Electromagnetic Compatibility
Test Report

Test Report No: STC 291006
Issued on: January 20, 2014

Product Name
Multi Function Power Meter
Model: PM172N/ PM174/PM175

Tested According to
IEC 62052-11: 2003, Sec.7.3.2, 7.4.5, and 7.5.6
Amendment 2

Tests Performed for
SATEC Ltd.
Har Hotzvim, P.O.Box 45022, Jerusalem 91450
Phone: 972-2-5411000

QualiTech EMC Laboratory
30 Hasivim St,
Petah-Tikva, 49517, Israel
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1633.01

Test personnel

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EMC Lab. Manager
QualiTech EMC Laboratory

Test Report details:

Test commencement date: 19.12.2006

Test completion date: 24.12.2006

Customer's Representative: Slava Dubrovsky

Issued on: 20.01.2014

Revision details:

Version	Date	Details/Reasons
Amendment 2	03.01.2007	Additional testing according to IEC 62052-11: 2003
Amendment 2 Rev.1	20.01.2014	Updates to include latest standard versions.

Assessment information:

This report contains an assessment of the EUT against Electromagnetic Compatibility based upon tests carried out on the samples submitted. The results contained in this report relate only to the items tested. Manufactured products will not necessarily give identical results due to production and measurement tolerances. QualiTech, EMC Lab does not assume responsibility for any conclusion and generalization drawn from the test results with regards to other specimens or samples of type of the equipment represented by test item.

Customer's statement:

According to Customer's declaration "SATEC PM174 and PM175 meters are manufactured on the PM172 N platform by replacing a device faceplate and downloading a different device firmware without any change in device hardware. A different device name designates a power quality option added by the device firmware. The microcontroller clock, external bus clock and communication ports' clocks frequencies have not been changed.

Partial Testing:

According to customer's request only following tests were performed: IEC 61000-4-4, IEC 61000-4-5. Since this test report contains tests requested by the client; a subset of tests deemed necessary by QualiTech, declaration of conformity is not given for this test report.

Modifications:

Modifications made to the EUT

None

Modifications made to the Test Standard

None

Summary of Compliance Status

The Multi Function Power Meter Model: PM174 was tested according to the following test methods. Test results are given in full in sections 3÷4.

Test type	Applied on	Test Method	Frequency Range/ application type	Test Voltage/ Stress	Performance Criteria applied	Notes	Test results
EFT	230 VAC	IEC/EN61000-4-4 IEC 62052-11, Sec.7.5.4	-	±4	A	-	**Comply**
	Input U		-	±4	A	-	**Comply**
	Input I		-	±4	A	-	**Comply**
	Relays		-	±2	A	-	**Comply**
Surge	Input U1/U2/U3	IEC/EN61000-4-5 IEC 62052-11, Sec.7.3.2	U1, U2, U3	±6kV	A	-	**Comply**
	Input I1/I2/I3		I1, I2, I3	±6kV	A	-	**Comply**
	Input U1/U2/U3	IEC/EN61000-4-4 IEC 62052-11, Sec.7.5.6	L1÷ N	±4kV	A	-	**Comply**
			L2÷ N	±4kV	A	-	**Comply**
			L3÷ N	±4kV	A	-	**Comply**
			L2÷ L3	±4kV	A	-	**Comply**
			L1÷ L2	±4kV	A	-	**Comply**
			L1÷ L3	±4kV	A	-	**Comply**
	Input I1/I2/I3		I1÷ I2	±4kV	A	-	**Comply**
			I2÷ I3	±4kV	A	-	**Comply**
			I1÷ I3	±4kV	A	-	**Comply**
	Relay		Port 26÷27 Port 28÷29	±1kV; 50Ω	A	-	**Comply**

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Table of Contents

1. General

1.1. Purpose:

The purpose of this report is to show compliance to Electromagnetic Immunity requirements outlined in the referenced specifications.

1.2. Referenced documents:

IEC 62052-11: 2003	Electricity Metering Equipment (Ac) - General Requirements, Tests And Test Conditions - Part 11: Metering Equipment
IEC/EN 61000-4-4:2004 + Amendment 1: 2010	Electro magnetic compatibility (EMC), Section 4: Electrical fast transient/burst immunity test
IEC/EN 61000-4-5: 2006	Electromagnetic compatibility (EMC), Section 5: Surge immunity test

1.3. Description of the EUT system:

General description of the EUT, configuration used for Immunity testing, and the method of performance verification were defined by the manufacturer. The acceptance performance criterion was declared by the manufacturer.

