# EZ 12S

Future of Socket SubmeterS

## Solid State Socket Meter Model#EZ 12S

### Product Overview

The backbone of this meter is powered by EZ Meter's robust, revenue grade proven product line modified to meet our client's ever evolving needs. This is designed for Read, Bill and Collect companies to remotely read a socket meter with the NextCentury Radio System.

### Next Century System

The simplicity of installation combined with our passion for providing the highest quality products and services has led NextCentury's solution to become the new standard across all applications of submetering.

### Features:

- Meters are UL Listed
- Radios are FCC Certified
- Radio is serially connected, not pulse related
- No start up pulse generated
- Revenue grade accuracy
- Mobile App for in-field setup
- Real-time verification of network communication
- Open API access to interval data
- Radio serial # engraved on front with barcode for easy installation




### Benefits

- NextCentury Integrated Radio
- Pre-Programming Available
- NextCentury Gateway Enabled
- Radio doesn't require battery
- Tested to ANSI C12.20 Accuracy

### Meter Specifications:

Nominal Voltage: 120/208 Vac

Frequency: 50-60 Hz

Power Consumption: Less than 2 watts

Automatic Meter Reading: Pulse with 3.3V

Pulse Duration: 50 milliseconds

Physical Size: 6.97"x4.93"

Available Forms: 12S

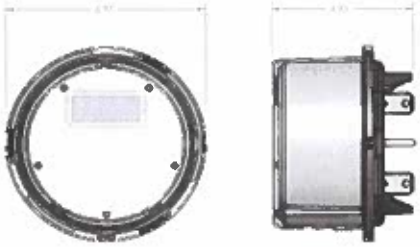
Operating Temp -20F to 160F

-20C to 71.1C

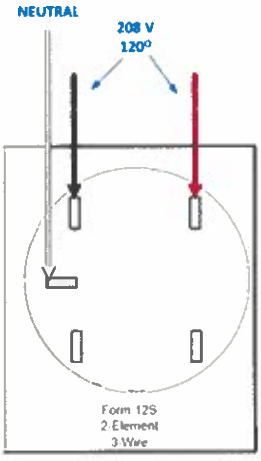
Storage Temp -40F to 160F

-40C to 71.1C

Accuracy: Revenue Grade








### TR4-E Embedded NC Specifications (Optional):

- FCC 2A8EC-TR4 | IC 28950-TR4
- 902-928 MHz wireless, unlicensed band
- Advanced two-way communication
- Redundant software and hardware encryption
- Automatic route discovery and optimization

For more info on this product line please contact Ryan Fetgatter at ryan@ezmeter.com

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# ANSI C12.1:2024 Test Report

For the

## EZ Meter E.M.O Technologies
## EZ 2S & EZ 12S (Utility socket meters w/RF capability

**Engineering Statement:** The measurements shown in this report were made in accordance with the procedures indicated. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements.



Johnnie Evans
General Manager


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## Report Status Sheet

| Revision | Report Date | Reason for Revision |
|---|---|---|
| Ø | July 9, 2025 | Initial Issue (EMC Draft 1) |
| 1 | August 29, 2025 | Updated all datasheets to support searchability (EMC Draft 2) |


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# 1 Executive Summary

Eurofins Electrical and Electronic Testing NA, LLC was contracted by EZ Meter E.M.O Technologies to perform testing on the EZ 2S & EZ 12S (Utility socket meters w/RF capability), under purchase order number 1EZM1703 /1EZM1703R1.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of EZ Meter E.M.O Technologies, EZ 2S & EZ 12S (Utility socket meters w/RF capability). The results obtained relate only to the item(s) tested.

| | |
|---|---|
| **Equipment Under Test:** | EZ 2S & EZ 12S (Utility socket meters w/RF capability) |
| **Model Number:** | EZ 2S<br>EZ 12S |
| **Ambient Lab Test Conditions:** | Temperature: 23º C±2°C |
| | Relative Humidity: 30-60% |
| | Atmospheric Pressure: 860-1060 mbar |
| **Evaluated by:** | Donald Salguero; Steven Lu; William Yip; Brandon Tracy |
| **Test date(s) covered:** | April 16, 2025<br>April 18, 2025<br>April 21, 2025<br>April 22, 2025<br>April 24, 2025<br>April 25, 2025<br>April 28, 2025<br>April 29, 2025<br>May 6, 2025<br>May 7, 2025<br>May 15, 2025<br>May 16, 2025<br>May 21, 2025<br>May 22, 2025 |

The test methods conducted on the EZ 2S & EZ 12S (Utility socket meters w/RF capability) and the corresponding results, as detailed in Table 1, were found to comply with the following specification(s):

- ANSI C12.1:2024, Electric Meters – Code for Electricity Meters
- Accuracy Class: 0.2


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| ANSI C12.1 Section | Test No. | Test Name | Test Result |
|---|---|---|---|
| | | Performance Requirement (As Received) | Completed |
| 4.7.2.1 | 1 | No Load | Complied |
| 4.7.2.2 | 2 | Starting Load | Complied |
| 4.7.2.3 | 3 | Load Performance | Complied |
| 4.7.2.4 | 4 | Effect of Variation of Power Factor | Complied |
| 4.7.2.5 | 5 | Effect of Variation of Voltage | Complied |
| 4.7.2.6 | 6 | Effect of Variation of Frequency | Complied |
| 4.7.2.7 | 7 | Equality of Current Circuits | Complied |
| 4.7.2.8 | 8 | Meter Losses | Complied |
| 4.7.2.9 | 9 | Temperature Rise | Complied |
| 4.7.2.11 | 11 | Effect of Internal Heating | Complied |
| 4.7.2.12 | 12 | Effect of Tilt - Test #12 | Not Applicable |
| 4.7.2.13 | 13 | Stability of Performance | Complied |
| 4.7.2.14 | 14 | Effect of Phase Sequence Reversal | Complied |
| 4.7.3.1 | 15 | Insulation | Complied |
| 4.7.3.2 | 16 | Voltage Interruptions Test | Complied |
| 4.7.3.3.1 | 17 | 100 kHz Ring Wave | Complied |
| 4.7.3.3.2 | 17 | 1.2/ 50 microsecond – 8/20 microsecond Combination Wave | Complied |
| 4.7.3.4 | 18 | Effect of External Magnetic Field | Complied |
| 4.7.3.5 | 19 | Effects of Variation of Ambient Temperature | Complied |
| 4.7.3.6 | 20 | Effect of Temporary Overloads | Complied |
| 4.7.3.7 | 21 | Effect of Current Surges in Ground Conductor | Complied |
| 4.7.3.8 | 22 | Effect of Superimposed Signals | Not Applicable |
| 4.7.3.9 | 23 | Effect of Voltage Variation – Secondary Time Base | Not Applicable |
| 4.7.3.10 | 24 | Effect of Variation of Ambient Temperature-Secondary Time Base | Not Applicable |
| 4.7.3.11 | 25 | Effect of Electrical Fast Transient/Burst Test | Complied |
| 4.7.3.11 | 25a | Effect of Electrical Oscillatory SWC Test | Complied |
| 4.7.3.12 | 26a | Radiated Interference | Complied |
| 4.7.3.12 | 26b | Conducted Interference | Complied |
| 4.7.3.13 | 27 | Conducted Emissions | Complied |
| 4.7.3.13 | 27 | Radiated Emissions | Complied |
| 4.7.3.14 | 28 | ESD | Complied |
| 4.7.3.15 | 29 | Effect of Storage Temperature | Not Applicable |
| 4.7.3.16 | 30 | Effect of Operating Temperature | Complied |
| 4.7.3.17 | 31 | Effect of Relative Humidity | Data TBD |
| 4.7.3.18 | 32 | Mechanical Shock | Data TBD |
| 4.7.3.19 | 33 | Transportation Drop | Data TBD |
| 4.7.3.20 | 34 | Mechanical Vibration | Data TBD |
| 4.7.3.21 | 35 | Transportation Vibration | Data TBD |
| 4.7.3.22 | 36 | Weather Simulation test | Data TBD |
| 4.7.3.23 | 37 | Salt-Spray test | Data TBD |
| 4.7.3.24 | 38 | Rain-tightness | Data TBD |
| 4.7.4.1 | 39 | 90 Degree phase fired waveform | Complied |
| 4.7.4.2 | 40 | Quadriform waveform | Complied |
| 4.7.4.3 | 41 | Peaked waveform | Complied |
| 4.7.4.4 | 42 | Pulse waveform | Complied |
| 4.7.4.5 | 43 | Multiple zero crossings on current | Complied |
| 4.7.4.6 | 44 | Multiple zero crossings on voltage | Complied |

**Table 1 - Executive Summary of Compliance Testing**


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# 2 Applicable Documents

| Publication | Title |
|---|---|
| **ANSI C12.1:2024** | American National Standard for Electric Meters – Code for Electricity Metering |
| **ANSI/IEEE C63.4:2014** | Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz |
| **ASTM B117:2019** | Standard Practice for Operating Salt Spray (Fog) Apparatus |
| **ASTM G155:2021** | Standard Practice for Operating Xenon Arc Lamp Apparatus for Exposure of Materials |
| **IEC 61000-4-2:2008** | Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test |
| **IEC 61000-4-3:2020** | Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test |
| **IEC 61000-4-4:2012** | Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test |
| **IEC 61000-4-6:2013** | Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio frequency fields. |
| **IEC 61000-4-8:2009** | Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test |
| **IEEE C37.90.1:2012** | IEEE Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus |
| **IEEE C62.41.1:2002** | IEEE Guide on the Surge Environment in Low-Voltage (1000 V and less) AC Power Circuits |
| **IEEE C62.41.2:2002** | IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000V and less) AC Power Circuits |
| **IEEE C62.45:2002** | IEEE Recommended Practice on Surge Testing for Equipment Connected to Low Voltage (1000 V and less) AC Power Circuits |
| **IEC 60068-2-6:2007** | Environmental Testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal) |
| **IEC 60068-2-27:2008** | Environmental Testing - Part 2-27: Tests - Test Ea and guidance: Shock |
| **International Safe Transit Association, Test Procedure 1A** | Performance Test for Individual Packaged - Products Weighing 150 lb. (68 kg) or Less (revision date: 2001), Vibration and Shock |
| **ISO/IEC 17025: 2017** | General Requirements for the Competence of Testing and Calibration Laboratories |

# 3 Terms and Abbreviations

The following abbreviations may be referenced within this report.

| | |
|---|---|
| **AC** | Alternating Current |
| **ACD** | Auxiliary Communication Device |
| **A/m** | Amps per meter |
| **BCI** | Bulk Cable Injection |
| **CDN** | Coupling-Decoupling Network |
| **CE** | Conducted Emissions |
| **CI** | Conducted Immunity |
| **cm** | centimeter |
| **dB** | Decibels |
| **dBµV** | Decibels (voltage level) referenced to 1 microvolt across 50 ohms |
| **dBµV/m** | Decibels (voltage level) referenced to 1 microvolt per meter |
| **DC** | Direct Current |
| **EMC** | Electromagnetic Compatibility |
| **EMI** | Electromagnetic Interference |
| **ESD** | Electrostatic Discharge |
| **EUT** | Equipment Under Test |
| **G** | Gig |
| **GHz** | Gigahertz |
| **GUI** | Graphical User Interface |
| **H** | Magnetic Field |
| **H/V** | Horizontal/Vertical |
| **Hz** | Hertz |
| **kHz** | kilohertz |
| **LISN** | Line Impedance Stabilization Network |
| **M/N** | Model Number |
| **m** | Meter |
| **max** | Maximum |
| **µH** | Microhenry |
| **MHz** | Megahertz |
| **MI** | Magnetic Immunity |
| **pF** | Picofarad |
| **P/N** | Part Number |
| **RE** | Radiated Emissions |
| **RI** | Radiated Immunity |
| **RMS** | Root Mean Square |
| **S/N** | Serial Number |
| **%** | Percent |
| **Ω** | Ohm |
| **UUT** | Unit Under Test |
| **V/m** | Volts per meter |

# 4 General Requirements

## 4.1 Test Site

Eurofins Electrical and Electronic Testing NA, LLC is part of the Eurofins Electrical & Electronics (E&E) global compliance network.

All testing was performed at Eurofins Electrical and Electronic Testing NA, LLC., 914 West Patapsco Avenue, Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology. Eurofins Electrical and Electronic Testing NA, LLC has been accredited by the American Association for Laboratory Accreditation (A2LA) (Certificate #: 0591.01) in accordance with ISO/IEC 17025:2017.

## 4.2 Measurement Uncertainty

Measurement uncertainty calculated as per NIST Technical Note (TN) 1297 and ANSI / NCSL Z540-2, as equivalent to EN 55016-4-2 / IEC CISPR 16-4-2.

| Test Method | Typical Expanded Uncertainty (dB) | K | Confidence Level |
|---|---|---|---|
| Radiated Emissions, (30 MHz – 1 GHz) | ±4.58 | 2 | 95% |
| Conducted Emission Voltage | ±3.33 | 2 | 95% |
| Radiated Immunity | ±2.61 | 2 | 95% |
| Conducted Immunity, (CDN) | ±1.72 | 2 | 95% |

**Table 2 - Measurement Uncertainty**

For the Electrostatic Discharge (ESD), Electrical Fast Transient/Burst (EFT/B), and Surge immunity tests, the limits for the most common sources of measurement uncertainty are provided in the test methods. The test equipment used to execute these tests has been verified to ensure that it complies with the requirements of the applicable standards and the results have been reported according to the applicable standards. Therefore, the measurement uncertainty requirements have been met.

## 4.3 Detector

For the conducted emissions testing, Quasi-peak and Average detectors were utilized in accordance with CISPR 16.

For the radiated emissions testing, a Quasi-peak detector was utilized in accordance with CISPR 16.

## 4.4 Test Automation Software

Eurofins E&E North America uses commercial software to control and record data from test instrumentation for the test methods listed below:

| Test Description | Software Version |
|---|---|
| Meter Accuracy Measurements | WATT-Net Version 7.1.1348.0 |
| Conducted Emissions | TILE! Version 7.9.2.5 |
| Radiated Emissions | TILE! Version 7.9.2.5 |
| Radiated Immunity | TILE! Version 7.9.2.5 |
| Conducted Immunity | TILE! Version 7.9.2.5 |

**Table 3 - Test Software Version**

# 5 Equipment Under Test

| | |
|---|---|
| **Name of EUT/Model:** | EZ 2S & EZ 12S (Utility socket meters w/RF capability) |
| **Description of EUT:** | Utility socket meters configured for use in standard 2S a 12S sockets. Meters are supplied with RF (wireless) capability. |
| **Mode of Operation:** | Meters are powered by connection to socket (V) and current flows through meter to provide kWh accumulated reading on its display and by wireless communication. |
| **Monitoring Method(s):** | Meters can be read directly from display or through wireless access. |
| **Estimated Additional Time to Monitor and Verify Each Reading via Wireless Communications (or other) during Tests:** | The kWh reading < 10 seconds. |
| **What is the highest frequency generated or used within this device? (including the Tx/Rx frequency, if it is a wireless transmitter)** | Transceiver (wireless): 902-928 MHz Unlicensed Band Metercrystal oscillator frequency: 16.384MHz |

**Table 4 - Equipment Details**


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Distribution Circuit Configuration:(1-Phase 2-Wire;1-Phase 3-Wire;3-Wire Network;3-Wire 3-Phase Delta;4-Wire 3-Phase Delta:4-Wire 3-Phase Wye)
Voltage: (L-N and/or L-L voltages per configuration)
Test Amps: Recommended TA points per CL - CL2: 0.25; CL10: 2.5; CL20: 2.5; CL100: 15; CL200: 30; CL320: 50

| Meter Form | Distribution Circuit Configuration | Voltage L-N | Voltage L-L | Current Class | Test Amps | Accuracy Class | Model/Part Number | Serial Number | Firmware Revision | External CT or Sensor |
|---|---|---|---|---|---|---|---|---|---|---|
| 2S | Single-Phase | 120 VAC | 240 VAC | 200 | 30 | 0.2 | EZ 2S | 11F0075D | | N/A |
| 2S | Single-Phase | 120 VAC | 240 VAC | 200 | 30 | 0.2 | EZ 2S | 11F0075E | | N/A |
| 2S | Single-Phase | 120 VAC | 240 VAC | 200 | 30 | 0.2 | EZ 2S | 11F009E7 | | N/A |
| 12S | 3-Wire Network | 120 VAC | 208 VAC | 200 | 30 | 0.2 | EZ 12S | 11F00911 | | N/A |
| 12S | 3-Wire Network | 120 VAC | 208 VAC | 200 | 30 | 0.2 | EZ 12S | 11F004CD | | N/A |
| 12S | 3-Wire Network | 120 VAC | 208 VAC | 200 | 30 | 0.2 | EZ 12S | 11F004CA | | N/A |
| 2S | Single-Phase | 120 VAC | 240 VAC | 200 | 30 | 0.2 | EZ 2S | 11F013C3 | | N/A |
| 2S | Single-Phase | 120 VAC | 240 VAC | 200 | 30 | 0.2 | EZ 2S | 11F013C5 | | N/A |
| 2S | Single-Phase | 120 VAC | 240 VAC | 200 | 30 | 0.2 | EZ 2S | 11F013C7 | | N/A |

**Table 5 - EUT List**

## 5.1 Modifications

### 5.1.1 Modifications to the EUT

No modifications were made to the EUT.

### 5.1.2 Modifications to the Standard

No modifications were made to the Test Standard.

## 5.2 Disposition of EUT

The test sample including all support equipment (if any), submitted to the Electromagnetic Compatibility Lab for testing was returned to EZ Meter E.M.O Technologies upon completion of testing.

# 6 Detailed Test Results

## 6.1 Performance Verification

### 6.1.1 Test Requirement(s)

The meter shall be mounted on a support that is free of vibration. All alternating-current tests shall be conducted on a circuit supplied by a sine-wave source, with a total harmonic distortion no greater than 1% on current and voltage. For meters with auxiliary devices powered line-to-line, the meter shall be tested with the voltage and current circuits individually energized to power the auxiliary device as it would be in the normal operation.

All tests, unless otherwise indicated in specified tests, shall be made at 23°C±2°C; rated voltage ±1%; rated frequency ±1 Hz; test amperes ±1%; and unity power factor (0°±2). The meter shall be stabilized at ambient temperature before performance tests are made. The meter performance under the test conditions above shall be as close as practical to zero error and in no case shall exceed ±0.4% error for accuracy class 1.0, 0.2% error for accuracy class 0.5, 0.1% error for accuracy class 0.2, or 0.05% error for accuracy class 0.1. The meter shall not be readjusted for the duration of the testing. This requirement only applies to type testing approval and is not intended for incoming acceptance testing or in-service testing.

### 6.1.2 Loading for accuracy tests

Unless otherwise specified, polyphase loading shall be used for calibration type tests listed in Table 10 for polyphase meters. Single-phase loading shall be used for calibration type tests listed in Table 10 of ANSI C12.1 for single-phase meters.

For polyphase loading, the meter shall be tested with voltage and current phase angles similar to actual service installations as described (polyphase loading) in Table 7 of ANSI C12.1. If the meter is certified for use with an alternate loading configuration, then for those tests designated in the Required Alternate Loading Tests column of Table 10 of ANSI C12.1, testing shall be performed using all Alternate Loading configuration(s) particular to the type description shown in Table 7 of ANSI C12.1. The internal meter connections for these Forms Designation are provided in ANSI C12.10.

### 6.1.3 Test Data and Results

The meters listed below are **compliant** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| 12S | CL200 | 120V/208V | 60Hz | SN 11F00911 |
| 12S | CL200 | 120V/208V | 60Hz | SN 11F004CD |
| 12S | CL200 | 120V/208V | 60Hz | SN 11F004CA |
| 2S | CL200 | 240V | 60Hz | SN 11F013C3 |
| 2S | CL200 | 240V | 60Hz | SN 11F013C5 |
| 2S | CL200 | 240V | 60Hz | SN 11F013C7 |
| 2S | CL200 | 240V | 60Hz | SN 11F00536 |
| 2S | CL200 | 240V | 60Hz | SN 11F00587 |
| 12S | CL200 | 120V/208V | 60Hz | SN 11F00510 |
| 2S | CL200 | 240V | 60Hz | SN 11F00947 |
| 12S | CL200 | 120V/208V | 60Hz | SN 11F00740 |
| 12S | CL200 | 120V/208V | 60Hz | SN 11F009751 |

Refer to the following test data and photographs for a complete overview of the test setup and results.


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| Performance Verification (As Received) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature (C)** | | | | | |
| **Engineer** | Steven Lu | | **Humidity (RH)** | | | | | |
| **Test Date** | 6/26/2025 | | **Observations** | None | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Serial Number** | 11F01951 | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **Zero Error Percentage** | **Limit from Zero Error** | **Result** |
| **Full Load** | 120 | 60 | 30 | 1.0 | 100.012 | 0.012 | ± 0.1 % | Pass |
| **Light Load** | 120 | 60 | 3 | 1.0 | 100.036 | 0.036 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 30 | 0.5 Lag | 100.161 | 0.161 | ± 0.2 % | Pass |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Serial Number** | 11F01940 | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **Zero Error Percentage** | **Limit from Zero Error** | **Result** |
| **Full Load** | 120 | 60 | 30 | 1.0 | 100.014 | 0.014 | ± 0.1 % | Pass |
| **Light Load** | 120 | 60 | 3 | 1.0 | 100.024 | 0.024 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 30 | 0.5 Lag | 100.160 | 0.160 | ± 0.2 % | Pass |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Serial Number** | 11F01947 | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **Zero Error Percentage** | **Limit from Zero Error** | **Result** |
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.928 | -0.072 | ± 0.1 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.940 | -0.060 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.964 | -0.036 | ± 0.2 % | Pass |

**Table 6 - As Received, Performance Verification**




**Photograph 1 - As Received, Test Setup**

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## 6.2 Test No. 1: No Load

### 6.2.1 Test Requirement(s)

The meter with the voltage circuit(s) energized and current circuit(s) open shall not issue more than 1 pulse on its output test pulse or accumulate more energy, in watthours, than the equivalent of 1 test pulse within 10 minutes and no additional equivalent test output pulses in the next 20 minutes.

Meters equipped with an ACD shall not exceed applicable limits while the ACD is being operated in the extreme state.

### 6.2.2 Test Procedure

The EUT was energized and observed for kWh consumption for a 30 minute period.

### 6.2.3 Test Data and Results

The meters listed below are **compliant** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120/208V | 60Hz | SN 11F00911 |
| Form 12S | CL200 | 120/208V | 60Hz | SN 11F004CA |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C7 |

Refer to the following test data and photographs for a complete overview of the test setup and results.


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| Test No. 1: No Load | | | | | |
|---|---|---|---|---|---|
| **Project Number** | 135452 | | **Temperature (C)** | 22.7 | |
| **Engineer** | Steven Lu | | **Humidity (RH)** | 52.0% | |
| **Test Date** | 5/15/2025 | | **Observations** | None | |
| | | | | | |
| **Meter Form** | 12S | | | | |
| **Current Class** | 200 | | | | |
| **Accuracy Class** | 0.2 | | | | |
| **Serial Number** | 11F00911 | | | | |
| **ACD State** | Extreme | | | | |
| **Time** | **Voltage** | **Current** | **Wh Reading** | **Result** | |
| t = 0 minutes | 120 | 0 | 121 | Reference | |
| t = 10 minutes | | | 121 | Pass | |
| t = 30 minutes | | | 121 | Pass | |
| | | | | | |
| **Meter Form** | 12S | | | | |
| **Current Class** | 200 | | | | |
| **Accuracy Class** | 0.2 | | | | |
| **Serial Number** | 11F004CD | | | | |
| **ACD State** | Extreme | | | | |
| **Time** | **Voltage** | **Current** | **Wh Reading** | **Result** | |
| t = 0 minutes | 120 | 0 | 200 | Reference | |
| t = 10 minutes | | | 200 | Pass | |
| t = 30 minutes | | | 200 | Pass | |
| | | | | | |
| **Meter Form** | 2S | | | | |
| **Current Class** | 200 | | | | |
| **Accuracy Class** | 0.2 | | | | |
| **Serial Number** | 11F013C7 | | | | |
| **ACD State** | Extreme | | | | |
| **Time** | **Voltage** | **Current** | **Wh Reading** | **Result** | |
| t = 0 minutes | 240 | 0 | 172 | Reference | |
| t = 10 minutes | | | 172 | Pass | |
| t = 30 minutes | | | 172 | Pass | |

**Table 7 - Test 1 No Load, Extreme State**


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**Photograph 2 - Test 1 No Load, Test Setup**

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### 6.2.4 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 1, No Load Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 4T1512 | WECO Meter Accuracy Tester w/ internal Radian st | Radian | WECO M4330X; Radian RX-30 | WECO: W8839; Radian: 710257 | N/A | 5/30/2026 |
| 1T9999 | Thermometer/ Hygrometer | VWR International | 36934-164 | 230368599 | 5/31/2023 | 5/31/2025 |

**Table 8 - Test 1 No Load, Equipment List**


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## 6.3 Test No. 2: Starting Load

### 6.3.1 Test Requirement(s)

The meter shall operate continuously with a load current as specified in Table 9. The lowest rated voltage value shall be used for wide ranging meters.

If the meter is designed for measurement of energy in both directions, then these conditions shall be performed twice, once with the energy flowing only in the delivered direction, and once with energy flowing only in the received direction.

For meters equipped with an ACD, two separate ACD tests shall be conducted, and shall meet the requirement while being operated in the following separate states. (Clause 4.5.6.7 of ANSI C12.1: 2024 does not apply in this case).

a) Dormant State
b) Extreme State

Note: This does not mean the ACD should simultaneously operate in both dormant and extreme states.

| Current Class | Current in Amperes | | | |
|---|---|---|---|---|
| | 1.0 Accuracy Class | 0.5 Accuracy Class | 0.2 Accuracy Class | 0.1 Accuracy Class |
| 2 | 0.003 | 0.001 | 0.001 | 0.001 |
| 10 | 0.025 | 0.01 | 0.01 | 0.01 |
| 20 | 0.025 | 0.01 | 0.01 | 0.01 |
| 100 | 0.15 | 0.05 | 0.05 | 0.05 |
| 200 | 0.3 | 0.1 | 0.1 | 0.1 |
| 320 | 0.5 | 0.16 | 0.16 | 0.16 |

**Table 9 - Starting Load Test**

### 6.3.2 Test Data and Results

The meters listed below are **compliant** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CA |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F00911 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C7 |

Refer to the following test data and photographs for a complete overview of the test setup and results.


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| Test No. 2: Starting Load | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | Steven Lu | | **Humidity (RH)** | 52.0% | | | | | |
| **Test Date** | 5/15/2025 | | **Observations** | None | | | | | |
| **Meter Form** | **Current Class** | **Accuracy Class** | **Serial Number** | **ACD State** | **Voltage (V)** | **Current (A)** | **Energy Direction** | **Operated Continuously** | **Result** |
| 12S | 200 | 0.2 | 11F00911 | Dormant | 120 | 0.1 | Delivered | Yes | Pass |
| 12S | 200 | 0.2 | 11F004CD | Dormant | 120 | 0.1 | Delivered | Yes | Pass |
| 2S | 200 | 0.2 | 11F013C7 | Dormant | 240 | 0.1 | Delivered | Yes | Pass |
| 12S | 200 | 0.2 | 11F00911 | Extreme | 120 | 0.1 | Delivered | Yes | Pass |
| 12S | 200 | 0.2 | 11F004CD | Extreme | 120 | 0.1 | Delivered | Yes | Pass |
| 2S | 200 | 0.2 | 11F013C7 | Extreme | 240 | 0.1 | Delivered | Yes | Pass |

**Table 10 - Test 2 Starting Load**


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**Photograph 3 - Test 2 Starting Load, Test Setup**

### 6.3.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 2, Start Load Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 4T1512 | WECO Meter Accuracy Tester w/ internal Radian st | Radian | WECO M4330X; Radian RX-30 | WECO: W8839; Radian: 710257 | N/A | 5/30/2026 |
| 1T9999 | Thermometer/ Hygrometer | VWR International | 36934-164 | 230368599 | 5/31/2023 | 5/31/2025 |

**Table 11 - Test 2 Starting Load, Equipment List**

## 6.4 Test No. 3: Load Performance

### 6.4.1 Test Requirement(s)

The performance of the meter shall not deviate from the reference registration by an amount exceeding the maximum deviation specified in Table 12.

For meters equipped with an ACD, this test should be conducted with the ACD in the dormant state. See 4.5.6.7 of ANSI C12.1: 2024 for ACD test options.

| Condition | Current in Amperes | | | | | | Maximum Deviation in Percent from Reference Performance | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Current Class | | | | | | Accuracy Class | | | |
| | 2 | 10 | 20 | 100 | 200 | 320 | 1.0 | 0.5 | 0.2 | 0.1 |
| 1 | 0.015 | 0.15 | 0.15 | 1 | 2 | 3 | ±2.0 | ±1.0 | ±0.4 | ±0.2 |
| 2* | 0.025 | 0.25 | 0.25 | 1.5 | 3 | 5 | ±1.0 | ±0.5 | ±0.2 | ±0.1 |
| 3 | 0.05 | 0.5 | 0.5 | 3 | 6 | 10 | ±1.0 | ±0.5 | ±0.2 | ±0.1 |
| 4 | 0.15 | 1.5 | 1.5 | 10 | 20 | 30 | ±1.0 | ±0.5 | ±0.2 | ±0.1 |
| 5* | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | Ref. | Ref. | Ref. | Ref. |
| 6 | 0.5 | - | 5 | 30 | 60 | 75 | ±1.0 | ±0.5 | ±0.2 | ±0.1 |
| 7 | 1 | 5 | 10 | 50 | 100 | 100 | ±1.5 | ±0.5 | ±0.2 | ±0.1 |
| 8* | 1.5 | 74.5 | 15 | 75 | 150 | 150 | ±2.0 | ±0.5 | ±0.2 | ±0.1 |
| 9 | 1.8 | - | 18 | 90 | 180 | 250 | ±2.0 | ±0.5 | ±0.2 | ±0.1 |
| 10 | - | 10 | - | 100 | 200 | 300 | ±2.0 | ±0.5 | ±0.2 | ±0.1 |
| 11 | 2 | - | 20 | - | - | 320 | ±2.5 | ±0.5 | ±0.2 | ±0.1 |

**Table 12 - Load Performance Test**

*If the meter is designed for measurement of energy in both directions, then these conditions shall be performed twice, once with energy flowing only in the delivered direction, and once with energy flowing only in the received direction.

Note: (1) The error in this reference condition shall conform to the requirements of Section 4.7.1 of ANSI C12.1: 2024.

The performance of the meters equipped with an ACD shall not deviate from the reference registration by an amount exceeding the maximum deviation in Table 13 below. Reference measurements must be made in the dormant state. (Clause 4.5.6.7 of ANSI C12.1: 2024 does not apply in this case.)

| Condition | Current in Amperes | | | | | | ACD State | Maximum Deviation in Percent from Reference Performance | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Current Class | | | | | | | Accuracy Class | | | |
| | 2 | 10 | 20 | 100 | 200 | 320 | | 1.0 | 0.5 | 0.2 | 0.1 |
| Reference for (1) | 0.015 | 0.15 | 0.15 | 1 | 2 | 3 | DORMANT | Ref. | Ref. | Ref. | Ref. |
| 1 | 0.015 | 0.15 | 0.15 | 1 | 3 | 3 | EXTREME | ±0.67 | ±0.33 | ±0.2 | ±0.1 |
| Reference for (2) | 0.025 | 0.25 | 0.25 | 1.5 | 3 | 5 | DORMANT | Ref. | Ref. | Ref. | Ref. |
| 2 | 0.025 | 0.25 | 0.25 | 1.5 | 3 | 5 | EXTREME | ±0.33 | ±0.17 | ±0.1 | ±0.05 |
| Reference for (3) | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | DORMANT | Ref. | Ref. | Ref. | Ref. |
| 3 | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | EXTREME | ±0.33 | ±0.17 | ±0.1 | ±0.05 |

**Table 13 - ACD Extreme State Load Performance Test**

Note: (1) The error in this reference condition shall conform to the requirements of Section 4.7.1 of ANSI C12.1: 2024 .


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### 6.4.2 Test Data and Results

The meters listed below are **compliant** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CD |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F00911 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C7 |

Refer to the following test data and photographs for a complete overview of the test setup and results.

| Test No. 3: Load Performance | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.8 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 52.0% | | | | | |
| **Test Date** | 5/16/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F004CD | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Energy Direction** | **Accuracy Percentage** | **Percent Deviation** | **Maximum Deviation** | **Result** |
| 1 | 120 | 60 | 2 | Delivered | 99.996 | 0.000 | ±0.4 | Pass |
| 2 | 120 | 60 | 3 | Delivered | 100.003 | 0.007 | ±0.2 | Pass |
| 3 | 120 | 60 | 6 | Delivered | 100.004 | 0.008 | ±0.2 | Pass |
| 4 | 120 | 60 | 20 | Delivered | 99.997 | 0.001 | ±0.2 | Pass |
| 5 | 120 | 60 | 30 | Delivered | 99.996 | Reference | | |
| 6 | 120 | 60 | 60 | Delivered | 99.995 | -0.001 | ±0.2 | Pass |
| 7 | 120 | 60 | 100 | Delivered | 100.007 | 0.011 | ±0.2 | Pass |
| 8 | 120 | 60 | 150 | Delivered | 100.037 | 0.041 | ±0.2 | Pass |
| 9 | 120 | 60 | 180 | Delivered | 100.060 | 0.064 | ±0.2 | Pass |
| 10 | 120 | 60 | 200 | Delivered | 100.067 | 0.071 | ±0.2 | Pass |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **ACD State** | **Accuracy Percentage** | **Percent Deviation** | **Maximum Deviation** | **Result** |
| 1 | 120 | 0 | 2 | Dormant | 99.996 | Reference | | |
| 1 | 120 | 0 | 2 | Extreme | 99.974 | -0.022 | ±0.2 | Pass |
| 2 | 120 | 0 | 3 | Dormant | 100.003 | Reference | | |
| 2 | 120 | 0 | 3 | Extreme | 99.978 | -0.025 | ±0.1 | Pass |
| 3 | 120 | 0 | 30 | Dormant | 99.996 | Reference | | |
| 3 | 120 | 0 | 30 | Extreme | 99.961 | -0.035 | ±0.1 | Pass |

**Table 14 - Test 3 Load Performance (Class 0.2), 12S, SN 11F004CD**


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| Test No. 3: Load Performance | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature (C)** | 22.8 | | | | |
| **Engineer** | Steven Lu | | **Humidity (RH)** | 52.0% | | | | |
| **Test Date** | 5/16/2025 | | **Observations** | None | | | | |
| | | | | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F00911 | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Energy Direction** | **Accuracy Percentage** | **Percent Deviation** | **Maximum Deviation** | **Result** |
| 1 | 120 | 60 | 2 | Delivered | 100.004 | 0.004 | ±0.4 | Pass |
| 2 | 120 | 60 | 3 | Delivered | 100.009 | 0.009 | ±0.2 | Pass |
| 3 | 120 | 60 | 6 | Delivered | 100.011 | 0.011 | ±0.2 | Pass |
| 4 | 120 | 60 | 20 | Delivered | 100.004 | 0.004 | ±0.2 | Pass |
| 5 | 120 | 60 | 30 | Delivered | 100.000 | Reference | | |
| 6 | 120 | 60 | 60 | Delivered | 100.007 | 0.007 | ±0.2 | Pass |
| 7 | 120 | 60 | 100 | Delivered | 100.013 | 0.013 | ±0.2 | Pass |
| 8 | 120 | 60 | 150 | Delivered | 100.045 | 0.045 | ±0.2 | Pass |
| 9 | 120 | 60 | 180 | Delivered | 100.050 | 0.050 | ±0.2 | Pass |
| 10 | 120 | 60 | 200 | Delivered | 100.074 | 0.074 | ±0.2 | Pass |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **ACD State** | **Accuracy Percentage** | **Percent Deviation** | **Maximum Deviation** | **Result** |
| 1 | 120 | 0 | 2 | Dormant | 100.004 | Reference | | |
| 1 | 120 | 0 | 2 | Extreme | 99.997 | -0.007 | ±0.2 | Pass |
| 2 | 120 | 0 | 3 | Dormant | 100.009 | Reference | | |
| 2 | 120 | 0 | 3 | Extreme | 99.999 | -0.010 | ±0.1 | Pass |
| 3 | 120 | 0 | 30 | Dormant | 100.000 | Reference | | |
| 3 | 120 | 0 | 30 | Extreme | 99.985 | -0.015 | ±0.1 | Pass |

**Table 15 - Test 3 Load Performance (Class 0.2), 12S, SN 11F00911**

| Test No. 3: Load Performance | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature (C)** | 22.3 | | | | |
| **Engineer** | Steven Lu | | **Humidity (RH)** | 48.0% | | | | |
| **Test Date** | 5/6/2025 | | **Observations** | None | | | | |
| | | | | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C7 | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Energy Direction** | **Accuracy Percentage** | **Percent Deviation** | **Maximum Deviation** | **Result** |
| 1 | 240 | 60 | 2 | Delivered | 99.984 | 0.008 | ±0.4 | Pass |
| 2 | 240 | 60 | 3 | Delivered | 99.988 | 0.012 | ±0.2 | Pass |
| 3 | 240 | 60 | 6 | Delivered | 99.991 | 0.015 | ±0.2 | Pass |
| 4 | 240 | 60 | 20 | Delivered | 99.978 | 0.002 | ±0.2 | Pass |
| 5 | 240 | 60 | 30 | Delivered | 99.976 | Reference | | |
| 6 | 240 | 60 | 60 | Delivered | 99.979 | 0.003 | ±0.2 | Pass |
| 7 | 240 | 60 | 100 | Delivered | 99.993 | 0.017 | ±0.2 | Pass |
| 8 | 240 | 60 | 150 | Delivered | 100.023 | 0.047 | ±0.2 | Pass |
| 9 | 240 | 60 | 180 | Delivered | 100.048 | 0.072 | ±0.2 | Pass |
| 10 | 240 | 60 | 200 | Delivered | 100.049 | 0.073 | ±0.2 | Pass |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **ACD State** | **Accuracy Percentage** | **Percent Deviation** | **Maximum Deviation** | **Result** |
| 1 | 240 | 0 | 2 | Dormant | 99.984 | Reference | | |
| 1 | 240 | 0 | 2 | Extreme | 99.955 | -0.029 | ±0.2 | Pass |
| 2 | 240 | 0 | 3 | Dormant | 99.988 | Reference | | |
| 2 | 240 | 0 | 3 | Extreme | 99.975 | -0.013 | ±0.1 | Pass |
| 3 | 240 | 0 | 30 | Dormant | 99.976 | Reference | | |
| 3 | 240 | 0 | 30 | Extreme | 99.913 | -0.063 | ±0.1 | Pass |

**Table 16 - Test 3 Load Performance (Class 0.2), 2S, SN 11F013C7**




**Photograph 4 - Test 3 Load Performance, Test Setup**

### 6.4.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 3 Load Performance Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 4T1512 | WECO Meter Accuracy Tester w/ internal Radian st | Radian | WECO M4330X; Radian RX-30 | WECO: W8839; Radian: 710257 | N/A | 5/30/2026 |
| 1T9999 | Thermometer/ Hygrometer | VWR International | 36934-164 | 230368599 | 5/31/2023 | 5/31/2025 |

**Table 17 - Test 3 Load Performance, Equipment List**

## 6.5 Test No. 4: Effect of Variation of Power Factor

### 6.5.1 Test Requirement(s)

The effect of variation of power factor upon performance of the meter shall not exceed that specified in Table 18.

Each element of a multi-element meter shall be loaded as per Table 7 (Section 4.7.1.1 of ANSI C12.1: 2024).

For meters equipped with an ACD, this test should be conducted with the ACD in the dormant state. See 4.5.6.7 of ANSI C12.1: 2024 for ACD test options.

For delivered watts, the test reference measurement is made as watthours delivered, with power factor tests in Q1 and Q4. For received watts, the test reference measurements are made as watthours received, with power factor tests in Q2 and Q3. See Figure 1, below, for a description of Energy Quadrants

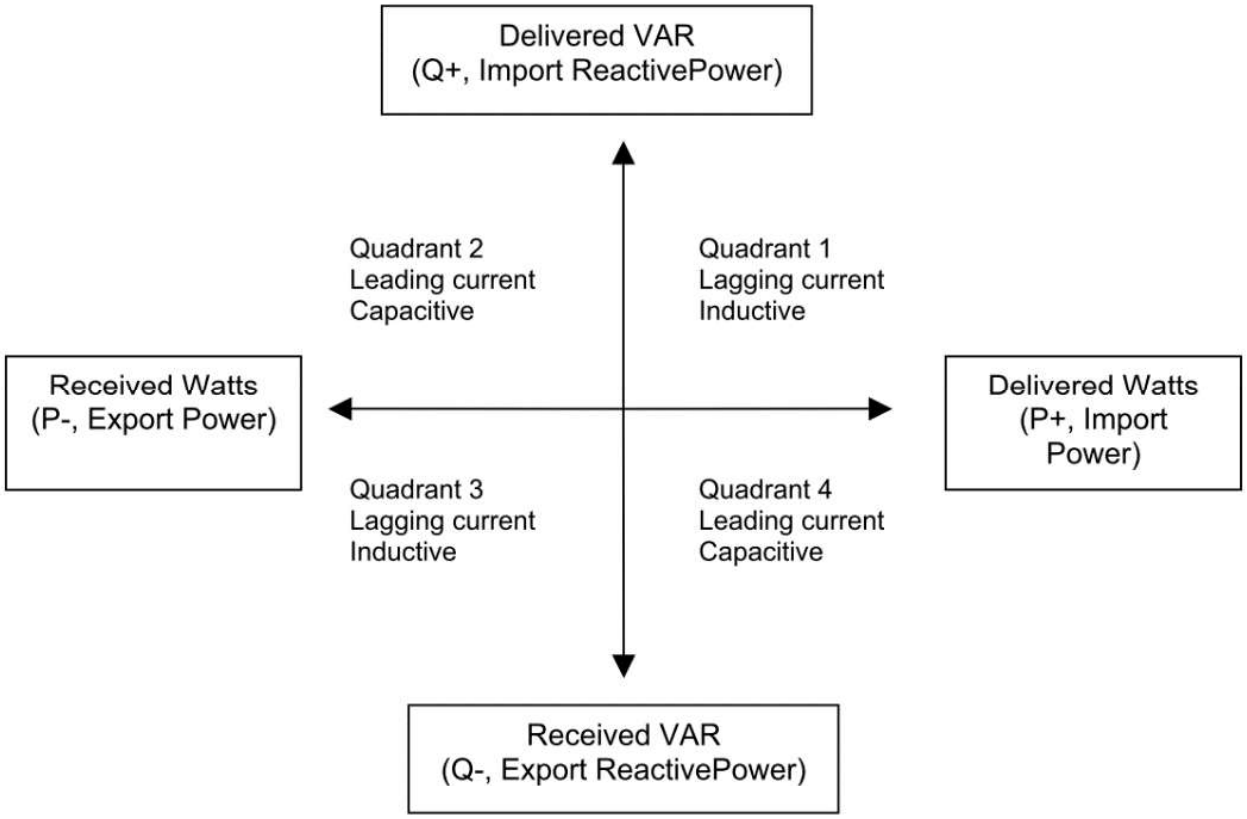


**Figure 1 - Diagram of Quadrants**


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| Condition | Current in Amperes | | | | | | Power Factor | Maximum Deviation in Percent from Reference Performance | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Current Class | | | | | | | Accuracy Class | | | |
| | 2 | 10 | 20 | 100 | 200 | 320 | | 1.0 | 0.5 | 0.2 | 0.1 |
| Reference for (1&2) | 0.05 | 0.25 | 0.5 | 1.5 | 3 | 5 | 1 | Ref. | Ref. | Ref. | Ref. |
| 1 | 0.1 | 0.5 | 1 | 3 | 6 | 10 | 0.866 Leading | ±2.0 | ±1.0 | ±0.5 | ±0.25 |
| 2 | 0.1 | 0.5 | 1 | 3 | 6 | 10 | 0.5 Lagging | ±2.0 | ±1.0 | ±0.5 | ±0.25 |
| Reference for (3&4) | 0.3 | 1.5 | 3 | 15 | 30 | 50 | 1 | Ref. | Ref. | Ref. | Ref. |
| 3 | 0.3 | 1.5 | 3 | 15 | 30 | 50 | 0.866 Leading | ±1.2 | ±0.6 | ±0.3 | ±0.15 |
| 4 | 0.3 | 1.5 | 3 | 15 | 30 | 50 | 0.5 Lagging | ±1.2 | ±0.6 | ±0.3 | ±0.15 |
| Reference for (5&6) | 1 | 5 | 10 | 50 | 100 | 150 | 1 | Ref. | Ref. | Ref. | Ref. |
| 5 | 1 | 5 | 10 | 50 | 100 | 150 | 0.866 Leading | ±1.2 | ±0.6 | ±0.3 | ±0.15 |
| 6 | 1 | 5 | 10 | 50 | 100 | 150 | 0.5 Lagging | ±1.2 | ±0.6 | ±0.3 | ±0.15 |
| Reference for (7&8) | 2 | 10 | 20 | 100 | 200 | 320 | 1 | Ref. | Ref. | Ref. | Ref. |
| 7 | 2 | 10 | 20 | 100 | 200 | 320 | 0.866 Leading | ±1.2 | ±0.6 | ±0.3 | ±0.15 |
| 8 | 2 | 10 | 20 | 100 | 200 | 320 | 0.5 Lagging | ±1.2 | ±0.6 | ±0.3 | ±0.15 |

**Table 18 - Effect of Variation of Power Factor Performance Test**

*If the meter is designed for measurement of energy in both directions, then these conditions shall be performed twice, once with energy flowing only in the delivered direction, and once with energy flowing only in the received direction

Note: If testing with delta polyphase loading, the 0.5 lagging power factor should be replaced with a 0.707 lagging power factor, because 1 element would not contribute at a power factor of 0.5.

### 6.5.2 Test Data and Results

The meters listed below are **compliant** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CA |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F00911 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C7 |

Refer to the following test data and photographs for a complete overview of the test setup and results.


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| Test No. 4: Effect of Variation of Power Factor | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature (C)** | 22.5 | | | | | |
| **Engineer** | Steven Lu | | **Humidity (RH)** | 26.0% | | | | | |
| **Test Date** | 4/16/2025 | | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | | |
| **Current Class** | 200 | | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | | |
| **Serial Number** | 11F004CA | | | | | | | | |
| **Condition** | **Circuit** | **Volt** | **Amp** | **Power Factor** | **Frequency** | **% Registration** | **Deviation** | **0.2 Class Limit** | **Result** |
| Reference (1) & (2) | A | 120 | 3 | 1.0 | 60 | 99.985 | Reference | Reference | Reference |
| (1) | A | 120 | 6 | 0.866 Lead | 60 | 99.948 | -0.037 | +/- 0.5 | Pass |
| (2) | A | 120 | 6 | 0.5 Lag | 60 | 100.107 | 0.122 | +/- 0.5 | Pass |
| Reference (3) & (4) | A | 120 | 30 | 1.0 | 60 | 99.969 | Reference | Reference | Reference |
| (3) | A | 120 | 30 | 0.866 Lead | 60 | 99.950 | -0.019 | +/- 0.3 | Pass |
| (4) | A | 120 | 30 | 0.5 Lag | 60 | 100.024 | 0.055 | +/- 0.3 | Pass |
| Reference (5) & (6) | A | 120 | 100 | 1.0 | 60 | 99.977 | Reference | Reference | Reference |
| (5) | A | 120 | 100 | 0.866 Lead | 60 | 99.983 | 0.006 | +/- 0.3 | Pass |
| (6) | A | 120 | 100 | 0.5 Lag | 60 | 99.994 | 0.017 | +/- 0.3 | Pass |
| Reference (7) & (8) | A | 120 | 200 | 1.0 | 60 | 100.031 | Reference | Reference | Reference |
| (7) | A | 120 | 200 | 0.866 Lead | 60 | 100.036 | 0.005 | +/- 0.3 | Pass |
| (8) | A | 120 | 200 | 0.5 Lag | 60 | 100.038 | 0.007 | +/- 0.3 | Pass |
| Reference (1) & (2) | C | 120 | 3 | 1.0 | 60 | 100.068 | Reference | Reference | Reference |
| (1) | C | 120 | 6 | 0.866 Lead | 60 | 99.975 | -0.093 | +/- 0.5 | Pass |
| (2) | C | 120 | 6 | 0.5 Lag | 60 | 100.327 | 0.259 | +/- 0.5 | Pass |
| Reference (3) & (4) | C | 120 | 30 | 1.0 | 60 | 100.054 | Reference | Reference | Reference |
| (3) | C | 120 | 30 | 0.866 Lead | 60 | 99.976 | -0.078 | +/- 0.3 | Pass |
| (4) | C | 120 | 30 | 0.5 Lag | 60 | 100.281 | 0.227 | +/- 0.3 | Pass |
| Reference (5) & (6) | C | 120 | 100 | 1.0 | 60 | 100.055 | Reference | Reference | Reference |
| (5) | C | 120 | 100 | 0.866 Lead | 60 | 100.002 | -0.053 | +/- 0.3 | Pass |
| (6) | C | 120 | 100 | 0.5 Lag | 60 | 100.225 | 0.170 | +/- 0.3 | Pass |
| Reference (7) & (8) | C | 120 | 200 | 1.0 | 60 | 100.101 | Reference | Reference | Reference |
| (7) | C | 120 | 200 | 0.866 Lead | 60 | 100.059 | -0.042 | +/- 0.3 | Pass |
| (8) | C | 120 | 200 | 0.5 Lag | 60 | 100.241 | 0.140 | +/- 0.3 | Pass |

**Table 19 - Test 4 Effect of Variation of Power Factor, 12S SN 11F004CA**

| Test No. 4: Effect of Variation of Power Factor | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature (C)** | 22.1 | | | | | |
| **Engineer** | Steven Lu | | **Humidity (RH)** | 31.0% | | | | | |
| **Test Date** | 4/21/2025 | | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | | |
| **Current Class** | 200 | | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | | |
| **Serial Number** | 11F00911 | | | | | | | | |
| **Condition** | **Circuit** | **Volt** | **Amp** | **Power Factor** | **Frequency** | **% Registration** | **Deviation** | **0.2 Class Limit** | **Result** |
| Reference (1) & (2) | A | 120 | 3 | 1.0 | 60 | 99.975 | Reference | Reference | Reference |
| (1) | A | 120 | 6 | 0.866 Lead | 60 | 99.937 | -0.038 | +/- 0.5 | Pass |
| (2) | A | 120 | 6 | 0.5 Lag | 60 | 100.082 | 0.107 | +/- 0.5 | Pass |
| Reference (3) & (4) | A | 120 | 30 | 1.0 | 60 | 99.968 | Reference | Reference | Reference |
| (3) | A | 120 | 30 | 0.866 Lead | 60 | 99.944 | -0.024 | +/- 0.3 | Pass |
| (4) | A | 120 | 30 | 0.5 Lag | 60 | 100.036 | 0.068 | +/- 0.3 | Pass |
| Reference (5) & (6) | A | 120 | 100 | 1.0 | 60 | 99.968 | Reference | Reference | Reference |
| (5) | A | 120 | 100 | 0.866 Lead | 60 | 99.971 | 0.003 | +/- 0.3 | Pass |
| (6) | A | 120 | 100 | 0.5 Lag | 60 | 99.981 | 0.013 | +/- 0.3 | Pass |
| Reference (7) & (8) | A | 120 | 200 | 1.0 | 60 | 100.018 | Reference | Reference | Reference |
| (7) | A | 120 | 200 | 0.866 Lead | 60 | 100.028 | 0.010 | +/- 0.3 | Pass |
| (8) | A | 120 | 200 | 0.5 Lag | 60 | 100.023 | 0.005 | +/- 0.3 | Pass |
| Reference (1) & (2) | C | 120 | 3 | 1.0 | 60 | 100.071 | Reference | Reference | Reference |
| (1) | C | 120 | 6 | 0.866 Lead | 60 | 99.965 | -0.106 | +/- 0.5 | Pass |
| (2) | C | 120 | 6 | 0.5 Lag | 60 | 100.372 | 0.301 | +/- 0.5 | Pass |
| Reference (3) & (4) | C | 120 | 30 | 1.0 | 60 | 100.058 | Reference | Reference | Reference |
| (3) | C | 120 | 30 | 0.866 Lead | 60 | 99.970 | -0.088 | +/- 0.3 | Pass |
| (4) | C | 120 | 30 | 0.5 Lag | 60 | 100.327 | 0.269 | +/- 0.3 | Pass |
| Reference (5) & (6) | C | 120 | 100 | 1.0 | 60 | 100.062 | Reference | Reference | Reference |
| (5) | C | 120 | 100 | 0.866 Lead | 60 | 99.997 | -0.065 | +/- 0.3 | Pass |
| (6) | C | 120 | 100 | 0.5 Lag | 60 | 100.270 | 0.208 | +/- 0.3 | Pass |
| Reference (7) & (8) | C | 120 | 200 | 1.0 | 60 | 100.112 | Reference | Reference | Reference |
| (7) | C | 120 | 200 | 0.866 Lead | 60 | 100.058 | -0.054 | +/- 0.3 | Pass |
| (8) | C | 120 | 200 | 0.5 Lag | 60 | 100.296 | 0.184 | +/- 0.3 | Pass |

**Table 20 - Test 4 Effect of Variation of Power Factor, 12S SN 11F00911**

| Test No. 4: Effect of Variation of Power Factor | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature (C)** | 22.1 | | | | | |
| **Engineer** | Steven Lu | | **Humidity (RH)** | 31.0% | | | | | |
| **Test Date** | 4/21/2025 | | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | | |
| **Current Class** | 200 | | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | | |
| **Serial Number** | 11F013C7 | | | | | | | | |
| **Condition** | **Circuit** | **Volt** | **Amp** | **Power Factor** | **Frequency** | **% Registration** | **Deviation** | **0.2 Class Limit** | **Result** |
| Reference (1) & (2) | A | 120 | 3 | 1.0 | 60 | 99.976 | Reference | Reference | Reference |
| (1) | A | 120 | 6 | 0.866 Lead | 60 | 99.940 | -0.036 | +/- 0.5 | Pass |
| (2) | A | 120 | 6 | 0.5 Lag | 60 | 100.099 | 0.123 | +/- 0.5 | Pass |
| Reference (3) & (4) | A | 120 | 30 | 1.0 | 60 | 99.964 | Reference | Reference | Reference |
| (3) | A | 120 | 30 | 0.866 Lead | 60 | 99.942 | -0.022 | +/- 0.3 | Pass |
| (4) | A | 120 | 30 | 0.5 Lag | 60 | 100.031 | 0.067 | +/- 0.3 | Pass |
| Reference (5) & (6) | A | 120 | 100 | 1.0 | 60 | 99.960 | Reference | Reference | Reference |
| (5) | A | 120 | 100 | 0.866 Lead | 60 | 99.962 | 0.002 | +/- 0.3 | Pass |
| (6) | A | 120 | 100 | 0.5 Lag | 60 | 99.957 | -0.003 | +/- 0.3 | Pass |
| Reference (7) & (8) | A | 120 | 200 | 1.0 | 60 | 99.978 | Reference | Reference | Reference |
| (7) | A | 120 | 200 | 0.866 Lead | 60 | 99.977 | -0.001 | +/- 0.3 | Pass |
| (8) | A | 120 | 200 | 0.5 Lag | 60 | 100.002 | 0.024 | +/- 0.3 | Pass |
| Reference (1) & (2) | C | 120 | 3 | 1.0 | 60 | 99.991 | Reference | Reference | Reference |
| (1) | C | 120 | 6 | 0.866 Lead | 60 | 99.948 | -0.043 | +/- 0.5 | Pass |
| (2) | C | 120 | 6 | 0.5 Lag | 60 | 100.125 | 0.134 | +/- 0.5 | Pass |
| Reference (3) & (4) | C | 120 | 30 | 1.0 | 60 | 99.976 | Reference | Reference | Reference |
| (3) | C | 120 | 30 | 0.866 Lead | 60 | 99.950 | -0.026 | +/- 0.3 | Pass |
| (4) | C | 120 | 30 | 0.5 Lag | 60 | 100.058 | 0.082 | +/- 0.3 | Pass |
| Reference (5) & (6) | C | 120 | 100 | 1.0 | 60 | 99.972 | Reference | Reference | Reference |
| (5) | C | 120 | 100 | 0.866 Lead | 60 | 99.973 | 0.001 | +/- 0.3 | Pass |
| (6) | C | 120 | 100 | 0.5 Lag | 60 | 99.966 | -0.006 | +/- 0.3 | Pass |
| Reference (7) & (8) | C | 120 | 200 | 1.0 | 60 | 99.990 | Reference | Reference | Reference |
| (7) | C | 120 | 200 | 0.866 Lead | 60 | 100.005 | 0.015 | +/- 0.3 | Pass |
| (8) | C | 120 | 200 | 0.5 Lag | 60 | 99.961 | -0.029 | +/- 0.3 | Pass |

**Table 21 - Test 4 Effect of Variation of Power Factor, 2S SN 11F013C7**




**Photograph 5 - Test 4 Effect of Variation of Power Factor, Test Setup**

### 6.5.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 4 Effect of Variation of Power Factor Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 4T1512 | WECO Meter Accuracy Tester w/ internal Radian st | Radian | WECO M4330X; Radian RX-30 | WECO: W8839; Radian: 710257 | N/A | 5/30/2026 |
| 1T9999 | Thermometer/ Hygrometer | VWR International | 36934-164 | 230368599 | 5/31/2023 | 5/31/2025 |

**Table 22 - Test 4 Effect of Variation of Power Factor, Equipment List**


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## 6.6 Test No. 5: Effect of Variation of Voltage

### 6.6.1 Test Requirement(s)

The effect of variation of voltage upon the performance of the meter shall not exceed the maximum deviation specified in Table 23.

For meters equipped with an ACD, this test should be conducted with the ACD in the dormant state. See 4.5.6.7 of ANSI C12.1: 2024 for ACD test options.

| Condition | Current in Amperes | | | | | | Percent Nominal Voltage | Maximum Deviation in Percent from Reference Performance | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Current Class | | | | | | | Accuracy Class | | | |
| | 2 | 10 | 20 | 100 | 200 | 320 | | 1.0 | 0.5 | 0.2 | 0.1 |
| Reference for (1, 2, & 3) | 0.025 | 0.25 | 0.25 | 1.5 | 3 | 5 | 100% of the lowest nominal voltage* | Ref. | Ref. | Ref. | Ref. |
| 1 | 0.025 | 0.25 | 0.25 | 1.5 | 3 | 5 | 90% of the lowest nominal voltage | ±1.0 | ±0.4 | ±0.2 | ±0.1 |
| 2 | 0.025 | 0.25 | 0.25 | 1.5 | 3 | 5 | 100% of each nominal voltage above the lowest nominal voltage | ±1.0 | ±0.4 | ±0.2 | ±0.1 |
| 3 | 0.025 | 0.25 | 0.25 | 1.5 | 3 | 5 | 110% of highest nominal voltage | ±1.0 | ±0.4 | ±0.2 | ±0.1 |
| Reference for (4, 5, & 6) | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | 100% of the lowest nominal voltage* | Ref. | Ref. | Ref. | Ref. |
| 4 | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | 90% of the lowest nominal voltage | ±1.0 | ±0.4 | ±0.2 | ±0.1 |
| 5 | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | 100% of each nominal voltage above the lowest nominal voltage | ±1.0 | ±0.4 | ±0.2 | ±0.1 |
| 6 | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | 110% of highest nominal voltage | ±1.0 | ±0.4 | ±0.2 | ±0.1 |

**Table 23 - Effect of Variation of Voltage**

*Manufacturers must declare all rated nominal voltage(s) for the meter. Meters with a lowest nominal voltage of less than 120 V may use 120 V as the reference voltage if this is within the meter's operating range.

### 6.6.2 Test Data and Results

The meters listed below are **compliant** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CA |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F00911 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C7 |

Refer to the following test data and photographs for a complete overview of the test setup and results.


