

# Current and Voltage Sensors

**EVT Series VoltageWatch**



**ECSJ Series CurrentWatch Current Switch**



**EACR Series CurrentWatch Current Sensor**



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**Unless otherwise noted, the products contained in this section should not be used for functional safety applications. These products were not designed or tested to IEC 60947-5-3 or recommended for functional safety.**

For Customer Service in the U.S. call 1-877-ETN CARE (386-2273),  
in Canada call 1-800-268-3578.

For Application Assistance in the U.S. and Canada  
call 1-800-426-9184.

# Revision notes

## Volume 8—Sensing Solutions, CA08100010E

Tab 7—Current and Voltage Sensors

| Revision date | Section | Change page(s) | Description                             |
|---------------|---------|----------------|---|
| 09/08/2017    | 7.0     | V7-T7-1        | Updates to TOC                          |
| 09/08/2017    | 7.1     | V7-T7-7        | Content edit                            |
| 09/08/2017    | 7.2     | V8-T7-10       | Page deleted                            |
| 09/08/2017    | 7.9     | V8-T7-35       | Drawing updated                         |
| 09/08/2017    | All     | All            | Revision date changed to September 2017 |



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### Product Selection Guide

#### EVT Series VoltageWatch Voltage Sensors



Page V8-T7-5

##### Overview

Eaton's VoltageWatch™ sensor is a high-performance, true RMS sensor for sensing voltage in single- and three-phase installations.

##### Applications

Detect below normal or “brown out” voltage conditions; protect against possible motor overheating  
Identify phase-loss conditions by detecting voltage reduction in one or more phases of a three-phase motor  
Monitor overvoltage conditions associated with regenerative voltage to help in diagnosing/avoiding motor drive issues  
Detect voltage conditions that may cause stress in or damage to soft starter components (SCRs)

##### Product Features

True RMS output—allows for use in situations where power supplied is non-sinusoidal  
Standard 4–20 mA loop powered output—industry standard output works easily and reliably with existing controllers  
Input/output isolation—input and output circuitry is electrically isolated for improved safety  
Compact DIN rail mount enclosure—space-saving 35 mm wide enclosure mounts quickly for an attractive installation

##### Voltage Range

120, 240, 480 V

##### Approvals

UL® Listed  
UL tested to Canadian safety standards  
CE  
RoHS Compliant



##### Note

① **ECSJ Series:** ECSJ424SC, ECSJ404SC and ECSJ405SC not listed.

#### ECS Series CurrentWatch AC Current Switches



Page V8-T7-8

##### Overview

AC current switches for detecting overcurrent condition.

##### Applications

Electronic proof of flow—current operated switches eliminate the need for multiple pipe or duct penetrations and are more reliable than electro-mechanical pressure or flow switches  
Conveyors—detect jams and overloads  
Lighting circuits—easier to install and more accurate than photocells  
Fans, pumps and heating elements—faster response than temperature sensors  
Critical motors  
Ancillary equipment

##### Product Features

Universal outputs—NO or NC solid-state switch for control circuits up to 240 Vac/Vdc, compatible with most automation systems  
Self-powered—cuts installation and operating costs  
Easily adjustable set point—increases application flexibility and speeds start-up  
Solid- or split-core housings—versions tailored for each type of installation  
LED indication—provides quick visual indication of contact status  
Built-in mounting feet—simple, two-screw panel mount or attach with optional din-rail mounting kit accessory

##### Current Range

Fixed or adjustable set point, 1–150 A

##### Approvals

UL Listed  
UL tested to Canadian safety standards  
CE  
RoHS Compliant



#### ECSC Series Compact CurrentWatch Current Switches



Page V8-T7-10

##### Overview

AC/DC current switches for detecting AC current above 0.5 A trip point.

##### Applications

Independent monitoring of essential elements—monitor current flow to lights, heating coils, motors and other vital components within a system  
Local disconnects—double check a contactor's auxiliary contact, which can incorrectly indicate the absence of a load  
Control panels—indicates the presence or absence of current flow through circuit breakers and other components

##### Product Features

Outputs—NO or NC solid-state switch for control circuits up to 120 Vac/Vdc, compatible with most automation systems  
Self-powered—cuts installation and operating costs  
Compact size—great for applications with space constrictions  
High sensitivity—detects 0.5 A without wrapping the conductor around the sensor several times

##### Current Range

0.5 A trip

##### Approvals

UL Listed  
UL tested to Canadian safety standards  
CE  
RoHS Compliant



#### ECSJ Series CurrentWatch AC Current Switches



Page V8-T7-13

##### Overview

Jumper selectable AC switches with solid-state output.

##### Applications

Electronic proof of flow—current operated switches eliminate the need for multiple pipe or duct penetrations and are more reliable than electro-mechanical pressure or flow switches  
Conveyors—detect jams and overloads  
Lighting circuits—easier to install and more accurate than photocells  
Fans, pumps and heating elements—faster response than temperature sensors  
Critical motors  
Ancillary equipment

##### Product Features

Choice of NO or NC solid-state outputs—  
1 A at 240 Vac  
0.15 A at 30 Vdc  
15 A at 120 Vac  
3 A at 120 Vac  
0.15 A at 30 Vdc, dual contact  
Self-powered—cuts installation and operating costs  
Easily adjustable set point—speeds start-up and reduces inventory  
Solid- or split-core housings—choose the appropriate version for your application  
LED indication—provides quick visual indication of output contact status  
Built-in mounting feet—provide for a secure installation

##### Current Range

Adjustable set point, 1.75–200 A

##### Approvals ①

UL Listed  
UL tested to Canadian safety standards  
CE  
RoHS Compliant



**ECS7 Series CurrentWatch  
AC Current Switches**



Page V8-T7-17

**Overview**

Self-calibrating AC current switch with solid-state outputs.

**Applications**

Conveyors—use current overload models to detect conveyor jams caused by scenarios such as side-by-sides

Electronic proof of flow—more reliable than electro-mechanical pressure or flow switches, with no need for pipe or duct penetrations

Pump protection—provides overload (jams) and underload (suction loss) indication

**Product Features**

Self-powered and self-calibrating—reduces installation costs

Status monitoring, overload and operating window options—choose the operating style that matches your application

Universal output—AC or DC compatibility with any automation system

**Current Range**

Self-calibrating set point, 1.5–150 A

**Approvals**

UL Listed  
UL tested to Canadian safety standards  
CE  
RoHS Compliant



**ECSTD Series CurrentWatch  
AC Current Switches**



Page V8-T7-21

**Overview**

AC current switches with time delay.

**Applications**

Motor protection—serves as an electronic proof-of-operation; detects current draw changes in motors when they encounter problems such as pumps running dry or pending bearing failure; non-intrusive and less expensive to install than differential pressure flow sensors or thermal switches

High inrush or temporary overload current—adjustable start-up/delay timer allows 0–15 second delay to eliminate nuisance trips from high inrush or short overload conditions

**Product Features**

Adjustable start-up/delay timer—field adjustable from 0–15 seconds to eliminate nuisance alarms due to start-up inrush or temporary overcurrent conditions

Choice of NO/NC/AC or universal outputs—contact ratings of 1.0 A at 240 Vac or universal outputs of 0.15 A at 240 Vac/Vdc (NO models) and 0.2 A at 135 Vac/Vdc (NC models) for use with most standard motor control systems

Improved ease of installation and use—self-powered, split-core models simplify installation, 1.0 A AC rating eliminates need for time delay relay, and status LED provides visual indication of set point trip and contact action

**Current Range**

Adjustable set point, 1.5–200 A

**Approvals**

UL Listed  
UL tested to Canadian safety standards  
CE  
RoHS Compliant



(ECSTD401SC and ECSTD402SC not listed)

**ECSD Series CurrentWatch  
DC Current Switches**



Page V8-T7-25

**Overview**

DC switch with solid-state or mechanical relay output.

**Applications**

Electronic proof of flow—current operated switches eliminate the need for multiple pipe or duct penetrations

Welders—Instant indication of equipment status

Large drive motors—provide monitoring for field loss protection

Power supplies—detect and signal over-current condition before equipment damage

UPS—monitors battery output

Ancillary equipment

**Product Features**

Choice of mechanical relay or solid-state outputs—SPDT (Form C) relay, 5.0 A at 240 Vac or 30 Vdc

Solid-state, NO, 0.15 A at 240 Vac/Vdc

Easily adjustable set point—speeds start-up and reduces inventory

Compact, one-piece design—easily fits in crowded control panels

Input isolation—safer than shunt/relay combinations

Adaptive hysteresis—hysteresis is five percent of set point, allowing closer control than fixed-hysteresis switches

Solid-core housings

**Current Range**

Varies by model

**Approvals**

UL Listed  
UL tested to Canadian safety standards  
CE  
RoHS Compliant



**EAC Series CurrentWatch  
AC Current Sensors**



Page V8-T7-28

**Overview**

AC current sensor with analog outputs and power supply options.

**Applications**

Automation equipment—analog current reading for remote monitoring and software alarms

Data loggers—self-powered sensor helps conserve data logger batteries

Panel meters—simple connection displays power consumption

**Product Features**

Highly accurate—factory matched and calibrated single-piece sensor is more accurate than traditional two-piece, field-installed solutions

Average responding—“average responding” algorithm gives an RMS output on pure sine waves, perfect for constant speed (linear) loads

Jumper selectable ranges—the ability to change input ranges reduces inventory and eliminates zero and span

Isolation—output is magnetically isolated from the input for safety and elimination of insertion loss (voltage drop)

**Current Range**

0–200 A

**Approvals**

UL Listed  
UL tested to Canadian safety standards  
CE  
RoHS Compliant



(EACP models not listed)

#### EACR Series CurrentWatch RMS Current Sensors



Page V8-T7-32

##### Overview

True RMS AC current sensing with 4–20 mA output.

##### Applications

VFD controlled loads—monitoring V<sub>dc</sub> output indicates how the motor and attached load are operating  
SCR controlled loads—accurate measurement of phase angle fired or burst fired (time proportioned) SCRs, with faster current measurement than temperature sensors  
Switching power supplies and electronic ballasts—true RMS sensing is the most accurate way to measure power supply or ballast input power

##### Product Features

True RMS output—true RMS technology is accurate on distorted waveforms like VFD or SCR outputs  
Jumper-selectable ranges—reduces inventory and eliminates zero and span  
Isolation—output is magnetically isolated from the input for safety and elimination of insertion loss (voltage drop)

##### Current Range

0–200 A true RMS

##### Approvals

UL Listed  
UL tested to Canadian safety standards  
CE  
RoHS Compliant



#### EDC Series CurrentWatch DC Current Sensors



Page V8-T7-35

##### Overview

Current sensing for DC loads up to 300 A with analog outputs.

##### Applications

Battery banks—monitors load current, monitors charging current and verifies operation  
Transportation—measures traction power or auxiliary loads  
Electric heating elements—monitors heater loads with a faster response time than temperature sensors

##### Product Features

Jumper-selectable ranges—reduces inventory and eliminates zero or span pots  
Isolation—output is magnetically isolated from the input for safety, also eliminating insertion loss (voltage drop)  
Internal power regulation—cuts installation costs and works well, even with unregulated power  
Split core design and built-in mounting brackets—makes installation quick and easy

##### Current Range

0–400 A

##### Approvals

UL Listed  
UL tested to Canadian safety standards  
CE  
RoHS Compliant



#### EGF Series CurrentWatch Ground Fault Sensors



Page V8-T7-39

##### Overview

Ground fault sensors with solid-state or mechanical relay outputs.

##### Applications

Personnel protection (typically 5 mA)—detects sensitive ground fault conditions, which could cause injury to people, and functions as a sensor and alarm trigger when applied as an input to an overall ground fault protection system  
Equipment protection (typically 10 or 30 mA)—for applications where personnel protection is not the primary concern, higher set point capability helps eliminate nuisance tripping while still providing adequate ground fault detection to protect machine electronics

##### Product Features

Broad range of options to meet application needs—NO or NC, solid-state or mechanical relays, normally energized or normally de-energized contacts  
Set point options maximize ease-of-use and application flexibility—field selectable 5, 10 or 30 mA set points on the EGF “Tri-set” models make user adjustments fast, sure and convenient  
Compatible with standard equipment—application on single- and three-phases systems, ideal for use with shunt trip breakers, and magnetically isolated from monitored circuit and control power

##### Current Range

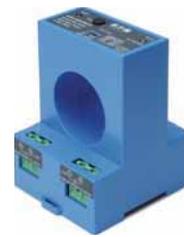
Fixed or adjustable 5/10/30 mA trip

##### Approvals

UL Listed  
UL tested to Canadian safety standards  
CE  
RoHS Compliant



#### EGFL Series CurrentWatch Ground Fault Sensors



Page V8-T7-44

##### Overview

Ground fault sensors with mechanical relays.

##### Applications

Personnel protection (typically 5 mA)—detects sensitive ground fault conditions, which could cause injury to people  
Equipment protection (typically 10 or 30 mA)—for applications where personnel protection is not the primary concern, higher set point capability helps eliminate nuisance tripping  
Regulatory—meets requirements as stipulated by governmental and industrial regulatory groups for ground fault sensing

##### Product Features

Broad range of options to meet application needs—mechanical relays, normally energized or normally de-energized contacts  
Set point options maximize ease-of-use and application flexibility—field selectable 5, 10 or 30 mA set points on the EGFL “tri-set” models make user adjustments fast, sure and convenient  
Compatible with standard equipment—application on single- and three-phase systems, ideal for use with shunt trip breakers, and magnetically isolated from monitored circuit and control power

##### Current Range

Tri-Set Adjustable, 5, 10 or 30 mA

##### Approvals

UL Listed  
UL tested to Canadian safety standards  
CE  
RoHS Compliant



EVT Series VoltageWatch Voltage Sensors



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EVT Series VoltageWatch Voltage Sensors

Product Description

Eaton’s VoltageWatch™ sensor is a high-performance, true RMS sensor for sensing voltage in single- and three-phase installations. Applicable on nominal circuits of 120 V, 240 V and 480 V, this voltage sensor provides a fully isolated analog output proportional to rated nominal voltage in both sinusoidal and non-sinusoidal (variable frequency) situations. It is housed in a slim, compact, easy-to-install DIN rail mount enclosure.

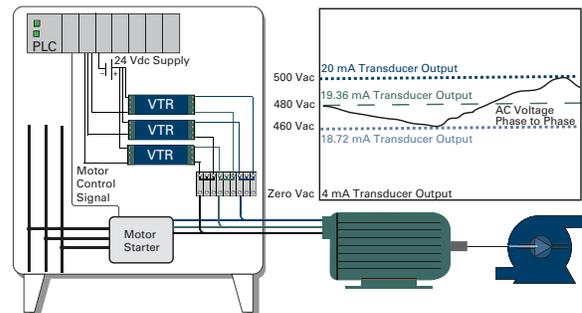
Ideal for situations where power quality is of interest or concern, the VoltageWatch sensor facilitates monitoring of supply voltage levels, identifying undervoltage or overvoltage conditions, and helping to protect critical motors and electronics. Designed with an industry-standard 4–20 mA output, VoltageWatch is easily coupled to a data logger, panel meter or PLC to enable basic trending of operational status of low voltage circuits up to real-time monitoring and reporting of supply voltage levels.

Application Description

True RMS Voltage Monitoring

- Detect below normal or “brown out” voltage conditions; protect against possible motor overheating
- Identify phase-loss conditions by detecting voltage reduction in one or more phases of a three-phase motor
- Monitor overvoltage conditions associated with regenerative voltage to help in diagnosing/avoiding motor drive issues
- Detect voltage conditions that may cause stress in or damage to soft starter components (SCRs)

Example Application—Phase Loss



Features

- **True RMS Output**— Allows for use in situations where power supplied is non-sinusoidal, such as VFD applications, poor power quality installations or other electrically harsh/challenging environments
- **Standard 4–20 mA Loop Powered Output**— Industry standard output works easily and reliably with existing controllers, data loggers and SCADA equipment
- **Input/Output Isolation**— Input and output circuitry is electrically isolated for improved safety
- **Compact DIN Rail Mount Enclosure**—Space-saving 35 mm wide enclosure mounts quickly for an attractive installation

For the most current information on this product, visit our Web site: [www.eaton.com](http://www.eaton.com)

For Customer Service in the U.S. call 1-877-ETN CARE (386-2273), in Canada call 1-800-268-3578. For Application Assistance in the U.S. and Canada call 1-800-426-9184.

