EXERTHERM by EATON

Webinar Q&As

CONTINUOUS THERMAL MONITORING WEBINAR

Maximize Resilience In Mission Critical Assets:

How Predictive Maintenance is Becoming a Standard Approach

Product Information and Selection

Q1. Can you share the different sensor types available so we can choose the best one for our application?

We offer various sensors suitable for different applications:

•IR Sensor (Non-contact): Measures delta T (temperature difference , between target an local ambient at the sensor) and is suitable for LV (Low Voltage) and MV (Medium Voltage) assets such as switchgear, transformers, UPS, and PDU. These are specifically designed for detecting hotspots on Bus connections.

•EM Cable Sensor: Measures delta T for LV assets, including switchgear and switchboards. These are specifically designed for attaching to Low voltage cables, and not for busbar connections.

•Exertherm Contact/Ambient Sensor: Designed for thermal monitoring of mechanical assets like bearings, gearboxes, and motors.

•MSL (MCC Sensor Loom): Part of our MCC (Motor Control Center) solutions kit, fits inside the bucket for LV solutions, with a similar solution now available for MV MCC.
•BSL (Bus Duct Sensor Loom): Comprises 8 sensors, used to monitor the joint pack connections in a busduct.

Q2. What is the temperature range of these sensors?

The temperature ranges for our sensors are as follows, although readings above 40°C Delta for the EM range of sensors is classed as critical temperature, the datacards limit the output to 70°C Delta as there is no requirement for a Delta reading past this point as outside any temperature standard for alarms.

•IR Sensor: 0 to 300°C (0 to 540°F) ΔT
•Cable Sensor: -10 to 150°C (-18 to 270°F) ΔT
•Contact/Ambient Sensor: -10 to 150°C (14 to 302°F)
•MSL (Motor Starter Loom): -40 to 120°C (Working temperature of the cable tie)
•BDMS (Bus Duct Monitoring Sensor): -40 to 110°C (Operating range of the sensor cable)

Q3. Can the sensor data be integrated into software platforms like SCADA or BMS systems?

Yes, with our solutions, from the datacards you will get real-time data that can be integrated into software platforms like SCADA / PLC or BMS systems.

Q4. How accurate are the temperature measurements?

The accuracy of the temperature measurements is as follows:

•For the Cable Sensor, Contact Sensor ±2% or 1°C of target value
•MCC solution, and BDMS: ±2%
•For the IR Sensor: ±5% of the actual reading, so 5% at 1°C Delta and 5% at any other output value.

Q5. Do you offer a humidity sensor?

We do not offer humidity sensors as on there own the data is meaningless. You would need numerous sensors to start calculating dewpoints and differences between inside and outside humidities to have any worthwhile data. These can be purchased off the shelf. We do not have any datacards that these can be connected to.

Q6. Can your Modbus card work with a humidity sensor as well?

No.

Q7. Do you have an HMI that can be mounted on or near the gear, or is the only option to route data to a BMS for integration?

Yes, we currently offer the ARMXL HMI, but it will soon be replaced with a new version. Although the ARM XL is designed as a standalone display and system, this does not replicate the BMS system. Alarms are generated in the ARM XL only and cannot be transmitted to the BMS. If you are integrating to a BMS type system, then connect datacards and devices direct and let the BMS generate alarms.

Q8. Is there a new busduct monitoring product available?

Yes, we have a new modular version coming next year. Stay tuned for more details!

Q9. Where is the sensor/temperature data sent, and how is it recorded?

The sensors are connected to the Modbus datacard, which processes signals from up to eight (8) Exertherm Sensors. The datacard then provides the processed information via the RS485 Modbus RTU protocol. This data can be sent to either the ARMXL (HMI) or any SCADA or BMS system for integration. No data is recorded or stored at the datacard or HMI, this must all be carried out by the SCADA / BMS system

Q10. Is there a price list available, and what is the current lead time for equipment?

Our lead time is approximately 6 to 8 weeks, but this can vary, Lead time is always confirmed on receipt of an order. For pricing information or any questions about existing projects, please contact us. We can prepare a quote for your specific needs.

Q11. What communication protocol do Exertherm sensors and data cards use?

The sensors all have a mV output which is connected to the datacard. This datacard then converts the mV signal to a temperature value and the comms output form the datacards is modbus RTU.

Note: If you use a different communication protocol, you can convert it to another protocol using a converter.

Q12. What is the voltage limit on the high-voltage side. (Transformer)?

The voltage limit on the high-voltage side of the transformer is up to generally 38kV, but the sensor MUST be mounted outside the minimum voltage clearance level.

Q13. Are there any annual monitoring or licensing fees?

No, there are no annual monitoring or license fees to pay for the system.

Q14. Do you have a solution for thermal condition monitoring of overhead lines at 345kV?

No, our solutions are designed for medium and low voltage systems. Overhead lines are better monitored with imaging devices as you need to monitor the length of the cable rather than a single spot / small area. Clearance distances for voltage would also be too large for the sensors

Q15. How many sensors can be monitored with one HMI display?

