



सत्यमेव जयते

TEST / CALIBRATION REPORT

EMC / EMI Test Report

for

MECO Digital Watt Meter

Testing as per BS EN 61326 (1998)



ELECTRONICS REGIONAL TEST LABORATORY (WEST)

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

Government of India

Plot No. F 7 & 8, MIDC Area, Opp. SEEPZ,
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MEMORANDUM

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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.

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| ELECTRONICS REGIONAL TEST LABORATORY (WEST) | REPORT NO. | | |
| MINISTRY OF I.T. AND COMMUNICATIONS (STQC DTE) | ERTL(W)/ 2002EMI 148 | | |
| SUBJECT: EMC TEST ON DIGITAL WATTMETER | DATE | PAGE | OF |
| | 14 AUG 2002 | 1 | 14 |

1. SCOPE

1.1 Service Request No :ERTL(W)/2002 0994

1.1.1 Service Request finalised on : 23 MAY 2002

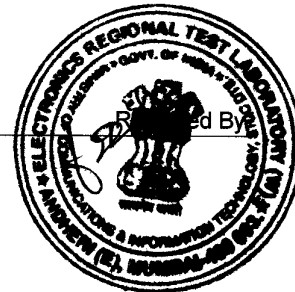
1.2 Requested by (Name and address of manufacturer) :MECO INSTRUMENTS PVT. LTD,
301, BHARAT INDUSTRIAL ESTATE,
T.T. ROAD, SEWREE,
MUMBAI 400 015

| 1.3 Item No. | Description | Qty | Manufacturer and Type No. | Serial Nos |
|--------------|-------------------|-----|---------------------------|------------|
| 1. | DIGITAL WATTMETER | 01 | MECO/ DWM33 | --- |

1.4 Test specifications BS EN 61326 - 1998

1.5 Lab Ambient Temperature : (25 +_2) deg.C
Humidity : (55 +_5) % RH

- 1.6 Test Equipment used :
1. EMI/003 : ESD Simulator (Schaffner, NSG 432)
 2. EMI/015 : Antenna Kit (EMCO, 1080) for R.E. test
 3. EMI/033 : EFT Simulator (EM-Test, EFT-800)
 4. EMI/034 : RS Chamber (Keytek, G-Strip)
 5. EMI/036 : RF Signal Generator (HP, 8648 A) for C.S and R.S. tests
 6. EMI/037 : RF Amplifier (AR, 25A100) for R.S test
 7. CPU/064 : EMI System (HP,8648 B) for CE and RE tests
 8. EMI/038 : C D N (Keytek) for C.S test
 9. EMI/044 : Immunity Test System(EM-Test, UCS 500 M6) for Surge test



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2.0 EQUIPMENT UNDER TEST (EUT)

2.1 Description

The DWM 33 is a panel meter , one of a complete range of Digital Panel Meters manufactured by MECO ltd for every application.

2.2 Operating modes during emissions and immunity testing

Emission and immunity testing was carried out on 415 V , three phase supply. During measurement, the three phase I/Ps were carrying a current of 5 A. During immunity test, the power indication was monitored

2.3 Functional check for immunity tests

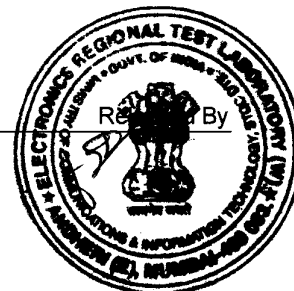
Variation in reading shall be less than ± 0.5 % of full scale

2.4 Performance Criteria

Criterion A : During testing Normal performance within specification limits.

Criterion B : During testing, temporary degradation, or loss of function or performance which is self recoverable.

Criterion C : During testing, temporary degradation, or loss of function or performance which is recoverable by operator intervention or system reset.



