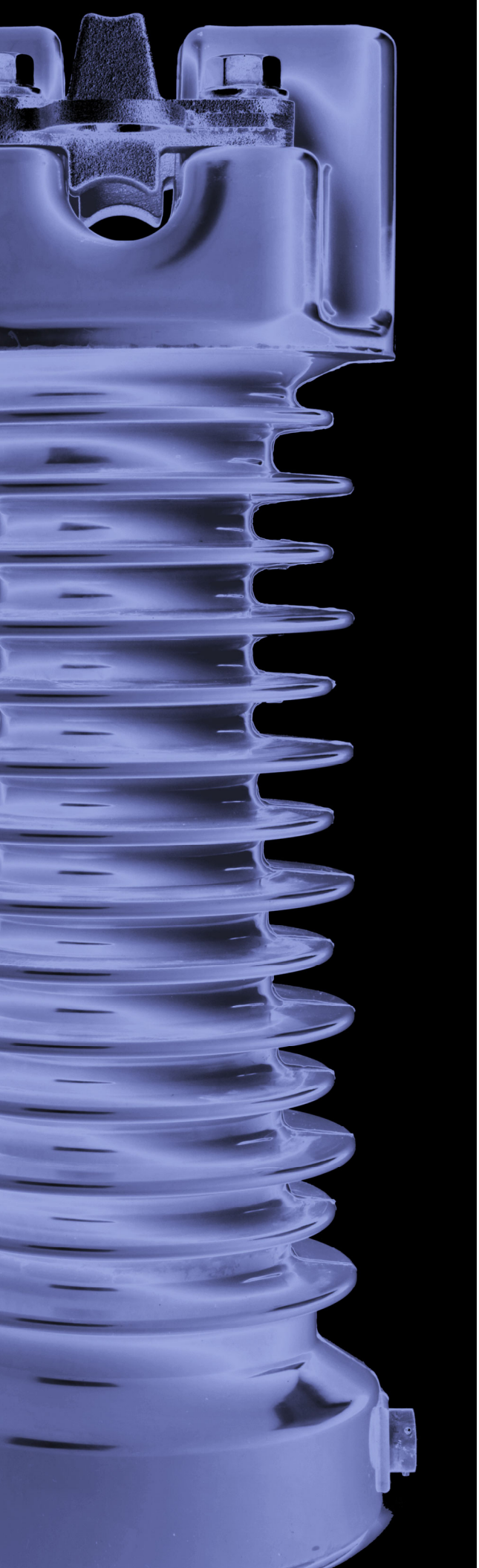

Lindsey Sensors

High Accuracy Medium Voltage Sensors & Accessories

for Overhead & Underground Distribution

LINDSEY SYSTEMS

LINDSEY SYSTEMS

Hallmarks of Lindsey Systems' Sensors

Reliable & Safe

> 10,000 Years

Lindsey sensors have demonstrated a 10,000 year MTBF over the past 35 years.

<1mA

Most voltage and current sensors produce an output of only 10V and less than 1mA of current to ensure safe handling.*

0.2%

High Accuracy Sensors™ offer 0.2% voltage accuracy, the best in the industry.

*Not applicable to sensor models with 1A or 5A current outputs, or where the specified voltage output is greater than 10V at rated line current.

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LINDSEY SYSTEMS

LINDSEY SYSTEMS

Voltage and Current Sensors by Lindsey Systems

For over 40 years, voltage and current sensors by Lindsey Systems have served a crucial role in medium voltage distribution networks. Well-known for exceptional reliability and long life, they are depended upon for their accuracy in voltage and current monitoring applications. Sensors by Lindsey Systems are the number one choice for substation, overhead, pad-mount, submersible, oil-filled, SF6 or OEM applications.

Sensing Elements

All Lindsey Systems' sensors use one or more of the following voltage and current sensing elements. With the exception of window CT-based sensors, the output current of all sensing elements is typically limited to <1mA to ensure exceptionally low energy levels in the event of contact during installation.

Voltage Sensing

High precision resistive voltage divider networks are used in all voltage sensors to provide exceptionally accurate analog voltage outputs. For overhead applications, Lindsey High Accuracy Sensors™ offer the industry's highest accuracy at 0.2%, with 0.5% accuracy standard for less demanding applications.

All voltage sensors for pad-mount and underground applications are available in 0.15% revenue metering, 0.3% metering, and standard 0.5% accuracy versions.

Outputs are linear with the primary voltage level applied. High ratio (=>1400:1) sensors have flat frequency response through the 20th harmonic with zero phase shift providing excellent harmonic performance.

Current Sensing

Two different current sensing methods are used depending on the actual product.

MultiCore current sensing

Two current sensing coils are used to measure current. This technique produces an accurate (1%) voltage output proportional to the primary current, typically 10V secondary at 600A primary.

The output of MultiCore sensors is linear with input current, making them ideal to accurately represent fault current magnitudes.

MultiCore current sensors are not recommended for harmonic current measurement applications as their frequency response is non-linear outside of rated fundamental frequency.

Window CTs

Iron core window CTs produce a higher accuracy measurement (to 0.3%) as well as flat frequency response through 3 kHz (+/-2% @ 3KHz) making them ideal for harmonic measurement applications.

Both 1A and 5A output versions are available.

Overhead and Outdoor Sensors

Overhead line sensors are available in a variety of configurations. The accuracy of Lindsey Systems' voltage sensors have made them the gold standard for Volt Var Optimization (VVO) and Conservation Voltage Reduction (CVR) applications.

The construction of line post and standoff sensors meet all the electrical and mechanical requirements of equivalent insulators providing endless installation options.

Switchgear and Specialty Sensors

Whether dead-front, live-front, oil or SF6 insulated, pad-mount, or underground, Lindsey Systems offers the widest range of voltage and current sensors for switchgear applications, including:

- Elbow and T-body voltage sensors for 200A IEEE cable systems
- Plug-style voltage sensors for 600A/900A IEEE cable systems
- Split-core and ring type current sensors
- Voltage sensors for live-front, SF6, oil-filled, and low voltage switchgear
- Voltage sensing bus standoff insulators

Note: Sensor accuracy is the variation from the as-tested output ratio (as stamped on each sensor's nameplate) across the stated accuracy temperature range. For more information, refer to Lindsey Systems' publication number 09R-017 SENSOR ACCURACY.

Lindsey Sensor Family Quick Reference

Overhead Post Insulator Voltage/Current Sensors

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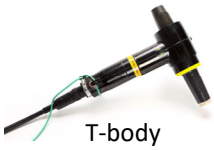

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LINDSEY SYSTEMS

LINDSEY SYSTEMS

GEN2 Sensors

The Accuracy you need. The Reliability you want. For over 40 years, Lindsey current and voltage sensing post insulators have been the standard for smart grid applications. Lindsey GEN2 line post sensors feature hydrophobic cycloaliphatic epoxy construction, providing superior performance in high pollution and wet environments.

Standard or High Accuracy GEN2 Sensors

Lindsey's standard GEN2 sensors offer 0.5% voltage accuracy and no phase shift. High Accuracy Sensors™ offer 0.2% accuracy from –40/+55°C; the industry's best.*

These sensors are ideal for feeder voltage control based on Volt/VAR Optimization (VVO) or conservation voltage reduction (CVR) applications, which rely on accurate voltage measurements. Greater accuracy allows for finer control of the voltage profile and maximizes the economic benefit which can be realized by these programs.

GEN2 sensors are completely passive designs. No external power source is required to power sensor electronics.

All GEN2 Sensors Include:

- Multicore style sensor providing 1% current accuracy with no phase shift
- Voltage and current accuracy independent of weather and conductor diameter
- Hydrophobic cycloaliphatic epoxy construction provides superior performance in high pollution and wet environments
- Physical construction that meets all the electrical and mechanical requirements of post insulators

Lineman Friendly Features

- Less than 1/2 the weight of Lindsey Systems' Polysil insulation based sensors
- Touch-friendly outputs. Low voltage, low current sensor outputs eliminate the risk of high voltages as may be found with conventional CT-based sensors. This allows GEN2 sensors to be installed on energized lines.
- Glove friendly cables use bayonet-style waterproof connectors that "snap" when closed, eliminating over-and under-tightening (Figure 1).

Figure 1: Bayonet-Style Waterproof Connector

*High Accuracy Sensors require the use of Lindsey Systems' High Accuracy gold-line cables to ensure accuracy across the entire temperature range.

Hot Stick Friendly Conductor Keepers

Conductor keepers establish the connection between the conductor and the sensor's internal sensing circuits. Lindsey provides two patent pending hot stick friendly versions.

Standard Hot Stick Keeper

This keeper design** is attached to the sensor via one through-bolt which acts as a hinge. This allows the conductor to be placed in the sensor saddle while the keeper is left open (see Figure 2).

The ring on the keeper provides a convenient point of connection to a hot stick for the purpose of pushing the keeper into the closed position (see Figure 3).

The bolts may then be tightened to finish the connection.

Figure 2:
Standard Hot Stick Keeper Shown Open

Figure 3:
Standard Hot Stick Keeper Shown Closed

Trunnion Keeper

The trunnion clamp keeper** is a full trunnion style conductor clamp designed to fit Multicore style sensors. (see Figure 4).

The trunnion clamps are affixed to either side of the sensor on the ground. Once in the air, the conductor is placed through the opened clamps and into the conductor saddle. The clamps' keepers are closed by turning the ring from below and away from the sensor using a hot stick. This allows the lineman to be located at a suitable distance from the line during final installation.

