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Overview

The Auto-Reset Safety Module AI (CE-SA-019-0001__2) is designed for situations where a collaborative robot needs to automatically reset from collaborative mode without requiring the operator to press a physical reset button. This module enables the machine to resume normal operation when the user exits the danger zone in the correct manner and orientation, resetting the collaborative safety function automatically. It interfaces with up to three safety devices and can connect to area scanners, light curtains, and other safety devices to perform safety functions. Every safety equipment deployment should be paired with a safety assessment to ensure risk reduction.

> **This document covers requirements for latest version of Vention's Auto-Reset Safety Module. For previous version, refer to link below:**
>
> ***Documentation for Previous Product Versions***

Features

- Compatible with the Robot Safety Module AI and every model of MachineMotion AI
- Configuration-free, plug-and-play
- Daisy-chainable
- Automatically resets the collaborative function of a robot upon operator exit
- Compatible with Datalogic 3-output area scanner (PR-DA-201-0489)
- Compatible with Datalogic SG4 & Keyence GL-R light curtains
- RGB LED indicator for safety status (emergency stop, faults)
- Single-color LED indicators for power and communication status
- Publishes safety state to the MachineMotion AI controller
- Reports warning of imminent auto-reset when sequence is accepted

Included cables

- 1x Safety Extension cable (5m) - CE-CA-102-5001__2
- 2x Safety Device Jumper - CE-SA-125-0001
- 1x Safety Jumper - CE-SA-102-0001

Important Notes

Safety

Vention’s safety modules perform safety functions as a part of a whole installation or machine. A complete safety system normally includes sensors or input units, logic units and contactors or output units. The manufacturer of the installation or machine is responsible for ensuring proper functioning of the whole system. The total concept of the control system into which the safety module is integrated must be validated by the user. Vention cannot guarantee all specifications of an installation or a machine without being responsible for the risk assessment and the design of the safety system. Vention takes over no liability for recommendations which are given or implied in the following description.
The following items must be taken into consideration during the design, risk assessment & installation of the safety system :

- The Safety Modules shall be put into operation only after the safety functions have been tested during the commissioning.
- According to EN IEC 60204-1:2018 and EN ISO 10218-1:2011 it is not allowed to restart automatically after emergency stop. Therefore the control systems of the connected devices have to disable the automatic start after emergency stop.
- Opening the Safety Module or implementing unauthorized changes voids any warranty.

Functional error! Danger to life, risk of serious injuries or property damage

- The Auto-Reset Safety Module AI may only be used in VENTION safety ecosystem;
- The Auto-Reset Safety Module AI does not monitor the input redundant signals at the Device ports. If the connected devices do not have monitoring of its output signals, the performance level of the safety function can be reduced;
- No emergency stop button shall be connected to the Safety IN port;
- When using the auto-reset function in a full body entry application, we recommend to use Devices 1, 2 & 3. If the risk assessment doesn't show risks of using only two zones, only Device 1 and Device 2 can be used;
- When using the auto-reset function in a partial body entry application, it is possible to use only the Device 1 port and connect a jumper to Device 2 and Device 3.
- When using the auto-reset function the risk of having two personnes entering the safeguard space at the same time shall be considered in the risk assessment. For example, that one of the personne access a non-monitored dangerous area from the monitored area.
- The auto-reset module should only be used in a safety chain connected to the Reduced port of a Robot Safety Module AI and/or if the safety assessment permits it.
- The risk assessment shall demonstrate that when triggering the safety devices connected to the Device ports, the state of the machine and the safety distance are acceptable. Refer to ISO 13855 and ISO 13857 for additional considerations on safety distances;
- The Auto-Reset Safety Module AI is designed to operate in indoor environments without dust or high humidity. Dust and dampness may lead to malfunction. Do not install or operate the Muting Safety Module outdoors;

- The machine shall be designed in such a way that it is not possible to press the reset button from inside a safeguarded area without triggering one of the devices connected to the Device ports.

