Installation Instructions

Original Instructions

Allen-Bradley

Guardmaster®

TLSZR/L-GD2 Guard Locking Switch

Catalog Numbers 440G-TZS21UPRH, 440G-TZS21UPLH, 440G-TZS21UTRH, 440G-TZS21UTLH

IMPORTANT	Do not attempt to install this device unless the installation instructions have been studied and understood. This installation instruction sheet is available in multiple languages at www.rockwellautomation.com/literature.

IMPORTANT	Ne pas tenter pas d'installer ce dispositif sans avoir étudié et compris les instructions d'installation. Cette notice d'installation est disponible dans certaines langues sur le site www.rockwellautomation.com/literature.

WICHTIG	Versuchen Sie nicht, dieses Gerät zu installieren, bevor Sie die Installationsanleitung gelesen und verstanden haben. Diese Installationsanleitung steht in mehreren Sprachen unter der folgenden Adresse zur Verfügung:www.rockwellautomation.com/literature.

IMPORTANTE	Non installare questo dispositivo senza prima avere letto e compreso le istruzioni per l'installazione. Queste istruzioni per l'installazione sono disponibili per alcune lingue sul sito www.rockwellautomation.com/literature.

IMPORTANTE	Não instale esse dispositivo sem estudar e compreender as instruções de instalação. Essa folha de instruções de instalação está disponível em algumas línguas em www.rockwellautomation.com/literature.

IMPORTANTE	No instale este dispositivo sin estudiar y entender las instrucciones de instalación. Esta hoja de instrucciones de instalación está disponible en algunos idiomas en www.rockwellautomation.com/literature.

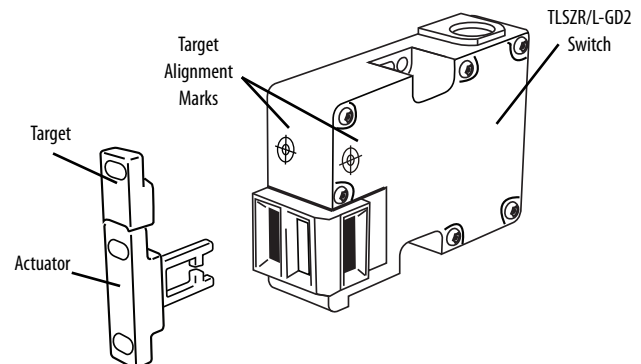| Viktigt	Läs monteringsanvisningen innan försök att installera enheten görs. Detta instruktionsblad finns tillgängligt på olika språk på www.rockwellautomation.com/literature.

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Summary of Changes

Added Auxiliary Out Function on page 3.

Installation Instructions

IMPORTANT	SAVE THESE INSTRUCTIONS FOR FUTURE USE

Target Alignment Marks

Target

Actuator

TLSZR/L-GD2 Switch

Allen-Bradley · Rockwell Software

Rockwell Automation

Installation must be in accordance with the following steps and stated specifications and conducted by competent personnel. The unit is not to be used as a mechanical stop. Guard stops and guides must be fitted. Adherence to the recommended maintenance instructions forms part of the warranty.

This device is intended to be part of the safety-related control system of a machine. Perform a risk assessment before installation to determine whether the specifications of this device are suitable for all operational and environmental characteristics of the machine. See Technical Specifications for certification information and ratings.

Use nonremovable screws, bolts, or nuts to mount the switch and actuators. Do not over torque the mounting hardware.

For use with flexible actuator only, 440G-A27143.

TLS-Z guard locking switches are classified according to ISO 14119 as Type 4 switching devices. The RFID targets are classified as having a high level of coding.

Measures are to be taken to minimize the need to defeat and to manage the use and availability of spare RFID targets.

> **ATTENTION:** Guard locking switches that are activated by the Power to Lock principle, 440G-TZS21UPLH, must only be used after a risk assessment has shown that the use of a Power to Release principle, 440G-TZS21UPRH, is inappropriate, since the guard can be immediately opened after a loss of the power supply or upon activation of the unlocking signal.

Technical Specifications

Safety Ratings

Standards	IEC 60947-5-3, IEC 60947-5-1, IEC 61508, EN ISO 13849-1, ISO 14119
Safety Classification and Functional Safety Data	Safety Classification of the guard door position and lock monitoring function is PLe, Category 4 to IEC 13949-1, IEC 61508. For details, see the Rockwell Automation® Functional Safety Data Sheet: http://literature.rockwellautomation.com/idc/groups/literature/documents/sr/safety-sr001_-en-e.pdf
Certifications	CE Marked for all applicable EU directives, c-UL-us (UL 508), and TÜV.