1.3.1. General Description:

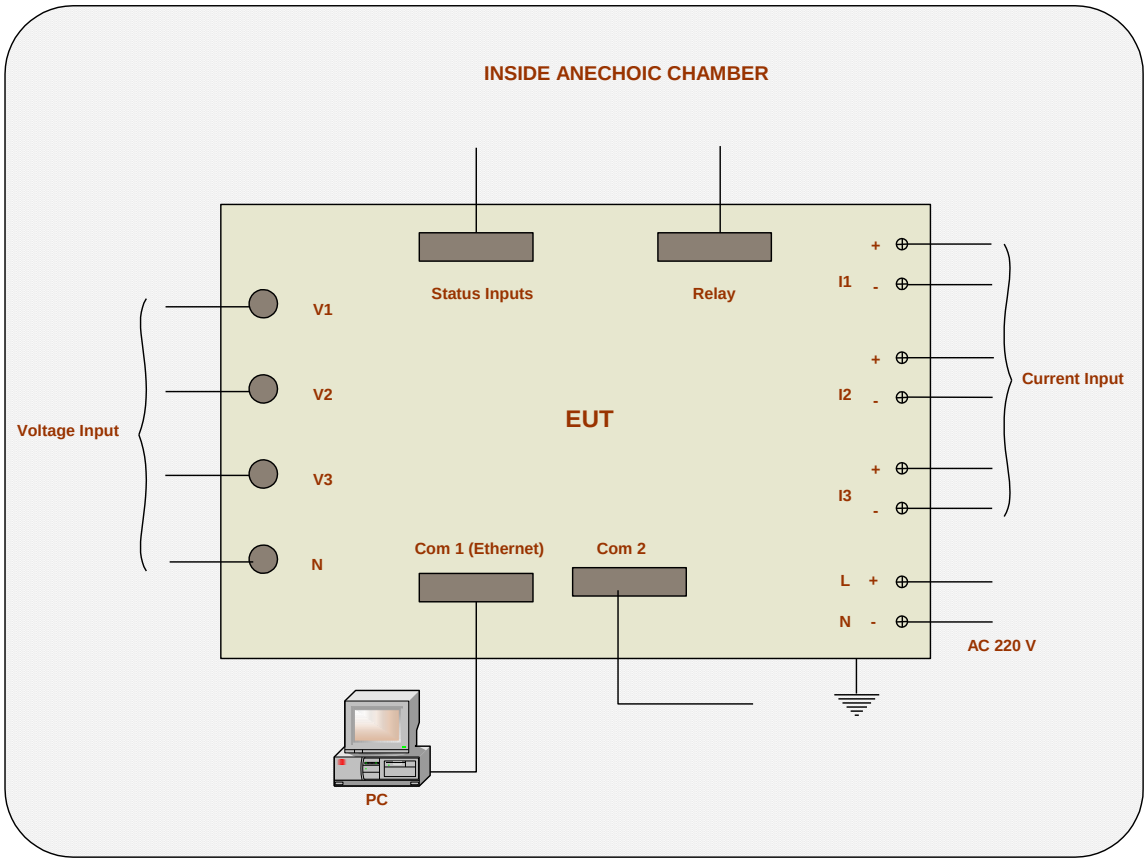
The PM174 is a compact, multi-function, three-phase AC power meter specially designed to meet the requirements of users ranging from electrical panel builders to substation operators. Bright 3-row LED display provides easy local meter readings.
Two communication ports allow local and remote automatic meter readings and setup though the supplemental communication or user data acquisition software. Different communication options are available for remote communications with the meter including public telephone lines, LAN and the Internet.

EUT Features:

- 3 voltage and 3 current transformer-isolated AC inputs for direct connection to power line or via potential and current transformers
- Multi-function 3-phase meter (true RMS, volts, amps, power, power factor, neutral current, voltage and current unbalance, frequency)
- Class 0.5 four-quadrant energy meter
- Time-of-Use, 8 totalization and tariff energy/demand registers x 8 tariffs, 4 seasons x 4 types of days, 8 tariff changes per day, easy programmable tariff schedule
- LED bar graph showing percent load with respect to user-definable nominal load current
- 2 digital inputs for monitoring external contacts, and receiving pulses from energy, water and gas meters
- 2 relay outputs for alarms and controls, and for output energy pulses
- 25/50/60/400 Hz operation

1.3.2. EUT Configuration:

EUT Configuration for Immunity Testing:



1.3.3. EUT Cards/Modules configuration:

No	Hardware Component	Manufacturer's Catalog Number	Serial Number	Hardware Revision	Quantity
1	PM172E	S172E-N4	0001	N4	1

1.3.4. Cables Identification:

Port/Line Name @ EUT	Type	Indoor/ outdoor	Impedance [Ohm]	Typical Length [m]	Tested Length [m]	# of ports/ boards available	# of ports/ boards connected	From	To
220 VAC	Standard	Indoor	4 kOhm	30	3	1	1	Power Line	PM
COM 1 (Ethernet)	UTP	Indoor	50	>300	5	1	1	PM	LAN
Current Input (3 Phase)	4 wires	Indoor	20 mOhm	>30	10	1	1	Current source	PM
Voltage Input (3 Phase)	4 wires	Indoor	500 kOhm	>30	10	1	1	Power Line	PM
Status Input	Unshielded unbalanced	Indoor	3k Ohm	<30	10	1	1	Dry Contact	PM
Relay	Unshielded Multipair	Indoor	100 …1000	<30	10	1	1	PM	Load
COM2 (RS-485)	Unshielded balanced	Indoor	50	1000	30	1	1	PM	LAN

1.3.5. Clock frequencies table:

Frequency [MHz]	Location
20 [MHz]	Microconrtroller (42)
32.768 kHz	RTC (423)

1.3.6. Method of Performance verification:

During all EMC Tests EUT was under constant observation for normal performance.
EUT connected through Com 2 (RS 485) transmitted data to the PC and the S/W PAS collected data on line. Communication & Register Data were observed for normal performance.