#### Standards and Certifications

- UL Listed
- UL tested to Canadian safety standards
- CE
- RoHS Compliant

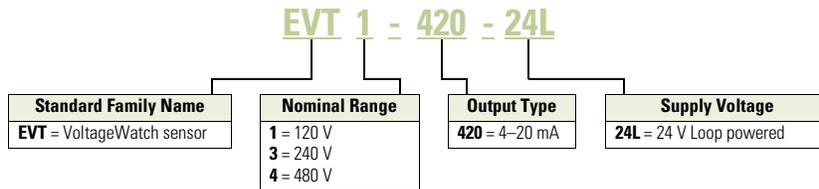


#### **⚠ DANGER**

**THIS SENSOR IS NOT A SAFETY DEVICE AND IS NOT INTENDED TO BE USED AS A SAFETY DEVICE.** This sensor is designed only to detect and read certain data in an electronic manner and perform no use apart from that, specifically no safety-related use. This sensor product does not include self-checking redundant circuitry, and the failure of this sensor product could cause either an energized or de-energized output condition, which could result in death, serious bodily injury, or property damage.

#### Catalog Number Selection

##### VoltageWatch EVT Series—Top Terminal Current Sensors



#### Product Selection

EVT Series



##### VoltageWatch EVT Series—Top Terminal Current Sensors

| Power Supply        | Output Signal | Nominal Voltage | Catalog Number      |
|---------------------|---------------|-----------------|---------------------|
| 24 Vdc loop powered | 4–20 mA       | 120             | <b>EVT1-420-24L</b> |
|                     |               | 240             | <b>EVT3-420-24L</b> |
|                     |               | 480             | <b>EVT4-420-24L</b> |

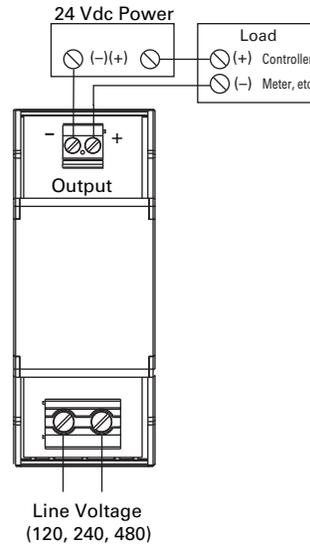
**Technical Data and Specifications**

**VoltageWatch EVT Series**

| Description           | Specification   |
|-----------------------|---|
| Power supply          | 24 Vdc loop-powered                                     |
| Input                 | 120 V, 240 V, 480 V                                     |
| Input over-range      | +15% of nominal range                                   |
| Output                | 4–20 mA proportional; capped at 24 mA maximum           |
| Response time         | 250 ms (to 90% value)                                   |
| Accuracy              | <1%   |
| Linearity             | <0.5%   |
| Loading               | <500 ohms   |
| Isolation voltage     | 2500 Vac  |
| Frequency range       | 40–100 Hz   |
| Operating temperature | –22 to 140 °F (–30 to 60 °C)                            |
| Mounting              | DIN rail compatible                                     |
| Case                  | UL 94 V0 flammability rated; noncorrosive thermoplastic |
| Environmental         | 14 to 122 °F (–10 to 50 °C), 0–95% RH noncondensing     |
| EMC/immunity          | EN50081-1, EN50082-2                                    |
| Ripple                | <1% (peak to peak)                                      |

**Wiring Diagram**

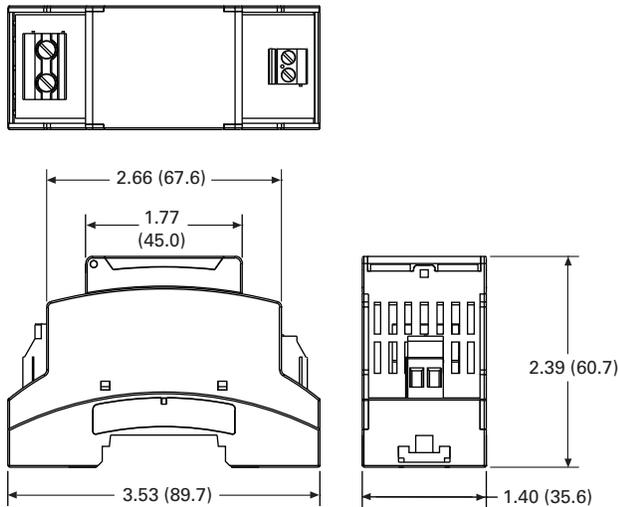
**VoltageWatch EVT Series**



**Dimensions**

Approximate Dimensions in Inches (mm)

**Complete Unit**



#### ECS Series CurrentWatch Current Switches



7

### ECS Series CurrentWatch Current Switches

#### Product Description

The CurrentWatch™ ECS Series from Eaton's Electrical Sector is a family of solid-state adjustable current switches, ideal for providing status information on electrical equipment. The ECS is excellent for new installations, where the conductors run through the housing, requiring no cutting. These switches are also ideal for retrofits, since split-core models can be opened to fit around existing conductors. The current switch is accurate, reliable and easy to install.

The ECS can sense continuous currents from 1 to 150 A and does not require any supply voltage, as the power required is induced from the monitored conductor. The output is a non-polarity-sensitive solid-state contact for switching AC and DC circuits up to 240 Vac/dc. This switch also includes an LED indicating two states: on and below trip point, and above trip point with contacts energized. All ECS Series switches carry an unconditional five-year warranty.

For the most current information on this product, visit our Web site: [www.eaton.com](http://www.eaton.com)

Any change in current can be sensed with the ECS Series. A change in current may indicate motor failure, belt loss/slippage or mechanical failure. Any of these events can cause the current to drop significantly, tripping the switch and notifying the controller.

#### Application Description

##### Typical Applications

- **Electronic Proof of Flow**—Current operated switches eliminate the need for multiple pipe or duct penetrations and are more reliable than electro-mechanical pressure or flow switches
- **Conveyors**—Detect jams and overloads
- **Lighting Circuits**—Easier to install and more accurate than photocells
- **Fans, Pumps and Heating Elements**—Faster response than temperature sensors
- **Critical Motors**
- **Ancillary Equipment**

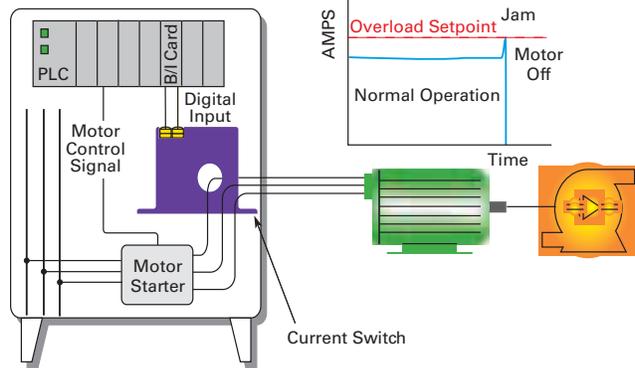
### Contents

#### Description

ECS Series CurrentWatch Current Switches

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#### Example Application— Pump Jam and Suction Loss Protection



#### Features

- **Universal Outputs**—NO or NC solid-state switch for control circuits up to 240 Vac/Vdc, compatible with most automation systems
- **Self-Powered**—Cuts installation and operating costs
- **Easily Adjustable Set Point**—Increases application flexibility and speeds start-up
- **Solid- or Split-Core Housings**—Versions tailored for each type of installation
- **LED Indication**—Provides quick visual indication of contact status
- **Built-In Mounting Feet**—Simple, two-screw panel mount or attach with optional DIN-rail mounting kit accessory

For Customer Service in the U.S. call 1-877-ETN CARE (386-2273), in Canada call 1-800-268-3578.

For Application Assistance in the U.S. and Canada call 1-800-426-9184.

**Standards and Certifications**

- UL Listed
- UL tested to Canadian safety standards
- CE
- RoHS Compliant



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**Product Selection**

**ECS Series CurrentWatch Current Switches**

**Top Terminal Current Switches**

|  | Power Supply                               | Aperture Size     | Output Signal   | Set Point and LED Configuration          | Catalog Number    |
|--|--|-------------------|-----------------|--|-------------------|
| <b>Solid-Core Housing</b><br> | <b>Solid-Core Housing</b>                  |                   |                 |  |                   |
|  | Self powered<br>(no external power needed) | 0.74 in (19 mm)   | Normally open   | Adjustable 1–150 A set point with LED    | <b>ECSNOASC</b>   |
|  |  |                   |                 | Fixed 0.75 A set point no LED            | <b>ECSNOFSC</b>   |
|  | Self powered<br>(no external power needed) | 0.74 in (19 mm)   | Normally closed | Fixed 5.5 A set point no LED             | <b>ECSNOFSCY1</b> |
|  |  |                   |                 | Adjustable 1–150 A set point with LED    | <b>ECSNCASC</b>   |
|  |  |                   |                 | Fixed 0.75 A set point no LED            | <b>ECSNCFSC</b>   |
| Fixed 0.75 A set point no LED  |  |                   |                 | <b>ECSNCFSC</b>                          |                   |
| <b>Split-Core Housing</b><br> | <b>Split-Core Housing</b>                  |                   |                 |  |                   |
|  | Self powered<br>(no external power needed) | 0.85 in (21.6 mm) | Normally open   | Adjustable 1.75–150 A set point with LED | <b>ECSNOASP</b>   |
|  |  |                   |                 | Fixed 1.25 A set point no LED            | <b>ECSNOFSP</b>   |
|  | Self powered<br>(no external power needed) | 0.85 in (21.6 mm) | Normally closed | Adjustable 1.75–150 A set point with LED | <b>ECSNCASP</b>   |
|  |  |                   |                 | Fixed 1.25 A set point no LED            | <b>ECSNCFSP</b>   |
|  |  |                   |                 | Fixed 1.25 A set point no LED            | <b>ECSNCFSP</b>   |
| Fixed 1.25 A set point no LED  |  |                   |                 | <b>ECSNCFSP</b>                          |                   |

**Accessories**

**DIN Rail Mounting Kit**



**ECS Series CurrentWatch Current Switches**

| Description             | Catalog Number |
|-------------------------|----------------|
| DIN rail mounting kit ① | <b>EDINKIT</b> |

**Note**

① Sensor pictured for reference and not included in kit.

## ECSC Series CurrentWatch AC Current Switches



7

## ECSC Series Compact CurrentWatch Current Switches

## Product Description

The CurrentWatch™ ECSC Series are a family of self-powered, solid-state current-operated switches that trigger when the current level sensed through the aperture exceeds the 0.5 A trip point threshold.

The solid-state output contacts can switch AC or DC, making the ECSC Series well suited for applications in automation systems.

Downtime and costly repairs can be avoided by utilizing Eaton's current sensor family; encompassing a broad range of products for cost-effective monitoring, status and predictive maintenance.

## Application Description

## Typical Applications

- Independent monitoring of essential elements—monitor current flow to lights, heating coils, motors, and other vital components within a system
- Local disconnects—double check a contactor's auxiliary contact, which can incorrectly indicate the absence of a load
- Control panels—indicate the presence or absence of current flow

## Contents

## Description

| Description                                  | Page     |
|--|----------|
| ECSC Series CurrentWatch AC Current Switches |          |
| Product Selection . . . . .                  | V8-T7-11 |
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| Wiring Diagram . . . . .                     | V8-T7-11 |
| Dimensions . . . . .                         | V8-T7-12 |

## Features

- **Outputs**—NO or NC solid-state switch for control circuits up to 120 Vac/Vdc, compatible with most automation systems
- **Self-powered**—cuts installation and operating costs
- **Compact size**—great for applications with space constrictions
- **High sensitivity**—detects 0.5 A without wrapping the conductor around the sensor several times

## Standards and Certifications

- UL Listed
- UL tested to Canadian safety standards
- CE
- RoHS Compliant

**DANGER**

**THIS SENSOR IS NOT A SAFETY DEVICE AND IS NOT INTENDED TO BE USED AS A SAFETY DEVICE. This sensor is designed only to detect and read certain data in an electronic manner and perform no use apart from that, specifically no safety-related use. This sensor product does not include self-checking redundant circuitry, and the failure of this sensor product could cause either an energized or de-energized output condition, which could result in death, serious bodily injury, or property damage.**

For the most current information on this product, visit our Web site: [www.eaton.com](http://www.eaton.com)

For Customer Service in the U.S. call 1-877-ETN CARE (386-2273), in Canada call 1-800-268-3578.

For Application Assistance in the U.S. and Canada call 1-800-426-9184.

**Product Selection**

**ECSC Series Compact CurrentWatch Current Switches**

**Current Switches**

|                           | Power Supply                               | Aperture Size    | Output Signal   | Set Point  | Catalog Number   |
|---------------------------|--|------------------|-----------------|------------|------------------|
| <b>Solid-Core Housing</b> | <b>Solid-Core Housing</b>                  |                  |                 |            |                  |
|                           | Self powered<br>(no external power needed) | 0.30 in (7.6 mm) | Normally open   | 0.5 A Trip | <b>ECSCNOFSC</b> |
|                           |  |                  | Normally closed | 0.5 A Trip | <b>ECSCNCFSC</b> |



**Technical Data and Specifications**

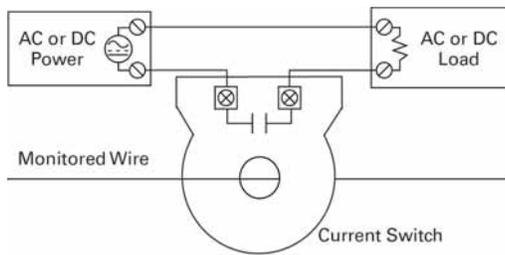
**ECSC Series CurrentWatch Current Switches**

| Description       | Specification                            |
|-------------------|--|
| Power supply      | Self-powered—no power supply needed      |
| Output            | Magnetically isolated solid-state switch |
| Output rating     | 0.15 A at 120 Vac/Vdc                    |
| Off-state leakage | <10 $\mu$ A                              |
| Response time     | 120 ms                                   |
| Fixed set point   | 0.5 A                                    |
| Hysteresis        | Approximately 5% of 0.5 A trip point     |

| Description       | Specification                                      |
|-------------------|--|
| Overload          | 6 sec at 500 A; 1 sec at 1000 A                    |
| Isolation voltage | UL listed to 1270 Vac, tested to 5000 Vac          |
| Frequency range   | 50–400 Hz  |
| Sensing aperture  | Solid-core housings: 0.30 in (7.6 mm)              |
| Housing           | UL94 V0 flammability rated                         |
| Environmental     | Operating temperature: -4 to 122 °F (-20 to 50 °C) |

**Wiring Diagram**

**ECSC Series CurrentWatch Current Switches**



# 7.3

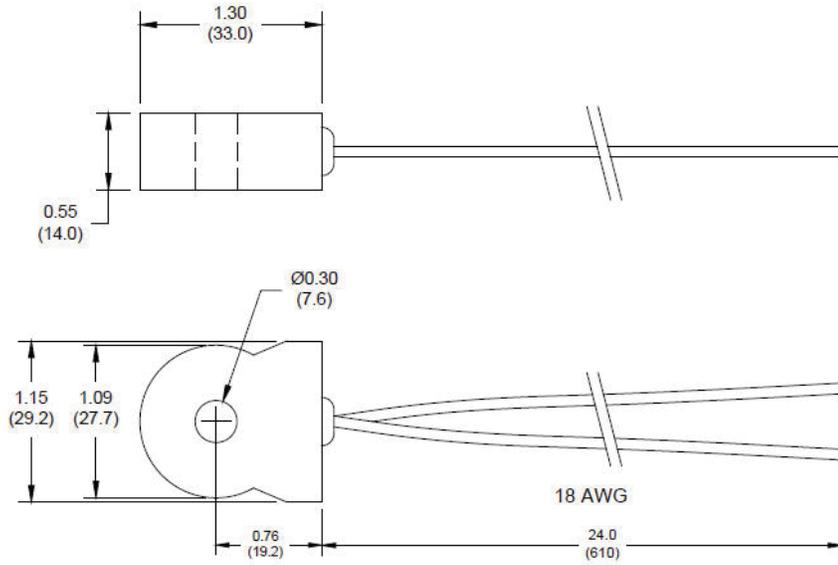
## Current and Voltage Sensors

### CurrentWatch ECSC Series

#### Dimensions

Approximate Dimensions in Inches (mm)

#### Solid-Core Housing



ECSJ Series CurrentWatch Current Switches



ECSJ Series CurrentWatch Current Switches

Product Description

The CurrentWatch ECSJ Series current operated switches from Eaton’s Electrical Sector provide the same dependable indication of status offered by the CurrentWatch ECS Series, but with the added benefit of increased set point precision. A choice of three, jumper-selectable input ranges allows the ECSJ Series to be tailored to an application, providing more precise control through improved set point resolution. Self-powering, isolated solid-state outputs, 1–6 A and 40–200 A input ranges, and a choice of split- or solid-core enclosures are standard.