**US & International patents pending

Figure 4: The Trunnion Keeper

LINDSEY SYSTEMS

GEN2 Voltage and Current Sensors by Lindsey Systems

Electrical Ratings			
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 (A) (in./mm)	12.4/315	15.75/400	20.0/508
Height to Conductor Saddle (B) (in/mm)	9.4/238	12.6/319	15.8/400
Withstand* (60HZ, 1 min.)	34 kV	40 kV	50 kV
Corona (extinction)	11 kV	19 kV	26 kV
Operating Temperature	-50° C to +80° C		
Stated Accuracy Temperature	-40° C to +55° C		
Conductor Diameter	Two-sided keeper accommodates 0.18" - 1.25" (4.6-32 mm) diameter		
Construction	Hydrophobic cycloaliphatic epoxy		

NOTE: Calibration of current and voltage signals is virtually unaffected by conductor material, size, temperature, armor rod, adjacent phases, line angle or insulator contamination.

***Withstand test is not performed on sensors with voltage sensing. Specify 50 HZ or 60 HZ.

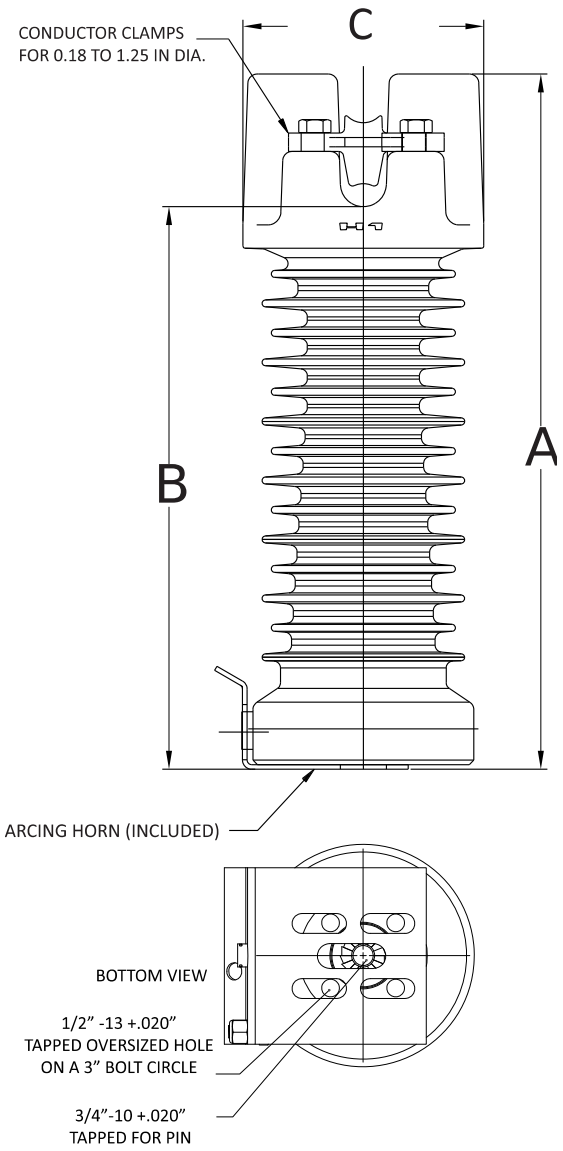
Voltage Signal Output	
Ratio	By catalog number
Output Impedance	Calibrated for a 1 MΩ load
Accuracy**	GEN2: +/- 0.5% High Voltage Accuracy GEN2: +/-0.2%
Phase Shift	0 degrees for sensors with ratios of 1400:1 or greater, - 2 degrees per 10 feet of cable for lower ratios

Mechanical Ratings			
Insulation Class	15 kV	25 kV	35 kV
Cantilever Strength (lbs./kg)	2800/1270	2800/1270	2800/1270
Weight (lbs./kg)	18/8.2	20/9.1	24/10.9
Shipping Weight (lbs./kg)	20/9.1	22/10.0	26/11.8

Current Signal Output	
Ratio	600A : 10 Volts
Output Burden/Load	Calibrated for 100 kOhm or greater load
Accuracy**	+/-1%
Phase Shift	0 degrees nominal, +/- 1 degree
Open Circuit Voltage	10V at 600A line current

****Accuracy guaranteed only when used with Lindsey supplied cables. GEN2 High Accuracy Sensors™ require the use of gold-line High Accuracy cables.

Figure 5: Dimension Drawing of GEN2 Sensor



GEN2 Ordering Table

Part Number Sequence: A B C / D E 0 F G

A

Family	
9E6	GEN2
9EHA6	GEN2 High Accuracy

B

Voltage Class	
5	15 kV
6	25 kV
7	35 kV

C

Leakage Distance			
0	**Standard Leakage**		
		GEN2	**GEN2 High Accuracy**
	15 kV	19.9 in. (505 mm)	29.4 in. (747 mm)
	25 kV	29.4 in. (747 mm)	29.4 in. (747 mm)
	35 kV	36.5 in. (927 mm)	36.5 in. (927 mm)
2	**High Leakage**		
	15 kV	29.4 in. (747 mm)	36.5 in. (927 mm)
	25 kV	36.5 in. (927 mm)	36.5 in. (927 mm
	35 kV	N/A	N/A
3	**Extra High Leakage**		
	15 kV	36.5 in. (927 mm)	N/A

/

D

Current Output	
E0	None
E1	600A : 10V

E

Voltage Divider Ratio	
0	None
1	1400:1
2	2200:1
3	3300:1
4	10,000:1
5^	60:1
6^	120:1
7^	166:1
8^	200:1
X	Special

F

Keeper	
6	Standard Hot stick
7	Trunnion

G

Frequency	
Blank	60 HZ
/50 HZ	50 HZ

EXAMPLE								
9E6	5	0	/	E1	1	0	6	Blank

Order Example: The 9E650/E1106 is a GEN2 sensor, 15 kV class, standard leakage distance, with a 600A:10V current output ratio, and a 1400:1 voltage output ratio. The sensor includes the standard hotstick keepers.

^These options are not available for the GEN2 High Accuracy Sensors™.

Accessories for GEN2 Sensors

Part #	Description
2004	Horizontal mounting base
2040	3/4" x 3" (2" below flange) mounting stud for metal cross-arms
2041	3/4" x 8 1/2" (7 1/2" below flange) mounting stud for wood cross-arms
R-23741	Extra Hot stick keeper set (2 keepers and bolts)
R-23865	Extra Trunnion keeper set
9609-UNIV-ASSEM	Arcing Bracket (horn) for GEN2 sensor (included). Accessory part number includes ground bolt and nut.

LINDSEY SYSTEMS

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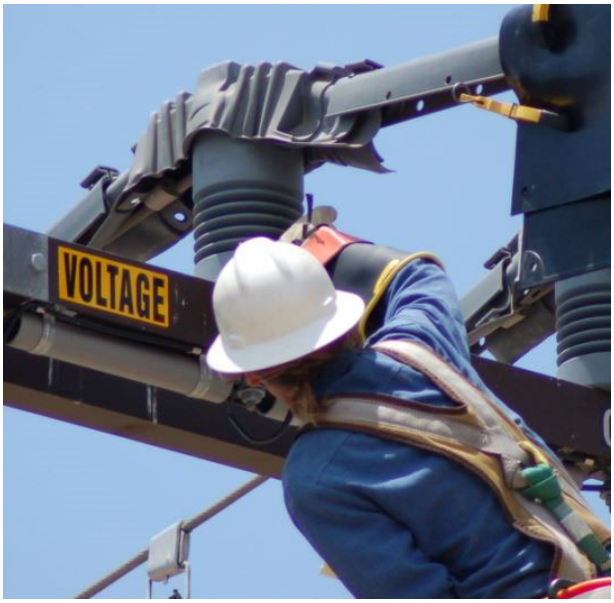
Polysil Overhead Line Post Voltage & Current Sensors

Accurate, Real-Time Measurement. Lindsey Systems' line post sensors have provided exceptionally reliable and highly accurate voltage and current monitoring for substation, overhead and pad-mount distribution applications since 1982. These sensors are constructed using Polysil, an advanced silica/resin composite insulation material developed in conjunction with EPRI.

Line post sensors are available in various sensor configurations and in four different physical packages. All sensors can be used in place of any vertical or horizontal line post insulator. This provides great flexibility both in installation and in applications.

Sensing Configurations

- Voltage-only sensing using precision resistive dividers providing 0.5% accuracy.
- Current-only sensing using either Lindsey Systems MultiCore or window CT sensors. MultiCore sensors offer fundamental frequency accuracy of 1%. Window CTs provide up to 0.3% accuracy and flat frequency response through the 40th harmonic.
- Voltage and current sensors, incorporating a combination of the configurations listed above.
- Calibration of current and voltage signals is virtually unaffected by conductor material, size, temperature, armor rod, adjacent phases, line angle or insulator contamination.



Voltage Signal Output	
Ratio	By catalog number
Output Impedance	Calibrated for a 1 MΩ load
Accuracy*	+/- 0.5% from -40° C to +55°C
Phase Shift	0 degrees for sensors with ratios of 1400:1 or greater, -2 degrees per 10 feet of cable for lower ratios

Current Signal Output				
	MultiCore	**Window CT**		
Accuracy*	+/-1%	1%	0.3%	2%
Phase Shift	0 degrees nominal, +/- 1.5 degrees	0 degrees nominal, +/- 0.5 degrees		
Operating Temperature Range	-45° C to +80° C	-45° C to +80° C		
Stated Accuracy Temperature	-40° C to +55° C	-40° C to +55° C		
Ratio	600A : 10 Volts	600A : 5A	600A : 1A	300A : 5A
Burden	Calibrated for 100 kOhm or greater load	0.9 Ohms, Max.	22.5 Ohms, Max.	0.22 Ohms, Max.
Open Circuit Voltage @600A	10V at 600A line current	14.5	88	8
*Accuracy guaranteed only when used with Lindsey supplied cables.				

