EXERTHERM™
24x7 Thermal Monitoring

24x7 Continuous Thermal Monitoring

The Next Technology Step



QHi Group
SYSTEMS DIVISION

QHiGroup.com/Exertherm

24x7 Thermal Monitoring

Exertherm continuously protects 24x7, 365 days a year to detect and identify the location of problems at an early stage of development via on-going trend analysis / alarms.

Standalone System
Optional common alarms to BMS/SCADA

Remote Access
Also possible via Internet

6
Intranet Network

Additional Buildings / Sites
Monitoring of multiple buildings/sites possible

London | New York | Paris

5 Building Management System
RS485 connection into existing BMS/SCADA

Network Gateway

4
ModBus Network

Network Connection
Industry standard RJ45 sockets located on the front of the unit enable simple connection to a RS485 ModBus network.

Internal View
Panel with sensors shown in position

1

Switchgear MCC

2

3

Data Card
Each data card can have 8x sensor inputs

Whats the problem?

In today's commercial environment the continued operation of mission critical buildings now has the objective of zero unscheduled downtime and minimal scheduled downtime.

The most common cause of electrical failure are bad connections. These cannot be detected via metering or load measurements, power quality etc. However, the thermal increase can be detected using thermally sensitive devices.

The Next Technology Step

Exertherm provides a major breakthrough by providing 24x7 CONTINUOUS Thermal Monitoring from INSIDE the enclosure, rather than periodic inspections from outside.

Exertherm provides capability for data logging / on-going trend analysis and user definable alarms. Warning and critical alarms can be configured which trigger in the event the temperature of any monitored component exceeds the pre-set limits.

Exertherm is easily installed (new/ retro) & integrates with most BMS/ SCADA systems.

Current Technology

Thermal imaging inspections are normally carried out once or twice per year (1 or 2 out of 365). Also, the inspections are done from OUTSIDE the enclosure in which the equipment is located.

Even thermal windows don't overcome the problems; they improve the view from camera to target, but don't resolve some key issues, like how to inspect targets with no direct line of sight, nor the fact that the inspections remain periodic, and also add significant cost.

How it works...

fig 1 Exertherm utilises small plastic, non-contact IR sensors which require no external power, have lifetime calibration & deliver ΔT measurement. These are placed INSIDE the enclosure, directly monitoring key connections.

fig 2 Cable joints can be monitored using a patented cable sensor which straps to the cable & delivers ΔT measurement.

fig 3 These connect to data cards (8 per card), which collect condition & transmit the data to the host system.

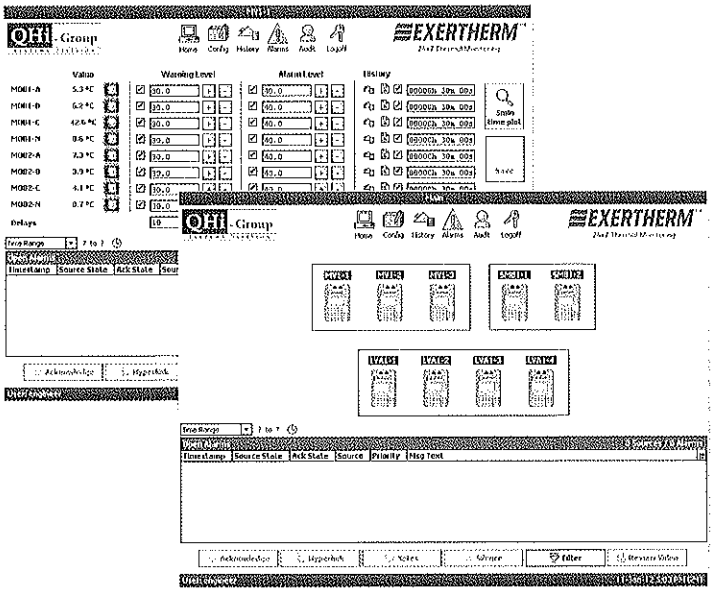
fig 4 Data cards utilise industry standard ModBus protocol for easy integration.

fig 5 Delivering the data to an existing BMS system is a straight forward process.

fig 6 This facilitates the thermal monitoring of all critical equipment, not just in one building, but for any location via WAN Intranet/Wireless etc.

Exertherm™ 'Out of the Box' Supervisory Software Solution:

EXERTHERM VISION™



Exertherm™ Software Solutions:

1 Exertherm™ provides capability for user-definable warning and critical alarms, which are configured in the software and trigger in the event the temperature of any monitored component exceeds the pre-set limits.

Software screens allow the user to easily view all, and individual, sensor / data card readings and alarm statuses.

2 Exertherm Vision™ software is fully user configurable with no unique software requirements other than standard Web Browser access. Unlike direct integration into a BMS / SCADA, which provides limited functionality, Exertherm Vision™ enables the user to create a fully working and scalable 'front end GUI' within minutes.

