



GPM-F

FIELD GROUND PROTECTION

Complete Generator System Protection

KEY BENEFITS

- Providing advanced field ground fault protection for generator applications
- Allowing both single point and double point injection methods provides optimal application flexibility depending on system configuration
- Reduce generator down-time by locating the fault within the field winding when connected in single point injection method
- Designed to operate with Multilin's industry leading G60 Generator Protection System
- Continuously monitors and protects the generator during stopped, starting and running conditions for increased asset life
- Reduce system configuration time by configuring the Field Ground Protection Module through the G60 Generator Protection System and the easy-to-use EnerVista Setup Software
- Increase generator lifespan by easily upgrading your current G60 generator protection relay with the Field Ground Protection Module
- Simplified setup and configuration using EnerVista setup software

APPLICATIONS

- Medium to large generator applications
- Deployable with redundant generator protection systems
- Suitable for use with generator field voltages up to 800VDC

FEATURES

Protection

- Two stage field ground resistance based element - 64F
- Wide range fault resistance coverage (1- 500Kohms)
- Injection frequency range 0.1 – 3Hz based on field winding capacitance
- Fault location feature while using single point injection
- Brush-lift off detection
- Injection blocking input for field flashing condition
- Supports redundant G60 configurations
- Field over current and field under current elements using dcmA input of G60

Diagnostics

- Injected voltage and frequency supervision
- Extensive internal diagnostics with critical-fail relay
- G60 detects loss of communication with GPM-F



Digital Energy

Protection & Control

The G60 Generator Protection System provides comprehensive protection for medium and large generators, including large steam and combustion turbines, combined-cycle generators and multi-circuit hydro units. The G60 includes advanced automation and communication capabilities, extensive I/O options, and powerful fault recording features that can simplify postmortem disturbance analysis and help minimize generator downtime. As part of the UR Family, the G60 provides superior protection and control that includes:

Field Ground Protection:

Field ground protection identifies occurrence of ground fault in a generator field winding and helps to prevent serious damage to the generator, maximizing operational lifespan. The field ground protection module, GPM-F works in combination with the Multilin G60 to detect ground faults in the field winding of the generator. Providing application flexibility, the field ground protection module can be configured for either single point injection or double point injection

based on application requirements. The solution includes: two stage field ground detection, injected voltage and current supervision, brush lift-off detection, field over and under current elements and field ground fault location.

If the rated field voltage of the generator is less than or equal to 600 Vdc, then a single box solution is provided. However if the rated field voltage of the generator is between 600-800Vdc, then an external resistor box is provided to facilitate safer installation and operational practices.

Single point Injection

Providing application flexibility and diagnostic information, single point injection provides the ability to quickly identify the fault location in the field winding, thus reducing damaging the generator and reducing down-time. Single point injection can't be used on generators with brushless excitation unless both poles of the field winding is directly connected to a brush.

