

# Robot Safety Module Datasheet

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## Overview

The Robot Safety Module is the interface between Vention's MachineMotion 2 controller & Vention's partner robots' safety interfaces. The Robot Safety Module manages the safety fault events that happen on the machine to safely stop both the MachineMotion 2 controller and the robot. With the Robot Safety Module connected in Vention's safety chain, a safety event from the robot will stop the MachineMotion 2 controller and a safety event from Vention's safety chain will also stop the robot. The Robot Safety Module also serves as an Ethernet switch between Vention's Pendant, MachineMotion 2 controller and the robot.

## Features

- Configuration Free, Plug & Play
- Compatible with MachineMotion 2
- Daisy-chainable
- Compatible with multiple Cobot brands
- On-board status LED
- Internal 3 port Ethernet switch

## Technical Specifications

## General Specifications

<b>Part Number</b>	CE-SA-009-0000
<b>Weight</b>	1 kg
<b>Dimensions</b>	66 x 127 x 172 mm
<b>Material</b>	<ul style="list-style-type: none"><li>• Bottom enclosure: ABS</li><li>• Top enclosure: Aluminum</li></ul>
<b>Operating Temperature</b>	0 to 40°C
<b>Certifications</b>	CE
<b>Included in the Box</b>	<ul style="list-style-type: none"><li>• 1x Robot Safety Module (CE-SA-009-0000)</li><li>• 1x Robot Safety Module "TO ROBOT" Cable (CE-SA-111-0001)</li><li>• 1x Robot Safety Module "FROM ROBOT" Cable (CE-SA-112-0001)</li><li>• 1x MachineMotion 2 Safety Extension Cable – 5m (CE-CA-102-5001)</li><li>• 1x MM2 Safety Jumper (CE-SA-102-0001)</li><li>• 2x M8 Drop-in Spring Loaded T-Nut (HW-FN-002-0001)</li><li>• 2x M8 x 18mm Screw (HW-FN-003-0018)</li></ul>

