

EATON

Cutler-Hammer

CurrentWatch™ Current Sensors

Product Focus

Current Sensors
Current Switches
Ground Fault Sensors



Introduction

Eaton's Cutler-Hammer® CurrentWatch family of current sensors provide high performance AC or DC current sensing for industrial use. These devices are ideal for providing status information or protection for electrified equipment. The CurrentWatch series is accurate, highly reliable and perfect for new or retrofit applications.

With models measuring up to 2,000 amps AC and 300 amps DC, CurrentWatch products can be used in a wide range of applications such as equipment monitoring, fan status, pump status and equipment protection. Target applications for current sensors include: detecting locked rotors; loss of load; open heater or lamp load; pump jams; suction loss; motor wellness; belt loss or slippage; and general mechanical wear or failure.

A Family of Switches and Sensors

CurrentWatch products are available in both switch and sensor variety. Understanding this distinction is key to

choosing the right product for your application.

Current switches are set to trip at an over or undercurrent condition. A change in current will send an output signal notifying of an unwanted event. Current switches are designed with fixed or adjustable trip points and are ideal for providing information on AC electrified equipment.

Current sensors operate by monitoring current flow in equipment. The current magnitude is converted into a linear and proportional analog signal (4 – 20 mA, 0 – 5 V or 0 – 10 V). Small changes in current can be detected, avoiding costly repairs and mechanical problems before they occur. These sensors are magnetically isolated, contain internal signal conditioning, are safer to use than current transformers, do not require additional circuitry, and are completely self-contained in one compact package.

Solid or Split-Core Housings

CurrentWatch products are available in either solid- or split-core housing types.

Solid-core housing models are ideal for new equipment installations where the conductor wire is ran through the fixed aperture.

Split-core models are perfect for retrofit applications because the housing can be opened to fit around an existing conductor. As such, split-core current sensors are easy to install, without re-wiring and

shutting down a process for long periods of time. The simplicity of installing split-core models reduces overall installation costs.

Self-Powered

Some CurrentWatch products are self-powered, requiring no external power supply to function. Instead, the power required is induced from the monitored conductor. With self-powered sensors, just connect the output to a PLC, DDC or some overall management controller.

Performance and Flexibility

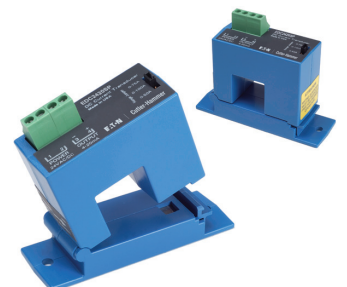
Many applications can benefit from measuring current flow. Because of this, the use of current sensors has grown beyond just circuit protection and reporting. Now, technological advances in current sensing provide more ways to monitor, improve performance and control power consumption. And with the straightforward installation of CurrentWatch products, current sensing has never been easier to implement.

Warranty Backed, Industry Approved

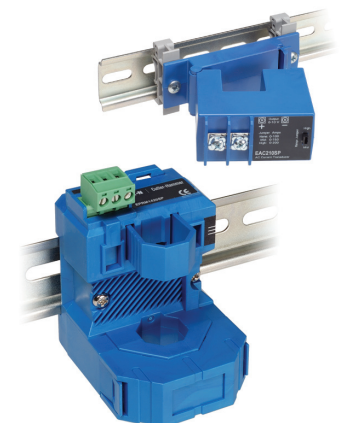
CurrentWatch products carry a five-year warranty and meet UL® and CE approvals. The proven technology of CurrentWatch is the right choice for your processes, equipment and overall continuous improvement approach to business.



