

# **36-SDMS-01**

**Rev. 0**

## **SPECIFICATION FOR POLE-MOUNTED METERING UNIT RATED 15KV UP TO 36KV**

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# **36-SDMS-01**

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**SPECIFICATION FOR POLE-MOUNTED METERING UNIT  
RATED 15KV UP TO 36KV**

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**Revision History**

#	Date	Revision No.	Revised By	Major Revision Description
1				
2				
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## 1 SCOPE

This specification defines the minimum technical requirements for design, engineering, manufacture, testing, inspection and performance of pole-mounted metering unit rated up to 36kV for outdoor installation intended to be used for the measurement of energy consumption of bulk customers fed directly from medium-voltage overhead lines. This unit shall be mounted on an H-frame pole structure.

## 2 CROSS REFERENCES TO OTHER SEC STANDARDS

This specification shall always be read in conjunction with SEC General Specification No. 01-SDMS-01 (latest revision) titled "General Requirements for all Equipment/Materials," which shall be considered as an integral part of this specification. It shall also be read in conjunction with SEC purchase order and/or contract schedules, and scope of work/technical specifications for projects, as applicable.

The latest revisions of the following specifications shall be applicable for the equipment/materials covered in this specification:

Standard #	Title
01-SDMS-01	General Requirements for All Equipment/Material
20-SDMS-02	Specification for Overhead Line Accessories
34-SDMS-02	Specification for Medium-Voltage and Low-Voltage Fuses and Fuse-Links
50-SDMS-01	Specification for Current Transformers Rated up to 36kV
SEC-01-01	SEC Monogram for Equipment Mounting

*Table 1: List of reference SEC standards*

## 3 APPLICABLE CODES AND STANDARDS

The latest revision of the following codes and standards shall be applicable for the equipment/materials covered in this specification. In case of any deviation, the vendor/manufacture may propose equipment/materials conforming to alternate codes or standards. However, the provisions of SEC standards shall supersede the provisions of these alternate standards in case of any difference.

Standard #	Title
IEC 60529	Degrees of Protection Provided by Enclosures (IP Code)
IEC 61869-1	Instrument Transformers - Part 1: General Requirements
IEC 61869-2	Instrument Transformers - Part 2: Additional Requirements for Current Transformers
IEC 61869-3	Instrument Transformers - Part 3: Additional Requirements for

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	Inductive Voltage Transformers
IEC 60282-1	High-Voltage Fuses – Part 1: Current-Limiting Fuses
IEC 62271-1	High-Voltage Switchgear and Control gear – Part 1: Common Specifications for Alternating Current Switchgear and Control gear
IEC 62217	Polymeric HV Insulators for Indoor and Outdoor Use – General Definitions, Test Methods and Acceptance Criteria
IEC TS 60815-3	Selection and Dimensioning of High-Voltage Insulators Intended for Use in Polluted Conditions – Part 3: Polymer Insulators for AC Systems
ASTM B117	Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM D3359	Standard Test Methods for Rating Adhesion by Tape Test
ISO 2063	Metallic Coatings – Protection of Iron and Steel Against Corrosion – Metal Spraying of Zinc and Aluminum

*Table 2: List of applicable standards*

#### **4 SERVICE AND SYSTEM CONDITIONS**

The pole-mounted metering unit shall be suitable for operation under the service conditions specified in the latest revision of SEC specification 01-SDMS-01.

All components, fittings and attachments of the unit shall be capable of withstanding the effects of direct solar radiation at their installed locations. The temperature of surfaces exposed to direct solar radiation shall be regarded as 75°C plus the effect of any internal heating.

#### **5 MATERIAL, DESIGN AND CONSTRUCTION REQUIREMENTS**

##### **5.1. GENERAL**

5.1.1. The pole-mounted metering unit shall be air-insulated, self-contained, factory assembled in a totally enclosing aesthetically acceptable cladding. General components and layout shall be as shown in the drawings.

5.1.2. **The pole-mounted metering unit shall consist, but not limited to the following major components:**

- 5.1.2.1. Enclosure
- 5.1.2.2. Current Transformers
- 5.1.2.3. Voltage Transformers

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5.1.2.4. High-Voltage Fuses

5.1.2.5. High-Voltage Bushings (Polymeric Type)

5.1.2.6. Instrument Wirings

5.1.3. The insulation levels of each of the component of the pole-mounted metering unit shall be coordinated with the insulation level of the whole unit applicable for its intended voltage level.