1.3.7. EUT Pass/Fail criteria for immunity tests:

General performance criteria:

Performance Criterion A:

The EUT shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer.
Normal Performance for criteria A is specified as:

- *Changes in register Data not allowed.*

Performance Criterion B:

The EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer. During the exposure to electromagnetic phenomenon, degradation of performance is, however allowed. No change of actual operation state or stored data is allowed.
Minimum performance level for criteria B is specified *as:*

- *Changes in register Data not allowed.*

Performance Criterion C:

Temporary loss of function is allowed provided the function is self- recoverable or can be restored by the operation of the controls.

Performance Criterion R:

The equipment shall withstand the test without damage or other disturbance (such as corruption of software or disoperation of fault protection facilities) and shall operate properly within specified limits after the transient electromagnetic stress has ceased. *It is not necessary to operate properly while the test condition is present*. The exposure may cause the operation of fuses or other specified devices, which have to be replaced or reset before normal operation is restored.

2. Test Facility & Uncertainty of Measurement

2.1. Accreditation/ Registration reference:

- *A2LA Certificate Number: 1633.01*

2.2. Test Facility description

The tests were performed at the EMC Laboratory, QualiTech Division, ECI Telecom Group

Address: 30, Hasivim St., Petah Tikva, Israel.
Tel: 972-3-926-8443

3. Immunity to Electrical Fast Transients (EFT)

Date of Test: 19.12.2006
Relative Humidity: 45%
Ambient Temperature: 22°C
Atmospheric Pressure: 1011.4 hPa

Test Method: IEC 61000-4-4 according to IEC 62052-11

Test Levels:

Power Supply Port:

Power Supply leads	Peak Voltage [kV]	Test Duration	Performance Criteria
220 VAC	±4kV	60sec	B

Telecommunication ports and Signal Lines:

Signal Line	Peak Voltage [kV]	Test Duration	Performance Criteria
Input U, Input I & Relays	±4kV	60sec	B
Relays	±2kV	60sec	B

Test Procedure:

Electrical Fast Transient/Burst Tests were performed on a ground reference plane 3m x 3m wide.
The EUT was placed on a table 0.8m above the ground reference plane, and was configured, arranged and operated in a manner consistent with typical application and load conditions. Normal functional performance of the EUT was verified.
Fast transients/Burst voltage at a repetition rate of 5 kHz was applied between the reference plane and the signal lines by means of a Capacitive Coupling Clamp, and between the ground reference plane and each of the power supply terminals, AC or DC, and protective earth (PE) terminal by means of a Coupling/Decoupling Network (CDN). Every coupling mode was applied for 1minute in each polarity.
The Fast transients/Burst generator and CDN were bonded to the reference plane. The distance between the EUT and the coupling network or clamp was 1m or less. Clear distance of 0.5m was kept from the EUT to all other conducting structures. All cables, including the one being tested, were separated by 10cm from the ground reference plane. During the tests, the EUT and external equipment were monitored to verify the required performance criteria.

List of Test Equipment:

Haefely Test System, including PEFT 4010 EFT/Burst Generator
PSPN1610 coupling network
IP4A Capacitive Coupling Clamp
WinPATS Control S/W

Test Details:

Supply/Signal line/Port under Test	Test applied at	Coupling Means	Test Setup No.	Photograph No.
230 VAC	AC Line	CDN	Fig.3.1	-
Input U	U1, U2, U3	Capacitive Coupling Clamp	Fig.3.2	-
Input I	I1, I2, I3	Capacitive Coupling Clamp	Fig.3.2	-
Relays	Relays	Capacitive Coupling Clamp	Fig.3.2	-

Test Results:

Supply/Signal line/Port under Test	Peak Voltage [kV]	Test Duration [Minutes]	BER/ # of errors	Performance Criteria Applied	Pass/ fail
230 VAC	±4	7	None	A	**Pass**
Input U	±4	2	None	A	**Pass**
Input I	±4	2	None	A	**Pass**
Relays	±2	2	None	A	**Pass**

