



**Overheating Protection for Contacts,
Connections and Conductors**

3C
**OVERHEATING
PROTECTION**

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Why Do I Need Overheating Protection?

Overheating is the commonest cause of failure in switchgear. A thermal management system is the best method of identifying potential future failures. Continuous overheating protection minimises the need for invasive maintenance and improves the integrity of critical assets.

The Limitations of Existing Solutions

Electronic circuit breakers are designed to protect only from overheating which is caused by increased load. They offer no protection from overheating in the conductive path caused by loose connections, compromised joints, ventilation failure or worn contacts.

Thermal imaging is invasive. The technician must remove and open the doors and covers of the switchgear to access live cable and busbar connections unless infra-red viewing windows are installed. Thermal surveys do not provide continuous protection.

A dedicated thermal monitoring system consisting of sensors, data acquisition system and software provides continuous overheating protection but is expensive to purchase and install.

Imagine if...

1. Overheating protection for the conductive path could be integrated with electronic circuit breakers
2. The overheating protection for contacts, connections and conductors was continuous.
3. The solution was excellent value for money

This is 3C Overheating Protection



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3C BENEFITS

- **LOW INVESTMENT** [system is integrated with circuit breakers]
- **FAST INSTALLATION** [breakers are supplied with sensors already fitted]
- **EASY UPGRADE** [the 3C system can be retrofitted to existing installations]
- **FREE EXTENDED WARRANTY ON NEW CIRCUIT BREAKERS**
[when 3C overheating protection is included with the order]

3C FOR CIRCUIT BREAKER CONDITION MONITORING

“Contact overheating is another common cause of switchgear failure. Improper circuit breaker installation or loose connections can result in localized [sic] overheating and arcing.”

– AC Power Systems Handbook. Jerry C. Whitaker. CRC Press.

The Health and Safety Executive (responsible for workplace safety in the UK) recognise that pressure to avoid shutdowns results in neglect of low voltage switchgear and deterioration of contacts. Contact corrosion inevitably leads to contact overheating and fire hazard. – HSG 230, HSE Books, 2002. ISBN 978 0 7176 2359 4

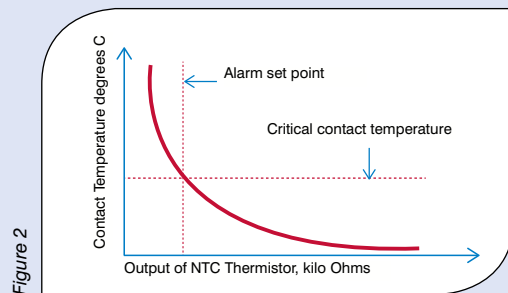
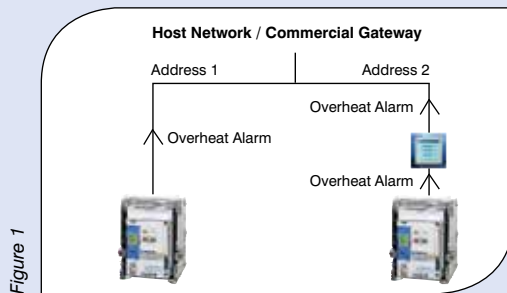
Terasaki’s Air Circuit Breakers (ACBs) have a unique self-monitoring system for the condition of the main contacts and conductive path.

The status and wear of the contacts is determined by temperature measurement using thermistors with negative temperature co-efficients (NTC thermistors). Self-diagnosis is therefore achieved by direct measurement of a physical property (temperature).

It is important to distinguish between direct, continuous measurement and contact wear indications which are based on algorithmic modelling. The latter are inherently less accurate and therefore more likely to result in false alarms or underprotection. Continuous monitoring of the contact temperature provides valuable input for preventative and predictive maintenance programs.

An abnormal temperature will generate an alarm on the integrated LCD window, close a volt-free output contact and deliver an alarm message to the Modbus network, *figure 1*.

The response of the thermistor to ACB contact temperature is shown in *figure 2*.