Double point Injection

In addition to single point injection, the GPM-F module allows for ground fault

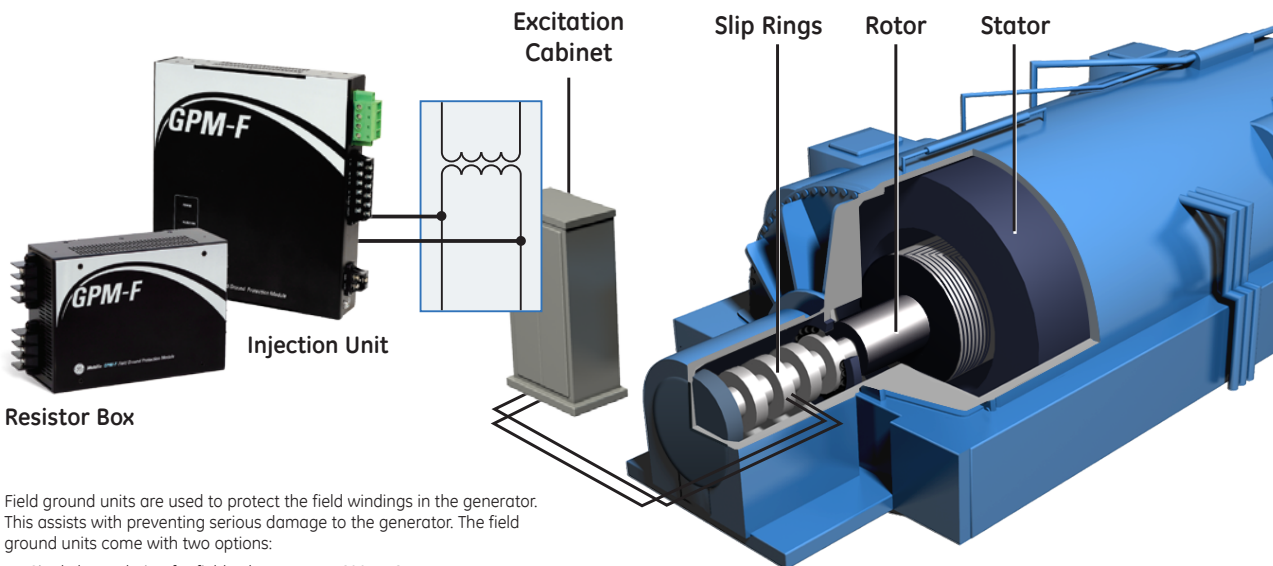
G60 Generator Protection Integration



- The G60, GPM-S, and GPM-F modules provide complete generator protection
- GPM-S & GPM-F Protection units are connected directly to the G60 relay
- All configuration and monitoring is performed through the G60

detection via double point injection. Double point injection has typically been used on applications where generators are equipped with static excitation. When the GPM-F is connected for double point injection the fault location feature is not available. It is recommended that if fault location is required that the GPM-F be configured for single point injection.

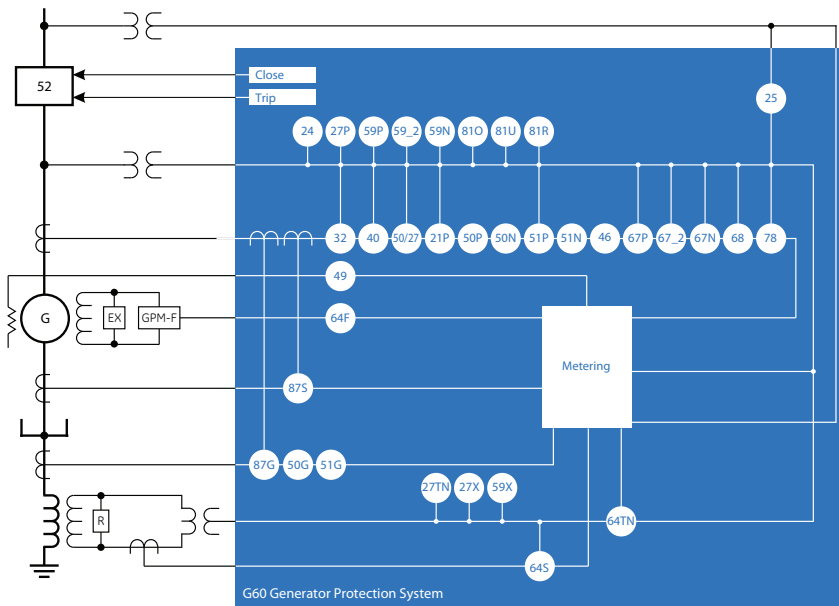
Field Ground Fault Detection



Field ground units are used to protect the field windings in the generator. This assists with preventing serious damage to the generator. The field ground units come with two options:

- Single box solution for field voltages up to 600 VDC
- An additional resistor box for field voltages between 600-800 VDC

