

DTM-Series

Dynamic Ratings

Distributed by AKRIBIS





DM Series

Diagnostic Transformer Monitor



Improved Reliability



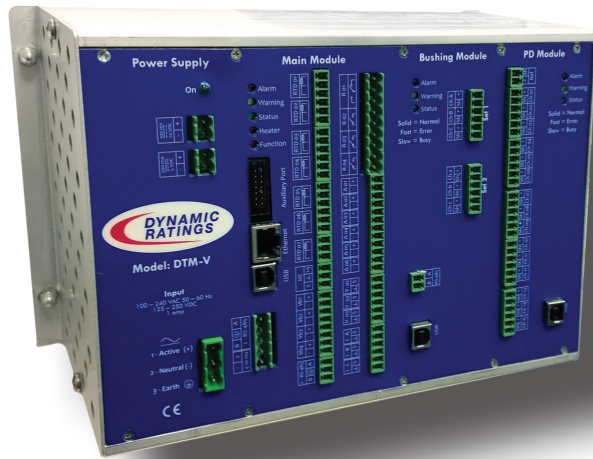
Cost-Effective



Optimal Design

RESPONSIVE

ASSET HEALTH SOLUTIONS



Transformer Bushing and Partial Discharge Monitoring

The Diagnostic Transformer Monitor (DTM) can detect problems in transformer bushings and windings, de-energized tap changer, OLTC/LTC and the bus connected to the transformer. Equipment health is easy to understand via Red-Yellow-Green indicators. Monitor configuration, historical data and detailed diagnostics provide an indication of the location, type and rate at which a problem is developing.

Partial discharge monitoring complements the bushing monitoring features of the DTM and the monitoring capabilities of a DGA device by identifying the location of the problem (identifying which phase and which winding). Online partial discharge monitoring responds faster than dissolved gas analysis, allowing correlation of the problem activity with various operating conditions. In all cases, the DTM's partial discharge monitoring provides a second level diagnostic confirmation of problems without taking an outage.



Improved Reliability

Implement a DTM into your condition maintenance program to avoid unnecessary maintenance tasks and focus limited resources on equipment with immediate needs. Many transformer failure modes are easier to detect online at operating voltage and temperature than during 10KV tests conducted at ambient. Further, the gestation time of many failure modes is significantly less than the offline testing cycle. The DTM's continuous assessment of equipment health will catch more problems and provide indication much earlier than off-line tests.



Cost Effective

Time based maintenance is costly and with each time equipment serviced, an element of risk is introduced by the maintenance task itself. The DTM serves as the cornerstone of condition maintenance programs at many utilities, capable of detecting problems in the main transformer tank, LTC compartment, bushings and interconnected iso-phase bus, allowing utilities to reduce O&M costs by scaling back or eliminating many time based maintenance activities.



Optimal Design

The modular design allows selection of the appropriate scope of monitoring for any distribution, transmission or generation application. Systems can be provided with the partial discharge capabilities built-in or with provisions to support periodic online partial discharge testing.

