



HI PHYSIX
testing & calibration laboratory

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TEST REPORT

TEST REPORT AS PER IS 2993:1998

SRF No. 18020823

Name & Address of Customer: M/s. TIBREWALA ELECTRONICS LIMITED Plot No. 17, S.V. Co-op. Industrial Estate, Balanagar, Hyderabad – 500 037	Test Report No: HPLI/Test/1802082302		
	Date of Issue: 26/02/2018		
	Customer Ref. & Date: Letter dated January 31, 2018		
	Date of Sample Receipt: 02/02/2018	Start of Test Date: 06/02/2018	End of Test Date: 18/02/2018

PART A - PARTICULARS OF THE SAMPLE SUBMITTED

Sample description	A.C. MOTOR CAPACITORS
Grade/ variety/ type/ class/ size etc.	80 MFD $\pm 5\%$, 440VAC, SH-MPP, 50 Hz, 25/85/21
Declared values, if any	80 MFD, 440Vac, 50 Hz, SH, MPP, 25/85/21, Continuous, AC Motor Run, C, (P0)
Code no., BIS seal and IO's sign. if any	Nil.
Batch no., date of manufacture and Brand name	Date of manufacture: 02/01/2018
Quantity	120 Nos.
Condition of the sample	OK
Reference specification (s)	IS 2993:1998 (Tests have been carried out as per the customer's request)
Environmental conditions	Temperature (25\pm4)$^{\circ}$C & Relative Humidity<65%

PART B - SUPPLEMENTARY INFORMATION

- Deviations from the test methods as per relevant specification/ work instructions, if any : Nil
- Details of the drawings, graphs, tables, sketches or photographs as referred in the test report, if any: Nil
- Testing procedure according to work instruction HPLI03/Test-cap/WI-18 to 29.
- The Management System is maintained in accordance with IS/ISO/IEC 17025:2005 and testing Standards/Instruments are traceable to National/International Standards.

- Notes:**
- This report is not to be reproduced wholly or in part without our special permission in writing.
 - This report refers only to the particular sample detailed above.
 - The results reported in this certificate are valid at the time of and under the stipulated conditions of measurement.
 - Remnants of sample will be disposed off after 30 days of issue of the test report if no any further information is received.

Tested By

Checked By

Format No. P 17F04-00

For HI PHYSIX LABORATORY INDIA PVT. LTD.

