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## Document History

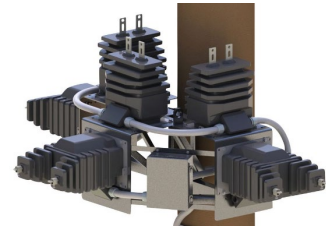
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Items	Warehouse Catalog #	Version	Date
PMA	012-84879	1	06/08/2023
	012-84880	1	06/08/2023
	012-84881	1	06/08/2023
	012-84882	1	06/08/2023
	012-84883	1	06/08/2023
	012-84884	1	06/08/2023
	012-84885	1	06/08/2023
PTs	012-84886	1	06/08/2023
	012-84887	1	06/08/2023
	012-84888	1	06/08/2023
	012-84889	1	06/08/2023
CTs	012-84890	1	06/08/2023
	012-84891	1	06/08/2023



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Originating Department: Distribution Engineering



## Overhead Primary Metering Assembly

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### 1. Introduction

This is a general specification that covers the minimum requirements for overhead primary metering assembly used in the distribution system in Puerto Rico. Further information will be provided by LUMA Energy at the time of order placement and will provide information on site specific conditions, quantity, and other requirements. This document includes the general electrical and mechanical characteristics of the equipment/material.

### 2. Special Requirements

- 2.1. Samples shall be furnished as requested by LUMA Energy. All documented testing required by applicable specifications and standards shall be submitted with product samples, including mechanical and electrical drawings, prior to approval. Vendors that have supplied this equipment/material to LUMA on previous orders, will not have to furnish samples at bid opening. If any equipment/material or design changes were made to an approved product, it must be re-submitted to the Material Specification engineer for approval before shipping.
- 2.2. Upon inspection of incoming equipment/material, the purchaser reserves the right to refuse product shipments and to determine the acceptability or rejection of product received. The supplier shall be liable for all costs incurred for products that are refused/rejected.
- 2.3. The equipment/material will be received at the LUMA's general warehouse (011) at Palo Seco, Puerto Rico. Shipping will include transportation and unloading at the indicated warehouse.

### 3. Literature

Descriptive and technical literature must be supplied by the vendor at time of bidding. This literature may include, but is not limited to details of equipment, drawings, documented testing, and instructions for use and installation. Failure to submit documents on time will cause bidder disqualification.

### 4. Markings

- 4.1. Wooden crates or packages must be clearly marked on the outside with LUMA Energy's purchase order, warehouse item number, and supplier's part number.
- 4.2. Packaging labels and tags shall be waterproof.

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### **5. Compatible with**

General Electric (GE-ITI): see Table 3 for models.

### **6. Packaging**

All equipment/material shall be packaged and marked in such a way as to facilitate handling and protection from damage and that the receiving warehouse can readily identify it and send it, in one complete unit, to a field location without opening crates or boxes to sort items and/or parts.

### **7. Number Per Package (Logistics)**

Standard package: One (1) complete unit per wooden crate or as requested by LUMA Energy.

### **8. Acceptance Criteria**

- 8.1. Test required: certified by external laboratories.
- 8.2. Product shall be manufactured in accordance with the latest issue ASTM, NEMA, IEEE and ANSI specification. When conflicts occur between purchaser's specifications and the ASTM, NEMA, IEEE, or ANSI specifications, the purchaser's specification shall prevail.
- 8.3. Latest applicable codes, standards, and other regulations:
  - a. IEEE C57.13: Performance requirements for electrical system and test interchangeability of current and inductively coupled voltage transformers for both indoor and outdoor applications.

### **9. Description**

- 9.1. The pole mounted primary metering assembly (hereinafter called PMA) described in this specification is intended to be used for metering in a three-phase grounded-wye connection.
- 9.2. The PMA frame must contain three (3) double bushing potential transformers (PTs), three (3) current transformers (CTs), and a junction box. The PTs and CTs shall be connected in a grounded-wye pattern and grounded through the frame. See Section 9.14 for PT's description, Section 9.15 for CT's description, and Section 9.16 for junction box description.
- 9.3. The configuration shall be Overhead-to-Overhead (CTs on top).
- 9.4. Shall be designed for high accuracy.
- 9.5. The PMA shall be dry type.

