Installation Manual:

ProLEC Fiber Optic System

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1 ProLEC Fiber Optic System Description

The ProLEC Fiber Optic System consists of the ProLEC FO, the ProLEC OEC, a lightning detection sensor, and 10 meters of fiber optic cable.

The ProLEC FO serves as the system's sensor. It must be positioned near the lightning protection system (LPS) downconductor, which is being monitored for lightning activity. The ProLEC FO is equipped with a lightning detection sensor, which needs to be looped around the LPS downconductor. Using this sensor, the ProLEC FO device is able to detect lightning strikes. The device is powered by a battery.

The ProLEC OEC is the system's communication unit. It is installed in the electrical cabinet and connected to the ProLEC FO via a fiber optic cable. This setup ensures electrical isolation and safety for personnel. The ProLEC OEC receives data on lightning events from the ProLEC FO and transmits this information to an external device using a simple signaling protocol. The ProLEC OEC is powered by a 24V DC supply.

This document is intended for individuals familiar with electronic circuitry and wiring practices, and it assumes expertise as an electronics, power, or electromechanical technician. The information provided is accurate as of the publication date.

Figure 1. ProLEC FO System Contents

2 ProLEC FO Description

The ProLEC FO is designed to detect impulse discharge currents (10/350 µs waveshape) and nominal discharge currents (8/20 µs waveshape) in a range from 2kA to 100kA.

Upon detecting such events, it immediately transmits the data to the ProLEC OEC system. This battery-powered, low-energy device can operate for up to three years on a single battery. It remains in stand-by mode for most of the time, actively monitoring for lightning events.

Additionally, the ProLEC FO wakes up a few times each day to send a signal to the ProLEC OEC, confirming its continued operational status.

Figure 2. ProLEC FO Device

3 ProLEC OEC Description

The ProLEC OEC receives data from the ProLEC FO device and, based on the information, passes it to an external device. Data is transmitted via fiber optic cables and forwarded to the next device by altering the relay state through various sequences. Specific signals and alarms related to these operations are detailed in the following paragraphs.

The ProLEC OEC is powered by a 24V DC supply. If the power supply is interrupted, the device will shut down, and any data transmitted from the ProLEC FO during this period will be missed. In the event of a lightning strike while the ProLEC OEC is powered off, the lightning event data will not be received. However, once the device is powered on again, the ProLEC FO will retransmit the information, ensuring that no critical event data is lost during power outages.

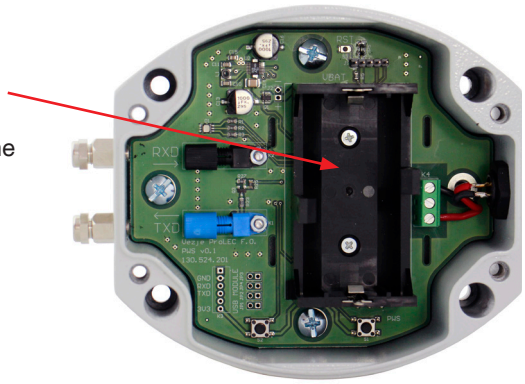
Figure 3. ProLEC OEC Device

4 Installation

4.1 ProLEC FO

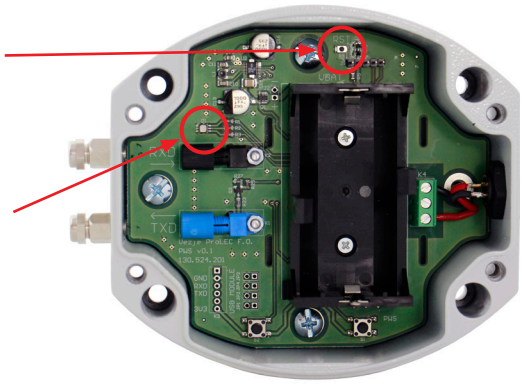
4.1.1 Before installing the device, a battery must be inserted. Remove the four screws securing the casing.

4.1.2 Open the cover and insert the battery, making sure to align the polarity correctly.



4.1.3 You can verify that the device is functioning by pressing the small reset button labeled “RST” on the PCB.

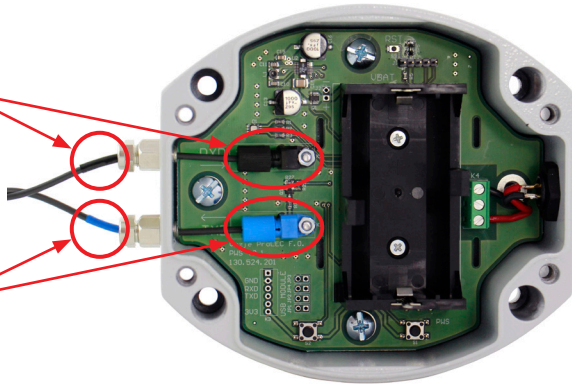
4.1.4 When the button is pressed, the green LED will illuminate for a few seconds.



