Installation Instructions

SensaGuard Rectangular Flat Pack
(These instructions are only for the Series B Version.)


Introduction

Installation must be in accordance with the following instructions and specifications and implemented by suitable competent personnel. Adherence to the recommended maintenance instructions forms part of the warranty.

This unit is not to be used as a mechanical stop. Guard stops and guides must be fitted.

This device is intended to be part of the safety-related control system of a machine. Before installation, a risk assessment is performed to determine whether the specifications of this device are suitable for all foreseeable operational and environmental characteristics.
**ATTENTION:** Read this document and the documents that are listed in the Additional Resources section about installation, configuration, and operation of this equipment before you install. Users are required to familiarize themselves with installation and connection instructions and requirements of all applicable codes, laws, and standards.

In accordance with applicable codes of practice, suitably trained personnel are required to implement installation, adjustments, service initiation, use, assembly, disassembly, and maintenance.

If this equipment is used in a manner that the manufacturer does not specify, the protection that is provided by the equipment can be impaired.

### Additional Resources

<table>
<thead>
<tr>
<th>Resource</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1</td>
<td>Provides general guidelines for installing a Rockwell Automation® industrial system.</td>
</tr>
<tr>
<td>Product Certifications website at Rockwell Automation Technical Data</td>
<td>Provides declarations of conformity, certificates, and other certification details.</td>
</tr>
</tbody>
</table>

You can view or download publications (including translations) at Literature Library. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

**ATTENTION:** Do not attempt to install this device unless the installation instructions have been studied and understood. This document acts as a guide for a typical installation and is available in additional languages at Literature Library.

## Technical Specifications

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Safety Ratings</strong></td>
<td></td>
</tr>
<tr>
<td>Standards</td>
<td>IEC 60947-5-1, Cat. 4 Plc Per ISO 13849-1, Type 4 interlocking device according to ISO 14119 with either low (standard) or high (unique) coding. SS C31 per IEC 62061 and IEC 61508</td>
</tr>
<tr>
<td>Safety Classification</td>
<td></td>
</tr>
<tr>
<td>Functional Safety Data</td>
<td>PHPr = 1.32E-9 (Probability of dangerous failure per hour) T1 = 20 (Proof test interval)</td>
</tr>
<tr>
<td>Certifications</td>
<td>CE marked for all applicable directives, c-US (UL 508), and TUV, see Rockwell Automation Technical Data</td>
</tr>
<tr>
<td><strong>Operating Characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>Sensing distance, Assured ON</td>
<td>15 mm (0.59 in.)</td>
</tr>
<tr>
<td>Sensing distance, Assured OFF</td>
<td>25 mm (0.98 in.)</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>24V DC 10%/-15% Class 2 SELV or PELV power supply</td>
</tr>
<tr>
<td>Response time (DIR)</td>
<td>45 ms</td>
</tr>
<tr>
<td>Utilization Category according to Ul le</td>
<td>DC-12 and DC-13</td>
</tr>
<tr>
<td>Frequency of operating cycle</td>
<td>0.25 Hz</td>
</tr>
<tr>
<td>No-load supply current</td>
<td>&lt; 50 mA</td>
</tr>
<tr>
<td><strong>Outputs (OSSD)</strong></td>
<td></td>
</tr>
<tr>
<td>Safe state</td>
<td>De-energized (2 x PNP, 0V), AUX energized (1 x PNP, 24V)</td>
</tr>
<tr>
<td>Run state</td>
<td>Energized (2 x PNP, 24V), AUX de-energized (1 x PNP, 0V)</td>
</tr>
<tr>
<td>Load current</td>
<td>200 mA maximum</td>
</tr>
<tr>
<td>Voltage drop</td>
<td>&lt; 1.5V</td>
</tr>
<tr>
<td>Switches connected in series</td>
<td>Unlimited, see Timing Diagram on page 6</td>
</tr>
<tr>
<td><strong>Mechanical</strong></td>
<td></td>
</tr>
<tr>
<td>Sensor case material</td>
<td>Polycarbonate</td>
</tr>
<tr>
<td>Actuator case material</td>
<td>Polycarbonate</td>
</tr>
<tr>
<td><strong>Environmental</strong></td>
<td></td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-25...+70°C (-13...+158°F)</td>
</tr>
<tr>
<td>Operating humidity</td>
<td>5...95% relative</td>
</tr>
<tr>
<td>Washdown rating</td>
<td>IP66, IP67, IP69K</td>
</tr>
<tr>
<td>Shock and Vibration</td>
<td>IEC 60068-2-27 — 10 g, 11 ms IEC 60068-2-6 — 10...55 Hz</td>
</tr>
<tr>
<td>Pollution Degree</td>
<td>IEC 60947-1 — 3</td>
</tr>
<tr>
<td><strong>Electro-magnetic Compatibility (EMC)</strong></td>
<td></td>
</tr>
<tr>
<td>Electrostatic Discharge ESD</td>
<td>IEC 61000-4-2: air discharge Per IEC 61000-4-2 (functional): 8 kV Per IEC 61000-6-7 (fail-safe): 8 kV</td>
</tr>
<tr>
<td>Radiated EMF immunity</td>
<td>IEC 61000-4-3 Per IEC 61000-4-3 (functional): 10V/m Per IEC 61000-6-7 (fail-safe): 20V/m</td>
</tr>
<tr>
<td>Electrical Fast Transient/Burst Immunity</td>
<td>IEC 61000-4-4 Per IEC 61000-4-4 (functional): 2 kV/5 kHz Per IEC 61000-6-7 (fail-safe): 2 kV/5 kHz</td>
</tr>
<tr>
<td>Conducted Immunity</td>
<td>IEC 61000-4-6 Per IEC 61000-4-6 (functional): 10V Per IEC 61000-6-7 (fail-safe): 20V</td>
</tr>
<tr>
<td>Rated Impulse Withstand Voltage</td>
<td>IEC 60947-1: 1 kV</td>
</tr>
<tr>
<td>Protection</td>
<td>Short circuit, overload, reverse polarity, overvoltage, loss of ground</td>
</tr>
</tbody>
</table>
Dimensions

