



Guardmaster Guard Locking Switch

Catalog Numbers 440G-LZS21SPx, 440G-LZS21SPRx, 440G-LZS21STLx, 440G-LZS21STRx, 440G-LZS21UPLx, 440G-LZS21UPRx, 440G-LZS21UTLx, 440G-LZS21UTRx



Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.



WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.



ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.

IMPORTANT Identifies information that is critical for successful application and understanding of the product.

Labels may also be on or inside the equipment to provide specific precautions.



SHOCK HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.



BURN HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.



ARC FLASH HAZARD: Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

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Summary of Changes

This manual contains new and updated information as indicated in the following table.

| Topic | Page |
|--|--------------------|
| Added risk assessment for PTL versions | 12 |
| Metallic particles | 13 |
| Revised pair proximity dimension | 14 |
| Use of supplied actuator mounting bracket | 16 |
| Added protection against liquids section | 16 |
| Use of thread locking compound on mounting screws | 18 |
| Added functional testing requirement | 21 |
| Corrected error in LED table | 25 |
| Added door proximity auxiliary version with truth tables | 26 |
| Revised drawing with an E stop added | 28 |
| Masking of OSSD test pulses | 29 |
| Masking of OSSD test pulses, with respect to point I/O | 31 |
| Revised nomenclature for catalogue code | 34 |
| Added information of protection of OSSD's thermal rating | 35 |
| Corrected some Fahrenheit temperatures | 35 |

Who Should Use This Manual

Use this manual if you are responsible for designing, installing, programming, or troubleshooting systems that use the Guardmaster 440G-LZ guard locking switch.

You should have a basic understanding of electrical circuitry and familiarity with safety-related systems. If you do not, obtain the proper training before using this product.

Purpose of This Manual

This manual is a reference guide for the Guardmaster 440G-LZ guard locking switch. It describes the procedures you use to install, wire, and troubleshoot your switch. This manual:

- Explains how to install and wire your 440G-LZ
- Provides an overview of the Guardmaster 440G-LZ guard locking switch

Conventions Used in This Manual

The following conventions are used throughout this manual:

- Bulleted lists such as this one provide information, not procedural steps.
- Numbered lists provide sequential steps or hierarchical information.

Additional Resources

The following document offers additional information about related Rockwell Automation products:

| Resource | Description |
|--|---|
| Allen-Bradley Industrial Automation Glossary, publication AG-7.1 | Glossary of industrial automation terms and abbreviations |

You can view and download publications at <http://www.rockwellautomation.com/literature/>. To order paper copies of technical documents, contact your local Rockwell Automation distributor or sales representative.

Terminology

| | |
|-----------------|---|
| OSSD | Output Signal Switching Device. Typically designates a pair of solid state signals pulled up to the DC source supply. The signals are usually tested for short circuits to the DC power supply, short circuits to the DC common, and short circuits between the two signals. |
| Standard coding | Same as Low coding as defined in EN ISO 14119:2013 |
| Unique coding | Same as High coding as defined in EN ISO 14119:2013 |

General Description

Guardmaster 440G-LZ Overview

This Guardmaster® 440G-LZ guard locking switch functions by extending a locking bolt from the switch through a hole in the actuator, which prohibits the opening of a guard.

The locking bolt drive mechanism and logic confirms that the locking bolt is allowed to extend only when the corresponding actuator is detected within range.

RFID coding detects the appropriate actuator.

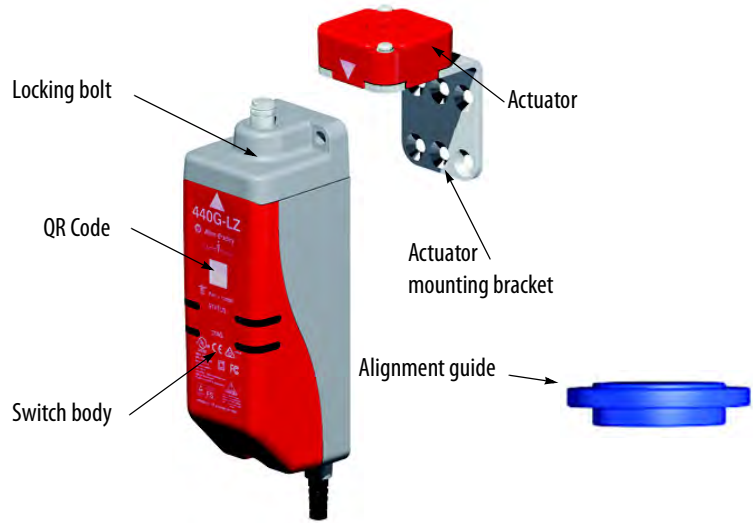
This version of the Guardmaster 440G-LC guard locking switch features OSSD outputs. These outputs are enabled only when the locking bolt is sensed in its extended position in the actuator, which happens only when the guard is both closed and locked.

The locking bolt drive mechanism uses a bi-stable solenoid. As a result, the switch consumes little electrical power, with peak currents occurring only briefly, upon start-up and after each movement of the locking bolt.

Because of its bi-stable drive, not only does the device consume minimal power, but it does not produce heat whether in its locked or unlocked condition.

Despite the bi-stable design of the locking bolt drive, the device logic and functionality are configured to replicate the functionality of a Power to Release or Power to Lock solenoid-operated switch (depending on type).

Guardmaster 440G-LZ Assembly Overview



Packaging Contents

The box includes the following components:



Figure 1 - Switch Body Including Connection Lead: 3 m or 10 m Flying Lead or Pigtail Equipped with M12 QD Connector



Figure 2 - Actuator Mounting Bracket

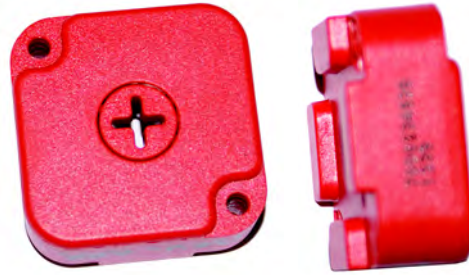


Figure 3 - Actuator



Figure 4 - Actuator-to-actuator Mounting Bracket Mounting Screws: 2 x T10 Torx



Figure 5 - Alignment Guide

Notes:

Safety Concept

Safety Standards Applied to the Guardmaster 440G-LZ Guard Locking Switch

The Guardmaster® 440G-LZ satisfies applicable requirements in the following standards that are related to functional and machinery assembly:

- IEC 60947-5-1: 2003+A1: 2009
- IEC 60947-5-3: 1999/A: 2005
- IEC 61508:2010 SIL 3
- IEC 62061:2005 SIL 3
- EN ISO 13849-1:2008/AC: 2009 Performance Level e (PLe), Category 4
- EN ISO 14119:2013
- UL 508 17th Edition dated 3/19/2013

Introduction

This section describes the safety Performance Level concept and explains how the Guardmaster 440G-LZ meets the requirements for SIL 3, Cat. 4, or Performance Level “e” (PLe) applications.

Safety Certification

The Guardmaster 440G-LZ is certified for use in safety applications up to and including SIL 3 according to IEC 61508 and IEC 62061 with a proof interval of 20 years, Performance Level PLe, and Category 4 in compliance with ISO 13849-1.

Safety requirements are based on the standards applicable at the time of certification.

The TÜV Rheinland group has approved the Guardmaster 440G-LZ for use in safety-related applications where Performance Level “e” is required for the door position and lock monitor functions.

The 440G-LZ must be installed in accordance with the applicable regulation and standards.

While the 440G-LZ can be used for SIL 3, PLe, and Category 4 applications, the installer must comply with guard requirements (for example, EN ISO 13854 and EN ISO 13857). And in some cases also minimum (safe) distance requirements (for example, EN ISO 13855).



ATTENTION: A risk assessment is required to prove that the selected switch can be used in the desired application. A function test of the system is necessary to validate that it works as expected.

Guard locking switches that are activated by the Power to Lock principle, 440G-LZS 21 **L*, must only be used after a risk assessment has shown that the use of a Power to Release principle, 440G-TZS1**R* is inappropriate. This assessment is necessary since the guard can be immediately opened after a loss of power supply or upon de-activation of the unlocking signal.

The installed system, including the safety control system and the means by which the machine stops, must achieve the needed safety performance. The 440G-LZ is one element in the safety system.

Additional guidance on guards, guard locking and guard interlock can be found in:

- EN ISO 12100
- EN ISO 13854
- EN ISO 13855
- EN ISO 13857
- EN ISO 14119
- EN ISO TR 24119
- EN ISO 14120
- Application-specific C-level standards

Installation and Wiring

General Considerations

The 440G-LZ guard locking switch is designed for use on guards that are engineered to be rigid without sag. A separately mounted latch (for example, magnetic or mechanical) and mechanical stop are required.

It can be used on Full Body Access guards that do not require escape release, emergency release, or remote release guards. It can also be used in any situation where the alignment tolerance falls within the stated specification.

Installation where metallic particles are present is not recommended and can result in the switch being inoperable. Particle build-up in the vicinity of the locking bolt will likely cause jamming of the locking bolt, which over time causes switch failure. Ferromagnetic metal particles are especially harmful as they are attracted to the permanent magnet at the tip of the locking bolt. Any particle build-up eventually causes seizing of the movement of the locking bolt, which results in switch failure and can be avoided. The correct installation is to mount the switch away from any source of metal particles. If the correct installation isn't possible, preventative maintenance is performed periodically to keep the switch clean of metallic particles. Pay particular attention during installation to be sure that any drilling swarf is excluded from the vicinity of the switch.

