

Manual for Installation and Operation

Manuel d'installation et de fonctionnement

Manual de Instalación y Operación

PS150 - PS4000 Series

Solar Submersible Pump Systems

Systèmes de Pompes Solaires Immergées

Sistemas de Bombas Solares Sumergibles

PS-CS-F Series / PS150 Boost

Solar Surface Pump Systems

Systèmes de Pompes Solaires de Surface

Sistemas de Bombas Solares de Superficie

EN

FR

ES

LORENTZ 



ENGLISH

Introduction

Thank you for purchasing a LORENTZ pump system. LORENTZ has set a new standard for quality, efficiency and durability in solar pumping.

Before you begin: All pump systems are equipped with nameplates, which contain all important data. Check the model numbers of all the components of your system, verify that they are the items that you ordered and ensure that the packaging is undamaged and complete. To allow best system performance and to avoid damage read and follow the installation instructions carefully.

How to use this guide: This manual is for system installation only, follow it closely for a safe and durable installation. The system layout must be planned beforehand. We advise using the LORENTZ COMPASS software for correct pump system sizing.

SITES: We highly recommend registering the installation at SITES in LORENTZ partnerNET. SITES provides an easy overview of all installed pump systems, including serial numbers and installation details. This will be essential information should problems occur and will simplify trouble shooting and warranty topics to great extent.

Installation Overview

This installation overview is provided to familiarize you with the typical steps that are taken when installing a solar water pumping system. Your particular installation may require the steps to be done in a different order. You should read the whole manual before making your first installation.



WARNING – This installation overview does not substitute the detailed instructions given in this manual. Read and follow the manual carefully to ensure reliable operation and long life of the product and to avoid danger to health and life.

1. PV and Controller Installation

Please follow manufacturer instructions for PV installation. Every PV installation must be equipped with a PV disconnect switch. Suitable switches are available from LORENTZ.

Please refer to “DC Disconnect Switch” on page 17 for more information on the requirements the PV disconnect must meet.

Install the controller close to the PV array in a shaded location to minimize cable length on the input side.

For detailed information refer to “7.6 Mounting, Space and Ventilation Requirements” on page 20.

2. Electrical Installation

1. Pump wiring: The ECDrive must be connected to the terminals L1, L2, L3 and GROUND. Observe rotation direction.

For detailed information refer to “7.7.1.2 Pump Wiring” on page 27.

2. Accessories wiring: Connect a well probe to terminals 1 and 2 (required), remote control switches to terminals 3, 4 and 5 (depending on type), flow meters to terminals 8 and 9 (with DataModule only), pressure sensors to terminals 10 and 11 (with DataModule only).

For detailed information refer to “7.7.1.3 Pump Accessories Wiring” on page 28.

3. DC input wiring: Connect the positive terminal of the PV array to +, the negative terminal to –. Observe max. input voltage. For battery systems install a jumper between terminals 6 and 7.

For detailed information refer to “7.7.1.4 Input Wiring for Solar-direct Systems” on page 29.

4. Grounding: A protective earth connection must be wired to either GND or ⊕, depending on the type of controller.

For detailed information refer to “7.7.1.6 Grounding” on page 31.

3. Pump Installation

Submersible pumps: Lower the pump into the water source with caution, use a safety rope.

For detailed information refer to “8.3 Submersible Pumps” on page 38.

Surface pumps: Install the surface pump on an adequate foundation with sufficient pipe sizing to ensure efficient operation. Fill the pump with clean water prior to starting it.

Depending on your pump system, refer to “8.4 CS-F Surface Pumps” on page 43 or “8.3 Submersible Pumps” on page 38 for detailed information.

1	Declaration of Conformity	6
2	Receipt, Storage and Handling	6
3	Product Specification	7
3.1	General	7
3.2	Features	7
3.3	Naming	8
4	Operating Conditions	9
5	Safety Instructions	10
6	Pump System Sizing & Layout Diagrams	12
6.1	Pump System Sizing	12
6.2	System Layout: Submersible Pumps	13
6.3	System Layout: Surface Pumps	14
6.4	System Layout: Surface Boost Pumps	15
7	Controller Installation	16
7.1	General	16
7.2	Controller Types	18
7.3	Controller Elements	19
7.4	Technical Data of the Controller	19
7.5	Controller Placement	20
7.6	Mounting, Space and Ventilation Requirements	20
7.7	Wiring the Controller	22
7.7.1	Controllers without pre-wired Plugs	22
7.7.1.1	Terminal Descriptions	22
7.7.1.2	Pump Wiring	27
7.7.1.3	Pump Accessories Wiring	28
7.7.1.4	Input Wiring for Solar-direct Systems	29
7.7.1.5	Input Wiring for Battery-based Systems	30
7.7.1.6	Grounding	31
7.7.2	Controllers with pre-wired Plugs	32
7.8	Jumper Settings (PS150 only)	35
8	Pump Installation	36
8.1	General Instructions	36
8.1.1	Pipe Sizing	36
8.1.2	Cable Splicing	37
8.2	Pump System Type	37
8.3	Submersible Pumps	38
8.3.1	Wiring the Pump	38
8.3.2	Installation and Handling	40
8.3.3	Installation Depth	41
8.3.4	Removal	41
8.3.5	Additional Features	42
8.3.5.1	Safety Rope	42
8.3.5.2	Plastic Pipes	42
8.3.5.3	Stilling Tube	42

8.4	CS-F Surface Pumps	43
8.4.1	Placement and Foundation	43
8.4.2	Pump Motor Wiring	44
8.4.3	Installation and Handling	45
8.4.4	Suction Head	46
8.4.5	Initial Start-up	47
	8.4.5.1 Filling Pump with Water	47
	8.4.5.2 Rotary Direction	48
	8.4.5.3 Final Check-up	48
8.5	Boost Surface Pumps	49
8.5.1	Placement and Foundation	49
8.5.2	Pump Motor Wiring	49
8.5.3	Installation Position	50
8.5.4	Filtering	51
8.5.5	Plumbing Design	52
8.5.6	Freeze Protection	53
9	Pump Accessories Installation54
9.1	Well Probe	54
9.2	Float Switch (Full Tank Shut-off)	56
9.3	SunSwitch	57
9.4	Water Meter Installation	58
9.5	Pressure Sensor Installation	58
9.6	Level Sensor Installation	58
9.7	Sacrificial Anode	58
9.8	Surge Protector	59
9.9	PV Disconnect with Lightning Surge Protection	59
10	Operating the Pump60
10.1	LED Status	61
10.2	Starting the Pump	63
10.3	Time Delays	63
10.4	Parameter Setting (with DataModule only)	64
11	LORENTZ CONNECTED65
11.1	DataModule	65
11.2	PumpScanner	65
11.3	PS Communicator & pumpMANAGER	66
12	Troubleshooting67
12.1	Pump does not run	67
12.2	Pump attempts a Restart every 120 Seconds	67
12.3	Pump Overload (Pump ON LED is red)	68

1 Declaration of Conformity

We, BERNT LORENTZ GmbH & Co. KG Germany, declare under our sole responsibility that the products

PS150 Boost, PS150 C, PS150 HR, PS200 HR, PS600 HR, PS600 C, PS600 CS-F, PS1200 HR, PS1200 C, PS1800 HR, PS1800 C, PS 1800 CS-F, PS4000 HR, PS4000 C, PS4000 CS-F

to which the declaration relates, are in conformity with the Council Directives on the approximation of the laws of the EC Member States relating to:

- Machinery (2006/42/EC)
- Electromagnetic compatibility (2004/108/EC)
- Electrical equipment designed for use with certain voltage limits (2006/95/EC)

Henstedt-Ulzburg, Germany
1 January 2014



Bernt Lorentz, CEO

2 Receipt, Storage and Handling

Check upon receipt that the packaging is undamaged and complete. If any abnormality is found, contact your supplier.

LORENTZ pumps are supplied from the factory in proper packing in which they should remain until they are to be installed at the site. Handle the pump with care and avoid unnecessary impacts and shocks.

Prolonged intermediate storage in an environment of high humidity and fluctuating temperatures must be avoided. Moisture condensation may damage metal parts. Non-compliance can void the warranty. It is recommended storing the parts in a closed and dry room.

The motor, the pump end and controller can be stored (not used) in the range of $-20\text{ }^{\circ}\text{C}$ to $+65\text{ }^{\circ}\text{C}$ ($-4\text{ }^{\circ}\text{F}$ to $+149\text{ }^{\circ}\text{F}$). The components should not be exposed to direct sunlight.

3 Product Specification

3.1 General

LORENTZ solar submersible and surface pump systems are designed to efficiently deliver high volumes of water running exclusively on solar power. They are typically used in irrigation projects and for wide area drinking water applications where they reliably meet the most demanding requirements, economically, without pollution and without a grid connection or diesel generator.

A typical solar pumping system is composed of a PV generator array, a pump and a solar pump controller. Based on the design philosophy that it is more efficient to store water rather than electricity, there is no energy storing device such as a storage battery in a typical solar pumping system.

The PV generator, an aggregation of PV modules connected in series and in parallel, absorbs solar irradiation and converts it into electrical energy, providing power for the whole system. The pump controller controls and adjusts the system operation and adjusts the output frequency in real-time according to the variation of sunlight intensity to realize the maximum power point tracking (MPPT).

Each LORENTZ pump system consists of a pump end, pump motor and a controller. This modular concept keeps all electronics above ground even for submersible pumps, simplifying servicing and lowering cost of ownership.

3.2 Features

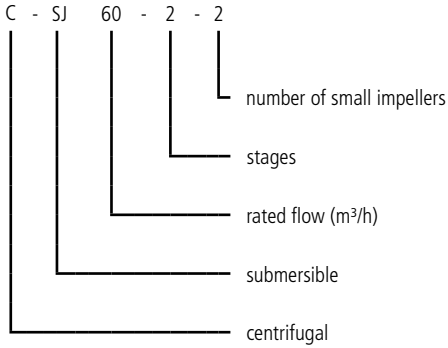
LORENTZ pumps have the following features:

- Engineered in Germany using high quality non-corrodible materials
- IP65/NEMA 3A corrosion resistant controller housing
- Pump control based on power available
- ECDRIVE DC Brushless motors, specifically designed for solar operation with up to 92% efficiency
- Controllers with DataModule (-D name tag):
Monitoring and management including on-board recording of up to 5 years of performance data, smart device access via PumpScanner Android™ App and integration to LORENTZ pumpMANAGER remote management service optionally available.

3.3 Naming

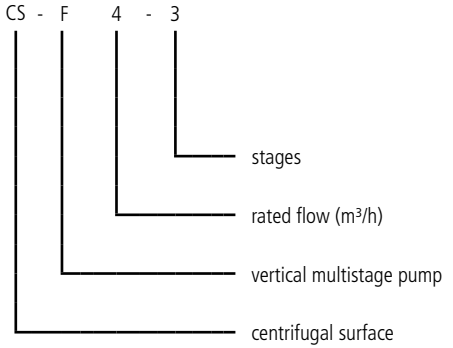
Pump model definition for submersible pumps:

For centrifugal pumps

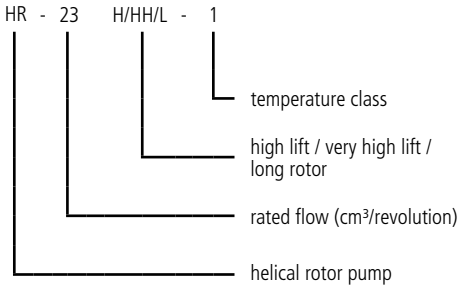


Pump model definition for surface pumps:

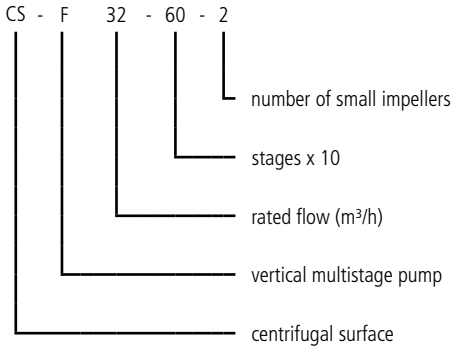
For CS-F1 to CS-F20 pumps



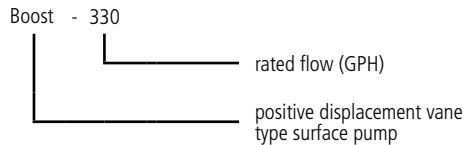
For helical rotor pumps



For CS-F32 to CS-F85 pumps



For boost pumps



4 Operating Conditions

Ambient requirements: PS pump systems can be operated up to 3000 meters above sea level and at an ambient temperature of up to 50 °C. The PS controller is designed for use in environments classified as pollution degree 3 in accordance with IEC-664-1: Conductive pollution occurs, or dry non-conductive pollution, which becomes conductive due to condensation, is to be expected.

Fluid: LORENTZ PS Helical Rotor (HR) and Centrifugal pumps can be used for drinking water supply, livestock watering and irrigation applications not containing solid or long fibred particles larger than sand grains, with a max. grain size of 2 mm. The max. permitted sand content is 50 ppm, a higher sand content will reduce the pump life considerably due to wear. The max. salt content is 300-500 ppm at max. 30°C / 85°F. Defects due to pumping other liquids are not covered by the warranty.

LORENTZ PS BOOST pumps can be used for clean water applications only. The water must not contain any abrasive particles. It is highly recommended to install an intake strainer to protect the pump from any dirt ingress. Please refer to "8.5.4 Filtering" on page 51 for further information.

Fluid temperature: Depending on the type of your LORENTZ pump system, different requirements for fluid temperatures apply:

PS centrifugal submersible - The maximum fluid temperature for centrifugal submersible pumps is **+50 °C**.

PS centrifugal surface - The maximum fluid temperature for centrifugal surface pumps is **+70 °C**.

PS boost surface - The maximum fluid temperature for boost pumps is **+80 °C**.