Technical specs

General Specifications

Item	Specification
Part Number	CE-SA-019-0001__2
Weight	0.8kg
Dimensions	19.0 x 15.0 x 9.0mm
Material	• Bottom enclosure: Aluminum • Top enclosure: Aluminum
Operating Temp	0 to 40°C
IP rating (IEC 60529)	IP54

Electrical Specifications

Item	Specification
Nominal input voltage	24 VDC (Class 2 or SELV power supply**
Input voltage range	19.2 ~ 26.4 VDC
Operating power consumption	5 W without safety devices
Short circuit protection	Internal electronic fuse, max 2.5A

** Note: In North America, the Safety Module shall be supplied by a certified class 2 power supply. In Europe, the Safety Module must be supplied by an SELV circuit. When powered by the MachineMotion AI those requirements are met.

Physical Interface

Figure 1: Physical Interface

LED Indicators

Name	LED Color	Indicates (when ON)
POWER	White	Power supplied to the module
COMM	White	Ethernet communication functional
FUSE	Red	Module internal fuse tripped
STATUS	Off	Module disconnected
STATUS	Green	System operational
STATUS	Orange	Error
STATUS	Red	Upstream fault, will require user reset to leave collaborative mode
STATUS	Blinking Red	Incorrect sequence, will require user reset to leave collaborative mode
STATUS	Blinking Blue	Sequence valid, will automatically reset collaborative mode upon exit

Functionality

The Auto-Reset Safety Module AI has 3 inputs ports (*Zone 1*, *Zone 2* and *Zone 3)* and can connect with up to 3 devices. These devices can be multiple light curtains or a single area scanner with 3 outputs. The inputs must be triggered sequentially and there must be an overlap where 2 contiguous zones are triggered at the same time. Any incorrect sequence will disable the automatic reset and require a user reset. The Auto-Reset Safety Module AI should always be connected to the *Reduced Speed* port of a Robot Safety Module AI. Only the collaborative mode function is affected by the automatic reset.

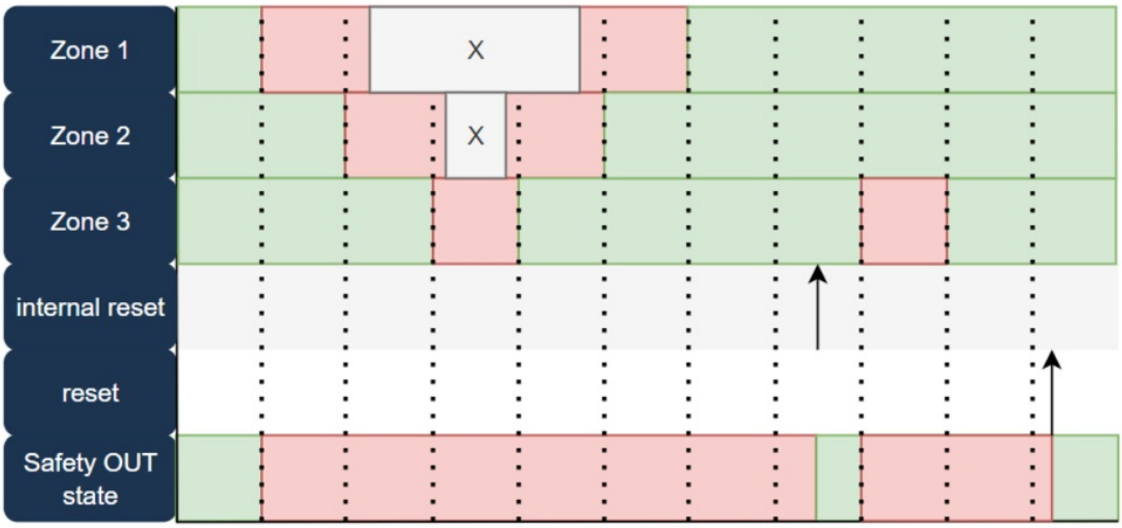

Figure 2: Auto-Reset Safety Module AI logic

Once the sequence is initiated, a fault is immediately triggered and latched on the *Safety Out* port. 5 seconds after the sequence is completed, the module will reset the fault on the *Safety Out* port. If the sequence is not respected, the module will latch the fault indefinitely, until a user presses on a reset button. The full sequence does not have to be completed for the automatic reset to occur. For example, an automatic reset would occur if a user only triggers *Zone 1* then exits the cell without ever triggering *Zone 2*. The Auto-Reset Module AI does not have agency over the physical *Reset* signal on pin 7 of the *Safety In* and *Safety Out* port and thus cannot reset an emergency stop.

