Si'Tarc®
SCIENTIFIC AND INDUSTRIAL TESTING AND RESEARCH CENTRE
(Formerly Small Industries' Testing and Research Centre)
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TEST REPORT

Test Report No.	:	11 0499
Date	:	13.12.2019
Page No.	:	1 of 19
Location of Testing	:	SCIENTIFIC AND INDUSTRIAL TESTING AND RESEARCH CENTRE (Si'Tarc) 83 & 84, Avarampalayam Road COIMBATORE – 641 006.
Service Requested by	:	M/s Tag Solar System LLP D 54 Subhash Marg, Chomu House, C-Scheme, Jaipur- 302 001.
Customer Doc. Ref. No. & Date	:	--, 05.12.2019
Item Description	:	3.7 kW/ 5.0 HP Universal Solar Pump Controller
Sample Identification Details Grade/Variety/Type/Size/Class. Batch No./Date of Manufacturing	:	Model: KISAN UNIVERSAL, S. No. 0719_4050_002007
Item Received on	:	06.12.2019
Seal/Signature	:	-
Si'Tarc Invoice No. & Date	:	Invoice No. 2661/19-20 Date: 13.12.2019 M/s Tag Solar System LLP D 54 Subhash Marg, Chomu House, C-Scheme, Jaipur- 302 001.
Any Other Information	:	Test as per Ministry of New and Renewable Energy Testing Procedure for Universal Solar Pump Controller (USPC) Annexure-iii of circular no. F. No. 41/3/2018-spv division dated 17.7.2019.

Issued By

R. JEYABHARATHI
Manager (Customer care)

Scientific and Industrial Testing and Research Centre ★ Si Tarc

Authorised By

A M SELVARAJ
Joint Director

TEST REPORT FOR UNIVERSAL SOLAR PUMP CONTROLLER

MINISTRY OF NEW AND RENEWABLE ENERGY

UNIVERSAL SOLAR PUMP CONTROLLER (USPC) SPECIFICATIONS FOR STAND-ALONE APPLICATIONS

Annexure-III of Circular No. F. No. 41/3/2018-SPV Division dated 17.7.2019

1.0 DETAILS OF THE SAMPLE

Name of the Sample	UNIVERSAL SOLAR PUMP CONTROLLER				
Rating in kW / HP	3.7 / 5.0	Volts (Nom)	350V	Sl.No	0719_4050_002007
Make	KINETICA SOLAR PVT LTD			Model No	KISAN UNIVERSAL
Description of the sample and specified requirements as received in data sheet enclosed with customer's Letter.					

2.0 SUPPLEMENTARY INFORMATION

2.1	Test Method	As per Ministry of new and Renewable Energy Testing Procedure for Universal Solar Pump Controller (USPC) Annexure-iii of circular no. F. No. 41/3/2018-spv division dated 17.7.2019			
2.2	Above sample as received in physically satisfactory condition.				
2.3	Only the tests requested by the customer have been carried out.				
2.4	The specified ambient conditions were maintained during the test.				
2.5	The tests declared in the Sl.No (--) are/were sub contracted according to the established procedure of this laboratory.				
2.6	Reference to the sampling procedure, wherever applicable			NIL	
2.7	Supporting documents for the measurements taken and results derived like graphs, tables, sketches and / or photographs as appropriate to test report, if any (to be attached)			Page. No 10 of 19 to Page. No 19 of 19	
2.8	Deviations from test methods are prescribed in relevant IS / Work instruction if any			NIL	
2.9	Measurement of uncertainty of test equipment is considered while testing				
2.10	"(see remark #)" refers to a remark appended to the report,"(see appended table)" refers to a table appended to the report.				
2.11	Under the test results the following indication (PASS, FAIL, N/A,"----') is marked against suitably.				
	Test item does meet the requirement	PASS	Test item does not meet the requirement		FAIL
	No Pass / Fail Decision Taken	"----"	Test case does not apply to the test object		N/A

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3.0 TEST DETAILS

SL.NO.	NAME OF THE TEST	TEST AS PER
3.1.	Selection and automatic operation of different solar based agriculture application	As per MNRE Testing Procedure for Universal Solar Pump Controller (USPC)
3.2.	Total Harmonics Distortion test	-DO-
3.3.	Protection(s) tests	-DO-
3.4.	Remote Monitoring	-DO-
3.5.	Measurement of Dynamic MPPT efficiency	-DO-
3.6.	Measurement of Converter efficiency	-DO-
3.7.	Torque observation on rated motor power	-DO-

