Grid Solutions

MULTILIN™ GPM-S

100% Stator Ground Protection Module

The Multilin GPM-S stator ground protection module works in combination with the Multilin G60 Generator Protection System to provide 100% stator ground fault protection that is operational during generator start-up, running and stopped conditions. In the 100% stator ground fault protection based on sub-harmonic injection, a 20Hz voltage is injected to detect ground faults at any point across 100% of the winding thereby protecting the complete stator winding and allowing early detection of stator ground fault conditions.

Key Benefits

- Detect ground faults through 100% of the stator winding including neutral point
- Sub-harmonic injection based stator ground protection provides early detection of ground fault conditions
- Designed to operate with GE Vernova 's Multilin industry leading G60 Generator Protection System
- Active protection of the generator even under machine shutdown conditions for increased asset life
- Providing a wide range of fault resistance coverage which allows for superior generator protection
- Increase generator lifespan by easily upgrading your current G60 generator protection relay with the 100% Stator Ground Protection Module
- Simplified setup and configuration using EnerVista setup software

Applications

- Medium to large generator applications
- Generators with high impedance grounding
- Deployable with redundant generator protection systems
- Suitable for unit transformer connected systems

Protection

- Two stage stator ground resistance based element – 64S
- Wide range fault resistance coverage (1-20Kohms)
- Over current element for low resistance faults
- CT phase angle error compensation

Diagnostics

- Sub-harmonic voltage supervision
- Sub-harmonic current supervision
- Extensive internal diagnostics with critical-fail relay

GE VERNOVA

Protection & Control

Stator Ground Protection Module:

Stator ground module works in combination with UR G60 to provide a 100% stator ground fault protection that is operational during generator start-up, running and stopped conditions. In the 100% stator ground fault protection based on sub-harmonic injection, a 20Hz voltage is injected to detect ground faults at any point across 100% of the winding thereby protecting the complete stator winding and allowing early detection of stator ground fault conditions.

Key components of the ground protection scheme:

- G60 Generator Protection System
- 20Hz Injection Module: GPM-S-G
- Coupling Filter: GPM-S-B
- CT: ITI Part # 204-SD-43737
- Sensitive ground CT/VT module in G60

G60 Generator Protection System

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

20Hz Injection Module

Using sub-harmonic injection provides early detection of stator ground fault conditions. This is accomplished by the injection module generating a square wave pulse of 20Hz with a magnitude of +/-26V into the stator winding. The injection module monitors the frequency and magnitude of the signal it generates, which allows for the Stator module to determine if a ground fault has occurred in the stator winding. In addition, the stator module is also equipped with a critical-fail relay that can be wired to alarm failure.