PS helical rotor (HR) submersible - Designing and building helical rotor pumps for a narrow range of fluid temperature is important to ensure the best possible efficiency. LORENTZ PS helical rotor pumps are available in five different temperature classes:

Temp. class 0 :	0 – +10 °C
Temp. class 1 :	+10 – +20 °C
Temp. class 2 :	+20 – +30 °C
Temp. class 3 :	+30 – +40 °C
Temp. class 4 :	+40 – +50 °C

The pumps have a tolerance range of ± 2 °C regarding the respective temperature ranges, except for the lowest allowed temperature of 0 °C.

The temperature class is part of the pump units' name tag, please refer to chapter "3.3 Naming" on page 8. The pump system shall only be operated within the temperature range specified upon ordering.



CAUTION – PS200 HR pump ends and pump units must always be ordered with the next higher temperature class, to avoid starting problems in weak irradiation conditions.

CAUTION – Operating the pump outside of the specified temperature range can lead to reduced efficiency and/or damage the pump and can void the warranty.

5 Safety Instructions

Safe operation of this product depends on its correct transportation, installation, operation and maintenance. Failure to follow these instructions can be dangerous to life or health and/or void the warranty.

READ AND FOLLOW ALL INSTRUCTIONS!

Explanation of warning symbols



WARNING – Disregard can lead to injury, death or damage the system.



CAUTION – Recommended to avoid damage, premature ageing of the pump or similar negative consequences.

When installing and using this electrical equipment, basic safety precautions should always be followed, including the following:



WARNING – To reduce the risk of injury, do not permit children to use this product unless they are closely supervised at all times.

WARNING – The appliance is not to be used by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they are instructed and closely supervised.

WARNING – To reduce the risk of electric shock, replace damaged cords immediately.

WARNING – It must be assured that all grounding connections are properly made and that the resistances meet local codes or requirements.

The manual contains basic instructions which must be observed during installation, operation and maintenance. Before installation and start-up, the manual should be carefully read by the person in charge of the installation. The manual should also be read by all other technical personnel/operators and should be available at the installation site at all times.

- **Personnel qualifications and training** – All personnel for the operation, maintenance, inspection and installation must be fully qualified to perform that type of job. Responsibility, competence and the supervision of such personnel must be strictly regulated by the operator. Should the available personnel be lacking the necessary qualification, they must be trained and instructed accordingly. If necessary, the operator may request the manufacturer/supplier to provide such training. Furthermore the operator/user must make sure that the personnel fully understand the contents of the manual.
- **Dangers of ignoring the safety symbols** – Ignoring the safety directions and symbols may pose a danger to humans as well as to the environment and the equipment itself. Non-observance may void the warranty. Non-observance of safety directions and symbols may for example entail the following: Failure of important functions of the equipment/plant; failure of prescribed methods for maintenance and repair; danger to persons through electrical, mechanical and chemical effects; danger to the environment because of leakage of hazardous material; danger of damage to equipment and buildings.
- **Safety-oriented operation** – The safety directions contained in the manual, existing national regulations for the prevention of accidents as well as internal guidelines and safety-regulations for the operator and user must be observed at all times.

- **General safety directions for the operator/user** – If hot or cold equipment parts pose a danger then they must be protected by the operator/user against contact with people. Protective covers for moving parts (e.g. couplings) must not be removed when the equipment is running. Leaks (e.g. at the shaft seal) of hazardous pumping media (e.g. explosive, toxic, hot liquids) must be disposed of in such a way that any danger to personnel and the environment is removed. All government and local regulations must be observed at all times. Any danger to persons from electrical energy must be eliminated by using good installation practices and working to local regulations (e.g. VDE in Germany).
- **Safety directions for maintenance, inspection and assembly work** – It is the user's responsibility to make sure that all maintenance, inspection and assembly work is performed exclusively by authorized and qualified experts sufficiently informed through careful study of the operating instructions. The accident prevention regulations must be observed. All work on the equipment must be done when it is not operational and ideally electrically isolated. Ensure all power sources and accessories (e.g. float switch) are disconnected when working on the system. Follow all appropriate electrical codes. There are no user-serviceable parts inside the motor or the controller. The sequence for shutting the equipment down is described in the manual and must be strictly observed. Pumps or pump units handling hazardous liquids must be decontaminated. Immediately upon completion of the work, all safety and protective equipment must be restored and activated. Before restarting the equipment, all points contained in chapter "Initial start-up" must be observed.
- **Unauthorized changes and manufacturing of spare parts** – Any conversion of or changes to the equipment may only be undertaken after consulting the manufacturer. Original spare parts and accessories authorized by the manufacturer guarantee operational safety. Using non-authorized parts may void any liability on part of the manufacturer. There are no user-serviceable parts inside the motor or the controller.
- **Unauthorized operation** – The operational safety of the equipment delivered is only guaranteed if the equipment is used in accordance with the directions contained in this manual. Limits stated in the data sheets may not be exceeded under any circumstances.

**RETAIN THESE
INSTRUCTIONS
FOR FUTURE USE!**

6 Pump System Sizing & Layout Diagrams

6.1 Pump System Sizing

To professionally size and install a water pumping system, depending on the pump type and application various variables need to be taken into consideration:

Static head - Vertical height from the dynamic water level to the highest point of water delivery.

Suction head - Vertical height from the water level to the pump inlet where the water level is below the pump inlet.

Pressure losses - Loss of water pressure due to pipe length and friction caused by pipe material and additional pipe line elements like elbows, valves.

For solar water pumping additionally local **irradiation** levels are necessary to calculate the available power during each day and the effect on water output.

To easily manage and consider the different variables, LORENTZ strongly advises to size pump systems with LORENTZ COMPASS, the solar pump planning software.

COMPASS is the LORENTZ tool for designing, planning and specifying solar pump systems. It is available for download to all LORENTZ partners on partnerNET.

COMPASS is a PC-based tool to simply specify solar pumping systems in real time. It is based on NASA weather data and uses precise algorithms for even the most complex calculations.

By selecting the location from a list of more than 250,000 cities, entering the total dynamic head (TDH) and the necessary amount of water per day the software will automatically show suitable pump systems and the necessary size of the PV generator.

For more complex situations COMPASS offers features from suction head calculation to pipe type specific pressure loss calculation.

NOTE - Always ensure the values used for sizing with COMPASS match the conditions on site. Incorrect parameters can lead to a wrong sizing report.

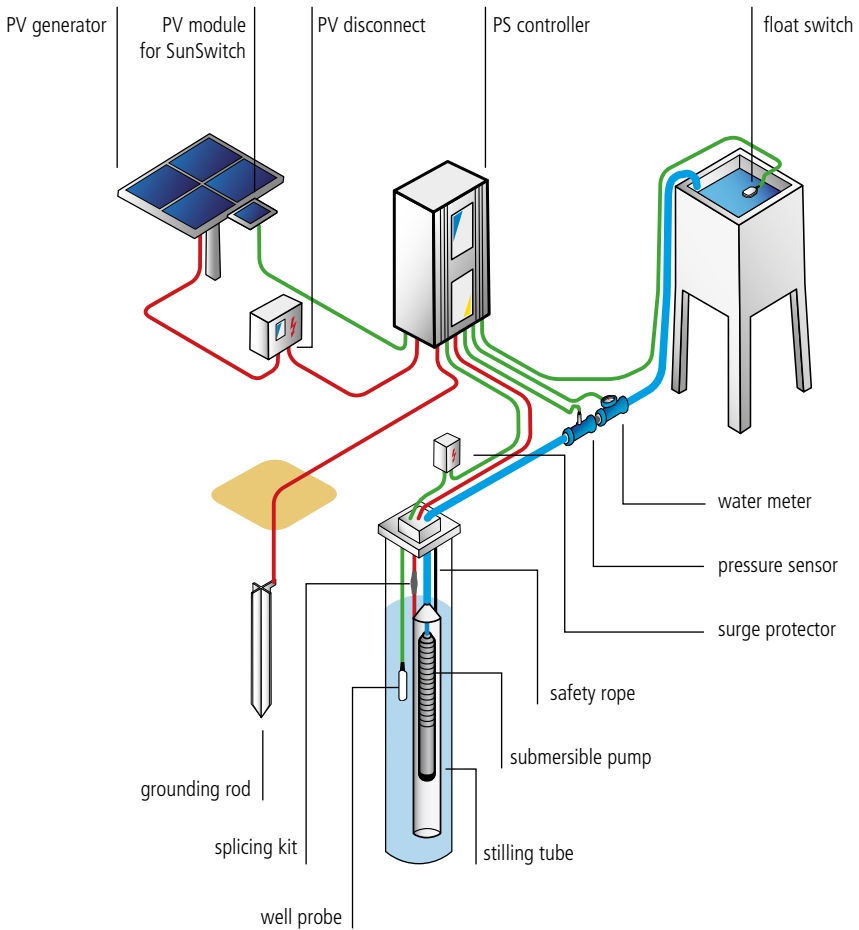
Figure 1: COMPASS sizing



6.2 System Layout: Submersible Pumps



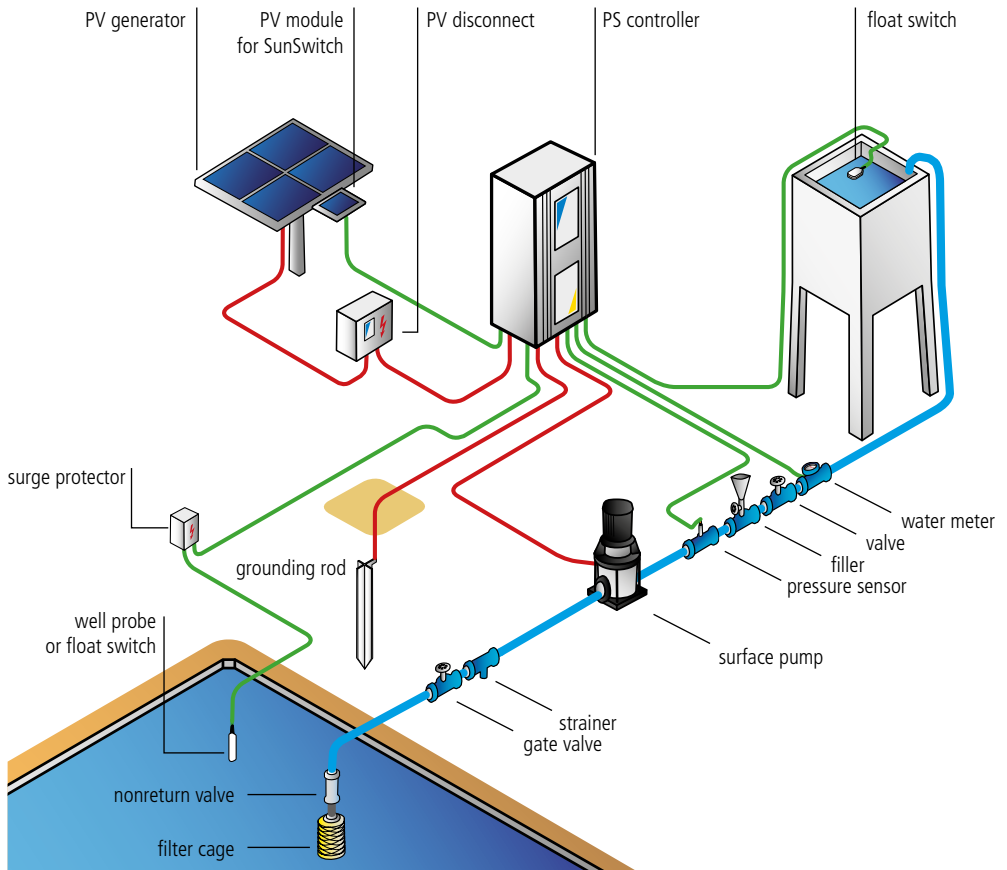
CAUTION - This graphic is an exemplary pump system layout diagram and for ease of understanding only. For system installation and wiring read and follow the detailed instructions given in this manual.



6.3 System Layout: Surface Pumps



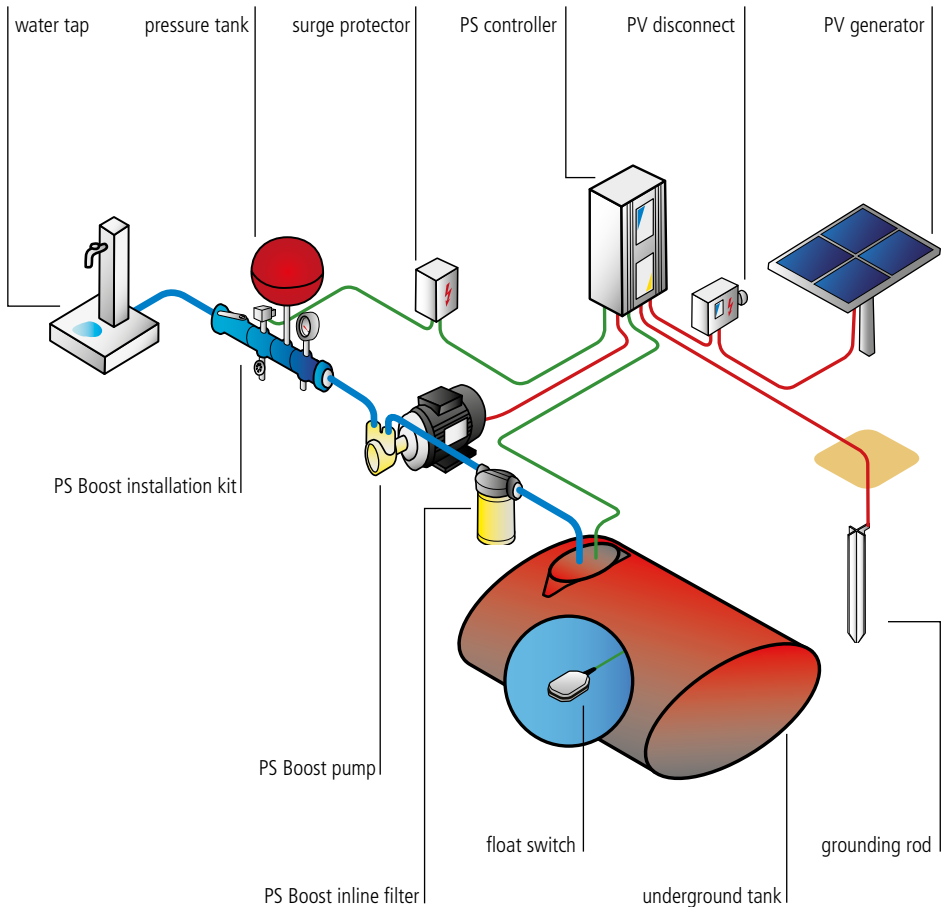
CAUTION - This graphic is an exemplary pump system layout diagram and for ease of understanding only. For system installation and wiring read and follow the detailed instructions given in this manual.



