



Document Title:
Gas Insulated Underground Switchgear

Document Type:
Material Specifications

Document No.:
4350.279

Department:
Distribution Standards & Materials

Issue Date:
November 1, 2022

Effective Date:

Author

Alex J. Rodríguez Rodríguez, PE
Standards Engineer, Distribution Stand & Materials

Signature and Date

Feb 3, 2023

Reviewer

Rafael Torres Martinez, PE
Supervisor, Distribution Standards & Materials

Signature and Date

Feb 3, 2023

Approver

Ricardo Castro Gómez, PE
Manager, Distribution Standards & Materials

Signature and Date

Feb 3, 2023

Version History

Date	Revision Comments
Nov. 1, 2022	Initial Release.

Warehouse Catalog	Item Version	Date
038- 83629	1	11/1/2022
038- 83630	1	11/1/2022



Equipment Specification

Document No.: 4350.279

Originating Department: Distribution Engineering



Dead Front Gas Insulated Switchgear

1. Introduction

This is a general specification that covers the minimum requirements for gas insulated underground switchgear to be 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 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 material to LUMA on previous orders, will not have to furnish samples at bid opening. With the exception if any material or design changes were made to an approved product, it must be re-submitted to the material specification engineer for approval before shipping. The material will be received at the LUMA's general warehouse (O11) at Palo Seco, Puerto Rico. Shipping will include transportation and unloading at the indicated warehouse.
- 2.2. The manufacturer shall furnish, upon request, certification of ratings of the load-interrupter switch, fault interrupter, and the integrated switchgear assembly consisting of switches and fault interrupters in combination with the hermetically sealed tank.
- 2.3. Product shall be manufacture 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. The product shall be furnished as described here in this specification or as amended by the purchase order. In case of any changes or updates to the supplier's procedures, quality routines, and/or inspection layout the supplier shall be responsible for all costs incurred for product that is rejected.
- 2.4. Upon inspection of incoming 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 product that is rejected.
- 2.5. Any changes or updates to the supplier's approved designs, procedures, quality routines and/or inspection layout shall be communicated to LUMA Energy's material specification engineer in writing.

- 2.6. The manufacturer of the switchgear shall be completely and solely responsible for the performance of the load-interrupter switch and fault interrupter as well as the complete integrated assembly as rated.

3. Quantity/Literature

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

4. Markings

- 4.1. Containers shall be marked outside with LUMA Energy's purchase order and item number, manufacturer's details such as model name and number, lot number, and the warehouse ID number where it will be received at.
- 4.2. Packaging labels and tags shall be waterproof.

5. Equal or Approved Equal to

- 5.1. S&C Remote Supervisory Vista Underground Distribution Switchgear, 4 ways, wet vault style, sulfur hexafluoride (SF6) insulating gas, 900 A or 600 A:
 - a) 900 A Model: 864222-A1A2A3A4B1B2B3B4C11C21D1D2D3D4GJ35K1K4L2L71M1O
R12R42UZ5Y4-SXXX
 - b) 600 A Model: 944222-A1A2A3A4B1B2B3B4C11C21D1D2D3D4GJ35L2L71M3O
R12T2UZ5Y4-SXXX

6. Packaging

- 6.1. The underground switchgear and all components shall be shipped on wooden skids protected with packing materials such as foam padding, cardboard, plastic, etc.
- 6.2. All material and equipment 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.
- 6.3. Warning label shall be placed on the equipment for special handling and storage requirements.
- 6.4. Any additional materials shall be packed in weatherproof boxes and identified with weatherproof labels.
- 6.5. All materials, elements, parts, and hardware crates shall be shipped on flatbed trailers and stored in such a way so that they can be unloaded by finger lifts. Deliveries in containers or closed platforms where finger lifts cannot be used will not be accepted.
- 6.6. A copy of each detailed packing list must be sent to LUMA Energy's personnel in charge of the requisition, prior to the delivery.

7. Number Per Package (Logistics)

Standard package: One unit per pallet or as requested by LUMA.