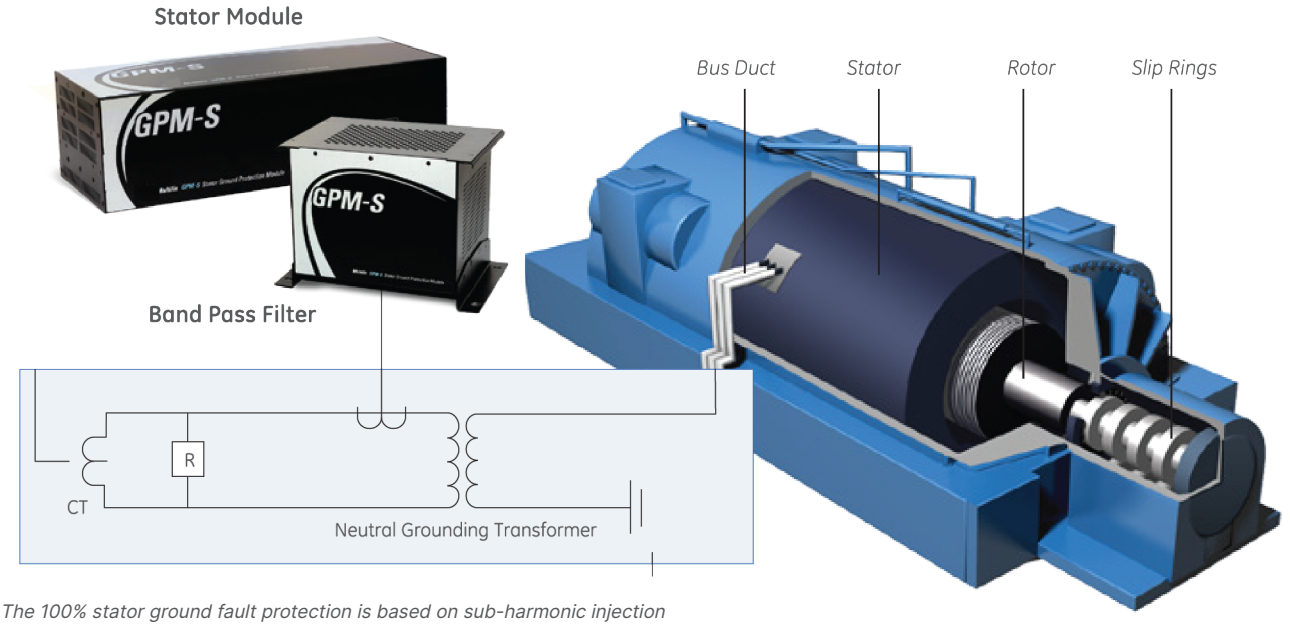
G60 Generator Protection Integration

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

Coupling filter

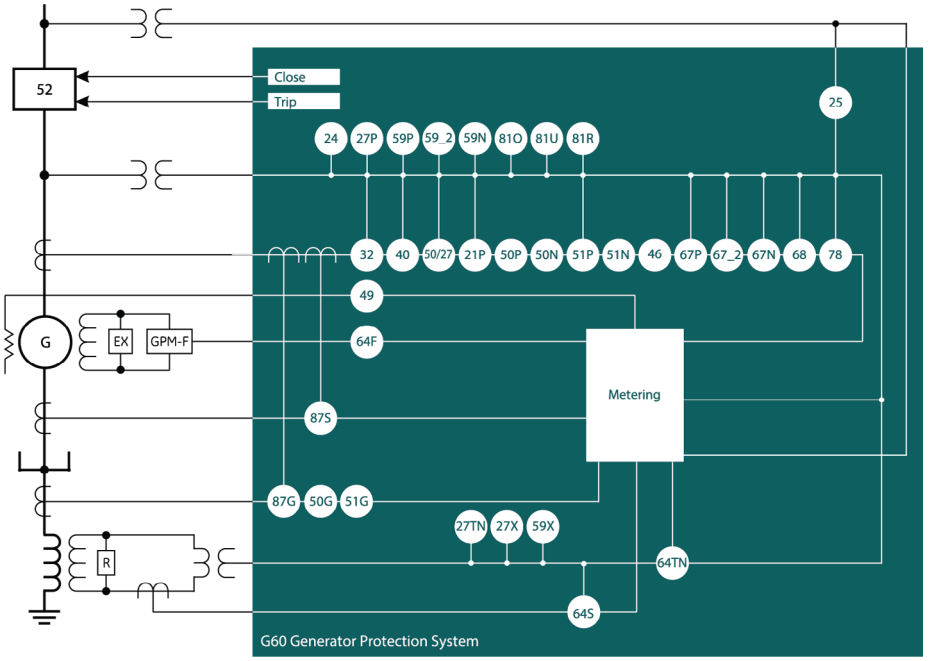
The coupling filter is used to meet two functions: to smooth the square wave and convert it into a sine wave and to protect the injection module from AC voltage impressed from the secondary of neutral grounding transformer. Coupling filter contains only passive components. It also contains voltage divider circuits to be used on applications with NGT secondary voltage greater than 500V.

