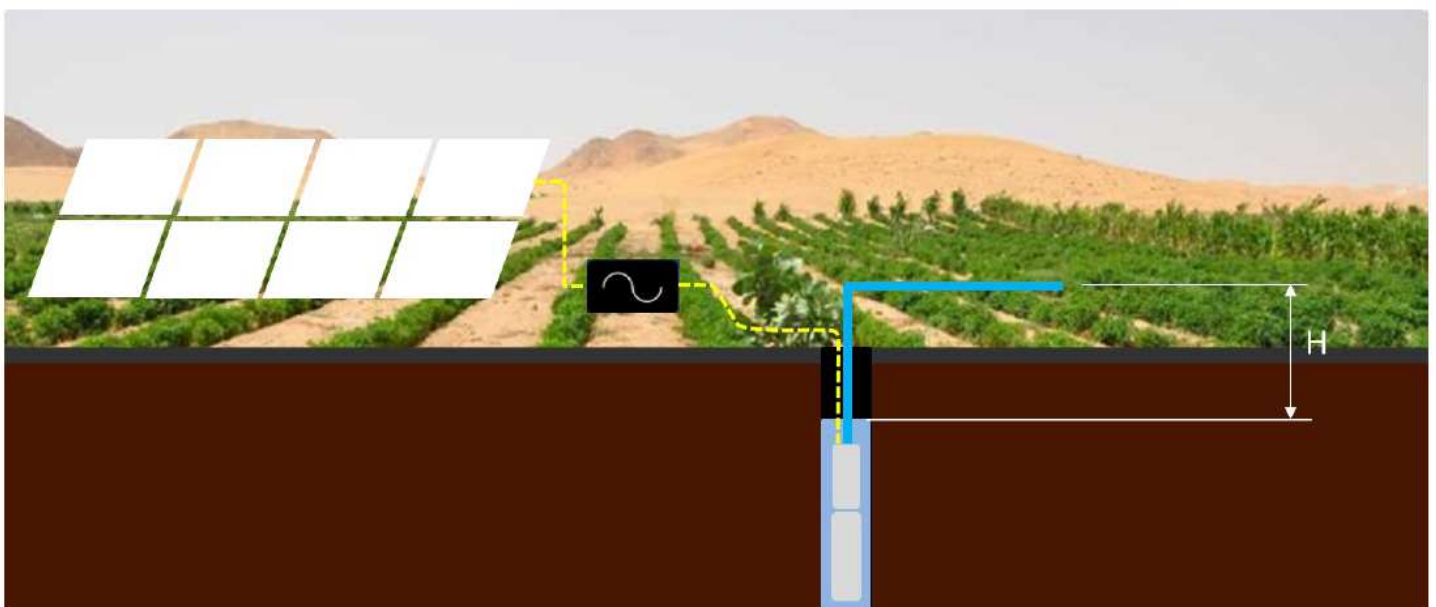










SOLAR WATER PUMP

OPERATING MANUAL



PACKAGING AND INSTALLATION COMPONENTS		
PACKING CODE	PHOTOGRAPH	COMPONENT
A-1		5 units 250 Wp solar panel (in 5 packages)
A-2		3 metallic bars for solar panel structure (in 1 package)
A-3		4 support structures for solar panel (in 2 packages)
B-1		33m Irrigation pipe (1 package)
B-2		1 Solar pump (1 package) with : 25m of cable for electrical connections 25 m of cable for water level sensor 1 water level sensor 25 m of cable for water pump fixation
B-3		1 electrical connections box, (1 package) with : *1 plastic bag with 2 big cable gland et 2 small cable gland *1 plastic bag with two fixation bars and screws
C-1		1 accesories box (inside pump box) (1 package) with : *A-4.- well cap *A-5.- metallic structure screws *A-6.- solar panel screws *A-7.-metallic structure plastic caps *A-8.- solar panel cables *B-4.-wire fixation solar pump *scotch tape *flanges

1. WATER SOLAR PUMP CHARACTERISTICS

- Extraction capacity : 4m³ /hours
- Working time: 6/7 hours
- Extraction average per day : 30 m³
- Average depth for extraction point :15m. depth
- Distance to water stockage tank, estimated in 10m. (considering the height and distance to the deposit in surface)
- Extraction region: Gambia
- Water kind : clean water suitable for consumption and irrigation.
- Solar water pump 4HS Multipower 05/04

