TEST REPORT

IEC AS 62052-11 Electricity metering equipment (AC) – General requirements, tests and test conditions – Metering equipment

IEC AS 62053-21 Electricity metering equipment (AC)—Particular requirements Part 21: Static meters for active energy (classes 1 and 2)

Test Report	
Reference No.:	**R4790778107 _IEC (AS)**
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Date of issue:	2023-09-08
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Contents:	407 pages

Laboratory details	
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Test specification	
Standard:	IEC 62052-11: 2016 (Ed 1.1), IEC 62053-21: 2016 (Ed 1.1) AS 62052-11: 2018 & AS 62053-21: 2018
Client details	
Applicant:	PT. MECOINDO - Itron
Address:	Plot 6B-2, EJIP, Bekasi, Jawa Barat, 17550, Indonesia
Product details	(see additional details on page 3)
Type of test object:	Energy meter
Model/type reference:	Gen™5 Riva
Rating:	230Vac, 5(100)A, Single Phase, 50Hz, Active CL 1

Accreditation details

This report shall not be reproduced, except in full, without the written approval to the Laboratory. The results in this report apply only to the test sample(s) specified and at the time of testing period only. The results are not to be used to indicate applicability to other similar products.

The results reported herein have been performed in accordance with the terms of accreditation under the Singapore Accreditation Council.

Accredited Laboratory SAC-SINGLAS LA-2009-0450-E

Possible results	
Test case omitted by customer request....................... :	ENR
Test case does not apply to the test object .... :	N(.A.)
Test sample does meet the requirement..................... :	P(ass)
Test sample does not meet the requirement.............. :	F(ail)

General remarks

"(see remark #)" refers to a remark appended to the report.

"(see appended table)" refers to a table appended to the report.

"(see appended results)" refers to results appended to the report.

The test results presented in this report relate only to the samples tested.

The test samples were provided by the client and were tested as submitted.

This report does not contain corrections or erasures.

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UL Singapore Lab uses the “Simple Acceptance” decision rule based on IEC Guide 115:2023, Clause 4.3.3 and measurement uncertainty is not applied when providing statements of conformity in accordance with IEC Guide 115:2023, 4.3.3.

Specific remarks

1) In this report, All the tests were covered based on IEC AS 62052-11 & 62053-21 standards except below clauses as omitted by customer.
   - AS 62052-11 clause 7.2 Heating tests (128A test which referred to AS 62052-31 variation Annex ZZ)
   - IEC AS 62052-11 clause 7.3 Insulation (SCS tests referred IEC AS 62052-31 clause 6.10.6)
   - IEC AS 62053-21 clause 8.2 table 8 operational accessories
2) All the tests in the report were performed with 230Vac (L-N)
3) Refer individual tests column for subcontracted tests to UL RTP Lab & Power Lab.

Statement of results

The test samples were assessed to customer selected 62052-11 & 62053-21 clauses of test specification.

The test samples were COMPLY with customer selected 62052-11 & 62053-21 clauses of test specification.

Product details	
Enclosure type ....:	Thermoplastic
Connection type ....:	Direct
Meter type ....:	Active and Reactive
Energy type……………………………:	Import and Export
Accuracy class ....:	Active 1 & Reactive 2
Protective class...................................:	II
Number of phases ....:	1
Number of elements ....:	1
Voltage rating………………………....:	230Vac
Operating Temperature……………...:	-25 °C to 70 °C
Limit range of operation……………...:	-25 °C to 55 °C
Storage and transportation…………..:	-25 °C to 70 °C
Standard current rating………………:	5A
Maximum current rating……………..….:	100A
Indoor or outdoor……………………..……:	Indoor
Frequency…………………………..……:	50 Hz
Clock…………………………………..……:	Crystal
Software/Firmware revision…………..	v106c2
Product mass ....:	0.85kg
Product dimensions ....:	201mm (H) x 125mm (W) x 91.6mm (D)

Marking details

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

1.	SCOPE	NOTED

2.	NORMATIVE REFERENCES	NOTED

3.	TERMS AND DEFINITIONS	NOTED

4.	STANDARD ELCTRICAL VALUES	NOTED

5.	MECHANICAL REQUIREMENTS AND TESTS		P
5.1	Mechanical requirements		P
	Designed and constructed to avoid introducing danger in normal use and under normal conditions; especially:		P
	- Protection against electric shock	See appendix result	P
	- personal safety against effects of excessive temperature	See appendix result	P
	- protection against spread of fire	See appendix result	P
	- protection against penetration of dust and water	See appendix result for water test	P
	Parts subject to corrosion under normal working conditions protected effectively		P
	Protective coatings not liable to damage by ordinary handling		P
	Protective coatings not liable to damage by exposure to air		P
	Outdoor meters withstand solar radiation	Indoor Meter	N
5.2	Case		P
5.2.1	Requirements		P
	Case sealed such that internal parts accessible only after breaking the seal(s)		P
	Cover not removable without use of a tool		P
	Non-permanent deformation cannot prevent operation of the meter		P

5.2.2	Mechanical tests		P
5.2.2.1	Spring hammer test	See appendix result	P

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result
5.2.2.2	Shock test		P
5.2.2.3	Vibration test		P
5.3	Window		P
	Cover is transparent; or		P
	One or more windows provided for reading display and observation of operation indicator, if fitted		P
	Window(s) of transparent material		P
	Window(s) cannot be removed undamaged without breaking the seals		P
5.4	Terminals – Terminal block(s) – Protective earth terminal	(see appended results)	P
	Terminal block material capable of passing tests in ISO 75-2 for temperature of 135°C and pressure of 1,8 MPa (method A).		P
5.5	Terminal cover(s)	The terminal covers are in place and covered fully	P
	Referred this clause to safety standard IEC AS 62052-31 clause 6.9.4		NOTED
	Terminals, if grouped together and not protected by other means, have separate cover which can be sealed independently of the meter cover		P
	Terminal cover encloses terminals, conductor fixing screws and suitable length of conductor and suitable length of conductors and their insulation		P
	When meter panel mounted, no access to terminals without breaking seal(s) of terminal cover(s)		P
5.6	Clearances and creepage distances		P
	Referred this clause to safety standard IEC AS 62052-31 clause 6.7		NOTED
5.7	Insulating encased meter of protective class II	Meter is protective class II.	P
	Referred this clause to safety standard IEC AS 62052-31 clause 3.6.8, 5.4.5.1, 6.5.2, 6.8 & 6.9.2		NOTED
5.8	Resistance to heat and fire		P
	Referred this clause to safety standard IEC AS 62052-31 clause 9		NOTED
	Terminal block, terminal cover and meter case subjected to glow wire test as specified according to IEC 60695-2-11	(see appended results)	P
5.9	Protection against penetration by dust and water	IEC 62052-31, Clause11 were refer to sub clause from IEC 62052-11 Ed 1.0 and IEC 60529 for IP tests	P
	Referred this clause to safety standard IEC AS 62052-31 clause 11		NOTED

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

	Meter conforms with degree of protection according to IEC 60529 (mounting means and test conditions as specified)		P
	Indoor meter IP 51	Customer request test with IP54	P
	Outdoor meter IP54 (without suction)		N
	AC Power Frequency voltage: IEC 62052-31 Clause 6.10.4.3.4	(see appended table)	P
5.10	Display of measured values		P
	Information shown either by:		P
	Electromechanical register; or		N
	Electronic display		P
	For electronic display, non-volatile memory have minimum retention time of 4 months	Up to 10 Years retention (see appended table)	P
	For multiple values presented in single display		N
	Possible to display content of all relevant memories		P
	Identification of each applied tariff applied		N
	For automatic sequencing displays, each display of register for billing purposes retained for at least 5 s	5s	P
	Active tariff rate indicated		N
	Principal unit for measured values		P
	- kWh		P
	Every digit of electronic display able to display all values from 0 to 9		P
	Register able to display energy for 1500 h at reference voltage and maximum current unity power factor	1500h at 230V x 100A = 34,500 kWh. Meter able to display up to 99999.9 kWh	P
	Impossible to reset indication of cumulative total of energy during use	Reset can only be done through proprietary software	P
5.11	Output device		P
	Meter has test output device capable of being monitored with suitable testing equipment		P
	Manufacturer states number of pulses to ensure measuring accuracy of at least 1/10 of class of meter		P
	Electrical pulse output		
	ON voltage Class A ≤ 8 V	Class B meter	N
	ON voltage Class B ≤ 1 V		P
	OFF voltage Class A ≥ 25 V	Class B meter	N

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result
	OFF voltage Class B ≥ 14 V		P
	ON current Class A ≥ 10 mA	Class B meter	N
	ON current Class B ≥ 2 mA		P
	OFF current Class A ≤ 2 mA	Class B meter	N
	OFF current Class B ≤ 0.15 mA		P
	ON time ≥ 30 ms		P
	OFF time ≥ 30 ms		P
	Transition time ≤ 5 ms		P
	Pulse constant correct		P
	Intrinsic errors within accuracy class specification		P
	Operation indicator, if fitted, is visible from the front		P

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

5.11.1	Mechanical and electrical characteristics		P
	Optical test output accessible from front		P
	Maximum pulse frequency not exceeding 2.5 kHz		P
	Measured frequency	2.5 Hz	
	Unmodulated output pulse has wave shape of Figure D2		P
	Pulse transition time not exceeding 20 μs		P
	Measured pulse transition time	0.75 μs	
	Sufficient spacing between outputs or status displays		P
	Rise time verified with receiver diode with t_r <= 0.2 μs		P
5.11.12	Optical characteristics		P
	Radiated signal between 550 nm and 1000 nm		P
	Signal wavelength	831 nm	
	Output device radiation strength in ON-condition measured 10 mm from surface of meter between 50 μW/cm^2 and 1000μW/cm^2		P
	Measured radiation strength (ON-condition)	113.77 μW/cm^2	
	Radiation < 2 μW/cm^2 in OFF-condition		P
	Measured radiation strength (OFF-condition)	0.31 μW/cm^2	
5.12	Marking of meter		P
	This subclause shall be read together with IEC 62052-31:2015, Clause 5. For metrology related markings, the existing text applies. For safety related markings IEC 62052-31:2015, Clause, 5 applies Note: IEC 62052-31 Clause 5 referred back to metrology Ed 1.0 standards IEC 62052-11 2003 62052-21 2004		P
5.12.1	Name-plates		P
	Meter bears following information; as applicable:		P
a)	Manufacturers name or trademark		P
	Place of manufacturer (if required)		P
b)	Designation of type		P
	Space for approval mark (if required)		N
c)	Number of phases		P
	Number of wires for which meter is suitable		P

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result
	Markings may be replaced by graphical symbols		P
d)	Serial number; or		P
	Year of manufacture		P
	Serial number marked on plate fixed to cover; also		N
	Marked on meter base; or		N
	Stored in meter's non-volatile memory	Data retention 10 years	P
e)	Reference voltage in one of the following forms:		P
	Number of elements and voltage at terminals	1	P
	Rated system voltage or secondary voltage of instrument transformer to which meter is intended to be connected	230V	P
f)	For direct connected meters; basic current and maximum current	5 (100)A	P
g)	Reference frequency (Hz)	50 Hz	P
h)	Meter constant	1000 imp/kWh & 1000 imp/kvarh	P
i)	Class index of meter	Class 1 Active & Class 2 Reactive	P
j)	Reference temperature if different from 23 °C		P
k)	Double square symbol for insulated encased meters of protective class II		P
	Information under a), b) and c) may be marked on external plate permanently attached to meter	On meter front cover	P
	Information under d) to k) marked on name-plate; preferably placed within the meter	On meter front cover	P
	Marking indelible, distinct and legible from outside the meter		P
	Meter of special type; this specified on name-plate or separate plate		N
	Instrument transformers taken into account in meter constant; transformer ratio(s) marked		N
	Standard symbols may be used (IEC 60387)		P
5.12.2	Connections diagrams and terminal marking		P
	Meter preferably marked with diagram of connections		P
	If not possible; reference made to connection diagram		N
	For polyphase meters, diagram shows phase sequence for which meter is intended		N

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result
	Where meter terminals are marked, marking appears on the diagram		P

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result
6.	CLIMATIC CONDITIONS		P
6.1	Temperature range		P
	Specified operating range		
	Indoor meter –10 °C to 45 °C	–25 °C to 70 °C	P
	Outdoor meter –25 °C to 55 °C		N
	Limit of operating range		
	Indoor meter –25 °C to 55 °C	–25 °C to 55 °C	P
	Outdoor meter –40 °C to 70 °C		N
	Limit range for storage or transport		
	Indoor meter –25 °C to 70 °C	–25 °C to 70 °C	P
	Outdoor meter –40 °C to 70 °C		N
	Other values negotiated with purchaser		P
6.2	Relative humidity		P
	The meter shall be designed to withstand the climatic conditions defined specified in IEC 62052-31:2015, 1.4.1 c), 1.4.2 c) and 1.4.3. For combined temperature and humidity test,see 6.3.3 (of IEC 62052-11)		P
6.3	Tests of the effect of the climatic environments		P
6.3.1	Dry heat test		P
	Test carried out according to IEC 60068-2-2 as specified (non-operating condition, +70 °C ± 2 °C, 72 h)		P
	After the test		P
	Shows no damage		P
	Shows no change of information		P
	Operates correctly	(see appended table)	P
6.3.2	Cold test	Tested with lower temperature -40 °C	P
6.3.3	Damp heat cyclic test	Tested with higher temperature 25 °C to 70 °C	P
6.3.4	Protection against solar radiation	Indoor meter.	N
7.	ELECTRICAL REQUIREMENTS		P
7.1	Influence of supply voltage		P
7.1.1	Voltage range		NOTED
7.1.2	Voltage dips and short interruptions		P
7.2(IEC)	Heating	(see appended table)	P

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result
7.2(AS variation)	Heating	Iovl 128A tests omitted by customer’s	N
	Referred temperature limits and resistance to heat to IEC AS 62052-31 clause 10		NOTED
7.3	Insulation	(see appended table)	P
	The requirements are referred to IEC AS 62052-31 clause 6.7, 6.8 & 6.10		NOTED
	IEC AS 62052-31 clause 6.10.6 SCS control switch omitted by customer’s		N
7.3.1	General test conditions		P
7.3.2	Impulse voltage test	(see appended table)	P
7.3.3	AC voltage test	(see appended table)	P
7.4	Immunity to earth fault	Direct connected meters	N
7.5	Electromagnetic compatibility		P
	Conducted or radiated electromagnetic phenomena or electrostatic discharge damage or affect accuracy		P
7.5.1	General test conditions		P
	Meter in normal working position with all covers and terminal covers in place		P
	All parts intended to be earthed are earthed		P
	After the test:		P
	Meter shows no damage		P
	Meter operates as specified in relevant standard(s)		P
7.5.2	Test of immunity to electrostatic discharge		P
7.5.3	Test of immunity to electromagnetic RF fields		P
7.5.4	Fast transient burst test		P
7.5.5	Test of immunity to conducted disturbances, induced by radio-frequency fields		P
7.5.6	Surge immunity test		P
	Test carried out according to IEC 61000-4-5 as specified (operating condition, voltage and auxiliary circuits energized with reference voltage, no current in current circuits, current circuit terminals open circuit, 1 m cable length between surge generator and meter, differential mode (line to line), pulses to be applied at 60° and 240° relative to zero crossing of AC supply, 5 positive and 5 negative tests, Repetition rate maximum 1/min)		P
	Test voltage on current and voltage circuits (mains lines): 4 kV; generator source impedance: 2 Ω	4kV	P

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result
	Test voltage on auxiliary circuits with reference voltage over 40 V: 1 kV; generator source impedance: 42 Ω		N
	During the test temporary degradation or loss of function is allowed		P
	Not produce a change in register of more than X units		P
	Test output not produce signal of more than X units		P
	Change in register	0	
	Test output signal	0	
	X	0.023	
7.5.7	Damped oscillatory waves immunity test	Direct connected meter	N
7.5.8	Radio interference suppression		P
	Test carried out according to CISPR 22 as specified (Class B equipment, table top equipment, for connection to the voltage circuits, an unshielded cable length of 1 m to each connector, meter in operating condition, voltage and auxiliary circuits energized with reference voltage, with a current between 0,1 and 0,2 I_b or 0,1 and 0,2 I_n (drawn by linear load and connected by unshielded cable length of 1 m))		P
	Results comply with the requirements in CISPR 22		P
8.	TYPE TESTS		P
8.1	Test conditions		P
	All test carried out under reference conditions unless otherwise stated		P
	Type test conducted on one or more meter(s)		P
	Selected by the customer		P
	Recommended test sequence in Annex F		NOTED
	For modifications made after the type test affecting only part of the meter only tests related to the changes need be tested		NOTED

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result
A	ANNEX A, RELATIONSHIP BETWEEN AMBIENT AIR TEMPERATURE AND RELATIVE HUMIDITY		NOTED
B	ANNEX B, VOLTAGE WAVE-FORM FOR THE TESTS OF THE EFFECT OF VOLTAGE DIPS AND SHORT INTERRUPTIONS		NOTED
C	ANNEX C, TEST CIRCUIT DIAGRAM FOR THE TEST OF IMMUNITY TO EARTH FAULT		NOTED
D	ANNEX D, OPTICAL TEST OUTPUT		NOTED
E	ANNEX E, TEST SET-UP FOR EMC TESTS		NOTED
F	ANNEX F, TEST SCHEDULE – RECOMMENDED TEST SEQUENCES		NOTED

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 5.1 GENERAL MECHANICAL REQUIREMENTS

Criteria

Meters shall be designed and constructed in such a way as to avoid introducing any danger in normal use and under normal conditions, so as to ensure especially:

• protection against electric shock, see IEC 62052-31:2015, Clause 6;

• protection against mechanical hazards and stresses, see IEC 62052-31:2015, Clauses 7 and 8;

• protection against spread of fire, see IEC 62052-31:2015, Clause 9;

• personal safety against effects of excessive temperature, see IEC 62052-31:2015, Clause 10;

• protection against penetration of, dust and water, see IEC 62052-31:2015, Clause 11.

• protection against liberated gases and substances, explosion and implosion, see IEC 62052-31:2015, Clause 12.

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Spring Hammer Test	Chris Ashby / Jackson Daniel	UL LLC, 12 Laboratory Dr, RTP, NC 27709	2023-08-24

Test Method

All parts which are subject to corrosion under normal working conditions shall be protected effectively. Any protective coating shall not be liable to damage by ordinary handling nor damage due to exposure to air, under normal working conditions. Outdoor meters shall withstand solar radiation.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Results

The Gen™5 Riva is **compliant** with the following customer specified testing AS 62052-11, Section 5.1 General Mechanical Requirements:

Note: This test results referred to R4790778107 -IEC (AS)_RTP report from UL RTP, Appendix A.

- 5.2.2.2 – Shock Test
- 5.2.2.3 – Vibration Test

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 5.2 CASE

Criteria

The meter shall have a case which can be sealed in such a way that the internal parts of the meter are accessible only after breaking the seal(s).

The cover shall not be removable without the use of a tool.

The case shall be so constructed and arranged that any non-permanent deformation cannot prevent the satisfactory operation of the meter.

The mechanical strength of the meter case shall be tested with the following tests:

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Spring Hammer	Chris Ashby / Jackson Daniel	UL LLC, 12 Laboratory Dr, RTP, NC 27709	2023-08-24

Test Method

IEC 62052-11 Sections:

- 5.2.2.1 – Spring Hammer Test
- 5.2.2.2 – Shock Test
- 5.2.2.3 – Vibration Test

Test Results

The GEN™5 RIVA is **compliant** with the following customer specified testing IEC 62052-11, Section 5.2 Case Requirements.

Note: This test results referred to R4790778107_IEC (AS)_RTP report from UL RTP. Report finds in Appendix A and

R4790778107-IEC_AS Safety

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 5.2.2.2 SHOCK TEST

Criteria

The test shall be carried out according to AS 60068.2.27, under the following conditions:

After the test, the meter shall show no damage or change of the information and shall operate correctly in accordance with the requirements of the relevant standard.

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Accuracy Check	Jackson Daniel	UL LLC, 12 Laboratory Drive RTP, NC 27709	2023-06-06
Shock Test	Chris Rose	UL LLC, 12 Laboratory Drive RTP, NC 27709	2023-06-13
Accuracy Check	Jackson Daniel	UL LLC, 12 Laboratory Drive RTP, NC 27709	2023-06-26

Test Method

1. Verify meter accuracy at I_b or I_n.
2. Mount the meter to the shock table in non-operating condition, without the packing;
3. Conduct the test with a half-sine pulse, peak acceleration: 30 g_n (300 m/s^2) and duration of the pulse: 18 ms.
4. Verify no mechanical damage to meter and then meter accuracy at I_b or I_n.

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11 Section 5.2.2.2 Shock Test.

Note: This test results referred to R4790778107_IEC (AS)_RTP report from UL RTP. Report finds in Appendix A.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 5.2.2.3 VIBRATION TEST

Criteria

The test shall be carried out according to AS 60068.2.6, under the following conditions:

After the test, the meter shall show no damage or change of the information and shall operate correctly in accordance with the requirements of the relevant standard.

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Accuracy Check	Jackson Daniel	UL LLC, 12 Laboratory Drive RTP, NC 27709	2023-06-06
Shock Test	Chris Rose	UL LLC, 12 Laboratory Drive RTP, NC 27709	2023-06-13
Accuracy Check	Jackson Daniel	UL LLC, 12 Laboratory Drive RTP, NC 27709	2023-06-26

Test Method

1. Verify meter accuracy at I_b or I_n.
2. Mount the meter to the shock table in non-operating condition, without the packing;
3. Conduct the test over a frequency range: 10 Hz to 150 Hz, with a transition frequency: 60 Hz, f < 60 Hz, constant amplitude of movement 0,075 mm, f > 60 Hz, constant acceleration 9,8 m/s^2 (1 g), a single point control, and number of sweep cycles per axis: 10.
4. Verify no mechanical damage to meter and then meter accuracy at I_b or I_n.

NOTE 10 sweep cycles = 75 min.

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11, Section 5.2.2.3 Vibration Test.

Note: This test results referred to R4790778107_IEC (AS)_RTP report from UL RTP. Report finds in Appendix A. Report find in Appendix A

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 5.3 WINDOWS

Criteria

If the cover is not transparent, one or more windows shall be provided for reading the display and observation of the operation indicator, if fitted. These windows shall be of transparent material which cannot be removed undamaged without breaking the seal(s).

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Windows	Vairakkannu Vairavan/ Soo Voo Key	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-07-11

Test Method

Verify the meter's contains windows, the registers can be read through the window, and they cannot be removed without breaking the seal(s).

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11, Section 5.3 Windows

Figure 1: Photograph of the Meter's Window(s)

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 5.4 TERMINALS – TERMINAL BLOCK(S)

Criteria

SEE IEC 62052-31:2015, 6.5.2, 6.9.5, and 6.9.7.

NOTE This subclause is based on IEC 61010-1:2010, 6.5.2.1 and IEC 60255-27:2013, 5.1.6.2.

Accessible conductive parts shall be bonded to the protective conductor terminal if they could become hazardous live in case of a single fault of the primary means of protection specified in 6.4. Alternatively, accessible conductive parts shall be separated from parts, which are hazardous live, by a conductive protective screen bonded to the protective conductor terminal.

Unearthed accessible conductive parts such as nameplates, screws, suspensions and rivets need not be bonded to the protective conductor terminal if they are separated from all hazardous live parts by double insulation or reinforced insulation.

Conformity is checked as specified in 6.5.2.2 to 6.5.2.5.

Terminals may be grouped in (a) terminal block(s) having adequate insulating properties and mechanical strength. In order to satisfy such

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

requirements when choosing insulating materials for the terminal block(s), adequate testing of materials shall be taken into account. See also 9.3.2.1

Conformity is checked with the test specified in 10.5.2.

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 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).

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.

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.

Each terminal shall be capable of accommodating and reliably clamping a multi-stranded conductor as specified in Table 1.

Table 1: Conductor sizes for Terminals

Terminal rating	Conductor size, mm^2	
A	Minimum	Maximum
32	2.5	6
50	4	10
100	4	25
125	4	35

Test Results

The GEN™5 RIVA is **compliant** with AS 62052-11, Section 5.4 Terminals – Terminal block(s).

Note*: This test data is referred from safety report number R4790778107-IEC_AS SAFETY

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 5.5 TERMINAL COVER(S)

Criteria

SEE IEC 62052-31:2015, 6.9.4.

Hazardous live parts shall be located within the equipment case.

If the equipment case has removable covers, they shall be firmly secured in place in such a way that:

a) they may only be removed by using a tool;

b) if protected by seals, they cannot be removed without breaking the seals.

NOTE 1 If the covers are fixed by screws these are generally protected by seals so that the covers cannot be removed without breaking the seals first then using a tool to loosen / fasten the screws.

NOTE 2 Some metering equipment is "sealed for life", so that the case can be only opened by breaking it.

NOTE 3 This requirement does not apply to covers within the meter enclosure.

Terminal covers covering terminals intended for connecting devices by the user do not need to be protected against removal. Terminals located under terminal covers that can be removed by a user shall be safe to touch (SELV, PELV or PEB). See 6.8.

Terminals may be grouped in connectors to prevent access to the terminals.

It shall not be possible to remove socket-mounted equipment from its specified matching socket without breaking a seal.

The case shall have sufficient mechanical strength, stability and durability to maintain the specified degree of protection and shall meet the rigidity requirements specified in 8.2.

The equipment case, including the covers and terminal covers shall provide a degree of protection as specified in Clause 11.

Conformity is checked by inspection and the tests of 8.2, 10.5.1, 10.5.2 and Clause 11.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Terminal Covers	Vairakkannu Vairavan / Soo Voo Key	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-08-08

Test Method

Terminals that are hazardous live shall be covered by terminal covers, enclosing the actual terminals, the conductor fixing screws and, unless otherwise agreed by the manufacturer and the purchaser, a suitable length of the external conductors and their insulation, so that no hazardous live terminals become accessible without removing the terminal cover. Terminal covers shall be firmly secured in place as specified above. Panel mounted meters do not have to be equipped with terminal covers if access to hazardous live terminals in normal operating condition is prevented by an appropriate barrier.

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11, Section 5.5 Terminal cover(s). Observed clear meter's terminal cover has been used as find in below picture.

Note*: This test data is referred from safety report number R4790778107-IEC_AS SAFETY

Figure 2: Photo of Terminal Covers

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 5.6 CLEARANCE AND CREEPAGE DISTANCES

Criteria

SEE IEC 65052-31:2015, 6.7

Test Method

The outputs were loaded to the rated value. The working voltage at each location was measured using an oscilloscope or other appropriate voltage meter and the result was recorded.

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Creepage & Clearance	Vairakkannu Vairavan / Soo Voo Key	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-08-24

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11, Section 5.6 Clearance and Creepage Distances.

Note: This test results referred to R4790778107 _IEC_AS_SAFETY report from UL RTP. Report finds in Appendix C

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 5.7 INSULATION ENCASED METER OF PROTECECIVE CLASS II

Criteria

SEE IEC 62062-31:2015:

- *3.6.8, (Protective) class II equipment;*
- *5.4.5.1, Protective class and earthing;*
- *6.5.2, Protective bonding;*
- *6.8, Insulation requirements between circuits and parts, and Annex B, Examples for insulation between parts;*
- *6.9.2, Insulating materials*

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11, Section 5.7 Insulation encased meter of protective class II. Meter is Protective Class II. See test results also in section 5.5 for 6.5.2 Protective bonding.

Note: This test results referred to R4790778107 _IEC_AS_SAFETY report from UL RTP. Report finds in Appendix C

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 5.8 RESISTANCE TO HEAT AND FIRE

Criteria

SEE IEC 62052-31:2015, Clause 9.

There shall be no spread of fire outside the equipment in normal condition or in the single fault condition.

Conformity check has been followed as

- *Testing in the single fault condition(see 4.4 in IEC 62052-31) that cause the spread of fire outside the equipment's. The conformity criteria of 4.4.4.3 shall be met*

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Glow Wire	Chris Ashby / Jackson Daniel	UL LLC, 12 Laboratory Dr, RTP, NC 27709	2023-08-17

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 – 75	-
Actual	23	53	-

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Method

[X]Tests were run at _230V, _100_ A, _50_ Hz, unless otherwise noted.

Duration of Tests – The equipment was operated until a further change as a result of the applied fault was unlikely. Each test was normally limited to 1 h. If at the end of 1 h there was an indication that a hazard may eventually occur the test was continued until hazards occurred or for a maximum period of 4 h.

If a device that interrupted or limited the current was included to limit the temperature of parts which could easily be touched, the maximum temperature attained by those parts were measured whether the device operated or not.

If the opening of a fuse terminated a fault and if the fuse did not operate within approximately 1 s, the current through the fuse under the relevant fault condition was measured. Evaluation with the pre-arcing time/current characteristics were made to find out if the minimum operating current of the fuses were reached or exceeded. The maximum time for the fuse to operate was also determined. The current through the fuse may vary as a function of time.

If the minimum operating current of the fuse was not reached in the test, the equipment was operated for a period corresponding to the maximum fusing time or for the maximum 4 h, with the fuse replaced with a short-circuit.

Note for Lab: For the purpose of this test, _125__ A fuses were attached to the voltage lines of the meter (to provide branch circuit protection) before applying fault conditions.

For Voltage and current terminals, The current terminal can accommodate cable sizes down to 4mm2 with use of ferrules as appropriate. Flexible cable, with a minimum rating of 90C should be used for wiring up the meter and the recommended fuse to use on the supply side of the meter. is an 80A gG fuse (for direct connected meter).this type of fuse will take up to 2hr to activate at 128A

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11, Section 5.8 Resistance to Heat and Fire. Refer ISO 75-2 documents in Appendix C

Note: This test results referred to R4790778107 _IEC_AS_SAFETY report from UL RTP. Report finds in Appendix C

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 5.9 PROTECTION AGAINST PENETRATION OF DUST AND WATER

Criteria

SEE IEC 62052-31:2015, Clause 11.

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

Australian Outdoor meter: IP53 (without suction)

The tests shall be carried out according to IEC 60529, under the following conditions:

9) *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 and Australian outdoor meters only, the same atmospheric

pressure is maintained inside the meter as outside (neither under- nor overpressure);

– first characteristic digit: 5 (IP5X)

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Any ingress of dust or water shall be only in a quantity not impairing the operation of the meter.

An insulation test according to 7.3 shall be passed.

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.

9) *Protection against penetration of water*

– meter in non-operating condition and mounted on an artificial wall;

– second characteristic digit: 1 (IPX1) for indoor meters;

3 (IPX3) for Australian outdoor 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.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Protection against penetration of dust (IP5X)

Criteria

Meter in non-operating condition and mounted on an artificial wall;

Test should be conducted with meter base installed (exposed ends sealed) and terminal cover in place;

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
IP 5X	Lim Mico/Vairavan/Soo Voo Key/Sherry Wong	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-06-07-2023-06-08

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 – 75	-
Actual	23.6	67.7	-

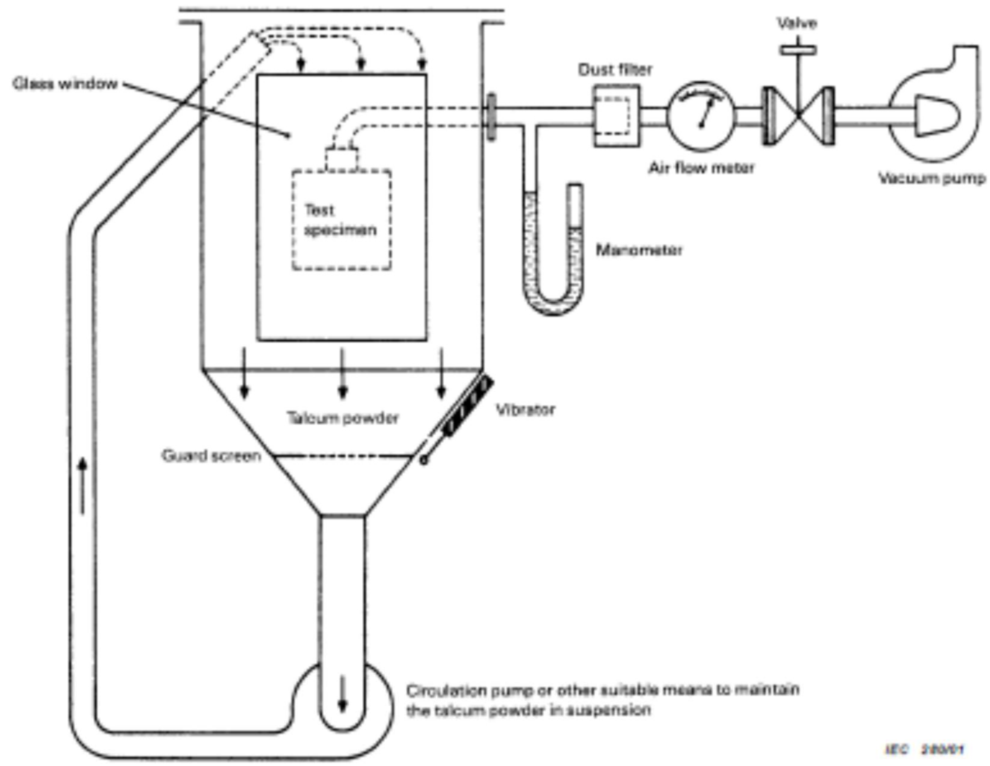
Test Method

Prior to testing perform accuracy test at I_b or I_n.

The test is made using a dust chamber incorporating the basic principles shown in figure 2 whereby the powder circulation pump may be replaced by other means suitable to maintain the talcum powder in suspension in a closed test chamber. The talcum powder used shall be able to pass through a square-meshed sieve the nominal wire diameter of which is 50 µm and the nominal width of a gap between wires 75 µm. The amount of talcum powder to be used is 2 kg per cubic meter of the test chamber volume. It shall not have been used for more than 20 tests.

NOTE Health and safety regulations should be observed in selecting the type of talcum powder and its use.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result



NOTE See IEC 60068-2-68, figure 2 valid for La2 only.

Figure 2 – Test device to verify protection against dust (dust chamber)

The enclosure under test is supported inside the test chamber and the pressure inside the enclosure is maintained below the surrounding atmospheric pressure by a vacuum pump. The suction connection shall be made to a hole specially provided for this test. If not otherwise specified in the relevant product standard, this hole shall be in the vicinity of the vulnerable parts.

If it is impracticable to make a special hole, the suction connection shall be made to the cable inlet hole. If there are other holes (for example, more cable inlet holes or drain-holes) these shall be treated as intended for normal use on site.

The object of the test is to draw into the enclosure, by means of depression, a volume of air 80 times the volume of the sample enclosure tested without exceeding the extraction rate of 60 volumes per hour. In no event shall the depression exceed 2 kPa (20 mbar) on the manometer shown in figure 2.

If an extraction rate of 40 to 60 volumes per hour is obtained the duration of the test is 2 h. If, with a maximum depression of 2 kPa (20 mbar), the extraction rate is less than 40 volumes per hour, the test is continued until 80 volumes have been drawn through, or a period of 8 h has elapsed.

At the completion of the test conduct the INS testing from 7.3 and then perform accuracy test at I_b or I_n.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11, Section 5.9 Protection against penetration of dust (IP5X).

Figure 3: EUT Configuration for Dust Testing

Table 2: EUT Evaluated for Dust Testing

Serial Number	Comments
SN928	There is no talc powder observed inside EUT enclosure

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Insulation tests ambient	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	15 – 25	45 – 75	86 - 106
Actual	23.6	67.7	103.8

Table 3: AC Voltage (after dust) Test Results

Sample Tested	Test voltage applied between:	Test voltage (V)	Breakdown
SN928	Current, voltage, auxiliary circuits > 40 V and earth	4000	No
	Circuits not intended to be connected together in service	-	-

Figure 4: AC Voltage Test Setup

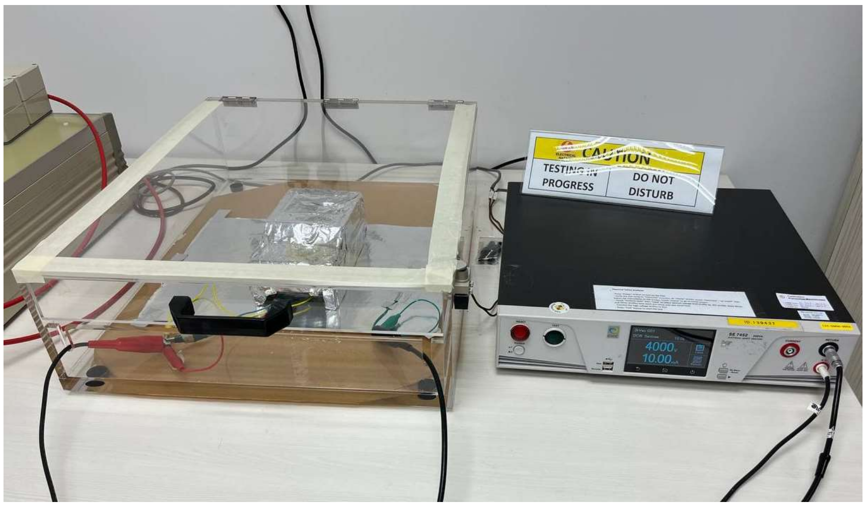


Table 4: Meter Accuracy Test Results (Dust protection) – Active

Meter Serial Number	Test Point	Phase Angle	Pre Test % Error	Post Test % Error	Limit Class 1	Pass/Fail Class 1
SN928	Ib	1	0.23	0.268	1	P

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Test System	159508	EMH	PRS 600.3	2022-11-29	2023-11-29
Temperature, Humidity and Pressure recorder	139451	OMEGA	iBTHX-W	2023-01-11	2024-01-10
Temperature, Humidity and Pressure recorder	139452	OMEGA	iBTHX-W	2023-01-11	2024-01-10
Dust Test Chamber	TT01887	ATT	SD 1000 FDP SP	-	-
Sport Timer	139436	EXTECH	365515	2023-02-14	2024-02-14
Electrical Safety Analyzer	139437	EEC	SE7452	2022-10-11	2023-10-11
Impulse Generator	67018	EMC PARTNER	MIG 1803	2023-02-22	2024-02-22

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Protection against penetration of water (IPX4)

Criteria

Meter in non-operating condition and mounted on an artificial wall;

Test should be conducted with meter base installed (exposed ends sealed) and terminal cover in place;

The second characteristic digit is IPX1 for indoor meters, IPX3 for Austrailian outdoor meters, and IPX4 for outdoor meters.

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Protection against penetration of water	Chris Ashby / Jackson Daniel	UL LLC, 12 Laboratory Drive RTP, NC 27709	2023-08-18

Test Method

Prior to testing perform accuracy test at I_b or I_n.

The test is made with a device which produces a uniform flow of water drops over the whole area of the enclosure.

An example of such a device is shown in figure 3 a). The turntable on which the enclosure is placed has a rotation speed of 1 r/min and the eccentricity (distance between turntable axis and specimen axis) is approximately 100 mm.

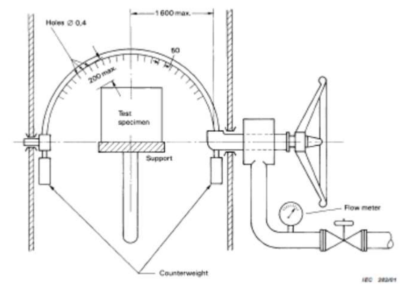
The enclosure under test is placed in its normal operating position under the drip box, the base of which is larger than that of the enclosure. Except for enclosures designed for wall or ceiling mounting, the support for the enclosure under test should be smaller than the base of the enclosure.

An enclosure normally fixed to a wall or ceiling is fixed in its normal position of use to a wooden board having dimensions which are equal to those of that surface of the enclosure which is in contact with the wall or ceiling when the enclosure is mounted as in normal use.

The duration of test is 10 min.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

NOTE When the base of the drip box is smaller than that of the enclosure under test, the latter may be divided into several sections, the area of each section being large enough to be covered by the dripping water. The test is continued until the whole area of the enclosure has been sprinkled for the specified time.



Dimensions in millimetres

NOTE The range of holes is shown as for second characteristic numeral 3 (see 14.2.3 a)).

Figure 4 – Test device to verify protection against spraying and splashing water; second characteristic numerals 3 and 4 (oscillating tube)

4) The oscillating tube has spray holes over an arc of 180° of the semicircle. The total flow rate is adjusted as specified in table 9 and is measured with a flow meter.

5) The tube is caused to oscillate through an angle of almost 360°, 180° on either side of the vertical, the time for one complete oscillation (2 × 360°) being about 12 s.

6) The duration of the test is 10 min.

7) If not specified otherwise in the relevant product standard, the support for the enclosure under test is perforated so as to avoid acting as a baffle and the enclosure is sprayed from every direction by oscillating the tube to the limit of its travel in each direction.

Second characteristic numeral	Test means	Water flow rate	Duration of test	Test conditions, see
0	No test required	–	–	–
1	Drip box Figure 3 Enclosure on turntable	$1^{+0,5}_{0}$ mm/min	10 min	14.2.1
2	Drip box Figure 3 Enclosure in 4 fixed positions of 15° tilt	$3^{+0,5}_{0}$ mm/min	2,5 min for each position of tilt	14.2.2
3	Oscillating tube Figure 4 Spray ± 60° from vertical, distance max. 200 mm or Spray nozzle Figure 5 Spray ± 60° from vertical	0,07 l/min ± 5 % per hole, multiplied by number of holes 10 l/min ± 5 %	10 min 1 min/m² at least 5 min	14.2.3 a) 14.2.3 b)
4	As for numeral 3 Spray ± 180° from vertical	As for numeral 3		14.2.4

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Table 9 – Total water flow rate q_V under IPX3 and IPX4 test conditions – Mean flow rate per hole q_{Vl} = 0,07 l/min

Tube radius R mm	Degree IPX3		Degree IPX4	
	Number of open holes N 1)	Total water flow q_V l/min	Number of open holes N 1)	Total water flow q_V l/min
200	8	0,56	12	0,84
400	16	1,1	25	1,8
600	25	1,8	37	2,6
800	33	2,3	50	3,5
1 000	41	2,9	62	4,3
1 200	50	3,5	75	5,3
1 400	58	4,1	87	6,1
1 600	67	4,7	100	7,0

1) Depending on the actual arrangement of the hole centres at the specified distance, the number of open holes N may be increased by 1.

7) At the completion of the test conduct the Insulation testing from 7.3 of IEC 62052-11.

Accuracy ambient	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	15 – 25	45 – 75	86 - 106
Actual	21.4	61.2	99.82

At the completion of the test conduct the INS testing from 7.3 and then perform accuracy test at I_b or I_n.

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11, Section 5.9, IPX4 Protection against penetration of water.

Note: This test results referred to R4790778107 _IEC_AS_SAFETY report from UL RTP. Report finds in Appendix C

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 5.10 DISPLAY OF MEASURED VALUES

Criteria

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.

The active tariff rate shall be indicated.

When the meter is not energized, the electronic display need not be visible.

The principal unit for the measured values shall be the kilowatt-hour (kW h), kilovar-hour (kvarh), kilovolt-ampere-hour (kVAh) or the megawatt-hour (MWh), megavar-hour (Mvarh), megavolt-ampere-hour (MVAh).

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.For direct connected meters there shall be no visible deciman drums.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Method

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.

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.

Every numerical element of an electronic display shall be able to show all the numbers from “zero” to “nine”.

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, without breaking a physical seal or without making an electronic log.

NOTE 3 The regular roll over of the display is not considered as a reset.

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11, Section 5.10 Display of measured values.

Note: Display of register for billing purposes is retained for 5s (measured).

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Figure 5: Photographs of Non-volatile Memory Technical Data

Micron

4Gb: x8 NAND Flash with 2Gb: x32 LPDDR MCP
4Gb, 8Gb: x8, x16 NAND Flash Memory

4Gb, 8Gb: x8, x16 NAND Flash Memory

Features

- Open NAND Flash Interface (ONFI) 1.0-compliant[1]
- Single-level cell (SLC) technology
- Organization
  - Page size x8: 2112 bytes (2048 + 64 bytes)
  - Page size x16: 1056 words (1024 + 32 words)
  - Block size: 64 pages (128K + 4K bytes)
  - Plane size: 2 planes x 2048 blocks per plane
  - Device size: 4Gb: 4096 blocks; 8Gb: 8192 blocks
- Asynchronous I/O performance
  - ^{t}RC/^{t}WC: 20ns (3.3V), 25ns (1.8V)
- Array performance
  - Read page: 25µs[2]
  - Program page: 200µs (TYP: 1.8V, 3.3V)[2]
  - Erase block: 700µs (TYP)
- Command set: ONFI NAND Flash Protocol
- Advanced command set
  - Program page cache mode[3]
  - Read page cache mode[3]
  - One-time programmable (OTP) mode
  - Two-plane commands[3]
  - Interleaved die (LUN) operations
  - Read unique ID
  - Block lock (1.8V only)
  - Internal data move
- Operation status byte provides software method for detecting
  - Operation completion
  - Pass/fail condition
  - Write-protect status
- Ready/Busy# (R/B#) signal provides a hardware method of detecting operation completion
- WP# signal: Write protect entire device
- Block 0 requires 1-bit ECC if PROGRAM/ERASE cycles are less than 1000
- RESET (FFh) required as first command after power-on
- Alternate method of device initialization (Nand_Init) after power-up (contact factory)
- Internal data move operations supported within the plane from which data is read
- Quality and reliability
  - Data retention: 10 years
- Operating voltage range
  - V_{CC}: 2.7–3.6V
  - V_{CC}: 1.7–1.95V
- Operating temperature
  - Commercial: 0°C to +70°C
  - Industrial (IT): –40ºC to +85ºC

Notes:
1. The ONFI 1.0 specification is available at www.onfi.org.
2. See Electrical Specifications – Program/Erase Characteristics (page 119) for ^{t}R_ECC and ^{t}PROG_ECC specifications.
3. These commands supported only with ECC disabled.

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IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Sport Timer	139436	EXTECH	365515	2023-02-14	2024-02-14

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 5.11 OUTPUT DEVICES

Criteria

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 62052-31.
If the test output is an optical test output, then it shall fulfil the requirements according 5.11.1 and 5.11.2.
The operation indicator, if fitted, shall be visible from the front.

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Output Devices	Jackson Daniel / Kelon Charles	UL LLC, 12 Laboratory Dr, RTP, NC 27709	2023-06-05

Test Method

a) Maximum pulse frequency (2.5 kHz)
b) Pulse transition time (rise time and fall time), including transient effects (must be less than 20 uS)
c) On time
d) Off time
e) Radiation strength On State
f) Radiation strength Off State

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11, Section 5.11 Output devices.

Note: This test results referred to R4790778107_IEC (AS)_RTP report from UL RTP. Report finds in Appendix A

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Section 5.11.1 Mechanical and electrical characteristics

Criteria

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 20μs (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 transmission 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
$t_r \leq 0,2$ *μs.*

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Optical Characteristics	Jackson Daniel / Kelon Charles	UL LLC, 12 Laboratory Dr, RTP, NC 27709	2023-06-05

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Method

1. Set up the MTE in manual mode to the rated voltage and max current.
2. Connect the optical reader
3. Open the control software and select the COM port
4. Set the optical controller to the wavelength of the pulse output specified by the manufacturer.
    a. Press the menu button
    b. Select wavelength
    c. Enter wavelength
    d. Accept changes
5. In the control software on the computer, set the meter mode to Peak Hold.
    a. Select the peak hold period needed to monitor the output and record the values accurately
6. Record the max value of the Peak Hold while the pulse output is ON.
7. Record the max value of the Peak Hold while the pulse output is OFF.
    a. Ensure current is off to be positive that no light is coming off the pulse LED. DO NOT TURN OFF METER OR COVER ANY OTHER LIGHTS

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11, Section 5.11.1 Mechanical and electrical characteristics.

Note: This test results referred to R4790778107_IEC (AS)_RTP report from UL RTP. Report finds in Appendix A

Section 5.11.2 Optical characteristics

Criteria

The wavelength of the radiated signals for emitting systems shall be between 550 nm and 1000 nm.

The output device in the meter shall generate a signal with a radiation strength E_T over a defined reference surface (optically active area) at a distance of a_1 = 10 mm ± 1 mm from the surface of the meter, with the following limiting values:

ON-condition : 50 $\mu W/cm^2 \leq E_T \leq 1\,000\ \mu W/cm^2$

OFF-condition: $E_T \leq 2\ \mu W/cm^2$

See also Figure D.1 of IEC 62052-11

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Optical Characteristics	Jackson Daniel / Kelon Charles	UL LLC, 12 Laboratory Dr, RTP, NC 27709	2023-06-05

Test Method

1. Set up the MTE in manual mode to the rated voltage and max current.
2. Connect the optical reader
3. Open the control software and select the COM port
4. Set the optical controller to the wavelength of the pulse output specified by the manufacturer
   a. Press the menu button
   b. Select wavelength
   c. Enter wavelength
   d. Accept changes
5. In the control software on the computer, switch to the Graphic Display tab.
6. With the meter running with pulse output, set the Time base and Power range to estimated values to begin with.
7. Press acquire.
   a. You will see the waveform of the pulse output update on the screen.
   b. You will need to adjust the Time base and Power range in order to show the best screen of the pulse waveform.
8. In order to keep the waveform still, press acquire again.
9. Different setting will be needed to capture all of the data needed.
   a. Rise Time
      i. Smaller time base in order to zoom in
      ii. Positive trigger slope
   b. Fall Time
      i. Smaller time base in order to zoom in
      ii. Negative trigger slope
   c. On/Off Time
      i. Larger time base in order to show whole wave
      ii. Positive or negative trigger slope depending on time base
10. Collect data from the scans.
   a. After getting a scan of one of the measurements, you will need to use the curser function to actually measure the time.
   b. Select “cursors enabled” in the cursors section of the control program.
   c. Select the correct function (usually the change in time though sometimes you will need to use frequency and calculate the time when the rise or fall time are so short that it displays 0 seconds in the time function)
   d. Use the left click button and right click button in order to select the location for the markers. The measurement will be displayed below the graph. Remember to select the points according to the standard.
11. Save the graphic plot
   a. In the “Meter” drop down menu click “save graphic screen” to save the values and waveform

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11, Section 5.11.2 Optical characteristics.

Note: This test results referred to R4790778107_IEC (AS)_RTP report from UL RTP. Report finds in Appendix A.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 5.12 MARKING OF METER

Section 5.12.1 Name-plates

Criteria

This subclause shall be read together with IEC 62052-31:2015, Clause 5.

For metrology related markings, the existing text applies. For safety related markings, IEC 62052-31:2015, Clause 5 applies.

If the meter is of a special type (for example in the case of a multi-rate meter, if the voltage of the changeover device differs from the reference voltage), this shall be specified on the name-plate or on a separate plate.

If the instrument transformers are taken into account in the meter constant, the transformer ratio(s) shall be marked.

Standard symbols may also be used (see IEC 60387).

Examples of markings are shown in Table 4.

Table 4 – Voltage marking

Meter	Voltage at the terminals of the voltage circuit(s) V	Rated system voltage V
Single-phase 2-wire 120 V	120	120
Single-phase 3-wire 120 V (120 V to the mid-wire)	240	240
Three-phase 3-wire 2-element (230 V between phases)	2 × 230	3 × 230
Three-phase 4-wire 3-element (230 V phase to neutral)	3 × 230 (400)	3 × 230/400

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Method

1) manufacturer's name or trade mark and, if required, the place of manufacture;
2) designation of type (see 3.1.8) and, if required, space for approval mark;
3) the number of phases and the number of wires for which the meter is suitable (for example, single-phase 2-wire, three-phase 3-wire, three-phase 4-wire); these markings may be replaced by the graphical symbols given in IEC 60387;
4) the serial number or property number or both and year of manufacture. If the serial number is marked on a plate fixed to the cover, the number shall also be marked on the meter base or stored in the meter's non-volatile memory. If both the serial number and property number are marked, it shall be done in a way that clearly delineates between them.
5) the reference voltage in one of the following forms:
   - the number of elements if more than one, and the voltage at the meter terminals of the voltage circuit(s);
   - the rated voltage of the system or the secondary voltage of the instrument transformer to which the meter is intended to be connected.
6) for direct connected meters, the basic current and the maximum current expressed, for example: 10-40 A or 10(40) A for a meter having a basic current of 10 A and a maximum current of 40 A;for transformer-operated meters, the rated secondary current of the transformer(s) to which the meter should be connected, for example: /5 A; the rated current and the maximum current of the meter may be included in the type designation;
7) the reference frequency in Hz;
8) the meter constant;
9) the class index of the meter;
10) the reference temperature if different from 23 °C;
11) the sign of the double square ⧈ for insulating encased meters of protective class II.

Information under points a), b) and c) may be marked on an external plate permanently attached to the meter cover.

Information under points d) to k) shall be marked on a name-plate preferably placed within the meter. The marking shall be indelible, distinct and legible from outside the meter.

Test Results

The GEN™5 RIVA is **Compliant** with IEC 62052-11, Section 5.12.1 Name plates.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Figure 6: Meter nameplate markings

Section 5.12.2 Connection diagrams and terminal markings

Criteria

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. For polyphase meters, this diagram shall also show the phase sequence for which the meter is intended. It is permissible to indicate the connection diagram by an identification figure in accordance with national standards.

If the meter terminals are marked, this marking shall appear on the diagram.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Method

1. Review the terminal cover and ensure there is a connection diagram for connecting the meter.

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11, Section 5.12.2 Connection diagrams and terminal markings.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 6.1 TEMPERATURE RANGE

Criteria

This subclause shall be read together with IEC 62052-31:2105, 1.4.1, 1.4.2, and 1.4.3

The temperature range of the meter shall be as shown in Table 5. The values are based on IEC 60721-3-3, Table 1, with the exception of m) Condensation and p) Formation of ice.

Table 5 – Temperature range

	Indoor meter	Outdoor meter	Austalian Outdoor meter
Specified operating range	–10 °C to 45 °C (class 3K5 mod.)	–25 °C to 55 °C (class 3K6)	–10 °C to 45 °C (class 3K5 mod.)
Limit range of operation	–25 °C to 55 °C (class 3K6)	–40 °C to 70 °C (class 3K7)	–25 °C to 55 °C (class 3K6)
Limit range for storage and transport	–25 °C to 70 °C (class 3K8H)	–40 °C to 70 °C (class 3K7)	–25 °C to 70 °C (class 3K8H)
NOTE 1 For special applications, other temperature values can be used according to purchaser contract, for example, for cold environment for indoor meters, class 3K7. NOTE 2 Operation and storage and transport of the meter at the extremes of this temperature range (class 3K7) should only be for a maximum period of 6 h.			

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Temperature Range	Vairakkannu Vairavan/ Soo Voo Key	UL SGP, 20 Kian Teck Lane, Singapore 627854	2023-07-12

Test Method

1. Confirm with the meter manufacturer that the meter meets the required range for its specified operating conditions.

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11, Section 6.1 Temperature Range

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 6.2 RELATIVE HUMIDITY

Criteria

The meter shall be designed to withstand the climatic conditions specified in IEC 62052-31:2015, 1.4.1 c), 1.4.2 c), and 1.4.3. For combined temperature and humidity test, see 6.3.3 (of IEC 62052-11).

The meter shall be designed to withstand the climatic conditions defined in Table 6. For combined temperature and humidity test, see 6.3.3.

Table 6 – Relative humidity

Annual mean	<75 %
For 30 days, these days being spread in a natural manner over one year	95 %
Occasionally on other days	85 %

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Relative Humidity	Vairakkannu Vairavan/ Lim Mico/ Soo Voo Key	UL SGP, 20 Kian Teck Lane, Singapore 627854	2023-07-12

Test Method

1. Confirm with the meter manufacturer that the meter meets the required range for its specified operating conditions.

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11, Section 6.2 Relative humidity.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 6.3 TEST OF THE EFFECT OF THE CLIMATIC ENVIRONMENTS

After each of the climatic tests, the meter shall show no damage or change of the information and shall operate correctly.

Section 6.3.1 Dry Heat Test

Criteria

The test shall be carried out according to AS 60068.2.2.

a) Meter not operating

b) Temperature +70 Celsius ± 2 C

c) Duration 72 hours

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Dry Heat Test	Vairakkannu Vairavan /Lim Mico	UL SGP, 20 Kian Teck Lane, Singapore 627854	2023-05-26 – 2023-05-30

Test Method

1. Verify meter accuracy at I_b or I_n.
2. Install the non-operational meter in an environmental chamber programed to the specified test condition, for the specified duration.
3. Verify no mechanical damage to meter and then meter accuracy at I_b or I_n.

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11, Section 6.3.1 Dry Heat Test.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Figure 7: Dry Heat Test Setup

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Figure 8: Dry Heat Chamber Plot

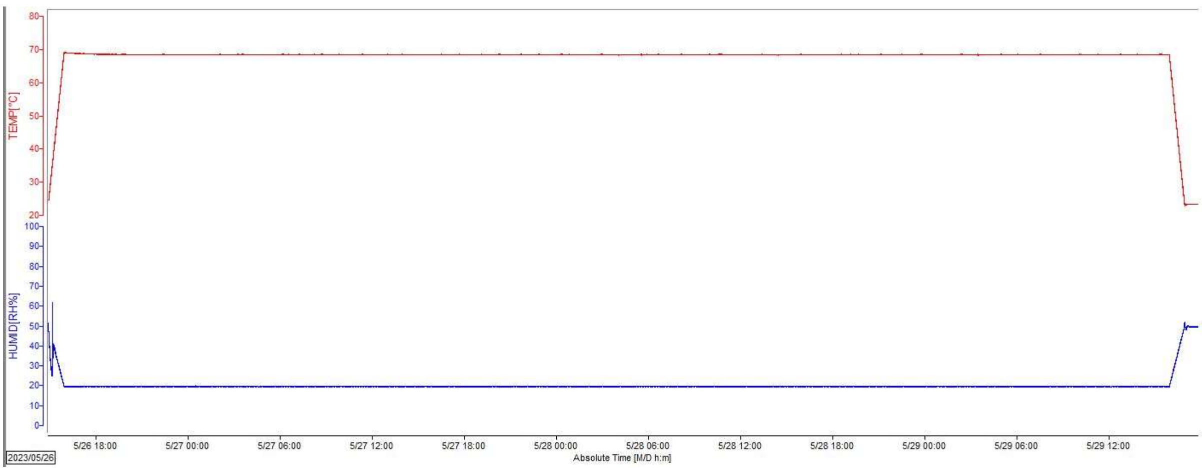


Table 5: Dry Heat Accuracy Results - Active

Meter Serial Number	Test Point	PF	Pre Test % Error	Post Test % Error	Limit Class 1	Pass/Fail Class 1
SN967	Ib	1	0	0.01	1	P

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20
ESPEC Temp/Humidity Chamber	1711282	ESPEC	EGNL28-12CWL	2022-12-08	2023-12-08
Temperature, Humidity and Pressure recorder	139452	OMEGA	iBTHX-W	2023-01-11	2024-01-10

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Section 6.3.2 Cold Test

Criteria

The test shall be carried out according to AS 60068.2.1

a) Meter not operating

b) Temperature:

[X] –25 °C ±3 °C for indoor meters;

[ ] –40 °C ±3 °C for outdoor meters;

c) Duration of the test:

[X] 72 h for indoor meters

[ ] 72 h for Australian outdoor meters

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Cold Test	Vairakkannu Vairavan /Lim Mico/ Sherry Wong	UL SGP, 20 Kian Teck Lane, Singapore 627854	2023-05-09 – 2023-05-13

Test Method

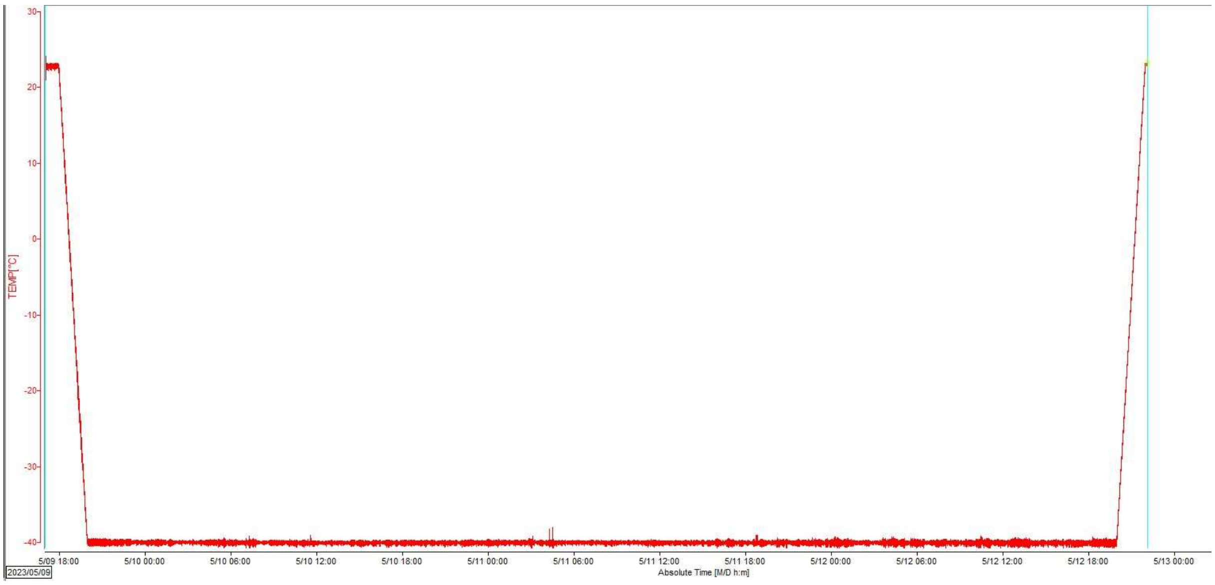
1. Verify meter accuracy at I_b or I_n.
2. Install the non-operational meter in an environmental chamber programed to the specified test condition, for the specified duration.
3. Verify no mechanical damage to meter and then meter accuracy at I_b or I_n.

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11 Section 6.3.2 Cold Test.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Figure 9: Cold test Plot



IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Figure 10: Cold Test Setup

Table 6: Cold Test Accuracy Results - Active

Meter Serial Number	Test Point	PF	Pre Test % Error	Post Test % Error	Limit Class 1	Pass/Fail Class 1
SN967	Ib	1	0.14	0.09	1	P

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20
Blue M Temperature Chamber	53671	TPS	ETC-095H-JY	2022-08-01	2023-07-31
Temperature, Humidity and Pressure recorder	139452	OMEGA	iBTHX-W	2022-01-25	2023-01-24

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Section 6.3.3 Damp Heat Cyclic Test

Criteria

The test shall be carried out according to AS 60068.2.30

The damp heat test also serves as a corrosion test. The result is judged visually. No trace of corrosion likely to affect the functional properties of the meter shall be apparent.

a) Voltage circuits energized with reference voltage

b) No current in the current circuits

c) Variant 1 for AS 60068.2.30 standard, it is 6 cycles with 93% humidity ± 3%.

[X] Temperature of 40 Celsius ± 2 C for indoor meters

[ ] Temperature of 55 Celsius ± 2 C for outdoor meters

d) After 24 hours finished test, a dielectric test must be done, applying a voltage factor of 0.8.

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Pre-Accuracy	Vairakkannu Vairavan /Lim Mico	UL SGP, 20 Kian Teck Lane, Singapore 627854	2023-05-15
Damp heat	Sherry Wong/Lim Mico	UL SGP, 20 Kian Teck Lane, Singapore 627854	2023-05-16 to 2023-05-22
Pre-Accuracy	Vairakkannu Vairavan /Lim Mico	UL SGP, 20 Kian Teck Lane, Singapore 627854	2023-05-22

Test Method

1. Verify meter accuracy at I_b or I_n.
2. Install the non-operational meter in an environmental chamber programed to the specified test condition, for the specified duration.
3. Power the meter accordingly per the test conditions.
4. 24 h after the end of this test, the meter shall be submitted to the following tests:
   - an insulation test, with the impulse voltage shall be multiplied by a factor of 0,8;
5. Immediately following the insulation testing, verify the meters accuracy at I_b or I_n.

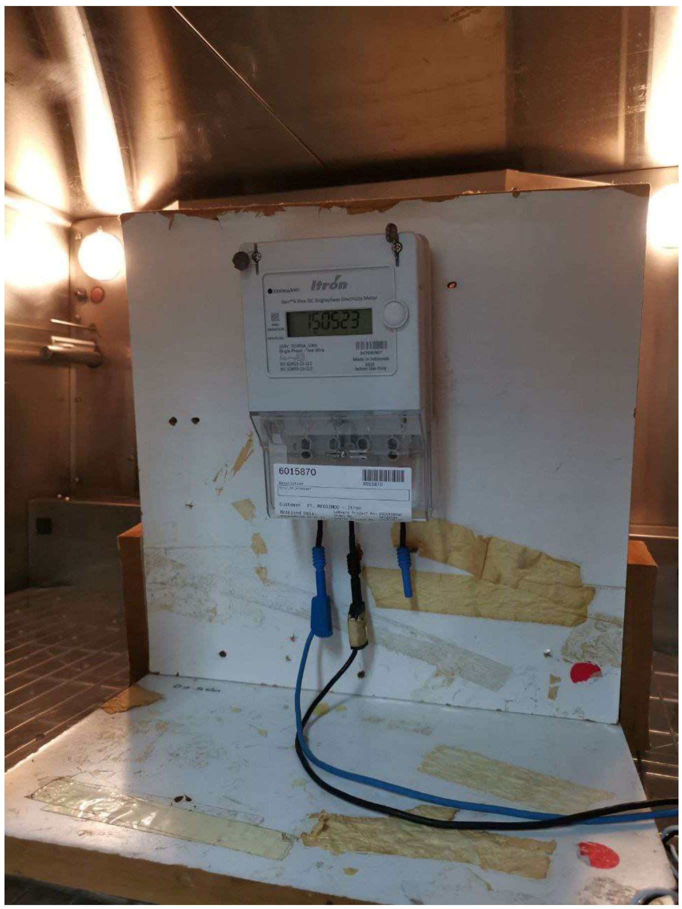
IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11 Section 6.3.3 Damp Heat Cyclic Test.

Note*: Impulse Voltage specification has been referred to NMI M6-1 standard with higher voltage and energy level as per applicant's request.