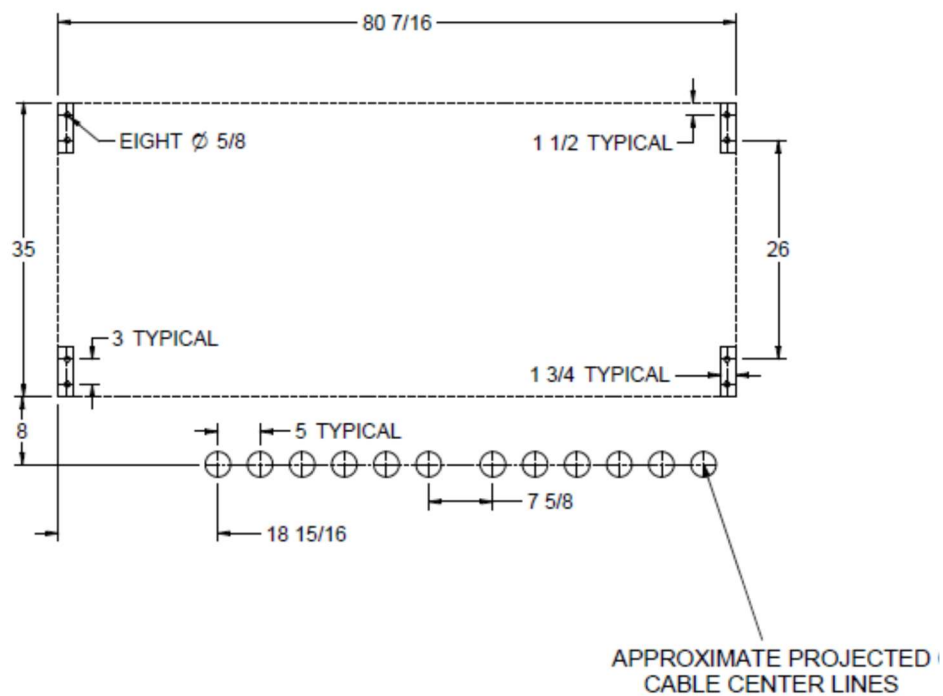
8. Acceptance Criteria

- 8.1. Test required: certified by external qualified laboratories.
- 8.2. Latest applicable codes, standards, and other regulations: IEEE, NEMA, ANSI, ASTM, NEC, and OSHA standards and the herein included requirements. The following standards shall form a part of this specification unless otherwise stated:
 - a) IEEE C37.74 - IEEE Standard Requirements for Subsurface, Vault, and Padmounted Load-Interrupter Switchgear and Fused Load-Interrupter Switchgear for Alternating Current Systems up to 38 kV
 - b) IEEE/IEC C37.60-2012 - International Standard - High-voltage Switchgear and Controlgear - Part 111: Automatic Circuit Reclosers and Fault Interrupters for Alternating Current Systems up to 38 kV
 - c) IEC 62271-100 - High-voltage Switchgear and Controlgear - Part 100: Alternating-Current Circuit-Breakers
 - d) IEC 62271-200 - High-voltage Switchgear and Controlgear - Part 200: AC Metal-Enclosed Switchgear and Controlgear for Rated Voltages Above 1 kV and up to and Including 52 kV
 - e) IEEE C37.20.7 - IEEE Guide for Testing Switchgear Rated Up to 52 kV for Internal Arcing Faults
 - f) ASTM D2472 - Standard Specification for Sulfur Hexafluoride
 - g) ASTM (A480) - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
 - h) IEEE 37.20.3 - Standard for Metal-Enclosed Interrupter Switchgear (1 kV–38 kV)
 - i) IEEE C57.12.28 - Pad-Mounted Equipment—Enclosure Integrity.
 - j) IEEE (386) - Standard for Separable Insulated Connector Systems for Power Distribution Systems Rated 2.5 KV through 35 KV.
 - k) IEEE C37.112 - Standard Inverse-Time Characteristic Equations for Overcurrent Relays
 - l) NEMA Class A20 for insulators.
 - m) ANSI Z535 for safety signs and colors.

9. Description

- 9.1. The gas insulated underground distribution switchgear is a sectionalizing device installed in distribution system primary feeders for interconnection with other primary feeders, create branch feeders, lateral circuits, and tap off three-phase primary service laterals to energize customer's facilities.
- 9.2. The gas insulated underground distribution switchgear shall be capable of provide automated switching and fault protection for underground distribution systems.