2. INSTALLATION COMPONENTS

- 5 solar panels of 250 wp, 1.250 wp de champ solar
- Metallic structure for solar panels support, inclination angle 15 °
- Submersible solar pump, with sensor and motor model 4HS Multipower 05/04
- Cable and ON-OFF sensor located in the tank .
- 25 m cable for security holding of solar pump
- 33m Flexible pipe between solar pump and tank.
- Electrical connections box with STOP/AC/DC switch
- Different accesories (flanges, fixations, screws,...)

3.- SOLAR FIELD DETERMINATION

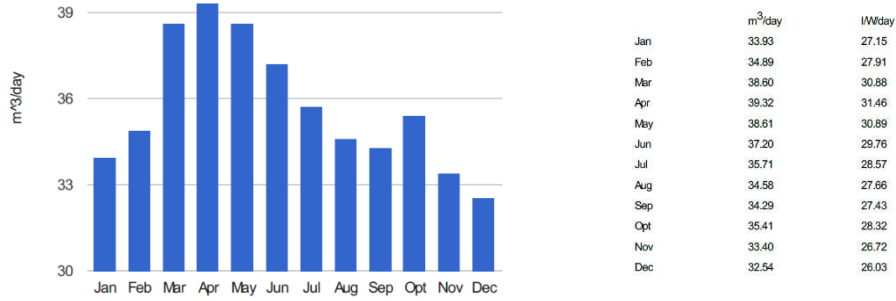
Gambia solar performance table

Selected months for operation

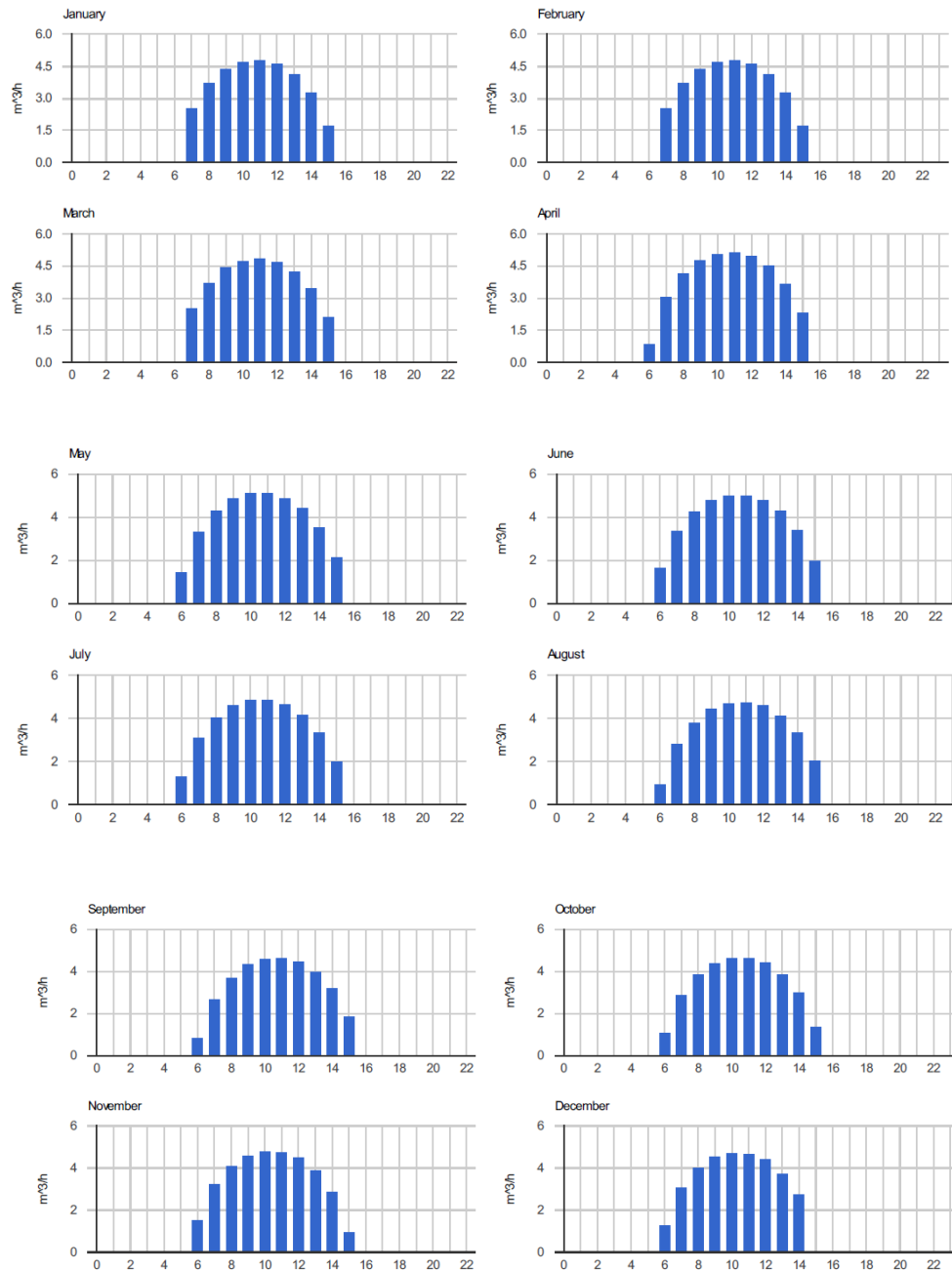
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVG
Average daily solar irradiance [kWh/m ² /day] for latitude tilted panels	5.47	5.74	6.54	6.67	6.53	6.19	5.82	5.56	5.51	5.82	5.54	5.30	5.89
Max daily ambient temperature [°C]	30.00	31.90	33.26	34.62	36.08	34.83	31.68	30.64	31.50	34.98	34.34	31.54	32.95
Min daily ambient temperature [°C]	18.57	19.43	20.10	21.30	22.83	23.06	23.67	24.17	24.17	24.75	23.46	20.49	22.17
Average daily temperature [°C]	24.29	25.67	26.68	27.96	29.46	28.95	27.68	27.41	27.84	29.87	28.90	26.02	27.56

