TEST REPORT

IEC 62053-22

Electricity metering equipment (a.c.) – Particular requirements – Part 22: Static meters for active energy (classes 0,2 S and 0,5 S)

IEC 62052-11

Electricity metering equipment (a.c.) – General requirements, tests and test conditions Part 11: Metering equipment

Report Number.....:	9412301409
Date of issue.....:	16/09/2014
Total number of pages	23 + appendices
Applicant's name .....:	SATEC Ltd.
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Testing Laboratory:	The Standards Institution of Israel
Testing location/ address .....:	42 Chaim Levanon St., Tel Aviv 69977, Israel
Tested by (name + signature).....:	SERGEY VOYTENKO
Approved by (name + signature)....:	MICHAEL TERMAN
Test specification:	
Standard .....:	IEC 62053-22: 2003 used in conjunction with IEC 62052-11: 2003
Test procedure.....:	N/A
Non-standard test method.....:	N/A
Test Report Form No. .....:	IEC62053_22A
Test Report Form(s) Originator.....:	The Standards Institution of Israel
Master TRF .....:	Dated 2014-07

General disclaimer:

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Test item description.....:	Power/Energy Management Meters
Trade Mark.....:	SATEC
Manufacturer .....:	SATEC Ltd.
Model/Type reference.....:	PM130EH PLUS, PM130PLUS, PM130P, PM130E, PM130EH, PM135; BFM136; EM133, EM132, EM131; PM175, PM172P, PM172E, PM172EH
Ratings.....:	PM130 models: PS: 85-265Vac, 88-290Vdc, 50/60Hz, 9VA; Measurement inputs: 690Vac, 1A, 5A BFM136: PS and measurement inputs: (115) 88-138 Vac or (230/277) 176-320Vac, 50/60Hz, 10VA EM133/132/131: PS: 40-300Vac/dc, 3VA max. Measurement inputs: 3x58/100-400/690Vac, 50/60Hz, 3x5A; PM175/172P/172E/172EH: PS: 85-264Vac, 85-290Vdc, 50/60Hz,10W Measurement inputs: 690Vac, 50Hz, 5A

List of Attachments (including a total number of pages in each attachment):

Appendix 1 – Photographs (13 pages attached)

Appendix 2 – EMC test report (57 pages attached)

Appendix 3 – Environmental test report (45 pages attached)

Appendix 4 – Accuracy reports (60 pages attached)

Summary of testing:

1. All testing was performed on Models PM130EH PLUS, EM133 and PM175 (the worst case configurations with all functions active) and was considered representative of all other models of the same group.
2. The maximum operating ambient temperature declared by the manufacturer for the product: 45°C.

Possible test case verdicts:

- test case does not apply to the test object.....: N/A

- test object does meet the requirement.....: P (Pass)

- test object does not meet the requirement.....: F (Fail)

Testing.....:

Date of receipt of test item .....: 9/01/2014

Date (s) of performance of tests.....: 20/01/2014-17/08/2014

General remarks:

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

General product information:

1. The equipment under test are electronic power or energy meters, mainly consisting of electronic boards housed inside an enclosure

2. Models PM130EH PLUS, PM130PLUS, PM130P, PM130E, PM130EH, and PM135 are electrically and mechanically identical except a number of active functions.
   Models EM133, EM132 and EM131 are electrically and mechanically identical except a number of active functions.
   Models PM175, PM172P, PM172E, and PM172EH are electrically and mechanically identical except a number of active functions.

General conclusion:

Electronic power/energy meters models PM130EH PLUS, PM130PLUS, PM130P, PM130E, PM130EH, PM135, BFM136, EM133, EM132, EM131, PM175, PM172P, PM172E, PM172EH comply with the requirements of IEC 62053-22: 2003 and IEC 62052-11: 2003 standards.

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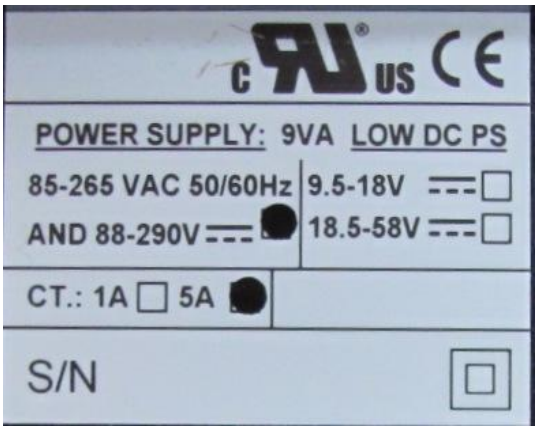
Copy of marking plate:



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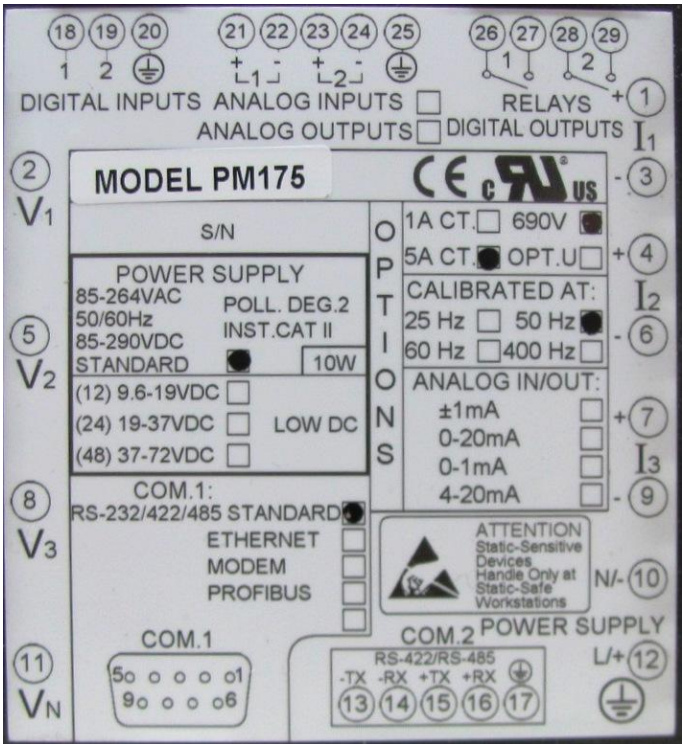

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IEC 62053-22 / IEC 62052-11			
Clause	Requirement + Test	Result - Remark	Verdict

4	**STANDARD ELECTRICAL VALUES (IEC62052-11)**		P
4.1	Standard reference voltages		P
4.2	Standard currents		P
4.3	Standard reference frequencies		P

5	**MECHANICAL REQUIREMENTS AND TESTS (IEC62052-11)**		P
5.1	General mechanical requirements	Meters are designed and constructed in such a way as to avoid introducing any danger in normal use and under normal conditions with respect to electric shock, excessinve temperatures, penetration of solid objects, dust and water, and other foreseeble hazards.	P
5.2	Case		P
5.2.1	General requirements		P
5.2.2	Mechanical tests		P
5.2.2.1	Spring hammer test (IEC 60068-2-75)	Mechanical strength of the meter case was tested with a spring hammer (0,2 J ± 0,02 J)	P
5.2.2.2	Shock test (IEC60068-2-27)	See Appendix 3	P
5.2.2.3	Vibration test (IEC60068-2-6)	See Appendix 3	P
5.3	Window	The meters employ displays with clearly see readings	P
5.4	Terminals – Terminal block(s) – Protective earth terminal		
	Terminals may be grouped in (a) terminal block(s) having adequate insulating properties and mechanical strength. In order to satisfy such requirements when choosing insulating materials for the terminal block(s), adequate testing of materials shall be taken into account. The material of which the terminal block is made shall be capable of passing the tests given in ISO 75-2 for a temperature of 135 °C and a pressure of 1,8 MPa (method A). The holes in the insulating material which form an extension of the terminal holes shall be of sufficient size to also accommodate the insulation of the conductors. The manner of fixing the conductors to the terminals shall ensure adequate and durable contact such that there is no risk of loosening or undue heating. Screw connections transmitting contact force and screw fixings which may be loosened and tightened several times during the life of the meter shall screw	**EM133 and PM175**: The terminals consist of special screw contact mounted in plastic enclosure of the meter. Insulation material of the enclosure is approved and rated heat deflection temperature according ISO 75-2 138°C **PM130EH PLUS and BFM136:** UL approved terminal blocks. Material of the housing: polyamide PA 6.6. rated heat deformation temperature 240°C. The adequate and durable contact of the conductors is provided. No risk of corrosion. All contacted surface are provided	P

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	into a metal nut. All parts of each terminal shall be such that the risk of corrosion resulting from contact with any other metal part is minimized. Electrical connections shall be so designed that contact pressure is not transmitted through insulating material. For current circuits, the voltage is considered to be the same as for the related voltage circuit. Terminals with different potentials which are grouped close together shall be protected against accidental short-circuiting. Protection may be obtained by insulating barriers. Terminals of one current circuit are considered to be at the same potential. The terminals, the conductor fixing screws, or the external or internal conductors shall not be liable to come into contact with metal terminal covers. The protective earth terminal, if any: a) shall be electrically bonded to the accessible metal parts; b) should, if possible, form part of the meter base; c) should preferably be located adjacent to its terminal block; d) shall accommodate a conductor having a cross-section at least equivalent to the main current conductors but with a lower limit of 6 mm2 and an upper limit of 16 mm2 (these dimensions apply only when copper conductors are used); e) shall be clearly identified by the graphical symbol IEC 60417-5019: Protective earth (ground). After installation, it shall not be possible to loosen the protective earth terminal without the use of a tool.	with galvanic coating. Contact pressure is not transmitted through insulating material. The terminals with different potentials are separated by insulation barriers. Protective earth terminal is part of the approved terminal block.	
5.5	Terminal cover(s) The terminals of a meter, if grouped in a terminal block and if not protected by any other means, shall have a separate cover which can be sealed independently of the meter cover. The terminal cover shall enclose the actual terminals, the conductor fixing screws and, unless otherwise specified, a suitable length of the external conductors and their insulation. When the meter is panel-mounted, no access to the terminals shall be possible without breaking the seal(s) of the terminal cover(s).	All terminals are provided with insulation covers	P

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IEC 62053-22 / IEC 62052-11			
Clause	Requirement + Test	Result - Remark	Verdict
5.6	Clearance and creepage distances The clearance and creepage distances between a) any terminal of a circuit with a reference voltage over 40 V and b) earth, together with terminals of auxiliary circuits with reference voltages below or equal to 40 V shall not be less than stated in – Table 3a for meters of protective class I; – Table 3b for meters of protective class II. The clearance and creepage distances between terminals of circuits with reference voltages over 40 V shall not be less than stated in Table 3a. The clearance between the terminal cover, if made of metal, and the upper surface of the screws when screwed down to the maximum applicable conductor fitted shall be not less than the relevant values indicated in Tables 3a and 3b. The requirement of the impulse voltage test shall also be met (see 7.3.2).	See appended Table 5.6	P
5.7	Insulating encased meter of protective class II		P
	A meter of protective class II shall have a durable and substantially continuous enclosure made wholly of insulating material, including the terminal cover, which envelopes all metal parts, with the exception of small parts, for example, name-plate, screws, uspensions and rivets. If such small parts are accessible by the standard test finger (as specified in IEC 60529) from outside the case, then they shall be additionally isolated from live parts by supplementary insulation against failure of basic insulation or loosening of live parts. The insulating properties of laquer, enamel, ordinary paper, cotton, oxide film on metal parts, adhesive film and sealing compound, or similar unsure materials, shall not be regarded as sufficient for supplementary insulation. For the terminal block and terminal cover of such a meter, reinforced insulation is sufficient.	**EM133, EM130EH PLUS:** The meter is fully enclosed by plastic enclosure with thickness 2mm. Laquer, enamel, ordinary paper, cotton, oxid film on metal. Adhesive film and sealing compound are not used as insulation.	P
5.8	Resistance to heat and fire		
	The terminal block, the terminal cover and the meter case shall ensure reasonable safety against spread of fire. They should not be ignited by thermal overload of live parts in contact with them. To comply therewith they shall fulfil the following test. The test shall be carried out according to IEC 60695-2-11, with the following temperatures: – terminal block: 960 °C ± 15 °C; – terminal cover and meter case: 650 °C ± 10 °C; – duration of application: 30 s ± 1 s. The contact with the glow wire may occur at any	**Terminals.** Insulation material of the EM133 enclosure is used as terminal housing. The material is rated GWIT 960°C. For other models approved terminals are used. Rated GWIT of the terminal housing is 960°C. **Covers and enclosures.** EM133 - 960 ºC PM130EH PLUS - 775 ºC	P

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IEC 62053-22 / IEC 62052-11			
Clause	Requirement + Test	Result - Remark	Verdict
	random location. If the terminal block is integral with the meter base, it is sufficient to carry out the test only on the terminal block.	PM175 - 875ºC All materials of the covers and enclosures are approved.	
5.9	Protection against penetration of dust and water The meter shall conform to the degree of protection given in IEC 60529. Indoor meter: IP51, but without suction in the meter. Outdoor meter: IP54. The tests shall be carried out according to IEC 60529, under the following conditions: a) Protection against penetration of dust – meter in non-operating condition and mounted on an artificial wall; – the test should be conducted with sample lengths of cable (exposed ends sealed) of the types specified by the manufacturer and terminal cover in place; – for indoor meters only, the same atmospheric pressure is maintained inside the meter as outside (neither under- nor over-pressure); – first characteristic digit: 5 (IP5X) Any ingress of dust shall be only in a quantity not impairing the operation of the meter. An insulation test according to 7.3 shall be passed. b) Protection against penetration of water – meter in non-operating condition; – second characteristic digit: 1 (IPX1) for indoor meters; 4 (IPX4) for outdoor meters. Any ingress of water shall be only in a quantity not impairing the operation of the meter. An insulation test according to 7.3 shall be passed.	All meters are intended for indoor installation. Panel-mount models PM130EH PLUS and PM175 were tested for IP51; DIN-mount models BFM136 and EM133 were tested for IP30. For these models protection shall be provided by an external cabinet.	P
5.10	Display of measured values		P
	The information can be shown either by an electromechanical register or an electronic display. In the case of an electronic display the corresponding non-volatile memory shall have a minimum retention time of four months. NOTE: 1 Longer retention time of the non-volatile memory should be the subject of a purchase contract. In the case of multiple values presented by a single display it shall be possible to display the content of all relevant memories. When displaying the memory, the identification of each tariff applied shall be possible and, for automatic sequencing displays, each display of register for billing purposes shall be retained for a minimum of 5 s.	All the meters have an electronic display, the energy registers and tariffs value and status have corresponding non-volatile memory with the retention time of 10 years. All these values accessible through the communication to PC or other Master device.	P

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	The active tariff rate shall be indicated.	One of the registers assigned for the active tariff rate	P
	When the meter is not energized, the electronic display need not be visible.		P
	The principal unit for the measured values shall be the kilowatt-hour (kWh), kilovar-hour (kvarh), kilovolt-ampere-hour (kVAh) or the megawatt-hour (MWh), megavar-hour (Mvarh), megavolt-ampere-hour (MVAh).	Active, reactive & total energy values are measured in the recommended principal units: kilowatt-hour (kWh), kilovar-hour (kvarh), kilovolt-ampere-hour (kVAh) or the megawatt-hour (MWh), megavar-hour (Mvarh), megavolt-ampere-hour (MVAh).	P
	For electromechanical registers, register markings shall be indelible and easily readable. When continuously rotating, the lowest values of the drums shall be graduated and numbered in ten divisions, each division being subdivided into ten parts, or any other arrangement ensuring the same reading accuracy. The drums which indicate a decimal fraction of the unit shall be marked differently when they are visible.		N/A
	Every numerical element of an electronic display shall be able to show all the numbers from “zero” to “nine”.	Meet the requirements	P
	The register shall be able to record and display, starting from zero, for a minimum of 1 500 h, the energy corresponding to maximum current at reference voltage and unity power factor. NOTE: 2 Values higher than 1 500 h should be the subject of purchase contract. It shall be impossible to reset the indication of the cumulative total of electrical energy during use. NOTE 3 The regular roll over of the display is not considered as a reset.	The energy registers contain 9 digits number of kWh, kVAh, kvarh. It is more than enough for 1500 h. The maximum secondary parameters: 100A x 3 maximum currents; 230V x 3 reference voltages. 230x100x3x1500=103.5x10^6= 103500kWAh (6 digits).	P
5.11	Output device		P
	The meter shall have a test output device capable of being monitored with suitable testing equipment. Output devices generally may not produce homogeneous pulse sequences. Therefore, the manufacturer shall state the necessary number of pulses to ensure a measuring accuracy of at least 1/10 of the class of the meter at the different test points. For electrical test output see, IEC 62053-31. If the test output is an optical test output, then it shall fulfil the requirements according 5.11.1and 5.11.2. The operation indicator, if fitted, shall be visible from the front.	The meters have an optical output device - RED LED.	P

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5.11.1	Mechanical and electrical characteristics An optical test output shall be accessible from the front. The maximum pulse frequency shall not exceed 2,5 kHz. Modulated and unmodulated output pulses are permitted. The unmodulated output pulses shall have the shape shown in Figure D.2. The pulse transition time (rise time or fall time) is the time of transition from one state to the other state, including transient effects. The transition time shall not exceed 20 µs (see Figure D.2). The distance of the optical pulse output from further adjacent ones or from an optical status display shall be sufficiently long that the transmission is not affected. An optimum pulse transmission2 is achieved when, under test conditions, the receiving head is aligned with its optical axis on the optical pulse output. The rise time given in Annex D, Figure D.2 shall be verified by a reference receiver diode with tr ≤ 0,2 µs.	The LED is accessible from the front and meet all requirements. The output device was tested with following testing equipment: The optical heads: 1. Model SH2003 (MTE manufacturer) 2. Model TK325 (Zera manufacturer) The calibrator: Model CMC256PLUS (OMICRON electronics GmbH manufacturer)	P
5.11.2	Optical characteristics The wavelength of the radiated signals for emitting systems shall be between 550 nm and 1 000 nm. The output device in the meter shall generate a signal with a radiation strength ET over a defined reference surface (optically active area) at a distance of a1 = 10 mm ± 1 mm from the surface of the meter, with the following limiting values: ON-condition: 50 µW/cm^2 ≤ E_T ≤ 1 000 µW/cm^2 OFF-condition: E_T ≤ 2 µW/cm^2 See also Figure D.1.	The wavelength of the radiated signals for emitting is 650 nm. The distance of the correct signal acceptance is in the range of: 1mm ... 50mm. The output device meets the requirements of ON/OFF condition.	P
5.12	Marking of meter		P
5.12.1	Name-plates: Every meter shall bear the following information as applicable: a) manufacturer's name or trade mark and, if required, the place of manufacture; b) designation of type (see 3.1.8) and, if required, space for approval mark; c) the number of phases and the number of wires for which the meter is suitable; d) the serial number and year of manufacture; e) the reference voltage; f) for direct connected meters, the basic current and the maximum current expressed;	All required information is included on the nameplates, additional markings and instructions.	P

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Clause	Requirement + Test	Result - Remark	Verdict
	g) the reference frequency in Hz; h) the meter constant; i) the class index of the meter; j) the reference temperature if different from 23 °C; k) the sign of the double square ⧈ for insulating encased meters of protective class II.		
5.12.2	Every meter shall preferably be indelibly marked with a diagram of connections. If this is not possible reference shall be made to a connection diagram.	All connections are clearly identified. Eletrical wiring diagrams are provided wither on the unts or in the product documentation (installation/operation instructions)	P

6	**CLIMATIC CONDITIONS (IEC62052-11)**		P
6.1	Temperature range	The temperature range of the meter is as shown in Table 5.	P
6.2	Relative humidity	See 6.3.3	P
6.3	Tests of the effect of the climatic environments		P
6.3.1	Dry heat test (IEC60068-2-2)	See Appendix 3	P
6.3.2	Cold test (IEC60068-2-1)	See Appendix 3	P
6.3.3	Damp heat cyclic test (IEC60068-2-30)	See Appendix 3	P
6.3.4	Protection against solar radiation (IEC60068-2-5)	The meters are intended for indoor installation	N/A

7	**ELECTRICAL REQUIREMENTS**		P
7.1	**Influence of supply voltage (IEC62052-11)**		P
7.1.1	Voltage range	Meet requirements of Table 7 of the standard	P
7.1.2	Voltage dips and short interruptions	The tests according to a), b) and c) were carried out	P
7.2	Heating (IEC62052-11)	See appended table 7.2	P
7.3	Insulation (IEC62052-11)		P
7.3.1	General test conditions		P
7.3.2	Impulse voltage test	Impulse waveform: 1,2/50 impulse specified in IEC 60060-1	P
7.3.2.1	Impulse voltage tests for circuits and between the circuits	Impulse voltage was applied ten times with one polarity and then repeated with the other polarity.	P
7.3.2.2	Impulse voltage test of electric circuits relative to earth		P

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7.3.3	AC voltage test	See 7.4 of IEC62053-22 below	P
7.4	Immunity to earth fault (IEC62052-11)	The meters under test are not intended for use in networks equipped with earth fault neutralizers	N/A
7.5	Electromagnetic compatibility (EMC) (IEC62052-11)		P
7.5.1	General test conditions	See Appendix 2	P
7.5.2	Test of immunity to electrostatic discharges	See Appendix 2	P
7.5.3	Test of immunity to electromagnetic RF fields	See Appendix 2	P
7.5.4	Fast transient burst test	See Appendix 2	P
7.5.5	Test of immunity to conducted disturbances, induced by radio-frequency fields	See Appendix 2	P
7.5.6	Surge immunity test	See Appendix 2	P
7.5.7	Damped oscillatory waves immunity test	See Appendix 2	P
7.5.8	Radio interference suppression	See Appendix 2	P

7	**ELECTRICAL REQUIREMENTS (IEC62053-22)**		**P**
	In addition to the electrical requirements in IEC62052-11, meters shall fulfil the following requirements:		P
7.1	Power consumption		P
	The power consumption in the voltage and current circuits shall be determined at reference conditions given in 8.5 by any suitable method. The overall maximum error of the measurement of the power consumption shall not exceed 5 %. The active and apparent power consumption taken at reference temperature and reference frequency, by each voltage circuit at reference voltage and by each current circuit at rated current, shall not exceed the values shown in Table 1.	Power consumption for all models comply with the requirements of Table 1 of IEC62053-22 standard	P
7.2	Influence of short-time overcurrents		P
	Short-time overcurrents shall not damage the meter. The meter shall perform correctly when back to its initial working condition and the variation of error at rated current and unity power factor shall not exceed 0,05 %. The test circuit shall be practically non-inductive and the test shall be performed for polyphase meters phase-by-phase. After the application of the short-time overcurrent with the voltage maintained at the terminals, the meter shall be allowed to return to the initial temperature with the voltage circuit(s) energized (about 1 h).	Tested and comply with the requirements of this clause	P

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	The meter shall be able to carry for 0,5 s a current equal to 20 Imax with a relative tolerance of +0 % to –10 %.		
7.3	Influence of self-heating		P
	The variation of error due to self-heating shall not exceed the values given in Table 2. The test shall be carried out as follows: after the voltage circuits have been energized at reference voltage for at least 2 h without any current in the current circuits, the maximum current shall be applied to the current circuits. The meter error shall be measured at unity power factor immediately after the current is applied and then at intervals short enough to allow a correct drawing to be made of the curve of error variation as a function of time. The test shall be carried out for at least 1 h, and in any event until the variation of error during 20 min does not exceed 0,05 %. The same test shall then be carried out at 0,5 (inductive) power factor. The cable to be used for energizing the meter shall have a length of 1 m and a cross-section of between 1,5 mm^2 and 2,5 mm^2.	Tested, see Appendix 4	P
7.4	AC voltage test	See appended table 7.4	P

8	**ACCURACY REQUIREMENTS (IEC 62053-22)**		P
8.1	Limits of error due to variation of the current	See Appendix 4	P
8.2	Limits of error due to influence quantities	See Appendix 4	P
8.2.1	Accuracy test in the presence of harmonics		P
8.2.2	Tests of the influence of sub-harmonics		P
8.2.3	Continuous magnetic induction of external origin		P
8.3	Test of starting and no-load condition	See Appendix 4	P
8.3.1	Initial start-up of the meter		P
8.3.2	Test of no-load condition		P
8.3.3	Starting		P
8.4	Meter constant	Considered	P
8.5	Accuracy test conditions	Considered	P
8.6	Interpretation of test results	Considered	P

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IEC 62053-22 / IEC 62052-11			
Clause	Requirement + Test	Result - Remark	Verdict

Table 7.2	**TABLE : Temperature Measurements**					**P**
7.2	**HEATING**. Temperature limits - NORMAL CONDITION					P
Operating conditions:	Normal continuous operation with max load specified by manufacturer: 5A per phase					
Frequency ..... :	50 Hz	Test room ambient temperature (t_a) .... :		22 °C		
Voltage ..... :	264* V	Test duration..... :		2 h 30 Min		
Part / Location		t_m °C	t_c °C	t_{max} °C	Verdict	Comments
EM133:						
Insulation near L2 contact		26.0	59.0	90	P	Insulation thermal class A (105°C)
Capacitor C7		30.7	63.7	100	P	
Common mode choke T2		31.0	64.0	90	P	Insulation thermal class A (105°C)
Transformer T1 winding		33.7	66.7	90	P	Insulation thermal class A (105°C)
Optocoupler ISO 5		32.4	65.4	100	P	
PCB near transformer T1		30.6	63.6	105	P	
PCB PCO285 near U14		35.8	68.8	105	P	
Battery 3_3V		32.1	65.1	70	P	
Contact panel		29.7	62.7	80	P	
Display panel		31.3	64.3	80	P	
NOTE 4 - See Form A.20B for details of winding temperature measurements						
Supplementary information: 1. tc - calculated to the maximum ambient temperature declared by the product manufacturer (55°C).						

42 Chaim Levanon St. Tel-Aviv 69977 Israel. Management: Tel: 972-3-6467800 Fax: 972-3-6467779 www.sii.org.il
Electronics: Tel: 972-3-6465050 Fax: 972-3-7454026 - Alarms Systems Section: Tel: 972-3-6465370 Fax: 972-3-6467262

IEC 62053-22 / IEC 62052-11			
Clause	Requirement + Test	Result - Remark	Verdict

Table 7.2	**TABLE : Temperature Measurements**					**P**
7.2	**HEATING**. Temperature limits - NORMAL CONDITION					P
Operating conditions:	Normal continuous operation with max load specified by manufacturer: 5A per phase					
Frequency..... :	50 Hz	Test room ambient temperature (t_a) .... :		22 °C		
Voltage..... :	264* V	Test duration..... :		2 h 30 Min		
Part / Location		t_m °C	t_c °C	t_{max} °C	Verdict	Comments
PM130EH PLUS:						
PCB PCO235 near J4		29.7	61.7	105	P	
Transformer T1 winding		36.5	68.5	90	P	Insulation thermal class A (105°C)
Capacitor C5		35.8	67.8	85	P	
Inductance L3		35.8	67.8	90	P	Insulation thermal class A (105°C)
PCB PCO233 near TR		36.5	68.5	105	P	
PCB PCO 210 near U5		38.6	70.6	105	P	
Voltage connector		27.7	59.7	70	P	
AC connector		28.2	60.2	70	P	
Current sensor		26.8	58.8	70	P	
Enclosure rear		26.9	58.9	80	P	
Enclosure up		26.6	58.6	80	P	
Enclosure right side		27.9	59.9	80	P	
Display		29.7	61.7	80	P	
NOTE 4 - See Form A.20B for details of winding temperature measurements						
Supplementary information: 1. tc - calculated to the maximum ambient temperature declared by the product manufacturer (55°C).						

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IEC 62053-22 / IEC 62052-11			
Clause	Requirement + Test	Result - Remark	Verdict

Table 7.2	**TABLE : Temperature Measurements**					**P**
7.2	**HEATING**. Temperature limits - NORMAL CONDITION					P
Operating conditions:	Normal continuous operation with max load specified by manufacturer: 5A per phase					
Frequency ..... :	50 Hz	Test room ambient temperature (t_a) .... :		21 °C		
Voltage ..... :	264* V	Test duration..... :		2 h		
Part / Location		t_m °C	t_c °C	t_{max} °C	Verdict	Comments
PM175:						
Current sensor		35.3	69.3	90	P	Insulation thermal class A (105°C)
Transformer T2 winding		37.3	71.3	90	P	Insulation thermal class A (105°C)
PCB PCO196 near R3		33.1	67.1	105	P	
Logic PCB near U3		38.6	72.6	105	P	
Battery		33.6	67.6	80	P	
PCO186 RS232 ISO3		41.6	75.6	85	P	
PCO093 connector J4		37.2	71.2	80	P	
PCO093 Common mode		41.5	75.5	90	P	Insulation thermal class A (105°C)
PCO093 Capacitor C6		46.3	80.3	105	P	
PCO093 Transformer winding		53.8	87.8	90	P	Insulation thermal class A (105°C)
PCO093 PCB near Transformer		51.4	85.4	105	P	
Internal wiring		37.0	71.0	80	P	
Enclosure rear panel		31.5	65.5	80	P	
Enclosure left side		35.1	69.1	80	P	
Display panel		36.5	70.5	80	P	
NOTE 4 - See Form A.20B for details of winding temperature measurements						
Supplementary information: 1. tc - calculated to the maximum ambient temperature declared by the product manufacturer (55°C).						

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IEC 62053-22 / IEC 62052-11			
Clause	Requirement + Test	Result - Remark	Verdict

Table 7.2	**TABLE : Temperature Measurements**					**P**
7.2	**HEATING**. Temperature limits - NORMAL CONDITION					P
Operating conditions:	Normal continuous operation with max load specified by manufacturer: 5A per phase					
Frequency ..... :	50 Hz	Test room ambient temperature (t_a) .....:		20 °C		
Voltage ..... :	264* V	Test duration .....:		2 h		
Part / Location		t_m °C	t_c °C	t_{max} °C	Verdict	Comments
BFM136:						
PCO190 Trans T1 winding		29.0	64.0	90	P	Insulation thermal class A (105°C)
PCO190 Common mode choke T2		31.7	66.7	90	P	Insulation thermal class A (105°C)
PCO190 Capacitor C2		31.3	66.3	85	P	
PCO190 PCB near heat sink		33.3	68.3	105	P	
PCO169 Capacitor C167		31.0	66	85	P	
PCO169 PCB near U6		32.7	67.7	105	P	
PCO169 T2 winding		30.4	65.4	90	P	Insulation thermal class A (105°C)
Enclosure display		27.6	62.6	80	P	
Enclosure up		27.1	62.1	70	P	
Enclosure left side		27.6	62.6	70	P	
NOTE 4 - See Form A.20B for details of winding temperature measurements						
Supplementary information: 1. tc - calculated to the maximum ambient temperature declared by the product manufacturer (55°C).						

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IEC 62053-22 / IEC 62052-11			
Clause	Requirement + Test	Result - Remark	Verdict

Table 5.6	**TABLE: Clearance and creepage distance measurements**							P
Clearance (cl) and creepage distance (cr) at/of/between:	Rated system voltage (V)	Rated impulse voltage (V)	Required Cl, mm		Cl (mm)	Required Cr, mm		Cr (mm)
			Indoor	Outdoor		Indoor	Outdoor	
EM133:								
Functional:								
I1 (phase L1) terminal and “10” (neutral) terminal	<300	4 000	3.0	N/A	7.7	3.2	N/A	7.7
“7” terminal (phase dry contact) and “VN” (neutral) terminal	<300	4 000	3.0	N/A	15.0	3.2	N/A	15.0
Basic/supplementary:								
PCB PCO284. “Com -01” and “N” pads (leads)	<300	4 000	3.0	N/A	6.5	3.2	N/A	6.5
PCB PCO284. “Com -01” and C14 pad (SMPS primary)	<300	4 000	3.0	N/A	6.5	3.2	N/A	6.5
Reinforced:								
I3 terminal (phase L3) and “+x” terminal (interface RS-485)	<300	6 000	5.5	N/A	7.8	6.3	N/A	7.8
ISO5 and ISO6 leads	<300	6 000	5.5	N/A	7.1	6.3	N/A	7.1
Supplementary information: functional insulation meets the requiremetns of Cl. 5.6., Table 3a								

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IEC 62053-22 / IEC 62052-11			
Clause	Requirement + Test	Result - Remark	Verdict

Table 5.6	**TABLE: Clearance and creepage distance measurements**								P
Clearance (cl) and creepage distance (cr) at/of/between:	Rated system voltage (V)	Rated impulse voltage (V)	Required Cl, mm		Cl (mm)	Required Cr, mm		Cr (mm)
			Indoor	Outdoor		Indoor	Outdoor	
PM130EH PLUS:								
Functional:								
PCB PCO235. V3 (phase L3) terminal and "Vn" (neutral) terminal connector J1 – J3	<300	4 000	3.0	N/A	7.0	3.2	N/A	7.0
PCB PCO235. "L" terminal (phase) and "N" (neutral) terminal connector J5	<300	4 000	3.0	N/A	3.5	3.2	N/A	3.5
Basic/supplementary:								
PCB PCO235. "L" pad and "N" track connector J5	<300	4 000	3.0	N/A	3.7	3.2	N/A	3.7
Reinforced:								
PCB PCO235. "N" (netral) lead-pad and "-" lead-pad (interface RS-485) connector J4	<300	6 000	5.5	N/A	5*2=10	6.3	N/A	5*2= 10
PCB PCO235 and PCO233. Components leads in the Primary and the Secondary circuits via spacer.	<300	6 000	5.5	N/A	7.0	6.3	N/A	N/A
Supplementary information: functional insulation meets the requiremetns of Cl. 5.6., Table 3a								

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IEC 62053-22 / IEC 62052-11			
Clause	Requirement + Test	Result - Remark	Verdict

Table 5.6	**TABLE: Clearance and creepage distance measurements**							P
Clearance (cl) and creepage distance (cr) at/of/between:	Rated system voltage (V)	Rated impulse voltage (V)	Required Cl, mm		Cl (mm)	Required Cr, mm		Cr (mm)
			Indoor	Outdoor		Indoor	Outdoor	
EM175:								
Functional:								
PCB PCO093 Power supply Casel VAF102. SS11 (Line) and L1 (neutral) leads/pads	<300	4 000	3.0	N/A	3.2	3.2	N/A	3.2
PCB PCO093. J4 via not used contact	<300	4 000	3.0	N/A	2*1.6 = 3.2	3.2	N/A	2*1.6 = 3.2
Basic/supplementary:								
RV19 (Line) and C24 (Ground) leads.	<300	4 000	3.0	N/A	7.0	3.2	N/A	7.0
Reinforced:								
PCB PCO093 Power supply Casel VAF102. Between PC11 leads	<300	6 000	5.5	N/A	7.3	6.3	N/A	7.3
RV19 lead (Line) and contact 5 J9 (Rs485 interface)	<300	6 000	5.5	N/A	15.7	6.3	N/A	15.7
R11 pad (Line, V1 circuit) and J22 contact 5 track (COM 1)	<300	6 000	5.5	N/A	18.4	6.3	N/A	18.4
Supplementary information: functional insulation meets the requiremetns of Cl. 5.6., Table 3a								

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IEC 62053-22 / IEC 62052-11			
Clause	Requirement + Test	Result - Remark	Verdict

Table 5.6	**TABLE: Clearance and creepage distance measurements**								P
Clearance (cl) and creepage distance (cr) at/of/between:	Rated system voltage (V)	Rated impulse voltage (V)	Required Cl, mm		Cl (mm)	Required Cr, mm		Cr (mm)
			Indoor	Outdoor		Indoor	Outdoor	
BFM136								
Functional:								
PCB PCO169. Terminal block J54, J55 leads (V1 or V2 or V3 and Vn)	<300	4 000	3.0	N/A	7.0	3.2	N/A	7.0
PCB PCO190 PH3 (V3) and N leads	<300	4 000	3.0	N/A	6.0	3.2	N/A	6.0
Basic/supplementary:								
PCB PCO169. C27 leads	<300	4 000	3.0	N/A	6.8	3.2	N/A	6.8
J54, J55 leads and left side panel of the enclosure	<300	4 000	3.0	N/A	5.8	3.2	N/A	5.8
The common mode choke T2 winding and grounded rear panel of the enclosure	<300	4 000	3.0	N/A	8.9	3.2	N/A	N/A
Reinforced:								
C2 lead (Primary) and J3 leads (Secondary)	<300	6 000	5.5	N/A	5.8	6.3	N/A	N/A
C11 leads	<300	6 000	5.5	N/A	7.5	6.3	N/A	7.5
ISO1 or ISO2 or ISO3 leads	<300	6 000	5.5	N/A	6.6	6.3	N/A	6.6
Supplementary information: functional insulation meets the requiremetns of Cl. 5.6., Table 3a								

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IEC 62053-22 / IEC 62052-11			
Clause	Requirement + Test	Result - Remark	Verdict

Table 7.3.3	**TABLE: Electric strength tests**		P
Test voltage applied between:	Voltage shape (AC, DC, impulse, surge)	Test voltage (V)	Breakdown Yes / No
EM133:			
Terminal 9 (Phase), terminal 10 (Neutral) and terminal 11 (common)	AC	2000	No
Terminals V1 – V3, I1 – I3 and terminal 11 (common)	AC	2000	No
Terminals V1 – V3, I1 – I3, 9 (phase), 10 (Neutral) and terminals “X+”, “X-“ (interface RS-485)	AC	2000	No
Terminals V1 – V3, I1 – I3, 9 (phase), 10 (Neutral) and metal foil on the display and terminals covers	AC	2000	No
PM130EH PLUS:			
Terminal J1, J3 (Phase V1, V2, V3, Vn), terminal J5 (L, N,) (Neutral) and terminal J5 (G)	AC	2000	No
Terminal J1, J3 (Phase V1, V2, V3, Vn), terminal J5 (L, N,) (Neutral) and terminal J6 (SH)	AC	2000	No
Terminal J1, J3 (Phase V1, V2, V3, Vn), terminal J5 (L, N,) (Neutral) and terminal J6 (“+”, “-“ interface RS-485)	AC	2000	No
Terminal J1, J3 (Phase V1, V2, V3, Vn), terminal J5 (L, N,) (Neutral) and metal foil on the display and terminals covers	AC	2000	No
PM175:			
Terminals V1, V2, V3, VN, I1, I2, I3, L, N and terminals marked as protective ground.	AC	2000	No
Terminals V1, V2, V3, VN, I1, I2, I3, L, N and RS485 terminal	AC	2000	No
Terminals V1, V2, V3, VN, I1, I2, I3, L, N and RS232 terminal	AC	2000	No
Terminals V1, V2, V3, VN, I1, I2, I3, L, N and metal foil on display cover	AC	2000	No
BFM136:			
Terminals V1, V2, V3, VN and terminals marked as protective ground	AC	2000	No
Terminals V1, V2, V3, VN and RS485 terminal	AC	2000	No
Terminals V1, V2, V3, VN and RS232 terminal	AC	2000	No
Terminals V1, V2, V3, VN and metal foil on display cover	AC	2000	No
Supplementary information:			

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List of test equipment used:

Testing / measuring equipment / material used				Range used	Calibration date	
SII Ref. No.	Instrument Type	Manufacturer	Model		Last	Due
4875	Power Analyzer	Avpower	PA2200	auto	11/13	11/14
53930	Industrial scopemeter	Fluke	123 S/N DM7540064	auto	11/13	11/14
5047	True RMS Multimeter	Fluke	87III	auto	02/14	02/15
52654	Jointed test finger	PTL	P 10.04	--	02/14	02/17
5972	Ground Bond Tester	Associated Research	3140	auto	12/13	12/14
6501330	Digital Caliper	SIGNET	75430	--	10/13	10/14
52746	Test gauge	PTL	L25.84	--	02/14	02/17
2374	Impact Hammer	PTL	F22.50 No. 9106151.2	--	12/12	12/15
5004 53935	Data Acquisition/Switch Unit with Thermocouples Type J 20-Channel Armature Multiplexer	Agilent	34970A S/N US37030301 34901A S/N US37242806	auto	10/13	10/14
5971	AC/DC Withstand Voltage Tester	Associated Research	3670	auto	12/13	12/14
6501243	Humidity/Baro/Temperature Data Recorder	Lutron	MHB-382SD S/N Q655831	auto	11/13	11/14

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APPENDIX 1
PHOTOGRAPHS

Fig. 1
BMF136 - overall external views

Fig. 2
BMF136 – internal board (two sides)

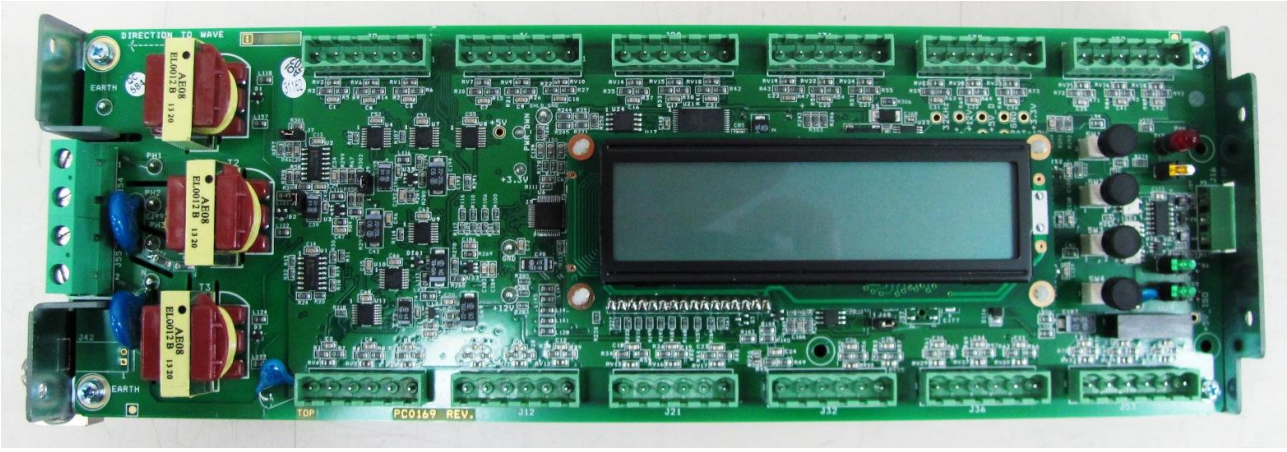


Fig. 3
EM133 - overall external views

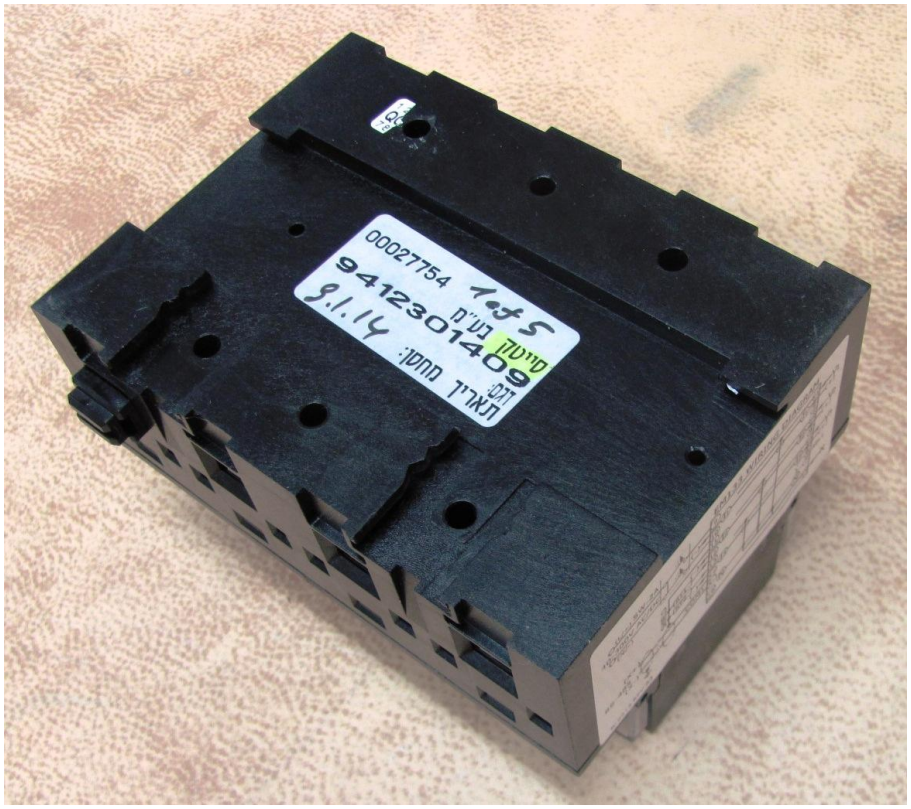
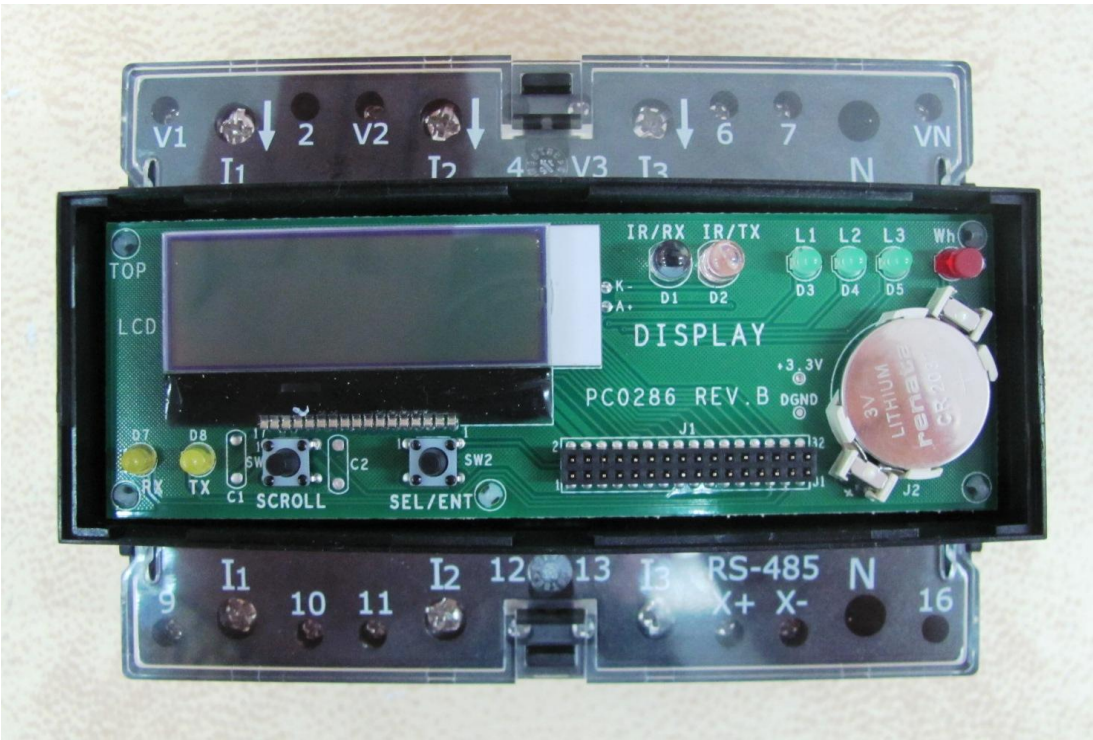


