

STANDARD SPECIFICATION FOR TYPE PMDF DEAD-FRONT PAD-MOUNTED PRIMARY METERING SWITCHGEAR

A. General

1. Product

The pad-mounted metering switchgear shall be in accordance with the applicable plans, drawings, and one-line diagrams and shall conform to these specifications.

2. Assembly

The outdoor pad-mounted primary metering switchgear shall consist of a single self-supporting enclosure, with primary bus, cable-termination points, provisions for customer provided current and voltage sensing transformers (see available optional choices to provide and/or install metering transformers at section D.2.c.iii) and optional components (section D.3). The unit will be factory assembled and checked to the level of the components supplied.

3. Configurations (radial or loop feed)

- a) Outdoor pad-mounted primary metering switchgear shall be specified by the customer for its intended applications – radial feed or loop feed.
- b) “Radial” designs shall have three (3) bushing wells for 200 ampere service on the source (line) side and three (3) bushing wells on the load side, for a total of six (6) bushing wells.
 - For 600-ampere source (line) and/or load applications, substitute 600-ampere bushings for 200-ampere bushing wells as appropriate.
 - Optional paralleled load-side bushing wells or bushings are an available option for a total of nine (9) bushing wells or bushings, three source (line) side and six on the load side.
 - Specify 200-ampere bushing wells or 600-ampere bushings, as appropriate, for source (line) and load applications.
 - Configurations with twelve (12) bushing wells and/or bushings (six each on source and load sides), are also available.
- c) “Loop” (or “feed-through”) designs shall have either six (6) bushing wells (for 200-ampere service) or 6 (six) bushings (for 600-ampere service) on the source (line) side and shall have three (3) bushing wells or bushings on the load side, for a total of nine (9) bushing wells or bushings.
 - Specify 200-ampere bushing wells or 600-ampere bushings, as appropriate, for source (line) and load applications.
 - Configurations with twelve (12) bushing wells and/or bushings (six each on source and load sides), are also available.

4. Ratings

The ratings for the integrated pad-mounted primary metering enclosure assemblies shall be as follows:

	System Voltage Class		
	15kV	25kV	35kV
kV, Nominal	15	25	35
kV, Maximum Design	17.5	25	38
kV, BIL	95	125	150
Main Bus Continuous, Amps ①②	200/600	200/600	200/600

① Specify whether 200 amp or 600 amp main bus is to be provided.

② Units rated up to 1200 amperes are also available.

5. Certification of Ratings:

The manufacturer shall be completely and solely responsible for the performance of the basic switchgear components as well as the complete integrated assembly as rated, with the exception of any current and/or voltage sensing transformers that are supplied by, or later installed by, the customer or a third party.

The manufacturer shall furnish, upon request, certification of ratings of the basic switchgear components and/or the integrated pad-mounted switchgear assembly consisting of the switchgear enclosure, primary bus, bushings and bushing wells.

If current and/or voltage sensing transformers are specified by, supplied by, or later installed by the customer or a third party, manufacturer’s certification requirements shall not apply to these transformer items.

6. Compliance with Standards and Codes

The pad-mounted primary metering switchgear shall conform to or exceed the applicable requirements of the following standards and codes:

- a) All portions of ANSI C57.12.28 covering enclosure integrity for pad-mounted equipment.
- b) Applicable portions of IEEE C37.74 covering the design and testing of distribution switchgear, components, and ways.
- c) Applicable portions of IEEE-386 (formerly ANSI C119.2), which covers bushings and bushing wells.

7. Enclosure Design

To ensure a completely coordinated design, the pad-mounted switchgear shall be constructed in accordance with the minimum construction specifications required to provide adequate electrical clearances and adequate space for operation of the unit and any required handling of components.

In establishing the requirements for the enclosure design, consideration shall be given to all relevant human factors, such as controlled access and tamper resistance, as well as environmental factors, such as ingress of air-borne con-

Specifications must be verified by factory.

mination and ventilation necessary for control of moisture and condensation.

