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<p>Author Alexamarie Santiago Otero Engineering Intern, Transmission Standards & Materials</p> <p>Reviewer 1 Leonardo Montes Sánchez, E.I.T. Engineer 2, Transmission Standards & Materials</p> <p>Reviewer 2 Andre Smit Sr. Advisor, Reliability</p> <p>Approver 1 Humberto Campán Colon, P.E. (Lic # 20343) Section Manager, Reliability</p> <p>Approver 2 Oscar Venegas, P.E. (Lic # 23125) Principal Engineer, Transmission Standards & Materials</p>	Signature and Date  Alexamarie Santiago (Oct 3, 2023 13:22 EDT)
	Signature and Date  Leonardo Montes Sanchez (Oct 3, 2023 13:23 EDT)
	Signature and Date  Andre Smit (Oct 3, 2023 13:27 EDT)
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Related/Referenced Documents

Please click here for the applicable document, section, or reference "[add link here](#)".

Version History

Version	Date	Revision
01	Oct 3, 2023	First Issue



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1. Introduction

- 1.1 This specification covers overhead automatic reset faulted circuit indicators (FCI) that monitors the overhead line and provides measured values and fault information to the control room.
- 1.2 Further information will be provided by LUMA Energy at time of order placement and will provide information on site specific conditions, quantity, FCI type, and electrical requirements.

2. Basic Use

- 2.1 Faulted Circuit Indicators (FCIs) are commonly used by electric utilities to aid in service restoration. They are various tests and tests conditions that FCIs must meet to validate their performance.
- 2.2 Faulted Circuit Indicators (FCIs) are applied to overhead power transmission lines.

3. Special Requirements

- 3.1. Samples must be furnished as requested by LUMA Energy. Vendors that have supplied this material to LUMA on previous orders, will not have to furnish samples at bid opening. The 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.
- 3.2. Any changes or update to the supplier's approved designs, procedures, quality routines and/or inspection layout must be communicated to the LUMA Transmission Standards and Materials Section in writing.
- 3.3. The purchaser reserves the right to refuse shipment and to determine the accept and reject ability of FCIs received. The supplier will be liable for all costs incurred for shipments that are refused, rejected, or replaced.

4. Marking, Packing, Shipping and Storage

- 4.1. The FCIs must be shipped with the targets in the fault condition.
- 4.2. Each FCI shall be permanently identified with supplier's catalog number, trip current value, minimum reset value, and manufacturing date.
- 4.3. FCIs must be individually boxed with the outside of each box marked with the LUMA warehouse item number, the supplier's name, and the supplier's catalog number.
- 4.4. If FCIs are stored outdoors open to the elements, packaging must prevent equipment from being damaged by rain, snow, ice, wind, etc.

- 4.5. The supplier shall include installation instructions in a medium agreed upon by the purchaser. Warning Label shall be placed on the equipment for special handling and storage requirement.
- 4.6. 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.
- 4.7. A copy of each detailed packing list must be sent to LUMA Energy personnel in charge of the requisition, prior to the delivery.

5. Quantity/Literature

- 5.1. Descriptive and technical literature shall be supplied if requested by LUMA. This literature may include, but is not limited to details of material, drawings, and instructions for use and installation. For products described in this specification as requiring qualification, awards will be made only for such products that, prior to the time for opening of bids, had been tested and/or approved by LUMA. Evidence of LUMA Energy's approval of the equipment or material shall be supplied by vendor if requested by LUMA Energy.
- 5.2. In an agreed upon time frame, after receipt of purchase order, the vendor must submit any special procedures, techniques, or precautions that must be followed during installation. The vendor shall provide digital and hardcopies of Operation and Maintenance manuals (O&M Manuals).

6. Acceptance Criteria

- 6.1. Each FCI must be built following the latest applicable ANSI/IEEE, NEMA, NEC, IEC, and ASTM Standard and the herein included requirements.
- 6.2. When conflict occurs between ANSI/IEEE and purchaser's specifications, the purchaser's specification shall prevail.
- 6.3. The following standards must form a part of this specification unless otherwise stated: ANSI/IEEE Std 495 Guide for Testing Faulted Circuit Indicators.
- 6.4. Certified design test reports shall be provided.

