M/S. KISAN SOLAR.

PROJECT NUMBER: 4787176167 .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		
Manufacturer	Refer Page 3		
Program	Solar Water Pump Testing as per MNRE 2015-Model-VI		
Test Lab Location	(a) Pump testing (b) PV panel testing	Refer to Cover page for the Location address	
Item Under Test	Solar Water Pump System		
Types / Models	5Hp Shallow well AC type pump and its Pump controller		
Number of samples	1 number		
Sample Identification	250W PV Panels -20nos, 5Hp pump & motor, 5Hp Pump controller,		
Condition of IUT on receipt	Good		
Date of Receipt	20 January 2016		
Reference Standards	MNRE Guidelines for Solar PV Water Pump Testing 2015-16		
Date of Testing (Start date)	21/1/2016	End Date	22/1/2016
Lab general* ambient condition	Temperature in °C		23±5°C
	Relative humidity in %		<70%
Date of Reporting	27 January 2016		
Test In-charge	Pradeep N		

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

Ananthrao Kulkarni Project Engineer Associate	Sriparn Saurabh Sr. Project Engineer
Reviewed by	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), AZ5411 (pump & motor), 08150050000066 (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 Shallow well 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	**PV Module/ Array**			
1.1	Array Capacity at STC	Should be between 200 Wp and 5000 Wp under STC.	4815.5Wp	
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 240.7 W	
1.5	Efficiency	Should be more than 14%	14.65%	
1.6	Fill Factor	Should be more than 70 %	74.2%	
1.7	Inter-module mis-match Power loss	should be within ±3%	1.8%	
2	**Motor & Pump Details**			
2.1	Make, model & Serial No.		Model No: Pump & Motor – ASOP 520, Pump controller - IACQUA_280_5, Serial no: Pump & Motor – AZ5411 , Pump controller – 08150050000066	Pump is made of Cast Iron
2.2	Type of pump	DC/AC	AC Induction type	
2.3	Operation	Shallow Well (Surface) Pumping System: MODEL-I to MODEL – VI as per MNRE specification Deep Well Pumping System: MODEL-I to MODEL –XIV as per MNRE specification	Shallow Well (Surface) Pumping System: Model-_VI_	Open well type immersed in water of 2-3m depth
2.4	MODEL specifications		Sine wave Inverter based Pump	

Reviewed by signature:

3	**Testing of complete SPV pump**			
3.1	Output of water per day/per watt at Irradiation of 7.15 Kwh/sq.m. at a total head of _20_ meters.	Not less than _45_ liters	58.2 liters	
3.2	Average Output of water per day at Irradiation of 7.15 Kwh/sq.m. at a total head of _20_ meters	Not less than _216000_ liters	279567 liters	A frictional loss of 1.5m is accounted and the corresponding water is added up in the delivery.
3.3	Shut off dynamic head	__30_ meters	_32_ meters	
4	***Tracking system***	Continuous, Manual, Passive or Electronic tracking are permitted.	Continuous	Solar Array simulator used and continuous tracking mode
5	Protections			
5.1	Against dry running	Required	Provided	
5.2	Against wind speed	Should withstand speeds up to 150 Kms/hr.	Not tested	
5.3	Against lightning, hail and storm.	Required	Not tested	
5.4	Against open circuit	Required	Provided	
5.5	Against short circuit and reverse polarity.	Required	Provided	
6	**Others**			
6.1	Design of PV array	Should be modular for easy replacement.	Modular	
6.2	DC/AC switch	Required	Only DC/PV panel	
6.3	Connection cable	Required	Provided	
6.4	Remote data logging	Remote logging of daily water output, Power generated by PV array, Uptime/downtime of system should be provided	Provided	Parameters like Power, freq, Flow rate, System ON/OFF status is provided
6.5	IP54 Protection	Required	Provided	As per manufacturer certificate attached

PV Module Test Report

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

Model of PV panel:

S no	Serial no	Voc (V)	Isc (A)	Vmax (V)	Imax (A)	Pmax (W)	F.F (%)	Module Efficiency (%)	Intermodule 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
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} = 4815.5Wp

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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. Due to 3inch delivery of the pump, customer used a reducer which is 8 inches after the pressure meter to convert to 2 inch pipe line, due to which a frictional loss of 1.5m is accounted and the corresponding water is added up in the delivery.**
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 370W/Sq m irradiance, Frequency: 42.8Hz, Current: 5.8A**
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 _45.4_ %.**

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Appendix

Appendix – A Installation Completion Letter

Appendix -- B Photographs and Drawings

Appendix – C Test Reports

Appendix – D Specifications, Datasheets and White papers.