ECS Series in Solid-Core Housing



EDC Series Current Sensor in Split-Core Housing



EAC Series with DIN-Rail Mounting Accessory and EPRM Series with DIN-Rail Mount Housing

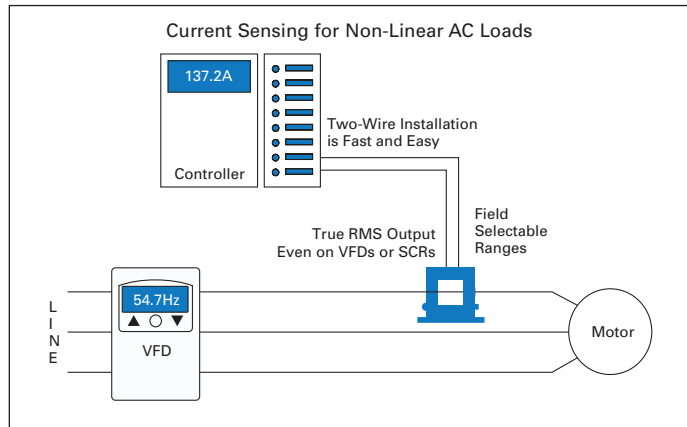
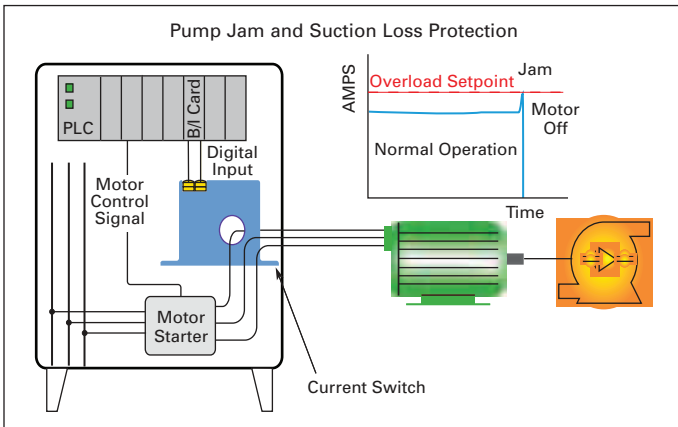
Key Features

- AC current sensing up to 2,000 amps, DC current sensing up to 300 amps
- Solid- or split-core housings for easy installation in new or retrofit applications
- DIN-rail mountable housings and DIN-rail mounting accessory
- Visual LED indicators for easy setup and status
- Self-powered models available
- Field adjustable current sensing ranges allow for increased flexibility and reduced stock
- Normally-closed or normally-open output configurations
- Discrete or analog outputs (4 – 20 mA, 0 – 5 V, 0 – 10 V)
- Five-year warranty, UL and CE approvals

Industrial Segments for CurrentWatch

- Agriculture
- Biotech and biofuels
- Industrial car wash
- Chemical treatment
- Extrusion processes
- Food and beverage
- Bottling and canning
- Generators
- Furnaces and kilns
- Lumber and logging
- Machine tool
- Manufacturing
- Material handling
- Material reduction
- Metalforming
- Mining
- Oil and gas
- Pharmaceutical
- Petrochemical
- Plastic and rubber molding
- Pumps and compressors
- Refrigeration
- Semiconductor processing
- Textile
- Water and wastewater