- 9.3. Underground switchgear shall consist of a stainless steel hermetically sealed tank containing sulfur hexafluoride (SF6) insulating gas that enclose load-interrupter switches and resettable fault interrupters. The equipment must include motor operators and controls, three phase voltage and current sensing, low-voltage submersible enclosure with microprocessor- based overcurrent control, and control battery pack.
- 9.4. The switchgear and all its components must be wet-vault mounted style designed to be installed in manholes subject to periodic flooding.
- 9.5. The switchgear must have the arc resistance feature conforming IEC 62271-200.
- 9.6. Equipment shall be dead-front and must be operable from grade level without exposure to high voltage.
- 9.7. The gas insulated switchgear must have 4 ways. Ways 1 and 4 must have load interrupter switches for source connection. Ways 2 and 3 must have fault interrupters for load connection. For phases and ways arrangement, refer to One Line Diagram on page 1 of LUMA standard no. URD-11-D.
- 9.8. The switchgear must include internal control power in order to supply power to control low voltage enclosure.
- 9.9. The unit shall be designed and constructed in accordance with LUMA standards no. URD-11-D latest revision.
- 9.10. The unit main bus must be made in copper and must be designed to comply with current rating specified in Switchgear Electrical Ratings Table Section 9.23.
- 9.11. Switchgear footprint must have the following dimensions:



- 9.12. Underground switchgear overall height with motor operators installed must be 36 3/4" maximum.

9.13. Tank Construction:

- a) Switchgear tank shall be submersible and able to withstand up to 10 feet (305 cm) of water over the base. Must be of welded construction made of 304L stainless steel. Tank construction must include a means of lifting.
- b) Switchgear tank and components shall be capable to withstand harsh environmental conditions caused by occasional flooding of water that may also contain typical levels of contaminants such as salt, fertilizer, motor oil, and cleaning solvents.
- c) The switchgear shall be filled with SF6 gas to a pressure of 7 psig at 68°F (20°C). The gas-tight tank shall be evacuated prior to filling with SF6 gas to minimize moisture in the tank. The SF6 gas shall conform to ASTM D2472.
- d) The switchgear shall withstand system voltage at a gas pressure of 0 psig at 68°F (20°C).
- e) A gas-fill valve and temperature-compensated pressure gauge shall be provided installed on the switchgear. The gauge must be color coded to show the operating range. The gauge shall be capable of provide consistent pressure readings regardless of the temperature or altitude at the installation site.
- f) The equipment must have an insulation gas low pressure alarm with signal for remote low-pressure indication.

9.14. Load Interrupter switches, Fault Interrupters and Operating Mechanism:

- a) Load-interrupter switches must provide three-pole live switching of 900 A or 600 A three-phase circuits and fault interrupters shall provide 600 A three-pole load switching and fault interruption. Load and Fault interrupters must have at least the three-time and ten-time duty-cycle fault-closing rating specified in Switchgear Electrical Ratings Table Section 9.23.
- b) Load interrupter switches and fault interrupter must be capable to be manually operated or motor operated. One manual handle shall be included with the equipment. All the switchgear ways must be furnished with motor operator package.
- c) Equipment must be furnished with auxiliary contacts in all load and fault interrupters. Contacts wires shall extend from inside tank to the low-voltage control enclosure. Auxiliary contacts signal must be compatible with switchgear control and must be capable to report faults through SCADA.
- d) Interrupters operation must have three positions (closed-open-ground). The operating mechanisms must function independently of the speed of the manual handle and shall prevent inadvertent operation from the closed position directly to the ground position and vice versa.
- e) A single, integrated operating mechanism shall fully operate each fault interrupter or load interrupter switch in a continuous movement, so additional operations are not required to establish Open or Ground positions.

- f) Operating mechanisms shall be equipped with an operation selector to prevent inadvertent operation from the Closed position directly to the Grounded position, or from the Grounded position directly to the Closed position. The operation selector shall require physical movement to the proper position to permit the next operation.
- g) Operating shafts must be padlockable in any position including ground position to prevent operation.
- h) The operating mechanism shall indicate the switch position, which shall be clearly visible from the normal operating position.
- i) Switchgear load-interrupter switches and fault interrupters shall have open gaps and integral grounds that must be visible through equipment viewing window. The open gaps of the switch shall be sized to allow cable testing through a feedthru bushing or the back of the elbow. The Ground position shall have a three-time and ten-time duty-cycle fault-closing rating.
- j) An internal indicator shall be provided for each fault interrupter to show when it is in the Tripped condition. The indicator shall be clearly visible through the viewing window.
- k) Manual operating mechanisms and viewing windows shall be located on the opposite side of the tank from the bushings so that operating personnel shall not be required to perform any routine operations in close proximity to high-voltage elbows and cables.