Operating Characteristics

TLSZR-GD2	Power to Release
TLSZL-GD2	Power to Lock
Assured Locking Distance [mm (in.)]	Maximum target distance: 13 (0.51) Maximum clearance between actuator base and switch in the door-closed position: 5 mm (0.2 in.) (See Clearance in Closed Position [mm (in)] (and Maximum Actuator Insertion Distance for Locking) on page 3)
Torque for M5 Mounting	1.4 Nm (12.39 lb-in.)
Torque for Cover Mounting	1.2 Nm (10.62 lb-in.)
Locking Force Fmax	Plastic pins: 1950 N (488 lb) Steel bolts: 2600 N (585 lb)
Locking Force Fzh (with EN/ISO 14119)	Plastic pins: 1500 N (337 lb) Steel bolts: 2000 N (450 lb)
Maximum Output Current (all outputs)	200 mA
Current Consumption - solenoid not energized (no load supply current)	50 mA
Current Consumption - solenoid energized (no load supply current)	120 mA (260 mA inrush)

Operating Characteristics

Solenoid Duty Cycle	100%
Off-State Current	< 0.5 mA DC
Maximum Number of Switches (connected in series)	Unlimited. See Unit Response Time on page 8
Operating Voltage Ue	24V DC +10% / -15%
Frequency of Operating Cycle	1 Hz maximum
Actuation Speed, Max.	160 mm (6.29 in.) per second
Actuation Speed, Min.	100 mm (3.94 in.) per minute
Response Time (Off)	75 ms first switch, 25 ms additional for each switch
Utilization Category (IEC 60947-5-2)	DC-13 24V 200 mA
Impulse Withstand Voltage Uimp	250V
Pollution Degree	3
Protection Class	2
Mechanical Life	1×10^6 cycles

Environmental

Operating Temperature [C (F)]	-10…+60 ℃ (+14…140 ℉)
Operating Humidity	5…95% relative
Risk Time	If the RFID door target moves outside of the operating distance, the safety outputs are deactivated after a maximum of 60 ms
Rated Insulation Voltage Ui	500V
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…55Hz
Radio frequency	IEC 61000-4-3 IEC 61000-4-6

The device can be used under normal service conditions. Maximum altitude up to 2000 m (6561.66 ft).

General

Housing Material	UL Approved glass-filled PBT
Actuator Material	Stainless steel
Target Material	UL Approved glass-filled PBT
Connection	M12 8-pin connector

Protection (the Outputs Are Short Circuit Protected)

Short Circuit Protection	Incorporated
Current Limitation	Incorporated
Overload Protection	Incorporated
False Pulse Protection	Incorporated
Transient Noise Protection	Incorporated
Reverse Polarity Protection	Incorporated
Overvoltage Protection	Incorporated
Thermal Shutdown/Restart	Incorporated

Outputs

Outputs	Description	Status
Safety	2 x PNP, 0.2 A max.	ON (+24V DC)

Voltage drop 2V maximum

Auxiliary Out Function

Lock and door position status are available for auxiliary output.

Lock Status (440G-TZS21UPRH and 440G-TZS21UPLH): Auxiliary output changes state when the lock is either unlocked or locked independent of the OSSD status.

Lock Status	AUX (QD Pin 1)
Unlocked	High, 24V (0.2 A max.)
Locked	Low, 0V

Door Position Status (440G-TZS21UTRH and 440G-TZS21UTLH): Auxiliary output changes state when the actuator key is either inserted or withdrawn. If the AUX is high (24V) the switch can lock, position sensing of the actuator is accomplished by an internal microswitch.

| Door Position Status	AUX (QD Pin 1)
Actuator key that is withdrawn	Low, 0V
Actuator key that is inserted	High, 24V (0.2 A max.)

OSSD Outputs and Pulse Testing

The safety inputs are Safety A+ and Safety B+.

The OSSD outputs are Safety A and Safety B with the safe state defined as 0V (guard door open or not locked).

The safety outputs use test pulses to detect short circuit and cross-wire short detection. The cross-short pulses are asynchronous of duration 0.1 ms repeats every 11 s and the short circuit pulses are synchronous of duration of 0.5 ms repeats every 11 s. The connected control system must be tolerant of these pulses.
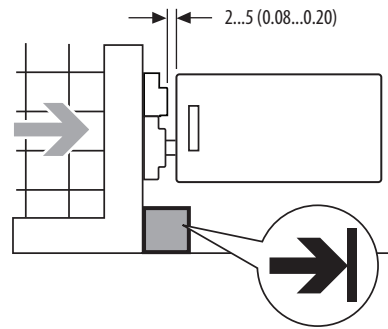
Allowable Approach Directions
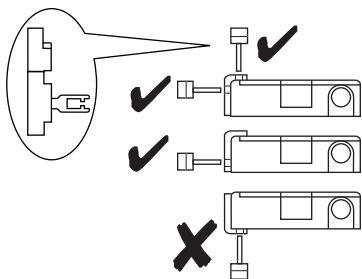
The actuator and target are always be mounted as "close coupled" and can approach the switch in any of the three entry slot positions shown.

