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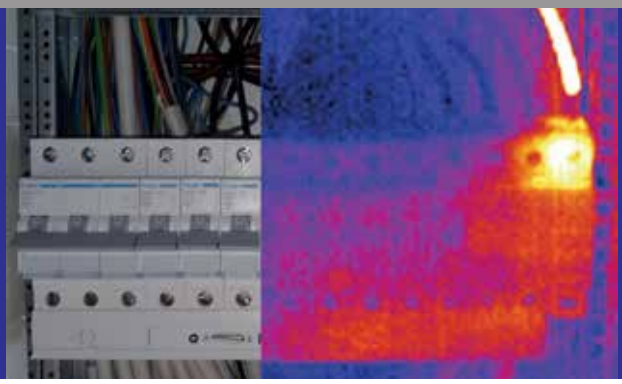

1 *Unwanted heating caused by faulty electrical contact.*
2 *RFID-Transponder with temperature sensor for monitoring of electrical contacts.*

CABINET MONITORING SYSTEM

Most of the fire events in electrical cabinets are caused by faulty electrical contacts. A fire causes a long-term failure of the system. However, in industrial environments a reliable electrical energy supply is essential. The thermography picture (Figure 1) illustrates the unwanted heating of a faulty connection in a cabinet. One reason for faulty contacts is very often an improper installation. This can be caused by incorrectly pressed lugs or screws with incorrectly tightened torque, for example. Other reasons are electro-chemical reactions or mechanical influence – for example vibrations. In all cases the contact resistance becomes worse and the temperature load increases further. If the critical temperature for structural integrity of used plastic components is exceeded, a fire will be the consequence. Unfortunately, these effects cannot be observed by visual inspection. Widely used thermography pictures are not continuously available and require on-site deployment of personnel. Hence a fault of a cabinet cannot easily be foreseen and prevented. A continuous monitoring of cabinets can prevent these fire events and hence increase safety and reliability of electrical energy supply.

The solution is a RFID temperature monitoring system developed by Fraunhofer IMS. RFID transponders are enhanced by temperature sensors and placed at electrical contacts. Furthermore, RFID transponders are passive and do not need any local power supply. They receive their energy from the electromagnetic radiation of the reader unit. This is the reason why sensor transponders are cheap and maintenance free. Thus the wireless safety monitoring of electrical contact temperatures is possible. A reader system installed in the cabinet enables the automatic capturing of temperature data. Multiple RFID transponders can be read out simultaneously. A clever arrangement of the reader antennas prevents communication holes and enables the readout of all RFID transponders distributed in the cabinet.

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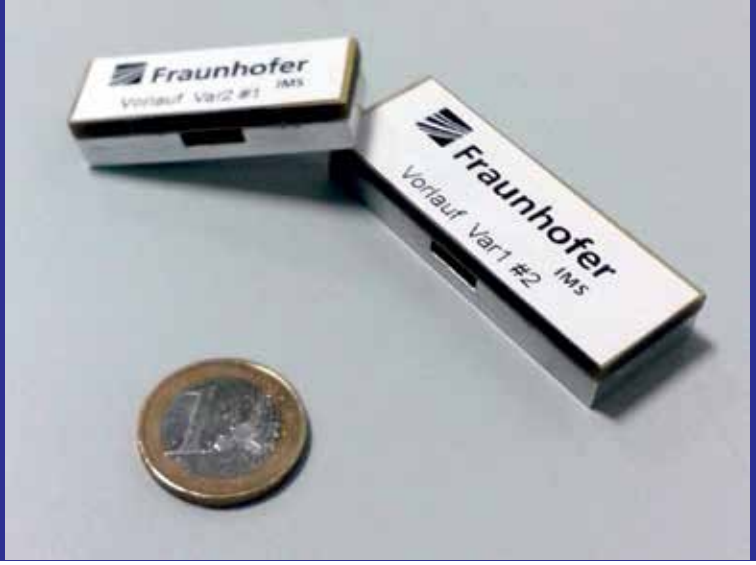


Figure 3 shows the system topology. It is composed of the RFID transponders with an integrated temperature sensor, reader antennas connected to a reader unit via a multiplexer, and a single board computer connected to the internet. A customized web service application implemented on the single board computer is provided wich reads temperature and identification data by an abstraction layer using IP communication and transmits this data over the internet to a central control system. Various possibilities for remote visualization and data processing are feasible.

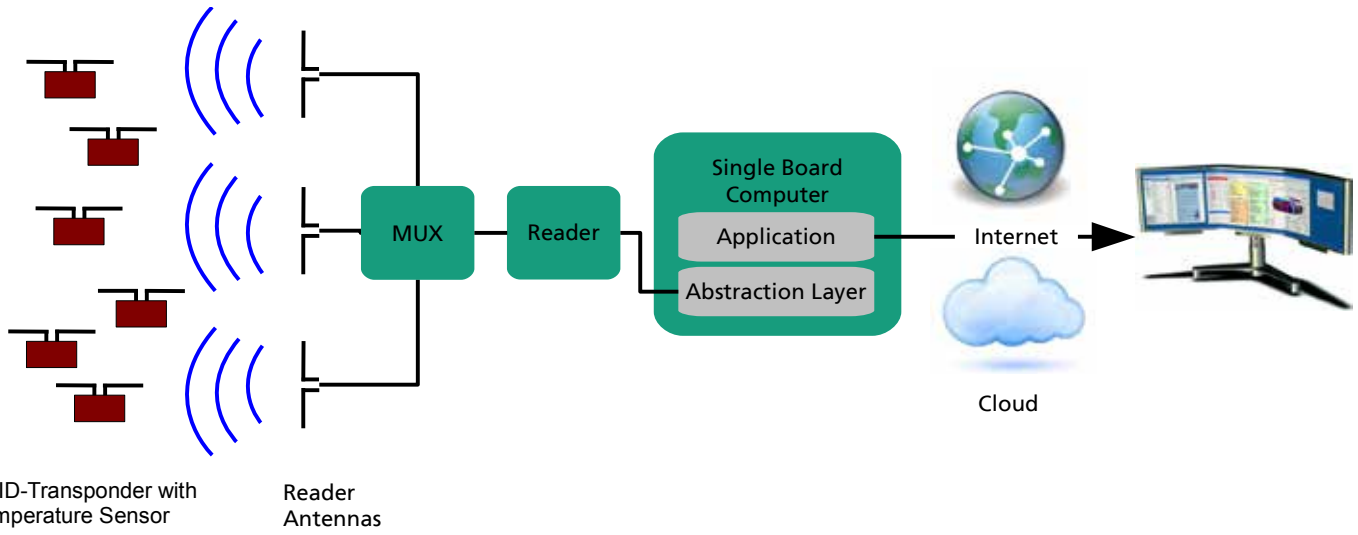
Key features

- Increase of reliability and safety of electrical cabinets
- Continuous monitoring of critical electrical connections
- Remote readout via internet- or cloud-based services
- Early prevention possible due to alert function in case of temperature increase
- On-site maintenance is not necessary
- Easy to upgrade existing cabinets

Specifications

Depending on the environment the typical system specifications are:

- 60 transponders or more
- -20 °C up to +85 °C
- read range app. 50 cm
- size of the tags: a few cm^3
- measurement rate depending on number of transponders, e.g. 50 tags/sec



3 *Remote cabinet monitoring system.*