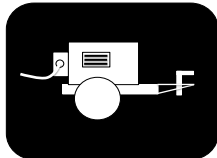
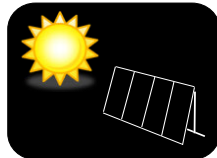
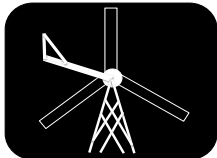


4HS MultiPower Submersible Pumps

Installation and Operating Manual

4HS



MultiPower



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1. Introduction to the 4HS MultiPower submersible pumps range

4HS MultiPower (4HS MP) is a 4" submersible pump for clean water composed by:

- three phase motor with wet rotor and canned type resin filled stator.
- Built-in inverter on board.
- Multi stage pump entirely made of AISI 304 stainless steel (centrifugal models)
- Helical rotor pump (helical rotor model)

Pump driving made by inverter allows:

- Modify the pump speed. In this way the pump is operated only and when needed thus avoiding unnecessary waste of energy and granting longer system life.
- Implement the soft start and the soft stop to increase the system life and reducing the current peaks.
- Protect the motor from overloading and dry running , overvoltage, undervoltage and possible abnormal conditions.

4HS is used on residential and industrial sectors for water pressurized systems, granting:

- Energy saving.
- Simplified and quick installation.
- Long life reliability.

4HS MultiPower pumps can be fed both AC and DC with wide margins of operating voltage (90-265 VAC or 90-340 VDC). This means that the same pump can be powered by photovoltaic panels, by wind or diesel generator or by batteries. The hydraulic performance will be adjusted automatically according to the power source and the power available.

In the application with photovoltaic panels an MPPT algorithm maximizes, for various conditions of irradiation and temperature, the electric power obtained from the panels thus the amount of water extracted.

Pump speed is adjusted in relation to solar irradiation. When solar irradiation increases, pump will run faster thus pumping more water. When solar irradiation decreases (clouds moving or different hours of the day) pump will reduce its frequency and so delivery but it continues pumping till solar irradiation reaches the minimum value necessary for working.

4HS MultiPower pumps can be installed with or without the surface control module.

When installed, the CM MultiPower monitors and records:

- Running hours.
- Input voltage, current and power.
- Alarms: dry running, overload, overvoltage.



Digital inputs make it possible to connect a float switch, a pressure switch, a start and stop signal, etc...

Running and alarm status are given by two digital outputs.

Analogical inputs can be used to connect sensors (i.e. flow meter).

2. Safety Instructions

NASTECC strongly suggests to reading carefully this operation manual before using and installing its products Any operation (installation, maintenance and repair) must be carried out by trained, skilled and qualified personnel. Failure to observe and follow the instruction of this manual may result fatal in dangerous electric shock.

| | |
|---|--|
|  | <p>The unit must be connected to the power supply by a switch granting the complete visual disconnection (separation) from the line before any operation.</p> |
|  | <p>Disconnect the unit from the power supply before any operation.</p> |
| | <p>4HS MP and pump system must be grounded properly before any operation.</p> |
| | <p>Do not start the pump for any reason if not completely immersed in water.</p> |

Avoid any shock or serious impact during transportation.

Damages due to transportation, incorrect installation, or improper use of the device will null and void the warranty.

NASTECC cannot be held responsible for any damage to people and/or property due to improper use of its products.

3. Stacking conditions

Store the product on its packaging in a dry and well ventilated environment within a temperature range from -20 ° C to 50 ° C.


If the pump remains in stock for more than a year is recommended to disassemble the rotating parts and test their functionality. It 'also need to power the electric pump (without running the motor) to allow charging of electrolytic capacitors of the inverter module.

If the pump has already been put into operation and is then placed in storage, the minimum storage temperature is 4 ° C. Alternatively you need to add anti-freeze fluid.