Fig. 4
EM133 – side view with wiring diagram

Fig. 5
EM133 - internal views



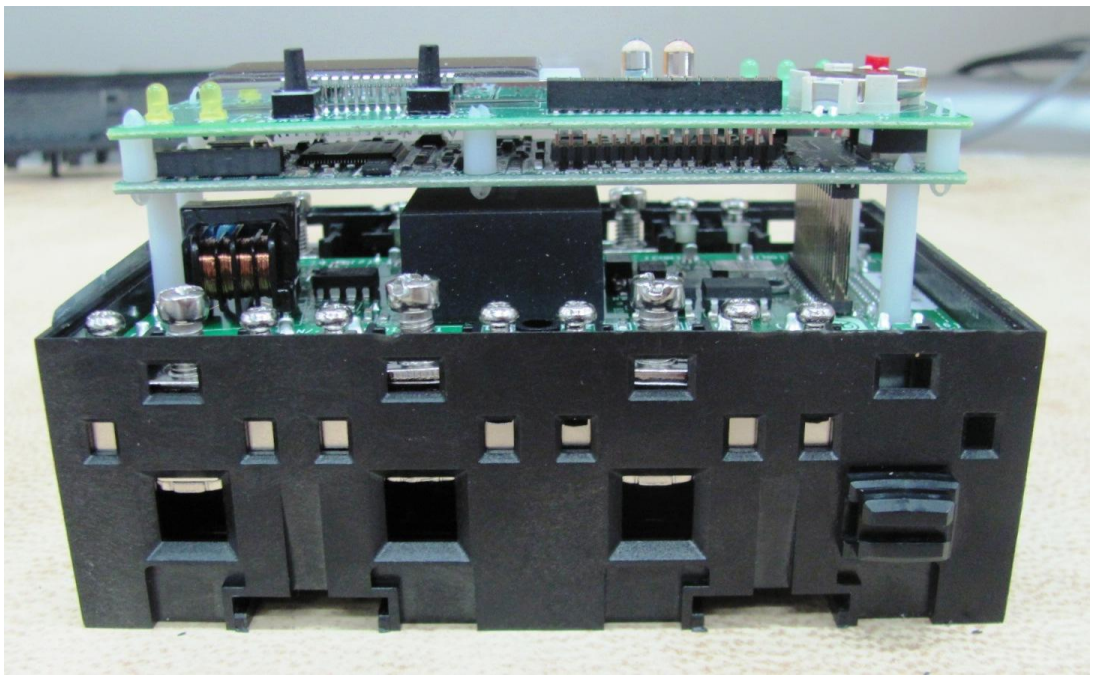
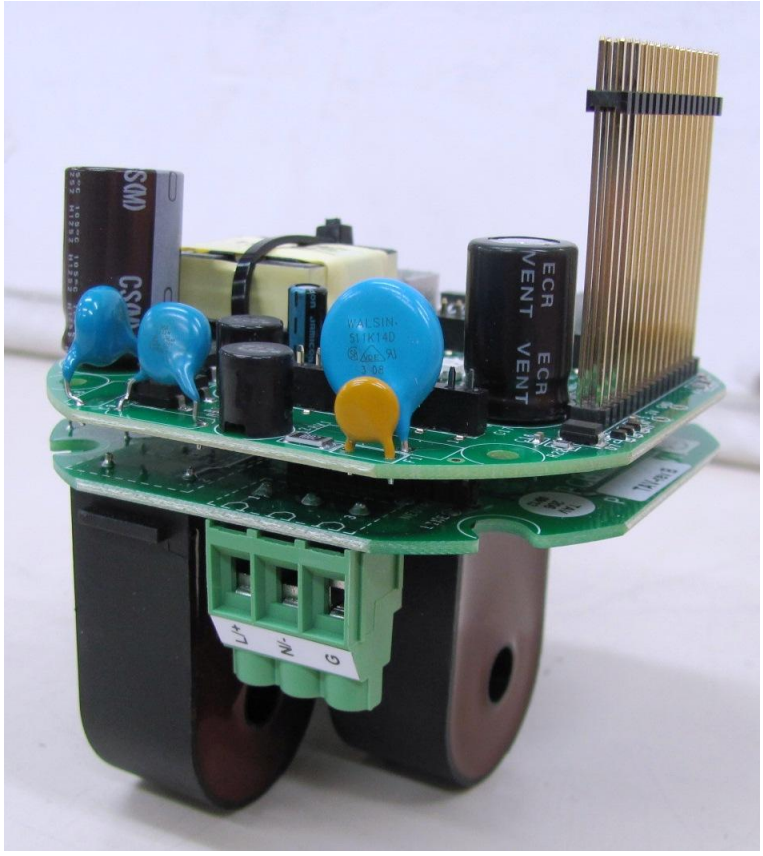


Fig. 6
PM130EH PLUS - overall external views

Fig. 7
PM130EH PLUS – front view

Fig. 8
PM130EH PLUS - internal views

Fig. 9
PM130EH PLUS - internal views



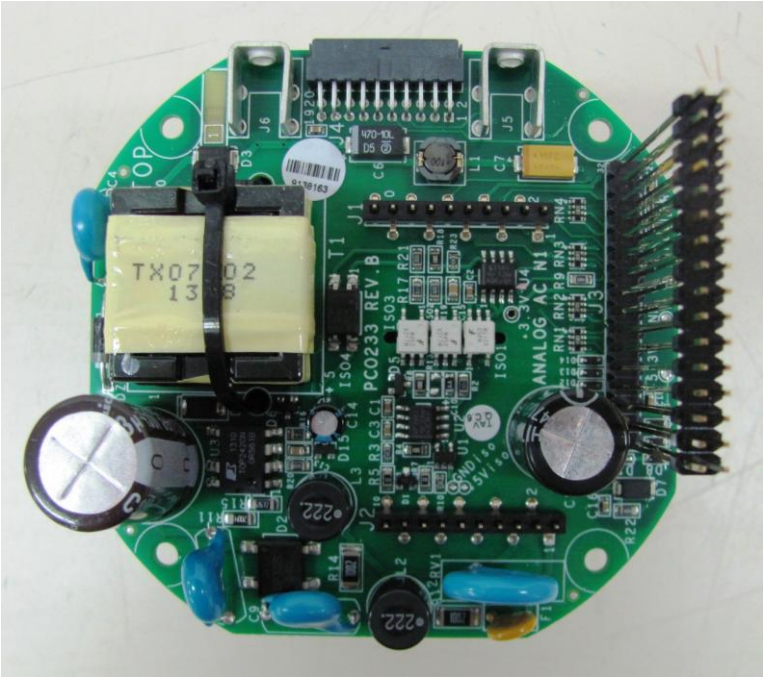
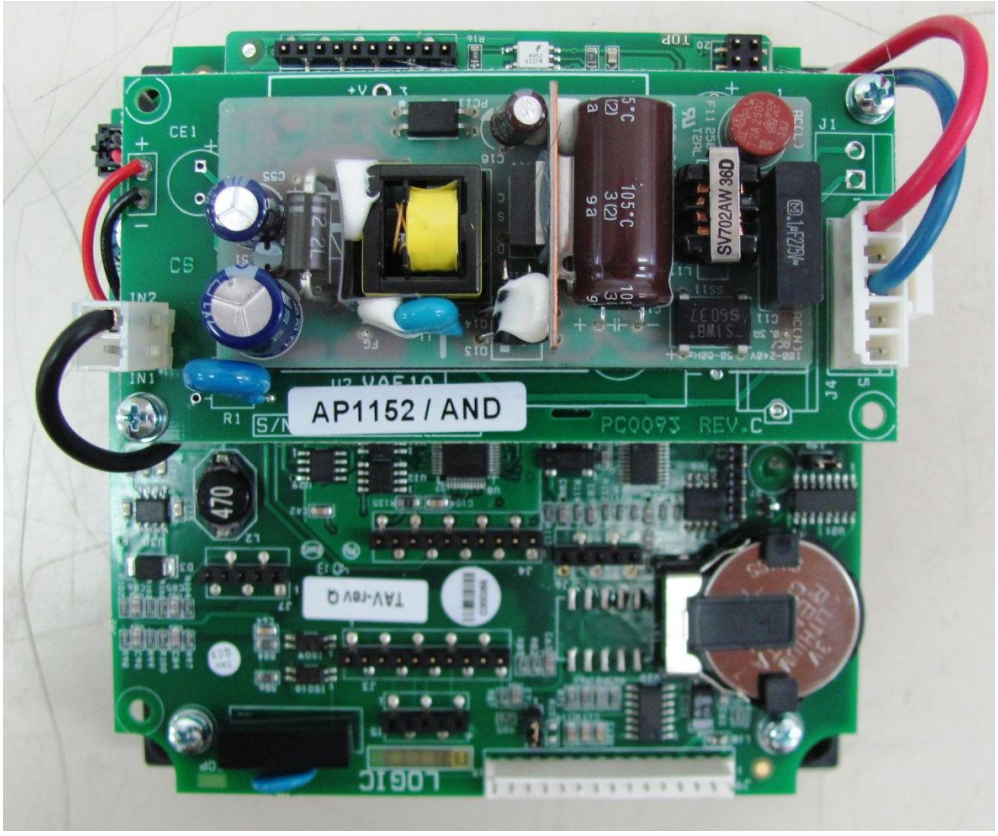
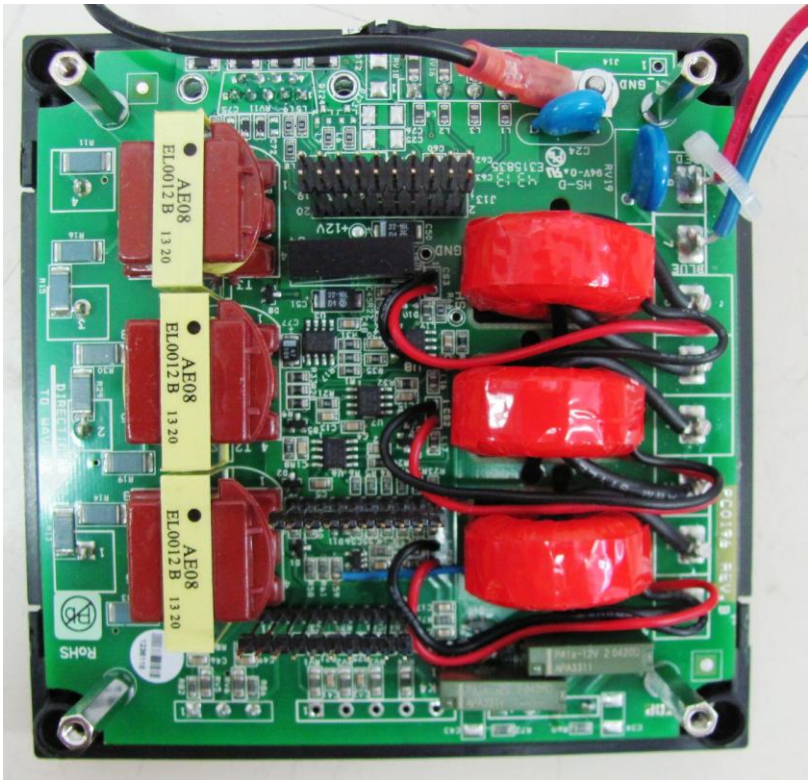


Fig. 10
PM175 - overall external views

Fig. 11
PM175 - internal view

Fig. 12
PM175 - internal views





Report Ref. No.: 9412301409

APPENDIX 2
EMC TEST REPORT

(57 pages including this cover page)

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The Standards Institution of Israel

This is to certify that:

CERTIFICATE OF CONFORMITY

Equipment Under Test #1: ***True Power Meter***
Name: ***Multifunctional Power Meter***
Model: ***PM130 PLUS***

Equipment Under Test #2: ***True Power Meter***
Name: ***DIN RAIL Smart Multi Meter***
Model: ***EM133***

Equipment Under Test #3: ***True Power Meter***
Name: ***Multifunctional Power Meter***
Model: ***PM175***

Equipment Under Test #4: ***Energy Management Meter***
Name: ***Branch Feeder Monitor***
Model: ***BFM136***

Manufactured by: ***SATEC Ltd.***

Address: Har Hotzvim Industrial Park, POB 45022
Jerusalem, 91450 Israel

Tested: *23-24/03, 30/04, 4/05, 13/07, 15-16/07/2014*

Has been tested by SII and was found to comply with the requirements of the following standards:

- **IEC 62052-11**
  Electricity metering equipment (a.c.) -
  General requirements, tests and test conditions
  Part 11: Metering equipment Ed. 1.0 (2003-02) Section: 7.5.

- **IEC 61000-3-3**
  Electromagnetic compatibility (EMC). Part 3. Limits.
  Section 3. "Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current < 16 A per phase and not subjected to conditional connection" Ed.2.0 (2008).

Test results are detailed in SII Test Report No. **9412304382**

Certificate no. 9412304382

Date of issue: August 24, 2014

Eng. Yuri Rozenberg
Head of EMC Branch

42 Chaim Levanon St. Tel-Aviv 69977, Israel. **Telematics Laboratory** Tel: 972-3-6467800 Fax: 972-3-6467779

Test Report No.9412304382

Applicant: ***SATEC Ltd.***

Equipment Under Test #1: ***True Power Meter***
Name: ***Multifunctional Power Meter***
Model: ***PM130 PLUS***

Equipment Under Test #2: ***True Power Meter***
Name: ***DIN RAIL Smart Multi Meter***
Model: ***EM133***

Equipment Under Test #3: ***True Power Meter***
Name: ***Multifunctional Power Meter***
Model: ***PM175***

Equipment Under Test #4: ***Energy Management Meter***
Name: ***Branch Feeder Monitor***
Model: ***BFM136***

Issued by:
The Standards Institution of Israel
Industry Division
Electronics & Telematics Laboratory
EMC Branch

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Test Report No.: 9412304382 **Page 1 of 54 Pages**

Title: Test on four power meters PM130 PLUSMultifunctional Power MeterModels: PM130 PLUS, EM133, PM175, BFM136PM130 PLUS

Applicant:	SATEC Ltd.
Address:	Har Hotzvim Industrial Park, POB 45022 Jerusalem, 91450 Israel
Sample for test selected by:	The customer
The date of test:	23-24/03, 30/04, 4/05, 13/07, 15-16/07/2014

Description of EUT #1:	True Power Meter
Name:	Multifunctional Power Meter
Model:	PM130 PLUS
Serial No.:	1038842, 1038844
Description of EUT #2:	True Power Meter
Name:	DIN RAIL Smart Multi Meter
Model:	EM133
Serial No.:	1049065, 1049067
Description of EUT #3:	True Power Meter
Name:	Multifunctional Power Meter
Model:	PM175
Serial No.:	1047402, 1047404
Description of EUT #4:	Energy Management Meter
Name:	Branch Feeder Meter
Model:	BFM136
Serial No.:	1048603, 1048607
Manufactured by:	SATEC Ltd.

Reference Documents:

- IEC 62052-11 — Electricity metering equipment (a.c.) - General requirements, tests and test conditions Part 11: Metering equipment Ed. 1.0 (2003-02)
- IEC 61000-3-3 — Electromagnetic compatibility (EMC). Part 3. Limits. Section 3. "Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current < 16 A per phase and not subjected to conditional connection" Ed.2 (2008).

Compliance:

Four EUT units were found to be in compliance with the requirements of the following standards:

- ✓ **IEC 62052-11 sec. 7.5.**
- ✓ **IEC 61000-3-3**

Details see in clause 1.

This Test Report contains 54 pages and may be used only in its entirety.	This Test Report applies only to the specimen tested and may not be applied to other specimens of the same product.

Table of Contents

1. Summary of Test Results

Multifunctional Power Meter Model: PM130 PLUS

Test	Standard	Class/ Severity level/lines	Test result
Emission (per IEC 62052-11 sec. 7.5.8)			
Radiated emission Freq. range: 30 - 1000 MHz	CISPR 22	Class A	Complies
Conducted emission Freq. range: 0.15 - 30 MHz		Class A 230VAC mains	Complies
Flicker tests	IEC 61000-3-3	*230VAC mains*	Complies
Immunity (per IEC 62052-11 sec. 7.5.2 - 7.5.7)			
Immunity from Electrostatic discharge (ESD)	IEC 61000-4-2	8 kV contact discharge 15 kV air discharge	Complies
Immunity from Radiated electromagnetic fields	IEC 61000-4-3	*With current*: 10 V/m 80 MHz ÷ 2 GHz 80 % AM 1 kHz *Without current*: 30 V/m 80 MHz ÷ 2 GHz 80 % AM 1 kHz	Complies
Immunity from Electrical Fast transient (EFT)	IEC 61000-4-4	*ac mains, Voltage/ Current circuit:* ± 4.0kV Tr/Th – 5/50 ns, 5 kHz	Complies
Immunity from Surge	IEC 61000-4-5	*ac mains, Voltage circuit:* ± 1.0 kV DM Tr/Th – 1.2/50 (8/20) μs	Complies
Immunity from conducted disturbances induced by radio-frequency fields	IEC 61000-4-6	*ac mains, Auxiliary circuit:* 10 VRMS 0.15-80MHz 80 % AM 1 kHz	Complies
Immunity from Ring wave	IEC 61000-4-12	*ac mains, Voltage circuit:* ± 1.0 kV DM 20 pulses, ± 2.5kV CM 40 pulses	Complies

DIN RAIL Smart Multi Meter Model: EM133

Test	Standard	Class/ Severity level/lines	Test result
Emission (per IEC 62052-11 sec. 7.5.8)			
Radiated emission Freq. range: 30 - 1000 MHz	CISPR 22	Class B	Complies
Conducted emission Freq. range: 0.15 - 30 MHz		Class A 230VAC mains	Complies
Flicker tests	IEC 61000-3-3	*230VAC mains*	Complies
Immunity (per IEC 62052-11 sec. 7.5.2 - 7.5.7)			
Immunity from Electrostatic discharge (ESD)	IEC 61000-4-2	8 kV contact discharge 15 kV air discharge	Complies
Immunity from Radiated electromagnetic fields	IEC 61000-4-3	*With current*: 10 V/m 80 MHz ÷ 2 GHz 80 % AM 1 kHz *Without current*: 30 V/m 80 MHz ÷ 2 GHz 80 % AM 1 kHz	Complies
Immunity from Electrical Fast transient (EFT)	IEC 61000-4-4	*ac mains, Voltage/ Current circuit:* ± 4.0kV Tr/Th – 5/50 ns, 5 kHz	Complies
Immunity from Surge	IEC 61000-4-5	*ac mains, Voltage circuit:* ± 1.0 kV DM Tr/Th – 1.2/50 (8/20) μs	Complies
Immunity from conducted disturbances induced by radio-frequency fields	IEC 61000-4-6	*ac mains, Auxiliary circuit:* 10 VRMS 0.15-80MHz 80 % AM 1 kHz	Complies
Immunity from Ring Surge	IEC 61000-4-12	*ac mains, Voltage circuit:* ± 1.0 kV DM 20 pulses, ± 2.5kV CM 40 pulses	Complies

Multifunctional Power Meter Model: PM175

Test	Standard	Class/ Severity level/lines	Test result
Emission (per IEC 62052-11 sec. 7.5.8)			
Radiated emission Freq. range: 30 - 1000 MHz	CISPR 22	Class B	Complies
Conducted emission Freq. range: 0.15 - 30 MHz		Class A 230VAC mains	Complies
Flicker tests	IEC 61000-3-3	*230VAC mains*	Complies
Immunity (per IEC 62052-11 sec. 7.5.2 - 7.5.7)			
Immunity from Electrostatic discharge (ESD)	IEC 61000-4-2	8 kV contact discharge 15 kV air discharge	Complies
Immunity from Radiated electromagnetic fields	IEC 61000-4-3	*With current*: 10 V/m 80 MHz ÷ 2 GHz 80 % AM 1 kHz *Without current*: 30 V/m 80 MHz ÷ 2 GHz 80 % AM 1 kHz	Complies
Immunity from Electrical Fast transient (EFT)	IEC 61000-4-4	*ac mains, Voltage/ Current circuit:* ± 4.0kV Tr/Th – 5/50 ns, 5 kHz	Complies
Immunity from Surge	IEC 61000-4-5	*ac mains, Voltage circuit:* ± 1.0 kV DM Tr/Th – 1.2/50 (8/20) μs	Complies
Immunity from conducted disturbances induced by radio-frequency fields	IEC 61000-4-6	*ac mains, Auxiliary circuit:* 10 VRMS 0.15-80MHz 80 % AM 1 kHz	Complies
Immunity from Ring wave	IEC 61000-4-12	*ac mains, Voltage circuit:* ± 1.0 kV DM 20 pulses, ± 2.5kV CM 40 pulses	Complies

Branch Feeder Meter Model: BFM136

Test	Standard	Class/ Severity level/lines	Test result
Emission (per IEC 62052-11 sec. 7.5.8)			
Radiated emission Freq. range: 30 - 1000 MHz	CISPR 22	Class A	Complies
Conducted emission Freq. range: 0.15 - 30 MHz		Class A 230VAC mains	Complies
Flicker tests	IEC 61000-3-3	*230VAC mains*	Complies
Immunity (per IEC 62052-11 sec. 7.5.2 - 7.5.7)			
Immunity from Electrostatic discharge (ESD)	IEC 61000-4-2	8 kV contact discharge 15 kV air discharge	Complies
Immunity from Radiated electromagnetic fields	IEC 61000-4-3	*With current*: 10 V/m 80 MHz ÷ 2 GHz 80 % AM 1 kHz *Without current*: 30 V/m 80 MHz ÷ 2 GHz 80 % AM 1 kHz	Complies
Immunity from Electrical Fast transient (EFT)	IEC 61000-4-4	*ac mains, Voltage/ Current circuit:* ± 4.0kV Tr/Th – 5/50 ns, 5 kHz	Complies
Immunity from Surge	IEC 61000-4-5	*ac mains, Voltage circuit:* ± 1.0 kV DM Tr/Th – 1.2/50 (8/20) μs	Complies
Immunity from conducted disturbances induced by radio-frequency fields	IEC 61000-4-6	*ac mains, Auxiliary circuit:* 10 VRMS 0.15-80MHz 80 % AM 1 kHz	Complies
Immunity from Ring wave	IEC 61000-4-12	*ac mains, Voltage circuit:* ± 1.0 kV DM 20 pulses, ± 2.5kV CM 40 pulses	Complies

Electronics and Telematics Laboratory
August 24, 2014

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2. EUT Description

Note: All information in this section was provided by the customer.

2.1. General description:

EUT #1.
Multifunctional Power Meter Model PM130 PLUS:

The Equipment Under Test (hereinafter: EUT) is a low cost multifunctional 3-phase power meter.

The **PM130 PLUS** is True Power-meter, assigned for Energy metering and power quality analysis.

This series provides a cost-effective substitute for numerous analog meters used by industrial, commercial and utility customers for basic power metering

The EUT dimensions: 11.4 x 11.4 x 10.9 cm approx

The EUT power supply: 85-265VAC 50/60/400 Hz, 88-290VDC, 4 W.

Figure 1 PM130 PLUS general view

EUT #2.
DIN RAIL Smart Multi Meter Model EM133:

The Equipment Under Test (hereinafter: EUT) is a True Power-meter, assigned for Energy metering and power quality analysis.

The **EM133** is a compact, Din Rail Smart Mater, three-phase AC Power meter (XE-"power") specially designed to meet the requirements of users ranging from electrical panel builders to substation operators.

The EUT dimensions: 9.0 x 12.5 x 7 cm approx
The EUT power supply: 40-300VAC 50/60Hz, 40-300VDC, Burden 5VA.

Figure 2 EM133 general view

EUT #3.
Multifunctional Power Meter Model PM175:

The Equipment Under Test (hereinafter: EUT) is a True Power-meter, assigned for Energy metering and power quality analysis.

The **PM175** is a multifunctional 3-phase power meter. This series provides a possibility for the complex power quality analysis combined with energy metering.

The EUT dimensions: 13.3 x 12.7 x 12.7 cm approx

The EUT power supply: 85-265VAC 50/60/400 Hz, 88-290VDC, 4 W.

Figure 3 PM175 general view

EUT #4.
Branch Feeder Meter Model BFM136:

The Equipment Under Test (hereinafter: EUT) is a 3-phase, multi-channel, multi-function energy meter suitable for use in single-phase and multi-phase electrical networks.

The EUT dimensions: 12.8 x 33.1 x 6.1 cm approx

The EUT power supply: Up to 3 x 277 VAC, 5 W.

Figure 4 BFM136 general view

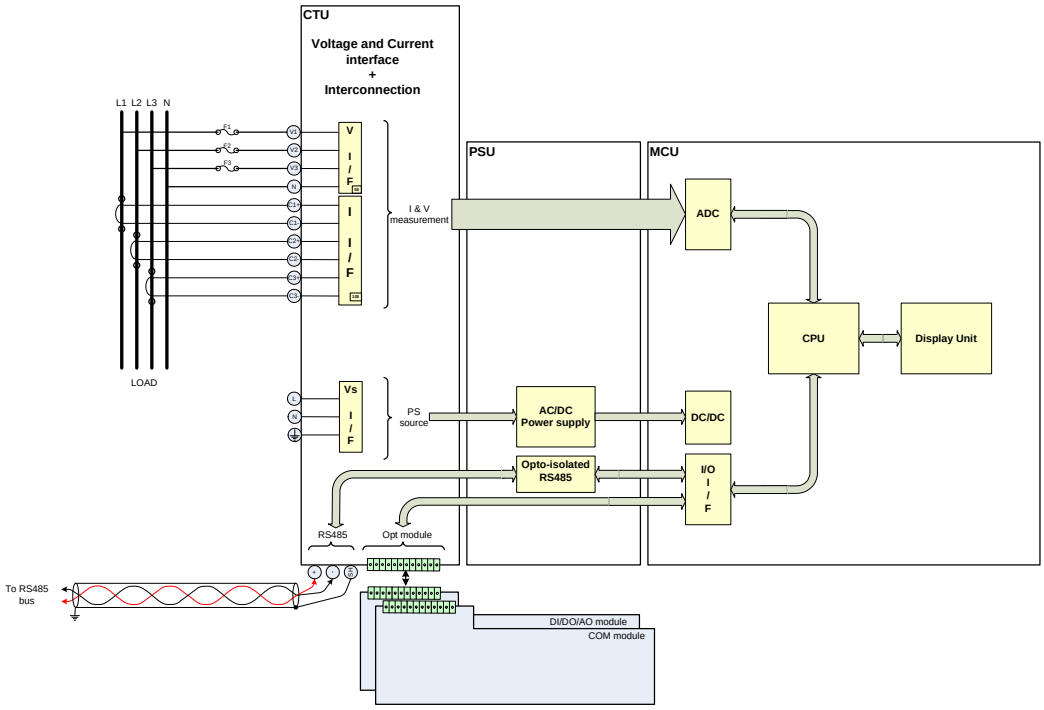


Figure 5 PM130 PLUS block diagram

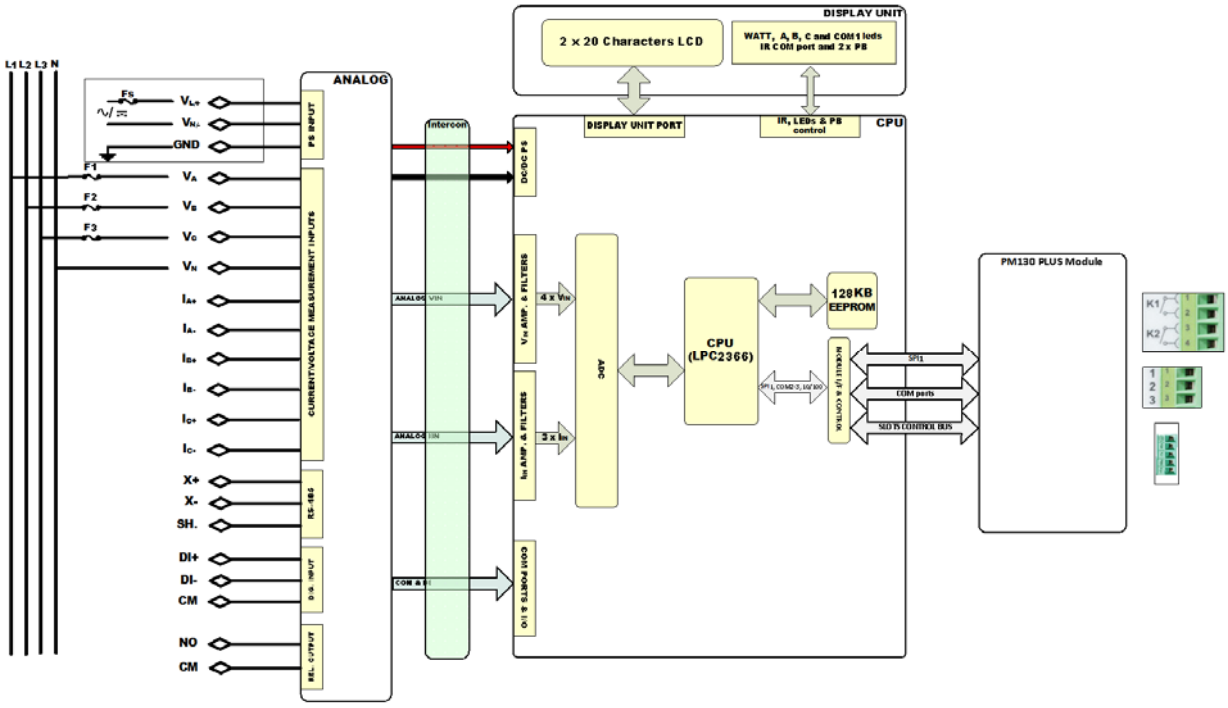


Figure 6 EM133 block diagram

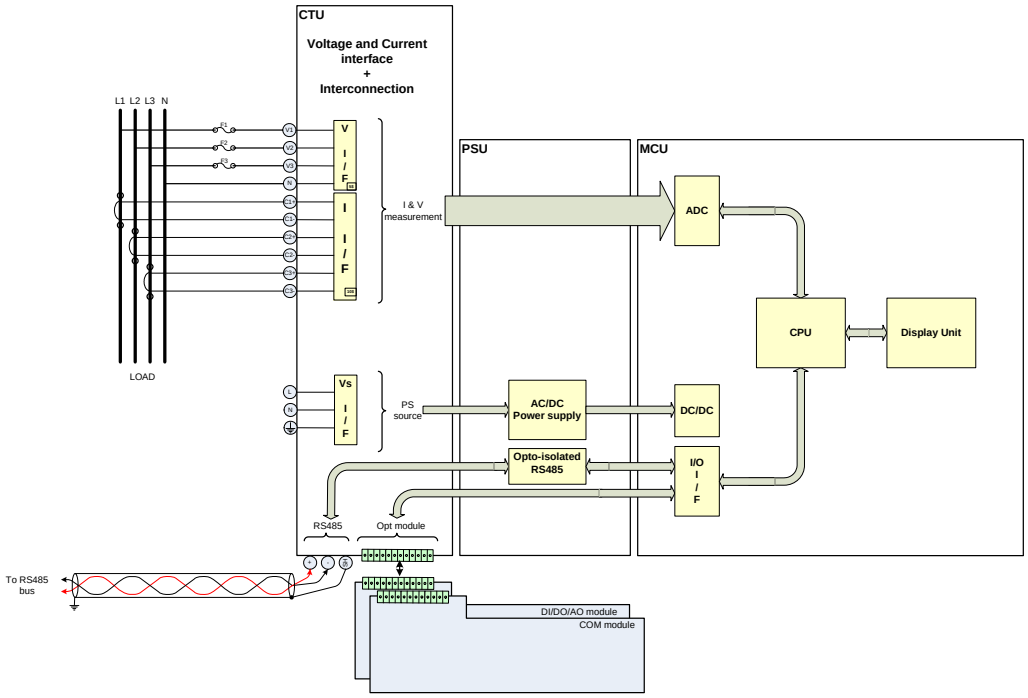


Figure 7 PM175 block diagram

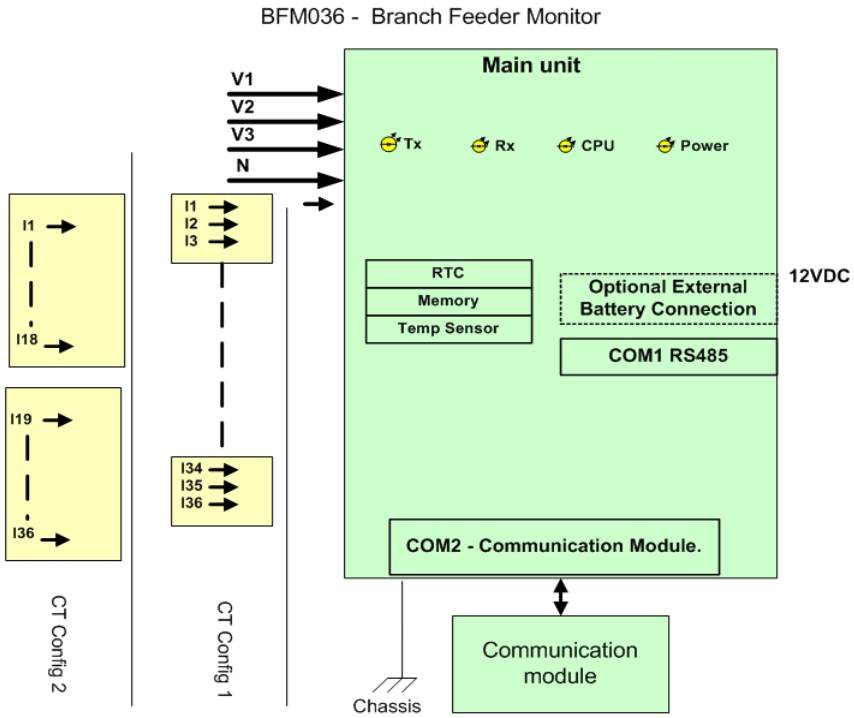


Figure 8 BFM136 block diagram

2.2. EUT sub-assemblies list:

Table 1. PM130 PLUS Sub-assemblies list

Description	Mfr	Model
Logic board	SATEC LTD.	PC0210
Analog board	SATEC LTD.	PC0233
CT board	SATEC LTD.	PC0235

Table 2. EM133 Sub-assemblies list

Description	Mfr	Model
Logic board	SATEC LTD.	PC0285
Analog board	SATEC LTD.	PC0284
Display board	SATEC LTD.	PC0286

Table 3. PM175 Sub-assemblies list

Description	Mfr	Model
Logic board	SATEC LTD.	PC0197
Analog board	SATEC LTD.	PC0196
Power Supply board	SATEC LTD.	PC0093

Table 4. BFM136 Sub-assemblies list

Description	Mfr	Model
Motherboard	SATEC LTD.	PC0169
Power Supply	SATEC LTD.	PC0190
Ethernet Module	SATEC LTD.	PC0181

2.3. EUT connector / cable list:

Table 5. PM130 PLUS Connector / Cable list

No.	Connectors description	Connector's type	Type of Cable	Length (m)	Location	No. of identical connectors
1	Voltages	Terminal 4x7.5mm	unshielded	1	Rear Panel	1
2	Power Supply	Terminal 3x7.5mm	unshielded	1		1
3	RS485	Terminal 3x5mm	unshielded	1		1

Table 6. EM133 Connector / Cable list

No.	Connectors description	Connector's type	Type of Cable	Length (m)	Location	No. of identical connectors
1	Voltages	Terminals	unshielded	1	Top Side	4
2	Currents (+)	Terminals	unshielded	1	Top Side	3
3	Currents (-)	Terminals	unshielded	1	Bottom Side	3
4	Power Supply	Terminals	unshielded	1	Bottom Side	2
5	RS485	Terminals	unshielded	1	Bottom Side	2
6	DIG IN	Terminals	unshielded	1	Bottom Side	3
7	DIG OUT	Terminals	unshielded	1	Top Side	2

Table 7. PM175 Connector / Cable list

No.	Connectors description	Connector's type	Type of Cable	Length (m)	Location	No. of identical connectors
1	Voltages	Terminal 4x20 mm	unshielded	1	Rear Panel	1
2	Currents	Terminal 6x10 mm	unshielded	1		1
3	Power Supply	Terminal 2x10 mm	unshielded	1		1
4	RS232/ RS422	DSUB-9	unshielded	1		1
5	DIG IN	Terminal 3x5 mm	unshielded	1		1
6	DIG OUT	Terminal 4x5 mm	unshielded	1		1
7	RS422	Terminal 5x5 mm	unshielded	1		1

Table 8. BFM136 Connector / Cable list

No.	Connectors description	Connector's type	Type of Cable	Length (m)	Location	No. of identical connectors
1	Currents	Terminal 6x5mm	unshielded	1	Front panel	12
2	Voltages	Terminal 4x10mm	unshielded	1	Front panel	1
3	Ground	Screw	unshielded	1	Case	1
4	RS485	Terminal 3x5mm	unshielded	1	Right side	1
5	Ethernet	RJ45	shielded	1	Right side	1

2.4. Potential emission sources:

Table 9. Potential emission sources

Frequency, (MHz)	Location	EUT Model
8	Logic board	PM130 PLUS / EM133
20	Logic board	PM175
20	Motherboard	BFM136

2.5. EUT setup and operation:

The test setup for each EUT is shown in Fig. 9-12.
Each EUT was operated to the normal operation mode.
The list of tests ant their applicability is detailed in table 4.

Table 10. List of applicable tests

Mains voltage	Emission tests				Immunity tests					
	IEC 62052-11// CISPR 22		IEC 61000-3-x		IEC 62052-11// IEC 61000-4-x					
	Conduct.	Rad.	-2	-3	-2	-3	-4	-5	-6	-12
230 VAC	✓	✓	NA	✓	✓	✓	✓	✓	✓	✓

"N/A" denotes the test is not applicable, no standard's requirement exists

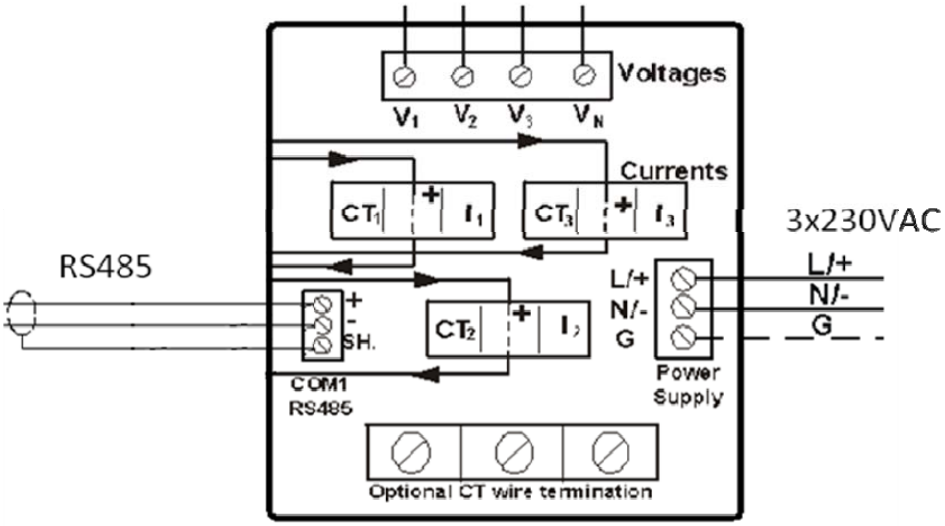


Figure 9. PM130 PLUS Test setup

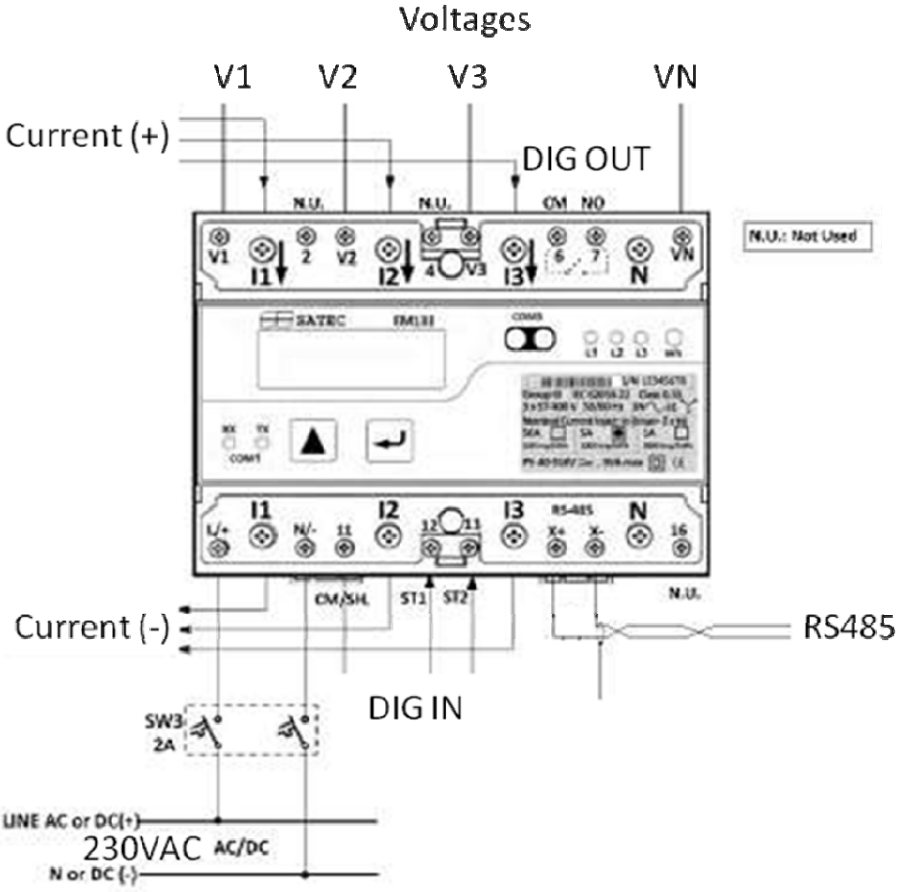


Figure 10. EM133 Test setup

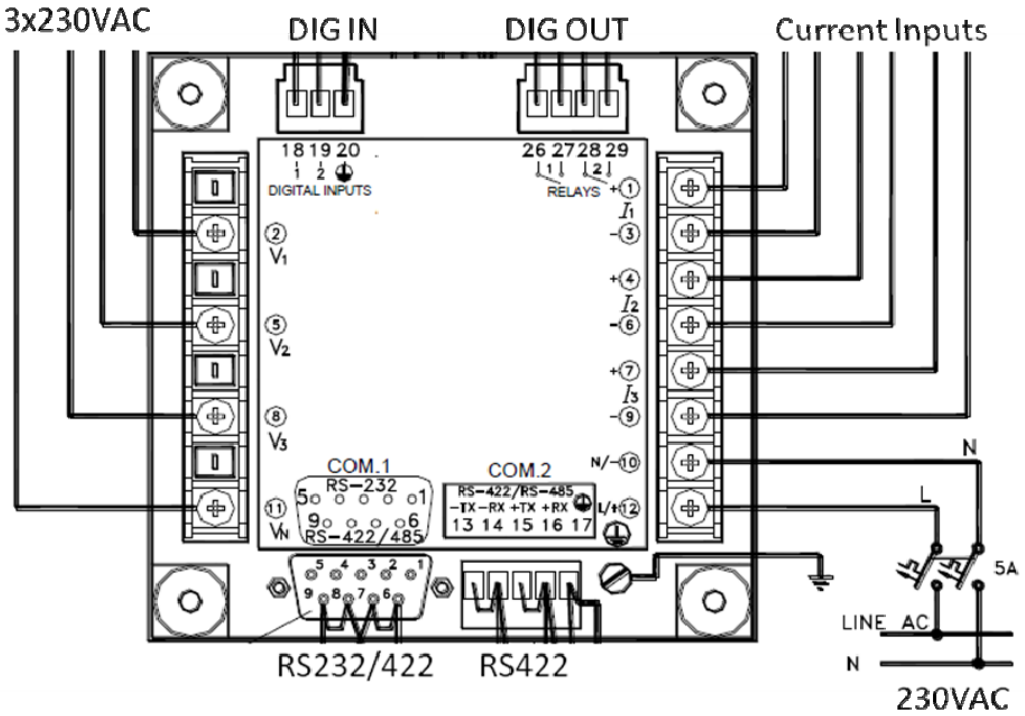


Figure 11. PM175 Test setup

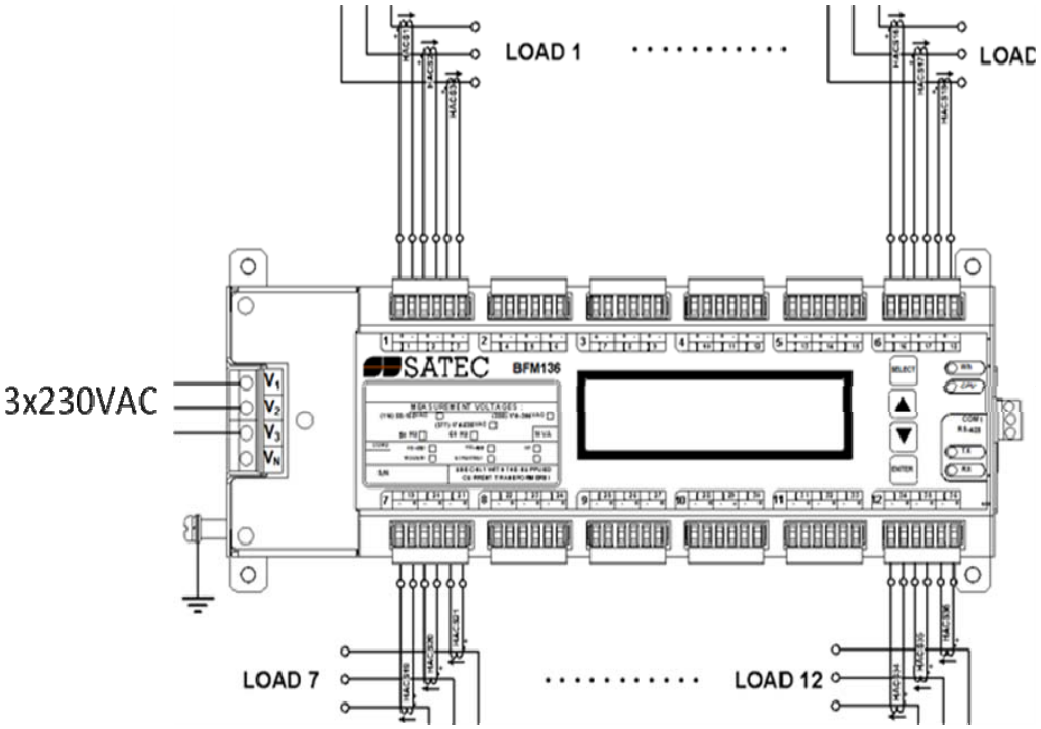


Figure 12. BFM136 Test setup

3. Test specification, Methods and Procedures

Test Specification:

❖ IEC 62052-11	Electricity metering equipment (a.c.) - General requirements, tests and test conditions Part 11: Metering equipment Ed. 1.0 (2003)
❖ IEC 61000-3-3	Electromagnetic compatibility (EMC) Part 3. Limits. Section 3. “Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current < 16 A per phase and not subjected to conditional connection” Ed.2 (2008).

Methods and Procedures:

❖ CISPR 22	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement (2010).	
❖ IEC 61000-3-3	Electromagnetic compatibility (EMC) Part 3. Limits. Section 3. “Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current < 16 A per phase and not subjected to conditional connection” Ed.2 (2008).	
❖ IEC 61000-4	Electromagnetic compatibility (EMC)	
	Part 4.	“Testing and measurement techniques;”
	Section 2:	"Electrostatic discharge immunity tests" (1995).
	Section 3:	“Radiated, radio-frequency, electromagnetic field immunity test" (2002).
	Section 4:	"Electrical Fast Transient/burst immunity test" (1995)."
	Section 5:	“Surge immunity tests" (1995).
	Section 6:	“Immunity to conducted disturbances induced by radio-frequency fields" (1996).
	Section 12:	Ring wave immunity test. Ed.2.0 (2006)

4. Additional deviations or exclusions from the test specifications

Not applicable

5. General conditions

5.1. Location of the Test Site:

The tests were carried out in the EMC laboratory of the Standards Institution of Israel in Tel-Aviv.

5.2. Emission tests:

- For both radiated and conducted measurements, initial scans were made using a peak detector but still using the appropriate CISPR 16 (Quasi-Peak) detector IF bandwidth.
- For conducted emissions, a tolerance limit was set 6 dB below the specification limit. Levels above the tolerance limit were retested using the Quasi-Peak detector or an average detector.
- For radiated emissions, a tolerance limit was set 10 dB below the specification limit. Levels above the tolerance limit were retested using the Quasi-Peak detector.

5.3. Initial visual check and functional test:

Initial visual check and brief built- in- test of the EUT was performed before testing. No external damages were found. The test on the EUT passed successfully.

6. Emissions

6.1. Radiated Emission Summary

Reference Documents:

IEC 62052-11 sec.7.5.8// CISPR 22

Test Procedure:

The measurements were conducted in the semi- anechoic chamber.

For each mode of operation the frequency spectrum was monitored. EUT configuration, cable configuration and mode of operation, which produced the emission that had the highest amplitude, were documented.

The frequency range from 30 MHz to 1 GHz was investigated.

Antenna used: Biconilog Antenna (20 MHz - 6000 MHz).

The levels were maximized by initially rotating the turntable through 360°, varying the antenna height between 1 m and 4 m, rerouting EUT cable and changing antenna- to- EUT polarization from vertical to horizontal.

Unless stated otherwise, the measuring equipment settings were:

Initial scan:		**Measurements**	
Detector type	Peak	Detector type	Quasi-peak (CISPR)
Mode	Max hold	Bandwidth	120 kHz/ 1MHz
Bandwidth	120 kHz	Measurement time	20 seconds/MHz
Step size	Continuous sweep	Observation	>15 seconds
Sweep time	>1 seconds/MHz		

Test Result:

EUT Model	Ref. Standard	Frequency range	Polar.	Table#	Result	Remarks
PM130 PLUS	CISPR 22 Class A	30-1000 MHz	V/H	11	**PASS**	The worst result is 9.5dB below limit at 240 MHz
EM133	CISPR 22 Class B			12	**PASS**	The worst result is 6.4dB below limit at 360 MHz
PM175	CISPR 22 Class B			13	**PASS**	The worst result is 1.8dB below limit at 215 MHz
BFM136	CISPR 22 Class A			14	**PASS**	The worst result is 9.4dB below limit at 167.7 MHz

Results: **Pass**
Ref. Standard / Limit: CISPR 22 Class A
Measured distance: 3m
Frequency range: 30-1000MHz

Table 11 PM130 PLUS Radiated emission test results

No	Frequency (MHz)	Antenna Polariz	Turn-table Angle (°)	Antenna Height (m)	Emission Level (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)	Results
1	100.0	V	0	1.1	36.7	50	-13.3	Complies
2	114.9	V	360	1.0	38.2	50	-11.8	Complies
3	177.4	H	242	1.2	36.4	50	-13.6	Complies
4	182.6	H	240	1.2	39.6	50	-10.4	Complies
5	192.6	H	212	1.0	38.9	50	-11.1	Complies
6	240.1	H	276	1.4	47.5	57	-9.5	Complies

Results: **Pass**
Ref. Standard / Limit: CISPR 22 Class B
Measured distance: 3m
Frequency range: 30-1000MHz

Table 12 EM133 Radiated emission test results

No	Frequency (MHz)	Antenna Polariz	Turn-table Angle (°)	Antenna Height (m)	Emission Level (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)	Results
1	37.1	V	269	1.1	32.0	40	-8.0	Complies
2	80.3	V	360	1.1	24.7	40	-15.3	Complies
3	240.0	H	98	1.1	39.2	47	-7.8	Complies
4	360.0	H	57	1.2	40.6	47	-6.4	Complies

Note: Emission level = E Reading (dBμV) + Cable loss (dB) + Antenna Factor (dB/m)
For Cable Loss and Antenna Factor refer to Appendix 2.