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3.1 CONDUCTED EMISSION

Test Rationale : To measure emissions of the EUT* (referenced to Earth) on Power Mains and to compare them with specified limits to ascertain that the EUT will not disturb other equipment by generating such emissions above a certain limit

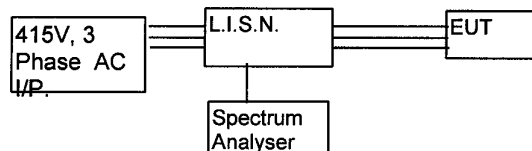
a) Test Condition

Set-up As per CISPR 22
 Measurement Range 150 kHz – 30 MHz
 Measurement On 415 V, 3 Phase.
 Line Voltage 230 V
 Line Frequency 50 Hz
 Length of mains 1 m
EUT in normal operating condition as per Sr. No. 2.2

b) Receiver

Bandwidth 9 KHz
 Detectors Quasi – peak and Average
 Configuration Conforming to CISPR 16

c) Test procedure



EUT supplied with required 3 Phase voltage through an LISN. Emission of the EUT were measured with a Spectrum Analyser.

d) Requirements

EUT emissions shall be below following Class 'B' limits

| Freq. (MHz) | Limits (dBuV) | |
|----------------|------------------|---------|
| | Quasi-Peak | Average |
| 0.15-0.5 | 66-56 | 56-46 |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

e) Observations

Pl. see Graph at page 14 of 14. Maximum emissions were observed on R phase and only those are given.

f) Results

Complies with Class 'B' Limits

* EUT : Equipment Under Test



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3.2 RADIATED EMISSION

Test Rationale :

To measure emissions of the EUT radiated into space and to compare them with specified limits to ascertain that the EUT will not disturb other equipment by generating such emissions above a certain limit.

a) Test Condition :

Set-up As per CISPR 22
 Frequency Range 30 MHz – 1000MHz
 EUT in normal operating condition as per Sr. No. 2.2

b) Receiver :

Bandwidth 120 KHz
 Detectors QP
 Antenna Bi-Conical (For 30 – 200 MHz)
 Log-Periodic (For 200 – 1000 MHz)
 Configuration Conforming to CISPR 16

c) Test procedure

- Emission measurements were carried out in an Open Area Test Site (OATS)
- Ambient measurements carried out first with EUT "off" and peaks noted
- EUT was switched "ON" and Emission peaks noted.
- Antenna height and position were changed to maximize Emissions.
- A table of Emission and corresponding Ambients was then drawn up.
- "Ambient" and "Emission" peaks were compared. Peaks with a difference of less than 5 dB were discarded.

d) Requirements

EUT emissions shall be below following limits

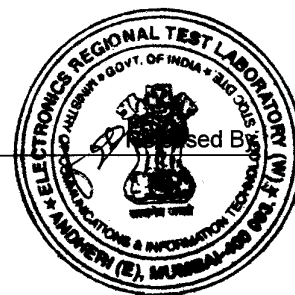
| Freq. (MHz) | Limits (dBuV/m) |
|----------------|--------------------|
| 30-230 | 40.45 |
| 230-1000 | 47.45 |

e) Observations

Maximum Emissions were obtained from front portion of EUT in Horizontal Polarisation and Antenna ht of 1 m
 Pl. see Table at page of for details

f) Results

Complies with Class 'B' limits



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3.3 RADIATED SUSCEPTIBILITY (RS) (Amplitude Modulated)

Test Rationale

To check immunity characteristics of the EUT in the presence of radiated fields generated by intentional emitters like Radio /TV transmitters, wireless equipment and the like by illuminating the EUT by such frequency

a Test Condition :

Set-up As per IEC 61000-4-3
 Frequency Range 80 MHz – 1000MHz
 Modulation 80 % AM @ 1 kHz
 Amplitude 10V/m
Simulation Using G-Strip RF immunity chamber
EUT in normal operating condition as per Sr. No. 2.2

c Test procedure

EUT was illuminated with the required field strength inside the test chamber, and operation was monitored.

d Requirements

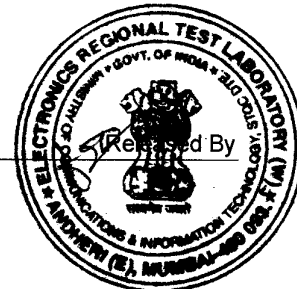
Operation of the EUT shall be normal as per Sr. No. 2.3 during and after the test.
 Performance Criterion : 'A'

e Observations

During the test variation of .6 KW could be observed during the test. Operation of the EUT was normal as per Sr. No. 2.3 after the test.

f Results

Complies with Criterion 'B'



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3.4 ELECTROSTATIC DISCHARGE (ESD)

Test Rationale :

To check immunity characteristics of the EUT against Discharge of Static Electricity that may occur when a charged operator touches the EUT.