4. Packing content

Packing includes:

- 4HS Multipower submersible pump with 2,5 meters flat cable length.
- Cable junction kit.
- Operating Manual.

| | |
|---|---|
|  | <p>Check the 4HS packing immediately upon delivery and check for damage and/or missing parts; in either cases immediately notify the supplier</p> |
|---|---|

5. General technical features

| PUMP 4HS MP | |
|--|---|
| Max. temperature of pumped liquid | 35 °C (92 °F) |
| Min. speed of water flow on motor case | 0.2 m/s |
| Characteristics of pumped liquid | clean, non-corrosive, non-explosive, free of particles and fibers, with a maximum sand content of 50 g/m ³ |
| Grade of protection | IP68 |
| Used Materials | Pump and motor body in AISI 304 |
| Cable | Flat cable ACS – KTM - WRAS approved |
| Control Module CM MP | |
| Max. ambient temperature | 50 °C (140 °F) |
| Grade of protection | IP55 (NEMA 4) |
| Used Materials | Aluminium , LCD membrane with PVC stickers, antipull plug in polyamide |
| Analog input | 2 x analog input 4-20 mA + 2 settable analog input 4-20 mA or 0-10 V . |
| Digital input | 4 inputs, N.O or N.C settable via software |
| Digital output | 2 output relays 5 A , 250 Vac, N.O. or N.C settable |
| Auxiliary feeding | 15 Vdc (300 mA),10 Vdc (5 mA) |
| User display | Backlit LCD display with 16 characters x 2 rows , 5 buttons, buzzer for acoustic |
| Dimensions | 180x180x120 mm |
| Short circuit protection | With fuse |
| CERTIFICATIONS | |
| CE | |

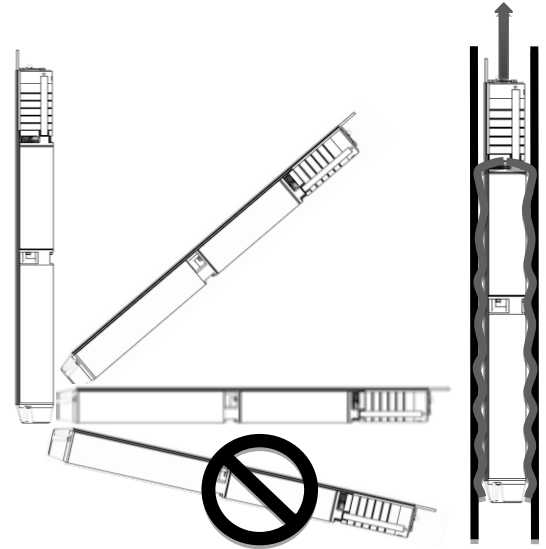
6. Pump installation



Entire installation procedure must be performed verifying that pump is not connected to the power supply.

Pump can be installed both vertically and horizontally, but the outlet should never be below the horizontal line. Minimum head of 10% than max pump head must be granted.

If the pump is not installed in a well, to grant a proper cooling, a cooling sleeve must be used; doing so the minimum speed of the pumped liquid has to be granted.



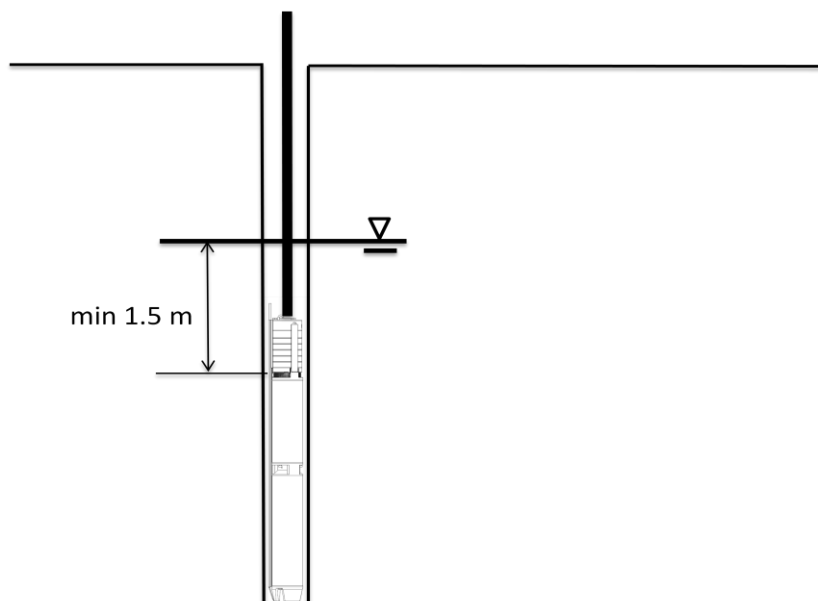
6.1 Installing pump in the well

To reduce noise transmission it is advised to use plastic pipes.

