TEST REPORT

IEC AS 62054-21
Electricity metering equipment (AC)—Tariff and load control
Part 21: Particular requirements of time switched

Test Report

Reference No.	**R4790913970 _IEC (AS) 62054-21**
Prepared by (+ signature)	Vairakkannu Vairavan (Supervise) **Project Engineer** Soo Voo Key **Project Engineer Associate (T)**
Approved by (+ signature)	Scott Hunter D **Operations Leader**
Date of issue	2023-09-13
Date of testing	July 2023 – August 2023
Contents	27 pages

Laboratory details

Name	**UL International-Singapore Pte Ltd**
Physical Address	20 Kian Teck Lane, Singapore 627854
Contact Details	Telephone (+65) 6274 0702

Test specification

Standard	IEC 62054-21: 2017 & AS 62054-21: 2018 (Ed 1.1) _Only time keeping accuracy clauses

Client details

Applicant	PT. MECOINDO - Itron
Address	Plot 6B-2, EJIP, Bekasi Jawa Barat, Jawa Barat, 17550, ID

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

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.

Possible results

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

In this report, only the following tests were performed based on applicant’s request.

- Section 7.5.2.2 Requirements for crystal-controlled time switches
- Section 7.5.2.3.3.1 Test of crystal-controlled time switches supplied by mains
- Section 7.5.2.3.3.2 Test of crystal-controlled time switches on operation reserve
- Section 7.5.2.3.3.3 Test of time-keeping accuracy of crystal-controlled time switches with temperature

Statement of results

The test samples COMPLY with the requested clauses of the test specification.

The test samples were fully assessed to the customer requested 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
Voltage rating.....:	230V
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

IEC IEC AS 62054-21			
Clause	Requirement – Test	Remark	Result
1.	SCOPE		NOTED
2. AS	NORMATIVE REFERENCES		NOTED
3.	TERMS AND DEFINITIONS		NOTED
	Requirements of AS 62052-21 apply		
4.	STANDARD ELCTRICAL VALUES		NOTED
	Requirements of AS 62052-21 apply		
5.	MECHANICAL REQUIREMENTS AND TESTS		N
	Requirements of AS 62052-21 apply		N
6.	CLIMATIC CONDITIONS		NOTED
	Conditions of AS 62052-11 apply		N
7.	ELECTRICAL REQUIREMENTS		N
	Requirements of AS 62052-11 apply		N
7.1	Supply Voltage		N
7.2	Heating		N
7.3	Insulation		N
7.4	Output Elements		N
7.5	Functional requirements and test- accuracy		N
7.5.1	Time setting and programming		N
7.5.2	Time-keeping accuracy		N
7.5.2.1	Requirements for synchronous time switches		N
7.5.2.2	Requirements for crystal-controlled time switches		P
7.5.2.3	Test of time-keeping accuracy		N
7.5.2.3.1	General test conditions		N

IEC

IEC IEC AS 62054-21			
Clause	Requirement – Test	Remark	Result
	Reference conditions from Annex B of AS 62052-21 are met		N
7.5.2.3.2	Test of synchronous time switches		N
7.5.2.3.3	Test of crystal-controlled time switches		P
7.5.2.3.3.1	Test of crystal-controlled time switches supplied by mains		P
	Time switch is synchronized to a reference crystal-controlled clock, and run for 30 days		P
	Time discrepancy between reference clock and time switch	-1.93 sec	
	Allowable time discrepancy	±15 sec	
7.5.2.3.3.2	Test of crystal-controlled time switches on operation reserve		P
	Meter powered prior to testing, long enough that operation reserve is fully available.		P
	Power supply of time switch is turned off for 36 hours		P
	Recorded time difference between time switch and reference clock	0.63	
	Allowable time difference	±1.5s	
7.5.2.3.3.3	Test of time-keeping accuracy of crystal-controlled time switches with temperature		P
	Time base is measure at +23°C		P
	Temperature is set at +45°C and allowed for thermal equilibrium to be obtained		P
	Amount of time ran for:	99109 seconds	
	Time keeping accuracy measured:	0.04	
	Allowable accuracy measurement:	+/-0.15s/c/day	
	Temperature set at -10°C and allowed for thermal equilibrium to be obtained		P
	Amount of time ran for:	91438 seconds	
	Time keeping accuracy measured:	-0.06	
	Allowable accuracy measurement:	+/-0.15s/c/day	
7.5.3	Switching accuracy		N
7.5.4	Synchronization		N
7.6	Electromagnetic compatibility (EMC)		N

