

# LINDSEY SYSTEMS

## Installation Guidelines

### GEN2 Current and Voltage Sensor

15 kV p/n 9E65, 25k V p/n 9E66, & 35 kV p/n 9E67



**IMPORTANT:** READ ALL THE DANGER, WARNING, AND CAUTION NOTICES IN THIS DOCUMENT. FOLLOW ALL INSTALLATION INSTRUCTIONS CONTAINED IN THIS DOCUMENT.



## DANGER OF SERIOUS INJURY OR DEATH

- ✓ DO NOT CONNECT SENSOR TO AN ENERGIZED PHASE CONDUCTOR UNLESS CONTROL CABLE IS CONNECTED AND GROUNDED.
- ✓ DO NOT CONNECT OR DISCONNECT CONTROL CABLE IF SENSOR IS CONNECTED TO AN ENERGIZED PHASE CONDUCTOR.



### DANGER

The sensor must be solidly grounded to earth AND the signal cable must be connected to the sensor before connecting the sensor to an energized high voltage phase conductor. Connection of the phase conductor will energize the sensor and reduce the working clearance to the signal cable connector. Failure to ground the sensor per these instructions AND to connect the signal cable before energizing may result in an electrical flashover resulting in serious injury or death and/or damage to the sensor.

## Lindsey Installation Guidelines



### DANGER

The sensor must be solidly grounded to earth before it is energized. Connection to the phase conductor will energize the sensor and will result in high voltage across the output **unless the sensor is grounded AND the signal cable is connected to the sensor**. Failure to ground before energizing can result in serious injury or death.



### DANGER

An energized conductor must be isolated from the sensor while installing or uninstalling the sensor per your company's work practices. Insufficient electric insulation or electrical clearance between an energized conductor and the sensor during installation can result in serious injury or death.



### DANGER

Sensor must be applied within its electrical and mechanical ratings. Application of sensor in excess of its ratings can result in immediate or delayed electrical or mechanical failure. Failure to apply the sensor within its ratings can result in serious injury or death, or in premature failure of the sensor.



### DANGER

Do not drop. While extremely durable, the sensor is cast from a material that can fracture if dropped onto a hard surface. Fractures can result in either catastrophic failure of the sensor upon energization resulting in serious injury or death, or in premature failure of the sensor.

## GEN2 Current and Voltage Sensor



### CAUTION

Sensor must remain in packaging during transportation to installation site. Transportation of the sensor without its protective packaging may result in chips, cracks, or fractures to the sensor body. Physical damage can result in premature failure of the sensor or reduced electrical ratings.



### CAUTION

Both the sensor cable connectors and the cable connector located on the sensor must remain dry and protected from inclement weather. The connectors are weatherproof once joined, but may allow moisture in the cable when the male or female connectors are left exposed to the elements. Moisture in the cable will result in inaccurate measurement readings.



### WARNING

The sensor must be installed with the supplied arcing bracket AND be solidly grounded as directed in this document. Use of the arcing bracket will direct any external flashover current to ground. Failure to install the arcing bracket as directed may result in catastrophic failure of the sensor in the event of a flashover.



### WARNING

**DO NOT HIPOT.** HIPOT (high potential) testing will thermally damage the resistor assemblies in the sensor causing permanent damage. HIPOT testing voids the sensor's warranty. If a HIPOT test is necessary, contact Lindsey for alternate product intended for HIPOT.

**Lindsey Installation Guidelines****GEN2 Current and Voltage Sensor****Specifications:**

| <b>Electrical Ratings</b> |   |           |           |
|---------------------------|---|-----------|-----------|
| Catalog No. Sequence      | 9E65x/...   | 9E66x/... | 9E67x/... |
| Insulation Class          | 15 kV   | 25 kV     | 35 kV     |
| Impulse (BIL)             | 110 kV  | 150 kV    | 200 kV    |
| Leakage Distance (in./mm) | 19.9/505  | 29.4/747  | 37.5/953  |
| Dry Arc Distance (in./mm) | 8.8/223   | 11.9/302  | 16.1/410  |
| Overall Height (in./mm)   | 12.4/315  | 15.5/395  | 19.7/501  |
| Withstand (60Hz, 1 min.)  | 34 kV   | 40 kV     | 50 kV     |
| Corona (extinction)       | 11 kV   | 19 kV     | 26 kV     |
| Operating Temperature     | -40° C to + 65° C   |           |           |
| Conductor Diameter        | Two sided keeper accommodates 0.18" - 1.25" (4.6-32mm) diameter |           |           |
| Construction              | Hydrophobic cycloaliphatic epoxy                                |           |           |

**Characteristics:**

Lindsey GEN2 sensors provide highly accurate voltage and/or current sensing for 15 to 35kV systems and offer greatly simplified installation process compared to conventional PTs and CTs. Unlike other sensors, no calibration is required for line conductor diameter.

