MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Reference package for procurement and maintenance review

GE

MIVII1000E00HI00

DIGITAL VOLTAGE PROTECTION RELAY

Used with the applicable Multilin MIV II configuration.

REFERENCE PACKAGE

OFFICIAL DOCUMENT

Selected official manufacturer pages follow this cover.

Source: GE MIVII1000E00HI00



MIV II

DIGITAL VOLTAGE AND FREQUENCY RELAY

Economical voltage and/or Frequency protection for motors, generators, automatic transfer systems, lines and busbars.

KEY BENEFITS

- Reduce troubleshooting and maintenance cost - event recording, and analogy/digital oscillography
- Design Flexibility - easy to use programming logic
- Access to information - Modbus RTU® communications
- Configurable logic, curves, digital I/Os, and LEDs
- Flash memory for field upgrades
- Two settings groups
- Password protection for local operation
- Automatic display of last fault information
- Three models available for voltage, frequency and combined protection
- AC/DC power supply
- Access via front panel keypad or communication links
- EnerVista™ compatible
- Isolated RS232 port

APPLICATIONS

- Voltage and/or frequency protection at any voltage in automatic transfer systems, generators, motors, lines and busbars

FEATURES

Protection and Control

- Three-phase over and undervoltage, ground overvoltage
- Voltage unbalance, over and underfrequency, with the following options:
  - Four independent time delay phase under/overvoltage elements complete with two independent fixed time ground overvoltage elements
  - Four units of frequency protection
  - Both voltage protection and two elements of frequency protection
- Circuit Breaker control (open/close)
- Configurable I/O
- 6 outputs, four configurable, plus trip and alarm

Monitoring and Metering

- 24-event record
- Analog/digital oscillography - 24 cycles at 8 samples per cycle
- Frequency and per-phase voltage
- Monitoring of the last 5 trips information from the display

User Interfaces

- 2x16 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
- EnerVista™ software - an industry leading suite of software tools that simplifies every aspect of working with GE Multilin devices

Overview

The MIV II, a member of the M II Family, is a digital device that provides voltage and frequency protection for a wide range of applications at any voltage level.

NOTE: The MIV II includes four independent time delayed phase under/overvoltage elements, and two independent fixed time ground overvoltage elements, the MIV II 2000 includes frequency functions (four units), and the MIV II 3000 includes both voltage and frequency (two) units.

The basic MIV II has two fixed digital inputs and six fixed digital outputs. An option is provided allowing the two inputs and four of the outputs to be user configurable.

The basic MIV II has six fixed status LEDs. An option is provided allowing four of these LEDs to be user configurable.

The front panel also features a 5-button keypad and a 16x2 LCD display that provides an easy to use user interface.

The front keypad allows the user to set the baud rate and relay address for communication. A front RS232 and a rear RS485 communication port are provided for computer access using ModBus® RTU protocol. The rear RS485 can be converted to an RS232 or fiber optic port (plastic or glass fiber optics) by means of using an external converter, such as GE Multilin DAC300 or F485. Windows® based EnerVista™ software is provided free of charge with the relay to allow setup and configuration of MIV units.

Computer access allows setting and configuration (inputs, outputs, LEDs and configurable logic) of the units, display of metering information and real time status of the unit. An option is provided allowing the display of event records and an oscillography record for the last fault.

The MIVII has a drawout construction in 1/4 of a 19" rack case.



Use the oscillography feature as an accurate troubleshooting and diagnostics tool

Protection

Phase Under/Overvoltage

Four independent time delayed under/overvoltage elements. Each of them can be enabled and set independently, with a pickup range from 2 to 60 V or 10 to 250 V, depending on the selected model, and a time delay range from 0 to 600 seconds. The protection elements can operate either on phase-to-phase or phase-to-ground voltage magnitudes. To avoid permanent undervoltage tripping whenever a breaker is open and the VTs are located on the line side, a separate setting is provided to enable/disable undervoltage protection elements when a breaker is open.

Ground Overvoltage

Two independent fixed time ground overvoltage elements. Each of them can be enabled and set independently, both for pickup voltage and timing.

The pickup setpoint range is from 2 to 60V or from 10 to 250 V, depending on the selected model, and a time delay range from 0 to 600 seconds.