4.0 TEST RESULTS

4 A SELECTION AND AUTOMATIC OPERATION OF DIFFERENT SOLAR BASED AGRICULTURE APPLICATION

SL.NO.	NAME OF THE TEST	SPECIFICATION / TEST REQUIREMENTS	TEST RESULTS	REMARKS
1.	Application description on screen and selection of applications	LCD screen provided on controller shows various applications which can be selected by keypad using up-down and enter key.	Provided	
2.	Automatic operation of applications	Universal solar Agriculture controller comes with multiple outputs which can be permanently connected to the application by selecting appropriate options of the following application Automatically started • Water Pumping • Chaff Cutter • Atta Chakki • Deep fridge/ Cold storage/ Compressor No manual change over required	Provided, No manual change over observed in USPC	At a time, single application operates by the selection among all the connected applications
3.	Application Specific output (Application specific software)	USPC should have inbuilt individual application specific software to run the agrarian applications other than pumps	Provided	USPC is found to have satisfactory operation for above applications

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4.0 TEST RESULTS

4 A	SELECTION AND AUTOMATIC OPERATION OF DIFFERENT SOLAR BASED AGRICULTURE APPLICATION			
SL.NO.	**NAME OF THE TEST**	**SPECIFICATION / TEST REQUIREMENTS**	**TEST RESULTS**	**REMARKS**
		and output of the controller should be suitable for above mentioned applications		
4.	Overload torque test.	Up to 150% of rated torque of the connected motor.	Satisfactory	Ref Table – 8
5.	Constant torque test	Constant Load given to motor within 100% of rated torque of the motor	Satisfactory	Ref Table – 7
6.	Constant power test	At variable load i.e. from No load to 150%	Satisfactory	Ref Table – 8
7.	Quadratic load test	Load given to motor within 100% of rated torque of the motor	Satisfactory	Ref Table – 2
8.	Impact load test	Load given to motor within 150% of rated torque of the motor	Satisfactory	Ref Table – 8
9.	Hydraulic load test	Load given to pump set having rated capacity of the controller.	Satisfactory	Ref Table – 2

4B	APPLICATION: SOLAR WATER PUMPING			
SL.NO.	**NAME OF THE TEST**	**SPECIFICATION / TEST REQUIREMENTS**	**TEST RESULTS**	**REMARKS**
1.	Input voltage range Minimum- Voc at STC Nominal - Voc at STC Maximum – Voc at STC	 280 V 350 V 420 V	Tested on 280,350,420 VOC	Satisfactory Ref Table – 1, 2 and 3
2.	Ripple and Total Harmonic distortion at output on full load	Below 3%	< 2.57 %	Satisfactory Ref Table 1, 2 and 3
3.	Insulation resistance	700 M ohm 500 V applied for 1 minute	810 MΩ @ 500V applied for 1 minute	Observed at 29°C & 80% RH
4.	Output Voltage (Sine Wave)	Three phase output with up to 400 V rms pure Sine Wave	Sin Wave CFU 1.47	Satisfactory

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5.	Low radiation mode protection	Provided		Observed	USPC shutdown at the low radiation if power is not sufficient to drive the particular application and indicates low radiation and Voc value on LCD and operation RANGE for Voc
6.	Dry run protection	Provided		Observed	Shutdown and Dry run protection on LCD
7.	Reverse Polarity Protection	Provided		Observed	Satisfactory
8.	Short Circuit protection	Provided		Observed	Satisfactory
9.	Open circuit protection	Provided		Observed	Satisfactory
10.	Remote monitoring	Provided		Built in RMU Observed with data storage	Satisfactory (Ref photograph – 2)
11.	Average MPPT tracking efficiency in Hot profile	To be measured		99.6%	Hot profile operated with 350 Voc and 4800 Wp array
12.	Average MPPT tracking efficiency in Cold Profile	To be measured		99.8%	Cold profile operated with 350 Voc and 4800 Wp array
13.	Output voltage THD at rated PV	To be measured		< 2.3%	Satisfactory
14.	Instantaneous output voltage and voltage spikes	Sinusoidal & no voltage spikes		Observed	Satisfactory
15.	Crest Factor in output at rated PPV	1.6 maximum		CFU: 1.47 CFI: 1.48	Satisfactory Ref Photograph No. 1
16.	Efficiency Tests of the Controller at Voc 350 V To be Measured	Controller Efficiency (%)	MPPT Efficiency (%)	Overall charge controller Efficiency (%) Ref Table - .2	
16.1.	At 10% of input power	78.82	99.5	78.43	
16.2.	At 25% of input power	90.74	99.3	90.11	
16.3.	At 50% of input power	92.54	99.6	92.17	
16.4.	At 75% of input power	93.22	99.9	93.13	
16.5.	At 100% of input power	93.27	99.9	93.18	