6.4 System Layout: Surface Boost Pumps



CAUTION - The displayed pump system layout diagrams are exemplary and for ease of understanding only. For system installation and wiring read and follow the detailed instructions given in this manual.



7 Controller Installation

7.1 General



WARNING – All electrical connections must be performed by qualified experts only.

WARNING – Do not dismantle the controller while still connected to the power supply! Before any installation, maintenance or inspection activities wait at least five minutes after the power supply has been disconnected from the controller!



CAUTION – Installing a SunSwitch is mandatory for all PS1800 CS-F and all PS4000 pump systems. Operating without a SunSwitch can lead to increased wear or damage to the pump. Such damage is excluded from the warranty.

CAUTION – Never let the pump run dry. Dry running will damage the pump and void the warranty. LORENTZ requires a dry run protection for every pump system.

For more information on mandatory accessories and their installation, please refer to "7.7.1.3 Pump Accessories Wiring" on page 28 and "9 Pump Accessories Installation" on page 54.

Treat the controller as industrial waste when processing the discarded controller. It is possible that some components could produce toxic and harmful gas.

DC Disconnect Switch

Every solar pump system **must** be equipped with a properly sized **DC disconnect switch**. The switch must be installed between the PV generator and controller. It must meet the following requirements:

- minimum rating according to “Table 1: Minimum DC disconnect rating” on page 17
- continuous current rating according to maximum current of the connected PV generator or higher
- the switch must be rated for DC current, **not AC**

A PV disconnect switch matching all requirements above can be purchased from LORENTZ.



CAUTION – The use of a properly sized disconnect switch is an important safety measure and obligatory for a professional installation of a solar pump system.

Table 1: Minimum DC disconnect rating

Controller	Min. DC disconnect switch rating
PS150	50V DC
PS200	100V DC
PS600	150V DC
PS1200	200V DC
PS1800	200V DC
PS4000	375V DC

Electrical Conduit

Electrical conduit is recommended. We recommend the use of an electrical conduit (pipe) to protect outdoor wiring from the weather, from human activities and from damage caused by animals. If you do not use a conduit, use a strong, high-quality outdoor cable. Where cables enter the junction box, install sealed strain-relief cable glands.

Wire sizes

For signal cables, the min. wire size should be 1.5 mm² (16AWG). For power cables, the min. wire size should be 2.5 mm² (14AWG). Compare your wire sizes to the LORENTZ COMPASS sizing reports. Cables should be shielded to meet the EMC requirements.

7.2 Controller Types

Depending on the pump system, the controller will either be in transparent plastic or aluminium housing.

Controllers in transparent housing have all indicator lights directly on board. The power on/off switch is located at the bottom of the housing, next to the cable glands.

The controllers in aluminium housing have indicator lights and a power on/off switch on the front.

Both controller types function in the same way and are to be wired according to the instructions in this manual.



NOTE – The on/off switch only affects the pump operation, it does not work as a power disconnect switch.

Prewired plugs: If ordered, the controller will have prewired plugs. In this case, no wiring is needed inside the controller. Refer to “7.7.2 Controllers with pre-wired Plugs” on page 32.

Datamodule: The datamodule is an **optional internal component**. It allows easy configuration of the pump system using the LORENTZ PumpScanner smartphone application. If combined with a PS Communicator it also allows remote pump monitoring and management with LORENTZ pumpMANAGER. For more information on the DataModule refer to chapter “11 LORENTZ CONNECTED” on page 65. For setup of the controller using PumpScanner please refer to the PumpScanner documentation available on partner-NET. For more information on pumpMANAGER please go to www.lorentz.de/connected.

Figure 2: Controller Types



7.3 Controller Elements

- **Power on/off switch** – The power switch is used to start or stop the system and as a reset switch. It does not work as power disconnect switch.
- **Indicator Lights** – The five LED lights on the front indicate different operational situations. For a detailed explanation refer to chapter “10 Operating the Pump” on page 60.

7.4 Technical Data of the Controller

Refer to “Table 2: Technical data of the PS controller” on page 19 for an overview of the most important technical specifications of the PS controller.

Table 2: Technical data of the PS controller

Model	Pump motor: rated power [kW]	Affiliated pump motor	Max. DC input voltage [V]	Min. recommended Vmp [V]	Max.output current [A]
PS150 Boost	0.3	ECDRIVE 150-Boost	50	17	18
PS150	0.3	ECDRIVE 150-C	50	17	18
PS200	0.3	ECDRIVE 200-HR	100	34	11
PS600	0.7	ECDRIVE 600-HR ECDRIVE 600-C ECDRIVE 600-CS-F	150	68	13
PS1200	1.7	ECDRIVE 1200-HR ECDRIVE 1200-C	200	102	9.5
PS1800	1.7	ECDRIVE 1200-HR ECDRIVE 1200-C ECDRIVE 1800-CS-F	200	102	14
PS4000	3.5	ECDRIVE 4000-HR ECDRIVE 4000-C ECDRIVE 4000-CS-F	375	238	15

7.5 Controller Placement

The controller must be protected from water, moisture and animals, so keep the controller box sealed. Place the controller in a dry and sufficiently ventilated environment.

Place the controller close to the solar array, not the pump, to reduce the risk of lightning damage. The controllers' input circuitry is more sensitive to surges than its output. Therefore it is safest to minimize the length of the input wiring.

Electronic devices are most reliable when they are protected from heat. Mount the controller where it is shaded from the midday sun. An ideal location is directly under the PV generator. If no shade is available, cut a piece of sheet metal and bolt it behind the top of the controller. Bend it over the controller to provide shade. This is especially important in extremely hot locations. Extreme heat may trigger a thermal function in the controller causing it to reduce the power consumption or turn it off. The controller housing can reach high temperatures when operating at high ambient temperatures. This is normal and will not reduce the expected lifetime of the controller or its components.

7.6 Mounting, Space and Ventilation Requirements

PS controllers can be mounted side by side.

All PS controllers have a fan-less design; they are cooled by air convection. It is strictly advised not to install the controller in an additional enclosure. If an additional enclosure is necessary a sufficient vertical airflow (from bottom to top) has to be ensured to allow sufficient cooling.

For controller dimensions, cf. "Table 3: Controller dimensions for installation" on page 21.

Figure 3: Controller dimensions for installation

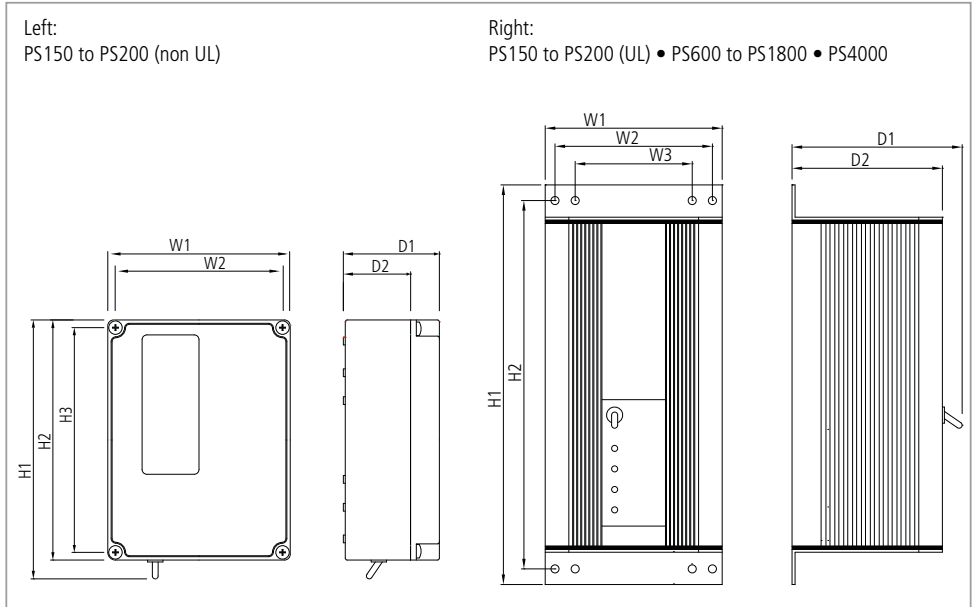


Table 3: Controller dimensions for installation

Controller Modell	Dimension [mm]								Weight [Kg]
	W1	W2	W3	H1	H2	H3	D1	D2	
PS150 to PS200 (non UL)	190	174	-	272	250	234	100	70.5	1,2
PS150 to PS200 (UL) PS600 to PS1800	178	156	116	396	364	-	150	165	4,5
PS4000	178	156	116	595	563	-	150	165	9,0

7.7 Wiring the Controller

7.7.1 Controllers without pre-wired Plugs



WARNING – All electrical connections must be performed by qualified experts only! Unqualified handling might lead to shock, burns, or death.

WARNING – Beware of high voltage. Never work on a system connected to power to avoid electric shock hazard.

Before starting to work on the electrical system make sure that all components are disconnected from the power source. Do not work on any components when power is connected or within five minutes after disconnection. The controller needs time to discharge.

Switch the system on only when all work is completed.



CAUTION – The controller should only be connected to power after correct wiring or the controller might get damaged.

CAUTION – Do not install disconnect switches in the power wires between the motor and pump controller. Connecting the motor wires to a switched-on controller may cause irreparable damage. Such damage is excluded from the warranty.

CAUTION – Solar-direct systems only – Do not connect any electrical load to the PV generator other than the LORENTZ pump controller. Connection of a battery charger, active solar tracker controller, electric fence charger, or other load simultaneously with LORENTZ PS systems may interfere with the controller and prevent proper operation.

CAUTION – Measure the voltage before connecting power to the controller. Voltage (open circuit) must not exceed the max. DC input (refer to "Table 2: Technical data of the PS controller" on page 19).

7.7.1.1 Terminal Descriptions

If you use the controller version without pre-wired plugs, open the housing by unscrewing the four screws at the bottom cover. After removing the cover the terminal rail will slide out for easier access. If the controller with prewired plugs is used, pay attention to chapter "7.7.2 Controllers with pre-wired Plugs" on page 32. All warnings and instructions concerning the wiring must be followed for both controller versions.

Terminal Description: PS150 to PS200 (non UL)

Figure 4: Terminal PS150 to PS200 (non UL)

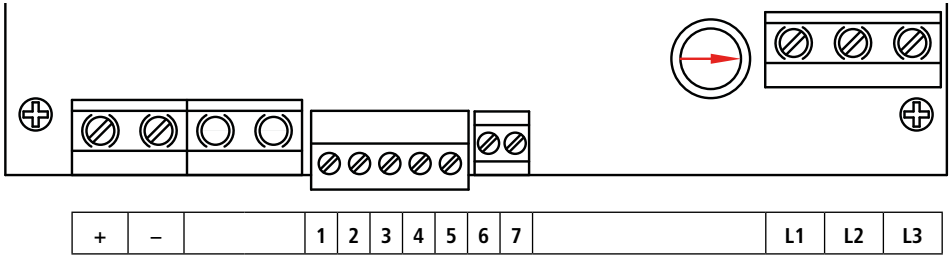
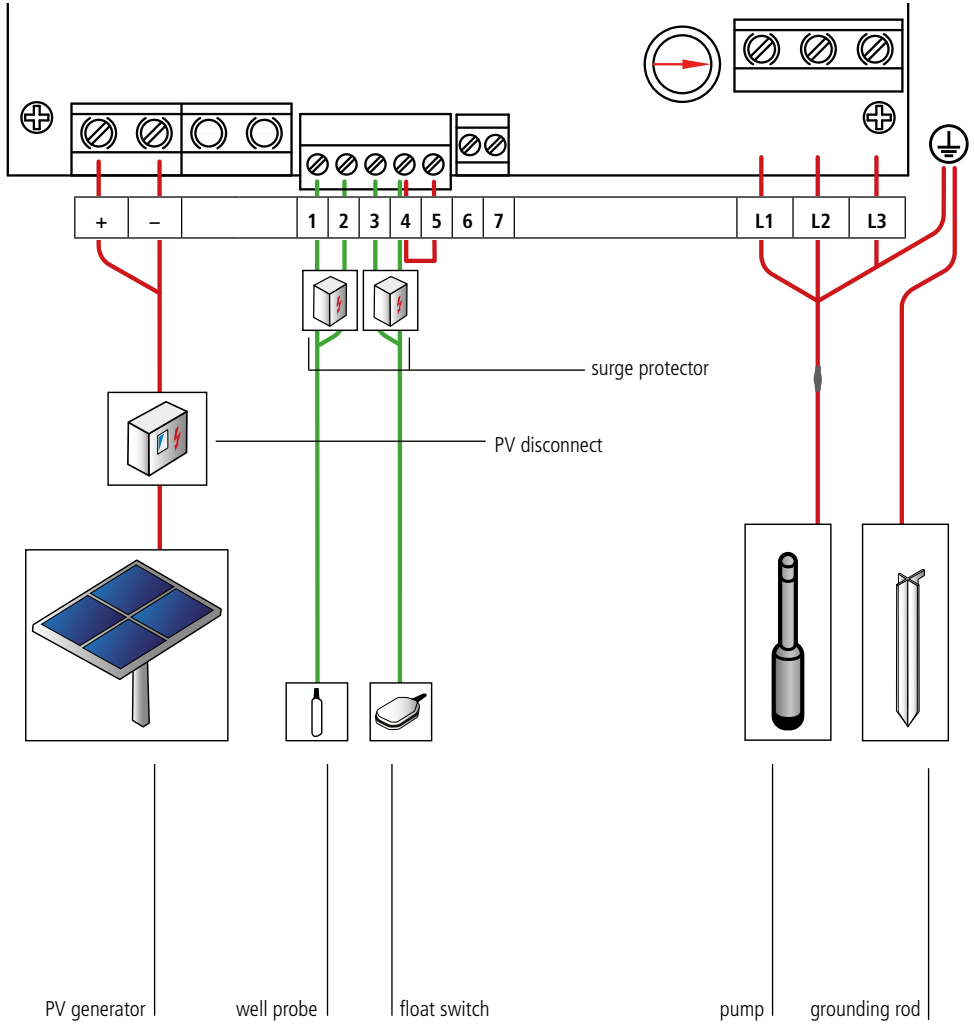