Dr. M. N. Awatade
(Dy. General manager)
Approved By



PART C-TEST RESULT

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Sl. No.	TESTS WITH CLAUSE REFERENCE	SPECIFIED REQUIREMENTS	RESULTS																																																																																																
Routine test (46 No. of Capacitors)																																																																																																			
1.	Sealing Test (Cl. No. 2.4.1a) and 2.12 of IS 2993: 1998)	The capacitor shall be mounted in a position most likely to reveal leakage at a temperature 10°C of higher than the maximum permissible capacitor operating temperature for a time sufficient for all parts of the capacitor to reach this temperature. The capacitor shall be maintained at this temperature for a further hour before cooling. After the test capacitors shall be inspected for liquid leakage and distorted case. Liquids are allowed to wet the surface but not to form droplets.	N/A (Dry Capacitors)																																																																																																
2.	Voltage Test Between terminals (Cl. No. 2.4.1b) and 2.7 of IS 2993: 1998)	The capacitors shall withstand an a.c. voltage of 880V (twice of the rated voltage) between terminals for 2 seconds at 50Hz. No flashover or permanent breakdown shall occur.	Withstood & No Flashover																																																																																																
3.	Voltage Test Between terminals and case (Cl. No. 2.4.1c) and 2.8 of IS 2993: 1998)	No routine test is required if the case is made entirely of insulating material.	N/A																																																																																																
4.	Visual Examination (Cl. No. 2.4.1d) and 2.6 of IS 2993: 1998)	The condition, workmanship, marking and finish shall be satisfactory. The marking shall be legible during the life of the capacitor.	Satisfactory																																																																																																
5.	Capacitance Measurement (Cl. No. 2.4.1e) and 2.9 of IS 2993: 1998)	Testing shall be carried out at between 0.9 and 1.1 times the rated voltage and at the rated frequency. Measured at 440 V & 50Hz. (Declared Value: 80 MFD \pm 5%, i.e. Max. 84 MFD, Min. 76 MFD)	<table><tr><th>Capacitor No.</th><th>MFD</th><th>Capacitor No.</th><th>MFD</th></tr><tr><td>1</td><td>80.4</td><td>24</td><td>80.3</td></tr><tr><td>2</td><td>79.9</td><td>25</td><td>80.4</td></tr><tr><td>3</td><td>80.0</td><td>26</td><td>80.0</td></tr><tr><td>4</td><td>80.1</td><td>27</td><td>80.3</td></tr><tr><td>5</td><td>79.8</td><td>28</td><td>80.2</td></tr><tr><td>6</td><td>80.3</td><td>29</td><td>80.2</td></tr><tr><td>7</td><td>80.0</td><td>30</td><td>80.3</td></tr><tr><td>8</td><td>79.9</td><td>31</td><td>80.1</td></tr><tr><td>9</td><td>80.0</td><td>32</td><td>80.2</td></tr><tr><td>10</td><td>80.2</td><td>33</td><td>80.3</td></tr><tr><td>11</td><td>80.3</td><td>34</td><td>80.0</td></tr><tr><td>12</td><td>80.1</td><td>35</td><td>80.2</td></tr><tr><td>13</td><td>80.2</td><td>36</td><td>80.0</td></tr><tr><td>14</td><td>80.4</td><td>37</td><td>80.6</td></tr><tr><td>15</td><td>80.1</td><td>38</td><td>80.2</td></tr><tr><td>16</td><td>80.6</td><td>39</td><td>80.3</td></tr><tr><td>17</td><td>80.3</td><td>40</td><td>80.0</td></tr><tr><td>18</td><td>80.1</td><td>41</td><td>80.2</td></tr><tr><td>19</td><td>80.2</td><td>42</td><td>80.0</td></tr><tr><td>20</td><td>80.5</td><td>43</td><td>80.4</td></tr><tr><td>21</td><td>80.3</td><td>44</td><td>80.6</td></tr><tr><td>22</td><td>80.0</td><td>45</td><td>80.4</td></tr><tr><td>23</td><td>80.5</td><td>46</td><td>80.3</td></tr></table>	Capacitor No.	MFD	Capacitor No.	MFD	1	80.4	24	80.3	2	79.9	25	80.4	3	80.0	26	80.0	4	80.1	27	80.3	5	79.8	28	80.2	6	80.3	29	80.2	7	80.0	30	80.3	8	79.9	31	80.1	9	80.0	32	80.2	10	80.2	33	80.3	11	80.3	34	80.0	12	80.1	35	80.2	13	80.2	36	80.0	14	80.4	37	80.6	15	80.1	38	80.2	16	80.6	39	80.3	17	80.3	40	80.0	18	80.1	41	80.2	19	80.2	42	80.0	20	80.5	43	80.4	21	80.3	44	80.6	22	80.0	45	80.4	23	80.5	46	80.3
Capacitor No.	MFD	Capacitor No.	MFD																																																																																																
1	80.4	24	80.3																																																																																																
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6	80.3	29	80.2																																																																																																
7	80.0	30	80.3																																																																																																
8	79.9	31	80.1																																																																																																
9	80.0	32	80.2																																																																																																
10	80.2	33	80.3																																																																																																
11	80.3	34	80.0																																																																																																
12	80.1	35	80.2																																																																																																
13	80.2	36	80.0																																																																																																
14	80.4	37	80.6																																																																																																
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16	80.6	39	80.3																																																																																																
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18	80.1	41	80.2																																																																																																
19	80.2	42	80.0																																																																																																
20	80.5	43	80.4																																																																																																
21	80.3	44	80.6																																																																																																
22	80.0	45	80.4																																																																																																
23	80.5	46	80.3																																																																																																

