

MII FAMILY

Modular Microprocessor Family

An economical choice for standard digital relaying applications



Key Benefits

- Ease of use and installation - same front panel programming, common cutout
- Follow technology evolution - Flash memory for product field upgrades
- Low priced scalable options - event reports, waveform capture, recloser, breaker fail
- Reduce troubleshooting and maintenance cost - Event reports, waveform capture
- Design flexibility - Easy to use programming logic
- Asset monitoring - Breaker health, and breaker failure protection
- Access to information - Modbus RTU™ communications
- AC/DC power supply
- Easy access via front panel keypad or communication links

Applications

- Feeder protection
- Main protection for small generators and motors
- Backup/Auxiliary protection for transformers, motors, generators and busbars
- Overload protection
- Automatic transfer equipment
- Load shedding and restoration schemes
- Backup directional overcurrent protection
- Reverse power protection
- Synchrocheck

Features

Features and Benefits

- Digital relay
- Incorporates protection, and control
- Local and remote user interfaces
- Internal memory
- Diagnostic features - event recording, and oscillography

User Interface and Programming

- Front Panel LEDs, key pad, and 2×16 character LCD display
- 6 LED indicators, 4 configurable in function and color
- Front RS232 and rear RS485 ports using ModBus® RTU protocol up to 19,200 bps

Monitoring and Metering

- Current, voltage, frequency, thermal image
- Analog/digital oscillography (optional)
- Event recording up to 32 events
- Self-diagnostics

EnerVista™ Software

- State of the art software for configuration and commissioning GE Vernova Multilin products
- Document and software archiving toolset to ensure reference material and device utilities are up-to-date
- EnerVista™ Integrator providing easy integration of data in MII relays into new or existing monitoring and control systems



GE VERNOVA

Protection

Multiple Settings Groups

Two separate settings groups are stored in non-volatile memory, with only one group active at a given time. Switching between setting groups 1 and 2 can be done by means of a setting, a communication command or contact input activation.

This allows users to have access to main relay functionalities in an extremely simple, user-friendly way by entering only main settings. Access to complete functionality for more complex use is available through advanced settings.

Features and Benefits

Event Recording

Events consist of a broad range of change of state occurrences, including pickups, trips, contact operations, alarms and self-test status. MII Family relays store up to 32 events, time tagged to the nearest millisecond. This information is invaluable in determining power system and relay operations. A user can inhibit the logging of selected events to aid in post-event analysis.

Oscillography

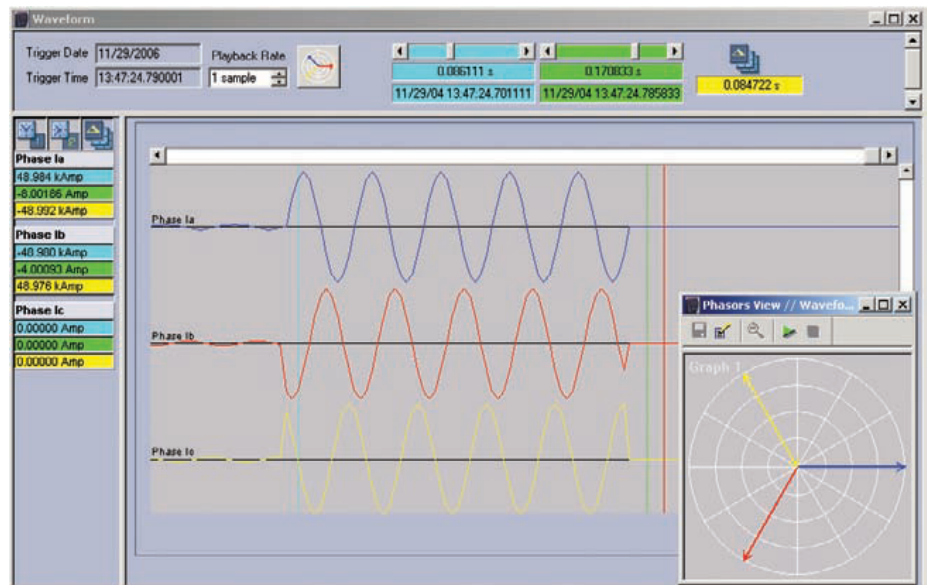
MII Family relays capture current waveforms and digital channels at eight samples per cycle. One oscillography record with a maximum length of 32 cycles is stored in memory. Oscillography is triggered either by internal signals or external contacts.