3 The Exertherm Vision™ 'Out of the Box' solution has the following features/benefits as standard:

- User configurable with standard Web Browser
- Ability to connect up to 54 separate data acquisition devices (432 sensors)
- Four levels of user security
- Three alarm escalation levels & alarm transmission via Email (connection to client network required)
- Optional contact alarm to BMS / SCADA
- Ability to view alarm database for time-stamped events and alarms
- History trending & storage per sensor with user configurable time interval
- Can connect to panel mounted HMI
- Access via local connection to laptop or via Intranet
- Suitable for retrofit or factory option

Exertherm Enterprise™

EXERTHERM ENTERPRISE™

4 Exertherm Enterprise™ has all the features & benefits of Exertherm Vision™ as a standard but also provides the user with the ability to have a single, or holistic overview of the whole facility / installation. The system operates either on a standalone PC or server (dependent on facility / project size) & communicates over standard Ethernet network backbone via TCP/IP protocols.

In addition to all the feature of Vision™, Enterprise™ has the following added functionalities:

- Ability to create customized views and graphics
- Possible connection to in excess of 100,000 sensing points
- Long term data storage (Enterprise™ connects to Vision™ units to gather & store all necessary data for up to 3 years)
- Unlimited number of clients able to login & view
- No on-going / recurring licence fees
- Gives the ability to have remote & secure VPN dial in to view system from anywhere in the world
- Single connection point for remote engineering support
- Opens up Exertherm Vision™ facility wide via Intranet / Network use

Clients can begin with Vision™ and then expand to the Enterprise™ solution to extend the capabilities & storage capacity (should your monitoring / facility needs develop) with the ability to archive previous years of valuable data.

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24x7 Thermal Monitoring

FACTSHEET

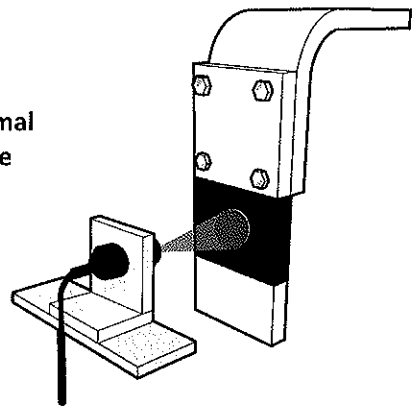
24x7 Continuous Thermal Monitoring of Critical Electrical Connections: Hotspot Detection

Q What does Continuous IR Thermal Monitoring do?

A real-time, continuous thermal monitoring system provides a solution for the detection of hotspots at critical busbar, cable, shipping and circuit breaker connections.

Exertherm™ is the next proven technology step onward from periodic thermal imaging inspections and is accepted as the new 'best practice', providing the following key advantages:

- Monitors 100% of time instead of 'snapshot' 1 day per year
- Direct line of sight via internally installed non-contact IR sensors
- Integrated real-time data
- Does not put operators at risk



Q What are the benefits of a continuous system over periodic?

The table below illustrates the benefits of a permanent system.

	Periodic Thermal Imaging/Windows	Permanent Exertherm™ IR Sensor System
Inspection Frequency	Typically 1 day out of 365 = <1% of time	24x7/365 = 100% of time
% Chance of Problem Detection	0.27%	100%
Positioning	External	Internal
View	Limited	Unlimited - direct line of sight
Reliability	Dependent on luck/correllation	Continuous reliable data
Availability	Data is not integrated or real time	Real-time data - integrated to BMS/EMS/ SCADA
Safety	Places operator at risk	Increases facility/operator safety
Self-diagnostics	Operator dependent	Automatic

FACTSHEET

24x7 Continuous Thermal Monitoring of Critical Electrical Connections: Hotspot Detection

EXERTHERM™
24x7 Thermal Monitoring

Q What value does Continuous Thermal Monitoring provide?

A **Exertherm™ Thermal Monitoring provides:**

- Increased Operator & Facility Safety
- Reduced need for intervention maintenance
- Increased Operational Uptime
- Reduced risk of fire / explosion resulting from Arc Flash
- Real-time data = improved critical asset integrity
- Enhanced protection for critical circuits operating at low load
- OEM Vendor Neutral
- Suitable for retrofit or new-build

RISK



NO RISK



Q How does the IR sensor system work?

A

A compromised joint can only be identified by the excess heat it generates. It is essential that 'excess heat' is not confused with 'heat rise' that is due to increased load or external environmental conditions. Consequently, the Exertherm™ IR sensors measure the Delta T ΔT (target temperature rise over ambient).

Exertherm™ comprises of small, plastic, Infrared, non-contact, non-powered sensors that are permanently installed INSIDE electrical equipment to directly view and continuously monitor the thermal condition of critical joints in energised electrical equipment. This enables permanent, non-invasive detection of hotspots at an early stage of development; thus avoiding potential downtime resulting from Arc Flash / power outage incidents.

Exertherm™ Continuous Thermal Monitoring provides a comprehensive and complete system solution:

- Infrared / cable sensors directly monitor critical connections
- Sensors connect to 8 channel data acquisition cards
- Automatic self-diagnostics
- Data is transmitted over Modbus network to front end software (local or remote view)
- User definable common alarms can also be sent to separate BMS/EMS/SCADA

Q Where to permanently monitor?

