

# MICRO-AIDE



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CURRENT SENSORS

LIGHT OUT DETECTORS

BATTERY MONITORS

VOLTAGE MONITORS

POWER ISOLATED MODEMS

CUSTOM ENGINEERING



## HCS-4 HIGH CURRENT SENSOR USER MANUAL

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# HCS-4 HIGH CURRENT SENSOR USER MANUAL

*Designed to detect excessive current draws by track switching machines, the HCS-4 can be used to provide an early warning indication of possible motor, lubricant, wiring and gearbox problems.*

## Description

This document is intended to provide a detailed description of the use and operation of the MICRO-AIDE HCS-4 High Current Sensor.

The HCS-4 is designed to provide its user with a simple and reliable method of sensing excessive current flow. It can be of great use in detecting unusual current levels in motor and lamp circuits that are commonly found in track switching and rail signal applications.

As many as four current carrying conductors can be monitored by an HCS-4. The user can adjust each of the four sensors to any Limit Value in the range of 1 to 20A. Both AC and DC currents can be monitored. Twenty-turn potentiometers allow the user to set very precise Limit Values.

If the current being sensed increases above the desired Limit Value, an internal relay will operate. Both normally open and normally closed contacts are available at the front panel of the unit. The dry contacts can be used to signal a fault condition to an Event Recorder or Crossing Alarm Reporter such as a MICRO-AIDE CWR-24E or CAR-24. Each of the four relays can be set to operate in either latching or non-latching mode. Additionally, four LEDs are used to indicate an existing or prior excessive current condition. A pushbutton switch allows the user to reset the LEDs and relays.

Each sensor incorporates a filter that allows the HCS-4 to ignore

high current transient signals. Current spikes of greater than 100A are easily rejected. The digitally implemented filter features a time constant 2.66 seconds. Careful research has demonstrated that this time constant works effectively when used to monitor track switching machines.

The HCS-4 can be powered by any DC source with a voltage in the range from 8 to 40Vdc. It utilizes state-of-the-art Hall Effect devices to sense current flow. Use of the HCS-4 does not require any modifications to the user's circuits. Its installation and operation is completely non-intrusive.

Figure 1 on page 4 provides a three-sided view of the unit. Figure 2 on page 5 illustrates how the unit can be set up. The last page of this document lists detailed specifications.

## Installation

The HCS-4 can be mounted on a shelf or back board. It can be oriented in either a horizontal or vertical plane. Four mounting holes at the base of the unit are used to secure the unit.

Five detachable connectors are used to simplify the installation procedure. Wire gauges in the range of 12 to 22AWG can be used. One end of each conductor should be stripped bare a length of .25". Each conductor is secured by tightening the set screw associated with each connector terminal. Power should not be applied to the unit prior to completing the installation work.

### New HCS-4

*MICRO-AIDE designed the first HCS-4 in 1995. In June of 2011 the HCS-4 was redesigned. The new design includes a smaller mounting footprint and a simplified setup procedure. The electronic design, which was entirely analog in nature, is now digital. This provides for increased accuracy and reliability.*

*The functional operation of the new design has not changed. This User Manual describes the new HCS-4.*

The unit's silkscreening provides a clear depiction of the connections to be made.

Four of the connectors are used to make connections to the output relays. Normally open, normally closed and two common leads are available per sensor. The fifth connector is used to connect power to the HCS-4. Dual positive and negative terminals are provided.

The two terminals of the fifth connector labeled "Test" can be used to test the unit by supplying a current to the two terminals. The same current will be sensed by each circuit. Its magnitude will be five times the actual current supplied. Five turns of wire, internal to the HCS-4, are wound around each of four toroids that are used in conjunction with the Hall Effect devices. Either positive or negative current can be supplied.

Each current carrying conductor to be monitored must be inserted through one of the holes in the unit. The diameter of the hole is such that a conductor terminated with a typical .5" ring lug will slip through the hole. The HCS-4 is designed to be insensitive to current polarity. Consequently, the conductor can be inserted front-to-back or back-to-front.

## Setup and Operation

Operation of the HCS-4 is fully automatic once the Limit Values and mode of operation have been selected.

