

# SM-xA-5A Safety Mat Monitoring Modules



## Datasheet

SM-GA-5A (12-24 V dc / 115 V ac operation) and SM-HA-5A (12-24 V dc / 230 V ac operation)



- Monitors one 4-wire safety mat, or multiple mats in series
- Selectable Automatic (Auto) Reset or Monitored Manual Reset
- Input monitoring circuit incorporates redundant microprocessors
- Plug-in terminal blocks
- Four normally open output switching channels for connection to control-reliable power interrupt circuits and one normally closed auxiliary output channel for status monitoring
- Two auxiliary solid-state outputs indicate state of internal relays K1 and K2, and state of system (ON = normal operation)
- 6 amp safety output contacts; 5 amp aux. output contacts
- DIN-rail-mountable 45 mm-wide housing
- External device monitoring (one-channel EDM)
- Design complies with UL 991, ISO 13856-1, ISO 13849-1 (EN 954-1) Category 4: Internal Module, or Category 3 with 4-wire Safety Mat connected



**WARNING: Not a Stand-Alone Safeguarding Device**

This Banner device is considered complementary equipment that is used to augment safeguarding that limits or eliminates an individual's exposure to a hazard without action by the individual or others. Failure to properly safeguard hazards according to a risk assessment, local regulations, and relevant standards may lead to serious injury or death.

## Models

Model	Supply Voltage	Outputs	Output Rating
SM-GA-5A	12 to 24 V dc or 115 V ac	4 Normally Open Safety	N.O. Safety Outputs: 6 A
SM-HA-5A	12 to 24 V dc or 230 V ac	1 Normally Closed Aux. 2 Solid-State Aux.	N. C. Aux. Outputs: 5 A SS Aux Outputs: 100 mA

## Important... Read This Before Proceeding

The user is responsible for satisfying all local, state, and national laws, rules, codes, and regulations relating to the use of this product and its application. Banner Engineering Corp. has made every effort to provide complete application, installation, operation, and maintenance instructions. Please direct any questions regarding the use or installation of this product to the factory applications department at the telephone numbers or address found at <http://www.bannerengineering.com>.

The user is responsible for making sure that all machine operators, maintenance personnel, electricians, and supervisors are thoroughly familiar with and understand all instructions regarding the installation, maintenance, and use of this product, and with the machinery it controls. The user and any personnel involved with the installation and use of this product must be thoroughly familiar with all applicable standards, some of which are listed within the specifications. Banner Engineering Corp. makes no claim regarding a specific recommendation of any organization, the accuracy or effectiveness of any information provided, or the appropriateness of the provided information for a specific application.



## Overview

Safety Mat Monitor Modules SM-GA-5A and SM-HA-5A (the "Safety Module") are used to verify the proper operation of 4-wire presence-sensing switching mats (sensors).

Multiple mats may be switched in series to one Safety Module. The Safety Module provides the redundant safety outputs required for creating a control-reliable safety circuit. The Safety Module has two functions:

- To monitor the conductive elements (plates) and the wiring of one or more safety mat(s) for failures and prevent the machine from restarting if any mat or the Module fails
- To provide a reset routine after the operator steps off the safety mat. This prevents the controlled machinery from restarting automatically after the mat is cleared. This necessary reset/restart function is required by ANSI B11 and ANSI NFPA 79 machine safety standards. If the Module is used in auto-reset mode, the reset/restart function must be provided by the machine control system



**NOTE:** The Safety Module is not designed to monitor 2-wire mats, bumpers, or edges (with or without sensing resistors).

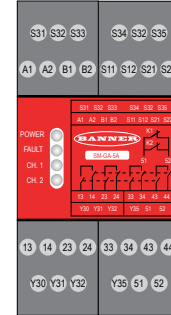


Figure 1. Indicator and Terminal Locations

In operation, the Safety Module monitors the conductive elements (plates) of the pressure-sensitive mat for shorting of those elements (that is, when the mat is stepped on) and certain faults, such as shorts to other sources of power or ground (0 V), or open connecting wires. With a +24 V dc supply, Channel 1 (S11-S12) supplies > 20 V dc that is pulsed low and Channel 2 (S21-S22) supplies < 2 V that is pulsed high; when these two channels are shorted together, the safety output contacts open (13-14, 23-24, 33-34, and 43-44).

If a fault is detected, the Module will lock out, open its safety outputs, and indicate the problem on its LED display, which can be diagnosed by using the troubleshooting table in this document. After repairing the fault, step on the mat and off it again to clear the lockout condition (or cycle power). If the fault has been cleared and no other faults exist, the Fault LED turns OFF and the Module can be reset (if configured for Auto Reset, the safety outputs will turn ON immediately).

The output relays energize automatically if the Module is wired for Auto Reset mode, all sensors are clear, all faults are removed or corrected, and power is applied. The Module requires a manual reset if it is wired for Manual Reset mode.

## Application of Pressure-Sensitive Mats and Floors

Pressure-sensitive mats and pressure-sensitive floors must meet the requirements of the category and performance level for which they are specified and marked. These requirements are defined in ISO 13849-1 (EN 954-1).

The Safety Module is designed to monitor 4-wire safety mats; it is not recommended to use two-wire devices (mats, sensing edges, etc., with two wires and a "sensing" resistor). While the Module internally meets or exceeds ISO 13849-1 (EN 954-1) Category 4 requirements, the overall safety circuit performance is determined by the mat(s) or other sensor(s) connected to the Module.



### WARNING: Application of Safety Mats

Safety Mat application requirements vary for the level of control reliability or category and performance level as described by ISO 13849-1 (EN 954-1) and ISO 13856. While Banner Engineering always recommends the highest level of safety in any application, the user is responsible to safely install, operate, and maintain each safety system per the manufacturer's recommendations and comply with all relevant laws and regulations.

Do not use safety mats as a tripping device to initiate machine motion (such as in a presence-sensing device initiation application), due to the possibility of unexpected start or re-start of the machine cycle resulting from failure(s) within the mat and the interconnect cabling.

Do not use a safety mat to enable or provide the means to allow the machine control to start hazardous motion by simply standing on the safety mat (for example, at a control station). This type of application uses reverse/negative logic and certain failures (for example, loss of power to the Module) can result in a false enable signal.