EXAMPLE APPLICATIONS



CURRENTWATCH GENERAL FEATURES AND CAPABILITIES

Description	Power Supply			Outputs		Housing		Current Range	Response Time	Approvals	
	Self Powered	Loop Powered	Auxiliary Powered	Discrete	Analog	Solid-Core	Split-Core				
Current Switches											
ECS Series	AC Current Switch	•	—	—	NO / NC	—	•	•	Fixed or Adjustable Set Point, 1 – 150 A	120 msec	UL and CE
ECSJ Series	AC Current Switch with Range Select	•	—	—	NO / NC	—	•	•	Adjustable Set Point, 1.75 – 200 A	40 – 120 msec	UL and CE
ECS7 Series	Self-Calibrating AC Current Switch	•	—	—	NO / NC	—	•	•	Self-Calibrating Set Point, 1.5 – 150 A	200 msec	UL and CE
ECSTD Series	AC Current Switch with Time Delay	•	—	—	NO / NC	—	•	•	Adjustable Set Point, 1.5 – 200 A	Adjustable, 0.2 – 15 sec	UL and CE
Current Sensors											
EAC Series	AC Current Sensor	•	•	•	—	4 – 20 mA, 0 – 5 V, 0 – 10 V	•	•	0 – 200 A	100 – 300 msec	UL and CE
EACR Series	AC Current Sensor, True RMS	—	•	—	—	4 – 20 mA, 0 – 5 V, 0 – 10 V	•	•	0 – 200 A True RMS	600 msec	UL and CE
EDC Series	DC Current Sensor	—	—	•	—	4 – 20 mA, 0 – 5 V, 0 – 10 V	•	•	0 – 300 A	20 – 100 msec	UL and CE
EPRM Series	AC Current Sensor with True RMS and DIN-Rail Mount	—	•	•	—	4 – 20 mA, 0 – 5 V, 0 – 10 V	—	•	0 – 400 A	< 500 msec < 1,000 msec	UL and CE, Pending
Ground Fault Sensors											
EGF Series	Ground Fault Sensor	—	—	•	NO / NC / Dual Contacts	—	•	—	Fixed or Adjustable 5/10/30 mA Trip	15 – 200 msec	UL Recognized CE

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Load Monitoring with CurrentWatch™

Application Note

New Information
May 2007

Introduction

Equipment protection and safety concerns are often addressed by interlocking two or more drive motors. The objective is to start the second motor only when the first motor is running and driving its load.

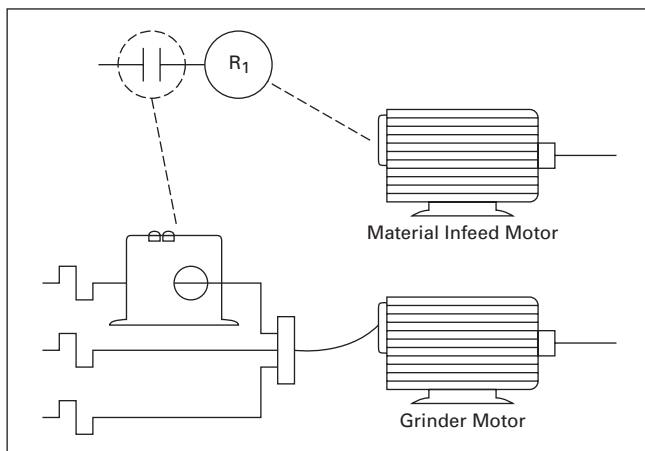


Figure 1. Application Example of a Two-Drive System

Many of these applications use sensing technologies that rely on motion or speed detection. These sensing methods may be compromised by misalignment, mechanical shock or mis-wiring during installation. Auxiliary contacts are not a reliable way to interconnect critical loads, and they are easily bypassed and susceptible to sticking or binding mechanisms. Overloading will most often cause the auxiliary contact to fail closed.

Advantages of Current Sensors

By installing a CurrentWatch™ switch such as the ECS Series on each motor, the operator will know when the load is actually running. And because the switch mounts right in the control panel or motor starter enclosure, installation does not require long field wiring runs or complex programming or mounting hardware.

Application Examples

Some examples of current sensor applications include:

- At a grain mill, an exhaust fan must be turned on before the silo is filled with flour. Flour dust — if allowed to build up — can be very dangerous and measures need to be taken to reduce risk. The ECS Series current switch, used on the fan power leads, can ensure the exhaust fan is running and moving air before the in-feed conveyor is allowed to operate.
- A high volume cabinetry shop uses the ECS7 Series current switch to ensure the sawdust exhaust system is operating as soon as any of the saws, planer or other woodworking machines are turned on.
- An automobile manufacturer uses ECSTD Series current sensors to monitor drive motors that move pallets of parts down a track and into a tempering oven. If a stray part jams the track, the current switch monitors the current in the drive motors. When the current increases, the sensor signals an alarm and the drive motors are shut down before equipment or parts are damaged.