Installation must be in accordance with the present manual and implemented by qualified personnel exclusively. The 440G-LZ guard locking switch is intended to be part of the safety-related control system of a machine. Before installation, a thorough risk assessment must be performed to determine whether the specifications of this device are suitable for all foreseeable operational and environmental characteristics of the application.

See the Specifications section of this manual. Use appropriate screws, bolts, or nuts that are fitted by tools to mount the switch and actuators to avoid tampering.

Do not over-torque the mounting hardware.



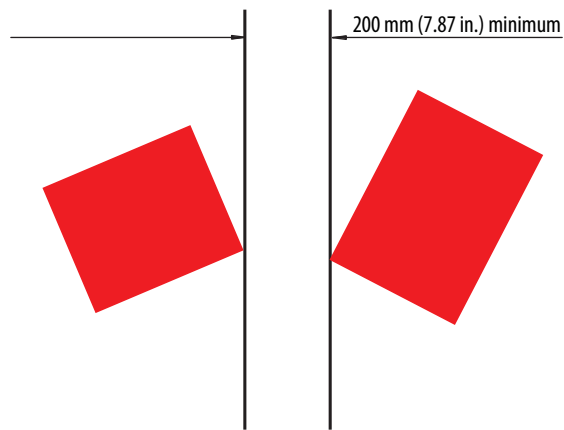
ATTENTION: For the switch, actuator and actuator mounting bracket:

- Only use the designated mounting holes.
 - Never drill or use to support other structures such as a conduit, cable ways, or other hardware.
-

Pair Proximity

During installation, make sure that you observe the following restriction: you must maintain a minimum distance between each pair of switches you mount. Make sure to maintain a minimum distance of 200 mm (8 in.) between any two switches and actuators, as indicated in the following illustration.

This restriction applies to both pairs of 440G-LZ switches and combinations of 440G-LZ switches with the TLS-Z guard locking switches and/or 440N-Z SensaGuard™ noncontact safety switches. All of these devices use inductive field technology for sensing actuator proximity and RFID technology for actuator code identification. These technologies enable high precision operation while also meeting the requirements to prohibit actuator substitution with either low- or high-level coding as described in EN ISO 14119.

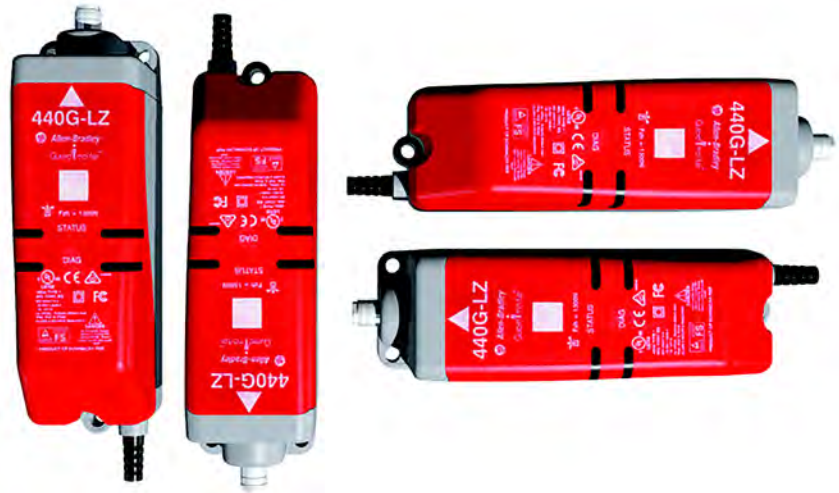


The distance of 200 mm (8 in.) is the closest proximity distance of a pair of switches. No red colored parts of the two switches can be closer than 200 mm (7.87 in.) including actuators.

If the minimum proximity dimension is not observed, the inductive fields interact causing cross talk. Cross talk results in nuisance faults and false operation.

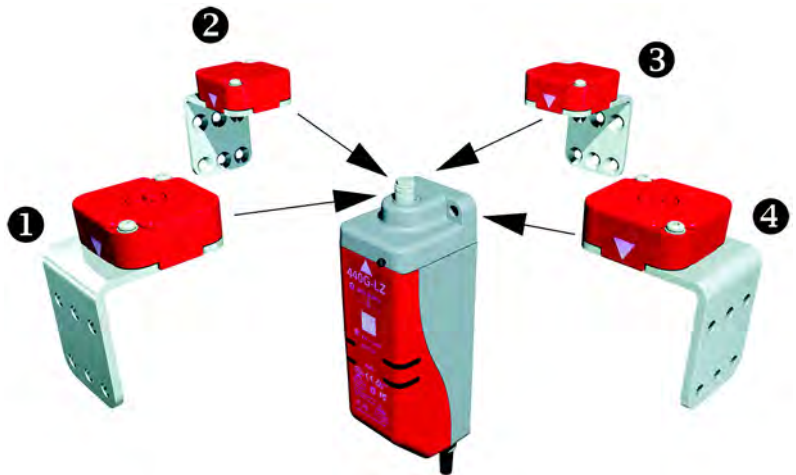
Orientation of Switches

Can be used in all mounting orientations.



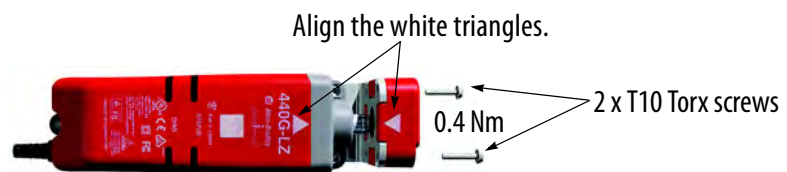
Setting the Actuator Direction of Approach

The actuator can approach the switch from all four directions.

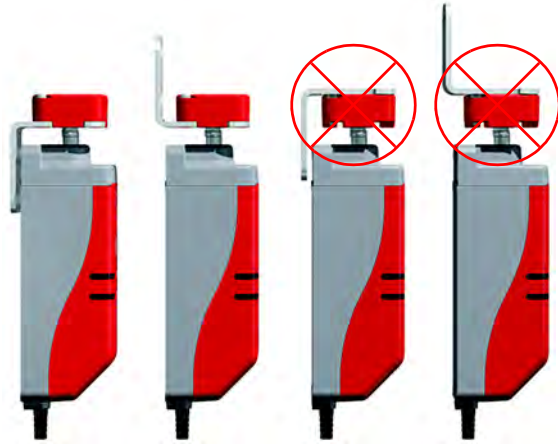


Verify that the white arrow on the actuator aligns with the white arrow on the switch body.

The actuator must be fitted to the actuator mounting bracket in such a manner that the white alignment triangles that are marked on both the actuator and switch body are in the installed position.



Verify that the locking bolt enters the actuator mounting bracket first.

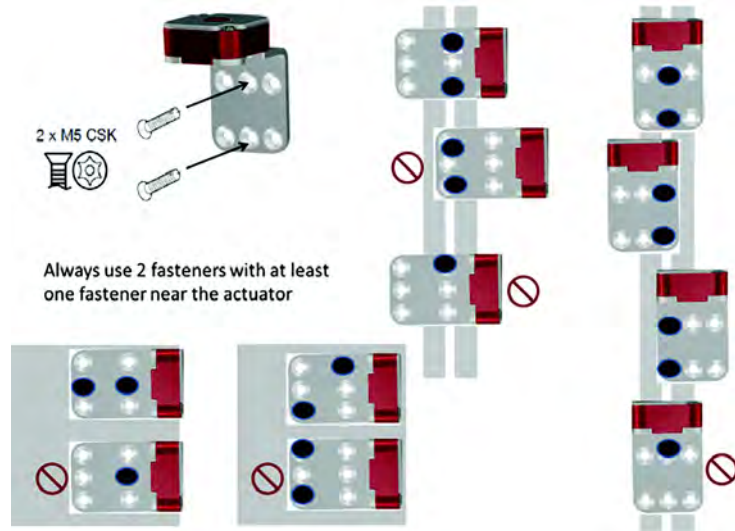


IMPORTANT The performance of the switch can only be guaranteed if the provided actuator mounting bracket is used. Mounting the actuator without the supplied bracket can result in the reduction of performance.

Mounting the Assembled Actuator

Verify that two fasteners are used with at least one fastener that is fitted close to the actuator bracket bend.

The following drawings show mounting possibilities when attaching to extruded aluminum profile and flat surface guard doors.



Mounting for Protection from Ingress of Liquids

The 440G-LZ is rated for IP69 in accordance with IEC 60529:192 + A2:2013. This rating involves a short-term test that is made with high-pressure water jets at 80° C (176° F). The test is passed if no water enters the enclosure

of the switch that contains the electrical components and the switch function is not impaired.

This rating does not promise protection from any liquids other than water and does not promise the mechanical longevity from continuous or frequent exposure.

However, the 440G-LZ is used in CIP (clean-in-place) applications by virtue of the following features.

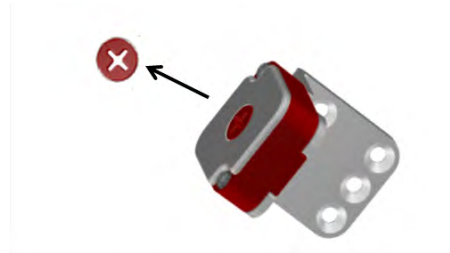
- Stainless steel is used for all metal parts including the M12 quick-disconnect.
- The product plastics are resistant to most alkaline cleaners used in CIP.
- An internal nitrile-rolling lip seal guards the locking bolt, which extends and retracts during locking/unlocking.

To be sure of maximum longevity when exposed to CIP, it is recommended that the switch be mounted in the inverted position with the actuator at the bottom. This position allows liquids to drain away from the locking bolt. It is also recommended that the plug in the middle of the actuator is removed to improve drainage (see Removal of the Actuator Plug).