Configurable I/Os

MII Family products have two configurable contact inputs and four configurable contact outputs. The configurable outputs can be latched. These units also have a fixed Trip and Service contact output.

Breaker Failure Protection (optional)

A simple "breaker has not opened" feature is standard. A more complex breaker failure scheme can be easily implemented through the use of a digital input and configurable output logic (logic gates and timers).



Use the oscillography feature as an accurate troubleshooting and diagnostics tool

Breaker Health (optional)

The breaker health threshold is set by the user to achieve "just in time" maintenance. When the cumulative I^2 value exceeds the threshold, an alarm occurs.

Configurable Logic (optional)

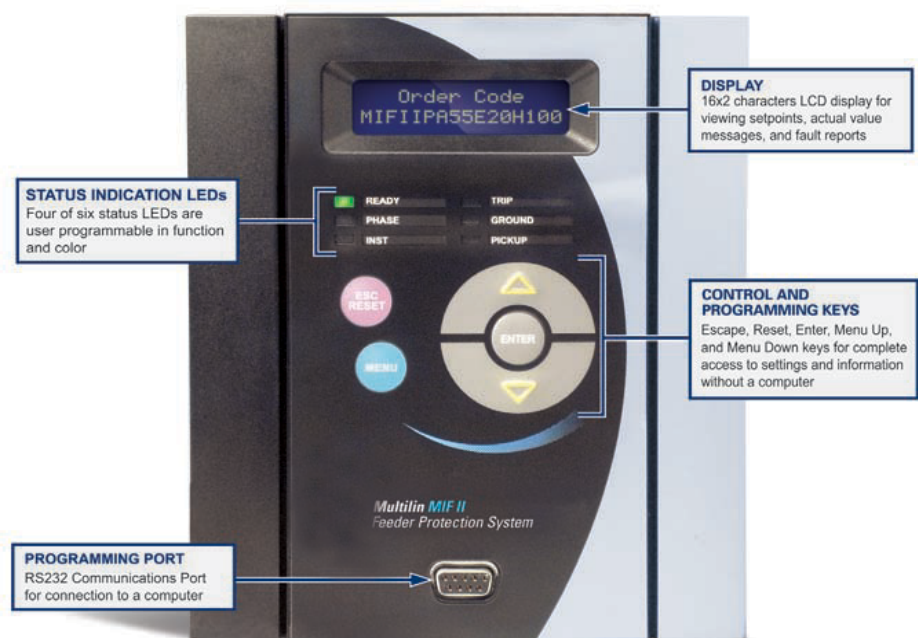
Up to four programmable logic schemes can be implemented by means of a set

of four logic gates and timers, using the graphical user interface provided. The outputs from programmable logic can operate contact outputs or faceplate LEDs.

Metering

Phase and ground current, voltage, frequency and thermal image are measured with a maximum error of $\pm 3\%$ across the range.

User Interface



User Interfaces

Display

Measurement data (actual values), fault reports for the last five trips, and settings are shown on the 16×2 characters LCD display.

Status LEDs

The MIF II incorporates 6 LED indicators in the front plate. The first one is a green LED identified as "READY", used to indicate the status of the protection elements. When "ON" it means the relay is energized and ready to protect, and at least one protection element has been enabled.

The second one is a red LED used for TRIP indication. It will be "ON" when a fault occurs and the relay energizes the trip outputs. Once energized, it will remain latched until the ESC/RESET key is pressed for three seconds to reset the relay.