3C FOR DATACENTRES WITH HIGH LOAD FACTOR

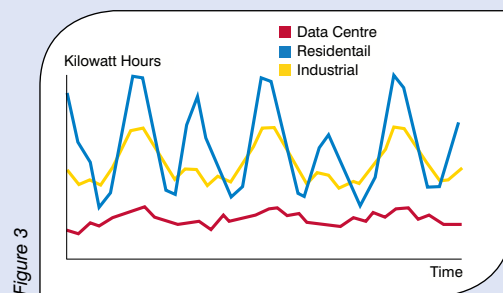
“Datacentres have a constant, non-cyclic, high load which will tend to increase over time. Many overheating problems in electrical panels are caused by this type of load profile combined with a faulty connection. Terasaki’s contact monitoring system is a good solution because it is based on actual temperature measurement, so it protects the connections as well as the circuit breakers.”

– Gary Burgon, Technical Director, The Rosebery Group

The load factor of an installation is the average load divided by the peak load (over a given period). Datacentres have a high load factor compared to residential, commercial or industrial installations as shown in *figure 3*.

Electrical equipment in an installation with a high load factor has a higher-than-normal risk of overheating.

A thermal protection system which is integrated with circuit breakers is a good investment for mission-critical electrical installations.



3C INSTALLATION EXAMPLE: The Rosebery Group

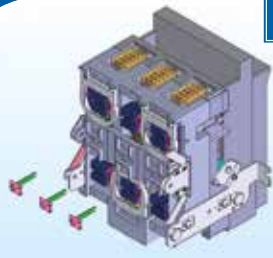
The Rosebery Group used Terasaki’s 3C Overheating Protection for a 12MW datacentre (pictured right).

Air Circuit Breakers (ACBs) with overheating protection, integrated display and data communication.

Plug-in Moulded Case Circuit Breakers (MCCBs) with overheating protection, integrated display.



3C IS INTEGRATED WITH TERASAKI CIRCUIT BREAKERS



3C

Main breakers: one integrated NTC thermistor per phase.

Alarm on breaker LCD + voltfree alarm contact + alarm on Modbus network.



3C

Overheat alarm can be sent from main breaker to optional T2ED panel-mounted display.



3C

Outgoing circuits: temperature sensors integrated with top and bottom terminals of MCCBs.
Volt free alarm contact + LED indication.



3C

Power distribution units (PDUs) and final circuits: modular temperature sensors integrated with terminals of MCBs. Retrofittable, with volt-free alarm contact.

ThePIP™ inside.

Supplied by Terasaki under licence with ThePIP Ltd.

Contact 3c@terasaki.co.uk

For Design Institutes, Engineering Consultancies and Project Engineers who are working on NEW SWITCHGEAR INSTALLATIONS:

- **FREE sample specification clauses**

Copy, edit and paste the sample specification clauses into your own documents . The clauses are clearly worded to maximise correct interpretation and to ensure the transmission of the message: “”always-on” overheating protection for contacts, connections and conductors is required for this project.”



For Facilities Managers, Site Engineers, Chief Engineers and End-users responsible for EXISTING SWITCHGEAR INSTALLATIONS:

- **3C retrofit contracts**

Upgrade existing switchboards with 3C overheating protection. 3C overheating protection can be added to existing switchboards which contain Terasaki circuit breakers.

Retrofitting additional protection will optimise existing equipment and will be installed with minimum “downtime”. Our Direct Response Service Division have a worldwide network of engineers who are focussed on ensuring the continuity of electrical supplies.



For re-sellers (outwith the UK only):

- **Training on installation of 3C overheating protection**

Certified training from the manufacturer on installation of 3C systems for Air Circuit Breakers, Moulded Case Circuit Breakers and Miniature Circuit Breakers.



Terasaki are an affiliate of the Institute of Fire Prevention Officers



TERASAKI
Innovators in Protection Technology



www.terasaki.com

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Ratings and specifications are subject to change without notice.