Figure 3.1: Setup for EFT test on AC Line

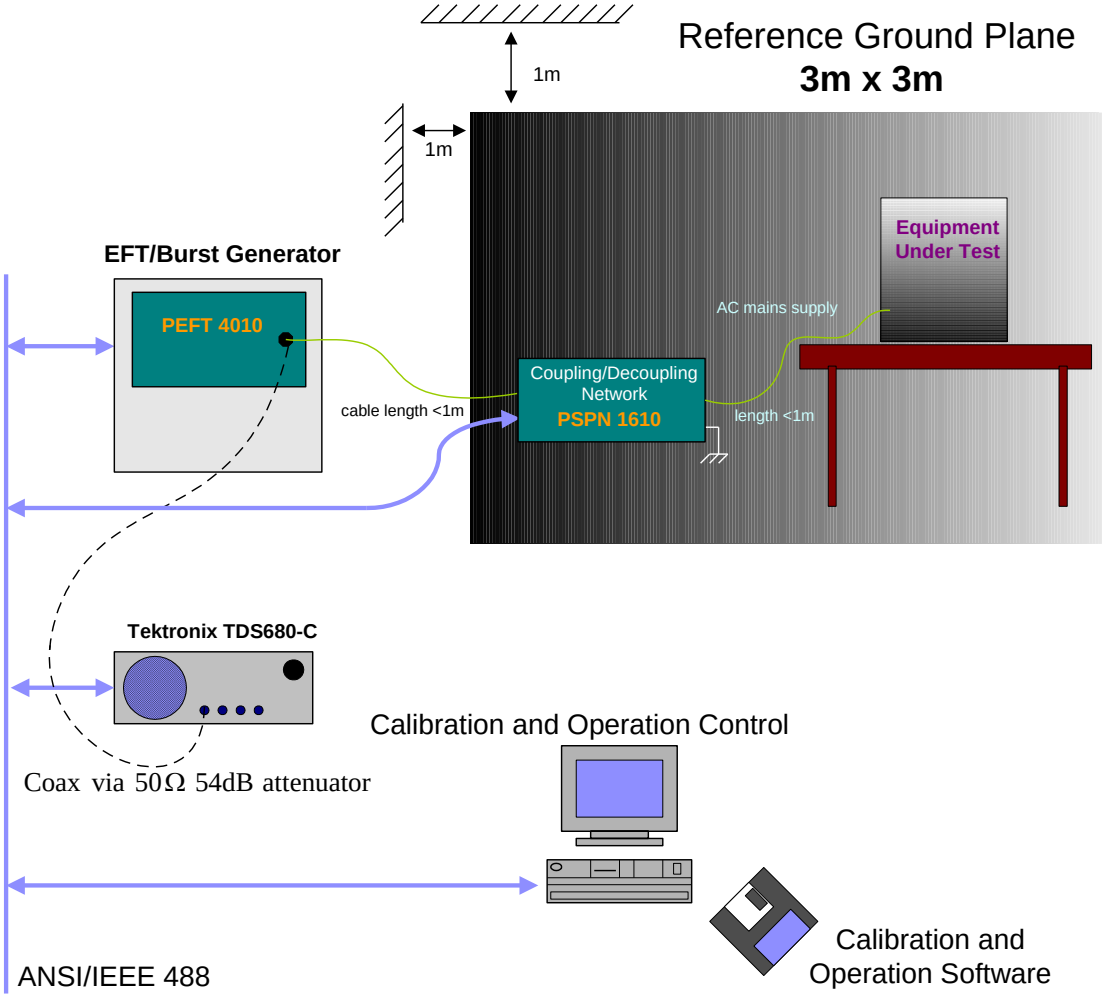
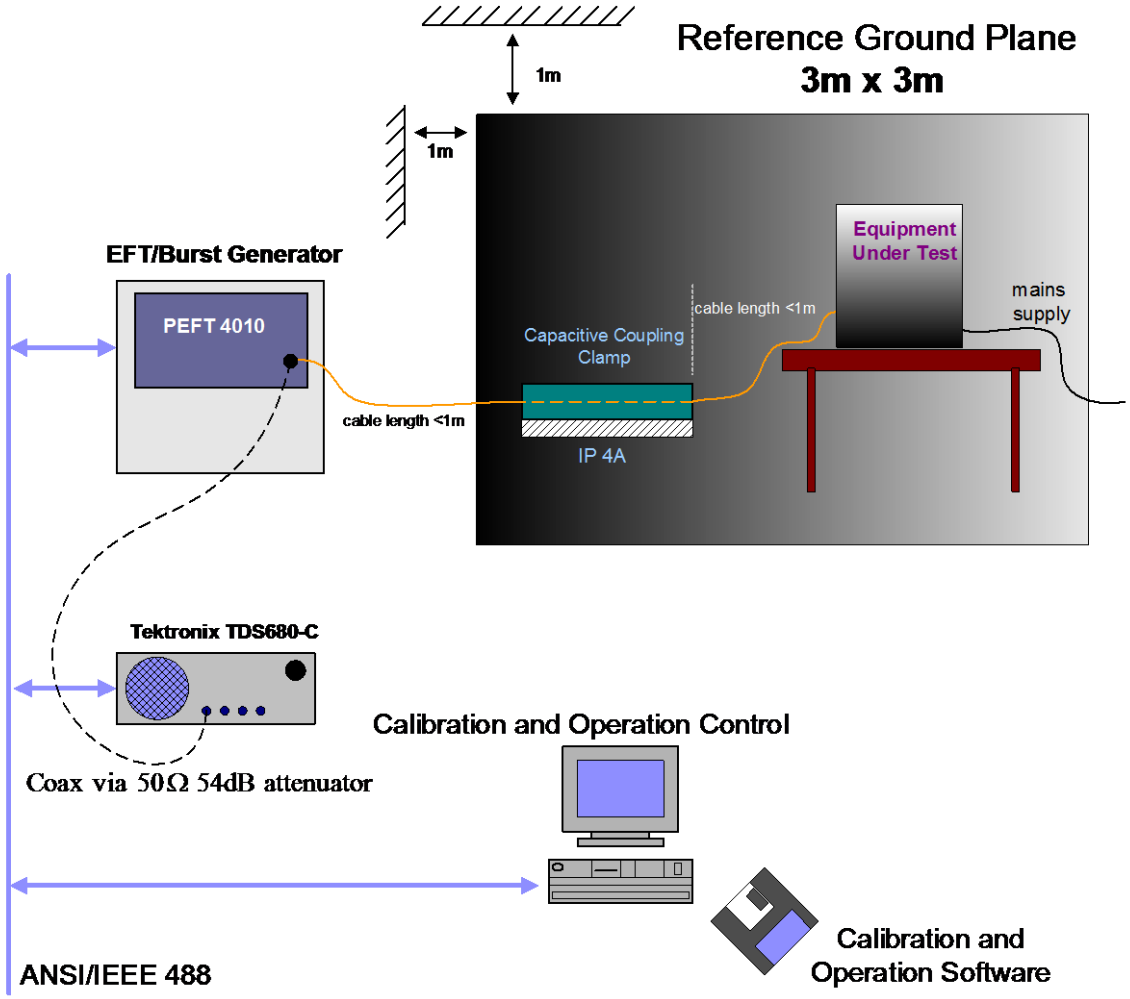
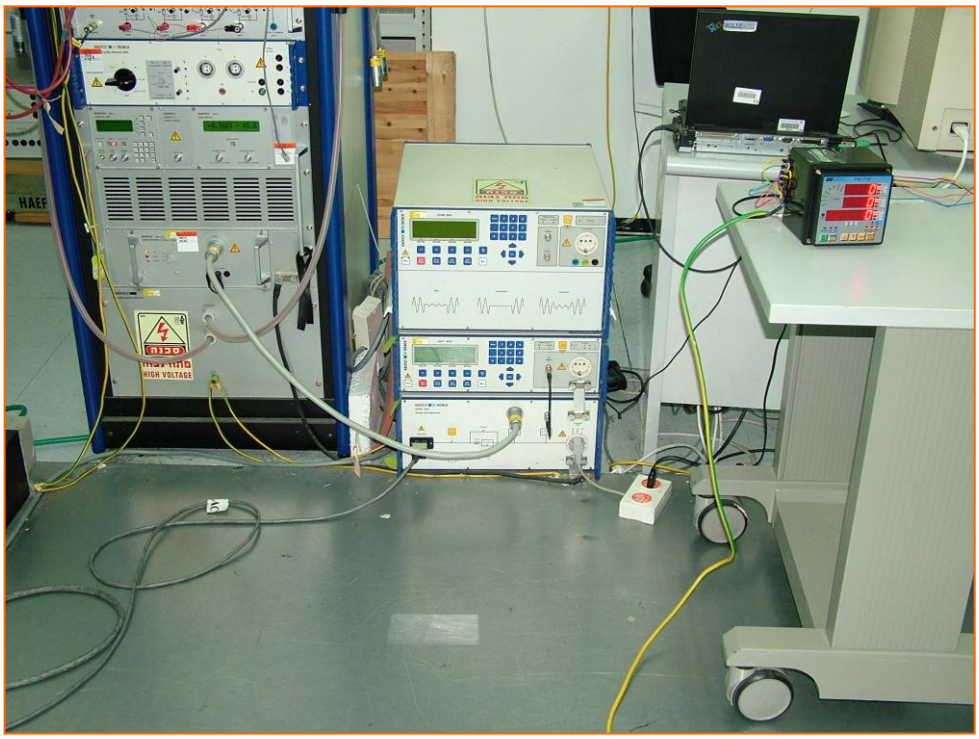


