



MOTOR PROTECTION SYSTEM

Modular Low Voltage Motor Protection in a Compact Form Factor.

KEY BENEFITS

- Small footprint and compact design - Fits into standard Motor Control Center "buckets"
- Easy to use - Preconfigured motor setting
- Modular design - Pick and choose the desired components
- PLC, SCADA, and DCS Interface - DeviceNet open protocol standard
- Easy installation - matched CTs; panel or chassis mount
- Programmed through EnerVista Launchpad

APPLICATIONS

- Ideally suited for motor control center applications
- Low voltage motors up to 500 hp
- Motor types: Full voltage reversing and non-reversing; reversing; two speed one and two windings; custom motor types

FEATURES

Protection and Control

- Overcurrent, Current Unbalance, Ground Fault, Overvoltage/Undervoltage
- Jam, Stall, Load Loss
- Power loss restart
- Two Speed Motor Protection
- 6 Digital Inputs, 4 Relay Outputs

Monitoring and Metering

- Phase current, ground current, voltage, kW, power factor, average current, current unbalance
- Trip history and maintenance information - last 10 fault history report
- Elapsed motor hours

User Interface

- DeviceNet open protocol
- RS232 Direct PC connection
- Optional Programmable Display Unit
- Spanish Language Option
- Passcode protection

Overview

The GE Multilin LM10 Low Voltage Motor Protection System is a modular device for low voltage motor protection. The compact design of the LM10 is ideally suited for Low Voltage Motor Control Center applications but can also be used in standalone applications. The LM10 comes standard with the DeviceNet protocol that allows the user to control and monitor the relay over a network. The relay also has an interface port to communicate to the optional LM10 Programmable Display Unit (PDU). This display unit allows for local programming and monitoring of the relay. Matched sets of three phase Current Transformers (CT) and one ground CT are also available as part of the LM10 package.

The LM10 features a small footprint and compact design allowing it to fit into standard Motor Control Center "buckets". The LM10 is easy to use with a simple configuration and setup program with EnerVista. The modular design allows the user to pick and choose the desired components for the specific application. The LM10 is compatible with most PLCs and is SCADA and DCS adaptable via the built in DeviceNet open protocol.

The LM10 can be used to replace:

- PLC I/O
- Timing Relays
- Load Sensing Relays
- Ground Fault Relays
- Ammeter
- Power Meter
- Elapse Time Meter

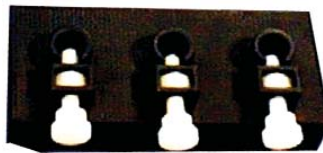
Protection and Control

Architecture

The LM10 uses a 6-channel simultaneous sample A/D converter that takes (through on board signal conditioning) a "snapshot" image of the three phases of current, one phase of voltage, and ground. When the relay trips one or more of the onboard control relays, indicators will be illuminated to show the status of the device. Additionally, the trip event will be stored in non-volatile memory. The relay also has an auxiliary communications port for connection to the PDU which can display the data within the relay in real-time. The PDU can also be used to configure the relay.



Programmable Display Unit



CT Pack Size 1&2&3.

Overcurrent (51)

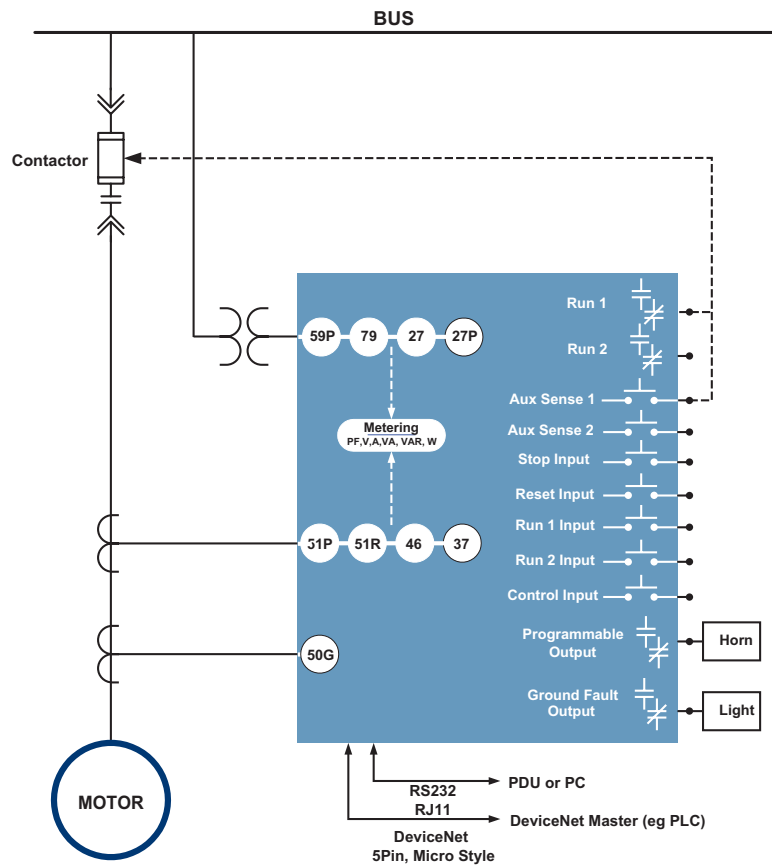
When current for any of the three phases becomes greater than nominal Full Load Amperage (FLA), the unit calculates time to trip. FLA, Trip Class, CT ratio and number of passes/turns through the CT, and Current input readings are taken into account. Separate algorithms are used for "cold" and "hot" motors. Since the LM10 does not measure temperature directly, motor condition is extrapolated from operating current versus FLA setting.