Removal of the Actuator Plug

This plug can be broken out from the actuator if a through-hole is required to avoid a food trap when mounted on the hazard side of a guard door.

Twist the plug with a screwdriver until it comes apart.



Mounting the Switch Body

Three M5 fasteners (not provided) are required for proper mounting to a rigid guard door frame.



IMPORTANT If it is decided to use a standard thread-locking compound on the mounting screws of the switch body, the manufacturers specification can be checked. Many standard thread-locking compounds attach the plastic feet of the switch body, which cause stress cracks. It is recommended to use cyanoacrylate-type thread-locking compounds.

Setting Actuator to Switch Alignment

There are three ways to achieve proper alignment.

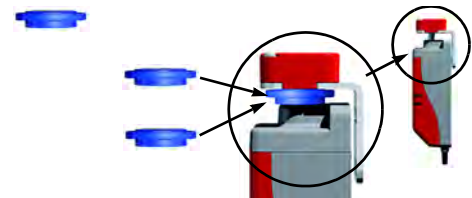
1. By setting gap "G"
2.5 mm (0.09 in.) [0...5 mm (0...0.19 in.)]



2. By mounting hole alignment "H"
6.5 mm (0.25 in.) [4...9 mm (0.15...0.35 in.)]



3. Use the alignment guide provided



ATTENTION: After installation, verify that there is no possibility of lifting the actuator over the extended locking bolt.



ATTENTION: After installation, confirm that there is no possibility of collision when the actuator approaches the switch body.



Actuator RFID Setting

Switches with Standard Coded Actuators

These switches are ready for use and need no special RFID setting.

Switches with Unique Coded Actuators

Before use, the switches must first “learn” a new RFID guard actuator. This task is not performed at the factory, as there are two possible methods:

- **“Multi-time” learning:** the switch can learn up to eight actuators consecutively.
- **“One-time” learning:** The switch learns one actuator only, for life, irreversibly.

The “one-time” learn method can be invoked at any time, not just during RFID setting. For example, the switch could “multi-time” (learn four different actuators consecutively), then complete a “one-time” learn process that would prohibit it from learning any additional actuators.

Learning the First “Multi-Time” Actuator

Connect the switch to 24V DC (see the wiring diagrams on [page 21](#)), and verify that the lock command is off.

The Status/Diagnostic status indicator blinks a number of times, which corresponds to the number of times a new actuator can be acquired (a total of eight times when the switch is new). Then it repeats, which indicates that the switch has yet to learn a new actuator.

The switch automatically starts the learn process as soon as an actuator is placed in the guard-closed position of the switch.

| Learning Sequence as Indicated by the Status/Diagnostic Indicators | |
|--|---|
| Actuator present | Blinking green, 1 Hz rate |
| Verifying actuator | Blinking green/red, 1 Hz rate (15 sec) |
| Programming switch (15 sec) | Blinking green/red, 4 Hz rate (15 sec) |
| Program finalization | Blinking green (remaining number of times a new actuator can be acquired, 15 sec) |
| Ready state (learn process is complete) | Solid green (Power to Release) Solid red (Power to Lock) |

Learn Additional “Multi-time” Actuators

Mount the new actuator on the guard and repeat the process. Introduce the actuator to the switch as previously described. During program finalization, the status indicator blinks green a number of times, which corresponds to the number of remaining learnable actuators.

Note: Once a unique coded switch learns a new actuator, any previous actuator is no longer usable by that switch.

“One-time” Learning Process

Proceed as in the “multi-time” teach process that was previously described, with the following exception. At the final programming (last) stage, withdraw the actuator from the switch until the status indicator turns solid red. Then immediately reposition the actuator near the switch. This process must be executed within 15 seconds.

The status indicator blinks, then turns solid to indicate that the learning process is complete.

| | |
|------------------|-------------|
| Power to Release | Solid green |
| Power to Lock | Solid red |

Note: For Power to Release switches, you execute a manual release to withdraw the actuator away from the switch as previously described.

Status/Diagnostic Indicator Error Codes during the Learning Process

The following code sequences persist until a Power On/Off cycle is completed.

| Status/Diagnostic Indicator Flashes (4 Hz) | Error Code |
|--|--|
| Green | OSSD inputs not valid |
| Red-red-red-green | Cannot learn a standard actuator |
| Red-red-red-green-green | Actuator already learned |
| Red-red-red-green-green-green | Bad RFID; actuator moved out of range |
| Red-red-red-green-green-green-green | Exceeded learning eight actuators |
| Red-red-red-green-green-green-green-green | Unit locked: cannot learn another actuator |

Prove Basic Lock Function

To prove basic lock function and to verify correct actuator alignment, it can be necessary to extend the locking bolt. Do not extend the locking bolt mechanically; you must proceed electrically. The following basic connections are required:

- Pin 2 (brown wire) must be connected to 24V DC
- Pin 7 (blue wire) must be connected to 0V (GND)

With a Power to Release switch, the locking bolt extends when the guard is shut and the actuator is aligned. Connect Pin 3 (green wire) to 24V DC to unlock the switch and withdraw the locking bolt.

If power is removed from a Power to Release switch in the locked position, the locking bolt remains in its extended position (switch locked). Use the manual auxiliary release to unlock the switch.

With a Power to Lock switch, connect pin 3 (green wire) to 24V DC to lock the switch (for example, extend the locking bolt). When you disconnect pin 3, it unlocks the switch.

If power is removed from a Power to Lock switch in the locked position, the switch unlocks.

In either type of lock, the locking bolt never extends in the absence of the actuator.

Functional Testing

A manual functional electric test must be made:

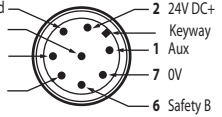
- After installation
- After any maintenance or change of component
- If the guard is used infrequently
 - Less than once a month for SIL 3/PLe
 - Less than once a year for SIL 2/PLd



ATTENTION: During the functional test, be sure that there are no persons in the danger area and that the machine startup does not cause a hazard.

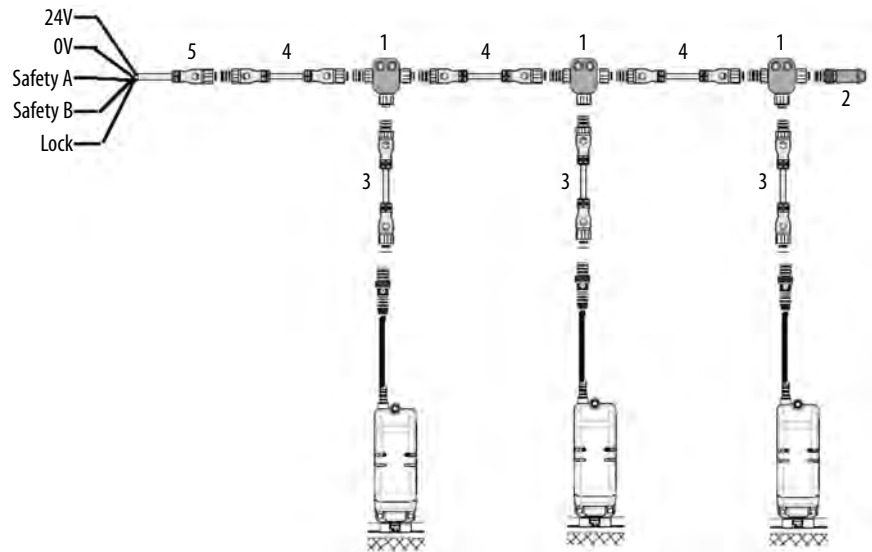
1. Be sure that the guard door is open.
2. Connect the 24V DC power to pin 2. The switch conducts a self-testing regime at the end of which the diagnostic indicator is solid red.
3. Test to be sure that the machine cannot start.
4. Be sure the lock control at pin 3 is set to 0V for PTR and 24V for PTL types.
5. Test again to be sure that the machine cannot start.
6. Close the guard door and then be sure that the guard is mechanically locked and the diagnostic indicator is solid green.
7. Test to be sure that the machine can start.
8. Change the lock control at pin 3V to 24V for PTR and 0V for PTL types.
9. Be sure the machine stops, the guard door is mechanically unlocked, and the machine cannot restart.

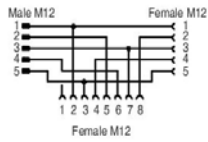
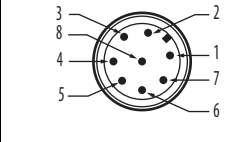

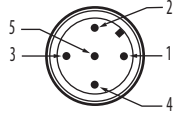




Wiring

| 8-Pin Micro (M12) | |  | |
|--|--------------|---|------------|
| 8-Pin Cordset 889D-F8AB-* or cable version | Color | Function | Pin |
| | White | AUX | 1 |
| | Brown | 24V DC+ | 2 |
| | Green | Lock | 3 |
| | Yellow | Safety B+ | 4 |
| | Gray | Safety A | 5 |
| | Pink | Safety B | 6 |
| | Blue | Gnd/OV | 7 |
| Red | Safety A+ | 8 | |

Connections Systems

The following connection system components facilitate connection.



