

COMPLETE BREAKER CONDITION MONITORING



**Qualitrol® QBCM
Series**

**Next Generation Line of
Breaker Condition Monitors**

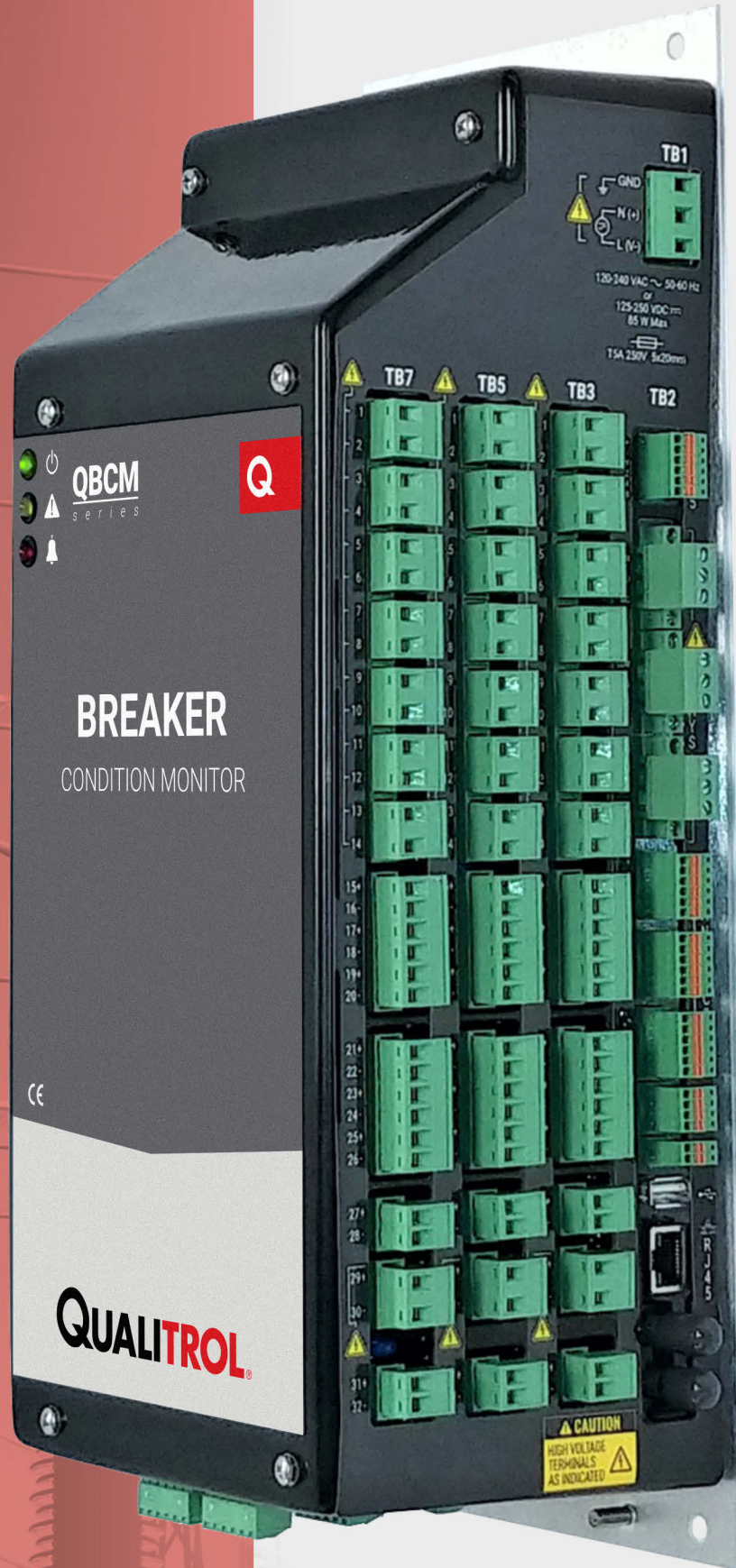
Reduce unscheduled asset downtime
and maintenance costs

Qualitrol® Company LLC

“

The QBCM is a one box solution for complete breaker condition monitoring. Self-learning with pattern matching algorithms that increase the reliability of asset health data whilst reducing false alarms, the QBCM supports the most effective condition based maintenance plans.”

