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TEST / CALIBRATION REPORT

Type Test Report
for
MECO Moving Coil Meter

Type Test as per IS 1248:1993 (Category II)

ELECTRONICS REGIONAL TEST LABORATORY (WEST)

MINISTRY OF COMMUNICATIONS & INFORMATION TECHNOLOGY, (STQC Dte.)

Government of India

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MEMORANDUM

The Test/Calibration Report issued by **ERTL (W)** is a record of the measurements conducted on the products submitted to it for testing / calibration and the results thereof. Unless otherwise specified in the report, the results are applicable only to those products which have been tested / calibrated and do not apply to other products even though declared to be identical.

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2. The report shall not be regarded in any way diminishing the normal contractual responsibilities / obligations between the customer and **ERTL (W).**

3. The result reported in this report are valid only at the time of and under the stated conditions of the measurements.

1. **SCOPE**

1.1 Service Request No : ERTL (W) / 20022611 dated 31-Dec.-2002

1.1.1 Service Request finalised on : 31-Dec.-2002.

1.2 Requested by
(Name and address of organisation) : MECO INSTRUMENTS PVT LTD.,
301, BHARAT INDUSTRIAL EASTATE,
T.J. ROAD, SEWREE (W),
MUMBAI – 400 015.

1.3

Description	Qty	Manufacturer	Model	Serial Nos.
MOVING COIL METER, (ANALOG PANEL METER) 0-60mV DC CLASS: 1.5	06 Nos.	MECO	ML 96	6183/2 - SAMPLE 1 (S1) 1165/3 - SAMPLE 2 (S2) 1166/3 - SAMPLE 3 (S3) **2nd set of samples** 1878/3 - SAMPLE 1 (S1) 1879/3 - SAMPLE 2 (S2) 1880/3 - SAMPLE 3 (S3)

1.4 Test specifications : TYPE TEST AS PER IS 1248:1993,
CATEGORY II

1.5 Lab Ambient : Temperature : (25 ±2) deg.C
Humidity : (55 ±5) % RH

1.6 Test Equipment used :

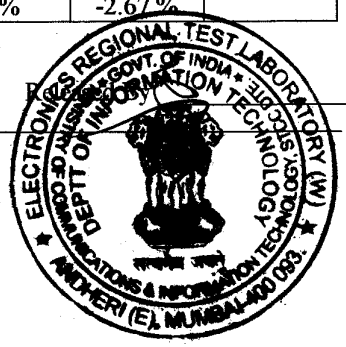
1.	Direct Volts Calibrator	S&C/036
2.	D.M.M	E&S/120
3.	Digital Insulation Tester	E&S/121
4.	W/I Auto Tester	E&S/066
5.	Environmental Chamber	ENV/042
6.	Environmental Chamber	WK 1000-2
7.	Vibration Machine	ENV/008
8.	Shock Test Machine	ENV/018

Witnessed by

ELECTRONICS REGIONAL TEST LABORATORY (W) GOVT. OF INDIA DEPTT. OF INFORMATION TECHNOLOGY/STQC DTE. MINISTRY OF COMMUNICATIONS & INFORMATION TECHNOLOGY ANDHERI (E), MUMBAI-400 093.

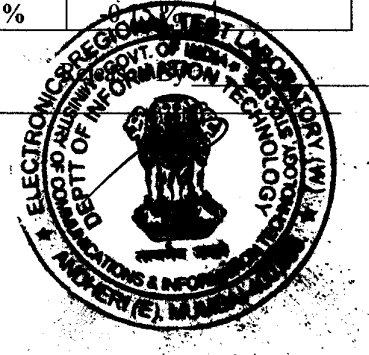
2.0 Test Results

Sr.No.	Test/Parameter	Test Condition	Requirement	Observation			Remark
2.1	Insulation Resistance	At 500 V DC for 1 min. between terminals shorted together and body.	Not less than 5 M ohm	S-1 > 2000 M ohm	S-2 > 2000 M ohm	S-3 > 2000 M ohm	Complied
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
2.3	Intrinsic Error	At following equidistant points	Error shall not exceed 1.5%	S - 1	S - 2	S - 3	Complied
		10 mV DC		0.18 %	0.13 %	-0.15 %	
		20 mV DC		0.08 %	0.13 %	-0.4 %	
		30 mV DC		-0.62 %	0.17 %	0.12 %	
		40 mV DC		-0.28 %	0.4 %	-0.35 %	
		50 mV DC		-0.28 %	-0.05 %	-0.05 %	
		60 mV DC		-0.1 %	-0.27 %	-0.3 %	
2.4	Variation due to influential quantities						
2.4.1 (a)	Variation due to ambient temp.	Lower temp. 10 deg. C, Upper temp. 37 deg.C Intrinsic error checked at following equidistant points.	Permissible variation shall be 100% of class index	S-1	S-2	S-3	Not complied. Please see general remark 3.1 at page 10.
		10 mV DC		0.33 %	-0.33 %	0.67 %	
		20 mV DC		-0.83 %	-0.83 %	1 %	
		30 mV DC		-1.33 %	-1 %	-1.5 %	
		40 mV DC		-1.33 %	-1.67 %	-1.83 %	
		50 mV DC		-2 %	-2.33 %	-1.83 %	
		60 mV DC		-2.3 %	-3 %	-2.67 %	