7. Description

7.1 Material and Make-Up

- a. Materials for the FCI must withstand the environmental and operating conditions as defined in ANSI/IEEE Std. 495.
- b. FCI shall be compatible with bare or non-shielded insulated conductors.

7.2. Current Sensor

- a. The current sensor portion of the FCI must be capable of being installed on an energized cable or wire. All FCIs must have provisions for installation with a hook stick.
- b. LUMA prefers that FCI be self-powered without the need of external power supplies or photocells. Batteries are acceptable but must have a minimum operating life of 10 years.
- c. FCI must automatically reset after the specified minimum current of at least 3 amps or less than 5kV. LUMA prefers if the unit also offer an automatic reset option after a minimum of 4 hours after a detected fault occur.
- d. The FCI system must have the capability to eliminate false tripping reporting.

7.3. Integral Targets


- a. The target must be mounted as part of the current sensor portion of the FCI.
- b. The standard face target indicators must be large enough to view from 100 feet. The target could be made of mechanical colored flags or LEDs.
- c. The target should display the red color depending on the device condition, the device can have an alternate color or flashing patterns to discern between temporary and permanent faults.

7.4. Environmental conditions

- a. Temperature & Humidity: Materials for the FCI must withstand the environmental and operating conditions as defined in ANSI/IEEE Std. 495 over the anticipated 40-year life of the installation. Equipment supplied must be adequate for an operating temperature range of 0°C to 50°C (32°F to 122°F), with humidity up to 100%.
- b. Wind conditions: All mounting equipment must be designed and constructed to withstand sustained hurricane-force wind velocities complying with the applicable construction codes, standards or LUMA Energy's design criteria for PR.
- c. Pollution: The equipment must be designed and constructed for the corrosive environment of a transmission system in a tropical zone close to sea or exposed to strong sea winds and it must provide reliable performance in environments with high exposure to salt, minerals, chemicals, or wind-borne particulate. The insulator contamination levels for the equipment should be adequate to prevent flashover. All exposed material must be made of materials with anti-corrosive capabilities.

7.5. Communication Accessories and Features

- a. This section will only apply to the units requested with this capability, as per Table 1.

- b. The FCI System shall allow for DNP 3.0 SCADA communications via wireless communication preferably cellular 4GLTE.
- c.
- d. The DNP 3.0 mapping for SCADA shall include, as a minimum, the following:
 - i. Fault detection
 - ii. Fault Current magnitude and duration
 - iii. Primary voltage magnitude and loss of voltage
 - iv. Primary current magnitude and loss of current
 - v.  Battery test and status (if equipped)
- e. The communication module if required for communication must accept Ethernet-based radios, cellular, or fiberoptic interface.

7.6. Technical Data

- a. Current measurement accuracy shall be $\pm 2A$ (0-10A), 3% (10-600A) and 5% (600-10,000A)
- b. Peak load memory shall be 72 hours.
- c. Lights indication shall be ultra bright high-power LEDs
- d. Auto reset values shall be automatic, manual by magnet or local via transmitter and remote via SCADA host
- e. Automatic time reset shall be 4 h \pm 10%
- f. Current restoration shall be 3 A load current
- g. Voltage restoration shall be 5 kV line voltage
- h. Power supply shall be inductively from line current (>5 A), internal rechargeable back-up battery and optional primary battery
- i. Withstand current shall be 600 A continuous, Standard: 25 kA/3 s and HV version: 40 kA/1 s
- j. Even reporting shall be fault detection, loss of current or voltage and fault current magnitude and duration.
- k. Remote monitoring shall be loading current monitoring (max/min/average) and voltage presence or absence (E-field based detection)
- l. Cellular (WAN) shall be 1 SIM card (only for master), 4G and others, and TLS secured data transmission
- m. LUMA SCADA is DNP3 from master to the FCI host, the host must DNP3, and required protocols to interface with the FCI's, the host can act as data concentrator, fleet management system and communication connection manager.
- n. Configuration and firmware shall be remotely (re)configurable settings over a wireless connection.
- o. Housing shall be UV resistant polycarbonate, IP65.

