

## PROCUREMENT SPECIFICATION

# E1 Plus Electronic Overload Relay

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## PART 1 GENERAL

### 1.01 QUALIFICATIONS

#### A. Manufacturer

1. The manufacturer shall have a minimum of 25 years of experience in the manufacture of electronic overload relays.
2. The approved manufacturers are:
  - a) Rockwell Automation Allen-Bradley
  - b) Substitutions: None permitted

#### B. Support

1. The manufacturer shall maintain factory trained and authorized service facilities within 100 miles of the project and shall have a demonstrated record of service for at least the previous ten years.
2. Support personnel are to be direct employees of the manufacturer and be available 24 hours per day through a toll-free number.
3. The manufacturer shall provide all required start-up and training services.
4. The approved manufacturers are:
  - a) Rockwell Automation Customer Support & Maintenance
  - b) Substitutions: None permitted

#### C. Certification

1. To ensure all quality and corrective action procedures are documented and implemented, all manufacturing locations shall be certified to the ISO-9001 Series of Quality Standards.
2. Third-party manufacturers and brand labeling shall not be allowed.

### 1.02 REFERENCES

#### A. The electronic overload relay shall be certified:

1. CE
2. cULus Listed
3. C-Tick
4. CCC

#### B. The following standards shall be met:

1. EN 60947-4-1
2. EN 60947-5-1
3. UL508
4. CSA C22.2 No. 14 (cUL)
5. NEMA ICS 2-1993 Part 4

#### C. Terminal markings shall comply with CENELEC and EN 50012.

### 1.03 ENVIRONMENTAL REQUIREMENTS

- A. The supplier shall confirm specified service conditions during and after installation of products.
- B. The supplier shall maintain the area free of dirt and dust during and after installation of products.

### 1.04 PRE-MANUFACTURE SUBMITTALS

- A. Refer to Section \_\_\_\_\_ for submittal procedures.
- B. Product Data
  - 1. Publications on electronic overload relay.
  - 2. Data sheets on the expansion module and accessories, when applicable.
- C. Specification Response
  - 1. Detailed response to this specification showing where in the literature each requirement is satisfied.
  - 2. Clearly identified clarifications and exceptions.
- D. Installation Instructions
  - 1. A copy of the manufacturer's installation instructions, including receiving, handling and storage instructions.
- E. Testing and Test Reports
  - 1. Testing per manufacturer's standard.
  - 2. A copy of the test reports, if available, shall be provided as part of the final documentation.

### 1.05 FINAL SUBMITTALS

- A. Refer to Section \_\_\_\_\_ for procedure on submittal of final documentation.
- B. Supplier Certification
  - 1. The supplier shall provide certification that the electronic overload relay has been installed in accordance with the manufacturer's instructions.
  - 2. The supplier shall provide certification that the electronic overload relay settings have been properly adjusted.
- C. Final Drawings
  - 1. The manufacturer shall provide final drawings reflecting the "As-Shipped" state of the installed equipment.
  - 2. Manufacturer drawings shall be provided in DWG format.
  - 3. Manufacturer drawings do not need to be stamped if a drawing schedule is provided that lists the drawing numbers, revision levels, and status of drawings (Preliminary, Approval, Final, etc.)
  - 4. The supplier shall be responsible for making any changes to the "As-Shipped" drawings from the manufacturer to reflect any field modifications.

D. Maintenance Data

1. Electronic overload relay installation instructions and User Manual.
2. Field service report from start-up service.
3. Name and phone number for a local distributor for the spare parts.