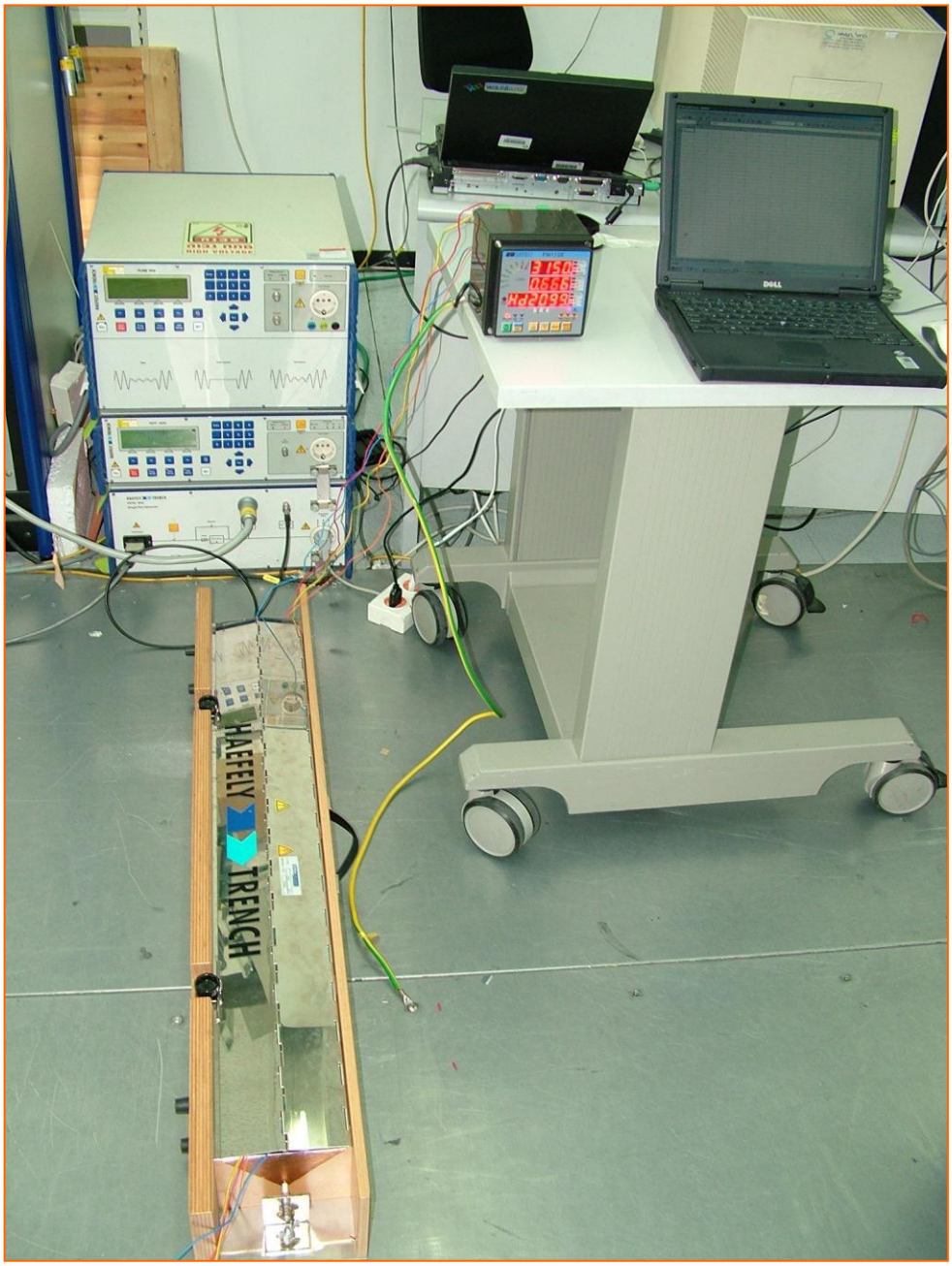
Figure 3.2: Setup for EFT test on Input U, Input I & Relays