Approach from the underside is not allowed.

Figure 1 - Clearance in Closed Position [mm (in)] (and Maximum Actuator Insertion Distance for Locking)
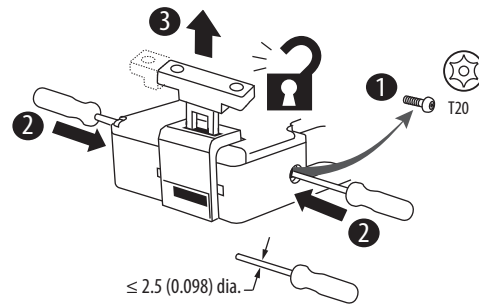

IMPORTANT	Do not use the switch as a guard stop.

Provide a separate mechanical stop to protect the switch.

- Minimum clearance: 2 (0.08)
- Maximum assured locking distance: 5 (0.20)

Auxiliary/Manual Release [mm (in.)]

If power is supplied to the switch and the switch is in the locked state, operation of the auxiliary release causes the switch to enter a fault condition (blinking red light-emitting diode).

To reset the switch, cycle the power.

A manual release is possible by removing the secure Torx screws and pressing the internal mechanism.

Minimum Operating Radius [mm (in.)]
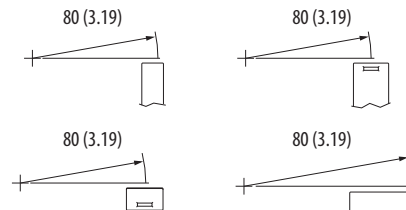
Minimum operating radius is for all planes of approach of the actuator key, both along the length and perpendicular to the key. Use the two setscrews on the actuator to optimize the key angle.

Manual Override Key for Power to Release Version

1.2 N•m (10.62 lb•in)
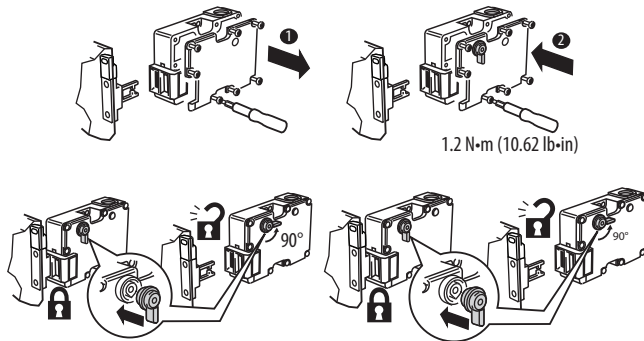
The cover with manual override key is intended for use with a Power to Release version TLSZR-GD2. It provides an auxiliary release function for use when power is not available to achieve automatic/electrical interlocking.

Mounting Restrictions

If a pair of TLS-Z switches is mounted close to each other, the two inductive fields interact causing crosstalk, which results in nuisance faults and false operation.

An absolute minimum of 200 mm (8 in.) must be used to help achieve correct operation.

The restriction applies if a TLS-Z switch is mounted close to the 440G-LZ guard locking and the 440N-Z SensaGuard™ switches.

Connections

8-Pin Micro (M12)

3 Lock Command
8 Safety A+
4 Safety B+
5 Safety A
2 24V DC+
1 Aux
7 0V
6 Safety B

	Color	Function	Pin
8-Pin Cordset 889D-F8AB-* or cable version	White	Aux	1
	Brown	24V DC+	2
	Green	Lock	3
	Yellow	Safety B+ OSSD Input	4
	Gray	Safety A OSSD Output	5
	Pink	Safety B OSSD Output	6
	Blue	Gnd / 0V	7
	Red	Safety A+ OSSD Input	8

* Replace symbol with 2 (2 m), 5 (5 m), or 10 (10 m) for standard cable lengths.

Status/Diagnostic LED Indicator

Operating

Status/Diagnostic LED State	Meaning
Solid Green	Door/guard closed and locked, safety outputs active.
Solid Red	Door/guard not locked, safety outputs off.
Blinking Red	Unit failure. See Troubleshooting.
Blinking Green	Door/guard closed and locked, no input signal.

Troubleshooting

Status/ Diagnostic LED State	Status	Troubleshooting
Off	Not powered	—
Solid Green	OSSD on	—
Solid Red	OSSD not active	—
Blinking Green	Power up test or Safety inputs not present	Check 24V DC or OSSD inputs (yellow and red wire)
Blinking Red	1 Hz Flash: Recoverable fault 4 Hz Flash: Non-recoverable fault	Recoverable fault: Check OSSD. Outputs are not shorted to GND, 24V DC, or each other. Cycle power. Non-recoverable fault: Cycle power.