IEC

IEC IEC AS 62054-21			
Clause	Requirement – Test	Remark	Result
7.7	Radio interference suppression		N
8	Test conditions and type test		N
ANNEX A	ACCEPTANCE TESTS		NOTED

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AS 62054-21 Section 7.5.2.3 Test of Time-Keeping Accuracy

Criteria

Any solid state internal clock used for electricity meters and load control devices shall meet the timing requirements specified in AS 62054.21.

Meters must demonstrate a convenient methodology of clock synchronization via the local optical or serial port.

For meters recording load profile for tariff calculation, the clock synchronization must not permit clock adjustment that crosses an interval boundary.

Test Method

The internal clock is subjected to the timing requirements of AS 62054.21 according to its clock type as below.

- Section 7.5.2.3.3.1 Test of crystal-controlled time switches supplied by mains
- Section 7.5.2.3.3.2 Test of crystal-controlled time switches on operation reserve
- Section 7.5.2.3.3.3 Test of time-keeping accuracy of crystal-controlled time switches with temperature

Test Results

The GEN™5 RIVA is **compliant** with AS 62054-21 Section 7.5.2.3 Test of Time-Keeping Accuracy.

AS 62054.21 Section 7.5.2.3.1 General test conditions

Criteria

Place the time switch under test in its normal operating position and, if necessary, in a climatic chamber, and supply it from an apparatus free of voltage dips and short interruptions.

Unless otherwise indicated, the reference conditions shown in Annex B of AS 62052.21 shall be maintained.

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AS 62054.21 Section 7.5.2.3.3.1 Test of crystal-controlled time switches supplied by mains

Criteria

At reference voltage and reference temperature, crystal-controlled time switches shall have a time-keeping accuracy better than ±0,5 s/day.

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Crystal-controlled time switches supplied by mains	Lim Mico, Vairakkanu Vairavan, Soo Voo Key	UL International-Singapore Pte Ltd, 20 Kian Teck Lane, Singapore 627854	2023-07-31 to 2023-08-30

Test Method

The meter under test is supplied together with, and synchronized to, a reference crystal-controlled clock.

After a testing period of 30 days, the time-indication discrepancy between the reference clock and the meter under test must be less than ±15 s.

AS 62054.21 Annex B Reference Value Requirements	Temperature (°C)	Humidity (%RH)	Pressure (kPa)	Supply Voltage, U_n	Supply frequency, f_n
Required	23 (±3)	65 ± 10%	-	U_n ± 1%	f_n ± 0.1
Actual*	23.6	67	-	230	50

Test Results

The Gen™ 5 Riva is **compliant** with AS 62054.21 Section 7.5.2.3.3.1 Test of Crystal-Controlled Time Switches Supplied by Mains.

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Figure 1: Test of Crystal-Controlled Time Switches Supplied by Mains Setup

Table 1: Test of Crystal-Controlled Time Switches Supplied by Mains Results

Error/30 Days Reading 1	-7.49	
Error/30 Days Reading 2	-2.00	
Error/30 Days Reading 3	-2.73	
Error/30 Days Reading 4	-2.40	
Error/30 Days Reading 5	-1.93	
Meter serial number	SN0005	
Initial Reading	For crystal controlled	
	Reference clock	EUT clock
Start date (dd/mm/yyyy)	2023-07-31	2023-07-31

