PS600 CS-15-1
PS1800 CS-36-1

Solar Water Pump Systems

Manual for Installation, Operation, Maintenance

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1 Introduction

Thank you for purchasing a LORENTZ PUMP.

Before you begin Check the model numbers of all the components of your system, and verify that they are the items that you ordered. Also check against the pump specifications and performance charts (end of this manual) to be sure the system is appropriate for your application.

Please fill in the SYSTEM REPORT This will be essential information if any problems occur.

Read the manuals of pump end, charger (optionally) and other components used in your system.

2 Declaration of Conformity

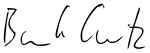
We, BERNT LORENTZ GMBH & Co. KG Germany, declare under our sole responsibility that the products

- PS600 CS-15-1
- PS1800 CS-36-1

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 2010



Bernt Lorentz, CEO

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Sun. Water. Life.

3 IMPORTANT SAFETY INSTRUCTIONS

READ AND FOLLOW ALL INSTRUCTIONS!

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

WARNING – It must be assured that all grounds are connected properly and that the resistances do not exceed the local codes.

CAUTION – This pump is for use with permanently-installed pools. Do not use with storable pools. A permanently-installed pool is constructed in or on the ground or in a building such that it cannot be readily disassembled for storage. A storable pool is constructed so that it is capable of being readily disassembled for storage and reassembled to its original integrity.

SAVE THESE INSTRUCTIONS!

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

- **Personnel Qualification 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 user. Should the available personnel be lacking the necessary qualification, they must be trained and instructed accordingly. If necessary, the operator may require the manufacturer/supplier to provide such training. Furthermore the operator/user must make sure that the personnel fully understands 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 machine itself. Non-observance may void any warranties. Non-observance of safety directions and symbols may for example entail the following: Failure of important functions of the machine/plant; failure of prescribed methods for maintenance and repair; endangerment of 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 working-, operational- and safety-regulations of the operator/user must be observed at all times.

- **General Safety Directions for the Operator/User** – If hot or cold machine parts pose a danger, such parts must be protected by the operator/user against contact with personnel. Protective covers for moving parts (e.g. coupling) must not be removed when the machine is running. Leakages (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 for personnel and the environment is removed. All government regulations must be observed at all times. Any danger to persons etc. by electrical energy must be excluded. (For details see e.g. regulations of VDE and the local utilities).

- **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 perusal of the Operating Instructions.The accident prevention regulations must be observed. Basically, all work on the machine is to be performed while the machine is not in operation. The sequence for shutting the machine down described in the manual 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 machine, all points contained in chapter "Initial Start-up" must be observed.

- **Unauthorized Changes and Manufacturing of Spare Parts** – Any conversion or changes of the machine 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 the part of the manufacturer in case of consequential damage.

- **Unauthorized Operation** – The operational safety of the machine delivered is only guaranteed if the machine is used in accordance with the directions contained in manual. Limits stated in the data sheets may not be exceeded under any circumstances.

- **Cited Standards and other Documentations** – DIN 4844 Part 1 Safety marking; Safety symbols W 8, Supplement 13; DIN 4844 Part 1 Safety marking; Safety symbols W 9, Supplement 14

- **Transportation and Intermediate Storage** – Prolonged intermediate storage in an environment of high humidity and fluctuating temperatures must be avoided. Moisture condensation may damage windings and metal parts. Non-compliance will void any warranty.

- Do not attempt to use the controller for any purpose other than LORENTZ PS pump systems. Do not attempt to run the motor without controller.

- Ensure all power sources 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 pump housing does not contain any inserts, therefore it can easily be recycled.

Explanation of Warning Symbols

WARNING
disregard might lead to injury or damage the installation

CAUTION
recommended to avoid disfunction or premature ageing of the pump etc.

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4 Product Description

The pumps of the PS-CS series have been designed to circulate pool water in combination with a corresponding filter unit.

- All parts in contact with the pumping medium are mostly of polypropylene PP, the impeller consists of PA 66 GF 30/PC and thus the parts possess excellent corrosion resistance against the pool water and the usual chemicals for treatment of the pool water.
- The pump housing does not contain any inserts, therefore it can easily be recycled.
- The motor shaft also serves as the pump shaft on which the impeller is mounted. The seal for the shaft is a bellows-type mechanical seal arranged on a plastic impeller hub. This guarantees positive electrical separation between the pool water and the electric motor.
- Because of the pump's close coupled design, a minimum of space is required.
- The pumps are driven by DC motors.
- Integrated in the pump housing is a strainer basket (3), which keeps coarse impurities from the pump's interior.

WARNING – The use of pumps for swimming pools and the restricted area around them is only permitted if pumps are installed in accordance with DIN/VDE 0100 part 702. Please consult your licensed electrician!

CAUTION – This pump is for use with permanently installed pools only. Do not use with storable pools!

5 Placement

5.1 Location

Rain and Weather Protection The pump is equipped with a motor protection type IP X4. In case the pump is installed outside, we recommend nevertheless to see for a simple rain protection. This will increase the durability of your pump.

WARNING – HUMIDITY If the pump is installed in a humid space, effective ventilation and aeration must be provided for, in order to prevent condensation.

WARNING – COOLING In case of very small installation spaces, the natural cooling of the air may be so insignificant that, also there, ventilation and aeration is necessary in order not to exceed the environmental temperature of 40°C.

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 in the direction of the motor fan (minimum 120 mm) and of the strainer basket (3) towards above (minimum 140 mm).

WARNING – Pump might heat up in operation. Pump must not be installed on combustible dangerous surface, but e.g. on cement surface or marble surface.

Connecting the pump to the foundation Fastening the pump to the foundation should be effected exclusively by means of bolts, threads (or dowels) in order to avoid blocking the removal of the motor unit.

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

WARNING – Sealing of connecting parts only by Teflon tape!

5.2 Installation Position

WARNING – The pump must be installed in a horizontal position and in dry condition.

WARNING – Make sure that the outlet hose/pipe opening is facing to the side of the pump, away from the motor, perpendicular to the motor central axis.

It may be installed either max. 3 m below (gravity feed) or above (suction mode) of 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).

CAUTION – Consider pipe pressure loss! A few meters or feet away from the pool can already cause considerable pressure losses! Make sure that you have included the pipe pressure losses during the sizing process of your system.

CAUTION – Make sure that the suction line is not leaky, otherwise the pump will prime insufficiently or not at all.

The transparent lid must be screwed on tightly and the suction/intake line should be as short as possible. This will reduce priming time, which is dependent on the air volume in the intake line. If the intake line is very long this may take up to 12 minutes. If possible the intake line to the pump should be installed below the water level. Whenever the pump is installed above the water level it is recommended to install a foot valve in the intake line. Thus the intake line cannot drain itself while the machine is shut down. This keeps priming times short e.g. after cleaning of the strainer basket (3).

Table 1: Technical Data of Controller

system			PS600 CS-15-1	PS1800 CS-36-1
max. power input (Vmp)*		[V DC]	>68	>102, >110 for TDH > 14 m
motor power		[W]	700	1700
open circuit voltage (Voc)		[V DC]	150	200
input voltage battery		[V DC]	48	96
battery low voltage disconnect		[V DC]	44	88
battery restart voltage		[V DC]	48	96
enclosure type	controller		IP54 weatherproof (NEMA type 3R)	IP54 weatherproof (NEMA type 3R)
	motor		IPX4 weatherproof (NEMA type 3)	IPX4 weatherproof (NEMA type 3)
ambient temperature	storage	[°C]	–30 to +55	–30 to +55
	operation of controller	[°C]	–20 to +50	–20 to +50
	operation of pump	[°C]	0 to +50	0 to +50

*) PV modules at standard test condition: AM = 1.5, E = 1,000 W/m², cell temperature: 25 °C

6 Installation

6.1 General

WARNING – All electrical connections should be performed by a qualified experts only!

Please make sure that the electrical installation has a disconnecting device, which allows disconnecting from the power supply with a minimum of 3 mm contact gap at each pole. This pump is built according to Protection Class 1.

WARNING – No disconnect switches must be installed in power wires between motor pump controller. Connecting the motor wire to the switched-on controller might irreparably damage it. Such damages are excluded from the warranty.