- Shaival Desai, Product Manager





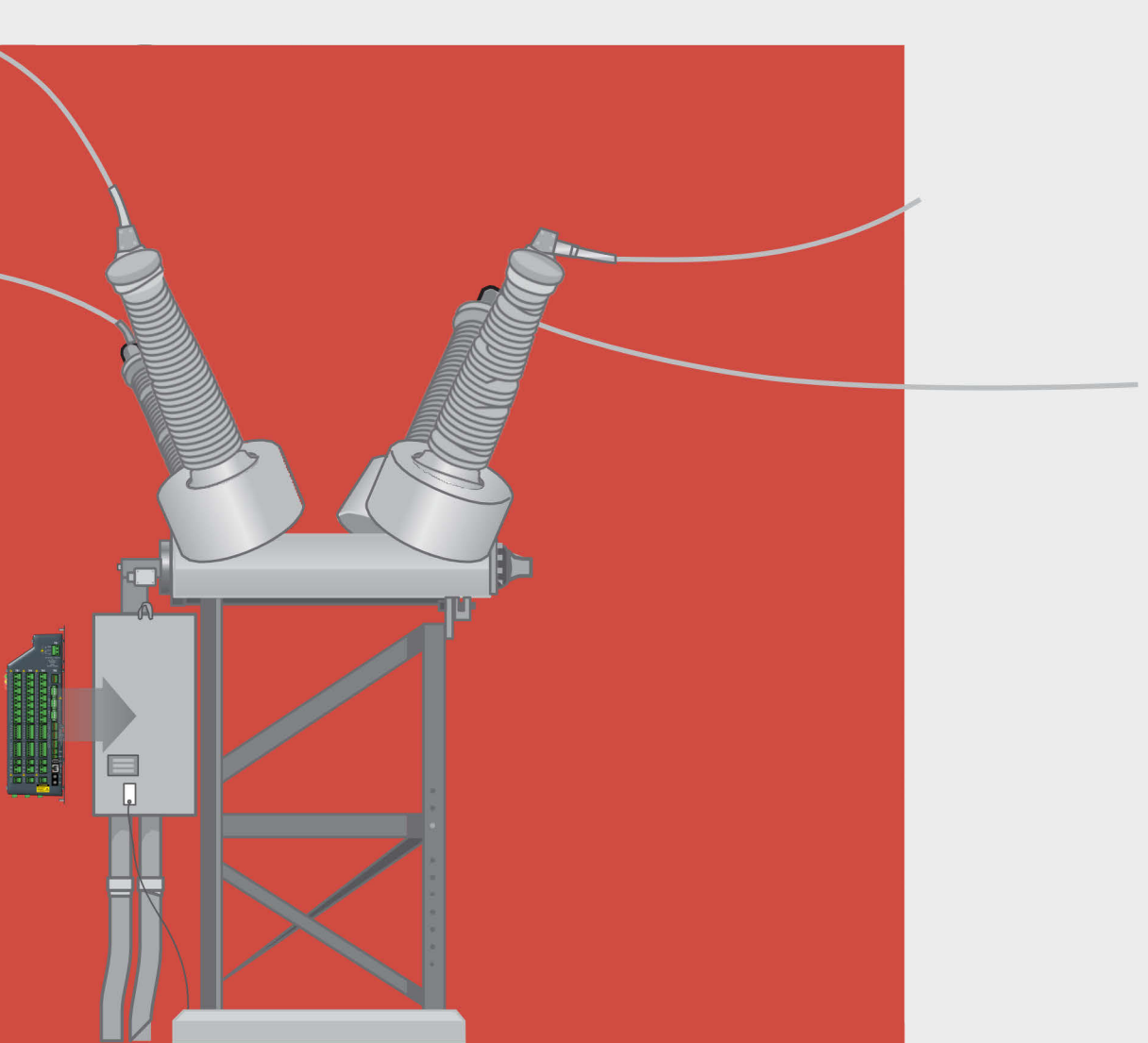
QBCM - The missing piece in your complete condition based maintenance and reliability plan

Circuit breakers aren't expensive when compared to other substation assets, so the temptation may be to simply replace them when they fail. But when they do fail, the damage to the rest of the system can be catastrophic.

The Qualitrol QBCM Series is a 24/7 online monitoring system for 69kv to 1200kv circuit breakers that pays for its modest investment by reliably detecting the smallest issues in the circuit breaker condition. Easy to install with plug-and-play sensors, the scalable QBCM Series increases grid reliability and safety by improving breakers condition awareness, and greatly reduces maintenance costs while it protects the cables and transformers in-line from over-load and damage.