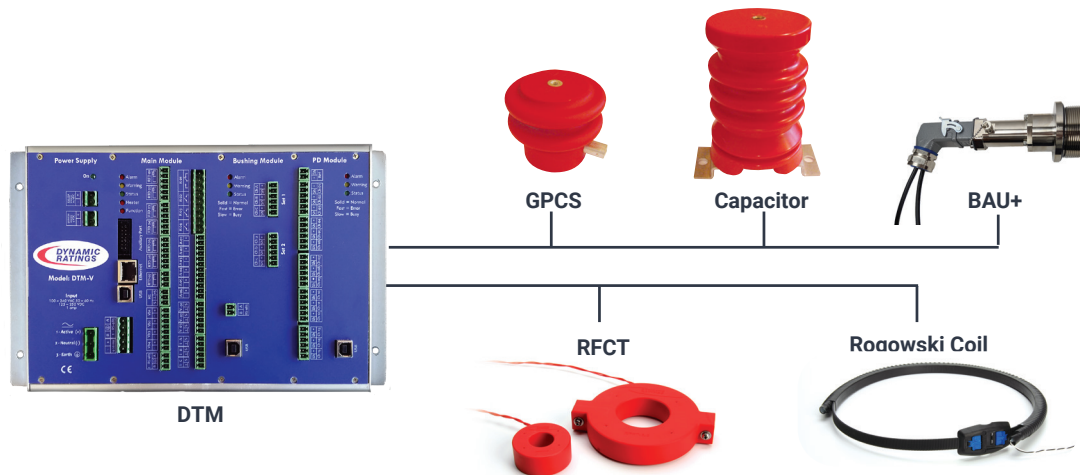
Capabilities

Features and Benefits

- Provides indication of the bushing power factor and capacitance while transmitting the high frequency partial discharge signal to support a second level diagnostic.
- DTM's correlation of temperature and humidity with the measured condition provides better and earlier indication of bushing problems.
- The DTM is designed for harsh ambient conditions including - 40° C to 70° C (- 40° F to 158° F), without the need of additional heating or cooling.
- A full range of advanced noise cancellation filters provide the ability to identify and eliminate external noise.
- The DTM with an iBridge IED Networking Solution option, offers secure and reliable communications as an affordable alternative to installing new communication cable or fiber.

Compatibility with multiple sensors

The DTM's ability to use a wide variety of sensors allows the system to be extended or expanded to provide coverage to all electrical aspects of the transformer including bushings, incoming cable connections and/or iso-phase bus.



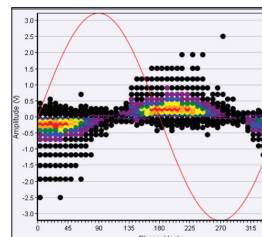
Analytic Capabilities

Electrical Partial Discharge

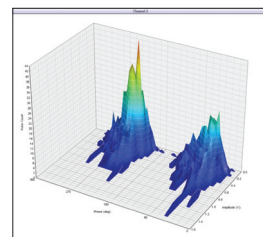
Trending is very important when analyzing partial discharge data. Trends of Magnitudes (mV or pC), Pulse Counts (Pulses Per Second) and Partial Discharge Intensity (PDI) are all key elements. The DTM will alarm on user selected values of both Magnitudes and PDI as well as trends. Correlating PD activity with load, oil temperature and LTC position provides additional diagnostic insight. Phase resolved data patterns are also generated (see examples below) enabling diagnosis of the type of discharges that may be occurring.

Partial Discharge Module Features:

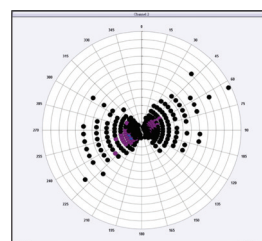
- 15 PD channels per module with simultaneous data acquisition on all channels
- Each channel is fully configurable
- Records pulse counts and pulse magnitudes
- Tracks full phase resolved data
- Stores up to 2 years of data with standard configuration
- Enhanced noise cancellation technology
- Two levels of alarming
- Configurable alarms for PD magnitude (mV or pC)