Appendix – A Installation Completion Letter

Solar Water Pump Setup Installation Completion Letter

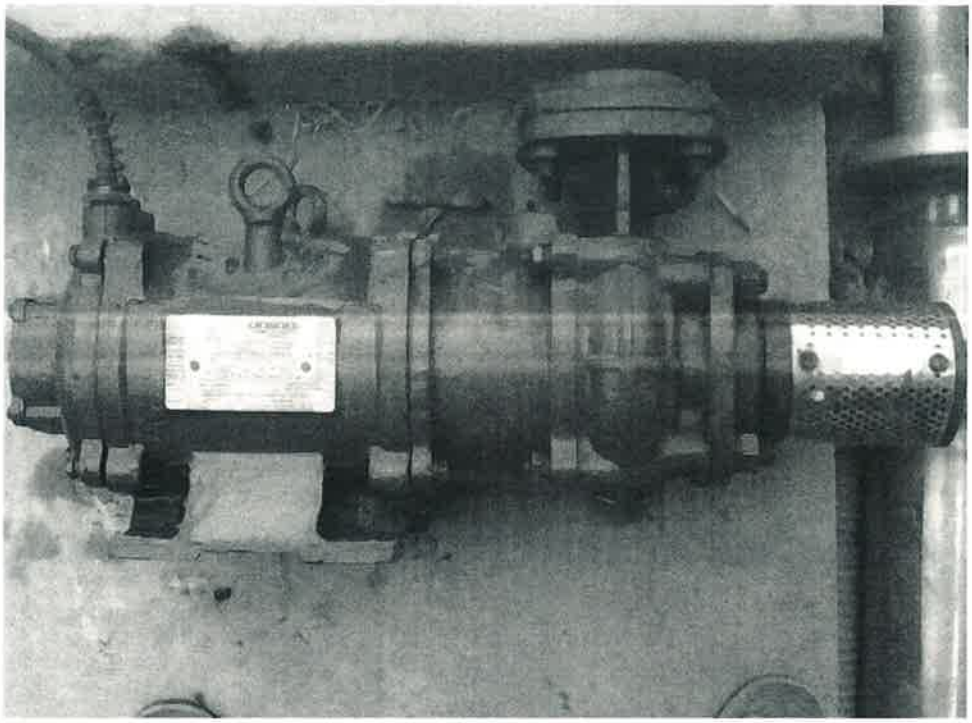
Submitted by/Customer name	Kisan Solar
PV panel Manufacturer	Kosol
Pump manufacturer	Anson Electromechanical works
Pump controller/VFD	Kisan solar
Item Under Test	Solar Water Pump system testing
Test Model	Model as per MNRE - 5HP Pump at 20m Head Shallow well Model VI
Testing Location	UL India Pvt Limited, JGI Global Campus Jakkasandra Post Kanakapura Taluk, Bangalore
Date of Receipt of Sample	20/1/16
Condition of DUT on Receipt	Good
Date of Installation	21/1/16
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 and Short circuit test. Fault error indication. Reverse polarity – Controller detected reverse polarity, Controller not ON. Dry Run: Motor running Dry indication All protections complied
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 Monitoring tested. All parameters found satisfactory