The FLA value can be set from 1.2A - 800A (in 0.1A increments).

Current Unbalance (46)

The LM10 monitors the three current phases and trips if the phases are unbalanced. In addition to phase A, B, and C Current, this function takes FLA, CT ratio and number of passes/turns through the CT into account. The Current Unbalance is programmable between 2% - 25% of FLA.

Functional Block Diagram



Ground Fault (50G)

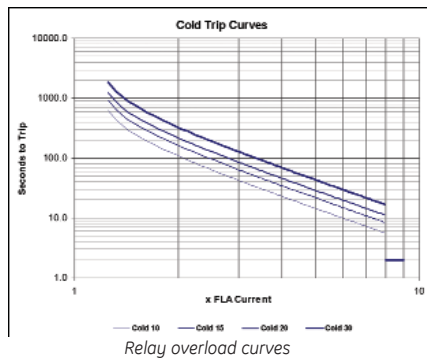
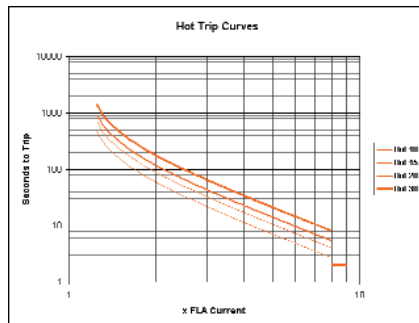
Zero-Sequencing Ground Fault can be enabled to trip and operate a separate Ground Fault relay when ground fault current exceeds the set point. The trip range is 0.4-20 A. Ground current can be continuously monitored at the PDU or over the network.

Overvoltage/Undervoltage (59, 27)

Maximum and minimum voltage trip points are set at 117% of nominal voltage. This corresponds to 96V and 140V with 120 V nominal scale. This fault condition is continuously monitored and cannot be disabled. Trip time is approximately 250 ms.

Jam

For relatively low over-current conditions, particularly on higher NEMA Class motors, trip times can be considerably longer than 2 minutes. A separate Jam fault is available because the standard TOC curve may not protect in this range. The user may set a Jam level of 100 - 250% of FLA or disable this function.



Stall

Cold motor trip times for a 6x FLA fault are determined by trip class. A separate Stall fault is available which would allow the user to reduce the trip time for large over-current situations.

The user may set a Stall level of 330 - 600% of FLA or disable this function.

Load Loss (Underpower 37)

The trip point is programmable as a percentage of full load. The motor would need to drop below this level for the pre-set time to cause the load loss fault. Full load is based on FLA, voltage at nominal value, and a 0.85 power factor.

Power Loss Restart

The LM10 has the ability to restart after a 4 second or less power outage. If power is restored within the set time, the unit can be set to automatically restart. On a power loss, the LM10 will record a Power Loss fault as well as latest motor condition and parameter settings.

Analog Inputs

The LM10 has inputs for two matched sets of three phase Current Transformers (CT) and one ground CT. One set will allow for .5A to 135A CTs to be connected; the other will allow for 135A to 1000A CTs.

Additionally, provisions were made both in the CPU application code and the Analog interface circuit to support various CTs for the 3 phase measurements. NEMA Class 10, 15, 20 & 30 are rotary Switch selectable. Additional Jam and Stall protection can be programmed. Using a Ground CT provides Zerosquence ground fault protection as an option.

Voltage input from the Control Power Transformer (CPT) will be conditioned and measured by the AD Converter to determine supply voltage status.

Inputs

Six digital inputs are available. These digital inputs are defined as Run 1 & 2, Stop, Trip, Operation Mode and Reset.