Voltage Unbalance

This function operates on negative sequence voltage, and is included in the MIV II 3000 relay. Pickup and time delay settings are the same as those of voltage functions.

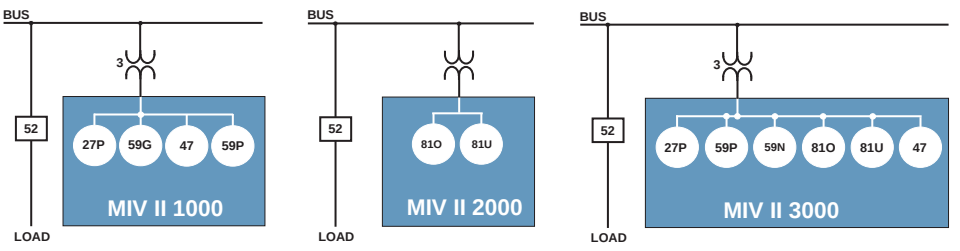
Frequency Functions

Depending on the model, either two or four independent definite time frequency units are provided. Each unit can be independently set as over and underfrequency, and is supervised by an independently adjustable undervoltage element.

Metering

MIV II provides metering values for phase and ground voltages. The accuracy is 3% in the complete range, and 1% at the rated voltage.

Functional Block Diagrams



ANSI Device Numbers & Functions

Device Number	Function
27P	Phase Undervoltage
47	Phase Reversal
59P	Phase Overvoltage
59G	Ground Overvoltage
81O	Overfrequency
81U	Underfrequency

Primary or Secondary Metering

The MIV II can monitor both the primary and secondary voltage metering values, by previously setting the corresponding CT ratio.

Event Recording

Events consist of a broad range of change of state occurrences, including pickups, trips, contact operations, alarms and self test status. The MIV II stores up to 24 events time tagged to the nearest millisecond. This provides the information needed to determine sequence of events which facilitates diagnosis of relay operation. Each event is individually maskable in order to avoid the generation of undesired events, and includes the voltage values and status of all the protection elements at the moment of the event.

Oscillography (MIV II 1000 and 3000)

MIV II captures current waveforms and digital channels at 8 samples per cycle. One oscillography record with a maximum length of 24 cycles is stored in memory. Oscillography is triggered either by internal signals or an external contact.

Oscillography (MIV II 2000)

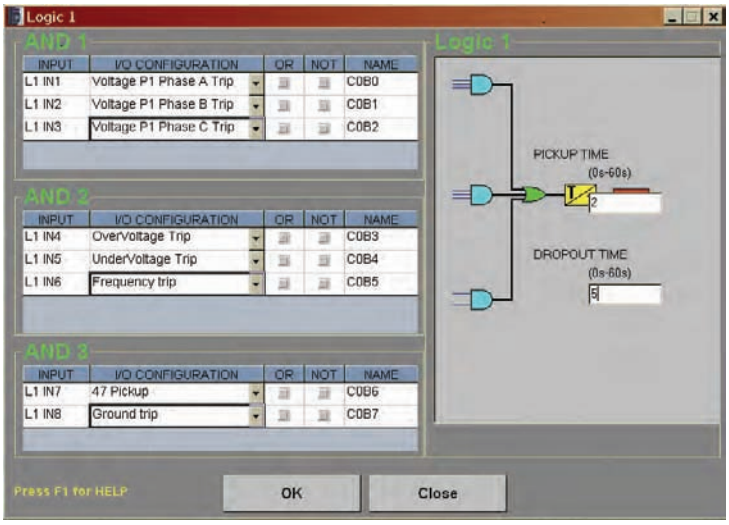
MIV II 2000 stores an oscillography record, with a resolution of 2 samples per cycle and a length of 432 cycles. Oscillography is triggered either by internal signals or an external contact.

Configurable I/O and LEDs

Two digital inputs are user configurable. Out of the six digital outputs incorporated, two have a fixed function (trip and service required), while the other four are user programmable. Those configurable outputs can be assigned either to a set of pre-configured values, or an OR/NOT combination of the same values. Each configurable output can be independently latched, and individually selected as NO or NC by means of a jumper.

Outputs 1 and 2 can be isolated from outputs 3 and 4 by removing jumperJX.

Four of the 6 LED indicators can also be programmed by the user. The first LED has a fixed assignment (relay in service), the second is fixed for trip, and the remaining four LEDs are configurable in function, memory and color (red or green).