WARNING – The ambient temperature must not exceed max. 40°C.

The motors are built according to isolation class F, the ribs may achieve temperatures up to 70°C.

WARNING – The use of pumps for swimming pools and the restricted area around them is only permitted if pumps are installed in accordance with DIN/VDE 0100 part 702. Please consult your licensed electrician!

6.2 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 are pipe pressure losses. Make sure that you have included the pipe pressure losses during the sizing process of your system.

CAUTION – Do not cheat yourself with undersized pipe! Consult COMPASS or a pipe pressure sizing chart to determine the correct size. Oversize the pipeline to reduce pressure drop.

CAUTION – When you determine the pipe pressure loss have in mind to double the length of the pipeline since you have an inlet and an outlet pipeline.

CAUTION – Size your pipeline diameter carefully if the pump is NOT installed directly at the pool. A few meters or feet away from the pool can already cause considerable pressure losses.

6.3 Initial Start-up

Loosen the lid (3) above the strainer basket (3) by turning anticlockwise (you may use the opening device included in the delivery). Slowly fill the pump with clean water until the water level reaches the inlet connection. Coat the O-ring seal (8) with Vaseline, close the lid by hand and make sure that it is well in the housing groove. Otherwise the pump will prime insufficiently or not at all. Never let the pump run dry, not even for the purpose of checking the direction of rotation!

WARNING – Make sure pump turns freely, especially after extended periods of down-time. Therefore put a screwdriver into the slot at the fan end and turn by hand in the direction of rotation (see arrow). If necessary remove fan cover and turn the fan by hand. Make sure the mechanical seal does not leak.

WARNING – Never operate the pump without the strainer basket (3) or strainer basket handle respectively (danger of the suction strainer bobbing up), otherwise the pump may get clogged and blocked.

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

6.4 Controller Input Wiring

WARNING – TEST THE VOLTAGE before connecting power to the controller. Voltage (open circuit) must not exceed 150 V DC for PS600 and 200 V DC for PS1800 controllers. (Even in cloudy weather, the open circuit voltage will be near maximum.)

WARNING – Do not apply a direct connection or an amp meter between + and – when the controller is connected. A short circuit here will cause a strong discharge.

WARNING – SOLAR-DIRECT systems only — Do not connect any electrical load to the solar array if it is not part of the LORENTZ Pump system. Connection of a battery charger, active solar tracker controller, electric fence charger, or other load simultaneously with LORENTZ PS systems may "confuse" the controller and prevent proper operation.

WARNING – A cord- and plug-connected unit shall be provided with a permanently attached flexible cord of a water-resistant type, Type SEW, SEOW, SJW, SJOW, SJEW, SJEOW, SJTW, SJTOW, SOW, STW, or STOW. When the pump is connected by cable at field, use extra hard type cable for connections.

WARNING – A solid copper bonding conductor not smaller than 8 AWG (8.4 mm²) shall be connected from the accessible wire connector on the motor to all metal parts of the swimming pool, spa, or hot tub structure and to all electrical equipment, metal conduit, and metal piping within 5 ft (1.5 m) of the inside walls of a swimming pool, spa, or hot tub, when the motor is installed within 5 ft (1.5 m) of the inside walls of the swimming pool, spa, or hot tub.

6.5 Electrical Installation – Terminals

See figure 1

Power IN For PV-direct systems, a two-pole disconnect switch may be installed between the solar array and the controller. Switch it off to prevent shock and arc burn hazard during installation and maintenance, or if the system will be shut down for the season. For battery systems: Connect the controller directly to the plus and minus terminals of the battery. Do not connect to the load terminals of the charger as they may be not strong enough to provide the starting current. A 30 A slow blow fuse must be installed between the controller and the battery.

WARNING – Make sure that the motor turns in the correct direction according to the arrow denoting the motor direction before starting (viewed from the fan side: clockwise). If this is not the case please contact an electrician (exchanging two phases).

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.

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 wires.

WARNING – No disconnect switches must be installed in power wires between motor pump controller. Connecting the motor wire to the switched-on controller might irreparably damage it. Such damages are excluded from the warranty.

No. 1 and 2 In order to protect the pump from being damaged by dry running connect one well probe cable to each terminal. If dry run protection is not needed, short cut these two terminals.

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

No. 6 and 7 Connect these two terminals to switch the controller to battery mode. The motor will be switched OFF by the controller if the input voltage is below 44 V DC (PS600) or 88 V DC (PS1800) respectively in order to protect the battery. If the battery voltage increases to 48 V DC (PS600) or 96 V DC (PS1800) respectively, the motor will be switched ON automatically.

6.6 Battery-based Systems

WARNING – Only PS600 and PS1800 pump systems can be operated from batteries.

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. The purpose of this protection is for safety in case of a wiring fault, and to provide a means of disconnect when installing or maintaining the system. PS600 and PS1800 controllers have electronic over-current protection against motor overload.

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.

The set points are:

System	Voltage	OFF	ON
PS600CS-15-1	48 V DC	44 V DC	48 V DC
PS1800CS-36-1	96 V DC	88 V DC	96 V DC

A controller in disconnect mode can be reset manually by turning off/on, but it will quickly disconnect again if the battery is not gaining a substantial recharge.

6.7 Wire Sizing

Wire sizing for the DC circuit Wire must be sized for no more than 5% voltage drop at 20 A (starting).

Refer to a wire sizing chart for 48 V DC (PS600) or 96 V DC (PS1800), or follow these examples:

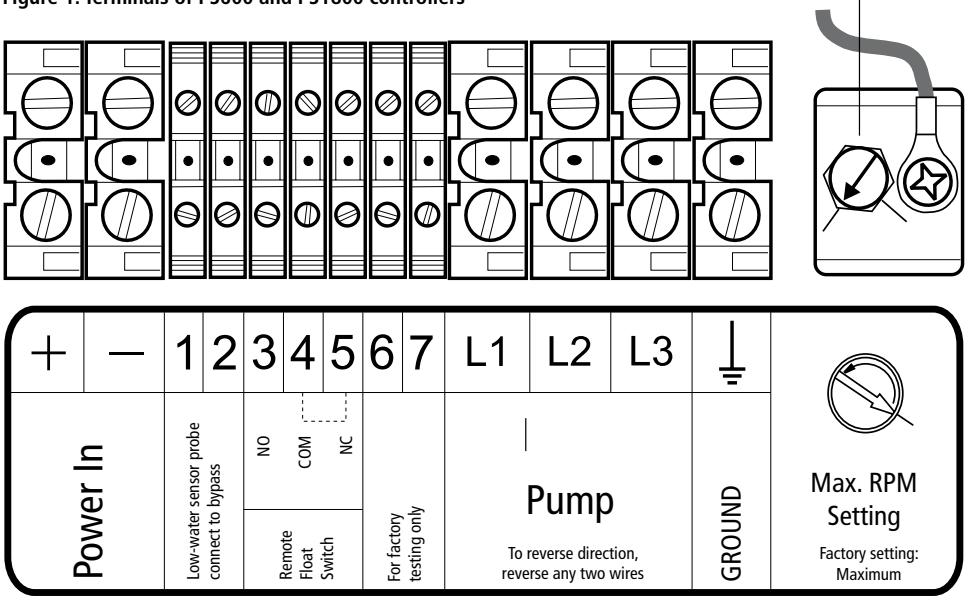
PV-direct systems
AWG #10 wire to maximum distance of 30 ft
Metric: 4 mm² to max. 20 m

Battery systems
AWG #10 wire to maximum distance of 30 ft
Metric: 4 mm² to max. 15 m

GREATER LENGTHS For each increase by 50 %, use next larger wire size

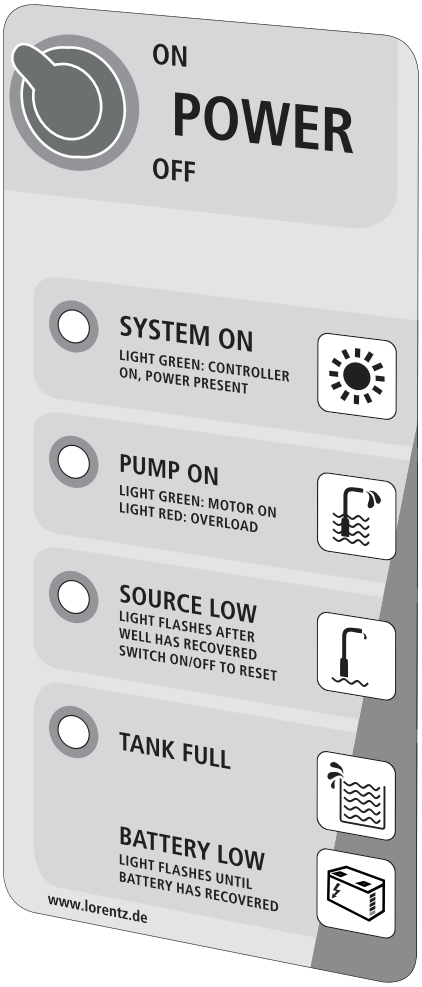
Terminals inside the PS controller
"Max. RPM setting" is at right.
To reduce RPM turn counter-clockwise

Figure 1: Terminals of PS600 and PS1800 controllers



7 Operating the Pump

This explains the function of the switch and the indicator lights on the pump controller.