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6.	Tangent of Loss angle (Cl. No. 2.4.1f) and 2.5 of IS 2993:1998)	The tangent of loss angle limit and measuring frequency shall be defined by the manufacture. Measured at rated voltage and frequency. (Declared Value: Not Declared)	Capacitor No.	Loss Angle	Capacitor No.	Loss Angle
			1	-0.0009	24	-0.0008
			2	-0.0010	25	-0.0009
			3	-0.0009	26	-0.0009
			4	-0.0009	27	-0.0010
			5	-0.0010	28	-0.0009
			6	-0.0008	29	-0.0010
			7	-0.0010	30	-0.0009
			8	-0.0010	31	-0.0011
			9	-0.0009	32	-0.0010
			10	-0.0009	33	-0.0009
			11	-0.0009	34	-0.0008
			12	-0.0010	35	-0.0009
			13	-0.0009	36	-0.0009
			14	-0.0011	37	-0.0009
			15	-0.0009	38	-0.0009
			16	-0.0009	39	-0.0010
			17	-0.0008	40	-0.0009
			18	-0.0009	41	-0.0010
			19	-0.0009	42	-0.0009
			20	-0.0010	43	-0.0009
			21	-0.0009	44	-0.0011
			22	-0.0009	45	-0.0009
			23	-0.0011	46	-0.0008
Type Tests (For Group 1) (No. of Capacitors Tested: 4 Nos.)						
1.	Visual Examination (Cl. 2.6 of IS 2993:1998)	The condition, workmanship, marking and finish shall be satisfactory. The marking shall be legible during the life of the capacitor.	Satisfactory			
2.	Marking (Cl. 5.1 of IS 2993: 1998)	The following information shall be marked on the capacitors.	See below			
		1) Manufacturer's name, abbreviated name or trade mark	Marked as 			
		2) Manufacturer's Type designations,	SH-MPP			
		3) Rated capacitance (C _N) in Microfarads and tolerances as percentage.	80 MFD ± 5%			
		4) Rated voltage (V _N) in Volts. For Continuous	440VAC			
		For Intermittent	N/A			
		5) Rated Duty Cycle (if the capacitor is not intended for continuous operation)	N/A			
		6) Rated frequency f _N in Hertz, if other than 50Hz.	50 Hz			

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


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Sl. No.	TESTS WITH CLAUSE REFERENCE	SPECIFIED REQUIREMENTS	RESULTS		
		7) Climatic Categories	25/85/21		
		8) Date of manufacture (Code may be used)	02/01/2018		
		9)  or SH for self-healing capacitors.	SH-MPP		
		10) Discharge device , if any, shall be written in full or indicated by the symbol 	N/A		
		11) Class of safety protection	Not marked		
		12) Approval marks	Not marked		
		13) Filling Material, Reference to liquid used (not needed for dry capacitors)	Not marked		
		14) Class of operation or life duration.	Not marked		
				15) Specification (Standard) number	IS:2993
3.	Check of dimensions (Cl. 2.10 of IS 2993: 1998)	Dimensions of the case, of the terminals and of the fixing arrangements shall comply with those indicated in the drawing, taking tolerances into account. Dimension declared by manufacturer are: Height: 120±2 mm, Width: 75±2 mm	Capacitor No.	Height (in mm)	Dia. (in mm)
			1	120.44	73.63
			2	119.95	73.32
			3	119.53	73.32
			4	119.51	73.20
		In addition, minimum Creepage distances and clearances indicated in table 5 shall be checked.	N/A (Made of insulating material and permanently sealed)		
4.	Mechanical Tests (Cl. 2.11 of IS 2993: 1998)	1) Robustness of terminations (Cl. 2.11.1 of IS 2993: 1998)	Satisfactory		
		a) Test Ua-tensile (Cl. 2.11.1.1 of IS 2993: 1998) Applied load: 20N, After the test no visible damage shall be observed.			
		b) Test Ub- Bending (Half of the termination) Two consecutive bends shall be applied. After the test no visible damage shall be observed. (Cl. 2.11.1.2 of IS 2993: 1998)	Satisfactory		
		c) Test Uc- Torsion (Other half of the termination) Two Successive rotations of 180° shall be applied. After the test no visible damage shall be observed. (Cl. 2.11.1.3 of IS 2993: 1998)	Satisfactory		
		d) Test Ud- Torque (screw terminals) The screw materials shall have adequate resistance against stress cracking. After the test no visible damage shall be observed. (Cl. 2.11.1.4 of IS 2993: 1998)	N/A		


