



# M/S. Kisan Solar.

PROJECT NUMBER: 4787516653.1.1

TEST LOCATION (A)  
UL INDIA PVT LIMITED,  
JGI GLOBAL CAMPUS  
JAKKASANDRA POST  
KANAKAPURA TALUK  
RAMANAGARA DISTRICT  
- 562 112

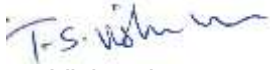

TEST LOCATION (B)  
UL INDIA PVT LIMITED,  
LABORATORY  
BUILDING, KALYANI  
PLATINA CAMPUS,  
SY.NO.129/4, EPIP ZONE,  
PHASE II, WHITEFIELD,  
BANGALORE - 560 066  
P:91-80-41384400

## TEST DISCIPLINE ELECTRICAL

### General details

|                                |  |  |           |
|--------------------------------|--|--|-----------|
| Customer                       | Kisan Solar, A/2, ATULYA BHAVAN, S G HIGHWAY, THALTEJ, AHMEDABAD, GUJARAT                      |  |           |
| Manufacturer                   | Refer Page 3   |  |           |
| Program                        | Solar Water Pump Testing as per MNRE 2015-16 Model- as per Clause II of MNRE 2015-16 guideline |  |           |
| Test Lab Location              | (a) Pump testing<br>(b) PV panel testing   | Refer to Cover page for the Location address |           |
| Item Under Test                | Solar Water Pump System  |  |           |
| Types / Models                 | 5Hp Submersible AC type pump and its Pump controller   |  |           |
| Number of samples              | 1 number   |  |           |
| Sample Identification          | 250W PV Panels -20nos,5 Hp pump, 5Hp motor , 5Hp Pump controller,                              |  |           |
| Condition of IUT on receipt    | Good   |  |           |
| Date of Receipt                | 7 July 2016  |  |           |
| Reference Standards            | MNRE Guidelines for Solar PV Water Pump Testing 2015-16  |  |           |
| Date of Testing (Start date )  | 7/07/2016  | End Date                                     | 7/07/2016 |
| Lab general* ambient condition | Temperature in °C  |  | 23±5°C    |
|                                | Relative humidity in %   |  | <70%      |
| Date of Reporting              | 19 July 2016   |  |           |
| Test In-charge                 | Pradeep N  |  |           |

# Fill in the rows with information or add hyphen (-)

|  |  |
|--|--|
| <br>Vishnu kumar<br>Project Engineer Associate<br>Reviewed by | <br>Sriparn Saurabh<br>Engineering Leader<br>Authorised signatory |
|--|--|

## TEST REPORT

### Solar PV Water Pump Testing using Solar Array Simulator

(as per JNNSM, MNRE Specification of Solar PV Water Pumping Systems 2015-16)

**Sample Number:** Refer page 6 (PV Panels),377237 (pump), 377240(motor) , 377242(pump controller),

**Pump Controller Manufactured by:** Kisan solar

**Pump Manufacturer:** ANCO MOTORS

**PV Array Manufacturer:** Kosol

**Submitted by:** Kisan solar

#### Description of Item under Test (IUT)

PV module PIV measurements/STC, 5\_Hp Submersible AC Induction type Motor and Pump & Pump controller

#### Test methodology adopted

Solar PV Water Pumping Systems 2015-16 as per JNNSM, MNRE

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| S.No. | Test Description                           | Requirements as per JNNSM, MNRE Specifications 2015-16.  | Observations  | Remarks   |
|-------|--|--|---|---|
| 1     | <b>PV Module/ Array</b>                    |  |   |   |
| 1.1   | Array Capacity at STC                      | Should be between 200 Wp and 5000 Wp under STC.  | 4815.54Wp   |   |
| 1.2   | Fabrication of PV Modules                  | Modules should be IEC 61215 & IEC 61730 Part I & Part-II, qualified, properly laminated and hermetically sealed. | Yes, properly laminated. IEC 61215 & IEC 61730 qualified  |   |
| 1.3   | Type of modules                            | Crystalline Silicon solar cell module.   | Multi Crystalline Silicon modules.  |   |
| 1.4   | Peak power output of SPV module under STC. | Peak wattage of each Module should be more than 125 Wp   | Nominal module wattage 240.77 W   |   |
| 1.5   | Efficiency                                 | Should be more than 14%  | 14.48%  |   |
| 1.6   | Fill Factor                                | Should be more than 70 %   | 74.25%  |   |
| 1.7   | Inter-module mismatch Power loss           | should be within $\pm 3\%$   | -1.1%   |   |
| 2     | <b>Motor &amp; Pump Details</b>            |  |   |   |
| 2.1   | Make, model & Serial No.                   |  | Motor/Pump<br>Anco motors<br>Model no: ASDW -520<br>Serial number:<br>46248<br><br>Pump controller:<br>Kisan Solar<br>Model No:<br>iACQUA_280_5<br>Serial Number:<br>0815-0050-000202 |   |
| 2.2   | Type of pump                               | DC/AC  | AC Induction type   |   |
| 2.3   | Operation                                  | Shallow Well Pumping System: MODEL-I to MODEL - VI as per MNRE specification                                     | Deep Well Pumping System: Model- _Customer specific_  | New model as per Clause II MNRE 2015-16 guideline |