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

Configurable Logic

Up to a maximum of 4 configurable logic schemes can be implemented into the MIV II by means of using a set of 4 pre-configured logic gates and timer cells. A graphical user interface is provided for configuration of MIV II logic.

The outputs of the MIV II configurable logic can be assigned to contact outputs and/or LEDs.

Circuit Breaker Control

The MIV II permits operation of the circuit breaker. Breaker opening and closing operations can be carried out by programming specific outputs, and digital inputs can be used for verifying the success of the operation.

User Interfaces

Display

Measurement data (actual values), fault reports for the last five trips, and settings are shown on the 16x2 characters LCD display.

Status LEDs

The MIV 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, 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.

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 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 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 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 retro-fit 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 M II 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

The EnerVista™ Suite is an industry-leading set of software programs that simplifies every aspect of using the relay. The EnerVista™ suite provides all the tools to monitor the status of the protected asset, maintain the relay, and integrate information measured into DCS or SCADA monitoring systems. Convenient waveform and Sequence of Events viewers are an integral part of the MII Setup software included with every MIV II relay, to carry out postmortem event analysis to ensure proper protection system operation.

EnerVista™ Launchpad

EnerVista™ Launchpad is a powerful software package that provides users with all of the setup and support tools needed for configuring and maintaining GE Multilin products. The setup software within Launchpad allows configuring devices in real-time by communicating using serial, Ethernet, or modem connections, or offline by creating setting files to be sent to devices at a later time.
Included in Launchpad is a document archiving and management system that ensures critical documentation is up-to-date and available when needed.

Documents made available include:

- Manuals
- Application Notes
- Guideform Specifications
- Brochures
- Wiring Diagrams
- FAQs
- Service Bulletins

Viewpoint Monitoring

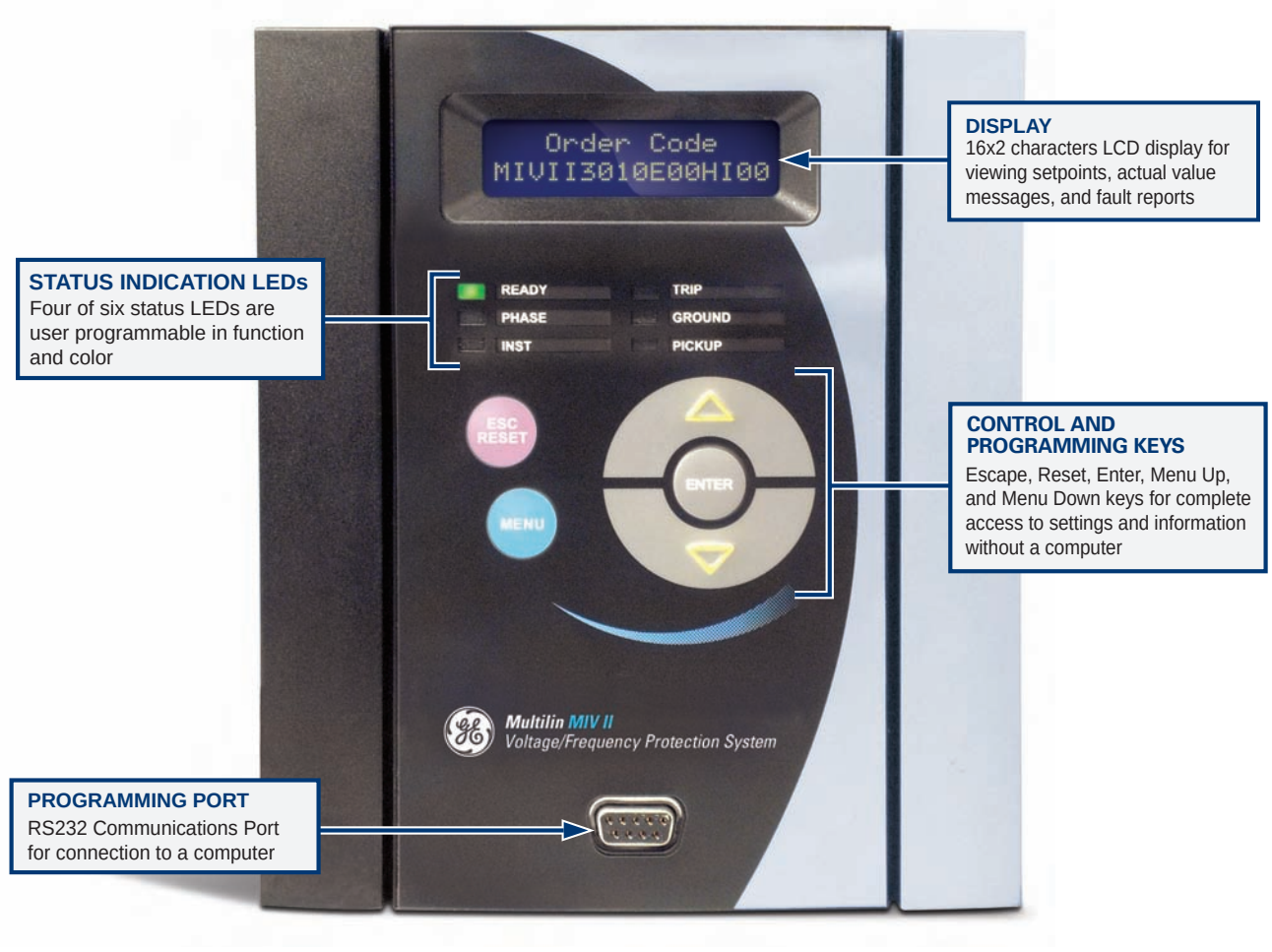
Viewpoint Monitoring is a simple-to-use and full-featured monitoring and data recording software package for small systems. Viewpoint Monitoring provides a complete HMI package with the following functionality:

- Plug-&-Play Device Monitoring
- System Single-Line Monitoring & Control
- Annunciator Alarm Screens
- Trending Reports
- Automatic Event Retrieval
- Automatic Waveform Retrieval

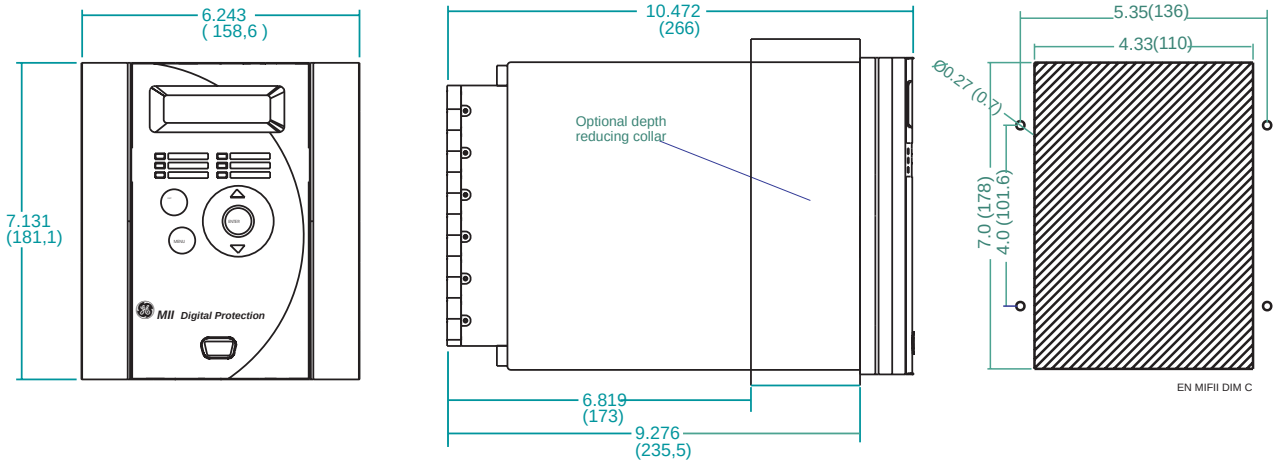


Connect up to 32 ModBus devices to your ethernet network including M II devices

User Interface