Figure 1 - Actuator [mm (in.)]

Figure 2 - Sensor Dimensions [mm (in.)]

Diagnostics

Table 1 - Unit Indicators

Mounting Information

Use non-removable screws, bolts, or nuts to mount the switch and actuator. Do not over torque the mounting hardware. Position the switch and actuator so they are aligned with each other.

Nut Torque Specification

Switch/Actuator: 2.20 N•m (19.5 lbs•in)

Figure 4 - Minimum Distance between Sensors

The actuator is supplied with the sensor.

See Unique Coded Diagnostic on page 5 for learning sequence errors.
The recommended cordset is 2 m (6.5 ft) - 889D-F5AC-2. For additional lengths, replace the 2 with 5 (5 m [16 ft]) or 10 (10 m [32.8 ft]) for standard cable lengths.

**IMPORTANT** If you do not require the auxiliary signal, a 4-pin cordset (889D-F4AC-2) can be used.

The recommended patchcord for use with ArmorBlock® Guard I/O™ module is 2 m (6.5 ft) - 889D-F4ACDM-2. Replace the 2 with 0M3 (0.3 m [0.98 ft]), 1 (1 m [3.28 ft]), 5 (5 m [16.4 ft]), or 10 (10 m [32.8 ft]) for standard cable lengths.

**IMPORTANT** Do not use a five-pin patchcord with the ArmorBlock® Guard I/O™ module.

**Commissioning (Unique Coded Units) — Power the Sensor**

Connect the sensor to 24V DC (see Typical Wiring Diagram on page 4 for help).

**IMPORTANT** The unique coded sensor is shipped from the factory unprogrammed and must be taught a unique coded actuator, see Teaching the Actuator (Ability to Learn an Additional Actuator).

A unique coded sensor can only learn a unique coded actuator and cannot learn a standard coded actuator.

A standard coded sensor does not work with a unique coded actuator.

The unique coded sensor, “Status/Diag” indicator, begins to blink green eight times then repeats, which indicates that the sensor has not yet learned an actuator.

The unique coded sensor can be locked so it cannot learn another actuator, see Teaching the Unique Actuator (One Time Learn Only; Unit Locked) on page 5.
Teaching the Actuator (Ability to Learn an Additional Actuator)

1. Power up the sensor and bring an actuator into the sensing range.
2. Leave the actuator in the sensing field for a minimum of two minutes.
3. Learn is complete.