|     |   |   |                  |  |
|-----|---|---|------------------|--|
|     |   | Deep Well Pumping System:<br>MODEL-I to MODEL –XIV as<br>per MNRE specification   |                  |  |
| 2.4 | MODEL specifications  |   | 5Hp-20m          | Submersible  |
| 3   | <b>Testing of complete SPV pump</b>   |   |                  |  |
| 3.1 | Output of water per<br>day/per watt at<br>Irradiation of 7.15<br>Kwh/sq.m. at a total<br>head of _20_ meters. | Not less than _45_ liters   | 57.54liters      |  |
| 3.2 | Average Output of<br>water per day at<br>Irradiation of 7.15<br>Kwh/sq.m. at a total<br>head of _20_ meters   | Not less than _216000__<br>liters   | 277117.50 liters |  |
| 3.3 | Shut off dynamic head   | _25__ meters  | 105 meters       |  |
| 4   | <b>Tracking system</b>  | Continuous, Manual, Passive<br>or Electronic tracking are<br>permitted.   | Continuous       | Solar Array<br>simulator used and<br>continuous tracking<br>mode |
| 5   | <b>Protections</b>  |   |                  |  |
| 5.1 | Against dry running   | Required  | Provided         |  |
| 5.2 | Against wind speed  | Should withstand speeds up<br>to 150 Kms/hr.  | Not tested       |  |
| 5.3 | Against lightning, hail<br>and storm.   | Required  | Not tested       |  |
| 5.4 | Against open circuit  | Required  | Provided         |  |
| 5.5 | Against short circuit<br>and reverse polarity.  | Required  | Provided         |  |
| 6   | <b>Others</b>   |   |                  |  |
| 6.1 | Design of PV array  | Should be modular for easy<br>replacement.  | Modular          |  |
| 6.2 | DC/AC switch  | Required  | Provided         |  |
| 6.3 | Connection cable  | Required  | Provided         |  |
| 6.4 | Remote data logging   | Remote logging of daily<br>water output, Power<br>generated by PV array,<br>Uptime/downtime of system<br>should be provided | Provided         |  |
| 6.5 | IP54 Protection   | Required  | Not tested       |  |


### PV Module Test Report

**Pre-Conditioning: PV panels should be pre-conditioned to 5.5kWh/m2 initially and then carried for PIV measurements.**

Peak Wattages of Individual PV Modules tested at UL India Pvt Ltd, with report no: 4787516653