## **5.2. ENCLOSURE**

THE ENCLOSURE SHALL BE DESIGNED AS FOLLOWS:

- 5.2.1 The enclosure shall be made of galvanized steel sheet with minimum thickness of 3.0mm or of Aluzinc steel sheet at least 2.0mm thick, the shape and dimensions are as shown in Figure 1 and Figure 2.
- 5.2.2 The enclosure shall be outdoor type with minimum degree of protection of IP54.
- 5.2.3 The enclosure shall have adequate mechanical strength to withstand rough handling as may be expected in normal uses.
- 5.2.4 Adequate ventilation shall be provided on the enclosure by means of breathable canopy and/or louvers to allow natural circulation of air. Ventilation shall be screened to prevent the entry of insects, vermin, and other foreign bodies. The screening material shall be rigid and strong made of stainless steel.
- 5.2.5 The enclosure shall be suitable to be installed on a fabricated steel skid base made of U-Channel 100mm x 50mm. The unit shall be supplied with complete set of hot-dipped galvanized Grade 8.8 mounting fasteners (bolts, nuts, washers, etc.)
- 5.2.6 Access shall be from the front by means of twin-door with gaskets and concealed stainless steel hinges duly welded. Each door shall be provided with three stainless steel hinges. The hinges shall have removable pins, to render it possible to remove the doors, if necessary.
- 5.2.7 Pressure fit type gasket shall be provided. Glue fit type is not acceptable.
- 5.2.8 The doors shall be provided with door stoppers and locking at open position up to 120° to prevent it from swinging.
- 5.2.9 Door security and locking provisions shall be as shown in Figure 1.
- 5.2.10 The enclosure shall be fitted with lifting lugs on both sides at the top, and suitably located to ensure that the complete unit is balanced when lifted.

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- 5.2.11 The enclosure shall be provided with surge arrester mounting brackets both on the incomer and outgoing side, respectively. The sizes of the surge arrester mounting holes are Ø14mm.
- 5.2.12 Two grounding terminals having M12 stainless steel stud and nut shall be provided and shall be clearly identified by a grounding mark. The grounding studs are internally connected on the earthing busbar by 35mm<sup>2</sup> tin-coated braided copper wire-links with terminal lugs on both ends.
- 5.2.13 Pocket for wiring diagrams, approved fabrication drawings, test reports, component details, and leaflets shall be fixed internally on the back-panel of left-side door.
- 5.2.14 SEC monogram and danger sign plate MV equipment, respectively in accordance with SEC-01-01 and Figure 49 of 20-SDMS-02, shall be provided on the front-panel of each door.
- 5.2.15 Indications of the power flow (INCOMING/OUTGOING) shall be marked legibly or engraved on a metallic plate to be fixed permanently near the bushings and are clearly visible from the ground-level.
- 5.2.16 The enclosure shall be adequately protected against corrosion and painted in accordance with the requirements of latest revision of SEC specification 01-SDMS-01. Paint color shall be RAL 7035.

### **5.3 CURRENT TRANSFORMERS**

- 5.3.1 Two dual-ratio CTs encapsulated-type shall be provided. It shall be well-fixed on the red and blue phases.
- 5.3.2 CTs shall conform to IEC 61869-1 and IEC 61869-2, and meet the applicable requirements of the latest revision of SEC specification 50-SDMS-01.

### **5.4 VOLTAGE TRANSFORMERS**

- 5.4.1 Two VTs encapsulated-type shall be provided.
- 5.4.2 The VTs shall be protected on the HV-side by a 6.0 ampere HV-fuses.
- 5.4.3 VTs shall conform to IEC 61869-1 and IEC 61869-3.
- 5.4.4 The secondary terminals of the VT circuit as shown in Figure 3 shall be connected on three low-voltage miniature circuit breakers located at the wire termination box.



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**5.5 HIGH-VOLTAGE FUSES**

5.5.1 Two HV-fuses rated 6.0A with striker (indicating device) shall be provided. Dimensions are as shown in Figure 4.

A suitable indicating mechanism clearly visible from the ground-level shall be mounted on the bottom part of the pole-mounted metering unit indicating that at least one of the fuses had blown-out. This mechanism will be activated by the striker pin of the fuse that is either mechanically or electrically linked to a flag. Alternative solution for this requirement may be proposed and subject for SEC evaluation and approval.