Without circuit breaker monitoring, offline testing, which requires equipment to be taken offline for up to two days, is typically performed every two to six years due to its expense and intrusiveness. That infrequency of testing leaves large gaps of uncertainty in which failure and property damage can occur. In addition, offline testing doesn't catch any SF₆ leaks - or trigger coils, main contacts, motors and heaters deterioration - critical for safe and timely breaker operation.

The new QBCM series analyzes a circuit breaker by comparing the performance data against a reference/benchmark performance of that breaker. It is not mandatory to know the current condition of the breakers because the QBCM monitors create a benchmark of performance and provide a warning when it begins to degrade. This allows users to understand the Rate of Degradation *which is the key measurement for condition based maintenance planning.*



“Installation into the existing breaker control cabinet is easy, non-intrusive and cost effective - and typically performed in less than one working day.”

DRIVE OPTIMAL PERFORMANCE

Qualitrol has leveraged years of experience with monitoring devices across the power grid to develop a solution that protects critical assets, enhances your ability to implement proactive maintenance, and maximizes the uptime and reliability of expensive substation equipment. The QBCM delivers advanced features and options in 3 optimally configured models to drive the highest ROI in the market.





Protect

critical grid infrastructure

Circuit breakers protect other critical assets in the grid network - predict well in advance when they will not!



Enhance

business workflows

Quickly transform raw data into actionable insights and schedule maintenance operations around the most economically viable time



Maximise

return on investments

Grow ROI with this least invasive condition monitoring solution while putting other valuable technical resources to best use

The QBCM can store up-to 10,000 operation records with full waveform signatures and can automatically compare with a benchmark waveform signature ('fingerprint') for smart warnings on breaker behavior changes during any operation. The most advanced SF₆ density algorithms provide reliable and continuous monitoring of SF₆, including time to reach lock-out estimation with ±1 day precision and yearly and cumulative SF₆ emissions tracking.

Simple installation

- installation is non-intrusive and performed in less than one working day, about 50% better than popular options
- A smart form factor enables installation in existing breaker control cabinets, reducing the cost of any additional cabinets
- No electrical or mechanical modifications are needed in the circuit breaker
- Simplest software interface in the industry - semi-auto-commissioning capability*
- Magnetic feet eliminate the need for destructive mounting in the breaker cabinet

Increased safety

- Smart pattern matching algorithm catches critical issues with adjustable sensitivity

- Audio-visual alarms and warnings increase technician awareness and safety
- Simple, actionable insights allow maintenance teams to easily implement condition-based maintenance before damaging events occur

Greater Return On Investments

- Protects multimillion-dollar grid equipment for a small investment
- A smart dashboard delivers quick condition check with maintenance tracking
- Measures SF₆ gas in real-time, eliminating the need for manual tracking and reducing environmentally regulated leaks
- Software refined with rigorous usability testing reduces burden on the users to learn, operate and manage the devices



'Complete'

What defines a complete circuit breaker monitor?

Our full series of breaker condition monitors can suit almost any monitoring need, from essential to extensive, all as a single box solution. In addition, the QBCM even provides spare digital inputs to digitize alarms and reduce expensive copper cable runs. The QBCM also provides IEC 61850 capabilities for future smart substations.

MODULAR ANALYTICS

Qualitrol's comprehensive QBCM product portfolio is designed for flexibility to enable asset managers to choose the right analytics mix for their maintenance needs. With the QBCM smart dashboard providing a trusted digital representation of the actual as-operating state of the breaker, you'll eliminate inefficiencies, optimize operations, and improve profitability.



QBCM-LT

Provides *essential* condition monitoring for gang operated circuit breakers (GOB).



QBCM-ST

Provides *extensive* condition monitoring for gang operated circuit breakers (GOB).



QBCM-IP

Provides *advanced* condition monitoring for independent pole operated circuit breakers (IPOB).



Smart System Dashboard

For LT/ST/IP monitors. Provides real-time access to breaker misoperation data for the most informed decision making.