SWITCH: POWER ON/OFF
When switched off/on during operation, it resets all system logic.

INDICATOR LIGHTS

SYSTEM (green)
The controller is switched on and the power source is present. In low-power conditions, the light may show even if there is not enough power to run the pump.

PUMP ON (green)
Motor is turning. Sequence of flashing indicates pump speed. See below sequence
PUMP OVERLOAD (green changes to red)

SOURCE LOW (red)
The water source dropped below the level of the low-water probe. After the water level recovers, the pump will restart, but this light will slowly flash until the sun goes down, power is interrupted, or the POWER switch is reset. This indicates that the water source ran low at least once since the previous off/on cycle.

TANK FULL (red)
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.

BATTERY LOW (tank light flashes)
Battery systems only – battery voltage fell to 44 V DC (PS600) or 88 V DC (PS1800), and has not yet recovered to 48 V DC (PS600) or 96 V DC (PS1800).

RPM indication Pump speed can be read off by the flashing sequence of the Pump ON LED.

Indication	RPM
LED ON	> 900
one flash	> 1,200
two flashes	> 1,600
three flashes	> 2,000
four flashes	> 2,400
five flashes	> 2,800

Starting the pump Be sure there is not a closed valve or other obstruction in the water line.

Fill the pump with clean water until the water level reaches the inlet connection. Coat the O-ring seal with vaseline, close the lid by hand and make sure that it is well in the housing groove. Otherwise the pump will prime insufficiently or not at all.

WARNING – NEVER LET THE PUMP RUN DRY, NOT EVEN FOR THE PURPOSE OF CHECKING THE DIRECTION OF ROTATION!

Switch on the array disconnect switch, and toggle the power switch on the controller. It is normal to leave the switches on at all times, unless you desire to have the system off.

A solar-direct pump should start under the following conditions

1. clear sunshine at an angle of about 20° or more from the surface of the solar array
2. cloudy conditions, if the sunshine is bright enough to cast some shadow
3. low-water probe submersed in the water source (or bypassed in the controller) – Water-low light OFF
4. full-tank float switch is not responding to a full tank – Tank-Full light OFF
5. battery system only – voltage is higher than the low-voltage disconnect point of 44 V DC (PS600) or 88 V DC (PS1800).

When sunshine is insufficient When sunshine on the array is present, but too weak for the pump to run, it will attempt to start about every 120 seconds. During each attempt, you will see the PUMP ON light come on.

When pump runs slowly (PUMP ON) under weak sun conditions the pump may spin without lifting water all the way to the outlet. This is normal.

When pump stops from a sudden shadow on the solar array If a shadow suddenly passes over the array, like if you walk in front if it, the controller will lose track of the input voltage. This does NOT indicate a problem. The pump will attempt to restart after the normal delay.

Time delays

1. After pump stops due to insufficient sunshine – 120 seconds
2. After full-tank float switch resets – 2 to 3 seconds
3. After low-water probe regains contact with water in the source – 20 minutes but the indicator light will slowly flash for the rest of the solar day, or until power is disrupted or the controller is turned off/on.
4. Battery systems – after low voltage disconnect point is reached, delay to stop pump – a few SECONDS. After voltage recovers, delay to re-connect – a few SECONDS

To force a quick start To test or observe the system, you can bypass the normal time delays. Switch the POWER switch off then on again. The pump should start immediately if sufficient power is present.

8 Automatic Control For Full-Tank Shutoff

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 small signal cable to a remote float switch, even if the tank is a long distance away.

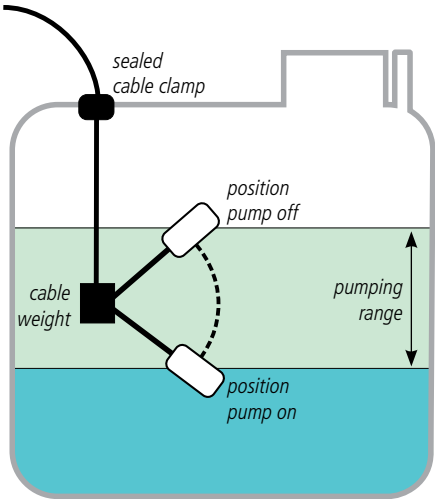
Float switch requirements

1. A switch must be used, not wet electrodes.
2. The preferred system requires a float switch to MAKE contact on rise to turn the pump OFF. This is called "normally open" (N.O.). It may be commercially labeled as a "pump down" switch, but here it works in reverse, to allow pumping up.

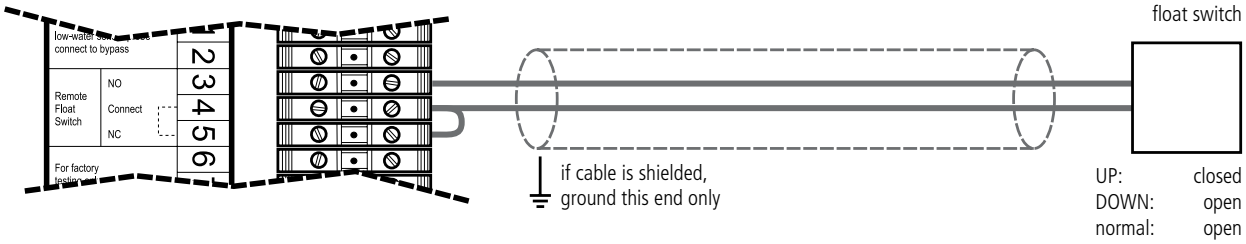
Float switch cable requirements

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

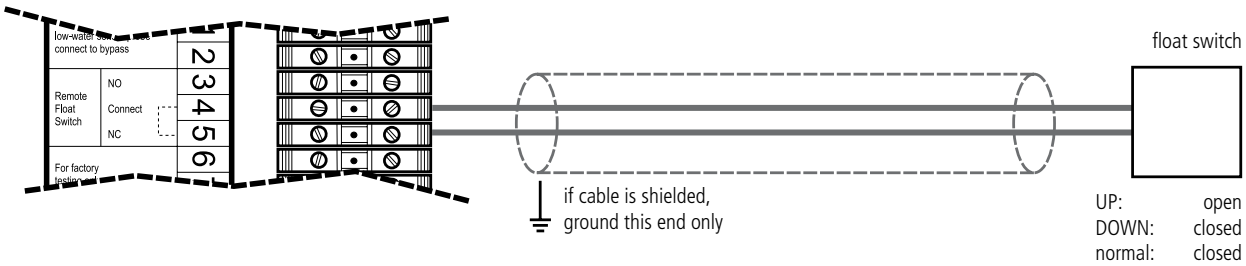
Grounding shielded float switch cable If you use shielded cable, connect the shield to ground AT THE CONTROLLER ONLY. DO NOT ground the shield at the float switch. This will reduce surges induced by nearby lightning.



Wiring to the controller The controller offers two options for connection of a remote switch. These allow the use of either a "normally open" (N.O.) or a "normally closed" (N.C.) switch. "Normal" refers to the status of the contacts when the switch is DOWN and calling for water.