PART 2 PRODUCTS

2.01 RATINGS

A. The electronic overload relay shall have a current operating range of:

1. 0.1 to 600 A (for NEMA models)
2. 0.1 to 800 A (for IEC selectable motor protection models)
3. 0.1 to 45 A (for IEC fixed motor protection models)

B. All relay contacts shall be rated AC15/B600.

C. The electronic overload relay main circuits shall be rated:

Insulation Voltage ( $U_i$ )	690 VAC [or 1000 VAC, D contactor models]
Impulse Strength ( $U_{imp}$ )	6 kV AC
Operating Voltage ( $U_e$ ) IEC/UL	690 VAC/600 VAC [or 1000 VAC/600 VAC, D contactor models]
Operating Frequency	50/60 Hz (sinusoidal)

A. The electronic overload relay control circuits shall be rated:

Insulation Voltage ( $U_i$ )	690 VAC
Impulse Strength ( $U_{imp}$ )	6 kV AC
Operating Voltage ( $U_e$ ) IEC/UL	690 VAC/600 VAC
Operating Current ( $I_e$ )	N.O./N.C.
12 – 120V	3/2
220 – 240V	1.5/1.5
380 – 480V	0.75/0.75
500 – 600V	0.6/0.6
Thermal Current ( $I_{the}$ )	5 A
Contact Reliability	17V, 5 mA

B. Environmental Specifications – The electronic overload relay shall be:

1. Capable of operating in an environment with a relative humidity range of 0 to 95%, non-condensing.
2. Able to withstand a shock of 30 G (per IEC 68-2-27).
3. Able to operate without disruption for vibration levels up to 3 G (per IEC 68-2-6).
4. Able to operate without de-rating to an elevation of 2000 m.
5. Rated for an operating environment of -20 to +60°C (-4 to +140°F).
6. Rated for application in Pollution Degree 3 environments.

## 2.02 CONSTRUCTION

- A. The electronic overload relay shall be a self-powered, low energy consumption (150 mW) device and shall consist of:
  - 1. Overload relay
  - 2. One side-mount expansion module (optional)
  - 3. Accessories (optional)
- B. The electronic overload relay shall be direct mounting style or compact, pass-through style with integrated DIN rail and panel mount. The direct mounting style shall be capable of being separate-mounted through a DIN rail/panel mount adapter accessory.

## 2.03 OVERLOAD RELAY

- A. The electronic overload relay shall be NEMA or IEC configuration, providing current measurement-based protection.
  - 1. Motor current shall be monitored through 3 integral current transformers, secured separately in the housing, that power the overload protection circuitry.
  - 2. Performance of the electronic overload relay shall not be impacted by ambient temperature over the specified temperature operating range.
- B. The electronic overload relay shall perform thermal modeling electronically with precision solid-state components and shall have:
  - 1. An application-specific integrated circuit (ASIC), which continually processes motor current data to accurately maintain the time-current status of the motor thermal capacity utilization value.
  - 2. A thermal memory circuit, which allows the relay to model the heating and cooling effects of motor on and off periods, ensuring accurate protection of both hot and cold motors.
  - 3. A separate phase loss detection circuit, which allows the relay to quickly respond to phase loss conditions, typically within 3 seconds.
- C. The electronic overload relay's trip class shall be:
  - 1. Fixed Trip Class 10, or,
  - 2. Selectable Trip Class 10, 15, 20 or 30, through means of a DIP switch setting.
- D. The electronic overload relay's reset mode shall be:
  - 1. Manual, or,
  - 2. Selectable Manual/Automatic, through means of a DIP switch setting.
- E. The face of the electronic overload relay shall provide:
  - 1. A potentiometer that can be set to a wide 5:1 adjustment range.
  - 2. A trip indicator flag for visual trip status indication.
  - 3. A reset button.
  - 4. A test button that momentarily actuates the N.C. contact.
  - 5. A mechanical trip cam for operating both sets of contacts.

F. Electrical connections:

1. The electronic overload relay shall work with three-phase or single-phase applications.
2. The electronic overload relay shall be capable of direct connection and mounting to contactors in low voltage applications.
3. The electronic overload relay shall provide 1 N.O. and 1 N.C. isolated auxiliary contacts. The isolated configuration allows them to be applied in circuits operating at different voltage levels and without polarity restrictions.
4. The electronic overload relay shall have line-side over-molded connections.
5. Wiring terminals shall provide IP20 finger protection.