Four additional LEDs are programmable in function and color. The factory default functions of the programmable LEDs are: Phase Trip, Ground Trip, 50 Trip, and Pickup, while the color is set to RED, and the status memory as self-resetting. The user may change the function and status memory through the use of the EnerVista™ software.

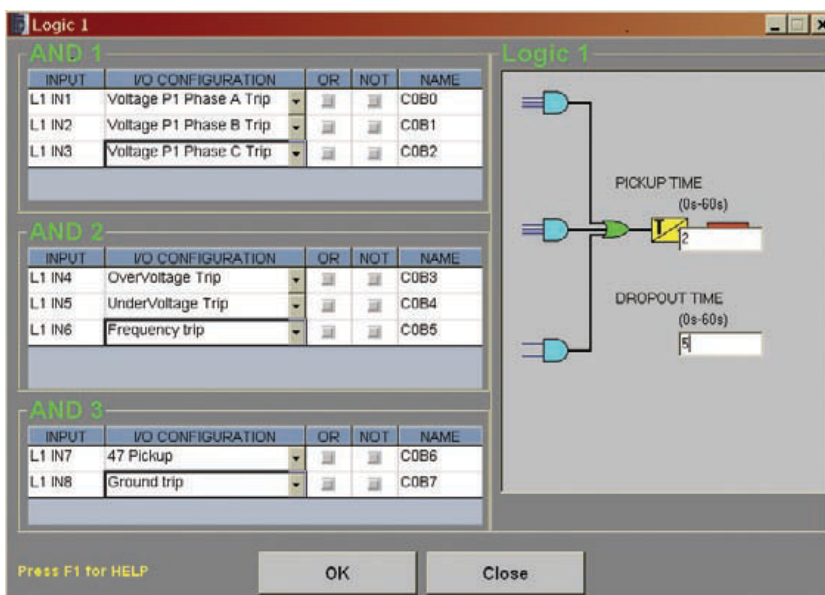
The LED color can be modified using the relay keypad. The status memory may be programmed either self-resetting or latching. If programmed as self-resetting, when the associated function drops out the corresponding LEDs turn off. If programmed as latched, the LED will remain "ON" until the ESC/RESET key is pressed for three seconds to reset the relay.

In order to test LEDs, pressing the ESC/RESET key for three seconds will turn "ON" all LEDs. When the key is released, the LEDs will turn off (except if the function pickups are still active). This allows easy testing of the equipment.

Keypad

A five-button keypad allows user access for easy relay interrogation and change of settings.

Access to events and oscillography records, and unit configuration is possible only through PC communication.



Use Programmable Logic to set the MIW II to meet specific application needs

Self-Test Diagnostics

Comprehensive self-test diagnostics occur at power up and continuously during relay operation. Any problem found by self-tests causes an alarm and an event is logged.

Communication Ports

A front mounted RS232 and a rear RS485 port allow easy user interface via a PC. ModBus® RTU protocol is used for all ports. The relay supports baud rates from 300 to 19,200 bps. Up to 32 GE Vernova Multilin devices can be addressed on a single communications

channel. A unique address must be assigned to each relay via a setting when multiple relays are connected.

MultiNet™ compatible

MultiNet™ is a communications module that provides GE Vernova Multilin serial ModBus IEDs with ModBus TCP/IP communications over Ethernet, allowing connection to fiber optic LAN and WAN network systems.

MultiNet™ has the capability to connect up to 32 serial ModBus devices eliminating complex wiring and additional communications converters, and providing



Connect up to 32 ModBus devices to your ethernet network including M II devices

a streamlined and economical Ethernet hub. Unlike most communications converters that are designed for commercial use, MultiNet™ is environmentally hardened to withstand severe utility and industrial conditions.

