Line Post Sensors

Product Instruction Manual

Hubbell has a policy of continuous product improvement. Please visit hubbellpowersystems.com to confirm current design specifications.

HUBBELL
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HUBBELL

DANGER

Electric Shock Hazard. All parts of sensor are energized.

Contact with in service sensor will cause death or severe injury.

Before contacting or servicing the equipment, or working on the electrical system, isolate and ground the sensor from the electrical system. Verify sensor is de-energized by testing with properly rated hot sticks and/or rubber gloves and volt meter.

DANGER

Electrical equipment contains hazardous voltages. Contact with these hazards will cause death, severe personal injury or damage equipment.

Only qualified personnel shall install, operate and maintain this equipment. Always properly ground equipment and lock out electric power (de-energize) before maintenance. Using non-specified/unauthorized parts or components to repair equipment, or tampering with safety devices/systems will result in dangerous conditions which can cause death, severe personal injury or damage to equipment. Take note of and follow all safety instructions contained in this installation, operation and maintenance manual.

IMPORTANT

These installation, operation and maintenance instructions do not claim to cover all details or variations in equipment. Nor do they provide for all possible conditions encountered while installing, operating or maintaining this equipment. If further information is desired or needed to address any particular installation, operation or maintenance problem not covered in this document, contact your authorized factory representative.
The information in this document does not relieve the user from exercising good judgment in selecting equipment for suitability of application. Nor does it relieve the user from using sound practices in installation, operation and maintenance of the equipment purchased.
Note: Because Hubbell has a policy of continuous product improvement, we reserve the right to change design and specifications without notice. Should a conflict arise between the general information in this document and the contents of drawings or supplementary material, or both, the latter shall take precedence.

QUALIFIED PERSON

For the purpose of this manual, a qualified person is:

a. **Familiar with the installation, construction or operation** of the subject equipment and the hazards involved with its installation, operation and maintenance.
b. **Trained** to de-energize, clear, ground, and tag circuits and equipment in accordance with established safety practices.
c. **Trained** in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses or face shields, flash clothing, etc., in accordance with established utility safety practices.
d. **Trained** to render first aid.

SUMMARY

The information in this document does not claim to cover all details or variations in equipment, nor to provide for every possible contingency encountered with installation, operation, or maintenance. Should further information be needed or problems arise that are not covered sufficiently, contact your factory representative.

The contents of this document are not part of, nor do they modify, any prior or existing agreement, commitment or relationship. Hubbell Power Systems, Inc. terms and conditions of sale constitute the entire obligation of Hubbell Power Systems, Inc. The warranty in the terms and conditions of sale is the sole warranty of Hubbell Power Systems, Inc. Any statements in this document do not create new warranties or modify any existing warranty.

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Safety Information

⚠ DANGER

All parts of the sensor are energized.

Contact with components will cause severe personal injury, death, or property damage.

Only qualified personnel should work on or around this equipment after becoming thoroughly familiar with this document and other publications regarding this equipment.

⚠ WARNING

This equipment is not intended to protect human life.

Can cause death, severe personal injury, and/or equipment damage.

Follow all locally approved procedures and safety practices when installing or operating this equipment.

Introduction
This manual is to guide you through the installation, operation and maintenance of the Hubbell Power Systems Line Post Sensor. This manual does not claim to cover all situations that may arise during installation. If additional information is needed, contact your factory representative. Nor does this manual supersede your company's established guidelines and practices for similar equipment. Take note of and heed all danger, warning and cautions contained in this document.

Qualified Person
Only qualified, trained, and competent personnel that understand proper safety procedures must select, install and service this equipment.

Read and understand these instructions before installing, operating or maintaining this equipment. This guide is not a substitute for adequate training and experience in safety procedures for this type of equipment.