For Learn Process light-emitting diode error codes, see <u>Status/ Diagnostic LED Error Codes during the Learn Process on page 5</u>.

If there's an internal fault, the switch disables the OSSD outputs. Safety A and Safety B to the safe state 0V and the diagnostic output light-emitting diode flashes red at 1 Hz or 4 Hz, depending on the fault.

Commissioning

Before use, the switch must first "learn" a new RFID door target. This step is not done at the factory, as there are two options:

- **"Multi-Time" learn:** the switch can learn up to eight targets consecutively
- **"One-Time" learn:** the switch can learn just one target, for life, non-reversible*
  - "One-Time" learn can be invoked at any time, not just at commissioning. For example, the switch could "Multi-Time" learn consecutively four different targets, and then complete a "One-Time" learn that would help prevent it from learning any more targets.

IMPORTANT	During the learning process, the target and actuator must always be inserted or withdrawn from the switch together in their normal mounting configuration. If the target is introduced or withdrawn without the actuator, or the actuator is inserted without the target present, then it's possible a non-recoverable fault condition occurs (requiring you to power off-on cycle).

"Multi-time" Learn Process

Learning the First "Multi-time" Target

- Connect the switch to 24V DC (see Wiring Diagrams on page 8). The Status/Diagnostic light-emitting diode blinks the number of times a new target can be learned (eight times when new). Then repeats, which indicates that the switch has not yet learned a target.

- The switch automatically starts the learning process as soon as a target and actuator are placed into the door-closed, locked position of the switch

IMPORTANT	Leave the target/actuator in the door-closed position during the learning process. If they are removed during the learning process, the ability to learn an additional target is disabled.

The learning sequence as indicated by Status/Diagnostic light-emitting diode:

- Target present: Blinking Green, 1 Hz rate
- Verifying target: Blinking Green/Red, 1 Hz rate (15 s)
- Programming switch: Blinking Green/Red, 4 Hz rate (15 s)
- Programming finalizing: Blinking Green (number of learns left, 15 sec)
- Verifying target: Blinking Green/Red, 1 Hz rate (15 s)
- Ready state (learn is completed):   Solid Green (TLSZR), Solid Red (TLSZL)

Learning Additional New "Multi-time" Targets

Mount the new target to the door and repeat the previous process, introduce the target and actuator to the switch as described. While finalizing the program, the light-emitting diode blinks Green indicating the number of learns remaining.

"One-time" Learn Process

- Proceed as the "Multi-time" learn process indicates except that at the programs completion stage withdraw the target and actuator from the switch until the light-emitting diode turns to solid Red. Then replace the target and actuator back to the switch. This action must be completed within 15 s.

- The light-emitting diode blinks and then turns solid to indicate that learn is complete:

    TLSZR: Solid green
    TLSZL: Solid red

IMPORTANT	For power-to-unlock switches, to be able to withdraw the target and actuator away from the switch as described it is necessary to execute a manual release.

Status/Diagnostic LED Error Codes during the Learn Process

These code sequences persist until the power off-on cycle is undertaken.

Status/Diagnostic LED - Flashes (4 Hz)	Error Code
Red-Red-Red-Green-Green	Target already learned
Red-Red-Red-Green-Green-Green	Bad RFID; target that is moved out of range
Red-Red-Red-Green-Green-Green-Green	Exceeded learning eight targets
Red-Red-Red-Green-Green-Green-Green-Green	Unit is locked to One-time learn; cannot learn another target

For operating Status/Diagnostic light-emitting diode codes, see Status/Diagnostic LED Indicator on page 4.