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| Test No. 5: Variation of Voltage | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.5 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 26.0% | | | | | |
| **Test Date** | 4/16/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F004CA | | | | | | | |

| Condition | Volt | Amp | Power Factor | Frequency | % Registration | Deviation | Limit | Result |
|---|---|---|---|---|---|---|---|---|
| Reference performance 100% voltage for (1) and (2) | 120 | 3 | 1.0 | 60 | 100.036 | Reference | Reference | Reference |
| (1) 90% of voltage | 108 | 3 | 1.0 | 60 | 100.038 | 0.002 | +/- 0.2 | Pass |
| (2) 110% of voltage | 132 | 3 | 1.0 | 60 | 100.040 | 0.004 | +/- 0.2 | Pass |
| Reference performance 100% voltage for (3) and (4) | 120 | 30 | 1.0 | 60 | 100.025 | Reference | Reference | Reference |
| (3) 90% of voltage | 108 | 30 | 1.0 | 60 | 100.026 | 0.001 | +/- 0.2 | Pass |
| (4) 110% of voltage | 132 | 30 | 1.0 | 60 | 100.026 | 0.001 | +/- 0.2 | Pass |

**Table 24 - Test 5 Variation of Voltage (5.5.2.5.1), 12S SN 11F004CA**

| Test No. 5: Variation of Voltage | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.1 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 31.0% | | | | | |
| **Test Date** | 4/21/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F00911 | | | | | | | |

| Condition | Volt | Amp | Power Factor | Frequency | % Registration | Deviation | Limit | Result |
|---|---|---|---|---|---|---|---|---|
| Reference performance 100% voltage for (1) and (2) | 120 | 3 | 1.0 | 60 | 99.996 | Reference | Reference | Reference |
| (1) 90% of voltage | 108 | 3 | 1.0 | 60 | 100.000 | 0.004 | +/- 0.2 | Pass |
| (2) 110% of voltage | 132 | 3 | 1.0 | 60 | 100.003 | 0.007 | +/- 0.2 | Pass |
| Reference performance 100% voltage for (3) and (4) | 120 | 30 | 1.0 | 60 | 99.992 | Reference | Reference | Reference |
| (3) 90% of voltage | 108 | 30 | 1.0 | 60 | 99.991 | -0.001 | +/- 0.2 | Pass |
| (4) 110% of voltage | 132 | 30 | 1.0 | 60 | 99.993 | 0.001 | +/- 0.2 | Pass |

**Table 25 - Test 5 Variation of Voltage (5.5.2.5.1), 12S SN 11F00911**

| Test No. 5: Variation of Voltage | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.3 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 34.0% | | | | | |
| **Test Date** | 4/22/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C7 | | | | | | | |

| Condition | Volt | Amp | Power Factor | Frequency | % Registration | Deviation | Limit | Result |
|---|---|---|---|---|---|---|---|---|
| Reference performance 100% voltage for (1) and (2) | 240 | 3 | 1.0 | 60 | 99.937 | Reference | Reference | Reference |
| (1) 90% of voltage | 216 | 3 | 1.0 | 60 | 99.941 | 0.004 | +/- 0.2 | Pass |
| (2) 110% of voltage | 264 | 3 | 1.0 | 60 | 99.944 | 0.007 | +/- 0.2 | Pass |
| Reference performance 100% voltage for (3) and (4) | 240 | 30 | 1.0 | 60 | 99.921 | Reference | Reference | Reference |
| (3) 90% of voltage | 216 | 30 | 1.0 | 60 | 99.923 | 0.002 | +/- 0.2 | Pass |
| (4) 110% of voltage | 264 | 30 | 1.0 | 60 | 99.923 | 0.002 | +/- 0.2 | Pass |

**Table 26 - Test 5 Variation of Voltage (5.5.2.5.1), 2S SN 11F013C7**




**Photograph 6 - Test 5 Variation of Voltage, Test Setup**

### 6.6.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 5 Effect of Variation of Voltage Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 4T1512 | WECO Meter Accuracy Tester w/ internal Radian st | Radian | WECO M4330X; Radian RX-30 | WECO: W8839; Radian: 710257 | N/A | 5/30/2026 |
| 1T9999 | Thermometer/ Hygrometer | VWR International | 36934-164 | 230368599 | 5/31/2023 | 5/31/2025 |

**Table 27 - Test 5 Variation of Voltage, Equipment List**


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## 6.7 Test No. 6: Effect of Variation of Frequency

### 6.7.1 Test Requirement(s)

The effect of variation of frequency upon the registration of a meter shall not exceed the maximum deviation specified in Table 28.

For meters equipped with an ACD, this test should be conducted with the ACD in the dormant state. See 4.5.6.7 of ANSI C12.1: 2024 for ACD test options.

| Condition | Current in Amperes | | | | | | Percent Rated Frequency | Maximum Deviation in Percent from Reference Performance | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Current Class | | | | | | | Accuracy Class | | | |
| | 2 | 10 | 20 | 100 | 200 | 320 | | 1.0 | 0.5 | 0.2 | 0.1 |
| Reference for (1&2) | 0.025 | 0.25 | 0.25 | 1.5 | 3 | 5 | 100 | Ref. | Ref. | Ref. | Ref. |
| 1 | 0.025 | 0.25 | 0.25 | 1.5 | 3 | 5 | 98 | ±1.0 | ±0.2 | ±0.1 | ±0.05 |
| 2 | 0.025 | 0.25 | 0.25 | 1.5 | 3 | 5 | 102 | ±1.0 | ±0.2 | ±0.1 | ±0.05 |
| Reference for (3&4) | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | 100 | Ref. | Ref. | Ref. | Ref. |
| 3 | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | 98 | ±1.0 | ±0.2 | ±0.1 | ±0.05 |
| 4 | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | 102 | ±1.0 | ±0.2 | ±0.1 | ±0.05 |

**Table 28 - Effect of Variation of Frequency**

### 6.7.2 Test Data and Results

The meters listed below are **compliant** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CA |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F00911 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C7 |

Refer to the following test data and photographs for a complete overview of the test setup and results.


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| Test No. 6: Variation of Frequency | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.5 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 26.0% | | | | | |
| **Test Date** | 4/16/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F004CA | | | | | | | |

| Condition | Volt | Amp | Power Factor | Frequency | % Registration | Deviation | Limit | Result |
|---|---|---|---|---|---|---|---|---|
| Reference performance 100% frequency for (1) and (2) | 120 | 3 | 1.0 | 60 | 100.007 | Reference | Reference | Reference |
| (1) 98% of frequency | 120 | 3 | 1.0 | 58.8 | 100.002 | -0.005 | +/- 0.1 | Pass |
| (2) 102% of frequency | 120 | 3 | 1.0 | 61.2 | 100.025 | 0.018 | +/- 0.1 | Pass |
| Reference performance 100% frequency for (3) and (4) | 120 | 30 | 1.0 | 60 | 100.004 | Reference | Reference | Reference |
| (3) 98% of frequency | 120 | 30 | 1.0 | 58.8 | 99.995 | -0.009 | +/- 0.1 | Pass |
| (4) 102% of frequency | 120 | 30 | 1.0 | 61.2 | 100.015 | 0.011 | +/- 0.1 | Pass |

**Table 29 - Test 6 Variation of Frequency (Class 0.2), 12S SN 11F004CA**

| Test No. 6: Variation of Frequency | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.1 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 31.0% | | | | | |
| **Test Date** | 4/21/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F00911 | | | | | | | |

| Condition | Volt | Amp | Power Factor | Frequency | % Registration | Deviation | Limit | Result |
|---|---|---|---|---|---|---|---|---|
| Reference performance 100% frequency for (1) and (2) | 120 | 3 | 1.0 | 60 | 99.990 | Reference | Reference | Reference |
| (1) 98% of frequency | 120 | 3 | 1.0 | 58.8 | 99.984 | -0.006 | +/- 0.1 | Pass |
| (2) 102% of frequency | 120 | 3 | 1.0 | 61.2 | 100.006 | 0.016 | +/- 0.1 | Pass |
| Reference performance 100% frequency for (3) and (4) | 120 | 30 | 1.0 | 60 | 99.984 | Reference | Reference | Reference |
| (3) 98% of frequency | 120 | 30 | 1.0 | 58.8 | 99.976 | -0.008 | +/- 0.1 | Pass |
| (4) 102% of frequency | 120 | 30 | 1.0 | 61.2 | 99.996 | 0.012 | +/- 0.1 | Pass |

**Table 30 - Test 6 Variation of Frequency (Class 0.2), 12S SN 11F00911**

| Test No. 6: Variation of Frequency | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.3 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 34.0% | | | | | |
| **Test Date** | 4/22/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C7 | | | | | | | |

| Condition | Volt | Amp | Power Factor | Frequency | % Registration | Deviation | Limit | Result |
|---|---|---|---|---|---|---|---|---|
| Reference performance 100% frequency for (1) and (2) | 120 | 3 | 1.0 | 60 | 99.948 | Reference | Reference | Reference |
| (1) 98% of frequency | 120 | 3 | 1.0 | 58.8 | 99.942 | -0.006 | +/- 0.1 | Pass |
| (2) 102% of frequency | 120 | 3 | 1.0 | 61.2 | 99.963 | 0.015 | +/- 0.1 | Pass |
| Reference performance 100% frequency for (3) and (4) | 120 | 30 | 1.0 | 60 | 99.930 | Reference | Reference | Reference |
| (3) 98% of frequency | 120 | 30 | 1.0 | 58.8 | 99.922 | -0.008 | +/- 0.1 | Pass |
| (4) 102% of frequency | 120 | 30 | 1.0 | 61.2 | 99.941 | 0.011 | +/- 0.1 | Pass |

**Table 31 - Test 6 Variation of Frequency (Class 0.2), 2S SN 11F013C7**




**Photograph 7 - Test 6 Variation of Frequency, Test Setup**

### 6.7.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 6 Effect of Variation of Frequency Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 4T1512 | WECO Meter Accuracy Tester w/ internal Radian st | Radian | WECO M4330X; Radian RX-30 | WECO: W8839; Radian: 710257 | N/A | 5/30/2026 |
| 1T9999 | Thermometer/ Hygrometer | VWR International | 36934-164 | 230368599 | 5/31/2023 | 5/31/2025 |

**Table 32 - Test 6 Variation of Frequency, Equipment List**


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## 6.8 Test No. 7: Equality of Current Circuits

### 6.8.1 Test Requirement(s)

For multi-current circuit meters, the change in performance when using only one current circuit, compared with the performance when using all current circuits, shall not exceed that specified in Table 33.

For meters equipped with an ACD, this test should be conducted with the ACD in the dormant state. See 4.5.6.7 of ANSI C12.1: 2024 for ACD test options.

For non-Blondel meters, round the number of elements up to the nearest whole number, therefore, N=2 for a 1.5-element meter, N=3 for a 2.5-element meter

| Condition | Connections of Current Circuits | Current in Amperes | | | | | | Maximum Deviation in Percent from Reference Performance | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Current Class | | | | | | Accuracy Class | | | |
| | | 2 | 10 | 20 | 100 | 200 | 320 | 1.0 | 0.5 | 0.2 | 0.1 |
| Reference for (1, 2, 3, 4, etc.) | All Circuits | 0.025 | 0.25 | 0.25 | 1.5 | 3 | 5 | Ref. | Ref. | Ref. | Ref. |
| 1 | Circuit A only | 0.025N | 0.25N | 0.25N | 1.5N | 3N | 5N | ±1.5 | ±0.7 | ±0.3 | ±0.15 |
| 2 | Circuit B only | 0.025N | 0.25N | 0.25N | 1.5N | 3N | 5N | ±1.5 | ±0.7 | ±0.3 | ±0.15 |
| 3, 4, etc. | Circuits C, D, etc. | 0.025N | 0.25N | 0.25N | 1.5N | 3N | 5N | ±1.5 | ±0.7 | ±0.3 | ±0.15 |
| Reference for (5, 6, 7, 8, etc.) | All Circuits | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | Ref. | Ref. | Ref. | Ref. |
| 5 | Circuit A only | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | ±1.5 | ±0.7 | ±0.3 | ±0.15 |
| 6 | Circuit B only | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | ±1.5 | ±0.7 | ±0.3 | ±0.15 |
| 7, 8, etc. | Circuits C, D, etc. | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | ±1.5 | ±0.7 | ±0.3 | ±0.15 |

**Table 33 - Equality of Current Circuits for Multi-Current Circuit Meters**

*N represents the number of current circuits in the meter.

### 6.8.2 Test Data and Results

The meters listed below are **compliant** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CA |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F00911 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C7 |

Refer to the following test data and photographs for a complete overview of the test setup and results.


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| Test No. 7: Equality of Current Circuits | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.5 | | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 26.0% | | | | | | |
| **Test Date** | 4/16/2025 | **Observations** | None | | | | | | |
| **Meter Form** | 12S | | | | | | | | |
| **Current Class** | 200 | | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | | |
| **Serial Number** | 11F004CA | | | | | | | | |

| Condition | Current Circuits | Volt | Amp | Power Factor | Frequency | % Registration | Deviation | Limit | Result |
|---|---|---|---|---|---|---|---|---|---|
| Reference performance for (5), (6), (7), (8), etc. | All Circuits | 120 | 3 | 1.0 | 60 | 100.015 | Reference | Reference | Reference |
| (5) | Circuit A only | 120 | 3N* | 1.0 | 60 | 99.984 | -0.031 | +/- 0.3 | Pass |
| (7), (8), etc. | Circuits C, D, etc. | 120 | 3N* | 1.0 | 60 | 100.055 | 0.040 | +/- 0.3 | Pass |
| Reference performance for (9), (10), (11), (12), etc. | All Circuits | 120 | 30 | 1.0 | 60 | 100.009 | Reference | Reference | Reference |
| (9) | Circuit A only | 120 | 30 | 1.0 | 60 | 99.974 | -0.035 | +/- 0.3 | Pass |
| (11), (12), etc. | Circuits C, D, etc. | 120 | 30 | 1.0 | 60 | 100.046 | 0.037 | +/- 0.3 | Pass |
| *N represents the number of elements in the metering device | | | | | | | | | |

**Table 34 - Test 7 Equality of Current Circuits, 12S SN 11F004CA**

| Test No. 7: Equality of Current Circuits | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.1 | | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 31.0% | | | | | | |
| **Test Date** | 4/21/2025 | **Observations** | None | | | | | | |
| **Meter Form** | 12S | | | | | | | | |
| **Current Class** | 200 | | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | | |
| **Serial Number** | 11F00911 | | | | | | | | |

| Condition | Current Circuits | Volt | Amp | Power Factor | Frequency | % Registration | Deviation | Limit | Result |
|---|---|---|---|---|---|---|---|---|---|
| Reference performance for (5), (6), (7), (8), etc. | All Circuits | 120 | 3 | 1.0 | 60 | 99.988 | Reference | Reference | Reference |
| (5) | Circuit A only | 120 | 3N* | 1.0 | 60 | 99.952 | -0.036 | +/- 0.3 | Pass |
| (7), (8), etc. | Circuits C, D, etc. | 120 | 3N* | 1.0 | 60 | 100.033 | 0.045 | +/- 0.3 | Pass |
| Reference performance for (9), (10), (11), (12), etc. | All Circuits | 120 | 30 | 1.0 | 60 | 99.985 | Reference | Reference | Reference |
| (9) | Circuit A only | 120 | 30 | 1.0 | 60 | 99.946 | -0.039 | +/- 0.3 | Pass |
| (11), (12), etc. | Circuits C, D, etc. | 120 | 30 | 1.0 | 60 | 100.023 | 0.038 | +/- 0.3 | Pass |
| *N represents the number of elements in the metering device | | | | | | | | | |

**Table 35 - Test 7 Equality of Current Circuits, 12S SN 11F00911**

| Test No. 7: Equality of Current Circuits | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.3 | | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 34.0% | | | | | | |
| **Test Date** | 4/22/2025 | **Observations** | None | | | | | | |
| **Meter Form** | 2S | | | | | | | | |
| **Current Class** | 200 | | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | | |
| **Serial Number** | 11F013C7 | | | | | | | | |

| Condition | Current Circuits | Volt | Amp | Power Factor | Frequency | % Registration | Deviation | Limit | Result |
|---|---|---|---|---|---|---|---|---|---|
| Reference performance for (5), (6), (7), (8), etc. | All Circuits | 120 | 3 | 1.0 | 60 | 99.954 | Reference | Reference | Reference |
| (5) | Circuit A only | 120 | 3N* | 1.0 | 60 | 99.960 | 0.006 | +/- 0.3 | Pass |
| (7), (8), etc. | Circuits C, D, etc. | 120 | 3N* | 1.0 | 60 | 99.958 | 0.004 | +/- 0.3 | Pass |
| Reference performance for (9), (10), (11), (12), etc. | All Circuits | 120 | 30 | 1.0 | 60 | 99.936 | Reference | Reference | Reference |
| (9) | Circuit A only | 120 | 30 | 1.0 | 60 | 99.945 | 0.009 | +/- 0.3 | Pass |
| (11), (12), etc. | Circuits C, D, etc. | 120 | 30 | 1.0 | 60 | 99.941 | 0.005 | +/- 0.3 | Pass |
| *N represents the number of elements in the metering device | | | | | | | | | |

**Table 36 - Test 7 Equality of Current Circuits, 2S SN 11F013C7**


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**Photograph 8 - Test 7 Equality of Current Circuits, Test Setup**

### 6.8.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 7 Equality of Current Circuits Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 4T1512 | WECO Meter Accuracy Tester w/ internal Radian st | Radian | WECO M4330X; Radian RX-30 | WECO: W8839; Radian: 710257 | N/A | 5/30/2026 |
| 1T9999 | Thermometer/ Hygrometer | VWR International | 36934-164 | 230368599 | 5/31/2023 | 5/31/2025 |

**Table 37 - Test 7 Equality of Current Circuits, Equipment List**


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## 6.9 Test No. 8: Internal Meter Losses

### 6.9.1 Test Requirement(s)

The loss in each current circuit of a meter, measured at test amps, shall not exceed 0.5 VA for current class 2, 10, and 20 meters or 1.0 VA for current class 100, 200 and 320 meters. For 2½-element, three- phase, four-wire wye current class 2. 10, and 20 meters loss in the current circuit common to both elements shall not exceed 1.0 VA. The loss in each voltage circuit of a meter shall neither exceed 5 watts or 20 VA. The losses in auxiliary devices that are powered by the meter power supply or connected to the line side terminals are not included.

The total meter losses in each voltage circuit shall be specified by the manufacturer for the meter with the ACD in each of the dormant, nominal, and extreme states.

The total meter losses shall be recorded in units of $W_{average}$ and $V_{Aaverage}$. The $W_{average}$ and $V_{Aaverage}$ tests shall be a minimum of 1 minute in length. The test period shall include at least 1 ACD transmission in the nominal state and 1 ACD transmission in the extreme state. The manufacturer is to specify the ACD conditions used for this test.

### 6.9.2 Test Data and Results

The meters listed below are **compliant** with the requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F00911 |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CD |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C7 |

Refer to the following test data and photographs for a complete overview of the test setup and results.


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| Test No. 8: Meter Losses | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.1 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 42.0% | | | | | |
| **Test Date** | 5/7/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F004CD | | | | | | | |
| **ACD State** | Dormant | | | | | | | |
| **Reference: Power Factor = Cosine q = Active Power (W) / Apparent Power (VA)** | | | | | | | | |
| **Voltage Circuit Meter Losses:** | **Power Factor** | **Voltage (V)** | **Current (A)** | **Active Power (Watts)** | **Limit (W)** | **Apparent Power (Volt-Amperes)** | **Limit (VA)** | **Result** |
| **Voltage A** | 0.6728 | 119.97 | 0.010694 | 0.863174936 | 5 | 1.28295918 | 20 | Pass |
| **Voltage C** | 0.9145 | 120.02 | 0.010633 | 1.167059898 | 5 | 1.27617266 | 20 | Pass |
| **Current Circuit Meter Losses:** | **Power Factor** | **Voltage (V)** | **Current (A)** | **Active Power (Watts)** | **Limit (W)** | **Apparent Power (Volt-Amperes)** | **Limit (VA)** | **Result** |
| **Current A** | 1 | 0.005 | 30 | 0.15 | - | 0.15 | 1 | Pass |
| **Current C** | 1 | 0.0047 | 30 | 0.141 | - | 0.141 | 1 | Pass |

**Table 38 - Test 8 Meter Losses, 12S, SN 11F004CD, Dormant**

| Test No. 8: Meter Losses | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 52.0% | | | | | |
| **Test Date** | 5/15/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F004CD | | | | | | | |
| **ACD State** | Extreme | | | | | | | |
| **Reference: Power Factor = Cosine q = Active Power (W) / Apparent Power (VA)** | | | | | | | | |
| **Voltage Circuit Meter Losses:** | **Power Factor** | **Voltage (V)** | **Current (A)** | **Active Power (Watts)** | **Limit (W)** | **Apparent Power (Volt-Amperes)** | **Limit (VA)** | **Result** |
| **Voltage A** | 0.6974 | 120.01 | 0.01134 | 0.949101005 | 5 | 1.3609134 | 20 | Pass |
| **Voltage C** | 0.8962 | 120.02 | 0.01126 | 1.211147264 | 5 | 1.3514252 | 20 | Pass |
| **Current Circuit Meter Losses:** | **Power Factor** | **Voltage (V)** | **Current (A)** | **Active Power (Watts)** | **Limit (W)** | **Apparent Power (Volt-Amperes)** | **Limit (VA)** | **Result** |
| **Current A** | 1 | 0.0044 | 30 | 0.132 | - | 0.132 | 1 | Pass |
| **Current C** | 1 | 0.0046 | 30 | 0.138 | - | 0.138 | 1 | Pass |

**Table 39 - Test 8 Meter Losses, 12S, SN 11F004CD, Extreme**

| Test No. 8: Meter Losses | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.1 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 42.0% | | | | | |
| **Test Date** | 5/7/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F004CD | | | | | | | |
| **ACD State** | Normal | | | | | | | |
| **Reference: Power Factor = Cosine q = Active Power (W) / Apparent Power (VA)** | | | | | | | | |
| **Voltage Circuit Meter Losses:** | **Power Factor** | **Voltage (V)** | **Current (A)** | **Active Power (Watts)** | **Limit (W)** | **Apparent Power (Volt-Amperes)** | **Limit (VA)** | **Result** |
| **Voltage A** | 0.6637 | 119.97 | 0.010613 | 0.845050457 | 5 | 1.27324161 | 20 | Pass |
| **Voltage C** | 0.09195 | 120.00 | 0.01056 | 0.11651904 | 5 | 1.2672 | 20 | Pass |
| **Current Circuit Meter Losses:** | **Power Factor** | **Voltage (V)** | **Current (A)** | **Active Power (Watts)** | **Limit (W)** | **Apparent Power (Volt-Amperes)** | **Limit (VA)** | **Result** |
| **Current A** | 1 | 0.0046 | 30 | 0.138 | - | 0.138 | 1 | Pass |
| **Current C** | 1 | 0.0057 | 30 | 0.171 | - | 0.171 | 1 | Pass |

**Table 40 - Test 8 Meter Losses, 12S, SN 11F004CD, Normal**

| Test No. 8: Meter Losses | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.1 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 42.0% | | | | | |
| **Test Date** | 5/7/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F00911 | | | | | | | |
| **ACD State** | Dormant | | | | | | | |
| **Reference: Power Factor = Cosine q = Active Power (W) / Apparent Power (VA)** | | | | | | | | |
| **Voltage Circuit Meter Losses:** | **Power Factor** | **Voltage (V)** | **Current (A)** | **Active Power (Watts)** | **Limit (W)** | **Apparent Power (Volt-Amperes)** | **Limit (VA)** | **Result** |
| **Voltage A** | 0.6647 | 119.97 | 0.010883 | 0.867854594 | 5 | 1.30563351 | 20 | Pass |
| **Voltage C** | 0.9185 | 120.01 | 0.010762 | 1.186286489 | 5 | 1.29154762 | 20 | Pass |
| **Current Circuit Meter Losses:** | **Power Factor** | **Voltage (V)** | **Current (A)** | **Active Power (Watts)** | **Limit (W)** | **Apparent Power (Volt-Amperes)** | **Limit (VA)** | **Result** |
| **Current A** | 1 | 0.0041 | 30 | 0.123 | - | 0.123 | 1 | Pass |
| **Current C** | 1 | 0.0049 | 30 | 0.147 | - | 0.147 | 1 | Pass |

**Table 41 - Test 8 Meter Losses, 12S, SN 11F00911, Dormant**

| Test No. 8: Meter Losses | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 52.0% | | | | | |
| **Test Date** | 5/15/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F00911 | | | | | | | |
| **ACD State** | Extreme | | | | | | | |
| **Reference: Power Factor = Cosine q = Active Power (W) / Apparent Power (VA)** | | | | | | | | |
| **Voltage Circuit Meter Losses:** | **Power Factor** | **Voltage (V)** | **Current (A)** | **Active Power (Watts)** | **Limit (W)** | **Apparent Power (Volt-Amperes)** | **Limit (VA)** | **Result** |
| **Voltage A** | 0.6869 | 120.01 | 0.01141 | 0.940581855 | 5 | 1.3693141 | 20 | Pass |
| **Voltage C** | 0.9029 | 120.02 | 0.01134 | 1.228871098 | 5 | 1.3610268 | 20 | Pass |
| **Current Circuit Meter Losses:** | **Power Factor** | **Voltage (V)** | **Current (A)** | **Active Power (Watts)** | **Limit (W)** | **Apparent Power (Volt-Amperes)** | **Limit (VA)** | **Result** |
| **Current A** | 1 | 0.0047 | 30 | 0.141 | - | 0.141 | 1 | Pass |
| **Current C** | 1 | 0.0044 | 30 | 0.132 | - | 0.132 | 1 | Pass |

**Table 42 - Test 8 Meter Losses, 12S, SN 11F00911, Extreme**

| Test No. 8: Meter Losses | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.1 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 42.0% | | | | | |
| **Test Date** | 5/7/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F00911 | | | | | | | |
| **ACD State** | Normal | | | | | | | |
| **Reference: Power Factor = Cosine q = Active Power (W) / Apparent Power (VA)** | | | | | | | | |
| **Voltage Circuit Meter Losses:** | **Power Factor** | **Voltage (V)** | **Current (A)** | **Active Power (Watts)** | **Limit (W)** | **Apparent Power (Volt-Amperes)** | **Limit (VA)** | **Result** |
| **Voltage A** | 0.6847 | 119.99 | 0.01147 | 0.942342545 | 5 | 1.3762853 | 20 | Pass |
| **Voltage C** | 0.9035 | 120.00 | 0.011348 | 1.23035016 | 5 | 1.36176 | 20 | Pass |
| **Current Circuit Meter Losses:** | **Power Factor** | **Voltage (V)** | **Current (A)** | **Active Power (Watts)** | **Limit (W)** | **Apparent Power (Volt-Amperes)** | **Limit (VA)** | **Result** |
| **Current A** | 1 | 0.0048 | 30 | 0.144 | - | 0.144 | 1 | Pass |
| **Current C** | 1 | 0.0056 | 30 | 0.168 | - | 0.168 | 1 | Pass |

**Table 43 - Test 8 Meter Losses, 12S, SN 11F00911, Normal**


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| Test No. 8: Meter Losses | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.1 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 42.0% | | | | | |
| **Test Date** | 5/7/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C7 | | | | | | | |
| **ACD State** | Dormant | | | | | | | |
| **Reference: Power Factor = Cosine q = Active Power (W) / Apparent Power (VA)** | | | | | | | | |
| **Voltage Circuit Meter Losses:** | **Power Factor** | **Voltage (V)** | **Current (A)** | **Active Power (Watts)** | **Limit (W)** | **Apparent Power (Volt-Amperes)** | **Limit (VA)** | **Result** |
| **Voltage** | 0.6863 | 240.03 | 0.005603 | 0.922996696 | 5 | 1.34488809 | 20 | Pass |
| **Current Circuit Meter Losses:** | **Power Factor** | **Voltage (V)** | **Current (A)** | **Active Power (Watts)** | **Limit (W)** | **Apparent Power (Volt-Amperes)** | **Limit (VA)** | **Result** |
| **Current A** | 1 | 0.0049 | 30 | 0.147 | - | 0.147 | 1 | Pass |
| **Current C** | 1 | 0.0042 | 30 | 0.126 | - | 0.126 | 1 | Pass |

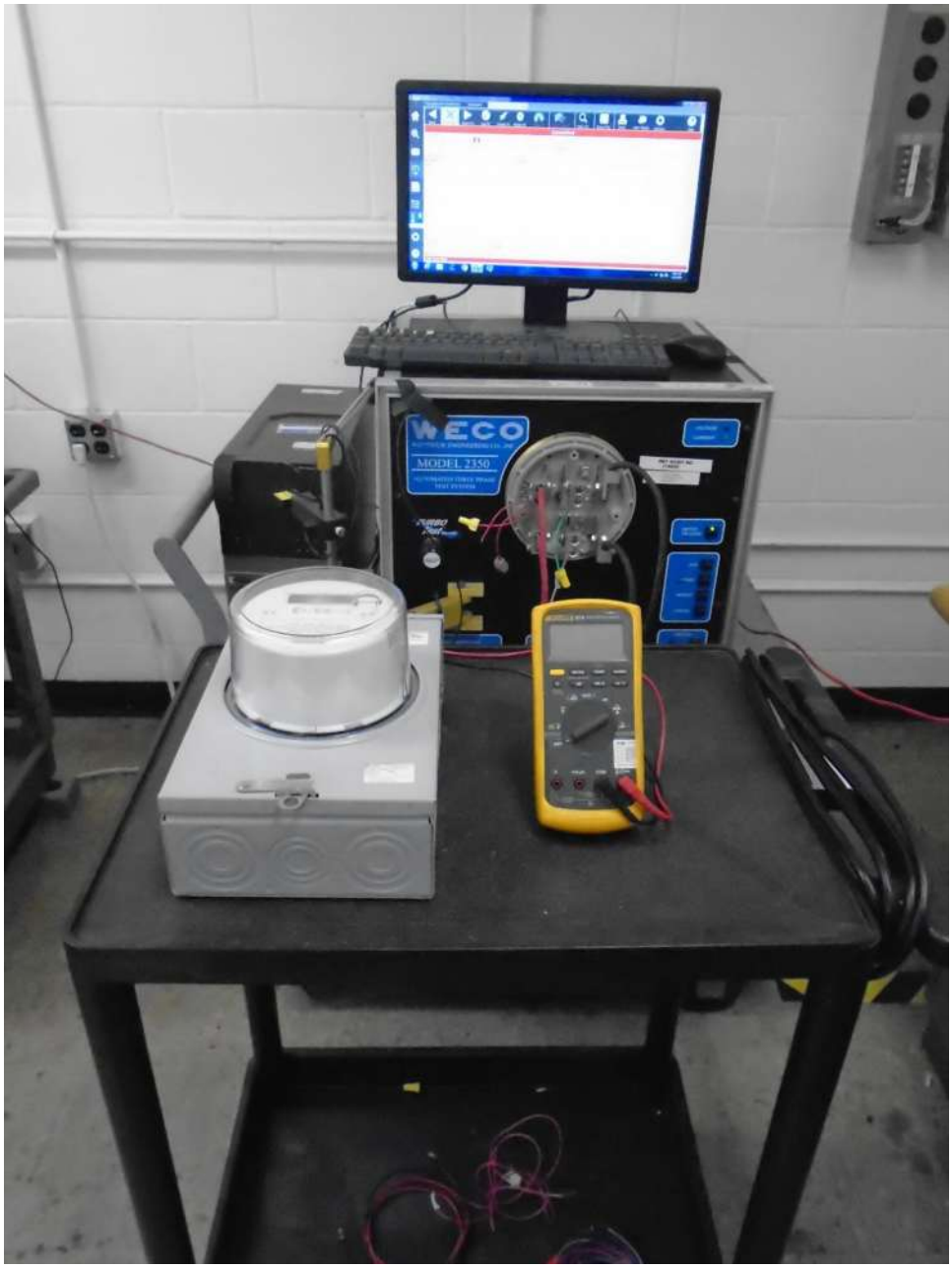
**Table 44 - Test 8 Meter Losses, 2S, SN 11F013C7, Dormant**

| Test No. 8: Meter Losses | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 52.0% | | | | | |
| **Test Date** | 5/15/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C7 | | | | | | | |
| **ACD State** | Extreme | | | | | | | |
| **Reference: Power Factor = Cosine q = Active Power (W) / Apparent Power (VA)** | | | | | | | | |
| **Voltage Circuit Meter Losses:** | **Power Factor** | **Voltage (V)** | **Current (A)** | **Active Power (Watts)** | **Limit (W)** | **Apparent Power (Volt-Amperes)** | **Limit (VA)** | **Result** |
| **Voltage** | 0.7058 | 240.03 | 0.005885 | 0.996996529 | 5 | 1.41257655 | 20 | Pass |
| **Current Circuit Meter Losses:** | **Power Factor** | **Voltage (V)** | **Current (A)** | **Active Power (Watts)** | **Limit (W)** | **Apparent Power (Volt-Amperes)** | **Limit (VA)** | **Result** |
| **Current A** | 1 | 0.0038 | 30 | 0.114 | - | 0.114 | 1 | Pass |
| **Current C** | 1 | 0.0048 | 30 | 0.144 | - | 0.144 | 1 | Pass |

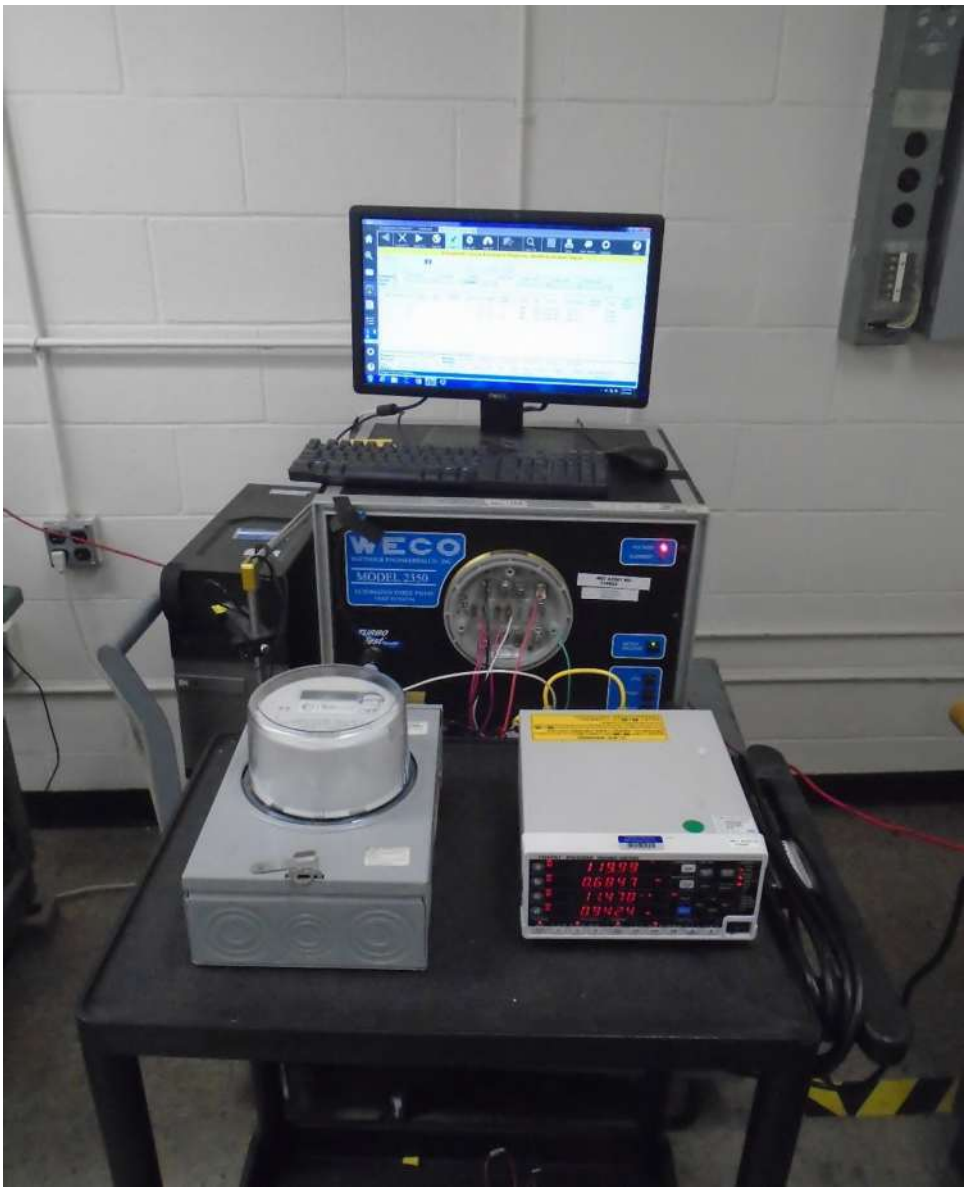
**Table 45 - Test 8 Meter Losses, 2S, SN 11F013C7, Extreme**

| Test No. 8: Meter Losses | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.1 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 42.0% | | | | | |
| **Test Date** | 5/7/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C7 | | | | | | | |
| **ACD State** | Normal | | | | | | | |
| **Reference: Power Factor = Cosine q = Active Power (W) / Apparent Power (VA)** | | | | | | | | |
| **Voltage Circuit Meter Losses:** | **Power Factor** | **Voltage (V)** | **Current (A)** | **Active Power (Watts)** | **Limit (W)** | **Apparent Power (Volt-Amperes)** | **Limit (VA)** | **Result** |
| **Voltage** | 0.7073 | 240.01 | 0.005891 | 1.000050699 | 5 | 1.41389891 | 20 | Pass |
| **Current Circuit Meter Losses:** | **Power Factor** | **Voltage (V)** | **Current (A)** | **Active Power (Watts)** | **Limit (W)** | **Apparent Power (Volt-Amperes)** | **Limit (VA)** | **Result** |
| **Current A** | 1 | 0.0039 | 30 | 0.117 | - | 0.117 | 1 | Pass |
| **Current C** | 1 | 0.0045 | 30 | 0.135 | - | 0.135 | 1 | Pass |

**Table 46 - Test 8 Meter Losses, 2S, SN 11F013C7, Normal**




**Photograph 9 - Test 8 Meter Losses, Test Setup_Current Circuit**




**Photograph 10 - Test 8 Meter Losses, Test Setup_Voltage Circuit**

### 6.9.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Equipment List - Test #8 Meter losses | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 3T6957 | AC Power Meter, 1 Phase | Hioki | PW3335-03 | 181045699 | 12/2/2024 | 12/2/2025 |
| 1T4833 | Automated Three-Phase Test System | WECO | 2350 | Nov-18 | 4/2/2025 | 4/2/2026 |
| 1T4602 | True RMS Multimeter | Fluke | 87 V | 95100189 | 3/28/2024 | 9/30/2025 |
| 1T9999 | Thermometer/Hygrometer | VWR International | 36934-164 | 230368599 | 5/31/2023 | 5/31/2025 |

**Table 47 - Test 8 Meter Losses, Equipment List**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## 6.10 Test No. 9: Temperature Rise

### 6.10.1 Test Requirement(s)

This test shall not apply for current class 2 meters.

The test shall be made with the specified current applied to all current circuits connected in series or polyphase. If current is applied using a polyphase source per Section 4.7.1.1, current circuits shall be connected independently to each phase of the source.

This test shall be applied to one meter of each class. All tests shall be performed in a room essentially free from drafts with the meter cover in place. The meter shall be mounted in a conventional manner on a suitably rated meter mounting device (socket) as defined in Table 48.

Wiring connecting the socket to the current source shall not be less than 4 ft. (1.22 m) long. Jumpers that join socket terminals directly to each other shall not be less than 8 ft. (2.44 m) long. Wiring shall be stranded, insulated, copper conductor as specified in Table 48.

Two 2 ft. (0.6 m) lengths of rigid steel conduit as specified in Table 48 are to be installed in the top and/or bottom of the meter mounting device. For detachable (type "S") meters, the opening where the conductors enter and leave the conduit and any other openings shall be closed with suitable material to prevent drafts.

The temperature rise as a result of this test under the specified conditions shall not exceed the values specified in Table 48. The temperature rating of all materials in contact with the current conductors of the meter shall be higher than that of the maximum temperature of the current conductors measured at the points of contact.

| Meter Class Designation | Wire-Size* (AWG Copper) | Current in Amperes | Detachable Meters | | | | Conduit Trade Size inches for 4 Wires |
|---|---|---|---|---|---|---|---|
| | | | Socket Rating in Amperes | Simulated Meter | Maximum Temperature Rise, Jaws | Maximum Temperature Rise, Simulated Jumper Bar | |
| 10 | No. 10 | 10 | 20 (min) | None | 65°C | N/A | ¾ |
| 20 | No. 10 | 20 | 20 (min) | None | 65°C | N/A | ¾ |
| 100 | No. 3 | 100 | Maximum of 135 Continuous | Fig. 2 | 65°C | 85°C | 1 ¼ |
| 200 | No. 3/0 | 200 | Maximum of 200 Continuous | Fig. 3 | 65°C | 85°C | 2 |
| 320 | 1-400 MCM or 2-3/0 | 320 | Maximum of 320 Continuous | Fig. 4 | 65°C | 90°C | 3 |

**Table 48 - Temperature-Rise Test Specifications**

*Wire sizes for 100, 200, and 320 A are those specified in ANSI/NFPA 70 for 75°C temperature rating.


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The temperature-rise test shall be made by means of temperature detectors in intimate contact with the metal of the simulated meter's current circuit and located at its approximate center. The temperature detectors for the socket jaws shall be in intimate contact with the metal of the jaws and located as shown in Figure 2.

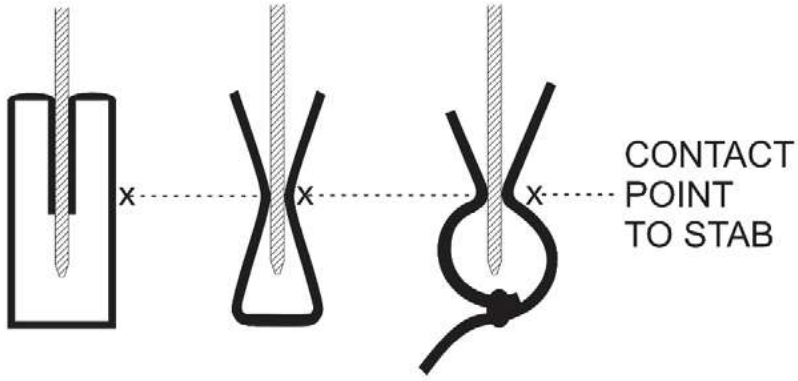


**Figure 2 - Location of Temperature Detectors**

In the case of meters provided with terminal compartments (type "A"), the temperature rise of any current-carrying parts of the meter shall not exceed 65°C. The test shall be conducted under the test conditions specified in Section 4.7.2.9 until the current-circuit temperatures have stabilized. The temperature rise shall be considered the difference in degrees Celsius between the stabilized temperature and ambient (room) temperature.

For detachable meters (type "S") current class 100, 200, and 320, the test installation shall be standardized using a simulated meter as specified in Figures 3, 4, and 5. The simulated meter shall have the same number of current jumper bars as current circuits in the meter to be tested. The simulated meter cover shall be constructed of glass or plastic with a volume not to exceed 153 $in.^3$ (2,510 $cm^3$). The volume of the cover shall be measured from the surface where the cover mates with the meter assembly, not from the ring or other attachment, so that variations in the flange overlapping the meter body will not affect the meter volume. The simulated meter cover shall have sufficient depth to accommodate the simulated meter jumper bars without deformation or bending, and after assembly of the simulated meter the cover shall not be in contact with the jumper bars.

A temperature-rise test shall be conducted on the simulated meter by applying the test current to all jumper bars until the temperature as indicated by the temperature detector has stabilized. The measured final temperature rise of the simulated meter as well as that of the jaws shall not exceed the values shown in Table 48. The simulated meter shall then be replaced by the meter to be tested.

The MUT (meter under test) shall be tested with its intended production cover. A temperature-rise test shall be conducted on the MUT by applying the test current to all jumper bars until the temperature as indicated by the temperature detector has stabilized. The MUT shall be in conformance if any MUT jaw temperature-rise measurement is not more than +5°C above the maximum temperature-rise value of any of those measured for the simulated meter test AND the average temperature-rise of all positions of the MUT is less than or equal to 65°C.

An Accuracy Performance Check shall be performed (Section 4.7.3.0.1) of ANSI C12.1.

## 6.10.2 Test Data and Results

The meters listed below are **compliant** with the requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C3 |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CA |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CD |

Refer to the following test data and photographs for a complete overview of the test setup and results.

| Performance Verification (External Influences) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 23 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 31.0% | | | | | |
| **Test Date** | 4/24/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C3 | | | | | | | |
| **Before Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage (As Reference)** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 120 | 60 | 30 | 1.0 | 99.908 | -0.092 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 3 | 1.0 | 99.925 | -0.075 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 30 | 0.5 Lag | 100.011 | 0.011 | ± 0.2 % | Pass |
| **After Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 120 | 60 | 30 | 1.0 | 100.082 | -0.174 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 3 | 1.0 | 100.091 | -0.166 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 30 | 0.5 Lag | 100.176 | -0.165 | ± 0.2 % | Pass |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F004CA | | | | | | | |
| **Before Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage (As Reference)** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 120 | 60 | 15 | 1.0 | 100.024 | 0.024 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 1.5 | 1.0 | 100.036 | 0.036 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 15 | 0.5 Lag | 100.017 | 0.017 | ± 0.2 % | Pass |
| **After Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 120 | 60 | 15 | 1.0 | 99.991 | 0.033 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 1.5 | 1.0 | 100.005 | 0.031 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 15 | 0.5 Lag | 100.105 | -0.088 | ± 0.2 % | Pass |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Meter Form** | 12S | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F004CD | | | | | | | |
| **Before Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage（As Reference）** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 120 | 60 | 30 | 1.0 | 99.965 | -0.035 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 3 | 1.0 | 99.977 | -0.023 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 30 | 0.5 Lag | 100.104 | 0.104 | ± 0.2 % | Pass |
| **After Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 120 | 60 | 30 | 1.0 | 100.034 | -0.069 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 3 | 1.0 | 100.042 | -0.065 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 30 | 0.5 Lag | 100.194 | -0.090 | ± 0.2 % | Pass |

**Table 49 - Test 9, Temperature Rise, Performance Verification - External Influences**

| **Test No. 9: Temperature Rise** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.8 | | | | | |
| **Engineer** | Steven Lu / William Yip | **Humidity (RH)** | 29.0% | | | | | |
| **Test Date** | 4/24/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.5 | | | | | | | |
| **Serial Number** | 11F004CA | | | | | | | |

| **Simulated Meter Current (A):** | **Ambient Temperature (°C):** | **Simulated Meter Jumper Bar Measured Temperature (°C):** | **Simulated Meter Jaws Measured Temperature (°C):** | **Simulated Meter Jumper Bar Temperature Rise (°C):** | **Simulated Meter Jaws Temperature Rise (°C):** | **Maximum Temperature Rise, Simulated Meter Jumper Bar (°C):** | **Result** | |
|---|---|---|---|---|---|---|---|---|
| 200 | 24 | 91.8 | 76.3 | 67.8 | 52.3 | 85 | Pass | |
| **Meter Current (A):** | **Ambient Temperature (°C):** | **Maximum Jaws Measured Temperature (°C):** | **Average Jaws Measured Temperature (°C):** | **Maximum Jaws Measured Temperature Rise (°C):** | **Average Jaws Temperature Rise (°C):** | **Maximum Temperature Average, Jaws (°C):** | **Maximum Temperature Rise plus 5°C, Jaws (°C):** | **Result** |
| 200 | 23.9 | 57.2 | 54.8 | 33.3 | 30.9 | 65 | 72.8 | Pass |

**Table 50 - Test 9, Temperature Rise, 12S SN 11F004CA, CL200**


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| Test No. 9: Temperature Rise | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 23.2 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 33.0% | | | | | |
| **Test Date** | 4/25/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.5 | | | | | | | |
| **Serial Number** | 11F004CD | | | | | | | |

| Simulated Meter Current (A): | Ambient Temperature (°C): | Simulated Meter Jumper Bar Measured Temperature (°C): | Simulated Meter Jaws Measured Temperature (°C): | Simulated Meter Jumper Bar Temperature Rise (°C): | Simulated Meter Jaws Temperature Rise (°C): | Maximum Temperature Rise, Simulated Meter Jumper Bar (°C): | Result | |
|---|---|---|---|---|---|---|---|---|
| 200 | 24 | 91.8 | 76.3 | 67.8 | 52.3 | 85 | Pass | |

| Meter Current (A): | Ambient Temperature (°C): | Maximum Jaws Measured Temperature (°C): | Average Jaws Measured Temperature (°C): | Maximum Jaws Measured Temperature Rise (°C): | Average Jaws Temperature Rise (°C): | Maximum Temperature Average, Jaws (°C): | Maximum Temperature Rise plus 5°C, Jaws (°C): | Result |
|---|---|---|---|---|---|---|---|---|
| 200 | 23.6 | 59.5 | 57.3 | 35.9 | 33.7 | 65 | 72.8 | Pass |

**Table 51 - Test 9, Temperature Rise, 12S SN 11F004CD, CL200**

| Test No. 9: Temperature Rise | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.8 | | | | | |
| **Engineer** | Steven Lu / William Yip | **Humidity (RH)** | 29.0% | | | | | |
| **Test Date** | 4/24/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.5 | | | | | | | |
| **Serial Number** | 11F013C3 | | | | | | | |

| Simulated Meter Current (A): | Ambient Temperature (°C): | Simulated Meter Jumper Bar Measured Temperature (°C): | Simulated Meter Jaws Measured Temperature (°C): | Simulated Meter Jumper Bar Temperature Rise (°C): | Simulated Meter Jaws Temperature Rise (°C): | Maximum Temperature Rise, Simulated Meter Jumper Bar (°C): | Result | |
|---|---|---|---|---|---|---|---|---|
| 200 | 24 | 91.8 | 76.3 | 67.8 | 52.3 | 85 | Pass | |

| Meter Current (A): | Ambient Temperature (°C): | Maximum Jaws Measured Temperature (°C): | Average Jaws Measured Temperature (°C): | Maximum Jaws Measured Temperature Rise (°C): | Average Jaws Temperature Rise (°C): | Maximum Temperature Average, Jaws (°C): | Maximum Temperature Rise plus 5°C, Jaws (°C): | Result |
|---|---|---|---|---|---|---|---|---|
| 200 | 24.6 | 57.6 | 56.2 | 33 | 31.6 | 65 | 72.8 | Pass |

**Table 52 - Test 9, Temperature Rise, 2S SN 11F013C3, CL200**


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**Photograph 11 - Test 9, Temperature Rise, Test Setup**



**Photograph 12 - Test 9, Temperature Rise, Test Simulated Setup**

### 6.10.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test#9 Temperature Rise Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 4T7293 | Data Acquisition/ Switch Unit | Agilent Technologies | 34970A | MY44011576 | Functional Verified | Functional Verified |
| 4T7308 | Transformer | General Electric | n/a | n/a | Functional Verified | Functional Verified |
| 4T7410 | Clamp Meter | Fluke | 376 | 32030477WS | 3/17/2025 | 9/30/2026 |

**Table 53 - Test 9, Temperature Rise, Equipment List**

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

## 6.11 Test No. 11: Effect of Internal Heating

### 6.11.1 Test Requirement(s)

The test shall be made with the meter mounted in a conventional manner on a suitably rated meter mounting device and wired with not less than 4 ft. (1.22 m) of conductor (8 ft. (2.44 m) jumper between terminals) of a size in accordance with Table 48 (Test #9) Openings around the conductor, and any other openings, shall be closed with suitable material to prevent drafts. The effect of internal heating upon the performance of a meter shall not exceed the maximum deviation specified in Table 54 or Table 55.

For meters equipped with an ACD, this test should be conducted with the ACD in the dormant state. See 4.5.6.7 of ANSI C12.1: 2024 for ACD test options.

| Condition | Current in Amperes | | | Maximum Deviation in Percent from Reference | | | |
|---|---|---|---|---|---|---|---|
| | Current Class | | | Accuracy Class | | | |
| | 2 | 10 | 20 | 1.0 | 0.5 | 0.2 | 0.1 |
| Reference for 1, 2, and 7 | 2 | 10 | 20 | Ref. | Ref. | Ref. | Ref. |
| Reference for 3 and 5 | 0.025 | 0.25 | 0.25 | Ref. | Ref. | Ref. | Ref. |
| Reference for 4 and 6 | 0.25 | 2.5 | 2.5 | Ref. | Ref. | Ref. | Ref. |
| 1 – One-half hour after application of load | 2 | 10 | 20 | ±1.0 | ±0.2 | ±0.2 | ±0.1 |
| 2– One-half hour after application of load | 2 | 10 | 20 | ±1.5 | ±0.3 | ±0.2 | ±0.1 |
| 3 – Immediately following test for condition 2 | 0.025 | 0.25 | 0.25 | ±1.5 | ±0.3 | ±0.2 | ±0.1 |
| 4 – Immediately following test for condition 3 | 0.25 | 2.5 | 2.5 | ±1.5 | ±0.3 | ±0.2 | ±0.1 |
| 5 – Two hours after test for condition 4 with meter at no load current during the 2-hour interval | 0.025 | 0.25 | 0.25 | ±1.5 | ±0.3 | ±0.2 | ±0.1 |
| 6 – Immediately following test for condition 5 | 0.25 | 2.5 | 2.5 | ±1.0 | ±0.2 | ±0.2 | ±0.1 |
| 7 – Immediately following test for 6 | 2 | 10 | 20 | ±1.0 | ±0.2 | ±0.2 | ±0.1 |

**Table 54 - Effect of Internal Heating for Current Classes 2, 10, and 20**

| Condition | Current in Amperes | | | Maximum Deviation in Percent from Reference | | | |
|---|---|---|---|---|---|---|---|
| | Current Class | | | Accuracy Class | | | |
| | 100 | 200 | 320 | 1.0 | 0.5 | 0.2 | 0.1 |
| Reference for 1, 2, and 7 | 100 | 200 | 320 | Ref. | Ref. | Ref. | Ref. |
| Reference for 3 and 5 | 1.5 | 3 | 5 | Ref. | Ref. | Ref. | Ref. |
| Reference for 4 and 6 | 15 | 30 | 50 | Ref. | Ref. | Ref. | Ref. |
| 1 – One-half hour after application of load | 100 | 200 | 320 | ±1.0 | ±0.4 | ±0.4 | ±0.2 |
| 2– One-half hour after application of load | 100 | 200 | 320 | ±1.5 | ±0.5 | ±0.4 | ±0.2 |
| 3 – Immediately following test for condition 2 | 1.5 | 3 | 5 | ±1.5 | ±0.5 | ±0.4 | ±0.2 |
| 4 – Immediately following test for condition 3 | 15 | 30 | 50 | ±1.5 | ±0.5 | ±0.4 | ±0.2 |
| 5 – Two hours after test for condition 4 with meter at no load current during the 2-hour interval | 1.5 | 3 | 5 | ±1.0 | ±0.5 | ±0.4 | ±0.2 |
| 6 – Immediately following test for condition 5 | 15 | 30 | 50 | ±1.0 | ±0.4 | ±0.4 | ±0.2 |
| 7 – Immediately following test for 6 | 100 | 200 | 320 | ±1.0 | ±0.4 | ±0.4 | ±0.2 |

**Table 55 - Effect of Internal Heating for Current Classes 100, 200, and 320**

### 6.11.2 Test Data and Results

The meters listed below are **compliant** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C3 |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F013CA |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CD |

Refer to the following test data and photographs for a complete overview of the test setup and results.

| Test No. 11: Internal Heating | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 20.6 | | | | | |
| **Engineer** | William Yip | **Humidity (RH)** | 39.0% | | | | | |
| **Test Date** | 4/28/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F004CD | | | | | | | |

| Condition | Volt | Amp | Power Factor | Frequency | % Registration | Deviation | Limit | Result |
|---|---|---|---|---|---|---|---|---|
| Reference performance for (1), (2) and (7) | 120 | 200 | 1.0 | 60 | 99.917 | Reference | Reference | Reference |
| Reference performance for (3) and (5) | 120 | 3 | 1.0 | 60 | 99.986 | Reference | Reference | Reference |
| Reference performance for (4) and (6) | 120 | 30 | 1.0 | 60 | 99.959 | Reference | Reference | Reference |
| (1) One-half hour after application of load | 120 | 200 | 1.0 | 60 | 100.124 | 0.207 | +/- 0.4 | Pass |
| (2) One hour after application of load | 120 | 200 | 1.0 | 60 | 100.238 | 0.321 | +/- 0.4 | Pass |
| (3) Immediately following test for (2) | 120 | 3 | 1.0 | 60 | 100.221 | 0.235 | +/- 0.4 | Pass |
| (4) Immediately following test for (3) | 120 | 30 | 1.0 | 60 | 100.194 | 0.235 | +/- 0.4 | Pass |
| (5) Two hour after test for (4) with meter at no load current during the two hour interval | 120 | 3 | 1.0 | 60 | 100.035 | 0.049 | +/- 0.4 | Pass |
| (6) Immediately following test for (5) | 120 | 30 | 1.0 | 60 | 100.010 | 0.051 | +/- 0.4 | Pass |
| (7) Immediately following test for (6) | 120 | 200 | 1.0 | 60 | 99.999 | 0.082 | +/- 0.4 | Pass |

**Table 56 - Test 11 Internal Heating (Class 0.2), 12S, SN 11F004CD, CL200**


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| Test No. 11: Internal Heating | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 21.9 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 29.0% | | | | | |
| **Test Date** | 4/28/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013CA | | | | | | | |

| Condition | Volt | Amp | Power Factor | Frequency | % Registration | Deviation | Limit | Result |
|---|---|---|---|---|---|---|---|---|
| Reference performance for (1), (2) and (7) | 120 | 200 | 1.0 | 60 | 100.055 | Reference | Reference | Reference |
| Reference performance for (3) and (5) | 120 | 3 | 1.0 | 60 | 100.085 | Reference | Reference | Reference |
| Reference performance for (4) and (6) | 120 | 30 | 1.0 | 60 | 100.062 | Reference | Reference | Reference |
| (1) One-half hour after application of load | 120 | 200 | 1.0 | 60 | 100.210 | 0.155 | +/- 0.4 | Pass |
| (2) One hour after application of load | 120 | 200 | 1.0 | 60 | 100.146 | 0.091 | +/- 0.4 | Pass |
| (3) Immediately following test for (2) | 120 | 3 | 1.0 | 60 | 100.208 | 0.123 | +/- 0.4 | Pass |
| (4) Immediately following test for (3) | 120 | 30 | 1.0 | 60 | 100.180 | 0.118 | +/- 0.4 | Pass |
| (5) Two hour after test for (4) with meter at no load current during the two hour interval | 120 | 3 | 1.0 | 60 | 100.085 | 0.000 | +/- 0.4 | Pass |
| (6) Immediately following test for (5) | 120 | 30 | 1.0 | 60 | 100.054 | -0.008 | +/- 0.4 | Pass |
| (7) Immediately following test for (6) | 120 | 200 | 1.0 | 60 | 99.870 | -0.185 | +/- 0.4 | Pass |

**Table 57 - Test 11 Internal Heating (Class 0.2), 12S, SN 11F013CA,CL200**


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| Test No. 11: Internal Heating | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 23 | | | | | |
| **Engineer** | William Yip | **Humidity (RH)** | 31.0% | | | | | |
| **Test Date** | 4/25/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C3 | | | | | | | |

| Condition | Volt | Amp | Power Factor | Frequency | % Registration | Deviation | Limit | Result |
|---|---|---|---|---|---|---|---|---|
| Reference performance for (1), (2) and (7) | 240 | 200 | 1.0 | 60 | 100.012 | Reference | Reference | Reference |
| Reference performance for (3) and (5) | 240 | 3 | 1.0 | 60 | 100.003 | Reference | Reference | Reference |
| Reference performance for (4) and (6) | 240 | 30 | 1.0 | 60 | 99.998 | Reference | Reference | Reference |
| (1) One-half hour after application of load | 240 | 200 | 1.0 | 60 | 100.003 | -0.009 | +/- 0.4 | Pass |
| (2) One hour after application of load | 240 | 200 | 1.0 | 60 | 99.987 | -0.025 | +/- 0.4 | Pass |
| (3) Immediately following test for (2) | 240 | 3 | 1.0 | 60 | 99.997 | -0.006 | +/- 0.4 | Pass |
| (4) Immediately following test for (3) | 240 | 30 | 1.0 | 60 | 99.997 | -0.001 | +/- 0.4 | Pass |
| (5) Two hour after test for (4) with meter at no load current during the two hour interval | 240 | 3 | 1.0 | 60 | 100.014 | 0.011 | +/- 0.4 | Pass |
| (6) Immediately following test for (5) | 240 | 30 | 1.0 | 60 | 100.013 | 0.015 | +/- 0.4 | Pass |
| (7) Immediately following test for (6) | 240 | 200 | 1.0 | 60 | 99.996 | -0.016 | +/- 0.4 | Pass |

**Table 58 - Test 11 Internal Heating (Class 0.2), 2S, SN 11F013C3, CL200**




**Photograph 13 - Test 11 Internal Heating, Test Setup**

### 6.11.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test # 11: Effect of Internal Heating | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 4T7283 | Automated Meter testing System | WECO | 2300 | 4952 | 3/28/2025 | 3/31/2026 |
| 4T7347 | Dytronic Reference Standard | Radian research | RD-20-203 | 204582 | 3/28/2025 | 3/31/2026 |
| 4T7329 | Dytronic Reference Standard | Radian Research | RD-20-203 | 204925 | 3/28/2025 | 3/31/2026 |
| 4T7330 | Dytronic Reference Standard | Radian Research | RD-20-203 | 204926 | 3/28/2025 | 3/31/2026 |

**Table 59 - Test 11 Internal Heating, Equipment List**

## 6.12 Test No. 13: Stability of Performance

### 6.12.1 Test Requirement(s)

The meter shall be operated continuously. The percentage registration shall be determined at the start of the test and at 10 successive intervals at least 24 hours apart within a period of two weeks.

