Motor Protection Solutions

Protecting Your Investments
Motor Protection Solutions

The Allen-Bradley® line of motor protection devices encompasses a range of simple, single purpose protection to the newer overload technologies featuring diagnostics and Logix integration.

Importance of Motor Protection

Electric motors are the backbone of today’s modern industry providing the mechanical energy needed for most manufacturing processes. Push too hard, too often, and there is the potential for unforeseen downtime while the affected motor shuts down and awaits reset.

Causes of Motor Failures

75% of motor failures can be prevented by appropriate protection measures.

- **Bearing, 51%**
- **Stator Winding, 16%**
- **Shaft Coupling, 2%**
- **External, 16%**
- **Rotor Bar, 5%**
- **Unknown, 10%**


MachineAlert™ Monitoring Relays

Key Features:
- Programmable latching or inhibit at set level
- Adjustable time delay settings
- Three-phase devices are powered by the measuring circuit
- Adjustable measurement set points

Bimetallic Overload Relays

Key Features:
- Ambient temperature compensation for consistency
- Rated for DC and variable frequency drives applications up to 400 Hz
- Optional remote reset solenoid and external reset accessories

857 Motor/Feeder Protection Relay

Key Features:
- Suitable for any system voltage to 450,000V
- Configurable interlocking schemes offering basic logic functions
- All settings, events, and indications are in a non-volatile memory
E1 Plus™ Electronic Overload Relay

Key Features:
• Current measurement-based protection
• Low energy consumption
• Side-mount expansion modules provide adjustable levels of protection and communication

E300™ and E200™ Electronic Overload Relays

Key Features:
• Provide critical motor protection functions
• Communication and diagnostics provide detailed logs and control from relay to motor
• Can simplify control architecture

Feature Comparison

<table>
<thead>
<tr>
<th>Protection Features</th>
<th>MachineAlert</th>
<th>Bimetallic</th>
<th>E1 Plus, EE Model</th>
<th>E200</th>
<th>E300</th>
<th>857</th>
</tr>
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<tbody>
<tr>
<td>Overload</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Phase loss</td>
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<tr>
<td>Ground fault</td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
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<td>Current imbalance</td>
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<td></td>
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</tr>
<tr>
<td>Jam</td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Over/under voltage</td>
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<td></td>
<td></td>
<td>✓</td>
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<table>
<thead>
<tr>
<th>Diagnostics Features</th>
<th>MachineAlert</th>
<th>Bimetallic</th>
<th>E1 Plus, EE Model</th>
<th>E200</th>
<th>E300</th>
<th>857</th>
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<tbody>
<tr>
<td>% Full load amperes</td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>% Thermal capacity utilization</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
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<td>Voltage</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Power</td>
<td></td>
<td></td>
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<td>✓</td>
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<tr>
<td>Energy</td>
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<th>Integration Features</th>
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<th>E1 Plus, EE Model</th>
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<tr>
<td>DeviceLogix™</td>
<td></td>
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<td>Logix controller</td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
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</table>
E1 Plus Electronic Overload Relay

The solid-state design of the E1 Plus overload relay, offered in two models, provides ambient temperature compensation, thermal and phase loss protection and a wide 5:1 adjustment range. The ED model provides fixed protection while the EE model provides selectable and expandable protection.

Customizable
The optional side mount modules* for the E1 Plus overload relays allow you to customize the device to your application’s specific needs.

* Side mount modules only available for EE model

Selectable Trip Class & Reset Mode
- Selectable manual/auto-manual reset modes
- Up to 4 trip class options

5:1 Current Range
- Wide FLA range

Side Mount Modules
- Communication
- Protection
- Remote reset

Communication Modules
- EtherNet/IP
- DeviceNet
- ProfiBus

Protection Modules
- Ground fault
- Jam protection
- Ground fault/jam protection
- PTC module

193-EE Shown
### Model Specifications

**Bulletin 193, ED Model**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
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<tbody>
<tr>
<td>Current Range</td>
<td>0.1…45 A</td>
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<tr>
<td>Trip Class</td>
<td>10 Fixed</td>
</tr>
<tr>
<td>Reset Mode</td>
<td>Manual Only</td>
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<tr>
<td>Side Mount Modules</td>
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**Bulletin 193/592, EE Model**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
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<tr>
<td>Current Range</td>
<td>0.1…800 A</td>
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<tr>
<td>Trip Class</td>
<td>10, 15, 20, 30 Adjustable</td>
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<tr>
<td>Reset Mode</td>
<td>Automatic and Manual</td>
</tr>
<tr>
<td>Side Mount Modules</td>
<td>Communication, Protection, Reset</td>
</tr>
</tbody>
</table>

### Diagnostics

The E1 Plus communication side-mount modules provide a cost-effective transformation of real-time data into your control architecture.

