UL LLC METER PERFORMANCE COMPLIANCE REPORT FOR:

EKM Metering LLC
363 Berkeley Way, Santa Cruz, California 95062-1039

Product: Omnimeter Pulse UL v.4

ANSI C12.20-2010 0.2 and 0.5 Accuracy Classes for Static Meter Test Report
American National Standard Institute, Inc.

DATE : JANUARY 6, 2016
PROJECT : 4787172802
REPORT : R11054177-ANSI

Verification Services

Written By:

Marion Pierce, Laboratory Engineer
Consumer Technology Division

Date: January 6, 2016

Reviewed By:

Scott Hunter, Program Manager
Consumer Technology Division

Date: January 6, 2016

Release Control Record

Issue No.	Reason for Change	Date Issued
1	None, original	January 6, 2016

Report Information

Independent Test Laboratory
UL LLC
12 Laboratory Dr, RTP, NC 27709

Testing Conducted For
EKM Metering LLC
363 Berkeley Way, Santa Cruz, California 95062-1039

Applicant Contact
Doug Brouwer
ContactTitle
831-425-7371
dbrouwer@ekmmetering.com

Standards Tested To	ANSI C12.20-2010 0.2 and 0.5 Accuracy Classes for Static Meter Test Report American National Standard Institute, Inc.
Equipment Under Test (EUT) Sample/Board Revision	Omnimeter Pulse UL v.4
UL Project Number	4787172802
Report	R11054177-ANSI
Date	January 6, 2016

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

TEST RESULTS SUMMARY

The Omnimeter Pulse UL v.4 as tested met the customer requested performance requirements of ANSI C12.20-2010, 0.2 and 0.5 Accuracy Classes.

Column Heading Definitions for Summary of Test Results Table

The following Summary of Test Results table contains these columns of information:

- **Section** column gives the Section numbers from ANSI C12.20.
- **Test No.** column gives the local number of the requirement (e.g., 1,2,3) from ANSI C12.20.
- **Test** column gives the Section name from ANSI C12.20.
- **Results** column gives the results of the evaluation (Compliant, Non-compliant, etc.).
  - ➢ **Compliant**: The Equipment Under Test met the requirements of the corresponding criteria.
  - ➢ **Non-compliant**: The Equipment Under Test did not meet the requirements of the corresponding criteria.
  - ➢ **NA**: The criteria were Not Applicable to Equipment Under Test {Explanation Required}
  - ➢ **ENR**: An Evaluation, to these criteria, was Not Requested by the customer.
- **Page** column gives the page number, in this report, for the corresponding criteria.

Table 1: ANSI C12.20 Summary of Test Results

| Section	Test No.	Test	Results	Comments	Page
5	-	**Acceptable Performance**	**-**		-
5.5.4	-	**Accuracy Tests**	**-**		-
5.5.4.3	3	Load Performance	**Compliant**	None.	10
5.5.4.4	4	Effect of Variation of Power Factor	**Compliant**	None.	12

TESTING OVERVIEW

Project Objective

Testing was performed to determine if the Omnimeter Pulse UL v.4 met the generic requirement for the American National Standard Institute C12.20.