- Converts Modbus RTU over RS485 into Modbus TCP/IP over Ethernet
- Supports both 10BaseT and 10BaseF fiber connections
- Connect up to 32 RS485 serial devices to an Ethernet network
- Modbus TCP/IP provides multiple SCADA masters allowing simultaneous communications to the same IED
- Flexible mounting options allow retrofit to existing devices
- Industrially hardened for utility and industrial applications
- Simple “plug & play” device setup with EnerVista™ software

MultiNet™ gives you the ability to connect MII serial devices to new or existing Ethernet networks. It has a 10Base-F fiber optic interface that provides high EMI/RFI immunity and inherent electrical isolation over long cable runs. MultiNet™ setup is simple, with a Windows® based EnerVista software program for installing and configuring the communication drivers.

EnerVista™ Software

A single PC setup software package is required to access, configure, and monitor all the relays in the M II family, regardless of their model, application, or available options. The EnerVista™ M II Setup Software extracts the model number, version, and configuration parameters from the connected relay to display only the relevant data and options for the relay it is communicating with. This eliminates having to manually configure the relay within the software and provides a simple and easy to use operator user interface. All M II Family products are supplied with Windows® based EnerVista™ M II Setup Software. EnerVista™ is an easy to use tool that allows the communication with M II Family relays for monitoring, setting changes, and configuration. EnerVista™

software may be run on a PC with any Windows® based operating system. The program may be used locally on the RS232 front port or remotely on the RS485 port. It provides full access to the relay data with the following features:

- View relay status and actual values
- View/edit settings on-line/off-line
- View event recorder for troubleshooting

- Configure inputs, outputs and LEDs through configurable logic
- Utilize a configurable protection curve
- Relay firmware programming for upgrades

In addition, all status information such as target messages and digital input/output states may be viewed with EnerVista M II Setup Software.

MII Family Feature comparison

	FEATURES	DEVICE	MIF II	MIG II	MIN II	MIV II	MIW II	MIB
PROTECTION	Phase Undervoltage	27P				•		
	Directional Low Forward Power	32L					•	
	Directional Reverse Power	32R					•	
	Loss of Excitation	40					•	
	Current Unbalance	46		•				
	Voltage Unbalance	47				•		
	Thermal Image Unit	49	•	•				
	Ground Overvoltage	59N				•		
	Ground IOC	50G	•	•	•			
	Phase IOC	50P	•	•				
	Ground TOC	51G	•	•	•			
	Phase TOC	51P	•	•				
	Phase Overvoltage	59P				•		
	Fuse Failure	VTFF					•	
	Ground Directional	67G			•			
	Isolated Ground Directional	67N			•			
	Petersen Coil Ground Directional	67PC			•			
	Loss of Mains	78						
	Overfrequency	81O				•		
	Underfrequency	81U				•		
	Starts per Hour and Locked Rotor			•				
	Undercurrent	37		•				
	Differential Unit	87						•
	Restricted Earth Fault	87RGF		•				•
	Breaker Failure Protection	50BF	O					
	Programmable I/O and LEDs		O	•	•	•	•	•
	Breaker Arcing Current		O					
	Programmable Logic		O	•	•	•	•	•
	Multiple Settings Groups		•	•	•	•	•	•
MONITORING AND METERING	Event Recorder		O	•	•	•	•	•
	Oscillography		O	•	•	•	•	•
	Thermal Capacity		•	•				
COMMUNICATIONS	Alphanumeric Display		•	•	•	•	•	•
	Three-Button Keypad		•	•	•	•	•	•
	ModBus® Communications		•	•	•	•	•	•
	RS232 Serial Port		•	•	•	•	•	•
	RS485 Serial Port		•	•	•	•	•	•