Results: **Pass**
Ref. Standard / Limit: CISPR 22 Class B
Measured distance: 3m
Frequency range: 30-1000MHz

Table 13 PM175 Radiated emission test results

No	Frequency (MHz)	Antenna Polariz	Turn-table Angle (°)	Antenna Height (m)	Emission Level (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)	Results
1	136.5	H	250	2.6	36.6	40	-3.4	Complies
2	137.9	H	252	2.6	35.8	40	-4.2	Complies
3	148.2	H	262	1.6	31.3	40	-8.7	Complies
4	209.7	H	260	1.9	33.7	40	-6.3	Complies
5	215.1	H	82	1.1	38.2	40	-1.8	Complies
6	223.3	V	335	1.6	33.3	40	-6.7	Complies
7	240.0	H	82	1.1	44.1	47	-2.9	Complies
8	270.3	H	82	1.1	38.3	47	-8.7	Complies

Results: **Pass**
Ref. Standard / Limit: CISPR 22 Class A
Measured distance: 3m
Frequency range: 30-1000MHz

Table 14 BFM136 Radiated emission test results

No	Frequency (MHz)	Antenna Polariz	Turn-table Angle (°)	Antenna Height (m)	Emission Level (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)	Results
1	30.6	V	100	1.2	36.6	50	-13.4	Complies
2	167.7	H	258	2.2	40.7	50	-9.4	Complies
3	169.4	H	258	2.0	34.8	50	-15.2	Complies
4	258.7	H	138	1.1	42.3	57	-14.7	Complies
5	312.2	H	41	1.1	40.3	57	-16.7	Complies
6	326.4	H	135	1.2	35.6	57	-21.4	Complies

Note: Emission level = E Reading (dBμV) + Cable loss (dB) + Antenna Factor (dB/m)
For Cable Loss and Antenna Factor refer to Appendix 2.

6.2. Conducted Emission Summary

Reference Documents:

IEC 62052-11 sec.7.5.8// CISPR 22.

Test procedure:

The measurements were performed on 230VAC mains.

Coupling network used - LISN.

The test was started with an initial scan. The final measurements were performed at each frequency where the signal was 10 dB below the limit or less.

Test equipment (EMI receiver) setup was as follow:

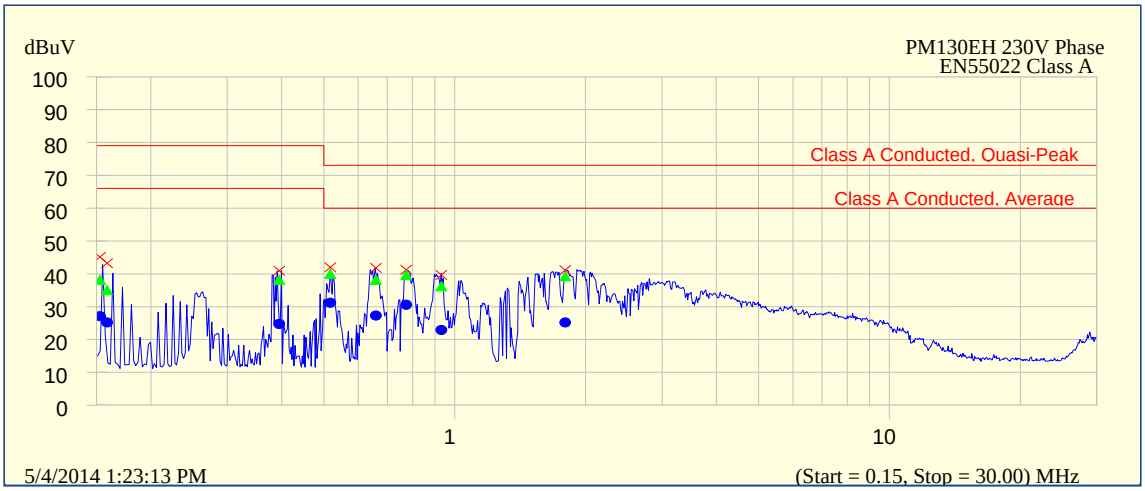
Initial scan:		**Measurements**	
Detector type	Peak	Detector type	Quasi-peak (CISPR)
Mode	Max hold	Bandwidth	9 kHz
Bandwidth	9 kHz	Observation	>15 seconds
Step size	Continuous sweep		
Sweep time	>100 msec		

Test Result:

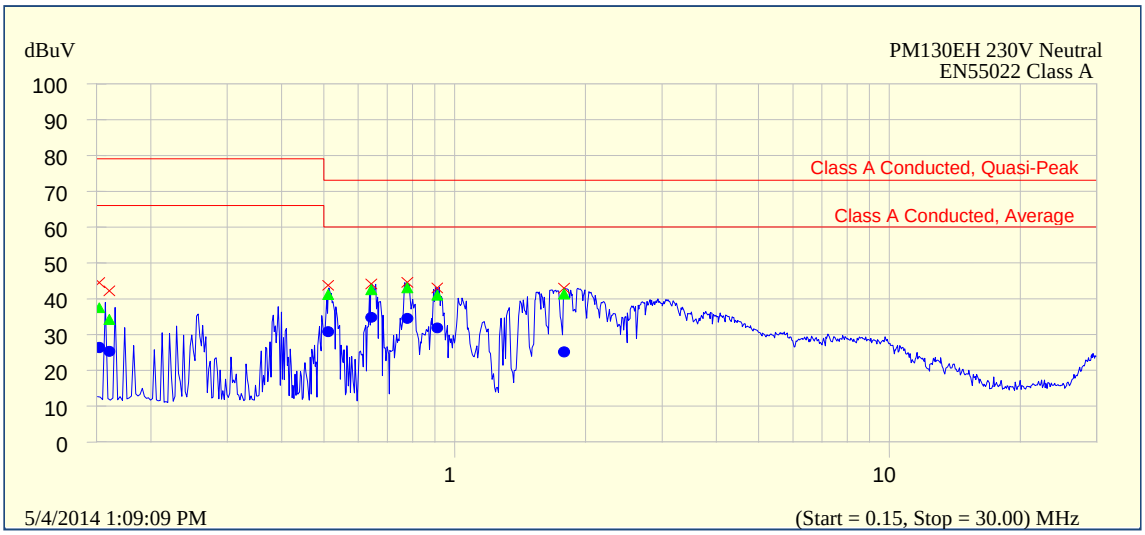
EUT Model	Line Description	Ref. standard	Coupling Network	Plot#	Result	Remarks
PM130 Plus	230 VAC mains	CISPR 22 Class A	LISN	#1-2	**PASS**	All detected peaks are 25dB at least below limit
EM133				#3-4	**PASS**	All detected peaks are 17dB at least below limit
PM175				#5-6	**PASS**	All detected peaks are 11dB at least below limit
BFM136				#7-8	**PASS**	All detected peaks are 7.3dB at least below limit

Results: **Pass**
Ref. Standard / Limit: CISPR 22 Class A
Measured line/port: 230VAC mains

Plot 1- Plot 2: **PM130 Plus Conducted emission. Phase/ Neutral**



Frequency MHz	Peak dBµA	QP dBµA	Avg dBµA	QP-QP Limit dB	Avg-Avg Limit dB
0.15	45.1	38.1	27.1	-40.9	-38.9
0.52	42.0	40.0	31.2	-33.0	-28.8
0.66	41.8	38.2	27.3	-34.8	-32.7
0.77	41.2	39.7	30.6	-33.3	-29.4
0.93	39.6	36.2	22.9	-36.8	-37.1
1.80	41.1	39.3	25.2	-33.7	-34.8



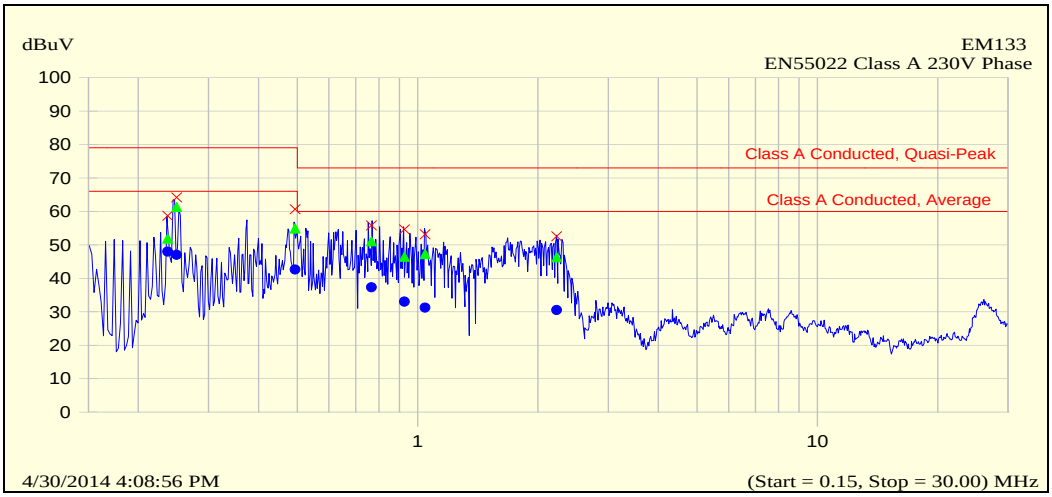
Frequency MHz	Peak dBµA	QP dBµA	Avg dBµA	QP-QP Limit dB	Avg-Avg Limit dB
0.15	44.5	37.5	26.4	-41.5	-39.6
0.51	43.7	41.1	30.8	-31.9	-29.2
0.64	44.1	42.5	34.8	-30.5	-25.2
0.78	44.6	43.0	34.5	-30.0	-25.5
0.91	43.0	41.0	31.9	-32.0	-28.1
1.79	42.9	41.3	25.1	-31.7	-34.9

Results: **Pass**

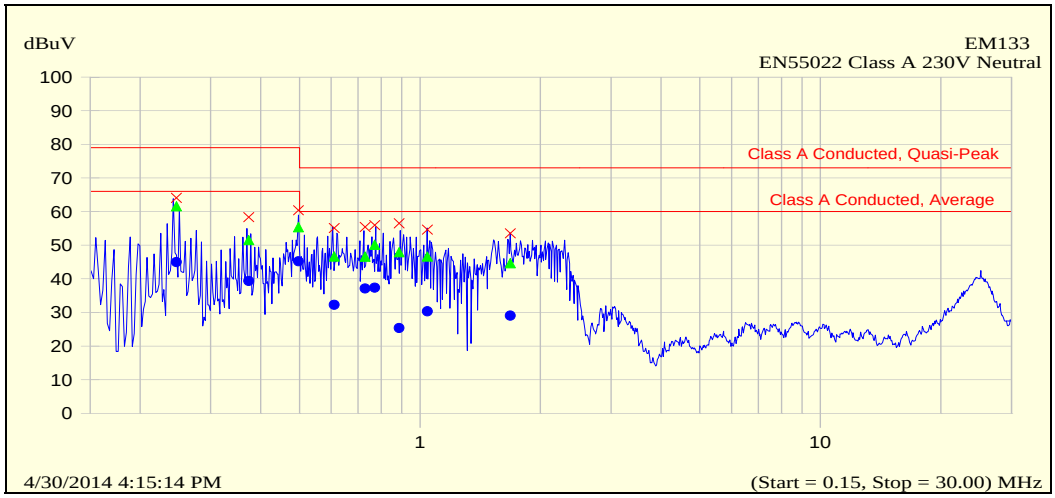
Ref. Standard / Limit: CISPR 22 Class A

Measured line/port: 230VAC mains

Plot 3- Plot 4: EM133 Conducted emission. Phase/ Neutral



Frequency MHz	Peak dBµA	QP dBµA	Avg dBµA	QP-QP Limit dB	Avg-Avg Limit dB
0.24	58.7	51.9	48.0	-27.1	-18.0
0.25	64.2	61.3	47.0	-17.7	-19.0
0.49	60.6	54.9	42.6	-24.1	-23.4
0.77	55.8	51.1	37.3	-21.9	-22.7
0.93	54.6	46.5	33.0	-26.5	-27.0
1.04	53.1	47.3	31.2	-25.7	-28.8



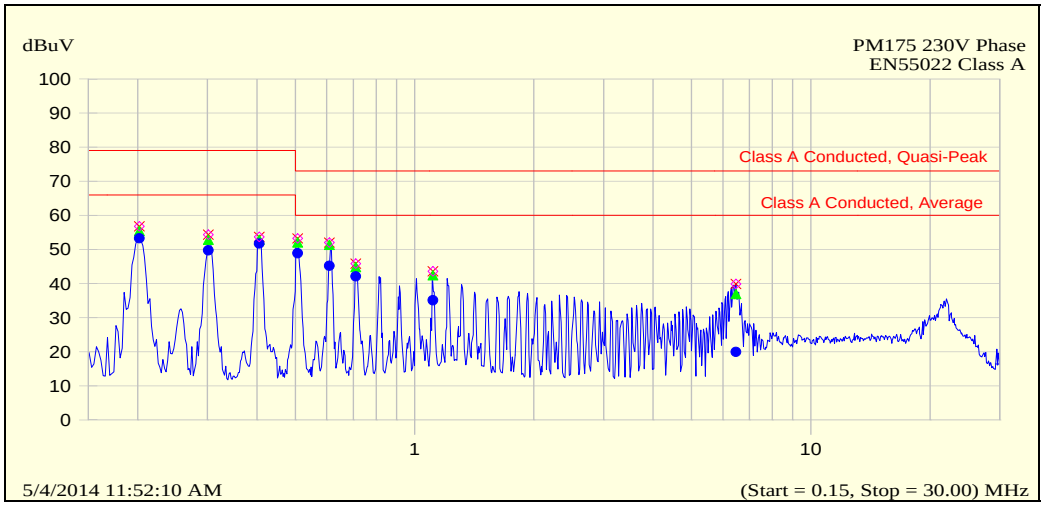
Frequency MHz	Peak dBµA	QP dBµA	Avg dBµA	QP-QP Limit dB	Avg-Avg Limit dB
0.25	64.1	61.6	45.0	-17.4	-21.0
0.37	58.3	51.5	39.3	-27.5	-26.7
0.50	60.4	55.3	45.2	-23.7	-20.8
0.61	55.1	46.7	32.2	-26.3	-27.8
0.73	55.4	46.6	37.1	-26.4	-22.9
0.77	55.9	50.1	37.3	-22.9	-22.7

Results: **Pass**

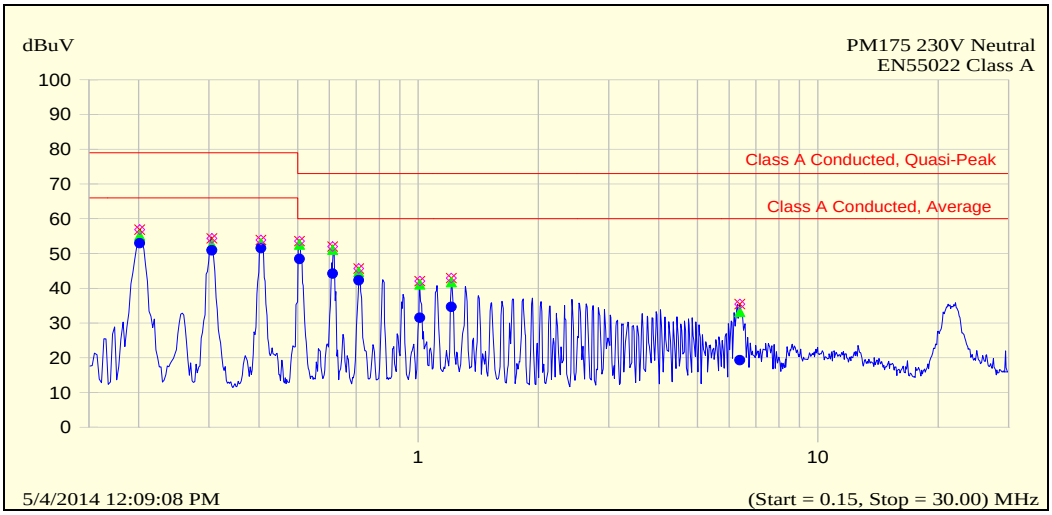
Ref. Standard / Limit: CISPR 22 Class A

Measured line/port: 230VAC mains

Plot 5- Plot 6: PM175 Conducted emission. Phase/ Neutral



Frequency MHz	Peak dBµA	QP dBµA	Avg dBµA	QP-QP Limit dB	Avg-Avg Limit dB
0.20	56.8	55.4	53.3	-23.6	-12.7
0.30	54.3	52.9	49.7	-26.1	-16.3
0.41	53.7	52.8	51.7	-26.2	-14.3
0.51	53.2	52.1	48.9	-20.9	-11.1
0.61	52.0	51.4	45.2	-21.6	-14.8
0.71	45.9	44.9	42.1	-28.1	-17.9



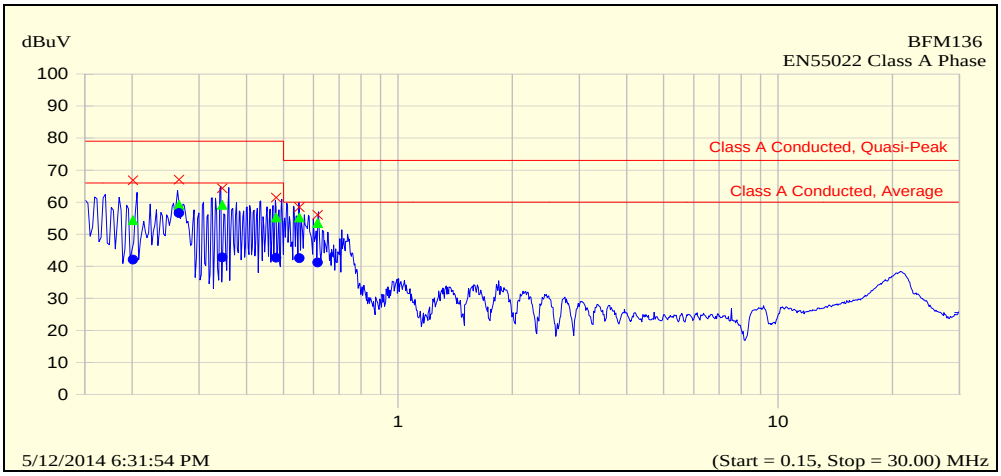
Frequency MHz	Peak dBµA	QP dBµA	Avg dBµA	QP-QP Limit dB	Avg-Avg Limit dB
0.20	56.9	55.2	53.0	-23.8	-13.0
0.31	54.3	52.5	50.9	-26.5	-15.1
0.40	53.9	52.9	51.5	-26.1	-14.5
0.51	53.6	52.6	48.4	-20.4	-11.6
0.61	52.0	51.1	44.2	-21.9	-15.8
0.71	45.7	44.8	42.3	-28.2	-17.7

Results: **Pass**

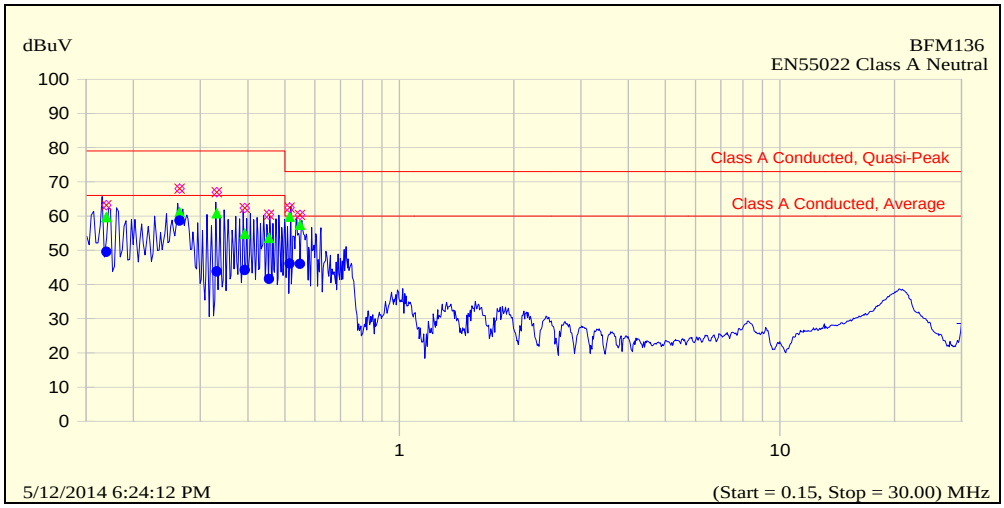
Ref. Standard / Limit: CISPR 22 Class A

Measured line/port: 230VAC mains

Plot 7- Plot 8: BFM136 Conducted emission. Phase/ Neutral



Frequency MHz	Peak dBµA	QP dBµA	Avg dBµA	QP-QP Limit dB	Avg-Avg Limit dB
0.20	66.8	54.4	42.0	-24.6	-24.0
0.27	67.0	59.1	56.6	-19.9	-9.4
0.35	64.3	59.1	42.7	-19.9	-23.3
0.48	61.4	55.2	42.6	-23.8	-23.4
0.55	58.4	55.2	42.5	-17.8	-17.5
0.62	56.0	53.5	41.2	-19.5	-18.8



Frequency MHz	Peak dBµA	QP dBµA	Avg dBµA	QP-QP Limit dB	Avg-Avg Limit dB
0.17	63.1	59.7	49.5	-19.3	-16.5
0.27	68.0	61.1	58.7	-17.9	-7.3
0.33	67.0	60.8	43.8	-18.2	-22.2
0.39	62.3	54.9	44.2	-24.1	-21.8
0.52	62.4	59.8	46.1	-13.2	-13.9
0.55	60.3	57.4	46.0	-15.6	-14.0

6.3. Flicker summary

Results: **Pass**
Ref. Standard: IEC 61000-3-3
Mains: 230VAC

Table 15. PM130 PLUS Flicker data

Product:	**SATEC PM130EH**					
Serial No:						
Description:						
Voltech IEC61000-3 Windows Software 1.24.12		Test Date:	2014 Jul 13 17:43			
Result:	**SATEC PM130EH**					
Type of Test:	Flickermeter Test - Table					
Power Analyzer:	Voltech PM6000 SN: 200006700333 Firmware version: v1.22.07RC6					
AC Source:	Mains / Manual Source					
Overall Result	**PASS**					
Notes:	Plt test duration only 20 minutes Measurement method - Voltage					
	Plt					
Limit	0.65					
Reading	0.046					
	Pst	dc(%)	dmax(%)	3.3		
Limit	1	3.3	4	500		
Reading 1	0.083	0	0	0		
Reading 2	0.083	0	0	0		

Table 16. EM133 Flicker data

Product:	**SATEC EM133**					
Serial No:						
Description:						
Voltech IEC61000-3 Windows Software 1.24.12		Test Date:	2014 Jul 13 14:51			
Result:	**SATEC EM133**					
Type of Test:	Flickermeter Test - Table					
Power Analyzer:	Voltech PM6000 SN: 200006700333 Firmware version: v1.22.07RC6					
AC Source:	Mains / Manual Source					
Overall Result	**PASS**					
Notes:	Plt test duration only 20 minutes Measurement method - Voltage					
	Plt					
Limit	0.65					
Reading	0.047					
	Pst	dc(%)	dmax(%)	3.3		
Limit	1	3.3	4	500		
Reading 1	0.085	0	0.706	0		
Reading 2	0.085	0	0.705	0		

Table 17. PM175 Flicker data

Product:	**SATEC PM175**					
Description:						
Voltech IEC61000-3 Windows Software 1.24.12		Test Date:	2014 Jul 15 08:37			
Result:	**SATEC PM175**					
Type of Test:	Flickermeter Test - Table					
Power Analyzer:	Voltech PM6000 SN: 200006700333 Firmware version: v1.22.07RC6					
AC Source:	Mains / Manual Source					
Overall Result	**PASS**					
Notes:	Plt test duration only 20 minutes Measurement method - Voltage					
	Plt					
Limit	0.65					
Reading	0.046					
	Pst	dc(%)	dmax(%)	3.3		
Limit	1	3.3	4	500		
Reading 1	0.084	0	0	0		
Reading 2	0.084	0	0	0		

Table 18. BFM136 Flicker data

Product:	**SATEC BFM136**					
Serial No:						
Description:						
Voltech IEC61000-3 Windows Software 1.24.12		Test Date:	2014 Jul 15 11:43			
Result:	**SAREC BFM136**					
Type of Test:	Flickermeter Test - Table					
Power Analyzer:	Voltech PM6000 SN: 200006700333 Firmware version: v1.22.07RC6					
AC Source:	Mains / Manual Source					
Overall Result	**PASS**					
Notes:	Plt test duration only 20 minutes Measurement method - Voltage					
	Plt					
Limit	0.65					
Reading	0.046					
	Pst	dc(%)	dmax(%)	3.3		
Limit	1	3.3	4	500		
Reading 1	0.084	0	0.803	0		
Reading 2	0.084	0	0.797	0		

7. Immunity Tests

7.1. Performance criteria per IEC 62052-11 sec.7.5

(a):

During the test the behavior of the equipment shall not be perturbed and the variation of the error shall be within the limits as specified in the relevant standards.

(b):

During the test a temporary degradation or loss of function or performance is acceptable

(c):

The application of the EMC disturbance shall not produce a change in the register of more than x units and the test output shall not produce a signal equivalent to more than x units. (formula for x is in IEC 62052-11 sec.7.1.2).

7.2. Electrostatic Discharge (ESD) immunity test

Results:	**Pass**
Ref. Standard:	IEC 62052-11 sec. 7.5.2
Test procedure:	IEC 61000-4-2
Temperature:	23°C
Relative humidity:	45%
Athmosph. pressure:	1010 mbar
Performance criteria:	See sec.7.1 (b), (c).

Table 19 PM130 Plus / EM133/ PM175 ESD Data

ESD type	Test points	Test Voltage (kV)	Number of pulses	EUT performance during test	Result
Contact	HCP	2,4,6,8	+/-(4*20)	NP	PASS
	VCP	2,4,6,8	+/-(4*20)	NP	PASS
Air	Front panel	2,4,6,8, 15	+/-(4*20)	NP	PASS

Table 20 BFM136 ESD Data

ESD type	Test points	Test Voltage (kV)	Number of pulses	EUT performance during test	Result
Contact	HCP	2,4,6,8	+/-(4*20)	NP	PASS
	VCP	2,4,6,8	+/-(4*20)	NP	PASS
	Enclosure - metal parts	2,4,6,8	+/-(4*20)	NP	PASS
Air	Front panel	2,4,6,8, 15	+/-(4*20)	NP	PASS

NP - Normal Performance

Test Result: All tested units continued to operate as intended. No change in the readings was observed during and after the test.

7.3. Radiated Immunity test

Results:	**Pass**
Ref. Standard:	IEC 62052-11 sec. 7.5.3
Test procedure:	IEC 61000-4-3
Temperature:	23°C
Relative humidity:	45%
Athmosph. pressure:	1010 mbar
Performance criteria:	test with current: See sec.7.1 (a) test without current: See sec.7.1 (b), (c)

Table 21 Radiated Immunity Data

Test parameters	EUT performance	Result
Test with current: EUT is loaded with 1A Load 10 V/m 80 ÷ 2000 MHz 80 % AM 1 kHz	NP	PASS
Test without current: No Load 30 V/m 80 ÷ 2000 MHz 80 % AM 1 kHz	NP	PASS

Test Result: All tested units continued to operate as intended. No change in the readings was observed during and after the test.

7.4. Electrical Fast Transients (EFT) immunity test

Results:	**Pass**
Ref. Standard:	IEC 62052-11 sec. 7.5.4
Test procedure:	IEC 61000-4-4
Temperature:	23°C
Relative humidity:	45%
Athmosph. pressure:	1010 mbar
Performance criteria:	See sec.7.1 (b), nevertheless the variation of the error shall be within the limits as specified in the relevant standards.

Table 22 EFT Data

No.	Port / Cable Description	Type of coupling	Test Voltage kV	Impulse	EUT performance during test	Result
1	230VAC mains	CDN	± 4.0 CM	Tr/Th – 5/50 ns, 5 kHz	NP	PASS
2	Voltage/ Current circuit	CDN	± 4.0 CM	Tr/Th – 5/50 ns, 5 kHz	NP	PASS

Test Result: All tested units continued to operate as intended. No change in the readings was observed during and after the test.

7.5. Surge immunity test

Results:	**Pass**
Ref. Standard:	IEC 62052-11 sec. 7.5.6
Test procedure:	IEC 61000-4-5
Temperature:	23°C
Relative humidity:	45%
Athmosph. pressure:	1010 mbar
Performance criteria:	See sec.7.1 (b), (c)

Table 23: Surge Data

No.	Port / Cable Descript.	Test Voltage kV	Type of coupling	Type of Surge, µs	Number of Pulses	EUT perform. during test	Result
1	AC mains	± 1.0 DM	CDN	1.2/50 (8/20)	± 20	NP	PASS
2	Voltage circuit	± 1.0 DM	CDN	1.2/50 (8/20)	± 20	NP	PASS

Test Result: All tested units continued to operate as intended. No change in the readings was observed during and after the test.

7.6. RF conducted immunity test

Results:	**Pass**
Ref. Standard:	IEC 62052-11 sec. 7.5.5
Test procedure:	IEC 61000-4-6
Temperature:	23°C
Relative humidity:	45%
Athmosph. pressure:	1010 mbar
Performance criteria:	See sec.7.1 (a)

Table 24 RF Conducted Immunity Data

No	Port/Cable Description	Type of coupling	Frequency range, MHz	Voltage level, Vrms	Modulation	EUT perform. during test	Result
1	AC mains	CDN	0.15 ÷ 80	10.0	AM 80% 1 kHz	NP	PASS
2	Auxiliary circuit	Coupling clamp				NP	PASS

Test Result: All tested units continued to operate as intended. No change in the readings was observed during and after the test.

7.7. Ring wave immunity test

Results:	**Pass**
Ref. Standard:	IEC 62052-11 sec. 7.5.7
Test procedure:	IEC 61000-4-12
Temperature:	23°C
Relative humidity:	45%
Athmosph. pressure:	1010 mbar
Performance criteria:	See sec.7.1 (b)

Table 25: Ring wave Data

No.	Port / Cable Descript.	Test Voltage kV	Type of coupling	Number of Pulses	EUT perform. during test	Result
1	AC mains Voltage circuit	± 1.0 DM	CDN	± 20	NP	PASS
2	AC mains Voltage circuit	± 2.5 CM	CDN	± 40	NP	PASS

Test Result: All tested units continued to operate as intended. No change in the readings was observed during and after the test.

8. Appendix 1: Test equipment used

All measurements equipment is on SII calibration schedule with a recalibration interval not exceeding once a year.

Instrument	Manufac-turer	Model	SII No.	Last calibration date	Next calibration date
CISPR 22					
EMI Receiver 9 kHz - 6.5 GHz	HP	8546A+85460A	4068	06/14	06/15
EMI Analyzer 10 kHz - 26.5 GHz	HP	E7405A	4944	05/14	05/15
EMI Test Receiver 20 Hz - 40 GHz	ROHDE & SCHWARZ	R&S®ESU40	5911	11/13	11/14
LISN 9 kHz – 30 MHz	FCC	LISN-50/250-32-4-16	5023	12/13	12/14
Transient limiter 0.009-200 MHz	Agilent Techn	11947A	3107A03104	08/13	08/14
Antenna Mast	Frankonia	FAM6	5952	N/A	N/A
Metallic turntable	Frankonia	FTM2-2	5952	N/A	N/A
Positioning controller	Frankonia	FCO2	5952	N/A	N/A
Biconilog Antenna 20 MHz - 6000 MHz	ETS Lindgren	3142D-SN:00146488	-	12/13	12/14
IEC 61000-3-3					
AC Power Supply	Elgar	SW 5250A	4684	N/A	N/A
Universal Power Analyzer 230 VAC, 3ph, 30A	Voltech	PM 6000	6501179	08/13	08/14

Instrument	Manufac-turer	Model	SII No.	Last calibration date	Next calibration date
IEC 61000-4-2					
ESD Simulator, Contact Disch.: ±0.5 to ±8kV, Air Discharge: ±0.5 to ±15kV	Teseq AG	NSG.435	606332	11/13	11/14
IEC 61000-4-3					
Spectrum Analyzer 9 kHz - 6 GHz	ROHDE & SCHWARZ	R&S®FSL6	5912	06/14	06/15
MXG Analog Microwave Signal generator 100 KHz - 20 GHz	Agilent	N5183A	6501148	05/14	05/16
RF power amplifier 80-1000 MHz, 100W	Amplifier Research	100W1000M1	4883	N/A	N/A
Biconilog Antenna 30 – 2000 MHz	Schaffner	CBL 6112B	5119	01/14	01/15
Horn Antenna High-Gain 0.8 – 4.2 GHz; 20 W	Amplifier Research	AT4002A	4966	N/A	N/A
RF Power Amplifier 0.8 - 4.2 GHz; 25 W	Amplifier Research	25S1G4A	4991	N/A	N/A
Electric Field Probe 100 kHz - 3000 MHz	PMM	EP 330	5448	01/14	01/15
Field Monitor 0.15 - 3000 V/m	Amplifier Research	FM5004	4956	N/A	N/A
Anechoic chamber	Chase	Euroshield	4806	N/A	N/A
IEC 61000-4-4					
Advanced EMC Immunity Sys.	Key-Tek	EMC PRO	4695	10/13	10/14
Capacitive coupling clamp	Key-Tek	CCL-4/S	9412243	N/A	N/A

Instrument	Manufac-turer	Model	SII No.	Last calibration date	Next calibration date
IEC 61000-4-5/ IEC 61000-4-12					
ECAT Control Center: Surge generator EFT/Surge Coupler/Decoupler	Key-Tek	ECAT E501A E4553	3751	 06/14 06/14	 06/15 06/15
Advanced EMC Immunity Sys.	Key-Tek	EMC PRO	4695	10/13	10/14
Capacitive coupling clamp	Key-Tek	CCL-4/S	S/N 9412243	N/A	N/A
IEC 61000-4-6					
RF Generator 10 kHz - 1040 MHz	HP	8657A	4923	03/14	03/15
RF Generator 100 KHz - 20 GHz	Agilent	N5183A	6501148	05/13	05/14
RF Generator 10 kHz - 1050 MHz	Fluke	6060B	2384	04/14	04/15
RF power amplifier 10 kHz - 250 MHz; 75 W	Ampl Research	75A250	4847	N/A	N/A
RF power amplifier 150 kHz - 300 MHz; 10 W	ENI	411LA	SII 3757 SN: 797F	N/A	N/A
Oscilloscope 300 MHz	Lecroy	9361	4009	12/13	12/14
CDN 150 kHz – 230 MHz	FCC	801-M3-16	51906	11/13	11/14
CDN 150 kHz – 230 MHz	Schaffner	CDN M325	5122	11/13	11/14
Attenuator 6 dB, 50W	Huber-Suhner AG	5906.17.006	S/N 302789	08/13	08/14
Bulk Current Injection Probe 10 kHz – 230 MHz	FCC	F-120-9A	53923	11/13	11/14

9. Appendix 2: Antenna factor and cable loss

Cable Loss (10m cable + Mast)

Point	Frequency (MHz)	Cable Loss (dB)	Point	Frequency (MHz)	Cable Loss (dB)	Point	Frequency (MHz)	Cable Loss (dB)
1	30	0.53	15	700	3.06	28	1700	4.85
2	50	0.75	16	750	3.201	29	1800	4.98
3	100	1.08	17	800	3.27	30	1900	5.19
4	150	1.39	18	850	3.38	31	2000	5.34
5	200	1.61	19	900	3.46	32	2100	5.51
6	250	1.752	20	950	3.55	33	2200	5.69
7	300	2.00	21	1000	3.68	34	2300	5.89
8	350	2.15	22	1100	3.82	35	2400	6.07
9	400	2.26	23	1200	4.07	36	2500	6.22
10	450	2.383	30	1900	5.19	37	2600	6.28
11	500	2.52	24	1300	4.24	38	2700	6.41
12	550	2.606	25	1400	4.43	39	2800	6.53
13	600	2.75	26	1500	4.6	40	2900	6.84
14	650	2.856	27	1600	4.7			

Antenna Factor
Biconilog Antenna, MFR ETS Lindgren, Type/Model 3142D, S/N: 00146490, 3 m distance

No.	f / MHz	AF / dB/m	f / MHz	AF / dB/m	f / MHz	AF / dB/m
1	30	18.7	250	12.0	2750	31.0
2	35	15.7	300	13.8	3000	31.2
3	40	12.9	400	16.2	3250	32.7
4	45	10.6	500	18.6	3500	34.5
5	50	9.0	600	20.2	3750	34.3
6	60	7.3	700	21.8	4000	34.5
7	70	7.7	800	22.9	4250	35.3
8	80	8.2	900	24.1	4500	35.5
9	90	9.2	1000	24.8	4750	36.1
10	100	9.4	1250	26.9	5000	37.4
11	120	8.5	1500	30.2	5250	38.4
12	140	8.5	1750	28.5	5000	39.9
13	160	9.1	2000	28.9	5750	38.2
14	180	10.5	2250	29.8	6000	39.1
15	200	10.9	2500	32.5		

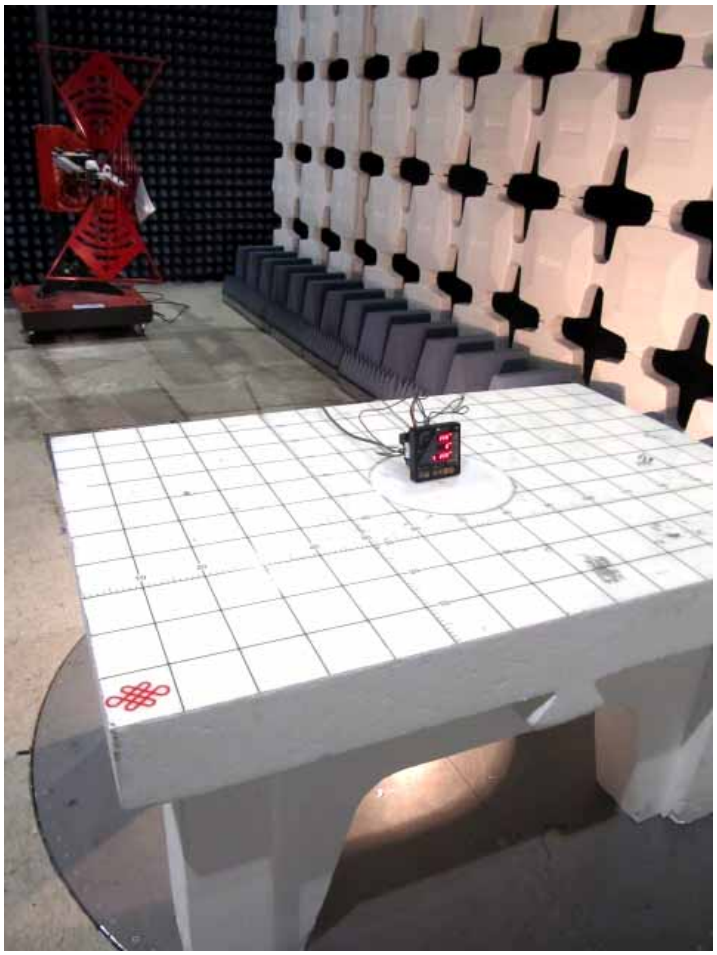
10. Appendix 3: Measurement uncertainty

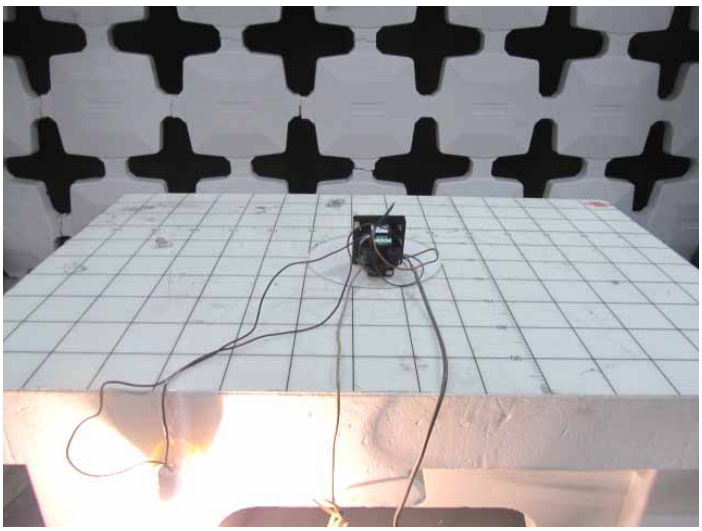
The test equipment has been calibrated according to its recommended procedures and is within the manufacturer's published limit of error.
The laboratory calibrates its standards by a third party (traceable to NIST, USA) on a regular basis according to equipment manufacturer requirements.
In the following table the uncertainty calculation is given.
Calculated uncertainty U_{LAB} are less than U_{CISPR}, therefore compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit.

Type of disturbance **Test description**	**Calculated uncertainty** U_{LAB}	U_{CISPR}
Conducted disturbance at mains port (9 kHz to 150 kHz)	3.3 dB	3.8 dB
Conducted disturbance at mains port (150 kHz to 30 MHz)	2.8 dB	3.4 dB
Disturbance power (30 MHz to 300 MHz)	3.3 dB	4.5 dB
Radiated disturbance (electric field strength at an OATS at 10 m distance) (30 MHz to 1 000 MHz)	4.18 dB	6.3 dB
Radiated disturbance (electric field strength in a SAR at 3 m distance) (30 MHz to 1 000 MHz)	4.32 dB	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	4.47 dB	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	4.47 dB	5.5 dB

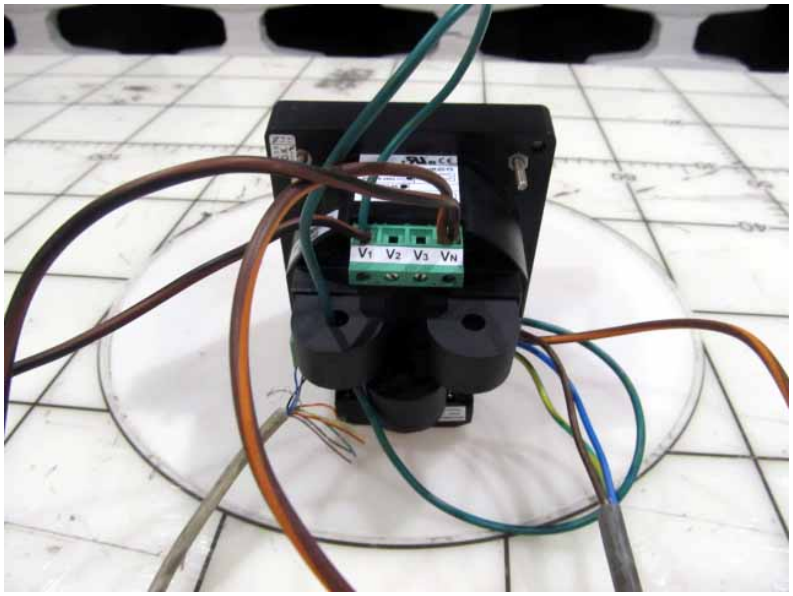
The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by coverage factor of 2.