A **The Exertherm™ solution is suitable for either LV or MV applications, enabling the following critical and key connections (including insulated bus) to be monitored simultaneously and in real-time:**

- All AIS circuit breakers – line / load side
- Bus couplers – line / load side
- Critical vertical to horizontal bus connections
- Critical cable connections - typically above 400A (via specialist Exertherm™ Cable sensors)
- All shipping / transport joints Exertherm™ cable sensors)
- MCC clamp connections

FAQ's

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Q Is Exertherm similar to thermal imaging?

A Both use non-contact infrared to measure temperature of the target, but that's where the similarity ends. Thermal imaging is done from OUTSIDE the enclosure, and can only be used for terminations / components immediately adjacent and with direct line of sight to the panel surface, (because it's measuring the temperature of the panel not the component).

Exertherm uses patented, small, plastic housed non-contact IR sensors, which require no external power. These are placed INSIDE the enclosure to directly thermally monitor any component in ANY location in the panel.

A key difference is that thermal imaging inspections are periodic, generally 1 or 2 days a year. To rely on detecting problems prior to failure in mission critical equipment, 1 or 2 days inspection out of 365 leaves an unacceptable reliance on luck.

"Don't thermal windows overcome these problems?"

"They improve the view from camera to target, but don't resolve some key issues, like how to inspect targets with no direct line of sight, nor the fact that the inspections remain periodic, and also add significant cost."

Q What main benefit does direct and continuous thermal monitoring provide?

A Exertherm continuously protects 24x7 365 days a year to detect and identify the location of problems at an early stage of development via on going trend analysis / alarms.

"24x7 Continuous Thermal Monitoring is 'Best Practice' technology for Mission Critical Facilities"

"What does Exertherm do?"

"Exertherm is a system specifically designed to provide continuous 24x7 thermal monitoring of mission critical electrical equipment within enclosures, and to detect and identify the exact location of the problem long BEFORE the failure."

Q Can it be interfaced by existing BMS / SCADA systems?

A Yes, and very easily. ModbusRS485 is the 'standard' export protocol but Modbus232 & Ethernet options are also available.

Q What should be monitored?

A Thermal inspection is internationally recognised as the best method of detecting poor terminations, the most common cause of power outages. Thus, if it's mission critical and within the enclosure, it should be considered. Generally, the IR sensors are utilised to monitor key busbar terminations (ACB's, switches, busbars etc). The cable sensors are utilised to monitor critical cable terminations (i.e. MCB's, MCCB's etc) which simply strap onto the cable, adjacent to the termination to be monitored.

Q Can it be retrofitted to existing equipment?

A As well as being designed into new installations, Exertherm can also be retro-fitted and / or subsequently expanded, by just adding to the existing system.

Q How reliable are the IR sensors?

A The IR sensors have a MTBF of in excess of 1,000 years.

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FAQ's

Q What if the problem develops quickly or trend data is not acted upon?

A We recommend your system is configured with 2 alarm levels, warning and critical, which trigger in the event the temperature of any monitored component exceeds the pre-set (user definable) limits. These can be created in most BMS or other host systems, sending SMS messages, or simply providing a remote warning.

"What type of business is most likely to benefit from installing Exertherm?"

"Any business which is 'power critical' i.e. will incur significant downtime costs, or safety is compromised in the event of a major power failure. Examples include data centres, financial services, telecommunications, oil and gas, Government establishments / defence, large scale manufacturing, shipping, healthcare, metro transport systems, petro-chemical industry etc."

"Exertherm protects your system from electrical power failure & arc flash, improving facility and operator safety"

Q Is the system expensive?

A No. In fact, over the lifetime of the switchgear, Exertherm will provide a considerable saving against the total cost of periodic thermal imaging inspections. In addition, shutdowns for conventional intrusive maintenance can often be extended, providing further significant savings. Generally payback is within 1-3 years.

"What is the importance of continuous thermal monitoring?"

- *Increased device reliability and uptime*
- *Extend conventional maintenance periods, thus achieving downtime savings*
- *Can potentially provide circa 20% extra life expectancy on major capital assets*
- *Prediction of electrical failure BEFORE the event*
- *Improved facility and operator safety (Arc flash)*
- *Integrated real time data 24x7 365 days a year*

Q Are there any other unique features of Exertherm?

A Yes, unique to Exertherm is 'Thermal Mapping' – this can only be accurately achieved by combining your load data with the ΔT data provided by Exertherm to create a bespoke thermal map of your facility.

Q How do the sensors connect back to the system?

A Each sensor connects back to an 8 channel data acquisition card, which conditions & linearises the input signal and converts to Modbus.

Within each panel the data cards are interconnected, providing a single cable connection to the host system outstation. Exertherm can also be installed as a stand alone system where required.

"Can Exertherm be used to thermally monitor other critical plant?"

"Yes – an increase in heat is a common symptom of malfunction across a diverse cross section of plant (i.e. bearings, motors, gearboxes, pumps etc). Therefore, virtually all key plant can also be continuously thermally monitored on the same system, using non-contact IR sensors, or contact cable sensors."