Application Description

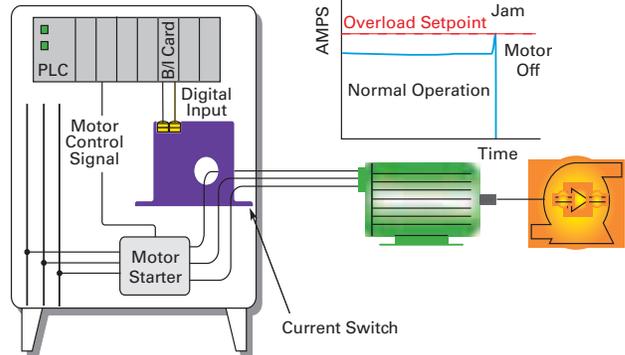
Typical Applications

- **Electronic Proof of Flow**—Current operated switches eliminate the need for multiple pipe or duct penetrations and are more reliable than electro-mechanical pressure or flow switches
- **Conveyors**—Detect jams and overloads
- **Lighting Circuits**—Easier to install and more accurate than photocells
- **Fans, Pumps and Heating Elements**—Faster response than temperature sensors
- **Critical Motors**
- **Ancillary Equipment**

Contents

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| Standards and Certifications . . . . .      | <b>V8-T7-14</b> |
| Product Selection . . . . .                 | <b>V8-T7-14</b> |
| Accessories . . . . .                       | <b>V8-T7-15</b> |
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| Wiring Diagrams . . . . .                   | <b>V8-T7-16</b> |
| Dimensions . . . . .                        | <b>V8-T7-16</b> |

Example Application—  
Pump Jam and Suction Loss Protection



Features

- **Choice of NO or NC Solid-State Outputs**—
  - 1 A at 240 Vac
  - 0.15 A at 30 Vdc
  - 15 A at 120 Vac
  - 3 A at 120 Vac
  - 0.15 A at 30 Vdc, dual contact
- **Self-Powered**—Cuts installation and operating costs
- **Easily Adjustable Set Point**—Speeds start-up and reduces inventory
- **Solid- or Split-Core Housings**—Choose the appropriate version for your application
- **LED Indication**—Provides quick visual indication of output contact status
- **Built-In Mounting Feet**—Provide for a secure installation
- **UL, cUL and CE Approved**—Accepted worldwide

For the most current information on this product, visit our Web site: [www.eaton.com](http://www.eaton.com)

For Customer Service in the U.S. call 1-877-ETN CARE (386-2273), in Canada call 1-800-268-3578.

For Application Assistance in the U.S. and Canada call 1-800-426-9184.

**Standards and Certifications**

- UL Listed
- UL tested to Canadian safety standards
- CE
- RoHS Compliant



**Note:** ECSJ424SC, ECSJ404SC and ECSJ405SC not listed.

**DANGER**

**THIS SENSOR IS NOT A SAFETY DEVICE AND IS NOT INTENDED TO BE USED AS A SAFETY DEVICE. This sensor is designed only to detect and read certain data in an electronic manner and perform no use apart from that, specifically no safety-related use. This sensor product does not include self-checking redundant circuitry, and the failure of this sensor product could cause either an energized or de-energized output condition, which could result in death, serious bodily injury, or property damage.**

**Product Selection****ECSJ Series CurrentWatch Current Switches****Front and Top Terminal Switches**

|  | Power Supply                                  | Aperture Size                     | Output Type, Voltage and Rating                        | Set Point and LED Configuration                        | Catalog Number     |
|--|---|-----------------------------------|--|--|--------------------|
| <b>Solid-Core Housing with Front Terminal</b><br> | <b>Solid-Core Housing with Front Terminal</b> |                                   |  |  |                    |
|  | Self-powered (no external power needed)       | 0.55 in (14 mm)                   | Normally open, 1 A at 240 Vac                          | Adjustable 1–6, 6–40 or 40–175 A set point with LED    | <b>ECSJ400SC</b>   |
|  |   |                                   | Normally open, 15 A at 120 Vac, 10 A at 240 Vac        | Adjustable 1–6, 6–40 or 40–175 A set point with LED    | <b>ECSJ406SC</b> ① |
|  |   |                                   | Normally closed, 1 A at 240 Vac                        | Adjustable 1–6, 6–40 or 40–175 A set point with LED    | <b>ECSJ401SC</b>   |
|  |   |                                   | Normally closed, 15 A at 120 Vac, 10 A at 240 Vac      | Adjustable 1–6, 6–40 or 40–175 A set point with LED    | <b>ECSJ407SC</b> ① |
|  |   |                                   | Dual contact, NO and NC, 0.15 A at 30 Vdc              | Adjustable 1–6, 6–40 or 40–175 A set point without LED | <b>ECSJ430SC</b> ① |
|  |   |                                   | Normally open, 0.15 A at 30 Vdc                        | Adjustable 1–6, 6–40 or 40–175 A set point with LED    | <b>ECSJ420SC</b>   |
|  |   |                                   | Adjustable 1–6, 6–40 or 40–175 A set point without LED | <b>ECSJ424SC</b>                                       |                    |
|  |   | Normally closed, 0.15 A at 30 Vdc | Adjustable 1–6, 6–40 or 40–175 A set point with LED    | <b>ECSJ421SC</b>                                       |                    |
| <b>Solid-Core Housing with Top Terminal</b><br>   | <b>Solid-Core Housing with Top Terminal</b>   |                                   |  |  |                    |
|  | Self-powered (no external power needed)       | 0.74 in (19 mm)                   | Normally open, 3 A at 120 Vac                          | Adjustable 1–6, 6–40 or 40–175 A set point with LED    | <b>ECSJ404SC</b>   |
|  |   |                                   | Normally closed, 3 A at 120 Vac                        | Adjustable 1–6, 6–40 or 40–175 A set point with LED    | <b>ECSJ405SC</b>   |
| <b>Split-Core Housing</b><br>                     | <b>Split-Core Housing</b>                     |                                   |  |  |                    |
|  | Self-powered (no external power needed)       | 0.85 in (21.6 mm)                 | Normally open, 1 A at 240 Vac                          | Adjustable 1.75–6, 6–40 or 40–200 A set point with LED | <b>ECSJ402SP</b>   |
|  |   |                                   | Normally closed, 1 A at 240 Vac                        | Adjustable 1.75–6, 6–40 or 40–200 A set point with LED | <b>ECSJ403SP</b>   |
|  |   |                                   | Normally open, 0.15 A at 30 Vdc                        | Adjustable 1.75–6, 6–40 or 40–200 A set point with LED | <b>ECSJ422SP</b>   |
|  |   | Normally closed, 0.15 A at 30 Vdc | Adjustable 1.75–6, 6–40 or 40–200 A set point with LED | <b>ECSJ423SP</b>                                       |                    |

**Note**

① Unit features built-in heatsink that adds to height. See dimension drawings on **Page V8-T7-16** for details.

**Accessories**

**DIN Rail Mounting Kit**



**ECSJ Series CurrentWatch Current Switches**

| Description             | Catalog Number |
|-------------------------|----------------|
| DIN rail mounting kit ① | EDINKIT        |

**Technical Data and Specifications**

**ECSJ Series CurrentWatch Current Switches**

| Description                        | AC Solid-State Output Specification  | DC Solid-State Output Specification  |
|------------------------------------|--|--|
| Power supply                       | Self-powered—no power supply needed  | Self-powered—no power supply needed  |
| Output                             | Isolated solid-state switch  | Isolated solid-state switch  |
| Output rating                      |  |  |
| Standard models                    | 1.0 A at 240 Vac   | 0.15 A at 30 Vdc   |
| High current switching models      | ECSJ404SC and ECSJ405SC: 3.0 A at 120 Vac  | ECSJ430SC: 0.15 A at 30 Vdc, dual contact, NO and NC   |
| Very high current switching models | ECSJ406SC and ECSJ407SC: 15 A at 120 Vac, 10 A at 240 Vac  | —  |
| Off-state leakage                  | NO models: <10 µA<br>NC models: 2.5 mA   | NO models: <10 µA<br>NC models: 2.5 mA   |
| Response time                      | 40–120 ms  | 40–120 ms  |
| Set point range (adjustable)       | Solid-core models: 1–6, 6–40 and 40–175 A<br>Split-core models: 1.75–6, 6–40 and 40–200 A  | Solid-core models: 1–6, 6–40 and 40–175 A<br>Split-core models: 1.75–6, 6–40 and 40–200 A  |
| Hysteresis                         | Low: 6%; mid: 4%; high: 3%   | Low: 6%; mid: 4%; high: 3%   |
| Isolation voltage                  | UL listed to 1270 Vac, tested to 5000 Vac  | UL listed to 1270 Vac, tested to 5000 Vac  |
| Frequency range                    | 6–100 Hz   | 6–100 Hz   |
| Sensing aperture                   | Solid-core, front terminal models: 0.55 in (14 mm)<br>Solid-core, top terminal models: 0.74 in (19 mm)<br>Split-core models: 0.85 in (21.6 mm) sq. | Solid-core, front terminal models: 0.55 in (14 mm)<br>Solid-core, top terminal models: 0.74 in (19 mm)<br>Split-core models: 0.85 in (21.6 mm) sq. |
| Housing                            | UL94 V0 flammability rated   | UL94 V0 flammability rated   |
| Environmental                      | Operating temperature: –58 to 122 °F (–50 to 50 °C)<br>Humidity: 0–95% RH, non-condensing  | Operating temperature: –58 to 122 °F (–50 to 50 °C)<br>Humidity: 0–95% RH, non-condensing  |

**Overload Ratings**

| Housing    | Range    | Maximum Amperes |            |
|------------|----------|-----------------|------------|
|            |          | Six Seconds     | One Second |
| Solid-core | 1–6 A    | 400 A           | 600 A      |
|            | 6–40 A   | 500 A           | 800 A      |
|            | 40–175 A | 800 A           | 1200 A     |
| Split-core | 1.75–6 A | 400 A           | 600 A      |
|            | 6–40 A   | 500 A           | 800 A      |
|            | 40–200 A | 800 A           | 1200 A     |

**Note**

① Sensor pictured for reference and not included in kit.

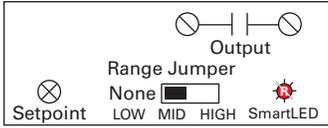
# 7.4

## Current and Voltage Sensors

### CurrentWatch ECSJ Series

#### Wiring Diagrams <sup>①②</sup>

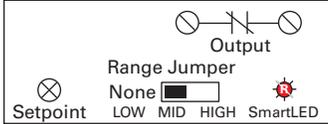
##### All Normally Open (NO) Models



##### ECSJ430SC (Dual Contact, NO and NC)



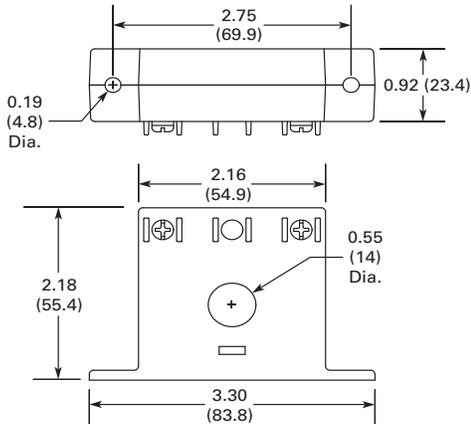
##### All Normally Closed (NC) Models



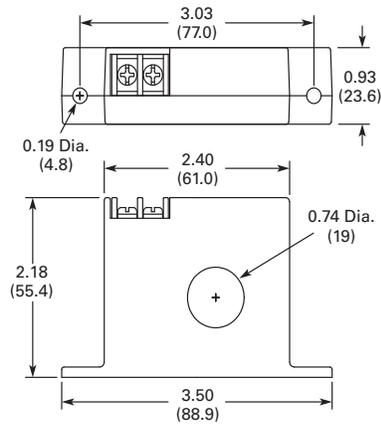
#### Dimensions

Approximate Dimensions in Inches (mm)

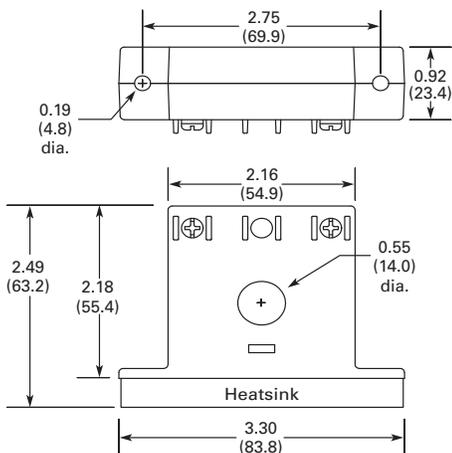
##### All Solid-Core Models with Front Terminals Except ECSJ406SC and ECSJ407SC



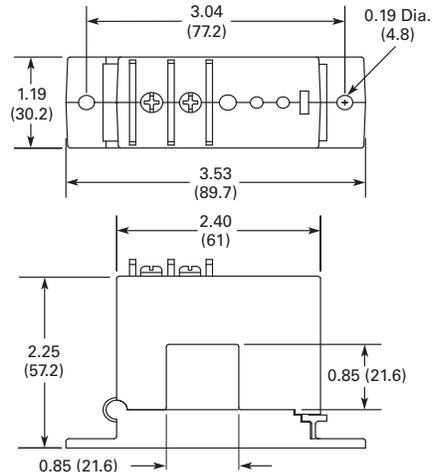
##### All Solid-Core Models with Top Terminals



##### ECSJ406SC and ECSJ407SC Solid-Core Models with Front Terminals



##### All Split-Core Models



#### Notes

- ① Terminals are #6 screws.
- ② DC contacts are polarity sensitive.

ECS7 Series CurrentWatch Current Switches



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| Accessories . . . . .                       | <b>V8-T7-18</b> |
| Technical Data and Specifications . . . . . | <b>V8-T7-19</b> |
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| Dimensions . . . . .                        | <b>V8-T7-20</b> |

ECS7 Series CurrentWatch Current Switches

Product Description

The CurrentWatch ECS7 Series load monitoring switches from Eaton’s Electrical Sector are designed for overload, underload or operating window applications. Upon sensing an average operating current, the ECS7 Series self-learns and establishes a limit-alarm trip point based on ±15% of the average expected current draw. The ECS7 Series is available in solid- or split-core housing styles.