11. Appendix 4: Test illustrations

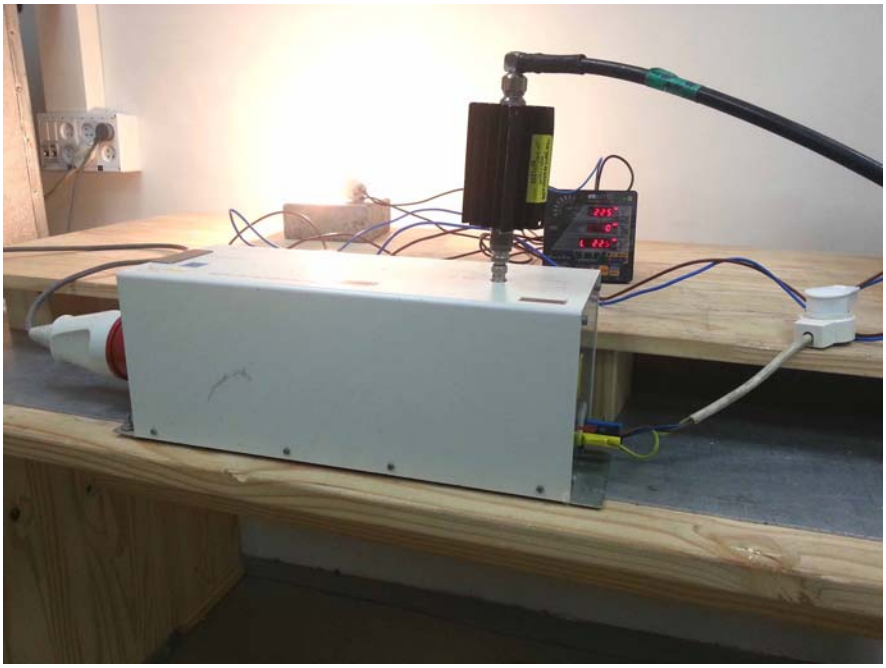


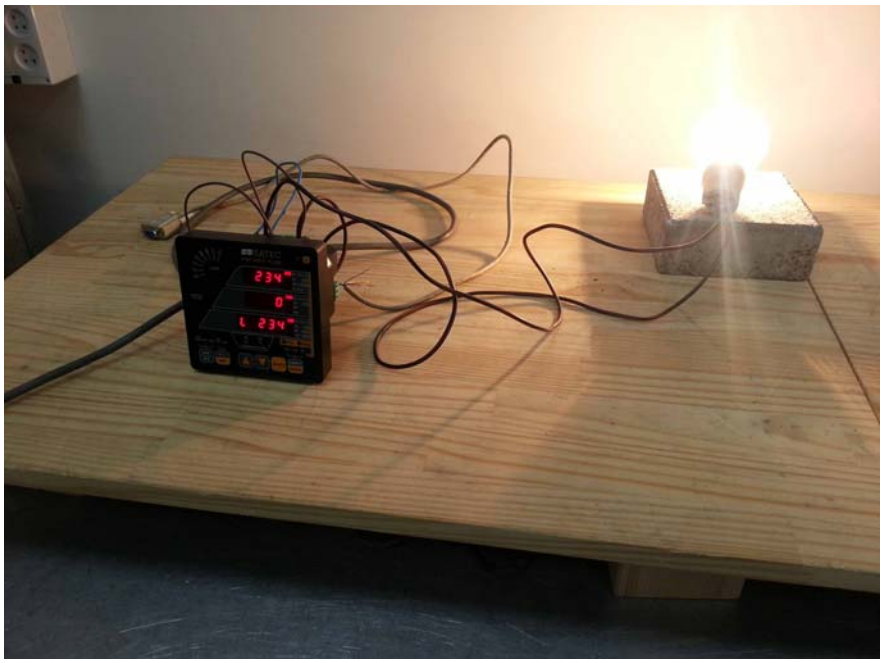


Picture #1 PM 130 Plus Radiated emission test setup

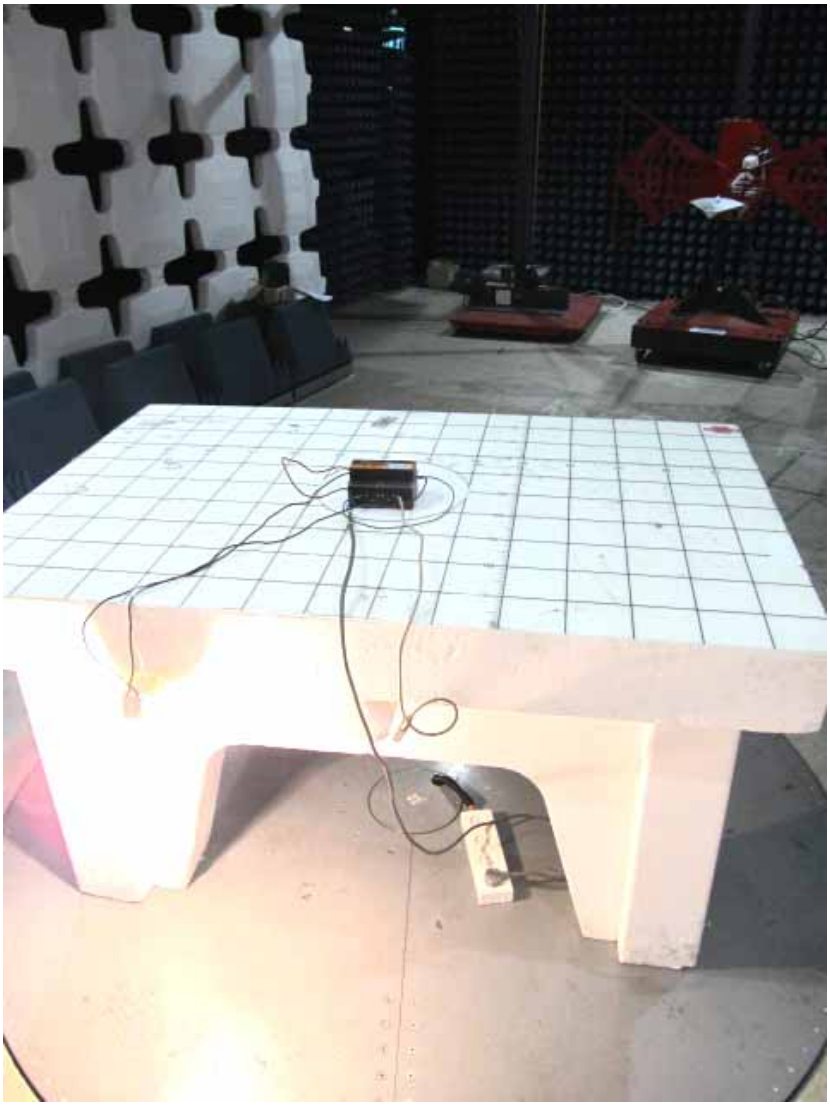


Picture #2
PM 130 Plus Radiated emission test setup



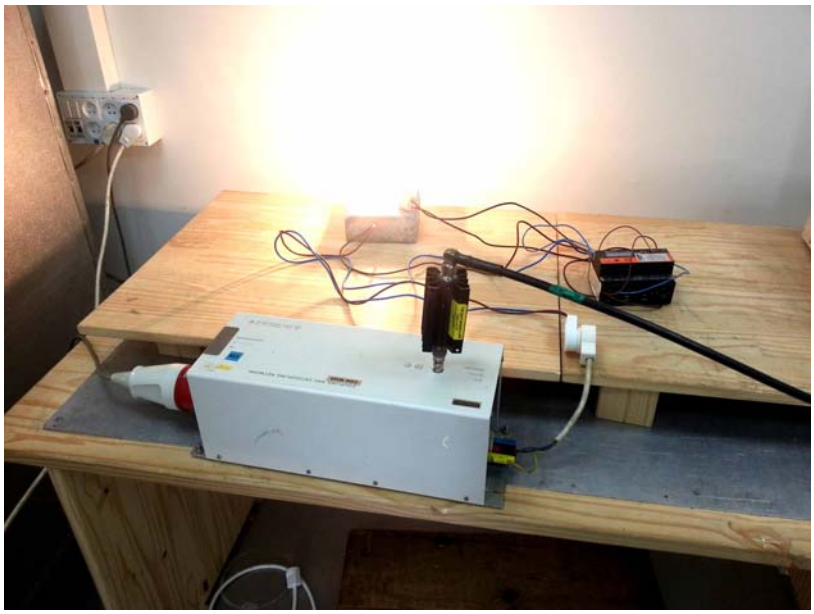


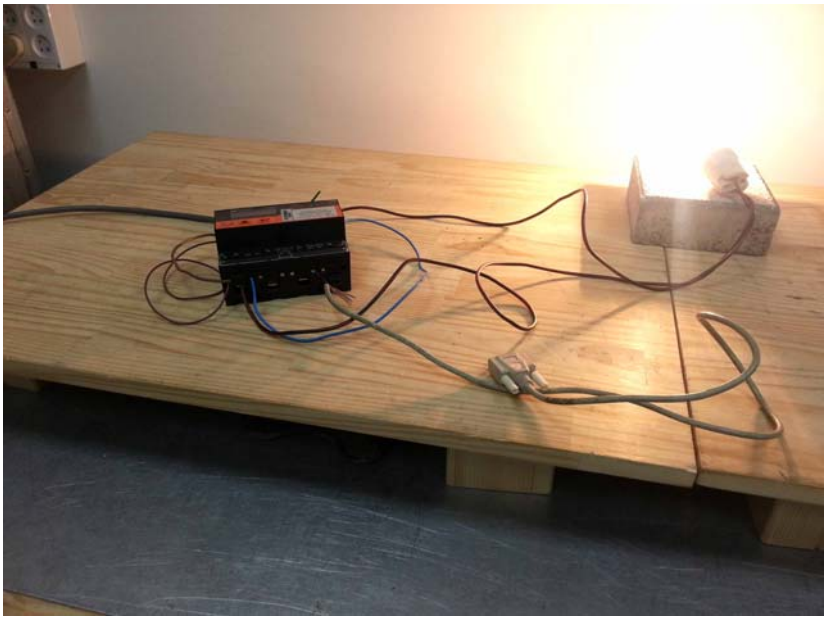
Picture #3 PM 130 Plus Immunity test setup



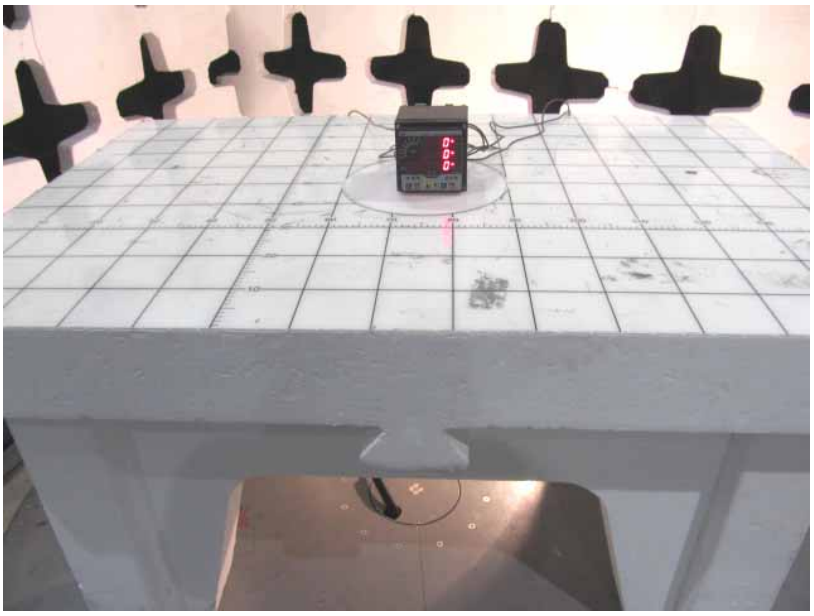
Picture #4
EM133 Radiated emission test setup

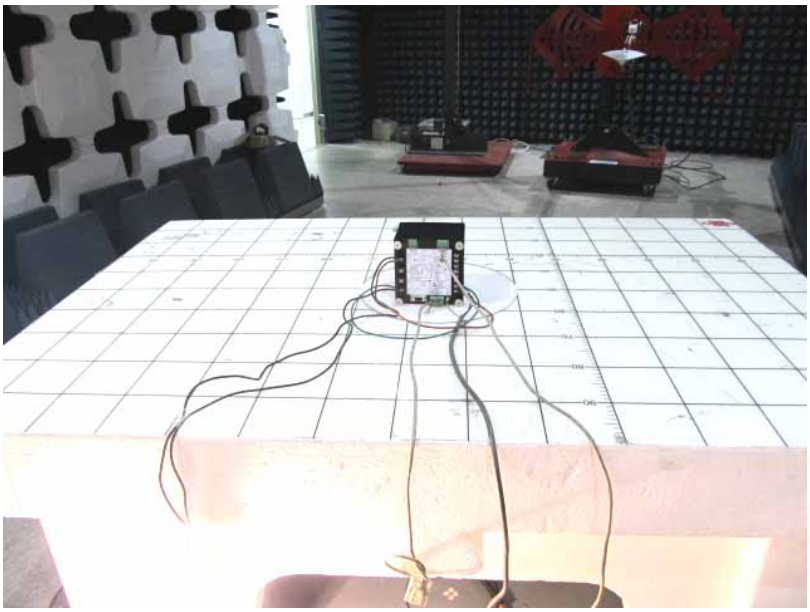
Picture #5
EM133 Radiated emission test setup



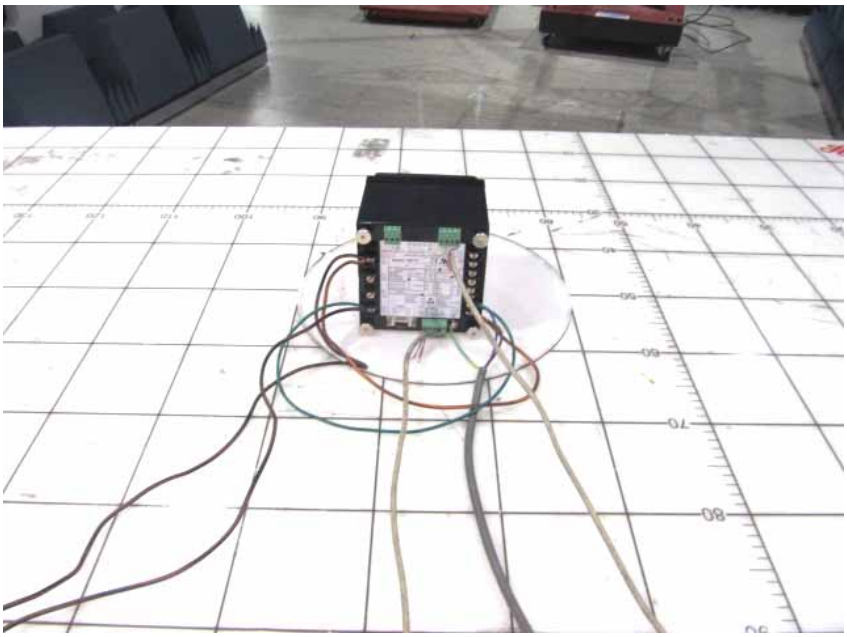


Picture #6 EM133 Immunity test setup

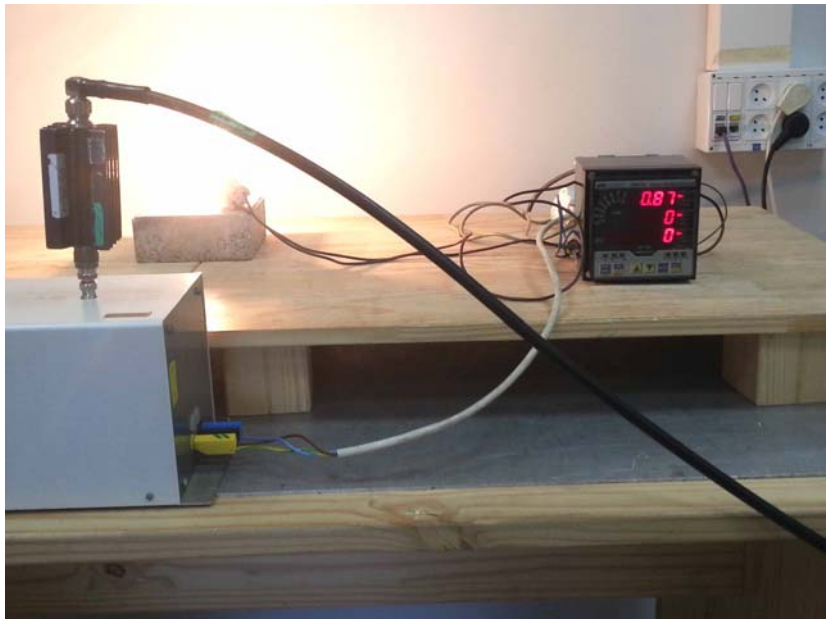


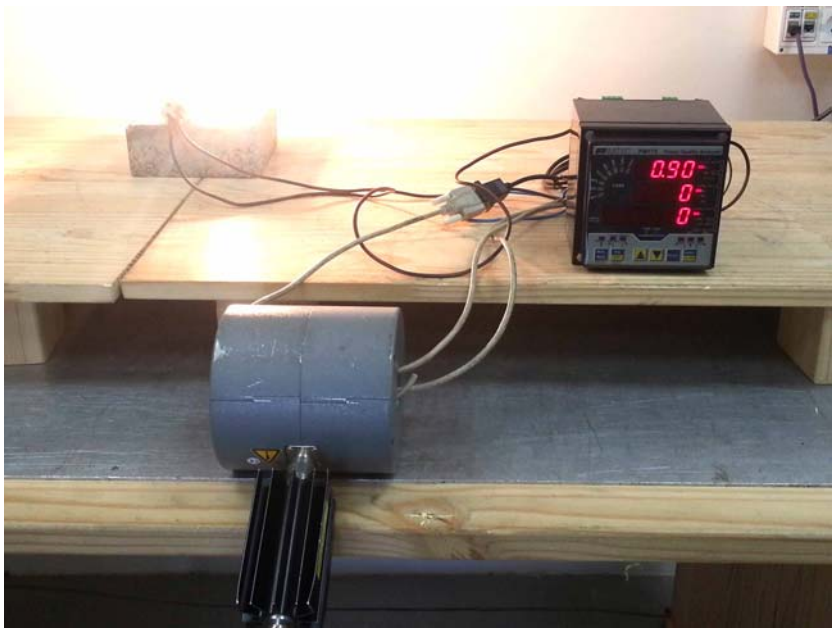


Picture #7
PM175 Radiated emission test setup

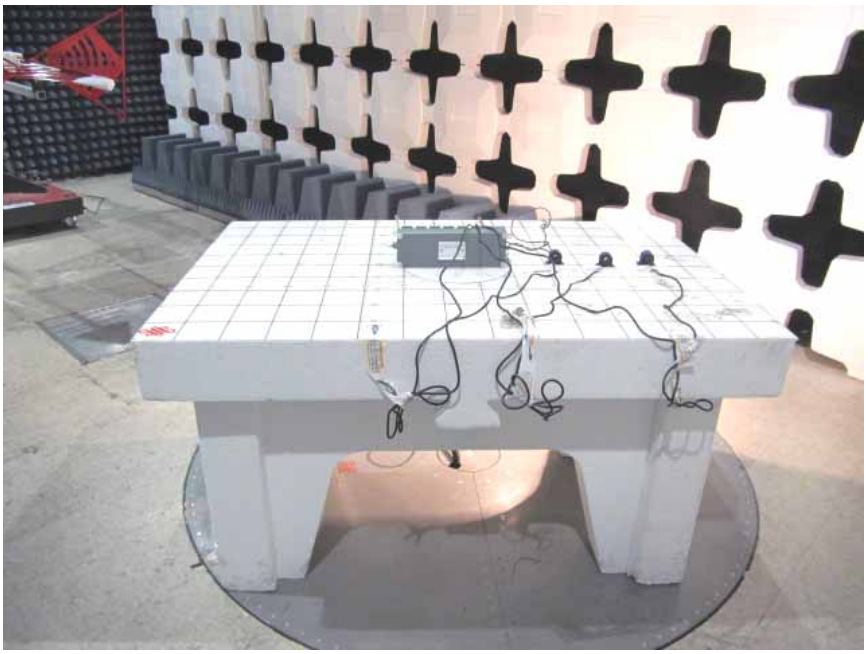


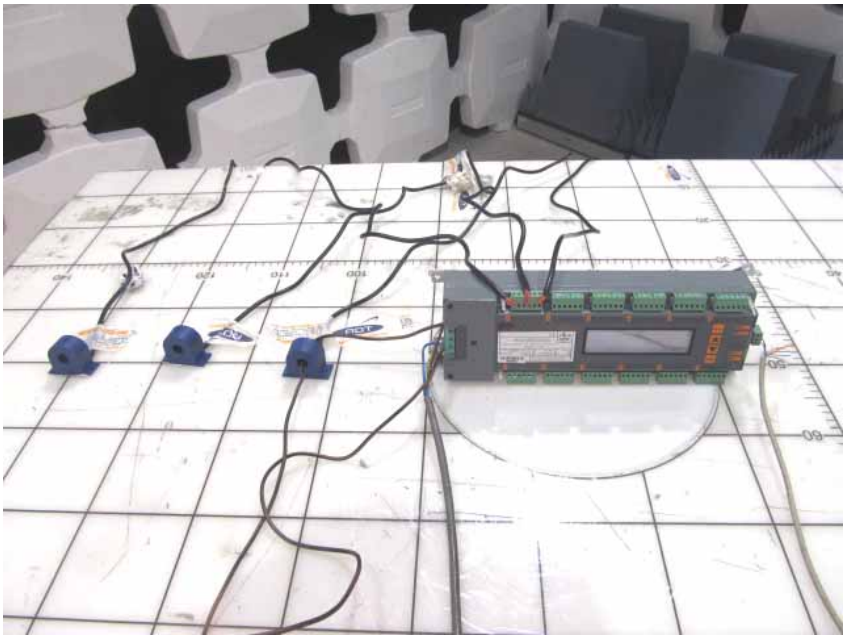
Picture #8
PM175 Radiated emission test setup



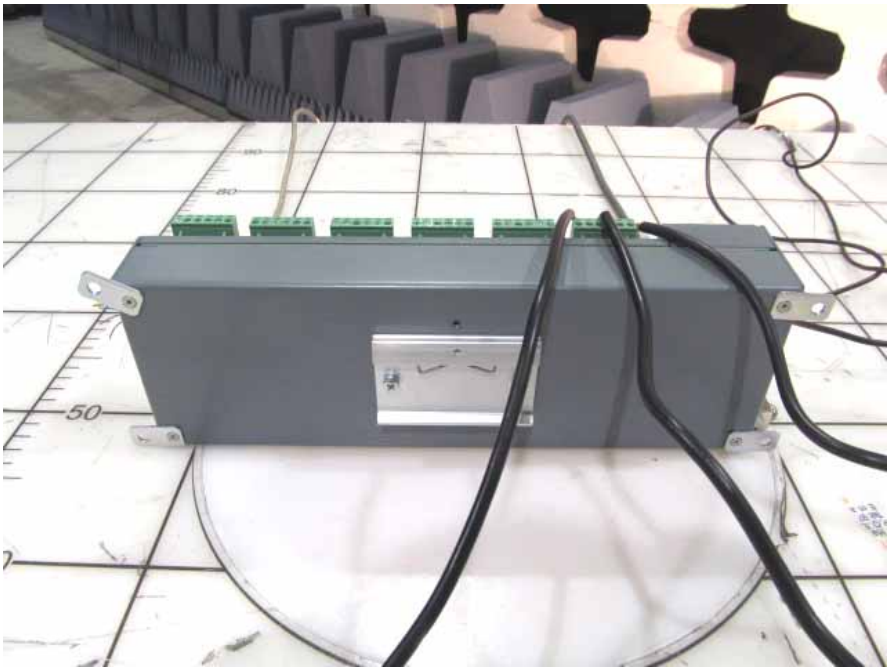


Picture #9 PM175 Immunity tests

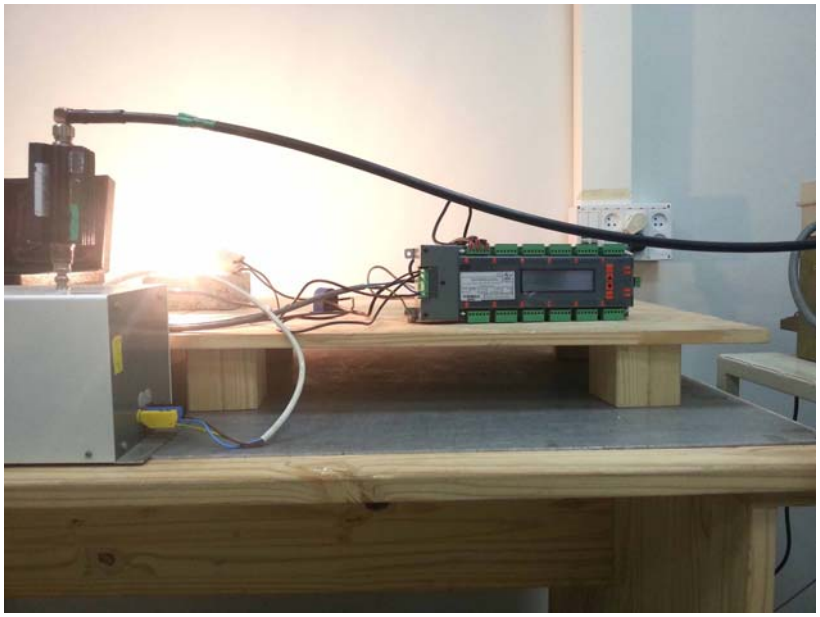


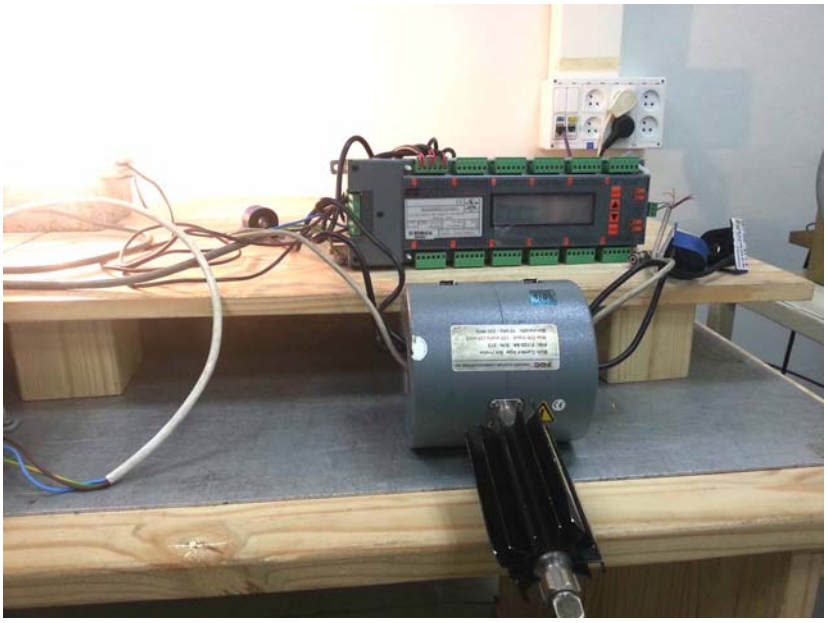


Picture #10 BFM136 Radiated emission test setup



Picture #11
BFM136 Radiated emission test setup





Picture #12 BFM136 Immunity tests

Report Ref. No.: 9412301409

APPENDIX 3
ENVIRONMENTAL TEST REPORT

(45 pages including this cover page)

42 Chaim Levanon St. Tel-Aviv 69977 Israel. Management: Tel: 972-3-6467800 Fax: 972-3-6467779 www.sii.org.il
Electronics: Tel: 972-3-6465050 Fax: 972-3-7454026 - Alarms Systems Section: Tel: 972-3-6465370 Fax: 972-3-6467262

ENVIRONMENTAL & MECHANICAL LABORATORY

TEST REPORT

ENERGY POWER METER

For

SII

21/08/2014

Report No: 20140818-1524

Report Edition: 01

Report Status: Released

ENVIRONMENTAL & MECHANICAL LABORATORY DETAILS

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Fax No.:	972-3-9268811.
E-Mail:	eli.avital@ecitele.com

CUSTOMER DETAILS

Company Name:	SII
Representative	Leonid Fine
Address:	42 Haim Levanon St., Tel Aviv 69977.
Phone No.:	03-6367635
Fax No.:	03-6467779
E-Mail:	leon_fine@sii.org.il

DOCUMENT CONTROL

DOCUMENT HISTORY

The following table records information regarding released editions of this document and briefly describes their file location, purpose, and changes made to them.

Edition ID	Release Date	Responsible Author	File Reference, Purpose and Description of Changes
01	21/08/2014	Dina Klebansky	**File Reference:** W:\Reports\TR\Proj2014\SII ENERGY POWER METER 2014-07-23.doc **Purpose:** **Changes:**

DOCUMENT APPROVALS

This edition has been approved by:

	Name	Title	Signature	Date
Compiled	Dina Klebansky	Technical Writer		21/08/2014
Tested	Zion Asslizada	Test Engineer		21/08/2014
Approved	Eli Avital	Environmental, HALT and HASS Labs Manager		21/08/2014

OPEN ISSUES

This part of the document control section is used to record and track open issues and/or unresolved questions. As the development of this document proceeds, these issues and questions should be resolved and then removed from the list.

No.	Subject/Section	Description
1.		
2.		

EXECUTIVE SUMMARY

The following table summarizes the tests that have been performed in QualiTech - Environmental & Mechanical Laboratory.
SII had performed the functional tests and the tests results are his sole responsibility.
The stated results apply only to the specific UUT that were currently tested.

No.	Test Name	Pass /Fail	Job Number	Notes
1.	Sine Vibration Test	Pass	14/2487	
2.	Mechanical Shock Test	Pass	14/2488	
3.	High Temperature (Dry Heat- Storage) Test	Pass	14/2489	
4.	Low Temperature (Storage) Test	Pass	14/2518	
5.	Temperature and Humidity (Damp Heat-Operation) Test	Pass	14/2519	
6.	Immunity to Voltage Surge Test	Pass	14/2628	Performed by EMC Lab.
7.	Temperature Cycling (Storage & Operation) Test	Pass	14/2631	

Statement of Compliance with test requirements:
QualiTech - Environmental & Mechanical Lab. declare that the UUT ENERGY POWER METER was tested to comply with the requirements of the applicable environmental test specification.

Customer granted the permission to reproduce and distribute this report only in the full format with no change and no addition.

A2LA symbol in the front page is applicable only to the tests under the scope of QualiTech accreditations.
QualiTech has A2LA accreditation to ISO/IEC 17025:2005 for test types as listed in the following link:
http://www.a2la.org/scopepdf/1881-01.pdf

TABLE OF CONTENTS

1. INTRODUCTION

1.1. PURPOSE

The purpose of this report is to outline the test results of the ENERGY POWER METER, which was tested according to the applicable documents (see section 1.3), at ECI Telecom Environmental & Mechanical Lab.

1.2. GLOSSARY

1.	ETR	Environmental Test Report
2.	ETS	European Telecommunication Standard
3.	IEC	International Electronic Community
4.	N/A	Not Applicable
5.	NCR	No Calibration Required
6.	RH	Relative Humidity
7.	TBD	To Be Defined
8.	UUT	Unit Under Test

1.3. APPLICABLE DOCUMENTS

This section contains a list of resources referenced by or related to this document.

- BS EN 62052-11:2003.
- IEC 60068.

2. UUT DESCRIPTION

4 units of SATEC Ltd.:

1. BFM 136 - Power meter, 100 – 240Vac, 50/60Hz, 10VA.

2. EM133 – 5 Power meter, 400Vac, 3 phases, 5A (10A), 3VA.

3. PM 130EH PLUS – Power meter, 240Vac, 50/60Hz, 5A, 9VA.

4. PM 175 – Power meter, 690Vac, 50Hz, 5A, 10W.

All units are 3-phase, multi-channel, multi-function energy meters suitable for use in single-phase and multi-phase electrical networks. The units monitor and measure voltage and current and calculate power consumption. Current monitored and measured via current transformers.

The units are intended for wall or DIN real mounting.

The units are equipped with RS-485 serial port module for communication. The Ethernet 10/100BaseT and wireless modem are also available.

3. SINE VIBRATION TEST - 14/2487

3.1. UNIT UNDER TEST OVERVIEW

Test Date	23/07/2014
Customer Representative	Leonid Fine
Customer Name	SII
Unit Name	ENERGY POWER METER
Item Manufacturer	SATEC
Item Quantity	4 units

3.2. TECHNICAL SOURCE

- BS EN 62052-11:2003, Paragraph 5.2.2.3.
- IEC 60068-2-6.

3.3. TEST INSTRUMENTATION

No.	Instrument Type	Instrument Model	Due Cal.
1.	Electrodynamic Vibration System	U&D TA117-60/CSTA	10/12/2014
2.	Vibration Control System	U&D VWIN Model 2000	10/12/2014
3.	Charge Amplifier	ENDEVCO ISOTRON P.S. Model 2793	10/12/2014
4.	Control Accelerometer Model	ENDEVCO 2224C	See Due Cal. at Accelerometers List Paragraph.

3.4. LAB'S ENVIRONMENTAL CONDITIONS

Parameter Name	Parameter Value	Tolerance Value	Measure Unit
Temperature	25	± 10	Degree Celsius (°C).
Humidity	55	± 27	% R.H.
Mains Voltage	230	± 23	Volts
Mains Frequency	50	± 2	Hertz
Site Air Pressure	760	± 5	mmHg
	1012	± 5	millibar

3.5. TEST PROCEDURE

3.5.1. EXCLUSIONS FROM THE TEST METHOD

None.

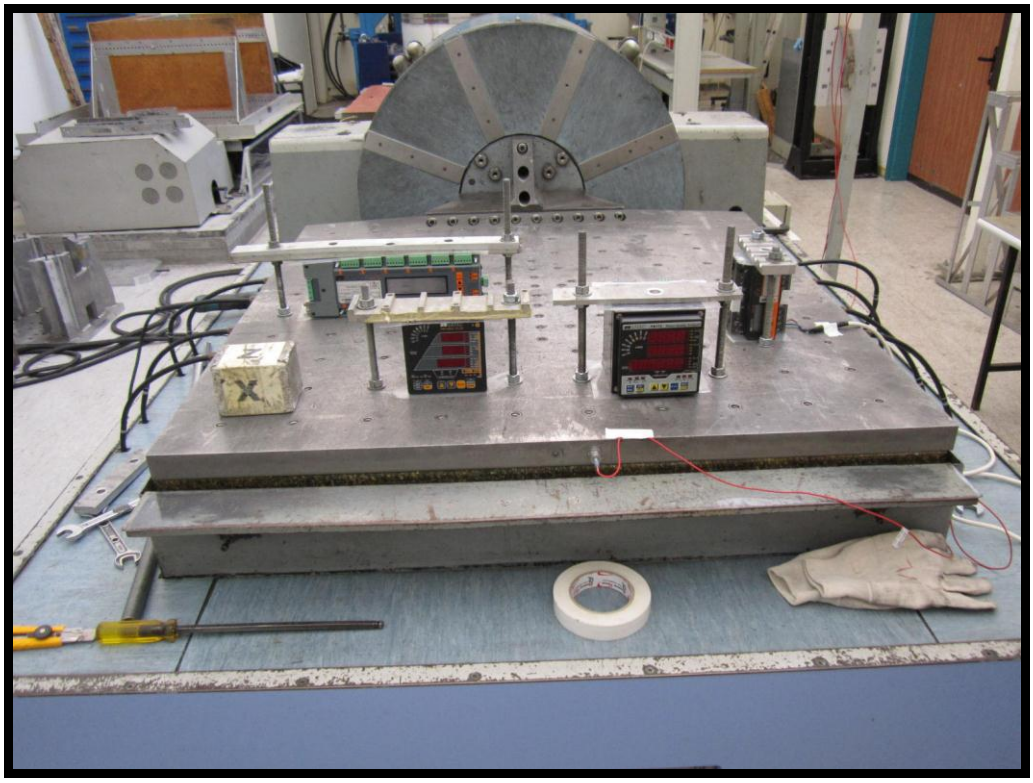
3.5.2. VIBRATION TEST PROCEDURE DESCRIPTION

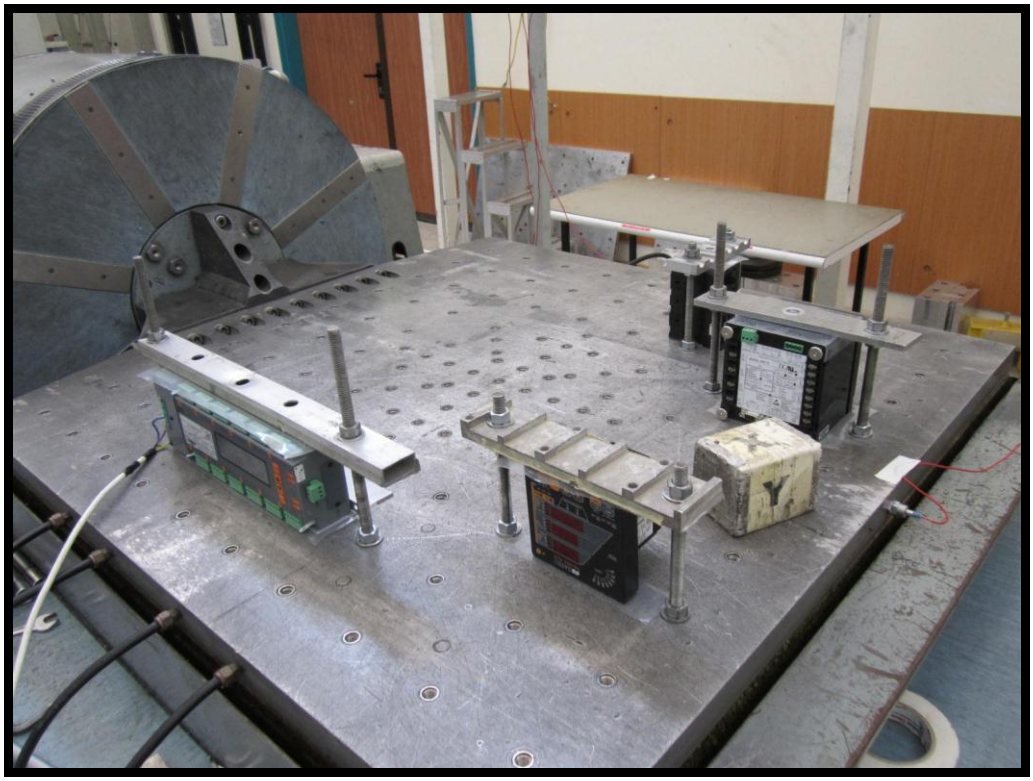
Item Position	The test item was strictly attached to vibration exciter.
Vibration Axes	3 (X, Y, Z).
Sweeping Frequency	Logarithm. From 10 Hz To 150 Hz. Within 03:54 minutes
Vibration Time in Each Axis	01:18 hours
Vibration Level	1 g max.

3.5.3. TEST PERFORMANCE

Functional Test	• At the end of test. • Performed by customer representative.
Visual Test	• At the end of test. • Performed by customer representative.

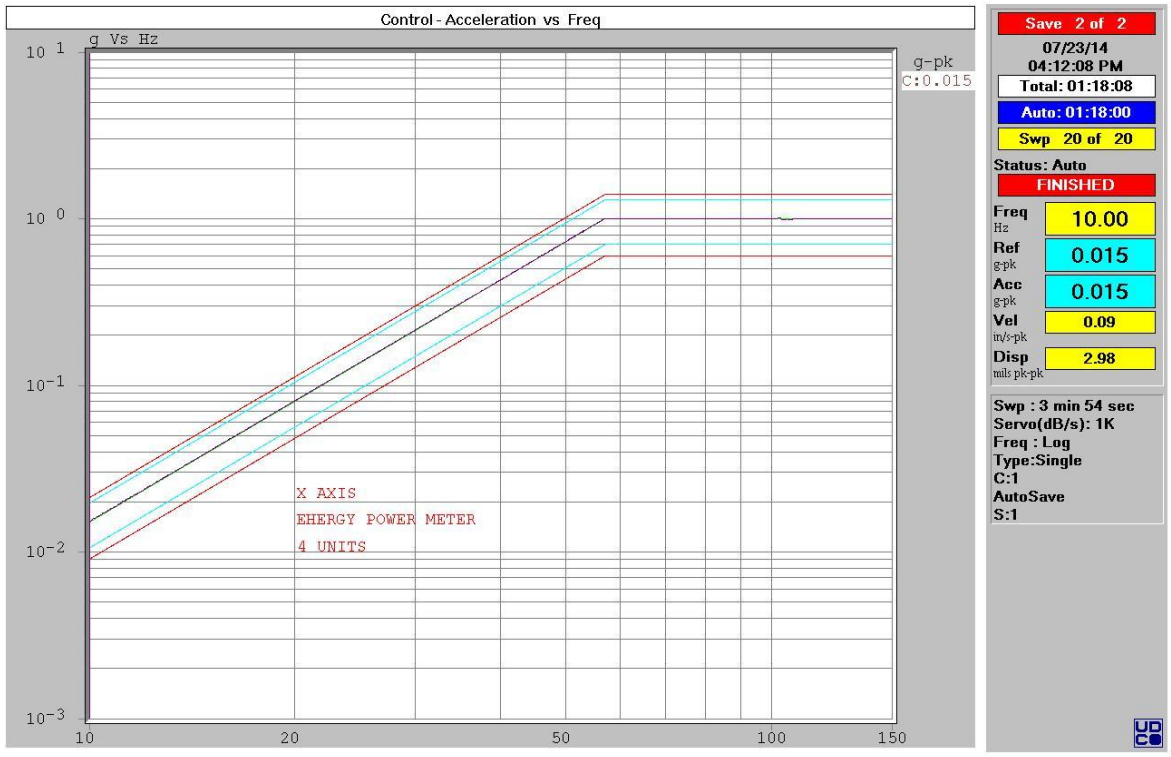
3.5.4. TEST PICTURES

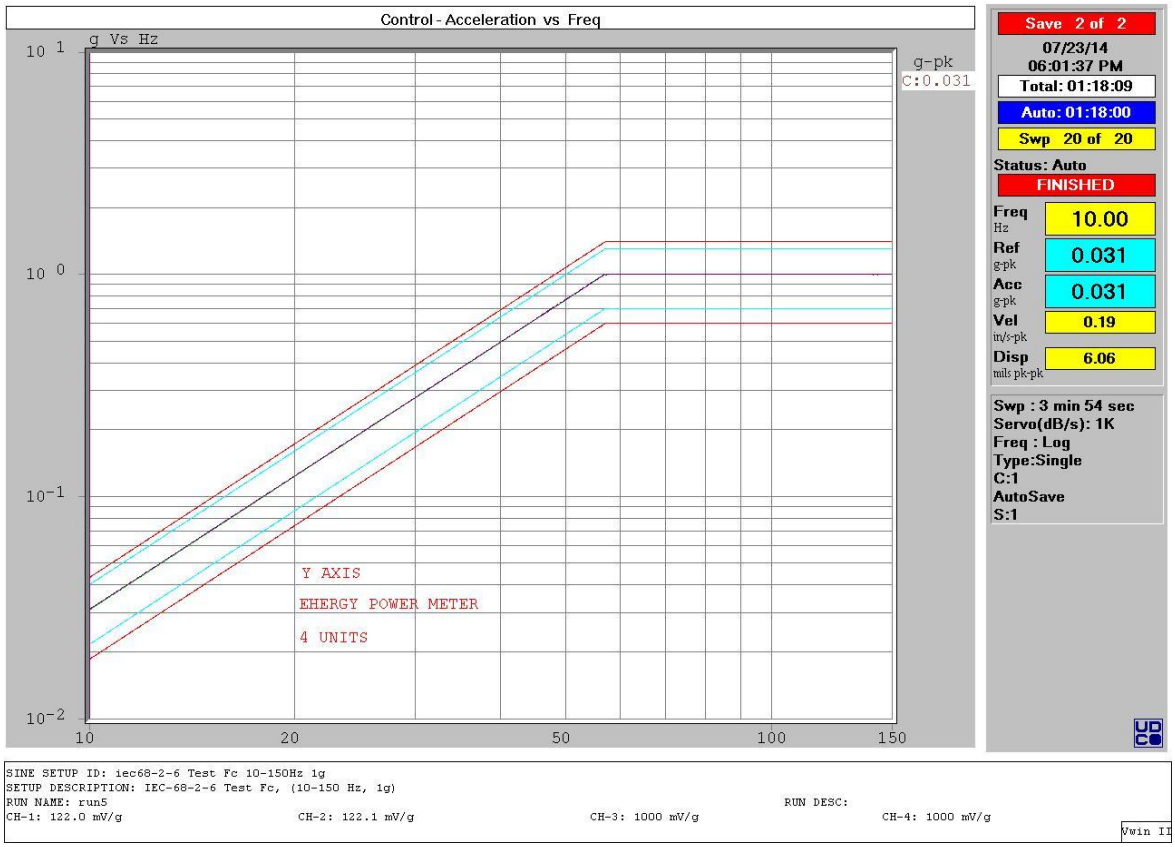


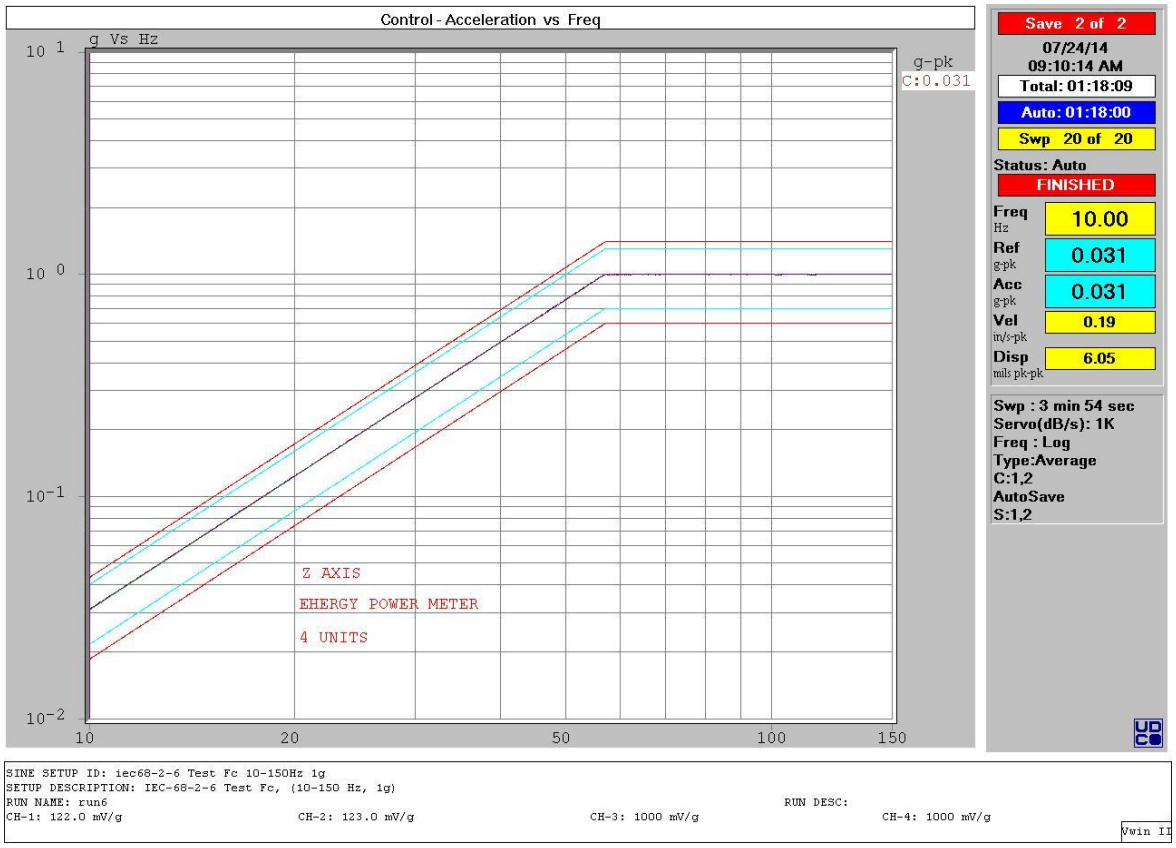

Y


Z

3.5.5. TEST GRAPHS







3.5.6. ACCELEROMETERS LIST

Channel (U&D)	Servo Output (mV/g)	Accelerometer Type		Due Cal.
		Model	Serial Number	
1	122	**ENDEVCO 2224C**	**19604**	10/12/2014
2	123	**ENDEVCO 2224C**	**19606**	10/12/2014

3.5.7. MEASUREMENT POINTS DESCRIPTION

No.	Setup	Run No.	Channel Meas. U&D	Control Axis	Meas. Axis	Definition of measurement points
1.	iec 68-2-6 Test Fc	4	1	X	N/A	Control on vibration fixture.
2.	iec 68-2-6 Test Fc	5	1	Y	N/A	Control on vibration fixture.
3.	iec 68-2-6 Test Fc	6	1,2	Z	N/A	Control on vibration fixture.

3.6. TEST RESULTS

Based on the customer's declaration - The unit under test has PASSED the test.

4. MECHANICAL SHOCK TEST - 14/2488

4.1. UNIT UNDER TEST OVERVIEW

Test Date	23/07/2014
Customer Representative	Leonid Fine
Customer Name	SII
Unit Name	ENERGY POWER METER
Item Manufacturer	SATEC
Item Quantity	4 units

4.2. TECHNICAL SOURCE

- BS EN 62052-11:2003, Paragraph 5.2.2.2.

4.3. TEST INSTRUMENTATION

No.	Instrument Type	Instrument Model	Due Cal.
1.	Mechanical Shock Machine	Electrodynamic vibration system: U&D TA117-60/CSTA	09/12/2014
2.	Shock Control System	U&D VWIN Model 2000	10/12/2014
3.	Charge Amplifier	ENDEVCO ISOTRON P.S. Model 2793	09/12/2014
4.	Control Accelerometer Model	ENDEVCO 2224C	See Due Cal. at Accelerometers List Paragraph.

4.4. LAB'S ENVIRONMENTAL CONDITIONS

Parameter Name	Parameter Value	Tolerance Value	Measure Unit
Temperature	25	± 10	Degree Celsius (°C).
Humidity	55	± 27	% R.H.
Mains Voltage	230	± 23	Volts
Mains Frequency	50	± 2	Hertz
Site Air Pressure	760	± 5	mmHg
	1012	± 5	millibar

4.5. TEST PROCEDURE

4.5.1. EXCLUSIONS FROM THE TEST METHOD

None.

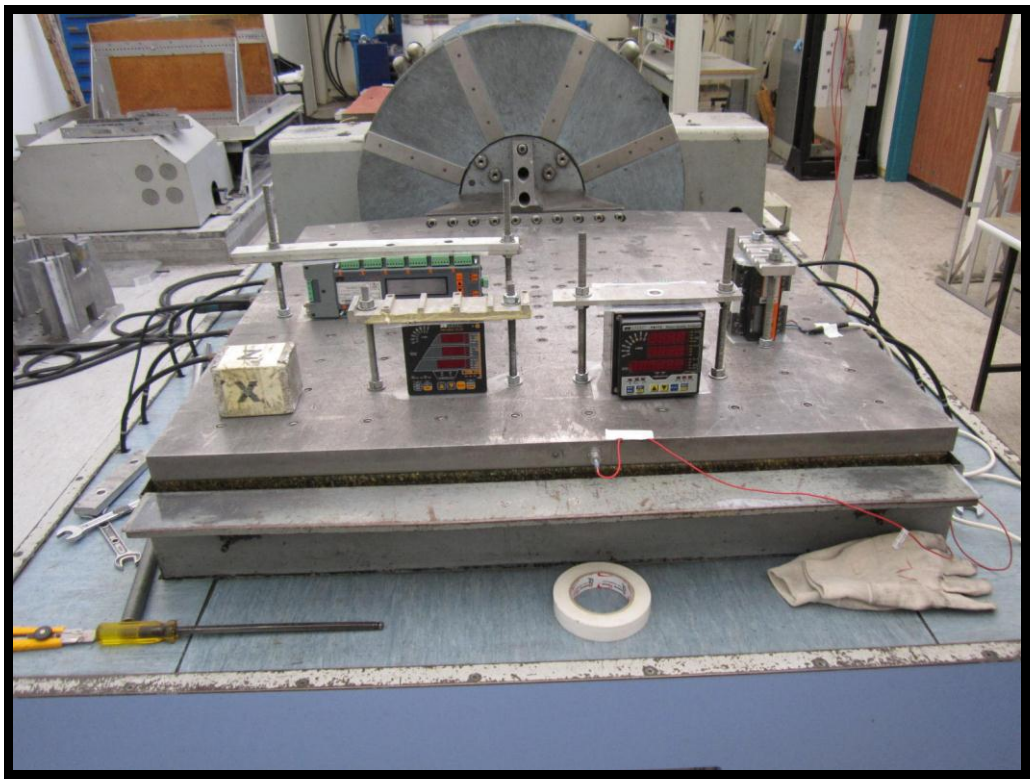
4.5.2. MECHANICAL SHOCK TEST PROCEDURE DESCRIPTION

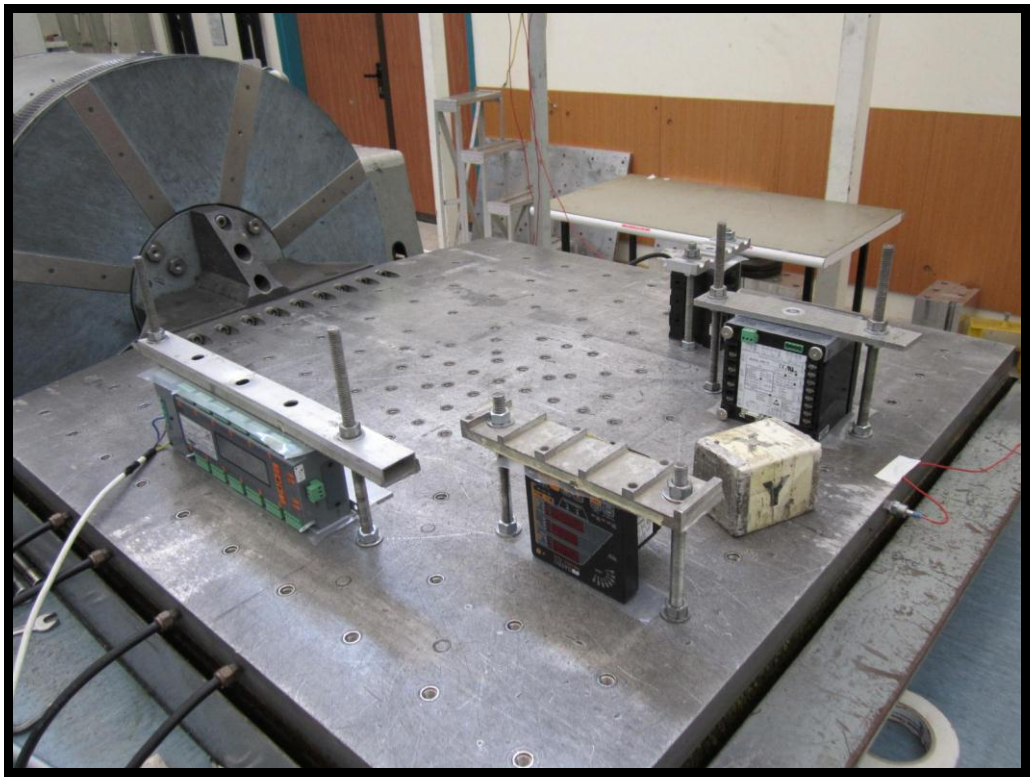
Item Position	The test item was rigidly attached to the shock machine.
Number of Shocks	3 shocks were conducted in each of the 6 directions of the test item.
Shock Level	27 g.
Time Duration	16 msec.
Shape	Half sine.
Total Number of Shocks	18 shocks.

