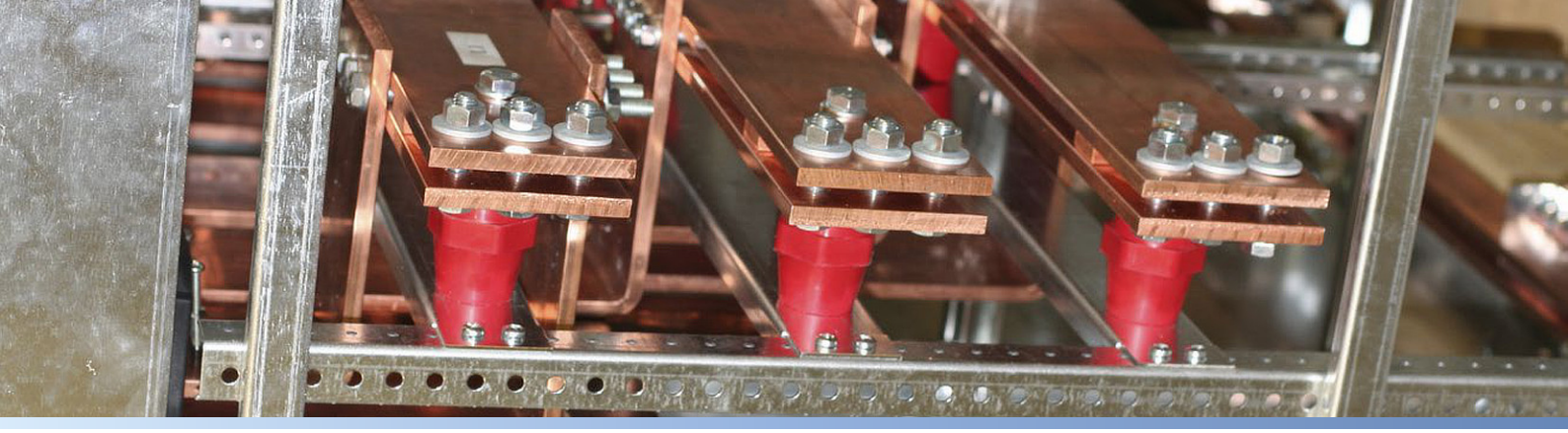
CALEX
ELECTRONICS LIMITED

Busbar Temperature Monitoring in Switchgear Cabinets

with Calex Infrared Temperature Sensors



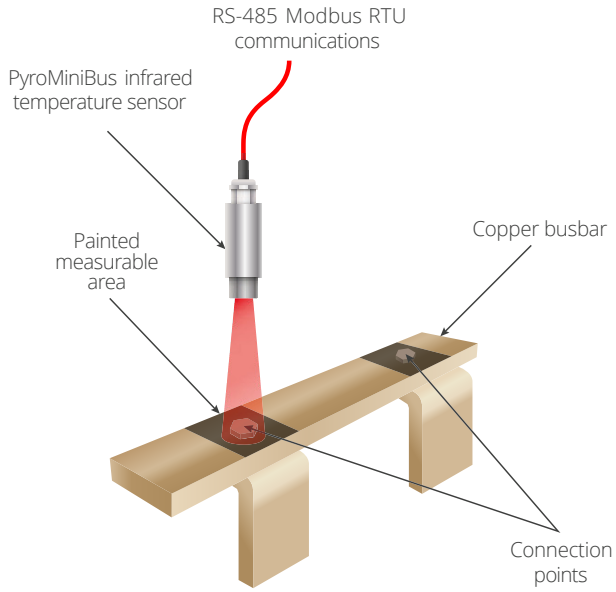
The temperature of electrical connections in power distribution systems is an important indicator of their condition. As connections degrade and fail, their resistance increases and their temperature can rise, causing further damage and a potential fire or explosion risk.

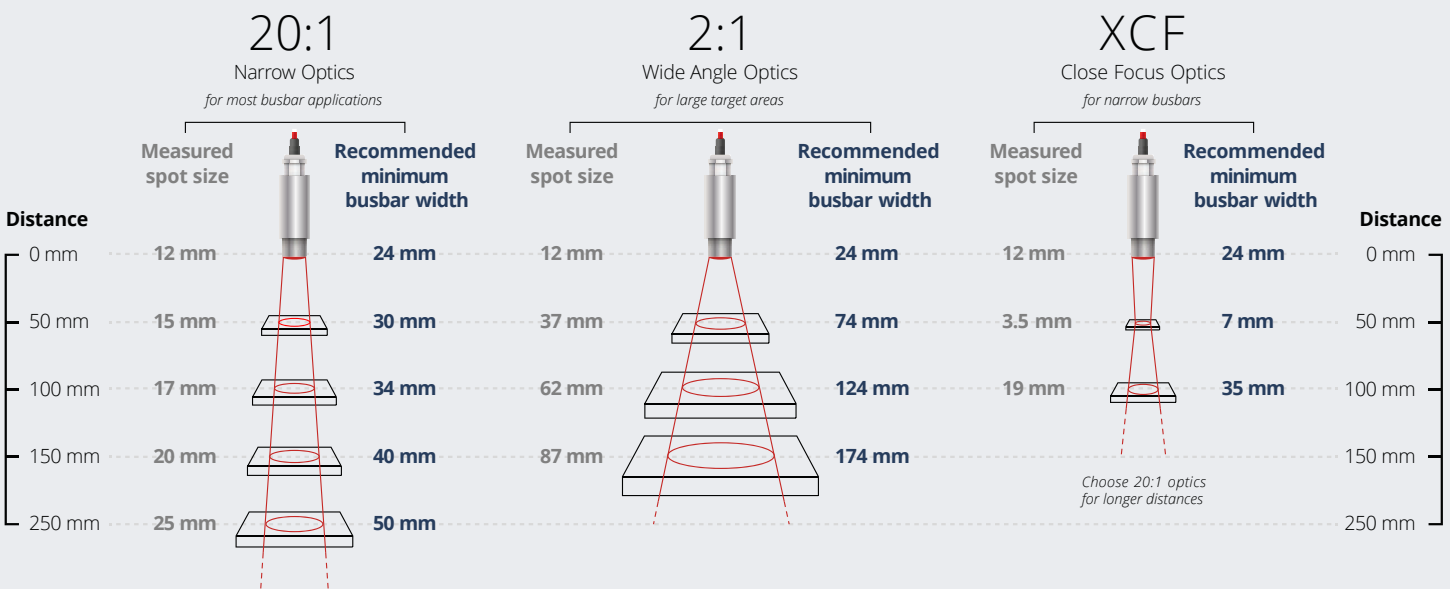
Most large industrial sites have a room containing the electrical switchgear, transformers and panels that distribute electricity around the site. Faults in this equipment can develop gradually over a long period of time, or quickly in case of the sudden failure of a component. To prevent costly downtime and help plan preventative maintenance, it is important that temperatures are continuously monitored.

Calex non-contact infrared temperature sensors, in conjunction with a centralised monitoring system, are an ideal way of measuring these temperatures. They provide an accurate, instant reading of the surface temperature of the conductor, while remaining physically isolated from the voltage it carries.

PyroMiniBus sensors are intended for condition monitoring and can help provide an early warning for pre-emptive maintenance purposes. They are not intended to be used for emergency shutdown or fire detection, or to be relied upon for safety purposes.

The PyroMiniBus is ideal for switchgear applications where the available space for mounting the sensor is limited. It may be used in ambient temperatures up to 120°C, and can measure object temperatures from -20°C to 1000°C.





Measuring the Temperature

Inside the switchgear cabinets, power is transferred by copper busbars that are bolted together at connections. This is the area most susceptible to failure.

An increase in joint temperature can be an early sign of deterioration, which can be detected quickly by continuously monitoring the temperature of each joint using low-cost IR temperature sensors mounted permanently inside the switchgear cubicles.

The surface of the busbar should be painted, coated or shrinkwrapped at the measurement location to make it non-reflective. This makes it extremely easy to achieve accurate temperature measurements.

The sensor is positioned at a safe distance from the busbar to avoid the risk of an electric arc, and will measure the surface temperature within a small spot. The size of the measured spot depends on the chosen optics and the measurement distance.

At short distances, the wide-angle 2:1 optics may be best suited; for higher voltages, narrower 20:1 optics allow a much longer measurement distance to be used for a given busbar width. Focused optics are available for measuring narrow busbars, or for measuring thicker busbars edge-on.

Temperature Monitoring Systems

General-purpose PyroMiniBus sensors and local displays provide temperature measurement and display functionality. They can be incorporated into a switchgear temperature monitoring, alarm and data logging system.

Sensors

PyroMiniBus sensors have RS-485 Modbus RTU communications, and can be connected directly to a Modbus Master, or optional local displays. The sensor body is made of 316 stainless steel to maximise shielding from electromagnetic interference.

Local displays

With optional PM180 6-channel touch screen terminals positioned close to the sensors, maintenance engineers can quickly and easily locate the high temperature reading.

The PM180 provides local temperature display, sensor configuration, data logging to MicroSD Card, and on-screen alarm indication. Alarm outputs are available locally via a connected module. The PM180 may in turn be networked with PM180 units in other switchgear cabinets.

Measuring Many Locations

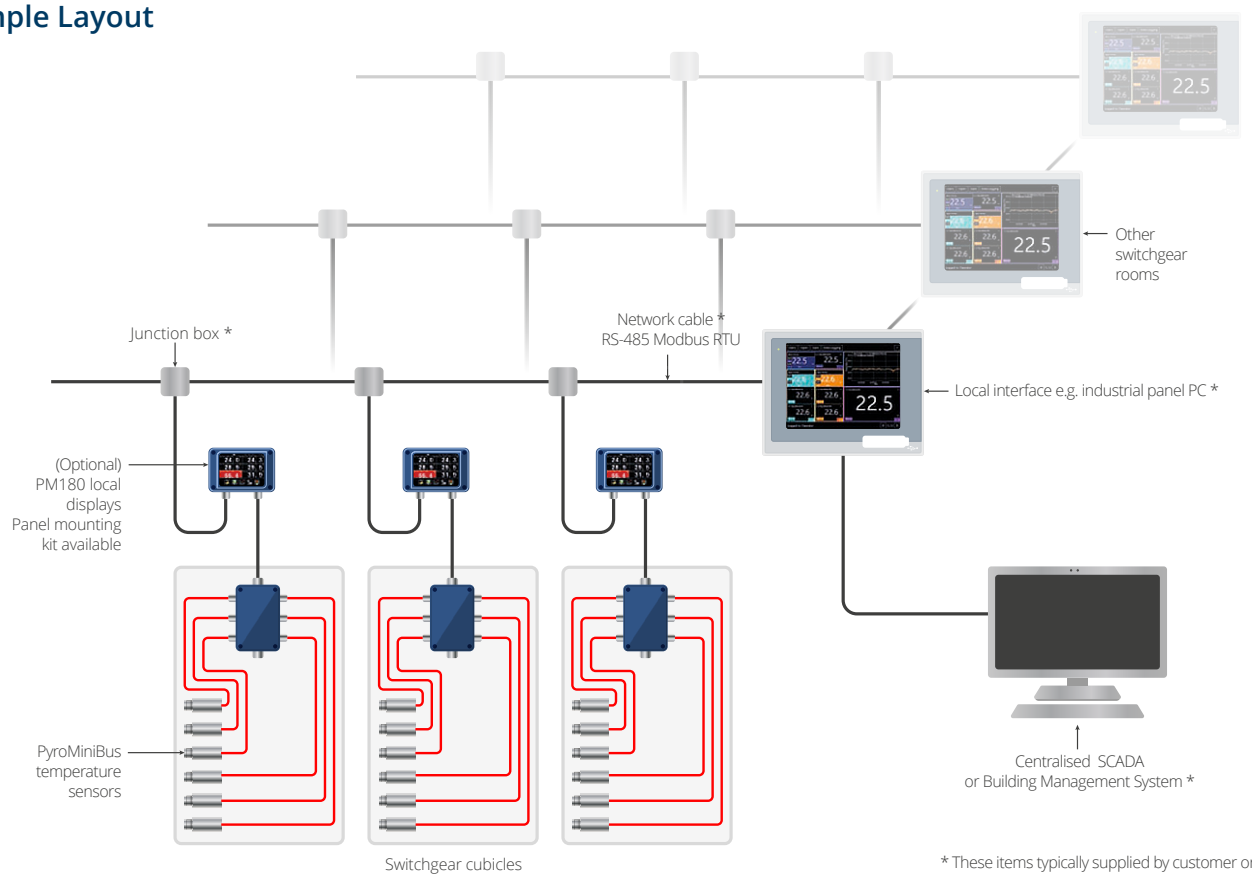
To display temperature data from multiple PM180 sub- networks, or from groups of sensors in direct connection, a local Modbus Master such as an industrial panel PC may be used.

In the example layout below, each panel PC is configured to display temperatures from all the sensors in a switchgear room, and the panel PC's Ethernet interface allows real-time access to the data on the central Building Management System (BMS) or Supervisory Control and Data Acquisition (SCADA) system

Centralised SCADA

Sensors, PM180 units and local panel PCs can be connected to an external SCADA or BMS. It is possible for an entire power distribution network to be monitored centrally using third-party software.

Example Layout



* These items typically supplied by customer or system integrator

Measurement Angle

When measuring painted surfaces, the angle of the sensor relative to the surface does not usually affect the measurement accuracy. This is because non-reflective surfaces emit infrared radiation relatively evenly at a wide range of angles.

Please note: when measuring at a 90-degree angle, the measured spot is circular, and at lower angles it is elliptical.

Alternative Sensors

Sensors with other output types, and sensors for ambient temperatures up to 180°C, are also available. Contact Calex to see how we can help you choose a sensor for your application.

Calex Electronics Ltd
PO Box 2, Leighton Buzzard, Bedfordshire, LU7 4AZ, UK
+44 (0)1525 373178 mail@calex.co.uk www.calex.co.uk