Figure 11: Damp Heat Cyclic Test Setup



IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Figure 12: Damp Heat Cyclic Chamber Plot

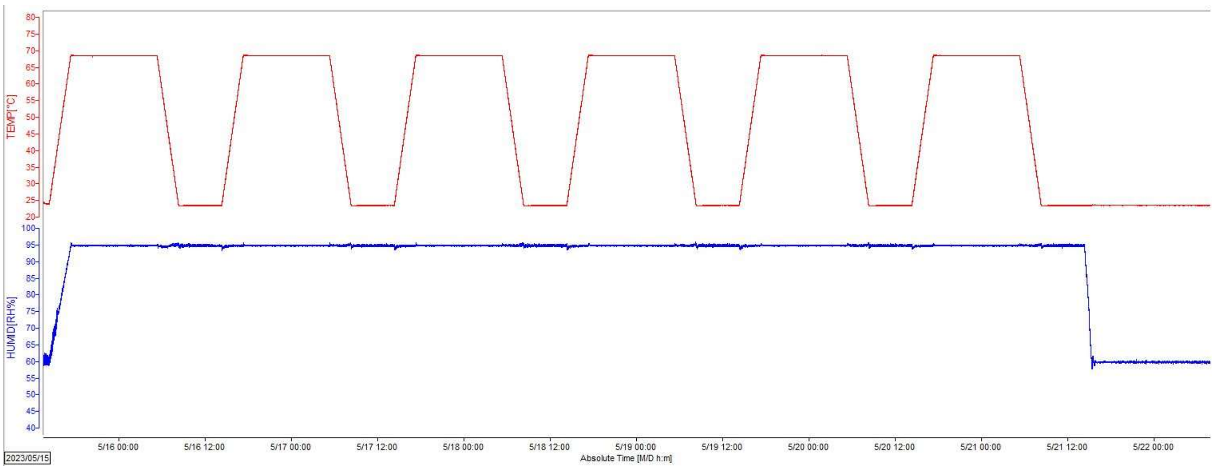


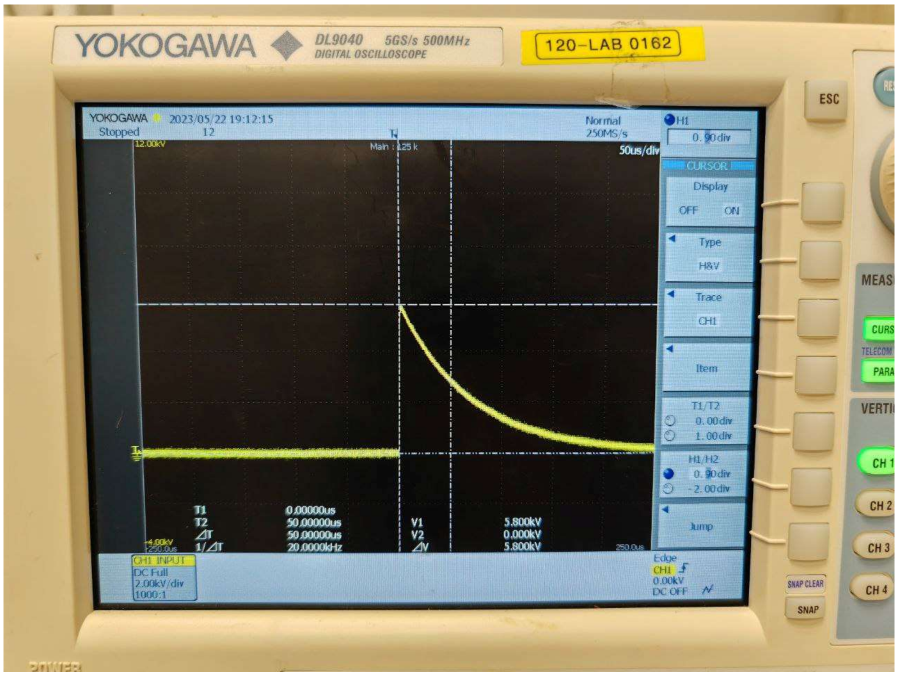
Table 7: Impulse Test (after damp heat cyclic) Test Results

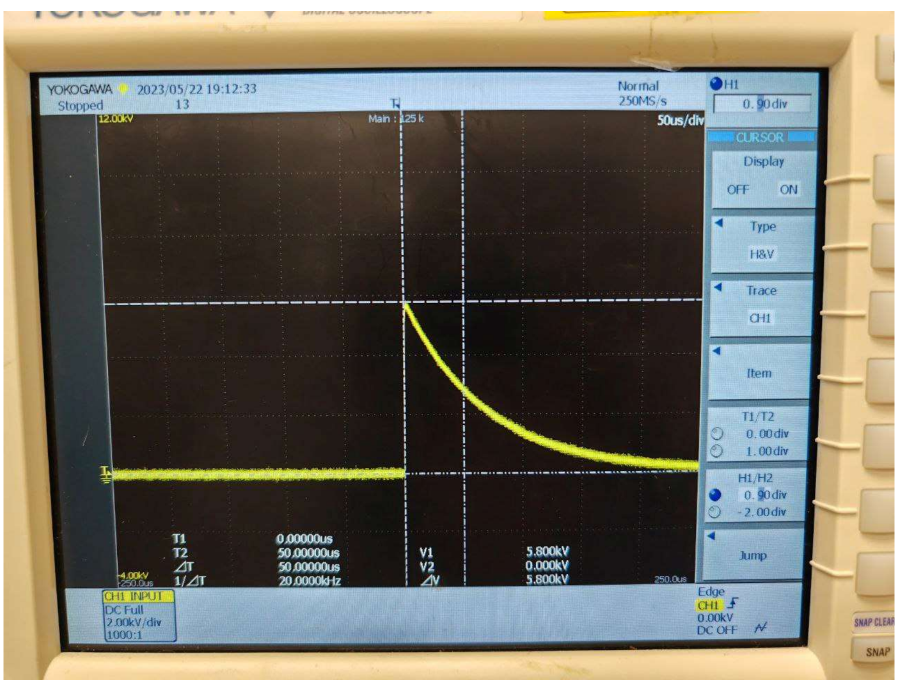
Sample Tested	Insulation (clearance) subjected to test	Impulse test voltage (V)	Breakdown
SN967	Each circuit to earth	9600	No
	All circuits > 40 V connected together and earth	8000	No

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

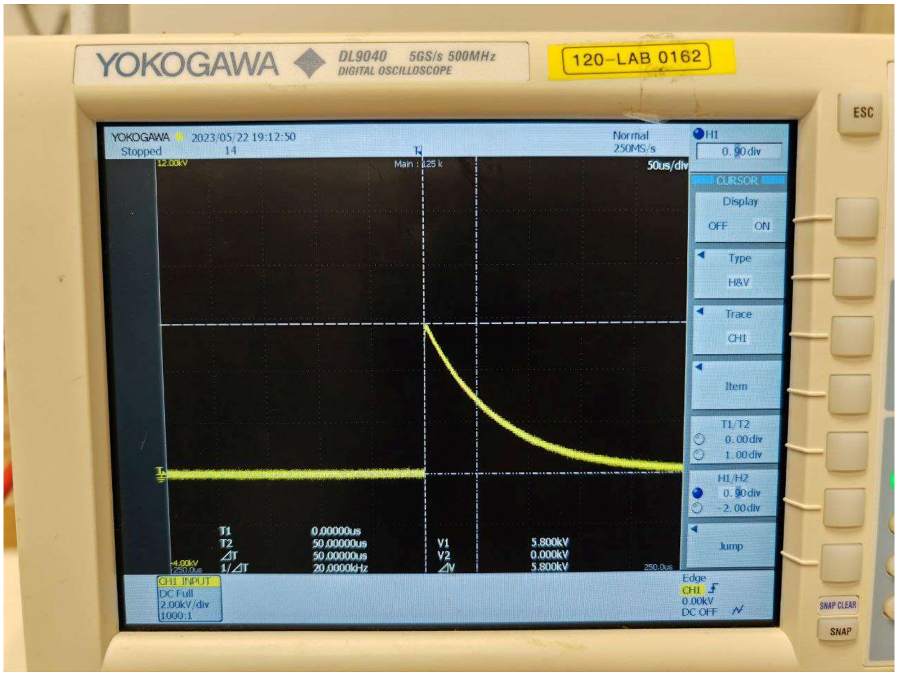
Table 8: Impulse Test graph

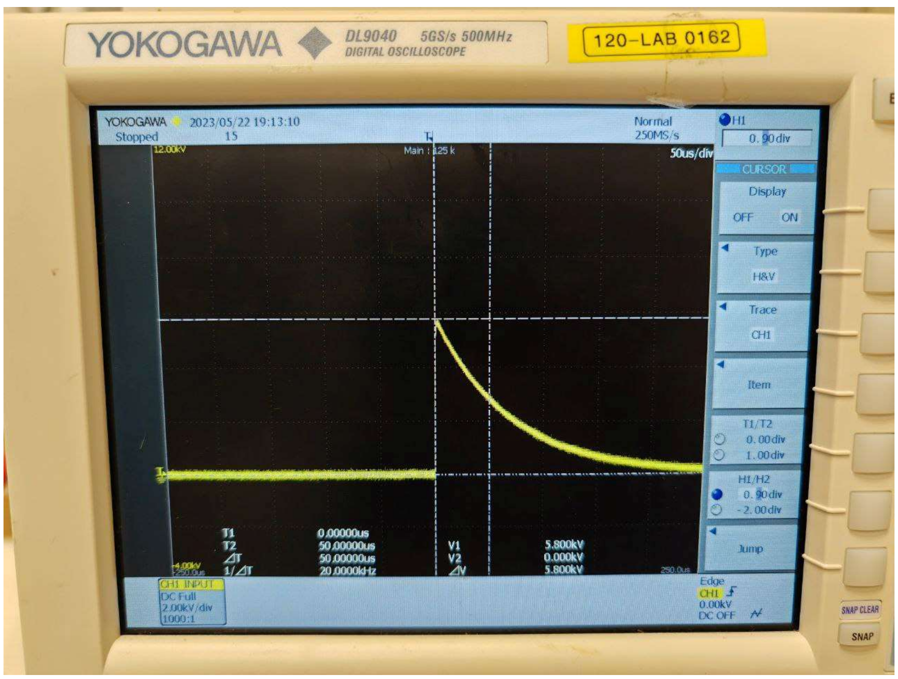
(GRD TO AOT +ve)



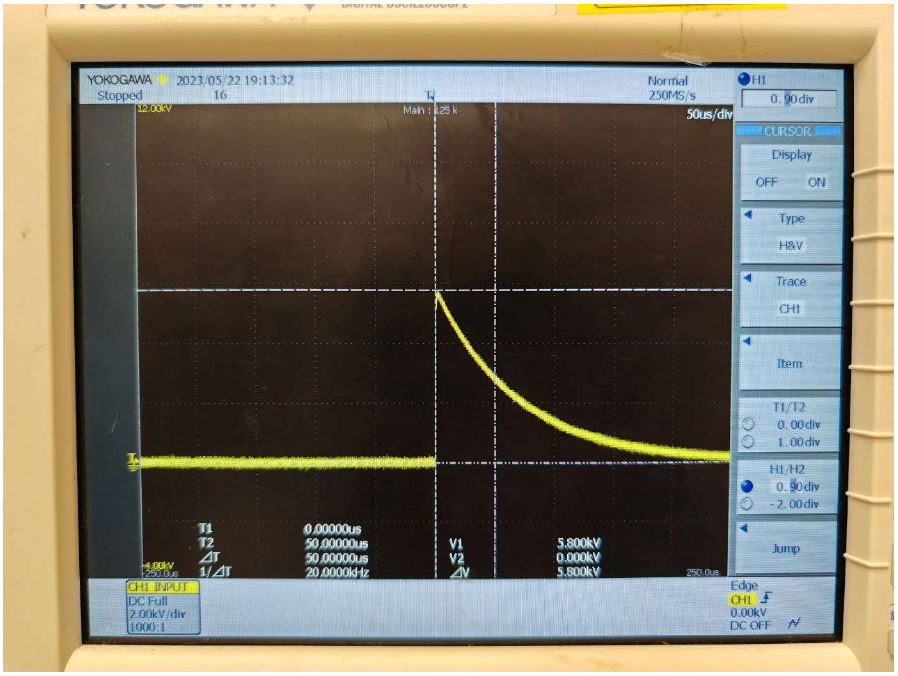


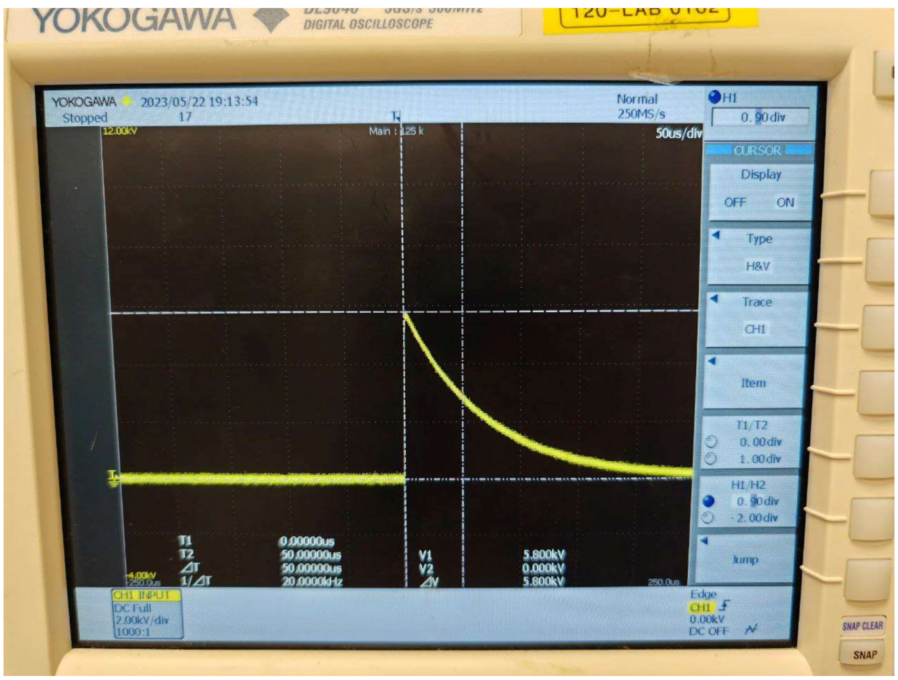
IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result



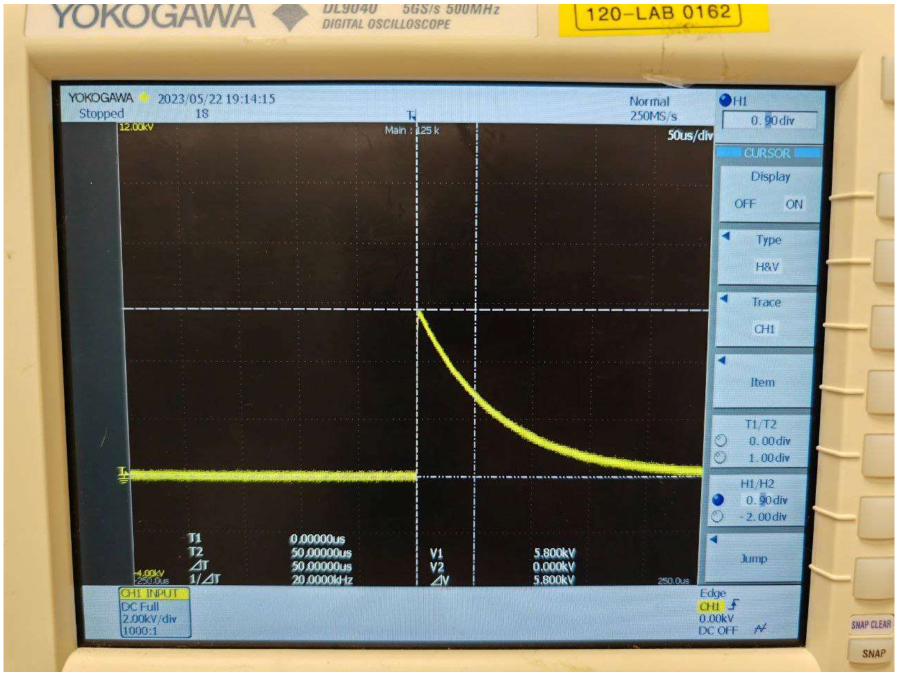


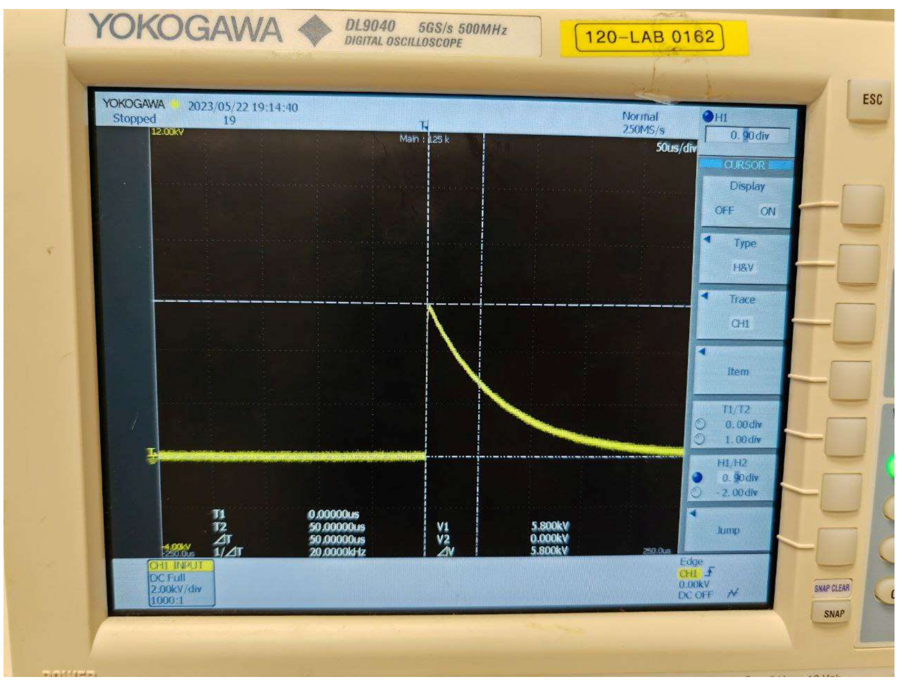
IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result



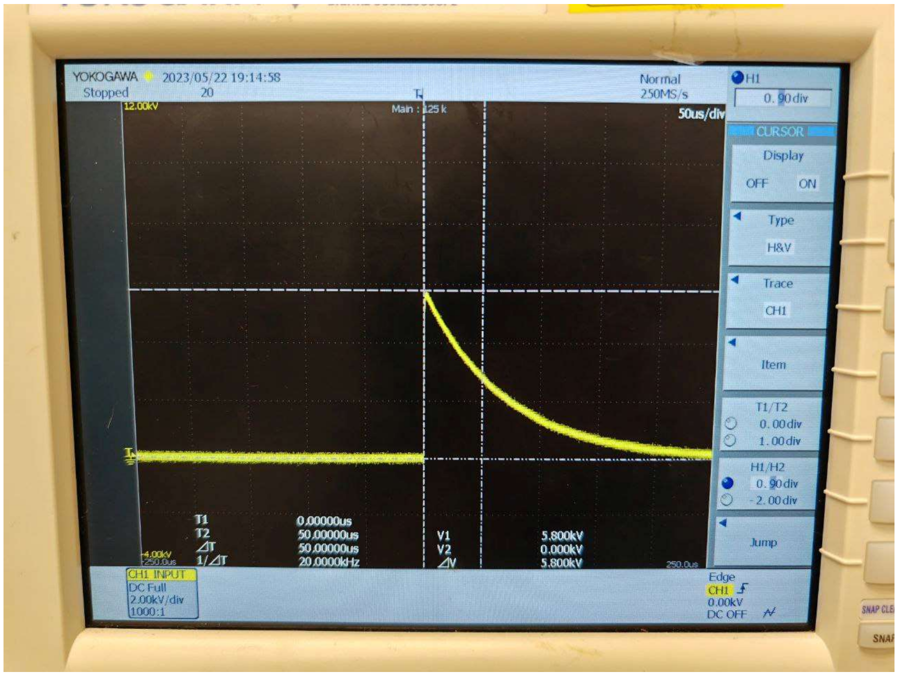


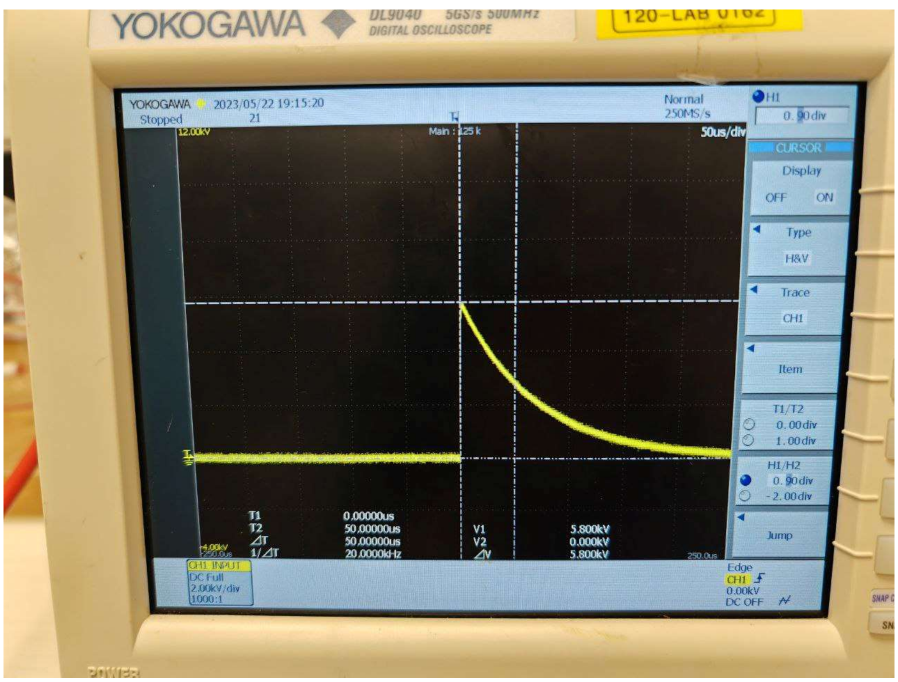
IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result





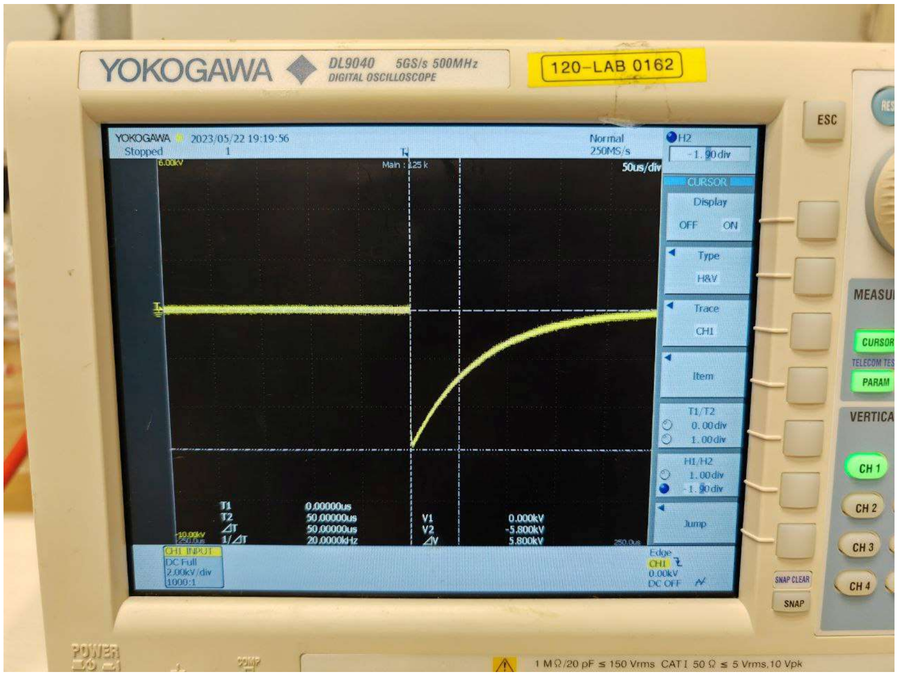
IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

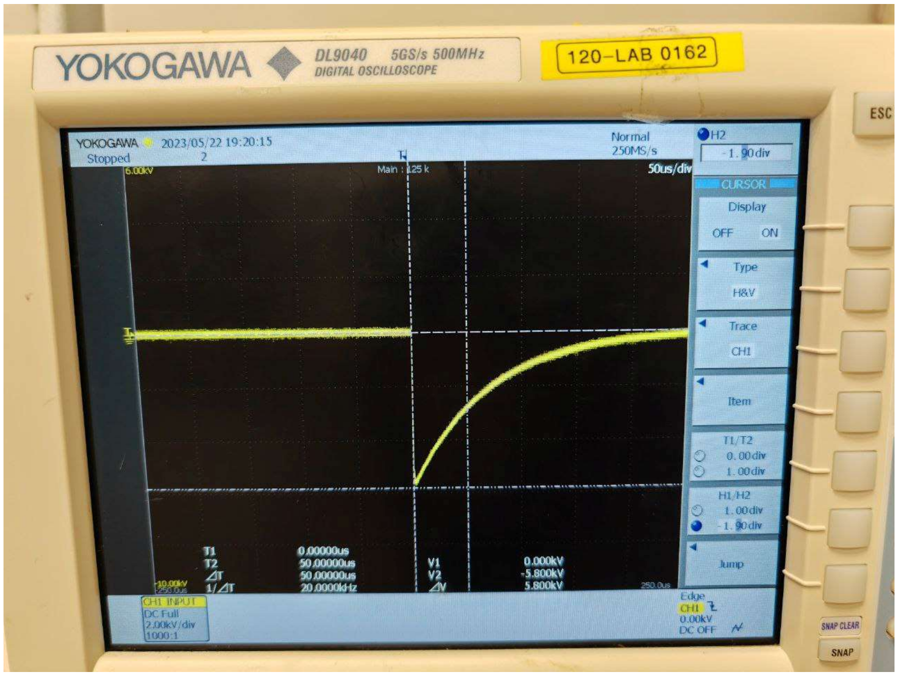




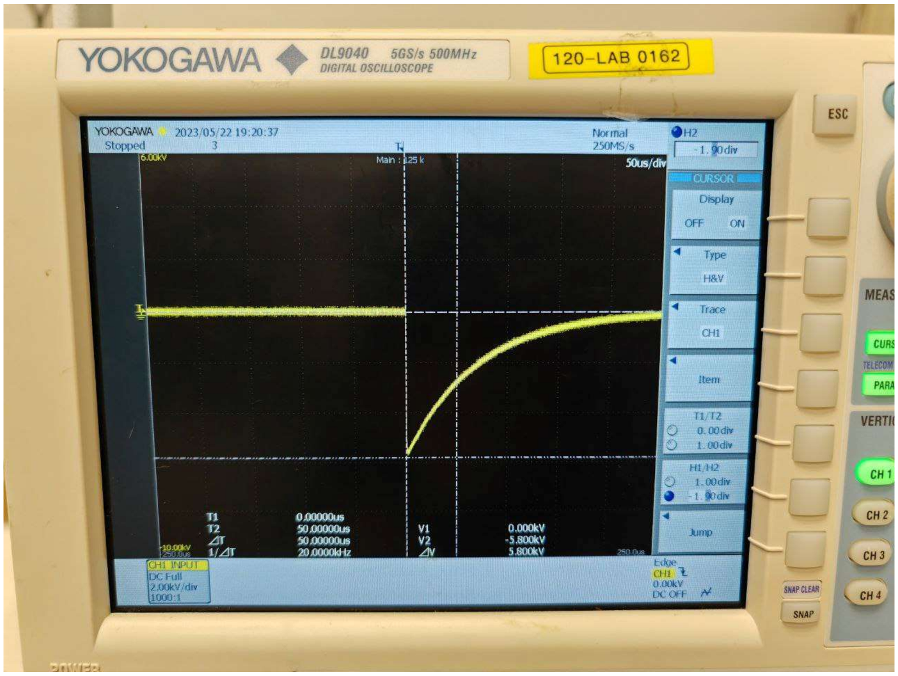
IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

(AOT TO GRD -VE)

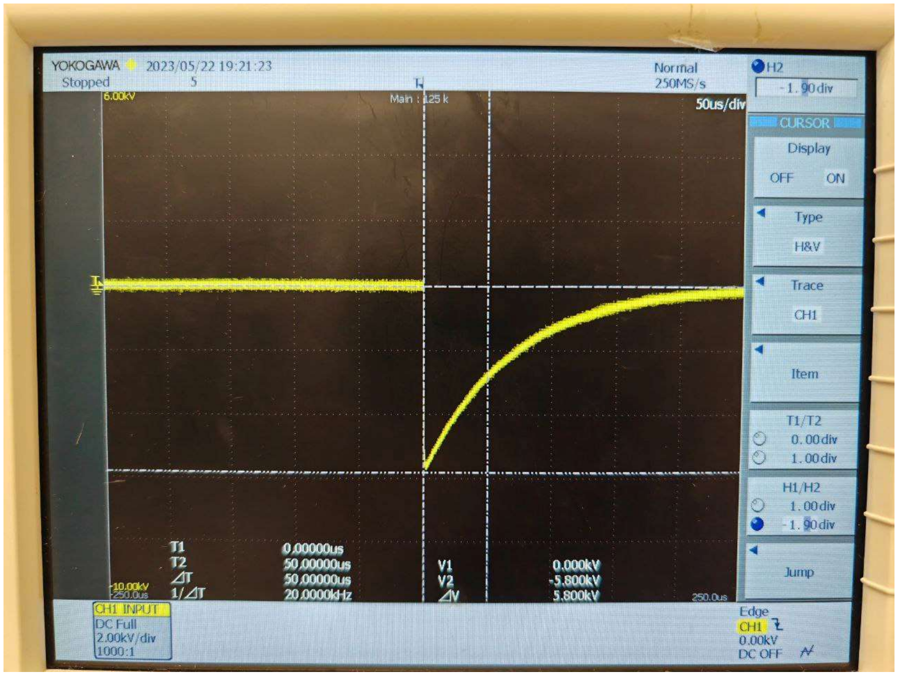




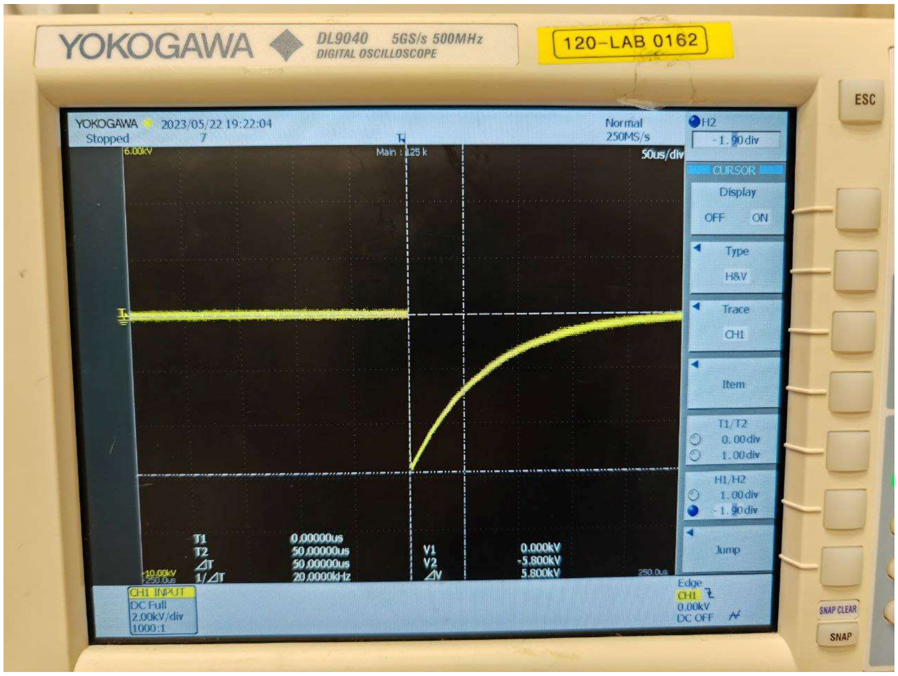
IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

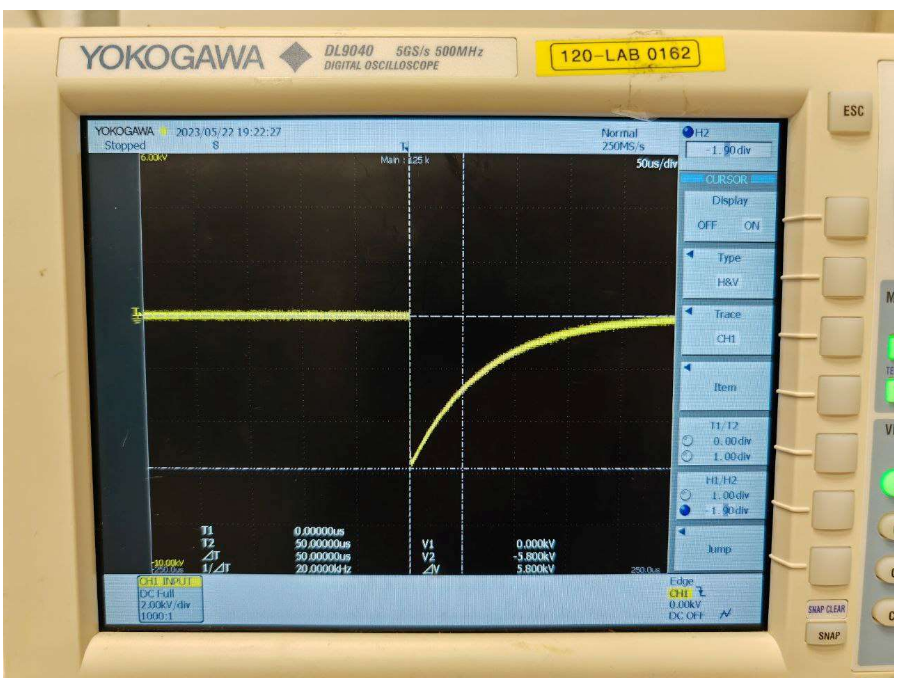


IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result



IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result





IEC AS 62052-11			
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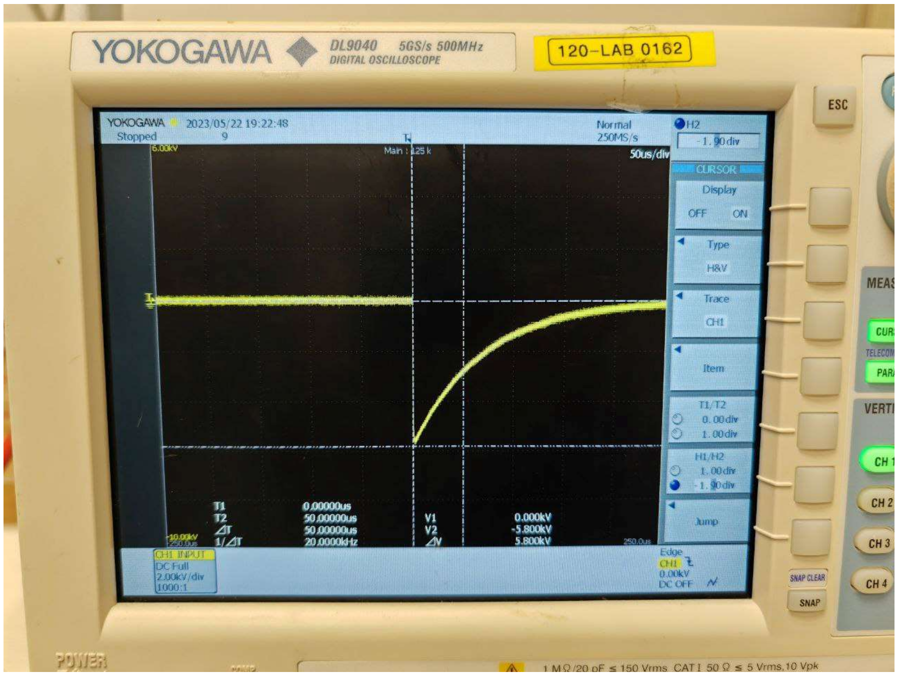
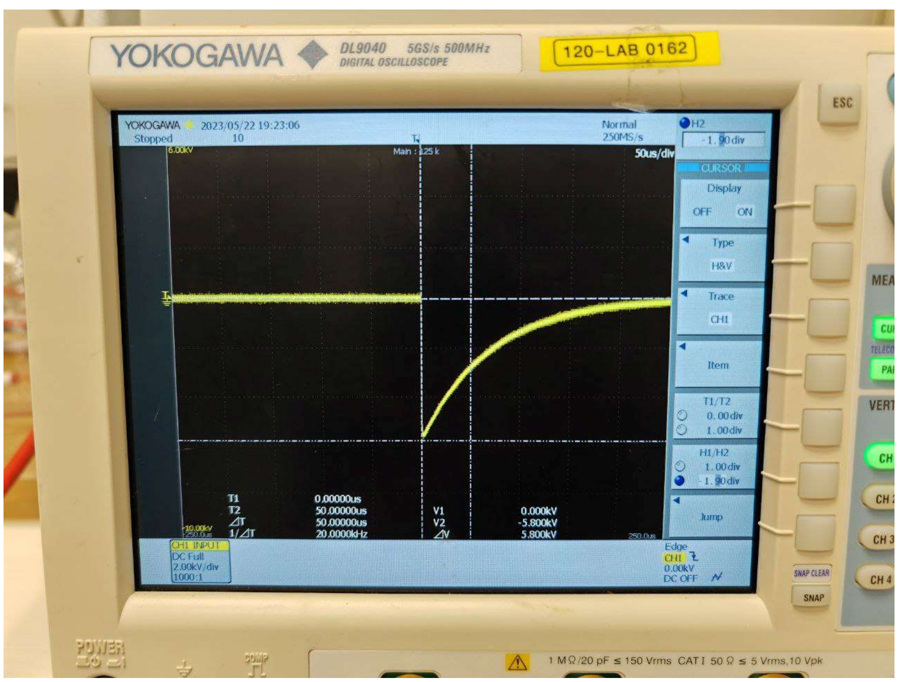
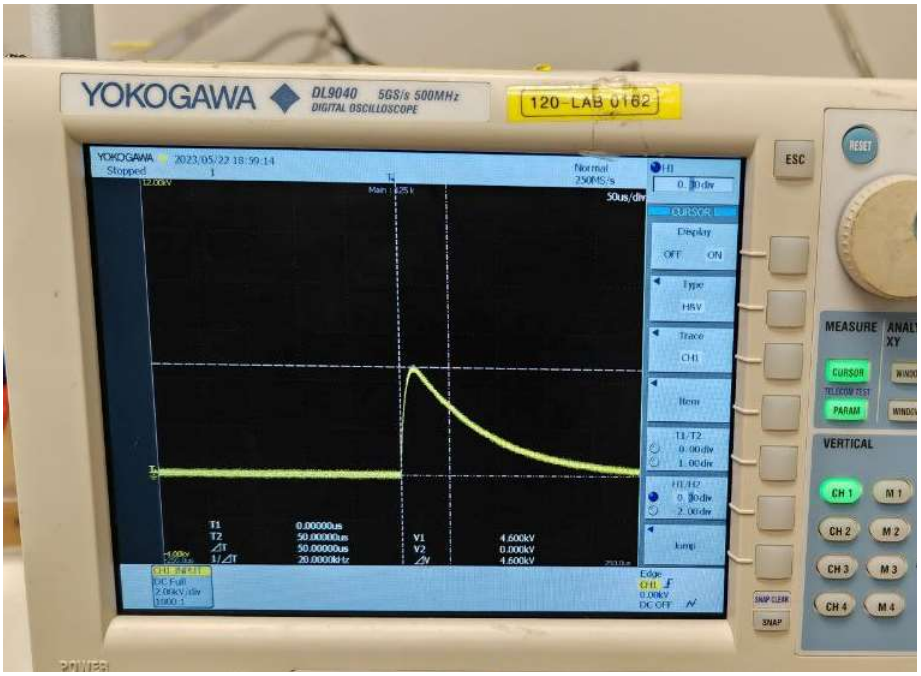
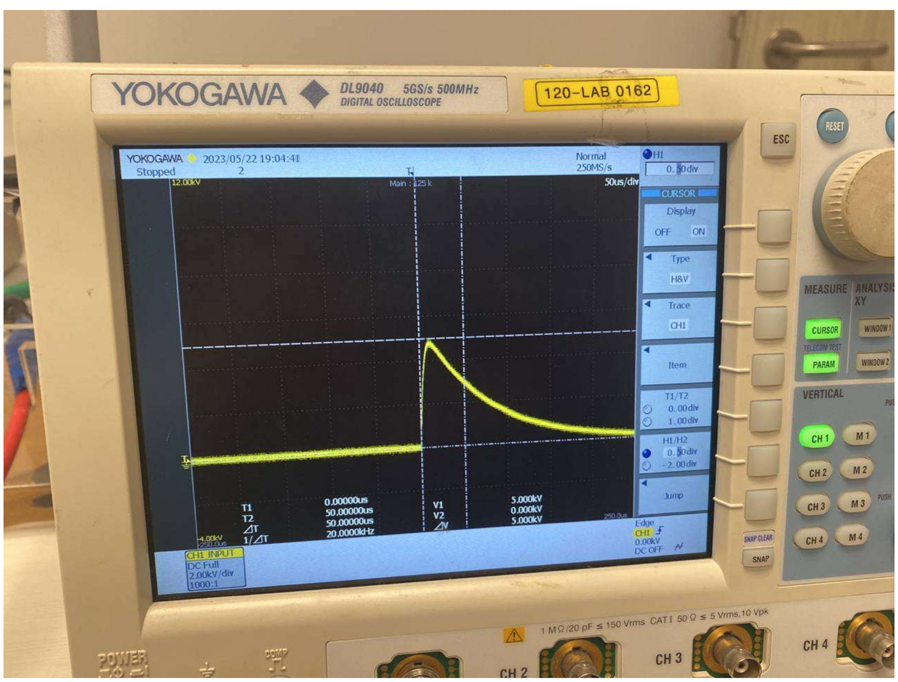




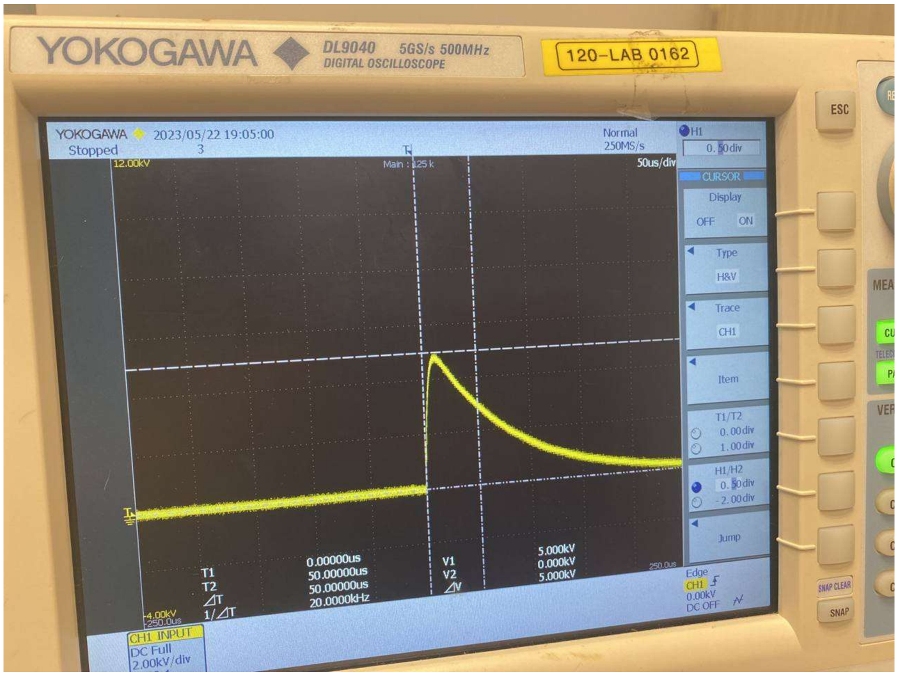
IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

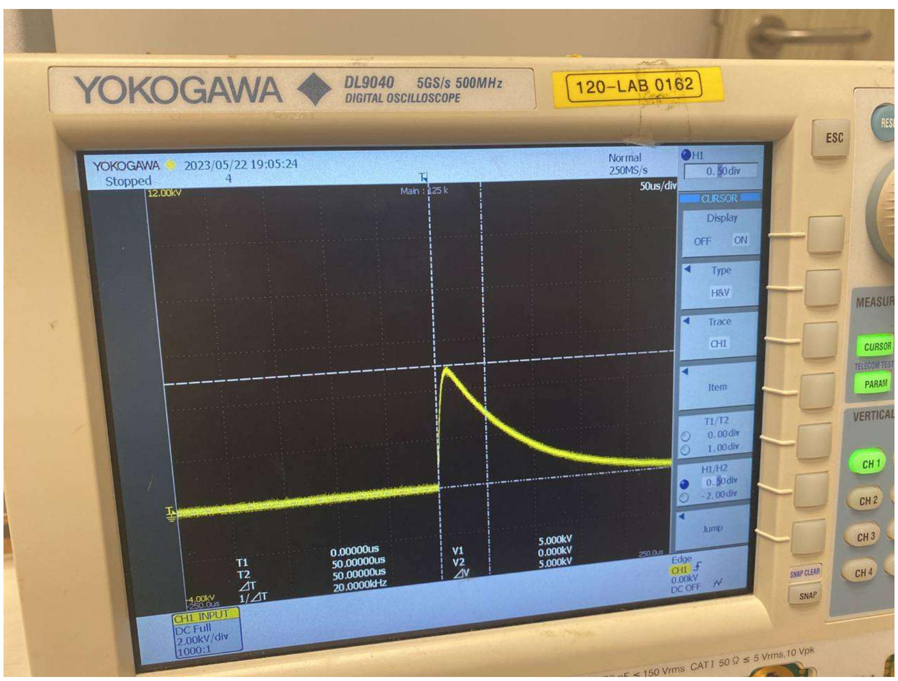
(L1 to AOT +ve)



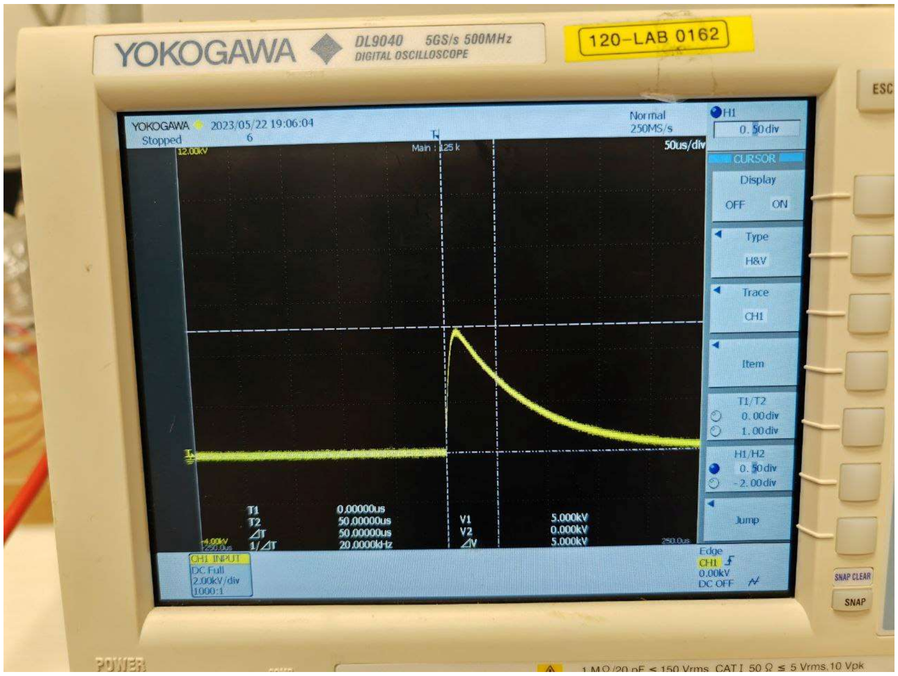


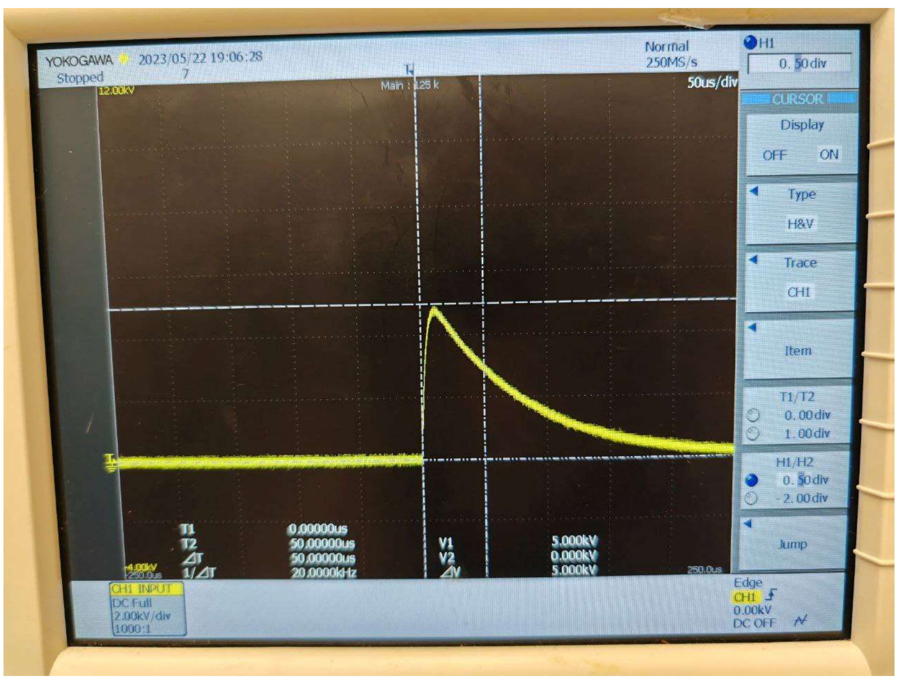
IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result



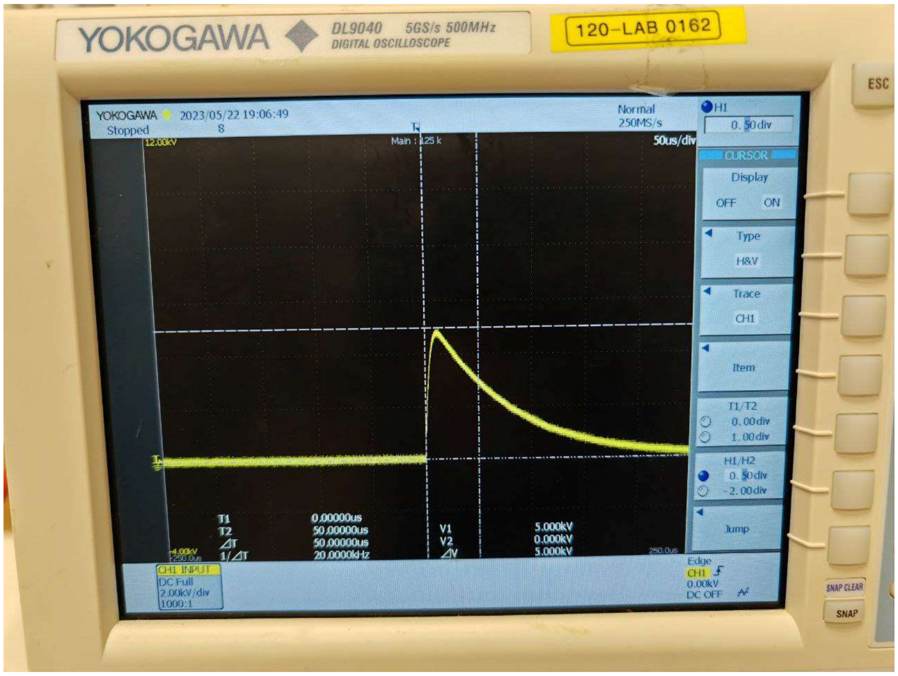


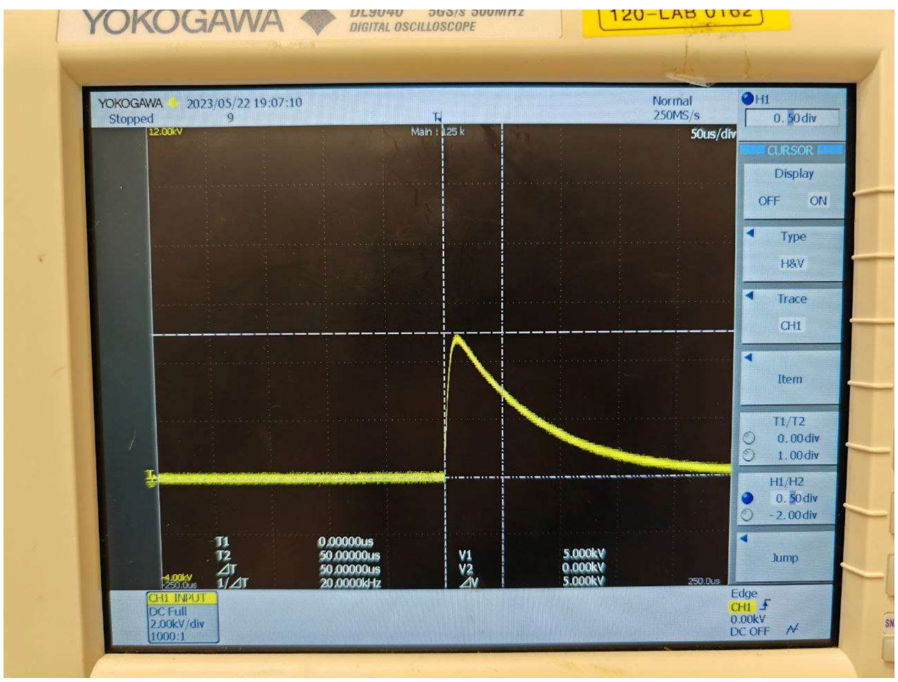
IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result



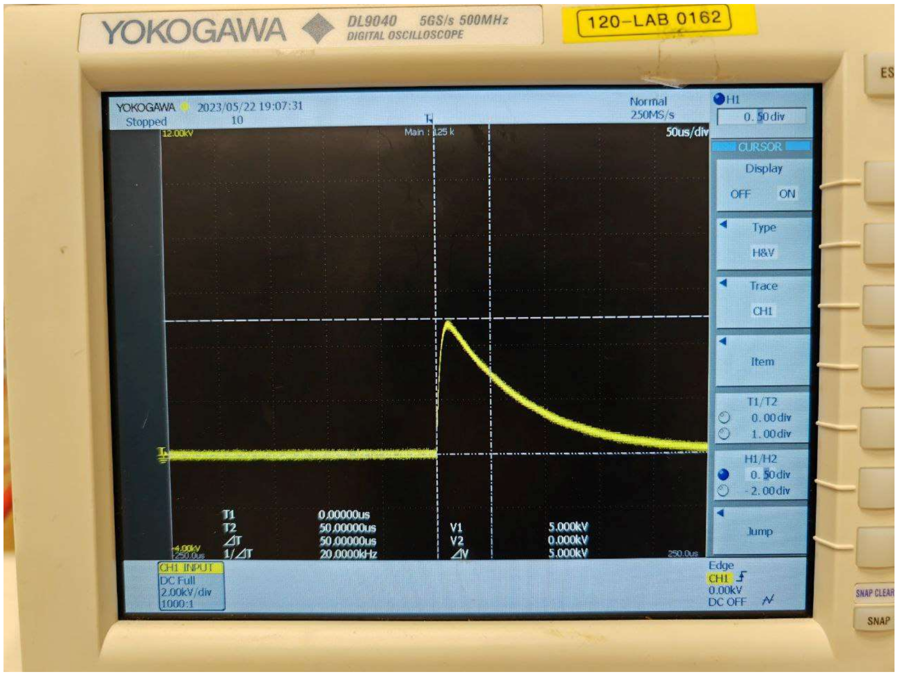


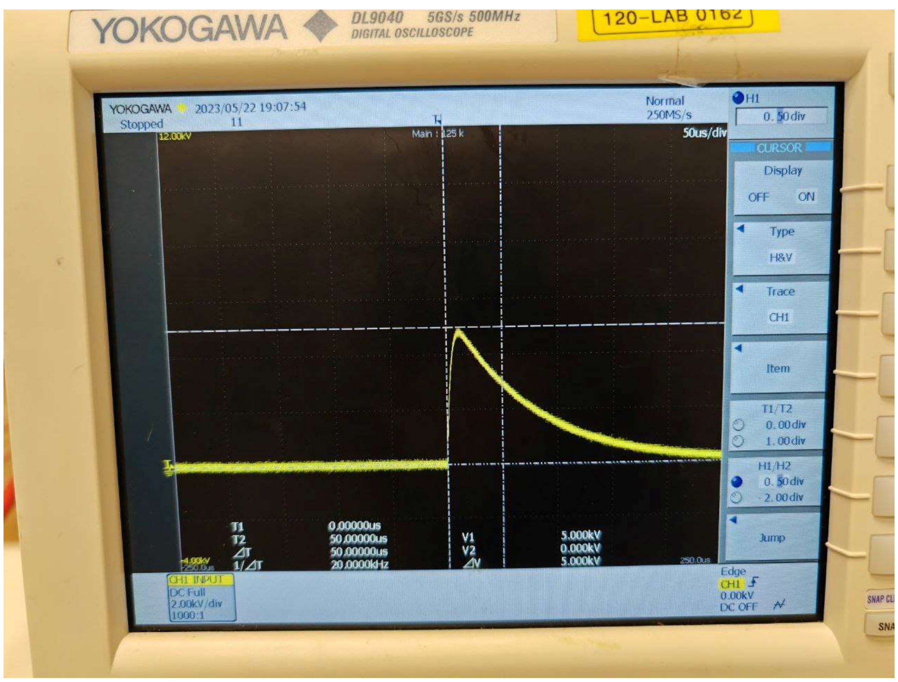
IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result





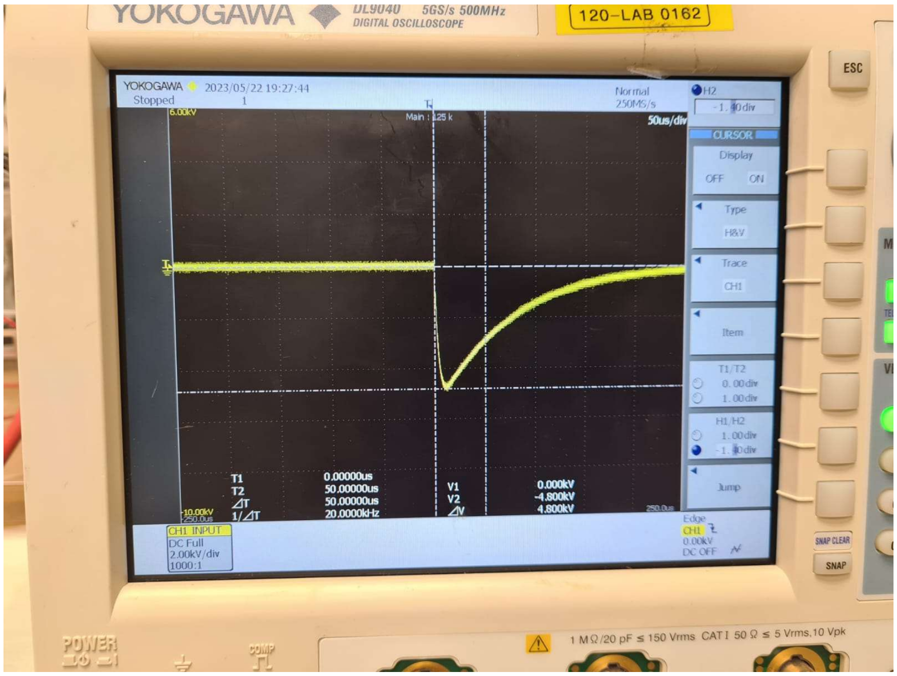
IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

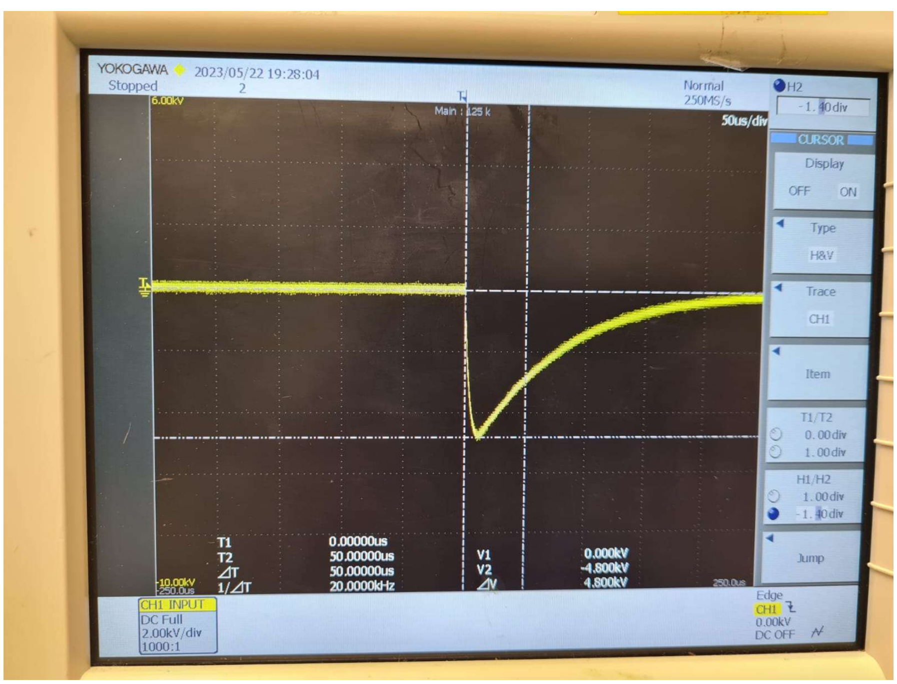




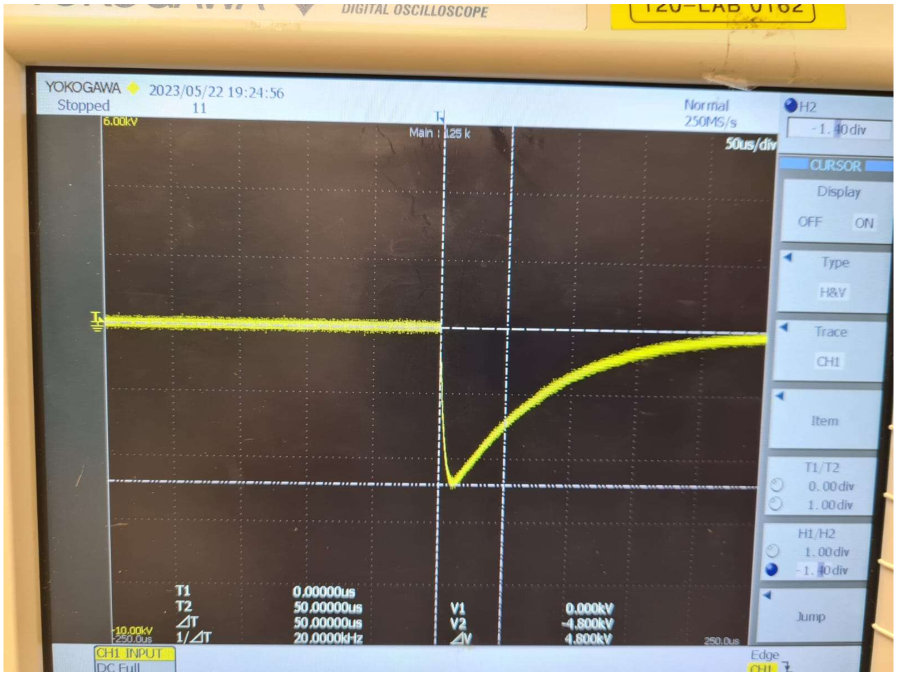
IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

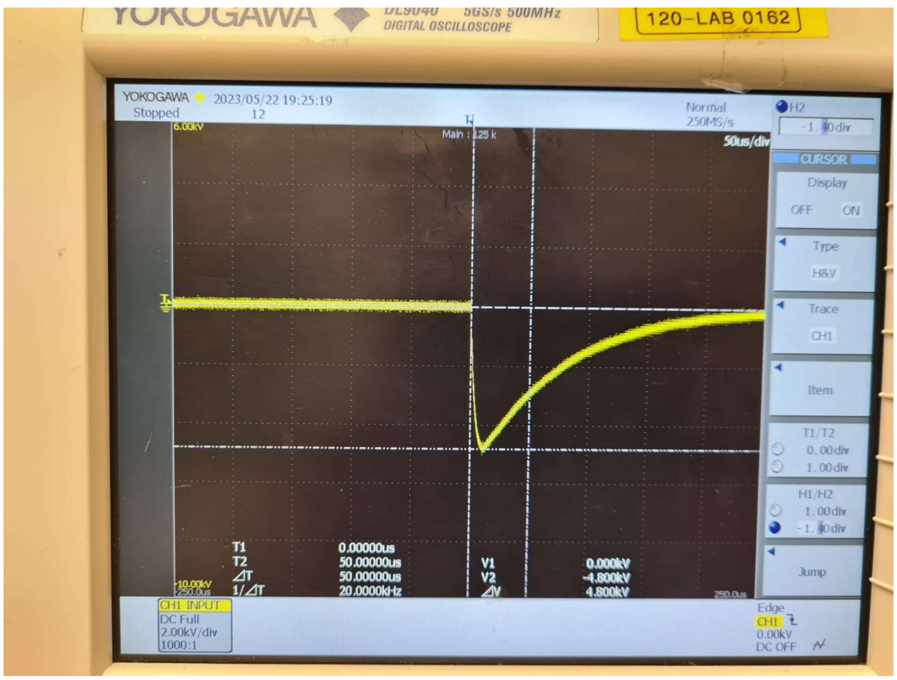
(L1 to AOT -ve)



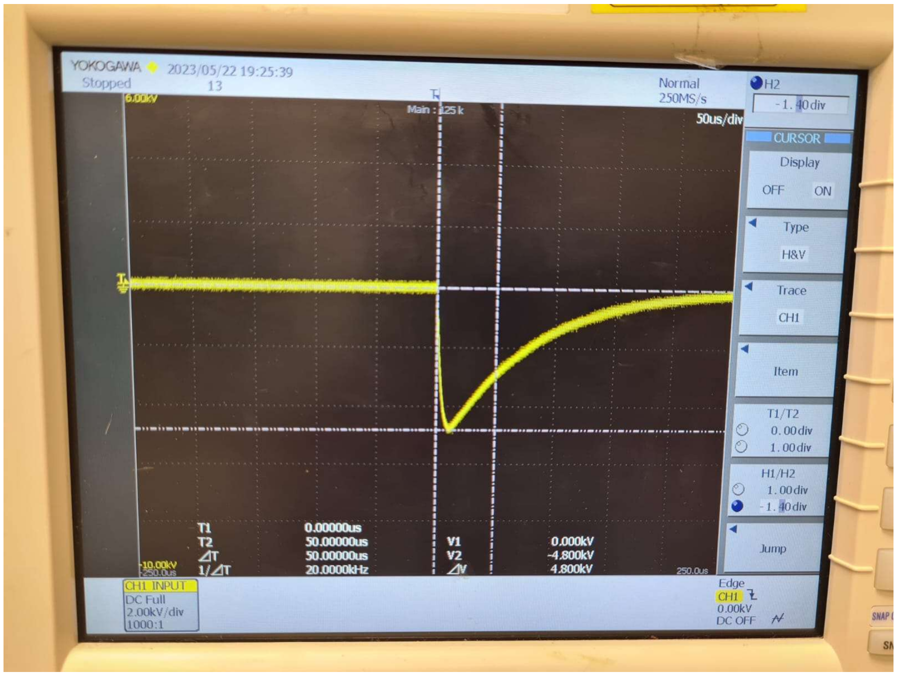


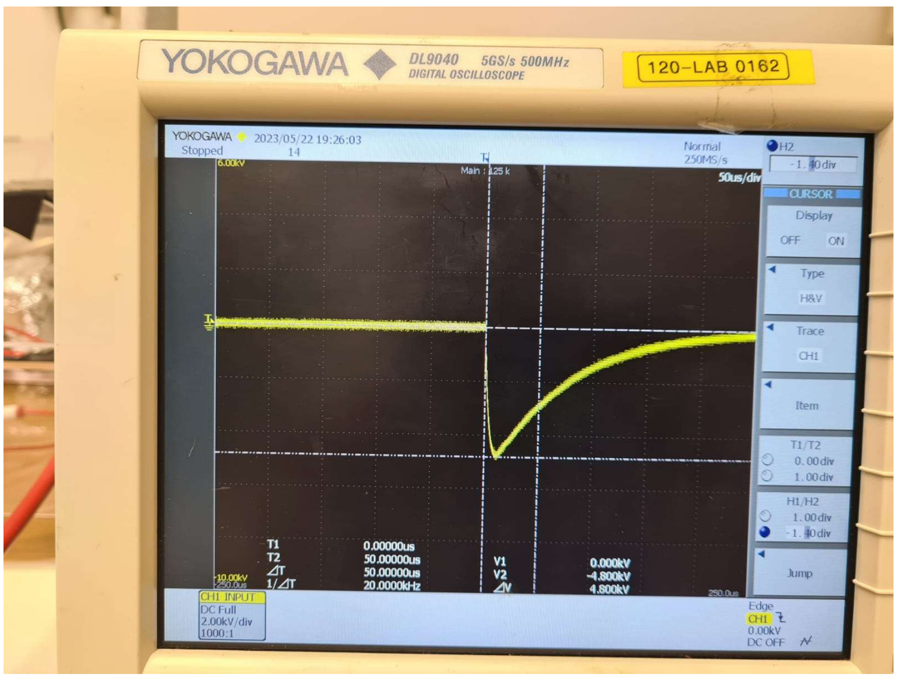
IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result



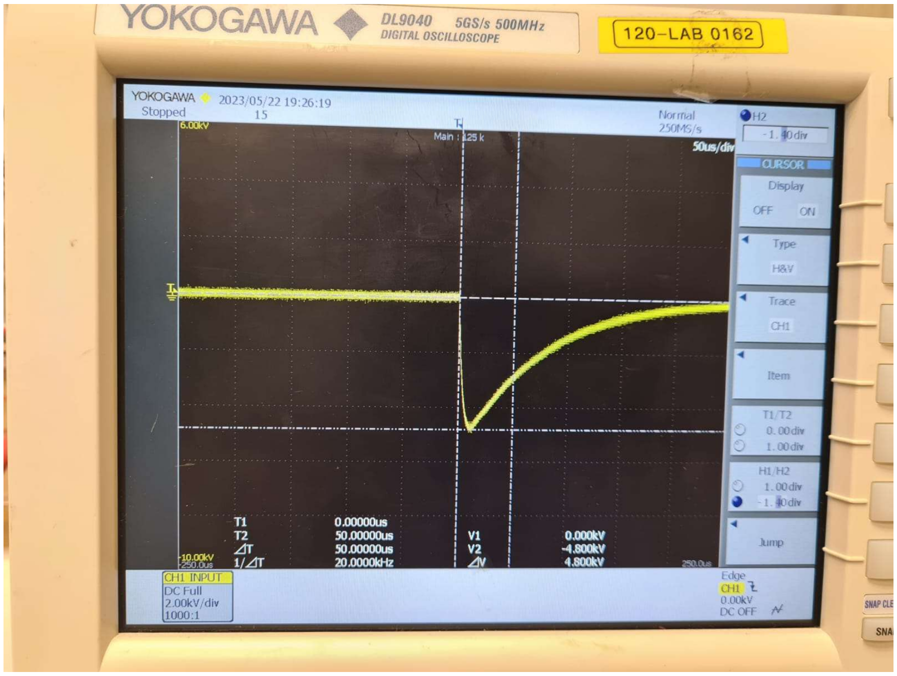


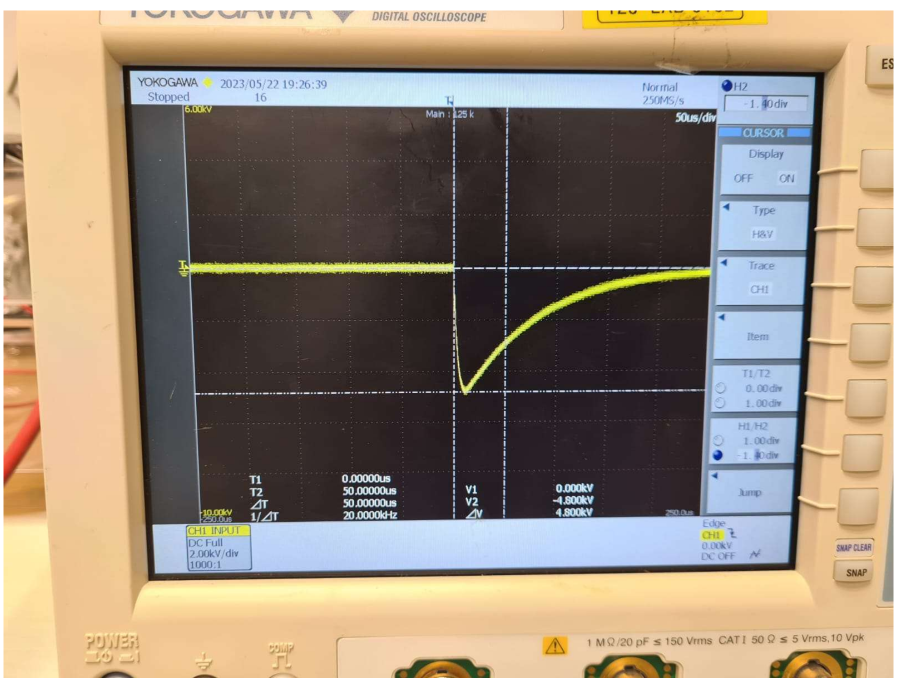
IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result



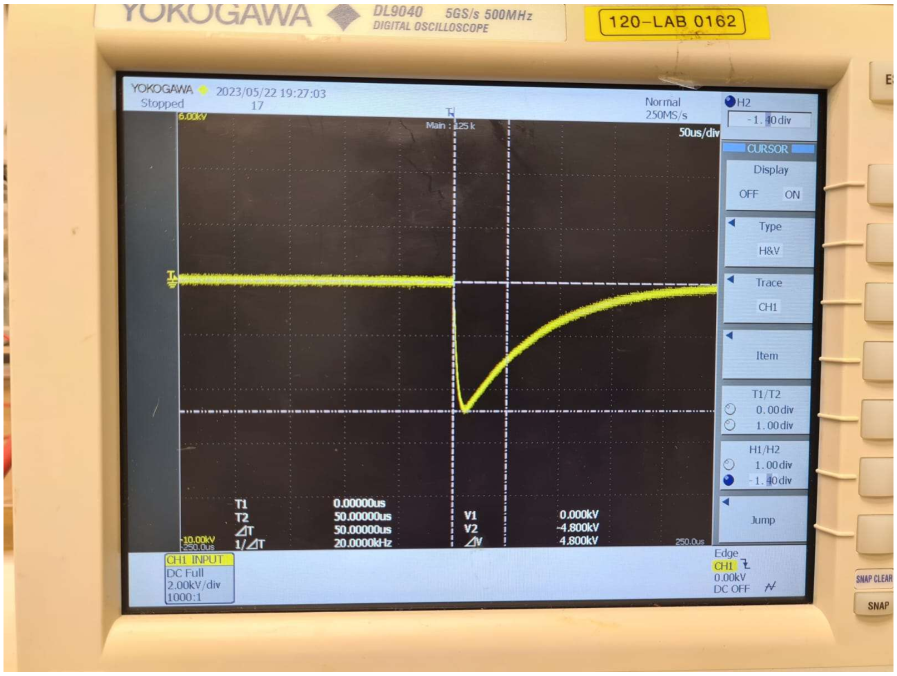


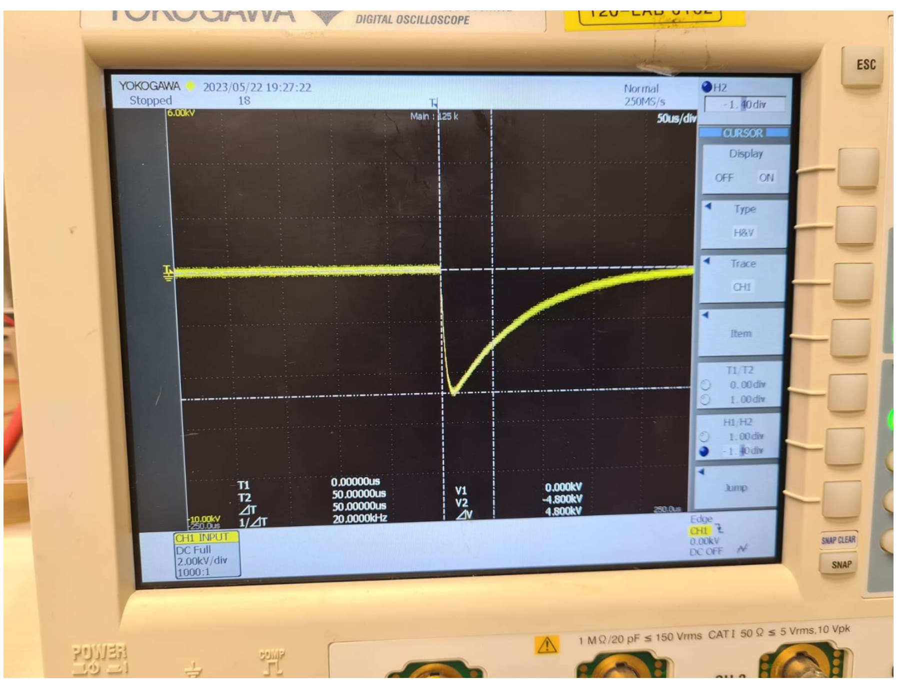
IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result





IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result





IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Insulation tests ambient	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	15 – 25	45 – 75	86 - 106
Actual	21.8	71.8	-

Table 9: AC Voltage (after damp heat cyclic) Test Results

Sample Tested	Test voltage applied between:	Test voltage (V)	Breakdown
SN967	Current, voltage, auxiliary circuits > 40 V and earth	4000	No
	Circuits not intended to be connected together in service	-	-

Table 10: Damp Heat Cyclic Accuracy Results – Active

Meter Serial Number	Test Point	Phase Angle	Pre Test % Error	Post Test % Error	Limit Class 1	Pass/Fail Class 1
SN967	Ib	1	0.04	-0.11	1	P

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20
Temperature, Humidity and Pressure recorder	139452	OMEGA	iBTHX-W	2023-01-11	2024-01-10
Impulse Generator	67018	EMC PARTNER	MIG 1803	2023-02-22	2024-02-22
Electrical Safety Analyzer	139437	EEC	SE7452	2022-10-11	2023-10-11
ESPEC Temp/Humidity Chamber	1711282	ESPEC	EGNL28-12CWL	2022-12-08	2023-12-08

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Section 6.3.4 Protection against Solar Radiation

NA for Indoor meter

AS 62052.11 Section 6.3.4 PROTECTION Against Solar Radiation

NA for Indoor meter

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 7.1 INFLUENCE OF SUPPLY VOLTAGE

Section 7.1.1 Voltage Range

Table 7 – Voltage range

Specified operating range	From 0,9 to 1,1 U_n
Extended operating range	From 0,8 to 1,15 U_n
Limit range of operation	From 0,0 to 1,15 U_n

NOTE For maximum voltages under earth-fault conditions see 7.4.