Available nominal voltage and current can be used for the duration of this test except when the meter is undergoing the specified accuracy test.

For meters equipped with an ACD, this test should be conducted with the ACD in the dormant state. See 4.5.6.7 of ANSI C12.1: 2024 for ACD test options.

The change in percentage registration from performance at the start of the test shall not exceed the limits in Table 60.

| Condition | Current in Amperes | | | | | | Maximum Deviation in Percent from Reference Performance | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Current Class | | | | | | Accuracy Class | | | |
| | 2 | 10 | 20 | 100 | 200 | 320 | 1.0 | 0.5 | 0.2 | 0.1 |
| Reference performance at beginning of test | 0.025 | 0.25 | 0.25 | 1.5 | 3 | 5 | Ref. | Ref. | Ref. | Ref. |
| Performance for all 10 subsequent tests | 0.025 | 0.25 | 0.25 | 1.5 | 3 | 5 | ±1.0 | ±0.5 | ±0.2 | ±0.05 |

**Table 60 - Limits for Stability of Performance**

### 6.12.2 Test Data and Results

The meters listed below are **compliant** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C7 |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CD |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F00911 |

Refer to the following test data and photographs for a complete overview of the test setup and results.


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| Test No. 13: Stability of Performance | | | | | |
|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature (C)** | 22.5 | |
| **Engineer** | William Yip / Steven Lu | | **Humidity (RH)** | 44% | |
| **Test Date** | 5/16/2025 | | **Observations** | None | |
| | | | | | |
| **Meter Form** | 12S | | | | |
| **Current Class** | 200 | | | | |
| **Accuracy Class** | 0.2 | | | | |
| **Serial Number** | 11F004CD | | | | |
| **Test Current:** | | 30 | | | |
| **Current (10% Test Current)** | | 3 | | | |
| **Day** | **% Registration** | **Deviation** | **0.2 Class Limit** | **Result** | |
| Start | 100.014 | Reference | Reference | Reference | |
| Day 1 | 99.988 | -0.026 | +/-0.2 | Pass | |
| Day 2 | 100.020 | 0.006 | +/-0.2 | Pass | |
| Day 3 | 99.992 | -0.022 | +/-0.2 | Pass | |
| Day 4 | 99.997 | -0.017 | +/-0.2 | Pass | |
| Day 5 | 99.995 | -0.019 | +/-0.2 | Pass | |
| Day 6 | 100.016 | 0.002 | +/-0.2 | Pass | |
| Day 7 | 100.009 | -0.005 | +/-0.2 | Pass | |
| Day 8 | 100.004 | -0.010 | +/-0.2 | Pass | |
| Day 9 | 100.017 | 0.003 | +/-0.2 | Pass | |
| Day 10 | 99.988 | -0.026 | +/-0.2 | Pass | |

**Table 61 - Test 13 Stability of Performance, 12S, SN 11F004CD**

| Test No. 13: Stability of Performance | | | | | |
|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature (C)** | 22.5 | |
| **Engineer** | William Yip / Steven Lu | | **Humidity (RH)** | 44% | |
| **Test Date** | 5/16/2025 | | **Observations** | None | |
| | | | | | |
| **Meter Form** | 12S | | | | |
| **Current Class** | 200 | | | | |
| **Accuracy Class** | 0.2 | | | | |
| **Serial Number** | 11F00911 | | | | |
| **Test Current:** | | 30 | | | |
| **Current (10% Test Current)** | | 3 | | | |
| **Day** | **% Registration** | **Deviation** | **0.2 Class Limit** | **Result** | |
| Start | 100.004 | Reference | Reference | Reference | |
| Day 1 | 100.093 | 0.089 | +/-0.2 | Pass | |
| Day 2 | 100.096 | 0.092 | +/-0.2 | Pass | |
| Day 3 | 100.075 | 0.071 | +/-0.2 | Pass | |
| Day 4 | 100.054 | 0.050 | +/-0.2 | Pass | |
| Day 5 | 100.076 | 0.072 | +/-0.2 | Pass | |
| Day 6 | 100.092 | 0.088 | +/-0.2 | Pass | |
| Day 7 | 100.017 | 0.013 | +/-0.2 | Pass | |
| Day 8 | 100.015 | 0.011 | +/-0.2 | Pass | |
| Day 9 | 100.023 | 0.019 | +/-0.2 | Pass | |
| Day 10 | 100.012 | 0.008 | +/-0.2 | Pass | |

**Table 62 - Test 13 Stability of Performance, 12S, SN 11F00911**


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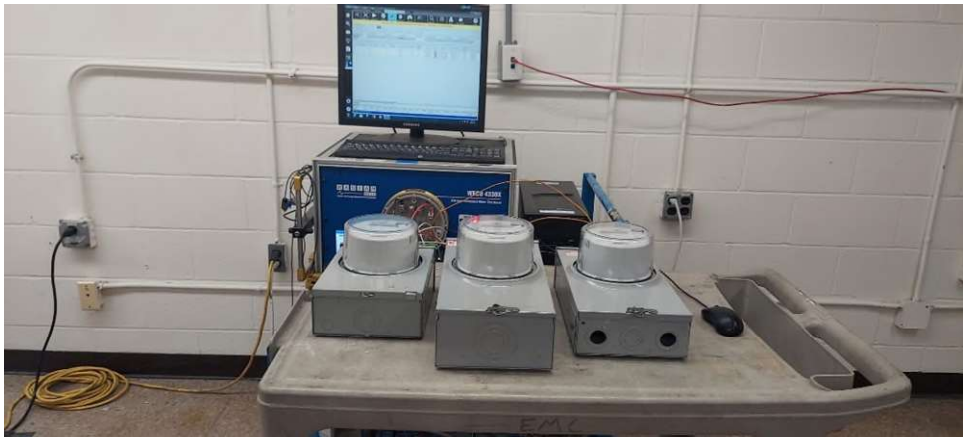
| Test No. 13: Stability of Performance | | | | | |
|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature (C)** | 22.5 | |
| **Engineer** | William Yip / Steven Lu | | **Humidity (RH)** | 44% | |
| **Test Date** | 5/16/2025 | | **Observations** | None | |
| | | | | | |
| **Meter Form** | 2S | | | | |
| **Current Class** | 200 | | | | |
| **Accuracy Class** | 0.2 | | | | |
| **Serial Number** | 11F013C7 | | | | |
| **Test Current:** | | 30 | | | |
| **Current (10% Test Current)** | | 3 | | | |
| **Day** | **% Registration** | **Deviation** | **0.2 Class Limit** | **Result** | |
| Start | 99.996 | Reference | Reference | Reference | |
| Day 1 | 99.971 | -0.025 | +/-0.2 | Pass | |
| Day 2 | 99.978 | -0.018 | +/-0.2 | Pass | |
| Day 3 | 99.978 | -0.018 | +/-0.2 | Pass | |
| Day 4 | 99.971 | -0.025 | +/-0.2 | Pass | |
| Day 5 | 99.959 | -0.037 | +/-0.2 | Pass | |
| Day 6 | 99.982 | -0.014 | +/-0.2 | Pass | |
| Day 7 | 99.964 | -0.032 | +/-0.2 | Pass | |
| Day 8 | 99.987 | -0.009 | +/-0.2 | Pass | |
| Day 9 | 99.966 | -0.030 | +/-0.2 | Pass | |
| Day 10 | 99.972 | -0.024 | +/-0.2 | Pass | |

**Table 63 - Test 13 Stability of Performance, 2S, SN 11F013C7**



**Photograph 14 - Test 13 Stability of Performance, Test Setup**

### 6.12.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 13 Stability of Performance Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 4T7347 | Dytronic Reference Standard | Radian research | RD-20-203 | 205414 | 3/28/2025 | 3/31/2026 |
| 4T7329 | Dytronic Reference Standard | Radian Research | RD-20-203 | 204925 | 3/28/2025 | 3/31/2026 |
| 4T7330 | Dytronic Reference Standard | Radian Research | RD-20-203 | 204926 | 3/28/2025 | 3/31/2026 |
| 4T7283 | Automated Meter testing System | WECO | 2300 | 4952 | 3/28/2025 | 3/31/2026 |
| 1T10002 | Thermometer/ Hygrometer/Barometer | Fisher Scientific | 14-650-118 | 240202396 | 3/6/2024 | 3/6/2026 |

**Table 64 - Test 13 Stability of Performance, Equipment List**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## 6.13 Test No. 14: Effect of Phase Sequence Reversal

### 6.13.1 Test Requirement(s)

This test only applies to meters with 2 or more elements.

At full load and light load, with unity power factor, the difference between registration of ABC rotation and CBA rotation, as described in Table 8 and Table 9 (in ANSI C12.1: 2024), shall not exceed the limits of Table 65.

For meters equipped with an ACD, this test should be conducted with the ACD in the dormant state. See 4.5.6.7 of ANSI C12.1: 2024 for ACD test options.

| Condition | Current in Amperes | | | | | | Power Factor | Maximum Deviation in Percent from Reference Performance | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Current Class | | | | | | | Accuracy Class | | | |
| | 2 | 10 | 20 | 100 | 200 | 320 | | 1.0 | 0.5 | 0.2 | 0.1 |
| Reference Performance for ABC Loading* | 0.025 | 0.25 | 0.25 | 1.5 | 3 | 5 | 1 | Ref. | Ref. | Ref. | Ref. |
| CBA Loading* | 0.025 | 0.25 | 0.25 | 1.5 | 3 | 5 | 1 | ±1.0 | ±0.6 | ±0.3 | ±0.1 |
| Reference Performance for ABC Loading* | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | 1 | Ref. | Ref. | Ref. | Ref. |
| CBA Loading* | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | 1 | ±1.0 | ±0.6 | ±0.3 | ±0.1 |

**Table 65 - Limits for Phase Sequence Reversal**

*If the meter is designed for measurement of energy in both directions, then these conditions shall be performed twice, once with energy flowing only in the delivered direction, and once with energy flowing only in the received direction

### 6.13.2 Test Data and Results

The meters listed below are **compliant** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CA |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F00911 |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CD |

Refer to the following test data and photographs for a complete overview of the test setup and results.


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| Test No. 14: Effect of Polyphase Loading | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.3 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 34.0% | | | | | |
| **Test Date** | 4/22/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F004CD | | | | | | | |

| Condition | Volt | Amp | Power Factor | Frequency | % Registration | Deviation | Limit | Result |
|---|---|---|---|---|---|---|---|---|
| Reference Performance for ABC Loading (Light Load) | 120 | 3 | 1.0 | 60 | 99.979 | Reference | Reference | Reference |
| CBA Loading (Light Load) | 120 | 3 | 1.0 | 60 | 99.919 | -0.060 | +/- 0.3 | Pass |
| Reference Performance for ABC Loading (Full Load) | 120 | 30 | 1.0 | 60 | 99.970 | Reference | Reference | Reference |
| CBA Loading (Full Load) | 120 | 30 | 1.0 | 60 | 99.909 | -0.061 | +/- 0.3 | Pass |

**Table 66 - Test 14 Effect of Polyphase Loading (Class 0.2), 12S SN 11F004CD**

| Test No. 14: Effect of Polyphase Loading | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 32.0% | | | | | |
| **Test Date** | 4/21/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F004CA | | | | | | | |

| Condition | Volt | Amp | Power Factor | Frequency | % Registration | Deviation | Limit | Result |
|---|---|---|---|---|---|---|---|---|
| Reference Performance for ABC Loading (Light Load) | 120 | 3 | 1.0 | 60 | 100.012 | Reference | Reference | Reference |
| CBA Loading (Light Load) | 120 | 3 | 1.0 | 60 | 99.958 | -0.054 | +/- 0.3 | Pass |
| Reference Performance for ABC Loading (Full Load) | 120 | 30 | 1.0 | 60 | 100.006 | Reference | Reference | Reference |
| CBA Loading (Full Load) | 120 | 30 | 1.0 | 60 | 99.946 | -0.060 | +/- 0.3 | Pass |

**Table 67 - Test 14 Effect of Polyphase Loading (Class 0.2),12S SN 11F004CA**


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| Test No. 14: Effect of Polyphase Loading | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 32.0% | | | | | |
| **Test Date** | 4/21/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F00911 | | | | | | | |

| Condition | Volt | Amp | Power Factor | Frequency | % Registration | Deviation | Limit | Result |
|---|---|---|---|---|---|---|---|---|
| Reference Performance for ABC Loading (Light Load) | 120 | 3 | 1.0 | 60 | 99.997 | Reference | Reference | Reference |
| CBA Loading (Light Load) | 120 | 3 | 1.0 | 60 | 99.938 | -0.059 | +/- 0.3 | Pass |
| Reference Performance for ABC Loading (Full Load) | 120 | 30 | 1.0 | 60 | 99.991 | Reference | Reference | Reference |
| CBA Loading (Full Load) | 120 | 30 | 1.0 | 60 | 99.930 | -0.061 | +/- 0.3 | Pass |
| Reverse Direction: Reference Performance for ABC Loading (Light Load) | 120 | 3 | 1.0 | 60 | | Reference | Reference | Reference |
| Reverse Direction: CBA Loading (Light Load) | 120 | 3 | 1.0 | 60 | | 0.000 | +/- 0.3 | Pass |
| Reverse Direction: Reference Performance for ABC Loading (Full Load) | 120 | 30 | 1.0 | 60 | | Reference | Reference | Reference |
| Reverse Direction: CBA Loading (Full Load) | 120 | 30 | 1.0 | 60 | | 0.000 | +/- 0.3 | Pass |

**Table 68 - Test 14 Effect of Polyphase Loading (Class 0.2),12S SN 11F00911**


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**Photograph 15 - Test 14 Effect of Polyphase Loading, Test Setup**

### 6.13.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 14 Effect of Polyphase Loading Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 4T1512 | WECO Meter Accuracy Tester w/ internal Radian st | Radian | WECO M4330X; Radian RX-30 | WECO: W8839; Radian: 710257 | N/A | 5/30/2026 |
| 1T9999 | Thermometer/ Hygrometer | VWR International | 36934-164 | 230368599 | 5/31/2023 | 5/31/2025 |

**Table 69 - Test 14 Effect of Polyphase Loading, Equipment List**


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## 6.14 Test No. 15: Insulation

### 6.14.1 Test Requirement(s)

With the meter voltage and current circuits de-energized, the insulation between current-carrying parts of separate circuits and between current-carrying parts and other metallic parts shall be capable of withstanding the application of a sinusoidal voltage of 2.5 kV rms, 60 Hz for one minute. The input circuit of the pulse initiators with independent power supplies shall be tested at 1.5 kV rms, 60 Hz for one minute. For both the 1.5 and 2.5 kV rms test, the leakage current shall not exceed 0.005 amps per circuit. Low-voltage electronic circuits, operating at less than 30 V rms, 42.6 V peak, or 60 V DC, and all output relay terminals, shall not be subjected to this test.

Components providing a path in parallel with the insulation to be tested, such as discharge resistors for filter capacitors, voltage limiting devices, or surge suppressors should be disconnected For self- contained meter forms, any potential circuit burden that cannot be isolated by means of test links may be isolated by disconnection or other appropriate means.

### 6.14.2 Test Data and Results

The meters listed below are **compliant** with the requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C3 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C5 |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CA |

Refer to the following test data and photographs for a complete overview of the test setup and results.


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| Test No. 15: Insulation | | | | | |
|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature (C)** | 22.5 | |
| **Engineer** | William Yip | | **Humidity (RH)** | 33% | |
| **Test Date** | 5/7/2025 | | **Observations** | None | |
| **Meter Form** | 12S | | | | |
| **Current Class** | 200 | | | | |
| **Accuracy Class** | 0.2 | | | | |
| **Serial Number** | 11F004CA | | | | |
| **Insulation Test** | **Position** | **Limit** | **Leakage Current** | **Result** | **Comment** |
| 2.5kV | Line 1 & Current Ckt A to PE | 5 mA | .09 mA | Pass | with test links and voltage circuits in place |
| 2.5kV | Line 3 & Current Ckt C to PE | 5 mA | .09 mA | Pass | with test links and voltage circuits in place |
| 2.5kV | N to PE | 5 mA | .09 mA | Pass | with test links and voltage circuits in place |
| 2.5kV | Current Ckt A to N | 5 mA | .09 mA | Pass | with test links and parallel circuitry removed |
| 2.5kV | Current Ckt C to N | 5 mA | .09 mA | Pass | with test links and parallel circuitry removed |
| 2.5kV | Current Ckt A to Current Ckt C | 5 mA | .11 mA | Pass | with test links and parallel circuitry removed |
| *Test Unit passes the Insulation test at 2.5 kVrms, 60 Hz for 1 minute. | | | | | |
| Since the test unit passes at this higher 2.5 kVrms level, the 1.5 kVrms , 60 Hz for 1 minute is unnecessary. | | | | | |

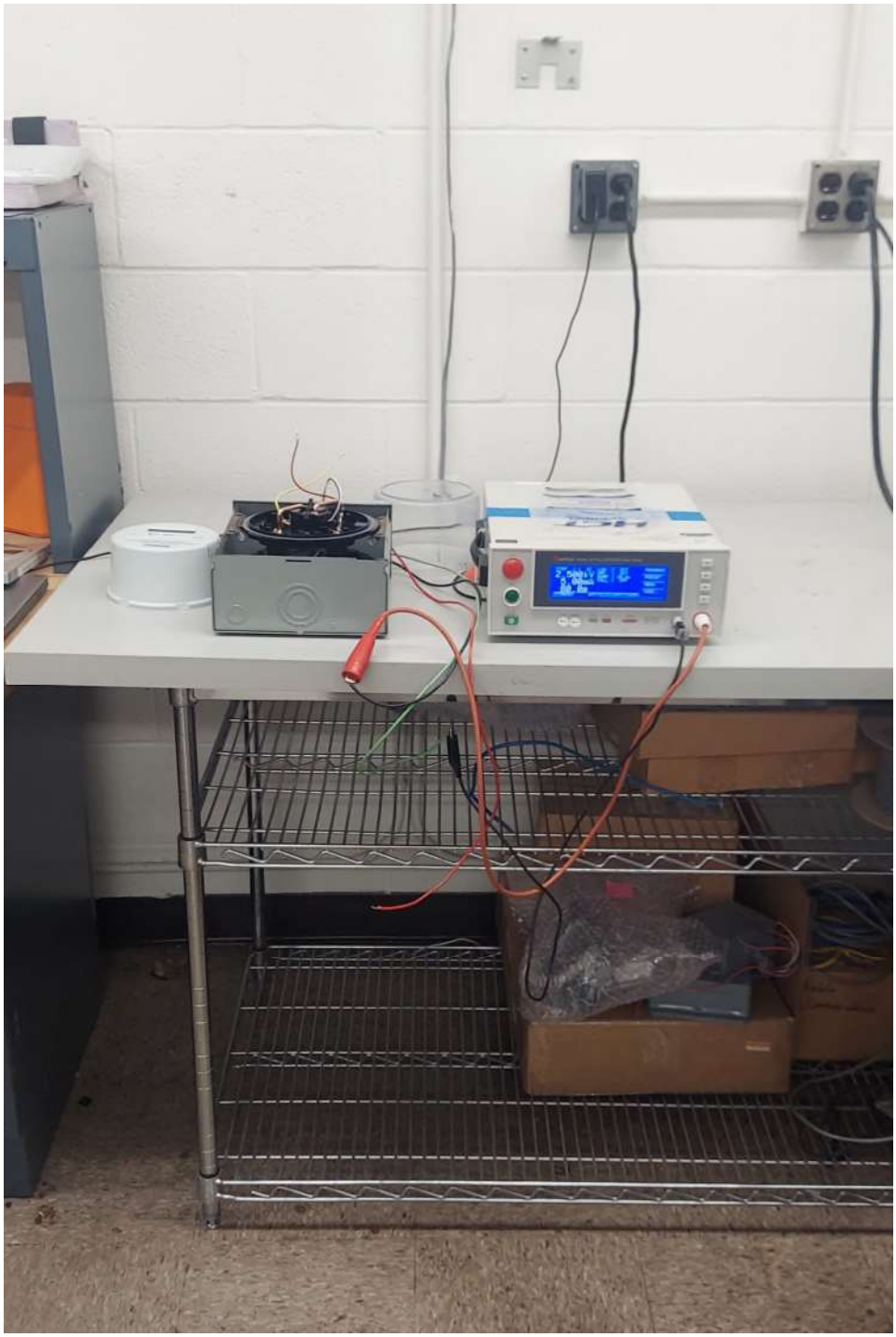
**Table 70 - Test 15, Insulation, 12S, SN 11F004CA**

| Test No. 15: Insulation | | | | | |
|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature (C)** | 22.5 | |
| **Engineer** | William Yip | | **Humidity (RH)** | 33% | |
| **Test Date** | 5/7/2025 | | **Observations** | None | |
| **Meter Form** | 2S | | | | |
| **Current Class** | 200 | | | | |
| **Accuracy Class** | 0.2 | | | | |
| **Serial Number** | 11F013C3 | | | | |
| **Insulation Test** | **Position** | **Limit** | **Leakage Current** | **Result** | **Comment** |
| 2.5kV | Line 1 & Current Ckt A to PE | 5 mA | .09 mA | Pass | with test links and voltage circuits in place |
| 2.5kV | Line 2 & Current Ckt B to PE | 5 mA | .09 mA | Pass | with test links and voltage circuits in place |
| 2.5kV | Current Ckt A to Current Ckt B | 5 mA | .11 mA | Pass | with test links and parallel circuitry removed |
| *Test Unit passes the Insulation test at 2.5 kVrms, 60 Hz for 1 minute. | | | | | |
| Since the test unit passes at this higher 2.5 kVrms level, the 1.5 kVrms , 60 Hz for 1 minute is unnecessary. | | | | | |

**Table 71 - Test 15, Insulation, 2S SN 11F013C3**

| Test No. 15: Insulation | | | | | |
|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature (C)** | 22.5 | |
| **Engineer** | William Yip | | **Humidity (RH)** | 33% | |
| **Test Date** | 5/7/2025 | | **Observations** | None | |
| **Meter Form** | 2S | | | | |
| **Current Class** | 200 | | | | |
| **Accuracy Class** | 0.2 | | | | |
| **Serial Number** | 11F013C5 | | | | |
| **Insulation Test** | **Position** | **Limit** | **Leakage Current** | **Result** | **Comment** |
| 2.5kV | Line 1 & Current Ckt A to PE | 5 mA | .09 mA | Pass | with test links and voltage circuits in place |
| 2.5kV | Line 2 & Current Ckt B to PE | 5 mA | .09 mA | Pass | with test links and voltage circuits in place |
| 2.5kV | Current Ckt A to Current Ckt B | 5 mA | .11 mA | Pass | with test links and parallel circuitry removed |
| *Test Unit passes the Insulation test at 2.5 kVrms, 60 Hz for 1 minute. | | | | | |
| Since the test unit passes at this higher 2.5 kVrms level, the 1.5 kVrms , 60 Hz for 1 minute is unnecessary. | | | | | |

**Table 72 - Test 15, Insulation, 2S SN 11F013C5**



**Photograph 16 - Test 15, Insulation, Test Setup**

### 6.14.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 15 Insulation Equipment List | | | | | |
|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Calibration Date** | **Calibration Due Date** |
| 1T10002 | Thermometer/ Hygrometer/ Barometer | Fisher Scientific | 14-650-118 | 3/6/2024 | 3/6/2026 |
| 4T7435 | AC/DC Hi-POT Tester | QuadTech | Sentry 30 Plus | 3/17/2025 | 9/30/2026 |

**Table 73 - Test 15, Insulation, Equipment List**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## 6.15 Test No. 16: Voltage Interruptions Test

### 6.15.1 Test Requirement(s)

No current shall be applied to the meter current circuits. Voltage shall be completely interrupted for six power line cycles (100 ms). The voltage interruption shall be applied 10 times within an interval of no more than 10 seconds.

An Accuracy Performance Check (4.7.3.0.1 of ANSI C12.1: 2024) and, if applicable, an ACD Performance Check (4.7.3.0.2 of ANSI C12.1: 2024) shall be performed

### 6.15.2 Test Procedure

The EUT was provided with AC power via the programmable power supply. The power supply was programmed to perform the applicable set of voltage dips, interruptions and variations. Each sequence was repeated a minimum of three times to verify the results.

### 6.15.3 Test Data and Results

The meters listed below are **compliant** with the requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C3 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C5 |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CA |

Refer to the following test data and photographs for a complete overview of the test setup and results.


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| Performance Verification (External Influences) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 20.6 | | | | | |
| **Engineer** | William Yip | **Humidity (RH)** | 61.0% | | | | | |
| **Test Date** | 5/6/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C3 | | | | | | | |
| **Before Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage (As Reference)** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.996 | -0.004 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.997 | -0.003 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 100.003 | 0.003 | ± 0.2 % | Pass |
| **After Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 240 | 60 | 30 | 1.0 | 100.002 | -0.006 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 100.004 | -0.007 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.996 | 0.007 | ± 0.2 % | Pass |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C5 | | | | | | | |
| **Before Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage (As Reference)** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 240 | 60 | 30 | 1.0 | 100.009 | 0.009 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 100.032 | 0.032 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 100.007 | 0.007 | ± 0.2 % | Pass |
| **After Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.970 | 0.039 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.993 | 0.039 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 100.040 | -0.033 | ± 0.2 % | Pass |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F004CA | | | | | | | |

| Before Test | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Condition | Voltage (VAC) | Frequency (Hz) | Current (A) | Power Factor | Accuracy Percentage （As Reference） | Percent Error Before Test | Before Test Limit from Zero | Result |
| Full Load | 120 | 60 | | 1.0 | 99.999 | -0.001 | ± 0.2 % | Pass |
| Light Load | 120 | 60 | 0 | 1.0 | 99.997 | -0.003 | ± 0.2 % | Pass |
| Power Factor | 120 | 60 | 0 | 0.5 Lag | 100.034 | 0.034 | ± 0.2 % | Pass |
| **After Test** | | | | | | | | |
| Condition | Voltage (VAC) | Frequency (Hz) | Current (A) | Power Factor | Accuracy Percentage | % Deviation From Reference After Test | After Test Deviation Limit From Reference | Result |
| Full Load | 120 | 60 | 0 | 1.0 | 99.993 | 0.006 | ± 0.2 % | Pass |
| Light Load | 120 | 60 | 0 | 1.0 | 99.995 | 0.002 | ± 0.2 % | Pass |
| Power Factor | 120 | 60 | 0 | 0.5 Lag | 99.997 | 0.037 | ± 0.2 % | Pass |

**Table 74 - Test 16 VDI, Performance Verification - External Influences**


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| Voltage Interruptions Test Datasheet | | | | | | |
|---|---|---|---|---|---|---|
| **Project Number** | 135988 | | | **Temperature** | 20.5°C | |
| **Engineer** | William Yip | | | **Relative Humidity** | 60% | |
| **Test Date** | 5/6/2025 | | | **Observations** | None | |
| **Meter Form** | 12S | | | **Serial Number** | 11F004CA | |
| **Current Class** | CL200 | | | **N/A** | | |
| **Duration** | **Voltage Interruption** | | **Repetition Rate** | **Number of Repetitions** | **Results/Observations** | |
| **Cycles** | **Rated Voltage** | **Test Voltage** | | | | |
| 6 | 120V | 120V | 10 Seconds | 10 | Pass; No Anomalies Detected | |
| **Performance Verification and Test Results** | | | | | | |
| **Register Reading Before Test (Wh)** | 8236 | | **ACD Verification Before Test** | Pass | | |
| **Register Reading After Test (Wh)** | 8236 | | **ACD Verification After Test** | Pass | | |
| **Difference In Reading (Wh)** | 0 | | **Test Results** | Pass | | |

**Table 75 - Test 16 VDI, 12S SN 11F004CA**

| Voltage Interruptions Test Datasheet | | | | | | |
|---|---|---|---|---|---|---|
| **Project Number** | 135988 | | | **Temperature** | 20.5°C | |
| **Engineer** | William Yip | | | **Relative Humidity** | 60% | |
| **Test Date** | 5/6/2025 | | | **Observations** | None | |
| **Meter Form** | 2S | | | **Serial Number** | 11F013C3 | |
| **Current Class** | CL200 | | | **N/A** | | |
| **Duration** | **Voltage Interruption** | | **Repetition Rate** | **Number of Repetitions** | **Results/Observations** | |
| **Cycles** | **Rated Voltage** | **Test Voltage** | | | | |
| 6 | 240V | 240V | 10 Seconds | 10 | Pass; No Anomalies Detected | |
| **Performance Verification and Test Results** | | | | | | |
| **Register Reading Before Test (Wh)** | 7108 | | **ACD Verification Before Test** | Pass | | |
| **Register Reading After Test (Wh)** | 7108 | | **ACD Verification After Test** | Pass | | |
| **Difference In Reading (Wh)** | 0 | | **Test Results** | Pass | | |

**Table 76 - Test 16 VDI, 2S SN 11F013C3**

| Voltage Interruptions Test Datasheet | | | | | | |
|---|---|---|---|---|---|---|
| **Project Number** | 135988 | | | **Temperature** | 20.5°C | |
| **Engineer** | William Yip | | | **Relative Humidity** | 60% | |
| **Test Date** | 5/6/2025 | | | **Observations** | None | |
| **Meter Form** | 2S | | | **Serial Number** | 11F013C5 | |
| **Current Class** | CL200 | | | **N/A** | | |
| **Duration** | **Voltage Interruption** | | **Repetition Rate** | **Number of Repetitions** | **Results/Observations** | |
| **Cycles** | **Rated Voltage** | **Test Voltage** | | | | |
| 6 | 240V | 240V | 10 Seconds | 10 | Pass; No Anomalies Detected | |
| **Performance Verification and Test Results** | | | | | | |
| **Register Reading Before Test (Wh)** | 1980 | | **ACD Verification Before Test** | Pass | | |
| **Register Reading After Test (Wh)** | 1980 | | **ACD Verification After Test** | Pass | | |
| **Difference In Reading (Wh)** | 0 | | **Test Results** | Pass | | |

**Table 77 - Test 16 VDI, 2S SN 11F13C5**



**Photograph 17 - Test 16 VDI, Test Setup 1**



**Photograph 18 - Test 16 VDI, Test Setup 2**

### 6.15.4 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 16 VDI Equipment List | | | | | |
|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Calibration Date** | **Calibration Due Date** |
| 1T10002 | Thermometer/ Hygrometer/ Barometer | Fisher Scientific | 14-650-118 | 3/6/2024 | 3/6/2026 |
| 1T4713 | Programmable AC/DC Power Supply 45kVA | California Instruments | MX453PI-480-413-HF-16C0 | N/A | Functionally Verified |

**Table 78 - Test 16 VDI, Equipment List**

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.


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## 6.16 Test No. 17: Effect of High Voltage Line Surges, 100 kHz Ring Wave

### 6.16.1 Test Requirement(s)

The metering device shall meet the AC Line Surge Requirements of IEEE C62.41.2-2024 IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits. The test waveforms shall meet the severity levels defined in C62.41.2 Tables 2 and 3 for a Category B location. The two required standard surge testing waveforms are the 100 kHz Ring Wave and the 1.2/50 µs 8/20 µs Combination Wave in accordance with the applicable test waveforms defined in Table 1 of IEEE C62.45 IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and less) AC Power Circuits

The metering device shall be energized at nominal voltage through an appropriate back filter The highest nominal voltage shall be used for wide-ranging meters. Self-contained meters shall be tested with the test links closed and the load side of the current circuits open. Transformer-rated meters shall be tested with the polarity side of the current circuits connected to the line and the non-polarity side open. These waveforms shall be applied in transverse mode to every pair of AC voltage and current inputs to the metering device. For metering devices that do not have an electrical connection to the neutral conductor, it is not required to test neutral coupling modes. For metering devices that contain a protective earth ground connection or strap, the waveforms shall be applied in common mode between protective ground and all AC line inputs that are not connected to ground externally Table 79 below details the required coupling modes for applicable meter connections. Each surge waveform shall be applied as a single transient surge event at both positive and negative polarities at each angular injection of 0. 90, and 270 degrees of the fundamental voltage waveform. This combination of 12 transient surge events shall be applied for each required coupling mode.

The transient surge events shall be applied with a maximum dwell time of two minutes between events. This dwell time may be reduced as appropriate if specified by the manufacturer.

| Test Number | Test Mode | Connection of Generator | | | | |
|---|---|---|---|---|---|---|
| | | Ground | Neutral | Line 1 | Line 2 | Line 3 |
| 1 | Common | L | $H_0$ | $H_1$ | $H_2$ | $H_3$ |
| 2 | Line-to-Ground | L | $H_0$ | | | |
| 3 | Line-to-Ground | L | | $H_1$ | | |
| 4 | Line-to-Ground | L | | | $H_2$ | |
| 5 | Line-to-Ground | L | | | | $H_3$ |
| 6 | Transverse | | L | $H_1$ | | |
| 7 | Transverse | | L | | $H_2$ | |
| 8 | Transverse | | L | | | $H_3$ |
| 9 | Transverse | | | L | $H_2$ | |
| 10 | Transverse | | | L | | $H_3$ |
| 11 | Transverse | | | | L | $H_3$ |
| | LEGEND<br>L = Connection to surge generator low output<br>$H_0$, $H_1$, $H_2$, $H_3$ = Connection to surge generator high outputs by coupling capacitor | | | | | |
| | **Notes:**<br>This table defines required coupling modes for all meter types. For any combination of electrical connections that a metering device may have, those applicable coupling modes should be connected to the surge generator according to connections shown in the relevant columns.<br><br>The sequence of required waveforms shall be applied in each required coupling mode.<br><br>The Common Mode test may have Lines 1, 2, and 3 powered from a single-phase source For polyphase meters, all other tests shall use a polyphase source | | | | | |

**Table 79 - Selected Coupling Modes for Power Line Surge Testing**

## 6.16.2 Test Procedure

This test subjects the power input of the meter to a 100 kHz ring wave with a peak voltage of 6 kV and short-circuit peak current of 0.5 kA.

The standard 0.5 µs-100 kHz ring wave applied to the meter shall have peak values and effective impedance specified for Location Category B as described in IEEE C62.41.2-2024, Table 2. The coupling modes shall be as specified in Table 79.

An Accuracy Performance Check (4.7.3.0.1 of ANSI C12.1: 2024) and, if applicable, an ACD Performance Check (4.7.3.0.2 of ANSI C12.1: 2024) shall be performed. It is acceptable to perform the Accuracy Performance Check and, if applicable, an ACD Performance Check once after the completion of both the 100 kHz ring wave test and the 1.2/50 microsecond - 8/20 microsecond combination wave test.

## 6.16.3 Test Data and Results

The meters listed below are **compliant** with the requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C3 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C5 |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CA |

Refer to the following test data and photographs for a complete overview of the test setup and results.


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| Performance Verification (External Influences) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 21.4 | | | | | |
| **Engineer** | Brandon Tracy | **Humidity (RH)** | 62.0% | | | | | |
| **Test Date** | 5/6/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C3 | | | | | | | |
| **Before Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage (As Reference)** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.903 | -0.097 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.919 | -0.081 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.994 | -0.006 | ± 0.2 % | Pass |
| **After Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 240 | 60 | 30 | 1.0 | 100.030 | -0.127 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.918 | 0.001 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.993 | 0.001 | ± 0.2 % | Pass |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C5 | | | | | | | |
| **Before Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage (As Reference)** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.951 | -0.049 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.972 | -0.028 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.970 | -0.030 | ± 0.2 % | Pass |
| **After Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.883 | 0.068 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.909 | 0.063 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.914 | 0.056 | ± 0.2 % | Pass |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |


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| Serial Number | 11F004CA | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Before Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage (As Reference)** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 120 | 60 | | 1.0 | 99.978 | -0.022 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 0 | 1.0 | 99.997 | -0.003 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 0 | 0.5 Lag | 100.127 | 0.127 | ± 0.2 % | Pass |
| **After Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 120 | 60 | 0 | 1.0 | 100.025 | -0.047 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 0 | 1.0 | 100.041 | -0.044 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 0 | 0.5 Lag | 100.166 | -0.039 | ± 0.2 % | Pass |

**Table 80 - Test 17, Surge, Performance Verification - External Influences**

| **Effect of High-Voltage Line Surges Test (100 kHz Ring Wave) Datasheet** | | | | | |
|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature** | 21.5°C | |
| **Engineer** | Donald Salguero | | **Relative Humidity** | 59% | |
| **Test Date** | 5/6/2025 | | **Observations** | None | |
| **Meter Form** | 12S | | **Input Voltage** | 120V L-N / 208V L-L | |
| **Current Class** | 200 | | **Coupling Mode** | CDN | |
| **Serial Number** | 11F004CA | | **Notes** | Single surge event at both polarities and angular injection listed below | |
| **Test Number** | **Port Under Test** | **Test Level** | **Phase Angle** | **Polarity** | **Results / Observations** |
| | | **kV** | **Degrees** | **±** | |
| 1 | Common (All Lines to Ground) | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected |
| 2 | Neutral to Ground | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected |
| 3 | Line 1 to Ground | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected |
| 5 | Line 3 to Ground | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected |
| 6 | Line 1 to Neutral | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected |
| 8 | Line 3 to Neutral | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected |
| 10 | Line 3 to Line 1 | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected |
| **Performance Verification and Test Results** | | | | | |
| **Register Reading Before Test (Wh)** | 81960 | | **ACD Verification Before Test** | Passed | |
| **Register Reading After Test (Wh)** | 81960 | | **ACD Verification After Test** | Passed | |
| **Difference In Reading (Wh)** | 0 | | **Test Results** | Passed | |

**Table 81 - Test 17, Surge, Ring Wave, 12S SN 11F004CA**

| Effect of High-Voltage Line Surges Test (100 kHz Ring Wave) Datasheet | | | | | | |
|---|---|---|---|---|---|---|
| **Project Number** | 135988 | | | **Temperature** | 21.4°C | |
| **Engineer** | Brandon Tracy | | | **Relative Humidity** | 62% | |
| **Test Date** | 5/6/2025 | | | **Observations** | None | |
| **Meter Form** | 2S | | | **Input Voltage** | 240V L-L | |
| **Current Class** | 200 | | | **Coupling Mode** | CDN | |
| **Serial Number** | 11F013C3 | | | **Notes** | Single surge event at both polarities and angular injection listed below | |
| **Test Number** | **Port Under Test** | **Test Level** | **Phase Angle** | **Polarity** | **Results / Observations** | |
| | | **kV** | **Degrees** | **±** | | |
| 1 | Common (All Lines to Ground) | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected | |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected | |
| 3 | Line 1 to Ground | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected | |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected | |
| 4 | Line 2 to Ground | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected | |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected | |
| 9 | Line 2 to Line 1 | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected | |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected | |
| **Performance Verification and Test Results** | | | | | | |
| **Register Reading Before Test (Wh)** | 70440 | | | **ACD Verification Before Test** | Passed | |
| **Register Reading After Test (Wh)** | 70440 | | | **ACD Verification After Test** | Passed | |
| **Difference In Reading (Wh)** | 0 | | | **Test Results** | Passed | |

**Table 82 - Test 17, Surge, Ring Wave, 2S SN 11F013C3**

| Effect of High-Voltage Line Surges Test (100 kHz Ring Wave) Datasheet | | | | | | |
|---|---|---|---|---|---|---|
| **Project Number** | 135988 | | | **Temperature** | 21.9°C | |
| **Engineer** | Brandon Tracy | | | **Relative Humidity** | 60% | |
| **Test Date** | 5/6/2025 | | | **Observations** | None | |
| **Meter Form** | 2S | | | **Input Voltage** | 240V L-L | |
| **Current Class** | 200 | | | **Coupling Mode** | CDN | |
| **Serial Number** | 11F013C5 | | | **Notes** | Single surge event at both polarities and angular injection listed below | |
| **1** | **Port Under Test** | **Test Level** | **Phase Angle** | **Polarity** | **Results / Observations** | |
| | | **kV** | **Degrees** | **±** | | |
| 1 | Common (All Lines to Ground) | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected | |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected | |
| 3 | Line 1 to Ground | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected | |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected | |
| 4 | Line 2 to Ground | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected | |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected | |
| 9 | Line 2 to Line 1 | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected | |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected | |
| **Performance Verification and Test Results** | | | | | | |
| **Register Reading Before Test (Wh)** | 1480 | | | **ACD Verification Before Test** | Passed | |
| **Register Reading After Test (Wh)** | 1480 | | | **ACD Verification After Test** | Passed | |
| **Difference In Reading (Wh)** | 0 | | | **Test Results** | Passed | |

**Table 83 - Test 17, Surge, Ring Wave, 2S SN 11F013C5**


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**Photograph 19 - Test 17, Surge, Effect of High-Voltage Line Surges, Test Setup**

### 6.16.4 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 17 Surge Ring Wave Equipment List | | | | | |
|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Calibration Date** | **Calibration Due Date** |
| 1T4774 | Digital Storage Oscilloscope, 4-Channel, 100MHz | Agilent Technologies | DSO-X2014A | 3/17/2025 | 3/31/2026 |
| 1T7324 | 70 MHz High Voltage Differential Probe | Sapphire Instruments Co. Ltd. | SI-9010 | 7/8/2024 | 7/31/2025 |
| 1T4844 | Wide Band Current Monitor | Pearson | 4418 | 7/8/2024 | 1/31/2026 |
| 1T4913 | Signal Transformer | Signal Transformer | DU-1 | N/A | Functionally Verified |
| 1T4650 | True RMS Multimeter | Fluke | 289 | 2/14/2025 | 8/31/2026 |
| 1T10002 | Thermometer/ Hygrometer/ Barometer | Fisher Scientific | 14-650-118 | 3/6/2024 | 3/6/2026 |

**Table 84 - Test 17, Surge, Equipment List**

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.


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## 6.17 Test No. 17: Effect of High Voltage Line Surges, Combination Wave

### 6.17.1 Test Requirement(s)

The metering device shall meet the AC Line Surge Requirements of IEEE C62.41.2-2024 IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits. The test waveforms shall meet the severity levels defined in C62.41.2 Tables 2 and 3 for a Category B location. The two required standard surge testing waveforms are the 100 kHz Ring Wave and the 1.2/50 µs 8/20 µs Combination Wave in accordance with the applicable test waveforms defined in Table 1 of IEEE C62.45 IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and less) AC Power Circuits

The metering device shall be energized at nominal voltage through an appropriate back filter The highest nominal voltage shall be used for wide-ranging meters. Self-contained meters shall be tested with the test links closed and the load side of the current circuits open. Transformer-rated meters shall be tested with the polarity side of the current circuits connected to the line and the non-polarity side open. These waveforms shall be applied in transverse mode to every pair of AC voltage and current inputs to the metering device. For metering devices that do not have an electrical connection to the neutral conductor, it is not required to test neutral coupling modes. For metering devices that contain a protective earth ground connection or strap, the waveforms shall be applied in common mode between protective ground and all AC line inputs that are not connected to ground externally Table 79 below details the required coupling modes for applicable meter connections. Each surge waveform shall be applied as a single transient surge event at both positive and negative polarities at each angular injection of 0. 90, and 270 degrees of the fundamental voltage waveform. This combination of 12 transient surge events shall be applied for each required coupling mode.

The transient surge events shall be applied with a maximum dwell time of two minutes between events. This dwell time may be reduced as appropriate if specified by the manufacturer.

| Test Number | Test Mode | Connection of Generator | | | | |
|---|---|---|---|---|---|---|
| | | Ground | Neutral | Line 1 | Line 2 | Line 3 |
| 1 | Common | L | $H_0$ | $H_1$ | $H_2$ | $H_3$ |
| 2 | Line-to-Ground | L | $H_0$ | | | |
| 3 | Line-to-Ground | L | | $H_1$ | | |
| 4 | Line-to-Ground | L | | | $H_2$ | |
| 5 | Line-to-Ground | L | | | | $H_3$ |
| 6 | Transverse | | L | $H_1$ | | |
| 7 | Transverse | | L | | $H_2$ | |
| 8 | Transverse | | L | | | $H_3$ |
| 9 | Transverse | | | L | $H_2$ | |
| 10 | Transverse | | | L | | $H_3$ |
| 11 | Transverse | | | | L | $H_3$ |
| | LEGEND<br>L = Connection to surge generator low output<br>$H_0$, $H_1$, $H_2$, $H_3$ = Connection to surge generator high outputs by coupling capacitor | | | | | |
| | **Notes:**<br>This table defines required coupling modes for all meter types. For any combination of electrical connections that a metering device may have, those applicable coupling modes should be connected to the surge generator according to connections shown in the relevant columns.<br><br>The sequence of required waveforms shall be applied in each required coupling mode.<br><br>The Common Mode test may have Lines 1, 2, and 3 powered from a single-phase source For polyphase meters, all other tests shall use a polyphase source | | | | | |

**Table 85 - Selected Coupling Modes for Power Line Surge Testing**

## 6.17.2 Test Procedure

This test subjects the AC power input of the meter to a 1.2/50 µs-8/20 µs combination wave with a peak voltage of 6 kV and peak current of 3 KA

The standard 1.2/50 µs - 8/20 µs combination wave applied to the meter shall have peak values and effective impedance specified for Location Category B, as described in IEEE C62.41.2-2024 Table 3. The coupling modes shall be as specified in Table 85.

An Accuracy Performance Check (4.7.3.0.1 of ANSI C12.1: 2024) and, if applicable, an ACD Performance Check (4.7.3.0.2 of ANSI C12.1: 2024) shall be performed. It is acceptable to perform the Accuracy Performance Check and, if applicable, an ACD Performance Check once after the completion of both the 100 kHz ring wave test and the 1.2/50 microsecond- 8/20 microsecond combination wave test

## 6.17.3 Test Data and Results

The meters listed below are **compliant** with the requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C3 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C5 |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CA |

Refer to the following test data and photographs for a complete overview of the test setup and results.

| Performance Verification (External Influences) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 21.4 | | | | | |
| **Engineer** | Brandon Tracy | **Humidity (RH)** | 62.0% | | | | | |
| **Test Date** | 5/6/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C3 | | | | | | | |
| **Before Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage (As Reference)** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.903 | -0.097 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.919 | -0.081 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.994 | -0.006 | ± 0.2 % | Pass |
| **After Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 240 | 60 | 30 | 1.0 | 100.030 | -0.127 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.918 | 0.001 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.993 | 0.001 | ± 0.2 % | Pass |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C5 | | | | | | | |
| **Before Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage (As Reference)** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.951 | -0.049 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.972 | -0.028 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.970 | -0.030 | ± 0.2 % | Pass |
| **After Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.883 | 0.068 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.909 | 0.063 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.914 | 0.056 | ± 0.2 % | Pass |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |


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| Serial Number | 11F004CA | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Before Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage (As Reference)** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 120 | 60 | | 1.0 | 99.978 | -0.022 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 0 | 1.0 | 99.997 | -0.003 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 0 | 0.5 Lag | 100.127 | 0.127 | ± 0.2 % | Pass |
| **After Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 120 | 60 | 0 | 1.0 | 100.025 | -0.047 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 0 | 1.0 | 100.041 | -0.044 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 0 | 0.5 Lag | 100.166 | -0.039 | ± 0.2 % | Pass |

**Table 86 - Test 17, Surge, Performance Verification - External Influences**

| **Effect of High-Voltage Line Surges Test (Combination Wave) Datasheet** | | | | | |
|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature** | 22.1°C | |
| **Engineer** | Brandon Tracy | | **Relative Humidity** | 60% | |
| **Test Date** | 5/6/2025 | | **Observations** | None | |
| **Meter Form** | 12S | | **Input Voltage** | 120V L-N | |
| **Current Class** | 200 | | **Coupling Mode** | CDN | |
| **Serial Number** | 11F004CA | | **Notes** | Single surge event at both polarities and angular injection listed below | |
| **Test Number** | **Port Under Test** | **Test Level kV** | **Phase Angle Degrees** | **Polarity ±** | **Results / Observations** |
| 1 | Common (All Lines to Ground) | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected |
| 2 | Neutral to Ground | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected |
| 3 | Line 1 to Ground | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected |
| 5 | Line 3 to Ground | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected |
| 6 | Line 1 to Neutral | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected |
| 8 | Line 3 to Neutral | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected |
| 10 | Line 3 to Line 1 | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected |
| **Performance Verification and Test Results** | | | | | |
| **Register Reading Before Test (Wh)** | 81960 | | **ACD Verification Before Test** | Passed | |
| **Register Reading After Test (Wh)** | 81960 | | **ACD Verification After Test** | Passed | |
| **Difference In Reading (Wh)** | 0 | | **Test Results** | Passed | |

**Table 87 - Test 17, Surge, Combination Wave, 12S SN 11F004CA**

| Effect of High-Voltage Line Surges Test (Combination Wave) Datasheet | | | | | | |
|---|---|---|---|---|---|---|
| **Project Number** | 135988 | | | **Temperature** | 22.1°C | |
| **Engineer** | Brandon Tracy | | | **Relative Humidity** | 60% | |
| **Test Date** | 5/6/2025 | | | **Observations** | None | |
| **Meter Form** | 2S | | | **Input Voltage** | 240V L-L | |
| **Current Class** | 200 | | | **Coupling Mode** | CDN | |
| **Serial Number** | 11F013C3 | | | **Notes** | Single surge event at both polarities and angular injection listed below | |
| **Test Number** | **Port Under Test** | **Test Level** | **Phase Angle** | **Polarity** | **Results / Observations** | |
| | | **kV** | **Degrees** | **±** | | |
| 1 | Common (All Lines to Ground) | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected | |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected | |
| 3 | Line 1 to Ground | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected | |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected | |
| 4 | Line 2 to Ground | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected | |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected | |
| 9 | Line 2 to Line 1 | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected | |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected | |
| **Performance Verification and Test Results** | | | | | | |
| **Register Reading Before Test (Wh)** | 70440 | | | **ACD Verification Before Test** | Passed | |
| **Register Reading After Test (Wh)** | 70440 | | | **ACD Verification After Test** | Passed | |
| **Difference In Reading (Wh)** | 0 | | | **Test Results** | Passed | |

**Table 88 - Test 17, Surge, Combination Wave, 2S SN 11F013C3**

| Effect of High-Voltage Line Surges Test (Combination Wave) Datasheet | | | | | | |
|---|---|---|---|---|---|---|
| **Project Number** | 135988 | | | **Temperature** | 21.9°C | |
| **Engineer** | Donald Salguero | | | **Relative Humidity** | 59% | |
| **Test Date** | 5/6/2025 | | | **Observations** | None | |
| **Meter Form** | 2S | | | **Input Voltage** | 240V L-L | |
| **Current Class** | 200 | | | **Coupling Mode** | CDN | |
| **Serial Number** | 11F013C5 | | | **Notes** | Single surge event at both polarities and angular injection listed below | |
| **Test Number** | **Port Under Test** | **Test Level** | **Phase Angle** | **Polarity** | **Results / Observations** | |
| | | **kV** | **Degrees** | **±** | | |
| 1 | Common (All Lines to Ground) | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected | |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected | |
| 3 | Line 1 to Ground | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected | |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected | |
| 4 | Line 2 to Ground | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected | |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected | |
| 9 | Line 2 to Line 1 | 6 | 0, 90, 270 | + | Pass; No Anomalies Detected | |
| | | | 0, 90, 270 | - | Pass; No Anomalies Detected | |
| **Performance Verification and Test Results** | | | | | | |
| **Register Reading Before Test (Wh)** | 1480 | | | **ACD Verification Before Test** | Passed | |
| **Register Reading After Test (Wh)** | 1480 | | | **ACD Verification After Test** | Passed | |
| **Difference In Reading (Wh)** | 0 | | | **Test Results** | Passed | |

**Table 89 - Test 17, Surge, Combination Wave, 2S SN 11F013C5**




**Photograph 20 - Test 17, Surge, Effect of High-Voltage Line Surges, Test Setup**

### 6.17.4 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 17 Surge Ring Wave Equipment List | | | | | |
|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Calibration Date** | **Calibration Due Date** |
| 1T4774 | Digital Storage Oscilloscope, 4-Channel, 100MHz | Agilent Technologies | DSO-X2014A | 3/17/2025 | 3/31/2026 |
| 1T7324 | 70 MHz High Voltage Differential Probe | Sapphire Instruments Co. Ltd. | SI-9010 | 7/8/2024 | 7/31/2025 |
| 1T4844 | Wide Band Current Monitor | Pearson | 4418 | 7/8/2024 | 1/31/2026 |
| 1T4913 | Signal Transformer | Signal Transformer | DU-1 | N/A | Functionally Verified |
| 1T4650 | True RMS Multimeter | Fluke | 289 | 2/14/2025 | 8/31/2026 |
| 1T10002 | Thermometer/ Hygrometer/ Barometer | Fisher Scientific | 14-650-118 | 3/6/2024 | 3/6/2026 |

**Table 90 - Test 17, Surge, Equipment List**

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

## 6.18 Test No. 18: Effect of External Magnetic Field

### 6.18.1 Test Requirement(s)

The test shall be applied per IEC 61000-4-8 to one metering device of each class. Meters are tested using the "immersion" method for Tabletop Equipment to deliver a continuous magnetic field measured in 60 ampere-turns, injected through a 1 m diameter circular coil. Testing is repeated in each of the three orthogonal orientations (Figure 3) while the MUT is assessed for accuracy performance during the tests.

Meter operating condition

- Voltage and auxiliary circuits energized with rated voltage.
- Current in the current circuits is specified in Table 91.

The change produced in the performance of a metering device by application of an AC magnetic field shall not exceed the maximum deviation of Table 91.