## Physical Interface

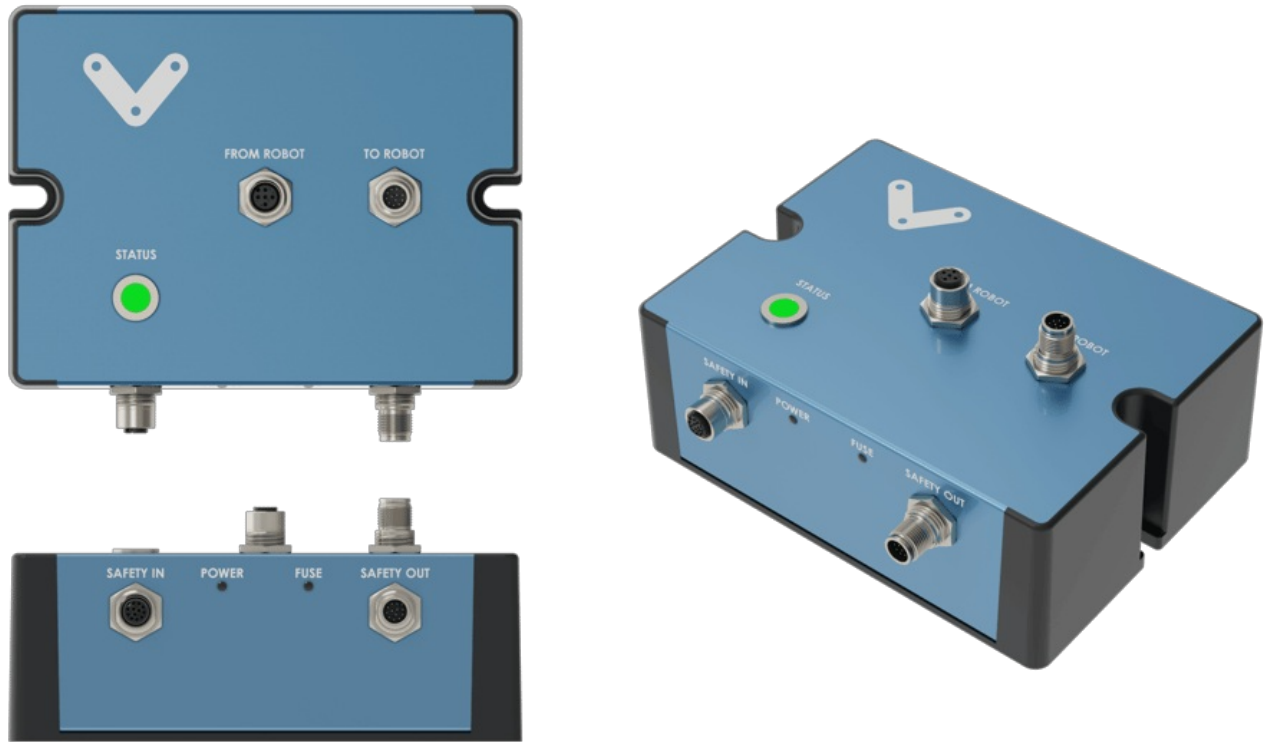


Figure 1: Robot Safety Module Physical Interface

## Electrical Specifications

Nominal Input Voltage	24 VDC
Input Voltage Range	19.2 - 26.4 VDC
Operating Power Consumption	4.8 W
FROM ROBOT Connector Input Type	Redundant 24V (4 contacts)
TO ROBOT Connector Output Type	<ul style="list-style-type: none"> <li>• Safety: Redundant Dry Contacts (4 contacts)</li> <li>• Reset: Dry Contacts (2 contacts)</li> <li>• Ethernet: Twisted pair Tx, Rx (4 pins in RJ45 connector)</li> </ul>
Short Circuit Protection	Internal E-FUSE IC
Maximum Current Allowed	2 A

Post-short Current	250 mA
Release Delay at 24V	< 40 ms
Reset Total Delay	7 seconds
Ethernet Switch	3 ports 10/100MB

## Pinout

### FROM ROBOT port

Connector: M12, female, 4-pin, A-Keyed

Pin	Description
Pin 1	Robot Safety Output 0V Contact 1
Pin 2	Robot Safety Output 24V Contact 1
Pin 3	Robot Safety Output 0V Contact 2
Pin 4	Robot Safety Output 24V Contact 2

### TO ROBOT port

Connector: M12, male, 12-pin, A-Keyed

Pin	Description
Pin 1	NC
Pin 2	NC
Pin 3	Robot Safety Input Channel 1 Contact 1
Pin 4	Robot Safety Input Channel 1 Contact 2
Pin 5	Robot Safety Input Channel 2 Contact 1
Pin 6	Robot Safety Input Channel 2 Contact 2
Pin 7	Robot Input Reset Contact 1
Pin 8	Robot Input Reset Contact
Pin 9	Robot Ethernet TX+
Pin 10	Robot Ethernet TX-
Pin 11	Robot Ethernet RX+

Pin	Description
Pin 12	Robot Ethernet RX-

## SAFETY IN port

Connector: M12, female, 12-pin, A-Keyed

Pin	Description
Pin 1	24V
Pin 2	0V
Pin 3	MachineMotion Safety Channel 1 Contact 1
Pin 4	MachineMotion Safety Channel 1 Contact 2
Pin 5	MachineMotion Safety Channel 2 Contact 1
Pin 6	MachineMotion Safety Channel 2 Contact 2
Pin 7	Input Reset Contact 1
Pin 8	Input Reset Contact 2
Pin 9	Pendant Ethernet TX+
Pin 10	Pendant Ethernet TX-
Pin 11	Pendant Ethernet RX+
Pin 12	Pendant Ethernet RX-

## SAFETY OUT port

Connector: M12, male, 12-pin, A-Keyed

Pin	Description
Pin 1	24V
Pin 2	0V
Pin 3	MachineMotion Safety Channel 1 Contact 1
Pin 4	MachineMotion Safety Channel 1 Contact 2
Pin 5	MachineMotion Safety Channel 2 Contact 1
Pin 6	MachineMotion Safety Channel 2 Contact 1