Physical Configurations

MultiCore

The MultiCore style design allows the conductor to be placed into the sensor's central saddle, eliminating the need to cut the conductor or make a jumper. This style sensor is ideal for live line installation.

MultiCore style sensors are only available with Lindsey Systems' MultiCore style current sensor with a 600A:10V output ratio.

MultiCore

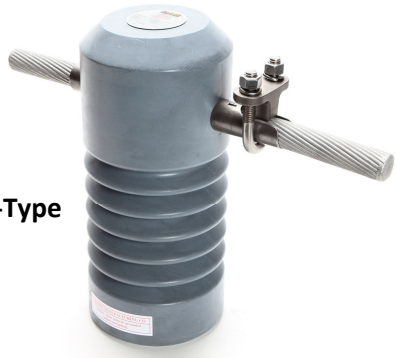
Substation/Busbar

This style sensor uses higher accuracy window CT current sensors. Both 2-hole (600A) and 4-hole (1200A) NEMA pad versions are available. This style sensor is ideal for substation or pad-mount applications. The ability to make a fixed connection also makes this style of sensor suitable for use as a component in automated, overhead switches.

Substation/Busbar

Tube-Type

The tube-type design provides a path for passing a conductor through the sensor body and then clamping to the integral stainless steel tube. This design uses higher accuracy window CT current sensors. This design is practical for many switchgear and substation applications.



Tube-Type

Clamp-Top

Like the MultiCore style sensor, the clamp-top design eliminates the need to cut the phase conductor. The use of window CT current sensors provides higher accuracy and harmonic current measurement capabilities than the MultiCore style unit.

Clamp-Top

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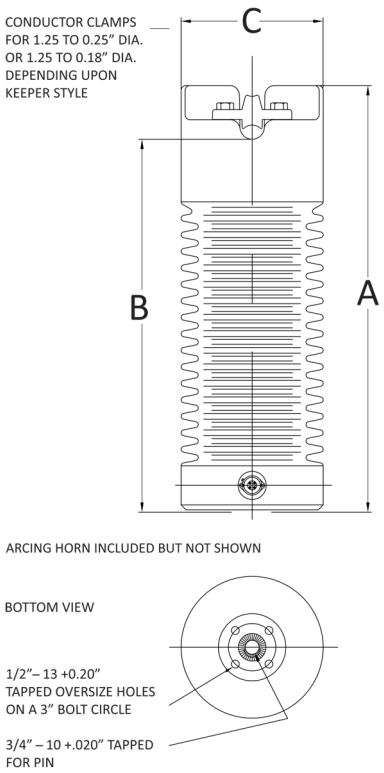
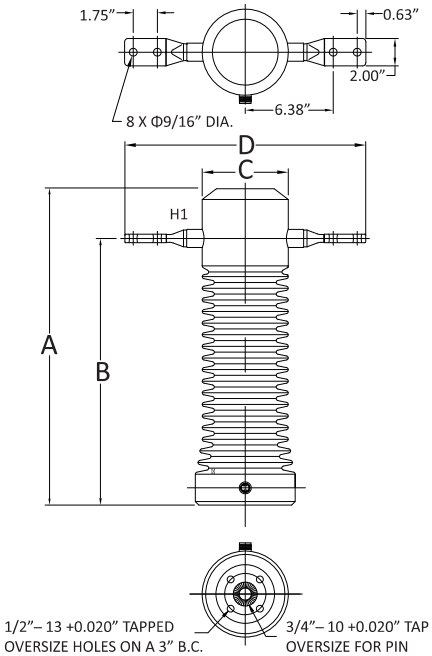
Polysil Dimensions



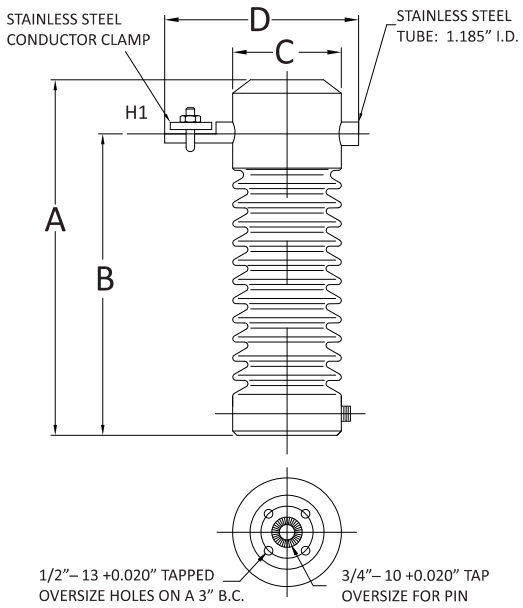


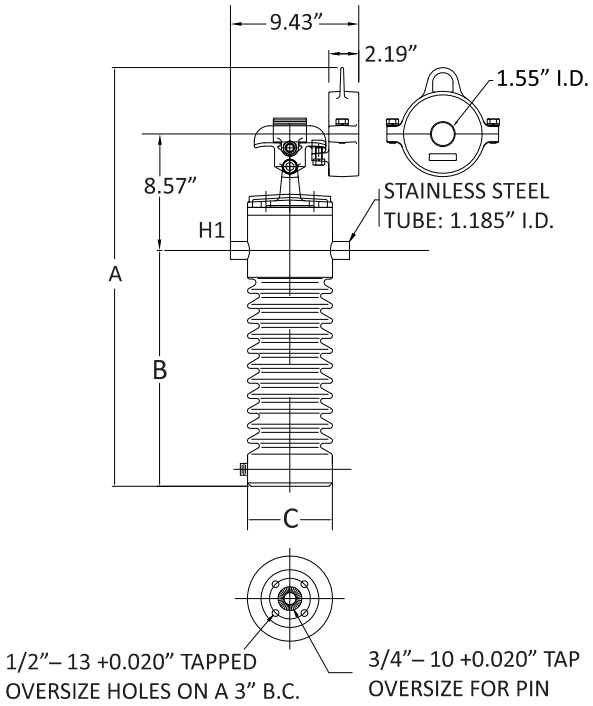
MultiCore	Inches/mm			lb./kg
Voltage Class	A	B	C	Weight
15kV	13.4/339.7	10.6/269.9	7.3/184.2	37.0/16.8
25kV	16.8/425.5	14.0/355.6	7.3/184.2	48.0/21.8
35kV	21.9/555.6	19.1/485.8	7.3/184.2	60.0/27.2

Busbar	Inches/mm				lb./kg
Voltage Class	A	B	C	D	Weight
15kV (2-hole)	14.0/355.6	10.6/269.9	6.3/158.8	17.5/444.5	29.0/13.2
25kV (2-hole)	16.2/411.2	12.8/325.4	6.3/158.8	17.5/444.5	33.0/15.0
35kV (2-hole)	20.4/517.5	17.3/438.2	6.3/158.8	17.5/444.5	43.0/19.5
46kV (2-hole)	23.0/584.2	19.4/492.1	6.3/158.8	17.5/444.5	65.0/29.5
Note: For sensors with 4-hole NEMA pads, add 0.5" (12mm) to D column.					

Mechanical Ratings				
Insulation Class	15 kV	25 kV	35 kV	46 kV
Cantilever Strength (lbs./kg)	2800/1270	2800/1270	2800/1270	2800/1270
Weight (lbs./kg):				
MultiCore	37 (16.8)	48 (21.8)	60 (27.2)	N/A
Busbar	29 (13.2)	33 (15.0)	43 (19.5)	65 (29.5)
Tube-Style	29 (13.2)	33 (15.0)	43 (19.5)	60 (27.2)
Clamp-Top	47 (21.3)	51 (23.1)	61 (27.7)	N/A

Polysil Overhead Sensors





Tube-Style	Inches/mm				lb./kg
Voltage Class	A	B	C	D	Weight
15kV	14.0/355.6	10.6/269.9	6.3/158.8	10.1/257.2	29.0/13.2
25kV	16.2/411.2	12.8/325.4	6.3/158.8	10.1/257.2	33.0/15.0
35kV	20.6/522.3	17.2/436.6	6.3/158.8	10.1/257.2	43.0/19.5
46kV	22.5/571.5	19.4/492.1	6.3/158.8	10.1/257.2	60.0/27.2

Clamp-Top	Inches/mm				lb./kg
Voltage Class	A	B	C	D	Weight
15kV	24.1/611.9	10.6/269.9	6.3/158.8	9.4/239.5	47.0/21.3
25kV	26.3/667.3	12.8/325.4	6.3/158.8	9.4/239.5	51.0/23.1
35kV	30.7/778.5	17.2/436.6	6.3/158.8	9.4/239.5	61.0/27.7

Electrical Ratings				
Insulation Class	15 kV	25 kV	35 kV	46 kV
Impulse (BIL)	110 kV	150 kV	200 kV	250 kV
Leakage Distance (in./mm)	15/381	19.3/490	28.1/714	39.0/991
Dry Arc Distance (in./mm)	8.3/211	10.4/264	15.0/381	17.1/434
Withstand* (60HZ, 1 min.)	34 kV	40 kV	50 kV	75 kV
Corona (extinction)	11 kV	19 kV	26 kV	33 kV
Operating Temperature Range	-45° C to +80° C			
Stated Accuracy Temperature	-40° C to +55° C			
MultiCore Conductor Diameter	0.18" - 1.25" (4.6-32 mm)			
Construction	Polysil			
*Withstand test is not performed on sensors with voltage sensing. Specify 50 HZ or 60 HZ.				