4.5.3. TEST PERFORMANCE

Functional Test	• At the end of test. • Performed by customer representative.
Visual Test	• At the end of test. • Performed by customer representative.

4.5.4. TEST PICTURES

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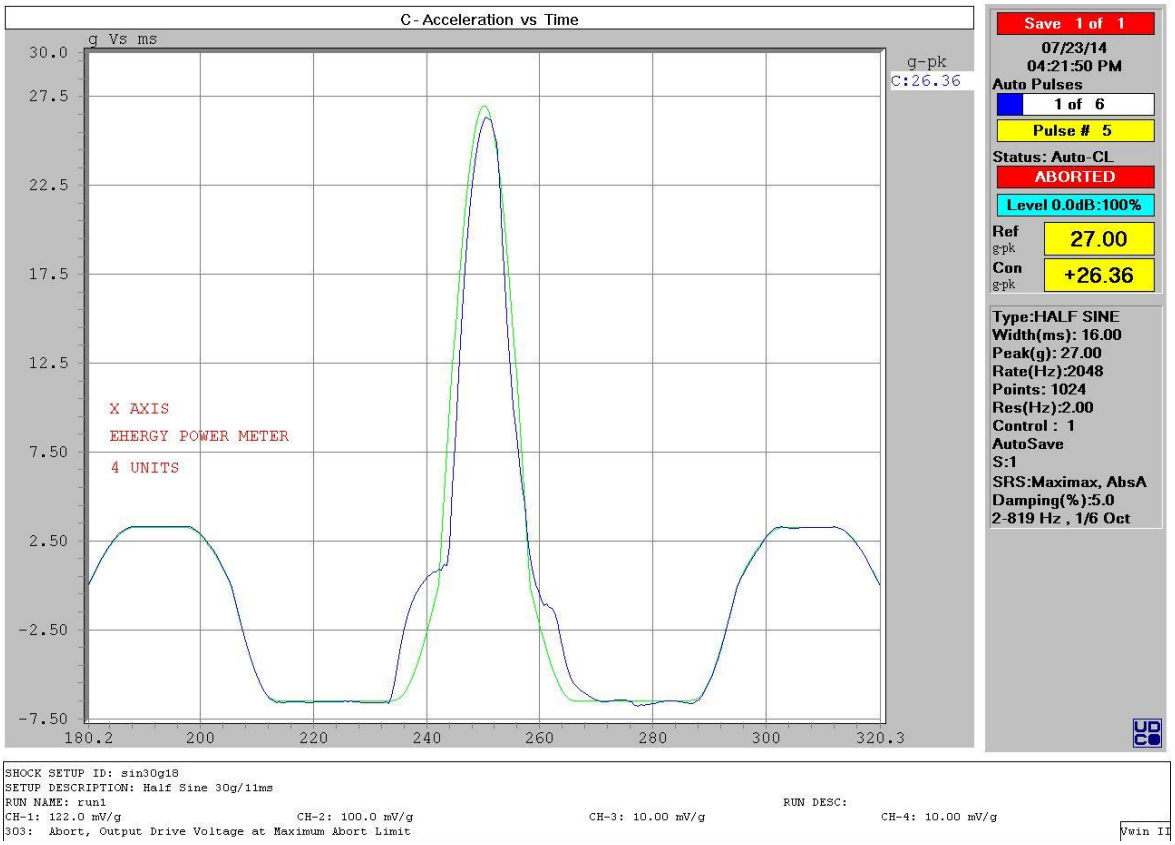
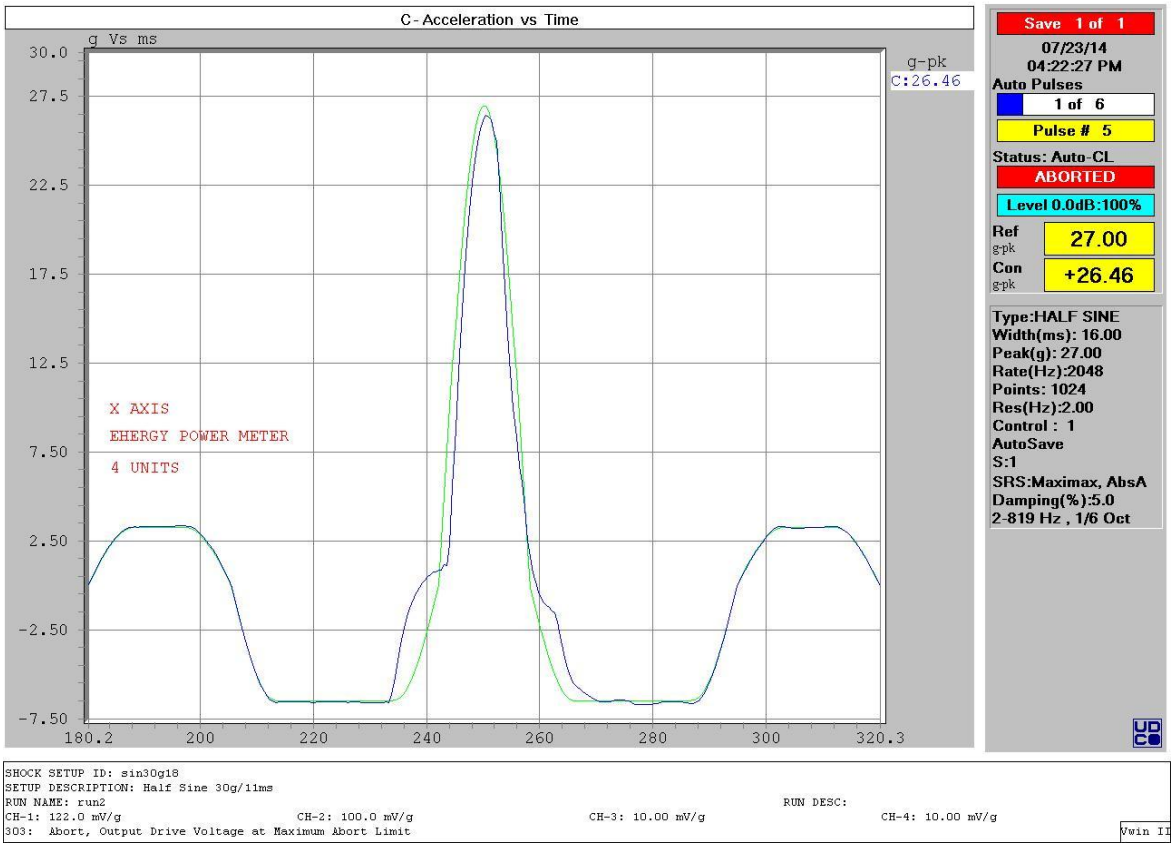
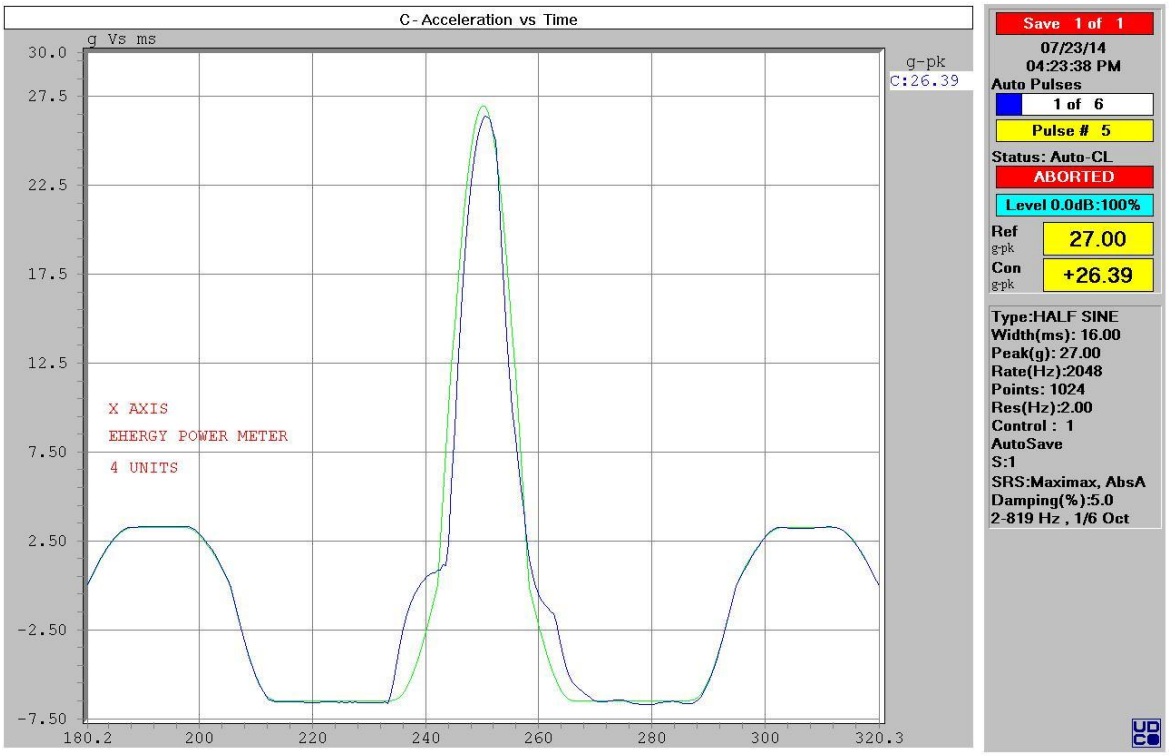
Z

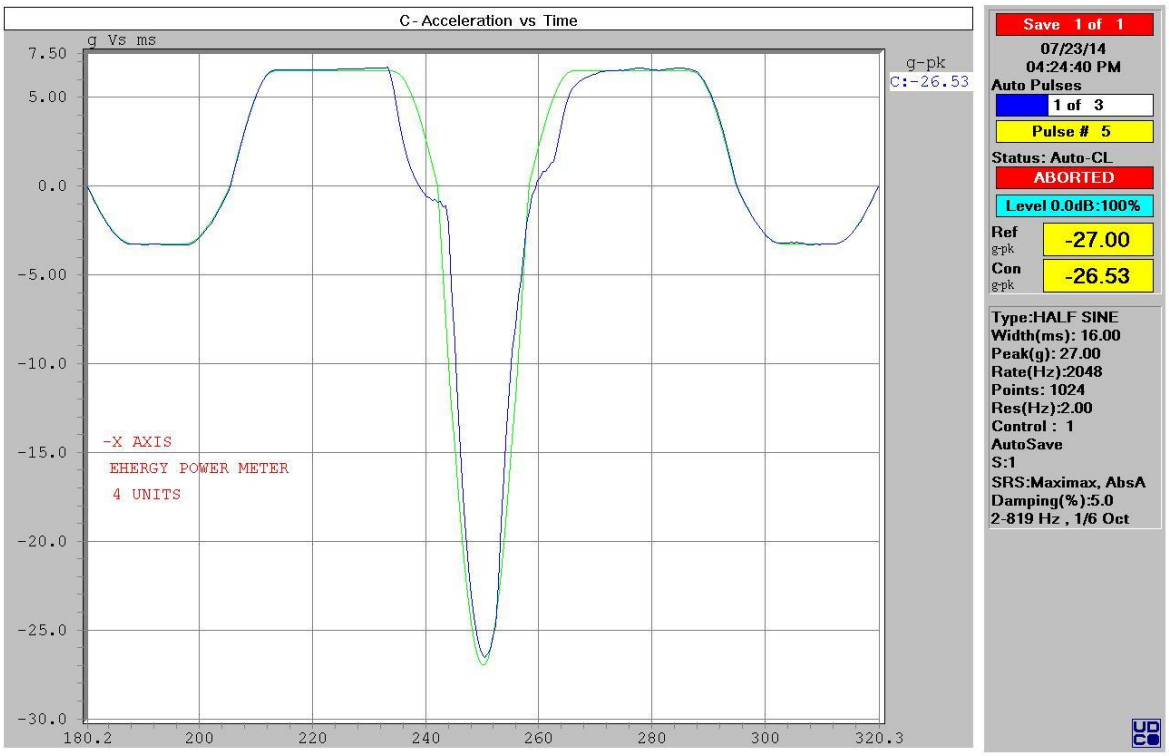
4.5.5. TEST GRAPHS



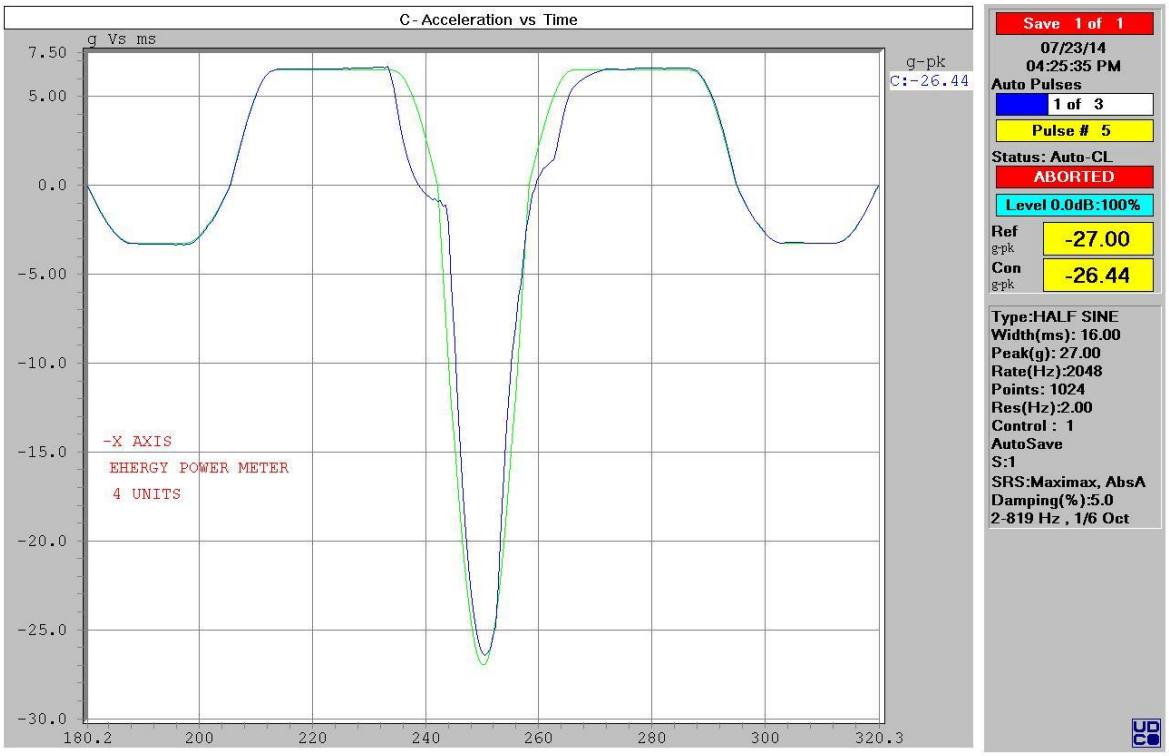




SHOCK SETUP ID: sin30g18
SETUP DESCRIPTION: Half Sine 30g/11ms
RUN NAME: run3 RUN DESC:
CH-1: 122.0 mV/g CH-2: 100.0 mV/g CH-3: 10.00 mV/g CH-4: 10.00 mV/g
303: Abort, Output Drive Voltage at Maximum Abort Limit Vwin II



SHOCK SETUP ID: sin30g18
SETUP DESCRIPTION: Half Sine 30g/11ms
RUN NAME: run4 RUN DESC:
CH-1: 122.0 mV/g CH-2: 100.0 mV/g CH-3: 10.00 mV/g CH-4: 10.00 mV/g
303: Abort, Output Drive Voltage at Maximum Abort Limit Vwin II




```
SHOCK SETUP ID: sin30g18
SETUP DESCRIPTION: Half Sine 30g/11ms
RUN NAME: run5                                                    RUN DESC:
CH-1: 122.0 mV/g        CH-2: 100.0 mV/g        CH-3: 10.00 mV/g        CH-4: 10.00 mV/g
303:  Abort, Output Drive Voltage at Maximum Abort Limit                                  Vwin II
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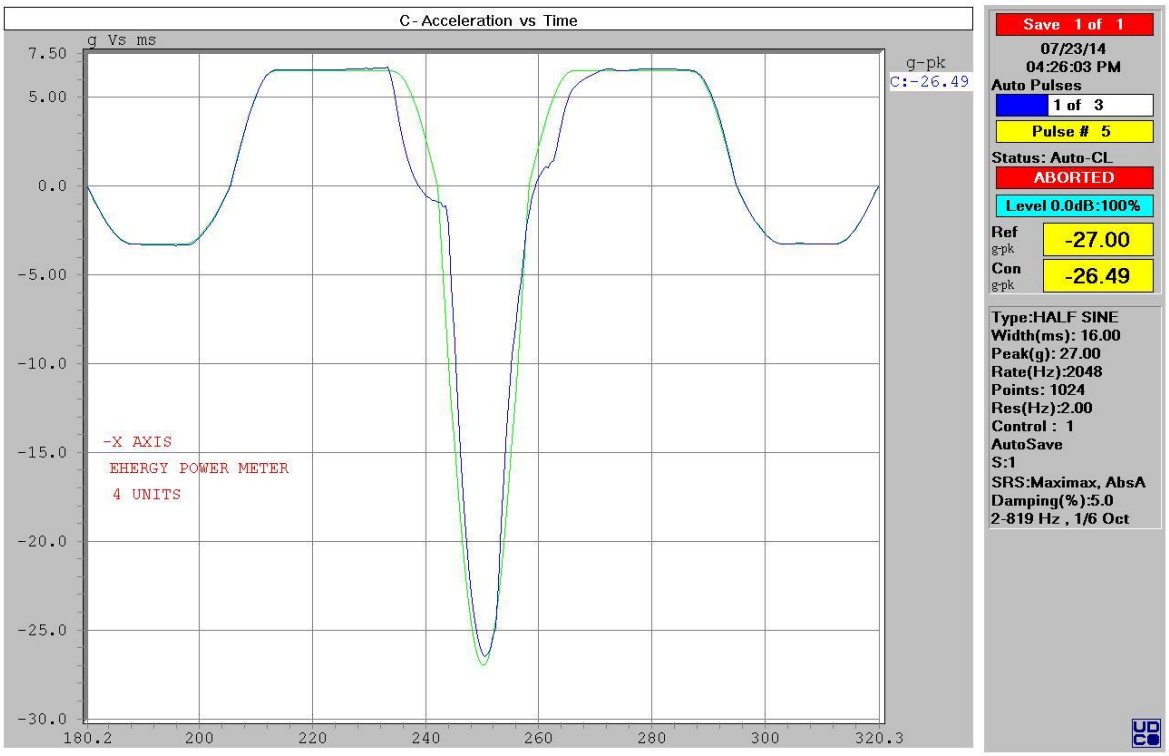


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SHOCK SETUP ID: sin30g18
SETUP DESCRIPTION: Half Sine 30g/11ms
RUN NAME: run6                                                    RUN DESC:
CH-1: 122.0 mV/g        CH-2: 100.0 mV/g        CH-3: 10.00 mV/g        CH-4: 10.00 mV/g
303:  Abort, Output Drive Voltage at Maximum Abort Limit                                  Vwin II
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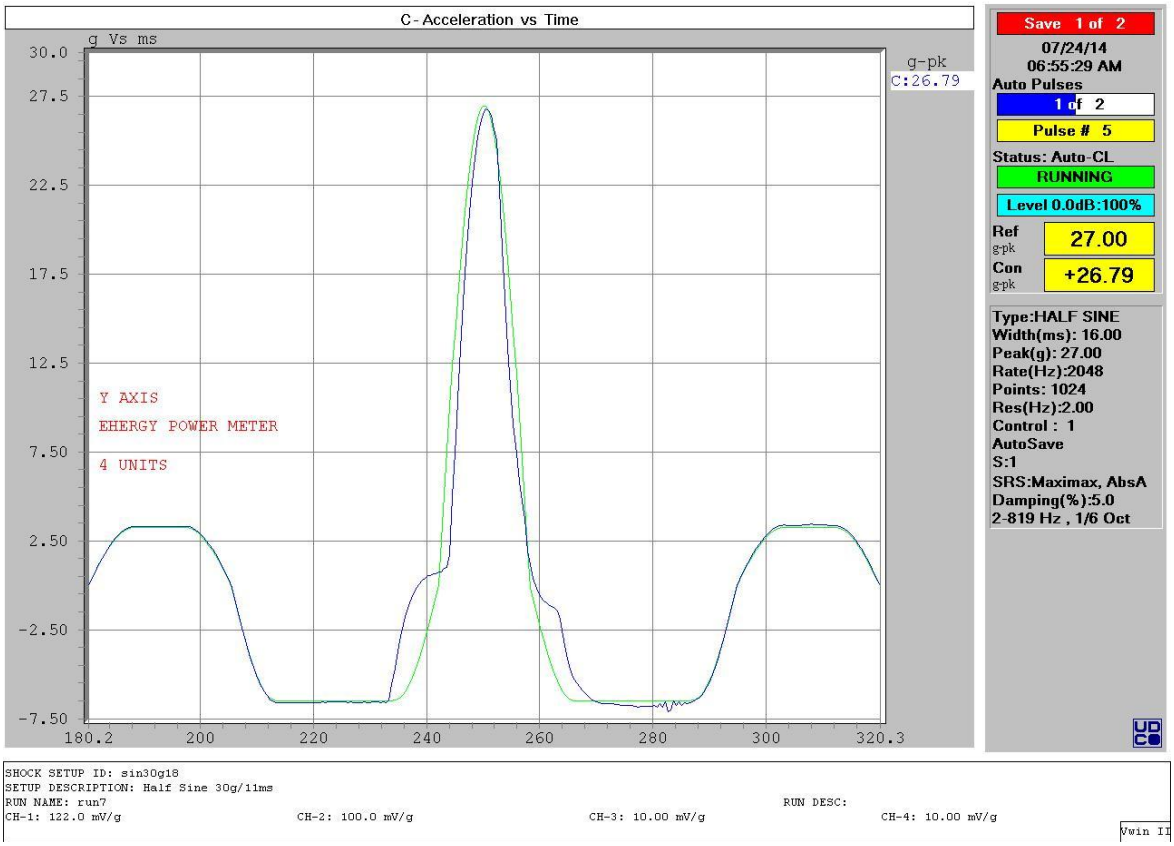
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g-pk
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EHERGY POWER METER
4 UNITS
Save 1 of 2
07/24/14
06:55:29 AM
Auto Pulses
1 of 2
Pulse # 5
Status: Auto-CL
RUNNING
Level 0.0dB:100%
Ref g-pk 27.00
Con g-pk +26.79
Type:HALF SINE
Width(ms): 16.00
Peak(g): 27.00
Rate(Hz):2048
Points: 1024
Res(Hz):2.00
Control : 1
AutoSave
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SRS:Maximax, AbsA
Damping(%):5.0
2-819 Hz , 1/6 Oct
SHOCK SETUP ID: sin30g18
SETUP DESCRIPTION: Half Sine 30g/11ms
RUN NAME: run7
RUN DESC:
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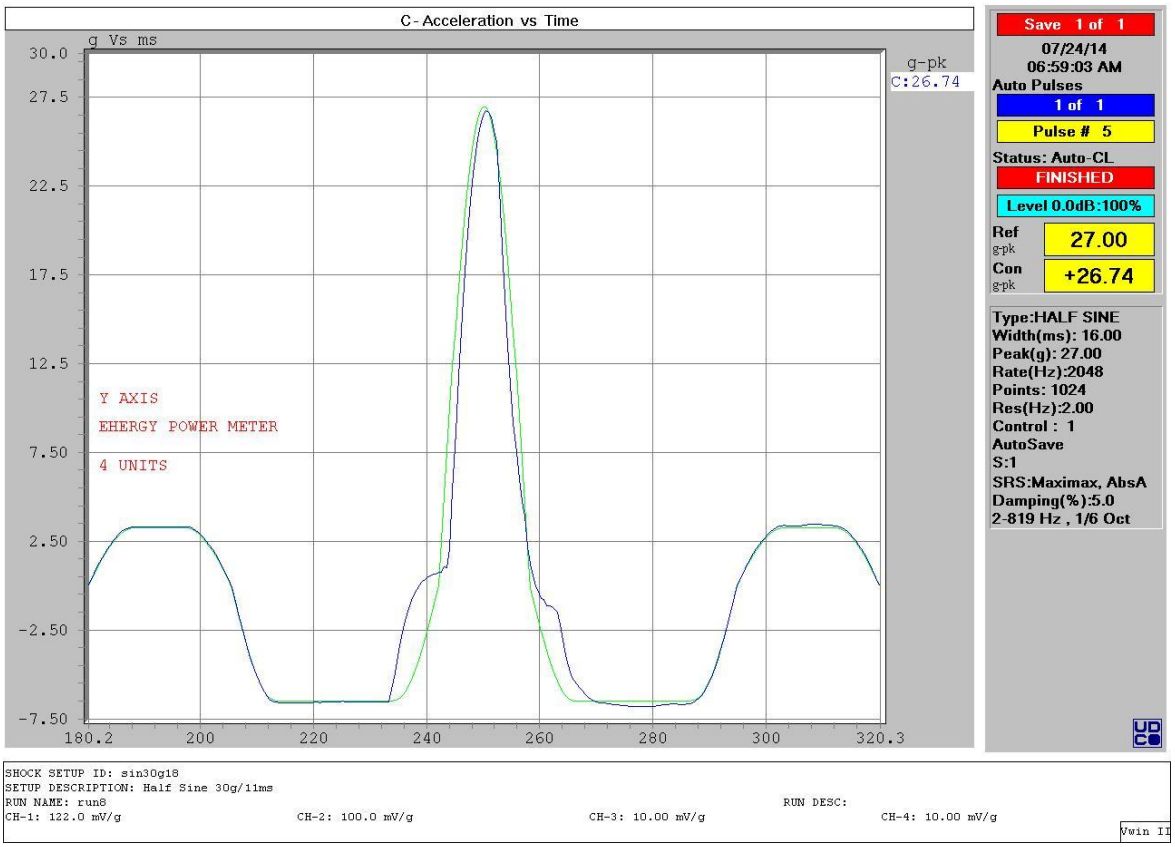
CH-2: 100.0 mV/g
CH-3: 10.00 mV/g
CH-4: 10.00 mV/g
Vwin II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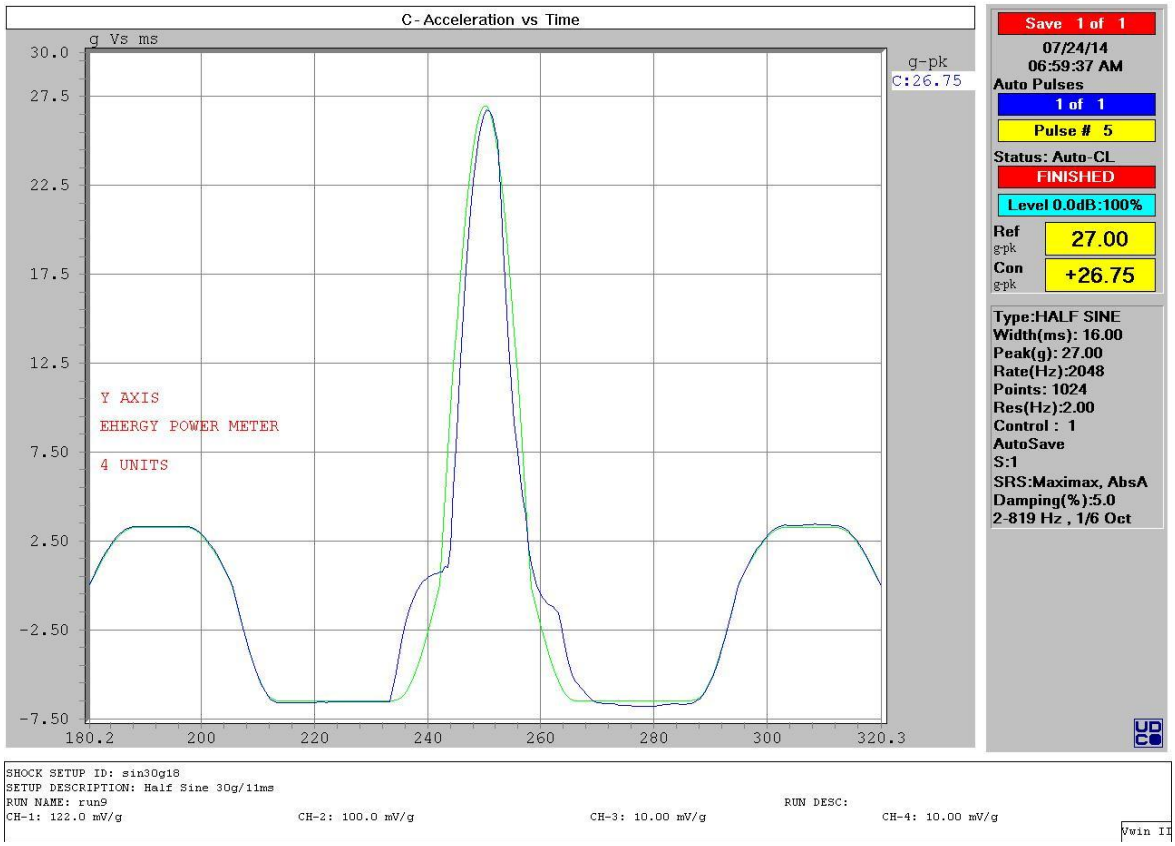
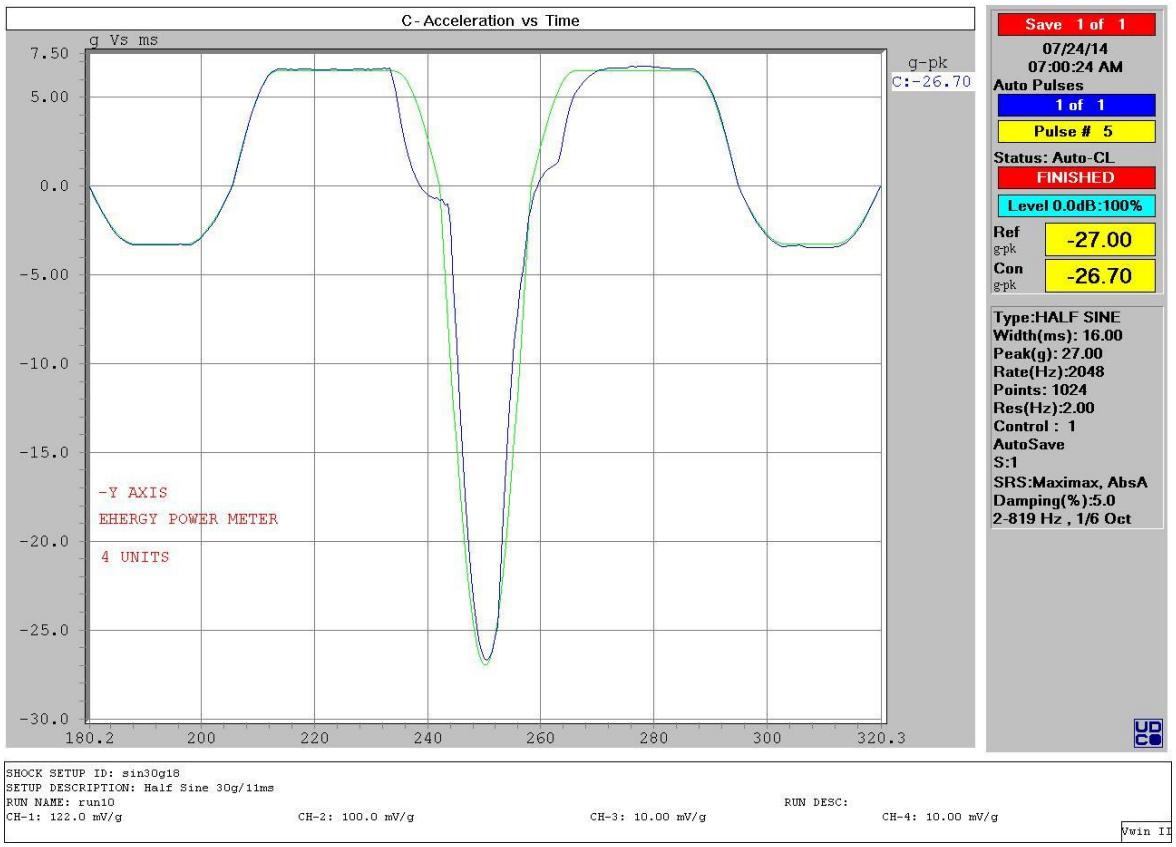
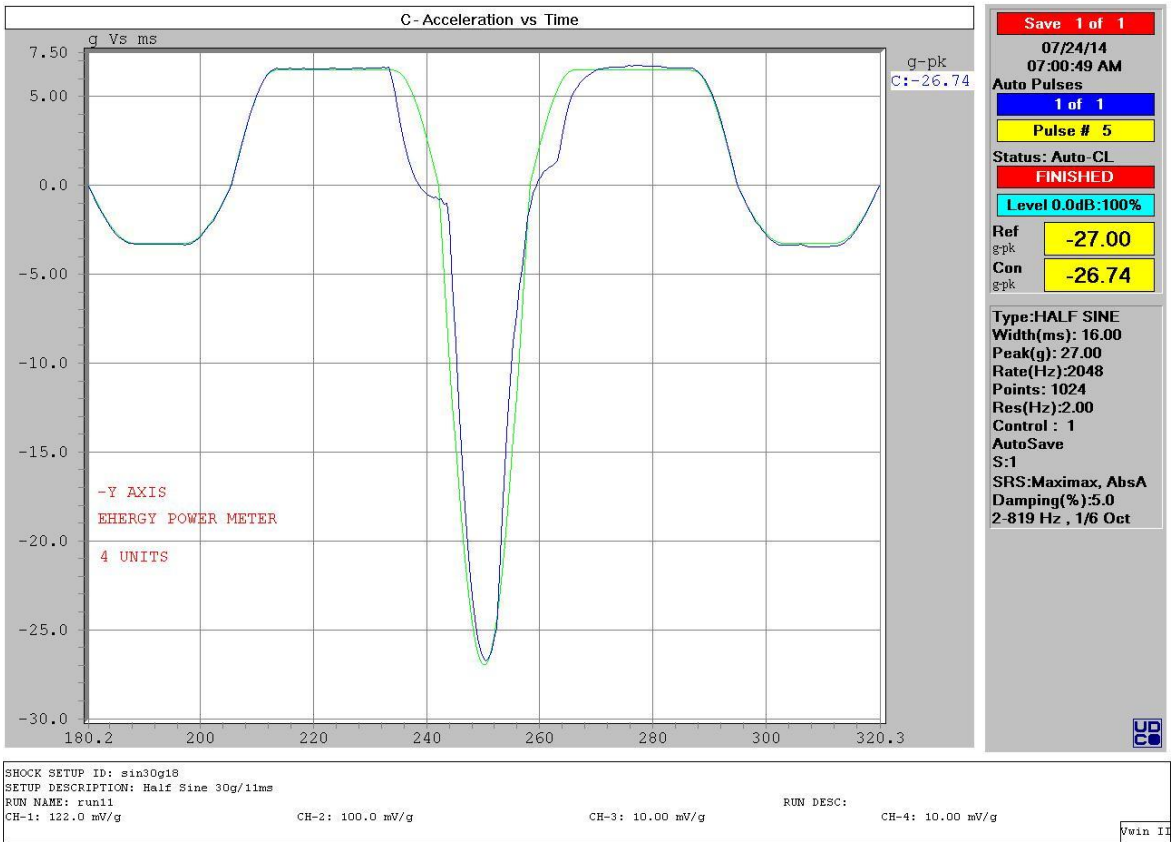
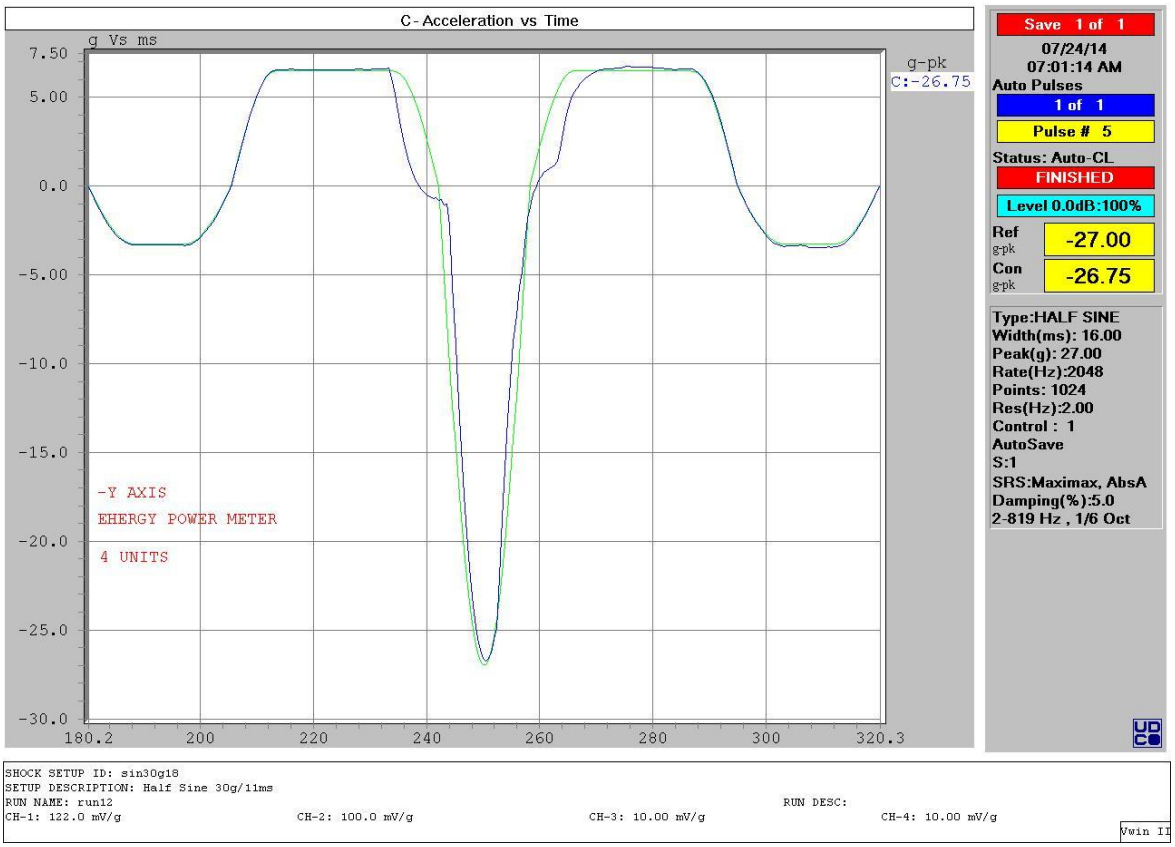
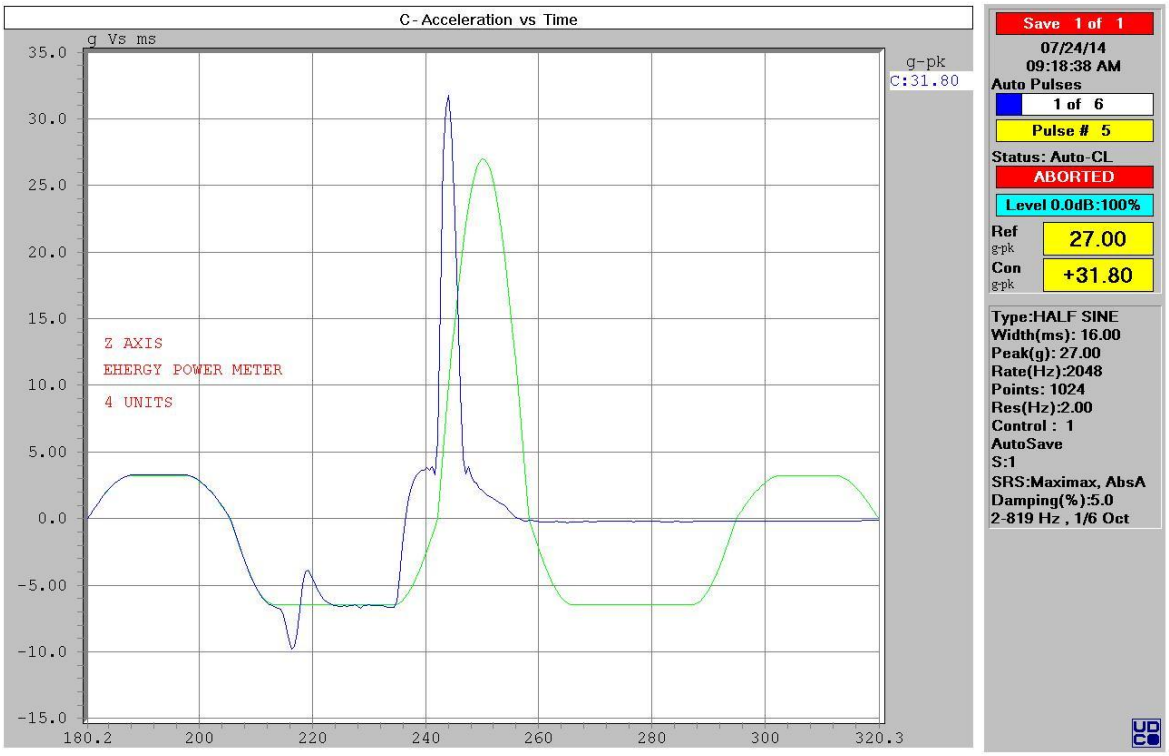
Status: Auto-CL
FINISHED
Level 0.0dB:100%
Ref g-pk 27.00
Con g-pk +26.74
Type:HALF SINE
Width(ms): 16.00
Peak(g): 27.00
Rate(Hz):2048
Points: 1024
Res(Hz):2.00
Control : 1
AutoSave
S:1
SRS:Maximax, AbsA
Damping(%):5.0
2-819 Hz , 1/6 Oct
SHOCK SETUP ID: sin30g18
SETUP DESCRIPTION: Half Sine 30g/11ms
RUN NAME: run8
RUN DESC:
CH-1: 122.0 mV/g
CH-2: 100.0 mV/g
CH-3: 10.00 mV/g
CH-4: 10.00 mV/g
Vwin II


C-Acceleration vs Time
g Vs ms
g-pk
C:26.75
Y AXIS
EHERGY POWER METER
4 UNITS
Save 1 of 1
07/24/14
06:59:37 AM
Auto Pulses
1 of 1
Pulse # 5
Status: Auto-CL
FINISHED
Level 0.0dB:100%
Ref g-pk 27.00
Con g-pk +26.75
Type:HALF SINE
Width(ms): 16.00
Peak(g): 27.00
Rate(Hz):2048
Points: 1024
Res(Hz):2.00
Control : 1
AutoSave
S:1
SRS:Maximax, AbsA
Damping(%):5.0
2-819 Hz , 1/6 Oct
SHOCK SETUP ID: sin30g18
SETUP DESCRIPTION: Half Sine 30g/11ms
RUN NAME: run9
RUN DESC:
CH-1: 122.0 mV/g
CH-2: 100.0 mV/g
CH-3: 10.00 mV/g
CH-4: 10.00 mV/g
Vwin II

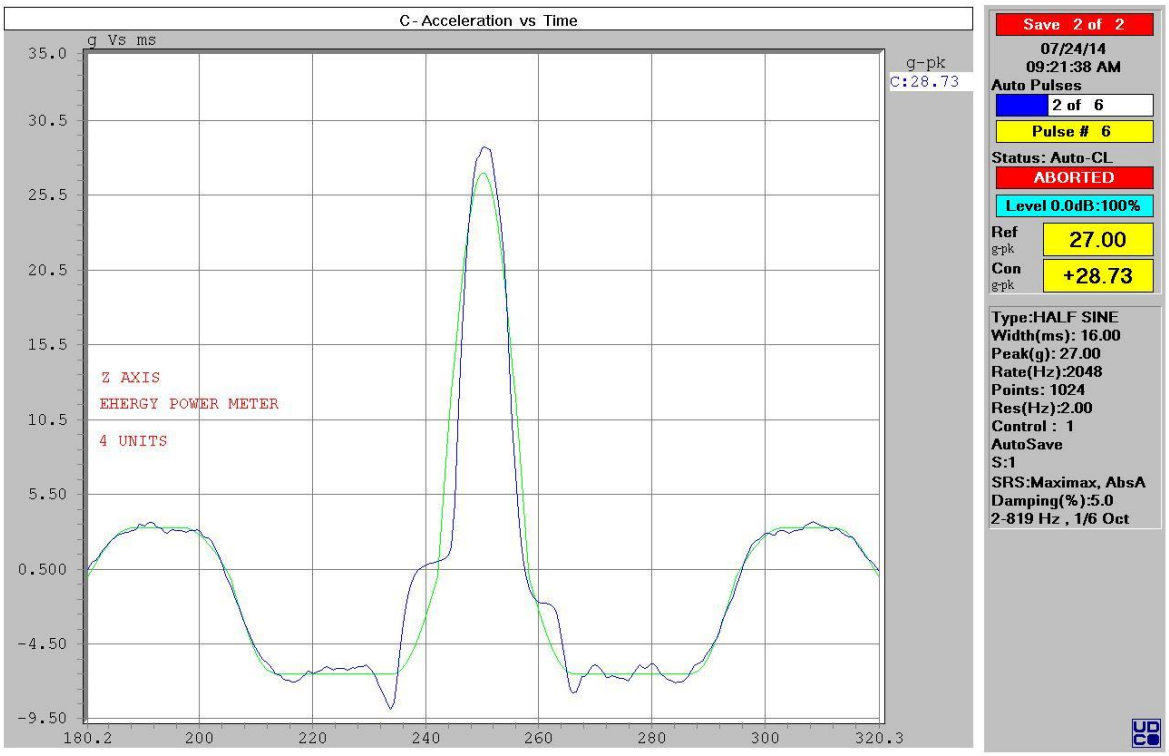

C-Acceleration vs Time
g Vs ms
g-pk
C:-26.70
-Y AXIS
EHERGY POWER METER
4 UNITS
Save 1 of 1
07/24/14
07:00:24 AM
Auto Pulses
1 of 1
Pulse # 5
Status: Auto-CL
FINISHED
Level 0.0dB:100%
Ref g-pk -27.00
Con g-pk -26.70
Type:HALF SINE
Width(ms): 16.00
Peak(g): 27.00
Rate(Hz):2048
Points: 1024
Res(Hz):2.00
Control : 1
AutoSave
S:1
SRS:Maximax, AbsA
Damping(%):5.0
2-819 Hz , 1/6 Oct
SHOCK SETUP ID: sin30g18
SETUP DESCRIPTION: Half Sine 30g/11ms
RUN NAME: run10
RUN DESC:
CH-1: 122.0 mV/g
CH-2: 100.0 mV/g
CH-3: 10.00 mV/g
CH-4: 10.00 mV/g
Vwin II


C-Acceleration vs Time
g Vs ms
7.50
5.00
0.0
-5.00
-10.0
-15.0
-20.0
-25.0
-30.0
180.2
200
220
240
260
280
300
320.3
g-pk
C:-26.74
-Y AXIS
EHERGY POWER METER
4 UNITS
Save 1 of 1
07/24/14
07:00:49 AM
Auto Pulses
1 of 1
Pulse # 5
Status: Auto-CL
FINISHED
Level 0.0dB:100%
Ref g-pk -27.00
Con g-pk -26.74
Type:HALF SINE
Width(ms): 16.00
Peak(g): 27.00
Rate(Hz):2048
Points: 1024
Res(Hz):2.00
Control : 1
AutoSave
S:1
SRS:Maximax, AbsA
Damping(%):5.0
2-819 Hz , 1/6 Oct
SHOCK SETUP ID: sin30g18
SETUP DESCRIPTION: Half Sine 30g/11ms
RUN NAME: run11
RUN DESC:
CH-1: 122.0 mV/g
CH-2: 100.0 mV/g
CH-3: 10.00 mV/g
CH-4: 10.00 mV/g
Vwin II

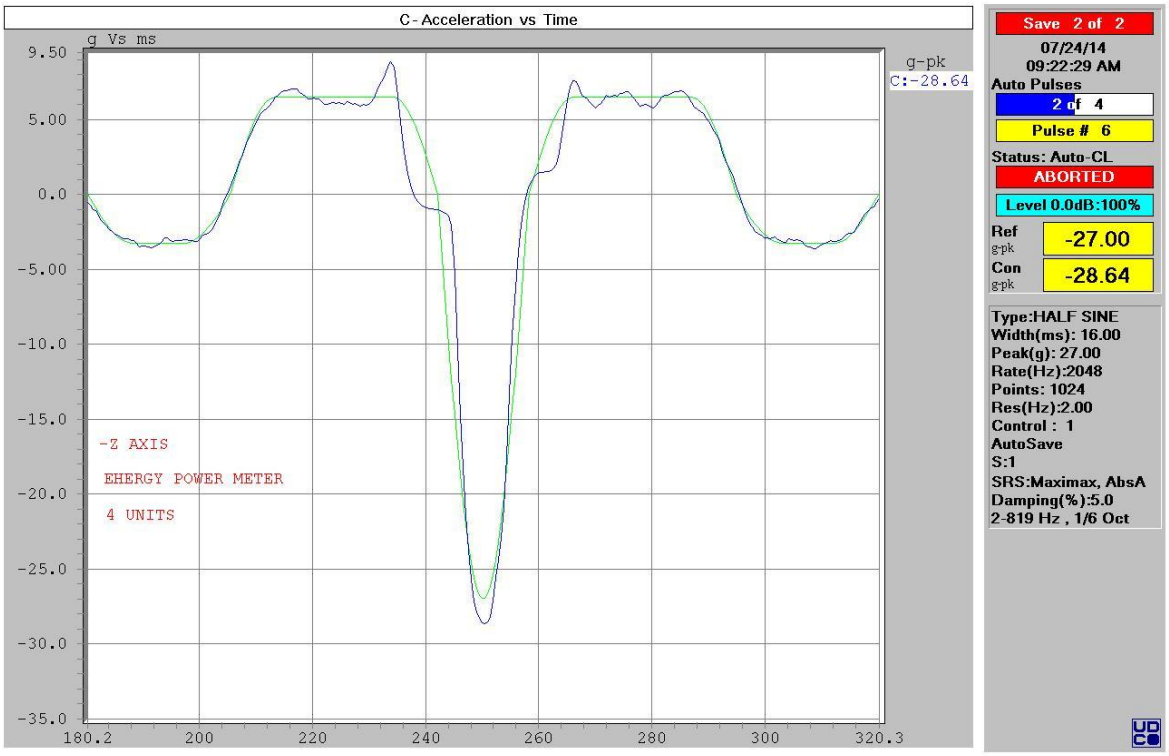

C-Acceleration vs Time
g Vs ms
7.50
5.00
0.0
-5.00
-10.0
-15.0
-20.0
-25.0
-30.0
180.2
200
220
240
260
280
300
320.3
g-pk
C:-26.75
-Y AXIS
EHERGY POWER METER
4 UNITS
Save 1 of 1
07/24/14
07:01:14 AM
Auto Pulses
1 of 1
Pulse # 5
Status: Auto-CL
FINISHED
Level 0.0dB:100%
Ref g-pk -27.00
Con g-pk -26.75
Type:HALF SINE
Width(ms): 16.00
Peak(g): 27.00
Rate(Hz):2048
Points: 1024
Res(Hz):2.00
Control : 1
AutoSave
S:1
SRS:Maximax, AbsA
Damping(%):5.0
2-819 Hz , 1/6 Oct
SHOCK SETUP ID: sin30g18
SETUP DESCRIPTION: Half Sine 30g/11ms
RUN NAME: run12
RUN DESC:
CH-1: 122.0 mV/g
CH-2: 100.0 mV/g
CH-3: 10.00 mV/g
CH-4: 10.00 mV/g
Vwin II



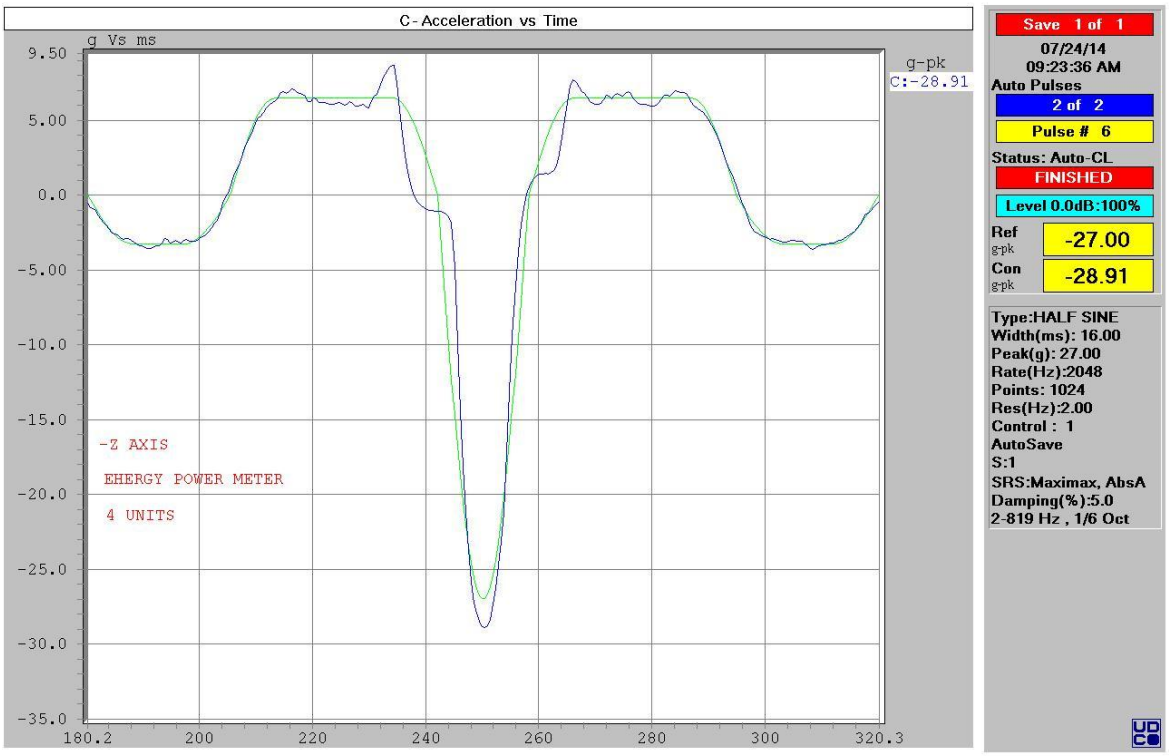
SHOCK SETUP ID: sin30g18
SETUP DESCRIPTION: Half Sine 30g/11ms
RUN NAME: run13 RUN DESC:
CH-1: 122.0 mV/g CH-2: 100.0 mV/g CH-3: 10.00 mV/g CH-4: 10.00 mV/g
309: Abort, D/A Clipping Vwin II



SHOCK SETUP ID: sin30g18
SETUP DESCRIPTION: Half Sine 30g/11ms
RUN NAME: run14 RUN DESC:
CH-1: 122.0 mV/g CH-2: 100.0 mV/g CH-3: 10.00 mV/g CH-4: 10.00 mV/g
303: Abort, Output Drive Voltage at Maximum Abort Limit Vwin II