Table 4: Terminal explanation

Socket	Terminal	Connection
POWER IN	+	connect to positive terminal of PV module
	-	connect to negative terminal of PV module
Well probe	1	connection to NC
	2	connection to COM
	3	connect N.O.
Float switch	4	connect ground
	5	connect N.C.
Jumper:	6	connect cable jumper for battery mode
Battery Mode	7	connect cable jumper for battery mode
Output to motor	L1	connect to the L1 phase of the motor
	L2	connect to the L2 phase of the motor
	L3	connect to the L3 phase of the motor

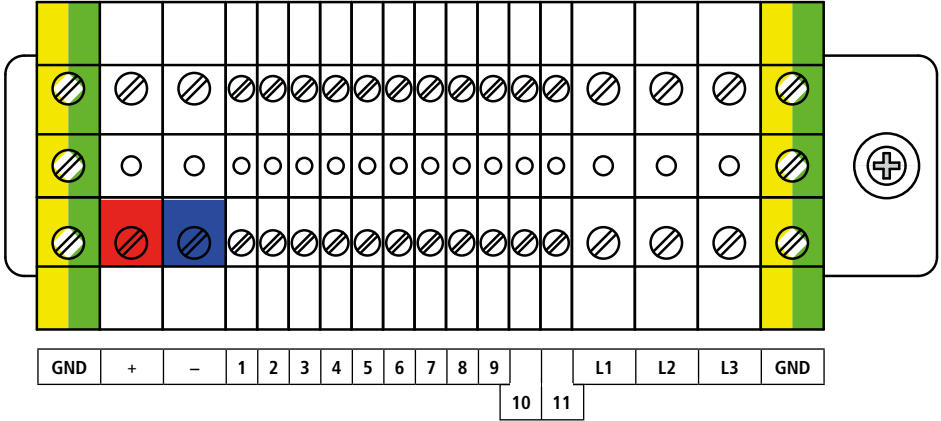
Terminal Wiring Example: PS150 to PS200 (non UL)

Figure 5: Terminal wiring example PS150 to PS200 (non UL)



Terminal Description: PS150-UL to PS200-UL / PS600 to PS4000

Figure 6: Terminal PS150-UL to PS200-UL / PS600 to PS4000



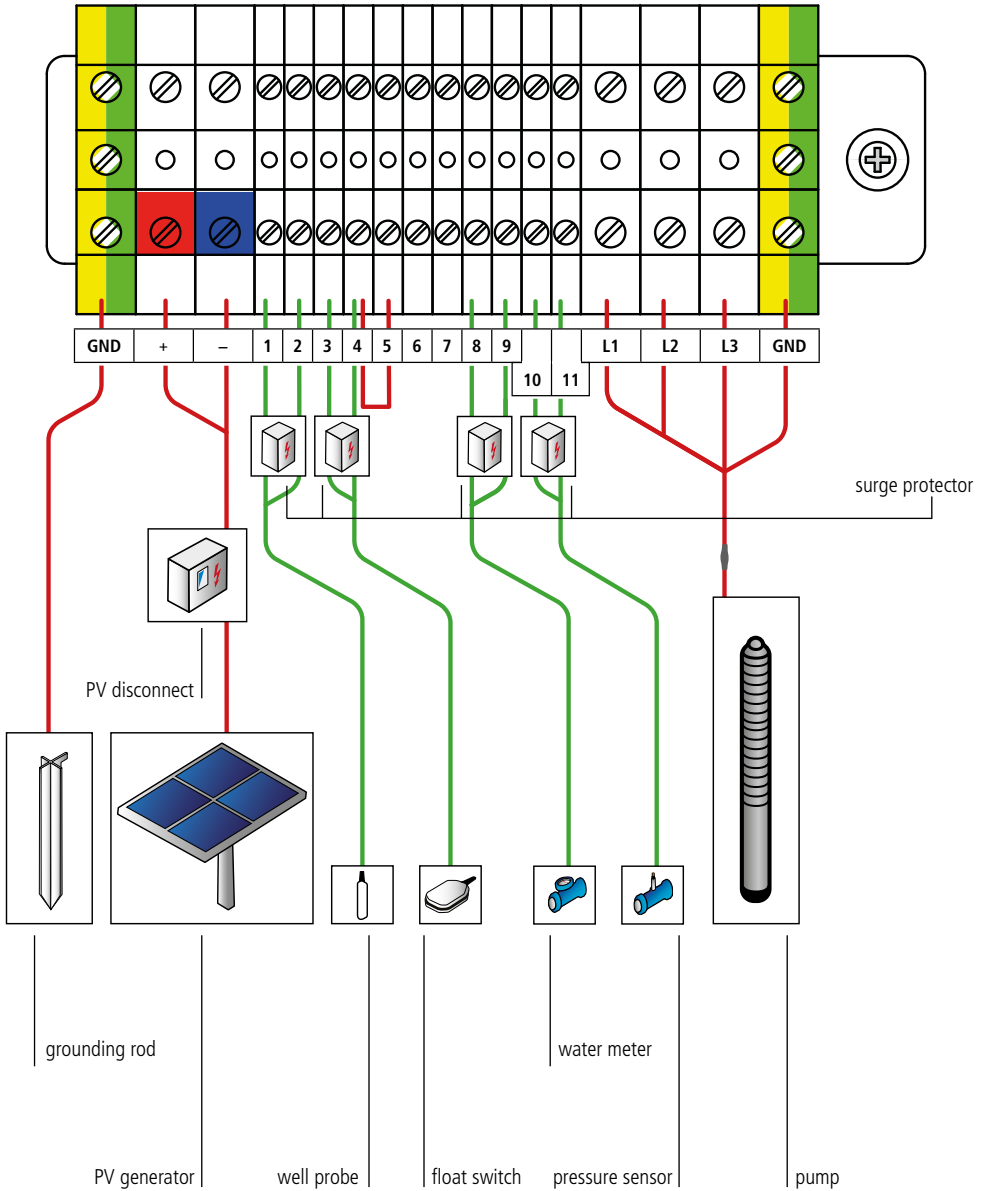
Socket	Terminal	Connection
Ground	GND	connected to protective ground wire (PE)
POWER IN	+	connect to positive terminal of PV module
	-	connect to negative terminal of PV module
Well probe	1	connection to NC
	2	connection to COM
Float switch	3	connect N.O.
	4	connect ground
	5	connect N.C.
Jumper:	6	connect cable jumper for battery mode
Battery Mode	7	connect cable jumper for battery mode
Flow meter	8	connect to signal
	9	connect to COM
Pressure sensor	10	connect positive (+)
	11	connect negative (-)
Output to motor	L1	connect to the L1 phase of the motor
	L2	connect to the L2 phase of the motor
	L3	connect to the L3 phase of the motor
	GND	connect to protective motor ground wire (PE)

Table 5: Terminal explanation

Operative only in controllers equipped with DataModule

Terminal Wiring Example: PS150-UL / PS PS600 to PS4000

Figure 7: Terminal wiring example PS600 to PS4000



7.7.1.2 Pump Wiring

The motor cables of the pump have a marking to allow correct wiring. Connect the wires using this sequence:

- 1: Motor cable L1
- 2: Motor cable L2
- 3: Motor cable L3

- ⊕: GND

If necessary, interchange any two phases to reverse direction. Refer to chapter “8 Pump Installation” on page 36 for detailed pump installation instructions.

7.7.1.3 Pump Accessories Wiring

Terminals 1 and 2

To protect the pump from being damaged by dry running connect a well probe to terminal 1 and 2. If dry run protection is not needed, add a jumper wire between these two terminals.



CAUTION - Never let the pump run dry. Dry running will damage the pump and void the warranty. LORENTZ requires a dry run protection for every pump system.

Terminals 3, 4 and 5

Connect any kind of external switch (NO or NC type) for remote control of the controller. If no switch is used the terminals No. 4 and 5 have to be connected with a jumper cable (factory setting). If a normally open switch is used (connected to the terminals No. 3 and 4) the jumper cable (connecting the terminals No. 4 and 5) must remain installed.

Terminals 6 and 7 (not for PS4000)

Connect a jumper cable between these two terminals to switch the controller to battery mode. Refer to "7.7.1.5 Input Wiring for Battery-based Systems" on page 30.



CAUTION – Only PS150, PS200, PS600, PS1200 and PS1800 pump systems can be operated from batteries.

Controllers with DataModule

Terminals 8 to 11 can only be used, if a DataModule is installed. If you are not sure whether a DataModule is preinstalled check the label on the controller housing.

Terminals 8 and 9

Install a flow meter in the pipeline and connect it to terminal 8 and 9. An impulse input of the flow meter between 1l/Impulse to 10l/impulse is recommended. The DataModule can handle up to 1000 impulse per second. The flow can be viewed with the LORENTZ PumpScanner software.

Terminals 10 and 11

Connect the pressure sensor to the terminals 10 and 11. The output voltage is 15VDC, the current (signal) range 4mA to 20mA and the load impedance 100Ω. Choose a pressure sensor which works with these characteristic values. Control and monitor the pump system with the LORENTZ Pump-Scanner application.



CAUTION – Only connect a suitable pressure sensor to terminals 10 and 11. Never create a short circuit. A short circuit will damage the DataModule immediately and will void the warranty. Observe the polarity of the pressure sensor.

7.7.1.4 Input Wiring for Solar-direct Systems



WARNING – Beware of high voltage! Electric shock hazard! Hazardous electricity may be present and can shock, burn, or cause death! Authorised, qualified personnel only!

The PV generator can produce hazardous voltage even under low light exposure. To prevent shock hazard while wiring the array, leave one or more wires disconnected or cover the solar array with opaque material.

Table 6: Max. power input

Controller	Max. DC input voltage
PS150	50 VDC
PS200	100 VDC
PS600	150 VDC
PS1200	200 VDC
PS1800	200 VDC
PS4000	375 VDC



CAUTION – An input voltage higher than specified in “Table 6: Max. power input” on page 29 will damage the controller and void the warranty. Damage may occur if the solar generator array is wired incorrectly. Measure the voltage and confirm the polarity before connecting the power to the controller.

Connect the positive terminal of the PV modules to + and the negative terminal of the PV modules to -. Connect the protective ground wire to an appropriate ground system. Refer to “7.7.1.1 Terminal Descriptions” on page 22 for terminal descriptions and to “7.7.1.6 Grounding” on page 31 for grounding instructions.

7.7.1.5 Input Wiring for Battery-based Systems



CAUTION – The PS4000 pump system can not be operated from batteries.

Install a jumper wire between terminals 6 and 7 to set the controller to battery mode when operating a PS150 to PS1800 controller. This will deactivate the MPP-Tracking function and activate the Low Voltage Disconnect (LVD).

Connect the PS controller directly to the battery and NOT to the load terminals of the charger as the terminals may not be rated for the starting load current of the pump. The PS controller has a low voltage disconnect function to protect the battery from being deeply discharged.

Some charge controllers monitor the capacity of the battery and regulate the charging accordingly. This method does not work when the PS controller is connected to the battery. In order to provide correct charging the charger should be set to voltage orientated regulation. This may require a jumper to be set in the charger. Check the manuals of the charger manufacturer.

Short circuit protection: Install a fuse or circuit breaker near the power source. Use a 30 A circuit breaker or a time delay (slow blow) fuse.

Low-voltage disconnect function: Lead-acid batteries can be permanently damaged by over-discharge when the voltage falls below a critical point. To prevent this, the PS battery system controller will turn off at low voltage, and turn back on only after the battery has recovered significantly.

Table 7: Set points for low voltage disconnect

Controller	Voltage	OFF	ON
PS150	12 VDC	11 VDC	12 VDC
	24 VDC	22 VDC	24 VDC
PS600	48 VDC	44 VDC	48 VDC
PS1200	96 VDC	88 VDC	96 VDC
PS1800	96 VDC	88 VDC	96 VDC

7.7.1.6 Grounding

Before starting to work on the electrical system make sure that all components are disconnected from the power source. Only switch on the system when you have finished all work.

Grounding is mandatory to protect the users from potentially fatal electric shocks. It also protects against electric charging or a short circuit inside the device. This is accomplished through clamping, bolting or other mechanical means to provide an effective grounding path to the earth to ensure safe operation at all time.

The grounding is also important to the system for lightning protection. In general it is meant for indirect lightning strikes and induced electrical potentials during operation of the pump system.

Before installation, contact the local code authorities to determine the necessary grounding requirements.

Insufficient ground source: Where there is an inadequate ground source you can use a grounding rod. A grounding profile rod should be located about 4–5m (13–16 ft) from the controller. The cable must not carry any mechanical loads. The rod must be completely buried in the ground (2.5 m/8 ft below ground level). You must refer to local standards and requirements. The grounding cable should be a copper cable with a cross section of not less than 16 mm² (AWG 6).

PS150 to PS200 (non UL): A protective earth connection must be linked to the controllers earth connector, marked with the protective earthing symbol \oplus . The protective earth wire of the motor must also be connected to the controllers earth connector.

PS150-UL, PS200-UL and PS600 to PS4000: A protective earth connection for the controller must be connected to the left GND terminal. The right GND terminal, next to the motor phases (L1, L2, L3), is for the protective earth wire of the motor.

All metallic support structures and electrical enclosures must be grounded.

For grounding of the PV generator, follow manufacturer instructions.

7.7.2 Controllers with pre-wired Plugs



NOTE – This section is for controllers with prewired plugs only.