The pump must always be secured in the well through a special rope attached to loop on the pump head.

It is recommended not to drop the pump in the well by using the electric cable, its integrity must be preserved in all operations. In this regard it is recommended to fix the cable on cable support or on the pipe.

During operation the pump suction must always remains at least 1.5 meters below the dynamic water level.



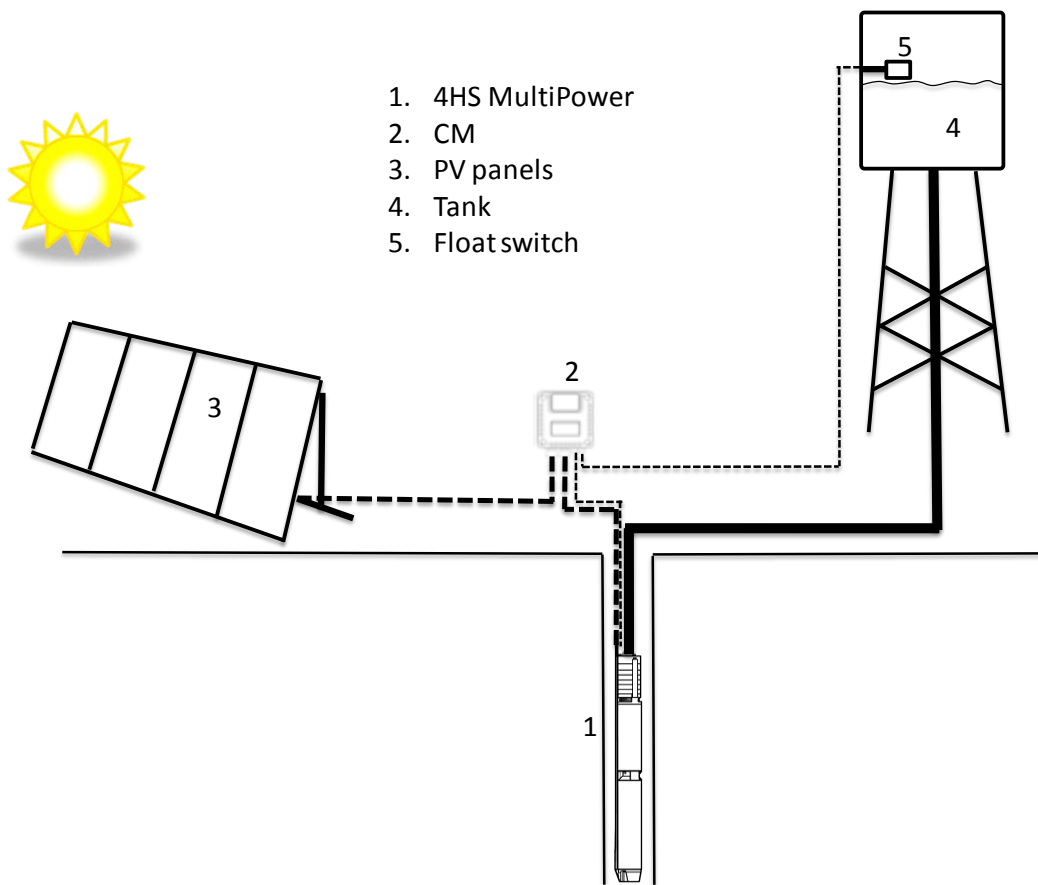
Do not drop the pump in the well by using the electric cable
Make sure about the electric cable integrity during all the operations.
Ensure the pump in the well with a stainless steel rope to be fixed to the hole in the pump head

6.2 Installing pump in a solar pumping system

4HS MultiPower pump can be installed with CM control module (optional) or not, so becoming “plug-in” operation. All protections of overload, overvoltage and dry running protection are integrated into the on board inverter .