4.1.5 The fiber optic cables must be connected correctly.

The cable with the **black ribbon** must be connected to the black connector on the PCB.

The cable with the **blue ribbon** must be connected to the blue connector on the PCB.



Ensure the optic cable is fully inserted into the connector until it touches the rear wall for optimal light communication. Once inserted, tighten the connector to secure the cable in place.

Afterward, close the device and tighten the retaining screws. The device is now ready for mounting next to the LPS downconductor.

4.1.6 The ProLEC FO System also comes with a sensor cable

4.1.7 One end of the cable should be connected to the device, ensuring alignment with the markings on the connector and housing.

The other end, featuring a loop, serves as the lightning current monitoring sensor. The LPS downconductor must pass through this loop, which can be unclipped for easy installation around the downconductor.

4.2 ProLEC OEC

4.2.1 Before connecting the power supply and turning the device ON, ensure all connections are secure and the correct polarity is followed.

The communication fiber optic cable must be properly connected: The blue-ribbon cable should be connected to the blue connector, and the black cable to the black connector.

Ensure the cables are inserted fully into the connector until they stop against the rear wall for optimal communication. It's crucial that the cables touch the back wall of the connector to prevent potential issues. Once inserted, tighten the connector to secure the cable in place.

Next, connect the OEC OUT and OEC IN to the appropriate terminals on the external monitoring device. The OEC OUT is polarity-independent and functions as a relay switch, electrically isolated from the ProLEC OEC device.

4.2.2 The OEC IN must be wired according to the markings on the case above the terminals.

4.2.3 The power supply must be wired according to the markings above the power terminals, and the voltage must be 24V DC.

5 System Functionality

5.1 ProLEC FO

The ProLEC FO is a low-power device and does not indicate errors using LEDs. Instead, any errors or alarm events are transmitted to the ProLEC OEC device, where they are displayed and processed.

To check the status of the ProLEC FO, press the RST button on the PCB. If the device is functioning properly, the green LED will illuminate for a few seconds. If communication between the ProLEC FO and ProLEC OEC fails, the green LED will remain OFF, and the red LED will blink momentarily.

NOTE: LED is a multicolour LED (red, green, blue)!

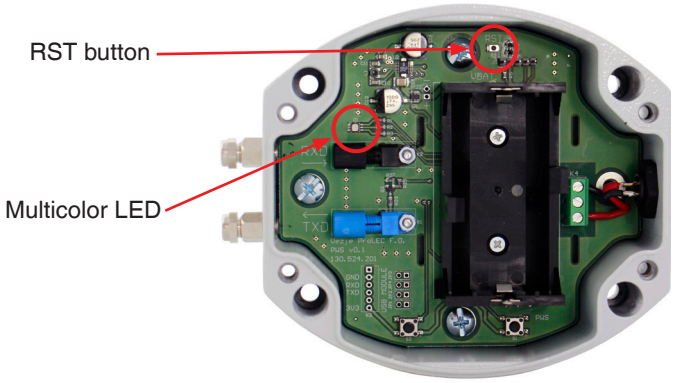


Figure 4. ProLEC FO LED and RST button position

5.2 ProLEC OEC: Communication Bridge and Status Indicator

ProLEC OEC acts as a communication bridge between the ProLEC FO and the user's external device. It also displays the status of the ProLEC FO through different LED colors, indicating various operational states:

5.2.1 Normal Operation:

- In normal operation, the ProLEC OEC relay remains in its default position (refer to Appendix A for signal details).
- The green LED stays ON continuously, indicating that communication between ProLEC OEC and ProLEC FO is functioning properly.

5.2.2 Lightning Event Detected:

- When a lightning event occurs, ProLEC FO transmits the data to ProLEC OEC.
- ProLEC OEC then sends a signal to the user's external device by changing the state of its relay. It remains in this state until it receives acknowledgment from the external device, after which the relay reverts to its previous position (see Appendix A for details).
- Additionally, a blue LED is illuminated when a surge event is detected from ProLEC FO. The LED clears once the external device acknowledges the event.

5.2.3 ProLEC FO Communication Lost:

- If communication between ProLEC FO and ProLEC OEC is lost, the relay changes state to signal this error and remains in that position until communication is restored (see Appendix A for signal details).
- The red LED turns ON to indicate the communication loss and clears when ProLEC FO is back online, returning the device to normal operation.

5.2.4 ProLEC OEC Power Lost:

- In the event of a power loss, the relay changes state and remains in this condition until the power is restored (see Appendix A for more details).
- All LEDs are turned OFF when the power is lost.

5.2.5 ProLEC FO Battery Low:

- When ProLEC FO's battery is low, it sends data to notify ProLEC OEC.
- In this case, the relay does not signal the event, but the green LED on ProLEC OEC toggles every second to indicate the low battery condition.