Application Description

Typical Applications

- **Conveyors**—Use current overload models to detect conveyor jams caused by scenarios such as side-by-sides
- **Electronic Proof of Flow**—More reliable than electro-mechanical pressure or flow switches, with no need for pipe or duct penetrations
- **Pump Protection**—Provides overload (jams) and underload (suction loss) indication

Features

- **Self-Powered and Self-Calibrating**—Reduces installation costs
- **Status Monitoring, Overload and Operating Window Options**—Choose the operating style that matches your application
- **Universal Output**—AC or DC compatibility with any automation system

Standards and Certifications

- UL Listed
- UL tested to Canadian safety standards
- CE
- RoHS Compliant



**⚠ DANGER**

**THIS SENSOR IS NOT A SAFETY DEVICE AND IS NOT INTENDED TO BE USED AS A SAFETY DEVICE. This sensor is designed only to detect and read certain data in an electronic manner and perform no use apart from that, specifically no safety-related use. This sensor product does not include self-checking redundant circuitry, and the failure of this sensor product could cause either an energized or de-energized output condition, which could result in death, serious bodily injury, or property damage.**

For the most current information on this product, visit our Web site: [www.eaton.com](http://www.eaton.com)

For Customer Service in the U.S. call 1-877-ETN CARE (386-2273), in Canada call 1-800-268-3578.

For Application Assistance in the U.S. and Canada call 1-800-426-9184.

## Product Selection

### ECS7 Series CurrentWatch Current Switches

#### Front and Top Terminal Switches

|  | Power Supply  | Output Type   | Aperture Size     | Intelligent Logic                          | Catalog Number    |
|--|---|---------------|-------------------|--|-------------------|
| <b>Solid-Core Housing</b><br> | <b>Solid-Core Housing</b><br>Self-powered<br>(no external power needed) | Normally open | 0.74 in (19 mm)   | Over/underload, 1.5–150 A self-calibrating | <b>ECS701SC</b> ① |
|  |   |               |                   | Overload only, 1.5–150 A self-calibrating  | <b>ECS700SC</b>   |
|  |   |               |                   | Underload only, 1.5–150 A self-calibrating | <b>ECS702SC</b>   |
| <b>Split-Core Housing</b><br> | <b>Split-Core Housing</b><br>Self-powered<br>(no external power needed) | Normally open | 0.85 in (21.6 mm) | Over/underload, 2.8–150 A self-calibrating | <b>ECS711SP</b> ① |
|  |   |               |                   | Overload only, 2.8–150 A self-calibrating  | <b>ECS710SP</b>   |
|  |   |               |                   | Underload only, 2.8–150 A self-calibrating | <b>ECS712SP</b>   |

## Accessories

### DIN Rail Mounting Kit



#### ECS7 Series CurrentWatch Current Switches

| Description             | Catalog Number |
|-------------------------|----------------|
| DIN rail mounting kit ② | <b>EDINKIT</b> |

#### Notes

- ① Output is closed when current is within  $\pm 15\%$  window.
- ② Sensor pictured for reference and not included in kit.

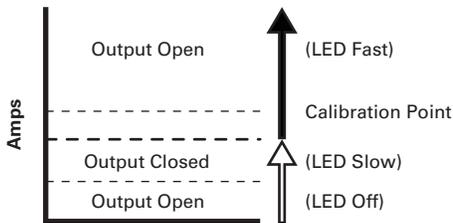
**Technical Data and Specifications**

**ECS7 Series CurrentWatch Current Switches**

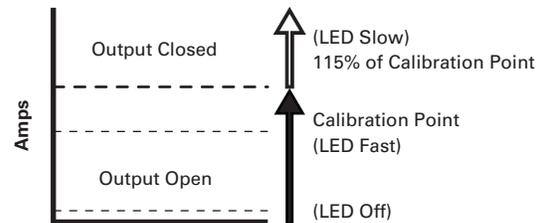
| Description       | Specification  |
|-------------------|--|
| Power supply      | Self-powered—no power supply needed  |
| Output            | Magnetically isolated solid-state switch   |
| Output rating     | Normally open (NO) models: 0.3 A at 135 Vac/Vdc<br>Not polarity sensitive                                  |
| Off-state leakage | <10 $\mu$ A  |
| Response time     | 200 ms   |
| Set point range   | Solid-core models: 1.5 to 150 A<br>Split-core models: 2.8 to 150 A   |
| Set point         | Overload models: +15% of load<br>Underload models: -15% of load<br>Operating window: $\pm$ 5% of set point |
| Hysteresis        | 5% of set point  |
| Overload          | 500 A at 6 sec., 1000 A at 1 sec.  |
| Isolation voltage | UL listed to 1270 Vac, tested to 5000 Vac  |
| Frequency range   | 6–100 Hz   |
| Sensing aperture  | Solid-core models: 0.74 in (19 mm) dia.<br>Split-core models: 0.85 in (21.6 mm) sq.                        |
| Housing           | UL94 V0 flammability rated   |
| Environmental     | Operating temperature: -58 to 122 °F (-50 to 50 °C)<br>Humidity: 0–95% RH, non-condensing                  |

**Current Switch Operation**

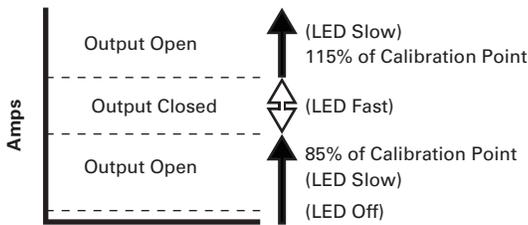
**Underload Only Models**



**Overload Only Models**



**Over/Underload Models ①**

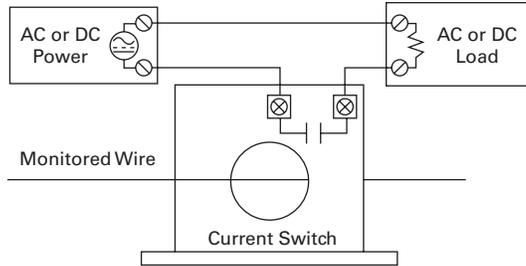


**Note**

① Output is closed when current is within  $\pm$ 15% window.

#### Wiring Diagram

##### ECS7 Series CurrentWatch Current Switches

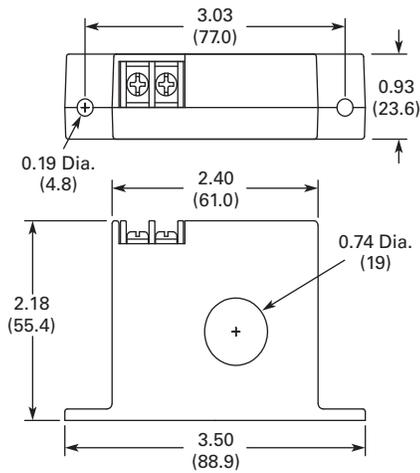


7

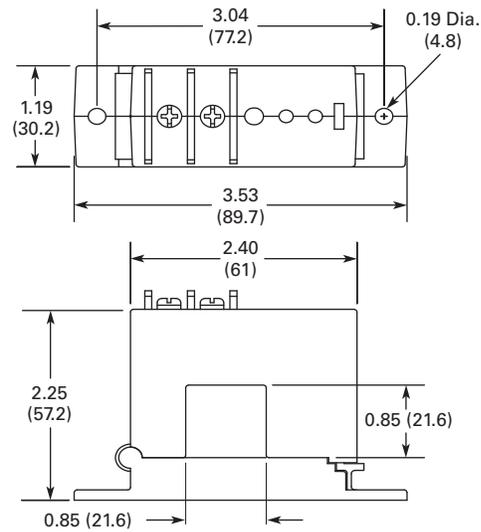
#### Dimensions

Approximate Dimensions in Inches (mm)

##### Solid-Core Housing



##### Split-Core Housing



ECSTD Series CurrentWatch Current Switches



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| Dimensions . . . . .                        | <b>V8-T7-24</b> |

ECSTD Series CurrentWatch Current Switches

Product Description

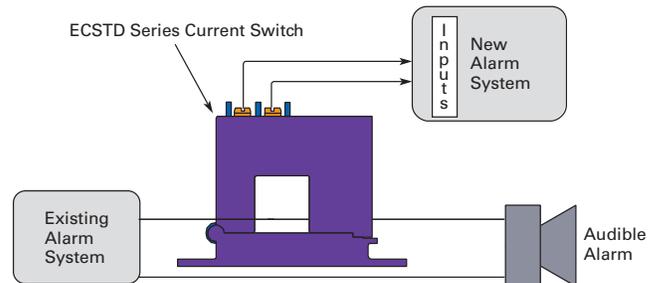
The CurrentWatch ECSTD Series from Eaton’s Electrical Sector is a family of high performance current-operated switches with field-adjustable time delay to help minimize nuisance trips during start-up and operation. Designed for motor status applications where set point accuracy and repeatability are critical, the ECSTD Series offers a linear set point characteristic and constant hysteresis. Standard features include self-powering, jumper-selectable ranges and a choice of outputs and housing styles.

Application Description

Typical Applications

- **Motor Protection**—Serves as an electronic proof-of-operation; detects current draw changes in motors when they encounter problems such as pumps running dry or pending bearing failure; non-intrusive and less expensive to install than differential pressure flow sensors or thermal switches; much quicker response time than Class 10 overload relays
- **High Inrush or Temporary Overload Current**—Adjustable start-up/delay timer allows 0–15 second delay to eliminate nuisance trips from high inrush or short overload conditions

Example Application—  
Isolated Alarm System Interfacing



Features

- **Adjustable Start-Up/Delay Timer**—Field adjustable from 0–15 seconds to eliminate nuisance alarms due to start-up inrush or temporary overcurrent conditions
- **Choice of NO/NC AC or Universal Outputs**—Contact ratings of 1.0 A at 240 Vac or universal outputs of 0.15 A at 240 Vac/Vdc (NO models) and 0.2 A at 135 Vac/Vdc (NC models) for use with most standard motor control systems
- **Improved Ease of Installation and Use**—Self-powered, split-core models simplify installation, 1.0 A AC rating eliminates need for time delay relay, and status LED provides visual indication of set point trip and contact action
- **Industrial Grade Performance**—Constant hysteresis and linear response characteristics enhance set point accuracy

For the most current information on this product, visit our Web site: [www.eaton.com](http://www.eaton.com)

For Customer Service in the U.S. call 1-877-ETN CARE (386-2273), in Canada call 1-800-268-3578.

For Application Assistance in the U.S. and Canada call 1-800-426-9184.

**Standards and Certifications**

- UL Listed
- UL tested to Canadian safety standards
- CE
- RoHS Compliant



**Note:** ECSTD401SC and ECSTD402SC not listed

**DANGER**

**THIS SENSOR IS NOT A SAFETY DEVICE AND IS NOT INTENDED TO BE USED AS A SAFETY DEVICE.** This sensor is designed only to detect and read certain data in an electronic manner and perform no use apart from that, specifically no safety-related use. This sensor product does not include self-checking redundant circuitry, and the failure of this sensor product could cause either an energized or de-energized output condition, which could result in death, serious bodily injury, or property damage.

**Product Selection****ECSTD Series CurrentWatch Current Switches****AC Output Switches (NO/NC 1 A at 240 Vac)**

|  | Power Supply                               | Aperture Size     | Output Type     | Set Point Options                                | Catalog Number    |
|--|--|-------------------|-----------------|--|-------------------|
| <b>Solid-Core Housing</b><br> | Self powered<br>(no external power needed) | 0.75 in (19 mm)   | Normally open   | Adjustable set points: 1.5–12, 12–55 or 50–175 A | <b>ECSTD401SC</b> |
|  |  |                   | Normally closed | Adjustable set points: 1.5–12, 12–55 or 50–175 A | <b>ECSTD402SC</b> |
| <b>Split-Core Housing</b><br> | Self powered<br>(no external power needed) | 0.85 in (21.6 mm) | Normally open   | Adjustable set points: 2–12, 12–55 or 50–200 A   | <b>ECSTD404SP</b> |
|  |  |                   | Normally closed | Adjustable set points: 2–12, 12–55 or 50–200 A   | <b>ECSTD405SP</b> |

**AC/DC Output Switches (NO 0.15 A at 240 Vac/Vdc, NC 0.2 A at 135 Vac/Vdc) ①**

|  | Power Supply                               | Aperture Size     | Output Type     | Set Point Options                                | Catalog Number    |
|--|--|-------------------|-----------------|--|-------------------|
| <b>Solid-Core Housing</b><br> | Self powered<br>(no external power needed) | 0.75 in (19 mm)   | Normally open   | Adjustable set points: 1.5–12, 12–55 or 50–175 A | <b>ECSTD406SC</b> |
|  |  |                   | Normally closed | Adjustable set points: 1.5–12, 12–55 or 50–175 A | <b>ECSTD407SC</b> |
| <b>Split-Core Housing</b><br> | Self powered<br>(no external power needed) | 0.85 in (21.6 mm) | Normally open   | Adjustable set points: 2–12, 12–55 or 50–200 A   | <b>ECSTD408SP</b> |
|  |  |                   | Normally closed | Adjustable set points: 2–12, 12–55 or 50–200 A   | <b>ECSTD409SP</b> |

**Note**

① Preferred for PLC inputs.

## Accessories

### DIN Rail Mounting Kit



### ECSTD Series CurrentWatch Current Switches

| Description             | Catalog Number |
|-------------------------|----------------|
| DIN rail mounting kit ① | EDINKIT        |

## Technical Data and Specifications

### ECSTD Series CurrentWatch Current Switches

| Description       | Specification   |
|-------------------|---|
| Power supply      | Self-powered—no power supply needed   |
| Output            | Magnetically isolated solid-state switch  |
| Output rating     | AC output models: NO/NC 1 A at 240 Vac<br>AC/DC output models: NO 0.15 A at 240 Vac/Vdc; NC 0.20 A at 135 Vac/Vdc |
| Off-state leakage | <10 $\mu$ A   |
| Response time     | Adjustable 0.2 to 15 sec.   |
| Set point range   | Solid-core: 1.5–12, 12–55 or 50–175 A<br>Split-core: 2–12, 12–55 or 50–200 A (jumper selectable)                  |
| Hysteresis        | 5% (constant)   |
| Isolation voltage | 5000 Vac (tested)   |
| Frequency range   | 50–100 Hz   |
| Sensing aperture  | Solid-core models: 0.75 in (19 mm) dia.<br>Split-core models: 0.85 in (21.6 mm) sq.                               |
| Housing           | UL94 V0 flammability rated  |
| Environmental     | Operating temperature: 5 to 122 °F (–15 to 50 °C)<br>Humidity: 0–95% RH, non-condensing                           |

### Overload Ratings

| Housing    | Range     | Maximum Amperes |             |            |
|------------|-----------|-----------------|-------------|------------|
|            |           | Continuous      | Six Seconds | One Second |
| Solid-core | 1.5–175 A | 175 A           | 400 A       | 1000 A     |
| Split-core | 2–200 A   | 200 A           | 400 A       | 1000 A     |

### LED Indication/Output Status

| Monitored Amps   | Output |        |                        |
|------------------|--------|--------|------------------------|
|                  | NO     | NC     | Smart-LED (If Present) |
| None or minimum  | Open   | Closed | Off                    |
| Below trip level | Open   | Closed | Slow (2 sec.)          |
| Above trip level | Closed | Open   | Fast (0.5 sec.)        |

#### Note

① Sensor pictured for reference and not included in kit.