Signal Words
The signal words "DANGER", "WARNING" and "CAUTION" (along with their assigned symbol) throughout this manual indicate the degree of hazard the user may encounter. These symbols are described as:

⚠ DANGER — **DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING — **WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION — **CAUTION** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION — **CAUTION** used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

Product
The products covered by this manual are the Hubbell Power Systems Line Post Sensors for medium voltage electrical distribution circuits (15kV, 25kV and 35kV applications).

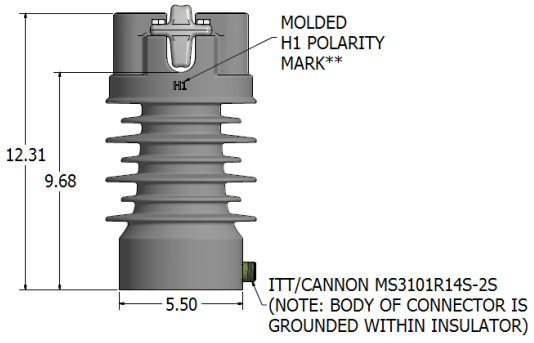
These products are designed for distribution circuits only at their rated capacities. They cannot be field modified for capacities other than what was shipped with the units.

Function
This product is a single-phase line post sensor, designed to provide a means to measure voltages and currents on medium voltage electrical distribution systems.

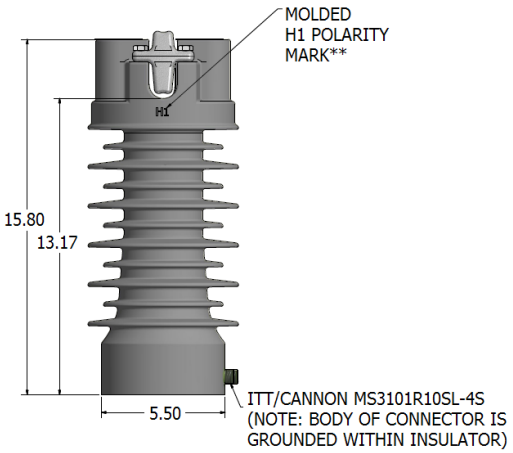
Overview

Ratings and Specifications

Product	Current Sensor			Voltage Sensor			Current and Voltage Sensor		
Measurement Output	600A:10V			10000:1			C - 600A:10V		
							C - 1000A:10V		
	1000A:10V			1400:1	2200:1	3300:1	V - 1400:1	V - 2200:1	V - 3300:1
							V - 10000:1	V - 10000:1	V - 10000:1
Nominal Rating (kV)	15	27	35	15	27	35	15	27	35
Rated Line to Ground Voltage (kV)	8.66	15.59	20.21	8.66	15.59	20.21	8.66	15.59	20.21
Positive Impulse Rating or BIL (kV)	110	150	170	110	150	170	110	150	170
Withstand Rating (kV)									
60Hz Dry Withstand	34	40	50	34	40	50	34	40	50
60Hz Wet Withstand	34	40	50	34	40	50	34	40	50
Leakage Distance (Inches)	23.2	35.4	35.4	23.2	35.4	35.4	23.2	35.4	35.4
Dry Arcing Distance (Inches)	9.7	13.2	13.2	9.7	13.2	13.2	9.7	13.2	13.2
Overall Height (Inches)	12.3	15.8	15.8	12.3	15.8	15.8	12.3	15.8	15.8
Partial Discharge Test Voltages (kV)	11	20	27.4	11	20	27.4	11	20	27.4
Maximum Pico Coulomb	10 pC or less at PD Test Voltage								
Weight (lbs)	17	21	21	17	21	21	17	21	21
Ultimate Cantilever Strength* (lbs)	2800	2800	2800	2800	2800	2800	2800	2800	2800
Temperature Range	-45° C to 65° C								
Current Signal Output (CMI and CVMI)									
Ratio	600A:10V (or) 1000A:10V								
Output Burden/Load	1 Meg Ohm or Greater								
Accuracy	± 1%								
Phase Shift	0° nominal, ± 1.5°								
Sensors are calibrated at 300A for best accuracy across load current range of 0-600A.									
Voltage Signal Output (VMI and CVMI)									
Ratio	10000:1 / 1400:1 / 2200:1 / 3300:1								
Output Burden/Load	1 Meg Ohm or Greater								
Accuracy	± 1%								
Phase Shift	0° nominal, ± 1°								
Each sensor is provided with a detailed calibration report. Entering the exact voltage ratio in the controller would result in better than ±0.5% accuracy.									
Conductor Diameter Range (Inches)	0.19 to 1.18								
Material	Cycloaliphatic Epoxy								
* Recommended maximum working load is 40% of the cantilever rating - Per ANSI C29.7									



