2.45.A100.1880.6.70H	2800 (1270)	3087 (1400)	3087 (1400)	3351 (1520)
S2.40.A80.1270.4.70M	2315 (1050)	2558 (1160)	2558 (1160)	2778 (1260)
S2.40.A80.1610.4.70M	2315 (1050)	2558 (1160)	2558 (1160)	2778 (1260)
S2.55.A120.1470.6.70M	2866 (1300)	3153 (1430)	3153 (1430)	3440 (1560)

Pump type	Net weight [lb (kg)]			
S3.45.A120.1070.8.70M	2866 (1300)	3153 (1430)	2977 (1350)	3285 (1490)
S3.45.A120.1880.6.70M	3131 (1420)	3440 (1560)	3440 (1560)	3748 (1700)
S3.45.A200.1070.8.70L	3858 (1750)	3967 (1800)	3967 (1800)	4233 (1920)
S3.45.A200.1880.8.70L	4300 (1950)	4630 (2100)	4410 (2000)	4718 (2140)

12. 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.

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