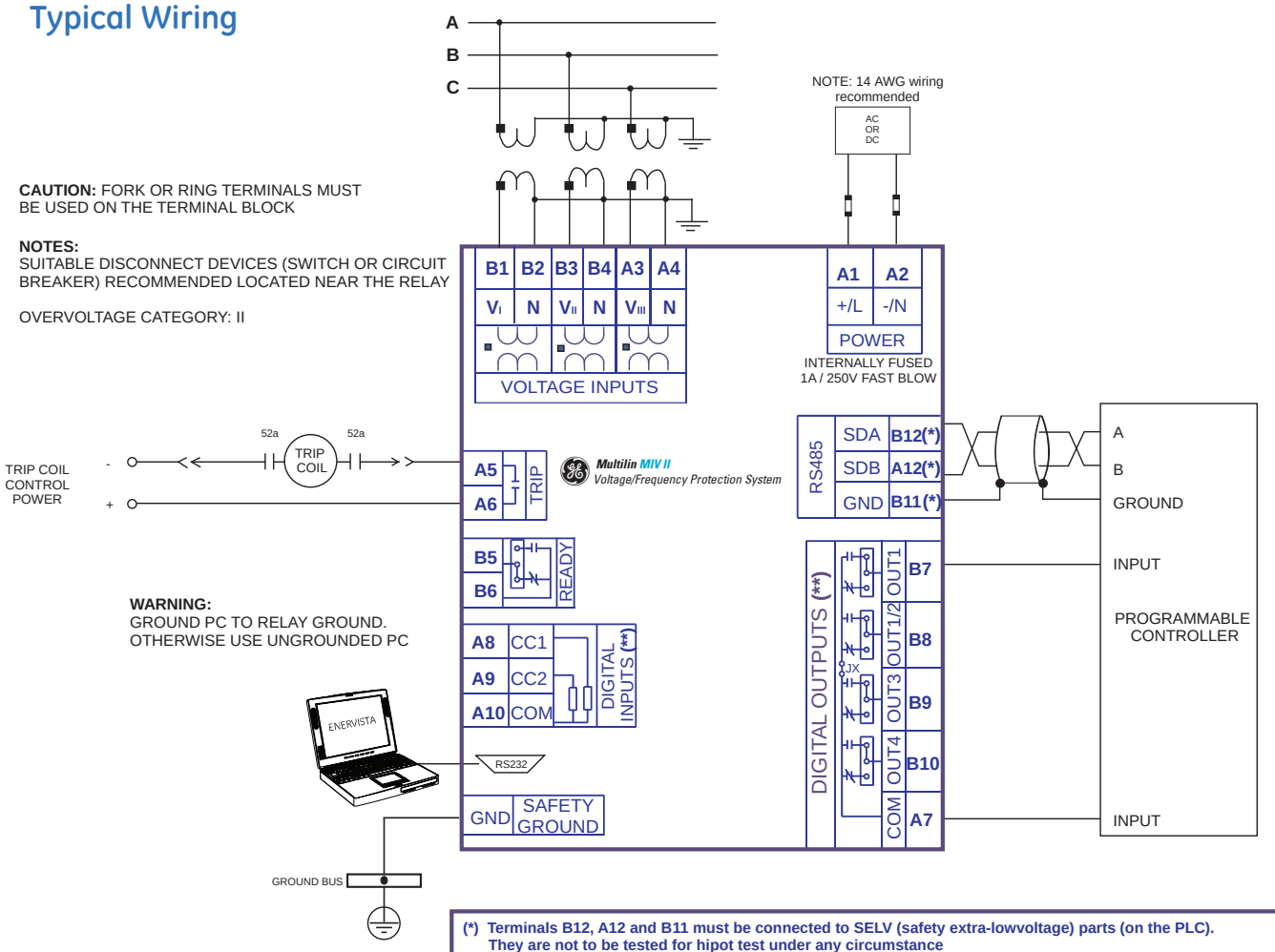


Dimensions



FRONT ***SIDE*** ***CUTOUT***

Typical Wiring

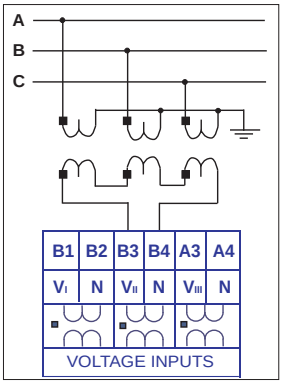


(*) Terminals B12, A12 and B11 must be connected to SELV (safety extra-lowvoltage) parts (on the PLC). They are not to be tested for hipot test under any circumstance