```
SHOCK SETUP ID: sin30g18
SETUP DESCRIPTION: Half Sine 30g/11ms
RUN NAME: run15                                                    RUN DESC:
CH-1: 122.0 mV/g          CH-2: 100.0 mV/g          CH-3: 10.00 mV/g          CH-4: 10.00 mV/g
303:  Abort, Output Drive Voltage at Maximum Abort Limit                                          Vwin II
```




```
SHOCK SETUP ID: sin30g18
SETUP DESCRIPTION: Half Sine 30g/11ms
RUN NAME: run16                                                    RUN DESC:
CH-1: 122.0 mV/g          CH-2: 100.0 mV/g          CH-3: 10.00 mV/g          CH-4: 10.00 mV/g
                                                                                                  Vwin II
```

4.5.6. ACCELEROMETERS LIST

Channel (U&D)	Servo Output (mV/g)	Accelerometer Type		Due Cal.
		Model	Serial Number	
1	122	**ENDEVCO 2224C**	**19604**	10/12/2014

4.5.7. MEASUREMENT POINTS DESCRIPTION

No.	Setup	Run No.	Channel Meas. U&D	Control Axis	Meas. Axis	Definition of measurement points
1.	sin30g18	1	1	X	N/A	Control on shock fixture.
2.	sin30g18	2	1	X	N/A	Control on shock fixture.
3.	sin30g18	3	1	X	N/A	Control on shock fixture.
4.	sin30g18	4	1	-X	N/A	Control on shock fixture.
5.	sin30g18	5	1	-X	N/A	Control on shock fixture.
6.	sin30g18	6	1	-X	N/A	Control on shock fixture.
7.	sin30g18	7	1	Y	N/A	Control on shock fixture.
8.	sin30g18	8	1	Y	N/A	Control on shock fixture.
9.	sin30g18	9	1	Y	N/A	Control on shock fixture.
10.	sin30g18	10	1	-Y	N/A	Control on shock fixture.
11.	sin30g18	11	1	-Y	N/A	Control on shock fixture.
12.	sin30g18	12	1	-Y	N/A	Control on shock fixture.
13.	sin30g18	13	1	Z	N/A	Control on shock fixture.
14.	sin30g18	14	1	Z	N/A	Control on shock fixture.
15.	sin30g18	15	1	-Z	N/A	Control on shock fixture.
16.	sin30g18	16	1	-Z	N/A	Control on shock fixture.

4.6. TEST RESULTS

Based on the customer’s declaration - The unit under test has PASSED the test.

5. DRY HEAT (Storage) TEST - 14/2489

5.1. UNIT UNDER TEST OVERVIEW

Test Date	24/07/2014
Customer Representative	Leonid Fine
Customer Name	SII
Unit Name	ENERGY POWER METER
Item Manufacturer	SATEC
Item Quantity	4 units

5.2. TECHNICAL SOURCE

- BS EN 62052-11:2003, Paragraph 6.3.1.

5.3. TEST INSTRUMENTATION - TEMPERATURE CHAMBER

No.	Instrumentation Name	Due Cal.
1.	THERMOTRON_SM-8C	11/12/2014

5.4. LAB'S ENVIRONMENTAL CONDITIONS

Parameter Name	Parameter Value	Tolerance Value	Measure Unit
Temperature	25	± 10	Degree Celsius (°C).
Humidity	55	± 27	% R.H.
Mains Voltage	230	± 23	Volts
Mains Frequency	50	± 2	Hertz
Site Air Pressure	760	± 5	mmHg
	1012	± 5	millibar

5.5. TEST PROCEDURE

5.5.1. EXCLUSIONS FROM THE TEST METHOD

None.

5.5.2. HIGH TEMPERATURE TEST PROCEDURE DESCRIPTION

Number of Cycles	One temperature cycle was conducted.
Cycle Time	73:30 hours

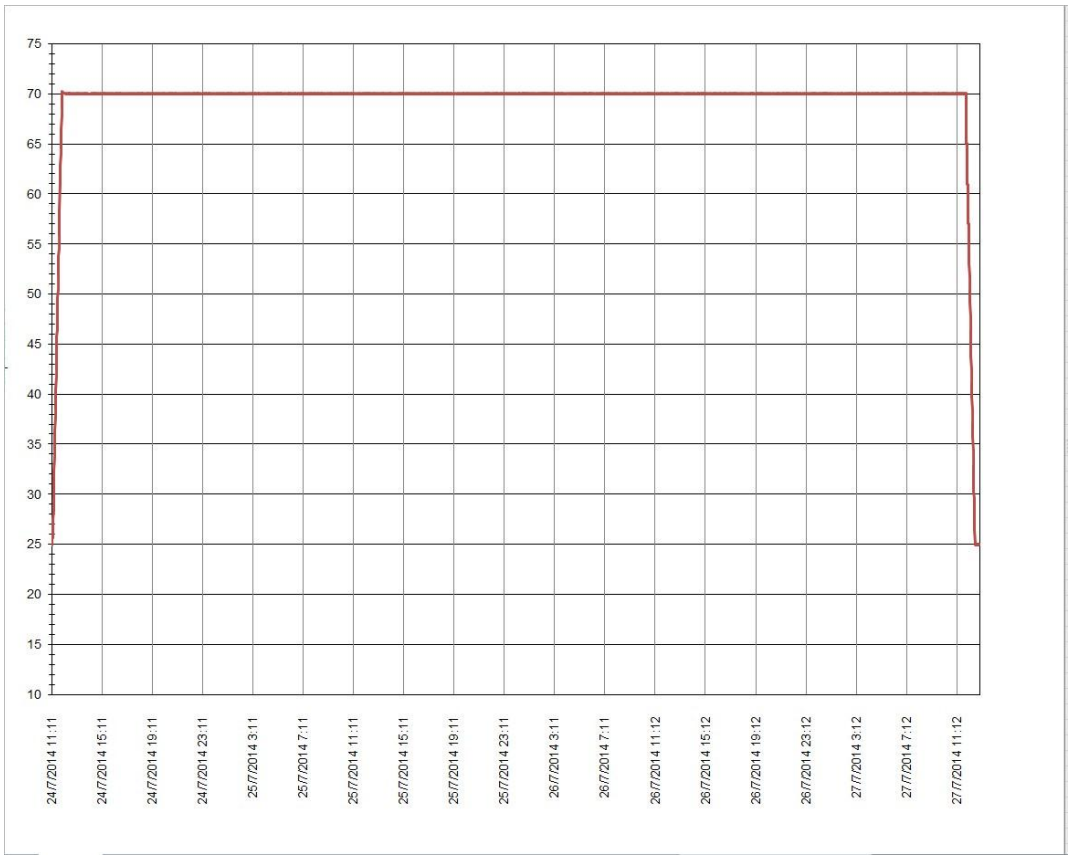
Temperature Change		Period	Remarks
From	To		
25°C	70°C	45 minutes	
70°C	70°C	72 hours	
70°C	25°C	45 minutes	

5.5.3. TEST PERFORMANCE

Functional Test	• At the end of test. • Performed by customer representative.
Visual Test	• At the end of test. • Performed by customer representative.

5.5.4. TEST PICTURES

5.5.5. TEST GRAPHS



5.6. TEST RESULTS

Based on the customer's declaration - The unit under test has PASSED the test.

6. LOW TEMPERATURE (Storage) TEST - 14/2518

6.1. UNIT UNDER TEST OVERVIEW

Test Date	27/07/2014
Customer Representative	Leonid Fine
Customer Name	SII
Unit Name	ENERGY POWER METER
Item Manufacturer	SATEC
Item Quantity	4 units

6.2. TECHNICAL SOURCE

- BS EN 62052-11:2003, Paragraph 6.3.1.

6.3. TEST INSTRUMENTATION - TEMPERATURE CHAMBER

No.	Instrumentation Name	Due Cal.
1.	THERMOTRON_SM-8C	11/12/2014

6.4. LAB'S ENVIRONMENTAL CONDITIONS

Parameter Name	Parameter Value	Tolerance Value	Measure Unit
Temperature	25	± 10	Degree Celsius (°C).
Humidity	55	± 27	% R.H.
Mains Voltage	230	± 23	Volts
Mains Frequency	50	± 2	Hertz
Site Air Pressure	760	± 5	mmHg
	1012	± 5	millibar

6.5. TEST PROCEDURE

6.5.1. EXCLUSIONS FROM THE TEST METHOD

None.

6.5.2. LOW TEMPERATURE TEST PROCEDURE DESCRIPTION

Number of Cycles	One temperature cycle was conducted.
Cycle Time	73:40 hours

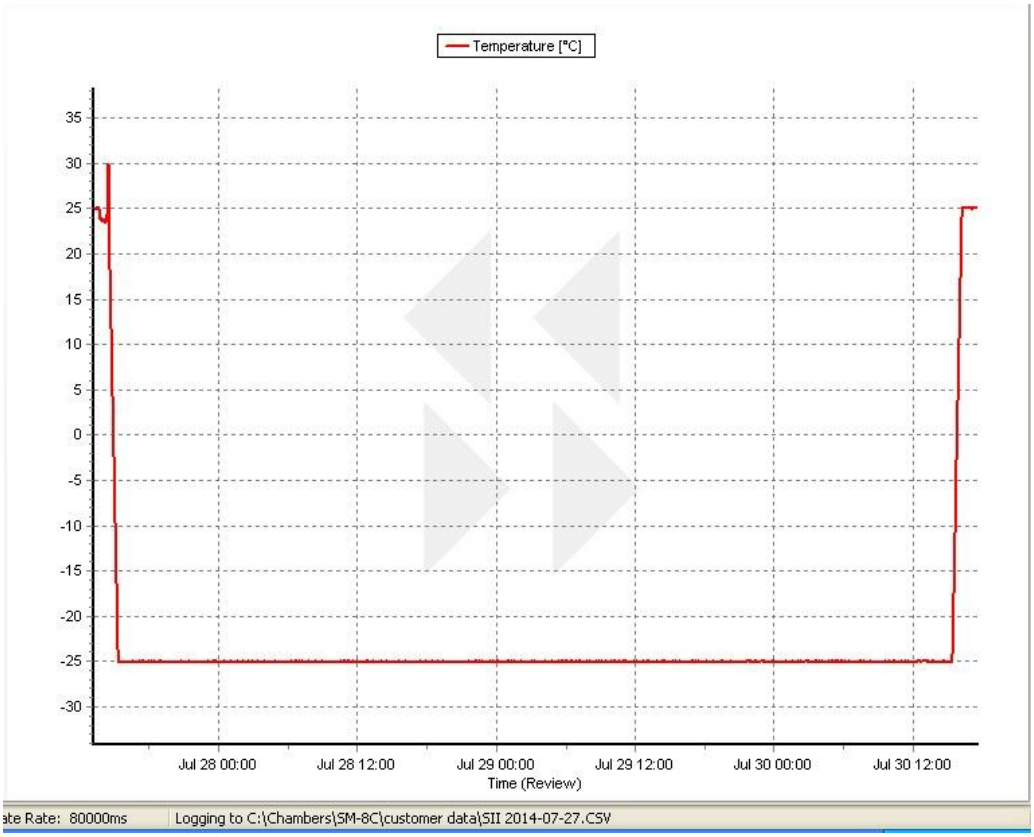
Temperature Change		Period	Remarks
From	To		
25°C	-25°C	50 minutes	
-25°C	-25°C	72 hours	
-25°C	25°C	50 minutes	

6.5.3. TEST PERFORMANCE

Functional Test	• At the end of test. • Performed by customer representative.
Visual Test	• At the end of test. • Performed by customer representative.

6.5.4. TEST PICTURES

6.5.5. TEST GRAPHS



6.6. TEST RESULTS

Based on the customer's declaration - The unit under test has PASSED the test.

7. HIGH TEMPERATURE (DUMP HEAT -Operation) TEST - 14/2519

7.1. UNIT UNDER TEST OVERVIEW

Test Date	31/07/2014
Customer Representative	Leonid Fine
Customer Name	SII
Unit Name	ENERGY POWER METER
Item Manufacturer	SATEC
Item Quantity	4 units

7.2. TECHNICAL SOURCE

- BS EN 62052-11:2003, Paragraph 6.3.3.

7.3. TEST INSTRUMENTATION - TEMPERATURE & HUMIDITY CHAMBER

No.	Instrumentation Name	Due Cal.
1.	THERMOTRON_SM-8C	11/12/2014

7.4. LAB'S ENVIRONMENTAL CONDITIONS

Parameter Name	Parameter Value	Tolerance Value	Measure Unit
Temperature	25	± 10	Degree Celsius (°C).
Humidity	55	± 27	% R.H.
Mains Voltage	230	± 23	Volts
Mains Frequency	50	± 2	Hertz
Site Air Pressure	760	± 5	mmHg
	1012	± 5	millibar

7.5. TEST PROCEDURE

7.5.1. EXCLUSIONS FROM THE TEST METHOD

None.

7.5.2. TEMPERATURE & HUMIDITY TEST PROCEDURE DESCRIPTION

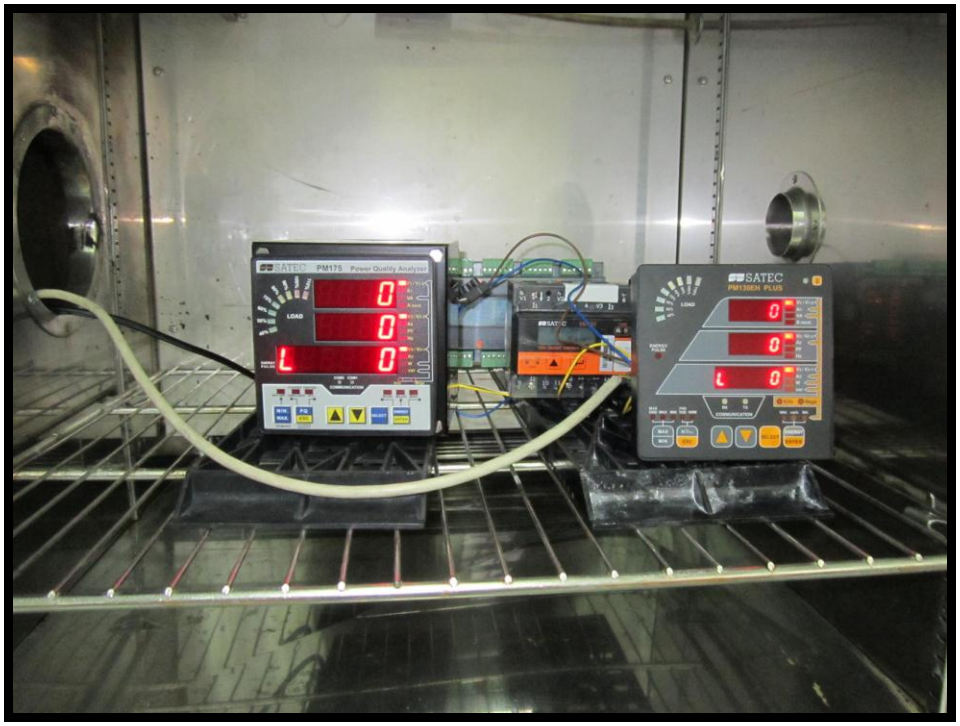
Number of Cycles	6 temperature & humidity cycles were conducted.
Cycle Time	24 hours

No.	Temperature Change		Humidity		Period	Remarks
	From	To	From	To		
1.	25°C	40°C	95%	95%	3 hours	
2.	40°C	40°C	95%	95%	9 hours	
3.	40°C	25°C	95%	95%	3 hours	
4.	25°C	25°C	95%	95%	9 hours	

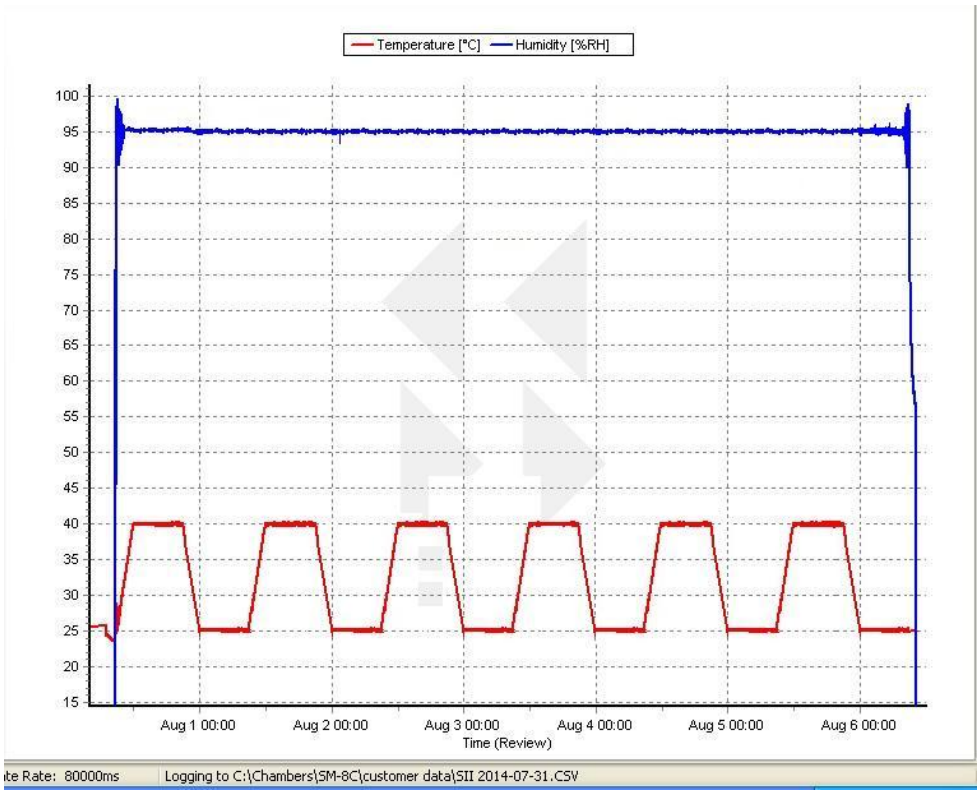
7.5.3. TEST PERFORMANCE

Functional Test	• During test. • At the end of test. • Performed by customer representative.
Visual Test	• At the end of test. • Performed by customer representative.

7.5.4. TEST PICTURES



7.5.5. TEST GRAPHS



7.6. TEST RESULTS

Based on the customer's declaration - The unit under test has PASSED the test.

- After Temperature & Humidity (Damp Heat) Test, Immunity To Voltage Surge Test was performed.

8. IMMUNITY TO VOLTAGE SURGE TEST - 14/2628

8.1. UNIT UNDER TEST OVERVIEW

Test Date	11/07/2014
Customer Representative	Leonid Fine
Customer Name	SII
Unit Name	ENERGY POWER METER
Item Manufacturer	SII
Item Quantity	4 units

- The test was performed by EMC Lab. See document below:

8.2. IMMUNITY TO VOLTAGE SURGE TEST

Date of Test: 11.07.2014
Relative Humidity: 48%
Ambient Temperature: 21°C
Atmospheric Pressure: 1011.4 hPa
Test performed by: Dmitry Isaev

8.2.1. TEST METHOD: EN61000-4-5

8.2.2. TEST PROCEDURE:

Surge Tests were performed on a ground reference plane 3m x 3m wide.
The EUT was placed on a table 0.1m above the ground reference plane, and was configured, arranged and operated in a manner consistent with typical application and load conditions.
Surge voltage was applied to the EUT power supply by means of a coupling/decoupling network, and directly to the tested ports.
The surges were applied as described in the table below.

8.2.3. LIST OF TEST EQUIPMENT:

IP6.2 2 & 4 -wire Coupling Network
EMtest, Coupling/Decoupling network for burst and surge, CNI 503 A18/ 32A
EMTest, Surge Generator combination wave, VCS 500 N10

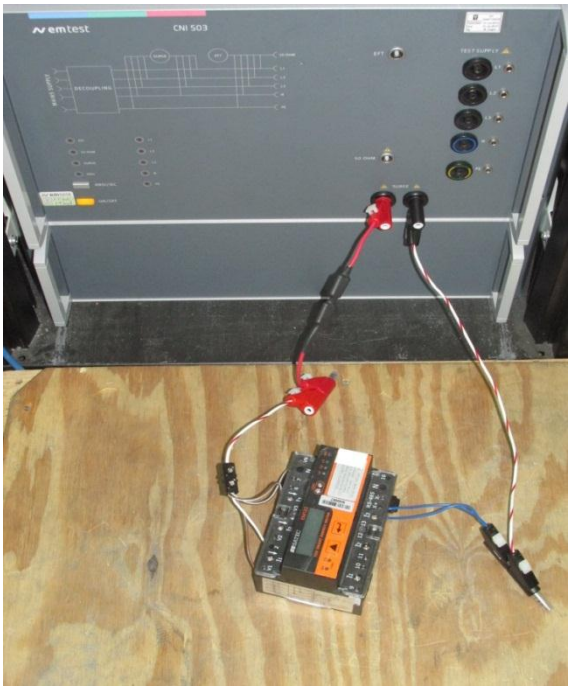
8.2.4. TEST RESULTS:

Surge Application	Test Level, kV	Repetitions at each polarity	Pass/ Fail
EM133			
V1+V2+V3+Vn to RS-485(X+ and X-)	±4	5	*
PM175			
V1+V2+V3+Vn+L+N to COM1	±4	5	*
V1+V2+V3+Vn+L+N to COM2			*
V1+V2+V3+Vn+L+N to GND			*
BFM136			
V1+V2+V3+Vn+L+N to COM1(RS-485)	±4	5	*
PM130EH Plus			
V1+V2+V3+Vn+L+N to RS-485	±4	5	*
V1+V2+V3+Vn+L+N to GND			*

***** Normal performance of the EUT should be verified by the customer at customer premises after tests.

8.2.5. TEST PICTURES

Test Picture 1: Surge on EM133



Test Picture 2: Surge on PM175

Test Picture 3: Surge on BFM136

Test Picture 4: Surge on PM130EH Plus

9. TEMPERATURE CYCLING (Storage & Operation) TEST - 14/2631

9.1. UNIT UNDER TEST OVERVIEW

Test Date	14/08/2014, 17/08/2014
Customer Representative	Leonid Fine
Customer Name	SII
Unit Name	ENERGY POWER METER
Item Manufacturer	SATEC
Item Quantity	4 units

9.2. TECHNICAL SOURCE

- BS EN 62052-11:2003, Paragraph 6.1
- IEC 60721-3-3, Table 1.

9.3. TEST INSTRUMENTATION - TEMPERATURE CHAMBER

No.	Instrumentation Name	Due Cal.
1.	ASSO_SK-3102	27/12/2014
2.	ASSO_ SD-305	12/12/2014

9.4. LAB'S ENVIRONMENTAL CONDITIONS

Parameter Name	Parameter Value	Tolerance Value	Measure Unit
Temperature	25	± 10	Degree Celsius (°C).
Humidity	55	± 27	% R.H.
Mains Voltage	230	± 23	Volts
Mains Frequency	50	± 2	Hertz
Site Air Pressure	760	± 5	mmHg
	1012	± 5	millibar

9.5. TEST PROCEDURE

9.5.1. EXCLUSIONS FROM THE TEST METHOD

None.

9.5.2. TEMPERATURE CYCLING TEST PROCEDURE DESCRIPTION

Temperature Cycling (Storage) Test

Number of Cycles	One temperature cycle was conducted.
Cycle Time	15:10 hours

Temperature Change		Period	Remarks
From	**To**		
25°C	-25°C	50 minutes	
-25°C	-25°C	6 hours	
-25°C	70°C	1:35 hours	
70°C	70°C	6 hours	
70°C	25°C	45 minutes	

Temperature Cycling (Operation) Test

Number of Cycles	One temperature cycle was conducted.
Cycle Time	13:50 hours

Temperature Change		Period	Remarks
From	**To**		
25°C	-10°C	35 minutes	
-10°C	-10°C	6 hours	
-10°C	45°C	55 minutes	
45°C	45°C	6 hours	
45°C	25°C	20 minutes	

9.5.3. TEST PERFORMANCE

Functional Test	• During test. • At the end of test. • Performed by customer representative.
Visual Test	• At the end of test. • Performed by customer representative.

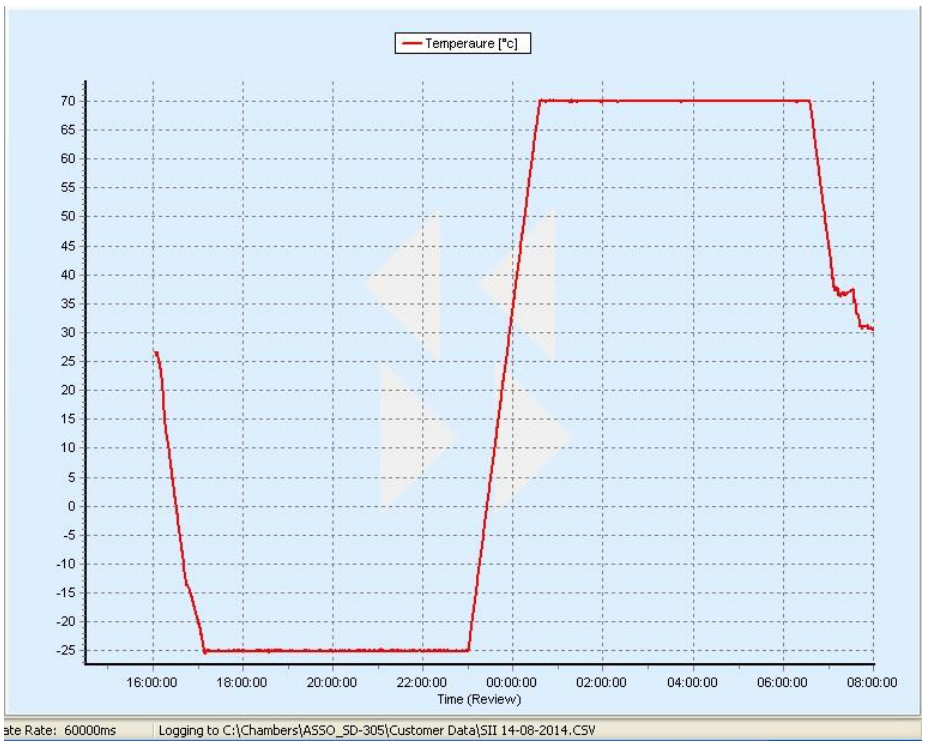
9.5.4. TEST PICTURES

Temperature Cycling (Storage) Test

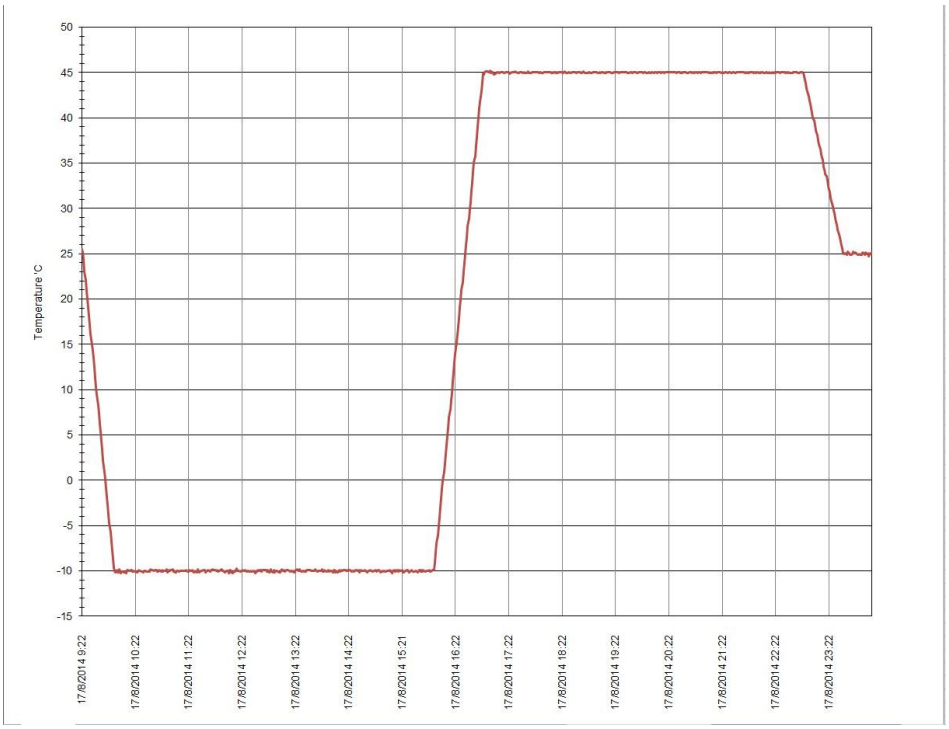
Temperature Cycling (Operation) Test

9.5.5. TEST GRAPHS

Temperature Cycling (Storage) Test Graph



Temperature Cycling (Operation) Test Graph



9.6. TEST RESULTS

Based on the customer's declaration - The unit under test has PASSED the test.

10. PARAMETERS ACCURACY & UNCERTAINTY BALANCE

ENVIRONMENTAL & MECHANICAL LABORATORIES
PARAMETERS ACCURACY & UNCERTAINTY **

Manufacturer	Model	Description	Parameter	Accuracy *	Uncertainty
AALBORG	DFC36	Gas Flow Controller	LPM	0.5	0.3
ASSOCIATED	SK-3102	Temperature Chamber	Deg C	1.5	1.5
ASSOCIATED	ZHH-2108	Temperature Chamber	Deg C	2.7	1.4
ASSOCIATED	ZHH-2127	Temp/Humidity Chamber	Deg C	1.5	1.37
			RH%	6.1	3.31
BRABENDER	KKW10.000/60	Temperature & Humidity Chamber	Deg C	1	1.45
			RH%	4.6	3.6
LANSMONT	PDT-56ED	Drop Tester	cm	0.1	0.1
MONARCH	PLT200	RPM Meter	rpm	2	0.5
TENNEY	36S	Altitude/Heat Chamber	Deg C	0.5	0.8
			Feet	100	100
TENNEY	JUNIOR	Temperature Chamber	Deg C	0.7	1.5
TENNEY	T30 RC	Temp/Humidity Chamber	Deg C	1.5	1.51
			RH%	5	3.6
TENNEY	T40 RC	Temp/Humidity Chamber	Deg C	2.1	1.6
			RH%	2.8	3.6
TENNEY	T-5S	Temperature Chamber	Deg C	2.1	1.28
THERMOTRON	F-40-CHMV-25-25 -2	Temperature & Humidity Agree Chamber	Deg C	0.5	2
			RH%	3.4	2.94
THERMOTRON	F-64-CHAMV-10-10 S	Temp. & Humidity & Altitude Chamber	Deg C	3.5	1.6
			RH%	2.5	3.6
THERMOTRON	TS-8-3Z-5-5-Ln2	Thermal Shock Chamber	Deg C	0.9	1.6
U&D	VWIN 2000	Controlled Vibration Machine	g (%)	3	3
WEISS	SNT-400	Salt Fog Chamber	Salt (%)	3	3
			Deg C	0.5	0.3
			pH	0.01	0.01
LAB	SC-1000	Bounce Machine	RPM	1	0.5

*** Accuracy in (%) only where parameter is defined in (%)**
**** Unless otherwise specified in the report these are the parameters values.**

END OF REPORT

APPENDIX 4
ACCURACY TEST REPORTS

(60 pages including this cover page)

הרשות הלאומית להסמכת מעבדות
Israel Laboratory Accreditation Authority
ISO/IEC 17025: 1999 Calibration Laboratory

Accreditation Certificate No. 094-02

Version 2

Israel Electric Corporation Ltd

Marketing division, Central Metering Unit
Meter Test Station

Standard Laboratory

Main site (Main Laboratory): 17 Lechi st. Bnei-Brak 51200, ISRAEL

Valid from: 01.01.2006 Until: 31.12.2006

The laboratory was assessed by the Israel Laboratory Accreditation Authority (ISRAC) and found to be worthy of accreditation to the detailed schedule attached. The schedule is an integral part of this certificate and is numbered with the above certificate number .

Accreditation demonstrates technical competence and operation of an internationally recognised quality management system. The laboratory accredited by ISRAC complies with ISO/IEC 17025:1999 meets both the technical competence requirements and management system requirements that are necessary for it to consistently deliver technically competent test results and calibration.

This accreditation is granted in accordance with the requirements of ISO/IEC 17011:2004, and entails periodic surveillance and reassessment by ISRAC to ensure that the laboratory continues to comply with the accreditation requirements.

The accreditation is valid provided that the laboratory continues to meet the criteria as laid down by ISRAC.

Date of first accreditation: 12.02.2003

ilac-MRA ISRAC הרשות הלאומית להסמכת מעבדות

Dr. Orna Dreazen
General Director

Test Report
Branch Feeder Monitor
Type BFM 136

List of Samples

Manufacturer	Type	Serial number	Reference voltage, V	Rated (maximum) current, A	Reference frequency, Hz
SATEC	BFM 136	000226 000227 000235	3 x 230/400	3 x 15(100)	50

Reference Instruments Used

I.D. number	Manufacturer	Type
7/4112	ZERA	TPZ 303
7/5146	LANDIS & GIR	ETALOGYR 1002
7/5131	ZERA	COM 303-3
7/5130	ZERA	MTS 320 PZ
7/4539	SCHAFNER	NS 600
7/4342	F.W.BELL	9500
7/4009	RB	UH 28 M
7/5282	VOTSCH	VCL 4034 MH
7/3671	ZERA	51-548-1
7/5088	SCHLUMBERGER	GP3050/3
K2251/19	BEHA	UNITEST
7/4581	IEC	TRANSFORMER

List of Tests

Number of current channels tested	Clause Number		Test	Test Number
	IEC62053-21 IEC62053-22	IEC62052-11		
12	8.1	-	Error due to variation of the current	1.
1	8.2	-	Error due to ambient temperature variation	2.
1	8.2	-	Error due to voltage variation	3.
1	8.2	-	Error due to frequency variation	4.
1	8.2	-	Error due to reversed phase sequence	5.
1	8.2	-	Error due to voltage unbalance	6.
1	8.2.1	-	Error due to harmonic components in the current and voltage circuit	7.
1	8.2.2	-	Error due to sub-harmonics in the a.c. current circuit	8.
1	8.2.2	-	Error due to odd harmonics in the a.c. current circuit	9.
1	8.2.3	-	Error due to magnetic indication of external origin 0.5 mT	10.
1	8.2	7.5.4	Error due to fast transient bust	11.
1	8.3.1	-	Test of initial start-up of the meter	12.
1	8.3.2	-	Test of no-load condition	13.
12	7.4	7.3.3	AC voltage test	14.

TEST RESULTS

1. Error due to variation of the current

1.1. Balanced load

1.1.1. Serial No. 000226

Error limits of (± %)		Current channel tested						Power Factor	Value of Basic Current	
IEC 62053-22	IEC 62053-21	1[1]	2[1]	3[2]	4[2]	5[2]	6[2]			
Class 0.5S	Class 1.0	Measurement Errors (± %)							A	%
1.0	-	0.207	-0.095	0231	0.350	-0.060	0.081	1	0.15	1
		-0.019	-0.193	-0.299	-0.208	0.379	0.175	0.5 lag.	0.30	2
		0.352	0.053	0.309	0.045	0.528	0.483	0.8 lead.		
0.5	1.5	0.235	0.264	0.144	0.217	0.282	0.301	1	0.75	5
	1.0	0.183	0.171	0.079	0.217	0.222	0.115	1	1.5	10
1.0	1.5	0.120	0.136	-0.035	0.006	0.118	0.002	0.5 lag.		
		0.302	0.224	0.161	0.234	0.187	0.226	0.8 lead.		
0.5	1.0	0.147	0.129	0.065	0.168	0.113	0.070	1	3.0	20
0.6		0.059	0.080	-0.049	-0.049	0.113	-0.049	0.5 lag.		
1.0	3.5	-0.153	0.058	-0.319	-0.273	0.036	-0.217	0.25 lag.		
0.6	1.0	0.240	0.091	0.099	0.205	0.187	0.157	0.8 lead.		
1.0	2.5	0.287	0.120	0.214	0.279	0.188	0.219	0.5 lead.		
0.5	1.0	-0.054	-0.005	-0.018	-0.027	-0.030	-0.027	1	7.5	50
		-0.012	-0.022	-0.090	-0.003	-0.016	-0.079	1	15	100
0.6		-0.141	-0.088	-0.204	-0.118	-0.083	-0.174	0.5 lag.		
1.0	3.5	-0.238	-0.237	-0.382	-0.389	-0.210	-0.347	0.25 lag.		
0.6	1.0	0.041	0.047	-0.083	-0.009	0.077	0.010	0.8 lead.		
1.0	2.5	0.081	0.024	0.028	0.112	0.110	0.073	0.5 lead.		
0.5	1.0	0.010	-0.090	-0.076	-0.023	-0.055	-0.073	1	50	333
0.6		-0.226	-0.253	-0.401	-0.353	-0.232	-0.364	0.5 lag.		
1.0	3.5	-0.628	-0.474	-0.741	-0.691	-0.476	-0.726	0.25 lag.		
0.6	1.0	0.123	0.009	-0.041	0.088	0.099	0.001	0.8 lead.		
1.0	2.5	0.218	0.044	0.174	0.261	0.117	0.144	0.5 lead.		
0.5	1.0	0.035	-0.059	-0.085	-0.019	-0.004	-0.049	1	100	666
0.6		-0.362	-0.307	-0.478	-0.391	-0.274	-0.476	0.5 lag.		
1.0	3.5	-0.744	-0.572	-0.893	-0.872	-0.530	-0.900	0.25 lag.		
0.6	1.0	0.131	0.025	0.091	0.148	0.038	0.086	0.8 lead.		
1.0	2.5	0.266	0.128	0.204	0.311	0.192	0.197	0.5 lead.		

[1] For channels 1 and 2, the calibration was made with their corresponding CT's.
[2] For these channels, the calibration was made with the CT's of channel 1.

ISRAEL ELECTRIC CO METERING STATION DEPT STANDARDS LABORATORY	Test Report No. 254-2006	DATE: 19.07.2006 Page 4 of 20

Error limits of (± %)		Current channel tested						Power Factor	Value of Basic Current	
IEC 62053-22	IEC 62053-21	7[3]	8[3]	9[3]	10[3]	11[3]	12[3]			
Class 0.5S	Class 1.0	Measurement Errors (± %)							A	%
1.0	-	0.666	0.543	0.684	0.624	0.678	0.692	1	0.15	1
0.5	1.5	0.245	0.237	0.222	0.210	0.232	0.170	1	0.75	5
	1.0	0.149	0.135	0.174	0.130	0.168	0.184	1	1.5	10
1.0	1.5	0.172	0.180	0.244	0.185	0.293	0.245	0.5 lag.		
		0.149	0.119	0.193	0.179	0.156	0.146	0.8 lead.		
0.5	1.0	0.070	0.076	0.142	0.057	0.117	0.126	1	3.0	20
0.6		0.044	0.093	0.164	0.125	0.159	0.166	0.5 lag.		
1.0	3.5	0.116	0.101	0.264	0.124	0.190	0.233	0.25 lag.		
0.6	1.0	0.107	0.014	0.142	0.066	0.107	0.083	0.8 lead.		
1.0	2.5	0.072	0.073	0.072	-0.040	0.119	0.049	0.5 lead.		
0.5	1.0	0.028	-0.082	0.024	-0.007	0.029	0.002	1	7.5	50
		0.004	-0.042	0.037	0.011	-0.001	0.073	1	15	100
0.6		-0.041	-0.041	0.033	-0.094	0.016	-0.045	0.5 lag.		
1.0	3.5	-0.170	-0.157	-0.053	-0.108	-0.056	-0.030	0.25 lag.		
0.6	1.0	0.047	-0.012	0.038	-0.075	0.038	0.003	0.8 lead.		
1.0	2.5	-0.007	0.000	0.060	0.014	0.072	0.069	0.5 lead.		
0.5	1.0	-0.042	-0.111	-0.016	-0.069	-0.002	-0.057	1	50	333
0.6		-0.231	-0.267	-0.107	-0.208	-0.230	-0.255	0.5 lag.		
1.0	3.5	-0.454	-0.490	-0.324	-0.409	-0.354	-0.431	0.25 lag.		
0.6	1.0	0.068	-0.046	0.029	-0.005	0.030	-0.044	0.8 lead.		
1.0	2.5	0.116	0.086	0.069	0.103	0.100	0.078	0.5 lead.		
0.5	1.0	0.007	-0.074	0.005	-0.008	-0.006	-0.002	1	100	666
0.6		-0.280	-0.311	-0.257	-0.269	-0.314	-0.328	0.5 lag.		
1.0	3.5	-0.580	-0.598	-0.395	-0.525	-0.557	-0.599	0.25 lag.		
0.6	1.0	0.076	-0.008	0.068	0.000	0.052	-0.025	0.8 lead.		
1.0	2.5	0.116	0.124	0.096	0.039	0.139	0.046	0.5 lead.		

[3] For channels 7, 8, 9, 10, 11 and 12 the calibration was made with another set of CT's (moved from channel to channel).

1.1.2. Serial No. 000227

Error limits of (± %)		Current channel tested						Power Factor	Value of Basic Current	
IEC 62053-22	IEC 62053-21	1[4]	2[4]	3[5]	4[5]	5[5]	6[5]			
Class 0.5S	Class 1.0	Measurement Errors (± %)							A	%
1.0	-	0.699	0.782	0.366	0.452	0.651	0.607	1	0.15	1
0.5	1.5	0.101	0.236	0.077	0.133	0.162	0.166	1	0.75	5
	1.0	0.152	0.135	0.047	0.194	0.137	0.217	1	1.5	10
1.0	1.5	0.044	0.147	-0.075	-0.067	0.134	0.017	0.5 lag.		
		0.247	0.185	0.158	0.310	0.159	0.243	0.8 lead.		
0.5	1.0	0.133	0.111	0.015	0.087	0.055	0.128	1	3.0	20
0.6		0.011	0.029	-0.155	-0.066	0.066	-0.024	0.5 lag.		
1.0	3.5	-0.201	0.040	-0.312	-0.291	-0.032	-0.180	0.25 lag.		
0.6	1.0	0.172	0.147	0.110	0.195	0.074	0.183	0.8 lead.		
1.0	2.5	0.265	0.073	0.169	0.248	0.055	0.276	0.5 lead.		
0.5	1.0	-0.035	-0.015	-0.174	-0.007	-0.036	0.000	1	7.5	50
		-0.027	-0.042	-0.154	-0.085	-0.062	-0.053	1	15	100
0.6		-0.073	-0.105	-0.218	-0.161	-0.111	-0.077	0.5 lag.		
1.0	3.5	-0.330	-0.220	-0.403	-0.330	-0.212	-0.222	0.25 lag.		
0.6	1.0	0.015	0.052	-0.058	0.088	0.005	0.034	0.8 lead.		
1.0	2.5	0.087	0.067	-0.002	0.143	0.040	0.101	0.5 lead.		
0.5	1.0	-0.043	-0.080	-0.114	-0.038	-0.034	-0.023	1	50	333
0.6		-0.361	-0.269	-0.403	-0.338	-0.229	-0.288	0.5 lag.		
1.0	3.5	-0.617	-0.458	-0.846	-0.732	-0.487	-0.758	0.25 lag.		
0.6	1.0	0.101	0.022	-0.002	0.127	-0.036	0.055	0.8 lead.		
1.0	2.5	0.218	0.117	0.70	0.301	0.099	0.210	0.5 lead.		
0.5	1.0	-0.047	-0.103	-0.151	-0.040	-0.034	-0.060	1	100	666
0.6		-0.343	-0.280	-0.544	-0.428	-0.315	-0.424	0.5 lag.		
1.0	3.5	-0.770	-0.598	-0.993	-0.902	-0.557	-0.853	0.25 lag.		
0.6	1.0	0.106	0.021	-0.057	0.069	-0.012	0.004	0.8 lead.		
1.0	2.5	0.245	0.124	0.159	0.322	0.106	0.204	0.5 lead.		

[4] For channels 1 and 2, the calibration was made with their corresponding CT's.
[5] For these channels, the calibration was made with the CT's of channel 2.

ISRAEL ELECTRIC CO METERING STATION DEPT STANDARDS LABORATORY	Test Report No. 254-2006	DATE: 19.07.2006 Page 6 of 20

Error limits of (± %)		Current channel tested						Power Factor	Value of Basic Current	
IEC 62053-22	IEC 62053-21	7[6]	8[6]	9[6]	10[6]	11[6]	12[6]			
Class 0.5S	Class 1.0	Measurement Errors (± %)							A	%
1.0	-	-0.309	-0.269	-0.141	-0.131	-0.288	-0.351	1	0.15	1
		No checkup				0.092	0.234	0.5 lag.	0.30	2
						0.162	-0.075	0.8 lead.		
0.5	1.5	0.163	0.191	0.216	0.289	0.133	0.225	1	0.75	5
	1.0	0.086	0.141	0.141	0.154	0.129	0.145	1	1.5	10
1.0	1.5	0.057	0.107	0.187	0.132	0.215	0.226	0.5 lag.		
		0.106	0.059	0.029	0.037	0.121	0.192	0.8 lead.		
0.5	1.0	0.018	0.064	0.064	0.071	0.112	0.133	1	3.0	20
0.6		0.027	0.113	0.111	0.047	0.112	0.109	0.5 lag.		
1.0	3.5	0.007	0.059	0.158	0.076	0.135	0.133	0.25 lag.		
0.6	1.0	0.042	0.026	0.033	0.043	0.023	0.091	0.8 lead.		
1.0	2.5	0.062	-0.008	0.053	0.021	0.059	0.057	0.5 lead.		
0.5	1.0	-0.054	-0.070	-0.049	-0.061	-0.062	0.002	1	7.5	50
		-0.013	-0.091	0.004	-0.003	-0.047	0.015	1	15	100
0.6		-0.144	-0.084	-0.075	-0.150	-0.019	-0.015	0.5 lag.		
1.0	3.5	-0.269	-0.204	-0.096	-0.262	-0.115	-0.158	0.25 lag.		
0.6	1.0	-0.023	-0.052	-0.049	-0.009	-0.056	0.011	0.8 lead.		
1.0	2.5	0.049	0.023	-0.003	0.048	-0.018	0.103	0.5 lead.		
0.5	1.0	-0.121	-0.087	-0.042	-0.022	-0.054	-0.040	1	50	333
0.6		-0.358	-0.353	-0.236	-0.323	-0.198	-0.235	0.5 lag.		
1.0	3.5	-0.594	-0.574	-0.379	-0.558	-0.442	-0.467	0.25 lag.		
0.6	1.0	-0.045	0.005	-0.075	-0.044	-0.034	0.037	0.8 lead.		
1.0	2.5	0.118	0.078	0.010	0.126	0.054	0.044	0.5 lead.		
0.5	1.0	-0.085	-0.090	-0.081	-0.088	-0.071	-0.048	1	100	666
0.6		-0.392	-0.339	-0.287	-0.359	-0.305	-0.316	0.5 lag.		
1.0	3.5	-0.711	-0.637	-0.515	-0.684	-0.594	-0.587	0.25 lag.		
0.6	1.0	0.011	-0.040	-0.034	0.019	-0.056	0.055	0.8 lead.		
1.0	2.5	0.140	0.062	0.076	0.149	0.094	0.068	0.5 lead.		

[6] In For channels 7, 8, 9, 10, 11 and 12 the calibration was made with another set of CT's (moved from channel to channel).

1.1.2. Serial No. 000235

Error limits of (± %)		Current channel tested						Power Factor	Value of Basic Current	
IEC 62053-22	IEC 62053-21	1[7]	2[7]	3[7]	4[7]	5[7]	6[7]			
Class 0.5S	Class 1.0	Measurement Errors (± %)							A	%
1.0	-	-0.124	-0.133	-0.089	0.019	0.047	-0.023	1	0.15	1
		-0.021	0.226	0.071	-0.011	0.179	0.025	0.5 lag.	0.30	2
		0.256	0.230	0.213	0.252	0.359	0.225	0.8 lead.		
0.5	1.5	0.319	0.233	0.201	0.294	0.277	0.218	1	0.75	5
	1.0	0.203	0.166	0.155	0.237	0.186	0.173	1	1.5	10
1.0	1.5	0.020	0.173	0.018	0.079	0.176	0.114	0.5 lag.		
		0.314	0.174	0.207	0.348	0.211	0.253	0.8 lead.		
0.5	1.0	0.159	0.136	0.079	0.216	0.159	0.112	1	3.0	20
0.6		-0.049	0.077	-0.026	0.033	0.125	0.012	0.5 lag.		
1.0	3.5	-0.320	0.092	-0.175	-0.172	0.105	-0.150	0.25 lag.		
0.6	1.0	0.229	0.109	0.123	0.297	0.215	0.200	0.8 lead.		
1.0	2.5	0.372	0.136	0.247	0.354	0.162	0.290	0.5 lead.		
0.5	1.0	0.007	-0.019	0.036	0.114	0.030	0.008	1	7.5	50
		0.013	0.013	-0.041	0.068	0.027	0.040	1	15	100
0.6		-0.162	-0.51	-0.098	-0.047	-0.022	-0.049	0.5 lag.		
1.0	3.5	-0.369	-0.121	-0.214	-0.251	-0.098	-0.165	0.25 lag.		
0.6	1.0	0.078	0.057	0.006	0.145	0.085	0.027	0.8 lead.		
1.0	2.5	0.198	0.071	0.070	0.214	0.121	0.099	0.5 lead.		
0.5	1.0	0.000	-0.040	-0.033	0.050	0.003	0.012	1	50	333
0.6		-0.324	-0.217	-0.330	-0.234	-0.120	-0.284	0.5 lag.		
1.0	3.5	-0.679	-0.376	-0.633	-0.614	-0.351	-0.597	0.25 lag.		
0.6	1.0	0.119	0.035	0.054	0.141	0.059	0.066	0.8 lead.		
1.0	2.5	0.343	0.144	0.179	0.372	0.174	0.225	0.5 lead.		
0.5	1.0	0.009	-0.014	-0.047	0.059	-0.009	-0.012	1	100	666
0.6		-0.360	-0.273	-0.403	-0.322	-0.204	-0.380	0.5 lag.		
1.0	3.5	-0.823	-0.561	-0.773	-0.756	-0.517	-0.770	0.25 lag.		
0.6	1.0	0.125	0.077	0.095	0.164	0.096	0.055	0.8 lead.		
1.0	2.5	0.332	0.164	0.238	0.375	0.180	0.196	0.5 lead.		

[7] For channels 7, 8, 9, 10, 11 and 12 the calibration was made with another set of CT's (moved from channel to channel).

Error limits of (± %)		Current channel tested						Power Factor	Value of Basic Current	
IEC 62053-22	IEC 62053-21	7[8]	8[8]	9[8]	10[8]	11[8]	12[8]			
Class 0.5S	Class 1.0	Measurement Errors (± %)							A	%
1.0	-	0.240	0.215	0.252	0.162	0.243	0.248	1	0.15	1
		0.010	0.022	0.215	0.121	0.175	0.194	0.5 lag.	0.30	2
		0.143	-0.026	0.087	0.029	0.037	0.112	0.8 lead.		
0.5	1.5	0.164	0.124	0.207	0.233	0.344	0.250	1	0.75	5
	1.0	0.184	0.188	0.271	0.253	0.250	0.256	1	1.5	10
1.0	1.5	0.183	0.172	0.352	0.266	0.316	0.295	0.5 lag.		
		0.252	0.219	0.293	0.202	0.299	0.249	0.8 lead.		
0.5	1.0	0.123	0.114	0.205	0.176	0.228	0.166	1	3.0	20
0.6		0.065	0.165	0.222	0.170	0.189	0.231	0.5 lag.		
1.0	3.5	0.047	0.136	0.270	0.162	0.270	0.276	0.25 lag.		
0.6	1.0	0.126	0.136	0.190	0.147	0.197	0.176	0.8 lead.		
1.0	2.5	0.167	0.138	0.172	0.154	0.148	0.202	0.5 lead.		
0.5	1.0	0.002	0.024	0.118	0.066	0.147	0.120	1	7.5	50
		0.094	0.061	0.102	0.049	0.139	0.100	1	15	100
0.6		-0.071	-0.050	0.120	-0.007	0.120	0.080	0.5 lag.		
1.0	3.5	-0.216	-0.147	0.064	-0.042	0.055	0.015	0.25 lag.		
0.6	1.0	0.085	0.040	0.150	0.088	0.132	0.107	0.8 lead.		
1.0	2.5	0.143	0.119	0.140	0.117	0.123	0.157	0.5 lead.		
0.5	1.0	0.004	0.004	0.026	0.054	0.091	0.003	1	50	333
0.6		-0.187	-0.165	-0.063	-0.074	-0.088	-0.146	0.5 lag.		
1.0	3.5	-0.447	-0.413	-0.270	-0.306	-0.271	-0.346	0.25 lag.		
0.6	1.0	0.092	0.060	0.090	0.101	0.105	0.082	0.8 lead.		
1.0	2.5	0.189	0.107	0.217	0.176	0.140	0.167	0.5 lead.		
0.5	1.0	0.024	-0.05	0.071	0.051	0.009	0.008	1	100	666
0.6		-0.245	-0.247	-0.148	-0.173	-0.219	-0.206	0.5 lag.		
1.0	3.5	-0.582	-0.517	-0.384	-0.439	-0.422	-0.508	0.25 lag.		
0.6	1.0	0.140	0.081	0.136	0.094	0.061	0.066	0.8 lead.		
1.0	2.5	0.234	0.197	0.221	0.189	0.182	0.170	0.5 lead.		

[8] For channels 7, 8, 9, 10, 11 and 12 the calibration was made with another set of CT's (moved from channel to channel).

1.2. Carrying a single-phase load, but with balanced polyphase voltages applied to voltage circuits

1.2.1. Serial No. 000226

Error limits of (± %)		Current channel tested						Power Factor	Current in Phase	Value of Basic Current	
IEC 62053-22	IEC 62053-21	1[9]	2[9]	3[10]	4[10]	5[10]	6[10]				
Class 0.5S	Class 1.0	Measurement Errors (± %)								A	%
0.6	-	0.261	0.197	0.102	0.129	0.253	0.290	1	R	0.75	5
		0.352	0.261	0.189	0.313	0.294	-0.003		S		
		0.084	0.247	0.285	0.287	0.394	0.300		T		
	2.0	0.228	0.086	0.090	0.194	0.174	0.075		R	1.5	10
		0.190	0.197	0.142	0.228	0.172	0.054		S		
		0.316	0.205	0.162	0.210	0.155	0.265		T		
1.0		0.065	0.170	0.028	-0.124	0.195	0.119	0.5 lag.	R		
		0.060	0.063	-0.049	0.049	-0.006	-0.102		S		
		0.170	0.257	-0.072	0.103	0.258	0.023		T		
0.6		0.190	0.113	-0.072	0.143	0.086	0.006	1	R	3.0	20
		0.142	0.139	0.076	0.188	0.179	0.040		S		
		0.186	0.143	0.133	0.155	0.150	0.189		T		
1.0		-0.074	0.105	-0.057	-0.197	0.119	0.048	0.5 lag.	R		
		0.031	0.012	-0.097	-0.024	0.015	-0.172		S		
		0.123	0.222	-0.130	0.067	0.208	-0.061		T		
0.6		0.028	-0.074	-0.108	-0.078	-0.116	-0.66	1	R	15	100
		0.008	-0.027	0.039	0.065	0.003	-0.159		S		
		0.047	0.054	-0.026	0.042	-0.025	0.062		T		
1.0		-0.212	-0.132	-0.260	-0.316	-0.087	-0.178	0.5 lag.	R		
		-0.177	-0.216	-0.340	-0.267	-0.225	-0.410		S		
		-0.082	0.015	-0.407	-0.202	-0.073	-0.201		T		
0.6		0.016	-0.112	-0.273	-0.099	-0.155	-0.123	1	R	100	666
		-0.029	-0.035	-0.030	0.006	-0.019	-0.227		S		
		0.056	-0.094	-0.167	-0.055	-0.127	-0.156		T		
1.0		-0.368	-0.393	-0.417	-0.450	-0.274	-0.328	0.5 lag.	R		
		-0.400	-0.456	-0.511	-0.387	-0.325	-0.606		S		
		-0.184	-0.137	-0.551	-0.291	-0.191	-0.466		T		

[9] For channels 1 and 2, the calibration was made with their corresponding CT's.
[10] For these channels, the calibration was made with the CT's of channel 1.

Error limits of (± %)		Current channel tested						Power Factor	Current in Phase	Value of Basic Current	
IEC 62053-22	IEC 62053-21	7[11]	8[11]	9[11]	10[11]	11[11]	12[11]				
Class 0.5S	Class 1.0	Measurement Errors (± %)								A	%
0.6	-	0.445	0.161	0.129	0.288	0.318	0.321	1	R	0.75	5
		0.123	0.045	0.279	0.248	0.338	0.145		S		
		0.203	0.213	0.381	0.168	0.144	0.215		T		
	2.0	0.304	0.065	0.223	0.203	0.218	0.283		R	1.5	10
		0.099	0.094	0.225	0.093	0.163	0.117		S		
		0.134	0.146	0.260	0.108	0.198	0.241		T		
1.0		0.187	0.125	0.228	0.228	0.210	0.355	0.5 lag.	R		
		0.157	0.195	0.233	0.138	0.095	0.199		S		
		0.183	0.220	0.314	0.319	0.411	0.239		T		
0.6		0.203	0.010	0.226	0.120	0.162	0.218	1	R	3.0	20
		0.047	0.048	0.127	0.064	0.051	0.073		S		
		0.055	0.086	0.160	0.112	0.159	0.124		T		
1.0		0.141	0.018	0.180	0.134	0.110	0.248	0.5 lag.	R		