| Connection | | Cat. No. ¹ | | | | | | | | | | | | | | | |
|---|---|---|-----|---|-------|---------|---|-------|----|---|-------|---------|---|-------|----|---|---|
| 1 — Safety-wired Splitter/T-Port | | 898D-438Y-D8 | | | | | | | | | | | | | | | |
|  |  |  | | | | | | | | | | | | | | | |
| 2 — Safety-wired Shorting Plug | | 898D-418U-DM | | | | | | | | | | | | | | | |
|  | <table border="0"> <tr><td>Pin 1</td><td>PWR</td><td>—</td></tr> <tr><td>Pin 2</td><td>OSSD 1+</td><td>—</td></tr> <tr><td>Pin 3</td><td>NA</td><td>—</td></tr> <tr><td>Pin 4</td><td>OSSD 2+</td><td>—</td></tr> <tr><td>Pin 5</td><td>NA</td><td>—</td></tr> </table> | Pin 1 | PWR | — | Pin 2 | OSSD 1+ | — | Pin 3 | NA | — | Pin 4 | OSSD 2+ | — | Pin 5 | NA | — |  |
| Pin 1 | PWR | — | | | | | | | | | | | | | | | |
| Pin 2 | OSSD 1+ | — | | | | | | | | | | | | | | | |
| Pin 3 | NA | — | | | | | | | | | | | | | | | |
| Pin 4 | OSSD 2+ | — | | | | | | | | | | | | | | | |
| Pin 5 | NA | — | | | | | | | | | | | | | | | |
| 3 — 8-pin Device Patchcords | | | | | | | | | | | | | | | | | |
| 1 meter, 8-pin |  | 889D-F8ABDM-1 | | | | | | | | | | | | | | | |
| 2 meters, 8-pin | | 889D-F8ABDM-2 | | | | | | | | | | | | | | | |
| 5 meters, 8-pin | | 889D-F8ABDM-5 | | | | | | | | | | | | | | | |
| 10 meters, 8-pin | | 889D-F8ABDM-10 | | | | | | | | | | | | | | | |
| 4 — 5-pin Patchcords | | | | | | | | | | | | | | | | | |
| 1 meter, 5-pin |  | 889D-F5ACDM-1 | | | | | | | | | | | | | | | |
| 2 meters, 5-pin | | 889D-F5ACDM-2 | | | | | | | | | | | | | | | |
| 5 meters, 5-pin | | 889D-F5ACDM-5 | | | | | | | | | | | | | | | |
| 10 meters, 5-pin | | 889D-F5ACDM-10 | | | | | | | | | | | | | | | |
| 5 — 5-pin Cordsets | | | | | | | | | | | | | | | | | |
| 2 meters, 5-pin |  | 889D-F5AC-2 | | | | | | | | | | | | | | | |
| 5 meters, 5-pin | | 889D-F5AC-5 | | | | | | | | | | | | | | | |
| 10 meters, 5-pin | | 889D-F5AC-10 | | | | | | | | | | | | | | | |

¹ Add the letter "S" to above cat. nos. for stainless steel connectors; for example, 889DS-F5AC-1

More detailed information can be found online at ab.com/product catalogues/ (search for "Connection Systems").

Description of Operation

Status/Diagnostic Indicators during Operation

Table 1 shows the status of the Guardmaster® 440G-LZ guard locking switch during operation.

Table 1 -

| Power to Lock Versions | Guard Status | Lock CMD | OSSD Input | Lock Status | Status Indicator | OSSD Status |
|---------------------------|----------------|----------|------------|-------------|--------------------------------|-------------|
| Power on and lock CMD off | Open or closed | Off | Off or on | Unlocked | Blinks 6x green then solid red | Off |
| Lock CMD on, door open | Open | On | Off or on | Unlocked | Fast flash green | Off |
| Lock CMD on, door closed | Closed | On | Off | Locked | Slow flash green | Off |
| Lock CMD on, door closed | Closed | On | On | Locked | Solid green | On |

Table 2 -

| Power to Release Versions | Guard Status | Lock CMD | OSSD Input | Lock Status | Status Indicator | OSSD Status |
|--|----------------|----------|------------|-------------|---|-------------|
| Power on with door open | Open | Off | Off or on | Unlocked | Blinks 6x green, then blinks 1x red, followed by fast flash green | Off |
| Power on with door closed | Closed | Off | Off | Locked | Blinks 6x green, then blinks 1x red, followed by slow flash green | Off |
| Power on with door closed, and OSSD input active | Closed | Off | On | Locked | Blinks 6x green, then blinks 1x red, followed by solid green | On |
| Unlock CMD on, and door closed or open | Open or closed | On | Off or on | Unlocked | Solid red | Off |

Status/Diagnostic Indicators during Troubleshooting

This section explains the meaning of the various status indicators during troubleshooting.

Table 3 -

| Status Indicator | Switch Status |
|---|--|
| Off | Not powered |
| Solid green | Door shut, locked, and OSSDs are ON. |
| Fast flash, green (4 Hz) | Wait to lock, actuator is not within range |
| Slow flash, green (1 Hz) | Door shut, locked. OSSDs are OFF because there's no safety input signal. |
| Solid red (PTL versions) | Door is open or shut, not locked. No lock signal. |
| Solid red (PTR versions) | Door is open or shut, not locked. Unlock signal is ON. |
| Flashes 3x green, then red - repeats | Attempt to lock/unlock, actuator is not aligned. |
| Flashes 3x green, then red - repeats, then finally fast flash red | Failure to lock/unlock. Align actuator, then cycle power. |
| Slow flash, red (1 Hz) | OSSD fault, check outputs are not shorted to GND, 24V DC, or each other. Cycle power to reset. |
| Fast flash, red (4 Hz) | General fault. Cycle power to reset. |

Auxiliary Out Function

The Auxiliary Out only changes state when the door is shut and locked, regardless of OSSD status.

Two types of auxiliary output are available.

Lock Status

Auxiliary output changes state when the lock is either unlocked or locked. Since the 440G-LZ can only lock if the door or guard is closed, the auxiliary out function can also be used to annunciate door position status if the lock command is set to lock.

Door Proximity Status

- Auxiliary output changes state when the actuator is in proximity to the switch body.
- The proximity is such that the actuator is within 20 mm (0.79 in.) (measured centerline of lock bolt to centerline of the hole in the actuator).
- Can be used for door position if a latch is fitted such that a guard or door is either open or fully closed.

Catalog codes for both types are explained in Appendix A, Specifications.

Table 4 - Lock Status Auxiliary Power to Release

| Inputs | | |
|---------------|---------------------|-------------------|
| Door | Lock Control | OSSD Input |
| Open | Off or On | High or Low |
| Closed | Off | Low 0V |
| Closed | On | Low 0V |
| Closed | Off | High 24V |
| Closed | On | High 24V |

| Outputs | | |
|--------------------|------------|--------------------|
| Lock Status | AUX | OSSD Output |
| Unlocked | High 24V | Low 0V |
| Locked | Low 0V | Low 0V |
| Unlocked | High 24V | Low 0V |
| Locked | Low 0V | High 24V |
| Unlocked | High 24V | Low 0V |

Table 5 - Lock Status Auxiliary Power to Lock

| Inputs | | |
|---------------|---------------------|-------------------|
| Door | Lock Control | OSSD Input |
| Open | Off or On | High or Low |
| Closed | Off | Low 0V |
| Closed | On | Low 0V |
| Closed | Off | High 24V |
| Closed | On | High 24V |

| Outputs | | |
|--------------------|------------|--------------------|
| Lock Status | AUX | OSSD Output |
| Unlocked | High 24V | Low 0V |
| Unlocked | High 24V | Low 0V |
| Locked | Low 0V | Low 0V |
| Unlocked | High 24V | Low 0V |
| Unlocked | Low 0V | High 24V |

Table 6 - Door Proximity Auxiliary Power to Release

| Inputs | | |
|---------------|---------------------|-------------------|
| Door | Lock Control | OSSD Input |
| Open | Off or On | High or Low |
| Closed | Off | Low 0V |
| Closed | On | Low 0V |
| Closed | Off | High 24V |
| Closed | On | High 24V |

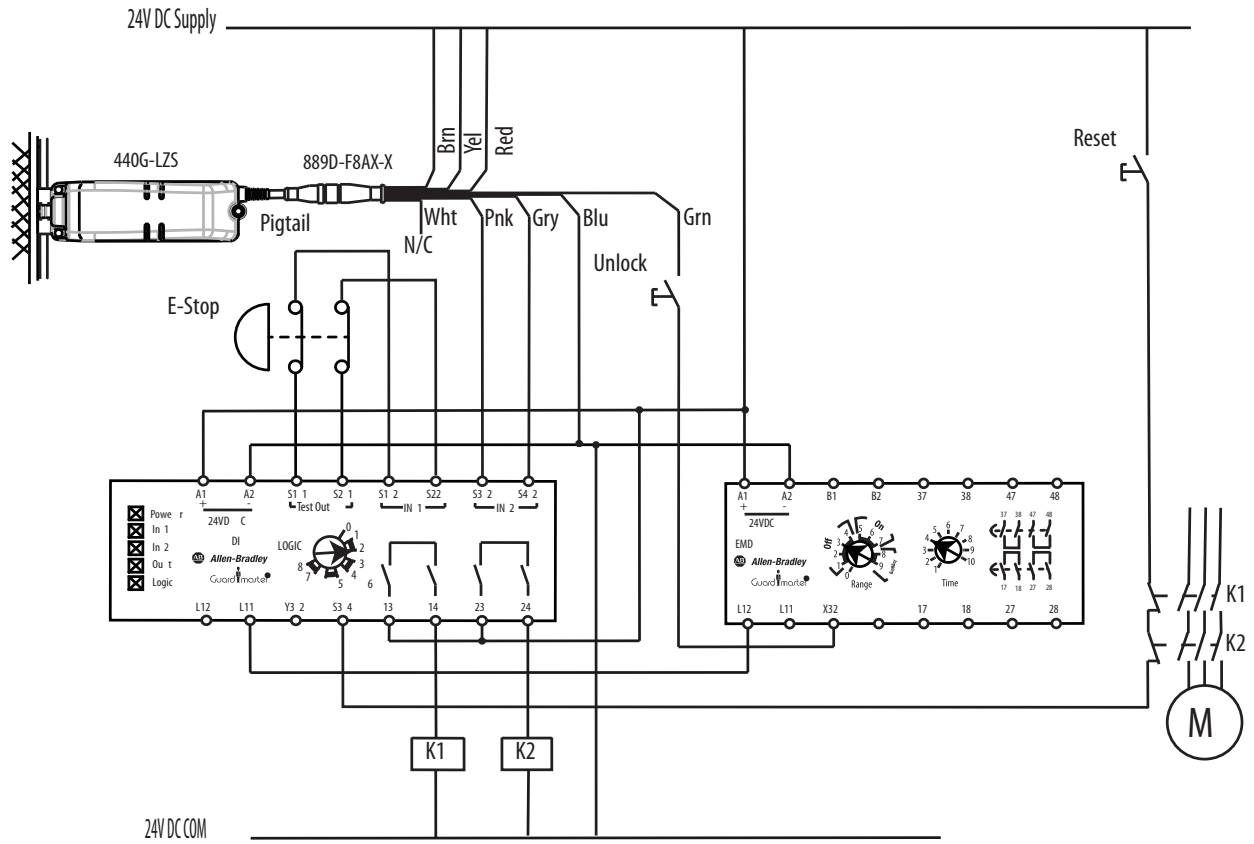
| Outputs | | |
|--------------------|------------|--------------------|
| Lock Status | AUX | OSSD Output |
| Unlocked | High 24V | Low 0V |
| Locked | Low 0V | Low 0V |
| Unlocked | Low 0V | Low 0V |
| Locked | Low 0V | High 24V |
| Unlocked | Low 0V | Low 0V |

