

SUBJECT : TYPE TESTING OF FREQUENCY METER

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1. SCOPE

- 1.1 Service Request No. : ERTL(W)/990354 dt.05-MAR-99
- 1.1.1 Service Request finalised on : 10-MAR-1999.
- 1.2 Requested by (Name and address of organisation) : RISHABH INSTRUMENTS P. LTD.
F-31, MIDC, SATPUR,
NASIK,
- | 1.3 Description | Qty. | Manufacturer | Type/Model No. |
|---|------|----------------------------------|---|
| FREQUENCY METER
(Category-II,
220 V,45-55 Hz,
Class 0.5) | 03 | RISHABH INSTRUMENTS
Pvt. Ltd. | ZQ 72
Sr.No.C6317 - Sample 1
Sr.No.C6318 - Sample 2
Sr.No.C6319 - Sample 3 |
- 1.4 Laboratory Ambient : Temperature : (25±2) deg. C
: Relative Humidity : (55±5)%
- 1.5 Test specification : Type test as per IS 1248-1993
- 1.6 Details of Test Equipments used
- 1) Autoranging Teraohm Meter (S&C/106)
 - 2) W/I Auto tester (E&S/066)
 - 3) Digital Multimeter (E&S/120)
 - 5) Repeat cycle timer (E&S/110)
 - 6) Programmable Humidity chamber (ENV/042)
 - 7) Vibration system (ENV/015)
 - 8) Shock test machine (ENV/018)
 - 9) Environmental Test Chamber (ENV/075)
 - 10) Temperature Test Chamber (ENV/026)
 - 11) Calibration System (S&C/138)
 - 12) Variac (E&S/099)

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2.0 TEST RESULTS

Sr.No.	Test Parameter	Test Condition	Requirement	Observation	Remarks
2.1	Insulation Resistance	At 500 V DC for 1 min. between terminals shorted together and body.	Not less than 5 M ohm.	100 Mohm > 100 Mohm	Complied. Please see Sr. No. 3.1 of general remark.

2.2	High Voltage test	At 2 kV ac rms for 1 min. between terminals shorted together and foil wrapped on body.	There shall not be any breakdown/flashover.	No Breakdown or flashover observed in case of any of the 3 samples.	Complied. Please see Sr. No. 3.1 of general remark.
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2.3	Intrinsic Error	At following equidistant points	Class index (0.5 %)
	45.0 Hz	-0.16 %	-0.02 %
	47.5 Hz	-0.07 %	+0.04 %
	50.0 Hz	+0.02 %	+0.11 %
	52.5 Hz	+0.07 %	+0.16 %
	55.0 Hz	-0.07 %	-0.07 %

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* As marked on sample.



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2.0 TEST RESULTS (CONTD...)

Sr.No.	Test Parameter	Test Condition	Requirement	Observation	Remarks
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2.4 Variation due to
 Influential
 quantities

2.4.1 Ambient
 Temperature

Lower temp. 10 deg. C, Upper temp. 37 deg. C
 Intrinsic error shall be checked at following equi-distant points

Complied

Sample No.	
1	2
+0.29 %	+0.27 %
-0.18 %	+0.25 %
+0.15 %	+0.22 %
+0.18 %	-0.16 %
-0.09 %	+0.15 %
	+0.09 %

2.4.2 Humidity

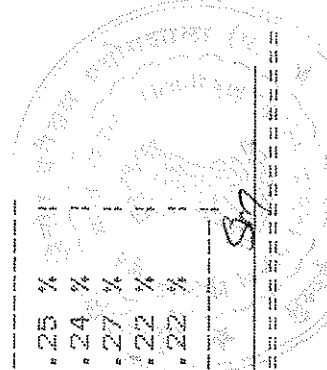
Lower Relative humidity 25% , Upper Relative humidity 80%
 duration = 16 hr.
 Intrinsic error shall be checked at following equi-distant points

Complied

Sample No.	
1	2
+0.38 %	+0.24 %
+0.44 %	+0.15 %
+0.36 %	+0.20 %
+0.31 %	+0.13 %
+0.35 %	+0.15 %
	+0.25 %
	+0.24 %
	+0.27 %
	+0.22 %
	+0.22 %

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2.0 TEST RESULTS (CONTD....)