Functional Block Diagram



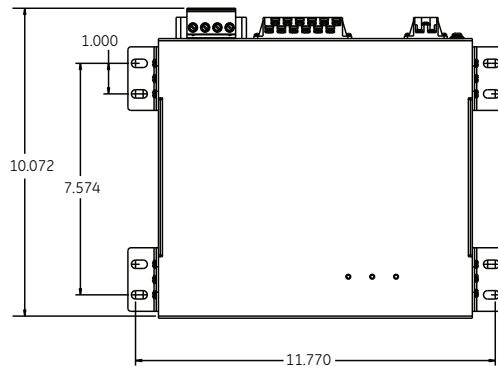
ANSI Device Numbers & Functions

Device Number	Function
21P	Phase Distance Backup
24	Volts Per Hertz
25	Synchronism Check
27P	Phase Undervoltage
27TN	Third Harmonic Neutral Undervoltage
27X	Auxiliary Undervoltage
32	Sensitive Directional Power
40	Loss of Field Relay
46	Generator Unbalance
49	Thermal Overload RTD
50G	Ground Instantaneous Overcurrent
50N	Neutral Instantaneous Overcurrent
50P	Phase Instantaneous Overcurrent
50SP	Split Phase Instantaneous Overcurrent
50/27	Accidental Energization
51G	Ground Time Overcurrent
51P	Phase Time Overcurrent
59N	Neutral Overvoltage
59P	Phase Overvoltage
59X	Auxiliary Overvoltage
59_2	Negative Sequence Overvoltage
64F	Field ground protection
64S	Sub-harmonic stator ground protection
64TN	100% stator ground
67_2	Negative Sequence Directional Overcurrent
67N	Neutral Directional Overcurrent
67P	Phase Directional Overcurrent
68	Power Swing Blocking
78	Out-of-Step Protection
81O	Overfrequency
81R	Rate of Change of Frequency
81U	Underfrequency
87G	Restricted ground fault
87S	Generator Stator Differential

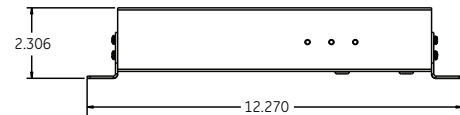
Dimensional Data

Field Ground Module (Up to 600 VDC Field Voltages)

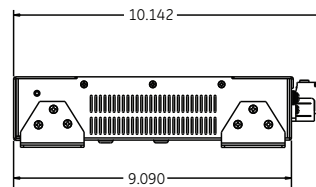
Top



Front

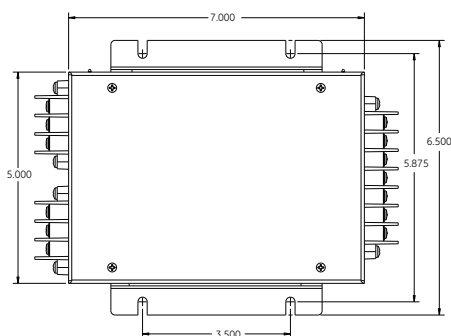


Side

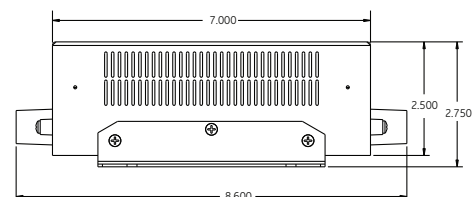


High Voltage Resistor Box Module (Field Voltages 600 VDC - 800 VDC)