15kV Line Post Sensor



27kV and 35kV Line Post Sensor

Dimensions

Installation Requirements

User Supplied Requirements

The following is required for installation. Be sure to have these items on hand before beginning installation.

Safety Equipment (PPE)

- Hard hat
- Steel-toe work boots
- Appropriate eye protection per your company's policy
- Other safety equipment as required by your company's policies

Hardware (Supplied by Hubbell)

QTY 1 - Grounding Plate Kit

- 1 x Aluminum grounding plate
- 1 x Grounding Screw, HEX HEAD SCREW 5/16"-24 THREAD, 3/4"
- 4 x Mounting bolts ,1/2"-13x1.25 flat head socket cap screws

QTY 1 - Hardware Keeper Kit

- 2 x A356-T6 Aluminum keeper clamps,
- 4 x lock washers, 3/8
- 4 x screws 3/8-16, 1-1/2L (recommended torque 18ftlb)

To Be Ordered Separately

- Surge arrestors and wire (optional)
- DF19M4, Line Post Insulator Mounting Stud or optional alternate as needed. *http://www.hubbellpowersystems.com/pole-line/insulator/studs*
- Sensor mating plug connector, with cable, 2- wire or 4-wire cut to specified length, for sensor output signal.

  PSC820221XX – 2 wire signal cable for Current Only Sensors and Voltage only Sensors (XX- Length of Wire in feet)- CMI, VMI models

  PSC820211XX – 4 wire signal cable for Current and Voltage Sensors (XX- Length of Wire in feet) – CVMI model

Note : Contact your Hubbell factory representative for any custom cable requirements

Receiving & Handling

Inspection

1. Inspect the packaging for obvious shipping damage.
2. Open and thoroughly inspect the product for hidden damage.
3. Note any damage on the "Bill of Lading" prior to accepting the delivery.
4. Check the material nameplate against the shipping list to ensure the correct material has been received. In case of shortage or incorrect material, immediately notify your factory representative or customer service.

Note: Documentation of visible shipping damage can determine the outcome of any damage claim. Notifying the carrier of concealed damage within 15 days is essential to resolving or minimizing unsettled claims. Immediately file your claim and notify your factory representative.

Unpacking

1. Carefully remove all items from the packaging. Exercise caution and do not drop the unit or strike the skirted end on anything as this may damage the sensor.
2. Refer to the figures in this document to familiarize yourself with all components.

Storage

If the sensor is not going to be put into service immediately, re-pack all components in the factory package to minimize storage damage and to ensure good operating conditions in the future. Hubbell Power Systems recommends that the sensor be stored indoors or under cover, off the ground, not subject to direct sun, rain or snow.

Installation

⚠WARNING

Follow all appropriate OSHA and company work rules in the installation of this equipment. All clearances, cover-up and personal protective equipment must be used. Failure to follow these instructions may result in damage to equipment, personal injury or death.

⚠WARNING

Do not store or lay the sensor in mud, snow or water.

This could contaminate the insulation leading to electrical flashover at system voltage.

A clean, dry storage environment is recommended.

Hubbell Power Systems Line Post Sensors are designed for 15kV, 27kV and 35kV outdoor pole or structure mounting applications. These sensors are used to measure voltage, current, or both, and provide a low voltage output proportional to the primary voltage or current being measured. This product is designed to greatly simplify the installation process, by allowing installation without the need to de-energize or cut the main conductor. The design includes a lay-in groove and clamps for optimal positioning the primary conductor for measurement. The sensor is also designed to replace the functionality of in-line vertical or horizontal insulators.

