



MODEL AT-8000

# EARTH FAULT RESISTANCE MONITOR

- Continuous online monitoring of faults while rotating or at standstill
- Fault resistance trending
- Continuously monitors field excitation voltage
- Alarm relay contact outputs
- Fault location indicator for ease of diagnosis and repair

## TYPICAL APPLICATIONS

- Rotor protection through condition based maintenance
- Predictive maintenance for large generators and motors

## CONTINUOUS ON-LINE MONITORING

The Earth Fault Resistance Monitor (EFREM) provides continuous wireless monitoring of insulation fault resistance and field voltage on brushless exciter generator/motor field windings, combining advanced ground fault measurement techniques with the latest innovations in digital telemetry.

The detection of field ground faults on generators or synchronous motors with brushless exciters has always been difficult. Conventional field ground detectors may detect the occurrence of faults but provide no advance warning or indication of the fault's severity. The severity at the detection threshold may vary by several orders of magnitude, depending on fault location.

By combining a new generation of 16-bit digital rotor telemetry technology for the measurement of generator ground faults, Accumetrics overcomes these limitations with EFREM. Measurement of actual resistance allows users to monitor trends over time and track the progression of ground faults from their onset. This provides an early warning of impending failure and allows for predictive maintenance of a machine. The severity of ground faults can be used in making operational and maintenance decisions.

SPECIFICATIONS	
<b>Field Voltage</b>	
Measurement Range	0 to 500 VDC (Contact factory for other ranges)
Measurement Transient without Damage	1000 volts for 5 seconds
<b>Resistance Measurement</b>	
Measurement Range	0 to 80 M ohms
Accuracy (readings through digital interface)	Sum of $\pm 250$ ohms and $\pm 0.5\%$ of reading over the range of 0 to 500k ohms (exclusive of the effects of AC content and noise from the excitation system)
<b>Earth Fault Location Factor</b>	
Range	0 to 100% representing ratio of potential at fault to total field voltage (0 at negative terminal and 100% at positive terminal)
Accuracy (readings through digital interface)	$\pm 1\%$ for a 10k ohms fault. Computation of location factor of field voltage accuracy is specified for $\geq 25$ V
<b>Receiver</b>	
Alarm Outputs	
Earth Fault	Two independent alarm resistance, user selectable via computer interface from 500 Ohms to 1M ohms
Malfunction	Active upon detection of a malfunction in Monitor operation or loss of receiver power
Alarm Interfaces	Form C relay; 6 A / 250 VAC
Analog Outputs	
Analog Outputs Option	Option: Dual analog outputs Field V and Log Resistance (4-20 mA) Note: this adds $\pm 0.25\%$ full scale current loop inaccuracy
Digital Interface	
Computer Interfaces	RS232, Ethernet
Output Data	Earth Fault Resistance, Field Voltage, Location Factor when faults occur, Alarm and error conditions
User Settings	Alarm Resistance Thresholds, Dwell Times, Network Settings
Software	EFREM view data display and .CSV format PC data archiving
Power	85 to 250 VAC 50 / 60 Hz, $< 20$ W
<b>Physical</b>	
Transmitter Weight	2.2 lb (1 kg) for shaft end mounting
Rotor Connections	Field Positive Terminal
	Field Negative Terminal
	Rotor Earth/Ground

SPECIFICATIONS (continued)	
<b>Environment</b>	
Ambient Temperature	32–185 °F (0–85 °C) at Rotor Module 32–122 °F (0–50 °C) at Receiver Unit
Rotor Speed	0 to 3600 RPM for center-line and mid-shaft mounting ( $\leq 16$ " Outer Diameter) Call factory for larger shaft diameters or specialized mounting



Mid-shaft EFREM



End of Shaft EFREM



EFREM Receiver