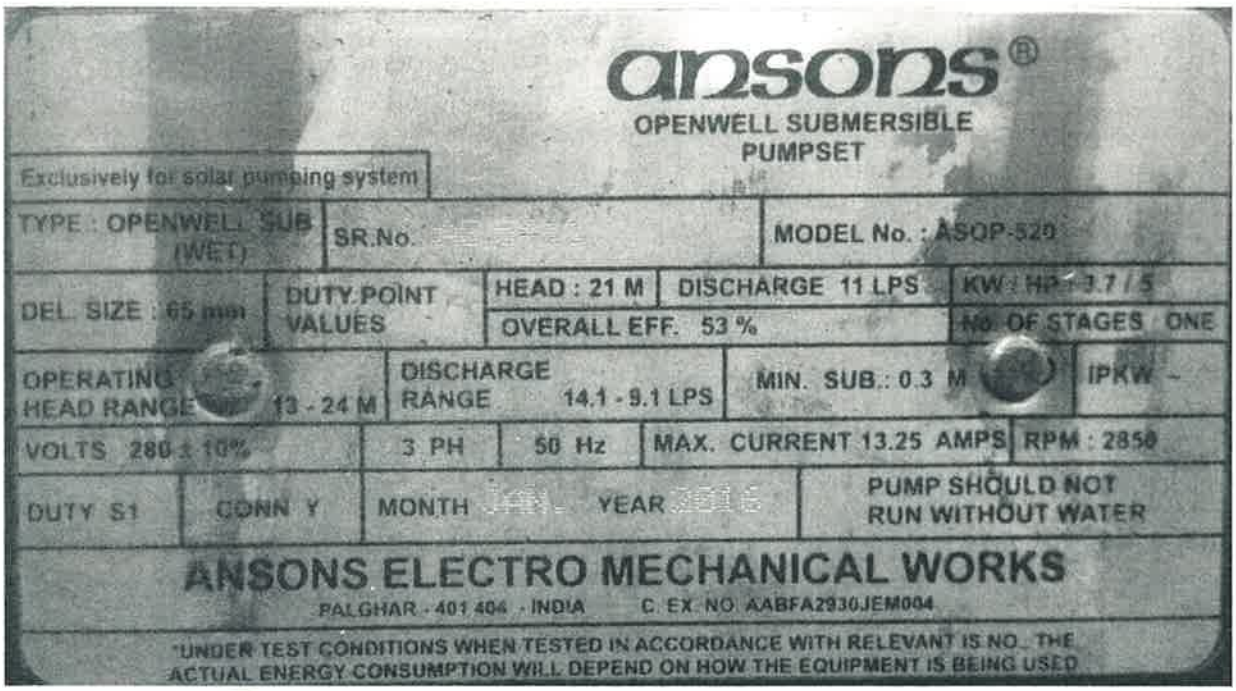
Note: After completion of installation the customer handover the test setup to UL India Pvt Ltd for further testing of Solar Water Pump setup as per MNRE specifications.

Vishnu Kumar	Rupesh Wandhare
Test Engineer-UL India Pvt Ltd (Name & Sign)	**Authorized Signatory (Customer Name & Sign)**