Model: KE 250


| S no    | Serial no       | Voc (V) | Isc (A) | Vmax (V) | Imax (A) | Pmax (W) | F.F (%) | Module Efficiency (%) | Inter module loss |
|---------|-----------------|---------|---------|----------|----------|----------|---------|-----------------------|-------------------|
| 2257878 | KE2502691502211 | 37.43   | 8.65    | 29.66    | 8.13     | 241.27   | 75      | 14.67                 | 0.2               |
| 2257879 | KE2503201502515 | 37.32   | 8.68    | 29.75    | 8.11     | 241.31   | 74      | 14.67                 | 0.2               |
| 2257880 | KE2502731502422 | 37.3    | 8.58    | 29.58    | 8.05     | 238.15   | 74      | 14.48                 | -1.1              |
| 2257881 | KE2503201502517 | 37.29   | 8.71    | 29.75    | 8.09     | 240.75   | 74      | 14.64                 | 0.0               |
| 2257882 | KE2503201502501 | 37.3    | 8.65    | 29.62    | 8.09     | 239.6    | 74      | 14.57                 | -0.5              |
| 2257884 | KE2503201502495 | 37.53   | 8.64    | 29.93    | 8.06     | 241.25   | 74      | 14.67                 | 0.2               |
| 2257885 | KE2503201502525 | 37.45   | 8.57    | 29.82    | 8.06     | 240.26   | 75      | 14.61                 | -0.2              |
| 2257886 | KE2503201502529 | 37.41   | 8.68    | 29.9     | 8.08     | 241.57   | 74      | 14.69                 | 0.3               |
| 2257887 | KE2503201502513 | 37.56   | 8.65    | 30.21    | 8.12     | 245.17   | 75      | 14.91                 | 1.8               |
| 2257888 | KE2503201502510 | 37.41   | 8.61    | 29.62    | 8.05     | 238.47   | 74      | 14.5                  | -1.0              |
| 2257889 | KE2503201502522 | 37.31   | 8.69    | 29.66    | 8.1      | 240.12   | 74      | 14.6                  | -0.3              |
| 2257890 | KE2503201502530 | 37.32   | 8.66    | 29.74    | 8.08     | 240.25   | 74      | 14.61                 | -0.2              |
| 2257891 | KE2503201502528 | 37.36   | 8.69    | 29.91    | 8.1      | 242.21   | 75      | 14.73                 | 0.6               |
| 2257892 | KE2503201502523 | 37.51   | 8.64    | 29.83    | 8.08     | 240.99   | 74      | 14.66                 | 0.1               |
| 2257893 | KE2503201502478 | 37.34   | 8.63    | 29.66    | 8.08     | 239.56   | 74      | 14.57                 | -0.5              |

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|         |                 |       |      |       |      |        |    |       |      |
|---------|-----------------|-------|------|-------|------|--------|----|-------|------|
| 2257894 | KE2503201502481 | 37.28 | 8.68 | 29.62 | 8.1  | 239.89 | 74 | 14.59 | -0.4 |
| 2257895 | KE2503201502479 | 37.45 | 8.62 | 30.12 | 8.05 | 242.43 | 75 | 14.74 | 0.7  |
| 2257896 | KE2503201502485 | 37.55 | 8.7  | 29.92 | 8.13 | 243.21 | 74 | 14.79 | 1.0  |
| 2257897 | KE2503201502482 | 37.4  | 8.69 | 29.83 | 8.09 | 241.19 | 74 | 14.67 | 0.2  |
| 2257910 | KE2503201502500 | 37.35 | 8.64 | 29.48 | 8.07 | 237.89 | 74 | 14.47 | -1.2 |

**Total  $P_{\max}$  = 4815.54Wp**

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**Comments:**

1. The Water pumping System sample was tested at UL with a total head of 20 meters. The Pump is installed at a head of 3m depth in the sump. So the total head maintained is 17m throughout the test. Hence, both together accounts for 20m Head
2. The radiation data was measured on the surface of PV array (i.e. coplanar with the PV modules) from dawn to dusk, and then was extrapolated for 7.15 KWh/sq.m., from the actual measured radiation which is fed to the Solar Array simulator. So the water pumping system is tested with the solar array simulator.
3. Threshold (where the pump starts delivery of water at dawn): Pump started flow of water at : 326.48 W/Sq m irradiance, Frequency: 35Hz, Current: 5.6A
4. MPPT is provided in the Pump controller
5. Remote datalogging facility is available in the Pump controller.
6. Water pumping system sample meets the requirements of JNNSM, MNRE specifications for 2015-16. The average efficiency of the pump over the day at 20 meter head (PV Power to Water conversion efficiency) is 45.10 %.

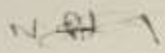
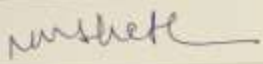




## Appendix – A Installation Completion Letter



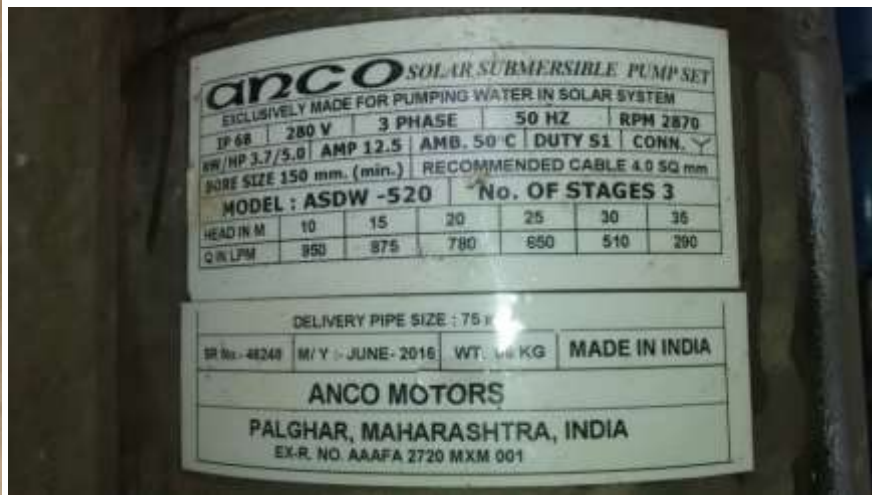
Solar Water Pump Setup Installation Completion Letter