ECSD Series CurrentWatch Current Switches



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ECSD Series CurrentWatch Current Switches

Product Description

The CurrentWatch ECSD Series current operated switches from Eaton’s Electrical Sector provides the same dependable indication of status offered by the CurrentWatch ECS Series, but with the added benefit of increased set point precision. A choice of three jumper-selectable input ranges allow the ECSD Series to be tailored to an application, providing more precise control through improved set point resolution. Features such as isolated solid-state or mechanical relay outputs; 4-20 A, 10-50 A, and 20-100 A input ranges are standard.

Application Description

Typical Applications

- **Electronic Proof of Flow**—Current operated switches eliminate the need for multiple pipe or duct penetrations and are more reliable than electromechanical pressure or flow switches
- **Welders**—Instant indication of equipment status
- **Large Drive Motors**—Provide monitoring for field loss protection
- **Power Supplies**—Detect and signal over-current condition before equipment damage
- **UPS**—Monitors battery output
- **Ancillary Equipment**

Features

- **Choice of Mechanical Relay or Solid-state Outputs**
  - SPDT (Form C) relay, 5.0 A at 240 Vac or 30 Vdc
  - Solid-state, NO, 0.15 A at 240 Vac/Vdc
- **Easily Adjustable Set Point**—Speeds start-up and reduces inventory
- **Compact, One-Piece Design**—Easily fits in crowded control panels
- **Input Isolation**—Safer than shunt/relay combinations
- **Adaptive Hysteresis**—Hysteresis is five percent of set point, allowing closer control than fixed-hysteresis switches
- **Solid-Core Housings**
- **LED Indication**—Provides quick visual indication of output contact status
- **Built-In Mounting Feet**—Provide for a secure installation

Standards and Certifications

- UL Listed
- UL tested to Canadian safety standards
- CE
- RoHS Compliant



**! DANGER**

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For the most current information on this product, visit our Web site: [www.eaton.com](http://www.eaton.com)

For Customer Service in the U.S. call 1-877-ETN CARE (386-2273), in Canada call 1-800-268-3578.

For Application Assistance in the U.S. and Canada call 1-800-426-9184.

## Product Selection

### ECSD Series CurrentWatch Current Switches

#### Top Terminal Switches

| Power Supply                                 | Aperture Size   | Output Type, Voltage and Rating                           | Set Point and LED Configuration   | Catalog Number   |
|--|-----------------|---|-----------------------------------|------------------|
| <b>Solid-Core Housings with Top Terminal</b> |                 |   |                                   |                  |
| 12 Vac/Vdc                                   | 0.74 in (19 mm) | Solid-state, normally open, 0.15 A at 240 Vac/Vdc         | Adjustable: 4–20, 10–50, 20–100 A | <b>ECSD112SC</b> |
|  |                 | Mechanical relay, SPDT (Form C), 5.0 A at 240 Vac, 30 Vdc |                                   | <b>ECSD212SC</b> |
| 24 Vac/Vdc                                   | 0.74 in (19 mm) | Solid-state, normally open, 0.15 A at 240 Vac/Vdc         | Adjustable: 4–20, 10–50, 20–100 A | <b>ECSD124SC</b> |
|  |                 | Mechanical relay, SPDT (Form C), 5.0 A at 240 Vac, 30 Vdc |                                   | <b>ECSD224SC</b> |

#### Solid-Core Housing with Top Terminal



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## Accessories

### DIN Rail Mounting Kit



### ECSD Series CurrentWatch Current Switches

| Description             | Catalog Number |
|-------------------------|----------------|
| DIN rail mounting kit ① | <b>EDINKIT</b> |

## Technical Data and Specifications

### ECSD Series CurrentWatch Current Switches

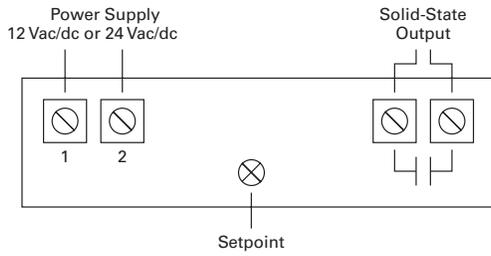
| Description       | Solid-State Output Models   | Mechanical Relay Models  |
|-------------------|---|--|
| Power supply      | 12 Vac/Vdc (operates from 10–18 Vac/Vdc)<br>24 Vac/Vdc (operates from 20–28 Vac/Vdc)      | 12 Vac/Vdc (operates from 10–18 Vac/Vdc)<br>24 Vac/Vdc (operates from 20–28 Vac/Vdc)     |
| Output            | Isolated solid-state contact  | Mechanical relay (SPDT)  |
| Output rating     | 0.15 A at 240 Vac/Vdc<br>Normally open  | 5.0 A at 240 Vac<br>5.0 A at 30 Vdc  |
| Off-state leakage | <10 µA  | —  |
| Response time     | 100 ms at 10% above set point<br>20 ms at 100% above set point                            | —  |
| Set point range   | Adjustable: 4–20, 10–50, 20–100 A   | —  |
| Hysteresis        | 5% of set point   | —  |
| Overload          | 1000% of range for 5 sec.   | —  |
| Isolation voltage | 3 kV  | —  |
| Frequency range   | DC to 400 Hz  | —  |
| Sensing aperture  | Solid-core, 0.74 in (19 mm)   | —  |
| Housing           | UL94 V0 flammability rated  | —  |
| Environmental     | Operating temperature: –40 to 140 °F (–40 to 60 °C)<br>Humidity: 0–95% RH, non-condensing | Operating temperature: –4 to 122 °F (–20 to 50 °C)<br>Humidity: 0–95% RH, non-condensing |

#### Note

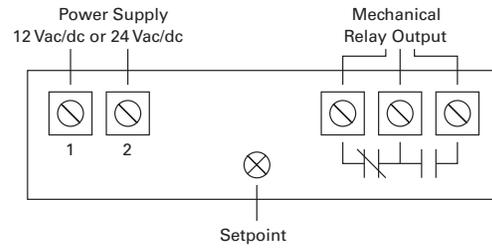
① Sensor pictured for reference and not included with kit.

**Wiring Diagrams**

**Solid-State Output Models**



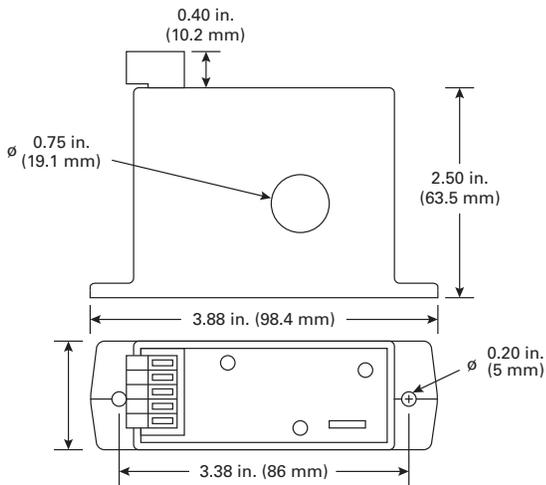
**Mechanical Relay Models**



**Dimensions**

Approximate Dimensions in Inches (mm)

**Solid-Core Models**



#### EAC Series CurrentWatch Current Sensors



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### EAC Series CurrentWatch Current Sensors

#### Product Description

The CurrentWatch EAC Series from Eaton's Electrical Sector combines a current transformer and signal conditioner into a single package. The EAC Series has jumper-selected current input ranges and industry standard outputs: 4–20 mA, 0–5 Vdc or 0–10 Vdc. This family of sensors is designed for application on "linear" or sinusoidal AC loads. Available in split-core or solid-core housings.

#### Application Description

##### Typical Applications

- **Automation Equipment**—Analog current reading for remote monitoring and software alarms
- **Data Loggers**—Self-powered sensor helps conserve data logger batteries
- **Panel Meters**—Simple connection displays power consumption

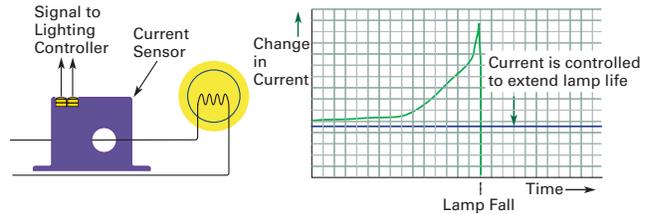
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#### Description

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#### Example Application— Preventative Maintenance of a Critical Lighting System



#### Features

- **Highly Accurate**—Factory matched and calibrated single-piece sensor is more accurate than traditional two-piece, field-installed solutions
- **Average Responding**—"Average Responding" algorithm gives an RMS output on pure sine waves, perfect for constant speed (linear) loads
- **Jumper Selectable Ranges**—The ability to change input ranges reduces inventory and eliminates zero and span
- **Isolation**—Output is magnetically isolated from the input for safety and elimination of insertion loss (voltage drop)

For the most current information on this product, visit our Web site: [www.eaton.com](http://www.eaton.com)

For Customer Service in the U.S. call 1-877-ETN CARE (386-2273), in Canada call 1-800-268-3578.

For Application Assistance in the U.S. and Canada call 1-800-426-9184.

**Standards and Certifications** ①

- UL Listed
- UL tested to Canadian safety standards
- CE
- RoHS Compliant



**⚠ DANGER**

**THIS SENSOR IS NOT A SAFETY DEVICE AND IS NOT INTENDED TO BE USED AS A SAFETY DEVICE.** This sensor is designed only to detect and read certain data in an electronic manner and perform no use apart from that, specifically no safety-related use. This sensor product does not include self-checking redundant circuitry, and the failure of this sensor product could cause either an energized or de-energized output condition, which could result in death, serious bodily injury, or property damage.

**Product Selection**

**EAC Series CurrentWatch Current Sensors**

**Top Terminal Current Sensors**

|  | Power Supply   | Aperture Size     | Output Signal          | Current Range          | Catalog Number         |
|--|--|-------------------|------------------------|------------------------|------------------------|
| <b>Solid-Core Housing</b><br> | <b>Solid-Core Housings</b>                           |                   |                        |                        |                        |
|  | Self-powered<br>(no external power needed)           | 0.74 in (19 mm)   | 0–5 Vdc                | 10, 20 or 50 A         | <b>EAC105SC</b>        |
|  |  |                   |                        | 100, 150 or 200 A      | <b>EAC205SC</b>        |
|  |  |                   | 0–10 Vdc               | 10, 20 or 50 A         | <b>EAC110SC</b>        |
|  | 100, 150 or 200 A                                    | <b>EAC210SC</b>   |                        |                        |                        |
|  | 24 Vdc loop-powered                                  | 4–20 mA           | 2 or 5 A               | <b>EAC0420SC</b>       |                        |
| 10, 20 or 50 A   |  |                   | <b>EAC1420SC</b>       |                        |                        |
| 100, 150 or 200 A  |  |                   | <b>EAC2420SC</b>       |                        |                        |
| <b>Split-Core Housing</b><br> | <b>Split-Core Housings – Self-Powered and 24 Vdc</b> |                   |                        |                        |                        |
|  | Self-powered<br>(no external power needed)           | 0.85 in (21.6 mm) | 0–5 Vdc                | 10, 20 or 50 A         | <b>EAC105SP</b>        |
|  |  |                   |                        | 100, 150 or 200 A      | <b>EAC205SP</b>        |
|  |  |                   | 0–10 Vdc               | 10, 20 or 50 A         | <b>EAC110SP</b>        |
|  | 100, 150 or 200 A                                    | <b>EAC210SP</b>   |                        |                        |                        |
|  | 24 Vdc loop-powered                                  | 4–20 mA           | 2 or 5 A               | <b>EAC0420SP</b>       |                        |
| 10, 20 or 50 A   |  |                   | <b>EAC1420SP</b>       |                        |                        |
| 100, 150 or 200 A  |  |                   | <b>EAC2420SP</b>       |                        |                        |
| <b>Split-Core Housing</b><br> | <b>Split-Core Housings – 120 Vac and 24 Vac/Vdc</b>  |                   |                        |                        |                        |
|  | 120 Vac  | 0.85 in (21.6 mm) | 4–20 mA                | 2 or 5 A               | <b>EACP0420120SP</b> ② |
|  |  |                   |                        | 10, 20 or 50 A         | <b>EACP1420120SP</b> ② |
|  |  |                   |                        | 100, 150 or 200 A      | <b>EACP2420120SP</b> ② |
|  | 24 Vac/Vdc   | 4–20 mA           | 2 or 5 A               | <b>EACP042024USP</b> ② |                        |
|  |  |                   | 10, 20 or 50 A         | <b>EACP142024USP</b> ② |                        |
| 100, 150 or 200 A  |  |                   | <b>EACP242024USP</b> ② |                        |                        |

**Notes**

- ① EACP models not listed.
- ② Not UL listed.

## Accessories

DIN Rail  
Mounting Kit

## EAC Series CurrentWatch Current Sensors

| Description             | Catalog Number |
|-------------------------|----------------|
| DIN rail mounting kit ① | EDINKIT        |

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## Technical Data and Specifications

## EAC Series CurrentWatch Current Sensors

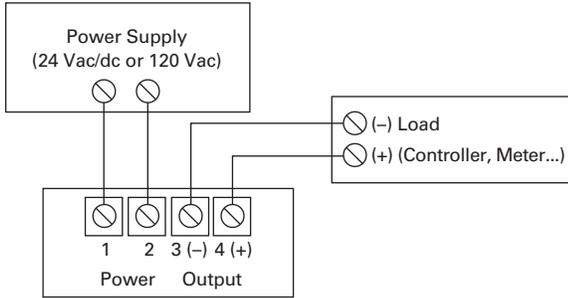
| Description       | Models with 0–5 Vdc Output Specification  | Models with 0–10 Vdc Output Specification   | Models with 4–20 mA Output Specification  | EACP Series Only Specification  |
|-------------------|---|---|---|---|
| Power supply      | Self-powered—no power supply needed   | Self-powered—no power supply needed   | 12–40 Vdc loop-powered  | Models ending -OSP: 120 Vac<br>Models ending -USP: 24 Vac/Vdc<br>(40 V maximum)             |
| Output signal     | 0–5 Vdc   | 0–10 Vdc  | 4–20 mA   | 4–20 mA   |
| Output limit      | 8.2 Vdc   | 15 Vdc  | 23 mA   | 22.4 mA   |
| Accuracy          | 1.0% FS   | 1.0% FS   | 1.0% FS   | 1% FS   |
| Response time     | 100 ms  | 100 ms  | 300 ms  | 100 ms  |
| Frequency range   | 50–60 Hz  | 50–60 Hz  | 20–100 Hz   | 40–100 Hz   |
| Loading           | 1M ohm minimum rated accuracy<br>100 kohms, add 1.3% error                                  | 1M ohm minimum rated accuracy<br>100 kohms, add 1.3% error                                  | See power supply above  | 50 kohms minimum<br>500 kohms maximum   |
| Isolation voltage | UL listed to 1270 Vac (tested to 5 kV)  | UL listed to 1270 Vac (tested to 5kV)   | UL listed to 1270 Vac (tested to 5kV)   | UL listed to 1270 Vac (tested to 5kV)   |
| Input ranges      | Field selectable ranges from 0–200 A ③  | Field selectable ranges from 0–200 A ③  | Field selectable ranges from 0–200 A ③  | 0–200 A jumper selectable   |
| Sensing aperture  | Solid-core: 0.74 in (19 mm) dia.<br>Split-core: 0.85 in (21.6 mm) sq.                       | Solid-core: 0.74 in (19 mm) dia.<br>Split-core: 0.85 in (21.6 mm) sq.                       | Solid-core: 0.74 in (19 mm) dia.<br>Split-core: 0.85 in (21.6 mm) sq.                       | 0.85 in (21.6 mm)   |
| Housing           | UL94 V0 flammability rated  |
| Environmental     | Operating temperature:<br>–4 to 122 °F (–20 to 50 °C)<br>Humidity: 0–95% RH, non-condensing | Operating temperature:<br>–4 to 122 °F (–20 to 50 °C)<br>Humidity: 0–95% RH, non-condensing | Operating temperature:<br>–4 to 122 °F (–20 to 50 °C)<br>Humidity: 0–95% RH, non-condensing | Operating temperature:<br>–4 to 122 °F (–20 to 50 °C)<br>Humidity: 0–95% RH, non-condensing |

## Notes

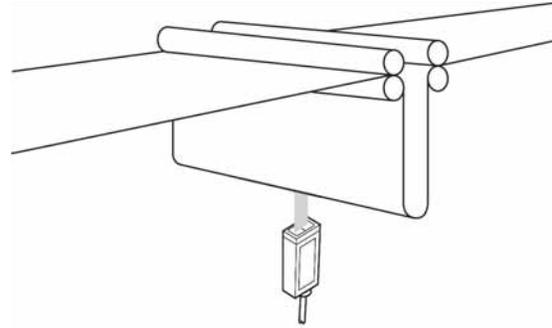
- ① Sensor pictured for reference and not included in kit.
- ② Does not apply to EACP series.
- ③ Additional custom ranges available from factory.