Appendix – B Photographs

Water Pump & Motor





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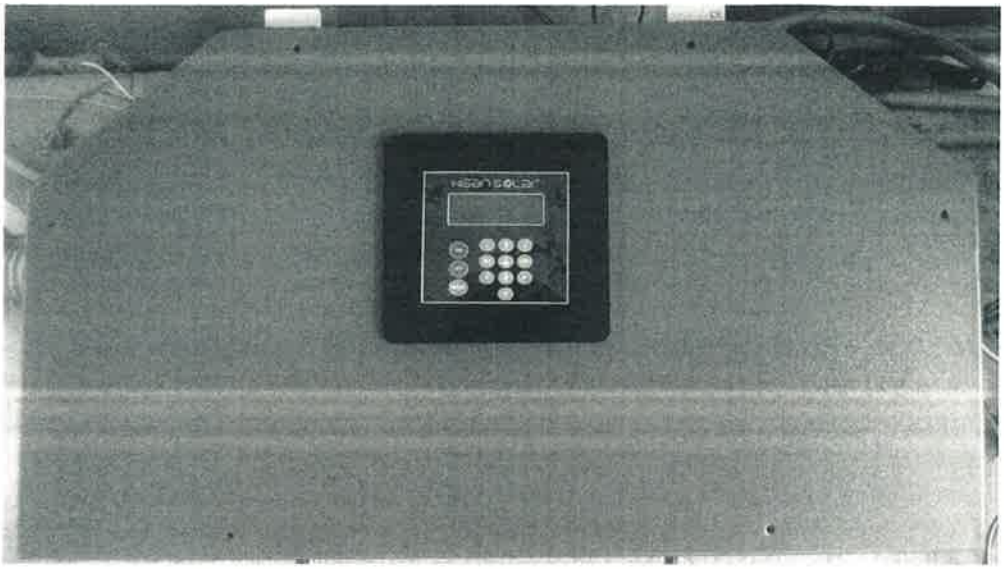
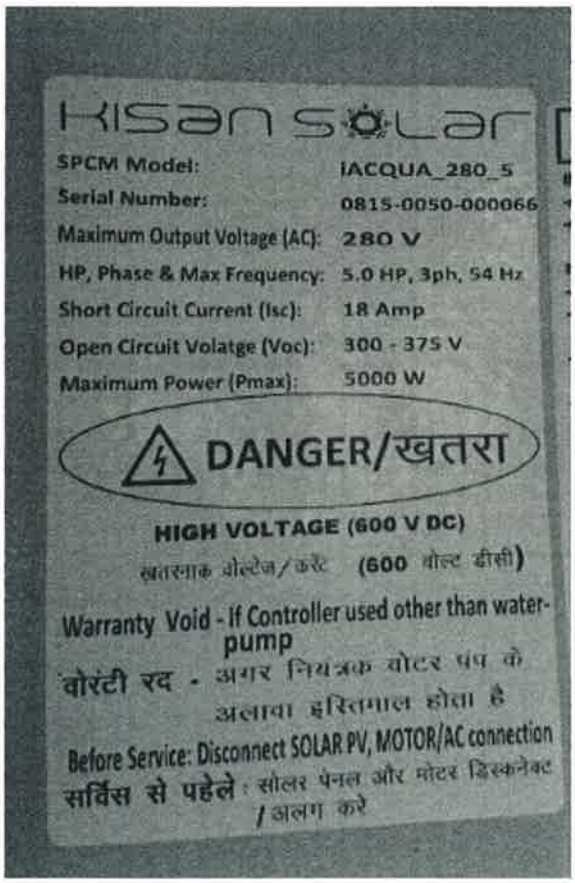
Pump Controller





Appendix – C Test Reports

Balance of Component	Test Report/Certificate No.	Remarks
PV Module IEC 61215, IEC 61730-1 & -2		To be attached by manufacturer.
PV Module IEC 61701 (For coastal area only)		To be attached by manufacturer.
STC Performance Test report for PV modules	-	To be attached by manufacturer.
Instruction Manual for the solar water pumping system		To be attached by manufacturer.
Warranty Card for PV module and Solar Water Pumping System		To be attached by manufacturer.
Protection Against Lightning, Hail, Storm & Wind speed		To be attached by manufacturer.

Certificates

Certificate No: T-1432

Test Report issued under the responsibility of:

Underwriters Laboratories

TEST REPORT IEC 61215 PV Module Safety Qualification Requirements for testing	
Report Reference No.	ULI-NABL(ELT)-MNRE-0057/2013
Date of issue	2013-05-02
Total number of pages	30
Testing Laboratory	UL India Pvt. Ltd, Bangalore.
Applicant's name	KOSOL HIRAMRUT ENERGIES PVT LTD
Address	KALTHIA HOUSE 193 SATYAGRAH CHHAVNI, OPP. ISCON MALL,SG HIGHWAY, AHMEDABAD , GJ 380015 India
Test specification:	
Standard	IEC 61215 Ed. 2
Test procedure	
Non-standard test method	N/A
Test item description	Crystalline Silicon Photovoltaic (PV) Modules (Multi-Crystalline)
Trade Mark	KOSOL ENERGIE
Manufacturer	KOSOL HIRAMRUT ENERGIES PVT LTD
Address	KALTHIA HOUSE 193 SATYAGRAH CHHAVNI, OPP. ISCON MALL,SG HIGHWAY, AHMEDABAD , GJ 380015 India
Model/Type reference	KE 300
Ratings	For the electrical rating see below table

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TEST CERTIFICATE

The product Photovoltaic Module has been tested by UL India Private Limited and found to Comply in accordance with the Standard indicated on this report.