4.- WATER EXTRACTION PERFORMANCE

ANUAL EXTRACTION PER MONTH.



Extraction of water m3 per hour / day depending on the month of the year



5.- IMPORTANT CONSIDERATIONS BEFORE THE INSTALLATION

- **5.1.-Determine well depth**

It is important to determine the distance to water level and to the bottom of the well.

For this let's use a rope where must be attached a stone or other heavy object, not forgetting to attach a cloth on the rope to detect water.

Determine dynamic water level

Slide the rope till water level, measure the distance to the water level.

Determine the bottom of the well.

Slide now the rope (the rope has a maximum of 25 m) till it touches the bottom of the well and measure the depth of the well.

The solar pump calculations for water extraction performance made in this manual has been made for a pump installed at 15m depth. According to the well characteristics the appropriate distance must be determined tacking into account that performance results will vary from the ones provided in this manual.

ATTENTION: the solar pump must be at a distance from the bottom of the well of a minimum of 1 m (to avoid dirty water absorption, sand, etc...)

- **5.2.-Determine distance and orientation of solar panels structure**

Solar panels must be installed taking into account the following characteristics:

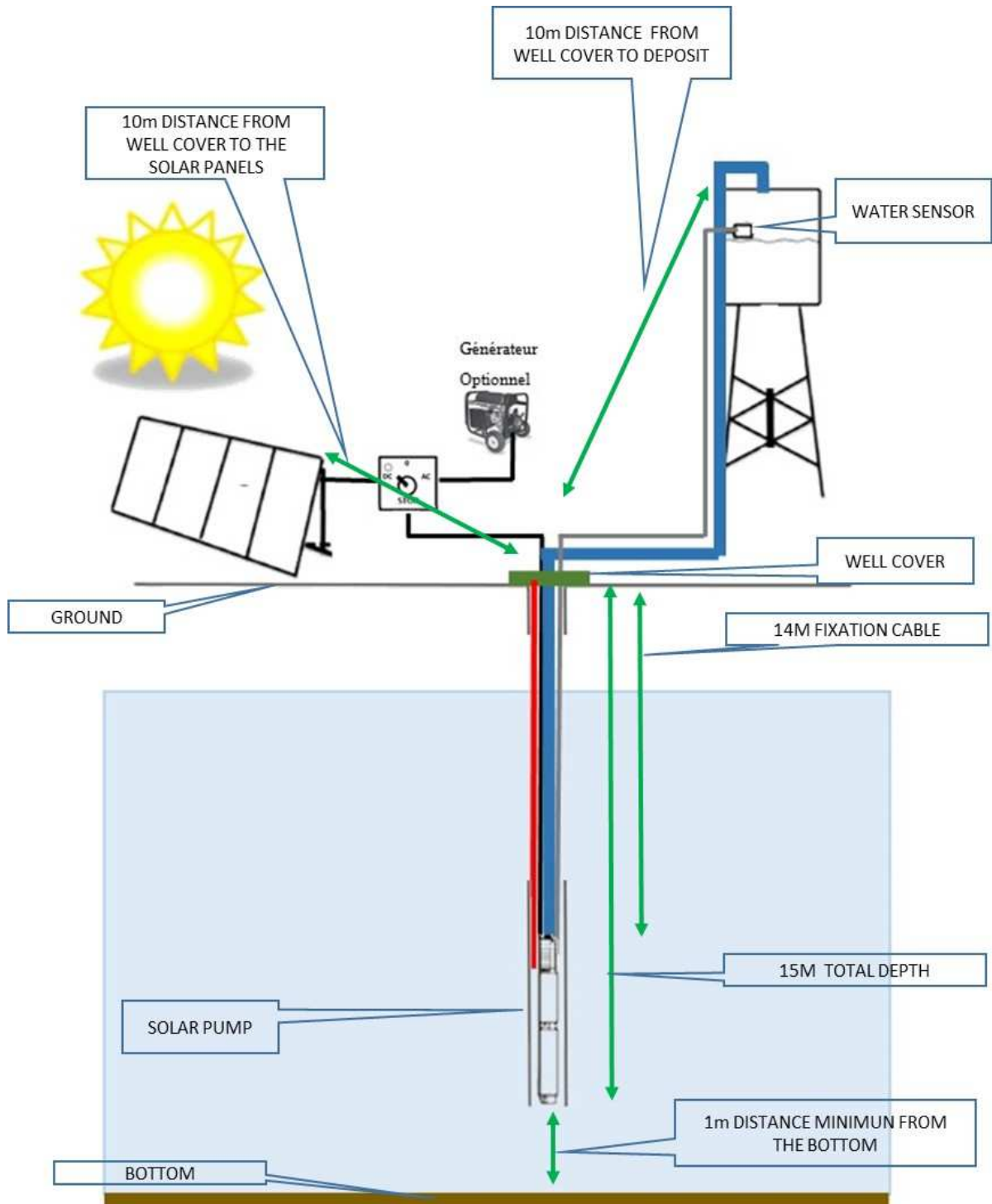
1. the distance between solar panels structure and the mouth of the well, if the pump is located at a depth of 15 m, should be maximum 8-10 m (if there is need to install the structure at a more distance, the power cable must be lengthen (the solar pump is supplied with a power cable of 25 m)
2. solar panels installation must be SOUTH orientated.

- **5.3.- Determine the distance and height of the water storage tank**

1. the solar water pump system has a 33 m irrigation pipe, if the solar pump is located at a depth of 15 m, 18 m of pipe are available to bring water to the deposit. You can add additional pipe metres.
2. the solar water pump is designed to reach 10 m height to the tank (from a depth of 15 m of the solar pump)
3. the determination of the distance and height of the tank will alter the efficiency of extraction of water of the solar pump

GENERAL INSTALLATION DIAGRAM

This diagram corresponds to a water pump installation with water extraction at 15 m depth



6.- INSTALLATION OF SOLAR PANELS

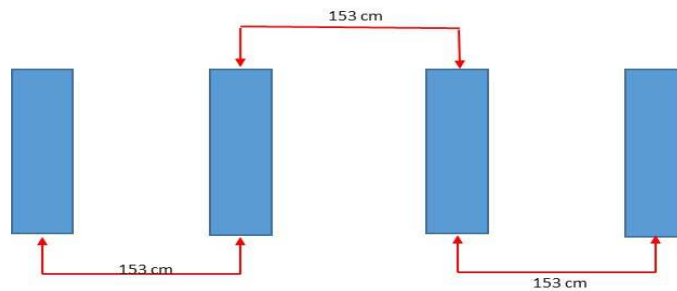
Define where the solar panels will be located, taking into account the distance to the well and orientation to the South:

- **6.1.- Installation foundation**

The solar structure must be fixed on a firm and stable ground to be resistant to wind. The foundation will have the following characteristics:

1. for each of the supporting structures, make a minimum foundation of 20 cm in width x 120 cm length x 25 cm depth

2. the distance between the blocs must comply with the following schema:



Regular intervals

3. If you notice that the ground where you want to install the structure is very unstable, increase the dimensions of the foundations.

- **6.2.-Structure fixation with bars**

First, fix using the mounting screws (A-4 code), the four support structures to the locking bars, there are two bars longer (which are for the upper part) and a shorter bar (on the back). See the following schema:



- **6.3.- Structure fixation to the foundation**

Once the metal structure has been mounted and foundations prepared (wait 2 days for positioning).

1. Drill directly with a bit of 12 mm to a depth of 10 cm
2. Turn the anchorage screws to receive solar panels (code A-5) and firmly secure them
3. Accordingly, fix this way each solar panel.
Put plastic caps in the ending bars holes (code A-7)

- **6.4.- Electrical connection box fixation.**

Before positioning the solar panels, we need to install the electrical connection box (packaging B-3 code):

1. Put the jacks in the box of connections, see picture



2. Define box location on the part the closest to the mouth of the well. The box must be positioned in a location protected from rain and Sun.

2. Fix the box of electrical connections to the structure of the panels, using the bars and screws inside the box. See photos of connection below :

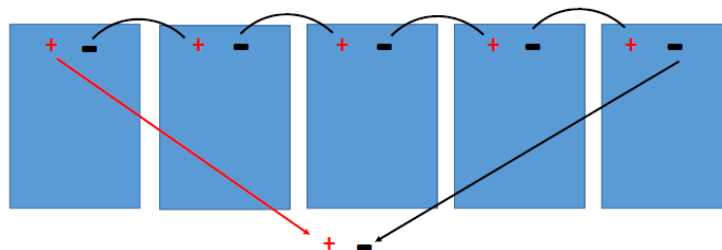


- **6.5.-Installation of solar panels**

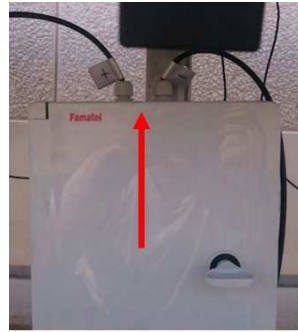
1. solar panels must be handled with care, as they are fragile and heavy material.
- 2 - for solar panels fixation we will use the solar panels screws (code A-6), screwed strongly.

- **6.6.-Electrical connection of solar panels**

1. the panels can be connected between them according to this scheme:



2. - the long solar panels wires + and - (code A-8 packing) are connected to the safety switch, taking into account the polarity positive (+) and negative (-). Before connection, check that the blue button of the switch is in the OFF position - off (blue button down)



3. - make the connection of the panels if the system is properly installed. (Attention: turn ON the switch if everything is well connected)

7.- INSTALLATION OF SOLAR PUMP

- **7.1.- Define the depth**

Once we have defined the depth of our well, it is necessary to define the dimensions of all the installation system.

- **7.2 .- Screw the reduction nut to the pipe.**

Screw strongly the reduction nut to the pipe.



- **7.3.-Connect irrigation pipe to water pump**

Unroll the irrigation pipe in full (33 m)

Take the water pump and screw the pipe, turn until pipe is strongly fixed.



- **7.4 - pass the d´irrigation tube and the cables through the opening of the well cover**

The water pump is connected by a 25 m cable, with the sensor cable.