**Wiring Diagrams**

**EACP Models**



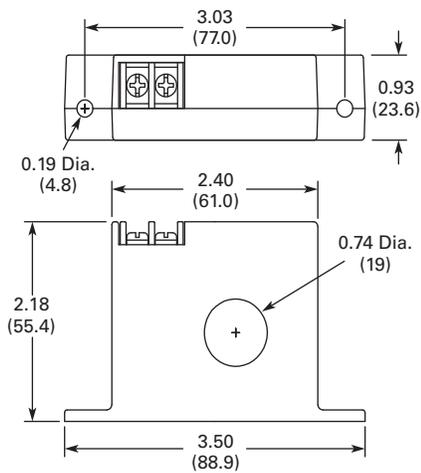
**All Other Models** ①



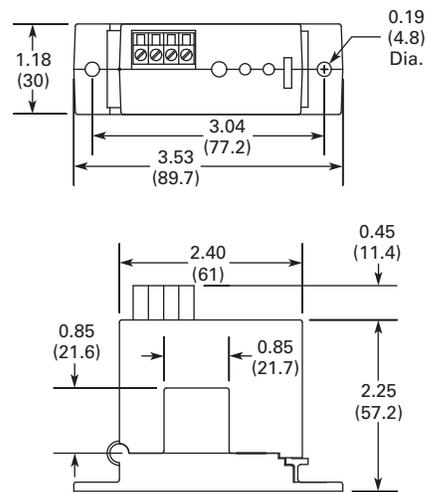
**Dimensions**

Approximate Dimensions in Inches (mm)

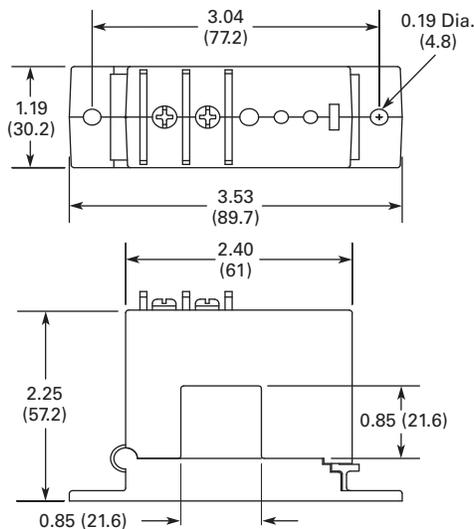
**Solid-Core Housing**



**EACP Series**



**All Other Models**



**Note**

- ① Pressure plate screw terminals.  
12–22 AWG solid or stranded.  
Field adjustable set point.

#### EACR Series CurrentWatch Current Sensors



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### EACR Series CurrentWatch Current Sensors

#### Product Description

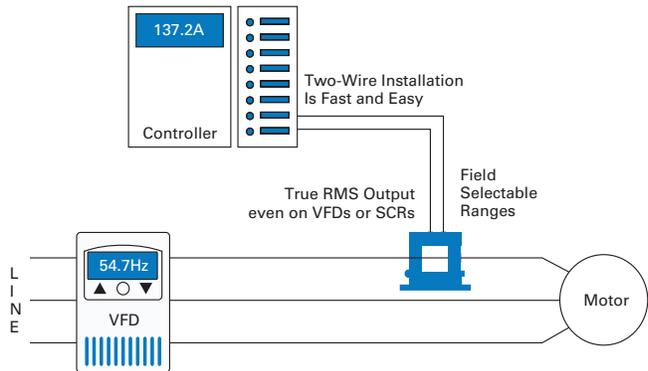
The CurrentWatch EACR Series current sensor family from Eaton’s Electrical Sector combines a current sensor and a “True RMS” signal conditioner into a single package. The EACR Series provides True RMS output on distorted waveforms found on VFD or SCR outputs, and on linear loads in “noisy” power environments. Available in solid- or split-core housings.

#### Application Description

##### Typical Applications

- **VFD Controlled Loads**—Monitoring VFD output indicates how the motor and attached load are operating
- **SCR Controlled Loads**—Accurate measurement of phase angle fired or burst fired (time proportioned) SCRs, with faster current measurement than temperature sensors
- **Switching Power Supplies and Electronic Ballasts**—True RMS sensing is the most accurate way to measure power supply or ballast input power

#### Example Application— Current Sensing for Non-Linear AC Loads



#### Why “True RMS”?

The current waveform of a typical linear load is a pure sine wave. In VFD and SCR applications, however, output waveforms are rough approximations of a sine wave. There are numerous spikes and dips in each cycle. The CurrentWatch EACR Series current sensors use a mathematical algorithm called “True RMS” which

integrates the actual waveform over time. The output is the amperage component of the true power (heating value) of the AC current waveform. True RMS is the only way to accurately measure distorted AC waveforms. Select the EACR Series sensors for nonlinear loads in “noisy” power environments.

For the most current information on this product, visit our Web site: [www.eaton.com](http://www.eaton.com)

For Customer Service in the U.S. call 1-877-ETN CARE (386-2273), in Canada call 1-800-268-3578. For Application Assistance in the U.S. and Canada call 1-800-426-9184.

**Features**

- **True RMS Output**—True RMS technology is accurate on distorted waveforms like VFD or SCR outputs
- **Jumper-Selectable Ranges**—Reduces inventory and eliminates zero and span
- **Isolation**—Output is magnetically isolated from the input for safety and elimination of insertion loss (voltage drop)

**Standards and Certifications**

- UL Listed
- UL tested to Canadian safety standards
- CE
- RoHS Compliant



**⚠ DANGER**

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**Product Selection**

**EACR Series CurrentWatch Current Sensors**

**Top Terminal Current Sensors**

|  | Power Supply                              | Aperture Size     | Output Signal | Current Range     | Catalog Number    |
|--|---|-------------------|---------------|-------------------|-------------------|
| <b>Solid-Core Housing</b><br>  | Solid-Core Housing<br>24 Vdc loop-powered | 0.74 in (19 mm)   | 4–20 mA       | 2 or 5 A          | <b>EACR0420SC</b> |
|  |   |                   |               | 10, 20 or 50 A    | <b>EACR1420SC</b> |
|  |   |                   |               | 100, 150 or 200 A | <b>EACR2420SC</b> |
| <b>Split-Core Housing</b><br> | Split-Core Housing<br>24 Vdc loop-powered | 0.85 in (21.6 mm) | 4–20 mA       | 2 or 5 A          | <b>EACR0420SP</b> |
|  |   |                   |               | 10, 20 or 50 A    | <b>EACR1420SP</b> |
|  |   |                   |               | 100, 150 or 200 A | <b>EACR2420SP</b> |

**Accessories**

**DIN Rail Mounting Kit**



**EACR Series CurrentWatch Current Sensors**

| Description             | Catalog Number |
|-------------------------|----------------|
| DIN rail mounting kit ① | <b>EDINKIT</b> |

**Note**

① Sensor pictured for reference and not included in kit.



EDC Series CurrentWatch Current Sensors



Contents

| Description                             | Page     |
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| EDC Series CurrentWatch Current Sensors |          |
| Standards and Certifications            | V8-T7-36 |
| Product Selection                       | V8-T7-36 |
| Accessories                             | V8-T7-37 |
| Technical Data and Specifications       | V8-T7-37 |
| Wiring Diagram                          | V8-T7-38 |
| Dimensions                              | V8-T7-38 |

EDC Series CurrentWatch Current Sensors

Product Description

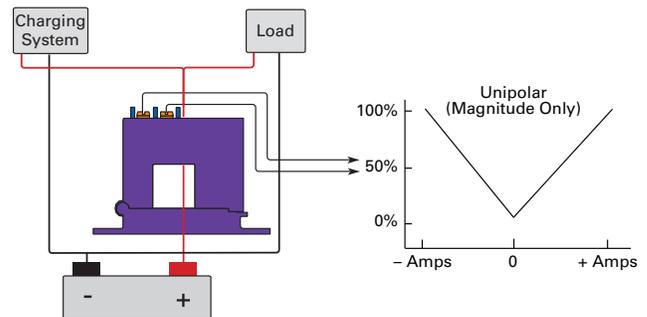
The CurrentWatch EDC Series from Eaton’s Electrical Sector combines a hall effect sensor and signal conditioner into a single package for use in DC current applications up to 300 A. The EDC Series has jumper-selected current input ranges and industry standard outputs: 4–20 mA, 0–5 Vdc or 0–10 Vdc. Available in split-core models for quick and easy installation.

Application Description

Typical Applications

- **Battery Banks**—Monitor load current, monitor charging current and verify operation
- **Transportation**—Measures traction power or auxiliary loads
- **Electric Heating Elements**—Monitor heater loads with a faster response time than temperature sensors

Example Application—Battery Charging System



Features

- **Jumper-Selectable Ranges**—Reduce inventory and eliminate zero or span pots
- **Isolation**—Output is magnetically isolated from the input for safety, also eliminating insertion loss (voltage drop)
- **Internal Power Regulation**—Works well with low cost, unregulated power supplies
- **Split Core Design and Built-In Mounting Brackets**—Make installation quick and easy

For the most current information on this product, visit our Web site: [www.eaton.com](http://www.eaton.com)

For Customer Service in the U.S. call 1-877-ETN CARE (386-2273), in Canada call 1-800-268-3578.

For Application Assistance in the U.S. and Canada call 1-800-426-9184.

**Standards and Certifications**

- UL Listed
- UL tested to Canadian safety standards
- CE
- RoHS Compliant


**DANGER**

**THIS SENSOR IS NOT A SAFETY DEVICE AND IS NOT INTENDED TO BE USED AS A SAFETY DEVICE.** This sensor is designed only to detect and read certain data in an electronic manner and perform no use apart from that, specifically no safety-related use. This sensor product does not include self-checking redundant circuitry, and the failure of this sensor product could cause either an energized or de-energized output condition, which could result in death, serious bodily injury, or property damage.

**Product Selection****EDC Series CurrentWatch Current Sensors****Top Terminal Current Sensors**

|  | Power Supply  | Aperture Size     | Output Signal  | Current Range     | Catalog Number   |
|--|---|-------------------|----------------|-------------------|------------------|
| <b>Split-Core Housing</b><br> | <b>Split-Core Housing—Uni-Polar Output, see Output Graph on Page V8-T7-37</b>       |                   |                |                   |                  |
|  | 24 Vac/Vdc  | 0.85 in (21.6 mm) | 0–5 Vdc        | 50, 75 or 100 A   | <b>EDC205SP</b>  |
|  |   |                   |                | 100, 150 or 200 A | <b>EDC305SP</b>  |
|  |   |                   |                | 150, 225 or 300 A | <b>EDC405SP</b>  |
|  | 0–10 Vdc  |                   |                | 50, 75 or 100 A   | <b>EDC210SP</b>  |
|  |   |                   |                | 100, 150 or 200 A | <b>EDC310SP</b>  |
|  |   |                   |                | 150, 225 or 300 A | <b>EDC410SP</b>  |
|  | 4–20 mA   |                   |                | 50, 75 or 100 A   | <b>EDC2420SP</b> |
|  |   |                   |                | 100, 150 or 200 A | <b>EDC3420SP</b> |
|  |   |                   |                | 150, 225 or 300 A | <b>EDC4420SP</b> |
| <b>Split-Core Housing</b><br> | <b>Split-Core Housing—Bidirectional Output, see Output Graph on Page V8-T7-37</b>   |                   |                |                   |                  |
|  | 24 Vac/Vdc  | 0.85 in (21.6 mm) | –10 to +10 Vdc | 0–100 A           | <b>EDCB100SP</b> |
|  |   |                   |                | 0–300 A           | <b>EDCB300SP</b> |
|  |   |                   |                | 0–400 A           | <b>EDCB400SP</b> |
| <b>Solid-Core Housing</b><br> | <b>Solid-Core Housing—Single-Polarity Output, see Output Graph on Page V8-T7-37</b> |                   |                |                   |                  |
| 24 Vac/Vdc   | 0.75 in (19 mm)   | 4–20 mA           | 5, 10 or 20 A  | <b>EDC1420SC</b>  |                  |

Accessories

DIN Rail Mounting Kit



CurrentWatch EDC Series

| Description             | Catalog Number |
|-------------------------|----------------|
| DIN rail mounting kit ① | EDINKIT        |

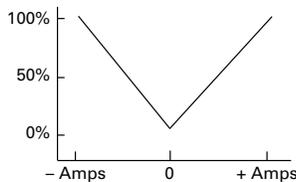
Technical Data and Specifications

EDC Series CurrentWatch Current Sensors

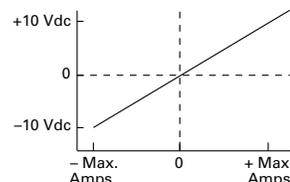
| Description       | Models with 0–5 Vdc Output Specification  | Models with 0–10 Vdc Output Specification   | Models with 4–20 mA Output Specification  |
|-------------------|---|---|---|
| Power supply      | 24 Vac/Vdc (22–38 Vac/Vdc) 2 VA maximum   | 24 Vac/Vdc (22–38 Vac/Vdc) 2 VA maximum   | 24 Vac/Vdc (22–38 Vac/Vdc) 2 VA maximum   |
| Output signal     | 0–5 Vdc   | 0–10 Vdc  | 4–20 mA   |
| Output limit      | 5.75 Vdc  | 11.5 Vdc  | 23 mA   |
| Accuracy          | Solid-core models: 1% FS<br>Split-core models: 2% FS<br>300 A models: 1.5% FS                         | Solid-core models: 1% FS<br>Split-core models: 2% FS<br>300 A models: 1.5% FS                         | Solid-core models: 1% FS<br>Split-core models: 2% FS<br>300 A models: 1.5% FS                         |
| Response time     | Solid-core models: 20 ms (to 90% of step change)<br>Split-core models: 100 ms (to 90% of step change) | Solid-core models: 20 ms (to 90% of step change)<br>Split-core models: 100 ms (to 90% of step change) | Solid-core models: 20 ms (to 90% of step change)<br>Split-core models: 100 ms (to 90% of step change) |
| Frequency range   | DC  | DC  | DC  |
| Loading           | 25 kohms minimum  | 50 kohms minimum  | 650 ohms maximum  |
| Isolation voltage | 3 kV (monitored line to output)   | 3 kV (monitored line to output)   | 3 kV (monitored line to output)   |
| Linearity         | 0.75% FS  | 0.75% FS  | 0.75% FS  |
| Current ranges    | Field selectable ranges from 0–300 A  | Field selectable ranges from 0–300 A  | Field selectable ranges from 0–300 A  |
| Sensing aperture  | Solid-core housings: 0.75 in (19 mm) dia.<br>Split-core housings: 0.85 in (21.6 mm) sq.               | Solid-core housings: 0.75 in (19 mm) dia.<br>Split-core housings: 0.85 in (21.6 mm) sq.               | Solid-core housings: 0.75 in (19 mm) dia.<br>Split-core housings: 0.85 in (21.6 mm) sq.               |
| Environmental     | Operating temperature: –4 to 122 °F (–20 to 50 °C)<br>Humidity: 0–95% RH, non-condensing              | Operating temperature: –4 to 122 °F (–20 to 50 °C)<br>Humidity: 0–95% RH, non-condensing              | Operating temperature: –4 to 122 °F (–20 to 50 °C)<br>Humidity: 0–95% RH, non-condensing              |

Output Graphs

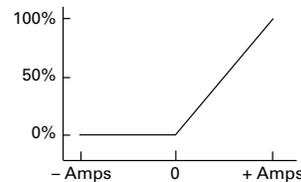
Uni-Polar Output for Split-Core



Bidirectional Output for Split-Core



Standard Analog Output for Solid-Core



Note

① Sensor pictured for reference and not included in kit.