Begin by verifying that power has been applied to the unit. The green LED labeled "Power" will flash once per second. This indicates that the unit is operational. Locate one of the test points labeled "TP" and the test point labeled "Ref". Connect a Digital Volt Meter (DVM) across the two test points. The positive lead of the DVM should be connected to the "TP" test point. Adjust the appropriate potentiometer labeled "Adj" until the DVM reading in volts equals  $1/10^{\text{th}}$  of the desired current Limit Value in Amps. As an example, if 9.5 A (AC or DC) is desired a reading of .95 Vdc is required. Adjust the remaining sensors as required.

*The factory default settings for the HCS-4 are 10.0A with latching relay operation.*

In the event of an excessive current condition the normally open contacts of the output relays will remain closed and the normally closed contacts will remain open if latching mode is selected. Non-latching mode allows the relays to operate only for the duration of the excessive current condition. In either mode the

LEDs will remain illuminated until a reset is performed. This allows the user to identify the offending circuit even when non-latching mode is selected.

If no alarms are pending (i.e., no excessive current conditions exist) the output relays will assume an un-energized state. This is the same condition that the unit assumes when power is lost.

*The adjusted DVM voltage reading should always be  $1/10^{\text{th}}$  of the desired current Limit Value in Amps.*

## Maintenance and Trouble-Shooting

The HCS-4 is designed to be completely maintenance free. It contains no consumable materials or serviceable components. It is equipped with an internal 1 A fuse for protection. If the fuse should blow or the unit fails to power-up for some other reason (as indicated by the green LED not flashing) the unit should be returned to MICRO-AIDE for repair.

As an aid to the user the HCS-4 can be easily tested. To test the unit supply a current to the terminals labeled "Test". The current should be slightly greater than  $1/5^{\text{th}}$  of the highest Limit Value. Refer to the installation section for additional details concerning testing of the HCS-4. When testing the unit the normal current conductors should not be carrying any current. Otherwise the sensor will react to the algebraic sum of both currents.

All rail signal products manufactured by MICRO-AIDE are protected by a five-year warranty. Contact information is listed below.

### MICRO-AIDE CORPORATION

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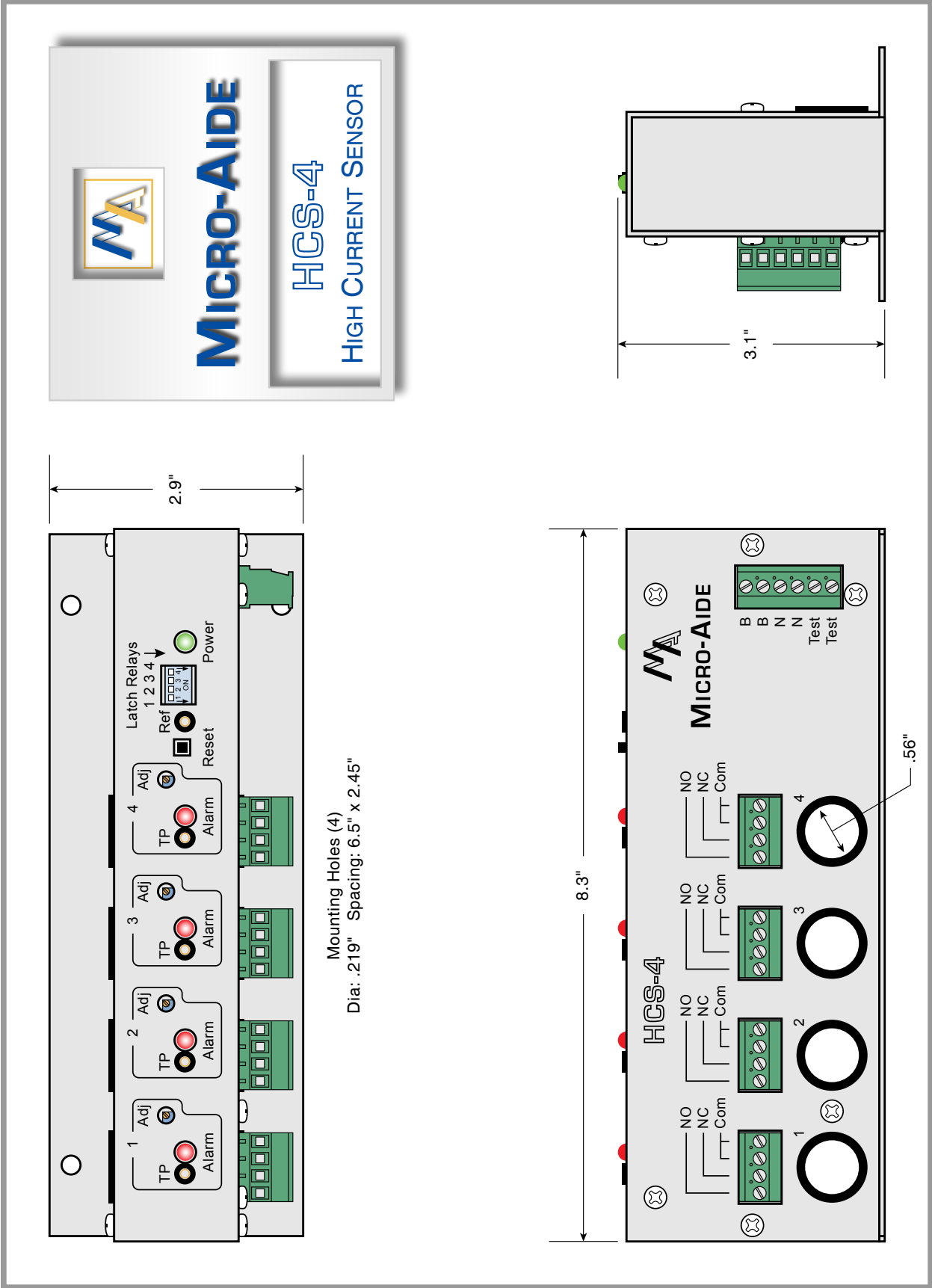