NOTE: STATUS LED is a multicolour LED (red, green, blue)!

6 ProLEC FO System Setup

After completing all necessary connections on both devices (as described in previous sections), they are ready to be powered ON.

Before inserting the battery into the ProLEC FO, ensure the ProLEC OEC is powered and functioning properly. If the ProLEC FO is not online, the ProLEC OEC will signal an error (ProLEC FO Offline) after 5 seconds.

Inserting the battery into the ProLEC FO powers it on. Upon startup, the ProLEC FO sends confirmation data to the ProLEC OEC, indicating that it is online and functioning. The ProLEC OEC will then turn on its green LED to indicate normal operation.

The ProLEC FO sends confirmation data to the ProLEC OEC every 9 to 10 hours. If the ProLEC OEC does not receive this data, it indicates that the ProLEC FO is offline, triggering an alarm as described earlier. This alarm is cleared once the ProLEC FO comes back online. If the ProLEC OEC is offline, the ProLEC FO will send data every minute until it receives an acknowledgment from the ProLEC OEC.

In the event of a lightning strike, the ProLEC FO immediately sends this information to the ProLEC OEC. The ProLEC OEC acknowledges the event. If the ProLEC OEC is offline and cannot acknowledge the event, the ProLEC FO will resend the information every minute until the ProLEC OEC is back online and can confirm receipt of the event.

To check the status of the ProLEC FO, open the device and press the small reset button labeled “RST” on the PCB. Pressing this button resets the device and sends a new confirmation message to the ProLEC OEC. The green LED will light up briefly and then automatically turn off after a few seconds. If the green LED does not light up, the ProLEC OEC’s battery needs to be replaced.

When the battery voltage of the ProLEC FO drops below 2.6V, the device sends a low battery warning to the ProLEC OEC. The ProLEC OEC will indicate the low battery condition by blinking its green LED.

7 Safety

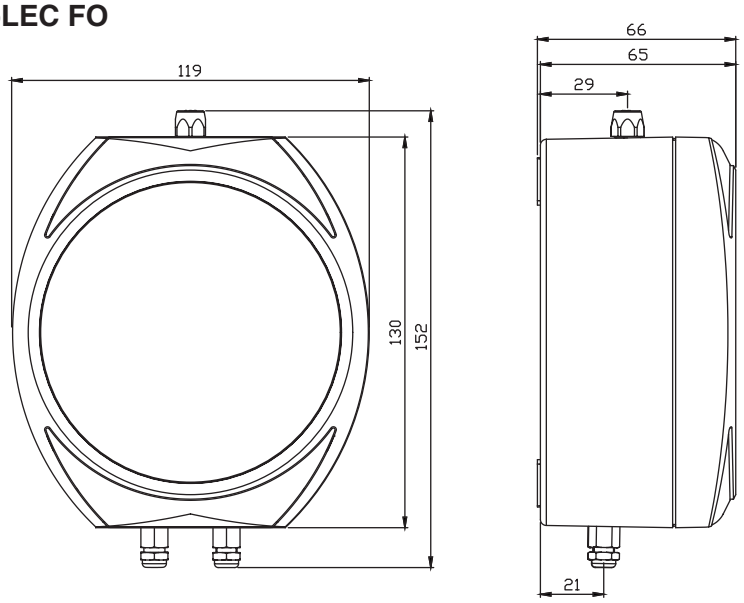
- Installation and maintenance must be performed by qualified personnel only.
- Compliance with national standards and safety regulations is required.
- Inspect the device for external mechanical integrity before installation. Do not install if there is visible damage.
- The device must be used within the limits specified in these installation instructions
- The ProLEC FO is suitable for both indoor and outdoor use, while the ProLEC OEC is intended for indoor use only.

8 Electrical Characteristics

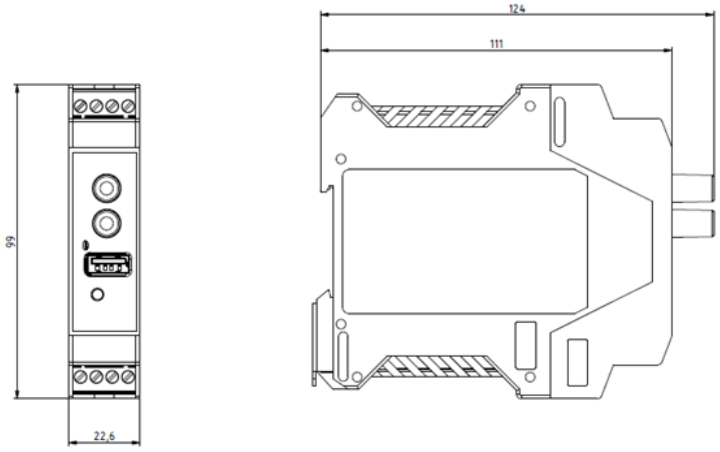
		ProLEC FO	ProLEC OEC
Power Supply		3.6 V (Battery size D)	24 V DC
Supply Current	Standby	0.2 mA	N/A
	Active	14 mA	12 mA
Temperature		-40°C to +55°C	-40°C to +70°C
Standards		EN 61326-1; EN 60068-2; IEC 62561-6	EN 61326-1