IMPORTANT The sensor can learn a new actuator up to eight times. The Status/Diag indicator blinks the number of actuators left that a sensor can learn.

The sensor automatically starts the learning process as soon as an actuator is brought into the sensing range.

Learning Sequence

1. Target present Status/Diag indicator blinking green 2 Hz rate (15 s)
2. Verifying actuator Status/Diag indicator blinking green/red 1 Hz rate (15 s)
3. Program sensor Status/Diag indicator blinking green/red 2 Hz rate (15 s)
4. Program complete Status/Diag indicator blinking green 2 Hz rate (number of learns remaining) (15 s)
5. Ready state Status/Diag indicator solid green
6. Learn is complete

Teaching the Unique Actuator (One Time Learn Only; Unit Locked)

Initially Teaching in the Actuator

The sensor automatically starts the learning process as soon as an actuator is brought into the sensing range.

Learning Sequence

1. Target present Status/Diag indicator blinking green 2 Hz rate (15 s)
2. Verifying actuator Status/Diag indicator blinking green/red 1 Hz rate (15 s)
3. Program sensor Status/Diag indicator blinking green/red 2 Hz rate (15 s)
4. Program complete Status/Diag indicator blinking green 2 Hz rate (number of learns remaining) (15 s)
5. Ready state Status/Diag indicator solid green
6. Learn is complete
7. Ready state Status/Diag indicator solid green
8. Learn is complete Sensor is locked and cannot learn another actuator.

Learning a New Actuator (Unique Coded Actuator Only)

To learn a replacement actuator, bring the actuator to be taught into the sensing range of the safety switch.

The learn sequence is the same as the sequence for teaching the actuator (ability to learn an additional actuator).

A sensor cannot relearn a previously learned actuator or a standard SensaGuard actuator.

The sensor only recognizes the most recently learned actuator.

Unique Coded Diagnostic

Error codes for learning process. Power cycle to clear fault.

<table>
<thead>
<tr>
<th>Status/Diag Indicator—Flashes (2 Hz)</th>
<th>Error Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>OSSD inputs not valid</td>
</tr>
<tr>
<td>Red-Red-Red-Green</td>
<td>Cannot learn a standard SensaGuard actuator</td>
</tr>
<tr>
<td>Red-Red-Green</td>
<td>Actuator already learned</td>
</tr>
<tr>
<td>Red-Red-Green-Green</td>
<td>Bad RFID; Target that is moved out of range</td>
</tr>
<tr>
<td>Red-Red-Green-Green-Green</td>
<td>Exceeded learning eight actuators</td>
</tr>
<tr>
<td>Red-Red-Green-Green-Green-Green</td>
<td>Unit locked: Cannot learn another actuator</td>
</tr>
</tbody>
</table>

Figure 6 - OSSD Test Pulses

![Diagram of OSSD Test Pulses]

Individual Pulses

Test pulses appear on each OSSD output. These pulses are approximately every 45 ms. The times that are shown are approximate and depend on the processing of the safety-related status.
Response Time: Safety Outputs Turn OFF
Initial Conditions: All actuators are in sensing distance.

Actuator 1 is moved out of sensing range.
Sensor 1 OSSD outputs (gray and pink) turn OFF. Sensor 1 indicator turns solid red.
Sensor 2 OSSD outputs (gray and pink) turn OFF. Sensor 2 indicator flashes green.
Sensor 3 OSSD outputs (gray and pink) turn OFF. Sensor 3 indicator flashes green.

Response Time: Safety Outputs Turn ON
Initial Conditions: Actuator 1 is out of sensing range. Sensor 1 indicator is solid red. Actuators 2 and 3 are in sensing range. Sensor 2 and 3 indicators flash green.

Actuator 1 is moved into sensing range.
Sensor 2 OSSD inputs (red and yellow) transition to 24V DC from Sensor 1 OSSD outputs. Sensor 1 indicator turns solid green.
Sensor 3 OSSD inputs (red and yellow) transition to 24V DC from Sensor 2 OSSD outputs. Sensor 2 indicator turns solid green.
Sensor 3 OSSD outputs (gray and pink) are energized. Sensor 3 indicator turns solid green.
Troubleshooting

Figure 8 - Series Circuit

OSSDs are OFF. Actuator 5 is in the sensing range.
Switch 5 is functioning properly. OSSD inputs are 0V. OSSDs are de-energized to 0V. Green indicator flashes to indicate that OSSD inputs are not.