Functional Testing

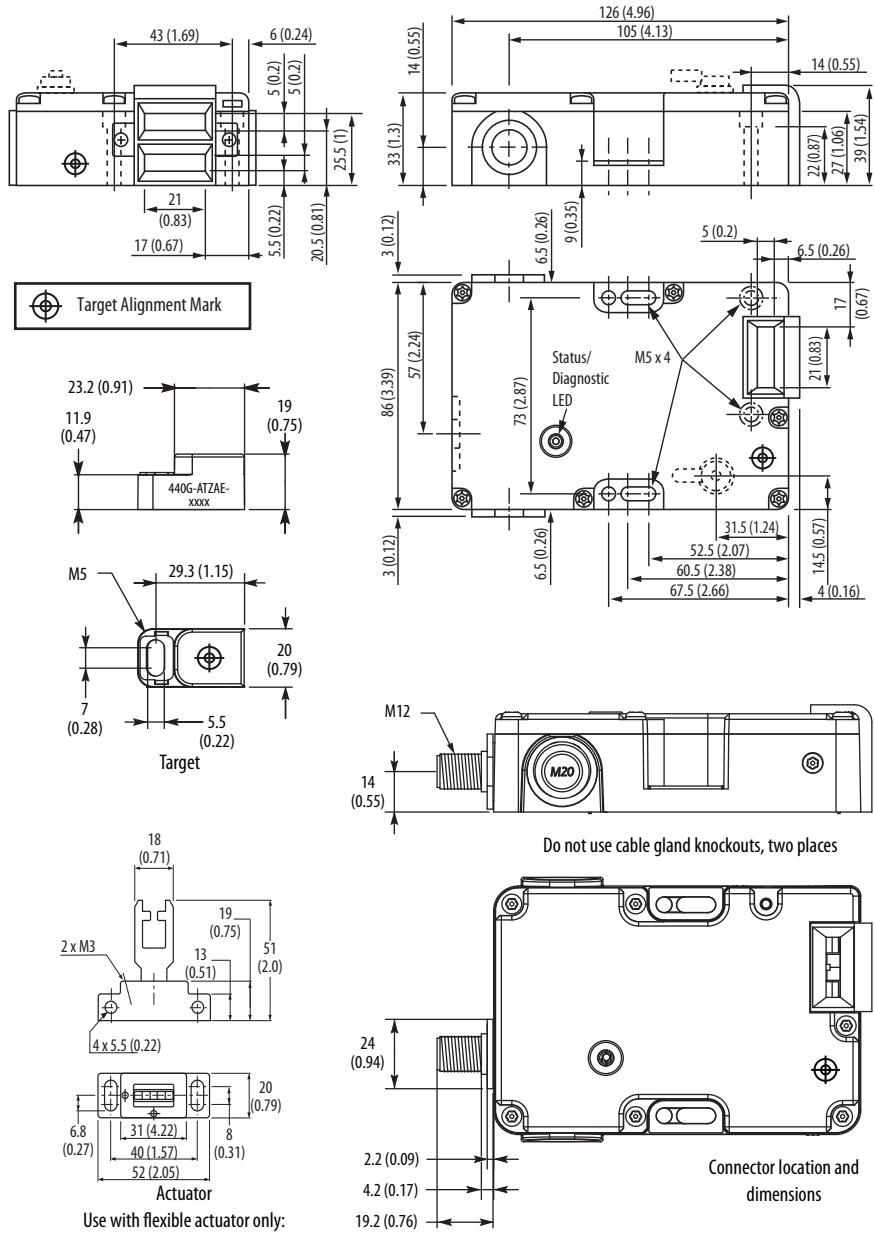A manual functional electric test must be made:

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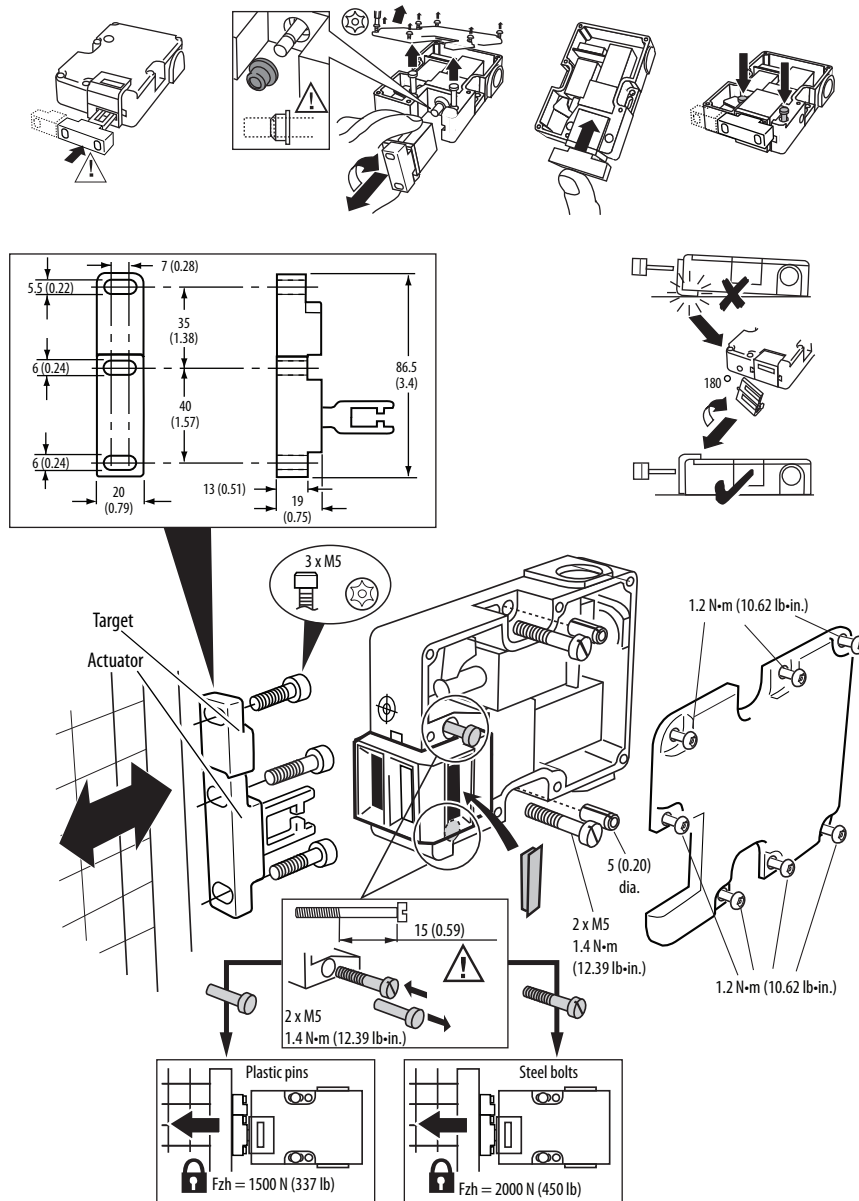   - Less than once per year for SIL 2/PLd