LINDSEY SYSTEMS

LINDSEY SYSTEMS

Polysil Ordering Table

Part Number Sequence: A B C / D E F G H I J

A

Family	
96	Polysil

B

Insulator Class
5= 15kV (BIL 110kV)
6= 25kV (BIL 150kV)
7= 35kV (BIL 200kV)
8= 46kV (BIL 250kV)***

C

Leakage Distance	
0= Standard Leakage (in./mm)	
MulitCore Style	15kV: (15.8/401)
	25kV: (24.5/600)
	35kV: (36.5/927)
Other Styles	15kV: (15.8/401)
	25kV: (19.3/490)
	35kV: (28.1/714)
	46kV: (39.0/990)
2=High Leakage (in./mm)	
MultiCore Style	15kV: (24.5/600)
	25kV: (36.5/927)
Other Styles	15kV: (19.3/490)
	25kV: (24.0/610)
	35kV: (31.8/808)
3=Extra High Leakage (in./mm)	
MultiCore Style	15kV: (36.5/927)
Other Styles	15kV: (24.0/610)
	25kV: (28.1/714)
4=Special (in./mm)	
Other Styles	35kV: (39.0/990)

D

Style
C = Clamp Top
S = Busbar or Tube
E = MultiCore**

E

Current Output Signal	
0	None
1	600A:10V
2	600A:6V
3	600A:5A
4	600A:1A
5	300A:5A
6	300A:10V
X	Special

F

Voltage Divider Ratio	
15kV Options	
0	None
1	1400:1
2	2200:1
3	3300:1
4	10,000:1
5	60:1
X	Special
25kV Options	
0	None
1	1400:1
2	2200:1
3	3300:1
4	10,000:1
6	120:1
X	Special
35kV Options	
0	None
1	1400:1
2	2200:1
3	3300:1
4	10,000:1
7	166:1
X	Special
46kV Options	
0	None
4	10,000:1
8	200:1
X	Special

EXAMPLE						
96	**5**	**0**	**/**	**E**	**1**	**1**

Order Example: The 9650/E1104A is a 15kV class, standard leakage distance, MultiCore style sensor with a 600A:10V current output ratio, a 1400:1 voltage output ratio, standard conductor keepers, and a cast-in Amphenol connector. Cable must be ordered separately.

G

Choke for Clamp-Top	
0	None
C	Clamp-Top Style*

H

Conductor Connection	
MultiCore	
4	Standard keeper
6	Hot stick Keeper
Busbar	
2	Aluminum Bus Bar, 2 Hole Pads
3	Aluminum Bus Bar, 4 Hole Pads
Tube-Style	
0	1.185” I.D. SS Tube for current sensing only or clamp-top
1	1.185” I.D. SS Tube w/SS Bonding Clamp (required for voltage sensing)
Clamp-Top	
0	1.185” I.D. SS Tube

I

Connector	
Blank	Std. ITT Cannon Connector
C	Cast-in cable
G	20” Cable with Amphenol Connector & Strain Relief
A	Amphenol Connector
B	Bayonet Connector

J

Frequency	
Blank	60Hz
/50Hz	50 Hz

0	4	A	Blank

*Required for Clamp-top style
**Multicore only available with 600A:10V Current Signal
***46kV units are available in Substation or Tube type only

LINDSEY SYSTEMS

ElbowSense™ Underground Voltage Sensors

Lindsey Systems offers a wide range of voltage sensors contained in familiar IEEE Std. 386 underground componentry. These sensors are suitable for pad-mount, metal-clad, submersible and underground applications. All sensors contain precision resistive voltage dividers to deliver high accuracy (0.5%) voltage sensing with flat frequency response through the 20th harmonic. Sensors provide an AC voltage output proportional to phase-to-ground voltage.

Optional Metering Accuracy or Revenue Accuracy

All ElbowSense underground voltage sensors are also available with 0.3% metering or 0.15% revenue metering accuracy.

These higher accuracy sensors are ideal for metering or other applications that would benefit from higher accuracy, such as Volt/VAR Optimization (VVO).

Specifications			
Voltage Accuracy	0.5%, 0.3%, or 0.15%		
Ratio	By Catalog Number		
Operating Temperature Range	-45°/+80°C		
Stated Accuracy Temperature	-40°/+55°C		
Insulation Class	15kV	25kV	35kV
Impulse (BIL)	95	120	150
Max Line-Ground (kV)	8.3	15.2	21.1
Corona (kV extinction)	11	19	26
Weight (lbs./kg)			
Elbow Sensors	4/1.8	4/1.8	N/A
T-body Sensors	4/1.8	N/A	N/A
Plug Sensors	8/3.6	8/3.6	9/4.1

The Lindsey Underground Voltage Sensor Family Includes:

- 200A Load-break Elbow Sensors
- 200A Dead-break T-body Sensors
- 600/900A Plug voltage Sensors

Physical Configurations

200A Load-Break Elbow Sensors

Available at 15kV, 25kV, and 35kV, these sensors are ideal for applications where connection can be made via a spare bushing well or suitable T-body connector. The sensors may also be applied with a reducing insert on 600A cable systems.

200A Load-Break Elbow

200A Dead-Break T-body Sensors

Available for 15kV applications, these sensors are ideal for applications where spare bushing wells are not available and all cable circuits are already terminated with elbow connectors.

200A Dead-Break T-body

600/900A Plug Voltage Sensors

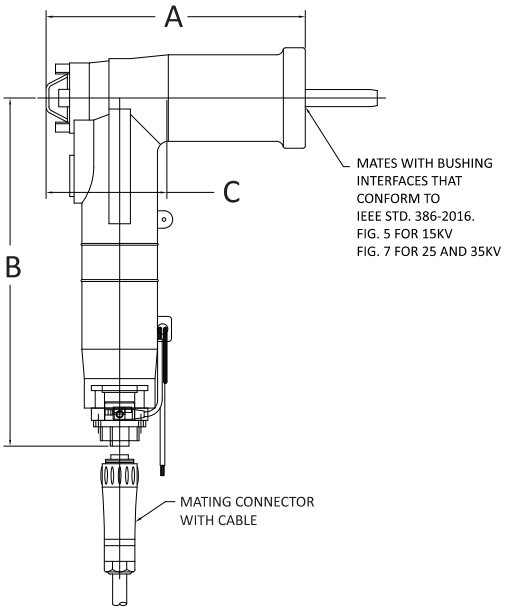
Available at 15kV, 25kV, and 35kV, these stainless steel sensors fit standard 600/900A T-body connectors.

600/900A Plug Voltage

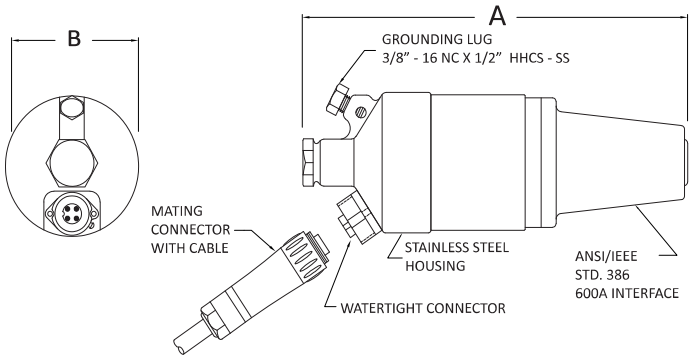
LINDSEY SYSTEMS

ElbowSense™ Voltage Sensor Dimensions

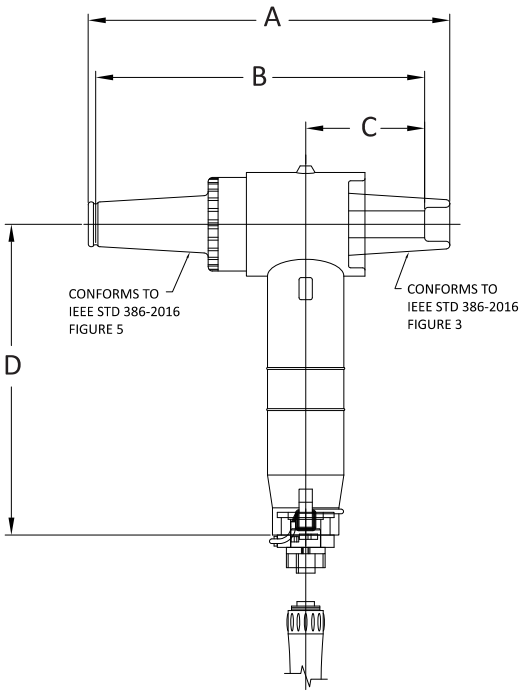
Load-Break Elbow Sensor



Plug-Style Sensor



T-body Dead-Break Sensor



ElbowSense™ Voltage Sensor Ordering

Part Number Sequence: A B C / 0 D E F

A

Family
95 ElbowSense 0.5% Accuracy
95M ElbowSense 0.3% Accuracy
95R ElbowSense 0.15% Accuracy

B

	Type
3	200A Elbow
4	200A T-body
5	600/900A Plug

C

	Voltage Class
	200A Elbow
2	15kV
3	25kV
4	35kV**
	200A T-body
2	15kV
	600/900A Plug
2	15kV
3	25kV
4	35kV**

D

	Ratio
1	1400:1
2	2200:1
3	3300:1
5	60:1*
6	120:1*
7	166:1*
X	Special (consult factory)

E

	Output Options
1	2 Contact socket for pad-mount, supplied with matching cable
2	Cast in cable for vault and submersible applications

F

Cable Length
F represents cable length in 10 ft. increments. Example: If F=1, the cable length will be 10 ft.