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- 9.6. The PMA will be connected to the electrical distribution system having the following characteristics:
  - a. System Voltages of 4.16kV to 15.0kV LL (2.4/4.16kV, 4.16/7.2kV, 4.8/8.32kV, & 7.62/13.2kV).
  - b. Nominal Currents from 125 A to 900 A.
  - c. System Frequency: 60 Hz
  - d. System Connection: Grounded wye (4-wire)
- 9.7. Meter form shall be 9S.
- 9.8. The PMA (including equipment and accessories) must be designed to withstand outdoor operation in a humid tropical zone with altitude ranging from 15 to 3,000 ft above sea level, under ambient temperature between 10° C and 40° C (50° F to 104° F) and subject to be installed close to seashore with a heavy corrosive environment.
- 9.9. The PMA, including any additional equipment/accessories, should be designed and constructed to withstand sustained hurricane force wind velocities according to LUMA Energy's requirement.
- 9.10. The PMA shall include high voltage jumpers between PTs and CTs.
- 9.11. The PMA must come completely pre-assembled from factory with all high voltage wiring accessories and terminal bushings provided with wildlife protection.
- 9.12. All connections between PT's and CT's conduit boxes and the junction box shall be made using 1" (2.54 cm) sealtight flexible conduit. The wiring used shall be 12 or 10 AWG THHN/THWN stranded.
- 9.13. The PMA frame must have the following features:
  - a. Must be made of stainless steel or aluminum for protection against corrosion.
  - b. All mounting hardware for the PMA and accessories shall be made of stainless steel.
  - c. The frame must accommodate three (3) PTs, three (3) CTs, and a junction box.
  - d. The frame must have a stainless steel or aluminum nameplate with the following information as minimum: Manufacturer's Name, Manufacture Year, System Voltage, Voltage ratio, Current ratio, and Basic Insulation Level (BIL).
  - e. The frame must include a ground connector that accommodates #10 AWG solid to #2 AWG stranded wire.

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- f. The pole-mounting bracket for the frame shall have mounting holes or a combination of mounting holes and slots of 13/16" (20.64 mm) diameter that comply with the following spacing: 8" (20.23 cm) and 12" (30.48 cm) in a three-hole/slot arrangement, or 24 in (60.96 cm) in a two-hole/slot arrangement in order to be mounted on a pole with hole spacing of 8" (20.23 cm) in one face and 12" (30.48 cm) in the other.

### 9.14. Potential Transformer (PT)

- a. Shall be for outdoor pole mounted applications close to seashore and suitable for operating meters, instruments, relays, and control devices.
- b. Shall be dry type.
- c. Primary voltage and ratio as per Table 1. The secondary voltage shall be 120 V.
- d. The insulation material shall be designed for water repellent, high tracking and arc resistance, UV resistant, and heavy corrosive environment such as Butyl, Hy-Bute, or Epoxy. For insulating class (BIL) and creepage distance see Table 1.
- e. Shall be double bushings with terminals suitable for copper and aluminum conductors. The terminals shall have high durability and corrosion resistance. Shall be solder-less type, tin plated bronze, with hard-cooper collar, and bronze pressure bolt.
- f. Secondary terminals material shall be tin-plated bronze with high durability and corrosion resistance and shall accommodate cables up to #6 AWG.
- g. The polarity shall be clearly identified as H1 and H2 for the primary side and X1 and X2 for the secondary side. All of them situated adjacent to their respective terminals.
- h. Shall be designed for high accuracy at burdens 0.3 W, X, M, Y, and Z.
- i. Thermal Rating: 1,500 VA @ 30°C (86°F)
- j. The primary voltage shall be indicated in two sides of the housing with high visibility in a permanent manner.
- k. Shall be furnished to be placed in any position.
- l. The baseplate shall be made of stainless steel or heavy gage aluminum (marine gage). Shall have one hole of approximately 7/16" (11.1 mm) in each corner for installation. A grounding lug of the same material of the base shall be included, fixed to the base (could be welded), for a conductor size up to #2 AWG.
- m. Shall have a detachable conduit box, where the secondary terminals are to be located, made of aluminum, with 1" (2.54 cm) threaded conduits hubs on the sides.
- n. Shall include a stainless steel or aluminum nameplate with the manufacturer name, manufacture year, system voltage, and voltage ratio.

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### 9.15. Current Transformer (CT)

