

# BM201

Transformer Bushing Monitor

# BM201

## Advanced Bushing Monitoring Module for Industry Applications



**Rugged Monitoring BM201 is an online bushing monitoring module designed compactly to monitor real time condition of the Bushings.**

Rugged Monitoring's BM201 bushing monitor detects insulation deterioration and other faults early on, ensuring accuracy and dependability in high-voltage substation environments. It measures power factor/tan delta and capacitance for precise early fault analysis, reducing transformer outages caused by bushing failures.

Providing a comprehensive view of the transformers bushing conditions BM201 combines accuracy and easy to use software which can further be expanded to additional transformers. It is available as a stand-alone or comprehensive system integrated with other transformer monitoring solutions and can stably monitor maximum upto 6 bushings.

Using custom-made adapters connected at the bushing test taps, the BM201 employs a balanced-current (Sum-of-Currents) method to monitor leakage currents across all three phases. It continuously measures:

- The variation in leakage current relative to baseline values derived from the bushing's nameplate data, enabling detection of changes in capacitance or insulation condition (i.e., Tan  $\delta$ ).
- The phase-angle differences between the leakage currents of the three bushing phases (i.e., the timing discrepancies) reflect subtle shifts in power factor, providing insight into insulation deterioration.

These key measurements (leakage current magnitude changes and inter-phase phase angle shifts) are used to infer early-stage bushing faults. The BM201 then transmits the calculated parameters (Tan  $\delta$  rate-of-change, capacitance, and voltage metrics) to third-party systems via Modbus RTU over RS-485 for real-time monitoring. The BM201 also captures the hourly average of the Tan  $\delta$ , Capacitance, and Voltage (absolute and rate of change). It has the capability for data integration across multiple monitoring platforms.



## » Benefits

- Minimize asset outages due to bushing failure
- Efficient to avoid most dangerous catastrophic failures of bushings
- Optimize bushing replacement planning: RoC of Tan  $\delta$  and capacitance.
- Cost optimized solution for different types of electrical asset
- Faster integration with SCADA or Cloud

## » Applications

- Monitoring of condensing/ capacitive type bushings
- Monitoring of Transformer Bushings

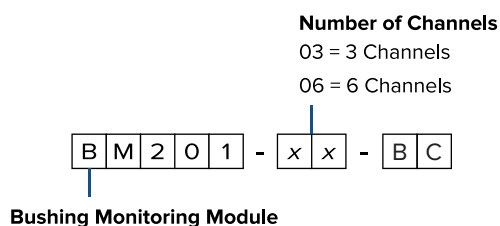
## » Features

- More than 45 + customizable bushing tap adaptors
- Highly accurate measurement for Tan  $\delta$  and Capacitance
- Double protection for earthing link breakage
- Easy to install and commission
- Support for multiple technologies of bushing monitoring Sum of Current Method (Balance Current Method) and Reference Method

## » Technical Specifications

ELECTRICAL SPECIFICATIONS	Measurement Range Leakage Current	1 to 280 mA, with minimum resolution of 0.1 mA
	Sampling Rate	3kS/s
	Bandwidth	2-90Hz
	Resolution	16 bits
	<b>Measurement Accuracy</b>	
	- Leakage Current	$\pm 0.5\%$
	- Tan Delta/Power Factor	$\pm 0.1\%$
	- Capacitance	$\pm 0.5\%$
	- Voltage	$\pm 0.5\%$
	Amplitude measurement error	$\pm 0.5\%$
	Phase angle measurement error	$0.05^\circ$
COMMUNICATION	Scan Rate	1 sec/channel
	Power Input	24V (Default) or 48V
	# of Relays Outputs	01 x Fail Safe Relay for System Failure
ENVIRONMENTAL SPECIFICATIONS	Serial Port	RS-485 with Modbus RTU
	Configuration Port	USB (to use with Rugged Connect windows software)
	Operating Temperature	-25 °C to 75 °C
MECHANICAL SPECIFICATIONS	Storage Temperature	-40 °C to +85 °C
	Humidity	95% Non-Condensing
	Dimensions	4.92" x 4.92" x 1.89" (125mm x 125mm x 48mm)
	Number of input Channels	3 or 6 channels

## » Ordering Code



### CERTIFICATIONS



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