CAUTION – All warnings and instructions mentioned for the wiring of the standard controller version must be considered and strictly observed.

CAUTION – For splicing accessories to the plugs and the grounding rod to the grounding connection, use a proper crimping tool and sleeves matching the cable size.



WARNING – All electrical connections must be performed by qualified experts only! Unqualified handling might lead to shock, burns, or death.

Plug connections are easy to assemble without opening the controller housing. The socket parts of the plug connections are prewired and preassembled inside the controller. The counterparts must be connected to the wires. All counterparts are included in the delivery, except the standard PV power plugs.



CAUTION – Even if a sensor plug is not used to connect a sensor it must be plugged into the controller to allow correct operation of the pump system. If a plug is not connected it will cause the pump system to stop.

Figure 8: Plug Controller Types



A1 – Power In

Connect the solar generator to the male and female MC4 plugs of the PS Controller. (Type PV-KBT4/6IUR, PV-KST4/6IUR, see "Figure 10: MC4 plug for power input" on page 34). Observe correct polarity. The counterparts to the MC4 plugs are not included in the delivery. Only original multiConnect plugs or plugs approved by multiConnect are supported. The PV side of the plug is not included in delivery.

A2 – Motor out

"Figure 11: Plug W for motor cable" on page 34 shows the arrangement of the pins. The pins are numbered and the plug has small grooves to ensure correct assembly.

- Pin 1: Motor cable L1
- Pin 2: Motor cable L2
- Pin 3: Motor cable L3

- Pin Ⓢ: Motor grounding cable

Ⓢ – Grounding

A grounding cable is led out of the controller that needs to be extended by splicing.

B1 – Low water sensor**B2 – Remote float switch**

For the connection of the low water sensor and remote float switch 2-pin plugs are used, see "Figure 12: 2-pin plug" on page 34. Cut the wire of the plug and splice the cables of the corresponding pump accessory to it. The polarity does not matter. If a plug socket is not used plug it into the socket of the controller housing without cutting the wire - 2-pin plugs are connected as normally closed to the controller terminals.

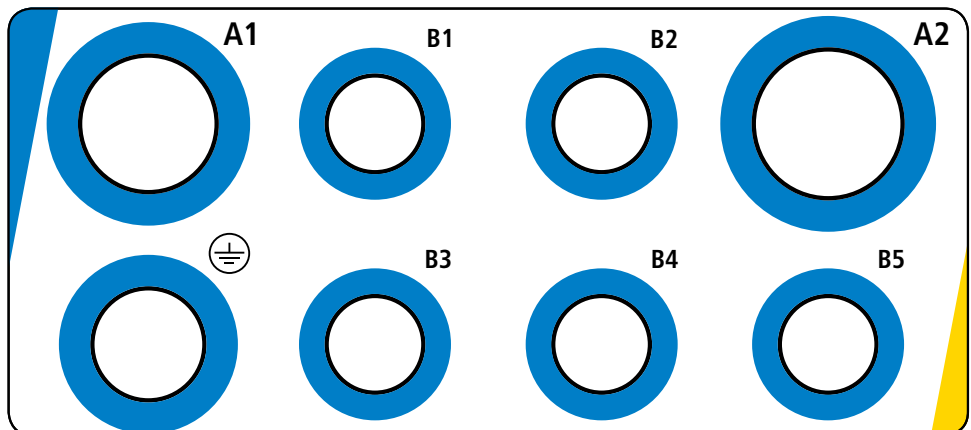


CAUTION – If a Surge Protector is installed (see "9.8 Surge Protector" on page 59), correct polarity must be ensured. Therefore the cables of the plugs are marked accordingly.

B3 to B5 – Accessories (UL controllers only)

For any additional accessories the cable glands can be used. They have to be connected in the same way as in PS controllers without prewired plugs, cf. "7.7.1.3 Pump Accessories Wiring" on page 28. The controller case has to be opened and the wires must be connected to the terminal clamps.

Figure 9: PS UL-plug-controller label. (For Non-UL controllers check the plug naming on the device)



Battery Mode (not PS4000)

The battery mode is activated in the same way as for PS controllers without pre-wired plugs. The controller case has to be opened and a jumper must be connected between terminals 6 and 7, refer to "7.7.1.5 Input Wiring for Battery-based Systems" on page 30.

Figure 10: MC4 plug for power input



Figure 11: Plug W for motor cable



Figure 12: 2-pin plug



7.8 Jumper Settings (PS150 only)



NOTE – The following chapter to adjust jumper settings is relevant for PS150 controllers only.

Before start-up check the setting of jumper Jmp2. For standard PS150 systems (centrifugal mode) Jmp2 must be set. For PS150 Boost systems make sure Jmp2 is **not** set, if necessary remove it. Please refer to “Figure 13: Jumper Jmp2 on PS150 controller boards” on page 35.

To access the mainboard in non-UL controllers unscrew the plastic cover; in UL controllers unscrew the top cover.



Jumper Jmp2

Make sure the two **left** pins are **not** connected for PS150 Boost mode or connected for centrifugal mode. (The two right pins are not connected)

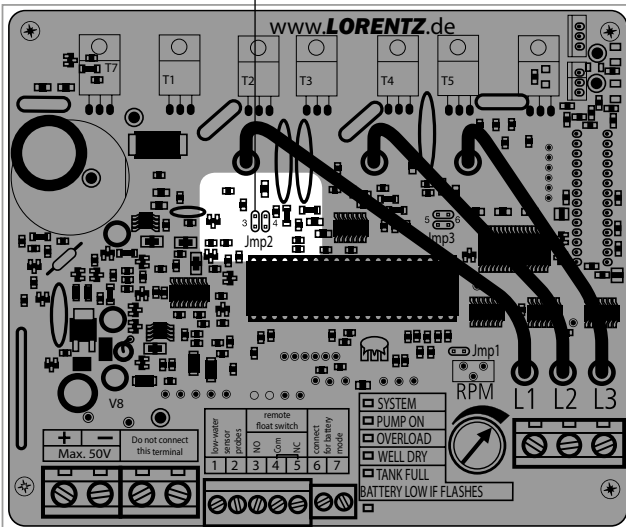


Figure 13: Jumper Jmp2 on PS150 controller boards

8 Pump Installation

8.1 General Instructions



WARNING – All electrical connections must be performed by qualified experts only.

WARNING – Before starting any work on the pump/motor, make sure that the electricity supply has been switched off and that it cannot be accidentally switched on!



CAUTION – Before you start the assembly, make sure that all parts were delivered and have not been damaged during transport.

8.1.1 Pipe Sizing

LORENTZ pump systems are extremely efficient. It is important to keep this efficiency throughout the entire system. A main reason for loss of efficiency is pipe pressure losses. Make sure that you have included the pipe pressure losses during the sizing process of your system.

Consider a smart pipeline design from the beginning.



CAUTION – Consult COMPASS or a pipe pressure sizing chart to determine the correct size. Oversize the pipe line to reduce the pressure drop.

CAUTION – The length of the inlet and of the outlet pipeline must be considered for the calculation of the pressure losses

CAUTION – Only run the pump when it is completely prefilled with water (surface pumps), submersible pumps must be completely submerged. This means there must be no air in the pipes.

CAUTION – For surface pumps, air locks must be avoided at the inlet pipe line. Avoid sharp 90° elbows and sharp pipe size adaptors.

8.1.2 Cable Splicing

To connect the motor cable with a cable extension you should connect the cable ends with a splicing kit.

It is very important that the cable joints are fully sealed otherwise moisture could cause a short circuit. This will damage the pump system.

For more information about connecting cable ends with a splicing kit see the “submersible cable splicing” manual in the package of the splicing kit.



CAUTION – Cable splice failures are a common source of errors. Check the splice for proper connections.

CAUTION – Bad cable splicing can damage the controller and/or the pump. Such damage is excluded from the warranty.

8.2 Pump System Type

Depending on your pump system, please refer to the correct chapter for installation instructions:

Pump type	Chapter
Submersible	8.3
Surface CS-F	8.4
Surface Boost	8.3

To determine the type of system you have, please refer to chapter “3.3 Naming” on page 8.

8.3 Submersible Pumps

For submersible pumps only: The pumps are water lubricated and therefore prefilled with water. If the motor is stored for more than three months, the water will have been pressed out; the rotor must be turned by hand before use to ensure that the rotor is not stuck.

8.3.1 Wiring the Pump



CAUTION - No disconnect switches must be installed between the motor and the pump controller. Connecting the motor wire to the switched-on controller might irreparably damage it. Such damage is excluded from the warranty.

CAUTION – If the pump wires are in the wrong order, the motor will run in reverse and the pump will not function correctly. Damage may result. Check the direction before installing the pump. The proper direction is counter-clockwise when viewed from above.

CAUTION – Never let the pump run dry. Dry running will damage the pump and void the warranty. LORENTZ requires dry run protection for every submersible pump system.

The motor cables of the pump have a marking to allow correct wiring. Connect the wires using this sequence:

- 1: Motor cable L1
- 2: Motor cable L2
- 3: Motor cable L3

- ⊕: GND

The submersible pump must be submerged in water before checking the correct rotational direction. The correct rotation direction for submersible pumps is counter-clockwise, viewed from the top. It is also labelled with an arrow on the pump end.

The testing process for rotational direction depends on the pump type. Please refer to the next page for detailed instructions on testing helical rotor (HR) and centrifugal submersible pumps. To determine which type of pump you have, please refer to "3.3 Naming" on page 8.

Figure 14: Exemplary LORENTZ submersible pumps



HR Pumps:

The HR pumps are positive displacement pumps and hence will only deliver flow rate when running with correct rotation direction. They will be damaged when running in reverse.

A new pump "out-of-the-box" is shipped from the factory with a lubrication film on the rotor which allows a test run of max. 5 seconds in total without submerging the pump. Once the pump came in contact with water it must not be operated without being completely submerged! Submerging only the inlet is not sufficient and will result in damage to the pump end.

Check the rotational direction as follows:

- (1) Connect the pump to the controller and power supply.
- (2) Observe the information regarding HR pump testing above and follow them strictly!
- (3) Start the pump and check the rotation direction by observing the motor shaft at the pump inlet.
- (4) Compare to the indicated rotation direction on the pump end.
- (5) In case the direction is wrong, switch off immediately and change two of the three phase leads (e.g. red and yellow).
- (6) Start the pump again and check the rotation direction. Do not exceed 5 seconds of combined testing time.
- (7) The pump will only deliver water flow when running with correct rotation direction.

Centrifugal Pumps:

Check the rotational direction as follows:

- (1) Connect the pump to the controller and power supply.
- (2) Start the pump and check the delivered flow rate.
- (3) Stop the pump, disconnect the power supply and change two of the three phase leads (e.g. red and yellow).
- (4) Start the pump again and check the delivered flow.
- (5) Stop the pump, disconnect the power supply and compare the flow rates from point 2 and 4. The wiring with the better flow rate has the right rotational direction.

8.3.2 Installation and Handling

To lower the pumps into the borehole, a crane or hoist is recommended, depending on your pump system.

All parts have to be strong enough to withstand the weight of the pump, the motor, the motor cable and the pipe system.

It is also helpful to lower a pump dummy into the borehole before you lower the pump to make sure that the hole is completely free and the pump can slide into the hole without obstructions.



WARNING – Never stand under suspended loads.

WARNING – Always take suitable security precautions (e.g. a strong safety rope) to safeguard the pump against slipping into the well during installation!



CAUTION – Be careful not to bend the pump, take particular care with centrifugal (C) pumps with a high number of stages. Make sure that the pump never stands on the motor cable, that the cable does not get jammed or damaged by sharp ledges or that the cable is not pulled or jerked where it enters the motor.

During the process of lowering the pump into the well the motor cable has to be fixed properly to the pipe, see “Figure 15: Fixing of the motor cable at a joint and a strait pipe” on page 40. Where a plastic pipe is used, the longitudinal stretch of the pipe under load has to be considered by leaving a sufficient gap between the pipe and the cable! The cable should be fixed with water-resistant tape. It is a good installation practice to form a loop with the motor cable near the pump and repeat it about every 40 m / 130 ft along the riser pipe. This will keep any tensile forces away from the motor cable.

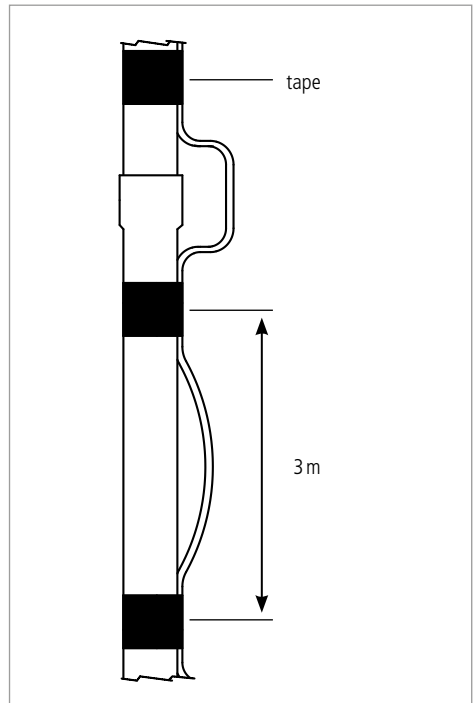
To extend the motor cable pay attention to chapter “8.1.2 Cable Splicing” on page 37.

Round off the edges of a flange to prevent damage to the cable. Do not fix the cable tightly. Leave space for the pipes to expand. The cable needs to get fixed every 3 m.



NOTE – Measuring and noting down the distances between the fixing will help to lower the pump to the right depth.

Figure 15: Fixing of the motor cable at a joint and a strait pipe



8.3.3 Installation Depth

Make sure that the pump unit is suspended properly and is not in contact with sand and mud from the well bottom. It is recommended to install the pump above the filter zone (= water entry zone) of the well to keep the sand content in the water low and ensure proper cooling of the motor.



CAUTION – The pump must be submerged completely. Never let the pump run dry. Dry running will damage the pump and void the warranty. LORENTZ requires a dry run protection for every pump system.

CAUTION – If the pump does not hang above the filter zone a flow sleeve is necessary.