Certificate Number:	**ULI-NABL(ELT)-MNRE-0057/2013**
Issue Date:	**2013-05-02**
Valid Till:	**2018-05-02**
Applicant:	**KOSOL HIRAMRUT ENERGIES PVT. LTD.** KALTHIA HOUSE, 193 SATYAGRAH CHAVNI, OPP. ISCON MALL, SG HIGHWAY, AHMEDABAD, GJ 380015, INDIA
Manufacturer:	**KOSOL HIRAMRUT ENERGIES PVT. LTD.** SURVEY NO. 415 VILLAGE BHAYLA, OPP. SUPERGAS. TAL- BAVLA, DIST -AHMEDABAD, GUJARAT 382220, INDIA
Tested Model:	KE300
Models Covered:	Model KE37, KE40, KE45, KE50, KE74, KE80, KE85, KE95, KE100, KE105, KE120, KE125, KE130, KE140, KE145, KE150, KE170, KE180, KE190, KE200, KE205, KE210, KE225, KE230, KE235, KE240, KE245, KE250, KE275, KE280, KE285, KE290, KE295, KE300.
Standard(s):	**IEC 61730-1 - Photovoltaic (PV) Module Safety Qualification Part 1: Requirements for Construction - Edition 1 - Issue Date 2004/10/01** **IEC 61730-2 - Photovoltaic (PV) Module Safety Qualification Part 2: Requirements for Testing - Edition 1 - Issue Date 2004/10/01**

Issued By:

Moumita Debnath
UL India Private Limited.

Authorized By:

Sriparn Saurabh
UL India Private Limited

Reviewed by signature:
Issue 1.0

GOVERNMENT OF INDIA
ELECTRONICS REGIONAL TEST LABORATORY (WEST)
MINISTRY OF COMMUNICATIONS & INFORMATION TECHNOLOGY
DEPT. OF ELECTRONICS & INFORMATION TECHNOLOGY, STQC DTE.

REPORT NO. ERTL (W)/ 2015ENV191 — PAGE 2 OF 7

TEST REPORT

TITLE: TESTING OF SPCM 5 HP	DATE OF ISSUE 18- NOV-2015

1.1	Service request no and Date :	As per cover sheet
1.2	Name and address of Customer :	As per cover sheet

1.3	Description & Identification of Test item(s)	Nomenclature	SPCM 5 HP
		Manufacturer	KISAN SOLAR
		Model/Type	iACQUA_280_5
		Sr. No.	0215-0050-000021
		Quantity	01 No.
1.4	Item(s) condition on receipt: OK	Received Date : 02- NOV-2015	Test Completed Date : 06- NOV-2015
1.5	Testing performed at	ERTL (W), Mumbai	
1.6	Laboratory Ambient	Temperature: (15-35)°C ; Humidity: (45-75) % RH	
1.7	Test Specification / Test Procedure used	IP54 Test as per IEC 60529 Edition: 2.2, 2013-08 Specification ENV/OP/ 23	

1.8 Major Equipments used and Traceability Details:

Sr. No.	Equipment Used	Uncertainty (Best Case)	Calibration Report Ref.	Valid up to
1.8.1	Dust Test Chamber (ENV/053)	± 0.64 °C	ERTL(W)/2015TNP88	26-MAY-2016
1.8.2	Hand Held Spray Nozzle (IPX3&X4) (ENV/95)	± 0.033bar	ERTL(W)/2014TNP26	24-FEB-2016
1.8.3	Digital Multimeter (ENV/094)	ACV: ± 0.07 % DCV: ± 0.02 % DCA: ± 0.04 %	ERTL(W)/2014S&C909	08-JAN-2016