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Start time (24 h format XX:XX:XX)	17:15:55	16:16:14
Reading 1	Reference clock	EUT clock
End date (dd/mm/yyyy)	04-08-2023	04-08-2023
End time (24 h format XX:XX:XX)	17:20:56	16:21:14
No of days	4	4
Additional time (s)	301	300
Total time (s)	345901	345900
Total number of days	4.003483796	
Time error	-1	
Time error / day	-0.25	
Time error /30 days	-7.49	
Reading 2	Reference clock	EUT clock
End date (dd/mm/yyyy)	15-08-2023	15-08-2023
End time (24 h format XX:XX:XX)	18:03:56	17:04:14
No of days	15	15
Additional time (s)	2881	2880
Total time (s)	1298881	1298880
Total number of days	15.03334491	
Time error	-1	
Time error / day	-0.07	
Time error /30 days	-2.00	
Reading 3	Reference clock	EUT clock
End date (dd/mm/yyyy)	22-08-2023	22-08-2023
End time (24 h format XX:XX:XX)	17:17:54	16:18:11
No of days	22	22
Additional time (s)	119	117
Total time (s)	1900919	1900917
Total number of days	22.00137731	
Time error	-2	
Time error / day	-0.09	
Time error /30 days	-2.73	

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Reading 4	Reference clock	EUT clock
End date (dd/mm/yyyy)	25-08-2023	25-08-2023
End time (24 h format XX:XX:XX)	17:27:55	16:28:12
No of days	25	25
Additional time (s)	720	718
Total time (s)	2160720	2160718
Total number of days	25.00833333	
Time error	-2	
Time error / day	-0.08	
Time error /30 days	-2.40	

Reading 5	Reference clock	EUT clock
End date (dd/mm/yyyy)	31/08/2023	31/08/2023
End time (24 h format XX:XX:XX)	17:42:47	16:43:04
No of days	31	31
Additional time (s)	1612	1610
Total time (s)	2680012	2680010
Total number of days	31.01865741	
Time error	-2	
Time error / day	-0.06	
Time error /30 days	-1.93	

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Temperature, Humidity and Pressure recorder	139452	OMEGA	iBTHX-W	2023-01-11	2024-01-11
PC with time synced to NIST server	R83EETM	Lenovo	7630BF2	No Cal Req	No Cal Req
Timer	139436	Extech	365515	2023-02-14	2024-02-14

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AS 62054.21 Section 7.5.2.3.3.2 Test of crystal-controlled time switches on operation reserve

Criteria

On operation reserve, at reference temperature, the time-keeping accuracy shall be better than ±120 s/day, if operation reserve is provided by a spring and better than ±1 s/day if operation reserve is provided by a supercapacitor, rechargeable battery or primary cell.

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Crystal-controlled time switches on operation reserve	Lim Mico, Vairakkanu Vairavan, Soo Voo Key	UL International-Singapore Pte Ltd, 20 Kian Teck Lane, Singapore 627854	2023-08-25 to 2023-08-27

Test Method

The meter to be tested is powered together with a reference clock. Before the test, the time switch shall be powered for a suitable length of time, so that the operation reserve is fully available.

NOTE The manufacturer should specify the time necessary for keeping the time switch powered up before the test of operation reserve may commence.

The power supply of the time switch under test is switched off for 36 h.

When the power supply is restored, the time-indication discrepancy between the reference clock and the meter under test shall not be more than that calculated from the time-keeping accuracy on operation reserve multiplied by the length of the operating reserve.

NOTE Consequently, the time indication discrepancy should be less than ±1,5 s.

The restoration of the voltage shall be made with the switching device free from bounce.

AS 62054.21 Annex B Reference Value Requirements	Temperature (°C)	Humidity (%RH)	Pressure (kPa)	Supply Voltage, U_n	Supply frequency, f_n
Required	23 (±3)	65 ± 10%	-	U_n ± 1%	f_n ± 0.1
Actual	21.9	67	-	230	50

Test Results

The GEN™5 RIVA is **compliant** with AS 62054.21 Section 7.5.2.3.3.2 Test of crystal-controlled time switches supplied on operation reserve.

Figure 2: Test of Crystal-Controlled Time Switches Supplied on Operation Reserve Setup

Table 2: Test of Crystal-Controlled Time Switches Supplied on Operation Reserve Results

Clock Calculations	CD-10399, issue 2.0, 11/01/12	
Tester	Mico	
Project Number	4790913970	
Temperature	21.9deg	
Clock type	SN003	
	Crystal Controlled	
Meter serial number	003	
	Reference clock	EUT clock
Start date (dd/mm/yyyy)	25/08/2023	25/08/2023
End date (dd/mm/yyyy)	27/08/2023	27/08/2023
No of days	2	2
Start time (24 h format XX:XX:XX)	18:06:54	17:07:12
End time (24 h format XX:XX:XX)	08:09:16	07:09:35
Additional time	-35858	-35857
Total time (s)	136942	136943
Total number of days	1.584976852	
Time error	1	