a Test Condition :

Set-up As per IEC 61000-4-2

Mode of simulation: Contact Discharge on conductive surfaces
Air Discharge on non- conductive surfaces

Test Voltage: Contact Discharge: 4kV
Air Discharge: 8kV

No. of Discharges 10

Polarity Positive and Negative

Points of Discharge **Contact Discharge**
Maintenance screws
Air Discharge :
Front Display

Simulation Using ESD Gun

EUT in normal operating condition as per Sr. No. 2.2

c Test procedure :

- EUT initially subjected to indirect discharge on VCP and HCP.
- EUT was then screened in continuous discharge mode.
- At susceptible points, ten single discharges were applied.

d Requirement :

Operation of the EUT shall be normal as per Sr. No. 2.3 after the test.
Performance Criterion : 'B'

e Observations :

Operation of the EUT was normal as per Sr. No. 2.3 during and after the test. No variation in Display could be observed

f Results :

Air Discharge : Complies with Criterion 'A'
Contact Discharge : Complies with Criterion 'A'



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3.5 ELECTRICAL FAST TRANSIENTS (EFT)

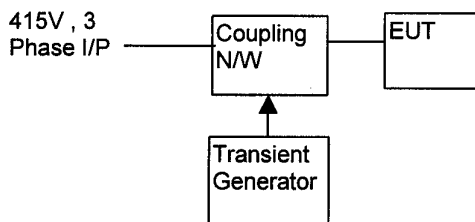
Test Rationale :

To check immunity characteristics of the EUT against transients generated by inductive load switching, Relay contact bouncing, switching of high voltage switchgear and the like

a Test Condition :

- Set-up** As per IEC 61000-4-4
 - Pulse** 5/50 nSec
 - Modes** Common and Differential
 - Pulse Amplitude** 2 kV
 - Pulse Rep. Rate** 5 kHz
 - Polarity** Positive and Negative
 - Duration of test in each mode** 60 s
 - Simulation** On 415 V , Three Phase I/P by Direct Injection
- EUT in normal operating condition as per Sr. No. 2.2.**

c Test procedure :



- Transients generated by the generator were coupled to the 415 V , Three Phase I/P through a coupling N/W
- The level was stepped up from minimum to the specified severity in steps of 0.5 kV to determine threshold of failure.

d Requirements :

Operation of the EUT shall be normal as per Sr. No. 2.3 after the test.
Performance Criterion : 'B'

e Observations :

During the test the display was observed to vary from 0 to 0.15 KW . Also blanking of display could be observed . Operation of the EUT was normal as per Sr. No. 2.3 after the test.

f Results :

Complies with Criterion 'B'



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3.6 CONDUCTED RF SUSCEPTIBILITY

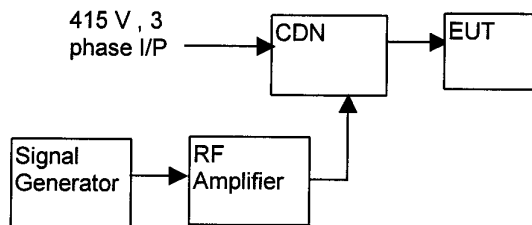
Test Rationale :

To study immunity characteristics of the EUT when subjected to continuous conducted Noise.

a Test Condition :

Set-up As per IEC 61000-4-6
 Frequency 150 kHz – 100MHz
 Modulation 80 % AM @ 1 kHz
 Amplitude 3V
 Simulation On 415 V , Three Phase I/P by CDN
 EUT in normal operating condition as per Sr. No. 2.2

c Test procedure :



- The required simulation signal was generated by the Signal Generator and the Amplifier
- It was then coupled onto 415 V, 3 Phase I/P using CDN and operation of EUT was monitored

d Requirements :

Operation of the EUT shall be normal as per Sr. No. 2.3 after the test.
 Performance Criterion : 'A'

e Observations :

Operation of the EUT was normal as per Sr. No. 2.3 during and after the test. No variation in display could be observed

f Results :

Complies with Criterion 'A'



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3.7 SURGE

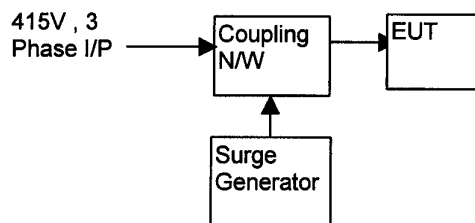
Test Rationale :

