

LINDSEY SYSTEMS

Installation Guidelines

Multicore Current and Voltage Sensor

Using Polysil Insulation

15kV P/N 965x/E..., 25kV P/N 966x/E..., 35kV P/N 9670/E...



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.

Multicore 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

Multicore Current and Voltage Sensor

Specifications:

ELECTRICAL RATINGS:			
CATALOG NUMBER SEQUENCE	965x/E...	966x/E...	9670/E...
INSULATION CLASS	15kV	25kV	35kV
IMPULSE (BIL)	110kV	150kV	200kV
LEAKAGE DISTANCE (in.)	15.8	24.5	36.5
DRY ARC DISTANCE (in.)	8.8	12.6	17.2
OVERALL HEIGHT (in.)	13.2	16.7	21.8
WITHSTAND (1 min.)	34kV	40kV	50kV
CORONA (extinction)	11kV	19kV	26kV

MECHANICAL:			
INSULATION CLASS	15kV	25kV	35kV
CANTILEVER STRENGTH (Ult. lbs.)	2,800	2,800	2,800
WEIGHT (lbs.)	39	49	59
SHIPPING WEIGHT (lbs.)	44	54	64

Characteristics:

Lindsey Multicore 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 0.25 to 1.25 inches.

For safe handling, the output signals of the MULTICORE 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 Multicore 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 MULTICORE 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. 8 for ordering information).

The MULTICORE 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. 8 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.

Multicore Current and Voltage Sensor

Figure 1.

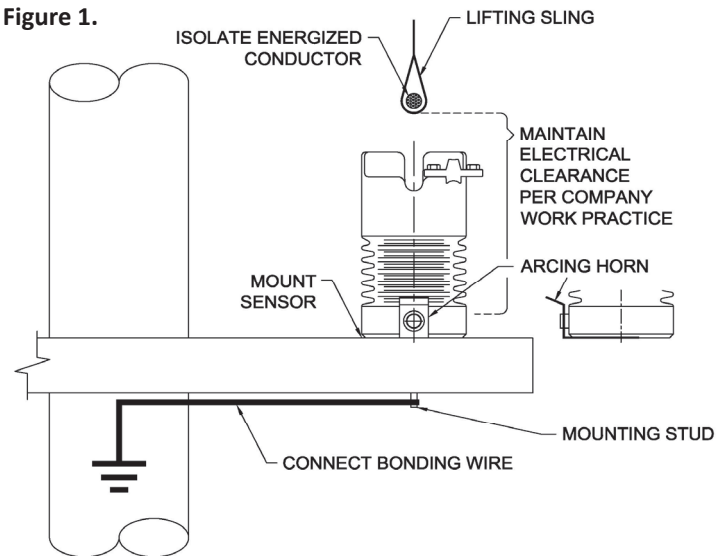


Figure 2. Location detail for installation of arcing bracket

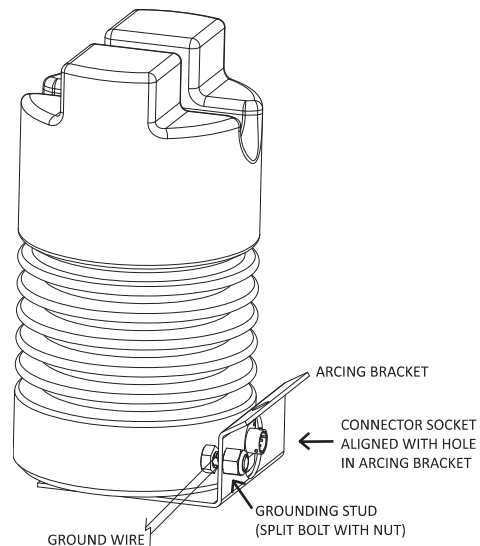


Figure 3. Example use of insulating blankets to shield sensor connector area from live line



Lindsey Installation Guidelines

Multicore 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 MULTICORE sensor and mount both on the crossarm using a 3/4" -10 mounting stud. The connector socket on the MULTICORE 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 opposite the signal cable connector.

NOTE: "H1" is also printed on the nameplate on the "H1" side.

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).

Alternate Method 1:

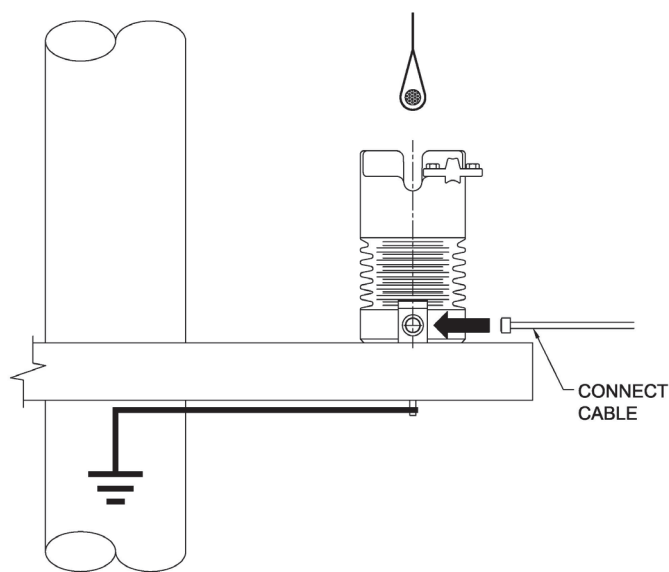
Tighten the nut on the mounting stud nut against a square washer on the crossarm. Add two square washers, double coil lock washer, and square nut to stud and loop a No. 6 (typical) solid copper ground wire between washers and tight the nut. (See Figure 1).