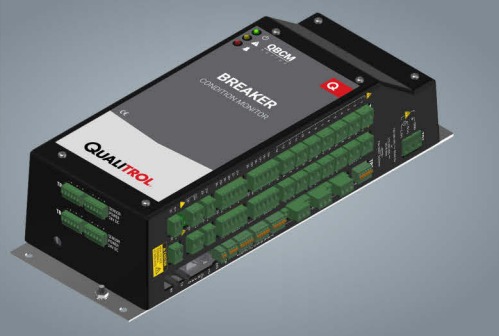
Monitors essential parameters:

- SF6 pressure, density and humidity
- Coil currents and voltages
- Phase currents
- Digital inputs
- Virtual contacts velocity monitoring

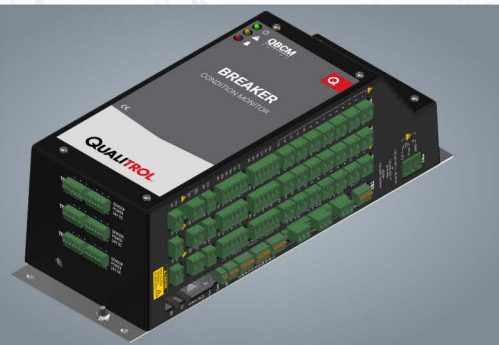


Field upgradable from the QBCM LT model with all the essential features plus:

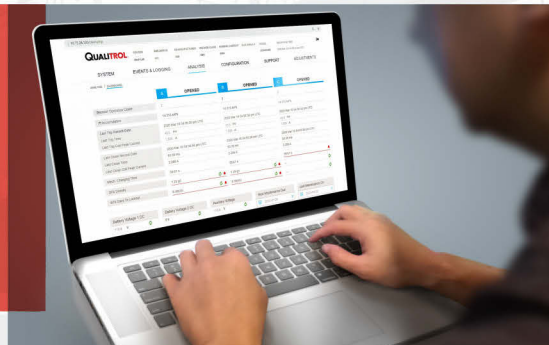
- Mechanism heaters monitoring
- Mechanism motors monitoring
- Extra digital inputs for alarms digitization



Flagship model with a full feature set for IPOB condition monitoring in a single compact footprint, greatly reducing installation time and effort.



QBCM smart dashboard is an essential tool where data is transformed into easy to read tracking visuals, helping operators understand data changes and deliver faster maintenance decisions.



TECHNICAL SPECIFICATIONS - POWER SUPPLY**QBCM****Universal power supply**

Input range	100 - 240 V AC, 125 - 250 V DC
Line frequency	50/60 Hz

TECHNICAL SPECIFICATIONS - INPUTS**Analog inputs**

3-phase currents	3 channels, 0-1 V AC or 0-333mV AC split-core CTs
Close coils	1-3 channels, 0-1 V DC shunt or hall effect sensor
Trip coils and B/U trip coils	2-6 channels, 0-1 V DC, shunt or hall effect sensor
Battery voltage	2 universal analog voltage inputs up to 299 V AC/DC
Auxiliary voltages	1 universal analog voltage input up to 299 V AC/DC
SF ₆ gas density/pressure/humidity/dewpoint	1-3 channel, 4-20mA for analog sensors (can also be used for hydraulic pressure) 1 channel, RS 485 for daisy-chained modbus sensors
Anti-condensation heaters	3 channels, 0-1 V AC or 0-333mV AC split-core CTs
Mechanism heaters	3 channels, 0-1 V AC or 0-333mV AC split-core CTs
Motor currents AC/DC	0-3 channels, 0-1 V AC or 0-333 mVAC split-core CT, shunts or Hall Effect DC sensor

Travel transducer

Mechanism travel stroke. And velocity (optional)	3 x RS 422 channels on mother board, stroke measured in mm, inches or degrees. Velocity calculated in meters/sec, feet/sec or degrees/sec
--	---

Digital inputs

Trip initiation A, B, C	1-3 channels, up to 250 V DC / 240 V AC, minimum 90 V
Backup trip initiation A, B, C	1-3 channels, up to 250 V DC / 240 V AC, minimum 90 V
Close initiation A, B, C	1-3 channels, up to 250 V DC / 240 V AC, minimum 90 V
52A auxiliary breaker contact status A, B, C	1-3 channels, up to 250 V DC / 240 V AC, minimum 90 V
52B auxiliary breaker contact status A, B, C	1-3 channels, up to 250 V DC / 240 V AC, minimum 90 V
Motor run timers 1, 2, 3	1-3 channels, up to 250 V DC / 240 V AC, minimum 90 V
Heater status 1, 2, 3	1-3 channels, up to 250 V DC / 240 V AC, minimum 90 V
Spare for alarms digitization	2-7 channels configurable option