9.15. Viewing Window:

- a) Equipment viewing windows must provide a clear view of the open gap, Ground position, ground bus, and fault indications allowing the operator to easily confirm the positions of the load-interrupter switchblades and fault interrupters disconnect-blades.
- b) Viewing window must be at least 6 inches (152 mm) by 12 inches (305 mm).
- c) A cover shall be provided for each viewing window to prevent operating personnel from viewing the flash which may occur during switching operations.

9.16. Primary Connection:

- a) High-Voltage Bus and interconnections shall withstand the stresses associated with short-circuit currents up through the maximum rating of the switchgear.
- b) Connection terminals shall be equipped with deadbreak bushings with a threaded stud. Connection terminals and bushings rating must be as specified in Switchgear Electrical Ratings Table, Section 9.23.
- c) Bushings shall conform to ANSI/IEEE Standard 386.
- d) Bushings shall include a semiconductive coating and must be mounted in such a way that the semiconductive coating is solidly grounded to the tank.
- e) Bushings shall be located on one side of the gear to reduce the required operating clearance.

9.17. Grounding:

- a) One ground-connection pad with bronze clamp connector shall be provided per way for grounding provision.
- b) The ground-connection pad shall be constructed of stainless steel and welded to the tank. It shall have a short-circuit rating equal to that of the switchgear.

9.18. Voltage Indication:

- a) Voltage indication with provisions for low-voltage phasing shall be provided for each load-interrupter switch and fault interrupter by means of capacitive taps on the bushings, eliminating the need for cable handling and exposure to high voltage to test the cables for voltage and phasing. This feature shall include a flashing liquid-crystal display to indicate the presence of voltage for each phase and a solar panel to supply power for testing of the complete voltage-indication circuit and phasing circuit.
- b) The voltage-indication feature shall be mounted on the covers for the viewing windows, on the opposite side of the gear from the bushings and bushing wells, so that operating personnel shall not be required to perform any routine operations in close proximity to high-voltage elbows and cables.
- c) Three-phase current and voltage sensing shall be provided in all load and fault interrupter ways. In the 900 A model, the equipment must include current sensors for the 2 sets of parallel cables connected to load interrupters switches (incoming and outgoing source).

9.19. Motor Operators and Controls

- a) Motor operators for local and remote supervisory control shall be included for all source load-interrupter ways and all three-pole fault-interrupter ways.
- b) Each motor operator shall have its own control board located within the low voltage enclosure. The control board shall have push buttons for locally operating the switches between the Closed and Open positions and between the Open and Grounded positions.
- c) Each control board shall have position-indicating lamps to show the Closed, Open, and Ground state of the motor operator.
- d) Each motor operator control board shall have a non-resettable, four-digit minimum operation counter, which will only increment on a closed-to-open transition.
- e) Each motor operator control board shall have an adapter for a portable remote-control device, which will allow the user to activate the motor operator.
- f) Equipment must include a portable remote control device that plugs into motor control board and allows the user to activate the motor operator at a maximum distance of 50 feet (1524 cm) from the gear.
- g) No decoupling or any adjustments shall be required to manually operate a way equipped with a motor operator.

- h) Removing the motor operator for decoupling shall be a simple, quick process requiring only standard tools.
- i) Motor operators and controls shall be interchangeable between load-interrupter switch ways or between three-pole fault- interrupter ways by simply moving the operator. No modifications to any low-voltage enclosure control components shall be required.
- j) The motor operators shall take no more than three seconds to change state from the time a local or remote-control signal is received.
- k) Only one local/remote switch shall be required for the entire gear.
- l) The motor operator control boards shall be designed to prevent simultaneous operation of two or more motor operators.
- m) The motor operator shall be watertight. Each unit shall be submersion-tested to verify that water under pressure does not enter the operator housing.
- n) It shall not be possible for the motor operator to be changed from the Closed position directly to the Ground position using local pushbutton or remote control. The Ground position shall be directly accessible only from the Open position.
- o) A mechanical interlock shall be provided to prevent a decoupled motor operator from being incorrectly recoupled.
- p) An integral means shall be provided for testing the position indicating lamps on the motor controls.
- q) Controls shall be easy to operate with or without 25-kV high-voltage rubber gloves and protectors.
- r) The gear shall include batteries to power the motor operators and controls in the event the external ac power is lost.
- s) The motor operator controls shall be capable of interfacing with a remote terminal unit (RTU).