The mechanical flag shall be colored stripes of yellow and black.

5.5.2 The high-voltage fuses shall conform to IEC 60282-1.

**5.6 HIGH-VOLTAGE BUSHINGS**

5.6.1 The pole-mounted metering unit shall be provided with two sets of roof-mounted, outdoor-type, polymeric high-voltage bushings for terminations of the incoming and outgoing conductors. The minimum requirements of the bushings are as follows:

Highest Operating Voltage	17.5kV	36kV
Rated Voltage	13.8kV	33kV
Rated Current	400A	200A
Withstand Voltage	(1)	(1)
BIL	(1)	(1)
Creepage Distance:		
• Inland	25mm/kV	25mm/kV
• Coastal Areas	40mm/kV	40mm/kV
<i>Note:</i>		
(1) - applicable value per Table 6 of latest revision 01-SDMS-01		

*Table 3: Minimum requirement of HV-Bushings*

5.6.2 The HV polymeric bushings shall conform to applicable clauses of IEC 62217.

**5.7 INSTRUMENT WIRING**

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- 5.7.1 Internal wirings of the pole-mounted metering unit shall be 2.5mm<sup>2</sup> single-wire solid-core copper with black PVC insulation designed for a maximum permissible continuous temperature of 90°C.
- 5.7.2 The wires shall be laid in ducts or ties from the CTs and VTs and connected on the terminal blocks located at the wire termination box. The CT and VT wires shall be tagged with ferrules, i.e. reference terminal block name/number.
- 5.7.3 The wire termination box shall house all the terminal blocks, shorting provisions, and MCBs. It shall be weatherproof sealable metallic box fixed on the lower part of the pole-mounted metering unit as shown in Figure 1.

Locking provision shall be provided to limit access on the wirings to authorized personnel only.

Cable clamps shall also be provided under this termination box to secure and hold the pilot cables.

One opening on the bottom plate of the termination box shall be provided for the entry of the pilot cable. This hole shall be provided with rubber bushing/grommet for sealing purposes.

## **6 NAMEPLATE**

Each pole-mounted metering unit shall have a clear metallic nameplate fixed permanently on the front-panel of either door. The nameplate shall bear the following information:

- a. Manufacturer and Model/Type
- b. Serial Number
- c. Year of Manufacture
- d. Origin
- e. SEC Issued PO Number
- f. Vendor Name
- g. Reference SEC Specification
- h. SEC Monogram
- i. Rated Current, Voltage, and Frequency
- j. Rated Power Frequency and Lightning Impulse Withstand Voltage
- k. CT Ratings
- l. VT Ratings
- m. Fuse Ratings

## **7 TESTING AND INSPECTION**

The pole-mounted metering unit shall be inspected and tested in conformance with the requirements of applicable standards and SEC specifications.

### **7.1. ROUTINE TESTS**

Routine tests shall be performed on all pole-mounted metering units. Electronic copies of the test reports shall be submitted to SEC in USB thumb drive for each batch to be delivered prior to issuance of the releases.

SEC reserves the right to witness the routine tests on all units or on randomly selected samples thereof.

### **7.2. TYPE TESTS**

Each major component of the pole-mounted metering unit shall be type tested, i.e. HV-bushings, CTs, VTs, Fuse System (fuse and fuse-base).

Type test for the whole pole-mounted metering units shall include but not limited to the following tests:

- a. Short-Circuit Current Withstand Test
- b. Power Frequency Withstand Voltage Test
- c. Lightning Impulse Test
- d. Temperature-Rise Test
- e. Degree of Protection Provided by Enclosures (IP Code)
- f. Salt Spray Test and Tape (Scratch) Test

Type test shall be performed in complete conformance with the applicable standards. It shall be performed at SEC approved laboratories.

SEC reserves the right to attend and witness the tests.

SEC reserves the right to request the supplier/manufacturer to repeat the type test every five (5) years, or as needed should the supplied units have frequent faults and failures.

### **7.3. SAMPLE INSPECTION**

Samples together with actual/approved CAD drawings and routine test reports shall be inspected prior to issuance of approval for mass production. The following attributes shall be checked:

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- a. Dimensional verification
- b. Design verification (checking of each component)
- c. Operation
- d. Finishing
- e. Packaging

## **8 PACKING AND SHIPPING**

Packing and shipping requirement shall generally be as per latest revision of SEC General Requirements for Equipment/Materials, 01-SDMS-01 or as per purchase order requirements.