Pin	Description
Pin 7	Output Reset Contact 1
Pin 8	Output Reset Contact 2
Pin 9	MachineMotion Ethernet TX+
Pin 10	MachineMotion Ethernet TX-
Pin 11	MachineMotion Ethernet RX+
Pin 12	MachineMotion Ethernet RX-

## Applications

The Robot Safety Module can link the safety interfaces of Cobots with MachineMotion 2. The following diagrams show the typical use-cases of the module:

### Use Case Examples

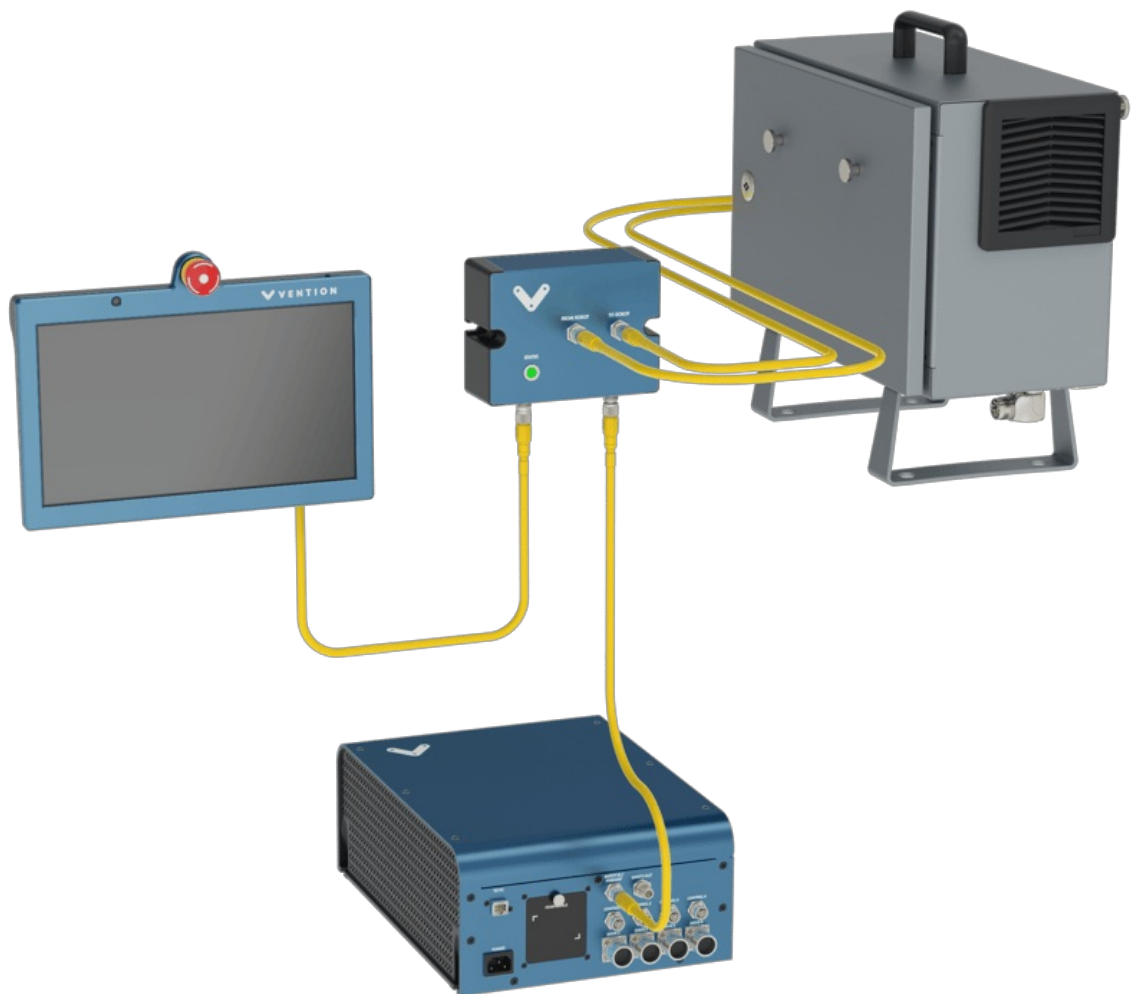
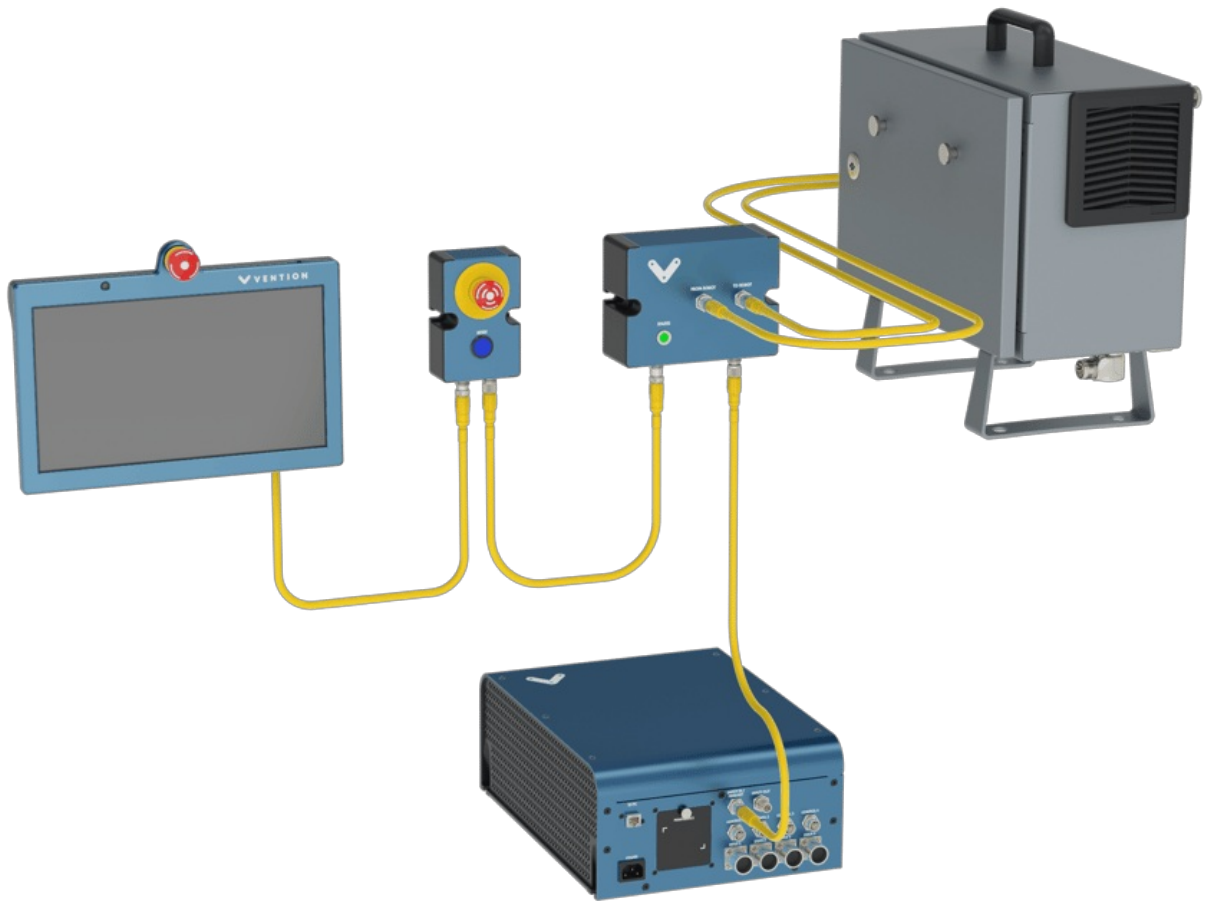


Figure 2: Robot Safety Module with Vention Pendant, Cobot Controller and MachineMotion 2



*Figure 3: Robot Safety Module with Vention Pendant, E-Stop and Reset Module 2, Cobot Controller and MachineMotion 2*