Section 7.1.2 Voltage Dips and short interruptions

Criteria

Voltage dips and short interruptions shall not produce a change in the register of more than x units and the test output shall not produce a signal equivalent of more than x units. The value x is derived from the following formula:

$$x = 10^{-6}\, m\, U_n\, I_{max}$$

where:

m *is the number of measuring elements;*

U_n *is the reference voltage in volts;*

I_{max} *is the maximum current in amperes.*

When the voltage is restored, the meter shall not have suffered degradation of its metrological characteristics.

For testing purposes, the register of the electricity meter shall have a resolution of at least 0,01 units.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
100% Interruption 3x	Vairakkannu Vairavan/Lim Mico/Soo Voo Key	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-06-06
100% interruption 1x	Vairakkannu Vairavan/Lim Mico/Soo Voo Key	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-06-06
50% interruption 1min	Vairakkannu Vairavan/Lim Mico/Soo Voo Key	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-06-06

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 - 75	-
Actual	23.7	65.6	-

Test Method

The tests shall be carried out under the following conditions:

voltage and auxiliary circuits energized with reference voltage;

without any current in the current circuits.

a) voltage interruptions of ΔU = 100 %
   - interruption time: 1 s;
   - number of interruptions: 3;
   - restoring time between interruptions: 50 ms. See also Annex 8, Figure 8.1.

b) voltage interruptions of ΔU = 100 %
   - interruption time: one cycle at rated frequency;
   - number of interruptions: 1. See also Annex 8, Figure 8.2.

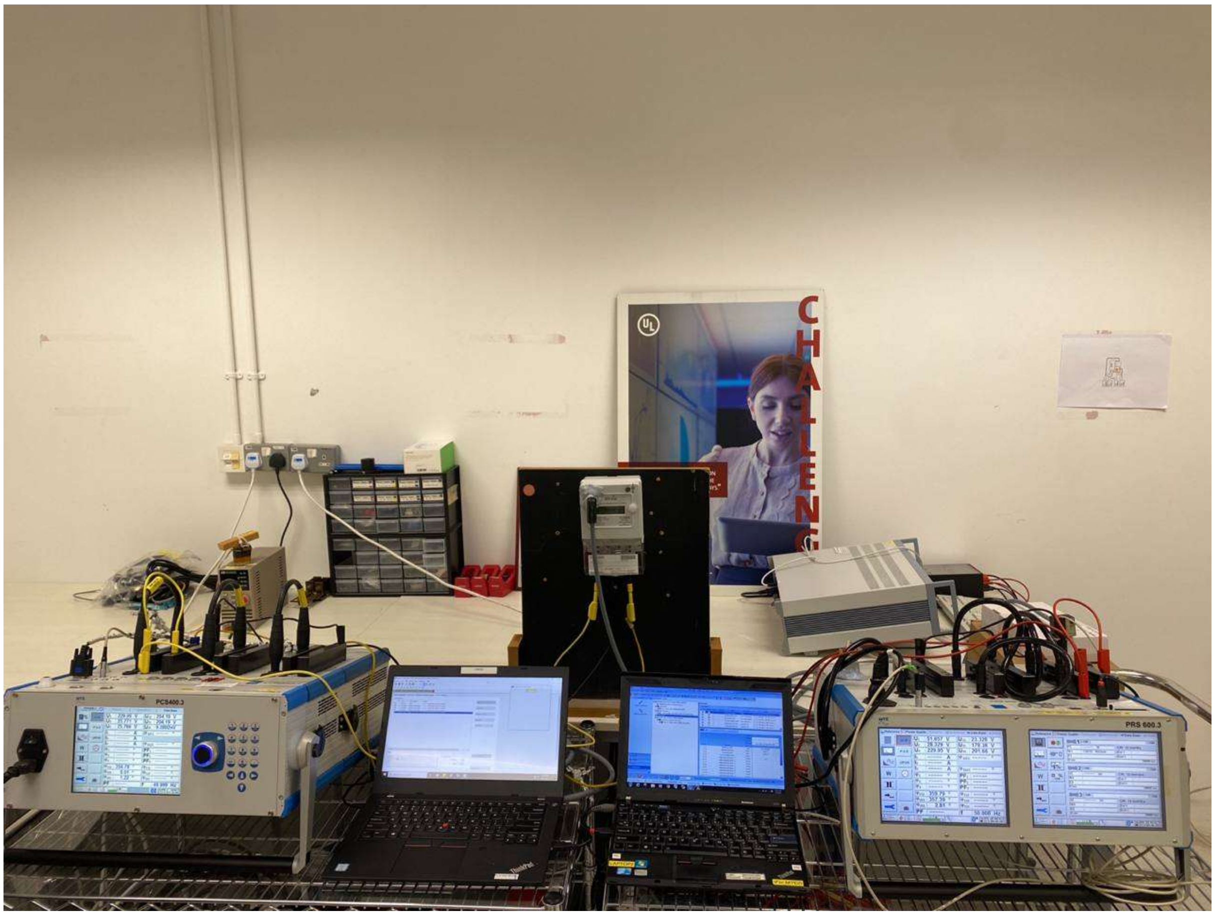
c) voltage dips of ΔU = 50 %
   - dip time: 1 min;
   - number of dips: 1. See also Annex 8, Figure 8.3.

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11 Section 7.1.2 Voltage dips and short interruptions.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Figure 13: Voltage dips and short interruptions Test Setup



IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Table 11: Voltage dips and short interruptions Test Results

Point of application	%Ut	%Reduction	Duration (s)	Period (Cycles)	Applications	Results*
Mains	0%	100%	1	-	3	1
Mains	0%	100%	-	0.5	1	1
Mains	50%	50%	60	-	1	1

*Results Descriptions:

X - Not Performed.

1 – Compliant - No observed response from EUT.

Table 12: Voltage dips and short interruptions Register Results

Meter Serial Number	Test Point	Initial Reading	Post Test Reading	Change	Limit	Pass/Fail
SN985	Register kWh	10.126	10.126	0	0.023	P
	Pulse	0	0	0	23	P

Table 13: Voltage dips and short interruptions Accuracy Results - Active

Meter Serial Number	Test Point	PF	Pre Test % Error	Post Test % Error	Limit Class 1	Pass/Fail Class 1
SN985	Ib	1	-0.10	-0.10	1	P

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Test System	159508	EMH	PRS 600.3	2022-11-29	2023-11-29
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20
Temperature, Humidity and Pressure recorder	139452	OMEGA	iBTHX-W	2023-01-11	2024-01-10

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 7.2 HEATING

Criteria

Under rated operating conditions, electrical circuits and insulation shall not reach a temperature which might adversely affect the operation of the meter.

See IEC 62052-31 Clause 10

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Temperature Rise	Chris Ashby / Jackson Daniel	UL LLC, 12 Laboratory Drive RTP, NC 27709	2023-08-23

Test Method

With each current circuit of the meter carrying rated maximum current and with each voltage circuit (and with those auxiliary voltage circuits which are energized for periods of longer duration than their thermal time constants) carrying 1,15 times the reference voltage, the temperature rise of the external surface shall not exceed 25 K, with an ambient temperature of 40 °C.

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11 Section 7.2 Temperature Rise.

Note: This test results referred to R4790778107 _IEC_AS_SAFETY report from UL RTP. Report finds in Appendix C

Note*: AS 62052-31 Annex ZZ Iovl 128A tests has been omitted by customer's

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 7.3 INSULATION

The meter and its incorporated auxiliary devices, if any, shall be such that they retain adequate dielectric qualities under normal conditions of use, taking into account the effects of the climatic environment and different voltages to which they are subjected under normal conditions of use.

The meter shall meet the requirements and shall pass the tests specified in IEC 62052-31:2015, 6.7, 6.8, and 6.10.

Section 7.3.2 Impulse Voltage Test

Criteria

The test shall be carried out under the following conditions:

impulse waveform: 1,2/50 impulse specified in IEC 60060-1;

voltage rise time: ±30 %;

voltage fall time: ±20 %;

source impedance: 500 Ω ± 50 Ω;

source energy: 0,5 J ± 0,05 J;

test voltage: in accordance with Table 3a or 3 b;

test voltage tolerance: +0 − 10 %.

For each test, the impulse voltage is applied ten times with one polarity and then repeated with the other polarity. The minimum time between the impulses shall be 3 s.

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

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Impulse Voltage	Chris Ashby / Jackson Daniel	UL LLC, 12 Laboratory Drive RTP, NC 27709	2023-08-08

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Method

7.3.2.1 Impulse voltage tests for circuits and between the circuits

The test shall be made independently on each circuit (or assembly of circuits) which is insulated from the other circuits of the meter in normal use. The terminals of the circuits which are not subjected to impulse voltage shall be connected to earth.

Thus, when the voltage and the current circuits of a measuring element are connected together in normal use, the test shall be made on the whole. The other end of the voltage circuit shall be connected to earth and the impulse voltage shall be applied between the terminal of the current circuit and earth. When several voltage circuits of a meter have a common point, this point shall be connected to earth and the impulse voltage successively applied between each of the free ends of the connections (or the current circuit connected to it) and earth. The other terminal of this current circuit shall be open.

When the voltage and the current circuits of the same measuring element are separated and appropriately insulated in normal use (for example each circuit connected to measuring transformer), the test shall be made separately on each circuit.

During the test of a current circuit, the terminals of the other circuits shall be connected to earth and the impulse voltage shall be applied between one of the terminals of the current circuit and earth. During the test of a voltage circuit, the terminals of the other circuits and one of the terminals of the voltage circuit under test shall be connected to earth and the impulse voltage shall be applied between the other terminal of the voltage circuit and earth.

The auxiliary circuits intended to be connected either directly to the mains or to the same voltage transformers as the meter circuits, and with a reference voltage over 40 V, shall be subjected to the impulse voltage test in the same conditions as those already given for voltage circuits. The other auxiliary circuits shall not be tested.

7.3.2.2 Impulse voltage test of electric circuits relative to earth

All the terminals of the electric circuits of the meter, including those of the auxiliary circuits with a reference voltage over 40 V, shall be connected together.

The auxiliary circuits with a reference voltage below or equal to 40 V shall be connected to earth. The impulse voltage shall be applied between all the electric circuits and earth. During this test no flashover, disruptive discharge or puncture shall occur.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	15 – 25	45 – 75	86 - 106
Actual	24.5	49.5	99.7

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11 Section 7.3.2 Impulse voltage test.

Note: This test results referred to R4790778107 _IEC_AS_SAFETY report from UL RTP. Report finds in Appendix C

Note*: AS 62052-31 clause 6.10.6 SCS switch tests has been omitted by customer's

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IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 7.3.3 AC VOLTAGE TEST

Criteria

See relevant standard for particular requirements.

See IEC 62053-21 7.4 for result.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 7.4 IMMUNITY TO EARTH FAULT

NA for DC meter

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 7.5.2 TEST OF IMMUNITY TO ELECTROSTATIC DISCHARGE

Criteria

The test shall be carried out according to AS/NZS 61000.4.2, under the following conditions:

- *tested as table-top equipment;*
- *meter in operating condition:*
- *voltage and auxiliary circuits energized with reference voltage;*
- *without any current in the current circuits (open circuit);*
- • *contact discharge;*
- *test voltage: 8 kV;*
- *number of discharges: 10 (in the most sensitive polarity)*

If contact discharge is not applicable because no metallic parts are outside, then apply air discharge with a 15 kV test voltage.

The application of the electrostatic discharge 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: see 7.1.2

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

Date and Location

Testing Performed	Test Operator	Location	Date(s)
ESD	Lim Mico/Soo Voo Key/Ilyasa	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-06-08

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Method

1. Verify the meter at I_n or I_b.
2. Conduct the test according to AS/NZS 61000.4.2, as modified by IEC 62052-11.
3. During testing monitor the meter's register and pulse output recording initial values before testing and final values after testing.
4. Immediately following the ESD testing, the meter's register values shall be recorded, and then verify the meter at I_b or I_n.

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	15 – 35	30 - 60	86 - 106
Actual	19	57	100.6

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11, Section 7.5.2 Immunity to electrostatic discharges.

Figure 14: Immunity to Electrostatic Discharges Test Setup

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Table 15: Immunity to Electrostatic Discharges Detailed Test Results

Serial Number	Application Location	Level (kV)	+ Polarity	- Polarity
SN934	VCP	8	1	1
	HCP	8	1	1
	Front of meter**	15	1	1
	Top of Meter	15	1	1
	Bottom of Meter	15	1	1
	Left side of Meter	15	1	1
	Right side of Meter	15	1	1
	Front buttons of meter	15	1	1
	Front optical port	8	1	1

* Note: 1 – Compliant - No perceived discharge, no observed response from EUT.
2 – Compliant - Discharge observed, no observed response from EUT.
X – Condition not performed nor required.

** Including button and LCD

Table 16: Immunity to Electrostatic Discharges Register Results - Active

Meter Serial Number	Test Point	Initial Reading	Post Test Reading	Change	Limit	Pass/Fail
SN934	Register	21.764	21.764	0	0.023	P
	Pulse	0	0	0	23	P

Table 17: Immunity to Electrostatic Discharges Accuracy Results - Active

Meter Serial Number	Test Point	Phase Angle	Pre Test % Error	Post Test % Error	Limit Class 1	Pass/Fail Class 1
SN934	Ib	1	-0.11	-0.16	1	P

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Lab					
Meter Test System	159508	EMH	PRS 600.3	2022-11-29	2023-11-29
Measuring Tape	139441	BLUE-POINT	-	2020-09-29	2023-09-29
EMC Lab					
ESD Generator	3000C02773	Noiseken	ESS-2000	2022-12-29	2023-12-29
ESD Gun	ESS06Y66343	Noiseken	ESS-2000	2022-12-29	2023-12-29
Temperature and Humidity meter	172447	USA	Omega	2022-06-28	2023-06-28

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 7.5.3 TEST OF IMMUNITY TO ELECTROMAGNETIC RF FIELDS

Radiated Immunity at 10V/m

Criteria

The test shall be carried out according to AS/NZS 61000.4.3, under the following conditions:

- *tested as table top equipment;*
- *cable length, exposed to the field: 1 m;*
- *frequency band: 80 MHz to 2 400 MHz;*

Note: This aligns with Australianlegal methrology requirements in NMI M 6-1 published by the National Measurement Institute.

- *carrier modulated with 80 % AM at 1 kHz sine wave. Example of test set-up, see Annex E, Figure E.1*

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
RDI (10V/m)	Sherry Wong/Lim Mico/Iman	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-05-18 – 2023-05-23

Test Method (10V/m)

a) Test with current

- meter in operating condition:
  . voltage and auxiliary circuits energized with reference voltage;
  . basic current I_b resp. rated current I_n, and cosφ resp. sinφ according to the value given in the relevant standard.
- unmodulated test field strength: 10 V/m.

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

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11 Section 7.5.3 Test of immunity to electromagnetic RF fields.

Figure 15:Immunity to electromagnetic RF fields Test Setup (10V/m) 80MHz-1GHz

Figure 16: Immunity to electromagnetic RF fields Test Setup (10V/m) 1-2.4GHz

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Table 18: Immunity to electromagnetic RF fields Detailed Test Results – (10V/m) During Testing (Active)

Serial Number	Application Location	Results*			
		80 MHz – 1 GHz		1 GHz – 2.4 GHz	
		Horizontal	Vertical	Horizontal	Vertical
SN967	Front	1	1	1	1
	Left	1	1	1	1
	Right	1	1	1	1
	Back	1	1	1	1

* Note: 1 – Compliant, no response observed from the EUT.
2 – Non-compliant.

Table 19: Immunity to electromagnetic RF fields (10V/m) Accuracy Variation Results (Active)

Meter Serial Number	Test Location	Test Point	Power Factor	% Error	Δ from Reference	Limit Class 1	Pass/Fail Class 1
SN967	REF	Ib	1	-0.20	-	-	-
	RDI 10V/M	Ib	1	-0.25	0.05	2	P

Table 20: Immunity to electromagnetic RF fields (10V/m) Accuracy Results (Active)

Meter Serial Number	Test Point	Phase Angle	Pre Test % Error	Post Test % Error	Limit Class 1	Pass/Fail Class 1
SN967	Ib	1	-0.20	-0.23	1	P

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
EMC lab					
EPM-P Series Dual-Channel Power Meter	MY56040009	Keysight	E4417A	2022-09-01	2023-09-01
Signal Generator (10MHz - 27GHz)	839256/0031	Rohde & Schwarz	SMR27	2022-10-04	2023-10-04
Power Sensor	MY62360002	Keysight	E9322A	2022-09-25	2023-09-25
Power Sensor	MY56020009	Keysight	E9322A	2022-08-30	2023-08-30
Power Amplifier (80MHz - 1GHz / 1200W)	1080866	Milmega	80RF1000-1200	Cal not read	Cal not read
Power Amplifier (800MHz - 3GHz / 75W)	5005	Schaffner	CBA9429	Cal not read	Cal not read
Log Periodic Antenna	N/A	Schwarzbeck	VULP-9118E-897	Cal not reqd	Cal not read
Stacked Double Log-Per Antenna	9149-248	Schwarzbeck	STLP 9149	Cal not reqd	Cal not read
Horn Antenna (1GHz – 6GHz)	1019	Schwarzbeck	BBHA9120D	2022-08-27	2023-08-27
Meter Lab					
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20
MEASURING TAPE	139441	BLUE-POINT	-	2020-09-29	2023-09-29
Temperature, Humidity and Pressure recorder	139452	OMEGA	iBTHX-W	2023-01-11	2024-01-10

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Radiated Immunity at 30V/m

Criteria

Test must be done under IEC 62052-11 and AS/NZS 61000.4.3standards.

Test must be done under the following conditions: Frequency interval 80 MHz to 2,000 MHz

a) Electric current circuits without power supply

- *Meter under operating conditions*
- *Electric current circuits open*
- *Field intensity 30 V/m*

This test cannot produce changes in the record more than "X" units and the pulse output cannot produce a signal more than "X" units.

X = 10exp -6 yVn Imax

Where

y: It is the number of meter elements

Vn: It is the nominal meter voltage

Imax: It is the maximum meter electric current

Meter must have a 0.01 resolution units

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
RDI (30V/m)	Vairakkannu, Vairavan/Lim Mico/Sherry Wong/Soo Voo Key	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-06-26

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Method (30V/m)

a) Verify the meter at I_b or I_n.
b) Test without any current
   – meter in operating condition:
      . voltage and auxiliary circuits energized with reference voltage;
      . without any current in the current circuits and the current terminals shall be open circuit.
   – unmodulated test field strength: 30 V/m.
c) The application of the RF field 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.
d) Immediately following the RDI testing, the meter's register values shall be recorded, and then verify the meter at I_b or I_n.

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

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11, Section 7.5.3 RDI (30V/m).

Figure 17: Immunity to electromagnetic RF fields Test Setup (30V/m) 80-1000MHz

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Figure 18: Immunity to electromagnetic RF fields Test Setup (30V/m) 1-2.4GHz

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Table 21: Immunity to electromagnetic RF fields (30V/m) Detailed Test Results

Sample Description	Serial Number	Application Location	Results*			
			80 MHz – 1 GHz		1 GHz – 2.4 GHz	
			Horizontal	Vertical	Horizontal	Vertical
GEN™5 RIVA	SN934	Front	1	1	1	1
		Left	1	1	1	1
		Right	1	1	1	1
		Top	1	1	1	1
		Bottom	1	1	1	1

* Note: 1 – Compliant, no response observed from the EUT.
2 – Non-compliant.

Table 22: Immunity to electromagnetic RF fields (30V/m) Register Results

Sample Description	Serial Number	Register	Initial Value	Post-test Value	|x|	Max allowed Δ	Pass / Fail
GEN™5 RIVA	SN934	Register Reading	1.632	1.632	0.000	0.023	P
		Pulse Output	0	0	0.000	23	

Table 23: Immunity to electromagnetic RF fields (30V/m) Accuracy Results_Active

Meter Serial Number	Test Point	Phase Angle	Pre Test % Error	Post Test % Error	Limit Class 1	Pass/Fail Class 1
SN934	Ib	1	-0.24	-0.09	1	P

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
EMC lab					
EPM-P Series Dual-Channel Power Meter	MY56040009	Keysight	E4417A	2022-09-01	2023-09-01
Signal Generator (10MHz - 27GHz)	839256/0031	Rohde & Schwarz	SMR27	2022-10-04	2023-10-04
Power Sensor	MY62360002	Keysight	E9322A	2022-09-25	2023-09-25
Power Sensor	MY56020009	Keysight	E9322A	2022-08-30	2023-08-30
Power Amplifier (80MHz - 1GHz / 1200W)	1080866	Milmega	80RF1000-1200	Cal not read	Cal not read
Power Amplifier (800MHz - 3GHz / 75W)	5005	Schaffner	CBA9429	Cal not reqd	Cal not reqd
Log Periodic Antenna	N/A	Schwarzbeck	VULP-9118E-897	Cal not reqd	Cal not reqd
Stacked Double Log-Per Antenna	9149-248	Schwarzbeck	STLP 9149	Cal not reqd	Cal not reqd
Horn Antenna (1GHz – 6GHz)	1019	Schwarzbeck	BBHA9120D	2022-08-27	2023-08-27
Meter Lab					
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20
MEASURING TAPE	139441	BLUE-POINT	-	2020-09-29	2023-09-29
Temperature, Humidity and Pressure recorder	139452	OMEGA	iBTHX-W	2023-01-11	2024-01-10

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 7.5.4 FAST TRANSIENT BURST TEST

Criteria

The test shall be carried out according to IEC 61000-4-4, under the following conditions:

- *tested as table-top equipment;*
- *meter in operating condition:*

During the test, a temporary degradation or loss of function or performance is acceptable, nevertheless the variation of the error shall be within the limits as specified in the relevant standard.

For examples of the test set-up, see Annex E, Figures E.2 and E.3

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Fast Transient Burst	Vairakkannu Vairavan / Lim Mico / Sherry Wong	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-05-18

Test Method

voltage and auxiliary circuits energized with reference voltage;

with basic current I_b resp. rated current I_n, and cosφ resp. sinφ according to the value given in the relevant standard;

- cable length between coupling device and EUT: 1 m;
- the test voltage shall be applied in common mode (line to earth) to:

the voltage circuits;

the current circuits, if separated from the voltage circuits in normal operation;

the auxiliary circuits, if separated from the voltage circuits in normal operation;

- test voltage on the current and voltage circuit: 4 kV;
- test voltage on the auxiliary circuits with a reference voltage over 40 V: 2 kV;
- duration of the test: 60 s at each polarity.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

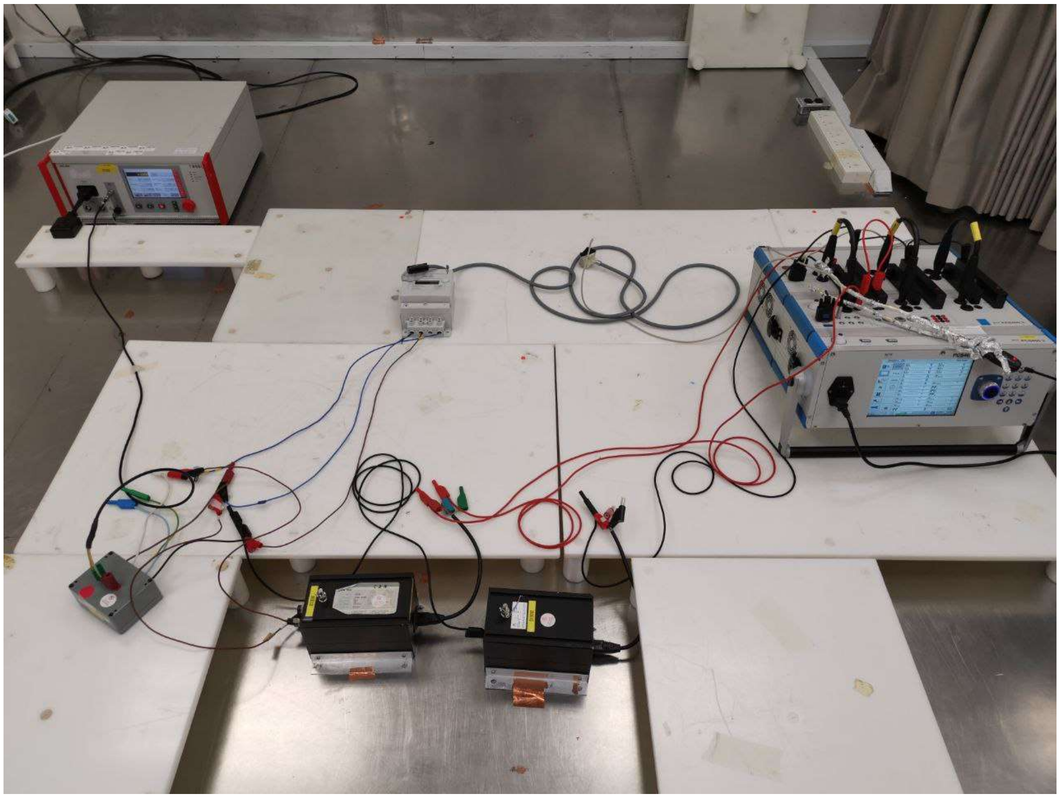
NOTE The accuracy may be determined by the registration method or other suitable means.

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 - 75	-
Actual	22	51	-

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11 Section 7.5.4 Fast Transient Burst test.

Figure 19: Fast Transient Burst Test Setup



IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Table 24: Fast Transient Burst Test Results (Active)

Serial Number	Application Location	Level (kV)	Results*
SN934	Mains	4	1

* Note: 1 – Compliant, no response observed from the EUT.
2 – Non-compliant, EUT exceeds variation of error limits. See below table for accuracy results.
X – Condition not performed nor required.

Table 25: Fast Transient Bursts Detailed Test Results – (During Testing) Active

Meter Serial Number	Test Location	Test Point	Phase Angle	% Error	Δ from Reference	Limit Class 1	Pass/Fail Class 1
SN934	REF	Ib	1	-0.25	-	-	-
		Ib	1	-0.27	0.02	4	P

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Lab					
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20
Measuring Tape	139441	BLUE-POINT	-	2020-09-29	2023-09-29
EMC Lab					
EFT GENERATOR	2200	TESEQ	NSG 3040	2022-08-23	2023-08-23
CDN	0900-14	EMTEST	CDN M3	CAL NO REQD	CAL NO REQD
CDN	9810155C	EMTEST	CDN - M3	CAL NO REQD	CAL NO REQD

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

62052-11 SECTION 7.5.5 TEST OF IMMUNITY TO CONDUCTED DISTURBANCES, INDUCED BY RADIO-FREQUENCY FIELDS

Criteria

The test shall be carried out according to IEC 61000-4-6, under the following conditions:

- *tested as table-top equipment;*
- *meter in operating condition:*

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.

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Conducted Disturbance	Vairakkannu Vairavan / Lim Mico / Sherry Wong	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-05-18

Test Method

voltage and auxiliary circuits energized with reference voltage;

with basic current I_b resp. rated current I_n and cosφ resp. sinφ according to the value given in the relevant standard;

- frequency range: 150 kHz to 80 MHz;
- voltage level: 10 V.

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 - 75	-
Actual	21	53	-

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11 Section 7.5.5 Immunity to conducted disturbances.

Figure 20: Immunity to conducted disturbances Test Setup

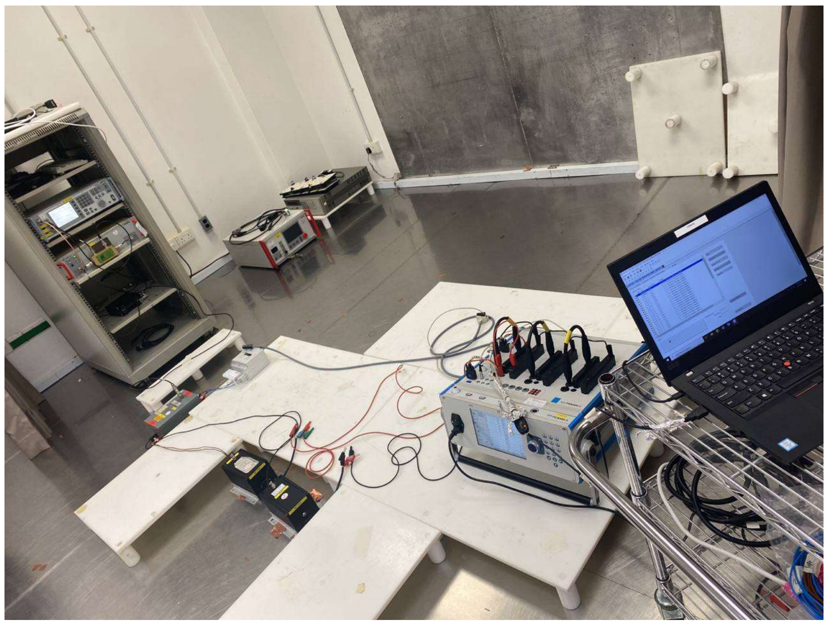


Table 26: Immunity to conducted disturbances Test Results (During Test) Active

Meter Serial Number	Test Location	Test Point	Phase Angle	% Error	Δ from Reference	Limit Class 1	Pass/Fail Class 1
SN934	REF	Ib	1	-0.27	-	-	-
		Ib	1	-0.30	0.03	2	P

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Lab					
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20
Measuring Tape	139441	BLUE-POINT	-	2020-09-29	2023-09-29
EMC Lab					
Multifunctional EMC Immunity Test System	54870	TESEQ	NSG4070	2022-12-16	2023-12-16
Power Amplifier	T44513	TESEQ	CBA 230M-035	CAL NO REQD	CAL NO REQD
CDN	9906	SCHAFFNER	CDN-M5-16	CAL NO REQD	CAL NO REQD
CDN	0900-14	EMTEST	CDN M3	CAL NO REQD	CAL NO REQD
CDN	9810155C	EMTEST	CDN - M3	CAL NO REQD	CAL NO REQD

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 7.5.6 SURGE IMMUNITY TEST

Criteria

The test shall be carried out according to IEC 61000-4-4, under the following conditions:

- *meter in operating condition:*

The application of the surge immunity test voltage 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: see 7.1.2.

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

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Surge Immunity	Ilyasa/Lim Mico/Sherry Wong	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-05-30

Test Method

voltage and auxiliary circuits energized with reference voltage;

without any current in the current circuits and the current terminals shall be open circuit;

1. cable length between surge generator and meter: 1 m;
2. tested in differential mode (line to line);
3. phase angle: pulses to be applied at 60o and 240o relative to zero crossing of Ac supply;
4. test voltage on the current and voltage circuits (mains lines):
    a. 4 kV, generator source impedance: 2 Ω;
5. test voltage on auxiliary circuits with a reference voltage over 40 V:
    a. 1 kV; generator source impedance: 42 Ω;
6. number of tests: 5 positive and 5 negative;
7. repetition rate: maximum 1/min.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 - 75	-
Actual	22.1	68	-

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11 Section 7.5.6 Surge immunity test.

Figure 21: Surge Immunity Test Setup

Table 27: Surge Immunity Test Results – 1P2W (Meter SN934)

Mains Application		Level	Injection Angle (°)	Polarity	Active	Reactive
+ Lead	- Lead					
L1	N	4kv	60	+	1	1
				-	1	1
			240	+	1	1
				-	1	1

Note: 1 – Compliant, no response observed from the EUT.
2 - Non-compliant, pulses observed from EUT. See below table for number of pulses.
X – Condition not performed nor required.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Table 28: Surge Immunity Register Results - Active

Meter Serial Number	Test Point	Initial Reading	Post Test Rreading	Change	Limit	Pass/Fail
SN934	Register	21764	21764	0	0.023	P
	Pulse	0	3	3	23	P

Table 29: Surge Immunity Accuracy Results - Active

Meter Serial Number	Test Point	Phase Angle	Pre Test % Error	Post Test % Error	Limit Class 1	Pass/Fail Class 1
SN934	Ib	1	-0.06	-0.09	1	P

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Lab					
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20
Measuring Tape	139441	BLUE-POINT	-	2020-09-29	2023-09-29
Digital Multimeter	77780330	FLUKE	177	2023-04-06	2024-04-05
EMC Lab					
3-Phase Coupling/Decoupling Networks	172230	TESEQ	CDN 3043-C32	2022-08-23	2023-08-23
Multifunction Generator Systems	172228	TESEQ	NSG 3040	2022-08-23	2023-08-23
AC Power Source	F321120156	AC Power Corp (Preen)	AFC-33030	Not Required	Not Required

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 7.5.7 DAMPED OSCILLATORY WAVES IMMUNITY TEST

NA for DC meter

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

IEC 62052-11 SECTION 7.5.8 RADIO INTERFERENCE SUPPRESSION

Criteria

The test shall be carried out according to CISPR 22, under the following conditions:

- *for class B equipment;*
- *tested as table-top equipment;*
- *for connection to the voltage circuits, an unshielded cable length of 1 m to each connector shall be used;*
- *meter in operating condition:*

voltage and auxiliary circuits energized with reference voltage;

with a current between 0,1 I_b and 0,2 I_b resp. 0,1 I_n and 0,2 I_n (drawn by linear load and connected by unshielded cable length of 1 m).

The test results shall comply with the requirements given in CISPR 22.

Conducted Emissions

Criteria

The test shall be carried out according to CISPR 22, under the following conditions:

- *for class B equipment*
- *tested as table-top equipment;*
- *for connection to the voltage circuits, an unshielded cable length of 1m to each connector shall be used;*

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Radio Frequency Conducted Emissions	Lim Mico/Sherry Wong/Ilyasa	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-05-19

Test Method

Test Description	Measurements were made on a ground plane. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN.

Basic Standard		
UL LPG	80-EM-S0026	
	Frequency range on each side of line	**Measurement Point**
Fully configured sample scanned over the following frequency range	150KHZ TO 30MHZ	Mains

Limits - Class B

Frequency (MHz)	**Limit (dBµV)**	
	Quasi-Peak	**Average**
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

Supplementary information: Meter loaded with 10-20% I_b or I_n during testing (see test result section for recorded load value).

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 - 75	-
Actual	22.9	58	-

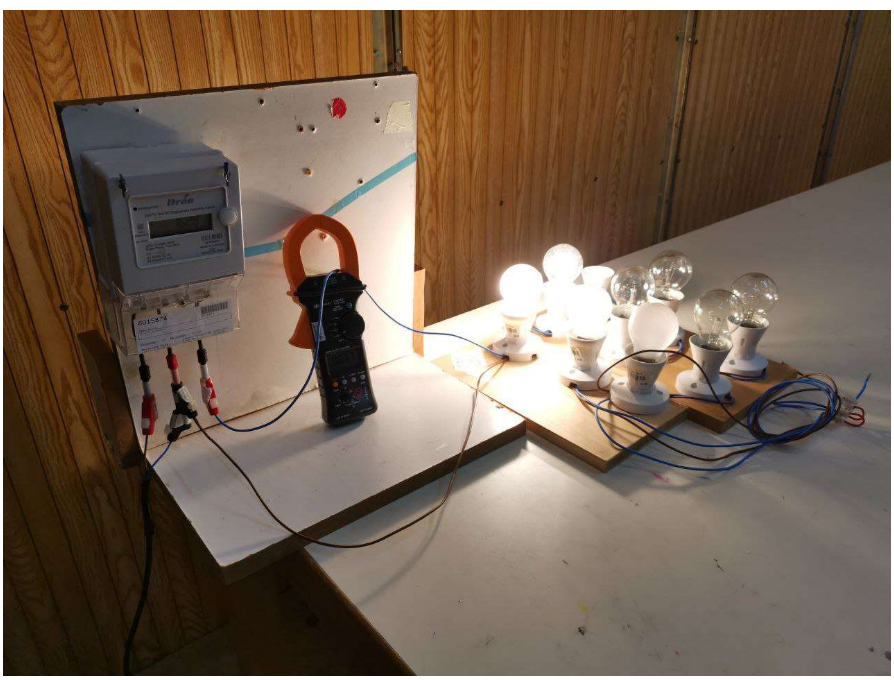
Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11 Section 7.5.8 Conducted Emissions.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Measured load current Phase A = 0.78A resistive at 230 Vac

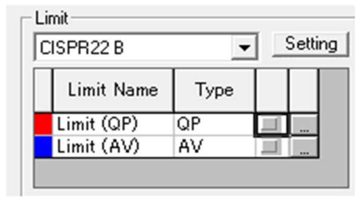
Figure 22: Radio Frequency Conducted Emissions Test Setup

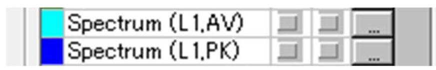


IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Figure 23: Radio Frequency Conducted Emissions Plot – Meter SN934 (Line 1)

LEGEND





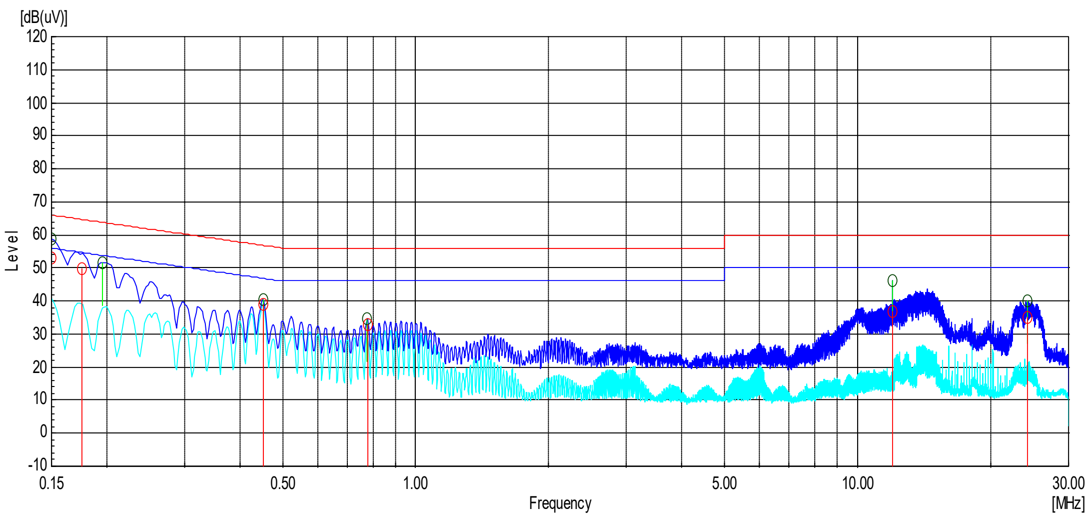


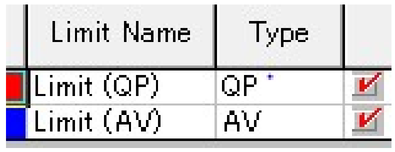
Table 30: Radio Frequency Conducted Emissions Test Results - Meter SN934 (Line 1)

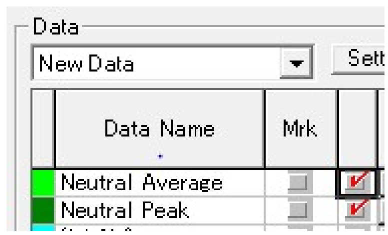
Frequency [MHz]	Level QP [dB(uV)]	Level AV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin AV [dB]
24.24727	35.1	21.1	60	50	24.9	28.9
12.01135	36.6	24.5	60	50	23.4	25.5
0.45206	39	38.1	56.8	46.8	17.8	8.7
0.15002	53.2	44.4	66	56	12.8	11.6
0.17591	49.6	41.4	64.7	54.7	15.1	13.3
0.77888	32.8	30.1	56	46	23.2	15.9

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Figure 24: Radio Frequency Conducted Emissions Plot – Meter SN934 (Neutral)

LEGEND





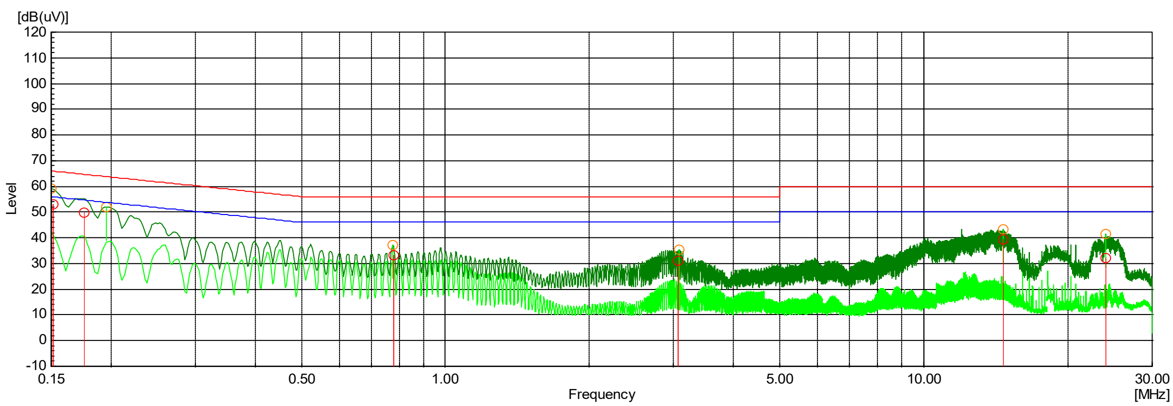


Table 31: Radio Frequency Conducted Emissions Test Results - Meter SN934 (Neutral)

Frequency [MHz]	Level QP [dB(uV)]	Level AV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin AV [dB]
0.15118	53.2	44.4	65.9	55.9	12.7	11.5
14.63021	39.3	24.9	60	50	20.7	25.1
24.00113	32.1	19.9	60	50	27.9	30.1
0.17591	49.7	41.5	64.7	54.7	15	13.2
0.77823	33	30.4	56	46	23	15.6
3.06745	31.2	24.6	56	46	24.8	21.4

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Equipment Used – Radio Frequency Conducted Emissions

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Lab					
Measuring Tape	139441	BLUE-POINT	-	2020-09-29	2023-09-29
EMC Lab					
AC Power Source / Analyzer	ABM000000213	Chroma	61504	Not required	Not required
Artificial mains network (EUT)	04/10069	Schnaffner	NNB 41	2022-08-23	2023-08-23
EMI Test Receiver	217633	Rohde & Schwarz	ESR7	2023-02-17	2024-02-17
Multimeter	13060144	Fluke	175	2022-12-06	2023-12-06
Clamp Meter	MY58210005	Keysight	U1212A	2022-08-15	2023-08-15

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Radiated Emissions

Criteria

The test shall be carried out according to CISPR 22, under the following conditions:

- *for class B equipment*
- *tested as table-top equipment;*
- *for connection to the voltage circuits, an unshielded cable length of 1m to each connector shall be used;*

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Radio Frequency Radiated Emissions	Lim Mico/Sherry Wong/Kumaran	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-05-19

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Test Method

Test Description	Measurements were made in a 10-meter semi-anechoic chamber that complies to CISPR 16/ANSI C63.4. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 10-meter. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in both horizontal and vertical polarities. Final measurements (quasi-peak or average as noted) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4-meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.

Basic Standard		
UL LPG	80-EM-S0029	
	Frequency range	**Measurement Point**
Fully configured sample scanned over the following frequency range	30MHZ – 1GHZ	(10 meter measurement distance)
Limits - Class B		

Frequency (MHz)	**Limit (dBµV/m)**	
	Quasi-Peak	**Average**
30-230	30	NA
230-1000	37	NA
Supplementary information: Meter loaded with 10-20% I_b or I_n during testing.		

	Temperature (°C)	Humidity (%RH)
Required	23 (±2)	50 - 75
Actual	22.9	68

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11 Section 7.5.8 Radiated Emissions.

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

Measured load current Phase A = 0.82A resistive at 230 Vac

Figure 25: Radio Frequency Radiated Emissions Test Setup

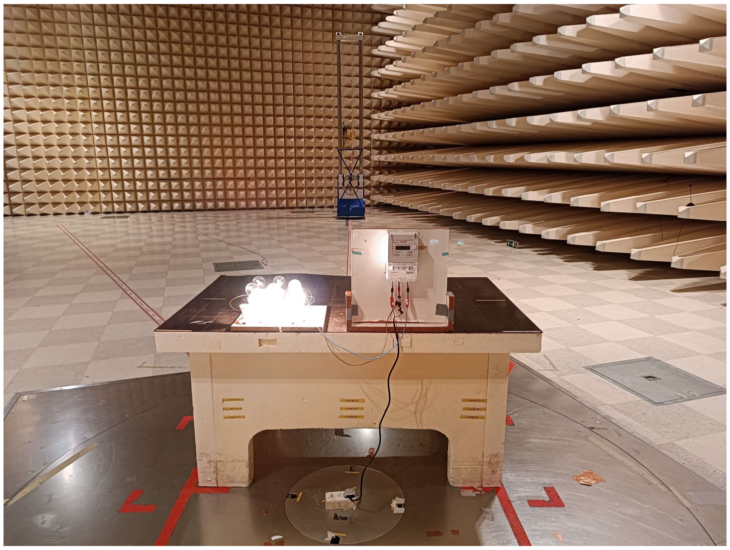


Figure 26: Radio Frequency Radiated Emissions Plot – Meter SN967

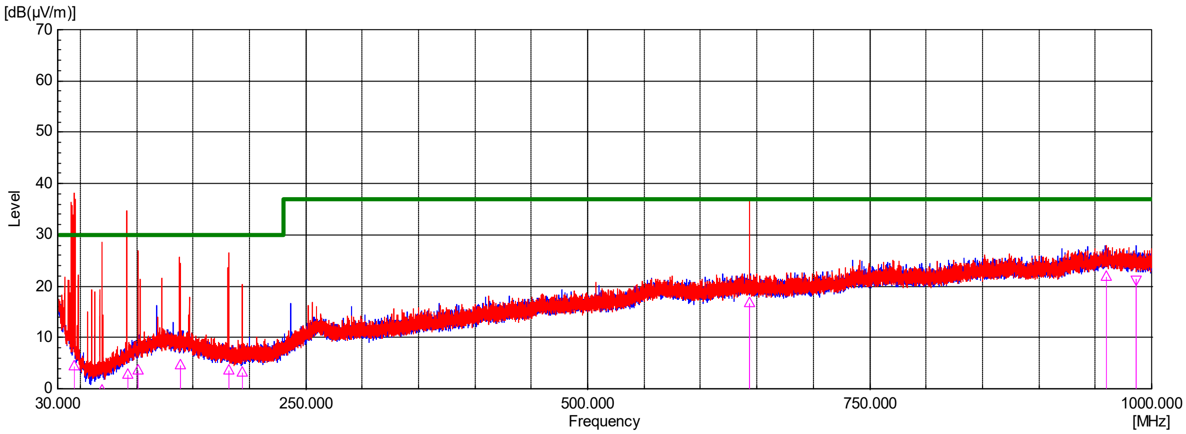


Table 32: Radio Frequency Radiated Emissions Test Results - Meter SN934

Frequency [MHz]	(P)	Reading QP [dB(µV)]	Factor [dB(1/m)]	Level QP [dB(µV/m)]	Limit QP [dB(µV/m)]	Margin QP [dB]	Height [cm]	Angle [°]
44.827	V	24.3	-20	4.3	30	25.7	102	317
69.134	V	23.9	-24.4	-0.5	30	30.5	122	317
91.894	V	23.9	-21.3	2.6	30	27.4	295	157
101.387	V	23.5	-20.1	3.4	30	26.6	193	252

IEC AS 62052-11			
Clause	Requirement – Test	Remark	Result

138.608	V	23.3	-18.7	4.6	30	25.4	295	332
181.493	V	24.1	-20.7	3.4	30	26.6	104	324
193.579	V	23.8	-20.8	3	30	27	103	317
643.393	V	22.8	-6.3	16.5	37	20.5	126	351
959.878	V	22.2	-0.4	21.8	37	15.2	100	336
986.317	H	21.9	-0.6	21.3	37	15.7	312	167

Test Equipment Used – Radio Frequency Radiated Emissions

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Lab					
Measuring Tape	139441	BLUE-POINT	-	2020-09-29	2023-09-29
EMC Lab					
EMI Test Receiver 20Hz – 26.5GHz	100405	Rohde & Schwarz	ESU26	2022-10-19	2023-10-19
Teseq Bilog Antenna 30MHz - 2GHz	53627	Teseq	CBL6111D	2022-06-11	2023-06-11
Teseq Bilog Antenna 30MHz - 2GHz + 6db att	53628	Teseq	CBL6111D	2023-02-24	2024-02-24
Pre-Amplifier 20MHz – 3GHz	980553	EMC Instruments Corporation	EMC330N	2022-07-04	2023-07-04
Multimeter	13060144	Fluke	175	2022-12-06	2023-12-06
Clamp Meter	MY58210005	Keysight	U1212A	2022-08-15	2023-08-15

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

1.	SCOPE		NOTED

2.	NORMATIVE REFERENCES		NOTED

3.	TERMS AND DEFINITIONS		NOTED
	Requirements of IEC 62052-11 apply		

4.	STANDARD ELCTRICAL VALUES		NOTED
	Requirements of IEC 62052-11 apply		

5.	MECHANICAL REQUIREMENTS AND TESTS		P
	Requirements of IEC 62052-11 apply		P

6.	CLIMATIC CONDITIONS		P
	Conditions of IEC 62052-11 apply		P

7.	ELECTRICAL REQUIREMENTS		P
	Requirements of IEC 62052-11 apply		P
7.1	Power consumption		P
	Power consumption in voltage and current circuits determined at reference conditions		NOTED
	Maximum measurement error not exceed 5%		P
7.1.1	Voltage circuits		P
	Power supply connected to voltage circuits		P
	Measured active power	Phase A: 513.67mW	
	Active power limit	2W	
	Measured apparent power	Phase A: 1.33VA	
	Apparent power limit	10VA	
	Power supply not connected to voltage circuits		N
	Measured apparent power		
	Apparent power limit		

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result
	Auxiliary power supply		N
	Measured apparent power		
	Apparent power limit		
7.1.2	Current circuits		P
	Class 1 measured apparent power	374.54mVA	
	Class 1 apparent power limit	4VA	
	Class 2 measured apparent power		
	Class 2 apparent power limit		
7.2	Influence of short time overcurrent's		P
	Short time overcurrent's do not damage meter		P
	Refer to PowerLab report ………..	PL1826-3ph	
	Variation in error not exceeding values in table 3		P
	Non inductive circuit		P
	Polyphase meters performed phase by phase		P
	Meter allowed to return to initial temperature with voltage circuits energised		P
	Meter for direct connection able to current of 30 I_{max} + 0% - 10% for one half cycle		P
	Test current		
	Meter connected through CT carry 20 I_{max} +0% - 10% for 0.5 s		N
	Test current		
	Error variation confirmed with		P
	I_n for CT connected meter		N
	I_b for direct connected		P
	Unity power factor		P
	Test current	5A	
	Measured error	-0.56	
	Reference error	-0.57	
	Variation	0.01	
	Limit of variation for Class 1 direct connected meters	1.5%	
7.3	Influence of self heating		P
	Variation in error not exceeding values in Table 4		P

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result
	Measured maximum variation in error for unity power factor	-0.04	
	Limit of variation for unity power factor for Class 1	0.7	
	Limit of variation for unity power factor for Class 1	-	
	Measured maximum variation in error for 0.5 power factor	-0.09	
	Limit of variation for 0.5 power factor for Class 1	1	
	Limit of variation for 0.5 power factor for Class 2	-	
	Voltage circuits energised at reference voltage with no current in current circuits for at least		P
	2 h for Class 1 meters		P
	1 h for Class 2 meters		N
	Maximum current applied to current circuits at unity power factor		P
	Error measured at intervals short enough to draw curve of error variation with time		P
	Test carried out for at least one hour		P
	Variation of error in 20 minute period not greater than 0.1%	(see appended graph)	P
	Test repeated at 0.5 power factor	(see appended graph)	P
	Cable length followed as per IEC/AS 62052-31 clause 4.3.2.11	1m	
	Cable cross sectional area	35mm^2	
	Current density	3.33 A/mm^2	
	Current density requirement	3.2 A/mm^2 and 4 A/mm^2	
7.4	AC Voltage test		P
	AC voltage test referred to IEC/AS 62052-31 Clause 6.10.4.3.4		NOTED
8	ACCURACY REQUIREMENTS		P
	Test conditions of IEC 62052-11 applied		P
8.1	Limits of error due to variation of current		P
	Meter tested under reference conditions of 8.5		P
	Percentage errors not exceeding limits of Tables 6 and 7	(see appended table)	P
	Meter measures energy in both directions ; values Tables 6 and 7 apply to each direction		P

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result
	Difference between balanced polyphase load and single phase load not exceeding 0.5% for Class 0.2 and 1% for Class 0.5		P
8.2	Limits of error due to influence quantities		P
	Additional percentage error due to change in influence quantities not exceeding values in Table 8	(see appended table)	P
8.2.1	Accuracy test in the presence of harmonics		P
	Test conditions:		
	– fundamental frequency current: I1 = 0,5 Imax		P
	– fundamental frequency voltage: U1 = Un		P
	– fundamental frequency power factor: 1		P
	– content of 5th harmonic voltage: U5 = 10 % of Un		P
	– content of 5th harmonic current: I5 = 40 % of fundamental current		P
	– harmonic power factor: 1		P
	– fundamental and harmonic voltages are in phase, at positive zero crossing		P
	Result(s)	(see appended table)	P
8.2.2	Tests of the influence of odd harmonics and sub-harmonics		P
	Tests made with circuit of Figure A.4 or equipment able to generate required waveforms, and current waveforms of Figure A.5 and Figure A.7 respectively		P
	Variation in percentage error when subjected to specified waveforms not exceeding limits of Table 8	(see appended table)	P
8.2.3	Tests of the influence of d.c. and even harmonics		P
	Tests made with circuit of Figure A.1 or equipment able to generate required waveforms, and current waveforms as shown in Figure A.2		P
	Variation in percentage error when subjected to specified waveforms not exceeding limits of Table 8	(see appended table)	P

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result
8.2.4	Continuous magnetic induction of external origin		P
	Magnetic field using electromagnet of Annex B; field (1000 At) applied to all accessible surfaces when in normal operating position		P
	Result	(see appended table)	P
8.3	Test of starting and no-load condition		P
	Conditions and values of influence quantities as per 8.5 unless otherwise specified		P
8.3.1	Initial start-up of the meter		P
	Meter functional within 5 s after application of reference voltage	1.13s	P
8.3.2	Test of no-load condition		P
	With voltage applied and no current flowing, meter does not produce more than 1 pulse		P
	k	1000 imp/kWh	
	m	1	
	U_n	230V	
	I_{max}	100	
	Test period	27min	
8.3.3	Starting		P
	Meter starts and continues to register at the starting currents in Table 9 at power factor 1		P
	Measured in both directions		P
	Starting current Transformer connected Class 1 0.004 I_b	40mA	
	Import Error %	-0.31	
	Export Error %	0.76	
8.4	Meter constant		P
	Relation between marking and test output correspond to nameplate		P
8.5	Accuracy test conditions		P
	Following test conditions maintained :		P
a)	Meter tested in its case with all covers in position and all parts intended to be earthed are earthed		P
b)	Circuits reached thermal stability before testing		P
c)	For polyphase meters :		P
	- phase sequence as marked		P

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result
	- voltages and currents substantially balanced		P
	Voltages not differ from average by more than 1%		P
	Currents not differ from average by more than 2%		P
	Phase displacement of current from corresponding phase to neutral voltage not differ by more than 2°		P
d)	Reference conditions as per Table 11		P
e)	Test stations as per IEC 60736		NOTED
8.6	Interpretation of results		N
	Displacement of the zero line parallel to itself by not more than the limits in Table the results are within limits		N

ANNEX A	TEST CIRCUIT DIAGRAM FOR D.C., EVEN HARMONICS,ODD HARMONICS AND SUB-HARMONICS	NOTED

ANNEX B	ELECTROMAGNET FOR TESTING THE INFLUENCE OF EXTERNALLY PRODUCED MAGNETIC FIELDS	NOTED

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

IEC 62053-21 SECTION 7.1 POWER CONSUMPTION

The power consumption in the voltage and current circuit 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 %.

Section 7.1.1 Voltage Circuits

Criteria

The active and apparent power consumption in each voltage circuit of a meter at reference voltage, reference temperature and reference frequency shall not exceed the values shown in Table 1.

Table 1 – Power consumption in voltage circuits for single-phase and polyphase meters including the power supply

Meters	Power supply connected to the voltage circuits	Power supply not connected to the voltage circuits
Voltage circuit	2 W and 10 VA	0.5 VA
Auxiliary power supply	–	10 VA
NOTE 1 In order to match voltage transformers to meters, the meter manufacturer should state whether the burden is inductive or capacitive (for transformer operated meters only). NOTE 2 The above figures are mean values. Switching power supplies with peak power values in excess of these specified values are permitted, but it should be ensured that the rating of associated voltage transformers is adequate.		

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Power Consumption in the Voltage Circuit	Vairakkannu Vairavan/Lim Mico/Soo VooKey/Sherry Wong	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-07-03

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Test Method

Measuring the meter losses for the voltage circuits:
With the meter operating at reference voltage, measure the supply voltage and the current in the voltage circuit, along with the power factor (or the active power) to obtain watts and VA.

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 - 75	-
Actual	25	65.6	-

Test Results

The GEN™5 RIVA is **compliant** with IEC 62053-21 Section 7.1.1 Voltage Circuits.

Figure 27: Voltage Circuits Test Setup

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Table 33: Voltage Circuits Test Results

Sample Description	Serial Number	Applied Voltage V	Measured Current mA	VA	Limit VA	Power Factor	Watts mW	Limit W	Pass/Fail
GEN™5 RIVA, ,1P2W, 5(100)A	SN944	229.9	5.80	1.33	10	0..6116	513.67	2	P

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20
Temperature, Humidity and Pressure recorder	139452	OMEGA	iBTHX-W	2023-01-11	2024-01-10

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Section 7.1.2 Current Circuits

Criteria

The apparent power taken by each current circuit of a direct connected meter at basic current, reference frequency and reference temperature shall not exceed the values shown in Table 2.

The apparent power taken by each current circuit of a meter connected through a current transformer shall not exceed the value shown in Table 2 at a current value that equals the rated secondary current of the corresponding transformer at reference temperature and reference frequency of the meter.

Table 2 – Power consumption in current circuits

Meters	Class of meter 1	2
Single-phase and polyphase	4,0 VA	2,5 VA
NOTE 1 The rated secondary current is the value of the secondary current indicated on the current transformer, on which the performance of the transformer is based. Standard values of maximum secondary current are 120 %, 150 % and 200 % of the rated secondary current.		

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Power Consumption in the Current Circuit	Vairakkannu Vairavan/Lim Mico/Soo VooKey/Sherry Wong	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-07-03

Test Method

Measuring the meter losses for the current circuits:
With the meter operating at reference voltage and Base Current (Ib), measure the current and the voltage drop across the current circuit to obtain the VA loss across the current circuit.