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		2) Vibration: The capacitors shall be subjected to vibration test with the severity: Frequency = 10 Hz to 55 Hz Amplitude = ± 0.35 mm Sweep rate = 1 Octave/minute Test duration per axis = 10 frequency cycles (3 axes offset from each other by 90°) (Cl. 2.11.3 of IS 2993: 1998)	Satisfactory		
		Before and after the test, the capacitance of the capacitors shall be measured. (Values in MFD)	Capacitor No.	Before Test	After Test
			1	80.3	80.4
			2	79.9	80.0
			3	80.1	80.0
			4	80.1	80.1
		No perceivable capacitance change is permitted.	Satisfactory		
		After the test, the capacitor shall be subjected to the voltage test between terminals and case. No dielectric breakdown or flashover shall occur. Test Voltage: 2000V for 60S.	Withstood & No Flashover		
		There shall be no any visible damage.	Satisfactory		
		3) Fixing bolts or studs (if fitted)	N/A		
5.	Sealing Test (Cl. 2.12 of IS 2993: 1998)	The capacitor shall be mounted in a position most likely to reveal leakage at a temperature 10°C of higher than the maximum permissible capacitor operating temperature for a time sufficient for all parts of the capacitor to reach this temperature. The capacitor shall be maintained at this temperature for a further hour before cooling. After the test capacitors shall be inspected for liquid leakage and distorted case. Liquids are allowed to wet the surface but not to form droplets.	N/A (Dry Capacitors)		
Type Tests (For Group 2) (No. of Capacitors Tested: 21 Nos.)					
6.	Endurance Test (Cl. 2.13 of IS 2993: 1998)	The capacitors shall be mounted in a test chamber of air temperature within ±2°C. The thermostat shall be set to (t _c -15°C), and capacitors are then energized according to the appropriate voltage and test cycle. During the first 24 h the difference between t _c and the indication of the temperature recording instrument shall be noted, and adjustments made to ensure the temperature of each capacitor case is at t _c ± 2 °C. The test is then continued to the end of the appropriate time without further adjustment of the thermostat, the time being measured from the first energization of the capacitors. The capacitors are energized at test voltage shall be 1.25U _N for 600hr Continuously.	See Remark 1		
		During the test no permanent breakdown, interruption or flashover shall occur.			

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Sl. No	TESTS WITH CLAUSE REFERENCE	SPECIFIED REQUIREMENTS	RESULTS		
		No leak should be apparent which form droplets within 10 minute, when kept at upper temperature limit in the most unfavorable position.	See Remark 1		
Type Tests (For Group 3) (No. of Capacitors Tested: 6 Nos.)					
7.	Soldering Test (Cl. 2.11.2 of IS 2993: 1998)	This test shall be carried out only when terminals are designed for connection by soldering.	N/A		
8.	Damp heat Test (Cl. 2.14 of IS 2993: 1998)	All capacitors shall be kept in the environmental chamber without energizing for at a temperature of 40°C±2°C & relative humidity between 90% to 96%. No voltage shall be applied to the samples and no measurement shall be taken during the test. After the damp-heat period, the capacitors shall be stored under standard atmospheric conditions for recovery for not less than 1 h and not more than 2 h. Immediately after recovery, the capacitance shall be measured. Testing duration: 21days (As specified by customer)	See Remark 1		
9.	Voltage Test Between terminals (Cl 2.7 of IS 2993: 1998)	The capacitors shall withstand an a.c. voltage of 880V (twice of the rated voltage) between terminals for 60 seconds at 50Hz. No flashover or permanent breakdown shall occur.	Withstood & No Flashover		
10.	Voltage Test Between terminals and case (Cl 2.8 of IS 2993: 1998)	The capacitors shall withstand an a.c. voltage of 2000V between the terminals (jointed together) and a metal foil wrapped tightly round the surface of the case, for 60seconds at 50Hz. During the test, no dielectric breakdown or flashover shall occur.	Withstood & No Flashover		
Type Tests (For Group 4) (No. of Capacitors Tested: 10 Nos.)					
11.	Self- healing test (Cl 2.15 of IS 2993: 1998)	The capacitors shall be subjected to an a.c. voltage of 880V between terminals for 60seconds at 50Hz. If fewer than five self-healing breakdowns (clearings) occur during this time, the voltage shall be increased at a rate of not more than 200V per minute until five clearings have occurred since the beginning of the test or until the voltage has reached a maximum of 3.5 U _N for continuously rated capacitor or 2.0U _N for intermittent or motor start capacitor. The voltage shall then be decreased to 0.8 times the voltage at which the fifth clearing occurred or 0.8 times the maximum voltage and maintained for 10s. One additional clearing in each capacitor shall be permitted during this period.	Capacitor No.	≥ 5 self healing occur at Voltage	No. of self healings observed at 0.8 times voltage
			32	880	0
			33	880	0
			34	880	0
			35	880	0
			36	880	0
			37	880	0
			38	880	0
			39	880	0
			40	880	0
			41	880	0