The applications for current sensors and switches are nearly limitless, as they can be used to monitor any piece of electrified equipment.

For application assistance or for help with technical issues regarding current sensors or any other sensor in Eaton's portfolio, contact our Sensor Application Engineers (800) 426-9184 option 2.



Monitoring Low Current with CurrentWatch™

Application Note

New Information
May 2007

Introduction

CurrentWatch™ current switches and sensors are designed to fulfill the sensing requirements of as many applications as possible, while keeping the number of stocked sensors to a minimum. This is achieved by offering products with field-selectable current sensing ranges, and smart technology such as the self-calibrating current ranges of the ECSJ Series.

Low Current Applications

Occasionally, an application requires that a sensor monitor a circuit drawing current lower than the range of the switch or sensor. For example, if the load draws 500 mA, there will not be enough sensed current to operate the ECSJ400SC, which requires a minimum current sensing range of one amp (1,000 mA). However, by looping the current conductor (monitored wire) through the sensor aperture more than once (twice, as in this example), the sensor will “see” current over the minimum setpoint and will operate correctly.

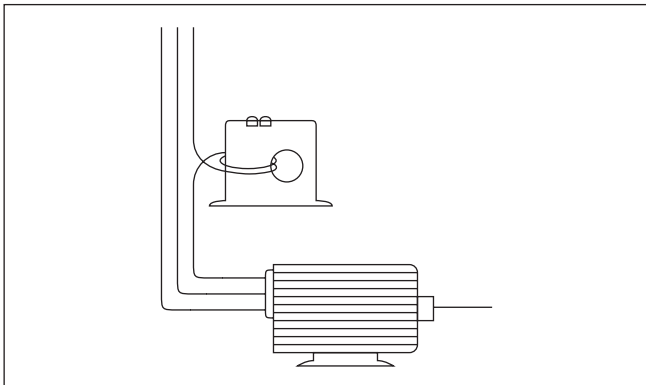


Figure 1. Conductor Wire Looped Two Times Through Current Sensor Aperture

Another way this “wrapping” approach can be useful: when monitored current rises above the range maximum, but also falls below that level. As an example, a 1.5 hp, 208V AC fan runs at 5.5 amps under normal conditions, but the full load amp rating is 6.6 amps, and needs to de-energize the coil of a relay connected to an alarm system. The ECSJ401SC will work properly for this application, but if the installer passes the conductor wire through the sensor twice or more, the current will remain within the range of 6 to 40 amps, the midrange for this particular current switch model. The switch will be sensing 11 amps at normal operation with two passes of the conductor (5.5 x 2) or 16.5 amps with three passes through the switch.

In another case, a 50 hp, 460V AC motor draws 65 amps at full load. The EAC2420SP current sensor has a low range of 0 to 100 amps, so the resolution will be nearly half at full load. If the conductor passes through the sensor twice, the sensor will see 130 amps at full load, which will provide higher resolution when the sensor is set to the 0 to 150 amp midrange.

Power Supply Options for CurrentWatch™

Application Note

New Information
May 2007

Introduction

CurrentWatch sensors and switch models are available in three power supply options, termed **self-powered**, **loop-powered** and **auxiliary-powered**. Understanding how to wire and install each type will help you choose the best product for your application.

Self-Powered Models

Self-powered refers to the sensor or switch generating its own power needs — no external power is required. Instead of requiring an input voltage, these sensors derive power from the monitored conductor wire running through the sensor aperture. This results in an easier installation, as the installer does not have to find a power source and run additional wiring. Only the output is wired to a control or alarming device.

Self-powered models are available in the following families: ECS, ECSJ, ECS7, ECSTD and EAC Series.

