EXERTHERM by EATON

Webinar Q&A

CONTINUOUS THERMAL MONITORING WEBINAR

How to Detect Compromised Electrical Connections Under Low Load Conditions

Q1. The thermal reading or the point which could cause high alarm (instead of high high), who decides it, manufacturer or system designer?

Generally, this would be the vendor or client who will set the alarm levels in their front-end system, we suggest/advice to set alarm levels based on the accepted standards (NETA Table 10.18 Suggested Actions based on Temperature Rise) for the monitoring of electrical systems used on Thermographic inspection.

Q2. If possible, please include code of IEC or applicable in APAC/ANZ region.

IEC 61439 for heat rise type testing.

Q3. How is altitude and atmospheric pressure taken into consideration?

The sensors are located within switchboards and are non-powered and output a Delta-T reading therefore not impacted by drastic changes in atmospheric conditions. They come with lifetime calibration too. The IR sensors are hermetically sealed (IP67)/NEMA 4X Rating therefore offers great protection against harsh environmental conditions. Atmospheric pressure and altitude do not play a part in the operation of the sensors.

Q4. What is a typical temperature gradient for say 70mm x 10mm bus bar copper? The reason for the question is how often are IR sensors required to be placed?

We typically advice to monitor both the line and load side of ACB breakers (feeders, Incomers, bus-tie) for MV switchboards along with shipping splits. For LV we advise to monitor the line and load side of ACB (Incomer and bus tie) and load side for rest of the feeder ACB along with shipping splits. For each of these connection points – you require 1 IR sensor per phase. Only site made connections need to be monitored, not every joint.

Q5. Does Exertherm LoadMap have application example or use case for reference?

LoadMap has been implemented and used across various industries and major projects and by many OEMS small and big. Due to limitation of strict NDAs with most OEMs and clients, we cannot share the information publicly. However, if more information is required about LoadMap solutions – please do not hesitate to reach out to us via our website Exertherm - **Contact Us**

Q6. In switchboard, say Bus A has 5 joints, does all joints require to install temperature sensor? Does LoadMap show analysis on each joint independently?

Generally sensors are placed at the site made joints in the switchboard. So say 3 for line side and 3 load side of a main breaker. If that breaker has metering then we can use LoadMap on each phase and both sides of that breaker to give health status of the joints as individual items. If you mean a piece of bus has 5 joints all along its length, then no we don't require temp sensors as most of those joints will be factory made and good quality, these tend not to fail. Only site made joints need monitoring.

Q7. Can LoadMap data transmit to other system e.g. DCS via common industrial communication such as Modbus, PROFIBUS etc?

LoadMap can be easily embedded into the client's front-end system i.e. DCS, BMS, SCADA etc. Additionally, it is also a vendor neutral solution and can work with any vendor's system. So therefore protocols are no issue.

Q8. How does LoadMap algorithm work against fluctuating cable compartment temperatures and room ambient temperatures? Is it continuously monitoring those temperatures?

The LoadMap system works with Delta-T sensors which output Delta-T values directly (these sensors read the rise in temperature above its surrounding ambient). Please watch our previous webinar on **Delta-T: why it's so important** and this will explain in detail how Delta-T can overcome the variation in ambient in different parts of the switchboard and external too. Also how it overcomes the day and night and season to season temperature variances.

Q9. Can this Exertherm LoadMap software be applicable for Transformer application? If yes, please elaborate.

If you can provide us with more details as to what type of Transformer it is and where its located, technical details and drawings, we can investigate this and provide you with suitable solution.

Q10. What are the limitations of the system (ambient temp and % load)?

The LoadMap system is not limited to %load or ambient temperatures, it works with Delta-T sensors which provide Delta-T readings directly. So at any load and ambient that can be expected within switchgear.

Q11. When you say "% load", is this based on the device, the busbar or something else? The cables used may affect the system. Any comments?

LoadMap utilises both the design load and the actual load on the system to calculate the Delta-T alarm threshold. if it's the cable and busbars terminations for a particular breaker we are monitoring, we will consider the design load of the 'weakest item' ie is the cable undersized or busbar oversized. For example, if the bar was 1000A and yet the cable connection point is 900A, then use design as the cable of 900A as that is the connection we are protecting, then utilise the actual load on it to calculate the alarm threshold.

Q12. Why do you only provide Delta T and not Delta T and ambient too? Is this another point to consider?

Delta-T is the globally accepted method for hotspot detection and used by thermographers for many years. Providing the ambient could give misleading information, and if used to calculate an actual temperature of the joint in question gives little to no use other than is a connection within a heat rise type test limits, this does not tell you if a joint is compromised or not. Please watch our previous webinar on **Delta-T: why it's so important** for more information.

Q13. When you mentioned that the heat goes proportional to the square of the current, what about the effect of a pulsed current (e.g. out of a VFD) vs a pure sine wave? Any effects? Harmonics?

The sensors itself are non-powered, passive devices and therefore not affected by harmonics and they simply detect the rise in heat above ambient, the heat that is dissipated from a compromised joint. So any pulsed currents or harmonics that cause heat will be detected and cause no issue.

Q14. Could you have negative values of Delta T?

This is only possible when the sensors surrounding ambient temperature is higher than that of the joint it monitors. But, yes this is possible and generally under no loads and can be seen to swing to -1 and fluctuate around -1 to +1.

Q15. What would be a recommended sampling time for historical collection from a SCADA system or historian?

This depends on the vendor or client's requirement as to how often they wish to have data and the storage capacity of their front-end system. But generally we recommend sampling at every 15 mins for any historical data, heat is a slow rise.