⚠	**ATTENTION:** During the functional test, confirm that there are no persons in the danger area and that the machine startup causes no hazard.

1. Confirm 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 light-emitting diode shows solid red.

3. Test to confirm the machine cannot start.

4. Confirm the lock control at pin 3 is set to 0V for PTR and 24V for PTL types.

5. Test again to confirm the machine cannot start.

6. Close the guard door and then confirm the guard is mechanically locked and the diagnostic light-emitting diode shows solid green.

7. Test to confirm the machine can now start.

8. Change the lock control at pin 3...24V for PTR and 0V for PTL types.

9. Confirm the machine stops, the guard door is mechanically unlocked, and the machine cannot restart.
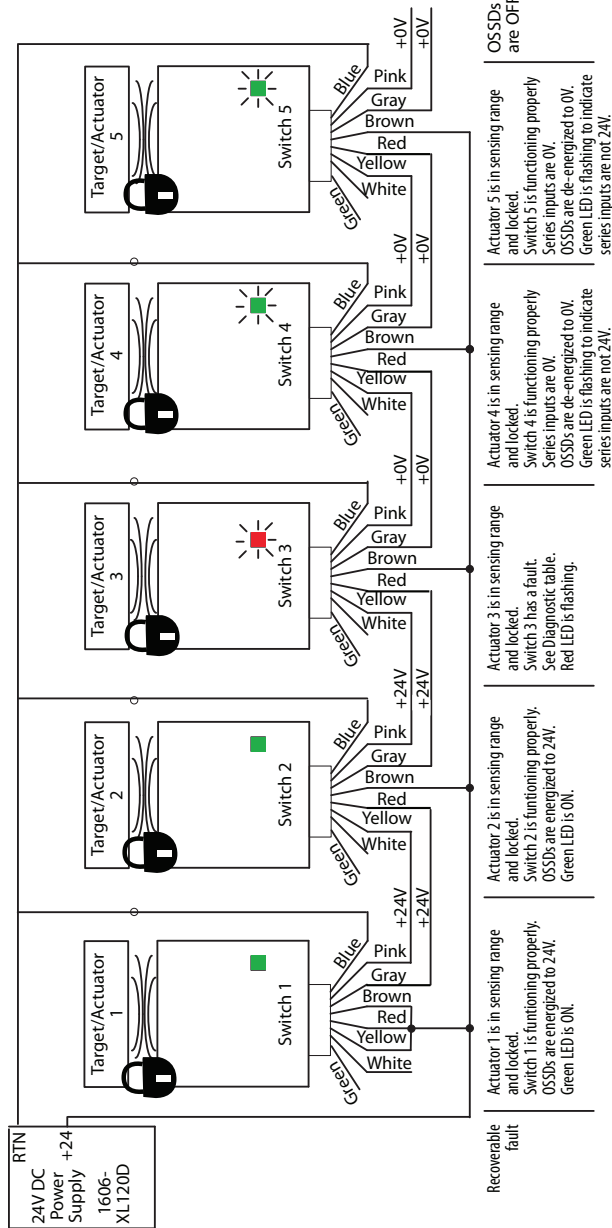
Dimensions [mm (in.)]