Alternate Method 2:

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

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

Figure 4.



Lindsey Installation Guidelines

Installation (*continued*)

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

⇒ **For bayonet style connector:** Gently rotate the outer 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 (See Figure 5) .

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



CAUTION

Do not over-tighten the screw type connector. Over tightening can displace the internal O-ring allowing moisture to enter the cable. Moisture in the cable will result in inaccurate measurement readings.

⇒ **For screw type connectors:** Hand-tighten to 18-20 ft-lb. See Figures 6 & 7 for the two types of available screw-type connectors.

7. Secure the control cable and the crossarm with wood staples or route inside an appropriate conduit. Be careful not to crimp or damage the signal cable.
8. Connect the other end of the signal cable to the controller.

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)

Multicore Current and Voltage Sensor

Figure 5. Control cable bayonet connector detail

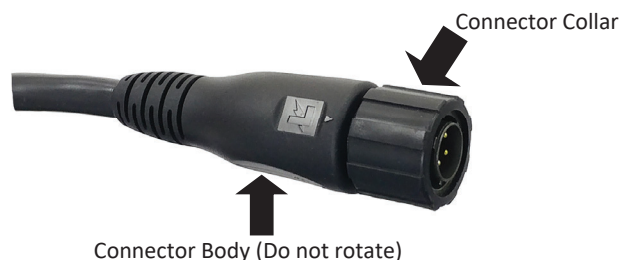


Figure 6. Control cable connector detail for Amphenol-style screw type connector

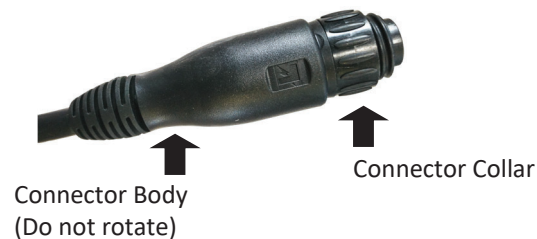
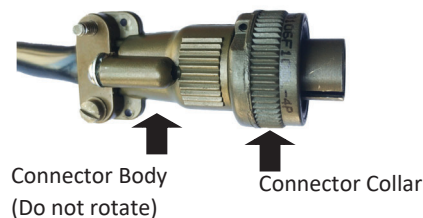


Figure 7. Control cable connector detail for ITT Cannon-style screw type connector



Lindsey Installation Guidelines

Multicore Current and Voltage Sensor

Installation (*continued*)

9. Install the conductor keepers (See Figure 8).

Important: The conductor keepers are reversible: one side accepts conductors ranging from 0.25 inch (6.4 - 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 MULTICORE sensor (See Figure 8).

13. Installation is complete.

Figure 8. As shown, H1 is on far side

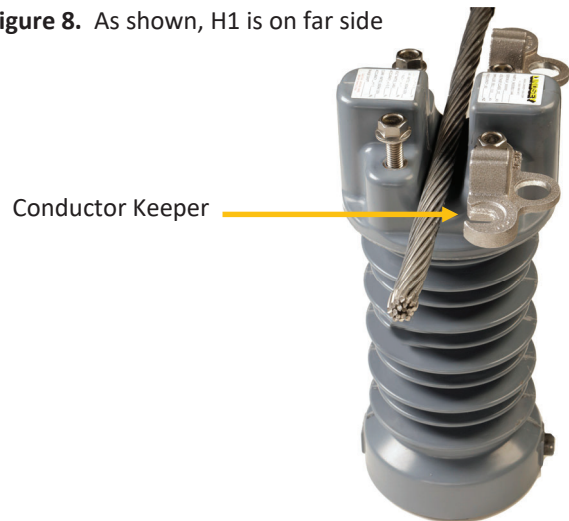
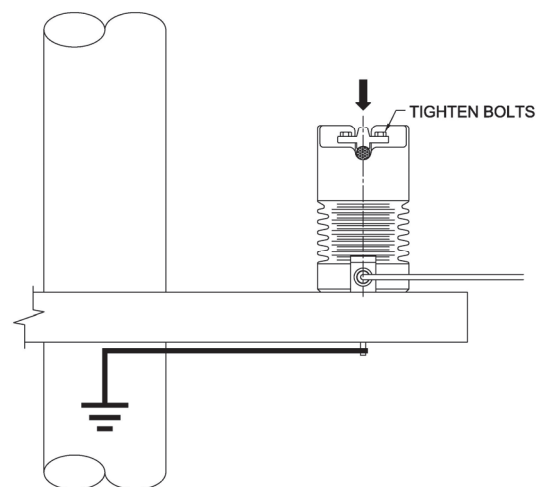


Figure 9.



Figure 10.



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.

10. **10a: De-energized or Insulated Glove Installation**

Method: Lower the conductor into the top groove of the sensor (See Figure 9).

10b: Hot Stick Installation Method: If the sensor was ordered with the hotstick keepers, lower the conductor into the top groove of the sensor (See Figure 9). Connect the shotgun/hot stick hook through the working hole on the keeper.

11. 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 MULTICORE. The MULTICORE device is now energized (See Figure 9).
12. Tighten both keeper bolts to 25 to 30 ft. lbs. with your organizations accepted practice/methods for live line work (See Figure 10).

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

Table 1. Safe Working Distances *

Voltage Class KV phase-phase	Distance to Work-man
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 MULTICORE sensor	Included