8.3.4 Removal

If you have to remove the pump system it is the same principle as the installation in reverse order. When removing the pump the pipes will be full of water and will be heavier.



CAUTION – When you lift the pump system out of the well the pipes are full of water. This causes additional weight.

In the table below you can see the additional weight of the water per meter pipe length.

Table 8: Additional weight per meter pipe length

Pipe diameter	Additional weight	
	[in]	[kg/m]
2	2.0	14.5
2.5	3.2	23.1
3	4.6	33.3
4	8.2	59.3
5	12.7	91.9
6	18.4	133.1

8.3.5 Additional Features

8.3.5.1 Safety Rope

We recommend the use of a safety rope as a loss insurance. If the pipe breaks because of start-up torques of the motor, too much weight, pipe corrosion or wrong installation a safety rope can prevent the total loss of the pump system and damage to the well.

Choose a safety rope that can handle the weight of the whole installation and the water inside the pipes. The rope material must be water-resistant. Near the well head the rope needs to be UV-resistant or protected from sunlight.



CAUTION - Do not use a nylon rope. Nylon is known to absorb water over time which will weaken the rope.

8.3.5.2 Plastic Pipes

When the pipes are strong enough the use of plastic pipes is possible. If you are not sure about the strength of your pipes contact the pipe manufacturer.



CAUTION - The pipes must be strong enough to hold the whole weight of the pump, the motor, the pipe system and the water in the pipes. It must also withstand the water pressure generated by the total dynamic head.

CAUTION - When using plastic pipes you should always use a safety rope.

8.3.5.3 Stilling Tube

For the maximum recommended sand content, before any significant detrimental effects occur, check chapter "4 Operating Conditions" on page 9.

A higher content will cause excessive wear within the pump and reduce the pump's life span considerably. Any pump that is blocked by sand will not be covered by warranty.

To reduce the amount of particles entering the pump, a stilling tube can be installed.

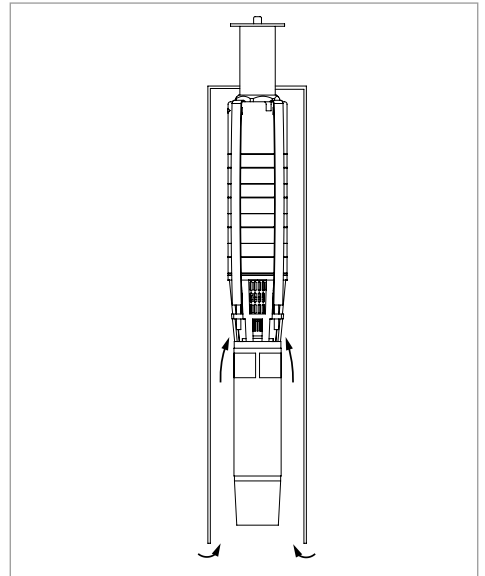


Figure 16: Stilling tube

8.4 CS-F Surface Pumps

8.4.1 Placement and Foundation

Rain and weather protection – The pump is equipped with IPX4-type motor protection. If it is installed outside, the pump must be protected from rain and direct sunlight. This will increase the durability of your pump.



CAUTION – CS-F pumps must not be submerged in water or subjected to rain or dripping water.

CAUTION – If the pump is installed in a humid area, effective ventilation and aeration must be provided in order to prevent condensation.

CAUTION – When installing in very small installation spaces the natural cooling may be insufficient. Carefully consider the ventilation in order not to exceed the maximum ambient temperature.

CAUTION – The pump might heat up in operation. The pump must not be installed on combustible surfaces. Strong incombustible surfaces should be used, e.g. concrete or stone surfaces.

Foundation – An arrow on the pump base shows the direction of the flow of the fluid through the pump. It is recommended to install the pump on a concrete foundation. The foundation must be level and should have min. approx. 1.5 times the weight of the pump to absorb vibration, shock and strain.

Connecting the pump to the foundation – Fastening the pump to the foundation should be done exclusively by means of properly sized bolts or threads (dowels) in order to avoid any movement of the pump unit.



CAUTION – The pump must be mounted vertically.

Space – During installation, make sure that there is enough space available to permit subsequent disassembly of the motor unit. It is recommended to have at least 1m of free space above the pump.

Figure 17: Exemplary LORENTZ surface pumps



8.4.2 Pump Motor Wiring



WARNING – The wiring has to be done by qualified service personnel only.

**WARNING – Beware of high voltage!
Electric shock hazard!**

The ECDRIVE must be connected to the terminals L1, L2, L3 and GROUND. The ECDRIVE requires four-conductor (four-wire) cable between the controller and the motor. The three wires L1, L2 and L3 carry power. The fourth wire carries ground. Connect the ground wire to the ground connection in the controller. Grounding helps to prevent shock hazard if there is a fault in the motor.

The correct order of the three motor phases is marked on the motor cables itself. Prior to splicing the order of the motor phases should be transferred to the cable. This will simplify the wiring.



CAUTION – No disconnect switches must be installed in power wires between motor and pump controller. Connecting the motor wires to a switched-on controller may cause irreparable damage which is excluded from the warranty.

CAUTION – If the pump wires are in the wrong order, the motor will run in reverse and may damage the pump. Never let the pump run dry, not even for the purpose of checking the direction of rotation.


Check the correct rotation direction after the pump is filled with water, see chapter “8.4.5.2 Rotary Direction” on page 48.


8.4.3 Installation and Handling

Handling – When lifting the pump use the eyebolts at the motor housing. If that is not possible lift the pump at the motor flange by using a holder or straps.

Strainer – If pipelines are welded together metal pieces might be present in the pipeline. Before pump installation, the inlet pipeline must be carefully cleaned. It is recommended to install a strainer about 1 m / 3 ft in front of the pump inlet to avoid pump damage due to any kind of impurities (cp. "Figure 18: Strainer"). The pressure drop of the strainer must be considered in the suction lift calculation.

Pipe system – We advise that pipe expansion joints are used close to the pump on both inlet and outlet to reduce noise and vibration (cp. "Figure 19: Pipe expansion joints"). It is recommended that you install a gate valve in the suction and discharge pipeline close to the pump to avoid draining of the pipe while cleaning (e.g. filters), repairing, servicing or replacing the pump system.

 **WARNING** – Inlet and outlet pipes must be mounted to the pump housing free of tension.

 **CAUTION** – Make sure that the suction pipe is sealed with no leaks, otherwise the pump will not prime or will prime insufficiently.

CAUTION – The pumps are shipped with plastic covers on the pump inlet and outlet. Remove them before connecting the pipes to the pump.

Check valve – A check valve at the inlet pipe is needed to assure that the pump and its suction pipeline remains completely water filled during the time the pump is switched OFF. Always install a check valve with one inch (1") larger diameter than the suction pipe in order to avoid too much suction pressure drop. For example if the suction pipe size is 3", then a 4" check valve should be installed.

Figure 18: Strainer

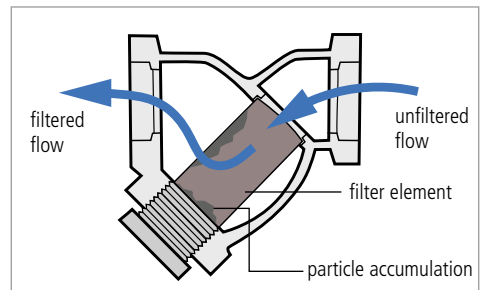
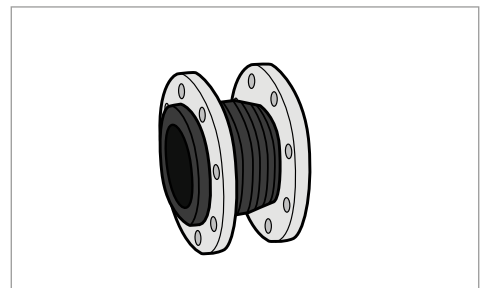


Figure 19: Pipe expansion joints



8.4.4 Suction Head

The maximum suction head is limited by the local air pressure, the water temperature of the medium, the pipe losses and the NPSH value of the pump.



CAUTION – If the suction pressure in the pump is lower than the vapor pressure of the fluid, cavitation will occur. Cavitation creates noise and will damage the pump. Damage due to cavitation is not subject to warranty. To avoid cavitation, the pressure of the fluid must be maintained above its vapor pressure at all points as it passes through the pump.

The maximum suction head (H) must be calculated in advance. The LORENTZ pump sizing software COMPASS can be used for NPSH calculation.

8.4.5 Initial Start-up



CAUTION – Never start the pump if it is not filled with water and has not been vented. The pump and suction pipe must be fully filled with clean water.

8.4.5.1 Filling Pump with Water

The pump and the whole suction pipe must be fully filled with clean water.

If the water level is higher than the pump inlet:

1. Close the gate valve in the outlet pipe and loosen the air vent screw.
2. Open the gate valve in the suction pipe slowly.
3. Tighten the air vent screw when water streams out continuously.

If the water level is below the pump inlet:

Suction pipeline and pump must be filled with water.

1. Close the gate valve in the outlet pipe and open the gate valve in the suction pipeline.
2. Loosen the air vent screw and fill the water into the pump.
3. Fasten the air vent screw after the pump and the suction pipeline are completely filled with water.

In open systems where the liquid surface is below the level of the pump the water injection hole can be used.



CAUTION – For larger diameter pipes the suction pipe should be primed separately from the pump. Installing a filler pipe simplifies this. The pump must be fully primed after the suction pipe is full.

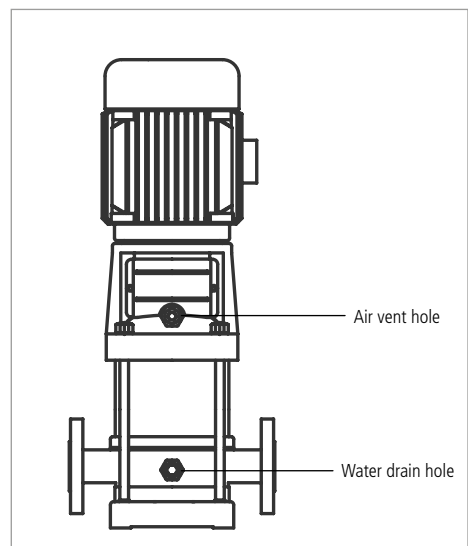
CAUTION – A nonreturn valve must be installed at the start of the inlet pipeline.



WARNING – Do not start the pump until it has been filled completely with water.

WARNING – Make sure that the installed shutoff valves in the suction and pressure lines are completely open during operation, the pump must never run with shutoff valves closed!

Figure 20: Vent and drain holes



8.4.5.2 Rotary Direction



CAUTION – Never let the pump run dry, not even for the purpose of checking the direction of rotation! Dry running will damage the pump and void the warranty.

Switch on the power supply and look at the rotary direction by looking at the motor fan. An arrow on the pump unit indicates the correct direction of the rotation.

Viewed from the top, the pump turns counterclockwise.

8.4.5.3 Final Check-up

Check whether the foundation bolts are fastened, the pump and suction pipes are completely filled with water, the voltage of the power supply is correct and that the pump turns correctly. Make sure all pipelines are connected tightly and can supply water normally. Make sure there is no closed valve or other obstruction in the water line.

8.5 Boost Surface Pumps

8.5.1 Placement and Foundation



WARNING – PS Boost pumps must not be submerged in or exposed to other sources of water, e.g. rain.

Operating noises – Make sure, by applying appropriate measures, that the environment will not be impaired by any sound produced by the pump.

Space – During installation, make sure that there is enough space available to permit subsequent disassembly of the motor unit.



WARNING – The pump might heat up in operation. It must be installed on a non flammable surface.

Connecting the pump to the foundation – Fastening the pump to the foundation should be done exclusively by using bolts, threads or dowels in order to avoid blocking the removal of the motor unit.



CAUTION – Inlet- and outlet-pipes must be attached to the pump free of tension.

8.5.2 Pump Motor Wiring

L1 – L2 – L3 – ECDRIVE requires four-conductor (four-wire) cable between the controller and the motor. The three wires L1, L2 and L3 carry power. The fourth wire carries ground. To reverse direction of rotation reverse any two phases.



CAUTION – No disconnect switches must be installed between motor and pump controller. Connecting the motor wire to the switched-on controller can cause damage. Such damage is excluded from the warranty.

Figure 21: LORENTZ boost pump



8.5.3 Installation Position

The pump may be mounted horizontally or vertically.



CAUTION – When installing the pump vertically, the pump head must be facing downwards.

Rigid mounting – is not required in most installations. In a non battery system, the pump starts gradually and does not jerk with the start. In a battery system it will jerk slightly, but can be stabilized by mounting it to a small wooden board. The pump may be hung vertically on a rope. Observe the pump to ensure pipes are not overstressed or loosened as it starts.



CAUTION – Do not mount the pump directly to a wall or wood floor in your home. This will increase the noise.

Changing the pump head position – The pumps' fittings can be changed to face sideways or downwards. The pump head may be rotated to a different position by loosening the clamp screws that secure the pump to the motor. Before installing the pump, inject water into the inlet and run the pump.

The pump may be installed either max. 3 m below (gravity feed) or above (suction mode) the water level. Thereby the geodetic head between liquid level and pump inlet must not exceed 3 m. The suction lift may be significantly reduced by flow resistance in the suction line (if the pipes are very long and/or insufficiently dimensioned).

8.5.4 Filtering



CAUTION – Sand, clay, rust or other solids will cause rapid wear or immediate damage to the pump.

If your water is free of any contamination, the LORENTZ fine intake strainer will provide sufficient protection. The use of the LORENTZ intake strainer is recommended as third-party solutions may not be sufficient. Since water conditions can be subject to change, the additional use of a filter is recommended.

A 30 inch intake filter/foot valve is necessary for pumps lowered into wells. For other installations an inline filter is best, installed close to the pumps' intake. If filters are expected to clog often, maintenance may be minimized by plumbing two or more filters in parallel. The inline filter has a clear bowl so its condition may be observed.



CAUTION – Have replacement cartridges ready.