Port definitions and pinouts

Figure 3: Auto-Reset Safety Module AI ports

Safety Out - M12, male, 12-pin, A-Keyed

The *Safety Out* port connects to the *Reduced Speed* port of the Robot Safety Module AI, or to another Safety Module when daisychaining.

Pin	Function
Pin 1	24 VDC input
Pin 2	0V input
Pin 3	OSSD output A
Pin 4	24 VDC input
Pin 5	OSSD output B
Pin 6	24 VDC input
Pin 7	Reset input
Pin 8	0V
Pin 9	Ethernet RX+
Pin 10	Ethernet RX-
Pin 11	Ethernet TX+
Pin 12	Ethernet TX-

Safety In - M12, female, 12-pin, A-Keyed

The *Safety In* port connects to the *Safety Out* port of another Safety Module when daisychaining. If the port is unused, plug the included yellow jumper (CE-SA-102-0001).

Pin	Function
Pin 1	24 VDC output
Pin 2	0V output
Pin 3	OSSD input A
Pin 4	24 VDC output
Pin 5	OSSD input B
Pin 6	24 VDC output
Pin 7	Reset output
Pin 8	0V output
Pin 9	Ethernet RX+
Pin 10	Ethernet RX-
Pin 11	Ethernet TX+
Pin 12	Ethernet TX-

Zone 1/2/3 - M12, female, 12-pin, A-Keyed

The *Zone 1/2/3* ports connect to safety devices. If any of these ports is unused, plug the included black jumper (CE-SA-125-0001).

Pin	Function
Pin 1	24 VDC (fused)
Pin 2	0V
Pin 3	NC
Pin 4	NC
Pin 5	OSSD input A
Pin 6	NC
Pin 7	NC
Pin 8	OSSD input B
Pin 9	NC
Pin 10	NC
Pin 11	NC
Pin 12	0V

Mounting

Install the module mounting bracket (CE-HW-005-1002) to the extrusion with the screws provided (HW-FN-003-0018). Install the module onto the mounting bracket as illustrated below.