Sensor Mounting & Orientation

The sensor is primarily intended for vertical or horizontal tangent conductor mounting and is not intended for use to dead-end the primary conductor. When mounting the sensor, the molded-in **"H1"** designation on the side of the sensor must be toward the source of power or feeder source for correct signal polarity. If reversed, the current output signal will be 180° out of phase.

H1 Polarity

Sensor base

Sensor base plate installed

Stud pin, mounting (To be ordered separately)

The line post sensor can be mounted either on an iron pin or on a metal cross arm or other apparatus surface.

For surface mounting, use the four 1/2"-13 3 inch bolt circle pattern inserts excluding the mounting plate. Both mounting options are threaded to accommodate the use of galvanized hardware.

For pin mounting, attach the base plate using the four (4) stainless steel flat-head socket cap screws. Mount the sensor on the stud using the 3/4"-10 bolt-hole insert.

The sensor is compatible with the Hubbell Power Systems part number DF19M4, Line Post Insulator Mounting Stud. *Please note that this is not provided with the sensor unit and will need to be ordered separately.* Information about optional line post insulator mounting hardware can be found in the following link: http://www.hubbellpowersystems.com/pole-line/insulator/studs/

If replacing an existing insulator, remove the existing insulator using approved work methods. Thread the sensor on the pin, and mount the pin on the arm as required.

Installation

Sensor Grounding
The line post sensor MUST be grounded before it is energized. The following are 2 different grounding procedures that could be followed to ensure a solid ground connection.

Standard Grounding Method

- Position the grounding plate on the base of the sensor and use the 1/2"-13 flat head socket cap screws to tighten the grounding plate to the 3 inch bolt circle inserts on the base.
- Install sensor on center pin on the cross arm.
- The grounding plate contains a slot for accommodating ground wire diameters from 0.102" [2.8] to 0.322" [8.2].
- Insert the ground wire through the slot and tighten the grounding screw to secure the grounding wire in position.
- Connect the grounding jumper to a low resistance pole ground.

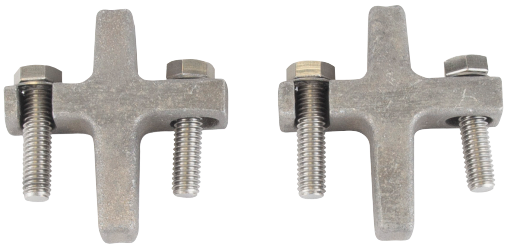
Grounding provision in base plate

Alternate Grounding Method

- A solid ground connection must be maintained at all times during operation.
- Position the grounding plate on the base of the sensor and use the 1/2"-13 flat head socket cap screws to tighten the grounding plate to the 3 inch bolt circle inserts on the base.
- Install sensor on center pin on the cross arm.
- On the bottom of the cross arm, add two square washers, a double coil lock washer, and a square nut to the stud; loop a No.6 (typical) solid copper ground wire between the washers and tighten the nut.
- Connect the grounding jumper to a low resistance pole ground.

Primary Conductor Clamping
The primary "swing style" clamp hardware to hold the conductor in the groove can be found in the hardware kit packed with each sensor. The clamps are reversible and can support different ranges of conductor diameter (954 MCM TO #6 AWG).