MII Family Common Technical Specifications

PROTECTION		PROTECTION		HIGH IMPEDANCE	
PHASE TIME OVERCURRENT		LOSS OF EXCITATION		OVERFREQUENCY	
Pickup level:	10 – 240% of CT rating	Circle 1 diameter:	2.5 – 300 ohm	Source:	Voltage (Phase B)
Curve shapes:	Definite time, inverse, very inverse, extremely inverse, custom	Circle 1 offset:	2.5 – 150 ohm	Pickup level:	42.0 to 67.5 Hz in steps of 0.01 Hz
Time multiplier:	0.05 – 2.00 in steps of 0.01	Circle 1 trip delay:	0.1 – 10 sec	Time delay:	0.0 to 600 sec in steps of 0.01
Definite time:	Up to 99.99 sec (10 msec steps)	Circle 2 diameter:	2.5 – 300 ohm	Voltage inhibit setting:	30 to 250 V/10 to 60 V in steps of 0.01
Accuracy:		Circle 2 offset:	2.5 – 150 ohm	UNDERFREQUENCY	
Level:	±3% in the complete range	Circle 2 trip delay:	0.1 – 10 sec	Source:	Voltage (phase B)
Time:	Greater of ±3% or ±25 ms	THERMAL IMAGE UNIT		Pickup level:	42.0 to 67.5 Hz in steps of 0.01 Hz
GROUND TIME OVERCURRENT		Tap current:	10 – 240% of CT rating	Time delay:	0.0 to 600 sec in steps of 0.01
Pickup level:	10 – 240% of CT rating	Cool rate:		Voltage inhibit setting:	30 to 250 V/10 to 60 V in steps of 0.01
Curve shapes:	Definite time, inverse, very inverse, extremely inverse, custom	T1	3 – 600 min	CURRENT UNBALANCE	
Time multiplier:	0.05 – 2.00 in steps of 0.01	T2	1 – 6 x T1	Pickup level:	5 – 99% of CT rating
Definite time:	Up to 99.99 sec (10 msec steps)	K	1 – 1.2	Definite time:	Up to 99.99 sec (10 msec steps)
Accuracy:		Alarm level:	70 – 100%	Curve shapes:	I2t = K
Level:	±3% in the complete range	PHASE UNDERVOLTAGE		Time multiplier:	K: 1 – 100
Time:	Greater of ±3% or ±25 ms	Pickup level:	2.0 to 60 V or 10 to 250 V in steps of 0.1 (depending on model)	Accuracy:	
PHASE INSTANTANEOUS		Curve shapes:	Definite time	Level:	±3% in the complete range
Pickup level:	10 – 3000% of CT rating	Time delay:	0.0 to 600 sec in steps of 0.01	Time:	Greater of ±3% or ±25 ms
Definite time:	Up to 99.99 sec (10 msec steps)	Accuracy:		STARTS/HOUR AND LOCKED ROTOR	
Accuracy:		Level:	±3% over the complete range	Pickup level:	101 – 1000% of CT rating
Level:	±3% in the complete range	Time:	Greater of ±3% or ±25 ms	Definite time:	0.1 – 99.9 sec
Time:	Greater of ±3% or ±25 ms	PHASE OVERVOLTAGE		Time window:	10 – 100 min
GROUND INSTANTANEOUS		Pickup level:	2.0 to 60 V or 10 to 250 V in steps of 0.1 (depending on model)	Number of starts:	1 – 10
Pickup level:	10 – 3000% of CT rating	Curve shapes:	Definite time	Restart block time:	10 – 100 min
Definite time:	Up to 99.99 sec (10 msec steps)	Time delay:	0.0 to 600 sec in steps of 0.01	UNDERCURRENT	
Level:	±3% in the complete range	Accuracy:		Pickup level:	10 – 99% of CT rating
Time:	Greater of ±3% or ±25 ms	Level:	±3% over the complete range	Definite time:	0 – 99.99 sec