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Time error /36 hours	0.63	

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Temperature, Humidity and Pressure recorder	139452	OMEGA	iBTHX-W	2023-01-11	2024-01-11
PC with time synced to NIST server	R83EETM	Lenovo	7630BF2	No Cal Req	No Cal Req
Timer	139436	Extech	365515	2023-02-14	2024-02-14

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Section 7.5.2.3.3.3 Test of time-keeping accuracy of crystal-controlled time switches with temperature

Criteria

The variation of the time-keeping accuracy with the temperature shall be less than (±0,15 s/°C/24 h).

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Time-keeping Accuracy of Crystal-Controlled Time Switches with Temperature	Lim Mico, Vairakkanu Vairavan, Soo Voo Key	UL International-Singapore Pte Ltd, 20 Kian Teck Lane, Singapore 627854	2023-08-01 to 2023-08-03

Test Method

The time switch is placed in a climatic chamber and its time base is measured at +23(±3) °C.

The temperature is set at +45 °C. After thermal equilibrium is obtained, the time-keeping accuracy shall be better than ±3,3 s/24 h plus the time-keeping accuracy measured at reference temperature (max. +0,5 s/24 h).

NOTE The accuracy of the time base should not differ from the 23 °C measurement by more than ±38 × 10–6.

The temperature is then set at –10 °C. After thermal equilibrium is obtained the time-keeping accuracy shall be better than ±4,95 s/24 h plus the time-keeping accuracy measured at reference temperature (max. +0,5 s/24 h).

NOTE The accuracy of the time base should not differ from the 23 °C measurement by more than ±57 × 10–6.

Test Results

The GEN™5 RIVA is **compliant** with AS 62054.21 Section 7.5.2.3.3.3 Test of Crystal-Controlled Time Switches with Temperature.

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Figure 3: Test of Crystal-Controlled Time Switches with Temperature Setup