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4C.	APPLICATION: SOLAR BASED CHAFF CUTTER			
SL.NO.	NAME OF THE TEST	SPECIFICATION / TEST REQUIREMENTS	TEST RESULTS	REMARKS (REF. TABLE – 4)
1.	Input PV voltage range Minimum-Voc at STC Nominal- Voc at STC Maximum-Voc at STC	 280 V 350 V 420 V	Observed	Satisfactory
2.	Output voltage waveform	Sinusoidal at rated conditions 380 to 400 V Ac rms	Observed	Satisfactory
3.	Input PV power range P Nominal	4800 Watts STC	Tested with 4800 Wp	Satisfactory
4.	Motor Rating	2 hp, 3 Phase, 50 Hz, 4 pole, 1440 RPM	2 hp	Loads as per chaff cutter load
5.	Continuous operation started @ power output from array	To be measured	1716 Wp	Operation starts at 50 Hz above this power with chaff cutter loading
6.	Cutter rotation speed for 4 pole type Motor	To be measured	1434-1442 RPM at motor pully	Satisfactory
7.	DC power in loading condition	To be measured	1054-1739 Wp	Totally depended on loading condition
8.	Cutter Operation at different output from 4800 Wp array At 40% Power At 50% Power At 75% Power At 100% Power	To be measured (cutter will not stop functioning)	Observed	Above 1054 Wp output from array chaff cutter operates satisfactory, else low radiation protection shutdown system and display on LCD
9.	Production Rate	kg/ hour	840 kg/hour	Produced 14 kg in 1 minute
10.	Total circuit protection	Provided	Observed	Soft Start up, low radiation protection
11.	Overload protection	Provided	Observed	Satisfactory
12.	Short Circuit protection	Provided	Observed	Satisfactory
13.	Open circuit protection	Provided	Observed	Satisfactory
14.	Reverse polarity protection	Provided	Observed	Satisfactory
15.	PV source operating condition during cutter operation	Operates in constant voltage of PV curve	Constant	Satisfactory

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4C.	APPLICATION: SOLAR BASED CHAFF CUTTER			
SL.NO.	NAME OF THE TEST	SPECIFICATION / TEST REQUIREMENTS	TEST RESULTS	REMARKS (REF. TABLE – 4)
16.	Cutter acceleration	Smooth	Soft start provided	Satisfactory

4 D	APPLICATION: SOLAR BASED COLD STORAGE/ DEEP FRIDGE/ COMPRESSOR			
SL.NO.	NAME OF THE TEST	SPECIFICATION / TEST REQUIREMENTS	TEST RESULTS	REMARKS (REF TABLE - 5)
1.	Input PV voltage range Minimum-Voc at STC Nominal-Voc at STC Maximum-Voc at STC	 280 V 350 V 420 V	Observed	Satisfactory
2.	Output voltage waveform	Sinusoidal at rated conditions 380 to 400 V Ac rms	Observed	Satisfactory
3.	Input PV power range P Nominal	4800 Watts STC	Tested with 4800 Wp	Satisfactory
4.	Compressor rating	Capacity 220 litre,	Volume 220 litre	
5.	Motor rating	4 hp, 3 Phase, 50 Hz, 4 pole, 1440 RPM	4 hp	
6.	Continuous operation started @ power output from array	To be measured	1837 Wp	Satisfactory operation starts at 50 Hz above this power with compressor loading
7.	Compressor operation at different output from 4800 Wp array At 40% Power At 50% Power At 75% Power At 100% Power	To be measured (Compressor will not stop functioning)	Observed	Above 1086 Wp output from array compressor operates satisfactory, else low radiation protection shutdown system and display on LCD
8.	Time Required for Air Pressure (0 to 10 bar)	In minute	7 minutes and 10 second	Electrical observation continuous operation found after 1086 Wp
9.	Total circuit protection	Provided	Observed	Soft Start up, low radiation protection
10.	Short Circuit protection	Provided	Observed	Satisfactory