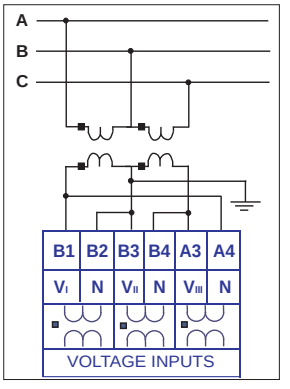
(**) The default configuation of inputs and outputs is as follows:

INPUTS	MIV II 1000	MIV II 2000	MIV II 3000
CC1:	Block phase voltage functions	Block frequency functions	Block voltage functions
CC2:	Block ground voltage functions	External trip command	Block frequency functions
OUTPUTS	**OUTPUTS**	**OUTPUTS**	**OUTPUTS**
OUT1:	**59/27** Trip	**81-1** Trip	**Phase voltage**Trip
OUT2:	59/27 Trip	81-2 Trip	Ground voltageTrip
OUT3:	59N1 Trip	81-3 Trip	Negative sequenceTrip
OUT4:	59N2 Trip	81-4 Trip	FrequencyTrip

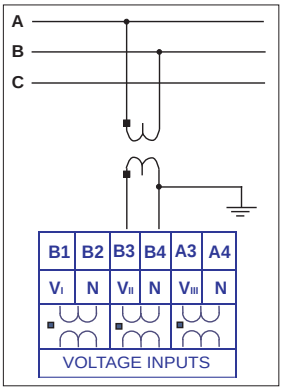
WYE-BROKEN-DELTA VT CONNECTION



OPEN DELTA VT CONNECTION



SINGLE PHASE VT CONNECTION



Technical Specifications

PROTECTION

VOLTAGE ELEMENTS (P1, P2, P3, P4)

Voltage:	Phasor
Function Type:	Overvoltage or Undervoltage selected by setting
Pickup Level:	10.0 - 250.0V in steps of 0.1V for range 0 models (High range) 2.0 - 60.0V in steps of 0.1V for range 1 models (Low range)
Dropout Level:	97% (typical) of the pickup value for overvoltage 103% (typical) of the pickup value for undervoltage
Level Accuracy:	±3% in the complete range.
Timer:	0 - 600s in steps of 0.01 s
Reset Type:	Instantaneous
Operation time:	< 30 ms at 1.20 x pickup @ 50 Hz
Timing Accuracy:	±3% of operation time or ±30 ms. (whichever is greater)
Supervision:	By minimum voltage (level selected by setting) By breaker position (enabled by setting)
Reset Time:	One power cycle (typical)

GROUND OVERVOLTAGE ELEMENT (59N1, 59N2)

Voltage:	Measured or calculated depending on Application
Pickup Level:	10.0 - 250.0 V in steps of 0.1V for range 0 models 2.0 – 60.0V in steps of 0.1V for range 1 models
Dropout Level:	97% (typical) of the pickup value
Level Accuracy:	±3% in the complete range.
Operation time:	< 30 ms at 1.20 x pickup @ 50 Hz
Timer:	0 – 600 s in steps of 0.01 s
Reset Type:	Instantaneous
Timing Accuracy:	±3% of operation time or ±30 ms. (whichever is greater)
Reset Time:	One power cycle (typical)

VOLTAGE UNBALANCE ELEMENT (47)

Voltage:	Negative sequence calculated from phase voltages
Pickup Level:	2.0 - 60.0 V in steps of 0.1 V
Dropout Level:	97% (typical) of the pickup value
Level Accuracy:	±3% in the complete range.
Operation time:	< 30 ms at 1.20 x pickup @ 50 Hz
Timer:	0 – 600 s in steps of 0.01 s
Reset Type:	Instantaneous
Timing Accuracy:	±3% of operation time or ±30 ms. (whichever is greater)

FREQUENCY ELEMENTS (81_1, 81_2, 81_3, 81_4)

Function Type:	Underfrequency or overfrequency selected by setting.
Pickup Level:	42.0 - 67.5 Hz in steps of 0.01 Hz.
Level Accuracy:	±10 mHz
Dropout Level:	± 40 mHz of the pickup value
Timer:	0 - 600 s in steps of 0.01 s
Reset Type:	Instantaneous
Timing Accuracy:	±3% of operation time + measuring time
Measuring Time:	Average of 8 cycles
Supervision Voltage Level:	30 - 250 V in steps of 0.1 V (range 10 - 250 V)