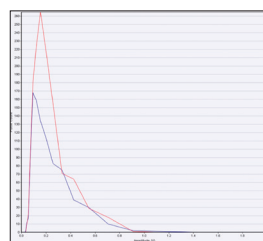
2D Phase Resolved



3D Phase Resolved



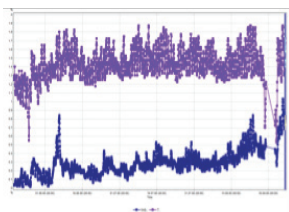
Polar Phase Resolved



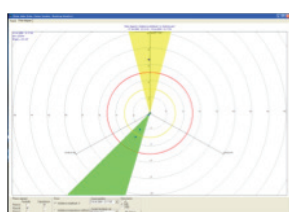
Pulse Height Distribution

Advanced Analytics

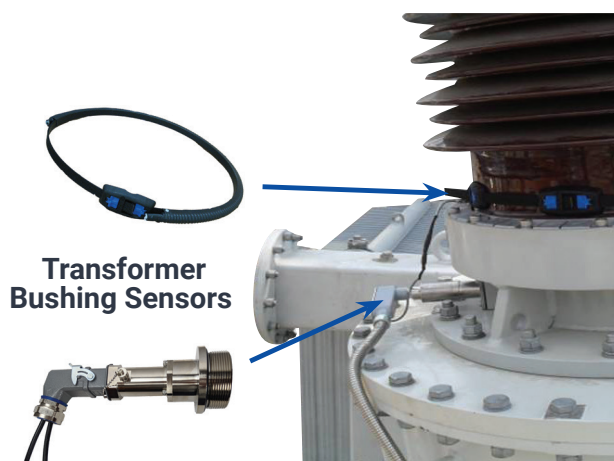
The key analytic for bushing monitoring is the magnitude and trend of the current imbalance. A DTM can provide system alarms on both of these quantities. Secondary analytics include behavior of the current imbalance with top oil temperature and the vector of the current imbalance. The magnitude of the current imbalance will provide information as to how severe the problem is. The vector will provide the indication of which bushing is failing and will identify if the power factor or capacitance of the bushing is changing.



Trend Showing Severity



Vector Identifies Bushing Phase



Option Modules

Bushing and Partial Discharge Monitoring Functionality

DTM systems allow up to four optional modules with a minimum requirement of one optional module, selecting either a bushing health or partial discharge module. Select no more than two of each module below.

Bushing Health Monitoring Module

Continuous online monitoring of bushings provides real-time information of bushing capacitance and power factor which can result in the early detection of a possible failure. DTM may be ordered with up to two optional bushing modules.

Temperature Correlation

The bushing module collects top oil temperature, load current and humidity inputs to provide a correlation with the bushing condition. This allows the system to reveal whether there is a specific inception point where the equipment deterioration accelerates.

Discrete Readings

The bushing module provides a discrete reading for each bushing. The reference is rotated to each of the three bushings providing the same high quality of reading on each bushing.

Diagnostic Software

Each system is provided with diagnostic software capable of providing polar plots, trending and data correlation making it easy to diagnose the severity, rate of change and whether the deterioration has a correlation to temperature, load or humidity.

Electrical Partial Discharge Monitoring Module

The partial discharge module measures electrical partial discharges in the transformer, bushing, and when applicable, the connected Iso-Phase Bus. DTM may be ordered with up to two optional modules.

Complementing DGA and Bushing Monitoring

Electrical PD monitoring is the perfect second level diagnostic tool to complement DGA and bushing monitoring systems. While a DGA system can indicate the type of fault, the electrical PD system can identify electrically where a fault is in the tank (identifying the phase and the winding).

Identification of the Fault Inception Point

DGA systems have an inherent delay in detecting problems due to the time it takes for fault gasses to diffuse throughout the oil, get to the sampling point, travel through the oil lines and then to wait for the next DGA sample test to occur. PD systems provide an immediate response to changes. Online systems provide correlation between operating conditions to identify the specific inception point for the fault.

PD Compatible

Dynamic Ratings model BAU+ bushing sensors are fully compatible with the use of the Partial Discharge module. Whether the PD option is included in the system or whether a portable PD system is used as a second level diagnostic, this compatibility provides a great advantage in diagnosing issues.

Detection of Additional PD Sources

The PD module can detect PD activity in places that cannot be detected by DGA or bushing monitoring. This includes activity within the OLTC (LTC) or in the connected Iso-Phase Bus.

Advanced Filtering

The system uses multiple filtering methods to differentiate high frequency signals originating from outside the equipment from actual PD activity within the equipment.

Sensor Compatibility

The system can use a wide range of sensors including bushing sensors, Rogowski coils, coupling capacitors, radio frequency CTs (RFCTs) and ground path current sensors (GPCS).

Accessories & Specifications

Sensors & Accessories

Part Number	Description
AuxCT	Current Transformer with Burden Resistor (5A Primary)
AmbH	Ambient Humidity Sensor
AmbT	Ambient Temperature Sensor
SE-060	RTD temperature sensor probe for 1/2" NPT Thermal Well
MMTS-3C	Magnetic Mount Temperature Sensor (3 wire PT-100 RTD) *Includes 1/2" NPT conduit connection.*
MMTS-3Wxx	Magnetic Mount Temperature Sensor (3 wire PT-100 RTD) *Includes stainless steel armored cable. Specify length of 25 ft., 50 ft. or 75 ft. (7.62m, 15.24m or 22.86m).