ELECTRONICS REGIONAL TEST LABORATORY (W) ANDHERI (E), MUMBAI-093 RELEASED BY

QSF 5.10.01 dated 01/01/2014

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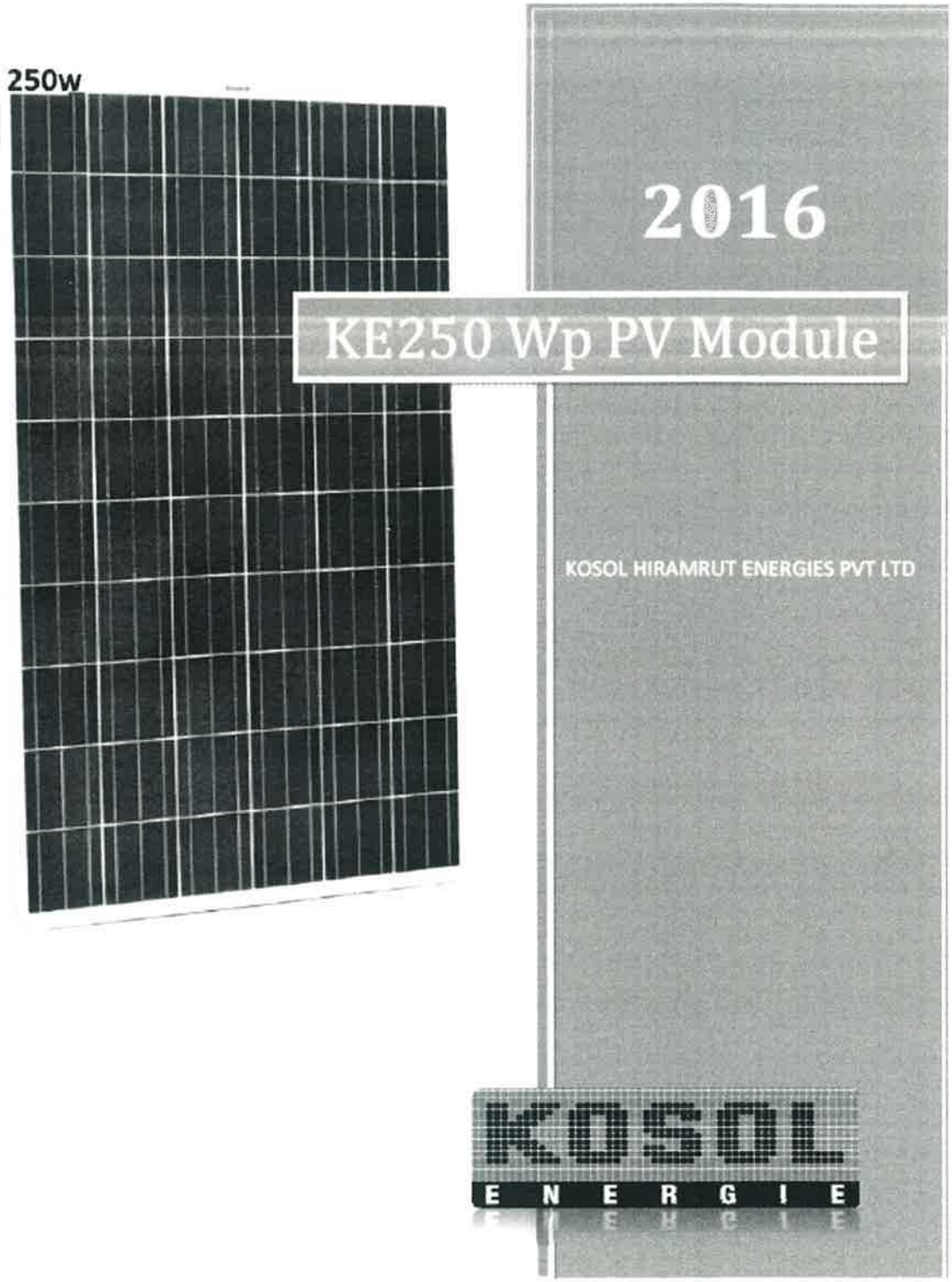
Appendix – D Specifications, Datasheets and White papers.

PV panel Specification



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TECHNICAL PARAMETERS

DATASHEET 1/2	
KE250	
Pmax	250
Vmax	30.93
Imax	8.09
Voc	37.68
Isc	8.63
Module Dim.(L X W X H) in mm	1660 X 990 X 35
Mounting Hole Dim. (V & H) in mm	900 & 948
Weight	17.2
Cell Configuration	10 X 6

TECHNICAL PARAMETERS

DATASHEET 2/2	
KE250	
Maximum series fuse Rating	15 A
Application Classification	Solar pumps
cell type	poly crystalline
Frame	with frame
J-box	3 diodes
Cables	4mm2 1000V ,1000mm
Connectors	MC4
Temperature co-efficient of Pmax	-0.46±0.02
Temperature co-efficient of Voc	-0.34±0.01
Temperature co-efficient of Isc	0.07±0.02
NOCT	47 °C ± 2 °C