Photograph: 3.1: EFT test on AC Line



Photograph 3.2: EFT test on Input U, Input I & Relays



4. Immunity to Voltage Surge

Date of Test: 19.12.2006
Relative Humidity: 45%
Ambient Temperature: 22°C
Atmospheric Pressure: 1011.4 hPa

Test Method: IEC 61000-4-5 according to IEC 62052-11

Test Procedure:

Surge Tests were performed on a ground reference plane 3m x 3m wide.
The EUT was placed on a table 0.8m above the ground reference plane, and was configured, arranged and operated in a manner consistent with typical application and load conditions. Normal performance of the EUT was verified.
The test was carried out according to IEC 61000-4-5 under the following conditions:

Sec. 7.3.2: Impulse Voltage Test

- Impulse waveform: 1.2/50 impulse specified in IEC 60060-1:
- Voltage rise time: ±30%
- Voltage fall time: ±20%;
- Source impedance: 500Ω ±50Ω;
- Source energy: 0.5J ± 0.05J;
- Test voltage: in accordance with Table 3a or 3b;
- Test voltage tolerance +0 – 10%
- Fore each test, the impulse voltage is applied ten times with one polarity and then repeated with the other polarity. The minimum time between the impulses shall be 3s.

Note: For areas where overhead supply networks are predominant, a higher peak value than given in Tables 3a and 3b of the test voltage may be required.

Sec. 7.5.6: Surge immunity test

- Meter in operating condition:
  - Voltage & auxiliary circuits energized with reference voltage;
  - Without any current in the current circuits and the current terminals were open circuit;
- Cable length between surge generator and meter: 1m;
- Tested in differential mode (line to line);
- Phase angle: pulses to be applied at 60° and 240° relative to zero crossing of AC supply;
- Test voltage on the current and voltage circuits (mains lines): 4kV, generator source impedance: 2Ω
- Test voltage on auxiliary circuits with a reference voltage over 40V: 1 kV; generator source impedance: 42Ω
- Number of tests: 5 positive and 5 negative;
- Repetition rate: maximum 1/min.

During the tests, the EUT and external equipment were monitored to verify the required functional performance criteria on all ports other than the tested port.