Wiring a "normally closed/reverse action switch"
Connect the switch to termins 4 and 5. Closing (connecting) the switch turns the pump ON



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9 Maintenance

9.1 General Maintenance

Controller The controllers electronic has no moving or wearing parts. It requires no maintenance. There are rubber plugs to seal at the bottom, unused conduit holes. Inspect them to insure that the controller is sealed from moisture, insects, etc. Check that mounting and conduit hardware is tight.

Motor The motor requires no maintenance. It has no brushes or other frequently wearing parts.

Pump end The pump mechanism (pump end) is lubricated only by water and requires no maintenance. It may wear after some years, especially if there are abrasive solids in the water. If sand accumulates in the storage tank or pipes as a result of normal pumping, it is best to take periodic measurement of the pump's performance. A worn pump end can be replaced in the field.

WARNING – The leakage pipe on the bottom between pump housing and motor must never be clogged or sealed; otherwise the water in it will rise and the motor will be damaged! Make sure that leakage cannot cause consequential damages! If necessary provide a suitable drip pan.

WARNING – If there is danger of freezing, the pump must be drained ahead of time. or this purpose open the drain plug in order to drain off all liquid. Also drain all pipes subject to freezing.

9.2 Cleaning the strainer

WARNING – The strainer basket (3) must be periodically emptied. A full or dirty strainer will impair the pump's flow rate and the filtration.

1. Shut down pump
2. Close shutdown valves
3. Open lid (4), if this is not possible by hand, use the opening device (included in the delivery). Remove strainer basket (3), clean and replace it.
4. Close lid (4)
5. Open shutoff valves
6. Restart pump

9.3 Mechanical Seal

The sealing between the motor and the pump housing is done by means of a mechanical seal. It is normal that a few drops of water seep once in a while, especially during break-in period. Depending on the nature of the water and the duration of operation said mechanical seal may become leaky after some time. If the water penetrates continuously, replace the complete mechanical seal by a new one. In case of malfunction we recommend contacting the pool builder of the unit first.

CAUTION – If ball bearings must be replaced, bearings with C3 air and high-temperature grease (approx. 180°C) are to be used!

9.4 mportant Hints for Repair Work

Replacement of the mechanical seal

Dismantling: Switch off the pump and disconnect it from the power supply. The exchange of the mechanical seal has to be done by an expert. The mechanical seal always has to be replaced completely. To do so it is not necessary to dismount the complete pump, only the motor unit has to be removed from the housing (1) by loosening the 8 tapping screws.

Removing of the impeller

The impeller is screwed onto the motor shaft (right-handed thread). Dismantling: Put a screwdriver into the slot of the motor shaft (fan side) hold it and unscrew the impeller.

CAUTION – The impeller is secured by LOCTITE 480 (similar to Cyanoacrylate immediate glue), possibly remove the motor fan blades and clamp the motor shaft.

Dismantling: Unscrew the impeller cap with o-ring and take it out. Separate the impeller with screw M 10 × 50 from the motor shaft by holding the impeller by hand and screwing-in the screw.

Assembly: Assembly is effected in reverse order (see dismantling). First screw–in the impeller cap with o-ring into the impeller hub, then press the impeller, with constant force at the impeller cap, until it catches.

CAUTION – Before re-assembly of the impeller, clean the surface of the lock ring and of the mechanical seal with alcohol or with a clean paper tissue.

WARNING – First leave the pumps for 24 hours at ambient temperature without using it in order to let the glue connection (see dismantling) impeller/shaft achieve its final consistency.

WARNING – For the reception of the counterforce, place the end of the motor shaft (centre of the fan cowl) or support it respectively. Otherwise there would be too much pressure on the ball bearing!

Re-assembly of the motor unit into the pump casing: Re-assembly in reserve order. Tighten the 8 Allen screws crosswise (tightening moment 3 nm).

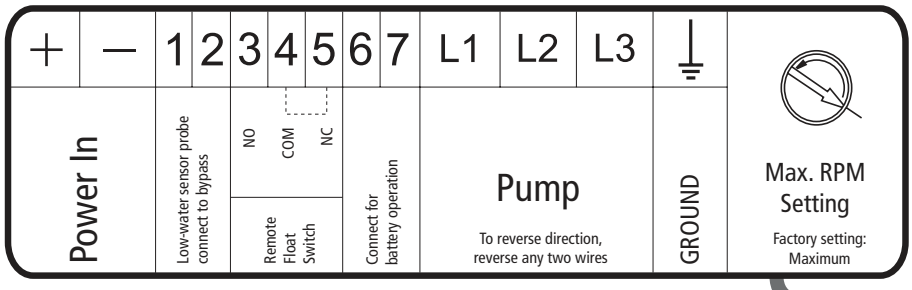
WARNING – For all repairs: Do never use force!

10 System Wiring Diagram for Solar-direct (non-battery) Systems

PS600 CS system typically uses 4 to 6 PV modules with a nominal voltage of 12 V DC and maximum power voltage (Vmp)* of approx. 17 V DC in series . Your system may vary in the number, voltage, and configuration of PV modules. The following example for PS600 CS uses four 12 V DC PV modules.

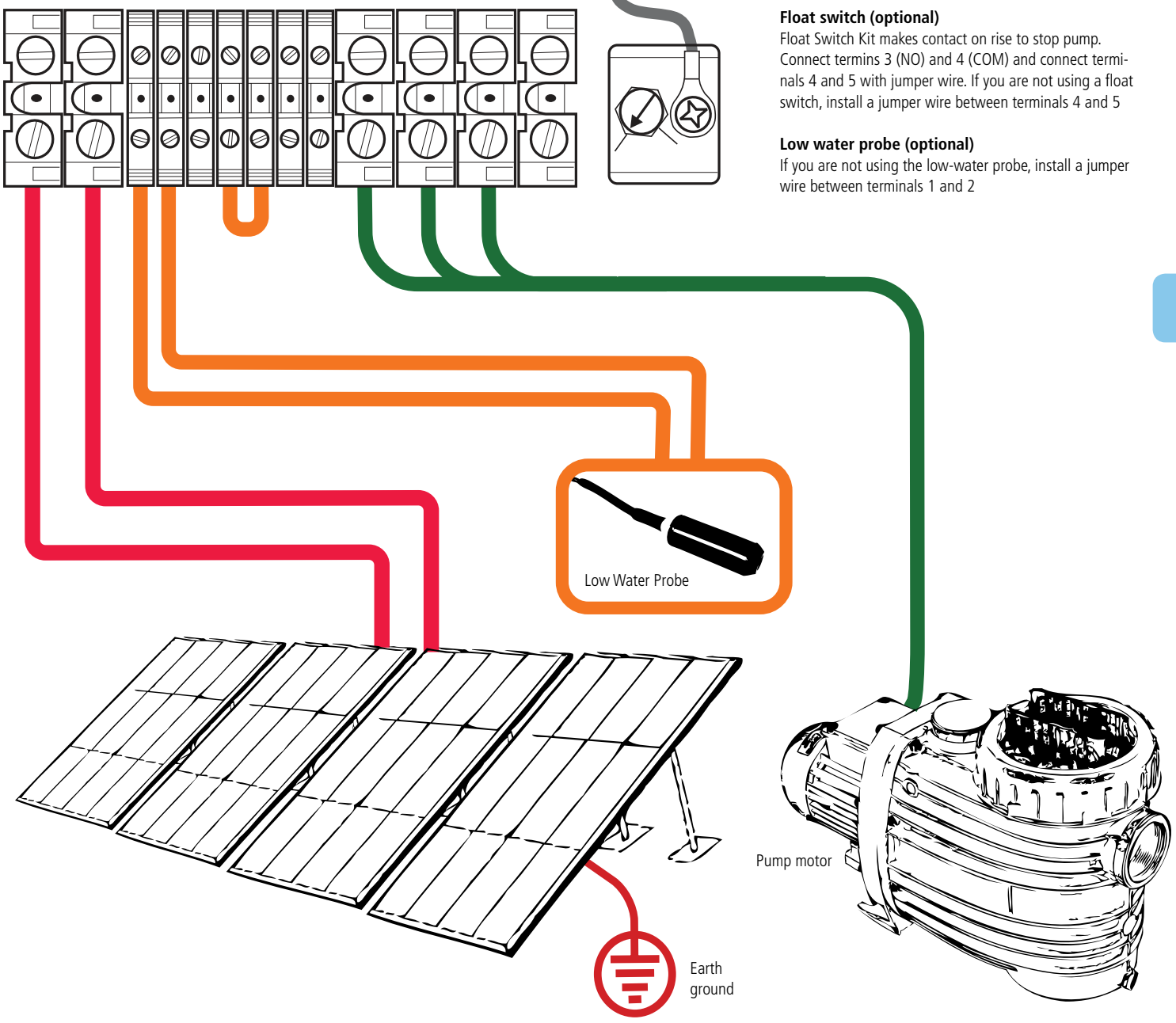
PS1800 CS systems typically use 6 to 8 PV modules with a nominal voltage of 12 V DC and maximum power voltage (Vmp)* of approx. 17 V DC in series.