Filter cartridges are available at retailers and local water system suppliers. LORENTZ recommends the use of 10-20-micron "spun polypropylene" type filters. Carbon taste and odor cartridges have less capacity for dirt, more resistance to flow, and are more expensive to use. Use them only if you have taste and odor problems.

A filter cartridge may look clean and still be clogged, due to fine silt embedded in the fibres. If the pump becomes increasingly noisy over time, it is usually due to a clogging filter cartridge. On the other hand a cartridge that looks discoloured may not be clogged. As long as the pump runs quietly, the filter is okay to use. The pump noise is an indicator for the need to change cartridges.

Iron pipes or fittings will introduce abrasive rust particles if installed on the intake side of the pump. Dirt is also introduced as pipe joints are assembled, especially in a trench.



CAUTION – Make sure inlet lines and fittings are flushed clean before attaching them to the pump.

The inline filter may have a red push button valve to release pressure for maintenance. If the filter is placed more than a few feet above the water source (at lowest level) the suction may open the valve and introduce air. Prevent this by sealing the surrounding area of the push button with silicone sealant or epoxy, or replace the button with a nut, tightened down.

8.5.5 Plumbing Design



CAUTION – New pumps are covered with foam plugs to prevent contamination. Remove the foam plugs before connecting pipes.

CAUTION – Handle the pump with caution, never use force on it.

Minimize suction lift – to max. 3 m total pressure loss (2 m for pumps with flow rate greater than 400 l/h (105 US Gal)). The less suction lift, the more reliable and quiet the pump will be. The motor may not be submerged, this will damage the pump.

Intake pipe – The intake pipe may run any reasonable horizontal distance, although it is best to keep it short. Use large pipe for the intake (1 to 1½" for larger booster pumps). Slope the intake line from the water source up towards the pump. Avoid humps in the intake line that cause air pockets which can block the flow.



CAUTION – Avoid leaks in the suction line. The pump will prime insufficiently or not at all.

The intake pipe must be **sized generously** to avoid high pressure drop at peak flow rate, or the pump will be noisy and will wear rapidly.

Use pipe reducer fittings to adapt the pumps' inlet or outlet to larger pipe size where necessary. Larger pipe sizing does not have a negative effect.



CAUTION – The intake must not be restricted by undersized pipe, excessive suction lift, or a clogged filter.

CAUTION – Excessive suction at the pump intake causes cavitation, resulting in noise and rapid pump wear.

CAUTION – Do not use thin wall hose or soft tubing on the pumps' intake. It may collapse under suction and restrict the flow.

CAUTION – Do not use polyethylene pipe for the suction side. It is prone to leakage at the fitting.

Inline filter – Inline filters should be mounted horizontally and as low as possible. This prevents any air trapped from blocking the water flow.

Foot valve – The foot valve is a check valve installed at the water intake. It is required in any situation where the pump is located higher than the lowest water level of the water source. A high quality spring loaded type is recommended to avoid loss of prime. A check valve allows water to flow one way only.

Priming the pump – Priming a pump means completely filling its intake and suction line with water. This must be done if the pump is mounted higher than the water source. A removable plug or a valve must be installed at the highest point in the suction plumbing. Prime the pump and intake line by pouring water into the opening until it is filled completely. Your foot valve prevents loss of prime by not allowing water to flow back into the water source. The pump will create sufficient vacuum to self-prime to around 3 m/10 ft (less at high elevations), but only when it is in new condition and wet inside. A priming plug is always recommended if the pump is installed above the water source. Using a good quality ball valve instead of a plug is recommended, especially if frequent priming is expected.

Check valve at the pump outlet – A check valve at the pump outlet is required if there is more than a 10 m/30 ft lift above the pump, or in any pressurizing system. This allows a more easy start of the pump. It also prevents back flow when changing filter cartridges.

Pipe unions – If you run rigid piping (copper or PVC) directly to the pump, unions are required. Unions make pump replacement easy, without the need to cut and re-solder or re-glue the pipe. "Copper Flex Connectors" commonly used for water heaters may be used instead.

8.5.6 Freeze Protection



CAUTION – The pump must be protected from freezing. Freezing may damage the pump.

CAUTION – When insulating the pump for freeze protection the motor must be excluded to prevent overheating.

9 Pump Accessories Installation



CAUTION – Installing a SunSwitch is mandatory for all PS1800 CS-F and all PS4000 pump systems. Operating without a SunSwitch can lead to increased wear or damage the pump. Such damage is excluded from the warranty.

CAUTION – Never let the pump run dry. Dry running will damage the pump and void the warranty. LORENTZ requires a dry run protection for every pump system.

CAUTION – Installing a surge protector at all sensor inputs is recommended, damaged inputs due to electric surges are not covered by the warranty.

9.1 Well Probe

The well probe contains a mechanical float with a magnet inside. When the probe is submerged, the float rises, and the magnet actuates a switch. The switch closes (makes contact) to indicate the presence of water. If the water level drops below the probe, the float drops, and the switch opens (breaks contact): The controller will stop the pump. When the water level recovers and the switch closes again, the controller will delay the restart for 20 minutes for the water level to recover. To force a quick restart, turn the controller off, then on again. The switch is sealed, so the contacts never touch the water.

Submersion depth – The maximum submersion depth is 50 meters.

Fixing – Along with the probe two cable ties are provided. For a pump that is to be installed in a vertical position, clamp the probe to the pipe just above the pump outlet, as shown in “Figure 22: Well probe fixing”. Splice the two wires of the probe using the splice kit components that are packed with the probe. The assembly procedure is the same as the main pump splice.

Wiring to the controller – The well probe must be wired to the controller at terminal 1 and 2, cf. “7.7.1.3 Pump Accessories Wiring” on page 28.

Plug controller - The well probe must be connected to the controller at socket B2, cf. “7.7.2 Controllers with pre-wired Plugs” on page 32

Potential problems with the well probe in surface water – The probe has a moving float. It is highly resistant to deposits and debris. However, the float can become stuck where algae or water creatures are present in surface water..

Figure 22: Well probe fixing



Possible solutions are:

- Fix the probe independently of the pump and pipe (clamped to a weight, but not to the drop pipe). This way, it can be pulled out for inspection or cleaning without the need to lift the pump. (This may not be feasible if the well casing is smaller than 6 in)
- Pull the probe out periodically (with the pump, if necessary) for testing and inspection. The pump should stop a few seconds after the probe leaves the water.
- Wrap the probe in a protective screen (fiberglass window screen, for example).
- Use a different type of float switch. You can use any switch that makes contact on rise (normally open).
- Use an encapsulated switch instead of the well probe if there is enough space for it to operate properly, for example the LORENTZ float switch.



CAUTION – Never let the pump run dry. Dry running will damage the pump and void the warranty. LORENTZ requires a dry run protection for every pump system.

CAUTION – The well probe must be positioned vertically, within 10°. If the pump is not to be installed vertically, find an alternative way to mount or suspend the probe, so that it is located higher than the pump, and in a vertical position.

9.2 Float Switch (Full Tank Shut-off)

We recommend the use of a float switch or other means to prevent overflow of your tank. This will stop the pump when the tank is full, then reset when the level drops. This conserves ground water, prevents overflow, and eliminates unnecessary pump wear. PS controllers allow the use of a small signal cable to a remote float switch, even if the tank is a long distance away.

Float switch requirements:

- (1) A switch must be used, not wet electrodes.
- (2) The preferred system requires a float switch to OPEN contact on rise to turn the pump OFF. This is called "normally closed" (N.C.).

Float switch cable requirements:

- (3) Two wires are needed.
- (4) Minimum wire size 1mm²/AWG 18. This is good for a distance as far as 600 m / 2,000 ft.
- (5) The cable must be suitable for its environment.
- (6) If it must run a long distance, use twisted-pair shielded cable to reduce the chance of damage from lightning-induced surge.

Grounding shielded float switch cable – If you use shielded cable, connect the shield to ground at the controller only. Do not ground the shield at the float switch. This will reduce surges induced by nearby lightning.

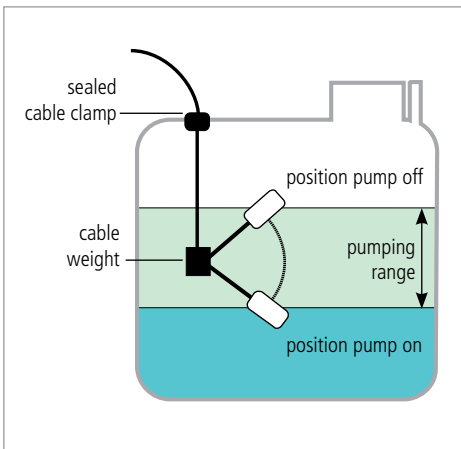
Operation of the float switch system – When the water level is high, the float switch will stop the pump. The TANK-FULL indicator on the controller will light up. When the water level drops, the float switch will signal this to the controller. The indicator light will turn off, and the pump will restart if sufficient power is available.

Wiring to the controller – The float switch must be wired to the controller at terminal 3 and 5, cf. "7.7.1.3 Pump Accessories Wiring" on page 28.

Plug controller - The dry run protection must be connected to the controller at socket B1, cf. "7.7.2 Controllers with pre-wired Plugs" on page 32

Manual remote control switch – The float switch circuit can be used with a manual switch to turn the pump on and off from a distance. Use any simple on/off switch available from an electronic supply, electrical supply, or hardware store (it only carries low voltage, very low current). Wire it according to the illustration above, for a normally closed float switch.

Figure 23: Float switch scheme



9.3 SunSwitch



CAUTION – Installing a SunSwitch is mandatory for PS1800 CS-F and all PS4000 pump systems. Operating without a SunSwitch can lead to increased wear or damage the pump. Such damage is excluded from the warranty.

Correct SunSwitch settings are given in the COMPASS report, subject to correct parameters. These settings must be checked on site to make sure that the parameters entered in COMPASS match the conditions on site and that the SunSwitch is working as intended.

In the early morning and the late evening hours there will be a timespan where the irradiation is sufficient to start a slow rotation of the pump but insufficient to deliver any water. Without water flow, the input power will be converted to heat and the water will heat up. Depending on the ambient conditions, it might even be possible that the water starts to boil.

The LORENTZ SunSwitch light sensor allows an irradiation level to be set at which the pump is switched on. This means the SunSwitch will not allow the pump to start until there is sufficient irradiation to power the pump to the point of water delivery.

For information about the SunSwitch installation and the correct settings please refer to the SunSwitch manual.

Figure 24: SunSwitch



Only for Controllers with DataModule

For setup of DataModule related accessories, the LORENTZ PumpScanner application for Android™ must be used, cf. "10.4 Parameter Setting (with DataModule only)" on page 64.

9.4 Water Meter Installation

For information on the water meter installation, please refer to the manufactures manual. Pay attention to the installation position, flow direction and the calming section.

Basic rule: The water meter should have 10 nominal diameters straight pipe ahead of the meter and 5 nominal straight pipe diameters after to ensure proper flow through the meter

9.5 Pressure Sensor Installation

The LORENTZ range of liquid pressure sensors are used to measure the pressure in a pipe. The sensors are commonly used to measure the pressure at a well head or feeding into irrigation systems. The liquid Pressure Sensor must be used with a PS DataModule equipped controller

For more information about the pressure sensor please refer to the COMPASS datasheet. Ensure that the pressure sensor is suitable for your application regarding pressure range and temperature resistance.

9.6 Level Sensor Installation

The LORENTZ range of liquid level sensors use pressure to measure the level or water in a well or tank. The sensors can be used for long term water level monitoring and also for pump control in applications where a well probe cannot be used. The liquid Level Sensor must be used with a PS DataModule equipped controller.

For further information about the Level sensor please refer to the COMPASS datasheet.

9.7 Sacrificial Anode

The LORENTZ Sacrificial Anode is designed for use with LORENTZ pump ends. Where solar pump ends operate in aggressive water conditions acidic water can attacks the passive layer of the high quality-steel pump end. This corrosion reduces the life time of the product. The LORENTZ Sacrificial Anode contributes to the protection of the pump system from this type of corrosion and extends the pumps life.

For further information about the Sacrificial Anode please refer to the COMPASS datasheet.

Figure 25: Sacrificial Anode for HR pumps



9.8 Surge Protector



CAUTION – Installing a surge protector at all sensor inputs is recommended, damaged inputs due to electric surges are not covered by the warranty.

CAUTION – Surge protectors provide an extended protection, not a guaranteed safety. Damages caused by electric surges are not covered by warranty.

CAUTION – When installing surge protectors, correct polarity must be ensured.

Surge protectors are designed to protect electrical devices from voltage spikes. The surge protectors are to be connected in parallel to each sensor/input, ideally within the PS controller case. For more information on the surge protector please refer to the datasheet in COMPASS.

9.9 PV Disconnect with Lightning Surge Protection

The LORENTZ PV Disconnect series is a PV connection box with an integrated disconnect switch and optional integrated lightning surge protector. The box is designed to connect one PV module string (6 strings for the 440-40-6) with the pump controller by using the terminal clamps located inside the box. The DC-rated disconnect switch is used as a manual circuit breaker between the solar array and the load. This switch is easily accessible by opening the hinged lid at the bottom spring lock.

The use of a properly sized DC disconnect switch is an important safety measure and obligatory for a professional installation of a solar pumping system. The switch must be installed between the solar generator and the pump controller. It must meet the electrical requirements of the connected devices. The PV Disconnect has been designed to cover the range of PS pump systems PS150 to PS4000.

Optionally a lightning surge protection device can be purchased from LORENTZ that fits into a pre-built hole of the PV Disconnect. It requires proper grounding to fulfil its protective function. There are a number of different devices available to suit the voltage level of each controller type.

For more information on installing the PV Disconnect please refer to the PV Disconnect manual.