2.04 OPTIONAL PROTECTIVE, REMOTE RESET AND COMMUNICATION MODULES (LIMIT 1)

A. Remote Reset Module

1. Ratings:

Insulation Voltage ( $U_i$ )	300V
Operating Voltage ( $U_e$ )	24 to 240 VAC/VDC, 50/60 Hz
Power at $U_e$	
24 VAC	0.8 W
120 VAC	0.8 W
240 VAC	1.0 W
Impulse Withstand Voltage	2.5 kV

2. The remote reset module shall provide remote reset of the electronic overload relay after a trip occurs.
  - a) Directly mounts to the left side of the electronic overload relay, adding only 18 mm to the overall width.
  - b) Electronically interfaces with the electronic overload relay so that all control circuit connections are made at the relay terminals.

B. Jam Protection Module with Remote Reset

1. Ratings:

Insulation Voltage ( $U_i$ )	300V
Operating Voltage ( $U_e$ )	24 to 240 VAC/VDC, 50/60 Hz
Power at $U_e$	
24 VAC	0.3 W
120 VAC	0.3 W
240 VAC	0.5 W
Impulse Withstand Voltage	2.5 kV

2. The jam protection module with remote reset shall provide flexible jam protection.
  - a) Directly mounts to the left side of the electronic overload relay, adding only 18 mm to the overall width.
  - b) Electronically interfaces with the electronic overload relay so that all control circuit connections are made at the relay terminals.
3. The jam protection module with remote reset shall provide front-accessible DIP switches that offer jam protection settings to match application requirements.

- a) Enabling/disabling of jam protection function and remote reset operation.
- b) Jam trip level settings at 150%, 200%, 300% and 400% of full load current setting.
- c) Trip delay settings of 1/2, 1, 2 and 4 seconds to minimize nuisance tripping.

C. Ground Fault Protection Module with Remote Reset

1. Ratings:

Insulation Voltage (U <sub>i</sub> )	300V
Operating Voltage (U <sub>e</sub> )	24 to 240 VAC/VDC, 50/60 Hz
Power at U <sub>e</sub>	
24 VAC	0.8 W
120 VAC	0.8 W
240 VAC	1.0 W
Impulse Withstand Voltage	2.5 kV

- 2. The ground fault protection module with remote reset shall provide flexible ground fault protection.
  - a) Directly mounts to the left side of the electronic overload relay, adding only 18 mm to the overall width.
  - b) Electronically interfaces with the electronic overload relay so that all control circuit connections are made at the relay terminals.
- 3. The ground fault protection module with remote reset shall provide front-accessible DIP switches that offer ground fault protection settings to match application requirements.
  - a) Enabling/disabling of ground fault protection function and remote reset operation.
  - b) Ground fault trip level settings in 4 ranges: 20 to 100 mA (resistive loads); 100 to 500 mA; 0.2 to 1 A; 1 to 5 A. Within each range, specific percentages of maximum ground fault can be set.
  - c) Trip delay fixed at 50 ms ± 20 ms.

D. Ground Fault/Jam Protection Module with Remote Reset

1. Ratings:

Insulation Voltage (U <sub>i</sub> )	300V
Operating Voltage (U <sub>e</sub> )	24 to 240 VAC/VDC, 50/60 Hz
Power at U <sub>e</sub>	
24 VAC	0.8 W
120 VAC	0.8 W
240 VAC	1.0 W
Impulse Withstand Voltage	2.5 kV

- 2. The ground fault/jam protection module with remote reset shall provide flexible ground fault and jam protection.
  - a) Directly mounts to the left side of the electronic overload relay, adding only 18 mm to the overall width.
  - b) Electronically interfaces with the electronic overload relay so that all control circuit connections are made at the relay terminals.



3. The ground fault/jam protection module with remote reset shall provide front-accessible DIP switches that offer ground fault and jam protection settings to match application requirements.
  - a) Enabling/disabling of ground fault protection and jam protection functions and remote reset operation.
  - b) Ground fault trip level settings in 4 ranges: 20 to 100 mA (resistive loads); 100 to 500 mA; 0.2 to 1 A; 1 to 5 A. Within each range, specific percentages of maximum ground fault can be set.
  - c) Ground fault trip delay fixed at 50 ms  $\pm$  20 ms.
  - d) Jam protection fixed at 400% of full load current setting with a 0.5 second trip delay.