EXAMPLE						
95	4	2	/ 0	1	2	1

Example: 9542/0121 is a 15kV class, 200A dead-break, 0.5% accuracy, T-body sensor with a 1400:1 ratio output with a cast-in 10 foot cable.

***Note:** Only available with 0.5% metering accuracy option.

****Note:** Not available with 0.15% metering accuracy option.

Sensor Dimensions	A	B	C	D
	Inches (mm)			
Elbow Sensor, 15kV	7.0 (178)	10.0 (253)	3.5 (88)	-
Elbow Sensor, 25kV/35kV	7.7 (196)	10.0 (253)	3.9 (99)	-
T-body Sensor, 15kV	10.3 (263)	9.4 (239)	3.4 (86)	8.9 (226)
Plug Sensor, 15kV	9.4 (238)	3.3 (83)	-	-
Plug Sensor, 25kV	9.4 (238)	3.3 (83)	-	-
Plug Sensor, 35kV	10.6 (270)	3.5 (89)	-	-

LINDSEY SYSTEMS

Type LVS Live-Front Voltage Sensor

Type LVS sensors are compact voltage sensors for use in live-front, air-insulated, electrical equipment where space is limited. An adjustable mounting bracket is supplied for connection to live front cable terminations or other bus work. Custom brackets are available.

These sensors are ideal for OEM or retrofit applications where the sensor's form factor may make it more convenient and cost effective to install than other forms of voltage sensing. Type LVS sensors are also available in longer lengths and with increased creep than listed. Contact the factory for additional information.

Sensor Configuration

- Both 0.5% accuracy and optional 0.3% metering accuracy versions are available.
- Solid cycloaliphatic epoxy sensor body contains a cast-in cable connector on the sensor's neutral end for convenient signal cable routing.
- Pig-tail mating cable is supplied as standard with each sensor.
- Optional 3-to-1 junction cables are also available. See Lindsey's Sensor Cable catalog or consult the factory.

Specification Table		
Insulation Class	15kV	25kV
Voltage Accuracy	0.3% or 0.5%	
Ratio	By Catalog Number	
Operating Temperature Range	-40°C / +55°C	
Stated Accuracy Temperature	-40°C / +55°C	
Impulse (BIL)	95kV	125kV
60Hz Withstand (1 minute)	30kV	40kV
Minimum Electrical Load	1 M-Ohm	
Length (A)	10.375" (265mm)	13.500" (343mm)
Length (B)	14.375" (365mm)	17.500" (445mm)
Leakage Distance	8 3/26" (208 mm)	12.0" (305mm)
Weight	2.3 lbs. (1.1 kg)	3.0 lbs. (1.4 kg)

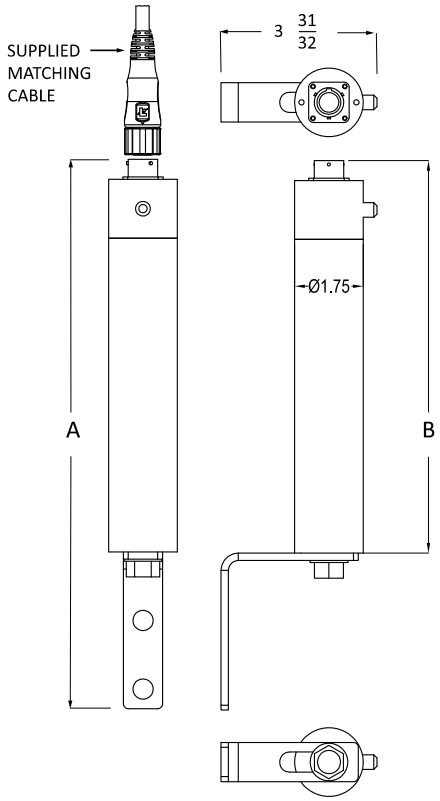
Type LVS Live-Front Switchgear Voltage Sensor Ordering Table

Part Number Sequence: A B / 0 C D E

A	B	/ 0	C	D	E
Family	**Voltage Class**		**Ratio**	**External Connection**	**Mating Pigtail Cable Length**
95L6- 0.5% accuracy	1-15kV		1-1400:1	1-Cast-in connector	X=Cable Length in 10 ft. increments
95LM6-0.3% accuracy	2-25kV		2-2200:1		**Note:** Set X to 0 if purchasing separate multi-phase junction cable.
			3-3300:1		
			4-10,000:1		
			5-60:1		
			6–120:1		
			7-166:1		
			8-200:1		
			X-Special		

EXAMPLE					
95L6	**1**	**/ 0**	**1**	**1**	**1**

EXAMPLE: 95L61/0111 is a 15kV, 0.5% accuracy live front switchgear voltage sensor with a 1400:1 ratio output with a cast-in connector and supplied with a matching 10-foot pigtail cable.



LINDSEY SYSTEMS

Type SVMI Voltage Sensors

Type SVMI voltage sensors are designed to be used in conjunction with overhead distribution reclosers or switches where high accuracy voltage sensing on one or both sides of the device is desired. CVR/VVO and other advanced smart grid applications where only voltage monitoring is required can also benefit from the use of these sensors.

Lindsey Systems type SMVI sensors are high accuracy (0.5%), zero-phase shift resistive voltage sensors contained in a compact insulator. Standard surge arrester mounting hardware may be used for convenient field installation of the SVMI. SVMI sensors are available up through 46kV.

SVMI sensors can also be custom ordered to withstand HiPot testing. Please contact the factory with the specific HiPot requirements.

Compact SVMI Sensors are ideal for:

- Retrofitting older reclosers without built-in voltage sensing or where only high-side voltage sensing is included.
- Replacing or upgrading low accuracy capacitive-style voltage sensors often built into reclosers.

Specifications & Dimensions				
Insulation Class	15kV	25kV	35kV	46kV
Voltage Accuracy	0.5%			
Ratio	By Catalog Number			
Operating Temperature Range	-45°/+80°C			
Stated Accuracy Temperature	-40°/+55°C			
Impulse (BIL)	110	150	200	250
Leakage Distance	27/686	27/686	37.3/947	37.3/947
Dry Arc Distance	13.6/345	13.6/345	17.3/439	17.3/439
Corona (kV extinction)	11	19	26	33
Height (in./mm) (A)	17.4/442	17.4/442	21.5/546	21.5/546
Diameter (in./mm) (B)	4/102	4/102	4.5/114	4.5/114
Weight (lbs./kg)	10/4.5	10/4.5	17/7.7	17/7.7
Construction	Polysil			

SVMI Ordering Table

Part Number Sequence: A B C D E

A

Family	
93	SVMI

B

Voltage Class	
1	15kV
2	25kV
3	35kV
4	46kV

C

Ratio	
1	1400:1
2	2200:1
3	3300:1
4	10,000:1
5	60:1
6	120:1
7	166:1
8	200:1
X	Special (consult factory)

D

External Connection	
Blank	Standard, 20” cast-in cable with 7-pin Amphenol connector
Cxx	Cast-in cable, xx represents cable length in feet with pigtail cable end
CxxB	Cast-in cable, xx represents cable length in feet with bayonet connector cable end
/Bayonet	Cast-in bayonet connector, cable ordered separately
/Cannon	Cast-in Cannon connector, cable ordered separately

E

Mounting Bracket	
Blank	Standard Mounting Bracket
/B	Heavy Duty Mounting Bracket*

EXAMPLE				
93	**1**	**2**	**Blank**	**/B**

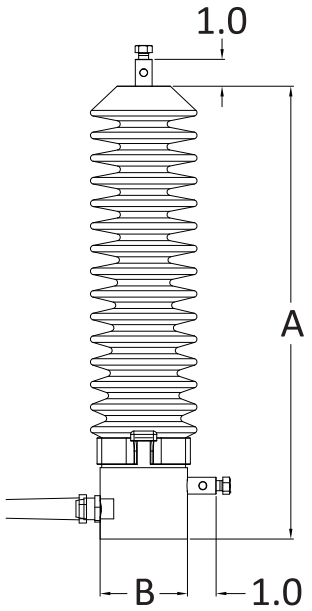
Order Example: The 9312/B is a 15kV class SVMI Sensor with 2200:1 output ration, 20” cast-in cable with Amphenol connector and heavy duty mounting bracket.

Note: All catalog numbers assume the SMVI sensors will be connected to controls, relays, etc., with a 1 MOhm input impedance. If the input impedance is not 1 MOhm, consult factory for correct part number.

*Heavy duty mounting bracket recommended for applications where the sensor will be mounted on another piece of equipment before truck transportation.

Figure 6: Dimension Drawing of SVMI Sensor.

For height and diameter, see table on page 22.