B. Construction — Assembly

1. Insulators, Bushings, and Bushing Wells

The pad-mounted metering switchgear insulators, bushings, and bushing wells shall have the following material characteristics and restrictions:

- a) Operating experience of at least twenty (20) years under similar conditions.
- b) Ablative action to ensure non-tracking properties.
- c) Adequate leakage distance established by test per IEC Standard 60507.
- d) Adequate strength for short-circuit stress established by test.
- e) Conformance to ANSI/IEEE standard 386.
- f) Homogeneity of the cycloaliphatic epoxy resin throughout each insulator, bushing, and bushing well to provide maximum resistance to power arcs. Ablation due to high temperature from power arcs shall continuously expose more material of the same composition and properties so that no change in mechanical or electrical characteristics takes place because of arc-induced ablation. Furthermore, any surface damage to insulating components during installation or maintenance of the pad-mounted gear shall expose material of the same composition and properties so that insulating components with minor surface damage or imperfections need not be replaced.
- g) Each insulator, bushing, and bushing well shall be x-rayed to assure it is free of voids. An alternative testing method may be used only by approval of the engineer.
- h) Conductor rods of bushings and bushing wells shall be of all copper construction, with the associated threaded studs to be copper with a silver flash.

2. High-Voltage Bus

- a) Bus and interconnections shall consist of bare aluminum bar of 56% IACS conductivity with an oxide-inhibiting agent at all bus joints.
- b) Bus and interconnections shall withstand the stresses associated with short circuits up to the maximum rating of the pad-mounted gear.
- c) Bolted aluminum to aluminum connections shall be made with a suitable number of non-corrosive bolts, with two Belleville spring washers per bolt, one under the bolt head and one under the nut, or with a wide-flange head bolt and one Belleville spring washer under the nut, per bolt. As an alternate, bolted aluminum-to-aluminum connections shall be made with a suitable equivalent surface area, i.e. — 1-bolt and spring washer. Bolts shall be tightened to an appropriate torque to assure good electrical connection.

- d) Before installation of the bus, all electrical contact surfaces shall first be prepared by abrading to remove any aluminum-oxide film. Immediately after this operation, the electrical contact surfaces shall be coated with a uniform coating of an oxide inhibitor and sealant.

3. Ground-Connection Pads

- a) A ground connection pad shall be provided in each termination compartment of the pad-mounted switchgear.
- b) The ground connection pad shall be constructed of 1/4" thick, stainless steel and have a NEMA 2-hole pattern for ground connections. The pad shall be welded to the enclosure and shall have a short-circuit rating equal to that of the integrated assembly.
- c) A full-width copper rod for connection of grounding devices and ground leads shall be provided in each cable termination compartment.

C. Construction Enclosure and Finish

1. Enclosure

- a) The primary metering enclosure shall be of unitized construction (not structural frame and bolted sheet) to maximize strength, minimize weight, and inhibit internal corrosion.
- b) The basic material for the enclosure, roof, and doors shall be 11-gauge, hot rolled, pickled and oiled steel.
- c) All structural joints and butt joints shall be welded, and the external seams shall be ground flush and smooth. A welding process shall be employed that eliminates alkaline residues and minimizes distortion and spatter.
- d) To guard against unauthorized or inadvertent entry, enclosure construction shall not utilize any externally accessible hardware.
- e) The base shall consist of continuous 90° flanges, turned inward and welded at the corners, for bolting to the concrete pad.
- f) The door openings shall have 90° flanges, facing outward, that shall provide strength and rigidity as well as deep overlapping between doors and door openings to guard against water entry.
- g) In consideration of tamper resistance, the enclosure shall conform to, or exceed, the requirements of ANSI/IEEE C57.12.28.
- h) A heavy coat of insulating "no-drip" compound shall be applied to the inside surface of the roof to reduce condensation of moisture thereon.
- i) The roof shall be removable with bolts accessible in the termination and the metering transformer compartments.
- j) Lifting tabs shall be removable. Sockets for the lifting-tab bolts shall be blind-tapped. A protective

material shall be placed between the lifting tabs and the enclosure to prevent the tabs from scratching the enclosure finish. This material shall be non-hygroscopic to prevent moisture from being absorbed and allowed to remain against the enclosure.