An accuracy Performance Check (4.7.3.0.1 of ANSI C12.1: 2024) and, if applicable, an ACD Performance Check (4.7.3.0.2 of ANSI C12.1: 2024) shall be performed.

| Condition | Current in Amperes | | | | | | Maximum Deviation in % From Reference Performance |
|---|---|---|---|---|---|---|---|
| | Current Class | | | | | | |
| | 2 | 10 | 20 | 100 | 200 | 320 | |
| Reference for 1, 2, & 3 | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | Reference |
| Orientation 1 | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | ±1.0 |
| Orientation 2 | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | ±1.0 |
| Orientation 3 | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | ±1.0 |

**Table 91 - Effect of External Magnetic Field**

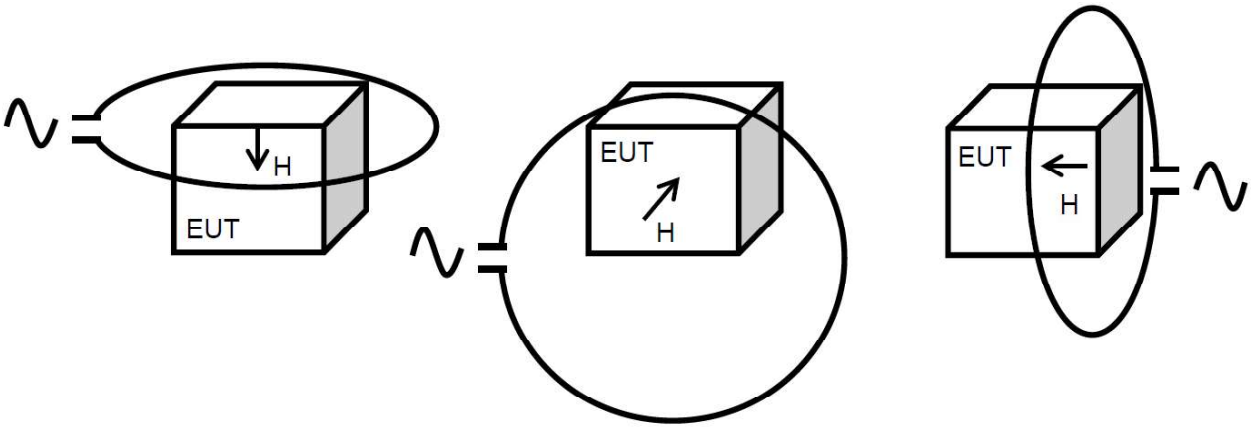


**Figure 3 - Magnetic Field Orientations 1, 2, and 3**


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## 6.18.2 Test Data and Results

The meters listed below are **compliant** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F00911 |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CD |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C3 |

Refer to the following test data and photographs for a complete overview of the test setup and results.

| Performance Verification (External Influences) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 20.4 | | | | | |
| **Engineer** | Donald Salguero | **Humidity (RH)** | 40.50% | | | | | |
| **Test Date** | 4/18/2025, 4/22/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Serial Number** | 11F004CD | | | | | | | |
| **Before Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage (As Reference)** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 120 | 60 | 30 | 1.0 | 99.978 | -0.022 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 3 | 1.0 | 99.995 | -0.005 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 30 | 0.5 Lag | 100.115 | 0.115 | ± 0.2 % | Pass |
| **After Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 120 | 60 | 30 | 1.0 | 99.954 | 0.024 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 3 | 1.0 | 99.968 | 0.027 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 30 | 0.5 Lag | 100.097 | 0.018 | ± 0.2 % | Pass |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Serial Number** | 11F00911 | | | | | | | |
| **Before Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage (As Reference)** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 120 | 60 | 30 | 1.0 | 99.955 | -0.045 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 3 | 1.0 | 99.974 | -0.026 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 30 | 0.5 Lag | 100.126 | 0.126 | ± 0.2 % | Pass |
| **After Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 120 | 60 | 30 | 1.0 | 99.954 | 0.001 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 3 | 1.0 | 99.973 | 0.001 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 30 | 0.5 Lag | 100.129 | -0.003 | ± 0.2 % | Pass |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Meter Form** | 2S | | | | | | |
| **Current Class** | 200 | | | | | | |
| **Serial Number** | 11F013C3 | | | | | | |

| **Before Test** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage (As Reference)** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.933 | -0.067 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.951 | -0.049 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 100.030 | 0.030 | ± 0.2 % | Pass |

| **After Test** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.917 | 0.016 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.936 | 0.015 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 100.018 | 0.012 | ± 0.2 % | Pass |

**Table 92 - Test 18 MI, Performance Verification - External Influences**

| **Effect of External Magnetic Field Test Datasheet** | | | | | | |
|---|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature** | 20.7°C | | |
| **Engineer** | Donald Salguero | | **Relative Humidity** | 41% | | |
| **Test Date** | 4/18/2025 | | **Observations** | None | | |
| **Meter Form** | 12S | | **Serial Number** | 11F004CD | | |
| **Current Class** | 200 | | **ACD State** | Dormant | | |

| **Meter Orientation** | **Test Level** | **Meter Current** | **Accuracy Percentage** | **Zero Error Percentage** | **Limit from Zero Error** | **Observations/Result** |
|---|---|---|---|---|---|---|
| **X/Y/Z** | **A/m** | **A** | | | | |
| **Reference** | | 30 | 99.782 | **Reference** | | |
| X | 60 | 30 | 99.789 | 0.007 | ±1.0 | Pass, No anomalies detected. |
| Y | 60 | 30 | 99.797 | 0.015 | ±1.0 | Pass, No anomalies detected. |
| Z | 60 | 30 | 99.800 | 0.018 | ±1.0 | Pass, No anomalies detected. |

| **Performance Verification and Test Results** | | | |
|---|---|---|---|
| **Register Reading Before Test (Wh)** | N/A | **ACD Verification Before Test** | OK |
| **Register Reading After Test (Wh)** | N/A | **ACD Verification After Test** | OK |
| **Difference In Reading (Wh)** | N/A | **Test Results** | Pass |

**Table 93 - Test 18 MI, Data, 12S, SN 11F004CD**

| Effect of External Magnetic Field Test Datasheet | | | | | | |
|---|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature** | 20.7°C | | |
| **Engineer** | Donald Salguero | | **Relative Humidity** | 41% | | |
| **Test Date** | 4/18/2025 | | **Observations** | None | | |
| **Meter Form** | 12S | | **Serial Number** | 11F00911 | | |
| **Current Class** | 200 | | **ACD State** | Dormant | | |
| **Meter Orientation** | **Test Level** | **Meter Current** | **Accuracy Percentage** | **Zero Error Percentage** | **Limit from Zero Error** | **Observations/Result** |
| **X/Y/Z** | **A/m** | **A** | | | | |
| **Reference** | | 30 | 99.810 | **Reference** | | |
| X | 60 | 30 | 99.809 | -0.001 | ±1.0 | Pass, No anomalies detected. |
| Y | 60 | 30 | 99.811 | 0.001 | ±1.0 | Pass, No anomalies detected. |
| Z | 60 | 30 | 99.813 | 0.003 | ±1.0 | Pass, No anomalies detected. |
| **Performance Verification and Test Results** | | | | | | |
| **Register Reading Before Test (Wh)** | N/A | | **ACD Verification Before Test** | OK | | |
| **Register Reading After Test (Wh)** | N/A | | **ACD Verification After Test** | OK | | |
| **Difference In Reading (Wh)** | N/A | | **Test Results** | Pass | | |

**Table 94 - Test 18 MI, Data, 12S, SN 11F00911**

| Effect of External Magnetic Field Test Datasheet | | | | | | |
|---|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature** | 21.5°C | | |
| **Engineer** | Donald Salguero | | **Relative Humidity** | 55% | | |
| **Test Date** | 4/22/2025 | | **Observations** | None | | |
| **Meter Form** | **2S** | | **Serial Number** | 11F013C3 | | |
| **Current Class** | **200** | | **ACD State** | Dormant | | |
| **Meter Orientation** | **Test Level** | **Meter Current** | **Accuracy Percentage** | **Zero Error Percentage** | **Limit from Zero Error** | **Observations/Result** |
| **X/Y/Z** | **A/m** | **A** | | | | |
| **Reference** | | 30 | 99.759 | **Reference** | | |
| X | 60 | 30 | 99.767 | 0.008 | ±1.0 | Pass, No anomalies detected. |
| Y | 60 | 30 | 99.766 | 0.007 | ±1.0 | Pass, No anomalies detected. |
| Z | 60 | 30 | 99.771 | 0.012 | ±1.0 | Pass, No anomalies detected. |
| **Performance Verification and Test Results** | | | | | | |
| **Register Reading Before Test (Wh)** | N/A | | **ACD Verification Before Test** | OK | | |
| **Register Reading After Test (Wh)** | N/A | | **ACD Verification After Test** | OK | | |
| **Difference In Reading (Wh)** | N/A | | **Test Results** | Pass | | |

**Table 95 - Test 18 MI, Data, 2S, SN 11F013C3**


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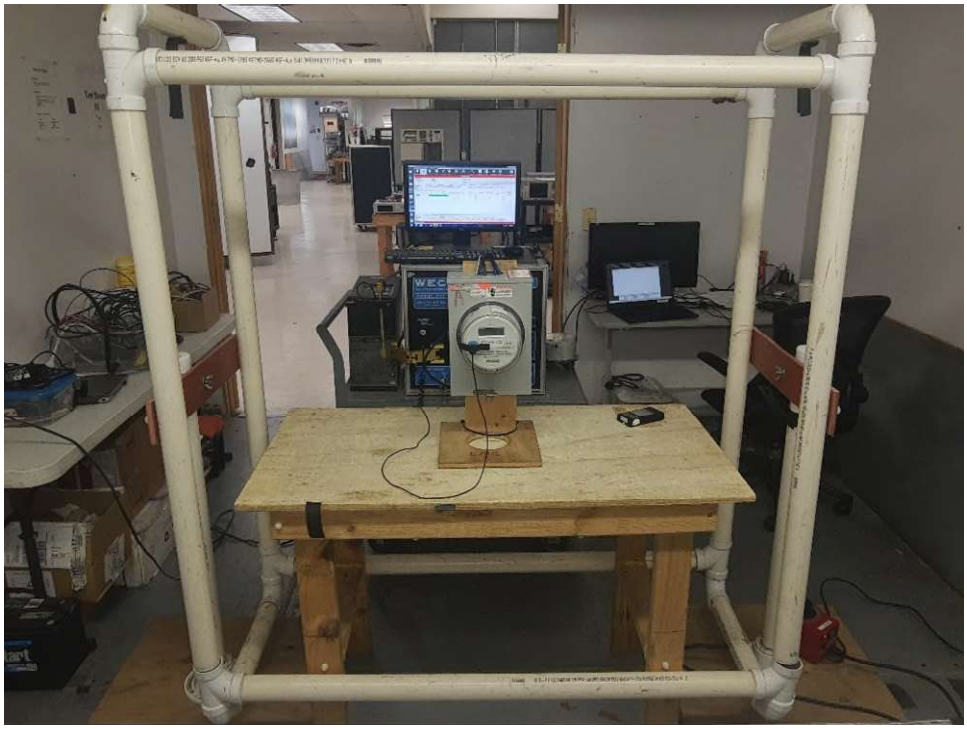
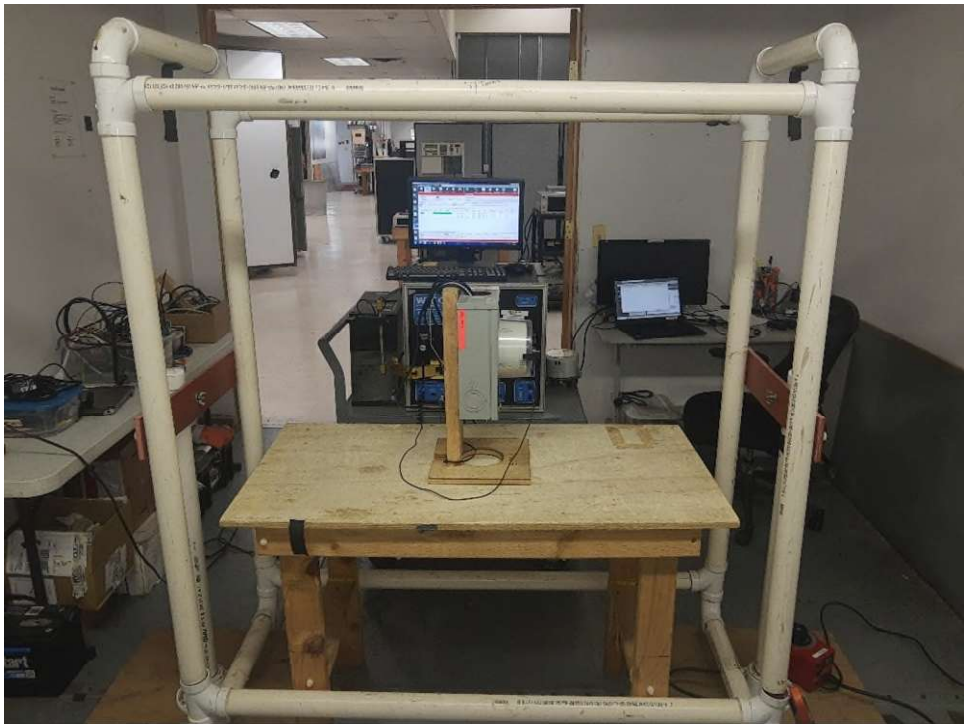
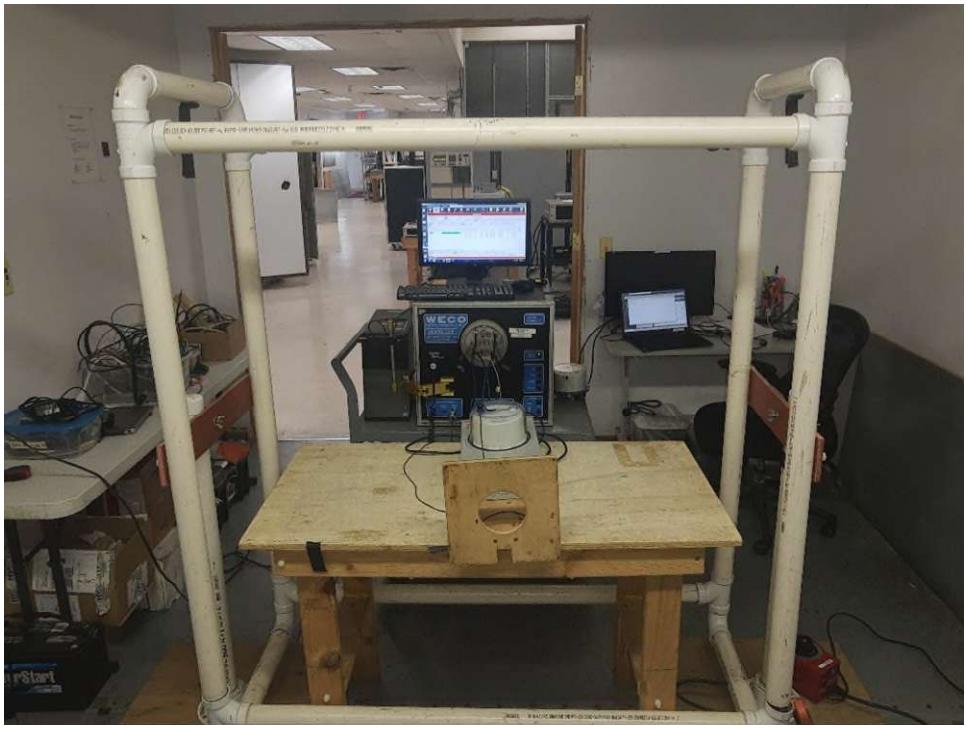


**Photograph 21 - Test 18 MI, Setup [X-Axis]**



**Photograph 22 - Test 18 MI, Setup [Y-Axis]**




**Photograph 23 - Test 18 MI, Setup [Z-Axis]**

## 6.18.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 18 Effect of External Magnetic Field Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 1T4404 | EMC Test Room 1 | MET Laboratories | N/A | N/A | N/A | N/A |
| 1T4833 | Automated Three-Phase Test System | WECO | 2350 | 6902 | Functional Verification | Functional Verification |
| 4T4007 | Dytronic Portable Standard | Radian Research, Inc. | RD-20-232 | 209198 | 04/02/2025 | 04/02/2026 |
| 4T4008 | Dytronic Portable Standard | Radian Research, Inc. | RD-20-232 | 209199 | 04/01/2025 | 04/01/2026 |
| 4T4009 | Dytronic Portable Standard | Radian Research, Inc. | RD-20-232 | 209200 | 04/01/2025 | 04/01/2026 |
| 1T7331 | True RMS Power Clamp Meter | Extech Instruments | 380976 | Z203121 | 07/22/2024 | 01/31/2026 |
| 1T4406 | HELMHOLTZ COIL | MET Laboratories | N/A | N/A | Functional Verification | Functional Verification |
| 1T9999 | Thermometer/Hygrometer | VWR International | 36934-164 | 230368599 | 05/31/2023 | 05/31/2025 |
| 4T4004 | Contact Voltage Regulator | Variacs Transformer | TDGC-0.5KM | n/a | Functional Verification | Functional Verification |

**Table 96 - Test 18 MI, Equipment List**

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

## 6.19 Test No. 19: Effects of Variation of Ambient Temperature

### 6.19.1 Test Requirement(s)

The test shall be applied to three meters. The meters shall be placed in a space having a temperature of 23°C ±5°C and allowed to stand for not less than two hours with the voltage circuits of the meters energized. Reference performance at each of the loads specified in Table 97 shall be obtained after operating the meters for one hour at the specified load. The meters shall then be operated and tested at each of the following conditions:

- Conditions (1) through (6). These tests shall be made with the meter placed in a space having a temperature of 50°C ±5°C After energizing the voltage circuits of the meters for a period of not less than two hours, the appropriate test currents at the power factors listed for conditions (1) through (6) of Table 97 shall be sequentially applied to the meters. Available nominal voltage and current can be used for the duration of this test except when the meter is undergoing the specified accuracy test.

- Conditions (7) through (12). Repeat Conditions (1) through (6), respectively, except that meters shall be placed in a space having a temperature of -20°C ±5°C. The effect of variation of temperature upon the performance of the meters shall not exceed the maximum deviation specified in Table 97. Available nominal voltage and current can be used for the duration of this test except when the meter is undergoing the specified accuracy test.

The time, program, and register reading requirement of 4.7.3 of ANSI C12.1: 2024 shall not apply.

| Condition | Current in Amperes | | | | | | Power Factor * | Ambient Temperature | Max. Deviation in % from Reference Performance at Nominal Temperature Difference | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Current Class | | | | | | | | Accuracy Class | | | |
| | 2 | 10 | 20 | 100 | 200 | 320 | | | 1.0 | 0.5 | 0.2 | 0.1 |
| Ref. for 1 & 7 | 0.025 | 0.25 | 0.25 | 1.5 | 3 | 5 | 1 | 23°C ±5°C | Ref. | Ref. | Ref. | Ref. |
| Ref. for 2 & 8 | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | 1 | 23°C ±5°C | Ref. | Ref. | Ref. | Ref. |
| Ref. for 3 & 9 | 1 | 5 | 10 | 50 | 100 | 150 | 1 | 23°C ±5°C | Ref. | Ref. | Ref. | Ref. |
| Ref. for 4 & 10 | 0.05 | 0.5 | 0.5 | 3 | 6 | 10 | 0.5 lag | 23°C ±5°C | Ref. | Ref. | Ref. | Ref. |
| Ref. for 5 & 11 | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | 0.5 lag | 23°C ±5°C | Ref. | Ref. | Ref. | Ref. |
| Ref. for 6 & 12 | 1 | 5 | 10 | 50 | 100 | 150 | 0.5 lag | 23°C ±5°C | Ref. | Ref. | Ref. | Ref. |
| 1 | 0.025 | 0.25 | 0.25 | 1.5 | 3 | 5 | 1 | 50°C ±5°C | ±2.0 | ±0.8 | ±0.3 | ±0.15 |
| 2 | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | 1 | 50°C ±5°C | ±1.0 | ±0.8 | ±0.3 | ±0.15 |
| 3 | 1 | 5 | 10 | 50 | 100 | 150 | 1 | 50°C ±5°C | ±1.0 | ±0.8 | ±0.3 | ±0.15 |
| 4 | 0.05 | 0.5 | 0.5 | 3 | 6 | 10 | 0.5 lag | 50°C ±5°C | ±3.0 | ±1.4 | ±0.5 | ±0.25 |
| 5 | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | 0.5 lag | 50°C ±5°C | ±2.0 | ±1.4 | ±0.5 | ±0.25 |
| 6 | 1 | 5 | 10 | 50 | 100 | 150 | 0.5 lag | 50°C ±5°C | ±2.0 | ±1.4 | ±0.5 | ±0.25 |
| 7 | 0.025 | 0.25 | 0.25 | 1.5 | 3 | 5 | 1 | -20°C ±5°C | ±3.0 | ±1.3 | ±0.5 | ±0.25 |
| 8 | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | 1 | -20°C ±5°C | ±2.0 | ±1.3 | ±0.5 | ±0.25 |
| 9 | 1 | 5 | 10 | 50 | 100 | 150 | 1 | -20°C ±5°C | ±2.0 | ±1.3 | ±0.5 | ±0.25 |
| 10 | 0.05 | 0.5 | 0.5 | 3 | 6 | 10 | 0.5 lag | -20°C ±5°C | ±4.0 | ±2.1 | ±0.9 | ±0.45 |
| 11 | 0.25 | 2.5 | 2.5 | 15 | 30 | 50 | 0.5 lag | -20°C ±5°C | ±3.0 | ±2.1 | ±0.9 | ±0.45 |
| 12 | 1 | 5 | 10 | 50 | 100 | 150 | 0.5 lag | -20°C ±5°C | ±3.0 | ±2.1 | ±0.9 | ±0.45 |

**Table 97 - Effect of Variation of Ambient Temperature**

*If testing with delta polyphase loading, the 0.5 lagging power factor should be replaced with a 0.707 lagging power factor, because 1 element would not contribute at a power factor of 0.5

Note: When the actual temperature difference between two tests differs from the nominal temperature difference specified for the two tests, the deviation shall be adjusted proportionally.

For the effect of variation of ambient temperature for temperatures greater than +50°C and less than -20°C reference Table 97.

| Maximum Allowed Temperature Coefficient (%/C) | | | | |
|---|---|---|---|---|
| Loading | Accuracy Class | | | |
| | 1 | 0.5 | 0.2 | 0.1 |
| Unity | 0.1 | 0.06 | 0.02 | 0.01 |
| PF | 0.14 | 0.1 | 0.04 | 0.02 |

**Table 98 - Effect of Variation of Ambient Temperature for Temperatures > +50°C and < -20°C**

The manufacturer shall specify the maximum ambient operating temperature ($T_{oper\text{-}max}$) and the minimum ambient operating temperature ($T_{oper\text{-}min}$). The temperature coefficient of the meter, c, shall be measured by making at least two accuracy measurements, not less than 15°C or greater than 23°C apart between $T_{oper\text{-}min}$ and -20°C, and also between +50°C and $T_{oper\text{-}max}$. The temperature coefficient shall be calculated using the below equation.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Eq. 4.7.3.5.1

$$c = \frac{(eu - el)}{(tu - tl)}$$

Where:

$e_u$ and $e_l$, are the accuracy errors at the uppermost and the lowest temperatures, respectively, in the temperature interval of interest; and

$t_u$, and $t_l$, are the uppermost and the lowest temperatures, respectively, in the temperature interval of interest.

Each temperature coefficient shall meet the requirements of Table 98.

## 6.19.2 Test Data and Results

The meters listed below **complied** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F00911 |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CD |
| Form 2S | CL200 | 120V/208V | 60Hz | SN 11F013C7 |

Refer to the following test data and photographs for a complete overview of the test setup and results.

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| Test No. 19: Variation of Ambient Temperatures | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature (C)** | 22.8 | | | | | |
| **Engineer** | Steven Lu/William Yip | | **Humidity (RH)** | 43.0% | | | | | |
| **Test Date** | 6/26/2025-7/1/2025 | | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | | |
| **Current Class** | 200 | | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | | |
| **Serial Number** | 11F01940 | | | | | | | | |
| **Condition** | **Volt** | **Amp** | **Power Factor** | **Frequency** | **Temperature** | **% Registration** | **Deviation** | **Limit** | **Result** |
| Reference performance for (1) and (7) | 120 | 3 | 1.0 | 60 | 23° C+/- 5C | 100.018 | Reference | Reference | Reference |
| Reference performance for (2) and (8) | 120 | 30 | 1.0 | 60 | 23° C+/- 5C | 100.003 | Reference | Reference | Reference |
| Reference performance for (3) and (9) | 120 | 100 | 1.0 | 60 | 23° C+/- 5C | 99.961 | Reference | Reference | Reference |
| Reference performance for (4) and (10) | 120 | 6 | 0.5 lag | 60 | 23° C+/- 5C | 100.216 | Reference | Reference | Reference |
| Reference performance for (5) and (11) | 120 | 30 | 0.5 lag | 60 | 23° C+/- 5C | 100.149 | Reference | Reference | Reference |
| Reference performance for (6) and (12) | 120 | 100 | 0.5 lag | 60 | 23° C+/- 5C | 99.978 | Reference | Reference | Reference |
| Condition (1) | 120 | 3 | 1.0 | 60 | 50° C+/- 5C | 100.289 | 0.271 | +/- 0.3 | Pass |
| Condition (2) | 120 | 30 | 1.0 | 60 | 50° C+/- 5C | 100.109 | 0.106 | +/- 0.3 | Pass |
| Condition (3) | 120 | 100 | 1.0 | 60 | 50° C+/- 5C | 100.002 | 0.041 | +/- 0.3 | Pass |
| Condition (4) | 120 | 6 | 0.5 lag | 60 | 50° C+/- 5C | 100.358 | 0.142 | +/- 0.5 | Pass |
| Condition (5) | 120 | 30 | 0.5 lag | 60 | 50° C+/- 5C | 100.235 | 0.086 | +/- 0.5 | Pass |
| Condition (6) | 120 | 100 | 0.5 lag | 60 | 50° C+/- 5C | 99.920 | -0.058 | +/- 0.5 | Pass |
| Condition (7) | 120 | 3 | 1.0 | 60 | -20° C+/- 5C | 99.913 | -0.105 | +/- 0.5 | Pass |
| Condition (8) | 120 | 30 | 1.0 | 60 | -20° C+/- 5C | 99.803 | -0.200 | +/- 0.5 | Pass |
| Condition (9) | 120 | 100 | 1.0 | 60 | -20° C+/- 5C | 99.707 | -0.254 | +/- 0.5 | Pass |
| Condition (10) | 120 | 6 | 0.5 lag | 60 | -20° C+/- 5C | 100.013 | -0.203 | +/- 0.9 | Pass |
| Condition (11) | 120 | 30 | 0.5 lag | 60 | -20° C+/- 5C | 99.990 | -0.159 | +/- 0.9 | Pass |
| Condition (12) | 120 | 100 | 0.5 lag | 60 | -20° C+/- 5C | 99.814 | -0.164 | +/- 0.9 | Pass |
| **Temperature Coefficient Measurements** | | | | | | | | | |
| **Condition** | **Volt** | **Amp** | **Power Factor** | **Frequency** | **Temperature** | **% Registration** | **% Errors** | | |
| $T_{oper\text{-}high}$ | 120 | 3 | 1.0 | 60 | 50° C+/- 5C | 100.289 | 0.289 | | |
| $T_{oper\text{-}high}$ | 120 | 6 | 0.5 lag | 60 | 50° C+/- 5C | 100.358 | 0.358 | | |
| $T_{uppermost}$ | 120 | 3 | 1.0 | 60 | 65° C+/- 5C | 100.327 | 0.327 | | |
| $T_{uppermost}$ | 120 | 6 | 0.5 lag | 60 | 65° C+/- 5C | 100.516 | 0.516 | | |
| $T_{oper\text{-}low}$ | 120 | 3 | 1.0 | 60 | -20° C+/- 5C | 99.913 | -0.087 | | |
| $T_{oper\text{-}low}$ | 120 | 6 | 0.5 lag | 60 | -20° C+/- 5C | 100.013 | 0.013 | | |
| $T_{lowest}$ | 120 | 3 | 1.0 | 60 | -35° C+/- 5C | 99.772 | -0.228 | | |
| $T_{lowest}$ | 120 | 6 | 0.5 lag | 60 | -35° C+/- 5C | 99.939 | -0.061 | | |
| **Unity Temperature Coefficient ($T_{oper\text{-}high}$)** | | | | | | | | | |
| $e_u$ | $t_u$ | $e_l$ | $t_l$ | **Calculated Temperature Coefficient** | **Limit** | **Result** | | | |
| 0.327 | 65 | 0.289 | 50 | 0.0025 | 0.02 | Pass | | | |
| **Unity Temperature Coefficient ($T_{oper\text{-}low}$)** | | | | | | | | | |
| $e_u$ | $t_u$ | $e_l$ | $t_l$ | **Calculated Temperature Coefficient** | **Limit** | **Result** | | | |
| -0.087 | -20 | -0.228 | -35 | 0.0094 | 0.02 | Pass | | | |


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| PF Temperature Coefficient ($T_{oper-high}$) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $e_u$ | $t_u$ | $e_l$ | $t_l$ | Calculated Temperature Coefficient | Limit | Result | | | |
| 0.516 | 65 | 0.358 | 50 | 0.0105 | 0.04 | Pass | | | |
| **PF Temperature Coefficient ($T_{oper-low}$)** | | | | | | | | | |
| $e_u$ | $t_u$ | $e_l$ | $t_l$ | Calculated Temperature Coefficient | Limit | Result | | | |
| 0.013 | -20 | -0.061 | -35 | 0.0049 | 0.04 | Pass | | | |

**Table 99 - Test 19 Variation of Ambient Temperatures, 12S SN 11F01940**


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| Test No. 19: Variation of Ambient Temperatures | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.8 | | | | | | |
| **Engineer** | Steven Lu/William Yip | **Humidity (RH)** | 43.0% | | | | | | |
| **Test Date** | 6/26/2025-7/1/2025 | **Observations** | None | | | | | | |
| **Meter Form** | 2S | | | | | | | | |
| **Current Class** | 200 | | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | | |
| **Serial Number** | 11F01947 | | | | | | | | |
| **Condition** | **Volt** | **Amp** | **Power Factor** | **Frequency** | **Temperature** | **% Registration** | **Deviation** | **Limit** | **Result** |
| Reference performance for (1) and (7) | 240 | 3 | 1.0 | 60 | 23° C+/- 5C | 99.960 | Reference | Reference | Reference |
| Reference performance for (2) and (8) | 240 | 30 | 1.0 | 60 | 23° C+/- 5C | 99.902 | Reference | Reference | Reference |
| Reference performance for (3) and (9) | 240 | 100 | 1.0 | 60 | 23° C+/- 5C | 99.836 | Reference | Reference | Reference |
| Reference performance for (4) and (10) | 240 | 6 | 0.5 lag | 60 | 23° C+/- 5C | 100.026 | Reference | Reference | Reference |
| Reference performance for (5) and (11) | 240 | 30 | 0.5 lag | 60 | 23° C+/- 5C | 99.900 | Reference | Reference | Reference |
| Reference performance for (6) and (12) | 240 | 100 | 0.5 lag | 60 | 23° C+/- 5C | 99.688 | Reference | Reference | Reference |
| Condition (1) | 240 | 3 | 1.0 | 60 | 50° C+/- 5C | 100.101 | 0.141 | +/- 0.3 | Pass |
| Condition (2) | 240 | 30 | 1.0 | 60 | 50° C+/- 5C | 100.063 | 0.161 | +/- 0.3 | Pass |
| Condition (3) | 240 | 100 | 1.0 | 60 | 50° C+/- 5C | 99.987 | 0.151 | +/- 0.3 | Pass |
| Condition (4) | 240 | 6 | 0.5 lag | 60 | 50° C+/- 5C | 100.176 | 0.150 | +/- 0.5 | Pass |
| Condition (5) | 240 | 30 | 0.5 lag | 60 | 50° C+/- 5C | 100.050 | 0.150 | +/- 0.5 | Pass |
| Condition (6) | 240 | 100 | 0.5 lag | 60 | 50° C+/- 5C | 99.850 | 0.162 | +/- 0.5 | Pass |
| Condition (7) | 240 | 3 | 1.0 | 60 | -20° C+/- 5C | 99.786 | -0.174 | +/- 0.5 | Pass |
| Condition (8) | 240 | 30 | 1.0 | 60 | -20° C+/- 5C | 99.713 | -0.189 | +/- 0.5 | Pass |
| Condition (9) | 240 | 100 | 1.0 | 60 | -20° C+/- 5C | 99.594 | -0.242 | +/- 0.5 | Pass |
| Condition (10) | 240 | 6 | 0.5 lag | 60 | -20° C+/- 5C | 99.812 | -0.214 | +/- 0.9 | Pass |
| Condition (11) | 240 | 30 | 0.5 lag | 60 | -20° C+/- 5C | 99.641 | -0.259 | +/- 0.9 | Pass |
| Condition (12) | 240 | 100 | 0.5 lag | 60 | -20° C+/- 5C | 99.531 | -0.157 | +/- 0.9 | Pass |
| **Temperature Coefficient Measurements** | | | | | | | | | |
| **Condition** | **Volt** | **Amp** | **Power Factor** | **Frequency** | **Temperature** | **% Registration** | **% Errors** | | |
| $T_{oper\text{-}max}$ | 240 | 3 | 1.0 | 60 | 50° C+/- 5C | 100.101 | 0.101 | | |
| $T_{oper\text{-}max}$ | 240 | 6 | 0.5 lag | 60 | 50° C+/- 5C | 100.176 | 0.176 | | |
| $T_{oper\text{-}max}$ | 240 | 3 | 1.0 | 60 | 65° C+/- 5C | 100.110 | 0.110 | | |
| $T_{oper\text{-}max}$ | 240 | 6 | 0.5 lag | 60 | 65° C+/- 5C | 100.202 | 0.202 | | |
| $T_{oper\text{-}min}$ | 240 | 3 | 1.0 | 60 | -20° C+/- 5C | 99.786 | -0.214 | | |
| $T_{oper\text{-}min}$ | 240 | 6 | 0.5 lag | 60 | -20° C+/- 5C | 99.812 | -0.188 | | |
| $T_{oper\text{-}min}$ | 240 | 3 | 1.0 | 60 | -35° C+/- 5C | 99.782 | -0.218 | | |
| $T_{oper\text{-}min}$ | 240 | 6 | 0.5 lag | 60 | -35° C+/- 5C | 99.771 | -0.229 | | |
| **Unity Temperature Coefficient ($T_{oper\text{-}high}$)** | | | | | | | | | |
| **$e_u$** | **$t_u$** | **$e_l$** | **$t_l$** | **Calculated Temperature Coefficient** | **Limit** | **Result** | | | |
| 0.110 | 65 | 0.101 | 50 | 0.0006 | 0.02 | Pass | | | |
| **Unity Temperature Coefficient ($T_{oper\text{-}low}$)** | | | | | | | | | |
| **$e_u$** | **$t_u$** | **$e_l$** | **$t_l$** | **Calculated Temperature Coefficient** | **Limit** | **Result** | | | |
| -0.214 | -20 | -0.218 | -35 | 0.0003 | 0.02 | Pass | | | |


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| PF Temperature Coefficient ($T_{oper-high}$) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $e_u$ | $t_u$ | $e_l$ | $t_l$ | Calculated Temperature Coefficient | Limit | Result | | | |
| 0.202 | 65 | 0.176 | 50 | 0.0017 | 0.04 | Pass | | | |
| **PF Temperature Coefficient ($T_{oper-low}$)** | | | | | | | | | |
| $e_u$ | $t_u$ | $e_l$ | $t_l$ | Calculated Temperature Coefficient | Limit | Result | | | |
| -0.188 | -20 | -0.229 | -35 | 0.0027 | 0.04 | Pass | | | |

**Table 100 - Test 19 Variation of Ambient Temperatures, 2S SN 11F01947**


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| Test No. 19: Variation of Ambient Temperatures | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.8 | | | | | | |
| **Engineer** | Steven Lu/William Yip | **Humidity (RH)** | 43.0% | | | | | | |
| **Test Date** | 6/26/2025-7/1/2025 | **Observations** | None | | | | | | |
| **Meter Form** | 12S | | | | | | | | |
| **Current Class** | 200 | | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | | |
| **Serial Number** | 11F01951 | | | | | | | | |
| **Condition** | **Volt** | **Amp** | **Power Factor** | **Frequency** | **Temperature** | **% Registration** | **Deviation** | **Limit** | **Result** |
| Reference performance for (1) and (7) | 120 | 3 | 1.0 | 60 | 23° C+/- 5C | 100.044 | Reference | Reference | Reference |
| Reference performance for (2) and (8) | 120 | 30 | 1.0 | 60 | 23° C+/- 5C | 99.963 | Reference | Reference | Reference |
| Reference performance for (3) and (9) | 120 | 100 | 1.0 | 60 | 23° C+/- 5C | 99.984 | Reference | Reference | Reference |
| Reference performance for (4) and (10) | 120 | 6 | 0.5 lag | 60 | 23° C+/- 5C | 100.210 | Reference | Reference | Reference |
| Reference performance for (5) and (11) | 120 | 30 | 0.5 lag | 60 | 23° C+/- 5C | 100.054 | Reference | Reference | Reference |
| Reference performance for (6) and (12) | 120 | 100 | 0.5 lag | 60 | 23° C+/- 5C | 99.735 | Reference | Reference | Reference |
| Condition (1) | 120 | 3 | 1.0 | 60 | 50° C+/- 5C | 100.284 | 0.240 | +/- 0.3 | Pass |
| Condition (2) | 120 | 30 | 1.0 | 60 | 50° C+/- 5C | 100.167 | 0.204 | +/- 0.3 | Pass |
| Condition (3) | 120 | 100 | 1.0 | 60 | 50° C+/- 5C | 100.120 | 0.136 | +/- 0.3 | Pass |
| Condition (4) | 120 | 6 | 0.5 lag | 60 | 50° C+/- 5C | 100.469 | 0.259 | +/- 0.5 | Pass |
| Condition (5) | 120 | 30 | 0.5 lag | 60 | 50° C+/- 5C | 100.283 | 0.229 | +/- 0.5 | Pass |
| Condition (6) | 120 | 100 | 0.5 lag | 60 | 50° C+/- 5C | 100.133 | 0.398 | +/- 0.5 | Pass |
| Condition (7) | 120 | 3 | 1.0 | 60 | -20° C+/- 5C | 100.074 | 0.030 | +/- 0.5 | Pass |
| Condition (8) | 120 | 30 | 1.0 | 60 | -20° C+/- 5C | 99.819 | -0.144 | +/- 0.5 | Pass |
| Condition (9) | 120 | 100 | 1.0 | 60 | -20° C+/- 5C | 99.862 | -0.122 | +/- 0.5 | Pass |
| Condition (10) | 120 | 6 | 0.5 lag | 60 | -20° C+/- 5C | 100.151 | -0.059 | +/- 0.9 | Pass |
| Condition (11) | 120 | 30 | 0.5 lag | 60 | -20° C+/- 5C | 99.900 | -0.154 | +/- 0.9 | Pass |
| Condition (12) | 120 | 100 | 0.5 lag | 60 | -20° C+/- 5C | 99.636 | -0.099 | +/- 0.9 | Pass |
| **Temperature Coefficient Measurements** | | | | | | | | | |
| **Condition** | **Volt** | **Amp** | **Power Factor** | **Frequency** | **Temperature** | **% Registration** | **% Errors** | | |
| $T_{oper-max}$ | 120 | 3 | 1.0 | 60 | 50° C+/- 5C | 100.284 | 0.284 | | |
| $T_{oper-max}$ | 120 | 6 | 0.5 lag | 60 | 50° C+/- 5C | 100.469 | 0.469 | | |
| $T_{oper-max}$ | 120 | 3 | 1.0 | 60 | 65° C+/- 5C | 100.188 | 0.188 | | |
| $T_{oper-max}$ | 120 | 6 | 0.5 lag | 60 | 65° C+/- 5C | 100.374 | 0.374 | | |
| $T_{oper-min}$ | 120 | 3 | 1.0 | 60 | -20° C+/- 5C | 100.074 | 0.074 | | |
| $T_{oper-min}$ | 120 | 6 | 0.5 lag | 60 | -20° C+/- 5C | 100.151 | 0.151 | | |
| $T_{oper-min}$ | 120 | 3 | 1.0 | 60 | -35° C+/- 5C | 99.933 | -0.067 | | |
| $T_{oper-min}$ | 120 | 6 | 0.5 lag | 60 | -35° C+/- 5C | 100.133 | 0.133 | | |
| **Unity Temperature Coefficient ($T_{oper-high}$)** | | | | | | | | | |
| **$e_u$** | **$t_u$** | **$e_l$** | **$t_l$** | **Calculated Temperature Coefficient** | **Limit** | **Result** | | | |
| 0.188 | 65 | 0.284 | 50 | 0.0064 | 0.02 | Pass | | | |
| **Unity Temperature Coefficient ($T_{oper-low}$)** | | | | | | | | | |
| **$e_u$** | **$t_u$** | **$e_l$** | **$t_l$** | **Calculated Temperature Coefficient** | **Limit** | **Result** | | | |
| 0.074 | -20 | -0.067 | -35 | 0.0094 | 0.02 | Pass | | | |


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| PF Temperature Coefficient ($T_{oper-high}$) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $e_u$ | $t_u$ | $e_l$ | $t_l$ | Calculated Temperature Coefficient | Limit | Result | | | |
| 0.374 | 65 | 0.469 | 50 | 0.0063 | 0.04 | Pass | | | |
| **PF Temperature Coefficient ($T_{oper-low}$)** | | | | | | | | | |
| $e_u$ | $t_u$ | $e_l$ | $t_l$ | Calculated Temperature Coefficient | Limit | Result | | | |
| 0.151 | -20 | 0.133 | -35 | 0.0012 | 0.04 | Pass | | | |

**Table 101 - Test 19 Variation of Ambient Temperatures, 12S SN 11F01951**


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**Photograph 24 - Test 19 Variation of Ambient Temperatures, Test Setup**

### 6.19.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 19 Variation of Ambient Temperatures Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 4T7283 | Automated Meter testing System | WECO | 2300 | 4952 | 3/28/2025 | 3/31/2026 |
| 1T10002 | Thermometer/ Hygrometer/ Barometer | Fisher Scientific | 14-650-118 | 240202396 | 3/6/2024 | 3/6/2026 |
| 2T5645 | Temperature Chamber (T2) | Cincinnati Sub-ZeroSUBZERO PRODUCTS | Z-32 | 89-11452 | 9/12/2024 | 9/30/2025 |
| 4T7329 | Dytronic Reference Standard | Radian Research | RD-20-203 | 204925 | 3/28/2025 | 3/31/2026 |
| 4T7330 | Dytronic Reference Standard | Radian Research | RD-20-203 | 204926 | 3/28/2025 | 3/31/2026 |
| 4T7347 | Dytronic Reference Standard | Radian research | RD-20-203 | 205414 | 3/28/2025 | 3/31/2026 |
| 1T10002 | Thermometer/ Hygrometer/ Barometer | Fisher Scientific | 14-650-118 | 240202396 | 3/6/2024 | 3/6/2026 |

**Table 102 - Test 19 Variation of Ambient Temperatures, Equipment List**

## 6.20 Test No. 20: Effect of Temporary Overloads

### 6.20.1 Test Requirement(s)

This test shall not apply for current class 2, 10, or 20 meters.

Self-contained meters shall be subjected to a symmetrical short-circuit current of 7,000 A peak, 60 Hz, for not less than one cycle, or for more than six cycles. For this test current circuits of the meters shall be connected in series adding.

The effect of short-circuit current on the performance of a meter shall not exceed the maximum deviation. Specified in Table 103. To eliminate residual effects, Condition (1) shall be conducted before tests of Condition (2).

| Condition | Current in Amperes | | | Maximum Deviation in Percent from Reference | | | |
|---|---|---|---|---|---|---|---|
| | Current Class | | | Accuracy Class | | | |
| | 100 | 200 | 320 | 1.0 | 0.5 | 0.2 | 0.1 |
| Reference for 1 | 15 | 30 | 50 | Ref. | Ref. | Ref. | Ref. |
| Reference for 2 | 1.5 | 3 | 5 | Ref. | Ref. | Ref. | Ref. |
| 1 | 15 | 30 | 50 | ±1.5 | ±0.1 | ±0.1 | ±0.05 |
| 2 | 1.5 | 3 | 5 | ±1.5 | ±0.1 | ±0.1 | ±0.05 |

**Table 103 - Effect of Temporary Overloads on Accuracy**

The meter shall withstand, for a duration of four cycles, a 60 Hz symmetrical fault current as follows:

a) Current class 100: 10,000 Arms
b) Current class 200: 12,000 A rms
c) Current class 320: 12,000 Arms

To meet the mechanical structure requirement of this test, the meter shall meet the constraint of 4.6.2.1(b) of ANSI C12.1: 2024.

To meet the insulation requirement of this test, the meter shall pass Test No. 15. Insulation, immediately following the completion of this test. The application of Test No. 15 in this manner shall not excuse the meter from the application of Test No: 15 in the tests performed as a group in Table 10 of the ANSI C12.1-2024 standard.

### 6.20.2 Test Data and Results

The meters listed below are **compliant** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CD |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CA |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C3 |

Refer to the following test data and photographs for a complete overview of the test setup and results.

| Test No. 20: Temporary Overloads | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Project Number | 135988 | Temperature (C) | 21.9 | | | | | |
| Engineer | Steven Lu | Humidity (RH) | 29.0% | | | | | |
| Test Date | 4/28/2025 | Observations | None | | | | | |
| Meter Form | 12S | | | | | | | |
| Current Class | 200 | | | | | | | |
| Accuracy Class | 0.2 | | | | | | | |
| Serial Number | 11F013CA | | | | | | | |

| Test | Voltage | Amps | Power Factor | Frequency | % Registration | % Error | Limit | Result |
|---|---|---|---|---|---|---|---|---|
| FL (Reference) | 120 | 30 | 1.0 | 60 | 100.085 | Reference | Reference | Reference |
| LL (Reference) | 120 | 3 | 1.0 | 60 | 100.054 | Reference | Reference | Reference |
| FL | 120 | 30 | 1.0 | 60 | 100.038 | -0.047 | +/- 0.1 | Pass |
| LL | 120 | 3 | 1.0 | 60 | 100.050 | -0.004 | +/- 0.1 | Pass |

**Table 104 - Test 20 Temporary Overloads (4.7.3.6.1), 12S, SN 11F004CA**

| Test No. 20: Temporary Overloads | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Project Number | 135988 | Temperature (C) | 21.9 | | | | | |
| Engineer | Steven Lu | Humidity (RH) | 29.0% | | | | | |
| Test Date | 4/28/2025 | Observations | None | | | | | |
| Meter Form | 12S | | | | | | | |
| Current Class | 200 | | | | | | | |
| Accuracy Class | 0.2 | | | | | | | |
| Serial Number | 11F004CD | | | | | | | |

| Test | Voltage | Amps | Power Factor | Frequency | % Registration | % Error | Limit | Result |
|---|---|---|---|---|---|---|---|---|
| FL (Reference) | 120 | 30 | 1.0 | 60 | 99.961 | Reference | Reference | Reference |
| LL (Reference) | 120 | 3 | 1.0 | 60 | 99.975 | Reference | Reference | Reference |
| FL | 120 | 30 | 1.0 | 60 | 99.968 | 0.007 | +/- 0.1 | Pass |
| LL | 120 | 3 | 1.0 | 60 | 99.979 | 0.004 | +/- 0.1 | Pass |

**Table 105 - Test 20 Temporary Overloads (4.7.3.6.1), 12S, SN 11F004CD**

| Test No. 20: Temporary Overloads | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Project Number | 135988 | Temperature (C) | 21.9 | | | | | |
| Engineer | Steven Lu | Humidity (RH) | 29.0% | | | | | |
| Test Date | 4/28/2025 | Observations | None | | | | | |
| Meter Form | 2S | | | | | | | |
| Current Class | 200 | | | | | | | |
| Accuracy Class | 0.2 | | | | | | | |
| Serial Number | 11F013C3 | | | | | | | |

| Test | Voltage | Amps | Power Factor | Frequency | % Registration | % Error | Limit | Result |
|---|---|---|---|---|---|---|---|---|
| FL (Reference) | 240 | 30 | 1.0 | 60 | 99.952 | Reference | Reference | Reference |
| LL (Reference) | 240 | 3 | 1.0 | 60 | 99.980 | Reference | Reference | Reference |
| FL | 240 | 30 | 1.0 | 60 | 99.953 | 0.001 | +/- 0.1 | Pass |
| LL | 240 | 3 | 1.0 | 60 | 99.967 | -0.013 | +/- 0.1 | Pass |

**Table 106 - Test 20 Temporary Overloads (4.7.3.6.1), 2S, SN 11F013C3**


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| Test No. 20: Temporary Overloads | | | | | |
|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature (C)** | 21.9 | |
| **Engineer** | Steven Lu | | **Humidity (RH)** | 29.0% | |
| **Test Date** | 4/28/2025 | | **Observations** | None | |
| **Meter Form** | 12S | | | | |
| **Current Class** | 200 | | | | |
| **Accuracy Class** | 0.2 | | | | |
| **Serial Number** | 11F004CD | | | | |
| **4.7.3.6.3 Effect on Mechanical Structure Requirement** | | | **Class/Over Current** | **Result** | |
| The meter shall withstand, for a duration of 4 cycles at nominal power line frequency, a symmetrical fault current without damage to the mechanical structure or reduction in the insulation. | | | 200/12,000A | Metering device shows no signs of physical damage as a result of the test procedure. | |
| **Insulation test** | **Position** | **Limit** | **Leakage Current** | **Result** | **Comment** |
| 2.5kV | Line 1 & Current Ckt A to PE | 5 mA | 0.09 mA | Pass | with test links and voltage circuits in place |
| 2.5kV | Line 3 & Current Ckt C to PE | 5 mA | 0.09 mA | Pass | with test links and voltage circuits in place |
| 2.5kV | N to PE | 5 mA | 0.09 mA | Pass | with test links and voltage circuits in place |
| 2.5kV | Current Ckt A to N | 5 mA | 0.09 mA | Pass | with test links and parallel circuitry removed |
| 2.5kV | Current Ckt C to N | 5 mA | 0.09 mA | Pass | with test links and parallel circuitry removed |
| 2.5kV | Current Ckt A to Current Ckt C | 5 mA | 0.09 mA | Pass | with test links and parallel circuitry removed |
| *Test Unit passes the Insulation test at 2.5 kVrms, 60 Hz for 1 minute. | | | | | |
| Since the test unit passes at this higher 2.5 kVrms level, the 1.5 kVrms , 60 Hz for 1 minute is unnecessary. | | | | | |

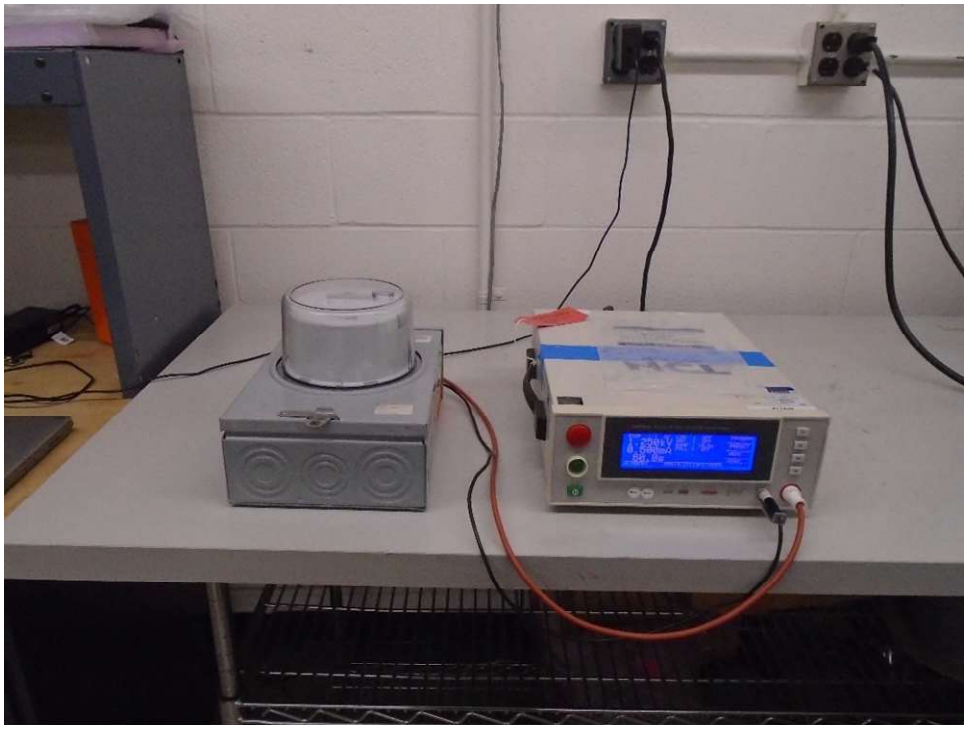
**Table 107 - Test 20 Temporary Overloads (4.7.3.6.3), 12S, SN 11F004CD**

| Test No. 20: Temporary Overloads | | | | | |
|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature (C)** | 21.9 | |
| **Engineer** | Steven Lu | | **Humidity (RH)** | 29.0% | |
| **Test Date** | 4/28/2025 | | **Observations** | None | |
| **Meter Form** | 12S | | | | |
| **Current Class** | 200 | | | | |
| **Accuracy Class** | 0.2 | | | | |
| **Serial Number** | 11F013CA | | | | |
| **4.7.3.6.3 Effect on Mechanical Structure Requirement** | | | **Class/Over Current** | **Result** | |
| The meter shall withstand, for a duration of 4 cycles at nominal power line frequency, a symmetrical fault current without damage to the mechanical structure or reduction in the insulation. | | | 200/12,000A | Metering device shows no signs of physical damage as a result of the test procedure. | |
| **Insulation test** | **Position** | **Limit** | **Leakage Current** | **Result** | **Comment** |
| 2.5kV | Line 1 & Current Ckt A to PE | 5 mA | 0.09 mA | Pass | with test links and voltage circuits in place |
| 2.5kV | Line 3 & Current Ckt C to PE | 5 mA | 0.09 mA | Pass | with test links and voltage circuits in place |
| 2.5kV | N to PE | 5 mA | 0.09 mA | Pass | with test links and voltage circuits in place |
| 2.5kV | Current Ckt A to N | 5 mA | 0.09 mA | Pass | with test links and parallel circuitry removed |
| 2.5kV | Current Ckt C to N | 5 mA | 0.09 mA | Pass | with test links and parallel circuitry removed |
| 2.5kV | Current Ckt A to Current Ckt C | 5 mA | 0.09 mA | Pass | with test links and parallel circuitry removed |
| *Test Unit passes the Insulation test at 2.5 kVrms, 60 Hz for 1 minute. | | | | | |
| Since the test unit passes at this higher 2.5 kVrms level, the 1.5 kVrms , 60 Hz for 1 minute is unnecessary. | | | | | |

**Table 108 - Test 20 Temporary Overloads (4.7.3.6.3), 12S, SN 11F013CA**

| Test No. 20: Temporary Overloads | | | | | |
|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature (C)** | 21.9 | |
| **Engineer** | Steven Lu | | **Humidity (RH)** | 29.0% | |
| **Test Date** | 4/28/2025 | | **Observations** | None | |
| **Meter Form** | 2S | | | | |
| **Current Class** | 200 | | | | |
| **Accuracy Class** | 0.2 | | | | |
| **Serial Number** | 11F013C3 | | | | |
| **4.7.3.6.3 Effect on Mechanical Structure Requirement** | | | **Class/Over Current** | **Result** | |
| The meter shall withstand, for a duration of 4 cycles at nominal power line frequency, a symmetrical fault current without damage to the mechanical structure or reduction in the insulation. | | | 200/12,000A | Metering device shows no signs of physical damage as a result of the test procedure. | |
| **Insulation test** | **Position** | **Limit** | **Leakage Current** | **Result** | **Comment** |
| 2.5kV | Line 1 & Current Ckt A to PE | 5 mA | 0.09 mA | Pass | with test links and voltage circuits in place |
| 2.5kV | Line 2 & Current Ckt B to PE | 5 mA | 0.09 mA | Pass | with test links and voltage circuits in place |
| 2.5kV | Current Ckt A to Current Ckt B | 5 mA | 0.09 mA | Pass | with test links and parallel circuitry removed |
| *Test Unit passes the Insulation test at 2.5 kVrms, 60 Hz for 1 minute. | | | | | |
| Since the test unit passes at this higher 2.5 kVrms level, the 1.5 kVrms , 60 Hz for 1 minute is unnecessary. | | | | | |

**Table 109 - Test 20 Temporary Overloads (4.7.3.6.3), 2S, SN 11F013C3**



**Photograph 25 - Test 20 Temporary Overloads, Test Setup, insulation check**




**Photograph 26 - Test 20 Temporary Overloads, Test Setup, performance check**




**Photograph 27 - Test 20 Temporary Overloads, Test Setup**

## 6.20.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Equipment List - Test #20 Temporary Overload | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 4T7283 | Automated Meter testing | WECO | 2300 | 4952 | 03/28/2025 | 03/31/2026 |
| 4T7316 | High Current Test Set | Phenix Technologies | HC-20C (240/480V) | Sep-32 | Functional Verification | Functional Verification |
| 4T7435 | AC/DC Hi-POT Tester | QuadTech | Sentry 30 Plus | 8140351 | 03/17/2025 | 09/30/2026 |
| 1T4636 | Wide Band Current Monitor | Pearson Electronics, Inc. | 1423 | 123643 | Functional Verification | Functional Verification |
| 4T7439 | Digital Phosphor Oscilloscope | Tektronix | TDS5104B | B021967 | 03/28/2024 | 09/30/2025 |

**Table 110 - Test 20 Temporary Overloads, Equipment List**

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

## 6.21 Test No. 21: Effect of Current Surges in Ground Conductors

### 6.21.1 Test Requirement(s)

This test shall not apply for meters with terminal compartments (Type A) or for current class 2, 10, or 20 meters.

Three meters shall be subjected to one transient surge of 20 Ka (20/50 microsecond wave) of either polarity through a conductor placed vertically 1.5 inches (38.1 mm) behind the flat portion of the base of the meter, with a socket in place. The effect of current surge upon the performance of a meter shall not exceed the maximum deviation specified in Table 111.

| Condition | Current in Amperes | | | Maximum Deviation in Percent from Reference Performance | | | |
|---|---|---|---|---|---|---|---|
| | Current Class | | | Accuracy Class | | | |
| | 100 | 200 | 320 | 1.0 | 0.5 | 0.2 | 0.1 |
| Reference Performance | 15 | 30 | 50 | Ref. | Ref. | Ref. | Ref. |
| 1 | 15 | 30 | 50 | ±1.0 | ±0.1 | ±0.1 | ±0.05 |

**Table 111 - Effect of Current Surge in Ground Conductor**

### 6.21.2 Test Data and Results

The meters listed below are **compliant** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CD |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CA |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C3 |

Refer to the following test data and photographs for a complete overview of the test setup and results.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| Performance Verification (External Influences) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.3 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 29.0% | | | | | |
| **Test Date** | 4/29/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C3 | | | | | | | |
| **Before Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage (As Reference)** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.914 | -0.086 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.933 | -0.067 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 100.001 | 0.001 | ± 0.2 % | Pass |
| **After Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.937 | -0.023 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.950 | -0.017 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 100.026 | -0.025 | ± 0.2 % | Pass |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F004CA | | | | | | | |
| **Before Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage (As Reference)** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 120 | 60 | 30 | 1.0 | 100.021 | 0.021 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 3 | 1.0 | 100.003 | 0.003 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 30 | 0.5 Lag | 100.134 | 0.134 | ± 0.2 % | Pass |
| **After Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 120 | 60 | 30 | 1.0 | 100.109 | -0.088 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 3 | 1.0 | 100.005 | -0.002 | ± 0.2 % | Pass |


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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Power Factor** | 120 | 60 | 30 | 0.5 Lag | 100.131 | 0.003 | ± 0.2 % | Pass |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F004CD | | | | | | | |
| **Before Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage（As Reference）** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 120 | 60 | | 1.0 | 99.947 | -0.053 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 0 | 1.0 | 99.968 | -0.032 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 0 | 0.5 Lag | 100.082 | 0.082 | ± 0.2 % | Pass |
| **After Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 120 | 60 | 0 | 1.0 | 99.975 | -0.028 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 0 | 1.0 | 99.990 | -0.022 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 0 | 0.5 Lag | 100.100 | -0.018 | ± 0.2 % | Pass |

**Table 112 - Test 21 Current Surges in Ground Conductors, Performance Verification - External Influences**

| Test No. 21: Effect of current surges in ground conductors | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.3 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 29.0% | | | | | |
| **Test Date** | 4/29/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | **Peak Discharge Current (kA)** | 20 | | | | | |
| **Current Class** | 200 | **Separation Impulser - EUT (inch)** | 1.5 | | | | | |
| **Accuracy Class** | 0.2 | **Number of Impulses** | 1 | | | | | |
| **Serial Number** | 11F004CA | **Meter Functionality** | OK | | | | | |

| Performance Check | Voltage | Amps | Power Factor | Frequency | % Registration | % Deviation from Reference | Limit | Result |
|---|---|---|---|---|---|---|---|---|
| Reference Performance | 120 | 30 | 1.0 | 60 | 100.021 | Reference | Reference | Reference |
| Condition 1 (After Test) | 120 | 30 | 1.0 | 60 | 100.109 | 0.088 | +/- 0.1 | Pass |

**Table 113 - Test 21 Current Surges in Ground Conductors, 12S, SN 11F004CA**

| Test No. 21: Effect of current surges in ground conductors | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.3 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 29.0% | | | | | |
| **Test Date** | 4/29/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | **Peak Discharge Current (kA)** | 20 | | | | | |
| **Current Class** | 200 | **Separation Impulser - EUT (inch)** | 1.5 | | | | | |
| **Accuracy Class** | 0.2 | **Number of Impulses** | 1 | | | | | |
| **Serial Number** | 11F004CD | **Meter Functionality** | OK | | | | | |

| Performance Check | Voltage | Amps | Power Factor | Frequency | % Registration | % Deviation from Reference | Limit | Result |
|---|---|---|---|---|---|---|---|---|
| Reference Performance | 120 | 30 | 1.0 | 60 | 99.947 | Reference | Reference | Reference |
| Condition 1 (After Test) | 120 | 30 | 1.0 | 60 | 99.975 | 0.028 | +/- 0.1 | Pass |

**Table 114 - Test 21 Current Surges in Ground Conductors, 12S, SN 11F004CD**

| Test No. 21: Effect of current surges in ground conductors | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.3 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 29.0% | | | | | |
| **Test Date** | 4/29/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | **Peak Discharge Current (kA)** | 20 | | | | | |
| **Current Class** | 200 | **Separation Impulser - EUT (inch)** | 1.5 | | | | | |
| **Accuracy Class** | 0.2 | **Number of Impulses** | 1 | | | | | |
| **Serial Number** | 11F013C3 | **Meter Functionality** | OK | | | | | |

| Performance Check | Voltage | Amps | Power Factor | Frequency | % Registration | % Error | Limit | Result |
|---|---|---|---|---|---|---|---|---|
| Reference Performance | 120 | 30 | 1.0 | 60 | 99.914 | Reference | Reference | Reference |
| Condition 1 (After Test) | 120 | 30 | 1.0 | 60 | 99.937 | 0.023 | +/- 0.1 | Pass |

**Table 115 - Test 21 Current Surges in Ground Conductors, 2S, SN 11F013C3**



**Photograph 28 - Test 21 Current Surges in Ground Conductors, Test Setup, front**

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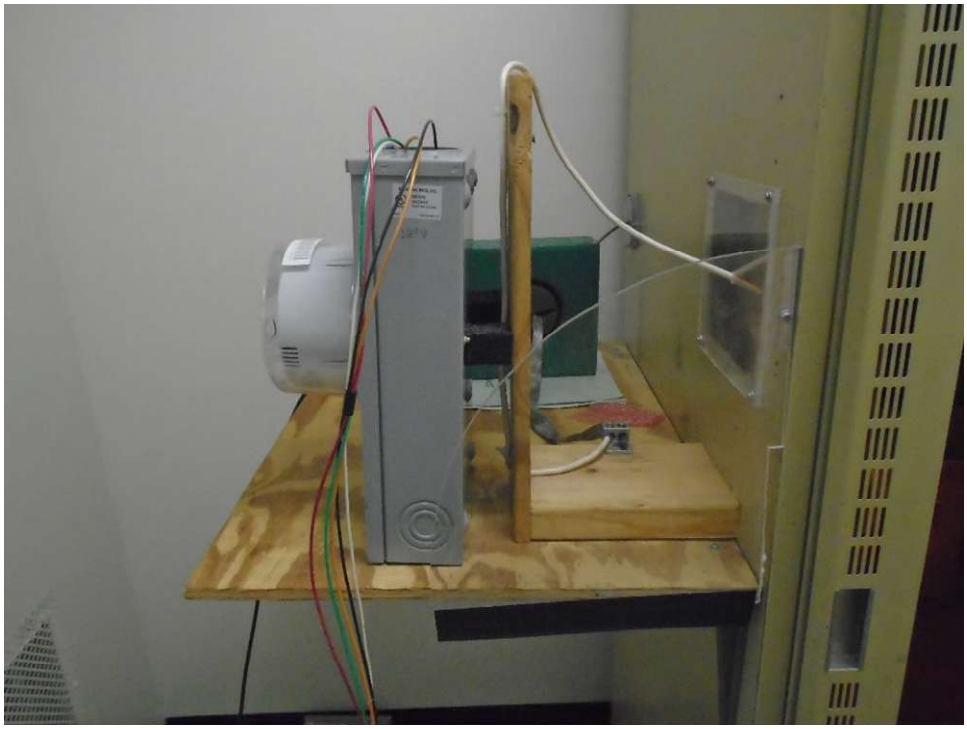

**Photograph 29 - Test 21 Current Surges in Ground Conductors, Test Setup, side**

## 6.21.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 21 Effect of current surges in ground conductors Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 4T7283 | Automated Meter testing System | WECO | 2300 | 4952 | 3/28/2025 | 3/31/2026 |
| 1T4231 | GENERATOR; 25KV SURGE | MET Laboratories | NONE | NONE | Functionally Verified | Functionally Verified |
| 1T4636 | Wide Band Current Monitor | Pearson Electronics, Inc. | 1423 | 123643 | Functionally Verified | Functionally Verified |
| 4T7439 | Digital Phosphor Oscilloscope | Tektronix | TDS5104B | B021967 | 3/28/2024 | 9/30/2025 |
| 1T4642 | Signal Transformer | Signal Transformer | DU-1 | N/A | Functionally Verified | Functionally Verified |
| 1T9999 | Thermometer/ Hygrometer | VWR International | 36934-164 | 230368599 | 5/31/2023 | 5/31/2025 |

**Table 116 - Test 21 Current Surges in Ground Conductors, Equipment List**

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

## 6.22 Test No. 25: Electrical Fast Transient/Burst

### 6.22.1 Test Requirement(s)

The meter shall meet the Fast Transient Surge Test requirements of IEC 61000-4-4. This test subjects the power inputs and the I/O circuits of the meter to repetitive busts of 5 ns rise time, 50 ns duration electrical fast transients.