Table 7 - Door Proximity Auxiliary Power to Lock

| Inputs | | |
|---------------|---------------------|-------------------|
| Door | Lock Control | OSSD Input |
| Open | Off or On | High or Low |
| Closed | Off | Low 0V |
| Closed | On | Low 0V |
| Closed | Off | High 24V |
| Closed | On | High 24V |

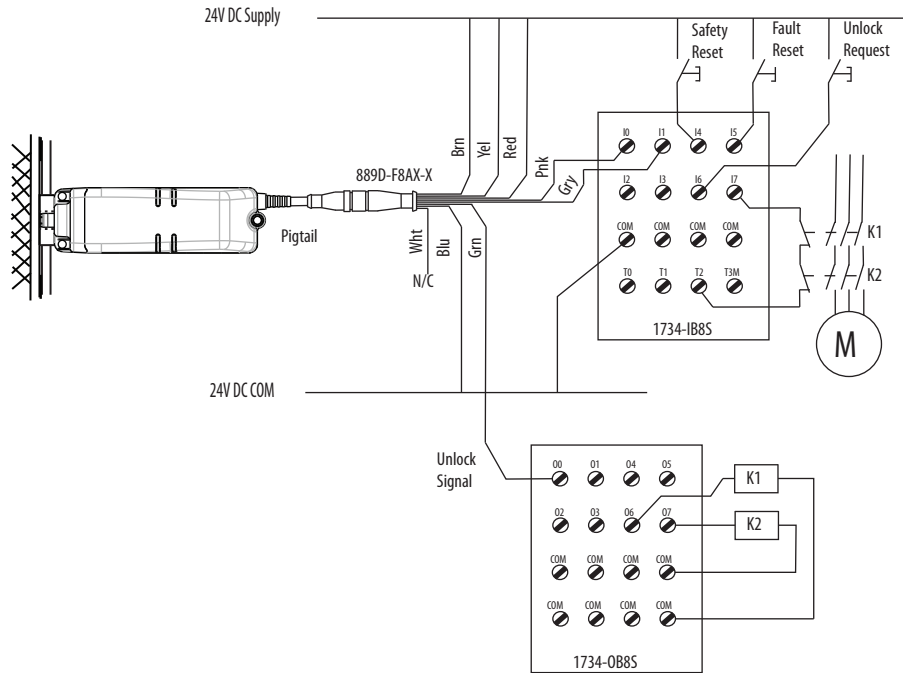
| Outputs | | |
|--------------------|------------|--------------------|
| Lock Status | AUX | OSSD Output |
| Unlocked | High 24V | Low 0V |
| Unlocked | Low 0V | Low 0V |
| Locked | Low 0V | Low 0V |
| Unlocked | Low 0V | Low 0V |
| Unlocked | Low 0V | High 24V |

Guardmaster 440G-LZ Wiring with GSR Relay

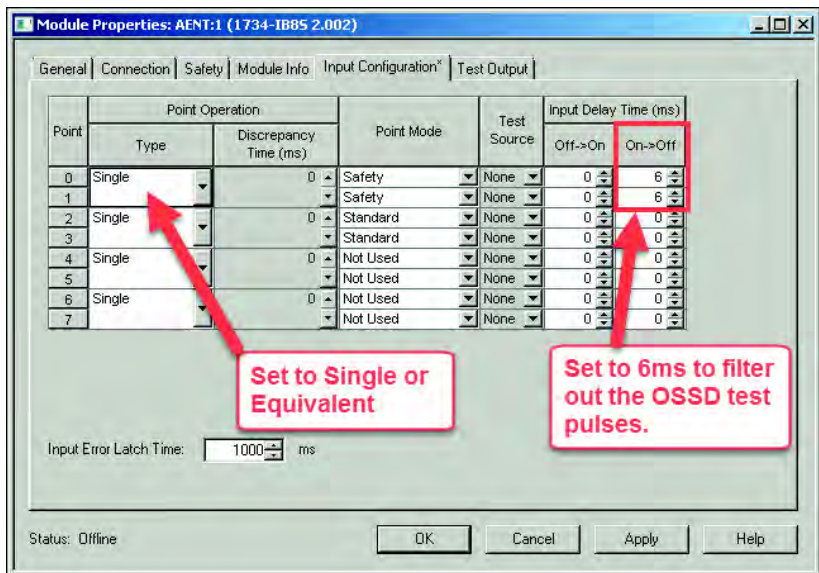


Guardmaster 440G-LZ Wiring with Point I/O

Point to Point I/O with Unlock request.



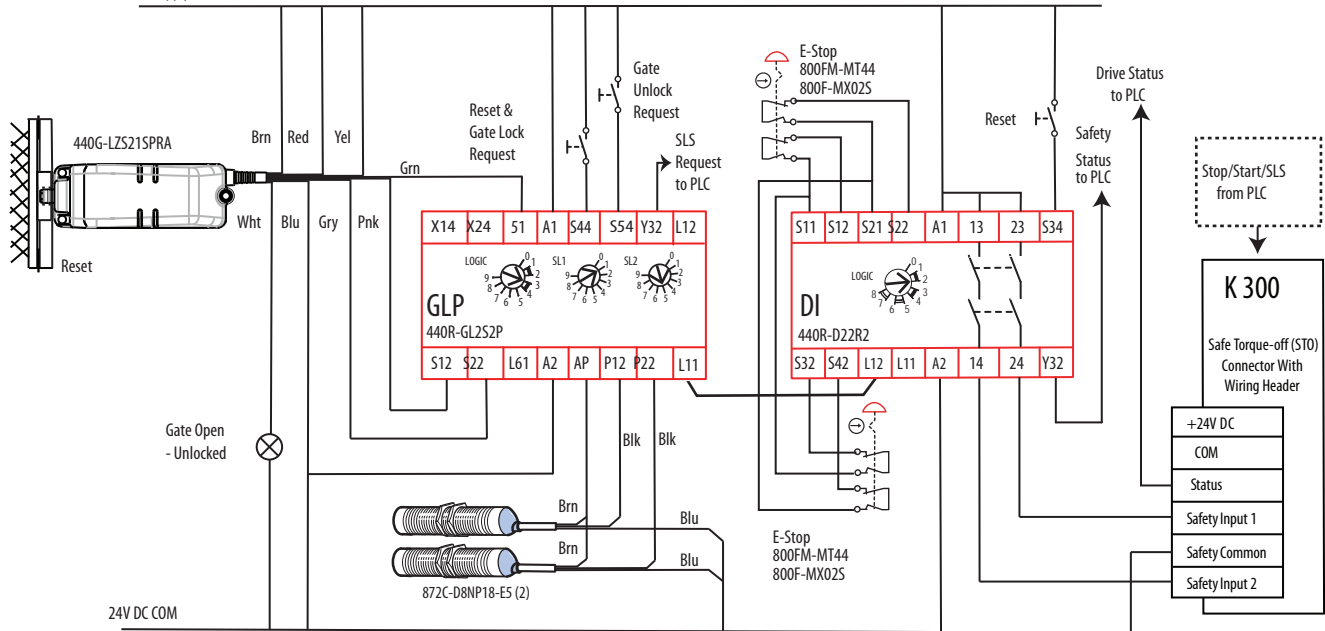
IMPORTANT To prohibit nuisance tripping, mask the OSSD input channels of the safety system with an On to Off delay of at least 6 ms. Example: Use 440G-LZ with 1734 POINT Guard I/O™ and 1732ES ArmorBlock®, click the 1734 IB8s. Select the input configuration tab. Set the On to Off delay to 6 ms for the two points that are connected to the 440G-LZ OSSD output. The Point of Operation can be set to either Single or Equivalent.