Figure 1: Three-Sided Dimensional View

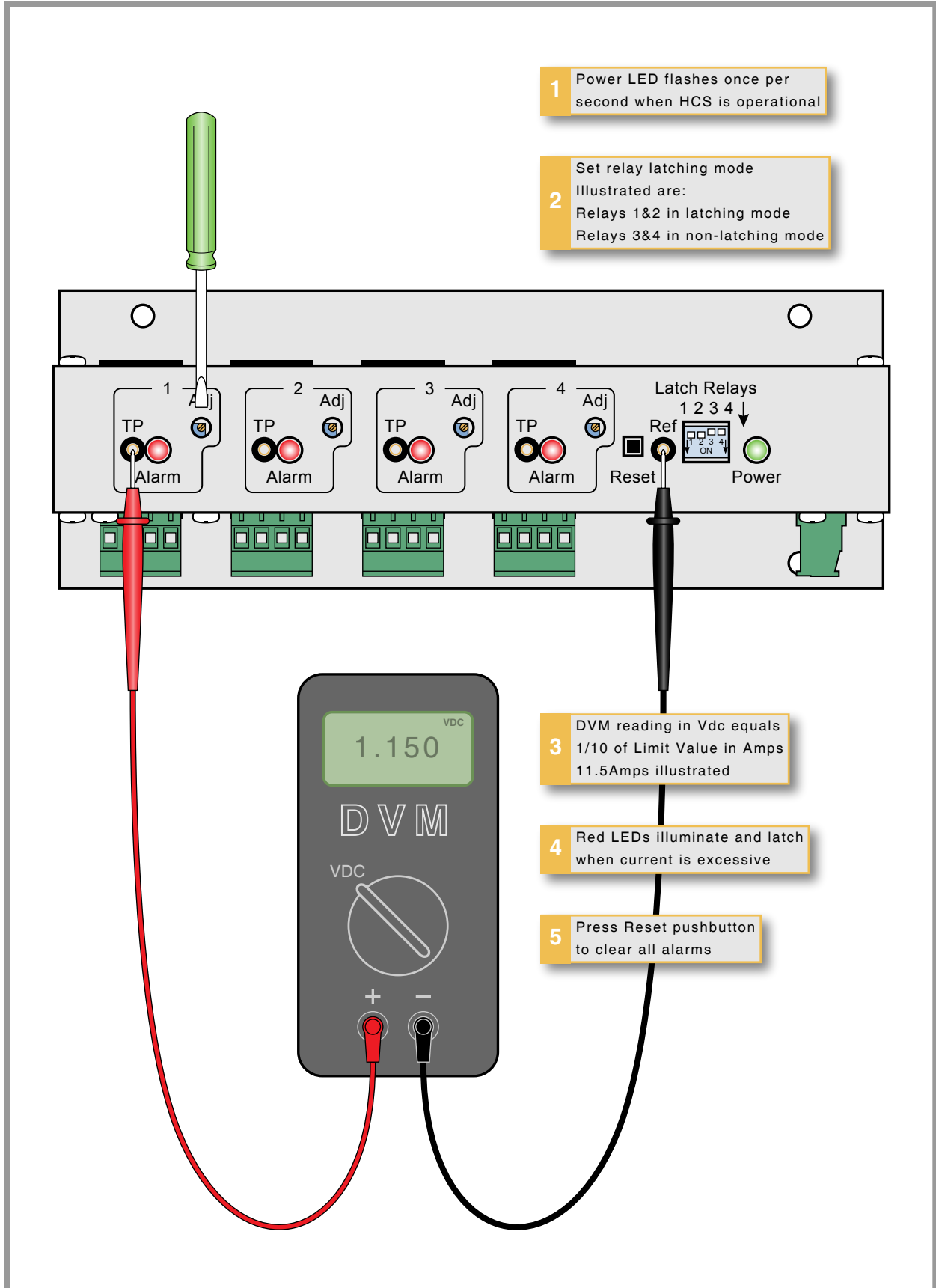


Figure 2: Setup and Operation

# HCS-4

## HIGH CURRENT SENSOR

### SPECIFICATIONS

#### Physical

##### Size

**Length:** 8.3"

**Width:** 2.9"

**Height:** 3.1"

**Weight:** 24oz.

#### Environmental

##### Storage

**Temperature:** -50°C to +85°C

**Humidity:** 0% to 95%, non-condensing

##### Operating

**Temperature:** -40°C to +72°C

**Humidity:** 0% to 95%, non-condensing

#### Mounting

Shelf or desktop

#### Construction

##### Chassis

Fully enclosed, anodized aluminum

Externally accessible connectors and LEDs

No inside access required

##### Electrical

Single PCB board with conformal coating, mounted inside chassis

#### Power

##### Voltage

**Input:** 8 to 40 Vdc

##### Consumption

Maximum 120mA (at 12 Vdc)

#### Protection

##### Isolation

Minimum 4000Vdc to ground, infinite duration, to any terminal input

##### Input Impedance

Infinite to current conductor (fully isolated)

#### Current Sensors (4)

**Range:** 1.0 and 20.0 Adc or Aac

**Hysteresis:** 3% of Limit Value, applies to diminishing current only

#### Transient Filtering

Each sensor includes hysteresis and a 2.66 second filter that will ignore momentary current fluctuations

#### Accuracy

The greater of  $\pm 2.0\%$  or  $\pm 2A$  as compared to 10 times Limit Value

#### Output Relays (4)

##### Operation

Operate when current exceeds Limit Value