Actuator 4 is in the sensing range. Switch 4 is functioning properly. OSSD inputs are 0V. OSSDs are de-energized to 0V. Green indicator flashes to indicate that OSSD inputs are not.

Actuator 3 is in sensing range. Switch 3 has a fault. See Diagnostic table — red indicator flashes.

Actuator 2 is in sensing range. Switch 2 is functioning properly. OSSDs are energized to 24V. Green indicator is ON.

Actuator 1 is in sensing range. Switch 1 is functioning properly. OSSDs are energized to 24V. Green indicator is ON.
Application Wiring Examples

Figure 9 - Wiring to MSR127 Safety Relay

**IMPORTANT**

The light curtain must be last (the furthest from MSR127).
Figure 10 - Guardmaster® SI or DI Safety Relay Wiring
Figure 11 - Guardmaster SI or DI Safety Relay Wiring

IMPORTANT

The green wire is connected to the housing of the stainless steel SensaGuard only; it has no connection for plastic SensaGuard.
Figure 12 - CR30 Software Configurable Relay Wiring

+24V DC

Gate Open

CR30 440C-CR30-22BBB

A1 A2 12 13 14 15 16 17 18 19 20 21

100S Contactors or 700S or 700HPS Relays

Gate Open

24V Ground

Safety Monitoring

Logic Level A

Logic Level B

Safety Output

SNH 1

SNH 2

SNH 3

SNH 4

Input 2

Input 1

Input

Advanced Settings

Advanced Settings

Advanced Settings

Advanced Settings

IOF 1

Input

Reset Type

Reset Input

Immediate_OFF

Output
Figure 13 - 1734 POINT Guard I/O™ Wiring

- +24V DC
- 1734-IB8S 1734-AENT 1734-OB8S
- I0 I1 I2 I3 T0 T1 T2 T3
- O0 O1 O2 O3 O4 O5 O6 O7
- COM COM COM COM
- 889D-F8AB-5 889D-F5AC-5
- Gate Open Gate Open
- 24V Ground
- 1734-IB8S 1734-AENT
- EtherNet/IP
- K1 K2
- Brown Blue Gray
- Green Safety Reset
- Brown Gray Blue
- Blue Yellow White
- Red Pink Black
- Gate Open
- 24V Ground
- 100S Contactors or 700S or 700HPS Relays
- Set On > Off Input Delay Time to 0 ms to ignore the SensaGuard 0550 output test pulses
The screen shots below show the input and output configuration for the 1732ES.
Recommended Safety Control Interfaces

Recommended relays are GSR DI, GSR DIS, GSR SI, CR30, MSR126, MSR127, MSR131, MSR138, SmartGuard™ controller, 1791DS/ES CompactBlock™ Guard I/O, 1732DS/ES ArmorBlock Guard I/O, 1734 POINT Guard I/O.

Maintenance

Every Month
Check the correct operation of the switching circuit. Also check for signs of abuse or interference. Inspect the switch casing for damage.

Every Five Years
Check the correct operation of the switching circuit. Also check for signs of abuse or interference. Inspect the switch casing for damage. The switch must be disconnected and readjusted.

Repair

If there is any malfunction or damage, no attempts at repair can be made. The unit must be replaced before machine operation is allowed.

Declaration of Conformity

This declaration is to declare that the products that are shown in this document conform with the Essential Health and Safety Requirement (EHSRs) of the European Machinery Directive 2006/42/EC.

Visit https://www.rockwellautomation.com/global/certification/overview.page
Notes:
Rockwell Automation Support

Use the following resources to access support information.

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Direct Dial Codes</td>
<td>Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.</td>
<td><a href="http://www.rockwellautomation.com/global/support/direct-dial.page">http://www.rockwellautomation.com/global/support/direct-dial.page</a></td>
</tr>
</tbody>
</table>

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete the How Are We Doing? form at http://literature.rockwellautomation.com/idc/groups/literature/documents/du/ra-du002-en-c.pdf.

Waste Electrical and Electronic Equipment (WEEE)

At the end of life, this equipment should be collected separately from any unsorted municipal waste.


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