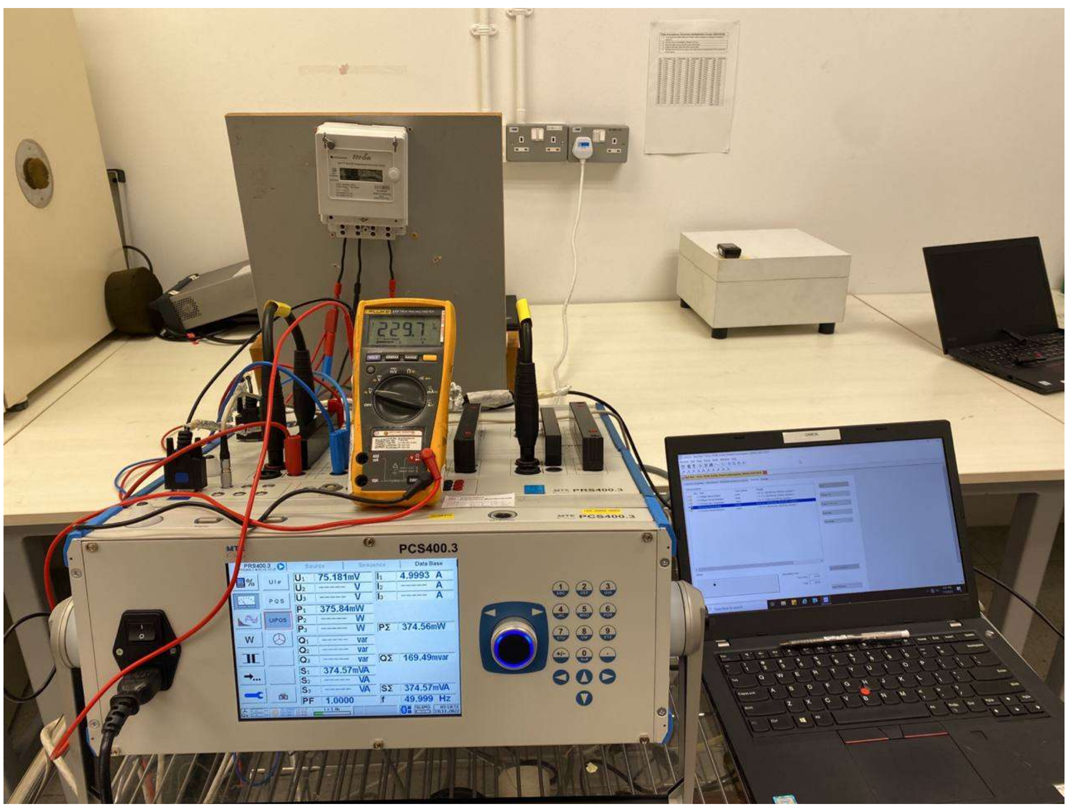
IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 - 75	-
Actual	25	65.6	-

Test Results

The GEN™5 RIVA is **compliant** with IEC 62053-21 Section 7.1.2 Current Circuits.

Figure 28: Current Circuits Test Setup



IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Table 34: Current Circuits Test Results

Sample Description	Serial Number	Voltage Drop mV	Current	Measured mVA	Limits	Pass/Fail
GEN™5 RIVA , 1P2W,5(100)A	SN944	75.2	10	374.57	4VA	P

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20
Temperature, Humidity and Pressure recorder	139452	OMEGA	iBTHX-W	2023-01-11	2024-01-10
Digital Multimeter	77780330	FLUKE	177	2023-04-06	2024-04-05

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

IEC 62053-21 SECTION 7.2 INFLUENCE OF SHORT-TIME OVERCURRENTS

Criteria

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 shall not exceed the values shown in Table 3.

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).

a) Meter for direct connection

The meter shall be able to carry a short-time overcurrent of 30 I_{max} with a relative tolerance of +0 % to –10 % for one half-cycle at rated frequency.

b) Meter for connection through current transformer

The meter shall be able to carry for 0,5 s a current equal to 20 I_{max} with a relative tolerance of +0 % to –10 %.

NOTE This requirement does not apply to meters having a contact in the current circuits. For this case, see appropriate standards.

Table 3 – Variations due to short-time overcurrents

Meters for	Value of current	Power factor	Limits of variations in percentage error for meters of class 1	2
Direct connection	I_b	1	1,5	1,5
Connection through current transformers	I_n	1	0,5	1,0

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Pre Short Time Current Verification	Lim Mico	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-04-03
Short Time overcurrent Test (Outsourced)	Keith Manson	Powerlab Limited	2023-04-17
Post Short Time Current Verification	Lim Mico	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-05-04

Test Method

1. Prior to testing, verify the meter at I_n or I_b.
2. Conduct the Short Time Current test phase by phase:
   a. Direct connected meters shall be subject to a short-circuit current of 30 Imax, for one-half cycle.
   b. Transformer meters shall be subjected to a short-circuit current of 20 Imax, for 0.5 seconds.
3. Following the test the meter shall be powered at nominal voltage for 1 hour.
4. At the completion of testing, verify the meter at I_n or I_b.

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 - 75	-
Actual	23.6	62.7	-

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Test Results

The GEN™5 RIVA is **compliant** with IEC 62053-21 Section 7.2 Short-Time Overcurrent's.

Note: Refer PL1826-3ph report in Appendix B for PowerLab report

Meter Serial Number	Test	Test Location	Test Point	Power factor	% Error	Δ from Reference	Limit Class 1	Pass/Fail Class 1
EE98	A	REF	Ib	1	-0.01	-	-	-
			Ib	1	-0.02	0.01	1.5	P
EE97	C	REF	Ib	1	-0.12	-	-	-
			Ib	1	0.64	0.76	1.5	P

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

IEC 62053-21 SECTION 7.3 INFLUENCE OF SELF-HEATING

Criteria

The variation of error due to self-heating shall not exceed the values given in Table 4.

The test shall be carried out as follows: after the voltage circuits have been energized at reference voltage for at least 2 h for class 1 and 1 h for class 2, 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 0,2 %.

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 to ensure that the current density is between 3,2 A/mm^2 and 4 A/mm^2

Table 4 – Variations due to self-heating

Value of current	Power factor	Limits of variations in percentage error for meters of class	
		1	2
I_{max}	1	0,7	1,0
	0,5 inductive	1,0	1,5

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Self-Heating	Vairakkannu Vairavan/Lim Mico/Soo VooKey/Sherry Wong	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-07-04

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Test Method

The variation of error due to self-heating shall not exceed the values given in Table 4.

The test shall be carried out as follows: after the voltage circuits have been energized at reference voltage for at least 2 h for class 0.2 and 1 h for class 0.5, 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 10 minute intervals 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 0.2 %.

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 to ensure that the current density is between 3,2 A/mm^2 and 4 A/mm^2

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 - 75	-
Actual	21.4	68.5	-

Test Results

The GEN™5 RIVA is **compliant** with IEC 62053-21 Section 7.3 Self-Heating.

Figure 29: Self-Heating Test Setup

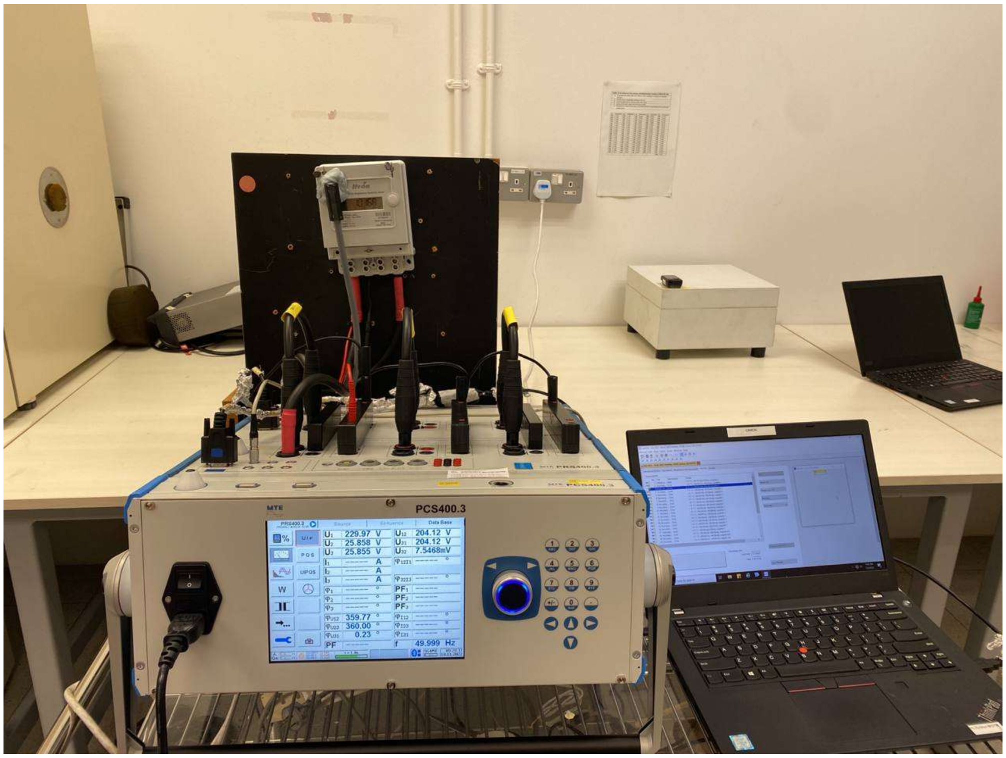


Table 35: Self-Heating Test Results

Meter Serial Number	Test Location	Test Point	PF	% Error	Δ from Reference	Limit Class 1	Pass/Fail Class 1
SN944	Ref	Imax	1	-0.07	-	-	-
	10 min	Imax	1	-0.04	0.03	0.7	P
	20 min	Imax	1	-0.05	0.02	0.7	P
	30 min	Imax	1	-0.06	0.01	0.7	P
	40 min	Imax	1	-0.06	0.01	0.7	P
	50 min	Imax	1	-0.06	0.01	0.7	P
	60 min	Imax	1	-0.06	0.01	0.7	P
	Ref	Imax	0.5	-0.19	-	-	-
	10 min	Imax	0.5	-0.16	0.03	1	P
	20 min	Imax	0.5	-0.09	0.10	1	P

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

	30 min	Imax	0.5	-0.17	0.02	1	P
	40 min	Imax	0.5	-0.18	0.01	1	P
	50 min	Imax	0.5	-0.19	0.00	1	P
	60 min	Imax	0.5	-0.19	0.00	1	P

Figure 30: Auto-warming Plot @ UPF – Meter SN944

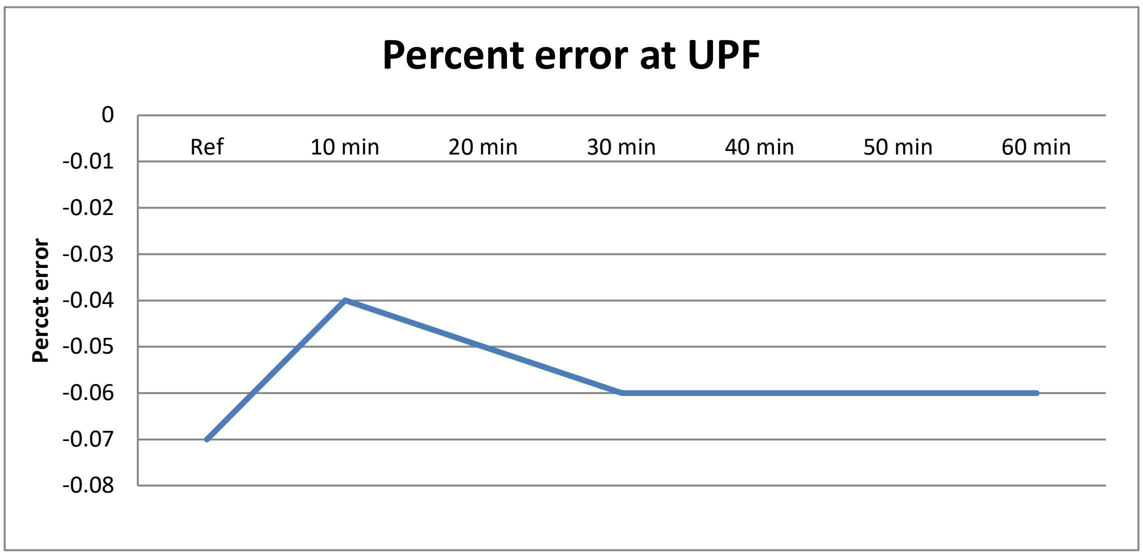
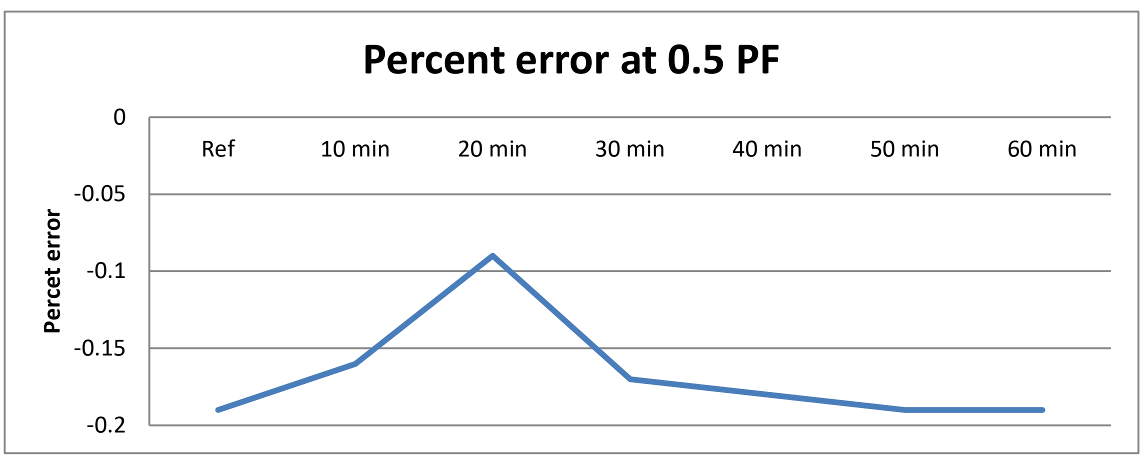


Figure 31: Auto-warming Plot @ 0.5PF – Meter SN944



IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20
Temperature, Humidity and Pressure recorder	139452	OMEGA	iBTHX-W	2023-01-11	2024-01-10
Measuring Tape	139441	BLUE-POINT	-	2020-09-29	2023-09-29

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

IEC 62053-21 SECTION 7.4 AC VOLTAGE TEST

Criteria

The a.c. voltage test shall be carried out in accordance with Table 5.

The test voltage shall be substantially sinusoidal, having a frequency between 45 Hz and

65 Hz, and applied for 1 min. The power source shall be capable of supplying at least 500 VA.

Table 5 – AC voltage tests

Test	Applicable to	Test voltage r.m.s	Points of application of the test voltage
B	Protective class II meters	4 kV	Between, on the one hand, all the current and voltage circuits as well as the auxiliary circuits whose reference voltage is over 40 V, connected together, and, on the other hand, earth
		2 kV	b) Between circuits not intended to be connected together in service
		–	c) A visual inspection for compliance with the conditions of 5.7 of IEC 62052-11

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
AC Voltage	Chris Ashby / Jackson Daniel	UL LLC, 12 Laboratory Drive RTP, NC 27709	2023-08-18

Test Method

During the tests relative to earth, the auxiliary circuits with reference voltage equal to or below 40 V shall be connected to earth.

All these tests shall be carried out with the case closed and the cover and terminal covers in place.

During this test, no flashover, disruptive discharge or puncture shall occur.

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	15 – 25	45 – 75	86 - 106
Actual	23	53.8	99.82

Test Results

The GEN™5 RIVA is **compliant** with IEC 62053-21 Section 7.4 AC Voltage Test.

Note*: This test data is referred from safety report number R4790778107-IEC_AS SAFETY

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

IEC 62053-21 SECTION 8.1 LIMITS OF ERROR DUE TO VARIATION OF THE CURRENT

Criteria

When the meter is under the reference conditions given in 8.5, the percentage errors shall not exceed the limits for the relevant accuracy class given in Tables 6 and 7.

If the meter is designed for the measurement of energy in both directions, the values in Table 6 and Table 7 shall apply for each direction.

The difference between the percentage error when the meter is carrying a single-phase load and a balanced polyphase load at basic current I_b and unity power factor for direct connected meters, respectively at rated current I_n and unity power factor for transformer operated meters, shall not exceed 1,5 % and 2,5 % for meters of classes 1 and 2 respectively.

NOTE When testing for compliance with Table 7, the test current should be applied to each measuring element in sequence.

Table 6 – Percentage error limits (single-phase meters and polyphase meters with balanced loads)

Value of current		Power factor	Percentage error limits for meters of class	
for direct connected meters	for transformer operated meters		1	2
$0,05\ I_b \le I < 0,1\ I_b$	$0,02\ I_n \le I < 0,05\ I_n$	1	±1,5	±2,5
$0,1\ I_b \le I \le I_{max}$	$0,05\ I_n \le I \le I_{max}$	1	±1,0	±2,0
$0,1\ I_b \le I < 0,2\ I_b$	$0,05\ I_n \le I < 0,1\ I_n$	0,5 inductive	±1,5	±2,5
$0,2\ I_b \le I \le I_{max}$	$0,1\ I_n \le I \le I_{max}$	0,5 inductive	±1,0	±2,0
When specially requested by the user: From $0,2\ I_b \le I \le I_b$	$0,1\ I_n \le I \le I_n$	0,25 inductive	±3,5	-

Table 7 – Percentage error limits (polyphase meters carrying a single-phase load, but with balanced polyphase voltages applied to voltage circuits)

Value of current		Power factor	Percentage error limits for meters of class	
for direct connected meters	for transformer operated meters		1	2

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

$0,1\ I_b \leq I \leq I_{max}$	$0,05\ I_n \leq I \leq I_{max}$	1	± 2,0	± 3,0
$0,2\ I_b \leq I \leq I_{max}$	$0,1\ I_n \leq I \leq I_{max}$	0,5 inductive	± 2,0	± 3,0

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Current Variation	Vairakkannu Vairavan/Lim Mico/Sherry Wong	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-04-25

Test Method

Power the meter with nominal voltage. Apply the current per the meter class from the appropriate table. Take accuracy reading for each load point for the appropriate meter class. Once all applicable load points have been evaluated verify that each load point test condition does not deviate from the specified value in the above tables.

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 - 75	-
Actual	23.8	68.3	-

Test Results

The GEN™5 RIVA is **compliant** with IEC 62053-21 Section 8.1 Limits of error due to variation of the current.

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Figure 32: Variation of Current Test Setup

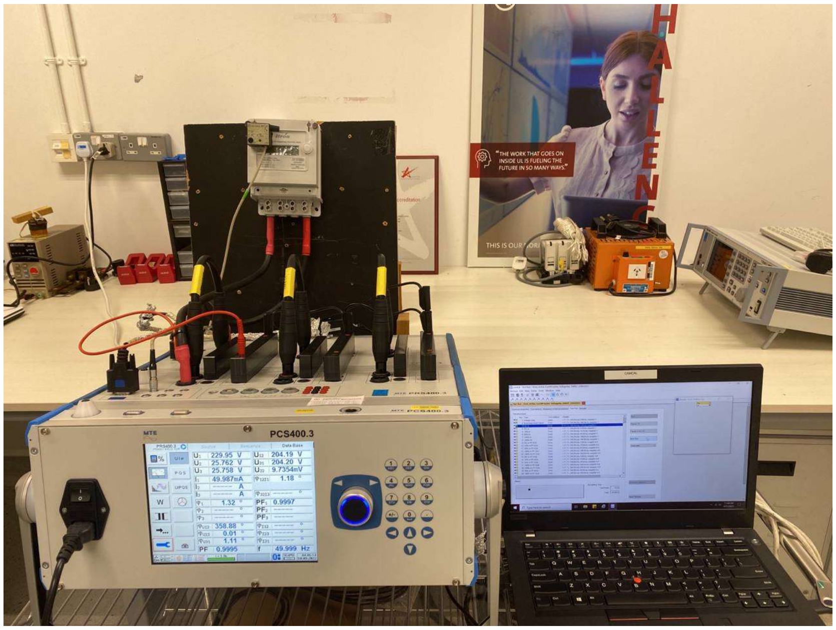


Table 36: Variation of Current Test (Balanced Load Import) Results

Meter Serial Number	Test Point	Phase Angle	Percent Error	Limit Class 1	Pass/Fail Class 1
SN967	0.05Ib	1	0.06	1.5	P
	0.1Ib	1	0.07	1	P
	0.2Ib	1	0.02	1	P
	Ib	1	0.09	1	P
	Imax	1	0.06	1	P
	0.1Ib	0.5 Ind	0.23	1.5	P
	0.2Ib	0.5 Ind	0.22	1	P
	Ib	0.5 Ind	0.13	1	P
	Imax	0.5 Ind	-0.10	1	P
	0.1Ib	0.8 Cap	0.00	1.5	P
	0.2Ib	0.8 Cap	0.01	1	P
	Ib	0.8 Cap	0.09	1	P
	Imax	0.8 Cap	0.11	1	P

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Table 37: Variation of Current Test (Balanced Load Export) Results

Meter Serial Number	Test Point	Phase Angle	Percent Error	Limit Class 1	Pass/Fail Class 1
SN967	0.05Ib	1	0.14	1.5	P
	0.1Ib	1	0.13	1	P
	0.2Ib	1	0.06	1	P
	Ib	1	0.11	1	P
	Imax	1	0.15	1	P
	0.1Ib	0.5 Ind	0.32	1.5	P
	0.2Ib	0.5 Ind	0.26	1	P
	Ib	0.5 Ind	0.15	1	P
	Imax	0.5 Ind	0.06	1	P
	0.1Ib	0.8 Cap	0.06	1.5	P
	0.2Ib	0.8 Cap	0.05	1	P
	Ib	0.8 Cap	0.10	1	P
	Imax	0.8 Cap	0.21	1	P

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20
Meter Test System	159508	EMH	PRS 600.3	2022-11-29	2023-11-29
Temperature, Humidity and Pressure recorder	139452	OMEGA	iBTHX-W	2023-01-11	2024-01-10

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

IEC 62053-21 SECTION 8.2 LIMITS OF ERROR DUE TO INFLUENCE QUANTITIES

Criteria

The additional percentage error due to the change of influence quantities with respect to reference conditions, as given in 8.5, shall not exceed the limits for the relevant accuracy class given in Table 8.

Ambient Temperature Variation

Criteria

Mean Temperature Coefficient must be determined for the whole operating range. The operating temperature range shall be divided into 20K wide ranges. The mean temperature coefficient shall then be determined for these ranges, by taking measurements 10K above and 10K below the middle of the range. During the test, the temperature shall be in no case outside the specified operating temperature range.

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Ambient Temperature Variation	Vairakkannu Vairavan/Lim Mico/Sherry Wong	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-04-26 to 2023-05-02

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Test Method

1. Install the meter inside a chamber capable of the full set of test conditions in the orientation as it would be installed in the field.
2. Power the meter with nominal voltage, and bring the chamber temperature down to the lowest determined test temperature.
3. Acclimate for 1 hour, then apply the current from the applicable criteria table and take the required measurements.
4. Repeat step 2 increasing the temperature to the next point no more than 20K above the previous temperature. Continue repeating steps 2, 3 & 4 until all test points at all temperatures have been taken.
5. Once all applicable load points have been evaluated verify that the mean coefficient between the load points and temperatures do not deviate by more than the specified value.

Test Results

The GEN™5 RIVA is **compliant** with IEC 62053-21 Table 8, Section 8.2 Ambient Temperature Variation.

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Figure 33: Ambient Temperature Variation Test Setup

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Table 38: Ambient Température Chamber Plot

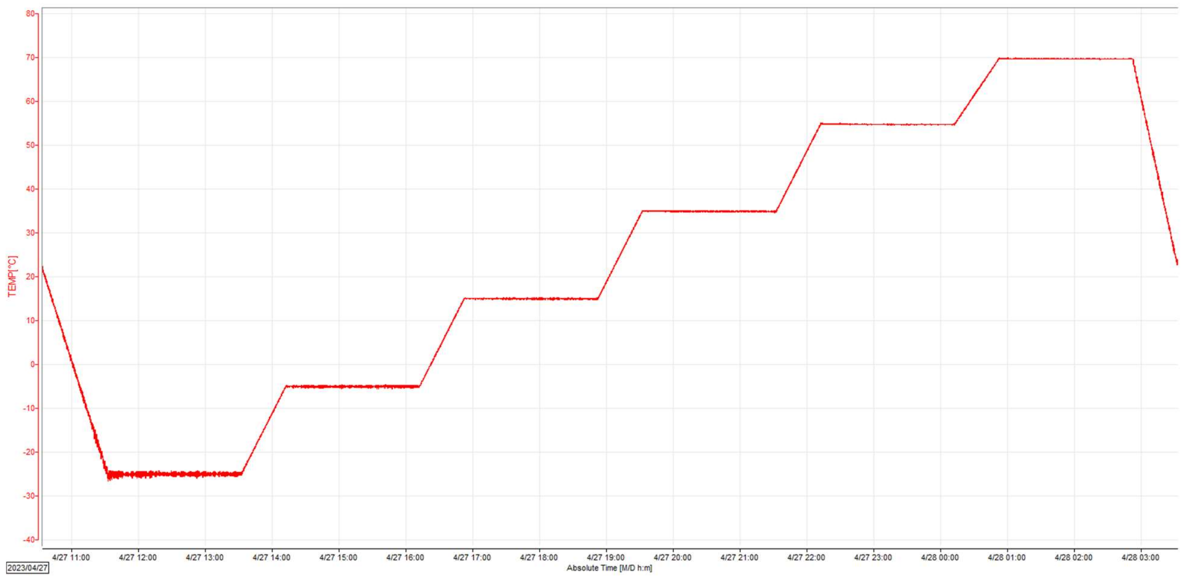


Table 39: Ambient Temperature Variation Test Results_1P2W (SN967)

Test Point	Pf	Low Temp	High Temp	Δ % Error	Temp Coeff	Limit Class 1	Pass/Fail Class 1
-	-	-25	-5			-	
0.1Ib	1	-0.03	0.03	0.06	0.000	0.05	P
Ib		0.01	0.06	0.05	0.000	0.05	P
Imax		0.00	0.04	0.04	0.000	0.05	P
0.2Ib	0.5 Inductive	0.09	0.17	0.08	0.000	0.07	P
Ib		0.04	0.09	0.05	0.000	0.07	P
Imax		-0.18	-0.15	0.03	0.000	0.07	P
-		-5	15			-	
0.1Ib	1	0.03	0.07	0.04	0.002	0.05	P
Ib		0.06	0.10	0.04	0.002	0.05	P
Imax		0.04	0.06	0.02	0.001	0.05	P
0.2Ib	0.5 Inductive	0.17	0.17	0.00	0.000	0.07	P
Ib		0.09	0.12	0.03	0.002	0.07	P

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Imax		-0.15	-0.14	0.01	0.000	0.07	P
		15	**35**			-	
0.1Ib	**1**	0.07	0.09	0.02	0.001	0.05	P
Ib		0.10	0.13	0.03	0.002	0.05	P
Imax		0.06	0.09	0.03	0.002	0.05	P
0.2Ib	**0.5 Inductive**	0.17	0.23	0.06	0.003	0.07	P
Ib		0.12	0.15	0.03	0.002	0.07	P
Imax		-0.14	-0.12	0.02	0.001	0.07	P
		35	**55**			-	
0.1Ib	**1**	0.09	0.11	0.02	0.001	0.05	P
Ib		0.13	0.18	0.05	0.003	0.05	P
Imax		0.09	0.12	0.03	0.002	0.05	P
0.2Ib	**0.5 Inductive**	0.23	0.25	0.02	0.001	0.07	P
Ib		0.15	0.19	0.04	0.002	0.07	P
Imax		-0.12	-0.08	0.04	0.002	0.07	P
		55	**70**			-	
0.1Ib	**1**	0.11	0.15	0.04	0.003	0.05	P
Ib		0.18	0.22	0.04	0.003	0.05	P
Imax		0.12	0.15	0.03	0.002	0.05	P
0.2Ib	**0.5 Inductive**	0.25	0.29	0.04	0.003	0.07	P
Ib		0.19	0.23	0.04	0.003	0.07	P
Imax		-0.08	-0.05	0.03	0.002	0.07	P

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Blue M Temperature Chamber	53671	TPS	ETC-095H-JY	2022-08-01	2023-07-31
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Voltage Variation

Criteria

The meter shall meet the specified value from the ranges of -10% to 10%.

For the voltage ranges from –20 % to –10 % and +10 % to +15 % the limits of variation in percentage errors are three times the values given in Table 5.

Below 0.8 U_n the error of the meter may vary between +10 % and –100 %.

The recommended test point for voltage variation and frequency variation is I_b for direct connected meters and I_n for transformer-operated meters.

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 - 75	-
Actual	23.8	68.3	-

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Voltage Variation	Vairakkannu Vairavan/Lim Mico/Sherry Wong	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-04-25

Test Results

The GEN™5 RIVA is **compliant** with IEC 62053-21 Table 8, Section 8.2 Voltage Variation.

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Figure 34: Voltage Variation Test Setup

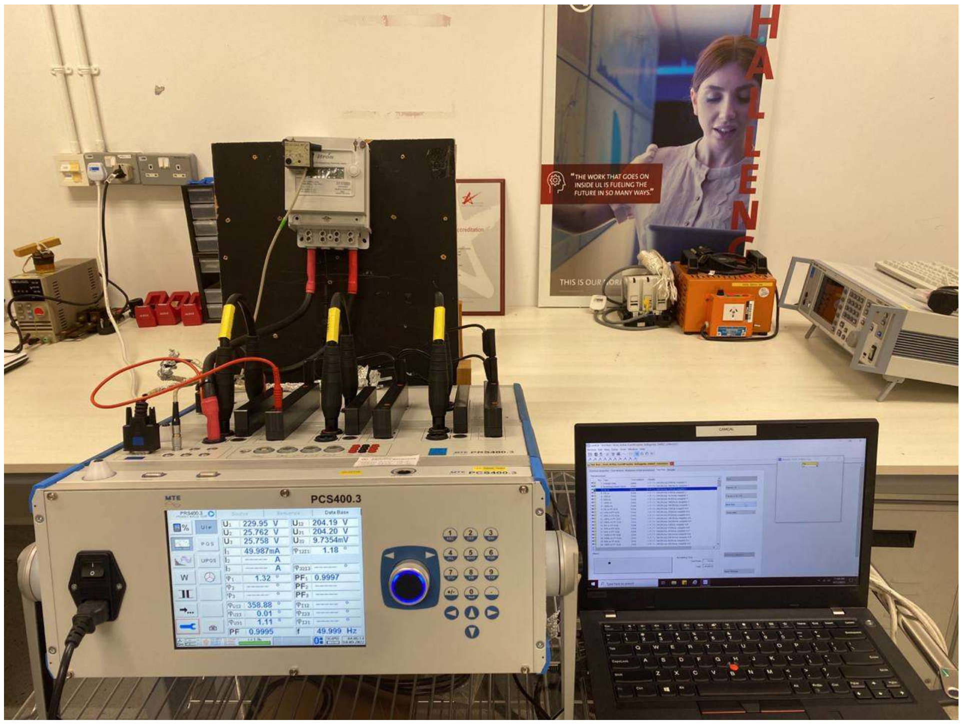


Table 40: Voltage Variation Detailed Test Results_1P2W

Meter Serial Number	Voltage	Test Point	Phase Angle	% Error	Δ from Reference	Limit Class 1	Pass/Fail Class 1
SN967	REF	0.05Ib	1	0.05	-	-	-
	10%	0.05Ib	1	0.11	0.06	0.7	P
	-10%	0.05Ib	1	0.06	0.01	0.7	P
	15%	0.05Ib	1	0.08	0.03	2.1	P
	-20%	0.05Ib	1	0.05	0.00	2.1	P
	-50%	0.05Ib	1	-0.05	0.10	-100	P
	REF	Ib	1	0.11	-	-	-
	10%	Ib	1	0.11	0.00	0.7	P
	-10%	Ib	1	0.11	0.00	0.7	P
	15%	Ib	1	0.12	0.01	2.1	P
	-20%	Ib	1	0.10	0.01	2.1	P
	-50%	Ib	1	0.09	0.02	-100	P
	REF	Imax	1	0.08	-	-	-
	10%	Imax	1	0.10	0.02	0.7	P

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

-10%	Imax	1	0.11	0.03	0.7	P
15%	Imax	1	0.13	0.05	2.1	P
-20%	Imax	1	0.12	0.04	2.1	P
-50%	Imax	1	0.09	0.01	-100	P
REF	0.1Ib	0.5 Ind	0.24	-	-	-
10%	0.1Ib	0.5 Ind	0.26	0.02	1	P
-10%	0.1Ib	0.5 Ind	0.21	0.03	1	P
15%	0.1Ib	0.5 Ind	0.24	0.00	3	P
-20%	0.1Ib	0.5 Ind	0.21	0.03	3	P
-50%	0.1Ib	0.5 Ind	0.13	0.11	-100	P
REF	Ib	0.5 Ind	0.15	-	-	-
10%	Ib	0.5 Ind	0.14	0.01	1	P
-10%	Ib	0.5 Ind	0.14	0.01	1	P
15%	Ib	0.5 Ind	0.15	0.00	3	P
-20%	Ib	0.5 Ind	0.13	0.02	3	P
-50%	Ib	0.5 Ind	0.13	0.02	-100	P
REF	Imax	0.5 Ind	-0.09	-	-	-
10%	Imax	0.5 Ind	-0.06	0.03	1	P
-10%	Imax	0.5 Ind	-0.06	0.03	1	P
15%	Imax	0.5 Ind	-0.03	0.06	3	P
-20%	Imax	0.5 Ind	-0.05	0.04	3	P
-50%	Imax	0.5 Ind	-0.11	0.02	-100	P

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20
Temperature, Humidity and Pressure recorder	139452	OMEGA	iBTHX-W	2023-01-11	2024-01-10

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Frequency Variation

Criteria

For the ranges from –2 % to +2 % the limits of variation in percentage errors are the values given in Table 8.

The recommended test point for voltage variation and frequency variation is I_b for direct connected meters and I_n for transformer-operated meters.

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 - 75	-
Actual	23.8	68.3	-

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Frequency Variation	Vairakkannu Vairavan/Lim Mico/Sherry Wong	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-04-25

Test Results

The GEN™5 RIVA is **compliant** with IEC 62053-21 Table 8, Section 8.2 Frequency Variation.

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Table 41: Frequency Variation Detailed Test Results

Meter Serial Number	Voltage	Test Point	Phase Angle	% Error	Δ from Reference	Limit Class 1	Pass/Fail Class 1
SN006	REF	0.05Ib	1	0.07	-	-	-
	2%	0.05Ib	1	0.07	0.00	0.5	P
	-2%	0.05Ib	1	0.06	0.01	0.5	P
	REF	Ib	1	0.10	-	-	-
	2%	Ib	1	0.10	0.00	0.5	P
	-2%	Ib	1	0.11	0.01	0.5	P
	REF	Imax	1	0.08	-	-	-
	2%	Imax	1	0.10	0.02	0.5	P
	-2%	Imax	1	0.11	0.03	0.5	P
	REF	0.1Ib	0.5 Ind	0.24	-	-	-
	2%	0.1Ib	0.5 Ind	0.25	0.01	0.7	P
	-2%	0.1Ib	0.5 Ind	0.25	0.01	0.7	P
	REF	Ib	0.5 Ind	0.15	-	-	-
	2%	Ib	0.5 Ind	0.15	0.00	0.7	P
	-2%	Ib	0.5 Ind	0.15	0.00	0.7	P
	REF	Imax	0.5 Ind	-0.08	-	-	-
	2%	Imax	0.5 Ind	-0.06	0.02	0.7	P
	-2%	Imax	0.5 Ind	-0.04	0.04	0.7	P

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20
Temperature, Humidity and Pressure recorder	139452	OMEGA	iBTHX-W	2023-01-11	2024-01-10

Reverse Phase

NA for single phase model.

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Voltage Unbalanced

NA for single phase meter.

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Magnetic Induction of external origin 0.5mT

Criteria

Power the meter with nominal voltage. Apply the current per the meter class from the applicable criteria table. Take a reference accuracy reading, then subject the meter to the 0.5mT field while inside the Magnetic loop. The filed shall be applied in all applicable directions, taking an accuracy reading in each direction to ensure the meter does not exceed the class deviation.

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 - 75	-
Actual	23	68	-

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Magnetic Induction of external origin 0.5mT	Vairakkannu Vairavan/Lim Mico/Soo Voo Key/ Sherry Wong	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-06-06

Test Results

The GEN™5 RIVA is **compliant** with IEC 62053-21 Table 8, Section 8.2 Mag Induction of External Origin.

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Figure 35: Magnetic Induction Setup (Vertical)

Figure 36: Magnetic Induction Setup (F-B)

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Figure 37: Magnetic Induction Setup (S-S)

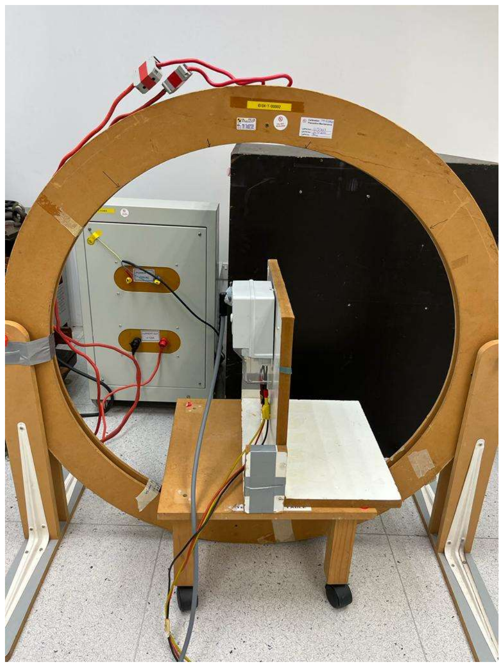


Table 42: Magnetic Induction Detailed Test Results

Meter Serial Number	Test Location	Test Point	Power Factor	% Error	Δ from Reference	Limit Class 1	Pass/Fail Class 1
SN983	REF	Ib (Line)	1	-0.05	-	-	-
	V	Ib (Line)	1	-0.16	0.11	2	P
	F-B	Ib (Line)	1	-0.34	0.29	2	P
	S-S	Ib (Line)	1	-0.46	0.41	2	P

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Test System	159508	EMH	PRS 600.3	2022-11-29	2023-11-29
Temperature, Humidity and Pressure recorder	139452	OMEGA	iBTHX-W	2023-01-11	2024-01-10
Measuring Tape	139441	BLUE-POINT	-	2020-09-29	2023-09-29
Clamp Meter	MY58210005	Keysight	U1212A	2022-08-15	2023-08-15
Current Source	CP2-1612027	Suzhou ESA Electrical Technology	CP2-120A	No cal reqd	No cal reqd
Induction coil 400AT	04-T-00002	UL	400AT	No cal reqd	No cal reqd

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Operation of Accessories

NA due to no accessories for this meter

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

IEC 62053-21 SECTION 8.2.1 ACCURACY IN THE PRESENCE OF HARMONICS

Criteria

Test conditions:

- *fundamental frequency current:* $I_1 = 0{,}5\ I_{max}$
- *fundamental frequency voltage:* $U_1 = U_n$
- *fundamental frequency power factor: 1*
- *content of 5th harmonic voltage:* $U_5 = 10\ \%$ *of* U_n
- *content of 5th harmonic current:* $I_5 = 40\ \%$ *of fundamental current*
- *harmonic power factor: 1*
- *fundamental and harmonic voltages are in phase, at positive zero crossing.*

Resulting harmonic power due to the 5th harmonic is $P_5 = 0{,}1\ U_1 \times 0{,}4\ I_1 = 0{,}04\ P_1$ *or total active power =* $1{,}04\ P_1$ *(fundamental + harmonics).*

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Presence of Harmonics	Vairakkannu Vairavan/Lim Mico/Sherry Wong	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-05-04

Test Method

Power the meter with nominal voltage. Apply the current per the meter class. Take accuracy reading then turn on harmonic components as described above and repeat accuracy measurement. Once harmonic points have been evaluated verify that each load point test condition does not deviate from the Reference condition by more than the specified value.

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 - 75	-
Actual	23.0	70.4	

Test Results

The GEN™5 RIVA is **compliant** with IEC 62053-21 Section 8.2.1 Accuracy in the presence of harmonics.

Table 43: Presence of harmonics Test Results

Meter Serial Number	Test Location	Test Point	Phase Angle	% Error	Δ from Reference	Limit Class 1	Pass/Fail Class 1
SN967	SG	0.5Imax	1	0.09	-	-	-
		0.5Imax	1	0.18	0.09	0.8	P

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20
Temperature, Humidity and Pressure recorder	139452	OMEGA	iBTHX-W	2023-01-11	2024-01-10

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

IEC 62053-21 SECTION 8.2.2 TEST OF THE INFLUENCE OF ODD HARMONICS AND SUB-HARMONICS

Criteria

The tests of the influence of odd harmonics and sub-harmonics shall be made with the circuit shown in Figure A.4 or with other equipment able to generate the required waveforms, and the current waveforms as shown Figure A.5 and Figure A.7 respectively.

The variation in percentage error when the meter is subjected to the test waveform given in Figure A.5 and Figure A.7 and when it is subjected to the reference waveform shall not exceed the limits of variation given in Table 8.

NOTE The values given in the figures are for 50 Hz only. For other frequencies, the values have to be adapted accordingly.

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Influence of Odd Harmonics and Sub-Harmonics	Vairakkannu Vairavan/Lim Mico/Sherry Wong	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-05-04

Test Method

Power the meter with nominal voltage. Apply the current per the meter class. Take accuracy reading then turn on harmonic component as described in above and repeat accuracy measurement. Once harmonic points have been evaluated verify that each load point test condition does not deviate from the Reference condition by more than the specified value.

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 - 75	-
Actual	23.0	70.4	-

Test Results

The GEN™5 RIVA is **compliant** with IEC 62053-21 Section 8.2.2 Tests of the influence of odd harmonics and sub-harmonics.

Figure 38: Odd and Sub Harmonics Test Setup

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Table 44: Odd Harmonics Test Results

Meter Serial Number	Test Location	Test Point	Phase Angle	% Error	Δ from Reference	Limit Class 1	Pass/Fail Class 1
SN967	REF	0.5Ib	1	0.11	-	-	-
	Odd Harmonics	Ib	1	0.13	0.02	0.8	P

Table 45: Sub-Harmonics Test Results

Meter Serial Number	Test Location	Test Point	Phase Angle	% Error	Δ from Reference	Limit Class 1	Pass/Fail Class 1
SN967	REF	0.5Ib	1	0.11	-	-	-
	Sub Harmonics	Ib	1	-0.03	0.14	1.5	P

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20
Temperature, Humidity and Pressure recorder	139452	OMEGA	iBTHX-W	2023-01-11	2024-01-10

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

IEC 62053-21 SECTION 8.2.3 TESTS OF THE INFLUENCE OF D.C. AND EVEN HARMONICS

Criteria

The tests of the influence of direct current and even harmonics shall be made with the circuit shown in Figure A.1 or with other equipment able to generate the required waveforms, and the current waveforms as shown in Figure A.2.

The variation in percentage error when the meter is subjected to the test waveform given in Figure A.2 and when it is subjected to the reference waveform shall not exceed the limits of variation given in Table 8.

NOTE The values given in the figures are for 50 Hz only. For other frequencies the values have to be adapted accordingly.

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
DC in the Even Harmonics	Jackson Daniel	UL LLC, 12 Laboratory Drive RTP, NC 27709	2023-06-06

Test Method

Power the meter with nominal voltage. Apply the current per the meter class. Take accuracy reading then turn on harmonic component as described in above and repeat accuracy measurement. Once harmonic points have been evaluated verify that each load point test condition does not deviate from the Reference condition by more than the specified value.

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	45 - 70	-
Actual	22.7	60.5	-

Test Results

The GEN™5 RIVA is **compliant** with NMI M 6-1 Section 4.8 Tests of the influence of d.c. and even harmonics.

Note : This test results referred to R4790778107 _IEC (AS)_RTP report from UL RTP

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

IEC 62053-21 SECTION 8.2.4 CONTINUOUS MAGNETIC INDUCTION OF EXTERNAL ORGIN

Criteria

The continuous magnetic induction may be obtained by using the electromagnet according to annex B.

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Continuous Magnetic Induction of External Origin	Lim Mico/Soo Voo Key/Sherry Wong	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-06-07

Test Method

Energized with a d.c. current. This magnetic field shall be applied to all accessible surfaces of the meter when it is mounted as for normal use. The value of the magneto-motive force applied shall be 1 000 At (ampere-turns).

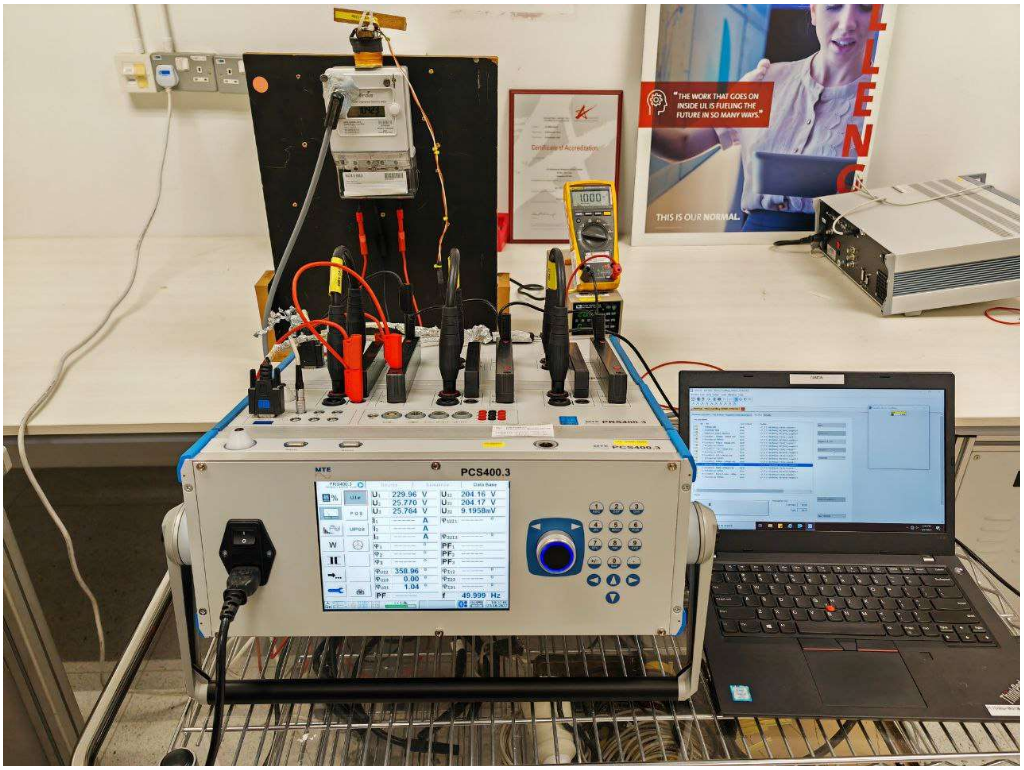
	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 - 75	-
Actual	24	68.5	-

Test Results

The GEN™5 RIVA is **compliant** with IEC 62053-21 Section 8.2.4 Continuous magnetic induction of external origin.

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Figure 39: Continuous Magnetic Induction of External Origin Test Setup



IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Table 46: Continuous Magnetic Induction of External Origin Test Results

Meter Serial Number	Test Location	Test Point	PF	% Error	Δ from Reference	Limit Class 1	Pass/ Fail Class 1
SN983	REF	Ib	1	-0.07	-	-	-
	LCD	Ib	1	-0.08	0.01	2	P
	Push Buttons	Ib	1	-0.08	0.01	2	P
	Top of meter	Ib	1	-0.08	0.01	2	P
	Left of Meter	Ib	1	-0.08	0.01	2	P
	Bottom of Meter	Ib	1	-0.08	0.01	2	P
	Right of Meter	Ib	1	-0.08	0.01	2	P

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20
Temperature, Humidity and Pressure recorder	139452	OMEGA	iBTHX-W	2023-01-11	2024-01-10
DC Power Supply	PSU05	ITECH	IT6720	No cal reqd	No cal reqd
Digital Multimeter	77780330	FLUKE	177	2023-04-06	2024-04-05
Electromagnet	04-T-00001	UL	Electromagnet	No cal reqd	No cal reqd

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

IEC 62053-21 SECTION 8.3 TEST OF STARTING AND NO-LOAD CONDITION

Section 8.3.1 Initial Start-up of the meter

Criteria

The meter shall be functional within 5 s after the reference voltage is applied to the meter terminals.

Test Method

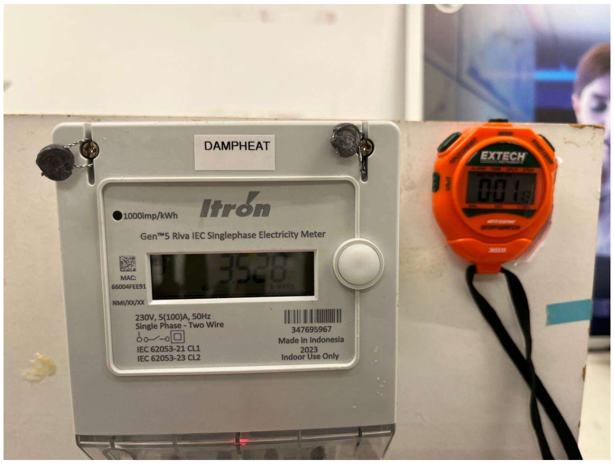
Power up the meter with voltage and verify that the screen shows all 8's across within the specified 5s after application of voltage.

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 - 75	-
Actual	21.8	74.1	-

Test Results

The GEN™5 RIVA is **compliant** with IEC 62053-21 Section 8.3.1 Initial start-up of the meter

Figure 40: Initial Start-up Test Setup



IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Table 47: Initial Start-up Test Results

Meter Serial Number	Voltage, Un (V)	Time recorded, sec	Limit, sec	Pass/Fail
SN967	230	1.13	5	Pass

Section 8.3.2 Test of No-Load Condition

Criteria

When the voltage is applied with no current flowing in the current circuit, the test output of the meter shall not produce more than one pulse.

For this test, the current circuit shall be open-circuit and a voltage of 115 % of the reference voltage shall be applied to the voltage circuits.

The minimum test period Δt shall be

$\Delta t \geq (480 \times 10^6) / k\ m\ U_n\ I_{max}$ *[min] for meters of class 2*

$\Delta t \geq (300 \times 10^6) / k\ m\ U_n\ I_{max}$ *[min] for meters of class 3*

where

k is the number of pulses emitted by the output device of the meter per kilowatt-hour (imp/kW·h);

m is the number of measuring elements;

U_n is the reference voltage in volts;

I_{max} is the maximum current in amperes.

For transformer-operated meters with primary or half-primary registers, the constant k shall correspond to the secondary values (voltage and currents).

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
No Load	Vairakkannu Vairavan/Lim Mico/Sherry Wong	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-05-04

Test Method

1. Determine the time the meter should run for based on the above formula.
2. Power up the meter at 115% of rated voltage with no current
3. Verify there are no accumulated pulses in the meter after the duration of time as determined in step 1.

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 - 75	-
Actual	22.3	69.1	-

Test Results

The GEN™5 RIVA is **compliant** with IEC 62053-23 Section 8.3.2 Test of no-load condition.

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Figure 41: No-Load condition Test Setup

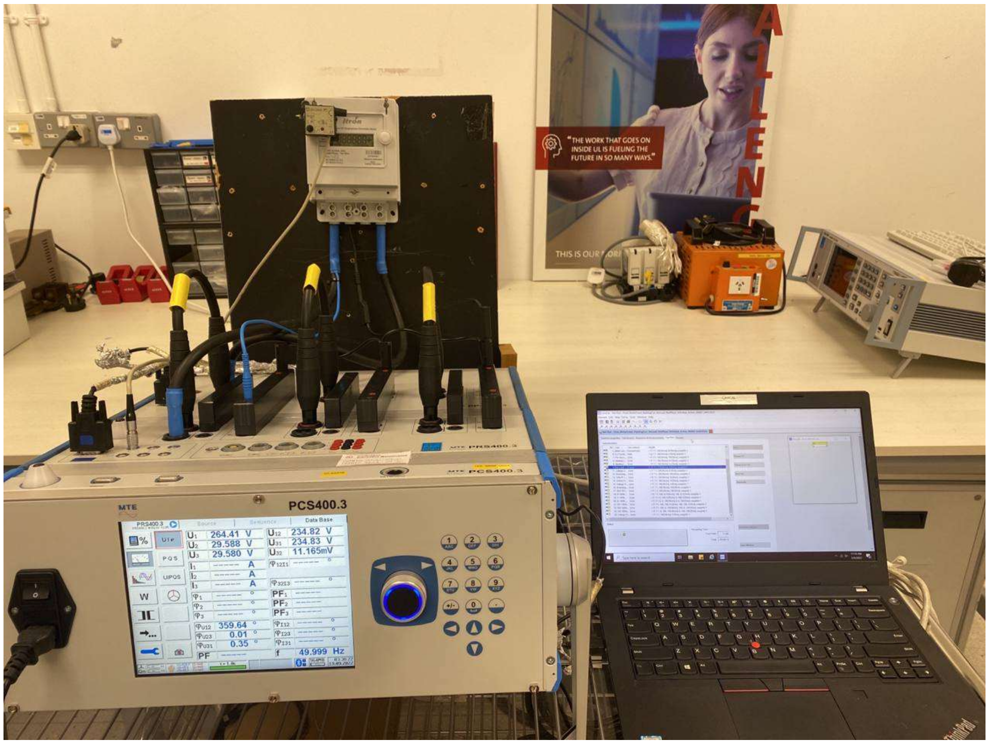


Table 48: No-Load condition Test Results

Meter Serial Number	Applied Voltage 1.15 Un	Applied Current	*Test Duration, min	Pulse counted after test duration	Pass / Fail
SN967	264.5	0A	27	0	P

*Note: k = 1000Imp/Wh, m = 1, Un = 230, Imax = 100

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20
Timer	139436	Extech	365515	2023-02-14	2024-02-14
Temperature, Humidity and Pressure recorder	139452	OMEGA	iBTHX-W	2023-01-11	2024-01-10

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

IEC 62053-21 SECTION 8.3.3 STARTING

Criteria

The meter shall start and continue to register at the starting current values (and in case of polyphase meters, with balanced load) shown in Table 9.

If the meter is designed for the measurement of energy in both directions, then this test shall be applied with energy flowing in each direction.

Table 9 – Starting current

Meters for	Class of meter		Power factor
	1	2	
Direct connection	0,004 I_b	0,005 I_b	1
Connection through current transformers	0,002 I_n	0,003 I_n	1

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Starting	Vairakkannu Vairavan/ Lim Mico/Sherry Wong	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-05-04

Test Method

Power the meter with nominal voltage. Apply the current per the meter class from Table 9. Confirm that the meter registers Energy into the kWh register on the face of the meter, while monitoring pules for operation.

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 - 75	-
Actual	22.3	69.1	-

Test Results

The GEN™5 RIVA is **compliant** with IEC 62053-21 Section 8.3.3 Starting.

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Figure 42: Starting Current Test Setup

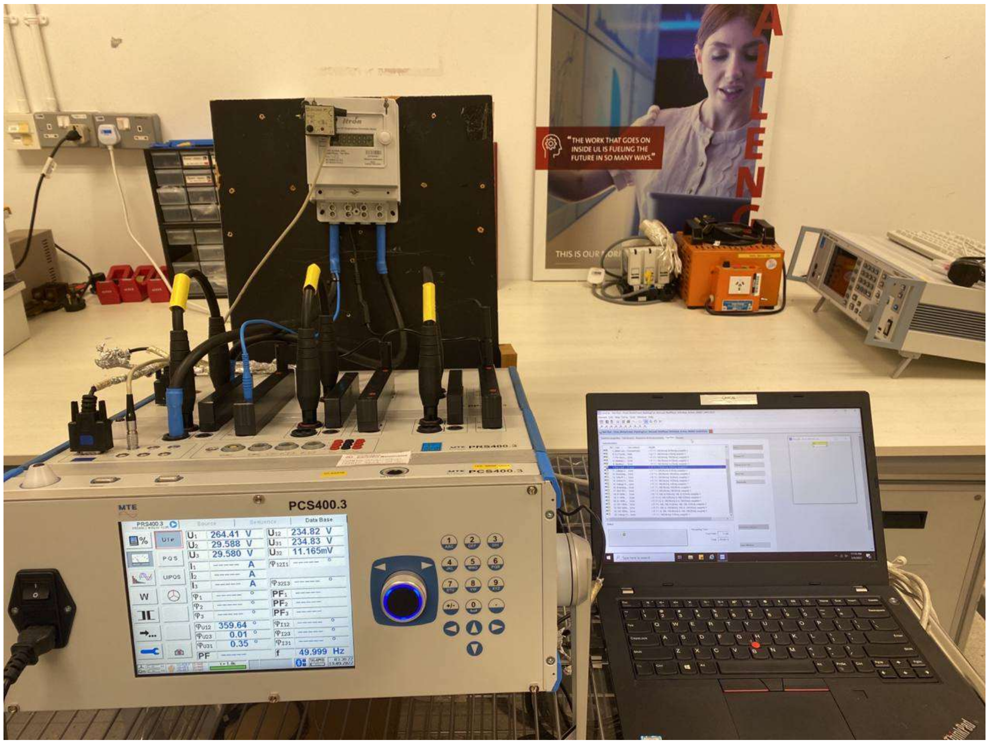


Table 49: Starting Current Test Results

Serial Number	Voltage Used	Ib	Staring Current Used A	PF	Direction	% Error	Pass/Fail
SN967	230	5	0.02	1	Import	-0.31	P
	230	5	0.02	1	Export	0.76	P

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20
Temperature, Humidity and Pressure recorder	139452	OMEGA	iBTHX-W	2023-01-11	2024-01-10

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

IEC 62053-21 SECTION 8.4 METER CONSTANT

Criteria

The relation between the test output and the indication in the display shall comply with the marking on the name-plate.

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Meter Constant	Vairakkannu Vairavan/Lim Mico/Sherry Wong	UL SGP , 20 Kian Teck Lane, Singapore 627854	2023-05-04

Test Method

1. Power the meter under rated voltage
2. Start readings of the register(s) under test are collected with current switched off
3. The current is switched on for dosage of 1kWh no more than ½ Imax
4. The current is switched off. End readings of the register(s) under test are collected.
5. The error is calculated whereas the energy calculated out of the counted pulses from test output of the meter under test is the nominal value as shown below.

$$\mathrm{Error} = \frac{(\mathrm{EndReading} - \mathrm{StartReading})}{\dfrac{\mathrm{CountedPulses}}{\mathrm{Constant}}} - 1$$

6. Confirm that the resulted error is no more than meter's accuracy class.

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 - 75	-
Actual	22.3	69.1	-

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Test Results

The GEN™5 RIVA is **compliant** with IEC 62053-21 Section 8.4 Meter constant.

Figure 43: Meter Constant Test Setup

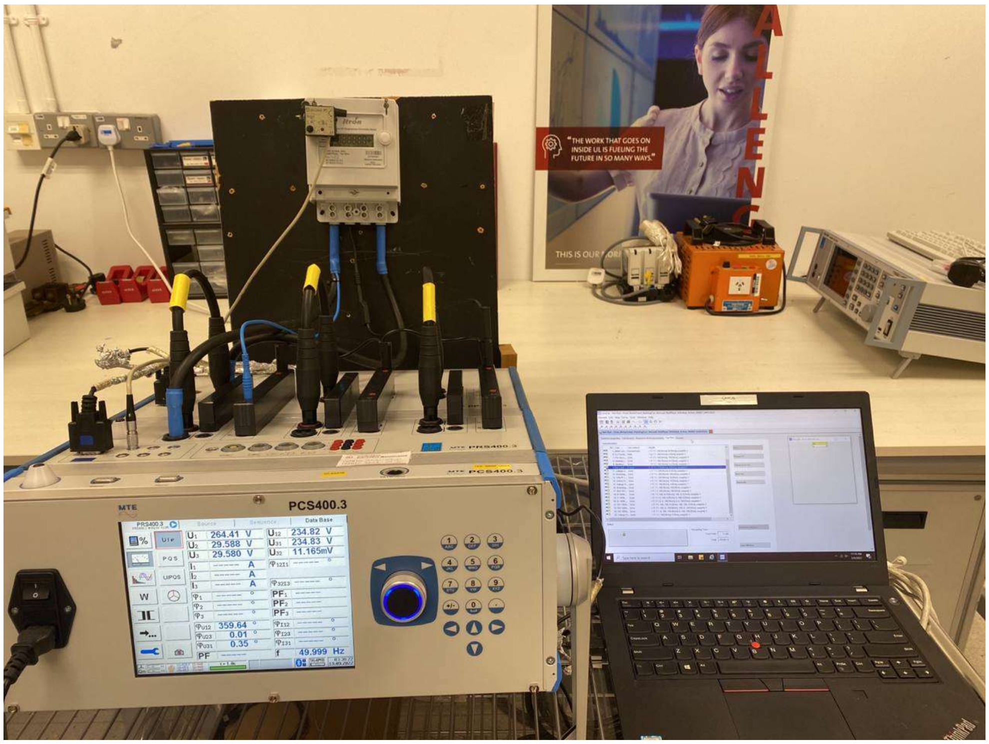


Table 50: Meter Constant Test Results

Meter Serial Number	Test Point	Phase Angle	# of Pulses	Counted Pulses	Register Start Reading	Register End Reading	% Error	Limit Class 1	Pass/Fail Class 1
SN967	0.5Imax	1	1,000	1,001	15.2520	16.2530	0.00	1	P

IEC AS 62053-21			
Clause	Requirement – Test	Remark	Result

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20
Temperature, Humidity and Pressure recorder	139452	OMEGA	iBTHX-W	2023-01-11	2024-01-10

APPENDIX A

RTP Test report: R4790778107 _IEC (AS)_RTP

TEST REPORT

IEC AS 62052-11 Electricity metering equipment (AC) – General requirements, tests and test conditions – Metering equipment

IEC AS 62053-21 Electricity metering equipment (AC)—Particular requirements Part 21: Static meters for active energy (classes 1 and 2)

Test Report	
Reference No.	R4790778107 _IEC (AS)_RTP
Prepared by (+ signature)	JaVon Terrell Senior Engineering Associate
Approved by (+ signature)	Scott Hunter D Operations Leader
Date of issue	2023-08-XX
Date of testing	March 2022 – August 2023
Contents	30 pages

Laboratory details	
Name	**UL LLC**
Physical Address	12 Laboratory Drive, RTP, NC 27709
Contact Details	Telephone (919) 549-1000

Test specification	
Standard	IEC 62052-11: 2016 (Ed 1.1), IEC 62053-21 : 2016 (Ed 1.1), AS 62052-11 : 2018 & AS 62053-21: 2018
Client details	
Applicant	PT. MECOINDO - Itron
Address	Plot 6B-2, EJIP, Bekasi, Jawa Barat, 17550, Indonesia
Product details	(see additional details on page 3)
Type of test object	Energy meter
Model/type reference	Gen™5 Riva
Rating	230Vac, 5(100)A, Single Phase, 50Hz, Active CL 1, Reactive CL 2

The issuance of this report in no way implies Listing, Classification or Recognition by UL and does not authorize the use of UL Listing, Classification or Recognition Marks or any other reference to UL on or in connection with the product or system. You cannot use this test data or UL's name or marks in connection with any product, packaging, advertising, promotion or marketing without UL's prior written permission. Please be informed that UL neither selected the sample nor determined whether the sample was representative of production samples. The test results apply only to the actual samples tested.

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UL Solutions

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Accreditation details
CERT #0751.06
UL LLC reports apply only to the specific samples tested under stated test conditions. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. UL LLC shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL LLC issued reports. This report shall not be used to claim, constitute or imply product certification, approval, or endorsement by NIST, A2LA, or any agency of the US government.

Possible results	
Test case omitted by customer request........................ :	ENR
Test case does not apply to the test object .... :	N(.A.)
Test sample does meet the requirement .... :	P(ass)
Test sample does not meet the requirement .... :	F(ail)

General remarks
"(see remark #)" refers to a remark appended to the report.
"(see appended table)" refers to a table appended to the report.
"(see appended results)" refers to results appended to the report.
The test results presented in this report relate only to the samples tested.
The test samples were provided by the client and were tested as submitted.
This report does not contain corrections or erasures.
This report shall not be reproduced except in full without the written approval of the testing laboratory
Decision rule for statement(s) of conformity is based on IEC Guide 115: 2007 Clause 4.4.3 Procedure 2 "Accuracy Method"

APPENDIX A

Specific remarks

1) In this report, the following tests were performed based on Singapore UL lab request
   - IEC 62052-11 SECTION 5.2.2.2 Shock test
   - IEC 62052-11 SECTION 5.2.2.3 Vibration test
   - IEC 62052-11 SECTION 5.11 Output Devices
   - IEC 62052-11 SECTION 5.11.1 Mechanical and Electrical characteristics
   - IEC 62052-11 SECTION 5.11.2 Optical Characteristics
   - IEC 62053-21 SECTION 8.2.3 Test of the influence of D.C and Even Harmonics

Statement of results

The test samples were fully assessed with Singapore UL Lab requested tests plan.

The test samples COMPLY with requested clauses by Singapore UL lab.

Product details

Enclosure type ....:	Thermoplastic
Connection type..................................:	Direct
Meter type ....:	Active and Reactive
Energy type.......................................:	Import and Export
Accuracy class ....:	Active 1 & Reactive 2
Protective class....................................:	II
Number of phases ....:	1
Number of elements ....:	1
Voltage rating...................................:	230Vac
Operating Temperature.....................:	-25 °C to 70 °C
Limit range of operation...................:	-25 °C to 70 °C
Storage and transportation...............:	-25 °C to 70 °C
Standard current rating....................:	5A
Maximum current rating....................:	100A
Indoor or outdoor..............................:	Indoor
Frequency...:	50 Hz
Clock...:	Crystal/Synchronous
Product mass ....:	0.85kg
Product dimensions ....:	201mm (H) x 125mm (W) x 91.6mm (D)

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Marking details


APPENDIX A

IEC 62052-11			
Clause	Requirement – Test	Remark	Result
1.	SCOPE		NOTED
2.	NORMATIVE REFERENCES		NOTED
3.	TERMS AND DEFINITIONS		NOTED
4.	STANDARD ELCTRICAL VALUES		NOTED
5.2.2	Mechanical tests		P
5.2.2.2	Shock test		P
5.2.2.3	Vibration test		P
5.11	Output device		P
	Meter has test output device capable of being monitored with suitable testing equipment		P
	Manufacturer states number of pulses to ensure measuring accuracy of at least 1/10 of class of meter		P
	Electrical pulse output		
	ON voltage Class A ≤ 8 V	Class B meter	N
	ON voltage Class B ≤ 1 V		P
	OFF voltage Class A ≥ 25 V	Class B meter	N
	OFF voltage Class B ≥ 14 V		P
	ON current Class A ≥ 10 mA	Class B meter	N
	ON current Class B ≥ 2 mA		P
	OFF current Class A ≤ 2 mA	Class B meter	N
	OFF current Class B ≤ 0.15 mA		P

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IEC 62052-11			
Clause	Requirement – Test	Remark	Result
	ON time ≥ 30 ms		P
	OFF time ≥ 30 ms		P
	Transition time ≤ 5 ms		P
	Pulse constant correct		P
	Intrinsic errors within accuracy class specification		P
	Operation indicator, if fitted, is visible from the front		P
5.11.1	Mechanical and electrical characteristics		P
	Optical test output accessible from front		P
	Maximum pulse frequency not exceeding 2.5 kHz		P
	Measured frequency	2.5 Hz	
	Unmodulated output pulse has wave shape of Figure D2		P
	Pulse transition time not exceeding 20 µs		P
	Measured pulse transition time	0.75 µs	
	Sufficient spacing between outputs or status displays		P
	Rise time verified with receiver diode with t_r <= 0.2 µs		P
5.11.12	Optical characteristics		P
	Radiated signal between 550 nm and 1000 nm		P
	Signal wavelength	831 nm	
	Output device radiation strength in ON-condition measured 10 mm from surface of meter between 50 µW/cm² and 1000µW/cm²		P
	Measured radiation strength (ON-condition)	113.77 µW/cm²	
	Radiation < 2 µW/cm² in OFF-condition		P
	Measured radiation strength (OFF-condition)	0.31 µW/cm²	

APPENDIX A

IEC 62052-11			
Clause	Requirement – Test	Remark	Result
A	ANNEX A, RELATIONSHIP BETWEEN AMBIENT AIR TEMPERATURE AND RELATIVE HUMIDITY		NOTED
B	ANNEX B, VOLTAGE WAVE-FORM FOR THE TESTS OF THE EFFECT OF VOLTAGE DIPS AND SHORT INTERRUPTIONS		NOTED
C	ANNEX C, TEST CIRCUIT DIAGRAM FOR THE TEST OF IMMUNITY TO EARTH FAULT		NOTED
D	ANNEX D, OPTICAL TEST OUTPUT		NOTED

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IEC 62052-11

IEC 62052-11 SECTION 5.2.2.2 SHOCK TEST

Criteria

The test shall be carried out according to AS 60068.2.27, under the following conditions:

After the test, the meter shall show no damage or change of the information and shall operate correctly in accordance with the requirements of the relevant standard.

