ELECTRICAL RESEARCH AND DEVELOPMENT ASSOCIATION

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TEST REPORT

NAME & ADDRESS OF CUSTOMER M/s. Ganesh Electricals G-14 Chinmay Tower, Nr. Subhash Chawk, Gurukul Road, Memnagar, Ahmedabad-380052.	**REPORT NO.:** RP-1718-049176 **DATE:** 02/01/2018	
	CUSTOMER'S REF. NO.: Not Specified **DATE:** 22/11/2017	
	DATE OF SAMPLE RECEIPT:	**DATE OF TESTING:**
	24/11/2017	28/12/2017 to 02/01/2018

SAMPLE DESCRIPTION: Solar PV water pumping system. **Pump System:** Pumpset Sr. No. (from name plate): KBOAG2685, Model no.: DRS-100/5, Type: Submersible, Rating: 5.00 HP, Manufacturer: FALCON PUMPS PVT. LTD. **PV Module:** Model no.: KE315, No. of cell in module: 72, Type of module: Multi crystalline, Power: 315 Wp, Module efficiency: 16.47 %, Manufacturer: KOSOL ENERGIE. **Array:** No. of module in series: 16, Array Capacity: 5000 Wp. **Enclosure:** Enclosure model: AT-5R5G-3-F, IP code: IP54. Enclosure Sr. No. (from name plate): 2017N0738. **Controller:** VFD Sr. no. (from name plate): M76A236A0009AG, VFD Model (from name plate): FRN0011C2S-4SL, VFD Manufacturer (from name plate): Fuji Electric. **Submitted By (System integrator):** M/s Ganesh Electricals	**SAMPLE IDENTIFICATION:** Pumpset Sr. No.: KBOAG2685 **ERDA SAMPLE CODE NO.:** ERDA-00233165

TEST DETAILS	**TEST SPECIFICATION**
Performance test of solar PV water pumping systems	As per customer requirements

Test results: As per enclosure.

Remarks: This pumping system Conforms to the requirements as specified by customer.

Enclosure: Sample photo as per Annexure 1.

Prepared by	**Checked by**	**G. B. Brahmbhatt** **Approved By**

NOTE:

1. This report relates only to the particular sample received for testing in good condition at ERDA, Vadodara.
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Report No.: RP-1718-049176
Date : 02/01/2018

TEST RESULTS:

Sr. No.	Particular of tests & Cl. No.	Requirement as per specification	Obtained Value	Remarks
1.	**PV Module/Array**			
	- Array capacity at STC	5000 Wp	5013.295 (As per sheet no. 6 of 7 & 7 of 7)	Satisfactory
	- Peak power output of SPV module under STC	315 Wp	Nominal module wattage 315 Wp	Satisfactory
		Module mismatch in array should be Within 3 %	0.75 %	
		Array total wattage mismatch should be within +10 %	2.99 %	
	- Type of module	The indigenously produced PV module should be mono/multi crystalline silicon solar cell.	Multicrystalline	Satisfactory
	- Certification of PV module	Module should be as per IEC 61215 & IEC 61730 part-1 & 2, the module should be properly laminated and hermetically sealed.	As per UL test certificate no. ULI-NABL(ELT)-MNRE-0057/2013 dated: 02/05/2013	Satisfactory
	- Module should be tested for Potential Induced Degradation test at 85°C and 85%RH for 3 cycles of 96 Hours	Micro crack shall not develop in module & power at STC shall not drop by more than 5%.	As per UL test certificate no. 4787425867.4.2-S1 dated: 04/11/2016	Satisfactory
	- Efficiency	The efficiency should be more than 14 %	As per sheet no. 6 of 7 & 7 of 7	Satisfactory
	- Fill factor	Should be more than 70 %	As per sheet no. 6 of 7 & 7 of 7	Satisfactory
	- Terminal box on the module	The terminal box in the module should have a provision for opening for replacing the cable.	Provided	Satisfactory

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TEST RESULTS:

Sr. No.	Particular of tests & Cl. No.	Requirement as per specification	Obtained Value	Remarks
	- Name plate of module	The name plate fixed inside the module should have a. Name of manufacturer or Distinctive logo	KOSOL ENERGIE	Satisfactory
		b. Model Number	KE315	
		c. Serial Number	As per sheet no. 6 of 7 & 7 of 7	
		d. Year of manufacture	2017	
		e. Made In India	Made in India	
2.	**MOTOR AND PUMP DETAILS**			
	- Capacity	5 HP	5 HP	Satisfactory
	- Type of Pump	Submersiblle	Submersible	Satisfactory
	- Operation	AC	AC	Satisfactory
	- Material	All external parts of pump & motor used in submersible pump which are in contact with water are made of stainless steel.	Provided	Satisfactory
	- Name plate of pumpset	a. Name of the manufacturer of Distinctive logo	Falcon	Satisfactory
		b. Model number	DRS 100/5	
		c. Serial number	KBOAG2685	

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TEST RESULTS:

Sr. No.	Particular of tests & Cl. No.	Requirement as per specification	Obtained Value	Remarks
3.	**Electronics and Protection**			
	- IP 54 Protection	Enclosure should be IP 54 protected	As per ERDA test report no: RP-1617-033672, dated: 19/10/2016	Satisfactory
	-Remote Monitoring Facility	The following parameters shall be provided 1) Daily Water Output 2) Power generated by the PV array 3) Up time of the pump during the year 4) No. of days the pump was unused or under breakdown/repairs Should be modular for easy replacement	Provided	Satisfactory
	- Against dry running	Protection against dry running shall be provided	Provided	Satisfactory
	- Against open circuit and short circuit	Protection against OC & SC shall be provided	Provided	Satisfactory
	- Against reverse polarity	Protection against reverse polarity shall be provided	Provided	Satisfactory
4.	**Tracking system**	Manual/Passive/ auto tracking system	Manual (3 times a day)	Satisfactory

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TEST RESULTS:

Sr. No.	Particular of tests & Cl. No.	Requirement as per specification	Obtained Value	Remarks
5.	**I) Testing of complete SPV pump with PV array Simulator** **A) Hot Profile** - Output of water at per watt peak at average daily solar radiation of 7.15 kWh/m^2 at a total head of **50 m. [Litre/Wp]**	≥ 19	19.78	Conforms
	- Average output of water per day at average daily solar radiation of 7.15 kWh/m^2 at a total head of **50 m. [Litre]**	≥ 95000	97758	
	- Shut off dynamic head **[m]**	≥70	83.63	
	B) Cold Profile - Output of water at per watt peak at average daily solar radiation of 7.15 kWh/m^2 at a total head of **50 m. [Litre/Wp]**	≥ 19	22.44	
	- Average output of water per day at average daily solar radiation of 7.15 kWh/m^2 at a total head of **50 m. [Litre]**	≥95000	110920	
6.	**Others**			Satisfactory
	- Design of PV array	Should be modular for easy replacement	Provided	
	-DC/AC switch	Required	Provided	
	- Connection cable	Required	Provided	

Comments: **The Water pumping system sample was tested at M/s. Electrical Research and Development Association at total head of 50 meters with PV array simulator & using actual PV array and the obtained water Output at average daily solar irradiance of 7.15kWh/sq.m**
1) Cold profile: 97758 Litre per Day
2) Hot profile: 110920 Litre per Day

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Report No.: RP-1718-049176
Date : 02/01/2018

Peak wattage of individual PV modules tested at M/s. Electrical Research and Development Association, Vadodara
Model no: KE315

Sr. No.	Test report no. and Date	Module ID	Voc [V]	Isc [A]	P max [Wp]	Vp max [V]	Ip max [A]	Fill factor [%]	Efficiency [%]
1.	RP-1718-047138, Dated: 22/12/2017	KE3151861708686	45.869	8.678	316.284	37.519	8.163	76.9	15.785
2.		KE3151861708687	45.915	8.685	309.338	37.766	8.191	77.6	15.942
3.		KE3151861708688	45.807	8.669	309.115	37.534	8.236	77.8	15.930
4.		KE3151861708689	45.832	8.676	317.980	37.636	8.183	77.4	15.872
5.		KE3151861708690	45.784	8.683	318.204	37.584	8.200	77.5	15.884
6.		KE3151861708691	45.811	8.684	317.820	37.944	8.112	77.4	15.864
7.		KE3151861708692	45.768	8.693	318.727	37.767	8.175	77.6	15.910
8.		KE3151861708693	45.817	8.707	309.617	37.539	8.248	77.6	15.956

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Peak wattage of individual PV modules tested at M/s. Electrical Research and Development Association, Vadodara
Model no: KE315

Sr. No.	Test report no. and Date	Module ID	Voc [V]	Isc [A]	P max [Wp]	Vp max [V]	Ip max [A]	Fill factor [%]	Efficiency [%]
9.	RP-1718-047138, Dated: 22/12/2017	KE3151861708694	45.763	8.725	310.017	37.760	8.210	77.6	15.977
10.		KE3151861708695	45.781	8.707	317.604	37.528	8.197	77.2	15.853
11.		KE3151861708696	45.864	8.667	309.891	37.972	8.161	78.0	15.970
12.		KE3151861708697	45.845	8.710	318.529	37.663	8.192	77.3	15.900
13.		KE3151861708698	45.937	8.703	310.921	37.769	8.232	77.8	16.024
14.		KE3151861708699	45.776	8.702	309.062	37.465	8.249	77.6	15.928
15.		KE3151861708700	45.887	8.693	309.729	37.695	8.217	77.7	15.962
16.		KE3151861708701	46.005	8.687	310.457	37.949	8.181	77.7	16.000

Quantity of Modules: 16 Nos.
Total Power: 5013.295 Wp.

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Annexure 1

Report No.: RP-1718-049176
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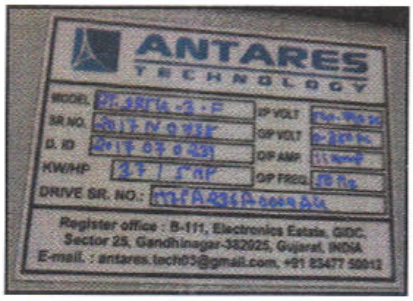
Solar Pumpset

Pumpset Name Plate

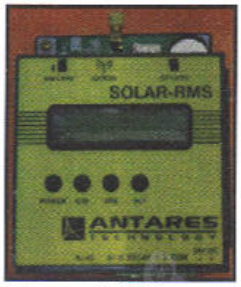
Enclosure



Enclosure Name Plate

VFD

VFD Name plate



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Annexure 1

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Photograph of marking of Photovoltaic Module

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Annexure 1

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Photograph of marking of Photovoltaic Module

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Annexure 1

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Photograph of marking of Photovoltaic Module

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