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4 D	APPLICATION: SOLAR BASED COLD STORAGE/ DEEP FRIDGE/ COMPRESSOR			
SL.NO.	NAME OF THE TEST	SPECIFICATION / TEST REQUIREMENTS	TEST RESULTS	REMARKS (REF TABLE - 5)
11.	Open circuit protection	Provided	Observed	Satisfactory
12.	Reverse polarity protection	Provided	Observed	Satisfactory
4 E	**APPLICATION: SOLAR BASED ATTA CHAKKI**			
SL.NO.	**NAME OF THE TEST**	**SPECIFICATION / TEST REQUIREMENTS**	**TEST RESULTS**	**REMARKS (REF TABLE -6)**
1.	Input PV voltage range Minimum-Voc at STC Nominal-Voc at STC Maximum-Voc at STC	 280 V 350 V 420 V	Observed	Satisfactory
2.	Output voltage waveform	Sinusoidal at rated conditions 380 to 400 V Ac rms	Observed	Satisfactory
3.	Input PV power range P Nominal	4800 Watts	Tested with 4800 W/p	Satisfactory
4.	Atta Chakki type	14 inches, open hopper store type, Production rate 14 to 18 kg/hour wheat flour, hopper size 15 to 20 kg	Observed	16 kg/hour
5.	Atta Chakki motor	4 hp, 3 Phase, 50 Hz, 2 pole, 2820 RPM	4 hp	Loads as per Atta Chakki load
6.	Continuous operation started @ power output from array	To be measured	3897 Wp	Operation starts at 50 Hz above this power for full loading
7.	Rotation speed	To be measured	Motor: 2894 RPM	Satisfactory
8.	Atta Chakki operation at different output from 4800 Wp array At 40% Power At 50% Power At 75% Power At 100% Power	To be measured (Atta Chakki will not stop functioning)	Observed	Above 1003 Wp output from array Atta Chakki operates at full load satisfactory, else below low radiation protection shut downs the system and display on LCD
9.	Production rate with wheat	kg/ hour	16 kg/hour	Produced 8.0 kg in 30 minutes
10.	Total circuit protection	Provided	Observed	Soft Start up, low radiation protection
11.	Overload protection	Provided	Observed	Satisfactory

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4 D	APPLICATION: SOLAR BASED COLD STORAGE/ DEEP FRIDGE/ COMPRESSOR			
SL.NO.	NAME OF THE TEST	SPECIFICATION / TEST REQUIREMENTS	TEST RESULTS	REMARKS (REF TABLE - 5)
12.	Short Circuit protection	Provided	Observed	Satisfactory
13.	Open circuit protection	Provided	Observed	Satisfactory
14.	Reverse polarity protection	Provided	Observed	Satisfactory

DETAILS OF EQUIPMENTS USED AS LOAD				
S.NO.	EQUIPMENT USED	MODEL	SERIAL NO	REMARKS
1.	Motor and Pump (submersible)	Motor- 5 hp S.S. Pump- 20 stage S.S.	D152456	3 Phase
2.	Chaff Cutter	2 hp, 4 Pole	00400715001	3 Phase
3.	Compressor	4 hp, 4 Pole	12634	3 Phase
4.	Atta Chakki	4 hp, 4 Pole	SGV 1450	3 Phase

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TABLE 1	CONVERTER EFFICIENCY AT MINIMUM VOLTAGE (TESTED AT VOLTAGE AT 280 Voc)					
S.NO.	INPUT POWER %	10	25	50	75	100
1.	Udc-1-Total	235.9	219.6	223.4	217.7	224
2.	Idc-1-Total	1.84	4.96	9.73	14.93	19.37
3.	P-1-Total	425	1087	2171	3248	4337
4.	FreqU-Total (Hz)	18.09	28.21	36.60	42.28	46.71
5.	Uthd-2-Total	-	1.8	1.98	2.17	2.16
6.	Ithd-2-Total	-	2.54	2.13	1.84	1.87
7.	Uthd-3-Total	-	1.91	2.04	2.24	2.08
8.	Ithd-3-Total	-	2.37	1.74	1.43	1.49
9.	Uthd-4-Total	-	1.85	2.08	2.17	2.13
10.	Ithd-4-Total	-	2.33	1.69	1.60	1.78
11.	Urms-SigmaA-Total	147.6	225.2	289.9	332.7	365.7
12.	Irms-SigmaA-Total	3.95	4.57	5.76	6.93	8.06
13.	P-SigmaA-Total (W)	339	983	2001	2997	4009
14.	PF-SigmaA-Total	0.335	0.55	0.69	0.75	0.78
15.	S-SigmaA-Total (VA)	1009	1782	2899	3994	5108
16.	Q-SigmaA-Total (VA)	952	1490	2093	2665	3204
17.	Controller efficiency (%)	79..59	90.41	92.16	92.26	92.45
18.	Mppt efficiency (%)	99.2	99.5	99.6	99.8	99.9
19.	Overall system efficiency	78.95	89.96	91.79	92.08	92.36