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Accuracy Check	Jackson Daniel	UL LLC, 12 Laboratory Drive RTP, NC 27709	2023-06-06
Shock Test	Chris Rose	UL LLC, 12 Laboratory Drive RTP, NC 27709	2023-06-13
Accuracy Check	Jackson Daniel	UL LLC, 12 Laboratory Drive RTP, NC 27709	2023-06-26

Test Method

1. Verify meter accuracy at I_b or I_n.
2. Mount the meter to the shock table in non-operating condition, without the packing;
3. Conduct the test with a half-sine pulse, peak acceleration: 30 g_n (300 m/s^2) and duration of the pulse: 18 ms.
4. Verify no mechanical damage to meter and then meter accuracy at I_b or I_n.

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11 Section 5.2.2.2 Shock Test.

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Table 1: Shock Test Detailed Accuracy Results_Active

Meter Serial Number	Test Point	Phase Angle	Pre Test % Error	Post Test % Error	Limit Class 1	Pass/Fail Class 1
5931	Ib	1	0.05	0.04	1	P

Table 2: Shock Test Register Results

Meter Serial	Test Point	Initial	Post Test	Change	Limit	Pass/Fail
5931	Register kWh	0.007	0.007	0	0.023	P
	Damage	No Damage Observed			-	Pass

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Figure 1: Shock Test Configuration (F-B)

Figure 2: Shock Test Configuration (S-S)

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Figure 3: Shock Test Configuration (V)

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SN: 5931

Figure 4: Shock Test Plot F-B (-)

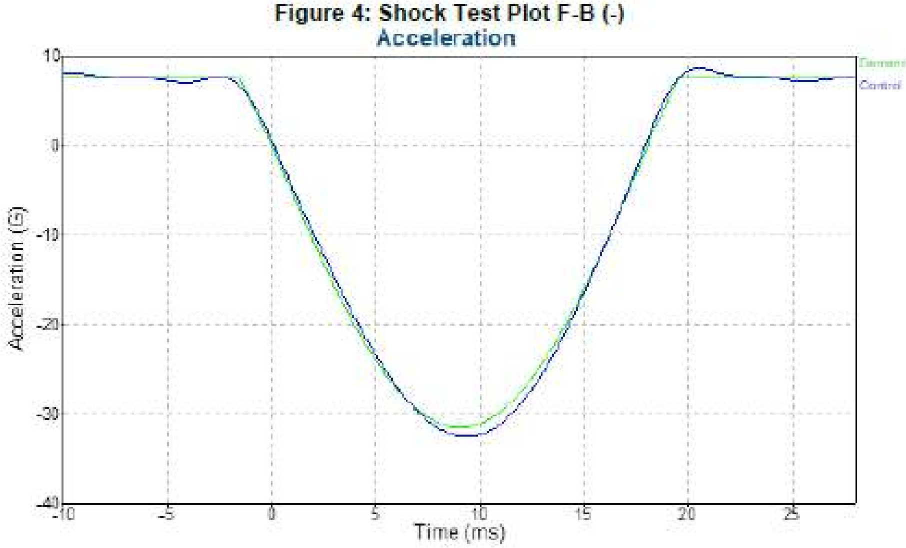

Figure 5: Shock Test Plot F-B (+)

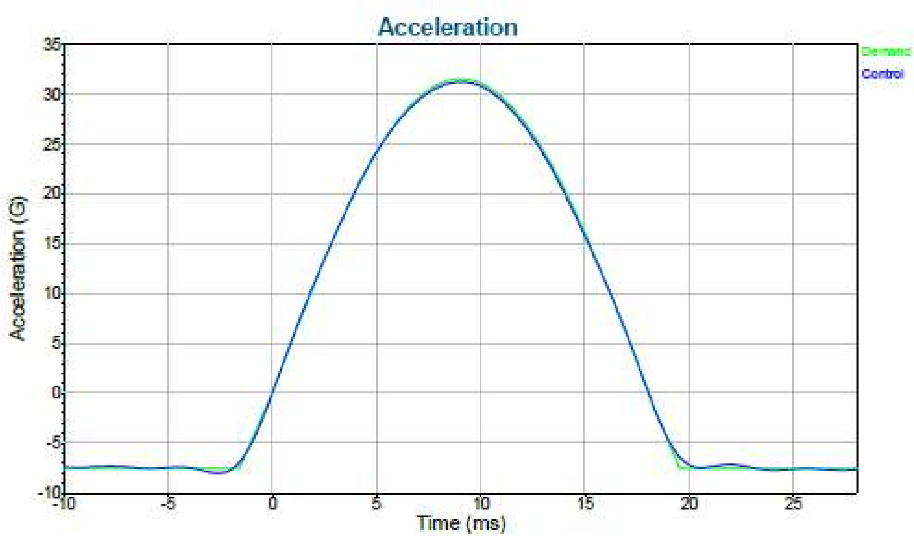

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Figure 6: Shock Test Plot S-S (-)

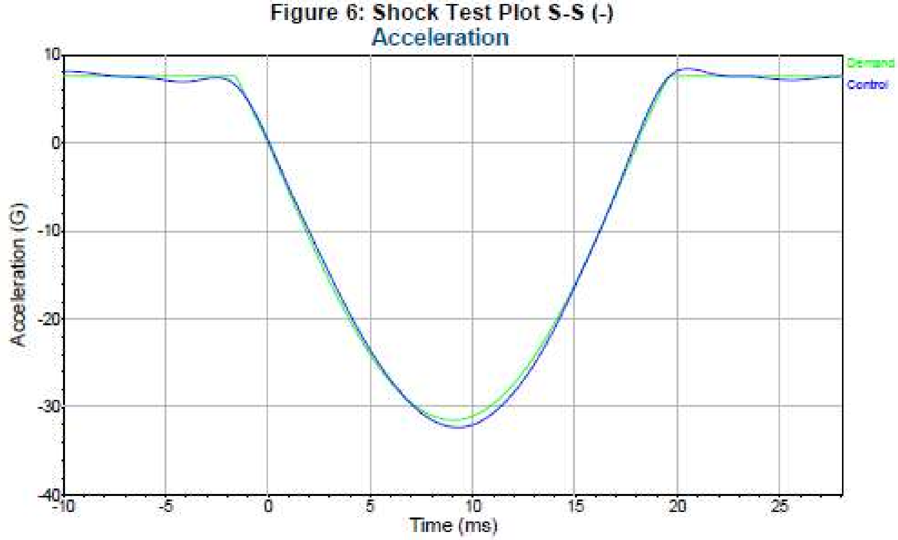

Figure 7: Shock Test Plot S-S (+)

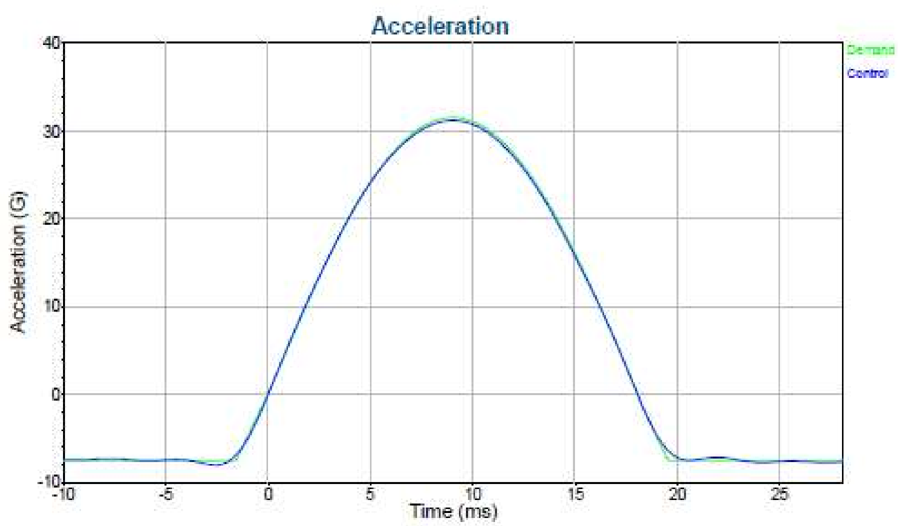

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Figure 8: Shock Test Plot V (-)

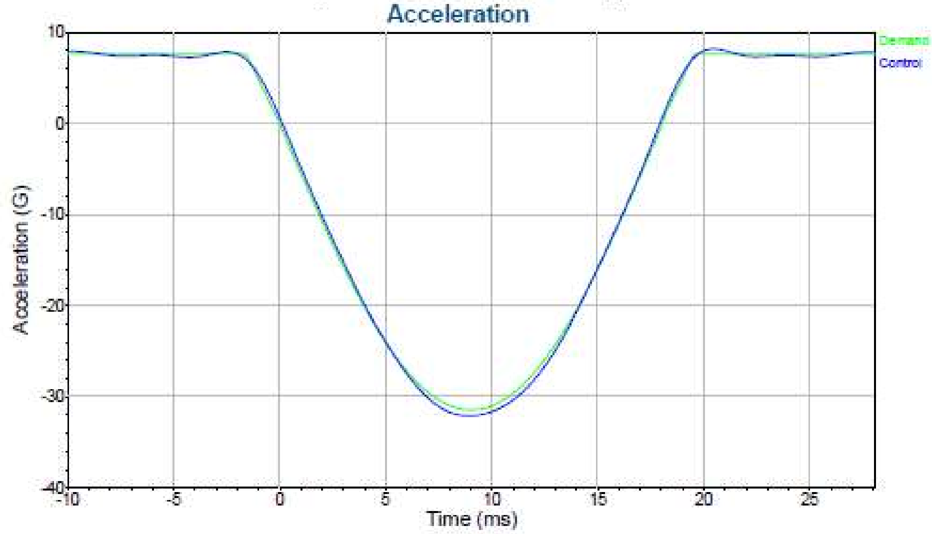
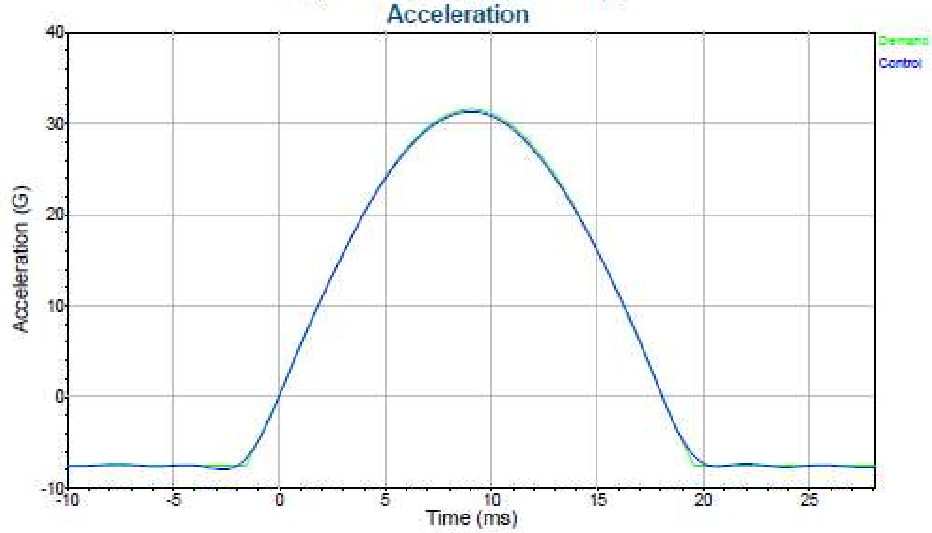


Figure 9: Shock Test Plot V (+)



APPENDIX A

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IEC 62052-11 SECTION 5.2.2.3 VIBRATION TEST

Criteria

The test shall be carried out according to AS 60068.2.6, under the following conditions:

After the test, the meter shall show no damage or change of the information and shall operate correctly in accordance with the requirements of the relevant standard.

Testing Performed	Test Operator	Location	Date(s)
Accuracy Check	Jackson Daniel	UL LLC, 12 Laboratory Drive RTP, NC 27709	2023-06-06
Shock Test	Chris Rose	UL LLC, 12 Laboratory Drive RTP, NC 27709	2023-06-13
Accuracy Check	Jackson Daniel	UL LLC, 12 Laboratory Drive RTP, NC 27709	2023-06-26

Test Method

1. Verify meter accuracy at I_b or I_n.
2. Mount the meter to the shock table in non-operating condition, without the packing;
3. Conduct the test over a frequency range: 10 Hz to 150 Hz, with a transition frequency: 60 Hz, $f < 60$ Hz, constant amplitude of movement 0,075 mm, $f > 60$ Hz, constant acceleration 9,8 m/s^2 (1 *g*), a single point control, and number of sweep cycles per axis: 10.
4. Verify no mechanical damage to meter and then meter accuracy at I_b or I_n.

NOTE 10 sweep cycles = 75 min.

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11, Section 5.2.2.3 Vibration Test.

Table 3: Vibration Test Detailed Accuracy Results_Active

Meter Serial Number	Test Point	Phase Angle	Pre Test % Error	Post Test % Error	Limit Class 1	Pass/Fail Class 1
5931	Ib	1	0.05	0.04	1	P

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Table 4: Vibration Test Register Results

Meter Serial	Test Point	Initial	Post Test	Change	Limit	Pass/Fail
5931	Register kWh	0.007	0.007	0	0.023	P
	Damage	No Damage Observed				Pass

Figure 10: Vibration Test Configuration (F-B)

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Figure 11: Vibration Test Configuration (S-S)

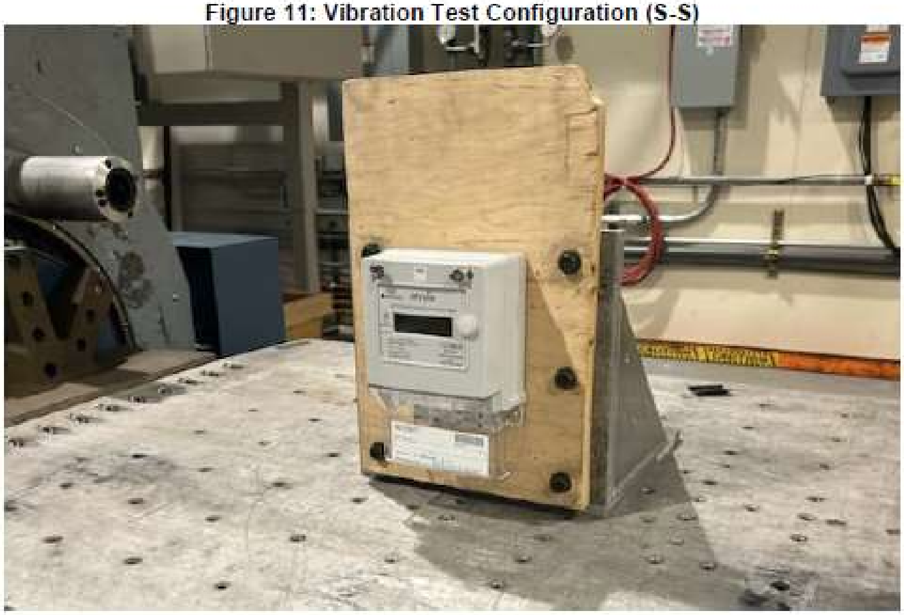

Figure 12: Vibration Test Configuration (V)

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SN:5931

Figure 13: Vibration Test Plot (F-B)

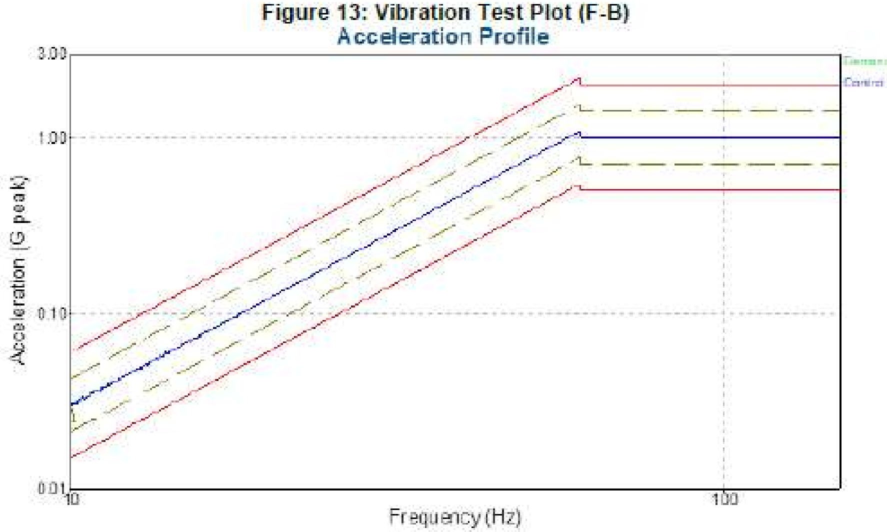

Figure 14: Vibration Test Plot (S-S)

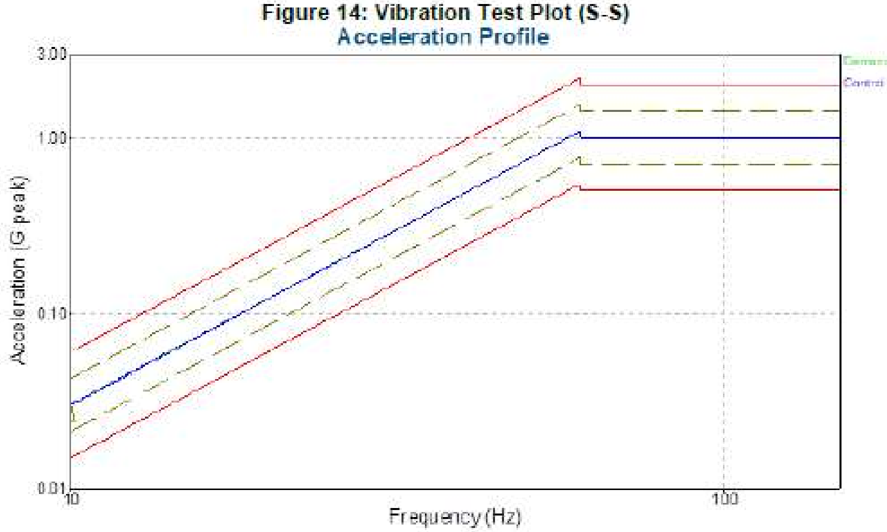

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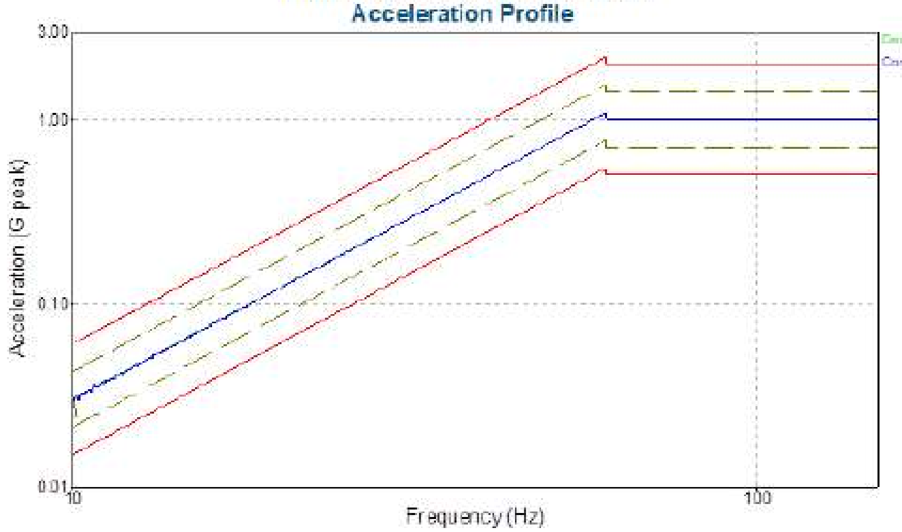
Figure 15: Vibration Test Plot (V)

Acceleration Profile



Test Equipment Used

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
See LWI Meter Use for Meters Lab equipment					
Vibration Controller	AX0068	Vibration Research	VR9500	2023-03-14	2024-03-31
Accelerometer	AX0013	PCB	J353B31	2021-09-09	2023-09-30

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IEC 62052-11 SECTION 5.11 OUTPUT DEVICES

Criteria

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 62052-31.
If the test output is an optical test output, then it shall fulfil the requirements according 5.11.1 and 5.11.2.
The operation indicator, if fitted, shall be visible from the front.

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Optical Characteristics	Jackson Daniel / Kelon Charles	UL LLC, 12 Laboratory Dr, RTP, NC 27709	2023-06-05

Test Method

a) Maximum pulse frequency (2.5 kHz)
b) Pulse transition time (rise time and fall time), including transient effects (must be less than 20 uS)
c) On time
d) Off time
e) Radiation strength On State
f) Radiation strength Off State

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11, Section 5.11 Output devices.

APPENDIX A

IEC 62052-11

Section 5.11.1 Mechanical and electrical characteristics

Criteria

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 20µs (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 transmission 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

$t_r \leq 0{,}2\ \mu s$.

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Optical Characteristics	Jackson Daniel / Kelon Charles	UL LLC, 12 Laboratory Dr, RTP, NC 27709	2023-06-05

APPENDIX A

IEC 62052-11

Test Method

1. Set up the MTE in manual mode to the rated voltage and max current.
2. Connect the optical reader
3. Open the control software and select the COM port
4. Set the optical controller to the wavelength of the pulse output specified by the manufacturer.
   a. Press the menu button
   b. Select wavelength
   c. Enter wavelength
   d. Accept changes
5. In the control software on the computer, set the meter mode to Peak Hold.
   a. Select the peak hold period needed to monitor the output and record the values accurately
6. Record the max value of the Peak Hold while the pulse output is ON.
7. Record the max value of the Peak Hold while the pulse output is OFF.
   a. Ensure current is off to be positive that no light is coming off the pulse LED. DO NOT TURN OFF METER OR COVER ANY OTHER LIGHTS

Test Results

The GEN™5 RIVA is compliant with IEC 62052-11, Section 5.11.1 Mechanical and electrical characteristics.

Figure 16: Mechanical and electrical characteristics pulse frequency

Test	Limit	Measured	Pass/Fail
Signal wavelength	550-1000nm	831Nm	Pass
Frequency	< 2.5kHz	6.38Hz	Pass
Waveshape	Figure D.2	Referred below	Pass
Rise Time	<20us	0.44us	Pass
Fall Time	<20us	0.75us	Pass
Time On	>=0.2ms	10ms	Pass
Time Off	>=0.2ms	146.75ms	Pass

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Section 5.11.2 Optical characteristics

Criteria

The wavelength of the radiated signals for emitting systems shall be between 550 nm and 1000 nm.

The output device in the meter shall generate a signal with a radiation strength E_T over a defined reference surface (optically active area) at a distance of a_1 = 10 mm ± 1 mm from the surface of the meter, with the following limiting values:

ON-condition : 50 $\mu W/cm^2 \leq E_T \leq 1\,000\ \mu W/cm^2$

OFF-condition: $E_T \leq 2\ \mu W/cm^2$

See also Figure D.1 of IEC 62052-11

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Optical Characteristics	Jackson Daniel / Kelon Charles	UL LLC, 12 Laboratory Dr, RTP, NC 27709	2023-06-05

APPENDIX A

IEC 62052-11

Test Method

1. Set up the MTE in manual mode to the rated voltage and max current.
2. Connect the optical reader
3. Open the control software and select the COM port
4. Set the optical controller to the wavelength of the pulse output specified by the manufacturer
    a. Press the menu button
    b. Select wavelength
    c. Enter wavelength
    d. Accept changes
5. In the control software on the computer, switch to the Graphic Display tab.
6. With the meter running with pulse output, set the Time base and Power range to estimated values to begin with.
7. Press acquire.
    a. You will see the waveform of the pulse output update on the screen.
    b. You will need to adjust the Time base and Power range in order to show the best screen of the pulse waveform.
8. In order to keep the waveform still, press acquire again.
9. Different setting will be needed to capture all of the data needed.
    a. Rise Time
        i. Smaller time base in order to zoom in
        ii. Positive trigger slope
    b. Fall Time
        i. Smaller time base in order to zoom in
        ii. Negative trigger slope
    c. On/Off Time
        i. Larger time base in order to show whole wave
        ii. Positive or negative trigger slope depending on time base
10. Collect data from the scans.
    a. After getting a scan of one of the measurements, you will need to use the curser function to actually measure the time.
    b. Select "cursors enabled" in the cursors section of the control program.
    c. Select the correct function (usually the change in time though sometimes you will need to use frequency and calculate the time when the rise or fall time are so short that it displays 0 seconds in the time function)
    d. Use the left click button and right click button in order to select the location for the markers. The measurement will be displayed below the graph. Remember to select the points according to the standard.
11. Save the graphic plot
    a. In the "Meter" drop down menu click "save graphic screen" to save the values and waveform

Test Results

The GEN™5 RIVA is **compliant** with IEC 62052-11, Section 5.11.2 Optical characteristics.

APPENDIX A

IEC 62052-11

Figure 17: Optical characteristics radiation strength

Test	Limit	Measured	Pass/Fail
Signal wavelength	550-1000nm	831nm	Pass
Amplitude (On Condition)	50-1000uW/cm^2	113.77	Pass
Amplitude (Off Condition)	< 2 uW/cm2	0.31	Pass

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
See LWI Meter Use.					

APPENDIX A

IEC 62053-21

IEC 62053-21 SECTION 8.2.3 TESTS OF THE INFLUENCE OF D.C. AND EVEN HARMONICS

Criteria

The tests of the influence of direct current and even harmonics shall be made with the circuit shown in Figure A.1 or with other equipment able to generate the required waveforms, and the current waveforms as shown in Figure A.2.

The variation in percentage error when the meter is subjected to the test waveform given in Figure A.2 and when it is subjected to the reference waveform shall not exceed the limits of variation given in Table 8.

NOTE The values given in the figures are for 50 Hz only. For other frequencies the values have to be adapted accordingly.

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
DC and Even Harmonics	Jackson Daniel	UL LLC, 12 Laboratory Drive RTP, NC 27709	2023-06-06

Test Method

Power the meter with nominal voltage. Apply the current per the meter class. Take accuracy reading then turn on harmonic component as described in above and repeat accuracy measurement. Once harmonic points have been evaluated verify that each load point test condition does not deviate from the Reference condition by more than the specified value.

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	45 - 70	-
Actual	22.7	60.5	-

Test Results

The GEN™5 RIVA is compliant with IEC 62053-21 Section 8.2 Tests of the influence of d.c. and even harmonics.

APPENDIX A

IEC 62053-21

Figure 18: D.C. and Even Harmonics Test Setup

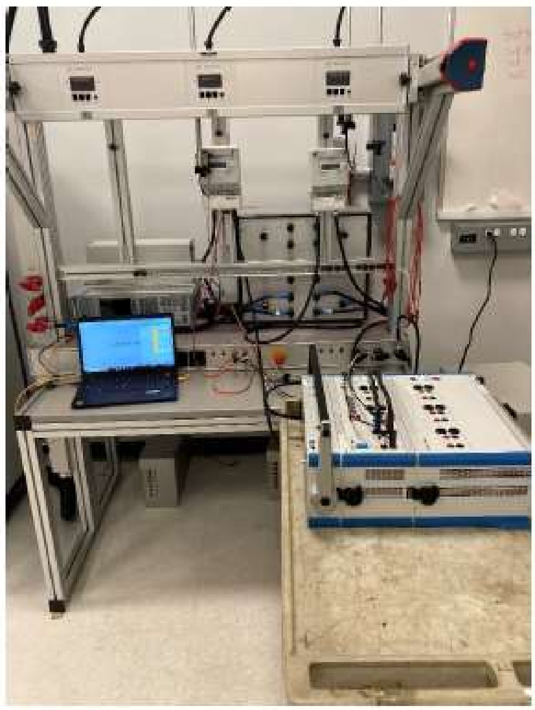


Table 5: D.C. and Even Harmonics Test Results_Active

Meter Serial Number	Test Location	Test Point	Phase Angle	% Error	Δ from Reference	Limit Class 1	Pass/Fail Class 1
5986	RTP	Imax/√2	1	-0.14	-	-	-
		Imax/√2	1	0.44	0.58	3	P

APPENDIX A

PHOTOGRAPHS

Front Meter cover

APPENDIX A

PHOTOGRAPHS

Front of PWB

APPENDIX A

PHOTOGRAPHS

END OF TEST REPORT

APPENDIX B

Power lab PL1817-ITRON test report

Report Number: PL1817-ITRON

Test Report

DATE ISSUED:	15 September 2022
DEVICE TESTED:	Itron single phase energy meter Type EMS12RA
CLIENT'S NAME:	UL International Singapore Pte Ltd 20 Kian Teck Lane Singapore 627854 Singapore Attention: Vairavan Vairakkannu
CLIENT'S REFERENCE:	PO 1230001369
TEST SPECIFICATION:	NMI M 6 2nd edition, Clause A.2.16 Short-time overcurrents, Tests A and C
DATE OF TEST COMPLETION:	2 September 2022
SUMMARY OF RESULTS:	The sample meters were subjected to 3000 A and 7000 A as specified in A.2.16. No damage to surrounding equipment occurred during the 3000 A Test. No damage to surrounding equipment occurred during the 7 kA Test.

All tests reported herein have been performed in accordance with the Laboratory's scope of accreditation. Accreditation Number: 42

Approved Signatory: K Manson

Checked By: G I Dix

International Accreditation New Zealand (IANZ) has a Mutual Recognition Arrangement (MRA) with ILAC, such that both IANZ and NATA recognize accreditations by IANZ and NATA as being equivalent. Users of inspection reports / certificates are recommended to accept inspection reports / certificates in the name of either accrediting body.

PowerLab Limited, PO Box 31034 Christchurch 8444 New Zealand, 5 Sheffield Crescent Christchurch New Zealand, Info@powerlab.co.nz. This Report must not be quoted except in full

APPENDIX B

Report Number: PL1817-ITRON

PowerLab

1.0 Meter Description

Meter Tested

ITRON single phase energy meter Type EMS12RA

Test A, S/N 66004FEE98

Test C, S/N 66004FEE97

Client rating instruction:

230 V

Meter Manufacturer Markings:

Refer to Photograph(s) included in this report

2.0 TEST PROCEDURE

2.1 Test Witnesses

Laboratory personnel: G I Dix and K Manson

2.2 Procedure

The test current was supplied via a step down transformer from the 11 kV laboratory mains supply. The nominal open circuit supply to the short circuit busbar was 230 V at 50 Hz.

The meter was energized prior to application of the test current.
The meter was tested on a phase by phase basis.

Test A, 3000 A was applied to the sample meter, nominal test duration was 10 ms
Test C, 7000 A was applied to the sample meter, nominal test duration was 60 ms.

Note: All current and voltages quoted in this Report are rms values unless otherwise stated.

Equipment

11 kV/440 V short circuit transformer
20,000/5 CT
2000/5 CT
Tektronix TDS3034 digitising oscilloscope
Laboratory constructed point on wave switch
Inductors and Resistors

Please refer to the Laboratory accreditation details at www.ianz.govt.nz for information on measurement uncertainty.

APPENDIX B

Report Number: PL1817-ITRON

Conditions during the test: 102.5 ± 5 kPa, 14 ± 1 °C (Meters conditioned at 20 °C prior to test)

Test Set-up

For Test A

The test circuit was according to the requirements of Clause A.2.16 and consisted of:

1) A supply with current of 3000 A 'practically non-inductive' open circuit voltage of 240 V
2) A point on wave switch
3) The meter under test
4) Supply voltage, test current and voltage at the phase terminals of the meter were monitored during the test

For Test C

The test circuit was according to the requirements of Clause A.2.16 and consisted of:

5) A supply with current of 7000 A 'practically non-inductive' open circuit voltage of 240 V
6) A point on wave switch
7) The meter under test
8) Supply voltage, test current and voltage at the phase terminals of the meter were monitored during the test

Calibration

Test A

3000 A Test:

Prospective current (obtained with the test object removed from the circuit) 2768 A (allowed minimum of 2700 A)
Circuit power factor 'practically non-inductive'
Duration 10 ms

Test C

7000 A Test:

Prospective current (obtained with the test object removed from the circuit) 6876 A (allowed minimum of 6300 A)
Circuit power factor 'practically non-inductive'
Duration 60 ms

APPENDIX B

3.0 RESULTS

For Test A:

During the tests:

1) Surroundings of the meter and load control equipment were not endangered and protection against indirect contact was assured.
2) The internal meter connections were intact after the test
3) No apparent indication of internal failure during the test was observed by examination of meter terminal voltage record

For Test C:

During the tests:

1) Surroundings of the meter and load control equipment were not endangered and protection against indirect contact was assured.

APPENDIX B

Report Number: PL1817-ITRON

PowerLab

4.0 OSCILLOGRAMS:

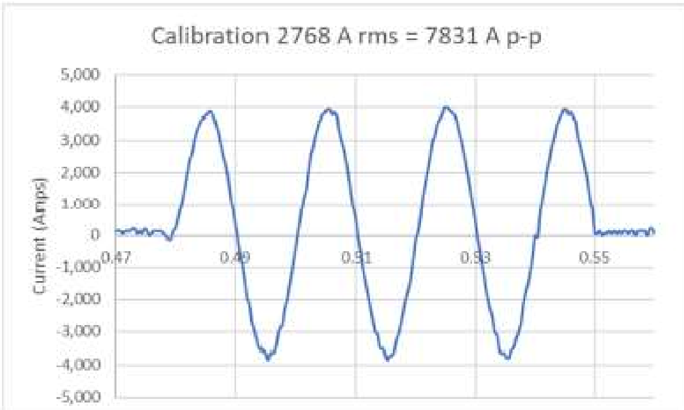


Figure 1, 3000 A Calibration.

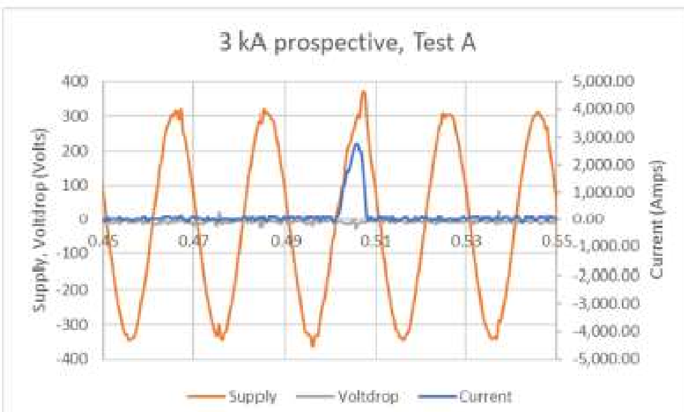


Figure 2, 3000 A test

APPENDIX B

Report Number: PL1817-ITRON

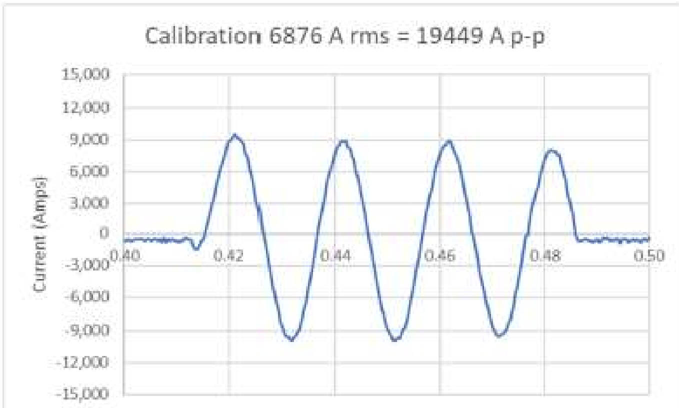


Figure 3, 7 kA Calibration

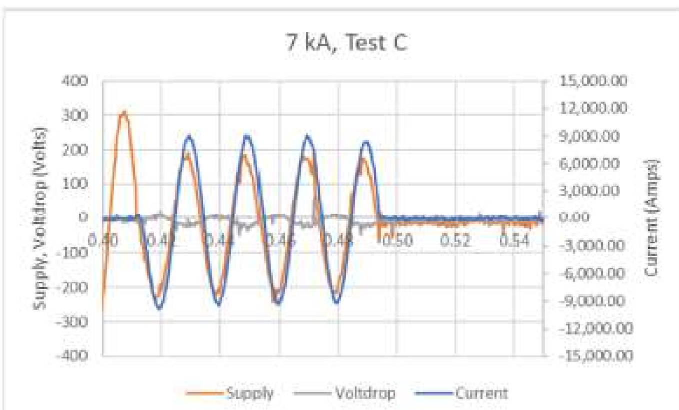


Figure 4, 7 kA Test

APPENDIX B

Report Number: PL1817-ITRON

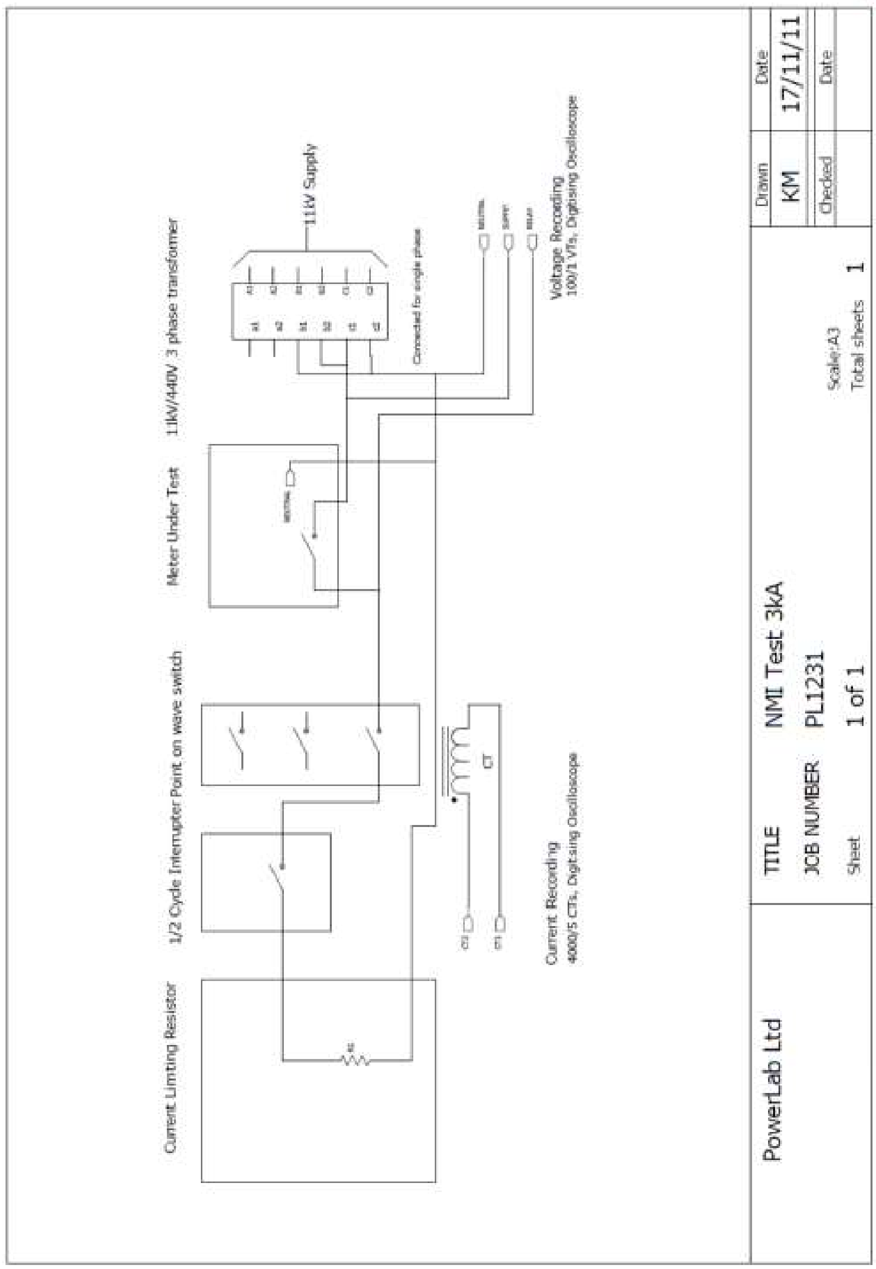


Figure 5Representative Test Schematic

APPENDIX B

Report Number: PL1817-ITRON

Photograph(s)

Photo 1 Meter top view

APPENDIX B

Report Number: PL1817-ITRON

Photo 2 Meter terminals

APPENDIX C

R4790778107-IEC_AS SAFETY

TEST REPORT

IEC 62052-31 Electricity metering equipment (AC) – General requirements, tests and test conditions –
Part 31: Product safety requirements and tests
AS 62052.31 Electricity metering equipment (AC) – General requirements, tests and test conditions –
Part 31: Product safety requirements and tests

Test Report	
Reference No. ....:	**R4790778107-IEC_AS SAFETY**
Prepared by (+ signature) ....:	Varia Bhavesh **Senior Project Engineer (Supervise)** Soo Voo Key **Engineer Project Associate (T)**
Approved by (+ signature) ....:	Wellhouse II, John H. **Staff Engineer**
Date of issue..:	September 7th 2023
Date(s) of testing ....:	May 2023 – August 2023
Contents ....:	164 pages

Laboratory details	
Name ....:	UL LLC
Physical Address.....................................:	12 Laboratory Drive, Research Triangle Park, NC 27709
Contact Details ....:	Telephone: +1 919 549 1000

Test specification	
Standards ....:	IEC 62052-31: 2015 (Ed 1.0) and AS 62052.31: 2017 (Ed 1.0)

Client details	
Applicant ....:	PT. MECOINDO - Itron
Address...:	Plot 6B-2, EJIP, Bekasi, Jawa Barat, 17550, Indonesia

Product details	(see additional details on page 3)
Type of test object ....:	Energy meter
Model/type reference ....:	Gen™5 Riva
Model description ....:	Single Phase Electricity Meter
Rating ....:	230Vac, 5(100)A, Single Phase, 50Hz, Active CL 1

The issuance of this report in no way implies Listing, Classification or Recognition by UL and does not authorize the use of UL Listing, Classification or Recognition Marks or any other reference to UL on or in connection with the product or system. You cannot use this test data or UL's name or marks in connection with any product, packaging, advertising, promotion or marketing without UL's prior written permission. Please be informed that UL neither selected the sample nor determined whether the sample was representative of production samples. The test results apply only to the actual samples tested.

APPENDIX C

Accreditation details

INTERNATIONAL ACCREDITATION SERVICE®

IAS Accreditation Number – TL-304

UL LLC reports apply only to the specific samples tested under stated test conditions. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured w ith identical electrical and mechanical components. UL LLC shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL LLC issued reports. This report shall not be used to claim, constitute or imply product certification, approval, or endorsement by IAS.

This report may contain test results that are not covered by the IAS accreditation. The scope of accreditation is limited to the specific tests that are listed on the IAS website.

General remarks

"(see remark #)" refers to a remark appended to the report.

"(see appended table)" refers to a table appended to the report.

"(see appended results)" refers to results appended to the report.

The test results presented in this report relate only to the samples tested.

The test samples were provided by the client and were tested as submitted.

This report does not contain corrections or erasures.

Throughout this report a '.' point is used as the decimal separator.

This report shall not be reproduced except in full without the written approval of the testing laboratory.

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:

The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided......: ☐ Yes ☒ Not applicable

When differences exist; they shall be identified in the general product information section.

APPENDIX C

Specific remarks

Below safety standard IEC AS 62052-31 tests were omitted by customer:

1. Testing of Current Circuits of Direct Connected Meters with SCSs Clause 6.10.6
2. Maximum Overload Current test (128A) under AS 62052-31 Appendix ZZ.

Below safety standard IEC AS 62052-31 tests were conducted and complied:

1. Clause 6.9.7.3 Cable flexion and pull test
2. Clause 6.10.3.2 Long term overvoltage withstand test
3. Clause 6.10.4.3.4 AC power frequency voltage test-after resistance for non-metallic enclosure test, after spring hammer and after humidity conditioning
4. Clause 6.10.3.3 Impulse voltage test without supply voltage
5. Clause 6.10.3.4 Surge test with supply voltage
6. Clause 6.10.3.5 Impulse voltage test with SPDs not present
7. Clause 6.10.4.2 Humidity conditioning test
8. Clause 8.2.2 Spring hammer test
9. Clause 9.3.2.1 Terminal block/cover glow wire test
10. Clause 10.1 to 10.4 Temperature test (Maximum rated current 100A only)
11. Clause 10.5.1 Resistance to heat for non-metallic enclosure test (mold stress)
12. Clause 11 Protection against penetration of dust and water (IPX4 only)

Additional remarks

NOTE: This Report is NOT a stand-alone IEC 62052-31 and/or AS 62052.31 Safety Test Report. It does NOT imply Safety Certification. Only a limited investigation and/or testing was performed. It is solely intended to supplement investigations to other metrology-based Meter Standards, which refer to IEC 62052-31 and/or AS 62052.31 for compliance to certain Clauses out of the metrology Standard(s).

Statement of results

The test samples were fully assessed to the customer-specified clauses of the test specification.

The test samples **COMPLY** with the customer-specified clauses of the test specification.

APPENDIX C

Product details	Error! Reference source not found.
Enclosure type ....:	Thermoplastic
Connection type ....:	Direct connected
Protective class ....:	II
Number of phases ....:	1
Number of elements ....:	1
Voltage rating.....................................:	230V AC
Standard current rating.....................................:	5 A
Maximum current rating.....................................:	100 A
Frequency.....................................:	50 Hz

APPENDIX C

Marking details

APPENDIX C

Test item particulars:	
Type of item ...:	Measurement
Description of equipment function...:	Electric utility meter for revenue recognition use in industrial, commercial, residential, or rural settings.
Connection to MAINS supply...:	Permanent
Overvoltage category...:	III
POLLUTION DEGREE...:	II
Means of protection ...:	Class II (isolated)
Environmental conditions ...:	Extended (Specify): -25…70°C (operating temperature for intermediate operating condition), -25…55°C (maximum rated ambient range for continuous operating condition at maximum current) Altitude ≤ 2000 m
For use in wet locations...:	No; Indoor Category 2
Equipment mobility ...:	Fixed
Operating conditions...:	Continuous
Overall size of equipment (W x D x H)...:	201mm (H) x 125mm (W) x 91.6mm (D)
Mass of equipment (kg) ...:	0.85 kg
Marked degree of protection to IEC 60529...:	IP54 (meter intended for indoors, but tested to IP54 requirements)
Possible results:	
- Test case does not apply to the test object ...:	N (Not Applicable)
- Test object does meet the requirement ...:	P (Pass)
- Test object does not meet the requirement ...:	F (Fail)
- Information provided was insufficient to accurately determine a verdict ...:	I (Inconclusive)
- Acceptability of test method and/or parameter(s) to be determined by applicant ...:	TBD (To be determined)
- Standard Clause is informational only in nature and does not require a verdict to be declared ...:	NOTED
Testing:	
Date(s) of performance of tests...:	May 2023 – August 2023

General remarks:

The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the issuing testing laboratory.

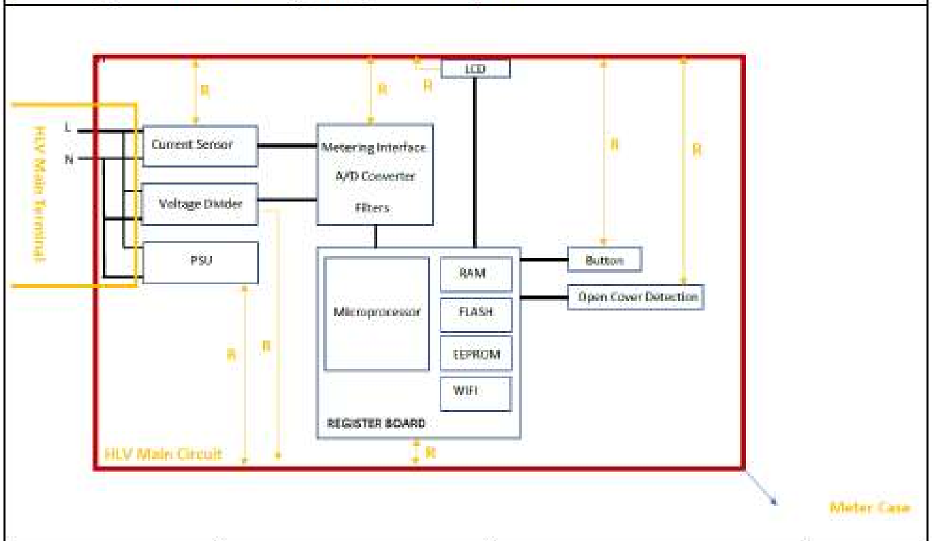
Throughout this report a '.' point is used as the decimal separator.

APPENDIX C

General product information: Description of unit: **Model GEN™5 RIVA Series:** This is a single-phase, 2-wire, 1-element, direct-connected, stand-alone, smart meter with one 100A relays/switches are mounted in the circuit of the meter with 1P2W configurations
Description of model differences. N/A
Description of special features. (HV circuits, high pressure systems etc.) N/A

APPENDIX C

Block Diagram of insulation system provided in product



Pollution Degree ....:	PD2	Overvoltage Category.................. :	OVC III
Altitude Rating ....:	2000 m	PWB Material Group..................... :	IIIb

Area Code	Area Code Description	Insulation Type Required	WORKING VOLTAGE			TEST VOLTAGE	
			RMS [V]	Peak [V]	Frequency [Hz]	Impulse [Vpeak]	AC Voltage [Vrms]
A	Mains Circuits to Measurement Circuits (HLV to N)	R	230	-	50	4800	1500

Insulation Types:
F = FUNCTIONAL
B = BASIC
D = DOUBLE
PI = PROTECTIVE IMPEDANCE
R = REINFORCED
S = SUPPLEMENTARY

APPENDIX C

Clearances and Creepages								
Area Code	Specific Locations within Area Code Indicated	Insulation Type	WORKING VOLTAGE	Clearance (mm)		Creepage (mm)		Verdict
			(Vrms)	Required	Measured	Required	Measured	
A	Ln terminal to N terminal	B	230 Vac	5.5	10.18	3.2	10.18	P
A	Transformer primary to secondary (on PWB)	R	230 Vac	5.5	8.31	3.2	8.31	P

APPENDIX C

IEC 62052-31/AS 62052.31

IEC 62052-31/AS 62052.31			
Clause	Requirement - Test	Remark	Result
4	TESTS		-
4.3.2.11	**Test cables**	NOTE 1 This subclause does not apply to installation, which is generally subject to national wiring regulations.	-
	Test cables for connecting the current circuits, supply control switches and load control switches shall be single core or stranded, suitable insulated cables with cross-sections as given in Table 1. The length of the test cables shall be:	NOTE 2 This subclause is based on IEC 60947-1:2007, 8.3.3.3.4. All test cables were 35 mm² AWG or smaller, stranded or single core, and suitably insulated for the voltages present.	P
	• 1 m for cross-sections up to and including 35 mm² (or AWG 2);		P
	• 2 m for cross-sections larger than 35 mm² (or AWG 2).	No cables larger than 35 mm² were used	N
	For the terminals of voltage circuits and auxiliary circuits the test cables shall be single core or stranded, suitably insulated cables of 1 mm², unless otherwise specified by the manufacturer.	Voltage and current circuits are connected together in normal operation. No auxiliary supply circuits are included.	N
	Unless otherwise specified by the manufacturer, stranded cables shall be terminated by fitting cable end ferrules and they shall be correctly crimped with an appropriate crimping tool. All contact surfaces shall be free of oxide layers.	NOTE 3 See DIN 46228-1:1992-08 *Aderendhülsen; Rohrform ohne Kunststoffhülse*. English title: *Tubular end sleeves without plastic sleeve*.	-
	Terminal screws, where used, shall be tightened according to the manufacturer's instructions.		P

6	PROTECTION AGAINST ELECTRIC SHOCK		-
6.5.2	**Protective bonding**		-
6.5.2.1	**General**	NOTE This subclause is based on IEC 61010-1:2010, 6.5.2.1 and IEC 60255-27:2013, 5.1.6.2.	-

APPENDIX C

IEC 62052-31/AS 62052.31

IEC 62052-31/AS 62052.31			
Clause	Requirement - Test	Remark	Result
	Accessible conductive parts shall be bonded to the protective conductor terminal if they could become hazardous live in case of a single fault of the primary means of protection specified in 6.4. Alternatively, accessible conductive parts shall be separated from parts, which are hazardous live, by a conductive protective screen bonded to the protective conductor terminal.	Since the meter is Protective Class II, no protective bonding is present.	N
	Unearthed accessible conductive parts such as nameplates, screws, suspensions and rivets need not be bonded to the protective conductor terminal if they are separated from all hazardous live parts by double insulation or reinforced insulation.		N
	Conformity is checked as specified in 6.5.2.2 to 6.5.2.5.		N
6.5.2.2	**Integrity of protective bonding**	NOTE 1 This subclause reproduces IEC 61010-1:2010, 6.5.2.2.	-
	The integrity of protective bonding shall be assured as specified below:	Since the meter is Protective Class II, no protective bonding is present.	NOTED
	a) protective bonding shall consist of directly connected structural parts or discrete conductors, or both. It shall withstand all thermal and dynamic stresses to which it could be subjected before the over-current protective means specified in 9.5 disconnects the equipment from the supply;		N
	b) soldered connections subject to mechanical stress shall be mechanically secured independently from the soldering. Such connections shall not be used for other purposes such as fixing constructional parts;		N

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UL Solutions

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IEC 62052-31/AS 62052.31

IEC 62052-31/AS 62052.31			
Clause	Requirement - Test	Remark	Result
	c) screw connections shall be secured against loosening;		N
	d) if a part of the equipment is removable, the protective bonding for the remainder of the equipment shall not be interrupted (except for a part that also carries the mains input connection to the whole equipment);		N
	e) unless they are specifically designed for electrical inter-connection and meet the requirements of 6.5.2.4, movable conductive connections, for example, hinges, slides, etc., shall not be the sole protective bonding path;		N
	f) the exterior metal braid of cables shall not be regarded as protective bonding, even if connected to the protective conductor terminal;		N
	g) if power from the mains supply is passed through metering equipment of protective class I for use by other equipment, means shall also be provided for passing the protective conductor through the metering equipment to protect the other equipment. The impedance of the protective conductor path through the equipment shall not exceed the values specified in 6.5.2.4.		N
	However, if metering equipment is of protective class II, then any – auxiliary – equipment powered through this equipment shall be also of protective class II.	NOTE 2 Item g) concerns only auxiliary equipment to the metering equipment. There's no auxiliary equipment powered through meter.	N
	h) protective conductors may be bare or insulated. Insulation shall be green-and-yellow, except in the following cases:		N

APPENDIX C

IEC 62052-31/AS 62052.31

IEC 62052-31/AS 62052.31			
Clause	Requirement - Test	Remark	Result
	1) for earthing braids, either green-and-yellow or colourless-transparent;		N
	2) for internal protective conductors, and other conductors connected to the protective conductor terminal in assemblies such as ribbon cables, busbars, flexible printed wiring, etc., any colour may be used provided that no hazard is likely to arise from nonidentification of the protective conductor.		N
	Equipment using protective bonding shall be provided with a terminal that is suitable for connection to a protective conductor and meets the requirements of 6.5.2.3.		N
	Conformity is checked by inspection.		NOTED
6.5.2.3	**Protective conductor terminal**	NOTE 1 This subclause is based on IEC 61010-1:2010, 6.5.2.3 adapted for metering.	-
	The protective conductor terminal shall meet the following requirements:	The meter is considered Protective Class II; no protective conductor terminal is provided, or required.	NOTED
	a) the contact surfaces shall be metal. Materials of protective bonding systems shall be chosen to minimize electro-chemical corrosion between the terminal and the protective conductor, or any other metal in contact with them;		N
	b) the protective conductor terminal should, if possible, form part of the meter base;		N
	c) the protective conductor terminal should preferably be located adjacent to the terminal block intended for connecting the mains-circuits;		N

APPENDIX C

IEC 62052-31/AS 62052.31

IEC 62052-31/AS 62052.31			
Clause	Requirement - Test	Remark	Result
	d) in the case of direct connected meters, the current carrying capacity of the protective conductor terminal shall be at least equivalent to the maximum current specified;		N
	e) in the case of transformer connected meters, the current carrying capacity of the protective conductor terminal shall be at least equivalent to 2 times the maximum current specified, or the current carrying capacity of the mains voltage terminals, whichever is larger;		N
	f) in the case of stand-alone time switches and ripple control receivers, the current carrying capacity of the protective conductor terminal shall be at least equivalent to the maximum total current specified;		N
	g) plug-in type protective conductor terminals combined with other terminals and intended to be connected and disconnected without the use of a tool, shall be designed so that the protective conductor connection makes first and breaks last with respect to the other connections;		N
	h) after installation, it shall not be possible to loosen the protective earth terminal without the use of a tool;		N

APPENDIX C

IEC 62052-31/AS 62052.31

IEC 62052-31/AS 62052.31			
Clause	Requirement - Test	Remark	Result
	i) if the protective conductor terminal is also used for other bonding purposes, the protective conductor shall be applied first and secured independently of other connections. The protective conductor shall be connected in such a way that it is unlikely to be removed during servicing that does not require disconnection of the protective conductor;		N
	j) it shall be clearly identified by the graphical symbol 6 of Table 3;		N
	k) functional earth terminals (for example, measuring earth terminals) shall allow a connection which is independent from the connection of the protective conductor;		N
	Equipment may be equipped with functional earth terminals, irrespective of the protective means taken.	Not provided	NOTED
	l) if the protective conductor terminal is a binding screw assembly (see Figure 5), it shall be of a suitable size for the bond wire, but with a thread size no smaller than 4,0 mm, with at least three turns of the screw engaged;		N
	m) the contact pressure required for a bonding connection shall not be capable of being reduced by deformation of materials forming part of the connection.		N
	Conformity is checked by inspection. Conformity for l) is also checked by the following test:		N

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Clause	Requirement - Test	Remark	Result
	The binding screw assembly is to be tightened and loosened three times, together with the least favourable conductor to be secured, using the tightening torques specified in Table 4. All parts of the binding screw assembly shall withstand this test without mechanical failure.		N
6.5.2.4	**Impedance of protective bonding of permanently connected equipment**	NOTE 1 The following text is based on IEC 61010-1:2010, 6.5.2.5 adapted for metering.	-
	Protective bonding of permanently connected equipment shall be of low impedance.	NOTE 2 Metering equipment within the scope of this standard are always permanently connected. The meter is considered Protective Class II; no protective bonding is provided.	NOTED
	Conformity is checked by applying a test current for 1 min between the protective conductor terminal and each accessible conductive part for which protective bonding is required. The voltage between them shall not exceed 10 V a.c. r.m.s. or d.c.		N
	a) *in the case of direct connected meters, the test current shall be equal to twice the maximum current of the meter. However, if the equipment*		N
	• *contains overcurrent protection devices for all hazardous live terminals (except the neutral) or is specified by the manufacturer to be installed with external overcurrent protection devices for all hazardous live terminals (except the neutral);*		N
	• *and the wiring on the supply side of the overcurrent protection devices cannot become connected to accessible conductive parts in case of a single fault,*		N

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Clause	Requirement - Test	Remark	Result
	the test current need not be more than twice the highest rated current of the overcurrent protection devices.		NOTED
	b) *in the case of current transformer or voltage and current transformer operated meters, the test current shall be the greater of:*		NOTED
	• *the value equal to twice the nominal current of the overcurrent protection in the voltage circuit(s) or other hazardous live circuits as recommended by the manufacturer; or*		N
	• *25 A;*		N
	c) *in the case of tariff and load control the test current shall be equal to twice the total current.*		N
6.5.2.5	**Transformer protective bonding screen**	NOTE 1 This subclause is based on IEC 61010-1:2010, 6.5.2.6.	-
	If a transformer is fitted with a screen for protective bonding purposes that is separated only by basic insulation from a winding that is connected to a hazardous live circuit, the screen shall satisfy the requirements of 6.5.2.2 a) and b), and be of low impedance.	Transformers in the meter are not fitted with a screen for protective bonding purposes.	N
	Conformity is checked by inspection and the following tests:		NOTED
	• *a test current specified in 6.5.2.4 is applied for 1 min between the screen and the protective conductor terminal. The voltage between them shall not exceed 10 V a.c. r.m.s. or d.c.*	NOTE 2 A specially prepared sample transformer having an extra lead-out wire from the free end of the screen is used to ensure that the current during the test passes through the screen.	N
6.7	**Insulation requirements**		-
6.7.1	**General – Electrical stresses, overvoltages and overvoltage categories**		-

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Clause	Requirement - Test	Remark	Result
6.7.1.1	**Electric stresses originating from mains**	NOTE 1 This subclause is based on IEC 61010-1:2010, 6.7.1.1 and IEC 60364-4-44:2007, adapted to metering.	-
	Electric stresses originating from mains include:		NOTED
	a) working voltage across the insulation. This working voltage is normally the line-to-neutral voltage of the mains supply. In the case of polyphase metering equipment some insulations will be stressed by the line-to-line voltage;	NOTE 2 An example for the latter is the terminal block of polyphase meters, where line-to-line voltage is present between terminals of the different phases.	NOTED
	b) transient overvoltages that may occasionally appear on the line conductors. The magnitude of the overvoltages depends on the overvoltage category and the line-toneutral voltage of the mains supply;		NOTED
	c) temporary power frequency overvoltages.		NOTED
6.7.1.2	**Protection against overvoltages of atmospheric origin or due to switching**	NOTE This subclause is based on IEC 60364-4-44:2007, 443.1.	-
	Metering equipment shall be protected against transient overvoltages of atmospheric origin transmitted by the supply distribution system and against switching overvoltages.	Voltage circuits include transient overvoltage protection in the form of MOVs.	P
	In general, switching overvoltages are lower than overvoltages of atmospheric origin and therefore the requirements regarding protection against overvoltages of atmospheric origin normally cover protection against switching overvoltages.		NOTED
6.7.1.3	**Classification of impulse withstand voltages (overvoltage categories)**		-

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Clause	Requirement - Test	Remark	Result
	The impulse withstand voltage (overvoltage category, OVC) is used to classify equipment energized directly from the mains.		NOTED
	IEC 60364-4-44:2018, Table 443.2 specifies overvoltage categories I to IV.		NOTED
	For metering equipment, overvoltage category III is taken as a basis for determining clearances. See also 1.4 and Annex K.	NOTE According to IEC 60664-1:2007, 4.3.3.2.2, equipment of overvoltage category III is equipment in fixed installations and for cases where the reliability and the availability of the equipment are subject to special requirements.	NOTED
6.7.2	**The nature of insulation**		-
6.7.2.1	**General**	NOTE Subclause 6.7.2 is based on IEC 61010-1:2010, 6.7.1.1.	-
	Insulation between circuits and accessible parts (see 6.2) or between separate circuits consists of a combination of clearances, creepage distances and solid insulation. When used to provide protection against a hazard, the insulation needs to withstand the electric stresses that are caused by the voltages that may appear on the mains or in the equipment.		NOTED
	The requirements for insulation depend on:		NOTED
	a) the required level of insulation (basic insulation, supplementary insulation, or reinforced insulation);	Refer to Insulation Diagram in the front pages of this Report.	P
	b) the maximum transient overvoltage that may appear on the circuit, either as a result of an external event (such as a lightning strike or a switching transient), or as the result of the operation of the equipment;		P
	c) the maximum working voltage (including steady-state and recurring peak voltages);	Voltage maps provided	P
	d) the pollution degree of the micro-environment;	Meter is rated for Pollution Degree 2	NOTED

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Clause	Requirement - Test	Remark	Result
	e) the maximum temporary overvoltage that may occur in a mains-circuit because of a fault in the mains distribution system. See also 6.10.3.2.		NOTED
6.7.2.2	**Clearances**	NOTE This subclause reproduces IEC 61010-1:2010, 6.7.1.2, except that for the measurement of clearances the text refers to IEC 60664-1:2007 ,6.2.	-
	Required clearances depend on the factors in 6.7.1.1 a) to c) as well as the rated altitude. If the equipment is rated to operate at an altitude greater than 2 000 m, then the clearances specified in the Tables referenced from the overview Table 6 shall be multiplied by the factors of Table 5.	The meter is rated for altitudes of up to 2000 m above sea level. Altitude correction factor is x1.00	NOTED
	For measurement of clearances, see IEC 60664-1:2007 ,6.2.		NOTED
6.7.2.3	**Creepage distances**	NOTE This subclause reproduces IEC 61010-1:2010, 6.7.1.3, except that for the measurement of creepage distances it refers to IEC 60664-1:2007, 6.2.	-
	Required creepage distances depend on the factors in 6.7.1.1 a) to c) as well the Comparative Tracking Index (CTI) of the insulating material.		NOTED
	Materials are separated into four groups according to their CTI values, as follows:		NOTED
	• material group I: 600 < CTI;		NOTED
	• material group II: 400 < CTI < 600;		NOTED
	• material group IIIa: 175 < CTI < 400;		NOTED
	• material group IIIb: 100 < CTI < 175.		NOTED

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Clause	Requirement - Test	Remark	Result
	These CTI values refer to values obtained, in accordance with IEC 60112, on samples of the relevant material specifically made for the purpose and tested with solution A. For materials where the CTI value is not known, material group IIIb is assumed.	Material groups IIIb were used depending on the insulating material.	NOTED
	For glass, ceramics, or other inorganic insulating materials which do not track, there are no requirements for creepage distances.	None present.	N
	For measurement of creepage distances, see IEC 60664-1:2007, 6.2.		NOTED
6.7.2.4	**Solid insulation**	NOTE This subclause reproduces IEC 61010-1:2010, 6.7.1.4.	-
	The requirements for solid insulation depend on factors in 6.7.1.1 a) to c).		NOTED
	The term "solid insulation" is used to describe many different types of constructions, including monolithic blocks of insulating material, and insulation subsystems composed of multiple insulating materials, organized in layers or otherwise.		NOTED
	The electric strength of a thickness of solid insulation is considerably greater than that of the same thickness of air. The insulating distances through solid insulation are therefore typically smaller than the distances through air. As a result, electric fields in solid insulation are typically higher, and often are less homogeneous.		NOTED

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Clause	Requirement - Test	Remark	Result
	Solid insulation material may contain gaps or voids. When a solid insulation system is constructed from layers of solid materials, there are also likely to be gaps or voids between the layers. These voids will perturb the electric field so that a disproportionately large part of the electric field is located in the void, potentially causing ionisation within the void, resulting in partial discharge. These partial discharges will influence the adjacent solid insulation and may reduce its service life.		NOTED
	Solid insulation is not a renewable medium: damage is cumulative over the life of the equipment. Solid insulation is also subject to ageing and to degradation from repeated high voltage testing.		NOTED
6.7.2.5	**Requirements for insulation according to type of circuit**	NOTE This subclause is based on IEC 61010-1:2010, 6.7.1.5 and Annex K.	-
	Requirements for insulation in particular circuits are specified as follows:		NOTED
	a) in 6.7.3 for mains-circuits;		NOTED
	b) in 6.7.4 for non-mains-circuits;		NOTED
	c) in 6.7.5 for circuits that have one or more of the following characteristics:		NOTED
	1) the maximum possible transient overvoltage is limited by the supply source or within the equipment (see 6.7.6) to a known level below the level assumed for the mains circuit;		NOTED
	2) the maximum possible transient overvoltage is above the level assumed for the mains circuit;		NOTED