Top



Side



Protection Specifications

Field Ground	Tests	Approvals
Measured Field Ground Resistance Range: 1 kΩ–20 MΩ	Dielectric voltage withstand EN60255-5	CE compliance EN60255-5 EN60255-27 EN60255-26 EN50263
Ground Resistance Accuracy: +/- 5% of reading +/- 250 Ω over the range 1 kΩ–500 kΩ	Impulse voltage withstand EN60255-5	North America UL508 UL1053 C22.2 No. 14
Field winding Capacitance: 1–10 μF	Insulation resistance EN60255-5	ISO ISO9001
Maximum Field Voltage: 600Vdc rated field voltage / 1000V ripple peak for single box option	Damped oscillatory IEC 61000-4-18 / IEC 60255-22-1	
800 Vdc rated field voltage / 2000V ripple peak for external resistor box option	Electrostatic discharge EN61000-4-2 / IEC 60255-22-2	
Field voltage measurement range: 15–800 Volts	RF immunity EN61000-4-3 / IEC 60255-22-3	
Field voltage measurement accuracy - low +/- 1V or +/- 3% of reading	Fast transient disturbance EN61000-4-4 / IEC 60255-22-4	
Field voltage measurement accuracy - high +/- 1V or +/- 5% of reading	Surge immunity EN61000-4-5 / IEC 60255-22-5	
Field ground RMS current accuracy: +/- 5% of reading	Conducted RF immunity EN61000-4-6 / IEC 60255-22-6	
Fault location accuracy: +/- 5% of reading	Voltage interruption and ripple DC IEC 60255-11	
Field ground resistance elements typical operating time: 1.1s + (1/Injection frequency)	Radiated and conducted emissions CISPR11/CISPR22/IEC 60255-25	
Field ground element dropout level accuracy: 102–103% of pickup	Sinusoidal vibration IEC 60255-21-1	
Time delay accuracy: +/- 3% of time delay setting or +/- 4ms whichever is greater	Shock and bump IEC 60255-21-2	
	Seismic IEC 60255-21-3	
	Power magnetic immunity IEC 61000-4-8	
	Pulse magnetic immunity IEC 61000-4-9	
	Damped magnetic immunity IEC 61000-4-10	
	Voltage dip and interruption IEC 61000-4-11	
	Voltage ripple IEC 61000-4-17	
	Ingress protection IEC 60529	
	Environment (Cold) IEC 60068-2-1	
	Environment (Hot) IEC 60068-2-2	
	Humidity IEC 60068-2-30	
	SWC oscillatory IEEE/ANSI C37.90.1	
	SWC transients IEEE/ANSI C37.90.1	
	RF immunity IEEE/ANSI C37.90.2	
	ESD IEEE/ANSI C37.90.3	
	Safety UL508	
	Safety ULC22.2-14	
Field Current		Environmentals
Field current measurement (dcmA) accuracy: +/- 0.2% of full scale		Temperature: Storage: -40C to +85C Operating: -40C to +70C
Field over and under current elements operating time: 1 power system cycle		Humidity: Up to 95% (non condensing) @ 55C (as per IEC60068-2-30 Variant 1, 6 days)
Field current element dropout level accuracy: 102–103% of pickup for UC and 97–98% for OC		Altitude: 2000m (maximum)
Time delay accuracy: +/- 3% of time delay setting or +/- 4ms whichever is greater		Pollution Degree: II
		Overvoltage Category: II
		Ingress Protection: IP10

Ordering

GPM-F	-	*	-	Description
Generator Field Voltage	L			Field Low Voltage (up to 600VDC field voltage)
	H			Field High Voltage (up to 800VDC field voltage)

Multilin Accessories

- | | |
|---------------------------------|----------------------------|
| • UR Applications I learning CD | TRCD-URA1-C-S-1 |
| • Multilink Ethernet Switch | ML2400-F-HI-HI-A2-A2-A6-G1 |
| • Viewpoint Engineer | VPE-1 |
| • Viewpoint Maintenance | VPM-1 |
| • Viewpoint Monitoring IEC61850 | VP-1-61850 |

Visit www.GEMultilin.com/GPM to:



- View Guideform specifications
- Download the instruction manual
- Review applications Notes and support documents
- Buy field ground protection online
- View/download the field ground protection brochure

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