| Solar Water Pump Setup Installation Completion Letter   |  |                        |                        |
|---|--|------------------------|------------------------|
| Submitted by/Customer name  | Kisan Solar, A2, ATULYA BHAVAN, S G HIGHWAY, THALTEJ, AHMEDABAD, GUJARAT   |                        |                        |
| Project No.   | 4787516653   |                        |                        |
| PV panel Manufacturer   | Kosol – Model no: KE 250   |                        |                        |
| Pump manufacturer   | Anco Motors  |                        |                        |
| Pump controller/VFD   | Kisan solar  |                        |                        |
| Test Model  | Model as per MNRE - 5HP Pump at 20m Head Submersible   |                        |                        |
| Testing Location  | UL India Pvt Limited, JGI Global Campus Jakkasandra Post Kanakapura Taluk, Bangalore   |                        |                        |
| Date of Receipt of Sample   | 7.7.16   | Type                   | Submersible AC/DC      |
| Condition of DUT on Receipt   | Good   |                        |                        |
| Date of Installation  | 7.7.16   |                        |                        |
| Installation of setup   | The given Solar water pump setup with Pump & pump controller has been installed by the customer in presence of UL Test Engineer and below are the observations |                        |                        |
| Protection/Abnormal Test  | Open circuit   | Pass / Fail            | Shows loose connection |
|   | Short circuit  | Pass / Fail            | Shows short circuit    |
|   | Reverse Polarity   | Pass / Fail            | Doesn't ON             |
|   | Dry Run  | Pass / Fail            | Shows dry run          |
|   | Wind, lightning, Hail & Storm  | Pass / Fail            | Not tested             |
|   | Design of PV Array Modular   | Pass / Fail            | Pass                   |
|   | Connection cable   | Provided / Notprovided | Provided               |
|   | DC / AC switch in the controller   |                        | Dc switch provided     |
| IP 54 Protection  | Pass / Fail  | Not tested             |                        |
| Pump run under normal operation   | The pump was running under normal operation with DC input applied to the pump controller and water delivery is good at nominal power output                    |                        |                        |
| Other Remarks/Remote Datalogging  | Provided   |                        |                        |
| Note: After completion of installation the customer handover the test setup to UL India Pvt Ltd for further testing of Solar Water Pump setup as per MNRE specifications. |  |                        |                        |
| <br>Test Engineer-UL India Pvt Ltd (Name & Sign)                                       | <br>Authorized Signatory (Customer Name & Sign)                            |                        |                        |

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## Appendix – B Photographs

### Water Pump & Motor



*T.S. Vishwanath*

### Pump Controller



Prepared by signature: *T.S. Vishwanath*  
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### Equipment and Calibration details

| Test Equipment            | Equipment ID | Calibration status (Valid up to) |
|---------------------------|--------------|----------------------------------|
| Solar Array Simulator     | CPS01&02     | 04/13/2017                       |
| Pressure Transmitter      | PT01&02      | 22/8/2016                        |
| Flow Transmitter          | FT05&06      | NA (Factory calibrated)          |
| Magnetic Flow transmitter | MFT 01&02    | NA (Factory calibrated)          |
| Pressure Control Valve    | PCV 01,02&03 | (Calibration not required)       |

#### Disclaimer

*The results of testing in this report apply only to the sample product/item, which was tested. UL Lab has not participated in the sample selection. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties. \*The applicable standard ambient condition supersedes the lab general ambient conditions.*

*This is a report on measurements carried out on SPV WATER PUMPING SYSTEM submitted to UL India Pvt Ltd as per specifications stipulated by the JNNSM, MNRE 2015-16. The data reported in this TEST REPORT are valid at the time of and under the stipulated conditions of measurement and the test results are applicable to those items of product which have been tested and do not apply to other products even though declared to be identical. The data contents in this report do not constitute a qualification certificate under any set of specifications. UL does not accept any liability for any consequences including commercial or otherwise arising out of the utilization of the information contained in this report.*

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\*\*\*\*\*End of Report\*\*\*\*\*