WARNING – Before connecting the array to the controller measure the open-circuit voltage. It must be within a range of 75 – 135 V DC (PS600 CS) or 115 – 180 V DC (PS1800 CS).



Float switch (optional)
Float Switch Kit makes contact on rise to stop pump. Connect termins 3 (NO) and 4 (COM) and connect terminals 4 and 5 with jumper wire. If you are not using a float switch, install a jumper wire between terminals 4 and 5

Low water probe (optional)
If you are not using the low-water probe, install a jumper wire between terminals 1 and 2



WARNING – Check manual of PV module for specific grounding requirements.

*) PV modules at standard test condition: AM = 1.5, E = 1,000 W/m², cell temperature: 25 °C

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Sun. Water. Life.

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11 Trouble Shooting

Please read this section before calling for help.

If you call for help, please refer to the model and serial numbers.

If The Pump Does Not Run

Most problems are caused by wrong connections (in a new installation) or failed connections, especially where a wire is not secure and falls out of a terminal. The System ON light will indicate that 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. It should attempt to start at intervals of 120 seconds.

Pump attempts to start every 120 seconds but doesn't run

The controller makes a slight noise as it tries to start the pump. The pump will start to turn or just vibrate a little.

1. There may be insufficient power reaching the controller. A solar-direct (non-battery) system should start if there is enough sun to cast a slight shadow. A battery system should start if the supply voltage is higher than 44 V DC (PS600) or 88 V DC (PS1800).
2. If the pump was recently connected (or reconnected) to the controller, it may be running in reverse direction due to wiring error.
3. If the motor shaft only vibrates and will not turn, it may be getting power on only two of the three motor wires. This will happen if there is a broken connection or if you accidentally exchanged one of the power wires with the ground wire.
4. The pump or pipe may be packed with mud, clay, sand or debris.

CAUTION – If the pump seizes, it has to be cleaned. Repeated starting of a blocked pump may cause damage to the motor. In that case any guarantee is voided.

PUMP OVERLOAD (PUMP ON light shows red instead of green) The system has shut off due to an overload. This can happen if the motor or pump is blocked or very difficult to turn and is drawing excessive current (hard to turn). Overload detection requires at least 250 W (for PS600) and 500 W (for PS1800) output of the PV array. 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 ON. The system will not reset until the ON / OFF switch is turned OFF and ON again.

Inspect the solar array

1. Is it facing the sun?
2. Is there a partial shadow on the array? If only 10 % of the array is shadowed, it can stop the pump!

Inspect all wires and connections

1. Look carefully for improper wiring (especially in a new installation).
2. Make a visual inspection of the condition of the wires and connections. Wires are often chewed by animals if they are not enclosed in conduit (pipe).
3. Pull wires with your hands to check for failed connections.

Inspect the controller

1. Remove the screws from the bottom plate of the controller. Move the plate downward (or the controller upward) to reveal the terminal block where the wires connect.
2. First, 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 low-water probe system

If the controller indicates "SOURCE LOW" when the pump is in the water, inspect the low-water probe 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 full-tank 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. Switch the on/off switch (or the power source) off then on again. The pump should start immediately if sufficient power is present.

If the pump responds to the bypass tests above 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.

1. Is the solar array receiving shadow-free light? (It only takes a small shadow to stop it.) Is it oriented properly toward the south, and tilted at the proper angle?
2. Be sure you have the right pump for the total lift that is required.
3. Be sure all wire and pipe runs are sized adequately for the distance. Refer to wire sizing in the pump sizing table.
4. Inspect and test the solar array circuit and the controller output, as above. Write down your measurements.
5. There may be a leak in the pipe from the pump.
6. There is a "max. RPM" adjustment in the controller. It may have been set to reduce the flow as low as 30 %.

Flow rate too low? Pool is still dirty ?

Check if the pipeline dimension are correct and not impose a considerably additional pressure loss on the pump as this will reduce the daily circulation flow. Cf. the pipe pressure loss information in chapter 6.2, p. 4

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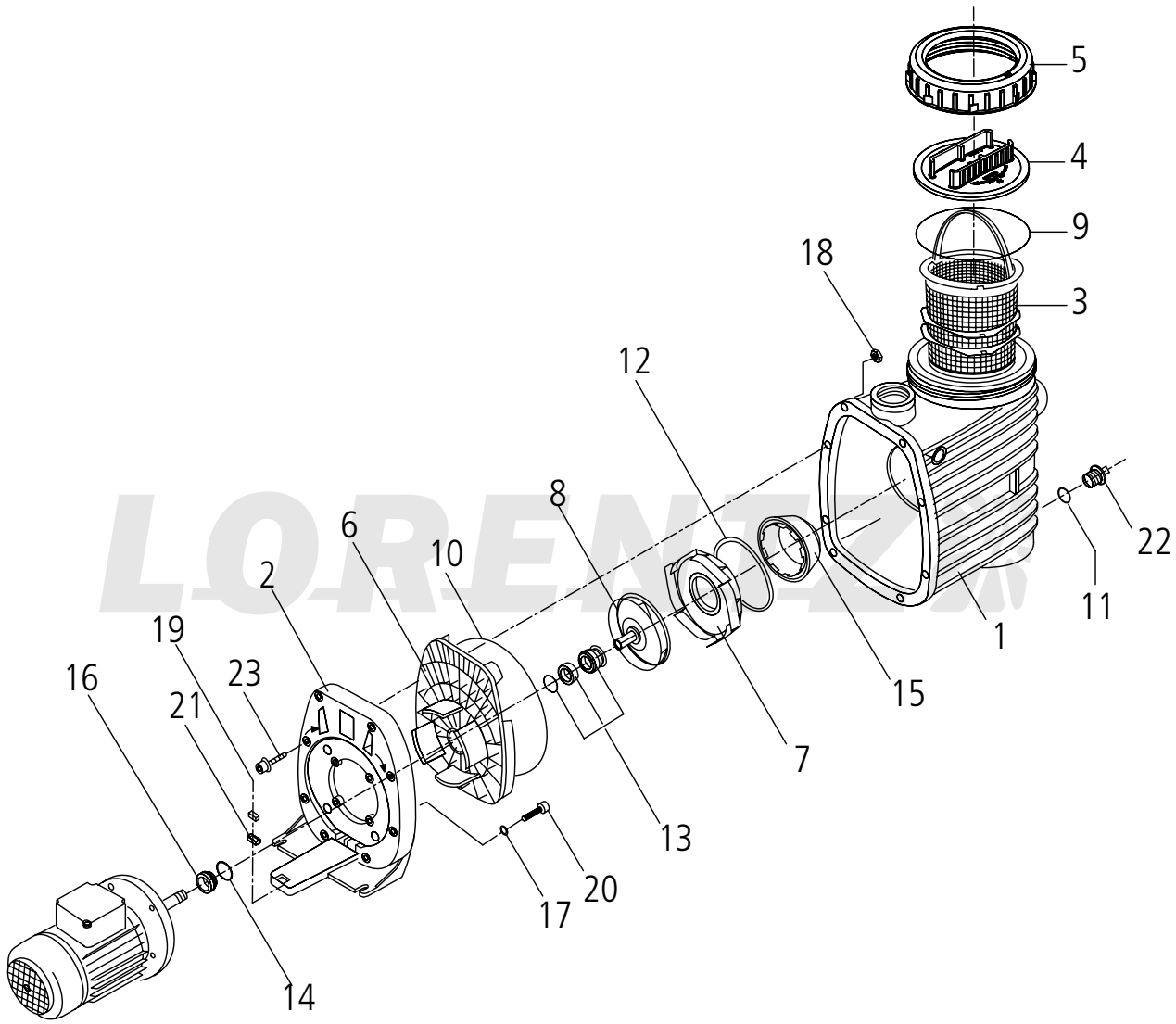
12 List of Parts and Explosion Assembly Drawing for PS-CS Pump Ends