- a. Shall be for outdoor pole mounted applications close to seashore and suitable for revenue metering.
- b. Shall be dry type.
- c. The insulation material shall be designed for water repellent, high tracking and arc resistance, UV resistant, and heavy corrosive environment such as Butyl, Hy-Bute, or Epoxy. Insulation class shall be 110 kVBIL with a creepage distance of 14" (35.56 cm) minimum.
- d. Primary terminals shall be flat cooper bars with two 9/16" (14.3 mm) holes or hole and slot combination with the same diameter, suitable for NEMA two-hole connectors. The slot shall be 1" (25.4 mm) long approximately. Shall be tin-plated to allow cooper and aluminum conductors.
- e. Secondary terminals shall be fixed stud or clamp-bolt type and shall accommodate wires from #14 to #6 AWG. The material shall be bronze for high durability and corrosion resistance.
- f. The polarity shall be clearly identified as H1 and H2 for the primary side and X1 and X2 for the secondary side. All of them situated adjacent to their respective terminals.
- g. Shall be designed for high accuracy (metering class 0.3B0.5) with high fault current withstand characteristics.
- h. Shall be rated for 15 kV class, 60 Hz. See Table 1 for ratio and rating factor (RF). The rating factor is at 30°C (86°F) ambient temperature.
- i. The primary current rating shall be indicated in two sides of the housing with high visibility in a permanent manner.
- j. Shall be furnished to be placed in any position.
- k. The baseplate shall be made of stainless steel or heavy gage aluminum (marine gage). Shall have one hole of approximately 7/16" (11.1 mm) in each corner for installation. A grounding lug of the same material of the base shall be included, fixed to the base (could be welded), for a conductor size up to #2 AWG.
- l. Shall have a conduit box, where the secondary terminals are to be located, made of aluminum, with 1" (2.54 cm) threaded conduits hubs on the sides. Shall include an internal secondary terminal block that secures the secondary terminals, as well as a stud in between the two terminals, which is used as a short-circuit device pivot.
- m. Shall include a stainless steel or aluminum nameplate with the manufacturer name, manufacture year, system voltage, and voltage ratio.

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### 9.16. Junction Box

- Shall be NEMA 3R for outdoor use.
- Shall include wire terminations on a screw-type terminal strip where the connections coming from the PTs and CTs will be made.
- Shall have a knockout provision for a 1" connector on the bottom side for future use, in addition to the ones already made for the PT's and CT's connection.
- Shall measure, approximately, 12" X 12" X 4" for easy access and making connections.

### 9.17. Table 1: PT's & CT's Arrangement

Voltage				PT's Creepage Distance	Nominal Current (A)				
kV L-L	kV L-N	PT Ratio	kV BIL		125	250	340	590	900
				CT Ratio					
13.2	7.62	63.5:1	110	20.38"	150/5, RF = 3: Total = 450/15			600/5, RF = 2: Total = 1200/10	
8.32	4.8	40:1	110	20.38"	150/5, RF = 3: Total = 450/15			600/5, RF = 2: Total = 1200/10	
7.2	4.16	35:1	75	13.5"	150/5, RF = 3: Total = 450/15			600/5, RF = 2: Total = 1200/10	
4.16	2.4	20:1	75	13.5"	150/5, RF = 3: Total = 450/15			600/5, RF = 2: Total = 1200/10	

**Note:** The nominal current is based on the different conductor sizes we have on overhead lines, coming from CU #6 AWG (125 A) to AAAC 927.2 MCM (900 A). See Table 2 for conductors' nominal current equivalences by colors.

### 9.18. Table 2: Nominal Current Equivalences Between Conductors Size and Material

Conductor Material	Size, (Strands) / (Amps), Strength, OD						
AAAC	N/A	123.3 kcmil (7) / (256 A) 4,460 lbf 0.398"	195.7 kcmil (7) / (342 A) 6,790 lbf 0.502"	394.5 kcmil (19) / (532 A) 13,300 lbf 0.721"	465.4 kcmil (19) / (590 A) 15,600 lbf 0.783"	652.4 kcmil (19) / (729 A) 21,900 lbf 0.927"	927.2 kcmil (37) / (908 A) 30,500 lbf 1.108"
ACSR	N/A	1/0 AWG (6/1) / (242 A) 4,380 lbf 0.398"	3/0 AWG (6/1) / (315 A) 6,620 lbf 0.532"	226.8 kcmil (26/7) / (475 A) 11,300 lbf 0.642"	*	556.5 kcmil (26/7) / (721 A) 19,800 lbf 0.914"	795.0 kcmil (26/7) / (907 A) 31,500 lbf 1.108"
CU	6 AWG (1) / (125 A) 1,970 lbf 0.162"	2 AWG (7) / (230 A) 3,050 lbf 0.292"	1/0 AWG (7) / (310 A) 4,752 lbf 0.373"	4/0 AWG (19) / (480 A) 9,617 lbf 0.528"	300 kcmil (37) / (590 A) 13,510 lbf 0.630"	*	*

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### 10. Inspection

The acceptance of any equipment/material shall in no way relieve the vendor from his responsibility to meet all the requirements of this specification, and it would not prevent subsequent rejection if such equipment/material were found later to be defective.

### 11. Proposal Information

11.1. Submitted proposals must include:

- a. Technical information
- b. Table of Compliance completed by the bidder with reference (see Appendix 1).

