GRIDSENSE™

Transformer IQ

FAQs

GRIDSENSE™

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FAQ 1. What size transformer will TransformerIQ monitor?

TransformerIQ will monitor any size transformer—from the largest available down to residential distribution kiosk transformers.

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FAQ 2. Are there different TransformerIQ versions?

There are different TransformerIQ versions for different applications; however, all use the same processor, firmware and programming. Following are the models and their applications:

- Distribution (P-version) – Small, single transformer or switch.
- Vault (V-version) – Multiple transformer or indoor vault.
- Small Power (D-version) – Transformers with up to 3 discrete inputs, relays for fan control only and no local display.
- Substation (S-version) - Outdoor installation on a power transformer; any transformer with a load tap changer or more than 3 discrete inputs or 2 discrete outputs required.

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FAQ 3. How are the units powered?

There are three different power options:

1. Line powering off the A-phase
2. Powering off a wall plug adapter
3. Parasitically powering the device off a cable that is fully insulated and carries at least 10amps of continuous line current.

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FAQ 4. What is measurable or monitorable on a small distribution transformer?

Transformer monitoring is usually associated with asset monitoring, which includes top oil and winding hot spot temperature for insulation loss-of-life calculation. However there are many other utility systems the functionality of which will benefit from data collected at the distribution point. For that reason, TransformerIQ also provides operational data such as real-time kVA rating based on the winding hot spot and ambient temperature, three-phase current, voltage,

and power factor. TransformerIQ also reports fault current phase and magnitude, and monitors and provides alarms at voltage sag/swells and excessive load currents.

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FAQ 5. How does TransformerIQ mount to a poletop transformer (single phase)?

The TransformerIQ unit measures 7 inches long by 5 inches wide and 4 inches deep and attaches to the bottom of the poletop transformer via two heavy-duty 50 lb. magnets.

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FAQ 6. How does TransformerIQ mount to a padmount transformer (single and three-phase)?

The TransformerIQ unit attaches magnetically inside the padmount compartment. Rogowski coils or current transformers are used to sense current and voltages up to 374VAC (600VAC line-line) that are also used to power the device.

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FAQ 7. What additional monitoring is available for large transformers?

TransformerIQ provides fully comprehensive monitoring with advanced algorithms for dissolved gas, on-load tap changer, core ground, and bushing monitoring.

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FAQ 8. Can the TransformerIQ be used to monitor more than one transformer?

TransformerIQ can monitor 12 phases or windings plus their neutrals on up to six transformer tanks.

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FAQ 9. Are there functions that cannot be monitored on more than one transformer?

The analog inputs cannot monitor more than one transformer. Examples of these are gas ppm monitoring from gas sensors and LTC position sensing and LTC motor current monitoring.

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FAQ 10. What types of communications are available with TransformerIQ?

TransformerIQ and other GridSense products are designed to accommodate a multiple of radio and cellular technologies or direct Ethernet or serial connection. TransformerIQ also supports unsolicited or polled DNP3, unsolicited CSV records, polled MODBUS, as well as proprietary protocols for larger custom applications.

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FAQ 11. With what software is the data collected?

GridSense provides back office and local versions of user interface and programming software called Grid InSite™. This software can be used for all data retrieval and display, set point programming and remote firmware upgrades. It is interfaced with a global mapping utility for instant viewing of all units filtered by load, temperature or fault status.

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FAQ 12. How often can readings be taken?

If TransformerIQ units are configured to be polled over a continuously maintained connection, there is no limit to how fast the data can be retrieved. Data values are updated every 1 second or faster. As for pitched, or unsolicited applications, the pitching rate can be done as fast as 1 minute intervals. Generally, users configure synchronous, regular messages to transmit every 15 minutes.

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FAQ 13. What measured information is available?

Both Rogowski coils and current transformers have an accuracy of more than 1% of full scale of sensor amps at 0.333VAC RMS. Metering accuracy, equal or better than 0.5% is available with some applications.

a. Voltage (L-N) is reported on three phases; ±0.5% accuracy attainable, 0.1V precision
b. Current is reported on three lines; ±0.5% accuracy attainable, 1.0A precision
c. Accumulated Energy is reported for all three windings; real kW*Hr & reactive kVAR*hr
d. Power Factor is reported with ±0.01pu accuracy and precision
e. Harmonics are reported through the 30th harmonic for current and voltage
f. Temperatures are reported on up to three top oils, bottom oil, ambient and case; ±1°C accuracy, ±0.01°C precision

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FAQ 14. How is temperature measured?