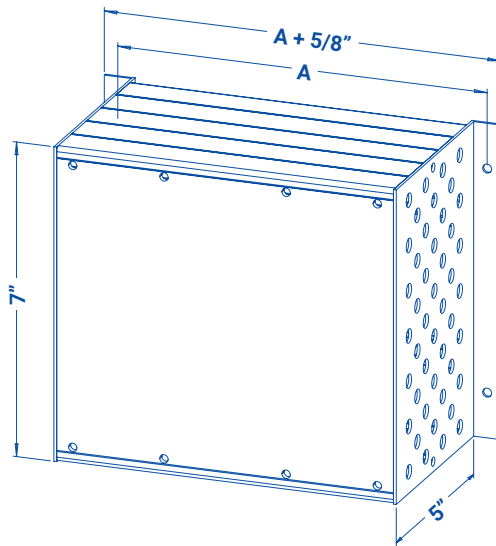
*Minimum required: RTD for top oil and one CT for winding temperature.

Specifications

Power Requirements:	100 - 240 VAC line voltage (50 – 60 Hz), 125-250 VDC
Internal Memory:	8 MB
Temperature Range:	-40°C to 70°C (-40°F to 158°F)

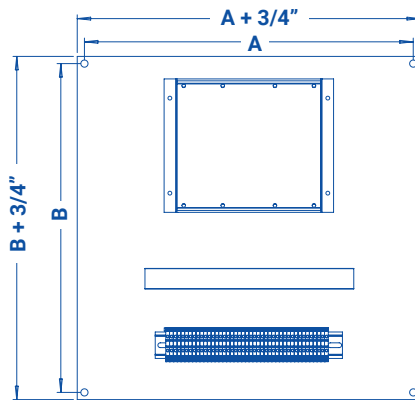
Standalone (S)	Panel Mounted (P)	Enclosure Mounted (E)
Includes: <ul style="list-style-type: none"> Monitoring Instrument populated with field wiring connectors Diagnostics Software 	Includes Option (S) and: <ul style="list-style-type: none"> Instrument mounted on an aluminum sub-panel with all functional connections wired to terminal blocks Shorting blocks are provided for bushing sensor connections Ambient temperature sensor wired Ambient humidity sensor wired 	Includes Option (P) and: <ul style="list-style-type: none"> Instrument mounted inside a NEMA 4 painted steel enclosure with all functional connections wired to terminal blocks Shorting blocks are provided for bushing sensor connections

Standalone (S)



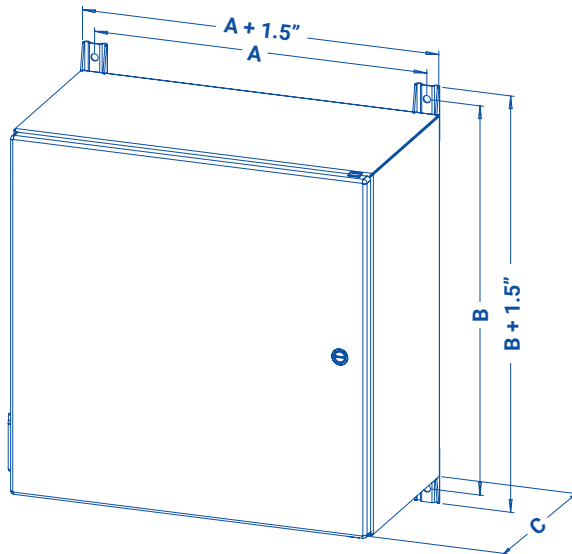
Number of Optional Modules	Dimension "A" (Mounting Hole Dimension)
1	20.64 cm / 8.125 in.
2	25.72 cm / 10.125 in.
3	30.80 cm / 12.125 in.
4	35.88 cm / 14.125 in.

Panel Mounted (P)



Number of Optional Modules	Mounting Hole Dimensions
1	31.12 cm x 36.20 cm (12.25 in. x 14.25 in.)
2	43.50 cm x 43.50 cm (17.125 in. x 17.125 in.)
3	Consult Factory
4	

Enclosure Mounted (E)



Number of Optional Modules	Dimension "A x B x C"
1	31.75 cm x 35.56 cm x 22.86 cm (12.5 in. x 14.0 in. x 9 in.)
2	46.99 cm x 54.61 cm x 27.94 cm (18.5 x 21.5 in. x 11 in.)
3	Consult Factory
4	



An ISO 9001, ISO 14001, ISO 27001, ISO 45001 Certified Company.

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