Relay Outputs

The LM10 contains 4 onboard normally open (NO) relays with C150 pilot duty ratings that control the coils for the motor contactors and programmable fault outputs indications. There are two control relays enabled from the control logic - Ground Fault and a programmable trip relay.

Monitoring and Metering

The LM10 continuously monitors the phase currents, ground current, voltage, kW, power factor, average current, current unbalance, and elapsed motor hours. These values are displayed on the PDU and are available across a network.

History

The LM10 maintains a trip history of 10 records which contain a snapshot of the conditions when the unit last failed. The trip records contain fault type, phase currents, ground current, voltage, power factor, kW, average current, and % current unbalance.

Elapsed Motor Hours

The LM10 keeps a running total of motor operation time, incremented hourly up to 65,535 hours. Upon power loss, the unit will retain any whole number of hours already recorded.

User Interfaces

The LM10 can display the following values, either through the PDU or via a network:

- Trip
- Phase Current A, B, C, GND
- Voltage
- Power Factor
- kW
- Average Current
- % Current Unbalance
- Motor Hrs

The user is able to configure the following parameters on the LM10:

- Time Delay's
- Auto Restart
- MAC ID
- Start/Stop Test
- Fault Reset
- Current Unbalance

- FLA
- Ground Fault
- Load Loss
- Jam & Stall
- Trip Class
- Starter Type
- System Frequency
- Reset Motor Hrs

The configuration and communication with the LM10 can be made through a variety of interfaces:

LM10 Base Unit

The LM10 Base Unit has 5 LEDs on the front panel for module status, network status, overcurrent, ground fault, and current unbalance.

There are also 3 sets of switches: NEMA Overload trip class rotary dipswitch, DeviceNet MAC ID, and DeviceNet baud rate.

Programmable Display Unit (PDU)

The PDU is a self-contained device consisting of a poly-carbonate plastic housing, a membrane switch keypad, a Liquid Crystal Display (LCD), and control electronics for communication with the Relay. The LCD is a 5x8 font pixelized



PDU mounted in Evolution Series E9000 MCC

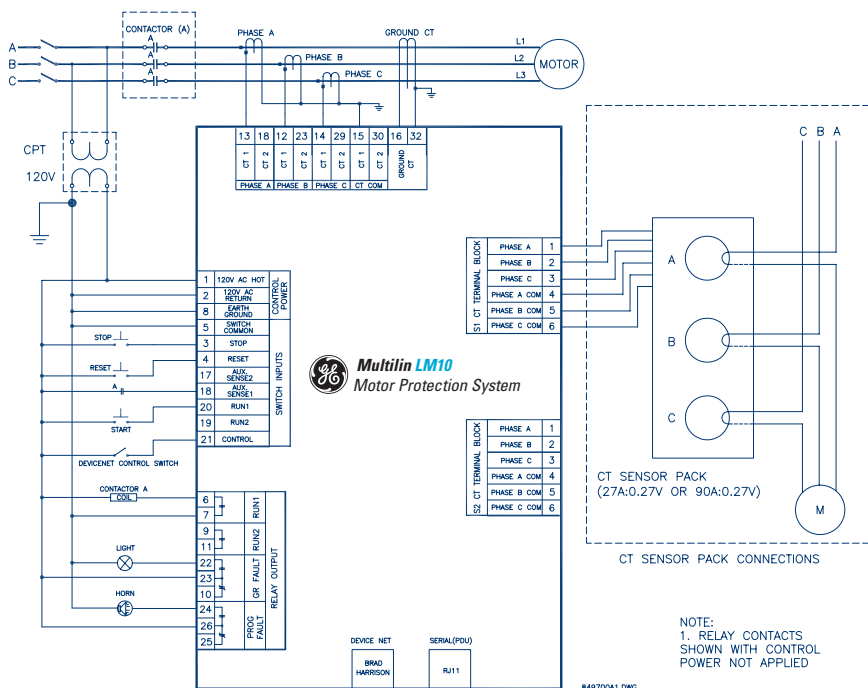
character type in a 16 character x 4 line format. The messages can be displayed in English or Spanish.

The PDU is used to configure the relay and can display the following faults: Over current, Adjustable ground fault, Jam, Stall, Current unbalance, Communication failure, Load Loss, Power Loss and User Trip. In addition the Programmable Display Unit (PDU) can be used to check status, phase current, voltage and Power.

The PDU is connected to the base unit via a standard RJ11 connector (RS-232 port). The communications and power will be provided to the PDU through this connection.

Physically, the PDU can be attached directly to the MPR or remotely mounted. This feature allows the MPR to be embedded within a control panel, but access can be conveniently made through the PDU, which can be mounted on the panel.