The sensor can be mounted vertically or horizontally to replace any standard insulator with the conductor held precisely by dual clamps. The deep groove design places the current path at the center of multiple sensing cores embedded inside the solid insulator. Overall symmetry of the internal sensing system ensures high accuracy when used with conductor diameters from 0.18 to 1.25 inches.

For safe handling, the output signals of the GEN2 sensor are presented as voltages of 10V and less than 1mA at rated line current and line voltage.

**Items Included with the purchase of a GEN2 Sensor:**

- The sensor
- Arcing bracket with ground stud
- Two conductor keepers with bolts (pre-installed on sensor)

**Items Not Included:**

- Mounting stud & hardware
- Parallel groove clamp if used for making ground connection
- All tools

## Lindsey Installation Guidelines



### DANGER

An energized conductor must be isolated from the sensor during installation per your company's work practices. Insufficient electric insulation or electrical clearance between an energized conductor and the sensor during installation can result in serious injury or death.

#### Installation:

Included with the GEN2 sensor is an arcing bracket (also known as an arcing horn), which will be installed under the sensor (See Figures 1 & 2). Mounting the sensor to the crossarm will require a 3/4" - 10 line post mounting stud (not included).

If a mounting stud is needed, it may be purchased from Lindsey (See Table 2 on p. 7 for ordering information).

The GEN2 Sensor is designed to be installed without de-energizing or cutting the main utility conductor.

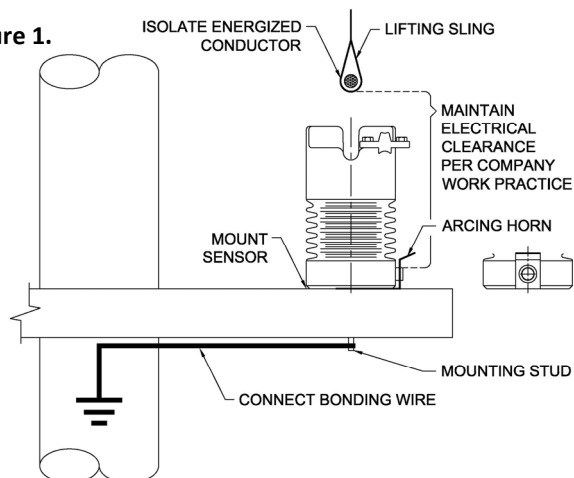
1. Using the sensor catalog number, use the Specifications table to ensure the sensor is being applied in accordance with its ratings.
2. **Preferred Method:**  
Lift the conductor up away from the work area to ensure a proper and safe AC line work minimum approach distance (See Figure 1). See Table 1 on p. 7 for clearance recommendations. As an example, the conductor may be lifted using a sling (See Figure 1). The sling could be attached to a bucket truck, a lift, hotsticks, or other insulated arms typically used to change out a cross arm.

#### Alternative Method:

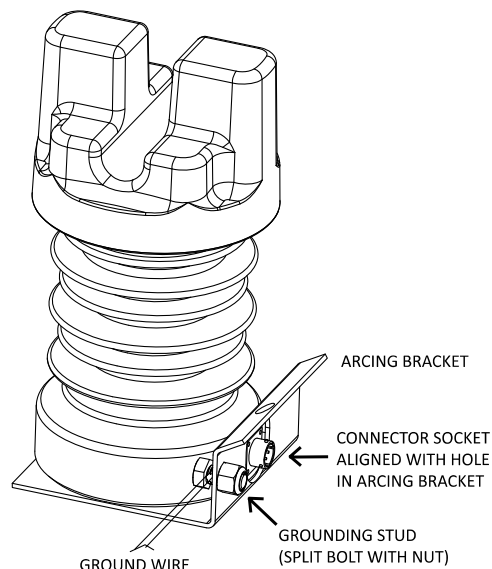
If allowed by your company's safe work practices, apply sufficient external insulating blankets (See Figure 3) to ensure proper and safe electrical clearances. Note that if using this method, Steps 4 & 5 for ground the sensor and connection of the control cable must still be followed before placing the energized conductor in the saddle at the top of the sensor.