### 12. Table 3: Warehouse and Asset Suite Identification Number for PMA

Warehouse Catalog #	Asset Suite #	Primary Voltage L-L (kV)	Voltage Ratio	Current Ratio (15 kV Class)	Compatible with GE Model
012-84879	84879	13.2	63.5:1	150/5, RF=3	-
012-84880	84880	8.32	40:1		-
012-84881	84881	7.2	35:1		-
012-84882	84882	4.16	20:1		-
012-84883	84883	13.2	63.5:1	600/5, RF=2	-
012-84884	84884	8.32	40:1		-
012-84885	84885	7.2	35:1		-
012-84886	84886	4.16	20:1		-

**Note:** See Tables 4 and 5 for PTs and CTs, respectively, as replacement parts for the Primary Metering Assembly (PMA).

### 13. Table 4: Warehouse and Asset Suite Identification Number for PTs

Warehouse Catalog #	Asset Suite #	Primary Voltage L-L (kV)	Primary Voltage L-N (kV)	Voltage Ratio	Compatible with GE Model
012-84887	84887	13.2	7.62	63.5:1	JVW-5 (765X030043)
012-84888	84888	8.32	4.8	40:1	JVW-5 (765X030041)
012-84889	84889	7.2	4.16	35:1	JVW-4 (764X030012)
012-84890	84890	4.16	2.4	20:1	JVW-4 (764X030011)

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### 14. Table 5: Warehouse and Asset Suite Identification Number for CTs

Warehouse Catalog #	Asset Suite #	Voltage Class (kV)	Voltage Ratio	Rating Factor (@ 30°C)	GE Model
012-84891	84891	15	150/5	3	JCK-5 (755X052010)
012-84892	84892	15	600/5	2	JCK-5 (755X052014)

— End of Specification —

**Document No.:** 4350.317

**Originating Department:** Distribution Engineering

## **Overhead Primary Metering Assembly**

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# **Appendix**

## Overhead Primary Metering Assembly

### Appendix 1: Table of Compliance for PMA

Line	Criteria	Description	Pass/Fail (P / F)	Comments
1	Specification	The Proponent complies with the corresponding specification document (4350.317).		
2	Industry Standards	The Proponent complies with the industry standards established in the specification document (ANSI, NEMA, ASTM, IEEE).		
3	Type	Pole Mounted Primary Metering Assembly, Dry Type		
4	Product Requirements	Rating: 15 kV, 110 kVBIL		
		Configuration: Overhead-to-Overhead (CTs on top)		
		System Connection: Grounded Wye (4-wire)		
		Meter Form: 9S		
		Outdoor Use		
		High Voltage Jumpers between PTs and CTs included.		
		Completely pre-assembled from factory.		
		Wildlife Protection on all primary bushings.		
5	Frame	Material: Stainless Steel or Aluminum		
		Mounting Hardware: Stainless-Steel		
		Must accommodate 3 PTs, 3 CTs, and a JB.		
		Ground connector for #10 AWG solid to #2 AWG stranded wire.		
		Stainless-Steel or Aluminum Nameplate as per section 9.13.d.		
		Pole Mounting Bracket with spacing of 8" and 12" in a three-hole/slot arrangement, or 24 in in a two-hole/slot arrangement. Holes diameter: 13/16"		
6	PTs	Designed for water repellent, high tracking and arc resistance, UV resistant, and heavy corrosive environment. Creepage distance as per Table 1.		
		Double Bushings with terminals (tin plated bronze) for CU/AL conductors.		
		Aluminum detachable conduit box with 1" threaded conduits hubs on the sides. Tin plated bronze terminals inside.		
		High Accuracy (burdens W, X, M, Y, and Z)		
		Thermal Rating: 1,500VA @ 30°C		
		Ratings as per Table 1 (High Accuracy)		
		Stainless steel or heavy gage aluminum base.		
		Stainless steel or aluminum nameplate as per section 9.14.n.		
		Polarity identified as H1, H2 for primary side and X1, X2 for secondary side.		
		Primary Voltage identified in two sides of the housing.		

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7	CTs	Designed for water repellent, high tracking and arc resistance, UV resistant, and heavy corrosive environment.		
		Insulation Class (kVBIL): 110		
		Creepage distance: 14"		
		15 kV Class, Ratio and Rating Factor as per Table 1.		
		High Accuracy (metering class 0.3B0.5)		
		Primary Terminals: Flat Cooper Bars for NEMA two-holes.		
		Aluminum conduit box with 1" threaded conduits hubs on the sides. Internal secondary terminal block with a stud in between the two terminals. Bronze terminals.		
		Stainless steel or heavy gage aluminum base.		
		Stainless steel or aluminum nameplate as per section 9.15.m.		
		Primary Current identified in two sides of the housing.		
8	Junction Box	NEMA 3R		
		Approximate Dimensions: 12" X 12" X 4"		
		Wire terminations on a screw-type terminal strip.		
		Knockout provision for a 1" connector on the bottom side for future use, in addition to the ones already made for the PT's and CT's connection.		











# 4350.317 Primary Metering Assembly (6-8-2023)

Final Audit Report

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