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TABLE 2	CONVERTER EFFICIENCY AT NOMINAL VOLTAGE (TESTED AT VOLTAGE AT 350 Voc)					
S.NO.	LOAD %	10	25	50	75	100
1.	Udc-1-Total	258.5	275.4	265.4	274	276.9
2.	Idc-1-Total	1.68	3.96	8.12	11.89	14.98
3.	P-1-Total	433	1090	2154	3260	4148
4.	FreqU-Total (Hz)	17.99	28.22	36.53	42.37	46.26
5.	Uthd-2-Total	-	1.86	1.91	2.15	2.03
6.	Ithd-2-Total	-	2.16	2.06	1.94	1.92
7.	Uthd-3-Total	-	1.96	1.99	2.12	1.95
8.	Ithd-3-Total	-	2.55	1.80	1.53	1.55
9.	Uthd-4-Total	-	1.92	2.00	2.16	1.98
10.	Ithd-4-Total	-	2.52	1.73	1.70	1.87
11.	Urms-SigmaA-Total	145.2	226.4	290.3	334.6	358.6
12.	Irms-SigmaA-Total	3.87	4.58	5.76	6.96	7.94
13.	P-SigmaA-Total (W)	334	990	1990	3035	3856
14.	PF-SigmaA-Total	0.34	0.55	0.69	0.75	0.78
15.	S-SigmaA-Total (VA)	972	1800	2900	4032	4933
16.	Q-SigmaA-Total (VA)	915	1500	2110	2675	3115
17.	Controller efficiency (%)	78.82	90.74	92.54	93.22	93.27
18.	Mppt efficiency (%)	99.5	99.3	99.6	99.9	99.9
19.	Overall system efficiency	78.43	90.11	92.17	93.13	93.18

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TABLE 3	CONVERTER EFFICIENCY AT MAXIMUM VOLTAGE (TESTED AT VOLTAGE AT 420 Voc)					
S.NO.	LOAD %	10	25	50	75	100
20.	Udc-1-Total	294.4	311.2	306.8	329.2	323.9
21.	Idc-1-Total	1.46	3.44	6.92	9.91	13.41
22.	P-1-Total	412	1067	2119	3261	4340
23.	FreqU-Total (Hz)	17.54	27.89	36.41	42.58	47.10
24.	Uthd-2-Total	-	2.09	1.98	2.15	2.16
25.	Ithd-2-Total	-	2.43	2.09	1.95	1.97
26.	Uthd-3-Total	-	2.13	2.04	2.10	2.04
27.	Ithd-3-Total	-	2.57	1.74	1.51	1.66
28.	Uthd-4-Total	-	2.14	2.04	2.13	2.14
29.	Ithd-4-Total	-	2.03	1.66	1.72	1.89
30.	Urms-SigmaA-Total	142.8	223.8	288.8	336	367.6
31.	Irms-SigmaA-Total	3.97	4.53	5.72	6.97	8.12
32.	P-SigmaA-Total (W)	311	958	1968	3350	4060
33.	PF-SigmaA-Total	0.36	0.54	0.68	0.75	0.78
34.	S-SigmaA-Total (VA)	982	2757	2861	4056	5176
35.	Q-SigmaA-Total (VA)	934	1478	2086	2696	3252
36.	Controller efficiency (%)	75.47	89.81	92.89	93.55	93.56
37.	Mppt efficiency (%)	99.5	99.3	99.6	99.9	99.9
38.	Overall system efficiency	75.09	89.18	92.52	93.46	93.47

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TABLE 4	CHAFF CUTTER OPERATION						
S.NO.	POWER %	25	30	40	50	75	100
1.	Udc-1-Total	254.7	261.8	263.2	318.6	333.8	339.4
2.	Idc-1-Total	4.12	4.90	6.52	5.48	5.20	4.84
3.	P-1-Total	1054	1284	1716	1739	1720	1626
4.	FreqU-Total (Hz)	36.34	40.98	49.25	50.18	50.20	50.15
5.	Uthd-2-Total	2.09	2.01	2.04	2.06	2.05	2.11
6.	Ithd-2-Total	3.49	3.48	3.12	3.03	3.42	3.11
7.	Uthd-3-Total	1.59	1.51	1.67	1.64	1.69	1.72
8.	Ithd-3-Total	3.13	3.48	2.80	2.92	3.00	3.08
9.	Uthd-4-Total	2.00	1.89	1.98	1.99	2.02	2.09
10.	Ithd-4-Total	2.84	3.15	2.83	2.95	2.78	3.27
11.	Urms-SigmaA-Total	266.6	298.9	361.4	369.0	369.1	369.3
12.	Irms-SigmaA-Total	2.58	2.73	3.02	3.02	3.00	2.88
13.	P-SigmaA-Total (W)	968	1192	1583	1611	1597	1512
14.	PF-SigmaA-Total	0.81	0.83	0.83	0.83	0.83	0.81
15.	S-SigmaA-Total (VA)	1191	1435	1892	1933	1921	1845
16.	Q-SigmaA-Total (VA)	741	868	1129	1168	1163	1353
17.	Controller efficiency (%)	91.82	92.81	92.24	92.63	92.80	92.98
18.	Speed in rpm	1010	1174	1279	1434	1439	1442
19.	Torque in Nm	9.10	8.16	8.64	9.69	9.72	10.02