Reversible Clamp Size	
Small groove range	0.19" [5] to 0.70" [18]
Large groove range	0.70" [18] to 1.18" [29]



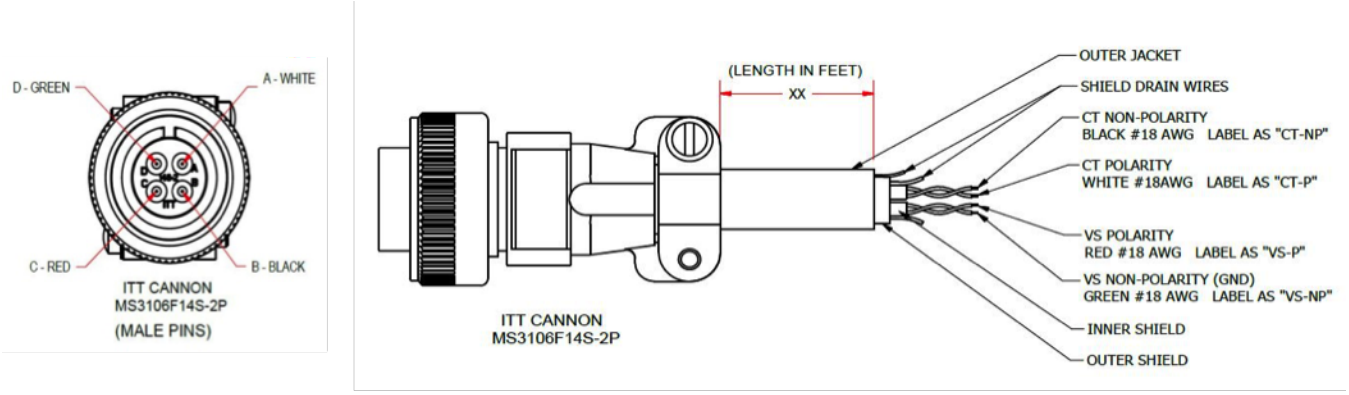
Primary clamps, keepers & hardware

The clamps are cast in A356-T6 aluminum and each clamp is provided with 2 sets of lock washer and bolts for holding and tightening the main conductor in position. Recommended Bolt Torque – 18 ft lb.

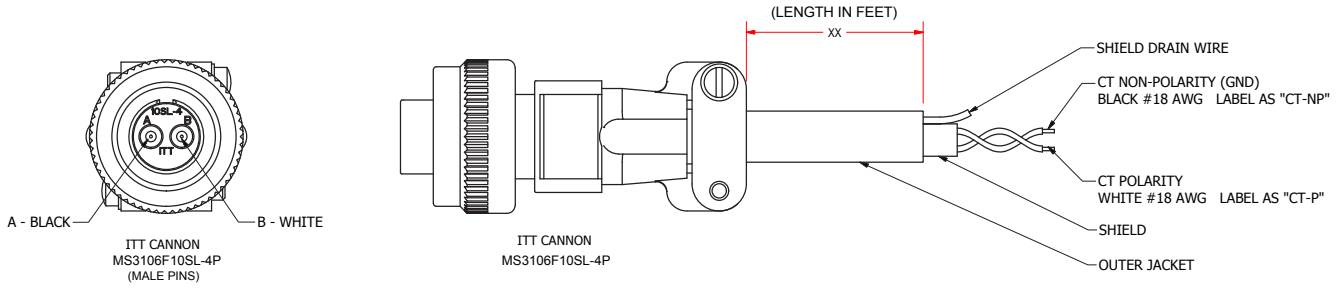
Keepers & hardware installed

Installation

Secondary Wiring



PSC820211XX - 4 wire signal cable for Current and Voltage Sensors (XX - Length of Wire in feet)



PSC820221XX - 2 wire signal cable for Current Sensors (XX – Length of Wire in feet)

The standard cable lengths are 20, 30, 40 and 50ft. However, the cables can be ordered to any specific length requested. The cable assemblies are provided with an ITT-CANNON connector (MIL-5015 specification and IP67 rated) and #18 AWG color coded, shielded and twisted pair wires for making the secondary connections.

If multiple sensors are used at the installation site, it is necessary to run separate cables for each phase; a common conduit may be utilized. The use of a conduit is recommended to prevent inadvertent damage to the secondary cable. The non-polarity wire from the sensor is internally connected to the sensor base ground connection. Ground the sensor and control to the common pole ground.

Sensor output receptacle & mating plug

4-wire cable, not terminated

⚠ DANGER

All parts of the sensor are energized.