#### E. PTC Module with Remote Reset

1. Ratings:

Insulation Voltage ( $U_i$ )	300V
Operating Voltage ( $U_e$ )	24 to 240 VAC/VDC, 50/60 Hz
Power at $U_e$	
24 VAC	0.8 W
120 VAC	0.8 W
240 VAC	1.0 W
Impulse Withstand Voltage	2.5 kV

2. The PTC module with remote reset shall provide enhanced motor protection based on actual temperature.
  - a) Directly mounts to the left side of the electronic overload relay, adding only 18 mm to the overall width.
  - b) Electronically interfaces with the electronic overload relay so that all control circuit connections are made at the relay terminals.
3. The PTC module with remote reset shall provide 2 terminals for the connection of positive temperature coefficient (PTC) thermistor sensors.
  - a) PTC sensors shall be able to directly monitor the temperature of motor stator windings.
  - b) Conditions such as obstructed cooling and high ambient temperature shall be addressed.

#### F. EtherNet/IP and Protection Module

1. Power Supply Ratings

Supply Voltage ( $U_s$ )	24 VDC
Operating Range ( $U_e$ )	20.4 to 26.4V
Supply Current ( $I_e$ )	0.11 A
Max Surge @ Power-Up	2.5 A
Max Power Consumption	2.7 W

2. Output Relay Ratings:

Thermal Current ( $I_{the}$ )	5 A
Insulation Voltage ( $U_i$ )	300 VAC

Operating Voltage ( $U_e$ )	240 VAC
Operating Current ( $I_e$ )	
120 VAC	3 A
240V	1.5 A
110 VDC	0.25 A
220 VDC	0.1 A
Minimum Operating Current	10 mA at 5 VDC
Designation/Utiliz. Category	B300/AC15

3. The EtherNet/IP and protection module shall provide seamless control and direct access to motor performance and diagnostic data on an Ethernet-based network.
  - a) Directly mounts to the left side of the electronic overload relay, adding only 22 mm to the overall width.
  - b) Electronically interfaces with the electronic overload relay so that all control circuit connections are made at the relay terminals.
4. The EtherNet/IP and protection module shall enhance communication.
  - a) Supports I/O and explicit messaging for data access by a PAC and contains compatible tags for direct software access.
  - b) Has integrated web and email server so information can be read and parameters can be configured via a web browser.
  - c) Uses a simple mail transfer protocol (SMTP) to send email or text messages in the event of a warning or trip condition.
5. The EtherNet/IP and protection module shall include integrated I/O: 2 inputs, 1 output.
6. The EtherNet/IP and protection module shall provide operational and diagnostic data:
  - a) Average motor current
  - b) Percentage of thermal capacity usage
  - c) Device status
  - d) Trip and warning identification
  - e) Trip history (5 previous trips)
7. The EtherNet/IP and protection module shall expand protective functions:
  - a) Overload warning
  - b) Jam protection
  - c) Underload warning

#### G. PROFIBUS and Protection Module

1. Power Supply Ratings

Supply Voltage ( $U_s$ )	24 VDC
Operating Range ( $U_e$ )	20.4 to 26.4V
Supply Current ( $I_e$ )	0.11 A
Max Surge @ Power-Up	2.5 A
Max Power Consumption	2.7 W