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TABLE 5	COMPRESSOR OPERATION						
S.NO.	POWER %	25	30	40	50	75	100
1.	Udc-1-Total	286.5	275.3	299.4	314.1	332.6	337.1
2.	Idc-1-Total	3.86	4.74	5.57	5.90	5.50	5.72
3.	P-1-Total	1086	1306	1667	1837	1807	1900
4.	FreqU-Total (Hz)	37.44	41.23	49.01	50.22	50.10	50.26
5.	Uthd-2-Total	2.35	2.23	2.07	2.19	2.19	2.11
6.	Ithd-2-Total	3.39	3.04	2.67	2.63	2.53	2.35
7.	Uthd-3-Total	2.06	1.91	1.74	1.67	1.84	1.78
8.	Ithd-3-Total	2.93	2.62	2.53	2.00	2.90	2.11
9.	Uthd-4-Total	2.31	2.17	2.04	2.10	1.77	2.03
10.	Ithd-4-Total	2.96	2.60	2.19	2.11	2.06	2.07
11.	Urms-SigmaA-Total	276.1	304.4	360.2	369.1	369.1	368.8
12.	Irms-SigmaA-Total	2.77	2.96	3.18	3.34	3.32	3.46
13.	P-SigmaA-Total (W)	1001	1205	1552	1699	1680	1775
14.	PF-SigmaA-Total	0.75	0.77	0.78	0.79	0.79	0.80
15.	S-SigmaA-Total (VA)	1321	1563	1905	2141	2123	2210
16.	Q-SigmaA-Total (VA)	899	1031	1250	1373	1363	1403
17.	Controller efficiency (%)	92.19	92.28	93.08	92.48	92.97	93.39

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TABLE 6	ATTA CHAKKI OPERATION						
S.NO.	POWER %	25	30	40	50	75	100
1.	Udc-1-Total	237.6	242.4	278.2	274.3	270.8	304.4
2.	Idc-1-Total	4.22	5.16	6.25	7.93	12.00	12.54
3.	P-1-Total	1003	1242	1739	2176	3253	3897
4.	FreqU-Total (Hz)	21.43	23.70	29.60	34.22	44.21	50.14
5.	Uthd-2-Total	1.53	2.11	1.80	1.70	1.55	1.67
6.	Ithd-2-Total	1.72	1.74	1.84	2.02	1.76	1.70
7.	Uthd-3-Total	1.55	2.18	1.77	1.55	1.31	1.44
8.	Ithd-3-Total	1.72	1.94	1.74	1.90	1.51	1.52
9.	Uthd-4-Total	1.55	2.26	1.93	1.82	1.57	1.71
10.	Ithd-4-Total	1.36	1.61	1.65	1.79	1.44	1.41
11.	Urms-SigmaA-Total	164.6	173.8	213.6	247.3	319.2	363.3
12.	Irms-SigmaA-Total	4.35	4.72	5.27	5.67	6.49	6.83
13.	P-SigmaA-Total (W)	938	1164	1638	2052	3070	3680
14.	PF-SigmaA-Total	0.80	0.81	0.83	0.84	0.85	0.85
15.	S-SigmaA-Total (VA)	1166	1424	1952	2432	3590	4300
16.	Q-SigmaA-Total (VA)	711	834	1095	1346	1950	2357
17.	Controller efficiency (%)	93.47	94.30	94.21	94.30	94.38	94.51
18.	Speed in rpm	1259	1356	1684	1954	2530	2894
19.	Torque in Nm	4.54	4.98	5.80	6.51	8.13	9.12

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TABLE 7	TORQUE OBSERVATION ON 5 HP MOTOR WITH DYNAMOMETER AS LOAD						
S.NO.	POWER %	25	30	40	50	75	100
1.	Udc-1-Total	223.3	260.1	279.6	286.6	272.2	293.6
2.	Idc-1-Total	4.3	4.9	6.2	7.5	11.9	14.8
3.	P-1-Total	953	1279	1743	2164	3256	4221
4.	FreqU-4-Total (Hz)	20.12	23.41	28.34	32.64	42.47	50.32
5.	Uthd-2-Total	1.87	1.88	1.63	1.50	1.53	1.41
6.	Ithd-2-Total	1.47	1.40	1.35	1.69	1.79	1.97
7.	Uthd-3-Total	1.88	2.01	1.70	1.49	1.17	1.30
8.	Ithd-3-Total	1.71	143	1.27	1.29	1.59	1.88
9.	Uthd-4-Total	1.88	2.03	1.80	1.62	1.54	1.44
10.	Ithd-4-Total	1.58	1.30	1.03	1.11	1.52	1.75
11.	Urms-SigmaA-Total	143.1	169.5	205.3	235.0	306.4	362.3
12.	Irms-SigmaA-Total	4.4	4.9	5.4	5.9	6.8	7.3
13.	P-SigmaA-Total (W)	893	1201	1644	2042	3088	3980
14.	PF-SigmaA-Total	0.82	0.83	0.84	0.85	0.86	0.86
15.	S-SigmaA-Total (VA)	1088	1441	1947	2402	3589	4614
16.	Q-SigmaA-Total (VA)	637	831	927	1327	1972	2770
17.	Controller efficiency (%)	93.75	93.94	94.33	94.40	94.85	94.29
18.	RPM	1119	1229	1589	1857	2408	2879
19.	Torque in Nm	4.41	4.83	6.52	6.47	8.52	9.83