9.20. Overcurrent Control and Communication

- a) The gas insulated underground distribution switchgear must include a communication and control package with submersible low voltage enclosure that host microprocessor-based controls for main feeder monitoring and lateral circuits protection.
- b) The switchgear control shall be composed of one (1) automatic switch control for main feeder monitoring at load interrupters, and one (1) protection relay to initiate fault interruption on lateral circuits. Both controls must have remote terminal unit (RTU) functionality, data logging, and communication capabilities.
- c) Control settings shall be field-programmable using a personal computer connected via a USB port to the control. The USB port shall be accessible from the exterior of the enclosure. All programming software must be resident on the control and can be accessed via personal computer using the web browser. Energization of the gear shall not be required to set or alter control settings.
- d) A USB cable kit shall be provided for connecting the overcurrent control to a user-furnished personal computer.
- e) Equipment control must provide a communication interface with ethernet provision and fiber optic capability.
- f) Power and sensing for the control shall be supplied by integral current transformers.
- g) The control shall provide time-current characteristic (TCC) curves, including standard E-speed, K-speed, T-speed, coordinating-speed tap, coordinating-speed main, and relay curves per IEEE C37.112-1996 and IEC 60255-151:2009. Coordinating-speed tap curves shall optimize coordination with load-side weak-link/backup current-limiting fuse combinations, and coordinating-speed main curves shall optimize coordination with tap-interrupter curves and upstream feeder breakers.
- h) The standard E-speed curve shall have phase-overcurrent settings ranging from 7E through 400E. The standard K-speed curve shall have phase-overcurrent settings ranging from 8K through 200K. The standard T-speed curve shall have phase-overcurrent settings ranging from 8T through 200T. The coordinating-tap curve shall have phase-overcurrent and independent ground-overcurrent settings ranging from 15 amperes through 400 amperes. The coordinating-main curve shall have phase-overcurrent and independent ground-overcurrent settings ranging from 25 amperes through 800 amperes.
- i) Time-current characteristic curves shall conform to the following IEEE C37.112- 1996 IEEE and IEC 60255-151:2009 Standard Inverse-Time Characteristic Equations for Overcurrent Relays: U.S. Moderately Inverse Curve U1, U.S. Inverse Curve U2, U.S. Very Inverse Curve U3, U.S. Extremely Inverse Curve U4, U.S. Short-Time Inverse Curve U5, I.E.C. Class A Curve (Standard Inverse) C1, I.E.C. Class B Curve (Very Inverse) C2, I.E.C. Class C Curve (Extremely Inverse) C3, I.E.C. Long-Time Inverse Curve C4, and I.E.C. Short-Time Inverse Curve C5.

- j) The control shall have two independently settable and field-adjustable definite- time delay settings. (A definite-time delay setting can be configured to be an instantaneous trip setting if the definite-time delay is set to 0 milliseconds.)
- k) The minimum trip current shall be 14 amperes for switchgear with 660:1 ratio current transformers, and 28 amperes for models with 1320:1 ratio current transformers.
- l) Event records shall be easily viewable from the control using a personal computer connected to the USB port. The event log shall capture the last 64 events recorded by the overcurrent control.
- m) The control shall store sufficient energy to operate the fault interrupters without affecting the accuracy or coordination under fault conditions.
- n) The control shall be mounted in a submersible enclosure. The control shall be removable in the field without taking the gear out of service.