12.1 PS600 CS-15-1

Part #	QTY	Description
1	1	Pump casing
2	1	Pump flange
3	1	Strainer basket
4	1	Lid
5	1	Ring for lid
6	1	Gland housing
7	1	Diffuser insert
8	1	Impeller
9	1	O-ring 135 × 5
10	1	O-ring 190 × 5.5
11	1	O-ring 11 × 2.5
12	1	O-ring 98 × 5

Part #	QTY	Description
13	1	Mechanical seal cpl.
14	1	Splash ring
15	1	Adapter
16	1	Shaft protector
17	4	Washer Ø 8.4
18	8	Nut M6
19	1	Rubber buffer
20	4	Hexagon socket screw M8 × 25
21	4	Stud for motor base
22	1	Drain plug
23	8	Hexagon socket screw with washer M6 × 55



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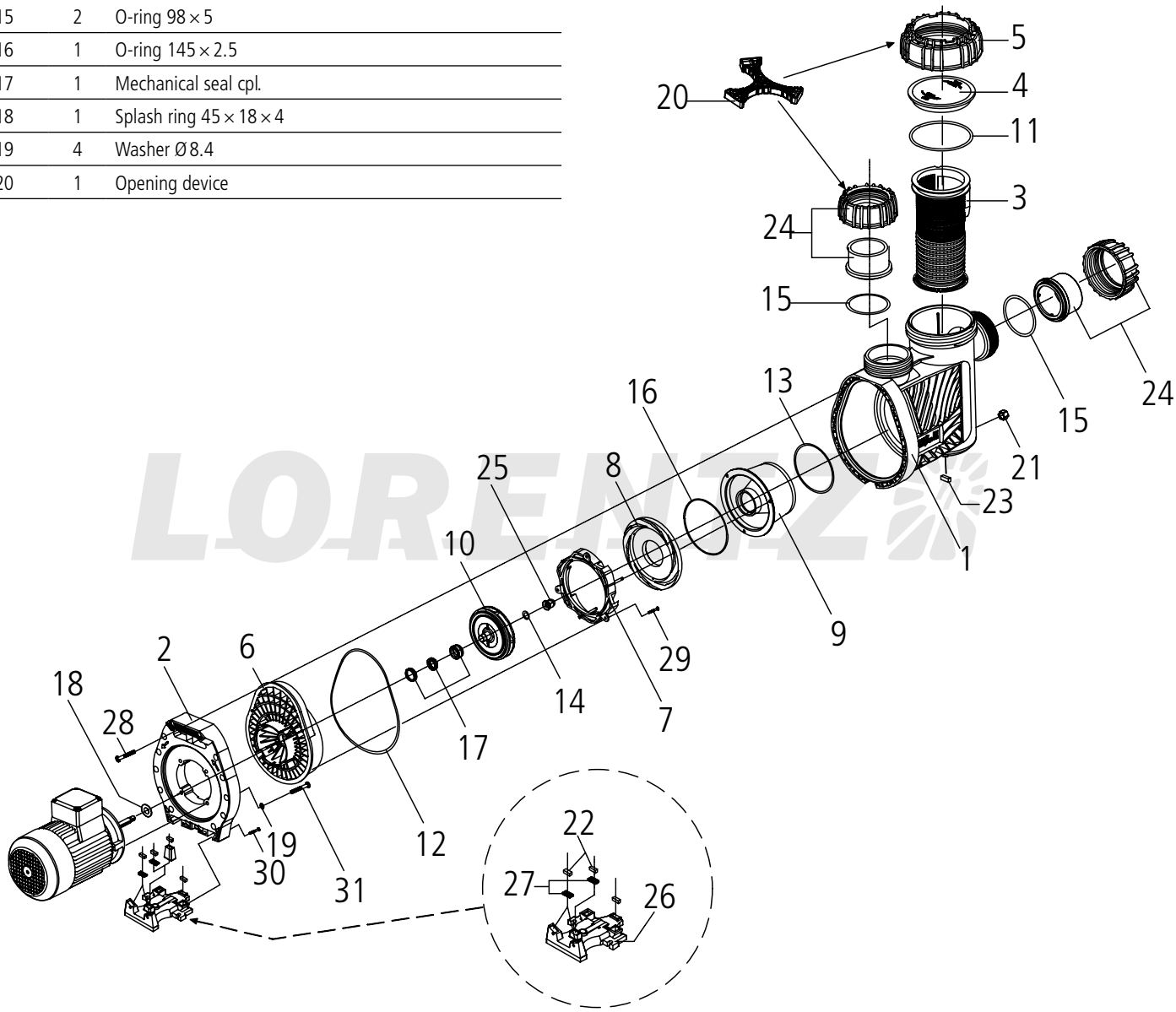
12.2 PS1800 CS-36-1

Part #	QTY	Description
1	1	Pump casing
2	1	Pump flange
3	1	Strainer basket
4	1	Lid
5	1	Ring for lid
6	1	Gland housing
7	1	Diffuser insert
8	1	Cover disk for diffuser
9	1	Confuser for diffuser
10	1	Impeller
11	1	O-ring 148 × 6.5
12	1	O-ring 240 × 6.5
13	1	O-ring 123.19 × 5.33
14	1	O-ring 16.9 × 2.75
15	2	O-ring 98 × 5
16	1	O-ring 145 × 2.5
17	1	Mechanical seal cpl.
18	1	Splash ring 45 × 18 × 4
19	4	Washer Ø 8.4
20	1	Opening device

Part #	QTY	Description
21	1	Drain cap
22	2	Rubber buffer
23	1	Rubber buffer for casing
24	2	Union
25	1	Insulate cap nut M12
26	1	Motor base
27	4	Stud for motor base
28	14	Self-tapping screw 7 × 48.4
29	3	Countersunk screw 5.5 × 22
30	2	Self-tapping screw 4 × 16
31	4	Hexagon socket screw M8 × 40



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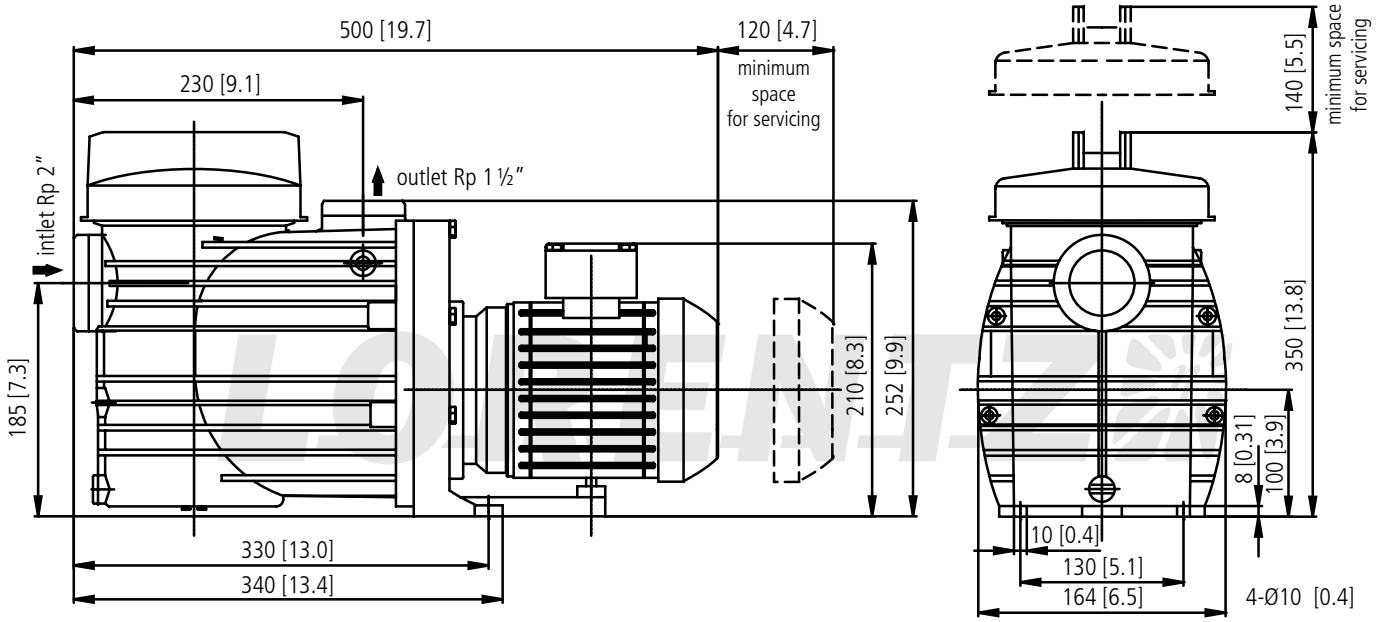
13 Dimensions