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TABLE 8	TORQUE OBSERVATION ON 5 HP MOTOR WITH DYNAMOMETER AS LOAD						
S.NO.	LOAD %	25	50	75	100	125	150
1.	Udc-1-Total	340.9	333.57	324.82	301.0	263.6	264.1
2.	Idc-1-Total	4.18	6.71	9.12	13.11	16.28	16.27
3.	P-1-Total	1413	2240	2959	3946	4292	4298
4.	FreqU-4-Total (Hz)	50.13	50.15	50.24	50.31	39.95	39.72
5.	Uthd-2-Total	2.78	2.61	2.09	1.59	1.48	1.77
6.	Ithd-2-Total	4.72	3.12	2.58	1.58	1.19	0.96
7.	Uthd-3-Total	2.89	2.20	1.66	1.35	1.59	1.93
8.	Ithd-3-Total	4.52	2.79	1.98	1.25	1.13	0.90
9.	Uthd-4-Total	3.07	2.69	2.13	1.53	1.55	1.88
10.	Ithd-4-Total	4.22	2.51	1.74	1.43	1.17	0.95
11.	Urms-SigmaA-Total	372.5	368.5	365.9	363.1	284.2	253.3
12.	Irms-SigmaA-Total	3.18	4.26	5.34	6.92	9.40	10.52
13.	P-SigmaA-Total (W)	1296	2099	2789	3724	4049	4050
14.	PF-SigmaA-Total	0.63	0.77	0.81	0.85	0.87	0.88
15.	S-SigmaA-Total (VA)	2052	2719	3382	4355	4639	4619
16.	Q-SigmaA-Total (VA)	1605	1795	1949	2355	2150	2121
17.	Controller efficiency (%)	91.72	93.70	92.28	92.39	94.33	94.23
18.	RPM	2978	2959	2928	2898	2214	1921
19.	Torque in Nm	2.59	4.98	7.43	10.01	12.40	14.69

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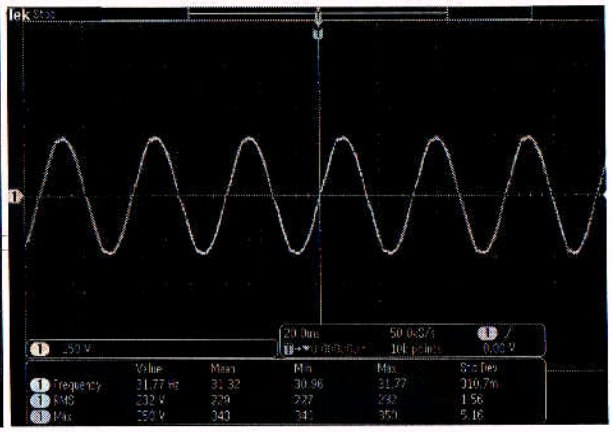
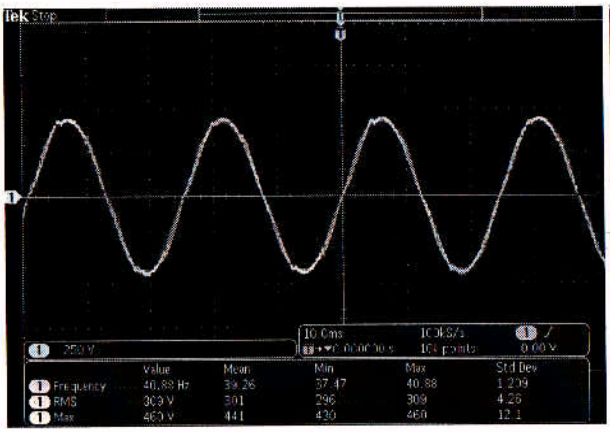
PHOTGRAPHS - 1 **OUTPUT WAVE OF USPC AT DIFFERENT RADIATION / POWER**