All digital inputs are polarity free with special pitch terminal blocks offering easy mistake proof installation

TECHNICAL SPECIFICATIONS - OUTPUTS**Relays**

BCM failure alarm (Relay #1)	Dry contact 10 A at 250 V AC / 0.2 A at 125 V DC
Breaker failure alarm (Relay #2)	Dry contact 10 A at 250 V AC / 0.2 A at 125 V DC
User configurable alarm (Relay #3)	Dry contact 10 A at 250 V AC / 0.2 A at 125 V DC

TECHNICAL SPECIFICATIONS - PERFORMANCE		QBCM
LEDs / audible alarms		
Power (Green)	BCM power OK	
Warning (Amber)	Automatic warnings as compared with fingerprint	
Alarm (Red)	Hard limit alarms as configured	
3 kHz buzzer	For warnings, alarms and notifications - can be muted from UI	
Recording		
Resolution	User selectable for 32 / 64 / 128 samples per cycle	
Storage		
Data storage memory	8 GB microSDHC standard (up to 10,000 operations records)	
Reporting		
SF ₆ emission	Days to reach lock-out level, total emission and year-to-date emission reporting	
Breaker operation analysis report	A standard report with detailed analysis for every breaker operation. Includes comparison with stored reference fingerprint operation record. Mechanism operation time, auxiliary contact time, current interruption time, motor run time, peak motor current, restrike detection, travel transducer sensor data	
Communications		
Hardware media types	1 x 10/100Base RJ-45, 1 x 100Base-FX with ST connector, 1 x USB 2.0 port, 1 x RS 485 copper port	
Protocols	DNP3.0, IEC 61850, Modbus	
Time sync inputs	NTP Standard or optional IEEE 1588 PTP	
Environmental		
Ambient operating temperature	-40° C to +75° C [-40° F to +165° F]	
Storage temperature	-55° C to +85° C [-67° F to +185° F]	
Humidity	5 - 97%, non-condensing	
Enclosure rating	IP20 (for installations inside breaker control cabinet) Optional IP67 enclosure for external mounting	
Seismic	IEC 60255-21-3	
Low temp, dry heat and damp heat Vibration and shock test compliance	BS-EN60068-2-1; BS-EN60068-2-2; BS-EN60068-2-56 BS-EN60068-2-6; BS-EN60068-2-27	
Immunity		
EMC test compliance	Conforms to relevant specifications for monitoring / control equipment in HV substations: BS-IEC-EN 61000-6-5:2015; BS-IEC-EN 61 000-3-2,3; BS-IEC-EN 61000-4-2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 16, 17, 18, 19, 29; IEEE-ANSI C37.90.1; IEC 810-2	
Others	BS-EN60255-27:2013 Safety; BS-EN 60255-5 sections 6 and 7 dielectric tests; IEC 60255-22-1 1 MHz burst immunity to noise, 2.5 kV EMI / RFI immunity	
Mechanical		
Dimensions	381mm x 140mm x 70/89/115mm (H) [15" x 5.5" x 2.75"/3.5"/4.5"]	
Weight	~0.8kg - 1.5 kg [~1.76lbs. - 3.3 lbs.]	

SYSTEM SENSORS

Our sensors are key components of the QBCM breaker condition monitoring system. Specifically designed for ease of installation, they send all signals to the QBCM data acquisition system for interpretation. Support for 3rd party or OEM provided sensors is also available.



AC current sensor:

The CT can be mounted to existing panels to measure or monitor AC current. These split-core CTs can be mounted without removing existing cables for ease of installation. The CTs are available in different measuring ranges to be used for phase current, motor currents and heater currents.



DC Hall effect sensor:

The DC hall effect sensor is a solid core high accuracy and very short response time solution to capture the coil signatures with maximum details and reliability. This sensor provides a reliable, non-intrusive solution for retrofit applications. The output of the sensor is 0-1V. OEM installed shunts can substitute these sensors for new breakers.



SF₆ sensors:

The QBCM supports analog and Modbus sensors. Analog sensors provide one parameter, while Modbus sensors provide multiple parameters. Sensors are available in density only versions, density/pressure/temp. versions and density/pressure/temp./dew-point versions. Adapters for DN8 and DN20 are also available for installation.



Travel transducers:

A rotary travel transducer is available for installation on breaker mechanism shafts. Standard 8mm and 10mm flexible couplings are available for the installation. Linear transducers may be available as a customer special solution.