9.21. Low Voltage Enclosure

- a) The low-voltage enclosure shall be a submersible, separate, grounded structure, and shall allow complete accessibility for test and/or maintenance without exposure to medium voltage. The low-voltage enclosure shall be mounted on manhole wall as detailed on LUMA standard no. URD-11-D.
- b) The low-voltage enclosure shall be large enough to accommodate four (4) motor operator controls.
- c) The low-voltage enclosure shall have a minimum space of 16 in. (41 cm) high X 26 in. (66 cm) wide X 11 in. (28 cm) deep for a user-specified RTU and communication device.
- d) All low-voltage components, including the batteries, shall operate over the temperature range of -40° C (-40° F) to +65° C (149° F).
- e) To guard against unauthorized or inadvertent entry, the low-voltage enclosure shall not have any externally accessible hardware.
- f) All motor operator wiring, and all current and voltage-sensing wiring between the switchgear tank and the low-voltage enclosure shall be submersible.
- g) Low-voltage wiring, except for short lengths, such as connections to terminal blocks, shall be shielded for isolation from medium voltage.
- h) The low-voltage enclosure shall be fabricated from Type 304 stainless steel.
- i) Control cabling between the tank and low-voltage enclosure shall be furnished with a braided shield to protect electronic components from damage under surge and transient conditions.
- j) Single-point grounding methods shall be used on cabling between the tank and low-voltage enclosure to protect electronic components from damage under surge and transient conditions.

9.22. Labeling

- a) The gas insulated switchgear must be furnish with compliance hazard-alerting signs.
- b) The underground switchgear shall be provided with a nameplate indicating the manufacturer’s name, catalog number, model number, date of manufacture, and serial number.
- c) Each unit of switchgear shall be provided with a ratings label indicating the following: voltage rating; main bus continuous current rating; short-circuit rating; fault-interrupter ratings, including interrupting and duty-cycle fault-closing; and load-interrupter switch ratings, including duty-cycle fault-closing and short-time.

9.23. Table 1 - Switchgear Electrical Ratings:

	600 A Model	900 A Model
Warehouse Catalog #	038- 83630	038- 83629
Asset Suite #	83630	83629
Electrical Parameters		
Voltage Class, kV	15.5	15.5
Maximum Voltage, kV	15.5	15.5
BIL Voltage, kV	95	95
Frequency, Hz	60	60
Short-Circuit Current, Amperes, RMS, Symmetrical	12500	25000
Main Bus Continuous Current, Amperes	600	1200
Three-Pole Load-Interrupter Switches (Quantity)	(2) (Ways 1, 4)	(2) (Ways 1, 4)
Continuous Current, Amperes	600	900
Load-Dropping Current, Amperes	600	900
Connection Terminal-Deadbreak Bushing Rating, Amperes	600	900
Fault-Closing Current, Duty-Cycle		
Three-Time, Amperes, RMS, Symmetrical	16000	25000
Three-Time, Amperes, Peak	41600	65000
Ten-Time, Amperes, RMS, Symmetrical	16000	16000
Ten-Time, Amperes, Peak	41600	41600
Fault Interrupters (Quantity) (Position)	(2) (Ways 2, 3)	(2) (Ways 2, 3)
Continuous Current, Amperes	600	600
Load-Dropping Current, Amperes	600	600
Connection Terminal-Deadbreak Bushing Rating, Amperes	600	600
Fault-Interrupting Current, Duty-Cycle		
Three-Time, Amperes, RMS, Symmetrical	12500	25000
Ten-Time, Amperes, RMS, Symmetrical	12500	25000
Fault-Closing Current, Duty-Cycle		
Three-Time, Amperes, RMS, Symmetrical	12500	25000
Three-Time, Amperes, Peak	32000	65000
Ten-Time, Amperes, RMS, Symmetrical	12500	16000
Ten-Time, Amperes, Peak	32500	41600

10. Inspection

The acceptance of any material or equipment 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 materials were found later to be defective.

11. Warranty

- 11.1. Replacement costs associated with equipment or parts failure due to inadequate design, faulty manufacturing, or packaging are to be responsibility of the supplier.
- 11.2. In reply to purchaser's request for quotation, supplier shall include the terms and conditions of the warranty period and coverage.
- 11.3. The supplier shall warrant the product against failure while operating under normal conditions.

12. Proposal Information

- 12.1. Submitted proposals must include:
 - a. Technical information
 - b. Table of Compliance completed by the bidder with reference. (See Appendix 1)