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Clause	Requirement - Test	Remark	Result
	3) the working voltage is the sum of voltages from more than one circuit, or is a mixed voltage;		NOTED
	4) the working voltage includes a recurring peak voltage that may include a periodic nonsinusoidal waveform or a non-periodic waveform that occurs with some regularity		NOTED
	5) the working voltage has a frequency above 30 kHz.		NOTED
	Table 6 provides an overview of the clauses specifying the requirements and the tests for insulations. Where no voltage test is specified, conformity is verified by inspection and / or measurement of mechanical dimensions.		NOTED
6.7.3	**Insulation requirements for mains-circuits**		-
6.7.3.1	**Nominal voltages and rated impulse voltages**		-
	The rated impulse voltage of the equipment shall be selected from Table 7 corresponding to the nominal/rated voltage of the equipment and the required level of insulation.	The meter is rated 230 V AC, which translates to the following rated impulse voltage values (before altitude correction adjustments): Basic/supplementary insulation: 4000 V Reinforced insulation: 6000 V Impulse test voltages for circuits under meeting any of 6.7.2.5c, Conditions 1-5 may use different impulse voltages than those noted above.	NOTED
6.7.3.2	**Clearances for mains-circuits**		-
	Clearances for mains-circuits shall meet the values of Table 8. If the equipment is rated to operate at an altitude greater than 2 000 m, the clearance shall be multiplied by the factors of Table 5.	Meters are rated for up to 2000 m.	P
	Conformity is checked by inspection, measurement and the test specified in 6.10.4.4.2.	Measurements and testing performed. The impulse tests required in Cl. 4.4.4.1b and Cl. 6.10.4.3.3 were used to represent this test.	P

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Clause	Requirement - Test	Remark	Result
6.7.3.3	**Creepage distances for mains-circuits**		-
	Creepage distances for mains-circuits for basic insulation and supplementary insulation shall meet the values of Table 9.		P
	Creepage distances of double insulation are the sum of the values of the basic insulation and supplementary insulation, which compose the double insulation system. Creepage distances for reinforced insulation shall be twice those determined for basic insulation from Table 9.		NOTED
	In general, a creepage distance cannot be less than the associated clearance so that the shortest creepage distance possible is equal to the required clearance. However, there is no physical relationship, other than this dimensional limitation, between the minimum clearance in air and the minimum acceptable creepage distance.	NOTE [This] paragraph is from IEC 60664-1:2007, 5.2.2.6.	NOTED
	Conformity is checked by inspection and measurement.		NOTED
6.7.3.4	**Solid insulation for mains-circuits**		-
6.7.3.4.1	General	NOTE 1 Subclause 6.7.3.4 is based on IEC 61010-1:2010, Annex K.1.3.	-
	Solid insulation of mains-circuits shall withstand the electrical and mechanical stresses that may occur in normal use, in all rated environmental conditions (see 1.4), during the intended life of the equipment.		P
	The manufacturer should take the expected life of the equipment into account when selecting insulating materials.		NOTED
	The test voltages are specified for short terms stress in Table 10 and for long term stress in Table 11.		NOTED

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Clause	Requirement - Test	Remark	Result
	Conformity is checked by both of the following tests:	NOTE 2 These two different voltage tests are required for these circuits for the following reasons. Test a) checks the effects of transient overvoltages, while test b) checks the effects of long-term stress of solid insulation.	NOTED
	a) *the impulse voltage test specified in 6.10.4.4.4.2 or the 5 s a.c. voltage test specified in 6.10.4.4.4.3 a);*	The impulse tests required in Cl. 4.4.4.1b and Cl. 6.10.4.3.3 were used to represent this test.	P
	b) *the 1 min a.c. voltage test specified in 6.10.4.4.4.4 a).*	The test required in Cl. 6.10.4.3.4 was used to represent this test.	P
	Solid insulation shall also meet the following requirements, as applicable:		NOTED
	1) for solid insulation used as an enclosure or barrier, the requirements of Clause 8, *Resistance to mechanical stresses*, and 10.5, *Resistance to heat*;	See the datasheets below for results.	P
	2) for moulded and potted parts, the requirements of 6.7.3.4.2;	No molded or potted parts are included within the meter.	N
	3) for inner layers of printed wiring boards, the requirements of 6.7.3.4.3;		P
	4) for thin-film insulation, the requirements of 6.7.3.4.4.	No thin film insulation is used within the meter.	N
	Conformity is checked as specified in 6.7.3.4.2 to 6.7.3.4.4, Clause 8 and subclause 10.5 as applicable.		P
6.7.3.4.2	**Moulded and potted parts**	NOTE This subclause reproduces IEC 61010-1:2010, Annex K.1.3.2.	-
	For basic insulation, supplementary insulation and reinforced insulation, conductors located between the same two layers moulded together (see Figure 6, item L) shall be separated by at least the applicable minimum distance of Table 12 after the moulding is completed.	No molded or potted parts are included within the meter.	N

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Clause	Requirement - Test	Remark	Result
	Conformity is checked by inspection and either by measurement of the separation or by inspection of the manufacturer's specifications.		N
6.7.3.4.3	**Inner insulating layers of printed wiring boards (PWBs)**	NOTE This subclause reproduces IEC 61010-1:2010, Annex K.1.3.3.	-
	For basic insulation, supplementary insulation and reinforced insulation, conductors located between the same two layers (see Figure 7, item L) shall be separated by at least the applicable minimum distance of Table 12.		P
	Conformity is checked by inspection and either by measurement of the separation or by inspection of the manufacturer's specifications.		NOTED
	Reinforced insulation of inner insulating layers of printed wiring boards shall also have adequate electric strength through the respective layers. One of the following methods shall be used:		NOTED
	a) the thickness through the insulation is at least the value of Table 12;	The thickness between layers is sufficient for several points. For the remaining items, 6.7.3.4.3b) was used.	P
	Conformity is checked by inspection and either by measurement of the separation or by inspection of the manufacturer's specifications.	Conformity was checked by measurement for these points.	P
	b) the insulation is assembled from at least two separate layers of printed wiring board materials, each of which is rated by the manufacturer of the material for an electric strength of at least the value of the test voltage of Table 10 for basic insulation;	See 6.7.3.4.3c), below	N
	Conformity is checked by inspection of the manufacturer's specifications.		NOTED

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Clause	Requirement - Test	Remark	Result
	c) the insulation is assembled from at least two separate layers of printed wiring board materials, and the combination of layers is rated by the manufacturer of the material for an electric strength of at least the value of Table 10 for reinforced insulation.	Confirmed via testing, the dielectric strength of the layers is high enough to provide reinforced insulation. Impulse test at 12kV, and 1 min a.c. voltage test 3000V.	P
	Conformity is checked by inspection of the manufacturer's specifications.		NOTED
	No minimum thickness is specified for basic or supplementary insulation between traces located on the opposite sides of the same layer of a printed wiring board. However, a layer of printed wiring board material used as basic or supplementary insulation shall be rated by the manufacturer of the material for an electric strength of at least the value of the test voltage of Table 7 for basic insulation.		NOTED
6.7.3.4.4	**Thin-film insulation**	NOTE 1 This subclause reproduces IEC 61010-1:2010, Annex K.1.3.4.	-
	For basic insulation, supplementary insulation and reinforced insulation, conductors located between the same two layers (see Figure 8, item L) shall be separated by at least the applicable clearance of 0, Table 8 and creepage distance of 6.7.3.3, Table 9.	No thin-film insulation is used within the meter.	N
	Conformity is checked by inspection and either by measurement of the separation or by inspection of the manufacturer's specifications.		NOTED
	Reinforced insulation through the layers of thin-film insulation shall also have adequate electric strength. One of the following methods shall be used.		N

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Clause	Requirement - Test	Remark	Result
	a) The thickness through the insulation is at least the value of Table 12;		NOTED
	Conformity is checked by inspection and either by measurement of the separation or by inspection of the manufacturer's specifications.		NOTED
	b) The insulation consists of at least two separate layers of thin-film materials, each of which is rated by the manufacturer of the material for an electric strength of at least the value of the test voltages from Table 10 for basic insulation.		N
	Conformity is checked by inspection of the manufacturer's specifications.		NOTED
	c) The insulation consists of at least three separate layers of thin-film materials, any two which have been tested to exhibit adequate electric strength of at least the value of the test voltages from Table 10 for reinforced insulation.		N
	Conformity is checked by the a.c. voltage test of 6.10.4.4.4.4 b).		N
	For the purposes of this test a special sample may be assembled with only two layers of the material.		N
6.8	**Insulation requirements between circuits and parts**	NOTE 1 This subclause is based on IEC 60255-27:2013, Annex A. This clause is mainly for informative or guidance purposes only.	-
	This subclause provides guidance on the isolation class and insulation requirements:		NOTED

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Clause	Requirement - Test	Remark	Result
	• on the one hand between these circuits; and on the other hand		P
	• between these circuits and accessible parts.		P
	Typical examples are provided in Annex B.		NOTED
	The insulation requirements should be used to determine the required clearances, creepage distances and solid insulation from 6.7.		NOTED
	The following mains circuits shall be considered as hazardous live (HLV) circuits:		NOTED
	• voltage and current circuits of direct connected and transformer operated meters;	NOTE 2 Current circuits of CT operated meters are generally earthed.	NOTED
	• neutral circuits;		NOTED
	• relays / control switches switching mains voltage;		NOTED
	• auxiliary supply circuits intended for connection to the mains.	No auxiliary supply circuits are included.	N
	Non-mains-circuits are classified by their working voltage and isolation class as; see Table 19:		NOTED
	• hazardous live voltage (HLV) circuits (circuits with voltage levels exceeding the values of 6.3.2);	All non-mains-circuits operate at voltages that are not considered hazardous live.	N
	• extra low voltage (ELV) circuits;		P
	• safety extra low voltage (SELV) circuits;		P
	• protective extra low voltage (PELV) circuits;	No earth connection is provided with the meter.	N
	• protection by equipotential bonding (PEB) circuits.		N

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Clause	Requirement - Test	Remark	Result
	Table 20 shows the insulation requirements between any two circuits.		NOTED
	Based on this:		NOTED
	• basic insulation is required between the case of a protective class I equipment and the HLV mains-circuits or HLV non-mains-circuits;	The meter is classified as a Protective Class II device.	N
	• double insulation is required between the case of protective class II equipment and the HLV mains-circuits or HLV non-mains-circuits. See also 6.10.4.3.2 , item b);	Reinforced insulation is provided between all HLV and other internal live parts, and also between HLV circuits and the case.	P
	• the clearance between the terminal cover, if made of metal, and the upper surface of the terminal screws when screwed down to the maximum applicable conductor fitted shall meet the requirements for basic insulation for protective class I equipment meters and double insulation for protective class II equipment;	Terminal cover is made of a polycarbonate material. Reinforced insulation provided.	P
	• the insulation between:		NOTED
	- non-mains-circuits and other circuits;		P
	- non-mains-circuits and the accessible parts;		P
	shall be dimensioned according to the isolation class of the non-mains-circuit.		P
	Annex B provides some examples.		NOTED
6.9	**Constructional requirements for protection against electric shock**		-
6.9.2	**Insulating materials**	NOTE This subclause reproduces IEC 61010-1:2010, 6.9.2.	-
	The following shall not be used as insulation for safety purposes:		NOTED

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	a) materials which can easily be damaged (for example, lacquer, enamel, oxides, anodic films);		P
	b) non-impregnated hygroscopic materials (for example, paper, fibres, fibrous materials).		P
	Conformity is checked by inspection.	None of these materials are present within the meter. Plastic and polycarbonate materials are used instead.	P
6.9.4	**Equipment case**		-
	Hazardous live parts shall be located within the equipment case.		P
	If the equipment case has removable covers, they shall be firmly secured in place in such a way that:	The meter has a removable terminal cover.	NOTED
	a) they may only be removed by using a tool;	A tool must be used to remove any/all covers.	P
	b) if protected by seals, they cannot be removed without breaking the seals.	NOTE 1 If the covers are fixed by screws these are generally protected by seals so that the covers cannot be removed without breaking the seals first then using a tool to loosen / fasten the screws. Seals may be provided (through the seal screws for the main outer cover) to additionally secure the meter.	P
	Terminals that are hazardous live shall be covered by terminal covers, enclosing the actual terminals, the conductor fixing screws and, unless otherwise agreed by the manufacturer and the purchaser, a suitable length of the external conductors and their insulation, so that no hazardous live terminals become accessible without removing the terminal cover. Terminal covers shall be firmly secured in place as specified above.	NOTE 2 Some metering equipment is "sealed for life", so that the case can be only opened by breaking it.	P

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Clause	Requirement - Test	Remark	Result
	Panel mounted meters do not have to be equipped with terminal covers, if access to hazardous live terminals in normal operating condition is prevented by an appropriate barrier.	NOTE 3 This requirement does not apply to covers within the meter enclosure. Terminal covers are provided for the meter.	N
	Conformity is checked by inspection and if necessary, the tests specified in 6.2 and 6.3.	Requirements were verified by inspecting the meter.	P
	Terminal covers covering terminals intended for connecting devices by the user do not need to be protected against removal. Terminals located under terminal covers that can be removed by a user shall be safe to touch (SELV, PELV or PEB). See 6.8.	No additional optional terminal is ready in meter.	N
	Terminals may be grouped in connectors to prevent access to the terminals.		NOTED
	It shall not be possible to remove socket-mounted equipment from its specified matching socket without breaking a seal.	This meter is not socket-mounted.	N
	The case shall have sufficient mechanical strength, stability and durability to maintain the specified degree of protection and shall meet the rigidity requirements specified in 8.2.		P
	The equipment case, including the covers and terminal covers shall provide a degree of protection as specified in Clause 11.	The tests for IP5x and IPx4 were conducted. Referred IP5X into IEC 62052-11 standard. See Test Report "TRF R4790778107_IEC AS 62052-11 62053-21_Gen™5 Riva_Itron" for details.	P
	Conformity is checked by inspection and the tests of 8.2, 10.5.1, 10.5.2 and Clause 11.	See the relevant datasheets (below) for details.	P
6.9.5	**Terminal blocks**	NOTE This subclause is based on IEC 62052-11:2003, 5.4.	-

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Clause	Requirement - Test	Remark	Result
	Terminals may be grouped in (a) terminal block(s). Terminal blocks shall have 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. See also 9.3.2.1.		P
	Conformity is checked with the test specified in 10.5.2.		P
	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.		P
	Conformity is checked by inspection.		P
6.9.7	**Terminals**	NOTE This subclause 6.9.7 is based on IEC 61010-1:2010, 6.6.4 and IEC 62477-1:2012, 4.11.8.	-
6.9.7.1	**General requirements**		-
	All parts of terminals which maintain electrical contact and carry current shall be made of metal having adequate mechanical strength.	Mains terminals are constructed of nickel-plated copper. Its accompanying housing is made of polycarbonate + 10% glass fiber reinforced material. The current carrying parts of the supply control switch are made of copper bus bar(s).	P
	All metal parts of each terminal shall be such that the risk of corrosion resulting from contact with any other metal part is minimized.		P
	Terminals shall be anchored, fitted or designed so that conductors will not work loose when they are tightened, loosened or when connections are made.		P
	The terminals, the conductor fixing screws, or the external or internal conductors shall not be liable to come into contact with terminal covers made of conducting material.	Terminal covers are not made of conducting material.	N

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Clause	Requirement - Test	Remark	Result
	Conformity is checked by manual test and inspection.		P
	The terminals of current circuits of direct connected meters shall be considered to be at the same potential as the related voltage circuit.	NOTE 1 The terminals of current circuits of current transformer operated meters are generally earthed.	NOTED
	Terminals of one current circuit shall be considered to be at the same potential.		NOTED
	Terminals which are grouped close together shall be protected against accidental short-circuiting that may be detrimental to the operation of equipment and the insulation shall not be reduced below the rated values, even if a strand of a conductor escapes from a terminal.	Terminals are recessed such that stranded conductors cannot cause a short-circuit condition (assuming proper installation and use).	P
	Protection may be obtained by insulating barriers.	No insulating barriers are used within the meter.	N
	Conformity is checked by inspection and – in case of doubt – by performing the following test:	NOTE 2 The following test is from IEC 60950-1:2005, 3.3.8. Inspection of the terminals was suitable in demonstrating compliance. No further examination or test was required.	P
	A piece of insulation approximately 8 mm long is removed from the end of a flexible conductor having the appropriate nominal cross-sectional area. One wire of the stranded conductor is left free and the other wires are fully inserted into, and clamped in the terminal.		N
	Without tearing the insulation back, the free wire is bent in every possible direction, but without making sharp bends around the guard.		N

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Clause	Requirement - Test	Remark	Result
	If the conductor is at hazardous voltage, the free wire shall not touch any conductive part that is accessible or is connected to an accessible conductive part or, in the case of double insulated equipment, any conductive part that is separated from accessible conductive parts by supplementary insulation only.		N
	If the conductor is connected to an earthing terminal, the free wire shall not touch any part at hazardous voltage.	No earthing terminals are provided.	N
6.9.7.2	**Connecting capacity**	NOTE 1 This subclause is based on IEC 62477-1:2012, 4.11.8.2.	-
	Terminals shall be capable to accommodate the conductors specified in the installation and maintenance manuals in accordance with the wiring rules applicable at the installation.	NOTE 2 Standard cross-sections are specified in Table 1. The maximum current of this meter is 100 A for all mains current circuits, and 100 A for the supply control switch. Table 1 3 AWG wire, respectively.	P
	The temperature of the terminals shall meet the requirements of 10.2.	Temperatures of terminals meet the requirements of 10.2 and Table 32.	P
	Compliance is checked by inspection.		P
6.9.7.3	**Reliability of screw-type connections**		-
	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.		P
	Electrical connections shall be designed in a way that contact pressure is not transmitted through insulating material.		P
	Screw connections transmitting contact force and screw fixings that may be loosened and tightened several times during the life of the meter shall screw into a metal nut.		P

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Clause	Requirement - Test	Remark	Result
	The reliability of the connection shall be checked with the following test (flexion test and pull test):	NOTE This test has been adopted from IEC 60947-1:2007, 8.2.4.3.	NOTED
	The test applies to mains terminals of direct connected meters, the current terminals of current transformer operated meters and to terminals of load control switches, for the connection of round copper conductors, of cross-section and type specified by the manufacturer, and prepared as specified by the manufacturer.		P
	Test methods for aluminum conductors may be made agreed between manufacturer and user.	Terminals are assumed to be suitable for copper conductors only.	N
	The test is to be carried out with suitable test equipment, see Annex H.		P
	The test shall be performed on at least two terminals, using both the conductor of minimum and maximum cross section specified by the manufacturer.	Test conducted on $L1_{in}$ and $L1_{out}$ terminal with minimum and maximum cross section: 16AWG (15mm²) & 3 AWG (35 mm²)	P
	The conductor shall be connected to the terminal tested. The length of the test conductors should be 75 mm longer than the height H specified in Table H.1. The clamping screws shall be tightened with a torque specified by the manufacturer.	The manufacturer specified a torque rating of 1.5 Nm to 1.8 Nm.	P
	The conductor is subjected to circular motions according to the following procedure:		NOTED
	• *the end of the conductor under test shall be passed through an appropriate size bushing in a platen positioned at a height H below the equipment terminal, as given in Table H.1. The bushing shall be positioned in the horizontal platen concentric with the conductor;*		NOTED

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Clause	Requirement - Test	Remark	Result
	• *the bushing shall be moved so that its centreline describes a circle of 75 mm diameter about its centre in the horizontal plane at 10 rpm ± 2 rpm. The distance between the mouth of the terminal and the upper surface of the bushing shall be within 15 mm of the height H in Table H.1. The bushing is to be lubricated to prevent binding, twisting or rotation of the insulated conductor. A mass as specified in Table H.1 is to be suspended from the end of the conductor. The test shall consist of 135 continuous revolutions.*		NOTED
	During the test, the conductor shall neither slip out of the terminal nor break near the clamping unit.		P
	Immediately following the flexion test, the pulling force given in Table H.1 shall be applied to the conductor. The clamping screws shall not be tightened again for this test.		NOTED
	The force shall be applied without jerks for 1 min, in the direction of the axis of the conductor.		NOTED
	During the test, the conductor shall neither slip out of the terminal nor break near the terminal.		P
6.10	**Safety related electrical tests**		-
6.10.3	**Testing of voltage circuits**		-
6.10.3.1	**Overview**		-
	Testing of voltage circuits comprises four tests:		NOTED
	a) testing of long term overvoltage withstand, see 6.10.3.2;		NOTED

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Clause	Requirement - Test	Remark	Result
	b) impulse voltage test without supply voltage – see 6.10.3.3 – and depending on the result:		NOTED
	c) surge test, superimposed on supply voltage, see 6.10.3.4; and		NOTED
	d) impulse voltage test without supply voltage, one step lower, see 6.10.3.5.		NOTED
6.10.3.2	**Long term overvoltage withstand**		-
	Meters and tariff and load control equipment shall withstand the maximum withstand voltage, 1,9 U_n applied as follows:	NOTE U_n is the nominal voltage between a line and the neutral.	NOTED
	• *for single-phase two-wire meters, the maximum withstand voltage shall be applied between the line and neutral terminals;*	Refers test result at Appendix.	P
	• *for single-phase two-wire multi-element meters the maximum withstand voltage shall be applied on all the elements simultaneously, between the line and neutral terminals;*	Meter is a single-phase unit with only 1 element.	N
	• *for three-phase four-wire polyphase types, the maximum withstand voltage shall be applied to any two phases and neutral with a phase angle of 60° between the two phase voltages. A total of three test runs is required to cover the pairs of phases, with a cooling period of 1 h between each run;*	Meter is a single-phase two wire unit.	N
	• *for three-phase three-wire meters this requirement does not apply.*	Meter is a single-phase two wire unit.	P

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Clause	Requirement - Test	Remark	Result
	• *when the current circuit (of a direct connected meter) contains supply control switches, then these switches shall be in the open position and the load side terminals shall be connected so that the maximum test voltage appears across the open supply control switch;*		P
	• *for tariff-and load control equipment, the maximum withstand voltage shall be applied between the line and neutral terminals.*		P
	The test circuit diagram is shown in Annex D.		NOTED
	In every configuration (test run) described above, the maximum withstand voltage of 1,9 U_n shall be applied for 4 h, with a cooling period of 1 h between the test runs.		P
	During the test, the EUT may be damaged, but no hazardous live parts shall be exposed, no fire shall occur, or if it occurs, it shall be contained in the meter. When more than one test run is required, all of them have to be passed.	No damage or exposure of live parts was observed on the meter after being subjected to the test.	P
6.10.3.3	**Impulse voltage test without supply voltage**		-
	This test does not have to be carried out if it can be ascertained from the circuit diagram that SPDs are present in the voltage circuit. In that case the tests specified in 6.10.3.4 and 6.10.3.5 have to be performed.	SPDs (varistors) are included in the voltage circuits.	NOTED
	The impulse voltage test specified in 6.10.2.3 shall be applied:		P
	a) *to voltage circuit(s):*		P

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Clause	Requirement - Test	Remark	Result
	1) *When the voltage and the current circuits of a measuring element are connected together in normal use (for example direct connected meters) the test shall be made on the whole measuring element. The impulse voltage shall be applied between this common point and earth, with the other terminal of the voltage circuit connected to the earth and the other end of the current circuit left open. If there is a supply control switch present, then it shall be closed. All other terminals shall be connected to earth. When the meter has several measuring elements the impulse voltage shall be applied to each measuring element one by one.*		P
	2) *When the voltage and the current circuits of a measuring element are separated and appropriately insulated in normal use (for example transformer operated meters) the test shall be made on the voltage circuit only. The impulse voltage shall be applied between one terminal of the voltage circuit and earth, with the other terminal of the voltage circuit and all other terminals connected to earth. When the meter has several measuring elements the impulse voltage shall be applied to each voltage circuit one by one.*	Voltage and current circuits are connected together in normal use.	N

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Clause	Requirement - Test	Remark	Result
	b) *to auxiliary supply circuit(s) with a reference voltage above 33 V a.c. or 70 V d.c. between the supply terminals.*		N
	The test voltage shall be as specified in Table 7 for basic insulation. For examples of test arrangements see Annex F.		N
	If during the test the impulse voltage is not clamped and the other pass / fail criteria of 6.10.2.3 are met, the test is passed.		N
	If the impulse voltage is clamped – that is the test voltage is reduced by more than 15 % – then the tests specified in 6.10.3.4 and 6.10.3.5 have to be performed as well.	Impulse voltage clamped. Proceeded with Clause 6.10.3.4 and 6.10.3.5 testing.	P
6.10.3.4	**Surge test with supply voltage**		-
	The surge test specified in 6.10.2.4 shall be applied as follows:		NOTED
	• *this test shall be carried out with a supply side overcurrent protection present in each phase to protect the coupling network. The characteristics of the protection shall be agreed between the manufacturer and the purchaser and shall be included in the test report;*		P
	• *the surges shall be applied to the same points as specified in 6.10.3.3;*		P
	• *the test voltage shall be as specified in Table 7 for basic insulation;*	Reinforced insulation is used.	N
	• *5 positive and 5 negative surges shall be applied;*		P
	• *the surges shall be superimposed on the peak of the sine wave;*		P

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Clause	Requirement - Test	Remark	Result
	• *the waveshape shall be recorded.*		P
	The requirements of the test are satisfied if no disruptive discharge (sparkover, flashover or puncture) occurs on the test object and no SPD failure occurs.		P
	If the surge voltage is still clamped, then the manufacturer and the test house shall agree if further tests are required.	No significant clamping or deformation in the waveform was observed.	N
6.10.3.5	**Impulse voltage test with SPDs not present**		-
	In the case where surge protective devices (SPDs) are used inside a meter to reduce the overvoltage levels below the rated impulse voltage values specified in Table 7, the impulse voltage test shall be also performed on a specially prepared sample with SPDs removed.	All SPDs were removed. See test results for additional details.	P
	The test shall be performed as specified in 6.10.3.3, but the value of the impulse test voltage shall be one step lower, as specified in 6.7.6.	*NOTE The purpose of this test is to verify that clearances meet the requirements for reduced impulse voltages.*	NOTED
	The pass / fail criteria of 6.10.2.3 apply.		NOTED
6.10.4	**Dielectric tests**		-
6.10.4.1	**Testing complete equipment vs. sub-assemblies**		-
	Dielectric tests on complete equipment is the preferred method.	*NOTE 1 The reason for this is that with some designs, metering equipment is sealed for life and all parts of the meter case eventually have functions in fulfilling the requirements for clearances and creepage distances.* The meter was tested as complete equipment.	P

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Clause	Requirement - Test	Remark	Result
	In some designs, applying test voltages for double or reinforced insulation between mains circuits and PELV / SELV circuits may overstress certain insulations or circuits that are not required to withstand these voltages, or some sensitive components may be damaged. In such cases insulation tests shall be carried out on sub-assemblies. See explanations to the figures in Annex B.	*NOTE 2 Verification of clearances and creepage distances by measurement as specified in 6.7 is performed on disassembled metering equipment.* Testing was able to be carried out on the complete equipment.	N
6.10.4.2	**Humidity preconditioning**	NOTE The following is based on IEC 61010-1:2010, 6.8.2.	-
	The equipment is subjected to humidity preconditioning before the dielectric tests. The equipment is not energized during preconditioning.		P
	When testing sub-assemblies, this treatment need not be applied to parts that are clearly unlikely to be influenced by humidity and temperature.	No subassemblies were tested.	N
	Preconditioning is carried out as specified in IEC 60068-2-78, in a humidity chamber containing air with a humidity of (93 ± 3) % RH. The temperature of the air in the chamber is maintained at (40 ± 2) °C.		P
	Before applying humidity, the equipment is brought to a temperature of 40 °C ± 2 °C, normally by keeping it at this temperature for at least 4 h before the humidity preconditioning.		P
	The air in the chamber is stirred and the chamber is designed so that condensation will not precipitate on the equipment.		P

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Clause	Requirement - Test	Remark	Result
	The equipment remains in the chamber for 48 h, after which it is removed and allowed a recovery period of 2 h under the environmental conditions of 4.3.1, with the covers of nonventilated equipment removed if this is possible.		P
	The tests are performed and completed within 1 h of the end of the recovery period after humidity preconditioning.		P
6.10.4.3	**Dielectric test on complete equipment**		-
6.10.4.3.1	**Test methods**		-
	This subclause specifies test methods for testing complete equipment using:		NOTED
	a) *impulse voltage test specified in 6.10.4.3.3; and*		P
	b) *a.c. power-frequency voltage test specified in 6.10.4.3.4.*		P
	The impulse voltage test shall be performed first, followed by the a.c. voltage test.		P
	The results of the insulation tests are considered to be valid only for the terminal arrangement of the metering equipment, which has undergone the tests. When the terminal arrangements differ, all the insulation tests shall be carried out for each arrangement.		P
6.10.4.3.2	**Preparation of the metering equipment for testing**	NOTE This subclause is based on IEC 62052-11:2003, 7.3.1.	-

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Clause	Requirement - Test	Remark	Result
	Unless otherwise specified, the tests shall be carried out on complete metering equipment, with its cover (except when indicated otherwise) and terminal cover in place, the terminal screws being screwed down to touch the conductors of the maximum size that can be accommodated by the terminals.	Tests were performed as noted here.	P
	To create a continuous circuit for the voltage tests, terminals and open contacts of switches shall be bridged where necessary. Before testing, semiconductor devices and other vulnerable components within a circuit may be disconnected and/or their terminals bridged to avoid damage occurring to them during the test. The modifications to be performed shall be agreed on by the manufacturer and the test laboratory and shall be documented in the test report.	No modifications were needed.	N
	For the purpose of these tests, the term "earth" has the following meaning:		NOTED
	a) *when the case of the metering equipment is made of metal, the "earth" is the case itself, placed on a flat conducting surface;*	The meter's case is not made of metal.	N
	b) *when the meter case or only a part of it is made of insulating material, the "earth" is a conductive foil wrapped around the meter touching all accessible conductive parts and connected to the flat conducting surface on which the meter base is placed.*		P
	A gap of 2 cm shall be left between the earth and the terminals to avoid flashover to the terminals.		P

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Clause	Requirement - Test	Remark	Result
	During the tests, circuits which are not under test shall be connected together and to the earth.		P
	For payment meters, the following special conditions apply: Where a physical token carrier acceptor is fitted, the meter shall withstand the tests with a metallic token in the token carrier acceptor or, if the metallic token cannot be retained, with a suitable electrical connection to the physical token carrier interface. Such metallic tokens or electrical connections shall then be connected to the earth for the purposes of these tests.	This is not considered a payment meter.	N
6.10.4.3.3	**The impulse voltage test**		-
	The impulse voltage test method specified in 6.10.2.3 is used.		NOTED
	The altitude correction factors specified in 6.10.2.7 apply.	A 1.20 correction factor was applied for the test site altitude (128 m), except when specified otherwise.	NOTED
	The test voltage shall be applied:		NOTED
	a) *between all the HLV terminals connected together and earth. The test voltage shall be as specified in Table 7, taken from the column "Basic and supplementary insulation" for metering equipment of protective class I and the column "Reinforced insulation" for metering equipment of protective class II.*		P

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Clause	Requirement - Test	Remark	Result
	b) *between each independent (group of) HLV circuit(s). The test voltage shall be as specified in Table 7, taken from the column "Basic and supplementary insulation". When testing the current circuits of transformer operated meters, the test voltage shall be selected based on the nominal voltage of the corresponding voltage circuit.*		P
	For examples of test arrangements see Annex F.		NOTED
6.10.4.3.4	**The AC power-frequency voltage test**	NOTE This subclause is based on IEC 60060-1:2010, Clause 5, IEC 62052-21:2004, 7.3.2.3, IEC 62053-11:2003, 7.4 and IEC 62053-21:2003, 7.4.	-
	The a.c. power-frequency voltage test method specified in 6.10.2.5 is used. The test voltage shall be applied for 1 min.		P
	Capacitors interfering with the a.c. voltage testing may be disconnected, or d.c. voltage testing can be considered. If capacitors are removed, this shall be documented in the test report.	No interference was observed from internal capacitors.	N
	The test shall be performed as specified in Table 25. Circuits not involved in the test shall be connected together and to the earth. The test voltage shall be applied directly to the terminals. For examples of test arrangements see Annex F.		P
	For electromechanical meters, additional tests are specified in Annex G.	Meter is not an electromechanical type.	N
	For performing AC voltage test as routine test, see Annex I.		NOTED
7	PROTECTION AGAINST MECHANICAL HAZARDS		-
7.1	**General**	NOTE This subclause is based on IEC 61010-1:2010, 7.1.	-

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Clause	Requirement - Test	Remark	Result
	The equipment shall not cause a mechanical hazard in normal use, or cause a hazard in a single fault condition that might not be easily noticed. Mechanical hazards include, but are not limited to, the following:		P
	• sharp edges which could cause cuts (see 7.2);	No sharp edges are present on the meter.	P
	• falling equipment, resulting from breakage of the carrying device (see 7.3).	No carrying devices present or necessary during installation of the metering equipment.	N
	Conformity is checked as specified in 7.2 and 7.3.		P
7.2	**Sharp edges**	NOTE 1 This subclause reproduces IEC 61010-1:2010, 7.2.	-
	All easily touched parts of the equipment shall be smooth and rounded so as not to cause injury during normal use of the equipment.	No sharp edges are present on the meter.	P
	Unless the fault presents an obvious hazard, easily-touched parts of the equipment shall not cause an injury in single fault condition.		P
	Conformity is checked by inspection and, if necessary, by application of an object that represents a finger in size, shape and hardness, to check for abrasions or cuts.	NOTE 2 An acceptable procedure is outlined in UL 1439. Conformity was checked by inspection	P
7.3	**Provisions for lifting and carrying**	NOTE This subclause is based on IEC 61010-1:2010, 7.5. It is relevant only to carrying handles used before installation of metering equipment.	-
	If a carrying handle is fitted with the metering equipment or supplied with it, it shall be capable of withstanding a force of four times the weight of the equipment in normal use and in single fault condition.	No carrying handles are used for installation of this metering equipment.	N
	Conformity is checked by inspection and by the following test.		NOTED

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Clause	Requirement - Test	Remark	Result
	The carrying handle is subjected to a force corresponding to four times the weight of the equipment. Unless the handle mounting screws (if any) are secured against loosening, one screw is removed before performing these tests. The force is applied uniformly over a 70 mm width at the centre of the handle or grip, without clamping. The force is steadily increased so that the test value is attained after 10 s and maintained for a period of 1 min.	Meter isn't provided with carrying handles.	N
	The carrying handle shall not have broken loose from the equipment and there shall not be any permanent distortion, cracking or other evidence of failure which could cause a hazard.	EUT does not incorporate any handles.	N
8	RESISTANCE TO MECHANICAL STRESSES		-
8.1	**General**		-
	Equipment shall not cause a hazard when subjected to mechanical stresses likely to occur in normal use.		P
	Conformity is checked by performing the following tests on the enclosure.	See individual test results for additional information.	P
8.2	**Spring hammer test**	NOTE This subclause is based on IEC 62052-11:2003, 5.2.2.1.	-
	The mechanical strength of the meter case shall be tested with a spring hammer (test Ehb, see IEC 60068-2-75:2014, Clause 6).		P
	The meter shall be mounted in its normal working position and the spring hammer shall act on the outer surfaces of the meter cover (including windows) and on the terminal cover with a kinetic energy of 0,2 J. The number of impacts shall be three per location.		P

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Clause	Requirement - Test	Remark	Result
	The result of the test is satisfactory if the meter case and terminal cover(s) do not sustain damage which would make hazardous live parts accessible. Slight damage which does not impair the protection against indirect contact or the penetration of solid objects, dust and water is acceptable.		P
9	PROTECTION AGAINST THE SPREAD OF FIRE		-
9.1	General	NOTE 1 Clause 9 is based on IEC 61010-1:2010 Clause 9 and IEC 62052-11:2003, 5.8.	-
	There shall be no spread of fire outside the equipment in normal condition or in single fault condition. Figure 11 is a flow chart showing methods of conformity verification.		P
	See also 9.5, Overcurrent protection.		NOTED
	Conformity is checked by at least one of the following methods.	Method c) used	NOTED
	a) *Testing in the single fault conditions (see 4.4) that could cause the spread of fire outside the equipment. The conformity criteria of 4.4.4.3 shall be met.*	This method was not used.	N
	b) *Verifying elimination or reduction of the sources of ignition within the equipment as specified in 9.2.*	This method was not used.	N
	c) *Verifying as specified in 9.3 that if a fire occurs it will be contained within the equipment.*	*NOTE 2 Methods b) and c) are based on fulfilling specified design criteria, in contrast to method a) which relies entirely on testing in specified single fault conditions.* No fire occurred during glow wire condition tests.	P
	These alternative methods can be applied throughout the equipment or individually for different sources of hazards or for different areas of the equipment.	*NOTE 3 See 12 concerning protection against fire caused by batteries.*	NOTED
9.3	Containment of fire within the equipment, should it occur		-
9.3.1	General		-

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Clause	Requirement - Test	Remark	Result
	The possibility of the spread of fire outside the equipment is considered to be reduced to a tolerable level if the equipment and the equipment enclosure conform to the constructional requirements of 9.3.2.		P
	Conformity is checked by inspection and as specified in 9.3.2.		P
9.3.2	**Constructional requirements**		-
9.3.2.1	**Terminal block, terminal cover, case**	NOTE This subclause is based on IEC 62052-11:2003, 5.8 and IEC 62055-31:2005, 5.8.	-
	The terminal block(s), insulating material retaining the main contacts of supply and load control switches, the terminal cover(s) and the meter case shall ensure reasonable safety against spread of fire. In particular, they should not be ignited by thermal overload of live parts in contact with them.	Full enclosure, Terminal covers and Terminal block are used Covestro Makrolon 9417 with Polycarbonate Reinforced with 10% Glass fibers (PC-GF10). Glow Wire Test conducted on each part.	P
	Conformity is checked by inspection of data on materials, and in case of doubt by performing the glow-wire test specified in IEC 60695-2-11, with the following temperatures:		NOTED
	• *terminal block and insulating material retaining the main contacts of supply and load control switches in position: 960 °C ± 15 °C;*	Verified documents Makrolon® 9417 for Glow Wire Flammability test. Glow Wire Flammability test was conducted as well. Refer to Appendix.	P
	• *terminal cover and meter case: 650 °C ± 10 °C;*		P
	• *duration of application: 30 s ± 1 s.*		P
	The contact with the glow-wire may occur at any 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.		NOTED

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Clause	Requirement - Test	Remark	Result
9.3.2.2	**Connectors and insulation materials on which components are mounted**	NOTE 1 This subclause reproduces IEC 61010-1:2010, 9.3.2.	-
	The following constructional requirements shall be met:	NOTE 2 This subclause does not apply to the terminal block accommodating the terminals of the mains circuits.	NOTED
	a) Connectors and insulating material on which components are mounted shall have a flammability classification V-2, or better, of IEC 60695-11-10. See also 13.3 for requirements for printed wiring boards.	NOTE 3 V-0 is better than V-1, which is better than V-2. All printed circuit board assemblies are rated UL94 V-0 and suitable for support of live parts. The UL94 V-0 rating is equivalent to the IEC 60695-11-10 V-0 Referred UL yellow card E301546 for the details.	P
	Conformity is checked by inspection of data on materials, and in case of doubt by performing the vertical burning test of IEC 60695-11-10 on samples used in the relevant parts.		NOTED
	b) Insulated wires shall retard flame propagation.	NOTE 4 Wire with a flammability rating of UL 2556 VW-1 or equivalent is considered to meet this requirement. Internal wire is provided for relay operation. Wire is AVLV2 (UL File: E502746), and suitably rated for application.	P
	Conformity is checked by inspection of data on materials, and in case of doubt by performing whichever of the following tests is applicable:	Conformity was checked by inspection of data on materials. No testing was required.	NOTED
	1) *for wires with overall cross-sectional area of the conductors exceeding 0,5 mm2, the test of IEC 60332-1-2:2004;*		N
	2) *for wires with overall cross-sectional area of the conductors of 0,5 mm2 or less, the test of IEC 60332-2-2:2004.*		N
10	EQUIPMENT TEMPERATURE LIMITS AND RESISTANCE TO HEAT		-
10.1	Surface temperature limits for protection against burns	NOTE This subclause is based on IEC 61010-1:2010, 10.1.	-

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IEC 62052-31/AS 62052.31			
Clause	Requirement - Test	Remark	Result
	At an ambient temperature of 40 °C, the temperature of easily touched surfaces shall not exceed:	The manufacturer declares 55°C as the maximum rated maximum ambient temperature.	NOTED
	a) the values of Table 31 in normal condition; and		P
	b) 105 °C in single fault condition, or when the EUT is exposed to the maximum overload current I_{ovl} as agreed by the manufacturer and the purchaser.	Single Fault and Overload testing not requested by client	TBD
	At ambient temperatures exceeding 40 °C, easily touched surfaces of equipment rated for a maximum ambient temperature above 40 °C are permitted to exceed:	The meter is rated for a 55°C max ambient temperature.	NOTED
	c) the values of Table 31 in normal condition; and		P
	d) 105 °C in single fault condition, or when the EUT is exposed to the maximum overload current I_{ovl} as agreed by the manufacturer and the purchaser,	Single Fault and Overload testing not requested by client	TBD
	by not more than the amount by which the maximum rated ambient temperature exceeds 40 °C.		P
	Example: If the maximum rated temperature of equipment is 55 °C, then the surface temperature limit of easily touched plastic parts in normal condition is:	Temperature limits were adjusted based on 55°C safety temperature.	NOTED
	a) 85 °C at an ambient temperature of 40 °C, from Table 31;		NOTED
	b) 85 °C + (55 °C – 40 °C) = 100 °C at an ambient temperature of 55 °C.		NOTED
	Surfaces of the terminal blocks covered by terminal covers or, in the case of panel mounted meters, protected by a barrier are not considered to be easily touched surfaces.		NOTED
	Conformity is checked by measurement as specified in 10.4.	See the datasheets below for specific test results.	NOTED

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Clause	Requirement - Test	Remark	Result
10.2	**Temperature limits for terminals**		-
	At an ambient temperature of 40 °C the temperature of terminals shall not exceed:	The meter is rated for a 55°C as rated safety ambient temperature.	NOTED
	a) the values of Table 32 in normal condition; and		P
	b) 135 °C in single fault condition, or when the EUT is exposed to the maximum overload current I_{ovl} as agreed by the manufacturer and the purchaser.		P
	At ambient temperatures exceeding 40 °C, the temperature of terminals is permitted to exceed:	55°C rated ambient	NOTED
	c) the values of Table 32 in normal condition; and		P
	d) 135 °C in single fault condition, or when the EUT is exposed to the maximum overload current Iovl as agreed by the manufacturer and the purchaser,		P
	by not more than the amount by which the maximum rated ambient temperature exceeds 40 °C.		P
	Example: If the maximum rated temperature is 55 °C, then the temperature limit of bare copper terminals is:		NOTED
	a) 100 °C at an ambient temperature of 40 °C from Table 32;		NOTED
	b) 100 °C + (55 °C – 40 °C) = 115 °C at an ambient temperature of 55 °C.		NOTED
	Conformity is checked by measurement as specified in 10.4.		NOTED
10.3	**Temperatures of internal parts**	NOTE This subclause is based on IEC 62477-1:2012, 4.6.4.1.	-

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Clause	Requirement - Test	Remark	Result
	The components, parts and materials of the equipment shall not attain temperatures in excess of those in Table 33 when the equipment is operated in accordance with its ratings.	Note: Manufacturer's HDT rating were used in some cases instead of typical UL RTI ratings. See data sheet for details.	P
	The equipment shall be is tested in worst case conditions, applying the maximum current I_{max} or, when agreed by the manufacturer and the purchaser the maximum overload current I_{ovl} and the maximum rated voltage, with all optional accessories attached.		P
	The maximum measured temperatures shall be corrected by adding the difference between the ambient temperature during the test and the rated maximum ambient temperature of the equipment.		P
	Compliance is checked by the test of subclause 10.4.	See the datasheets below for specific test results.	NOTED
	To determine the temperature rise of a winding by the change of resistance method the following formula shall be used.	This method was not used for recording the transformer's temperature.	N
	$\Delta t = \frac{R_2 - R_1}{R_1}(k + t_1) - (t_2 - t_1)$		NOTED
	where:		NOTED
	Δt is the temperature rise above t_2 so that the maximum temperature equals to $\Delta t + t_2$;		NOTED
	R_2 is the resistance at the end of the test, in Ω;		NOTED
	R_1 is the resistance at the beginning of the test, in Ω;		NOTED
	t_1 is the ambient temperature at the beginning of the test, in °C;		NOTED
	t_2 is the ambient temperature at the end of the test, in °C;		NOTED

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Clause	Requirement - Test	Remark	Result
	k is 234,5 for copper, 225,0 for electrical conductor grade (EC) aluminum. Values of the constant for other conductors shall be determined.		NOTED
10.4	**Temperature test**	NOTE This subclause is based on IEC 62477-1:2012, 5.2.3.10 as well as on IEC 62052-11:2003, 7.2 and IEC 62052-21:2004, 7.2.	-
	The test is intended to ensure that accessible surfaces and parts of the metering equipment do not exceed the temperature limits specified in subclauses 10.1, 10.2 and 10.3 and that the manufacturer's temperature limits of safety-relevant parts are not exceeded.	Note: Manufacturer's HDT rating were used in some cases instead of typical UL RTI ratings. See temperature test data sheet for details.	P
	It is allowed to use a new metering equipment for the test.		NOTED
	Equipment shall be tested built in as specified in the installation instructions, using walls of plywood painted matt black, approximately 10 mm thick when representing the walls of a cabinet, approximately 20 mm thick when representing the walls of a building. The connecting cables shall be as specified in 4.3.2.11.	A 20mm thick plywood painted matt black was used. Refer to the test results for additional details. All cables were used 35 mm2	P
	The test shall be performed under reference conditions specified in 4.3.1, with ambient temperature 23 °C ± 2 °C at the start of the test with each voltage circuit (and with those auxiliary voltage circuits which are energized for periods of longer duration than their thermal time constants) carrying 1,15 times the reference voltage and:		P
	a) *in the case of single phase two-wire meters, both the phase and the neutral conductor carrying rated maximum current;*	Meter is a single-phase, two wire.	P
	b) *in the case of single-phase three-wire meters:*	Meter is a single-phase, two wire.	N

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Clause	Requirement - Test	Remark	Result
	1) *each current circuit carrying rated maximum current with the neutral conductor not carrying current;*		N
	2) *one phase and the neutral conductor carrying rated maximum current;*		N
	c) *in the case of three-phase three-wire meters each current circuit carrying rated maximum current;*	Meter is a single-phase, two wire.	N
	d) *in the case of three-phase four-wire meters:*	Meter is a single-phase, two wire.	N
	1) *each current circuit carrying rated maximum current with the neutral conductor not carrying current;*		N
	2) *the current circuit closest to the neutral terminal and the neutral terminal carrying rated maximum current;*		N
	e) *in the case of tariff and load control equipment, energized with 1,15 times the reference voltage and carrying maximum total current.*	The supply control switches are same carried rated current (according to the meters nameplate)	P
	For test with polyphase currents, current shall be balanced in each phase within ±5 % and the average of these currents shall be not less than the appropriate test current.		N
	The test shall be maintained until thermal stabilization has been reached. That is, when three successive readings, taken at intervals of 10 % of the previously elapsed duration of the test and not less than 10 min intervals, indicate no change in temperature, defined as ± 1 °C between any of the three successive readings, with respect to the ambient temperature.		P

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Clause	Requirement - Test	Remark	Result
	If a heat source could cause the failure of insulation at a certain point leading to a hazard, the temperature of the electrical insulation (other than that of windings) is measured on the surface of the insulation at the closest point to the heat source.		P
	If temperatures of windings are measured by the thermocouple method, the thermocouple shall be located on the surface of the winding located at the hottest part due to surrounding heat emitting components. See also notes in Table 33.		P
	The maximum temperature attained shall be corrected to the rated maximum ambient temperature of the metering equipment by adding the difference between the ambient temperature attained during the test and the rated maximum ambient temperature.	See the datasheets below for additional details.	P
	No corrected temperature shall exceed the rated temperature of the material or component measured.		P
	The rated maximum ambient temperature is 40 °C. The meter case is made of plastic. The ambient temperature attained during the test is 32 °C. The maximum temperature measured on the meter case is 64 °C. The corrected temperature is 64 + (40-32) = 72 °C. This is below 85 °C, the limit specified in Table 31. The meter passed.	EXAMPLE 1	NOTED
	The rated maximum ambient temperature is 55 °C. The meter case is made of plastic. The ambient temperature attained during the test is 32 °C. The maximum temperature measured on the meter case is 64 °C. The corrected temperature is 64 + (55-32) = 87 °C.	EXAMPLE 2	NOTED
	The temperature limit based on Table 31 scaled to the maximum rated temperature is 85+(55-40) = 100 °C. The meter passed.		NOTED

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Clause	Requirement - Test	Remark	Result
	The rated maximum ambient temperature is 55 °C. The meter case is made of plastic. The ambient temperature attained during the test is 32 °C. The maximum temperature measured on the meter case is 79 °C. The corrected temperature is 79 + (55-32) = 102 °C.	EXAMPLE 3	NOTED
	The temperature limit based on Table 31 scaled to the maximum rated temperature is 85+(55-40) = 100 °C. The meter failed.		NOTED
	When the manufacturer and the purchaser agreed that the meter may be exposed to the maximum overload current Iovl, see 3.3.11, the test shall also be carried out on a new test specimen, with the meter carrying the maximum overload current agreed instead of the maximum current. The test duration shall be 2 h. All other conditions shall be the same as during the test with the maximum current.	Test omitted by client	TBD
	The maximum temperature attained shall be corrected to the rated maximum ambient temperature of the metering equipment by adding the difference between the ambient temperature attained during the test and the rated maximum ambient temperature.		NOTED
	The corrected temperature of easily touched surface shall not exceed 105 °C, the temperature of terminals shall not exceed 135 °C and the temperature of internal materials and components shall not exceed the values specified in Table 33.		NOTED
10.5	**Resistance to heat**		-
10.5.1	**Non-metallic enclosures**	NOTE This subclause is based in IEC 61010-1:2010, 10.5.2.	-
	Enclosures of non-metallic material shall be resistant to elevated temperatures.		P

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Clause	Requirement - Test	Remark	Result
	Conformity is checked by test, after one of the following treatments.		NOTED
	a) *A non-operative treatment, in which the equipment, not energized, is stored for 7 h at 70 °C ± 2 °C, or at 10 °C ± 2 °C above the temperature measured during the test of 10.4, whichever is higher. If the equipment contains components that might be damaged by this treatment, an empty enclosure may be treated, followed by assembly of the equipment at the end of the treatment.*	See datasheets for test temperature and other details.	P
	b) *An operative treatment, in which the equipment is operated under the reference test conditions of 4.3, except that the ambient temperature is 20 °C ± 2 °C above 40 °C, or above the maximum rated ambient temperature if higher than 40 °C, and loaded as specified in 10.4.*	This method was not used.	N
	Within 10 min of the end of treatment the equipment shall be subjected to the stress specified in 8.2, and meet the pass criteria of 8.1.		P
10.5.2	**Insulating materials**	NOTE 1 This subclause is based on IEC 61010-1:2010, 10.5.3 and IEC 62052-11:2003, 5.4, with alternative test methods added.	-
	Insulating materials supporting the mains terminals and the contacts of supply and/or load control switches shall have adequate resistance to heat.		P
	Conformity is checked by inspection of data on materials, and in case of doubt by performing one of the following tests.	Terminal Block material Covestro Makrolon 9417 meets these requirements without additional testing. See below for properties.	P
	a) *The deflection temperature test (ISO 75-2)*	The manufacturer's specifications for the terminal block material exceed the requirements for this test.	P

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Clause	Requirement - Test	Remark	Result
	The insulating material shall be capable of passing the test given in ISO 75-2 for a temperature of 124 °C and a pressure of 1,8 MPa (method A).	Material rated 135°C	P

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Makrolon® 9417

Glass fiber (Normal fiber) reinforced grades / 10 % Glass fiber reinforced

MVR (300 °C/1.2 kg) 6.0 cm³/10 min; 10 % glass fiber reinforced; flame retardant; UL 94V-0/1.5 mm and 5VA/3.0 mm; high viscosity; UV stabilized; easy release; injection molding - melt temperature 310 - 330 °C; available in opaque colors only

ISO Shortname: ISO 7391-PC,MFLR,(,,)-09-9,GF10

Rheological properties

	Property	Test Condition	Unit	Standard	typical Value
C	Melt volume-flow rate	300 °C/ 1.2 kg	cm³/10 min	ISO 1133	6.0
C	Molding shrinkage, parallel	60x60x2 mm/ 500 bar	%	ISO 294-4	0.8
C	Molding shrinkage, normal	60x60x2 mm/ 500 bar	%	ISO 294-4	0.45
	Molding shrinkage, parallel/normal	Value range based on general practical experience	%	b.o. ISO 2577	0.4 - 0.6
	Melt mass-flow rate	300 °C/ 1.2 kg	g/10 min	ISO 1133	7.0

Mechanical properties (23 °C/50 % r. h.)

	Property	Test Condition	Unit	Standard	typical Value
C	Tensile modulus	1 mm/min	MPa	ISO 527-1,-2	3800
	Yield stress	5 mm/min	MPa	ISO 527-1,-2	64
	Yield strain	5 mm/min	%	ISO 527-1,-2	4.0
C	Stress at break	5 mm/min	MPa	ISO 527-1,-2	45
C	Strain at break	5 mm/min	%	ISO 527-1,-2	15
C	Tensile creep modulus	1 h	MPa	ISO 899-1	3600
C	Tensile creep modulus	1000 h	MPa	ISO 899-1	2900
	Flexural modulus	2 mm/min	MPa	ISO 178	3650
	Flexural strength	2 mm/min	MPa	ISO 178	105
	Flexural strain at flexural strength	2 mm/min	%	ISO 178	5.8
	Flexural stress at 3.5 % strain	2 mm/min	MPa	ISO 178	88
C	Charpy impact strength	23 °C	kJ/m²	ISO 179/1eU	150C(N)
C	Charpy impact strength	-30 °C	kJ/m²	ISO 179/1eU	120C(N)
	Charpy impact strength	-60 °C	kJ/m²	ISO 179/1eU	100C
	Charpy notched impact strength	23 °C/ 3 mm	kJ/m²	ISO 7391/b.o. ISO 179/1eA	10C
	Izod notched impact strength	23 °C/ 3 mm	kJ/m²	ISO 7391/b.o. ISO 180/A	10C
C	Puncture impact properties - maximum force	23 °C	N	ISO 6603-2	4000
C	Puncture impact properties - maximum force	-30 °C	N	ISO 6603-2	3700
C	Puncture energy	23 °C	J	ISO 6603-2	25
C	Puncture energy	-30 °C	J	ISO 6603-2	15
	Ball indentation hardness		N/mm²	ISO 2039-1	128

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Clause	Requirement - Test	Remark	Result

covestro

Makrolon® 9417

Thermal properties

	Property	Test Condition	Unit	Standard	typical Value
C	Temperature of deflection under load	1.80 MPa	°C	ISO 75-1,-2	135
C	Temperature of deflection under load	0.45 MPa	°C	ISO 75-1,-2	141
C	Vicat softening temperature	50 N; 50 °C/h	°C	ISO 306	143
	Vicat softening temperature	50 N; 120 °C/h	°C	ISO 306	144
C	Coefficient of linear thermal expansion, parallel	23 to 55 °C	10^{-4}/K	ISO 11359-1,-2	0.4
C	Coefficient of linear thermal expansion, normal	23 to 55 °C	10^{-4}/K	ISO 11359-1,-2	0.65
C	Burning behavior UL 94 (1.5 mm) [UL recognition]	1.5 mm	Class	UL 94	V-0
C	Burning behavior UL 94-5V [UL recognition]	3.0 mm	Class	UL 94	5VA (NC, BK, GY)
	Burning behavior UL 94-5V [UL recognition]	6.0 mm	Class	UL 94	5VA
C	Oxygen index	Method A	%	ISO 4589-2	36
	Thermal conductivity, normal	23 °C; 50 % r. h.	W/(m·K)	ISO 8302	0.22
	Resistance to heat (ball pressure test)		°C	IEC 60695-10-2	136
	Relative temperature index (Tensile strength) [UL recognition]	1.5 mm	°C	UL 746B	125
	Relative temperature index (Tensile impact strength) [UL recognition]	1.5 mm	°C	UL 746B	115
	Relative temperature index (Electric strength) [UL recognition]	1.5 mm	°C	UL 746B	125
	Glow wire test (GWFI)	0.75 mm	°C	IEC 60695-2-12	960
	Glow wire test (GWFI)	1.5 mm	°C	IEC 60695-2-12	960
	Glow wire test (GWFI)	3.0 mm	°C	IEC 60695-2-12	960
	Glow wire test (GWIT)	1.0 mm	°C	IEC 60695-2-13	825
	Glow wire test (GWIT)	1.5 mm	°C	IEC 60695-2-13	900
	Glow wire test (GWIT)	3.0 mm	°C	IEC 60695-2-13	900
	Application of flame from small burner	Method K and F/ 2.0 mm	Class	DIN 53438-1,-3	K1, F1
	Burning rate (US-FMVSS)	>=1.0 mm	mm/min	ISO 3795	passed
	Flash ignition temperature		°C	ASTM D1929	475
	Self ignition temperature		°C	ASTM D1929	550

Electrical properties (23 °C/50 % r. h.)

	Property	Test Condition	Unit	Standard	typical Value
C	Relative permittivity	100 Hz	-	IEC 60250	3.2
C	Relative permittivity	1 MHz	-	IEC 60250	3.2
C	Dissipation factor	100 Hz	10^{-4}	IEC 60250	10
C	Dissipation factor	1 MHz	10^{-4}	IEC 60250	90
C	Volume resistivity		Ohm·m	IEC 60093	1E14
C	Surface resistivity		Ohm	IEC 60093	1E16
C	Electrical strength	1 mm	kV/mm	IEC 60243-1	36
C	Comparative tracking index CTI	Solution A	Rating	IEC 60112	175
	Comparative tracking index CTI M	Solution B	Rating	IEC 60112	125M
	Electrolytic corrosion		Rating	IEC 60426	A1

Clause	Requirement - Test	Remark	Result
-	b) *The ball pressure test (IEC 60695-10-2)*		N

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Clause	Requirement - Test	Remark	Result
	A sample of the insulating material, at least 2,5 mm thick, is subjected to a ball-pressure test using the test apparatus shown in Figure 12. The test is made at 125 °C ± 2 °C. The part to be tested is supported so that its upper surface is horizontal, and the spherical part of the apparatus is pressed against this surface with a force of 20 N. After 1 h the apparatus is removed and the sample is cooled within 10 s to approximately room temperature by immersion in cold water. The diameter of the impression caused by the ball shall not exceed 2 mm.	NOTE 2 If necessary, the required thickness may be obtained by using two or more sections of the part.	N
	c) *The Vicat softening test (ISO 306)*	NOTE 3 For supply and load control switches, only those parts that support or retain the contacts in position are subjected to the test. Compliance was determined via Method A.	N
	Method A120 using a force of 10 N and a heating rate of 120 °C/h. The Vicat softening temperature shall be at least 130 °C.		N
11	**Protection against penetration of dust and water**		-
	Metering equipment shall conform to the following degree of protection given in IEC 60529:1989:	NOTE 1 This subclause is based on IEC 62052-11:2003, 5.9.	NOTED
	• indoor meters IP51;	NOTE 2 Meters equipped with physical payment token carriers acceptors are for indoor use only, unless otherwise specified by the manufacturer. Meter intended for indoor use, but Applicant requested more stringent testing to IP54.	P
	• outdoor meter: IP54.		N
	For panel mounted meters, where the panel provides IP protection, the IP ratings apply to the meter parts exposed in front of (outside of) the electrical panel.	NOTE 3 Meter parts behind the panel may have lower IP rating, e.g. IP30. Meter is typically installed as a standalone device.	N
	The enclosure shall be treated as:		NOTED

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Clause	Requirement - Test	Remark	Result
	• category 2 in the case of indoor meters;	NOTE 4 Category 2 enclosures are enclosures where no pressure difference relative to the surrounding air is present.	P
	• category 2 or category 1 in the case of outdoor meters according to the documentation provided by the manufacturer.	NOTE 5 Category 1 enclosures are enclosures where the normal working cycle of the equipment causes reductions in air pressure within the enclosure below that of the surrounding air, for example, due to thermal cycling effects. Meter enclosure is rated as Category 2.	P
	Conformity is checked with the following tests:		NOTED
	a) *Dust test for first characteristic numeral 5, according to IEC 60529:1989, 13.4:*	Test was conducted without suction.	P
	• *meter in non-operating condition and installed according to the manufacturer's instructions, including all terminal covers provided;*		P
	• *with sample lengths of cable (exposed ends sealed) of the type specified by the manufacturer and with the terminal cover(s) in place;*		P
	• *meters equipped with physical payment token acceptors shall be tested without any token carrier in place in the token carrier acceptor;*	Meter isn't equipped with payment token acceptors.	N
	• *metering equipment with category 2 enclosures shall not be connected to a vacuum pump.*		P
	The protection is satisfactory if, on inspection, talcum powder has not accumulated in a quantity or location such that, as with any other kind of dust, it could interfere with the correct operation of the equipment or impair safety. No dust shall deposit where it could lead to tracking along the creepage distances.		P

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Clause	Requirement - Test	Remark	Result
	Care should be taken during the inspection to avoid accidental transfer of the talcum powder to locations where its accumulation could be interpreted as a test failure.		NOTED
	b) *Protection against penetration of water*		P
	• *meter in the same conditions as for test a)*		P
	• *test for second characteristic numeral 1 (IPX1) for indoor meters as specified in IEC 60529:1989, 14.2.1 with drip box;*	Meter is rated for indoor use with IP54 rating.	N
	• *test for second characteristic numeral 4 (IPX4) for outdoor meters as specified in IEC 60529:1989, 14.2.4, with oscillating tube.*	Meter is rated for indoor use.	P
	After testing the enclosure shall be inspected for ingress of water. If any water has entered, it shall not:		P
	• *be sufficient to interfere with the correct operation of the equipment or impair safety;*		P
	• *deposit on insulation parts where it could lead to tracking along the creepage distances;*		P
	• *reach live parts or windings not designed to operate when wet;*		P
	• *accumulate near the cable ends or enter the cables.*		P
	In addition, the AC power-frequency voltage test as specified in 6.10.4.3.4 shall be passed.		P

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AS 62052.31			
Clause	Appendix ZZ - Variations to IEC 62052-31	Remark	Result
1.4.1	*Delete* Item a) and *replace* with the following: a) indoor use, or when protected from extreme weather conditions if used outdoors; *Delete* Item c) and Note 2 and *replace* with the following: *c)* climatic conditions according to 3K5, or if intended for use outdoors with protection, 3K6 but with a low air temperature of –10 °C and maximum relative air humidity of 95% (see IEC 60721-3-3:1994); NOTE 2 3K5 specifies low air temperature of –5 °C and high air temperature +45 °C, low relative humidity 5%, high relative humidity 95% and 3K6 specifies low air temperature of –25 °C and high air temperature +55 °C, low relative humidity 10%, high relative humidity 100%. See the Table 1 in IEC 60721-3-3:1994. The application of 3K5 and a modified 3K6 reflects the operating environments of metering equipment in Australia.	Testing for 3K5 indoor use (low temp –10°C, high temp +45°C), covered within range tested.	P

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AS 62052.31			
Clause	Appendix ZZ - Variations to IEC 62052-31	Remark	Result
2	1 *Add* the following as a second paragraph: Where IEC normative references are replaced in Appendix ZZ by Australian or Australian/New Zealand Standards, all references in the source text to those IEC normative references shall be replaced by references to the corresponding Australian or Australian/New Zealand Standards. Australian or Australian/New Zealand Standards that are identical adoptions of international normative references may be used interchangeably. 2. *Delete* the listed document, IEC 60950-1, and *replace* with the following: AS/NZS 60950.1—*Information technology equipment—Safety*, Part 1: *General requirements (IEC 60950-1, Ed.2.2 (2013), MOD)*		NOTED

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AS 62052.31			
Clause	Appendix ZZ - Variations to IEC 62052-31	Remark	Result
3.1	After Definition 3.1.4, Isolation, *add* the following: **3.1.101** **Australian public electricity distribution network** the Australian public electrical power delivery system consisting of both underground and overhead electrical conductors predominantly located in public spaces which interconnects predominantly low voltage (230/400V) individual electricity consumers while upstream connecting all electricity consumers to the wider national grid made up of the electricity transmission system and generation assets NOTE For networks within the scope of the National Electricity Rules of Australia.		NOTED
3.2.11	After Definition 3.2.11, indoor meter, *add* the following: **3.2.11.101** **Australian outdoor meter** Meter that is: (a) intended for use outdoors but protected from extreme weather conditions, and/or (b) intended for use at the interface with the Australian public electricity distribution network	Meter was tested for IP54, which covers Australian outdoor meters (IP53) .	P

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AS 62052.31			
Clause	Appendix ZZ - Variations to IEC 62052-31	Remark	Result
Table 22	For table heading, 'Utilization category[a]', *add* reference mark '[e]' and *insert* following additional footnote: [e]) For direct connected metering equipment intended for use at the interface with the Australian public electricity distribution network, the minimum utilization category shall be UC3. Under the footnotes, *add* the following: NOTE At the interface with the public electricity distribution network in Australia, direct connected services are typically designed to tolerate relatively high prospective short circuit current with protective device maximum of 80A HRC. For Requirement 10, Maximum overload current I_{ovl}, *add* reference mark 'f' and *insert* the following additional footnote: [f]) For direct connected metering equipment intended for use at the interface with the Australian public electricity distribution network, I_{ovl} shall be ≥128A. Under the footnotes, *add* the following: NOTE At the interface with the public electricity distribution network in Australia, direct connected services are typically designed with the maximum protective device size of 80A HRC fuse. The value of 128A is derived from 80A × 1.6, where 1.6 represents the accepted scaling factor which determines the typical 2 hour operation time for an HRC fuse in overload.	Test omitted by client	TBD

APPENDIX C

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AS 62052.31			
Clause	Appendix ZZ - Variations to IEC 62052-31	Remark	Result
6.10.3.4	At the end of the Clause, *insert* the following new subclause: **6.10.3.4.101 Impulse test for robustness** The test shall be performed as specified in 6.10.3.3, except the value of the impulse test voltage shall be 10 000V and the conventional output impedance of the generator shall be 40 Ω ± 10%. The pass/fail criteria of 6.10.2.3 shall apply. NOTE This test is intended to verify the robustness of the metering equipment against the typical environmental (higher lightning risk) and operational (open conductor) conditions of the Australian public electricity network.	Impulse Test for Robustness was conducted. The MOVs acted to reduce the incoming impulse voltage.	P
11	Immediately prior to the dot point 'outdoor meter: IP54.' *insert* the following dot point: • Australian outdoor meter: IP53; NOTE The accepted normal operating condition for metering equipment in Australia includes protection from extreme weather conditions, such as being located within a covered veranda space but without a meter cabinet.	Meter was tested for IP54, which covers the IP53 rating.	P

APPENDIX C

IEC 62052-31/AS 62052.31

APPENDIX A – UL Electrical Lab Testing

The following datasheets contain results for tests performed in UL's Electrical Lab at Research Triangle Park, NC.

Project No. 4790778107 File N/A Page 1 of 10
LABORATORY DATA PACKAGE

Number of pages in this package 10 [including additional pages ____]
(Fill in when using printed copy as record)

CLIENT INFORMATION	
Company Name	PT. MECOINDO-Itron
Address	Plot 6B-2, EJIP, Bekasi, Kawa Barat, 17550, Indonesia

AUDIT INFORMATION:			
Description of Tests Per Standard No.	[X] IEC 62052-31, Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 31: Product safety requirements and tests	Edition/ Revision Date	1st / 2015
	[X] AS 62052.31, Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 31: Product safety requirements and tests (IEC 62052-31:2015 (ED.1.0) MOD)	Edition/ Revision Date	1st / 2017
[X] Tests Conducted by1	VINCENT VIRGILIO		
[] UL Staff conducting or witnessing testing (WTDP, TMP, WMT only) [ ] UL Staff supervising UL Staff in training			
[ ]Authorized Signatory (CIDP, TPTDP, TCP, PPP, SMT)			
	Printed Name	Signature. Include date for CIDP, TPTDP, TCP, PPP, WMT, TMP, SMT	

TESTS TO BE CONDUCTED:			
Test No.	Done3	Test Name	[ ] Comments/Parameters [ ] Tests Conducted by1 [ ] Link to separate data files4
1	2023-08-14	CABLE FLEXION AND PULL TEST (IEC/AS 6.9.7.3)	

IEC-62052-31-AREM-DataSheet-2001 Form Issued: 2018-03-15
Form Page 1 Form Revised:

APPENDIX C

IEC 62052-31/AS 62052.31

Instructions -

1 - When all tests are conducted by one person, name can be inserted here instead of including name on each page containing data.