		0.058	0.097	0.154	0.081	0.024	0.060		S		
		0.076	0.102	0.161	0.218	0.224	0.196		T		
0.6		0.128	-0.075	0.025	-0.025	0.066	0.055	1	R	15	100
		-0.117	-0.096	0.009	-0.068	-0.012	-0.099		S		
		0.006	-0.009	0.011	-0.006	0.016	-0.010		T		
1.0		-0.038	-0.171	0.039	-0.064	-0.012	0.101	0.5 lag.	R		
		-0.082	-0.073	-0.032	-0.102	-0.146	-0.103		S		
		-0.039	-0.037	0.011	0.031	0.131	0.008		T		
0.6		0.112	-0.088	0.026	-0.009	-0.023	-0.093	1	R	100	666
		-0.185	-0.142	-0.057	-0.125	-0.139	-0.165		S		
		0.105	-0.142	-0.012	0.015	-0.036	-0.033		T		
1.0		-0.257	-0.317	-0.182	-0.228	-0.288	-0.205	0.5 lag.	R		
		-0.443	-0.358	-0.275	-0.367	-0.450	-0.438		S		
		-0.211	-0.271	-0.209	-0.261	-0.189	-0.389		T		

[11] For channels 7, 8, 9, 10, 11 and 12 the calibration was made with another set of CT's (moved from channel to channel).

1.2.2. Serial No. 000227

Error limits of (± %)		Current channel tested						Power Factor	Current in Phase	Value of Basic Current	
IEC 62053-22	IEC 62053-21	1[12]	2[12]	3[13]	4[13]	5[13]	6[13]				
Class 0.5S	Class 1.0	Measurement Errors (± %)								A	%
0.6	-	0.261	0.197	0.102	0.129	0.253	0.290	1	R	0.75	5
		0.352	0.261	0.189	0.313	0.294	-0.003		S		
		0.084	0.247	0.285	0.287	0.394	0.300		T		
	2.0	0.228	0.086	0.090	0.194	0.195	0.075		R	1.5	10
		0.190	0.197	0.142	0.228	-0.006	0.054		S		
		0.316	0.205	0.162	0.210	0.258	0.265		T		
1.0		0.066	0.170	0.028	-0.124	0.086	0.119	0.5 lag.	R		
		0.060	0.063	-0.049	0.049	0.179	-0.102		S		
		0.170	0.257	-0.072	0.103	0.150	0.023		T		
0.6		0.190	0.113	-0.072	0.143	0.119	0.006	1	R	3.0	20
		0.142	0.139	0.076	0.188	0.015	0.040		S		
		0.186	0.143	0.133	0.155	0.208	0.189		T		
1.0		-0.074	0.105	-0.057	-0.197	-0.116	0.048	0.5 lag.	R		
		0.031	0.012	-0.097	-0.024	0.003	-0.172		S		
		0.123	0.222	-0.130	0.067	-0.025	-0.061		T		
0.6		0.028	-0.074	-0.108	0.078	-0.087	-0.066	1	R	15	100
		0.008	-0.027	0.039	0.065	-0.225	-0.159		S		
		0.047	0.054	-0.026	0.042	-0.073	0.062		T		
1.0		-0.212	-0.132	-0.260	-0.316	-0.155	-0.178	0.5 lag.	R		
		-0.177	-0.216	-0.340	-0.267	-0.019	-0.410		S		
		-0.082	0.015	-0.407	-0.202	-0.127	-0.201		T		
0.6		0.016	-0.112	-0.273	-0.099	-0.274	-0.123	1	R	100	666
		-0.029	-0.035	-0.030	0.006	-0.325	-0.227		S		
		0.056	-0.094	-0.167	-0.055	-0.191	-0.156		T		
1.0		-0.368	-0.393	-0.417	-0.450	-0.274	-0.328	0.5 lag.	R		
		-0.400	-0.456	-0.531	-0.387	-0.325	-0.606		S		
		-0.184	-0.137	-0.551	-0.291	-0.191	-0.466		T		

[12] For channels 1 and 2, the calibration was made with their corresponding CT's.
[13] For these channels, the calibration was made with the CT's of channel 2.

Error limits of (± %)		Current channel tested						Power Factor	Current in Phase	Value of Basic Current	
IEC 62053-22	IEC 62053-21	7[14]	8[14]	9[14]	10[14]	11[14]	12[14]				
Class 0.5S	Class 1.0	Measurement Errors (± %)								A	%
0.6	-	0.445	0.161	0.129	0.288	0.318	0.321	1	R	0.75	5
		0.123	0.045	0.279	0.248	0.338	0.145		S		
		0.203	0.231	0.381	0.168	0.144	0.215		T		
	2.0	0.304	0.065	0.223	0.203	0.218	0.283		R	1.5	10
		0.099	0.094	0.225	0.093	0.163	0.117		S		
		0.134	0.146	0.260	0.108	0.198	0.241		T		
1.0		0.187	0.125	0.228	0.228	0.210	0.355	0.5 lag.	R		
		0.157	0.195	0.233	0.138	0.095	0.199		S		
		0.183	0.220	0.314	0.319	0.411	0.239		T		
0.6		0.203	0.010	0.226	0.120	0.162	0.218	1	R	3.0	20
		0.047	0.048	0.127	0.064	0.051	0.073		S		
		0.055	0.085	0.160	0.112	0.159	0.124		T		
1.0		0.141	0.018	0.180	0.134	0.110	0.248	0.5 lag.	R		
		0.058	0.097	0.154	0.081	0.024	0.060		S		
		0.076	0.102	0.161	0.218	0.224	0.196		T		
0.6		0.128	-0.075	0.025	-0.025	0.066	0.055	1	R	15	100
		-0.117	-0.095	0.009	-0.068	-0.012	-0.099		S		
		0.006	-0.009	0.011	-0.006	0.016	-0.010		T		
1.0		-0.038	-0.171	0.039	-0.064	-0.012	0.101	0.5 lag.	R		
		-0.082	-0.073	-0.032	-0.102	-0.146	-0.103		S		
		-0.039	-0.037	0.011	0.031	0.131	0.008		T		
0.6		0.112	-0.088	0.026	-0.009	-0.023	-0.093	1	R	100	666
		-0.185	-0.142	-0.057	-0.125	-0.139	-0.165		S		
		0.105	-0.142	-0.012	0.015	-0.036	-0.033		T		
1.0		-0.257	-0.317	-0.182	-0.228	-0.288	-0.205	0.5 lag.	R		
		-0.443	-0.356	-0.275	-0.367	-0.450	-0.438		S		
		-0.211	-0.271	-0.209	-0.261	-0.189	-0.389		T		

[14] For channels 7, 8, 9, 10, 11 and 12 the calibration was made with another set of CT's (moved from channel to channel).

1.2.3. Serial No. 000235

Error limits of (± %)		Current channel tested						Power Factor	Current in Phase	Value of Basic Current	
IEC 62053-22	IEC 62053-21	1[15]	2[15]	3[15]	4[15]	5[15]	6[15]				
Class 0.5S	Class 1.0	Measurement Errors (± %)								A	%
0.6	-	0.390	0.256	0.098	0.355	0.131	0.172	1	R	0.75	5
		0.288	0.276	0.326	0.370	0.180	0.228		S		
		0.168	0.164	0.228	0.368	0.260	0.401		T		
	2.0	0.310	0.125	0.050	0.229	0.173	0.114		R	1.5	10
		0.217	0.182	0.253	0.338	0.237	0.226		S		
		0.145	0.152	0.173	0.255	0.149	0.273		T		
1.0		0.059	0.205	0.139	0.066	0.304	0.209	0.5 lag.	R		
		0.044	0.017	0.083	0.173	0.099	0.022		S		
		-0.011	0.213	-0.163	0.129	0.225	0.062		T		
0.6		0.290	0.082	0.007	0.174	0.098	0.085	1	R	3.0	20
		0.120	0.126	0.214	0.265	0.198	0.146		S		
		0.053	0.088	0.198	0.185	0.120	0.209		T		
1.0		-0.054	0.134	0.094	-0.019	0.252	0.112	0.5 lag.	R		
		-0.068	-0.001	0.089	0.070	0.046	-0.037		S		
		-0.060	0.153	-0.217	0.051	0.122	0.001		T		
0.6		0.161	-0.022	-0.044	0.041	-0.034	0.008	1	R	15	100
		0.050	0.006	-0.052	0.154	0.036	-0.003		S		
		-0.043	-0.020	0.000	0.093	0.100	0.141		T		
1.0		-0.142	-0.035	-0.109	-0.221	0.025	-0.063	0.5 lag.	R		
		-0.302	-0.144	-0.177	-0.091	-0.057	-0.204		S		
		-0.238	-0.013	-0.294	-0.049	-0.073	-0.197		T		
0.6		0.139	-0.035	-0.204	-0.004	-0.067	-0.110	1	R	100	666
		-0.012	-0.036	-0.028	0.034	-0.026	-0.058		S		
		-0.056	-0.028	-0.049	0.057	-0.019	-0.045		T		
1.0		-0.361	-0.269	-0.377	-0.491	-0.166	-0.301	0.5 lag.	R		
		-0.444	-0.340	-0.294	-0.357	-0.305	-0.530		S		
		-0.378	-0.175	-0.522	-0.259	-0.195	-0.387		T		

[15] For channels 7, 8, 9, 10, 11 and 12 the calibration was made with another set of CT's (moved from channel to channel).

Error limits of (± %)		Current channel tested						Power Factor	Current in Phase	Value of Basic Current	
IEC 62053-22	IEC 62053-21	7[16]	8[16]	9[16]	10[16]	11[16]	12[16]				
Class 0.5S	Class 1.0	Measurement Errors (± %)								A	%
0.6	-	0.317	0.073	0.405	0.310	0.372	0.329	1	R	0.75	5
		0.209	0.251	0.228	0.233	0.175	0.175		S		
		0.103	0.108	0.296	0.265	0.199	0.077		T		
	2.0	0.379	0.232	0.317	0.280	0.345	0.414		R	1.5	10
		0.143	0.246	0.292	0.195	0.233	0.228		S		
		0.131	0.126	0.236	0.202	0.232	0.242		T		
1.0		0.213	0.112	0.403	0.305	0.328	0.370	0.5 lag.	R		
		0.184	0.245	0.342	0.245	0.223	0.316		S		
		0.187	0.224	0.255	0.250	0.387	0.233		T		
0.6		0.272	0.128	0.280	0.239	0.211	0.309	1	R	3.0	20
		0.080	0.157	0.235	0.159	0.189	0.167		S		
		0.059	0.100	0.194	0.154	0.153	0.158		T		
1.0		0.127	0.056	0.274	0.217	0.219	0.293	0.5 lag.	R		
		0.071	0.180	0.254	0.066	0.169	0.209		S		
		0.098	0.120	0.204	0.221	0.288	0.128		T		
0.6		0.194	0.025	0.180	0.145	0.152	0.182	1	R	15	100
		-0.018	0.049	0.120	0.053	0.072	0.063		S		
		0.008	0.010	0.070	0.059	0.062	0.084		T		
1.0		0.004	-0.111	0.203	0.084	.078	0.124	0.5 lag.	R		
		-0.133	0.035	0.124	-0.029	0.005	-0.005		S		
		-0.027	-0.020	0.041	0.088	0.169	-0.004		T		
0.6		0.193	-0.024	0.121	0.114	0.037	0.030	1	R	100	666
		-0.078	0.024	-0.010	0.023	-0.54	-0.096		S		
		-0.075	-0.052	0.003	-0.041	-0.50	-0.040		T		
1.0		-0.158	-0.271	-0.003	-0.155	-0.130	-0.132	0.5 lag.	R		
		-0.339	-0.256	-0.231	-0.309	-0.306	-0.293		S		
		-0.216	-0.240	-0.191	0.133	-0.139	-0.269		T		

[16] For channels 7, 8, 9, 10, 11 and 12 the calibration was made with another set of CT's (moved from channel to channel).

2. Error due to ambient temperature variation

Limits mean temperature coefficient		Serial No. 000226				Power Factor	Value of Current A
IEC 62053-22	IEC 62053-21	Mean temperature coefficient (± %/K)					
Class 0.5S	Class 1.0	0°÷-20°	20°÷0°	20°÷40°	40°÷60°		
0.03	-	0.025	0.018	-0.011	-0.005	1.0	0.75
	0.05	0.021	0.009	-0.013	-0.012	1.0	1.5
0.05	-	0.025	0.013	-0.017	-0.017	0.5 lag	
	0.07	0.016	0.011	-0.012	-0.018	0.5 lag	3
0.03	0.05	0.016	0.008	-0.011	-0.011	1.0	15
0.05	0.07	0.018	0.008	-0.010	-0.017	0.5 lag	
0.03	0.05	0.013	0.007	-0.008	-0.010	1.0	100
0.05	0.07	0.012	0.008	-0.011	-0.012	0.5 lag	

Limits mean temperature coefficient		Serial No 000235				Power Factor	Value of Current A
IEC 62053-22	IEC 62053-21	Mean temperature coefficient (± %/K)					
Class 0.5S	Class 1.0	0°÷-20°	20°÷0°	20°÷40°	40°÷60°		
0.03	-	0.011	0.006	-0.007	0.000	1.0	0.75
	0.05	0.009	0.008	-0.005	-0.006	1.0	1.5
0.05	-	0.007	-0.001	-0.014	-0.004	0.5 lag	
	0.07	0.004	0.002	-0.008	-0.023	0.5 lag	3
0.03	0.05	0.013	0.003	-0.006	-0.007	1.0	15
0.05	0.07	0.006	0.002	-0.011	-0.008	0.5 lag	
0.03	0.05	0.010	0.005	-0.007	-0.006	1.0	100
0.05	0.07	0.004	0.002	-0.010	-0.005	0.5 lag	

3. Error due to voltage variation

Limits of variation error (± %)		Serial No. 000226	Serial No. 000235	Voltages (%Vn)	Power Factor	Value of Basic Current (%)
IEC 62053-22	IEC 62053-21	Mean variation error (± %)				
Class 0.5S	Class 1.0					
0.2	0.7	0.07	0.06	90	1.0	5
		-0.10	0.02	110		
0.4	1.0	-0.07	-0.10	90	0.5	10
		-0.12	-0.12	110		
0.2	0.7	0.00	0.01	90	1.0	100
		-0.08	-0.02	110		
0.4	1.0	0.03	0.00	90	0.5	
		-0.01	-0.05	110		
0.2	0.7	-0.02	0.00	90	1.0	666
		-0.17	0.05	110		
0.4	1.0	-0.01	0.02	90	0.5	
		-0.03	0.04	110		

4. Error due to frequency variation

Limits of variation error (± %)		Serial No. 000226	Serial No. 000235	Frequency (Hz)	Power Factor	Value of Basic Current (%)
IEC 62053-22	IEC 62053-21	Mean variation error (± %)				
Class 0.5S	Class 1.0					
0.2	0.5	-0.01	-0.01	49	1.0	5
		0.02	0.02	51		
	0.7	-0.09	-0.09	49	0.5	10
		0.00	-0.03	51		
	0.5	-0.05	-0.02	49	1.0	100
		0.02	0.02	51		
	0.7	-0.04	-0.01	49	0.5	
		0.06	0.10	51		
	0.5	-0.01	0.02	49	1.0	666
		0.04	0.08	51		
	0.7	-0.06	-0.02	49	0.5	
		0.01	0.09	51		

5. Error due to reversed phase sequence

Limits of variation error (± %)		Serial No. 000226	Serial No.000235	Value of Basic Current (%)
IEC 62053-22	IEC 62053-21	Mean variation error (± %)		
Class 0.5S	Class 1.0			
0.1	1.5	-0.01	-0.05	10

6. Error due to voltage unbalance

Limits of variation error (± %)		Serial No. 000226	Serial No.000235	Strain in Phase	Value of Basic Current	
IEC 62053-21	IEC 62053-21					
Class 0.5S	Class 1.0	Mean variation Error (± %)			A	%
1.0	2.0	-0.03	-0.03	A	1.5	0.1
		-0.03	0.00	B		
		-0.04	-0.10	C		

7. Error due to harmonic components in the current and voltage circuit

Limits of variation error (± %)		Serial No. 000226	Serial No.000235	Value of Current
IEC 62053-22	IEC 62053-21	Mean variation error (± %)		
Class 0.5S	Class 1.0			
0.5	0.8	-0.06	-0.08	0.5 Imax

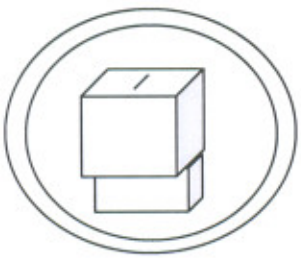
8. Error due to sub-harmonics in the a.c. current circuit

Limits of variation error (± %)		Serial No. 000226	Serial No.000235	Value of Current
IEC 62053-22	IEC 62053-21	Mean variation error (± %)		
Class 0.5S	Class 1.0			
1.5	3.0	-0.2	0.2	0.5 Ib

9. Error due to odd harmonics in the a.c. current circuit

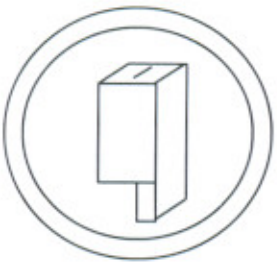
Limits of variation error (± %)		Serial No. 000226	Serial No.000235	Value of Current
IEC 62053-22	IEC 62053-21	Mean variation error (± %)		
Class 0.5S	Class 1.0			
-	6.0	0.2	0.1	0.5 Ib

10. Error due to magnetic indication of external origin 0.5 mT

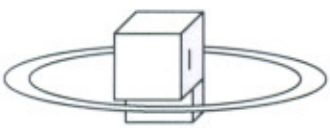


Serial No. 000226	Serial No. 000235	Corner of turn of a magnetic field in degree
Mean Error (± %)		
-0.05	-0.04	Before influence of a magnetic field
-0.04	-0.02	0
-0.11	-0.01	60
-0.14	-0.12	120
-0.08	-0.12	180
0.00	-0.05	240
0.02	0.04	300
-0.04	0.00	360
-0.05	-0.04	After influence of a magnetic field
0.07	0.04	Variation Error (+)
-0.09	-0.08	Variation Error (-)

2.0	Class 1.0	IEC 62053-21	Limits of variation error (± %)
1.0	Class 0.5S	IEC 62053-22	



Serial No. 000226	Serial No. 000235	Corner of turn of a magnetic field in degree		
Mean Error (± %)				
-0.07	0.02	Before influence of a magnetic field		
-0.06	0.02	0		
-0.04	-0.03	60		
-0.02	0.03	120		
0.01	0.07	180		
-0.01	-0.01	240		
-0.06	-0.04	300		
-0.07	-0.01	360		
-0.07	0.02	After influence of a magnetic field		
0.08	0.05	Variation Error (+)		
0.00	-0.06	Variation Error (-)		
2.0		Class 1.0	IEC 62053-21	Limits of variation error (± %)
1.0		Class 0.5S	IEC 62053-22	



Serial No. 000226	Serial No. 000235	Corner of turn of a magnetic field in degree		
Mean Error (± %)				
-0.04	-0.04	Before influence of a magnetic field		
-0.05	-0.02	0		
-0.11	-0.01	60		
-0.14	-0.12	120		
-0.08	-0.12	180		
0.00	-0.05	240		
0.02	0.04	300		
-0.04	0.00	360		
-0.04	-0.04	After influence of a magnetic field		
0.06	0.08	Variation Error (+)		
-0.10	-0.08	Variation Error (-)		
2.0		Class 1.0	IEC 62053-21	Limits of variation error (± %)
1.0		Class 0.5S	IEC 62053-22	

11. Error due to fast transient burst

Limits of variation error (± %)		Serial No. 000226	Serial No.000235	Value of Current
IEC 62053-22	IEC 62053-21	Mean variation error after influence (± %)		
Class 0.5S	Class 1.0			
2.0	4.0	0.05	0.02	5

12. Test of initial start-up of the meter

Limit time of initial start-up of IEC 62053-22 (sec)	Serial No. 000226	Serial No.000235	
5	2	2	Time of initial start-up (sec)

13. Test of no-load condition

Serial No. 000226	Serial No.000235
PASS	PASS

14. AC voltage test

Serial No. 000226	Serial No.000235
PASS	PASS

Notes:

1. *Test No.14 was done at* 2000V AC.
2. *Tests No.2 to No.13 were made:*
   - *The meter which serial № 226 - was tested at channel 1*
   - *The meter which serial №235 - was tested at channel 2*

חברת החשמל לישראל בע"מ
מחלקת מבדקות מונים
מעבדת תקנים
ISRAEL ELECTRIC CORP., Ltd
MARKETING DIVISION
METER TEST STATION

	Name	Date	Signature
Tested by	G. Mitelman	19.07.06	
Checked by	B. Ricanati	23.07.06	
Approved by	A. Stern	23.07.2006	A. Stern

Israel Electric Corporation
Marketing Division
Central Metering Unit

17 Ha-Lehi Street, Bnei Brak 51200, Israel
Tel. 972 3 6174859 Fax 972 3 6174908

ISRAC הרשות הלאומית להסמכת מעבדות ISO/IEC 17025 No. 094 מס.

ISRAEL ELECTRIC CO. LTD. DIVISION CENTRAL MARKETING UNIT METER TESTING LABORATORY DEPARTMENT. STANDARDS LABORATORY

Test Report

Certificate No: **Date:** *31/1/2012* **Page 1 of** *21*

According to procedure No –
Procedure version is valid for the day of the test

And/or according to requirement: *Proposal* for *services: 25-2011&Complying with relevant clauses of standards: IEC62052-11, IEC62053-22 and IEC62053-23 class 0.5S which were tested.*

Date received : *09.2011*

Description of tested item: Smart Multifunctional Meter EM133 series

Manufacturer: *SATEC Ltd.*

Type: *EM133 5A, EM133 50A*

Serial No: *12345720, 12345722 12345724, 12345741, 12345794*

Status as received: *new*
(new; used; repaired; other)

Customer: *SATEC LTD.* **Address:** *Har Hotzvim Industrial Park Jerusalem*

Environmental conditions: *As stated in the work sheet*

Method: *compare to reference meter*

Suggested date for next calibration: *n/a*

☒ **Calibration was done without adjustment**

☐ **Calibration was done after adjustment.** **No. of attached Test Report before adjustment:**

List of equipment used for the calibration

Description/Type	Manufacturer	Serial number	Calibration date
MTS320	*ZERA*	7/5382	*12.2011*
VCL4034MH	*VOTSCH*	7/5267	*8.2011*

The results of calibration characterize the calibrated item at the time of calibration only, and not include any changes after this time.
The reported expanded measurement uncertainties correspond to the coverage probability of approximately 95% and based on coverage factor k=2, or as stated in enclosed documents.
This certificate need to be related in full and no part thereof shall be quoted in other document.
Usage of this Certificate is under customer's responsibility only, and the Laboratory is not responsible for the usage as such.
This Calibration meets the requirements of ISO/IEC 17025 and reference quantities of the laboratory are traceable to national and international reference quantities.
The Laboratory is accredited by ISRAC to carry out calibrations and tests in accordance with the laboratory scope of accreditation. The results which are not included in the laboratory scope of accreditation are marked on the results pages.
ISRAC is not responsible for the results of the tests performed by the organization/ research facility and accreditation/ recognition does not constitute a certificate of approval of any item, system or process tested.
The use of ISRAC symbol relates to tests/calibrations which are included in the laboratory scope of accreditation, and performed according to the accreditation rules as detailed in the accreditation certificate.
ISRAC is one of the signatories of the International Accreditation Cooperation (ILAC) arrangement for the mutual recognition of test and calibration reports/certificates

Tested by: G. Mitelman **Date:** 05.01.12 **Signature:**

Verified by: I. Gueta **Date:** 5.1.12 **Signature:**

Model of equipment under test

Test item(s): *EM133 Din Rail TOU SMART ENERGY METER*
Condition of equipment: **Production**
Manufacturer: SATEC Ltd.
Model (Types): EM133 5A, EM133 50A

Applicant information

Company:	SATEC LTD.		
Address:	Har Hotzvim Industrial Park		
P.O. Box:	45022	**Postal code:**	91450
City:	Jerusalem	**Country:**	ISRAEL
Tel.:	02-5411000	**Fax:**	02-581 2371
Representative:	B. Sindler I. Jacoby,	**E-mail:**	ilyaj@satec-global.com
Responsible:	B. Sindler	**E-mail:**	boriss@satec-global.com

Table of Meters details

Manufacturer	Type	Serial number	Reference voltage, V	Rated (maximum) current, A	Constant of test	Reference frequency, Hz
SATEC	EM133	12345741	230/400	3 x 5(10)	10000	50
		12345794				
		12345720		3 x 50(100)	1000	
		12345722				
		12345724				

List of performed tests

Number of test	Test	Number of item in IEC62052-11	Number of item in IEC62053-22 Cl. 0.5S	Number of item in IEC62053-23 Cl. 2.0	Result of test	
					In 10A	In 100A
1.	Window	5.3	-	-	Pass	Pass
2.	Terminals	5.4	-	-	Pass [1,2,3]	Pass[1,2,3]
3.	Terminals covers	5.5	-	-	Pass [1,4]	Pass[1,4]
4.	Insulating encased meter of protective class II	5.7	-	-	Pass	Pass
5.	Display of measured values	5.10	-	-	Pass[5]	Pass[5]
6.	Marking of meter	5.12	-	-	Pass	Pass
7.	Power consumption	-	7.1	-	Pass	N/A
8.	Influence of supply voltage	7.1	8.2	-	Pass	Pass
9.	Influence of self-heating	-	7.3	7.3	Pass	Pass
10.	AC voltage Insulation test (4kV)	7.3.3	7.4	7.4	Pass	Pass
11.	Error due to variation of the current	-	8.1	8.1	Pass	Pass
12.	Error due to ambient temperature variation	-	8.2	8.2	Pass	Pass
13.	Error due to voltage variation	-	8.2	8.2	Pass	Pass
14.	Error due to frequency variation	-	8.2	8.2	Pass	Pass
15	Error due to reversed phase sequence	-	8.2	-	Pass	Pass
16.	Error due to voltage unbalance	-	8.2	-	Pass	Pass
17.	Error due to magnetic indication of external origin 0.5 mT	-	8.2	8.2	Pass	Pass

Number of test	Test	Number of item in IEC62052-11	Number of item in IEC62053-22 Cl. 0.5S	Number of item in IEC62053-23 Cl. 2.0	Within the scope of accreditation	
					Imax 10A	Imax 100A
18.	Error due to harmonic components in the current and voltage circuit	-	8.2.1	-	Pass	Pass
19.	Error due to sub-harmonics in the a.c. current circuit	-	8.2.2	-	Pass	Pass
20.	Error due to Continuous magnetic induction of external origin	-	8.2.3	8.2.2	Pass	Pass
21.	Test of initial start-up of the meter	-	8.3.1	8.3.1	Pass	Pass
22.	Test of no-load condition	-	8.3.2	8.3.2	Pass	Pass
23.	Test of starting current	-	8.3.3	8.3.3	Pass	Pass
24.	Impulse voltage tests for circuits and between the circuits (6KV-Prot. Class II)	7.3.2.1	-	-	Pass	Pass
25.	Impulse voltage test of electric circuits relative to earth	7.3.2.2	-	-	Pass[6]	Pass[6]

[1] Terminals not grouped in terminal block
[2] Conformity of materials to the standard ISO 75-2 was not checked
[3] The manner of fixing the conductors to the terminals shall not ensure adequate and durable contact such that there is no risk of loosening or undue heating.
[4] The assignment of terminal transparent cover is to prevent access to terminal screws only.
[5] Not tested minimum time saving information and content of registers.
[6] The conductive foil, wrapped around the meter (earth contact) approached the terminals and the holes for the conductors within a distance of 20mm (10mm min).

Expanded uncertainty: 200ppm at PF = 1 and 250ppm at PF = 0.5

TEST RESULTS

1. Meters for active energy (IEC62053-22)

1.1. Error due to variation of the current (Test No 11)

1.1.1 Balanced loads

Value of Rated Current (% In)	Power Factor	Measurement Errors (± %)				Error limits IEC 62053-22 Class 0.5S (± %)
		I max 10A		I max 100A		
		Meter No. 12345741	Meter No. 12345794	Meter No. 12345722	Meter No. 12345720	
1	1	-0.06	0.28	-0.22	0.00	1.0
2	0.5 lag.	-0.50	-0.37	-0.37	-0.40	1.0
	0.8 lead.	0.05	0.20	-0.22	-0.13	
5	1	0.09	0.02	-0.07	-0.07	0.5
10	0.5 lag.	0.03	0.03	0.02	0.02	0.6
	0.8 lead.	0.05	0.09	-0.01	-0.01	
	0.25 lag,.	0.07	-0.05	0.05	0.05	1.0
	0.5 lead.	0.06	0.15	0.00	0.00	
100	1	-0.04	-0.01	-0.01	-0.04	0.5
	0.5 lag.	-0.03	-0.03	-0.04	-0.07	0.6
	0.8 lead.	0.02	0.00	0.03	0.00	
	0.25 lag.	-0.11	-0.08	-0.17	-0.20	1.0
200	1	-0.04	-0.04	0.00	-0.04	0.5
	0.5 lag.	-0.18	-0.14	-0.07	-0.10	0.6
	0.8 lead.	0.06	0.03	0.00	-0.01	
	0.25 lag.	-0.34	-0.31	-0.12	-0.22	1.0
	0.5 lead.	0.11	0.08	0.06	0.07	

1.1.2. Carrying a single-phase load, but with balanced polyphase voltages applied to voltage circuits

Value of Rated Current (% In)	Current in Phase	Power Factor	Measurement Errors (± %)				Error limits IEC 62053-22 Class 0.5S (± %)
			I max 10A		I max 100A		
			Meter No. 12345741	Meter No. 12345794	Meter No. 12345722	Meter No. 12345720	
5	R	1	0.03	0.03	-0.12	0.00	0.6
	S		0.06	0.03	-0.15	0.00	
	T		0.03	0.03	-0.09	-0.06	
10	R	0.5 lag.	0.04	0.04	0.00	0.03	1.0
	S		0.02	0.00	0.06	0.15	
	T		0.01	0.04	-0.15	-0.15	
100	R	1	-0.06	-0.06	0.09	0.09	0.6
	S		-0.03	-0.03	-0.03	0.00	
	T		-0.03	-0.03	-0.07	-0.13	
	R	0.5 lag.	-0.08	-0.02	-0.06	-0.03	1.0
	S		-0.11	-0.08	-0.02	0.00	
	T		-0.07	-0.01	-0.20	-0.33	
200	R	1	-0.06	-0.03	0.12	0.09	0.6
	S		-0.06	-0.03	0.00	0.00	
	T		-0.03	-0.03	-0.10	-0.13	
	R	0.5 lag.	-0.12	-0.12	0.00	-0.03	1.0
	S		-0.26	-0.22	-0.04	0.00	
	T		-0.12	-0.12	-0.19	-0.23	

1.2. Error due to ambient temperature variation (Test No 12)

Value of Rated Current (% In)	Power Factor	Meter No. 12345741, Imax 10A Mean temperature coefficient (± %/K)				Limits mean temperature coefficient IEC 62053-22 Class 0.5S (± %/K)
		From 30° to 50° C	From 20° to 40° C	From 20° to 0° C	From 0° to -20° C	
200	1.0	-0.002	0.001	0.003	-0.003	0.03
	0.5	0.000	-0.003	0.002	0.007	0.05
100	1.0	-0.002	0.002	0.000	-0.001	0.03
	0.5	0.002	-0.003	-0.002	0.010	0.05
10	0.5	0.000	0.005	0.000	0.010	0.03
5	1.0	0.003	0.000	-0.002	0.000	0.05

Value of Rated Current (% In)	Power Factor	Meter No. 12345794, Imax 10A Mean temperature coefficient (± %/K)				Limits mean temperature coefficient IEC 62053-22 Class 0.5S (± %/K)
		From 30° to 50° C	From 20° to 40° C	From 20° to 0° C	From 0° to -20° C	
200	1.0	-0.007	-0.005	0.006	0.007	0.03
	0.5	-0.007	-0.010	0.005	0.007	0.05
100	1.0	-0.005	-0.003	0.007	0.007	0.03
	0.5	-0.003	-0.006	0.007	0.001	0.05
10	0.5	-0.007	-0.005	0.007	0.005	0.03
5	1.0	-0.002	-0.004	0.006	0.007	0.05

Value of Rated Current (% In)	Power Factor	Meter No. 12345722, Imax 100A Mean temperature coefficient (± %/K)				Limits mean temperature coefficient IEC 62053-22 Class 0.5S (± %/K)
		From 30° to 50° C	From 20° to 40° C	From 20° to 0° C	From 0° to -20° C	
200	1.0	-0.002	-0.005	0.004	-0.002	0.03
	0.5	-0.003	-0.002	0.005	0.008	0.05
100	1.0	-0.004	0.000	0.005	-0.002	0.03
	0.5	-0.002	-0.003	0.007	0.003	0.05
10	0.5	-0.003	-0.003	0.008	-0.003	0.03
5	1.0	-0.002	0.002	0.003	-0.006	0.05

1.3. Error due to voltage variation (Test No 13)

Value of Rated Current (% In)	Power Factor	Voltage (% Vn)	Mean variation Error (± %)				Limits of variation error IEC 62053-22 Class 0.5S (± %)
			I max 10A		I max 100A		
			Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722	
5	1.0	110	0.04	0.00	0.03	0.01	0.2
		90	0.00	0.00	0.00	0.02	
10	0.5	110	0.04	0.01	0.01	0.01	0.4
		90	-0.01	0.02	0.02	0.05	
100	1.0	110	-0.02	-0.02	0.01	0.05	0.2
		90	0.00	-0.04	0.00	0.04	
	0.5	110	0.06	0.02	-0.01	0.00	0.4
		90	0.02	-0.02	0.02	0.00	
200	1.0	110	0.03	0.03	-0.01	0.03	0.2
		90	0.00	0.04	-0.03	-0.04	
	0.5	110	0.01	-0.02	-0.01	0.06	0.4
		90	0.01	-0.02	0.01	0.03	

1.4. Error due to frequency variation (Test No 14)

Value of Rated Current (% In)	Power Factor	Frequency (Hz)	Mean variation Error (± %)				Limits of variation error IEC 62053-22 Class 0.5S (± %)
			I max 10A		I max 100A		
			Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722	
5	1.0	49	-0.06	0.01	-0.03	-0.03	0.2
		51	-0.03	0.03	-0.03	0.00	
10	0.5	49	0.03	0.01	0.03	-0.03	
		51	0.02	-0.01	0.03	0.00	
100	1.0	49	0.00	-0.01	0.02	0.00	
		51	0.04	0.00	0.02	-0.01	
	0.5	49	0.00	-0.01	0.03	0.03	
		51	-0.01	0.02	0.03	0.03	
200	1.0	49	-0.02	0.04	0.01	0.00	
		51	-0.01	0.02	0.03	-0.01	
	0.5	49	0.06	-0.01	-0.04	0.02	
		51	0.02	0.02	-0.04	0.02	

1.5. Error due to reversed phase sequence (Test No 15)

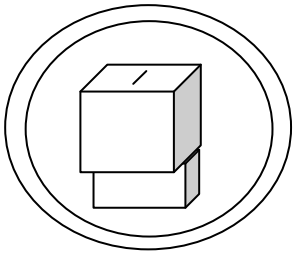
Value of Rated Current (% In)	Mean variation Error (± %)				Limits of variation error IEC 62053-22 Class 0.5S (± %)
	I max 10A		I max 100A		
	Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722	
10	-0.07	0.00	-0.06	0.01	0.1

1.6. Error due to voltage unbalance (Test No 16)

Value of Rated Current	Strain in Phase	Mean variation Error (± %)				Limits of variation error IEC 62053-22 Class 0.5S (± %)
		I max 10A		I max 100A		
		Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722	
In	R	-0.09	-0.05	-0.02	-0.04	1.0
	S	-0.06	-0.06	-0.06	-0.04	
	T	-0.06	-0.03	-0.10	-0.15	
	RS	-0.06	-0.02	0.01	-0.02	
	RT	-0.06	0.01	0.04	-0.05	
	ST	-0.03	-0.02	-0.05	-0.08	

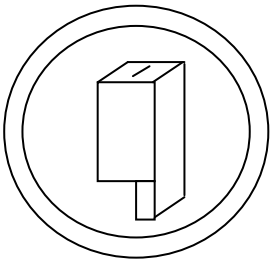
1.7. Error due to magnetic indication of external origin 0.5 mT (Test No 17)

1.7.1. Front



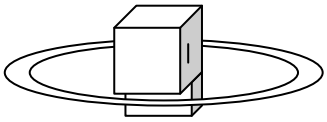
Corner of turn of a magnetic field in degree	Mean Error (± %)				Limits variation error IEC 62053-22 (± %)
	I max 10A		I max 100A		
	Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722	
0	0.06	0.03	0.00	0.07	1.0
30	0.00	0.03	0.00	0.04	
60	0.06	0.00	-0.04	0.00	
90	0.00	0.00	-0.07	0.00	
120	0.06	0.00	-0.03	0.03	
150	0.00	0.03	0.00	0.04	
180	0.00	0.03	-0.03	0.00	
210	0.00	0.03	0.00	0.07	
240	0.00	-0.01	-0.03	0.07	
270	0.00	0.03	-0.03	0.03	
300	0.06	0.06	0.01	0.00	
330	0.00	0.03	-0.03	0.04	
Variation Error (+)	0.06	0.06	0.00	0.07	
Variation Error (-)	0.00	-0.01	-0.07	0.00	

1.7.2. Side



Corner of turn of a magnetic field in degree	Mean Error (± %)				Limits variation error IEC 62053-22 (± %)
	I max 10A		I max 100A		
	Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722	
0	0.04	0.00	-0.01	0.00	1.0
30	0.04	0.07	-0.01	0.00	
60	0.06	0.00	-0.04	0.00	
90	0.00	0.00	-0.01	0.04	
120	0.04	0.00	-0.04	0.04	
150	0.04	0.00	-0.01	0.01	
180	0.06	0.03	-0.04	0.04	
210	0.00	0.00	0.00	0.01	
240	0.03	0.06	-0.02	0.04	
270	0.00	0.00	0.00	0.01	
300	0.03	0.03	-0.03	0.00	
330	0.00	-0.01	0.00	0.04	
Variation Error (+)	0.06	0.07	0.00	0.04	
Variation Error (-)	0.00	-0.01	-0.04	0.00	

1.7.3. Horizon



Corner of turn of a magnetic field in degree	Mean Error (± %)				Limits variation error IEC 62053-22 (± %)
	I max 10A		I max 100A		
	Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722	
0	0.00	0.03	-0.03	0.01	1.0
30	0.03	0.03	0.00	0.04	
60	0.00	0.03	-0.03	0.01	
90	0.00	0.00	-0.03	0.01	
120	0.03	-0.01	0.00	0.01	
150	0.00	0.00	-0.03	0.01	
180	0.00	0.00	0.03	0.01	
210	0.00	0.06	0.01	0.01	
240	0.04	0.03	0.00	0.01	
270	0.00	0.00	0.00	0.04	
300	0.01	0.03	-0.03	0.01	
330	0.04	0.00	-0.03	0.04	
Variation Error (+)	0.04	0.06	0.03	0.04	
Variation Error (-)	0.00	-0.01	-0.03	0.01	

1.8. Error due to harmonic components in the current and voltage circuit (Test No 18)

Value of Current	Mean variation Error (± %)				Limits of variation error IEC 62053-22 (± %) Class 0.5S
	I max 10A		I max 100A		
	Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722	
0.5 Imax	-0.06	-0.02	-0.02	-0.04	0.5

1.9. Error due to sub-harmonics in the a.c. current circuit (Test No 19)

Value of Current	Mean variation Error (± %)				Limits of variation error IEC 62053-22 Class 0.5S (± %)
	I max 10A		I max 100A		
	Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722	
0.5 Imax	-0.02	-0.04	-0.01	0.03	0.5

1.10. Error due to Continuous magnetic induction of external origin (Test No 20)

Corner of turn of a magnetic field in degree	Mean Error (± %)				Limits variation error IEC 62053-22 (± %)
	I max 10A		I max 100A		
	Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722	
Front	0.06	0.00	0.00	0.01	2.0
Left	0.00	0.00	0.03	0.00	
Right	0.03	-0.03	0.00	0.01	
Atop	0.00	-0.03	0.00	-0.03	
Below	0.03	0.00	0.06	0.01	
Variation Error (+)	0.06	0.00	0.06	0.01	
Variation Error (-)	0.00	-0.03	0.00	-0.03	

1.11. Test of starting current (Test No 23)