GROUND DIRECTIONAL		Time:	Greater of ±3% or ±25 ms	METERING	
Torque angle:	-90°, +90° (1° steps)	GROUND OVERVOLTAGE		Frequency:	±5m Hz
Direction:	Forward/back (rew)	Pickup level:	2.0 – 60 V or 10 – 250 V in steps of 0.1 (depending on model)	Voltage/current:	±3% over the complete range
Loss of voltage polarization logic:	Enable/disable	Curve shapes:	Definite time	THERMAL CAPACITY	
ISOLATED GROUND DIRECTIONAL (MIN options)		Time delay:	0.0 to 600 sec in steps of 0.01	Current circuits:	
Voltage pickup levels:	Vh 2 – 70 V in steps of 0.01 V Vi 2 – 70 V in steps of 0.01 V	Accuracy:		Continuously:	4 x In
Current pickup levels:	I low 5 – 400 mA in steps of 1 mA I hi 5 – 400 mA in steps of 1 mA	Level:	±3% over the complete range	During 3 sec:	50 x In
Definite time:	0 – 99.99 sec in steps of 10 msec	Time:	Greater of ±3% or ±25 ms	During 1 sec:	100 x In
Instantaneous trip deviation time:	0 – 99.99 sec in steps of 100 msec	HIGH IMPEDANCE		MONITORING (OPTIONAL)	
Torque angle:	-90°, +90° (1° steps)	DIFFERENTIAL UNIT		OSCILLOGRAPHY	
PETERSEN COIL GROUND DIRECTIONAL		Pickup Level:	10mA to 400mA	Records:	1 × 24 cycles
Voltage pickup levels:	Vh 2 – 45 V in steps of 0.1 V	Definite Time:	Up to 600 sec (10 msec steps)	Sampling rate:	8 samples per power frequency cycle
Current pickup levels:	I low 5 – 100 mA in steps of 1 mA	Accuracy:		Triggers:	Any element pickup or operate Digital input change of state Digital output change of state Communication command
Real power pickup levels:	10 – 4500 mW in steps of 0.1 mW	Level:	±3% in the complete range	Data:	AC input channels Digital input/output channels Self-test events
Definite time:	0.03 – 3 sec in steps of 10 msec	Time:	Greater of ±3% or ±25 ms	EVENT RECORDER	
Instantaneous trip deviation time:	1 – 10 sec in steps of 100 msec	ALARM UNIT		Capacity:	24 events (32 in MIF)
Torque angle:	-90, +90 (0.01 steps)	Pickup Level:	10mA to 400mA	Time-tag:	To 1 millisecond
DIRECTIONAL REVERSE POWER		Definite Time:	Up to 600 sec (10 msec steps)	Triggers:	Any element pickup, operate or reset Digital input/output change of state Self-test events
Power pickup level:	0.01 – 0.99 x Rated MW	Accuracy:		RANGES	
Time delay:	0.2 – 120 seconds in steps of 0.1	Level:	±3% over the complete range	Current:	0.2 – 30 x In
Block from online:	0 – 5,000 sec.	Time:	Greater of ±3% or ±25 ms	Voltage:	Pickup level
DIRECTIONAL LOW FORWARD POWER		VOLTAGE UNBALANCE			
Power pickup level:	0.01 – 0.99 x Rated MW	Pickup level:	2.0 to 60 V or 10 to 250 V in steps of 0.1 (depending on model)		
Time delay:	0.2 – 120 seconds in steps of 0.1	Curve shapes:	Definite time		
Block from online:	0 – 15,000 sec.	Time delay:	0.0 to 600 sec in steps of 0.01		
		Accuracy:			
		Level:	±3% over the complete range		
		Time:	Greater of ±3% or ±25 ms		