MONITORING

OSCILLOGRAPHY

Records:	1 x 24 cycles (for MIV II 1000 and 3000) 1 x 432 cycles (for MIV II 2000)
Sampling rate:	8 samples per power frequency cycle (for MIV II 1000 and 3000) 2 samples per cycle (for MIV II 2000)
Triggers:	Any element pickup or operation Digital input configured as oscillography trigger Communications command
Information:	AC input channels Digital input/output channels Self-test events

EVENT RECORDER

Capacity:	24 events
Time-tag:	To 1 millisecond
Triggers:	Any element pickup, operation or reset. Digital input/output change of state Self-test events

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 @ 48 – 62 Hz
Min./Max. AV Voltage:	88 / 264 Vac @ 48 – 62 Hz
Power Consumption:	Max. = 15 W
Backup time:	(date, time and log memory) without power supply voltage > 1 week

INPUTS

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

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

OUTPUTS

TRIPPING CONTACTS

Contact capacity:	
Max. Operating Voltage:	400 Vca
Continuous current:	16 A
Make and Carry:	30 A
Breaking:	4000 VA

OUTPUT RELAYS

Configuration:	6 electro-mechanical, form C
Contact Material:	silver alloy suited for inductive loads

Operations:
Maximum ratings for 100.000 operations:

Voltage		M&C	M&C CONT.	Break 0.2 seg	Max Load
DC Resist	24 Vdc	16A	48A	16A	384W
	48 Vdc	16A	48A	2.6A	125W
	125 Vdc	16A	48A	0.6A	75W
	250 Vdc	16A	48A	0.5A	125W
DC Induct. (L/R=40ms)	24 Vdc	16A	48A	8A	192W
	48 Vdc	16A	48A	1.3A	62W
	125 Vdc	16A	48A	0.3A	37.5W
	250 Vdc	16A	48A	0.25A	62.5W
AC Resist	120Vdc	16A	48A	16A	720W
	250 Vdc	16A	48A	16A	4000W
AC Indust. PF=0.4	120Vdc	16A	48A	16A	720W
	250 Vdc	16A	48A	16A	1250W

COMMUNICATIONS

Local communication:	Alphanumerical display; 3 button front keypad

Remote communication:
(Local or remote PC and communications network):

Mode:	Modbus RTU
Baudrate:	300 to 19200 bps

DB9 connector for front RS232 port and rear RS485 port

METERING

Frequency:	±10 mHz
Voltage:	±1% in the metering range(50/80V) ±3% or 0.5V in the complete range

MECHANICAL CHARACTERISTICS

Stainless-steel 304 housing in 1/4 of a 19'' rack, 4 units high
IP52 protection degree

ENVIRONMENTAL

Temperature:	
Storage:	-40ºC to +80ºC
Operation:	-20ºC to +60ºC.
Humidity:	Up to 95% without condensing.

PACKAGING

Approximate Weight:

Net:	2.7 kgs (5.9 lbs)
Ship:	3.2 kgs (7 lbs)

TYPE TESTS

TEST	STANDARD	CLASS
INSULATIONTEST 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
RADIOINTERFERENCE:	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)	

APPROVALS

CE	Conforms to 89/336/CEE and 73/23/CEE
CNL:	C22.2 Certified
UL:	UL508 Certified
ISO:	Manufactured to an ISO9001 registered program

Ordering

	MIV II	*	0	*	0	*	0	0	**	*	*	Description
Position		1										Voltage functions
		2										Frequency functions
		3										Voltage & Frequency functions
Voltage Range				0								10-250V (all models)
				1								2-60 V (only MIVII1000)
Language						E						English Language
						F						French Language
Power Supply									LO			24-48 Vdc (Range: 19~58 Vdc)
									HI			110-250 Vdc (Range: 88-300 Vdc)110-230 Vac (Range: 88-264 Vac)
Conformal Coating											0	Without Conformal Coating
											H	With Conformal Coating
Special Models										*	*	For special models contact factory.

Visit www.GEMultilin.com/MIVII to:



- View Guideform specifications
- Download the instruction manual
- Review applications notes and support documents
- Buy a MIV II online
- View the MIV II brochure