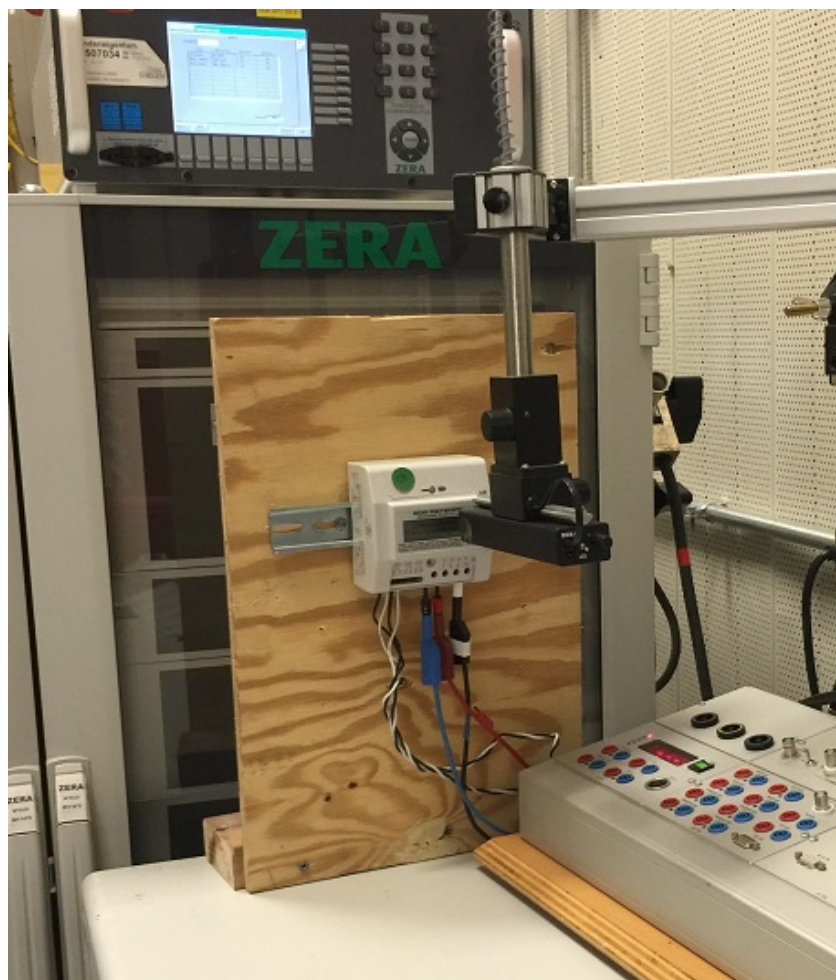### Equipment Configuration and Test Conditions

Figure 1: Display and Markings - Meter
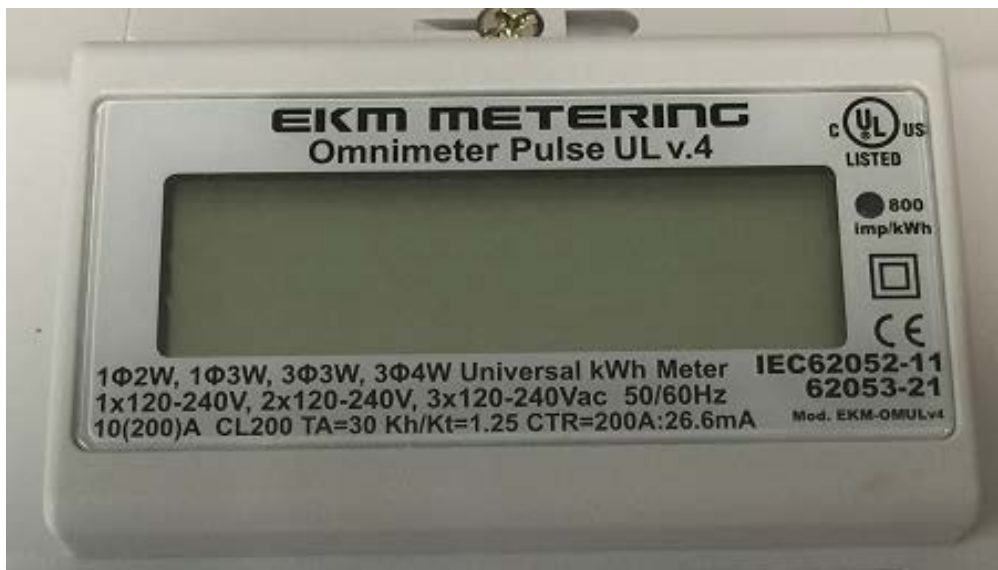
Figure 2: Display and Markings - CT

Figure 3: Test setup for Internal Influences testing

Equipment Operating Conditions

The Omnimeter Pulse UL v.4 was powered under the following conditions, unless otherwise specified by the conditions of the test.

Table 2: EUT supply conditions

Meter Model	Form	Current Rating (A)	Elements	Low Voltage Condition (L-N / L-L) (V)	Line Frequency (Hz)
Omnimeter Pulse UL v.4	1 Phase 3 Wire	200	One	120 / 240	60

Unless otherwise noted, the meter was configured in a manner representative to the worst real world installation. For the Omnimeter Pulse UL v.4 , the following was described by the manufacturer as the worst case real world installation:

The units were marked as a single voltage meter and tested as 120/240 (L-N / L-L). The meter's electronics are 120V, and the metering circuit is 240V. The units were configured with two 200A CT (solid core, BCT013200 to meter L1 & L2. These are the only CTs covered under the scope of this investigation.