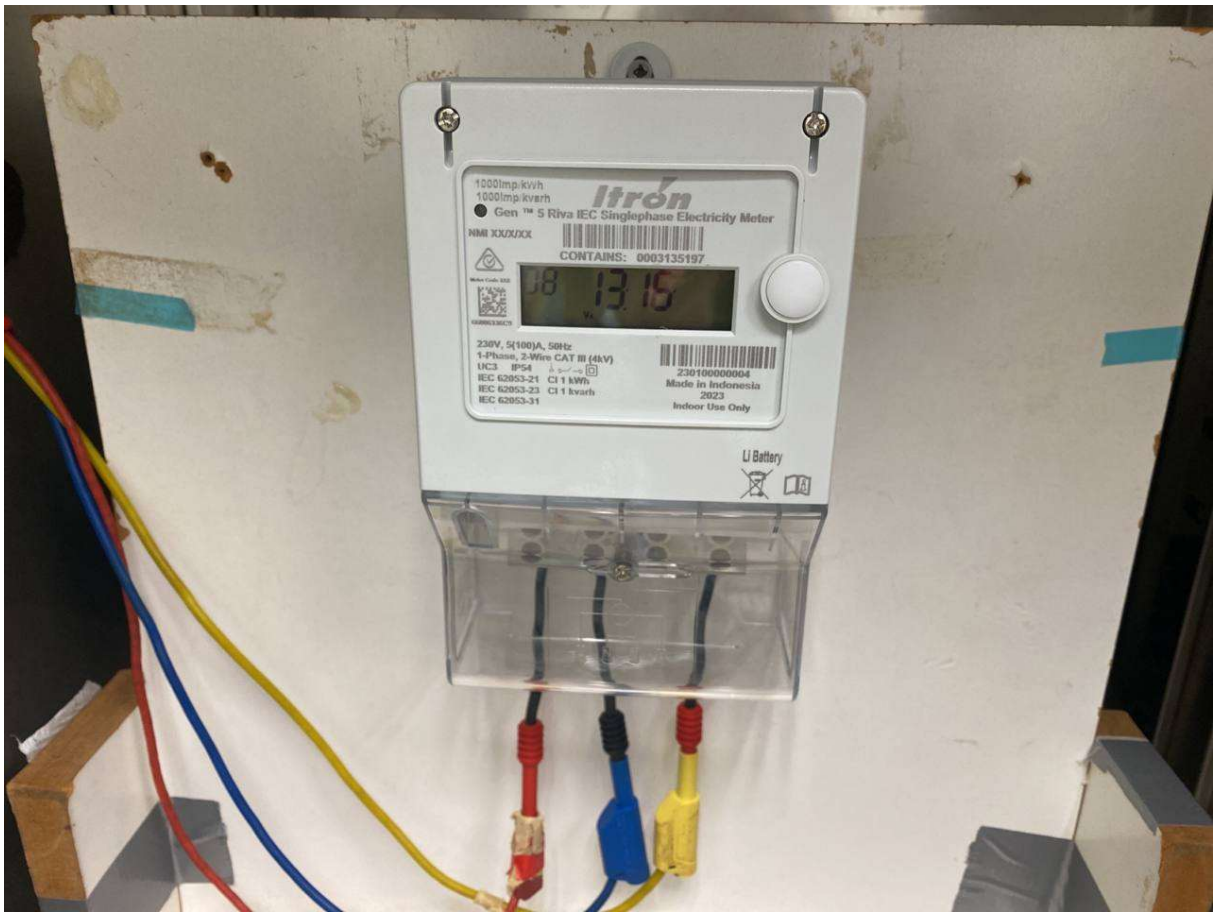

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Table 3: Test of Crystal-Controlled Time Switches with High Temperature Results

Clock Calculations	CD-10399, issue 2.0, 11/01/12	
	For crystal controlled	
Meter SN	SN004	
Initial Reading @ 23	Reference clock	EUT clock
Start date (dd/mm/yyyy)	1/8/2023	1/8/2023
Start time (24 h format XX:XX:XX)	14:32:37	13:32:46
Reading @ 45		
End date (dd/mm/yyyy)	2/8/2023	2/8/2023
End time (24 h format XX:XX:XX)	18:04:25	17:04:35
No of days	1	1
Additional time (s)	12708	12709
Total time (s)	99108	99109
Total number of days	1.147083333	
Time error	1	
Time error / day	0.87	
Time error / day / degree	0.04	

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Table 4: Test of Crystal-Controlled Time Switches with Low Temperature Results

Clock Calculations	CD-10399, issue 2.0, 11/01/12	
	For crystal controlled	
Meter SN	004	
Initial Reading @ 23	Reference clock	EUT clock
Start date (dd/mm/yyyy)	02/08/2023	02/08/2023
Start time (24 h format XX:XX:XX)	18:11:56	17:12:06
Reading @ -10		
End date (dd/mm/yyyy)	03/08/2023	03/08/2023
End time (24 h format XX:XX:XX)	19:35:52	18:36:04
No of days	1	1
Additional time (s)	5036	5038
Total time (s)	91436	91438
Total number of days	1.058287037	
Time error	2	
Time error / day	1.89	
Time error / day / degree	-0.06	