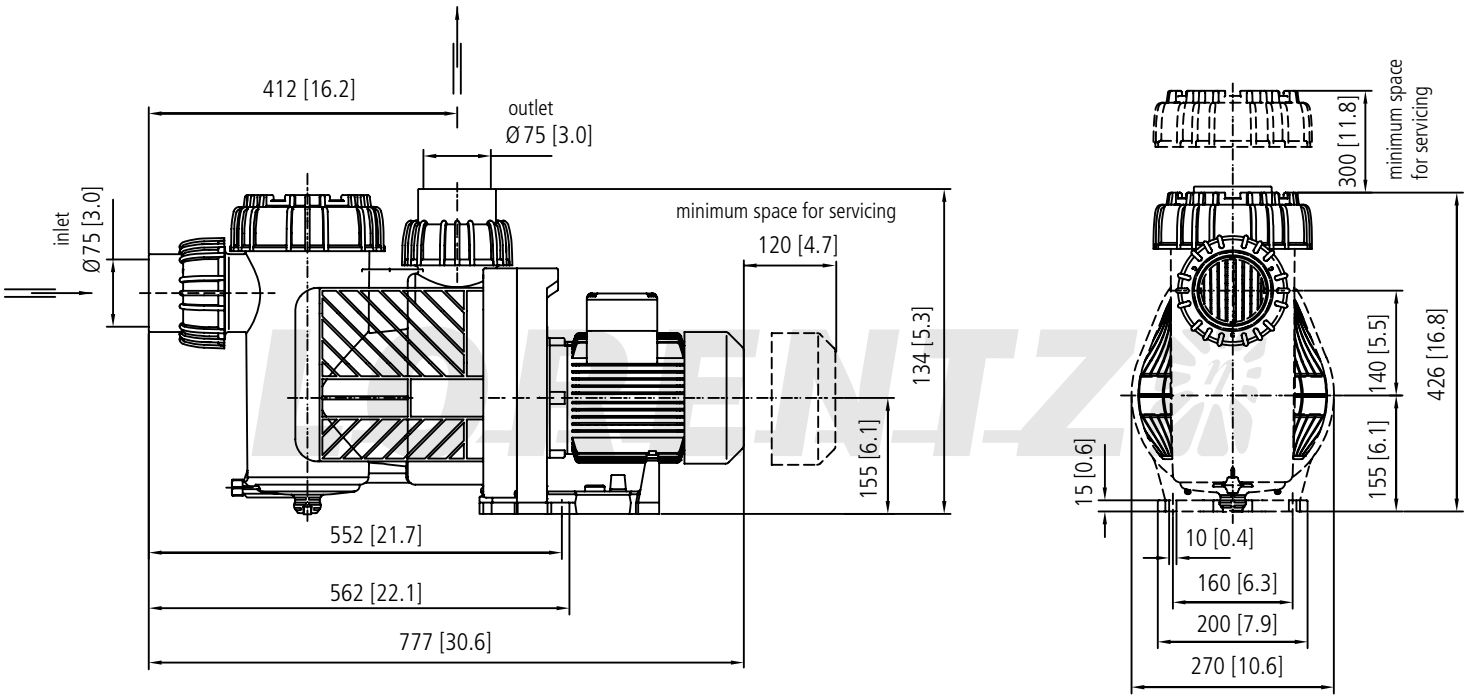
13.1 Pump End PS600 CS-15-1



all measurements in mm [in]

13

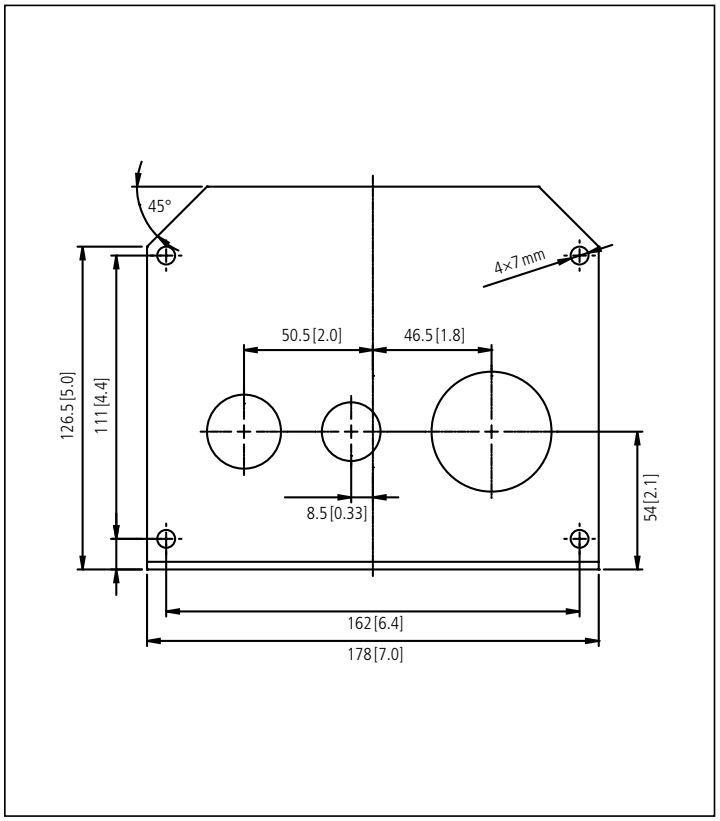
13.2 Pump End PS1800 CS-36-1



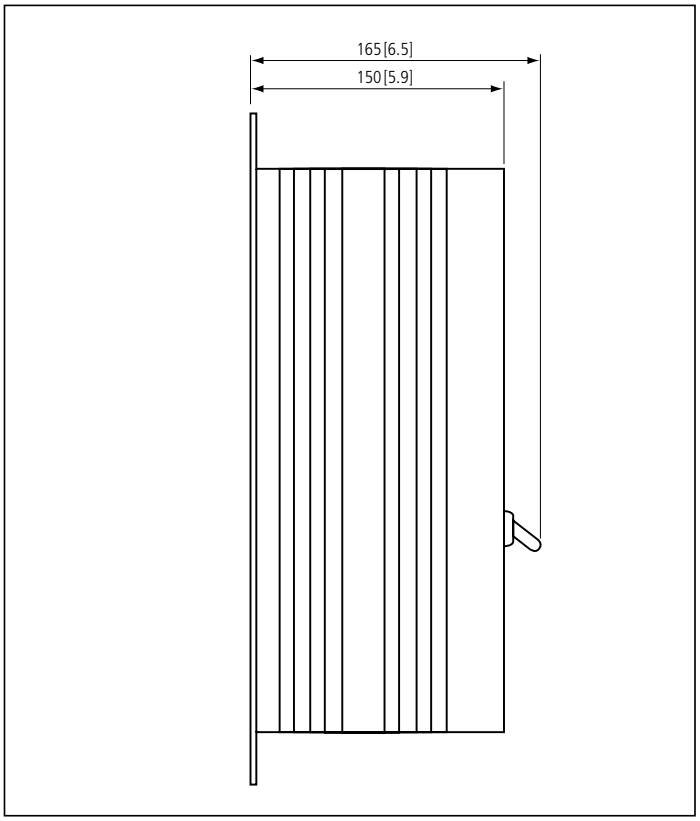
all measurements in mm [in]