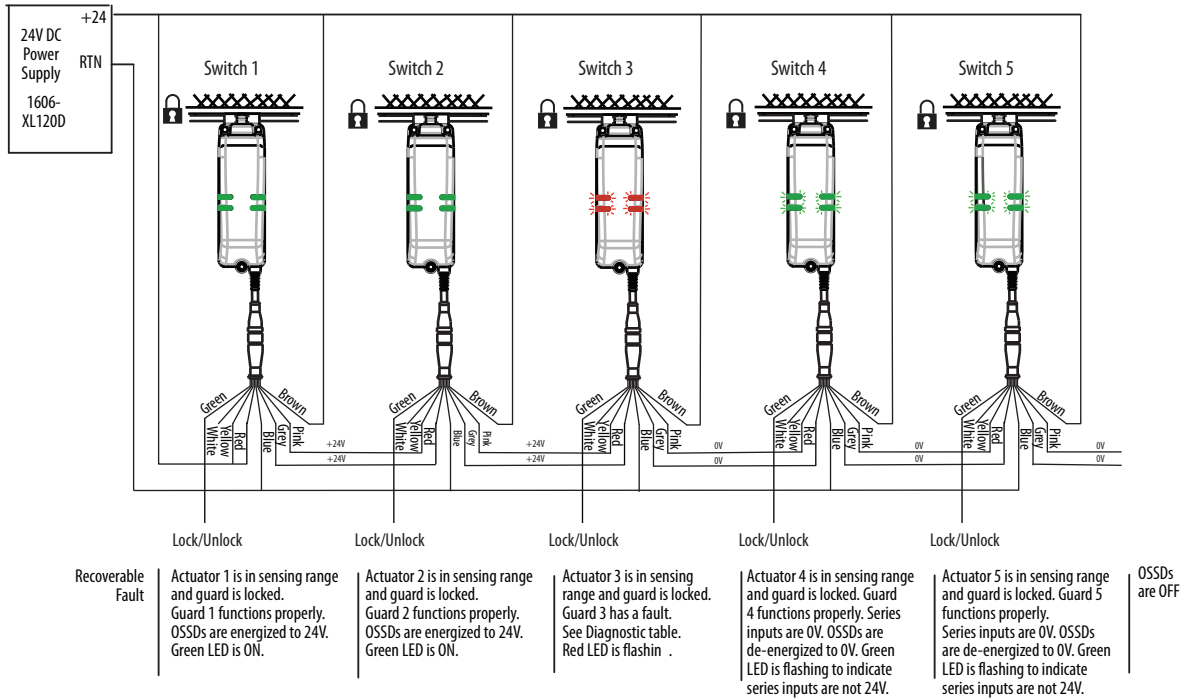
Guardmaster 440G-LZ Wiring with GLP Relay

E-stops with Speed Monitoring, Guard Locking, and servo drive

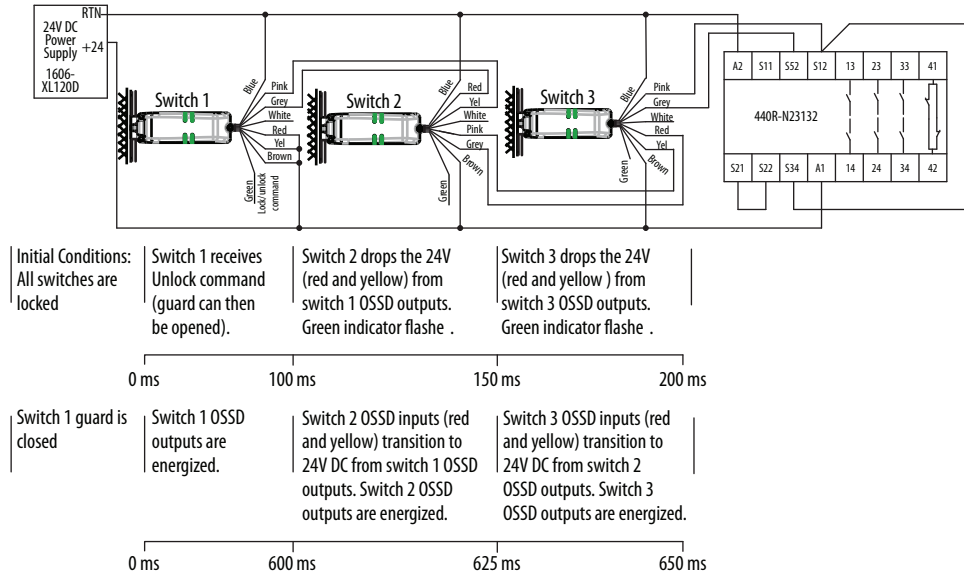
24V DC, Class 2 Supply



Troubleshoot Series Circuit

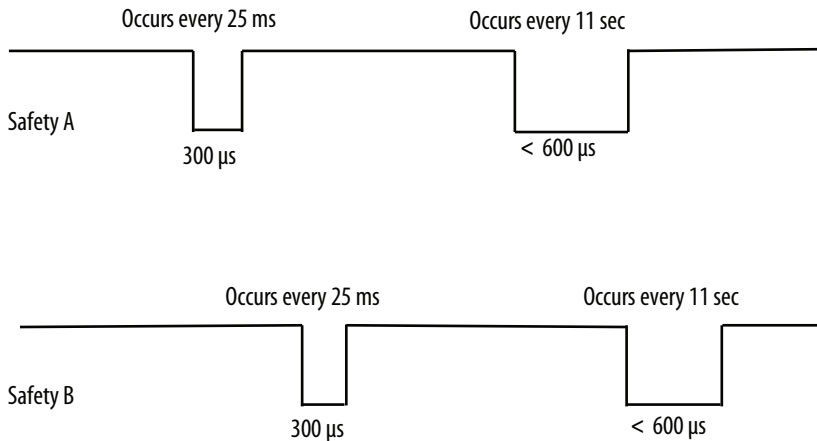


Unit Response Times When Connected in Series



OSSD Output Test Pulses

The Guardmaster 440G-LZ guard locking switch uses test pulses to check for OSSD output faults. This process is illustrated graphically as follows:



IMPORTANT To prohibit nuisance tripping, mask the OSSD input channels of the safety system with an On to Off delay of at least 6 ms.

Auxiliary/Manual Release

Table 8 -



The manual release is provided to allow you to unlock the guard door if an unforeseen and uncommon circumstance occurs.

If power is supplied to the switch and the switch is in its locked state, if you invoke the auxiliary release, it causes the switch to enter a fault condition (blinking red status indicator).

To reset the switch, simply cycle the power.

Specifications

Introduction

This appendix provides the specifications for the Guardmaster® 440G-LZ guard locking switch.

Note: The holding force Fzh is in accordance to EN ISO 14119:2013, clause 5.7.4. Additional validation was performed in accordance with IEC 60947-5-1:2009, clause C.1.2.2.

Safety Ratings

| | |
|--|--|
| Standards | IEC 60947-5-3, IEC 60947-5-1, IEC 61508, EN ISO 13849-1, IEC 62061, EN/ISO14119, UL 508 |
| Safety Classification: Guard door sensing and lock monitoring | PLe Category 4 per ISO 13849-1, SIL 3 per IEC 61508 and IEC 62061 |
| Functional Safety Data: Guard door sensing and lock monitoring | PFHD: 9.1×10^{-10} Dual channel interlock is suitable for use in applications up to PLe (in accordance with ISO 13849-1) and for use up to SIL 3 systems (in accordance with IEC 62061), depending on application characteristics. Mission time/PTI: 20 years |

Operating Characteristics

| | |
|---|---|
| 440G-LZS21*PR* | Power to Release |
| 440G-LZS21*PL* | Power to Lock |
| Switch function | OSSDs enable when guard closed and locked |
| Torque for M5 mounting of switch and actuator mounting bracket | 2 Nm max. |
| Lock bolt insertion for assured lock and hold force | Minimum of 5 mm (0.19 in.), maximum of 10 mm (0.39 in.) |
| Approach speed | Minimum of 2 mm/s |
| Lock bolt alignment tolerance X, Y, Z | Maximum of +/- 2.5 mm (0.1 in.) |
| Hold force Fmax (EN ISO 14119) | 1,690 N |
| Hold force Fzh (EN ISO 14119) | 1,300 N |
| Maximum output current (each output) | 200 mA |
| Quiescent power consumption, Locked or Unlocked | 2.5 W |
| Peak current, during turn-on or after Lock/Unlock operation | 400 mA |
| Duration of peak current, at turn-on or after Lock/Unlock operation | 100 ms |
| Maximum number of switches connectable in series | Unlimited, See Chapter 4, Unit Response Times |
| Operating voltage Ue | 24V DC + 10% / -15% Class 2 SELV |
| Maximum frequency of operating cycles | 0.2 Hz |
| Dwell time between subsequent locking/unlocking | 2.5 s |
| Response time (Off) | 100 ms first switch, +50 ms for each additional switch |
| Risk time (according to IEC 60947-5-3) | 100 ms |
| Start-up time (availability) | 5 s |
| Usage category (IEC 60947-5-2) | DC-13 24V 200 mA |
| Insulation voltage Ui (IEC 60947-5-1) | 75V |
| Impulse withstand voltage U _{imp} (IEC 60947-5-1) | 1 kV |
| Pollution degree (IEC 60947-5-1) | 3 |
| Manual (auxiliary) release | Built-in |
| Emergency release | No |
| Escape release | No |
| Protection class (IEC 61140) | Class II |

* See Nomenclature for Complete Switches section and cat. nos. section on [page 34](#).