The test shall be conducted utilizing the test equipment configurations provided in Figure 4 and Figure 5. The test shall be carried out according to IEC 61000-4-4, under the following conditions.

1. Test severity level: 4
2. Test voltages on the voltage and current circuits: 4 kV
3. Test voltage on I/O signal, data, and control lines: 2 kV
4. Repetition rate: 5 kHz
5. Duration of the test: minimum 60 seconds, maximum 70 seconds
6. Voltage and auxiliary circuits energized with reference voltage
7. Without any current in the current circuits and the current terminals shall be open circuit

An Accuracy Performance Check shall be performed (4.7.3.0.1 of ANSI C12.1: 2024).

This test shall be conducted on all meters excluding LED voltage indicators.

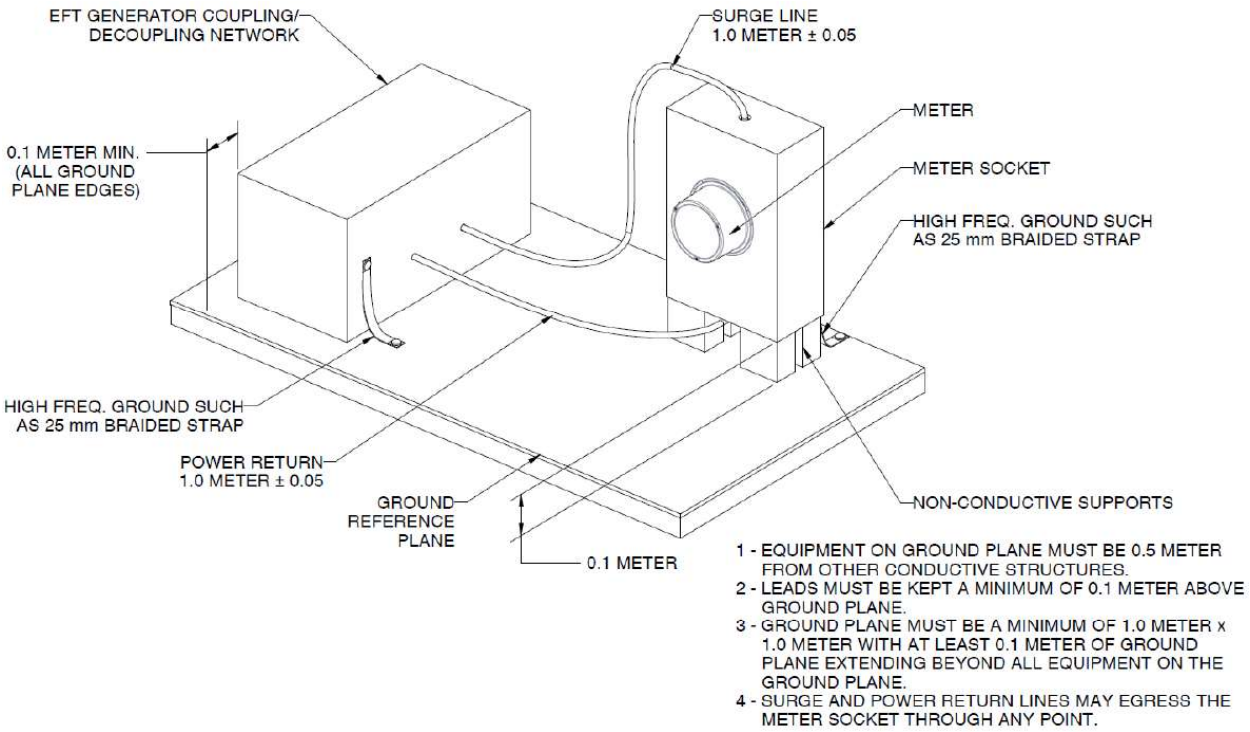


**Figure 4 - Test No. 25 Electrical Fast Transient/Burst Direct Connection**

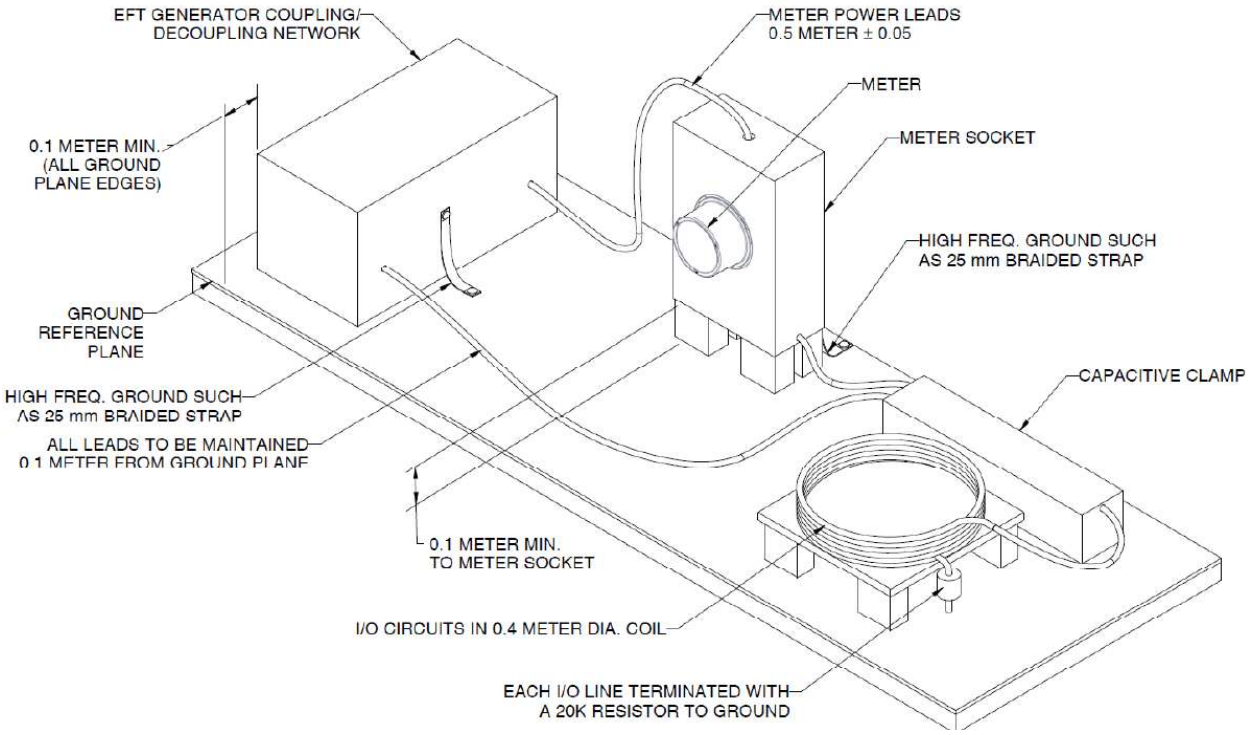


**Figure 5 - Test No. 25 Electrical Fast Transient/Burst Capacitive Clamp Connection**

## 6.22.2 Test Data and Results

The meters listed below are **compliant** with the requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C3 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C5 |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CA |

Refer to the following test data and photographs for a complete overview of the test setup and results.

| Performance Verification (External Influences) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 20.6 | | | | | |
| **Engineer** | William Yip | **Humidity (RH)** | 61.0% | | | | | |
| **Test Date** | 5/6/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C3 | | | | | | | |
| **Before Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage (As Reference)** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 240 | 60 | 30 | 1.0 | 100.030 | 0.030 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.918 | -0.082 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.993 | -0.007 | ± 0.2 % | Pass |
| **After Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 240 | 60 | 30 | 1.0 | 100.003 | 0.027 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.998 | -0.080 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.997 | -0.004 | ± 0.2 % | Pass |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C5 | | | | | | | |
| **Before Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage (As Reference)** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 120 | 60 | 30 | 1.0 | 99.883 | -0.117 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 3 | 1.0 | 99.909 | -0.091 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 30 | 0.5 Lag | 99.914 | -0.086 | ± 0.2 % | Pass |
| **After Test** | | | | | | | | |
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 120 | 60 | 30 | 1.0 | 99.996 | -0.113 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 3 | 1.0 | 99.961 | -0.052 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 30 | 0.5 Lag | 99.923 | -0.009 | ± 0.2 % | Pass |


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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Meter Form** | 12S | | | | | | |
| **Current Class** | 200 | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | |
| **Serial Number** | 11F004CA | | | | | | |

| **Before Test** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage (As Reference)** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 120 | 60 | | 1.0 | 100.025 | 0.025 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 0 | 1.0 | 100.041 | 0.041 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 0 | 0.5 Lag | 100.166 | 0.166 | ± 0.2 % | Pass |

| **After Test** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 120 | 60 | 0 | 1.0 | 100.001 | 0.024 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 0 | 1.0 | 100.002 | 0.039 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 0 | 0.5 Lag | 100.037 | 0.129 | ± 0.2 % | Pass |

**Table 117 - Test 25, EFT, Performance Verification - External Influences**

| Effect of Electrical Fast Transient/Burst Test Datasheet | | | |
|---|---|---|---|
| **Project Number** | 135988 | **Temperature** | 20.6°C |
| **Engineer** | William Yip | **Relative Humidity** | 61% |
| **Test Date** | 5/6/2025 | **Observations** | None |
| **Meter Form** | 12S | **Input Voltage** | 120V L/N / 208V L-L |
| **Current Class** | CL200 | **Coupling Mode** | CDN |
| **Serial Number** | 11F004CA | **Notes** | 1 minute duration for each coupling path listed below |

| Port Under Test | Repetition Frequency | Test Level | Polarity | Results / Observations |
|---|---|---|---|---|
| | kHz | kV | ± | |
| Common (All Lines and Ground) | 5 | 4 | + | Pass; No Anomalies Detected |
| | | | - | Pass; No Anomalies Detected |
| Line 1, Terminal 1 | 5 | 4 | + | Pass; No Anomalies Detected |
| | | | - | Pass; No Anomalies Detected |
| Line 3, Terminal 3 | 5 | 4 | + | Pass; No Anomalies Detected |
| | | | - | Pass; No Anomalies Detected |
| Neutral | 5 | 4 | + | Pass; No Anomalies Detected |
| | | | - | Pass; No Anomalies Detected |
| Ground | 5 | 4 | + | Pass; No Anomalies Detected |
| | | | - | Pass; No Anomalies Detected |

| Performance Verification and Test Results | | | |
|---|---|---|---|
| **Register Reading Before Test (Wh)** | 8204 | **ACD Verification Before Test** | Passed |
| **Register Reading After Test (Wh)** | 8204 | **ACD Verification After Test** | Passed |
| **Difference In Reading (Wh)** | 0 | **Test Results** | Passed |

**Table 118 - Test 25, EFT, 12S SN 11F004CA**

| | | | |
|---|---|---|---|
| **Project Number** | 135988 | **Temperature** | 20.6°C |
| **Engineer** | William Yip | **Relative Humidity** | 61% |
| **Test Date** | 5/6/2025 | **Observations** | None |
| **Meter Form** | 2S | **Input Voltage** | 240V L-L |
| **Current Class** | CL200 | **Coupling Mode** | CDN |
| **Serial Number** | 11F013C3 | **Notes** | 1 minute duration for each coupling path listed below |

| Port Under Test | Repetition Frequency | Test Level | Polarity | Results / Observations |
|---|---|---|---|---|
| | kHz | kV | ± | |
| Common (All Lines and Ground) | 5 | 4 | + | Pass; No Anomalies Detected |
| | | | - | Pass; No Anomalies Detected |
| Line 1, Terminal 1 | 5 | 4 | + | Pass; No Anomalies Detected |
| | | | - | Pass; No Anomalies Detected |
| Line 2, Terminal 2 | 5 | 4 | + | Pass; No Anomalies Detected |
| | | | - | Pass; No Anomalies Detected |
| Ground | 5 | 4 | + | Pass; No Anomalies Detected |
| | | | - | Pass; No Anomalies Detected |

| Performance Verification and Test Results | | | |
|---|---|---|---|
| **Register Reading Before Test (Wh)** | 7060 | **ACD Verification Before Test** | Passed |
| **Register Reading After Test (Wh)** | 7060 | **ACD Verification After Test** | Passed |
| **Difference In Reading (Wh)** | 0 | **Test Results** | Passed |

**Table 119 - Test 25, EFT, 2S SN 11F013C3**


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| Effect of Electrical Fast Transient/Burst Test Datasheet | | | |
|---|---|---|---|
| **Project Number** | 135988 | **Temperature** | 20.6°C |
| **Engineer** | William Yip | **Relative Humidity** | 61% |
| **Test Date** | 5/6/2025 | **Observations** | None |
| **Meter Form** | 2S | **Input Voltage** | 240V L-L |
| **Current Class** | CL200 | **Coupling Mode** | CDN |
| **Serial Number** | 11F013C5 | **Notes** | 1 minute duration for each coupling path listed below |

| Port Under Test | Repetition Frequency | Test Level | Polarity | Results / Observations |
|---|---|---|---|---|
| | kHz | kV | ± | |
| Common (All Lines and Ground) | 5 | 4 | + | Pass; No Anomalies Detected |
| | | | - | Pass; No Anomalies Detected |
| Line 1, Terminal 1 | 5 | 4 | + | Pass; No Anomalies Detected |
| | | | - | Pass; No Anomalies Detected |
| Line 2, Terminal 2 | 5 | 4 | + | Pass; No Anomalies Detected |
| | | | - | Pass; No Anomalies Detected |
| Ground | 5 | 4 | + | Pass; No Anomalies Detected |
| | | | - | Pass; No Anomalies Detected |

| Performance Verification and Test Results | | | |
|---|---|---|---|
| **Register Reading Before Test (Wh)** | 1720 | **ACD Verification Before Test** | Passed |
| **Register Reading After Test (Wh)** | 1720 | **ACD Verification After Test** | Passed |
| **Difference In Reading (Wh)** | 0 | **Test Results** | Passed |

**Table 120 - Test 25, EFT, 2S SN 11F013C5**


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**Photograph 30 - Test 25, EFT, Test Setup**

## 6.22.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 25 Electrical Fast Transient Equipment List | | | | | |
|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Calibration Date** | **Calibration Due Date** |
| 1T9587 | Immunity Test System | EMC Partner | IMU-MGS | 11/14/2024 | 11/14/2025 |
| 1T10002 | Thermometer/ Hygrometer/Barometer | Fisher Scientific | 14-650-118 | 3/6/2024 | 3/6/2026 |

**Table 121 - Test 25, EFT, Equipment List**

## 6.23 Test No. 25a: Oscillatory Surge Withstand Capability

### 6.23.1 Test Requirement(s)

The meter shall meet the Electrical Oscillatory SWC Test requirements of IEEE C37.90.1. This test subjects the power inputs and the I/O circuits of the meter to repetitive bursts damped oscillatory waves with an initial crest of 2.5 kV for a duration of two seconds.

The test shall be conducted utilizing the test equipment configurations and test conditions specified in IEEE C37.90.1. The application points shall be current, voltage, power supply, input circuit, output, Data communications, and Signal circuit as defined in IEEE C37.90.1-2002, and be per Table 122 below. In addition to the definitions of these terms in IEEE C37.90.1-2002, "Data communications" and "Signal circuit" shall be defined for a meter as follows:

> **Data communications** shall include: TIP and Ring on an output from a Modem, any RS232/485 lines, plus any other communications type output/inputs. The application of the waveform would be capacitively coupled to the lines. These lines shall not be considered as "input circuit" or "output," requiring a direct application to the ports.
>
> **Signal circuits** shall include: KYZ outputs, KYZ inputs, customer alert lines, EOI outputs, EOI inputs, plus others. The application of the waveform would be capacitively coupled to the lines. These lines shall not be considered as "input circuit" or "output," requiring a direct application to the ports.

| External Connection Group | Test Modes | | Oscillatory Test Voltage to Be Applied | Application |
|---|---|---|---|---|
| | Common | Transverse | | |
| Current | Yes | No | 2.5 kV | Direct |
| Voltage | Yes | Yes | 2.5 kV | Direct |
| Power supply | Yes | Yes | 2.5 kV | Direct |
| Input circuit | Yes | Yes | 2.5 kV | Direct |
| Output | Yes | Yes | 2.5 kV | Direct |
| Data communications | Yes | No | 2.5 kV | Capacitive |
| Signal circuit | Yes | No | 2.5 kV | Capacitive |

**Table 122 - Test Modes, Voltage, and Application for Each External Connection Group, Oscillatory Test**

An Accuracy Performance Check shall be performed (4.7.3.0.1 of ANSI C12.1: 2024)

This test shall be conducted on all meters excluding LED voltage indicators.

### 6.23.2 Test Data and Results

The meters listed below are **compliant** with the requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C3 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C5 |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CA |

Refer to the following test data and photographs for a complete overview of the test setup and results.


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| Performance Verification (External Influences) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Project Number | 135988 | Temperature (C) | 20.6 | | | | | |
| Engineer | William Yip | Humidity (RH) | 61.0% | | | | | |
| Test Date | 5/6/2025 | Observations | None | | | | | |
| Meter Form | 2S | | | | | | | |
| Current Class | 200 | | | | | | | |
| Accuracy Class | 0.2 | | | | | | | |
| Serial Number | 11F013C3 | | | | | | | |

**Before Test**

| Condition | Voltage (VAC) | Frequency (Hz) | Current (A) | Power Factor | Accuracy Percentage (As Reference) | Percent Error Before Test | Before Test Limit from Zero | Result |
|---|---|---|---|---|---|---|---|---|
| Full Load | 240 | 60 | 30 | 1.0 | 100.003 | 0.003 | ± 0.2 % | Pass |
| Light Load | 240 | 60 | 3 | 1.0 | 99.998 | -0.002 | ± 0.2 % | Pass |
| Power Factor | 240 | 60 | 30 | 0.5 Lag | 99.997 | -0.003 | ± 0.2 % | Pass |

**After Test**

| Condition | Voltage (VAC) | Frequency (Hz) | Current (A) | Power Factor | Accuracy Percentage | % Deviation From Reference After Test | After Test Deviation Limit From Reference | Result |
|---|---|---|---|---|---|---|---|---|
| Full Load | 240 | 60 | 30 | 1.0 | 100.023 | -0.020 | ± 0.2 % | Pass |
| Light Load | 240 | 60 | 3 | 1.0 | 99.995 | 0.003 | ± 0.2 % | Pass |
| Power Factor | 240 | 60 | 30 | 0.5 Lag | 99.996 | 0.001 | ± 0.2 % | Pass |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Meter Form | 2S | | | | | | | |
| Current Class | 200 | | | | | | | |
| Accuracy Class | 0.2 | | | | | | | |
| Serial Number | 11F013C5 | | | | | | | |

**Before Test**

| Condition | Voltage (VAC) | Frequency (Hz) | Current (A) | Power Factor | Accuracy Percentage (As Reference) | Percent Error Before Test | Before Test Limit from Zero | Result |
|---|---|---|---|---|---|---|---|---|
| Full Load | 240 | 60 | 30 | 1.0 | 99.996 | -0.004 | ± 0.2 % | Pass |
| Light Load | 240 | 60 | 3 | 1.0 | 99.961 | -0.039 | ± 0.2 % | Pass |
| Power Factor | 240 | 60 | 30 | 0.5 Lag | 99.923 | -0.077 | ± 0.2 % | Pass |

**After Test**

| Condition | Voltage (VAC) | Frequency (Hz) | Current (A) | Power Factor | Accuracy Percentage | % Deviation From Reference After Test | After Test Deviation Limit From Reference | Result |
|---|---|---|---|---|---|---|---|---|
| Full Load | 240 | 60 | 30 | 1.0 | 99.993 | 0.003 | ± 0.2 % | Pass |
| Light Load | 240 | 60 | 3 | 1.0 | 99.998 | -0.037 | ± 0.2 % | Pass |
| Power Factor | 240 | 60 | 30 | 0.5 Lag | 99.968 | -0.045 | ± 0.2 % | Pass |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Meter Form | 12S | | | | | | | |
| Current Class | 200 | | | | | | | |
| Accuracy Class | 0.2 | | | | | | | |
| Serial Number | 11F004CA | | | | | | | |


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| Before Test | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Condition | Voltage (VAC) | Frequency (Hz) | Current (A) | Power Factor | Accuracy Percentage （As Reference） | Percent Error Before Test | Before Test Limit from Zero | Result |
| Full Load | 120 | 60 | | 1.0 | 100.001 | 0.001 | ± 0.2 % | Pass |
| Light Load | 120 | 60 | 0 | 1.0 | 100.002 | 0.002 | ± 0.2 % | Pass |
| Power Factor | 120 | 60 | 0 | 0.5 Lag | 100.037 | 0.037 | ± 0.2 % | Pass |
| **After Test** | | | | | | | | |
| Condition | Voltage (VAC) | Frequency (Hz) | Current (A) | Power Factor | Accuracy Percentage | % Deviation From Reference After Test | After Test Deviation Limit From Reference | Result |
| Full Load | 120 | 60 | 0 | 1.0 | 100.021 | -0.020 | ± 0.2 % | Pass |
| Light Load | 120 | 60 | 0 | 1.0 | 100.003 | -0.001 | ± 0.2 % | Pass |
| Power Factor | 120 | 60 | 0 | 0.5 Lag | 99.992 | 0.045 | ± 0.2 % | Pass |

**Table 123 - Test 25a, SWC, Performance Verification - External Influences**

| Effect of Electrical Oscillatory SWC Test Datasheet | | | | | |
|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature** | 21.6°C | |
| **Engineer** | William Yip | | **Relative Humidity** | 60% | |
| **Test Date** | 5/6/2025 | | **Observations** | None | |
| **Meter Form** | 12S | | **Input Voltage** | 120V L/N / 208V L-L | |
| **Current Class** | CL200 | | **Coupling Mode** | CDN | |
| **Serial Number** | 11F004CA | | **Notes** | 2 minute duration for each coupling path listed below | |
| **Port Under Test** | **Mode** | **Test Level kV** | **Polarity ±** | **Results / Observations** | |
| All Lines to Ground | Common | 2.5 | + | Pass; No Anomalies Detected | |
| | | | - | Pass; No Anomalies Detected | |
| Line 1, Terminal 1 to Line 3, Terminal 3 | Transverse | 2.5 | + | Pass; No Anomalies Detected | |
| | | | - | Pass; No Anomalies Detected | |
| Line 1, Terminal 1 to Neutral | Transverse | 2.5 | + | Pass; No Anomalies Detected | |
| | | | - | Pass; No Anomalies Detected | |
| Line 3, Terminal 3 to Neutral | Transverse | 2.5 | + | Pass; No Anomalies Detected | |
| | | | - | Pass; No Anomalies Detected | |
| Line 1, Terminal 1 to Ground | Common | 2.5 | + | Pass; No Anomalies Detected | |
| | | | - | Pass; No Anomalies Detected | |
| Line 3, Terminal 3 to Ground | Common | 2.5 | + | Pass; No Anomalies Detected | |
| | | | - | Pass; No Anomalies Detected | |
| **Performance Verification and Test Results** | | | | | |
| **Register Reading Before Test (Wh)** | 8212 | | **ACD Verification Before Test** | Passed | |
| **Register Reading After Test (Wh)** | 8212 | | **ACD Verification After Test** | Passed | |
| **Difference In Reading (Wh)** | 0 | | **Test Results** | Passed | |

**Table 124 - Test 25a, SWC, 12S SN 11F004CA**

| Effect of Electrical Oscillatory SWC Test Datasheet | | | | | |
|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature** | 21.6°C | |
| **Engineer** | William Yip | | **Relative Humidity** | 60% | |
| **Test Date** | 5/6/2025 | | **Observations** | None | |
| **Meter Form** | 2S | | **Input Voltage** | 240V L-L | |
| **Current Class** | CL200 | | **Coupling Mode** | CDN | |
| **Serial Number** | 11F013C3 | | **Notes** | 2 minute duration for each coupling path listed below | |
| **Port Under Test** | **Mode** | **Test Level kV** | **Polarity ±** | **Results / Observations** | |
| All Lines to Ground | Common | 2.5 | + | Pass; No Anomalies Detected | |
| | | | - | Pass; No Anomalies Detected | |
| Line 1, Terminal 1 to Line 2, Terminal 2 | Transverse | 2.5 | + | Pass; No Anomalies Detected | |
| | | | - | Pass; No Anomalies Detected | |
| Line 1, Terminal 1 to Ground | Common | 2.5 | + | Pass; No Anomalies Detected | |
| | | | - | Pass; No Anomalies Detected | |
| Line 2, Terminal 2 to Ground | Common | 2.5 | + | Pass; No Anomalies Detected | |
| | | | - | Pass; No Anomalies Detected | |
| **Performance Verification and Test Results** | | | | | |
| **Register Reading Before Test (Wh)** | 7088 | | **ACD Verification Before Test** | Passed | |
| **Register Reading After Test (Wh)** | 7088 | | **ACD Verification After Test** | Passed | |
| **Difference In Reading (Wh)** | 0 | | **Test Results** | Passed | |

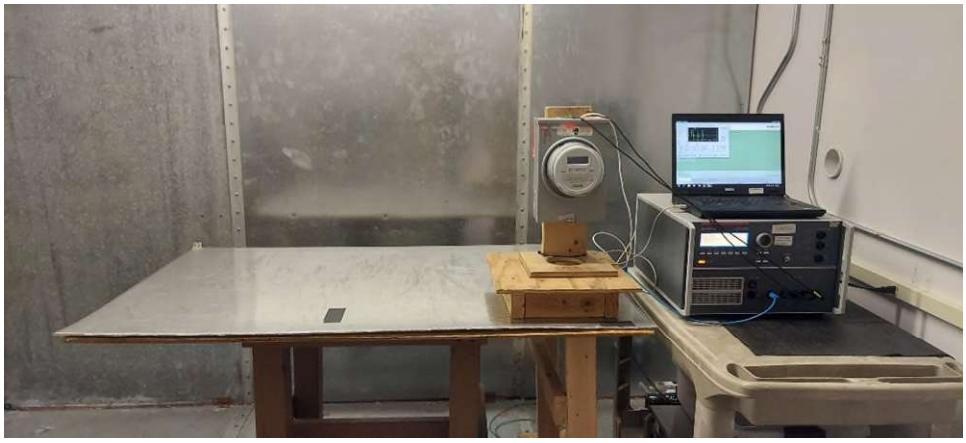
**Table 125 - Test 25a, SWC, 2S SN 11F013C3**

| Effect of Electrical Oscillatory SWC Test Datasheet | | | |
|---|---|---|---|
| **Project Number** | 135988 | **Temperature** | 21.6°C |
| **Engineer** | William Yip | **Relative Humidity** | 60% |
| **Test Date** | 5/6/2025 | **Observations** | None |
| **Meter Form** | 2S | **Input Voltage** | 240V L-L |
| **Current Class** | CL200 | **Coupling Mode** | CDN |
| **Serial Number** | 11F013C5 | **Notes** | 2 minute duration for each coupling path listed below |

| Port Under Test | Mode | Test Level kV | Polarity ± | Results / Observations |
|---|---|---|---|---|
| All Lines to Ground | Common | 2.5 | + | Pass; No Anomalies Detected |
| | | | - | Pass; No Anomalies Detected |
| Line 1, Terminal 1 to Line 2, Terminal 2 | Transverse | 2.5 | + | Pass; No Anomalies Detected |
| | | | - | Pass; No Anomalies Detected |
| Line 1, Terminal 1 to Ground | Common | 2.5 | + | Pass; No Anomalies Detected |
| | | | - | Pass; No Anomalies Detected |
| Line 2, Terminal 2 to Ground | Common | 2.5 | + | Pass; No Anomalies Detected |
| | | | - | Pass; No Anomalies Detected |

| Performance Verification and Test Results | | | |
|---|---|---|---|
| **Register Reading Before Test (Wh)** | 1800 | **ACD Verification Before Test** | Passed |
| **Register Reading After Test (Wh)** | 1800 | **ACD Verification After Test** | Passed |
| **Difference In Reading (Wh)** | 0 | **Test Results** | Passed |

**Table 126 - Test 25a, SWC, 2S SN 11F013C5**



**Photograph 31 - Test 25a, SWC, Test Setup**

### 6.23.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 25a Effect of Electrical Oscillatory Equipment List | | | | | |
|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Due Date** |
| 1T4774 | Digital Storage Oscilloscope, 4-Channel, 100MHz | Agilent Technologies | DSO-X2014A | 3/17/2025 | 3/31/2026 |
| 1T7324 | 70 MHz High Voltage Differential Probe | Sapphire Instruments Co. Ltd. | SI-9010 | 7/8/2024 | 7/31/2025 |
| 1T4844 | Wide Band Current Monitor | Pearson | 4418 | 7/8/2024 | 1/31/2026 |
| 1T4913 | Signal Transformer | Signal Transformer | DU-1 | N/A | Functionally Verified |
| 1T4650 | True RMS Multimeter | Fluke | 289 | 2/14/2025 | 8/31/2026 |
| 1T10002 | Thermometer/ Hygrometer/ Barometer | Fisher Scientific | 14-650-118 | 3/6/2024 | 3/6/2026 |
| 1T4723 | Oscillatory Compact Simulator | EM test | OCS 500 N6.4 | N/A | Functionally Verified |

**Table 127 - Test 25a, SWC, Equipment List**

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

## 6.24 Test No. 26a: Effect of Radio Frequency Interference – Radiated Interference

### 6.24.1 Test Requirement(s)

This test shall be conducted in accordance with IEC 61000-4-3, under the following conditions:

- The meter shall be mounted, in a conventional manner, in a suitably rated meter mounting device
- Meter in operating condition
  - Voltage and auxiliary circuits energized with lowest rated nominal voltage
  - With nominal current (Nameplate TA)
- A Reference Standard shall be used to provide a reference energy measurement
  - Voltage connected in parallel to the Meter Under Test
  - Current connected in series with the Meter Under Test
- Cable length, exposed to the field: 1 m
- Frequency Range: 80 MHz – 6 GHz
- Test Level: 10 V/m (-0, +6 db)
- The signal shall be 80% amplitude modulated with a 1.0 kHz sine wave
- Antenna Polarity
  - Horizontal
  - Vertical

-or-

  - Uniform field
- Energy shall be accumulated individually for each sweep in each orientation

For each sweep, the measured energy accumulation of the meter shall not differ from the energy accumulated by the reference standard per the limits in Table 128.

| Accuracy Class | 1.0 | 0.5 | 0.2 | 0.1 |
|---|---|---|---|---|
| Maximum Difference in Energy Accumulation | 5% | 2% | 1% | 0.5% |

**Table 128 - Maximum Different in Energy Accumulation, Radiated Interference**

During testing, the meter can be perturbed; however, it cannot exceed the limits of Table 128.

An Accuracy Performance check shall be performed (4.7.3.0.1 of ANSI C12.1: 2024).

This test shall be conducted on all metering devices excluding LED voltage indicators.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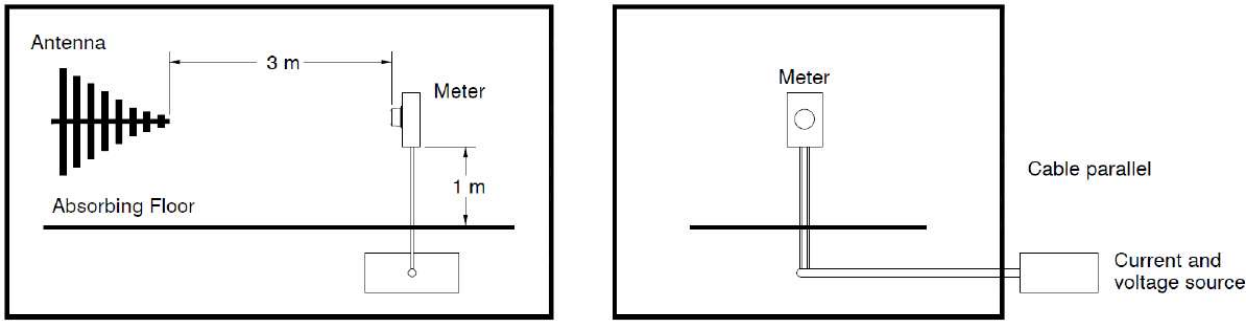


**Figure 6 - Typical Test Layout for Test 26a: Effect of Radio Frequency Radiated Interference**

## 6.24.2 Test Data and Results

The meters listed below are **compliant** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F00510 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F00536 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F00587 |

Refer to the following test data and photographs for a complete overview of the test setup and results.

| Performance Verification (External Influences) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 21.8 | | | | | |
| **Engineer** | William Yip | **Humidity (RH)** | 55.9% | | | | | |
| **Test Date** | 5/22/2025 | **Observations** | None | | | | | |
| | . | | | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F00536 | | | | | | | |

**Before Test**

| Condition | Voltage (VAC) | Frequency (Hz) | Current (A) | Power Factor | Accuracy Percentage (As Reference) | Percent Error Before Test | Before Test Limit from Zero | Result |
|---|---|---|---|---|---|---|---|---|
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.891 | -0.109 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.906 | -0.094 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.976 | -0.024 | ± 0.2 % | Pass |

**After Test**

| Condition | Voltage (VAC) | Frequency (Hz) | Current (A) | Power Factor | Accuracy Percentage | % Deviation From Reference After Test | After Test Deviation Limit From Reference | Result |
|---|---|---|---|---|---|---|---|---|
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.849 | 0.042 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.866 | 0.040 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.938 | 0.038 | ± 0.2 % | Pass |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F00587 | | | | | | | |

**Before Test**

| Condition | Voltage (VAC) | Frequency (Hz) | Current (A) | Power Factor | Accuracy Percentage (As Reference) | Percent Error Before Test | Before Test Limit from Zero | Result |
|---|---|---|---|---|---|---|---|---|
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.874 | -0.126 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.887 | -0.113 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.934 | -0.066 | ± 0.2 % | Pass |

**After Test**

| Condition | Voltage (VAC) | Frequency (Hz) | Current (A) | Power Factor | Accuracy Percentage | % Deviation From Reference After Test | After Test Deviation Limit From Reference | Result |
|---|---|---|---|---|---|---|---|---|
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.825 | 0.049 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.843 | 0.044 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.904 | 0.030 | ± 0.2 % | Pass |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Meter Form** | 12S | | | | | | |
| **Current Class** | 200 | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | |
| **Serial Number** | 11F00510 | | | | | | |

| **Before Test** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage (As Reference)** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 120 | 60 | | 1.0 | 99.949 | -0.051 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 0 | 1.0 | 99.962 | -0.038 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 0 | 0.5 Lag | 100.107 | 0.107 | ± 0.2 % | Pass |

| **After Test** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 120 | 60 | 0 | 1.0 | 99.822 | 0.127 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 0 | 1.0 | 99.844 | 0.118 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 0 | 0.5 Lag | 99.986 | 0.121 | ± 0.2 % | Pass |

**Table 129 - Test 26a, RI, Performance Verification - External Influences**

| Effect of Radio Frequency Interference (Radiated Interference) | | | |
|---|---|---|---|
| **Project Number** | 135988 | **Accuracy Class** | 0.2 |
| **Engineer** | Brandon Tracy | **Temperature (°C)** | 21.2 |
| **Test Date** | 5/22/2025 | **Relative Humidity** | 54.7% |
| **Meter Form** | 12S | **Dwell Time** | 1 Second |
| **Current Class** | 200 | **Test Level** | 10 V/m |
| **Voltage** | 120/208V | **Modulation** | 80%, AM, 1 kHz |
| **Serial Number** | 11F00510 | **Step Size** | 1% |
| **Note:** | | | |

| Side Tested | Start Frequency | Stop Frequency | Polarity | Before Test Energy Reading | After Test Energy Reading | Reference | Percent Error | Limit (%) | Result |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | MHz | H/V | | | | | | |
| Front | 80 | 1000 | H | 2149.3 | 4299.5 | 2158.2 | -0.37% | ±1.0 | Pass |
| | 80 | 1000 | V | 0.0 | 2149.3 | 2157.9 | -0.40% | ±1.0 | Pass |
| Left | 80 | 1000 | H | 4299.5 | 6449.3 | 2157.6 | -0.36% | ±1.0 | Pass |
| | 80 | 1000 | V | 6449.3 | 8598.7 | 2157.1 | -0.36% | ±1.0 | Pass |
| Right | 80 | 1000 | H | 10753.0 | 12904.1 | 2158.5 | -0.34% | ±1.0 | Pass |
| | 80 | 1000 | V | 8598.7 | 10753.0 | 2161.9 | -0.35% | ±1.0 | Pass |
| Rear | 80 | 1000 | H | 12904.1 | 15053.9 | 2157.1 | -0.34% | ±1.0 | Pass |
| | 80 | 1000 | V | 15053.9 | 17204.6 | 2157.9 | -0.33% | ±1.0 | Pass |
| Front | 1000 | 6000 | H | 30111.4 | 32262.7 | 2158.2 | -0.32% | ±1.0 | Pass |
| | 1000 | 6000 | V | 32262.7 | 34414.0 | 2158.2 | -0.32% | ±1.0 | Pass |
| Left | 1000 | 6000 | H | 27960.7 | 30111.4 | 2157.6 | -0.32% | ±1.0 | Pass |
| | 1000 | 6000 | V | 25810.0 | 27960.7 | 2157.6 | -0.32% | ±1.0 | Pass |
| Right | 1000 | 6000 | H | 21507.4 | 23658.9 | 2158.6 | -0.33% | ±1.0 | Pass |
| | 1000 | 6000 | V | 23658.9 | 25810.0 | 2158.0 | -0.32% | ±1.0 | Pass |
| Rear | 1000 | 6000 | H | 19356.0 | 21507.4 | 2158.4 | -0.32% | ±1.0 | Pass |
| | 1000 | 6000 | V | 17204.6 | 19356.0 | 2158.6 | -0.33% | ±1.0 | Pass |

**Table 130 - Test 26a, RI, 12S SN 11F00510**


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| Effect of Radio Frequency Interference (Radiated Interference) | | | |
|---|---|---|---|
| **Project Number** | 135988 | **Accuracy Class** | 0.2 |
| **Engineer** | William Yip | **Temperature (°C)** | 21.2 |
| **Test Date** | 5/22/2025 | **Relative Humidity** | 54.7% |
| **Meter Form** | 2S | **Dwell Time** | 1 Second |
| **Current Class** | 200 | **Test Level** | 10 V/m |
| **Voltage** | 240V | **Modulation** | 80%, AM, 1 kHz |
| **Serial Number** | 11F00536 | **Step Size** | 1% |
| **Note:** | | | |

| Side Tested | Start Frequency MHz | Stop Frequency MHz | Polarity H/V | Before Test Energy Reading | After Test Energy Reading | Reference | Percent Error | Limit | Result |
|---|---|---|---|---|---|---|---|---|---|
| Front | 80 | 1000 | H | 30092.5 | 31883.3 | 1797.8 | -0.39% | ±1.0 | Pass |
| | 80 | 1000 | V | 28301.4 | 30092.5 | 1798.1 | -0.39% | ±1.0 | Pass |
| Right | 80 | 1000 | H | 26510.9 | 28301.4 | 1797.9 | -0.41% | ±1.0 | Pass |
| | 80 | 1000 | V | 24719.8 | 26510.9 | 1797.5 | -0.36% | ±1.0 | Pass |
| Left | 80 | 1000 | H | 19346.6 | 21137.8 | 1798.1 | -0.38% | ±1.0 | Pass |
| | 80 | 1000 | V | 17555.4 | 19346.6 | 1798.1 | -0.38% | ±1.0 | Pass |
| Rear | 80 | 1000 | H | 21137.8 | 22928.9 | 1798.1 | -0.39% | ±1.0 | Pass |
| | 80 | 1000 | V | 22928.9 | 24719.8 | 1797.8 | -0.38% | ±1.0 | Pass |
| Front | 1000 | 6000 | H | 2149.2 | 4298.7 | 2157.3 | -0.36% | ±1.0 | Pass |
| | 1000 | 6000 | V | 0.0 | 2149.2 | 2157.4 | -0.38% | ±1.0 | Pass |
| Right | 1000 | 6000 | H | 4298.7 | 6448.3 | 2157.4 | -0.36% | ±1.0 | Pass |
| | 1000 | 6000 | V | 6448.3 | 8598.3 | 2157.6 | -0.35% | ±1.0 | Pass |
| Left | 1000 | 6000 | H | 12897.7 | 15047.7 | 2157.8 | -0.36% | ±1.0 | Pass |
| | 1000 | 6000 | V | 15047.7 | 17197.2 | 2157.6 | -0.38% | ±1.0 | Pass |
| Rear | 1000 | 6000 | H | 10748.0 | 12897.7 | 2157.6 | -0.37% | ±1.0 | Pass |
| | 1000 | 6000 | V | 8598.3 | 10748.0 | 2157.4 | -0.36% | ±1.0 | Pass |

**Table 131 - Test 26a, RI, 2S SN 11F00536**


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| Effect of Radio Frequency Interference (Radiated Interference) | | | |
|---|---|---|---|
| **Project Number** | 135988 | **Accuracy Class** | 0.2 |
| **Engineer** | William Yip | **Temperature (°C)** | 21.2 |
| **Test Date** | 5/22/2025 | **Relative Humidity** | 54.7% |
| **Meter Form** | 2S | **Dwell Time** | 1 Second |
| **Current Class** | 200 | **Test Level** | 10 V/m |
| **Voltage** | 240V | **Modulation** | 80%, AM, 1 kHz |
| **Serial Number** | 11F00587 | **Step Size** | 1% |
| **Note:** | | | |

| Side Tested | Start Frequency | Stop Frequency | Polarity | Before Test Energy Reading | After Test Energy Reading | Reference | Percent Error | Limit | Result |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | MHz | H/V | | | | | | |
| Front | 80 | 1000 | H | 30019.1 | 31805.3 | 1797.8 | -0.65% | ±1.0 | Pass |
| | 80 | 1000 | V | 28232.4 | 30019.1 | 1798.1 | -0.63% | ±1.0 | Pass |
| Right | 80 | 1000 | H | 26445.9 | 28232.4 | 1797.9 | -0.63% | ±1.0 | Pass |
| | 80 | 1000 | V | 24659.1 | 26445.9 | 1797.5 | -0.60% | ±1.0 | Pass |
| Left | 80 | 1000 | H | 19299.2 | 21086.2 | 1798.1 | -0.62% | ±1.0 | Pass |
| | 80 | 1000 | V | 17512.2 | 19299.2 | 1798.1 | -0.62% | ±1.0 | Pass |
| Rear | 80 | 1000 | H | 21086.2 | 22873.1 | 1798.1 | -0.62% | ±1.0 | Pass |
| | 80 | 1000 | V | 22873.1 | 24659.1 | 1797.8 | -0.66% | ±1.0 | Pass |
| Front | 1000 | 6000 | H | 2144.0 | 4288.2 | 2157.3 | -0.61% | ±1.0 | Pass |
| | 1000 | 6000 | V | 0.0 | 2144.0 | 2157.4 | -0.62% | ±1.0 | Pass |
| Right | 1000 | 6000 | H | 4288.2 | 6432.6 | 2157.4 | -0.60% | ±1.0 | Pass |
| | 1000 | 6000 | V | 6432.6 | 8577.1 | 2157.6 | -0.61% | ±1.0 | Pass |
| Left | 1000 | 6000 | H | 12865.9 | 15010.6 | 2157.8 | -0.61% | ±1.0 | Pass |
| | 1000 | 6000 | V | 15010.6 | 17155.1 | 2157.6 | -0.61% | ±1.0 | Pass |
| Rear | 1000 | 6000 | H | 10721.5 | 12865.9 | 2157.6 | -0.61% | ±1.0 | Pass |
| | 1000 | 6000 | V | 8577.1 | 10721.5 | 2157.4 | -0.60% | ±1.0 | Pass |

**Table 132 - Test 26a, RI, 2S SN 11F00587**


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**Photograph 32 - Test 26a, RI, Test Setup (80 MHz to 1 GHz)**


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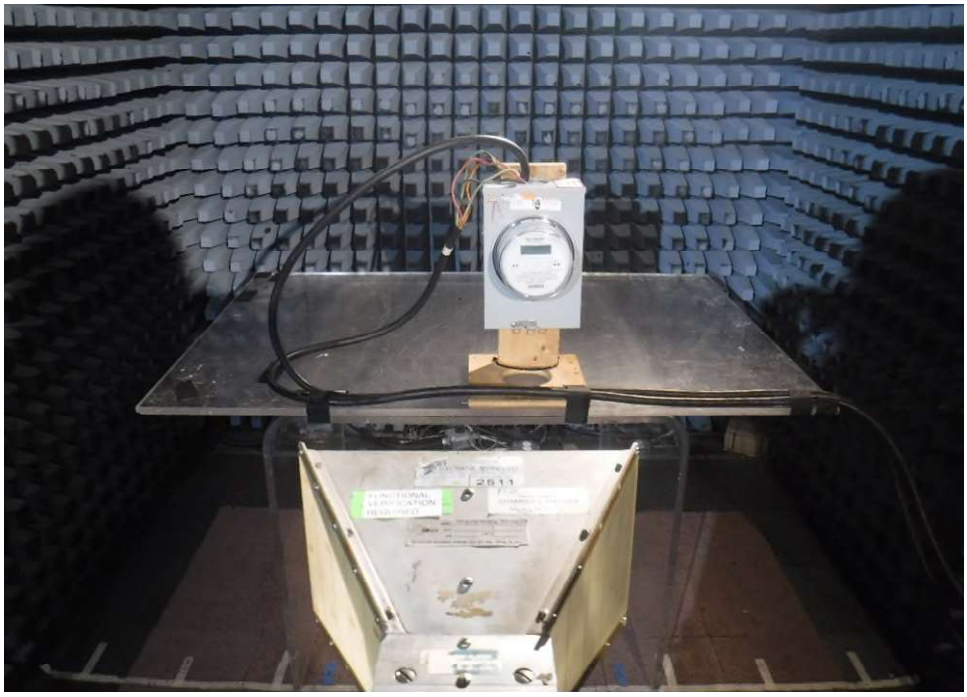


**Photograph 33 - Test 26a, RI, Test Setup (1 GHz to 6 GHz, Window 1)**

### 6.24.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 26a Effect of Radio Frequency Interference (Radiated Interference) Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 1T9995 | Signal Generator | Rigol Technologies Co., LTD. | DSG836 | DSG8M2421000 25 | 11/7/2023 | 5/31/2025 |
| 1T4354 | Signal Generator | Hewlett Packard | 83752A | 3610A01117 | 4/23/2025 | 4/30/2026 |
| 1T8912 | Signal Generator | Agilent | 33210A | MY48001552 | 7/22/2024 | 1/31/2026 |
| 1T8802 | Amplifier - 500 Watt | Amplifier Research | 500W1000B | 344827 | N/A | Functionally Verified |
| 1T4735 | Amplifier; Microwave TWT | Instruments for Industry | ST121-50-25BC | N1015-0710 | N/A | Functionally Verified |
| 1T4915 | USB Power Sensor | Agilent Technologies | U2004A | MY53100020 | 10/1/2024 | 4/30/2026 |
| 1T4119 | Antenna: Biconilog | EMCO | 3143 | 1117 | 1/9/2017 | Functionally Verified |
| 1T2511 | Antenna; Horn | EMCO | 3115 | 2459 | 12/7/2017 | Functionally Verified |
| 1T4148 | Shield Room #2 Semi-Anechoic | Rantec | 20 | 11531 | 1/2/2007 | Functionally Verified |
| 1T4148A | Uniform Field Area Calibration | N/A | N/A | N/A | 5/24/2024 | 5/31/2025 |
| 4T7387 | Automated Test Platform | WECO | 4330 | 6978 | N/A | Functionally Verified |
| 1T9999 | Thermometer/ Hygrometer | VWR International | 36934-164 | 230368599 | 5/31/2023 | 5/31/2025 |

**Table 133 - Test 26a, RI, RI, Equipment List**

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

## 6.25 Test No. 26b: Effect of Radio Frequency Interference – Conducted Interference

### 6.25.1 Test Requirement(s)

This test shall be conducted in accordance with IEC 61000-4-6, under the following conditions.

- Meter in operation condition
  - Voltage circuits energized with lowest rated nominal voltage
  - Nominal Current (Nameplate TA)
- A Reference Standard shall be used to provide a reference energy measurement
  - Voltage connected in parallel to the Meter Under Test
  - Current Connected in series with the Meter Under Test
- Voltage Level
  - 10 V
- Frequency Range
  - 150 kHz to 80 MHz

Energy shall be accumulated over the entire test.

The measured energy accumulation of the meter shall not differ from the energy accumulated by the reference standard per the limits in Table 134.

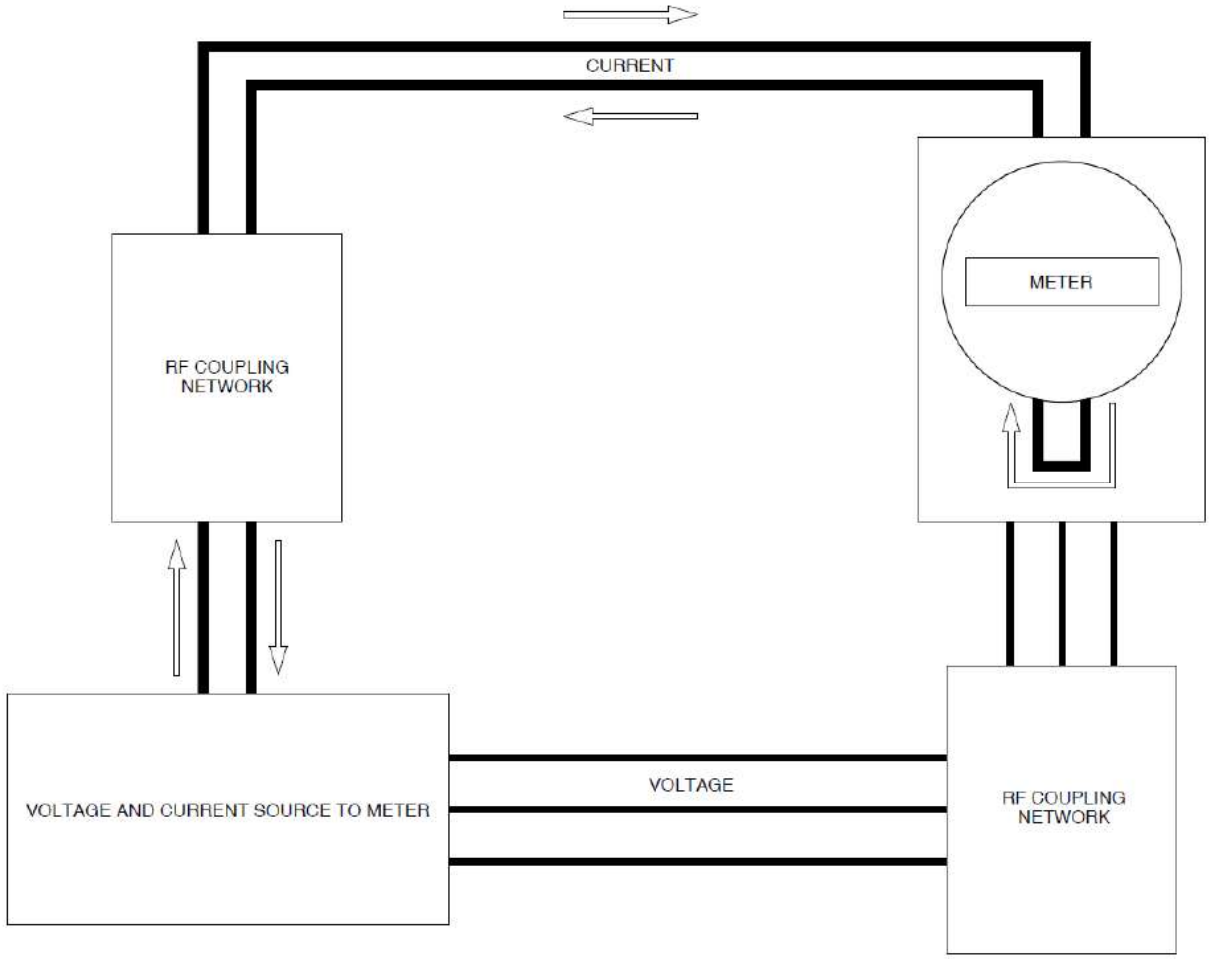
| **Accuracy Class** | 1.0 | 0.5 | 0.2 | 0.1 |
|---|---|---|---|---|
| **Maximum Difference in Energy Accumulation** | 5% | 2% | 1% | 0.5% |

**Table 134 - Maximum Difference in Energy Accumulation, Conducted Interference**

During testing, the meter can be perturbed; however, it cannot exceed the limits of Table 134.

An Accuracy Performance Check shall be performed (4.7.3.0.1 of ANSI C12.1: 2024).

No tests are required for induced disturbances caused by electromagnetic fields coming from intentional RF transmitters in the frequency range 9 kHz to 150 kHz.




Note: Diagram simplified to show connection for single phase only.

**Figure 7 - Typical Wiring Diagram for Test 26b—Conducted Interference**

## 6.25.2 Test Data and Results

The meters listed below are **compliant** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F00510 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F00536 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F00587 |

Refer to the following test data and photographs for a complete overview of the test setup and results.

| Performance Verification (External Influences) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.5 | | | | | |
| **Engineer** | William Yip | **Humidity (RH)** | 50.7% | | | | | |
| **Test Date** | 5/21/2025 | **Observations** | None | | | | | |
| | . | | | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F00536 | | | | | | | |

**Before Test**

| Condition | Voltage (VAC) | Frequency (Hz) | Current (A) | Power Factor | Accuracy Percentage (As Reference) | Percent Error Before Test | Before Test Limit from Zero | Result |
|---|---|---|---|---|---|---|---|---|
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.991 | -0.009 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.928 | -0.072 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.997 | -0.003 | ± 0.2 % | Pass |

**After Test**

| Condition | Voltage (VAC) | Frequency (Hz) | Current (A) | Power Factor | Accuracy Percentage | % Deviation From Reference After Test | After Test Deviation Limit From Reference | Result |
|---|---|---|---|---|---|---|---|---|
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.891 | 0.100 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.906 | 0.022 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.976 | 0.021 | ± 0.2 % | Pass |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F00587 | | | | | | | |

**Before Test**

| Condition | Voltage (VAC) | Frequency (Hz) | Current (A) | Power Factor | Accuracy Percentage (As Reference) | Percent Error Before Test | Before Test Limit from Zero | Result |
|---|---|---|---|---|---|---|---|---|
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.903 | -0.097 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.920 | -0.080 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.979 | -0.021 | ± 0.2 % | Pass |

**After Test**

| Condition | Voltage (VAC) | Frequency (Hz) | Current (A) | Power Factor | Accuracy Percentage | % Deviation From Reference After Test | After Test Deviation Limit From Reference | Result |
|---|---|---|---|---|---|---|---|---|
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.874 | 0.029 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.887 | 0.033 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.934 | 0.045 | ± 0.2 % | Pass |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Meter Form** | 12S | | | | | | |
| **Current Class** | 200 | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | |
| **Serial Number** | 11F00510 | | | | | | |

| **Before Test** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage (As Reference)** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 120 | 60 | | 1.0 | 99.984 | -0.016 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 0 | 1.0 | 99.891 | -0.109 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 0 | 0.5 Lag | 100.035 | 0.035 | ± 0.2 % | Pass |

| **After Test** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 120 | 60 | 0 | 1.0 | 99.949 | 0.035 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 0 | 1.0 | 99.962 | -0.071 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 0 | 0.5 Lag | 100.107 | -0.072 | ± 0.2 % | Pass |

**Table 135 - Test 26b, CI, Performance Verification**

| Conducted Interference Datasheet | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Project Number** | | 135988 | | **Temperature** | | 22.5 C | |
| **Engineer** | | William Yip | | **Relative Humidity** | | 50.20% | |
| **Test Date** | | 5/21/2025 | | **Dwell Time** | | 1 Second | |
| **Meter Form** | | 12S | | **Test Level** | | 10 V | |
| **Current Class** | | 200 | | **TA** | | 30 Amps | |
| **Serial Number** | | 11F00510 | | **Step Size** | | 1% | |
| **Accuracy Class** | | 0.2 | | **Note** | | N/A | |
| **Start Frequency** | **Stop Frequency** | **Before Test Energy Reading** | **After Test Energy Reading** | **Reference** | **Percent Error** | **Limit** | **Result** |
| **kHz** | **MHz** | | | | | | |
| 150 | 80 | 0 | 3592.9 | 3597.928711 | -0.13976683 | 1% | Pass |

**Table 136 - Test 26b, CI, 12S SN 11F00510**

| Conducted Interference Datasheet | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Project Number** | | 135988 | | **Temperature** | | 22.5 C | |
| **Engineer** | | William Yip | | **Relative Humidity** | | 50.20% | |
| **Test Date** | | 5/21/2025 | | **Dwell Time** | | 1 Second | |
| **Meter Form** | | 2S | | **Test Level** | | 10 V | |
| **Current Class** | | 200 | | **TA** | | 30 Amps | |
| **Serial Number** | | 11F00536 | | **Step Size** | | 1% | |
| **Accuracy Class** | | 0.2 | | **Note** | | N/A | |
| **Start Frequency** | **Stop Frequency** | **Before Test Energy Reading** | **After Test Energy Reading** | **Reference** | **Percent Error** | **Limit** | **Result** |
| **kHz** | **MHz** | | | | | | |
| 150 | 80 | 0 | 3595.0 | 3600.370728 | -0.149171513 | 1% | Pass |

**Table 137 - Test 26b, CI, 2S SN 11F00536**

| Conducted Interference Datasheet | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Project Number** | | 135988 | | **Temperature** | | 22.5 C | |
| **Engineer** | | William Yip | | **Relative Humidity** | | 50.20% | |
| **Test Date** | | 5/21/2025 | | **Dwell Time** | | 1 Second | |
| **Meter Form** | | 2S | | **Test Level** | | 10 V | |
| **Current Class** | | 200 | | **TA** | | 30 Amps | |
| **Serial Number** | | 11F00587 | | **Step Size** | | 1% | |
| **Accuracy Class** | | 0.2 | | **Note** | | N/A | |
| **Start Frequency** | **Stop Frequency** | **Before Test Energy Reading** | **After Test Energy Reading** | **Reference** | **Percent Error** | **Limit** | **Result** |
| **kHz** | **MHz** | | | | | | |
| 150 | 80 | 0 | 3595.4 | 3601.146582 | -0.15957645 | 1% | Pass |

**Table 138 - Test 26b, CI, 2S SN 11F00587**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**Photograph 34 - Test 26b, CI, Test Setup**

### 6.25.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 26b Conducted Interference Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 1T4249 | Powerline Coupling/ Decoupling Network | Fischer Custom Communications Inc | FCC-801-M3-25 | 9803 | 11/14/2024 | 11/30/2025 |
| 1T10002 | Thermometer/ Hygrometer/ Barometer | Fisher Scientific | 14-650-118 | 240202396 | 3/6/2024 | 3/6/2026 |
| 1T9995 | Signal Generator | Rigol Technologies Co., LTD. | DSG836 | DSG8M2421000 25 | 11/7/2023 | 5/31/2025 |
| 1T4915 | USB Power Sensor | Agilent Technologies | U2004A | MY53100020 | 10/1/2024 | 4/30/2026 |
| 1T4749 | USB Power Sensor | Agilent Technologies | U2004A | MY47400132 | 11/11/2024 | 5/31/2026 |
| 1T4298 | Amplifier: Wideband RF Power | Kalmus | 275LC | 8916-1 | N/A | Functionally Verified |
| 1T4741 | Directional Coupler | Werlatone | C5091-10 | 92452 | N/A | Functionally Verified |
| 4T7387 | Automated Test Platform | WECO | 4330 | 6978 | N/A | Functionally Verified |

**Table 139 - Test 26b, CI, Equipment List**

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

## 6.26 Test No. 27: Radio Frequency Conducted Emissions Test

### 6.26.1 Test Requirement(s)

The meter shall conform to all applicable requirements of the Code of Federal Regulations (CFR) 47, Part 15—Radio Frequency Devices, Subparts A—General and B—Unintentional Radiators issued by the Federal Communication Commission for Class "B" digital devices.