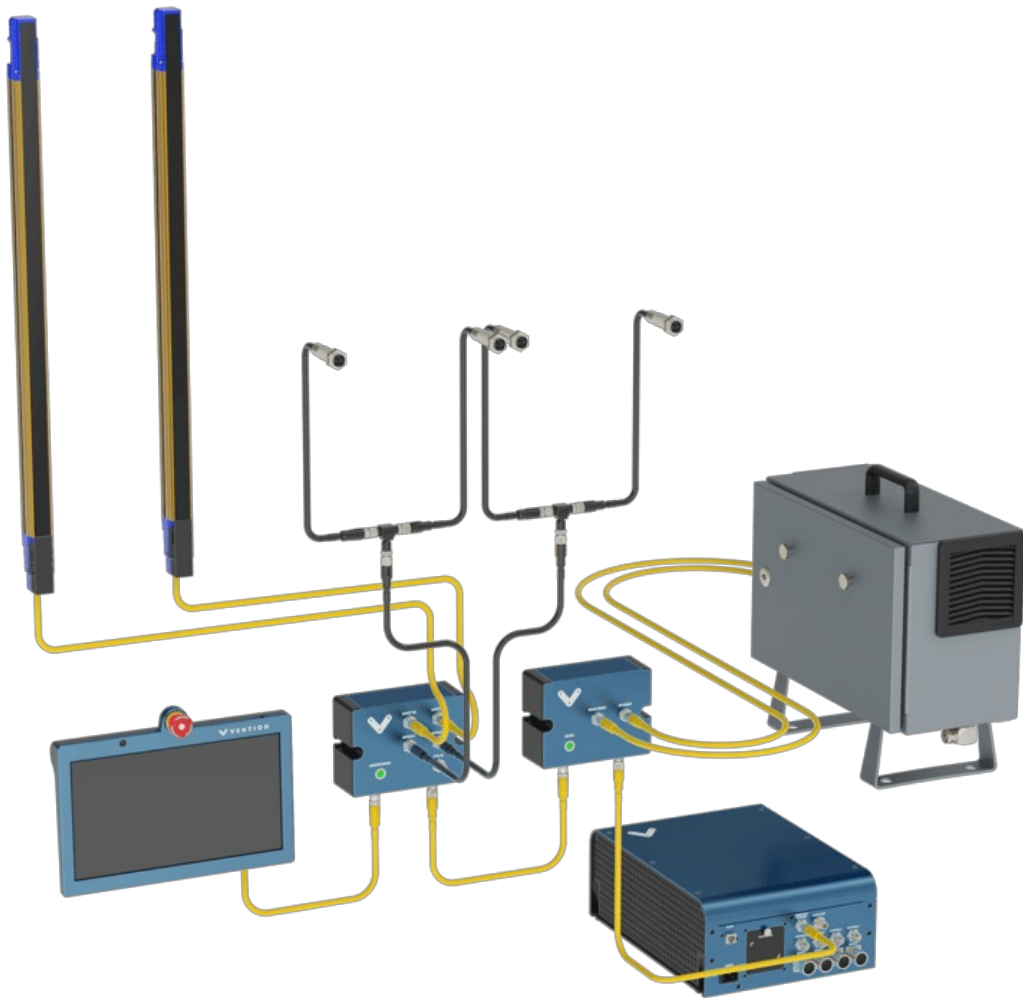


Figure 4: Robot Safety Module with Vention Pendant, Safety Module (interfaced with Light Curtains and Muting Sensors), Cobot Controller and MachineMotion 2

## Safety Data

The Robot Safety Module is used to propagate safety signals between :

- The SAFETY IN port to the TO ROBOT port
- The FROM ROBOT port the SAFETY OUT port; and
- The SAFETY IN port to the SAFETY OUT port.

For each of these functions performed by the Robot Safety Module, safety data can be found in the following table:

Function	PL	Cat.	MTTF <sub>d</sub>	DC <sub>avg</sub>
From Robot to Safety OUT	e	3	128.3	98.72%
From Safety IN to To Robot	e	3	65.8	98.90%
From Safety IN to Safety OUT	e	3	126.1	98.81%

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

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

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