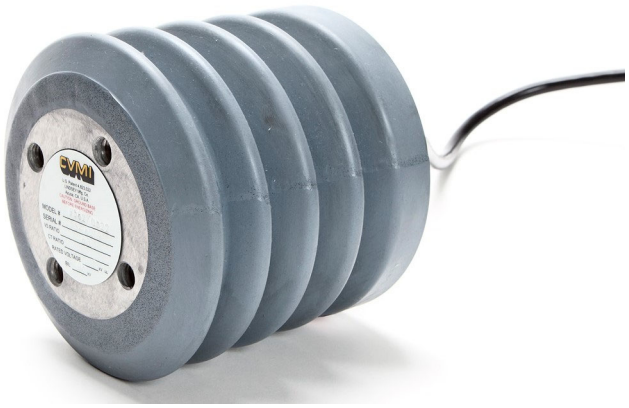
LINDSEY SYSTEMS

LINDSEY SYSTEMS

VMI Voltage Sensing Standoff Insulators

Type VMI voltage sensors are high accuracy (0.5%) voltage sensors contained within industry standard 3-inch bolt-circle post-type apparatus insulators. VMI sensors are ideal for use in air-insulated, pad-mount equipment which require the use of insulators to isolate internal buswork from a cabinet at ground potential. In this application, VMI sensors provide voltage sensing of the supported buswork without the need for additional insulators.

VMI sensors can be custom ordered to withstand the extended application of high voltages as is typical when HiPot testing of the completed switchgear is required. Please contact the factory with specific HiPot requirements.



Specifications								
Voltage Accuracy	0.5%							
Ratio	By Catalog Number							
Operating Temperature Range	-45°/+80°C							
Stated Accuracy Temperature	-40°/+55°C							
Insulation Class	15kV				25kV		35kV	46kV
Impulse (BIL)	95	95	110	110	150	150	200	250
Root Part Number	9562	9563	9564	9565	9566	9567	9568	9569
Height (in./mm) (A)	6.0/152	7.5/190	10.0/254	12.0/305	14.0/356	15.0/381	18.0/457	22.0/559
Leakage Distance	10.8/274	12.3/312	17.2/437	20.2/513	25.0/635	29.3/744	37.7/958	42.0/1067
Dry Arc Distance (in./mm)	6.0/152	7.5/190	10.0/254	12.0/305	14.0/356	15.0/381	18.0/457	22.0/559
Corona (kV extinction)	11	11	11	11	19	19	26	33
Cantilever strength (lbs./kg)	1200/544	2000/907	2000/907	2000/907	2000/907	2000/907	2000/907	2800/1270
Weight (lbs./kg)	12/5.4	14/6.3	21/9.5	25/11.3	29/13.1	31/14.1	37/16.8	52/23.6
Diameter (in./mm) (B)	6.25/159							
Construction	Polysil							

VMI Voltage Sensing Standoff Insulators Ordering

Part Number Sequence: A B / 0 C D X

A

Family	
956	VMI

B

Voltage Class & Leakage (in./mm)	
2	15kV (10.8/274)
3	15kV (12.3/312)
4	25kV (17.2/437)
5	25kV (20.2/513)
6	35kV (25.0/635)
7	35kV (29.3/744)
8	46kV (18.0/457)
9	46kV (22.0/559)

C

Ratio	
1	1400:1
2	2200:1
3	3300:1
4	10,000:1
5	60:1
6	120:1
7	166:1
8	200:1
X	Special (consult factory)

D

External Connection*	
1	Bottom mounted 4-pin Cannon connector (comes with matching cable as selected by X)
2	Cast-in pigtail cable exiting the center of the bottom of the sensor

X

Cable Length	
X	Cast in cable where X represents cable length in 10 ft. increments. Example: If X=1, the cable length will be 10 ft.

EXAMPLE					
956	3	/	0	1	2	2

Order Example: 9563/0122 is a 7.5" (190mm) tall, TR202 equivalent, 95kV BIL sensor with a 1400:1 voltage ratio and a 20 ft cast-in pigtail cable.

* Note: VMI sensors are also available with bottom-exit or side-exit cast-in connectors and / or with cast-in connectorized cables. Contact the factory for ordering details.

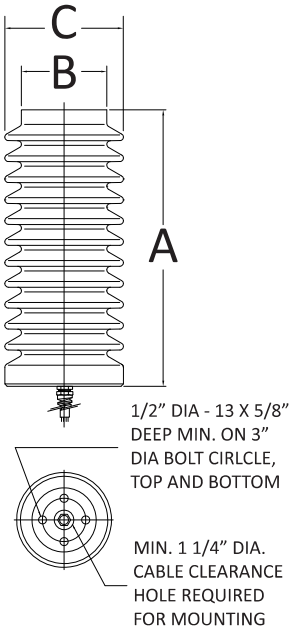


Figure 7: Dimension Drawing of VMI Sensor.
For dimensions, see table on page 24.

TR-Style Insulator Cross Reference	
Voltage Class Code (See Ordering Option "B" Above)	**TR2xx Equivalent Post-Type Insulator**
3	TR202
4	TR205
6	TR208
8	TR210
9	TR214

Most VMI sensors correspond to the dimensional requirements of standard "TR-" number post-type apparatus insulators per ANSI C29-9. VMI sensors do not correspond to the mechanical characteristics. Check your application before use to ensure mechanical requirements are met.

LINDSEY SYSTEMS

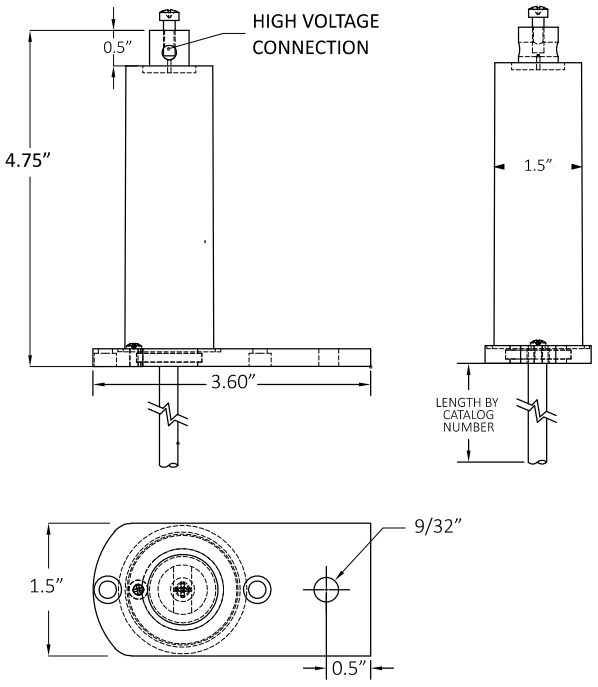
High Accuracy Low-Voltage, Voltage Sensor

Type 9561 sensors are voltage sensors for use in low voltage (up to 1000 V) switchgear where high accuracy voltage sensing and monitoring applications are required. Beneficial for use in environments such as data centers or areas where space is limited, and integral voltage sensing is essential.

Type 9561 sensors are ideal for OEM or retrofit applications where the sensor's form factor may make it more convenient and cost effective to install than other forms of voltage sensing.

Sensor Construction and Output

- Solid cycloaliphatic epoxy body sensor with integral cast-in pigtail cable on the sensor's neutral end.
- Primary high-side connection via copper terminal stud with integral screw.
- Sensor mounting plate located on the sensor's neutral end serves as the ground connection point.
- Very high accuracy internal resistor voltage divider network intended to interface with high input impedance (≥ 1 MΩ) meters, relays, controls, RTUs, or other IEDs.



Low Voltage, Voltage Sensor Ordering Table

Part Number Sequence: A / 0 B C D

A	/ 0	B	C	D
Family		**Ratio**	**External Connection**	**Pigtail Cable Length**
9561– 1% accuracy		5 - 60:1	2 - Cast-in pigtail cable	X=Cable Length in 10 ft. increments
9561M-0.5% accuracy		6 - 120:1		
		7 - 166:1		
		8 - 200:1		
		X - Special		
EXAMPLE				
9561	**/ 0**	**5**	**2**	**1**

EXAMPLE: 9561/0521 is a low voltage, 1% accuracy voltage sensor with a 60:1 ratio output with a cast-in 10-foot pigtail cable.

Specification Table	
Insulation Class	1000 V
Voltage Accuracy	0.5% or 1%
Ratio	By Catalog Number
Operating Temperature Range	-40°C / +55°C
Stated Accuracy Temperature	-40°C / +55°C
60Hz Withstand (1 minute)	2000 Volts
Minimum Electrical Load	1 M-Ohm
Length	4 3/4" (120mm)
Weight (without cable)	0.5 lb. (0.2 kg)

LINDSEY SYSTEMS

Type UOV Under Oil Voltage Sensor

Type UOV sensors are voltage sensors with either 0.5% or 0.3% accuracy for use in medium voltage, oil-filled electrical equipment which includes overhead, pad-mount, and submersible transformers, circuit breakers, and switchgear where integral voltage sensing is required.

UOV sensors are ideal for OEM or retrofit applications where the sensor's form factor may make it more convenient and cost effective to install than other forms of voltage sensing.