Mean variation			
I max 10A		I max 100A	
Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722
Pass	Pass	Pass	Pass

1.16. Influence of supply voltage (Test No 8)

Value of Current	Auxiliary voltage	Mean variation Error (± %)				Limits of variation error IEC 62053-22 Class 0.5S (± %)
		I max 10A		I max 100A		
		Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722	
0.01 In	+15%	0.00	-0.04	0.03	-0.01	0.1
	-15%	0.00	-0.04	0.03	-0.01	

1.17. Influence of self-heating (Test No 9)

Power factor	Mean variation Error (± %)				Limits of variation error IEC 62053-22 Class 0.5S (± %)
	I max 10A		I max 100A		
	Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722	
1	0.00	0.01	0.12	-0.03	0.2
0.5	-0.02	0.00	0.10	-0.06	

2. Meters for reactive energy (IEC62053-23)

2.1. Error due to variation of the current (Test No 11)

2.1.1. Balanced loads

Value of Rated Current (% In)	Power Factor	Measurement Errors (± %)				Error limits IEC 62053-23 Class 2.0 (± %)
		I max 10A		I max 100A		
		Meter No. 12345741	Meter No. 12345794	Meter No. 12345722	Meter No. 12345720	
2	1	-0.18	-0.09	-0.34	-0.18	2.5
5	1	0.00	0.02	-0.10	0.05	2.0
	0.5 lag.	0.06	0.00	-0.31	-0.12	2.5
	0.5 lead.	0.04	-0.02	-0.31	-0.15	
10	0.5 lag.	0.04	0.11	-0.25	-0.09	2.0
	0.5 lead.	0.00	-0.05	-0.11	0.00	
	0.25 lag.	0.01	0.17	-0.17	-0.07	2.5
	0.25 lead.	-0.05	-0.08	0.07	0.11	
100	1	-0.04	0.00	-0.04	-0.08	2.0
	0.5 lag.	0.02	0.02	-0.04	0.08	
	0.5 lead.	-0.09	-0.06	-0.12	-0.09	
	0.25 lag.	-0.02	-0.02	-0.03	0.00	2.5
	0.25 lead.	-0.17	-0.11	-0.16	-0.23	
200	1	-0.04	-0.04	-0.04	-0.01	2.0
	0.5 lag.	0.05	0.12	-0.03	0.06	
	0.5 lead.	-0.17	-0.17	-0.07	-0.11	
	0.25 lag.	0.23	0.26	0.08	0.17	2.5
	0.25 lead.	-0.35	-0.35	-0.13	-0.27	

2.1.2. Carrying a single-phase load, but with balanced polyphase voltages applied to voltage circuits

Value of Rated Current (% In)	Current in Phase	Power Factor	Measurement Errors (± %)				Error limits IEC 62053-23 Class 2.0 (± %)
			I max 10A		I max 100A		
			Meter No. 12345741	Meter No. 12345794	Meter No. 12345722	Meter No. 12345720	
5	R	1	0.00	0.00	-0.19	0.00	3.0
	S		0.00	0.00	-0.18	-0.02	
	T		0.03	0.06	-0.19	-0.06	
10	R	0.5 lag.	0.01	0.08	-0.20	-0.01	
	S		-0.02	0.13	-0.31	-0.25	
	T		0.07	0.13	-0.08	-0.08	
	R	0.5 lead.	-0.01	0.01	-0.05	0.00	
	S		0.01	-0.05	0.09	0.21	
	T		-0.02	0.00	-0.19	-0.09	

Value of Rated Current (% In)	Current in Phase	Power Factor	Measurement Errors (± %)				Error limits IEC 62053-23 Class 2.0 (± %)
			I max 10A		I max 100A		
			Meter No. 12345741	Meter No. 12345794	Meter No. 12345722	Meter No. 12345720	
100	R	1	-0.10	-0.03	0.00	0.09	3.0
	S		-0.03	0.00	-0.03	-0.03	
	T		-0.03	-0.03	-0.17	-0.13	
	R	0.5 lag.	-0.03	0.00	0.19	0.22	
	S		0.00	0.00	-0.10	-0.03	
	T		0.02	0.02	0.02	0.02	
	R	0.5 lead.	-0.09	-0.06	-0.18	-0.08	
	S		-0.11	-0.08	-0.04	-0.04	
	T		-0.10	-0.06	-0.25	-0.32	
200	R	1	-0.10	-0.03	0.02	0.06	
	S		-0.03	-0.06	-0.03	-0.03	
	T		-0.06	0.00	-0.10	-0.10	
	R	0.5 lag.	0.02	0.05	0.12	0.25	
	S		0.12	0.08	-0.07	0.00	
	T		0.09	0.09	-0.02	0.00	
	R	0.5 lead.	-0.16	-0.19	-0.05	-0.04	
	S		-0.26	-0.22	-0.03	-0.03	
	T		-0.18	-0.18	-0.17	-0.20	

2.4. Error due to ambient temperature variation (Test No 12)

Value of Rated Current (% In)	Power Factor	Meter No. 12345741, Imax 10A Mean temperature coefficient (± %/K)				Limits mean temperature coefficient IEC 62053-23 Class 2.0 (± %/K)
		From 30° to 50° C	From 20° to 40° C	From 20° to 0° C	From 0° to -20° C	
200	1.0	0.002	0.002	0.002	0.000	0.10
	0.5 lag.	0.002	0.006	0.000	-0.005	0.15
100	1.0	0.003	0.000	0.000	0.000	0.10
	0.5 lag.	0.000	0.004	0.000	-0.007	0.15
10	0.5 lag.	-0.001	-0.003	0.002	-0.007	0.15
5	1.0	0.002	0.003	0.000	0.002	0.10

Value of Rated Current (% In)	Power Factor	Meter No. 12345794, Imax 10A Mean temperature coefficient (± %/K)				Limits mean temperature coefficient IEC 62053-23 Class 2.0 (± %/K)
		From 30° to 50° C	From 20° to 40° C	From 20° to 0° C	From 0° to -20° C	
200	1.0	-0.005	0.10	0.008	0.003	0.10
	0.5 lag.	-0.003	0.15	0.003	0.002	0.15
100	1.0	-0.005	0.10	0.007	0.003	0.10
	0.5 lag.	-0.003	0.15	0.005	0.001	0.15
10	0.5 lag.	-0.002	0.10	0.003	0.003	0.15
5	1.0	-0.005	0.15	0.005	0.003	0.10

Value of Rated Current (% In)	Power Factor	Meter No. 12345722, Imax 100A Mean temperature coefficient (± %/K)				Limits mean temperature coefficient IEC 62053-23 Class 2.0 (± %/K)
		From 30° to 50° C	From 20° to 40° C	From 20° to 0° C	From 0° to -20° C	
200	1.0	-0.002	-0.003	0.003	0.001	0.10
	0.5 lag.	0.003	0.002	0.002	0.000	0.15
100	1.0	-0.002	-0.003	0.002	0.003	0.10
	0.5 lag.	0.000	0.000	-0.001	0.004	0.15
10	0.5 lag.	0.003	0.003	0.002	0.000	0.15
5	1.0	0.000	-0.003	0.002	0.002	0.10

2.5. Error due to voltage variation (Test No 13)

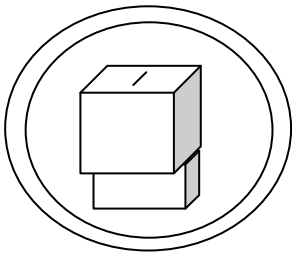
Value of Rated Current (% In)	Power Factor	Voltage (% Vn)	Mean variation Error (± %)				Limits of variation error IEC 62053-23 Class 2.0 (± %)
			I max 10A		I max 100A		
			Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722	
2	1.0	110	0.06	0.05	-0.02	-0.01	1.0
		90	0.03	0.00	-0.03	-0.02	
5	0.5 lag.	110	-0.02	0.01	-0.04	-0.10	2.0
		90	-0.02	0.01	-0.07	-0.07	
	0.5 lead.	110	0.00	0.01	-0.01	0.05	
		90	0.00	0.04	-0.02	0.07	
100	1.0	110	-0.02	0.01	0.01	-0.03	1.0
		90	-0.01	0.00	0.03	-0.04	
	0.5 lag.	110	0.00	0.03	0.01	-0.03	2.0
		90	-0.02	0.04	-0.04	-0.05	
	0.5 lead.	110	-0.03	0.04	0.01	-0.04	
		90	-0.01	0.03	-0.01	-0.01	
200	1.0	110	0.00	0.04	-0.04	0.01	1.0
		90	0.00	0.00	0.01	0.04	
	0.5 lag.	110	0.01	0.04	0.01	0.01	2.0
		90	0.02	0.02	0.08	0.02	
	0.5 lead.	110	-0.03	0.01	0.05	0.05	
		90	-0.01	-0.01	0.07	0.01	

2.6. Error due to frequency variation (Test No 14)

Value of Rated Current (% In)	Power Factor	Frequency (Hz)	Mean variation Error (± %)				Limits of variation error IEC 62053-23 Class 2.0 (± %)
			I max 10A		I max 100A		
			Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722	
2	1.0	49	0.03	-0.04	0.02	0.02	2.5
		51	0.02	-0.02	0.02	0.06	
5	0.5 lag.	49	-0.01	0.02	-0.01	-0.04	
		51	0.00	0.02	0.03	-0.02	
	0.5 lead.	49	0.02	-0.02	-0.05	0.00	
		51	0.01	0.00	-0.01	0.00	
100	1.0	49	-0.02	0.03	-0.04	0.03	
		51	0.01	0.04	-0.03	0.05	
	0.5 lag.	49	-0.03	0.05	0.04	-0.01	
		51	0.01	0.07	0.01	-0.02	
	0.5 lead.	49	0.00	-0.03	0.02	-0.03	
		51	-0.04	-0.01	0.05	-0.03	
200	1.0	49	0.00	-0.03	-0.03	0.01	
		51	0.04	0.04	-0.03	0.01	
	0.5 lag.	49	0.06	-0.01	0.00	0.03	
		51	0.09	0.08	0.04	0.04	
	0.5 lead.	49	-0.03	-0.03	0.01	0.01	
		51	-0.05	-0.05	0.01	0.01	

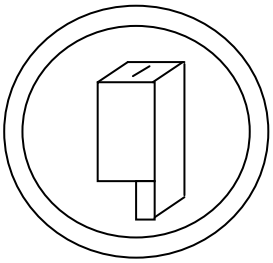
2.7. Error due to magnetic indication of external origin 0.5 mT (Test No 17)

2.7.1. Front



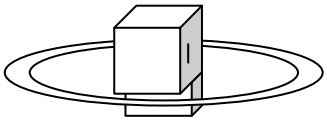
Corner of turn of a magnetic field in degree	Mean Error (± %)				Limits of variation error IEC 62053-23 Class 2.0 (± %)
	I max 10A		I max 100A		
	Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722	
0	0.06	0.00	0.00	0.07	3.0
30	0.00	0.06	0.00	0.04	
60	0.06	0.00	-0.04	0.00	
90	0.00	0.03	-0.07	0.00	
120	0.06	0.00	-0.03	0.03	
150	0.00	0.00	0.00	0.04	
180	0.00	0.00	-0.03	0.00	
210	0.00	0.00	0.00	0.07	
240	0.00	0.04	-0.03	0.07	
270	0.00	0.00	-0.03	0.03	
300	0.06	0.03	0.01	0.00	
330	0.00	0.00	-0.03	0.04	
Variation Error (+)	0.06	0.06	0.01	0.07	
Variation Error (-)	0.00	0.00	-0.07	0.00	

2.7.2. Side



Corner of turn of a magnetic field in degree	Mean Error (± %)				Limits of variation error IEC 62053-23 Class 2.0 (± %)
	I max 10A				
	Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722	
0	0.04	0.00	0.00	0.00	3.0
30	0.04	0.00	0.00	0.00	
60	0.06	0.03	0.00	0.00	
90	0.00	0.03	0.00	0.04	
120	0.04	0.04	-0.03	0.04	
150	0.04	0.00	0.00	0.01	
180	0.06	0.00	-0.03	0.04	
210	0.00	0.00	-0.03	0.01	
240	0.03	0.00	0.00	0.04	
270	0.00	0.03	-0.03	0.01	
300	0.03	0.00	0.00	0.00	
330	0.00	0.03	0.00	0.04	
Variation Error (+)	0.06	0.04	0.00	0.04	
Variation Error (-)	0.00	0.00	-0.03	0.00	

2.7.3. Horizon



Corner of turn of a magnetic field in degree	Mean Error (± %)				Limits of variation error IEC 62053-23 Class 2.0 (± %)
	I max 10A				
	Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722	
0	0.00	0.00	-0.03	0.01	3.0
30	0.03	0.03	0.00	0.04	
60	0.00	0.00	-0.03	0.01	
90	0.00	0.07	-0.03	0.01	
120	0.03	0.00	0.00	0.01	
150	0.00	0.03	-0.03	0.01	
180	0.00	0.00	0.00	0.01	
210	0.00	-0.03	-0.03	0.01	
240	0.04	0.03	0.00	0.01	
270	0.00	0.03	0.02	0.04	
300	0.01	0.03	-0.03	0.01	
330	0.04	0.00	0.00	0.04	
Variation Error (+)	0.04	0.07	0.02	0.04	
Variation Error (-)	0.00	-0.03	-0.03	0.01	

2.8. Error due to Continuous magnetic induction of external origin (Test No 20)

Corner of turn of a magnetic field in degree	Mean Error (± %)				Limits of variation error IEC 62053-23 Class 2.0 (± %)
	I max 10A		I max 100A		
	Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722	
Front	0.04	0.03	0.00	0.01	3.0
Left	0.04	0.00	0.03	0.00	
Right	0.04	0.07	0.00	0.01	
Atop	0.01	0.03	0.00	-0.03	
Below	0.06	0.00	0.06	0.01	
Variation Error (+)	0.06	0.07	0.06	0.01	
Variation Error (-)	0.01	0.00	0.00	-0.04	

2.9. Influence of self-heating (Test No 9)

Power factor	Mean variation Error (± %)				Limits of variation error IEC 62053-23 Class 2.0 (± %)
	I max 10A		I max 100A		
	Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722	
1	-0.06	0.03	0.09	-0.03	1.0
0.5	0.07	0.03	0.16	0.03	1.5

2.10. Test of starting current (Test No 23)

Result of test			
I max 10A		I max 100A	
Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722
Pass	Pass	Pass	Pass

3. Test of initial start-up of the meter (Test No 21)

Limit time of initial start-up IEC 62053-22 (sec)	Result of test			
	I max 10A		I max 100A	
	Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722
5.0	Pass	Pass	Pass	Pass

4. Test of no-load condition (Test No 22)

Result of test			
I max 10A		I max 100A	
Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722
Pass	Pass	Pass	Pass

5. AC voltage Insulation test (Test No 10)

Result of test			
I max 10A		I max 100A	
Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722
Pass	Pass	Pass	Pass

6. Impulse voltage tests for circuits and between the circuits (Test No 24)

Result of test			
I max 10A		I max 100A	
Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722
Pass	Pass	Pass	Pass

7. Impulse voltage test of electric circuits relative to earth (Test 25)

Result of test			
I max 10A		I max 100A	
Meter No. 12345794	Meter No. 12345741	Meter No. 12345720	Meter No. 12345722
Pass	Pass	Pass	Pass

8. Power consumption (Test No 7)

Serial number	Rated current, A	Phase	Voltage circuits		Current circuits, VA	Power supply	
			VA	W		VA	W
12345794	5	R	0.054	0.053	0.325	3.3	1.40
		S	0.054	0.053	0.520		
		T	0.054	0.053	0.330		
12345741		R	0.054	0.053	0.300	3.3	1.40
		S	0.054	0.053	0.365		
		T	0.054	0.053	0.325		
maximum permissible value their self consumption in accordance with standard IEC 62053-22			0.5	not rated	not rated	10	not rated
maximum permissible value their self consumption in accordance with standard IEC 62053-23			0.5	not rated	5.0	10	not rated

- self *consumption of current circuits exceeds the standard* IEC 62053-23

	Name	Date	Signature
Tested by	G. Mitelman	31.01.12	
Checked by	E. Gueta	31.1.12	
Approved by	Y. Rivkin	31.1.12	

ISRAEL ELECTRIC CORP. METERING STATION DEPT. STANDARDS LABORATORY	Test Report No.178-2006	DATE: 24.05.2006 Number of pages: 1 of 8

Test report of samples "Powermeters PM172"

List of samples

Manufacturer	Type	Serial number	Reference voltage, V	Rated (maximum) current, A	Reference frequency, Hz
SATEC	PM172E	517581 517583	3 x 120	3 x 5(10)	50

List of reference equipment

I.D. number	Manufacturer	Type
7/4112	ZERA	TPZ 303
7/5146	LANDIS & GIR	ETALOGYR 1002
7/5131	ZERA	COM 303-3
7/5130	ZERA	MTS 320 PZ
7/4539	SCHAFNER	NS 600
7/4342	F.W.BELL	9500
7/4009	RB	UH 28 M
7/5282	VOTSCH	VCL 4034 MH
7/3671	ZERA	51-548-1
7/5088	SCHLUMBERGER	GP3050/3
K2251/19	BEHA	UNITEST

List of performed tests

Number of item in IEC62053-22	Number of item in IEC62052-11	Test	Number of test
8.1	-	Error due to variation of the current	1.
8.2	-	Error due to ambient temperature variation	2.
8.2	-	Error due to voltage variation	3.
8.2	-	Error due to frequency variation	4.
8.2	-	Error due to reversed phase sequence	5.
8.2	-	Error due to voltage unbalance	6.
8.2.1	-	Error due to harmonic components in the current and voltage circuit	7.
8.2.2	-	Error due to sub-harmonics in the a.c. current circuit	8.
8.2.3	-	Error due to magnetic indication of external origin 0.5 mT	9.
8.2	7.5.4	Error due to fast transient bust	10.
8.3.1	-	Test of initial start-up of the meter	11.
8.3.3	-	Test of starting	12.
7.4	7.3.3	AC voltage Insulation test	13.

TEST RESULTS

1. Test No.1. Error due to variation of the current

1.1. Balanced loads

Error limits IEC 62053-22 (± %) Class 0.2S	Meter No.517581	Meter No.517583	Power Factor	Value of Rated Current (% In)
	Measurement Errors (± %)			
0.4	0.069	-0.026	1	1
	0.089	0.014	1	2
0.5	0.249	0.122	0.5 lag.	
	-0.019	-0.122	0.8 lead.	
0.2	0.050	0.004	1	5
0.5	0.188	0.148	0.5 lag.	
	-0.029	-0.084	0.8 lead.	
0.2	-0.043	-0.039	1	10
0.3	0.056	0.056	0.5 lag.	
	-0.061	-0.102	0.8 lead.	
0.5	0.147	0.169	0.25 lag,.	
	-0.119	-0.196	0.5 lead.	
0.2	-0.085	-0.084	1	50
	-0.079	-0.059	1	60
	-0.080	-0.100	1	100
0.3	-0.226	-0.184	0.5 lag.	
	0.015	-0.044	0.8 lead.	
0.5	-0.337	-0.232	0.25 lag.	
	0.104	0.026	0.5 lead.	
0.2	-0.085	-0.085	1	120
0.3	-0.257	-0.196	0.5 lag.	
	-0.007	-0.027	0.8 lead.	
0.5	-0.481	-0.322	0.25 lag.	
	0.112	0.032	0.5 lead.	
0.2	-0.115	-0.097	1.0	200
0.3	-0.343	-0.283	0.5 lag.	
	0.018	-0.001	0.8 lead.	
0.5	0.161	0.119	0.5 lead.	

1.2. Carrying a single-phase load, but with balanced polyphase voltages applied to voltage circuits

Error limits IEC 62053-22 (± %) Class 0.2S	Measurement Errors (± %) Meter No.517581	Power Factor	Current in Phase	Value of Rated Current (% In)
0.3	0.04	1	R	5
	0.05		S	
	0.02		T	
0.4	0.10	0.5 lag.	R	10
	0.16		S	
	0.08		T	
0.3	-0.14	1	R	100
	-0.09		S	
	-0.16		T	
0.4	-0.27	0.5 lag.	R	
	-0.18		S	
	-0.33		T	
0.3	-0.12	1	R	120
	-0.06		S	
	-0.14		T	
0.4	-0.24	0.5 lag.	R	
	-0.18		S	
	-0.32		T	
0.3	-0.10	1	R	200
	-0.06		S	
	-0.16		T	
0.4	-0.27	0.5 lag.	R	
	-0.23		S	
	-0.40		T	

2. Error due to ambient temperature variation

Limits mean temperature coefficient IEC 62053-22 (± %/K) Class 0.2S	Meter No.517581 Mean temperature coefficient (± %/K) -20°	0°	40°	60°	Power Factor	Value of Rated Current (% In))
0.01	0.005	0.006	-0.005	-0.007	1.0	5
0.02	0.001	0.004	-0.004	-0.004	0.5	10
0.01	0.000	0.005	-0.004	-0,004	1.0	100
0.02	0.007	0.005	-0.005	-0.008	0.5	
0.01	0.001	0.003	-0.004	-0.003	1.0	120
0.02	0.009	0.005	-0.008	-0.008	0.5	

Limits mean temperature coefficient IEC 62053-22 (± %/K)	Meter No.517583				Power Factor	Value of Rated Current (% In)
	Mean temperature coefficient (± %/K)					
Class 0.2S	-20°	0°	40°	60°		
0.01	0.006	0.005	-0.001	-0.007	1.0	5
0.02	-0.001	0.003	-0.003	-0.005	0.5	10
0.01	-0.003	0.004	-0.002	-0,004	1.0	100
0.02	0.004	0.004	-0.001	-0.006	0.5	
0.01	-0.003	0.002	-0.001	-0.005	1.0	120
0.02	0.004	0.005	-0.001	-0.006	0.5	

3. Error due to voltage variation

Limits variation error IEC 62053-22 (± %)	Meter No.517581	Meter No.517583	Voltages (%Vn)	Power Factor	Value of Rated Current (% In)
	Mean variation Error (± %)				
Class 0.2S					
0.1	-0.01	0.01	90	1.0	5
	0.00	0.00	110		
0.2	0.00	0.01	90	0.5	10
	0.01	0.00	110		
0.1	0.02	-0.02	90	1.0	100
	0.02	0.04	110		
0.2	-0.01	-0.01	90	0.5	
	0.01	0.01	110		
0.1	0.02	0.00	90	1.0	120
	0.03	-0.01	110		
0.2	-0.03	-0.01	90	0.5	
	-0.01	0.00	110		
0.1	-0.02	0.03	90	1.0	200
	-0.02	0.01	110		
0.2	-0.01	0.00	90	0.5	
	-0.01	0.00	110		

4. Error due to frequency variation

Limits variation error IEC 62053-22 (± %) Class 0.2S	Meter No.517581	Meter No.517583	Frequency (Hz)	Power Factor	Value of Rated Current (% In)
	Mean variation Error (± %)				
0.1	-0.01	0.03	49	1.0	5
	0.01	0.00	51		
	0.00	-0.03	49	0.5	10
	0.00	0.01	51		
	0.00	-0.02	49	1.0	100
	-0.01	0.02	51		
	0.01	-0.01	49	0.5	
	0.00	0.02	51		
	0.02	-0.02	49	1.0	120
	0.00	0.04	51		
	-0.01	-0.05	49	0.5	
	0.02	0.01	51		
	0.02	-0.02	49	1.0	200
	0.00	0.02	51		
	-0.01	-0.04	49	0.5	
	0.03	0.02	51		

5. Error due to reversed phase sequence

Limits variation error IEC 62053-22 (± %) Class 0.2S	Meter No.517581	Meter No.517583	Value of Rated Current (% In)
	Mean variation Error (± %)		
0.05	0.000	0.042	10

6. Error due to voltage unbalance

Limits variation error IEC 62053-22 (± %) Class 0.2S	Meter No.517581	Meter No.517583	Strain in Phase	Value of Rated Current (% In)
	Mean variation Error (± %)			
0.5	0.03	0.04	AB	100
	0.03	0.06	BC	
	0.02	0.01	AC	
	0.11	0.09	A	
	0.07	0.03	B	
	0.05	0.09	C	

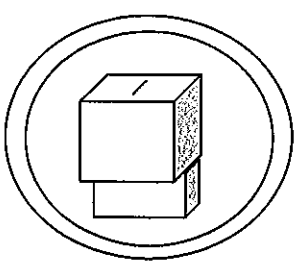
7. Error due to harmonic components in the current and voltage circuit

Limits variation error IEC 62053-22 (± %)	Meter No.517581	Meter No.517583	Value of Current
Class 0.2S	Mean variation Error (± %)		
0.4	0.00	0.00	0.5 Imax

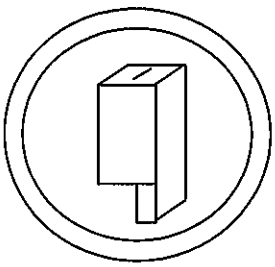
8. Error due to sub-harmonics in the a.c. current circuit

Limits variation error IEC 62053-22 (± %)	Meter No.517581	Meter No.517583	Value of Current
Class 0.2S	Mean variation Error (± %)		
0.6	0.02	-0.02	0.5 In

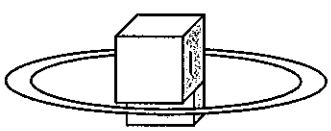
9. Error due to magnetic indication of external origin 0.5 mT



Limits variation error IEC 62053-22 (± %)	Meter No.517581 Mean Error (± %)	Corner of turn of a magnetic field in degree
Class 0.2S	-0.08	Before influence of a magnetic field
	-0.11	0
	-0.09	60
	-0.09	120
	-0.13	180
	-0.09	240
	-0.09	300
	-0.13	360
	-0.08	After influence of a magnetic field
0.5	0.00	Variation Error (+)
	-0.05	Variation Error (-)



Limits variation error IEC 62053-22 (± %)	Meter No.517581 Mean Error (± %)	Corner of turn of a magnetic field in degree
Class 0.2S	-0.05	Before influence of a magnetic field
	-0.05	0
	-0.09	60
	-0.09	120
	-0.05	180
	-0.05	240
	-0.05	300
	-0.09	360
	-0.05	After influence of a magnetic field
0.5	0.00	Variation Error (+)
	-0.04	Variation Error (-)



Limits variation error IEC 62053-22 (± %)	Meter No.517581 Mean Error (± %)	Corner of turn of a magnetic field in degree
Class 0.2S	-0.05	Before influence of a magnetic field
	-0.09	0
	-0.09	60
	-0.09	120
	-0.09	180
	-0.09	240
	-0.13	300
	-0.09	360
	-0.05	After influence of a magnetic field
0.5	0.00	Variation Error (+)
	-0.08	Variation Error (-)

10. Error due to fast transient bust

Limits variation error IEC 62053-22 (± %)	Meter No.517583	Value of Current (A)
Class 0.2S	Mean variation Error (± %)	
1.0	-0.02	5

11. Test of initial start-up of the meter

Limit time of initial start-up IEC 62053-22 (sec)	Meter No.517581	Meter No.517583	
5.0	3.5	3.5	Time of initial start-up (sec)

12. Test of starting

Current maximum of the meter shall start IEC 62053-22 (A)	Meter No.517581
0.005	PASS

13. AC voltage Insulation test

Meter No.517581	Meter No.517583
PASS	PASS

Note: This test it was done at 2000V AC.

	Name	Date	Signature
Tested by	G. Mitelman	25.05.06	
Checked by	B. Ricanati	28/5/06	
Approved by	A. Stern	05.06.06	

ISRAEL ELECTRIC CORP., Ltd.
MARKETING DIVISION
METER TEST STATION

Israel Electric Corporation
Marketing Division
Central Metering Unit

17 Ha-Lehi Street, Bnei Brak 51200, Israel
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ISRAC הרשות הלאומית להסמכת מעבדות ISO/IEC 17025 No. 094-02 מס

Test Certificate

Page *1* **of** *9* **Date:** *10/07/2007* **Test Certificate No.:** *167-2007*

According to procedure No. *n/a* **And/or according to requirement:** *29-2007*

Date of acceptance: *25/06/2007* **Description of tested item:** *Power Meter*

Manufacturer: *SATEC* **Type:** *PM130 PLUS* **Serial No:** *72446, 72447*

Status: *new*

Customer: *SATEC* **Address:** *Har Ha-tzofim, Science Based Industrial Park, POBox 45022, Jerusalem 91450, Israel.*

Environmental conditions: *Ambient temperature: 23°C±2°C; relative humidity: 50%±20%*
Method: *Comparison with reference standard*
Suggested next test date: *n/a*

List of main equipment used for the calibration

Description/Type	Manufacturer	Serial number	Test date
RMM 3000	Zera	*7/5302*	*3/2006*
MTS 320	Zera	*7/5130*	*6/2007*
9500	F.W.Bell	*7/4342*	*11/2004*
UNITEST	BEHA	*K2251/19*	*2/2007*
UH 28 M	RB	*7/4009*	*2/2004*
GP3050	SCHLUMBERGER	*7/5098*	*6/2007*
VCL 4034 MH	VOTSCH	*7/5282*	*9/2006*
51-548-1	ZERA	*7/3671*	*11/2004*

The reported expanded measurement uncertainties correspond to the coverage probability of approximately 95% and based on coverage factor K=2, or as stated in enclosed document.
The results of calibration characterize the calibrated item at the time of calibration only, and not include any changes after this time.
Reference should be made the full document. The document or part of it should not be copied without confirmation with the laboratory manager.
This Calibration meets the requirements of ISO/IEC 17025 and reference quantities of the laboratory are traceable to national and international reference quantities.
The use of ISRAC symbol relates to tests/calibrations which are included in the laboratory scope of accreditation, as detailed in the accreditation certificate.
ISRAC is one of the signatories of the International Accreditation Cooperation (ILAC) Agreement for the mutual recognition of test and calibration reports/certificates.

ISRAEL ELECTRIC CO. LTD. MARKETING DIVISION - CENTRAL MARKETING UNIT METER TESTING LABORATORY DEPARTMENT STANDARDS LABORATORY

Signature: **Date**: *10/07/07* **Tested by:** *G. Mitelman*

Signature: **Date:** 12/7/07 **Verified by:** בן ציון רכניוי
מהנדס מומחה
מנהל טכני במעבדת תקנים
מחלקת מבדקה למונים

Test report of samples "Power Meter PM130 PLUS"

List of samples

Manufacturer	Type	Serial number	Reference voltage, V	Rated (maximum) current, A	Reference frequency, Hz
SATEC	PM130 PLUS	724446 724447	230/400	3 x 5(10)	50

List of performed tests

# item in IEC62053-22- class 0.5 s	# item in IEC6205 2-11	Test	Pass/No pass	# test
8.1	-	Error due to variation of the current	Pass	1.
8.2	-	Error due to ambient temperature variation	Pass	2.
8.2	-	Error due to voltage variation	Pass	3.
8.2	-	Error due to frequency variation	Pass	4.
8.2	-	Error due to reversed phase sequence	Pass	5.
8.2	-	Error due to voltage unbalance	Pass	6.
8.2.1	-	Error due to harmonic components in the current and voltage circuit	Pass	7.
8.2.2		Error due to sub-harmonics in the a.c. current circuit	Pass	8.
8.2.3	-	Error due to magnetic indication of external origin 0.5 mT	Pass	9.
8.3.1	-	Test of initial start-up of the meter	Pass	10.
7.4	7.3.3	AC voltage Insulation test	Pass	11.
7	7.3.2	Impulse voltage tests for circuits and between the circuits	Pass	12.

Expanded uncertainty of energy error: 200ppm at PF = 1 and 250ppm at PF = 0.5

TEST RESULTS

1. Error due to variation of the current

1.1. Balanced loads

Error limits IEC 62053-22 (± %) Class 0.5S	Meter No. 72446	Meter No.72447	Power Factor	Value of Rated Current (% In)
	Measurement Errors (± %)			
1.0	-0.91	-0.25	1	1
1.0	-0.76	-0.20	0.5 lag.	2
	-0.51	-0.39	0.8 lead.	
0.5	-0.23	-0.10	1	5
0.6	-0.10	0.05	0.5 lag.	10
	-0.04	0.02	0.8 lead.	
1.0	-0.25	0.09	0.25 lag,.	
	-0.13	0.03	0.5 lead.	
0.5	0.00	0.02	1	100
0.6	-0.10	0.03	0.5 lag.	
	0.02	0.06	0.8 lead.	
1.0	-0.15	-0.06	0.25 lag.	
0.5	-0.01	0.08	1	120
0.6	0.27	0.31	0.5 lag.	
	-0.01	0.12	0.8 lead.	
1.0	-0.17	-0.04	0.25 lag.	
	0.33	0.35	0.5 lead.	
0.5	-0.01	0.05	1	200
0.6	-0.13	-0.03	0.5 lag.	
	0.01	0.11	0.8 lead.	
1.0	-0.23	-0.16	0.25 lag.	
	0.25	0.28	0.5 lead.	

1.2 Carrying a single-phase load, but with balanced polyphase voltages applied to voltage circuits

Error limits IEC 62053-22 (± %) Class 0.5S	Meter No. 72446	Meter No.72447	Power Factor	Current in Phase	Value of Rated Current (% In)
	Measurement Errors (± %)				
0.6	-0.15	0.08	1	R	5
	-0.24	-0.09		S	
	-0.27	-0.12		T	
1.0	-0.03	0.22	0.5 lag.	R	10
	-0.24	0.04		S	
	-0.06	0.00		T	
0.6	0.00	0.00	1	R	100
	0.02	0.00		S	
	0.00	0.00		T	
1.0	-0.01	-0.01	0.5 lag.	R	
	-0.07	0.00		S	
	-0.03	0.02		T	
0.6	0.01	-0.01	1	R	120
	0.05	0.05		S	
	0.01	0.02		T	
1.0	-0.05	-0.01	0.5 lag.	R	
	-0.08	-0.01		S	
	-0.08	-0.05		T	
0.6	0.02	0.02	1	R	200
	0.02	0.06		S	
	-0.04	0.06		T	
1.0	-0.10	-0.10	0.5 lag.	R	
	-0.13	-0.03		S	
	-0.09	-0.09		T	

2. Error due to ambient temperature variation

Limits mean temperature coefficient IEC 62053-22 (± %/K) Class 0.5S	Meter No.72446 Mean temperature coefficient (± %/K)				Power Factor	Value of Rated Current (% In)
	From 3° to -17° C	From 23° to 3° C	From 23° to 43° C	From 40° to 60° C		
0.03	0.012	0.013	0.0027	0.0016	1.0	120
0.05	0.006	0.013	0.0017	0.0048	0.5	
0.03	0.009	0.008	-0.0004	0.0051	1.0	100
0.05	0.008	0.006	0.0065	-0.0003	0.5	
0.03	0.008	0.010	0.0028	0.0027	0.5	10
0.05	0.009	0.011	0.0043	0.0054	1.0	5

Limits mean temperature coefficient IEC 62053-22 (± %/K) Class 0.5S	Meter No.72447 Mean temperature coefficient (± %/K)				Power Factor	Value of Rated Current (% In)
	From 3° to -17° C	From 23° to 3° C	From 23° to 43° C	From 40° to 60° C		
0.03	0.012	0.013	-0.010	-0.010	1.0	120
0.05	0.006	0.013	-0.008	-0.012	0.5	
0.03	0.006	0.008	-0.008	-0.011	1.0	100
0.05	0.009	0.006	-0.011	-0.009	0.5	
0.03	0.008	0.010	-0.012	-0.008	0.5	10
0.05	0.009	0.011	-0.014	-0.009	1.0	5

3. Error due to voltage variation

Limits of variation error IEC 62053-22 (± %) Class 0.5S	Meter No.724446	Meter No.724447	Power Factor	Value of Rated Current (% In)
	Mean variation Error (± %)			
0.2	-0.02	-0.03	1.0	5
	0.01	-0.01		
0.4	-0.01	0.02	0.5	10
	0.04	0.05		
0.2	-0.03	-0.08	1.0	100
	0.03	0.00		
0.4	0.06	-0.04	0.5	
	0.03	-0.01		
0.2	-0.06	-0.02	1.0	120
	0.00	-0.03		
0.4	-0.04	-0.05	0.5	
	0.00	-0.01		

4. Error due to frequency variation

Limits of variation error IEC 62053-22 (± %)	Meter No.724446	Meter No.724447	Frequency (Hz)	Power Factor	Value of Rated Current (% In)
Class 0.5S	Mean variation Error (± %)				
0.2	0.01	0.03	49	1.0	5
	0.00	-0.03	51		
	-0.01	-0.02	49	0.5	10
	-0.02	0.01	51		
	-0.03	0.00	49	1.0	100
	0.00	-0.02	51		
	0.00	0.00	49	0.5	
	-0.07	-0.02	51		
	0.00	-0.02	49	1.0	120
	0.00	0.00	51		
	0.00	0.05	49	0.5	
	0.00	-0.04	51		

5. Error due to reversed phase sequence

Limits of variation error IEC 62053-22 (± %)	Meter No.724446	Meter No.724447	Value of Rated Current (% In)
Class 0.5S	Mean variation Error (± %)		
0.1	0.03	-0.03	10

6. Error due to voltage unbalance

Limits of variation error IEC 62053-22 (± %)	Meter No.724446	Meter No.724447	Strain in Phase	Value of Rated Current (% In)
Class 0.5S	Mean variation Error (± %)			
1.0	-0.06	0.03	AB	100
	-0.03	0.03	BC	
	0.00	0.06	AC	
	-0.03	0.03	A	
	0.02	0.09	B	
	-0.06	0.06	C	

7. Error due to harmonic components in the current and voltage circuit

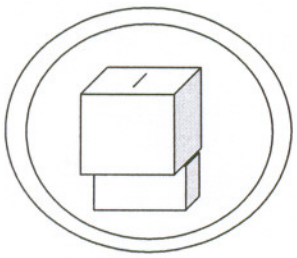
Limits of variation error IEC 62053-22 (± %)	Meter No.724446	Meter No.724447	Value of Current

Class 0.5S	Mean variation Error (± %)		
0.5	0.04	0.01	0.5 Imax

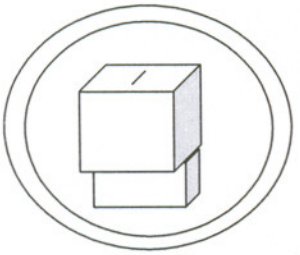
8. Error due to sub-harmonics in the a.c. current circuit

Limits of variation error IEC 62053-22 (± %)	Meter No.724446	Meter No.724447	Value of Current
Class 0.5S	Mean variation Error (± %)		
0.5	0.04	0.00	0.5 In

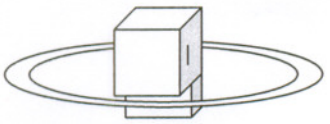
9. Error due to magnetic indication of external origin 0.5 mT



Limits variation error IEC 62053-22 (± %)	Meter No. 724447 Mean Error (± %)	Corner of turn of a magnetic field in degree
Class 0.5S	0.020	Before influence of a magnetic field
	0.015	0
	0.018	30
	0.025	60
	0.044	90
	-0.002	120
	-0.034	150
	-0.008	180
	-0.003	210
	0.025	240
	-0.040	270
	0.054	300
	0.016	330
	0.015	360
	0.020	After influence of a magnetic field
1.0	0.03	Variation Error (+)
	-0.06	Variation Error (-)



Limits variation error IEC 62053-22 (± %)	Meter No. 724447 Mean Error (± %)	Corner of turn of a magnetic field in degree
Class 0.5S	-0.055	Before influence of a magnetic field
	-0.053	0
	-0.045	30
	-0.025	60
	-0.074	90
	-0.021	120
	-0.061	150
	-0.054	180
	0.007	210
	-0.095	240
	-0.055	270
	-0.053	300
	-0.019	330
	-0.058	360
	-0.055	After influence of a magnetic field
1.0	0.06	**Variation Error (+)**
	-0.04	**Variation Error (-)**



Limits variation error IEC 62053-22 (± %)	Meter No. 724447 Mean Error (± %)	Corner of turn of a magnetic field in degree
Class 0.5S	-0.012	Before influence of a magnetic field
	-0.012	0
	-0.008	30
	-0.012	60
	0.019	90
	-0.012	120
	-0.037	150
	-0.031	180
	-0.014	210
	-0.007	240
	-0.038	270
	-0.038	300
	-0.040	330
	-0.012	360
	-0.085	After influence of a magnetic field
1.0	0.07	**Variation Error (+)**
	-	**Variation Error (-)**

10. Test of initial start-up of the meter

Limit time of **initial start-up** IEC 62053-22 (sec)	Meter No. 724446	Meter No. 724447	
5.0	2.7 s	2.8 s	Time of initial start-up (sec)

11. AC voltage Insulation test

Meter No. 724446	Meter No. 724447
PASS	PASS

Note: This test was done at 2500V AC.

12. Impulse voltage tests for circuits and between the circuits

Meter No. 724447
PASS

Note: This test was done at 6000V.

	Name	Date	Signature
Tested by	G. Mitelman	12.07.07	
Checked by	B. Ricanati	12/7/07	
Approved by	A. Stern	12.07.2007	A. Stern