The test shall be conducted with the meter tested on a tabletop, in normal service position, with all cables connected, with all options and accessories specified, in a configuration closely resembling typical field in-service connections. Typical in-service configurations are provided in Figure 8, Figure 9, and Figure 10. These figures shall be followed as closely as possible, appropriate to the type of meter tested and test chamber utilized for the test. The LISN can be optionally located on the floor. For all other aspects of this test not covered by CFR 47, Part 15A and B, and this standard, refer to ANSI/IEEE C63.4.

This test shall be conducted on all meters excluding voltage indicators.

The time, program, and register reading requirement of 4.7.3 of ANSI C12.1: 2024 shall not apply.

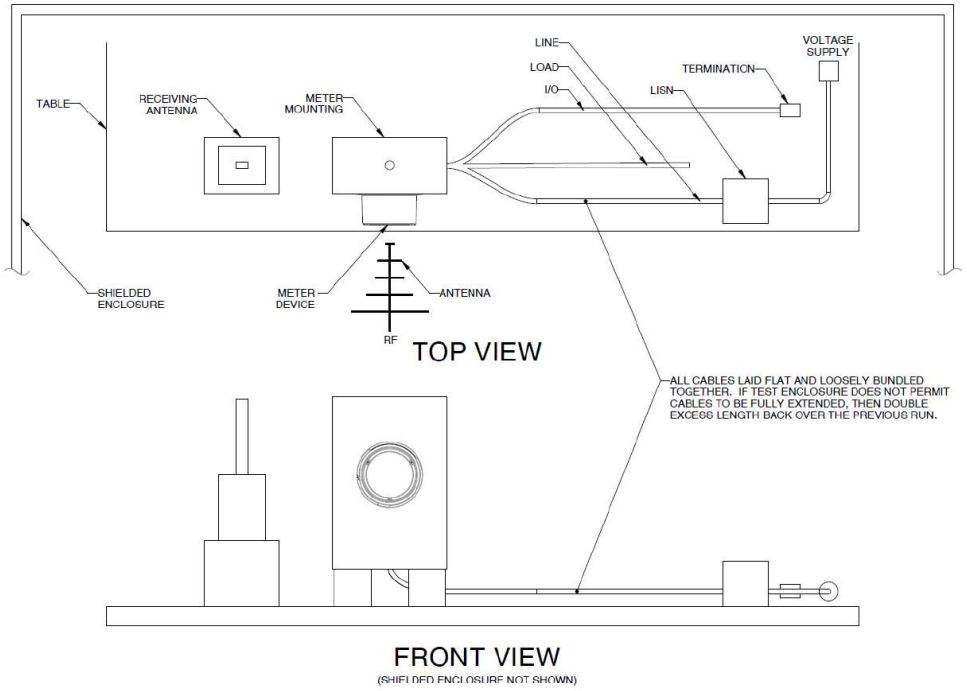


**Figure 8 - Typical Test Layout for Test 27 - Radiated and Conducted Emissions**


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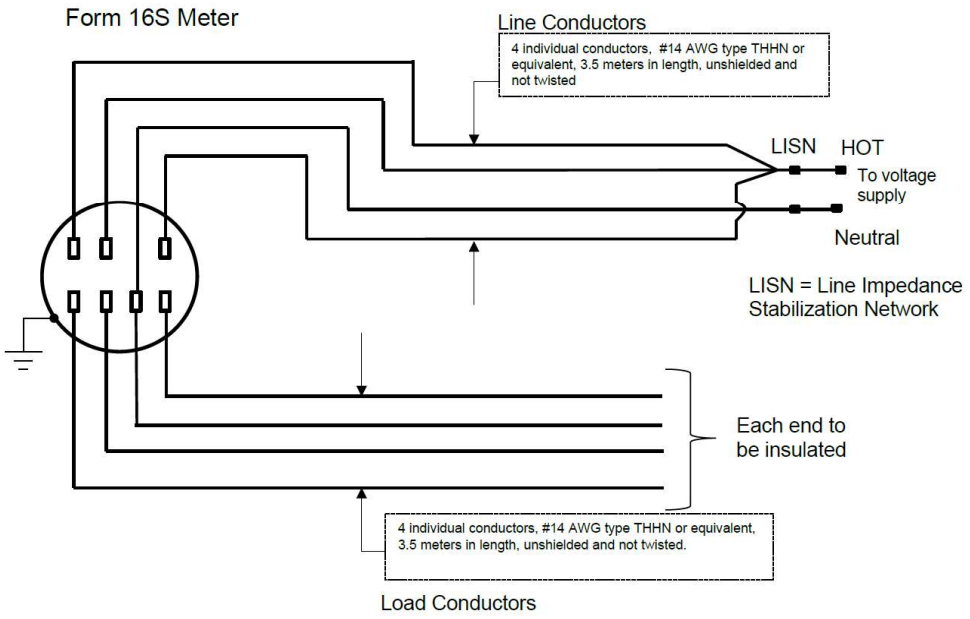


**Figure 9 - Typical Wiring Detail for Self-Contained Meters for Test 27 - Radiated and Conducted Emissions**

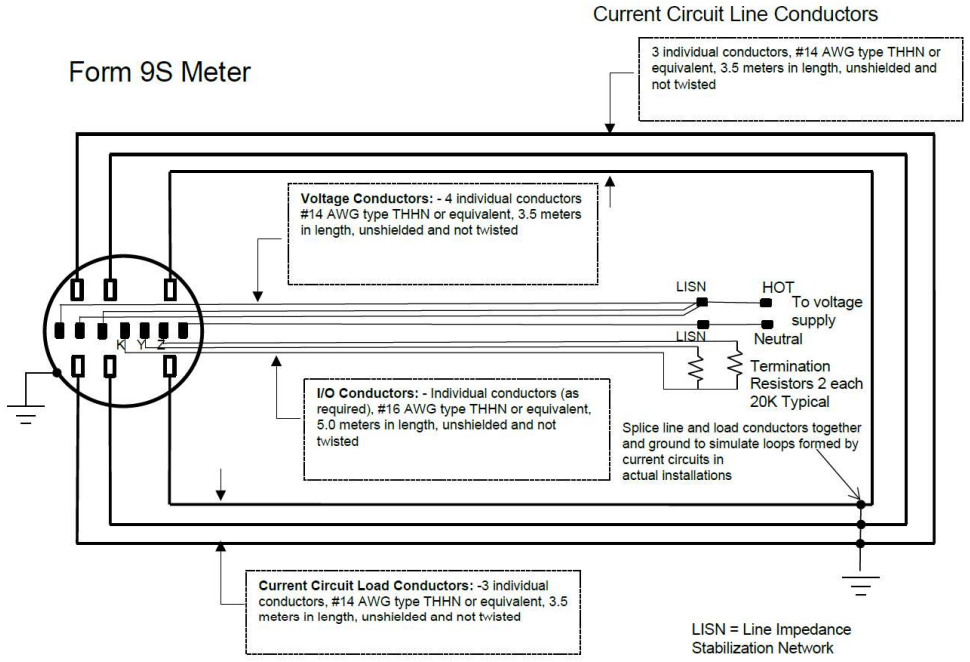


**Figure 10 - Typical Wiring Detail for Transformer Rated Meters for Test 27 - Radiated and Conducted Emissions**


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### 6.26.2 Test Data and Results

The meters listed below are **compliant** with the requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F00911 |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CD |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C3 |

Refer to the following test data and photographs for a complete overview of the test setup and results.


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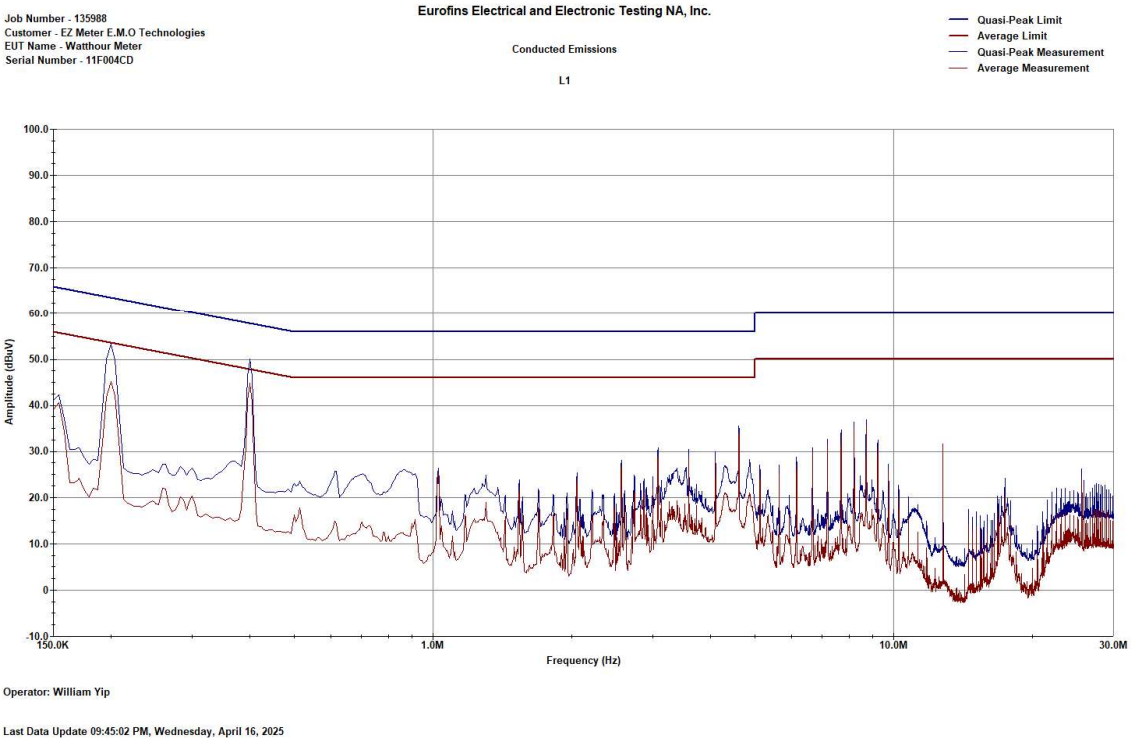


**Figure 11 - Test 27, CEV, Prescan (120V_60Hz, Line 1) SN 11F004CD**

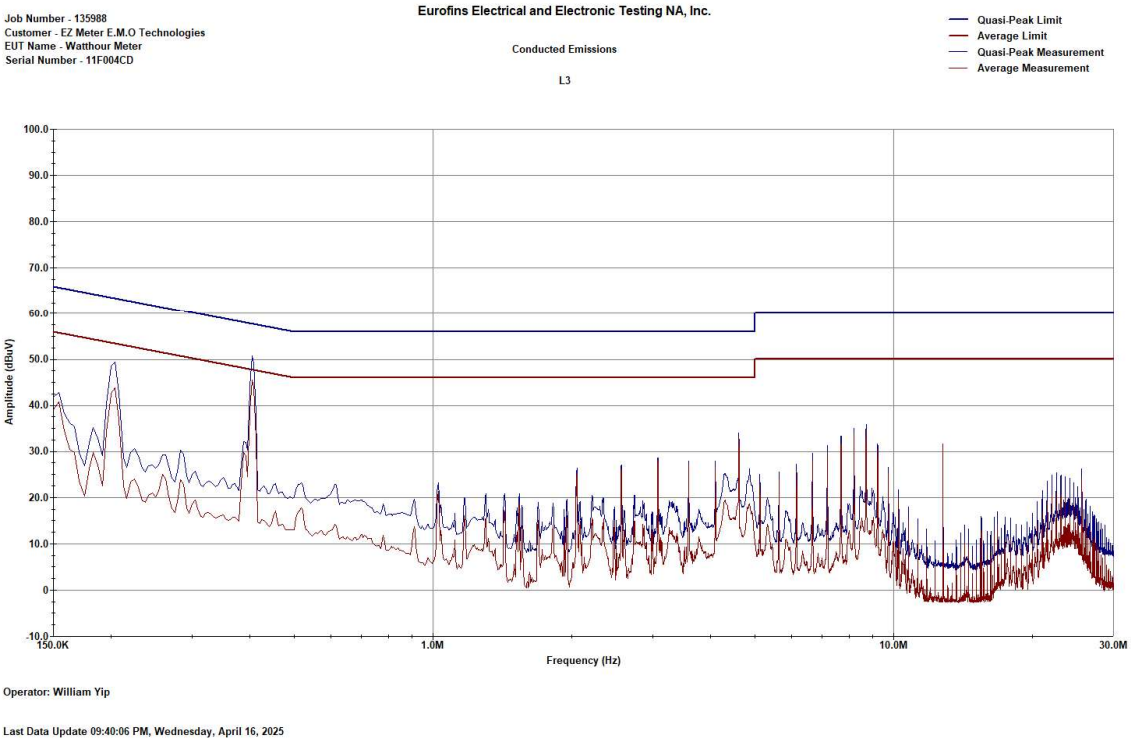


**Figure 12 - Test 27, CEV, Prescan (120V_60Hz, Line 3) SN 11F004CD**

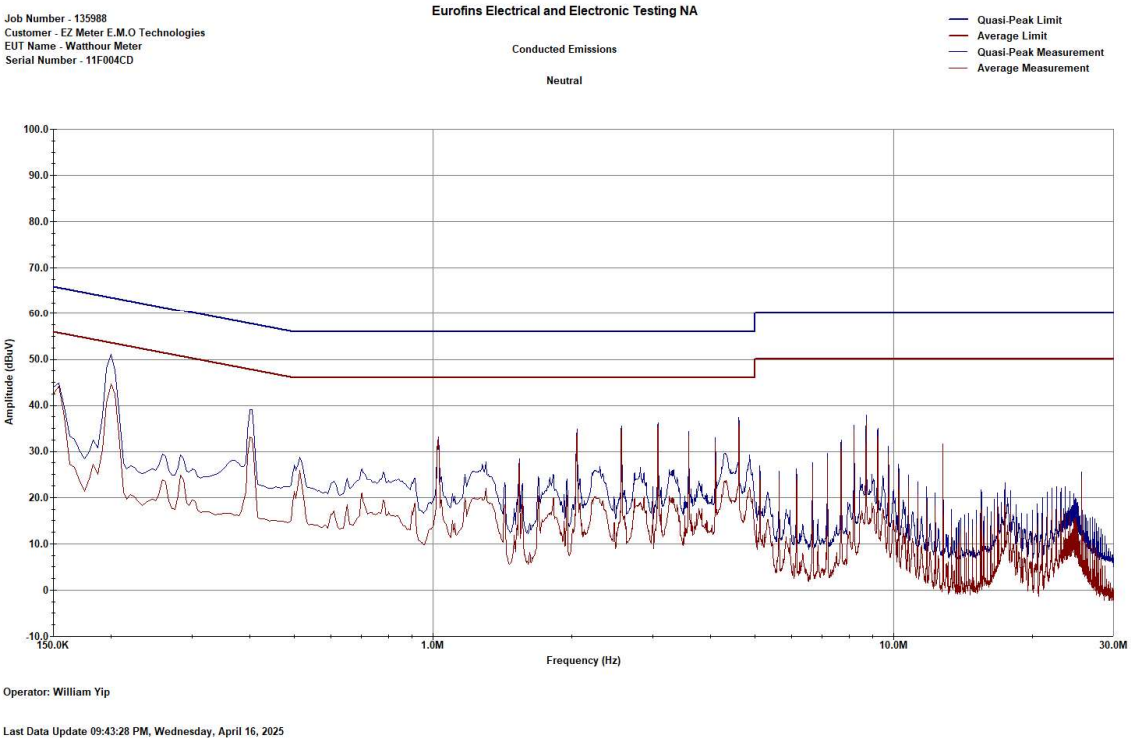


**Figure 13 - Test 27, CEV, Prescan (120V_60Hz, Neutral) SN 11F004CD**

| | | | | | | Customer | Form | Serial Number | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | EZ Meter E.M.O Technologies | 12S | 11F004CD | | | | | |
| | Frequency | Quasi-Peak Measurement | Correction Factor | Corrected Measurement | Quasi-Peak Limit | Margin | Result | Average Measurement | Correction Factor | Corrected Measurement | Average Limit | Margin | Result |
| | MHz | dBµV | dB | dBµV | dBµV | dB | Pass/Fail | dBµV | dB | dBµV | dBµV | dB | Pass/Fail |
| Line 1 | 0.1540 | 32.44 | 9.84 | 42.28 | 65.88 | -23.60 | PASS | 30.78 | 9.84 | 40.62 | 55.88 | -15.26 | PASS |
| | 0.2000 | 43.55 | 9.80 | 53.36 | 64.57 | -11.21 | PASS | 35.40 | 9.80 | 45.20 | 54.57 | -9.37 | PASS |
| | 0.4000 | 40.32 | 9.77 | 50.09 | 58.85 | -8.76 | PASS | 35.11 | 9.77 | 44.88 | 48.85 | -3.97 | PASS |
| | 4.6140 | 25.65 | 9.78 | 35.44 | 56.00 | -20.56 | PASS | 24.18 | 9.78 | 33.96 | 46.00 | -12.04 | PASS |
| | 8.2060 | 26.60 | 9.79 | 36.39 | 60.00 | -23.61 | PASS | 25.46 | 9.79 | 35.26 | 50.00 | -14.75 | PASS |
| | 8.7190 | 27.13 | 9.81 | 36.95 | 60.00 | -23.05 | PASS | 25.80 | 9.81 | 35.61 | 50.00 | -14.39 | PASS |
| Line 3 | 0.1540 | 32.98 | 9.84 | 42.82 | 65.88 | -23.06 | PASS | 30.87 | 9.84 | 40.71 | 55.88 | -15.17 | PASS |
| | 0.1830 | 25.43 | 9.81 | 35.24 | 65.05 | -29.80 | PASS | 34.07 | 9.80 | 43.87 | 54.45 | -10.58 | PASS |
| | 0.2040 | 39.61 | 9.80 | 49.41 | 64.45 | -15.04 | PASS | 35.77 | 9.77 | 45.54 | 48.73 | -3.19 | PASS |
| | 0.4040 | 40.94 | 9.77 | 50.71 | 58.73 | -8.02 | PASS | 23.37 | 9.78 | 33.16 | 46.00 | -12.84 | PASS |
| | 8.2020 | 25.27 | 9.79 | 35.06 | 60.00 | -24.94 | PASS | 24.08 | 9.79 | 33.88 | 50.00 | -16.12 | PASS |
| | 8.7150 | 25.97 | 9.81 | 35.78 | 60.00 | -24.22 | PASS | 24.75 | 9.81 | 34.56 | 50.00 | -15.44 | PASS |
| Neutral | 0.1540 | 35.07 | 9.83 | 44.90 | 65.88 | -20.99 | PASS | 34.26 | 9.83 | 44.09 | 55.88 | -11.79 | PASS |
| | 0.2000 | 41.34 | 9.80 | 51.14 | 64.57 | -13.43 | PASS | 34.85 | 9.80 | 44.65 | 54.57 | -9.92 | PASS |
| | 0.4040 | 29.38 | 9.78 | 39.15 | 58.73 | -19.58 | PASS | 25.34 | 9.79 | 35.13 | 46.00 | -10.87 | PASS |
| | 3.0790 | 26.37 | 9.79 | 36.16 | 56.00 | -19.84 | PASS | 25.73 | 9.79 | 35.52 | 46.00 | -10.48 | PASS |
| | 4.6140 | 27.58 | 9.80 | 37.38 | 56.00 | -18.62 | PASS | 26.37 | 9.80 | 36.17 | 46.00 | -9.83 | PASS |
| | 8.7190 | 27.97 | 9.84 | 37.82 | 60.00 | -22.19 | PASS | 26.51 | 9.84 | 36.36 | 50.00 | -13.64 | PASS |

**Table 140 - Test 27, CEV, Data, 12S, SN 11F004CD**

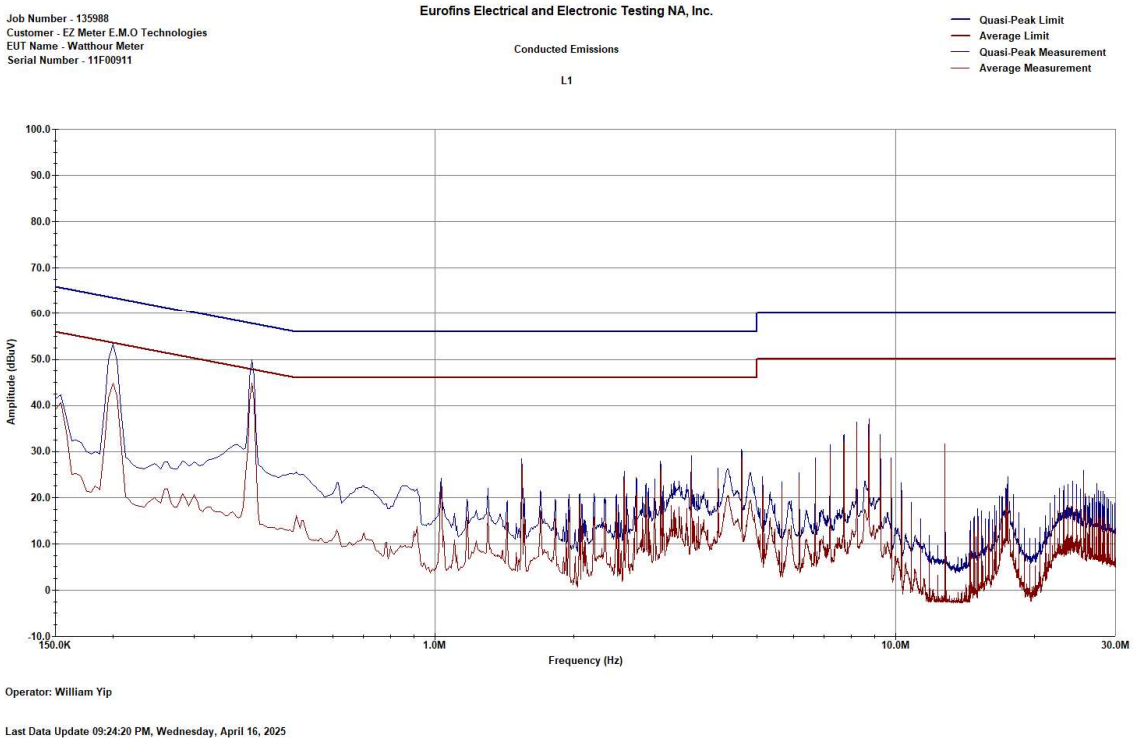


**Figure 14 - Test 27, CEV, Prescan (120V_60Hz, Line 1) SN 11F00911**

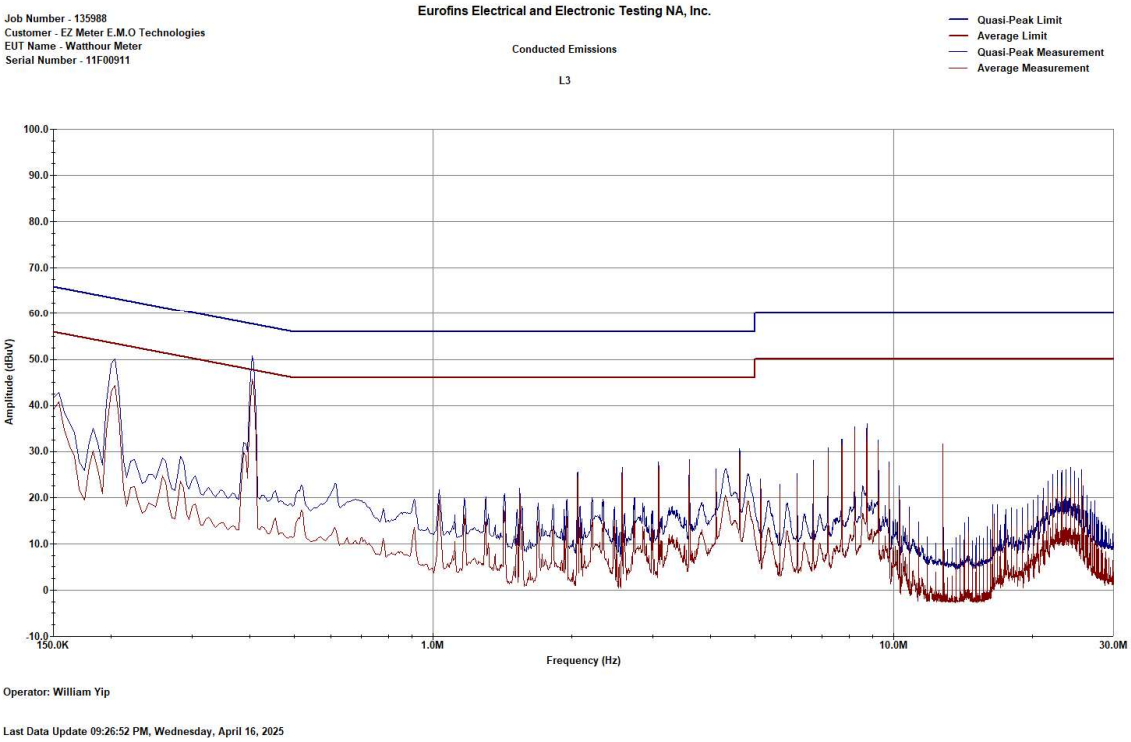


**Figure 15 - Test 27, CEV, Prescan (120V_60Hz, Line 3) SN 11F00911**

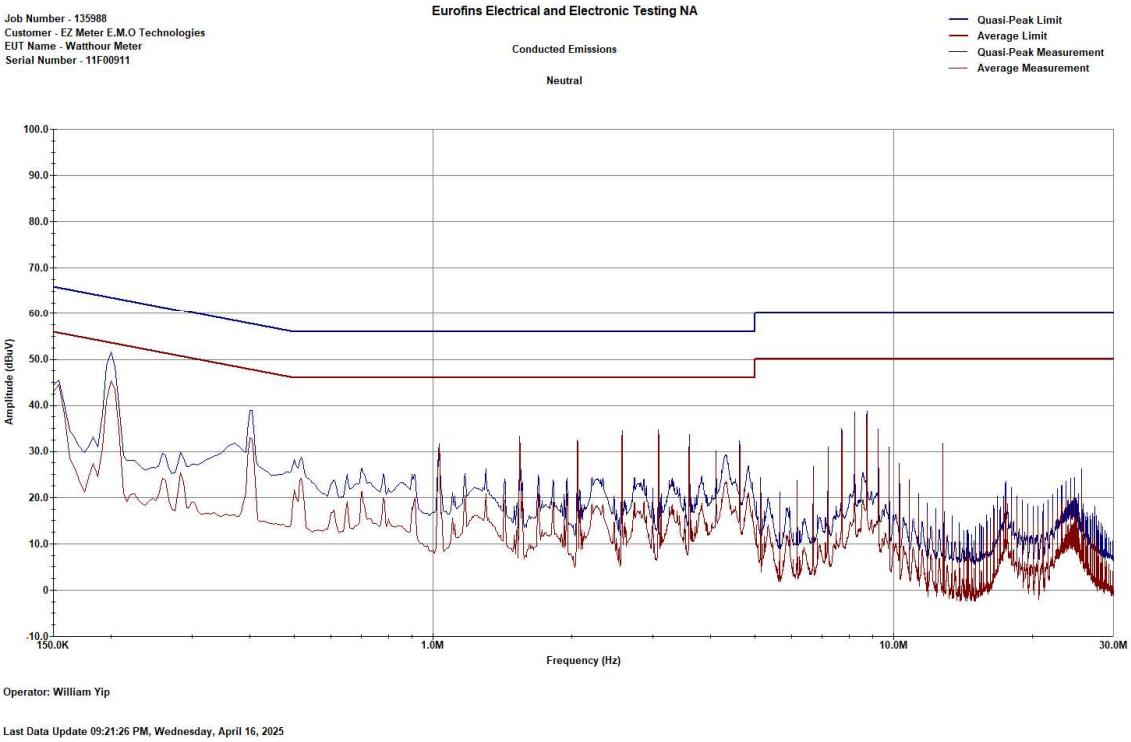


**Figure 16 - Test 27, CEV, Prescan (120V_60Hz, Neutral) SN 11F00911**

| | | | | | | Customer | Form | Serial Number | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | EZ Meter E.M.O Technologies | 12S | 11F00911 | | | | | |
| | Frequency | Quasi-Peak Measurement | Correction Factor | Corrected Measurement | Quasi-Peak Limit | Margin | Result | Average Measurement | Correction Factor | Corrected Measurement | Average Limit | Margin | Result |
| | MHz | dBµV | dB | dBµV | dBµV | dB | Pass/Fail | dBµV | dB | dBµV | dBµV | dB | Pass/Fail |
| Line 1 | 0.1540 | 32.50 | 9.84 | 42.34 | 65.88 | -23.55 | PASS | 30.68 | 9.84 | 40.52 | 55.88 | -15.36 | PASS |
| | 0.2000 | 43.49 | 9.80 | 53.29 | 64.57 | -11.28 | PASS | 35.09 | 9.80 | 44.89 | 54.57 | -9.68 | PASS |
| | 0.4000 | 40.16 | 9.77 | 49.92 | 58.85 | -8.93 | PASS | 35.08 | 9.77 | 44.85 | 48.85 | -4.00 | PASS |
| | 7.7220 | 23.92 | 9.79 | 33.71 | 60.00 | -26.29 | PASS | 22.49 | 9.79 | 32.28 | 50.00 | -17.72 | PASS |
| | 8.2350 | 26.60 | 9.80 | 36.40 | 60.00 | -23.60 | PASS | 25.61 | 9.80 | 35.40 | 50.00 | -14.60 | PASS |
| | 8.7480 | 27.24 | 9.81 | 37.06 | 60.00 | -22.94 | PASS | 25.96 | 9.81 | 35.78 | 50.00 | -14.23 | PASS |
| Line 3 | 0.1540 | 32.90 | 9.84 | 42.73 | 65.88 | -23.15 | PASS | 30.90 | 9.84 | 40.74 | 55.88 | -15.14 | PASS |
| | 0.1830 | 25.12 | 9.81 | 34.93 | 65.05 | -30.12 | PASS | 34.51 | 9.80 | 44.31 | 54.45 | -10.14 | PASS |
| | 0.2040 | 40.31 | 9.80 | 50.11 | 64.45 | -14.34 | PASS | 35.84 | 9.77 | 45.60 | 48.73 | -3.13 | PASS |
| | 0.4040 | 40.96 | 9.77 | 50.72 | 58.73 | -8.01 | PASS | 24.64 | 9.80 | 34.44 | 50.00 | -15.56 | PASS |
| | 8.2350 | 25.55 | 9.80 | 35.34 | 60.00 | -24.66 | PASS | 24.78 | 9.81 | 34.60 | 50.00 | -15.40 | PASS |
| | 8.7480 | 26.25 | 9.81 | 36.07 | 60.00 | -23.93 | PASS | 21.83 | 9.85 | 31.67 | 50.00 | -18.33 | PASS |
| Neutral | 0.1540 | 35.64 | 9.83 | 45.47 | 65.88 | -20.41 | PASS | 34.69 | 9.83 | 44.52 | 55.88 | -11.37 | PASS |
| | 0.2000 | 41.85 | 9.80 | 51.65 | 64.57 | -12.92 | PASS | 35.55 | 9.80 | 45.35 | 54.57 | -9.22 | PASS |
| | 0.4040 | 29.18 | 9.78 | 38.96 | 58.73 | -19.77 | PASS | 24.33 | 9.79 | 34.12 | 46.00 | -11.88 | PASS |
| | 7.7180 | 25.20 | 9.82 | 35.02 | 60.00 | -24.98 | PASS | 24.66 | 9.79 | 34.45 | 46.00 | -11.55 | PASS |
| | 8.2350 | 28.79 | 9.83 | 38.61 | 60.00 | -21.39 | PASS | 27.31 | 9.83 | 37.14 | 50.00 | -12.86 | PASS |
| | 8.7480 | 28.93 | 9.84 | 38.78 | 60.00 | -21.22 | PASS | 27.80 | 9.84 | 37.64 | 50.00 | -12.36 | PASS |

**Table 141 - Test 27, CEV, Data, 12S, SN 11F00911**

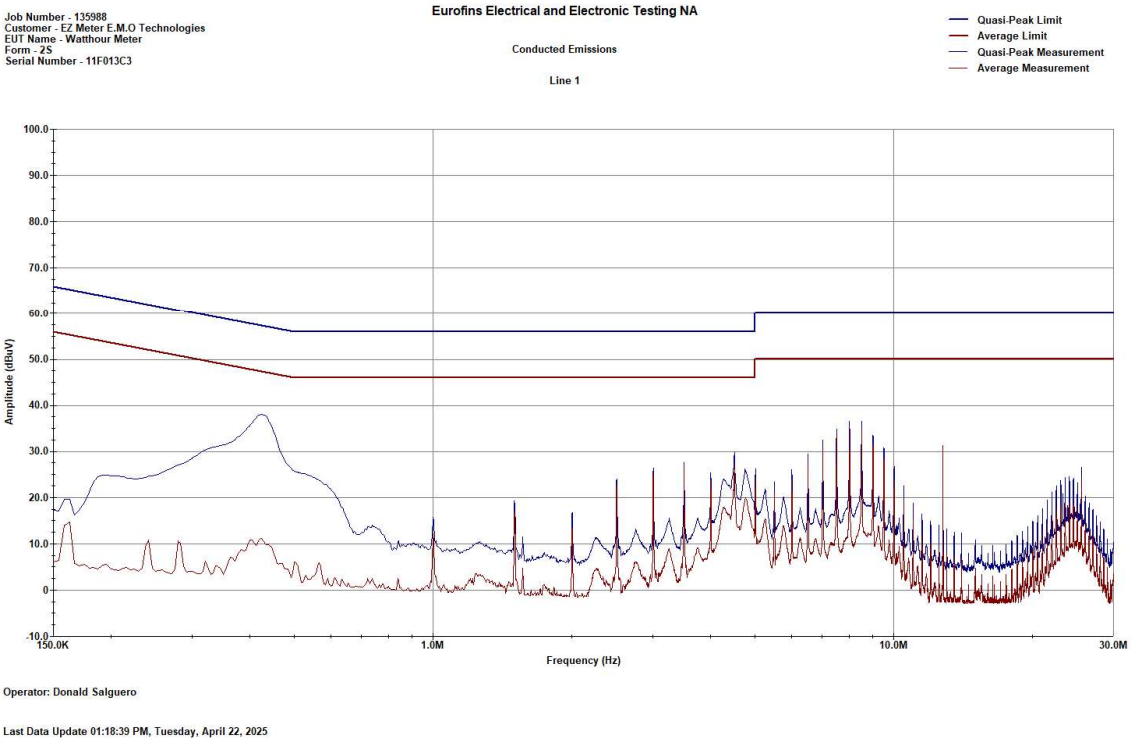


**Figure 17 - Test 27, CEV, Prescan (240V_60Hz, Line 1) SN 11F013C3**

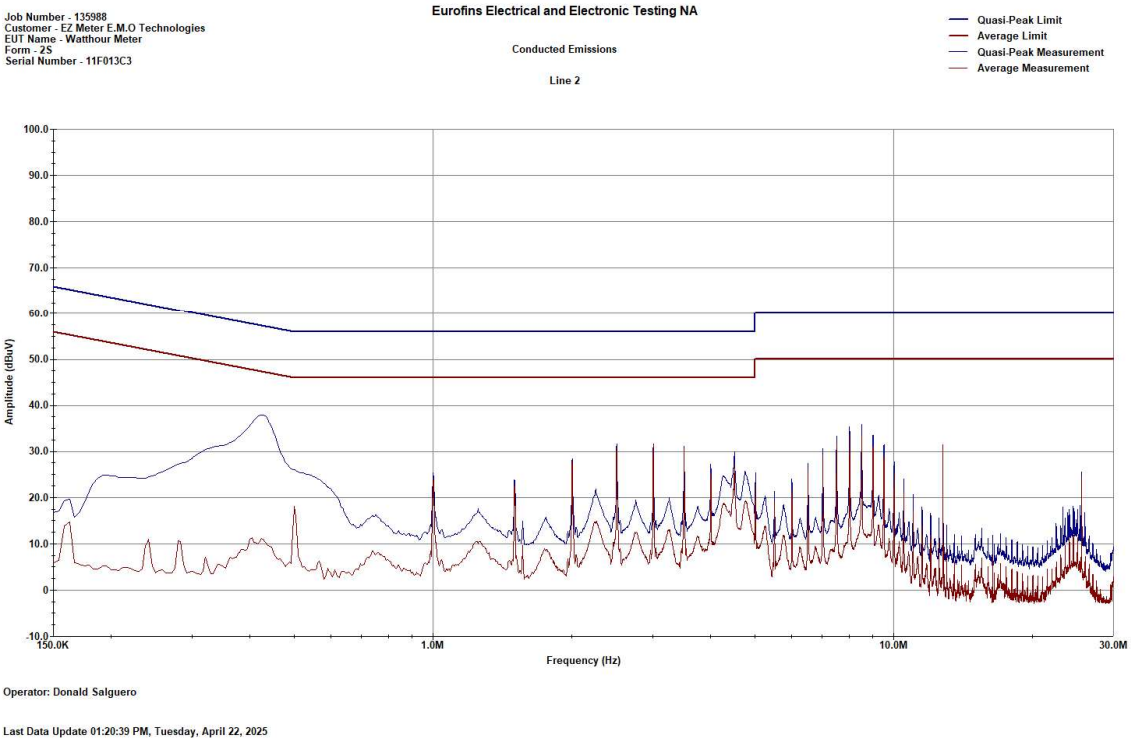


**Figure 18 - Test 27, CEV, Prescan (240V_60Hz, Line 2) SN 11F013C3**

| | | | | | | Customer | Form | Serial Number | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | EZ Meter E.M.O Technologies | 2S | 11F013C3 | | | | | | |
| | Frequency | Quasi-Peak Measure-ment | Correction Factor | Corrected Measure-ment | Quasi-Peak Limit | Margin | Result | Frequency | Average Measure-ment | Correction Factor | Corrected Measure-ment | Average Limit | Margin | Result |
| | MHz | dBµV | dB | dBµV | dBµV | dB | Pass/Fail | MHz | dBµV | dB | dBµV | dBµV | dB | Pass/Fail |
| Line 1 | 0.4250 | 28.30 | 9.74 | 38.04 | 58.13 | -20.09 | PASS | 7.02 | 21.04 | 9.73 | 30.77 | 50.00 | -19.23 | PASS |
| | 7.0170 | 22.76 | 9.73 | 32.50 | 60.00 | -27.50 | PASS | 7.52 | 23.68 | 9.73 | 33.41 | 50.00 | -16.59 | PASS |
| | 7.5180 | 25.07 | 9.73 | 34.80 | 60.00 | -25.20 | PASS | 8.02 | 25.61 | 9.73 | 35.34 | 50.00 | -14.66 | PASS |
| | 8.0180 | 26.78 | 9.73 | 36.51 | 60.00 | -23.49 | PASS | 8.52 | 25.19 | 9.73 | 34.92 | 50.00 | -15.08 | PASS |
| | 8.5190 | 26.79 | 9.73 | 36.52 | 60.00 | -23.48 | PASS | 9.02 | 21.81 | 9.73 | 31.54 | 50.00 | -18.46 | PASS |
| | 9.0190 | 23.81 | 9.73 | 33.54 | 60.00 | -26.46 | PASS | 12.80 | 21.53 | 9.72 | 31.25 | 50.00 | -18.75 | PASS |
| Line 2 | 0.4250 | 28.24 | 9.70 | 37.95 | 58.13 | -20.19 | PASS | 3.01 | 21.66 | 9.67 | 31.33 | 46.00 | -14.67 | PASS |
| | 3.0080 | 21.99 | 9.67 | 31.66 | 56.00 | -24.34 | PASS | 7.52 | 22.05 | 9.65 | 31.70 | 50.00 | -18.30 | PASS |
| | 7.5180 | 23.58 | 9.65 | 33.22 | 60.00 | -26.78 | PASS | 8.02 | 24.08 | 9.63 | 33.72 | 50.00 | -16.28 | PASS |
| | 8.0220 | 25.74 | 9.63 | 35.37 | 60.00 | -24.63 | PASS | 8.52 | 23.79 | 9.63 | 33.43 | 50.00 | -16.57 | PASS |
| | 8.5230 | 26.29 | 9.63 | 35.92 | 60.00 | -24.08 | PASS | 9.02 | 21.50 | 9.65 | 31.14 | 50.00 | -18.86 | PASS |
| | 9.0240 | 23.85 | 9.65 | 33.49 | 60.00 | -26.51 | PASS | 12.80 | 21.70 | 9.67 | 31.37 | 50.00 | -18.63 | PASS |

**Table 142 - Test 27, CEV, Data, 2S, SN 11F013C3**


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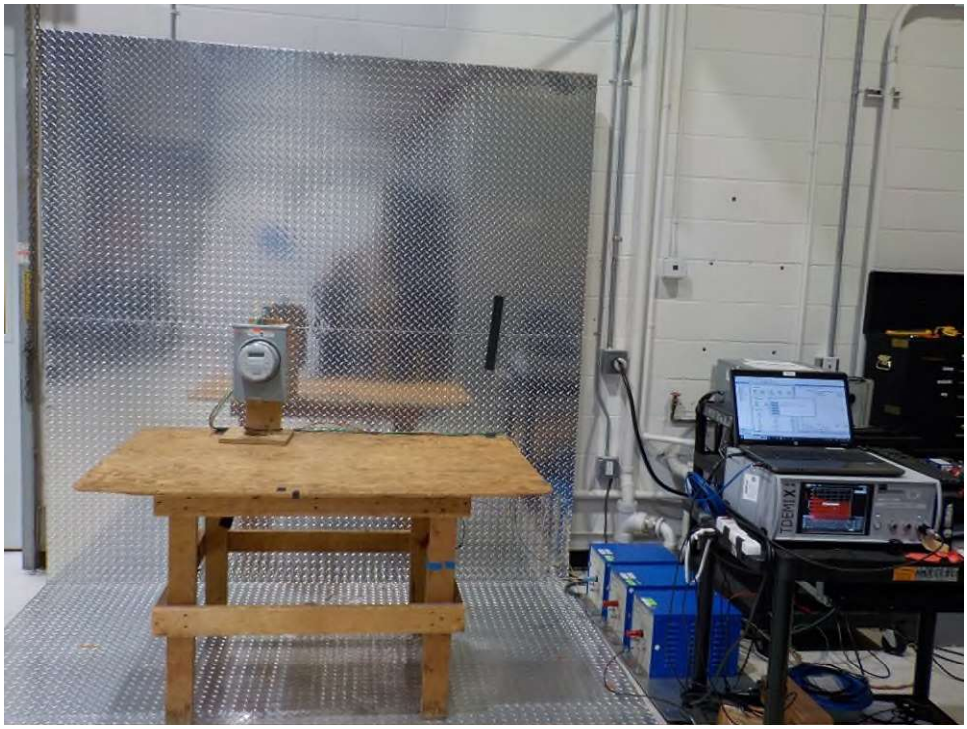
**Photograph 35 - Test 27, CEV, Test Setup (Rear)**



**Photograph 36 - Test 27, CEV, Test Setup**

## 6.26.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Conducted Emissions Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 1T9572 | EMI Receiver | Gauss Instruments | TDEMI X40 | 1902001 | 11/2/2023 | 11/30/2025 |
| 1T0001 | 10 dB Attenuator | Inmet | INMET-18N10W-10dB | N/A | Functionally Verified | Functionally Verified |
| 1T4795 | LISN | Com-Power | LI-150A | 201065 | 5/21/2022 | 11/30/2025 |
| 1T4796 | LISN | Com-Power | LI-150A | 201072 | 5/21/2024 | 11/30/2025 |
| 1T4878 | LISN | Com-Power | LI-150A | 201125 | 5/21/2024 | 11/30/2025 |
| 1T8374 | Power Supply | Ametek Programmable Power | CSW5550-160-208-704 | 1708A01789 | Functionally Verified | Functionally Verified |
| 1T9999 | Thermometer/ Hygrometer | VWR International | 36934-164 | 230368599 | 5/31/2023 | 5/31/2025 |

**Table 143 - Test 27, CEV, Equipment List**

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

## 6.27 Test No. 27: Radio Frequency Radiated Emissions Test

### 6.27.1 Test Requirement(s)

The meter shall conform to all applicable requirements of the Code of Federal Regulations (CFR) 47, Part 15—Radio Frequency Devices, Subparts A—General and B—Unintentional Radiators issued by the Federal Communication Commission for Class "B" digital devices.

The test shall be conducted with the meter tested on a tabletop, in normal service position, with all cables connected, with all options and accessories specified, in a configuration closely resembling typical field in-service connections. Typical in-service configurations are provided in Figure 19, Figure 20, and Figure 21. These figures shall be followed as closely as possible, appropriate to the type of meter tested and test chamber utilized for the test. The LISN can be optionally located on the floor. For all other aspects of this test not covered by CFR 47, Part 15A and B, and this standard, refer to ANSI/IEEE C63.4.

This test shall be conducted on all meters excluding voltage indicators.

The time, program, and register reading requirement of 4.7.3 of ANSI C12.1: 2024 shall not apply.

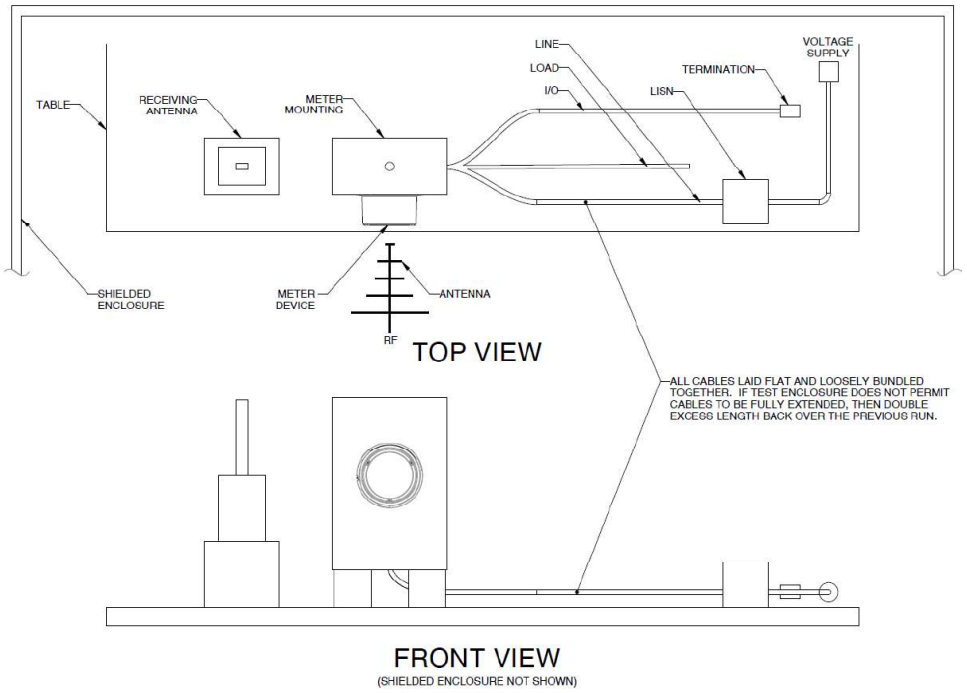



**Figure 19 - Typical Test Layout for Test 27 - Radiated and Conducted Emissions**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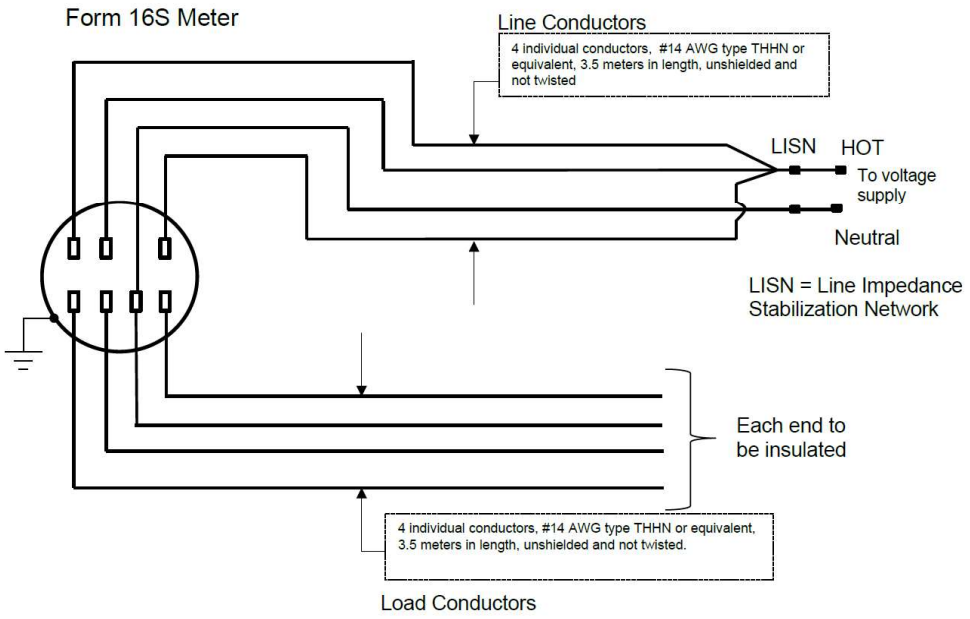


**Figure 20 - Typical Wiring Detail for Self-Contained Meters for Test 27 - Radiated and Conducted Emissions**

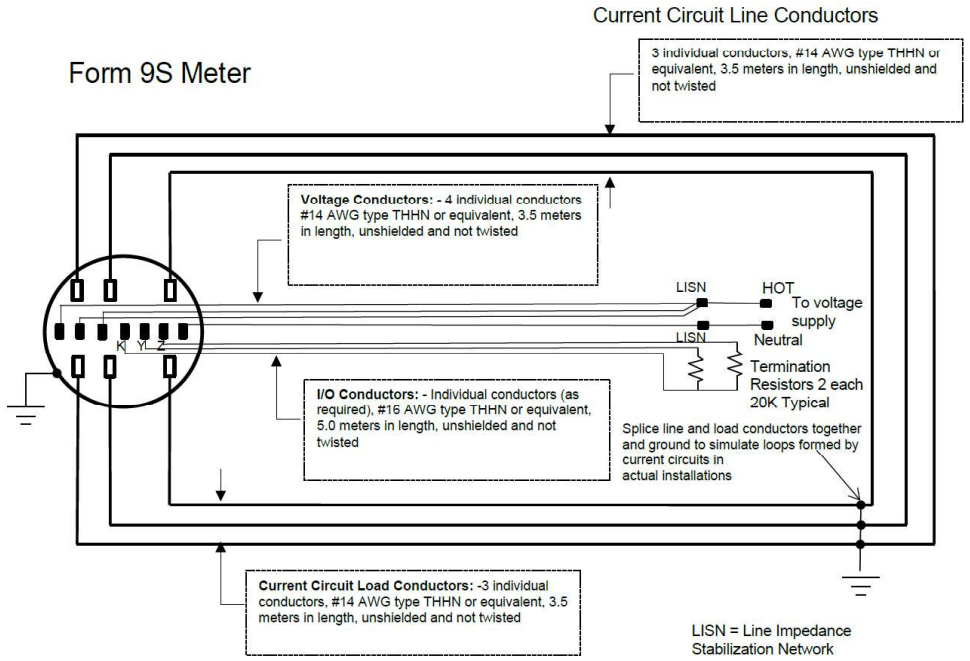


**Figure 21 - Typical Wiring Detail for Transformer Rated Meters for Test 27 - Radiated and Conducted Emissions**


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### 6.27.2 Test Data and Results

The meters listed below are **compliant** with the requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F00911 |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CD |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C3 |

Refer to the following test data and photographs for a complete overview of the test setup and results.