RADIATION 250 W/m^2

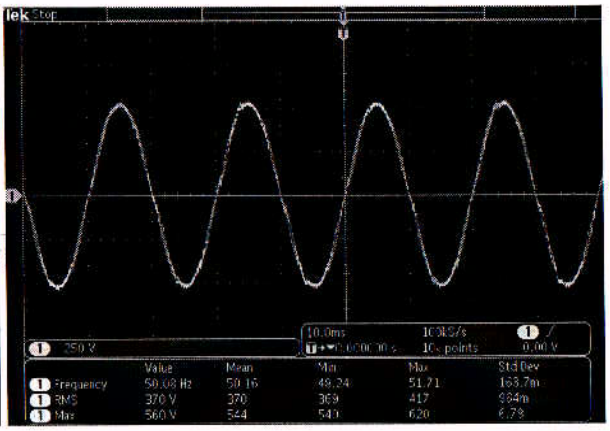
RADIATION 400 W/m^2



RADIATION 600 W/m^2



RADIATION 900 W/m^2



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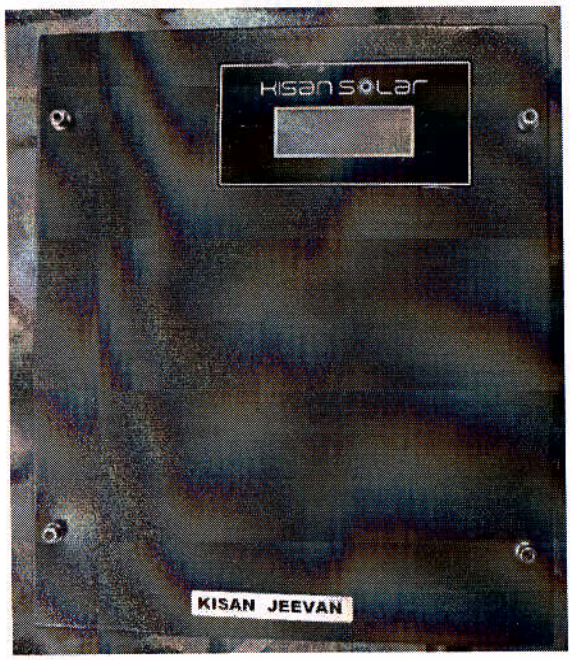
PHOTGRAPHS - 2

VISUAL INSPECTION OF USPC

FRONT VIEW



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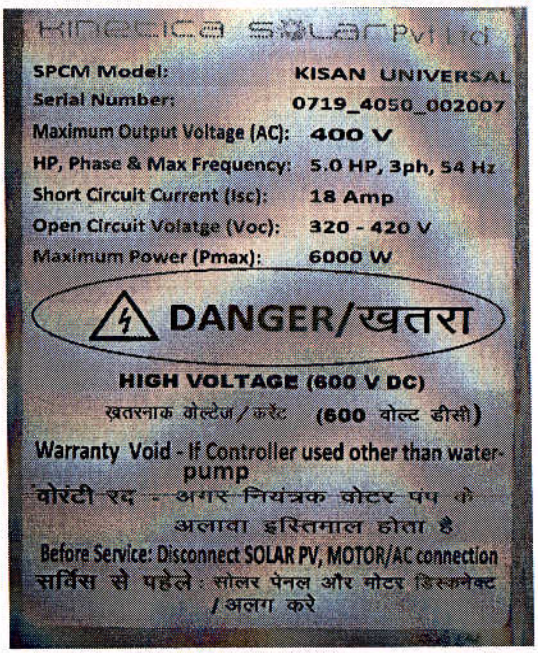
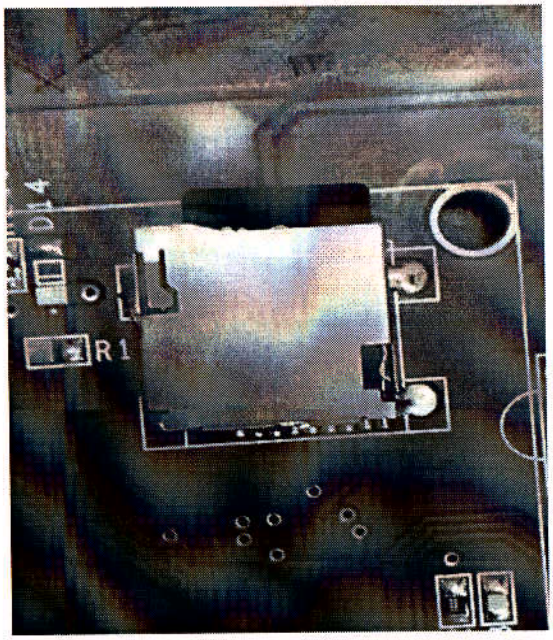


DATA STORAGE PROVISION



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