To check immunity characteristics of the EUT against Surges generated because of Capacitive Bank Switching, Faults, Lightning and the like.

a Test Condition :

Set-up As per IEC 61000-4-5
Pulse 1.2 / 50 uS
Modes Common (Line to Ground) and Differential (Line to Line)
Pulse Amplitude Common Mode : 2 kV
Differential Mode : 1kV
Polarity Positive and Negative
No. of transients Five in each mode
Simulation On 415 V , Three Phase I/P by Direct Injection
EUT in normal operating condition as per Sr. No. 2.2

c Test procedure :



- Surges generated by the generator were coupled to the 415V, Three Phase I/P through coupling N/W.
- The level was stepped up from minimum to the specified severity in steps of 0.5 kV to determine threshold of failure.

d Requirements :

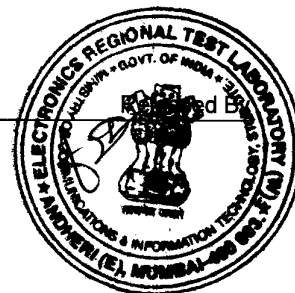
Operation of the EUT shall be normal as per Sr. No. 2.3 after the test.
Performance Criterion : 'B'

e Observations :

Operation of the EUT was normal as per Sr. No. 2.3 during and after the test. No variation in display could be observed

f Results :

Complies with Criterion 'A'.



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3.8 VOLTAGE DIPS AND INTERRUPTIONS

Test Rationale :

To study performance of the EUT when subjected to voltage dips and interruptions

a Test Condition :

Set-up As per IEC 61000-4-11
Line Voltage 230 VAC
Line Frequency 50 Hz
Reduction 100%
Duration 10 mSec (0.5 cycle)
Simulation On 415 V , Three Phase I/P
EUT in normal operating condition as per Sr. No. 2.2

c Test procedure :

The above conditions were simulated using dedicated test system and operation of the EUT was monitored

d Requirements :

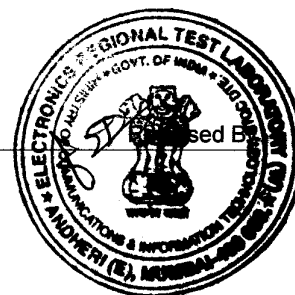
Operation of the EUT shall be normal as per Sr. No. 2.3 after the test.
Performance Criterion : 'C'

e Observations :

Operation of the EUT was normal as per Sr. No. 2.3 during and after the test. No variation in display could be observed

f Results :

Complies with Criterion 'A'

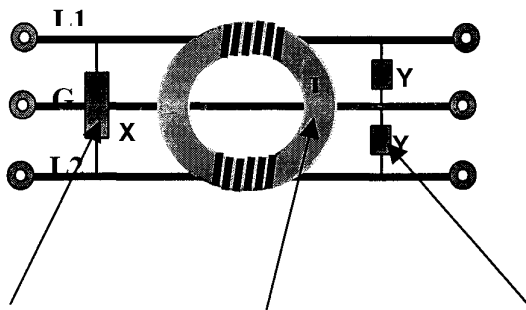


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4.1 EMC modifications incorporated

Conducted RF Susceptibility

- A Power Line Filter was introduced in the power mains. It was mounted close to the mains entry point to reduce long length of unfiltered mains.



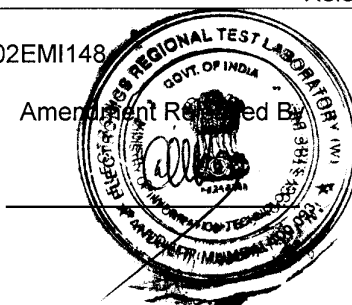
X Capacitor (2.2 nF/ 1 kV) Inductor (6 mH/line) Y Cap(2.2 nF/ 1 kV)

Released By

This is an amended version of page 11 of 14 of report No ERTL(W)/2002EMI148

Amendment Issued By

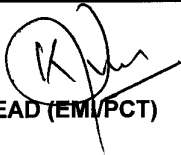
Amendment Received By



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3.0 General Remarks : Nil

REPORT APPROVED BY


HEAD (EM/PCT)