Sr.No.	Test Parameter	Test Condition	Requirement	Observation	Remarks
2.4.3	Position	Intrinsic error to be measured at reference plane and then at 5 deg.inclination plane in forward,backward, left & right direction. Max.deviation from ref.plane to be measured.	Max. deviation from reference plane shall not exceed 50 % of class index.	Max. deviation : Sample no. 1 2 3 +0.09% -0.12% -0.12%	Complied
2.4.4	Magnetic field of external origin	AC excitation of upper limit under an external magnetic field of 0.4kA/m. Maximum deviation to be observed.		Sample No. 1 2 3 -0.09% -0.07% -0.09%	
2.4.5	Ferromagnetic supports	Accuracy test carried out by mounting UUT on Non-ferrous Panel (PVC) & Ferrous Panel at following equidistant points 45.0 Hz 47.5 Hz 50.0 Hz 52.5 Hz 55.0 Hz	100 % of class index	Sample No. 1 2 3 0.00 % -0.07 % -0.07 % -0.07 % 0.00 % -0.09 % 0.00 % -0.07 % -0.06 % -0.09 % -0.11 % -0.09 % -0.07 % -0.16 % -0.11 %	Complied

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2.0 TEST RESULTS (CONTD....)

Sr.No.	Test Parameter	Test Condition	Requirement	Observation	Remarks																														
2.4.6	Conductive supports	Accuracy test carried 100 % of out by mounting UUT class on Conductive support index at following equid-distant points: 45.0 Hz 47.5 Hz 50.0 Hz 52.5 Hz 55.0 Hz	100 % of class index	<table border="1"> <thead> <tr> <th>Sample No.</th> <th>1</th> <th>2</th> <th>3</th> <th>Complied</th> </tr> </thead> <tbody> <tr> <td></td> <td>+0.25 %</td> <td>-0.20 %</td> <td>-0.07 %</td> <td></td> </tr> <tr> <td></td> <td>-0.07 %</td> <td>-0.27 %</td> <td>-0.04 %</td> <td></td> </tr> <tr> <td></td> <td>-0.24 %</td> <td>-0.33 %</td> <td>-0.22 %</td> <td></td> </tr> <tr> <td></td> <td>-0.29 %</td> <td>-0.24 %</td> <td>-0.20 %</td> <td></td> </tr> <tr> <td></td> <td>-0.04 %</td> <td>-0.25 %</td> <td>+0.00 %</td> <td></td> </tr> </tbody> </table>	Sample No.	1	2	3	Complied		+0.25 %	-0.20 %	-0.07 %			-0.07 %	-0.27 %	-0.04 %			-0.24 %	-0.33 %	-0.22 %			-0.29 %	-0.24 %	-0.20 %			-0.04 %	-0.25 %	+0.00 %		
Sample No.	1	2	3	Complied																															
	+0.25 %	-0.20 %	-0.07 %																																
	-0.07 %	-0.27 %	-0.04 %																																
	-0.24 %	-0.33 %	-0.22 %																																
	-0.29 %	-0.24 %	-0.20 %																																
	-0.04 %	-0.25 %	+0.00 %																																

2.4.7 Voltage of measured quantity

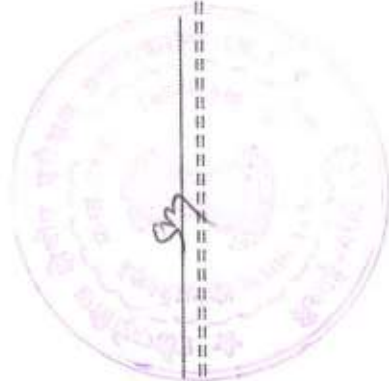
Accuracy test at mid-scale point to be carried out at rated voltage. Then test to be repeated at upper and lower limit (+/- 15 %) of rated voltage & variation (%) to be measured.

Max. Variation :
Sample No.

Sample No.	1	2	3
	+0.38%	-0.33%	-0.29%

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2.0 TEST RESULTS (CONTD...)