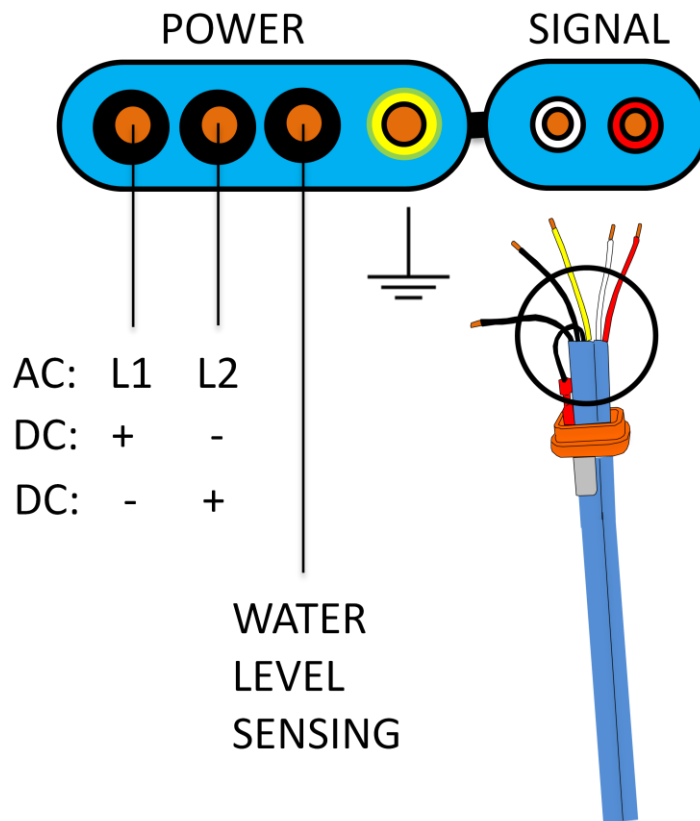
If the signal cables are connected to the CM control module , is possible to:

- Control the electric parameters (current, power, voltage).
- Record and store all the alarms related to the working hours
- Connect a pressure or a flow sensor to control the pump performances
- Connect a pressure or a float switch.
- Provide an alarm digital output for remote control



6.3 Pump cable

4HS MultiPower are equipped, in their standard configuration, with 2,5 meter flat cable length.



4HS MP pump communicates with CM MP (surface control module) (if installed) by signal wires. If CM is not installed it's recommended to short-circuit and insulate signal wires inside the splice joint, or to extend the wires in surface to be closed by an external switch.

If the distance between the pump and the power supply is longer than the supplied cable it is necessary to make a junction performed by the special kit supplied as standard.

The cable section for additional power conductors must be calculated considering the maximum allowed power loss.

$$S = \frac{2 \times \rho \times L \times P1 \times 100}{V^2 \times \Delta P_{[\%]}}$$

- S: wire section [mm²]
- ρ : specific resistance = 0,018 [Ω mm²/m]
- L: cable length [m]
- P1: pump electrical power [W].
- V: voltage at maximum power.
- ΔP : allowed power loss [%]. It is recommended not to exceed 3%.

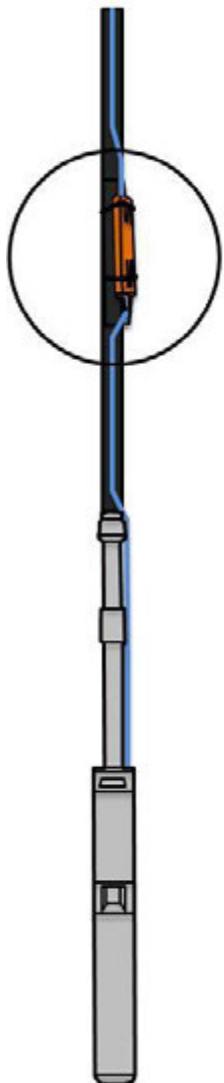


To make the junction is necessary to follow carefully the instructions inside the kit.