Contact with components will cause severe personal injury, death, or property damage.

Only qualified personnel should work on or around this equipment after becoming thoroughly familiar with this document and other publications regarding this equipment.

All secondary wires must be kept away from energized primary conductors. Failure to follow safety procedures during installation may result in personal injury, death or equipment damage.

Installation

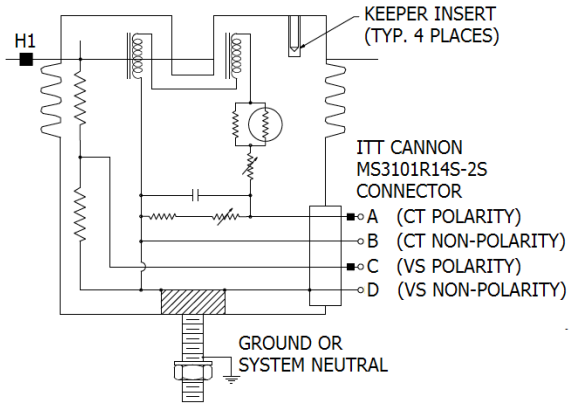
Secondary Output Loading

The sensor output accuracy will be affected by excessive loading of the sensor outputs. It is recommended to have an input impedance of at least 1 Meg-ohm in the controller for best accuracy results.

NOTE: The sensor will not be damaged by short-circuiting or open circuiting the secondary wires and does not require short-circuiting when not connected to a burden. Even so, it is recommended to short-circuit and ground the terminals when not being used to prevent floating voltage across the terminals.

Sensor Outputs

The low voltage outputs of the sensor ensure safe and accurate signals and prevent damage to the controller or electronics. The sensors are designed for 15kV, 27kV and 35kV outdoor pole applications and do not require any special calibration in the field to achieve the specified accuracy. The overall symmetry of the sensing elements ensures a high accuracy output when used with conductor diameters of 0.19 to 1.18 inches (954 MCM to #6 AWG). The design also provides an improved immunity to coupling impact from adjacent phases when a recommended minimum spacing between the main conductors of 18" or higher is maintained.



Sensor Wiring Diagram - current and voltage

Current Output

The output of the current sensor is a low-voltage AC signal proportional to the primary current. The inductive coils in the sensor are coupled to the magnetic field produced by the primary current via precise mechanical positioning during the manufacturing process, providing high accuracy output proportional to the primary current.

The sensors are calibrated for a nominal 0 degree phase shift. In order to retain compatibility with existing controllers and RTUs, the following 2 options are available at the time or order for current output.

- 600A:10V
- 1000A:10V

The standard current calibration value for the sensors is 300A for optimum accuracy.

Voltage Output

The voltage sensor uses a high precision, non-inductive, reliable resistive divider that provides a low voltage AC output signal proportional to the primary line-to-ground voltage. The following voltage ratios are available to ensure compatibility with a wide range of controllers and RTUs.

Voltage Ratios:

1. 10000:1 (for 15, 27 and 35kV - 1 Meg Ohm or Higher burden)
2. 1400:1 (for 15kV, 1 Meg Ohm burden)
3. 2200:1 (for 27kV, 1 Meg Ohm burden)
4. 3300:1 (for 35kV, 1 Meg Ohm burden)

During sensor installation, please ensure the main conductor makes a solid electrical contact with the mounting clamps and that the mounting clamps are properly tightened and secured. Please contact your Hubbell representative if any custom voltage ratios are needed for special applications.

Please ensure that the sensor is solidly grounded and makes a solid electrical contact.

Maintenance

The sensor is configured and installed similar to a line-post insulator with dual clamps to hold the conductor precisely in the groove. All the electrical sensing, protection and temperature compensation elements are sealed inside a homogenous casting of maintenance-free cycloaliphatic epoxy. Use the same procedure employed for porcelain insulators for cleaning of the epoxy surface.

Contact Information

For further information or questions relating to this product, installation procedure or accessories, please contact your local HPS Representative.

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