

MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Reference package for procurement and maintenance review

GE

239-RTD-AN

239 MOTOR PROTECTION RELAY WITH RTD AND ANALOG OUTPUT

Used with the applicable GE Multilin 239 configuration.

REFERENCE PACKAGE

OFFICIAL DOCUMENT

Selected official manufacturer pages follow this cover.

Source: GE official technical documentation for 239-RTD-AN



MOTOR PROTECTION SYSTEM

Motor protection and management for small to medium size motors

KEY BENEFITS

- Enhanced Motor Overload Protection with Thermal Modeling
- Simple configuration and system monitoring using EnerVista™ 239 Setup software
- Reduced cost and commissioning time with Protection, Monitoring, and Control in a single device
- Scalable protection with optional RTD inputs and advanced Motor Protection elements
- Simplified testing and commissioning with built in simulation features
- Field upgradable firmware and relay options
- Easy access to system and relay information using Modbus RTU

APPLICATIONS

- Multiple groups of protection settings allows flexible protection for flexible systems
- Small to Medium sized three phase AC induction and synchronous motors
- Pumps, conveyors, compressors, fans, etc.

FEATURES

Protection and Control

- Thermal Overload (15 selectable curves) - Trip and alarm, immediate current overload alarm
- Phase short circuit
- Mechanical jam
- Thermal memory lockout
- Single-Phasing /Current unbalance
- Ground fault - trip and alarm
- Overtemperature: via thermistor or optional RTD inputs
- Undercurrent
- Breaker Failure
- Trip/alarm/auxiliary/service outputs
- Multi-speed motor protection
- Motor start supervision

Communications

- RS485 Serial Communications
- Modbus RTU protocol

Monitoring and Metering

- Status/current/temperature display
- Fault diagnosis
- Trending
- Trip record, last 5
- Process control
- Optional analog output

User Interface

- 40 Character backlit display for easy viewing of settings and actual values
- 6 Motor and relay status LED's
- Multiple programming keys to allow easy access to system values and relay settings

EnerVista™ Software

- State of the art software for configuration and commissioning GE 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 the 239 into new or existing monitoring and control systems

Protection and Control

The 239 is a digital motor protection system designed for three phase AC motors and associated mechanical equipment. Advanced protection features include:

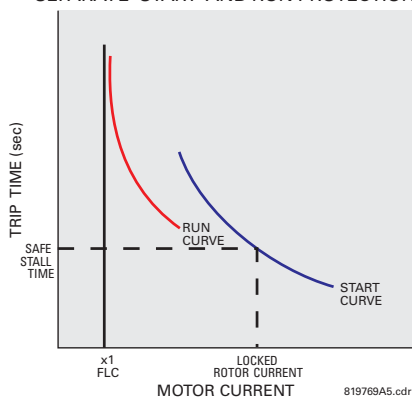
Thermal Overload

This function calculates the thermal capacity used by the motor during different stages of the motor operation. The value is updated based on the time-current overload characteristics and the motor overload lockout time setpoints.

Motor Starting

During acceleration, the motor is protected by an I^2t overcurrent curve which passes through the setpoints "Locked Rotor Current" and cold "Safe Stall Time." The running overload curve is not active during acceleration, therefore providing starting protection independent of running protection.

SEPARATE START AND RUN PROTECTION



Separate start and run modeling provides optimum rotor and stator protection.