At the time of joining and electrical connection is essential to maintain the correspondence between the signal cables.

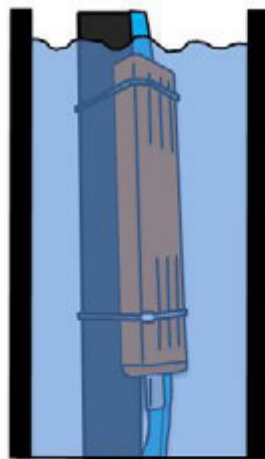
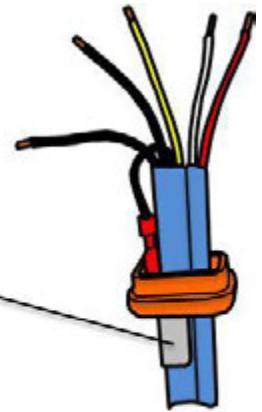
After cable joining and placed the pump in the well you must perform, before connecting to power supply, a test of insulation: join together the two power cables and, applying a voltage of 500V, an insulation resistance from the ground higher than 100 Mohm must be verified. Join together the two signal cables and, applying a voltage of 500V, an insulation resistance from the ground higher than 100 Mohm must be verified.

6.4 Water level sensing

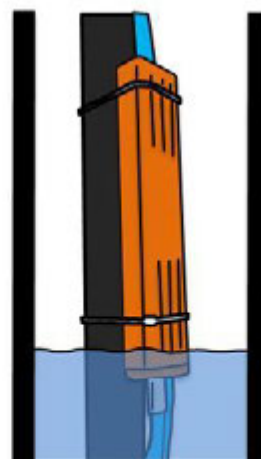


WATER LEVEL SENSOR

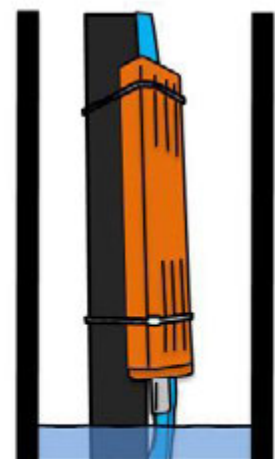
Water level sensing is based on variation of measured impedance. Keep it clean and not in direct contact with pipes in order to grant its function.



WATER



WATER



NO WATER

7. Sizing of a solar pumping system

7.1 Pump selection

For the correct selection of a 4HS MultiPower pump, it is necessary to know:

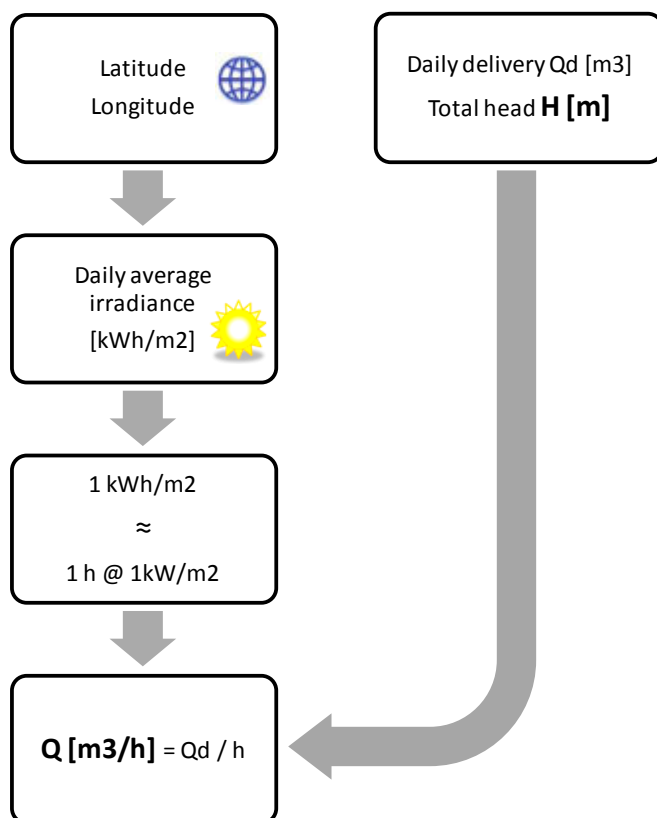
- Desired daily water quantity.
- Total head (static + dynamic).
- Installation location.
- Working period (seasonal or year).