100% Stator Ground Fault Detection



- *The 100% stator ground fault protection is based on sub-harmonic injection*
- *20Hz voltage is injected to detect ground faults at any point across 100% of the winding*
- *The stator ground module works in combination with the G60 to provide 100% stator ground fault protection*
- *Operational during generator start-up, running and stopped conditions*

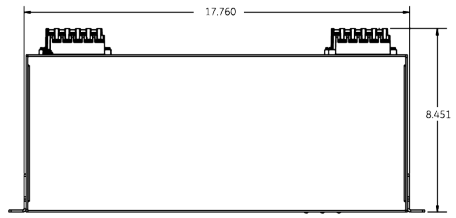
100% Stator Ground Fault Detection



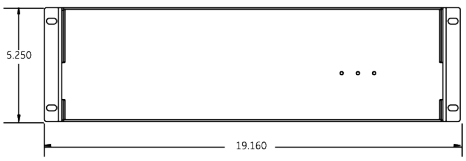
Dimensional Data

Stator Module

Top

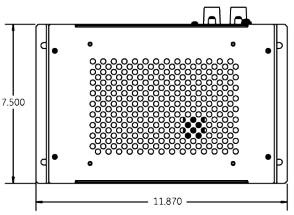


Front

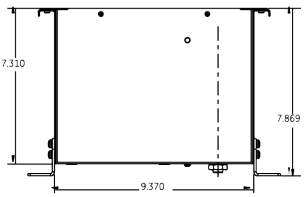


Band Pass Filter Module

Top



Front



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

Ordering

SUB-HARMONIC 100% STATOR GROUND (64S)	
Stator ground resistance pickup accuracy:	+/-5% of reading over the range from 1 kΩ-10 kΩ and +/-10% of reading over the range of 10-20 kΩ
Total Stator Capacitance to Ground:	200nF–2 µF
Sub-harmonic voltage metering accuracy:	+/-2% of reading or 0.2V over the range 0.5V to 25Vac
Sub-harmonic current metering accuracy:	+/-2% of reading or 5mA over the range 5mA to 200mA
Sub-harmonic element operating time:	0.6 – 1.2 sec
Sub-harmonic element dropout level accuracy:	102-103% of pickup
Time delay accuracy:	+/- 3% of time delay setting or +/- 4ms whichever is greater

TESTS	
Dielectric voltage withstand	EN60255-5
Impulse voltage withstand	EN60255-5
Insulation resistance	EN60255-5
Damped oscillatory	IEC 61000-4-18/ IEC 60255-22-1
Electrostatic discharge	EN61000-4-2/ IEC 60255-22-2
RF immunity	EN61000-4-3/ IEC 60255-22-3
Fast transient disturbance	EN61000-4-4/ IEC 60255-22-4
Surge immunity	EN61000-4-5/ IEC 60255-22-5
Conducted RF immunity	EN61000-4-6/ IEC 60255-22-6
Voltage interruption and ripple DC	IEC 60255-11
Radiated and conducted emissions	CISPR11/CISPR22 IEC 60255-25
Sinusoidal vibration	IEC 60255-21-1
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/ANSIC37.90.3
Safety	UL508
Safety	ULC22.2-14
Safety	UL1053

ENVIRONMENTALS	
Temperature:	Storage: -40C to +85C Operating: -40C to +70C
Humidity:	Up to 95% (non condensing) @ 55C (as per IEC60068-2-30 Variant 1, 6 days)
Altitude:	2000m (maximum
Pollution Degree:	II
Overvoltage Category:	II
Ingress Protection:	IP10

APPROVALS	
CE compliance	EN60255-5 EN60255-27 EN60255-26 EN50263
North America	UL508 UL1053 C22.2 No. 14
ISO	ISO9001
CE compliance	EN60255-5 EN60255-27 EN60255-26 EN50263
North America	UL508 UL1053 C22.2 No. 14
ISO	ISO9001

Ordering

GPM-S	Description
Included Components	20Hz Generator Band Pass Filter Current Transformer

For more information, visit
gevernova.com/grid-solutions

GEA-12878(E)
English
150209

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