8. Testing

8.1. Design Tests

All applicable tests specified should be performed by the manufacturer to demonstrate that FCIs meet ratings and are suitable for operation under the intended service conditions.

In addition, the manufacturer should periodically test a sufficient number of production FCIs to ensure continuing compliance with design tests.

9. Nameplate Information

9.1. Each FCI must be permanently identified with the LUMA's warehouse item number, appropriate catalog number, supplier's catalog number, trip current value, minimum reset value, and date code.

10. Guarantee

10.1 In reply to purchaser's request for quotation, suppliers must respond to the terms and conditions for the FCIs being proposed to include warranty period and coverage. FCIs shall be designed and manufactured to provide a life expectancy of a minimum of 40 years. Replacement costs associated with premature fault indicator failure due to inadequate design or faulty manufacturing shall be the responsibility of the supplier.

10.2 Replacement costs associated with FCI failure due to inadequate design, faulty manufacturing, or software errors are to be the responsibility of the supplier.

10.3 Non-conformance observed during sampling will require the supplier to bring the FCIs into compliance with the specification 14 days after notification. The units to be brought into compliance with the specification must be shipped to the supplier at the Supplier's expense.

11. Warehouse and Asset Suite Identification Information

TABLE 1 Transmission Overhead Fault Circuit Indicators

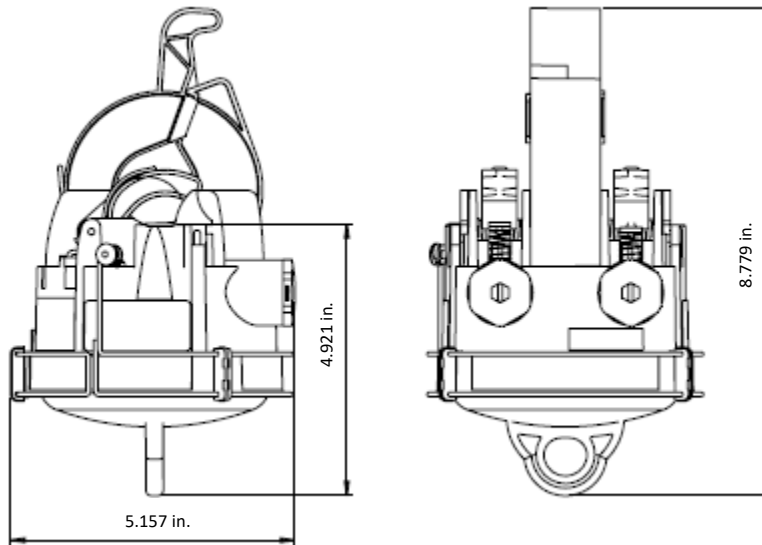
Item	Warehouse Number	Cable Diameter range (mm.)	Temperature Range	Power Distribution Line Voltage	Communication Enabled	Short Circuit Trip Current	Manufacture and Model
1	072-85341	Up to 33 mm	-30 to + 75°C (IEEE 495: -40 to + 85°C)	Standard: ≤ 46 kV (L-L)	WAN: 4G cellular modem Local: 868/915 MHz short range wireless radio (range: 100m)	7 - 1,200 Amps (load tracking) or fixed up to 2,000 Amps	HORSTMANN, Smart Navigator 2.0
2	072-85342	Up to 33 mm	-30 to + 75°C (IEEE 495: -40 to + 85°C)	HV Version: ≤ 115kV (L-L)	WAN: 4G cellular modem Local: 868/915 MHz short range wireless radio (range: 100m)	7 - 1,200 Amps (load tracking) or fixed up to 2,000 Amps	HORSTMANN, Smart Navigator 2.0

12. Proposal Information

12.1. Submitted proposals shall include:

- a. Technical information
- b. Any exceptions taken to this specification
- c. Copies of sample nameplates
- d. Lists of special and standard maintenance tools
- e. List of recommended spare parts

13. Drawing



— End of Specification —












4752.329 Transmission SCADA Fault Indicator


Final Audit Report


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