Sr.No.	Test Parameter	Test Condition	Requirement	Observation	Remarks
2.5	Damping			Sample No.	
				1	3
				0 %	0 %
2.5.1	Mechanical overshoot	By suddenly applying 2/3rd of measuring range & note down the % overshoot.	Overshoot Shall not exceed 20% of scale length		Complied
2.5.2	Response time	By suddenly applying 2/3rd of measuring range & note down time (sec).	Time taken shall be <4 sec for index to reach within 1.5% scale length.		Complied
2.6	Self Heating	By applying 90% of upper limit of measuring range for 30 to 35 min. & note down the deviation (%)	Deviation shall be within 100% of class index.	1	3
				-0.04%	-0.05%
2.7	Continuous overload	a) By applying 120% of upper limit for 2h (ie. 264 V) b) Accuracy test at following equidistant points.	a) error shall be within 100% of class index.	No residual deflection observed	Complied
		45.0 Hz			
		47.5 Hz			
		50.0 Hz			
		52.5 Hz			
		55.0 Hz			
				+0.20 %	-0.07 %
				-0.07 %	-0.18 %
				-0.24 %	-0.24 %
				-0.34 %	-0.24 %
				-0.18 %	-0.00 %

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2.0 TEST RESULTS (CONTD...)

Sr.No.	Test Parameter	Test Condition	Requirement	Observation	Remarks
2.0	Overloads of short duration	a) Apply 440 VAC. for 0.5s nine times at an interval of 60s and once for 5s.		Conditioned.	
		b) Accuracy test at the following equidistant points:-	a) Error shall be within class index.		Complied.
		45.0 Hz		1	
		47.5 Hz		2	
		50.0 Hz		3	
		52.5 Hz			
		55.0 Hz			
2.9	Environmental Tests.				

2.9.1 Temp. cycling
 55 deg.C for 16h & -10 deg.C for 8h, 3 cycles while at 80% of the upper limit of excitation. During the last cycle at the end of 16h and while at high temp. slowly increase & decrease the excitation until index reaches the upper limit of measuring range & return to zero. Similarly after 8h at lower temp. slowly increase & decrease the excitation until index reaches the upper limit of measuring range & return to zero.

Conditioned.
 Index was found to respond to excitation changes.



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2.0 TEST RESULTS (CONTD....)

Sr.No.	Test Parameter	Test Condition	Requirement	Observation	Remarks
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2.9.2 Post Measurement		At the following equidistant points	Error shall be within class index.	Sample No.	Complied
(Intrinsic error)	45.0 Hz			1	
	47.5 Hz			2	
	50.0 Hz			3	
	52.5 Hz				
	55.0 Hz				

2.9.3 Damp Heat Cyclic Test As per IS 9000, Part 5, Sec. 1. (16+8 h) cycle. 2 cycles Recovery 24 h.

Conditioned.

2.9.4 Post Measurement		At the following equidistant points	Error shall be within class index.	Sample No.	Complied
(Intrinsic error)	45.0 Hz			1	
	47.5 Hz			2	
	50.0 Hz			3	
	52.5 Hz				
	55.0 Hz				

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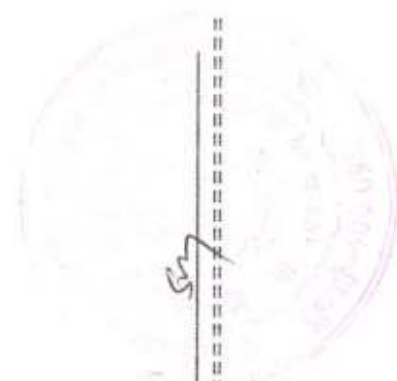
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2.0 TEST RESULTS (CONTD....)

Sr.No.	Test Parameter	Test Condition	Requirement	Observation	Remarks
2.10	Deviation from zero	Energise the samples for 30s at upper limit of measuring range. Quickly reduce the excitation to zero. Deviation from zero shall be measured 15 s after the excitation has been reduced to zero.	Deviation expressed as percentage of scale length shall not exceed more than 50% of class index.	No deviation observed in any of the three samples.	Complied
2.11	Vibration test	As per IS 9000 Part 8. Sweep range:10-150-10 Hz, Displacement amplitude: 0.15 mm peak in the range 10-60 Hz, Acceleration: 2 g in the range:60-150 Hz, Sweep Rate: 1 octave/min., Duration : 6 h. Endurance shall be performed at resonance frequency. Vibration shall be applied at the resonance frequency for 6h in that direction.		Conditioned. However, no visual damage or any resonant frequency observed.	