- DeviceNet
- EtherNet/IP
- PROFIBUS

### Advantages

- Includes integrated I/O
  - Provides convenient local termination of motor-related inputs (2) and outputs (1), simplifying the control architecture
- Provides operational and diagnostic data
  - Average motor current
  - Percentage of thermal capacity usage
  - Device status
  - Trip and warning identification
  - Trip history (5 previous trips)
- Expands protective functions
  - Overload warning
  - Jam protection
  - Underload warning

### Mounting Options

- IEC Motor Starter
- NEMA Motor Starter
- DIN Rail Mount with Pass-thru

### Reset Modules

- Remote reset
- Remote indicator

22 mm push button cutout
E300/E200 Electronic Overload Relay

The E300/E200 Electronic Overload Relays provide a flexible design and advanced intelligence. Real-time diagnostics are transformed into actionable information – maximizing your up-time and protecting your assets.

On-Device Settings
- Network address configuration
- Restore factory default settings
- Enable security settings

Modular Design
The modular design of the E300/E200 overload relays allow customers to tailor the device for their application’s exact needs.

Dual Port EtherNet/IP
- Supports device level ring

Removable Terminal Blocks

Expansion Port
- Expansion I/O
- Operator station

Customizable
Multiple accessory options allow for the E300/E200 overload relay to be customized to fit your application needs. Customers can expand out to 4 of the available Digital I/O modules, plus 4 Analog I/O modules along with a power supply and operator interface.

Expansion Digital I/O
- 4 inputs/2 outputs
- 24V DC
- 120V AC
- 240V AC
Module Specifications

Communication Module

<table>
<thead>
<tr>
<th>193-ECM*</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• EtherNet/IP</td>
</tr>
<tr>
<td></td>
<td>• DeviceNet</td>
</tr>
<tr>
<td></td>
<td>• E200/Parameter Configuration Module (PCM)</td>
</tr>
<tr>
<td></td>
<td>Includes Single USB Type B interface port</td>
</tr>
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</table>

Control Module

<table>
<thead>
<tr>
<th>193-EIO*</th>
<th>Control Voltage</th>
<th>Inputs</th>
<th>Relay Outputs</th>
<th>Inputs</th>
<th>Relay Outputs</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>110…120V AC 50/60 Hz</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>110…120V AC 50/60 Hz</td>
<td>2</td>
<td>2</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>220…240V AC 50/60 Hz</td>
<td>2</td>
<td>2</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>24V DC</td>
<td>6</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>24V DC</td>
<td>2</td>
<td>2</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

Sensing Module

<table>
<thead>
<tr>
<th>592/193-ESM*</th>
<th>Sensing Options:</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>• Voltage/Current/Ground Fault</td>
</tr>
<tr>
<td></td>
<td>• Current/Ground Fault</td>
</tr>
<tr>
<td></td>
<td>• Current</td>
</tr>
<tr>
<td>Current Range:</td>
<td>• 0.5…30 A</td>
</tr>
<tr>
<td></td>
<td>• 6…60 A</td>
</tr>
<tr>
<td></td>
<td>• 10…100 A</td>
</tr>
<tr>
<td></td>
<td>• 20…200 A</td>
</tr>
<tr>
<td>Current transformer solutions available for applications above 200 A</td>
<td></td>
</tr>
</tbody>
</table>

Mounting Options

IEC Motor Starter

NEMA Motor Starter

DIN Rail Mount Motor Starter

Diagnostics

The E300/E200 overload relay provides real-time motor diagnostic information to proactively indicate when a motor is having a problem allowing you to efficiently troubleshoot. This information includes:

- Current
- Ground fault current
- Voltage
- Power
- Energy
- % thermal capacity utilization
- Time to trip
- Time to reset
- Trip history
- Trip snapshot

The communication options of the E300/E200 overload relay allow users to view this diagnostic information using the following methods:

- Logix add-on profile
- Embedded web browser
- FactoryTalk® View
- Pre-configured Operator Faceplate Objects
- Connected Component Workbench™ software (E200 only)
MachineAlert Monitoring Relays

The MachineAlert family of dedicated function motor protection relays offers supplementary protective functions that are easily added to your motor control circuits.

