GRIDSENSE™

Line IQ

FAQs

GRIDSENSE™

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FAQ 1. What is the difference between LineIQ-60 and the LT40 and LT50?

An LT40 is the basic model Sensor and can be used on conductors rated at up to 68 kV. It functions as a fault indicator and a load logger, and monitors load and fault currents as well as power status. Optionally, the LT40 can also measure and log Displacement Power Factor (DPF). The LT40 communicates locally on a 900MHz frequency.

An LT50 is an enhanced LT40 that also monitors and logs ambient and conductor temperatures. Like an LT40, it can also be optionally configured to measure and log DPF. LT50s can be used on conductors rated up to 132 kV. The LT50 also communicates locally on a 900MHz frequency.

In addition to physical upgrades that both ruggedize the device and simplify line placement, LineIQ monitors all parameters monitored by the LT50 on lines up to 138kV. It also includes fault direction capability, and communicates locally via 2.4GHz frequency, which minimizes power consumption.

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FAQ 2. Do I need a license for the radio system used for communications between LineIQ Sensor units and the Communications Gateway?

No. The LineIQ radio system uses a low power half duplex radio in the unlicensed 2.4 GHz band. GridSense sets the frequency and output powers in accordance with the requirements of the country of sale. A user license is not required.

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FAQ 3. Can a LineIQ-60 Sensor unit be used as a standalone fault indicator?

Yes. A LineIQ Sensor can be used as a stand alone fault indicator and provides visible indication of fault conditions via high visibility red and amber light emitting diodes (LEDs).

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FAQ 4. How many LineIQ Sensors can be associated with one Communications Gateway?

Up to twelve (12) LineIQ Sensors can be associated with each Gateway, but all units must be within 45m (150ft.) of the Gateway.

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FAQ 5. Can more than one Communications Gateway be used at a single location?

Yes. More than one Gateway can be used at a single location. This allows more than 9 LineIQ Sensors to be monitored at a single location.

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FAQ 6. Why must a LineIQ Sensor be within 45m (150ft) of an associated Gateway?

The license-free radio system used for communication between LineIQ Sensors and a Communications Gateway operates with limited power and hence has limited range.

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FAQ 7. How does a LineIQ Sensor know which Communications Gateway it is associated with?

In order to associate a LineIQ Sensor with a Gateway, the Sensor configuration must include the Parent Gateway serial number.

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FAQ 8. How does a Communications Gateway know which LineIQ Sensors are associated with it?

The Gateway configuration allows up to nine (9) “child” Sensors to be associated with it.

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FAQ 9. How are conflicts avoided with the RF communications system?

The LineIQ RF communication system operates at a single frequency. Each device uses the last 5 digits of the serial number as a radio ID. This allows two devices, such as a Local Link and a LineIQ Sensor or a LineIQ Sensor and a Communications Gateway to have an individual conversation.

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FAQ 10. How many modems can be installed in a Communications Gateway?

Two modems can be installed in a Gateway. The power to each modem can be independently controlled.

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FAQ 11. How does a LineIQ Sensor measure line current?

Line current is measured using a Rogowski coil which is clamped around the conductor when the Sensor is installed. A Rogowski coil is used rather than an iron-cored CT for the following reasons:

- A Rogowski coil contains no iron, and is therefore lighter than a conventional iron cored CT.
- A Rogowski coil does not saturate.

The Rogowski coil output is integrated and then amplified using a gain controlled amplifier, allowing a LineIQ Sensor to measure currents over a wide dynamic range. Load currents as lows as 1 A can be measured, as well as fault currents of up to 25 kA.

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FAQ 12. How does a LineIQ Sensor determine if line power is present?

The basic Sensor measurements of line voltage and line current are used to determine power status, which can be either ON or OFF.

Power is considered to be ON when either voltage, current or both voltage and current are present.

A normal energized line will have both voltage and current present, while an energized, open circuited line will only have voltage present. If a LineIQ Sensor is located close to but upstream

from ground fault, then the line will have current but not voltage present. In all these case, power is considered to be ON.

Power is considered to be OFF if both voltage AND current are absent.

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FAQ 13. How are events triggered?

LineIQ events are triggered by both voltage and current.

When an event trigger is detected, a 1 minute arming period is started.

A Power Return (PR) event occurs when either voltage OR current are present on the line.

A Long Interruption (LI) event occurs when both voltage AND current are absent for more than the length of the arming period, typically 1 minute.

A Short Interruption (SI) event occurs when both voltage AND current are absent for less than the length of the arming period, typically 1 minute.

A Fault Path (FP) event occurs when a high current is detected. This can occur in one of 2 ways:

- If the line current exceeds200% of the pre-fault current (i.e. more than doubles) AND there is a 25% change (positive or negative) in the line voltage
- If the line current exceeds 500% of the pre-fault current (i.e. it increases by more than a factor of 5) irrespective of any change in the line voltage.

The 1 minute arming period is extended if another Fault Path (FP) event is detected during the arming period.

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FAQ 14. How are events classified?

LineIQ classifies events into four basic categories:

A Power Return (PR) occurs when an un-energized line is energized.

A Long Interruption (LI) occurs when power is OFF for at least 60 seconds.

A Short Interruption (SI) occurs when power is OFF for less than 60 seconds.

A Fault Path (FP) event occurs when a high current is detected.

A Long Interruption (LI) event is normally followed by a Power Return (PR) event.

Both LI and SI events can be accompanied by a FP event.

An FP event can also occur without an LI or SI event. This indicates a transient or self clearing fault.

As an example consider a three phase feeder monitored by 3 LineIQ Sensors installed downstream from a recloser:

FP would be indicated on phases A & B if a transient fault caused a brief current surge between phases A & B. Typically this would be caused by a bird or animal bridging the phases. There would be no indication on phase C.

LI followed some time later by PR would be indicated on phases A, B & C if the feeder was disconnected by the upstream protection because of an upstream fault between the recloser and the Sensor.

SI on phases A & B and SIFP on phase C indicates a phase to ground/earth fault on phase C which has been cleared by an upstream recloser.

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FAQ 15. Do LineIQ Sensors respond to inrush currents?

Inrush current occurs when an un-energized line is re-energized.

LineIQ Sensors include sophisticated algorithms which detect inrush currents (typically characterized by 2nd harmonic distortion) and do not generate event triggers.

Inrush currents generated by recloser operations are recorded during the 1 minute sampling period which occurs after an event is detected.

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FAQ 16. How does a LineIQ Sensor generate an event profile?

When an event is triggered, the Sensor first records the pre-event current. This is obtained from the current fast filter. The power status (ON or OFF) is also recorded..

The time of the event trigger is then recorded, and the arming period (normally 1 minute) is then started.

The maximum current immediately following the event trigger is then recorded. This is typically the fault current, and becomes the reference current.

The current and power status are then monitored continuously.

When the current differs from the reference level by more than 50% (i.e. reduces to less than 0.5 times the reference current or increases to more than 1.5 times the reference current) the current, power status and time are recorded.

The measured current at this time then becomes the new reference current.

This process continues until the end of the arming period.

At the end of the arming period, the time stamped line current and power status are again recorded.

This data can then be used to provide a good approximation to the current profile.

The power status (ON or OFF) is also recorded during the arming period.

After the event data is downloaded from the Sensor, LineView software can be used to display the event profile in either tabular or graphical form.