Motor Running

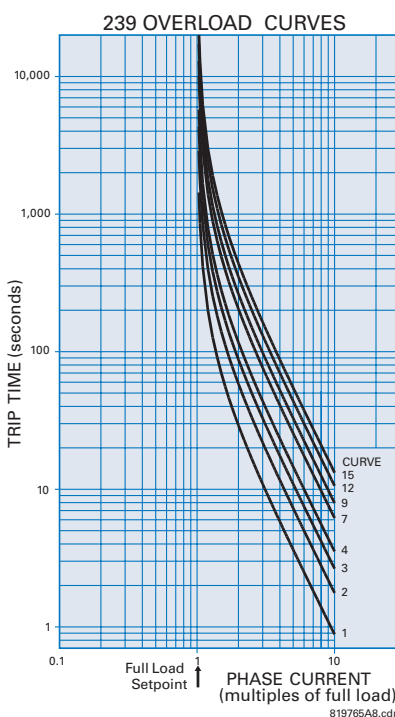
To protect the motor against overloads while it is running, select one of 15 different curves to accurately match the motor overload characteristic. Curves automatically adjust for hot motor compensation to ensure correct thermal modeling. For some non-typical applications, the relay can be ordered with additional custom programmable overload curves, allowing the user to construct the precise curve that matches the thermal characteristics of the protected motor (MOD 506).

A user-programmable overload lockout time controls the motor cooling rate. If

the process criteria require shorter cooling periods, particularly for small motors, a different time can be used.

The minimum level of thermal capacity that the relay will calculate under normal operation will be determined by the Hot/Cold stall time ratio, which distinguishes between cold and hot motor conditions. An Auto Reset feature resets the overload trip once the thermal capacity has decreased to 15% or less.

An immediate overload alarm alerts the operator. This may be useful for systems that do not normally experience overloads.



Trip time overload curves, data and formulae are provided for protection and co-ordination.

An immediate overload pickup setpoint is also available. The relay can also be ordered with the option to allow the relay to learn the thermal capacity used during successful starts.

Hot Motor

This function utilizes thermal capacity used (TCU) value to initiate a hot motor alarm when the TCU is approaching the motor thermal limit (100% TCU).

Immediate Overload Alarm

This function is used to alarm on a motor overload condition that requires an

immediate intervention to eliminate the cause of the sudden overload.

Phase Short Circuit

This element provides complete phase-to-phase and Phase-to-ground protection. Trip or Auxiliary contacts can be selected to operate instantaneously, or with a time delay up to 60 seconds.

Mechanical Jam

This function prevents motor damage during abnormal operational conditions. Quick motor shut down can reduce damage to gears, bearings, and other mechanical parts associated with the drive system. A current surge will cause the relay assigned to the mechanical jam protection to become active. The user may set the pickup level, time delay, and inhibits.

Undercurrent

This function is typically used to protect pumps from loss of suction, fans from loss of airflow due to a closed damper, or conveyor systems from a broken belt. This function can be used as an alarm or as a trip, or disabled if not required. Alternatively this feature can be used as a pre-overload warning by setting the undercurrent pickup above the normal operating current but below the rated full load current.

Single-Phase (Unbalance)

Current unbalance is another significant contributor to motor overheating. The unbalance protection function has an unbalance pickup level and time delay that can trigger a trip or an alarm. Typical pickup is intended to detect and clear single phasing. Use the alarm level as a warning for system voltage unbalance.

Breaker Failure

This function allows tripping of all breakers feeding a fault in the event that the breaker protected by the 239 fails to operate and clear the fault.

Ground Fault Protection

Aging and thermal cycling can cause the stator insulation to break down, resulting in ground faults. Ground faults can also occur in motors because of environmental conditions such as moisture or conductive

dust. The 239 can trigger a trip or an alarm if the ground pickup level is exceeded. A time delay may be entered for time coordination of systems with several levels of ground fault detection. There are two ground inputs available in the 239, allowing two methods of ground protection.

- Core balance (Zero sequence) High Impedance Ground Fault (HGF) current transformers with 5A secondary
- Core balance (Zero sequence) current transformers with a 50:0.025 Amp current ratio for sensitive current detection.

When the residual connection of the phase CTs is used to detect ground currents, nuisance trips can occur during start due to unequal saturation of CTs. This may cause Zero sequence currents to appear, of sufficient magnitude to reach the pickup setting of the Ground Fault protection function. To avoid this, the 239 has two independent time delay settings, one for motor starting, and one for motor running. The 239 can be ordered with MOD512 for 1A ground current input and MOD 509 for direction ground fault sensing.