Nomenclature for Complete Switches

440G-LZS21

| a | | b | | b | | d | |
|---|-----------------|---|---------------------|---|------------------|---|-----------|
| S | Standard Coding | P | AUX- Lock Status | R | Power to Release | A | 3 m Cable |
| U | Unique Coding | T | AUX- Door Proximity | L | Power to Lock | B | 10 Cable |
| | | | | | | H | M12 8-pin |

Outputs (Guard Closed and Locked)

| Outputs | Description/Status |
|-----------|------------------------------------|
| Safety | 2 x PNP, 0.2 A max. / ON (+24V DC) |
| Auxiliary | 2 x PNP, 0.2 A max. / OFF (+0V DC) |

Environmental

| | |
|--------------------------|---|
| Operating temperature | 0...55 °C (+32...131 °F) |
| Storage temperature | -25...+75 °C (-13...+167 °F) |
| Operating humidity | 5...95%, relative |
| Enclosure ingress rating | NEMA 3, 4x, 12, 13, IP66, IP67, IP69K |
| Shock and vibration | IEC 68-2-27 30 g (1.06 oz), 11 ms/IEC 68-2-6 10...55 Hz |
| Hygienic | ISO 14159:2004 and EN 1672-2005 (for part of the machine that is defined as “food splash area”) |
| Washdown | Suitable for sodium hydroxide-based washdown fluids |
| Radio frequency / EMC | IEC-60947-5-3, FCC-1 (Parts 18 & 15), R&TTE |

General

| | |
|------------------------|---|
| Materials | ABS, lock bolt and mount bracket 304 stainless steel |
| Weight switch/actuator | Switch 400 g (14.1 oz), actuator 22 g (0.78 oz), actuator mounting bracket 60 g (2.12 oz) |
| Connection | Flying lead or pigtail with M12 8-pin QD connector (stainless steel) |

Protection

| | |
|-----------------------------|-------------------------------|
| Short circuit protection | Incorporated |
| Current limitation | Incorporated |
| Overload protection | Incorporated |
| Reverse polarity protection | Incorporated |
| Overvoltage protection | Incorporated (up to 60V max.) |
| Thermal shutdown/restart | Incorporated |

The OSSD outputs are semi-conductor PNP transistors and are safeguarded against over-temperature at the semi-conductor junction. They are rated at 0.2 A and don't exceed the trip temperature unless the current significantly exceeds this rated value. This protection does not “trip out” the complete switch when it is exposed to ambient temperatures greater than 55°C (131°F). It would only switch off the OSSDs and the indicator diagnostic would report a non-recoverable fault as shown by a slow red flash, 1 Hz (see Status/Diagnostic indicator troubleshooting).

Certifications

See the Product Certification link at <http://www.rockwellautomation.com/rockwellautomation/certification/> for Declaration of Conformity, Certificates, and other certification details.

- UL Listed Industrial Control Equipment, Certified for US and Canada
- CE Marked for all applicable directives
- C-Tick Marked
- TÜV Certified for Functional Safety up to SIL 3 Category 4 for use in safety applications up to and including SIL 3. Also in accordance with IEC 61508 and EN 62061, Performance Level “e” and Category 4 in accordance with ISO 13849-1, both for guard position and for lock monitor according to EN ISO 14119:2013.

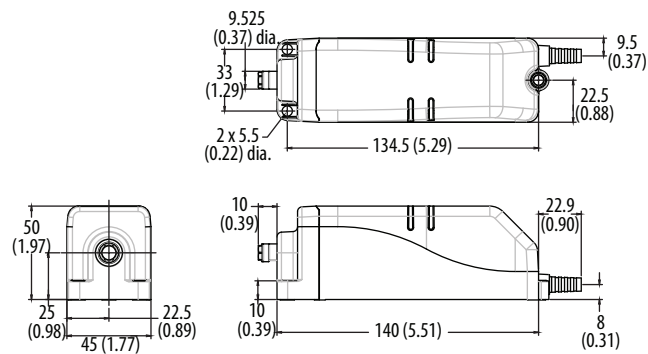
Compliance to European Union Directives

This product bears the CE Mark and is approved for installations within the European Union and EEA regions. It has been designed and tested to meet the following directives (Machine Safety and EMC).

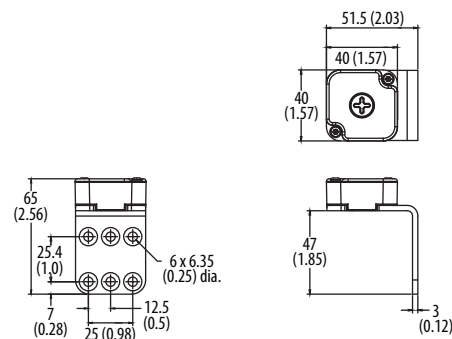
For a complete list of standards used (including Machine Safety Directive and EMC Directive), see [EU Declaration of Conformity on page 42](#) of this manual.

Overall Dimensions

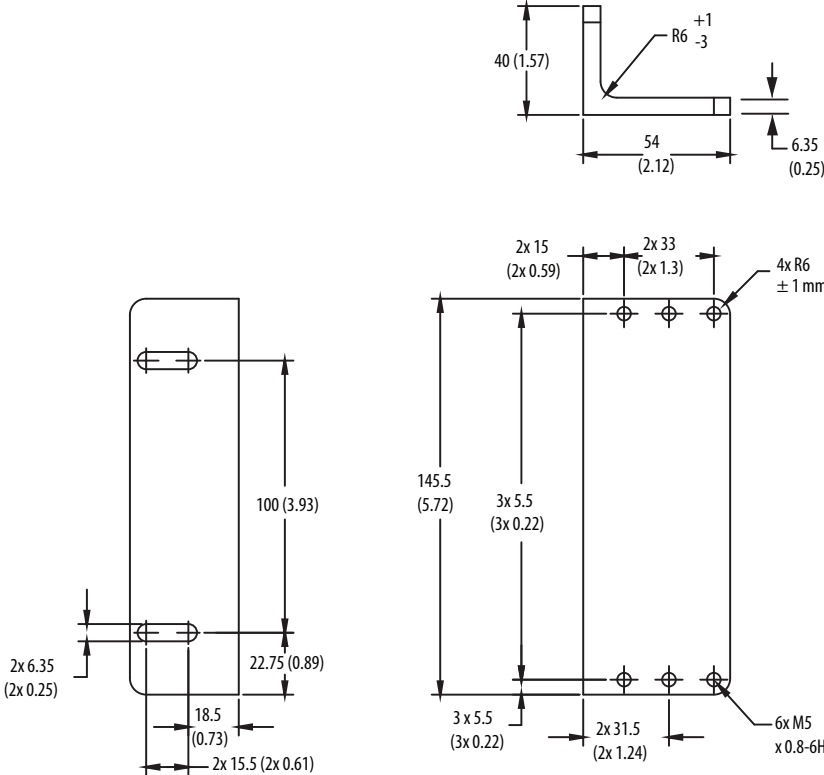
Switch Body



Actuator and Actuator Mounting Bracket



Switch Mounting Bracket 440G-LZAM2



Cat. Nos.

Complete switches, including switch body, actuator, and actuator mounting bracket.

| Type | Actuator Coding | Cat. No. | | | |
|------------------|--|----------------|----------------|---|----------------|
| | | Connection | | | |
| | | 3 m lead | 10 m lead | 6 in. pigtail with M12 8-pin Quick Disconnect | Auxiliary Type |
| Power to Release | Standard (Low level to EN ISO 14119:2013) | 440G-LZS21SPRA | 440G-LZS21SPRB | 440G-LZS21SPRH | Lock Status |
| | Unique (High level to EN ISO 14119:2013) | 440G-LZS21UPRA | 440G-LZS21UPRB | 440G-LZS21UPRH | Lock Status |
| Power to Lock | Standard (Low level to EN ISO 14119:2013) | 440G-LZS21SPLA | 440G-LZS21SPLB | 440G-LZS21SPLH | Lock Status |
| | Unique (High level to EN ISO 14119:2013) | 440G-LZS21UPLA | 440G-LZS21UPLB | 440G-LZS21UPLH | Lock Status |
| Power to Release | Standard (Low-level EN ISO 14119:2013) | 440G-LZS21STRA | 440G-LZS21STRB | 440G-LZS21STRH | Door Proximity |
| | Unique (High-level EN ISO 14119:2013) | 440G-LZS21UTRA | 440G-LZS21UTRB | 440G-LZS21UTRH | Door Proximity |
| Power to Lock | Standard (Low-level EN ISO 14119:2013) | 440G-LZS21STLA | 440G-LZS21STLB | 440G-LZS21STLH | Door Proximity |
| | Unique (High-level EN ISO 14119:2013) | 440G-LZS21UTLA | 440G-LZS21UTLB | 440G-LZS21UTLH | Door Proximity |

Spare actuators and actuator mounting bracket

| Type | Coding | Cat. No. |
|---------------------------|---|-------------|
| Power to Release | Standard (Low-level EN ISO 14119:2013) | 440G-LZASPR |
| | Unique (High-level EN ISO 14119:2013) | 440G-LZAUPR |
| Power to Lock | Standard (Low-level EN ISO 14119:2013) | 440G-LZASPL |
| | Unique (High-level EN ISO 14119:2013) | 440G-LZAUPL |
| Actuator mounting bracket | | 440G-LZAM1 |

Accessories

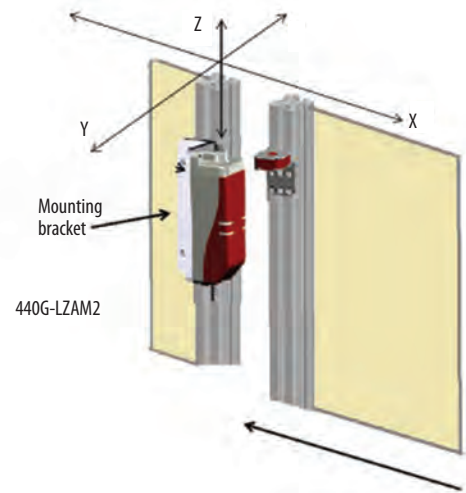
| Description | Cat. No. |
|------------------------------|------------|
| Switch body mounting bracket | 440G-LZAM2 |

Typical Installations

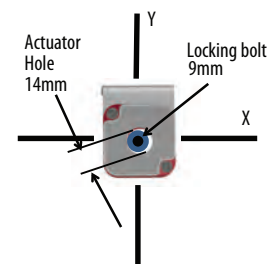
Switch Mounted Parallel to Hinge Axis

The X and Y positions can be adjusted using the slotted holes of the mounting bracket and appropriate selection of the three pairs of actuator bracket holes, once the bracket is centered.