MII Family Common Technical Specifications

OUTPUTS

TRIPPING CONTACTS

Contact capacity:

Max. operating voltage: **400 VAC**

Continuous current: 16 A

Make and carry: 30 A

Breaking: 4000 VA

OUTPUT RELAYS

Configuration: 6 electromechanical Form C

Contact material: silver alloy suited for inductive loads

Operate time: 8 ms

Max ratings for 100000 operations:

Voltage		M/C cont.	M/C 0.2 sec	Break	Max Load
DC Resistive	24 VDC	16 A	48 A	16 A	384 W
	48 VDC	16 A	48 A	2.6 A	125 W
	125 VDC	16 A	48 A	0.6 A	75 W
	250 VDC	16 A	48 A	0.5 A	125 W
DC Inductive	24 VDC	16 A	48 A	8 A	192 W
	48 VDC	16 A	48 A	1.3 A	62 W
	125 VDC	16 A	48 A	0.3 A	37.5 W
(L/R = 40 ms)	250 VDC	16 A	48 A	0.25 A	62.5 W
AC Resistive	120 VAC	16 A	48 A	16 A	1920 VA
	250 VAC	16 A	48 A	16 A	4000 VA
AC Inductive PF=0.4	120 VAC	16 A	48 A	6 A	720 VA
	250 VAC	16 A	48 A	5 A	1250 VA

INPUTS

AC CURRENT

Secondary Rated Current: 1m 5 A depending on the selected model, or 50 mA for sensitive ground models

Frequency: 50 / 60 Hz ± 3 Hz (The unit can be set to 50 or 60 Hz)

Relay Burden: < 0.2 VA @ $I_n = 5$ A secondary
< 0.08 VA @ $I_n = 1$ A secondary
< 0.08 VA @ $I_n = 1$ A sensitive ground, secondary

Current Withstand: 4 x I_n continuously
100 x I_n for 1 sec.

AC VOLTAGE

High Range

Secondary Rated Voltage: 50-240 Vac

Frequency: 50 / 60 Hz ± 3 Hz (The unit can be set to 50 or 60 Hz)

Relay Burden: < 0.2 VA @ 120 Vac

Voltage Withstand: 440 Vac continuously

Low Range

Secondary Rated Voltage: 20-60 Vac

Frequency: 50 / 60 Hz ± 3 Hz (The unit can be set to 50 or 60 Hz)

Relay Burden: < 0.2 VA @ 120 Vac

Voltage Withstand: 250 Vac continuously

INPUTS

DIGITAL INPUTS

High Range

Voltage Threshold: 75 Vdc

Maximum Voltage: 300 Vdc

Relay Burden: 5 mA @ 300 Vdc

Low Range

Voltage Threshold: 12 Vdc

Maximum Voltage: 57 Vdc

Relay Burden: 2 mA @ 57 Vdc

COMMUNICATIONS

Local communication: Alphanumeric display; 3 button frontal keypad

Remote communication (local or remote PC and communications net):

Mode: ModBus® RTU

Speed: 300 to 19,200 bp

POWER SUPPLY

LOW RANGE

Rated DC Voltage: 24 to 48 Vdc

Min./Max. DC Voltage: 19 / 58 Vdc

HIGH RANGE

Rated DC Voltage: 110 to 250 Vdc

Min./Max. DC Voltage: 88 / 300 Vdc

Rated AC Voltage: 110 to 230 Vac @ 50 – 60 Hz

Min./Max. AV Voltage: 88 / 264 Vac @ 50 – 60 Hz

Power Consumption: Max. = 10 W

Backup time: (date, time and log memory) without power supply voltage > 1 week

MECHANICAL CHARACTERISTICS

- Metallic package in quarter 19" rack and four units high
- Frontal MMI with display and keypad
- DB9 connector for RS232 ports on the front (1) and RS485 on the rear
- Protection class IP52 (according to IEC 529)