List of Test Equipment:

Haefely Test System, comprising of PSURGE 6.1 Mainframe,
WinPATS Control S/W and WinPATS Control S/W.
IP6.2 2 & 4 -wire Coupling Network,
PSPN 1610 Single Port Network,
PHV30.2 1.2x50/8x20µs Combination Wave Plug-In unit,

Test Details:

Port under Test	Test applied at	Test method reference	Generator Waveform	Test Setup No.	Photograph No.
Input U1/U2/U3	U1/U2/U3	7.3.2	Combination Wave	Fig. 4.1	Photo.4
Input I1/I2/I3	I1/I2/I3		Combination Wave		
Input U1/U2/U3	L1÷ N	Sec. 7.5.6	Combination Wave	Fig. 4.2	
	L2÷ N				
	L3÷ N				
	L2÷ L3				
	L1÷ L2				
	L1÷ L3				
Input I1/I2/I3	I1÷ I2				
	I2÷ I3				
	I1÷ I3				
Relay	Relay		Combination Wave	Fig. 4.2	

Test Results:

Port under Test	Terminal Connections	Test Level	Repetitions, each polarity	BER/ # of errors	Performance Criteria applied	Remarks
Input U1/U2/U3	U1, U2, U3	±6kV	5	None	A	**Pass**
Input I1/I2/I3	I1, I2, I3	±6kV	5	None	A	**Pass**
Input U1/U2/U3	L1÷ N	±4kV	5	None	A	**Pass**
	L2÷ N	±4kV	5	None	A	**Pass**
	L3÷ N	±4kV	5	None	A	**Pass**
	L2÷ L3	±4kV	5	None	A	**Pass**
	L1÷ L2	±4kV	5	None	A	**Pass**
	L1÷ L3	±4kV	5	None	A	**Pass**
Input I1/I2/I3	I1÷ I2	±4kV	5	None	A	**Pass**
	I2÷ I3	±4kV	5	None	A	**Pass**
	I1÷ I3	±4kV	5	None	A	**Pass**
Relay	Port 26÷27 Port 28÷29	±1kV; 50Ω	5	None	A	**Pass**

Figure 4.1: Setup for Impulse voltage test

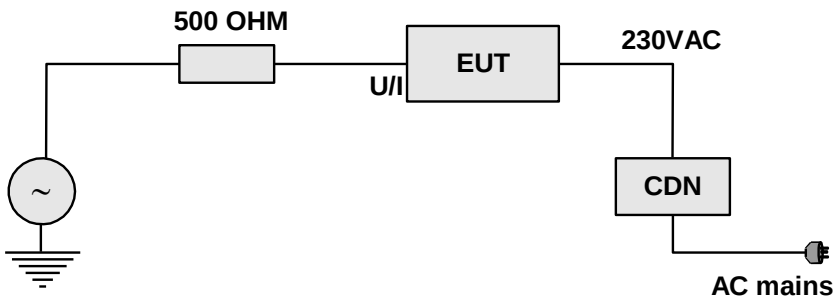
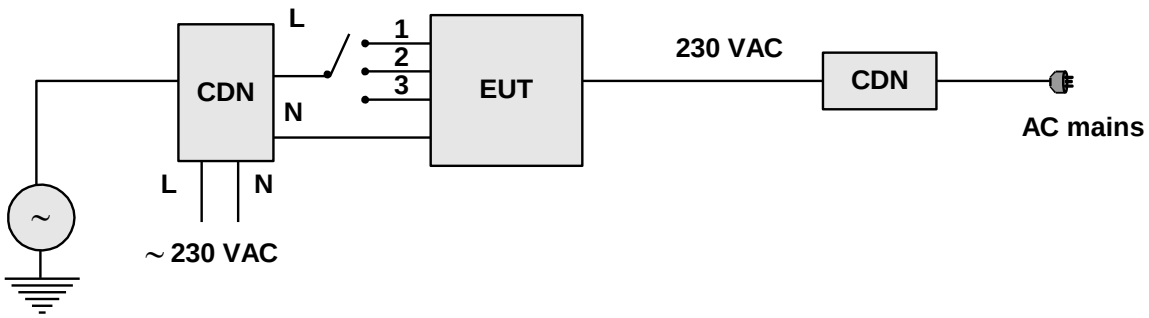
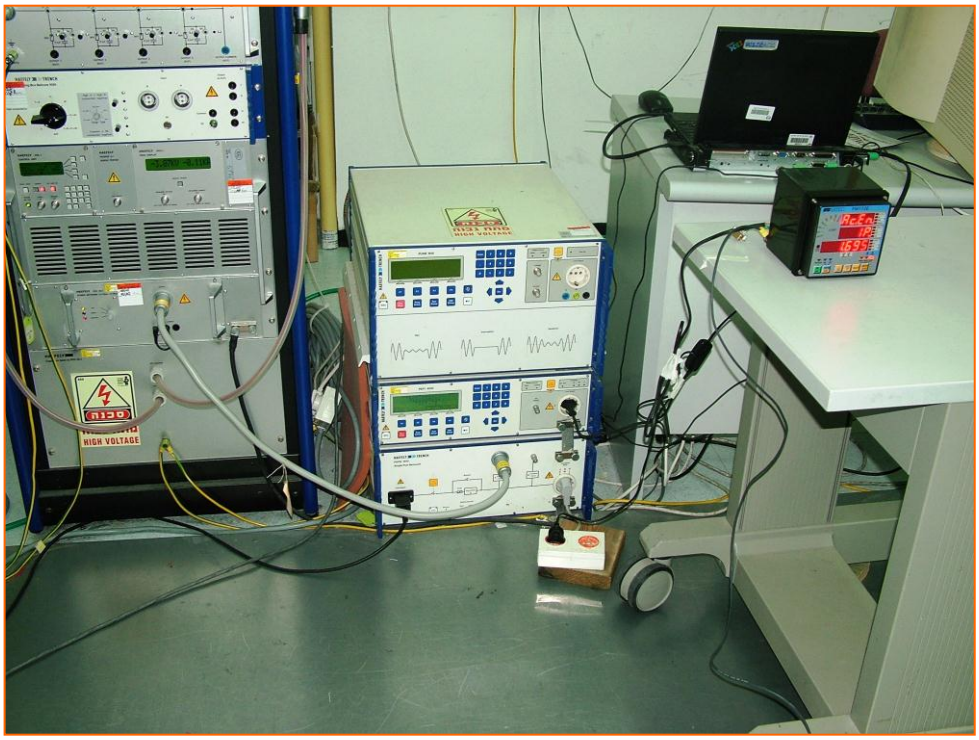
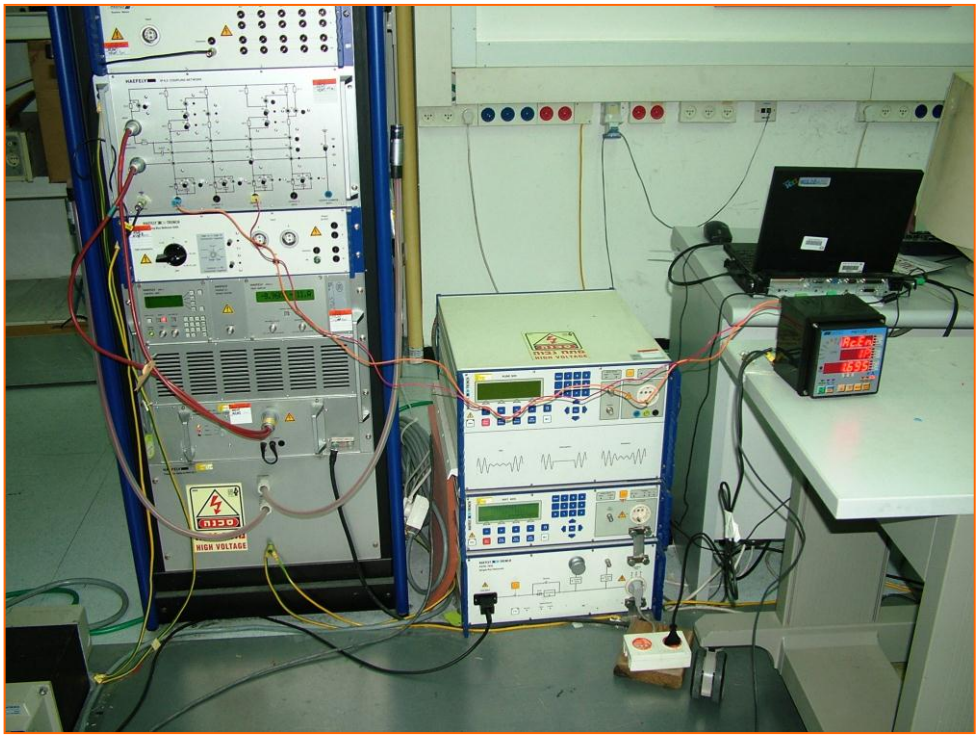