Typical Wiring Diagram



EnerVista

The LM10 is fully supported through EnerVista, Multilin's industry leading relay setup and support software. Relay configuration can be made by directly connecting the PC running EnerVista to the relay, via the RJ11 connector (RS232). Product updates including documentation and software can automatically be obtained via EnerVista Subscriptions.

DeviceNet

The LM10 has DeviceNet communication utilizing one micro-style 5-pin connector (Brad Harrison style) that allows the use of prebuilt cables for attachment to the unit and the ability to daisy chain from one unit to the next. These connections meet all DeviceNet physical layer requirements.

The DeviceNet unique MAC ID and baud rate are dipswitch selectable.

Terminals

Clearly marked for inputs and outputs.

LM10 Technical Specifications

ENVIRONMENTAL
0 to 60 degree C -30 to 80 degree C storage Run in 95% non-condensing humidity
OPTIONAL CONTROL POWER
Programmable Display Unit (PDU) NEMA 12 Self powered form MPR RJ phone jack to MPR or PC Door mounted or Hand held High Impact Screen
PROGRAMMABLE FAULT OUTPUTS
Zero Sequence Ground Fault Load Loss Current Unbalance
ACCURACY
Power Factor + 5% Current + 3% Timers 5% + 1 second
ERROR MESSAGES
Over Current LED & Network Current Unbalance LED & Network Ground Fault LED & Network Load loss Command Trip

CT-SENSOR PACK
NEMA size 1, ½ Amp to 27 FLA NEMA size 2 & 3, 5 Amps to 90 FLA's
CT's with 5A secondary, matched for MPR 30-540 FLA
VOLTAGE RATING
VOLTAGE RATING: Control Power 100V to 135V System set up range 200V to 7.2KV
RELAY OUTPUTS
NEMA C150 RATED 1/3HP @120V AC

LM10 Guideform Specifications

For an electronic version of the LM10 guideform specifications, please visit: www.GEMultilin.com/specs, fax your request to 905-201-2098 or email to literature.multilin@ge.com.



User Interface

Display
Liquid crystal display -4 line by 16 characters

Status
The Status sub-menu can display Current (FLA) Status, Run 1, Run 2, Faults, MAC ID, Baud rate & OL Class

Reset
The rely can be reset from the PDU, Push Button or the LAN

Mounting Flexibility
Relay can be attached to PDU with out hardware to facilitate door mounting.

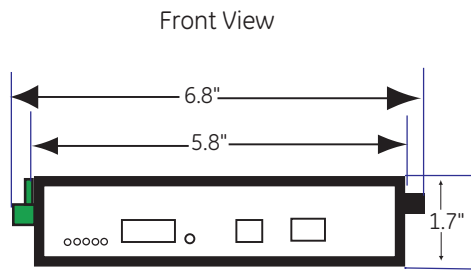


LEDS
Green LED power indicator and a flashing Red LED fault indicator, over/under current, current unbalance, ground fault, under/over voltage, and Trip command

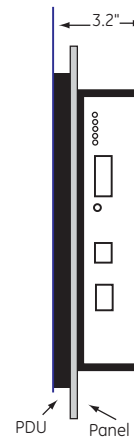
CONFIG
The parameters can be programmed by the Config button . The Config sub-menu is similar to Status but here the user may change parameters: Current, Voltage, Fault settings & Time Delays.

History
Display last 8 trip records. The conditions at the time of that fault are displayed and can be scrolled through using the Up/Down arrows.

Dimensions



Side View



Ordering

LM10	LM10-D*	- CT **	- GF **	- C *	- XX	
Base Unit	X					Base Unit - Motor Protection Relay
Programmable Display Unit	1					No Display Unit Programmable Display Unit (with cable)
Thermal Overload Current Transformer		XX 01 02 03 04 05				No Current Transformer Current Sensor, NEMA Starter Size 1, 3 phase, 30 amp Current Sensor, NEMA Starter Size 2&3, 3 phase, 90 amp Current Sensor, NEMA Starter Size 4, 3 phase, 200 amp Current Sensor, NEMA Starter Size 5, 1 phase, 300 amp Current Sensor, NEMA Starter Size 6, 1 phase, 600 amp
Ground Fault Sensor			XX 01 02 03 04 05 06			No Ground Fault Sensor Ground Fault Sensor - 3 phase, 20 amp, 0.44" window Ground Fault Sensor - 1 phase, 20 amp, 1.56" window Ground Fault Sensor - 3 phase, 20 amp, 2.08" window Ground Fault Sensor - 3 phase, 20 amp, 2.08" window Ground Fault Sensor - 1 phase, 20 amp, 3.31" window Ground Fault Sensor - 1 phase, 20 amp, 4.62" window
Cable				X 1	XX	No cable 30" Connection cable from relay to PC Future use