## GEN2 Current and Voltage Sensor

**Figure 1.**



**Figure 2.** Location detail for installation of arcing bracket



**Figure 3.** Example use of insulating blankets to shield sensor connector area from live line



## Lindsey Installation Guidelines

## GEN2 Current and Voltage Sensor

### Installation (*continued*):

3. **3a:** If replacing an existing insulator, remove the existing insulator using approved work methods.  
**3b:** Place the provided arcing bracket (see Figures 1 & 2) underneath the GEN2 sensor and mount both on the crossarm using a 3/4" -10 mounting stud. The connector socket on the GEN2 sensor must be aligned with the hole in the arcing bracket (See Figure 2).  
**3c:** Rotate the sensor to place "H1" towards the feeder source. "H1" is always on the right side of the sensor when looking at the sensor with the signal cable connector facing you. NOTE: "H1" is also printed on the nameplate on the "H1" side of the sensor and is molded into the body of the sensor.

### 4. Grounding procedure:

#### Preferred Method:

Pass a No. 6 (typical) copper ground wire through the split bolt attached to the arcing bracket (See Figure 2).

Trim or bend any excess ground wire to avoid contact with the connector/shell of the cable.

#### Alternate Method 1:

Tighten the nut on the mounting stud nut against a square washer on the crossarm. Add two square washers, double coil lock washer, and square nut to stud and loop a No. 6 (typical) solid copper ground wire between washers and tight the nut. (See Figure 1).

#### Alternate Method 2:

Attach a ground wire to the mounting stud by use of an appropriately sized parallel groove clamp.

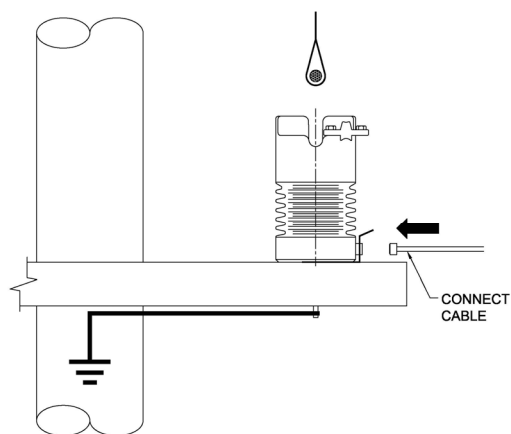
Connect the grounding wire to a low resistance (<5 Ohms) pole ground.

5. Connect signal cable to the sensor while maintaining the safe and proper electrical clearances established during Step 2. See Figure 4.

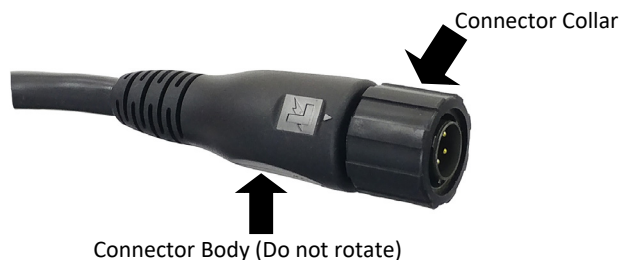
The cables used with the GEN2 sensors are fitted with bayonet-style connectors (See Figure 5). Gently rotate the connector collar of the cable connector until you feel the slots in the cable align with the pins on the female base which is molded into the sensor. Do not rotate the connector body once the connector is inserted into the sensor.

Push gently until the cable is seated against the sensor. Rotate the outer collar of the cable connector 1/4 turn clockwise until you feel a "click" as the connector halves seat into each other.

**Figure 4.**



**Figure 5.** Control cable bayonet connector detail



## Lindsey Installation Guidelines

## GEN2 Current and Voltage Sensor

### Installation (*continued*)

6. **6a:** Secure the control cable to the crossarm with wood staples or route inside an appropriate conduit. Be careful not to crimp or damage the signal cable.

**6b:** Connect the other end of the signal cable to the controller.

7. Install the conductor keepers (See Figure 6).

**Important:** The conductor keepers are reversible: one side accepts conductors ranging from 0.18 inch to 0.73 inch (4.6 - 18.5 mm) diameter; inverting the keeper will allow it to accept conductors from 0.73 to 1.25 inch (18.5 - 32 mm) diameter. If preferred, armor rod may be used without affecting accuracy.

Install one keeper pivot bolt through the keeper into the top of the sensor. Start a second bolt into the top of the sensor. Both bolts should be tightened only so far as to allow free movement of the keeper in the direction of the top groove.

Swing the keepers to the side clear of the top groove of the GEN2 sensor (See Figure 6).



### CAUTION

If the phase conductor is insulated (for example, tree wire), the insulation must be removed from the cable where the conductor keepers will contact the cable. A metallic connection between the conductor and the keepers is required to energize the voltage sensing circuit in the sensor. Failure to remove the insulation will make it impossible for the sensor to detect voltage.