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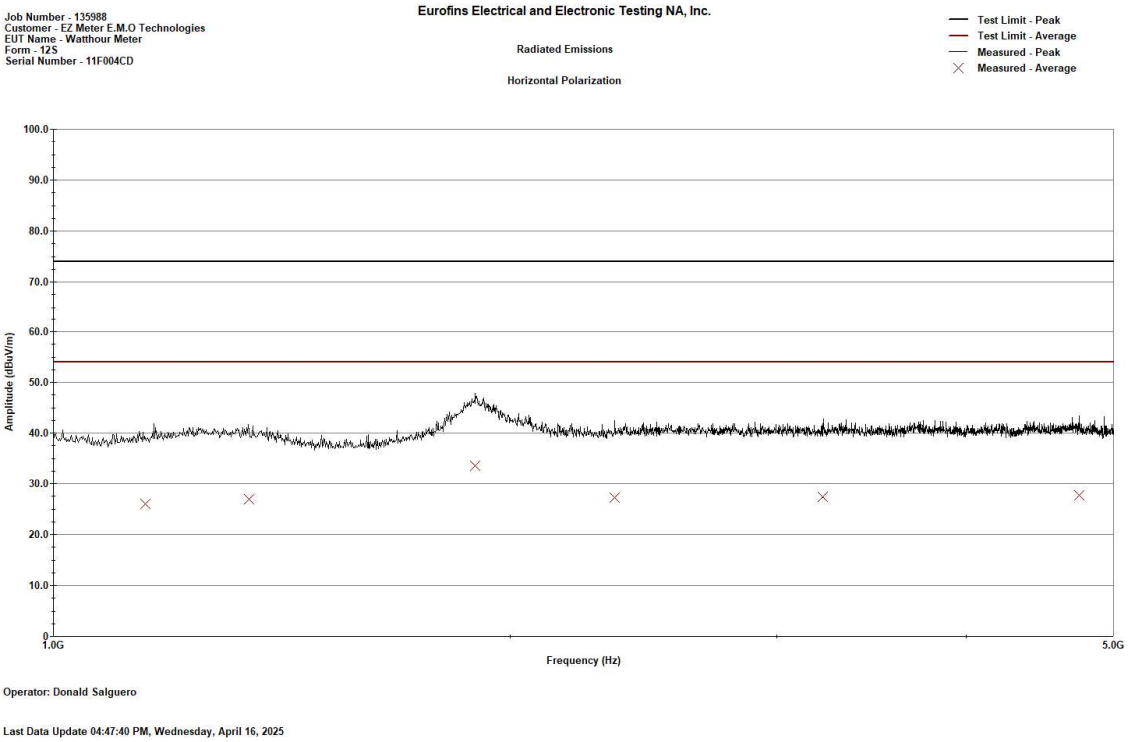


**Figure 22 - Test 27, REE, Prescan [12S, SN 11F004CD, 1GHz - 5GHz, Horizontal]**

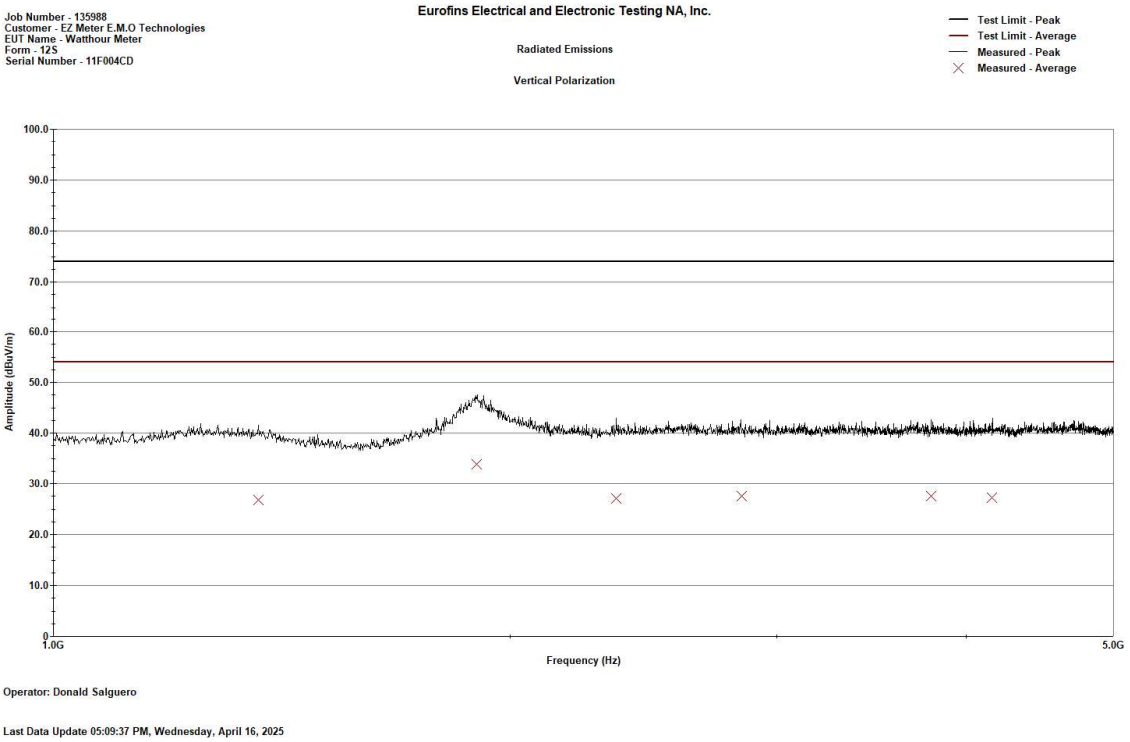


**Figure 23 - Test 27, REE, Prescan [12S, SN 11F004CD, 1GHz - 5GHz, Vertical]**

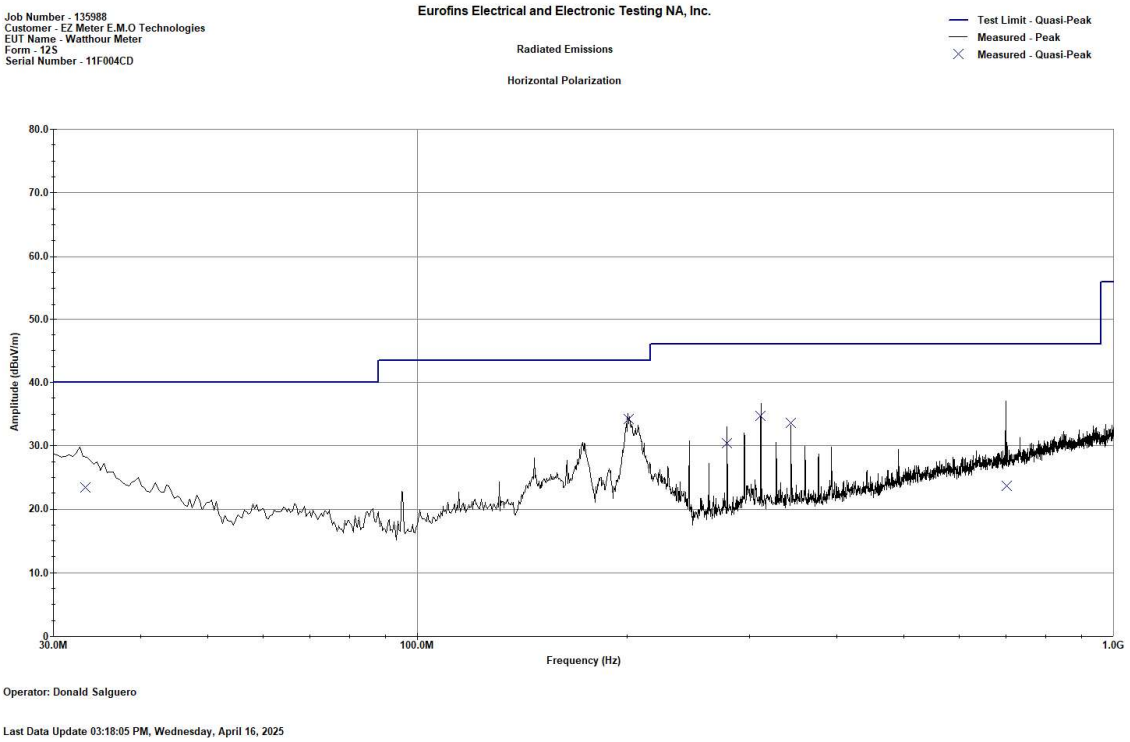


**Figure 24 - Test 27, REE, Prescan [12S, SN 11F004CD, 30MHz - 1GHz, Horizontal]**

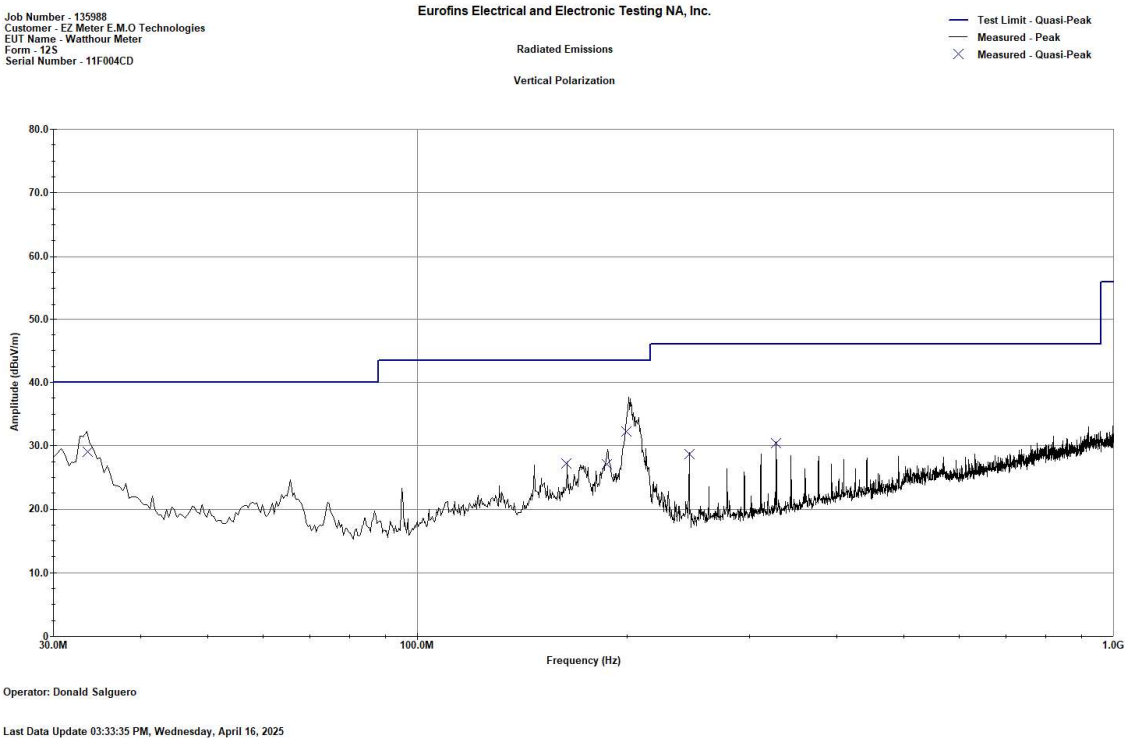


**Figure 25 - Test 27, REE, Prescan [12S, SN 11F004CD, 30MHz - 1GHz, Vertical]**

| | | | Customer | Form | Serial Number | 1 GHz to 5 GHz | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | EZ Meter E.M.O Technologies | 12S | 11F004CD | Peak | | | |
| **Frequency** | **Polarity** | **Antenna Height** | **Turntable Position** | **Measured** | **Correction Factor** | **Corrected Reading** | **Limit** | **Margin** | **Results** |
| **MHz** | **Horizontal/Vertical** | **cm** | **Degrees** | **dBµV** | **dB** | **dBµV/m** | **dBµV/m** | **dB** | **Pass/Fail** |
| 1.15 | H | 166.00 | 16.60 | 48.31 | -10.11 | 38.19 | 74.00 | -35.81 | PASS |
| 1.35 | H | 242.00 | 243.40 | 47.70 | -8.41 | 39.28 | 74.00 | -34.72 | PASS |
| 1.90 | H | 123.00 | 251.10 | 45.22 | 0.24 | 45.46 | 74.00 | -28.54 | PASS |
| 2.35 | H | 301.00 | 163.50 | 43.88 | -4.77 | 39.11 | 74.00 | -34.89 | PASS |
| 3.22 | H | 108.00 | 62.90 | 42.73 | -2.83 | 39.90 | 74.00 | -34.10 | PASS |
| 4.75 | H | 142.00 | 104.80 | 39.79 | 0.14 | 39.93 | 74.00 | -34.07 | PASS |
| 1.37 | V | 151.00 | 189.50 | 47.58 | -8.38 | 39.20 | 74.00 | -34.80 | PASS |
| 1.90 | V | 234.00 | 67.60 | 45.22 | 0.48 | 45.70 | 74.00 | -28.30 | PASS |
| 2.35 | V | 217.00 | 262.40 | 44.26 | -4.73 | 39.52 | 74.00 | -34.48 | PASS |
| 2.84 | V | 104.00 | 174.70 | 42.98 | -3.38 | 39.59 | 74.00 | -34.41 | PASS |
| 3.79 | V | 204.00 | 110.60 | 41.28 | -1.69 | 39.59 | 74.00 | -34.41 | PASS |
| 4.16 | V | 151.00 | 333.20 | 40.33 | -0.77 | 39.56 | 74.00 | -34.44 | PASS |

**Table 144 - Test 27, REE, 12S, SN 11F004CD, 1 GHz to 5 GHz, Peak**

| | | | Customer | Form | Serial Number | 1 GHz to 5 GHz | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | EZ Meter E.M.O Technologies | 12S | 11F004CD | Average | | | |
| **Frequency** | **Polarity** | **Antenna Height** | **Turntable Position** | **Measured** | **Correction Factor** | **Corrected Reading** | **Limit** | **Margin** | **Results** |
| **MHz** | **Horizontal/Vertical** | **cm** | **Degrees** | **dBµV** | **dB** | **dBµV/m** | **dBµV/m** | **dB** | **Pass/Fail** |
| 1.15 | H | 166.00 | 16.60 | 36.10 | -10.12 | 25.99 | 54.00 | -28.01 | PASS |
| 1.35 | H | 242.00 | 243.40 | 35.30 | -8.41 | 26.89 | 54.00 | -27.11 | PASS |
| 1.90 | H | 123.00 | 251.10 | 33.27 | 0.24 | 33.51 | 54.00 | -20.49 | PASS |
| 2.35 | H | 301.00 | 163.50 | 31.94 | -4.77 | 27.16 | 54.00 | -26.84 | PASS |
| 3.22 | H | 108.00 | 62.90 | 30.12 | -2.83 | 27.29 | 54.00 | -26.71 | PASS |
| 4.75 | H | 142.00 | 104.80 | 27.61 | 0.14 | 27.75 | 54.00 | -26.25 | PASS |
| 1.37 | V | 151.00 | 189.50 | 35.12 | -8.38 | 26.73 | 54.00 | -27.27 | PASS |
| 1.90 | V | 234.00 | 67.60 | 33.32 | 0.48 | 33.80 | 54.00 | -20.20 | PASS |
| 2.35 | V | 217.00 | 262.40 | 31.85 | -4.73 | 27.12 | 54.00 | -26.88 | PASS |
| 2.84 | V | 104.00 | 174.70 | 30.97 | -3.38 | 27.59 | 54.00 | -26.41 | PASS |
| 3.79 | V | 204.00 | 110.60 | 29.28 | -1.69 | 27.59 | 54.00 | -26.41 | PASS |
| 4.16 | V | 151.00 | 333.20 | 28.05 | -0.77 | 27.28 | 54.00 | -26.72 | PASS |

**Table 145 - Test 27, REE, Data, 12S, SN 11F004CD, 1 GHz to 5 GHz, Average**

| | | | Customer | Form | Serial Number | 30 MHz to 1GHz | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | EZ Meter E.M.O Technologies | 12S | 11F004CD | QP | | | |
| **Frequency** | **Polarity** | **Antenna Height** | **Turntable Position** | **Measured** | **Correction Factor** | **Corrected Reading** | **Limit** | **Margin** | **Results** |
| **MHz** | **Horizontal/Vertical** | **cm** | **Degrees** | **dBµV** | **dB** | **dBµV/m** | **dBµV/m** | **dB** | **Pass/Fail** |
| 33.34 | H | 197.82 | 16.70 | -1.22 | 24.59 | 23.37 | 40.00 | -16.63 | PASS |
| 201.05 | H | 146.91 | 156.60 | 14.64 | 19.52 | 34.16 | 43.50 | -9.34 | PASS |
| 278.57 | H | 107.26 | 245.10 | 10.54 | 19.83 | 30.37 | 46.00 | -15.63 | PASS |
| 311.32 | H | 253.34 | 113.70 | 14.15 | 20.48 | 34.63 | 46.00 | -11.37 | PASS |
| 344.09 | H | 106.26 | 290.50 | 12.60 | 21.01 | 33.61 | 46.00 | -12.39 | PASS |
| 701.86 | H | 165.00 | 273.80 | -4.05 | 27.65 | 23.59 | 46.00 | -22.41 | PASS |
| 33.58 | V | 103.34 | 157.50 | 6.48 | 22.51 | 28.99 | 40.00 | -11.01 | PASS |
| 163.85 | V | 173.08 | 109.00 | 8.84 | 18.32 | 27.16 | 43.50 | -16.34 | PASS |
| 187.18 | V | 202.95 | 65.90 | 9.97 | 17.12 | 27.09 | 43.50 | -16.41 | PASS |
| 199.58 | V | 106.34 | -1.40 | 13.16 | 19.04 | 32.21 | 43.50 | -11.29 | PASS |
| 245.79 | V | 204.17 | 289.90 | 10.63 | 18.01 | 28.64 | 46.00 | -17.36 | PASS |
| 327.70 | V | 129.91 | 288.70 | 10.20 | 20.21 | 30.40 | 46.00 | -15.60 | PASS |

**Table 146 - Test 27, REE, Data, 12S, SN 11F004CD, 30MHz to 1GHz**


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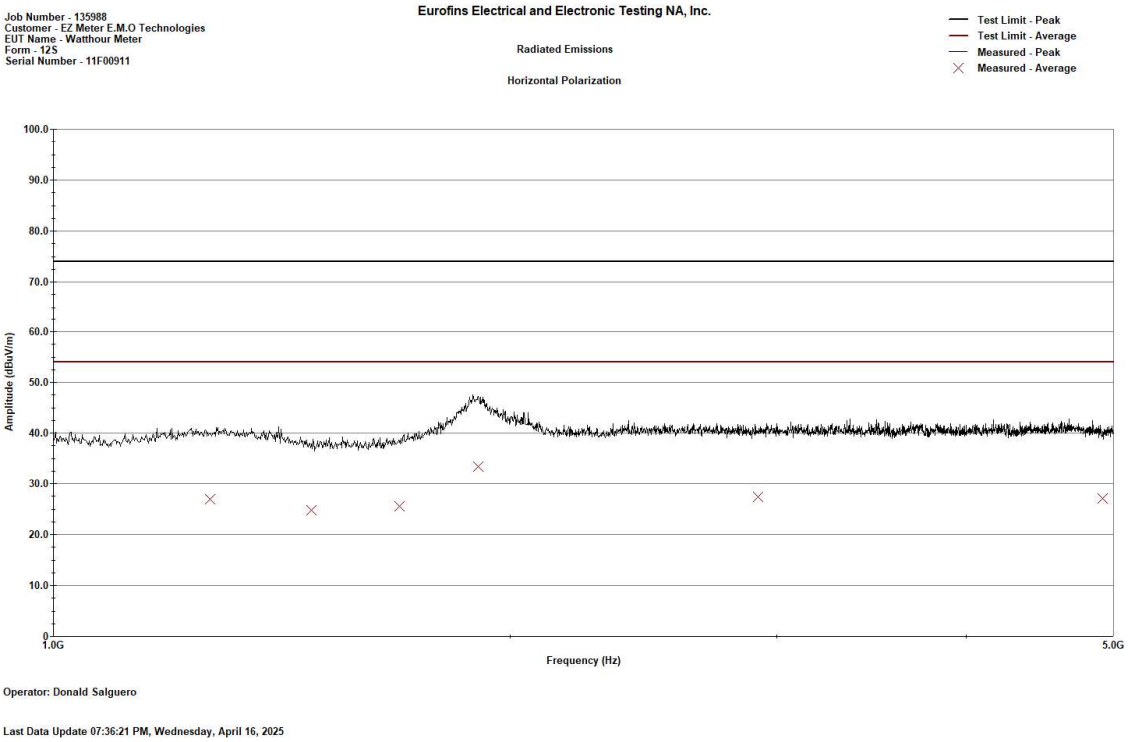


**Figure 26 - Test 27, REE, Prescan [12S, SN 11F00911, 1GHz - 5GHz, Horizontal]**

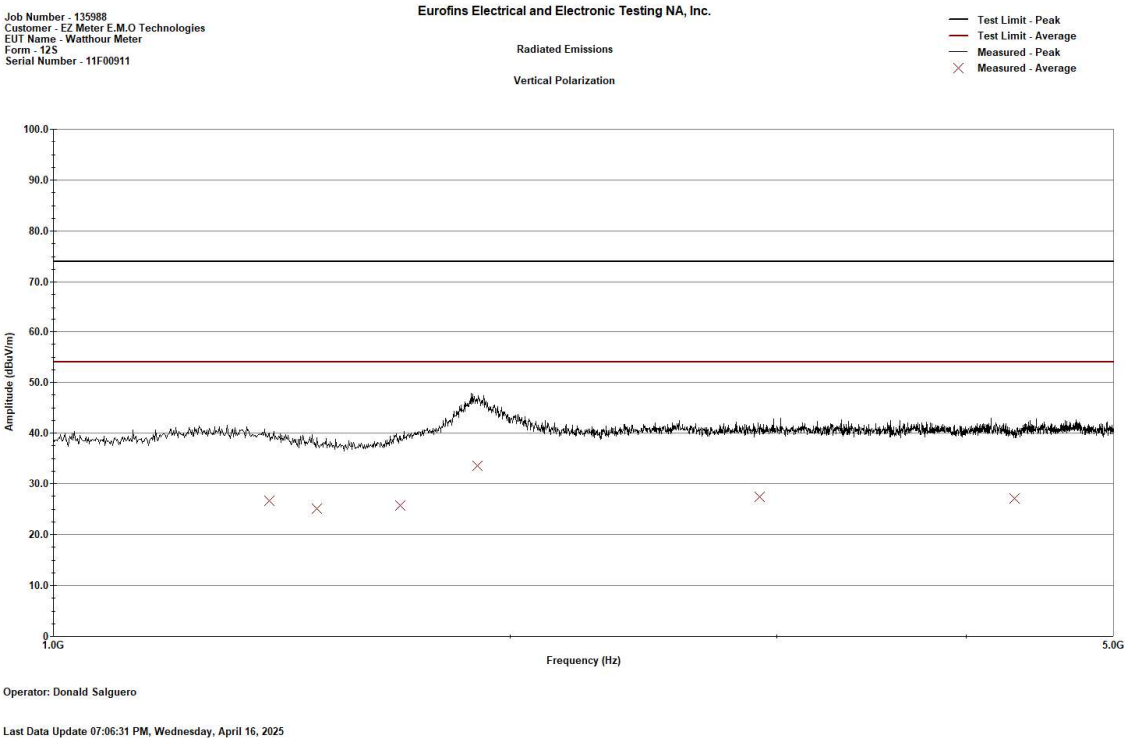


**Figure 27 - Test 27, REE, Prescan [12S, SN 11F00911, 1GHz - 5GHz, Vertical]**

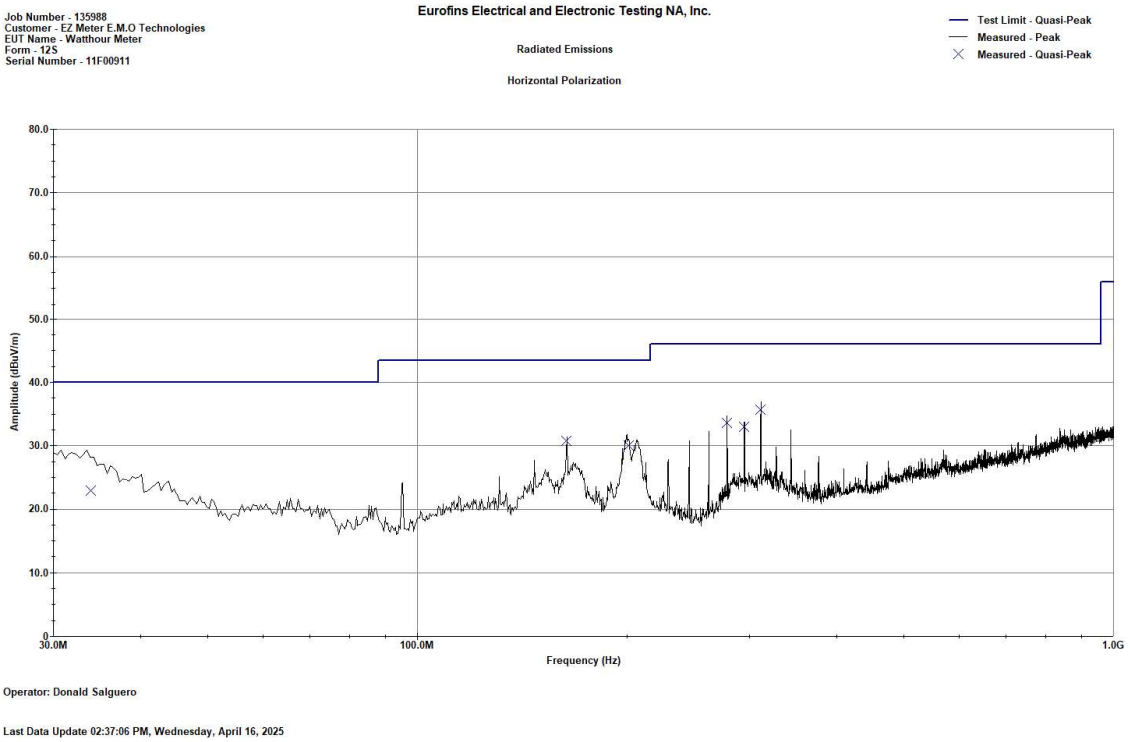


**Figure 28 - Test 27, REE, Prescan [12S, SN 11F00911, 30MHz - 1GHz, Horizontal]**

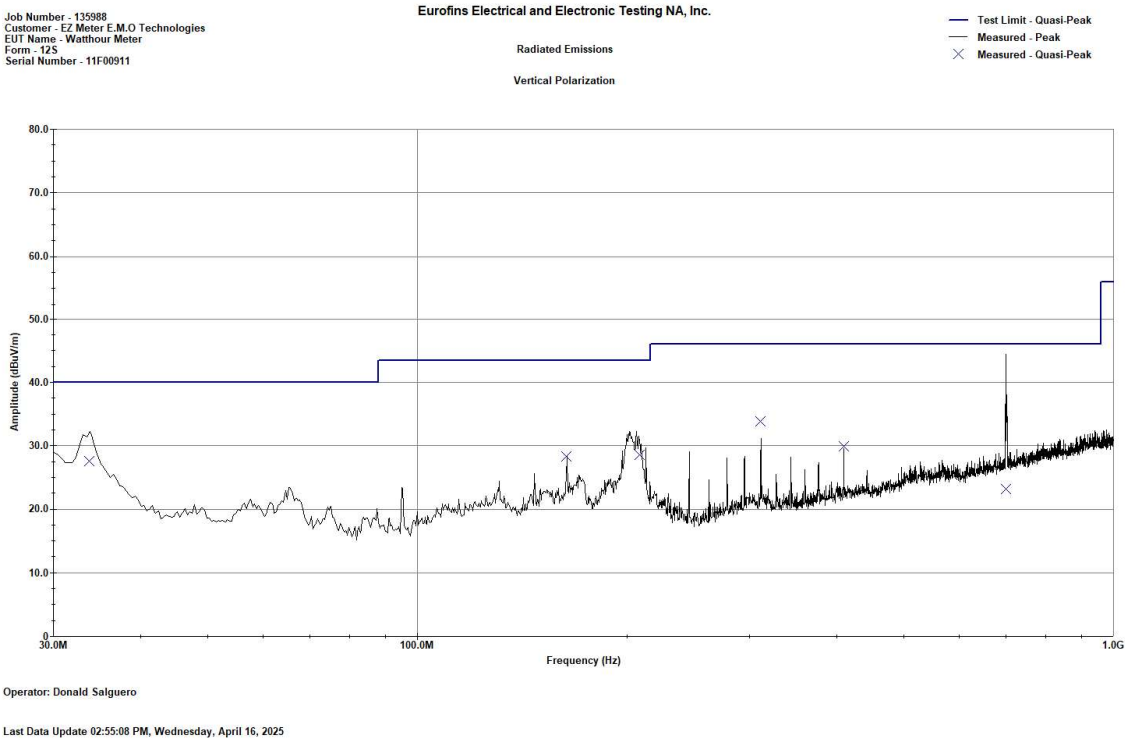


**Figure 29 - Test 27, REE, Prescan [12S, SN 11F00911, 30MHz - 1GHz, Vertical]**

| | | | Customer | Form | Serial Number | 1 GHz to 5 GHz | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | EZ Meter E.M.O Technologies | 12S | 11F00911 | Average | | | |
| **Frequency** | **Polarity** | **Antenna Height** | **Turntable Position** | **Measured** | **Correction Factor** | **Corrected Reading** | **Limit** | **Margin** | **Results** |
| **MHz** | **Horizontal/Vertical** | **cm** | **Degrees** | **dBµV** | **dB** | **dBµV/m** | **dBµV/m** | **dB** | **Pass/Fail** |
| 1.27 | H | 148.00 | 320.50 | 35.54 | -8.58 | 26.96 | 54.00 | -27.04 | PASS |
| 1.48 | H | 264.00 | 177.50 | 34.61 | -9.82 | 24.79 | 54.00 | -29.21 | PASS |
| 1.69 | H | 174.00 | 68.90 | 33.90 | -8.33 | 25.56 | 54.00 | -28.44 | PASS |
| 1.91 | H | 165.00 | 291.60 | 33.13 | 0.21 | 33.35 | 54.00 | -20.65 | PASS |
| 2.92 | H | 128.00 | 265.40 | 30.90 | -3.54 | 27.36 | 54.00 | -26.64 | PASS |
| 4.92 | H | 168.00 | 289.40 | 26.88 | 0.15 | 27.03 | 54.00 | -26.97 | PASS |
| 1.39 | V | 156.00 | 158.60 | 35.23 | -8.65 | 26.57 | 54.00 | -27.43 | PASS |
| 1.49 | V | 264.00 | 34.20 | 34.72 | -9.68 | 25.03 | 54.00 | -28.97 | PASS |
| 1.69 | V | 144.00 | 123.60 | 33.77 | -8.08 | 25.69 | 54.00 | -28.31 | PASS |
| 1.90 | V | 127.00 | -0.50 | 33.14 | 0.40 | 33.54 | 54.00 | -20.46 | PASS |
| 2.92 | V | 210.00 | 99.40 | 30.72 | -3.42 | 27.31 | 54.00 | -26.69 | PASS |
| 4.30 | V | 208.00 | 250.20 | 28.11 | -1.11 | 27.00 | 54.00 | -27.00 | PASS |

**Table 147 - Test 27, REE, Data, 12S, SN 11F00911, 1 GHz to 5 GHz, Average**

| | | | Customer | Form | Serial Number | 1 GHz to 5 GHz | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | EZ Meter E.M.O Technologies | 12S | 11F00911 | Peak | | | |
| **Frequency** | **Polarity** | **Antenna Height** | **Turntable Position** | **Measured** | **Correction Factor** | **Corrected Reading** | **Limit** | **Margin** | **Results** |
| **MHz** | **Horizontal/Vertical** | **cm** | **Degrees** | **dBµV** | **dB** | **dBµV/m** | **dBµV/m** | **dB** | **Pass/Fail** |
| 1.27 | H | 148.00 | 320.50 | 48.79 | -8.58 | 40.21 | 74.00 | -33.79 | PASS |
| 1.48 | H | 264.00 | 177.50 | 46.70 | -9.82 | 36.89 | 74.00 | -37.11 | PASS |
| 1.69 | H | 174.00 | 68.90 | 46.37 | -8.33 | 38.03 | 74.00 | -35.97 | PASS |
| 1.91 | H | 165.00 | 291.60 | 45.22 | 0.21 | 45.44 | 74.00 | -28.57 | PASS |
| 2.92 | H | 128.00 | 265.40 | 42.98 | -3.54 | 39.44 | 74.00 | -34.56 | PASS |
| 4.92 | H | 168.00 | 289.40 | 38.86 | 0.15 | 39.01 | 74.00 | -35.00 | PASS |
| 1.39 | V | 156.00 | 158.60 | 47.20 | -8.65 | 38.54 | 74.00 | -35.46 | PASS |
| 1.49 | V | 264.00 | 34.20 | 47.09 | -9.68 | 37.41 | 74.00 | -36.59 | PASS |
| 1.69 | V | 144.00 | 123.60 | 45.74 | -8.08 | 37.66 | 74.00 | -36.34 | PASS |
| 1.90 | V | 127.00 | -0.50 | 46.17 | 0.40 | 46.57 | 74.00 | -27.43 | PASS |
| 2.92 | V | 210.00 | 99.40 | 43.49 | -3.42 | 40.08 | 74.00 | -33.93 | PASS |
| 4.30 | V | 208.00 | 250.20 | 41.42 | -1.11 | 40.31 | 74.00 | -33.69 | PASS |

**Table 148 - Test 27, REE, Data, 12S, SN 11F00911, 1 GHz to 5 GHz, Peak**


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| | | | Customer | Form | Serial Number | 30 MHz to 1GHz | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | EZ Meter E.M.O Technologies | 12S | 11F00911 | QP | | | |
| **Frequency** | **Polarity** | **Antenna Height** | **Turntable Position** | **Measured** | **Correction Factor** | **Corrected Reading** | **Limit** | **Margin** | **Results** |
| **MHz** | **Horizontal/Vertical** | **cm** | **Degrees** | **dBµV** | **dB** | **dBµV/m** | **dBµV/m** | **dB** | **Pass/Fail** |
| 33.94 | H | 229.60 | 16.30 | -1.27 | 24.14 | 22.87 | 40.00 | -17.13 | PASS |
| 163.85 | H | 151.52 | 167.40 | 12.47 | 18.31 | 30.79 | 43.50 | -12.71 | PASS |
| 201.36 | H | 107.91 | 152.30 | 10.64 | 19.42 | 30.06 | 43.50 | -13.44 | PASS |
| 278.57 | H | 269.73 | 90.30 | 13.77 | 19.83 | 33.60 | 46.00 | -12.40 | PASS |
| 294.90 | H | 107.04 | 88.30 | 12.87 | 20.08 | 32.95 | 46.00 | -13.05 | PASS |
| 311.32 | H | 261.26 | 77.90 | 15.14 | 20.48 | 35.62 | 46.00 | -10.38 | PASS |
| 33.79 | V | 103.60 | 16.30 | 5.14 | 22.37 | 27.52 | 40.00 | -12.48 | PASS |
| 163.85 | V | 198.56 | 80.60 | 9.97 | 18.32 | 28.29 | 43.50 | -15.21 | PASS |
| 208.57 | V | 106.30 | -0.30 | 11.77 | 16.83 | 28.60 | 43.50 | -14.90 | PASS |
| 311.32 | V | 136.17 | 166.30 | 13.96 | 19.90 | 33.86 | 46.00 | -12.14 | PASS |
| 409.62 | V | 106.73 | 18.80 | 7.52 | 22.35 | 29.87 | 46.00 | -16.13 | PASS |
| 700.99 | V | 263.43 | -1.60 | -4.05 | 27.19 | 23.13 | 46.00 | -22.87 | PASS |

**Table 149 - Test 27, REE, Data, 12S, SN 11F00911, 30 MHz to 1 GHz**

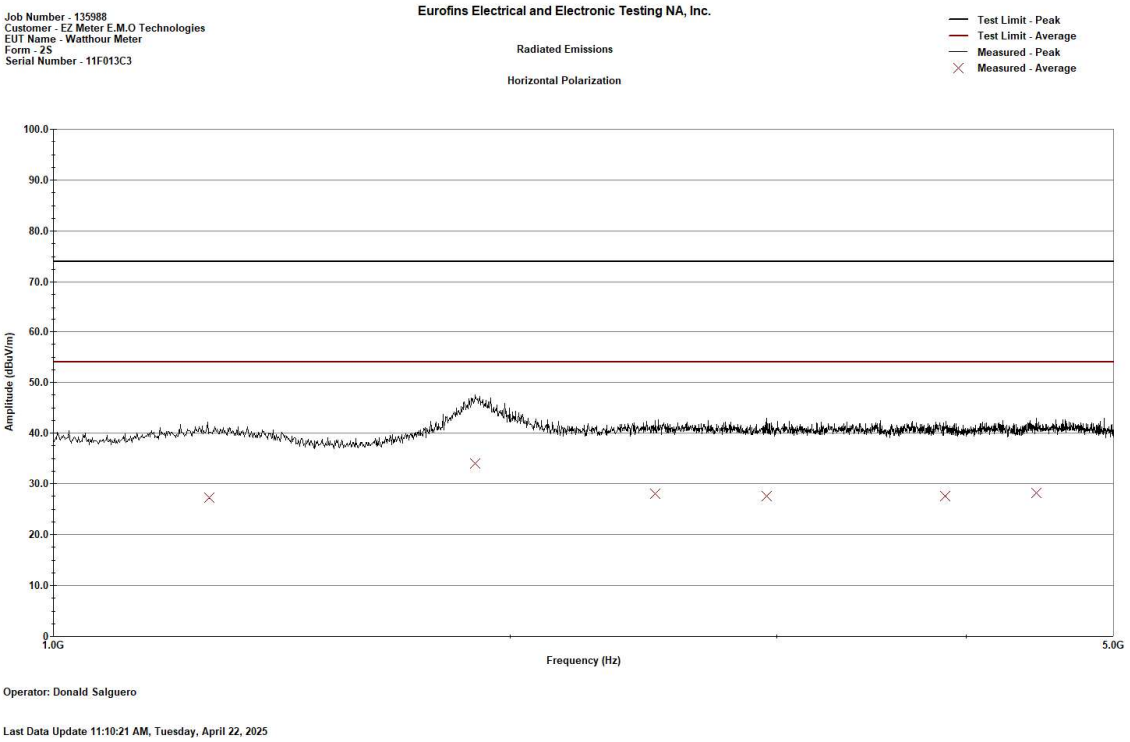


**Figure 30 - Test 27, REE, Prescan [2S, SN 11F013C3, 1GHz - 5GHz, Horizontal]**

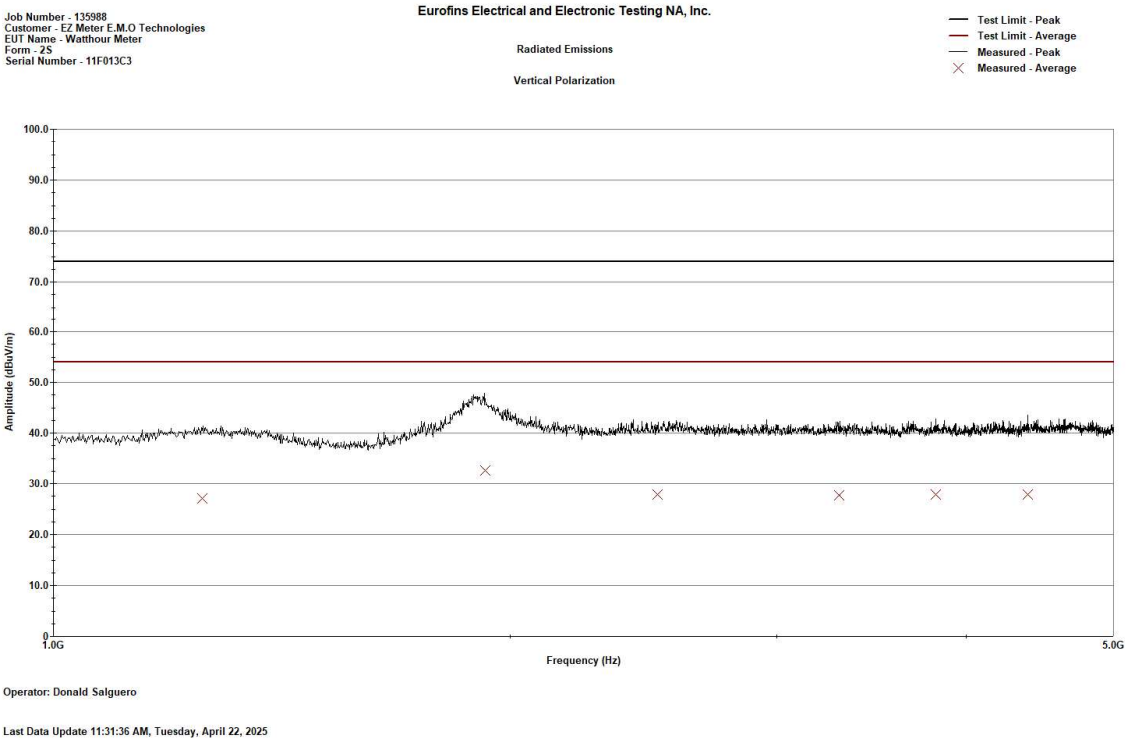


**Figure 31 - Test 27, REE, Prescan [2S, SN 11F013C3, 1GHz - 5GHz, Vertical]**

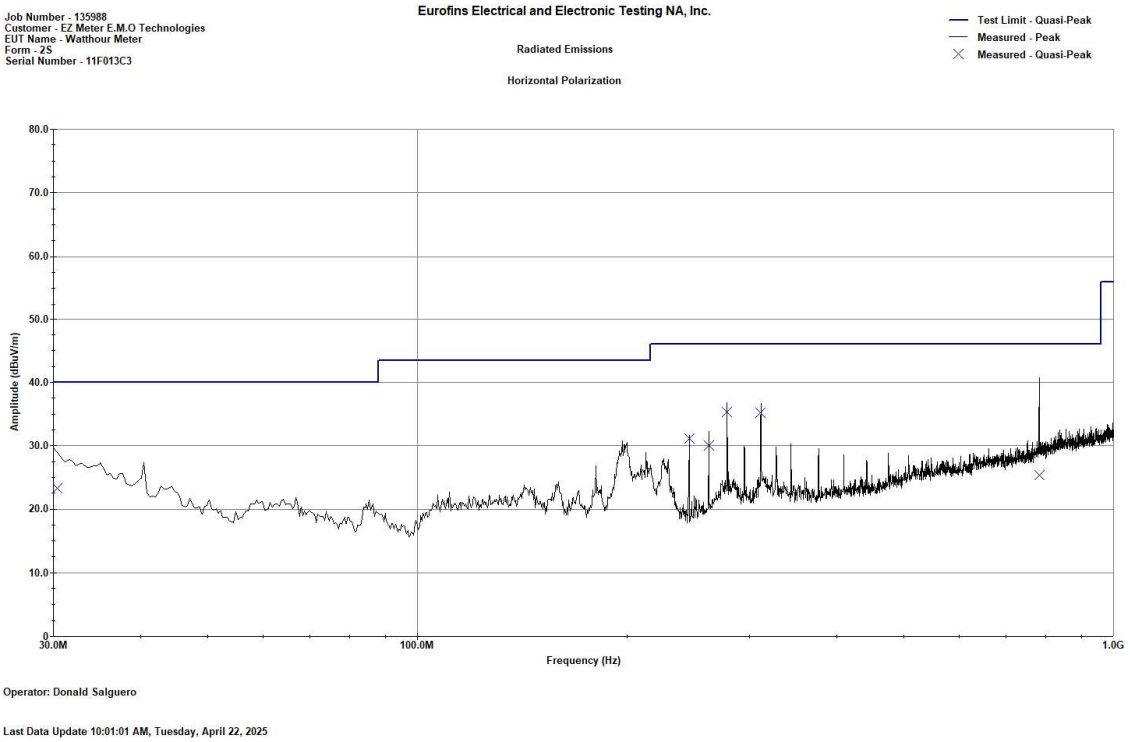


**Figure 32 - Test 27, REE, Prescan [2S, SN 11F013C3, 30MHz - 1GHz, Horizontal]**

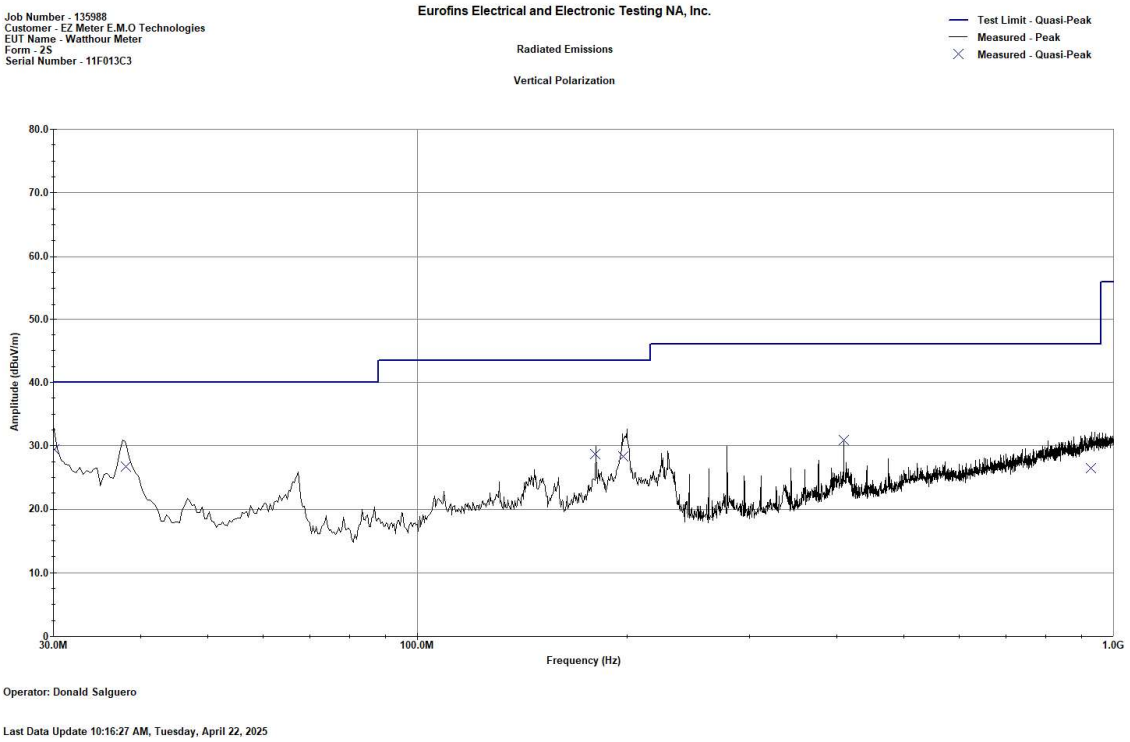


**Figure 33 - Test 27, REE, Prescan [2S, SN 11F013C3, 30MHz - 1GHz, Vertical]**

| | | | Customer | Form | Serial Number | 1 GHz to 5 GHz | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | EZ Meter E.M.O Technologies | 2S | 11F013C3 | Average | | | |
| **Frequency** | **Polarity** | **Antenna Height** | **Turntable Position** | **Measured** | **Correction Factor** | **Corrected Reading** | **Limit** | **Margin** | **Results** |
| **MHz** | **Horizontal/Vertical** | **cm** | **Degrees** | **dBµV** | **dB** | **dBµV/m** | **dBµV/m** | **dB** | **Pass/Fail** |
| 1.27 | H | 277.00 | 276.40 | 35.73 | -8.58 | 27.15 | 54.00 | -26.85 | PASS |
| 1.90 | H | 202.00 | 172.90 | 33.69 | 0.27 | 33.96 | 54.00 | -20.04 | PASS |
| 2.49 | H | 275.00 | 5.80 | 32.20 | -4.28 | 27.91 | 54.00 | -26.09 | PASS |
| 2.95 | H | 128.00 | 282.10 | 30.99 | -3.47 | 27.51 | 54.00 | -26.49 | PASS |
| 3.87 | H | 116.00 | 266.60 | 29.32 | -1.72 | 27.60 | 54.00 | -26.40 | PASS |
| 4.45 | H | 162.00 | 186.30 | 28.35 | -0.28 | 28.07 | 54.00 | -25.93 | PASS |
| 1.25 | V | 125.00 | 37.00 | 35.60 | -8.51 | 27.09 | 54.00 | -26.91 | PASS |
| 1.93 | V | 228.00 | 23.10 | 33.01 | -0.41 | 32.60 | 54.00 | -21.40 | PASS |
| 2.50 | V | 241.00 | 319.10 | 31.93 | -4.11 | 27.82 | 54.00 | -26.18 | PASS |
| 3.30 | V | 182.00 | 53.30 | 29.87 | -2.24 | 27.63 | 54.00 | -26.37 | PASS |
| 3.82 | V | 204.00 | 110.80 | 29.47 | -1.66 | 27.81 | 54.00 | -26.19 | PASS |
| 4.39 | V | 178.00 | 311.80 | 28.21 | -0.36 | 27.85 | 54.00 | -26.15 | PASS |

**Table 150 - Test 27, REE, Data, 2S, SN 11F013C3, 1 GHz to 5 GHz, Average**

| | | | Customer | Form | Serial Number | 1 GHz to 5 GHz | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | EZ Meter E.M.O Technologies | 2S | 11F013C3 | Peak | | | |
| **Frequency** | **Polarity** | **Antenna Height** | **Turntable Position** | **Measured** | **Correction Factor** | **Corrected Reading** | **Limit** | **Margin** | **Results** |
| **MHz** | **Horizontal/Vertical** | **cm** | **Degrees** | **dBµV** | **dB** | **dBµV/m** | **dBµV/m** | **dB** | **Pass/Fail** |
| 1.27 | H | 277.00 | 276.40 | 48.13 | -8.58 | 39.54 | 74.00 | -34.46 | PASS |
| 1.90 | H | 202.00 | 172.90 | 46.48 | 0.27 | 46.75 | 74.00 | -27.25 | PASS |
| 2.49 | H | 275.00 | 5.80 | 44.88 | -4.28 | 40.60 | 74.00 | -33.40 | PASS |
| 2.95 | H | 128.00 | 282.10 | 43.62 | -3.47 | 40.15 | 74.00 | -33.85 | PASS |
| 3.87 | H | 116.00 | 266.60 | 41.28 | -1.72 | 39.57 | 74.00 | -34.43 | PASS |
| 4.45 | H | 162.00 | 186.30 | 40.33 | -0.28 | 40.05 | 74.00 | -33.95 | PASS |
| 1.25 | V | 125.00 | 37.00 | 47.32 | -8.50 | 38.82 | 74.00 | -35.18 | PASS |
| 1.93 | V | 228.00 | 23.10 | 46.08 | -0.41 | 45.67 | 74.00 | -28.33 | PASS |
| 2.50 | V | 241.00 | 319.10 | 44.01 | -4.11 | 39.89 | 74.00 | -34.11 | PASS |
| 3.30 | V | 182.00 | 53.30 | 41.98 | -2.24 | 39.74 | 74.00 | -34.26 | PASS |
| 3.82 | V | 204.00 | 110.80 | 41.56 | -1.66 | 39.90 | 74.00 | -34.10 | PASS |
| 4.39 | V | 178.00 | 311.80 | 40.33 | -0.35 | 39.98 | 74.00 | -34.03 | PASS |

**Table 151 - Test 27, REE, Data, 2S, SN 11F013C3, 1 GHz to 5 GHz, Peak**


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| | | | Customer | Form | Serial Number | 30 MHz to 1GHz | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | EZ Meter E.M.O Technologies | 2S | 11F013C3 | QP | | | |
| **Frequency** | **Polarity** | **Antenna Height** | **Turntable Position** | **Measured** | **Correction Factor** | **Corrected Reading** | **Limit** | **Margin** | **Results** |
| **MHz** | **Horizontal/Vertical** | **cm** | **Degrees** | **dBµV** | **dB** | **dBµV/m** | **dBµV/m** | **dB** | **Pass/Fail** |
| 30.36 | H | 343.73 | 20.70 | -3.63 | 26.89 | 23.26 | 40.00 | -16.74 | PASS |
| 245.73 | H | 107.91 | 65.30 | 13.04 | 18.04 | 31.08 | 46.00 | -14.92 | PASS |
| 262.18 | H | 107.39 | 78.30 | 11.22 | 18.83 | 30.05 | 46.00 | -15.95 | PASS |
| 278.51 | H | 106.17 | 65.10 | 15.49 | 19.83 | 35.32 | 46.00 | -10.68 | PASS |
| 311.32 | H | 107.69 | 91.00 | 14.71 | 20.48 | 35.19 | 46.00 | -10.81 | PASS |
| 783.03 | H | 320.43 | 106.30 | -3.63 | 28.98 | 25.36 | 46.00 | -20.64 | PASS |
| 30.12 | V | 104.52 | 111.60 | 3.47 | 25.93 | 29.40 | 40.00 | -10.60 | PASS |
| 38.16 | V | 106.08 | 23.10 | 7.36 | 19.38 | 26.74 | 40.00 | -13.26 | PASS |
| 180.24 | V | 176.95 | 110.90 | 11.58 | 17.11 | 28.69 | 43.50 | -14.81 | PASS |
| 197.40 | V | 107.95 | -0.30 | 9.97 | 18.28 | 28.24 | 43.50 | -15.26 | PASS |
| 409.62 | V | 107.47 | 22.80 | 8.50 | 22.35 | 30.85 | 46.00 | -15.15 | PASS |
| 928.93 | V | 382.17 | 68.20 | -3.56 | 30.02 | 26.46 | 46.00 | -19.54 | PASS |

**Table 152 - Test 27, REE, Data, 2S, SN 11F013C3, 30 MHz to 1 GHz**


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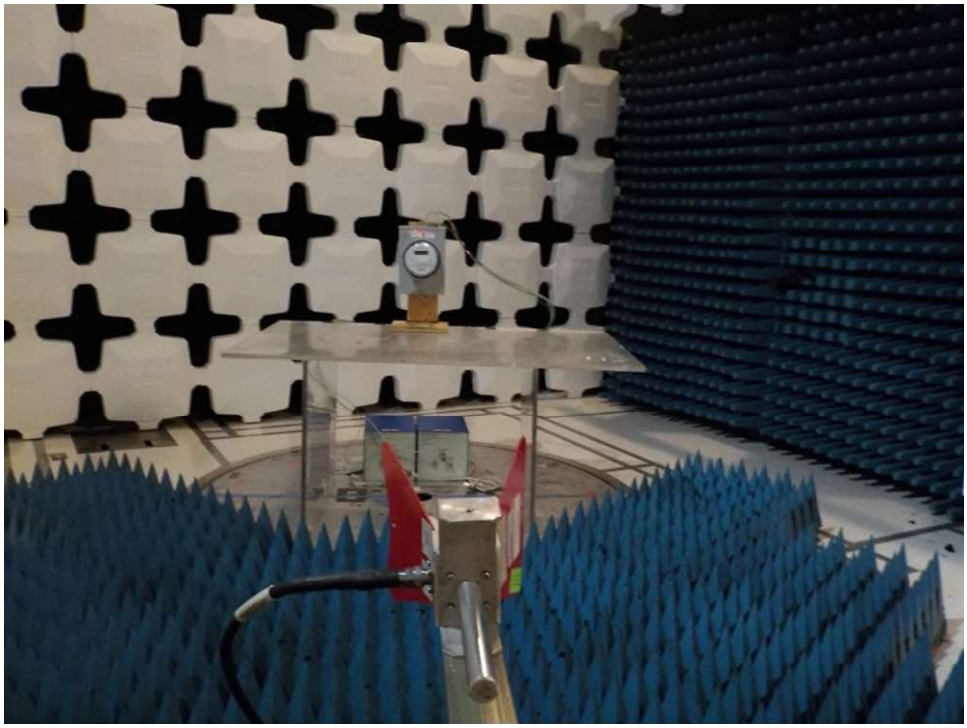
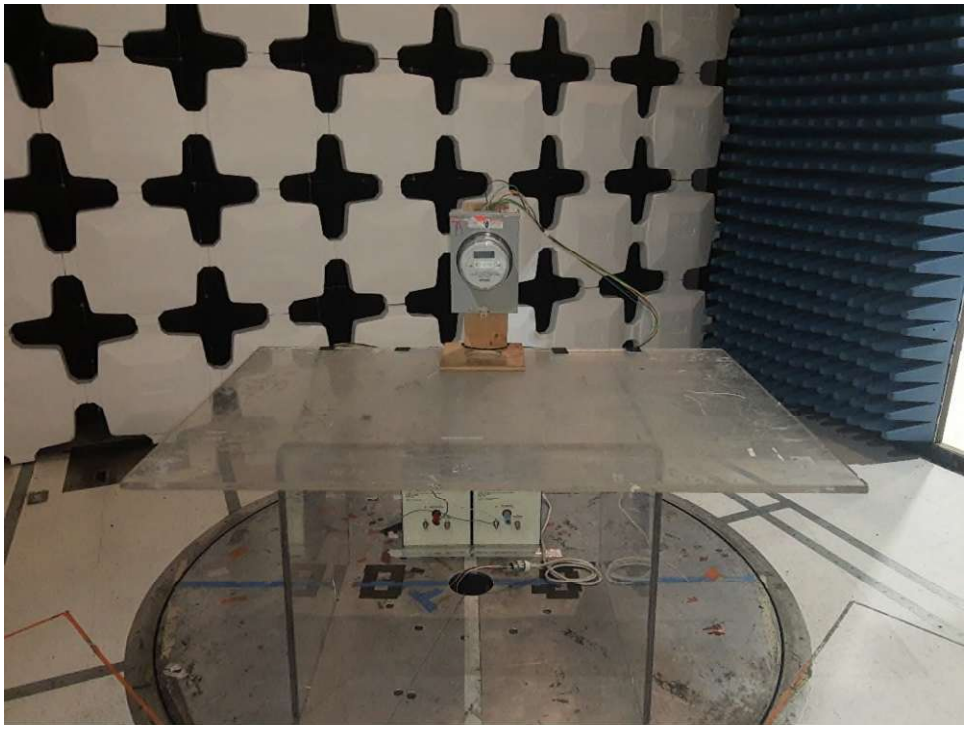
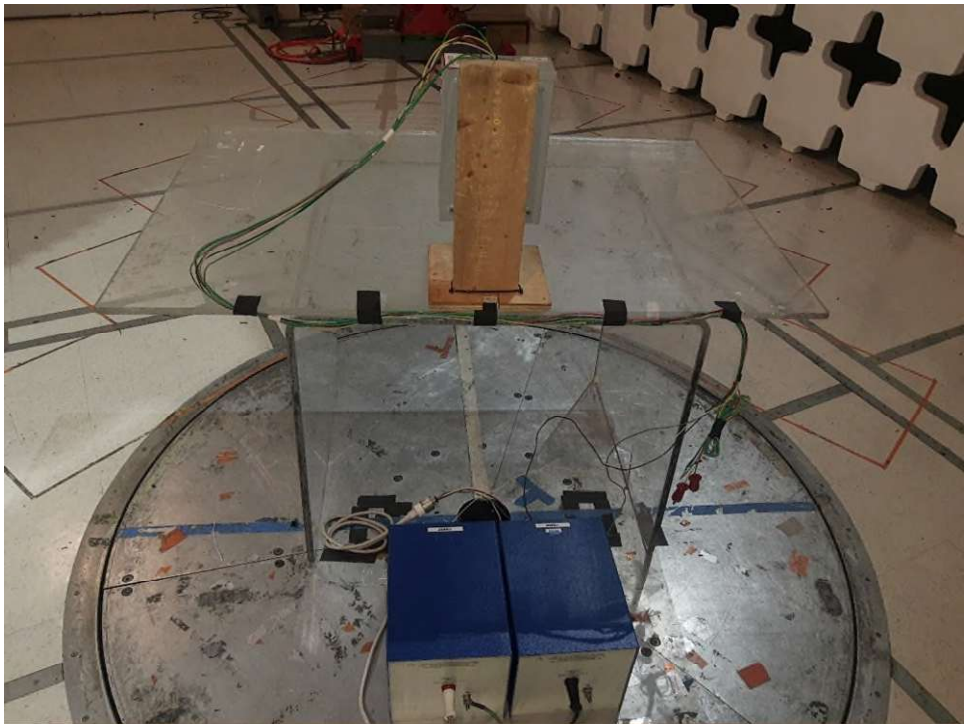
**Photograph 37 - Test 27, REE, Test Setup [30MHz - 1GHz]**



**Photograph 38 - Test 27, REE, Test Setup [1GHz - 5GHz]**



**Photograph 39 - Test 27, REE, Test Setup [Front]**



**Photograph 40 - Test 27, REE, Test Setup [Rear]**

### 6.27.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Radiated Emissions Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 1T4409 | EMI Receiver | Rohde & Schwarz | ESIB7 | 100207 | 11/25/2024 | 5/31/2026 |
| 1T4753 | Antenna - Bilog | Sunol Sciences | JB6 | A110310 | 12/5/2023 | 6/30/2025 |
| 1T4300 | SEMI-ANECHOIC CHAMBER (NSA) | EMC TEST SYSTEMS | NONE | NONE | 8/31/2023 | 8/31/2025 |
| 1T4300B | Semi-Anechoic 3m Chamber sVSWR | EMC TEST SYSTEMS | NONE | NONE | 2/12/2024 | 2/12/2026 |
| 1T9999 | Thermometer/ Hygrometer | VWR International | 36934-164 | 230368599 | 5/31/2023 | 5/31/2025 |
| 1T4757 | Antenna; Horn | ETS-Lindgren | 3117 | 123516 | 7/24/2023 | 1/31/2025 |
| 1T8743 | Preamplifier | A.H. Systems, Inc. | PAM-0118P | 419 | Functionally Verified | Functionally Verified |

**Table 153 - Test 27, REE, Equipment List**

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

## 6.28 Test No. 28: Effect of Electrostatic Discharge (ESD)

### 6.28.1 Test Requirement(s)

This test shall be carried out according to IEC 61000-4-2, under the following conditions:

a. Test severity level: 4
b. Contact discharge voltage (1): 8 kV
c. Contact discharge locations
   - Socket Base: Mounting device cover to the right, left, top, and bottom of meter (it is acceptable to remove surface coating at contact points)
   - A-Base: Ground plane mounting surface to the right, left, and top of meter
d. Air discharge voltage (2): 15 kV
e. Air discharge locations
   - Socket Base: On meter cover right, left, top, bottom, and face
   - A-Base: On meter cover right, left, top, bottom, and face
f. Number of discharges: 10 per discharge location (5 positive, 5 negative)
g. Voltage and auxiliary circuits energized with reference voltage
h. Without any current in the current circuits and the current terminals shall be open circuit

Discharges shall be applied only to such points and surfaces of the meter that are normally accessible with the cover (and terminal compartment cover when applicable) in place. Discharges shall not be applied to any point that is accessible only for maintenance purposes, including, but not limited to, the meter terminals or the conductors connected to the terminals.

All metering functions shall be operating during test. Metering functions may include: demand, real-time clock, time of use, load profile, reactive, etc.

This test shall be conducted on all meters excluding LED voltage indicators.

An Accuracy Performance Check shall be performed (4.7.3.0.1 of ANSI C12.1: 2024).

Note (1): Contact discharges shall be applied on conductive surfaces.
Note (2): Air discharges shall be applied on non-conductive surfaces.

### 6.28.2 Test Data and Results

The meters listed below are **compliant** with the requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C3 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C5 |
| Form 12S | CL200 | 120V/208V | 60Hz | SN 11F004CA |

Refer to the following test data and photographs for a complete overview of the test setup and results.