Pump Controller Specification

KISAN SOLAR

Datasheet iACQUA_280_5

Sinusoidal Pump Controller with MPPT (SPCM) iACQUA_280_5, 5Hp

S.No.	Parameters / Specifications	Range	Values	Remarks
1.	Input supply type			Photovoltaic (PV) panel only (with FF>0.65)
2.	Input PV Power capacity	3.5kW to 5.2kW		Input rated PV power at STC
3.	Output load type			AC Motor-pump load only
4.	Maximum output power capacity for motor load		5.5Hp	
5.	Output Voltage and frequency (Sine wave)	0 -280V AC Sine wave 0 – 50Hz		Governed by VbyF ratio upto rated motor voltage
6.	Extended frequency range	50 to 54Hz		Subject to motor pump set
7.	Controller input voltage (Voc)	300-375V		Maximum Absolute Voc allowed at inverter input is 395Vdc
	Minimum Input voltage		300	
	Nominal Input voltage		340	
	Maximum Input voltage		375	
8.	Input current range	8 to 19Amp		Isc of PV at STC
9.	Input connector			MC4 +/- PV connector
10.	Controller Grounding			At both input and output cable (Green coded)
11.	Input and output cabling		4 sqmm, multi-stranded Copper	
12.	Ripple and Distortion in voltage and current at rated power	-	Below 3%	For linear / balance motor load
13.	Insulation Resistance test	-	> 500MΩ @ 1000V applied for 1 minutes	At standard test condition

A-2 Ambica Bhavan, Near CERC, S.G.Highway, Thaltej, Ahmedabad 380054
Email: info@kisansolar.com Web: www.kisansolar.com

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KISAN SOLAR

14.	Low irradiation mode protection			Provided
	Dry run protection			Provided
	Reverse polarity protection			Provided
	Short Ckt protection			Provided
	Open Ckt Protection			Provided
15.	Data logging and remote monitoring			Provided on customer demand
16.	Auto Turn On / Auto Turn Off			Provided
17.	Energy Efficiency Tests of the Controller at Nominal Input PV Voltage (340V)			Typical at standard test condition
	At 25%of input power		92.0%	
	At 50%of input power		94.0%	
	At 75%of input power		94.8%	
	At 100%of input power		95.0%	
18.	Average MPPT tracking efficiency (%) @ duty point of motor	> 99.5%		
19.	Output voltage THD at rated Ppv		1.75%	
20.	Maximum crest factor		1.44	At standard test condition

A/2 Arshiya Bhavan, Near CEPC, S G Highway, Thaltej, Ahmedabad 380054
Email: info@kisansolar.com Web: www.kisansolar.com

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Pump Specification

ansons

ANSONS OPENWELL SUBMERSIBLE PUMPSET

EXCLUSIVELY FOR SOLAR PUMPING SYSTEM

TYPE	:	OPENWELL SUB.(WET)
MODEL NO.	:	ASOP 520
DEL SIZE	:	65mm
DUTY POINT VALUES	:	
HEAD	:	21 M
DISCHARGE	:	11 LPS
KW / HP	:	3.7 / 5
OVERALL EFFICIENCY	:	50 %
NO. OF STAGES	:	ONE
OPERATING HEAD RANGE	:	13 - 24 M
DISCHARGE RANGE	:	14.1 – 9.1 LPS
MIN. SUB	:	0.3 M
IPKW		
VOLTS	:	280 ± 10 %
PHASE	:	3
FREQUENCY	:	50 Hz
MAX CURRENT	:	13.25 AMPS
RPM	:	2850
DUTY	:	S1
CONNECTION	:	Y

NOTE: PUMP SHOULD NOT RUN WITHOUT WATER

ANSONS ELECTRO MECHANICAL WORKS

PALGHAR – 401 404 – INDIA

C.EX.NO. : AABFA2930JEM004

UNDER TEST CONDITIONS WHEN TESTED IN ACCORDANCE WITH RELEVANT IS NO. THE ACTUAL ENERGY CONSUMPTION WILL DEPEND ON HOW THE EQUIPMENT IS BEING USED.