— End of Specification —

Appendix

Appendix 1: Table of Compliance

Line	Criteria	Description	Pass/Fail (P / F)	Comments
1	Specification	The Proponent complies with the corresponding specification document 4350.279, and standard no. URD-11-D.		
2	Industry Standards	The Proponent complies with the industry standards established in the specification document. (ASTM, ANSI/IEEE & NEMA)		
3	Material	<ul style="list-style-type: none"> • Insulating Gas: SF6 • Tank: Stainless Steel 304L • Low Voltage Enclosure: Stainless Steel 304 • Main Bus: Copper • Switch Blades: Copper 		
4	Product Requirement	Switchgear is dead front, submersible, wet vault mounted style.		
5		Underground switchgear consists of a stainless steel hermetically sealed tank containing sulfur hexafluoride (SF6) insulating gas that enclose load-interrupter switches and resettable fault interrupters.		
6		Must have 4 Ways. 2 with load interrupter switches and 2 with fault interrupters.		
7		Ways arrangement is according to One Line Diagram on LUMA standard no. URD-11-D.		
8		Underground switchgear complies with electrical rating parameters according to corresponding model presented in Switchgear Electrical Ratings Table Section 9.23 of LUMA specification document 4350.279.		
9		The switchgear includes internal control power.		
10		Equipment tank has 4 stainless steel grounding pads with bronze clamp connector.		
11		Connection terminals are equipped with deadbreak bushings with threaded studs.		

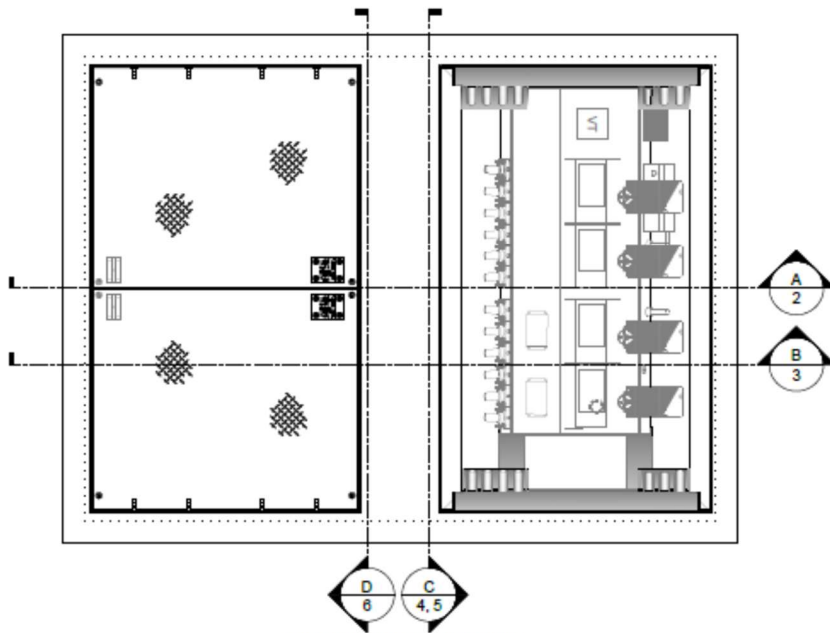
Line	Criteria	Description	Pass/Fail (P / F)	Comments
12	Product Requirement	Bushings rating conform corresponding model.		
13		Switchgear dimensions comply with Section 9.11 and 9.12 of LUMA specification document 4350.279.		
14		Switchgear interrupters rating conform to corresponding model.		
15		Interrupters operation have three positions (closed-open-ground).		
16		Switchgear has a viewing window that shows interrupters blades state and fault indication.		
17		Switchgear interrupters are capable to be manually operated or motor operated.		
18		All the switchgear ways are furnished with watertight motor operator package.		
19		Equipment includes a portable motor operator remote control with at least 50' of cable.		
20		Equipment includes auxiliary contacts in all load and fault interrupters.		
21		Equipment provides voltage indication and low voltage phasing.		
22		Switchgear includes three-phase voltage and current sensing.		
23		Equipment Includes a communication and control package with low-voltage submersible enclosure and microprocessor-based overcurrent control.		
24		The switchgear control shall be composed of one (1) automatic switch control for main feeder monitoring at load interrupters and (1) protection relay to initiate fault interruption on lateral circuits. Both controls must have remote terminal unit (RTU) functionality, data logging, and communication capabilities.		
25	Time-current characteristic curves in protection relay shall conform IEEE C37.112.			

Line	Criteria	Description	Pass/Fail (P / F)	Comments
26	Product Requirement	Control includes a communication interface with ethernet provision and fiber optic capability		
27		switchgear communication and control package include control battery pack.		
28		switchgear communication and control package include control battery pack.		
29		Equipment is supplied with a fixed nameplate indicating manufacturer's name, catalog number, model number, date of manufacture, and serial number.		
30		Equipment is supplied with a ratings label.		