Test Equipment Used

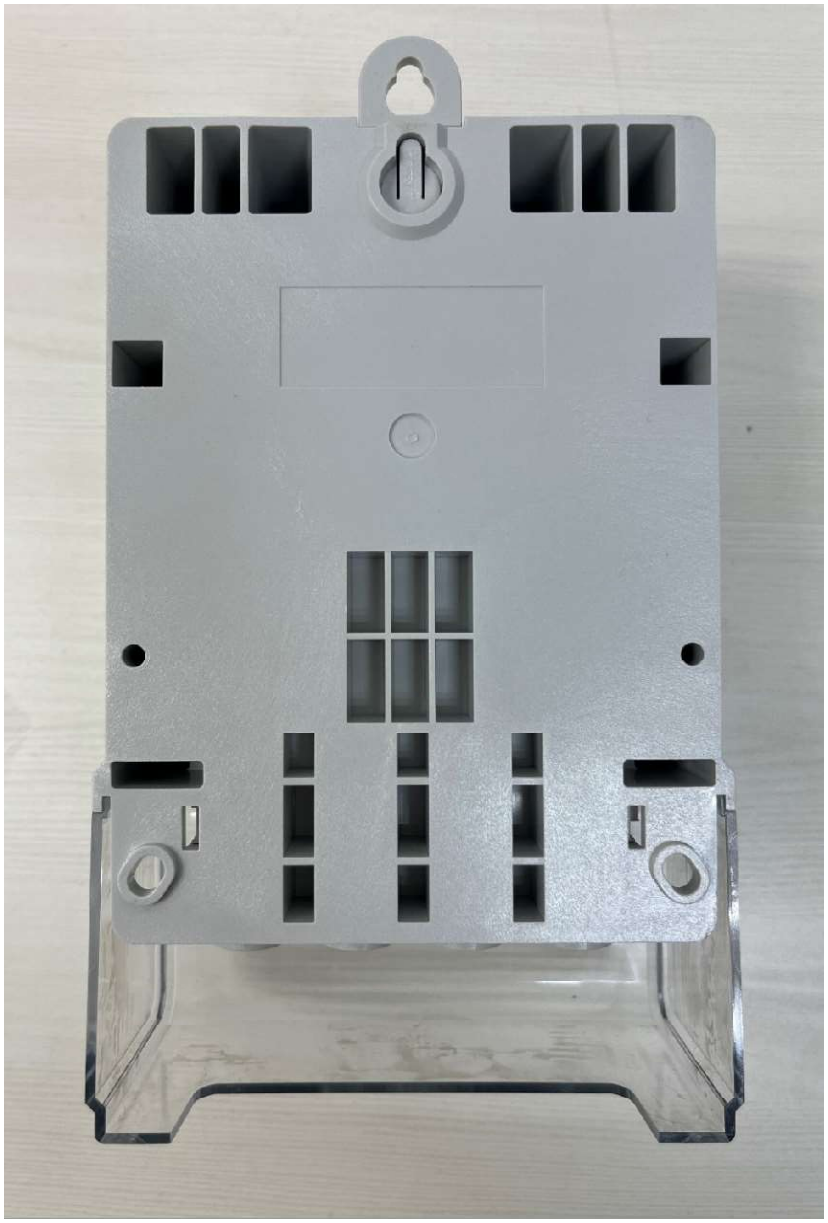
Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Meter Test System	53479	EMH	PRS 400.3	2021-09-21	2023-09-20
Timer	139436	Extech	365515	2023-02-14	2024-02-14
Blue M Temperature Chamber	53671	TPS	ETC-09SH-JY	2023-07-20	2024-07-20