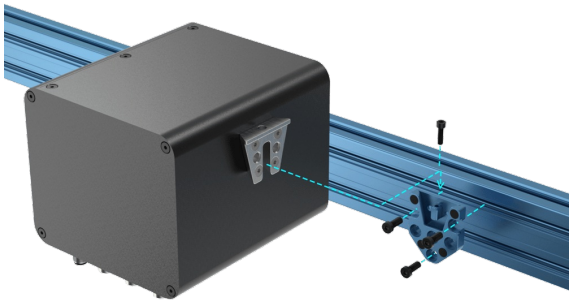

Figure 4: Module Mounting

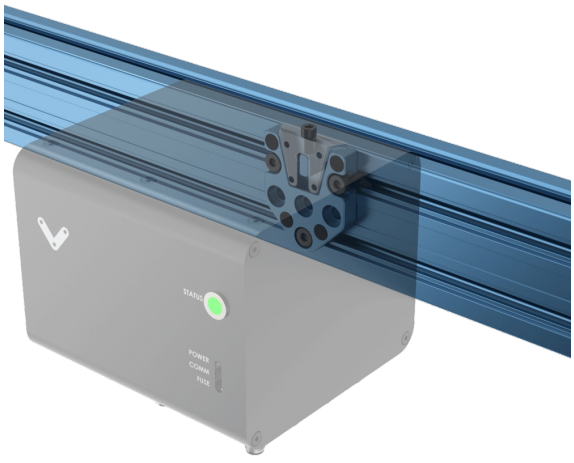

Figure 4: Module Mounting

Wiring Diagram

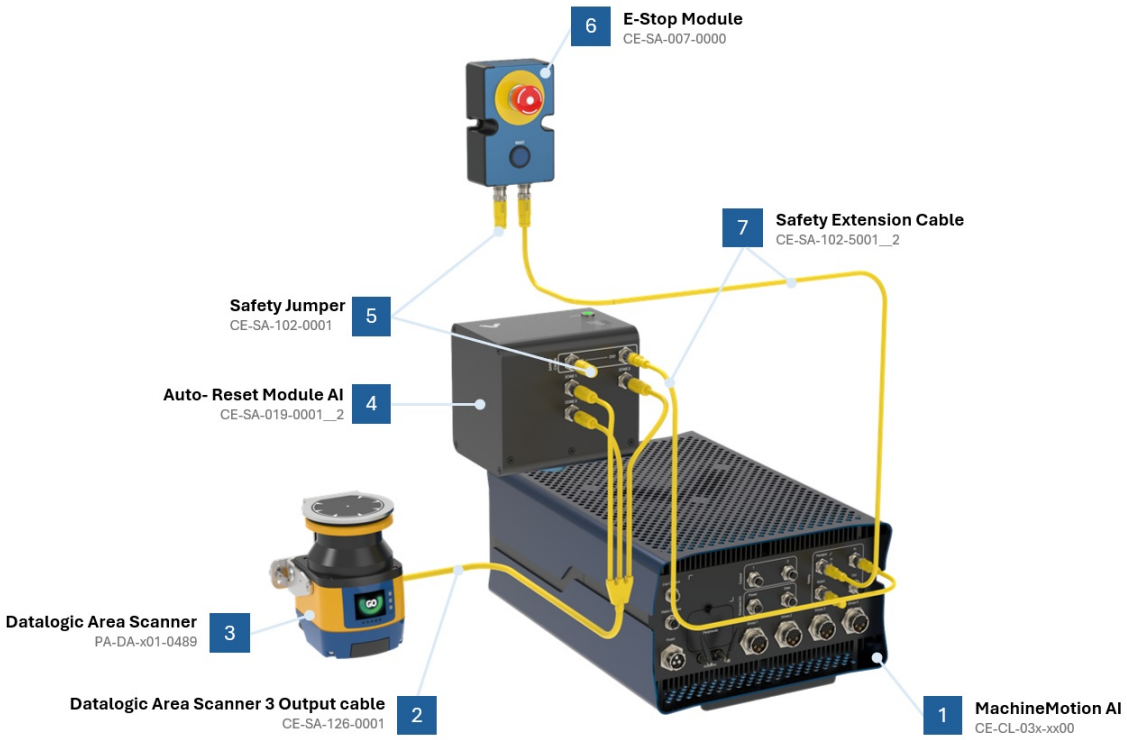

Figure 5: Auto-Reset Safety Module AI wiring diagram

*Note: Insert a jumper on any unused safety input for proper functionality. See table below to identify the appropriate jumper part number (included with the module).

Jumper Part Number	Description	Target module	Port restrictions
CE-SA-125-0001	M12, male, 12 pins, black jumper	Muting Safety Module AI (CE-SA-015-0001__2) Mode Switching Module AI (CE-SA-018-0001__2) Auto-Reset Module AI (CE-SA-019-0001__2)	Strictly reserved for *Device* ports
CE-JP-000-0002	M12, male, 4 pins, yellow jumper	Access Request Module AI (CE-SA-017-0001__2)	Strictly reserved for *End Effector* port
CE-SA-102-0001	M12, male, 12 pins, yellow jumper	All modules	Other unused safety input ports

Important information

- The electronic fuse contained in the Auto-Reset Module AI protects from internal faults and external faults, but only on the *Zone* ports. The 24V power output on the *Safety In* port is not protected by the electronic fuse. The electronic fuse has an auto-retry mechanism (it does not latch faults and does not require a power cycle to reset).

Safety Data

The Vention's Safety Modules realize the following safety functions :

- System emergency stop output at the Safety OUT connector from the Safety IN port (E-stop_SafetyIN-to-SafetyOUT);
- The Device port (light-curtain or area scanner) to the Safety OUT portSystem emergency stop output at the Safety OUT connector from a Safety Device port (E-stop_Device-to-SafetyOUT); and
- System reset propagation from the Safety IN port to the Safety OUT port (Reset_SafetyOUT).

For each of these functions, safety data can be found in the following table.

Safety Function	PL	Cat.	$MTTF_d$	DC_{avg}	PFH_d	Response time
E-stop_SafetyIN-to-SafetyOUT	e	3	224	99%	4.29E-08	20 ms
E-stop_Device-to-SafetyOUT	e	3	224	99%	4.29E-08	20 ms
Reset_SafetyOUT	c	1	>100	N/A	1.14E-06	Not applicable

The above information have been calculated based on the following operation conditions:

Data	Value	Unit
d_{op}	365	days/years
h_{op}	24	hours/days
t_{cycle}	8640	s/cycle

Documentation for Previous Product Versions

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