Take the lid of the well (code B-4 package) and pass the pipe for the central hole and the cables through the lateral hole



- **7.5 - join the water pump with water pump cover**

The lid of the pump has the function to hold the solar pump, for this purpose it is supplied the solar water pump fixation cable (packaging code B-5). This cable is special for use in water can support a load of more than 1000 kg:

1. attach strongly the fixation cable to the pump, in the ring of the pump, see picture

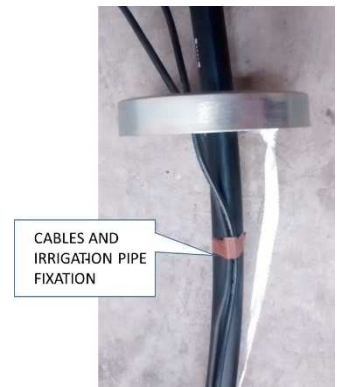


2 – If pump must be at 15m depth , we must hold the pump with the fixation cable but reducing 1m of the cable, as solar water pump length is 1m, see "general installation diagram".



- **7.6.- Cables and irrigation pipe fixation**

To avoid that the cables and pipe are loose inside the well, it is needed to secure the wires and pipe using adhesive tape, every 3 m. To set the adhesive tape, cables and pipe must be clean and dry. Do not tight too much the tape, it is only needed to join them.



- **7.7.-Immerse water pump**

When everything is ready, immerse the solar pump, holding the pump by the cable (**do not use the electrical cable or the pipe**), descend it gradually to the desired depth and put the well cap. **IMPORTANT:** the well cover measures 22cm in diameter, if the well mouth diameter is larger, it will be needed to find a few bars of iron, sheet metal or other system that guarantee the stability of the solar pump cover.

If the lid of the pump water is not actually fixed and stable during the activation of the system this can cause movements and displacements.

8.- SENSOR INSTALLATION IN THE TANK

The solar water pump system is supplied with a sensor for water stockage control. This sensor has a dual function:

1. Stop water supply when the water reaches a certain level in the tank to prevent overflow from the tank
2. Turn on the pump when the water level is low.

- **8.1 – Installation of the irrigation pipe till the tank**

The water tank sensor, is provided already connected to the pump

To prevent the movement of this cable, once already positioned correctly, it must be joined by flanges to the irrigation tube and the structure of the tank.

- **8.2 - determine the position of the sensor in the tank**

It is important to put the sensor correctly so that it meets the objectives of control of the loading and unloading of the tank:

1. the sensor has two parts, the sensor and the counterweights, these two parts are those that govern the functioning, the distance between these two components must be established according to the measures of the tank.