2 - When test conducted by more than one person, name of person conducting the test can be inserted next to the test name instead of including name on each page containing data. Test dates may be recorded here instead of entering test dates on the individual datasheet pages.

3 - Use of this field is optional and may be employed differently. If used to include a date instead of entering the testing date on the individual datasheet pages, the date shall be the date the test was conducted.

4 - Link to separate data files for a test can be inserted here. The link must be to a server that is accessible to UL staff, that provides for backup, required retention periods and a path, including file name, that does not change and result in a broken link. Not applicable to DAP.

Special Instructions -

[X] Unless specified otherwise in the individual Methods, the tests shall be conducted under the following ambient conditions. Confirmation of these conditions shall be recorded at the time the test is conducted.

Standard	Ambient Temperature, °C	Relative Humidity, %	Barometric Pressure, kPa
IEC/AS 62052-31	+15°C to +25°C	45% to 75%	86 kPa to 106 kPa

[ ] No general environmental conditions are specified in the Standard(s) or have been identified that could affect the test results or measurements.

RISK ANALYSIS RELATED TO TESTING PERFORMANCE:

The following types of risks have been identified. Take necessary precautions. This list is not all inclusive.

[X] Electric shock	[ ] Radiation
[ ] Energy related hazards	[ ] Chemical hazards
[ ] Fire	[ ] Noise
[ ] Heat related hazards	[ ] Vibration
[X] Mechanical	[X] Other: Slipping

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TEST LOCATION: (To be completed by Staff Conducting the Testing)	
[X]UL or Affiliate	~~[ ]WTDP~~ ~~[ ]CTDP~~ ~~[ ]TPTDP~~ ~~[ ]TCP~~ ~~[ ]PPP~~ ~~[ ]WMT~~ ~~[ ]TMP~~ ~~[ ]SMT~~
Company Name:	UL LLC
Address:	12 Laboratory Drive Research Triangle Park, NC 27709 United States

TEST EQUIPMENT INFORMATION

[X] UL test equipment information is recorded on Meter Use.

[ ] ~~UL test equipment information is recorded on <<insert location and local laboratory equipment system identification.>>~~

Inst. ID No.	Instrument Type	Test Number +, Test Title or Conditioning	Function /Range	Last Cal. Date	Next Cal. Date
-	-	-	-	-	-

+ - If Test Number is used, the Test Number must be identified on the data sheet pages or on the Data Sheet Package cover page.

The following additional information is required when using client's or rented equipment, or when a UL ID Number for an instrument number is not used. The Inst. ID No. below corresponds to the Inst. ID No. above.

Inst. ID No.	Make/Model/Serial Number/Asset No.

APPENDIX C

IEC 62052-31/AS 62052.31

TEST SAMPLE IDENTIFICATION:

The table below is provided to provide correlation of sample numbers to specific product related information. Refer to this table when a test identifies a test sample by "Sample No." only.

Sample Card No.	Date Received	[X] Test No.	Sample No.	Manufacturer, Product Identification and Ratings
347695921	2023-04-24	1	6015977-1	Itron, Model Gen™5 Riva rated 230V,50Hz,5(100)A, Single phase, direct-connected, Operating range -25 °C to 70 °C, Rated Maximum Ambient Temperature -25 to +55°C , IP54

+ - If Test Number is used, the Test Number or Numbers the sample was used in must be identified on the data sheet pages or on the Data Sheet Package cover page.

[ ] Sampling Procedure -

[ ] This document contains data or information using color and if printed, should be printed in color to retain legibility and the information represented by the color.

APPENDIX C

11. CABLE FLEXION AND PULL TEST (IEC/AS 6.9.7.3)

Sample # : 6015877-1 Tested by: Vincent Virgilio Test date: 2023-08-14

Ambient Temperature, °C 22.0 Ambient Humidity, % 62% Ambient Pressure, kPa 100.0

GENERAL

The reliability of the connections were checked with the following test (flexion test and pull test). The test applies to mains terminals of direct-connected meters.

METHOD

The test shall be performed on at least two terminals, using both the conductor of minimum and maximum cross section specified by the manufacturer.

[X] Per deviation as specified in AS 62052.31: minimum cross section tested shall be ≤ 4 mm² (12 AWG).

The conductor shall be connected to the terminal tested. The length of the test conductors should be 75 mm longer than the height H specified in Table H.1. The clamping screws shall be tightened with a torque specified by the manufacturer.

The conductor is subjected to circular motions according to the following procedure:

• the end of the conductor under test shall be passed through an appropriate size bushing in a platen positioned at a height H below the equipment terminal, as given in Table H.1. The bushing shall be positioned in the horizontal platen concentric with the conductor;

• the bushing shall be moved so that its centerline describes a circle of 75 mm diameter about its center in the horizontal plane at 10 rpm ± 2 rpm. The distance between the mouth of the terminal and the upper surface of the bushing shall be within 15 mm of the height H in Table H.1. The bushing is to be lubricated to prevent binding, twisting or rotation of the insulated conductor. A mass as specified in Table H.1 is to be suspended from the end of the conductor. The test shall consist of 135 continuous revolutions.

During the test, the conductor shall neither slip out of the terminal nor break near the clamping unit.

Immediately following the flexion test, the pulling force given in Table H.1 shall be applied to the conductor. The clamping screws shall not be tightened again for this test.

The force shall be applied without jerks for 1 min, in the direction of the axis of the conductor.

During the test, the conductor shall neither slip out of the terminal nor break near the terminal.

APPENDIX C

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LABORATORY DATA PACKAGE

11. CABLE FLEXION AND PULL TEST (IEC/AS 6.9.7.3)

Sample #: 6015877-1 Tested by: Vincent Virgilio Test date: 2023-08-14

Ambient Temperature, °C 22.0 Ambient Humidity, % 62% Ambient Pressure, kPa 100.0

TEST EQUIPMENT FOR CABLE FLEXION AND PULL TEST

Figure H.1 shows the test equipment for the cable flexion and pull test. The distance of the platen from the clamping unit, the diameter of the bushing, the mass to be applied during the flexion test and the pull force to be applied after the flexion test is shown in Table H.1.

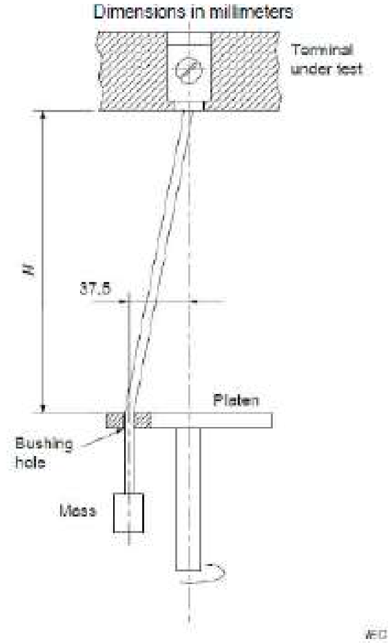

Figure H.1 – Test equipment for cable flexion and pull test (see 6.9.7.3)

APPENDIX C

IEC 62052-31/AS 62052.31

11. CABLE FLEXION AND PULL TEST (IEC/AS 6.9.7.3)(CONT'D):

Sample # : 6015877-1 Tested by: Vincent Virgilio Test date: 2023-08-14

Ambient Temperature, °C 22.0 Ambient Humidity, % 62% Ambient Pressure, kPa 100.0

Table H.1 – Test values for flexion and pull-out tests for round copper conductors

Conductor cross-section	Diameter of bushing hole [a, b]	Height H [a]	Mass	Pulling force
mm^2	mm	mm	kg	N
1,0	6,5	260	0,4	35
1,5	6,5	260	0,4	40
2,5	9,5	280	0,7	50
4,0	9,5	280	0,9	60
6,0	9,5	280	1,4	80
10,0	9,4	280	2,0	90
16,0	13,0	300	2,9	100
25,0	13,0	300	4,5	135
35,0	14,5	320	6,8	190
50,0	15,9	343	9,5	236

a Tolerances: for height H ± 15 mm, for diameter of the bushing hole ±2 mm.

b If the bushing hole diameter is not large enough to accommodate the conductor without binding, a bushing having the next larger hole size may be used.

NOTE The values have been taken from IEC 60947-1:2007, Table 5.

APPENDIX C

IEC 62052-31/AS 62052.31

Information for Lab :

Model #	Gen™5 Riva	
Sample #	6015877-1 – T1+T4	
Terminal	Terminal L1in & L1out (1st terminal and 4th from the left when viewing the meter from the front)	
Wire Size or Combinations, Conductor Material[1]	16 AWG / 1.5 mm² (Min)	3 AWG / 35 mm² (Max)
Tightening Torque [Nm]~~[in-lb]~~	1.5 Min	1.8 Max

Bushing Diameter, [mm]~~[in.]~~	6.5 ± 2	14.5 ± 2
Height, [mm]~~[in.]~~	260 ± 15	320 ± 15
Weight, [kg]~~[lb]~~	0.4	6.8

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11. CABLE FLEXION AND PULL TEST (IEC/AS 6.9.7.3)(CONT'D):

Sample # : 6015877-1 Tested by: Vincent Virgilio Test date: 2023-08-14

Ambient Temperature, °C 22.0 Ambient Humidity, % 62% Ambient Pressure, kPa 100.0

RESULTS

[X] The results were considered acceptable since the conductor did not slip out of the terminal nor break near the clamping unit.

[ ] The results were not considered acceptable since the conductor:
[ ] did slip out of the terminal.
[ ] broke near the clamping unit.

IEC 62052-31 FLEXION TEST (135 revolutions):

Model #	Gen™5 Riva	
Sample #	6015877-1	
Terminal	Terminal L in & L out (1st terminal and 4th from the left when viewing the meter from the front)	
Wire Size or Combinations, Conductor Material[1]	16 AWG / 1.5 mm² (Min)	3 AWG / 35 mm² (Max)
Tightening Torque [Nm][~~in-lb~~]	1.5 Min	1.8 Max

Bushing Diameter, [mm][~~in.~~]	6.5 ± 2	14.5 ± 2
Height, [mm][~~in.~~]	260 ± 15	320 ± 15
Weight, [kg][~~lb~~]	0.4	6.8

IEC 62052-31 PULL-OUT TEST (following the Flexion Test):

Force Applied, [N] [~~lb~~]	40	190
Results	[A] [U]	[A] [U]

A – Acceptable, did not break or slip
U – Unacceptable, broke or slipped

Use additional pages for additional wire sizes/combinations.

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APPENDIX C

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Project No. «ProjectNumber» File «FileNumber» Page 1
LABORATORY DATA PACKAGE

«ReviewerOfficeCode»
Number of pages in this package __11__ [including additional pages ____]
(Fill in when using printed copy as record)

CLIENT INFORMATION	
Company Name	PT. MECOINDO-Itron
Address	Plot 6B-2, EJIP, Bekasi, Kawa Barat, 17550, Indonesia

AUDIT INFORMATION:			
Description of Tests Per Standard No.	[X] IEC 62052-31, Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 31: Product safety requirements and tests	Edition/ Revision Date	1st / 2015
	[X] AS 62052-31, Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 31: Product safety requirements and tests (IEC 62052-31:2015 (ED.1.0) MOD)	Edition/ Revision Date	1st / 2017
[X] Tests Conducted by[1]	Chris Ashby / Jackson Daniel		
[ ] UL Staff conducting or witnessing testing (WTDP, TMP, SMT only) [ ] UL Staff supervising UL Staff in training			
[ ]Authorized Signatory (CTDP, TPTDP, TCP, PPP, SMT)	Printed Name	Signature. Include date for CTDP, TPTDP, TCP, PPP, WMT, TMP, SMT	

TESTS TO BE CONDUCTED:			
Test No.	Done[3]	Test Name	[X] Comments/Parameters [ ] Tests Conducted by[2] [ ] Link to separate data files[4]
1	2023-08-17	TERMINAL BLOCK/COVER GLOW WIRE TEST (IEC/AS 9.3.2.1)	No comments

IEC-62052-31-AAEM-DataSheet-2001 Form Issued: 2018-08-15
Form Page 1 Form Revised:

APPENDIX C

IEC 62052-31/AS 62052.31

Project No. «ProjectNumber» File «FileNumber» Page 2
LABORATORY DATA PACKAGE

Instructions –
1 – When all tests are conducted by one person, name can be inserted here instead of including name on each page containing data.
2 – When test conducted by more than one person, name of person conducting the test can be inserted next to the test name instead of including name on each page containing data. Test dates may be recorded here instead of entering test dates on the individual datasheet pages.
3 – Use of this field is optional and may be employed differently. If used to include a date instead of entering the testing date on the individual datasheet pages, the date shall be the date the test was conducted.
4 – Link to separate data files for a test can be inserted here. The link must be to a server that is accessible to UL staff, that provides for backup, required retention periods and a path, including file name, that does not change and result in a broken link. Not applicable to DAP.

Special Instructions –

Standard	Ambient Temperature, °C	Relative Humidity, %	Barometric Pressure, mBar
IEC/AS 62052-31	+15° C to +25° C	45% to 75%	86 kPa to 106 kPa

[X] Unless specified otherwise in the individual Methods, the tests shall be conducted under the following ambient conditions. Confirmation of these conditions shall be recorded at the time the test is conducted.

Ambient Temperature, C ____ ± ____ Relative Humidity, % ____ ± ____ Barometric Pressure, mBar ____ ± ____

[ ] No general environmental conditions are specified in the Standard(s) or have been identified that could affect the test results or measurements.

RISK ANALYSIS RELATED TO TESTING PERFORMANCE:

The following types of risks have been identified. Take necessary precautions. This list is not all inclusive.

[X] Electric shock	[ ] Radiation
[X] Energy related hazards	[ ] Chemical hazards
[X] Fire	[ ] Noise
[X] Heat related hazards	[ ] Vibration
[X] Mechanical	[ ] Other (Specify)__

IEC-62052-31-AAEM-DataSheet-2001 Form Issued: 2018-03-16
Form Page 2 Form Revised:

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File «FileNumber» Page T__-3 of 11 Issued: ____________
New: ____________

TEST LOCATION: (To be completed by Staff Conducting the Testing)	
[X]UL or Affiliate [ ]WTDP [ ]CTDP [ ]TPTDP [ ]TCP [ ]PPP [ ]WMT [ ]TMP [ ]SMT	
Company Name:	UL LLC
Address:	12 Laboratory Drive Research Triangle Park, NC 27709 United States

TEST EQUIPMENT INFORMATION

[X] UL test equipment information is recorded on Meter Use.

[ ] UL test equipment information is recorded on <<insert location and local laboratory equipment system identification.>>

Inst. ID No.	Instrument Type	Test Number +, Test Title or Conditioning	Function/ Range	Last Cal. Date	Next Cal. Date
-	-	-	-	-	-

+ - If Test Number is used, the Test Number must be identified on the data sheet pages or on the Data Sheet Package cover page.

The following additional information is required when using client's or rented equipment, or when a UL ID Number for an instrument number is not used. The Inst. ID No. below corresponds to the Inst. ID No. above.

Inst. ID No.	Make/Model/Serial Number/Asset No.

APPENDIX C

IEC 62052-31/AS 62052.31

File «FileNumber» Page I__-6 of 11 Issued: ____________
New: ____________

TEST SAMPLE IDENTIFICATION:

The table below is provided to provide correlation of sample numbers to specific product related information. Refer to this table when a test identifies a test sample by "Sample No." only.

Sample Card No.	Date Received	[ ] Test No.	Sample No.	Manufacturer, Product Identification and Ratings
347685931	2023-04-24	1	6015877-1	Itron, Model Gen5 Riva rated 230V,50Hz,5(100)A, Single phase, direct-connected, Operating range -25 °C to 70 °C, Rated Maximum Ambient Temperature -25 to +55°C, IP54

* - If Test Number is used, the Test Number or Numbers the sample was used in must be identified on the data sheet pages or on the Data Sheet Package cover page.

[ ] Sampling Procedure -

[ ] This document contains data or information using color and if printed, should be printed in color to retain legibility and the information represented by the color.

APPENDIX C

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File «FileNumber» Page T__-5 of 11 Issued: ____
New: ____

TERMINAL BLOCK/COVER GLOW WIRE TEST (IEC/AS 9.3.2.1)
Sample # : 6015677-1 Tested by: Refer page 1 Test date: Refer page 1

Ambient Temperature, °C - Ambient Humidity, % - Ambient Pressure, mBar -

METHOD

The terminal block, insulating material retaining the main contacts of supply and load control switches, 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 and insulating material retaining the main contacts of supply and load control switches in position: 960 °C ± 15 °C;
- terminal cover and meter case: 650 °C ± 10 °C;
- duration of application: 30 s ± 1 s.

[X] The sample specimens were first conditioned for 24 h in an atmosphere having a temperature between 15 °C and 35 °C and a relative humidity between 45 % and 75 %.

Test specimens arranged so that the surface in contact with the tip of the glow-wire was vertical and glow wire tip applied to surface of the specimen likely to be subjected to thermal stresses in normal use.

A single layer of wrapping tissue, resting on, and in close contact with a wooden board, having a minimum thickness of 10mm, was placed 200mm ±5mm beneath the specimen.

Wrapping tissue, as specified in 6.8.6 of ISO 4046 is a soft and strong, lightweight wrapping tissue of grammage between 12 g/m² and 30 g/m².

The contact with the glow-wire may occur at any 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.

Sample #	Complete Product Description	Specimens (Taken/Cut from Complete Product)	Specimen Sample #
6015677-1	Itron, Model Gen™5 Riva rated 230V,50Hz,5(100)A, direct-connected, IP54	Case Back	1
		Terminal cover	2
		Case Front	3
		LCD cover	4
		Terminal Block	5

APPENDIX C

IEC 62052-31/AS 62052.31

File «FileNumber» Page T__-6 of 11 Issued: ______
New: ______

TERMINAL BLOCK/COVER GLOW WIRE TEST (IEC/AS 9.3.2.1) (CONT'D):

Sample # : 6015877-1 Tested by: Refer page 1 Test date: Refer page 1

Ambient Temperature, °C - Ambient Humidity, % - Ambient Pressure, mBar -

RESULTS

Conditioning:

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	23 (±2)	50 - 75	-
Actual	23	53	-

Sample conditioning start: 10:00 AM 2023-08-16
Sample conditioning end: 10:00 AM 2023-08-17

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IEC 62052-31/AS 62052.31

File «FileNumber» Page I__-7 of 11 Issued: ____________
New: ____________

TERMINAL BLOCK/COVER GLOW WIRE TEST (IEC/AS 9.3.2.1) (CONT'D):

Resistance to Heat and Fire Detailed Test Results

SPECIMEN NUMBER	1	2	3	4	5
SPECIMEN DESCRIPTION	CASE BACK	TERMINAL COVER	CASE FRONT	LCD COVER	TERMINAL BLOCK
Material	COVESTRO MAKROLON 9417, PC-GF 10, POLYCARBONATE GLASS FIBER 10%	COVESTRO MAKROLON 9417, PC-GF 10, POLYCARBONATE GLASS FIBER 10%	COVESTRO MAKROLON 9417, PC-GF 10, POLYCARBONATE GLASS FIBER 10%	COVESTRO MAKROLON 9417, PC-GF 10, POLYCARBONATE GLASS FIBER 10%	COVESTRO MAKROLON 9417, PC-GF 10, POLYCARBONATE GLASS FIBER 10%
Color	GREY	CLEAR	GREY	CLEAR	GREY
Glow wire tip temperature(°C)	650	650	650	650	960
Duration of glow wire application (t_a) (s)	30	30	30	30	30
OBSERVATIONS					
Duration from beginning of glow-wire tip application to ignition of specimen or layer (t_i) (s)	NI	NI	NI	NI	1.6
Duration from beginning of glow-wire tip application to when flames extinguish (t_e) (s)	NA	NA	NA	NA	32.6
Maximum height of flames after initial 1s (to nearest 5 mm) (mm)	NA	NA	NA	NA	150
Flame impingement on other parts	NA	NA	NA	NA	SBD
Degree of tip penetration	WPNI	WPNI	WPNI	WPNI	WPNI
Degree of specimen distortion	SMD	SMD	SMD	SMD	SBD
Scorching of pinewood board	NA	NA	NA	NA	NO
Visible flame or sustained glowing	NI	NI	NI	NI	YES
Duration of flaming or glowing after tip removal (max. allowable 30 s) (s)	NI	NI	NI	NI	2.6
Surrounding parts burned away completely (not permitted)	NI	NI	NI	NI	NO
Ignition of wrapping tissue layer (not permitted)	NI	NI	NI	NI	NO

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File «FileNumber» Page T__-8 of 11 Issued: ____________
New: ____________

RESULTS	PASS	PASS	PASS	PASS	PASS

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File «FileNumber» Page 7__-9 of 11 Issued: ____________
New: ____________

LEGEND:	CE	Complete Equipment	SA	Sub Assembly	SE	Self Extinguished
	EBD	Emitted Burning Droplets	SBD	Specimen Burned and Distorted	SMD	Specimen Melted and Distorted
	ME	Manually Extinguished	SC	Separate Component	SS	Specimen Scorched
	NA	Not Applicable	SCC	Specimen Completely Consumed	WPNI	Wall Penetrated but no Ignition
	NI	No Ignition	X	Flame Appeared for an Instant	PASS	Compliant Results
	NO	Negative				

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IEC 62052-31/AS 62052.31

File «FileNumber» Page T__-10 of 11 Issued: ____________
New: ____________

TERMINAL BLOCK/COVER GLOW WIRE TEST (IEC/AS 9.3.2.1) (CONT'D):

RESULTS:

Samples Before Heat and Fire Testing:

Samples After Heat and Fire Testing:

APPENDIX C

IEC 62052-31/AS 62052.31

File «FileNumber» Page I__-11 of 11 Issued: ____________
New: ____________

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APPENDIX C

IEC 62052-31/AS 62052.31

Project No. 4790778107 File N/A Page 1 of 10
LABORATORY DATA PACKAGE

Number of pages in this package 10 ~~(including additional pages ____)~~
(Fill in when using printed copy as record)

CLIENT INFORMATION	
Company Name	PT. MECOINDO-Itron
Address	Plot 6B-2, EJIP, Bekasi, Kawa Barat, 17550, Indonesia

AUDIT INFORMATION:			
Description of Tests Per Standard No.	[X] IEC 62052-31, Electricity metering equipment (AC) – General requirements, tests and test conditions – Part 31: Product safety requirements and tests	Edition/ Revision Date	1st / 2015
	[X] AS 62052.31, Electricity metering equipment (AC) – General requirements, tests and test conditions – Part 31: Product safety requirements and tests (IEC 62052-31:2015 (ED.1.0) MOD)	Edition/ Revision Date	1st / 2017
[X] Tests Conducted by[1]	Chris Ashby / Jackson Daniel		
[ ] UL Staff conducting or witnessing testing (WTDP, TMP, WMT only) [ ] UL Staff supervising UL Staff in training			
[ ]Authorised Signatory (CTDP, TPTDP, TCP, PPP, SMT)	Printed Name	Signature. Include date for CTDP, TPTDP, TCP, PPP, WMT, TMP, SMT	

TESTS TO BE CONDUCTED:			
Test No.	Done[3]	Test Name	[ ] Comments/Parameters [X] Tests Conducted by[2] [ ] Link to separate data files[4]
1	2023-08-18	PROTECTION AGAINST PENETRATION OF DUST AND WATER (IEC/AS 11):	Chris Ashby / Jackson Daniel

APPENDIX C

IEC 62052-31/AS 62052.31

Instructions –
1 – When all tests are conducted by one person, name can be inserted here instead of including name on each page containing data.
2 – When test conducted by more than one person, name of person conducting the test can be inserted next to the test name instead of including name on each page containing data. Test dates may be recorded here instead of entering test dates on the individual datasheet pages.
3 – Use of this field is optional and may be employed differently. If used to include a date instead of entering the testing date on the individual datasheet pages, the date shall be the date the test was conducted.
4 – Link to separate data files for a test can be inserted here. The link must be to a server that is accessible to UL staff, that provides for backup, required retention periods and a path, including file name, that does not change and result in a broken link. Not applicable to DAP.

Special Instructions –

[X] Unless specified otherwise in the individual Methods, the tests shall be conducted under the following ambient conditions. Confirmation of these conditions shall be recorded at the time the test is conducted.

Standard	Ambient Temperature, °C	Relative Humidity, %	Barometric Pressure, kPa
IEC/AS 62062-31	+15°C to +25°C	45% to 75%	86 kPa to 106 kPa

[ ] No general environmental conditions are specified in the Standard(s) or have been identified that could affect the test results or measurements.

RISK ANALYSIS RELATED TO TESTING PERFORMANCE:

The following types of risks have been identified. Take necessary precautions. This list is not all inclusive.

[X] Electric shock	[ ] Radiation
[ ] Energy related hazards	[ ] Chemical hazards
[ ] Fire	[ ] Noise
[ ] Heat related hazards	[ ] Vibration
[X] Mechanical	[X] Other: Slipping

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TEST LOCATION: (To be completed by Staff Conducting the Testing)	
[X]UL or Affiliate ~~[ ]WTDP~~ ~~[ ]CTDP~~ ~~[ ]TPTDP~~ ~~[ ]TCP~~ ~~[ ]SPP~~ ~~[ ]WMT~~ ~~[ ]TMP~~ ~~[ ]SMT~~	
Company Name:	UL LLC
Address:	12 Laboratory Drive Research Triangle Park, NC 27709 United States

TEST EQUIPMENT INFORMATION

[X] UL test equipment information is recorded on Meter Use.

[ ] ~~UL test equipment information is recorded on <<insert location and local laboratory equipment system identification.>>~~

Inst. ID No.	Instrument Type	Test Number +, Test Title or Conditioning	Function/Range	Last Cal. Date	Next Cal. Date
-	-	-	-	-	-

+ - If Test Number is used, the Test Number must be identified on the data sheet pages or on the Data Sheet Package cover page.

The following additional information is required when using client's or rented equipment, or when a UL ID Number for an instrument number is not used. The Inst. ID No. below corresponds to the Inst. ID No. above.

Inst. ID No.	Make/Model/Serial Number/Asset No.

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TEST SAMPLE IDENTIFICATION:

The table below is provided to provide correlation of sample numbers to specific product related information. Refer to this table when a test identifies a test sample by "Sample No." only.

Sample Card No.	Date Received	[X] Test No.	Sample No.	Manufacturer, Product Identification and Ratings
347696538	2023-04-24	1	6015878-1	Itron, Model Gen5 Riva rated 230V,50Hz,5(100)A, Single phase, direct-connected, Operating range -25 °C to 70 °C, Rated Maximum Ambient Temperature -25 to +55°C , IP54

* - If Test Number is used, the Test Number or Numbers the sample was used in must be identified on the data sheet pages or on the Data Sheet Package cover page.

[ ] Sampling Procedure -

[ ] This document contains data or information using color and if printed, should be printed in color to retain legibility and the information represented by the color.

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PROTECTION AGAINST PENETRATION OF DUST AND WATER (IEC/AS 11):

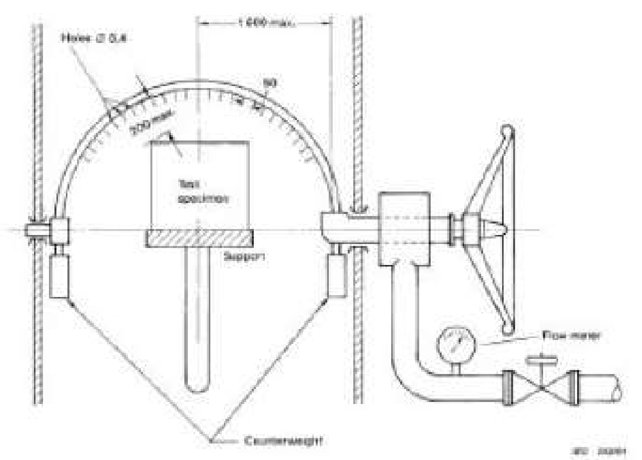
Sample # : 6018878-1 Tested by: (see Page 2) Test date: (see Page 2)

Ambient Temperature, °C _____ Ambient Humidity, % _____ Ambient Pressure, kPa _____

METHOD (~~IPx3 and~~ IPx4) -- PROTECTION AGAINST PENETRATION OF WATER

The test is made using one of the two test devices described in figure 4 and in figure 5 in accordance with the relevant product standard.

- Conditions when using the test device as in figure 4 (oscillating tube):



Dimensions in millimetres

NOTE The range of holes is shown as for second characteristic numeral 3 (see 14.2.3 a)).

Figure 4 – Test device to verify protection against spraying and splashing water; second characteristic numerals 3 and 4 (oscillating tube)

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METHOD (IPx3 and IPx4) -- PROTECTION AGAINST PENETRATION OF WATER (CONT'D):

Sample # : 6016878-1 Tested by: (see Page 2) Test date: (see Page 2)

Ambient Temperature, °C 21.4 Ambient Humidity, % 61.2 Ambient Pressure, kPa 99.82

[X] IPx4 Method:
The oscillating tube has spray holes over the whole 180° of the semicircle. The total flow rate is adjusted as specified in table 9 and is measured with a flow meter. The tube is caused to oscillate through an angle of almost 360°, 180° on either side of the vertical, the time for one complete oscillation (2 × 360°) being about 12 s. The duration of the test is 10 min. If not specified otherwise in the relevant product standard, the support for the enclosure under test is perforated so as to avoid acting as a baffle and the enclosure is sprayed from every direction by oscillating the tube to the limit of its travel in each direction.

Note*: Test to be conducted with Vertical Wall mounting

[ ] IPx3 Method: (Applicable for AS 62052-31 Australian outdoor meters)
The oscillating tube has spray holes over the whole 180° of the semicircle. The total flow rate is adjusted as specified in table 9 and is measured with a flow meter. The tube is caused to oscillate through an angle of 120°, 60° on either side of the vertical, the time for one complete oscillation (2 × 120°) being about 12 s. The duration of the test is 10 min. If not specified otherwise in the relevant product standard, the support for the enclosure under test is perforated so as to avoid acting as a baffle and the enclosure is sprayed from every direction by oscillating the tube to the limit of its travel in each direction.

Second characteristic numeral	Test means	Water flow rate	Duration of test	Test conditions, see
0	No test required	–	–	–
1	Drip box Figure 3 Enclosure on turntable	$1^{+0,5}_{0}$ mm/min	10 min	14.2.1
2	Drip box Figure 3 Enclosure in 4 fixed positions of 15° tilt	$3^{+0,5}_{0}$ mm/min	2,5 min for each position of tilt	14.2.2
3	Oscillating tube Figure 4 Spray ±60° from vertical, distance max. 200 mm or Spray nozzle Figure 5 Spray ± 60° from vertical	0,07 l/min ± 5 % per hole, multiplied by number of holes 10 l/min ± 5 %	10 min 1 min/m² at least 5 min	14.2.3 a) 14.2.3 b)
4	As for numeral 3 Spray ± 180° from vertical	As for numeral 3		14.2.4

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METHOD (IPx3 and IPx4) — PROTECTION AGAINST PENETRATION OF WATER (CONT'D):

Sample # : 6015878-1 Tested by: (see Page 2) Test date: (see Page 2)

Ambient Temperature, °C ____ Ambient Humidity, % ____ Ambient Pressure, kPa ____

Table 9 – Total water flow rate q_v under IPX3 and IPX4 test conditions – Mean flow rate per hole q_{vl} = 0,07 l/min

Tube radius R mm	Degree IPX3		Degree IPX4	
	Number of open holes N[1]	Total water flow q_v l/min	Number of open holes N[1]	Total water flow q_v l/min
200	8	0,56	12	0,84
400	16	1,1	25	1,8
600	25	1,8	37	2,6
800	33	2,3	50	3,5
1 000	41	2,9	62	4,3
1 200	50	3,5	75	5,3
1 400	58	4,1	87	6,1
1 600	67	4,7	100	7,0

[1] Depending on the actual arrangement of the hole centres at the specified distance, the number of open holes N may be increased by 1.

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METHOD (IPx3 and IPx4) -- PROTECTION AGAINST PENETRATION OF WATER (CONT'D):

Sample # : 6016878-1 Tested by: (see Page 2) Test date: (see Page 2)

Ambient Temperature, °C 28.0 Ambient Humidity, % 54.8 Ambient Pressure, kPa 100.4

RESULTS

AC Power Frequency Voltage Test (performed after Water):

Sample Tested	Test voltage applied between:	Test voltage (Vrms)	Breakdown
6016878-1	Current, voltage, auxiliary circuits > 40 V and earth	3000	~~Yes /~~ No
	Mains circuits not intended to be connected together in service	1500	~~Yes / No~~ NA

Visual Inspection Comments:	The covers were only removed for visual inspection of ingress after the AC voltage test was conducted and passed. A few drops of water were found on the inside of the sample, however it is believed that the water ingress did not occur during the test, but rather as the cover was removed by the technicians conducting the inspection even though caution was taken to reduce the chances of incidental ingress.

Results were considered [acceptable] ~~[not acceptable]~~.

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END OF DATASHEET PACKAGE. THIS PAGE INTENTIONALLY LEFT BLANK

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DATA PACKAGE INFORMATION SHEET

Applicant Information	Name / Address:	PT. MECOINDO-Itron Plot 6B-2, EJIP, Bekasi, Jawa Barat, 17550, Indonesia

Product Information	Standards:	IEC 62052-31:2015, Electricity metering equipment (AC) – General requirements, tests and test conditions – Part 31: Product safety requirements and tests, ED.1.0 AS 62052.31:2017, Electricity metering equipment (AC) – General requirements, tests and test conditions – Part 31: Product safety requirements and tests,
	CCNs:	AAEM
	Product:	Smart Electricity Meter
	Models:	Gen™5 Riva

Test Location Information	Tests Conducted By**:		Chris Ashby / Jackson Daniel
	** When all tests are conducted by one person, the printed name and signature can be inserted here instead of on each page containing data		
	Authorized Signatory or TCP Reviewer:	Sign	
		Print	
		Date	
	UL WTDP / WMT Witness:		

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LIST OF TESTS

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Special Instructions - Unless specified otherwise in the individual Methods, the tests shall be conducted under the following ambient conditions. Confirmation of these conditions shall be recorded at the time the test is conducted.

Standard	Ambient Temperature, °C	Relative Humidity, %	Barometric Pressure, kPa
IEC/AS 62052-31	+15° C to +25° C	45% to 75%	86 kPa to 106 kPa

Test site altitude..:	126m
Test voltage correction factor (see Table 24) ....:	1.20

RISK ANALYSIS RELATED TO TESTING PERFORMANCE:

The following types of risks have been identified. Take necessary precautions. This list is not all inclusive.

[X] Electric shock	[] Radiation
[X] Energy related hazards	[] Chemical hazards
[X] Fire	[] Noise
[X] Heat related hazards	[] Vibration
[] Mechanical	[] Other (Specify)__

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TEST SAMPLE IDENTIFICATION

The table below is to provide correlation of sample numbers to specific product related information. Refer to this table when a test identifies a test sample by "Sample No." only.

Sample Number	Sample Card Number	Date Received	Manufacturer, Product Identification and Ratings
6015889-1	347695986	2023-04-24	Itron, Model Gen™5 Riva rated 230V,50Hz,5(100)A, direct-connected, IP54
Sampling Procedure (if used) :	See below for Ratings **Where a Sample Number is indicated for Multiple Tests, please conduct in order shown in test sequence below**		

1.1. Critical meter information			
Base current (A)	5	Maximum current (A)	100
Rated voltage (V)	230V	Rated frequency (Hz)	50
Accuracy class	1	Protective class	Class II
Export / Import	Both	Active / reactive	Both
Direct connected	Yes	Transformer connected	No
Polyphase / single phase	Single phase	Contains datalogger	No
Provides tariff control	Yes	Meter contains relay (s)	No
Indoor/Outdoor	Indoor	Clock accuracy testing?	No
IP Rating	IP54	Clock type	Both
Insulation class of any wound components (CT, Transformers, etc.)		-	
Meter Pulse Constant (i.e. 10.8Wh/imp) per Form/Current Class		-	
Details of any relay-controlled disconnect switches provided (Load or Supply Control Switches); number and how relays are operated		SCS: 100A	
Number of measuring elements to be tested		1	
Does the meter contain a battery or super cap? If yes, please state which one is applicable.		Both, for clock backup only.	
Wavelength specification for all incorporated LED's		-	
Software/Firmware revision number		v106c2	
Temperature Ranges		Specific Operating Range: -25°C to +70°C Storage and Transportation: -25°C to +70°C Limit range of operation: -25°C to +55°C Humidity: 95%	
Torque value for enclosure screws, if required for IP testing. (Otherwise, they will be hand-tightened)		N/A	

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For payment meters; utilization category, details of keypad, token acceptor etc	N/A

TEST SEQUENCE BY SAMPLE NUMBER

Sample Number	Sample Card Number	Test Number	Test Description
1	347695986	1	IMPULSE VOLTAGE TEST Without Supply Voltage (IEC 6.10.3.3):
1	347695986	2	SURGE TEST WITH SUPPLY VOLTAGE (IEC/AS 6.10.3.4) :
1	347695986	5	DIELECTRIC TESTS (IEC/AS 6.10.4):
1	347695986	4	HUMIDITY CONDITIONING TEST (IEC/AS 6.10.4.2):
1	347695986	5-1	IMPULSE VOLTAGE TEST – After humidity conditioning (IEC/AS 6.10.4.3.3):
1	347695986	5-2	AC POWER-FREQUENCY VOLTAGE TEST – AFTER HUMIDITY CONDITIONING (IEC/AS 6.10.4.3.4):
1	347695986	3	IMPULSE VOLTAGE TEST WITH SPDS NOT PRESENT (IEC/AS 6.10.3.5):

*Note: Test number indicates the test sequences to be conducted

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TEST LOCATION: (To be completed by Staff Conducting the Testing)	
[X]UL or Affiliate	~~[ ]WTDP~~ ~~[ ]CTDP~~ ~~[ ]TPTDP~~ ~~[ ]TCP~~ ~~[ ]PPP~~ ~~[ ]WMT~~ ~~[ ]TMP~~ ~~[ ]SMT~~
Company Name:	UL LLC
Address:	12 Laboratory Drive Research Triangle Park, NC 27709 United States

TEST EQUIPMENT INFORMATION

[X] UL test equipment information is recorded on Meter Use.

~~[ ] UL test equipment information is recorded on <<insert location and local laboratory equipment system identification>>~~

Inst. ID No.	Instrument Type	Test Number +, Test Title or Conditioning	Function/Range	Last Cal. Date	Next Cal. Date
-	-	-	-	-	-

+ - If Test Number is used, the Test Number must be identified on the data sheet pages or on the Data Sheet Package cover page.

~~The following additional information is required when using client's or rented equipment, or when a UL ID Number for an instrument number is not used. The Inst. ID No. below corresponds to the Inst. ID No. above.~~

Inst. ID No.	Make/Model/Serial Number/Asset No.
-	-

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Sample # :	6015889-1	Tested by:	Chris Ashby / Jackson Daniel	Test date:	2023-08-08
Ambient Temperature, °C	24.5	Ambient Humidity, %	49.5	Ambient Pressure, kPa	99.7

1) IMPULSE VOLTAGE TEST WITHOUT SUPPLY VOLTAGE (IEC 6.10.3.3):

METHOD

The standard impulse shall be a full impulse having a virtual front time of 1,2 µs and a time to half-value of 50 µs. It is described as a 1,2 / 50 impulse.

The following differences are accepted between specified values for the standard impulse and those actually recorded:

- peak value ± 3 %;
- front time ± 30 %;
- time to half-value ± 20 %.

Where high capacitive loading does not allow the impulse waveshape to be obtained within the specified tolerances, it may be necessary to perform a d.c. voltage test as an alternative (see 6.10.2.6).

Unless otherwise specified, the conventional output impedance of the generator shall be 500 Ω ± 10 %.

[X] Per deviation as specified in AS 62052-31: the conventional output impedance of the generator shall instead be 40Ω ± 10%.

Unless stated otherwise, the test voltage shall be as specified in Table 7 for basic insulation.

[X] Per deviation as specified in AS 62052-31: test voltage shall be 10kV.

Unless otherwise specified, the impulse voltage is applied for ten times with one polarity and then repeated with the other polarity. The minimum time between the impulses shall be 3 s.

The waveshape of each impulse shall be recorded.

It is permissible for an impulse voltage waveform applied across test points connected to surge suppression devices, inductive devices or potential dividers, to be attenuated or distorted if this is not due to electrical breakdown.

The waveform applied to test points not connected to such devices, will not be noticeably distorted or attenuated unless the insulation does not withstand the impulse voltage test.

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1) IMPULSE VOLTAGE TEST WITHOUT SUPPLY VOLTAGE (IEC 6.10.3.3): (CONT.)

Sample # : 6015889-1 Tested by: Chris Ashby / Jackson Daniel Test date: 2023-08-08

Ambient Temperature, °C 24.5 Ambient Humidity, % 49.5 Ambient Pressure, kPa 99.7

The impulses shall be applied to:

[X] voltage circuit(s):

[X] When the voltage and the current circuits of a measuring element are connected together in normal use (for example direct connected meters) the test shall be made on the whole measuring element. The impulse voltage shall be applied between this common point and earth, with the other terminal of the voltage circuit connected to the earth and the other end of the current circuit left open. If there is a supply control switch present, then it shall be closed. All other terminals shall be connected to earth. When the meter has several measuring elements the impulse voltage shall be applied to each measuring element one by one.

~~[ ] When the voltage and the current circuits of a measuring element are separated and appropriately insulated in normal use (for example transformer operated meters) the test shall be made on the voltage circuit only. The impulse voltage shall be applied between one terminal of the voltage circuit and earth, with the other terminal of the voltage circuit and all other terminals connected to earth. When the meter has several measuring elements, the impulse voltage shall be applied to each voltage circuit one by one.~~

~~[ ] auxiliary supply circuit(s) with a reference voltage above 33 V a.c. or 70 V d.c. between the supply terminals.~~

RESULTS

Location	Working voltage, V	Test voltage r.m.s./peak/ d.c.	Test duration	Results / Comments
Between all HLV terminals and earth	230	12 kV (peak)(*)	10x (+) 10x (-)	Pass. Sample Clamped.

(*) – voltage adjusted per test site altitude. See page 3.

[x] No disruptive discharge (sparkover, flashover, puncture) occurred during the test.

[ ] Disruptive discharge (sparkover, flashover, puncture) occurred during the test.

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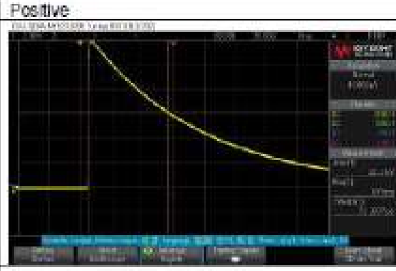
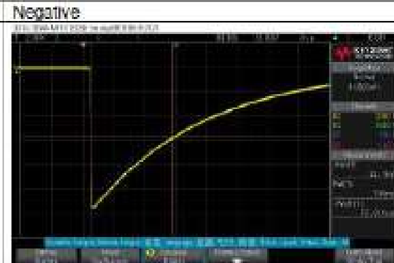
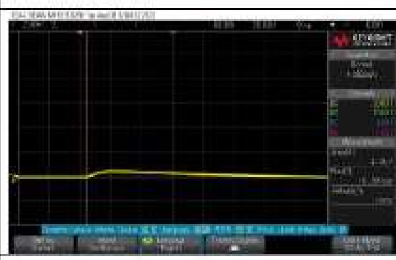
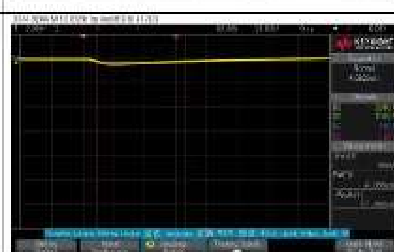
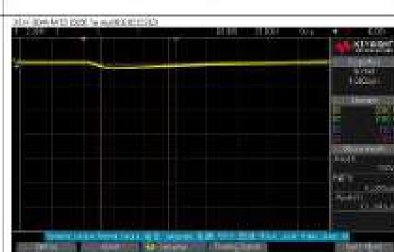
1) IMPULSE VOLTAGE TEST WITHOUT SUPPLY VOLTAGE (IEC 6.10.3.3): (CONT.)

1P2W:

Test	Positive	Negative
Reference		
Shot1		
Shot2		

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UL Solutions

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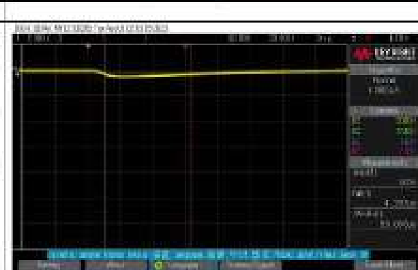
Shot3		
Shot4		
Shot5		
Shot6		

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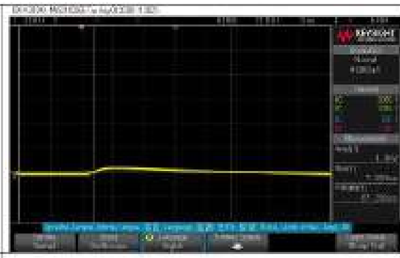
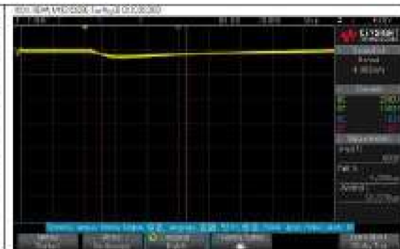
Shot 7		
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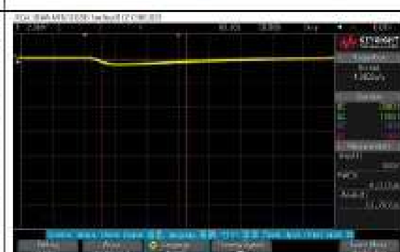
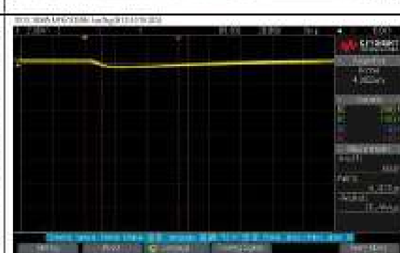
Shot 9		
Shot 10		

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2) SURGE TEST WITH SUPPLY VOLTAGE (IEC/AS 6.10.3.4) :

Sample # :	6015889-1	Tested by:	Chris Ashby / Jackson Daniel	Test date:	2023-08-14
Ambient Temperature, °C	23.3	Ambient Humidity, %	52.0	Ambient Pressure, kPa	99.98

CRITERIA

The generator is intended to generate a surge having:

- *an open-circuit voltage front time of 1,2 μs;*
- *an open-circuit voltage duration of 50 μs;*
- *a short-circuit current front time of 8 μs; and*
- *a short-circuit current time duration of 20 μs*

For convenience, the ratio of peak open-circuit output voltage to peak short-circuit current of a combination wave generator may be considered the effective output impedance.
The waveform of the voltage and current is a function of the EUT input impedance. This impedance may change during surges to equipment due either to proper operation of the installed protection devices, or to flash over or component breakdown if the protection devices are absent or inoperative. Therefore, the 1,2/50 μs voltage and the 8/20 μs current waves have to be available from the same generator output as required by the load.

Characteristics and performance of the generator:

- *Open-circuit voltage:*
  - *– Front time: 1,2 μs ± 30 %;*
  - *– Time to half value: 50 μs ± 20 %.*
  - *– Peak voltage tolerance: ± 10 %*
- *Short-circuit current:*
  - *– Front time: 8 μs ± 20 %;*
  - *– Time to half value 20 μs ± 20 %;*
  - *– Peak current tolerance: ± 10 %.*

The test voltage may be applied with – using suitable coupling/decoupling networks – or without mains as specified in the relevant clauses (6.10.3.4 and 6.10.6.5).

The test levels, the polarity and the position of the surges relative to the mains voltage, the number and the repetition rate of the surges shall be as specified in the relevant clauses.

Pass / fail criteria: as specified in the relevant clauses.

METHOD

The surge test specified in 6.10.2.4 shall be applied as follows:

- this test shall be carried out with a supply side overcurrent protection present in each phase to protect the coupling network. The characteristics of the protection shall be agreed between the manufacturer and the purchaser and shall be included in the test report;
- the surges shall be applied to the same points as specified in 6.10.3.3;
- the test voltage shall be as specified in Table 7 for basic insulation;
- 5 positive and 5 negative surges shall be applied;
- the surges shall be superimposed on the peak of the sine wave;
- the waveshape shall be recorded.

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2) SURGE TEST WITH SUPPLY VOLTAGE (IEC/AS 6.10.3.4) (CONT.) :

Sample # : 6015889-1 Tested by: Chris Ashby / Jackson Daniel Test date: 2023-08-14

Ambient Temperature, °C 23.3 Ambient Humidity, % 52.0 Ambient Pressure, kPa 99.98

METHOD (CONT.):

The requirements of the test are satisfied if no disruptive discharge (spark over, flashover or puncture) occurs on the test object and no SPD failure occurs.

If the surge voltage is still clamped, then the manufacturer and the test house shall agree if further tests are required.

	Temperature (°C)	Humidity (%RH)	Pressure (kPa)
Required	15 - 25	45 - 75	86 - 106
Actual	23.3	52.0	99.98

RESULTS:

Mains Application		Test Level	Injection Angle (°)	Polarity	Result
+ Lead	- Lead				
L1	AOT and GND	4 kV	90	+	Pass
				-	Pass
			270	+	Pass
				-	Pass

AOT – All other terminals
GND – Ground (including the enclosure, which is wrapped in foil)

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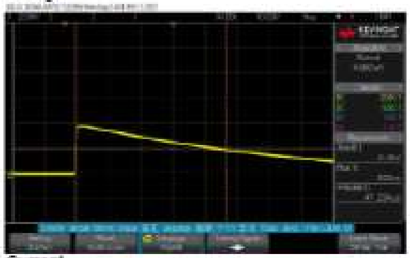
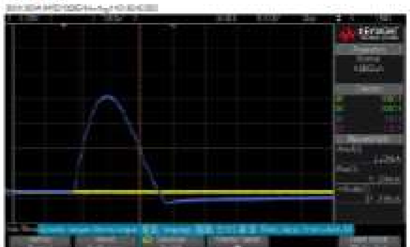
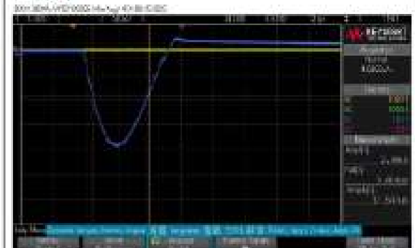
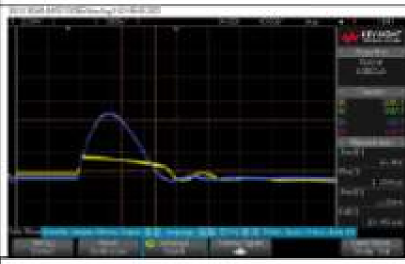
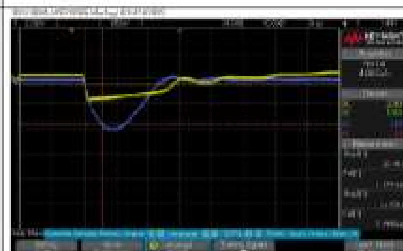
2) SURGE TEST WITH SUPPLY VOLTAGE (IEC/AS 6.10.3.4) (CONT.) :

PHASE L1 , 90 Degree

Test F.1a	Positive	Negative
Reference	Voltage  Current  Test Reference	Voltage  Current  Test Reference
Shot 1		

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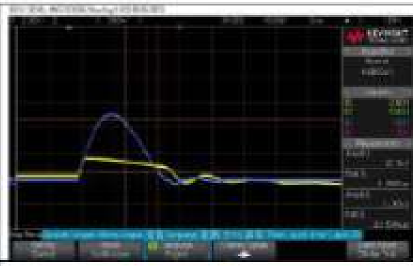
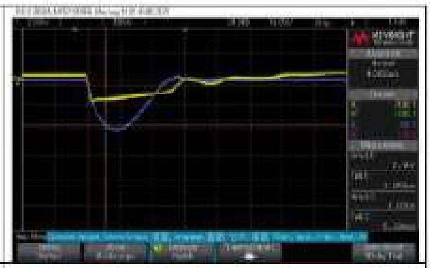
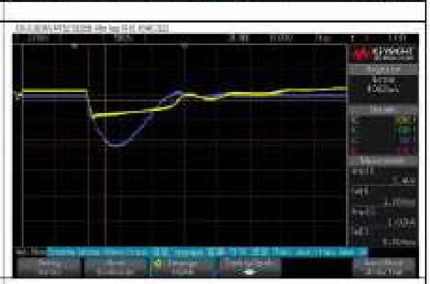
Shot2		
Shot3		
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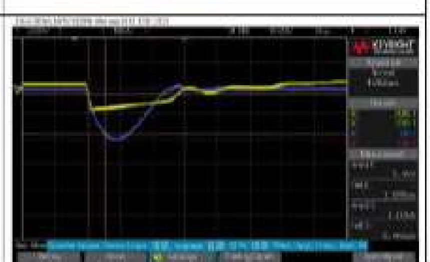
Shot5		

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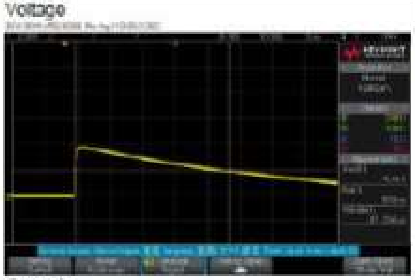
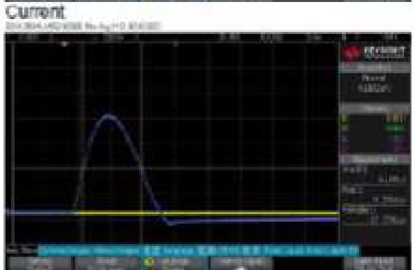
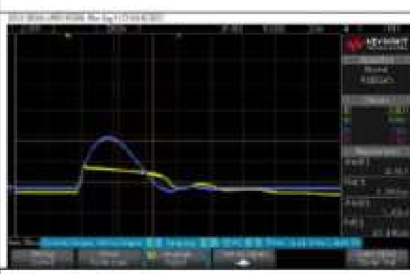
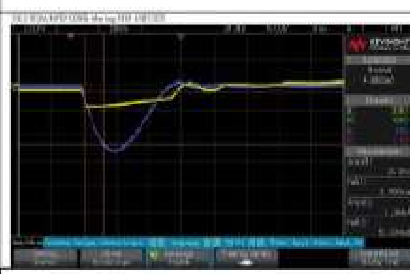
PHASE L1 , 270 Degree

Test F.1a	Positive	Negative
Reference	Voltage  Current  Test Reference	Voltage  Current  Test Reference
Shot1		

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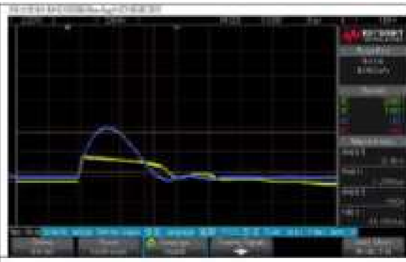
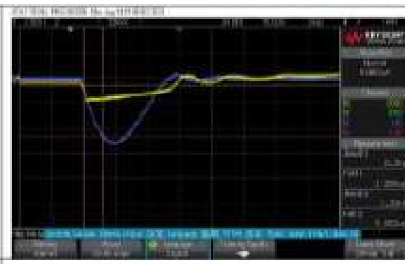
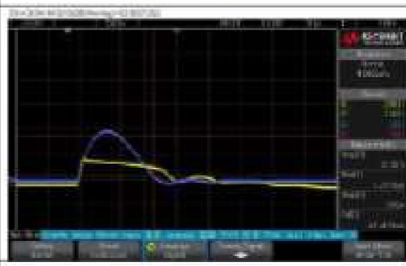
Shot2		
Shot3		
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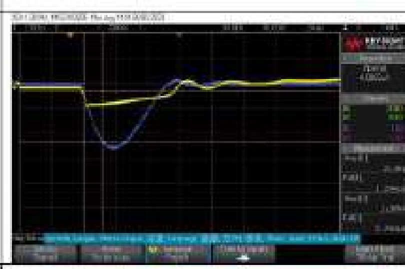
Shot5		

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3) IMPULSE VOLTAGE TEST WITH SPDS NOT PRESENT (IEC/AS 6.10.3.5):

Sample # :	6015889-1	Tested by:	Chris Ashby/ Jackson Daniel	Test date:	2023-08-25
Ambient Temperature, °C	23.7	Ambient Humidity, %	48.9	Ambient Pressure, kPa	99.08

METHOD

In the case where surge protective devices (SPDs) are used inside a meter to reduce the overvoltage levels below the rated impulse voltage values specified in Table 7, the impulse voltage test shall be also performed on a specially prepared sample with SPDs removed.

The test shall be performed as specified in 6.10.3.3, but the value of the impulse test voltage shall be one step lower, as specified in 6.7.6.

NOTE The purpose of this test is to verify that clearances meet the requirements for reduced impulse voltages.

The pass / fail criteria of 6.10.2.3 apply.

From 6.10.3.3 the impulse voltage test specified in 6.10.2.3 shall be applied:

[X] to voltage circuit(s):

[X] When the voltage and the current circuits of a measuring element are connected together in normal use (for example direct connected meters) the test shall be made on the whole measuring element. The impulse voltage shall be applied between this common point and earth, with the other terminal of the voltage circuit connected to the earth and the other end of the current circuit left open. If there is a supply control switch present, then it shall be closed. All other terminals shall be connected to earth. When the meter has several measuring elements the impulse voltage shall be applied to each measuring element one by one.

~~[ ] When the voltage and the current circuits of a measuring element are separated and appropriately insulated in normal use (for example transformer operated meters) the test shall be made on the voltage circuit only. The impulse voltage shall be applied between one terminal of the voltage circuit and earth, with the other terminal of the voltage circuit and all other terminals connected to earth. When the meter has several measuring elements the impulse voltage shall be applied to each voltage circuit one by one.~~

~~[ ] to auxiliary supply circuit(s) with a reference voltage above 33 V a.c. or 70 V d.c. between the supply terminals.~~

The test voltage shall be as specified in Table 7 for basic insulation, however, correction factors per Table 24 apply based on altitude of test site location. The test voltage shall be applied to the mode(s) that was protected by the SPD.

[X] Remove MOVs from sample prior to testing

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3) IMPULSE VOLTAGE TEST WITH SPDS NOT PRESENT (IEC/AS 6.10.3.5): (CONT.):

Sample # : 6015889-1 Tested by: Chris Ashby/ Jackson Daniel Test date: 2023-08-25

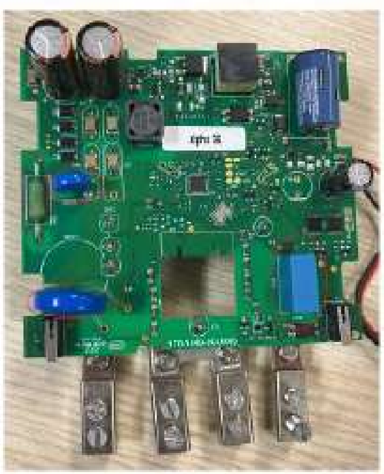
Ambient Temperature, °C 23.7 Ambient Humidity, % 48.9 Ambient Pressure, kPa 99.98

RESULTS:

Location	Working voltage V AC	Test voltage r.m.s./peak/ d.c.	Test duration	Results / Comments
Voltage terminal to all other terminals and ground	230	3000 (peak)	10x (+) 10x (-)	Pass

[X] No disruptive discharge (sparkover, flashover, puncture) occurred during the test.

[ ] Disruptive discharge (sparkover, flashover, puncture) occurred during the test.



SPD to be removed (recommended by customer):
- MOV1
- MOV2
- R88
- C89

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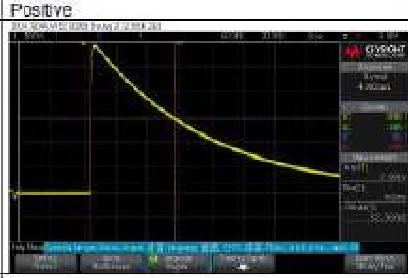
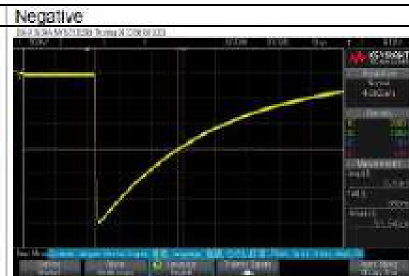
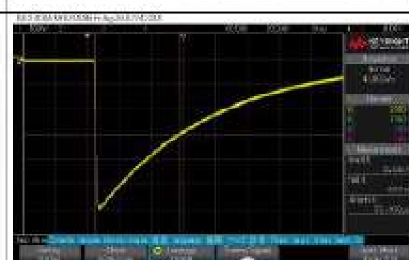
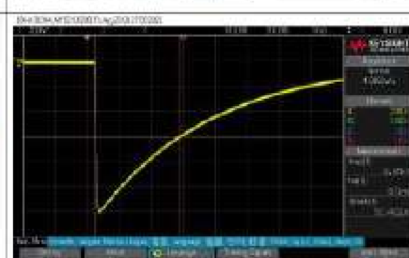
3) IMPULSE VOLTAGE TEST WITH SPDS NOT PRESENT (IEC/AS 6.10.3.5): (CONT.):

1P2W

Test F.1a	Positive	Negative
Reference		
Shot1		
Shot2		

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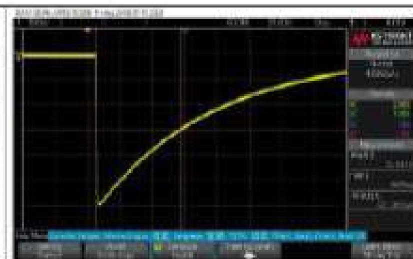
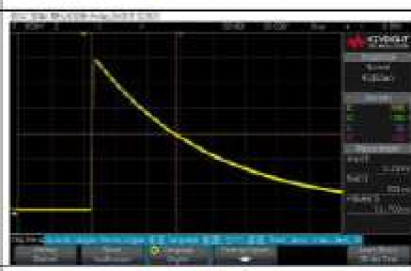
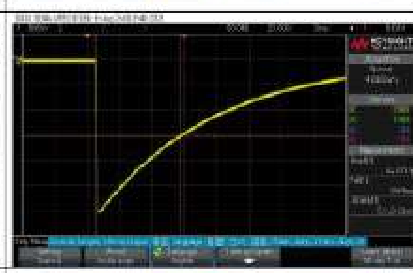
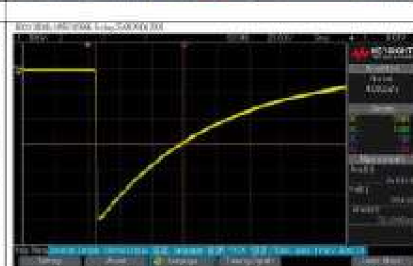
Shot3		
Shot4		
Shot5		
Shot6		

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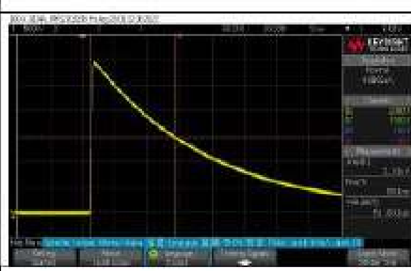
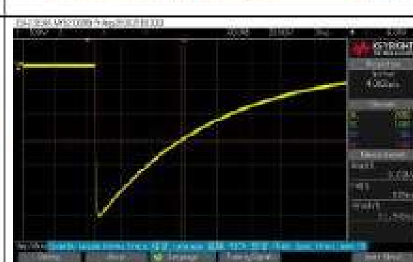
Shot 7		
Shot 8		
Shot 9		

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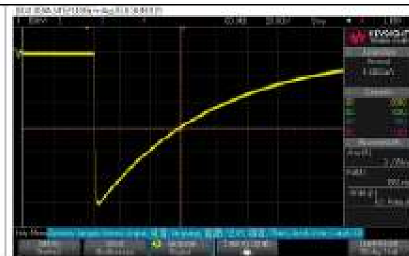
Shot 10		

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5) DIELECTRIC TESTS (IEC/AS 6.10.4):

Sample # :	6015889-1	Tested by:	Chris Ashby / Jackson Daniel	Test date:	2023-08-25
Ambient Temperature, °C	-	Ambient Humidity, %	-	Ambient Pressure, kPa	-

[X] Humidity Preconditioning: The equipment, un-energized, shall be subjected to humidity preconditioning before performing the dielectric tests.

Humidity Preconditioning shall be carried out for 48 hrs as specified in IEC 60068-2-78, in an air-circulating humidity chamber containing air with a humidity of (93 ± 3) % RH. The temperature of the air in the chamber is maintained at (40 ± 2) °C.

Before applying humidity, the equipment shall be brought to temperature of 40°C ± 2°C, normally by keeping it at this temperature for at least 4 hr before the humidity preconditioning.

After the 48 hr period, the equipment was removed and allowed a recovery period of 2 hr with the following environmental conditions, with covers removed:

Ambient Temperature, °C	Relative Humidity, %	Barometric Pressure, kPa
15 - 25	45 - 75	86 - 106

Within 1 hr after completing the recovery period, the equipment was subjected to the dielectric tests.

METHOD

A test potential as noted in the following table was applied between the locations listed below. The following test procedures were applied, with Impulse Testing directly preceding the AC Voltage Test.

[X] Impulse Test:
The Impulse Test was conducted for ten (10) impulses of each polarity with an interval of at least 3 s between impulses. The impulse voltage test was carried out with a 1.2/50 µs waveform (see Figure 1 of IEC 61180-1). The wave shape of each impulse shall be observed and recorded. ~~[ ] When verifying clearances, protective impedance and voltage-limiting devices in parallel with the insulation to be tested were disconnected.~~

[X] AC Voltage Test:
Dielectric Testing shall be carried out on complete equipment, unless specified otherwise. All covers shall be in place, with terminal screws being screwed down to touch the conductors of the maximum size that can be accommodated by the terminals.

[X] Accessible insulating parts of ENCLOSURE were covered with metal foil everywhere except around terminals. The distance from foil to terminal was not more than 20 mm.

To create a continuous circuit for the voltage tests, terminals and open contacts of switches shall be bridged where necessary. Semiconductor devices and other vulnerable components within a circuit may be disconnected and/or their terminals bridged to avoid damage.

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5) DIELECTRIC TESTS (IEC/AS 6.10.4): (CONT.):

Sample # : 6015889-1 Tested by: Chris Ashby / Jackson Daniel Test date: 2023-08-25

Ambient Temperature, °C - Ambient Humidity, % – Ambient Pressure, kPa -

For the purpose of these tests, the term "earth" has the following meaning:

~~a) when the case of the metering equipment is made of metal, the "earth" is the case itself, placed on a flat conducting surface;~~
b) when the meter case or only a part of it is made of insulating material, the "earth" is a conductive foil wrapped around the meter touching all accessible conductive parts and connected to the flat conducting surface on which the meter base is placed.

During the tests, circuits which are not under test shall be connected together and to the earth.

	Test site altitude .... :			___128__________ m		
	Test voltage correction factor (see Table 10)* :			___1.2__________		
Location		Working voltage V	Impulse Test Voltage, V	AC Voltage Test voltage, Vrms	Impulse Test Results / Comments	AC Voltage Test Results / Comments
Mains Terminals connected together to Enclosure / Earth		230	7200	3000	Pass (Clamped)	Pass
Supplementary information: NA						

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4) HUMIDITY CONDITIONING TEST (IEC/AS 6.10.4.2):

Sample # :	6015889-1	Tested by:	Chris Ashby / Jackson Daniel	Test date:	2023-08-16 – 2023-08-18
Ambient Temperature, °C	23 - 40	Ambient Humidity, %	50-93	Ambient Pressure, kPa	99.82

METHOD

A sample of the product was brought to a temperature of 40 ± 2°C, and kept at this temperature for at least 4 h before the Humidity Conditioning Test. Humidity conditioning was then carried out in a humidity chamber containing air with humidity of 93 ± 3 percent relative humidity. The temperature of the air in the chamber was maintained at 40 ± 2°C. The air in the chamber was stirred. The chamber was designed so that condensation would not precipitate on the equipment. The equipment remained in the chamber for 48 h, with parts which could be removed without the use of tool, removed and subjected to the humidity preconditioning together with the main part. After the conditioning,

[X] The unit was removed and allowed a recovery period of 2 h under the following environmental conditions:

1. A temperature of 15°C to 25°C.
2. A relative humidity of 45% to 75%.
3. An air pressure of 86 kPa to 106 kPa.
4. No hoar-frost, dew, percolating water, rain, solar irradiation, etc.