Overheating

Direct temperature sensing is necessary to detect the effects of motor overheating due to blocked ventilation or high ambient temperature. Temperature rise under these types of conditions is usually slow enough to allow the accurate sensing of the actual motor temperature.

A motor temperature input for a thermistor is standard on the 239. Additionally, three RTDs located in the stator and/or bearings can be connected to the 239 with the RTD temperature sensing option. This provides displayed temperatures as well as alarm and trip settings for both bearing and stator RTDs. Four RTD types are supported: 100Pt, 120Ni, 100Ni, and 10Cu. A RTD failure alarm is also provided.

Monitoring and Metering

The 239 provides users with advanced monitoring and metering functions that include:

Metering

Measured values include:

- Phase current
- Ground current

- Current unbalance
- Current % of full load
- Motor load current as a % of full load
- Motor thermal capacity used
- Stator temperature (RTD option)
- Bearing temperature (RTD option)

Multi-Speed Motors

Optional switches allow alternate parameters to be activated for protection of multi-speed motors. Additional settings provided with multiple speed motor protection include:

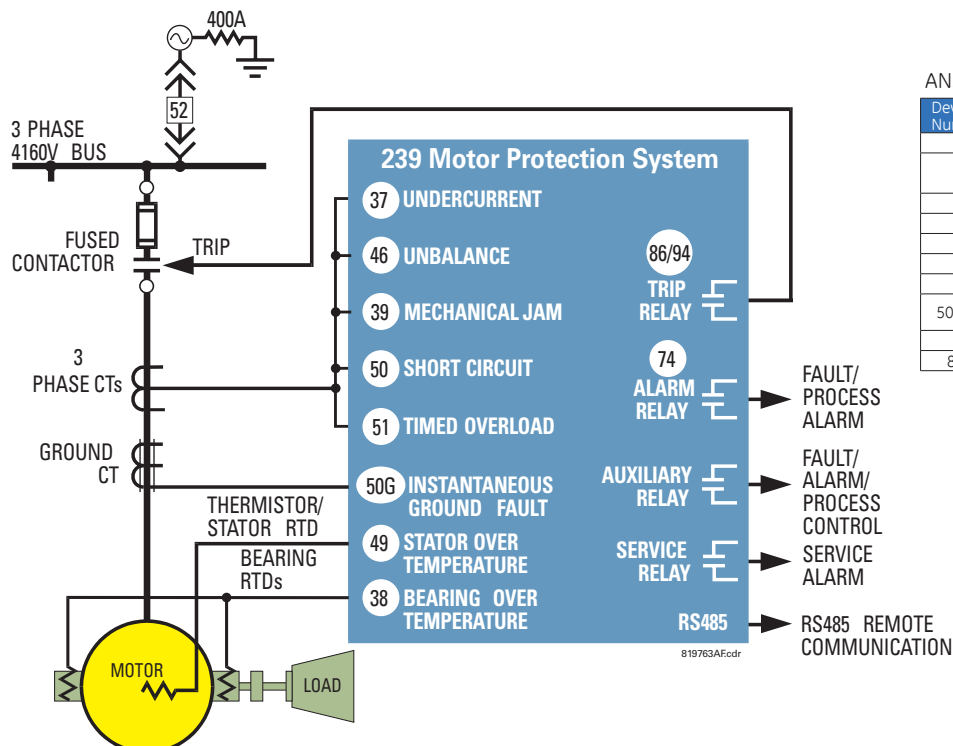
- Phase CT primary
- Full load current
- Overload curve
- Short circuit trip settings

Motor Start Supervision (MOD 505)

The 239 relay can be furnished with this function, which is an enhanced protection against multiple starts. The function consist of 2 elements:

- Time Between Starts
- Starts per Hour

Functional Block Diagram



ANSI Device Numbers & Functions

Device Number	Function
37	Undercurrent/minimum load
38	Motor/load bearing
39	Mechanical jam
46	Current unbalance
49	Stator winding overtemperature
50	Phase short circuit
51	Timed overload
50G/50N	Ground fault instantaneous or definite time
74	Alarm relay
86/94	Lockout and trip relay