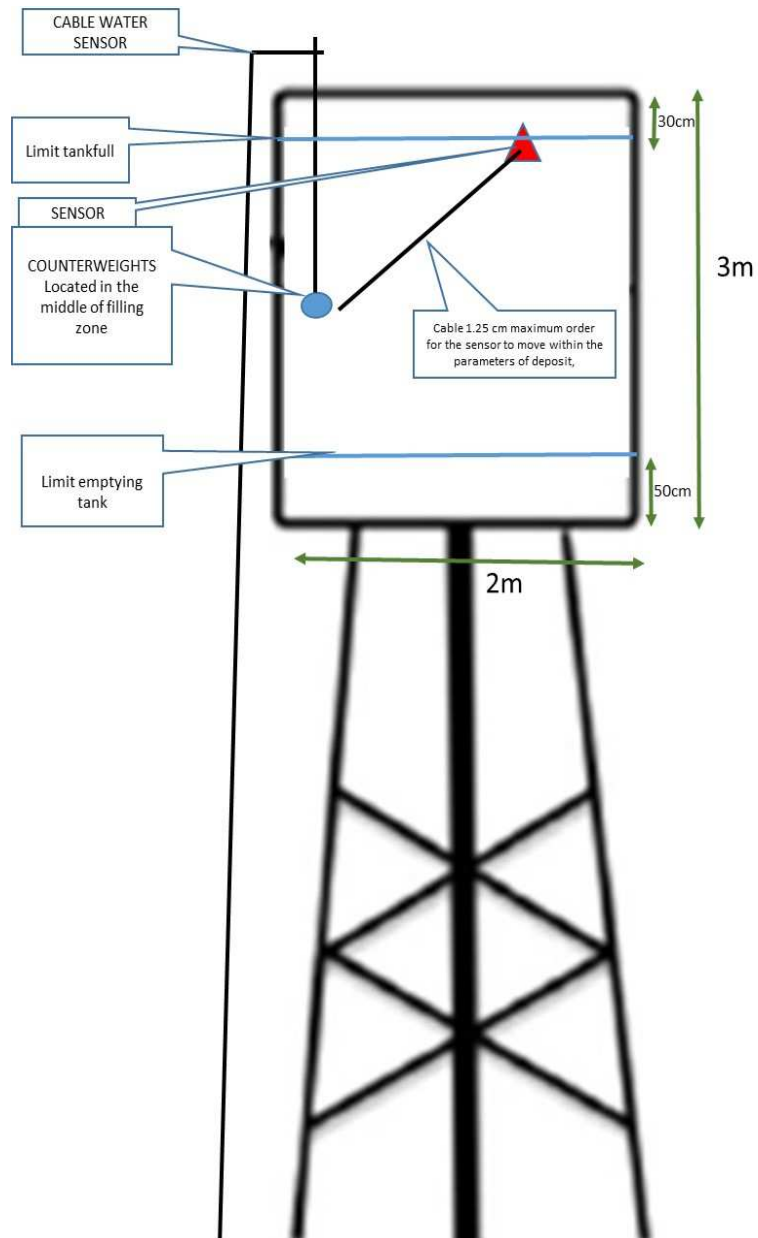


- **8.3 - to adjust the counterweight and the water level switch (buoy)**

Once we have defined the maximum filling water level of the tank and the minimum limit of the water we must regulate the operation by considering three aspects:

1. the distance between the limit of maximum filling and overflow.
2. the depth at which the counterweight is located, which usually coincides with half the distance between maximum and minimum water limit of the tank.
3. the length of the cable between the counterweight and the water level switch (buoy). It should be sufficient to allow the buoy to move inside the tank up to the limit of overflow and the minimum filling limit.

Take this example of a tank of 2 m x 3 m high and where the distance between the maximum filling line and the line of overflow is 220 cm



Once positioned correctly the sensor and the counterweight, we can modify the performance of the system by changing the distance between the sensor and the counterweight

ATTENTION - The position of the counterweight and sensor must be adapted to the curve characteristics

9.- ELECTRICAL CONNECTION OF PUMPING SYSTEM

Once the installation of the water pump and the structure of solar panels has been made, it is the momento to make the electrical connections, so let's make the connection in the following order for the proper functioning of the system

- **9.1 – Disconnection system**

The safety switch is turned off, OFF position (blue button down) and the cam switch in position 0



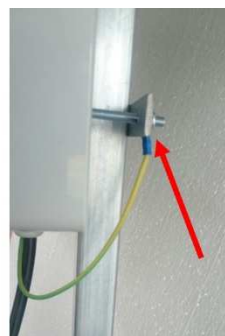
- **9.2 - Solar pump connection**

Two electrical cables from the solar pump must be passed into the box of connections from below and be connected with the black electrical connections tab. Fix the cable.



- **9.3 – Ground point connection**

Among the cables of the solar pump there is a neutral earthing cable, which has a hook connection, this cable must be attached to the panels structure that holds the connections box, as derivation of ground point connection.



● **9.4.-Solar panels connection**

Solar panels have been connected already to the safety switch.

● **9.5.-Water pump activation**

System is now totally connected so solar pump can be activated.

1. Activate safety switch, turn it on, ON position (blue switch up)
2. Activate the cam switch, turn it to DC position – solar energy Pump must start working.



10.- NOTE : 220V GENERATION UTILIZATION (OPTIONAL)

Solar water pump supplied can work with a generator which provides 220V, so we must proceed in the following way:

1. place the cam switch in position 0
- 2 - disconnect the input of solar panels, by turning OFF safety switch – OFF position (blue switch down).



3. connect the cables of the generator on the white electrical connections tab, passing the cables of protection from the left side of the box.



4. Before activating the system turning into AC position- generator, **make sure that 15 minutes have past since the pump has stopped working**

5. Turn the switch in position AC - generator
Keep the safety switch turned OFF- OFF position (blue button down) and the pump will be activated.

The performance of the solar pump, when it works with 220V generator, will have an efficiency of at least 50% more for water extraction capacity.





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