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| Performance Verification (External Influences) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 20.5 | | | | | |
| **Engineer** | William Yip | **Humidity (RH)** | 57.0% | | | | | |
| **Test Date** | 5/6/2025-5/7/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C3 | | | | | | | |

**Before Test**

| Condition | Voltage (VAC) | Frequency (Hz) | Current (A) | Power Factor | Accuracy Percentage (As Reference) | Percent Error Before Test | Before Test Limit from Zero | Result |
|---|---|---|---|---|---|---|---|---|
| **Full Load** | 240 | 60 | 30 | 1.0 | 100.002 | 0.002 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 100.004 | 0.004 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.996 | -0.004 | ± 0.2 % | Pass |

**After Test**

| Condition | Voltage (VAC) | Frequency (Hz) | Current (A) | Power Factor | Accuracy Percentage | % Deviation From Reference After Test | After Test Deviation Limit From Reference | Result |
|---|---|---|---|---|---|---|---|---|
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.994 | 0.008 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.991 | 0.013 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.995 | 0.001 | ± 0.2 % | Pass |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C5 | | | | | | | |

**Before Test**

| Condition | Voltage (VAC) | Frequency (Hz) | Current (A) | Power Factor | Accuracy Percentage (As Reference) | Percent Error Before Test | Before Test Limit from Zero | Result |
|---|---|---|---|---|---|---|---|---|
| **Full Load** | 240 | 60 | 30 | 1.0 | 99.970 | -0.030 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.993 | -0.007 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 100.040 | 0.040 | ± 0.2 % | Pass |

**After Test**

| Condition | Voltage (VAC) | Frequency (Hz) | Current (A) | Power Factor | Accuracy Percentage | % Deviation From Reference After Test | After Test Deviation Limit From Reference | Result |
|---|---|---|---|---|---|---|---|---|
| **Full Load** | 240 | 60 | 30 | 1.0 | 100.007 | -0.037 | ± 0.2 % | Pass |
| **Light Load** | 240 | 60 | 3 | 1.0 | 99.996 | -0.003 | ± 0.2 % | Pass |
| **Power Factor** | 240 | 60 | 30 | 0.5 Lag | 99.997 | 0.043 | ± 0.2 % | Pass |


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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Meter Form** | 12S | | | | | | |
| **Current Class** | 200 | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | |
| **Serial Number** | 11F004CA | | | | | | |

| **Before Test** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage (As Reference)** | **Percent Error Before Test** | **Before Test Limit from Zero** | **Result** |
| **Full Load** | 120 | 60 | | 1.0 | 99.993 | -0.007 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 0 | 1.0 | 99.995 | -0.005 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 0 | 0.5 Lag | 99.997 | -0.003 | ± 0.2 % | Pass |

| **After Test** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Condition** | **Voltage (VAC)** | **Frequency (Hz)** | **Current (A)** | **Power Factor** | **Accuracy Percentage** | **% Deviation From Reference After Test** | **After Test Deviation Limit From Reference** | **Result** |
| **Full Load** | 120 | 60 | 0 | 1.0 | 99.999 | -0.006 | ± 0.2 % | Pass |
| **Light Load** | 120 | 60 | 0 | 1.0 | 100.007 | -0.012 | ± 0.2 % | Pass |
| **Power Factor** | 120 | 60 | 0 | 0.5 Lag | 100.036 | -0.039 | ± 0.2 % | Pass |

**Table 154 - Test 28, ESD, Performance Verification - External Influences**

| Electrostatic Discharge Datasheet | | | |
|---|---|---|---|
| **Project Number** | 135988 | **Temperature** | 20.5°C |
| **Engineer** | William Yip | **Relative Humidity** | 58% |
| **Test Date** | 5/7/2025 | **Barometric Pressure** | 1012mb |
| **Meter Form** | 12S | **Test Voltage** | 120 V L-N / 208V L-L |
| **Current Class** | CL200 | **Observations** | N/A |
| **Serial Number** | 11F004CA | **Notes** | 10 per discharge location (5 positive and 5 negative) |
| **Voltage and auxiliary circuits energized without current.** | | | |

| Discharge Type | Test Level | Test Point on Socket Base | Results / Observations |
|---|---|---|---|
| **Air / Contact** | **kV** | | |
| Contact | ± 8 | mounting device cover to right side | Pass, no anomalies detected. |
| Contact | ± 8 | mounting device cover to left side | Pass, no anomalies detected. |
| Contact | ± 8 | mounting device cover to top side | Pass, no anomalies detected. |
| Contact | ± 8 | mounting device cover to bottom side | Pass, no anomalies detected. |
| Air | ± 15 | on meter cover to right side | Pass, no anomalies detected. |
| Air | ± 15 | on meter cover to left side | Pass, no anomalies detected. |
| Air | ± 15 | on meter cover to top side | Pass, no anomalies detected. |
| Air | ± 15 | on meter cover to bottom side | Pass, no anomalies detected. |
| Air | ± 15 | on meter cover to face side | Pass, no anomalies detected. |

| Performance Verification and Test Results | | | |
|---|---|---|---|
| **Register Reading Before Test (Wh)** | 8244 | **ACD Verification Before Test** | Passed |
| **Register Reading After Test (Wh)** | 8244 | **ACD Verification After Test** | Passed |
| **Difference In Reading (Wh)** | 0 | **Test Results** | Passed |

**Table 155 - Test 28, ESD, 12S SN 11F004CA**


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| Electrostatic Discharge Datasheet | | | |
|---|---|---|---|
| **Project Number** | 135988 | **Temperature** | 20.5°C |
| **Engineer** | William Yip | **Relative Humidity** | 58% |
| **Test Date** | 5/7/2025 | **Barometric Pressure** | 1012mb |
| **Meter Form** | 2S | **Test Voltage** | 240V L-L |
| **Current Class** | CL200 | **Observations** | N/A |
| **Serial Number** | 11F013C3 | **Notes** | 10 per discharge location (5 positive and 5 negative) |
| **Voltage and auxiliary circuits energized without current.** | | | |

| **Discharge Type** / **Air / Contact** | **Test Level** / **kV** | **Test Point on Socket Base** | **Results / Observations** |
|---|---|---|---|
| Contact | ± 8 | mounting device cover to right side | Pass, no anomalies detected. |
| Contact | ± 8 | mounting device cover to left side | Pass, no anomalies detected. |
| Contact | ± 8 | mounting device cover to top side | Pass, no anomalies detected. |
| Contact | ± 8 | mounting device cover to bottom side | Pass, no anomalies detected. |
| Air | ± 15 | on meter cover to right side | Pass, no anomalies detected. |
| Air | ± 15 | on meter cover to left side | Pass, no anomalies detected. |
| Air | ± 15 | on meter cover to top side | Pass, no anomalies detected. |
| Air | ± 15 | on meter cover to bottom side | Pass, no anomalies detected. |
| Air | ± 15 | on meter cover to face side | Pass, no anomalies detected. |

| **Performance Verification and Test Results** | | | |
|---|---|---|---|
| **Register Reading Before Test (Wh)** | 7160 | **ACD Verification Before Test** | Passed |
| **Register Reading After Test (Wh)** | 7160 | **ACD Verification After Test** | Passed |
| **Difference In Reading (Wh)** | 0 | **Test Results** | Passed |

**Table 156 - Test 28, ESD, 2S SN 11F013C3**


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| Electrostatic Discharge Datasheet | | | |
|---|---|---|---|
| **Project Number** | 135988 | **Temperature** | 20.5°C |
| **Engineer** | William Yip | **Relative Humidity** | 58% |
| **Test Date** | 5/7/2025 | **Barometric Pressure** | 1012mb |
| **Meter Form** | 2S | **Test Voltage** | 240V L-L |
| **Current Class** | CL200 | **Observations** | N/A |
| **Serial Number** | 11F013C5 | **Notes** | 10 per discharge location (5 positive and 5 negative) |
| **Voltage and auxiliary circuits energized without current.** | | | |

| **Discharge Type** / **Air / Contact** | **Test Level** / **kV** | **Test Point on Socket Base** | **Results / Observations** |
|---|---|---|---|
| Contact | ± 8 | mounting device cover to right side | Pass, no anomalies detected. |
| Contact | ± 8 | mounting device cover to left side | Pass, no anomalies detected. |
| Contact | ± 8 | mounting device cover to top side | Pass, no anomalies detected. |
| Contact | ± 8 | mounting device cover to bottom side | Pass, no anomalies detected. |
| Air | ± 15 | on meter cover to right side | Pass, no anomalies detected. |
| Air | ± 15 | on meter cover to left side | Pass, no anomalies detected. |
| Air | ± 15 | on meter cover to top side | Pass, no anomalies detected. |
| Air | ± 15 | on meter cover to bottom side | Pass, no anomalies detected. |
| Air | ± 15 | on meter cover to face side | Pass, no anomalies detected. |

| **Performance Verification and Test Results** | | | |
|---|---|---|---|
| **Register Reading Before Test (Wh)** | 2080 | **ACD Verification Before Test** | Passed |
| **Register Reading After Test (Wh)** | 2080 | **ACD Verification After Test** | Passed |
| **Difference In Reading (Wh)** | 0 | **Test Results** | Passed |

**Table 157 - Test 28, ESD, 2S SN 11F013C5**




**Photograph 41 - Test 28, ESD, Test Setup**



**Photograph 42 - Test 28, ESD, Vertical Coupling Plane**

### 6.28.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 28 Electrostatic Discharge Immunity | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 1T4604 | ESD Simulator | Teseq | NSG-437 | 109 | 4/8/2025 | 4/30/2026 |
| 1T4673 | Horizontal Ground Plane | MET Laboratories | N/A | N/A | Not Required | Not Required |
| 1T4395 | Vertical Coupling Plane | MET Laboratories | N/A | N/A | Not Required | Not Required |
| 1T4725 | ESD Insulation Sheet | NoiseKen | 03-00004A | N/A | Not Required | Not Required |
| 1T10002 | Thermometer/ Hygrometer/ Barometer | Fisher Scientific | 14-650-118 | 240202396 | 3/6/2024 | 3/6/2026 |

**Table 158 - Test 28, ESD, Equipment List**


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## 6.29 Test No. 30: Effect of Operating Temperature

### 6.29.1 Test Requirement(s)

The meter shall operate continuously when exposed to the temperature extremes specified by the manufacturer. As a minimum, $T_{oper\text{-}max}$ of +70°C and $T_{oper\text{-}min}$ of -30°C shall be applied.

a. The meter enclosure door or cover shall be closed (normal operating position) for the duration of the test.
b. The meter shall be powered and operating in a normal manner for the duration of the test.
c. The test duration shall be 168 hours.
d. The temperature shall be cycled once each 24 hours, as described below. The temperature ramping shall be smooth and continuous. The rate of temperature change during ramping shall not exceed 25°C per hour.
e. The daily temperature cycle shall be conducted as follows:
    i. Ramp up from room ambient to the Maximum Operating Temperature, $T_{oper\text{-}max}$, in approximately three hours.
    ii. Soak at $T_{oper\text{-}max}$ for approximately 11 hours.
    iii. Ramp down to Minimum Operating Temperature, $T_{oper\text{-}min}$, in approximately five hours.
    iv. Soak at $T_{oper\text{-}min}$ for approximately three hours.
    v. Ramp up to room ambient in approximately two hours.
    vi. If present, the battery carryover function shall be tested by removing the external power for any 48-hour period during the temperature test.

Available nominal voltage and current can be used for the duration of this test when run independent of any other test. Current during this test should be between light load and class amps.

An Accuracy Performance Check shall be performed (4.7.3.0.1 of ANSI C12.1: 2024).

It is acceptable to perform the Accuracy Performance Check (4.7.3.0.1 of ANSI C12.1: 2024) once after the completion of both the effect of operating temperature test and the effect of relative humidity test.

### 6.29.2 Test Data and Results

Data TBD


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## 6.30 Test No. 31: Effects of Relative Humidity

### 6.30.1 Test Requirement(s)

This test shall be conducted as follows:

a. The meter enclosure door or cover shall be closed (normal operating position) for the duration of the test.
b. The meter shall be powered and operating in a normal manner for the duration of the test.
c. The test duration shall be 24 hours at 85°C and 95% ±4% relative humidity or 72 hours for 40°C and 95% ±4% relative humidity.
d. The temperature shall be cycled once at 85°C and 95% ±4% relative humidity or three times at 40°C and 95% ±4% relative humidity, as described below. The temperature ramping shall be smooth and continuous. The rate of temperature change during the ramping shall not exceed 20°C per hour. The relative humidity shall be held at 95%±4% during the peak temperature soak period. Relative humidity need not be controlled during temperature ramping except to prevent condensation. The mere presence of condensation on meter components and assemblies shall not be construed as a failure of the meter to meet the conditions of this test.
e. Each temperature/humidity cycle shall be conducted as follows:
    1. Ramp up from room ambient to 40°C or 85°C in approximately three hours.
    2. Soak at 95% ±4 relative humidity at 40°C or 85°C for approximately 18 hours.
    3. Ramp down to room ambient in approximately three hours.

Available nominal voltage and current can be used for the duration of this test when run independent of any other test. Current during this test should be between Light Load and Class Amps.

An Accuracy Performance Check shall be performed (4.7.3.0.1 of ANSI C12.1: 2024).

It is acceptable to perform the Accuracy Performance Check (4.7.3.0.1 of ANSI C12.1: 2024) once after the completion of both the effect of operating temperature test and the effect of relative humidity test.

### 6.30.2 Test Data and Results

Data TBD


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## 6.31 Test No. 32: Mechanical Shock

### 6.31.1 Test Requirement(s)

This test shall be conducted as described in IEC 60068-2-27 based on the following conditions:

a. The meter shall not be operating and shall be without packaging.
b. The meter shall be rigidly mounted to a test fixture and the reference point for the control accelerometer shall be attached to the test fixture
c. Half sine pulse applied three times in each direction, for each of the three mutually perpendicular axes, for a total of 18 shocks.
d. Peak acceleration shall be 15g (150m/s$^2$) with a duration of 11ms with a corresponding velocity change of 1.0 m/s.

An Accuracy Performance Check shall be performed (4.7.3.0.1 of ANSI C12.1: 2024).

### 6.31.2 Test Data and Results

Data TBD


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## 6.32 Test No. 33: Transportation Drop

### 6.32.1 Test Requirement(s)

This test follows Test No. 35: Transportation vibration and shall be conducted as described as Shock Testing in the International Safe Transit Association Test Procedure 1A.

a. The meter shall be in its intended final packaging.
b. The meter shall be exposed to 10 drops to a hard floor in accordance with the above referenced ISTA standard.

An Accuracy Performance Check shall be performed (4.7.3.0.1 of ANSI C12.1: 2024).

### 6.32.2 Test Data and Results

Data TBD

## 6.33 Test No. 34: Mechanical Vibration

### 6.33.1 Test Requirement(s)

This test shall be conducted as described in IEC 60068-2-6 with the following conditions.

a. The meter shall not be operating and shall be without packaging.
e. The meter shall be rigidly mounted to a test fixture and the reference point for the control accelerometer shall be attached to the test fixture
b. The test shall be run over a frequency range of 30 to 350 Hz, with a sweep time of one octave per minute at 5 $m/s^2$ (0.5g) along each of three mutually perpendicular axes.
c. The sweep duration shall be 30 minutes along each axis.

An Accuracy Performance Check shall be performed (4.7.3.0.1 of ANSI C12.1: 2024).

### 6.33.2 Test Data and Results

Data TBD


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## 6.34 Test No. 35: Transportation Vibration

### 6.34.1 Test Requirement(s)

This test exposes the meter, packaged for shipment, to transportation vibration for approximately one hour.

This test shall be done on the same meters and the same packaging as Test No. 33 and shall be done before Test No. 33. The meter packaged in its intended packaging container shall pass the requirements described as Vibration Testing in the International Safe Transit Association Test Procedure 1A.

### 6.34.2 Test Data and Results

Data TBD


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## 6.35 Test No. 36: Weather Simulation Test

### 6.35.1 Test Requirement(s)

This test is intended for devices used in outdoor applications. The meter shall be in a normal operating condition (cover on, etc.), but not powered. The meter shall be mounted in the normal operating orientation in the weathering apparatus with the side normally exposed to the weather facing the test chamber light source and water spray. Meters shall be tested in a suitable mounting device with the conduit holes sealed against moisture. Meters shall then be subjected to a series of two-hour weathering cycles for a total of 14 days in accordance with Exposure Condition 1 of Table X3.1 of the 2005 edition of ASTM G155:

a. Each two-hour cycle shall consist of 102 minutes of light exposure followed by 18 minutes of both light and water spray.
b. The light source shall be a xenon-arc lamp utilizing borosilicate glass inner and outer optical filters to simulate the spectral power distribution of natural daylight. The irradiance measured at 340 nm shall be maintained at 0.35 $W/m^2$ throughout the test. During the light-only portion of the cycle, the black panel temperature shall be maintained at 63°C.
c. The water spray shall be applied to the meters under test using spray nozzles adjusted so that water is sprayed onto the surfaces on the test samples that are normally exposed to the weather.

After this test, covers, terminal covers, etc., shall be readily removable. There shall be no progressive corrosion or electrolytic action that will adversely affect the functioning of any part of the meter. Also, there shall be no evidence of deleterious discoloration or fading of finishes or materials. The time, program, and register reading requirement of 4.7.3 (of ANSI C12.1: 2024) shall not apply.

### 6.35.2 Test Data and Results

Data TBD


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## 6.36 Test No. 37: Salt-Spray Test

### 6.36.1 Test Requirement(s)

This test is intended for devices used in outdoor applications. The meter shall be mounted in its normal operating position in a salt-spray chamber and subjected to a 25-hour salt-spray test in accordance with ASTM B117. The meter shall be tested with a suitable mounting device with the conduit holes sealed against moisture.

After this test, covers, terminal covers, etc., shall be readily removable. There shall be no progressive corrosion or electrolytic action that will adversely affect the functioning of any part of the apparatus. The time, program, and register reading requirement of 4.7.3 (of ANSI C12.1: 2024) shall not apply.

### 6.36.2 Test Data and Results

Data TBD


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## 6.37 Test No. 38: Rain-tightness

### 6.37.1 Test Requirement(s)

When mounted in its normal operating position in or on a mounting device intended for outdoor installation, a meter shall meet the requirements of Section 4.3.2, Enclosures (of ANSI C12.1: 2024), when subject to the test described in NEMA 250, Rain Test. The time, program, and register reading requirement of 4.7.3 (of ANSI C12.1: 2024) shall not apply.

### 6.37.2 Test Data and Results

Data TBD


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## 6.38 Test No. 39: 90 Degree Phase Fired Waveform

### 6.38.1 Test Requirement(s)

This test shall be performed at a voltage of $V_{ref}$ sinusoidal. The energy and current shall first be measured with a sinusoidal current waveform of amplitude ($I_{ref}$). A second measurement shall then be performed with the same voltage waveform, but the current waveform replaced by the 90-degree phase fired waveform of Figure 34.

In the test waveform, the current ($I_{test}$) is zero from 0 to 90 degrees, two times $I_{ref}$ from 90 to 180 degrees, zero from 180 to 270 degrees, and two times $I_{ref}$ from 270 to 360 degrees. Refer to Appendix F for details regarding various methods of generating this waveform and accuracy requirements.

For meters equipped with an ACD, this test should be conducted with the ACD in the dormant state. See 4.5.6.7 of ANSI C12.1: 2024 for ACD test options.

The effect of the harmonic influence using the 90-degree phase fired waveform upon the performance of a meter shall not exceed the specifications listed in Table 159.

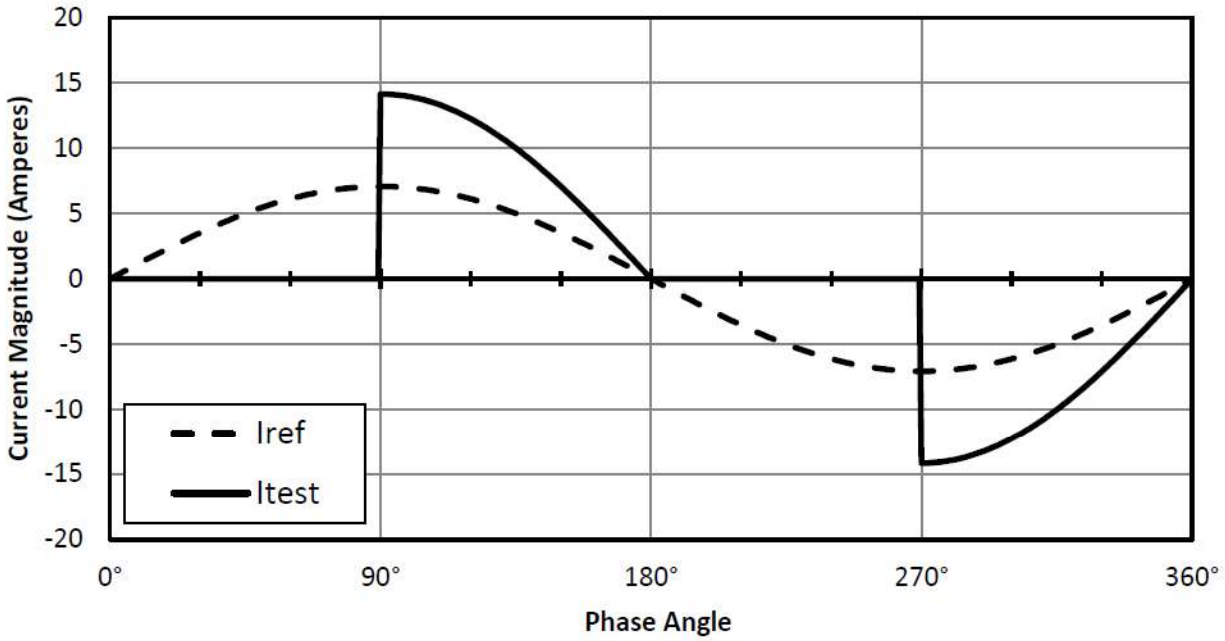


**Figure 34 - 90 Degree Phase Fired Waveform**


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| Condition | Voltage Waveform | Current Waveform | Maximum Deviation in Percent from Reference Performance | | |
|---|---|---|---|---|---|
| | | | Accuracy Class | | |
| | | | 0.5 | 0.2 | 0.1 |
| (1) | $V_{ref}$ Sinusoidal | $L_{ref}$ Sinusoidal | Reference | Reference | Reference |
| (2) | $V_{ref}$ Sinusoidal | 90 Degree Phase Fired Waveform | ±0.5% | ±0.3% | ±0.2% |

**Table 159 - Effect of Harmonic Influence: 90 Degree Phase Fired Current Waveform Performance Requirements**

Note: The measured value of demand for Condition (2) should be the same as the value of Condition (1).

## 6.38.2 Test Data and Results

The meters listed below are **compliant** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120V | 60Hz | SN 11F00911 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C5 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C7 |

Refer to the following test data and photographs for a complete overview of the test setup and results.


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| Test No. 39: 90 Degree Phase Fired Waveform | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 32.0% | | | | | |
| **Test Date** | 4/22/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F00911 | | | | | | | |

| Test | Voltage | Amps | Power Factor | Frequency | % Registration | % Error | Limit from Zero Error | Result |
|---|---|---|---|---|---|---|---|---|
| (1) - Reference | 120 | 30 | 1.0 | 60 | 100.000 | Reference | Reference | Reference |
| (2) | 120 | 30<br>90 degree phase fired | 1.0 | 60 | 100.074 | 0.074 | +/- 0.3% | Pass |

**Table 160 - Test 39 90 Degree Phase Fired Waveform (0.2), 12S SN 11F00911**

| Test No. 39: 90 Degree Phase Fired Waveform | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | William Yip | **Humidity (RH)** | 32.0% | | | | | |
| **Test Date** | 4/22/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C5 | | | | | | | |

| Test | Voltage | Amps | Power Factor | Frequency | % Registration | % Error | Limit from Zero Error | Result |
|---|---|---|---|---|---|---|---|---|
| (1) - Reference | 240 | 30 | 1.0 | 60 | 99.940 | Reference | Reference | Reference |
| (2) | 240 | 30<br>90 degree phase fired | 1.0 | 60 | 99.950 | 0.010 | +/- 0.3% | Pass |

**Table 161 - Test 39 90 Degree Phase Fired Waveform (0.2), 2S SN 11F013C5**

| Test No. 39: 90 Degree Phase Fired Waveform | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 32.0% | | | | | |
| **Test Date** | 4/22/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C7 | | | | | | | |

| Test | Voltage | Amps | Power Factor | Frequency | % Registration | % Error | Limit from Zero Error | Result |
|---|---|---|---|---|---|---|---|---|
| (1) - Reference | 240 | 30 | 1.0 | 60 | 99.935 | Reference | Reference | Reference |
| (2) | 240 | 30<br>90 degree phase fired | 1.0 | 60 | 99.980 | 0.045 | +/- 0.3% | Pass |

**Table 162 - Test 39 90 Degree Phase Fired Waveform (0.2), 2S SN 11F013C7**


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**Photograph 43 - Test 39 90 Degree Phase Fired Waveform, Test Setup**

### 6.38.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 39: 90 Degree Phase Fired Waveform Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 4T1512 | WECO Meter Accuracy Tester w/ internal Radian st | Radian | WECO M4330X; Radian RX-30 | WECO: W8839; Radian: 710257 | N/A | 5/30/2026 |
| 1T9999 | Thermometer/ Hygrometer | VWR International | 36934-164 | 230368599 | 5/31/2023 | 5/31/2025 |

**Table 163 - Test 39 90 Degree Phase Fired Waveform, Equipment List**


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## 6.39 Test No. 40: Quadriform Waveform

### 6.39.1 Test Requirement(s)

Two measurements are made as part of this test: (1) sinusoidal voltage with harmonic current; and (2) harmonic voltage and harmonic current. The harmonic voltage and currents are defined in Table 164.

For meters equipped with an ACD, this test should be conducted with the ACD in the dormant state. See 4.5.6.7 of ANSI C12.1: 2024 for ACD test options.

The effect of the harmonic influence using the Quadriform waveform upon the performance of a meter shall not exceed the specifications listed in Table 165.

| Harmonic | Voltage Amplitude % $V_{ref}$ | Phase | Current Amplitude % $I_{ref}$ | Phase | Demand |
|---|---|---|---|---|---|
| 1 | 100 | 0 | 100 | 0 | 100.000 |
| 3 | 3.8 | 180 | 30 | 0 | -1.140 |
| 5 | 2.4 | 180 | 18 | 0 | -0.432 |
| 7 | 1.7 | 180 | 14 | 0 | -0.238 |
| 11 | 1.1 | 180 | 9 | 0 | -0.099 |
| 13 | 0.8 | 180 | 5 | 0 | -0.040 |
| Total Demand | | | | | 98.051 |

**Table 164 - Quadriform Waveform**

| Condition | Voltage Waveform | Current Waveform | Maximum Deviation in Percent from Reference Performance | | |
|---|---|---|---|---|---|
| | | | Accuracy Class | | |
| | | | 0.5 | 0.2 | 0.1 |
| (1) | $V_{ref}$ Sinusoidal | $L_{ref}$ Sinusoidal | Reference | Reference | Reference |
| (2) | $V_{ref}$ Sinusoidal | Quadriform Current Waveform | ±0.5% | ±0.3% | ±0.2% |
| (3) | Quadriform Voltage Waveform | Quadriform Current Waveform | ±0.8% | ±0.5% | ±0.3% |

**Table 165 - Effect of Harmonic Influence: Quadriform Waveform Performance Requirements**

Note: The measured value of demand for Condition (3) should be 0.98051 times the value of Condition (2).


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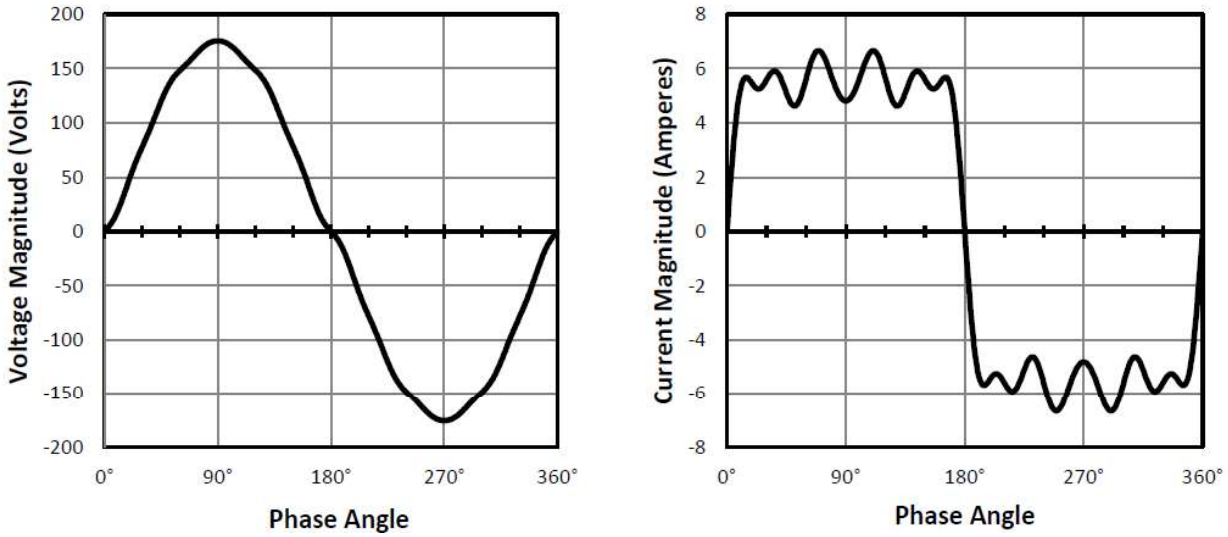


**Figure 35 - Quadriform Waveform**

## 6.39.2 Test Data and Results

The meters listed below are **compliant** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120V | 60Hz | SN 11F00911 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C5 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C7 |

Refer to the following test data and photographs for a complete overview of the test setup and results.


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| Test No. 40: Quadriform Waveform | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 32.0% | | | | | |
| **Test Date** | 4/22/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F00911 | | | | | | | |

| Test | Voltage | Amps | Power Factor | Frequency | % Registration | % Error | Limit from Zero Error | Result |
|---|---|---|---|---|---|---|---|---|
| (1) - Reference | 120 | 30 | 1.0 | 60 | 100.000 | Reference | Reference | Reference |
| (2) | 120 | Quadriform Current Waveform | 1.0 | 60 | 100.001 | 0.001 | +/- 0.3% | Pass |
| (3) | Quadriform Voltage Waveform | Quadriform Current Waveform | 1.0 | 60 | 99.995 | -0.005 | +/- 0.5% | Pass |

**Table 166 - Test 40 Quadriform Waveform (Class 0.2), 12S SN 11F00911**

| Test No. 40: Quadriform Waveform | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | William Yip | **Humidity (RH)** | 32.0% | | | | | |
| **Test Date** | 4/22/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C5 | | | | | | | |

| Test | Voltage | Amps | Power Factor | Frequency | % Registration | % Error | Limit from Zero Error | Result |
|---|---|---|---|---|---|---|---|---|
| (1) - Reference | 240 | 30 | 1.0 | 60 | 99.944 | Reference | Reference | Reference |
| (2) | 240 | Quadriform Current Waveform | 1.0 | 60 | 99.943 | -0.001 | +/- 0.3% | Pass |
| (3) | Quadriform Voltage Waveform | Quadriform Current Waveform | 1.0 | 60 | 99.742 | -0.202 | +/- 0.5% | Pass |

**Table 167 - Test 40 Quadriform Waveform (Class 0.2), 2S SN 11F013C5**


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| Test No. 40: Quadriform Waveform | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | Steven Lu | | **Humidity (RH)** | 32.0% | | | | | |
| **Test Date** | 4/22/2025 | | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | | |
| **Current Class** | 200 | | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | | |
| **Serial Number** | 11F013C7 | | | | | | | | |
| **Test** | **Voltage** | **Amps** | **Power Factor** | **Frequency** | **% Registration** | **% Error** | **Limit from Zero Error** | **Result** | |
| (1) - Reference | 240 | 30 | 1.0 | 60 | 99.938 | Reference | Reference | Reference | |
| (2) | 240 | Quadriform Current Waveform | 1.0 | 60 | 99.942 | 0.004 | +/- 0.3% | Pass | |
| (3) | Quadriform Voltage Waveform | Quadriform Current Waveform | 1.0 | 60 | 99.936 | -0.002 | +/- 0.5% | Pass | |

**Table 168 - Test 40 Quadriform Waveform (Class 0.2), 2S SN 11F013C7**


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**Photograph 44 - Test 40 Quadriform Waveform, Test Setup**

### 6.39.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No. 40 Quadriform Waveform Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 4T1512 | WECO Meter Accuracy Tester w/ internal Radian st | Radian | WECO M4330X; Radian RX-30 | WECO: W8839; Radian: 710257 | N/A | 5/30/2026 |
| 1T9999 | Thermometer/ Hygrometer | VWR International | 36934-164 | 230368599 | 5/31/2023 | 5/31/2025 |

**Table 169 - Test 40 Quadriform Waveform, Equipment List**


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## 6.40 Test No. 41: Peaked Waveform

### 6.40.1 Test Requirement(s)

Two measurements are made as part of this test: (1) sinusoidal voltage with harmonic current; and (2) harmonic voltage and harmonic current. The harmonic voltage and currents are defined in Table 170.

For meters equipped with an ACD, this test should be conducted with the ACD in the dormant state. See 4.5.6.7 of ANSI C12.1: 2024 for ACD test options.

The effect of the harmonic influence using the peaked waveform upon the performance of a meter shall not exceed the specifications listed in Table 171.

| Harmonic | Voltage Amplitude % $V_{ref}$ | Phase | Current Amplitude % $I_{ref}$ | Phase | Demand |
|---|---|---|---|---|---|
| 1 | 100 | 0 | 100 | 0 | 100.000 |
| 3 | 3.8 | 180 | 30 | 0 | -1.140 |
| 5 | 2.4 | 180 | 18 | 0 | -0.432 |
| 7 | 1.7 | 180 | 14 | 0 | -0.238 |
| 11 | 1.1 | 180 | 9 | 0 | -0.099 |
| 13 | 0.8 | 180 | 5 | 0 | -0.040 |
| Total Demand | | | | | 98.051 |

**Table 170 - Peaked Waveform**

| Condition | Voltage Waveform | Current Waveform | Maximum Deviation in Percent from Reference Performance | | |
|---|---|---|---|---|---|
| | | | Accuracy Class | | |
| | | | 0.5 | 0.2 | 0.1 |
| (1) | $V_{ref}$ Sinusoidal | $I_{ref}$ Sinusoidal | Reference | Reference | Reference |
| (2) | $V_{ref}$ Sinusoidal | Peaked Current Waveform | ±0.5% | ±0.3% | ±0.2% |
| (3) | Peaked Voltage Waveform | Peaked Current Waveform | ±0.8% | ±0.5% | ±0.3% |

**Table 171 - Effect of Harmonic Influence: Peaked Waveform Performance Requirements**

Note: The measured value of demand for Condition (3) should be 0.98051 times the value of Condition (2).

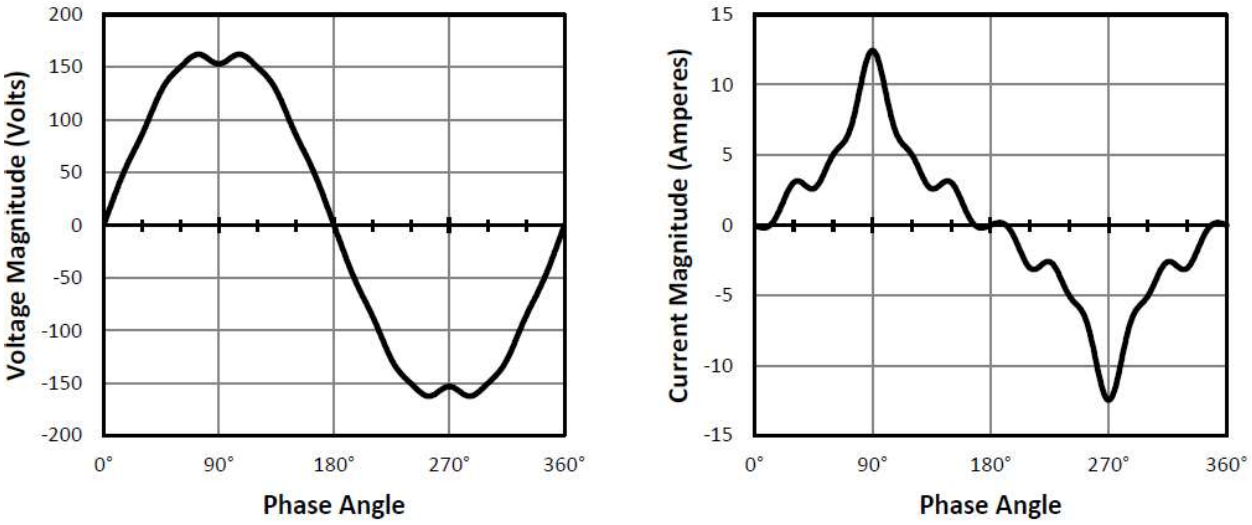


**Figure 36 - Peaked Waveform**

## 6.40.2 Test Data and Results

The meters listed below are **compliant** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120V | 60Hz | SN 11F00911 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C5 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C7 |

Refer to the following test data and photographs for a complete overview of the test setup and results.


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| Test No. 41: Peaked Waveform | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 32.0% | | | | | |
| **Test Date** | 4/22/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F00911 | | | | | | | |

| Test | Voltage | Amps | Power Factor | Frequency | % Registration | % Error | Limit from Zero Error | Result |
|---|---|---|---|---|---|---|---|---|
| (1) - Reference | 120 | 30 | 1.0 | 60 | 99.999 | Reference | Reference | Reference |
| (2) | 120 | Peaked Voltage Waveform | 1.0 | 60 | 99.993 | -0.006 | +/- 0.3% | Pass |
| (3) | Peaked Voltage Waveform | Peaked Voltage Waveform | 1.0 | 60 | 100.004 | 0.005 | +/- 0.5% | Pass |

**Table 172 - Test 41 Peaked Waveform (Class 0.2), 12S SN 11F00911**

| Test No. 41: Peaked Waveform | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | William Yip | **Humidity (RH)** | 32.0% | | | | | |
| **Test Date** | 4/22/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C5 | | | | | | | |

| Test | Voltage | Amps | Power Factor | Frequency | % Registration | % Error | Limit from Zero Error | Result |
|---|---|---|---|---|---|---|---|---|
| (1) - Reference | 240 | 30 | 1.0 | 60 | 99.947 | Reference | Reference | Reference |
| (2) | 240 | Peaked Voltage Waveform | 1.0 | 60 | 99.952 | 0.005 | +/- 0.3% | Pass |
| (3) | Peaked Voltage Waveform | Peaked Voltage Waveform | 1.0 | 60 | 99.953 | 0.006 | +/- 0.5% | Pass |

**Table 173 - Test 41 Peaked Waveform (Class 0.2), 2S SN 11F013C5**


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| Test No. 41: Peaked Waveform | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | Steven Lu | | **Humidity (RH)** | 32.0% | | | | | |
| **Test Date** | 4/22/2025 | | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | | |
| **Current Class** | 200 | | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | | |
| **Serial Number** | 11F013C7 | | | | | | | | |
| **Test** | **Voltage** | **Amps** | **Power Factor** | **Frequency** | **% Registration** | **% Error** | **Limit from Zero Error** | **Result** | |
| (1) - Reference | 240 | 30 | 1.0 | 60 | 99.942 | Reference | Reference | Reference | |
| (2) | 240 | Peaked Voltage Waveform | 1.0 | 60 | 99.942 | 0.000 | +/- 0.3% | Pass | |
| (3) | Peaked Voltage Waveform | Peaked Voltage Waveform | 1.0 | 60 | 99.948 | 0.006 | +/- 0.5% | Pass | |

**Table 174 - Test 41 Peaked Waveform (Class 0.2), 2S SN 11F013C7**


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**Photograph 45 - Test 41 Peaked Waveform, Test Setup**

### 6.40.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No.41: Peaked Waveform Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 4T1512 | WECO Meter Accuracy Tester w/ internal Radian st | Radian | WECO M4330X; Radian RX-30 | WECO: W8839; Radian: 710257 | 5/30/2025 | 5/30/2026 |
| 1T9999 | Thermometer/ Hygrometer | VWR International | 36934-164 | 230368599 | 5/31/2023 | 5/31/2025 |

**Table 175 - Test 41 Peaked Waveform, Equipment List**


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## 6.41 Test No. 42: Pulse Waveform

### 6.41.1 Test Requirement(s)

Two measurements are made as part of this test: (1) sinusoidal voltage with harmonic current; and (2) harmonic voltage and harmonic current. The harmonic voltage and currents are defined in Table 176.

The effect of the harmonic influence using the pulse waveform upon the performance of a meter shall not exceed the specifications in Table 177.

For meters equipped with an ACD, this test should be conducted with the ACD in the dormant state. See 4.5.6.7 of ANSI C12.1: 2024 for ACD test options.

| Harmonic | Voltage Amplitude % $V_{ref}$ | Phase | Current Amplitude % $I_{ref}$ | Phase | Demand |
|---|---|---|---|---|---|
| 1 | 100 | 0 | 100 | 0 | 100.000 |
| 3 | 3.8 | 0 | 80 | 180 | -3.040 |
| 5 | 2.4 | 180 | 60 | 0 | -1.440 |
| 7 | 1.7 | 0 | 40 | 180 | -0.680 |
| 9 | 1.5 | 180 | 22 | 0 | -0.330 |
| 11 | 1.1 | 0 | 12 | 180 | -0.132 |
| 13 | 0.8 | 180 | 5 | 0 | -0.040 |
| 15 | 0.6 | 0 | 2 | 180 | -0.012 |
| 17 | 0.4 | 180 | 1 | 0 | -0.004 |
| 19 | 0.3 | 0 | 0.5 | 180 | -0.0015 |
| Total Demand | | | | | 94.321 |

**Table 176 - Pulse Waveform**

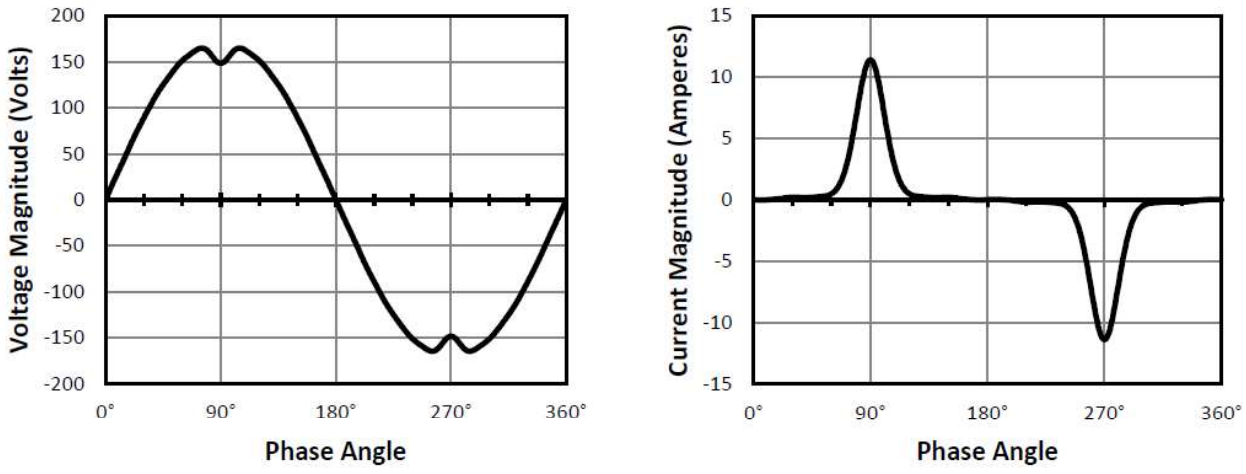


**Figure 37 - Pulse Waveform**


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| Condition | Voltage Waveform | Current Waveform | Maximum Deviation from Reference Performance | | |
|---|---|---|---|---|---|
| | | | Accuracy Class | | |
| | | | 0.5 | 0.2 | 0.1 |
| (1) | $V_{ref}$ Sinusoidal | $I_{ref}$ Sinusoidal | Reference | Reference | Reference |
| (2) | $V_{ref}$ Sinusoidal | Pulse Current Waveform | ±0.5% | ±0.3% | ±0.2% |
| (3) | Pulse Voltage Waveform | Pulse Current Waveform | ±0.8% | ±0.5% | ±0.3% |

**Table 177 - Effect of Harmonic Influence: Pulse Waveform Performance Requirements**

Note: The measured value of demand for Condition (3) should be 0.94321 times the value of Condition (2).

## 6.41.2 Test Data and Results

The meters listed below are **compliant** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120V | 60Hz | SN 11F00911 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C5 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C7 |

Refer to the following test data and photographs for a complete overview of the test setup and results.


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| Test No. 42: Pulse Waveform | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | Steven Lu | | **Humidity (RH)** | 32.0% | | | | | |
| **Test Date** | 4/22/2025 | | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | | |
| **Current Class** | 200 | | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | | |
| **Serial Number** | 11F00911 | | | | | | | | |
| **Test** | **Voltage** | **Amps** | **Power Factor** | **Frequency** | **% Registration** | **% Error** | **Limit from Zero Error** | **Result** | |
| (1) - Reference | 120 | 30 | 1.0 | 60 | 99.999 | Reference | Reference | Reference | |
| (2) | 120 | Pulse Voltage Waveform | 1.0 | 60 | 100.012 | 0.013 | +/- 0.3% | Pass | |
| (3) | Pulse Voltage Waveform | Pulse Voltage Waveform | 1.0 | 60 | 100.009 | 0.010 | +/- 0.5% | Pass | |

**Table 178 - Test 42 Pulse Waveform (Class 0.2), 12S SN 11F00911**

| Test No. 42: Pulse Waveform | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | William Yip | | **Humidity (RH)** | 32.0% | | | | | |
| **Test Date** | 4/22/2025 | | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | | |
| **Current Class** | 200 | | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | | |
| **Serial Number** | 11F013C5 | | | | | | | | |
| **Test** | **Voltage** | **Amps** | **Power Factor** | **Frequency** | **% Registration** | **% Error** | **Limit from Zero Error** | **Result** | |
| (1) - Reference | 240 | 30 | 1.0 | 60 | 99.951 | Reference | Reference | Reference | |
| (2) | 240 | Pulse Voltage Waveform | 1.0 | 60 | 99.969 | 0.018 | +/- 0.3% | Pass | |
| (3) | Pulse Voltage Waveform | Pulse Voltage Waveform | 1.0 | 60 | 99.970 | 0.019 | +/- 0.5% | Pass | |

**Table 179 - Test 42 Pulse Waveform (Class 0.2), 2S SN 11F013C5**


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| Test No. 42: Pulse Waveform | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 32.0% | | | | | |
| **Test Date** | 4/22/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C7 | | | | | | | |

| Test | Voltage | Amps | Power Factor | Frequency | % Registration | % Error | Limit from Zero Error | Result |
|---|---|---|---|---|---|---|---|---|
| (1) - Reference | 240 | 30 | 1.0 | 60 | 99.945 | Reference | Reference | Reference |
| (2) | 240 | Pulse Voltage Waveform | 1.0 | 60 | 99.997 | 0.052 | +/- 0.3% | Pass |
| (3) | Pulse Voltage Waveform | Pulse Voltage Waveform | 1.0 | 60 | 99.959 | 0.014 | +/- 0.5% | Pass |

**Table 180 - Test 42 Pulse Waveform (Class 0.2), 2S SN 11F013C7**


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**Photograph 46 - Test 42 Pulse Waveform, Test Setup**

### 6.41.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No.42: Pulse Waveform Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 4T1512 | WECO Meter Accuracy Tester w/ internal Radian st | Radian | WECO M4330X; Radian RX-30 | WECO: W8839; Radian: 710257 | 5/30/2025 | 5/30/2026 |
| 1T9999 | Thermometer/ Hygrometer | VWR International | 36934-164 | 230368599 | 5/31/2023 | 5/31/2025 |

**Table 181 - Test 42 Pulse Waveform, Equipment List**


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## 6.42 Test No. 43: Multiple Zero Crossings on Current

### 6.42.1 Test Requirement(s)

This test is intended to determine if the meter remains accurate if the current waveform exhibits multiple zero crossings. The test is conducted with a sinusoidal voltage waveform of amplitude $V_{ref}$. The current waveform is defined in Table 182.

For meters equipped with an ACD, this test should be conducted with the ACD in the dormant state. See 4.5.6.7 of ANSI C12.1: 2024 for ACD test options.

The effect of the harmonic influence using the multiple zero crossing on current waveform upon the performance of a meter shall not exceed the specifications listed in Table 183.

| Harmonic | Voltage Amplitude % $V_{ref}$ | Phase | Current Amplitude % $I_{ref}$ | Phase | Demand |
|---|---|---|---|---|---|
| 1 | 100 | 0 | 100 | 0 | 100 |
| 2 | 0 | 0 | 5±1 | 90±2 | 0 |
| 3 | 0 | 0 | 18±2 | -160±2 | 0 |
| 4 | 0 | 0 | 10±2 | 110±2 | 0 |
| 5 | 0 | 0 | 66±3 | 130±2 | 0 |
| 7 | 0 | 0 | 50±3 | 50±2 | 0 |

**Table 182 - Multiple Zero Crossing Current Waveform**

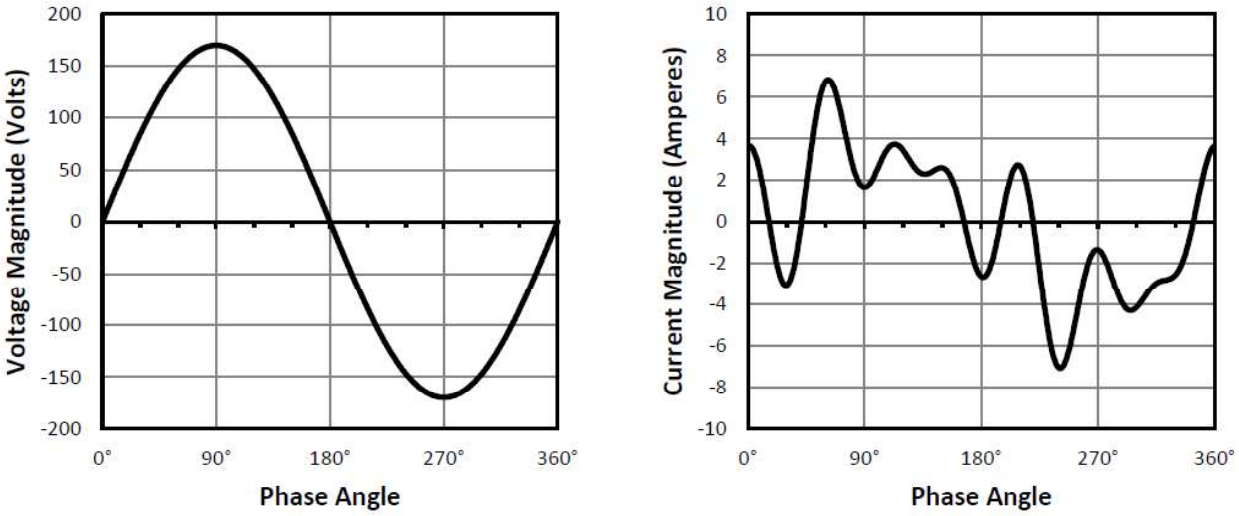


**Figure 38 - Multiple Zero Crossing Current Waveform**


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| Condition | Voltage Waveform | Current Waveform | Maximum Deviation in Percent from Reference Performance | | |
|---|---|---|---|---|---|
| | | | Accuracy Class | | |
| | | | 0.5 | 0.2 | 0.1 |
| (1) | $V_{ref}$ Sinusoidal | $I_{ref}$ Sinusoidal | Reference | Reference | Reference |
| (2) | $V_{ref}$ Sinusoidal | MZC Current Waveform | ±0.5% | ±0.3% | ±0.2% |

**Table 183 - Effect of Harmonic Influence: Multiple Zero Crossing Current Waveform Performance Requirements**

Note: The measured value of demand for Condition (2) should be the same as the value of Condition (1).

## 6.42.2 Test Data and Results

The meters listed below are **compliant** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120V | 60Hz | SN 11F00911 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C5 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C7 |

Refer to the following test data and photographs for a complete overview of the test setup and results.


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| Test No. 43: Multiple Zero Crossings on Current | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 32.0% | | | | | |
| **Test Date** | 4/22/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F00911 | | | | | | | |

| Test | Voltage | Amps | Power Factor | Frequency | % Registration | % Error | Limit from Zero Error | Result |
|---|---|---|---|---|---|---|---|---|
| (1) - Reference | 120 | 30 | 1.0 | 60 | 99.995 | Reference | Reference | Reference |
| (2) | 120 | MZC Current Waveform | 1.0 | 60 | 100.016 | 0.021 | +/- 0.3% | Pass |

**Table 184 - Test 43 Multiple Zero Crossings on Current (Class 0.2), 12S SN 11F00911**

| Test No. 43: Multiple Zero Crossings on Current | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | William Yip | **Humidity (RH)** | 32.0% | | | | | |
| **Test Date** | 4/22/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C5 | | | | | | | |

| Test | Voltage | Amps | Power Factor | Frequency | % Registration | % Error | Limit from Zero Error | Result |
|---|---|---|---|---|---|---|---|---|
| (1) - Reference | 240 | 30 | 1.0 | 60 | 99.956 | Reference | Reference | Reference |
| (2) | 240 | MZC Current Waveform | 1.0 | 60 | 99.963 | 0.007 | +/- 0.3% | Pass |

**Table 185 - Test 43 Multiple Zero Crossings on Current (Class 0.2), 2S SN 11F013C5**

| Test No. 43: Multiple Zero Crossings on Current | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 32.0% | | | | | |
| **Test Date** | 4/22/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C7 | | | | | | | |

| Test | Voltage | Amps | Power Factor | Frequency | % Registration | % Error | Limit from Zero Error | Result |
|---|---|---|---|---|---|---|---|---|
| (1) - Reference | 120 | 30 | 1.0 | 60 | 99.971 | Reference | Reference | Reference |
| (2) | 120 | MZC Current Waveform | 1.0 | 60 | 99.985 | 0.014 | +/- 0.3% | Pass |

**Table 186 - Test 43 Multiple Zero Crossings on Current (Class 0.2), 2S SN 11F013C7**


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**Photograph 47 - Test 43 Multiple Zero Crossings on Current, Test Setup**

### 6.42.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No.43: Multiple Zero Crossings on Current Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 4T1512 | WECO Meter Accuracy Tester w/ internal Radian st | Radian | WECO M4330X; Radian RX-30 | WECO: W8839; Radian: 710257 | N/A | 5/30/2026 |
| 1T9999 | Thermometer/ Hygrometer | VWR International | 36934-164 | 230368599 | 5/31/2023 | 5/31/2025 |

**Table 187 - Test 43 Multiple Zero Crossings on Current, Equipment List**


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## 6.43 Test No. 44: Multiple Zero Crossings on Voltage

### 6.43.1 Test Requirement(s)

This test is intended to determine if the meter remains accurate if the voltage waveform exhibits multiple zero crossings. The test is conducted with a sinusoidal current waveform of amplitude $I_{ref.}$ The voltage waveform is defined in Table 188.

For meters equipped with an ACD, this test should be conducted with the ACD in the dormant state. See 4.5.6.7 of ANSI C12.1: 2024 for ACD test options.

The effect of the harmonic influence using the multiple zero crossings on voltage waveform upon the performance of a meter shall not exceed the specifications listed in Table 189.

| Harmonic | Voltage Amplitude % $V_{ref}$ | Phase | Current Amplitude % $I_{ref}$ | Phase | Demand |
|---|---|---|---|---|---|
| 1 | 100 | 0 | 100 | 0 | 100 |
| 3 | 0 | 0 | 0 | 0 | 0 |
| 5 | 20±2 | 155±5 | 0 | 0 | 0 |
| 7 | 25±4 | 155±5 | 0 | 0 | 0 |

**Table 188 - Multiple Zero Crossing Voltage Waveform**

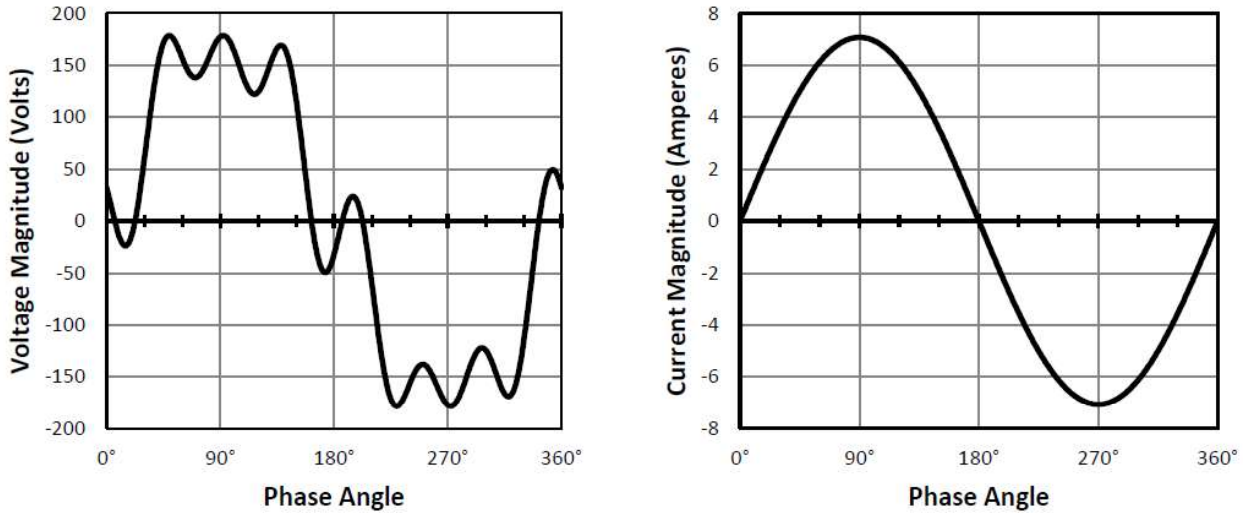


**Figure 39 - Multiple Zero Crossing Voltage Waveform**


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| Condition | Voltage Waveform | Current Waveform | Maximum Deviation in Percent from Reference Performance | | |
|---|---|---|---|---|---|
| | | | Accuracy Class | | |
| | | | 0.5 | 0.2 | 0.1 |
| (1) | $V_{ref}$ Sinusoidal | $I_{ref}$ Sinusoidal | Reference | Reference | Reference |
| (2) | MZC Voltage Waveform | $I_{ref}$ Sinusoidal | ±0.5% | ±0.3% | ±0.2% |

**Table 189 - Effect of Harmonic Influence: Multiple Zero Crossing Voltage Waveform**

Note: The measured value of demand for Condition (2) should be the same as the value of Condition (1).

## 6.43.2 Test Data and Results

The meters listed below are **compliant** with the 0.2 accuracy class requirements outlined in this section.

| Meter Type | Class | Voltage | Frequency | Serial Number |
|---|---|---|---|---|
| Form 12S | CL200 | 120V | 60Hz | SN 11F00911 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C5 |
| Form 2S | CL200 | 240V | 60Hz | SN 11F013C7 |

Refer to the following test data and photographs for a complete overview of the test setup and results.


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| Test No. 44: Multiple Zero Crossings on Voltage | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 32.0% | | | | | |
| **Test Date** | 4/22/2025 | **Observations** | None | | | | | |
| **Meter Form** | 12S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F00911 | | | | | | | |

| Test | Voltage | Amps | Power Factor | Frequency | % Registration | % Error | Limit from Zero Error | Result |
|---|---|---|---|---|---|---|---|---|
| (1) - Reference | 120 | 30 | 1.0 | 60 | 99.992 | Reference | Reference | Reference |
| (2) | 120 | MZC Voltage Waveform | 1.0 | 60 | 99.991 | -0.001 | +/- 0.3% | Pass |

**Table 190 - Test 44 Multiple Zero Crossings on Voltage (Class 0.2), 12S SN 11F00911**

| Test No. 44: Multiple Zero Crossings on Voltage | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | William Yip | **Humidity (RH)** | 32.0% | | | | | |
| **Test Date** | 4/22/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C5 | | | | | | | |

| Test | Voltage | Amps | Power Factor | Frequency | % Registration | % Error | Limit from Zero Error | Result |
|---|---|---|---|---|---|---|---|---|
| (1) - Reference | 240 | 30 | 1.0 | 60 | 99.956 | Reference | Reference | Reference |
| (2) | 240 | MZC Voltage Waveform | 1.0 | 60 | 99.957 | 0.001 | +/- 0.3% | Pass |

**Table 191 - Test 44 Multiple Zero Crossings on Voltage (Class 0.2), 2S SN 11F013C5**


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| Test No. 44: Multiple Zero Crossings on Voltage | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project Number** | 135988 | **Temperature (C)** | 22.7 | | | | | |
| **Engineer** | Steven Lu | **Humidity (RH)** | 32.0% | | | | | |
| **Test Date** | 4/22/2025 | **Observations** | None | | | | | |
| **Meter Form** | 2S | | | | | | | |
| **Current Class** | 200 | | | | | | | |
| **Accuracy Class** | 0.2 | | | | | | | |
| **Serial Number** | 11F013C7 | | | | | | | |

| Test | Voltage | Amps | Power Factor | Frequency | % Registration | % Error | Limit from Zero Error | Result |
|---|---|---|---|---|---|---|---|---|
| (1) - Reference | 240 | 30 | 1.0 | 60 | 99.967 | Reference | Reference | Reference |
| (2) | 240 | MZC Voltage Waveform | 1.0 | 60 | 99.969 | 0.002 | +/- 0.3% | Pass |

**Table 192 - Test 44 Multiple Zero Crossings on Voltage (Class 0.2), 2S SN 11F013C7**


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**Photograph 48 - Test 44 Multiple Zero Crossings on Voltage, Test Setup**

### 6.43.3 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

| Test No.44: Multiple Zero Crossings on Voltage Equipment List | | | | | | |
|---|---|---|---|---|---|---|
| **Asset Number** | **Description** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Date** | **Calibration Due Date** |
| 4T1512 | WECO Meter Accuracy Tester w/ internal Radian st | Radian | WECO M4330X; Radian RX-30 | WECO: W8839; Radian: 710257 | 5/30/2025 | 5/30/2026 |
| 1T9999 | Thermometer/ Hygrometer | VWR International | 36934-164 | 230368599 | 5/31/2023 | 5/31/2025 |

**Table 193 - Test 44 Multiple Zero Crossings on Voltage, Equipment List**


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**END OF REPORT**

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