8. **8a: De-energized or Insulated Glove Installation Method:** Lower the conductor into the top groove of the sensor (See Figure 6).

**8b: Hot Stick Installation Method:** Lower the conductor into the top groove of the sensor (See Figure 6).

Connect the shotgun/hot stick hook through the working hole on the keeper.

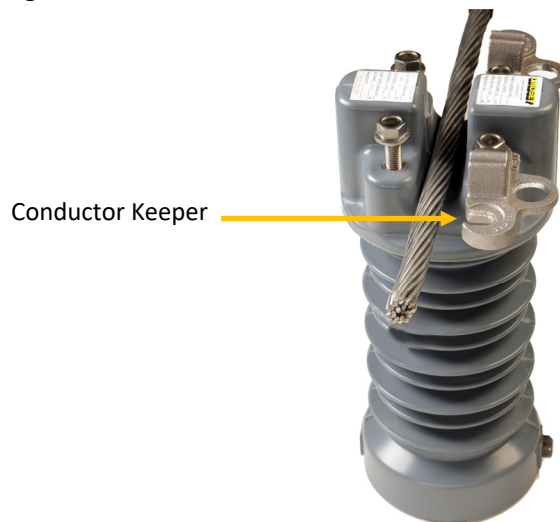
**8c:** Swing the keeper over the conductor in the top groove until the slotted hole in the keeper makes contact with the second bolt in the top of the GEN2. **The GEN2 device is now energized (See Figure 7).**

### NOTE:

When bringing the far end of the cable into a control cabinet, make sure the hole or cable gland in the cabinet can accept the following connector or cable diameters for proper pass through.

| Cable End                         | Min. Hole or Gland Dia. |
|-----------------------------------|-------------------------|
| Pigtail                           | 0.635 in. (16 mm)       |
| Single Sensor Connector           | 1.46 in. (37 mm)        |
| 3-to-1 or 4-to-1 Sensor Connector | 2.00 in. (51 mm)        |

**Figure 6.** As shown, H1 is on far side



**Figure 7.**





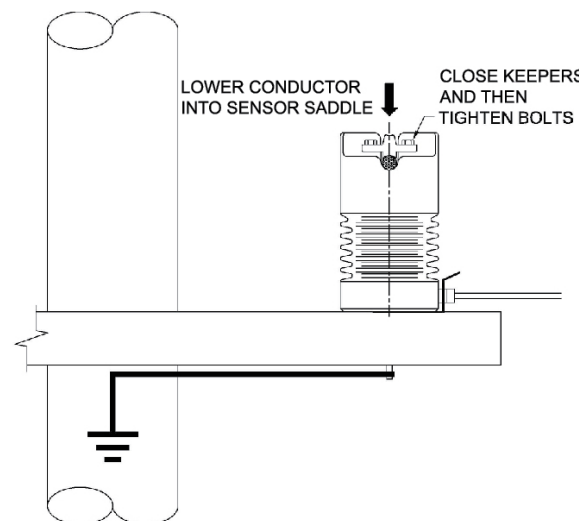
**Lindsey Installation Guidelines****GEN2 Current and Voltage Sensor****Installation (continued)**

9. Tighten both keeper bolts to 25 to 30 ft. lbs. with your organizations accepted practice/methods for live line work. (See Figure 8)

Repeat the same procedure to the keeper on the opposite side of the GEN2.

**CAUTION:** Do not use pneumatic hand drills to torque down the keepers. Pneumatic drills can apply mechanical shocks that may crack the sensors. Cracked sensors may fail prematurely.

10. Installation is complete.

**Figure 8.****Table 1. Safe Working Distances\***

| Voltage Class KV phase-phase | Distance to Workman |
|------------------------------|---------------------|
| 15kV                         | 26 inches (660 mm)  |
| 25kV                         | 31 inches (790mm)   |
| 35kV                         | 31 inches (790mm)   |

\*National Electric Safety Code C2-2007, IEEE, 2007, Table 441-1, p. 266

**Table 2. Accessories**

| Part #    | Description   | Note     |
|-----------|---|----------|
| 2004      | Horizontal mounting base                                      | Optional |
| 2040      | 3/4" x 2 3/16" mounting stud for metal cross-arms             | Optional |
| 2041      | 3/4" x 7 1/2" mounting stud for wood or fiberglass cross-arms | Optional |
| R-23741   | Extra Hotstick keeper set (2 keepers and bolts)               | Optional |
| 9609-UNIV | Arcing Bracket (Horn) for GEN2 sensor                         | Included |

**IMPORTANT: Read ALL Danger, Warning, & Caution Notices Prior to Installation**

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