Sr.No.	Test/Parameter	Test Condition	Requirement	Observation			Remark
	Test results of 2nd set of samples						
2.4.1 (b)	Variation due to ambient temp	Lower temp. 10 deg. C, Upper temp. 37 deg.C Intrinsic error checked at following equidistant points.		S-1	S-2	S-3	Complied. Please see general remark 3.2 at page 10.
		10 mV DC		-0.52%	-0.67 %	0.3 %	
		20 mV DC		-0.97 %	-0.5 %	-0.25 %	
		30 mV DC		-0.83 %	0.33 %	0.48 %	
		40 mV DC		-0.98 %	0.4 %	0.47 %	
		50 mV DC		-1.00 %	-0.03 %	0.63 %	
		60 mV DC		-1.17 %	-0.22 %	0.65 %	
2.4.2	Variation due to humidity	Lower Relative humidity 25%, Upper Relative humidity 80% Intrinsic error checked at following equidistant points	Permissible variation shall be 100% of class index				Complied
		10 mV DC		-0.45 %	-0.55 %	0.25 %	
		20 mV DC		-0.33 %	-0.23 %	-0.27 %	
		30 mV DC		-0.15 %	-0.12 %	0.3 %	
		40 mV DC		-0.28 %	0.3 %	0.37 %	
		50 mV DC		-0.27 %	0.13 %	0.42 %	
		60 mV DC		0.08 %	0.18 %	0.62 %	
2.4.3	Variation due to ripple on measured quantity	a) Apply DC excitation at 80 % of upper limit. b) Superimpose 20 % of ripple at 45 Hz and increase to 65 Hz. c) Note down the frequency for maximum deviation. d) Change the DC excitation to bring down the value as at (a) above e) Repeat for 90 Hz to 130 Hz.	Permissible variation shall be 50% of class index	0 %	0 %	0 %	Complied

Sr.No.	Test/Parameter	Test Condition	Requirement	Observation			Remark
2.4.4	Variation due to position	Intrinsic error to be measured at reference plane and then at 5 deg. Inclination plane in forward, backward, left & right direction. Maximum deviation at following equidistant points	Permissible variation shall be 50% of class index	S-1	S-2	S-3	Complied
		10 mV DC		-0.12 %	0.15 %	0.2 %	
		20 mV DC		0.2 %	-0.12 %	0.12 %	
		30 mV DC		-0.57 %	-0.18 %	-0.25 %	
		40 mV DC		-0.53 %	-0.4 %	-0.27 %	
		50 mV DC		-0.62 %	-0.42 %	-0.22 %	
		60 mV DC		-0.74 %	-0.42 %	-0.17 %	
2.4.5	Variation due to magnetic field of external origin	AC excitation of upper limit under an external magnetic field of 0.4kA/m. Maximum deviation to be observed.	6 % of fiducial value	S-1	S-2	S-3	Complied
				0.67 %	0.67 %	0.5 %	
2.4.6	Variation due to ferromagnetic supports	Accuracy test carried out by mounting UUT on Non Ferrous Panel (PVC) & Ferrous Panel at following equidistant points	Within the limit of intrinsic error (1.5%)				Complied
		10 mV DC		0.08 %	0.12 %	0.3 %	
		20 mV DC		-0.07 %	0.07 %	0 %	
		30 mV DC		-0.02 %	0.08 %	0.23 %	
		40 mV DC		-0.17 %	0.15 %	0.02 %	
		50 mV DC		-0.32 %	0.17 %	-0.27 %	
		60 mV DC		-0.47 %	0.27 %	[illegible]	