Each pole-mounted metering unit with all its components and accessories shall be packed as a complete unit/assembly and shall be delivered ready for use.

Packing shall protect the pole-mounted metering unit against damage during shipment and site handling.

Each pole-mounted metering unit shall be packed to ensure that no dust, dirt, or foreign matter will enter.

Suppliers should coordinate with SEC Warehousing Department for additional packing, handling, and or shipping instructions, as applicable.

Each packed pole-mounted metering unit shall be printed with the following information:

- a. Purchase Order Number / Tender Number
- b. Pole-Mounted Metering Unit Rating
- c. Manufacturer's Name and Model/Type
- d. Year of Manufacture
- e. SEC Item Code

## **9 GUARANTEE**

The supplier/manufacturer shall guarantee the products against all defects arising out of faulty design or manufacturing defects or defective materials for a period of five (5) years from the date of delivery.

The supplier shall guarantee the uniformity of the products delivered with the approved samples.

## **10 SUBMITTALS**

### **10.1. SUBMITTALS REQUIRED WITH TENDER/INQUIRY**

- 10.1.1. Summary in table form with the following information: list of items offered, B.O.Q. for each unit offered, manufacturer, origin, catalogue number, and quantity
- 10.1.2. Clause-by-clause compliance with the latest revision of SEC specification 36-SDMS-01
- 10.1.3. Catalogues of each component
- 10.1.4. Certificate stating that the raw materials and major components has been sampled, tested and inspected in accordance with relevant standard specifications
- 10.1.5. Product type test reports and certificates carried out from SEC approved laboratories including type test reports of each major components
- 10.1.6. Filled-up technical data schedule on each of the items offered, e-copy in Excel (\*.xlsx) format
- 10.1.7. Manufacturer CAD drawings, e-copy in AutoCAD 2013 (\*.dwg) format, for each of the items offered
- 10.1.8. USB Flash Drive containing e-copy of all the documents mentioned above

### **10.2. SUBMITTALS REQUIRED FOLLOWING AWARD OF CONTRACT**

- 10.2.1. Fabrication CAD drawings
- 10.2.2. Quality Assurance Tests
- 10.2.3. Manufacturing and Routine Test Schedules
- 10.2.4. Special tests, if applicable
- 10.2.5. USB Flash Drive containing e-copy of all the documents mentioned above

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**11 TECHNICAL DATA SCHEDULE**

SEC Inquiry No:

Item No:

No	Description	SEC Specified Values (*)	Vendor Proposed Values (**)
<b>1</b>	<b>General</b>		
	Highest Operating Voltage	15kV or 36kV	
	Nominal Voltage	13.8kV or 33kV	
	Rated Frequency	60Hz	
	Short-Circuit Level for 1 second	21kA for 15kV 25kA for 36kV	
	Rated Lightning Impulse Withstand Voltage	*	
	Rated Power Frequency Withstand Voltage	*	
	Rated Current	*	
<b>2</b>	<b>Enclosure</b>	-	
	Material	Galvanized or Aluzinc	
	Minimum Thickness	3.0mm or 2.0mm	
	Color	RAL 7035	
	IP Code	IP54	
	Surge Arrester Mounting Brackets Available Both on Incomer and Outgoing	Yes	
<b>3</b>	<b>Current Transformers</b>	-	
	Reference Manufacturing Standard	IEC 61869-1 IEC 61869-2	
	Rated Voltage	13.8kV or 33kV	
	Rated Frequency	60Hz	
	Current Ratio (Dual-Ratio)	*	
	Burden	15VA	
	Accuracy Class - Metering	0.2	
	Rated Short-Time Thermal Current, $I_{th}$	*	
	Rated Dynamic Current, $I_{dyn} \geq (2.5 \times I_{th})$	*	
	Rated Primary Terminal Insulation Level - Impulse Withstand Voltage (Peak), kV	*	