PHOTOGRAPH

Front Meter cover

PHOTOGRAPH

Back Meter cover

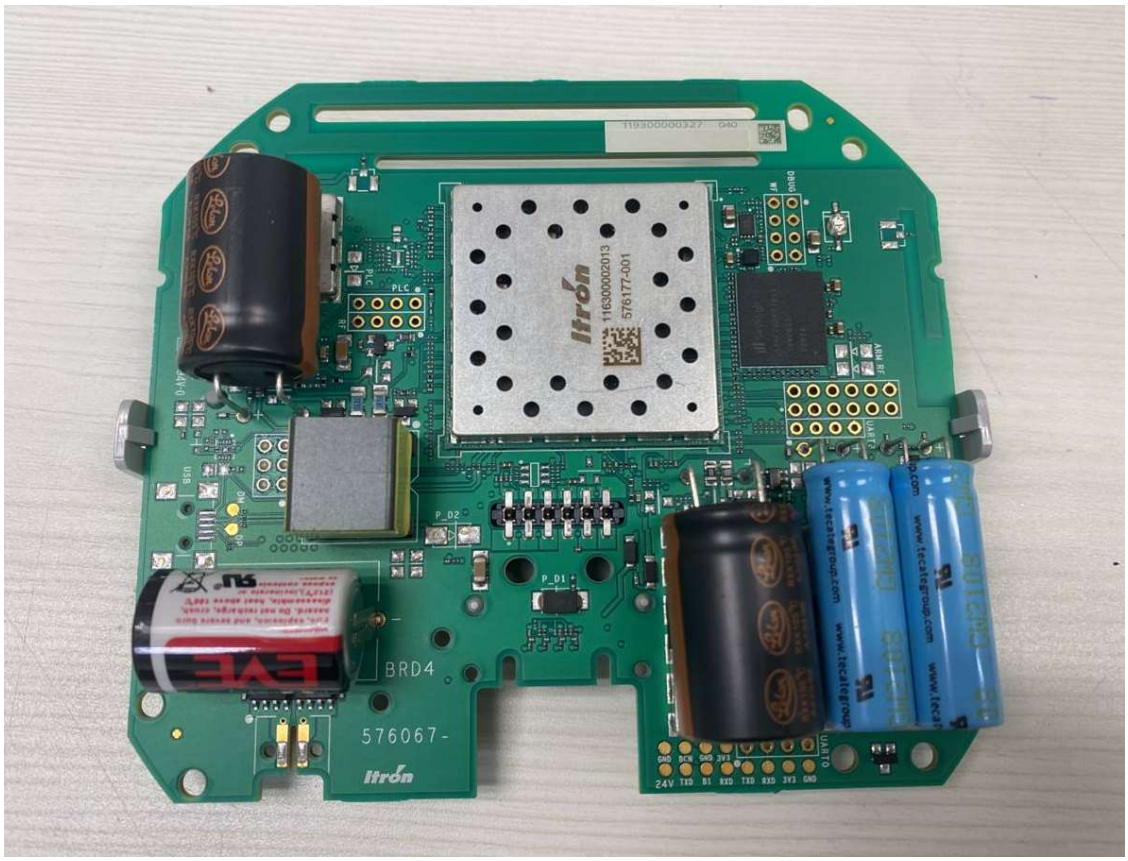


PHOTOGRAPH

Front of PWB

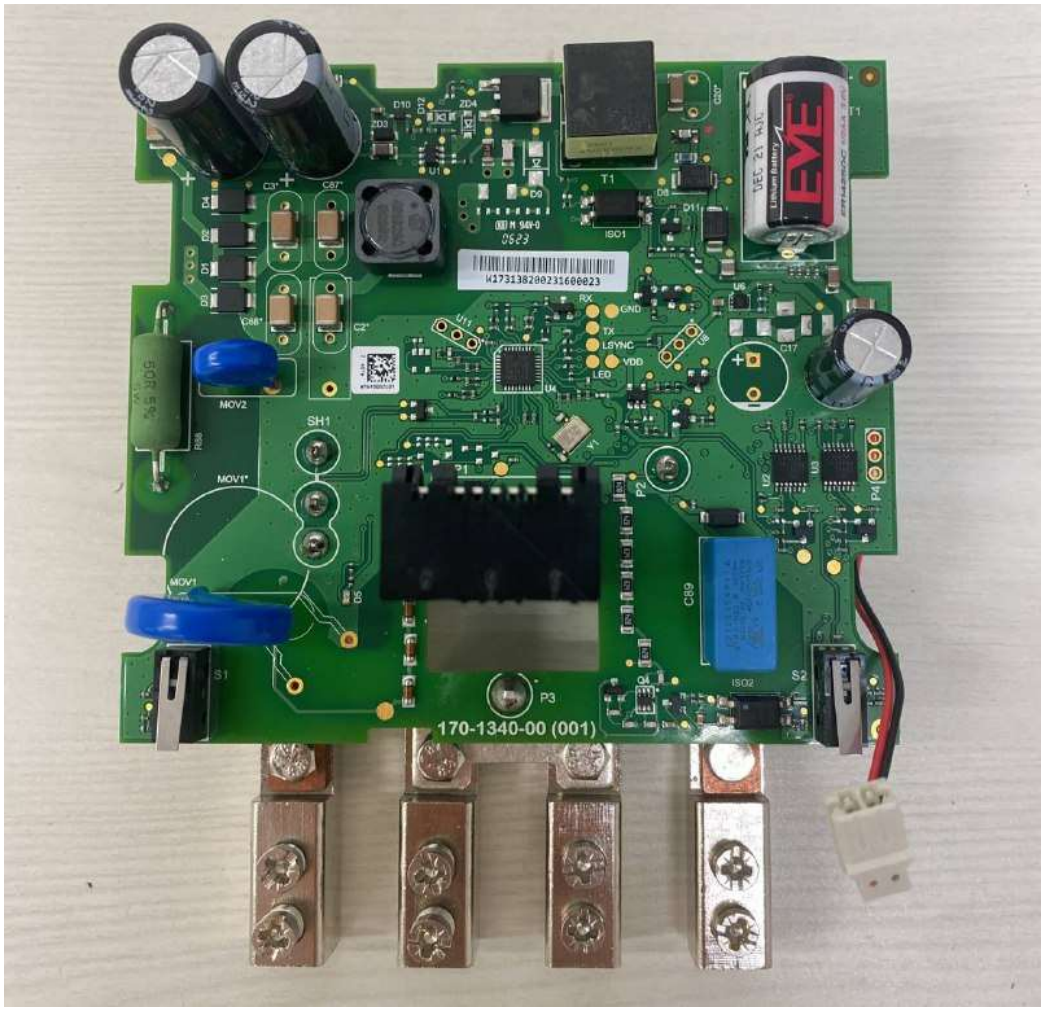
PHOTOGRAPH

Front layer rear PWB