Figure 26: Surge Protector



Figure 27: PV Disconnect with surge protection



10 Operating the Pump

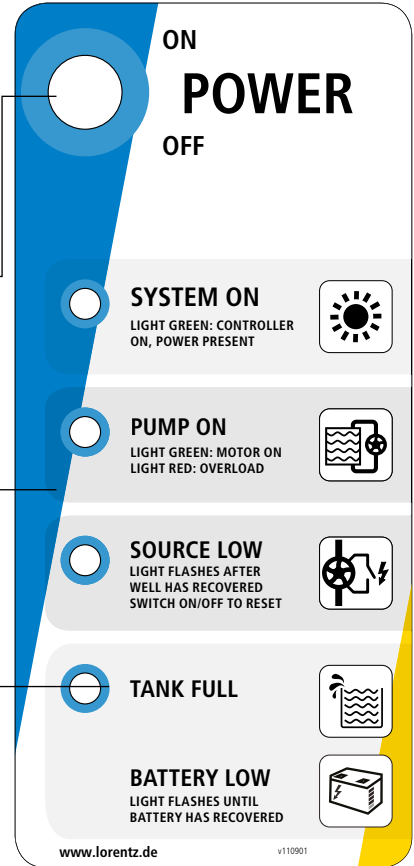
This graphic displays the LED and label layout for PS150-UL, PS200-UL and PS600 to PS4000. PS150 and PS200 controllers have LED indicators directly on-board.

The LED status indication described in "10.1 LED Status" applies to all types of controllers unless specified differently.





POWER SWITCH (ON/OFF)
Only switches pump operation ON/OFF.
Does not work as power disconnect switch.
When switched OFF/ON during operation, it resets the system

LED status

Battery status indication with "TANK FULL" LED
PS150 to PS1800 only



10.1 LED Status

	System status of controller	green light	Power is present, controller is switched on
		no light	System turned off or powerless
	Running and shutdown indicator light for pump	green light	Pump is on Flashing indicates pump rpm
		no light	Pump is not running
		red light	Pump is off due to overload Flashing indicates overtemperature of the controller
	Low water source indicator (submersible pumps) Dry run protection (surface pumps)	red light	Water sensor has detected a low water source Flashing indicates "source low" incident during the day
		no light	Water source is OK
	Tank full (or other connected external remote switch triggered)	red light	Event triggered, pump stopped
		red light flashing	Battery low (not PS4000)

Status Description

- **SYSTEM (green)** – The controller is switched on and power is available. In low-power conditions, the light may show even if there is not enough power to run the pump.
- **PUMP ON (green)** – Pump is turning. The sequence of flashing indicates pump speed (RPM). RPM can be read off by the flashing sequence of the Pump ON LED:

	RPM
LED On	> 900
1 flash	> 1200
2 flashes	> 1600
3 flashes	> 2000
4 flashes	> 2400
5 flashes	> 2800

If the **PUMP is OVERLOADED**, green changes to red.

- **PUMP ON (red)** – pump overload. System shutoff due to overload, e.g. a blocked motor or pump. Overload detection requires at least 250 W output of the PV generator. The controller will attempt three starts before shutting down the system. To restart, a reset with the POWER switch is necessary. Flashing indicates that the controller's thermal protection was triggered due to a too high temperature. The controller will automatically restart after cooling down.
- **SOURCE LOW (red)** – The water source has dropped below the level of the low-water probe or the water sensor has detected air in the suction pipe. After the water level recovers or the suction pipe has been re-filled with water, the pump will restart after a delay of 20 minutes. Flashing indicates that the controller has stopped due to a "SOURCE LOW" incident detected earlier. The number of flashes indicates the number of incidents. Toggle the ON/OFF switch to reset this indicator.
- **TANK FULL (red)** – The pump is turned off by action of the remote float switch (or pressure switch or manual switch, whichever is wired to the remote float switch terminals).

PS150 to PS1800 only

- **BATTERY LOW (tank light flashes)**
The measured battery voltage fell to a specific threshold and has not yet recovered to the nominal battery voltage. Battery system voltage and nominal voltage are detected automatically. The voltage thresholds for "BATTERY LOW" indication are given in the table below:

BATTERY LOW threshold in V	Nominal battery voltage in V
11	12
22	24
44	48
88	96

10.2 Starting the Pump

- (1) Make sure that an unhindered water flow is possible and not blocked, e.g. by closed valves.
- (2) Switch on the PV generator disconnect switch.
- (3) Toggle the power switch on the controller to ON. A solar-direct pump will now start when sufficient irradiation levels are reached and neither the well probe nor float switch respond to a low water source or full tank.

10.3 Time Delays

Event	Time delay
Pump stops due to insufficient irradiation	120 seconds
Full-tank float switch resets	2 - 3 seconds
Low water well probe regains contact with water	15 Minutes
Shutdown due to overtemperature	Automatic restart after cooling down
Shutdown due to overload	Manual reset of POWER switch necessary

To force a quick start, the above listed delays can be bypassed by switching the POWER switch OFF/ON. The pump should now start immediately if sufficient power is present.

10.4 Parameter Setting (with DataModule only)



NOTE – Please always refer to the PumpScanner documentation available on partnerNET for the latest developments.

It is highly recommended to make an initial configuration of the DataModule inside the PS controller using LORENTZ PumpScanner, our Application for Android smartphones.

To gain access to the DataModule using PumpScanner, the installation must be registered online in partnerNET at “Sites” first. The “License list” within PumpScanner settings must be updated afterwards.

For detailed instructions on how to set up a “Site” and how to install and use PumpScanner read the “PS Datamodule and PumpScanner” manual. It is available on partnerNET.



NOTE – Always make sure that the latest version of PumpScanner is installed on your device. Make sure that the DataModule is equipped with the latest firmware version. The firmware can be checked and updated using PumpScanner.

Check whether the latest version of PumpScanner is installed on your android device. Check the PumpScanner manual for help.

1. Make sure that the physical installation is completed and that all connections have been double checked for correct connection.
2. Connect the power to the PS controller but leave the ON/OFF toggle switch of the PS controller in position OFF. The pump must not run at this point.
3. Connect to the pump controller using PumpScanner as per the PumpScanner manual.
4. Check the PS controller Firmware version as per the PumpScanner manual and update it if asked by PumpScanner to do so.
5. Click on “Pump profile” in PumpScanner to access the parameter settings for the PS controller. Do not forget to scroll to the bottom and **SAVE the changes** before leaving the “pump profile” menu.

Controller and pump unit – Use the pull down menu to select the correct controller and the correct pump unit.

Cable length and cable size – Enter the length and size of the installed motor cable to allow PumpScanner to calculate the correct cable losses for the pump system.

Flow meter and pressure sensor – If any Water Meter or Pressure Sensor is connected to the PS controller enter the characteristics of the sensors as described.

The remaining options are explained in the PumpScanner manual.

Always click the **SAVE Button** on the bottom of the pump profile menu to keep the changes.

The pump profile configuration is done and the pump can be switched ON.

11 LORENTZ CONNECTED

The LORENTZ CONNECTED portfolio takes water pumping to the next level. It offers a range of features for monitoring and managing pumps, even remotely over the internet. CONNECTED - a new water pumping experience.

11.1 DataModule

The LORENTZ PS DataModule is an integral data logger and remote control device for the whole PS range of helical, centrifugal and surface pumps. Together with the PumpScanner App for Android™, the LORENTZ Communicator and pumpMANAGER, the PS DataModule opens new opportunities in drinking water supply for people and livestock, irrigation and swimming pool applications. The PS DataModule collects performance data from the pump system and stores it for periodic collection. It uses Bluetooth™ to communicate with the LORENTZ PumpScanner Android™ App and via Communicator with the browser based pumpMANAGER service, allowing secure data collection without physical connections.

The PS DataModule opens up new opportunities to improve customer service, knowledge and certainty.

11.2 PumpScanner

PumpScanner allows you and your customers to monitor and manage your PS and PSk2 solar pumps from a smartphone or tablet. This exciting development for the LORENTZ pump systems is a clear differentiator from the competitor offerings.

To use PumpScanner you need to order your PS controllers with a DataModule pre-installed, there is small premium for this but it opens up a new world of information.

PumpScanner will give you detailed information about the pumps' operational status and help you to fault find any problems more effectively, so saving you money, time and effort. You can download PumpScanner and see the demo features today without any additional equipment.

PumpScanner runs on the Android™ operating system which is found in many smart phones and tablets. More information is available on LORENTZ partnerNET at

www.lorentz.de/en/partnernet/support/pumpscanner

and at www.lorentz.de/connected.

11.3 PS Communicator & pumpMANAGER

The LORENTZ PS Communicator and pumpMANAGER service combine to offer customers a cost effective full management and monitoring system for their LORENTZ pump estate. This is attractive to commercial farms, industrial processes, government or NGO monitoring and anywhere that water is critical to people, livestock or crops.

The PS Communicator sends data from each pump across the cellular (mobile) data network to a secure central web server application called pumpMANAGER. The pumpMANAGER application can be accessed from any web connected device anywhere in the world making access to information and control of your solar pumps simple and convenient. As the connection is two way the pumps can be programmed, speed controlled or switched off, providing full remote control. The pumpMANAGER application also monitors the status of your LORENTZ pump systems and will alert you if there are any unexpected events.

You can login to pumpMANAGER at www.lorentz.de using your standard partnerNET credentials and see the demo features today without any additional equipment or investment.

Figure 28: pumpMANAGER view of installation site



Figure 29: pumpMANAGER view of system details



12 Troubleshooting

Please read this section carefully in case you experience any problems with the pump system and follow the checklists. Should technical support by LORENTZ become necessary, please provide the model and serial numbers.

12.1 Pump does not run

Most problems are caused by either wrong cable connections (in a new installation) or failed connections, especially insufficiently tightened cables that come loose from the terminal. Please check the wiring. The System ON light will indicate that the system is switched on and connected to the controller. It indicates that voltage is present but in a solar-direct system there may not be sufficient power to start the pump. In this case it will attempt a restart every 120 seconds.

12.2 Pump attempts a Restart every 120 Seconds

The controller will emit a low noise as it tries to start the pump. The pump will start to turn or only vibrate a little.

- (1) There may be insufficient power reaching the controller. A solar-direct (non-battery) system should start if there is sufficient sun to cast a slight shadow. A battery system should start if the supply voltage is higher than what is listed in "Table 7: Set points for low voltage disconnect" on page 30.
- (2) If the pump was recently connected (or reconnected) to the controller, it may be running in reverse direction due to a wiring error.
- (3) If the motor shaft only vibrates but does not turn, it may have power on only two of the three motor wires. This will happen if there is a broken connection or if you accidentally interchanged one of the power wires with the ground wire.
- (4) The pump or pipe may be blocked by mud, clay, sand or debris



CAUTION – if the pump is blocked, it has to be cleaned. Repeated starting of a blocked pump may cause damage to the motor. This will void the warranty.

12.3 Pump Overload (Pump ON LED is red)

The system has shut down due to an overload. This can happen if the motor or pump is blocked or very hard to turn and is drawing excessive current (Overload may not be triggered when the irradiation is low).

This can be caused by a high concentration of solids in the pump. The controller will make 3 start attempts before shutting down the system. The System ON LED will be OFF and the red OVERLOAD LED will be ON. The system will not reset until the ON / OFF switch is manually switched OFF and ON again.

Check the PV generator

Make sure the PV generator is facing the sun and there is no partial shading of the array. A partial shading of as little as 10% of the arrays' surface can stop the pump.

Check all wires and connections

Carefully check for improper wiring (especially in a new installation) and wiring condition. Wires are often damaged by animals if they are not enclosed in conduit (pipe). Pull on wires slightly to check for failed connections.

Check the controller

- (1) Remove the screws from the bottom plate of the controller and slide out the backplate to access the terminal block where the wires connect.
- (2) Check for a burnt smell. This will indicate a failure of the electronics. Look for burnt wires, bits of black debris, and any other signs of lightning damage.
- (3) Inspect the grounding wires and connections. Most controller failures are caused by an induced surge from nearby lightning where the system is not effectively grounded. Ground connections must be properly made and free of corrosion.

Check the dry running protection

If the controller indicates "SOURCE LOW" when the pump is submerged in water or draws from a sufficient water source, check the dry running protection system. The probe is mounted on, or near the pump. If inspection is not feasible, you can bypass the probe or test it electrically.

Check the float switch

If the controller indicates "TANK FULL" when the storage tank is not full, inspect the float switch system. If your system has a float switch, it will be mounted in the tank. If inspection is not feasible, you can bypass the switch or test it electrically.

Force a quick start

If you restore a connection or bypass the probe or float switch, there is no need to wait for the normal time delay. Manually switch the on/off switch (or the power source) off and on to reset the system. The pump should start immediately if sufficient power is present.

If the pump responds to the bypass tests but not to the float switch, the wires may be shorted (touching each other) or open (broken) or the switch may be stuck with debris, or out of its correct position.

Quick checklist

Make sure

- (1) the pump is suited for the total lift that is required.
- (2) the "max. RPM" adjustment in the controller is not set to limit the pump.
- (3) the solar array is receiving sufficient sun light without shading on the modules, the PV generator is oriented properly and tilted at the correct angle. Inspect and test the PV generator circuit and the controller output, as stated. Take notes of your measurements.
- (4) all wires and pipe runs are sized adequately for the respective distance.
- (5) there is no leak in the output pipe from the pump.

Could the issue not be resolved, please raise a service case with LORENTZ including the service support forms available on partnerNET, model and serial numbers and your measurements.

Installation details

Site/System name/nom/nombre:	<input type="text"/>		
Pump setting in bore Profondeur de la pompe Profundidad de la bomba	<input type="text"/>	Number of Modules Nombre de panneaux Número de paneles	<input type="text"/>
Static head Perte de pression statique Altura estática	<input type="text"/>	Power / module (wp) Puissance / module (wp) Potencia / módulo (wp)	<input type="text"/>
Pipe length Longueur de canalisation Longitud de la tubería	<input type="text"/>	Total power (Wp) Puissance totale (Wp) Potencia total (Wp)	<input type="text"/>
Pipe size Diamètre du tuyau Tamaño del tubo	<input type="text"/>	Number of strings Nombre de strings Número de strings	<input type="text"/>
Water temperature Température de l'eau Temperatura del agua	<input type="text"/>		

Product labels

PS Controller

Pump end

DataModule

Motor

Communicator SIM ID (19 digits/chiffres/cifras)

Communicator

LORENTZ 

www.lorentz.de