Sr.No.	Test/Parameter	Test Condition	Requirement	Observation			Remark
2.4.7	Variation due to conductive supports	Accuracy test carried out by mounting UUT on conductive support following equidistant points	Shall meet the requirement of intrinsic error				Complied
		10 mV DC		0.08 %	-0.58 %	0.15 %	
		20 mV DC		-0.43 %	-0.93 %	-0.58 %	
		30 mV DC		-0.67 %	-0.83 %	-1.42 %	
		40 mV DC		-0.92 %	-0.6 %	-1.25 %	
		50 mV DC		-1.0 %	-0.5 %	-0.5 %	
		60 mV DC		-1.17 %	-0.67 %	0.18 %	
2.5	Damping						
2.5.1	Mechanical overshoot	By suddenly applying 2/3rd of measuring range & note down the % overshoot.	Shall not exceed 20% of scale length	5 %	7.5 %	2.5 %	Complied
2.5.2	Response time	By suddenly applying 2/3rd of measuring range & note down time (sec).	Within 1 % scale length after 4 s.	Indices reached the position of rest within 4s in each case			Complied
2.6	Self Heating	By applying 90% of upper limit of measuring range for 30 to 35 min. & note down the deviation (%)	Shall comply with the requirements of class index.	S-1	S-2	S-3	Complied
				0.17 %	0 %	0.33 %	

Sr.No.	Test/Parameter	Test Condition	Requirement	Observation			Remark
2.7	Continuous overload	a) By applying 120% of upper limit for 2h b) Accuracy test at following equidistant points after 2 h.	a) Residual deflection shall not exceed 1 % of scale length b) Shall comply with the accuracy requirement.	No residual deflection observed			Complied
				S-1	S-2	S-3	
		10 mV DC		-0.08 %	-0.67 %	0.38 %	
		20 mV DC		-0.05 %	-0.82 %	0.02 %	
		30 mV DC		0.25 %	-0.77 %	-0.82 %	
		40 mV DC		0.1 %	-0.6 %	-0.47 %	
		50 mV DC		0.18 %	-0.35 %	-0.13 %	
		60 mV DC		-0.08 %	-0.12 %	0.6 %	
2.8	Overloads of short duration	a) Apply 150mVDC for 0.5s nine times at an interval of 60s and once for 5s. b) Accuracy test at the following equidistant points :	a) Deviation of index from zero scale mark shall not exceed 0.5 % of scale length b) Shall comply with accuracy requirements.	No deviation observed on any of the three samples.			Complied
				S-1	S-2	S-3	
		10 mV DC		-0.08 %	-0.4 %	0.17 %	
		20 mV DC		-0.43 %	-0.35 %	-0.05 %	
		30 mV DC		0.08 %	-0.4 %	-0.48 %	
		40 mV DC		-0.38 %	-0.35 %	-0.38 %	
		50 mV DC		-0.37 %	-0.4 %	-0.1 %	
		60 mV DC		-0.52 %	-0.22 %	0.25 %	

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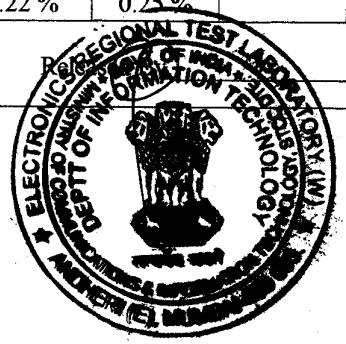

Sr.No.	Test/Parameter	Test Condition	Requirement	Observation			Remark
2.9	Environmental Tests						
2.9.1	Temp. cycling	55 deg.C for 16h & -10 deg.C for 8h. 3 cycles while at 80% of the upper limit of excitation. During the last cycle at the end of 16h and while at high temp. slowly increase & decrease 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.	To be conditioned	Conditioned Indices were responding to excitation change.			-----
2.9.2	Post Measurement Intrinsic error	At the following equidistant points : 10 mV DC 20 mV DC 30 mV DC 40 mV DC 50 mV DC 60 mV DC	Error shall be within class index (1.5%)	S-1 0.18 % 0.17 % 0.08 % -0.5 % -1.47 % -1.43 %	S-2 -0.48 % -1.0 % -0.93 % -1.0 % -1.3 % -1.17 %	S-3 0 % -1.17 % -1.47 % -1.43 % -1.32 % -0.5 %	Complied
2.9.3	Damp Heat Cyclic Test	As per IS 9000. Part 5 Sec. 1 (16+8) h cycle. 2 cycles. Recovery 24 h.	To be conditioned	Conditioned			----
2.9.4	Post Measurement Intrinsic error	At the following equidistant points : 10 mV DC 20 mV DC 30 mV DC 40 mV DC 50 mV DC 60 mV DC	Error shall be within class index (1.5%)	S - 1 0.42 % 0.25 % 0.08 % -0.5 % -1.33 % -1.5 %	S - 2 0.33 % -1.0 % -0.83 % -1.0 % -1.17 % -1.25 %	S - 3 0 % -1.17 % 1.5 % -1.5 % -1.17 % -0.5 %	Complied