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Sl. No	TESTS WITH CLAUSE REFERENCE	SPECIFIED REQUIREMENTS	RESULTS		
		The capacitors shall meets the following requirements: a) Change of capacitance is < 0.5%	Capacitor No.	Before Test (in MFD)	After Test (in MFD)
			32	80.2	80.1
			33	80.3	80.2
			34	80.0	80.0
			35	80.2	80.1
			36	80.0	80.0
			37	80.6	80.5
			38	80.2	80.1
			39	80.3	80.2
			40	80.0	80.0
			41	80.2	80.1
			Change in capacitance < 0.5% observed		
		b) RC value is ≥ 100s.		RC value is > 100s observed	
Type Tests (For Group 5) (No. of Capacitors Tested: 10 Nos.)					
12.	Destruction Test CI 2.16 of IS 2993: 1998	This test applicable on Capacitors on which of class of safety protection (P2) or (P1) is marked.	N/A (P0,declared by Manufacturer)		
13.	Permissible overloads (CI 3.1 of IS 2993: 1998)	Maximum permissible voltage: Irrespective of their type of operation, metal-foil and metalized capacitors shall be suitable for operation under abnormal conditions for prolonged periods at an rms voltage between terminals not exceeding 1.10 times the rated voltage. (CI 3.1.1 of IS 2993: 1998)	Voltage between terminals not exceeding 1.10 times the rated voltage as declared by manufacturer		
		Maximum permissible current: Capacitors shall be suitable for operation at rms current not exceeding 1.30 times the current which occurs at rated sinusoidal voltage and rated frequency excluding transients. (CI 3.1.2 of IS 2993: 1998)	rms current not exceeding 1.30 times the current which occurs at rated sinusoidal voltage and rated frequency excluding transients as declared by manufacturer		
		Maximum permissible reactive output: The overload resulting from operation at voltage and current exceeding the rated values shall not exceed 1.35 times the rated output. (CI 3.1.3 of IS 2993: 1998)	voltage and current exceeding the rated values shall not exceed 1.35 times the rated output as declared by manufacturer		
		Permissible extension of the duty cycle: Capacitors shall be suitable for operation: a) With a relative operation time not exceeding the rated operation time, b) With an absolute operation time not exceeding the product of rated relative operation time and rated cycle duration. (CI 3.1.4 of IS 2993: 1998)	N/A		

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Sl. No	TESTS WITH CLAUSE REFERENCE	SPECIFIED REQUIREMENTS	RESULTS
14.	SAFETY REQUIREMENTS (Cl 4 of IS 2993: 1998)	Creepage distances and clearances: The creepage distances over external surfaces of terminal insulation and the clearances between the exterior parts of terminal connections or between such live parts and the metal case of the capacitor, if any, shall be not less than the minimum values given in table 5. (Cl 4.1 of IS 2993: 1998)	N/A
		Terminals and connecting cables: Terminals and undetachable connecting cables shall have a conductor cross-section which can safely carry the current of the capacitor and shall have sufficient mechanical strength. (Cl 4.2 of IS 2993: 1998)	N/A
		Earth connections: If the metal case of the capacitor is intended to be connected to earth or to a neutral conductor, means shall be provided to enable an effective connection to be made. (Cl 4.3 of IS 2993: 1998)	N/A
		Discharge devices: When a discharge device is specified, it must reduce the voltage at the terminals from the peak of the rated voltage to a value of 60 V or less in the time of 1 min from the moment the capacitor is switched off. (Cl 4.4 of IS 2993: 1998)	N/A

PART D:

- Remarks:** 1. Test report issued excluding Endurance test and Damp Heat test as per customer request. Test report for Endurance test and Damp Heat test will be issued separately after completion of test.
2. The observations given in part A of the cover page of the test report are taken from the marking on samples and specification provided with the sample.
3. N/A=Not Applicable

*******END OF THE TEST REPORT*******

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For HI PHYSIX LABORATORY INDIA PVT. LTD.

Dr. M. N. Awatade
(Dy. General manager)
Approved By