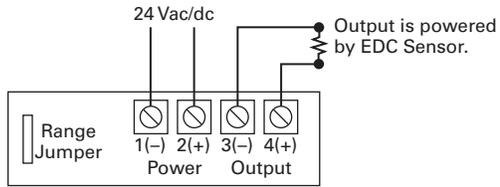
# 7.10

## Current and Voltage Sensors

### CurrentWatch EDC Series

#### Wiring Diagram

##### EDC Series CurrentWatch Current Sensors

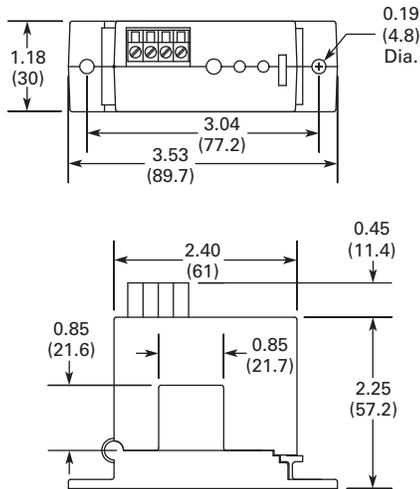


## 7

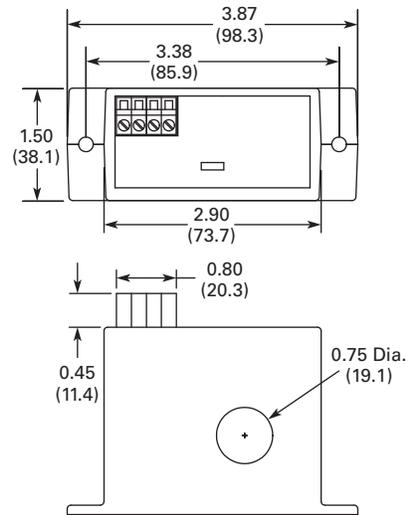
#### Dimensions

Approximate Dimensions in Inches (mm)

##### Split-Core Housing



##### Solid-Core Housing



EGF Series CurrentWatch Current Sensors



EGF Series CurrentWatch Current Sensors

Product Description

The CurrentWatch EGF Series from Eaton’s Electrical Sector is a family of ground fault (earth leakage) sensors. Ground fault sensors help protect people, products and processes from damage by ground fault conditions by monitoring all current-carrying conductors in grounded single- and three-phase delta or wye systems.

The EGF Series with solid-state outputs offers the benefit of reliable, long-lasting solid-state switches. Solid-state design provides unlimited switch operating life, superior resistance to shock and vibration, zero off-state leakage, high switch speeds and high input-output isolation.

The EGF Series with mechanical relay outputs is available in solid-core housings with a choice of NO or NC SPST latching relays and a SPDT Form C relay with auto-reset.

Application Description

Typical Applications

- Personnel Protection (Typically 5 mA)**—Detects sensitive ground fault conditions, which could cause injury to people, and functions as a sensor and alarm trigger when applied as an input to an overall ground fault protection system
- Equipment Protection (Typically 10 or 30 mA)**—For applications where personnel protection is not the primary concern, higher set point capability helps eliminate nuisance tripping while still providing adequate ground fault detection to protect machine electronics
- Regulatory**—Meets requirements as stipulated by governmental and industrial regulatory groups for ground fault sensing

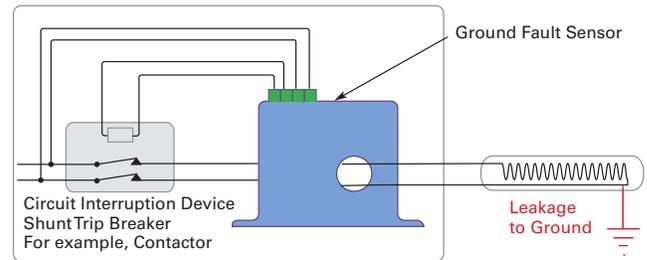
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Description

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| EGF Series CurrentWatch Current Sensors     |                 |
| Features . . . . .                          | <b>V8-T7-40</b> |
| Standards and Certifications . . . . .      | <b>V8-T7-40</b> |
| Product Selection . . . . .                 | <b>V8-T7-40</b> |
| Accessories . . . . .                       | <b>V8-T7-41</b> |
| Technical Data and Specifications . . . . . | <b>V8-T7-42</b> |
| Wiring Diagrams . . . . .                   | <b>V8-T7-43</b> |
| Dimensions . . . . .                        | <b>V8-T7-43</b> |

Example Application—Insulation Breakdown Monitoring



“Zero Sequence” Operating Principle

In three-phase delta and wye systems, under normal conditions, current in the “hot” leg of a two-wire load is equal in magnitude but opposite in sign to the current in a neutral leg. As a result, the electromagnetic fields surrounding these two conductors cancel, producing a “zero sum current.” As

soon as current leaks to ground (fault condition), the two currents become imbalanced and a net magnetic field results. The CurrentWatch EGF Series sensors monitor this field and trip the contacts when the leakage rises above the set point.

For the most current information on this product, visit our Web site: [www.eaton.com](http://www.eaton.com)

For Customer Service in the U.S. call 1-877-ETN CARE (386-2273), in Canada call 1-800-268-3578.

For Application Assistance in the U.S. and Canada call 1-800-426-9184.

#### Features

- **Broad Range of Options to Meet Application Needs**—NO or NC, solid-state or mechanical relays, normally energized or normally de-energized contacts
- **Set Point Options Maximize Ease-of-Use and Application Flexibility**—Field selectable 5, 10 or 30 mA set points on the EGF “tri-set” models make user adjustments fast, sure and convenient
- **Compatible with Standard Equipment**—Application on single- and three-phases systems, ideal for use with shunt trip breakers, and magnetically isolated from monitored circuit and control power

#### Standards and Certifications

- UL Listed
- UL tested to Canadian safety standards
- CE
- RoHS Compliant



#### **⚠ DANGER**

**THIS SENSOR IS NOT A SAFETY DEVICE AND IS NOT INTENDED TO BE USED AS A SAFETY DEVICE. This sensor is designed only to detect and read certain data in an electronic manner and perform no use apart from that, specifically no safety-related use. This sensor product does not include self-checking redundant circuitry, and the failure of this sensor product could cause either an energized or de-energized output condition, which could result in death, serious bodily injury, or property damage.**

#### Product Selection

##### EGF Series CurrentWatch Current Sensors

#### Solid-State Output Sensors

| Solid-Core Housing  | Power Supply                       | Set Point                         | AC Solid-State Output             | DC Solid-State Output             | Contacts              | Catalog Number       |
|---|------------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------|----------------------|
|  | 120 Vac                            | Fixed, 50 mA                      | Solid-state, NO, 1 A at 240 Vac   | —                                 | Normally energized    | <b>EGF1NOACNE050</b> |
|   |                                    |                                   |                                   |                                   | Normally de-energized | <b>EGF1NOACDE050</b> |
|   |                                    |                                   | Solid-state, NC, 1 A at 240 Vac   | —                                 | Normally energized    | <b>EGF1NCACNE050</b> |
|   |                                    |                                   |                                   |                                   | Normally de-energized | <b>EGF1NCACDE050</b> |
|   |                                    |                                   | —                                 | Solid-state, NO, 0.15 A at 30 Vdc | Normally energized    | <b>EGF1NODCNE050</b> |
|   |                                    |                                   |                                   |                                   | Normally de-energized | <b>EGF1NODCDE050</b> |
|   | —                                  | Solid-state, NC, 0.15 A at 30 Vdc | Normally energized                | <b>EGF1NCDCNE050</b>              |                       |                      |
|   |                                    |                                   | Normally de-energized             | <b>EGF1NCDCDE050</b>              |                       |                      |
|   | 120 Vac                            | Fixed, 100 mA                     | Solid-state, NO, 1 A at 240 Vac   | —                                 | Normally energized    | <b>EGF1NOACNE100</b> |
|   |                                    |                                   |                                   |                                   | Normally de-energized | <b>EGF1NOACDE100</b> |
|   |                                    |                                   | Solid-state, NC, 1 A at 240 Vac   | —                                 | Normally energized    | <b>EGF1NCACNE100</b> |
|   |                                    |                                   |                                   |                                   | Normally de-energized | <b>EGF1NCACDE100</b> |
| —   |                                    |                                   | Solid-state, NO, 0.15 A at 30 Vdc | Normally energized                | <b>EGF1NODCNE100</b>  |                      |
|   |                                    |                                   |                                   | Normally de-energized             | <b>EGF1NODCDE100</b>  |                      |
| —   | Solid-state, NC, 0.15 A at 30 Vdc  | Normally energized                | <b>EGF1NCDCNE100</b>              |                                   |                       |                      |
|   |                                    | Normally de-energized             | <b>EGF1NCDCDE100</b>              |                                   |                       |                      |
| 120 Vac   | Tri-set adjustable, 5, 10 or 30 mA | Solid-state, NO, 1 A at 240 Vac   | —                                 | Normally energized                | <b>EGF3NOACNET3</b>   |                      |
|   |                                    |                                   |                                   | Normally de-energized             | <b>EGF3NOACDET3</b>   |                      |
|   |                                    | Solid-state, NC, 1 A at 240 Vac   | —                                 | Normally energized                | <b>EGF3NCACNET3</b>   |                      |
|   |                                    |                                   |                                   | Normally de-energized             | <b>EGF3NCACDET3</b>   |                      |
|   |                                    | —                                 | Solid-state, NO, 0.15 A at 30 Vdc | Normally energized                | <b>EGF3NODCNET3</b>   |                      |
|   |                                    |                                   |                                   | Normally de-energized             | <b>EGF3NODCDET3</b>   |                      |
| —   | Solid-state, NC, 0.15 A at 30 Vdc  | Normally energized                | <b>EGF3NCDCNET3</b>               |                                   |                       |                      |
|   |                                    | Normally de-energized             | <b>EGF3NCDCDET3</b>               |                                   |                       |                      |

**Mechanical Relay Output Sensors**

**Solid-Core Housing**



| Power Supply               | Set Point   | Mechanical Relay Output   | Contacts  | Catalog Number  |                    |
|----------------------------|---|---|---|---|--------------------|
| <b>Solid-Core Housings</b> |   |   |   |   |                    |
| 120 Vac                    | Fixed, 50 mA  | Mechanical relay, NO SPST relay, Form A (1 A at 120 Vac, 2 A at 30 Vdc)   | Latching relay  | <b>EGF1NOLA050</b>  |                    |
|                            |   | Mechanical relay, NC SPST relay, Form B (1 A at 120 Vac, 2 A at 30 Vdc)   | Latching relay  | <b>EGF1NCLA050</b>  |                    |
|                            |   | Mechanical relay, SPDT Form C, auto-reset (1 A at 120 Vac, 2 A at 30 Vdc) | Normally energized  | <b>EGF1SPDTNE050</b>  |                    |
|                            |   |   | Normally de-energized   | <b>EGF1SPDTE050</b>   |                    |
|                            |   | Fixed, 100 mA   | Mechanical relay, NO SPST relay, Form A (1 A at 120 Vac, 2 A at 30 Vdc) | Latching relay  | <b>EGF1NOLA100</b> |
|                            |   |   | Mechanical relay, NC SPST relay, Form B (1 A at 120 Vac, 2 A at 30 Vdc) | Latching relay  | <b>EGF1NCLA100</b> |
|                            | Mechanical relay, SPDT Form C, auto-reset (1 A at 120 Vac, 2 A at 30 Vdc) |   | Normally energized  | <b>EGF1SPDTNE100</b>  |                    |
|                            |   | Normally de-energized   | <b>EGF1SPDTE100</b>   |   |                    |
|                            | Tri-set adjustable, 5, 10 or 30 mA  | Mechanical relay, NO SPST relay, Form A (1 A at 120 Vac, 2 A at 30 Vdc)   | Latching relay  | <b>EGF1NOLAT3</b>   |                    |
|                            |   |   | Mechanical relay, NC SPST relay, Form B (1 A at 120 Vac, 2 A at 30 Vdc) | Latching relay  | <b>EGF1NCLAT3</b>  |
|                            |   |   |   | Mechanical relay, SPDT Form C, auto-reset (1 A at 120 Vac, 2 A at 30 Vdc) | Normally energized |
|                            |   | Normally de-energized   | <b>EGF1SPDDET3</b>  |   |                    |
| 24 Vac/Vdc                 |   | Fixed, 50 mA  | Mechanical relay, NO SPST relay, Form A (1 A at 120 Vac, 2 A at 30 Vdc) | Latching relay  | <b>EGF2NOLA050</b> |
|                            |   |   | Mechanical relay, NC SPST relay, Form B (1 A at 120 Vac, 2 A at 30 Vdc) | Latching relay  | <b>EGF2NCLA050</b> |
|                            | Mechanical relay, SPDT Form C, auto-reset (1 A at 120 Vac, 2 A at 30 Vdc) |   | Normally energized  | <b>EGF2SPDTNE050</b>  |                    |
|                            |   |   | Normally de-energized   | <b>EGF2SPDTE050</b>   |                    |
|                            | Fixed, 100 mA   |   | Mechanical relay, NO SPST relay, Form A (1 A at 120 Vac, 2 A at 30 Vdc) | Latching relay  | <b>EGF2NOLA100</b> |
|                            |   |   | Mechanical relay, NC SPST relay, Form B (1 A at 120 Vac, 2 A at 30 Vdc) | Latching relay  | <b>EGF2NCLA100</b> |
|                            |   | Mechanical relay, SPDT Form C, auto-reset (1 A at 120 Vac, 2 A at 30 Vdc) | Normally energized  | <b>EGF2SPDTNE100</b>  |                    |
|                            | Normally de-energized   |   | <b>EGF2SPDTE100</b>   |   |                    |
|                            | Tri-set adjustable, 5, 10 or 30 mA  | Mechanical relay, NO SPST relay, Form A (1 A at 120 Vac, 2 A at 30 Vdc)   | Latching relay  | <b>EGF2NOLAT3</b>   |                    |
|                            |   |   | Mechanical relay, NC SPST relay, Form B (1 A at 120 Vac, 2 A at 30 Vdc) | Latching relay  | <b>EGF2NCLAT3</b>  |
|                            |   |   |   | Mechanical relay, SPDT Form C, auto-reset (1 A at 120 Vac, 2 A at 30 Vdc) | Normally energized |
|                            |   | Normally de-energized   | <b>EGF2SPDDET3</b>  |   |                    |

**Accessories**

**DIN Rail Mounting Kit**



**EGF Series CurrentWatch Current Sensors**

| Description             | Catalog Number |
|-------------------------|----------------|
| DIN rail mounting kit ① | <b>EDINKIT</b> |

**Note**

① Sensor pictured for reference and not included in kit.