Target Alignment Mark

23.2 (0.91)

11.9 (0.47)

19 (0.75)

440G-ATZAE-xxxx

M5

29.3 (1.15)

20 (0.79)

7 (0.28)

5.5 (0.22)

Target

43 (1.69)

6 (0.24)

5 (0.2)

5 (0.2)

25.5 (1)

21 (0.83)

5.5 (0.22)

20.5 (0.81)

17 (0.67)

126 (4.96)

105 (4.13)

14 (0.55)

14 (0.55)

33 (1.3)

22 (0.87)

27 (1.06)

39 (1.54)

3 (0.12)

6.5 (0.26)

9 (0.35)

5 (0.2)

6.5 (0.26)

17 (0.67)

86 (3.39)

57 (2.24)

73 (2.87)

Status/Diagnostic LED

M5 x 4

21 (0.83)

3 (0.12)

6.5 (0.26)

31.5 (1.24)

52.5 (2.07)

60.5 (2.38)

67.5 (2.66)

14.5 (0.57)

4 (0.16)

M12

14 (0.55)

M20

Do not use cable gland knockouts, two places

18 (0.71)

2 x M3

19 (0.75)

13 (0.51)

51 (2.0)

4 x 5.5 (0.22)

20 (0.79)

6.8 (0.27)

31 (4.22)

40 (1.57)

52 (2.05)

8 (0.31)

Actuator

Use with flexible actuator only:

24 (0.94)

2.2 (0.09)

4.2 (0.17)

19.2 (0.76)

Connector location and dimensions

Mounting Information [mm (in.)]

Wiring Diagrams

Troubleshooting Series Circuit

Unit Response Time

(Excludes relay response time)
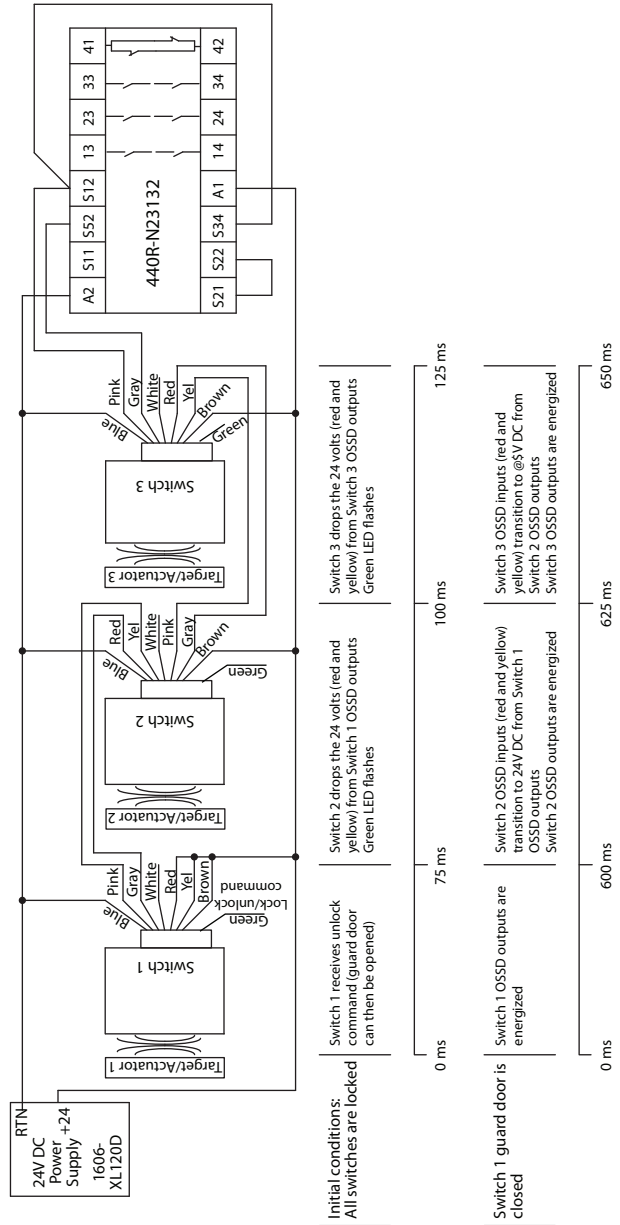
Application Wiring Example