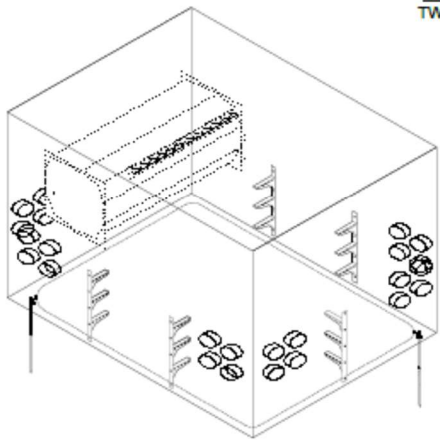


DISTRIBUTION ENGINEERING
UNDERGROUND DISTRIBUTION STANDARDS

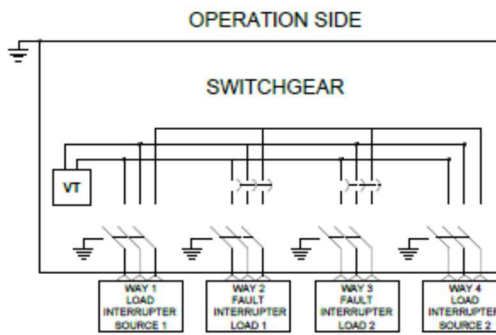
TITLE: GAS INSULATED DISTRIBUTION SWITCHGEAR 4 WAYS, WET VAULT MOUNTED STYLE REMOTE SUPERVISORY CAPABLE SOURCE RATING: 600 A OR 900 A MAXIMUM LOAD RATING: 600 A MAXIMUM VOLTAGE: 13.2 KV	STANDARD NO. <u>URD-11-D</u> VERSION <u>1</u> DOCUMENT NO. <u>4325.024</u>
	PAGE <u>1</u> OF <u>14</u> DATE <u>OCT 7, 2022</u> SUBMITTED <u>ALEX J. RODRIGUEZ LIC. 24174</u> REVIEWED <u>IVETTE D. SANCHEZ LIC. 13837</u> APPROVED <u>RICARDO CASTRO LIC. 12135</u> DIGITIZED <u>ALEX J. RODRIGUEZ LIC. 24174</u> <u>EMILIO CUADRADO LIC. 3000</u>



SWITCHGEAR PLAN VIEW
TWO SOURCES - TWO LOADS
(SEE NOTES 1 AND 2)



ISOMETRIC VIEW



TERMINATION SIDE

ONE LINE DIAGRAM











4350.279 Gas Insulated Switchgear rev20221201

Final Audit Report

2023-02-03

Created:	2023-02-03
By:	Alex Rodriguez (alex.rodriguez2@lumapr.com)
Status:	Signed
Transaction ID:	CBJCHBCAABAAIHa9vqbs3tyPnob_mEfUdA16blCUlx1a

"4350.279 Gas Insulated Switchgear rev20221201" History

-  Document created by Alex Rodriguez (alex.rodriguez2@lumapr.com)
2023-02-03 - 2:20:09 PM GMT
-  Document e-signed by Alex Rodriguez (alex.rodriguez2@lumapr.com)
Signature Date: 2023-02-03 - 2:29:09 PM GMT - Time Source: server
-  Document emailed to Rafael Torres-Martinez (rafael.torresm@lumapr.com) for signature
2023-02-03 - 2:29:10 PM GMT
-  Email viewed by Rafael Torres-Martinez (rafael.torresm@lumapr.com)
2023-02-03 - 2:30:51 PM GMT
-  Document e-signed by Rafael Torres-Martinez (rafael.torresm@lumapr.com)
Signature Date: 2023-02-03 - 2:30:59 PM GMT - Time Source: server
-  Document emailed to ricardo.castro@lumapr.com for signature
2023-02-03 - 2:31:00 PM GMT
-  Email viewed by ricardo.castro@lumapr.com
2023-02-03 - 2:46:09 PM GMT
-  Signer ricardo.castro@lumapr.com entered name at signing as Ricardo Castro Gómez
2023-02-03 - 2:46:36 PM GMT
-  Document e-signed by Ricardo Castro Gómez (ricardo.castro@lumapr.com)
Signature Date: 2023-02-03 - 2:46:38 PM GMT - Time Source: server
-  Agreement completed.
2023-02-03 - 2:46:38 PM GMT