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Sr.No.	Test/Parameter	Test Condition	Requirement	Observation			
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 15s 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: 2g 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. If the 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.	To be conditioned	Conditioned No visual damage observed			----
2.12	Accuracy Test (Post Vibration)	At the following equidistant points :	Error shall not deviate more than 50 % of class index	S-1	S-2	S-3	Complied
		10 mV DC		0.52 %	0.47 %	0.7 %	
		20 mV DC		0.12 %	0.65 %	0 %	
		30 mV DC		0.22 %	0.12 %	0.27 %	
		40 mV DC		0.63 %	0.68 %	0.38 %	
		50 mV DC		0.07 %	0.67 %	0.02 %	
		60 mV DC		0.13 %	0.25 %	0.67 %	

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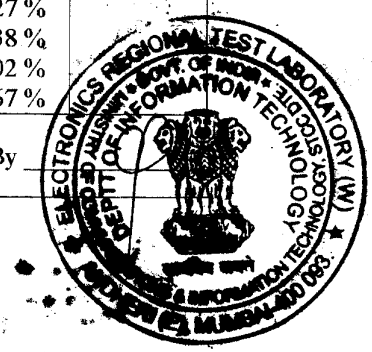

Sr.No.	Test/Parameter	Test Condition	Requirement	Observation			
2.13	Shock Test	As per IS 9000 P-7, Peak Acceleration: 15g, Pulse shape: half sine, Duration: 11 ms, 3 shocks in both directions of 3 mutually perpendicular axes (total 18 shocks)	To be conditioned	Conditioned			-----
2.14	Accuracy Test (Post Shock)	At the following equidistant points :	Error after test shall not deviate by more than 100 % of class index from the original values measured before shock test.	S-1	S-2	S-3	Complied
		10 mV DC		0.37 %	0.25 %	0.08 %	
		20 mV DC		0.35 %	0.17 %	0.02 %	
		30 mV DC		0.35 %	0.13 %	0.1 %	
		40 mV DC		0.23 %	0.08 %	0.13 %	
		50 mV DC		0.08 %	0.15 %	0.12 %	
		60 mV DC		0.03 %	0.1%	0.12 %	
2.15	Life Test	The UUT shall be subjected to 1,50,000 full scale deflections, the impulse supplied being of such amplitude that the pointer reaches max. value of the scale without impinging on the end stop. ON for 1 sec OFF for 4 sec during one cycle.	To be conditioned	Conditioned			-----
2.16	Accuracy Test (Post Life Test)	At the following equidistant points :	Error shall be within class index (1 %)	-0.2 %	-0.53 %	-0.72 %	Complied
		10 mV DC		-0.4 %	-1.23 %	-0.65 %	
		20 mV DC		0.33 %	-1.2 %	-0.97 %	
		30 mV DC		-0.28 %	-0.97 %	-0.68 %	
		40 mV DC		-0.7 %	-0.57 %	-1.13 %	
		50 mV DC		-1.18 %	-0.8 %	-0.75%	
		60 mV DC					

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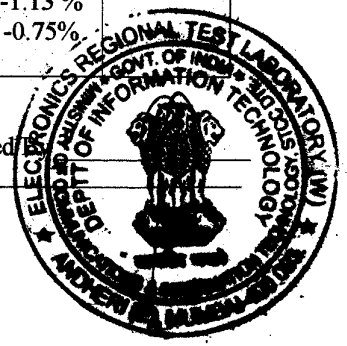

3.0 **General Remarks :**

3.1 All three samples failed to meet accuracy requirement at test Sr. No. 2.4.1. Further set of fresh 3 samples were submitted by customer.

3.2 The fresh set of 3 samples tested from test Sr. No. 2.4.1(b) to 2.16 and result are reported.

REPORT APPROVED BY

HEAD (E&S)

REPORT PREPARED BY

ELECTRONICS REGIONAL TEST LABORATORY (W) DEPTT OF INFORMATION TECHNOLOGY MINISTRY OF COMMUNICATIONS & INFORMATION TECHNOLOGY GOVT. OF INDIA ANDHERI, MUMBAI-400 093.

OUR ACCREDITATION STATUS

ERTL (W) set up under the STQC Directorate, Ministry of Communications & Information Technology, Govt. of India has been accreditated under number of national / international systems as follows :

SYSTEM	AREA	STATUS
IECQ (International Electro-technical Commission on Quality Assessment System for Electronic Components)	**Component Testing** • Resistors (Fixed) • Capacitors (Fixed)	Accreditated as ITL (Independent Test Laboratory)
NABL (C), India National Accreditational Board for Test & Calibration laboratories (Calibration System)	**Calibration** • Electro-technical discipline • Thermal discipline • Mechanical discipline	Accreditated Calibration Laboratory
NABL(T), India National Accreditational Board for Test & Calibration laboratories (Testing System)	Electronic & Electrical Testing	Accreditated Test Laboratory
IECEE-CE-Scheme	• Mains Operated Electronic Consumer Products	Approved as a CB test Laboratory
Other recognisation		Recognised by CSPO of State Govt., DOT, Naval Docyard, LCSO etc.