2. Output Relay Ratings:

Thermal Current ( $I_{the}$ )	5 A
Insulation Voltage ( $U_i$ )	300 VAC
Operating Voltage ( $U_e$ )	240 VAC
Operating Current ( $I_e$ )	
120 VAC	3 A
240V	1.5 A
110 VDC	0.25 A
220 VDC	0.1 A
Minimum Operating Current	10 mA at 5 VDC
Designation/Utiliz. Category	B300/AC15
3. The PROFIBUS and protection module shall provide seamless control and direct access to motor performance and diagnostic data on a field bus-based network.
  - a) Directly mounts to the left side of the electronic overload relay, adding only 22 mm to the overall width.
  - b) Electronically interfaces with the electronic overload relay so that all control circuit connections are made at the relay terminals.
4. The PROFIBUS and protection module shall support both PROFIBUS DP-V0 and DP-V1.
5. The PROFIBUS and protection module shall include integrated I/O: 2 inputs, 1 output.
6. The PROFIBUS and protection module shall provide operational and diagnostic data:
  - a) Average motor current
  - b) Percentage of thermal capacity usage
  - c) Device status
  - d) Trip and warning identification
  - e) Trip history (5 previous trips)
7. The PROFIBUS and protection module shall expand protective functions:
  - a) Overload warning
  - b) Jam protection
  - c) Underload warning

#### H. DeviceNet and Protection Module

1. Ratings:

Insulation Voltage ( $U_i$ )	
Terminals 13 & 14	300 VAC
Terminals 1, 2, 3	30 VDC
DeviceNet Terminals	30 VDC
Operating Voltage ( $U_e$ )	
Terminals 13 & 14	250 VAC
Terminals 1, 2, 3	24 VDC
DeviceNet Terminals	24 VDC
Power at $U_e$	
24 VDC	2.0 W

Impulse Withstand Voltage	2.5 kV
Designation	B300

2. The DeviceNet and protection module shall provide seamless deployment of motor starters onto the Integrated Architecture™.
  - a) Directly mounts to the left side of the electronic overload relay, adding only 18 mm to the overall width.
  - b) Electronically interfaces with the electronic overload relay so that all control circuit connections are made at the relay terminals.
3. The DeviceNet and protection module shall enhance communication.
  - a) ODVA tested
  - b) Unconnected Message Manager (UCMM) support
  - c) Get/set single attribute explicit messaging
  - d) Autobaud network rate detection
4. The DeviceNet and protection module shall include integrated I/O: 2 inputs, 1 output.
5. The DeviceNet and protection module shall provide operational and diagnostic data:
  - a) Average motor current
  - b) Percentage of thermal capacity usage
  - c) Device status
  - d) Trip and warning identification
  - e) Trip history (5 previous trips)
6. The DeviceNet and protection module shall expand protective functions:
  - a) Overload warning
  - b) Jam protection
  - c) Underload warning

I. Remote Indication Display

1. Ratings:

Insulation Voltage (U <sub>i</sub> )	300V
Operating Voltage (U <sub>e</sub> )	24 VDC
Degree of Protection	IP 65/66 (Type 4/4X/12/13)
2. The remote indication display shall display the status of the electronic overload relay from the front of a panel.
  - a) Features status indicators and a reset button.
  - b) Mounts in a standard 22 mm push button cutout.

## 2.05 ACCESSORIES

- A. A DIN rail/panel adapter shall be available from the manufacturer for separate mounting of direct mounting style models.
- B. A current adjustment shield shall be available from the manufacturer to provide protection from inadvertent adjustment of the FLA setting.

- C. External reset buttons and adapters shall be available from the manufacturer for enclosed applications.
- D. A core balanced ground fault sensor shall be available from the manufacturer for use with the ground fault modules.

## PART 3 EXECUTION

### 3.01 DELIVERY, STORAGE, AND HANDLING

- A. The supplier shall coordinate the shipping of equipment.
- B. The supplier shall store the equipment in a clean and dry space.
- C. The supplier shall protect the units from dirt, water, construction debris and traffic.

### 3.02 INSTALLATION

- A. The supplier shall verify all electronic overload relay settings have been properly adjusted prior to energizing.
- B. The supplier shall ensure accessibility to diagnostic lights, communication ports and optional modules. These components shall be free from obstruction at all times.

### 3.03 SPARE MATERIALS

- A. Provide one (1) spare overload relay of each size utilized, including options.

### 3.04 WARRANTY

- A. The manufacturer shall provide their standard parts warranty for eighteen (18) months from the date of shipment or twelve (12) months from the date of being energized, whichever occurs first.
- B. The manufacturer shall confirm this warranty as part of the submittal.

END OF SECTION

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