Q16. Can first time attendees to Exertherm webinar see previous webinar recordings?

Yes, these are available on our website: click here **Exertherm CTM webinar series**

Q17. Can you show photos about installation of your equipments?

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Q18. What is the minimum low load period for maintaining the accuracy of low load analyses? My question would be about the application during the commissioning phase.

There is no low load period for maintaining accuracy. The system will recalculate every 30 seconds or so which could be extended quite easily to 1 minute or so and give the outputs for warning alarms and temperatures, loads etc. What the algorithms also perform is to inhibit alarms if say a circuit is a device moving from high load to almost zero load and therefore a drop in connection temperature. It will wait for temps to lower below the new calculated alarm threshold before re-activating alarm logic. This stops false alarms on cycling loads. LoadMap can play a significant role in detecting issues at low loads in earlier stages of commissioning hence saving time and costs as any issues identified can be rectified at very earlier stages.

Q19. Do you have the sensors under your brand or do you use another brand(s)? In the case you don't use your own sensors, please indicate the brand or manufacturer of the sensors.

Exertherm owns the IP and patent for all Exertherm brand sensors even though this are made by our chosen vendors. We are under strict agreements with all in regard to IP and patent protection. So all the sensors are our own brand.

Q20. The design of the Exertherm protection system can be made by engineering companies or must be made by Exertherm?

We work closely with the switchboard OEM to help them with sensor positioning and other ancillary equipment required by providing them with complete solution drawings marked up on their GA or Single line drawings. We also conduct regular design meetings and work together with OEMs and clients right from design stage to successful project completion and we also provide customer support required at any time thereafter.

Q21. Do you have data about the average of % of the cost of the Exertherm Protection System versus the total cost of the electrical installation to be protected?

Generally, Exertherm system is a very small fractional cost compared to the actual cost of the switchboard. For more accurate cost analysis, we require a GA or SLD drawing, and we can provide cost of our system. We must also consider the TCO (total cost of ownership) based on using Exertherm versus periodic thermal scanning based on say a 30 to 35 life cycle of the switchgear. If this is looked at, then Exertherm offers considerable savings over the life of the switchgear as this is a one off cost versus continual yearly costs. Please contact us at **Exertherm-Support@eaton.com** and we can discuss this in more detail.

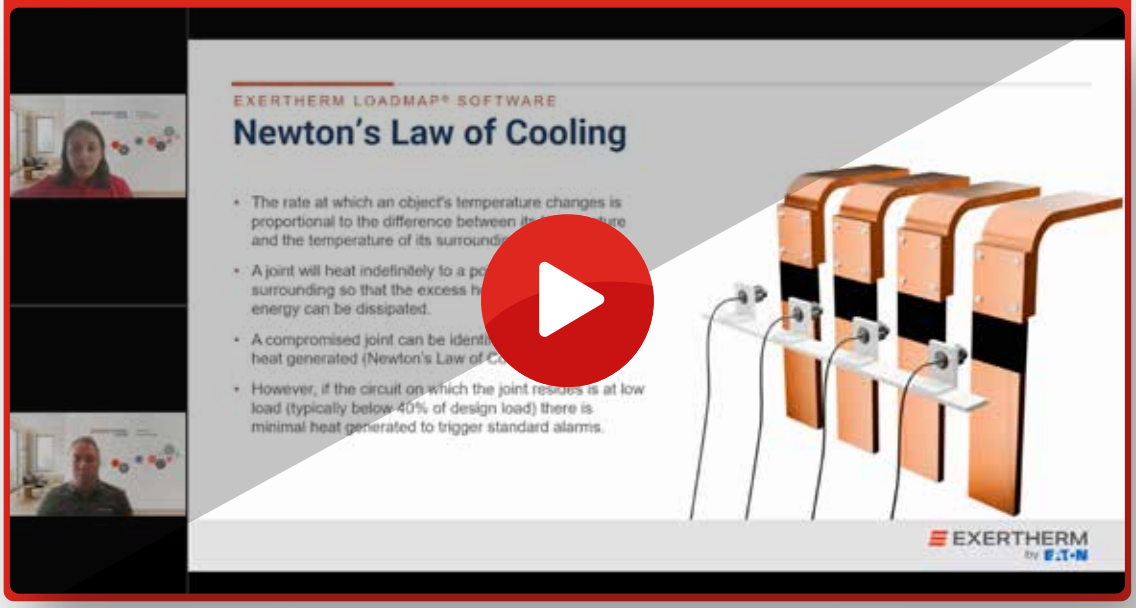
Q22. What is the maximun operating temperature of sensors?

The IR sensors – 0-70°C Delta T, EM Cable sensors – upto 150°C Delta T.

Q23. Given that compromised electrical connections under low load conditions often exhibit minimal thermal signatures, how does your CTM solution differentiate between normal ambient thermal fluctuations and early-stage degradation, without generating false positives, especially in an environment with variable ambient conditions of intermittent loads?

The LoadMap system works with Delta-T sensors which output Delta-T values directly (these sensors read the rise in temperature above its surrounding ambient). Please watch our previous webinar **Delta-T: why it's so important** and this will explain in details how Delta-T can overcome the variation in ambient temperatures and yet provide dynamic low load protection using LoadMap.

WATCH OUR WEBINAR:



Additional resources:

Future-Proof Electrical Assets With Continuous Thermal Monitoring

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Revolutionizing Mission Critical Electrical Assets with Exertherm's Thermal Sensors

Learn More

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