Non-ventilated equipment may have its covers removed for this recovery.

~~[ ] No recovery period was applicable (due to extended environment rating) and;~~
~~[ ] unit was removed from the chamber.~~
~~[ ] unit was kept in chamber to avoid condensation.~~

Within 1 hour after the recovery period, the unit was then subjected to a repeat of the Dielectric Withstand Test. Parts that have been removed were re-assembled or not, whichever was less favorable.

Any protective impedance in parallel with the insulation to be tested was disconnected.

RESULTS

There [~~was~~] [was no] indication of dielectric breakdown.

[X] Chamber setting(s) were monitored to ensure that the setting(s) were stable throughout the test time frame. Any deviations from the setting(s) are noted below. See graph of chamber conditions shown below.

Date	Test	Instrument Code	Time period of deviation	Setting(s)

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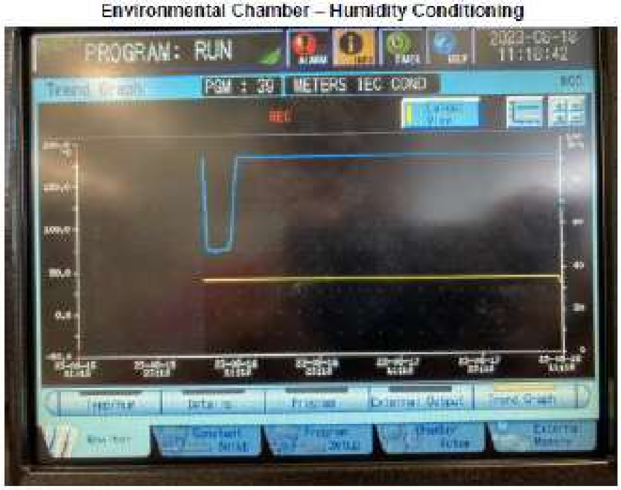
4) HUMIDITY CONDITIONING (IEC/AS 6.10.4.2): (CONT.):

Sample #:	6015889-1	Tested by:	Chris Ashby / Jackson Daniel	Test date:	2023-08-16 – 2023-08-18
Ambient Temperature, °C	23 - 40	Ambient Humidity, %	50-93	Ambient Pressure, kPa	99.82

Environmental Chamber – Humidity Conditioning



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5-1) IMPULSE VOLTAGE TEST – After humidity conditioning (IEC/AS 6.10.4.3.3):

Sample # :	6015889-1	Tested by:	Chris Ashby / Jackson Daniel	Test date:	2023-08-18
Ambient Temperature, °C	23.0	Ambient Humidity, %	53.8	Ambient Pressure, kPa	99.82

METHOD

The standard impulse shall be a full impulse having a virtual front time of 1,2 µs and a time to half-value of 50 µs. It is described as a 1,2 / 50 impulse.

The following differences are accepted between specified values for the standard impulse and those actually recorded:

- peak value ± 3 %;
- front time ± 30 %;
- time to half-value ± 20 %.

Where high capacitive loading does not allow the impulse waveshape to be obtained within the specified tolerances, it may be necessary to perform a d.c. voltage test as an alternative (see 6.10.2.6).

Unless otherwise specified the conventional output impedance of the generator shall be 500 Ω ± 10 %.

The test voltage shall be applied between:

[X] All the HLV terminals connected together and earth. The test voltage shall be as specified in Table 7, taken from the ~~column "Basic and supplementary insulation" for metering equipment of protective class I and the~~ column "Reinforced insulation" for metering equipment of protective class II.

[X] Each independent (group of) HLV circuit(s). The test voltage shall be as specified in Table 7, taken from the column "Basic and supplementary insulation".

Correction factors per Table 24 apply based on altitude of test site location.

Unless otherwise specified, the impulse voltage is applied for ten times with one polarity and then repeated with the other polarity. The minimum time between the impulses shall be 3 s.

The waveshape of each impulse shall be recorded.

It is permissible for an impulse voltage waveform applied across test points connected to surge suppression devices, inductive devices or potential dividers, to be attenuated or distorted if this is not due to electrical breakdown.

The waveform applied to test points not connected to such devices, will not be noticeably distorted or attenuated unless the insulation does not withstand the impulse voltage test.

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5-1) IMPULSE VOLTAGE TEST – AFTER HUMIDITY CONDITIONING (IEC/AS 6.10.4.3.3/6.10.2.3): (CONT.)

Sample # : 6015889-1 Tested by: Chris Ashby / Jackson Daniel Test date: 2023-08-18

Ambient Temperature, °C 23.0 Ambient Humidity, % 53.8 Ambient Pressure, kPa 99.82

RESULTS

Test Voltage r.m.s./peak/dc:			7200(Test F.2a)	
Working voltage, V:			230(L-N)	
Polarity	Impulse No.	Test F.2a	N/A	N/A
Positive	1	N		
Positive	2	N		
Positive	3	N		
Positive	4	N		
Positive	5	N		
Positive	6	N		
Positive	7	N		
Positive	8	N		
Positive	9	N		
Positive	10	N		
Negative	1	N		
Negative	2	N		
Negative	3	N		
Negative	4	N		
Negative	5	N		
Negative	6	N		
Negative	7	N		
Negative	8	N		
Negative	9	N		
Negative	10	N		
Key: N – No disruptive discharge/flashover F – Disruptive discharge/flashover X – Not Applicable				
Test Arrangements: F.2a: Between all HLV terminals and earth				

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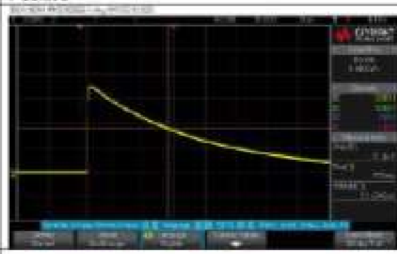
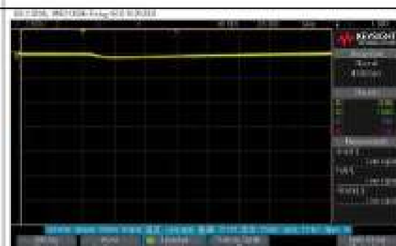
5-1) IMPULSE VOLTAGE TEST – AFTER HUMIDITY CONDITIONING (IEC/AS 6.10.4.3.3/6.10.2.3):
(CONT.)

Test F.2a	Positive	Negative
Reference		
Shot1		
Shot2		

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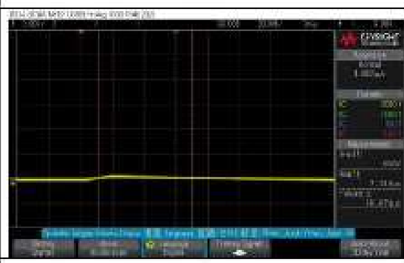
Shot3		
Shot4		
Shot5		
Shot6		

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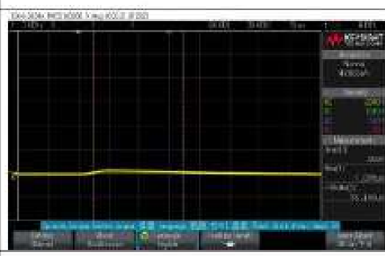
Shot 7		
Shot 8		
Shot 9		
Shot 10		

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5-2) AC POWER-FREQUENCY VOLTAGE TEST – AFTER HUMIDITY CONDITIONING (IEC/AS 6.10.4.3.4):

Sample # :	6015889-1	Tested by:	Chris Ashby / Jackson Daniel	Test date:	2023-08-18
Ambient Temperature, °C	23.0	Ambient Humidity, %	53.8	Ambient Pressure, kPa	99.82

METHOD

The alternating test voltage, as applied to the test object, shall have a frequency in the range 45 Hz to 65 Hz, normally referred to as power-frequency test voltage.

The voltage shape shall approximate to a sinusoid with both half-cycles closely alike.

The test voltage shall be as specified in the relevant clauses. A tolerance of ± 3 % is acceptable between the specified and the measured test voltage values when connected to the EUT.

For test voltages exceeding 3 000 V, it is sufficient that the rated power of the test equipment is equal to or greater than 600 VA.

The tripping current of the generator shall be adjusted to a tripping current of 10 mA or for test voltages above 6 000 V to the highest possible value.

The voltage shall be applied to the test object starting at a value sufficiently low to prevent any effect of overvoltages due to switching transients. It shall be raised sufficiently slowly as to permit accurate reading of the measuring instrument but not so slowly as to cause unnecessary prolongation of the stressing of the test object near to the test voltage.

These requirements are, in general, met if the rate of the rise is about 5 % of the estimated final test voltage per second, when the applied voltage is above 75% of this voltage. It shall be maintained for the specified time ([**X**] 1 min ~~[ ] other~~) and then rapidly decreased, but not suddenly interrupted, as this may generate switching transients which could cause damage or erratic results.

Conductive foil was wrapped around the enclosure except near terminals.

APPENDIX C

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5-2) AC POWER-FREQUENCY VOLTAGE TEST – AFTER HUMIDITY CONDITIONING (IEC/AS 6.10.4.3.4) (CONT.):

RESULTS

Location	Working voltage V	Test voltage r.m.s./~~peak/ d.c.~~	Test duration	Results / Comments
Between all HLV terminals and earth	230 (L-N)	3000	1 min	Pass

[X] No flashover of clearances or breakdown of solid insulation occurred during the test.

[ ] Flashover of clearances or breakdown of solid insulation occurred during the test.

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END OF TEST DATASHEET PACKAGE. THIS SHEET IS LEFT INTENTIONALLY BLANK.

APPENDIX C

Test Report
R4790778107-
IEC_AS SAFETY
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LABORATORY DATA PACKAGE

Number of pages in this package 24 [including additional pages ____]
(Fill in when using printed copy as record)

CLIENT INFORMATION	
Company Name	PT. MECOINDO-Itron
Address	Plot 6B-2, EJIP, Bekasi, Jawa Barat, 17550, Indonesia

AUDIT INFORMATION:			
Description of Tests Per Standard No.	[X] IEC 62052-31, Electricity metering equipment (AC) - General requirements, tests and test conditions – Part 31: Product safety requirements and tests	Edition/ Revision Date	1st / 2015
	[X] AS 62052.31, Electricity metering equipment (AC) - General requirements, tests and test conditions – Part 31: Product safety requirements and tests (IEC 62052-31:2015 (ED.1.0) MOD)	Edition/ Revision Date	1st / 2017
[X] Tests Conducted by[1]	Chris Ashby / Jackson Daniel		
[ ] UL Staff conducting or witnessing testing (WTDP, TMP, WMT only) [ ] UL Staff supervising UL Staff in training			
[ ]Authorized Signatory (CTDP, TPTDP, TCP, PPP, SMT)	Printed Name	Signature. Include date for CTDP, TPTDP, TCP, PPP, WMT, TMP, SMT	

IEC-62052-31-AAEM-DataSheet-2001 Form Issued: 2018-03-15
Form Page 1 Form Revised:

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Test No.	Done[3]	Test Name	[X] Comments/Parameters [X] Tests Conducted by[1] ~~[ ] Link to separate data files[4]~~
1	2023-08-22	LONG TERM OVERVOLTAGE WITHSTAND Test (IEC/AS 6.10.3.2)	No comments Chris Ashby / Jackson Daniel
2	2023-08-24	RESISTANCE TO HEAT FOR NONMETALLIC ENCLOSURE TEST (MOLD STRESS) (IEC/AS 10.5.1):	No comments Chris Ashby / Jackson Daniel
4	2023-08-24	SPRING HAMMER TEST (IEC/AS 8.2.2):	No comments Chris Ashby / Jackson Daniel
3	2023-08-23	TEMPERATURE TEST (IEC/AS 10.1-10.4)	No comments Chris Ashby / Jackson Daniel

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Instructions –
1 – When all tests are conducted by one person, name can be inserted here instead of including name on each page containing data.
2 – When test conducted by more than one person, name of person conducting the test can be inserted next to the test name instead of including name on each page containing data. Test dates may be recorded here instead of entering test dates on the individual datasheet pages.
3 – Use of this field is optional and may be employed differently. If used to include a date instead of entering the testing date on the individual datasheet pages, the date shall be the date the test was conducted.
4 – Link to separate data files for a test can be inserted here. The link must be to a server that is accessible to UL staff, that provides for backup, required retention periods and a path, including file name, that does not change and result in a broken link. Not applicable to DAP.

Special Instructions –

[X] Unless specified otherwise in the individual Methods, the tests shall be conducted under the following ambient conditions. Confirmation of these conditions shall be recorded at the time the test is conducted.

Standard	Ambient Temperature, °C	Relative Humidity, %	Barometric Pressure, kPa
IEC/AS 62052-31	+15° C to +25° C	45% to 75%	86 kPa to 106 kPa

[ ] No general environmental conditions are specified in the Standard(s) or have been identified that could affect the test results or measurements.

RISK ANALYSIS RELATED TO TESTING PERFORMANCE:

The following types of risks have been identified. Take necessary precautions. This list is not all inclusive.

[X] Electric shock	[ ] Radiation
[ ] Energy related hazards	[ ] Chemical hazards
[X] Fire	[ ] Noise
[X] Heat related hazards	[X] Vibration
[X] Mechanical	[ ] Other: EXPLOSION (during Single Fault Condition tests)

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TEST LOCATION: (To be completed by Staff Conducting the Testing)	
[X]UL or Affiliate	~~[ ]WTDP~~ ~~[ ]CTDP~~ ~~[ ]TPTDP~~ ~~[ ]TCP~~ ~~[ ]PPP~~ ~~[ ]WMT~~ ~~[ ]TMP~~ ~~[ ]SMT~~
Company Name:	UL LLC
Address:	12 Laboratory Drive Research Triangle Park, NC 27709 United States

TEST EQUIPMENT INFORMATION

[X] UL test equipment information is recorded on Meter Use.

~~[ ] UL test equipment information is recorded on <<insert location and local laboratory equipment system identification.>>~~

~~Inst. ID No.~~	~~Instrument Type~~	~~Test Number *, Test Title or Conditioning~~	~~Function/ Range~~	~~Last Cal. Date~~	~~Next Cal. Date~~
-	-	-	-	-	-

~~* - If Test Number is used, the Test Number must be identified on the data sheet pages or on the Data Sheet Package cover page.~~

~~The following additional information is required when using client's or rented equipment, or when a UL ID Number for an instrument number is not used. The Inst. ID No. below corresponds to the Inst. ID No. above.~~

~~Inst. ID No.~~	~~Make/Model/Serial Number/Asset No.~~
-	-

APPENDIX C

IEC 62052-31/AS 62052.31

TEST SAMPLE IDENTIFICATION:

The table below is provided to provide correlation of sample numbers to specific product related information. Refer to this table when a test identifies a test sample by "Sample No." only.

Sample Card No.	Date Received	[X] Test No.	Sample No.	Manufacturer, Product Identification and Ratings
347696986	2023-04-24	1 to 4	6016875 -1	Itron, Model Gen™5 Riva rated 230V,50Hz,5(100)A, Single phase, direct-connected, Operating range -25 °C to 70 °C, Limited operating temperature -25 to +55°C IP54

+ - If Test Number is used, the Test Number or Numbers the sample was used in must be identified on the data sheet pages or on the Data Sheet Package cover page.

[ ] Sampling Procedure -

[ ] This document contains data or information using color and if printed, should be printed in color to retain legibility and the information represented by the color.

APPENDIX C

IEC 62052-31/AS 62052.31

1. LONG TERM OVERVOLTAGE WITHSTAND Test (IEC/AS 6.10.3.2):

Sample # : 6015876-1 Tested by: Chris Ashby/ Jackson Daniel Test date: 2023-08-22

Ambient Temperature, °C 23.2 Ambient Humidity, % 66.8 Ambient Pressure, kPa 100.3

METHOD

Meters and tariff and load control equipment shall withstand the maximum withstand voltage, 1.9*Un applied as follows:

NOTE Un is the nominal voltage between a line and the neutral.

- for single-phase two-wire meters, the maximum withstand voltage shall be applied between the line and neutral terminals;

- when the current circuit (of a direct connected meter) contains supply control switches, then these switches shall be in the open position and the load side terminals shall be connected so that the maximum test voltage appears across the open supply control switch;

- for tariff-and load control equipment, the maximum withstand voltage shall be applied between the line and neutral terminals.

The test circuit diagram is shown in Annex D.

In every configuration (test run) described above, the maximum withstand voltage of 1.9*Un shall be applied for 4 h, with a cooling period of 1 h between the test runs.

During the test, the EUT may be damaged, but no hazardous live parts shall be exposed, no fire shall occur, or if it occurs, it shall be contained in the meter. When more than one test run is required, all of them have to be passed.

APPENDIX C

IEC 62052-31/AS 62052.31

1. LONG TERM OVERVOLTAGE WITHSTAND TEST (IEC/AS 6.10.3.2): (CONT'D):

Sample # : 6018875-1 Tested by: Chris Ashby/ Jackson Daniel Test date: 2023-08-22

Ambient Temperature, °C 23.2 Ambient Humidity, % 55.8 Ambient Pressure, kPa 100.3

RESULTS

Location	Nominal voltage U_n (V AC)	Test voltage r.m.s./~~peak/ d.c.~~	Test duration (hh:mm)	Results / Comments
Line and neutral energized	230	437	04:00	Pass

NOTE – U_n is the nominal voltage between a line and the neutral.

[x] No hazardous live parts were exposed, and no fire occurred in the EUT during all test runs.

[ ] Hazardous live parts were exposed, which [were] [were not] contained within the EUT.

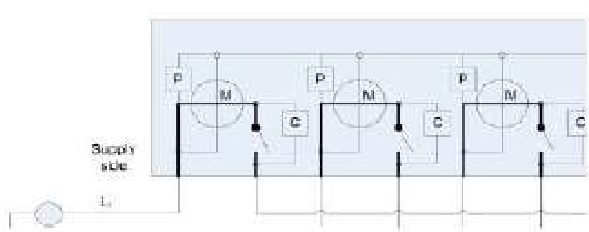
[ ] Fire occurred in the EUT, which [was] [was not] contained within the EUT

Annex D
(normative)

Test circuit diagram for the test of long term o

Figure D.1 shows the test circuit diagram, for the long te
specified in 6.10.3.2 in the case of testing a three-phase four w

Figure D.2 shows the voltages that appear at the terminals of t



APPENDIX C

IEC 62052-31/AS 62052.31

2. RESISTANCE TO HEAT FOR NONMETALLIC ENCLOSURE TEST (MOLD STRESS) (IEC/AS 10.5.1):

Sample # : 6015675-1 Tested by: Chris Ashby / Jackson Daniel Test date: 2023-08-24

Ambient Temperature, °C – Ambient Humidity, % – Ambient Pressure, kPa –

METHOD

[X] Non-Operative Treatment: The equipment in an unenergized state was stored for 7 h at a temperature of 70°C or 10°C above the temperatures measured during the test of 10.4, whichever is higher.

[ ] Operative Treatment: Equipment is operated under reference test conditions of 4.3, except the temperature is 20°C above 40°C or above the maximum rated ambient temperature.

[ ] Since the equipment, contained components which might be damaged by this treatment, an empty enclosure was treated, followed by assembly of the equipment at the end of the treatment.

After the above conditioning, the sample was subjected to a repeat of the Dielectric Withstand Test.

[X] Within 10 minutes of the end of treatment the equipment shall be subjected to the Spring Hammer Test.

RESULTS

10.5.1	TABLE: Resistance to heat of non-metallic enclosures		RESULTS
	Temperature during test	99.4C	–
	Treated samples were subjected to dielectric strength tests (see Table 6.8)		

Description	Material	Comments
Meter Enclosure: Enclosure Surface - Top, Front, Back Outer Cover Surface - Top & Terminal Block Cover (above the terminals)	Plastic maker: Covestro Material: PC-GF 10 RTI: 125°C Flammability rating: V-0, 1.5mm	See Spring Hammer Test results for additional details
Supplementary information: NA		

APPENDIX C

IEC 62052-31/AS 62052.31

2) AC POWER-FREQUENCY VOLTAGE TEST – AFTER RESISTANCE TO HEAT FOR NONMETALLIC ENCLOSURE TEST (IEC/AS 6.10.4.3.4):

Sample # :	6015875-1	Tested by:	Chris Ashby/ Jackson Daniel	Test date:	2023-08-24
Ambient Temperature, °C	–	Ambient Humidity, %	–	Ambient Pressure, kPa	

METHOD

The alternating test voltage, as applied to the test object, shall have a frequency in the range 45 Hz to 65 Hz, normally referred to as power-frequency test voltage.

The voltage shape shall approximate to a sinusoid with both half-cycles closely alike.

The test voltage shall be as specified in the relevant clauses. A tolerance of ± 3 % is acceptable between the specified and the measured test voltage values when connected to the EUT.

For test voltages exceeding 3 000 V, it is sufficient that the rated power of the test equipment is equal to or greater than 600 VA.

The tripping current of the generator shall be adjusted to a tripping current of 10 mA or for test voltages above 6 000 V to the highest possible value.

The voltage shall be applied to the test object starting at a value sufficiently low to prevent any effect of overvoltages due to switching transients. It shall be raised sufficiently slowly as to permit accurate reading of the measuring instrument but not so slowly as to cause unnecessary prolongation of the stressing of the test object near to the test voltage.

These requirements are, in general, met if the rate of the rise is about 5 % of the estimated final test voltage per second, when the applied voltage is above 75% of this voltage. It shall be maintained for the specified time ([X] 1 min ~~[ ] other~~) and then rapidly decreased, but not suddenly interrupted, as this may generate switching transients which could cause damage or erratic results.

Conductive foil was wrapped around the enclosure except near terminals.

APPENDIX C

IEC 62052-31/AS 62052.31

2-1) AC POWER-FREQUENCY VOLTAGE TEST - AFTER RESISTANCE TO HEAT FOR NONMETALLIC ENCLOSURE TEST (IEC/AS 6.10.4.3.4):

RESULTS

Location	Working voltage V	Test voltage r.m.s./~~peak/~~ d.c.	Test duration	Results / Comments
Between all HLV terminals and earth	230 (L-N)	3000	1 min	Pass

[X] No flashover of clearances or breakdown of solid insulation occurred during the test.

[ ] Flashover of clearances or breakdown of solid insulation occurred during the test.

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4. SPRING HAMMER TEST (IEC/AS 6.2.2):

Sample # : 6015976-1 Tested by: Chris Ashby/ Jackson Daniel Test date: 2023-08-24

Ambient Temperature, °C - Ambient Humidity, % - Ambient Pressure, kPa -

METHOD

1. The meter shall be mounted in its normal working position and the spring hammer shall act on the outer surfaces of the meter cover (including windows) and on the terminal cover with a kinetic energy of 0,2 J. The number of impacts shall be 3 per location.
2. Verify no mechanical damage to meter.

At the conclusion of the test, the equipment was then subjected to a repeat of the Dielectric Voltage Withstand Test.

RESULTS

Impact Surface	Impact Force (Joules)	Results (Pass/Fail)	Comments
Impact on outer surface(s)	0.2	Pass	-
Impact on window(s)	0.2	Pass	-
Impact on terminal cover(s)	0.2	Pass	-

Comments:
1. NA

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IEC 62052-31/AS 62052.31

4-1) AC POWER-FREQUENCY VOLTAGE TEST – AFTER Spring Hammer (IEC/AS 6.10.4.3.4):

Sample # :	6015875-1	Tested by:	Chris Ashby / Jackson Daniel	Test date:	2023-08-24

Ambient Temperature, °C	-	Ambient Humidity, %	-	Ambient Pressure, kPa	-

METHOD

The alternating test voltage, as applied to the test object, shall have a frequency in the range 45 Hz to 65 Hz, normally referred to as power-frequency test voltage.

The voltage shape shall approximate to a sinusoid with both half-cycles closely alike.

The test voltage shall be as specified in the relevant clauses. A tolerance of ± 3 % is acceptable between the specified and the measured test voltage values when connected to the EUT.

For test voltages exceeding 3 000 V, it is sufficient that the rated power of the test equipment is equal to or greater than 600 VA.

The tripping current of the generator shall be adjusted to a tripping current of 10 mA or for test voltages above 6 000 V to the highest possible value.

The voltage shall be applied to the test object starting at a value sufficiently low to prevent any effect of overvoltages due to switching transients. It shall be raised sufficiently slowly as to permit accurate reading of the measuring instrument but not so slowly as to cause unnecessary prolongation of the stressing of the test object near to the test voltage.

These requirements are, in general, met if the rate of the rise is about 5 % of the estimated final test voltage per second, when the applied voltage is above 75% of this voltage. It shall be maintained for the specified time ([X] 1 min ~~[ ] other~~) and then rapidly decreased, but not suddenly interrupted, as this may generate switching transients which could cause damage or erratic results.

Conductive foil was wrapped around the enclosure except near terminals.

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4-1) AC POWER-FREQUENCY VOLTAGE TEST - AFTER SPRING HAMMER (IEC/AS 6.10.4.3.4):

RESULTS

Location	Working voltage V	Test voltage r.m.s./~~peak/~~ d.c.	Test duration	Results / Comments
Between all HLV terminals and earth	230 (L-N)	3000	1 min	Pass

[X] No flashover of clearances or breakdown of solid insulation occurred during the test.

[ ] Flashover of clearances or breakdown of solid insulation occurred during the test.

Parts which were considered hazardous live ~~[became]~~ [did not become] accessible.

The enclosure ~~[showed]~~ ~~[~~ did not show] cracks which could cause a hazard.

The device [withstood] ~~[did not withstand]~~ a repeat of the Dielectric Withstand Test without Humidity Preconditioning.

APPENDIX C

IEC 62052-31/AS 62052.31

3. TEMPERATURE TEST (IEC/AS 10.1-10.4):

METHOD

Part 1 (required): Maximum Rated Current

The device was tested under maximum conditions of normal load (264.5 V AC [L-N], 100 A, 50 Hz) until steady state temperatures were obtained. If the meter contains a neutral pass-through, maximum rated current shall also be flowing in this path.

The test shall be maintained until thermal stabilization has been reached. That is, when three successive readings, taken at intervals of 10 % of the previously elapsed duration of the test and not less than 10 min intervals, indicate no change in temperature, defined as ± 1 °C between any of the three successive readings, with respect to the ambient temperature.

Temperatures were measured by thermocouples and/~~or change of resistance~~ as indicated.

[X] Per deviation as specified in AS 62052-31: the maximum rated ambient temperature shall be min. 55°C.

The equipment was tested built-in and positioned on the walls, corner, floor, and/or ceiling in the following manner, as specified by the manufacturer:

Mounted on a wall with the meter face perpendicular to the ground. Screws (or the like) are placed through the three holes provided (two are seen near the edges of the meter when the terminal cover is removed, the third is the hanger notch at the top of the meter) to secure the meter to the wall.

3 AWG wire is used for the current terminals. All wire used had a length of 1 m.

[ ] The test apparatus walls were plywood painted mat black, approximately 10 mm thick to represent walls of a cabinet.

[X] The test apparatus walls were plywood painted mat black, approximately 20 mm thick to represent walls of a building.

[X] Part 2 (optional for IEC, required for AS): Overload Current

If specified by the manufacturer, the Temperature Test shall be repeated under the same conditions, except the current increased to maximum overload current value, I_{ovl}, (128 A). The test duration shall be 2 hours. At completion of 2 hours, the maximum temperatures shall be recorded.

[X] Per deviation as specified in AS 62052.31: For direct-connected metering equipment intended for use at the interface with the Australian public electricity distribution network, I_{ovl} shall be 2128A.

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IEC 62052-31/AS 62052.31

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3. TEMPERATURE TEST (IEC/AS 10.1-10.4): (CONT.)

Sample # : 6016876-1 Tested by: Chris Ashby / Jackson Daniel Test date: 2023-08-23

Ambient Temperature, °C 24.7 Ambient Humidity, % 47.4 Ambient Pressure, kPa 100.28

RESULTS - Part 1 (Maximum Rated Current):

10	TABLE: Temperature Measurements (Thermocouple method)		
	Frequency (Hz) .... :	50	
	Voltage (V) .... :	264.5	
	Maximum Rated Current (I_{max}) (A).............:	100	
	Wire Size (AWG), and Length (Meters)..........:	3 AWG (35mm2), 1 m	
	Test room ambient temperature (t_a) (°C)	21.6	
	Test duration (~~?-hr~~/min) .... :	02:02:33	

	Part / Location	t_{m1} °C	t_{m2} °C	t_{m3} °C	t_c °C	T_{max} °C (Scaled)	Comments
T/C no.	Time of measurement:	01:40:32	01:50:12	02:02:33			
1	Line Terminal 1(Near to Housing, Top)	89.1	89.2	89.4	122.8	135	Nickel plated terminal (110 degree) + correction temperature (55 degree-21.6 degree)= 143.4. However, terminal temp limit maximum is 135.
2	Load Terminal 1 (Near to Housing, Top)	85.4	85.4	85.7	119.1	135	
3	Neutral Terminal 1(Near to Housing, Top)	52.3	52.3	52.4	85.8	135	
4	SCS body	85	85.1	85.3	118.7	130	
5	Transformer T1- Windings outer wrap	67.1	67.2	67.5	100.9	105	
6	Enclosure Surface - Top	44.6	44.5	44.7	78.1	100	
7	Enclosure Surface - Front	36	36	36	69.4	100	
8	Enclosure Surface - Back	53.2	53.4	53.6	87	125	
9	Outer Cover Surface - Top	41.7	41.4	41.8	75.2	100	

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	Part / Location	t_{m1} °C	t_{m2} °C	t_{m3} °C	t_c °C	t_{max} °C	Comments
10	Outer Cover Surface - Terminal Block Cover (above the terminals)	43.9	43.9	44	77.4	100	
11	Printed wiring board - (The hottest point on the main power supply PCB will be where the bus-bar connects to the PCB (see image below with label "Location A"))	83.3	83.3	83.4	116.8	130	
12	Room Ambient	21.7	21.6	21.6	55	55	
Supplementary information:							
Where: tm = measured temperature tc = tm corrected (tm-ta+ 40°C or max. RATED ambient 55°C) tmax = maximum permitted temperature							

The corrected temperatures ~~[did]~~ [did not] exceed the limits specified for t_{max}.

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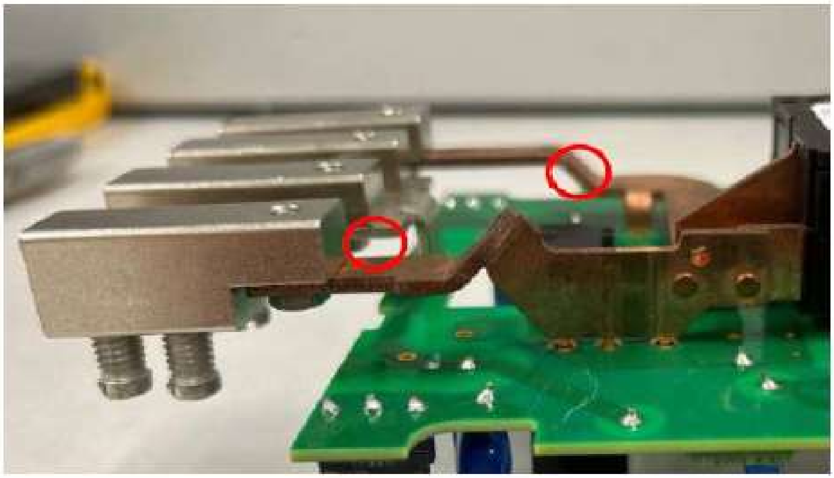
IEC 62052-31/AS 62052.31

3. TEMPERATURE TEST (IEC/AS 10.1-10.4): (CONT.)

Location A: Printed wiring board - Docking Station PWB.
(The hottest point on the DOCK PCB will be where the bus-bar connects to the PCB)



APPENDIX C

IEC 62052-31/AS 62052.31

3. TEMPERATURE TEST (IEC/AS 10.1-10.4): (CONT.)

Table 31 – Surface temperature limits in normal condition

Part	Limit °C
1) Outer surface of enclosure (unintentional contact)	
a) metal, uncoated or anodized	65
b) metal, coated (paint, non-metallic)	80
c) plastics	85
d) glass and ceramics	80
e) small areas (<2 cm²) that are not likely to be touched in normal use	100
2) Knobs and handles (normal use contact)	
a) metal	55
b) plastics	70
c) glass and ceramics	65
d) non-metallic parts that in normal use are held only for short periods (1 s – 4 s)	70
NOTE 1 EN 563 and CENELEC Guide 29 provide information about the effect of the duration of contact.	
NOTE 2 For an example of evaluating test results, see 10.4.	

APPENDIX C

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3. TEMPERATURE TEST (IEC/AS 10.1-10.4): (CONT.)

Table 32 – Temperature limits for terminals

Terminal material	Temperature limits °C [a]
Bare copper	100
Bare brass	105
Tin plated copper or brass	105
Silver plated or nickel plated copper or brass	110
Other metals	[b]

[a] The use in service of connected conductors significantly smaller than those listed in Table 1 could result in higher terminals and internal part temperatures and such conductors should not be used without the manufacturer's consent since higher temperatures could lead to equipment failure.

[b] Temperature limits to be based on service experience or life tests but not to exceed 105 °C

NOTE This table is based on IEC 60947-1:2007, Table 2, by adding 40 °C to the temperature rise limits specified in that table.

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3. TEMPERATURE TEST (IEC/AS 10.1-10.4): (CONT.)

Table 33 – Maximum measured total temperatures for internal materials and components

	Materials and components	Thermocouple method °C		Rise of resistance method °C	
1	Rubber- or thermoplastic-insulated conductors [a]	75			
2	Copper bus bars and connecting straps	[b]			
3	Insulation systems on magnetic components (windings) [c]	[d]		[d]	
	Class of insulation (See IEC 60085)	Normal	Single fault	Normal	Single fault
		condition		condition	
	Class A (105)	90	135	100	145
	Class E (120)	105	150	115	160
	Class B (130)	110	155	120	165
	Class F (155)	130	165	140	175
	Class H (180)	155	185	165	195
4	Phenolic composition [a]	155			
5	On bare resistor material	415			
6	Capacitor	[e]			
7	Power electronic devices	[f]			
8	PWBs	[g]			
9	Components bridging at least basic protection	[e]			
10	Batteries	[e]			

[a] The limitation on rubber and thermoplastic insulation and phenolic composition does not apply to compounds which have been investigated and found to meet the requirements for a higher temperature.

[b] The maximum permitted temperature is determined by the temperature limit of support materials or insulation of connecting wires or other components. A maximum temperature of 140 °C is recommended.

[c] The maximum temperatures on insulation of magnetic components assume thermocouples are applied on the surface of coils, and are therefore not located on hot-spots. Rise of resistance method results in a measurement of the average temperature of the winding.

[d] These limits are extracted from the group safety standards IEC 61558-1 and IEC 61558-2-16 (Safety of power transformers, power supplies, reactors and similar products).

[e] For a component, the maximum temperature specified by the manufacturer should not be exceeded.

[f] The maximum temperature on the case should be the maximum case temperature for the applied power dissipation specified by the manufacturer of power electronic devices.

[g] The maximum operating temperature of the PWB shall not be exceeded.

APPENDIX C

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END OF DATASHEET PACKAGE. THIS PAGE INTENTIONALLY LEFT BLANK.

APPENDIX C

IEC 62052-31/AS 62052.31

APPENDIX B - PHOTOGRAPHS

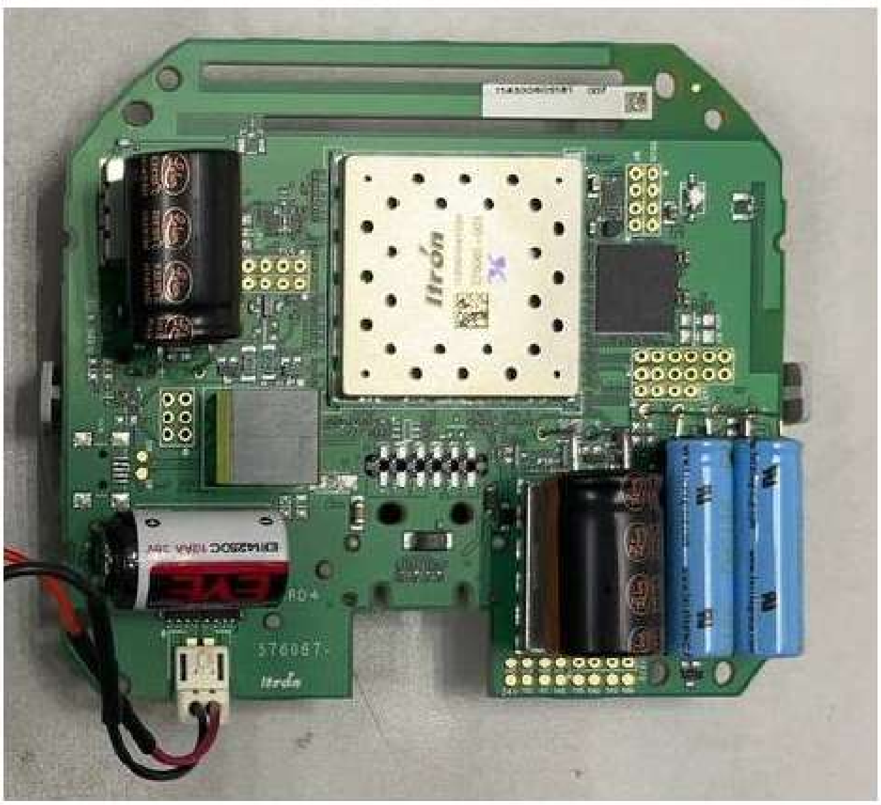
Front Meter cover

Note*: The photo above is the testing samples which has not finalised with printing marking.

APPENDIX C

IEC 62052-31/AS 62052.31

Front layer rear PWB



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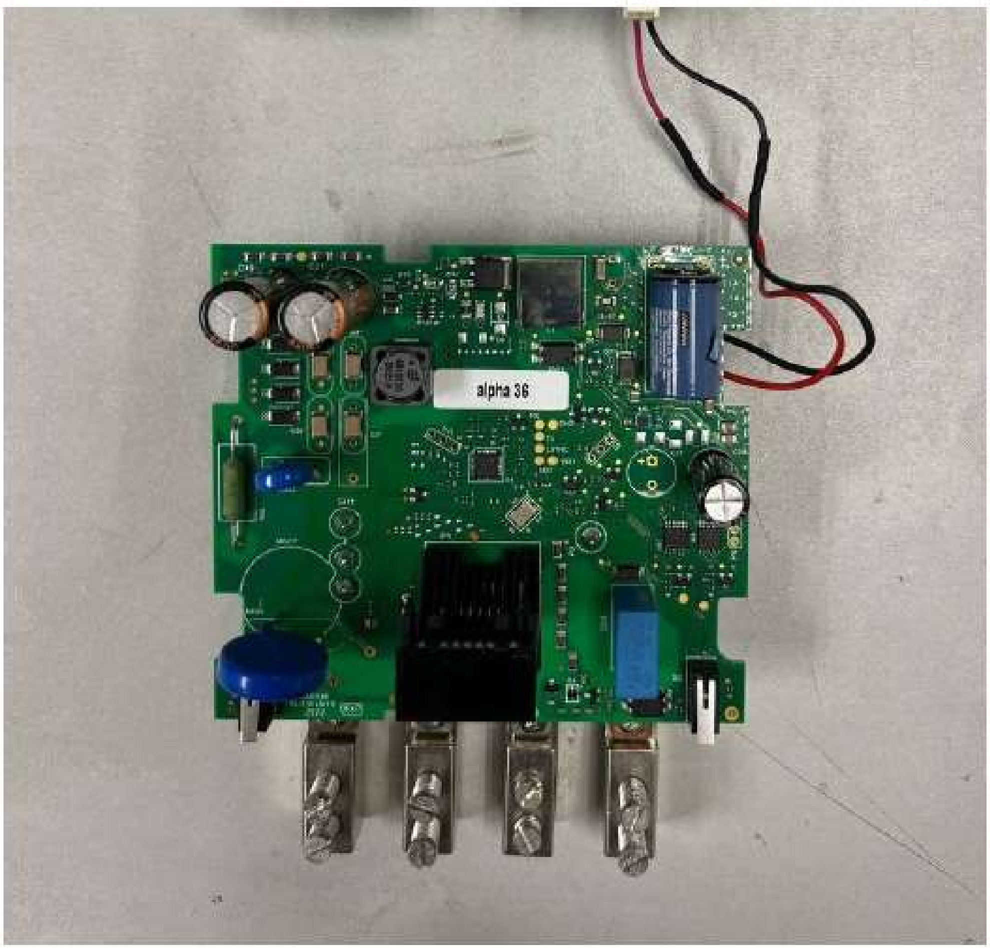
IEC 62052-31/AS 62052.31

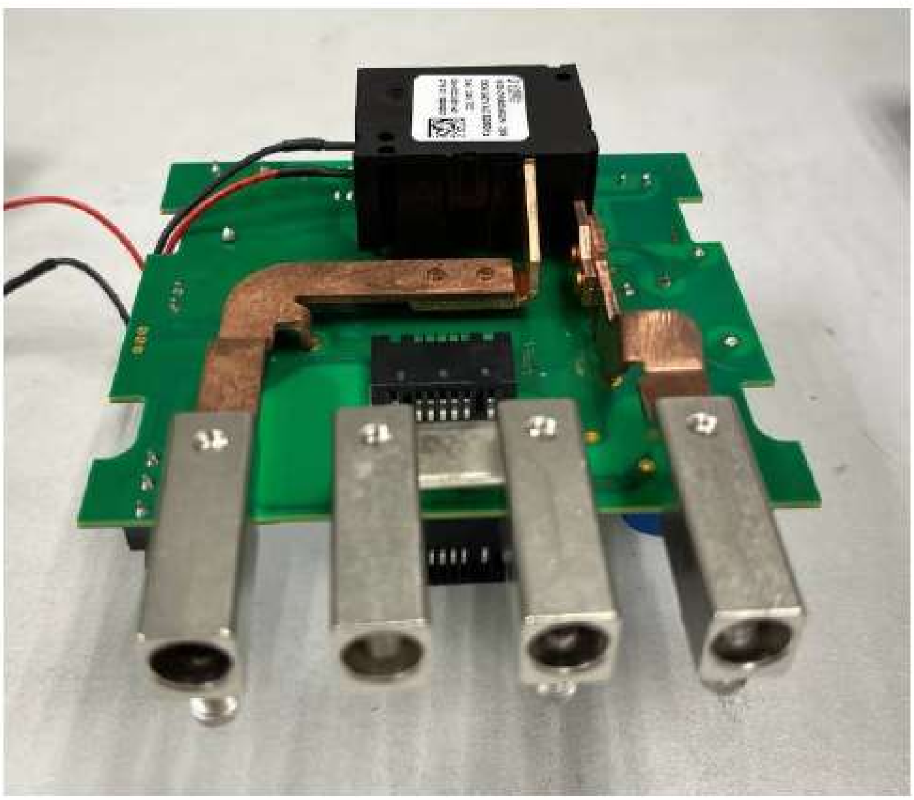
Bottom of PWB



APPENDIX C

IEC 62052-31/AS 62052.31

Bottom layer with rear end



APPENDIX C

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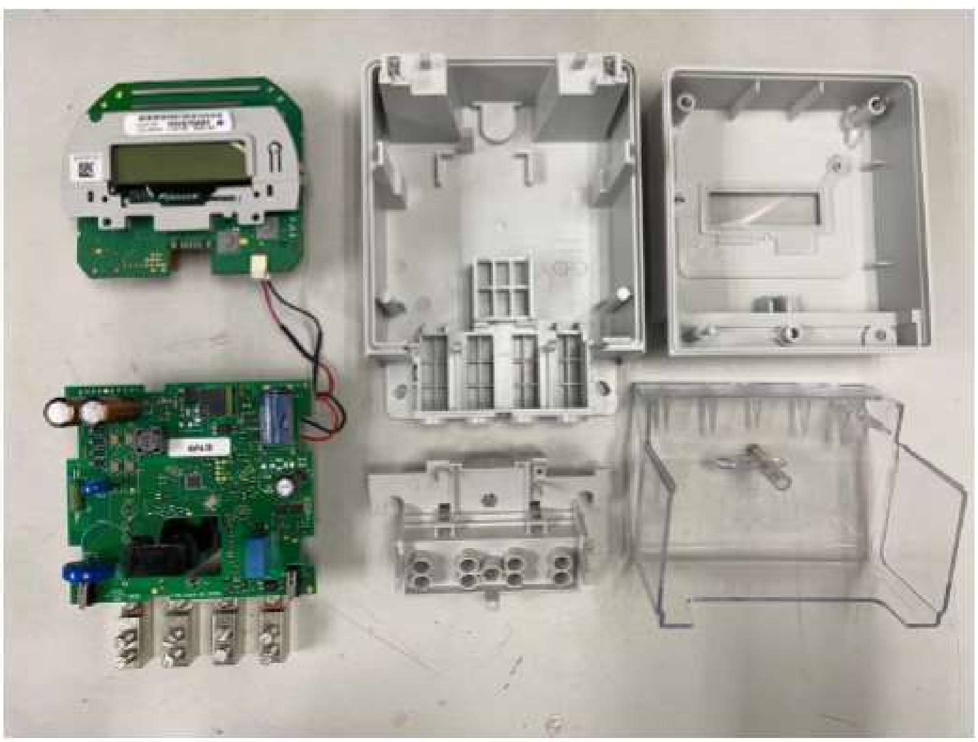
IEC 62052-31/AS 62052.31

Inside Enclosure



APPENDIX C

IEC 62052-31/AS 62052.31

END OF TEST REPORT

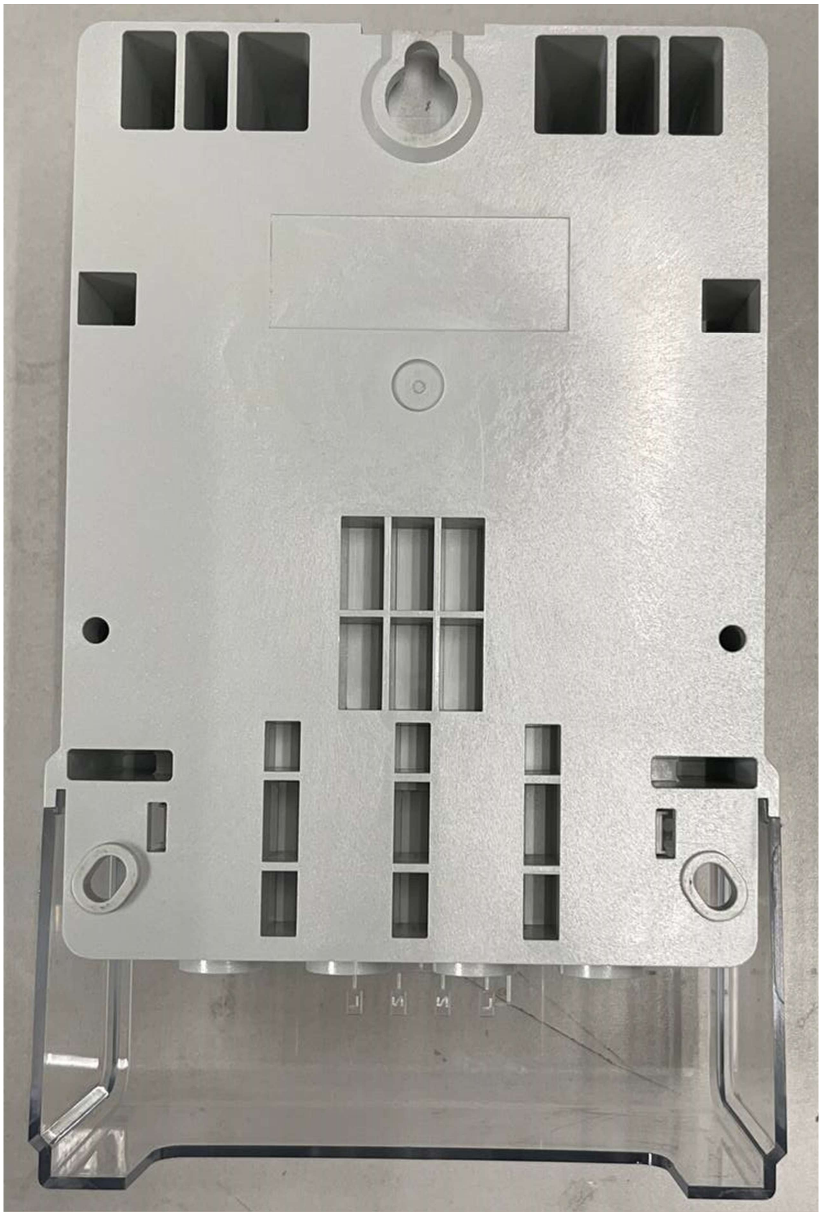
PHOTOGRAPHS

Front Meter cover

Note*: Refers to page 20 for final version of markings.

PHOTOGRAPHS

Back Meter cover

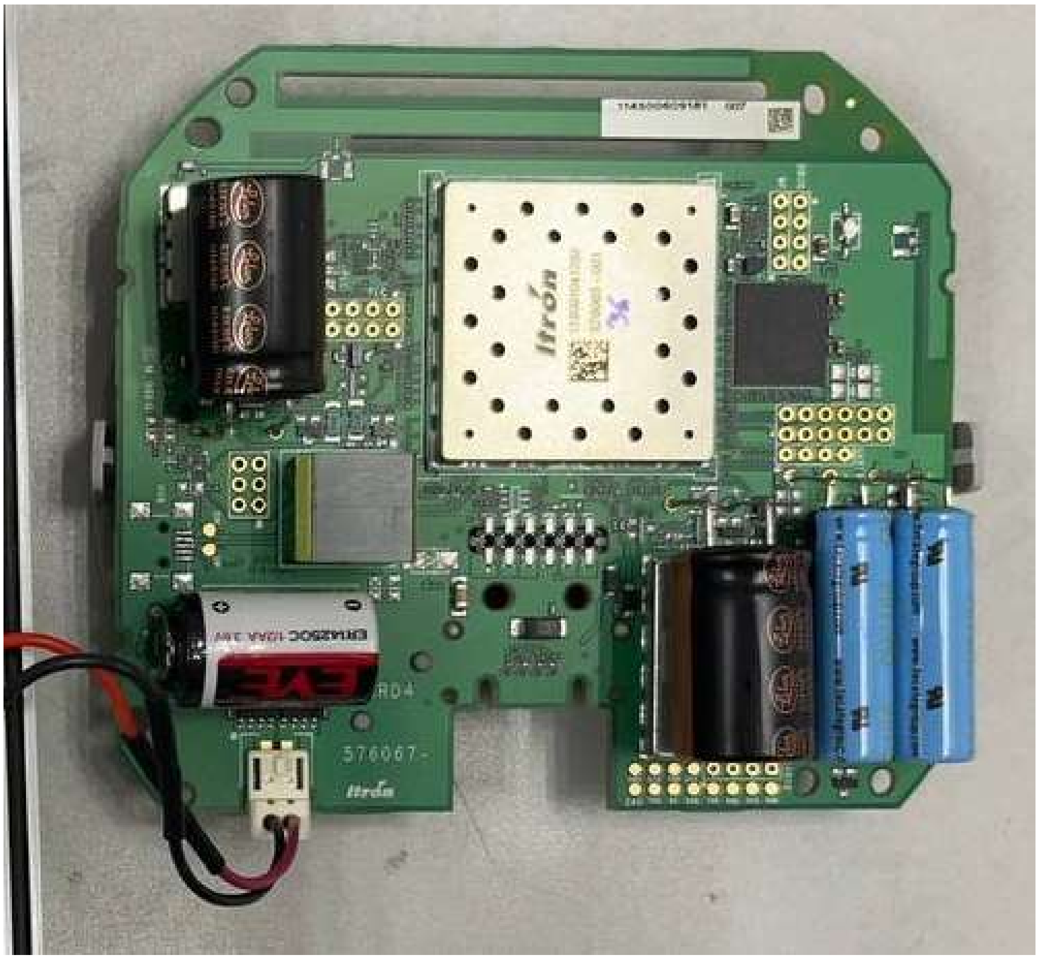


PHOTOGRAPHS

Front layer of PWB

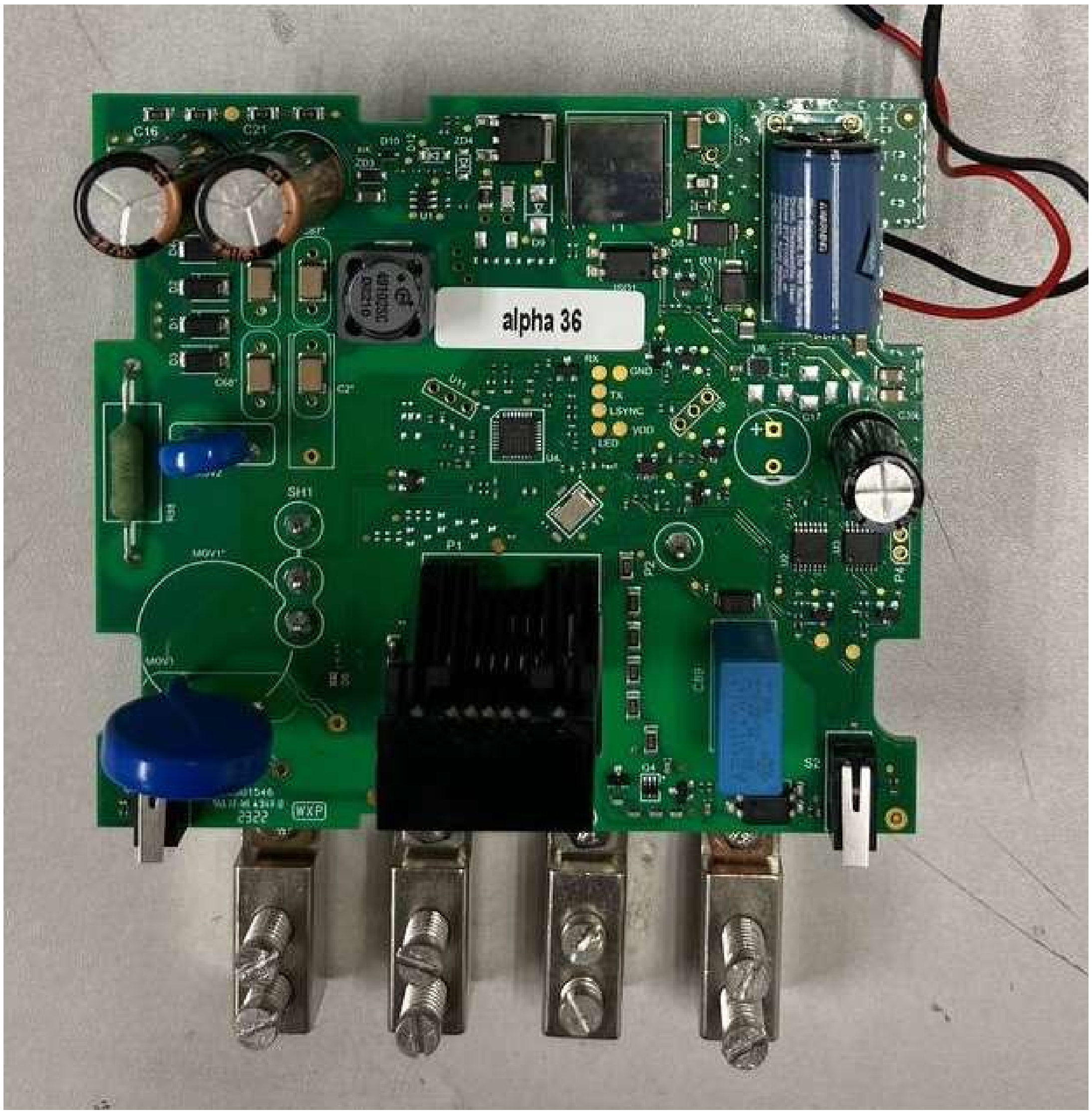
PHOTOGRAPHS

Front layer rear PWB



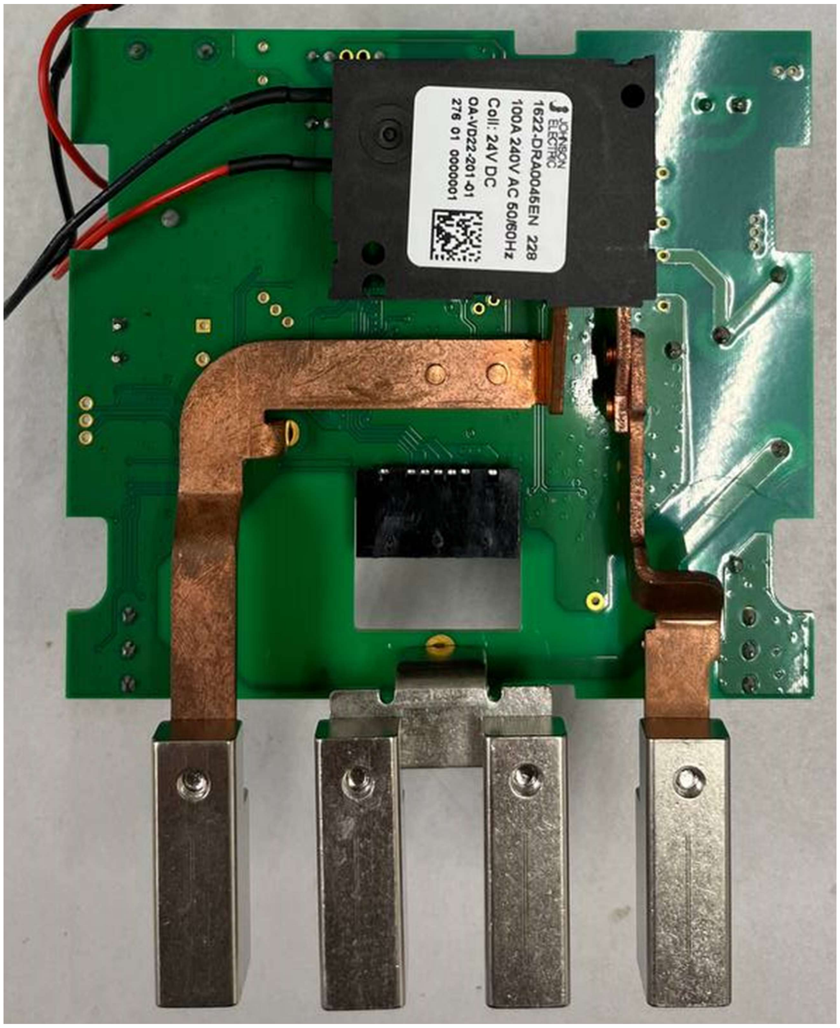
PHOTOGRAPHS

Bottom layer of PWB



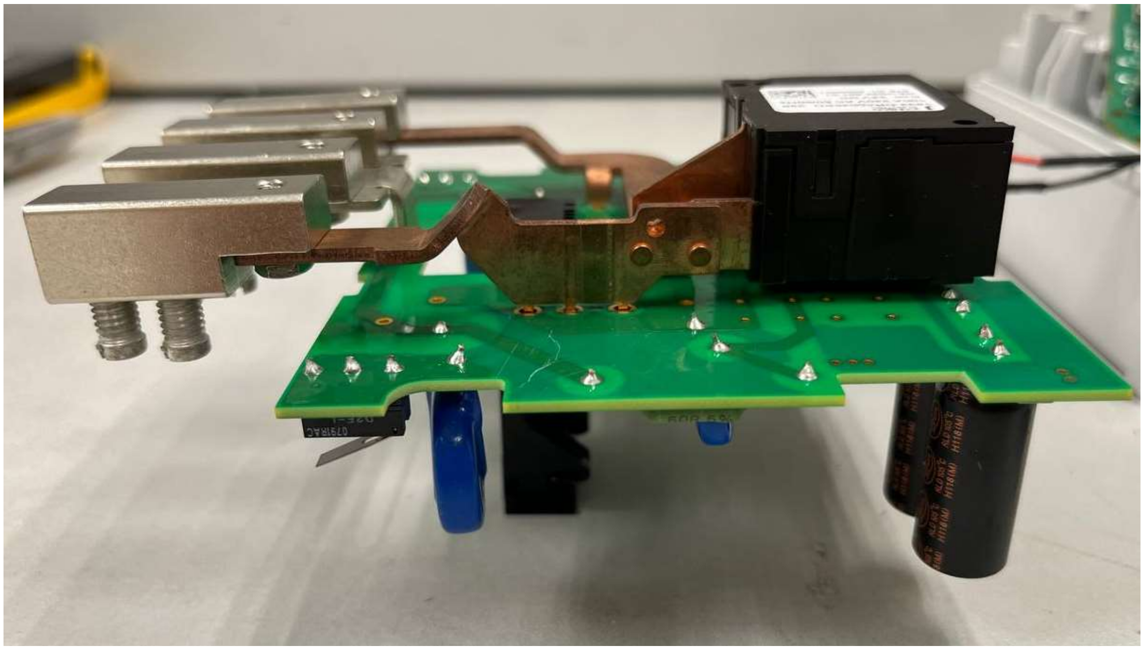
PHOTOGRAPHS

Bottom layer with rear end

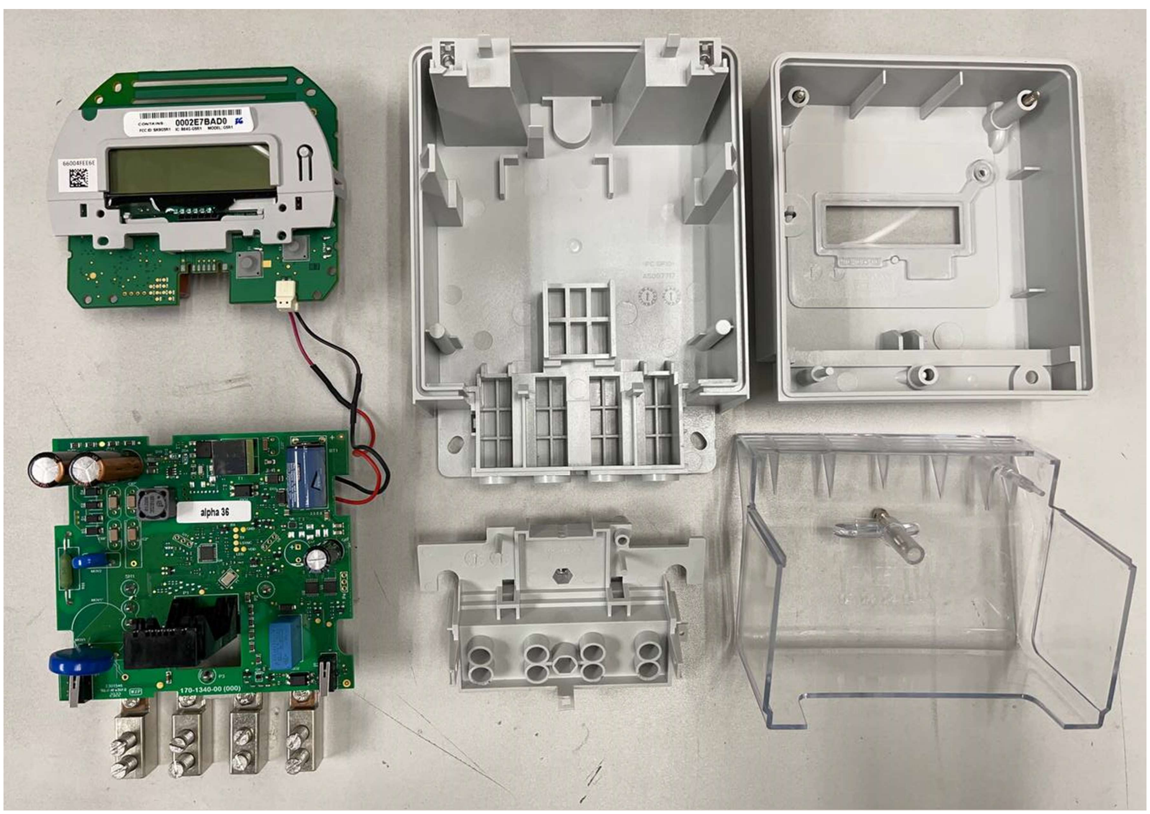


PHOTOGRAPHS

Bottom layer with side view

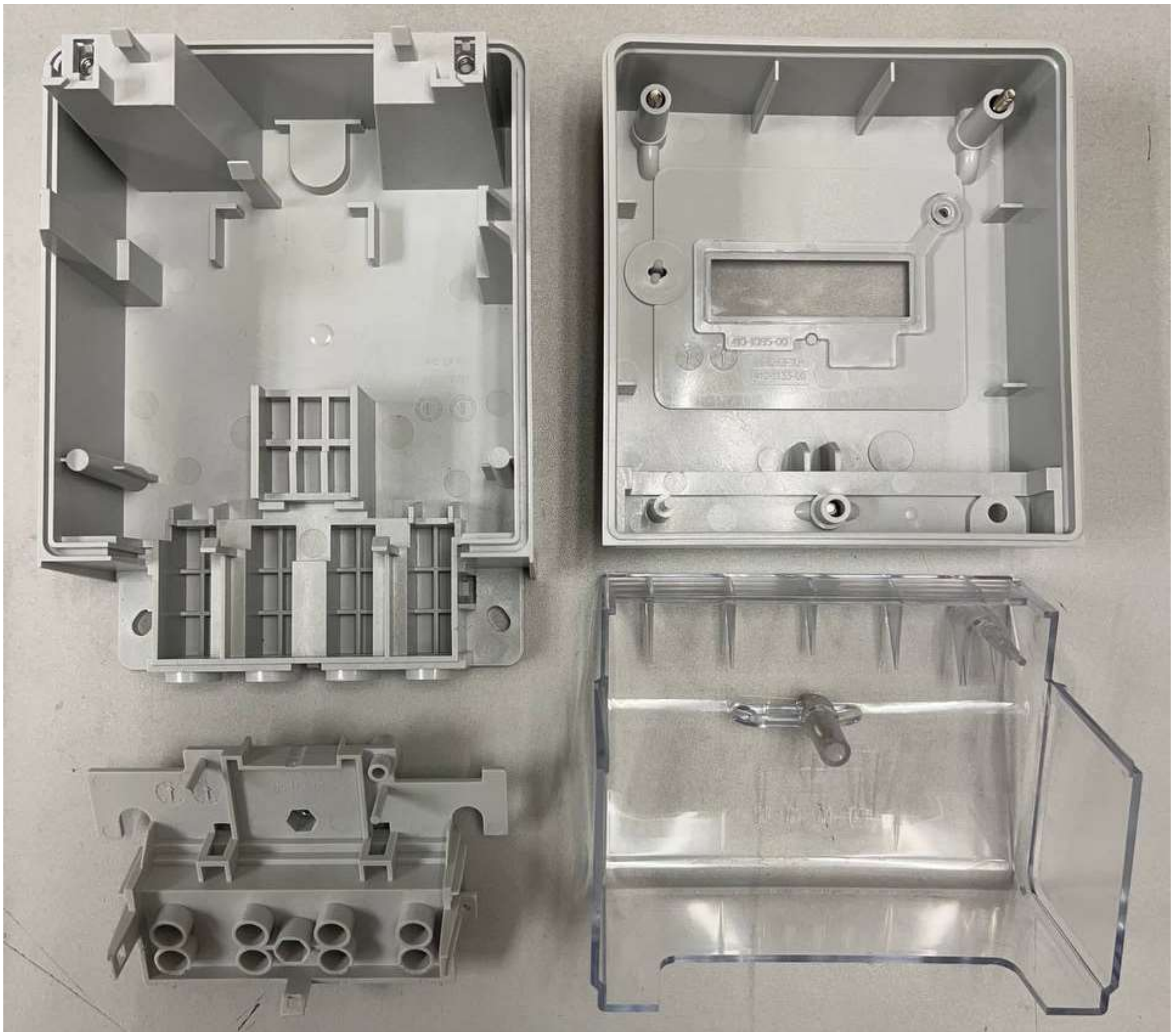


Inside Enclosure with PWB



PHOTOGRAPHS

Inside Enclosure without PWB



PHOTOGRAPHS

END OF TEST REPORT