Technical description
Intelligent controlling of the high-current system

Temperature monitoring system for Isolated Phase Busduct

Isolated Phase Busducts have to run without exceeding of the allowed conductor and enclosure temperature.

The monitoring system is an additional controlling unit of temperatures, pressures and humidity.

If limit values are exceeded warnings and alarm signals can be generated. The monitoring system is configurable for all layouts of Isolated Phase Busducts and runs independent from existing controlling and safety equipment. The application is especially suitable for retrofitting on existing high current systems.
Structure of the temperature monitoring system of the high current system 02

Application
Isolated Phase Busducts have to run without exceeding of the allowed conductor and capsule temperature. Selective material usage and constant cooling of the Isolated Phase Busduct achieve this. As long as the temperature limit values are observed, increased wear of the Isolated Phase Busduct is not to be expected.

By application of the monitoring system it is possible to monitor the temperatures conveniently. Furthermore, the capsule pressure (gauge pressure) and the humidity inside the Isolated Phase Busduct are monitored. A definition of limit values and alarm signals is possible for all measurements.

Product specification
- Simple and clearly displaying of measurements
- Laptop, iPad durch WLAN
- Exact monitoring
- Trend analysis with actual and memorized measurement values
- Illustration according to KKS identification system
- Traffic lights system (green, yellow, red)

- The modular structure of the software program allows a visualization of the system state in individual variations. With the programmed functions (device programming, capturing, visualization and processing of measurements) it is possible to implement the measured values into a Windows-Measuring platform and to use them effectively. Especially project pictures are suitable to visualize charts, schemes or circuit diagrams where the actual measured values can be integrated.
Sensors

The high-current monitoring system includes temperature, pressure and humidity sensors that are designed for high-magnetic field conditions. All sensor types are tested according to IEC/IEEE 622 71-37-013 and communicate via Modbus (EIA-485).

Temperature

The temperatures inside the Isolated Phase Busduct are measured using infrared temperature sensors. These are able to receive thermal radiation and convert it into a signal voltage. The infrared temperature sensors primarily consist of a lens, a spectral filter, a pyro-electrical infrared sensor and a signal evaluation electronic.

By the touchless measuring of temperature, the surface temperatures of all connecting elements inside the difficult to access and energized Isolated Phase Busduct can be monitored easily.

Pressure

Difference pressure sensors monitor the pressurizing of the Isolated Phase Busduct. By utilization of the piezo-resistive effect and the „Wheatstone“ measuring principle the pressure is measured independently from any temperature flows in the Isolated Phase Busduct.

Humidity

To measure the moisture content in the pressurized air capacitive humidity sensors are installed. These sensors work with the principle of a disc capacitor that has a thin and moisture sensible polymer film as dielectric medium. Its permittivity changes dependent on the absorbed moisture.

The hereby-changing capacity is used as measuring value.

Measurement system

The measurement system consists of the measuring device, intelligent connecting plugs and the sensors. The measuring device is integrated in a 19” case and has 250 available measuring inputs. The intelligent connecting plugs ensure that the measuring device identifies the present sensors automatically because all sensor data is stored in the connecting plug. For this reason, the measuring device is configured automatically with plug-in.

Visualization

Different visualization possibilities are applicable with the software program. The display of measurements is possible by analog display, bar charts, measurement value tables or line charts and X/Y-Charts. Especially project pictures are suitable to visualize charts, schemes or circuit diagrams where the actual measured values can be integrated. The system state can be read out by using a variation of display modes at every time either on-site with the local control cubicle or web based via remote monitoring.

Software

The software program was developed especially for device programming, capturing, visualization and processing of measured values of the measurement device. With the programmed functions, it is possible to implement the measured values into a Windows-Measuring platform and to use them effectively. Since the software offers an open system, existing processing mechanism can be used and be adapted to changing requirements any time.
Installation
All sensors are delivered with a 20 cm ready-made cable. The installation of the sensors is possible either on existing maintenance openings or on later installed sensor flange cases. The sensors are connected with cables and T-connectors serially and plugged to the measurement system. The optimized installation allows a retrofit without additional shut-down periods of the Isolated Phase Busduct.

System monitoring unit
- Infrared radiation sensors generate a signal voltage
- The analog input signals are already digitalised inside the sensor unit
- Routing of the measurement values to the communication unit (comparison to limit values)
- Routing to switch via serial connection (LAN)
- Visualization with HMI / Webinterface

Advantages
- Safety of work according to EMC
- Save of costs at labor utilization
- Trend analysis
  - Controlled over-capacities
  - Planning of maintenances at an early stage
  - Projectable budget, (no surprises)
- Highest quality => (high measurement precision)
- Flexible structure => 100% aligned to customer requirements
- Fast installation and commissioning => short shut-down periods
- 24/7 Monitoring (roundtrips are inapplicable)
- Documentation throughout the whole monitoring period

System monitoring architecture 06
### Technical sensor specification

#### Infrared thermometer sensor
- **Measure principle**: Infrared thermal radiation
- **Metering range**: 233, 15 K ... 398, 16 K (+/- 4 K) - 40°C...125°C (+/- 4°C)
- **Opening angle of blind**: 7°C
- **Emission grade**: 0.97
- **Power supply**: 10...30 VDC
- **Interface**: RS485 / Modbus (RTU)
  - 19200 Bit/s (Default) | 9600 Bit/s
  - EVEN Partly - 1 Stop bit (Default) | NO Parity - 2 Stop bits
- **Address range**: ID 1-255
  - (ID 0 = Broadcast)
- **Ambient temperatures**: +30°C...90°C Operation /
  - (Sensor - 40°C...105°C)
- **MTBF**: >500 000 h, 105°C

#### Pressure sensor
- **Measure principle**: Piezoresistiver Effekt
- **Metering range**: 5000 Pa...+5000 Pa (+/- 1.5 % EW bel + 20°C
- **Pressure type**: Difference pressure
- **Zero point offset**: +/- 10 % metering range
- **Power supply**: 24 V AC und (15...36 VDC)
- **Interface**: RS485 / Modbus (RTU)
  - 9600 | 19200 | 38400 Bit/s
  - EVEN Partly - 1 Stop bit (Default) | NO Parity - 2 Stop bits
- **Address range**: ID 1-247
  - (ID 0 = Broadcast)
- **Medium temperatures**: -0°C...-50°C Operation

#### Humidity sensor
- **Measuring principle**: Capacitive moisture measuring
- **Metering range**: 0...100 r.H. +/- 2 % (moisture)
  - 35°C...80°C (temperature)
- **Zero point offset**: +/- 10 % metering range
- **Power supply**: 24 V AC and (15...36 VDC)
- **Interface**: RS485 / Modbus (RTU)
  - 9600 | 19200 | 38400 Bit/s
  - EVEN Partly - 1 Stop bit (Default) | NO Parity - 2 Stop bits
- **Address range**: ID 1-247
  - (ID 0 = Broadcast)
- **Ambient temperatures**: -30°C...-70°C
References
The hard coal power plant Heilbronn, unit 7, is equipped with an ABB monitoring system. Within this high-current system, 50 sensors have been installed. Thereof 45 sensors are designated for temperature, three for pressure and two for humidity measuring.

For interested visitors it is possible to do a viewing of the unit according to prior agreement.

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<th>Rated-current (A)</th>
<th>Conductor Type</th>
<th>Diameter capsule (mm)</th>
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