The ambient temperature in the meter laboratory shall be 23°C, with tolerances that depend upon the effects of temperature on the standards used and the apparatus under test. This temperature shall be held constant not only during a test or calibration procedure, but also for a preceding period sufficient to ensure effective temperature equilibrium in the test equipment and in the device being tested. Relative humidity shall not exceed 80% noncondensing.

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. If the meter has more than one voltage and current circuit, it shall be tested with the voltage circuits effectively in parallel and with the appropriate current circuit(s) energized effectively in series, unless otherwise specified.

All tests, unless otherwise indicated in specific 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 reference point shall be as close as practical to zero error and in no case shall exceed 0.2% error for accuracy class 0.5 or exceed 0.1% for accuracy class 0.2

Metering devices shall pass all tests listed in Table 3 of ANSI C12.20, appropriate to the type of device being tested. Test performed in series shall be conducted on the same metering devices, in accordance with subclause 4.1.6 of ANSI C12.1-2008.

5.5.4.3   TEST NUMBER 3: LOAD PERFORMANCE

Criteria

The performance of the meter shall not deviate from the reference registration by an amount exceeding that specified in Table 3.

Table 3: Load Performance Test

Condition	Current in Amperes						Maximum Deviation in Percent from Reference Performance	
	Current Class						Accuracy Class	
	2	10	20	100	200	320	0.5	0.2
(1)	0.015	0.15	0.15	1	2	3	±1.0	±0.4
(2)	0.025	0.25	0.25	1.5	3	5	±0.5	±0.2
(3)	0.05	0.50	0.5	3	6	10	±0.5	±0.2
(4)	0.15	1.5	1.5	10	20	30	±0.5	±0.2
(5)	0.25	2.5	2.5	15	30	50	Reference	Reference
(6)	0.5	--	5	30	60	75	±0.5	±0.2
(7)	1	5	10	50	100	100	±0.5	±0.2
(8)	1.5	7.5	15	75	150	150	±0.5	±0.2
(9)	1.8	--	18	90	180	250	±0.5	±0.2
(10)	--	10	--	100	200	300	±0.5	±0.2
(11)	2	--	20	--	--	320	±0.5	±0.2

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Load Performance	Graham Allen Marion Pierce	UL LLC, 12 Laboratory Dr, RTP, NC 27709	2015-12-08

Test Method

Power the meter with nominal voltage. Apply the current per the meter class from Table 3. Take accuracy reading for each load point for the appropriate meter class. Once all applicable load points have been evaluated verify that each load point test condition does not deviate from the Reference condition (5) by more than the specified value from Table 3.

Test Results

The Omnimeter Pulse UL v.4 is **compliant** with Test number 3: Load performance.

Table 4: Load Performance Detailed Test Results

Sample Description	Serial Number	Condition	% Error	Δ from Reference	Pass/Fail Class 0.5	Pass/Fail Class 0.2
Omnimeter Pulse UL v.4 with BCT013200 200A CT's 120/240V 60Hz	Sample 1	1	0.04	-0.02	P	P
		2	0.04	-0.02	P	P
		3	0.04	-0.02	P	P
		4	0.03	-0.03	P	P
		5	0.06	-	P	P
		6	0.15	0.09	P	P
		7	0.07	0.01	P	P
		8	0.04	-0.02	P	P
		9	0.025	-0.03	P	P
		10	0.03	-0.03	P	P
		11	-	-	-	-
Omnimeter Pulse UL v.4 with BCT013200 200A CT's 120/240V 60Hz	Sample 2	1	-0.02	-0.06	P	P
		2	0.00	-0.04	P	P
		3	0.02	-0.02	P	P
		4	0.02	-0.02	P	P
		5	0.04	-	P	P
		6	0.02	-0.02	P	P
		7	0.03	-0.01	P	P
		8	0.02	-0.02	P	P
		9	0.02	-0.02	P	P
		10	0.02	-0.02	P	P
		11	-	-	-	-
Omnimeter Pulse UL v.4 with BCT013200 200A CT's 120/240V 60Hz	Sample 3	1	-0.03	-0.05	P	P
		2	-0.01	-0.03	P	P
		3	0.00	-0.02	P	P
		4	0.00	-0.02	P	P
		5	0.02	-	P	P
		6	0.00	-0.02	P	P
		7	0.01	-0.01	P	P
		8	0.00	-0.02	P	P
		9	0.03	0.01	P	P
		10	0.00	-0.02	P	P
		11	-	-	-	-