Based on location it is possible to get from maps and tables (available in the web) the following values:

- a) Average daily radiation per year, minimum and maximum (KWh/m²)
- b) Average daily radiation per months, minimum and maximum.
- c) Optimal tilt angle of the photovoltaic panels.

Starting from daily radiation could be considered the number of hours with 1kW/m², standard value to which PV panels performances are referred.

Dividing the required water quantity by the number of hours of sun we can get the flow rate and in addition to the required head we can select the right pump.



7.2 PV panels number and wiring

The power rating of the selected pump (P1) defines the total power of the PV system to be adopted.

The photovoltaic panels are characterized by:

- Rated power (Pmax)
- Rated voltage (Vmpp)
- Rated current (Impp)
- Open circuit voltage (Voc)

$P1/P_{mpp}$ will determine the number of panels needed.

The panels are connected in series until the total open circuit voltage ($V_{oc} \times n$. Panels) does not exceed the voltage limit of the pump (400 VDC). Beyond this limit the panels are connected in parallel.

The panels are connected in parallel as long as the current does not exceed the current limit of the pump (16 A).

Sizing : example

Daily delivery **Qd = 26 m³**

Total head **H = 50 m**

Location : Mossano, Vicenza, Italia

Latitude: 45° 25'

Longitude: 11° 33'

Optimal tilt angle is 35°



| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | Year |
|--------------------|------|------|------|------|------|------|------|------|------|------|------|------|--|------|
| kWh/m ² | 1,54 | 2,44 | 3,72 | 4,81 | 5,81 | 6,34 | 6,39 | 5,42 | 4,16 | 2,69 | 1,73 | 1,19 | | 3,85 |

If the pump is used the full year, have to be considered the average daily radiation per year that is 3,85 kWh/m² (3,85 h @ 1kW/m²) and, considering the required daily delivery Qd, a pump granting $26/3,85 = 6,75$ m³/h should be selected.

If the pump is used only in the summer (June, July, August), have to be considered the average daily radiation for the selected months that is 6,05 kWh/m² (6,05 h @ 1kW/m²).

* Sizing considering photovoltaic panels of 240 Wm_{pp}, nominal voltage 30 Vm_{pp}, nominal current 8 Im_{pp}, no load voltage 38 Voc.

| | Year | Summer |
|-----------------------|--------------|--------------|
| Q [m ³ /h] | 6,75 | 4,3 |
| H [m] | 50 | 50 |
| 4HS MultiPower | 05/08 | 05/04 |
| P1 [W] | 2650 | 1400 |
| PV panels * | 12 | 6 |
| Series | 6 | 6 |
| Parallel | 2 | 0 |

8. Troubleshooting

If the pump, after the installation and power supply connection, doesn't provide any water please verify:

- correct wiring.
- voltage conditions (90 – 340 VDC, 90 – 265 VAC).
- enough power available (solar irradiance).
- water presence: if pump during operation runs dry, an alarm occurs and pump will stop. Every 5 minutes pump will attempt to restart the operation after 5 minutes.

DECLARATION OF CONFORMITY

In according with:

Machine Directive 2006/42/EC

EMC Directive 2004/108/CE

Low Voltage Directive 2006/95/EC

We Nastec srl, Via della Tecnica, 8, 36024, Mossano, Vicenza, Italy, declare that **4HS MultiPower pumps** conform to the following regulations:

EN 55011 Class A

EN 60335-1, EN60335-2-41

Ing. Marco Nassuato
Operation Manager