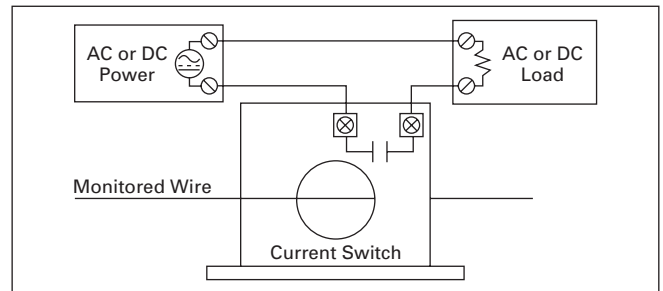


Figure 1. Wiring Diagram for Self-Powered Sensor

Loop-Powered Models

Loop-powered, or two-wire connection, indicates the sensor derives its power from the loop. Analog outputs are commonly found in loop-powered sensors. The most common supply voltage is +24V DC. A key benefit of loop power is that the voltage drop in the wiring does not affect the accuracy of the signal.

Loop-powered models are available in the following families: EAC, EACR and EPRM Series.

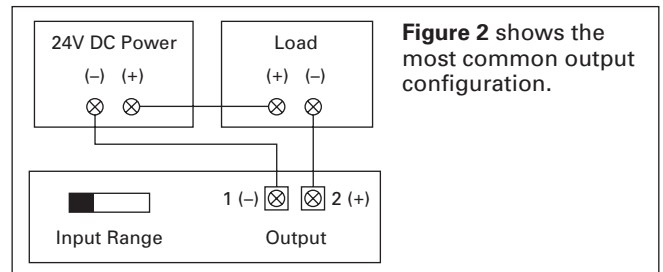


Figure 2 shows the most common output configuration.

Figure 2. Wiring Diagram for Loop-Powered Sensor

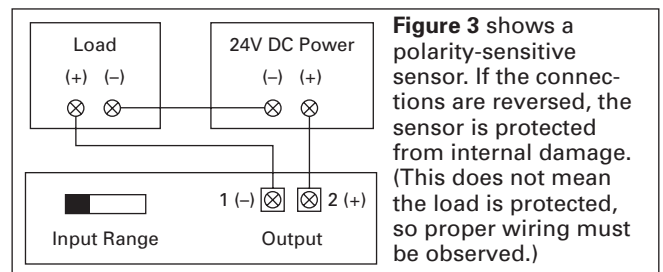


Figure 3 shows a polarity-sensitive sensor. If the connections are reversed, the sensor is protected from internal damage. (This does not mean the load is protected, so proper wiring must be observed.)

Figure 3. Alternate Wiring Diagram for Loop-Powered Sensor

Auxiliary-Powered Models

Auxiliary-powered, or four-wire connection, indicates the sensor requires an external power supply connected to the sensor to allow the internal electronics to function. Auxiliary-powered units can be connected to 120V AC or 24V AC/DC, depending on the model type. Polarity and load connections require proper connections to ensure correct functionality.

Auxiliary-powered models are available in the following families: EAC, EDC, EPRM and EGF Series.

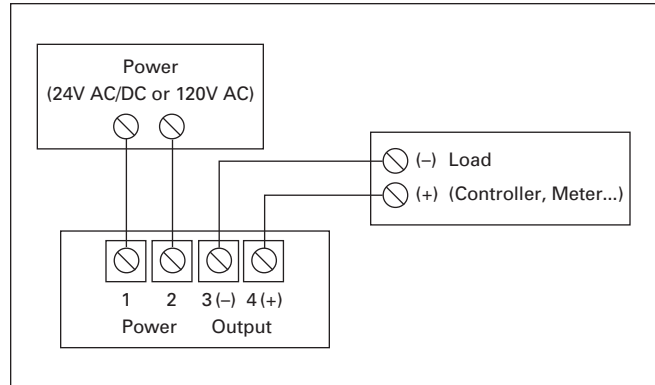


Figure 4. Wiring Diagram for Auxiliary-Powered Sensor

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