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Reference Meter	COMP005	ZERA	COM 3003-00V01	2015-03-25	2017-03-31
Temp/Humid/Pressure	HI0078	Springfield	-	2015-05-05	2016-05-31

5.5.4.4   TEST NUMBER 4: EFFECT OF VARIATION OF POWER FACTOR

Each element of a multi-element meter shall be tested as a single-element meter, but all voltage circuits shall be energized.

5.5.4.4.1   Single-element meters

Criteria

The effect of variation of power factor upon performance of the meter shall not exceed that specified in Table 5.

Table 5: Effect of variation of power factor for single-element meters

Condition	Current in Amperes						Power Factor	Maximum Deviation in Percent from Reference Performance	
	Current Class							Accuracy Class	
	2	10	20	100	200	320		0.5	0.2
Reference performance for condition (1)	0.05	0.25	0.5	1.5	3	5	1.0	Reference	Reference
Condition (1)	0.1	0.5	1	3	6	10	0.5 lag	±1.0	±0.5
Reference performance for condition (2)	1	5	10	50	100	150	1.0	Reference	Reference
Condition (2)	1	5	10	50	100	150	0.5 lag	±0.6	±0.3
Reference performance for condition (3)	2	10	20	100	200	320	1.0	Reference	Reference
Condition (3)	2	10	20	100	200	320	0.5 lag	±0.6	±0.3

Test Date and Location

Testing Performed	Test Operator	Location	Date(s)
Effect of Variation of Power Factor	Graham Allen Marion Pierce	UL LLC, 12 Laboratory Dr, RTP, NC 27709	2015-12-08

Test Method

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

Test Results

The Omnimeter Pulse UL v.4 is **compliant** with Test number 4: Effect of Variation of Power Factor.

Table 6: Effect of Variation of Power Factor Detailed Test Results

Sample Description	Serial Number	Condition	% Error	Δ from Reference	Pass/Fail Class 0.5	Pass/Fail Class 0.2
Omnimeter Pulse UL v.4 with BCT013200 200A CT's 120/240V 60Hz	Sample 1	Ref (1)	0.05	-	-	-
		1	-0.02	-0.07	P	P
		Ref (2)	0.04	-	-	-
		2	-0.10	-0.14	P	P
		Ref (3)	0.04	-	-	-
		3	-0.11	-0.15	P	P
Omnimeter Pulse UL v.4 with BCT013200 200A CT's 120/240V 60Hz	Sample 2	Ref (1)	0.00	-	-	-
		1	-0.05	-0.05	P	P
		Ref (2)	0.03	-	-	-
		2	-0.11	-0.14	P	P
		Ref (3)	0.02	-	-	-
		3	-0.13	-0.15	P	P
Omnimeter Pulse UL v.4 with BCT013200 200A CT's 120/240V 60Hz	Sample 3	Ref (1)	-0.01	-	-	-
		1	-0.07	-0.06	P	P
		Ref (2)	-0.01	-	-	-
		2	-0.13	-0.12	P	P
		Ref (3)	0.00	-	-	-
		3	-0.15	-0.15	P	P

Test Equipment Used

Description	Serial No.	Manufacturer	Model	Cal. Date	Cal. Due
Reference Meter	COMP005	ZERA	COM 3003-00V01	2015-03-25	2017-03-31
Temp/Humid/Pressure	HI0078	Springfield	-	2015-05-05	2016-05-31

Appendix A   Sample List

Model Number	Serial Number	Test Group	Comments
Omnimeter Pulse UL v.4	Sample 1	NA	Sample Tag 2255600
	Sample 2		
	Sample 3		
BCT-013-200UL	024291	NA	Sample Tag 2255601
	024432		