PHOTOGRAPH

Bottom of PWB

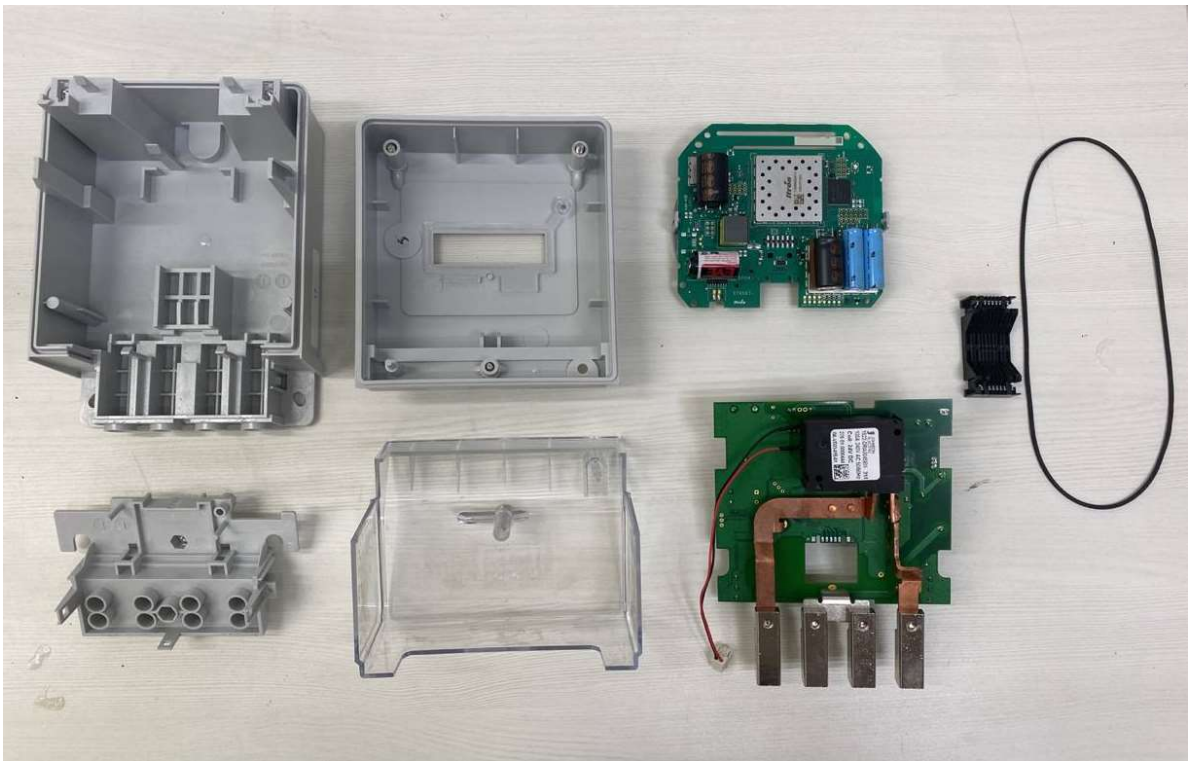


PHOTOGRAPH

Bottom layer with rear end

PHOTOGRAPH

Inside Enclosure



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