## Technical Data and Specifications

### EGF Series CurrentWatch Current Sensors

| Description   | Solid-State Output Models Specification  | Mechanical Relay Output Models Specification   |
|---|--|--|
| Power supply  | 120 Vac (55–110% of nominal voltage)<br>24 Vac/Vdc ( $\pm 20\%$ )  | 120 Vac (55–110% of nominal voltage)<br>24 Vac/Vdc ( $\pm 20\%$ )  |
| Output contact type                                     | Isolated dry contact   | Mechanical relay   |
| Output rating (switching current and switching voltage) | AC output switching models: 1 A at 240 Vac<br>DC output switching models: 0.15 A at 30 Vdc   | Auto reset models, SPDT relay:<br>1 A at 120 Vac; 2 A at 30 Vdc<br>Latching models, SPST relay:<br>1 A at 120 Vac; 2 A at 30 Vdc           |
| Off-state leakage                                       | NO models: $<10 \mu\text{A}$<br>NC models: $<2.5 \text{ mA}$   | None   |
| Response time   | 200 ms at 5% above trip point<br>60 ms at 50% above trip point<br>15 ms at 500% above trip point   | 200 ms at 5% above trip point<br>60 ms at 50% above trip point<br>15 ms at 500% above trip point   |
| Frequency range   | 50–400 Hz (monitored circuit)  | 50–400 Hz (monitored circuit)  |
| Loading   | 2 VA maximum   | 2 VA maximum   |
| Isolation voltage                                       | 5000 Vac (tested)  | 5000 Vac (tested)  |
| Sensing aperture  | 0.74 in (19 mm) diameter   | 0.74 in (19 mm) diameter   |
| LED indicator   | Green LED for power ON status;<br>red LED for contact status   | Green LED for power ON status;<br>red LED for contact status   |
| Housing   | UL94 V0 flammability rated   | UL94 V0 flammability rated   |
| Environmental   | Operating temperature: $-4$ to $122 \text{ }^\circ\text{F}$ ( $-20$ to $50 \text{ }^\circ\text{C}$ )<br>Humidity: 0–95% RH, non-condensing | Operating temperature: $-4$ to $122 \text{ }^\circ\text{F}$ ( $-20$ to $50 \text{ }^\circ\text{C}$ )<br>Humidity: 0–95% RH, non-condensing |

### Output Tables

Protection from faults and control power loss.

#### Normally Energized Models

|                        | No Power | Control Power Applied |        |
|------------------------|----------|-----------------------|--------|
|                        |          | No Fault              | Fault  |
| Normally open models   | Open     | Closed                | Open   |
| Normally closed models | Closed   | Open                  | Closed |

#### Normally De-Energized Models

|                        | No Power | Control Power Applied |        |
|------------------------|----------|-----------------------|--------|
|                        |          | No Fault              | Fault  |
| Normally open models   | Open     | Open                  | Closed |
| Normally closed models | Closed   | Closed                | Open   |

### Latching (Mechanical Relay Output) Models

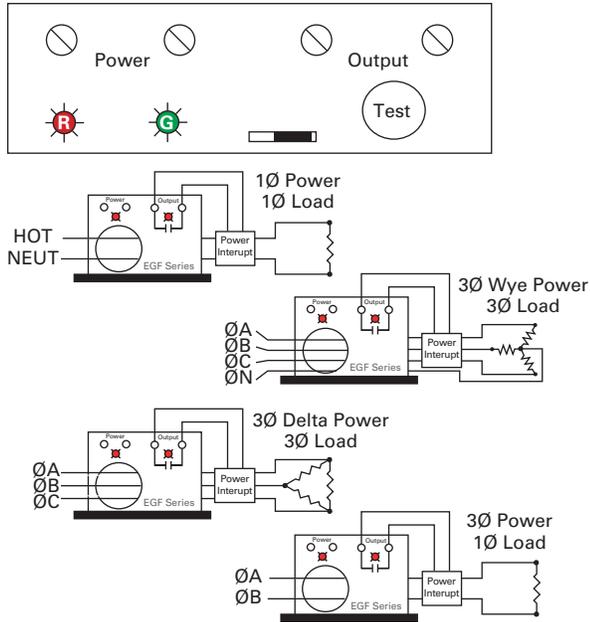
Latching models power up initially in the rest (normal) mode. If there is a fault condition or the test button is pushed, the output contacts will change state and latch.

The output will remain latched regardless of whether the fault is cleared or control power is removed. To reset the output, apply a momentary contact across "reset" terminals.

**Wiring Diagrams**

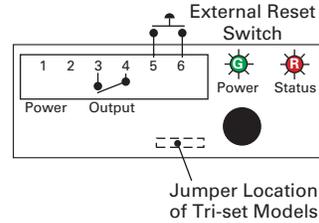
**Solid-State Output Models**

**All Models**

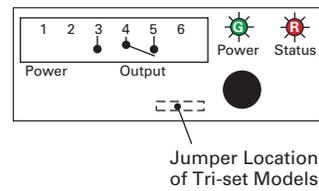


**Mechanical Relay Output Models**

**Latching Models**



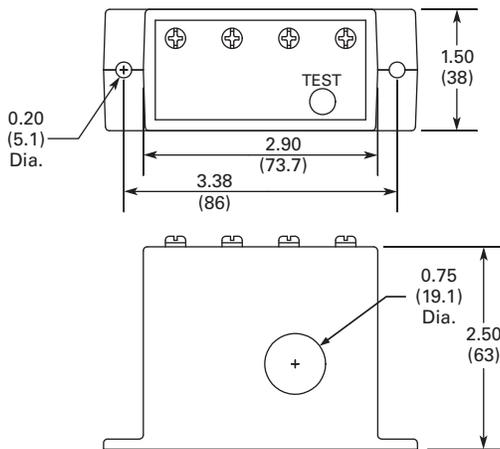
**Auto Reset Models**



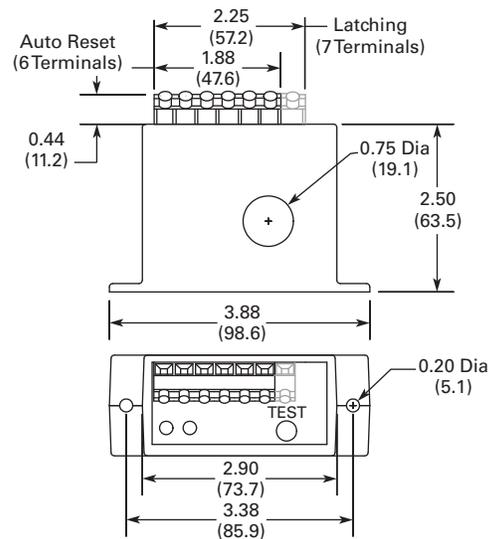
**Dimensions**

Approximate Dimensions in Inches (mm)

**Solid-State Output Models**



**Mechanical Relay Models**



#### EGFL Series CurrentWatch Current Sensors



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### EGFL Series CurrentWatch Current Sensors

#### Product Description

The CurrentWatch EGFL Series from Eaton's Electrical Sector is a family of ground fault (earth leakage) sensors. Ground fault sensors help protect people, products and processes from damage by ground fault conditions by monitoring all current-carrying conductors in grounded single- and three-phase delta or wye systems. For more information, see "Zero Sequence" Operating Principle on this page. The EGFL Series is available with either solid-state or mechanical relay outputs.

The EGFL Series with mechanical relays are available in solid-core housings with a choice of NO or NC SPST latching relays and a SPDT Form C relay with auto-reset. All mechanical models can be ordered with a fixed set point or with a "tri-set" option, which provides three factory-set, field adjustable set points.

#### Application Description

##### Typical Applications

- Personnel Protection (Typically 5 mA)**—Detects sensitive ground fault conditions, which could cause injury to people, and functions as a sensor and alarm trigger when part of an overall ground fault protection system
- Equipment Protection (Typically 10 or 30 mA)**—For applications where personnel protection is not the primary concern, higher set point capability helps eliminate nuisance tripping while still providing adequate ground fault detection to protect machine electronics
- Regulatory**—Meets requirements as stipulated by governmental and industrial regulatory groups for ground fault sensing

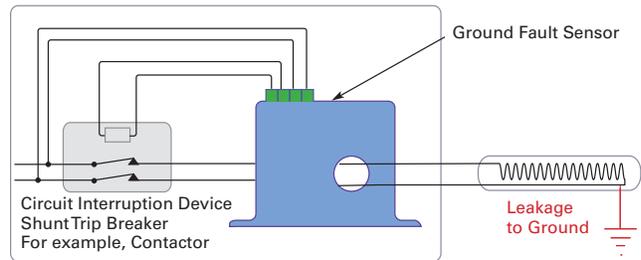
### Contents

#### Description

EGFL Series CurrentWatch Current Sensors

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#### Example Application—Insulation Breakdown Monitoring



#### "Zero Sequence" Operating Principle

In three-phase delta and wye systems, under normal conditions, current in the "hot" leg of a two-wire load is equal in magnitude but opposite in sign to the current in a neutral leg. As a result, the electromagnetic fields surrounding these two conductors cancel, producing a "zero sum current." As

soon as current leaks to ground (fault condition), the two currents become imbalanced and a net magnetic field results. The CurrentWatch EGFL Series sensors monitor this field and trip alarm contacts when the leakage rises above the set point.

For the most current information on this product, visit our Web site: [www.eaton.com](http://www.eaton.com)

For Customer Service in the U.S. call 1-877-ETN CARE (386-2273), in Canada call 1-800-268-3578.

For Application Assistance in the U.S. and Canada call 1-800-426-9184.

**Features**

- **Broad Range of Options to Meet Application Needs**—Mechanical relays, normally energized or normally de-energized contacts
- **Set Point Options Maximize Ease-of-Use and Application Flexibility**—Field selectable 5, 10 or 30 mA set points on the EGFL “tri-set” models make user adjustments fast, sure and convenient
- **Compatible with Standard Equipment**—Application on single- and three-phase systems, ideal for use with shunt trip breakers, and magnetically isolated from monitored circuit and control power

**Standards and Certifications**

- UL Listed
- UL tested to Canadian safety standards
- CE
- RoHS Compliant



**⚠ DANGER**

**THIS SENSOR IS NOT A SAFETY DEVICE AND IS NOT INTENDED TO BE USED AS A SAFETY DEVICE. This sensor is designed only to detect and read certain data in an electronic manner and perform no use apart from that, specifically no safety-related use. This sensor product does not include self-checking redundant circuitry, and the failure of this sensor product could cause either an energized or de-energized output condition, which could result in death, serious bodily injury, or property damage.**

**Product Selection**

**EGFL Series CurrentWatch Current Sensors**

**Mechanical Relay Sensors**

|   | Power Supply               | Set Point                          | Output Type                               | Contacts              | Catalog Number       |
|---|----------------------------|------------------------------------|---|-----------------------|----------------------|
| <b>Solid-Core Housing</b><br> | <b>Solid-Core Housings</b> |                                    |   |                       |                      |
|   | 120 Vac                    | Tri-set adjustable, 5, 10 or 30 mA | Mechanical relay, NO SPST relay, Form A   | Latching relay        | <b>EGFL1NOLAT3</b>   |
|   |                            |                                    | Mechanical relay, NC SPST relay, Form B   | Latching relay        | <b>EGFL1NCLAT3</b>   |
|   |                            |                                    | Mechanical relay, SPDT Form C, auto-reset | Normally energized    | <b>EGFL1SPDTNET3</b> |
|   |                            |                                    |   | Normally de-energized | <b>EGFL1SPDDET3</b>  |
|   | 24 Vac/Vdc                 | Tri-set adjustable, 5, 10 or 30 mA | Mechanical relay, NO SPST relay, Form A   | Latching relay        | <b>EGFL2NOLAT3</b>   |
|   |                            |                                    | Mechanical relay, NC SPST relay, Form B   | Latching relay        | <b>EGFL2NCLAT3</b>   |
|   |                            |                                    | Mechanical relay, SPDT Form C, auto-reset | Normally energized    | <b>EGFL2SPDTNET3</b> |
|   |                            |                                    |   | Normally de-energized | <b>EGFL2SPDDET3</b>  |

**Technical Data and Specifications**

**EGFL Series CurrentWatch Current Sensors**

| Description       | Specifications   |
|-------------------|--|
| Power supply      | 120 Vac (55–110% of nominal voltage)<br>24 Vac/Vdc (± 20%)   |
| Output signal     | Mechanical relay   |
| Output rating     | Auto reset models, SPDT relay: 1 A at 125 Vac; 2 A at 30 Vdc<br>Latching models, SPST relay: 1 A at 125 Vac; 2 A at 30 Vdc |
| OFF-state leakage | None   |
| Response time     | 200 ms at 5% above trip point<br>60 ms at 50% above trip point<br>15 ms at 500% above trip point                           |
| Frequency range   | 50–400 Hz (monitored circuit)  |
| Loading           | 2 VA max.  |
| Isolation voltage | 5000 Vac (tested)  |
| Sensing aperture  | 1.83 in (46.5 mm) diameter   |
| LED indicator     | Green LED for power ON status<br>Red LED for contact status  |
| Housing           | UL94 V0 flammability rated   |
| Environmental     | Operating temperature: –4 to +122 °F (–20 to +50 °C)<br>Humidity: 0–95% RH, non-condensing                                 |

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## Current and Voltage Sensors

### CurrentWatch EGFL Series

#### Output Tables

Protection from faults and control power loss.

#### Normally Energized Models

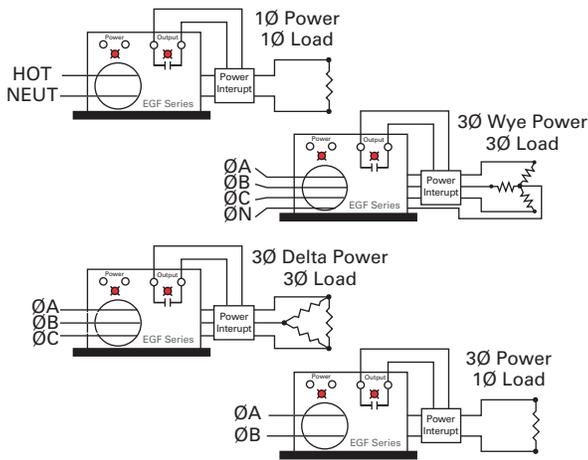
|                        | No Power | Control Power Applied |        |
|------------------------|----------|-----------------------|--------|
|                        |          | No Fault              | Fault  |
| Normally open models   | Open     | Closed                | Open   |
| Normally closed models | Closed   | Open                  | Closed |

#### Normally De-Energized Models

|                        | No Power | Control Power Applied |        |
|------------------------|----------|-----------------------|--------|
|                        |          | No Fault              | Fault  |
| Normally open models   | Open     | Open                  | Closed |
| Normally closed models | Closed   | Closed                | Open   |

#### Wiring Diagrams

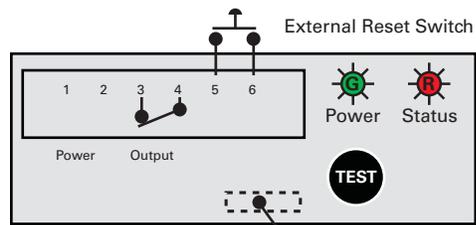
##### General Wiring Diagram for Ground Fault Sensors



#### Latching Models

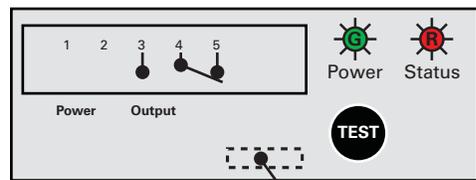
Latching models power up initially in the rest (normal) mode. If there is a fault condition or the test button is pushed, the output contacts will change state and latch. The output will remain latched regardless of whether the fault is cleared or control power is removed. To reset the output, apply a momentary contact across "reset" terminals.

#### Latching Models



Jumper Location for Tri-Set Models

#### Auto Reset Models



Jumper Location for Tri-Set Models

#### Dimensions

Approximate Dimensions in Inches (mm)

#### Mechanical Relay Models