DI = 440R-D22R2

EMD =440R-EM4R2D
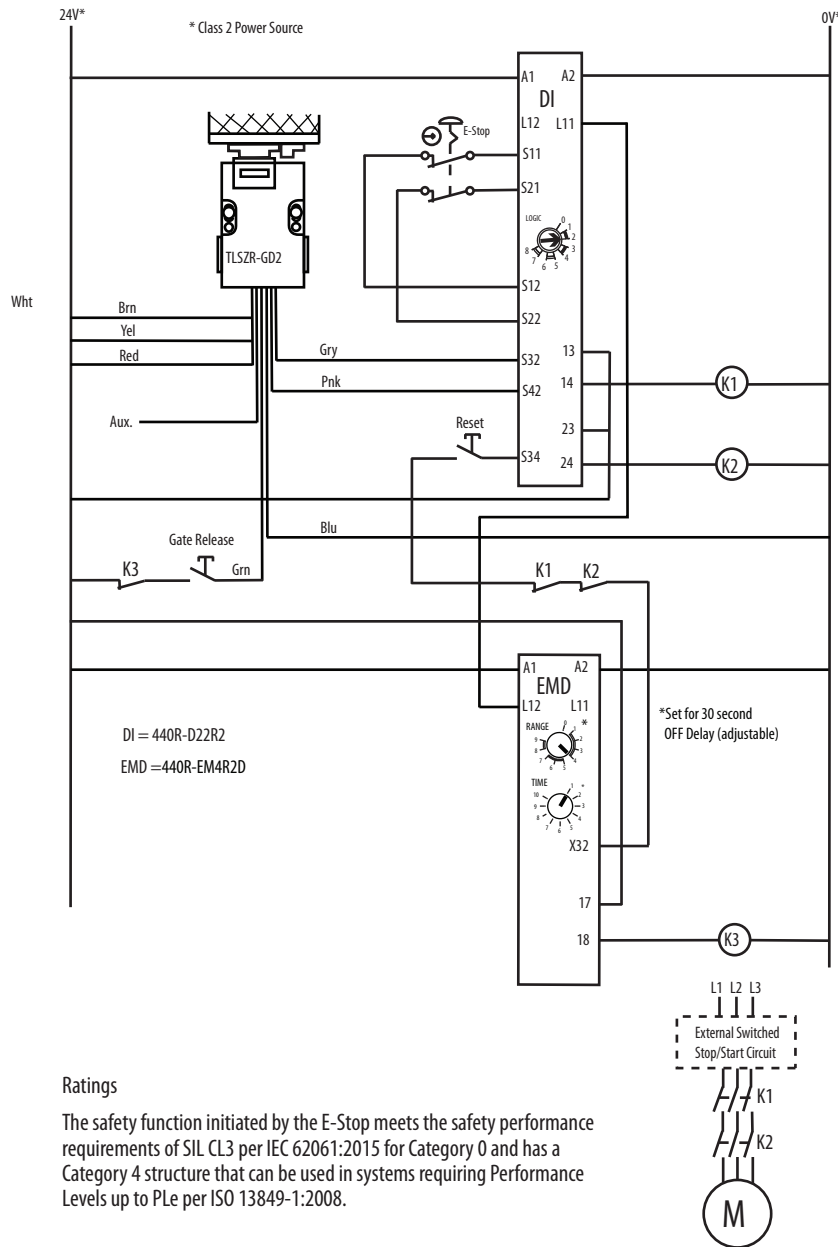
Ratings

The safety function initiated by the E-Stop meets the safety performance requirements of SIL CL3 per IEC 62061:2015 for Category 0 and has a Category 4 structure that can be used in systems requiring Performance Levels up to PLe per ISO 13849-1:2008.

Recommended Relays

Guardmaster® safety relay family, (440R-D22R2, 440R-D22S2, 440R-S12R2, 440R-S13R2, 440R-GL4S2P, 440R-GL4S2T), MSR 57, MSR126, MSR127, MSR131, MSR138, MSR211, MSR320, SmartGuard™, Safety PLC I/O.
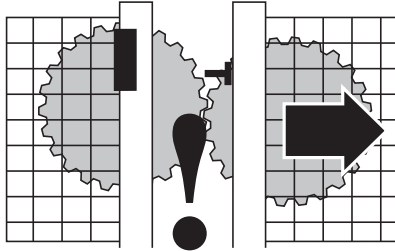
Check that the machine is isolated and stopped whenever the interlocked guard door is open.

IMPORTANT	After installation and commissioning, the actuator, switch, and switch lid mounting screws are coated with tamper evident varnish or similar compound.

Maintenance

Every week check for signs of abuse or interference. Check for missing screws, particularly for the manual release, which can indicate abuse or interference. Check for damage which can cause loss of sealing at the lid or conduit entry.

If there is any malfunction or damage, no attempts at repair can be made. The unit must be replaced before machine operation is allowed. DO NOT DISMANTLE THE UNIT.

$C\,E$ Declaration of Conformity

This product conforms to the Essential Health and Safety Requirements (EHSRs) of the relevant European Directives.

Copies of this certification are available at
http://www.rockwellautomation.com/certification/overview.page

Notes:

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

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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-e.pdf.

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

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