With one HMI display (ARM XL), you can monitor up to 80 sensors (EM cables or IR sensors) + 60 MMDs (up to 10 datacards and 5 MMAs) This would give approx. 13 to 20 main breakers and 60 MCC drawers or buckets.

Q16. Is there a real-time demo site available that I can view?

There is no online real time demo site at the moment, but, we can arrange a visit to the Eaton Experience Center to see our solutions in action, or our sales team can meet with you to demonstrate our demo case.

Service Life and Calibration

Q17. What is the average service life of Delta T Exertherm sensors inside the switchgear panel?

The Exertherm IR Sensors and EM Cable Sensors will outlive the switchgear panels they are installed in and have a lifetime warranty. The sensor will be replaced for free if they fail, as long as they are used and installed correctly and kept within the specified temperature range.

Q18. How is lifetime calibration performed for Exertherm sensors?

The IR Sensors are factory calibrated for life before shipping, this is a once only operation and never needs to be repeated. They are non-powered so have no amplifier that can drift. Onsite, the only works that are needed during setup is to apply a 'Gain adjustment' which adjusts for bus size and mounting distance therefore the amount of IR that is detected at the sensor. They are then fit and forget.

Q19. Do Exertherm sensors need recalibration after initial calibration?

No, once Exertherm sensors are installed and correctly positioned, they never require recalibration.

Q20. What is the typical lifespan of Exertherm sensors?

Exertherm sensors are designed to last for the entire lifetime of the equipment they are installed in, typically over 25 to 40 years. The sensors will outlast the switchgear.

Q21. Do IR windows need calibration over their lifetime if they degrade?

Yes, IR windows need periodic maintenance as they degrade. Degradation depends on the type of material the window is made from and will affect how well they allow infrared to pass through, leading to inaccurate temperature readings. What this calibration actually means is that before each use of the thermography camera on a window, each IR window should be checked for a known loss of signal, and the only way to carry this out is to use a known heat source behind the window and measure the loss through the window. This will change on an annual basis and can be in the region of a loss of 2 to 4 degs. This value should be recorded at the window. In reality, this is very rarely carried out which over the life of the window would result in vastly different readings in year 1 to year 10 of the life of that window. IR windows maintenance and possibly calibration depended on vendors (manufacturers) Windows also need replacing, usually around the 8 to 10 year lifespan mark.

Suitability and Effectiveness

Q22. Are these infrared sensors suitable and effective for use with both oil and dry transformers?

We need to take these two in isolation. Firstly on the oil filled transformers, we can monitor the input and output connections if they are accessible and the voltage level allows with clearance. What we cannot monitor is any connection or winding inside the 'oil tank' itself.
For the dry type transformers, we can monitor (again if voltage level allows) the connections on each HV coil end and tap change connection, and then the output side connections either 3 pole or 4 pole.

Q23. Can these sensors measure temperature in both the motor and generator parts of electric generators?

The sensors can be used to monitor the output terminals on a generator cable connection box, if space and clearance allows.

Q24. Is the MCC Temperature solution compatible with older and non-Eaton MCCs?

Yes, we can work with any manufacturer. Our solutions can be installed in both new projects and retrofits.

Q25. Is it possible to use these sensors in an explosive (Ex) environment, even if it's not common?

Yes, it is possible. As the sensors would be installed inside the electrical enclosure / switchgear which itself would be Ex rated. They are also passive devices which require no external power.

Q26. Are the infrared sensors resistant to dust?

Yes, they are resistant to dust. However, the IR sensors should not be installed pointing at any upward angle. They are IP67 / Nema4x rated

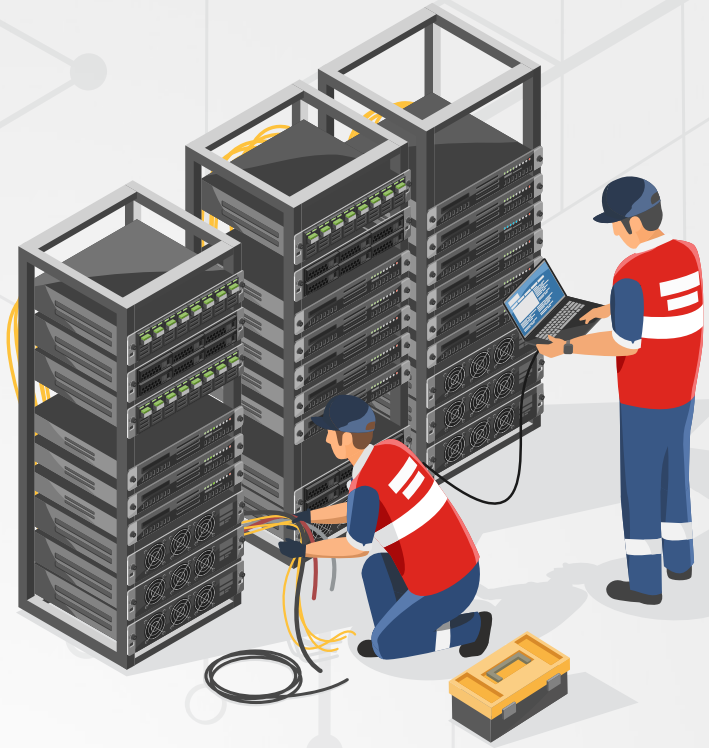
Q27. Are there specific climatic conditions required for the optimal performance and longevity of the infrared sensors and their accessories?