**Ideal Applications**

- Protects against single phasing during start-up and run-time in motor applications
- Detects incorrect phase sequence to keep the motor from starting
- Detects no-load conditions indicating absence of water in water lubricated pumps
- Protects motors from over temperature conditions

**Status LED**
- Relay
- Alarm
- Power

**DIP Switch Configuration**
- Protective functions
- Inhibit mode
- Start-up delay

*Based on model

**Adjustable Fault Delay**

**817S Thermistor Monitoring Relay**
Protects equipment from overtemperature conditions

**814S Power (kW) Monitoring Relay**
Monitors for under and over active power as well as power direction

**809S Current Monitoring Relay**
Provides under and overcurrent detection

**813S Voltage Monitoring Relay**
Guards against the damaging effects of phase loss, under and overvoltage, phase imbalance, and voltage quality of incoming power line

**Provides supplemental protection in conjunction with Bimetallic and Electronic Overload Relays**
Bimetallic Overload Relays

The bimetallic thermal overload relays compensate for ambient temperature while providing overload protection and phase-loss sensitivity. They are a cost-effective way to protect your electrical equipment investment.

Ideal Applications

Ideal for light industry and low critical process
• Conveyors
• Fans
• Pumps
• VFD-controlled motors
• DC motors

Visible Trip Indication

Reset Modes
• Selectable reset switch – manual or automatic
• Remote reset solenoid option

193-T Bimetallic
The 193-T bimetallic overload relays are designed for use with the 100-C contactors and 104-C reversing contactors

193-K Bimetallic
The 193-K bimetallic overload relays are designed for use with the 100-K miniature contactors and 104-K miniature reversing contactors

Offers basic motor protection at an economic price
Functions

This device also includes many programmable functions for various protection and communication situations:

- Ultra-fast arc protection (optional)
- Power quality assessment
- Trip circuit supervision
- Circuit breaker protection
- Complete protection and control
Product Selection Attributes

**Diagnostics**

<table>
<thead>
<tr>
<th>Feature</th>
<th>E1 Plus*</th>
<th>E300</th>
<th>857</th>
</tr>
</thead>
<tbody>
<tr>
<td>% FLA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% TCU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amps RMS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trip Log</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Trip Snapshot</td>
<td></td>
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<td></td>
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<tr>
<td>Warning Log</td>
<td></td>
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<tr>
<td>Virtual Clock</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real-time Clock</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Usability**

- **Bimetallic**
  - Selectable reset mode
  - Built-in test/reset button
  - Manual trip

- **E1 Plus***
  - Multiple trip class options
  - Selectable reset modes
  - Wide current range
  - Additional modules for communications and protection

- **E300**
  - Wide current range
  - Advanced performance and diagnostics
  - Embedded communications
  - Modularity
  - Multiple expansion options

- **857**
  - Highly configurable
  - Motor and feeder protection in one unit
  - Multiple communication interfaces and protocols
  - Extensive diagnostic capabilities
  - Suitable for all system voltages to 450,000V

**Performance**

- Protection
- Diagnostics
- Networks and Integration
- Embedded Logic and I/O
- Scalable

* E1 Plus, EE model used in comparison charts.

Prevent motor failures, protect your investments
Local Distributor
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www.rockwellautomation.com/distributor

Online Product Directory
Our portfolio of motor protection devices are designed to protect your manufacturing investments.
https://ab.rockwellautomation.com/allenbradley/productdirectory.page

The Connected Enterprise
Learn more about how The Connected Enterprise transforms real-time data, from intelligent assets and multi-disciplined control from a plant, or a remote site into actionable information.
https://www.rockwellautomation.com/global/capabilities/connected-enterprise/overview.page

Product Selection Toolbox
Our powerful range of product selection and system configuration tools assist you in choosing and applying our products.

Rockwell Automation, Inc. (NYSE:ROK), the world’s largest company dedicated to industrial automation, makes its customers more productive and the world more sustainable. Throughout the world, our flagship Allen-Bradley® and Rockwell Software® product brands are recognized for innovation and excellence.

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