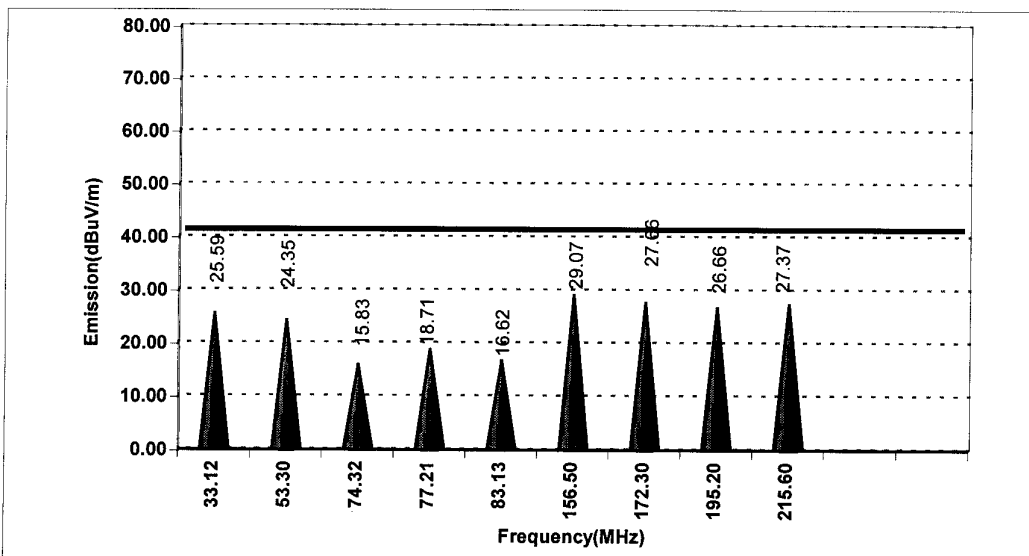
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Radiated Emission Test Results

| Sr. | Frequency(MHz) | Emissions (dB μ V/m) | Limit (dB μ V/m) | Results |
|-----|----------------|--------------------------|----------------------|---------|
| 1. | 33.12 | 25.59 | 40.45 | Pass |
| 2. | 53.3 | 24.35 | 40.45 | Pass |
| 3. | 74.32 | 15.83 | 40.45 | Pass |
| 4. | 77.21 | 18.71 | 40.45 | Pass |
| 5. | 83.13 | 16.62 | 40.45 | Pass |
| 6. | 156.5 | 29.07 | 40.45 | Pass |
| 7. | 172.3 | 27.66 | 40.45 | Pass |
| 8. | 195.2 | 26.66 | 40.45 | Pass |
| 9. | 215.6 | 27.37 | 40.45 | Pass |



14 AUG 2002

28 May 2002 15: 56: 09

ERTL (w) MUMBAI
EMISSION LEVEL [dBuV]

EN 55022 CLASS B CONDUCTED
JC NO 2002EMI140
DIGITAL WATTMETER, DWM 33
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110

90

70

50

30

QP LIMIT

AVERAGE LIMIT



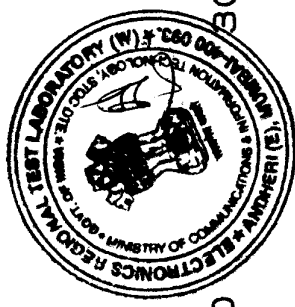
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FREQUENCY [MHZ]



OUR ACCREDITATION STATUS

ERTL (W) set up under the STQC Directorate, Ministry of Communications & Information Technology, Govt. of India has been accredited 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 <ul style="list-style-type: none"> ● Resistors (Fixed) ● Capacitors (Fixed) | Accredited as ITL (Independent Test Laboratory) |
| NABL (C), India National Accredital Board for Test & Calibration laboratories (Calibration System) | Calibration <ul style="list-style-type: none"> ● Electro-technical discipline ● Thermal discipline ● Mechanical discipline | Accredited Calibration Laboratory |
| NABL(T), India National Accredital Board for Test & Calibration laboratories (Testing System) | Electronic & Electrical Testing | Accredited Test Laboratory |
| IECEE-CE-Scheme | <ul style="list-style-type: none"> ● Mains Operated Electronic Consumer Products | Approved as a CB test Laboratory |
| Other recognition | | Recognised by CSPO of State Govt., DOT, Naval Docyard, LCSO etc. |