ENVIRONMENTAL

Temperature

Storage: -40° C to +80° C

Operation: -20° C to +60° C

Humidity: Up to 95% without condensing

TYPE TESTS

Test	Standard	Class
Insulation Test Voltage:	IEC 60255-5	2kV, 50/60 Hz 1 min
Surge Test Voltage:	IEC 60255-5	5 kV, 0.5 J. (3 positive pulses and 3 negative.)
1 MHz Interference:	IEC 60255-22-1	III
Electrostatic Discharge:	IEC 60255-22-2 EN 61000-4-2	IV 8 kV in contact, 15 kV through air
Radio interference:	IEC 60255-22-3: 40 MHz, 151 MHz, 450 MHz and cellular phone	III
Radiated Electromagnetic fields with amplitude modulation.	ENV 50140	10 V/m
Radiated Electromagnetic fields with amplitude modulation Common mode	ENV 50141	10 V/m
Radiated Electromagnetic fields with frequency modulation.	ENV 50204	10 V/m
Fast Transients:	ANSI/IEEE C37.90.1 IEC 60255-22-4 BS EN 61000-4-4	IV IV IV
Magnetic fields at industrial frequency:	EN 61000-4-8	30 AV/m
Power Supply interruptions:	IEC 60255-11	
Temperature:	IEC 57 (CO) 22	
RF Emission:	EN 55011	B
Sinusoidal Vibration:	IEC 60255-21-1	II
Shock:	IEC 60255-21-2	I
Insulation Test:	IEC255-5 (Tested on CTs, Power Supply terminals, Contact Inputs and Contact Outputs)	

PACKAGING

Approximate weight:	Two 4-rack	One 8-rack
Net:	8.8 lbs (4 kgs)	3.9 lbs (2.7 kg)
Ship:	9.9 lbs (4.5 kgs)	7 lbs (3.2 kg)

APPROVALS

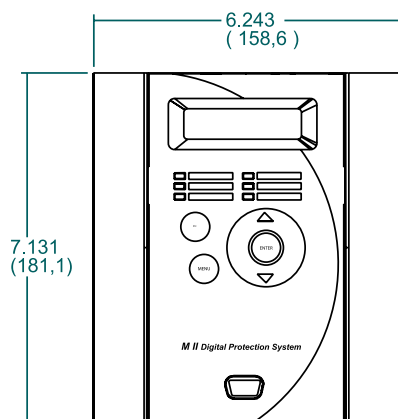
ISO: Manufactured under an ISO9001 registered system.



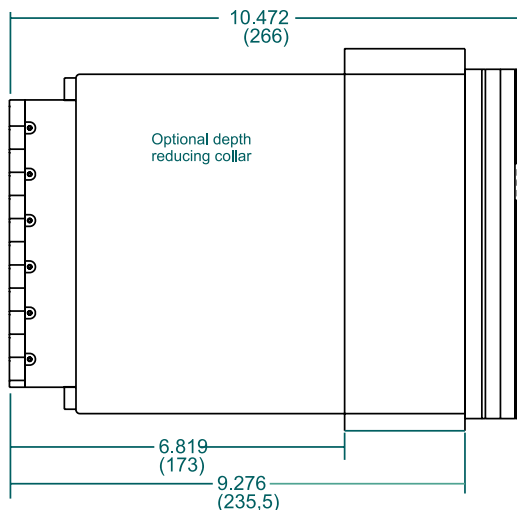
Conforms to EN 55011/CISPR 11,
EN 50082-2, Conforms to IEC 947-1,
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*Specifications subject to change without notice.

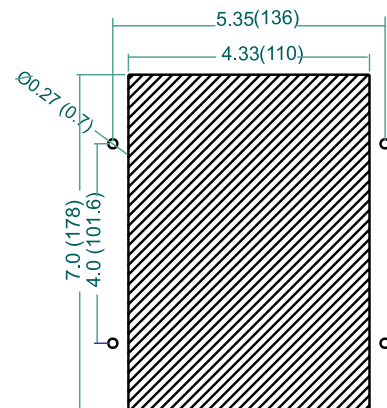
Dimensions



FRONT



SIDE



CUTOUT

The MII Family of products have a drawout construction in four-inch wide modules for relays including current channels or in two-inch wide modules for relays including only voltage channels. These drawout modules may be mounted in standard 19" racks, half racks, individual cases, or supplied with depth reducing collar for space efficiency.

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



GE VERNOVA

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