- k) To prevent moisture ingress, the roof shall be one-piece construction and shall not include any gasketed joints.
- l) Any welded butt joints exposed to the exterior shall be ground smooth.
- m) A steel equipment wall is provided for mounting of the bushing wells and/or bushings, as well as to separate the dead-front cable termination compartment from the medium voltage transformer compartment.

The following optional feature may be specified

- n) A steel (specify compartmented or non-compartmented) base spacer shall be provided to increase the elevation of the live parts in the primary metering switchgear above the mounting pad by (specify – 6, 12, 18, 24) inches.

2. Barrier Assembly

Insulating barriers shall be provided between metering transformers when required to achieve necessary insulation levels between phases. The barriers shall be constructed of fiberglass reinforced polyester (NEMA GPO-3).

3. Doors

- a) Doors shall be constructed of 11-gauge hot-rolled, pickled and oiled sheet steel.
- b) Door edge flanges shall overlap with door opening flanges and shall be formed to create a mechanical maze that shall guard against water entry and discourage tampering or insertion of foreign objects.
- c) Doors shall have a minimum of three stainless steel hinges and hinge pins. The hinge pins shall be secured in place to guard against tampering.
- d) One active and one passive door shall be provided in the case where there are two adjacent doors. In consideration of controlled access and tamper resistance, each active door shall be equipped with a three-point latching mechanism and padlock hasp.
- e) Each active door shall be provided with a hinged stainless-steel cover over the padlock hasp. The cover shall be padlockable and shall incorporate a cover to protect the padlock shackle from tampering.
- f) Each handle shall be provided with a recessed penta-head bolt (hex-head optional) for additional security.
- g) Each passive door shall be independently secured (bolted or latched) to the enclosure.

- h) Each door shall be provided with a stainless-steel door holder (or “wind brace”) located above the door opening. These holders shall be hidden from view when the door is closed. It shall not be possible for the holders to swing inside the enclosure.

4. Finish

- a) Full coverage at joints and blind areas shall be achieved by processing enclosures independently of components, such as doors and roofs, before assembly as unitized structures.
- b) All exterior welded seams shall be sanded or ground smooth for neat appearance.
- c) All surfaces shall undergo a chemical cleaning, phosphatizing or zirconization and sealing process before any protective coatings are applied in order to remove oils and dirt, form a chemically and anodically neutral conversion coating, improve the finish-to-metal bond, and retard under-film propagation of corrosion.
- d) The finishing system shall be applied without sags or runs.
- e) After the enclosure is completely assembled and the components (bus, bushings, etc.) are installed, the finish shall be inspected for scuffs and scratches.
- f) Blemishes shall be carefully touched up by hand to restore the protective integrity of the finish.
- g) Unless otherwise specified, the color shall be Munsell No. 7GY 3.29/1.5, bell green.
- h) To ensure that the finishing system is capable of resisting corrosion, the manufacturer shall provide, on request, certification that the representative test panels, protected by the manufacturer’s finish system, have passed the coating system performance requirements in ANSI/IEEE C57.12.28 as verified by an independent third party certifier, such as UL®.

D. Construction - Internal Components

1. Cable Termination Compartments

- a) Cable termination compartments shall be provided with 600-ampere rated apparatus bushings and/or 200-ampere bushing wells, as specified by the customer.
 - i. 600-ampere rated bushings shall include removable silver-plated copper threaded studs to accommodate a choice of elbow-termination systems.
 - ii. 200-ampere rated bushing wells shall be designed to accept 200-ampere bushing inserts and shall have removable, silver-plated copper studs.
- b) Bushings and bushing wells shall have interfaces in accordance with ANSI/IEEE Standard 386 to accept all standard separable insulated connectors and inserts.