##### Type

Non-latching mechanical, with dual form C contacts, wired in parallel

##### Contacts

**Rated Load:** 2 A at 24 Vdc, 1 A at 125 Vac

**Minimum Load:** 2 mA at 5 Vdc

**Maximum Operating Voltage:** 60 Vdc, 125 Vac

**Maximum Switching Capacity:** 125 VA, 60 W

**Service Life:** 5 million mechanical (minimum), 1 million electrical (typical)

#### Connectors

##### Power

Detachable, screw-down with 6 terminals, 12 to 22 AWG, requires .25" stripped end

**Terminals 1 & 2:** B, battery positive

**Terminals 3 & 4:** N, battery negative

**Terminals 5 & 6:** test inputs

##### Output Relays (4)

Detachable, screw-down with 4 terminals, 12 to 22 AWG, requires .25" stripped end

**Terminal 1:** normally open relay contact

**Terminal 2:** normally closed relay contact

**Terminals 3 & 4:** relay common

#### Controls

**Potentiometers (4):** 20-turn, used to adjust current Limit Values

**Test Points (5):** female, used to connect DVM when setting current Limit Values

**Latching Mode Switches (4):** selects latching or non-latching operation of relay outputs

**Reset Switch:** Pushbutton, resets LEDs and relays

#### LED Indicators

##### High Current (4)

**Red:** indicates current has exceeded Limit Value

##### Power

**Green:** flashes once per second to indicate unit is operational

*MICRO-AIDE reserves the right to make changes, at its sole discretion, to any specification listed herein.*