Figure 4.2: Setup for surge test



Photograph 4: Surge





5. Appendix

Appendix A: Abbreviations/ Glossary used in the test report

AC	Alternating Current
AVR	Average (Detector)
A/m	Ampere per meter
AE	Auxiliary equipment
AM	Amplitude modulation
cm	Centimeter
CE	Conducted Emission
CI	Conducted Immunity
dB	Decibel
dBm	Decibel referred to one Mill watt
dB(µV)	Decibel referred to one micro volt
dB(µV/*m*)	Decibel referred to one micro volt per meter
DC	Direct Current
ESD	Electrostatic Discharge
EFT	Electrical Fast Transients
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Immunity
EN	European Standard
EUT	Equipment under test
F/O	Fiber optic
GHz	Gigahertz
Hz	Hertz
HCP	Horizontal Coupling Plane
kHz	Kilohertz
kV	Kilovolt

ISN	Impedance stabilization network
LISN	Line Impedance Stabilization Network
m	Meter
MHz	Megahertz
NA	Not Applicable
QP	Quasi-Peak (Detector)
Ω	Ohm
PM	Pulse modulation
PC	Personal Computer
RF	Radio Frequency
RE	Radiated Emission
RI	Radiated Immunity
rms	Root-mean-square
sec	Second
SA	Spectrum analyzer
Transceiver	Transmitter -receiver
V	Volt
VCP	Vertical coupling plane
W	Watt

Appendix B: Accreditation Certificate

ilac-MRA

American Association for Laboratory Accreditation

Accredited Laboratory

A2LA has accredited

QUALITECH

Petach-Tikva, Israel

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 7th day of December 2012.

President & CEO
For the Accreditation Council
Certificate Number 1633.01
Valid to September 30, 2014

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

End of the Test Report