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2.0 TEST RESULTS (CONTD....)

Sr.No. Test Parameter Test Condition Requirement

If no resonance is observed in any of these 3 directions, the equipment shall be subjected to vibration at each of the frequencies 25, 50, 100 and 150 Hz in each of the 3 mutually perpendicular direction so that the total duration shall not exceed 6 h.

Observation Remarks

Sample No.	Observation	Remarks
1		
2		
3		

2.11.1 Deviation of error (after vibration test)

At following equidistant points

45.0 Hz	+0.22 %	+0.08 %	+0.13 %
47.5 Hz	+0.15 %	+0.09 %	-0.05 %
50.0 Hz	-0.13 %	-0.20 %	-0.13 %
52.5 Hz	+0.09 %	-0.05 %	+0.04 %
55.0 Hz	-0.05 %	-0.22 %	-0.13 %

The error shall not deviate by more than 50% of class index from the original value measured before test.

2.12 Shock test

As per IS 9000, Part7, Peak acceleration- 15 g. Pulse shape - half sine. Duration - 11 ms. 3 shocks in both directions of 3 mutually perpendicular axes. (total 18 shocks)

Conditioned. No visual damage observed

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3.0 GENERAL REMARKS

- 3.1 Humidity conditioning before IR & HV test was not required by the customer
- 3.2 Variation due to distortion of a.c. measured quantity could not be checked due to facility limitation.

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REPORT RELEASED BY

Ganfan Ban
Head (E&S)



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2.0 TEST RESULTS (CONTD....)

Sr.No.	Test Parameter	Test Condition	Requirement	Observation	Remarks																								
2.12.1	Deviation of error after shock test	At the following equidistant points:- 45.0 Hz 47.5 Hz 50.0 Hz 52.5 Hz 55.0 Hz	Error shall not deviate by more than 100 % of the class index from the original value measured before shock test.	<table border="1"> <thead> <tr> <th>Sample No.</th> <th>1</th> <th>2</th> <th>3</th> </tr> </thead> <tbody> <tr> <td></td> <td>-0.13 %</td> <td>+0.05 %</td> <td>0.00 %</td> </tr> <tr> <td></td> <td>-0.02 %</td> <td>+0.03 %</td> <td>+0.18 %</td> </tr> <tr> <td></td> <td>+0.16 %</td> <td>+0.16 %</td> <td>+0.18 %</td> </tr> <tr> <td></td> <td>-0.02 %</td> <td>+0.09 %</td> <td>-0.05 %</td> </tr> <tr> <td></td> <td>-0.13 %</td> <td>+0.18 %</td> <td>-0.07 %</td> </tr> </tbody> </table>	Sample No.	1	2	3		-0.13 %	+0.05 %	0.00 %		-0.02 %	+0.03 %	+0.18 %		+0.16 %	+0.16 %	+0.18 %		-0.02 %	+0.09 %	-0.05 %		-0.13 %	+0.18 %	-0.07 %	Complied
Sample No.	1	2	3																										
	-0.13 %	+0.05 %	0.00 %																										
	-0.02 %	+0.03 %	+0.18 %																										
	+0.16 %	+0.16 %	+0.18 %																										
	-0.02 %	+0.09 %	-0.05 %																										
	-0.13 %	+0.18 %	-0.07 %																										

2.13 Life test

The meter shall be subjected to 150 000 full scale deflections, the impulse supplied being of such amplitude that the pointer reaches the maximum value of the scale without impinging on the end stop. ON for 1 s and OFF for 4 s during 1 cycle.

Conditioned

2.13.1 Intrinsic error

At the following equidistant points:-
45.0 Hz
47.5 Hz
50.0 Hz
52.5 Hz
55.0 Hz

Error shall be within class index .

Sample No.	1	2	3
	+0.09 %	-0.05 %	-0.09 %
	+0.04 %	-0.15 %	-0.16 %
	-0.02 %	-0.20 %	-0.18 %
	-0.09 %	-0.14 %	-0.11 %
	-0.09 %	-0.15 %	-0.20 %

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