Temperature is sensed magnetically off the surface of the tank for top and bottom oil; an external ambient temperature sensor points directly off the face of the device

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FAQ 15. How is line current measured?

TransformerIQ is the only transformer monitor that can accommodate either Rogowski coils (air core dI/dt sensors) or iron core current transducers (CTs) with a shunt resistor and a maximum output of 0.333VAC RMS. In a vault or distribution application, Rogowski coils are valued for their low cost and quick installation. In a substation application, the bushing-mounted CTs typically have an output of 10 amps AC maximum. A clip-on current transformer can be placed on the output of these CTs to provide TransformerIQ a signal.

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FAQ 16. How is line voltage measured?

TransformerIQ can measure three phase line voltages up to 480VAC +10%. If you need to measure higher voltages, a potential transformer with an output of 120 or 240VAC can be used. The required voltage isolation module (part name T-VOLTAGE) provides optical isolation with 2-second withstand of 4000VAC RMS, complying with IEC 61010 Category IV-300V(L-N) safety rating.

The connection to the phase voltages can be either temporary with large, jumper-cable style clamps or permanent distribution connectors can be used to clamp the connection to LV busbars. If dead-front elbow connections for insulated cable are used, voltage sensors are available which plug permanently into the elbow test connection.

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FAQ 17. Can you monitor both grounded wye and delta secondary voltages?

The three voltage inputs are completely independent, but must be referenced to a neutral voltage. All voltages are reported with respect to the neutral. If measuring a delta voltage with no neutral voltage present, the neutral voltage can be connected to one of the phases, but the phase-phase leg not connected to that corner of the delta will not be reported.

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FAQ 18. What secondary voltage and current levels can you monitor?

Line-to-neutral voltages up to 347VAC +10% maximum over-excitation, 60Hz and 290VAC +10% over-excitation at 50Hz can be accommodated. The maximum current measurable is determined by the current transformers or Rogowski coils (dI/dt sensors) used. Currents exceeding 10kA are easily measurable.

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FAQ 19. How is power factor measured?

True power factor is measured based on the zero-crossings of the voltage and current wave forms on every winding.

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FAQ 20. How is temperature measured?

Platinum, 100 ohm Resistive Temperature Devices (RTDs) are used for all temperature measurements. The encapsulated version accommodates 2-wire RTDs where the other versions also accept a 3 or 4-wire RTD. The third and fourth wires are purely for lead compensation and applicable only for lead lengths approximately 100 feet or more.

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FAQ 21. How is winding temperature obtained?

Winding temperature can only be directly measured using fiber optic probes wound into the transformer windings during manufacturing. The winding temperature is otherwise calculated based on adding some amount of heat to the top oil measurement. This added value—the winding gradient—is calculated from ANSI or IEC standard models and can be refined with manufacturer's test report data.

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FAQ 22. How are AC or DC discrete (control) inputs sensed?

The discrete inputs are independent and optically isolated. This allows for sensing a 240VAC signal on one input and a 12VDC signal on an adjacent input. Voltage sensing allows for direct sensing of control voltages without the need for isolation relaying.

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FAQ 23. How is fault current sensed and what information is provided?

Fault currents in excess of 5kA can be captured and measured using air-core Rogowski coils. These coils will not saturate and higher currents will be captured, but their magnitudes will be clipped. If fault currents of higher magnitudes are desired, smaller signal output (higher current) coils can easily be used, but it is important to realize that load current resolution is lost with the higher current Rogowski coils. The fault current is captured reliably on any or all phases if the duration is at least three cycles in length. If the fault current has a duration of up to ½-cycle, the fault magnitude may not be recorded, but the fault will be captured.

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FAQ 24. How are AC or DC discrete (control) inputs sensed?

The discrete inputs are independent and optically isolated. This allows for sensing a 240VAC signal on one input and a 12VDC signal on an adjacent input. Voltage sensing allows for direct sensing of control voltages without the need for isolation relaying.

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