The tolerance to misalignment is ± 2.5 mm (0.10 in.).



The Z (height) position is adjusted by sliding the actuator bracket up/down on the profile. If the setting gap is centered between the minimum of 0 mm and the maximum of 5 mm (0.20 in.), a tolerance to misalignment of ± 2.5 mm (0.10 in.) is achieved.



The Z position can be carefully selected to offset the anticipated door sag or door drop. Simultaneously, be sure that the alignment is such that it is not possible to lift the door up and off the locking bolt. Also make sure that there is no possibility that the actuator would collide with the switch when the guard door is being closed. It is essential to check the alignment periodically throughout the use of the guard locking switch.

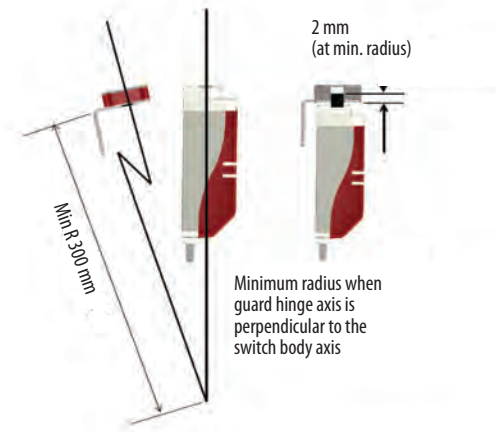
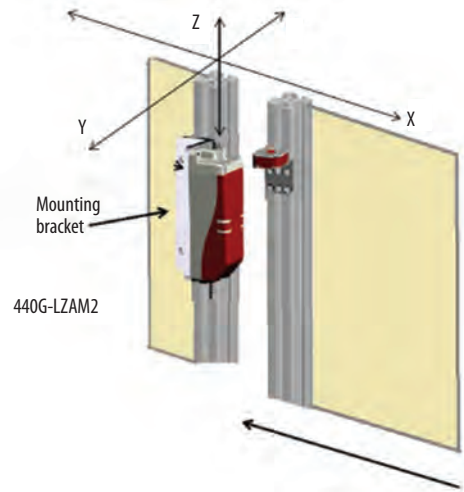
Switch Mounted Perpendicularly to Hinge Axis

The Z (height) position is adjusted by sliding the actuator bracket up/down on the profile. If the setting gap is centered between the minimum of 0 mm and the maximum of 5 mm (0.20 in.), a tolerance to misalignment of ± 2.5 mm (0.10 in.) is achieved.

The X and Y positions can be adjusted using spacers underneath the switch and appropriate selection of the three pairs of actuator bracket holes, once the bracket is centered.

The tolerance to misalignment is ± 2.5 mm (0.10 in.).

The Z position can be carefully selected to offset the anticipated door sag or door drop. Simultaneously, be sure that the alignment is such that it prohibits lifting the door up and off the locking bolt. Also check to be sure there is no possibility that the actuator would collide with the switch when closing the guard door. It is essential to check the alignment periodically throughout the use of the guard locking switch.

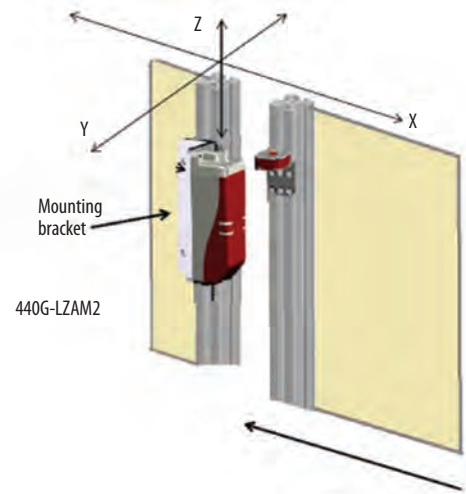


Switch Mounted to a Sliding Guard Door

The Z (height) position is adjusted by sliding the actuator bracket up/down on the profile. If the setting gap is centered between the minimum of 0 mm and the maximum of 5 mm (0.20 in.), a tolerance to misalignment of ± 2.5 mm (0.10 in.) is achieved.

The X and Y positions can be adjusted using the slotted holes of the mounting bracket and appropriate selection of the three pairs of actuator bracket holes, once the bracket is centered.

The tolerance to misalignment is ± 2.5 mm (0.10 in.).



EU Declaration of Conformity



EU Declaration of Conformity

| | | |
|--|--|-------------|
| <i>Identification of the product:</i> | Guard Locking Safety Switch | |
| <i>Name and address of the manufacturer:</i> | <i>Name and address of the authorised representative:</i> | |
| Rockwell Automation, Inc. 2 Executive Drive Chelmsford, MA 01824 USA | Rockwell Automation B.V. Rivium Promenade 160 2909 LM Capelle aan den IJssel The Netherlands | |
| <i>This declaration of conformity is issued under the sole responsibility of the manufacturer.</i> | | |
| <i>Object of the declaration:</i> | Allen Bradley / Guardmaster 440G-LZ21 Series <i>(reference the attached list of catalogue numbers)</i> | |
| <i>The object of the declaration described above is in conformity with the relevant EU harmonisation legislation:</i> | | |
| 2004/108/EC | EMC Directive | (EMC) |
| 2006/42/EC | Machinery Directive | (MD) |
| <i>References to the relevant harmonised standards used or references to the specifications in relation to which conformity is declared:</i> | | |
| EN 60947-1:2007 | Low-voltage switchgear and controlgear – Part 1: General rules | |
| EN 60947-5-3:1999 + A1:2005 | Low-voltage switchgear and controlgear – Part 5-3: Control circuit devices and switching elements – Requirements for proximity devices with defined behaviour under fault conditions (PDF) | |
| EN 60204-1:2006 + A1:2009 | Safety of Machinery – Electrical equipment of machines – General requirements | |
| IEC 61508: Part 1-7:2010 | Functional Safety of electrical /programmable electronic safety related systems | |
| EN ISO 13849-1:2008 | Safety related parts of control systems – Part 1: General principles of design | |
| EN 62061:2005 | Safety of Machinery – Functional safety of safety related electrical, electronic and programmable electronic control systems | |
| EN ISO 14119:2013 | Safety of Machinery – Interlocking devices associated with guards – Principles for design and selection | |
| <i>Notified Body:</i> | TUV Rheinland IndustrieService GmbH 51105 Koln Germany | |
| <i>performed:</i> | EU Type Examination | |
| <i>and issued the certificate:</i> | 968/EZ 616.00/13 | |
| <i>Additional information:</i> | | |
| <i>Person authorised to compile the technical file (MD):</i> | Authorised representative (see details above). | |
| <i>Product Safety Function (MD):</i> | Interlocking devices suitable for use in safety related applications up to PLe (EN ISO 13849-1) and SIL/SIL CL (EN 61508/EN 62061) | |
| <i>Signed for and on behalf of the above named manufacturer:</i> | | |
| <i>Place and date of issue:</i> | Milwaukee, WI USA | 11-Nov-2013 |
| <i>Name, function:</i> | Daniel L. Nachtigall, Technical Leader – Product Certification Engineering | |
| <i>Signature:</i> | | |

**Rockwell
Automation**

| Catalogue number | Series ¹ | Description | Directive ² | |
|--------------------|---------------------|---|------------------------|-----|
| | | | EMC | MD |
| 440G-LZ21**** | | Guard locking RFID non-contact safety switches | Yes | Yes |
| Accessories | | | | |
| 889D-F8AB-* | | Cordset for use with sensors with Micro (M12) connector | N/R | N/R |
| 889D-F8ABDM-* | | Patchcord for use with sensors with Micro (M12) connector | N/R | N/R |

1) If no series number is given, then all series are covered

2) Yes = Product is certified to this directive.

N/R = This directive is not required for this product

NOMENCLATURE:

| | | | | |
|------------|---|---|---|---|
| 440G-LZS21 | U | P | R | H |
| 1 | 2 | 3 | 4 | 5 |

| | |
|---|--|
| 1 | Designates Product Type 440G-LZS21 – Guard locking RFID non-contact safety switch w/2 safety outputs and 1 auxiliary output |
| 2 | Designates Actuator Coding Type U – Unique S – Standard code |
| 3 | Designates Sensor Type P – Plastic Switch |
| 4 | Designates Lock Mode R – Power to release L – Power to lock |
| 5 | Designates Connection Type H – 8 pin micro (M12) connector pigtail A – 3 meter cable B – 10 meter cable |

Rockwell Automation Support

Use the following resources to access support information.

| | | |
|---|---|---|
| Technical Support Center | Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates. | https://rockwellautomation.custhelp.com/ |
| Local Technical Support Phone Numbers | Locate the phone number for your country. | http://www.rockwellautomation.com/global/support/get-support-now.page |
| Direct Dial Codes | Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer. | http://www.rockwellautomation.com/global/support/direct-dial.page |
| Literature Library | Installation Instructions, Manuals, Brochures, and Technical Data. | http://www.rockwellautomation.com/global/literature-library/overview.page |
| Product Compatibility and Download Center (PCDC) | Get help determining how products interact, check features and capabilities, and find associated firmware. | http://www.rockwellautomation.com/global/support/pcdc.page |

Documentation Feedback

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