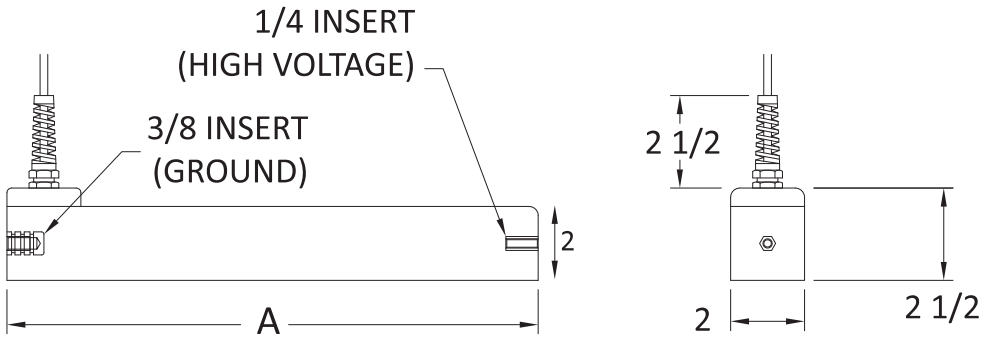
Embedded stainless steel stud connectors provide for direct bus work connections and allow the sensor to be used as a standoff.

Operation Requirements

During operation, this type of sensor is required to be immersed in insulating fluids to achieve their electrical ratings. The solid epoxy body sensor with integral cast-in cable is fully compatible with the following insulating fluids:

- FR3® – natural ester based dielectric fluid
- Envirotemp® 200 – synthetic ester based dielectric fluid
- HyVolt® II – petroleum/mineral based oil dielectric fluid

Note: Please contact the factory for compatibility confirmation when considering dielectric fluids other than those listed above.



Type UOV Under Oil Voltage Sensor Ordering Table

Part Number Sequence: A B / 0 C 2 D

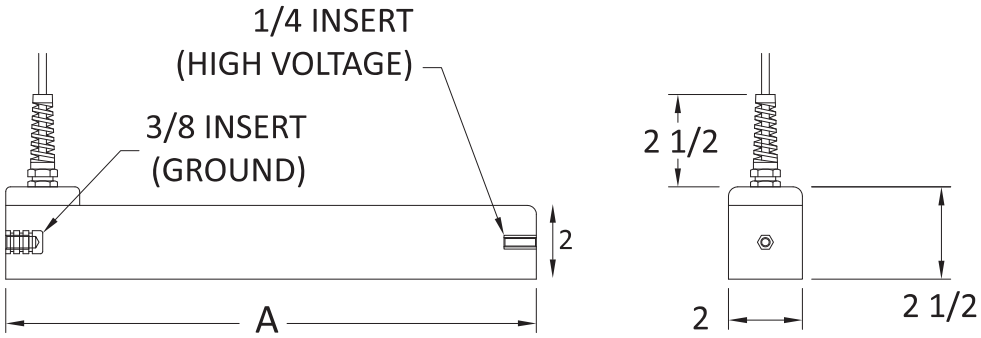
A	B	/ 0	C	2	D
Family	**Voltage Class**		**Ratio**		**Cast-in Pigtail Cable Length**
958 - 0.5% accuracy	2-15kV		1-1400:1		X= cable length in 10 ft. increments
95M8 - 0.3% accuracy	3-25kV		2-2200:1		
	4-35kV		3-3300:1		
			4-10,00:1		
			X– Special		
EXAMPLE					
958	**2**	**/ 0**	**1**	**2**	**1**

EXAMPLE: 9582/0121 is a 15kV, 0.5% accuracy under-oil voltage sensor with a 1400:1 ratio output with a cast-in 10-foot pigtail cable.

Specification Table			
Insulation Class	15kV	25kV	35kV
Voltage Accuracy	0.3% or 0.5%		
Ratio	By Catalog Number		
Operating Temperature Range*	-40°C / 60°C (with excursions ≤ 80°C)		
Stated Accuracy Temperature*+	-40°C / 60°C (with excursions ≤ 80°C)		
Operating Environment	Immersed in one of the listed compatible insulating fluids		
Compatible Insulating Fluids	FR3, Envirotemp 200, HyVolt II		
Impulse (BIL)	95kV	125kV	125kV
60Hz Withstand (1 minute)	30kV	60kV	60kV
Minimum Electrical Load	1 M-Ohm		
Length (A)	10.375" (265mm)	14.375" (365mm)	14.375" (365mm)
Weight	4 lbs. (1.8 kg)	6 lbs. (2.7 kg)	6 lbs. (2.7 kg)
*Stated range is for the sensor. Insulating fluids may have lower ranges.			
+Accuracy from +55 to +80C may approach 1%.			

SF6 Voltage Sensors

Lindsey Systems' SF6 Voltage sensor provides high accuracy (0.5%) voltage sensing in a package designed for use in SF6-insulated environments. The embedded stud connectors are designed for direct buswork connections and allow the sensor to be used as a standoff. All SF6 Voltage sensors come standard with a 15' (4.6m) cast-in pigtail end cable.



Specification and Ordering		
Part No.	R-22466	R-18889
Voltage Class	15kV	25kV
BIL	95kV	125kV
60 Hz Withstand (1 min.)	30kV	60kV
Output Ratio	1400:1	1400:1
Minimum Load	1 MOhm	1 MOhm
Length (A)	10 3/8" (265mm)	14 3/8" (365 mm)
Weight	4 lbs. (1.8 kg)	6 lbs. (2.7 kg)

ElbowSense™ Current Sensors

Lindsey Systems offers a variety of current sensors for use in underground, pad-mount, and specific overhead applications. All current sensors are rated 600V and are intended to be used with either insulated medium voltage conductors, or low voltage neutral conductors.

ElbowSense Ring-Style Current Sensor

This air-core CT based sensor is watertight and suitable for use in pad-mount, metal-clad, and submersible vault applications. It offers high accuracy (to 0.3%), no phase shift, and flat harmonic response through the 20th harmonic. Pigtail cable is included per ordered part number.

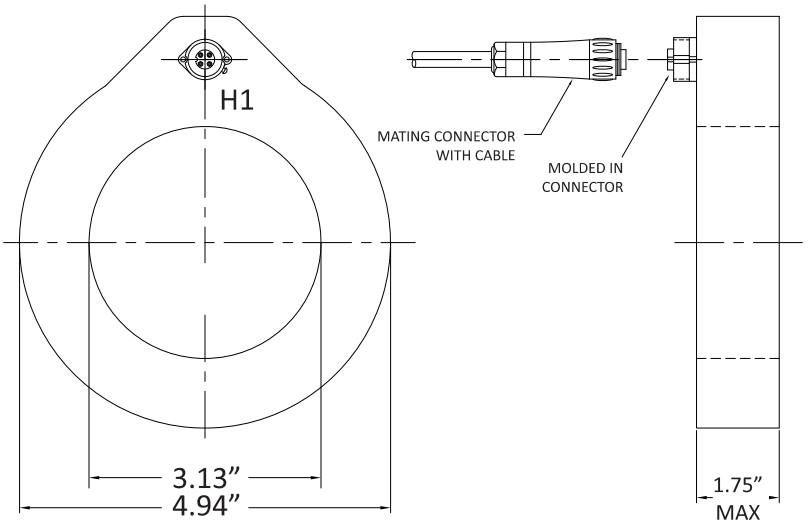
ElbowSense Split-Core Current Sensor

This sensor incorporates the same current sensor as used in Lindsey Systems' MultiCore style overhead line sensors (see page 4 for a description). The split-core design provides installation flexibility by eliminating the need to slip the sensor over a cable's separable connector. It is suitable for use in pad-mount and metal-clad applications. The split-core sensor offers 1% current accuracy and no phase shift at fundamental frequency. It is not recommended for harmonic measurement applications.

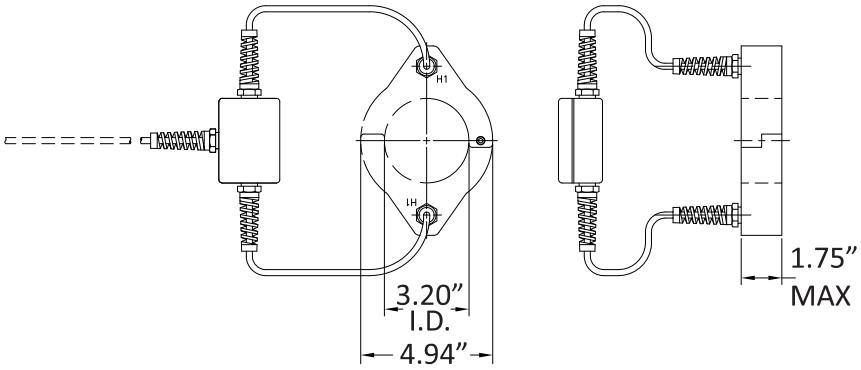
Neutral Current Sensor

The Lindsey Systems' neutral current sensor is commonly used to sense neutral-to-ground current in small capacitor banks, including both pole-mounted and pad-mount. The voltage-output sensor has a top which can be opened for easy installation around conductors up to 1.25" (30mm) in diameter. The sensor has 1% accuracy and comes standard with a 35 ft (10.5m) cast-in cable with pig-tail leads. Connectorized versions are also available. The sensor is rated IP68.