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	- Power Frequency Withstand Voltage, kV	*	
	Product is Type Tested	Yes	
	SEC Approved Laboratory	**	
	Date Tested	**	
	Manufacturer	**	
	Model/Type	**	
	Country of Origin	**	
<b>4</b>	<b>Voltage Transformers</b>		
	Reference Manufacturing Standard	IEC 61869-3	
	Rated Voltage	13.8kV or 33kV	
	Rated Frequency	60Hz	
	Voltage Ratio	*	
	Burden	*	
	Accuracy Class	0.2	
	Rated Primary Terminal Insulation Level		
	- Impulse Withstand Voltage (Peak), kV	*	
	- Power Frequency Withstand Voltage, kV	*	
	Product is Type Tested	Yes	
	SEC Approved Laboratory	**	
	Date Tested	**	
	Manufacturer	**	
	Model/Type	**	
	Country of Origin	**	
<b>5</b>	<b>High-Voltage Fuses</b>	-	
	Reference Manufacturing Standard	IEC 60282-1	
	Rated Voltage	13.8kV or 33kV	
	Rated Maximum Breaking Capacity at Rated Voltage (Symmetrical)	*	
	Rated Continuous Current	6.0A	
	Fuse Type	Type I - Airtight	
	Product is Type Tested	Yes	
	SEC Approved Laboratory	*	

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	Date Tested	*	
	Manufacturer	*	
	Model/Type	**	
	Country of Origin	*	
<b>6</b>	<b>High-Voltage Bushings</b>	-	
	Reference Manufacturing Standard	IEC 62217	
	Rated Voltage	13.8kV or 33kV	
	Material	Polymer	
	Rated Current	*	
	Minimum Creepage Distance, mm/kV	25 or 40	
	Rated Insulation Level		
	- Impulse Withstand Voltage (Peak), kV	*	
	- Power Frequency Withstand Voltage, kV	*	
	Product is Type Tested	Yes	
	SEC Approved Laboratory	**	
	Date Tested	**	
	Manufacturer	**	
	Model/Type	**	
	Country of Origin	**	
<b>7</b>	<b>Pole-Mounted Metering Unit</b>		
	Product is Type Tested	Yes	
	SEC Approved Laboratory	**	
	Date Tested	**	
	Manufacturer	**	
	Model/Type	**	
	Country of Origin	**	
	Submittals Required with Tender/Inquiry Included or Not?	**	

Table 4: Technical Data Schedule



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**Pole-Mounted Metering Unit**

SEC Inquiry No:

Item No:

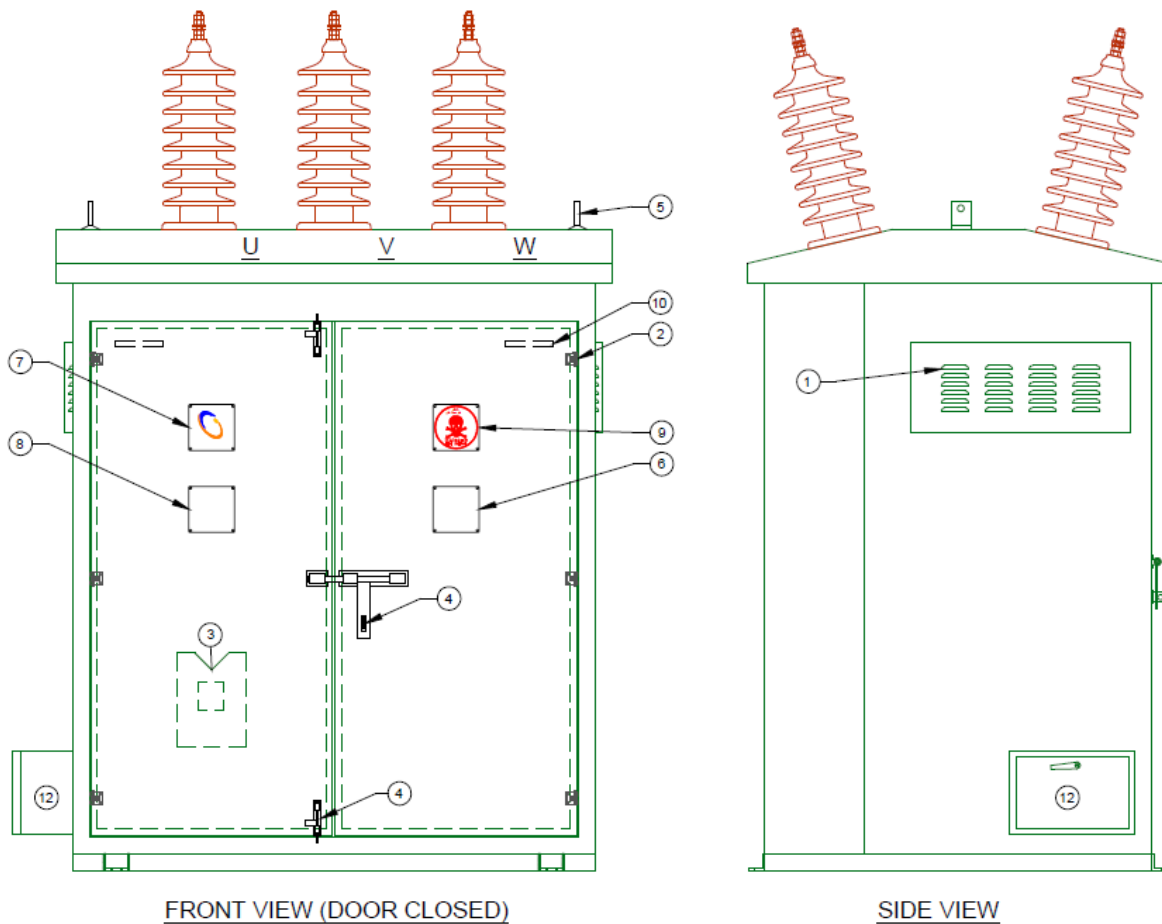
- Additional Technical Information or Features Specified by SEC
- Additional Supplementary Data or Features Proposed by Bidder/Vendor/Supplier.
- Other Particulars to be filled-up by the Bidder/Vendor/Supplier.
- List of Deviations and Clauses to which exception is taken by the Bidder/Vendor/Supplier. (Use separate sheet, if necessary).

Description	Manufacturer of Material/Equipment	Vendor/Supplier
Name of Company		
Location and Office Address		
Name and Signature of Authorized Representative with Date		
Official Seal / Stamp		

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**12 DRAWINGS**



**OUTDOOR POLE MOUNTED METERING UNIT**

**LEGENDS:**

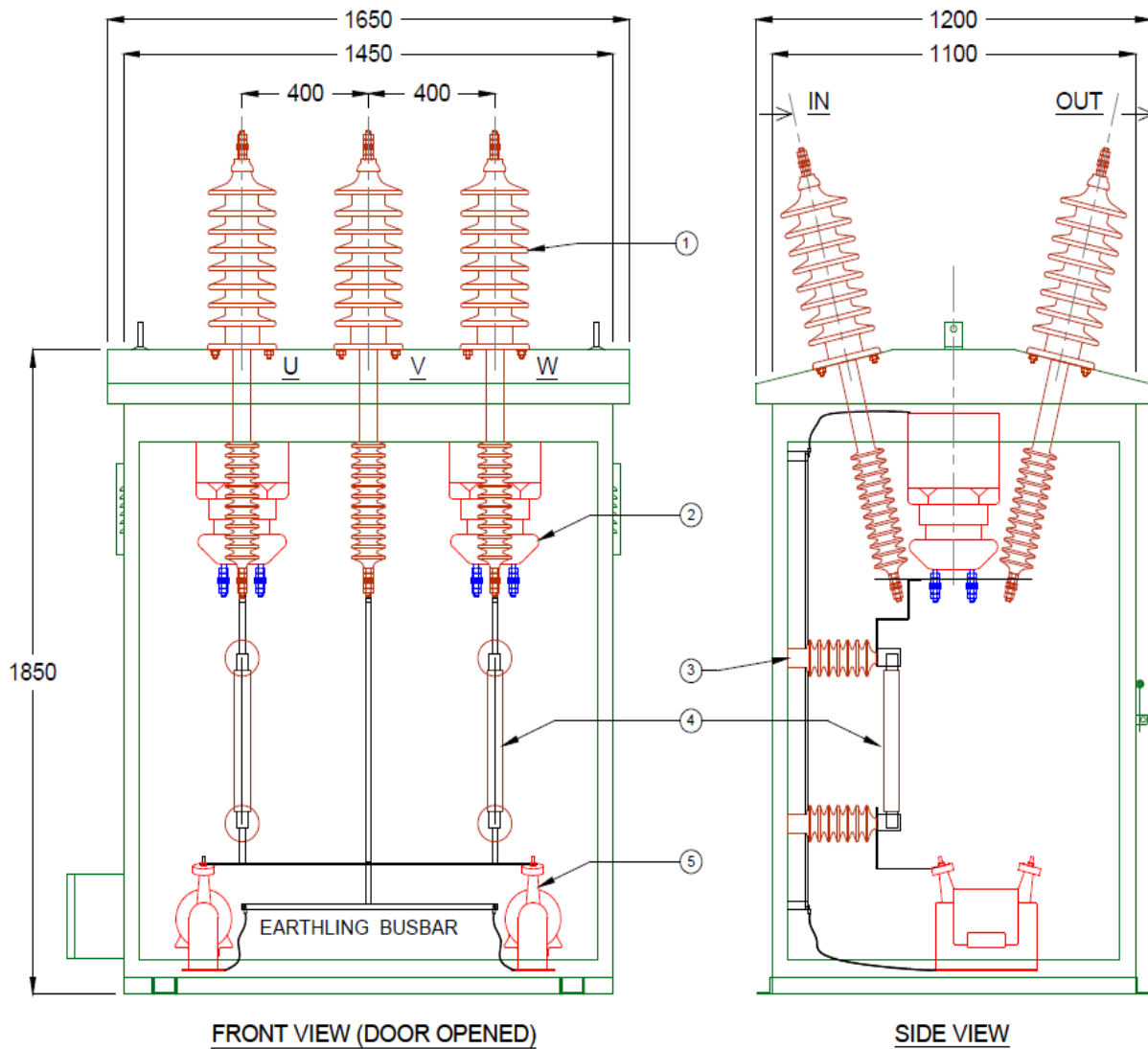
- |  |   |
|--|---|
| 1. LOUVERS WITH FIXED METALLIC FILTER  | 6. NAME PLATE                             |
| 2. CONCEALED STAINLESS STEEL HINGES (WELDED)                                     | 7. SEC MONOGRAM                           |
| 3. DRAWINGS & CATALOGUE HOLDER<br>WELDED AT BACK OF THE DOOR                     | 8. MANUFACTURER MONOGRAM                  |
| 4. MAIN BARREL BOLT LOCK STAINLESS STEEL<br>WITH INTEGRATED PADLOCKING PROVISION | 9. SEC DANGER SIGN PLATE FOR MV EQUIPMENT |
| 5. LIFTING LUG   | 10. DOOR STOPPER                          |
|  | 11. MINI BARREL BOLT LOCK STAINLESS STEEL |
|  | 12. WIRE TERMINATION BOX                  |

*Figure 1: General Features of Pole-Mounted Metering Unit*

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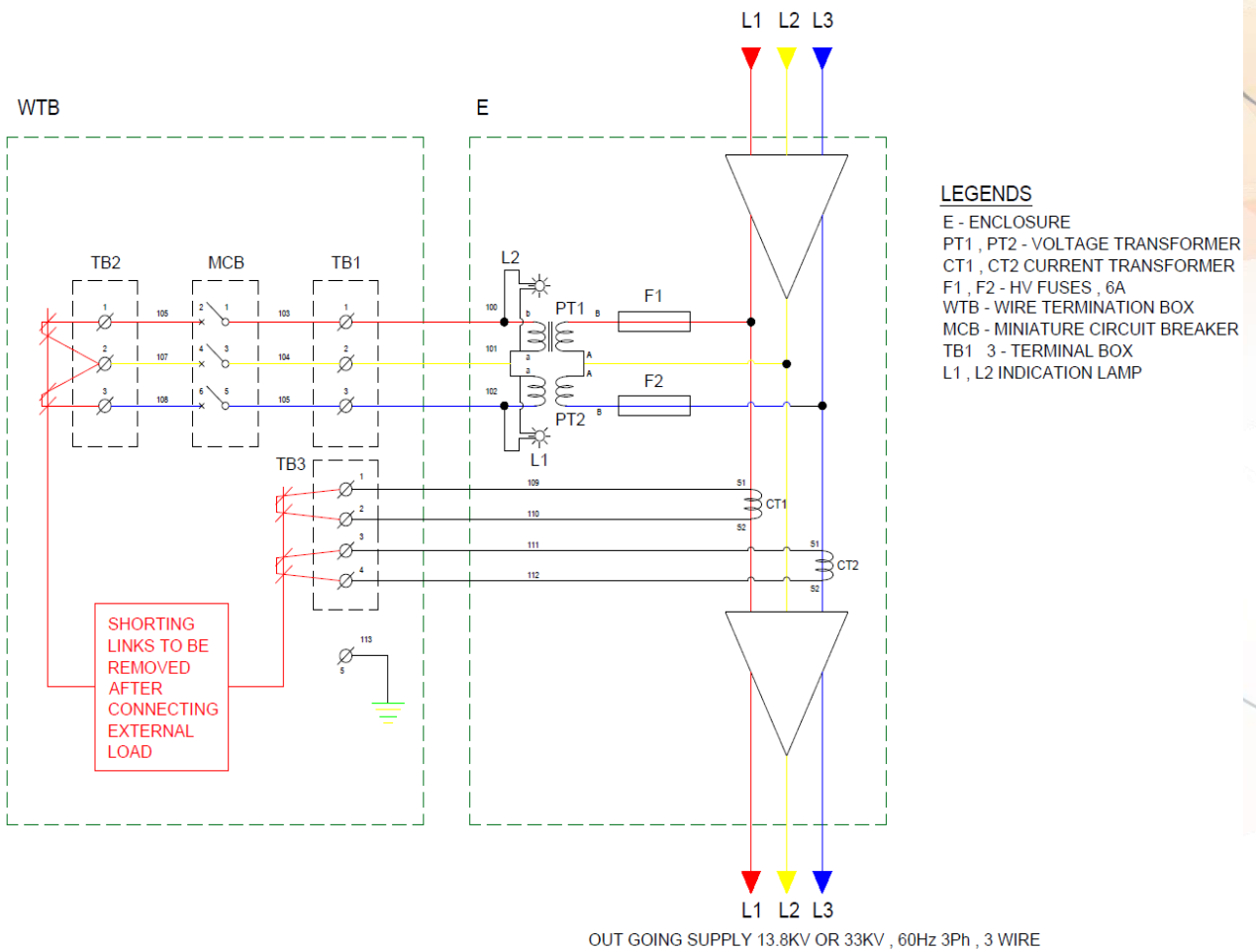
**LEGENDS:**

1. HIGH-VOLTAGE THROUGH BUSHINGS (POLYMERIC TYPE)
2. CURRENT TRANSFORMER
3. FUSE HOLDER
4. FUSE
5. VOLTAGE TRANSFORMER

*Figure 2: Internal Features and Dimensions of Pole-Mounted Metering Unit*

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**LEGENDS**

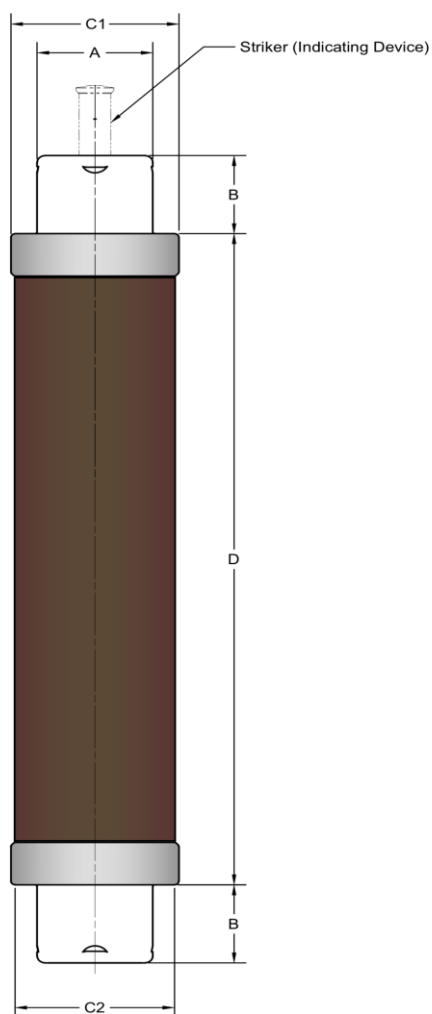
- E - ENCLOSURE
- PT1 , PT2 - VOLTAGE TRANSFORMER
- CT1 , CT2 CURRENT TRANSFORMER
- F1 , F2 - HV FUSES , 6A
- WTB - WIRE TERMINATION BOX
- MCB - MINIATURE CIRCUIT BREAKER
- TB1 3 - TERMINAL BOX
- L1 , L2 INDICATION LAMP

*Figure 3: Circuit Diagram of Pole-Mounted Metering Unit*

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Fuse Type	ØA (mm)	B (mm)	ØC1 (Max.) (mm)	ØC2 (Max.) (mm)	D (mm)
Type I - Airtight	45	33	88	88	442

Figure 4: High-Voltage Fuses for Pole-Mounted Metering Unit