The sensors have operational temp and humidity conditions which must be adhered to for optimal performance, but these are well within the operating conditions experienced for electrical switchgear. For the IR sensors this is 0 to 70°C ambient and 0 to 95% non-condensing humidity, for the Cable Em sensor this is -20 to 70°C and 0 to 95% non-condensing humidity.

Q28. How does ambient temperature affect the accuracy of temperature readings? Do warmer environments impact the quality of these readings?

The IR and Cable EM sensors are both a Delta T sensor, so this takes into account the local ambient temperature at the sensor head. By utilizing this method, if the ambient changes then the connection point being monitored reacts to this change and the Delta remains the same. This is a very important point and is why Exertherm uses Delta T. Accuracy is not affected.

Installation



Q29. Does the installation of these sensors and their supporting brackets affect the conducted type tests for the panels?

No, because they are always installed outside the minimum clearance requirements.

Q30. Can you highlight the pros and cons of infrared (contactless) sensors versus contacting sensors, particularly regarding installation, panel coupling (MV switchgear), shrouding, and type test effects?

If a contact sensor is used internally within a piece of MV switchgear then, this is attached to a 'live' component. This instantly reduces the designed in minimum clearance within the panel as now we have effectively moved a live component closer to another point, either phase or earth. This would require a re-type test as the electrical characteristics within the panel have been altered.
By installing the IR sensors which are always installed outside the minimum clearance for voltage, we have not impeded on any clearance and therefore no re-type test should need to be carried out as we have not effected and phase to phase or phase to earth clearance.
As far as panel coupling, the IR sensors are all wired so we always recommend to install sensors and datacards on a per column or section basis, so when moving to site there is no need to re terminate sensors to datacards and cross sections. Also the Exertherm sensors can be fully commissioned at the OEM factory with no site commissioning required. Whereas a wireless contact system can only be commissioned onsite when the switchgear sections are fully assembled and powered.

Q31. How easy or difficult is it to install sensors on existing switchgear compared to new equipment?

While it can be slightly more challenging to install sensors as a retrofit (as with any sensor system), our sensors are designed for ease of installation. For new equipment, it's even simpler because you can design the bracket and components specifically for the sensor. Whether for new projects or retrofits, our sensors offer a straightforward and efficient fit and forget solution.

Q32. Do you have drivers available for integration with Allen Bradley PLCs? Most of our stand-alone equipment uses these, as well as DCS.

This all depends on what protocol the PLC can accommodate, if it can read Modbus RTU then there is no issue. However, you can use converters, such as MOXA or other brands, to convert Modbus RS485 to the required communication protocol.

Q33. What are the concerns regarding the proximity of IR sensors in MV gear and the recommended routing of sensor cables?

For IR sensors, we state that the minimum voltage clearance for the panel design MUST be maintained at all times for both sensor head and any cables. If this is adhered to then there should be no risk of arc flash.
When routing sensor cables through switchgear, it's important to keep them away from all busbars and follow good electrical practices and regulations. Do not route sensor cables parallel to any live conductor, if any conductor must be crossed then cross at 90° and maintain minimum voltage clearance. Always Start routing at the sensor head, run the cable back to the datacard, cut to the required length, dress, and connect. Never attach the sensor or its cable to a busbar, even temporarily.

Q34. Why can't a camera be used to scan the connections on MCC drawers? Isn't it possible to see them clearly?

When using IR cameras, it is impossible to see the connections at the rear of the drawer even if a window was installed in the drawer front. The reason being that between the front of the drawer and the rear are many devices such as isolators, contactors, fuses, VFD devices and other components such as metal barriers which block the view entirely.
So the drawer would have to be completely removed to access those connections, resulting in both downtime and the connections cooling.
Note: Checking live electrical gear is risky. Installing our solutions in MCC drawers helps make monitoring safer by reducing the need to get close to hazards, thus eliminating risks associated with inspections.

Webinars

Q35. I missed the first three webinars. Is there a way to watch them now?

Absolutely! If you'd like to catch up on our 2024 webinar series, you can find the recordings here: https://www.exertherm.com/ctm-webinar-series

WATCH OUR WEBINAR:

Additional resources:

Future-Proof Electrical Assets With Continuous Thermal Monitoring

Download

Developing an IEEE Continuous Thermal Monitoring Standard and a Major Company's Protection of Their Electrical Assets

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