- c) A parking stand of stainless steel shall be provided adjacent to each bushing and bushing well to accommodate horizontal feed-through assemblies and stand-off bushings.
- d) A location to accommodate drain wires from elbow connectors and accessories shall be provided adjacent to each bushing and bushing well.

2. Metering Transformer Compartment

- a) An insulated, hinged, GPO-3 barrier system, secured with pentahead bolts, inside the exterior steel doors, shall be provided to restrict immediate direct exposure to interior of the instrument-transformer compartment.
- b) Provisions for Instrument Transformers (standard) Mounting provisions (channels or angles) shall be provided to support the instrument transformers. These mounting channels or angles shall be designed and constructed to provide adequate support for voltage transformers (VTs or PTs) and current transformers (CTs) without any noticeable sag.

If the customer will be installing the instrument transformers, the customer must provide the transformer manufacturer's catalog number, weight, and dimensions of these transformers and hole drilling locations for securing the CTs and PTs.

- c) The following options may be provided:
 - i. Clear polycarbonate hinged inner barrier with pentahead bolt closures to replace the GPO-3 barriers.
 - ii. Hex-head bolts in lieu of pentahead bolts.
 - iii. Metering Transformers – Customer Specified or Provided (Options)
 - a. If the metering transformers are to be purchased and installed by the switchgear manufacturer, then the customer must specify the approved metering transformers to be purchased and any special wiring requirements.
 - b. The manufacturer shall install customer-supplied metering transformers, if specified.

3. Other Optional Components and Features

a) Meter Socket

A meter socket may be specified as an option. If a meter socket is specified, the customer must specify the socket to be used.

b) Test Switch

A test switch may be specified as an option. If a test switch is specified, the customer must specify the switch to be used.

c) Wiring

When factory wiring is specified, the customer must provide the specific wiring requirements desired for the metering circuit.

d) Additional Configurations and Options

Primary metering requirements are also available in custom designs, incorporating higher continuous currents, fusing and switching arrangements, as well as optional externally mounted KWH meters in low voltage compartments.

Consult the factory for dimensions, configurations, and optional features.

E. Labeling

1. Warning Signs

All active external doors shall be provided with approved "Warning – High Voltage – Keep Out" signs.

2. Additional Hazard-Alerting Signs and Labels for the Metering Transformer Compartment shall include:

- a) A "Danger – High Voltage – Keep Out – Qualified Persons Only" sign on the inside of each door.
- b) A "Danger" sign on both sides of each barrier in the metering transformer compartment.

3. Nameplates, Ratings Labels, & Connection Diagrams

- a) The outside of both the front and back shall be provided with nameplates indicating the manufacturer's name, serial number, catalog number, model number, and date of manufacture.
- b) The inside of each door shall be provided with a ratings label indicating the following: voltage ratings, main bus continuous rating, short circuit ratings (amperes RMS symmetrical at rated nominal voltage), and approximate weight.
- c) A one-line connection diagram showing the bus, terminations, and locations of the PTs and CTs will be provided on the inside of the front and rear doors.
- d) The exterior shall include labeling indicating the Elbow compartment and the Metering compartment, centered above the door(s).

Individual interior labeling shall be provided for the following:

- e) Phase identification (numbered)
- f) "Line" bushing well (or bushing) identification
- g) "Load" bushing well (or bushing) identification

F. Accessories

- 1. Furnish fuse components of the type specified by the purchaser.
 - a) Other than PT fuses, no fuse units shall be supplied unless actually noted by the purchaser in the specifications available to the switchgear manufacturer at the time of quotation.
- 2. A fuse handling tool as recommended by the fuse manufacturer shall be furnished if noted by the purchaser in the specifications.

Specifications must be verified by factory.

Every effort is made to ensure that customers receive up-to-date information on the use of Federal Pacific products; however, from time to time, modifications to our products may without notice make the information contained herein subject to alteration.