13.3 Controllers PS600, PS1800

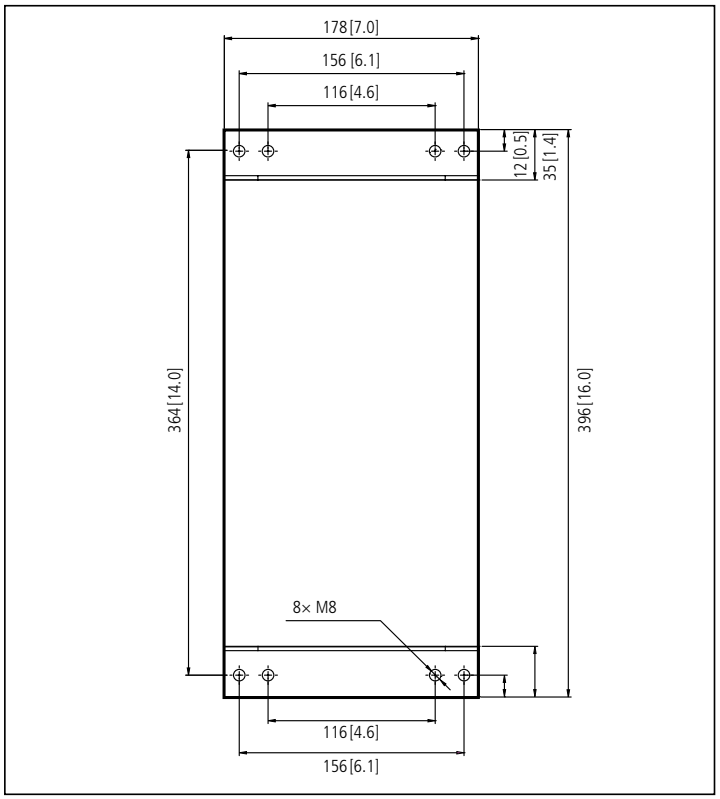
13.3.1 Controller dimensions: bottom view in mm [in]



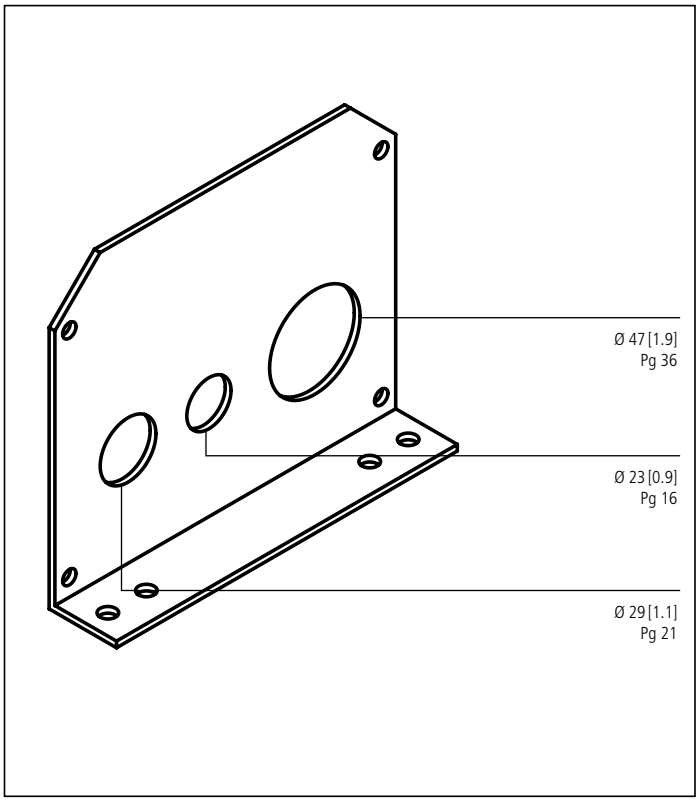
13.3.1 Controller dimensions: side view in mm [in]



13.3.3 Controller dimensions: front view and position of holes for fixation in mm [in]



13.3.4 Steel conduit threads in mm [in]



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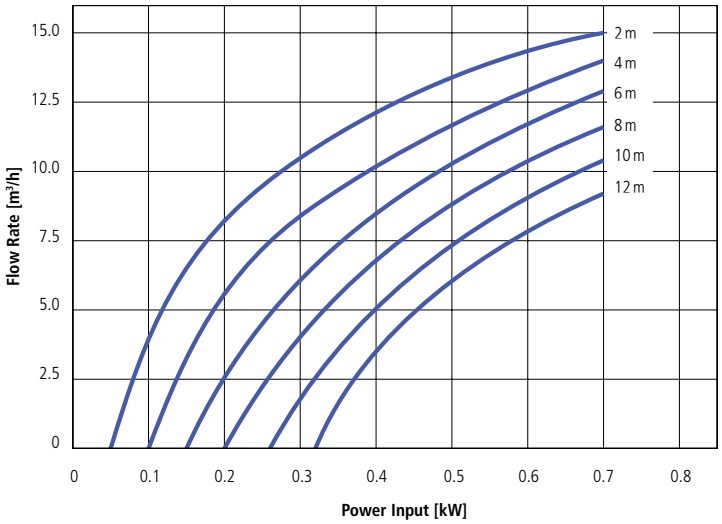
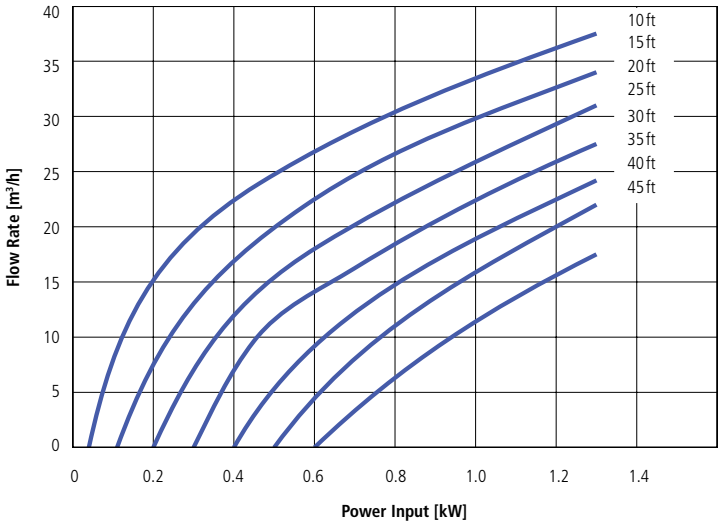
14 Performance Charts

14.1 PS600 CS-15-1



14.2 PS1800 CS-36-1



For more detailed performance charts and layout contact your dealer or distributor.
Use COMPASS system sizing software for system layout.

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15 System Report

System and Components

Date of purchase

Dealer
(full contact details)

System

System

☐ PS600 CS-15-1

☐ PS1800 CS-36-1

Controller serial #

Motor serial #

PV generator

PV modules

PV module brand

PV module model

Vmp V DC

Voc V DC

Quantity

wired ☐ serial ☐ parallel

Battery system

Battery system ☐ yes ☐ no

If yes:

System voltage V DC

Capacity of battery bank Ah

Type of batteries

Quantity

wired ☐ serial ☐ parallel

Installation

Installation date

Installer
(full contact details)

Head m | ft

Suction

Suction head m | ft

Max. suction head (drawdown) m | ft

Positive suction head m | ft

Max. positive suction head (drawdown) m | ft

Suction pipe

Size mm² | in

Type

Length m | ft

Drop pipe

Size mm² | in

Type

Length m | ft

Pump cable

Wire size mm² | AWG

Length (Controller to pump) m | ft

Max. RPM control

Factory setting is max. ☐ yes ☐ no

If this setting was reduced,
enter setting here: