

QCM-T-BM

Transformer bushing monitor



Protect bushings with continuous, real-time measurement of Tan δ and capacitance

- Advance warning of bushing failure ensures reliable operation and prevents sudden outage
- Creates highly accurate reports on bushing condition hence reduces maintenance cost
- Easy integration with Transformer Monitoring System provides higher return on investment
- Automatic control and advance protection of bushing tap connection maintains higher safety standards
- Robust design and excellent interference immunity to withstand any voltage fluctuations on bushing

Product Summary

Description The QCM-T-BM system is an on-line Tan δ and Capacitance monitoring system for substation bushings. It measures the phase difference induced by capacitive layers of bushings and calculate rate of change to predict defects in bushing insulation. It can predict defects related to faults in the insulation, e.g. void, free particles, corona, and partial breakdown.

Application The QCM-T-BM is used to continuously assess the performance of insulation in bushings so that corrective actions can be taken before any failure occurs. The information gained from the system is used for condition based maintenance decisions to optimise maintenance expenditure.



QCM-T-BM Transformer bushing monitor

Protect bushings with continuous, real-time measurement of Tan δ and capacitance

- The sensors are fitted on the bushing tap to continuously measure the leakage current from bushing
- Real time calculation and trending of Tan δ and capacitance while transformer is in service
- Calculates the changing rate of the Tan δ and capacitance of the bushing
- Supports all kind of bushings, e.g. Oil or Resin Impregnated Paper bushings (OIP/RIP)

Advance warning of bushing failure ensures reliable operation and prevents sudden outage

- Sensors to detect early changes in Tan δ and Capacitance of bushing
- The time trend of the bushing parameters that characterizes developing defects
- Green, yellow or red status intuitively indicates the level of risk for each monitored bushing
- Relay output for any deviations from normal conditions for Tan δ and capacitance
- Easy alarm setting configurable for each channel separately

Creates highly accurate reports on bushing condition hence reduces maintenance cost

- Higher accuracy of measurement (Tan δ : < 0.1mrad error and capacitance: <0.2% error)
- Higher sampling rate (200 kS/sec) provides accurate phase difference
- ADC (Analog to Digital Conversion) resolution of 16 bit improves the accuracy of analysis
- Intelligent separation between actual incipient fault over environmental changes
- Fault identification support helps in severity analysis and scheduling maintenance

Easy integration with Transformer Monitoring System provides higher return on investment

- Designed for future expandability and ability to take inputs from other sensors, e.g. Partial Discharge, temperature, pressure, etc
- Software can be integrated with the enterprise monitoring software, SMARTSUB
- 16 GB SLC SSD storage, capable of being upgraded if required
- Expandable and easily changeable front panel alarm layout

Automatic control and advance protection of bushing tap connection maintains higher safety standards

- Bushing adaptor has advance protection circuit for transient voltages
- Redundant earth connection from bushing tap adaptor
- Software raises alarm if first earthing fails
- Facility to send the relay signal for alarm raised due to earthing connection failure

Robust design and excellent interference immunity to withstand any voltage fluctuations on bushing

- IP66 rated bushing tap adaptors, sensors and monitor
- Built-in display and remote client enable safe operations in difficult environmental conditions
- Advanced noise gating algorithms to eliminate noise induced by high voltage environment
- System has life expectancy of minimum 10 years
- System and communication failure alarm to indicate any problem in the system

Flexible installation and configuration options to meet customer expectations

- Adaptor and sensors can be fitted to any bushing tap
 - Local configuration using touch screen interface and facility to configure remotely using remote client software
 - Easy to retrofit - minimum outage to install bushing tap adaptor and sensors
 - Support to multiple operating systems (Windows XP, Windows 7)
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Advanced HMI with smart and quick real time alarming and reporting

- Easily programmable alarm criteria and rule engines
 - Hardwired alarms for SCADA and local user interface
 - Fast and easy access of data in generating reports
 - Integrated Reporting: Need based customizable reports created automatically in a single document
 - Export functions for analysis results / reports
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Other key benefits

- Meets highest security standards, including NERC cyber-security standards
 - Built-in time synchronization through NTP/SNTP
 - Multiple communication methods (Ethernet, RS-485, RS-232)
 - Long term serviceability assurance and upgrade options to the system
 - Built-in support for Modbus and IEC 61850 protocols
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QCM-T-BM - A complete package solution

Bushing adaptor and sensor

- The bushing adaptor is used as a bridge between bushing sensor and bushing tap. Different kinds of adaptors are required to fit on to different bushings tap. It has temperature sensor fitted for measuring temperature of the bushing
- The bushing sensor takes current signal from the bushing tap and sends it to data acquisition system. The bushing sensor has built-in protection for transient voltage and short-circuit
- In new transformers the adaptors and sensors are usually fitted during the installation and commissioning of transformer hence does not require outage
- For retrofit, outage is required to fit the bushing tap and sensors
- Qualitrol DMS can custom-design all types of bushing adaptor and sensors depending on the bushing tap drawing / measurements

Data Acquisition Unit

- The Data Acquisition Unit takes signals from bushing sensors and reference VT / CVT, performs analog to digital conversion and sends to the expert analysis system (SmartBM) for analysis
- It connects the bushing sensors and VT / CVT using twisted pair cables
- The unit is totally protected against high-voltage transients and are suitable for use in harsh environments

SMARTBM - Expert analysis tool for data handling, display, reporting and interpretation

- The Expert analysis system displays the current value of $\tan \delta$ and capacitance for all bushings. It also shows the trend for $\tan \delta$ and capacitance for a selected time period
- It also displays the $\tan \delta$ change versus temperature and reference voltage signal
- Other key features of the SmartBM are:
 - Alarm and warnings for $\tan \delta$ and capacitance abnormalities
 - Programmable alarm criteria
 - Automatic communication of warning/alarm condition to headquarters PC
 - Alarm notification using IEC 61850
 - Automatic report generation (daily / weekly / monthly) as per customer needs
 - Transfer of data to remote site by company LAN or Modem



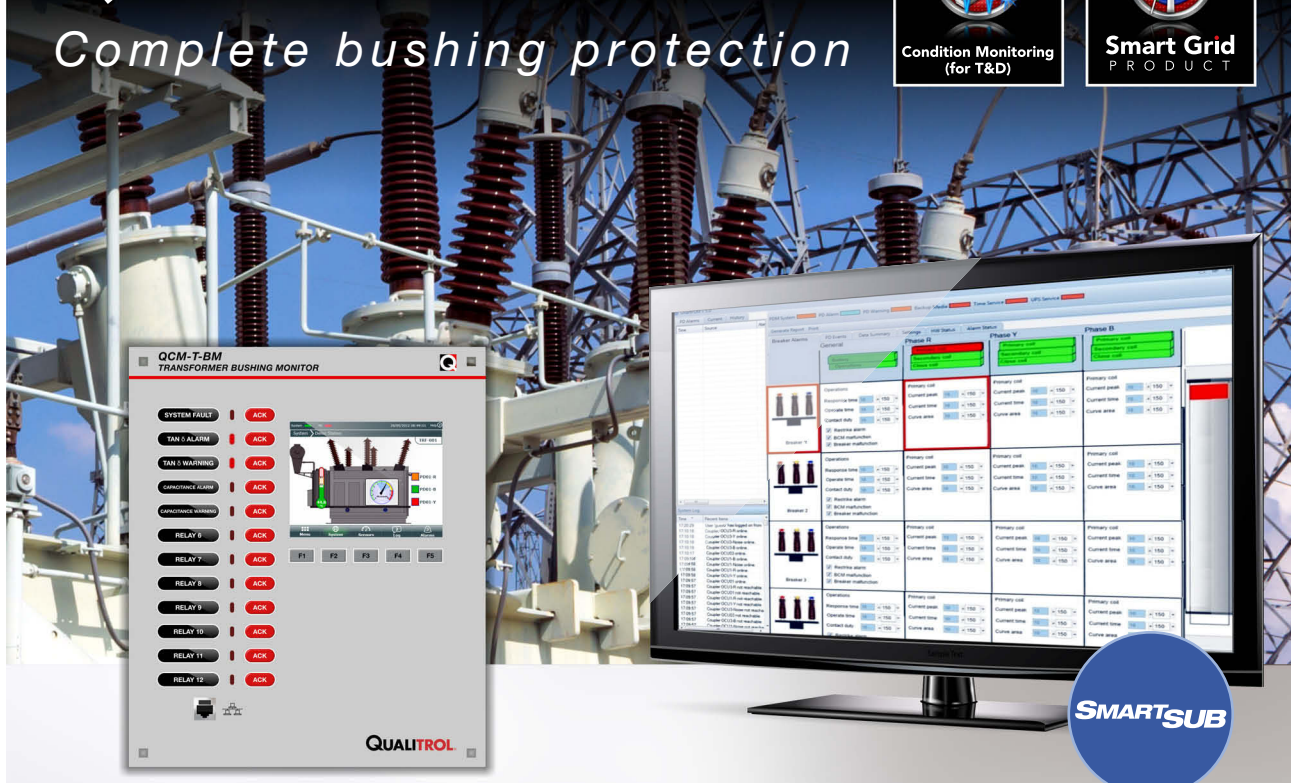
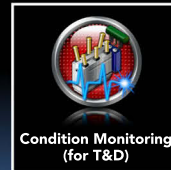
TECHNICAL SPECIFICATIONS

Equipment cabinet	Voltage range	90 to 264 V AC; 47 to 63 Hz
	Supply power	70 W
	Local MMI interface	5.7" resistive touch
	Inputs	6 x current inputs for leakage current from bushing tap 6 x temperature inputs for bushing tap temperature 6 x voltage (reference) inputs from existing VT / CVT
	Outputs	Software alarms and configurable LED (12) status indicators (bi-colour) for: <ul style="list-style-type: none"> • Tan δ Alarm • Tan δ Warning • Capacitance Alarm • Capacitance Warning • System Fault Up to 6 relay output for sending alarm to SCADA
Bushing sensors	Mounting	Screwed on the bushing tap
	Input	High voltage current signal from bushing taps
	Output	Analog current signal Temperature signal from temperature sensor
	Sensitivity	Voltage range: 0V to 150 Volt, 50 Hz / 60 Hz Temperature range: -50°C to +200°C
Bushing monitor base unit	Sample rate	200,000 samples/sec
	Memory	2 GB, upgradable (if required)
	Clock	1.6 GHz
	Data storage	16 GB
	Reporting	Daily, weekly, and monthly reports
Comms	Ethernet ports - external	RS-232, RJ45 (10/100 Mbps) Optional RS-485 (full duplex and half duplex)
	USB	One port to facilitate firmware upgrade, configuration upgrade and manual download of data
	Protocols	Ethernet / serial; Modbus (serial); IEC 61850
Environmental	Ambient operating temperature	-50° to +75° C [-58° to +167° F]
	Storage temperature	-25° to +85° C [-13° to +185° F]
	Humidity	5 - 95% Non-Condensing
	Enclosure rating	IP66
	Siesmic	IEEE C37.98 (Seismic Testing of Relays)
	Environmental test compliance	BS EN 60068-2-2 BS EN 60068-2-1, BS EN 60068-2-78
	Vibration test compliance	BS EN 68-2-6, BS EN 68-2-27 BS EN 68-2-29
Immunity	EMC test compliance	Confirms to relevant specifications for monitoring / control equipment in HV substations BS EN 55022 (:2006); BS EN 61000-3-2 to -3-3 BS EN 61000-4-2 to -4-6, BS EN 61000-4-8, BS EN 61000-4-11 BS EN 61000-4-18; IEC 60255-5, IEC 61180-1
	Others	EMI / RFI immunity



QCM-T-BM

Complete bushing protection



- Allows alarm, warnings and temperature compensation setting for each bushing separately
- Excellent interference immunity for Tan δ and capacitance measurement under difficult conditions
- Expandable software to integrate into SMARTSUB enterprise level monitoring
- Smart and Quick real-time alarming / alerting mechanism
- Implementation of efficient, condition-based maintenance strategies
- Reduces insurance premium of costly HV apparatus
- Tan δ and capacitance measurement for any kind of bushing
- Robust and rugged design - IP66 rated enclosure
- Supports IEC 61850

About QUALITROL®

Established in 1945, with continual improvement at the core of our business, QUALITROL® provides smart utility asset condition monitoring across the globe. We are the largest and most trusted global leader for partial discharge monitoring, asset protection equipment and information products across generation, transmission and distribution. At QUALITROL® we are redefining condition monitoring technology for Electric utilities assets.

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