Ring Style Current Sensor



Split-Core Style Current Sensor



Neutral Current Sensor

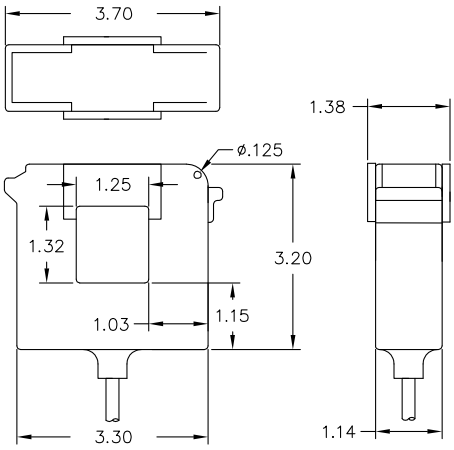


Figure A

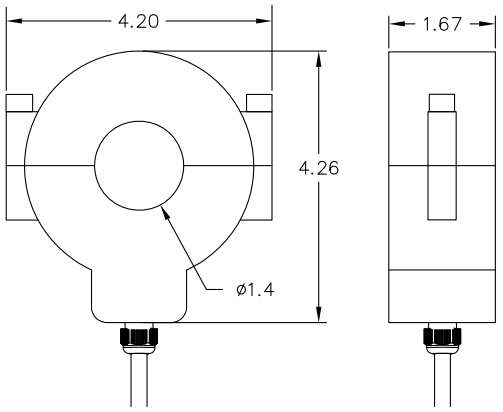


Figure B

ElbowSense™ Current Sensor Ordering

Part Number Sequence: A B 0 / C 0 D E

A — Family

95 ElbowSense
95M ElbowSense 0.3% Metering Accuracy* ***(Requires 600A:1A option)***

B — Sensor Type

1	Ring-Style
2	Split-Core Style

C — Current Output Signal

Ring-Style Options	
1	600A:10V
3	600A:5A
4	600A:1A ***(Available with 0.3% and 0.5%)***
5	300A:5A
Split-Core Options	
1	600A:10V

D — Connector

1	Cast-in connector. Matching cable of length "E" included.
2	Cast-in cable. Required for split-core sensor.

E — Cable Length

1	10 ft. (3m)
2	20 ft. (6m)

EXAMPLE

95	2	0 /	1	0	2	1

Example: 9520/1021 is a split-core style current sensor, 600A:10V ratio, with 10ft. (3m) cast in cable.

Note: For other options, contact the Factory.

*The standard 600:1A ratio "95" ring sensor provides protection class accuracy from 0.10 - 20x the primary current (600A). Saturation at >20x. The "95M" version of the 600:1A ring current sensor provides metering class accuracy from 0.05 - 5x the primary current (600A). Saturation at < 5x.

ElbowSense Current Sensor Specifications

Sensor Style	**Ring-Type**				**Split-Core**
Ratio	600A:5A	600A:1A	300A:5A	600A:10V	600A:10V
Burden	0.9 Ohms, MAX	22.5 Ohms, MAX	0.22 Ohms, MAX	10kOhm, MIN	1 Mohm, MIN
Max. Open Circuit Voltage @600A	14.5V	88V	8V	10V	10V
Accuracy	1%	0.3%	2%	1%	1%
Phase Shift	0 degrees nominal, +/- 0.5°				
Operating Temperature Range	-45°C / +80°C				
Stated Accuracy Temperature	-40°C / +55°C				

Neutral Current Sensor Ordering Table

A	B	/	X
Family	**Connector**		**Cable Length**
9525	Blank - Pigtail		Blank– 35 ft. (10.7m)
	C (4-pin male, plastic)		X (ft.) multiples of 5 ft. maximum 35 ft.
	S (7-pin female, plastic)		
	FE (4-pin female, metal bayonet)		

Neutral Current Sensor Specifications

Part No.	9525	9525-12	9525-21
Accuracy	1%	1%	2%
Output Ratio	100A:10V	300A:5V	100A:25V
Figure Reference	A	B	B
Insulation Voltage Class	600 VAC		
Minimum Load	200 kOhm		

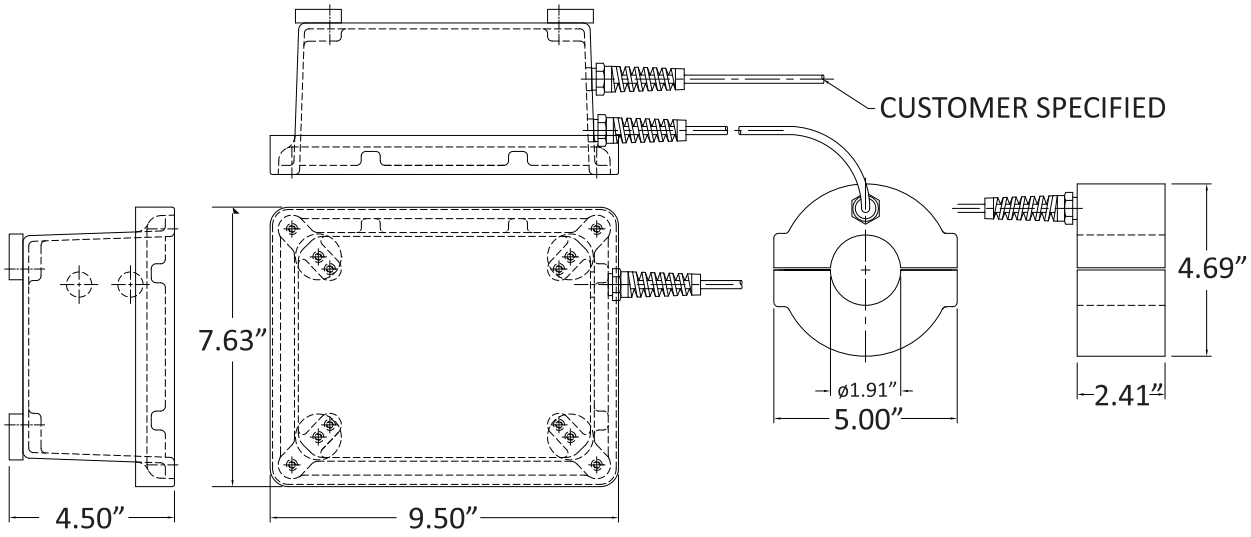
LINDSEY SYSTEMS

Underground Power Supply

Lindsey Systems' Underground Power supply is ideal for use when automating legacy pad-mount or underground switchgear without auxiliary power availability. Lindsey's patented underground power supply installs quickly and easily to provide a self-contained source of 12 VDC power for meters, radios, and controls. Continuous power back-up is provided via an integral LiFePO4 battery.

Method of Operation

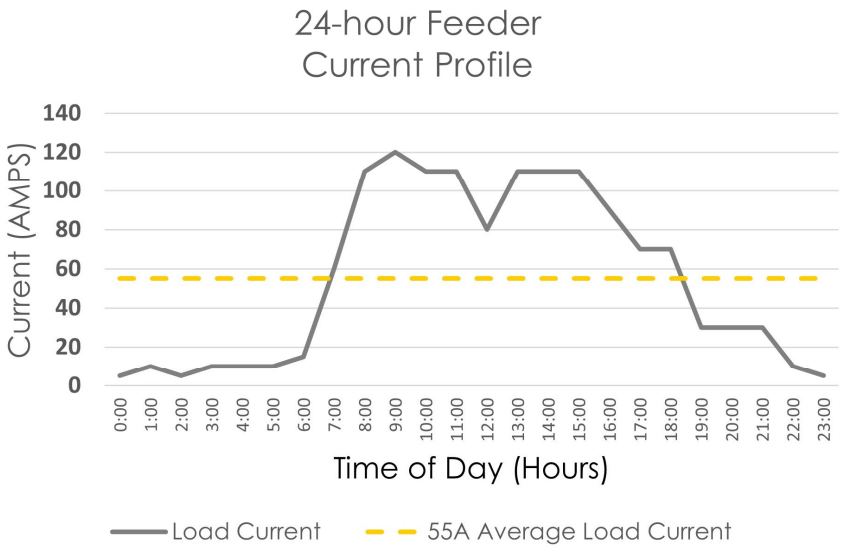
The 600V class CT harvests power from any non-magnetically shielded phase of a 200A/600A underground cable system. If the amount of power required by the connected control/ communication equipment exceeds the power produced by the harvesting circuit, the balance is drawn from the battery. If more power is produced by the harvesting circuit than needed, the excess is used to charge the battery. Additional CTs are available to lower the minimum current required. Consult factory for more information.



Use the following formula* to determine the minimum average daily load current (I_{AVE}) required to flow through the cable to which the harvesting CT is connected. This is the amount of line current which will produce sufficient power to supply the connected control/ communications equipment.

$I_{AVE} = (I_{DC} \times 63) + 11$ Amps

Note that a minimum of 11A is required for charging of the battery to occur.



Example:

You are connecting communications and control equipment that draws a total of 700mA at 12VDC. Your feeder must have an average daily current of 55A.

An example daily load profile can be seen below.

$I_{AVE} = (0.7 \times 63) + 11 = 55A$

*Underground power supplies with serial numbers below 1100 follow the formula $I_{AVE} = (I_{DC} \times 66) + 27$

Specifications and Ordering	
Catalog No.	9251
DC Output Voltage	12.8VDC nominal, 14.6VDC max
DC Output Current	4.0A max
Battery	12.8VDC, 4.5 or 9.0 Amp-hour
Operating Temp.	-20C to 60C (-4F to 140F)
Power Supply/CT Weight	6.8 or 7.3vkg (15 or 17 lbs.)
Mount	Magnetic (Clip mount optional)

About Lindsey Systems

Lindsey Systems is recognized globally as an innovator in the electric power industry. As a supplier of systems, products, and product solutions for the transmission and distribution of electricity, Lindsey enables utilities to meet the challenges of the modern-day electrical grid.

With over 75 years of experience and a reputation as a thought leader in the industry, Lindsey Systems' products are known around the world for reliability and performance.

Lindsey is ISO-9001, ISO-14001, ISO-27001, and CSA W47.2 Certified.

For more information, visit www.Lindsey-USA.com.

Thoughtful Solutions in Medium Voltage Sensors

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Specifications subject to change without notice.

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