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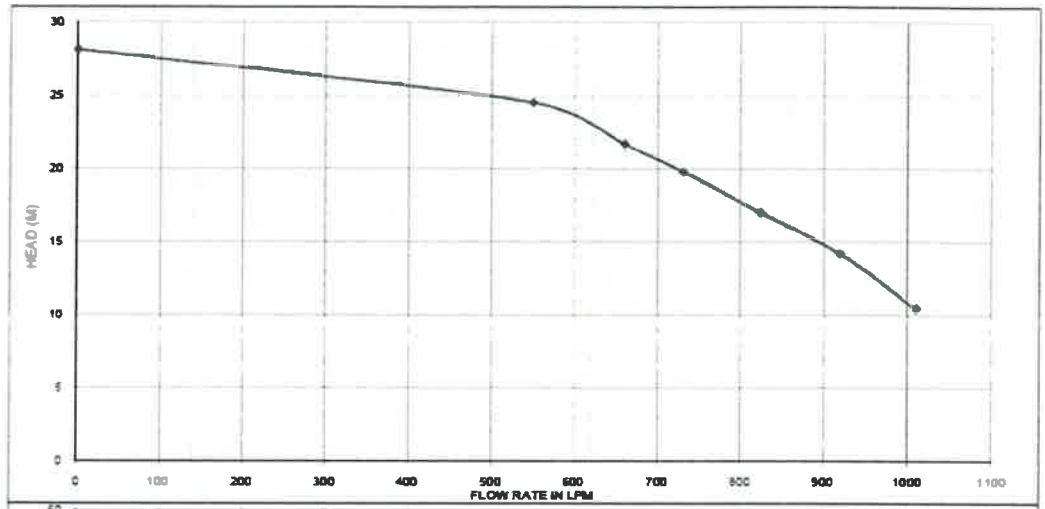
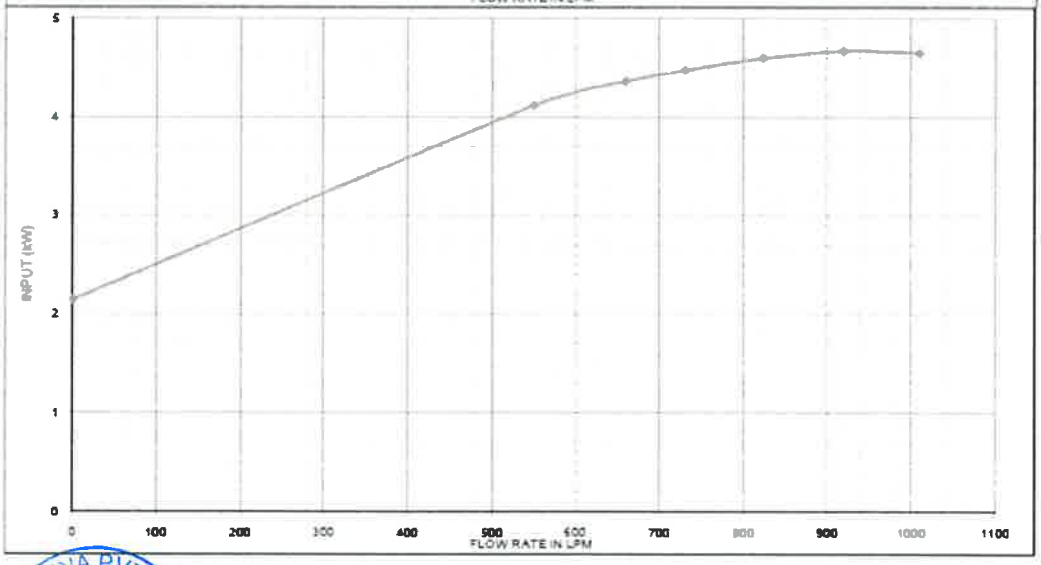
Reviewed by signature:

Ansons Electro Mechanical Works
Palghar.

5HP X 2800 RPM TYPE : ASOP 520 80 X 65 mm 280V





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Equipment and Calibration details

Test Equipment	Model No.	Serial No.	Manufacturer	Calibration status (Valid up to)
Solar Array Simulator	62150H-1000S	-	Chroma	16/4/2016
DC Power Supply	Gen1500W	-	TDK-Lambda	28/5/2016
Pressure Transmitter	2051TG	-	Emerson	5/5/2016
Flow Transmitter	2051CF	-	Emerson	5/6/2016
Pressure Control Valve	SD2000	-	Pneucon	(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******

UL INDIA PVT. LTD. BANGALORE-560 099