9 Dimensional Drawings

ProLEC FO



ProLEC OEC



APPENDIX A
Description of Input and Output Signals

The ProLEC OEC transmits alarm states via its relay output, labeled “OEC OUT” and marked with a switch symbol. This relay is isolated from the rest of the ProLEC OEC circuit, making the polarity irrelevant.

ProLEC OEC OUT Default State:

Upon powering up, the ProLEC OEC relay output switches to its default state. If no errors are detected, the relay remains in this position.

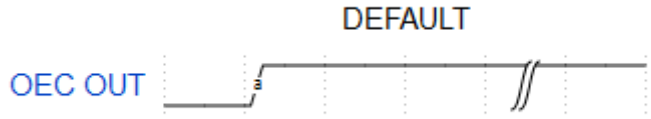


Figure 5. ProLEC OEC Default State – Point **a** indicates the ProLEC OEC powering up and the relay switching to its default state

Lightning Event Alarm:

When the ProLEC OEC receives a lightning event alarm from the ProLEC FO, the OEC OUT relay switches to a new position. It remains in this position for a minimum of 1 second and continues until it receives a confirmation signal from the user’s external device.

Figure 6 illustrates the relay switching process, while Figure 7 shows the signal required for lightning event confirmation. The external device must be connected to the ProLEC OEC via the OEC IN terminals, following the markings on the housing for proper configuration.

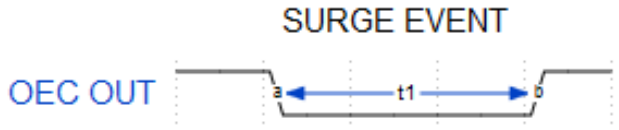


Figure 6. Surge Event Alarm – The OEC OUT relay changes position and remains in this position for at least 1 second (**t1**)

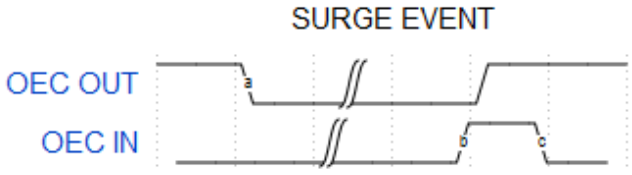


Figure 7. Surge Event Alarm: Point **a** indicates the occurrence of the surge event; at point **b**, the external device confirms the information, causing the OEC OUT to switch back to its default state; at point **c**, the external device returns to its normal state

ProLEC FO Offline Alarm:

If the ProLEC FO stops functioning or communication between the ProLEC FO and ProLEC OEC fails, the ProLEC OEC triggers the offline alarm. The OEC OUT relay switches position and remains in this state until the ProLEC FO comes back online and communication is restored. This alarm cannot be cleared by any other means. Figure 8 illustrates the OEC OUT signal during this event.

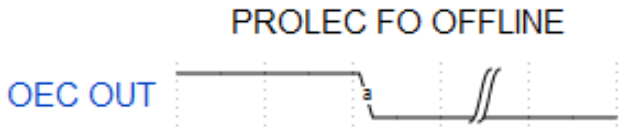


Figure 8. ProLEC FO Offline – Point **a** indicates the moment when the ProLEC FO goes offline; this alarm can only be cleared by reestablishing communication between the ProLEC FO and ProLEC OEC

ProLEC OEC Power Lost Alarm:

In the event of a power loss to the ProLEC OEC, the OEC OUT relay switches to a new position. It remains in this position for the duration of the power outage. Once the power supply is restored, the OEC OUT relay automatically switches back to its default position.

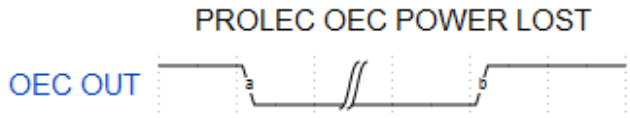


Figure 9. ProLEC OEC Power Lost – Point **a** indicates the moment when power is lost, and at point **b**, the power supply is restored.

OEC IN Voltage Levels :

V_{IH} (Input Voltage High Level)	11 – 24 V
V_{IL} (Input Voltage Low Level)	0 – 7 V

Input current up to 30 mA

OEC OUT Electrical Characteristic :

Relay Switching Voltage	30VDC - Max
Relay Contact Rating (Current)	2A

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