AT-6000 GDS Ground Fault Detection System

Field ground fault monitoring for synchronous generators/brushless excitation using digital telemetry

Accumetrics developed the GDS for use with large, turbine-driven synchronous generators. The system detects the occurrence of ground fault leakage current between the generator field circuit and rotor ground, and transmits a good/bad fault determination (based upon a fixed leakage current threshold) from the rotor transmitter to the non-rotating receiver.

Note: Although the AT-6000 is available, the newer Accumetrics AT-8000, and AT-8300 products are recommended as an upgrade path. These provide ground fault alarms and valuable trending information based on the resistance of the fault, and are not sensitive to the fault location voltage. Contact Accumetrics for information on these.

The AT-6000 GDS system uses a wireless inductive coupling technique to convey electrical power to the rotor and transmit data off the rotor. It provides reliable transmission of data which is unaffected by electrical noise, dirt, or contamination. During normal operation, power to operate the transmitter circuitry is transferred from the stationary antenna loop as a radio frequency.

With a copper tubing pickup loop, the Ground Detection system operates under any machine condition; it does not require the generator to be rotating or the field excitation to be activated. The transmitter auxiliary signal monitoring circuit provides a communications interface for a discrete signal from a rotor-mounted electronic module, such as a diode fault detector, and transmits this signal off the rotor to the stationary receiver. The paddle style receiver design requires rotor RPM for operation. The AT-6000 series has been provided to OEM’s and end users since 1999.
Ground Fault Detection Method

The rotating transmitter module contains circuitry capable of detecting the occurrence of a ground fault condition. The ground fault condition is defined as an electrical leakage path modeled as a resistor $RL$ which may exist from any point along the field winding to the rotor ground. An effective ground fault detector must respond to ground faults at any location on the field winding. The ground fault detection circuitry makes an electrical connection between the rotor ground and the negative side of the field, introducing a small DC voltage that elevates the negative side of the field above ground. In this manner, a current will flow through $RL$ even when the ground fault exists in the negative terminal of the field. This current is measured within the ground detector and activates a ground alarm if the current exceeds a fixed threshold.

### Specifications

<table>
<thead>
<tr>
<th>Mechanical requirements</th>
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</thead>
<tbody>
<tr>
<td>Rotor Axial Growth</td>
<td>25.4 mm span</td>
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<tr>
<td>Radial Gap</td>
<td>15 mm nominal</td>
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<tr>
<td>Ambient Temperature</td>
<td></td>
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<tr>
<td>transmitter/antenna: -40 to 70 °C</td>
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<tr>
<td>power supply/receiver: 0 to 70 °C</td>
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<table>
<thead>
<tr>
<th>Ground Fault Detection</th>
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<tbody>
<tr>
<td>Minimum threshold for detection</td>
<td>60 kOhms typical</td>
</tr>
<tr>
<td>Bias voltage</td>
<td>12 V typical</td>
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<thead>
<tr>
<th>Signal Output</th>
<th></th>
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<tbody>
<tr>
<td>Signal levels</td>
<td>0 V low, 24 V high</td>
</tr>
<tr>
<td>System malfunction</td>
<td>Alarm – high</td>
</tr>
<tr>
<td>Ground fault alarm</td>
<td>Alarm – low</td>
</tr>
<tr>
<td>Auxiliary system</td>
<td>Alarm – low</td>
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<thead>
<tr>
<th>Auxiliary input</th>
<th></th>
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<tbody>
<tr>
<td>Input current for detection</td>
<td>1 mA min., 40 mA maximum @ 70 °C</td>
</tr>
<tr>
<td>Input type</td>
<td>Optically isolated current input</td>
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<tr>
<th>Power requirements</th>
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<tbody>
<tr>
<td>Voltage</td>
<td>120 VAC/240 VAC 50/60 Hz</td>
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<tr>
<td>Watts</td>
<td>50 W maximum</td>
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### Benefits

Accumetrics offers these advantages over conventional technology:

- Wireless data transmission
- Unaffected by noise, dirt, or contamination
- Self-checking device for data accuracy
- Proven design
- Auxiliary motor input

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**About Accumetrics:**

Founded in 1991, and a part of PCB Group (2013), Accumetrics is a world leader in rotor telemetry, pioneering in every phase of rotor telemetry, from quickly applied single channel dependable torque systems to advanced aerospace systems with hundreds of high bandwidth channels. No matter your industry or what your telemetry requirement, chances are we can provide a system that will meet your needs.

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